GEOLOGY OF THE GREY RIVER AREA - REGIONAL SUMMARY

by

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The Grey River area is underlain by a narrow east-west trending belt of metasedimentary, metavolcanic and gneissic rocks intruded and bounded to the north and south by granitoid rocks. An examination of the regional geology this summer revealed that the geology is more complex than previously described (Bahyrycz, 1957), with a number of tectonic and synkinematic intrusive events followed by a complicated postkinematic history of multiple intrusion.

The area is well known for its tungsten prospect (Fogwill, 1970), the mineralization being related to late quartz veins which are being investigated in a Ph.D. study by Higgins.

GENERAL GEOLOGY

The following sequence of geologic events has been determined from coastal exposures near Grey River Point and along the Grey River fiords as well as limited inland traverses.

Unit 1: Tonalite and granodiorite gneiss

The tonalite to granodiorite gneisses are light to dark gray, medium grained, well banded on a 1-2 cm scale with rare intrafolial folds. They consist largely of quartz, plagioclase, biotite and hornblende. They outcrop as screens between younger intrusions in the sea cliffs west of Grey River Point.

Unit 2a: Amphibolite

Minor blocks of medium grained, plagiophyric amphibolite occur within the tonalitic gneisses (Figure 1). The amphibolites either represent an earlier host to the tonalitic gneiss or disrupted dikes. In one locality an alignment of the amphibolitic blocks suggests that they were dikes.

Unit 2b, 2c: Quartz Diorite

The tonalitic gneisses are cut by medium grained quartz diorite sills and dikes that lack the gneissic banding characteristic of the tonalite gneiss although they are strongly foliated. A biotite-bearing phase and a hornblende-bearing phase can be distingished locally.

Unit 3a, 3b, 3c: Amphibolite and Micaceous Schist

Much of the Grey River area is underlain by coarse to medium grained amphibolites and micaceous schists metamorphosed in the epidote-amphibolite facies (Bahyrycz, 1957). The amphibolite protoliths were probably dominantly tuffaceous sediments but may include extrusive volcanic rocks. The amphibolites and the micaceous schists are interbanded on a gross scale and both are intruded by numerous thin dikes of pretectonic granite forming injection migmatites (Figure 1). Micaceous schist outcropping at the entrance to Southeast Arm have a strong, kinked schistosity that is locally overgrown by cordierite porphyroblasts. These may be related to the intrusion of a large K-feldspar megacrystic granite (Unit 6) that lies to the north of the metamorphic belt.

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LEGEND

DEVONIAN AND YOUNGER (?)

Posttectonic

10	Quartz veins
9	Diabase dikes
8	Aplites, garnetiferous leucogranite, alaskite, and pegmatite.
7b	Net-veined diorite
7a	Pegmatite, gray porphyritic granite

Late tectonic

6	K-feldspar megacrystic granite
5b	Amphibolitic dikes
5a	Ultramafic plugs

DEFORMATION AND MIGMATIZATION

DEVONIAN AND OLDER (?)

