STRATIGRAPHY AND STRUCTURE OF THE ELDORADO MOUNTAIN AREA, CHILCOTIN RANGES, SOUTHWESTERN BRITISH COLUMBIA*
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By John I. Garver
University of Washington
and
P. Schiarizza and R.G. Gaba

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INTRODUCTION

The Eldorado Mountain area has been the focus of several recent tectonostratigraphic and structural studies (Rusmore, 1985; Garver, 1987; Garver *et al.*, 1988; Glover *et al.*, 1988a; Umhoefer *et al.*, 1988a, 1988b) in an attempt to better understand the tectonic evolution of various terranes and overlap sequences of this important area situated between the Insular and Intermontane superterranes (Figure 1-15-1). Previous detailed mapping in the Eldorado Creek area by Rusmore (1985), the Taylor Creek area by Garver (unpublished) and the Tyaughton Creek area by Umhoefer *et al.* (1988b) was incorporated in our 1988 mapping program undertaken in conjunction with the Taseko–Bridge River 1:50 000 mapping project (Glover and Schiarizza, 1987; Glover *et al.*, 1987, 1988a, 1988b; Garver *et al.*, 1989; Schiarizza *et al.*, 1989, this volume). Results of the current mapping include the identification of a pervasive Late Cretaceous strike-slip system and evidence for mid-Cretaceous compressional structures. Recognition of these structures has been made possible only through detailed documentation and complete understanding of the regional stratigraphy. The coincidence of precious and base metal concentrations along Cretaceous strike-slip faults suggests spatial and possibly temporal relationships between faults and metal distribution in the Bridge River mining camp.

LITHOLOGY

BRIDGE RIVER COMPLEX

In the Eldorado Mountain area (Figure 1-15-2), the Bridge River complex (Potter, 1983, 1986) is a heterogeneous assemblage of structurally juxtaposed chert and metachert, chert-rich clastic rocks, green volcanic sandstone, greenstone, blueschist and greenschist, and serpentinite. Metamorphic mineral assemblages include quartz-carbonate, prehnite-pumpellyite, epidote-actinolite and lawsonite-crossite. Rapid changes in metamorphic grade within the assemblage are the result of postmetamorphic imbrication and structural repetition. The rock types comprising the Bridge River complex are described below.

CHERT-RICH CLASTIC ROCKS

Interbedded argillite, sandstone, chert-rich conglomerate and bedded chert occur within the Bridge River complex west of the Castle Pass fault (Figure 1-15-2). The conglomerate and sandstone are crudely graded, clast supported, generally poorly sorted and in depositional contact with argillite and bedded chert. These rocks are internally disrupted and stratigraphic trends are unknown. This unit is, however, spatially associated with interbedded black argillite and chert that may be related stratigraphically.

The chert-rich clastic rocks contain clasts and detrital grains of radiolarian-bearing chert and recrystallized chert, fragments of silicic to intermediate volcanic rock, fragments of clastic sedimentary rock, and minor plagioclase. The clastic sedimentary fragments are dominantly fine-grained volcanic arkoses. This unit may represent local reworking of stratigraphically(?) lower parts of the Bridge River complex.

The chert-rich clastic rocks generally have bedding-parallel foliation; thin-bedded layers are commonly isoclinally folded. Although these rocks have a penetrative cleavage, their metamorphic grade is quite low. Metamorphic assemblages, which occur in veins and in the matrix, include carbonate-quartz or smectite-illite. The age of these rocks is not known

GREEN VOLCANIC-LITHIC SANDSTONE

Interbedded green volcanic-lithic sandstone and minor mudstone are sparsely distributed in the Bridge River complex. The most extensive exposure is in a fault-bound panel within the Marshall Creek fault system near Liza Lake (Schiarizza *et al.*, 1989, this volume). Smaller isolated exposures occur in the upper Pearson Creek drainage (Figure 1-15-2; Garver *et al.*, 1989). These rocks are typically massive to thin-bedded, green-weathering sandstone with minor interbeds of black mudstone. Internal disruption prohibits stratigraphic analysis. These clastic rocks are commonly imbricated with a greenstone unit.

Detrital grains in the coarse-grained sandstone are dominated by felsic and intermediate volcanic rock fragments,

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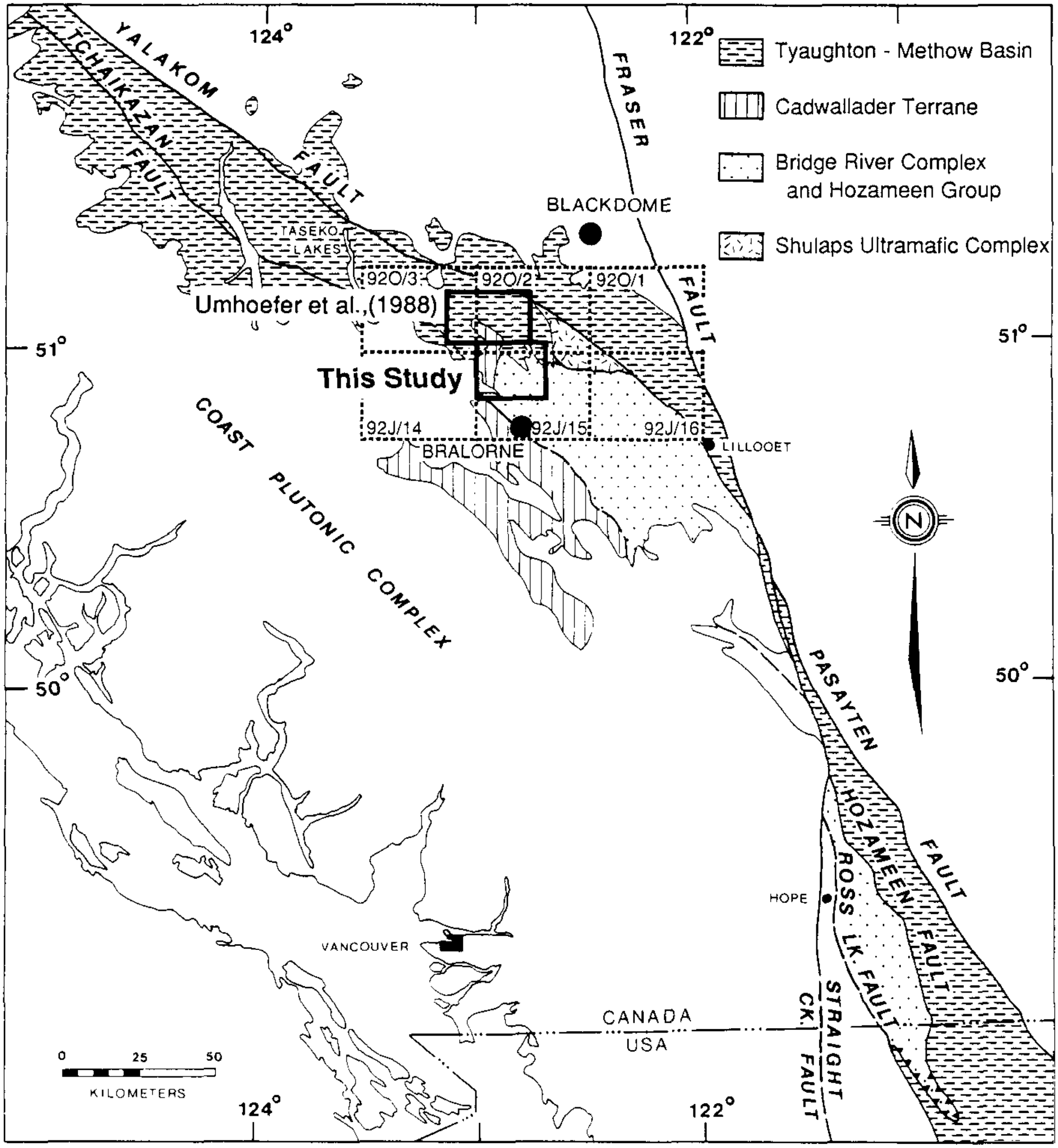


