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PATU LAKE AREA

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GEOLOGY

of the

PATU LAKE AREA

NEW QUEBEC TERRITORY

Preliminary Report

by

Burkhard Dressler

Québec

1972

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INTRODUCTION

Location and Access

The map-area, about 145 miles north-northwest of Schefferville, is bounded by longitudes 68°30' and 69°00' and latitudes 56°30' and 56°45'. It covers about 325 square miles.

Access to the area is by aircraft from Schefferville. All the larger lakes in the area are accessible to float- or ski-equipped planes. Canoe travel is feasible only on the lakes.

Description of the Area

Most of the area is hilly and rugged. The highest point, about 4 miles north of Hematite lake, has an elevation of 1816 feet above sealevel; the lowest, Le Moyne lake, lies at 250 feet.

All the area drains northward to Ungava Bay. Swampy Bay river is the only major river.

The lower parts of the area are covered by lichen and subarctic forest. Spruce and tamarack are here the most common trees. Almost all hilltops are barren, though slopes are often covered by thick alders.

Natural Resources

Hydroelectric power sufficient for local developments could be developed at the falls on Swampy Bay river between Patu and Le Moyne lakes, where the river drops 260 feet in about 2½ miles. A sufficient amount of hydroelectric energy for mining developments would be available at Shale falls, on Caniapsiscau river, just one mile northwest of the area.

Previous Work

The area lies within a region mapped by Roscoe (1957)* at the scale of 1 inch = 4 miles. Parts of the area have been studied by geologists of different mining companies. The region south of the present area was mapped by Dimroth (1969) at the scale of 1 inch = 1 mile. His stratigraphic nomenclature is used in this preliminary report.

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* See list of 'References' at end of report.

Field Work

The field work was carried out during the summer of 1971. Ground traverses were made at half-mile intervals or less, wherever outcrops were plentiful. Complex structural geology often made it necessary to follow stratigraphic contacts. Small, flat areas near Shale falls (outside the map-area) and near Doutreleau lake, which showed no rock exposures on air photos, were examined from airplane and, if promising, traversed on foot.

GENERAL GEOLOGY

The map-area lies almost entirely within the "Labrador Trough". The western boundary of the Trough cuts the extreme southwestern corner.

All bedrock (except possibly the post-Kaniapiskau volcanics) is Precambrian in age. The oldest rocks, Archean granites, are overlain by sedimentary and volcanic rocks of the Kaniapiskau Supergroup.

The sedimentary rocks include arkoses, sandstones, siltstones, shales, dolomites and ironstones; the volcanic rocks gabbros and basalts. Some Post-Kaniapiskau volcanic rocks were found, mainly west of Hematite and Magnetite lakes. They are of uncertain age.

All these rocks, except the last-mentioned volcanics, have been folded and faulted, and are also slightly metamorphosed.

Table I: Table of Formations

Pleistocene and Recent	Moraine deposits, sand, gravel				
— Unconformity —					
Early Proterozoic (Aphebian)	Post-Kaniapiskau Volcanics				
	— Intrusive Contacts —				
?	Kaniapiskau Supergroup	Montagnais Group			
		— Intrusive Contacts —			
		Knob Lake Group		Menihek Formation	
			Ferriman Subgroup	Sokoman Formation	
				Ruth Formation	
				Wishart Formation	
			— Unconformity —		
			Swampy Bay Subgroup	Otelnuk Formation*	
				Savigny Formation	
				Hautes Chutes Formation*	
			Pistolet Subgroup	Uvé Formation	
				Alder Formation	
				Lace Lake Formation	
			Seward Subgroup	Du Portage Formation - Dunphy Formation	
				Chakonipau Formation	
— Unconformity —					
Archean	Ashuanipi Complex (Superior Province)				

* Not observed in the map-area.

Precambrian

Archean

Ashuanipi Complex

Pink, coarse-grained granites form the Archean basement (Ashuanipi Complex, Superior Province) in the region. It underlies the southwestern corner of the map-area west of the Trough. Three inliers of this granite also underlie areas southwest of Hematite lake, at Patu lake, and about 2 miles southwest of Le Moyne lake.

Outside the Trough, and southwest of Hematite lake, the granites are less altered than those at the other occurrences. They show only a weak chloritization of biotite and somewhat saussuritized plagioclase.

The granite at Patu lake is sheared and chloritized, and exposed where the Kaniapiskau rocks have been eroded away.

The granite near ~~the~~ Le Moyne lake is also retrograde, and is highly brecciated and, in places, only a parautochthonous breccia.

All the granites show normal mineralogy: quartz, microcline, plagioclase and biotite. In the granites of the inliers, the plagioclase is saussuritized and the biotite is leached and chloritized. At Patu lake the granite and overlying sedimentary rocks are both somewhat metamorphosed (greenschist facies). No contact was found there, but in places thin, aplitic, quartz-rich veins cut the sediments. They are the result of this metamorphism.

