GEOLOGICAL SURVEY OF CANADA

ROBERT BELL, D.Sc. (CANTAB.), M.D., LL.D., F.R.S., I.S.O.

# REPORT

ON AN

# EXPLORATION

OF

# EKWAN RIVER, SUTTON MILL LAKES

## ERRATA

NOTE.—The map of Ekwan river, Sutton Mill Lakes and Trout river, has been incorporated in the map of Northwestern Ontario and Eastern Keewatin, No. 814, which accompanies Part A, Vol. XV, and does not appear in this report.

OTTAWA

PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1904

14—F

No. 815.

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ON AN

# EXPLORATION

OF

# EKWAN RIVER, SUTTON MILL LAKES

AND

# PART OF THE WEST COAST OF JAMES BAY

BY

D. B. DOWLING, B.Ap.Sc.

APPENDIX I.—*Preliminary list of fossils by Dr. J. F. Whiteaves.*
" II.—*List of plants by Prof. John Macoun.*

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To Robert Bell, M.D., L.L.D., F.R.S., ETC.

Director Geological Survey of Canada.

SIR,—I have the honour to submit the accompanying report for 1901 on the country traversed by the Ekwan river and of a route thence northward through Sutton Mill lakes and down Trout river to Hudson bay, together with a short description of the west coast of James bay. The map which accompanies the report is compiled from our own survey of Ekwan river to Washagami river and track-surveys of the route northward to Hudson bay with log-survey of Sutton Mill lakes and part of the west shore of James bay. In this work I was ably assisted by Mr. W. H. Boyd who performed most of the instrumental surveying. A list of the fossils collected, by Dr. Whiteaves and another of the plants by Prof. Macoun, are appended.

I have the honour to be, Sir,
Your obedient servant,

D. B. DOWLING.

Geological Survey Office,
Ottawa.

# REPORT

ON A

# SURVEY OF THE EKWAN RIVER

AND OF THE

## ROUTE THROUGH SUTTON MILL LAKES NORTHWARD

By D. B. Dowling.

General features.

The country included in the angle between Hudson bay and the west shore of James bay, is drained by several large streams running mainly to the north-east. Those entering James bay incline to the east after running north-east for a large part of their courses. The whole surface slopes gradually to the north and east, and the greater part of it is covered by a heavy deposit of clay and sand. On the north slope, or that lying south of Hudson bay, proper, the deposit is thicker than on the slope to James bay. On the Fawn river, a branch of the Severn, Mr. Low reports *high cut banks of clay near the junction with the Severn, which are as much as two hundred feet above the stream.

In the valley of Sutton Mill lakes there is a heavy cut, such as that mentioned by Mr. Low on the Fawn. The lake is very deep for its width, and the banks, where they are of clay, are 100 feet above the water, while several soundings in the lake gave a depth of over 200 feet. The submersion of much of this area has been proven by the presence of salt water shells in the surface deposits.

On the Attawapiskat river, Dr. Bell does not mention such an accumulation of drift, while our own observations on the Ekwan show that the general depth of the drift covering is about 100 feet.

Recent uplift.

The recent uplift of the land, as observed by Dr. Bell in several places to the south of this, is as much as 500 feet. At the highest

* Annual Report Geol. Surv. Can., Vol. II (N.S.) 1886, p. 18 F.

point reached by the marine terraces in the vicinity of Sutton Mill lakes the elevation was determined by simultaneous readings of aneroids at the lake and on the shore of Hudson bay at the mouth of Trout river. The western limit of these clays on the Albany river is below Martens falls and on the Attawapiskat near the mouth of the Black Fence river. On the Ekwan, the edge of the deposit was not reached, and on the Severn, the marine clays were found on the Fawn branch near the first outcrop of Laurentian rock. At the period of greatest submergence the sea covered a large part of the area under discussion, but it is quite possible that part of the elevated ridge, consisting mostly of Cambrian rocks, in the latitude of Sutton Mill lakes was either out of water or formed shallow reefs or a chain of islands.

Course of streams probably changed

On the removal of the great mass of the glacier and the consequent inauguration of the retreat of the sea and elevation of the land, the former lines of drainage were more or less blocked by the deposit left by the glacier and a new system of drainage was consequently formed. That some of these streams changed their courses as the upward tilting of the land took place, is very probable. In the case of the Ekwan, the upward tilting to the north caused the deflection of the stream from the valley through which it ran on its way to the sea to the north of Sutton Mill lakes. The deflected part of the river is now the section below the Little Ekwan and is noticeable as being much newer than the upper part.

Surface covered by thin forest.

The general surface is very even on that part covered by the marine deposit, and is a gently sloping plain covered for the most part by a thin forest of black spruce and tamarack, In the river valleys, especially near the streams, other trees occur, notably the poplars (*Populus tremuloides* and *P. balsamifera*) and birch. In the case of the latter tree, few large ones occur north of the Albany river, and the Hudson's Bay Co. have established a canoe-building industry at Albany post to supply the Indians coming from farther north. On the Ekwan, a solitary birch was seen, and that was only a small sapling on one of the islands. Five individuals of the Banksian pine were seen in one group on the north bank fifty miles up the river, so that the northern limit of both birch and Banksian pine may be said to be south of this stream. Poplar follows the valleys of the streams nearly as far north as the spruce. The country behind Cape Henrietta Maria is treeless, as is also a strip of the coast both to the south and the west of the cape.

Survey of Ekwan river.

A micrometer survey of the Ekwan river was made to the mouth of the Washagami branch, a distance of one hundred and fifty miles.

The general valley is a narrow cut through clay, with cut banks on either side for most of the distance to the first branch.

The country on either side is covered by a mossy swamp with a sparce growth of black spruce and tamarack. The course of the river, from the mouth of the Washagami, is east-south-east, but above this it evidently takes another direction, changing its upward course toward the south and, as its head-waters lie between the heads of the Attawapiskat and Winisk rivers, it probably flows to the north-east for some distance before turning to the east. The upper part is an older channel and its course, as before mentioned, was probably through the Sutton Mill lakes valley to the shore of the bay, which was at that time not so far from the lake as at the present time. In the latter part of its course, it is now cutting down a new valley through marine clays which cover the underlying rocks to a depth varying from twenty to fifty feet. From the lowest rock exposure to the sea, the current is swift and it is constantly moving a large quantity of gravel and finer material towards its mouth, and into the bay into which it empties. Limestone in apparently horizontal beds is exposed at intervals in that section which lies between forty and one hundred miles from the sea. From the fossils collected it would appear that they are probably of Silurian age. Forming new valley.

Above the Little Ekwan, the river issues from a wide valley which is cut through a higher plateau, but this valley gradually narrows before the Washagami is reached, and cut banks of clay, higher but somewhat similar to those in the river below, occur at many of the bends. These clays contain marine shells such as *Saxicava rugosa*, *Macoma calcarea*, *Mya truncata* and *Cardium ciliatum*. These were also found about 390 feet above tide at the highest point at which the clays were seen. In the bed of the river the living fresh water species noticed were : Marine clays.

*Anodonta Kennicotti* Lea, *A. marginata*, Say, and *Lampsilis luteolus (Lamarck)* var., as identified by Dr. Whiteaves.

The Washagami river is but a small stream, divided a few miles from the Ekwan into two branches. The northern branch comes from a long lake-valley running north and south, or parallel to that of Sutton Mill lakes, and this may also have been one of the outlets for a stream such as the upper part of the Ekwan. The lower part of this valley or the portion near the Ekwan, is now being cut into by the stream and a short new valley eroded. Washagami river.

The fall in the Ekwan from the mouth of the Washagami, as given by our barometric readings, is over 300 feet. North of this, to beyond Fall in stream

Sutton Mill lakes, extends a plateau which is at an elevation of 400 feet above tide. Through this, in latitude 54° 20′, rounded or oval masses of trap protude to a height of from fifty to one hundred feet. Through the plateau, on a line where there is also a break in the trap rocks, a deep narrow valley has been eroded in a north and south direction, which is now occupied by the waters of Sutton Mill lakes. At the lake the surface of the clay plain is 390 feet and the surface of the water of the lake is 290 feet above tide. Soundings show that the bottom of the southern part of the lakes is 310 feet below the plain and that of the northern part 250 feet below this datum or only forty feet above tide.

*Drawn by P. M. Papineau.*

CLIFFS OF TRAP AND CHARACTERISTIC TALUS AT GORGE, NARROWS OF SUTTON MILL LAKES.

Silurian limestone on Trout river.

Silurian limestone is found on Trout river, which drains Sutton Mill lakes, and is also found in the bed of the lake just north of the trap rocks. The rocks at the narrows of the lake are cliffs of trap one hundred and

fifty feet high, capping beds of probably Animikie age*. These are dark slates impregnated with iron ore and interbanded with beds of jaspilyte. Some of the beds contain a high percentage of magnetite. On the east shore a section of about ninety feet of these jasper and iron-bearing slates is exposed above the lake, but on the west side they have been brought down to below the water level by a series of north and south faults, and the exposures there are of the trap alone. These rocks form an east-and-west ridge reaching to the upper lakes on the Washagami, and eastward to a large lake on a branch of the Trout river which, as before stated, drains Sutton Mill lakes and runs to the north. The slates and jaspilyte or jasper-sandstone beds form a long anticline, whose axis runs east-and-west, and the majority of the beds exposed belong to the northern slope of the anticline. This ridge is terminated on the lake by a series of north and-south faults with downthrow to the west of unknown amount. The overflow of trap appears to have been at a later date, as there seems to be some unconformity at the base of the trap, the flow having filled all the inequalities in the underlying surface. The cliff at the west side of the narrows is of trap, one hundred and fifty feet high, with none of the jaspilytes showing beneath it. On the east side, however, ninety feet of these beds are exposed, with a varying thickness of trap above them.

Iron bearing slates.

The shore of James bay is low and shallow, and a short description as given in the summary report is here added. The delta at the mouth of the Moose river is divided into three channels which enter James bay. The northern one runs from north of Middleboro island to the north-west of Ship Sands, but it is nearly dry at low water and is also impeded by large boulders, so that it is not used except by canoes and small boats. The southern channel is also reported to be shallow. The central channel, which runs along the south edge of the Ship Sands, shoals to seven feet at low tide, and vessels pass at high water after having been lightened to draw about twelve feet.

Description of shore of James bay.

Northward from the outer bar to North point, the water is very shoal, but it deepens slightly to Nomansland. The low-tide flats are not very wide, but bars project from many of the points for long distances, as at Long Ridge and Cockispenny points. At Halfway point, limestone fragments are pushed up along the shore from rock apparently *in situ* below tide. Long Ridge point is built up mostly of

* In my written instructions from Dr. Bell he predicted that these rocks would probably prove to be of this age and not Laurentian, as had been previously supposed. See Summary Report, Geol. Survey for 1901, p. 113.

gravel, with a few boulders showing on the surface. From Nomansland to the Albany river the shore is very flat, and at low tide the mud shoals extend out for several miles.

Mouth of Albany river.

The Albany river, like the Moose, is divided at its mouth into three channels. The trading establishment and mission are situated on an island on the north side of the southern channel. North of this island is the broad opening called locally, North river. This has a long bar at its mouth, similar in position to the Ship Sands at Moose. The southern entrance to this is the larger, and it seems to be much deeper than the channel going to the settlement. The small channel north of the bar is shallow at low water and has a bar outside on which we found a depth, at high tide, of very little over one fathom. Very shoal water, in which boulders appear, extends northward beyond Nottashay point and boats are obliged to keep nearly out of sight of land to escape the shoals. Chickaney river, which enters north of the Albany, is said to be another channel from the same river.

Shoals.

Shoals were observed well out from shore to near the Kapiskau river. In the inner water between Akimiski island and the mainland there seems to be a maximum depth of about two fathoms. This shoals gradually to one fathom at a distance of three miles from either shore. The mainland is generally without a beach and between the woods and the tide-line is a wide flat covered with grass. The northwest part of Akimiski island approaches the mainland much closer than is shown on the maps, and a number of shoals are scattered from hence to the point south of the Ekwan river. The boat channel, according to our guide, runs to the west of the two islands which here lie off the shore. The position of the mouth of the Ekwan river according to several observations, is in latitude 53° 14' 0".

Description of shore north from Ekwan river.

Northward from the Ekwan, the shore, for a long distance, is flanked by high gravel bars, but at low tides a broad belt of mud extends out several miles, so that travelling along this coast with canoes is very unpleasant should the time of high water be in the middle of the day or night. Landing on the beach without a long "carry" through the mud is only possible at high tide.

The rivers that enter the bay between Niahkow point and Cape Henrietta Maria are not large and, as the former maps are mere sketches, it is difficult to locate those which are not known by a local Indian name. The first stream north of the Ekwan is a small channel said to be a branch from that river. It is marked by two gravel bars to the north about a mile from the beach. Swan river, which is perhaps Raft river of the map, enters in latitude 53° 36'. It is in a

Swan river.

slight bay or curve in the shore line. In latitude 54° the shore takes a curve to the west, forming a point and, as the tree-line curves to the north-west from here, this is probably Point Mourning, the first wooded point south of Cape Henrietta Maria. Several small streams flow into this bay. The first is called by the Indians, Nowashe river—the next Patchipawapoko—then the largest along this coast, the Opinnagan, followed by the last stream Nikitowasaki, fifteen miles north of the Opinnagan. The latitude of the mouth of Opinnagan river, by observation, is 54° 12′ 24″.

The bay to the south of Cape Henrietta Maria is shallow and muddy with wide mud flats, but near the extreme eastern end of the cape, the shore is reported to be bolder, and limestone beds are said to outcrop at high tide mark. These are probably continuations of those found on the Ekwan and Attawapiskat rivers to the south-west.

The timber along the coast gradually becomes smaller in going northward and the tree line recedes from the shore, leaving it finally at the Opinnagan, so that the country behind the cape is more or less an open plain. The shore, where the trees are at a distance from the beach, is generally an even mud slope, covered above high tide with grass, followed by a wide belt of stunted gray willows which give an appearance like the sage bush of the plains. Behind this, a few isolated spruces of small size appear before the tree-line is reached. In sailing along this coast, it is impossible to know which way to steer so as to run parallel to the land as nothing is to be seen ahead by which to shape one's course.