Figure 1-15-1. Location and geologic setting of the map area, showing adjoining mapping projects.

plagioclase and quartz which occurs as unstrained angular fragments; strained, vacuole-rich grains commonly with interlocking plagioclase grains; and quartz tectonites. The variation in the quartz grains suggests that volcanic, plutonic and metamorphic sources supplied detritus to the unit.

The green volcanic sandstone is generally unfoliated and cut by small-scale faults and fractures indicative of pervasive brittle deformation. The metamorphic grade is low; overgrowths and veins include carbonate, prehnite and carbonate, and pumpellyite. The age of this unit is not known.

Chert and Metachert

Bedded chert is a common constituent of the Bridge River complex. Beds of grey, green, black, red and yellow-brown chert, 1 to 10 centimetres thick, are commonly interbedded

Plate 1-15-1. Gently folded chert of the Bridge River complex that occurs directly below the overturned unconformity of the overlying Dash conglomerate. Photograph is in the Taylor Creek drainage looking to the northeast at the overturned strata of the Silverquick conglomerate.

with minor argillite. Bedded chert is in depositional contact with argillite and sandstone, limestone, and greenstone. Metachert is typically recrystallized, quartz veined and complexly folded. Chert with characteristics transitional between bedded and recrystallized chert is equally abundant.

Chert occurs as relatively undeformed and gently warped panels (Plate 1-15-1) to highly deformed and attenuated beds that are complexly folded. The relative deformation of chert is not homogeneous; no trends have been recognized in the intensity of deformation. The variety of colours, lithologic associations, and structural disposition suggest that cherts of various affinities and ages are juxtaposed in the Bridge River complex. Chert from several localities in the area contains Middle Triassic to Early Jurassic radiolarians (Figure 1-15-3; Potter, 1983; Cordey, 1986).

GREENSTONE

Greenstone is typically massive and weathers greenish brown; pillow structures and breccia textures are commonly preserved in sequences with interbedded chert or limestone. Quartz-carbonate veins and pervasive fracturing are common. Interbedded limestone and chert is rare. Ten samples of greenstone from the Bridge River complex collected further to the east were analysed by Potter (1983) for trace element geochemistry; they plot in the ocean-floor tholeiite to oceanic-island basalt fields of various published discriminant diagrams. The metamorphic grade of the greenstone appears to be variable, but is presently incompletely studied.

TYAUGHTON GROUP

The Tyaughton Group was originally defined by Cairnes (1943) as rocks of Triassic age. Overlying Lower to Middle Jurassic shales were included in the group by Tipper (1978) but in this study are mapped as a separate unit (Figure 1-15-2; as suggested by H.W. Tipper, personal communication, 1987). The Tyaughton Group is best exposed and most thoroughly studied in the Castle Peak area, 10 to 15 kilometres north of the study area (Tozer, 1967; Umhoefer, 1985). Paleontological studies of fauna within the Tyaughton Group (Figure 1-15-3) are principally those of Tozer (1967) and Tipper (1978, and unpublished). The sedimentology and structure of the group is currently under investigation (Umhoefer, 1986; and unpublished).

The Tyaughton Group can be divided into five distinct units. The lower redbeds, which form the base to the group, are about 500 metres thick and contain abundant conglomerate with limestone, volcanic and minor plutonic clasts; some of the conglomerate in the Spruce Lake area contains 95 to 99 per cent limestone clasts (P.J. Umhoefer, personal communication, 1988). The lower redbeds are overlain by light-grey-weathering, massive limestone (30 to 50

