1-1-1973

The Granitic Rocks of Southwetern New Brunswick

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INTRODUCTION

The geologic record in the rocks of southwestern New Brunswick encompasses the time interval between the Precambrian and the Triassic. The rocks have been involved in two documentable deformation events – the traditionally accepted Acadian Orogeny, the effects of which were regional, and the Variscan-Appalachian Orogeny (Rast and Grant, 1973b), which affected the rocks along the Fundy coast in the eastern half of the area of Figure 1.

Post-orogenic intrusions (H and I, Fig. 1) compose the largest area of plutonic rocks. The largest of these intrusions is the St. George Pluton (550 sq. miles) which is composed of a calc-alkali suite consisting of adamellite, granite and gabbro in order of abundance. Rocks intermediate in composition between gabbro and adamellite occur in small volumes in the western part of the pluton and can be demonstrated to be the products of reaction between a gabbro and later felsic intrusions (Stops 2-9). A Rb/Sr whole rock isochron age of 400 my has been obtained for the rocks of the westernmost part of the pluton (R. Cormier, written communication, 1972). A smaller layered tholeiitic ultrabasic intrusion .occurs at St. Stephen, just off the northwest end of the St. George Pluton. This intrusion consists of a basal peridotite overlain in sequence by an anorthosite zone and gabbro. This body is intruded by felsic rocks similar to those of the St. George intrusions (K. Butt, oral communication, 1973). Four stocks north of the St. George Pluton (K, Fig. 1) consisting of adamellite have given K/Ar ages between 320 and 338 m y (Ruitenberg et al, 1970). All these intrusions have not been deformed nor metamorphosed during the Acadian Orogeny.

Older intrusive rocks which are metamorphosed and/or possess a tectonic fabric occur in the southeastern part of the area constituting all of unit F (Stops 13 and 14) and most of unit C (Stops 15, 17, 19; Fig. 1). An intrusive body consisting of unaltered adamellite within unit C is tentatively correlated with the St. George intrusion (Stop 18). Many of the intrusive rocks in this area were transported in the Variscan-Appalachian (Stop 17 and 19; Rast and Grant, this guidebook) or in earlier thrust sheets (Stop 14; Helmstaedt, 1968; Rast, oral communication). Geologic

