Big Salmon Complex versus Iberian pyrite Belt: lithologic, geochemical and tectonic comparisons

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Introduction

More than 1700 80-A mappable stratigraphic units exceeding 100 m in section height, with 95% of the units having a 25% or greater relative abundance, have been recognized in the Big Salmon Complex (BSC). These units are dominated by interbedded sandstones, siltstones, and minor conglomerates of volcanoclastic and volcanogenic origin. There is consistent, widespread distribution of primary coal and the relatively common occurrence of interbedded carbonaceous siltstone and shale, indicating a marine sedimentary origin in the lower Paleozoic. The spatial lateral coarsening and preferential preservation of the coarse beds in the lower Paleozoic suggests a transgressive-regressive sequence deposited in a passive margin setting. The preservation of the sediments and the relative abundance of volcanoclastic and volcanogenic rocks are consistent with the inferred presence of a volcanic arc in the southern boundary of the North American Plate. The regional distribution and relative abundance of the BSC units suggest a time of deposition of at least several million years and a spatial extent of at least several hundred kilometers. The presence of significant amounts of carbon and the distribution of other elements (e.g., strontium, barium) suggest that the BSC represents a significant euxinic basin in the late Paleozoic.

Location

Figure 1. Location of the Big Salmon Complex and the Iberian Pyrite Belt. The data sources are the BSC crinkle chert, IPB chert, and BSC mafic volcanics. The location of the BSC crinkle chert is shown in Figure 2, which also shows the location of the IPB chert. The BSC mafic volcanics are shown in Figure 3, which also shows the location of the BSC mafic volcanics.

Additional Sources:

Recent discoveries of volcanogenic massive sulphide (VMS) deposits in Yukon-Tanana Terrane (YTT) rocks of the southern Yukon (e.g. Kudz Ze Kayah, Wolverine, Fyke Lake) has focused attention on the VMS potential of the proposed southern extension of the Yukon-Tanana Terrane within British Columbia. The Big Salmon project was initiated in 1997 with the aim of determining the tectonic affiliation of the Big Salmon Complex (BSC), a polymetallic massive sulphide (VMS) deposit in Yukon-Tanana Terrane (YTT) rocks of the southern Yukon. Work on the BSC project was postponed within British Columbia. The Big Salmon infrastructure and expertise through the Yukon-Tanana Terrane (YTT) rocks of the southern Yukon border and east of Teslin Lake areas including 104N/9 and 104O/11. The mapping area extends for 70km from the Yukon border to the south, about 54km to the north.

Mapping in 2000 was aimed at providing fill-in traverses, principally in 104O/14W, and to address systematic problems illuminated during completion of 104O/13, especially around the Cannareng property.

**Mineral Potential**

Within the entire Big Salmon Complex in British Columbia, the only known mineral resource potential occurs at MINERCO (see Table 5, in the Appendix). Any proposed exploration program must be based on a thorough understanding of the geology of the area. The BSC project has identified a polymetallic deposit with significant VMS potential. The deposit is hosted by a suite of metavolcanic rocks and sedimentary strata that are interpreted to represent a back-arc basin setting. The deposit is characterized by a series of mineralized zones that extend for several hundred meters in the north-south direction. The mineralization is hosted by a sequence of metavolcanic rocks, including andesite, dacite, and rhyolite, and is associated with a series of hydrothermal alteration zones, including quartz-sericite, albite, and pyrite. The deposit is located within a regional tectonic zone that is associated with the Tintina Fault, a major dextral fault that extends for over 1000 km across northern British Columbia and into Alaska.

**Regional Geology**

The Big Salmon Complex is located in the Cache Creek Terrane, a composite terrane composed of several allochthonous thrust sheets. The Cache Creek Terrane is characterized by a suite of metavolcanic and metasedimentary rocks that are interpreted to represent an oceanic to continental arc setting. The terrane is bounded by the Cache Creek Fault, a major dextral fault that extends for over 1000 km across northern British Columbia and into Alaska. The Cache Creek Terrane is characterized by a suite of metavolcanic and metasedimentary rocks that are interpreted to represent an oceanic to continental arc setting. The terrane is bounded by the Cache Creek Fault, a major dextral fault that extends for over 1000 km across northern British Columbia and into Alaska.
Mapping results from the Big Salmon Project (Yukon-Tanana Terrane)

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INTRODUCTION

Regional geological mapping of the Big Salmon Complex in northwestern British Columbia (104N09 & 10 and 104O12, 13 & 14) was conducted in 1999 under the aegis of the Ancient Pacific Margin National Mapping Program (NATMAP, Fig. 1). This mapping builds on 1997 reconnaissance work that confirmed long-standing correlations between the Big Salmon Complex in British Columbia and the Yukon (Fig. 2a).