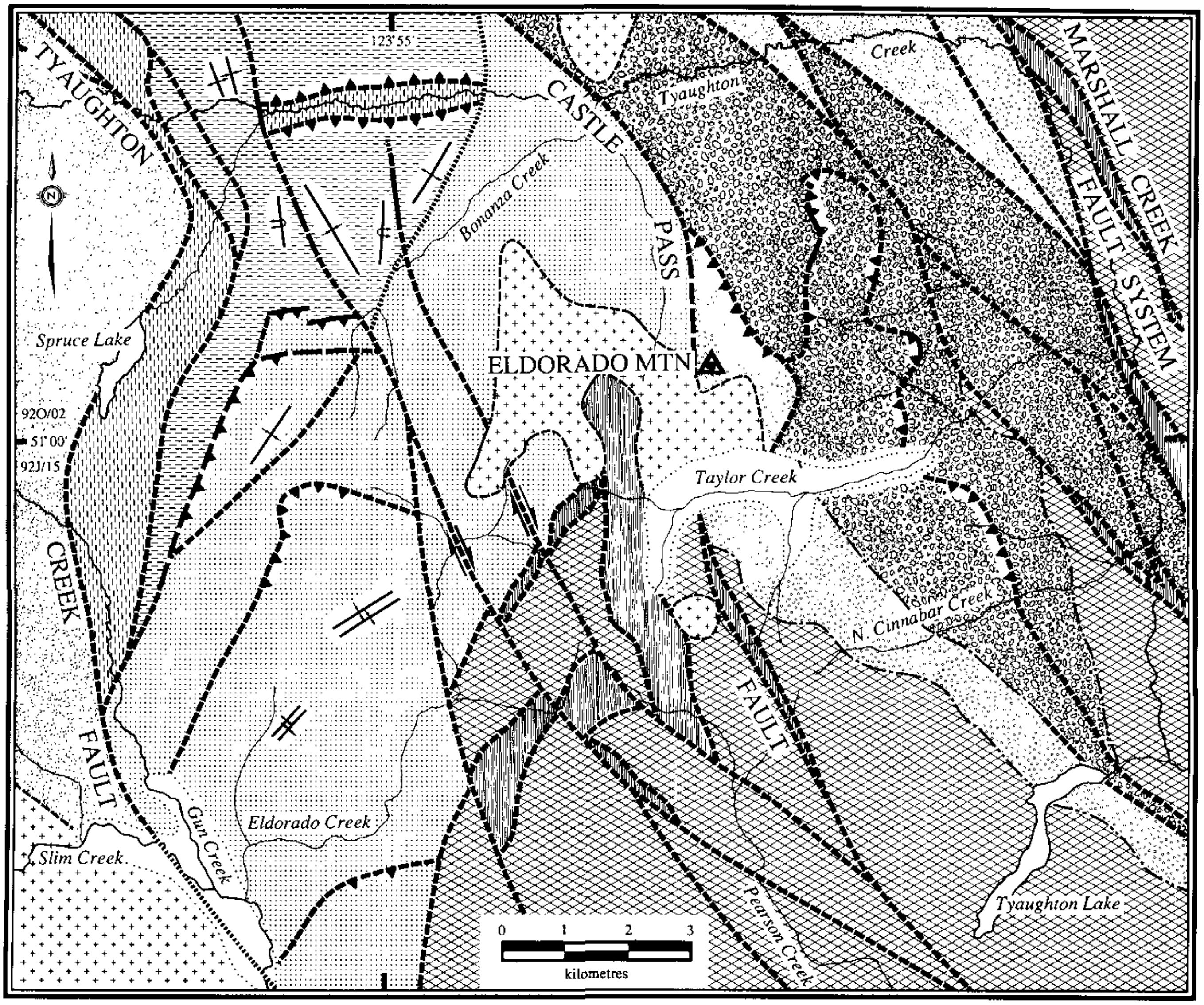


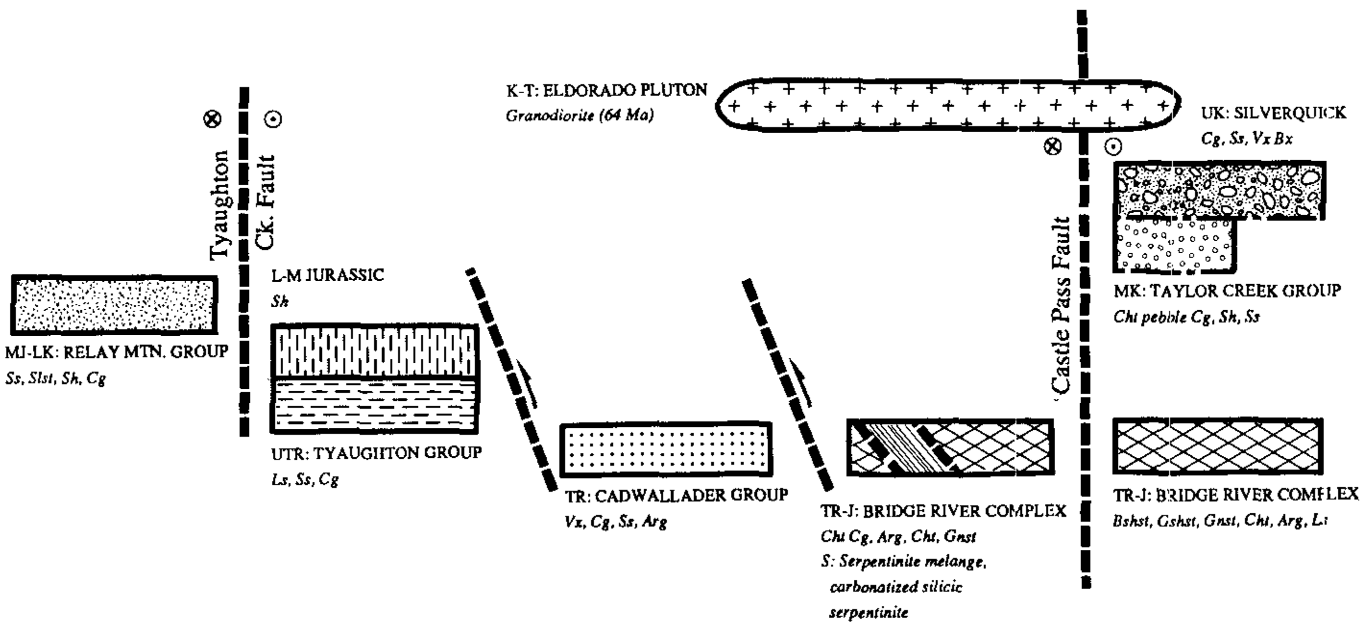
Figure 1-15-2. Geologic map of the Eldorado Mountain area with a tectonostratigraphic legend. Stratigraphic positions and ages of units are detailed in Figure 1-15-3. Lithologic abbreviations: cg = conglomerate, ss = sandstone, slts = siltstone, sh = shale, arg = argillite, ls = limestone, vx = volcanic rocks, bx = breccia, cht = chert, gnst = greenstone, bshst = blueschist, gshst = greenschist; for a complete description of units see text.

metres thick) grading upwards into thin-bedded micritic limestone (less than 15 metres thick), which contains the widely distributed and biostratigraphically significant *Monotis* bivalve. A limestone-cobble conglomerate with quartzose sandstone (less than 20 metres thick) lies, with possible disconformity, above the micritic limestone (Umhoefer, 1986). This conglomerate grades upward into green, cross-stratified sandstone with minor interbedded conglomerate (about 70 metres thick) which is conformably overlain by a brown-weathering siltstone and sandstone unit that contains the distinct and easily recognized bivalve *Cassianella lingulata*. The uppermost unit in the Tyaughton Group is composed of greenish sandstone and volcanic-pebble conglomerate, similar to the lower green-sandstone and conglomerate unit. Most of these units are interpreted to have been deposited in shallow marine to marginal marine conditions with the lower redbeds probably deposited in a fluvial environment (Umhoefer, 1986). The composition of the sediments suggests that they were deposited in an arc-proximal setting, possibly adjacent to the source terrane which supplied detritus to the Cadwallader Group (Rusmore, 1985; Umhoefer, 1986). The Tyaughton Group is probably middle to upper Norian (Figure 1-15-3; Tozer, 1967; Tipper, 1978). Contacts with the Cadwallader Group are faults (Figure 1-15-2), but the closeness of ages and compositional similarity between the Tyaughton and Cadwallader groups suggest they were originally a coherent sequence (Rusmore, 1985).

LOWER TO MIDDLE JURASSIC SHALE

A distinct but unnamed ammonite-bearing calcareous shale unit disconformably overlies the Tyaughton Group. The

TECTONOSTRATIGRAPHIC LEGEND



lower 200 to 300 metres of this unit comprises brown sandstone, siltstone and minor conglomerate which is locally crossbedded. These rocks grade upwards into grey to black, calcareous shale with minor interbedded sandstone which is less than 200 metres thick (Umhoefer *et al.*, 1988b). The shales commonly contain ammonites that indicate an upper Hettangian to lower Bajocian age for the unit (Figure 1-15-3; Tipper, 1978 and personal communication, 1987).

RELAY MOUNTAIN GROUP

The Relay Mountain Group is exposed in the Spruce Lake area (Figure 1-15-2); this is the southernmost occurrence of this widely distributed unit that occurs principally in its type area on Relay Mountain, 10 to 15 kilometres to the north. In the Eldorado Mountain area contacts with the underlying Early to Middle Jurassic shale unit are faulted but elsewhere the contact may be an unconformity (Jeletzky and Tipper, 1968). The Relay Mountain Group, which is 1500 to 2800 metres thick, displays facies changes throughout the area that were recognized on the basis of abundant and well-preserved *Buchia* and *Inoceramus* fossils. Lithologic monotony and subtle facies changes prohibit traditional lithologic mapping of this unit. Workers have used the rich and biostratigraphically distinct fauna as a basis for mapping (Jeletzky and Tipper, 1968; Glover *et al.*, 1987, 1988b; Umhoefer *et al.*, 1988b). The Relay Mountain Group has been divided into eight biostratigraphic subdivisions. Most of the subdivisions show significant facies changes in the region that suggest deposition in a two-sided, northwest-trending basin. Relay Mountain Group rocks in the Spruce Lake area are inferred to represent the southwest margin of this basin.

