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SUMMARY REPORT

ON

EXPLORATIONS IN NOVA SCOTIA

1907

BY

HUGH FLETCHER



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SUMMARY REPORT FOR 1907.

BY HUGH FLETCHER.

The early part of 1907 was spent by the writer in the usual work of the office, in which he was assisted by Mr. H. F. Tufts, who compiled the surveys of the summer of 1906 and continued a compilation of those previously made in the counties of Hants and Kings. During March, 1907, Mr. Tufts made two short trips into the country north of Ottawa to collect certain natural history specimens for the Museum, under instructions from Professor John Macoun. On April 14 he left Ottawa for Nova Scotia to engage in similar work and to collect skins of birds and mammals; he continued this work for Professor Macoun until June 17, when he again resumed geological work in the neighbourhood of Whiterock, assisted by Mr. W. W. Hughes and, a few days later, by Mr. M. H. McLeod. Mr. Hughes left Nova Scotia on July 14, but Messrs. McLeod and Tufts continued work there until the end of the season.

As is frequently the case with field officers of the Survey, part of the writer's time during the winter was taken up with queries from companies and individuals upon questions of mining geology. From December 3 to December 13, 1906, he was at the Londonderry mines, to study with the manager, Mr. J. J. Drummond, and the superintendent of mines, Mr. W. F. C. Parsons, the singular and interesting deposit of hematite discovered on the west side of the Great Village river, not far above the bridge on the Cumberland road, and worked by the company at the Brooking mine in the immediate vicinity of the igneous rocks of the district.

The Londonderry hematite is eighteen to twenty feet wide where opened on the bank of a brook by a cross-cut or tunnel from which a steep shoot runs up to the surface, and it appears to follow a mass

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of diorite and quartz felsite perhaps contemporaneous with the ore. To test its extension farther down the brook on the line of its apparent strike eastward a second tunnel was begun from a lower level. This tunnel cut soft sedimentary shales and breccia which extended nearly to the diorite, but were not succeeded by iron ore. A third tunnel was driven into massive diorite on the supposition that the vein would keep on the course followed in the first tunnel.

From No. 1, or the working tunnel, drifts were driven easterly and westerly along the hematite, which was stoped down to the levels, but to the westward passed into carbonate or white ore, apparently of subsequent origin and associated with pyrite, while to the eastward it became of low grade and was succeeded by an intrusive rock not rich in iron. The failure of the other tunnels to cut ore seems to show that the ore body is of limited extent; and a borehole subsequently put down to intersect the ore at a level below No. 1 tunnel also failed to find a workable mass of hematite. The mode of occurrence of this ore is in many ways like that of the siliceous hematites of other parts of Nova Scotia, that at Arisaig, Blanchard, Torbrook and elsewhere are associated with diorite, but unlike that of the contact carboniferous deposits of Newton Mills, Boisdale and other places in Cape Breton.

Leaving Ottawa on June 12, the writer accompanied Dr. Ells down the St. Lawrence river to examine the great masses of quartzite exposed in high knobs and ridges near St. Paschal and Kamouraska among red, greenish and grey slates. They are folded and show nearly vertical dips almost in contact with the slates and flags, and they include limestone concretions and patches of bastard limestone containing fossils, while graptolites are found in the dark slates. The slates somewhat resemble and may perhaps represent the Dictyonema slates of Gaspereau and Highbury, N.S.; the Quebec quartzites have not been recognized as distinct from the slates, but are regarded as lenticularly included among them, all being assigned to the Cambrian, while a map of the outcrops of the quartzite about Whiterock, in Kings county, compiled on a scale of twenty chains to an inch, suggests rather that the quartzites there rest unconformably upon the Dictyonema slates.*

*(Sum. Rep. for 1906, p. 141.)

