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PRELIMINARY REPORT, GEOLOGY OF BAIE-DES-MOUTONS AREA, DUPLESSIS COUNTY

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DEPARTMENT OF NATURAL RESOURCES

RENÉ LÉVESQUE, MINISTER

P.-E. AUGER, DEPUTY MINISTER

Geology

of

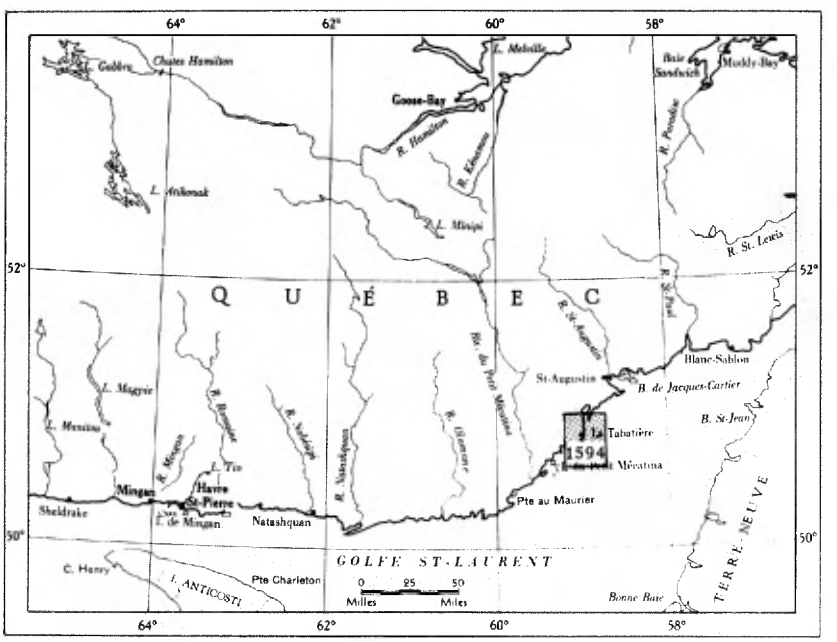
BAIE-DES-MOUTONS AREA

DUPLESSIS COUNTY

PRELIMINARY REPORT

by

Raymond Davies



QUÉBEC

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QUEBEC DEPARTMENT OF NATURAL RESOURCES

RENÉ LÉVESQUE, MINISTER P.-E. AUGER, DEPUTY MINISTER

GEOLOGICAL EXPLORATION SERVICE

H.W. MCGERRIGLE, CHIEF

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INTRODUCTION

The Baie-des-Moutons (Mutton Bay) area, mapped by the author during the summer of 1964, borders on the north shore of the Gulf of St. Lawrence, about 330 miles east of Sept-Iles. It lies within longitudes 58°45' and 59°15' and latitudes 50°30' and 51°00', and covers about 430 square miles. It includes Boishébert and parts of Montesson and Céry townships, and the villages of Tête-à-la-Baleine (summer village), Baie-des-Moutons (Mutton Bay), Tabatière, Lac-Salé, and Baie-de-la-Terre (Baie des Ha! Ha!).

Previous work in the area is slight. The area adjacent to the northeast was mapped by the writer (1963a, 1963b, 1963c, 1964). De Puyjalon (1899) reported on the minerals of the North Shore, and Longley (1944) described the area between Aguanish and baie du Homard. Hale (1962) did a reconnaissance survey of an area covering 700 square miles which includes the area mapped by the writer.

Tabatière, Baie-des-Moutons and Tête-à-la-Baleine may be reached by ship (Clarke Steamship Co. Ltd.) leaving either from Quebec fortnightly or from Rimouski via Sept-Iles weekly. Planes (Northern Wings Ltd.) run tri-weekly from Havre-Saint-Pierre or Sept-Iles, weather permitting. No villages east of Havre-Saint-Pierre have hotels and one must seek accommodation with private families.

Most of the area is coastal and readily accessible by boat. Numerous lakes and rivers connected by well-cut portages provide easy access to the northwest.

The area is rugged and consists of a central resistant mass of syenite surrounded by lower-lying gneissic terrain which has the features of an ancient peneplain cut by pre-glacial valleys now occupied by lakes and streams. The syenite reaches elevations close to 1,000 feet, whereas the surrounding gneisses are generally no more than 300 feet above sealevel.