BLUESCHIST AND GREENSCHIST

Structurally interleaved blueschist, greenschist and metachert are exposed to the south and stratigraphically below the unconformity at the base of the Taylor Creek Group in the upper Cinnabar Creek drainage, and as isolated outcrops in the Tyaughton Creek canyon (Figure 1-15-2; *see* Schiarizza *et al.*, 1989, this volume). The largest outcrop belt extends for a strike length of about 4 kilometres.

The blueschist unit is dark blue schistose metabasalt and interlayered, strongly flattened, locally isoclinally folded, blue and grey metachert. A crenulation cleavage is common in outcrop but is not present in blueschist clasts in the overlying basal conglomerate of the middle Albian Taylor Creek Group. The crenulation is therefore probably a post-middle Albian structure. The blueschist assemblage is characterized by fine-grained crossite-actinolite, lawsonite and albite, with or without sphene. Garnet and white mica are locally abundant. The crossite is typically intergrown with actinolite/tremolite in textural equilibrium. Locally, barrositic amphibole forms cores to the crossite/actinolite grains and may represent an early phase of higher temperature metamorphism (A.B. Till, personal communication, 1988).

Strongly foliated greenschist and complexly deformed metachert are spatially associated with blueschist; all occur within the same structural package. Locally, the greenschist has blue amphibole along its foliation. Metachert is present in minor quantities. The metachert is strongly flattened and tightly folded about axial surfaces that are subparallel to bedding.

Blueschist-facies metamorphism must have predated the middle Albian (*circa* 100 to 105 Ma) because sediments of this age contain clasts of blueschist. Potassium-argon whole-rock dating of three *in situ* blueschist samples yielded ages ranging from 195 to 250 Ma (R.L. Armstrong, personal communication, 1988). More precise age determination of the blueschist is in progress.

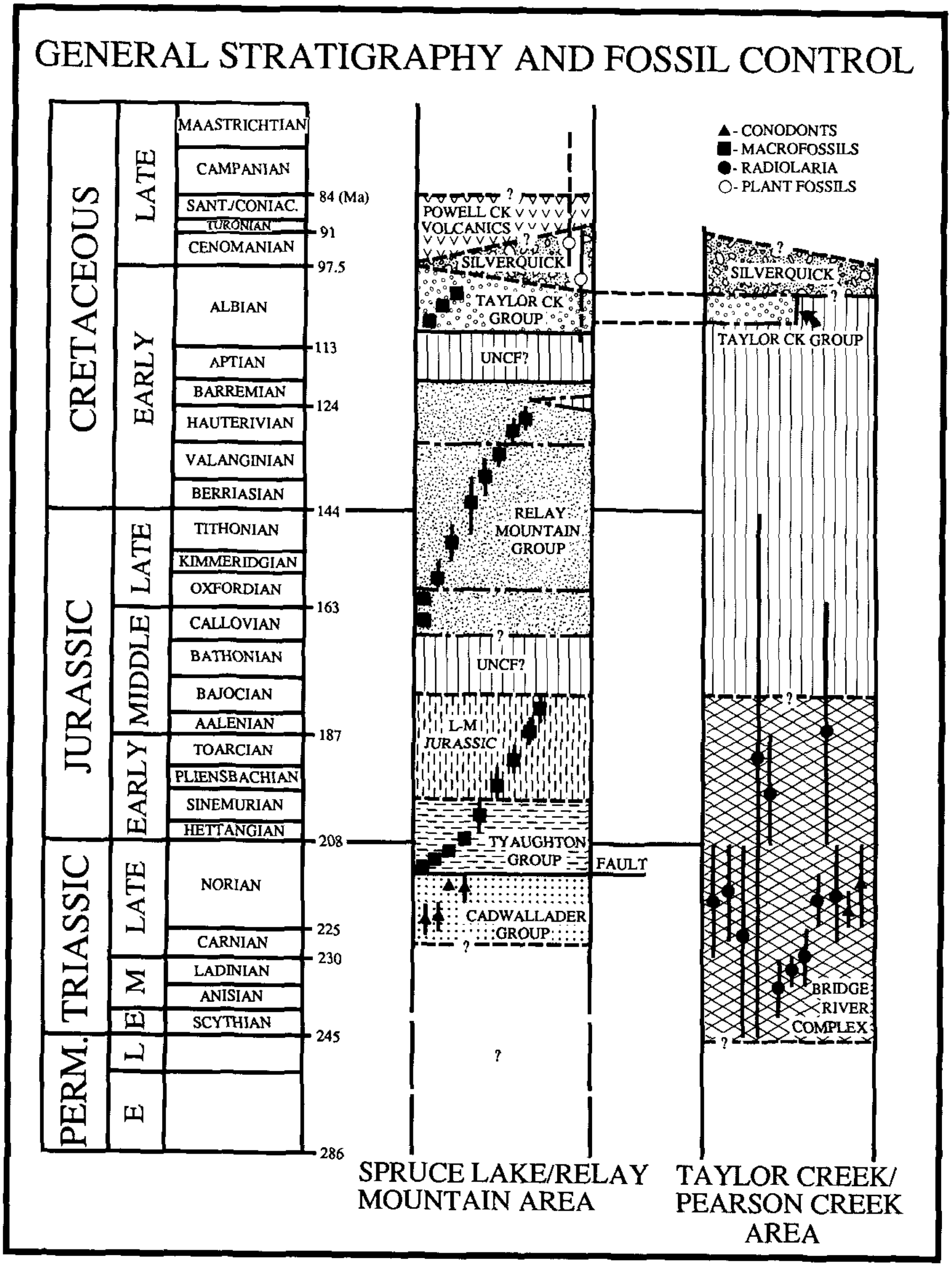


Figure 1-15-3. Stratigraphy and faunal control of the units discussed in the text.

SERPENTINITE MELANGE

A distinct and mappable unit in the Eldorado Creek area is serpentinite with abundant metre to decametre-sized blocks or "knockers" of greenstone, chert, clastic rocks, gabbro and diorite, porphyry and unfoliated ultramafic rocks (Figure 1-15-2). Serpentinite and many of the knockers are foliated. Foliation directions are chaotic, but a crude north to northeast-trending, west-dipping foliation is apparent. Fabric trends are further obscured by later strike-slip faults.

CADWALLADER GROUP

The Cadwallader Group nomenclature has a colorful history which is discussed in detail by Rusmore (1985). Originally named by Drysdale (1916, 1917), later workers have wrestled with both the nomenclature and internal stratigraphy of the group (Roddick and Hutchison, 1973; Rusmore, 1987; Church *et al.*, 1988). In this study, we recognize three principal lithologic units in the Cadwallader Group: basaltic volcanic rocks, conglomerate and coarse-grained bedded sedimentary rocks, and thin-bedded sandstone and argillite. We concur with the subdivisions and relative stratigraphic position of the units outlined in detail by Rusmore (1985, 1987). The following is a brief synopsis of Rusmore's stratigraphic divisions.