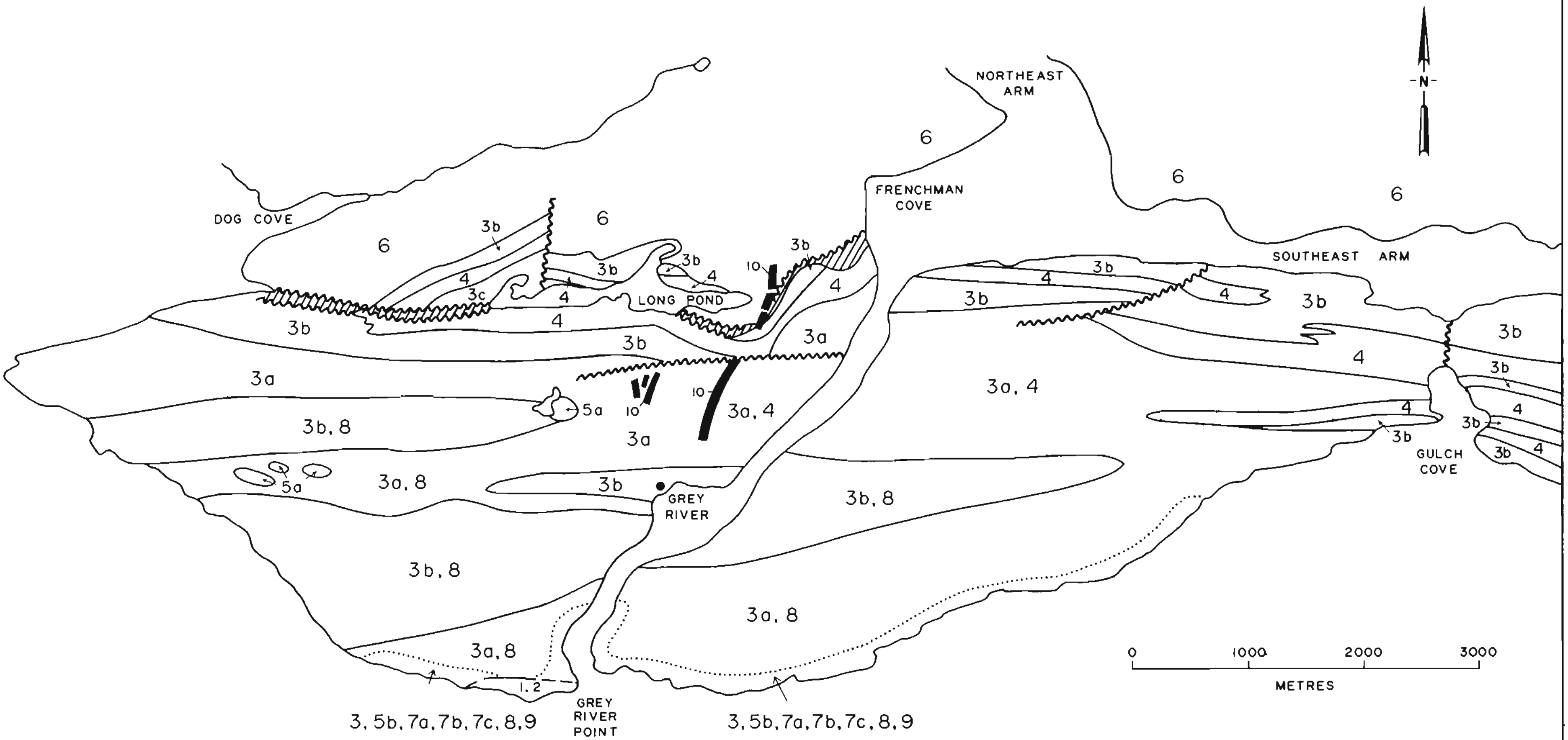
Pretectonic

4	Leucogranite
3c	Argillaceous marble and metaconglomerate
3b	Micaceous schist
3a	Amphibolite
2c	Biotite bearing quartz diorite
2a	Amphibolite dikes (?)

DEFORMATION

PRECAMBRIAN (?)

1	Intrusion of tonalite to granodiorite gneiss protolith



Simplified Geological Map of The Grey River Area, Modified after Bahyrycz (1957)

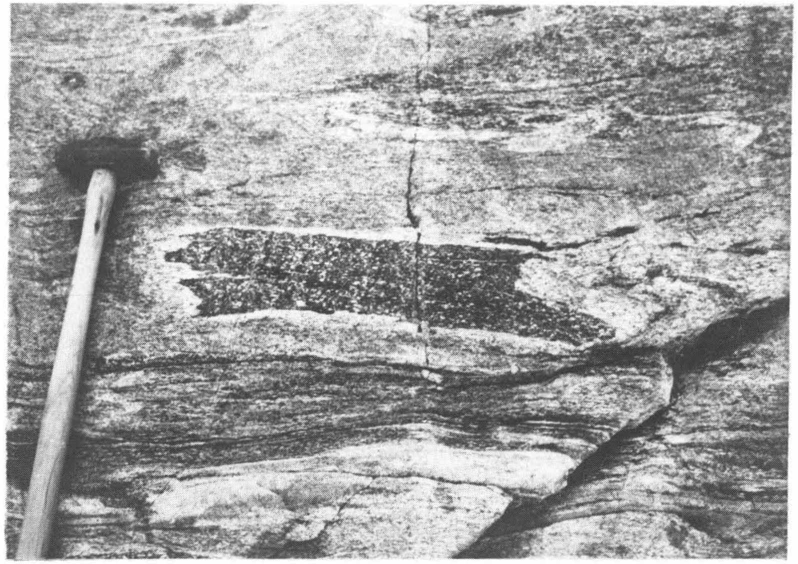


Figure 1. Plagiophyric amphibolite block in banded tonalite gneiss. The amphibolite may be either a xenolith or a disrupted dike. West of Grey River Point.

