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## THE BLACK RIVER GROUP IN THE REGION BETWEEN MONTREAL AND QUEBEC.

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### ABSTRACT.

The Black River Group of formations (Middle Ordovician) in the district between the cities of Montreal and Quebec, on the north shore of St. Lawrence River is described.

Detailed sections, with lists of fossils, are given for exposures along the Ouareau River near Joliette; the Radnor Forge and Fontain quarries in the St. Maurice district; and along the St. Anne and Jacques Cartier Rivers.

It is concluded that the Pamela formation extends east of Montreal, at least as far as Joliette, and that the Leray is present as far east as the St. Anne River. A transition zone between the true Leray (Chaumont) and the true Trenton is recognised in the Ouareau River section.

During the summer of 1937, I visited several localities in the region between the cities of Montreal and Quebec. This afforded a splendid opportunity to extend my previous study of the Black River Group in the immediate vicinity of Montreal. I am much indebted to Prof. F. F. Osborne and Prof. T. H. Clark of McGill University for their many courtesies and an actual assistance in the collection of fossils.

In the region under discussion, the Palaeozoic formations form a continuous belt, in general paralleling the northeastern course of the St. Lawrence River. The width of the belt varies from over 25 miles at Montreal to only about two miles near Deschambault. On the northwest the belt is bounded by the Pre-Cambrian rocks of the Canadian shield, on the southeast the boundary is formed by the River.

The Palaeozoic formations represented in the region range from the Potsdam sandstone to the Utica shale. The Black River Group outcrops in a narrow band, within the belt, interrupted at several points by faults or tongue like extensions of the Pre-Cambrian. Eastward the Group extends at least as far as the St. Anne River. The Black River Group consists of three formations,—the Pamela, Lowville, and Leray. These subdivisions were firmly established by the work of

Raymond in 1911 and 1912, and are accepted by the Geological Survey of Canada and later workers in the region.

The Pamela is a dolomitic and shaly formation, thinning eastward from its typical development in the Ottawa River valley, and in general is not fossiliferous at, and east, of Montreal. It was originally (Raymond, 1912) thought not to extend beyond L'Original, but the work of T. H. Clark, J. J. Harris, and V. J. Okulitch established its presence at Montreal. Present work extends its range as far east as Joliette. The Lowville and Leray are limestone formations, resembling both lithologically and faunally the standard sections in the state of New York.

The region has previously received attention from several prominent geologists. The earliest geological report was by Sir William Logan (1852-53). Later, R. W. Ells, P. E. Raymond, and W. A. Parks have contributed to the knowledge of the geology of the district.

Of particular importance are the reports by Logan, Raymond, and Parks. Logan describes practically all the outcrops of Palaeozoic rocks in this district, and his paper is the most important and authoritative guide for any one working in the area. Parks gives detailed descriptions of several sections, including the very complete one on the Ouareau River. The work of P. E. Raymond (1911, 1912) establishes the broader subdivisions of the Trenton and offers some suggestions of correlation between the eastern and western portions of the area, besides describing the Trenton at Lorette and Neuville.

The Black River group, so far, has been treated either as a part of the Trenton, or at best as a unit without attempting to subdivide it into its component formations. It is my intention to do this in this paper.

It is proposed to describe the sections systematically going from west to east.

#### THE OUAREAU RIVER SECTION.

The section is located on the Ouareau River, tributary to the Assumption River, about four miles west of the town of Joliette, and about 40 miles NNE of Montreal.

The Ordovician section on the Ouareau River starts with an exposure of Beekmantown, under the highway bridge at the village of St. Liguori. The Beekmantown here is a thin bedded, flat lying, sandy formation with indistinct fossils. For about two miles below this, all outcrops are hidden, and the next out-

crop is near the bridge on the highway from Joliette to St. Jacques. The section starts with Pamela and extends without interruption into the middle Trenton. There is another break here, and the section is resumed at the Crabtree village, where the *Rafinesquina deltoidea* beds, typical of the Upper Trenton, are exposed.

