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GEOLOGY AND GEOCHEMISTRY OF THE ALICE ARM MOLYBDENUM DEPOSITS

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ABSTRACT

A number of molybdenum-bearing granitic stocks, referred to as the Alice Arm intrusions, are emplaced in sedimentary rocks marginal to the east contact of the Coast Plutonic Complex between Stewart and Terrace. Several deposits are known in the vicinity of Alice Arm, of which the most important is Lime Creek.

The Alice Arm intrusions occur as small stocks of quartz monzonite porphyry, most of which exhibit the features of multiple intrusion. All plutons are cut by lamprophyre dykes of post-mineral age. Sedimentary rocks adjacent to stock contacts are thermally metamorphosed to biotite hornfels.

Several stages of molybdenite mineralization are contained in quartz veinlet stockworks best developed near stock contacts. Late stage polymetallic veins are known at most deposits.

Geochemical investigations of the Lime Creek deposit show that distribution patterns for alteration minerals and geochemical elements define the main geological events inasmuch as some elements correlate with original unaltered rock while others are related to contact metasomatism or stages of hydrothermal alteration and mineralization.

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K-Ar ages indicate that the age of intrusion and mineralization are nearly synchronous at about 53 m y.

INTRODUCTION

A number of porphyry molybdenum deposits and prospects occur along the eastern margin of the Coast Plutonic Complex between Stewart and Terrace in northwestern British Columbia (Figure 1). The greatest clustering of these deposits is in the vicinity of Alice Arm, at the head of an inlet of the same name 160 km north of Prince Rupert. To date, the most significant of these deposits is the former producing mine, British Columbia Molybdenum, situated on Lime Creek 6.5 km south of Alice Arm (Figure 1).

This paper is divided into two parts: the first part describes the general geological setting of the molybdenum deposits while the second part is devoted to a more extensive description of each deposit, and in particular the geology and geochemistry of the Lime Creek deposit.

HISTORY

Molybdenite mineralization in the Alice Arm area was first recognized during early prospecting for silver-bearing veins. Part of the Lime Creek deposit was first staked in 1911 by W. McLean but the main feature of interest at that time was a narrow silver-lead-zinc vein later determined to be peripheral to the molybdenite deposit.

The first molybdenite production in the area was from the Tidewater deposit in 1916 (Figure 1) where 345 tonnes averaging 1.60 percent molybdenite was mined from quartz veins in sedimentary rocks just south of a small granitic stock.

Intensive exploration for molybdenite deposits took place in the late 1950's when Kennco Explorations, (Western) Limited did limited work on the Roundy Creek and Tidewater properties and, in 1959, acquired an option on claims at Lime Creek from Gunn Fiva of Alice Arm. Diamond drilling was carried out from 1959 to 1963 when British Columbia Molybdenum Limited, a wholly owned subsidiary, was incorporated. A decision to put the property into production was made in late 1964. Mining and milling operations began in 1967 and were suspended in August 1972 due to weak molybdenum markets. Production totalled 10,400 tonnes of molybdenum. Remaining reserves are estimated to be in the order of 36 million tonnes of slightly less than 0.20 percent molybdenite.

Climax Molybdenum Corporation of British Columbia, Limited acquired the property in 1973 and has been conducting geological and feasibility studies since that time.

Exploration in the area for similar deposits during the 1960's resulted in the discovery of several good prospects including the Ajax, Bell Molybdenum, and Roundy Creek properties in the immediate Alice Arm area and a number of other prospects such as the THM, Hoan Creek, and those south of the Nass River (Figure 1).

GEOLOGICAL SETTING

Molybdenum-bearing granitic stocks, referred to collectively as the Alice Arm intrusions (Carter, 1974), occur near the western edge of the Bowser successor basin and marginal to the Coast Plutonic Complex (Figure 1). The Alice Arm intrusions occur in the form of small stocks, generally not exceeding 0.8 km in diameter. Porphyritic quartz monzonite is the dominant rock type, and this distinguishes the molybdenum-bearing stocks from equigranular satellitic stocks related to the Coast Plutonic Complex. While molybdenum-bearing stocks generally intrude Bowser assemblage siltstones, greywackes, and shales of Late Jurassic age, some do occur within the Coast Plutonic Complex. Examples of these are Molly Mack and Penny Creek prospects.

