NOTES ON THE SPORE-BEARING ORGAN *CODONOTHECA* AND ITS RELATIONSHIP WITH THE CYCADOFILICES.

By E. H. Sellards.

[Text Fig. 7.]

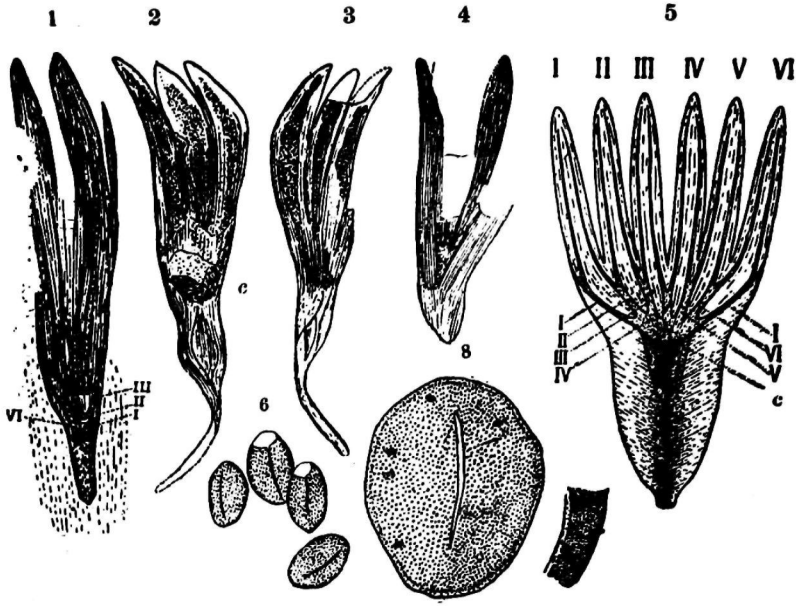
THE spore-bearing organ, *Codonotheca*, was described in detail by the writer in 1903 from impressions in iron-clay concretions from Mason Creek, Illinois.[1] A few additional specimens contained in the museum of the University of Florida direct attention anew to this organ, and invite renewed comparison between this and other known spore-bearing organs. The following description is abstracted from the detailed account in the paper to which reference has been made.

The organ is a symmetrical cup- or bell-shaped body, made up of a circle of six equidistant, lamina-like, spore-bearing divisions. These, arising at a common level, unite laterally at the base, are free at the tips, and thus surround a central cavity. Each division is traversed on the inner or spore-bearing side by two strong vascular bundles, supplied by the dichotomy of six main strands. The union of the parts below forms a cylindrical base, while the whole organ is borne on a slender petiole. The base which seems to have consisted for the most part of an external envelope of non-resistant fleshy tissue, is usually more or less completely flattened in the fossil condition. It is traversed by lines often irregular and wavy, lying near the surface and extending along the dorsal side of the spore-bearing divisions, probably representing sub-epidermal strands of strengthening tissue. The fusion of the six main vascular strands forms a cone-shaped body pointed below, and large at the top where it breaks into bundles. This area occasionally retains its cylindrical shape (Text-fig. 7. 1). The six strands originating at a common level diverge and dichotomize also at approximately the same level. The twelve bundles thus formed pass into the six spore-bearing divisions or segments, each segment receiving one bundle from each of the two adjacent main strands (5). This arrangement of bundles is verified from numerous specimens and is significant as probably indicating that the six segments arose

[1] *Codonotheca*, a New Type of Spore-Bearing organ from the Coal Measures. Amer. Journ. Sci., Vol. XVI, pp. 87-95, pl. VIII.

from the dividing up of an original disk. The free tips of the segments occasionally stand open, thus retaining in part their original shape, owing probably to their having been quickly buried in sediment. The average specimens of *Codonotheca caduca* measure 3 to 5 centimeters from base to tip. The width of the top is about 1⅓ centimeters. The segments above the point where they become

Codonotheca caduca, SELLARDS.



TEXT-FIG. 7.

1. The fleshy covering has disappeared by maceration from the base of this specimen, allowing the resistant area at the centre, which still retains its shape, to stand out prominently. Strands I., II., III. and VI., are visible, IV. and V. being hidden on the opposite side. Twice natural size.

2 and 3. Figures two and three illustrate the two sides of a single specimen. The very numerous large spores lie in a depressed channel along the inner side of the segments from the tip to the base. The cavity formed by the united bases of the segments ends at C. Natural size.