As already stated by Parks (1930) the section on the Ouareau River is supplemented by the section on the Assomption River. However the greater accessibility, and absence of faulting on the Ouareau River, make it a better standard Black River-Trenton section for the region.

Only the Black River section is considered in this paper. The work on the Trenton is in progress and will be published as soon as possible.

DESCRIPTION OF SECTION.

*Top of section.*

Bed Nos.	<i>Top of section.</i>	Thickness. Indi- Cumu- vidual lative
	<i>Base of Middle Trenton.</i>	
	<i>Top of Lower Trenton.</i>	
	Typical Lower Trenton, dark grey and buff coloured limestone with <i>Dalmanella rogata</i> , <i>Platystrophia amoena</i> , <i>Rafinesquina cf. alternata</i> , <i>Camarella hemiplicata</i> , etc.	
	Conglomeratic bed at base.	80 ft. 144'- 1"
	<i>Base of Trenton.</i>	
	<i>Ouareau transition beds.</i>	
12.	Thin bedded, dark, bluish limestone outcropping immediately below the highway bridge. <i>Columnaria halli</i> , <i>Dalmanella rogata</i> , <i>Hormotoma gracilis</i> , <i>Helicotoma cf. planulata</i> .	19 ft. 64'- 1"
	<i>Top of typical Leray.</i>	
11.	Prominent massive bed, hard, bluish limestone, light grey on weathering. <i>Stromatocerium rugosum</i> , <i>Columnaria halli</i> .	3'-4" 45'- 1"
10.	Irregular, thick and thin beds of brownish black, slightly bituminous limestone. <i>Stromatocerium rugosum</i> , <i>Tetradium fibratum</i> , <i>Columnaria halli</i> , <i>Strophomena cf. filitexta</i> , <i>Isotelus cf. gigas</i> .	9'-3" 41'- 9"
9.	Fairly massive bluish grey limestone with reticulated shale. <i>Columnaria halli</i> , <i>Solenopora compacta</i> .	1'-6" 32'- 6"
8.	Thin bedded rubbly limestone. <i>Stromatocerium rugosum</i> , <i>Lambeophyllum profundum</i> , <i>Columnaria halli</i> , <i>Tetradium fibratum</i> , <i>Strophomena incurvata</i> , <i>Cyrtodonta cf. canadensis</i> , <i>Hormotoma gracilis</i> , <i>Orthoceras cf. junceum</i> , <i>Isotelus cf. gigas</i> .	5'-1" 31'- 0"

Bed Nos.	Top of section.	Thickness.	
		Individual	Cumulative
7.	Dark grey, brownish weathering limestone with thin layers of hard blue limestone. Numerous large <i>Strophomenids</i> . <i>Tetradium fibratum</i> , <i>Columnaria halli</i> , <i>Batostoma canadensis</i> , <i>B. superbum</i> , <i>Solenopora compacta</i> , <i>Strophomena incurvata</i> , <i>Rafinesquina grandis</i> , <i>Cyrtodonta cf. huronensis</i> , <i>Lophospira perangulata</i> , <i>Orthoceras multicameratum</i> , <i>O. cf. ottawaense</i> , <i>Schizocrinus nodosus</i> .	5'-5"	25'-11"
6.	Dark, brownish or bluish black limestone, dove grey on weathering, with very uneven surface. Splits into 5" beds. A <i>Stromatocerium</i> reef. <i>Stromatocerium rugosum</i> , <i>Columnaria alveolata</i> , <i>Columnaria halli</i> , <i>Solenopora compacta</i> , <i>Actinoceras cf. gracile</i> , <i>Actinoceras tenuifilum</i> , <i>Orthoceras multicameratum</i> , <i>O. ottawaense</i> , <i>Endoceras proteiforme</i> .	2'-5"	20'- 6"
5.	Dark hard limestone. No fossils.	4"	18'- 1"
4.	Honey-combed or pitted, hard, dark blue limestone. The pitting is caused by differential weathering out of shaly patches. Very few fossils. <i>Base of Leray.</i> <i>Top of Lowville.</i>	9"	17'- 9"
3.	Bluish grey to dove grey limestone with some oölitic layers. Typical "birdseye" limestone. Tetradium beds. Abundant fossils: <i>Phytoopsis tubulosum</i> , <i>Stromatocerium rugosum</i> , <i>Tetradium cellulosum</i> , <i>T. fibratum</i> , <i>T. clarki</i> , <i>Pachydictya acuta</i> , <i>Solenopora compacta</i> , <i>Cyrtodonta cf. huronensis</i> , <i>Lophospira perangulata</i> , <i>Hormotoma gracilis</i> , <i>Orthoceras cf. multicameratum</i> , <i>Schizocrinus nodosus</i> , <i>Leperditia canadensis nana</i> , etc. <i>Base of Lowville.</i> <i>Top of Pamela.</i>	9'-0"	17'- 0"
2.	Rubbly and nodular, impure limestone. Fragmental fossils. Unidentifiable gastropods.	2'-0"	8'- 0"
1.	Very hard, light grey, brown weathering dolomitic limestone or dolomite. Fossils scarce. <i>Rhyncotrema increbescens</i> , <i>Strophomena cf. corrugata</i> . <i>Base of section.</i>	6'-0"	6'- 0"

