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GEOLOGY AND MINERALIZATION IN THE HUNGRY GROVE POND (1M/14) MAP AREA, SOUTHEASTERN NEWFOUNDLAND

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ABSTRACT

The Hungry Grove Pond (1M/14) map area straddles the boundaries between the recently proposed Avalon, Gander and Dunnage zones. The Avalon Zone in the map area comprises the upper Precambrian (Proterozoic III) Belle Bay and Rencontre formations of the Long Harbour Group, the Simmons Brook Batholith and late diabase dykes. To the northwest, and separated from the Avalon Zone by the Hermitage Bay Fault, the Gander and Dunnage zones consist of sedimentary and volcanic rocks of the Middle Ordovician and older Baie d'Espoir Group, including the Little Passage Gneiss, granitoids of the syntectonic North West Brook Complex, and the Lower Devonian posttectonic Koskaecodde pluton. Apart from the Baie d'Espoir Group, all units in the map area and the Hermitage Bay Fault are intruded by the 375 Ma Ackley Granite Suite. Glacial-flow indicators show that Pleistocene ice movement was towards 170°.

A small fault-bound sliver of magnesite occurs along the Le Pouvoir Fault, which is a strike-parallel fault within the Isle Galet Formation of the Baie d'Espoir Group. This fault separates the schistose felsic and mafic volcanic rocks and conformably underlying Little Passage Gneiss from the less-deformed sedimentary and volcanic rocks of the Isle Galet Formation and greywacke of the Riches Island Formation. High Cr and Ni values indicate that the magnesite has an ultramafic parentage. Thus the presence of magnesite indicates that the Le Pouvoir Fault is possibly a deep-seated thrust that has penetrated the oceanic crust basement to the Baie d'Espoir Group.

Stibnite ± gold mineralization occurs in chloritic mafic tuffs of the Isle Galet Formation and extensive quartz veining occurs along the Collins Brook Fault. The gold discoveries at Westfield Mineral's Little River prospects just to the west of the map area give the Isle Galet Formation a significant potential for further gold findings.

INTRODUCTION

The Hungry Grove Pond (1M/14) map area is located in southeast central Newfoundland, approximately 20 km east of Milltown, Bay d'Espoir. There are no settlements within the map area. Disused woods roads and Newfoundland Hydro roads provide access to the power line in the northern part of the map area, but only 'all-terrain vehicles' (ATVs) are suitable for these roads. The locally rugged terrain, swamps, boulder fields and forests hinder ATV access to areas outside the proposed wilderness reserve, which occupies the general area between the Bay du Nord River and North East Brook (Figure 1). Helicopters and float planes, available in the Bay d'Espoir area, provide the most efficient form of access to the wilderness reserve but only certified scientific surveys are permitted to use these forms of transportation. The western boundary of the wilderness reserve is still under discussion and may be moved slightly to the east to the western edge of the Bay du Nord River valley. Claim staking is not permitted in the proposed wilderness reserve.

The Baie d'Espoir Group is currently the focus of intense mineral exploration as it hosts significant gold ± stibnite showings that occur in two of the main volcanic horizons within the map area. This report is concerned mainly with the geology of the area west of the Ackley Granite Suite (Tuach, 1987). Detailed geology and geochemistry of the Ackley Granite Suite is given in Dickson (1983), Tuach *et al.* (1986) and Tuach (1987).

Regional Setting

Following the proposal of Williams *et al.* (1988) the Hungry Grove Pond map area (Figure 1) straddles the southeastern portions of the Gander and Dunnage zones and the western margin of the Avalon Zone (terrane of Williams and Hatcher, 1983). Williams *et al.* (1988) have proposed that the Baie d'Espoir Group (of Colman-Sadd, 1976), formerly part of the Gander Terrane (of Williams and Hatcher, 1983) be included in Exploits Subzone of the Dunnage Zone and that the generally higher grade metasedimentary rocks of the

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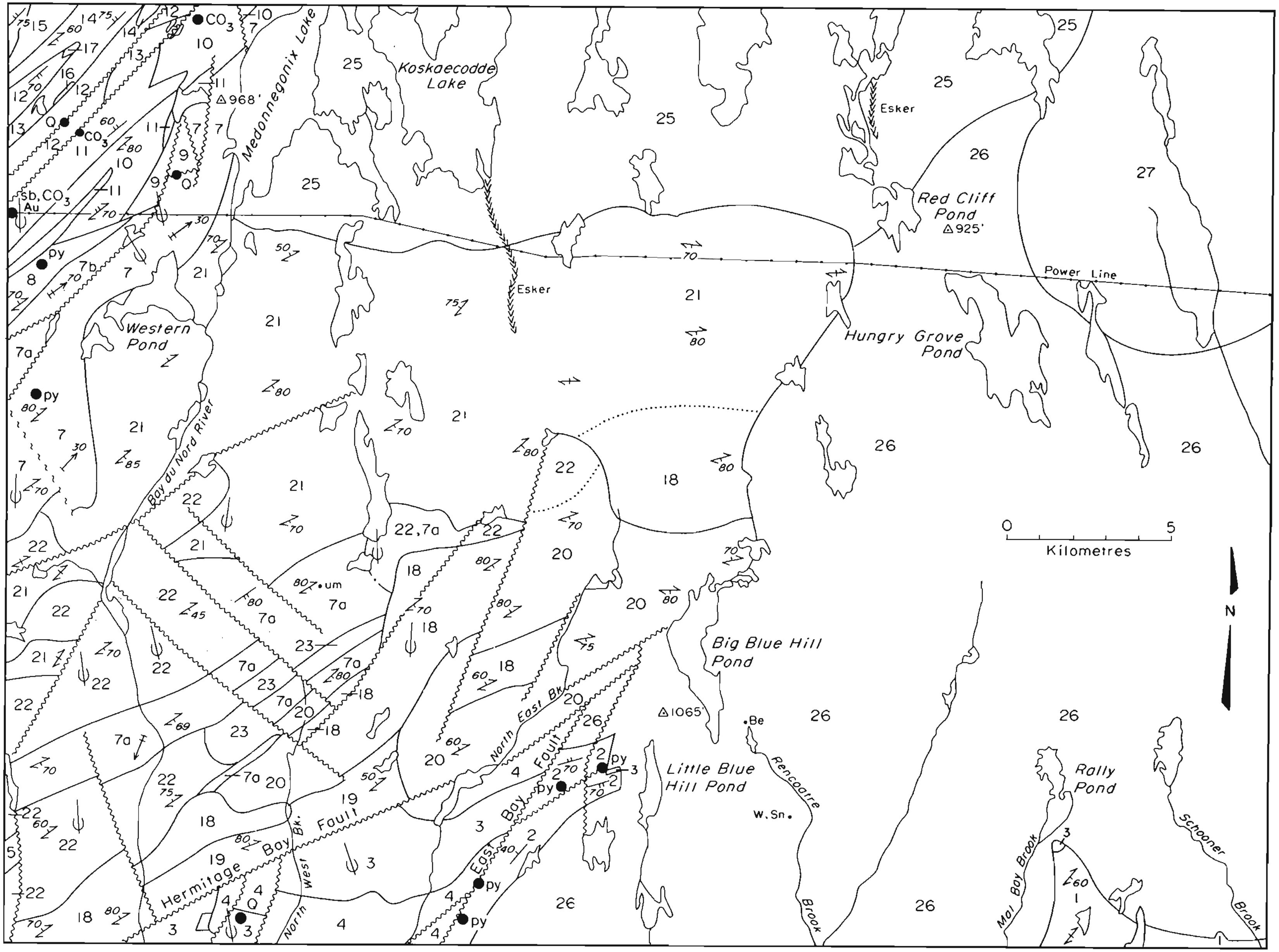

Figure 1. *Geology of the Hungry Grove Pond (1M/14) map area.*

LEGEND

DEVONIAN

ACKLEY GRANITE SUITE (Units 26 and 27)

27 *Pink and red, massive, coarse grained, leucocratic, equigranular, biotite granite and minor, fine grained, quartz – feldspar-porphyritic, biotite granite*

26 *Pink, massive, coarse grained, leucocratic, K-feldspar-porphyritic, biotite granite*

25 KOSKAECODDE PLUTON: *pink to grey, massive, coarse grained, K-feldspar-porphyritic, biotite granite; minor layered, massive, medium grained, equigranular biotite ± muscovite granite*

24 *Grey, massive, fine grained, diabase dykes*

SILURIAN – DEVONIAN

NORTH WEST BROOK COMPLEX (Units 18 to 23)

23 *Pink, foliated, fine grained, equigranular, biotite granite*

22 *Pink to buff, foliated, medium grained, equigranular and K-feldspar-porphyritic, biotite ± muscovite granite*

21 *Pink to buff, foliated, coarse grained, K-feldspar-porphyritic, biotite granite (cut by dykes of Unit 22)*

20 *Pink to buff, foliated, medium grained, equigranular, biotite ± muscovite granite*

19 *Buff to grey, foliated, medium grained, equigranular, biotite granodiorite*

18 *Orange to black, strongly foliated, coarse grained, feldspar-porphyritic, biotite granodiorite;* 18a, *massive, coarse grained, equigranular, biotite quartz diorite*

ORDOVICIAN OR SILURIAN

17 *Grey, foliated and sheared, medium grained, equigranular biotite granodiorite*

16 *Black, massive, coarse grained diabase;* 16a, *large, massive quartz veins*

ORDOVICIAN

BAIE D'ESPOIR GROUP (Units 7 to 15)

15 RICHES ISLAND FORMATION: *Grey, cleaved, medium bedded sandstone and slate*

ISLE GALET FORMATION – Units 7 to 14

14 *Medium- to coarse-grained, strongly cleaved, poorly sorted sandstone, pebble conglomerate and breccia containing abundant clasts of felsic volcanic rocks and quartz – sericite schist*

13 *Rhyolitic flows, bedded lapilli and fine grained tuff, and quartz – feldspar-crystal, ash-flow tuff*

12 *Grey, medium- to thick-bedded slate, siltstone and sandstone*

11 *Strongly deformed, chlorite ± sericite schist, and minor cleaved basalt flows, quartz – sericite schist and grey slate;* 11a, *chloritic semipelite and psammite*

10 *Strongly deformed, quartz – sericite ± chlorite schist (felsic metavolcanic rocks) and minor chlorite schist and slate*

