THE GEOLOGY OF THE CARTWRIGHT REGION

LABRADOR

by

C.F. Gower, V. Owen, & G. Finn

INTRODUCTION

Reconnaissance mapping at 1:100,000 scale conducted in the Cartwright region during the 1981 field season covered a 10,000 km^2 area extending from the Mealy Mountains to the Labrador Sea between latitudes 53°30' and 54°00'. This work concludes a stage of 1:100,000 reconnaissance mapping in the Grenville Province in eastern Labrador, completing mapping east of longitude 59° and north of latitude 53°30'.

PREVIOUS WORK

Early work in the region was done by Daly (1902), Christie (1951), Taylor (1951), Kranck (1939, 1953) and Douglas (1953). Their work was confined to coastal exposures but they delineated the main rock types present in the region; namely, gneiss, granite, amphibolite, gabbro and anorthosite. Most of the early work in the interior was done by Brinex (Piloski, 1955; Sutton, 1965; Bradley, 1966) in selected areas. Much of this work was done outside the area shown in the sketch map, although some investigations were conducted at the south end of Sandwich Bay. The first regional geological map of the area was completed by Eade (1962) who defined most of the major rock types in the area. 1:100,000 mapping was done by Cherry (1978a, b) in the Sandwich Bay area and the area north of North River was mapped by Gower *et al.* (1981).

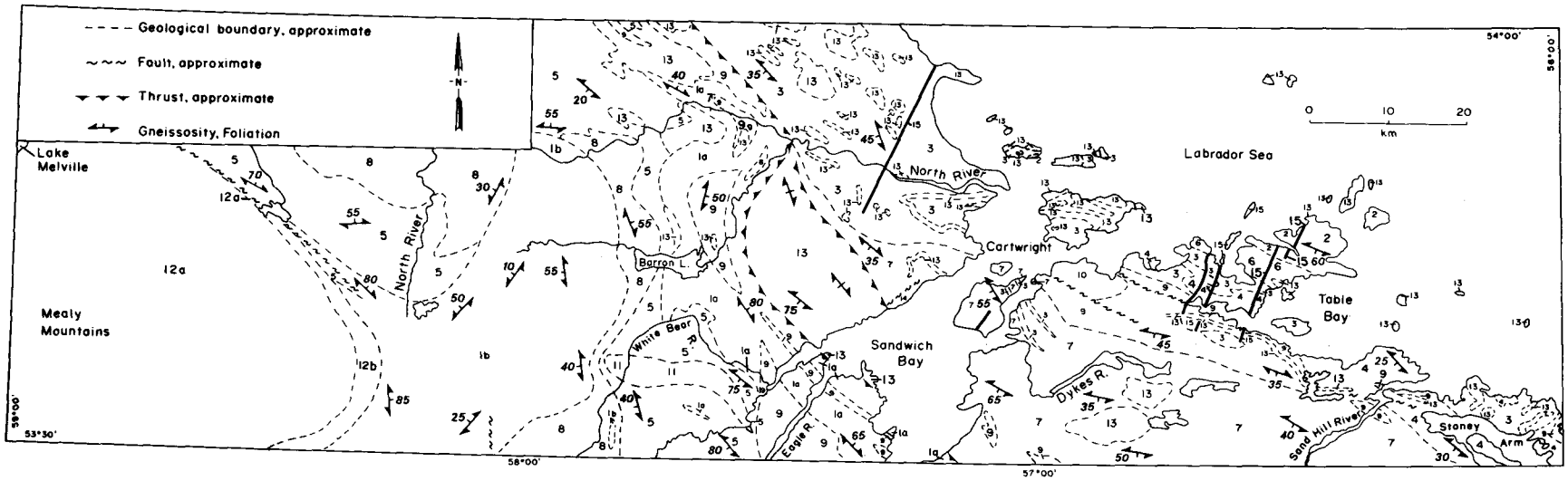
No absolute age data are available for any major unit within the region although ages are available for two Paleozoic dikes (Grasty *et al.*, 1969; Wanless *et al.*, 1970).

