CONTINUED GEOLOGIC MAPPING IN THE DAVIS INLET - MISTASTIN LAKE CORRIDOR, LABRADOR

by

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INTRODUCTION

This is the fourth report on a five year regional mapping project begun in 1977 in the area between Davis Inlet and Mistastin Lake, Labrador. Bedrock mapping in 1979 was completed in N.T.S. areas 13N/12 and 13N/13 at a scale of 1:50,000 using a five person field party supported by float plane and helicopter from Goose Bay. Preliminary mapping was also continued in N.T.S. areas 13M/9 and 13M/16, the results of which will be included in a subsequent publication. Final publication of the whole area will be at 1:100,000. The sketch map given in Figure 1 incorporates the field data of Taylor (1972) in addition to the mapping of J.D. Hill, A. Kerr and J.M. Hill completed in 1979.

Outcrop in the mapped area is only abundant above the treeline on the hills. For this reason, the geology is poorly known in the valleys, particularly in those of the Notakwanon River and Flowers River. Place names are rare so lakes are identified in the text by their elevations in metres (*e.g.* the 356 m lake). Igneous rock names used in the report are those recommended by the I.U.G.S. subcommission (Streckeisen, 1976) with minor modifications given by Hill (1978).

GENERAL GEOLOGY

The area mapped lies in the southern part of the Nain igneous complex and consists of two age groups of gneisses and two age groups of undeformed igneous rocks. Layered gneisses occurring as small interplutonic screens are believd to be Archean in age. A larger gneiss terrain to the southwest is contiguous with a much more extensive belt of gneisses included in the Churchill structural province (Taylor, 1971). These rocks show a wide range in K-Ar ages from 1.2 to 2.2 billion years (Emslie, 1978) but they are poorly understood and may be Archean in part (Greene, 1974). In any case, all of the Churchill gneisses in the area mapped were deformed by the Hudsonian Orogeny and must be older than about 1.7 billion years (Emslie, 1978).

The older group of undeformed igneous rocks range from anorthosite to granite in composition and are Elsonian in age (Emslie, 1978). The younger group consists of peralkaline granite and is part of a larger granite - volcanic rock complex extending to the east (Hill, 1979). Preliminary unpublished Rb-Sr dates by C. Brooks of the University of Montreal suggest these rocks may be significantly younger than Elsonian.

No occurrences of economic minerals were found within the map area.

DESCRIPTION OF UNITS

Archean Gneisses (Unit 1)

Unit 1 consists of a large variety of plagioclase-pyroxene and plagioclase-quartz-biotite gneisses that range from gabbro to granite in composition. Banded plagioclase-pyroxene gneiss appears to be the main rock type. It occupies whole outcrops and is liberally invaded by slightly deformed biotite granite and undeformed leucogranite. The plagioclase-pyroxene gneiss also occurs locally as trains of inclusions in banded plagioclase-quartz-biotite gneiss. This latter lithology is more restricted in occurrence and contains up to 25% mafic minerals including

accessory graphite. In areas adjacent to younger undeformed intrusions, the gneisses commonly form extensive agmatite with the igneous rocks.

The gneisses included in Unit 1 are characterized by regular banding and a granoblastic texture. They are similar to gneisses farther east that belong to the Nain structural province (Hill, 1979). For these reasons, these gneisses are believed to be Archean in age. However, the gneisses in the two screens south of the 123 m lake are intermediate in character between the Archean gneisses to the east and the Aphebian(?) gneisses to the west. Therefore, their ages are less certain.

Aphebian(?) Gneisses (Unit 2)

The gneisses exposed in the southwest part of the map area are contiguous with a much larger belt of gneisses to the west which are part of the Churchill structural province (Taylor, 1971). They are characterized by a variably developed cataclastic mineral foliation and the general occurrence of biotite and garnet bearing metamorphic mineral assemblages. This fabric and mineralogy is preserved throughout the gneiss terrain with no regard to proximity to younger plutons. The position of the boundary between the Nain and Churchill structural provinces is masked by younger intrusions but it appears to lie in approximately the same position as that determined by Taylor (1972, 1977) by reconnaissance mapping.