Basaltic volcanic rocks are typically pillowed and brecciated and weather green to purple. Rusmore reports the occurrence of minor andesitic and quartz-bearing rhyolitic dykes within this unit. These basaltic volcanic rocks are traditionally referred to as the Pioneer greenstone but correlation with rocks at the type locality has not been proven and remains an outstanding stratigraphic problem in the area.

Transitional rocks include tuffaceous sandstones with interbedded conglomerates that contain clasts of limestone, mafic to intermediate volcanic rocks and quartz-bearing granitic rocks (Plate 1-15-2). This transitional unit is found interbedded with both the stratigraphically lower basalts and the overlying fine-grained sedimentary rocks. Locally, transitional rocks are missing and the fine-grained sedimentary rocks rest directly on the lower volcanic rocks.

Fine-grained sedimentary rocks composed of interlayered thinly bedded sandstone and black argillite are at the stratigraphic top of the Cadwallader Group. These rocks are interpreted to have been deposited as turbidites and are probably correlative with the Hurley Formation of other workers (Roddick and Hutchison, 1973; Church *et al.*, 1988).

Trace-element abundances in the basaltic volcanic rocks suggest an affinity to modern island arc tholeiites (Rusmore, 1985, 1987). The sedimentology and provenance of the overlying sedimentary rocks also suggest proximity to a volcanic arc.

Conodonts from the sedimentary part of the sequence suggest the group is uppermost Carnian or lowest Norian to

Plate 1-15-2. Vertical beds of poorly sorted but well-bedded transitional rocks of the Cadwallader Group above Spruce Lake. Coast Range intrusions are in the background.

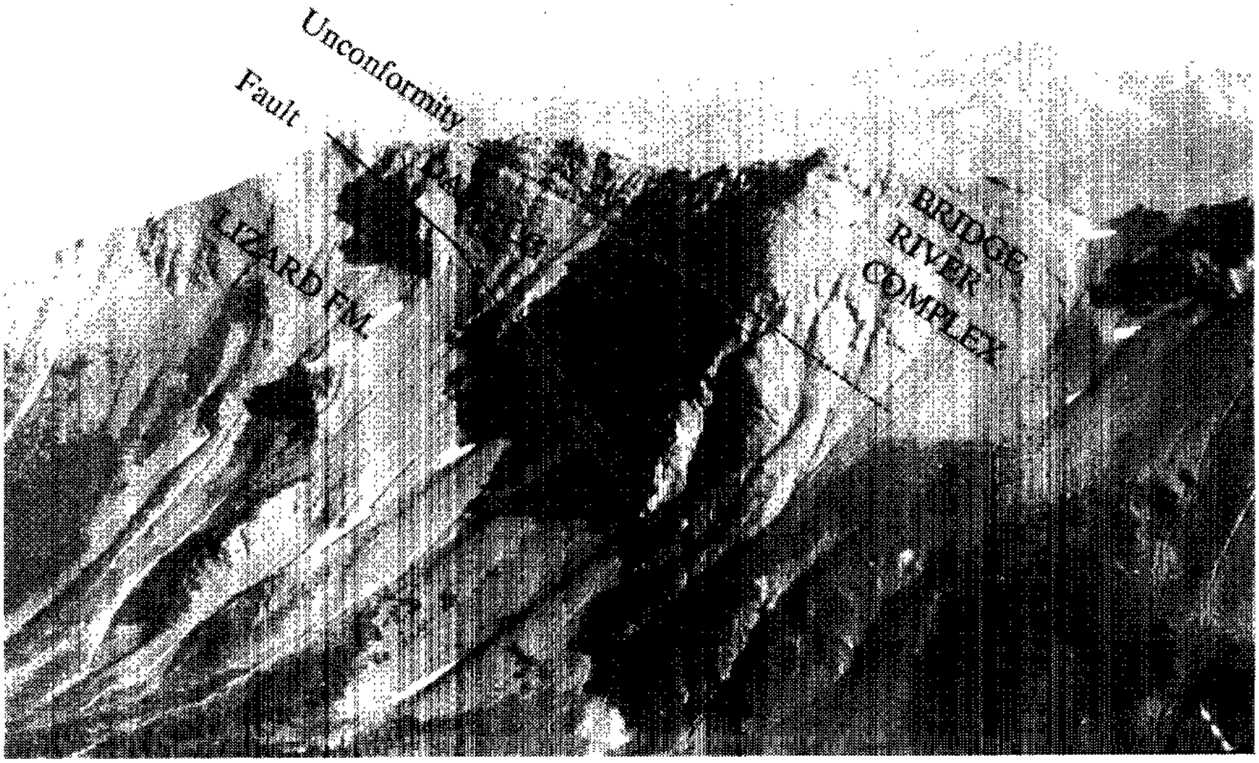


Plate 1-15-3. Overturned unconformity with the middle Albian Dash conglomerate depositionally overlying metachert and blueschist of the Bridge River complex.

upper-middle Norian (Rusmore, 1985; Figure 1-15-3). The uppermost volcanic rocks are interbedded with these dated sediments so must be Late Triassic or older.

In general, the Relay Mountain Group is a sequence of sandstone, shale and minor conglomerate that contains abundant marine bivalves and ammonites, plant fragments and rare sedimentary structures. Volcanic, sedimentary and minor plutonic pebbles are constituents of the conglomerates. A particularly thick section of conglomerate (tens of metres) occurs on the ridge between Slim and Gun creeks (Figure 1-15-2) and has yielded a possible Early Cretaceous *Buchia* (P.J. Umhoefer, personal communication, 1988). Jeletzky and Tipper (1968) note that younger strata of the Relay Mountain Group (Hauterivian) in the Spruce Lake area contain a coarse-grained facies of tuffaceous greywacke most likely deposited in a shallow-marine environment at the southwest basin margin. The Relay Mountain Group contains fossils that indicate an Oxfordian to Hauterivian and possibly Barremian age; all stages (except the Barremian) are represented by at least one biostratigraphic zone.

TAYLOR CREEK GROUP

Cairnes (1937, 1943) originally named the "Taylor Group", but imprecisely defined its stratigraphic elements. Jeletzky and Tipper (1968) modified the name to Taylor Creek Group and restricted its use to what they considered to be marine chert-rich clastic rocks. They estimated a thickness of approximately 3300 metres. Stratigraphically higher nonmarine, chert-pebble conglomerates were named "Kingsvale sediments" and were effectively removed from the Taylor Creek Group. They recognized that these nonmarine conglomerates grade upward into a thick sequence of andesitic volcanic rocks which they named the "Kingsvale volcanics". In the present study the basic subdivisions of Jeletzky and Tipper are retained. However, the stratigraphic interpretation has been refined and names for the upper divisions abandoned in accordance with evidence that the volcanic rocks are not equivalant to the slightly older volcanic rocks near the village of Kingsvale (Thorkelson, 1985; Glover and Schiarizza, 1987; Glover *et al.*, 1988a).

The Taylor Creek Group is informally subdivided into the Dash conglomerate and the Lizard formation, both of which are easily mappable units. The estimated thickness of the Taylor Creek Group exceeds 2800 metres in the centre of the basin (Relay Mountain area to the north), and is approximately 1200 metres in the Eldorado Mountain area.

