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GEOLOGY

of the

LA LANDE LAKE AREA

New Quebec Territory

Preliminary Report

by

Burkhard Dressler

Québec

1973

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INTRODUCTION

Location and Access

The map-area lies about 180 miles north-northwest of the mining town of Schefferville and is bounded by longitudes  $69^{\circ}00'$  and  $69^{\circ}30'$  and latitudes  $57^{\circ}00'$  and  $57^{\circ}15'$ . It covers about 330 square miles.

Access to the area is by airplane from Schefferville or Fort-Chimo. All large lakes and Caniapiscau river are accessible to float- or ski-equipped aircraft.

Description of the Area

The ground around La Lande lake and in the southwestern part of the map-area is hilly. The highest point lies in this southwestern part and has an elevation of about 1,700 feet above sealevel. Large areas covered by sand or morainic deposits (700 - 900 feet elevation) border Caniapiscau river (200 feet elevation).

The entire area drains to Ungava bay.

The Caniapiscau river-valley and wind-sheltered areas are covered by subarctic forest. The high plains and the hilltops are barren or covered by thick carpets of cladonia (caribou moss).

#### Previous Work

The area lies within a region mapped by FAHRIG (1965)\* at the scale of 1 inch = 4 miles, north of an area mapped by DRESSLER (1973b) at the scale of 1 inch = 1 mile, and west of HASHIMOTO's (1964) Jogues Lake Area (1 inch = 1 mile).

#### Field Work

The present report gives the results of part of the field work carried out during the summer of 1973 (16.06. - 10.09).

Outcrops are plentiful only around La Lande lake, and in the southernmost and northernmost parts of the area. Large, more or less flat, almost completely sand- and morainic- covered areas were examined from an airplane before being traversed on foot.

### GENERAL GEOLOGY

The map-area lies almost completely within the Labrador Trough. All bedrock is Precambrian in age. Archean granites are overlain by sedimentary and volcanic rocks of the Kaniapiskau Supergroup.

This supergroup was tentatively subdivided by Dimroth and al. (1970) into three 'cycles'. Sediments below the Wishart Formation belong to the first cycle;

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\* References at end of report

the Ferriman Subgroup, the Menihek Formation, and siltstones — probably equivalents of the Chioak Formation of the northern Labrador Trough — form the second one; dolomites (Abner? dolomite) and siltstones above the Abner(?) dolomite form the third cyclé in the area. Most of the volcanic rocks of the area are placed within the Montagnais Group.

The sedimentary rocks of the Kaniapiskau Supergroup, mainly in the miogeosyncline (the western part of the map-area), include conglomerates, arkoses, sandstones, siltstones, argillites, cherts, cherty ironstones and dolomites. Volcanics of the miogeosyncline are carbonatite breccias and olivine-melilitite tuffs.

The volcanic rocks of the eugeosyncline (the eastern part of the region) are basalts, gabbros, rhyolites, tuffs and agglomerates. Intercalated in these volcanics are argillites, siltstones and minor conglomerates.

Table I - Table of Formations

Pleistocene and Recent		Morainic deposits, sand, gravel					
- Unconformity -							
Aphebian	Kaniapiskau Supergroup	Knob Lake Group		Abner Formation*	3rd. Cycle	Montagnais Group	
				Chioak Formation*	2rd. Cycle		
				Menihek Formation			
			Ferriman Subgroup	Carbonatite breccias, tuffs			
				Sokoman Formation			
				Ruth Formation			
				Wishart Formation			
		- Unconformity -				1st. Cycle	?
		Swampy Bay Subgroup Pistolet Subgroup Seward Subgroup	In present area: a little sandstone, siltstone and argillite - no subdivision possible.				
		- UNCONFORMITY -					
Archean		Granite (Superior Province)					

\* Tentative classification

PrecambrianArcheanBasement Granites (1)\*

Granite forms the basement in the region. It underlies three sectors within the map-area. Two are outside the Trough — one at the southern, one at the western limit of the map-area. The third occurrence forms an inlier south of La Lande lake.

