GAULTOIS MAP AREA (1M/12), NEWFOUNDLAND

by S.P. Colman-Sadd

INTRODUCTION

Mapping was completed in the Gaultois map area during the first part of the 1977 field season. Work was concentrated on Long Island and in the western part of the Garrison Hills, with a few days being spent on Bois Island to improve mapping done in previous years.

The map area is divided in two by Hermitage Bay and the Hermitage Bay Fault, which trend in a northeasterly direction across the central part of the area. The fault is considered to mark the boundary between the Avalon and Gander Zones of the Newfoundland Appalachians (Blackwood and O'Driscoll, 1976). The present project is concerned only with the rocks of the Gander Zone north and west of the Harbour Breton road and only these are included in the sketch map, which also incorporates the results of a Ph.D. thesis by Colman-Sadd (1974) and mapping during 1976 (Colman-Sadd, 1977). Mapping in the Avalon Zone and a small part of the Gander Zone has been completed by Greene and O'Driscoll (1976). A preliminary report to be published on the Gaultois map area will combine the work of Colman-Sadd, Greene and O'Driscoll.

The rocks of the Gander Zone exposed within the map area can be divided into three groups: (1) basement gneisses, (2) metasedimentary and metavolcanic cover rocks, and (3) granitoid intrusions. As well as these, quartz veins and basic dikes occur in various parts of the area. The basement gneisses include a variety of lithologies and are referred to the Little Passage Gneiss Complex of Colman-Sadd (1974). They are overthrust in the northwest by cover rocks of the Isle Galet and Riches Island Formations of the Ordovician Baie d'Espoir Group (Colman-Sadd, 1976); these cover rocks have undergone polyphase deformation and garnet grade metamorphism. The granitoid intrusions within the Gaultois map area are restricted to the basement terrain; they postdate the gneissic foliations of the basement rocks and have mostly been affected by later deformations apparently associated with tectonic activity in the Baie d'Espoir Group and along the Hermitage Bay and other faults.

BASEMENT GNEISSES

The basement gneisses lie between the Baie d'Espoir Group and the Gaultois Granite, and extend from the western to the northern edge of the map area. They are continuous with the gneisses described from the St. Alban's map area (1M/13) (Colman-Sadd, 1976). Gneisses also occur as large sheets within the Gaultois Granite and the equigranular granite suite.

Three groups of gneisses are distinguished in this report: (a) psammitic, semipelitic and granitic gneisses with minor unseparated amphibolitic gneiss (Unit 1), (b) amphibolitic gneiss (Unit 2), and (c) tonalitic orthogneiss (Unit 3). The psammitic and semipelitic gneisses are fine to coarse grained, have variable feldspar contents and contain either muscovite or biotite as the principal mica; garnet, amphibole and fibrolitic sillimanite occur locally as prominent accessory minerals. Red, hematitic staining and quartz segregations are also common throughout. The gneissic foliation is defined by mica segregations 1 to 2 cm wide and is well developed everywhere; intrafolial folds are common. Fine grained, pale pink biotite granitic gneiss is commonly interbanded with the psammitic and semipelitic gneisses on a scale of 25 to 100 m; it has a 1 to 2 mm wide banding defined by biotite segregations. Small sheets and pods of amphibolitic gneiss also occur; they resemble the larger outcrops of amphibolitic gneiss that are separated on the sketch map.

The amphibolitic gneiss is exposed best in the southern part of Little Passage, where it occurs in narrow outcrops about 100 m wide and up to 7 km long. It is composed of hornblende (40-70 percent), plagioclase (10-30 percent), biotite (5-15 percent) and quartz (5-15 percent). It is medium grained and has a fine banding consisting of mafic bands up to 3 cm wide separated by discontinuous feldspathic streaks which are rarely more than a few millimetres thick. Intrafolial folds are present in the feldspathic bands, and the banding as a whole has been isoclinally folded.

