

GEOLOGICAL MAPPING - BAY D'ESPOIR AREA

S.P. Colman-Sadd

Introduction

The present report covers field work done between September 17 and October 17, 1974 in the parts of the St. Alban's N.T.S. sheet 1M/13 (west half) indicated on fig. 1. The rest of the area was mapped and the main structure elucidated during Ph.D. studies at Memorial University of Newfoundland (Colman-Sadd, 1974).

The Baie d'Espoir Group is divided into four formations (see fig. 1, legend), here referred to as the Salmon River Dam, St. Joseph's Cove, Riches Island, and Isle Galet Formations. These have been regionally deformed twice, the second deformation being responsible for the major structure, the Bay d'Espoir Nappe; this is a southeast facing recumbent anticline with a limb length of at least 25 km. It brings the Baie d'Espoir Group into tectonic contact with the Little Passage Gneisses, a basement complex well exposed to the south of Bay d'Espoir. Regional metamorphism in the Baie d'Espoir Group varies between biotite and sillimanite grades, and appears to have reached its peak between the first and second deformations. It is related, both in time and space, to the North Bay Granite, a synorogenic garnetiferous leucocratic granite, which includes basement gneisses in its core.

Four areas were mapped during the fall of 1974:

1. Southeast of Barasway de Cerf.
2. Between Conne River and Arran Back Cove.
3. Between Milltown and Morrisville.
4. Around Long Pond, northwest of St. Alban's.

Mapping in the first three areas consisted of following along strike units already recognized and described by Colman-Sadd (1974) and no further mention will be made of them here. Mapping in the fourth area contributed new information on the lithology, stratigraphy, structure and metamorphism of the Salmon River Dam Formation; the boundaries of the North Bay Granite and a serpentinite body were defined, and the Salmon River fault and a new outcrop of basement rocks were discovered.

The Geology Around Long Pond, Northwest of St. Alban's

Basement rocks

Gneisses occur in both sections of the Salmon River Valley included in the St. Alban's map sheet. In both places they are heavily migmatized by the North Bay Granite. In the north they are mafic or biotite rich, and although unbanded have a strong foliation. To the south the gneiss is banded; much of it is granitized, but ungranitized sheets and xenoliths of semipelitic composition also occur enclosed in North Bay Granite.

A pink equigranular granite occurs in the Salmon River Valley, 3 km. southwest of Long Pond. Its contacts with surrounding rocks were not observed

Figure 1

Preliminary geologic map of St. Albans 1M/13 (west half)

LEGEND

MIDDLE ORDOVICIAN OR EARLIER

8 North Bay Granite.

7 Serpentinite

BAIE D'ESPOIR GROUP

6 Isle Galet Formation

5 Riches Island Formation

4 St. Joseph's Cove Formation

3 Salmon River Dam Formation

PRECAMBRIAN ?

2 Pink equigranular granite

1 Gneiss: 1a, mainly tonalitic (southeast of Little River);
1b, migmatite (salmon River Valley).

--- lithologic contact

— fault

▲ thrust fault

↗ bedding, tops known (inclined, overturned)

