CANADA

12 B/9 E   EDITION 2

HARRYS RIVER

ST. GEORGE'S DISTRICT

NEWFOUNDLAND

SCALE 1:50 000 ÉCHELLE

HARRYS RIVER 12 B/9 E EDITION 2

LEGEND

Q — glacial deposits; easterly derived cobbles and boulders in silty matrix, minor bedded sand and gravel

----- great unconformity -----

S2 — red to pink amphibole and aegirine granite, massive and coarse-grained to pegmatitic; (b) Hare Hill granite one feldspar granite; (g) Goose Hill one feldspar granite; (b) Bear Ridge two-feldspar amphibole-biotite granite; (f) foliated biotite and biotite-muscovite granite

----- gradational to OS, other relations unknown -----

S1 — pale pink chloritized amphibole leucogranite and brecciated granite; agmatite and hybrid rocks

----- intrudes OS and CH; other relations unknown -----

OS — TULKS POND COMPLEX; Lineated, foliated granitic gneiss with up to 15% of biotite amphibole schist in concordant layers and schlieren. Contains massive to fine granoblastic granite layers. (a) amphibole series; amphibole commonly in polycrystalline spindles, (q) quartz series, contains large quartz "studs", minor quartzite and biotite-garnet granite, (b) biotite series, mesocratic microcline-porphyritic granite gneiss (m) mafic schist and gneiss, tectonized mafic dykes

----- gradational to S1 and P4 -----

O1 — GLOVER GROUP: intermediate to acid volcanic rocks; chlorite actinolite schist, porphyritic rhyolite and porphyry, gabbroic and dioritic sills, minor red chert

----- tectonic contact -----

OC2 — grey to buff; finely recrystallized limestone and dolostone; original fine phyllmites preserved in tectonic inclusions, but mainly strongly tectonized

----- tectonic contacts -----

OC1 — olive to black shale and pelitic schist; phyllite with large pyrite crystals; (s) serpentinite, ultramafics

----- tectonic contacts -----

CH2 — finely banded pelitic and semi-pelitic schist with thin marble and quartzite beds, marble

----- gradational contact -----

CH1 — semi-pelitic schist with abundant quartzite beds, quartzite, deformed conglomerate, calc-silicate gneiss, amphibolite

----- tectonized unconformity -----

P4 — composite gneiss complex; biotite+/-amphibole schist and gneiss, amphibolite, granoblastic trondjhemite and trondjhemitic gneiss, heterogeneous migmatite; shows plastic small folds, later cleavage associated with retrogression

----- gradational contact -----

P3 — STEEL MOUNTAIN COMPLEX (units P2 and P3) hornblende gabbro gabbro, norite, pyroxenite, hornblende schist

----- interfingering contact, probably igneous -----

P2 — anorthosite, gabbroic anorthosite, anorthositic gabbro. Pale lilac to white, local preserved igneous texture, but generally strongly cataclastic

----- relations unknown -----

P1 — DISAPPOINTMENT HILL COMPLEX: salic to intermediate ortho-pyroxene-bearing gneiss and retrograded biotite equivalents, orthopyroxene granite, locally megacrystic

rock outcrop, area of outcrop — major woods road
geological contact, approximate, assumed
foliation, compositional banding — shearing
cleavage — lineation
bedding, tops known, unknown — fault, high angle
small fold and plunge, (movement sense known, unknown) — thrust fault (teeth on thrust block)

Geology by K.L. Currie, J.T. van Berkel and M.A.J. Piasecki 1985 and 1986, and J.C. Martin 1985. Additional information from Williams (1985), Kennedy (1981) and Martineau (1980).

MARGINAL NOTES FOR HARRYS RIVER (12B/9E) AND PART OF LITTLE GRAND LAKE (12A5) MAP AREAS, SOUTHERN LONG RANGE, NEWFOUNDLAND

Dissection of an old peneplane has produced isolated flat-topped hills with precipitous sides separated by broad wooded valleys which merge westward into boggy lowland. The valleys have been extensively cut over for pulpwood, and contain an extensive network of woods roads. Large rock exposures occur on some hill tops, in major creek valleys, and along Grand Lake, but hill sides between 150 and 350 m elevation are virtually devoid of outcrop except where road building operations have caused major slope wash. A thick blanket of stratified sand and gravel fills the western end of Grand Lake to a depth of tens of meters. Glacial material is entirely derived from the east.

