GASPÉ OF YESTERDAY

PERCÉ GEOLOGY
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Dr.John M.Clarke, Geologist, writes of the remarkable rock formations of Percé.

KEN ANNETT

PERCÉ GEOLOGY-CLARKE

PREFACE

Despite the impression left recently by a news item on the CBC Radio program, "BREAKAWAY", there has been a long and distinguished record of work by geologists in Gaspesia. Some aspects of such work has been recalled by "GASPÉ OF YESTERDAY" in the following articles:

* #011 LOGAN IN GASPÉ. Early geological surveys by (Sir) William Logan in Gaspesia.

* #061 THE GOLDEN GOAL. PARTS I;II;III
#062
#63 The search for petroleum in Gaspé.

* #071 THE DOUBLETS IN GASPÉ AND THE GULF. Including their pioneer mining venture of 1665 at Grand Grève.

* #163 TWO GEOLOGISTS - WELL KNOWN AND REMEMBERED IN GASPÉ.
Dr. Harold William McGerrigle
Dr. Islwyn W.Jones

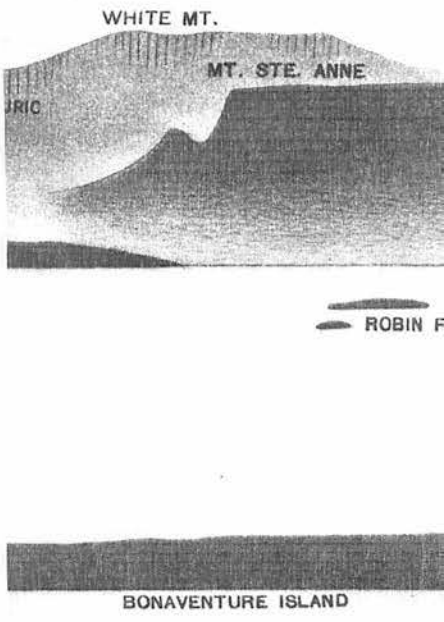
* #207 THE G.F. AND C.M. COMPANY. Recalling the activities of the Gaspé Fishery and Coal Mining Company.

* #220 WORLD'S LEADING GEOLOGISTS VISIT GASPÉ. The 1913 visit by members of the XII International Congress to Gaspesia.

Other articles of this series have recalled the work of Dr.John Mason Clarke of Albany, New York, Director of the State Museum of New York State and State Geologist. Dr.Clarke not only had expert knowledge of Gaspesian geology but he wrote in such volumes as, "THE HEART OF GASPE" and "ILE PERCEE" with remarkable insight and sympathy for the history and life-style of the Gaspesians of his time.

The following article on "PERCÉ GEOLOGY" is from a relatively rare NEW YORK STATE MUSEUM BULLETIN 149, SEVENTH REPORT OF THE DIRECTOR, 1910 published by Dr.John M.Clarke

PANORAM



NOTES ON THE GEOLOGY OF THE GULF OF ST LAWRENCE

BY JOHN M. CLARKE

As opportunity has afforded during the summer months the writer has continued his observations on the geology, principally of the Paleozoic formations, lying about and within the Gulf of St Lawrence. Not all the notes and records made are yet properly digested and fitted into their sequence in the geological history of this region, but there are some which extend and fortify my earlier researches and others which illuminate the investigations of earlier workers in these fields. The more tangible of these records are here brought together as an expression of progressing knowledge which it may be hoped will eventually give us a clearer conception of the development of this interesting region and of the causes producing the gulf itself.

