

SPECIES OF FOSSIL MARINE PLANTS

FROM THE

CARBONIFEROUS MEASURES.

COLUMBUS O., 10 April, 1876.

DEAR SIR: Please find herewith a short report on the specimens of marine plants of the coal measures which you have sent to me for examination. To the description of the species I have added a few remarks on their relation and their distribution. A number of specimens, partly referable to the three first species, were communicated by Mr. J. F. Miller, of Richmond, Indiana. The fifth species is described from one specimen from the coal measures of Illinois, found with others of the same kind, by Mr. I. H. Southwell, of Port Byron, Illinois, to whom the communication is credited.

Respectfully Yours,

L. LESQUEREUX.

To PROF. E. T. Cox,

State Geologist of Indiana.

The occurrence of fucoïdal remains or of fossil marine plants, in the coal measures, is extremely rare. Indeed it is questionable if any species of this kind has ever been discovered in the carboniferous formations of Europe. In this country one species only has been described, in 1866, (Trans.

Amer. Phil. Soc., vol. xiii, pp. 313-328, pl. vii,) from specimens found in a thin bed of limestone, occupying the place of the millstone grit, opposite Wurtemberg, on Slippery Rock creek, a branch of the Coneconessing river in Pennsylvania.* The species is related by its characters, to the so called and well known *Fucoides Caudagalli* of the middle and upper Devonian, and therefore does not represent ancient types, like those which are described here, and which recall the oldest forms of marine plants, those of the Silurian, even of the lower divisions of this formation, the Calcareous sandstone of New York.

It may seem of little importance to have plants of this kind described and figured in a geological report, but as geologists have to consider, for the determination of the age of the strata of our earth, the remains of plants and of animals which, preserved in their compounds, may determine by their nature, the position of valuable deposits of minerals, even mere fragments of these organisms become important for their researches. And when fossils are found, which not only represent new types of plants or of animals, but which are remarkable by their presence in a formation where nothing like has ever been found, the discovery is indeed worth recording in the annals of geology, and gives to the report where they are described a wide and general interest.

DESCRIPTION OF GENERA AND SPECIES.

Genus, PALEOPHYCUS. Hall.

FronD expanding from a cylindrical simple axis, enlarging in ascending by repeated forking of the branches, (dichotomy); branches cylindrical or slightly flattened by compression, either simple or anastomosing by divisions in right angle, obtuse or obtusely pointed, sometimes umbonate (bossed), surface smooth or dotted.

This genus, established by Hall, in Paleontology of New

*It is quoted under the name of *Phytophyucus marginatus*, in Schimper's *Vegetable Paleontology*, where all the fossil plants known to our time, (1875), are described, as the only species of marine plants positively known from the coal measures. L

York, Vol. I, p 7, is here somewhat modified according to the characters of the species which I refer to it. It is the equivalent, by its name at least, of the old genus *Fucoides*, of Brongniart, which, used as it was originally for the description of marine plants of far different characters, even of Graptolithes, has become too vague and uncertain for classification. Modified as it has been recently by Schimper, it represents merely species of the type of *Fucoides antiquus*, Brgt., or *Buthotrephis antiquata* ? Hall, and also species of *Paleophycus*. This last generic name, however, was proposed before this modification, and is worth preserving for the American species of marine plants answering to the character of the genus, and which are of a type widely represented in the old formations of this continent, and rarely recognized in Europe until now.

1. PALEOPHYCUS MILLERI. Spec. nov. Pl. i. Figs. 1-3.

Frond (whole plant) erect, enlarging in ascending by subdivision of its branches, forking in an acute angle of divergence; branches cylindrical or slightly flattened by compression, apparently of a coriaceous substance, when living, gradually increasing in thickness from the base to an obtuse, sometimes umbonate point, irregularly split across or slightly strangled by deep lines in right angle to the axis; surface punctate with projecting obtuse dots or very small warts in more or less distinct rows, sometimes smooth at the upper surface by abrasion.