*Tides, Fur bearing Animals and Game.*

Rise and fall of tides not regular.

The tides along this narrow shore are not regular in their amount of rise and fall, which is determined in a great measure by the direction and strength of the wind. From the Ekwan river northward, the high tide appears to be about six and a half hours after the moon's meridian passage—the flood and ebb running seven and five hours respectively, while to the south of the shallow ground between Akimiski island and the mainland, the flood comes from the south and is much earlier. High tide at Lowasky river occurs at between two and a half and three hours, and at Albany about the same. The flood tide at Lowasky river runs four hours and the ebb eight. At Albany the flood runs five hours and the ebb seven. At the outer bar at Moose river the tides are from half an hour to an hour earlier.

Fur-bearing animals and game.

Fur-bearing animals are not particularly numerous, but the Indians bring in to the Hudson's Bay Company's posts, fox, otter and beaver Caribou are occasionally secured but not in large numbers. Black skins. bears are also occasionally killed. Last season (1901) I was informed that the Indians on Akimiski island killed three white or polar bears during the early summer, and one was seen by our party along the coast north of the Ekwan.

In the interior, the game birds are all very scarce, the fall hunt for ducks and geese being confined to the shores of the bay. The rivers afford a limited supply of whitefish, and a small species of this fish is caught in the tide-water along the west shore of James bay. The nets are set or hung on stakes on the tide flats, and are covered by the tide for a few hours each day. Sutton Mill lakes are well supplied with a slender variety of gray trout and the streams running to the north into Hudson bay are, at certain seasons, well stocked with brook trout. In August the stream draining Sutton Mill lakes was full of these fish, and several fine specimens were caught on the lake above at the narrows.

*Historical summary.*

Early explorers of Hudson bay.

The southern coast of Hudson bay, east from Port Nelson (York Factory), was visited or explored by Captains Luke Fox and Thos. James in 1631, and again visited by James in 1632. These two navigators met off the coast near the mouth of the Winisk river on August 29-30, 1631. Each had given a name to the country to the south-west. Fox called it 'New Yorkshire' and James 'The South Principality of Wales' probably on account of the previous name 'New Wales' given by Button in 1612 to the land southwest of Port Nelson. These two navigators sailed together eastward to the entrance to James bay and there separated, Fox to go north and James southward into the bay to winter. Fox called the cape he had left 'Wolstenholmes Ultimum Vale.' James, after rounding the cape, determined its latitude (55°.05') and called it Cape Henrietta Maria, after the queen and also after his own ship. His name for the cape has been retained and his description of the coast near it is still very true and is in a concise form * :—'From Port Nelson to this cape the land, trends (generally) east-south-east, but makes with points and bays, which in the particulars doth alter it a point, two, or three. The distance is about one hundred and thirtie leagues. The variation at the Cape, taken by

Description of coast by Capt. James.

* Voyages of Fox and James to the North-west. Haklyut Society, p. 490.

Amplitude, is about sixteene degrees. A most shoald and perilous coast, in which there is not one Harbour to be found.'

He did not follow the shore far to the south of the cape, but made out to the Bear islands and so on to the south end of Charlton island, where he wintered. Returning in the summer (1632) he landed at the cape and set up a cross with the arms of the king and of the city of Bristol.

The eastern face of the point seems to have deeper water off it than along the north shore, as James anchored in six fathoms about a mile from the shore. He reports a long shoal point running out to the northward or north-east.

Description of coast from Seven river to Cape Henrietta Maria by Capt. Coats.

In a publication by the Haklyut Society entitled 'The Geography of Hudsons Bay' by Capt. Coats (an officer with the H. B. Co. from 1727-1751), the description of the coast from Severn river to Cape Henrietta Maria in written for the information of sailors, but in it is given some indication of the character of the land as well. The following extracts from the above work give the main part of Coats' description (*see* pp. 46-52.)

'From Severn river to Cape Henrietta Maria, in latitude 55° 10′ N., the course is E. S. E., to westward of which in 55° 30′ near Cape Lookout is some broken ground, banks and ridges a great way off, come no nearer than seventeen fatham; the land very low and fenny, appears here and there in tufts of tree.

To southward of the Cape the land runs S. S. E., very low but clean even soundings with wood in some places. The shore is flatt a good ways off.'

Point Mourning.

'....Near the same latitude (54° 38′ to 54° 28′) on the west main is a bluff of wood, called Point Mourning, from the burying of one of Captain James men there. The land to northward of this, and westward of the Cape is all a low fenny unbounded marsh, not to be seen but in fine weather, so your lead is your principal guide.'

The topography of this coast and of the western side of James bay has been but roughly sketched by these navigators and little altered by subsequent ones. The streams draining to Hudson bay, as also those flowing eastward, were mapped from sketches made by various officers of the Hudson's Bay Company. The route through Sutton lakes, by the Little Ekwan river was sketched by Mr. Thos. Bunn in 1803. Later, a route to the Winisk *via* the Washagami branch of the Ekwan was mapped from a track-survey or sketch by Mr. Geo. Taylor in 1808. This latter route is not used by the Indians of the present

Routes changed.

day as perhaps the streams to be navigated are too small. The Little Ekwan is now reported to be blocked up by driftwood and the old routes are totally changed. The route to the lake is now from the Washagami eastward over a long stretch of muskeg, and that to the Winisk in made by a portage from farther up the Ekwan, direct to a small stream, a tributary of the Winisk.

The information as to the origin of the topography which appeared on the old maps is obtained from a manuscript map compiled for the Hudson's Bay Company to show the explorations of Mr. Peter Fiddler. This is now in the office of the Geographer, Interior Department. These sketches were no doubt supplied to Arrowsmith and were since reproduced on all the maps of this district.

Survey of Attawapiskat by Dr. R. Bell.

The Attawapiskat, river at the southern boundary of this district, was surveyed in 1886 by Dr. R. Bell, who the same year completed his survey of the Albany river. The same season Mr. A. P. Low traversed the country to the west from Lake Winnipeg to the Severn river and descended the latter stream to the sea. Instead of following the main stream for the whole distance, he crossed from Severn lake to Trout lake lying to the east and descended the eastern branch or Fawn river, joining the main stream about fifty miles from the sea.

## Ekwan River.

Outlet of Ekwan river.

Of the many outlets at the mouth of this stream, the principal or that having the greatest depth of water, is the central one. Several small wooded islands are situated at the mouth, and to the east of these the several branches of the stream flow over boulder and gravel flats to the sea. At high tide the level of the river is only affected as far up as the first wooded island, and at low tide there is about a mile of swift current from this point to the sea. Boats entering at low tide have only about two feet of water at the steepest slope. In the spring there is probably sufficient water to float boats drawing over four feet of water.

Strong current.

There is a strong current in ascending the river for the first eighty miles, and, in this part, the whole distance is usually made by tracking the canoes. In the present condition, the sides of the valley are generally free from bushes and trees, so that there is good walking along the bank.

After passing above the islands in the mouth of the stream, it is found that the river has cut down through a terrace of clay with a small percentage of sand and pebbles. The pebbles are generally found

near the surface of the terrace—here about fifteen feet above the stream. The eastern edge of this terrace slopes steeply to the sea and, as it is wooded to near high tide mark, scarcely any trace of it is seen from the sea. The tide flat which borders the coast is probably derived from the denudation of the edge of this terrace. The absence of cliffs or cut-banks along the coast would indicate a recently receded shoreline.

The surface of the terrace was found to be covered with a thick coating of moss, and the timber on it is mostly small spruce and tamarack. Some of the trees might be from six to eight inches in diameter but the average is much less. At the edge of the bank a fringe of larger trees occasionally appears, but it does not extend far from the stream. Timber consists of small spruce and tamarack.

The exposures on the banks show the terrace to be made up mostly of stratified clay and sand, near the surface, with a fine clay of soft texture beneath. Of the boulders and pebbles in the channel of the stream and along the sloping banks, fully fifty per cent are of light yellowish-gray limestone and the remainder are of Huronian and Laurentian crystallines. Occasionally, bits of red quartzite and iron-bearing shales from the rocks of the Nastapoka Group were seen. Large boulders of greenstone, having rounded inclusions of coarser texture and lighter colours, occur here as well as on most of the streams entering James bay. These are also probably derived from the amygdaloids in the upper part of the Cambrian sections found on the east side of Hudson bay.

Not far from the mouth, the river again divides into a number of channels, and the banks in this vicinity are only about ten feet high. The current increases slightly and several swift places are caused by an accumulation of boulders in the channel. A small branch channel, running north to the bay north of Niahkow point, leaves the river from behind some of the islands of this group. The river continues with swift current and is divided in a few places by islands.

Thirty-three miles from the mouth, the first strong rapid occurs, and the underlying limestones outcrop, in a ledge running across the bed of the stream. The beds are lying apparently horizontal, and are of a grayish-white dolomitic limestone holding a few badly preserved fossils, from which Dr. Whiteaves describes or identifies the following:— Fossils.

*Favosites Hisingeri ; Trimerella borealis ; Reticularia septentrionalis ; Euomphalus* sp. indet. ; and *Bronteus Ekwanensis.*

Limestones outcrop at Middle rapid.

In the next ten miles, which is the distance to the portage at a series of heavy rapids, there are two stiff rapids at which the limestones outcrop. At the heaviest of these, called the Middle rapid, the fall amounts to approximately five feet. The beds exposed here are thicker and contain many more fossil remains than at the first rapid—The fossils are principally large trilobites and corals, as in the following list : *Spirifer crispus* ; *Reticularia septentrionalis* ; *Salpingostoma boreale* ; *Diapho. rostoma perforatum* ; *Phragmoceras lineolatum* ; *Illænus* sp. indet. ; and *Bronteus Ekwanensis.*

Above this the banks gradually rise in a series of steps to thirty feet, which might be taken as an indication of an old shore line.

The portage mentioned above is on the northern side of the river. Here the stream has cut a shallow gorge through the limestone. This has been slowly widened, and is the first indication of age that the river, thus far has shown. Below this, from the sea up stream, the river-channel is new—that is to say, it is still wearing down the sides of the valley and is bordered by cut-banks. The material thus fed into the river is being rapidly removed, and there is little of it deposited till the sea is reached.

Similar to limestones on Attawapiskat river.

The rapids below the portage show a certain amount of river wear, but not so pronounced as at the portage. The beds cut are not deposited in a regular manner, but are disarranged owing to the local development of coral reefs, which give the immediately overlying beds the appearance of having been disturbed and bent. These same limestones on the Attawapiskat river, just to the south, are described by Dr. Bell as cavernous limestones. It would seem that the more porous, or what seem to be the coralline masses, weather much more easily than the thinner beds. On this river there are no caverns, as the valley is not eroded deeply enough to expose much of the rock. The beds below the coral reef at the portage are thin and lying nearly horizontal, but above the portage the beds are thicker and contain a very numerous assortment of remains of gastropods and corals. The collections made here for the purpose of determining the horizon were mostly from the rocks near the upper end of the portage road. The list of species determined or described by Dr. Whiteaves, and published as a supplement to this report, in his opinion indicates a horizon rather high up in the Silurian.

Those which occur at this part of the river are given in the following list :—

D.B.D. Photo. 1901.

Landslides on outer bends of Ekwan River.

D.B.D. Photo. 1901

Gravel piled on upper end of island, Ekwan River. Effect of ice shoving in spring freshets.

*Halysites catenularia ; Lyellia superba ; Zaphrentis Stokesii ; Pycnostylus elegans ; Pycnostylus Guelphensis ; Favosites Gothlandica ; Favosites Hisingeri ; Stromatoporoid* sp. indet. ; *Crinoidea* sp. indet. ; *Fenestella subarctica ; Trimerella Ekwanensis ; Strophodonta* sp. indet. ; *Plectambonites transversalis ; Spirifer* sp. indet. ; *Reticularia septentrionalis ; Meristina (?) expansa ; Reticularia* sp. indet. ; *Glassia variabilis ; Atrypa reticularis ; Camarotœchia Ekwanensis ; Ambonychia undulata ; Ambonychia septentrionalis ; Mytilarca pernoides ; Ctenodonta su bovata ; Euomphalopterus* sp. indet. ; *Megalomphala robusta ; Salpingostoma boreale ; Gyronema speciosum ; Gyronema Dowlingii ; Gyronema brevispira ; Loxonema* sp. indet. ; *Orthonychia obtusa ; Platyceras compactum ; Strophostylus amplus ; Strophostylus inflatus ; Strophostylus filicinetus ; Endoceras* (or *Nanno*) sp. indet. ; *Kionoceras cancellatum ; Orthoceras Ekwanense : Orthoceras* sp. indet. ; *Phragmoceras lineolatum ; Illænus* sp. indet. ; *Bronteus Ekwanensis ; Bronteus aquilonaris ;* and *Ceraurus Tarquinius.* List of fossils.

For nearly four miles above the portage the current is swift and several small rapids occur, the largest of which has a fall of three feet. At thirteen miles from the portage is another rapid where the exposed rock is a thinly bedded limestone in a low anticline, the axis of which runs N.E. and S.W. A steady swift current is met all the way to Flint rapid, thirty miles above the portage, but the banks are in places partly overgrown with grass and the edge of the slope fringed with willow. Both species of poplar begin to make their appearance, and some trees are of fair size. In the lower reaches the banks are for the most part bare and clay, with boulder pavements near the stream.

All the exposures of the clay contain marine shells near the top, from which the following species were collected :—*Saxicava rugosa, Mya truncata, Macoma calcarea* and *Cardium ciliatum.* Marine shells.

No definite boulder clay was seen, as it is covered by the marine clay and the constant sliding from the surface conceals the underlying beds.

The Flint rapids are not more pronounced than many of the others, but as the river has cut partly through a series of beds of yellowish gray limestone, in which there are many inclusions of chert, the Indians have named the rapid " Piwana powestik " or Flint rapid.

