GEOLOGY OF TWILLICK BROOK (2D/4) AND PART OF BURNT HILL (2D/5), NEWFOUNDLAND

by S.P. Colman-Sadd

INTRODUCTION

Geologic mapping of the Twillick Brook (2D/4) 1:50,000 area, which was begun in 1977 (Colman-Sadd, 1978c), was completed during 1978. Mapping was also extended into the southwest corner of the Burnt Hill (2D/5) area.

Access to the western part of the area was described by Colman-Sadd (1978b). The eastern part can be reached from the Grand Falls transmission line, the Bay d'Espoir highway, and from woods roads to Twillick Pond and southeast of North Cut-off dam. Only three traverses, north of Matthews Pond, had to be made from a fly camp.

The area was mapped previously by Anderson and Williams (1970) at the 1:250,000 scale. The part of the area adjacent to Round Pond was mapped by Slipp (1952). NALCO geologists reported the asbestos mineral occurrence near Newfoundland Dog Pond (Stewart, 1958), and mapped the area around Matthews Pond (Bowen, 1955).

The rocks of the area are divided into three groups: a) sedimentary and volcanic rocks (Units 1-4), b) serpentine and associated breccia (Unit 5), and c) later intrusive rocks (Units 6-10). The sedimentary and volcanic rocks form part of the Baie d'Espoir Group and are conformable with rocks exposed in the St. Alban's (1M/13) and Gaultois (1M/12) map areas (Colman-Sadd, 1976, 1978a). They are considered to be Middle Ordovician on the basis of fossils found at Conne River (Colman-Sadd, 1976) and along strike near Middle Ridge (Anderson and Williams, 1970). The serpentine breccia, which is interpreted as an ophiolitic mélange, marks a major structural discontinuity that extends northwestwards to the Pipestone Pond ultramafic body (Slipp, 1952; Geological Survey of Canada, 1954, 1968); it may form the northwestern boundary of rocks that can be reasonably included in the Baie d'Espoir Group. The later intrusive rocks, ranging from gabbro to granite, intruded the Baie d'Espoir Group and probably the serpentine breccia. K-Ar radiometric ages of 406 ± 17 Ma from the Rocky Bottom tonalite and 342 ± 16 Ma from the North Bay Granite were reported by Anderson and Williams (1970).

BAIE D'ESPOIR GROUP (Units 1-4)

The Baie d'Espoir Group within the map area is divided into three formations, the Salmon River Dam (1), Riches Island (2), and St. Joseph's Cove (3) Formations (Colman-Sadd, 1976), and one informal unit, the North Steady Pond unit (4). The latter will be formally proposed as a formation in a subsequent publication.

The Salmon River Dam Formation stratigraphically underlies the St. Joseph's Cove Formation and the North Steady Pond unit. The relationship cannot be directly determined from bedding and facing directions because of early isoclinal folding. Plunges of the early fold axes indicate, however, that the Salmon River Dam Formation only outcrops where it has been domed upwards around igneous intrusions and the younger units have been removed by erosion. The boundary between the St. Joseph's Cove Formation and the North Steady Pond unit is a gradational, lateral facies change. The contact between the Riches Island and the St. Joseph's Cove Formations is sharp, but its surface trace is extremely irregular as a result of sedimentary interfingering and/or early isoclinal folding; the relative stratigraphic positions of the two formations are uncertain, although the proposition favored here is that they are laterally equivalent.

Salmon River Dam Formation (Unit 1)

The rock types of this formation have been described by Colman-Sadd (1978c). Apart from the location of one new outcrop, southwest of Matthews Pond, nothing new has been discovered during the 1978 field season.

Riches Island Formation (Unit 2)

The typical rock type of the formation is greenish gray, parallel laminated pelite with 1 to 2 cm greenish gray, parallel and cross laminated siltstone beds. Similar rocks also occur locally within the St. Joseph's Cove Formation, and St. Joseph's Cove rock types occur locally in the Riches Island Formation (Colman-Sadd, 1976). In the extreme southeast corner of the area, the formation includes light gray massive psammite, and very fine grained graphitic siltstone and schist; these rock types are better developed in the St. Alban's (1M/13) area to the south.

St. Joseph's Cove Formation (Unit 3)

Most of this formation consists of thinly interbedded, slightly calcareous, brown, fine grained sandstone and siltstone, and dark gray pelite (Colman-Sadd, 1978b,c). A volcanic unit within the formation was mapped during the 1978 field season, and is informally referred to as the Twillick Brook felsic pyroclastic member. The member has been shown on previous maps (Williams, 1967; Anderson and Williams, 1970), but no contacts had been found and it was not known whether it was intrusive or extrusive. Exposure in a new quarry on the west side of the Bay d'Espoir highway shows an interbedded relationship with enclosing sediments. This evidence, together with the presence of medium grained, corroded and fractured quartz and feldspar crystals set in a muddy matrix, indicates a pyroclastic origin. Furthermore, although the member has not metamorphosed the country rocks, it has had a marked effect on the sedimentary environment; it is surrounded by graphitic schist and where this passes outwards into the typical turbidite cycles of the St. Joseph's Cove Formation, the pelitic divisions are green rather than the usual dark gray.