The Pamela beds are the ones farthest upstream in the section, outcropping a few hundred feet above the ruins of an old mill, north of the highway bridge.

Beds 1 and 2 closely resemble lithologically the Pamela at Montreal. The presence of *Rhyncotrema* and *Strophomena*, quite definitely indicate that the beds are of the Black River

rather than Chazy age, as supposed by Parks (1930). They are also quite different from the typical Chazy as seen about four miles east on the Assomption River at Joliette. At Montreal (Okulitch 1936), the Pamela is nine feet six inches thick and consists of yellow weathering dolomitic limestone without fossils. The Ouareau Pamela is therefore only slightly thinner, while the presence of the few brachiopods might indicate slightly clearer waters.

The Lowville, is typical dove-grey, buff weathering limestone with birdseyes (*Phytopsis tubulosum*) and abundant *Tetradium cellulosum*, typical of the formation elsewhere. The thickness of nine feet is considerably less than the 16 feet at Montreal, or 30 feet at Ottawa. The fauna is notably poorer in the number of species. The vertical range of the formation is determined by the presence of *Tetradium cellulosum*, which was not seen above bed 3. Although it might be a local condition, it was decided to follow the practice established at Montreal, and restrict the Lowville to the range of *T. cellulosum*. This view is also supported by the lithology; the beds included in the Lowville forming a natural group.

The overlying Leray is a thick formation made up of thin and thick limestone beds of generally bluish-grey colour, with occasional shaly partings. The total thickness to the base of the bed 12, is 28 feet. This compares very closely with the 22 feet at Montreal. The formation on the Ouareau differs in several respects from that at Montreal. Lithologically the difference is in the absence of chert and the irregular brownish sandy layers, so characteristic of the Pointe Claire section. The beds are relatively thinner with greater amount of shaly material. In other words the Leray resembles Lowville here more than it does at Montreal. The greatest faunal difference is the abundance of *Stromatocerium* and *Tetradium fibratum*. The latter is entirely absent from the Leray at Montreal, being there confined to the Lowville. However, the presence of large cephalopods; the corals—*Columnaria halli*, and *C. alveolata*, plus the typical brachiopods such as *Rafinesquina clara*, and *R. grandis*; and the gastropods, all indicate a close general similarity.

Of especial interest is the succeeding series of beds, marked 12 (the Ouareau transition beds). Lithologically the beds are very similar to the underlying Leray, and the natural tendency is to include them with the Leray. However, faunally there are sufficient differences from both the Trenton and the Leray to warrant special treatment.

In the Montreal region, and also at points farther east, the lowest beds of the Trenton are typically indicated by the presence of *Dalmanella rogata* and an allied fauna of brachiopods such as *Camarella hemiplicata*, and *Platystrophia amoena*. These forms are not known in the Leray. On the other hand, hereabouts, *Columnaria halli*, does not extend into the Trenton. In beds designated 12, both *Columnaria halli*, and *Dalmanella rogata* occur together, thus creating a transition zone between the typical Leray and the typical Trenton of the region.