In southern Yukon, Big Salmon Complex (BSC) rocks have been included with the Kootenay Terrane (Gordey, 1995) which include the Lower and Middle Units of the Yukon-Tanana Terrane (YTT) as used by Mortensen (1992). However, the extension of this belt of rocks within B.C. was included with the oceanic Slide Mountain terrane (SM). REE data do not permit the SM assignment, but confirm the YTT association. This correlation is important because YTT rocks, historically ignored by mineral exploration geologists, have been the focus of mineral exploration programs since 1993 with the discovery of mineralized float at what came to be the Kuda Ze Kayah deposit. Other exploration successes include the Wolverine and Fyre Lake volcaniclastic massive sulphide deposits.

STRATIGRAPHY

A persistent stratigraphy provides the foundation for correlating from one area to another in the Big Salmon Complex. In B.C., three distinctive and contrasting units are recognized as forming a marker succession. Based on new isotopic and geologic constraints, their stratigraphic order, inverted from that of Mihalynuk et al. (1998), is now known to be (oldest to youngest):

- 1200 m of tuffite-dominated greenstone;
- 20-50 m of thinly bedded, finely laminated manganiferous crinkle chert / quartzite with muscovite partings;
- >1000 m of heterogeneous, quartz-rich clastics interbedded with thin limestone and mafic and felsic tuffs.

In general terms, the BSC stratigraphy might be correlatable with the stratigraphy farther north in the Glenlyon and Finlayson Lake areas. Such correlations are important because the prolifically mineralized horizons in the Finlayson Lake area appear to have temporal equivalents in the BSC, and these could be similarly mineralized.

GEOCHRONOLOGY

Critical age data from two units provide a younging direction within the stratigraphy. Hazel orthogneiss occurs within the greenstone unit, which it apparently cuts, thereby providing a minimum age on the greenstone which underlies more than half of the map area. Intermediate to felsic tuff that is interbedded with limestone on the north flank of Mount Francis is believed to occupy one of the highest stratigraphic positions within the Big Salmon Complex (Fig. 3).

Mount Hazel orthogneiss

Eight fractions of the clearest and coarsest grains available all gave discordant results (2-10% discordant), with ellipses aligned in a linear fashion. An upper intercept of 362.3±7.6 Ma is interpreted as the best estimate for the igneous age of the Mt. Hazel pluton. A well-defined lower intercept of 189±16 Ma may correspond with the time of Pb loss, possibly due to a late deformational event which produces a strong fabric in the circa 196 Ma Coconino tonalite, whereas the circa 185 Ma Simpson Peak batholith is mostly undeformed.

Mount Francis dacitic tuff

Seven strongly abraded fractions of the clearest grains available all likely show the effects of Pb loss, despite abrasion. Four fractions (A, F, G and H) are discordant, and are inferred to contain significant inheritance; they give 207Pb/206Pb ages of ca. 546-1235 Ma. Fractions B and C give 207Pb/206Pb ages of about 325 Ma. The weighted average 207Pb/206Pb age for these two fractions, 325±4.5 Ma, provides the best estimate for the age of the rock.

MAPPING BY:

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MINERALIZATION

Several new mineralized zones were discovered in 1999. They are either intrusion-related gold veins or stratiform copper-rich lenses in crinkle chert. One pyritic sericite schist is geochemically unremarkable, but extensive. Along west shore of northern Teslin Lake, 6 km south of the Yukon border, a set of moderately to steeply west to northwest dipping, west-side-up brittle shears are spaced about 5-10 metres apart within an Eocene granitoid body. They are invaded by pyritic quartz veins with rare malachite staining. One 2-3 cm thick vein with a 20 centimetre alteration envelope was chip sampled for 2.5 metres along its length. The sample returned 1.30 ppm Au, 0.4% Ag, and 194 ppm Sb.

Numerous occurrences of minor sulphide mineralization and copper staining were encountered in the crinkle chert unit, further indication of its high mineral content. Most significantly, a chlorite porphyroblastic 6 metre by 0.5 metre lens with disseminated chalcopyrite returned 0.9% Cu, 0.3g Au, 2.9g Ag, 6.8% Fe, and 0.17% Ba from a chip sample across its width.

Pyritic-rich sericite schist crops out at many localities within the map area. Most extensive are those near the Jennings River “knee” occurring within a regional quartz-phyric horizon of probable dacite composition. Despite scarp exposures, the felsic host unit is intermittently exposed for at least 15 km, representing a significant mineralizing system. Most ground is open for staking as of Jan 19, 2000 (Fig. 4).

Fig. 1. Fig. 2a. Fig. 3. Fig. 4. Fig. 5.