APHEBIAN? (UNITS 1 & 2)

Units 1a, 1b and 2 include a range of upper amphibolite facies metamorphic rocks interpreted as paragneisses. Unit 1a in its least metamorphosed form comprises brownish weathering psammitic gneiss interlayered with irregular zones of pelitic gneiss, minor quartzite, pyritic layers and rare calc-silicate horizons. More typically, it is an inhomogeneous diatexite consisting of a restite of biotite + garnet + sillimanite + opaque mineral enveloped in a pink quartzofeldspathic neosome. In places, the restite is evenly dispersed as ovoid patches in the neosome giving a mottled appearance to the rock and scant resemblance to its original metasedimentary protolith.

Unit 1b has a similar mineralogy to Unit 1a but more commonly has the appearance of a well banded granitic gneiss. In places the gneiss grades into an irregularly banded rock with pink granitic pegmatoid neosome associated with biotitic schlieren. On the basis of (i) sillimanite observed in some outcrops, (ii) a characteristic (of paragneisses) mauve-coloured garnet, and (iii) extrapolation from paragneiss associated with common quartzite in the lower English River area, these rocks are also interpreted as paragneisses.

Unit 2 comprises muscovite-biotite and biotite - garnet ± muscovite schists and gneisses with the muscovite rich rocks being particularly schistose. From preliminary examination of a few thin sections, kyanite is seen to be a common additional phase and sillimanite absent. The less schistose rocks have a 'knotty' appearance related to a black restite



LEGEND

PALAEOZOIC

15. Gabbro, olivine gabbro and diabase dikes.

HADRYNIAN

14. Conglomerate with abundant gabbroid and gneissic clasts. (*cf* **Double Mer Formation**)

HELIKIAN (*cf* **ELSONIAN?**)

13. Gabbro, leucogabbro, diabase; some monzonite and syenite; amphibolite in part.

12. **Mealy Mountains Intrusive Suite.**

- *a. Anorthosite, leucogabbro, minor monzonite.*
- *b. Granite, alkali feldspar granite, some monzonite.*

11. Leucocratic, medium grained, feldspar-garnet rock with minor hornblende, quartz and chlorite (recrystallized anorthositic gabbro?).

10. Coarse grained monzonite, recrystallized in part; massive to foliated.

HELIKIAN (*cf* **KETILIDIAN?**)

9. Medium to coarse grained, generally megacrystic biotite granodiorite; augen gneiss in part, foliated to gneissic.

8. Medium to coarse grained, seriate textured biotite and hornblende quartz monzonite to granodiorite.

7. Medium to coarse grained, biotite hornblende diorite to quartz diorite, amphibolitic in part.

HELIKIAN AND/OR APHEBIAN?

6. Medium grained, melanocratic, extremely garnetiferous diorite grading to amphibolite; some could be deformed equivalent of Unit 13.

5. Medium grained biotite granodiorite gneiss. Hornblende-bearing in part, some amphibolite enclaves.

4. Medium grained biotite hornblende quartz diorite granodiorite, migmatitic. Possibly gradational into Unit 3.

3. Medium grained, biotite tonalite to granodiorite gneiss. Discontinuously to well banded, migmatitic.

APHEBIAN?

2. Kyanite muscovite garnet biotite schist and gneiss (metatexites). Paragneisses.

1.
- *a. Sillimanite-garnet pelitic schists and gneiss, (homogeneous and inhomogeneous diatexites). Minor quartzite and rare calc-silicate layers. Paragneisses.*
- *b. Sillimanite-bearing garnetiferous granitic gneisses similar to 1a.*

composed of biotite + opaque minerals enclosed within a pink quartzofeldspathic neosome and both subsequently intensely folded. Irregular, muscovite bearing alaskite dikes and muscovite + tourmaline bearing pegmatites intrude Unit 2. These are partially discordant to compositional layering in the gneiss, and hence later, but a spatial association is unequivocal.

Units 1 and 2 are believed to be among the earliest rocks in the area and possibly of Aphebian age, though no age data are presently available. Both may well have been derived from similar metasedimentary protoliths though the presence of quartzite and psammite suggests a higher arenaceous component to Unit 1.

HELIKIAN AND/OR APHEBIAN (UNITS 3-6)

Unit 3 consists mostly of medium grained biotite tonalite to granodiorite with common amphibolite enclaves. Locally, the rock grades into quartz diorite or K-feldspar megacrystic granodiorite. Most of the tonalitic gneiss contains 5-30%, slightly coarser grained, creamy weathering leucosome generally concordant to the prevailing fabric. Hornblende is commonly an additional essential phase in the tonalitic gneiss and small garnets are ubiquitous.