The country on either side is about ten feet above the stream. Poplar shows in spots and occasionally clumps of large black spruce, but these are generally on the islands or prominent points of the river banks.

What is called Upper or Last rapid is a small fall of two feet, nine miles above Flint rapid, where the river flows over thin beds of lime- Fossils collected at Last rapid.

stone. The section of the rocks exposed consists of only a few beds, making a total of about six feet. The lower members are ashy gray in colour, somewhat mottled, and break into irregular lumpy fragments. A few fossils collected from these beds are given in the following list, from the appendix by Dr. Whiteaves.

*Zaphrentis Stokesii; Favosites Gothlandica; Orthis* sp. indet.; *Pleurotomaria* sp. indet.; *Actinoceras Keewatinense; Phagmoceras lineolatum; Isochilina* or *Leperditia* sp. indet.

The central beds are yellow and full of cavities of irregular shape, with a thickness of perhaps two or three feet. The top beds are gray and similar to those at the base. Fossils are scarce.

Above the rapid to the mouth of Little Ekwan river, the valley is probably slightly older than below, and the banks are covered with willow and poplar. The channel is wide and dotted with numerous islands. In a few places side channels form large islands and the current in this part is much slower, averaging only about a mile and a half per hour.

Little Ekwan river.

The Little Ekwan enters from the north in a narrow valley. The stream appears to be very small and is reported to be blocked by drift timber and windfalls, so that the Indians do not travel on it with canoes. Just to the south is the mouth of the Wagakashi coming from the south in a valley which is a continuation of that of the Little Ekwan. Another stream from the south, the Matiteto, enters three miles above the Little Ekwan and there are several places in the stream between these two points where the current is swift. Here the river has cut a channel through thin bedded limestone and about a foot of this shows on the banks. It is a fine-grained yellow limestone and shows no fossils. Three miles above the Matiteto, the same beds apparently, are also cut by the channel of the river, and this is the highest point on the river where we saw the underlying rocks. These exposures no doubt formed rapids in the earlier history of the channel, but they have since disappeared, and the general grade of the river is now nearly reached, except at one or two points. Similar denudation is observed at Flint and Last rapids, but, as there is a heavier bed of limestone to cut through, there is still a large amount of work for the river to do. At the portage and the series of rapids in that vicinity the rock is in thicker masses, consequently the falls are in the midst of the rock exposures.

Denudation.

Above the mouth of the Matiteto a higher terrace is reached and through this an older valley, opening to the east in a wide mouth is entered. The eastern face of this terrace and the sides of the old

valley show sandy deposits which are probably the shore deposits when the sea flanked the eastern edge of this plateau. Their nature was not worked out, owing to lack of time, but there is little doubt that beaches may be found in this vicinity. Through the old valley the river is now cutting another channel and for ten miles upward the stream is very active and is wearing rapidly through the clay. Above this the grade is not so steep and consequently the current is much slower. The immediate banks of the stream in many places do not reach the sides of the old valley, but the higher plateau is in view at many points and finally, before reaching the mouth of the Washagami, the river seems to be flowing in a much narrower valley with occasional cut-banks, apparently the old channel slightly deepened. The active part of the revived stream has not yet reached the underlying rock, and its work is retarded by an occasional accumulation of boulders. About six miles below the Washagami a sudden bend of the stream to the south has thrown the current against the south bank, and excavation on a large scale is going on in this locality.

River cutting another channel.

The high plateau here entered, as well as its eastern slope to James bay, is covered by a coating of marine clay which probably overlies boulder clay. That some of this exists beneath the marine clay is proved at only one or two small exposures. It probably, in many places, contains no boulders and therefore the dividing line between it and the marine clay is hard to define. The reddish clay near the mouth of this river, although mainly free from boulders, appears to have received its colouring matter from a soft red shale which, though not outcropping on the bank may occur in the bed of the river below the limestone. This may be a local development of the boulder clay, as were it a part of the marine deposit a more extensive distribution might be expected. Large boulders are not numerous in the river channel, but at intervals there are accumulations of them. Small rounded boulders and pebbles are common, but the majority seem to come from the surface of the clay or the upper part of the section. Marine shells were collected from the banks near the top of the exposures, and these are of the same species as those recorded on a previous page as having been found near the mouth of the stream. The same species were also collected from the higher parts of the plateau at an elevation of four hundred feet above tide, showing that all this region was submerged at the close of the glacial period, to at least between four and five hundred feet. The uplift since then has been greater perhaps in the northern part of this area than in that to the south near the height-of-land. This differential uplift is clearly shown in the area to the west formerly covered by the glacial Lake Agassiz, where the highest

Plateau covered with marine clay.

Differential uplift.

beach at the north-east corner of the Duck Mountains is now 350 feet above the outlet at Lake Traverse. The plain now drained by the Ekwan and Attawapiskat rivers, on its emergence from the sea, sloped northward, and the drainage probably took a northern direction to Hudson bay but, as the plateau reached an elevation approaching its present position, this slope was lessened and the streams were diverted toward James bay. The older portions of the river channel, which are situated in the higher part of the plateau, probably carried streams which found their outlet by uniting, and flowing to the north from the vicinity of the Little Ekwan river and thus through the deep valley in which is situated Sutton Mill lakes. The present general direction for both these streams is on nearly parallel lines running north-easterly, but making a decided bend to the east and east-south east from the vicinity of the Little Ekwan.

Slope of country towards James bay regular.

The surface of the plane or slope toward James bay is very regular, and the uplift and consequent retreat of the sea very uniform in its movement. A slight steepness in the slope at the rapids at an elevation of 100 feet above the sea might be accounted for by a short halt of the sea margin at this line and consequent denudation. As the drainage on all this slope is new, the greater part of the surface is still very flat and swampy, as the minor drainage is not developed.

## Washagami River.

Washagami river.

The canoe route from the Ekwan river to Sutton Mill lakes follows a small branch from the north to the first small lake and thence westward, by a series of portages, to a stream flowing north to the lake. This branch, called the Washagami, is a small stream, very swift in its upper part and having a steady strong current all the way down to the Ekwan. Five miles from this stream it receives a tributary from the west, called the Nematagoi river, which appears to be nearly as large as the north branch which is supposed to be the main stream. Above this the water of the stream is clearer and comes from a series of lakes above. Several tributary brooks enter the valley but they are all apparently small. In the upper part, the stream meanders from side to side of a valley which it has formed. This is cut down about twenty-five feet and numerous exposures show stratified clay, with a few feet at the top of a sandy clay with pebbles. A few boulders in the bed of the river are apparently derived from the surface or upper part of the clay. Probably the majority are from the harder clay beneath, down to which the channel has been cut. Some of the steeper parts of the channel, where the current is also

swift, are completely paved from side to side to side with these boulders, now considerably rounded. The valley in the lower part approaching the Ekwan is wider and the present channel of the river seldom reaches either side.

Fall of over two feet per mile.

In the distance traversed to the first lake, seventeen miles in direct line, the fall is about fifty-five feet or an average of over two feet per mile for the lower third of this distance, and this is increased in the upper to at least five feet per mile for a short distance.

On reaching the first lake it is quite noticeable that there is no longer a river valley such as in the lower part, but the lakes occupy a wider depression that may have been an old channel. The first one is Washagami lake and it is succeeded by a chain of three closely connected small lakes to another large one called Minago or Spruce lake. The first mentioned is said to be the largest or rather longest of the group. Beyond Minago lake lie Moss and Tamarack lakes. On the north side of the latter, high hills of black rocks, which are probably similar to the trap rocks of Sutton Mill lakes, are reported.

This series of lakes appear to lie in a valley now draining south, but it seems too large or wide to have been formed by the small stream now draining through it. The present stream has no doubt formed a new channel to the south of the lakes, as it is still very actively widening the bends where it touches each side of its own valley, but above this there is an older valley. The origin of this, as well as of the valley of Sutton Mill lakes is no doubt connected with the early system of drainage, now probably diverted into other channels by the differential uplift of the coast.

Portage route from the Washagami to Sutton Mill lakes.

The portage route from the Washagami to Sutton Mill lakes is mainly along the surface of the higher plateau through mossy muskeg interrupted by a few small lakes all draining eastward to the Little Ekwan river. Leaving the Washagami, the trail runs northward nearly a mile through muskeg, rising steadily to a gravel ridge having the appearance of a beach ridge. This is followed a mile to the north-east to the first small lake. On the north side of this ridge are several small lakes which all drain to the east from one to the other. At these lakes two short portages are made and then the second long portage is reached. This is about a mile and a quarter long through lumpy mossy muskeg and only one slight rise is crossed where the ground is dry. It ends at a small lake about 500 yards long with low margin. From the north-east end of this, another long portage of about the same length running east north-east reaches the western

edge of a deep valley running north to Sutton Mill lakes. This contains a small stream from the north-west which has cut a deep narrow gorge through the boulder clay. This stream enters the valley at Sutton Mill lakes about two miles south of the lake and meanders back and forth through a marsh at its border. The stream is navigable for canoes from the end of the trail or for that part of its course which is in the deeper valley. Several small rapids over gravel bars are passed before the stream reaches the marsh. The Indians have erected a fishing weir at one of the upper ones. This structure is merely a close fence made of poles standing across the stream having a basket at one side also of poles sloping slightly up from the water to imprison the fish as they are going down stream. Small fish pass readily either way, but the larger ones are caught.

Timber in valley larger.

The timber in the valley is very much larger than on the surface of the plateau. Black spruce and tamarack are the principal trees, and on the plateau these average about four or five inches, but in the valley near the lake several about twelve inches in diameter were seen. The surface is nearly everywhere covered with moss, even on the slopes of the valley, and only in occasional places was grass seen.

## Sutton mill Lakes.

Sutton Mill lakes.

These are represented on the older maps by two fairly large wide lakes joined by a short small stream, whereas the lakes are long and very narrow, occupying a deep valley running north and south. At the south end another valley from a short distance to the west makes a bend to the east and joins the main one. The water of the lake is about 100 feet below the level of the bordering country. The slopes of the valley are steep and in many places show cut-banks of marine clay, probably overlying boulder clay. Marine shells were collected near the upper surface of the plateau at a height of 90 feet above the lake, so that practically all this area has been submerged with the exception perhaps of a ridge of trap-covered rocks which cross the lake at the narrows. Those rocks protrude through the clay plain in rounded oval ridges.

Marine shells prove submergence of plateau.

The depth of the valley below the general surface seems to be greatest in the southern lake where, by sounding, the water was found to be 210 feet deep, or a total depth for the valley below the surface of 310 feet. In the northern part, or the northern lake, the width is much narrower, but the depth in the centre runs from 100 to 160 feet or 250 to 260 feet below the general surface. In the narrows the cliffs are

broken down and the debris has filled the channel, raising the water in the southern lake about five feet. The heavy mantle of drift has effectually concealed the rock, and only in the river valleys and in such a cut as this is much rock to be seen. The limestone of the Ekwan river does not come north to the lakes, as outliers of the trap hills occur just to the south of the lake in the valley into which the trail from the Washagami leads. In the northern lake, past the trap hills, limestone again appears, and an exposure of it occurs on a small island where there is about ten feet exposed. Below the water-level the cliff is abrupt to a depth of sixty feet. This shows that probably the Silurian deposits surround the Cambrian, but are at a lower level. The valley, although excavated through the superficial deposits, found as its lowest level a former break not only through the Cambrian at the narrows but also a deep cleft in the limestone beds to the north. In the valley which runs northward from the lake, the limestone beds cross the present river channel at a greater elevation above the sea than the cut through them in the lake valley.

Rocks concealed by drift.

As to the origin of the valley in which the lake lies, it seems to be clearly caused by the action of a stream, which in some manner has since been diverted, probably to flow eastward to James bay.

Origin of valley.

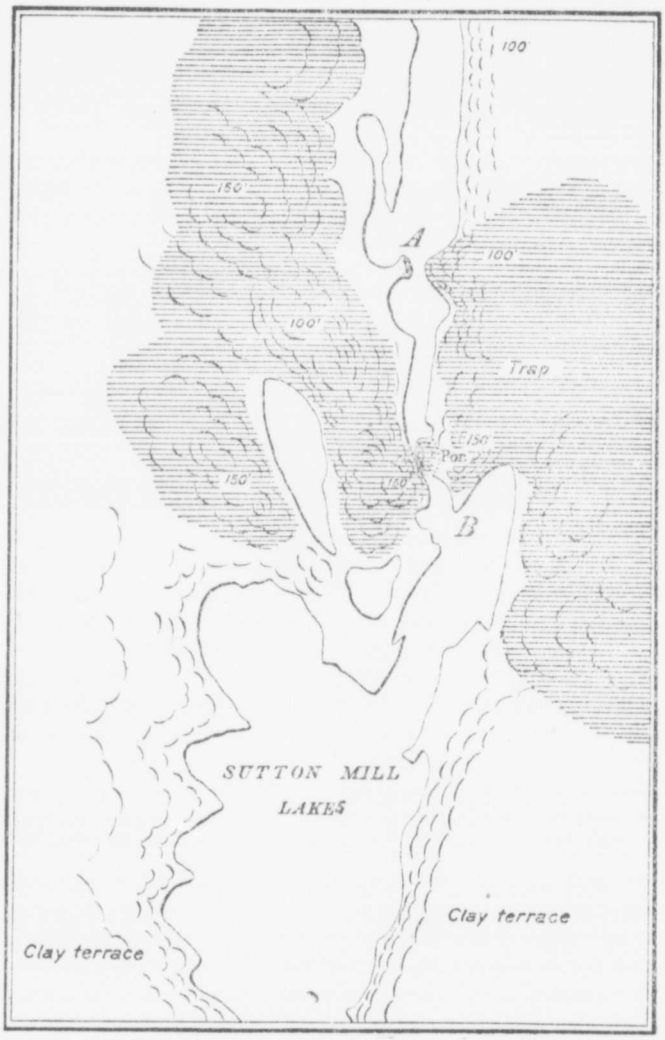
If the rising of the land was inaugurated in the southern part and gradually proceeded north as the pressure of the glacial mass was removed, then the general slope northward would have been steeper in front of the elevated portion and drainage channels would follow in this direction forming valleys trending north. After the elevation was accomplished or the land assumed its present contour, parts of these valleys would be so tilted as to back up the contained streams and cause them to spill down the present slight incline to the east. In this way it seems probable that such streams as the Ekwan and Attawapiskat, which make a decided turn to the east from a point south of this lake, might have originally run northward to Hudson bay. In the description of the Ekwan river the difference in age of the upper and lower parts of the valley is noted and also the supposition that the stream left its present valley near the mouth of the Little Ekwan.