Tonalitic orthogneiss occurs on Long Island and in the western part of the Garrison Hills. It is medium to coarse grained and composed of plagioclase (40-50 per cent), quartz (10-30 per cent) and biotite (10-20 percent); zircon, sphene, apatite, garnet and sillimanite occur as accessory minerals. The tonalitic gneiss is distinctly more massive in outcrop than the other gneisses. It is heterogeneously deformed; in places it has a strong foliation but has undergone only minor metamorphic segregation, whereas elsewhere it has a gneissic banding on a 2 to 5 cm scale and numerous intrafolial folds. The tonalitic gneiss has distinct intrusive contacts with the amphibolitic gneiss in the southern part of Little Passage, and characteristically contains xenoliths of amphibolite . Its contacts with the more quartz-rich gneisses are highly deformed; the relationships are obscure and in most places apparently gradational, but it is presumed that these contacts were also originally intrusive.

Within about 1 km of the thrust fault separating the Baie d'Espoir Group from the basement, the gneisses (psammitic, semipelitic, granitic and amphibolitic) have been wholly or partly mylonitized. Grain size has been reduced and compositional heterogeneities have been largely obscured. Over much of the reworked zone the most widespread period of mylonitization was followed by the intrusion of equigranular garnet-muscovite granite (Unit 9) and the regrowth of minerals, particularly plagioclase porphyroblasts. A second intense, but more localized, period of deformation has formed augen around the plagioclase porphyroblasts and has mylonitized both the gneisses and the garnet-muscovite granite within a few hundred metres of the basement-cover thrust fault; this period of deformation is apparently related to movement on the fault and to the second deformation of the Baie d'Espoir Group.

BAIE D'ESPOIR GROUP

Two formations of the Baie d'Espoir Group are represented in the map area, the Isle Galet Formation adjacent to the outcrop of basement gneisses and, in the northwest, the Riches Island Formation. The two formations are conformable but it is uncertain whether one is older than the other or the two are lateral equivalents. The rocks have been regionally deformed twice. There is evidence along strike in the St. Alban's area that they were unlithified during the first deformation. The second deformation followed an episode of garnet grade regional metamorphism and it increases in intensity towards the basement-cover thrust fault, where it completely masks first deformation structures.

Isle Galet Formation (unit 5)