On June 28, on his way to Sydney, the writer investigated the unimportant beds of reddish, highly ferruginous slate or impure hematite uncovered in a trench cut across siliceous Cambrian rocks near the house of Mr. Archie Gillis in the rear of Beaver cove. Explorations subsequently undertaken among these rocks at Eskasoni seem to have met with no better success. A few days later the writer visited with Messrs. F. H. and R. Chambers a much more important deposit of hematite which was being exploited by the Nova Scotia Steel and Coal Company northeast of the St. Mary's road among the Silurian rocks of Meiklefield in Pictou county. Like the hematites of East river Pictou, Blanchard, Torbrook and other places this ore is full of fossils, in irregular beds sometimes of large size, and contains forty to fifty per cent of iron, but is high in silica. Here the Silurian rocks are apparently greatly folded, but the structure has not yet been closely defined. Large quantities of siliceous hematite occur among these rocks and will some day be used in the manufacture of iron.

A few days spent in examining numerous pits and boreholes between Glace bay and Schooner pond, with Mr. C. M. Odell, resident engineer of the Dominion Coal Company, Mr. Joseph Daniels of Lehigh University, Pa., in charge of the explorations, and Mr. Patrick Neville, deputy inspector of mines, convinced the writer that no mistake had been made in locating No. 6 as a colliery to supply the demand for Phelan seam coal, that the seam worked at No. 6 could be no other than the coal of the Clyde mines and of McDonald (Tice) cove, called the Phelan, that the Emery seam is everywhere at its proper distance beneath it, and that, therefore, No. 6 cannot be on the Emery seam as had been suggested.

With the same gentlemen the writer walked along the cliffs of the opposite shores of Glace bay, in which rocks overlying these two seams are well exposed and must appeal powerfully to the most unobservant in favour of their identity and continuity, by the position of the various coal seams, large and small at the same distance apart, by the recurrence of similar associated strata and by the strike of every bed of one section towards corresponding beds on the other shore, a correspondence greatly strengthened by shaft-records and mine workings at Caledonia and No. 2 mines and by boreholes on

the west side of Glace bay—all of which agree perfectly with the sections of the east side as recorded in Mr. G. Robb's report for 1874-75. When, moreover, it is remembered that it is a matter of common belief that the Phelan seam of Caledonia mines was first so-called and mined at the Clyde mines and opened on the west side of Glace bay by tracing it from the latter, that it was found in dredging Port Caledonia, that coal which after a storm covers the west end of Glace Bay beach, almost, to the rise of the submarine levels of Caledonia mines, is derived from its outcrop and that the underlying Emery seam has been traced by boring nearly across the interval concealed by the beach, it is not surprising that the writer should advise the Dominion Coal Company to desist from further explorations in that direction. His conclusions, which agreed with those communicated to the Dominion Iron and Steel Company in January, after consideration of all the official evidence on the subject, were again presented, with some additions, in a statement made to the vice-president and other representatives of the Dominion Coal Company. The accuracy of the Geological Survey reports in regard to the Glace Bay basin was re-affirmed at a meeting in Halifax on July 15; it had been confirmed by the extensive mining and exploration operations carried on since 1874.

It was urged by the Dominion Coal Company's counsel, however, that the reports of the Geological Survey might not be accepted as evidence in court, that it was indispensable that the fact of No. 6 being on the Phelan seam should be proved at first hand. Authority was obtained from Ottawa for the writer to proceed again to Glace bay and establish this point beyond a reasonable doubt and he remained in the neighbourhood of Glace bay until the close of the trial.

Besides tracing by means of boreholes and pits an underlying coal, the Lorway seam, which runs parallel to and south of the outcrops of the Phelan and Emery seams, to define the structure and regularity of the coal basin, Mr. Daniels had in the meantime measured independent sections of the shores on opposite sides of Glace bay, in even greater detail than those of Mr. Robb, but fully corroborating the latter, and had prepared a sheet to compare the sections drawn from his own measurements with others derived from

the records of shafts and borings at the different mines and to show graphically the different beds of coal, carbonaceous shale, sandstone, limestone, ironstone, etc. This sheet served at the trial to prove the Dominion Coal Company's contention about the Phelan seam. The writer's evidence on some of the points involved, given on August 12, is to be found in the court records of the trial.