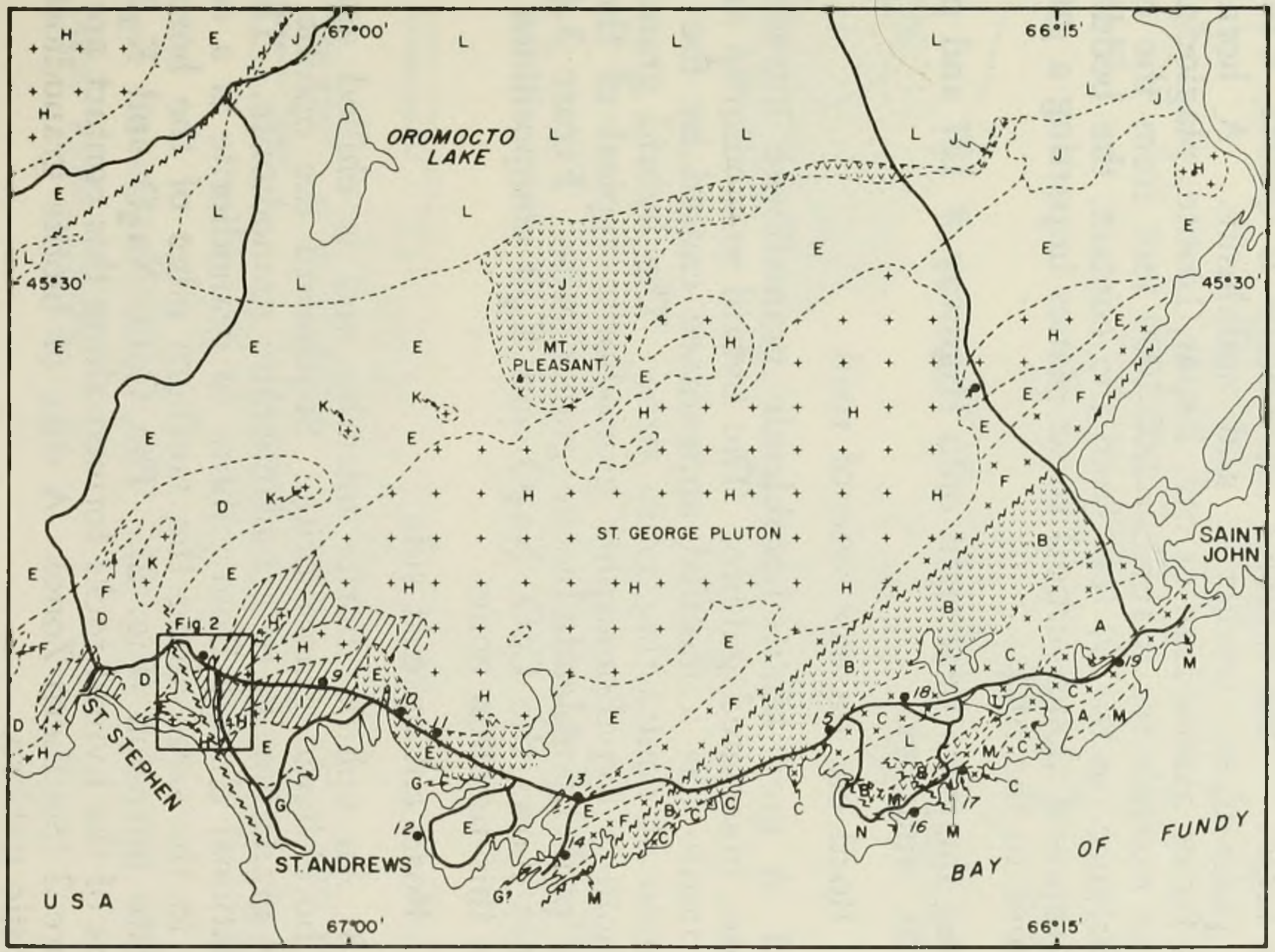

Fig. 1 — Generalized Geological Map of Southwestern New Brunswick.

evidence indicates the existence of Precambrian and Silurian intrusions amongst the older intrusions (Neale and Pajari, 1972; H. Donohoe, oral communication).

LOG AND STOPS

MILEAGE

0 Junction of Highways 1 and 3 in St. Stephen.

9.9 East side of Waweig Bay

STOP 1 The outcrops along Highway 1 represent contact metamorphosed Silurian sediments adjacent to a gabbroic phase of the St. George Pluton.

A zone 100' wide adjacent to the contact is in the pyroxene hornfels facies — the mineral assemblage is quartz, k-feldspar, biotite, plagioclase, cordierite and andalusite. A hornblende hornfels facies assemblage of qtz, k-spar, biotite, plagioclase and muscovite extends for a further 500-1000 feet from the contact. For a distance up to 150 feet from the contact, the bedding has been transposed along vertical shear planes imparting a gneissose appearance to the rock.

Leaving this stop bear right onto Highway # 127 and proceed toward St. Andrews.

10.5 Road cut on east side of road

STOP 2 A grey biotite-hornblende granodiorite intrudes and assimilates brecciated gabbro. The hybrid granodiorite adjacent to the diorite has a mottled appearance caused by the patchy distribution of contrasting grain sizes. The hybrid granodiorite grades into a hypidiomorphic granodiorite typical of the main body of pink hornblende-biotite granodiorite. Figure 3 (Northern Zone) shows the CaO, Na_2O and K_2O compositions of the rocks in this reaction zone.

11.9 Road cut on east side

STOP 3 An ophitic diorite intrudes and is chilled against a hybrid hornblende granodiorite. Southward the ophitic diorite changes gradationally to a melanocratic granodiorite. This type of gradational change from gabbro to granodiorite is a common feature in the zone along the northern edge of the hornblende adamellite intrusion (Fig. 2). The CaO, Na_2O and K_2O compositions of the hybrid rocks formed along this contact are shown in Figure 3 (Southern Zone). A dike of biotite granodiorite cuts the ophitic gabbro.