These beds are absent at Montreal, and are also absent farther east. It is therefore concluded that this is a local condition. Unfortunately the available collection of fossils from these beds is not complete enough to permit correlation with points farther west.

The lowest Trenton bed is indistinctly conglomeratic, and the one immediately above it is the typical fairly coarsely grained Trenton limestone containing the usual Trenton brachiopods. *Platystrophia amoena* and *Dalmanella rogata* are fairly common, but *Camarella hemiplicata* is very rare in this locality.

The next important Black River section is found about 50 miles north-east of Joliette, on Rivière du Lard, a tributary to the Champlain River. This outcrop is best reached from the Three Rivers-Shawinigan Falls highway. The main highway is followed north from Three Rivers to St. Maurice Quarries just north of St. Louis, and then a side road running in a general NE direction to St. Narcisse. The limestone outcrops at St. Maurice Quarries are fairly high Trenton, and are to be described later.

The Rivière du Lard section starts at the bridge of the St. Narcisse road over the Rivière du Lard creek, about six miles north-east of the main highway. Following the creek southward, very good exposures of the Black River limestone are seen along the creek, and in the abandoned Radnor Forge and Fontain quarries. About half-way between the Radnor Forge and Fontain quarries the lowest Trenton beds with abundant *Receptaculites* and *Camarella hemiplicata* appear.

Because of very gentle undulation of the strata the same series of beds are exposed along the creek and in the Radnor Forge quarry. The quarry is the most convenient place for collecting and making measurements. About half a mile south from the Radnor Forge quarry, the Rivière du Lard pierces the outcrops of Trenton and Black River limestones, and flows in a narrow valley deeply covered with drift. Just at the end

of the outcrops a narrow dell is formed in the Trenton rocks. The Fontain quarry was opened at this point. Here both the Lowest Trenton and the Uppermost Black River are well exposed.

The contact of the two formations is very sharp both faunally and lithologically. I consider this one of the best localities in the whole region for studying the Black River-Trenton boundary.

This set of outcrops is most conveniently taken up as three units:—(1) The Radnor Forge quarry and the outcrops north of it, (2) the outcrops along the Rivière du Lard, south of Radnor Forge quarry, (3) the outcrops in the Fontain quarry.

RADNOR FORGE QUARRY.

Only the Leray formation of the Black River Group can be seen in the Radnor Forge quarry. The quarry is very shallow, and since the beds lie nearly horizontally, a thickness of only 13.5 feet is exposed. The data given here are the results of combining the measurements and collections from three subsections along the quarry wall. The section begins at the level of the creek.

Bed numbers.	<i>Top of section.</i>	Individual thickness.
16.	Dark grey, weathering light grey to cream, somewhat fractured and irregular limestone. <i>Lambeophyllum profundum</i> , <i>Rafinesquina clara</i> , <i>R. minnesotensis</i> ?, <i>Helicotoma planulata</i> .	11"
15.	A thick, massive bed, in places coalescing with the overlying 16. Dove-grey, fine grained limestone, weathering white or cream-white; contains stringers of chert. The lighter portions resemble the "sandy streaks" in the upper Leray of Pointe Claire, Que. Lower surface carries numerous bryozoa and algae. <i>Columnaria halli</i> , <i>Tetradium cf. fibratum</i> , <i>Helicotoma planulata</i> , <i>Bumastus milleri</i> , <i>Leperditia cf. fabulites</i> .	14"-18"
14.	A very prominent and regular bed, in places forming an overhanging ledge. Made of light weathering, dark grey to bluish grey limestone with some chert stringers and streaks of sandy material. <i>Stromatocerium rugosum</i> , <i>Rafinesquina minnesotensis</i> , <i>Liospira cf. larvata</i> , <i>Actinoceras bigsbyi</i> .	14"-26"
13.	A somewhat rubbly and shaly limestone, with lenses of hard, dark, very fine-grained limestone. Thickness of the bed is very irregular. Lower surface very uneven. <i>Stromatocerium rugosum</i> , <i>Tetradium fibratum</i> , <i>T. clarki</i> (?), <i>Columnaria halli</i> , <i>Lambeophyllum profundum</i> .	6"-28"