There is unequivocal evidence that some of the gneisses are pre-Grenvillian, inasmuch as the gneissosity is truncated by gabbro sheets probably emplaced about 1400 Ma. It is unknown whether the gneissosity developed during the Hudsonian Orogeny or an earlier event. Clearly this rock is a good candidate for a basement on which the paragneisses were deposited. However, there is also good evidence that some of the tonalite/granodiorite gneisses are the product of Grenvillian reworking of (?Paleohelikian) granitoid rocks that probably postdate the paragneisses. This is partly a scale-of-mapping problem and could be resolved with detail work.

Unit 4 comprises homogeneous quartz diorite, quartz monzodiorite or granodiorite. The rocks are medium to coarse grained and though extensively recrystallized have suggestions of plutonic igneous texture remaining. Biotite and hornblende are essential mafic phases and small garnets are commonly also present. The rock has experienced incipient partial melting with about 5% leucosome developed. Amphibolite enclaves and light weathering microgranite minor intrusions are characteristic of the unit. Unit 4 is closely spatially associated with Unit 3 and may be either a less migmatised and deformed equivalent or a slightly younger plutonic rock emplaced into the gneisses.

Unit 5 includes a wide range of foliated and gneissic rocks with variable fabrics ranging from agmatite to nebulite and including some homogeneous granodioritic rocks. Gneissosity is accentuated by amphibolite enclaves and 5-30% leucosome. Biotite, hornblende and garnet are the usual mafic phases. Unit 5 is interpreted as a mixture of Hudsonian or older gneissic rocks and Paleohelikian granitoid rocks, both reworked during the Grenvillian Orogeny. The unit is closely comparable to Unit 3, but is presently distinguished because the overall assemblage appears to be granodioritic rather than tonalitic as well as being a more heterogeneous association of lithologies. Perhaps field differences can be ascribed to the fact that the unit occurs south of a major thrust fault system with correspondingly greater Grenvillian reworking.

Unit 6 is a weakly to strongly foliated, medium grained, recrystallized diorite with hornblende and garnet as essential mafic minerals. Abundant garnet (greater than 15%) is characteristic of the unit. Rarely, the diorite contains K-feldspar megacrysts. On the north side of Table Bay the diorite develops agmatitic features close to a gabbro body and then appears to be

gradational into the gabbro. This suggests that the diorite may be a deformed equivalent of the gabbro, in which case the whole unit is younger than its present stratigraphic position indicates. However, farther west, there are indications that the gabbro intrudes the diorite. Our preference is to group the diorite with the tonalite-granodiorite gneissic package with which it is spatially associated.

HELIKIAN (*cf.* KETILIDIAN) (UNITS 7-9)

Unit 7 is a medium to coarse grained hornblende diorite to quartz diorite with rare K-feldspar megacrysts. Irregularly developed leucosome (5-10%) gives the rock an agmatitic appearance in places and the heterogeneity is emphasized by lenses and layers of amphibolite. Where subsequently flattened, the rock has a banded gneiss appearance. An 'amphibolitic diorite' unit will be distinguished on 1:100,000 maps in areas of abundant amphibolite. On the west side of Sandwich Bay, the equivalent rock is pink weathering, in contrast to its normal black and white appearance, and gives the misleading impression that the rock is a monzonite or quartz monzonite. Stained slabs have demonstrated that the colour is attributable to hematite alteration - this can be correlated with retrograde effects along a major northeast trending fault in the area.

Unit 8 is a medium to coarse grained, pink, buff or orange weathering granitoid rock with a composition ranging from granodiorite to quartz monzonite, although in places it may approach granite or quartz syenite. The dominant mafic mineral is hornblende, but biotite is also present and garnet occurs sporadically.