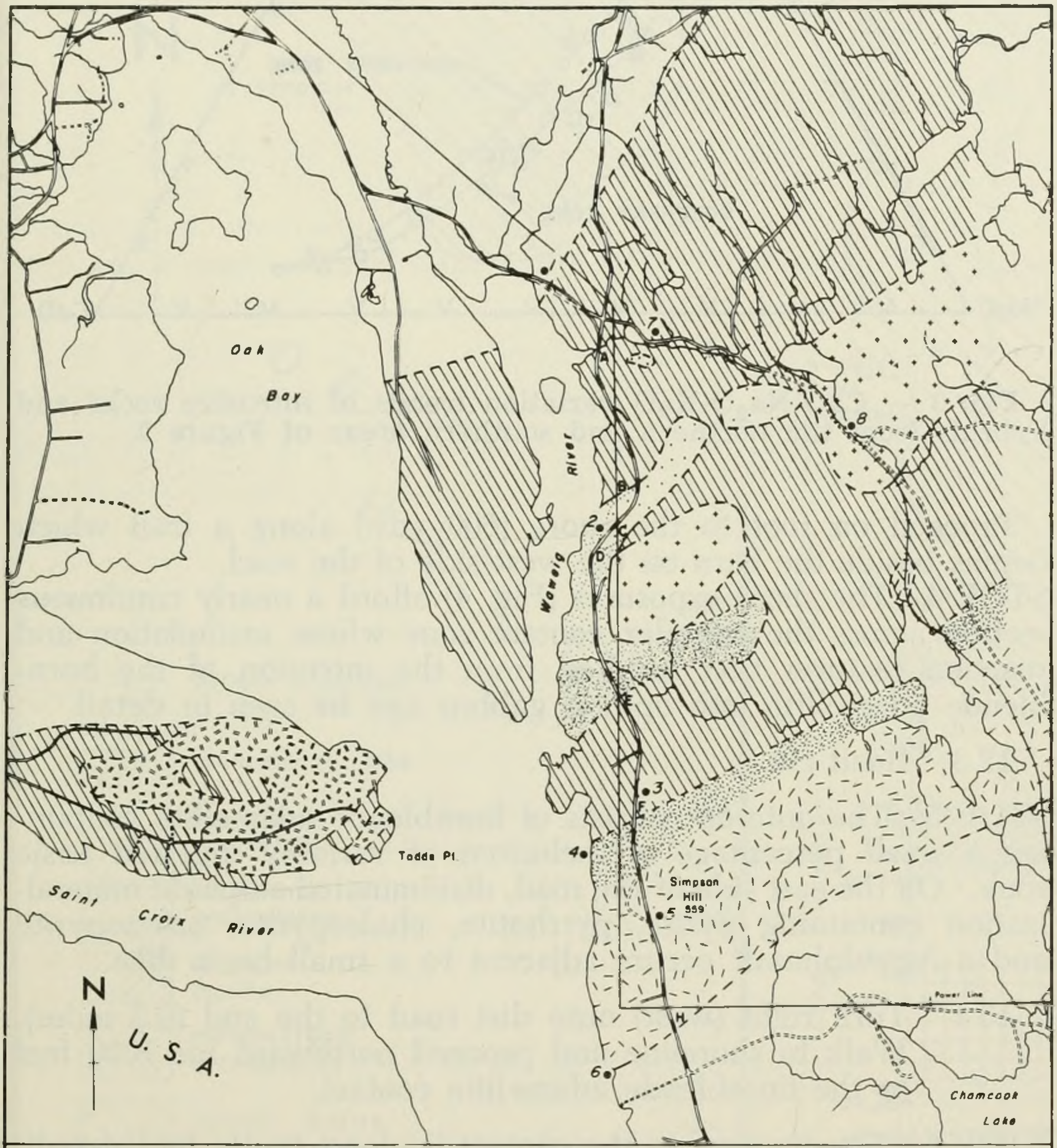

Fig. 2 — Geological Map of the western part of the St. George Pluton (after Fyffe, 1971).