Bed numbers.	Top of section.	Individual thickness
12.	Massive, fine grained, brownish to dove grey limestone with conchoidal fracture. Some shaly material arranged in veinlets. <i>Stromatocerium rugosum</i> , very large heads of <i>Columnaria halli</i> , <i>Tetradium fibratum</i> , <i>Lambeophyllum profundum</i> , <i>Rafinesquina alternata</i> , <i>R. minnesotensis</i> , <i>R. williamsi</i> , <i>Hormotoma gracilis</i> , <i>Cyrtoceras cf. falx</i> , <i>Orthoceras sp. ind.</i> , <i>Leperditia cf. fabulites</i> , <i>L. canadensis</i> .	20"
11.	Dark, fine grained limestone, considerably fractured, occasionally breaking into several thinner beds. <i>Stromatocerium rugosum</i> , <i>Columnaria halli</i> , <i>Lambeophyllum profundum</i> , <i>Homotrypa sp.</i> , <i>Helicotoma planulata</i> .	24"
10.	Massive, dark fine-grained limestone followed by a shaly parting. Not fossiliferous.	9"
9.	Dark grey, light grey weathering limestone with crystals of pink calcite. <i>Hormotoma gracilis</i> , <i>H. wilsoni</i> , <i>Omospira cf. laticincta</i> , <i>Lophospira bicincta</i> , <i>Helicotoma planulata</i> .	2"
8.	Massive bed of dark grey limestone containing pink crystals of calcite and small pieces of black mica. <i>Actinoceras bigsbyi</i> , <i>Orthoceras cf. multicameratum</i> , <i>Bumastus milleri</i> .	5"
7.	Brownish weathering, dove grey limestone splitting	
6.	irregularly into two or three beds about 3" thick.	9"—10"
5.	<i>Columnaria halli</i> , <i>Lambeophyllum profundum</i> , <i>Hormotoma gracilis</i> .	
4.	Nodular limestone with shaly partings. <i>Lambeophyllum profundum</i> .	4"
3.	Bluish grey limestone. Unfossiliferous limestone. Very few brachiopod fragments.	4"
2.	Gap in section.	12"—16"
1.	Composite, three bedded layer, of brown weathering dark grey limestone. Individual beds 2"—3" thick. <i>Lambeophyllum profundum</i> , <i>Tetradium fibratum</i> , <i>Stromatocerium rugosum</i> , <i>Hallopora sp.</i> , <i>Strophomena incurvata</i> , <i>Rafinesquina cf. alternata</i> , <i>Lophospira bicincta</i> , <i>Liospira cf. peneplana</i> , <i>Hormotoma gracilis</i> , <i>Actinoceras cf. billingsi</i> , <i>Orthoceras cf. multicameratum</i> , <i>Bumastus milleri</i> , <i>Leperditia canadensis</i> .	20"
	Bottom of section at creek level.	Maximum thickness 13.5 ft.

All beds exposed in the Radnor Forge quarry are in my opinion of Leray age. The presence of *Columnaria halli*, *Tetradium fibratum*, *Stromatocerium rugosum*, and the usual typical Leray gastropods seem to be conclusive. Neither the bottom nor the top of the formation is exposed. The lower beds are comparatively thin bedded,—the fossils are predominantly gastropods and cephalopods. The higher beds are

thicker, and the corals, especially *Columnaria halli*, become comparatively more abundant.

Although in places the fossils are fairly numerous, and some individuals reach to an exceptional size, thus one *Columnaria halli* head, accurately measured, was found to be 45 inches in diameter and ten inches high, the general impression is that fossils are considerably less abundant than in the corresponding beds of the Montreal Leray. The comparative scarcity of the large cephalopods is especially noteworthy.

Lithologically the limestone at Radnor Forge quarry does not resemble the Montreal Leray. The beds are in general thinner, darker in colour, and lack the chert nodules. Sandy stringers are, however, present. The presence of several shaly partings, and the sandy lenses suggest rather unstable conditions of depth and currents, possibly close to the shore line.