Kaniapiskau Supergroup

Knob Lake Group

Seward Subgroup

Chakonipau Formation

Southwest of Hematite lake, the granite of the Ashuanipi Complex is covered by white or pink, medium-grained, arkosic sandstone. It, in turn, is overlain unconformably by rocks of the Wishart Formation. Dimroth (1969) in his map-area just to the south correlates this arkosic sandstone with the Chakonipau Formation.

Du Portage and Dunphy Formations

Rocks of the Du Portage Formation crop out in an area between the south end of Le Moyne lake and Patu lake. They consist of gray and green argillite; gray, red and purple siltstone; white, pink or red, sometimes dolomitic arkose and sandstone; and gray or pink dolomite.

The classification of these rocks as Du Portage Formation is based only on lithologic evidence, and on the comparison of these rocks with the descriptions given by Dimroth (1969).

Moreover, the pink dolomites east of Patu lake and on the northern shoreline of Le Moyne lake, mapped as Dunphy Formation, correspond to the descriptions of rocks so mapped by Dimroth (1969).

Pistolet Subgroup

Lace Lake Formation

In this map-area the Lace Lake Formation of Perrault (1955) consists of dark gray siltstone, argillite and shale. Typical interbeds of gray, brown-weathering dolomite, and shaly or sandy dolomite are between 2 inches and 4 feet thick.

This occurrence of Lace Lake Formation is continuous with a zone to the south (Dimroth, 1969), where it is below typical Alder Formation.

Alder Formation

The Alder Formation is characterized by extreme facies changes. It comprises arkoses and conglomerate, white or gray quartzitic sandstone, red and green siltstone and argillite, purple and red sandstone, and dolomitic sandstone. These rocks crop out west of Patu lake and south of Edgar lake.

Lack of continuous outcrop does not allow measurements of stratigraphic sequences. The reasons for the correlation of these rocks as Alder Formation are mostly lithologic. The correlation is substantiated only at Edgar lake, where the Alder Formation underlies Uvé Dolomite in a large anticline. West of Patu lake, map unit 4b is lithologically typical of the formation. Map unit 4c is composed mainly of rocks that could occur in any

formation of the Pistolet Subgroup but contains interbeds of white or gray sandstone that are characteristic of the Alder Formation. Map unit 4d is also lithologically indistinct but likewise contains interbeds of gray sandstones that are also characteristic of the Alder Formation.

Uvé Formation

The Uvé Formation in the area consists of gray or light gray, in places somewhat sandy, dolomite. Now and then it contains interbeds of dolomitic sandstone. The weathered surface of the light gray, recrystallized variety is light brown or ~~of~~ buff, that of the gray, more or less non-recrystallized variety is chocolate brown. Black chert, in lenses, thin bands or blobs, is common in the recrystallized rock.

Dimroth (1969) describes gray argillites and siltstones at the base of the Uvé Formation southwest of Hematite lake. This lowest member seems to crop out in places on top of the Alder Formation about 3 miles southeast of Edgar lake.

Non-subdivided Pistolet Subgroup

Map units 4f and 4g are lithologically indistinct. They consist of gray shales and siltstones with subordinate green and purple sandstones and siltstones. Dolomite is rare. These rocks are correlated with the Pistolet Subgroup because map unit 4g is a continuation of a zone of similar rocks that overlie the

Dunphy Dolomite (Seward Subgroup), and therefore is correlated with the Lace Lake Formation. Map unit 4f is correlated with the Pistolet Subgroup because it is associated with map unit 4e, the Uvé Dolomite.

Swampy Bay Subgroup

Only the Savigny Formation of the Swampy Bay Subgroup has been found within the map-area. The Hautes Chutes and Otelnuk Formations are absent.

Savigny Formation

The Savigny Formation is composed of gray slates and argillites. It crops out in the Edgar Lake syncline above the Uvé Formation. Just west of Doutreleau lake lithologically indistinct argillites (map unit 4f or 5) crop out; they belong either to the Pistolet or the Swampy Bay Subgroup. Dimroth (1969) mapped them as Savigny Formation (Swampy Bay) in a continuous zone just to the south.

Ferriman Subgroup

An almost complete stratigraphic section through the Ferriman Subgroup is exposed at a cliff about one mile northeast of Edgar lake (Table II).