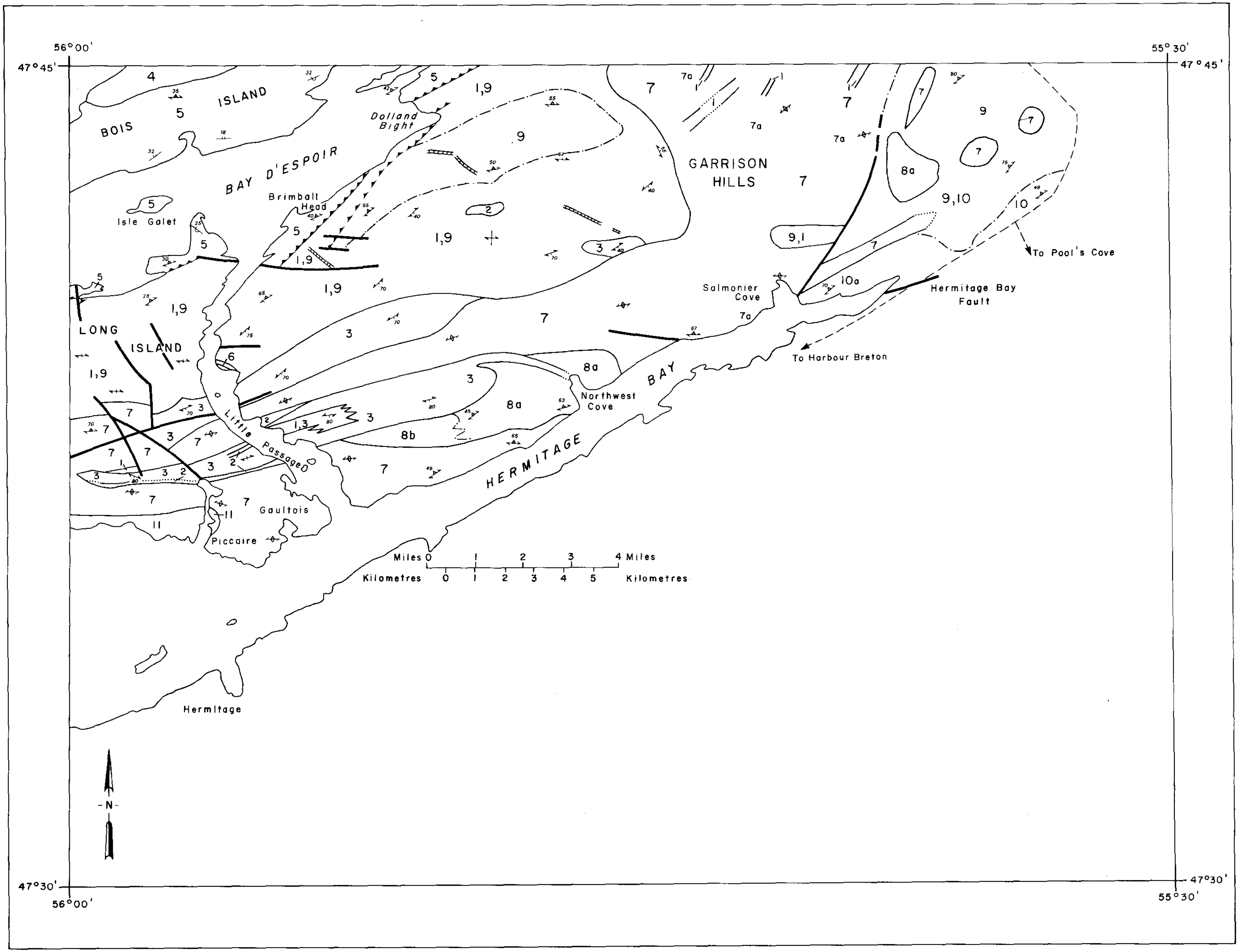
Lithologies of the formation include acidic and basic volcanic rocks, graphitic schist, greenish semipelitic phyllite, minor psammites, and a single occurrence of siliceous marble on the south coast of Bois Island.

The acidic volcanic rocks are mainly crystal tuffs consisting of subhedral or euhedral quartz and microcline crystals up to 5 mm across set in a fine quartzofeldspathic matrix with varying amounts of muscovite. Small lenses of lapilli tuff up to 1 m thick—occur within the crystal tuffs; the lapilli consist of fine grained quartz and feldspar with rare euhedral phenocrysts. These tuffs of the Isle Galet Formation generally occur as massive unbedded sheets between 6 and 100 m thick which form continuous outcrops for several kilometres. They form prominent cliffs along the south side of Bois Island, on Isle Galet and in Dolland Bight; in most places they weather white but in a few places on Bois Island, where they contain sulphides, they are rusty brown or, rarely, malachite green.

The basic volcanic rocks of the Isle Galet Formation are everywhere metamorphosed to amphibolites. They consist of thinly bedded rocks, presumed to be mafic tuffs, discordant dikes, and massive concordant sheets up to 100 m in thickness which may have been either intrusive or extrusive. The largest of the concordant sheets extends from near Brimball Head along the north shore of Long Island.

The principal nonvolcanic lithology in the Isle Galet Formation is graphitic schist. The schist is a fine grained, gray or black rock with locally occurring silty beds up to 5 mm thick. It is generally garnetiferous and may also contain hornblende. Its high pyrite content gives it a characteristically rusty brown appearance on weathered surfaces.