Trends of the valleys are determined mainly by zones of fracture and to a lesser degree by more easily weathered layers in the gneisses. The area exhibits two drainage patterns, a radial pattern of small streams around the syenite, and a rectangular pattern in the gneisses. Gros-Mécatina (Mécatina) lake lies along the western contact of the syenite mass and reaches the sea via a rapid at its south end. Gros-Mécatina river enters the sea via Gros-Mécatina lake and also via Pommereau lake. Charles lake occupies a northeast-striking fracture zone in the northwest and reaches the sea via Monger lake in the north as well as via Gros-Mécatina lake to the south.

Forested areas are sparse and are confined to river valleys and a few sheltered slopes. Tops of hills and coastal islands have only a thin covering of moss and there are numerous exposures of bare rock. Because of abundant exposure, only those outcrops at which geological information was recorded are marked on the map.

GENERAL GEOLOGY

The oldest rocks in the area are Precambrian gneisses, quartzite, calc-silicate rocks, and metagabbro (amphibolite). Metagabbro both intrudes and is interlayered with the gneisses. Intruding the gneisses in the southwest and west are generally concordant bodies of porphyritic granite. Granodiorite dikes are widely distributed. Cutting all the above rocks is a circular syenite pluton of uncertain age that occupies about 175 square miles in the center of the area. The youngest intrusive rocks are basic and syenitic dikes, generally less than 10 feet wide, which are abundant in and around the syenite pluton.

Unconsolidated gravels, sand, silt, and clay of Pleistocene and Recent age occur in depressions, and on the sides of hills.

Gneisses

Gneisses underlie about half of the area mapped. They vary in composition, color, and texture, and are closely banded.

Table of Formations

Pleistocene and Recent	Sand, silt, gravel, clay, peat
Unconformity	
?	Diabase, trachyte and related dikes
	Intrusive Contact
	'Mutton Bay' syenite Gabbro dikes
Intrusive Contact	
Precambrian	Pegmatites, aplites Granodiorite-quartz monzonite-monzonite dikes
	Intrusive Contact
	Coarse-grained porphyritic granite
	?
	Metagabbro (amphibolites)
	Intrusive Contact
	Interlayered metagabbro (amphibolites) Quartzite (+sillimanite and garnetiferous varieties) Calc-silicate rocks Mixed gneisses Fine- to medium-grained pink granitic gneiss Green pyroxene-plagioclase gneisses Light gray plagioclase gneiss Gray-(garnet)-(graphite)-(sillimanite)-biotite gneiss

Mappable units show considerable range in composition, and all the gneisses are mixed to some degree, but in the units mapped one rock type predominates. The major units chosen are (a) fine- to medium-grained pink granitic gneisses, (b) green pyroxene-plagioclase gneiss, (c) gray-(garnet)-(sillimanite)-(graphite)-biotite gneiss, and (d) mixed gneisses. Light gray plagioclase gneiss occurs with (a), (b), and (c) but does not form mappable units itself.

Gray-(garnet)-(sillimanite)-(graphite)-biotite gneiss

Included here are rocks that are essentially gray and that all contain biotite. Amphibole and pyroxene are absent. The rocks are generally garnetiferous and many contain sillimanite. Graphite and pyrite accompany sillimanite in many places and these zones are made conspicuous in the field by thin gossan layers on the surfaces of outcrops.

Light gray plagioclase gneiss

The light gray plagioclase gneiss is fine to medium grained and composed essentially of plagioclase and quartz with varying amounts of potash feldspar. Mafics include biotite and hornblende with pyroxene in low potash feldspar varieties. The gneiss is similar in appearance to the fine-grained pink granitic gneiss with which it is associated in many places. With increase in potash feldspar it grades into the granitic gneiss, whereas with increase in mafics it passes into "green" pyroxene-plagioclase gneiss. Under more detailed mapping this gneiss could be mapped as a distinct unit. Instead it is combined with the rocks in which it is interlayered and designated a mixed unit.

"Green" pyroxene-plagioclase gneiss

Most varieties are medium grained and olive green to greenish gray, and are composed essentially of green plagioclase with lesser amounts of quartz and potash feldspar. All contain pyroxene with hornblende or biotite or both. Garnetiferous varieties occur in the south near the coarse-grained pink porphyritic granite. The composition is granodioritic to quartz-dioritic.

Foliation is well-developed, being similar to that of the well-foliated, pink, granitic gneiss. Lineation of mafics and quartz-feldspar aggregates on foliation planes is also pronounced.