During the writer's residence at No. 6, an important hole was bored from the strata above the Phelan seam at that mine, down through the Phelan and Emery seams and for some distance below the latter, a record of which was kept by him, and some of the cores from which were examined for fossils by Dr. H. M. Ami.

The writer visited also a boring by one of the government drills in charge of Mr. Terry Patten, drilled for the Broughton Company, to a depth of 1,080 feet, on a small brook in the angle of the Backlands and shore roads not far from Belloni post office and Milton station on the Sydney and Louisburg railway. A five-foot seam of coal, believed to be the Tracy seam, was cut at 556 feet, the section of the rocks above corresponding closely with that of the shore of Mira bay given in the Geological Survey Report for 1874-75, grey sandstone with thin bands of grey argillaceous shale and one or two of dark-grey or blackish Cordaite shale underlying the large coal seam.

Some new openings on the Mullins seam near Lynk lake do not seem to have added much to the information given on page 121 of the Summary Report for 1905. The argillo-arenaceous roof shales contain very beautiful calamites, lepidodendra, ferns and other fossil plants.

At Newville* after boring labouriously with a calyx drill at a depth of 2,484 feet, the hole was abandoned, being now 125 feet deeper than that in which coal was discovered at Pettigrew, a mile farther north from the edge of the basin, and a sample of the core, ten inches long and four and a half inches in diameter, from a depth of 2,463 feet still showing conglomerate, in nearly horizontal bedding, composed of large pebbles of felsitic, granitic and dioritic rocks with a few of slate and quartzite probably Devonian. It was thought that the calyx drill might be used to greater advantage in the other hole to obtain information about the strata underlying the coal seam, and

*Sum. Rep. for 1906, p. 142.

the drill was accordingly moved to Pettigrew, where the old hole was cleaned out to a depth of 2,357 feet, below which some difficulty was experienced which it is hoped will soon be overcome. The immense thickness of the conglomerate formation is remarkable. The success with which a core-drill has been substituted for the cable-drill whenever desirable in these boreholes is very gratifying and reflects great credit on the driller, Mr. Maynard Mumford.

East of Trenton, in Pictou county, Mr. Isaac McNaughton is now drilling a hole which has reached a depth of 564 feet. The principal varieties of the cores were described and many of them selected for transmittal to Ottawa for use in collections. The position of the several holes drilled by Mr. McNaughton between Pictou Landing and Trenton was also defined on a map and the records copied from Mr. McNaughton's notes. These have not yet been compiled, but they appear to prove all the strata southward from the borehole nearest Pictou Landing to the New Glasgow conglomerate, one of them being 857 feet deep.

In the Sydney coalfield in several cases mining areas held by one company interfere with the active operations of another in such a manner as to require readjustment by the government unless a satisfactory arrangement can be made otherwise. Further extension seaward of the workings of the Nova Scotia Steel and Coal Company at the Princess pit, for example, cannot be proceeded with unless that company can acquire certain areas now held by the Dominion Coal Company. On the other hand the Nova Scotia Steel and Coal Company owns a block of submarine areas fronting the Dominion Coal Company's Lingan areas.

Explorations by means of trial-pits were again undertaken last season along the steep north outcrop of the Cow Bay basin near Sand lake and Birch ridge; but in view of the discordant statements regarding the number, thickness, extent and relation of the coal seams on the opposite sides of this basin, it has been suggested that holes should be carefully drilled on the low-dipping south side both at the west end some miles inland and also on the shore near a hole put down in 1905 by government drill No. 6 to test the measures underlying the McAulay seam, as described in the report of the Nova Scotian Department of Mines for that year.