DASH CONGLOMERATE

The Dash conglomerate is approximately 300 to 500 metres thick and forms the base to the Taylor Creek Group in the Eldorado Mountain area. The basal part of the conglomerate contains a spectacular blueschist, greenstone and chert-pebble to boulder conglomerate that rests unconformably on the Bridge River complex. This unconformity is overturned and is overlain by tens of metres of interbedded conglomerate and red-weathering siltstone (Plates 1-15-3, 1-15-4). In the Relay Mountain area, the Taylor Creek Group probably rests on the Relay Mountain Group (Figure 1-15-3).

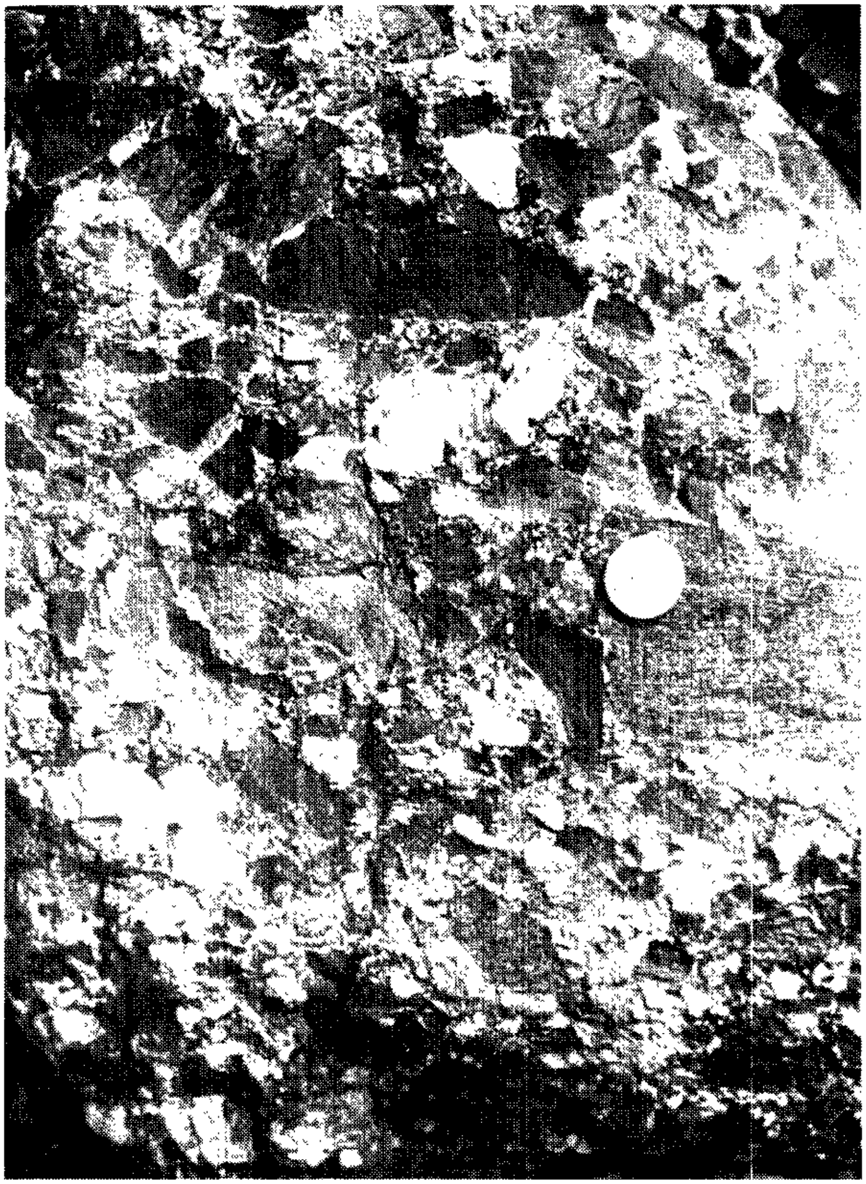


Plate 1-15-4. The basal Dash conglomerate containing angular pebbles of greenstone, chert, blueschist (under coin and elsewhere) and greenschist.

The upper 100 to 150 metres of the Dash conglomerate is also dominantly conglomerate and contains ammonites and shallow marine bivalves (Plate 1-15-5). The transition from fluvial to delta to prodeltaic facies represents rapid subsidence within the basin. Paleocurrent indicators are rare but those present suggest transport was toward the west.

As mentioned, the basal conglomerate contains locally derived Bridge River complex detritus. Stratigraphically higher the conglomerate contains chert, bull quartz, volcanic fragments and minor sedimentary and metamorphic fragments. The clastic detritus in the Dash conglomerate is almost exclusively derived from the Bridge River complex.

The age of the Dash conglomerate is well constrained elsewhere in the basin where it is lower to middle Albian based on ammonite fauna (Jeletzky and Tipper, 1968; Garver, unpublished data). The uppermost prodeltaic sediments in the Eldorado Mountain area contain a middle to upper Albian *Inoceramus* species (Jeletzky and Tipper, 1968). The Dash conglomerate in the Eldorado Mountain area is probably correlative to the upper part (middle Albian) of the well-dated Dash conglomerate in the Relay Mountain area.

Lizard Formation

The Dash conglomerate is abruptly, but conformably, overlain by 500 to 600 metres of shale and interbedded thin to medium-bedded sandstone of the Lizard formation. The sandstone is typically graded with complete Bouma sequences. Abundant flute and groove marks suggest paleotransport was to the north-northeast. Volumetrically minor chert-pebble conglomerate and chert-lithic sandstone are locally interbedded with these turbibites.