Differences in age of Ekwan river valley.

The great depth to which the basin is eroded may be due to other causes, and one suggested by the presence of faults at the narrows is that the changes of level to which the crust has been subjected caused a great fissure to open along the line of the lake valley and a portion of the overlying deposits was thus allowed to drop down. If however, this was the chief cause, the break would probably be traced for a greater distance than the length of the present lake valley.

Rock exposures at the narrows.

The rock exposures occur principally at the narrows, or near the small stream connecting the two lakes. Approaching this from the south, the clay slopes give place to rocky hills rising from the water, in



steep slopes and nearly bare surfaces, to about 100 feet above the lake level. Back from the lake; some of the hills seem to attain still higher elevations, of probably over 200 feet. The sketch-map on the opposite page shows the trap-crowned hills of this vicinity. On the east side a series of fine-grained compact red and black beds is exposed, on the west the exposures are of trap to the water's edge. The fault, which runs north and south, here has a downthrow to the west of over 50 feet, carrying all the stratified lower rocks beneath the lake level. The only sections of these beds to be seen are on the east side, principally in the vicinity of the portage. Just at this place a small cap of trap stands near the gorge and behind it, to the east, is a narrow valley not eroded as deeply as the cut at the stream, but only to the upper beds of the sandstone and slate. Through this valley the road for the portage passes, rising to about fifty feet between its extremities.

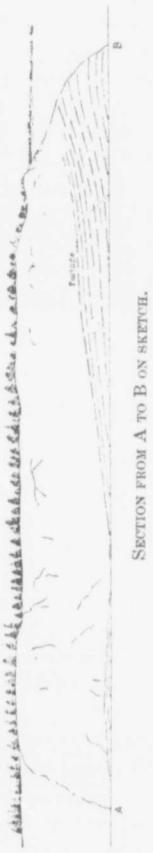
Iron-bearing slates.

The highest point that the trail reaches is over a ledge of iron-bearing slates, above which on either hand rise the rough hills of trap. As the slates are nearly horizontal, the total thickness exposed on the portage road, together with that brought up by a slight anticline just to the south, represents all that was seen of these rocks. Northward the beds decline at a slight angle, so that they reach the water and are brought up again for a short distance at the second narrows, or the point marked A on the sketch. Here the fault runs to the west of the projecting point so that the same beds appear on both sides of the channel, but the western point is separated from the rocks to the westward by an accumulation of drift material forming a low spit with sandy bays on either side. The deep channel is eroded through the sandstones, to a depth of 140 feet. The section published in the summary report is that of the rocks to the south of the portage road. The jaspilytes when examined in thin section are found to be compacted sandstones, the grains of which are stained to various shades of red by the presence of iron oxide, which forms in many cases a coating around them All the beds are made up of fragments of various degrees of fineness arranged in a natural order, the coarser at the base and the finer at the top. The slaty beds just beneath the trap are made up of much finer grained particles of quartz, coloured dark by a matrix of opaque fine-grained material separating the grains. Some at least of this mass is probably magnetite. The quartz grains constitute 50 per cent of the mass, and of this about half are of red chalcedonic quartz and the other part clear grains made up of a mass of mosaic quartz. The red beds beneath are of much coarser grain, and are seen, even in a hand specimen, to be made up of rounded particles of red colours.

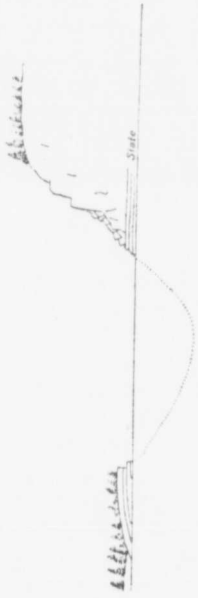
Jaspilytes.

At point A the dark slates have a thickness of 20 feet, and below this the red beds begin to appear in thin streaks. The partings of the


Cross section at B on sketch.



Section from A to B on sketch.




Cross section at A on sketch.

fine-grained dark slates become thinner and the lower beds become red in colour.

At the portage the section consists of ninety feet of stratified beds capped by a varying thickness of trap. On the west side of the stream there is a thickness of about 150 feet. This is a dark green gabbro with a diabase structure. The predominating mineral is chlorite, with plagioclase, albite and quartz. Small dark almost opaque crystals of ilmenite surrounded by limestone, are occasionally seen. The slates beneath, to a thickness of 20 feet, are dark grayish black to greenish black and are thin-bedded and of fine grain.

Near the base they resemble clay slates but are very hard and brittle, being cemented by the magnetite. An analysis of a specimen from this bed, furnished by Dr. Hoffmann, gives metallic iron 33·40 per cent, siliceous insoluble residue 48·49 per cent. The percentage of quartz increases downward in the section, and thin layers found at eighteen feet from the top are nearly all quartz. Some of the red beds near the top are somewhat crystalline in appearance, but on a polished surface the rounded grains are quite apparent. At 27 feet below the top, the rock consists is of a bright red, close grained jaspilyte, which in thin section shows well rounded grains of a bright red material, in all probability an eruptive, which was broken to a sand and cemented by quartz forming hard quartzite. The cementing quartz is in a fine mosaic, and some of the red grains show minute cracks and sometimes a network of fissures which are filled by the same mosaic. In a few of the grains that have less of the colouring matter, the material is a reddish chalcedonic quartz with a dark red staining around the margin. At about 30 feet down in the section, the red sandstones alternate with dark rusty-weathering coarse slates. At 35 feet, the dark semi-crystalline beds are composed mainly of small particles of quartz and magnetite. The percentage of magnetite, as determined by Dr. Hoffmann, is very high—the metallic iron content being 68·62, the insoluble residue, 4·21 with no trace of titanic acid. This would make a very good ore, but it appears to be in very thin beds alternating with the sandstones. As all these ores have a very high percentage of silica, owing to the bands of sandstone, a reduction of this constituent might be had by selection or some mechanical process. From many of the beds between 40 and 50 feet in the section, thin members are found to be nearly pure magnetite, while the thicker beds are of the dark red sandstone containing less of the iron ore. A talus covers the section from 50 to 70 feet. Dark hard beds with narrow partings of slates similar to the top beds are found down to 80 feet. The lowest beds, or down to 90

An analysis gives 33.40 per cent metallic iron.

Percentage of magnetite high.

feet, are very dark red sandstones of the same character as those above, but the outside of the grains and in many cases the whole individual is composed of the iron ore. An analysis of a specimen from the lowest bed exposed shows less iron than in the slates at the top; besides the lower members of this section are very hard. This rock contained metallic iron 27·72 per cent; insoluble siliceous residue 61·12 per cent. These samples are not specially rich in iron, but serve to show that the whole mass of this hill contains a large amount of low grade ore. The three samples analyzed are from the top, middle and bottom of the section.

Analysis of specimen from lowest beds.

On the small island in the northern lake a cliff of limestone was found. The beds exposed are somewhat similar to those seen on the Ekwan at the upper rapids. In this cliff there seems to be a great mass of broken fragments of corals and shells, mixed with what appears to be limestone fragments, the whole forming an agglomerate. The colour is an ashy gray. Beneath the water the beds are yellowish and of a finer grain. A few badly preserved fossils were collected, but among these Dr. Whiteaves has recognized or described the following species: *Zaphrentis Stokesii*; *Favosites Hisingeri*; *Phænopora Keewatinensis*; *Stropheodonta* sp. indet.; *Calymene Niagarensis* (?); *Encrinurus* sp. indet. Limestone fragments are numerous along the shores to the south of this, to within four miles of the narrows, and are derived no doubt from the beds beneath the water.

Timber.

In the southern lake, limestone pebbles are also numerous, but they are mixed with fragments of other rocks and are derived from the boulder-clay of the banks, while marine shells from the upper marine clay are also mixed with them. The timber seen along this lake is mostly spruce and tamarack. The heaviest growth is in the valley at the southern end of the lake, and along the small streams draining into it from the west. In going up the lake, the timber gradually becomes smaller, though at the portage between the two lakes, there is a fair grove of spruce, and a few poplars form a fringe along the southern slope and on the lower ground south of the narrows. In the northern part there is one grove of poplar on the western side, four miles north of the narrows, growing on a ridge which seems to be made up of lime-stone fragments and therefore well drained. This grove is quite park-like, it being carpeted by grass instead of the almost universal moss which seems to cover the whole country. The spruce is mainly the black species (*Picea nigra*) and scarcely any trees of the white spruce are seen. Of the poplar, both species are found on the

Ekwan, but on the lake *Populus tremuloides* seems to range farthest north. Near the north end of the lake the spruce trees become not only small, but are separated from one another by mossy openings, as if they had been set out artificially. Along the top of the bank the fringe of trees is thin and at the outlet, Trout river, a patch of burnt country will in a few years be bare.

Brook and lake trout plentiful.

The country seems to be nearly devoid of game, but the waters of the lake are well stocked with a slender kind of lake trout, and in the stream draining north and at the narrows, brook trout were found in large numbers up to three pounds in weight. Along the shores marine shells from the clays of the sides of the valley are found along with those of fresh water species now existing. These latter embrace the following:—*Valvata tricarinata*, Say; *V. sincera*, Say; *Planorbis parvus*, Say; *Limnæa stagnalis*, *L.*; *L. palustris*, *Muller*; and *L. catascopium*, Say; as determined by Dr. Whiteaves.

## COAST OF JAMES BAY FROM EKWAN RIVER NORTHWARD.

Bars at mouth of Ekwan river.

In the bay into which the river empties there are many bars, but the main channel leads straight out to sea for a short distance and is then diverted north and south by a long bar which shoals at half tide. This bar is about three miles from low tide mark. There are two or three branch channels just at the mouth, through the gravel and mud delta, but these are used only when the tide is in. Along the shore to the point about five miles north of the river the general slope of the shore is fairly steep, that is, the mud flats do not extend out very far. The resident Indians call this point "Niahkow" (the sandy point), but it seems to be made up principally of mud and boulders with a sandy beach ridge at high tide. The boulder bar stretches out far to the east at low water. We saw it only at half tide and then had to make a long detour around it with the canoes. Several small brooks break through the ridge to the bay, and tent poles at these places indicate their occasional use as halting places or camps.

Timber line near the shore.

The timber line is here near the shore but runs at some distance back of the point from Niahkow northward; for about ten miles the shore is fairly straight but shallow, with few boulders on the mud flats. The beach ridge is separated from the timbered land behind by a narrow strip of mud, which in some places is covered by grass and a few small willows. A high gravel bar lying about a mile off shore marks the mouth of a small stream, which is an outflow from the Ekwan river. The stream is small and flows in a shallow sheet over the mud

flats, so that it cannot be entered even by canoes except at high tide. Here the higher beach ridge is near the timber line and a mud flat extends out 200 yards to a second gravel ridge which has been formed in front by the high tides. A lower ridge is now being formed in advance of this again, but it is covered by the highest tide. When the tide is out, it dries or uncovers to beyond the high gravel bar opposite, or to the north of the mouth of the river. The evening we arrived at this place, the Indians who were camped there pointed out to us a white object on the bar and by examination with the glass it proved to be a wandering white bear which had come ashore on a piece of ice. Our friends were rather nervous over the matter, but the animal had disappeared by morning, and the only other traces of this species were some tracks that were seen along the shore farther to the north.

Swan river

Northward from this brook there is a slight bend in the coast to the west to form a shallow bay and at about ten miles from the brook a fair sized stream called locally Wabishew Sipi (Swan river) enters the bay. The shore of this bay is flanked in many places by sand ridges, but as we passed at low tide we saw only part of the shore, and the mouth of the river being at a distance was hard to make out. As the shore here is backed by a uniform line of small spruce trees, varied occasionally by higher bunches or groups, a grove of poplar which shows on the left bank of the stream when opposite, is about the only indication of the presence here of a river. Northward from this stream the shore bends slightly to the east again, and a point sixteen miles north of the river is in the same longitude as the mouth of the brook which comes from the Ekwan river. At eight miles from Raft river, gravel bars that form small islands at half tide, run out from the shore to the southeast, and behind these the shore ridge for a short distance is wanting, and the mud slopes up gradually to a grassy flat. The tree line of small spruce follows the shore pretty closely for about fifteen miles north, but it then leaves the beach and turns to the north west.

The points are merely high gravel ridges, which are formed parallel to the shore in an irregular order. The intervals between are connected by lower ridges formings loops. Another series is also found in a few places near the tree-line belonging to an earlier set. Small streams are found running out by the gaps in the shore ridges and afford camping places between the mouths of the larger streams. At thirty miles north of the Raft river two high sand bars or small islands are again seen near the shore.

They are situated inside the tide-line and at low tide are not reached by the sea. Opposite, on the mainland, a narrow fringe of trees forms a point behind which the tree-line bears off toward the northwest. This may be the "Point Mourning" referred to by Capt. Coats, as being so named from the burying of one of Capt. James' men there. James' account does not mention this occurrence, and he appears to have landed on this coast only at Cape Henrietta Maria.

Mud flats make shore line difficult to determine.

Sailing along in a canoe, the shore-line seems very far away, but gulls, yellow legs and other small birds were perched along on the edge of the mud and were the principal guide to the direction of the shore-line, as the mud flats look like smooth water, since there is always so much water draining down the slope.