The specimens here figured were communicated by Prof. E. T. Cox, but later I obtained, by the kindness of Mr. J. F. Miller, Superintendent of 1st Division, Pittsburg, Cincinnati & St. Louis railroad, a number of others, among them one branch of larger size, more distinctly and repeatedly dichotomous than those of the figures. The branches vary from one-half to two centimeters in thickness; a cross section of the largest measures two centimeters in the horizontal direction, and one and one-fourth centimeters vertically, it being somewhat flattened. As seen in figure 1., they greatly differ in size, even at their point of separation, the branch

can be seen, is two millimeters, decreasing upward to the obtuse point of the branches, scarcely one-half millimeter broad. The branches and stems are exactly cylindrical, apparently fragile, broken in fragments, imbedded in the clay, generally smooth, sometimes slightly irregularly dotted. The surface character of the branches is seen in the enlarged figures 4^a 5^a 5^b. This punctuation seems to refer this plant to the former as a mere variety; it is, however, positively distinct and separated by its harder consistence, indicated by the cylindrical preservation of its branches, by its mode of division in repeated forkings at a more open angle of divergence, by the gradual attenuation of the divisions and by its size. A relation of the same kind exists between two species of marine plants,—*Fucoides antiquus*, Brgt. and *F. gracilis*, Hall, which Goppert considers as mere varieties of the same.* Without taking into account the great difference between the size and form of the branches, as figured by Goppert, it is certainly hazardous to unite in one species, fragments of marine plants of Europe and of the United States, in comparing them from mere figures. It seems, however, evident that *Buthotrephis antiquata*, Hall. loc. cit., pl. ii, fig. 6, of the Calceiferous sandstone, and *B. gracilis*, Hall., pl. xxi, fig. 1, of the Trenton limestone, are the same species. Both figures of Goppert, loc. cit., are, however, far different.

3. PALEOPHYCUS DIVARICATUS Spec. nov.

Fronde, round in outline by the flattening or compression of the branches in the vertical direction all around the central axis; branches irregularly forking and anastomosing by cross divisions, nearly equal in size in their whole length, obtusely pointed, surface smooth.

This species differs from the first by its narrower, more slender branches, not falcate, rarely forking, but diverging all around the base, joined together by divisions, anastomosing at right angle, and smooth. The general appearance is quite different. It is represented by two specimens in

*Goppert. Uebergang's Flora, p. 81, pl. i, figs. 1 and 2.

the possession of Mr. Miller, and these were received too late to be figured, or, after the preparation of the plates. The species is, however, easily recognized by the characters indicated above. It is comparable by its form, the direction and mode of anastomosing of the branches, to *Phytopsis cellulosa*, Hall., which, according to Emmons, is a Polyp; but we do not see, in the cross section of the branches of this species, anything like transverse parietes, or stellate and cruciform cells, as in the New York *Phytopsis*, but an homologous, amorphous compound, like that of the former plants, and characters which force me to consider this organism as referable to the same genus, if not as a variety of the first of these species. Indeed I should have considered it in that way, if any part of the specimens which represent it had shown traces of dots upon their surface. The anastomosis of branches in right angle is not a specific character, as seen from *Paleophycus tubularis*, Hall., which, in one specimen, has the branches simple and dichotomous, while the other indicates a disposition to anastomosis in right angle, by branches and branchlets.

HABITAT. All the specimens representing the three species described above, were found imbedded in concretions of carbonate of iron, in a bed of clay over coal L, on the banks of a branch of Salt creek, one mile south of Bruilette creek, Vigo county, where Prof. Cox collected in great abundance, *P. Milleri* and *P. gracilis*. The specimens of Mr. Miller are from the same locality, or about; they represent *P. Milleri* and *P. divaricatus*.

Genus ASTEROPHYCUS, *Lesqra.*

FronD or rhizoma, expanded at its base in star-like divisions from a central axis, (broken); divisions oblong or obovate, rounded or emarginate at the outside border; surface wrinkled in the length.