Unit 9 is characteristically a weakly to strongly foliated K-feldspar megacrystic granodiorite. The megacrystic granodiorite east-southeast of Cartwright grades into a coarse grained alkali feldspar granite at Table Bay and has a transitional southern boundary into the quartz diorite of Unit 7. In the Eagle River area, the megacrystic granodiorite grades into sparsely megacrystic and nonmegacrystic granodiorite. The rock is termed granitic augen gneiss by Cherry (1978a) who incorrectly shows the unit as trending north-south. Margins of the bodies are conformable with the enclosing paragneisses but a finer grained 'porphyry' texture at the border suggests an intrusive relationship. Biotite is the characteristic mafic mineral but small garnets occur in the groundmass. Deformational fabrics indicate very heterogeneous strain with the smaller bodies and narrow portions of larger plutons exhibiting extremely strained ribbon-like quartz and crushed feldspar. Enclaves of tonalitic gneiss within the megacrystic granite in the Table Bay area demonstrate age relationships with respect to Unit 3. Some enclaves contain pegmatite dikes discordantly intruding the gneissosity of the enclave with the dikes themselves truncated against the enclosing megacrystic granodiorite.

Although Units 8 and 9 are strongly foliated in places, they do not have a gneissic/migmatized appearance and are readily recognizable as plutonic intrusive rocks. These features, and the fact that the units occur as coherent bodies with relatively simple outcrop patterns lead us to interpret them as younger than Units 3-6. Megacrystic granodiorite shows a close spatial relationship with the paragneiss of Unit 1a. The obvious hypothesis, that they are S-type granites derived from the paragneisses, will be tested during future work.

HELIKIAN (*cf.* ELSONIAN) (UNITS 10-13)

Unit 10 is a coarse grained, massive to strongly foliated monzonite that occurs in one area east of Cartwright. The unit was originally delineated by Cherry (1978a) who described it as a coarse grained and

massive monzonite at the centre and fine grained and foliated at the margins. He notes the mineralogy as plagioclase, perthitic microcline, quartz, biotite, hornblende, orthopyroxene and clinopyroxene. Cherry describes the margin as gradational into poorly foliated garnetiferous granite and augen gneiss. We have grouped these latter rock types as part of Unit 9, but acknowledge that no well defined boundary between the two rock types exists. The dark gray weathering colour and coarse grained, massive appearance makes the unit lithologically similar to monzonites associated with the anorthosites. However, the spatial relationships and perhaps transitional boundaries suggests a genetic link with the megacrystic granodiorite of Unit 9, which is lithologically more comparable to Paleohelikian granitoid rocks. These alternatives and the possibility of a continuum of Paleohelikian-Elsonian plutonism will be examined during future work.

Unit 11 is the most poorly exposed and least understood rock type in the area. It is a medium to coarse grained, leucocratic, recrystallized, feldspar-garnet rock with minor hornblende, quartz and chlorite. From limited stained slabs it appears that the feldspar is mainly plagioclase. The composition suggests an anorthositic protolith but, if this is so, it is texturally dissimilar from other anorthositic rocks in the region.

Although the Mealy Mountains Intrusive Suite (Unit 12a, b) has been included in the geological sketch map, only the eastern margin was examined, as the suite is the subject of more detailed work by Emslie (in preparation). An obvious distinction has been made between coarse grained, pink weathering, massive alkali feldspar granite (Unit 12b) and gray-brown weathering rocks ranging from monzonite to anorthosite (Unit 12a). This distinction was previously recognized by Emslie (1976) who referred to the border unit (12b) as pyroxene quartz monzonite.

Unit 13 embraces a range of medium to coarse mafic intrusive rocks that includes gabbro, leucogabbro, pyroxenite, monzonite and locally syenite. Most of these were probably intruded as subhorizontal sheets except for the mass extending northwest from Sandwich Bay which appears to be a larger layered mafic intrusion. The sheets commonly show layering on scales ranging from less than 1 cm to tens of metres. Particularly good examples are present on Grady Island where layered units consist of a lower olivine gabbro/gabbro which is transitional over less than 2 m into an upper monzonite/syenite. Similar syenites were recognized by Gower *et al.* (1981; Unit 11), who noted a spatial association between syenite and gabbro. The syenites are beneath gabbro sheets and it is now clear that they are merely the upper portions of underlying layered units. The petrography of the gabbros along the coastline has been described by Taylor (1951).

HADRYNIAN

A new occurrence of post-Grenvillian conglomerate (Unit 14) identical to the Double Mer Formation (Kindle, 1924; Stevenson, 1970) was found on the northwestern side of Sandwich Bay. The conglomerate comprises rounded to subrounded boulders of gneiss, granite and gabbro up to 1 m diameter in a pebbly matrix of similar material. As with other areas, the unit is confined by faults, in this case a major northeast trending structure parallel to the northwest side of Sandwich Bay.