I

THE RELATIONS OF THE PALEOZOIC TERRANES IN THE VICINITY OF PERCÉ

Percé is a region of boundless geological variety and interest. The writer feels that he has, in previous publications, only intimated its history, the details of much of which must be left to future students of the region, particularly that part of it lying back of the coast mountains. But in order to portray in panorama the relations of the Paleozoics here represented in a way that may help to clarify the situation, in the accompanying sketch a liberty has been taken with this irregular coast line by stretching out all its angles, headlands and bays into a straight line, so that, regardless of the unavoidable distortion involved, the eye may grasp not only the attitude of the rocks but their relative history. This section, which will be taken as only an approximation to accuracy of expression and whose discrepancies are freely avowed because of stretching a right angle into a straight line, is about six miles in length, unequally foreshortened at the north end, and extends from near Cannes des Roches at the north to the vicinity of l'Anse au Beaufils at the south. The point of view is out to sea east of Bonaventure Island, from the edge of the 50-fathom line which along this stretch of coast makes a deep bay inward toward this island (see Hydrographic map, p. 14, N. Y. State Mus. Mem. 9. v. 1 Early Devonic of Eastern North America, 1908). This 50-fathom line is a submarine terrace at this point, one of the steps leading down to the great cut in the Bonaventure rock plateau made by the channel of the St Lawrence river. What is actually exhibited in this sketch is the present stage of the attack of the gulf waters on the folded and unfolded rocks of Percé, supplemented by the outstanding fault faces of the mountain cliffs and by the general effect of weathering denudation.

A contrast of fundamental moment lies in the attitude of the younger and older rock beds; the former horizontal or gently undulating, the latter simply inclined and, on the south front, vertical. A fact of similar moment is that the latter, consisting of Lower and Upper Siluric and Lower Devonic, are exposed in jutting cliffs by the removal of the mantle of softer beds from over them.

Bonaventure sands and conglomerates. These beds lie today much as they were originally laid down in the shallow waters of a rough coast which must have been not greatly unlike, in its broken rugged cliffs, the coast of Percé as it is now. I believe the Bonaventure series of beds, at least so far as we can distinguish it from the Gaspé sandstone series, or so far as it can be defined from its

original section on Bonaventure Island, represents in time the latest stage of the Devonic and possibly the earliest of the Carbonic. We can not prove the latter affiliation from any evidence around Percé, nor indeed is this age demonstrable from intrinsic evidence at any point throughout its distribution from Gaspé bay to the head of the Bay of Chaleur. We have been in the way of deferring to current opinion in this matter, but can now go no further than to recognize an interval between this deposit and the earlier Devonic of the country, often intensified by down-faulting, the absence of any marine later Devonic and the continuity of this mass of sands and conglomerates as an accumulation of landwash along a bold upturned Precambric and early Paleozoic coast. I have had occasion before to refer to the fossil-bearing pebbles of this conglomerate,—Cambric, Siluric and Devonic; heads of Halysites often of large size (that here figured is from the cliff face on Bonaventure Island); fragments of the Gaspé sandstone and of the Percé Rock massive with their characteristic species. There is some order in the assortment of these pebbles, for there are as a rule few jaspers and other crystallines mixed with the limestones and few fossil-bearing blocks where the crystalline pebbles abound. Logan records a block in this conglomerate weighing upward of eight tons, but while such large ones are not familiar to my observation there is plenty of similar evidence that large, usually angular, masses were thrown down by seasonal freezing and thawing in the sea cliffs of those old days.

While these red Bonaventure rocks have undergone but slight deformation, it is their noteworthy down-faulting that has given to Mt Ste. Anne and its outlying cliffs their peculiar impressiveness. Ste. Anne rises, back of the sea cliffs and terrace of Percé, in a vertical east face from which has parted and, as I take it, slid down to lower level, that portion of the original mantle represented now by Bonaventure island and by the Robin reefs which the waters of the "Channel" have not yet washed away. Ste. Anne was once the "Table-a-rolante," and its gently rolling surface slopes downward to the north; but passing this, the observer is abruptly confronted by a second majestic fault scarp, the Grande Coupe, over whose smoothed face the water falls in vertical wavering lines to a level as low as the road, thence following to the sea a second fault plane which traverses the older rocks in a line at right angles to the Grande Coupe. This scarp faces north. Again at the back of Ste. Anne facing the south and west is an even more impressive fault cliff, the "Amphitheatre." Cut off thus by three bold fault faces, this mass of Bonaventure conglomerate is peculiarly isolated. The mountains roll up to greater heights westward of these undulating surfaces of Ste. Anne, but except for the first range, known as White mountain, their composition is as yet little understood. There is no area of these Bonaventure rocks known to me along the coast from there up the Bay of Chaleur, where this mode of bold faulting has been repeated, nor is there any very satisfactory evidence that the down-breaking of Mt Ste. Anne on at least three sides has involved the lower rocks on which it rests. These lower and older rocks constitute the very heart of appalachian upfolding and made a most irregular and unstable floor for the conglomerates, which may account for the manner in which the mantle has broken asunder without great distortion. Remnants of the

