NOTES ON THE GEOLOGY OF THE KING GEORGE IV LAKE AREA, SOUTHWEST CENTRAL NEWFOUNDLAND

John R. DeGrace

Abstract

The western part of the King George IV Lake area in southwest central Newfoundland is underlain by a polydeformed garnetiferous biotite-amphibole gneiss and granite complex of probable pre-Ordovician age. Steeply-dipping west-facing mafic volcanic rocks of probable Ordovician age underlying the east part of the area show little evidence of deformation and are intruded by an underformed granite of presumed Devonian age. The contact between the metamorphic complex and the volcanic rocks is hidden under a cover of undeformed sediments of possible Carboniferous age. These sediments rest with apparent unconformity on the older granites to the west; and are in reverse fault contact with the volcanic rocks to the east.

The area shows little economic potential except for a unit of pillowed lavas and pyroclastics on the west side of King George IV Lake.

Introduction

King George IV Lake is located in southwest central Newfoundland, within a quadrangle extending roughly from 48°10' to 48°15' north latitude, and 57°45' to 57°55' west longitude. That quadrangle, about fifty square miles in area, was geologically mapped at a scale of 1:50,000 during a ten-day period in the summer of 1973.

The venture was considered as a geological reconnaissance preliminary to a possible more detailed examination. Although no mineral deposits were known from the area, the fact remained that geological investigations had not been extensive, and that a possible favourable environment for sulphide deposition was in Ordovician volcanic rocks at the southern extremity of the Annieopsquatch Mountains to the east of the lake. In addition, it was anticipated that the lake would be flooded within a very few years for hydroelectric generation purposes, in which case important shoreline exposures would be lost.

General Geology

The map area is located in the western part of Newfoundland's Central Mobile Belt as defined by Williams (1962). Within that belt, the area lies in an enigmatic position where tectonic/stratigraphic zones, E, F, and G (Williams, Kennedy and Neale, 1972) converge in the western part of the Hermitage Flexure (Williams, Kennedy and Neale, 1970). The area includes rocks of various ages and deformational histories.

The oldest rocks in the area are intensely deformed feldspar-quartz-garnet-amphibole gneisses of probable pre-Ordovician age. These are intruded by an amphibole-biotite granite pluton which is at least in part deformed along with the enclosing gneisses. Ordovician(?) mafic volcanic rocks are in assumed fault contact with this "older" granite under a cover of later sediments. These mafic flows, pillowed lavas, pillow breccias and aquagene tuffs are steeply dipping and have only one weakly-developed, non-penetrative schistosity. The volcanic rocks are intruded by undeformed biotite and biotite-amphibole granite pluton(s) of probable Devonian age. Undeformed conglomerate, sandstone and limestone of Carboniferous(?) age rest with probable nonconformity on the older granites and are in reverse fault contact with the Ordovician volcanic rocks.

Table of Formations

<table>
<tr><td>Upper Paleozoic</td><td>Carboniferous(?)</td><td colspan="2">Conglomerate, Sandstone & Limestone</td></tr>
<tr><td></td><td colspan="3">Unconformity on 1, 2; Fault contact with 3,4.</td></tr>
<tr><td rowspan="6">Lower Paleozoic</td><td rowspan="2">Devonian(?)</td><td colspan="2">"Younger" Granite (4)</td></tr>
<tr><td colspan="2">Intrusive Contact into 3</td></tr>
<tr><td>Ordovician(?)</td><td colspan="2">Mafic Volcanics and Pyroclastics (3)</td></tr>
<tr><td colspan="3">Fault Contact</td></tr>
<tr><td rowspan="3">Pre-Ordovician</td><td rowspan="3">Metamorphic Complex</td><td>"Older" Granite (2)</td></tr>
<tr><td>Intrusive Contact</td></tr>
<tr><td>Garnetiferous Biotite-Amphibole Gneiss (1)</td></tr>
</table>

Metamorphic terrain and "older" granite pluton

The metamorphic terrain is exposed in scattered shoreline outcrops on the west arm of King George IV Lake, and at a few inland localities. For the most part, however, the rock unit is hidden under thick overburden and is not amenable to any detailed structural work.