9 *Pink to red, weakly cleaved, rhyolitic tuff and flows*

8 *Highly folded and quartz-veined, grey to black, locally rusty, pelite and semipelite*

7 LITTLE PASSAGE GNEISS: *highly deformed, grey to black, pelitic to psammitic, biotite schist and biotite gneiss and migmatite;* 7a, *dominantly pelitic biotite schist and minor psammitic biotite schist, containing locally extensive, rusty, micaceous alteration zones;* 7b, *quartz-rich, biotite psammite and semipelite*

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LEGEND

(Continued from previous page)

ORDOVICIAN OR OLDER

6 *Magnesite*

UPPER PRECAMBRIAN

SIMMONS BROOK BATHOLITH (Units 3 to 5)

5 *Grey, massive, medium- to fine-grained, diabase dykes*

4 *Pink to green, massive and locally brecciated, medium- to coarse-grained, equigranular, hornblende–biotite granodiorite*

3 *Black to dark-green, massive, medium- to coarse-grained, gabbro, diabase and minor pyroxenite*

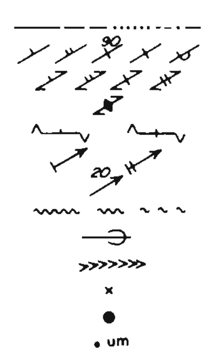
LONG HARBOUR GROUP (Units 1 and 2)

2 RENCONTRE FORMATION: 2a, *grey, massive, thick bedded, locally micaceous, sandstone hornfels;* 2b, *grey and brown, strongly cleaved, medium bedded sandstone and siltstone;* 2c, *medium bedded, pebble conglomerate and sandstone, minor thick bedded limestone*

1 BELLE BAY FORMATION: *grey to buff, flow-layered rhyolite, rhyolitic tuff, massive basaltic flows*

SYMBOLS

Geological boundary (defined, approximate, assumed, gradational)
Bedding, tops known, unknown (inclined, vertical, overturned)
Cleavage or schistosity, first, second generation (inclined, vertical)
Primary igneous flow layering (vertical)
Shear fabric (inclined, vertical)
Fold plunge and amount (first, second generation)
Mineral lineation with amount of plunge
Fault (defined, approximate, assumed)
Glacial striation–direction of ice movement known
Esker
Examined outcrop
Mineral occurrence
Ultramafic erratics



MINERAL OCCURRENCES

W .... *tungsten*
Sn .... *tin*
by .... *beryl*
sb .... *stibnite*
Au .... *gold*
py .... *pyrite*
Q .... *quartz veining*
CO_3 .... *carbonate alteration or veining*
po .... *pyrrhotite*
asp .... *arsenopyrite*
gn .... *galena*
sph .... *sphalerite*

Little Passage Gneiss are a part of the Gander Lake Subzone of the Gander Zone. The boundary between the Dunnage Zone and Gander Lake Subzones is the Day Cove Thrust of Colman-Sadd (1974, 1976). The Avalon Zone is represented by small portions of the upper Precambrian (Proterozoic III) Long Harbour Group (Williams, 1971), which is widespread to the south in the Fortune Bay area, and the probable upper Precambrian Simmons Brook Batholith (Widmer, 1950), which continues to the southwest of the map area.

The Avalon and Gander zones are juxtaposed along the Hermitage Bay Fault (Widmer, 1950; Blackwood and O'Driscoll, 1976) and the extensive (2700 km^2) Ackley Granite Suite intrudes both zones (Figure 2). The Middle Devonian Ackley Granite Suite is the oldest rock common to both the Gander and Avalon zones and provides the minimum age of movement on the fault. There is no indication of fault-related features, common elsewhere along the Hermitage Bay Fault, such as fault brecciation, fracture-filling quartz veins, alteration of biotite or plagioclase in the Ackley Granite Suite, along the northeast projection of the fault in the Big Blue Hill Pond area. Tuach (1987) dated the Hungry Grove Granite (Unit 26) at 367–374 Ma. The geometric relationships between the East Bay and Hermitage Bay faults indicate that the East Bay Fault truncates the Hermitage Bay Fault. Two km west of Big Blue Hill Pond, brecciated and altered granite occurs within 150 m of the massive Ackley Granite Suite. The altered granite is similar to the Ackley Granite Suite but is identical to altered granite of the Simmons Brook Batholith exposed to the southwest and northeast of North East Brook, along the Hermitage Bay Fault. The Ackley Granite is here interpreted to have been emplaced along the fault.

The Little Passage Gneiss has been included in the Baie d'Espoir Group by Blackwood (1985). In this report, the gneisses are also considered to form part of a continuous succession with the Baie d'Espoir Group although, in places, the contact is faulted. Thus the Gander Lake Subzone may not be present in the map area.

Previous Work

The earliest recorded work in the area is a reconnaissance survey by Baird *et al.* (1951) and a regional geological survey of the Hamilton Sound to Bay d'Espoir area by the Photographic Survey Corporation (?1951). The Little River to Medonnegonix Lake area was surveyed locally in detail but most of the area was assessed by aerial photographic interpretation with only local ground checks.

The area west of Medonnegonix Lake and Western Pond was included in a regional survey (Moore, 1953) of the Sylvester Lake (Diamond Lake; Mount Sylvester 2D/3 map area) to Conne River and River Pond area (St. Alban's 1M/13 map area) in which the major lithotypes were outlined with some accuracy. Some now significant components of the succession, such as mafic chlorite schists, however, were not differentiated.

McCabe *(in* Berrangé and McCabe, 1955) mapped from Medonnegonix Lake to the western boundary of the map area. However, in contrast to Moore (1953), felsic and mafic schistose volcanic rocks were mapped as metasediments, an error included in the paper of Anderson (1967). In Anderson's (1965) 1:250,000 compilation map of the Belleoram (1M) map area, none of the detailed geology defined by Moore (1953) or Baird *et al.* (1951) was shown. A molybdenite–bismuthinite showing in the Big Blue Hill Pond area (Anderson, 1967) has not been located in subsequent surveys.

An aeromagnetic survey by the Geological Survey of Canada (1969) showed several prominent anomalies and these can now be seen to coincide with significant geological contacts or lithologies.

Blackwood (1975) mapped the area along the Hermitage Bay Fault, in the Hungry Grove Pond map area, as part of a regional study of the fault, and noted that the fault was defined by a narrow breccia zone 50 to 100 m in width.

Saunders and Prince (1977) carried out a VLF and magnetometer survey about 4 km north of the Le Pouvoir showing but obtained no significant geophysical anomalies.

Dean (1978) included the area west of Medonnegonix Lake in a regional exploration survey of the Kaegudeck Lake area and noted the presence of felsic pyroclastic rocks that earlier surveys had mapped as conglomerate. Virtually all lithofacies west of Medonnegonix Lake were mapped as felsic or mafic volcanic rocks.

Aerodat Limited (1979) carried out an airborne electromagnetic and magnetic survey in the Kaegudeck Lake to Little River area for Hudson's Bay Oil and Gas Company Limited. Two sizable anomalies were outlined in the area west of Medonnegonix Lake, as shown previously by the Geological Survey of Canada (1969).

Butler and Davenport (1979) carried out a lake-sediment geochemistry program that included the Hungry Grove Pond Map area. Mo, U and F anomalies were indicated in the Big Blue Hill Pond area and single-site Ni, Co and Zn anomalies occur in an area 8 km northeast of the Le Pouvoir Sb showing. The lake sediment anomalies within the Ackley Granite Suite were followed up by Rio Tinto Canadian Exploration (McKenzie, 1980) and Falconbridge Nickel Mines Limited (Saunders, 1980, 1981). However, only minor Mo and Zn values were obtained from stream, soil, and rock samples.

Dickson *et al.* (1980) and Dickson (1982, 1983) carried out a reconnaissance lithogeochemical survey that included all the granitoid rocks in the Hungry Grove Pond map area, as outlined by Anderson (1967). This survey showed that the distribution of the Ackley Granite was distinctly different from that shown by Anderson (1967) and that the area southwest of Hungry Grove Pond was underlain by a variety of deformed