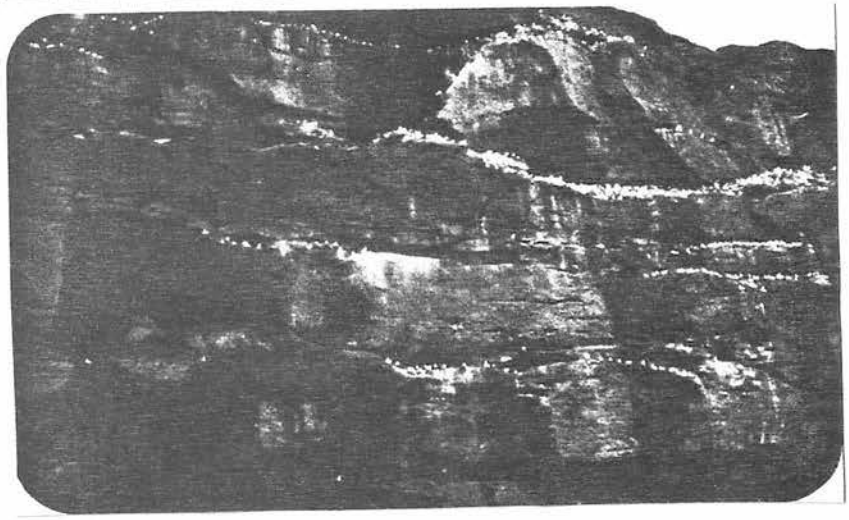
down-thrown blocks still lie on the land; one constitutes the shore front in a strip reaching from the Robin beach south to Birmingham's hill; another lies beyond the vertical limestone of Cape Blanc, where there is a sharp fault against the latter, with evidence that the edges of the conglomerates have been dragged downward; again, way at the north end of the section at Cannes des Roches, is a tipped block lying at fault with the Siluric, while the very top of Red peak, the highest point overhanging the Malbay, seems to be an outlier of the Bonaventure limestone-conglomerate resting on the upturned angles of the Percé Rock Devonic; this too has presumably been separated from the parent mass of Ste. Anne by a fault.

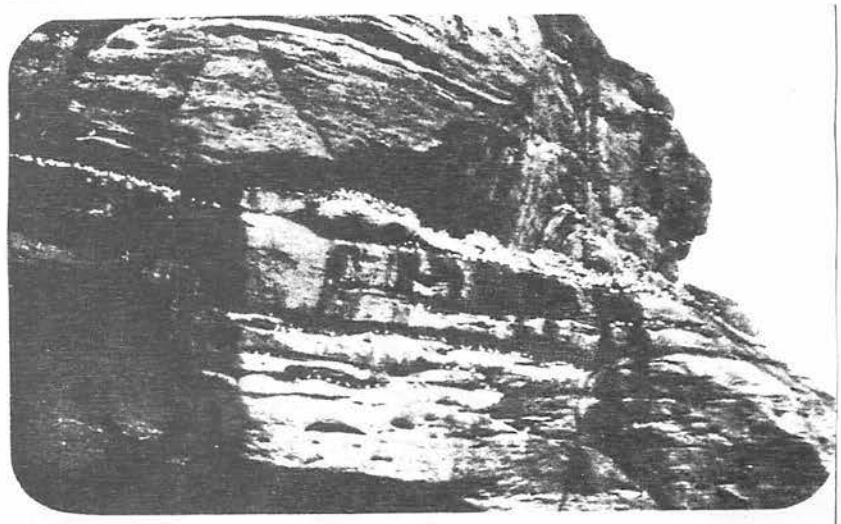
One additional fact is here worthy of record. Overlying the slopes of Mt Joli, particularly the south flank, is a very thin mantle of a gray unfossiliferous shale, whose attitude is apparently at right angles to those vertical beds. What is present is a mere residuum reduced to little more than a film but it seems to be a remnant of some gray shale that pertained to the Bonaventure series and has been broken up by weather. I would make this intimation with reserve, as it is possible that this thin accumulation has some later origin.