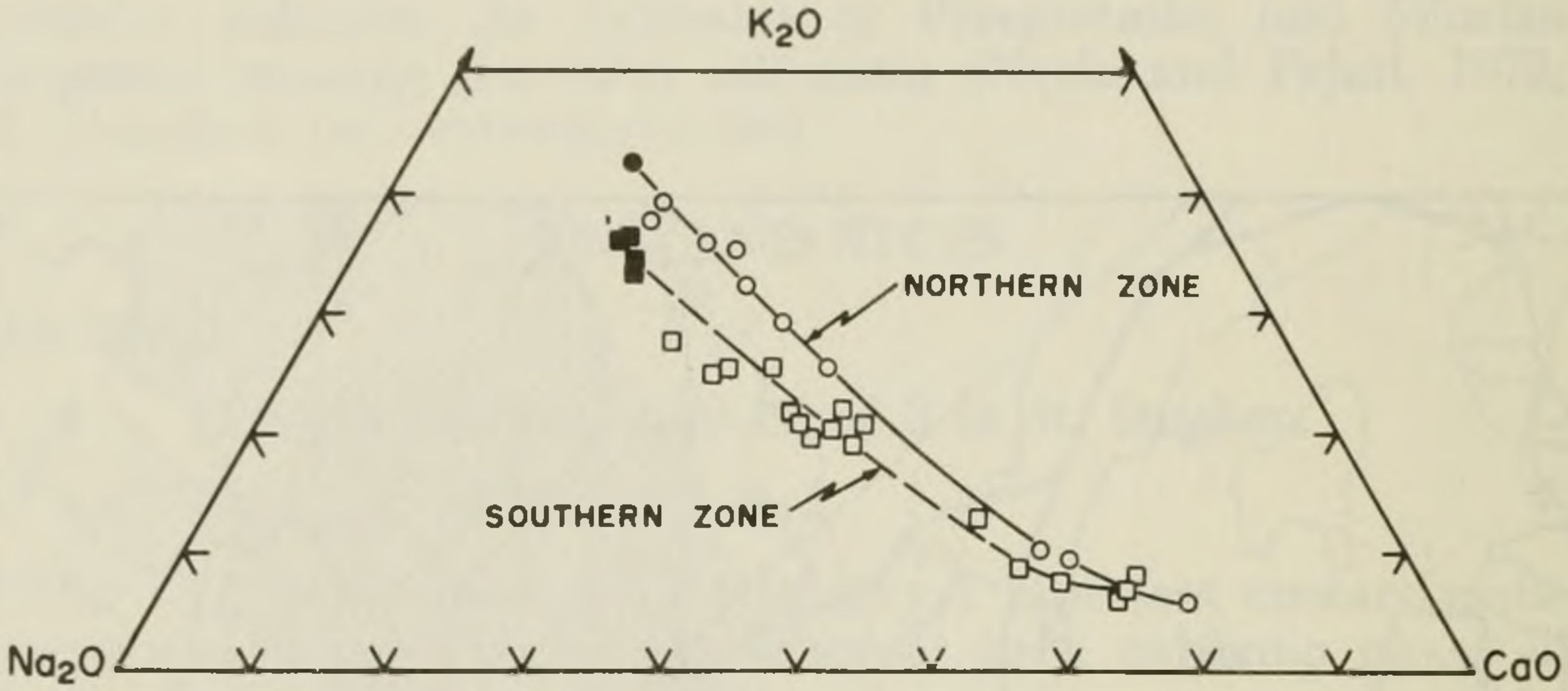

Fig. 3 — CaO-Na_2O-K_2O variation trends of intrusive rocks and hybrids from the northern and southern areas of Figure 2.

Proceed on foot to the shore (600 yds.) along a trail which begins beside the barn on the west side of the road.

STOP 4 The shore exposures (Fig. 4) afford a nearly continuous section across the complex contact zone where assimilation and reaction features that resulted from the intrusion of the hornblende adamellite into ophitic gabbro can be seen in detail.

12.3 Road cut

STOP 5 The outcrop consists of hornblende adamellite containing a small percentage of inclusions of variably digested basic rock. On the east side of the road, disseminated sulphide mineralization containing pyrite, pyrrhotite, chalcopyrite, arsenopyrite and a Ag-sulphosalt occurs adjacent to a small basic dike.

13.1 Turn right (west) onto dirt road to the end (0.3 miles). Walk to shoreline and proceed northward for 1000 feet to the hornblende adamellite contact.

STOP 6 The traverse to the contact is along gently folded sedimentary and igneous rocks of lower Devonian age (Boucot et al, 1966). The rocks up to 20 feet from the adamellite intrusion have not been noticeably disturbed nor metamorphosed by the intrusion. Return to cars and drive to St. Andrews for the night.

SECOND DAY

Proceed to the junction of Highways 1 and 127 at Waweig Bay and turn right (east) on Highway 1 (mile 0.0).