Unit 2a is composed of a large variety of fine to coarse grained, banded feldspar-quartz-biotite-garnet gneisses that are tonalitic in average composition. Individual bands vary from 1 mm to 10 cm in width and range in composition from leucocratic granite to amphibolite and biotite schist. The dominant foliation is defined by a cataclastic alignment of all of the constituent minerals except garnet. In a few outcrops, the amount of strain is variable across strike. This has resulted in the alternation of mylonitic and more granoblastic fabrics which magnifies any compositional banding present. Garnet occurs as subhedral to euhedral crystals up to 5 cm in diameter and appears to generally predate the mylonitic fabric. In addition, the garnet is typically altered to biotite and chlorite. The gneissosity defines folds in many outcrops whose axes are parallel to the strike of the foliation. Slightly deformed biotite-garnet leucogranite is commonly present as concordant sheets which locally truncate the gneissosity.

The dominant lithology in Unit 2a is a banded, medium to coarse grained biotite-garnet tonalite gneiss whose origin is uncertain. A smaller portion of Unit 2a consists of finely banded, fine grained biotite-garnet gneiss that appears to be sedimentary in origin. These rocks contain individual bands with up to 70% quartz which are typically graphitic and pyritiferous. In addition, cordierite and sillimanite have been observed locally. Immediately west of the 191 m lake, a band of feldspar-quartz flaser gneiss at least 50 m thick and a band of plagioclase-pyroxene(?) gneiss 10 to 30 m thick are concordant and contained within a belt of paragneisses. The feldspar-quartz flaser gneiss is extremely homogeneous in composition from outcrop to outcrop. The rock is not banded except for ribbons of quartz and feldspar developed on a millimetre scale and it contains no inclusions or dikes. It is medium grained, mylonitic, white weathering and has about 1% biotite. This rock is in abrupt and concordant contact with dark colored plagioclase-pyroxene(?) gneiss of gabbroic composition. These features are suggestive of a sequence of felsic and mafic volcanic rocks lying within a sedimentary terrain.

Unit 2b consists of coarse grained feldspar-quartz-biotite-garnet gneiss containing feldspar augen up to 10 cm long. These rocks vary only slightly from an average composition of

LEGEND

Helikian (and younger)

6 fine to coarse grained, equigranular, leucocratic peralkaline granite.

5 medium to coarse grained, rusty weathering pyroxene-olivine granite and quartz monzonite.

4 medium grained, rusty weathering pyroxene-olivine-amphibole syenite, monzonite and monzodiorite.