The Disappointment Hill complex (map unit P1) comprises granulitic gneisses in various stages of retrogression. Intruded by orthopyroxene-bearing granitoid rocks. On Disappointment Hill the gneiss exhibits granoblastic texture, compositional layering, and orthopyroxene in both salic and mafic varieties. The rocks are medium grained (0.5-1.0 mm) and lack small-scale structures, although mapping of foliation suggests open folding on a scale of hundreds of meters. South of Caribou Brook the gneisses are extensively retrograded and consist mainly of biotite gneiss with distinctive fine granoblastic texture and homogeneous character. Both pristine and retrograded gneisses are intruded by an orthopyroxene-bearing granite which contains green feldspar and weathers to honey-yellow shades. On the crest of Disappointment Hill the rock is spectacularly megacrystic with irregular masses of feldspar to 5 cm. South of Caribou Brook the rock usually contains biotite, but the colour, texture, and relict pyroxene remain distinctive. Although the charnockite cuts the granulitic gneiss, outcrops of the Disappointment Hill complex have a very homogeneous appearance and gneiss and charnockite appear to form a single unit.

On the steep western slopes of Disappointment Hill this charnockite is involved in a high-strain zone across which there is gradation to granitoid gneiss of unit OS. No relations have been found with the Steel Mountain complex (units P2 and P3), but the map pattern strongly suggests the Disappointment Hill complex and the Steel Mountain complex are related. The granulitic gneiss is the only rock so far discovered which could form a reasonable host for the Steel Mountain complex.

The Steel Mountain complex (units P2 and P3), a very large anorthositic complex (van Berkel and others 1986), has its northern termination in the Harrys River area. The main body consists principally of coarse white to lilac anorthosite. Spectacular pegmatite and cumulate layering textures are locally preserved, even where mafic minerals exhibit corona textures, but much of the anorthosite exhibits a range of cataclastic textures from granulation through brecciation to ductile deformation producing thinly layered anorthosite schist with biotitic parting planes. In addition to the main body, two satellitic masses occur west of Tulks Pond. These satellitic plutons contain a much higher proportion of mafic rocks, mainly coarse pyroxene and pyroxene-hornblende gabbro and pyroxenite, with well preserved graded layering. Bands of white to grey granular anorthosite up to 200 m wide also occur.

West of Tulks Pond the satellitic pluton has been affected by deformation and metasomatism which has converted the mafic rocks to distinctive hornblende-biotite schist with flattened plagioclase porphyroblasts. These schists form an integral part of the composite gneiss complex (unit P4). In the extreme southwestern corner of the area calc-silicates of unit CH1 appear to rest unconformably on anorthosite. The composite gneiss complex (unit P4) consists mainly of varying proportions of amphibolite of several types, a white, granoblastic granitoid of trondjhemitic affinity, and hornblende biotite granite with numerous enclaves, schliers and partings of hornblende-biotite schist, Thin bands of garnetiferous biotite gneiss and quartzite were observed in a few outcrops. Typically the complex consists of layers 10 to 100 m thick of relatively homogeneous amphibolite or hornblende-biotite gneiss, commonly schistose and strongly lineated, containing large, brassy, poikilitic biotite flakes in the foliation. Between the layers sinuous to ptygmatic lenticles of white granite occur. Where biotite gneiss or strongly feldspathic amphibolitic layers occur they are always strongly migmatized in lit-par-lit fashion. North of Goose Hill a second period of migmatization has produced spectacular ellipsoidal masses of pink leucogranite which cut the older migmatitic host. The lithologies of the composite gneiss complex strongly suggest an extended and complex history involving two or more periods of dyking and at least two periods of migmatization.

A characteristic feature of the composite gneiss is small scale folding ranging from open, near concentric cylindrical folds, to very complex curviplanar folds. The folds appear to exhibit no consistency in style or orientation, and no axial plane cleavage. These observations suggest an origin by flowage rather than flexural slip. Where cleavage is recognizable, it consistently strikes north northeast, dips steeply, and commonly cuts gneissosity at a large angle, and has no obvious relation to the folds. This late cleavage results from a low grade overprint which has affected all minerals, breaking down hornblende and straining and recrystallizing quartz and feldspars to fine grained mosaics. This cleavage contains new biotite south of Grand Lake and chlorite+/-biotite north of Grand Lake. North of Grand Lake the cleavage is locally strong enough to partially transpose the foliation, producing spectacular examples of younger deformation overprinting older.