Rest of Upper Hematite Iron-formation and the Upper Silicate-carbonate Iron-formation are absent at this cliff.		
Upper Hematite Iron-formation	+ 16'	Sokoman Formation ++ 150'
Lower Silicate-carbonate Iron-formation	38'	
Intermediate Hem. Iron-form., jasper bands + intraclasts	8'	
Lower Silicate-carbonate Iron-formation	4'	
Lower Hematite Iron-formation; "banded jaspilite"	88'	
Argillite and siltstone: upper parts - dark red and brown, laminated lower parts - brown, greenish gray, laminated	55'	Ruth Formation 78'
Gray and red laminated siltstone and argillite	3'	
Fine-grained, leached, white sandstone (in places still with brown spots)	18'	
Black, white or reddish brown chert	2'	
Fine-grained, greenish gray sandstone	11'	Wishart Formation 56'
Gray, medium-grained sandstone and arkose	45'	
Unconformity		
Dark gray shale	+100'	Savigny Formation + 100' (Swampy Bay Subgroup)

Table II: Almost complete section of the Ferriman Subgroup near Edgar lake.

Wishart Formation

The Wishart Formation is composed mainly of gray, medium-grained arkose or sandstone in the lower parts, and of dark greenish gray, fine-grained, sometimes crossbedded sandstone in the upper parts (see table II). In places it includes gray siltstone or argillite. Locally the base of the formation is composed of a dolomitic, dark-brown-weathering sandstone. One mile north of Sur les Montagnes lake this dolomitic sandstone contains pebbles, up to 10 cm. in diameter, of the underlying pink sandstone of the Alder Formation.

The Wishart Formation overlies unconformably the Chakonipau Formation west of Magnetite lake, the Alder Formation one mile north of Sur les Montagnes lake, and the Savigny Formation around Edgar lake.

Ruth Formation

The Ruth Formation is composed mainly of chert, shale, argillite and siltstone.

A 2 - 10 foot thick bed of black, white or reddish brown chert marks the base of the formation. Above lies a dark gray, sometimes brownish or greenish, in places silty, argillite. Only around Edgar lake a former dark brown, now almost completely leached, white, fine-grained sandstone is intercalated between the chert and the argillite (see table II). The highest horizon

of the Ruth Formation is composed of a laminated siltstone with argillite bands. This rock grades abruptly upwards into the banded jaspilite of the Sokoman Formation. The contact between the two formations has been drawn where no more silty bands were observed.

Sokoman Formation

The Sokoman (= Iron) Formation crops out in large parts of the western half of the area. It is roughly subdivided into four members, from the base upwards:

a) Lower hematite iron-formation

b) Lower silicate-carbonate iron-formation

c) Upper hematite iron-formation

d) Upper silicate-carbonate iron-formation

The contacts between these units are gradational.

The hematite iron-formation is composed mainly of a dark brown-red, oolitic and finely intraclastic, hematite ironstone, alternating with laminated, brick-red jasper. Lenses or layers of carbonate rocks occur here and there. The thickness of the jasper bands ranges from some mm. to about 5 cm., those of the oolitic interbeds from about 1 cm. to 30 cm. The intraclasts in these latter beds are discs, up to 5 cm. in diameter, of brick-red jasper.

The silicate-carbonate iron-formation is composed mainly of silicate-carbonate ironstones and of laminated silicate-

carbonate chert. The most common rock type of this member is a very fine-grained, compact, gray-green, rusty-brown-weathering ironstone. It is composed mainly of quartz, carbonate, hematite, secondary magnetite, and minnesotaite, in varying amounts. It is interlayered mostly with dark gray or black chert, seldom with some black ironshale or iron-rich siltstone. The chert and ironstone often contain small blobs of carbonate which give the rocks a typical spotted appearance. All transitions occur between an almost pure "lean chert" and a very carbonate-rich rock.

Sedimentary features in both the hematite and the silicate-carbonate ironstones include cross-bedding, imbrication, bedding and fine lamination.

Menihek Formation

The Menihek Formation consists of three units, from bottom to top:

a) shale: gray, laminated - grading into a gray, silty and marly shale — $>100'$ thick; $\pm 35'$

b) siltstone: gray, weathering pale yellowish brown; somewhat dolomitic; sometimes crossbedded. — $\pm 315'$

c) sandstone: chocolate-brown, fine-grained, very homogeneous — $>140'$

The formation is exposed at four places within the area: on a big peninsula in Magnetite lake; about 2 miles east of this lake; 3 miles north of Edgar lake; and in a large syncline about 4 miles northwest of Hematite lake.

Montagnais Group

The Montagnais Group consists of metagabbros and metabasalts. Two different types of metagabbro can be distinguished.

The more common, type I, is a medium- to coarse-grained, often ophitic gabbro with a typical greasy, light green colour on fresh surface.

The type II metagabbro is dark green, fine- to medium-grained, aphanitic at contacts with sediments, and is intercalated with metabasalts.

Type I crops out in large separate masses west of Le Moyne lake and north and northeast of the southern end of this lake. It forms high hills in an otherwise more or less flat terrane covered by moraine deposits.