Several large boulders appear at low tide at this point, and there are also two high gravel bars opposite the end of the trees. From Point Mourning northward, the shore turns about northwest as far as the Opinnagow river, and the beaches seen at high tide disappear and the slope of the shore becomes much flatter. Long shallow ridges of clay run out to the northeast, just after passing Point Mourning, and on these are scattered many boulders. The larger ones are frequently near the shore, but they do not seem to indicate having been shoved in any direction by the ice, as is so often shown on the shores of such shallow lakes as Lake Winnipegosis. The shore slopes upward very gradually, and is of mud to the highest point.

At the margin of the ordinary tides a thick wiry grass covers the surface, and is succeeded by a small scrubby willow which extends back to the timbered country. Several brooks and small rivers enter the bay just to the northwest of Point Mourning. A stream called Nowashe river, at eight miles from the point, cuts a wide but shallow channel through the mud, but it is not deep enough to enter except at high tide and is probably an overflow channel from the Patchipawapoko, the next stream which comes in at about eleven miles from the point. The mouth at low tide is wide but very shallow and dotted with boulders. The sand bars which have formed the beach, end before reaching this stream, and are succeeded by mud shores. These extend along for six miles between the last stream and the Opinnagow river, which is the largest along this part of the coast. The channel leading to this river is deeper at low tide than any of the others. Instead of a broad shallow bar at the mouth, the river is divided into two channels by a grassy island near the sea. That to the south is probably the larger, but is impeded by boulders. At low tide there is a shallow part near the line of high tide where the greatest accumu-

Opinnagow river.

lation of the boulders is found, but below this and out to low tide the boulders are less frequent. At low tide the entrance to this channel is two or three feet deep, so that a small boat could get in and come up the river as the tide deepened the channel. The main difficulty would be in finding the river at all, as there is so little to mark its position—the tree line being so far from the shore.

Along this part of the coast there are no bars visible at any distance from the land, as is the case along that part near the mouth of the Ekwan.

Navigation along coast not difficult for small craft.

Although the coast is very flat the navigation for small boats does not offer any great difficulties except from the want of harbours. Our guide thought that a small sail-boat could be taken into the mouths of Raft and Opinnagow rivers, and that as the shore was fairly free from boulders, the boat could if necessary be run ashore without damage at high tide and left in the mud.

The great objection to this method of finding harbour is in the fact that the tide does not maintain an even flow or ebb, being influenced to a very large extent by the direction and force of the wind. The ordinary flow of the tide may be assumed to be about six feet, but a heavy north wind may raise it to over twelve and a south wind will lessen the flow, though not to such a large amount.

## Geology.

The formations observed in the district consist of (1) the Cambrian rocks of Sutton Mill lakes; (2) the Silurian limestone bordering the west shore of James bay and the south shore of Hudson bay; and (3) the clays which form the general covering over nearly all the country left by the ancient glacier and the retreating ocean.

### CAMBRIAN.

Rocks of Cambrian age similar to those on east coast of Hudson bay.

The rocks which are probably of this age are closely allied to those previously described by Dr. R. Bell and afterwards by Mr. A. P. Low on the east coast of Hudson bay and in the narrow belt of islands parallel to that shore—the Manitounuck, Nastapoka and Hopewell islands, and the narrow strip along the coast in the neighborhood of Manitounuck sound and at Richmond gulf. These were described by Dr. Bell in the report for 1877-78 pp. 11-19 o and called the "Maintounuck Group," and their similarity to the rocks of the Lake Nipigon region was pointed out.

D.B.D. Photo. 1901.

Gap in Trap Hills at Narrows, Sutton Mill Lakes.

D.B.D. Photo. 1901.

Mud Flats, west shore James Bay, near Opinnagan River, looking shoreward.

The section there recorded, is in a general way, made up of quartz conglomerates, quartzites and sandstones. Associated with and over-

*Drawn by P. M. Papineau.*
THE GORGE AT PORTAGE BETWEEN SUTTON MILL LAKES, LOOKING SOUTH.

lying them is a series of cherts and shales, mostly dark colored. Overlying these beds is a heavy trap overflow and the total thickness of the series is placed at about 2,800 feet. This great thickness is not found [1] on the west side of the bay, however, but the upper part is probably there represented. The lower part is no doubt concealed by the Silurian limestones which are deposited along the margin, flanking it, not only along the Hudson bay side, but also to the south in the valley of the Ekwan river. The thickness of the marine clays and till which surround this rocky ridge, also conceals the underlying rock,

and it is only in such an erosion valley as that of the lake above referred to, that exposures of the beds beneath the trap can be seen.

In the vicinity of Sutton Mill lakes the series is nearly horizontal, inclining slightly to the north toward the basin of Hudson bay and as exposed consists of a thickness of 90 feet of sandstone and slates, capped by an extrusive trap showing a thickness of 150 feet. The sandstones and slates here, as well as on the Labrador peninsula, are impregnated with iron oxides chiefly in the form of magnetite and hematite. The sandstones exposed are composed of rounded and flattened grains of a reddish chalcedonic quartz surrounded by a slight deposit of the iron ore, and the interspaces are filled by a fine mosaic of quartz. In the darker coloured rock the grains are surrounded, and in parts replaced, by magnetite, while the interstitial quartz is less in amount. The appearance of the beds is that of a banded jasper, consisting of red beds separated by numerous narrow seams of a dark slate. On smooth surfaces the individual grains of the sandstone are distinctly shown. The slates which occupy the upper part of the section are made up of minute fragments of quartz, both red and colourless, forming 50 per cent of the mass, while the remainder is made up of a series of opaque particles which, from the result of an analysis of the rock, is probably largely magnetite.

Sandstones and slates impregnated with iron oxides.

Rocks similar to the Animikie of Thunder bay.

These rocks, when compared with those from the Animikie of Thunder bay, present many features in common. Their description as given by Mr. E. D. Ingall (Annual Report, Geo. Surv. Can., vol. III. p. 81 H.) shows that the general character is very much the same, but in the Sutton Mill lakes rocks the calcareous and dolomitic portions are wanting or have been replaced. The only mineral of economic importance observed in this series is iron. Magnetic ores of this metal are freely distributed throughout the whole of the section of the stratified series, but the fact that these ores are not generally concentrated in thick enough beds would count against their practical value. Closer examination might show that the richer parts of the section could be profitably worked. A few specimens from the exposure were brought in to the laboratory, and analyses of three were made. These are from the upper part of the section, the centre, and the lowest bed. The analyses of the three samples, as furnished by Dr. G. C. Hoffmann, are given below :—

From the upper bed—

| | |
|---|---|
| Metallic iron | 33·40 per cent. |
| Insoluble siliceous residue | 48·49 " |
| Titanic acid | none |

From centre of the section—

| | |
|---|---|
| Metallic iron | 68·62 per cent. |
| Insoluble siliceous residue | 4·21 " |
| Titanic acid | none |

Results of three analyses

From lowest bed exposed—

| | |
|---|---|
| Metallic iron | 27·72 per cent. |
| Insoluble siliceous residue | 61·12 " |
| Titanic acid | none |

The upper and lower beds represent the general mass of the sandstone and slate, the first being the slate of the beds just below the trap and not picked out as being an iron ore, while the specimen from the base of the section was of the dark red sandstone or jaspilyte, which showed streaks in which the magnetite made up a large percentage. The specimen from the centre of the section represents one of many of the richer beds in which nearly all the silica has been replaced by magnetite. There is a probability that thick enough beds of this ore could be found for profitable working, but their remoteness from the sea on, any near line of railway would render their present value in any case very doubtful.

## SILURIAN.

Wide belt of limestone.

The valleys of all the streams entering the western side of James bay are cut down through the drift deposits to a flat-lying limestone, which forms a wide belt around the west shore of the bay and along the southern shore of Hudson bay. On the Albany river the upper part of the series is proved to be of Devonian age, and beneath, at a greater distance from sea, Silurian limestones are exposed. These beds probably overlap any older ones that may be beneath, and rest directly on the Archæan.

Rocks proved to be of age. Silurian.

On the Attawapiskat river Dr. Bell recognized the Silurian in the upper reaches of that stream, but a small series of fossils collected farther down, near the bay, seemed to present a Devonian facies, and the rocks of this age were then supposed to extend northward to this river. The collection of fossils from the portage on the Ekwan river was as complete as we could make it in view of this fact Many of the species formerly collected both from the Attawapiskat and the Severn rivers were of forms apparently new to science or undescribed, so that their value as horizon markers was not very great. My collection embraced many more species and some in a good state of preservation, so that Dr. Whiteaves had no difficulty in deciding at once that they were not

Devonian but Silurian and that the species brought from the Attawapiskat river were in a great measure duplicated in this collection.

Devonian rocks confined to southern part of James bay.

It seems therefore certain that the Devonian rocks are confined to the southern part of James bay and the adjacent country, extending a short distance north of the Albany river. On the Severn river Mr. Low collected fossils which appear to be of Silurian age.

The section of the Ekwan appears to be nearly horizontal, or the beds exposed in ascending the stream seem to be in an ascending series. The first appearance of the underlying rocks noted in ascending the stream is a colouration in the boulder clay, probably from a red shale in the bed of the river Exposures of this were not seen, but higher up at the first heavy rapid, limestone of a gray to whitish colour in lumpy beds outcrops both below and at the rapid. The beds are very hard and dolomitic and contain very few fossils. At the next rapid the beds are yellowish and appear in thinner layers and of finer grain. The thickness exposed at both these rapids does not appear to be of any great amount, probably not over 20 feet.

The exposure at the portage is of a very irregularly bedded limestone, owing to the presence of large masses of porous or coralline formation, which has formed a very irregular surface for the succeeding layer which in consequence seems contorted. Below the coralline mass the beds are thin and of fine texture. The general colour is a grayish white and the rock is hard, tough and massive, and contains a greater variety of fossils than at any of the other exposures. Lists of the species found at these several rapids are given in the general descriptions for the localities. All the exposures at the rapids above this have a very similar appearance, except that in the exposures near the last rapid of this series the lower beds are fragmental, or break with a lumpy surface and are ash gray in colour. Above these are yellow beds, in which there are numerous irregular cavities. The ashy coloured beds bear a very strong resemblance to the Devonian rocks of the south shore of Lake Winnipegosis, but do not hold different fossils from those at the portage on this river. The yellow beds which are full of cavities are similar to rocks of Silurian age on Cedar lake in the Saskatchewan district.

Other exposures of these beds occur to the north of the Cambrian rocks of Sutton Mill lakes, and are found very near them so that the continuity of the series around this mass both by the south to the Severn river and to the east by the coast is almost certain. On the extreme end of the eastern point at Cape Henrietta Maria, our Indian

guide described exposures of what seemed undoubtedly to be limestone of about the same characteristics as that on the Ekwan river.

## POST TERTIARY.

Glacial striae recorded.

On all the rock exposures in the country adjacent to the Ekwan river, where the exposed surfaces have not been subjected to denuding agencies, glacial striæ have been recorded showing a movement of the ice mass toward the southwest. Only one exposure on the Ekwan showed such a striated surface, and this gave S. 40° W. All or nearly all the surfaces exposed in the valley were eroded by river action and the scouring effect of ice in the spring floods, so that the original glacial striae were obliterated. The till left by this ancient glacier is deposited in an even mantle over the surface and contains a few boulders, but the fragmental portions of the mass are of small size The depression of the earth's surface, owing to the weight of the ice sheet, is shown by the presence of marine clays on the surface of the boulder clay, and as these are of nearly the same composition as the clays beneath, the line of demarcation is hard to define. The marine clays extend up the Ekwan river to past the mouth of the Washagami and northward to and surrounding the ridge of trap which protrudes through the plain at Sutton Mill lakes. The extreme limit of submergence in the district to the south is given by Dr Bell as 500 feet. Near Sutton Mill lakes the top of the marine terrace now stands at 400 feet above tide, so that the submergence of the present coast line was greater than this amount. The fossils which determine these clays include the following species: *Saxicava rugosa*, *Mya truncata*, *Macoma calcarea* and *Cardium ciliatum*.

Limit of submergence.

# APPENDIX I.

*Preliminary list of fossils from the Silurian (Upper Silurian) rocks of the Ekwan river, and Sutton Mill lakes, Keewatin, collected by D. B. Dowling in 1901, with descriptions of such species as appear to be new.*

BY J. F. WHITEAVES.

## *ANTHOZOA.

### TETRACORALLA.

*Zaphrentis Stokesii*, Edwards and Haime.

Ekwan river: portage road at falls, two specimens; and upper rapid, two specimens.

Small island in the northern of the two Sutton Mill lakes: four specimens.

*Pycnostylus Guelphensis*, Whiteaves.

Ekwan river: portage road at falls, one specimen; and foot of portage road, one specimen.

*Pycnostylus elegans*, Whiteaves.

Ekwan river, portage road at falls: one specimen.

### HEXACORALLA.

*Favosites Gothlandica*, Lamarck.

Ekwan river: foot of portage road, five specimens; portage road at falls, one specimen; and upper rapid, one specimen.

*Favosites Hisingeri*, Edwards and Haime.

Ekwan river: lower rapid, one specimen; foot of portage road, one specimen; and portage road at falls, one specimen.

*The Anthozoa have kindly been determined by Mr. L. M. Lambe.

Small island in the northern Sutton Mill lake ; one specimen.

This species occurs also in the Niagara and Guelph formations of Ontario.

### OCTOCORALLA.

*Halysites catenularia*, L.

"The typical form, as identified by Canadian and United States palæontologists, under this name or that of *Catenipora escharoides*, Lamarck, and *C. agglomerata*, Hall." Lambe.

Ekwan river, foot of portage road: one specimen, that, according to Mr. Lambe, is like specimens from the Niagara and Guelph formations of Ontario and from Division 4 of the Anticosti group of Anticosti.

*Lyellia superba.* (=*Trematopora superba*, Billings.)

Ekwan river, portage road at falls: one specimen.

## HYDROZOA.

*Stromatoporoidea*, genera and species undetermined.

Ekwan river, portage road at falls: two fragments, which seem to be referable to different genera.

## ECHINODERMATA.

*Crinoidea*, genera and species uncertain.