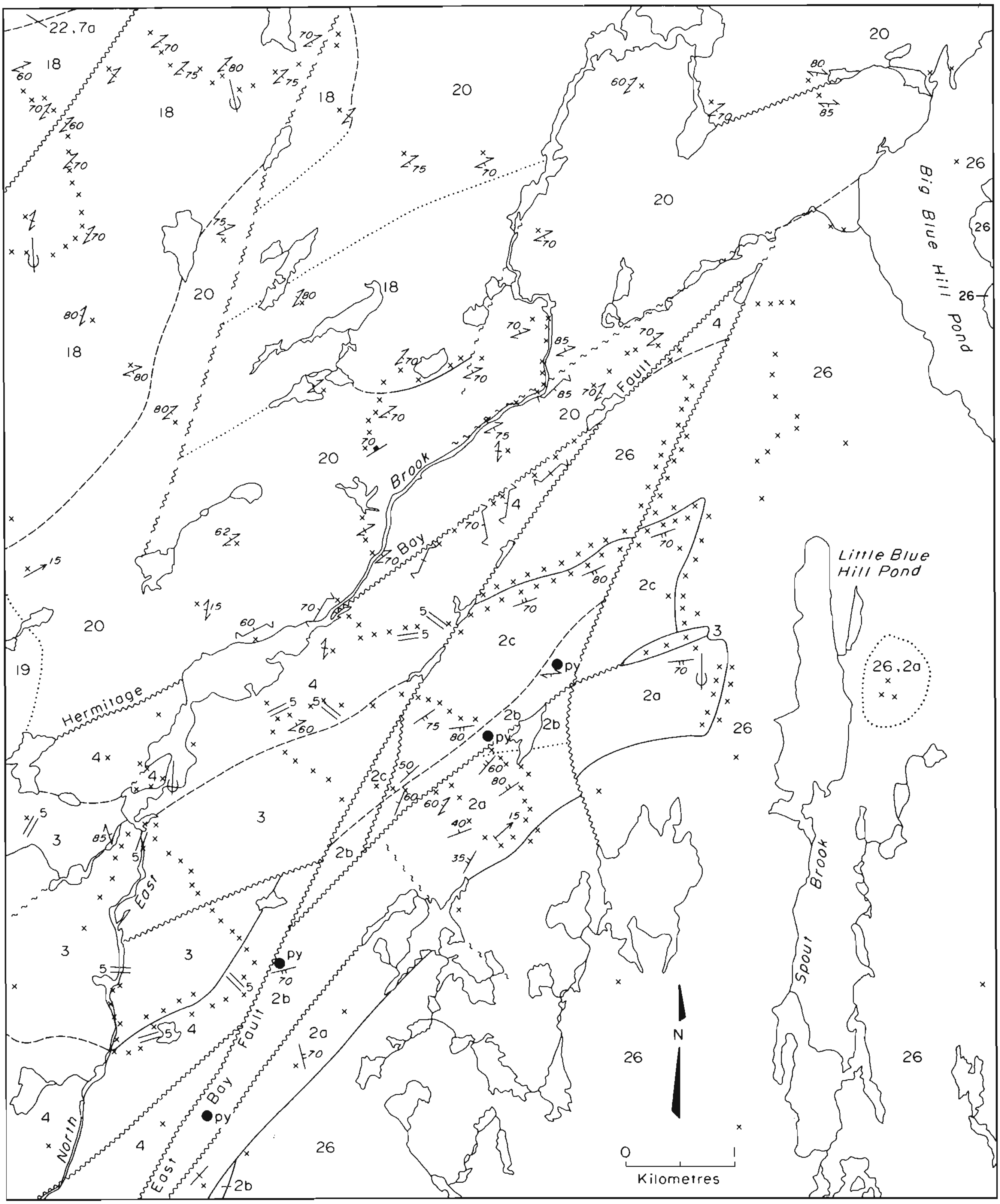


Figure 2. *Geological map of the Rencontre Formation in the Big Blue Hill Pond area (from Dickson, 1987b); legend as in Figure 1.*

granitoid and metasedimentary rocks. Various phases of the Ackley Granite Suite were also outlined.

Fenton (1981a,b) reported on extensive geophysical, geochemical and geological surveys and prospecting carried out in the area between Little River and the eastern end of Kaegudeck Lake. West of Medonnegonix Lake, several geophysical conductors were mapped and trenched and found to be mainly graphitic horizons. However, pyrite–pyrrhotite mineralization was also discovered in bedrock and anomalous Zn and Sb values were obtained in soils at the 'Lulwind Cove' horizon, 2 km northwest of Medonnegonix Lake. Epidote ± carbonate alteration of mafic volcanic rocks at Lulwind Cove was also noted, but no significant gold values were obtained. It is perhaps significant that the highest Sb and Zn values (160 and 2040 g/t respectively) were obtained from rocks in the fault zone between chlorite schist and sedimentary rocks. This fault is termed the Le Pouvoir Fault in this report (see Figure 3).

Swinden (1980, 1982) presented a metallogenic model for the various mineral occurrences in the Bay d'Espoir area including the Hungry Grove Pond and Mount Sylvester map areas. Swinden (op. cit.) and Colman-Sadd (1980a) interpreted the volcanic rocks of the Isle Galet Formation as lateral facies variants of a volcanic complex, centred near Kim Lake (Mount Sylvester map area), with more distal facies now exposed to the southwest.

Vanderveer (1982) carried out a reconnaissance survey of glacial features in the Hungry Grove Pond map area as part of a regional survey of the southern half of the Ackley Granite.

Following the discovery of gold in the Ordovician rocks at Hope Brook, numerous companies staked the stratigraphically and laterally equivalent Isle Galet Formation (see O'Brien and Dickson, 1986). Tillicum Resources Limited and Westfield Minerals Limited hold the ground in the Hungry Grove Pond map area. Extensive till and soil geochemical surveys and prospecting (McHale, 1985a,b; McHale and McKillen, 1986) resulted in the rediscovery of the Le Pouvoir Sb showing (apparently discovered by P. Chance, see Fenton 1981b; McHale, 1985a) and the discovery of several areas with minor stibnite and anomalous gold values (McKillen, written communication to J. Tuach, 1986) in the Le Pouvoir horizon (McHale, 1985a; see Figure 3). Westfield Minerals (1986) reported high gold values in 'felsic volcanic tuffs' of the Isle Galet Formation (Little River prospect; see Figure 4). The '... mineralized zone ...' which occurs within a '... target stratigraphic horizon for 30 km' has been termed the Kim Lake horizon (McHale, 1985a) and extends through the northwest corner of the map area (see Figures 3 and 4).

Tuach (1984a,b) reported significant Sn and W values from greisen in the Ackley Granite Suite, southeast of Big Blue Hill Pond. Tuach *et al.* (1985) showed systematic differences in delta ^{18}O values for the Hungry Grove Granite (Unit 26), of the Ackley Granite Suite, and the Koskaecodde pluton. Higher values in the Koskaecodde pluton reflect input from the Gander Zone metasedimentary rocks and the lower values in the Ackley Granite Suite reflect input from the volcanic rocks and volcaniclastic sediments of the Avalon Zone. Tuach *et al.* (1986) and Tuach (1987) described certain geochemical trends in the Ackley Granite Suite that resulted from high-level enrichment processes in high-silica granites. Tuach (1987) named the various units of the Ackley Granite Suite and reported new ages for some units and mineralization in the suite. The ages for the various granites, along with the geochemical differences, indicate that the Koskaecodde pluton is unrelated to the Ackley Granite Suite.

Adjacent map areas have been mapped by Williams (1M/11, 1971), Colman-Sadd (1M/13, 1976), O'Brien *et al.* (1M/15, 1984) and Dickson (2D/3; 1986, 1987a). A summary of the regional geology and metallogenesis is found in Colman-Sadd and Swinden (1982).

Radiometric Dating

Wanless *et al.* (1972) obtained a 405 ± 17 Ma K/Ar (biotite) age (recalculated using current decay constants) on foliated granite (Unit 21, North West Brook Complex) near the southwest corner of Medonnegonix Lake. Tuach (1987) dated the Koskaecodde pluton (Unit 25) at 427 ± 12 Ma (Rb/Sr whole rock) and 410 ± 4 Ma ($^{40}Ar/^{39}Ar$ biotite) and the granite in the Big Blue Hill Pond area (Unit 26) was dated at about 358 ± 12 Ma (Rb/Sr whole rock) and 367–372 Ma ($^{40}Ar/^{39}Ar$ biotite and hornblende)

GENERAL GEOLOGY

Physiography and Glacial Features

The Hungry Grove Pond map area contains remnants of the 'High Valley Peneplane', which is estimated to have had an average height of 1000 feet in the Bay d'Espoir area (Twenhofel and McClintock, 1940). Remnants include 'Big Blue Hill' (1065 feet) and 'Red Cliff Pond hill' (925 feet); isolated hills west of Medonnegonix Lake and Western Pond are over 900 feet high. The Precambrian volcanic rocks south of Rally Pond form a coastal ridge that commonly exceeds 1000 feet in height. Most of the area forms part of the lower 'Lawrence Peneplane', which averages 700 feet in this area.

The topography reflects the variations in rock type such that low ground is underlain by homogeneous granites of the Koskaecodde pluton and the Ackley Granite Suite and is undulating, whereas the other areas comprising a great variety of rock types are highly dissected. Faults are commonly the sites of deep gorges.

The entire area was glaciated and striae and erratics are ubiquitous. Striae typically trend toward 170° with a range from 150° to 190°. Crag and tail, stoss and lee surfaces, and rock ramps also indicate a southerly ice-flow direction. Most of the area east of Medonnegonix Lake and Little Blue Hill Pond is hummocky terrain having innumerable granite erratics of local origin. Vanderveer (1982) noted abundant south-oriented drumlinoid linear moraines and minor transverse moraines in this area. The area to the west is dominated by

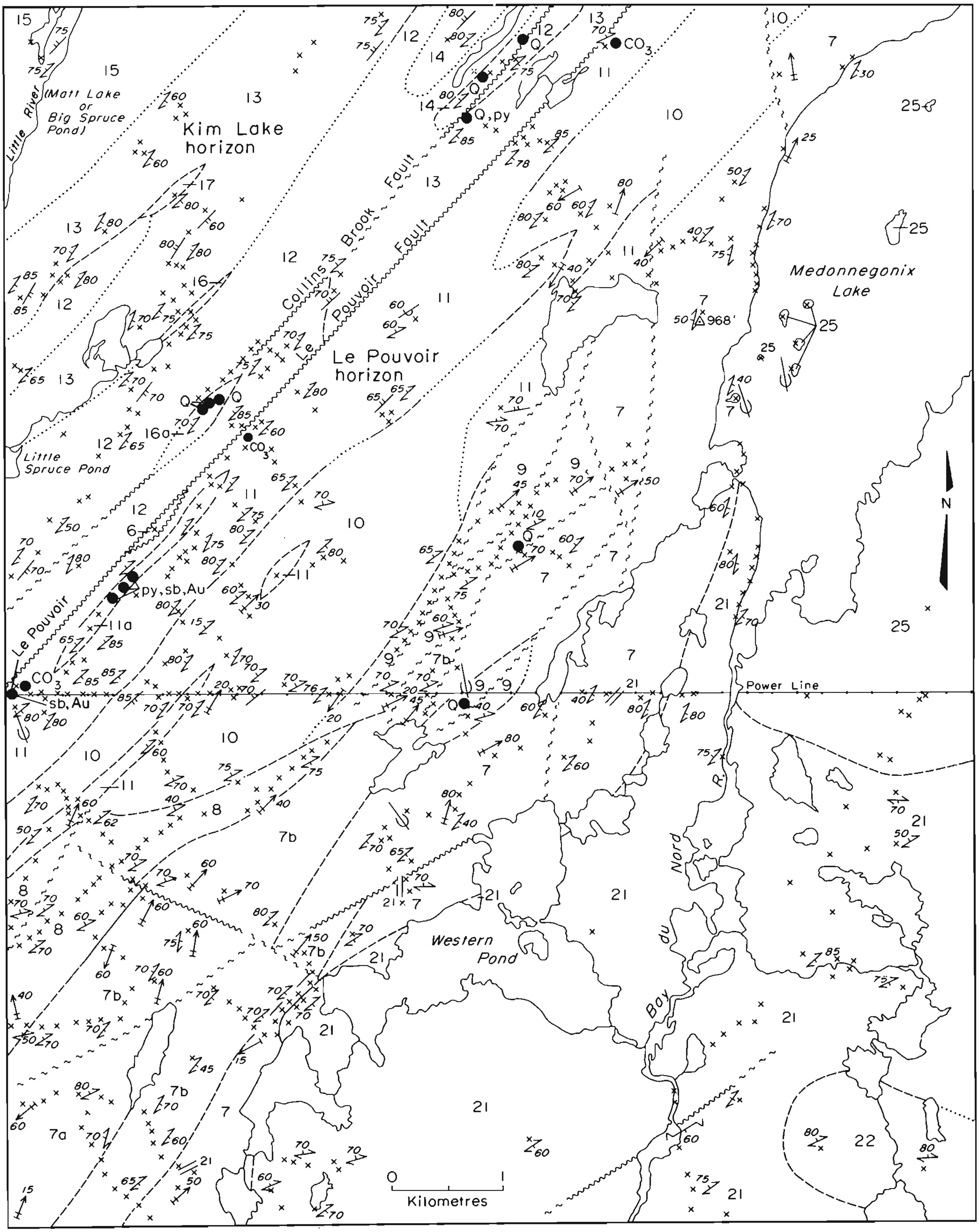


Figure 3. *Geological map of the Baie d'Espoir Group, west of Medonnegonix Lake (from Dickson, 1987b); legend as in Figure 1.*