Evidence for both forceful and passive emplacement of the intrusions is well documented. In the Alice Arm area, sedimentary rocks have been arched and domed around the stocks. Elsewhere, little disturbance of the country rock is seen and the elongate nature of some of the intrusions indicates that they probably were emplaced along major fault zones.

South of Alice Arm, several molybdenum-bearing stocks are clustered near remnants of flat-lying Quaternary basalt which probably overlie their feeders. In the Nass River area, small stocks occur south and west of the Recent lava flow.

Many of the stocks apparently have been localized at or near intersections of east-northeast and north-northwest faults (Seraphim, et al., this volume). Several of the stocks (Bell Molybdenum, Roundy Creek, Kay) in the Alice Arm to Nass River area are elongated in an east-northeast direction which may also represent some control by faults or by the attitude of the sedimentary rocks. Also, a crude east-northeast distribution of the stocks is evident in the cluster south of Alice Arm and south of the Nass River (Figure 1). Some stock contacts are rectilinear in plan, again reflecting the dominant fault and fracture patterns. A good example of this is seen at the Ajax molybdenum deposit northeast of Alice Arm (Figure 2).

COMPARATIVE GEOLOGY OF THE MOLYBDENUM DEPOSITS

Molybdenum deposits are associated with the Alice Arm intrusions, which usually occur as small oval or elongate stocks. Some intrusions, most notably those at Roundy Creek and Tidewater near Alice Arm, are sheet or sill-like in form and are related to small feeder pipes. Intrusions at Alder Creek, near Lava Lake (Figure 1) and Molybdenum Creek, north of Terrace, are northwest-striking dyke swarms intruding sedimentary rocks. Major geologic features of four deposits are illustrated on Figure 2.

Quartz monzonite porphyry is the prevalent host rock at most deposits. Phenocrysts range in size from 2 mm to 1 cm and include, in decreasing order of abundance, euhedral plagioclase, K-feldspar, and both euhedral and anhedral quartz eyes. Quartz monzonite porphyry is characteristically mesocratic with both biotite and hornblende as primary mafic minerals. Leucocratic quartz feldspar porphyry phases of quartz monzonite to granite composition also are prominent at most of the deposits and at some they constitute the bulk of the intrusive rocks. Muscovite is the mica mineral of this phase.

Some intrusions are zoned, most notably the intrusion that is host to the Lime Creek deposit. Here, a core of quartz monzonite porphyry is bordered by more basic granodiorite and quartz diorite, which may be in part older than the quartz monzonite phase.

Most molybdenum-bearing stocks exhibit several stages of intrusion. The first stage forms the bulk of the stock and is represented by quartz monzonite and/or quartz feldspar porphyry and lesser quartz diorite such as Lime Creek. This main phase may be intruded by fine-grained, equigranular alaskite that consists essentially of quartz, K-feldspar, and myrmekite. Alaskites, which are very common at the Lime Creek and Roundy Creek properties (Figure 2), occur as dykes and irregular masses and are host to better grades of disseminated and lens-like molybdenite mineralization.

Other inter-mineral intrusions include dykes and irregular lenses of intrusive breccia, best developed along the northern stock contact at the Lime

Creek deposit (Figure 2). Angular fragments 1 to 2 cm in size, of both intrusive and country rock, are contained in a granulated matrix of quartz, plagioclase, and K-feldspar.

Several deposits feature intrusive phases that are very late in the intrusive-mineralization sequence. These also are quartz monzonite in composition. Examples include an unexposed plug at Lime Creek, the southwest portion of the Bell Molybdenum stock (Figure 2), and post-mineral dykes at some of the Nass River deposits (Figure 1).

Post-mineral lamprophyric and basalt dykes cut virtually all of the molybdenum-bearing stocks. These usually strike northeasterly, dip vertically, and truncate all pre-existing rocks and structures, including mineralized fractures.

Northwesterly striking faults that are younger than the plutons and lamprophyric dykes are found at Bell Molybdenum, Roundy Creek, and Nass River deposits.

Sedimentary rocks adjacent to the Alice Arm intrusions have been thermally metamorphosed to biotite hornfels in an aureole which may extend outward from the stock contact for 100 to 150 m. Biotite hornfels is a brown, indurated, fine grained rock with a granoblastic texture that consists of quartz, minor feldspar, and abundant felted, brown biotite. Some cordierite and andalusite are developed in the hornfels adjacent to intrusive contacts.