Greenish semipelitic phyllite occurs interbedded with the graphitic schist and in places grades laterally into acidic tuff beds. It consists mainly of fine grained quartz, feldspar, muscovite and chlorite with a few garnets. It includes parallel laminated gray silt beds and


56°00'
47°45'
55°30'
47°45'
BOIS
ISLAND
BAY D'ESPOIR
Dolland Bight
Brimball Head
Isle Galet
LONG
ISLAND
GARRISON
HILLS
Salmonier Cove
Hermitage Bay Fault
To Pool's Cove
To Harbour Breton
Northwest Cove
Little Passage
HERMITAGE
BAY
Gaultois
Piccaire
Hermitage
Miles 0 1 2 3 4 Miles
Kilometres 0 1 2 3 4 5 Kilometres
N
47°30'
56°00'
47°30'
55°30'

LEGEND

LOWER PALEOZOIC (?)

GRANITOID INTRUSIONS

11	**PICCAIRE GRANITE**
10	*Deep pink muscovite-biotite or chlorite granite (including* **STRADDLING GRANITE; 10a**).
9	*Equigranular, locally garnetiferous, muscovite or biotite granite.*
8	**NORTHWEST COVE GRANITE: 8a,** *Muscovite bearing variety;* **8b,** *biotite bearing variety.*
7	**GAULTOIS GRANITE,** *including associated diorite and tonalite,* **7a.**
6	**SEAL NEST COVE TONALITE**

MIDDLE ORDOVICIAN

BAIE D'ESPOIR GROUP

5	**ISLE GALET FORMATION:** *Acid and basic volcanic rocks; graphitic schist; phyllite; psammite.*
4	**RICHES ISLAND FORMATION:** *Phyllite.*

PRECAMBRIAN (?)

GNEISSES

3	*Tonolitic gneiss, including unseparated amphibolitic gneiss.*
2	*Amphibolitic gneiss, where separated.*
1	*Psammitic gneiss, including mylonitized gneiss and unseparated amphibolitic gneiss.*

SYMBOLS

Geologic boundary (defined or approximate, assumed, gradational) ....

Fault (defined or approximate, assumed) ....

Thrust fault (defined or approximate, assumed) ....

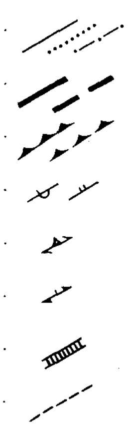
Bedding (inverted, tops unknown) ....

Cleavage ....

Gneissic foliation ....

Quartz vein ....

All weather roads ....



numerous structureless pink quartz-garnet beds, most of which are less than 2 cm thick.

Both the graphitic schist and the phyllite grade laterally into graywackes and well laminated brown and gray psammites at the eastern end of Bois Island. These continue northwards into the St. Alban's area where the sediments are coarser grained and the apparent stratigraphic thickness is much reduced.

Riches Island Formation (unit 4)

The formation, as exposed within the map area, consists of greenish semipelitic phyllite with occasional beds of graphitic schist. Both lithologies are similar to those occurring in the Isle Galet Formation but the phyllite predominates over the graphitic schist.

GRANITOID INTRUSIONS

Six groups of granitoid intrusions postdate the basement gneisses. Within the Gaultois map area these intrusions are almost entirely restricted to the basement terrain and their age relative to the Baie d'Espoir Group can only be inferred indirectly.

Seal Nest Cove Tonalite (unit 6)

The tonalite forms a small intrusion in the central part of Little Passage. It cuts the basement gneisses but is itself cut by pink aplite and pegmatite veins thought to be associated with the Gaultois Granite.

The rock consists of a fine grained groundmass of quartz and plagioclase with small phenocrysts of plagioclase oscillatorily zoned from oligoclase to albite. Biotite is the only mica and it occurs as xenoblastic flakes defining a moderately developed fabric. At its north end the intrusion has been intensely fractured.

