

RP 507(A)

PRELIMINARY REPORT, GEOLOGY OF MIDDLE HART-JAUNE RIVER AREA, SAGUENAY COUNTY

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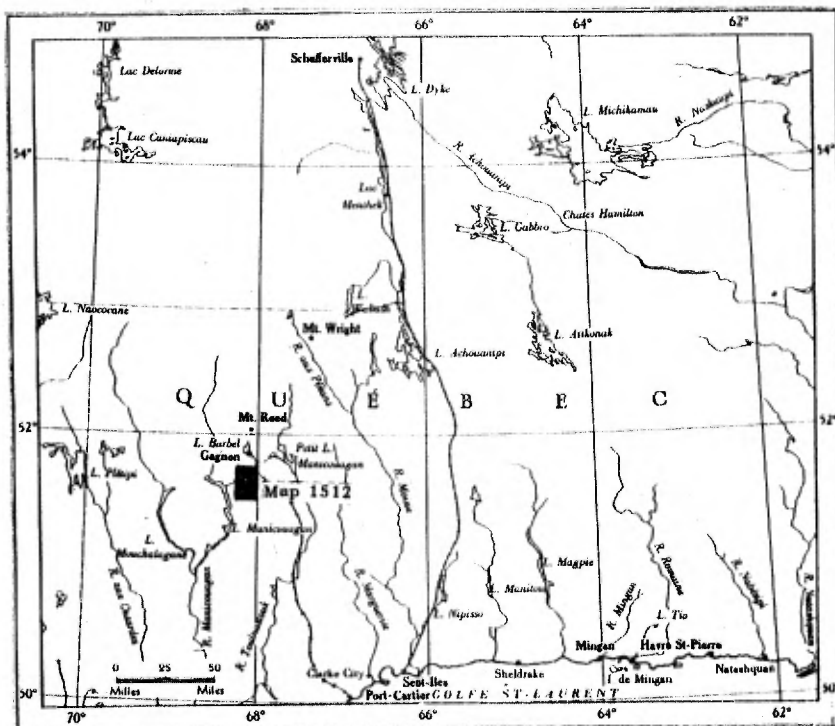
Geology of MIDDLE HART-JAUNE RIVER AREA

SAGUENAY COUNTY

PRELIMINARY REPORT

by

Leslie Kish



QUEBEC

1963

R.P. NO 507

QUEBEC DEPARTMENT OF NATURAL RESOURCES

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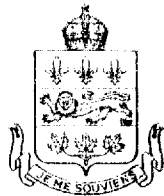
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INTRODUCTION

The area, which was mapped in 1962, is between latitudes $51^{\circ}30'$ and $51^{\circ}45'$ and longitudes $68^{\circ}00'$ and $68^{\circ}15'$. It covers about 185 square miles and includes parts of Berthelet, Brien, Jauffret and Godefroy townships and some unsurveyed ground. Its centre is about 170 miles north of Baie-Comeau. The mapping of this area completed a cross-section between Manicouagan lake (Kish 1962, Bérard 1962) and the iron mining district to the north (MacKean, in preparation).

The area can be reached most conveniently by float-plane or helicopter. Three lakes are suitable for float-planes: Espadon lake in the northwestern portion, Boissinot lake in the mid-centre and Joyel lake in the southeast. The latter two were frozen in 1962 till the end of June. The Hart-Jaune river on the western boundary also can be used for landing at high water-level. Most parts of the area may be reached only by helicopter or on foot.

For purposes of description, the topography of the area may be divided into two parts at about the latitude of Beaupin brook, the main tributary of the Hart-Jaune. To the south of this latitude, the surface rises rapidly to 3,000 feet or more above sea-level in the Manicouagan highlands. A general accordance of summits defines a plateau-like terrane above which rise some prominent hills, such as Tom mountain (3,494 feet) in the centre and Loaf mountain (3,623 feet) west of the south end of Joyel lake. The topography of the highlands is characterized by rounded hills with intervening deeply incised linear valleys. North of the latitude of Beaupin brook, the average altitude is generally less than 1,500 feet, except along the eastern margin where it reaches 2,500 feet.