Alteration patterns within and marginal to the molybdenum-bearing stocks are similar to other porphyry deposits. At many of the deposits, a central zone of potassic alteration is partially coincident with molybdenite mineralization. At Lime Creek the most intense potassic alteration occurs in a circular zone in the northern part of the stock (Figure 2). Rock within this core of intense alteration is laced with barren quartz veinlets rimmed by secondary K-feldspar, such that the original quartz monzonite porphyry has been converted to a rock consisting mainly of quartz and K-feldspar. In the outer part of this alteration zone is an annular zone of molybdenite mineralization where secondary K-feldspar is restricted to the margins of quartz-molybdenite veinlets. Other deposits also feature secondary K-feldspar but not to the same degree as at Lime Creek. Secondary biotite, an alteration of primary hornblende, is present to a limited degree in several of the deposits. At Lime Creek, this alteration of hornblende, particularly in the quartz diorite, may be in part deuteric. At Roundy Creek, the potassic alteration zone contains quartz-muscovite veins.

The potassic zone at most deposits is gradational outward to a phyllic (quartz-sericite-pyrite) zone. Where coincident with the margins of the plutons it is superimposed on the effects of thermal metamorphism. This zone is represented at many deposits by a bleaching of the biotite hornfels to a cream or light green colour marginal to fractures and quartz veinlets and is due to the development of very fine-grained quartz, sericite, and some epidote. This type of alteration may be weakly developed, as at many of the deposits, or so intense that the original biotite hornfels has been largely transformed to a buff or light green-coloured rock within a zone several tens of metres outward from the stock contact, as at the Lime Creek and Ajax deposits. Pyrite is a common constituent in this alteration zone, occurring both in quartz veinlets and as disseminations. The intensity of pyritization may be related in part to thermal metamorphism, which involves formation of pyrite and pyrrhotite in the hornfels.

Better grades of molybdenite mineralization in the Alice Arm intrusions are dependent on structural and lithologic controls. Fracturing and attendant quartz-molybdenite veining are best developed near stock contacts. Later alaskite intrusive phases may contain disseminated to nearly massive molybdenite. The ore zone at Lime Creek is annular or ring-shaped in plan, occurring in the northern half of the stock (Figure 2) with molybdenite occurring as selvages in a network of east-northeast and west-northwest quartz veinlets. A similar style of mineralization occurs at most of the other deposits.

Disseminated molybdenite is contained in the alaskite intrusive phase at the Lime Creek deposit. At Roundy Creek, the alaskite contains nearly massive lenses, pods, and parallel bands of molybdenite and much of this is in the form of feather-like intergrowths with the feldspar. Disseminated rosettes of molybdenite occur in leucocratic quartz-feldspar porphyry phases at the Tidewater and Kay properties.

Most of the deposits exhibit several stages of quartz-molybdenite, pyrite, and quartz-pyrite veining. Virtually all of the Alice Arm molybdenite deposits feature late-stage polymetallic quartz-carbonate veins which contain pyrite, galena, sphalerite, tetrahedrite, chalcopyrite, minor molybdenite, and at Lime Creek, four silver-lead-bismuth sulphosalts.

Pyrite halos may extend outward from the molybdenite zone for 150 m to 300 m. Where exposed, the pyrite zone is weathered to a prominent gossan, particularly at the Ajax and Snafu properties.

Two molybdenite deposits are known to occur within granite rocks of the Coast Plutonic Complex. These are the Molly Mack prospect near Anyox and the Penny Creek showing south of Alice Arm (Figure 1). At the Molly Mack property, coarse-grained molybdenite is abundantly disseminated in a small zone of biotite granite contained within a stock-like body of leucocratic quartz monzonite porphyry which is similar in appearance to some phases of the Alice Arm intrusions. The Penny Creek occurrence consists of rosettes of molybdenite in a biotite quartz monzonite, a late phase of the Coast Plutonic Complex.

Numerous showings of molybdenite occur near the eastern margin of the Coast Plutonic Complex and in the satellite stocks related to the complex.

in the localization of the stock. Later movement along these faults particularly the north-northwest set, is documented by the apparent offsetting of the stock contacts along two major faults (Figure 2) and by the presence of numerous post-mineral shears noted in drill core.

Molybdenum mineralization occurs in both the quartz monzonite porphyry and biotite hornfels adjacent to the central and eastern stock contacts (Figure 2).