Weathering is generally deep and only along shorelines was the gneiss recognizable by its green color. Elsewhere it is a rusty, dirty brown color, and generally friable. The deep weathering of this gneiss may lead to its being poorly exposed with respect to interlayered bands of more resistant granitic rocks.

Fine- to medium-grained pink granitic gneisses

There are essentially two types. One is a well-foliated medium-grained variety closely associated with the "green" gneiss in many places. The contacts with surrounding rocks are concordant. There is commonly a subtle gradation into the "green" gneiss with varieties intermediate between the two. While most varieties are pink to pinkish-gray, some contain a little greenish feldspar (plagioclase). The most important minerals are quartz, potash feldspar, and plagioclase with about 5% biotite and/or hornblende.

Difficult to distinguish from the low mafic varieties of the above are fine-grained, pink, granite gneisses with a weak foliation and an aplitic appearance. The color is distinctly pink on both fresh and weathered surfaces. Small pink garnets are present here and there. This variety generally occurs as distinct conformable bands with sharp contacts.

Mixed gneisses

Various combinations of rock types give rise to the mixed units as mapped. Two of these units are composed essentially of pink granitic gneisses and green pyroxene-plagioclase gneiss, one or the other rock type being dominant locally. A third unit is the most diverse, consisting of three or more main rock types, including at least two of the following: quartzite, calc-silicate rock, gray-(garnet)-(sillimanite)-(graphite)-biotite gneiss, amphibolite, fine-grained pink and gray gneisses. Green pyroxene-plagioclase gneiss and coarse-grained porphyritic granite may also be present. Two of the units mapped as mixed gneiss contain either pink granitic gneiss or green pyroxene-plagioclase gneiss associated with much light-gray plagioclase gneiss.

Quartzites

Quartzites occur throughout the area interlayered in the gneisses, and serve as marker horizons. Layers more than 50 feet thick were observed, though generally they are thinner. Several can be traced for more than a mile. Narrow layers tend to be rather massive, whereas the thicker layers show a distinct banding or perhaps bedding.

Most of the quartzites are white to gray and consist of glassy quartz with variable amounts of pink microcline. Many are garnetiferous. Sillimanite and biotite occur locally in thin folia to bands up to 2 inches wide.

Calc-silicate rocks

Calc-silicate rocks are rare. They are banded and of variable composition, the individual bands consisting of varying combinations of diopside, scapolite, feldspar, quartz, biotite, and calcite. Sphene is a common accessory. In some places narrow calcite bands (1-12 inches wide) are present.

Metagabbro (amphibolites)

Throughout the area of gneisses are bodies of metagabbro (amphibolites) from less than a foot to over 2,000 feet wide. Most are conformable with the gneisses, whereas a few are clearly intrusive. The largest is the apparently concordant mass in the structural basin in the gneisses between Monger and Charles lakes.

These rocks are dark greenish black, medium to coarse grained, and strongly lineated. They consist essentially of amphibole and plagioclase. Biotite is usually a minor constituent. A local pyroxene-bearing variety occurs in the Monger - Charles Lakes body. Magnetite, ilmenite, and rare pyrite are accessory minerals.

Coarse-grained porphyritic granite

Coarse-grained porphyritic granite occurs as a large body, well exposed on the islands off Tête-à-la-Baleine (Whale Head) in the southwest, and as a tongue-shaped northern extension of the same body passing through Grenfell lake to north of Blais lake. Foliation on a regional scale is concordant with that of the gneisses. A smaller, partly concordant, and partly discordant, irregular-shaped mass intrudes the gneisses west of Baie-des-Moutons. Large inclusions of country rock are common, especially near the contacts.

The rock is pink and coarse grained with large potash feldspar phenocrysts in a medium- to coarse-grained matrix of essentially quartz and potash feldspar with plagioclase, biotite, hornblende and opaque minerals. Darker-colored granodiorite varieties are present but in minor amounts.

Quartz monzonite-monzonite-granodiorite dikes

Widely distributed in the gneisses but by no means abundant are dikes with a granodioritic-monzonitic-quartz monzonitic composition. They are straight-walled, steeply-dipping bodies with sharp contacts. However, faults with minor displacements cross them in many places.

There is generally a strong foliation parallel to the contacts, accentuated by the development of small quartz-feldspathic veinlets. Rarely the foliation is oblique to the contacts, indicating a post-emplacement metamorphism.

The rocks are gray, greenish gray, or pinkish gray and medium to fine grained.