4. Specimen showing the fleshy base flattened and with the vascular cone at the centre. Natural size.

5. Plan of structure of the spore-bearing organ. The organ is represented as cut down the middle and laid open, the cut passing between the segments, hence in the basal part through one of the main strands. The end of the cavity is marked at C. Natural size.

6. Group of spores imbedded in a deposit of sphalerite, and with the surface ornamentation consequently well preserved. Enlarged 28 times linear.

7. Section through the spore wall, showing the thick outer, and a thin compact inner layer. Enlarged 200 times linear.

8. A single spore showing the slit as commonly observed. Enlarged 84 times linear. Author's illustrations.

free are 1½ to 2 centimeters long, and 2½ to 3 millimeters wide. The petiole is slender and long. Regarding the manner in which the organ was borne it was only possible at the time of writing the original description to state that "Two of the fossils lie side by side on one of the nodules in such a way as to indicate that both were probably attached by long petioles to a common stem. At one side, and at a slightly lower level, is seen a slender striated stem, but the actual connection is not observed." One of the new specimens now at hand shows several of the spore-bearing organs lying on either side of a central stem, those toward the top being reduced in size. Although the preservation is not perfect, still the relation of the several organs to each other and to the central stem is such as to leave scarcely a doubt but that they are borne by terminal divisions, and are attached by slender petioles to the central stem.

The spores lie, as seen in impressions of well preserved mature specimens, over the inner surface of the segments from base to tip, and are confined to a more or less well-marked depression occupying from one-half to two-thirds of the width of the segments. The spores are large, elongate eliptical, 0·29 to 0·31 millimeters long, 0·18 to 0·20 millimeters wide, and of a brownish colour. There is no grouping of the spores or other indications of the location of sporangia, which were doubtless more or less completely immersed in the tissue, the dividing walls probably disappearing at maturity.

In connection with the original description *Codonotheca* was compared with all types of spore-bearing organ known at that time with which it could apparently have any possible relations. The type was regarded as not probably referable to any one of the better known classes of plants, but possible to the class of Cycadofilices, the fructification of which was but imperfectly known. The *Calymmatotheca Schimperi* of Stur, and *Aphlebiocarpus* Stur were mentioned as forms possibly related. Kidston's specimens of *Neuropteris heterophylla* were also mentioned as evidence of the dimorphic character of the Neuropterid group. The resemblance of the spores of *Codonotheca* in size and shape to the spores (pollen-grains) of *Dolerophyllum* was noted. The intimate association of *Codonotheca* at the Mason Creek locality with the large pinnuled Neuropteris, *N. decipiens*, led to the suggestion that *Codonotheca* may be the spore-bearing organ of this particular genus and species of Cycadofilices.

The conclusions thus very tentatively stated in 1903 were later more definitely formulated. In a letter to Professor F. W. Oliver,

under date of January 27th, 1905, the writer expressed the belief that *Codonotheca* is the "male spore-bearing organ of the Neuropteris type" of Cycadofilices. In a letter to Mr. David White, dated March 20th, 1905, the writer expressed the belief that some one of the seeds at Mason Creek and *Codonotheca* would ultimately be found to represent respectively female and male fruits of the Cycadofilicinean genus and species *Neuropteris decipiens*. Similar views were expressed to other palæontologists. The several important new types of fructifications since described by various writers from the early deposits appear to the writer to lend support rather than discouragement to the hypothesis of the Cycadofilicinean relations of *Codonotheca*.

ON THE ASSIMILATORY TISSUE OF MANGROVE SEEDLINGS.

By Madeline Carson, B.Sc.

[Text-Figs. 8—10.]

IN making a study of some seedlings of *Rhizophora* and *Bruguiera* my attention was drawn to their mode of nutrition. As is well known, the seedlings of these and other mangrove plants remain attached to the fruits for a considerable time, during which they obtain their food from the parent plant. In *Bruguiera*, according to the researches of Haberlandt[1], the endosperm consists of the cells, some of which form a connection with the cotyledons and with the ovular integument by haustorial processes.

But, as this method seemed to me not sufficient to provide all the food material necessary for so large a seedling, often attaining a length of a foot or more, I concluded that the seedling itself might undertake some carbon assimilation particularly as Professor Weiss, who gathered the seedlings at Mombasa, informed me that when fresh they had distinctly green colour beneath the yellowish epidermis.

[1] Haberlandt G. Die Ernährung der Keimlinge und die Bedeutung des Endosperms bei viviparen Mangrove-pflanzen. Annales du Jardin de Buitenzorg, Vol. XII., 1895.