Molybdenite occurs mainly as selvages to steeply dipping quartz veinlets 0.5 to 1 cm thick, that follow major fracture directions. Four stages of quartz veining and mineralization have been noted. A first stage of barren quartz veinlets is followed by the second, most important stage, consisting of quartz-molybdenite-pyrite veinlets that are steeply inclined. These are offset locally by flat quartz-molybdenite veins and hairline fractures. The final stage consists of 2 cm and larger veins of quartz and carbonate that contain variable amounts of pyrite, pyrrhotite, galena, and sphalerite. A 25 cm wide quartz-carbonate vein containing pyrite, pyrrhotite, galena, and sphalerite was noted in a shear zone in argillaceous sediments 460 m east of the stock.

Roundy Creek

This property is situated south of Alice Arm Inlet on Roundy Creek, 2.4 km from tidewater (Figure 1) (Lat. 55° 25', Long. 129° 39', NTS 103P/6W, El. 305 m).

The property was originally discovered in the early 1900's. Exploration and development work between 1965 and 1971, primarily by Sileurian Chieftain Mining Company Limited, consisted of 9,300 m of diamond drilling and 780 m of underground development. The property was purchased by Climax Molybdenum Corporation of British Columbia, Limited in 1975.

Molybdenum mineralization is associated with an elongate, small composite intrusion of quartz monzonite porphyry. The intrusion is partly stock-like and partly sill-like. It has been segmented by northwest faults along and adjacent to Roundy Creek (Figure 2).

The intrusion consists of a number of similar but distinguishable phases. The most widespread of these is a leucocratic 'quartz-eye' quartz monzonite porphyry that forms the core of the intrusion. This phase is composed of 2 to 4 mm phenocrysts of subhedral quartz, perthitic K-feldspar, and euhedral oligoclase set in a very fine grained matrix of quartz and feldspar. The rock contains only minor biotite and sericite is the chief micaceous mineral. Where intensely sheared and fractured, the 'quartz-eye' quartz monzonite porphyry grades into brecciated quartz monzonite in which feldspar phenocrysts are partially shattered and the many randomly oriented fractures are coated with chlorite, sericite, carbonate, and molybdenite.

The 'quartz-eye' quartz monzonite porphyry is apparently gradational to biotite quartz monzonite, which is most abundant in the central and border areas of the intrusion. This rock type has a seriate texture and consists essentially of 2 to 4 mm grains of quartz, fresh euhedral oligoclase, and perthitic orthoclase, plus scattered flakes of biotite that are partially altered to chlorite and sericite.

Dykes and irregular masses of fine grained white alaskite cut all of the aforementioned rock types. Alaskites consist of a fine grained mosaic of quartz, sodic plagioclase, granophyre, and some sericite. In some areas the alaskite is gradational to a quartz feldspar porphyry.

A late intrusive phase seen in one of the underground levels and a few drill holes forms narrow dykes of fine grained, light grey biotite quartz monzonite. This last phase contains only trace amounts of molybdenite.

Narrow hornblende and biotite lamprophyre dykes that strike northeastward and dip steeply cut all granitic rocks and mineralized veinlets and fractures. Many terminate at, or are offset by, northwesterly trending faults (Figure 2).

Sedimentary rocks have been metamorphosed to biotite hornfels in a zone roughly 60 m wide surrounding the intrusion. Structural relationships of the intrusion are complex. Drill evidence indicates inward dipping lower intrusive contacts that suggest parts of the intrusive may be sheet-like in form surrounding a central feeder pipe. The eastern segment is apparently tabular in section.

Alteration of the intrusive rocks includes a potassic zone, which is best developed within and marginal to better grades of molybdenum mineralization. Potassic alteration, particularly in the leucocratic quartz monzonite porphyry, occurs as fracture-coated planes with abundant sericite and lesser biotite. Secondary biotite, principally on fractures, is best developed in the biotite quartz monzonite peripheral to the main zones of mineralization.

Two zones of molybdenum mineralization are known within the intrusion (Figure 2). The eastern segment is host to uniform grades of molybdenite occurring as selvages in numerous randomly oriented quartz veinlets and as fracture fillings. Drilling has indicated the presence of 7 million tonnes of 0.11 percent molybdenite in this zone. High-grade molybdenum mineralization occurs in the central and southern part of the intrusive where drilling and underground work has indicated 1.35 million tonnes of 0.347 percent molybdenite in the southern zone and some 35,000 tonnes grading 0.668 percent in a small zone to the north.