A dacite dike occurring on the island in the middle of Little Passage is of similar mineralogy to the Seal Nest Cove Tonalite. Like the tonalite, it was intruded by aplite veins and then deformed. After this first deformation it was intruded by veins of equigranular garnetiferous granite and then deformed a second time; the second deformation is correlated with the second deformation of the Baie d'Espoir Group.

Gaultois Granite (unit 7)

This granite outcrops from the west edge of the map area on Long Island eastwards to Salmonier Cove and northwards to grade into tonalite and diorite mapped in the St. Alban's area (Colman-Sadd, 1976). It intrudes the basement gneisses, and sheets and xenoliths of gneiss are included in it. The Gaultois Granite is a megacrystic biotite granite with prominent pink megacrysts of microcline up to 4 cm long; locally, the megacrysts are absent and the rock resembles the tonalite and diorite that predominate in the St. Alban's map area. The granite is cut by numerous dikes of pink pegmatite and aplite. Both the granite and the dikes have a tectonic fabric defined by biotite and elongated quartz grains. The fabric is best developed on Long Island and diminishes in importance eastwards.

Northwest Cove Granite (unit 8)

There are two separate bodies of this granite in the Gaultois map area. The most important occurs at Northwest Cove and extends in a westerly direction almost to Little Passage. A second body occurs within the outcrop area of the equigranular garnetiferous granite suite, northeast of Salmonier Cove.

The granite at Northwest Cove intrudes the basement gneisses and is apparently intrusive into the Gaultois Granite but no completely conclusive contact relationships have been found. The intrusion northeast of Salmonier Cove was deformed and then intruded by rocks of the equigranular garnetiferous granite suite.

The granite, as typically developed at Northwest Cove, is pink, medium grained and equigranular, and has a good fabric defined by muscovite, the only mica. The mineralogy of the Northwest Cove intrusion changes progressively westwards with the replacement of muscovite by biotite but the other characteristics of the granite remain constant. Northwest of Salmonier Cove the muscovite is again the only mica in this granite.

Equigranular, locally garnetiferous, muscovite or biotite Granite (unit 9)

Rocks of this granite suite outcrop north of the head of Hermitage Bay and from Dolland Bight southwestwards into northern Long Island. The granite is intrusive into the basement gneisses, the Gaultois Granite and the Northwest Cove Granite.

The outcrop north of the head of Hermitage Bay is a heterogeneous mixture of self-intruding, equigranular, gray or pink, biotite and muscovite granites. It extends northwards into the St. Alban's map area and eastwards beyond the Harbour Breton road. Locally, the granite is sparsely garnetiferous; at its margins it is intruded by garnet and tourmaline bearing pegmatite and aplite dikes. One tectonic fabric is generally recognizable and, locally, this is overprinted by a strain-slip cleavage; in a few places, however, the granite is apparently undeformed.

The granite between Dolland Bight and Long Island is mainly of the garnet-muscovite bearing variety which occurs as dykes and sills in the gneisses. The only substantial outcrop is just south of Dolland Bight. This granite was affected by the second deformation of the Baie d'Espoir Group and is mylonitized near the contact between the cover and basement rocks; farther from the contact the intensity of deformation decreases.

A single dike of garnet-muscovite granite has been found intruding the Baie d'Espoir Group. It cuts rocks of the Isle Galet Formation on the south coast of Bois Island.

Deep Pink Muscovite, Biotite or Chlorite Granite (unit 10)

This granite extends eastwards from Salmonier Cove along the valley at the head of Hermitage Bay and includes the Straddling Granite of Greene and O'Driscoll (1976). On the shoreline at Salmonier Cove it is faulted against the Gaultois Granite but farther east it is presumed to intrude this granite posttectonically, although the actual contact is not exposed. Its relationship to the equigranular garnetiferous granite suite is uncertain; the contacts exposed in the brook at the head of Hermitage Bay and along the Harbour Breton road are gradational with a progressive decrease in the pink coloration of the feldspar and the chloritization of the biotite.