The rock consists generally of feldspar-biotite-quartz schists and gneisses. However, towards the western part of the map area, the metamorphic grade is higher; and garnet-amphibole gneisses are exposed on a hilltop north of the west arm of the lake. These higher grade metamorphic rocks exhibit extreme planarity in mineral banding (though preferred mineral orientation does not significantly contribute to the S-fabric) with alternating bands of hornblende and of corroded(?) garnet and epidote. Plagioclase, quartz and an opaque mineral are present as accessories. Quartz is more abundant to the east towards the contact zone with the "older" granite. Biotite rather than amphibole is the principal mafic constituent close to the pluton, and garnet is absent. In addition, gneissic banding is less well-developed close to the pluton and the fabric is the result of preferred mineral orientation.

The structure of the garnet-amphibole gneisses in the western part of the map-area is complex; the gneissic banding has been folded at least twice, as indicated by interference folds seen in places. Deformation proceeded to the extent that in a few places fold hinges were completely detached from their limbs and rotated to chaotic orientations. Towards the contact with the older granite, gneissic banding is evident in feldspar-biotite-amphibole-quartz schists, but evidence of subsequent deformation is lacking.

In the poorly-defined contact zone, anatectic-like banding is present in the gneissic rocks; and flattened and contorted xenoliths of metamorphic rocks are included in the pluton. The granite itself is foliated near the contact. The intrusion is therefore interpreted to have been derived by partial melting from the enclosing rocks after some metamorphism had occurred, and to have been in place before the completion of all structural events in the host rock.

Away from the contact zone, the older intrusion is a massive, pinkish, medium to coarse-grained amphibole-biotite granite, exhibiting some feldspar porphyry in places. Allanite is present as an accessory mineral.

The age of these rocks is unknown, but on structural and metamorphic evidence they are older than the other rocks in the map-area, and may be Precambrian.

Mafic Volcanics and Pyroclastics

To the east of King George IV Lake, mafic volcanic rocks are exposed on a rugged plateau at the southern extremity of the Annieopsquotch Mountains. Two units were recognized in the volcanic rocks (see map). To the east of the north arm of the lake, dark green aphanitic to fine-grained massive volcanic rocks of presumed tholeiitic composition are exposed. No flow tops or chilled margins were seen. Tectonic fabric seems to be entirely lacking. This unit is fault-bounded to the west; being in reverse fault contact with Carboniferous(?) sediments, and farther south, in presumed fault contact with the second volcanic unit.

To the east of the south arm of King George IV Lake is a unit of pillowed lava, pillow breccia and aquagene(?) tuff. Where attitudes could be obtained, the unit strikes almost due north and dips steeply to the west. Close-packed pillows are up to four feet in maximum dimension with well-developed buns and basal points. Chilled margins are well-developed in sections of pillow breccia and aquagene tuff. A weak, inhomogeneously developed mineral orientation fabric is present in places. This unit is apparently fault-bounded on all sides, the fault along the lakeshore being reverse and the continuation of the fault bounds the volcanic rocks to the north.

The volcanic rocks are presumed to be Ordovician in age because they lie along strike from, and apparently belong to, a similar lithologic unit that is fossiliferous south of Red Indian Lake.

"Younger" Intrusive Rocks

The northern volcanic unit is intruded by massive, pinkish, fine to medium-grained hornblende and biotite-hornblende granite of presumed Devonian age. Mafic minerals predominate in the northern part of the pluton, comprising up to 50 percent of the rock in places. This trend is accompanied by the lessening of visible quartz content so that the rock may approach the composition of a syenite or monzonite there. Typical intrusive contacts with the enclosing volcanic rocks were observed with angular xenoliths of country rock included in the pluton nearby. The granite is in fault contact with Carboniferous(?) sediments near the east shore of King George IV Lake.

Carboniferous (?) Sediments

A topographically low trough-like area contains the north and south arms of King George IV Lake. This area is underlain by undeformed conglomerate, grit, sandstone and limestone. These

rocks strike north to northeast and dip to the east at 35 to 40 degrees. Conglomerate is exposed near the bottom of the section on the west side of the north arm of the Lake. There, pebble and cobble conglomerate beds up to three feet thick alternate with slightly thinner gritty layers. Approximately 40 per cent of the clasts over one-half inch in diameter are grit and sandstone; with most of the balance being volcanic in origin, predominantly acid. Rare clasts of granite and argillite are also present. Most of the smaller fragments are quartz, but microcline perthite is common and altered plagioclase clasts are present as well. The rock is practically unmetamorphosed.