#### Section exposed along the Rivière du Lard.

North of the Radnor Forge quarry, and between it and the highway bridge, beds similar to those in the quarry are exposed. Because of very gentle dip, and some warping, no lower horizons are exposed, and the top of the Lowville is not reached.

South of the quarry isolated outcrops of Leray continue:— the beds exposed being of the same character as those in the Radnor Forge quarry. About one half-mile down, at the second sharp bend of the stream, the creek begins to cut continuously through limestone, forming narrow dells. The Lowest Trenton beds come in at this point. The fossils are fairly numerous, all of decidedly Trenton aspect.

#### FAUNA.

*Endoceras proteiforme* Hall  
*Platystrophia cf. amoena* McEwan  
*Prasopora simulatrix* Ulrich  
*Receptaculites sp.* (very abundant)  
*Sowerbyella sericea* Sowerby  
*Lingula* fragments,  
*Hallopora sp.*

It seems, therefore, that the upper Leray beds along the river are hidden, and that the Trenton follows bed 16. The *Receptaculites* beds follow the river down to the Fontain quarry, where a slight up-arching of the strata again exposes the underlying Leray.

*Fontain Quarry.*

The Fontain quarry is in a semi-operating condition. It is a small pit, carved out of the southern-most edge of the dells of the Rivière du Lard. The quarry is about one mile south of the St. Narcisse highway, and about half a mile north of the St. Louis road.

The total thickness of beds exposed is 14 to 16 feet, of which only the lower four feet are Leray. The Leray contains the usual fauna of large cephalopods, *Columnaria halli*, *Lambeophyllum profundum*, *Stromatocerium rugosum*, and the typical gastropod assemblage. This is followed by a shaly parting, marking the Black River-Trenton boundary, above which the typical Trenton limestone comes in with abundant *Camarella hemiplicata*, *Platystrophia amoena*, *Dalmanella rogata*, *Rafinesquina cf. alternata*, *Prasopora cf. simulatrix*, *Receptaculites*, and *Phragmolites compressus*.

The change both in lithology and fauna is striking, and is at best as good as the Black River-Trenton contact at St. Vincent de Paul, near Montreal. There is no transition zone as on the Ouareau River. The Leray surface is uneven, with large heads of *Columnaria* and *Stromatocerium*, but any suggestion of erosional or angular unconformity is lacking. The dip is south at two degrees.

## BLACK RIVER FAUNA AT THE FONTAIN QUARRY.

*Tetradium cf. fibratum* Safford  
*Stromatocerium rugosum* Hall  
*Columnaria halli* Nicholson  
*Lambeophyllum profundum* (Conrad)  
*Hormotoma gracilis* (Hall)  
*Lophospira biccincta* (Hall)  
*Ormoceras sp. ind.*  
*Actinoceras cf. bigsbyi* Bronn  
*Orthoceras multicameratum* Emmons  
*Isotelus cf. gigas?* deKay

It is significant that here as at Montreal and Quebec the lowest Trenton carries the *Camarella hemiplicata* fauna.

*St. Anne River.*

In the area east and northeast of St. Maurice valley outcrops are few and mostly of Precambrian age. On crossing this Precambrian axis, Ordovician beds again reappear in the St. Anne River valley. Near the village of St. Alban, where the highway from St. Marc crosses the river, the lowest exposed beds

are probably of Upper Leray age. The evidence is not quite sufficient, but presence of such fossils as *Columnaria halli* and *Stromatocerium rugosum*, the large cephalopods, and the stratigraphic position of the beds make this probable. There is some faulting on the St. Anne River, which considerably increases the apparent thickness of the Trenton.

*Description of Section on St. Anne River near St. Alban.*

From the water's edge the first four to five feet are fine-grained, bluish-black limestone with numerous shaly stringers and containing *Lambeophyllum profundum*, *Columnaria halli*, *Stromatocerium rugosum*, and *Actinoceras* or *Ormoceras*.