PALEOZOIC

A series of north-northeast trending gabbroid dikes (Unit 15) are well exposed on the coast east of Cartwright and some were previously mapped by Eade (1962). Their distribution can be clearly seen in coastal

areas from aerial photographs and further delineated using associated aeromagnetic anomalies. The dikes are vertical and range from a few metres to over 100 m in width. Wanless *et al.* (1970) report an age of 544 ± 22 Ma (K/Ar, biotite) from a dike on the west side of Hare Harbour and Grasty *et al.* (1969) have dated a dike from Shag Island (not shown on the map - 21 km north of Cartwright) as 505 ± 8 Ma (K-Ar, whole rock). The latter dike is described as fresh, coarse grained olivine gabbro with good ophitic texture - a generally applicable description.

SUMMARY OF MINOR MAFIC INTRUSIONS

There are several generations of mafic dikes most of which are too small to include on the sketch map. These are critically important in understanding the geological evolution of the area and it is now possible to present a preliminary synthesis. This is given in order of increasing age and goes beyond the Cartwright region.

(i) Mesozoic dikes and lamprophyres related to the opening of the Labrador Sea (*ca.* 150 Ma).

(ii) Paleozoic gabbro dikes with north-northeast trend (*ca.* 500 Ma).

(iii) Middle to late Grenvillian diabase dikes with trends either east-northeast or east-southeast (*ca.* 1100-950 Ma). The basaltic dikes intruding the Mealy Mountains Intrusive Suite dated at 1123 ± 50 Ma and 1078 ± 48 Ma (K-Ar whole rock) by Gittins (1972) are included in this group as are dikes which have a 1000-950 Ma age range from the Makkovik area (Gandhi *et al.*, 1969; Gower and Flanagan, in preparation), Unit 33 in the Benedict Mountains area (Gower, 1981) and numerous east-southeast trending dikes in both the Rigolet and Cartwright regions.

(iv) Layered mafic sheets which include pyroxenite, olivine gabbro, leucogabbro, anorthosite, monzonite and syenite (*ca.* 1400 Ma). The term Michael Gabbro used informally by Fahrig and Larochelle (1972) who reported an age of 1457 ± 107 Ma, should be confined to this particular suite of intrusions. Alternatively the name should be discarded in favour of Shabogamo Intrusive Suite (1365 ± 60 Ma), (Brooks *et al.*, 1981), with which the rocks are almost certainly correlative. That they represent a hypabyssal phase of anorthosite magmatism was originally suggested by Kranck (1953).

(v) Net-veined, irregular and possibly rectiplanar dikes (*ca.* 1600 Ma). The net-veined and irregular form of many of the dikes is believed to be related to intrusion shortly after granitoid emplacement and before the granitoid rocks had completely crystallized. These dikes are best displayed on the coastline north of the Benedict Mountains but also occur within the Grenville Province on the coastline north of Groswater Bay and in southeast Sandwich Bay.

(vi) There may be another period of mafic dike injection after the emplacement of the Paleohelikian granites and before the Michael Gabbro. One outcrop on the south side of Groswater Bay shows evidence of three periods of mafic dike intrusion with all dikes metamorphosed and the youngest dike similar to Michael Gabbro. Other outcrops nearby show two intersecting dikes, both obviously pre-Grenvillian, both dissimilar from Michael Gabbro and both intruding granitoid rocks tentatively considered as Paleohelikian.

(vii) An outcrop of foliated to gneissic granodiorite in south Sandwich Bay contains two intersecting mafic dikes, the earlier isoclinally folded. These are intruded by a dike of megacrystic granite which is lithologically comparable to Unit 9 of this report. Assuming the megacrystic granite is Paleohelikian and that the lithological comparison is valid, this

implies that there are two pre-Paleohelikian periods of mafic dike injection.