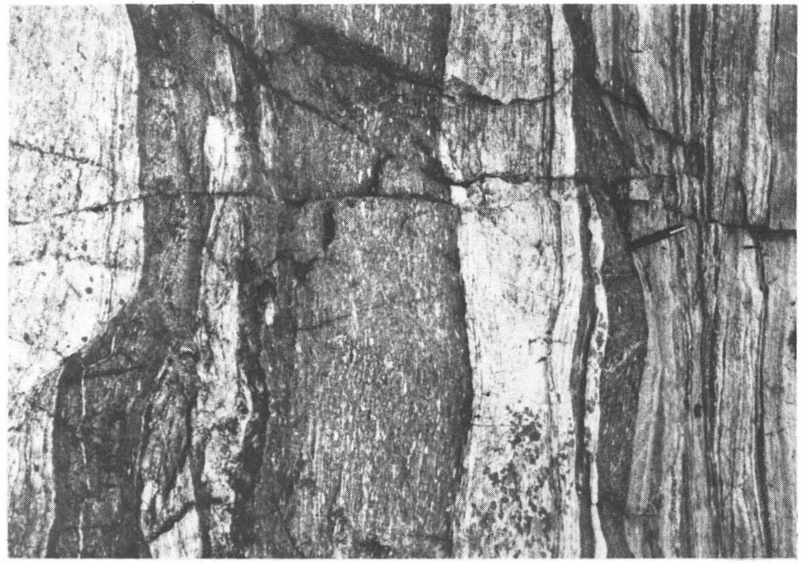


Figure 2. Banded amphibolites with thin injections of pretectonic granite cut by thicker leucocratic granite sheets that crosscut the early foliation and granite. Coast north of Grey River.

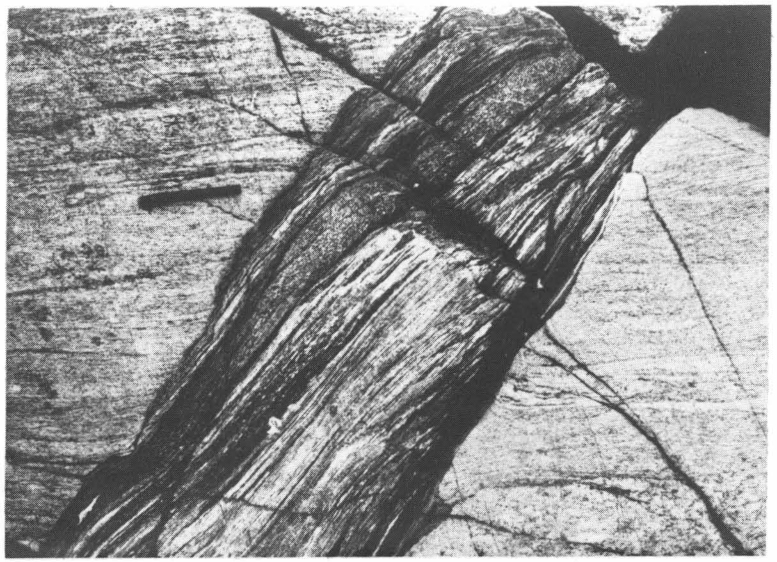


Figure 3. Foliated amphibolite dikes crosscutting banding in tonalite gneiss. The dike was intruded in an active transcurrent fissure. Coast west of Grey River Point.

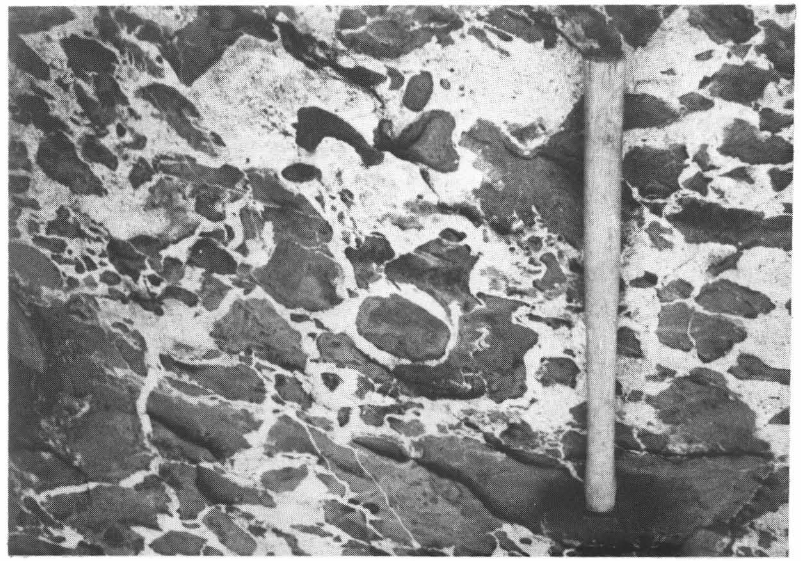


Figure 4. Net veined diorite dike with granite veins dividing the diorite into irregular fragments. Coast west of Grey River Point.

North of Long Pond and a major zone of cataclasis, the metamorphic rocks include schistose limy argillites and metaconglomerates (Unit 3c). The conglomerate contains granite and rhyolite clasts and its relationship to the metasedimentary rocks to the south is unknown.

