

OSTRACACANTHUS DILATATUS (GEN. ET SPEC. NOV.), A FOSSIL FISH FROM THE COAL MEASURES SOUTH OF HALIFAX, YORKSHIRE.* BY JAMES W. DAVIS, F.G.S., &c.

THE fossil remains of a fish, which I introduce in this paper, were found in a bed of cannel or stone coal, occurring south-west from Halifax in this county. The coal is extensively wrought, and occupies what appears to have been a number of depressions on the surface of the land during carboniferous times. The beds of coal are found to be thickest in the centre, and, thinning off in every direction, disappear in the course of a few miles. There were probably several of these lagoon-like depressions, and they are known to have extended over twelve to sixteen square miles.† In some cases the coal is found to contain a large number of fossil fish; but this is by no means universally the case. In far the greater majority of the districts worked, the fish remains are extremely rare. I have however obtained from the bed from which this ichthyodorulite was got the remains of both ganoids and sharks, including *Megalichthys*, *Rhizodopsis*, *Cœlacanthus*, and *Ctenodus*. Spines of *Gyracanthus*, *Ctenacanthus*, and a series of *Pleuracanthus* and *Orthacanthus*, including some new species which demonstrate that the two genera ought to be united and also include with them the teeth *Diplodus*. Teeth of *Helodus* and *Ctenoptychius*, and some others. Labyrinthodont remains are also common. By far the most predominant fish is *Cœlacanthus*; compared with all the others it is, individually, the most numerous.

The special object to which I wish to draw attention is a very peculiar form of "ichthyodorulite," connected with what appears to be a portion of the exoskeletal plates of a

* Read at British Association, Sheffield, 1879.

† See Prof. Green's *Geology of the Yorkshire Coal Field*, pp. 322-4.

fish. The principal part of the fossil consists of a bony protrusion, or spine, 1·4 inches in length at the longest side preserved. Its breadth at the base is ·5 of an inch. A portion is broken away; when perfect it would probably be ·7 of an inch in diameter. From the base, the diameter diminishes rapidly, and at half an inch from the apex it is ·15 of an inch. This diameter is maintained for ·4 of an inch, and the spine terminates in an obtuse point. Originally circular, the base, more especially, is now compressed to an oval form. The upper part of the spine is smooth and covered with hard ganoine. The lower part is grooved. The grooves are longitudinal, and increase rapidly in number towards the base by bifurcation. The spine appears to be solid; no internal cavity or canal is distinguishable in this specimen. The base of the spine is composed of chondroid bone: *i.e.*, cartilage with numerous osseous centres, but not completely ossified, a similar structure to the bony parts of *Pleuracanthus* (*Diplodus*). Extending from the base, there is a mass of similar bony matter. Contiguous to the spine this is produced into two or three short denticles. It then becomes thinner, but again develops into a mass which may very well have served as the base of a second spine, if one were present. There is no evidence, however, of a second spine remaining on the present specimen; it has rather the appearance of a thick scale, somewhat acuminate towards the centre.

Prof. Agassiz, in the "Pois. Foss. des Vieux Grès Rouge," describes the genus *Byssacanthus* with three species, viz., *B. crenulatus*, *B. lævis*, and *B. arcuatus*. The two former are figured (Table 33, figs. 11 to 14, and fig. 15). The genus is defined as containing spines more or less arched, longitudinally furrowed, with the base much expanded. The spines are about an inch in length and three-quarters of an inch wide at the base. They converge rapidly to an obtuse

point, and are slightly curved; deep grooves extend quite to the point longitudinally along each lateral expansion. In some respects *Byssacanthus* presents features similar to those of the spine described above. Both are obtusely pointed and much expanded towards the base; but whilst in *Byssacanthus* the anterior portion of the spine is round and strong, the posterior is much expanded and appears to be thin. In my specimen the basal portion radiates equally in all directions from the point. The furrows on *Byssacanthus* also indicate this great difference—they lie parallel to the anterior margin from the point to the base on the thicker portion, whilst on the posterior wing-like expansion they are wider apart and spread rapidly towards the base. In my specimen the furrows indicate the homogeneous character of the spine by their similarity in form and arrangement on all sides. There is no further indication that the spine of *Byssacanthus* was other than the appendage of an ordinary *Cestraciont*.