0.2 Road cut on left side of road.

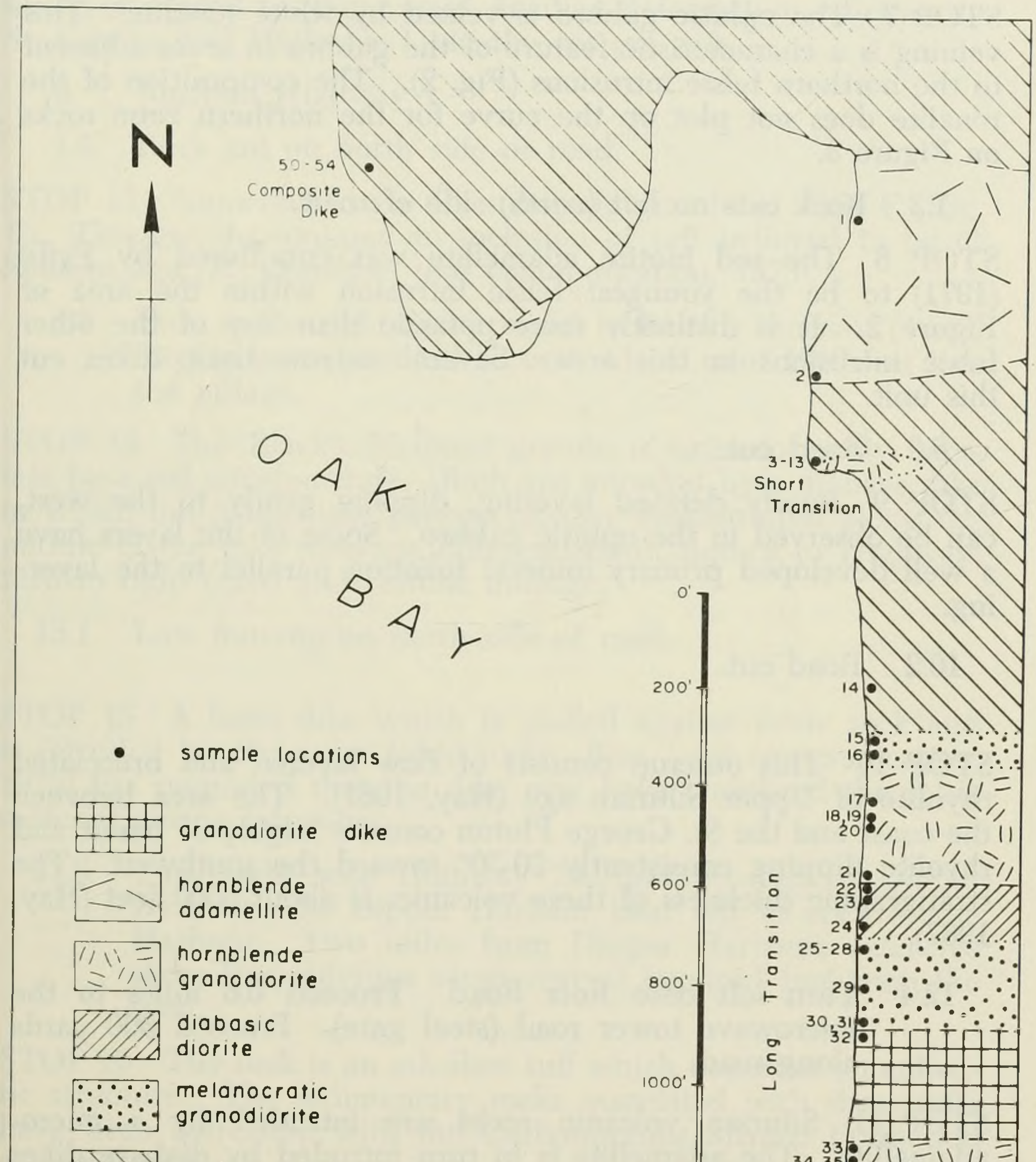

Fig. 4 — Geological Map of the contact zone between gabbro (diorite) and a younger adamellite (after Fyffe, 1971).

STOP 7 The ophitic gabbro is veined by white tonalite. This veining is a characteristic feature of the gabbro in areas adjacent to the northern felsic intrusions (Fig. 2). The composition of the tonalite does not plot on the curve for the northern zone rocks on Figure 3.