exposed rock, and till is restricted to the valleys. Boulder fields are locally extensive. Twelve km south-southeast of Medonnegonix Lake, rounded boulders (up to 5 m) of serpentinized peridotite and harzburgite occur in a lateral moraine along with biotite schist of local derivation. The closest known source of serpentinized ultramafic rock is 5 km northeast of Conne River Pond (Mount Sylvester map area; Dickson, 1987) suggesting that they have been transported approximately 30 km. Two eskers occur in the northern part of the map area and indicate that meltwater channels drained to the south to the South East Brook and Mal Bay Brook drainage systems.

Drainage patterns partly reflect the geological structures with faults often utilized by streams. Stream capture is particularly well displayed in the vicinity of the Hermitage Bay Fault and several major rivers that cross the fault have captured the subsequent streams that flow along the fault line. Major rivers such as the Bay du Nord River, North East and North West brooks, may have originally flowed along parts of the Hermitage Bay Fault valley. The river valleys have been modified by ice as truncated spurs occur along the major rivers.

AVALON ZONE

Long Harbour Group (Units 1 and 2)

The Belle Bay Formation (White, 1939; Williams, 1971) is the oldest formation of the Long Harbour Group (Williams, 1971) and the Rencontre Formation (White, 1939) is the youngest (Williams, 1971). South of the map area, the Belle Bay Formation is unconformably overlain by the Rencontre Formation and the fossiliferous, Middle Cambrian Youngs Cove Group (Smith and White, 1954; Williams, 1971).

The Belle Bay Formation (Unit 1) forms a protrusion from the main belt of volcanic rocks to the south of the map area. The contact with the Ackley Granite Suite was mapped and described by Dickson (1982), who noted contact-metamorphic andalusite porphyroblasts and recrystallization of the rocks along the contact. The dominant rock types in this area are weakly cleaved, grey rhyolite, rhyolitic lapilli tuff, tuffaceous sandstone and crystal-lithic tuff. Flow layering is locally developed in the rhyolite. Near the contact with the Ackley Granite Suite, 3 km southeast of Rally Pond, thick basalt flows are intercalated with the tuffs. Bedding is apparent only in the tuffaceous sandstones and is generally parallel to the northeast-striking cleavage that dips to the northwest or southeast.

The Rencontre Formation (Unit 2), exposed along a highly dissected, northeast-trending narrow ridge, can be divided into three components (Figure 2) which, based on the few facing criteria and the north dip of the beds, young from south to north. The oldest component (subunit 2a) is a sequence of mainly very thick bedded (up to 5 m), virtually featureless, grey sandstone with locally abundant muscovite. Parallel laminations in the thick bedded sandstones have been enhanced by the growth of mica during contact metamorphism. Strongly cleaved, thinner bedded (up to 1 m), grey sandstone is locally pyritic with rusty weathering surfaces.

Subunit 2b is dominated by thin bedded (2 to 10 cm), strongly cleaved, grey, locally micaceous sandstone and siltstone. A prominent feature of the subunit is the extensive gossans formed by weathering of fine grained disseminated pyrite. The siltstones locally contain cordierite porphyroblasts 1 km from the surface contact with the Ackley Granite Suite. This may indicate that the Rencontre Formation is a roof pendant of the granite as cordierite porphyroblasts are commonly restricted to the area adjacent to the contact with the granite.

Subunit 2c contains a variety of sedimentary rock types such as breccia, conglomerate, sandstone and limestone. Of particular interest are the grey and red, medium to thick bedded, clast-supported, pebble conglomerate and breccia that contain abundant felsic and mafic volcanic clasts (Plate 1). The volcanic clasts are probably from the Belle Bay Formation. The conglomerate is interbedded with grey, locally micaceous sandstone which, as in the conglomerates, contain abundant feldspar and quartz grains. Cross bedding was found in a few places. Near the northern contact of the subunit with the Ackley Granite Suite, 1 to 3 cm long, angular, sedimentary clasts occur in thick-bedded breccia. A thin, lensoid (20 m by 5 m) sequence of limestone and calcareous siltstone is interbedded with the conglomerate and sandstone.

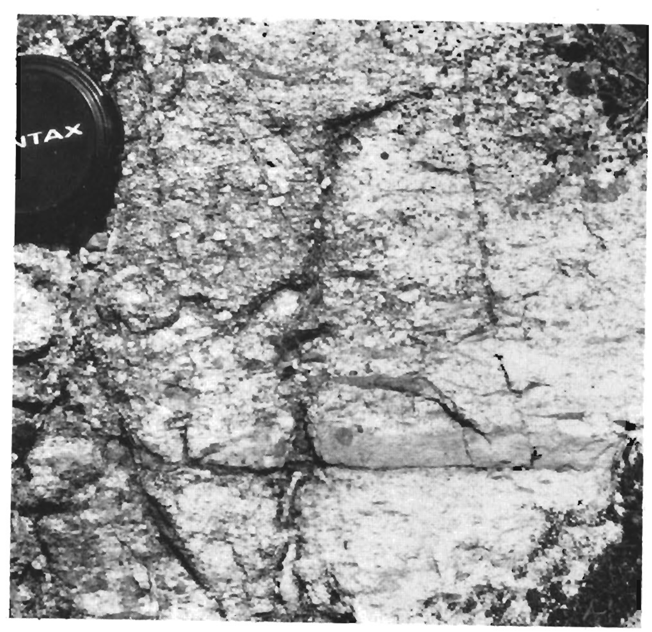


Plate 1. *Bedded breccia (subunit 2c), from the Rencontre Formation, showing rhyolite (white) and sedimentary (grey) angular clasts; at contact with Ackley Granite, 2 km southeast of South East Brook; lens cap is 5 cm in diameter.*

Parallel laminations and bedding, cross bedding, poor sorting and angular fragments suggest that the Rencontre Formation is a fluvial sequence. The limestone may indicate a marine component in the sequence.

The formation is in contact with the Simmons Brook Batholith along the East Bay Fault (Williams, 1971) to the west, and is in intrusive contact with the Ackley Granite Suite to the north, east and southeast. The fault contact with the Simmons Brook Batholith is exposed south of the map area (Williams, 1971). In several places, however, the Rencontre Formation and the Simmons Brook Batholith are brecciated and cut by small quartz veins, and a major northeast-trending lineament defines the trace of the East Bay Fault. There is no evidence that the Simmons Brook Batholith has intruded the Rencontre Formation. The intrusive contact of the Ackley Granite Suite is generally sharp and parallel to the strike of the Rencontre Formation. However, a 200 to 300 m wide zone of intrusion breccia has developed where the Ackley Granite Suite cuts across the strike of the Rencontre Formation, to the west of Little Blue Hill Pond. A well-developed aureole is indicated by randomly orientated biotite and muscovite porphyroblasts in a hornfels zone up to 300 m wide.

Simmons Brook Batholith (Units 3–5)

The northeastern 60 km^2 portion of the 150 km^2 Simmons Brook Batholith (Williams, 1971; Bay du Nord Batholith of White, 1939) is exposed in the map area. Massive gabbro (Unit 3) and granodiorite (Unit 4) are the main components of the Simmons Brook Batholith; diabase dykes (Unit 5) cut Units 3 and 4. The contact of the gabbro with the granodiorite is sharp in an exposure on South East Brook. Williams (1971, page 18) notes that mafic phases occur as inclusions within the granitic rocks. In other areas, gabbro to granodiorite are in close proximity (5 m) but contacts are not exposed.

The gabbro is commonly medium to coarse grained, equigranular, massive, green to black, and contains pyroxene, hornblende and dark-coloured plagioclase (Plate 2). Locally the gabbro is a coarse grained hornblendite and in other places a medium grained diabase. Epidote is common along joints and in narrow, fault breccia zones. Along the northern contact with the granodiorite, the gabbro contains abundant (30 percent), 1 cm long hornblende laths in a plagioclase-rich matrix. This zone may represent a transitional contact with the granodiorite.

The granodiorite is a massive, green to buff, quartz–plagioclase–hornblende–biotite rock with about 10 percent K-feldspar. Hornblende forms stubby, 5-mm-long laths. Although the granodiorite is dominantly coarse grained (average 5-mm crystals), medium grained, granodiorite is the typical lithology near the contact with the gabbro on South East Brook. The granodiorite is altered and brecciated along the Hermitage Bay Fault and veined by quartz. The mafic minerals have been altered to sericite and chlorite.

Diabase (Unit 5) occurs throughout the batholith as isolated dykes that have no consistent trend. Crosscutting dykes indicate that at least two generations are present. The most common variety of diabase is medium grained (Plate 2) and massive whereas fine grained hornblende-porphyritic diabase is less common. The dykes are commonly altered with epidote and chlorite-coated joint surfaces and rare quartz veins. Along the Hermitage Bay Fault, northeast of North East Brook, brecciated diabase is common within the highly brecciated and chloritized granodiorite of the Simmons Brook Batholith.