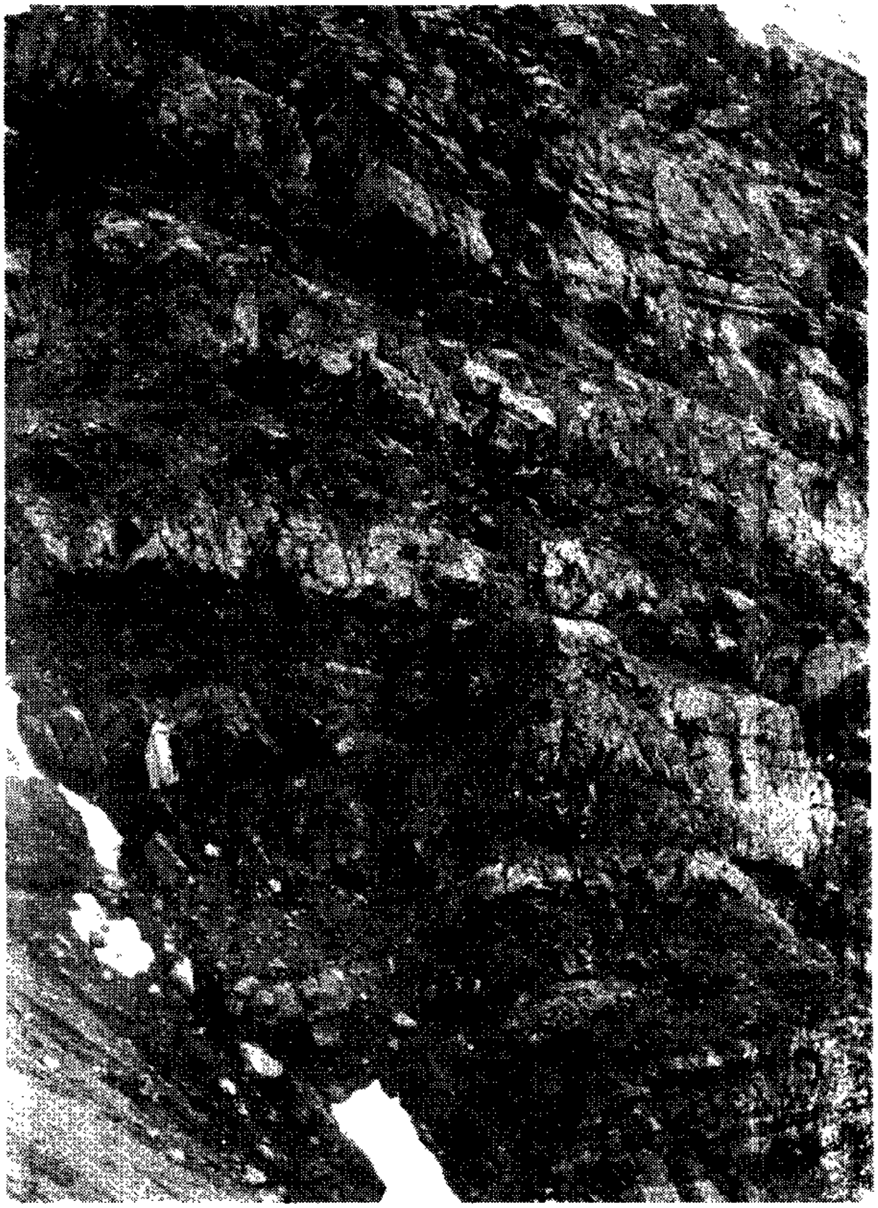


Plate 1-15-5. Thick-bedded Dash conglomerate. Finer grained intervals contain bivalves and, uncommonly, plant fragments. These beds are interpreted to have been deposited in a fan-delta setting.

The Lizard sandstone is a medium to coarse-grained quartzofeldspathic litharenite with several per cent detrital white mica and lesser biotite. The sedimentary rocks contain plagioclase (28 to 36 per cent), quartz (25 to 35 per cent) and volcanic lithic fragments, which are mostly felsic and intermediate (31 to 48 per cent). The composition of detrital grains suggests that the source area was comprised of tonalitic or dioritic plutonic rocks, intermediate to silicic volcanic rocks, and minor schistose metasedimentary rocks. Although the Dash conglomerate and the Lizard formation together form the Taylor Creek Group, they were derived from distinctly different source terranes.

A possible middle Albian ammonite fossil has been collected from the Lizard formation about 10 kilometres to the west in the Lizard Creek area (Garver, unpublished data). In the Eldorado Mountain area, the basal beds contain middle to upper Albian *Inoceramus* fossils (Jeletzky and Tipper, 1968; Garver, unpublished data). The unconformably(?) overlying Silverquick conglomerate is probably Albian-Cenomanian, but this age is poorly constrained.

SILVERQUICK CONGLOMERATE

The Silverquick conglomerate is divided into two parts. The lower unit is about 1500 metres thick and is almost exclusively composed of chert-pebble conglomerate and minor fine-grained interbeds. The upper unit (of undetermined thickness) contains chert-pebble conglomerate, andesitic breccia and fine-grained interbeds; this unit is referred to as the Powell Creek volcanic transition because it probably passes upward into the Powell Creek volcanics of

Glover *et al.* (1988a). The Silverquick conglomerate is typified by rapid and dramatic changes in thickness and sedimentological characteristics.

LOWER UNIT

The lower unit comprises numerous fining-upward sequences of 2 to 8-metre-thick, pebble to cobble-conglomerate beds and minor fine-grained intervals. The coarse-grained sedimentary rocks are typically poorly sorted, clast supported and locally have poorly developed horizontal and cross-stratification. Individual sequences within the lower unit typically thin and fine upward into interbedded siltstone and sandstone with minor lenticular pebble-rich beds. The finer grained beds typically contain complete leaf fossil imprints and are locally red or maroon weathering.

Facies of the Silverquick conglomerate are slightly different in the upper and lower plates of a thrust fault mapped east of Eldorado Mountain (Figure 1-15-2). Rocks in the lower plate are generally finer grained and include abundant redbeds, but they have the same clast composition as the rocks in the upper plate. Lower plate rocks possibly rest unconformably on the Bridge River complex in Taylor Creek (Figures 1-15-2, 1-15-3) and in Tyaughton Creek although both exposures are equivocal. Well-exposed upper plate rocks rest with possible low-angle unconformity on the underlying Lizard formation. This possible difference in substrate may attest to basin margin deformation prior to and probably during the deposition of the Silverquick conglomerate.

Pebbles and cobbles in the Silverquick conglomerate include chert (50 per cent), sedimentary rock fragments (20 to 25 per cent), volcanic rock fragments (20 per cent), greenstone and metamorphic rock (5 per cent), and dioritic clasts (less than 5 per cent – percentages based on 17 pebble counts). These rocks have a similar provenance to the Dash conglomerate but the abundance of sedimentary rock fragments (and turquoise-coloured silicic tuff clasts) may be representative of clastic input from erosion of Cadwallader Group rocks. The source area for clasts of chert, greenstone, ultramafic rocks, limestone, and uncommonly, blueschist was undoubtedly the Bridge River complex.

UPPER UNIT

The lower unit grades upward into interbedded volcanic-clast and chert-rich conglomerate and fine-grained clastic rocks. The volcanic-clast-rich beds are typically 1 to 3 metres thick, and contain very poorly sorted clasts of plagioclase, hornblende and pyroxene-phyric volcanics. Poor sorting, large clast size and the monolithologic nature of these volcanic conglomerates probably represent the onset of intrabasinal volcanism that culminated in the accumulation of 2000 to 3000 metres of Powell Creek volcanic rocks (Glover *et al.*, 1988b).

The age of the Silverquick conglomerate is imprecisely known. It rests with possible unconformity above the middle to upper Albian Lizard formation. In the map area the Silverquick contains nondiagnostic leaf fossils but elsewhere in the Tyaughton Creek region it contains Albian-Cenomanian flora (Jeletzky and Tipper, 1968). The overlying Powell Creek volcanics are intruded by 84.7 to 86.7 ± 2.5 Ma plutons (potassium-argon dates on mica; *see* discussion in Glover and Schiarizza, 1987).

The Taylor Creek Group and the overlying Silverquick conglomerate are representative of syntectonic sedimentation in which rapid basin subsidence, coarse-clastic sedimentation and thick basin fill mark an inferred period of compressional tectonics. Angular unconformable relationships that may represent little or no time gap attest to active deformation during sedimentation. Folding and thrusting have deformed the entire sequence, these structures probably represent continued compressional tectonics following sediment infill of the active sedimentary basin.

IGNEOUS INTRUSIONS

The central part of the map area is occupied by the Eldorado pluton which is an equigranular biotite quartz diorite to granodiorite. The pluton intrudes the Castle Pass fault (discussed below) and therefore provides an important constraint on the timing of motion on this fault. The Eldorado pluton has been dated at 63.7 ± 2.2 Ma (potassium-argon on biotite; K.M. Dawson, personal communication, 1987). Small plugs and dykes of mainly hornblende-feldspar and quartz-feldspar porphyry also occur in the area.