The vegetation in the highlands is transitional between sub-arctic and arctic types; grasses, and low bushes of the high hills give way to stands of short, stubby spruce in the valleys and on the lower hills. Widespread forests of spruce with some

birch grow on the glacial overburden of the northern section. Kame deposits and terraces border the valleys of Hart-Jaune river and the main streams.

The drainage of the area is through Hart-Jaune river into Manicouagan lake or directly into the lake. The Hart-Jaune drops some 400 feet between the northeastern corner, where it enters the area, and the western boundary (800 feet). The narrow finger lakes of the highlands are parallel to fractures in the bedrock. Glacial lakes and swamps alternate with large boulder deposits in the north.

GENERAL GEOLOGY

The bedrock of the area is Precambrian. Paragneisses, including layers of crystalline limestone and quartzite and mixed gneisses, crop out north of an east-northeasterly-trending line that crosses the western margin of the area about midway of its length. South of this line the most abundant rock is foliated and composed of plagioclase and pyroxene; it is believed to be an altered gabbro, and for convenience is referred to as "granulitic" gabbro. A belt of hornblende gneisses, apparently formed from the granulitic gabbro, occurs close to the above-mentioned line of separation.

Anorthosite and anorthositic gabbro crop out in two sectors both of which are parts of larger bodies extending beyond the area. A massive meta-gabbro cuts the gneisses of the northern part and ultrabasic rocks are found in both parts.

GNEISSES

Most of the rocks of the northern part of the area are gneisses, and in the field these rocks were assigned to one of four categories, namely: thin-layered paragneisses; hornblende-plagioclase gneisses; and two varieties of mixed gneisses, one with relatively planar layers of diverse composition, and the other with more irregular pattern.

Thin-layered paragneiss

The paragneisses are medium to fine grained and in layers of different shades of grey from 1/16 inch to 4 inches thick. Feldspar, quartz, biotite and garnet are common. Some of the rocks contain hornblende with some pyroxene, and others contain kyanite. In places, some of the feldspar and garnet is in porphyroblasts that distort the foliation.

TABLE OF FORMATIONS

Pleistocene and Recent	Sand, gravel, boulders, till
Unconformity	
Precambrian	Pegmatites (not shown on map) Ultrabasic rock Massive meta-gabbro Anorthosite and anorthositic gabbro
	Granulitic gabbro and associated rocks; Layered and amphibolitized marginal gneiss Layered, granulitic gabbro Homogeneous, granulitic gabbro
	Granitic gneiss Mixed gneisses Hornblende - plagioclase gneiss, amphibolite Quartzite Crystalline limestone Thin-layered paragneiss

Hornblende-plagioclase gneisses, amphibolite

Hornblende-plagioclase gneisses occur as lenses or layers within, and conform to the structure of, other gneisses. A common variety is a medium-grained, equigranular aggregate of about equal quantities of hornblende and plagioclase with minor amounts of biotite and garnet. Another variety contains hornblende in excess of plagioclase and more garnet than the common variety. Some of the rocks with hornblende and plagioclase are so massive as to merit the name amphibolite; these have a greater tendency to weather to a crumbly surface than do the gneissic varieties.

Mixed gneisses

The gneisses described above are commonly inter-layered with pink, medium-grained granitic rock or with pink pegmatite. In many exposures the layers are relatively thin and of uniform thickness giving a typical lit-par-lit structure, but in some places the gneisses are contorted. The proportion of pink granitic material is diverse from exposure to exposure, varying from a minute fraction in some thin-layered varieties to a very large part in true granitic gneisses.

Granitic gneisses

The granitic gneisses are medium grained, massive to gneissic and commonly pink; grey varieties are found only as intrusions in the granulitic gabbro. They appear as injections in the other gneisses and grade to a uniform composition (locally porphyritic) in areas where they have been mapped separately. They consist of a granitoid assemblage of feldspar and quartz with less than 10% biotite and hornblende. Schistosity is apparent where the higher content of oriented mafic minerals is present.