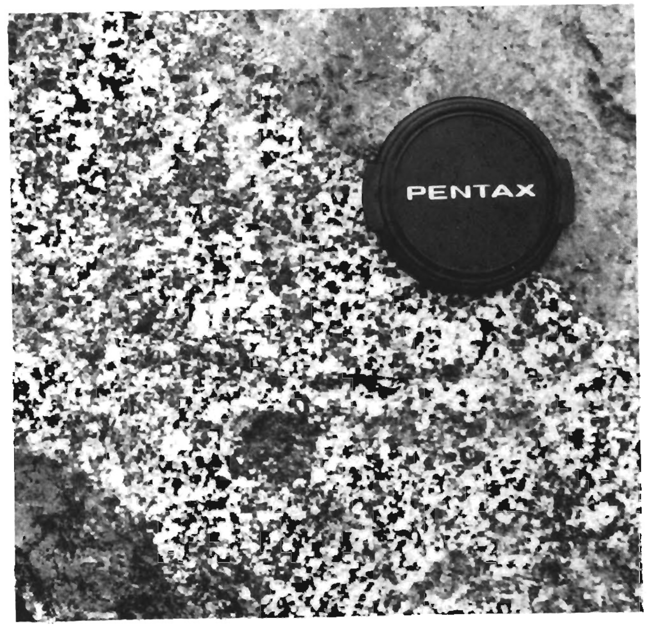


Plate 2. *Gabbro (Unit 3) (below lens cap) cut by grey, fine grained diabase dyke (above lens cap) (Unit 5), both part of the Simmons Brook Batholith; on South East Brook–lens cap is 5 cm in diameter.*

The Simmons Brook Batholith forms a fault-bounded block between the East Bay and Hermitage Bay Faults. Southwest of the Hungry Grove Pond map area, the batholith has intruded the upper Precambrian Connaigre Bay Group (Widmer, 1950), which is a probable stratigraphic equivalent of the Long Harbour Group. O'Driscoll (1977) and O'Driscoll and Strong (1979) demonstrated a chemical similarity between the various units of the batholith and the volcanic rocks of the Connaigre Bay Group. They proposed that they were genetically related and therefore the same age, viz. late Precambrian. A gabbro dyke has intruded the Rencontre Formation, west of Little Blue Hill Pond, and a plug of gabbro has intruded the Belle Bay Formation, southeast of Rally Pond. These intrusions are assumed to be related to the Simmons Brook Batholith.

DUNNAGE ZONE

The Dunnage Zone is represented by the Middle Ordovician and/or older Baie d'Espoir Group (Units 7–15) that has been intruded by the Silurian and older North West Brook Complex (Units 18–23) and the Lower Devonian Koskaecodde pluton (Unit 25). Minor components are magnesite (Unit 6), gabbro (Unit 16), quartz veins (subunit 16a), granodiorite (Unit 17) and diabase (Unit 24). The Ackley Granite Suite is not restricted to this terrane but is described in this section.

Two major northeast-trending faults, which lie within the Isle Galet Formation, were discovered during this survey. The Le Pouvoir Fault is named after the Le Pouvoir Sb showing that lies 200 m southeast of the fault. The Collins Brook Fault, named after Collins Brook (in the St. Alban's map area), runs parallel and 500 m to the northwest of the Le Pouvoir Fault. Both faults are marked by prominant lineaments. A small exposure of magnesite, several areas of quartz–carbonate veins and fault breccia occur along the Le Pouvoir Fault. Large (<50 m) quartz veins occur along the Collins Brook Fault and in the adjacent sedimentary and volcanic rocks.

Magnesite (Unit 6)

The oldest component of the Dunnage Zone is considered here to be a small area of magnesite that outcrops along the Le Pouvoir Fault, 2 km northeast of the Le Pouvoir Sb–Au showing (Figure 3; Plate 3). This unit is considered to be older than the Baie d'Espoir Group as probable equivalent-aged ultramafics, in the Gander area, are nonconformably overlain by conglomerates and late Llanvirn–early Llandeilo fossiliferous calc-arenites of the Davidsville Group (Blackwood, 1978; Stouge, 1980). The Davidsville Group is interpreted as a lateral equivalent of the Baie d'Espoir Group (Blackwood and Green, 1983).

Plate 3. *Massive, jointed magnesite (Unit 6) exposed along the Le Pouvoir Fault, 2 km northeast of the Le Pouvoir stibnite–gold showing; Barry Wheaton for scale.*

The magnesite occurs in a single exposure, along the lineament formed by the Le Pouvoir Fault, at the northeast corner of an elongate, 200-m-long pond. The exposure covers an area of about 50 m^2 and is surrounded by boulders of magnesite. The magnesite is a yellow-brown-weathering (grey on fresh surfaces) massive rock, veined by magnetite and carbonate. The magnesite is well jointed and unfoliated (Plate 3). Contacts with the surrounding rocks are not exposed. Analyses of two samples of magnesite give high Ni and Cr values (Table 1) and indicate an ultramafic parentage for the magnesite.

Table 1. Ni and Cr analyses (in g/t) for samples of magnesite (Unit 6) from the Le Pouvoir Fault

Sample No.	Ni	Cr
2242933	1780	1340
2242943	1370	1210

The presence of ultramafic rocks along the Le Pouvoir Fault may indicate that it is a deep-seated thrust that has penetrated oceanic crust forming the basement to the Baie d'Espoir Group (as postulated by Colman-Sadd, 1980a).

Baie D'Espoir Group (Units 7–15)

The Baie d'Espoir Group, as currently defined (Colman-Sadd, 1976), consists of the Salmon River Dam Formation, which is overlain from northwest to southeast by the North Steady Pond, St. Joseph's Cove, Riches Island and Isle Galet formations. Middle Ordovician fossils have been found in the Riches Island Formation. Colman-Sadd (1976) and Dunlop (1954) found poorly preserved fossils in the Riches Island and Isle Galet formations, which gave a poorly defined Ordovician to possibly Cambrian age. The Little Passage Gneiss (Colman-Sadd, 1974) have been interpreted to underlie the Baie d'Espoir Group and to be in thrust contact with the Isle Galet Formation (Colman-Sadd, 1976). A tentative Precambrian age was assigned to the gneisses (Colman-Sadd, 1974, 1976, 1980a). The thrust contacts between the Little Passage Gneiss and Isle Galet Formation are exposed along the Harbour Breton road (Figure 4). Continuous sections in the Western Pond area (Figure 3) indicate that the gneisses do stratigraphically underlie the Baie d'Espoir Group, although faulted and sheared contacts are also present. Thus the Little Passage Gneiss is here considered to be a lower unit of the group. Blackwood (1985) proposed that the Little Passage Gneiss also forms part of the Baie d'Espoir Group but occurs stratigraphically higher in the sequence on the overturned limb of a recumbent fold. The Salmon River Dam, North Steady Pond, and St. Joseph's Cove formations lie to the northwest of the map area and are described in some detail in Colman-Sadd (1976, 1980b) and Dickson (1987a).

Rocks assigned to the Little Passage Gneiss occur in two areas. In the Western Pond–Medonnegonix Lake area, a complex belt of psammitic, semipelitic and pelitic schist, gneiss and migmatite (Unit 7, subunits 7a, 7b) occurs between the Isle Galet Formation and the North West Brook Complex. Dickson (1987a) indicated that this belt of metasedimentary rocks was a lower member of the Isle Galet Formation with no break in the sequence. A northeast-trending belt of biotite schist (Subunit 7a) lies within the North West Brook Complex and is continuous with previously defined Little Passage Gneiss to the west of the map area (Colman-Sadd, 1976).

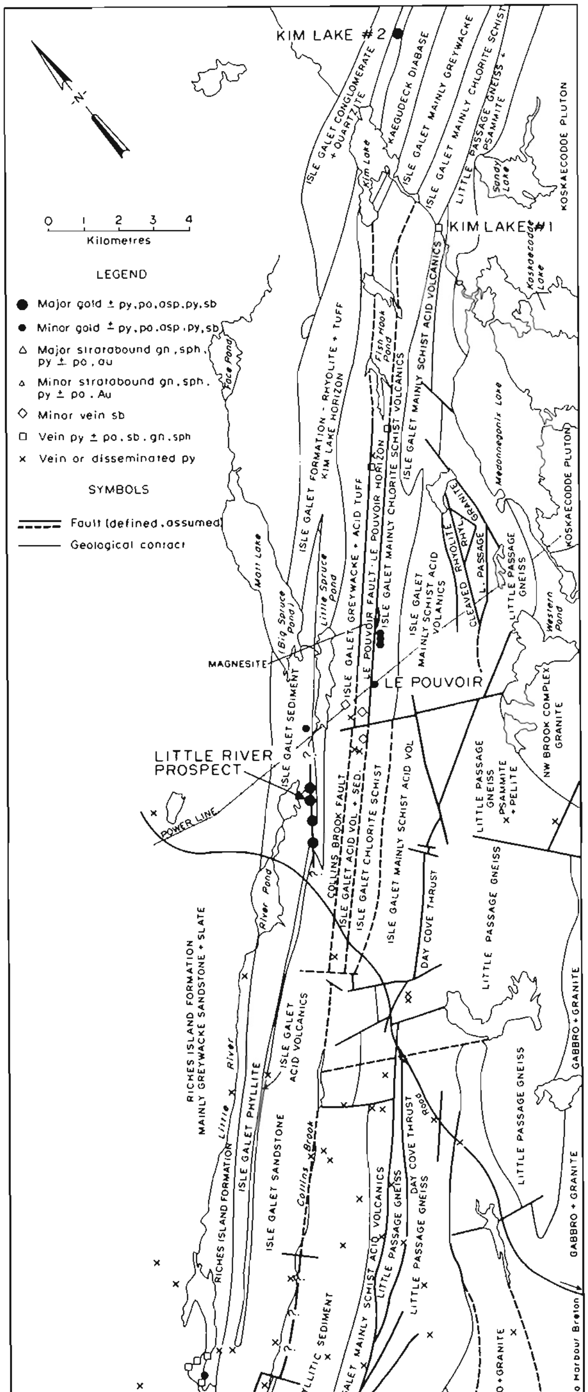


Figure 4. *Simplified geological–metallogenic map of the Isle Galet Formation between Barasway de Cerf and Kim Lake; based on Dunlop (1954), Colman-Sadd (1976), Colman-Sadd and Swinden (1982), Swinden (1980, 1982), McKillen (written communication to J. Tuach, 1986), and Dickson (1987a,b; unpublished data).*

The Little Passage Gneiss (Unit 7) consists mainly of strongly foliated and highly folded psammitic schist and gneiss (Plate 4). Toward the contact with Unit 21 granite, the metasedimentary rocks become migmatitic and are locally intruded by dykes of Unit 21. Along the western shore of Medonnegonix Lake, the metasediments display a well-developed banding which is probably related to recrystallization of thin beds within the aureole of the Koskaecodde pluton. To the southwest of Western Pond, the metasediments are cut by numerous quartz and pegmatite veins.