↖ second deformation schistosity

↗ second deformation fold axes

+...+ limits of geologic mapping, fall 1974

Scale 0 5
kilometers

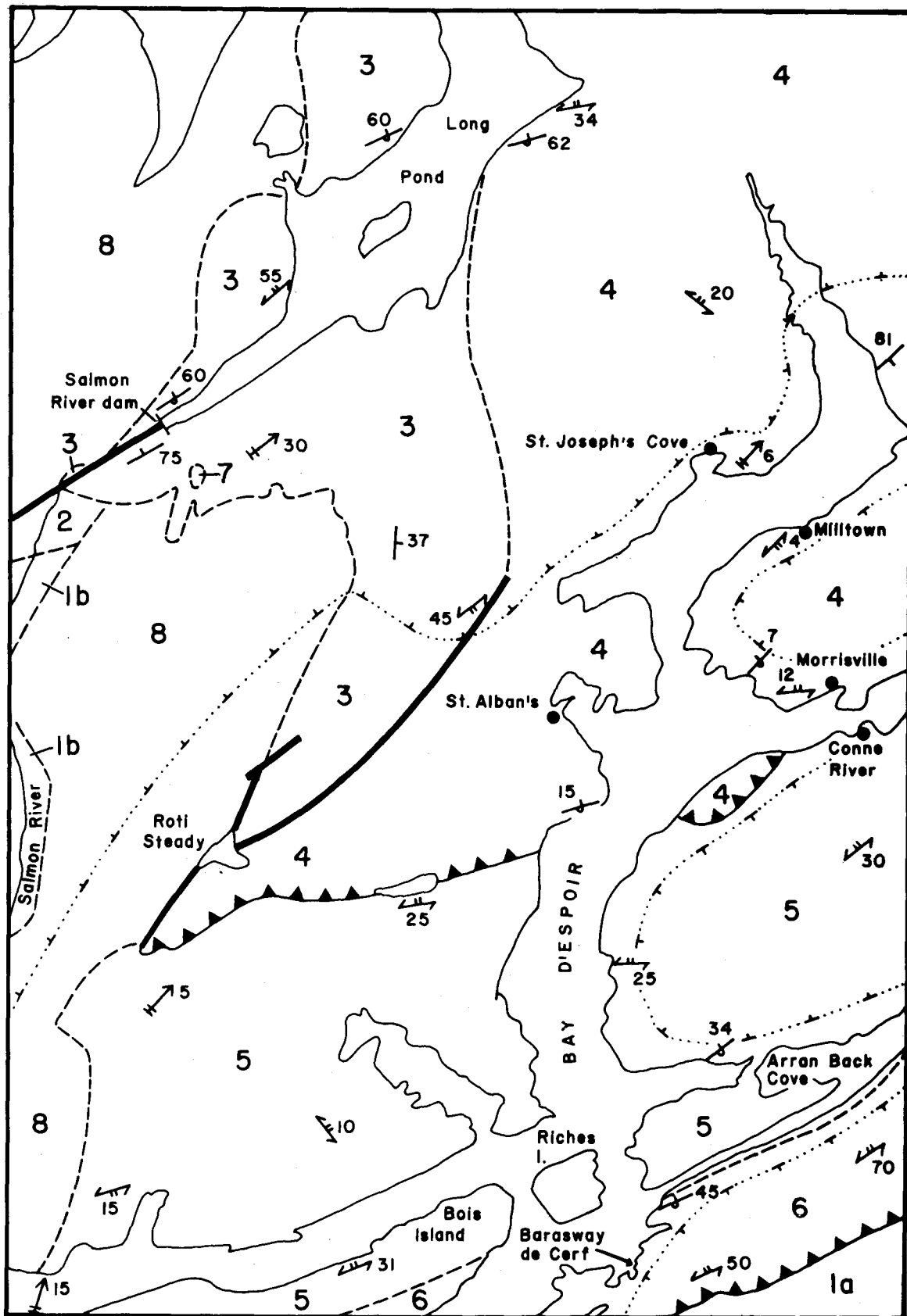


Fig. 1 St. Alban's Map

but it is thought to belong to the basement complex because it has a strong tectonic fabric which is discordant with any structures in the Baie d'Espoir Group or North Bay Granite.

Salmon River Dam Formation

The formation typically consists of well laminated sandstone and siltstone with thin pelitic and calc-silicate beds; ripple cross-bedding and slumping are common. The lower parts of the formation exposed around the North Bay Granite, south of Long Pond, consist of graphitic schist and psammite; these rocks are more highly metamorphosed and their conformity with the sandstone and siltstone is not certain. Towards the east the Salmon River Dam Formation becomes more pelitic until it grades into the St. Joseph's Cove Formation consisting of interbedded pelite and thin siltstone beds.

The Salmon River Dam Formation has been regionally deformed twice. The first deformation took place when the sediments were still unconsolidated; dewatering structures and chaotic folding are common, and, to the north of the Salmon River dam, a pseudo-conglomerate has been formed by the fragmentation of thin sandy beds. As far as can be determined the first deformation did not form any major structures.