Explorations carried on last summer by Mr. D. H. McLeod and others of the Inverness Coal and Railway Company, along McNeil brook at St. Rose, a few miles south of Chimney Corner coal mines, and near a borehole drilled by Mr. Sands to a depth of more than 600 feet, seem to have developed several bands of black shale and eight seams of coal, one of which, of good quality and eight feet thick, appears to overlie the four feet seam previously described as worked by Mr. William McRae and others, and to differ, according to Mr. D. Northall-Laurie, from the large seam of the borehole, the roof of which consists of fifteen feet of black shale, whereas the new seam has grey roof-shales. These explorations indicate an important thickness of coal measures, the breadth of which, however, between the base and a fault proved by the gypsum extending along the shore, does not seem to exceed 2,000 feet.

During a stay of about two weeks in Pictou county, visits were made to some of the collieries at which points of interest have developed in the course of the workings and explorations. In regard to the operations at the new Allan shafts on two of the large seams of the Albion mines, the Foord and Cage-pit seams, Mr. Harry Coll, the manager, explained to the writer the curious effects of pressure and folding in the basin which have polished the shales and given rise to conditions of crumpling and irregularities of thickness in the coal seams which require great care and skill to overcome. Mr. Coll is making an interesting plaster model of these workings.

The writer also accompanied Mr. Thomas Blackwood, Deputy Inspector of Mines, and Messrs. Malcolm Blue and J. G. MacKenzie, of the Intercolonial colliery, across a line of borings put down, from the mouth of the Drummond slope northward about 2,000 feet to the road, in the dark shales that overlie the main seam at these mines, and proving that no workable coal overlies the main seam in this distance.

He also visited with them other explorations made to define the position of the McCulloch Brook fault near the railway, the slope now down 7,200 feet (6,912 feet horizontal projection), being very near the point at which this fault is indicated on Poole's map of the Pictou coalfield. (G. S. C. Report, Part M., Vol. XVI.) The extension eastward of the lowest mine-level is perhaps, however, the

surest and cheapest method of proving the structure of this portion of the coalfield.

The operations of many years and the high price of labour have greatly raised the cost of producing coal at the old mines. Owing to the quantity of water that had to be pumped at the Joggins mines in Cumberland county, for example, for a comparatively small output of coal, the directors decided to abandon the old slope and to open another, at the crossing of the shore road and the tramway to the loading ground, which is now down about 600 feet.

The reported discoveries of large seams of coal in Antigonish county refer to renewed explorations among the Lower Carboniferous (Devonian) bituminous shales of the Hallowell Grant, Big Marsh, Maryvale and Cape George district, described in Geological Survey Reports, Vol. II., Part P, pp. 73, 74 and 113, and Vol. V., Part P, pp. 173, 174, which are not known to have developed any new coals of workable size and quality.

In these reports the bituminous shales are described as precisely similar to those of Horton Bluff in Kings county and are stated to be so rich in bituminous matter that hopes are entertained of utilizing them as a source of coal oil, as in the case of the Albert and Baltimore shales of the same age in New Brunswick. They break with smooth, polished faces so as to resemble coal, for which they have often been mistaken even where not a trace of good coal has been obtained; but in many places they pass into and include layers of coal of fair quality. The discovery of coal and fossil plants on the North river of Antigonish was noticed by Gesner* in 1836. Explorations made from 1859 onward are described by Dr. D. Honeyman, Sir J. W. Dawson, Dr. Henry How, Dr. Edwin Gilpin, Mr. John Rutherford and others†

Mr. John Campbell's explorations showed 'that these oil coals and shales underlie the Carboniferous limestone at Big Marsh; he divides them into two groups, the lower seventy or eighty feet in thickness, including twenty feet of good oil shale, five feet of which

* Geology of Nova Scotia, p. 142.