Plagioclase, potash feldspar, and quartz constitute 2/3 to 3/4 of the rock, with hornblende, biotite, and opaque iron ores constituting the remainder. Phenocrysts of biotite and feldspar are common.

Pegmatites and Aplites

Pegmatites and aplites are widespread and are of more than one age. They occur both as bodies parallel to the foliation of the gneisses and as cross-cutting dikes.

Syenite and Related Rocks

Syenite

The Baie-des-Moutons syenite pluton is a roughly circular body, centered on Tabatière, with a diameter of about 15 miles. The western half is well exposed, forming a resistant mass rising to about 900 feet above sealevel. Much of the eastern half lies submerged but a number of well-situated islands clarify the structural picture.

The pluton is a multiple-injection, layered body. Walls are steep, though, away from the contacts, dips are towards the center at decreasing angles.

Varieties of rocks making up the pluton range from fine to very coarse grained. Color ranges from red through gray to green, and the texture from massive to extreme trachytoidal.

The most conspicuous feature in thin-sections is the perthitic character of the feldspars, the plagioclase and potash feldspar occurring in roughly equal amounts. Non-perthitic feldspar is rare. Quartz is conspicuous in some of the coarse-grained, massive, red varieties. Mafics include biotite, hornblende and opaques, with pyroxene in the green varieties. Apatite and sphene are common.

Gabbro

A coarse-grained gabbro dike 200 feet wide outcrops on an island in the northeast corner of the area. It is the southern extension of one of the gabbro dikes of the St. Augustin - Ha! Ha! Bay area (Davies, 1963c, 1964).

The rock is greenish gray and medium to coarse grained with a granulitic texture, and is composed essentially of plagioclase and pyroxene.

Diabase and related dikes cut the gabbro dike and are concentrated near it. The relation of the gabbro to the syenite is not known. The dike has been unaffected by regional metamorphism and is thus younger than the granodioritic dikes.

Dikes

Closely associated with the syenite is a swarm of dikes of varying composition. They may be divided into an early and late group.

Early dikes

Basic Lamprophyres: These dikes are found in the contact zone. They were emplaced early but were broken up by later movements of the syenite.

Aplitic syenite, and acid veins: They are found throughout the syenite body and are related to the closing phase of consolidation.

Late dikes

Diabase and Trachytic dikes: Most of these dikes are negative topographic features, which have been eroded to depths of up to 20 feet by wave action. They are found both in and around the pluton, being abundant up to 5 miles from the contact, but are relatively rare farther away. They are straight-walled, steeply dipping bodies seldom more than 10 feet wide.

The dikes have intruded along joints, the most common strike being north to northeast.

Trachytic dikes are red to brown, whereas the diabases are dark greenish black. Porphyritic varieties of both are common.

Carbonate, quartz veins: Following the intrusive phase, hydrothermal activity resulted in the deposition of carbonate and quartz as narrow veins in open fractures.

PLEISTOCENE AND RECENT

Deposits of glacial origin are represented by unsorted gravel and sand in shallow depressions, and by erratic boulders on tops of hills. Sand and gravel exposed in valleys and on marine beaches are mostly of glacial origin but have been reworked.

Gray clay is found in sheltered coves and bays along the coast and is seldom exposed above high-water level. It is found also in many lakes. Since much of it contains marine shells, it is believed to have been deposited during marine submergence.

Evidence of glacial erosion is abundant, particularly along the coast where rock surfaces, only very recently exposed by marine emergence, show beautifully striated glacial pavements, friction cracks, fluting, grooves, and potholes. Hills have been rounded, and plucking is evident on their south and southeast slopes.

Movement of the ice was generally to the southeast. Occasionally deep striae parallel to the regional trend have superimposed upon them a second set of finer striae controlled by local topography.

STRUCTURAL GEOLOGY

Foliation, layering

Foliation in the gneisses and metasedimentary rocks is concordant with the large-scale layering. In the porphyritic granite S-planes are parallel to the intrusive contacts which are in most cases concordant with the layering of the intruded rocks. The syenite pluton consists of rocks both massive and trachytoidal. In each intrusive phase of the syenite, the feldspars, when exhibiting a preferred orientation, lie parallel to intrusive contacts. The pluton consists of many intrusive phases disposed roughly concentrically around the center. The general picture is thus one of a layered pluton with strikes parallel to contacts, and dips vertical to steep at contacts and decreasing towards the center.

Lineation

Lineations are displayed by most gneisses, metasedimentaries and metagabbros (amphibolites) and are parallel to major fold axes. Lineation in the syenite and porphyritic granite is rarely recognized in the field.