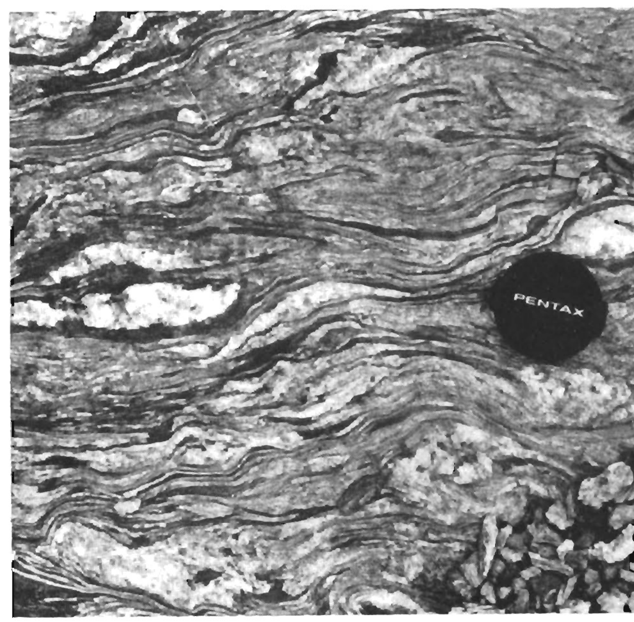


Plate 4. *Banded, biotite psammite gneiss (Unit 7; Little Passage Gneiss) with lensoid, quartz segregations in the aureole of the North West Brook Complex; on power line, 600 m west of contact with Unit 21–lens cap is 5 cm in diameter.*

Subunit 7a of the Little Passage Gneiss is predominantly biotite-rich, pelitic schist with lesser psammitic schist. In the southern outcrop area, numerous granite dykes occur along the margin of the subunit. Subunit 7b is dominated by psammitic schist with minor, interbedded, pelitic and semipelitic schist. Some psammite beds are highly porous, rusty weathering, and veined by quartz, and originally may have been felsic volcanic rocks.

Isle Galet Formation (Units 8–13). A variety of sedimentary, felsic and mafic volcanic rocks comprise the Isle Galet Formation. One cross-laminated, northwest-dipping, overturned sandstone bed was found in Unit 11 but some found in the Mount Sylvester map area (Dickson, 1987a) indicate that the formation youngs to the northwest. Units form linear belts along strike with no apparent major folds. Thus the sequence is assumed to face to the west toward the less deformed rocks. However, the newly-discovered, strike-parallel Le Pouvoir Fault defines significant abrupt changes in deformation and rock type which, along with small tight folding, indicate that the stratigraphic sequence is more complicated.

Unit 8 pelite and psammite is in gradational contact with subunit 7b. These black and grey rocks form thick sequences that lack sedimentary structures. Bedding is apparent only where pelite and psammite are present. The pelites show widespread development of folded cleavage and late quartz veining. Fold axes of the small folds commonly plunge to the northeast at 50 to 70° and the quartz veins locally cut across the fold axes. The veins are, however, more commonly parallel to the cleavage. Rusty zones occur within the pelites and one pyritic zone was trenched by Hudson's Bay Oil and Gas Limited (Fenton, 1981a) but no significant mineralization was found.

Unit 9 consists of cleaved and locally folded, pink to grey rhyolite and rhyolitic tuff exposed in two areas. The contact between Unit 9 and the Little Passage Gneiss is locally a zone of intense deformation, and in one place the rhyolite has been extensively silicified and then deformed along the contact (Plate 5). Narrow mylonite zones (10 to 50 m) occur within the Little Passage Gneiss close to the contact. At the power line, west of Medonnegonix Lake, the southern area of rhyolite is rusty and quartz veined and is probably in fault contact with the Little Passage Gneiss as topographic lineaments surround the block of rhyolite.

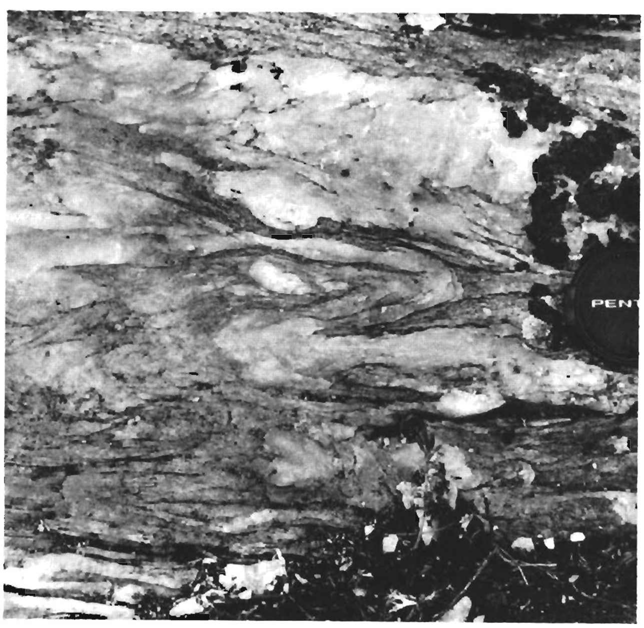


Plate 5. *Folded quartz veins, in silicified rhyolite (Unit 9) of the Isle Galet Formation, along the fault contact of the formation with the Little Passage Gneiss, 2 km west of Medonnegonix Lake; lens cap is 5 cm in diameter.*

Unit 10 consists of an apparently thick sequence of cream to buff-coloured, quartz–sericite schist, cleaved and recrystallized, rhyolitic tuff, and minor chlorite–sericite schist and pelitic schist. Volcanic textures are locally preserved and the rock is derived from a crystal tuff with quartz and feldspar phenocrysts. Elongate, darker-coloured fragments are rarely present and these may be fiamme or coarse ejecta in the tuff. The rhyolite and rhyolitic tuff are generally less schistose toward the contact with Unit 9 and the rhyolite has been recrystallized to form granoblastic aggregates of quartz, feldspar and sericite.

The tuffs (Unit 10) have their widest areal extent in the vicinity of the power line and the unit tapers to the northeast and southwest. There is little change in rock type along strike. Northwest of Medonnegonix Lake, the tuffs are interbedded with chlorite schists and pelites. Colman-Sadd (1976) has shown that the schistose, felsic volcanic rocks south of the Collins Brook Fault extend to the southwest in a 1-km-wide zone to Barasway de Cerf (Figure 4).

Unit 11 is dominated by chlorite schists with minor interbedded, weakly cleaved, basalt flows and quartz–sericite schist. Psammitic and pelitic schist (subunit 11a) occur within Unit 11. This assemblage has been informally termed the Le Pouvoir horizon (McHale, 1985a). The Le Pouvoir horizon is separated from Units 12 and 13 by the Le Pouvoir Fault. The chlorite schists are dominantly green to buff and homogeneous, so that bedding is rarely apparent. Primary layering was observed only where psammites or quartz–sericite schists are interbedded with the tuffs. The chlorite schists contain euhedral plagioclase phenoclasts and are considered to be derived from mafic tuffs. Two km northeast of Le Pouvoir, a 75-m-thick, weakly cleaved, basalt flow is intercalated with the sequence. Generally, the sedimentary units are less than 100 m thick and form elongate lenses within the sequence of chlorite schists.

Alteration of the sequence is concentrated along the western margin of the Le Pouvoir horizon. At the Le Pouvoir showing, a 2-m-thick, cream-coloured band, within the chlorite schist unit, contains abundant interstitial carbonate and disseminated pyrite and in several places to the northeast of Le Pouvoir, the chlorite schist is veined by quartz and carbonate. In several places close to the fault, a banded, highly folded rock with chlorite-rich and quartz–sericite-rich, 1-cm-thick layers locally contains carbonate and quartz veins (Plate 6). The banded unit is possibly a recrystallized chemical sediment. A similar banded rock occurs 1.7 km west of Medonnegonix Lake. Fenton (1981b) noted that carbonate–epidote alteration occurs along the 'Lulwind Cove horizon' that lies along the Le Pouvoir Fault.

Unit 12 of the Isle Galet Formation is interbedded with the felsic volcanic rocks of Unit 13 and pebble conglomerate of Unit 14. Collectively, these three units form the Kim Lake horizon. The Collins Brook Fault occurs within Unit 12 and

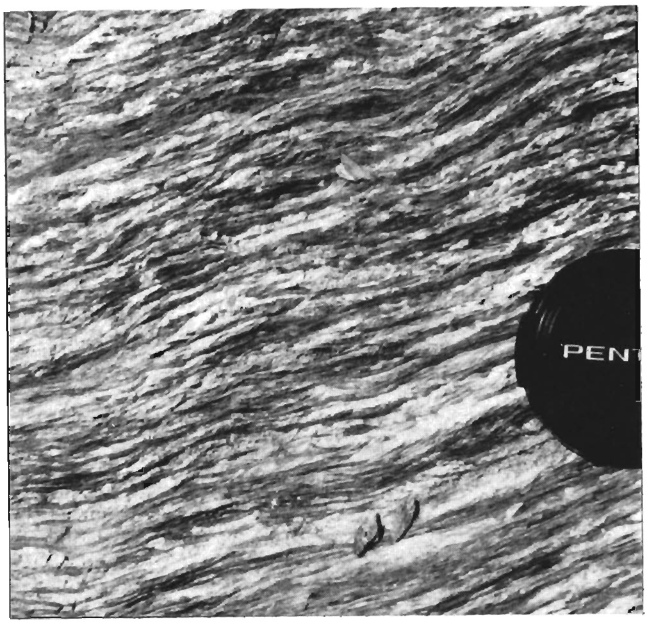


Plate 6. *Banded quartz–carbonate–sericite and chlorite–sericite schist (part of Unit 11 of the Isle Galet Formation), 2 km northeast of the Le Pouvoir stibnite–gold showing; lens cap is 5 cm in diameter.*

is locally marked by extensive quartz veins (in part subunit 16a). Sheared and brecciated sedimentary and volcanic rocks (eastern belt of Unit 13) occur along the northern portion of the fault. The fault may continue southwest of the map area to Barasway de Cerf area (Figure 4).