STRUCTURE AND METAMORPHISM

The regional structural trend is southeast except in the area east of the Mealy Mountains Intrusive Suite, where it progressively swings from southeast to south and then southwest approaching the Mealy Mountains. Folding in Units 1-6 is related to this southeast trend; characteristically, folds are tight to isoclinal and overturned to the north. Refolded folds are evident in places. Many axial surfaces are horizontal or dip south at less than 10°. Kranck (1953) described and sketched a typical recumbent fold in tonalitic gneisses east of Cartwright. Numerous tight, north verging folds are present in the inhomogeneous diatexites of Unit 1a at the south end of Sandwich Bay. These appear to be related to a southeast trending thrust exposed on the shoreline that separates the paragneisses from gabbroic rocks. The positioning of the northwest continuation of the thrust is based on aeromagnetic interpretation but correlates with a thrust indicated by Gower *et al.* (1981) farther north. The second thrust shown, on the north side of the gabbroid rocks, has not been seen but is interpreted from highly strained fabrics seen in Unit 7 immediately north of the thrust, as well as an obvious topographic lineament.

The deformation described above is the result of intermixed Grenvillian and pre-Grenvillian orogenic effects. The effects of deformation attributable to the Grenvillian Orogeny in Units 8 and 9 are rapid gradations from massive to cataclastic or mylonite fabrics.

Two periods of folding have affected the *ca.* 1400 Ma gabbros. The dominant fold trend is best seen on the islands north of Cartwright where wave lengths are 5-6 km and folds plunge shallowly west. The subsidiary trend is northeast and wave lengths are generally less than about 100 m. The resultant effect, when combined with boudinage has been to disrupt the gabbro into huge, tilted and curved tablets with tonalitic gneiss remobilized between blocks and at gabbro/gneiss interfaces.

Numerous faults are present throughout the region, but to aid clarity only a few major structures are shown on the sketch map. Many of these are strike faults and their occurrence is based on observed brecciation and alteration rather than displaced lithological contacts. There is some evidence from aeromagnetic data that the fault bordering the Mealy Mountains continues southeast to link up with a series of faults in the Alexis River - Gilbert River region. Many of the faults are probably post-Grenvillian structures - this is certainly true of the northeast trending fault bordering the conglomerate on the northwest side of Sandwich Bay. Late stage calcite filled, north-northeast trending tension gashes are common at the south end of Sandwich Bay.

Metamorphic grade is at upper amphibolite to granulite facies with retrograde greenschist facies effects along fault and thrust zones. Eade (1962) has indicated that the rocks immediately east of the Mealy Mountains are of granulite grade. Plagioclase + K-feldspar + quartz + biotite $\pm$ garnet $\pm$ sillimanite $\pm$ muscovite are the typical assemblages in Unit 1. Cherry (1978b) reported cordierite in some assemblages. Similar assemblages are present in Unit 2 except that kyanite, rather than sillimanite is present. The tonalitic, diorite and granodioritic rocks of Units 3-9 have mineralogies typical of igneous protoliths (with metamorphic fabrics) with the addition of garnet. Both garnet and hornblende occur as porphyroblasts and there is good textural evidence that they are the product of incongruent melting of the adjacent rock. Primary mineralogy is preserved in many gabbros though thin bodies and the margins of thicker units have been converted to

amphibolite, commonly garnetiferous or biotite rich.

ECONOMIC POTENTIAL

The paragneisses offer the highest economic potential. Numerous pyritic bands (with minor chalcopyrite) occur in the diatexites in the Eagle River area. Those observed were up to 3 m thick and traceable for 10-20 m along strike. Douglas (1953) mentioned malachite, chalcopyrite and bornite associated with quartzite in the lower Eagle River area. We observed a pyritic band associated with quartzite on the opposite side of the river which is probably the strike continuation. The pyritic bands gave no significant response when tested for uranium mineralization.

Malachite staining is also common in the muscovite rich schists of Unit 2 but pyritic layers were not seen. Tourmaline bearing, muscovite rich pegmatites are abundant in Unit 2 and merit rare earth prospecting. Minor molybdenite was found in pegmatite 18 km east of Cartwright.

ACKNOWLEDGEMENTS

J. Blagdon, H. Norman, A. Walsh and G. Whelan gave excellent and willing field assistance throughout the field season. Safe and courteous pilot services were provided by B. Russell and D. Forgie of Sealand Helicopters and Ches Anderson of Newfoundland Air Transport. Logistical support was provided by E.W. Tuttle and E.J. Tuttle of the Department of Mines and Energy. R. Lethbridge helped us in numerous ways while in Cartwright.

REFERENCES

Bradley, D.A.
1966: Geology of southeastern part of Sandwich Bay - Square Island joint venture area. Unpublished report, Brinex, 15 pages.