Ekwan river, portage road at falls: a cast of the interior of a dorsal cup, that shows little more than the general shape and the impress of a few large hexagonal plates. Foot of portage road: two portions of finely annulated columns, which are circular in section and perforated by a pentalobate axial canal.

## POLYZOA.

*Fenestella subarctica*, sp. nov.*

Zoarium spreading, somewhat fan-shaped, but probably funnel shaped when perfect. Branches very slender, carinated on the celluliferous face, and averaging from a fourth to a third of a millimetre in thickness. Bifurcations very infrequent in the only specimen collected,

*It is hoped that the new species described in this appendix, will soon be illustrated in one of the palæontological publications of the Survey.

occurring at intervals of five mm. or more. Interstices much wider than the branches. Dissepiments about one mm. apart, or four and a half to five in the space of five mm. Fenestrules longer than wide, irregular but somewhat rectangular, nearly or quite a mm. long and approximately about half as wide as long. Zoœcial apertures circular, in two ranges, opening somewhat laterally, twenty in each range in the space of five mm., and three to four on each side in the length of a fenestrule, closely disposed but separate, slightly irregular in their disposition, sometimes alternate on the two sides of the keel, sometimes opposite, their margins indenting the borders of the fenestrules. Under a highly magnifying simple lens, the keel appears to be minutely spinose in places.

Ekwan river, portage road at falls: one fairly good specimen. Mr. R. S. Bassler, of the U. S. National Museum, to whom the writer is indebted for critical suggestions in regard to the structural peculiarities, and affinities of this and the following species, writes that the zoœcial apertures of this *Fenestella* "seem unusually large, but this is due to the removal of the outer investment of the zoarium."

*Phœnopora Keewatinensis*, sp. nov.

Zoarium bifoliate, branching, consisting of a thin flattened frond which is six millimetres wide on an average, but ten mm. wide at a bifurcation, and which bifurcates at intervals of about eleven mm. Zoœcia rhombic, a little longer than wide, seven in two millimetres measuring lengthwise and eight to eight and a half measuring transversely, divided by thin, straight longitudinal partitions, which form their sides and separate them into longitudinal rows. Apertures of the zoœcia obliquely oval. Surface marked by arching striæ, which curve convexly forward.

Small island in the northern Sutton Mill lake, one specimen. In regard to this specimen, M. Bassler writes as follows: It is "a *Phœnopora* closely allied to several Clinton species, but which I should regard as new. In zoœcial structure is is very close to *P. multifida*, Hall, and especially to *P. fimbriata*, James. *P. multifida* has a different zoœcial growth and slightly larger zoœcia. *P. fimbriata* has about the same zoœcial measurements, but the growth of the zoarium is quite different."

Seven other species of *Phœnopora* are known to occur in the Cambro-Silurian and Silurian rocks of Canada. These are: *P. incipiens*, Ulrich, from the Trenton limestone of Montreal; *P. constellata*, *P. ensiformis* and *P. explanata*, Hall, also *P. punctata*, Nicholson and

Hinde, from the Clinton and Niagara formations of Ontario; and *P. excellens* (*Ptilodictya excellens*, Billings), and *P. superba* (*Ptilodictya superba*, Billings), from the Anticosti group of that island.

## BRACHIOPODA.

*Trimerella Ekwanensis*, nom. emend.

*Trimerella Equanensis*, Whiteaves, 1902. Ottawa Naturalist, vol. xvi, p. 141, pl. II, figs. 1 & 2, pl. III, fig. 1.

Ekwan river, portage road at falls: three ventrals and two imperfect dorsal valves.

The specific name is here slightly amended, in accordance with the more modern spelling of the name of the river.

*Trimerella borealis.*

*Trimerella borealis*, Whiteaves, 1902. Ottawa Naturalist, vol. xvi, p. 142, pl. III, figs. 2 & 3.

Ekwan river, lower rapid: a cast of the interior of both valves.

*Stropheodonta*, sp. indet.

Ekwan river, foot of portage road: one well preserved ventral valve, with the surface markings essentially like those of *S. varistriata*, var. *arata*.

*Stropheodonta*, sp. indet.

Small island in the northern Sutton Mill lake: two specimens, with the exterior marked by very fine, equal, radiating striæ.

*Plectambonites transversalis* (Wahlenberg).

Ekwan river, foot of portage road: two imperfect but characteristic ventral valves. In the Museum of the Survey there are specimens of this species from the Niagara group at Grimsby, Dundas, and Hamilton; from divisions 2, 3 and 4 of the Anticosti group, four miles west of Jupiter river, at East point, and at the Jumpers, Anticosti; also from the Silurian (upper Silurian) rocks of Lake Temiscouata, N.B.

*Orthis*, sp. indet.

Ekwan river, upper rapid: one half of the ventral valve of a small, rather coarsely ribbed and apparently undescribed species of the *O. Davidsoni* type. A similar but more perfect valve, in the

Museum of the Survey, was collected on the Fawn river, or branch of the Severn, by Mr. A. P. Low in 1886.

*Camarotœchia Ekwanensis*, sp. nov.

Shell small, moderately convex, transversely subelliptical and wider than long.

Ventral valve with an extremely small, narrow, erect or straight beak, behind, and a well defined mesial sinus, that extends backward to about the midlength, in front; the whole surface of the valve marked with thirteen rather distant angular radiating ribs, three in the mesial sinus and five on each side.

Dorsal valve with a still smaller beak, and with a fold corresponding to the mesial sinus of the ventral, its surface marked with twelve angular ribs, four on the fold and four on each side of it.

Hinge area and interior of the valves unknown.

Ekwan river, portage road at falls: one well preserved cast of the interior of the closed valves.

This small rhynchonelloid may possibly prove to be an extreme variety of *C. neglecta* (the *Atrypa neglecta*, Hall, of the second volume of the Palæontology of the State of New York) from which it seems to differ chiefly in its transversely and rather narrowly subelliptical marginal outline.

*Atrypa reticularis*, L.

Ekwan river, foot of portage road: two small specimens.

*Glassia variabilis*, sp. nov.

Shell very small, strongly compressed and lenticular in outline in transverse section, or moderately convex and varying in marginal outline from nearly circular and sometimes a little wider than long to subovate and a little longer than wide.

Ventral valve with the front margin either nearly straight and devoid of sinus, or faintly sinuated, or provided with a rather wide but not distinctly defined, shallowly concave or not very deep, mesial sinus, that extends backward to about the midlength. Umbo of the ventral valve small, narrow and not very prominent or produced, its beak slightly incurved and apparently perforate.

Dorsal valve with the umbo and beak smaller than those of the ventral.

Surface apparently smooth.

Spiralia directed toward the dorsal side (Schuchert); jugum, muscular impressions, and hinge dentition unknown.

Dimensions of a typical and average specimen (from the Winisk river): maximum length, slightly over eight millimetres; greatest width, eight mm. and a half; maximum thickness, four mm.

Two small loose blocks of limestone from or near the mouth of the Winisk river, collected by Mr. W. McInnes in 1903, are almost exclusively composed of nearly perfect shells of this species, many of which have the spiralia, or internal spiral cones, preserved. Some of the best of these specimens have been examined by Mr. Charles Schuchert, of the U. S. National Museum, who writes as follows in regard to them in a letter dated March 9, 1904. "The spiral cones in the Winisk shell are directed toward the dorsal side, but I cannot see the jugum. For the present I would refer it to *Glassia*. In external characters it is very near to *G. subovata* (Sowerby) but the difference in the spiralia will distinguish them, as the latter has the cones inwardly or medially directed. This difference is certainly of specific value, but for the present I should not regard it as of generic importance, as different genera of the Atrypidæ have the spiralia directed either laterally, medially or dorsally."

Ekwan river, foot of portage road, one specimen; Fawn river (or branch of the Severn), thirteen specimens; all of which are probably referable to this species, though none of them show any vestige of the spiralia or of any of the other characters of the interior of the valves. They are, perhaps, a little more convex proportionately than the typical form from the Winisk river. The sinus in each of their ventral valves seems to be a little more developed. In these respects the specimens from the Winisk are more like the *Atrypa compressa* of Sowerby, and those from the Ekwan and Fawn rivers more like the *A. subovata* of the same author, both of which are now regarded as forms of *Glassia subovata*.

*Spirifer crispus?* Hisinger. Var.

Ekwan river, middle rapid: one good specimen of a small radiately ribbed *Spirifer*, that is apparently similar, in size and general shape, to the *S. crispus*, as described and figured by European and American palæontologists, but which has narrow and angular, not wide and rounded ribs.

*Spirifer* (?) sp. indet.

Ekwan river: portage road at falls, one specimen; and at foot of portage road, one specimen; both casts of the interior of ventral valves that are possibly referable to *S. radiatus*, Sowerby, but that are much too imperfect and too badly preserved to be satisfactorily determined even generically.

*Reticularia septentrionalis*, sp. nov.

Shell strongly biconvex, but often with a faint, shallow, narrow longitudinal groove or depression in the median line of each valve; varying in outline in different specimens from subovate or somewhat pentagonal and a little longer than wide, to not far from circular and as wide as long, but always abruptly contracted and attenuate in the umbonal region behind; front margin of the valves straight and entirely devoid of a mesial fold or sinus.

Ventral valve with a narrow but prominent or produced umbo, a depressed, incurved and acute beak, and an extremely small delthyrium.

Umbo and beak of the dorsal smaller and less prominent.

Most of the specimens are little more than mere casts of the interior of the closed valves. Their surface is entirely devoid of ribs of any kind, and at first sight would seem to be marked only with concentric lines of growth. But, upon closer examination, numerous, obscure, close-set and very slightly raised concentric lines, or faint and minute, low, rounded ridges, can be detected on portions of the exfoliated test that happen to be preserved, and the shell structure, under a lens, is seen to be fibrous.

Characters of the interior of the valves unknown, though there are indications of a median septum in each.

Ekwan river: lower rapids, one specimen; middle rapid, one specimen; and portage road at falls, four specimens.

This large and nearly smooth species is provisionally referred to the genus *Reticularia* on account of its general resemblance to *R. modesta* (Hall), and *R. perplexa* (McChesney) which is the *Spirifer lineatus* of Shumard and other American palæontologists, but not of Martin; though it may prove to be a *Martinia*.

*Reticularia (?)* sp. indet.

Ekwan river, foot of portage road: two specimens, each of which has the whole of the dorsal valve and most of the ventral preserved,

though the umbo and beak of the latter are broken off. Both are transversely subelliptical in outline and wider than long, and both have a rather shallow marginal sinus in the ventral valve. They are entirely ribless, but the better preserved one of the two is finely and nodosely cancellated by numerous, close-set, minute concentric ridges, that are crossed by similar radiating ones.

At the portage road at the falls a specimen, with the same general shape and with a similar sinus in the ventral valve, was collected, but it is so much worn that its surface markings are quite obliterated, and the beak of the ventral is so imperfect that it is impossible to tell whether it was originally perforate or not. This specimen seems to correspond fairly well with E. Billings' figures of *Athyris Blancha*, from the Silurian rocks of Maine, which Hall and Clarke refer to *Meristina*, but which Schuchert says is a *Meristella*.

*Meristina* (?) *expansa*, sp. nov.

Shell tumid, regularly and rather strongly biconvex, transversely subelliptical and always a little wider than long; front margin of the valves not at all sinuated; surface entirely devoid of any kind of ribs.

Ventral valve with a rather depressed though slightly prominent umbo, and an incurved beak.

Dorsal valve with a much more depressed umbo and a smaller beak.

Surface markings of the exterior of the test unknown, those of its exfoliated inner layer consisting of numerous, close-set and very minute, concentric raised lines, as well as of a few rather distinct concentric lines of growth; structure of the test fibrous.

Characters of the interior of the valves unknown, though there is clearly a long mesial septum in the ventral valve, and apparently a similar one in the dorsal.

Ekwan river: portage road at falls, one specimen; and foot of portage road, an unusually large but imperfect specimen. Attawapiskat river, seventeen to thirty miles below Rainy island, Dr. R. Bell, 1886: eight specimens.

These specimens are mere casts of the interior of the closed valves, with small portions of the inner layer of the test attached to some of them. It is by no means clear whether the beak of the ventral valve of any of them is perforate or not. They are provisionally and very doubtfully referred to *Meristina*, on account of their general resemblance in external form, to the European *M. tumida*, but it may be

that they should rather be referred to *Meristella* or *Reticularia*. They seem to differ from *Reticularia septentrionalis* in their uniformly, transversely and broadly subelliptical contour, and in the more depressed umbo of the ventral valve of each.

## MOLLUSCA.

### PELECYPODA.

*Ambonychia undulata* (Whitfield).

*Leptodomus undulatus*, Whitfield, 1878. Ann. Rep. Geol. Surv. Wiscons. for 1877, p. 81; and (1880) Geol. Wiscons., vol. IV p. 293, pl. xviii, figs. 1 and 2.

Ekwan river: portage road at falls, an imperfect left valve; and foot of portage road, a nearly perfect and very convex right valve.

Both of these specimens are marked with "strong regularly rounded concentric undulations." Mr. E. O. Ulrich, who has kindly examined the five specimens of pelecypoda collected by Mr. Dowling, and to whom the writer is indebted for some critical suggestions in regard to them, thinks that *Leptodomus undulatus* is an *Ambonychia* allied to *A. planistriata*, Hall, and that the former had fine surface radii.

*Ambonychia septentrionalis*, sp. nov.

Shell obliquely and acuminately subovate or subrhomboidal, very inequilateral, rather strongly convex, most prominent in the umbonal region of each valve. Anterior side very short, abruptly truncated, or rather inflected, and flattened; posterior side a little longer, broadly rounded at its extremity and forming a subangular junction with the hinge line above. Umbones prominent, tumid but rather narrow; beaks incurved, anterior, and almost if not quite terminal; hinge line straight behind the beaks, equal to about two thirds of the greatest length of the valves beneath.

Surface marked with a few faint and obscure concentric undulations and lines of growth, also by extremely minute radiating lines. Test very thin.

Hinge dentition and muscular impressions unknown.

Ekwan river, portage road at falls: a cast of the interior of both valves, with part of the test preserved.