† How's Mineralogy, pp. 28 and 34. Dawson's Acadian Geology, p. 349; Trans. N S Inst. Sc., Vol. VI, p. 70; Gilpin's Mines of Nova Scotia, p. 14.

is curly cannel, rich in oil; the upper 150 feet thick, in immediate contact with the limestone, containing a large percentage of oil. The pits dug in search of coal in and about Big Marsh are shown on the map. The black shales are associated with light-grey micaceous shale and sandstone, full of impressions of broken plants. In the report of the Commissioner of Mines for 1868, page 21, a return is made of \$682.50 expenditure for preparatory work in driving a tunnel into the face of a hill for the purpose of cutting the seam of coal. An additional expenditure is returned of \$590 next year, but the presence of faults near the crop of the seam is said to have impeded progress. In 1870 considerable difficulty is said again to have been experienced in consequence of the disturbed state of the strata, a series of faults having thrown the seam out of its regular position, and necessitated much extra work in drifting.* At two of the pits, on the Beaver road, a black, very bituminous shale passes into grey, rusty, crumbling shale, glistening with mica and containing obscure plants. Coal has also been sought in the black, bituminous, carbonaceous shale near Ogden pond.⁷

In the course of a search for coal at Hallowell Grant in 1888, Mr. Alex. McBean, the well-known explorer of the Pictou coalfield, found 'a thickness of 150 feet of black shale, containing twenty feet of curly cannel, mentioned by Campbell, and a little coal is underlaid by a great thickness of greenish shale, underlaid in turn by coarse sandstone and soft conglomerate. Mr. McBean supposes that there are several bands of this shale arranged in the form of a basin which underlies the limestone of Big Marsh post office, and is perhaps broken on the north side by a fault. The west end of this basin seems to be at the fork of the old Gulf road, and the east end at the fork of a large brook two miles east of the post office. It does not seem to pass more than half a mile northwest of Big Marsh road or half a mile southeast of McGillivray road, until it is underlaid by the coarse sandstone and conglomerate. Dunlop's pits are northeast of the post office. A long tunnel is in the brook, half a mile east of the post office; it was driven 150 feet in black shale, cutting at the end a seam from which coal is said to have been taken. At a very small brook west of the long tunnel, the limestone overlies grey and

* Rutherford's report.

reddish conglomerate. Up the west branch of this brook is the best coal seam in the district, said to be five feet thick and to dip to the westward, but to be broken off both east and west of the brook. A considerable quantity of coal was extracted from it. The dark shales are nearly all curly and polished; the masses of coal are lenticular or crushed. In most cases it is a hard bituminous variety, somewhat shaly, streaked with pyrite; but in places it resembles cannel.'

The workings of 1907-08 are on the little brook less than a quarter of a mile northeast of the post office at Big Marsh. A sample collected from these workings by Mr. Thomas Blackwood and analysed for the Nova Scotian Department of Mines yielded:

Moisture..	2.25
Volatile combustible matter..	23.28
Fixed carbon..	47.54
Ash..	26.93
	100.00
Sulphur..	3.15

Other samples, selected on January 9, 1908, by Mr. Blackwood and the writer, to represent the whole thickness of an exposure of this coal as well as the more favourable portions, were given to Mr. F. G. Wait and yielded on analysis by fast coking:—

	1	2
Water..	1.12	.66
Volatile combustible matter.	21.58	28.39
Fixed carbon...	30.84	41.55
Ash..	46.46	29.40
	100.00	100.00
Coke, strong, compact...	77.30	70.95
Ratio of volatile combustible matter to fixed carbon...	1 : 1.43	1 : 1.46

No. 1 was slightly pyritiferous, but no determination of sulphur was made. Sample arrived in very moist condition. It was air-dried at laboratory temperature a few days before sampling.

The great interest taken in the search for coal beneath the Permian having induced the Nova Scotian Institute of Science to republish Sir William E. Logan's great section of the Joggins and others of Chignecto bay, and these sections being now in print, Mr. Harry Piers sent them for final revision in November with a request that the writer should finish a map and longitudinal section to accompany them. To accomplish this, the coast between Seaman brook at Minudie and Flat brook at Little Shulie was re-examined in order to add to the map other points of importance according to a scheme laid down by the committee of publication. With the assistance of Mr. M. H. McLeod, who in former years had also made many surveys along this coast, a map and sections were then compiled on a scale of forty chains to an inch and sent Professor J. E. Woodman to be redrawn for publication in Halifax.