In both zones, higher grades of molybdenum mineralization are contained in alaskites. In the upper underground heading, closely spaced 1 to 2 cm bands of molybdenite are oriented crudely parallel to the trend of an enclosing alaskite body and appear to be an integral part of the magmatic crystallization. One cm rosettes of molybdenite also are uniformly distributed within the alaskite.

Molybdenite also occurs in numerous randomly oriented hairline fractures with chlorite in brecciated quartz monzonite and in closely spaced 0.5 to 1 cm wide quartz veinlets in alaskites and leucocratic 'quartz-eye' quartz monzonite porphyries.

Drilling and underground exploration indicate that the zones of molybdenum mineralization are lens-like in form and extremely erratic in lateral and vertical extent. The distribution of the higher grade zones suggests they are spatially related to the intrusive centre or feeder pipe.

Ajax

The Ajax property is on the east slope of Mount McGuire, 13 km northeast of Alice Arm (Figure 1) (Lat. 55° 35', Long. 129° 24', 103P/11W, El. 900 m).

Lead-zinc-silver mineralization, peripheral to the molybdenite zone, was explored by prospectors in the early part of the century. A reference to molybdenite mineralization, contained in the 1927 Minister of Mines Annual Report, prompted S. J. Barclay to locate the property for Newmont Mining Corporation in 1965. Some 8,100 m of diamond drilling was carried out on the property between 1965 and 1967.

A sequence of sedimentary rocks with minor interbedded volcanic rocks which form part of the eastern limb of the northwestward trending anticlinal structure are intruded by four small closely spaced stocks of quartz monzonite porphyry (Figure 2). These four stocks are grouped together in an elliptical area oriented northwesterly and measuring 900 by 750 m. The stocks, of varying sizes (Figure 2), are roughly rectilinear in plan and continue downward to the limits of drilling without merging into one intrusive body. However, the area between the stocks is laced with a network of dykes of similar composition.

Tungsten mineralization, in the form of scheelite, was accompanied by some pyrrhotite. This relatively late introduction of pyrrhotite accounts for some of the erratic pyrrhotite values appearing within the stock (Figure 4).

Tungsten does not form a good halo to the molybdenite mineralization. It occurs throughout the Lime Creek stock and the adjacent hornfels in a fairly erratic pattern (Figure 3).

Polymetallic Veins

The late polymetallic quartz veins occur within the area of anomalous molybdenum but they are not concentric to the main stage of hydrothermal alteration and mineralization. The pattern for lead (Figure 8) reflects the erratic nature of its distribution. Closer sample spacing would probably make the erratic nature of the pattern even more evident. Patterns for silver, bismuth, gallium, antimony zinc, and cadmium are very similar to the lead pattern.

K-Ar AGE DETERMINATIONS

Potassium-argon ages obtained from samples collected in the Alice Arm-Nass River area are shown on Figures 1 and 2. Analytical data for these and other samples are contained in a preceding paper (Christopher and Carter) in this volume.

Most samples were collected to date the age of intrusion and mineralization. Several, however, were collected to date other geologic units and to assess their relationship to the molybdenum deposits. These include samples collected from the Coast Plutonic Complex and from the basalt outliers south of Alice Arm. With the exception of whole rock samples of biotite hornfels and basalt, all analyses were carried out on biotite separates.

Samples for dating were collected from molybdenum-bearing quartz monzonite porphyries and related intrusive phases at six of the deposits.

Potassium-argon results from the main mineralized phase at these deposits fall within the range of 52.0±3 m y to 53.3±3 m y (Figures 1 and 2). Quartz diorite border phases at British Columbia Molybdenum and Bell Molybdenum are 51.4±1.5 m y and 51.7±2.2 m y respectively, both within the limits of analytical error for the main quartz monzonite phase.