The second deformation caused close similar folds and the formation of a crenulation or penetrative schistosity. The intensity of the deformation was greatest in the area southeast of Long Pond within 5 km. of the

North Bay Granite. The major structure formed by it was the Bay d'Espoir Nappe.

Metamorphism in the Salmon River Dam Formation was generally in the lower amphibolite facies, decreasing towards the northeast, and increasing to staurolite grade or higher near the margins of the North Bay Granite, south of Long Pond. Northwest of Long Pond the aureole around the granite is less prominent and is marked by a zone of hornfels about 100 m. wide.

Serpentinite

A small serpentinite body about 500 m. long is present in graphitic and semipelitic schist of the Salmon River Dam Formation in the aureole of the North Bay Granite, south of Long Pond (Dunlop, 1954).

The rock has a grain size of about 1 cm. and a slight tectonic fabric. Nowhere is its contact with the surrounding rocks exposed and it has had no obvious effect on their structure or metamorphism.

North Bay Granite

The North Bay Granite is a leucocratic garnetiferous granite which intruded the Baie d'Espoir Group and migmatized the gneisses in the Salmon River Valley.

South of Long Pond it is equigranular and its margins have been strongly deformed during the second deformation of the Baie d'Espoir Group.

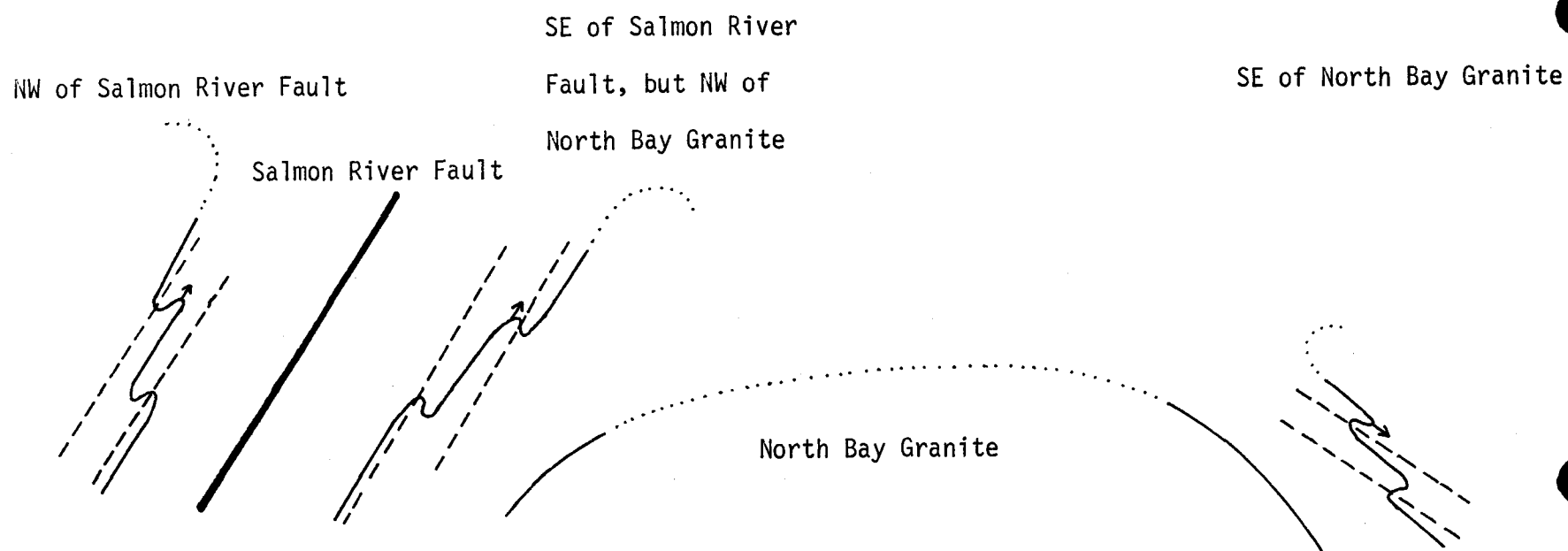


Figure 2: Diagram showing structural attitudes in the Salmon River Dam Formation near the Salmon River dam. Light solid and dotted lines indicate bedding or intrusive contacts; heavy solid line, fault; dashed line, second deformation schistosity; and arrows, facing directions of folds.

