# NOTES.

**CANTHELIOPHORUS, BASSLER: NEW RECORDS OF SIGILLARIOSTROBUS (MAZOCARPON).**—In my recent paper[1] I regret having overlooked some interesting incrustation specimens which Nathorst had recorded[2] some years previously from the Palaeozoic rocks of Spitzbergen. After figuring them and discussing their nature he concludes as follows:

'Als Resultat unserer Untersuchungen kann nur gesagt werden, dass dieselben wahrscheinlich die Mikrosporophylle eines bisher unbekannten *Lepidostrobus*- oder *Lepidocarpon*-Typus darstellen, dessen Sporangien durch ihren komplizierten, vorläufig aber nicht näher zu bestimmenden Bau von den bisher bekannten *Lepidophyllum*-Arten abweichen.'

In the August number[3] of the 'Botanical Gazette' of 1919, Bassler brought the above specimens into line with a number of American incrustation fossils not hitherto described. I owe to him, therefore, the fact that my attention has been drawn to this large number of new specimens. Bassler has, however, misinterpreted, as I conceive, both Nathorst's specimens and his own. He thinks they all exhibit 'a large lamellar sporangiophore developed in the radial plane of the strobilus from the superior face of the sporophyll pedicel, bearing two large elongate sporangia, one upon each side, pannier-like'; and it is this interpretation which has suggested the generic name *Cantheliophorus* (*κανθήλια*, pack-saddle with panniers) for both Nathorst's specimens and his own.

Thus Bassler thinks he has discovered in these impressions evidence of 'a truly sporangiophoric Lepidophyte' and thus shown that the Lepidodendreae 'are not the homogeneous, stereotyped group they were long supposed to be'.

Before proceeding to discuss his position I will state at once that all the species included in Bassler's new genus appear to me to admit of an alternative explanation.

It is unfortunate that Bassler, owing possibly to his work being carried out in a geological laboratory, has overlooked the full account of *Mazocarpon*, or I feel sure he would have realized the features of resemblance to the microsporophylls there described. He only refers to a very inadequate preliminary reference to *Mazocarpon*[4] which was published before the critical specimens had been obtained. In my view the bulk of the specimens figured, if not all, belong to various species of *Sigillariostrobus* (*Mazocarpon*) and represent microsporophylls which have become separated from the cone axis.

[1] Benson: *Mazocarpon*, or the Structure of *Sigillariostrobus*. Ann. Bot., vol. xxxii, 1918, p. 569.

[2] Nathorst: Zur fossilen Flora der Polarländer. Nachträge zur palaeozoischen Flora Spitzbergens, Teil I, 1914, p. 62.

[3] Bassler: A Sporangiophoric Lepidophyte from the Carboniferous. Bot. Gaz., vol. lxviii, 1919, p. 73.

[4] Benson: The Sporangiophore. New Phyt., vol. vii, pp. 143–9, 1908.

To make my position clearer I will refer to a few of the figures in detail:

*Lepidophyllum mirabile* as shown in Nathorst's photomicrograph (Nathorst, loc. cit., Taf. 13, Fig. 27) should be compared with Text-fig. 4 B in the *Mazocarpon* paper. Though less bulky, the resemblances in the form of the sporange and of the bract are unmistakable. Nathorst states: 'die Partie über dem oberen Feld scheint in einer dreieckigen Spitze oberhalb der Blattlamina frei zu endigen'. If we also note that the sporophylls are detached from their cone axis, we see that we have several characters strongly indicative of the *Sigillariostrobus* microsporophyll. The trabeculate character of the sterile tissue and the suggestion of a longitudinal ridge or lamina are also in harmony with this interpretation. If the *Mazocarpon* paper had antedated Nathorst's 'Palaeozoic Flora of Spitzbergen', Teil I, it is probable that he would himself have included these specimens in *Sigillariostrobus*.

Turning now to Bassler's specimens we find he recognized nine species, of which seven are new to science. Specimens of each are figured. All are found, like Nathorst's, to be detached from the cone axis. When found in their original relative position to one another the axis has perished—a condition similar to that of the microsporophylls of *Sigillariostrobus* recorded by Kidston.[1] They all show the characteristic prolongation of the sporange beyond its line of insertion on the bract. Indications of the *Mazocarpon* position of the vascular bundle in the pedicel and not in the keel are possibly seen in Bassler's Fig. 22, and several specimens (Figs. 1–3, 16 and 27) suggest the occurrence of a so-called 'lateral lamella' which is characteristic of *Mazocarpon* and possibly is the true interpretation of the line referred to as 'the brace' (Bassler, loc. cit., p. 79), while the region Bassler calls 'the crest' has been called in *Mazocarpon* 'the ridge'.