This shell is rather similar to the *A. affinis* of Ulrich from the Middle Galena of Minnesota and Illinois, both in its shape and surface markings. But, in the former the posterior end is more broadly rounded and not so much produced below, and the radiating raised lines of the surface are much more minute.

*Mytilarca pernoides*, sp. nov.

Shell compressed convex, rather obliquely subovate and very inequilateral, or broadly mytiloid and subalate behind. Anterior side very short, truncated or abruptly inflected above and rounded below; posterior side a little longer, its outer margin truncated somewhat obliquely and forming an angular or subangular junction with the cardinal border above, but rounded below. Cardinal border behind the beaks straight, its entire length equal to fully two thirds or more of the greatest length of the valves below; hinge area large; umbones apparently not very prominent; beaks appressed, incurved and almost terminal.

Surface marked with a few impressed and concentric striæ of growth; test rather thick.

Hinge with both cardinal and lateral teeth; muscular impressions unknown.

Ekwan river, portage road at falls: one testiferous left valve.

Mr. Ulrich thinks that this shell is "closely related to, if not quite the same as, *Ambonychia aphœa*, Hall," from the Niagara limestone of Illinois, which he (Mr. Ulrich) referred to *Mytilarca* in 1894, in the seventh volume of the Reports of the Geological Survey of Ohio. *A. aphœa*, however, was based upon a mere cast, which does not show the proportionate length of the hinge line, the size of the cardinal area, nor the surface markings, so that it is scarcely possible to make a satisfactory comparison between it and the specimen from the Ekwan river.

*Ctenodonta subovata*, sp. nov.

Shell small, inequilateral, moderately convex, subovate and one fourth longer than high. Anterior (?) side short and rounded; posterior (?) side produced, a little longer, and more narrowly rounded at its outer termination; ventral margin gently convex; superior border sloping abruptly downward in front of the beaks and much more gradually so behind them; umbones small and moderately prominent; beaks also small, incurved and placed in advance of the midlength; ligament external, short, placed on the shorter end of the hinge line.

Surface faintly, very minutely and concentrically striated.

Hinge dentition and muscular impressions unknown.

Dimensions of the only specimen collected: maximum length, twenty millimetres; greatest height, fifteen mm. and a quarter; maximum thickness, ten mm. and a quarter.

Ekwan river, portage road at falls: one testiferous specimen, with both valves.

The homologies of the shell of *Ctenodonta* are unknown, and it is not at all clear which is the anterior and which the posterior side of this species. If the shorter is the posterior side, as in *Nucula* and as would seem to be indicated by the position of the ligament, then the beaks of this species are placed a little behind the midlength and *vice versa*.

"In outline this shell agrees very nearly with my *C. simulatrix* and less closely with *C. Albertina*, but these species had the ligament on the longer, instead of the shorter end of the hinge." Ulrich.

GASTEROPODA.

*Pleurotomaria* (or *Euomphalopterus*) sp. indet.

Ekwan river, upper rapid: five badly preserved casts of the interior of the shell of a widely umbilicated species of *Pleurotomaria* or *Euomphalopterus*, with a very low obtuse spire. These specimens are very similar in shape to casts of *Pleurotomaria Valeria*, Billings, which is probably an *Euomphalopterus*, but the outer whorl of each is not so distinctly keeled at the periphery.

*Euomphalopterus*, sp. indet.

Ekwan river, foot of portage road: a specimen with the upper half of the shell completely worn away, the basal half, which is all that is left, being narrowly umbilicated and showing part of a peripheral alation.

*Megalomphala robusta*, sp. nov.

Shell large for the genus, strongly convex but deeply and rather widely umbilicated on both sides, the umbilicus occupying about one half of the entire diameter though its margin is not very distinctly defined. Whorls at least three and perhaps more, increasing very rapidly in size and laterally expanding, coiled closely on the same plane and everywhere in close contact, but with little or scarcely any overlapping; their periphery encircled by a continuous slit-band; exposed portions of the inner ones truncated almost vertically but somewhat obliquely on each side. Outer whorl rounded on the periphery in some specimens, faintly and obtusely subangular in others, distinctly subangular around the umbilical margin on both sides, the umbilical wall being steep but somewhat oblique. Slit-band narrow, in half-

grown specimens moderately elevated and bounded on each side of its summit by a spiral raised line, but this minute double keel becomes obsolete on the outer half of the last volution, in adult shells. Outline of transverse section near the aperture subreniform and much wider than high in some specimens but somewhat triangular and nearly or quite as high as wide in others; outer lip not preserved in any of the specimens collected, but apparently not abruptly expanded; apertural slit unknown.

Surface of most of the specimens collected marked only with curved, transverse striæ of growth, but in one specimen the markings consist of small narrow, thin transverse ridges, with flat spaces between them.

Ekwan river, portage road at falls: seven specimens, all of which are imperfect at the aperture. The largest is seventy two millimetres in its maximum diameter.

The generic name *Megalomphala*, Ulrich, 1897, is, however, too close to *Megalomphalus*, Brusina, 1871.

*Salpingostoma boreale*, sp. nov.

Shell small, consisting of three rounded volutions that are a little wider than high and coiled on the same plane, in close contact, with little or no overlap, or at least closely contiguous if not actually in contact; umbilicus wide and open, exposing most of the inner whorls. Aperture trumpet shaped, lip widely and abruptly expanded.

Surface marked with minute rounded spiral ribs, that are crossed by small, crenate, lamellose raised ridges. The slit-band is not well shown in either of the few specimens collected, but it seems to be narrow, and continuous, at least at some distance behind the aperture.

Ekwan river: middle rapid, foot of portage road, and portage road at falls; one specimen from each of these localities. The largest of these specimens, though only twenty-three millimetres, or less than an inch, in its maximum diameter, has an abruptly expanded aperture. The other two are obviously immature shells, each about eleven mm. in its greatest diameter. In one of them the posterior half of the earliest volution is free from, and not quite in contact with, that which immediately succeeds it.

It is only in the continuity of the slit-band that this species and shells of this genus are supposed to differ from *Tremanotus*, or as Dr. Paul Fischer spells it, *Trematonotus*.

*Euomphalus*, sp. indet.

Ekwan river, lower rapid: a cast of the interior of part of the outer whorl of a large species.

*Gyronema speciosum*, sp. nov.

Shell quite large for the genus, imperforate, turbinate, a little higher or longer than wide, spire slightly higher than the outer whorl. Whorls six or seven, rounded, ventricose; aperture widely subovate, not far from circular, lip thin and simple.

Surface marked with numerous and rather close-set small spiral ridges, that are crossed by still more numerous, more close-set and minute, transverse raised lines. On the last whorl but one there are about eight of these spiral ridges, and on the last or outer one there are not less than twelve and probably as many as fifteen.

Ekwan river, portage road at falls: two specimens. The larger of these was probably about forty-five millimetres high or long, when perfect, and its maximum width is thirty-five mm.

*Gyronema Dowlingii*, sp. nov.

Shell turbinate, higher or longer than wide, spire elevated, volutions rounded and ventricose; umbilicus almost or quite closed. Lower whorls of the spire marked with three rather distant, acute and prominent spiral keels. Outer whorl encircled by four comparatively large spiral keels and by a few much smaller spiral ridges, or minute raised lines. Between the second and third spiral keels there are three close-set, low and rounded, minute spiral raised lines, and there are indications of a few small spiral ridges in the umbilical region, below the lowest of the four large spiral keels.

Ekwan river, portage road at falls: one imperfect specimen with the apical whorls broken off, but with the test preserved on the last two whorls of the spire, and on part of the outer whorl.

A rather smaller species than the preceding and with very different sculpture. It is somewhat similar in shape to the *Cyclonema sulcatum* of Hall, from the Guelph formation of Ontario (which is probably a *Gyronema* rather than a *Polytropis*). But the whorls of *G. Dowlingii* are not shouldered above, its suture is not channeled, and its outer volution is encircled by only four large spiral keels. *G. Dowlingii* is still more closely allied to, but apparently quite distinct from the *C. cariniferum* of Sowerby, as figured by Lindström in his monograph of

the Silurian Gastropoda and Pteropoda of Gotland, which Ulrich says is a *Gyronema*.

*Gyronema brevispira*, sp. nov.

Shell rather small, turbinate conical and wider than high; spire shorter than the outer volution. Whorls four or five, those of the spire obliquely compressed; last whorl of the spire angulated and carinated below, next to the suture; outer whorl obliquely compressed above, rounded and almost imperforate below, the umbilicus being represented by a minute, short and very narrow chink behind the columellar lip; aperture ovately subcircular; lip thin and simple.

Surface encircled by small narrow and acute spiral keels. On the last whorl but one there are five of these keels, and on the outer whorl eleven.

Ekwan river, portage road at falls: two specimens.

*Loxonema*, sp. indet.

Ekwan river, at the following localities. Foot of portage road, a specimen of a small slender species, with six whorls preserved; and, upper rapid, a much more imperfect but otherwise similar specimen. Portage road at falls, a fragment of a larger shell, with apparently similar characters, but with only two of the whorls preserved.

*Orthonychia obtusa*, sp. nov.

Shell straight, conical, slightly compressed at the sides, but more so on the right than on the left side, and moderately elevated, the height being less than the maximum length at the aperture or base. Apex erect, bluntly pointed and rather eccentric; base with two faint, obscure, shallow undulations on the right side. Aperture and outline of transverse section at and near the base, subovate but somewhat irregular in outline; lip shallowly undulated on the right side.

Surface markings unknown, though casts of the interior are quite smooth, and the exterior of large pieces of the thin and presumably inner layer of the test, that happen to be preserved, is marked with numerous, irregular and often not continuous, fine concentric striæ. Muscular impressions unknown.

Ekwan river, foot of portage road: two specimens, that are very different in shape to any species of *Orthonychia* or *Platyceras* that the writer is acquainted with.

*Platyceras compactum*, sp. nov.

Shell turbinate, imperforate, a little wider than high, spire small and short. Whorls certainly three and probably as many as four or five in perfect specimens (the apex being broken in both of those collected) rounded, closely coiled and increasing rapidly in size; outer whorl inflated and expanded, with two faint low rounded spiral plications near and at the aperture in young specimens, and from three to four in adult ones.

Surface marked with numerous, close-set, transverse lines of growth, that are flexuous where they cross the spiral plications.

Ekwan river, portage road at falls: one apparently adult and one half grown specimen. The former, which is well preserved and nearly perfect, is thirty five millimetres wide, and was probably about thirty mm. high when perfect, allowing two mm. for a small piece broken off at the apex.

*Diaphorostoma perforatum*, sp. nov.

Shell depressed turbinate, much wider than high; spire short, raised very little above the highest level of the outer whorl; base narrowly but deeply umbilicated. Whorls five, increasing rapidly in size, those of the spire flattened above and rounded below; the outer one rounded and ventricose, but depressed at the suture above; umbilical margin rounded and very indistinctly defined. Aperture rounded subovate, pointed above and slightly insinuated on the columellar side by the encroachment of the preceding whorl, wider and rounded below; lip thin and simple; characters of the columella not well shown in the only specimen collected.

Surface marked with numerous close-set, nearly straight and very minute, transverse raised lines, that are scarcely visible without the aid of a lens; also by a few larger and more distant impressed lines of growth.

Ekwan river, middle rapid: one nearly perfect specimen, with the test preserved.

This shell seems to be referable to the genus *Platyostoma*, Conrad (1842), but Lindström asserts that this name is preoccupied by Klein in 1753, by Meigen in 1803, and by L. Agassiz in 1829. For this reason Dr. Paul Fischer (in 1885) proposed to distinguish Conrad's genus by the name *Diaphorostoma*, though Lindström maintains that both *Platyostoma*, Conrad, and *Strophostylus*, Hall, are mere synonyms of *Platyceras*. Fischer explicitly states that the only difference between

*Diaphorostoma* and *Strophostylus* is the obliquely folded columella of the latter, while Eastman, in the first volume of his recently published translation of Zittel's "Text-book of Palæontology," quotes *Strophostylus*, Hall, as a synonym of *Platyostoma*, Conrad.

*Strophostylus amplus*, sp. nov.

Shell imperforate, subglobose, widely expanded and slightly depressed, about as wide as high, spire small and very short. Whorls four, increasing very rapidly in size, those of the spire rounded; the outer one moderately convex as viewed dorsally, expanded widely in the direction of its height, widest above the midheight and rather narrowly rounded at the base; suture distinctly impressed; aperture very large, apparently widely subovate; outer lip thin and simple; characters of the columella not well shown in either of the specimens collected; posterior portion of the outer lip extended considerably so as to embrace part of the preceding whorl.

Surface marked with fine transverse striæ of growth, which are curved convexly forward parallel to the outer lip.

Ekwan river, portage road at falls: three specimens, which do not show the exact shape of the aperture at all well. The interior of each is completely filled with stone, so that the inner edge of the columella is covered, but in one of the specimens there are indications of a flexuous longitudinal groove just behind the columella.

*Strophostylus inflatus*, sp. nov.

Shell subglobose, naticoid, imperforate, about as wide as high, spire short. Whorls probably four in perfect specimens, though not more than three are preserved in the most perfect specimen collected, increasing rapidly in size, the outer one inflated and ventricose, most convex at about its midheight; aperture not well shown in the specimen described but apparently subovate; outer lip thin and simple, its posterior portion apparently not so extended as to embrace part of the previous whorl

Surface marked with obliquely transverse lines of growth.

Ekwan river, portage road at falls: a cast of the interior of the shell of a large specimen with small portions of the test preserved, from which the foregoing description was made, and two small specimens; also a large testiferous specimen that is probably referable to this species, though its outer whorl is considerably compressed laterally.

*Strophostylus filicinctus*, sp. nov.

Shell depressed turbinate and wider than high, spire rather short, less than half as high as the outer whorl, as viewed dorsally. Whorls six or perhaps seven, rounded but slightly flattened at the suture above, increasing rapidly in size, the outer one strongly inflated, ventricose and imperforate at the base. Aperture subcircular, lip thin and simple.