Higher in the section, red sandstone with grey limestone interbeds are exposed on the east side of the lake. The sandstones are fairly well-bedded and seem to be completely unmetamorphosed, having retained obvious porosity with the passage of time. Coarse and fine sandy beds alternate, the latter having been scoured in places before deposition of the former. Graded bedding is present in places and confirms that the beds are not overturned.

One bed of limestone about three feet thick is exposed on the east shore opposite the west arm of the lake. The bed is in gradational contact with the enclosing red sandstone beds, and quartz grains are scattered throughout the carbonate material. The weathered surface shows a crude anastomosing texture in places. A search for microfossils in the limestone by Dr. L.E. Fahraeus of Memorial University proved unsuccessful.

The rocks are in observed reverse fault contact with mafic volcanic rocks to the east. Where seen, the fault zone is only a few inches thick and dips to the east about 55 degrees. The adjacent sandstones and volcanics are altered and somewhat sheared in places within a few feet of the fault. To the west the sediments are interpreted as resting unconformably on the older granite, although the contact was not observed. The abundance of quartz, acid volcanic rock and microcline perthite in the basal conglomerate testifies to its close genetic relationship with the underlying rocks. In addition, the contact between the granites and sediments is less topographically linear than the contact to the east, suggesting an unconformable rather than a fault relationship.

The unit is assumed to be Carboniferous in age, despite the conclusion of Riley (1957) who interpreted it to be Devonian. The rocks are completely unmetamorphosed, unlike known Devonian (Bay du Nord) rocks to the south (Cooper, 1957), and bear little lithological resemblance to them (J.S. Sutton, pers. comm., 1973). The red sandstones bear a pronounced resemblance to Carboniferous sandstones elsewhere in central Newfoundland (H.R. Peters, pers. comm., 1973). Micropaleontological studies and more detailed mapping may resolve this problem.

Economic Potential of the Map-Area

There are no known mineral occurrences in the map-area. Scattered rusty-weathering patches on the volcanic rocks may be related to disseminated pyrite. The fault-bounded wedge of pillowed lavas and pyroclastics in the southeast part of the map-area is favourable prospecting ground for some type of stratabound sulphide deposits (Kennedy & DeGrace, 1972).

References

Cooper, J.R.
1954: La Poile - Cinq Cerf Map-area, Newfoundland, Geol. Surv. Can., Mem. 276, 62p.

Kennedy, M.J. and DeGrace, J.R.
1972: Structural Sequence and its Relationship to Sulphide Mineralization in the Ordovician Lush's Bight Group of Western Notre Dame Bay, Nfld., CIM Transactions LXXV, p. 300-308.