STRUCTURE

STRIKE-SLIP FAULTS

The Eldorado Creek area is cut by numerous high-angle, north to northwest-trending faults which comprise part of a regionally extensive dextral strike-slip fault system. The faults are narrow zones (tens of metres) of brittley deformed rocks that typically contain horizontal to subhorizontal slickensides on fault surfaces; locally, vertical slickensides record the latest movement or simply reflect the complexity of movement along these faults. Fibrous mineral growth orientations and stepped lineations are consistant with the dextral movement indicated by *en echelon* folding and offset of piercing points along the same faults to the north (Glover *et al.*, 1988a). Strike-slip faults cutting the Bridge River complex are commonly marked by strongly foliated serpentinite that has locally undergone a syn to post-faulting carbonate alteration. Serpentinite is uncommon where these faults cut bedded sedimentary rocks unless the Bridge River complex is the immediate basement.

The Tyaughton Creek, Castle Pass and Relay–Marshall Creek fault systems are the principal structures in the Eldorado Mountain area (Figure 1-15-2). Minor subparallel fault strands with tens to hundreds of metres displacement are ubiquitous. Glover *et al.* (1988b) and Umhoefer *et al.* (1988b) have mapped the extensions of these faults to the north. Possible piercing points on the Tyaughton Creek fault suggest that movement may have been in the order of 10 kilometres (Glover *et al.*, 1988a). In the Eldorado Mountain area, strike-slip faults were probably also the loci of minor vertical displacement.

The 64 Ma Eldorado pluton intrudes the Castle Pass fault. The northwestward continuations of other faults in the system (for example, the Tyaughton Creek fault) cut the lower Upper

Cretaceous Battlement Ridge Group (Glover *et al.*, 1988a); movement on this system was during the Late Cretaceous.

MIDDLE CRETACEOUS THRUSTING

In the North Cinnabar and Taylor Creek areas (Figure 1-15-2) a large panel of overturned sedimentary rocks of the Taylor Creek Group (Plate 1-15-3) and the overlying Silverquick conglomerate are in apparent thrust contact with underlying upright rocks of the Silverquick conglomerate. Approximately 3 kilometres of stratigraphic section are overturned; they are interpreted to represent a limb of a large-scale northeast-directed fold that was probably produced during compression and associated thrust faulting. This overturned panel, which includes unconformably underlying blueschist, greenstone and chert of the Bridge River complex, is cut by strike-slip faults. The scale of folding recorded in this overturned panel is an order of magnitude greater than in folds associated with strike-slip faulting in this area. Elsewhere, the Powell Creek volcanics unconformably overlie deformed rocks of the Taylor Creek Group (Glover and Schiarizza, 1987). We infer that thrust faulting was coincident with and immediately following deposition of the non-marine Silverquick conglomerate. If true, this regionally important intrabasinal compressional event occurred between the late Albian and the Santonian (*circa* 100 to 85 Ma). Northward-verging thrusts and folds are also recognized within the Cadwallader Group (D2 of Rusmore, 1985, 1987). The age of these structures is unknown but they may be contemporaneous with the Middle Cretaceous structures described above; alternatively, they may be later strike-slip related features, as suggested by Rusmore (1985).

NORTHEASTERLY TRENDING STRUCTURES OF UNKNOWN AGE

Upright, northeast-trending folds and steep faults are the earliest structures recognized within the Cadwallader Group (D1 of Rusmore, 1985, 1987). They predate northerly directed folds and thrusts which, as suggested above, may be contemporaneous with Middle Cretaceous compressional structures documented within the Taylor Creek Group and the Silverquick conglomerate. The Cadwallader Group defines a northeasterly trending belt juxtaposed against the Tyaughton Group and the Bridge River complex (Figure 1-15-2).

Along its southeastern margin, the Cadwallader Group is next to the Bridge River complex and associated serpentinite mélange; this poorly defined north-northeasterly trending belt is referred to as the Eldorado fault zone by Rusmore (1985). She suggests that the zone represents an important tectonic boundary between the Bridge River complex and the Cadwallader Group, and notes it is cut by the Bralorne fault zone; this relationship suggests pre-Middle Cretaceous movement. The serpentinite mélange bears some resemblance to fault zones which juxtapose the Shulaps ultramafic complex above the Bridge River complex and Cadwallader Group rocks further to the east (Schiarizza *et al.*, 1989, this volume); these structures may be contemporaneous. The predominant orientation of structures that separate the Cadwallader Group from other rocks and the distribution of units suggests juxtaposition by westerly directed overthrusting.

IMBRICATION OF THE BRIDGE RIVER COMPLEX

Structural relationships within the Bridge River complex are poorly understood. Although it is clear the complex displays much structural repetition, the nature and age(s) of the structures are not well known. Imbricated lithologies are different on either side of the Castle Pass fault. East of the fault, northwest-trending, southwest-dipping lenticular panels of differing metamorphic grade (prehnite to blueschist facies) are imbricated along metre-wide zones of localized strain that are interpreted to be thrust faults. This imbrication preceded deposition of the unconformably overlying Taylor Creek Group (middle Albian) which contains pebbles and boulders from the different panels (Plates 1-15-3, 1-15-4). West of the Castle Pass fault, imbrication has juxtaposed the following assemblages: (1) greenstone with minor limestone; (2) chert; (3) argillite and chert; and (4) argillite, chert-pebble conglomerate and interbedded chert. High-angle fault zones cutting this package commonly contain serpentinite. The metamorphic grade of these rocks is low (prehnite-pumpellyite) and some show no affects of regional metamorphism.

SUMMARY

The Eldorado Mountain area is located in a critical area between sedimentary rocks of the Tyaughton basin to the northwest and the Bridge River oceanic complex to the south and east. This transitional area has provided important information concerning the nature and timing of deformation, lithologic distribution within units, and the sedimentology and provenance of units. The following outlines the most significant findings in the Eldorado Mountain area:

- The Bridge River complex contains lenses of blueschist facies metabasalt and metachert, which may suggest deformation and metamorphism in a subduction zone.
- Blueschist, greenschist and prehnite-pumpellyite facies metamorphic rocks of the Bridge River complex were imbricated following metamorphism and brought to the surface by middle Albian time.
- Basin response to the initial phase of compressional tectonics may be recorded in the synorogenic deposits of the Taylor Creek Group which are lower to middle Albian in age (*circa* 110 to 97 Ma).
- Compressional tectonics, manifested by large-scale folds and thrusting, which probably verged to the northeast, occurred between *circa* 97 and 85 Ma. Inferred synorogenic conglomerates show extreme variation in thickness on a regional scale. This period of deformation corresponds to the timing of mineralization at Bralorne, *circa* 90 Ma (Leitch and Godwin, 1988). Movement on the Bralorne fault zone may have been contemporaneous with deposition of the Silverquick conglomerate.
- Parts of a major strike-slip fault system cut the area. The timing of the major movement was between 64 and about 86 Ma. Stibnite-scheelite-cinnabar mineralization occurs along these faults.

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