This granite south of La Lande lake is not a pluton penetrating the overlying sediments, for:

- a) the sediments that are in contact with the granite are unmetamorphosed;
- b) fractures in the granite are, in places, filled with an arkose; and
- c) the sediments dip outward from the granite body.

All granites of the area are pink and mostly coarse grained. They are massive or, rarely, foliated or cataclastic. Their mineralogy is normal: quartz, hypidiomorphic microcline, plagioclase, biotite and, in places, hornblende. Commonly the biotite appears to be chloritized.

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\* Number of rock unit on preliminary map that accompanies this report.

ProterozoicAphebianKaniapiskau Supergroup1st. Cycle (2a, b, c)\*

Sedimentary rocks below the Wishart Formation outcrop at two places in the area studied:

- a) south of the granite body south of La Lande lake;
- b) east of the granite at the southern limit of the map-area.

1a) South of La Lande lake, reddish brown siltstones (2a)\* overlain by medium-grained white or pink sandstones (2b)\* occupy a narrow band between the granite and some outcrops of typical, dark-grey sandstone of the Wishart Formation. No actual contact between these rocks was observed; the white or pink sandstone possibly belongs to the Wishart Formation.

1b) At the other, very small occurrence the rock underlying the Wishart is a black, fissile argillite (2c)\*.

2nd. Cycle

The second cycle comprises the Wishart, the Ruth, the Sokoman, the Menihek and the Chioak Formations. These formations underlie most of the map-area west of Caniapiscau river. Grey and red siltstones below the Abner dolomite are tentatively classified as Chioak Formation.

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\* Number of rock unit on accompanying map.

The Wishart, Ruth and Sokoman Formations belong to the Ferriman Subgroup of the Kaniapiskau Supergroup.

2a) Wishart Formation (3a, 3b)

The Wishart Formation is composed mainly of medium-grained, in places arkosic, sandstone (3a). Commonly it is grey, greenish grey or dark grey and weathers light grey. In a few places it includes grey siltstones.

A possible time-equivalent rock of the Wishart sandstones is a dolomite (3b) observed in the northeastern part of the map-area. It is light grey, weathers light brown, and possibly corresponds to the Lower Dolomite of Auger (1954) and Owens (1955) in the northern Labrador Trough.

2b) Ruth Formation (4)

The Ruth Formation is composed of chert, siltstone and iron-rich argillite.

The base of the formation is marked by a grey, greenish-grey or rarely red chert, 2 - 10 feet thick. However, it was not observed everywhere the Ruth Formation crops out. Above the chert lies:

a) close to Caniapiscau river, a dark-brown-weathering, grey siltstone that contains, in its upper parts, thin, grey, cherty and silty layers. These layers are 5 - 10 mm. thick. A few bands of black, fissile, iron-rich argillite, up to two feet thick, were observed.

b) west of Caniapiscau river, a grey siltstone that, in turn, is overlain by a sequence of oolitic jasper, up to 10 cm. thick, interlayered with brown or black, iron-rich siltstone;

c) northeast of La Lande lake, black, iron-rich argillite and siltstone. These rocks are dark grey or brownish, and weather rusty brown. They are laminated, the laminae being 1 - 10 mm. thick. Rarely, they contain thin chert bands.

The contact between the Ruth Formation and the Sokoman Formation has been drawn where no more silty layers were observed. (However, the rocks of the Sokoman Formation may contain silty components).

2c) Sokoman Formation (5a, b)

The Sokoman Formation crops out in the western half of the area and northeast of La Lande lake. It is composed of cherty ironstones. Hematite iron-formation and silicate-carbonate iron-formation are the major rock units.

The hematite iron-formation (5a) is composed mainly of dark brown-red, oolitic and finely intraclastic ironstones. Rock-forming constituents are quartz, hematite, magnetite and, in minor amounts, carbonates, minnesotaite and stilpnomelane. Bands of brick-red, oolitic and intraclastic jasper are intercalated in the hematite ironstone. They are up to 5 cm. thick and commonly discontinuous. In many places the hematite iron-formation is slightly recrystallized, giving the rock a typical metallic appearance.