4. ASTEROPHYCUS COXII, *Spec. nov., pl. 2, figs. 1, 2.*

The specimen, one-half of which is represented upon the plate, bears five flattened star-like bodies, similar to each other, placed in two rows, three on one side, two on the

other, those of the corners being opposite. The largest of them is twelve centimeters broad between the points of the opposite branches, the smallest only six centimeters, and the divisions, in all, are in five or six, one of them being doubled, as in fig. 2. From the superposition or doubling of one of the branches, it seems as if they had been growing successively by the development of new ones, as far as the vegetable increased in size, or by the reproduction of smaller, nearly cylindrical projections, appearing either upon the original rays, or outside and between them, as seen in figs. 1^a and 1^b. These younger shoots do not preserve their cylindrical form in growing, but enlarge and enter into the composition of the plants as new divisions. The surface of all the rays, when fully developed, is deeply, irregularly wrinkled in the length. The young branches are slightly and transversally rugose, as in fig. 1^b. The central part, raised up as a columnar support, or as a cylindrical base of a frond, is broken a little above the point, where it enlarges in its connection to the rays.

As the fracture of the axis is exactly the same upon all the specimens under examination, just above the star-like division, it might suggest the idea that they represent an over turned plant, the axis being a rhizoma penetrating the ground, and the rays showing the lower part of a flower-like expansion. In that way the organism would be comparable to some species of geasters (star mushrooms), as seen upon the ground with their receptacle open and divided star-like, in five or six rays, after the detachment of the globule. Two specimens from Kentucky, communicated by Rev. H. Herzer, of Louisville, and representing the same species with somewhat varied forms, contradict this supposition. The largest one, eighteen centimeters wide, shows an upraised cylindrical axis or base of a frond, broken at the column, like the specimen from Indiana, dividing around from its sloping base in numerous cylindrical branches, varying in thickness from one to two centimeters. These branches are simple, not divided, depending all from the main axis which they join by the narrowed upper end,

enlarging downward to the middle, and thus generally spindle shaped. These are the characters of a fucoidal plant, whose axis is the broken column of a frond, to which the divisions around serve as a support, the true plant, which may be merely cylindrical in its development, being as yet unknown. In another specimen from the same locality, the subdivisions, passing nearly horizontally from the axis, are in six thick branches, placed star-like around the central axis, as in the specimens which are figured pl. ii. They bear from their under surface numerous cylindrical rootlets, which, traversing the whole thickness of the stone, three centimeters, appear upon the under face of the specimen like small circular protuberances, three to five millimeters thick. This shows that these plants figured in this natural position with their upper surface exposed to view, represent an expansion of the column to which, and underneath, are attached the rootlets, which, penetrating the sand, served to fix the plants more firmly to the bottom. It is probable that careful researches in the strata where these vegetable remains have been found, will cause the discovery of the upper part of the plants or fronds attached to the rhizomes. These, however, may have had long supports, as stipes, if they were not merely simple and of the same cylindrical form and size in their whole length. The base of some species of large algæ of the present time have a configuration similar to that of these fossil remains. Marine plants have not true roots; they are attached to the rocks by mere expansions of the base of the fronds, either divided in various ways, sometimes star-like, or flat and expanding around, taking firm hold of the rocks by adhesion of the lower closely applied surface, or penetrating the sand by cylindrical branches like rootlets.

A peculiar fact which may be due, perhaps, to the vegetation of these marine plants, is the exactly similar nature of the rocks wherein the Kentucky and the Indiana specimens are found imbedded. It is a kind of very hard, siliceous quartzite, of whitish color, giving fire by the hammer's stroke, like silex. It is a well known fact that though the

algæ do not take their food from the rocks to which they adhere, they often modify the composition of these rocks by their growth. Their influence, either by their vegetation or their decomposition, is still more marked upon the sand or any soft substances surrounding them. These modifications are as yet imperfectly recognized by chemistry. In the present case, these algæ seem to have covered the sandy bottom in immense numbers, as a single specimen, about sixty square inches, is nearly fully covered by five and one-half of the plants here described.