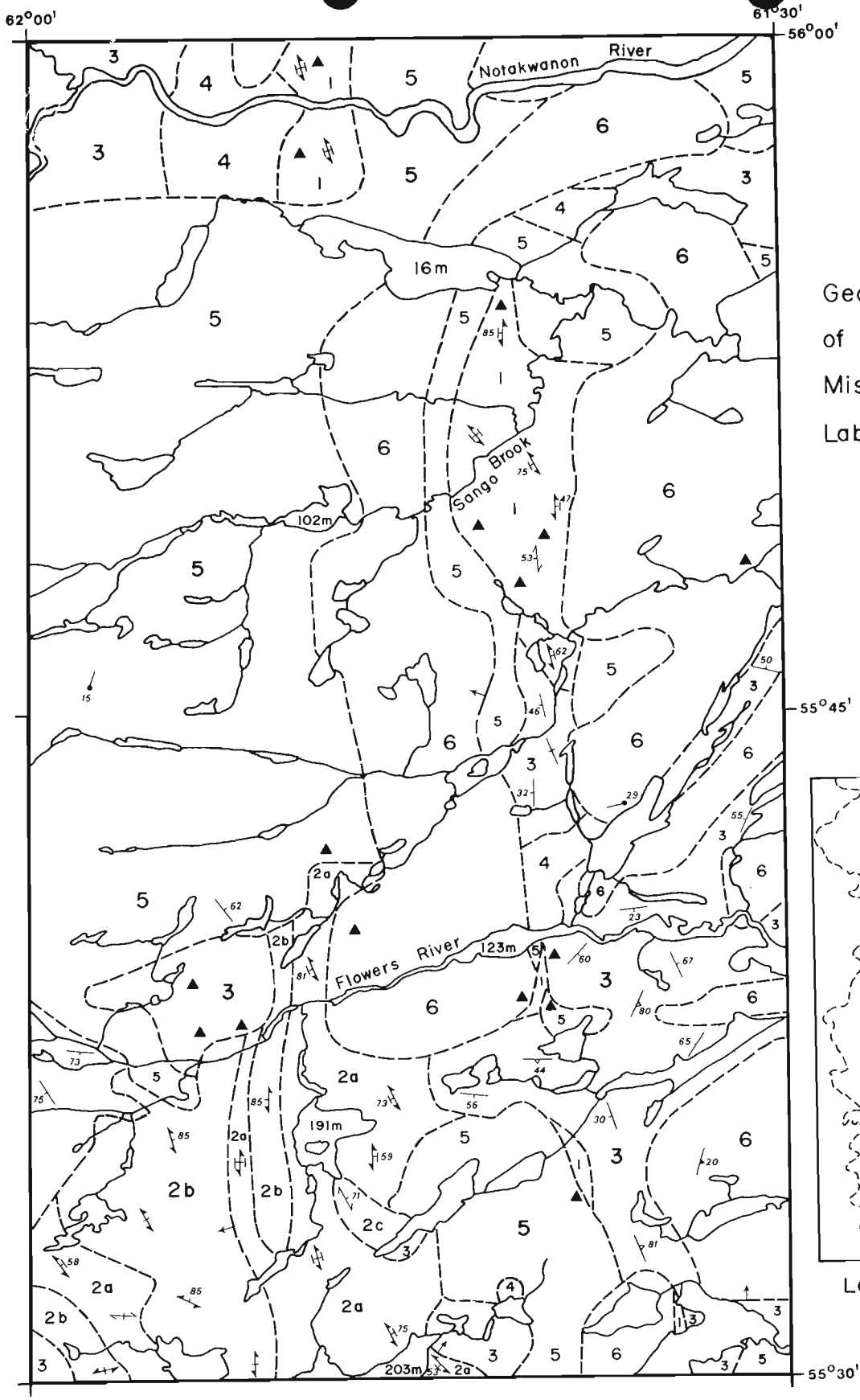
3 coarse and very coarse grained plagioclase cumulate and minor plagioclase-olivine cumulate, locally grading into narrow chilled margins of fine grained olivine gabbro.

Aphebian (and older?)

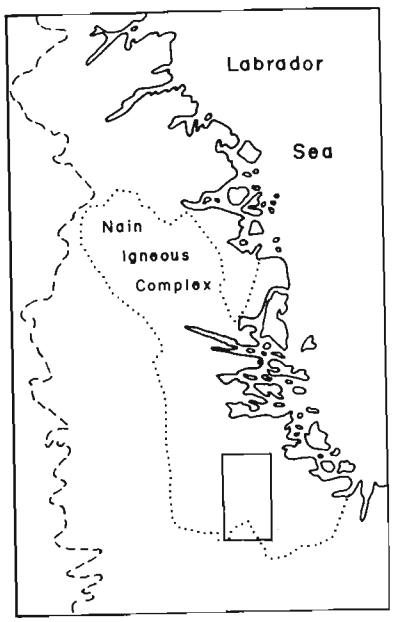
2 2a, fine to coarse grained, banded, mylonitic feldspar-quartz-biotite-garnet gneiss with an average composition of tonalite.
2b, coarse grained, homogeneous mylonitic feldspar-quartz-biotite-garnet orthogneiss with an average composition of granodiorite.
2c, medium grained, slightly deformed quartz diorite.

Archean

1 banded plagioclase-pyroxene and plagioclase-quartz-biotite gneiss, locally intruded by abundant granite and pegmatite.



Geology of a portion of the Davis Inlet–Mistastin Lake Corridor, Labrador.



Location of map area

granodiorite. Biotite ranges from 5 to 15% and garnet varies from 0 to 15%. The rocks possess a cataclastic fabric in which fine to medium grained quartz, feldspar and biotite wrap around larger feldspar augen. Garnet appears to have formed prior to development of the fabric and is altered to biotite and chlorite. Textures vary from mylonitic devoid of augen to relatively massive and plutonic looking, even within single outcrops. The contact of Unit 2b with Unit 2a was observed in two places north of the 203 m lake. At the more southern locality, the contact is abrupt and concordant with the mylonitic fabric. The foliation is similar in intensity and orientation on both sides of the contact. Inclusions of Unit 2a occur within Unit 2b immediately west of the contact. Farther north, the contact is more gradational with concordant sheets of Unit 2b in Unit 2a increasing in abundance until the rocks of Unit 2a disappear entirely. The plutonic textures, contact relationships and homogeneous composition of Unit 2b suggest these rocks were originally part of one or more igneous intrusions of granodiorite composition, emplaced prior to the Hudsonian Orogeny but after the formation of Unit 2a.