The vertical rocks. It is in the matter of attitude that the great contrasts of this coastal geology lie. On all the southward stretch from the angle of Mt Joli, the old rocks are but very little out of the perpendicular, standing with an inclination of 80°–85° s. This is true of all the Siluric shales and thin limestones of Mt Joli and Mt Canon, of the highly colored Devonic of Percé Rock and of the red and white limestones of Cape Blanc. On the north limb of the coast angle these older strata are less uniform in attitude and more faulted against each other but all steeply inclined. Throughout the complete series, however, there is a multitude of displacements, to which I have previously given some attention. Denuding these earlier rocks of their overburden, one finds the basis on which to restore the pre-Bonaventure appalachian upfolding, which has received its essential shove from the south, as the arm of the great mountain system here curved itself toward the east. All the capes and promontories of the coast lie where the more durable vertical rocks have stood against the sea, while the softer Bonaventure mantle was destroyed. These various Paleozoic rocks and their contents have been already pretty freely discussed by the writer and on this occasion it is desired only to consider somewhat more fully the character of the *cliffs at Cape Blanc and their extension into the White mountain.*

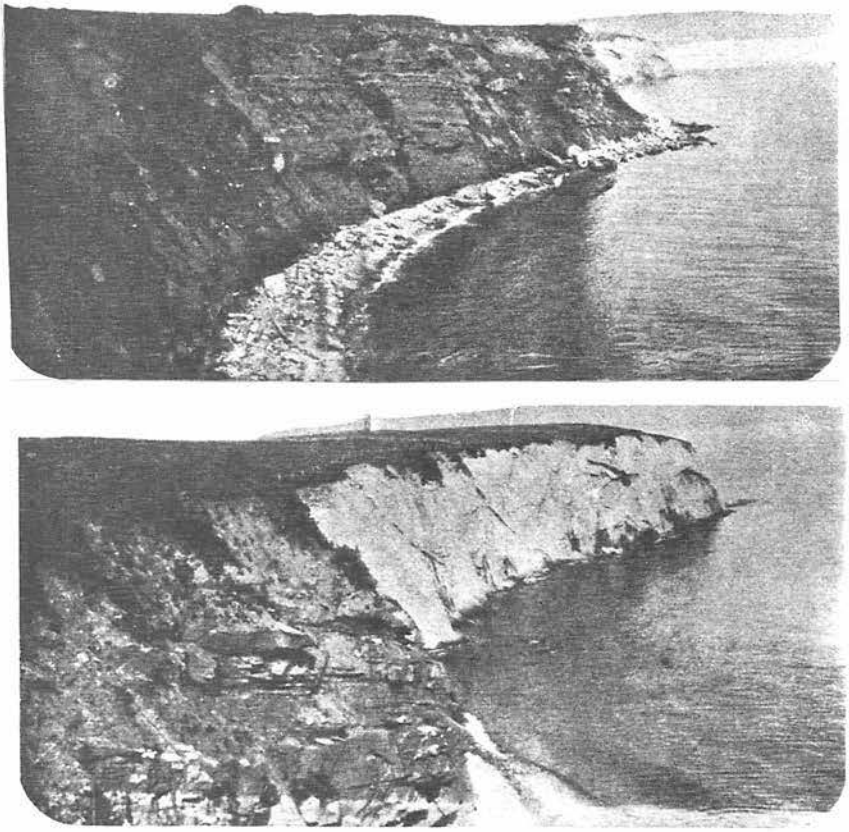
The overlap of the red Bonaventure sands and conglomerates on these vertical limestones is beautifully seen on this sea front. Unfortunately these cliffs are very difficult of access except in a calm sea, for they run sheer to the water with only a little beach here and there north of the cape. From above they are quite out of reach. The northernmost part of the vertical series, especially where covered by the red Bonaventure, is deeply stained red and green, but the color has not been derived from the rocks above. The basal mass of the Bonaventure here is wholly of deep red, soft sands, the conglomerates not appearing for a distance of some 30 to 50 feet higher. The vertical beds below, beginning at the north, are alternating shales and thin sands with thin limestones, the shales dark, the limestone bands red, green or blue. Southward the color is lessened and the beds become a gray white as they approach the point of the cape where the lighthouse stands. Beyond the