Late intrusive phases, which exhibit definite crosscutting relationships with the first phase, were sampled at British Columbia Molybdenum. A dyke of intrusive breccia near the northern contact of the stock has an age of 53.6±1.7 m y, almost identical to the age obtained from the geologically older quartz monzonite porphyry phase (53.2±3 m y). An age of 48.3±1.6 m y was obtained for a sample of a later, nearly post-molybdenite phase of quartz monzonite occurring at a depth of 300 m below the exposed northeast part of the stock. This age determination corroborates the geological evidence that this is a younger porphyry phase which post-dates the main period of molybdenite mineralization and provides an upper limit for the age of molybdenite mineralization. A similar post-mineral porphyry dyke that cuts the quartz monzonite porphyry host rock at one of the Nass River deposits (Figure 2) yields a potassium-argon age of 49.0±2 m y.

A whole rock sample of biotite hornfels from outside the mineralized zone at Bell Molybdenum was dated at 48.7±1.5 m y. Although such a sample should reflect the age of intrusion, the somewhat younger age could be explained by partial argon loss inherent in a whole rock sample.

Two molybdenum deposits returned somewhat anomalous ages. The 48.3±1.9 m y age determined for the Molly Mack occurrence south of Anyox (Figure 1) might be explained by partial resetting of a slightly older age by the emplacement of the adjacent Coast Plutonic Complex granitic rocks. The 36.1±1.6 m y age for the Penny Creek occurrence southwest of Alice Arm (Figure 1) possibly could be due to a complete resetting of the original age by a younger lamprophyre dyke although none was seen during field examination. However, it should be noted that similar Oligocene ages for granitic rocks have been reported in the Prince William Sound area of southern Alaska by Lanphere (1966) and on Vancouver Island by Carson (1969).

Potassium-argon results obtained from previous and contemporary studies in the Alice Arm area are in good agreement with those reported here.

Woodcock, et al. (1966) reported a potassium-argon age of 53.3 m y for a sample collected near the south contact of the British Columbia Molybdenum stock. Later work on the same deposit in 1971 by D. L. Giles, formerly of the Geological Research and Laboratory Division of Kennecott Copper Corporation (Giles and Livingstone, 1975), indicated an age of 53.7 m y for secondary biotite from the alaskite phase.

Giles and Livingstone (1975) also reported an age of 63.2 m y for a biotite from fresh intrusive rock in a drill hole at a depth of 730 m below the open pit. This age is interpreted to represent the age of intrusion of the main granodiorite to quartz monzonite phase. This result is at variance with the interpretation of results described here, where biotite hornfels samples which could be expected to reflect the age of initial intrusion, returned ages in the 50 m y range. Giles' sample could have returned an anomalous age due to accumulation of excess argon.

Potassium-argon ages for four samples collected from granitic rocks of the Coast Plutonic Complex between Alice Arm and Lava Lake (Figure 1) range from 48.8±1.5 to 50.7±2.1 m y. These are in agreement with ages obtained by the Geological Survey of Canada in the same area and are somewhat younger than the mean age of 53 m y determined for the molybdenum-bearing porphyry stocks. Although within the limits of analytical error, these consistently younger ages found along the eastern margin of the Coast Plutonic Complex over a relatively large geographic area (Figure 1) suggest that the molybdenum-bearing stocks were intruded a measurable amount of time prior to the emplacement of the Coast granitic plutons.

Prior to potasssium-argon work, the flat-lying basalts south of Alice Arm were regarded as being of Early to Middle Tertiary age. A sample collected from north of the Bell Molybdenum stock has an age of 0.62±0.6 m y, which is an average of three determinations. A similar sample from a basalt remnant east of Lime Creek has an age of 1.6±0.8 m y. This apparent disparity in age can be attributed to a lower level of accuracy in the conventional potassium-argon method in this geologically young age range.

SYNTHESIS

Molybdenite deposits in the Alice Arm area are genetically related to small intrusions of quartz monzonite composition.

These intrusions, known collectively as the Alice Arm intrusions, are clustered near the east flank of the Coast Plutonic Complex, although potassium-argon ages suggest that the stocks were emplaced a few million years prior to the intrusion of the Coast Plutonic Complex.

The Alice Arm intrusions were probably localized by deep-seated faults and fracture systems (Seraphin and Hollister, this volume). Supporting this concept are initial strontium isotope ratios (Giles and Livingstone, 1975) which indicate that the igneous rocks and mineralization were derived from mantle material with only minor crustal contamination.

The distribution of Quaternary and Recent basalts south of Alice Arm and Nass River suggests that they may have been localized by the same regenerated fault and fracture systems. The incidence of young volcanic activity nearby molybdenite deposits is not uncommon in the Canadian Cordillera.