Unit 2c consists of slightly deformed quartz diorite which underlies a poorly defined area southeast of the 191 m lake. The rocks are homogeneous in composition and contain about 15% quartz and 30 to 40% biotite and pyroxene(?). The contact relationships with the other units are unknown. However, the quartz diorite must be older than the Elsonian intrusions since it is deformed and the latter are not. For this reason, the quartz diorite is included with the Aphebian(?) rocks although it is probably younger than the main period of Hudsonian deformation.

Gabbroid Plutons (Unit 3)

Anorthosite, leucogabbro and gabbro form a series of isolated plutons within the map area. Some of these are similar in lithology to each other and may once have been part of a larger body, disrupted by younger granite intrusions. These rocks show all variations between gabbro and anorthosite and are grouped under the term gabbroid (Streckeisen, 1976).

The gabbroid plutons are dominated by coarse and very coarse grained anorthosite and leucogabbro in which plagioclase varies in amount from about 65 to 100%. The mafic minerals are mainly olivine, pyroxene and Fe-Ti oxides and these are generally interstitial to plagioclase except locally where olivine is subhedral to euhedral and equidimensional in habit. In many places, the olivine and oxides form small oikocrysts giving the rock a spotted appearance. In contrast, pyroxene never occurs as oikocrysts but only as small wedges lying between plagioclase tablets. An unusual type of leucogabbro occurs in the southwest part of the area. There, the rocks contain varying amounts of quartz up to 10%. Although parts of these plutons contain numerous blocks of gneiss, the presence of quartz appears to be unrelated to the proximity to the inclusions.

In a few places where bedrock exposure is sufficient, the coarse grained plagioclase-rich rocks in the interiors of the plutons can be traced gradationally into fine grained olivine gabbro at the margins of the plutons. However, this marginal phase is absent along the southern contact of the gabbroid pluton directly west of the 123 m lake. There, the contact zone is marked by a large area of agmatite in which outcrops of gneiss alternate with outcrops of rusty, quartz-bearing leucogabbro.

Textures and structures in the gabbroid plutons suggest the anorthosites and leucogabbros are cumulate in origin. Rhythmic layering and plagioclase lamination are sporadically developed in all of the gabbroid plutons. Although olivine

appears to be a minor cumulus phase in some outcrops, plagioclase is by far the dominant cumulus mineral. Pyroxene, Fe-Ti oxides and generally olivine are intercumulus in nature. Plagioclase megacrysts up to 10 cm long are present in some places. Blocks of older anorthosite are found in leucogabbro in a few outcrops, especially along the western part of the Notakwanon River. One peculiar structure deserves special mention. It consists of irregular to disc shaped lenses of leucogabbro enclosed within anorthosite. In one outcrop, the lenses are aligned parallel to a plagioclase lamination which is developed in both lithologies. On an island in Sango Bay to the east of the map area, this mixed rock merges across the strike of the lamination into a rhythmically layered sequence of the same two rock types. For this reason, the structure is believed to have been caused by the disruption of layered cumulates prior to complete consolidation.

The gabbroid plutons are undeformed and are correlated with the numerous other anorthositic intrusions of Elsonian age to the north and south.

Syenite, Monzonite, Monzodiorite (Unit 4)

Unit 4 consists of relatively homogeneous plutons that range in composition from syenite to monzodiorite. These rocks are typically medium grained, massive and deeply weathered in outcrop. Pyroxene, fayalitic olivine and amphibole are the main mafic phases. Quartz may be absent or it may be present in amounts up to a few percent. A typical mode is given for a syenite collected north of the 123 m lake in Table 1.

The shapes of the plutons of Unit 4 are generally unknown due to the lack of outcrops along contacts. However, the west side of the Unit 4 pluton on the Notakwanon River in the northwest part of the map area is partly exposed. The main part of the pluton appears to be linked with a series of monzonite caps overlying anorthosite on small hills to the west which have been isolated by erosion. If this interpretation is correct, then the western part of the pluton has an approximately horizontal base.