Formation has been domed upward by the North Bay Granite. At the northwest edge of the granite the beds are the right way up and dip steeply to the northwest; the second deformation schistosity has a steeper dip to the northwest indicating that these rocks lie on the north limb of an anticline closing upwards to the southeast. Around the northeastern edge of the granite, fold axes in the Salmon River Dam Formation plunge towards the northeast. Southeast of the granite, the beds dip and face to the southeast and the axial planar schistosity also dips southeast but at a shallower angle than the bedding; schistosity-bedding intersections and minor folds indicate that these rocks form the lower limb of a syncline facing downwards to the southeast. In this part of the area the Salmon River Dam Formation is in faulted contact with the St. Joseph's Cove Formation.

Further to the northeast there is no recognizable structural break either across Long Pond or between the Salmon River Dam and St. Joseph's Cove Formations. Minor folds consistently face upwards and the beds generally dip northeast and are overturned. The second deformation schistosity dips steeply to the northwest on the northwest side of Long Pond and then flattens out or locally dips southeasterly on the southeast side of the pond. The major structure is an unbroken southeast facing recumbent anticline.

Principal Conclusions

1. Basement rocks consisting of gneisses and a pink equigranular granite occur in the Salmon River Valley.

In the extreme northwest of the map sheet, the granite contains xenoliths of biotite schist and is coarsely porphyritic with phenocrysts of potassium feldspar up to 10 cm. long; these frequently show a flow alignment which is parallel to a tectonic fabric in the matrix and suggests that the granite was not completely solidified during the second deformation of the Baie d'Espoir Group.

General Structure

The area is structurally divided into two parts by the Salmon River Fault which causes the prominent northeast-southwest lineament in the upper part of Salmon River and southwest Long Pond. In the valley of Salmon River, the fault is marked by a 100 m. wide fracture zone, across which the Salmon River dam has been built. The exposed part of the fracture zone is formed from Salmon River Dam Formation sandstone and metadiorite, not exposed elsewhere in the area; both lithologies are extremely chloritized, and the fragments are set in a fine white groundmass of granulated quartz, feldspar, and calcite.

Northwest of the Salmon River Fault, the Salmon River Dam Formation is generally overturned and dips steeply to the northwest. The schistosity formed during the second deformation also dips northwest but at a shallower angle. The relationship between bedding, schistosity, and minor folds indicates that the rocks form the southern limb of an anticline closing upwards to the northwest (fig. 2).

To the southeast of the Salmon River Fault, the Salmon River Dam

2. The Salmon River Dam Formation underlies the St. Joseph's Cove Formation and grades upwards into it with an increase in the pelitic content of the sediment.

3. A serpentinite body of unknown relationships is present within the outcrop area of the Salmon River Dam Formation; it predates at least one of the deformations of the Baie d'Espoir Group.

4. The North Bay Granite has a coarsely porphyritic variety which was still partly liquid during the second deformation of the Baie d'Espoir Group.

5. A major fault, the Salmon River Fault, separates rocks northwest of the Salmon River dam from those to the southeast.

6. The North Bay Granite southeast of the Salmon River dam has interfered with the formation of the Bay d'Espoir Nappe and has caused doming of the metasediments.

Acknowledgement

The author is indebted to Dr. M.J. Kennedy of Memorial University of Newfoundland for introducing him to the area and for advising him during much of his work there.

References

Colman-Sadd, S.P.

1974: The geologic development of the Bay d'Espoir area, southeastern Newfoundland; unpublished Ph.D. thesis, Memorial University of Newfoundland.

Dunlop, W.B.

1954: Exploration of the Bay d'Espoir area; Newfoundland and Labrador Corp., unpublished company report.