For the analogy of these remains with others known in a fossil state, there is a point of comparison in some kinds of vegetables figured by Prof. Hall, in the New York Paleontology, vol. 2, pl. x, fig 9*. They are not described, but considered by the author as roots of *Buthotrephis*. One of them represents a cone with the point turned downward, and wrinkled in the length, expanding and flat in the upper part, like the mouth of a funnel. If this represents the support of a fucoidal plant, the expanded limb should be the base adhering to the bottom, and the cone the axis, either entire and therefore a whole plant, or broken and separated from the frond, as in the remains described above. In that way this organism would have a kind of affinity to this species, and still more to the following.

Habitat. In a sandstone connected with the coal beds of the Cut-off of the Wabash, near New Harmony, Indiana, discovered by Prof. E. T. Cox. The specimens communicated by Rev. H. Herzer, are from Rock Castle, Kentucky. Lower carboniferous.

Genus CONOSTICHUS, *Lesqrx.*

Rhizome(?) obconical, formed of successive rows or disks, diminishing in size from the base to the point of the cone, regularly cut on the borders, in short, obtuse, inflated lobes, corresponding in their divisions.

5. CONOSTICHUS ORNATUS, *Spec. nov. pl. 1, fig. 6.*

This peculiar cone shows a series of six successive layers, increasing in diameter from the upper one toward the base

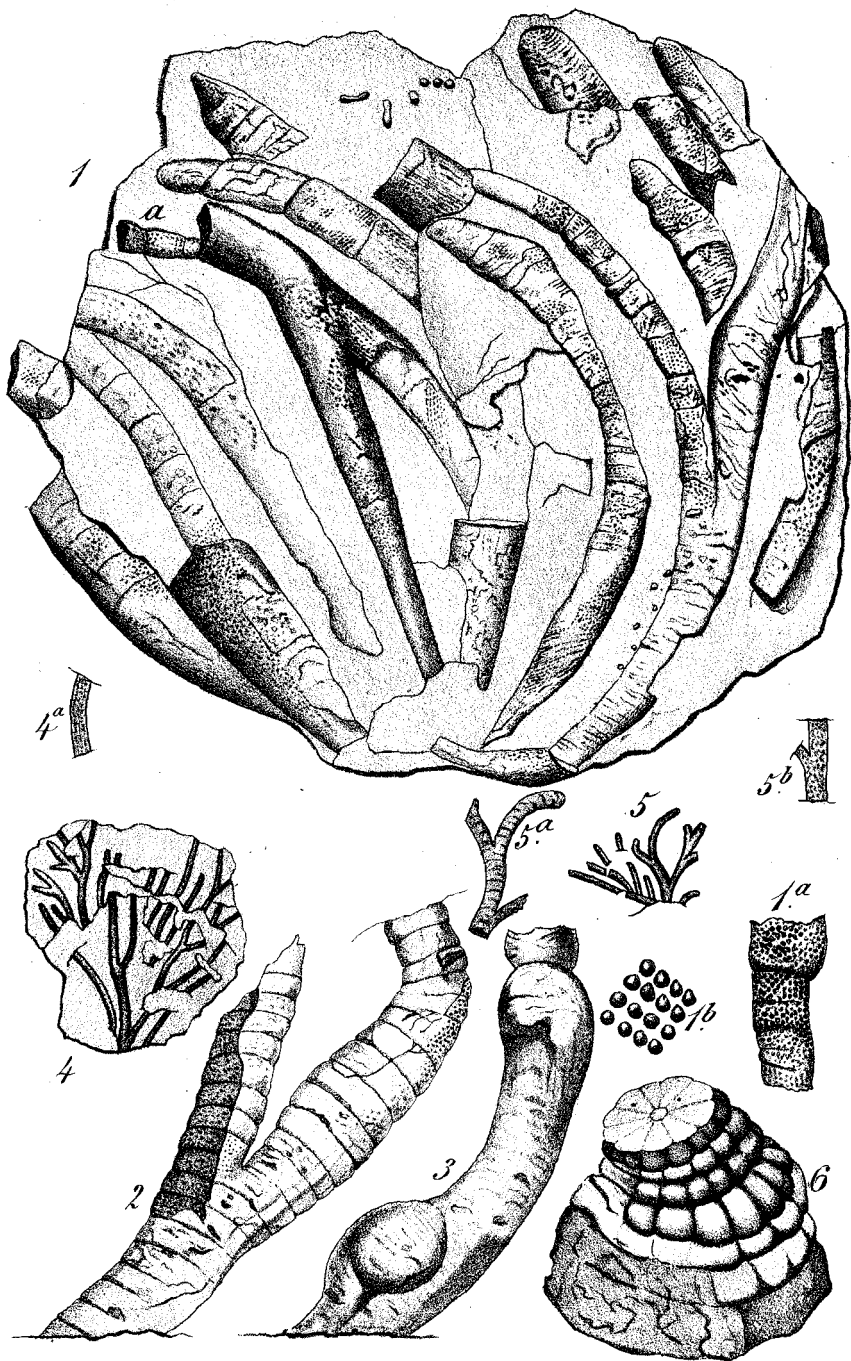
or the broadest part of the body, cut around and on the borders in short lobes by deep lines more or less corresponding with those above and below, and apparently coming like rays from the center, the upper disk being divided at the surface by these lines in equal rays, like a star. These layers or superposed disks are irregular in thickness, becoming thicker, and their borders less distinctly lobed at the widest part of the cone, where their measure is about five millimeters, reduced to three millimeters near the point. The top is flat, or rather, slightly convex, without trace of breakage. The lower or broader part is quite flat, marked around by a border three to five millimeters thick, as if the body had been funnel shaped, and its open mouth filled by sand. As in the former species, this organism seems to represent the enlarged base of a species of algæ, whose frond has been separated from the column; or, perhaps, as the upper disk does not show any trace of breakage, we have here the whole plant as it was, attached to the rocks or fixed to the sand by its enlarged adhering base, and growing up by a succession of superposed disks, diminishing in diameter. There is also a point of comparison for this peculiar vegetable in Hall, loc. cit., pl. x, figs. 9 and 10, and pl. vii, figs. 2 a, b, c, considered by the author as roots of *Buthotrephis*. They represent oval or globular bodies, regularly costate around a character which relates them to our plants. They are, however, very different, by their shape.