The age of molybdenite mineralization is virtually congruent with the age of intrusion as determined by radiometric (K-Ar) methods. The mineralizing intrusive phase are the alaskites, a feature particularly evident at the Lime Creek and Roundy Creek deposits. Intense fracturing attendant with intrusion of the stocks has resulted in most of the economic and sub-economic molybdenite mineralization occurring in the contact areas of the stocks.

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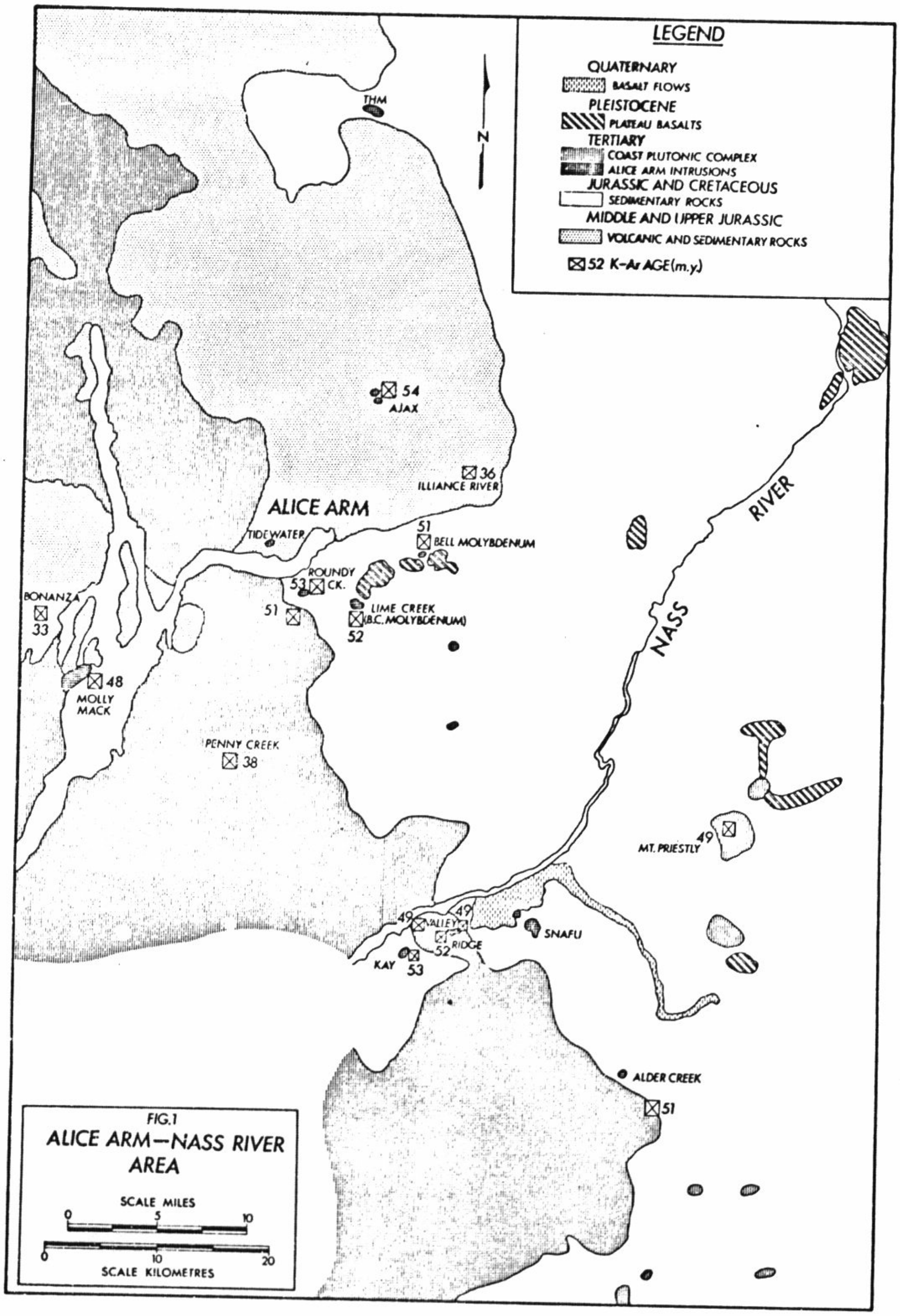

FIG.1
ALICE ARM—NASS RIVER AREA