The silicate-carbonate iron-formation (5b) consists mainly of dark-grey or greenish-grey, rusty-weathering, chert-rich ironstone. Rock-forming minerals are quartz, carbonates, minnesotaite, stilpnomelane and iron oxides. The rock is banded, at a 2 - 100 cm. scale. The bands contain varying amounts of the above-mentioned minerals. Commonly, carbonate blobs give the rock a typical spotted appearance.

As does the hematite ironstone, the silicate-carbonate ironstone exhibits sedimentary features such as oolites and intraclasts. Some bands of "lean chert" contain oncolites up to 3 cm. in diameter. At a few places crossbedding was observed.

The stratigraphy of the Sokoman Formation in the present area is commonly different from that found in areas to the south (DRESSLER 1973a, b). At one place only (just east of the granite occurrence at the southern limit of the map-area) it can be — as in the south — roughly subdivided into four members:

- d) Upper silicate-carbonate iron-formation;
- c) Upper hematite iron-formation;
- b) Lower silicate-carbonate iron-formation;
- a) Lower hematite iron-formation.

Near Caniapiscau river, however, almost no hematite iron-formation crops out, and silicate-carbonate iron-formation rests directly on the Ruth Formation.

In the southwestern part of the area, almost all iron-formation is hematite ironstone.

#### 2d) Olivine-melilitite tuffs and carbonatite breccias (6a, b)

These rocks crop out in the southwestern part of the map-area in areas underlain by the Sokoman Formation. DIMROTH (1969) and DRESSLER (1973a) classified them as Post-Kaniapiskau. However, new evidence proves these rocks to be of Kaniapiskau age and to be older than the deposition of the Menihek Formation.

a) FRYER (1972) dated the Sokoman Formation at  $1870 \pm 50$  m.y.\* A lamprophyre — termed meimechite by DRESSLER (1973a) — associated with carbonatites, olivine-

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\* Whole rock Rb-Sr

melilitite tuffs and carbonatite breccias of the same kind as found in the present area, was dated by the Geological Survey of Canada (courtesy of K.L. Currie) at  $1873 \pm 53$  m.y.\* (DRESSLER, in preparation).

b) Carbonatites, carbonatite breccias, etc. have never been found in areas underlain by rocks of the Menihek Formation —for instance, in the Moraine Lake East map-sheet (DRESSLER, 1973b). However, south of that map-area (DRESSLER, 1973a) and north of it (this report) they crop out in areas underlain by rocks of the Sokoman Formation.

The olivine-melilitite tuff (6a) consists of black or very dark-green lapilli cemented together by varying amounts of calcite. In thin-section, the lapilli are composed of serpentized, commonly idiomorphic olivine surrounded by pseudomorphosed melilite, carbonate and opaque minerals.

The carbonatite breccia (6b) is a grey, brown-weathering rock that contains fragments of iron-formation, highly strained, subangular or rounded quartz, and olivine-melilitite lapilli, set in a carbonate groundmass. The rock fragments are up to 2 cm. in size, the quartz grains up to 2 mm.

#### 2e) Menihek Formation (7a, b, c)

The Menihek Formation is exposed over large areas west of Caniapiscou river, less so east of the river. It consists of siltstones, sandstones and argillites.

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\* Whole rock K-Ar

The siltstone (7a) is grey and in places laminated. The base contains argillite.

The sandstone (7b) is very fine grained and chocolate brown. It was observed only in the southern part of the map-area.

The argillite (7c) is dark grey or black and fissile. It crops out east and west of Caniapiscaw river and north of the zone underlain by the Menihek siltstone. It possibly grades laterally into this siltstone.

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THE CLASSIFICATION OF THE FOLLOWING TWO MAP-UNITS AS CHIOAK AND ABNER FORMATIONS IS TENTATIVE. In the northern Labrador Trough these formations overlie an iron-formation. Sure correlations between those formations in the south and in this northern section of the Labrador Trough will be possible only after mapping is completed north of the present area.