Surface marked with extremely minute and close set, low, rounded, spiral raised lines, and by fine transverse striæ of growth. On the last volution but two of one specimen there are nineteen of these spiral raised lines, and four and a half in a millimetre. On the outer whorl of an apparently adult specimen, and near the aperture, there are three spiral raised lines to a mm.

Ekwan river, portage road at falls: two specimens, with the minute surface markings well preserved. One of these is a testiferous specimen with nearly the whole of the spire preserved, but with the outer whorl almost completely broken off; and the other a cast of the interior of the last two whorls of the shell of an adult specimen, with a small piece of the test preserved, at and near the aperture. Beside these there are four specimens that are probably referable to this species, though none of them show any trace of the minute spiral lines upon the exterior of the test. Three of these are from the portage road at the falls, and one from the foot of the portage road.

This species would seem to be congeneric with *Cyclonema cancellatum* of Lindström, from the Silurian rocks at Gotland, which Ulrich says is a *Strophostylus*.

CEPHALOPODA.

*Endoceras* (or *Nanno*) sp. indet.

Ekwan river, portage road at falls: two fragments of siphuncles, or of a siphuncle, that are presumed to be referable to either *Endoceras* or *Nanno*, on account of their apparent homologies with specimens collected by Dr. Ells and the writer in 1902 in the chazy or Black River limestone at Kingston Mills, Ont.

*Actinoceras Keewatinense*, nom. prov.

This is a provisional name for some peculiar, obliquely subnummuloidal and presumably submarginal siphuncles, or portions of siphuncles, somewhat resembling those of *A. cochleatum* (Schlotheim). They are longicone and increase very slowly in thickness, nearly circular in transverse section, and encircled, at more or less regular intervals, by

narrow and rather deep, obliquely transverse constrictions. Between these constrictions the siphuncle is laterally compressed and but slightly expanded, while its tranverse diameter is from two to three times as great as the distance between the constrictions.

The surface makings of these siphuncles consist of fine close-set longitudinal striæ.

Rainy island, Attawapishkat river, Dr. R. Bell, 1886: three fine and rather slender specimens. Ekwan River, upper rapid: two distorted fragments.

The best specimen, from the Attawapishkat river, which shows ten of the siphuncular constrictions, is three inches and nearly a half in length, by twelve millimetres in diameter near the smaller end, and twenty-two near the larger. In this specimen the width of the siphuncle is about twice as great as the distance between two of the constrictions. In another equally slender but shorter specimen from the same locality, which shows seven siphuncular constrictions, the width of the siphuncle is nearly three times as great as the distance between the constrictions, at the smaller end; and only twice as great at the larger.

*Kionoceras cancellatum* (Hall).

*Orthoceras cancellatum*, (Hall). 1852.

*Orthoceras columnare*, Hall. 1866. Not *O. columnare*, Marklin, 1857.

*Orthoceras Scammoni*, *O. Hoyii*, *O. lineolatum*, and *O. irregulare*, McChesney, 1861; teste Hall.

*Orthoceras Woodworthi*, McChesney, 1865; teste Hall.

*Orthoceras Cadmus*, Billings. 1886.

*Orthoceras angulatum*, Hall. 1867. But not *O. angulatum*, Wahlenberg. 1821.

*Orthoceras virgatum*, Hall. 1867. Not *O virgatum*, Sowerby. 1839.

*Orthoceras subcancellatum*, Hall. 1877.

*Orthoceras orus*, Hall. 1877.

Ekwan river: portage road at falls, two fragmentary specimens, the largest less than two inches in length; and middle rapid, two similar fragments; all of which seem to be referable to this species. Each of these specimens is a portion of a longicone orthoceratite, with a circular transverse section, a central or nearly central siphuncle, and marked with narrow longitudinal ridges, separated by wider grooves or intervals, with minute, close-set, transverse, raised lines between them. Specimens with similar external characters have been found in the Niagara and Guelph formations at three localities in Ontario and Quebec. These are the *Orthoceras Cadmus*, of Billings, from

Grimsby and Elora; a specimen from Elora that the writer has referred to *O. Scammoni*; and a specimen from L'Anse à la Barbe, near Port Daniel, in the Baie des Chaleurs, in the Museum of the Survey, labelled *O. virgatum*, by E. Billings.

*O. Cadmus, O. subcancellatum* and *O. orus* are names that have been given to this shell on the assumption that Hall's *Orthoceras cancellatum* is not the same as the *Orthoceratites cancellatus* of Eichwald. Billings, in a paper entitled "New Species of Fossils from the Clinton and Niagara formations" and published with his "Catalogues of the Silurian Fossils of the Island of Anticosti", says that his *O. Cadmus* appears to be *O. cancellatum*, Hall, not Eichwald. And in the explanation of fig. 11, of Plate 19 (10) of the Twentieth Regents' Report, Hall says that the character of the surface of impressions of the exterior of specimens from Wisconsin and Illinois that he figures and refers to *O. angulatum* and *O. virgatum*, is "precisely like that of *O. cancellatum*, Hall, from the Niagara group of New York, and differs in no essential particular from the minute surface markings of *O. columnare*." But Dr. Foord has shown that Eichwald's *Orthoceratites cancellatus* is an *Endoceras*, and the specific name *cancellatum* does not appear to be preoccupied in *Orthoceras*, and certainly is not in *Kionoceras*. And if it be objected that "once a synonym always a synonym", then the next specific name to be selected would seem to be *K.* or *(O.) Scammoni*, if Hall's *O. cancellatum* is not the same as the *O. canaliculatum* of Sowerby.

*Orthoceras*, sp. indet.

Apparently brevicone; longitudinally ridged, ridges unequal in size and irregular in distribution.

Ekwan river, portage road at falls: a fragment that is not sufficiently long to show conclusively whether it formed part of a brevicone orthoceratite or not.

*Orthoceras Ekwanense*, sp. nov.

Shell increasing rather rapidly in thickness, compressed, elliptical in cross section; surface of the test smooth; septa very close together, siphuncle apparently central, though the internal structure is badly preserved in the only specimen collected.

Ekwan river, portage road at falls: one specimen, a little over two inches in length, and fully two inches in its longer diameter at the larger end. Perhaps a *Rizoceras*, which is possibly an inadvertent spelling of *Rhizoceras*.

*Phragmoceras lineolatum*, sp. nov.

Shell, or cast of the interior of the shell, apparently essentially similar to that of *P. Nestor*, as described and figured by Hall, in general shape and in that of its aperture, but with the exterior of the test marked with very numerous, closely and regularly disposed, minute transverse impressed lines, that give to the surface a minutely ribbed appearance, under a lens.

Ekwan river: middle rapid, a cast of the interior of a large body chamber; foot of portage road, one good specimen and three fragments; portage road, at falls, two good specimens and one fragment: and upper rapid, a large but imperfect cast of the body chamber and of nine or ten of the chambers between the septa.

The type of *P. Nestor* is a mere cast of the interior of the shell, with no indications of the surface markings of the test, and in *P. Nestor*, var. *Canadense*, there are remains of rather coarse longitudinal ribs.

## CRUSTACEA.

### OSTRACODA.

*Isochilina* or *Leperditia*, sp. indet.

Ekwan river, upper rapid: a rather large right valve about twelve millimetres long, but with only its interior exposed.

### TRILOBITA.

*Calymene Niagarensis*? Hall.

*Calymene Blumenbachii*, Billings, pars; but perhaps not of Brongniart.

Small island in the northern Sutton Mill lake: an imperfect head that is probably referable to this species, though it shows little more than a cast of the glabella, which is proportionately wider in front than that of average examples of C. *Niagarensis* from the Anticosti group of Anticosti. The Canadian Calymenes that E. Billings identified with *C. Blumenbachii* are now usually referred to four species, viz., *C. senaria*, Conrad, from the Trenton limestone; *C. callicephala*, Green, from the Hudson River group; *C. Niagarensis*, from the Niagara, Guelph and Lower Helderberg formations and from the Anticosti group; and *C. platys*, Green, from the Corniferous limestone.

*Illænus*, sp. indet.

Ekwan river: middle rapids, one pygidium; foot of portage road, three glabellæ and four pygidia; portage road at falls, one pygidium. The dorsal furrows of these three glabellæ are well defined, but the shape and position of the eyes or ocular lobes are not well shown in either.

*Bronteus Ekwanensis*, sp. nov.

Pygidium very large, attaining to a length of a little more than four inches and a little longer than wide, longitudinally and broadly subelliptical but truncated anteriorly, its posterior end being rather narrowly rounded and its lateral margin nearly straight on each side anterior to the midlength. Axis moderately convex, inversely subtriangular, longer than wide, with an obtuse apex, occupying more than one-third but less than one-fourth of the entire length of the pygidium and marked with a transverse groove near its anterior margin. Pleural region most prominent at and near the midlength of each of the pleural ribs, decreasing abruptly in convexity outward to the lateral margins of the pygidium, but much more gradually so to its posterior margin; marked by fifteen large flattened convex radiating ribs, with narrow grooves between them; each rib being narrow at and near the axis and wider at some distance from it, though all the ribs fade out at a short distance from the margin and before reaching it. The median rib is shallowly bifurcate posteriorly.

Surface apparently smooth. Cephalon and thoracic segments unknown.

Ekwan river: lower rapid one, imperfect pygidium; middle rapid, the largest and most perfect pygidium collected; and foot of portage road, one imperfect pygidium and two fragments.

*Bronteus aquilonaris*, sp. nov.

Pygidium of medium size, apparently not exceeding an inch and a half in width, transversely subelliptical and much wider than long, with an almost flat but slightly convex axis, and still flatter pleural region. Axis short, inversely subtriangular, with an obtuse apex and somewhat concave sides, nearly twice as wide as long, almost smooth but marked with one transverse furrow near the anterior margin; median rib a little wider than any of the lateral ribs and bifurcate posteriorly; lateral ribs seven on each side, straight and flattened convex, all of the ribs fading out before reaching the margin.

Surface apparently smooth. Cephalon and thoracic segments unknown.

Ekwan river: portage road at falls, three pygidia, each with the axis imperfect; and foot of portage road, one pygidium with the axis well preserved.

*Bronteus Niagarensis*, Hall, from the Niagara limestone of Ontario, has a much larger pygidium, with the midrib entire and contracted at its midlength, while the lateral ribs are wider and flexuous. *B. acamas*, Hall, from "limestone of the Niagara group at Wisconsin" and Ontario (which S. A. Miller says is a synonym of *B. occasus* of Winchell and Marcy) has a much larger and more pointed pygidium, with an "entirely simple" and undivided midrib. *B. insularis* of Billings, from the Anticosti group of Anticosti, is a diminutive species with a pygidium less than half an inch wide and wider than large; while *B. Pompilius*, Billings, from the Silurian (Upper Silurian) rocks at Port Daniel, has a small pygidium with a "longitudinal median lobe in the axis."

*Ceraurus Tarquinius* (Billings).

*Cheirurus Tarquinius*, Billings, 1863. Proc. Portland Nat. Hist. Soc., vol. i, p. 121, fig. 22.

Ekwan river: portage road at falls, and foot of portage road. At each of these localities two heads were collected, which seem to be essentially similar to the types of *C. Tarquinius*, from Port Daniel, in the Museum of the Survey, though the characters of the posterior angles of the cephalon of that species are still unknown. In the Ekwan river specimens, the eyes are opposite the second lobe of the glabella, the cheeks are coarsely punctured, and each of the posterior angles of the cephalon ends in a short spine.

# APPENDIX II.

*List of plants collected by Mr. D. B. Dowling at the mouth of the Ekwan and Albany rivers, 1891.*

BY JOHN MACOUN, M.A., F.L.S.

Though Mr. Dowling only collected 41 species of flowering plants the collection is in several respects an interesting one. In the first place no plants had previously been obtained from the west coast of James bay as far north as the Ekwan river, so that the range of every species collected has been extended. No truly Arctic plants were obtained, but on the other hand there were several species which require a temperate climate. Among these are *Lathyrus palustris*, *Rosa blanda*, *Mertensia paniculata* and *Erysimum cheiranthoides*.

One of the most interesting plants in the collection is the rare *Pyrethrum bipinnatum* only found in Canada in the Hudson bay region. Other interesting species are *Primula stricta*, *Cypripedium passerinum*, *Carex turfosa*, and *Poa alpina*.

1. Anemone multifida, Poir.
2. Anemone parviflora, Mx.
3. Ranunculus circinatus, Sibth.
4. Braya purpurascens, Bunge.
5. Erysimum cheiranthoides, L.
6. Stellaria longipes, Goldie.
7. Lathyrus palustris, L.
8. Hedysarum Mackenzii, Rich.
9. Potentilla Anserina, L. Var. Grœnlandica, Sen.
10. Potentilla fruticosa, L.
11. Fragaria Virginiana, Duch.
12. Rosa blanda, Ait.
13. Rubus arcticus, L.
14. Heracleum lanatum, Mx.
15. Achillaea Millefolium, L., var. nigrescens, L.
16. Artemisia Canadensis, Mx.
17. Erigeron hyssopifolius, Mx.
18. Senecio Balsamitae, T. & G.
19. Senecio palustris, Hook.
20. Pyrethrum bipinnatum, Willd.
21. Taraxacum officinale, L.
22. Primula farinosa, L.
23. Primula stricta, Horn.
24. Mertensia paniculata, Don.
25. Pedicularis Grœnlandica, Retz.
26. Castilleia pallida, Kunth.
27. Pinguicula vulgaris, L.
28. Plantago maritima, L.
29. Cypripedium passerinum, Rich.
30. Habenaria dilatata, Gray.
31. Habenaria hyperborea, R. Br.
32. Sisyrinchium angustifolium.
33. Allium Schœnoprasum, L.
34. Juncus Balticus, Willd.
35. Triglochin maritimum, L.
36. Carex maritima, Mull.
37. Carex turfosa Fries.
38. Eriophorum polystachyon, L.
39. Elymus mollis, Trin.
40. Poa alpina, L.
41. Poa arctica, R. Br.