The early deformation and migmatization could be Grenvillian. All that can be stated with certainty is that the composite gneiss is younger than the Steel Mountain complex, satellites of which are incorporated into the composite gneiss, and older than the granite gneiss of the Tulks Pond complex (unit OS) which incorporates elements of the composite gneiss.

A metasedimentary complex comprising units CH1 and CH2 consists of a lower quartzite and conglomerate dominated unit and an upper unit dominated by pelitic schist and marble. This sequence has been variously termed the Loon Pond Group south of Grand Lake (Martineau 1980), the Keystone schist on Glover Island (Knapp 1982), and given formational names north of Grand Lake (Kennedy 1981). The stratigraphic sections in all three regions are very similar or identical. The base of the sequence is exposed at three localities on the south shore of Grand Lake. Biotite-muscovite schist rests on composite gneiss with a sharp, but roughly conformable contact interpreted to be a slightly tectonized unconformity. Above a narrow (about 1 m) basal interval of mica schist, the lower part of the complex (unit CH1) consists mainly of quartzite varying from flaggy with micaceous parting to quartzite and mica schist interbedded on a scale of a few cm. This interval contains a characteristic but discontinuous bed of conglomerate with rounded quartz cobbles and clasts of white, granular hornblende granite derived from the composite gneiss. The upper margin of the lower unit is marked by a distinctive massive granular calc-silicate band up to 10 m thick, commonly associated with an amphibolite of about equal thickness. The top of the lower unit is commonly marked by a thrust fault, or by an intercalation of strongly foliated biotite-muscovite granite. The upper unit of the complex (unit CH2) consists of pelitic schist and marble. The base consists of relatively massive and homogeneous pelitic schist overlain by pelitic and carbonate units interlayered on a scale of a few m, with some thicker carbonate beds up to a m, while the top of the sequence appears to be a massive marble unit >10 m thick.

North of Grand Lake the grade of metamorphism does not exceed biotite-chlorite-muscovite. South of Grand Lake the metamorphic grade of the metasedimentary complex is high. Pelitic beds contain biotite+muscovite+garnet+staurolite(+kyanite), where the kyanite is now represented by muscovite pseudomorphs ("shimmer aggregate"). Calcareous units contain tremolite-diopside-quartz. The conglomerate lenses have been pervasively granitized. A first period of metamorphism was pre- to syn-tectonic, as demonstrated by wrapping of the minerals in the cleavage. A second post-tectonic period produced spectacular euhedral garnets and pegmatitic patches of calc-silicates. Both periods of metamorphism appear to be of the same grade, and it seems reasonable to suppose that deformation took place during an extended period of metamorphism.

The relative age of the metasedimentary complex is well fixed, since it unconformably overlies the composite gneiss, and is intruded by the Tulks Pond granite complex. Williams (1985) considered the rocks correlative to, or slightly older than the Cambrian(?) rocks west of the Grand Lake fault.

West of the Grand Lake fault olive to black shale, pelitic schist and phyllite (map unit OC1) occur in one narrow belt along the trace of the fault, and another along the Trans Canada Highway. The rocks vary from thin bedded (<1 cm) graded grey siltstone and shale, preserved only in tectonic inclusions, through intricately small folded and cleaved rocks to intensely sheared schist which spalls off in silver dollar sized pieces, to a chloritic schist. The most characteristic and ubiquitous unit is an olive coloured phyllite with large pyrite cubes spaced about 3-5 cm apart. Serpentinite blocks or pods occur in this unit at its southern tip and possibly also north of Grand Lake (Kennedy 1982). North of Grand Lake the phyllite contains within it horses of carbonate (unit OC2) and thinly banded quartz mica schist (unit CH2) up to 200 m or more in largest dimension. Kennedy (1982) correlated the western belt with allochthonous middle Ordovician rocks of the Humber Arm allochthon, while he erected the Cambrian (?) Grand Lake Brook Group for the eastern belt. Williams (1985) placed the western belt in the Cape Cormorant Formation, but Williams and Cawood (1986) returned the western belt to the Humber Arm allochthon, noting that relations between allochthonous and autochthonous rocks had been considerably complicated by later deformation. Williams and Cawood (1986) did not consider the position of the Grand Lake Brook Group, but there is no lithologic reason to distinguish it from the western belt. Both belts locally consist of tectonic melange. The two belts appear correlative, and the term Grand Lake Brook Group is superfluous.