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2f) Chioak Formation (8)

Rocks that are classified - somewhat arbitrarily - as Chioak Formation crop out in only a very few places in the northwestern part of the area. They consist of argillites, siltstones, and siltstones interlayered with dolomite. No conglomerates were observed.

The classification of these rocks as Chioak Formation is based on stratigraphic evidence. They underlie a dolomite, probably the Abner dolomite.

Just north of the present area, on the western bank of Caniapiscau river at latitude  $57^{\circ}00'17''$ , a section through the Chioak Formation is exposed (table II). However, no contact with typical Menihek Formation was observed. Therefore, lower portions of the sequence described in table II may possibly belong to the Menihek Formation.

Table II - Chioak Formation

Abner Formation	siltstone dolomite dolomitic sandstone dolomite
Chioak Formation	<p>(Repetition of part of the upper sequence due to drag-folding).</p> <p><u>siltstone</u>: red and grey, dolomitic (±40')</p> <p><u>dolomite and argillite</u>: pinkish-white, brown-weathering dolomite, up to 15 cm. thick, interlayered with silty, green, brown or red, laminated argillite (±18')</p> <p><u>siltstone and dolomite</u>: dolomitic siltstone, finely laminated, interlayered with dolomite bands up to 5 cm. thick (±30')</p> <p><u>siltstone</u>: grey, dolomitic (±17')</p> <p><u>siltstone and dolomite</u>: grey, dolomitic siltstone, dolomite lenses and discontinuous dolomite bands (±18')</p> <p><u>siltstone</u>: grey, somewhat dolomitic, laminated; in places fine-grained sandstone (±65')</p> <p><u>siltstone</u>: dark grey (±75')</p> <p><u>argillite</u>: grey, in places silty and laminated (&gt;50')</p>
? ? Menihek Formation	? — ? — ? — ? — ?

### 3rd Cycle

The third cycle of sedimentation in the Labrador Trough began, according to Dimroth et al. (1970), with the deposition of the Abner dolomite.

#### 3a) Abner Formation (9a, b, c)

The Abner Formation crops out in the northwestern part of the present area. It consists of a dolomite (9a - "Abner Dolomite"), a dolomitic sandstone (9b) interlayered with the dolomite, and siltstone and argillite (9c)\* overlying the dolomite.

The Abner dolomite (9a) is aphanitic or fine-grained, recrystallized and exhibits different colors. Commonly it is grey and weathers light grey, but white, pink, red and buff colors were also observed. Chert stringers are common. In many places it is intraclastic, intraclasts being 0.5 to 3, rarely up to 30 cm. in size. Some of it contains fine to coarse quartz grains.

Stromatolites in the dolomite are abundant. Commonly they are turbinate or bulbous and contiguous. Topmost individuals of coalescent forms are up to 60 cm. in diameter. The laminae of the stromatolites are commonly marked by thin layers of black chert.

A band of dolomitic sandstone (9b) in the dolomite is about 50 feet thick. In places two layers of this sandstone were observed. The quartz is medium

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\* These siltstones and argillites are tentatively classified as part of the Abner Formation.

or coarse grained, subangular to rounded, and is set in a grey or buff dolomitic matrix, the quartz making up 60% or more of the rock. In places, the rock contains clasts, up to 4 cm. in size, of dolomite or dolomitic sandstone.

The siltstone (9c) that overlies the Abner dolomite is grey and weathers light buff. It is commonly interlayered with beds of grey argillite. In a few places it grades into a fine-grained sandstone.

Non-subdivided Kaniapiskau Supergroup (Map-units 10-13)

Map-units 10-13 are lithologically indistinct. They crop out in areas almost completely underlain by volcanic rocks or form more or less isolated exposures in otherwise sand-covered areas. A stratigraphic classification is not possible.

Map-unit 10 consists of a boulder conglomerate underlying rhyolite in the northern part of the area. The boulders are up to 1½ feet long, commonly elliptic, and are set in a fine-grained, black, silty matrix. They consist of a medium-grained sandstone that contains a few small volcanic fragments.