Crystalline limestone and quartzites

A 10-foot-thick layer of crystalline limestone is associated with paragneisses and a layer of quartzite at the falls on Hart-Jaune river. Layers composed mainly of carbonate are intercalated with thin micaceous layers up to 3/4 inch thick. The limestone is a medium-grained aggregate of white to grey crystals of calcite and phlogopite. The quartzite layer is about 3 feet thick and varies in colour in keeping with the main impurities. Sutured grains of quartz, some feldspar and traces of mica are the main constituents.

Quartzite also occurs as layers up to one foot thick within the paragneisses included with the mixed gneisses near Beupin brook. This quartzite contains more feldspar than the one associated with the limestone, and also has traces of graphite.

GRANULITIC GABBROS AND RELATED ROCKS

The granulitic gabbros that crop out in the southern two-thirds of the area are part of a larger mass that extends beyond the limits of the area. The rocks in general have the mineral composition of a gabbro and appear to have been metamorphosed to the granulite grade.

On the map this formation is shown as being divided into two principal parts: one is a relatively homogeneous, granulitic gabbro; the other is granulitic intersected by quartzose layers, mylonite zones and sheared pegmatites. A third unit, exposed close to the northwest limit of the body is composed of amphibolitic gneisses derived from the granulitic gabbro.

Homogeneous granulitic gabbro

The homogeneous, granulitic gabbro is medium grained and grey. It is made up of variable proportions of black or, more rarely, green pyroxene and of plagioclase, both of constant composition. Porphyroblasts and uniformly disseminated small grains of garnet may constitute up to 30% of the gabbro in the observed outcrops. Biotite was noted at three localities, where it forms less than 2% of the rock.

Differences in the proportions of pyroxene and plagioclase produce a layering. The rocks, particularly the more massive varieties, have a typical salt-and-pepper weathered surface caused by differential alteration of the constituent minerals.

Layered granulitic gabbro

A part of the outcrop of granulitic gabbro has been shown as a separate unit on the map because of the high incidence of layers of siliceous material and mylonitic zones. These layers are from 6 inches to 6 feet thick and may make up 30% of the exposures. The siliceous layers are the most common and in the field they resemble chert both in their grey colour and in their resistance to weathering. At some localities they are seen to belong to two intersecting sets; in one place a set striking east is cut by a set striking southeast. In places, the cherty facies grades into a coarse-grained facies that has considerable pink feldspar; the latter is probably a sheared pegmatite. Near the southeast corner of the area some layers have medium-grained quartz and the rock resembles a quartz-rich paragneiss.

A massive rock composed of plagioclase and garnet with some quartz forms layers parallel to the siliceous layers, or independently of them, in the western and northwestern parts of the body of granulitic gabbro.

Mylonite or microbreccia layers in which the pyroxene, plagioclase and garnet have been drawn out into layers less than 1 mm. thick are also found. Some quartz, commonly bluish, has been introduced along the zones and the rock as a whole resembles some of the siliceous layers.

Amphibolitized marginal gneiss of granulitic gabbro

Near the northwestern edge of the granulitic gabbro, in a belt parallel to Beaupin brook, the granulitic gabbro grades into a fine- to medium-grained, dark grey gneiss with a conspicuous linear arrangement of inequant minerals. The presence of lenses of gabbro coupled with preserved original texture and minerals (e.g. pyroxene) in the gneisses strongly suggests that the latter are metamorphic equivalents of the gabbros. Farther northwest an increasing number of injections of granite occur and the origin of the belt seems less obvious.

ANORTHOSITE AND ANORTHOSITIC GABBRO

Anorthosite occurs near the western boundary and in a larger body near the northeast corner; the latter extends beyond the eastern boundary. Much of the anorthosite is coarse grained and massive. On the weathered surface the plagioclase is grey and the pyroxene is rusty brown. On the fresh surface the plagioclase is bluish. Some varieties contain coronas of ferromagnesian minerals and, in some places, scattered garnets. Like the granulitic gabbros, the anorthositic rocks on the western boundary grade into hornblende-plagioclase gneisses.