It seems unnecessary further to discuss the details, as a comparison of the figures can hardly fail to convince the observer that we are dealing in both with the same type of structure.

For convenience I will tabulate what I regard as the more important indications that most, if not all, of Bassler's new specimens can be interpreted as *Sigillariostrobus*.

1. Their general occurrence free from the axis of the cone.
2. The form of the sporange and of the bract.
3. The occurrence of lateral lines, some of which suggest the vascular pedicel and some the 'lateral lamella' of *Mazocarpon*.
4. The indication of a bulky sporange wall and the relatively small spore-bearing region.

With respect to Bassler's grouping of his specimens into numerous species, I should like to state that I do not consider the data are sufficient in every case. There were sporophylls on a single cone in *Mazocarpon* which showed as wide a range as that between *C. linearifolius* (Lx) and *C. grandis*.

Some of the specimens (Bassler's Figs. 4 and 19–21) which have been reproduced from Nathorst's work representing *Lepidophyllum riparium* and *L. waldenburgense* I should prefer to leave as Nathorst left them, as nothing is to be gained by attempting to interpret them further than as sporophylls bearing sporangia 'of some-

[1] Kidston: On the Fossil Flora of the Yorkshire Coal Field (second paper). Trans. Roy. Soc. Ed., vol. xxxix, Part I, 1897, Pl. II, Fig. 1.

what complex structure'. They are perhaps as much like *Lepidocarpon* as *Mazocarpon*.

I trust I have adduced sufficient evidence to show that there is no adequate ground for assuming the existence of a sporangiophoric Lepidophyte. On the other hand, most of the remarkable specimens now for the first time collected and figured by Bassler are welcomed as further examples of Sigillarian microsporophylls, of which we had hitherto only one incrustation record (Kidston, loc. cit., Pl. II, 1, esp. d').

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**ON THE GEMMAE OF TORTULA MUTICA, LINDB.** Among mosses, the production of gemmae is a comparatively rare phenomenon, as is seen from the fact that of the six hundred and twenty odd British species adopted by Braithwaite[1] only seventeen are known to reproduce themselves in this manner.

In these seventeen species the form and origin of the gemmae are exceedingly various. They may be red, club-shaped, septate processes which become detached from the margins of the leaf; or they may grow in clusters at the leaf-apex. More complicated gemmae are sometimes met with in the axils of the leaves, and these are often red and may develop directly into bulbils which become detached from the parent plant. In the most highly specialized plants the gemmae are borne within special cups of leaves, or on leafless pseudopodia.

Braithwaite records that in one specimen of *Tortula mutica* which he had examined there were 'minute globular gonidia scattered over the surface of the leaf, not unlike those in *Tortula papillosa*'.[2] His record is extremely brief, and no figure is given.

Recently, however, a specimen of *Tortula mutica* from North Wales has been examined, and was observed to bear numerous gemmae. They were simple in form and were usually borne scattered over the surface of the leaf. Each consisted, as a rule, of two (Fig. 3) or four (Figs. 2 and 5) cells bounded by thick, reddish-brown cell-walls, and containing dense granular protoplasm and a number of large, circular or somewhat irregular, discoid chloroplasts. Occasionally larger gemmae were found (Fig. 4), and in these the disposition of the cells was more irregular than in the smaller gemmae. The gemmae were attached to the leaf of the mother-plant by means of a single colourless stalk-cell, which grew from the surface of one of the cells of the blade, as shown in Fig. 2. The chloroplasts in the gemmae were very much larger than those in the cells of the leaf-blade, while their colour was a deep bluish-green, far more intense than that observed in the leaf itself.

Much more rarely, gemmae were found growing laterally on protonema-filaments whose walls had assumed a brown colour almost as dark as that of the cell-walls of the gemmae, and whose contents were destitute of chloroplasts. These gemmae were attached to the protonema-filament by means of a short stalk-cell, and rarely consisted of more than two green cells (Fig. 1).

[1] R. Braithwaite: British Moss Flora. London, 1887.
[2] Loc. cit., i, p. 222.