

## CARBONIFEROUS DIPNOANS FROM NOVA SCOTIA.

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IN their summary of American Carboniferous dipnoans, Romer and Smith<sup>1</sup> came to the conclusion that only two specimens were known in North America which could be assigned to the genus *Ctenodus*. As considerable doubt could be held regarding both these assignments, the discovery of undoubted *Ctenodus* remains in the Nova Scotian Carboniferous is worth recording. At the same time another Nova Scotian specimen, one of the two hesitatingly assigned to *Ctenodus* is refigured and redescribed below as a species of *Sagenodus*.

The *Ctenodus* material (No. 8813, Geol. Survey Canada) consists of most of one palatal and two "splenial" dental plates, together with a dentary, part of a splenial, and part of a bone which I cannot identify.

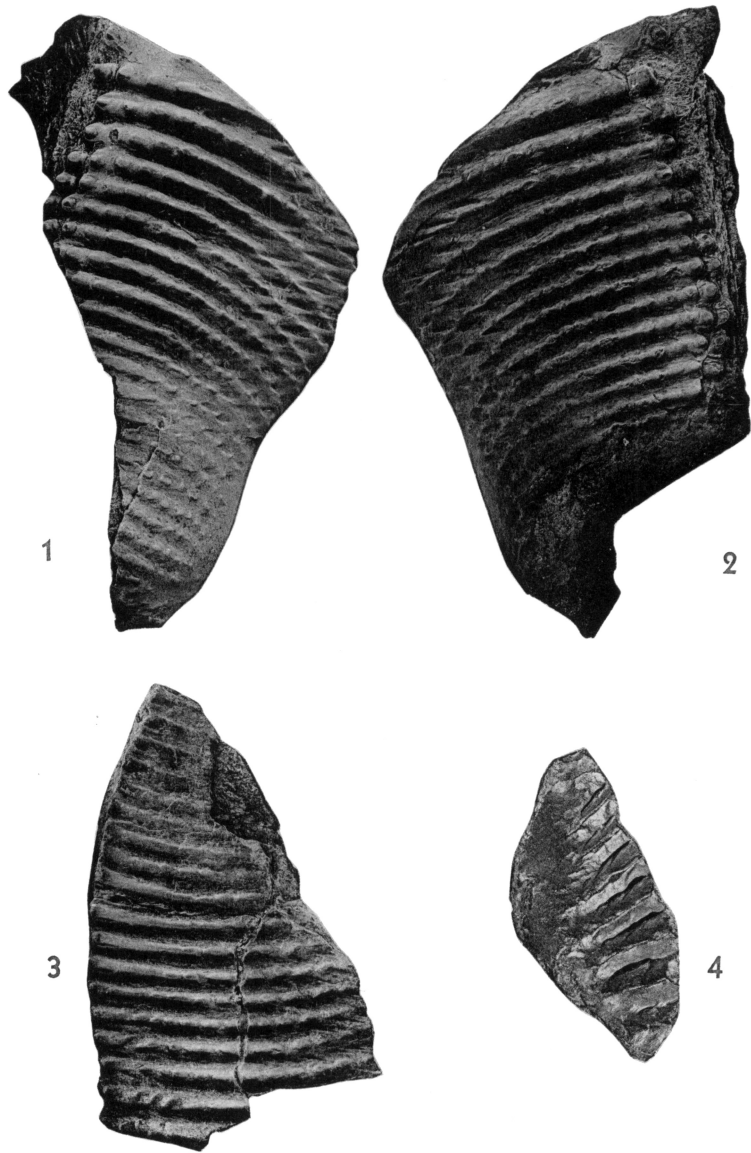
Dr. W. A. Bell, who sent this material to me, writes that it comes from the roof shales of the Phalen coal seam,<sup>2</sup> Glace Bay, N. S. This horizon is full of the freshwater pelecypod *Anthraconauta phillipsi* and is thus of upper Westphalian age. As this species is also characteristic of one phase of the English upper Westphalian,<sup>3</sup> it is not surprising that the *Ctenodus* material represents a species commonly found in that horizon, *C. murchisoni*.

The palatal plate is only partly present, but it exhibits the basic characters of *Ctenodus murchisoni* rather well. It is concave from side to side, with eighteen tuberculated, parallel ridges. The individual variability of dipnoan dental plates is demonstrated rather well by a comparison of this plate with the type. In the latter the tubercles on the ridges appear more or less round, while in the Nova Scotian specimen they are com-

<sup>1</sup> Romer, A. S., and Smith, H. J.: 1934, "American Carboniferous Dipnoans," Jour. Geol., Vol. XLII, p. 702.

<sup>2</sup> Bell, W. A.: 1938, "Fossil Flora of Sydney Coalfield, Nova Scotia," Geol. Survey Canada, Mem. 215, p. 6.

<sup>3</sup> Bisat, W. S.: 1936, "The Faunal Stratigraphy and Goniatite Phylogeny of the Carboniferous of Western Europe, with Notes on the Connecting Links with North America," Int. Geol. Cong., Rept. of XVI Session, Vol. I, table 1.