cape the white beds and the entire series is terminated by down-faulting against the red Bonaventure rocks beyond them. The thickness of this vertical series of limestones is from 1500 to 2000 feet without much evidence of loss from internal faulting; and in attitude the beds fully conform to those of the Percé Rock and the Mt Joli series. I have before shown that the fossils of these beds are distinctively Siluric and the lists I have given indicate now a Lower Siluric age for the southernmost or whiter layers and a later stage for the northern, more highly-colored series. This condition, if correctly inferred, seems to imply an overturn of the strata, but much still remains to be learned from the fauna. The fossils are not especially abundant, not often clearly preserved and rather difficult to acquire, but the acquisition and subdivision of the fauna of the series remains an interesting problem. This limestone massive inshore affords exposures along Birmingham's brook and thence on toward Irishtown, rising gradually into the ribs of White mountain, skirts the rear of the Ste. Anne plateau in higher elevations, shows itself at Corner of the Beach and comes out to the Malbay shore in that vicinity (shown on the section here at the north end). It thus encircles the entire series of Siluric, Devonic and Bonaventure rocks about Percé, and forms the outstanding wall of an ancient basin within which the Bonaventure rocks were here laid down. We have as yet no reliable evidence that these Bonaventure deposits extended westward beyond this rock wall.

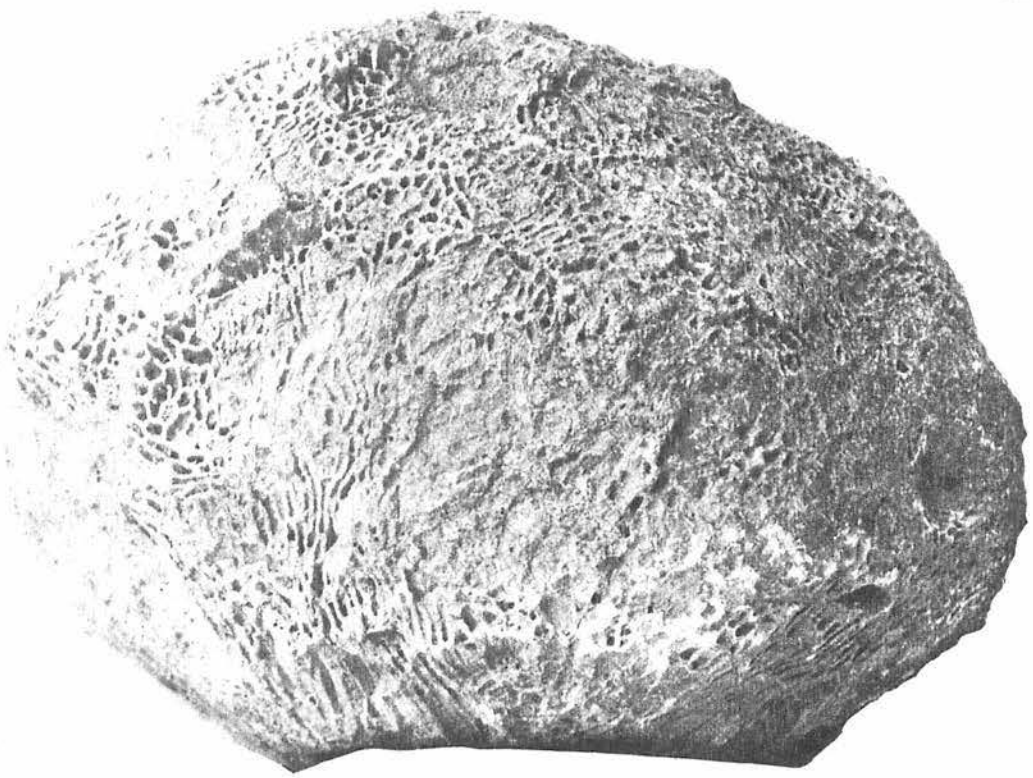




Bonaventure conglomerate; Gannet cliffs of Bonaventure island



Cliffs of Cape Blanc or Whitehead, Percé, viewed from the south. In the foreground horizontal red Bonaventure sandstone; the cape is composed of vertical gray-white Silurie-Devonie beds



Colony of Halysites — a boulder from the Bonaventure conglomerate, Bonaventure island. Length of original 10 inches.