The best exposures of this granite are in the hills above the north shore of Hermitage Bay. It is pink, equigranular, medium grained and contains biotite as the principal mica; there is no tectonic fabric. Along the shoreline of Hermitage Bay and on the Harbour Breton road, the granite is brecciated and, locally, has a tectonic fabric; it may or may not contain muscovite, and biotite is altered to chlorite. The deformation and alteration is apparently related, at least in part, to the faulting at Salmonier Cove and on the Hermitage Bay Fault.

Piccaire Granite (unit 11)

The granite outcrops along the south shore of Long Island from Piccaire westwards to the edge of the map area. It was apparently intruded into the Gaultois Granite after the deformation of the latter, although exposures of the actual contacts have not been observed.

The granite is equigranular, medium grained and light pink. Biotite is the only mica. It has a barely discernible L-fabric defined by elongated quartz grains; the fabric has a northeasterly trend and makes an angle of about 45° with the S-fabric in the Gaultois Granite on Long Island.

OTHER INTRUSIONS

Basic dikes that cannot be definitely related to the Isle Galet Formation cut the basement gneisses and the granitoid rocks. Two dikes cut the Gaultois Granite on Long Island; they have a slight tectonic fabric and their principal minerals have been altered to andesine, biotite and hornblende.

At the head of Hermitage Bay there are many occurrences of narrow dykes cutting the Straddling Granite and related rocks; these dikes are composed of altered plagioclase, chlorite and calcite, and have no tectonic fabric. Amphibolite with a simple but intense tectonic fabric occurs in the reworked zone of the basement gneisses adjacent to the basement-cover thrust fault; the rock is thought to be derived from postgneiss intrusions rather than from amphibolitic gneiss because it is unbanded and has slightly discordant contacts.

Quartz veins up to 150 m in width cut the basement gneisses, the equigranular garnetiferous granite, and rocks of the Baie d'Espoir Group. The most prominent veins occur southeast of Dolland Bight and south of Brimball Head. They are undeformed.

MINERALIZATION

The most obvious prospects for mineral deposits are in the volcanic rocks of the Isle Galet Formation. There are known occurrences of copper on the south coast of Bois Island, and lead and zinc along strike at Barasway de Cerf in the St. Alban's area.

No significant showings of metallic minerals have been discovered in the basement gneisses or granitoid intrusions, but the quartz vein southeast of Dolland Bight has been investigated for its silica potential (Gale, 1965; Butler and Greene, 1976).

Acknowledgements: *The author thanks Anthony Benoit for able assistance in the field.*

REFERENCES

Blackwood, R.F., and O'Driscoll, C.F.
1976: The Gander-Avalon Zone boundary in southwestern Newfoundland; Canadian Journal of Earth Sciences, Volume 13, pages 1155-1159.

Butler, A.J., and Greene, B.A.
1976: Silica resources of Newfoundland; Newfoundland Department of Mines and Energy, Mineral Development Division, Report 76-2, 68 pages.

Colman-Sadd, S.P.
1974: The geologic development of the Baie d'Espoir area, southeastern Newfoundland; Ph.D. thesis, Memorial University of Newfoundland, 271 pages.

1976: Geology of the St. Alban's map area (1M/13), Newfoundland Newfoundland Department of Mines and Energy, Mineral Development Division, Report 76-4, 19 pages.
1977: Gaultois map area; *in* Report of Activities for 1976, R.V. Gibbons (Editor); Newfoundland Department of Mines and Energy, Mineral Development Division, Report 77-1, pages 15-19.

Gale, G.H.
1965: Garrison Hills quartz prospect, Bay d'Espoir; Newfoundland Department of Mines, Agriculture and Resources, Mineral Resources Division, unpublished report.

Greene, B.A., and O'Driscoll, C.F.
1976: Geology, Gaultois map area (1M/12), Newfoundland; Newfoundland Department of Mines and Energy, Mineral Development Division, Map 767;