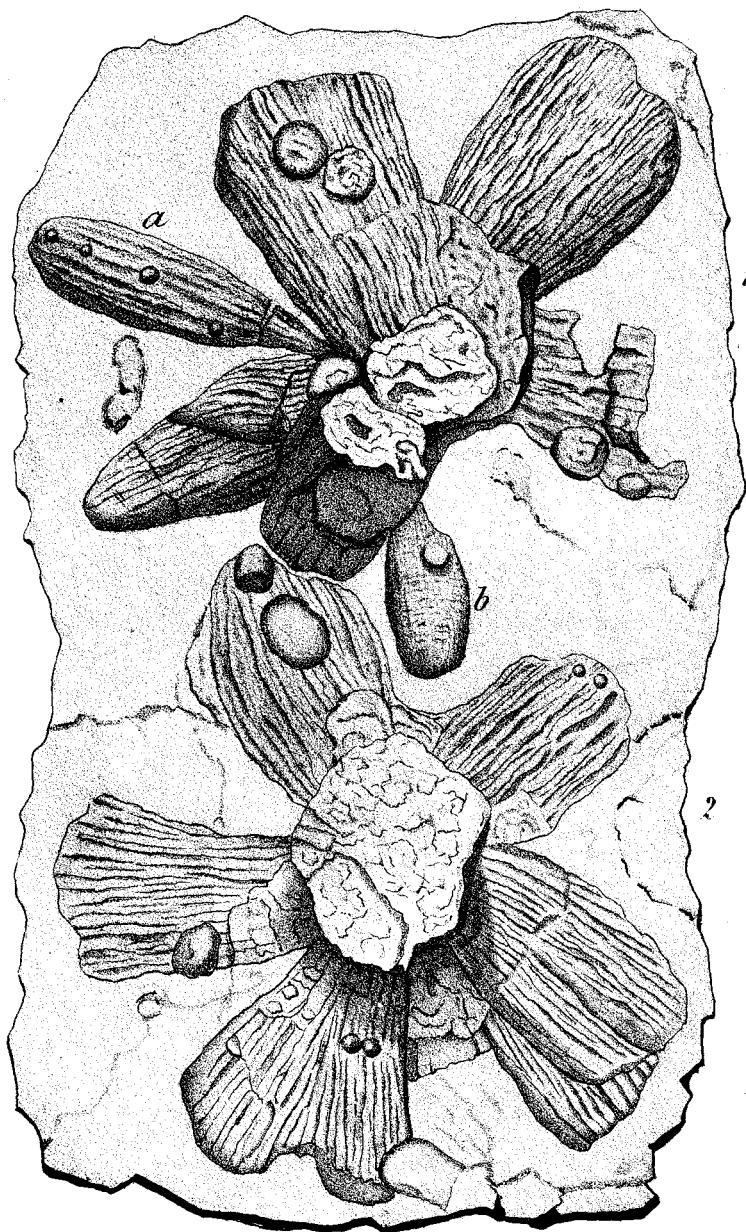
The specimen figured here is one of the smallest which have been found, and the only one communicated to me. It is three and one-half centimeters high, about four centimeters broad in its widest part, and one and one-half centimeters at the narrow end of the cone. I have seen, however, in the cabinet of the State Geological Survey of Illinois, at Springfield, some specimens evidently representing the same species, and which were at least four times as thick as this one. They had been discovered by Mr. I. H. Southwell, of Port Byron, Illinois, to whom I owe the communication of the one described above.