Unit 4: Leucogranite

The migmatites of Units 3a, 3b are cut by leucogranite sills and dikes. The leucogranites are themselves foliated and generally parallel with the migmatitic banding. Locally, however, they diverge from the banding. The leucogranites, which continue eastwards at least as far as Gulch Cove, were incorrectly interpreted by Bahyrycz (1957) to be quartzites of sedimentary origin. It is possible that many of the other banded quartzites in the Grey River - Cape La Hune area (Williams, 1971; Butler & Greene, 1976) may also be of igneous origin.

A period of intense deformation followed the intrusion of the leucogranites and resulted in a strong fabric development in all previously described units.

Unit 5a, 5b

Late in the deformational episode a series of small (100-200 m wide) plugs of ultramafic rocks were intruded into migmatized sediments of Unit 3a and 3b. The deformation fabric in the margins of the plugs is parallel with that in the country rocks but dies out towards the centre of the bodies.

The plugs consist of very coarse dunite displaying a well preserved cumulative texture; serpentized olivine embayed by clinopyroxene and orthopyroxene forms the intercumulus phase. Low grade metamorphic minerals such as talc, chlorite, and muscovite are superimposed on the fabric.

Proabably at the same time as intrusion of the ultramafic plugs, a series of mafic to intermediate dikes (5b) were injected into active sinistral shear zones in the tonalitic gneisses (Unit 1) and quartz diorites. The dikes are strongly foliated and the foliation is slightly divergent to the orientation of the dike walls (Figure 3).

Unit 6: K-feldspar megacrystic granite

A large pluton of K-feldspar megacrystic, biotite rich granite forms the northern boundary of the metamorphic belt (3a, b). The granite is undeformed to moderately foliated and probably postdates the major deformation episode. The granite contains K-feldspar megacrysts up to 3 cm long that locally have plagioclase mantles. Often the megacrysts are aligned but their direction varies suggesting primary flow rather than a metamorphic alignment. The granite is contaminated in the contact zone by ingestion of country rocks. Strong cataclastic deformation is developed in the granite where a major mylonite zone is localized close to the contact with the country rocks. This intense cataclasis, well exposed at Frenchman Cove, dies out to the north.

Unit 7a, 7b, 7c

At the southern coastal exposures a number of posttectonic intrusive events are recognized and locally up to 70 percent of the outcrop consists of granite dikes and pegmatite.

The earliest are coarse, red, pegmatite dikes (7a) which are often intruded up their centres by spectacular dikes of net-veined diorite (7b) consisting of diorite fragments from cobble to block size surrounded by veins of gray porphyritic granite (Figure 4). The pegmatites and diorites were probably intruded contemporaneously, with the network of granite veins being derived from the pegmatites.

Unit 8

Aplite, alaskite, pegmatite and garnetiferous granite dikes were emplaced after the intrusion breccias. In the cliffs above Grey River Point the granitic material makes up 100 percent of the outcrop and defines a small stock. The frequency of dikes decreases away from this body.

Unit 9: Diabase dikes

The last intrusive event recognized consists of dark gray to green diabase dikes which cut all the earlier phases. These dikes are sometimes porphyritic with pyroxene and plagioclase phenocrysts.

Unit 10

Wolframite and scheelite occur within a hydrothermal quartz-vein system. The veins occupy fissures formed by a conjugate system of normal faults, which cut all of the above units. Other ore minerals include pyrite, chalcopyrite, molybdenite, bismuthinite, bismuth and marcasite. Fluorite and calcite occur as gangue minerals along with quartz. The vein system was offset by several east-west normal faults, and later was cut by a series of tensional veins containing fluorite, calcite, barite, sphalerite, galena, apophyllite and harmotome.

CONCLUSIONS

The tonalite and granodiorite gneiss (Unit 1) may be correlated with the Little Passage Gneiss (Colman-Sadd, 1974) exposed on Long Island, Bay d'Espoir. Based on concepts developed elsewhere in the Gander Zone (Kennedy and McGonigal, 1972; Colman-Sadd, 1974; Kennedy 1976), these gneisses may represent pre-Appalachian basement rocks, although these interpretations have recently been challenged by Blackwood (1978) and others.

It is not known whether the quartz diorites (Unit 2) that cut the tonalite gneiss are the same intrusions which form the injection migmatites in the amphiolites and micaceous schists (Unit 3). Also the age of these metasedimentary rocks is not known. The nearest dated metasedimentary and metavolcanic rocks are the Ordovician Baie d'Espoir Group to the east, but this group lacks the extensive migmatization characteristic of the Grey River area.

The amphibolites and mica schists of Unit 3 are texturally and lithologically similar to parts of the undated Port aux Basques Gneiss (Brown, 1976) to the west. This unit was considered to be Precambrian by Brown (1976) but this is questioned by Chorlton (personal communication) on the basis of work to the east. Samples of the Port aux Basques Granite (Brown, 1976), a synkinematic intrusion into the gneiss, were collected for U-Pb dating. These results may indirectly help solve some of the many problems of the geology of the Grey River area.

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