The carbonate rocks west of the Grand Lake fault (unit OC2) are strongly tectonized and completely recrystallized except for the extreme northwestern corner of the mapped area, and small tectonic inclusions. The unit originally consisted largely of pale olive rhythmites with limestone and dolostone interbedded on a millimetre scale, now largely converted to a fine grey marble in which the thin dolomite layers have been boudinaged and intricately folded. Some outcrops exhibit thin, platy layering and large calcite porphyroblasts.

The Glover Group (unit O1) consists of uniform, fine-grained grey green intermediate igneous material. Salic pyroclastics with preserved shards and fragments, and ignimbrites with well developed flamme occur, as well as small amounts of red chert. The group contains abundant thin gabbroic sills, and less abundant pink porphyry dikes and sills, both interpreted to be sub-volcanic equivalents of the volcanics. Amphibolite and chloritized amphibolite are common around younger intrusions. Paleontological data indicating a lower Ordovician (Arenig) age for the Glover Group is presented by Knapp (1982).

The Tulks Pond complex (unit OS1) comprises heterogeneous granitoid rocks characterized by L-S fabric, granitization and metasomatic phenomena. In typical exposures south of Tulks Pond the complex comprises leucocratic, pale pink granitoid rocks with polycrystalline spindles of mafic minerals up to 2 cm long and several mm in diameter. Where the spindles consist of fine-grained amphibole, amphibole+garnet or amphibole+aegirine, the rock resembles the Hare Hill and Goose Hill granites to which it passes gradationally. Some leucocratic biotite-bearing gneiss grades by increase in fine-grained biotite to the composite gneiss complex, schliers of which are found throughout the Tulks Pond complex. A highly distinctive variant of the complex contains large quartz crystals which stand up prominently on weathered surfaces, and may comprise up to 60 % of the volume. This material is associated with quartzite and garnetiferous quartz-mica schist in a narrow belt which can be traced continuously for nearly 20 km. The Tulks Pond complex consistently contains 5-15% of mafic schliers and transposed dykes, most of which have been converted to biotitic schists. Near Goose Hill the dykes are slightly better preserved and the rocks appear to be a spectacular zone of mixing of salic and mafic rocks with visible disintegration of the mafic schliers into xenocrysts, generally rimmed, in the salic matrix.

The Tulks Pond complex exhibits a very strong and pervasive lineation defined by the polycrystalline mafic clots, but planar structures are locally also significant. The attitude of both lineation and foliation is strikingly consistent, with the lineation plunging 35-75° toward 160°, and the planar structure dipping 70-90° toward 070 to 090°.

Massive to near massive, granitoid rocks have been divided into two units. Unit S1 includes foliated granitoid rocks east of the Tulks Pond complex, while unit S2 comprises more massive granite mainly enclosed by the Tulks Pond complex. Large granite bodies (unit S1) within the Glover Group consist of coarse-grained chloritized amphibole leucogranite with schliers of amphibolitic material, presumably derived from the surroundings. Contacts appear to be sheeted, or even migmatitic. These bodies contrast with the distinctive, high-level porphyry dykes of the Glover Group. One of the coarse granites is brecciated along the Long Range fault, demonstrating the young age of brittle deformation. Granites of unit S1 within the metasedimentary sequence typically form strongly foliated sheets and contain minor muscovite along with biotite. The contacts with the sedimentary rocks are gradational where granite is emplaced in the conglomerate of unit CH1, but sharp and intrusive where granite contacts unit CH2. The granite sheets range from 10 to 50 m in thickness, and were emplaced during the process of deformation, as shown by strong planar segregation of phyllosilicates, but undeformed contact aureoles.

Coarse alkaline to peralkaline leucogranite (unit S2) is a homogeneous one feldspar rock with interstitial poikilitic mafics. The Hare Hill body is pink, due to minor iron staining, and contains aegirine with possible relicts of enigmatite. The Goose Hill body is white and the mafics, probably originally alkali amphibole, have been pseudomorphously replaced by ilmenite. The Bear Hill body and the southwestern body appear substantially less alkaline, but are also one feldspar granites. Both are biotite-amphibole granites, but the Bear Hill body is a white granite with large, prominent quartz crystals, while the other body is a pink granite which is near equigranular but distinctly foliated. The granites appear to pass continuously into lineated and/or foliated rocks of the surrounding Tulks Pond complex.