It may be suggested that this and the former species might, perhaps, be referable to sponges rather than to vegetables. This supposition can not be admitted for *Asterophycus*, on account of the tubercular rootlets which are growing from the lower face of the divisions, and marked, as they are, upon the specimens, by circular spots. There is also no trace of sponginess in the texture of their remains. If we are right in supposing that the broken part represents the axis of a frond, supported by a star-like rhizoma, we have indeed a relation, if not of forms and characters, at least of growth between *Asterophycus* and *Conostichus* species, and therefore have to consider these last, as vegetable organized marine bodies, like the former ones. Moreover, the form of *Conostichus ornatus* is too regular for sponges, and its substance, though transformed into a coarse sandstone, does not show any trace of pores or small cavities like those which are generally observable upon the fossil sponges.

Habitat. According to the statement of the discoverer, Mr. I. H. Southwell, in a sandstone bed of the coal measures, between coal No. 1 and No. 2, of the Illinois Geological Reports, or the stratum No. 5, in section p. 230, vol. 5, of the same report.

The description of these five species of marine plants opens a new chapter in the records of the vegetation of the Carboniferous age. The great developments of marine formations in the coal measures of the west where strata of limestone, some of them of great thickness, and intermixed with a profusion of marine animal remains, sometimes immediately overlies the beds of coal, has often suggested inquiries concerning the causes of the total absence of marine plants in the same strata. The scarcity of fucoidal remains in the wide expanse of the swamps where the coal had its origin, is easily accounted for, but not the total absence of these plants in the coal measures. Now, only, we are beginning to know something about the distribution and the nature of the marine vegetation during the





carboniferous period. It may be little as yet, but a reason the more valid for carefully recording the first discoveries in that new field of paleontology.

EXPLANATION OF THE PLATES. PLATE I.

Figures 1 and 3. *Paleophycus Milleri*. Spec. nov. p. 136.

Figures 1^a and 1^b. Branch of the same, enlarged, showing dots on the surface.

Figures 4 and 5. *Paleophycus gracilis*. Spec. nov. p. 137.

Figures 4, 5^a, and 5^b. Fragments of branches of the same. Enlarged.

Figure 6. *Conostichus ornatus*. Spec. nov. p. 142.

PLATE II.

Figures 1 and 2. *Asterophycus Coxii*. Spec. nov. p. 139.