Immediately above this is about 50 feet of typical thin bedded Trenton, with some shaly partings in the lower part and becoming more crystalline, massive and lighter coloured toward the top. The fauna of the lowest Trenton beds consists mostly of *Hormotoma gracilis*, *Rafinesquina cf. alternata*, *Sowerbyella sericea*, *Dalmanella rogata* and the bryozoa.

Lithologically the Leray looks unlike the Leray elsewhere. It is criss-crossed with numerous shaly and siliceous stringers and is greyish blue on weathering. There is no angular unconformity between the Trenton and the Black River, but the contact is marked by a shaly parting with some broken up fossils. The lowest Trenton bed, especially the first inch of it, contains numerous grains of sand, which have a wind blown appearance, and possibly suggests that the sea either withdrew temporarily or that the shore line was very close.

For one to three quarters of a mile down the river, successively higher beds of the Trenton are exposed. However, at the first sharp "S" curve of the river is an important fault. The fault surface is nearly vertical, striking almost due east-west. The rock in the immediate proximity to the fault is shattered and brecciated. The up-thrown southerly side is displaced anywhere from 150 to 200 feet, and so brings the lower Trenton to the surface again. The lowest beds contain *Columnaria halli* and so possibly are either Black River or the lowest Trenton. Lack of sufficient diagnostic fossils makes accurate determination impossible.

*Section on Jacques Cartier River at Pont Rouge.*

An excellent Trenton section is exposed on the Jacques Cartier River. No systematic work was done at this locality and it is therefore impossible to arrive at very definite conclusions.

From a hurried examination of the section, however, it seems that the beds are of the lower Trenton age, with the possibility that the Black River group or a transitional zone or group of beds higher than the Leray is present.

The reasons for thus thinking are: the presence of *Hormotoma gracilis*, *Columnaria halli*, *Actinoceras* and *Endoceras*, and the general lithological resemblance to the Leray farther west. These problematical beds are best exposed in a small quarry, right on the river bank, below the highway bridge at Pont Rouge. Overlying them is some 30 feet of Trenton, with the usual Trenton assemblage of fossils,—among which *Receptaculites*, *Dalmanella*, *Rafinesquina cf. alternata*, *Camarella* and *Prasopora* are prominent.

#### SUMMARY.

From the foregoing it is clear that Black River Group is exposed north of St. Lawrence River, in the region between Montreal and Quebec, and is easily distinguishable from the overlying Trenton. It seems that it extends east at least as far as the St. Anne River, and possibly even as far as Jacques Cartier River.

Throughout its extent from Montreal to St. Anne River the group is characterized by certain fossils, which, although they may not be unailing guides to the Black River formations elsewhere, seem to be restricted to the group in this region. Among such fossils *Columnaria halli*, *Tetradium fibratum*, *T. cellulosum*, *T. clarki*, *Lambeophyllum profundum*, *Stromatocerium rugosum*, *Lophospira biccincta*, *L. perangulata*, *Actinoceras billingsi* and *Orthoceras multicameratum* seem to be good guides to the group.

The lowest Trenton in most places is easily distinguished by the presence of *Dalmanella rogata*, *Platystrophia amoena*, *Camarella hemiplicata*, and the typical Trenton trilobites. On the Ouareau River the situation is made somewhat more complex by a presence of 19 feet of beds in which the typical Trenton and Black River fauna seems to be intermingled. So *Columnaria halli*, *Stromatocerium rugosum*, and *Dalmanella rogata* occur together. The lithology of the beds in question is of the Leray type. Further work might make it desirable to separate these beds into a distinct formation, to which the name of Ouareau formation would be appropriate. At present, however, until a fuller collection of fossils is made from these beds,

it is believed better to leave them as simply the Ouareau transitional zone.

Faunally the Black River Group in this region is poorer, but quite similar to the Black River of Montreal. Lithologically there are differences, of which the absence of chert in the Leray is the most striking one. On the whole the district is a difficult one in which to trace out stratigraphic units. Outcrops are few and far between, and when found, in many instances, only a few beds are exposed. The fossils are mostly very poorly preserved. However, the typical forms can be recognised even when fragmentary. I might add, that the type of preservation is such, that in many cases actual collecting is made impossible, and it is necessary to identify the fossils in the field.

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