Unit 12 consists of medium bedded, well cleaved, grey sandstone and siltstone. Sedimentary features are rare and consist of parallel laminations. No younging criteria were found. This lack of younging criteria is particularly frustrating as the bifurcation of Unit 13 around a wedge of Unit 12 sediments could indicate tight folding. It is assumed that this wedge is simply a lens of sediments deposited within the sequence of volcanics and indicates that sedimentation and volcanism were contemporaneous. The sediments are steeply dipping and the main (first) cleavage is parallel to bedding. Second-generation folds are open, gently northeast-plunging and have axial planes and associated cleavage that dip to the southeast at around 10°.

Unit 13 consists of two areas of medium to very thick bedded, felsic volcanic rocks and minor, thin to thick bedded, clastic, sedimentary rocks. The southeastern area lies between the Collins Brook and Le Pouvoir faults and is underlain by massive rhyolite, interbedded, schistose felsic and possibly mafic (chloritic) tuff and minor, fine grained porcellanite (waterlain, siliceous, volcanic ash). Extensive, rusty, quartz veins cut the porcellanite near the Collins Brook Fault. The northwestern belt of Unit 13, forming the Kim Lake horizon, is dominated by a central portion of cleaved, fine grained, rhyolitic tuff. The southeastern portion of this belt consists of interbedded fine grained tuff, lapilli tuff, and rhyolite exposed in a series of low hills. The northwestern portion of the belt contains quartz–feldspar-crystal tuff and fine grained tuff.

In the Mount Sylvester map area, the volcanic rocks of Unit 13 narrow to about 500 m and are dominated by massive rhyolite and autobrecciated rhyolite. These types of felsic volcanics are commonly considered to be proximal deposits whereas the bedded tuffs and ash flows (such as the crystal tuffs) may be deposited well away from a volcanic centre. A thin unit of felsic volcanic rocks, continuous with the Kim Lake horizon, has been traced to 8 km northeast of Barasway de Cerf (Colman-Sadd, 1976; Figure 4). These features support the proposal of Swinden (1980) that the volcanic centre was in the Kim Lake area. Furthermore, the volcanic rocks appear to have been deposited only to the southwest of the Kim Lake area and this may indicate some topographic control on deposition of the flows.

Unit 14 consists of pebble conglomerate, breccia and coarse micaceous sandstone outcropping in two separate areas. The southeastern area lies to the northwest of the Collins Brook Fault and consists of schistose, extensively quartz veined, pebble conglomerate with abundant pebbles of felsic volcanic rocks. The pebbles contain the same schistosity as the matrix. The northwestern area of Unit 14 consists of thick breccia beds, with angular fragments of rhyolite and sandstone, interbedded with grey muscovite-rich sandstone and pelite. The beds range in thickness from a few centimetres to about 2 m.

Riches Island Formation (Unit 15). In the map area, the Riches Island Formation is a poorly exposed sequence of medium bedded, grey sandstone and siltstone, and is exposed on islands in Little River (Figure 3). The sediments consist of parallel-bedded, thinly laminated greywacke and siltstone containing a well-developed cleavage parallel to bedding. Contacts with the presumably underlying Isle Galet Formation are not exposed in the map area. Colman-Sadd (1976) reported that a conformable contact is exposed near Morgan Arm, in Bay d'Espoir.

Units 16, 16a, and 17: Gabbro, quartz veins, and granodiorite

A 5-m-thick, weakly cleaved, medium grained, equigranular, gabbro dyke (Unit 16) has been intruded parallel to the contact between Unit 12 sediments and Unit 13 felsic volcanic rocks. This dyke has an exposed length of about 30 m and is similar to the Kaegudeck diabase dykes in the Kim Lake area (Dickson, 1987a). A 5-m-thick, chloritic pelite band lies between the dyke and the felsic volcanic rocks.

Subunit 16a is a series of extensive outcrops of quartz veins that occur along the Collins Brook Fault. The veins are discontinuously exposed over a distance of 500 m along strike and the unit has an apparent width of 100 m. Quartz veins within Units 12, 13 and 14 are part of the same system. The veins are composite with late, massive, quartz veins injected into foliated vein quartz.

Unit 17 is a poorly exposed, white-weathering, quartz–feldspar-porphyritic (?)granodiorite cut by narrow shear zones. On fresh surfaces the rock is black and fine grained and may be mylonitic.

North West Brook Complex (Units 18–23)

A variety of foliated, biotite ± muscovite granitoids and spatially associated metasedimentary rocks of the Little Passage Gneiss comprise the North West Brook Complex (Dickson, 1983). Exposed contacts show that the granitoids have intruded the Little Passage Gneiss and have been intruded by the Ackley Granite Suite. Although the contact with the massive Koskaecodde pluton is not exposed, a well-defined aeromagnetic anomaly coincides with the change from massive to foliated granitoids and the contact is almost certainly intrusive.

The oldest unit of the North West Brook Complex is mafic, coarse grained, feldspar-porphyritic, strongly foliated, biotite granodiorite and granite (Unit 18; Plate 7). This unit commonly contains xenoliths of metasediment of the Little Passage Gneiss and is cut by dykes of adjacent intrusions. Xenoliths of Unit 18 occur in Units 19, 20 and 23. The feldspar phenocrysts in Unit 18 are deformed and form augen. Near the contact with the Ackley Granite Suite, mafic, massive quartz diorite (subunit 18a) is tentatively included with Unit 18. The granodiorite is similar to the Gaultois Granite of Colman-Sadd (1974).

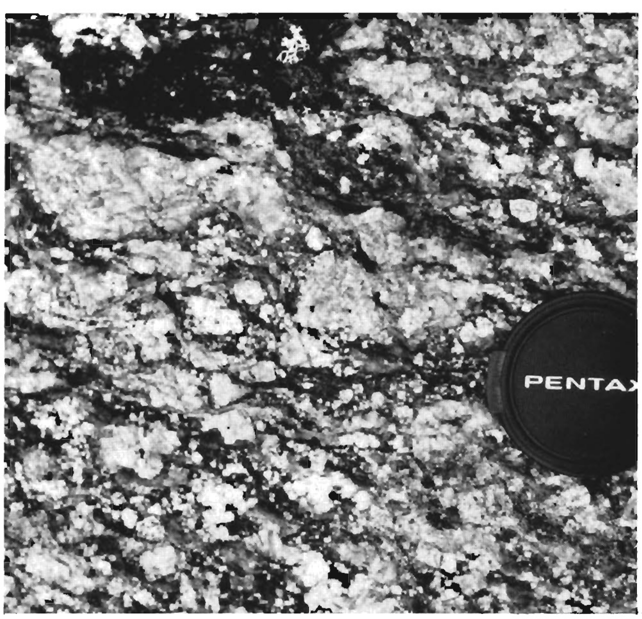


Plate 7. *Coarse grained, K-feldspar-porphyritic, foliated, biotite granite (Unit 18) of the North West Brook Complex; 4 km north of Big Blue Hill Pond–lens cap is 5 cm in diameter.*

Units 19 and 20 are medium grained, equigranular granites with Unit 19 being more mafic and lacking muscovite. Foliations are generally weak and only along the Hermitage Bay Fault is Unit 20 strongly deformed. The rock is foliated and brecciated having fragments coated with sericite and chlorite. Quartz veins are common. Unit 21 consists of variably deformed, coarse grained, K-feldspar porphyritic biotite granite and is most commonly weakly deformed. Locally, however, narrow (5 to 20 m) zones contain intensely deformed granite but these do not extend over 100 m in length. Near the contact with the Koskaecodde pluton, Unit 21 is locally massive and difficult to distinguish from the Koskaecodde pluton. However, the presence of medium grained, muscovite-bearing granite dykes (Unit 22) can be used to differentiate the two granites.

Unit 22 consists of a number of slightly different types of granite. Various combinations of biotite ± muscovite ± feldspar phenocrysts occur over short distances and mappable units are therefore difficult to define. In the vicinity of the Bay du Nord River, granite with 2 cm by 3 mm, rectangular, K-feldspar phenocrysts are common. This granite is cut by large dykes of equigranular granite. Unit 23 is a distinctive, pink, fine grained, biotite granite, which has been emplaced in that part of the Little Passage Gneiss enclosed within the complex. This granite has not been intruded by any other granite and is considered to be the youngest member of the complex.

Pegmatites are common within the muscovite-bearing Units 20 and 22 of the complex, particularly in the vicinity of the metasediments (subunit 7a) and near the contacts with Unit 18. Beryl was found in one pegmatite (Dickson, 1983).

Diabase Dykes (Unit 24)

A few isolated diabase dykes have intruded the North West Brook Complex and the Little Passage Gneiss. All are fresh, massive, parallel-sided, and display chilled margins. The dykes range in width from 1 to 4 m, are steeply dipping and trend north or northeast. The presence of only one diabase dyke in the Koskaecodde pluton and the Ackley Granite Suite (Dickson, 1983) indicates that the more abundant dykes in the North West Brook Complex predate these units.

Koskaecodde Pluton (Unit 25)

The Koskaecodde pluton (Tuach, 1987) is an undeformed, K-feldspar-porphyritic, biotite granite that has intruded the Little Passage Gneiss and the North West Brook Complex. On the southwest shore of Medonnegonix Lake, an intrusive breccia is formed by blocks of psammitic, gneissic hornfels in a granite matrix. North of Red Cliff Pond, the granite of Koskaecodde pluton is distinctly grey rather than buff or pink. This may reflect alteration or contact metamorphism by the Ackley Granite Suite.

The Koskaecodde pluton consists of coarse grained, K-feldspar-porphyritic biotite granite with 10 to 30 percent phenocrysts and 2 to 5 percent coarse (2 to 5 mm) biotite flakes. Rare, thin, layered granite dykes contain well-aligned biotite in a hypidiomorphic-granular matrix; this alignment is considered to be flow layering.