Map-unit 11 comprises medium-grained sandstones, arkoses and greywackes.

Map-unit 12 is a dark grey siltstone.

Map-unit 13 is a black, fissile argillite.

Volcanic rocks of the Kaniapiskau Supergroup

Montagnais Group (Map-units 14-17)

Volcanic rocks of the Kaniapiskau Supergroup consist of basalts, gabbros, rhyolites, tuffs and agglomerates. They crop out in the eastern part of the map-area.

It is to be noted that the Montagnais Group is not a stratigraphic unit. As used in this report, it comprises all volcanic rocks except the carbonatite breccias and olivine-melilitite tuffs described previously. One is tempted to classify the Montagnais volcanics with the sediments that they intruded or on which they extruded. However, uniform appearance, petrography and chemistry makes the approach faulty. Only the presence of rhyolitic flows might allow part of the volcanic sequence to be classified as Murdoch Formation (Baragar, 1967), as in the Schefferville district, where it overlies the Menihek Formation.

The basalts (14) are aphanitic or fine grained and rarely porphyritic or vesicular. They are dark grey or greenish grey and commonly weather greenish brown. In many places they are pillowed, the pillows being some inches to 10 feet across.

The gabbros (15) are fine to medium grained, green or grey-green, and weather brown or greenish grey. Gradations from basalt to gabbro were observed along the strike of mountain ridges.

The rhyolites (16) are quite abundant, compared with all regions in the Labrador Trough south of the present area. The common rhyolite is dark grey or black and weathers light grey. In a few places it is vesicular. Laminated rhyolites were rarely observed, the laminae being a few millimetres thick. At one occurrence, on a peninsula in southeastern La Lande lake, a rhyolite breccia underlies a

laminated rhyolite that, in turn, is overlain by normal rhyolite. Perlitic rhyolite is scarce, the pearls being up to 1.3 mm. in diameter.

The tuffs and agglomerates (17) form layers several feet thick. They are green or greenish grey and commonly foliated or sheared. Fragments in the agglomerates are up to 6 cm. in size.

#### Pleistocene and Recent (18)

Large areas are covered by tills and stratified deposits. Loose material of all sizes is found on the high plains west of Caniapiscau river, whereas east of the river stratified sand predominates. Close to the river sand deposits reach thicknesses of more than 100 feet.

Glacial striae trend between  $010^{\circ}$  and  $120^{\circ}$ , mostly around  $040^{\circ}$ . Wherever indicative they show the true direction of ice-movement to be northeastward.

#### STRUCTURAL GEOLOGY

Almost all the map-area lies within the Labrador Trough. In general, the rocks trend north-northwest. In the northern part of the area, west of Caniapiscau river, they form a large syncline. South of this, the structural pattern is not clear because of scarcity of outcrop. Here the structure is very complex. Close folding and thrust faults were observed. In places, fold axis are perpendicular to those of neighboring folds. At the southern limit of the area a granite is thrust over sediments. East of Caniapiscau river the structure seems to be more or less uniform, trending north-northwest.

All rocks in the area are only slightly metamorphosed (low green schist facies).

#### ECONOMIC GEOLOGY

Mining companies have long been interested in the area. It is favourable for prospecting, especially for iron.

In the 1950's exploration for direct-shipping iron-ore was carried out, but without much success. Highly magnetic taconite could warrant more exploration.

Gabbros, basalts and rhyolites contain finely disseminated sulfides in many places; specimens from two small gossan zones in rhyolite were sent to the Laboratories of the Quebec Department of Natural Resources for chemical analysis.

Very minor galena showings in the Abner dolomite are probably of no economic importance.

#### GEOCHEMISTRY

Concurrently with the geologic mapping, stream-sediment samples were collected from certain watercourses. Close to the banks of Caniapiscau river, above its high-water level, samples were taken from small streams.

The samples were sent to the Department's Laboratories Services, and are being analysed for Cu, Zn, Pb, Ni, Ag, Mn, U and Sb.

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