Brooks, C., Wardle, R.J. and Rivers, T.
Geology and geochronology of Helikian magmatism, western Labrador. Canadian Journal of Earth Sciences, Volume 18, pages 1211-1227.

Cherry, M.
1978a: Geological mapping in the Sandwich Bay area, southeastern Labrador. *In* Report of Activities for 1977. *Edited by* R.V. Gibbons, Newfoundland Department of Mines and Energy, Mineral Development Division, Report 78-1, pages 9-15.

Cherry, M.
1978b: Sandwich Bay. Newfoundland Department of Mines and Energy, Mineral Development Division, Map 78176.

Christie, A.M.
1951: Geology of the southern coast of Labrador from Forteau to Cape Porcupine, Newfoundland. Geological Survey of Canada, Paper 51-13.

Daly, R.A.
1902: The geology of the northeast coast of Labrador. Bulletin of the Museum of Comparative Zoology, Harvard, Volume 38, Geological Series, Volume 5, Number 5, pages 205-269.

Douglas, G.V.
1953: Notes on localities visited on the Labrador Coast in 1946 and 1947. Geological Survey of Canada, Paper 53-1, 67 pages.

Eade, K.E.
1962: Geology, Battle Harbour - Cartwright, Labrador. Geological Survey of Canada, Map 22-1962.

Emslie, R.F.
1976: Mealy Mountains Complex, Grenville Province, southern Labrador. *In* Report of Activities, Part A. Geological Survey of Canada, Paper 76-1A, pages 165-170.

Fahrig, W.F. and Larochelle, A.
1972: Paleomagnetism of the Michael Gabbro and possible evidence of the rotation of the Makkovik Subprovince. Canadian Journal of Earth Sciences, Volume 9, pages 1287-1296.

Gandhi, S.S., Grasty, R.L. and Grieve, R.A.F.
1969: The geology and geochronology of the Makkovik Bay area, Labrador. Canadian Journal of Earth Sciences, Volume 6, pages 1019-1034.

Gittins, J.
1972: A note on the age of basaltic dikes in the Mealy Mountains, Labrador, Canada. Canadian Journal of Earth Sciences, Volume 9, pages 1337-1338.

Gower, C.F.
1981: The Geology of the Benedict Mountains, Labrador (13J northeast and 13I northwest). Newfoundland Department of Mines and Energy, Mineral Development Division, Report 81-3, 26 pages.

Gower, C.F., Noel, N. and Gillespie, R.T.
1981: The Geology of the Rigolet Regionn, Labrador. *In* Current Research for 1980. *Edited by* C.F. O'Driscoll and R.V. Gibbons, Newfoundland Department of Mines and Energy, Mineral Development Division, Report 81-1, pages 121-129.

Grasty, R.L., Rucklidge, J.C., and Elders, W.A.
1969: New K-Ar age determinations on rocks from the east coast of Labrador. Canadian Journal of Earth Sciences, Volume 6, pages 340-344.

Kindle, E.M.
1924: Geography and geology of Lake Melville District, Labrador Peninsula. Geological Survey of Canada, Memoir 141, 105 pages.

Kranck, E.H.
1939: Bedrock geology of the seaboard region of Newfoundland and Labrador. Newfoundland Geological Survey, Bulletin 19, 44 pages.

Kranck, E.H.
1953: Bedrock geology of the seaboard region of Labrador between Domino Run and Hopedale, Newfoundland. Geological Survey of Canada, Bulletin 26, 41 pages.

Piloski, M.J.
1955: Geological report on Area E, Labrador concession. Unpublished report, Brinex, 21 pages.

Stevenson, I.M.
1970: Rigolet and Groswater Bay map area, Newfoundland (Labrador). Geological Survey of Canada, Paper 69-48, 24 pages.

Sutton, W.R.
1965: Report on Sandwich Bay - Square Island, southeast Labrador joint venture area. Unpublished report, Brinex.

Taylor, F.C.
1951: A petrographic study of the gabbro-diabase series of the coast of Labrador, south of Hamilton Inlet. Unpublished M.Sc. thesis, McGill University, Montreal, 68 pages.

Wanless, R.K., Stevens, R.D., LaChance, G.R. and Delabio, R.N.
1970: Age determinations and geological studies. Geological Survey of Canada, Paper 69-2A, pages 71-78.