1.3 Rock cuts on left (north) side of road.

STOP 8 The red biotite adamellite was considered by Fyffe (1971) to be the youngest felsic intrusion within the area of Figure 2. It is distinctly more potassic than any of the other felsic intrusions in this area. Several narrow basic dikes cut this unit.

6.3 Road cut.

STOP 9 Poorly defined layering, dipping gently to the west, can be observed in the ophitic gabbro. Some of the layers have a well developed primary mineral foliation parallel to the layering.

10.2 Road cut.

STOP 10 This outcrop consists of flow layered and brecciated rhyolite of Upper Silurian age (Hay, 1967). The area between the coast and the St. George Pluton consists largely of basalt and rhyolite dipping consistently 20-30° toward the southwest. The stratigraphic thickness of these volcanics is about 5000 feet (Hay, 1967).

12.4 Turn left onto Roix Road. Proceed 0.6 miles to the microwave tower road (steel gate). Proceed 500 yards along road.

STOP 11 Silurian volcanic rocks are intruded by a micro-adamellite. The adamellite is in turn intruded by diabase dikes and coarse-grained granite. This granite is typical of the rock composing the southern half of the St. George Pluton. Proceed back to Highway 1.

15.8 Take right hand exit road into St. George. Proceed to Letete via Back Bay on Highway 772. Turn right and continue northward 1.5 miles from Letete. Turn left onto a private road and continue to end (0.3 miles).

STOP 12 Lower Devonian (Gedennian) sediments are intruded by an aphanitic felsic body showing typical high level intrusive characteristics. The sedimentary rocks possess a cleavage which

has been folded by the second Acadian deformation. Return to St. George and Highway 1 via the eastern exit.

0 Junction Highway 1.

1.5 Rock cut on north side of road.

STOP 13 Numerous basic dikes intrude granite of Unit F (Fig. 1). This granite contains an inclusion of tuff believed to be of Silurian age (H. Donohoe, oral communication, 1973).

2.7 Turn to the right and proceed to Black's Harbour (4 mi.) Stop at prominent hill on east side of road 1000 feet into the village.

STOP 14 The Black's Harbour granite is unconformably overlain by a red conglomerate. Both are intruded by a diabase dike in which the plagioclase phenocrysts are concentrated along the middle of the dike (flowage differentiation). Return to Highway; turn to right (east) and resume mileage.

15.1 Low outcrop on north side of road.

STOP 15 A basic dike which is chilled against felsic rock and is intruded by the same felsic rock. Rast (oral communication, 1973) has suggested that the dike may have mobilized the felsic material during intrusion.

17.8 Turn right onto Highway 790 and proceed to Dipper Harbour. At Dipper Harbour bear left to encircle the Harbour. Two miles from Dipper Harbour, extensive shore line outcrops occur several hundred feet from the road.

STOP 16 The rock is an ash-flow tuff which possesses an eutaxitic structure. The sedimentary rocks associated with these tuffs have been correlated with the Carboniferous Mispec Formation at Saint John.

Proceed eastward toward Little Dipper Harbour on Highway 790. One half mile east of the turnoff to Little Dipper Harbour turn right onto unimproved road. Stop at sand beach 0.7 miles from intersection.

STOP 17 The Carboniferous sedimentary rocks can be observed to have been subjected to two periods of deformation (see Rast and Grant, this guidebook). The older granites north of the road and across the cove have been thrust over the sediments along a nearly horizontal plane which is about 40 feet above sea level at this location.

Return to Highway 790, turn to the right and proceed for 3 miles. At the intersection, turn left and continue to the junction with Highway 1. Turn right (toward east).

0 Junction Highway 1.

0.5 Road cut on north side of road.

STOP 18 The fresh adamellite at this location is identical to ones in the St. George Pluton and have therefore, been tentatively correlated with the St. George intrusive event.

9.8 Large road cut on the south side of Highway 1 along the road under construction.

STOP 19 The deformed and altered igneous rocks in this outcrop are a part of a thrust sheet which has over-ridden Carboniferous rocks exposed at the east end of the lake across Highway 1 (see Rast and Grant, this guidebook).

The heterogeneity of the rock compositions observed in this exposure is typical of the deformed intrusions.