Ackley Granite Suite (Units 26 and 27)

The western portion of the Ackley Granite Suite and its contact with the North West Brook Complex were mapped in detail. The intrusive contact with the complex is exposed in one place and is discordant to the foliation in Unit 18 of the complex. The contact was found to be several kilometers farther west from that shown by Dickson (1983). The Ackley Granite Suite is generally coarse grained up to the contact. Fine grained, quartz–feldspar-porphyry dykes, typical of the marginal facies of the Ackley Granite Suite, occur in coarse, variably porphyritic granite in the Red Cliff Pond area. The presence of the dykes and lower colour index distinguishes the Ackley Granite Suite from the Koskaecodde pluton. Near Big Blue Hill Pond, fine grained porphyry dykes are common at the contact and, to the northeast of the pond, the granite is distinctly red rather than the usual pink.

Unit 26 contains abundant, 1- to 3-cm-long, K-feldspar phenocrysts in a coarse grained matrix with 1 to 2 percent, 2- to 3-mm-long biotite flakes. Unit 27 is similar to Unit 26 but is only sparsely porphyritic with 1- to 2-cm-long K-feldspar phenocrysts.

More detailed descriptions of the Ackley Granite Suite and the Koskaecodde pluton (Unit 9 of the Ackley Granite of Dickson, 1983) are given in Dickson (1983).

STRUCTURE AND METAMORPHISM

The Long Harbour Group sedimentary and volcanic rocks of the Avalon Zone are generally steeply dipping and possess a single, northeast-trending cleavage. Only a few open folds were found and these are restricted to the sedimentary rocks. Regional metamorphism is weak to absent with the possible development of fine grained micas in the cleaved rocks. The Simmons Brook Batholith is deformed only in the vicinity of faults. The deformation of the Long Harbour Group is generally considered to be part of the Acadian Orogeny (Silurian-Devonian) as Devonian rocks to the south are much less deformed (Williams, 1971). However, the lack of deformation in the Simmons Brook Batholith may indicate that deformation predates this intrusion. This would then require a late Precambrian age for the deformation which is perhaps related to the Avalonian Orogeny.

Units older than the Koskaecodde pluton, in the Gander(?) and Dunnage zones, were deformed prior to emplacement of the pluton; i.e., approximately pre-410–427 Ma. The initial emplacement of ultramafic thrust slices can be considered to be a pre-Middle Ordovician event as ophiolitic rocks in the Gander area are unconformably overlain by Middle Ordovician fossiliferous rocks. However, the ultramafic rocks, in the Hungry Grove Pond map area, were probably not emplaced in their present position at this time but during the deformation of the Baie d'Espoir Group in the Acadian Orogeny. Evidence for this is provided from the D'Espoir Lake area to the west, where probable thrusts with ultramafic inclusions affect rocks of Silurian or Devonian age (e.g., the North Bay Granite; Colman-Sadd, 1976; Dickson and Tomlin, 1983). Parts of this granite have been dated at 396 Ma (U/Pb zircon; Krogh, written communication, 1985). The presence of thrusts is indicated over large areas of the Baie d'Espoir Group, from near the southern limits of the group (Day Cove Thrust of Colman-Sadd, 1974; Figure 4) to central Newfoundland (Colman-Sadd and Swinden, 1984) where ultramafics are considered by them to have been most probably emplaced during the late Silurian or Devonian. The attitude of the Le Pouvoir Fault is uncertain. Foliations are absent in the magnesite and, although the enclosing rocks commonly dip steeply toward the northwest, southeast-dipping structures are also found. Kilfoil *(this volume)* has shown that foliated, ultramafic slivers (Dickson, 1987a) in the Mount Sylvester map area dip moderately to the southeast, parallel to the foliation in the slivers, indicating that the thrust (reverse) faults also dip to the southeast. The dominance of northwest-dipping fabrics along the Le Pouvoir Fault is taken to indicate that the fault dips to the northwest.

The Little Passage Gneiss has been metamorphosed to at least the greenschist facies with the extensive development of biotite and muscovite. Migmatization north of Western Pond indicates that the grade of metamorphism is locally in the amphibolite facies. Contact metamorphism along the contact with the Koskaecodde pluton has converted the psammites into hornfels and cordierite occurs rarely in pelitic bands. The gneisses are strongly foliated and in places the psammitic rocks show a well-developed banding. The banding and the strong schistosity in the pelitic rocks are locally deformed into tight, commonly northeast-plunging folds with steep axial planes.

Metamorphism and apparent complexity of deformation of the Isle Galet Formation increases toward the southeast. The Le Pouvoir Fault marks the boundary between the weakly metamorphosed Units 12 to 14 and more strongly metamorphosed Units 7 to 11. The volcanic units (Units 9 to 11) of the Isle Galet Formation, east of the Le Pouvoir Fault, display a well-developed, steeply dipping, northeast-trending schistosity (S_1) defined by chlorite $\pm$ sericite $\pm$ epidote and sericite $\pm$ chlorite assemblages in the mafic and felsic rocks, respectively. Small, tight folds and intrafolial folds occur locally. The intrafolial folds are formed by the partial transposition of the main (S_1) fabric into gently northeast- or southwest-plunging folds with a steep, axial planar fabric parallel to the main fabric.

West of the Le Pouvoir Fault, the Isle Galet and Riches Island formations are steeply dipping with a slaty cleavage (S_1) parallel to bedding. Gentle, northeast-plunging F_2 folds with gently, east-dipping axial planes and a weak axial planar cleavage occur within the Isle Galet Formation sedimentary rocks (Unit 11). This style of deformation is identical to that found to the north in the Riches Island and St. Joseph's Cove formations (Colman-Sadd, 1976; Dickson, 1987a).

MINERALIZATION AND ALTERATION

The Baie d'Espoir Group has been explored by numerous companies since 1952. Only Westfield Minerals Limited has found significant mineralization with potential for development. The Le Pouvoir horizon hosts four significant stibnite–gold showings and contains several areas with quartz–carbonate alteration near the Le Pouvoir Fault. The Le Pouvoir stibnite showing is a vein of massive, undeformed quartz and coarse-grained stibnite (Plate 8), and contains up to 50 percent stibnite. The vein is hosted by strongly cleaved, chlorite- and chlorite–sericite schist. The vein is about 1 m by 30 cm and is concordant to the schistosity. Rare, large (30 cm) and several, small (5 cm), loose blocks are scattered to the south of the showing for 10 to 15 m. McKillen (written communication to J. Tuach, 1986) indicated that the stibnite also contained anomalous gold values. McKillen (op. cit.) also indicated that three pyrite–stibnite–gold showings occur to the northeast of the Le Pouvoir showing. These showings occur in trenches that exposed quartz-veined, chloritic and pelitic schists with trace amounts of stibnite. As noted previously, Fenton (1981b) obtained anomalous values from quartz–carbonate-veined chloritic schist from the Le Pouvoir Fault zone. Quartz veins along the Collins Brook Fault are locally rusty and contain small amounts of pyrite. Several samples were analyzed for gold but a high value of only 30 ppb was obtained from a vein in tuff (Unit 13).

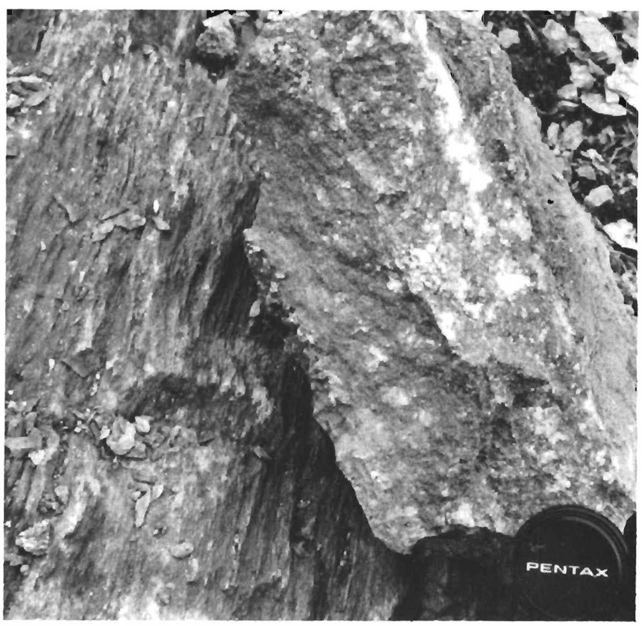


Plate 8. *Block of stibnite (grey)–quartz (white) vein, lying on host chlorite schist, at the Le Pouvoir stibnite–gold showing; lens cap is 5 cm in diameter.*

The Kim Lake horizon contains significant Au and Au–Sb mineralization along strike to the northeast and southwest of the map area. These occurrences are shown in Figure 4. No areas of alteration were found in the Kim Lake horizon in the Hungry Grove Pond map area and quartz veining is rare. However, large areas of the horizon are covered by blanket bog and soil or till sampling is required to assess these areas.

The Little Passage Gneiss, west of the Bay du Nord River, contains numerous alteration zones in which the pelitic and semipelitic schists are locally pyritic. The zones range in size from 100 m^2 to 1 ha and contain abundant randomly oriented, secondary? white mica.

Figure 4 presents a simplified metallogenic map of the Isle Galet Formation and Little Passage Gneiss. The main showings are emphasized and all other known showings are indicated. Many of the minor pyrite showings were reported by Dunlop (1953) and have not been examined since. The most significant mineral occurrences are from the Kim Lake horizon where silicified, arsenopyrite-bearing, foliated tuffs contain gold. It is important to note that the other main showings are spatially related to significant faults and volcanic horizons. The Barasway de Cerf prospect is, however, a stratabound, volcanogenic-exhalative deposit (Swinden, 1982). Gold–stibnite mineralization has been reported in the Little River estuary (Meikle, 1955), 6 km to the northeast of Barasway de Cerf (Figure 4). Much exploration remains to be carried out on the Isle Galet Formation and the potential for further discoveries is high.

The well-cleaved siltstones (subunit 2b) of the late Precambrian Rencontre Formation are commonly rusty with locally extensive gossans. This alteration is due to weathering of the fine grained, disseminated pyrite. Samples were assayed for gold but only background values ($<$15 ppb) were obtained.

Along the Hermitage Bay Fault, northeast of North East Brook, the fault breccia is extensively chloritized and sericitized. Trace amounts of pyrite were also found. Quartz veins and, rarely, jasper veins occur in the breccia. The Simmons Brook Batholith is also altered along the fault.

Mineralization within the granitoid rocks is generally of limited extent. Beryl has been reported from pegmatite in the North West Brook Complex (Dickson, 1983). Tuach (1984a, b) reported significant Sn and W values from thin gneisen veins in the Ackley Granite Suite, 3 km southeast of Big Blue Hill Pond.

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