Faults and high strain zones dominate the structure of the Harrys River area. Recognizable folds occur only on a small scale and within certain units. The composite gneiss complex exhibits complex small folds of diverse style which appear mainly due to plastic flow of the matrix. The carbonates west of the Grand Lake fault exhibit intricate small scale folding of boudined dolostone beds, again probably due to flow of the matrix marble. Metasedimentary rocks east of the Grand Lake fault exhibit well developed meso-scale tight to isoclinal folding affecting both compositional banding cleavage. These folds dip east at moderate angles (40-60°) and plunge gently south southeast.

West of the Grand Lake fault strain is concentrated in narrow zones of brittle deformation. The boundary between shale and carbonate is always marked by intense deformation and shearing of the shale. Dubious kinematic indicators in the shale (drag folds) suggest the carbonate consistently moved up with respect to the shale. Late northwest trending faults in the carbonates are marked by reddening and brecciation. Sparse kinematic indicators suggest dextral or north side up motion.

The steeply-dipping Grand Lake fault shows evidence of dextral, sinistral and vertical motions, as well as traces of an older ductile deformation regime predating the late brittle motion. This sinuous fault appears to be offset dextrally by late northwest trending faults. The Grand Lake fault separates low grade metasedimentary rocks to the west from crystalline rocks to the east.

Between the Grand Lake and the Long Range faults the rocks fall into a western domain of crystalline rocks (anorthosite, granite) and an eastern domain of metasedimentary rocks. The structural history of the two domains appears to be similar, namely thrusting from southeast to northwest at elevated temperatures. The crystalline rocks contain a multitude of fine-grained, laminated mylonites which progressively transpose older foliations from older northerly trends to younger easterly trends. Mylonitic zones vary in width from 10 to several hundred meters are mylonitic or blastomylonitic. The metasedimentary rocks exhibit a spectacular, basement-involved stack of thrust slices. East of Falls Brook the bounding thrusts are well exposed, and the stratigraphy is repeated at least four times by thrusting. The basement-involved nature of this thrusting can be seen in the continuous exposure along Grand Lake where slices of the composite gneiss complex separate repetitions of the metasedimentary sequence in two places. A similar relation can be inferred north of the lake. The dip of the thrust surfaces appears to vary inversely with the competence of the rocks involved falling as low as 10° in marble, and going as high as 60° in granite gneiss. Thrusting took place during metamorphism and granite intrusion. The thrust complex terminates abruptly against a large shatter zone which separates metasedimentary rocks from metavolcanic rocks of the Glover Group. The same shatter zone north of Grand Lake passes through the thrust complex, and on Glover Island, the Glover Group rests unconformably on correlatives of the metasedimentary rocks (Keystone schist) according to Knapp (1982).

REFERENCES

Kennedy,D.P.
1981 Geology of the Corner Brook Lake area, western Newfoundland. unpublished M.Sc. thesis, Memorial University of Newfoundland, Saint John's,337 p.

Kennedy,D.P., Knapp,D.A., and Martineau,Y.A.
1979 Stratigraphy, structure and regional correlation of rocks at Grand Lake, western Newfoundland. Geological Survey of Canada Paper 79-1A, 317-325

Knapp,D.A.
1982 Ophiolite emplacement along the Baie Verte-Brompton line at Glover Island, western Newfoundland. unpublished Ph.D. thesis, Memorial University of Newfoundland, Saint John's, 337 p.

Martineau,Y.A.
1980 The relationships among rock groups between the Grand Lake Thrust and Cabot Fault, western Newfoundland. unpublished M.Sc. thesis, Memorial University of Newfoundland, Saint John's, 150p.

van Berkel,J.T., Johnston,H.P. and Currie,K.L.
1986 A preliminary report on the geology of the southern Long Range, southwest Newfoundland. Geological Survey of Canada Paper 86-1B, 157-170

Whalen,J.B., and Currie,K.L.
1984 Peralkaline granite near Hare Hill, south of Grand Lake Newfoundland. Geological Survey of Canada Paper 84-1A, 181-184

Williams,H.
1985 Geology, Stephenville map-area, Newfoundland (north half) Geological Survey of Canada Map 1579A

Williams,H. and Cawood,P.A.
1986 Relationships along the eastern margin of the Humber Arm Allochthon between Georges Lake and Corner Brook, western Newfoundland. Geological Survey of Canada Paper 86-1A, 759-765

Contribution to Canada-Newfoundland Mineral Development Agreement 1984-89, a subsidiary agreement under the Economic and Regional Development Agreement. Project funded by the Geological Survey of Canada.

DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

Energy, Mines and Resources Canada   Énergie, Mines et Ressources Canada

Canada

OPEN FILE
DOSSIER PUBLIC
1406
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
1986