MASSIVE META-GABBRO

Lenses of meta-gabbros occur in the gneisses in the northern part of the area, but most are so small that they are not indicated on the map. The rock is medium to coarse grained and rusty weathering. Although the primary minerals are altered, the primary texture is still recognizable. Relics of primary pyroxene and olivine can be identified with the hand-lens in coronitic structures.

ULTRABASIC ROCKS

Igneous rocks without feldspar are referred to as ultrabasic. Within the area, several varieties, ranging from dunite to pyroxenite, occur either as lenses or as dykes in all the formations described above. At one locality a lens enclosed by gneisses has a core composed of a medium-grained aggregate of granulo olivine. Towards the western margin of this lens the rock, which is foliated parallel to the contact, has pyroxene and magnetite in addition to olivine. On the eastern end of this same body, the ultrabasic rock has 5% garnet with pyroxene and olivine.

A dyke of medium-grained pyroxenite cuts the anorthosite in the northwest corner of the area. Here, also, a lens of pyroxenite in the anorthosite consists of clinopyroxene with interstitial lamellar magnetite. A lens of pyroxenite also occurs in the granulitic gabbro near the eastern limit of the area.

PEGMATITES

The pegmatites of the area are composed mainly of quartz and pink feldspar and are generally poor in mafic minerals. Some are deformed and others are not. The deformed or sheared pegmatites form layers in the granulitic gabbros, and the component minerals are elongated parallel to the foliation of the adjacent rocks and are interlocked.

Undeformed pegmatites are widely scattered in the area, and are especially common in the granitic and mixed gneisses.

STRUCTURAL GEOLOGY

Folds. The attitude of the foliation and layering in the granulitic gabbros changes from northeast and east-northeast in the northern part of the outcrop area of these rocks to north-northeast in the south, and a succession of north-northeast-trending folds is indicated in the southeast corner of the map-area. In the gneisses of the northern part of the map-area the structural relationships, although complex in detail, only serve to delineate broad north-northeasterly-trending bands of the various units. Both the intermingled material in the mixed gneisses and the siliceous bands in the granulitic gabbros show wrinkles or irregular minor folds produced when the rock was in a plastic state.

Faults, shears. A fault, which strikes N.60°E. or parallel to Hart-Jaune river, enters the area one mile south of the river. Beaupin brook, a tributary of the Hart-Jaune, is on strike with this fault and divides the shear zone into two parts. The rocks south of Beaupin brook are lineated and those to the north are highly sheared and chloritized. The shear zone, followed by Beaupin brook terminates in massive anorthosite to the northeast. The shear zone is the dividing line between the northern gneisses and the granulitic gabbros to the south. In the marginal rocks, the lineation trends south and the plunge changes from 35°-40° near the northern contact to 50°-65° along the southern contact.

Mylonitized bands up to 4 inches wide occur in the granulitic gabbros.

Joints. Joints are a prominent structural feature of the granulitic gabbro body, with two nearly vertical sets and one horizontal set being represented. The joints are a late structural feature in the granulitic gabbro and many are near, although rarely parallel to, the siliceous bands. The trends are indicated by the direction of streams and the elongation of lakes.

ECONOMIC GEOLOGY

Part of the area has been prospected and a group of claims has been staked by Quebec Cartier Mining Company one mile southeast of Joyel lake. Pyrite and pyrrhotite occur in the granulitic gabbros. Oxidation has formed some gossan deposits that may be as much as 2 feet thick in places. Graphite is found here and there in the siliceous bands.

The tenor of magnetite is so high in parts of the granulitic gabbros and in the ultrabasic rocks, especially the one associated with the anorthosite, that potential bodies could be easily detected by aeromagnetic surveys.

REFERENCES

- Bérard, Jean (1962) Summary Geological Investigation of the Area Bordering Manicouagan and Mouchalagane Lakes, Saguenay County. Que. Dept. Nat. Res. P.R. No. 489.
- Kish, Leslie (1962) Preliminary Report on Lower Hart-Jaune River Area, Saguenay County. Que. Dept. Nat. Res. P.R. No. 486.