The Unit 4 plutons intrude the Elsonian gabbroid plutons and are in turn intruded by pyroxene-olivine granite of Unit 5.

Table 1: Representative modes of some igneous rocks from the map area.

	A	B	C	D
plagioclase	96.7	3.8	11.9	
K-feldspar		75.7	56.6	72.9
quartz		0.3	18.3	24.7
olivine		6.4	5.2	
clinopyroxene	2.1	7.6	6.0	1.6
amphibole	0.1	3.0	0.9	0.9
opaques	0.9	3.1	0.6	
accessories	0.2	0.1	0.7	0.2
No. of counts	817	1061	852	1052

A - coarse grained plagioclase adcumulate (Unit 3, sample JH-77-125).
B - medium grained syenite (Unit 4, sample JH-77-130A).
C - fine grained pyroxene-olivine granite (Unit 5, sample JH-78-173).
D - medium grained peralkaline granite (Unit 6, sample JH-78-020B).

Pyroxene - Olivine Granite (Unit 5)

Pyroxene-olivine granite forms several plutons in the map area and increases in proportion relative to the other units farther west. It is generally medium to coarse grained, massive and deeply weathered in outcrop. Quartz is variable in amount and ranges from 10 to 35%. Where the quartz content

is low, the granite becomes difficult to distinguish from the monzonites of Unit 4. The mafic minerals vary between 5 and 15% and include pyroxene, olivine and amphibole as the main phases. Biotite is generally lacking except in one area northwest of the 123 m lake where it is the dominant mafic mineral. A representative mode is given in Table 1.

The pyroxene-olivine granite is typically inequigranular and can be distinguished from the peralkaline granite of Unit 6 on this basis. Finer grained crystals of quartz and mafic minerals tend to lie between larger feldspar tablets. In some places, this texture is developed to the point where the quartz content is difficult to quantify in the field. Southwest of the 16 m lake, two textural varieties of similar composition are present. A fine grained, porphyritic phase is intruded by medium to coarse grained granular granite and the two types are well mixed within single outcrops.

The pyroxene-olivine granite is correlated with similar granites of Elsonian age farther north in the Nain igneous complex (Wheeler, 1955). The granite intrudes both Unit 3 and Unit 4 and appears to be the youngest member of the Elsonian igneous rock suite in the area.

Peralkaline Granite (Unit 6)

Coarse grained, equigranular peralkaline granite is the dominant unit in the eastern part of the area. It is part of a much larger mass of granite lying to the east (see Hill, 1979). Unit 6 is distinguished in the field from the granite of Unit 5 by its leucocratic composition, white weathering outcrops and coarse, interstitial amphibole crystals. The peralkaline granite is intrusive into all of the other units.

The peralkaline granite consists mainly of perthitic alkali feldspar, quartz and arfvedsonite-riebeckite. The amphibole is typically interstitial to the quartz and feldspar suggesting late crystallization. Sodic pyroxene occurs as an accessory phase in some outcrops. A representative mode is given in Table 1.

The peralkaline granite is generally massive and homogeneous, and dikes of related pegmatite and inclusions of older rock occur only rarely. However, adjacent to contacts with other units, the granite becomes fine grained and prophyritic with quartz and perthite phenocrysts. In addition, it commonly possesses an inequigranular groundmass with small, medium and coarse grained patches lying in, and gradational with, the fine grained material. Immediately north of the 356 m lake, fine grained, porphyritic peralkaline granite is exposed over a large area and may represent a roof phase in the pluton.

In the northeast near the Notakwanon River and in the south just west of the 356 m lake, rocks included in Unit 6 may belong to Unit 5. They display characteristics intermediate between the two types of granite and their affinity is uncertain until thin section data are obtained.

An undefined zone of breccia occurs in the peralkaline granite about 1 km north of the 356 m lake. The breccia consists of angular fragments of fine to medium grained granite which range from less than 1 mm to about 4 cm in diameter. The fragments are set in a dark red-brown, very fine grained matrix that appears to be comminuted granite. The breccia grades into the surrounding granite which is similar in texture and composition to the fragments. Miarolitic cavities and fractures associated with the breccia are lined with drusy quartz. The breccia occurs within the area of fine grained granite described above and may have been caused by explosive degassing of the crystallizing granite magma near the roof of the intrusion.

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