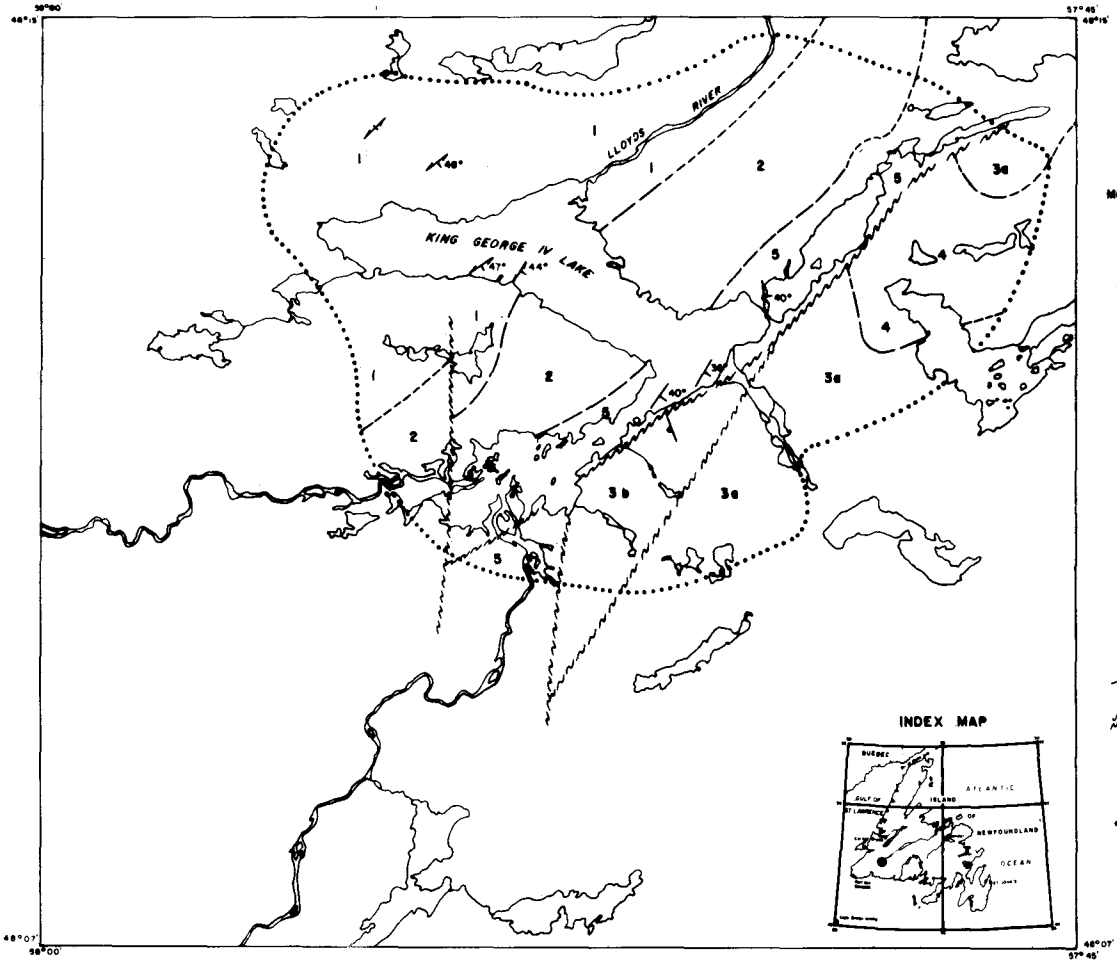
Riley, G.C.
1957: Red Indian Lake (West Half), Nfld., Geol. Surv. Can., Map 8-1957.

Riley, G.C.
1959: Burgeo-Ramea, Nfld. Geol. Surv. Can., Map 22-1959.

Williams, H., Kennedy, M.J. and Neale, E.R.W.
1970: The Hermitage Flexure, the Cabot Fault, and the Disappearance of the Newfoundland Central Mobile Belt, Geological Association America Bulletin, v. 81, p. 1563-1568.

Williams, H., Kennedy, M.J. and Neale, E.R.W.
1972: The Appalachian Structural Province, in Variations in Tectonic Styles in Canada, Price and Douglas, ed., Geol. Assoc. Can., Special Paper 11, p. 182-261.

Williams, H.
1970: Red Indian Lake (East Half), Nfld., Geol. Surv. Can., Map 1196A.



KING GEORGE IV LAKE AREA
NEWFOUNDLAND

SCALE

Miles 1 0 1 2 3 Miles

LEGEND

PALEOZOIC

CARBONIFEROUS (?)

5 Conglomerate, sandstone and limestone.

DEVONIAN

4 Biotite and amphibole-biotite granite.

ORDOVICIAN OR EARLIER

3 3b-Mafic pillowed lava, pillow breccia and aquagene tuff.

3a-Massive or nearly massive mafic volcanics.

PRE-ORDOVICIAN

2 Biotite-amphibole granite.

1 Garnetiferous biotite-amphibole gneiss.

SYMBOLS

Geological Boundary, defined, approximate, inferred.

Fault, defined, approximate, inferred.

40° Bedding, inclined; tops known, dip unknown.

44° Dominant attitude of gneissic banding.

Limit of geological mapping.

Geology by John R. DeGrace
Mineral Development Division
Department of Mines and Energy
Government of Newfoundland and Labrador
1973