On July 9, in company with Mr. A. Dick, of the Dominion Coal Company, a visit was paid to the district between Forks lake and the Coxheath copper mines where discoveries of small quantities of chalcopyrite have recently been made near Hector McRae's and Kenneth McKenzie's. These all occur among felsitic rocks, the richly mineralized portions apparently in a laminated or shattered belt on both sides of a more massive crystalline axis of the Coxheath hills; but it is doubtful if any one of these outcrops is worthy of attention.

On August 29, in accordance with instructions received from the Director and in company with Mr. M. S. Beaton, general manager of the Inverness coal mines, D. Northall-Laurie and W. F. Davis, C.E., an examination was made of a deposit of copper ore at Whyccomagh, lying not far west of a tunnel driven in search of gold some years ago and in proximity to a rock containing a large percentage of magnetite, not far from Salt mountain. The ore, chiefly chalcopyrite, has been opened by a trench and small pits in a light-coloured granite among dark dioritic rocks, cut by small veins of quartz and calcite, to which, however, the ore does not seem to be confined, and containing besides a large quantity of magnetite and pyrite in grains and small aggregations. The development hitherto made does not seem to promise a persistent deposit.

Rich specimens of chalcopyrite were found also in a vein or belt

near Cheticamp, and an irregular deposit near a contact of sandstone with igneous rock at Scottsville near the outlet of Lake Ainslie, similar in mode of occurrence to the ores of Cheticamp, Lochaber and other places, has been reported by Mr. W. F. Jennison of Sydney.

Developments continued in the gold of the Pre-Cambrian of Middle river* have led to closer examinations of similar rocks on the upper waters of Ingonish river and elsewhere in Cape Breton, information about which is given in the Geological Survey Report and Maps for 1882-84.

The writer's opportunity for work in Kings and Annapolis counties, in which he had hoped to spend the greater part of the past season in fixing the age and limits of the various formations underlying the Horton, was thus very short. In connexion with this work he re-examined the brooks south of Marshy Hope in Antigonish county, in which slates, described as possibly Cambro-Silurian, show, like those near Whiterock, a cleavage oblique to the bedding; and he spent a few days in October with Messrs. McLeod and Tufts at their work near Lawrencetown and Kingston.

These gentlemen, as already stated, spent the latter part of June in a search for fossils among the red slates of Highbury, but they found only trails of annelids, like those obtained by Mr. N. D. Daru in 1905, of no determinative value. Mr. Tufts also surveyed several small tributaries of the upper Gaspereau river and made further studies of the rocks north of that river necessary to determine their structure and relative position. After moving to the old Dalhousie road at the crossing of the Lahave river on July 2, Messrs. McLeod and Tufts devoted themselves to the more extensive surveys necessary to complete Sheets 97, 104 and 105. The Lahave river and its tributaries they surveyed northward to the height of land near the waters of the Annapolis river and eastward to and including the Sixty river or stream. The country north of the Dalhousie road was surveyed as far west as Kelly brook and Trout-lake stream at the head of the Nictaux river, about three miles west of the Halifax and Southwestern railway; and the main Nictaux river was surveyed to the bluff north of Alpena. The whole of this district, which includes

* Sum. Rep. for 1906, p. p. 144.

fifty or sixty lakes of different size, is underlaid by granite and in part almost inaccessible.

After leaving this wilderness on September 28, Mr. McLeod undertook a survey of the brooks and roads of the settled country south of the Annapolis river between Middletown and Lawrencetown; while Mr. Tufts occupied himself in October with the rocks in the neighbourhood of Fales river and Torbrook, from which he was successful in obtaining Silurian fossils among the red and grey slates of Fales river hitherto believed to be barren. On November 14 he resumed the collection of zoological specimens for Professor Macoun, which he continued until December 7th.