North Steady Pond unit (Unit 4)

Rocks of the St. Joseph's Cove Formation grade northwards into the North Steady Pond unit, consisting of greenish gray pelite with very thin, parallel and cross laminated, siltstone beds and graded quartz-feldspar sandstone beds (4a). The sandstone beds are typically 5 m to 1 m in thickness and have a grain size of less than 3 mm; they are more numerous towards the northeast of the area, where they form over 90 percent of the rock sequence.

Medium grained felsic crystal tuff and minor felsic lithic tuff(4b) occur near the Partridgeberry Hills and become increasingly common north of Round Pond; individual beds are up to 10 m thick. Probable rhyolite flows also occur north of Round Pond.

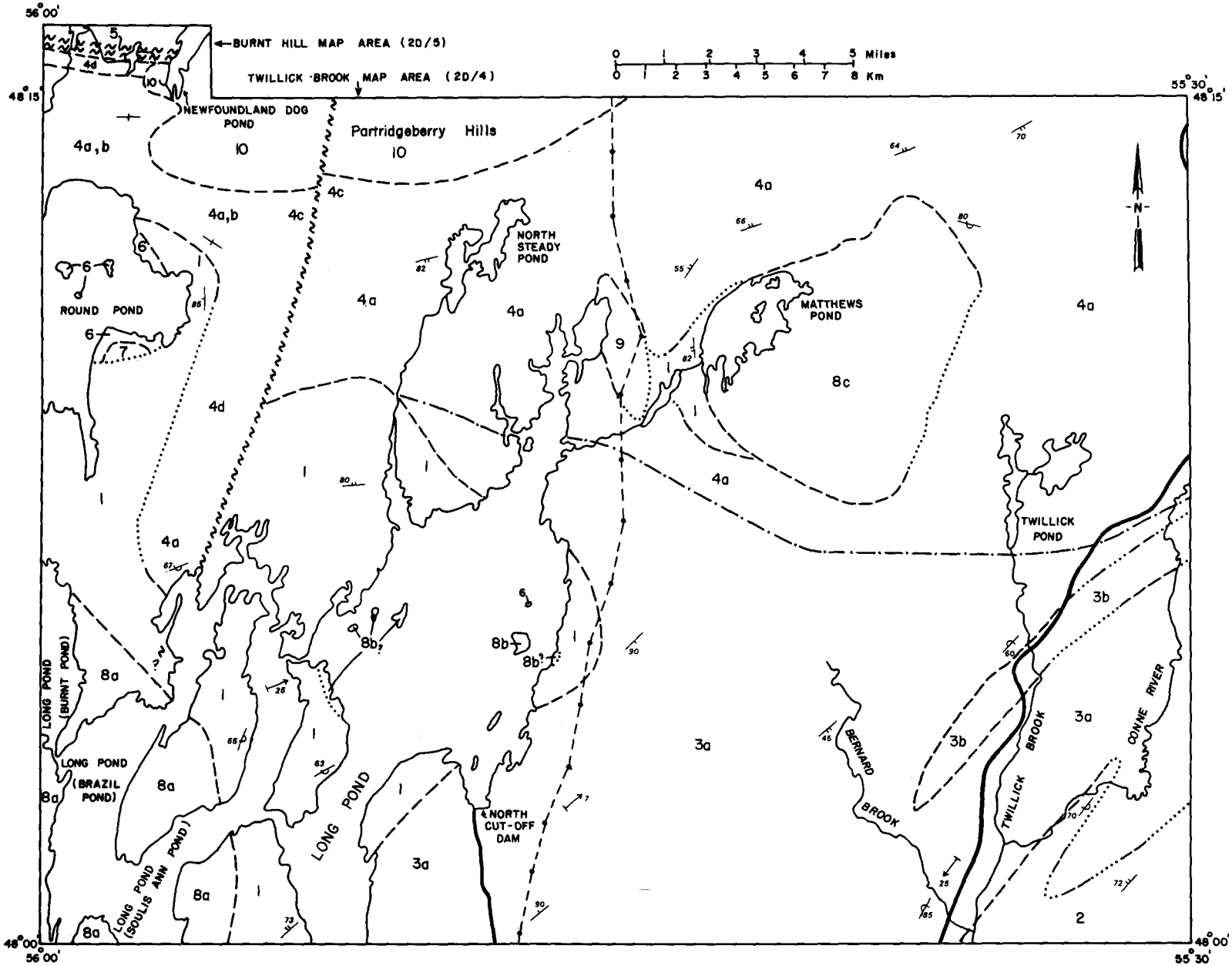
Mafic pyroclastic rocks (4c) are present in two exposures on each side of the main northeast trending fault.