This spine, and its attachment to the dermal covering of the fish, bears a strong resemblance to the bony spines of the Trunk-fish, *Ostracion cornutus*. The Trunk-fish is a small squarely-built fish, protected by a covering of six-sided plates. On its anterior and posterior extremities the dermal covering is produced so as to form four bony spines, broad at the point of insertion, rapidly contracting, and thence continuing to the apex, and ending in a sharp point. The spines of the trunk-fish are long and slender in proportion to their breadth; being fully three times as long as the diameter of the base. The fossil spine is comparatively short, and much stronger, but otherwise they are very similar, both in form and method of attachment.

Hitherto the fishes found in the Coal Measures have been classed as members of one of the two great groups which formed the vertebrate fauna characteristic of the carboni-

ferous age, namely the Elasmobranchii and the Ganoidei. In the genus *Ostracacanthus*, if the diagnosis I have attempted should be substantiated by further discoveries, there is evidence that fishes closely allied to some of the more abnormal forms of the Teleosteans of the present day existed during that period. Prof. Huxley, in *The Tenth Decade of the Memoirs of the Geological Survey*, has expressed the opinion that several of the fishes of the Devonian rocks are closely related to the modern Siluroids. In the structure of the head of *Coccosteus*, the general arrangement of the bony exoskeleton much resembles that of the tropical fish *Clarias*; whilst the peculiar form of the mandibles, and the expansion of the bony elements usually considered to be homologous with the coracoid and radius of other fishes, so as to form a large ventral shield, offers many points of resemblance to the Siluroid, *Loricaria*. The Devonian *Pterichthys* is also in several ways closely related with the modern Siluroids. Its osseous envelope can only be compared to the box-like cincture of the modern *Ostracion*; and the fossil fish *Cephalaspis* has also certain resemblances to *Callichthys* and *Loricaria*. Prof. Huxley remarks that "at any rate I think the *prima facie* case in favour of the Teleostean nature of *Coccosteus* is so strong that it can no longer be justifiable to rank it among the Ganoids, '*sans phrase*,' but that even those who will not allow it to be a Teleostean must attach to it the warning adjunct of *incerta sedis*." And further, "Why should not a few Teleosteans have represented their order among the predominant Ganoids of the Devonian epoch, just as a few Ganoids remain among the predominant Teleosteans of the present day? When it is considered that an ichthyologist might be acquainted with every fresh-water and marine fish of Europe, Asia, South Africa, South America, the Indian Archipelago, Polynesia and Australia, and yet know of only one Ganoid—the sturgeon—a fish so unlike the

majority of its congeners that a naturalist might be well acquainted with almost all the fossil ganoids and yet not recognise a sturgeon as a member of the group,—it will not seem difficult to admit the existence of a Teleostean among the Devonian ganoids, even though that Teleostean should in some, even important, points differ from those with which we are familiar.”

It may be somewhat premature, considering the fragmentary nature of the specimen, to express an opinion that a fish resembling the Teleostean Ostracion has been found in the Coal Measures. The spine and its peculiar attachment, however, are totally different from every other form of ichthyodorulite with which I am conversant, and providing the evidence on which Prof. Huxley bases the arguments given above is held to be correctly applied, and that the oldest Devonian fishes have many points of similarity and relationship with the Siluroid family of the Teleosteans, the probability of the occurrence of fishes of a somewhat similar type during the succeeding carboniferous age is rendered at least plausible. I have therefore thought it advisable to bring this peculiar fossil to your notice, not with any wish to dogmatise on its relation to the modern Ostracion, but merely to afford the members of this Society taking an interest in fossil fishes an opportunity of thinking on the subject, and with the hope that some more perfect specimens may soon be discovered which shall place the present one in its true position.

I take the liberty of distinguishing the specimen with the generic name of *Ostracacanthus*,* from the resemblance of the spine to those of the Ostracion, and adding the *nomen triviale*, *dilatatus*, in reference to its wide and dilated base.

* "Οστρακον, a hard shell or testacea, and ακανθα, a thorn.