## CARBONIFEROUS DIPNOANS

FIGS. 1 and 2. Left and right "splenial" dental plates of *Ctenodus murchisoni*. Geol. Survey Canada No. 8813. Slightly over X1.

FIG. 3. Left palatal dental plate of *Ctenodus murchisoni*. Geol. Survey Canada No. 8813. Slightly over X1.

FIG. 4. Left palatal plate of *Sagenodus plicatus* (Dawson). McGill College collection No. 3073. X1.

pressed in the direction of the ridge. Also in this specimen wear seems to have been more or less equal over the whole surface, while in the type it was more pronounced medially.

If I interpret Rode's figure<sup>4</sup> correctly, the tooth plate of *Ctenodus purchisoni* shown is convex and thus cannot be a palatal plate as he states. However difficult it may be to distinguish upper and lower plates in other species, in *Ctenodus purchisoni* the upper plates seem to be strongly concave, the lower plates strongly convex.

The mandibular plates have a maximum width of 45 mm., and an estimated length of 75 mm., and thus agree in size with the type.<sup>5</sup> Twenty ridges are present. In an unworn specimen these would be straight and not tuberculated medially. Tubercles are present in the lateral one-third of the plate: along the inside of this zone they are closely connected and compressed anteroposteriorly; along the outer side there is a single row of round and completely isolated tubercles; between the two there is a simple gradation. Isolated grooves running inwards and anteriorly from the front edge of the ridges indicate that jaw movement was mostly from side to side.

For half a century the single dipnoan tooth which Dawson<sup>6</sup> called *Conchodus plicatus* has been mentioned periodically and guesses made as to its relationships. Woodward<sup>7</sup> and Romer and Smith<sup>8</sup> called it *Ctenodus*; Hay<sup>9</sup> retained *Conchodus*, and Rode<sup>10</sup> notes that it is called *Ctenodus* only with "great trouble." Through the kindness of Dr. T. H. Clark, Curator of the Peter Redpath Museum, McGill University, I have been allowed to examine Dawson's type, the only specimen as yet known. Examination shows that it represents a species of *Sagenodus* somewhat close to *S. periprion* (Cope). The type of *Sagenodus plicatus* (Dawson), then, is a left palatal plate, somewhat worn, defective posteromedially and laterally, and is No. 3073 of the McGill University collection. It comes from

<sup>4</sup> Rode, K.: 1938, "Der erste Lungenfisch als dem deutschen Oberkarbon," Z. deutsch. geol. Ges. Bd. 90, Pl. 18, Fig. 4.

<sup>5</sup> Woodward, A. S.: 1891, "Catalogue of Fossil Fishes in the British Museum," Pt. II, p. 255.

<sup>6</sup> Dawson, J. W.: 1868, "Acadian Geology," p. 209, Fig. 63.

<sup>7</sup> Woodward, A. S.: Op. cit., p. 255.

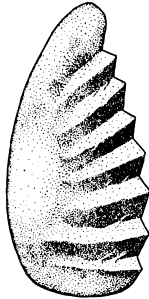
<sup>8</sup> Romer, A. S., and Smith, H. J.: Op. cit., p. 702.

<sup>9</sup> Hay, O. P.: 1929, "Catalogue of Fossil Vertebrata of North America," Carnegie Inst. Washington, Vol. I, p. 664.

<sup>10</sup> Rode, K.: Op. cit., p. 617.

the Carboniferous of Joggins, N. S., which is middle Westphalian in age.<sup>11</sup>

The plate seems to be relatively thin: seven ridges occupy the lateral one-half of its surface, while a prominent heel whose level is that of the top of the ridges, occupies the inner half of the plate. The ridges are untuberculated, sharp-crested, angulated at about 60°, and are disposed in such a fashion that the



Text-Fig. 1. Attempted restoration of left palatal dental plate of *Sagenodus plicatus* (Dawson).  $\times 1$ .

crests, if projected mediad, would converge about ten mm. behind the plate and about 15 mm. in front of its posterior edge. In both Fig. 4, Pl. I, and Text-Fig. 1 small, oblique grooves may be seen in the valleys between the ridges. These are attrition marks, and may indicate, as in *Ctenodus murchisoni*, that tubercles were present on the opposing plate. This specimen reminds one very much of *Sagenodus periprion* (Cope) and it may be that tuberculations were present laterally on the ridges. Text-Fig. 1 is an attempted restoration of the plate without these tuberculations.

In conclusion it might be said that as *Sagenodus cristatus* Eastman seems just as likely to be a species of *Sagenodus* as *Ctenodus*, and as Dawson's "*Conchodus*" *plicatus* has been shown above to be a species of *Sagenodus*, the contention of Romer and Smith that *Ctenodus* is rare in North America seems to be correct. At present writing only one specimen in North America, *Ctenodus murchisoni* from Glace Bay, N. S., can be readily assigned to that genus.

<sup>11</sup> Bell, W. A.: 1927, "Outline of the Carboniferous Stratigraphy and Geologic History of the Maritime Provinces of Canada," Trans. Royal Soc. Canada, 3d Ser., Vol. XXI, Pt. II, Sec. IV.