Folds

Folds are well displayed by air photographs, and the field mapping and photo-interpretation confirm and complement each other. The structure north of Pommereau lake is relatively simple, while to the south, with the lack of continuous outcrop, interpretation is not so easy and is further complicated by the irregular mass of intrusive porphyritic granite.

Two sets of minor folds are present. One parallels the lineation and the other is at approximately right angles to it. Open folds are the most common with a wave length to amplitude ratio of approximately 10:1. Closed folds are, however, conspicuous on the east side of Ha! Ha! bay where the structure is locally complex, and in the complex area south of Pommereau lake mentioned above.

Joints

Joints are well developed throughout the area. Many strike parallel to one or other of the prominent linears and are generally steeply dipping. More variable are joints parallel or subparallel to the foliation.

Faults and shear zones

Linear valleys or drowned valleys, representing faults or fracture zones, are a prominent feature of the area.

The most prominent set strikes parallel to the coast (NE.-SW.). Evidence of faulting along the Charles Lake linear is shown by the displacement of folds and of characteristic marker horizons. Other linears show similar evidence but less impressively since movement has not been as great.

A second, less prominent, set strikes east and shows minor displacement.

A number of minor faults and shear zones were observed along the well-exposed coastal shorelines.

ECONOMIC GEOLOGY

Sulfides

Pyrite: Disseminated grains of pyrite occur in most rock types. However, concentrations were observed in the paragneisses north of Fecteau island, and those west of des Moutons bay. The pyrite occurs in zones parallel to the layering and produces conspicuous rusty weathered surfaces. West of des Moutons bay the pyrite is commonly associated with sillimanite and graphite-bearing gneisses.

A sample taken from 1/2 mile north of Fecteau island assayed Cu, 0.02%; Pb, 0.01%; Zn, 0.16%; Mo, 0.01%; and Ag, 0.010 ounce a ton.

A sample from an island west of des Moutons bay assayed Cu, 0.02%; Zn, 0.01%; and Ag, 0.006 ounce a ton.

Pyrite is conspicuous in many diabase dikes. A sample assayed Cu, 0.02%; Zn, 0.02%; and Ag, 0.006 ounce a ton.

On islands in Querry bay, pyrite is found in metagabbros similar to those described just to the north in the St. Augustin - Ha! Ha! Bay area (Davies, 1963c, 1964).

Galena: One-half mile north of Fecteau island a number of narrow galena-bearing carbonate veins fill fractures in impure quartzite. A little galena was also observed as a small fracture-filling in the syenite on Fecteau island. A sample of galena from the first locality assayed Pb, 41.61%; Zn, 5.71%; Cu, 0.01%; Cd, 0.01%; Au, traces; and Ag, 0.87 ounce a ton.

Molybdenite: Molybdenite was observed at two points in a massive green syenite in the village of Tabatière. The best exposure is in a small quarry on the side of the road between the wharf and the Hudson's Bay store. The molybdenite occurs as irregular masses and appears to be primary. However, thin veinlets cut the rock and may be related.

A grab sample of syenite containing visible molybdenite assayed Mo, 0.70%; Cu, 0.01%; Pb, 0.00%; and Zn, 0.00%.

Magnetite

Minor concentrations of magnetite are found in the syenite in some instances. They occur in mafic-rich clots, narrow acidic veins, or as important accessories in local, more basic differentiates.

Magnetic disturbances that occur near Flat island at the contact of the syenite with the gneisses in the southeast corner of the map-area (Canadian Hydrographic Service, Chart No. 4474) might be related to magnetite concentrations in the syenite, but are more likely caused by something outside the syenite mass as the disturbances which cause magnetic declinations to vary between 30°15'W.to 34°45' W. are found also as far as 10 to 20 miles to the south. The disturbances might, however, be caused by concentrations of magnetic sands which could be derived from the syenite. Such concentrations occur on the very few sandy beaches that are found in the area, the best concentrations being those on the beach at the south end of Gros-Mécatina island.

Sand and Gravel

Large sand and gravel deposits are rare within the area. Beach deposits are the main source. At Tabatière deeply weathered syenite has been used on roads.

GEOCHEMICAL PROSPECTING

In order to outline parts of the area worthy of further prospecting, samples of stream sediments containing as much organic material as possible were taken and analysed for copper, zinc, lead and molybdenum. The results of these analyses appear on the geological map accompanying this report.

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