Type II forms long continuous ridges east of Patu lake and east of Le Moyne lake, just at the border of the map-area.

Both types of gabbro, as well as the basalts, are retrograde. Their mineralogy is: pyroxene (mostly [illegible] as relicts), actinolitic hornblende, saussuritized plagioclase, titanomagnetite, epidote and chlorite. The metabasalts are pillowed in places.

Post-Kaniapiskau Volcanic Rocks

Carbonatites, carbonatite breccia, olivine-melilitite tuffs, meimechite, barite

These rocks occur in the western part of the map-area, mainly west of Hematite and Magnetite lakes. All are undeformed.

Pure carbonatites are rare. They consist of coarse-grained carbonate and include some very fine-grained, chloritized(?) rock fragments. Fluidal texture and flow layering are often visible.

Carbonatite breccias occur in small masses and dykes. No vertical contacts were seen in the area. The fragments of the breccia — 1 mm. to about 10 cm. in diameter — are derived from the host rock and underlying sediments. A big boulder (about 2 feet in diameter) of carbonatite breccia, found close to Hematite lake, contains fragments of the Pre-Kaniapiskau Archean basement rock. The fine-grained to aphanitic, dark gray groundmass consists mainly of carbonate, some serpentine, and some very fine opaque minerals. Few carbonate phenocrysts occur.

The olivine-melilitite tuff is the most common type of this group of rocks. It occurs mainly west of Hematite lake where it forms dykes(?), up to 1.5 miles long, which parallel the strike of the host rock (Sokoman Formation). Dimroth (1969) could prove the intrusive nature of this rock at a locality just south of Hematite lake. The field observations made in the present map-area show no clear evidence for or against intrusive and

crosscutting, or synsedimentary volcanism. The tuff is composed of pea-sized, black lapilli of serpentinized or carbonatized olivine, altered melilite and opaque minerals, cemented together by calcite.

The meimechite crops out at only three places: just north of Sur les Montagnes lake; about 1.5 miles farther north of this lake; and 1.5 miles southeast of Edgar lake. The rock is green, fine-grained, and composed mostly of completely serpentinized olivine, phlogopite-biotite, apatite, a small amount of garnet, opaque minerals, and some carbonate and chlorite.

Barite veins up to 1 inch thick were noted in the Uvé Dolomite about 1.5 miles south of Edgar lake. They may belong to the volcanic suite described in this section. The rock is dark gray and fibrous.

STRUCTURAL GEOLOGY

Almost all the map-area lies in the western part of the Labrador Trough, within a north-northwest-trending structural zone. Two very small areas having an abnormal tectonic pattern — owing to volcanic forces — were observed.

In general, the area consists of a large synclinorium west and northwest of Hematite lake, the Sur les Montagnes Lake thrust zone, and the Edgar Lake anticline. East of this anticline the structural pattern is not clear because of scarcity of outcrop. However, the dark green metagabbros and metabasalts east of this zone again show the general north-northwest-trending structure.

In almost all the map-area the structure is very complex owing to the interlayering of competent and incompetent rocks, and to heavy thrusting from the northeast. This leads to close folding, the overturning of folds, and to thrust slicing mainly in the Sur les Montagnes Lake thrust zone, and in a minor synclinorium north and northeast of Edgar lake.

Small, abnormal, heavily faulted and shattered areas occur at two places in the map-area. They are independent of the general trend; they are due to explosive(?) extrusions of meimechite or to meimechite pipes that did not reach the surface.

A compact green meimechite forms the core of one of these small faulted zones, just north of Sur les Montagnes lake. The core is only about 30 feet in diameter.

At the other occurrence — 1.3 miles north of Edgar lake — a meimechite that failed to pierce the surface is believed to lie below the strongly faulted area.

ECONOMIC GEOLOGY

The map-area is of great economic interest, and considerable prospecting work has been carried out during the past several years. The region is favourable for prospecting, especially for iron, copper and perhaps rare earth minerals and barite.

In the iron-formation the interesting zones, mainly around Hematite lake, were prospected without success for direct-shipping iron ore in the 1950's and early 1960's. More recently,

considerable taconite occurrences led to more prospecting work; large areas were sampled by trenching and claims were staked.

Minor copper showings in sedimentary rocks and in metagabbros close to Patu lake led to exploration work by different mining companies. During the course of the present field work, some more small mineralized zones were noted in a black, fissile argillite at Le Moyne lake and in metagabbros not far from this lake.

Preliminary chemical studies (Dimroth, 1969) on carbonatites and meimechites have not raised hopes of finding economic tenors of rare earth metals in these rocks. However, more chemical work is at present (December, 1971) in progress.

Minor barite showings have already been mentioned in the chapter on "Post-Kaniapiskau Volcanic Rocks".

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