Conglomerate (4d) east of Round Pond was described by Colman-Sadd (1978c). Another band was found in the 1978 field season just south of, and possibly interfingering with, the serpentine breccia near Newfoundland Dog Pond. It consists of 30 cm to 1 m beds of conglomerate and laminated sandstone with gradational bed contacts. The conglomerate has a sandstone and pelite matrix in which the clasts have a a slight preferred orientation parallel to bedding, are subrounded to angular, and are poorly sorted; the largest clast found was 15 cm across. Most clasts are composed of quartz, feldspar, felsic volcanic or plutonic rocks, and green pelite. A fluxoturbidite origin is suggested.

SERPENTINE BRECCIA (Unit 5)

The serpentine breccia is exposed in the brook flowing west from Newfoundland Dog Pond. In the western part of the brook internally brecciated serpentine blocks 10 to 30 m across are mixed with brecciated felsic volcanic rock fragments up to 10 cm across, sheared graphitic mudstone and psammite, and conglomerate. In the eastern part of the brook there is a single block of brecciated serpentine with an exposed length of 500 m; the block is composed of fragments up to 10 cm in diameter and is cut by talc coated shear surfaces. The serpentine contains chromite and asbestos veins.

The contact between the serpentine breccia and the Partridgeberry Hills Granite is just to the west of Newfoundland Dog Pond. It is marked by a 30 cm gap in exposure. On one side of the gap there is a sheared, light green, talc-serpentine rock and dark green brecciated serpentine; on the other side is an unbrecciated and unusually fresh biotite granite. It is concluded that the granite has intruded the brecciated serpentine, although it is conceivable that the serpentine has been emplaced tectonically against preexisting granite.



LEGEND

MIDDLE ORDOVICIAN OR LATER

10 **Partridgeberry Hills Granite:** *Medium grained, chloritized and sericitized, biotite and perthitic microcline granite; intricately mixed with phyllite and felsic pyroclastic rocks near southern margin.*

9 **Rocky Bottom** *tonalite, with biotite phenocrysts.*

8 *Biotite or garnet-muscovite leucocratic granite:* **8a, North Bay Granite; 8b, Long Pond granite; 8c, Matthews Pond granite.**

7 *Hornblende bearing granodiorite.*

6 *Hornblende gabbro.*

5 *Serpentine breccia; north of Round Pond, also contains fragments of felsic intrusive or extrusive rocks, psammite, and schist.*

MIDDLE ORDOVICIAN

Baie d'Espoir Group

4 **North Steady Pond unit: 4a,** *Green-gray phyllite with very thin gray siltstone beds and thin to thick graded sandstone beds;* **4b,** *as 4a but also containing felsic pyroclastic rocks and minor felsic volcanic flows(?);* **4c,** *mafic pyroclastic rocks;* **4d,** *sandstone and conglomerate.*

3 **St. Joseph's Cove Formation: 3a,** *Thin bedded brown siltstone and gray or green pelite, with minor thick bedded sandstone, graphitic schist and green phyllite;* **3b,** *Twillick Brook felsic pyroclastic member.*

2 **Riches Island Formation:** *Green-gray phyllite with very thin gray siltstone beds.*

1 **Salmon River Dam Formation:** *Medium to thick bedded sandstone and siltstone, with minor pelite and calc-silicate beds.*

Gradational boundary marking lateral facies change between St. Joseph's Cove Formation and North Steady Pond unit

INTRUSIVE ROCKS (Units 6-10)

All the intrusions in the area except the Matthews Pond granite (8c) have been been described by Colman-Sadd (1978c).

Part of the gabbro intrusion at Round Pond is somewhat more felsic than was previously thought and is here separated as granodiorite. Some of the boulders of gabbro on the shores of Round Pond contain pegmatite veins that have marginal zones consisting of feldspar and hornblende and central zones of quartz, feldspar, garnet and tourmaline. The veins may indicate a genetic link between the hornblende gabbro and the garnetiferous granites of the map area, and provide support for the theory of Cawthorn and Brown (1976) that these granites are derived by amphibole fractionation.

The Matthews Pond granite is medium grained, equigranular, and contains either biotite or, rarely, biotite and muscovite. In a few places it is cut by garnet and tourmaline bearing aplite veins. It is similar to the North Bay and Long Pond granites (8a, b) and is presumed to be continuous with them in the subsurface. Also, it is probably related to the Middle Ridge granite northeast of the map area. Granites of this type seem to form a linear northeastward trending belt from Bay d'Espoir to Gander Lake.

STRUCTURE AND METAMORPHISM

The description by Colman-Sadd (1978c) of the effects of deformation and metamorphism in the west half of the map area is equally applicable to the east half, and the reader is referred to that publication.

MINERALIZATION

Pyrite was found during this study in felsic pyroclastic rocks of the North Steady Pond unit exposed in the brook flowing west from Newfoundland Dog Pond.

Veins of asbestos less than 3 mm wide and with poor fibre quality were found in the serpentine breccia west of Newfoundland Dog Pond.

Acknowledgements: *Anthony Benoit is thanked for able assistance in the field. Baxter Kean and Jim Hibbard reviewed the manuscript.*

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