

František N ě m e j c :

## On *Hymenotheca globulifera* NĚMEJC, a sphenopteroid fern of the Westphalian of central Bohemia

**Abstract:** The morphology of the fructifications of the sphenopteroid westphalian fern *Hymenotheca globulifera* NĚMEJC collected at the coal mines near Lubná at Rakovnik (Westphalian C) is examined. Attention is especially drawn to the primarily terminal position of its rather large oval sporangia. Several notes dealing with its taxonomical problems are included.

In a preliminary report dealing with the *Sphenopterides* of the Bohemian coal districts (F. NĚMEJC 1936 [1937]) I briefly mentioned a very interesting sphenopteroid fern type, the leaflets of which are deeply cut into linear, narrow, uninerved and forklike divided laciniae, which terminally at their ends bear one large oval sporangium. From the taxonomical point of view I have ascribed this fern to the genus of *Hymenotheca* in KINDSTON'S more restricted sense. All available specimens, mostly mere impressions with some only exceptionally preserved small casts of carbonised sporangia, were collected at the coal mines in the surroundings of Lubná (coalfield of Rakovnik, W. from Prague) within the coal bearing beds of Westphalian C (in a very high zone of the Upper Radnice coal measures).

The large compound fronds of this fern are three till four times pinnate (see Plate XX: 1—10). No aphlebiae have been found on their rhachises. Their main rhachis is about 7 mm thick and straight just as all the other thinner rhachises of higher degrees. The rhachises of the last degree are narrowly winged because of the decurrent lamina of the leaflets. The leaflets, as already mentioned above, are forklike divided into lineal, narrow, uninerved laciniae, ca.  $\frac{3}{4}$  mm wide and 2 to 4 mm long. Most parts of the laciniae are fertile and are preserved at their ends by one rather large, oval sporangium ca. 1.5 mm wide and to 2 mm long.

The walls of the sporangia, judging according to the thick carbonised fragments, were composed most probably of a tissue of more cells thick. But because of the rather inconvenient state of preservation of the carbonised substance, it was impossible to elucidate their anatomical construction. The outer surface of the carbonised sporangia shows no annular nor any other dehiscence apparatus; it exhibits a rather homogenous tissue composed of cells slightly longitudinally elongated. The whole inside of the sporangia is filled up with small spores (microspores; Pl. XX. fig. 10) showing nearly smooth walls and the well marked three radiate small scars.

The orientation of the sporangia with regard to the leaflets (resp. laciniae) lamina is of a quite different kind than as in the most true ferns (excl. the coenopteroid ferns). Instead of being attached to the ventral side of the leaflets on the veinlets and turned by their longitudinal axis more or less vertically toward the plane of the leaf lamina (event. attached laterally on the projecting end portions of the veinlets), their longitudinal axis represents here the direct continuation of the end portions of the veins of the narrow leaflets laciniae,

to the tops of which they are attached. They occupy a terminal position in the true sense of this word, like the sporangia on the telomoid twigs of the various devonian psilophytoid plants or in the various utterly primitive ferns of the group of *Profilicidae* (*Swalbardia*, *Aneurophyton*, *Protopteridium*, *Archaeopteris*, *Stauropteris* a. o.) In that way our *Hymenotheca globulifera* NĚMEJC exhibits also a certain similarity with a rather curious fern like plant, the impressions of which were described and figured by the late prof. Dr. W. J. JONGMANS in 1956 (W. J. JONGMANS 1956, pp. 249—252) without any special name\*) as a supposed psilophytoid plant from the Namurian of the Ruhr coal district in western Germany (surroundings of Velbert). Our upper westphalian fern differs from JONGMANS's namurian plant type in having typical frond like leaves, pinnately branched in only one plane and leaflets (resp. their laciniae) provided by typical flat leaf lamina.

In spite of a psilophytoid orientation of the sporangia, we have therefore here to do already with a morphogenetically rather very progressive type of ferns, perhaps of an eusporangiate (or even proleptosporangiate?) kind. We may best characterise it as a type, which as to the shape and orientation of the sporangia retained the original psilophytoid features, but which on the other hand in the evolution of its fronds reached already the stage of normal dorsiventral, large pinnate leaves like all true ferns of today.

Because of the lack of knowledge of the anatomical structure of the stalks (resp. stems) and of the leaf rhachises, we hardly are able to indicate more precisely the taxonomical position of this fern type in the system of ferns (*Pteropsida*). With regard to the morphology of its fructifications it is very probable that it is to be regarded as representant of a special independent eusporangiate (or even proleptosporangiate?) fern order, parallel as to its phylogenetical evolution with the orders *Marattiales*, *Ophioglossales* and *Osmundales*.

A nearer knowledge of the features and position of the sporangia in our bohemian species of *Hymenotheca globulifera* NĚMEJC evokes at the same time also some further special taxonomical tasks. As to its general appearance, our species stands probably very near to KINDSTON's *H. acuta* of the Westphalian of Gr. Britain. Evidently it has nothing in common with the *H. dathei* POT. of the Lower Stephanian of N. E. Bohemia (Svatoňovice coal mines of the Intrasudetian coal basin), which by H. POTONIÉ was originally described as one of the species of his genus *Hymenotheca*. R. KIDSTON studying anew this interesting genus with respect to the various specimens collected in Gr. Britain, recognised that most of the species joined by POTONIÉ to the genus of *Hymenotheca* do not correspond with POTONIÉ's definition of that genus, and restricted therefore this term only to species provided only by one oval sporangium at the tops of the leaflet laciniae i. e. *H. dathei* POT., *H. acuta* KIDST. a. o. (all the other POTONIÉ's species bearing large elongated sporangia were assigned by KIDSTON with the generic name of *Radstockia*). But as newly stated in my paper from 1958 (pp. 30 resp. 63) dealing with the floras of the coal districts of Žacléř, Svatoňovice, Radvanice and Hronov, the supposed sporangia

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\*) Recently this plant type was very thoroughly reexamined by R. KRÄUSEL (1959) and considered as belonging to Dolianiti's south american genus of *Paulophyton*. R. KRÄUSEL describes it under the name of *Paulophyton jongmansii* and regards it as an intermediate plant type between the old psilophytoid forms and the ferns. He supposes it to represent most probably fructifying fronds (or fertile frond parts) of some *Rhodea* species.

of *H. dathei* POT. are better to be regarded as only mere swollen ends of the veinlets (perhaps hydathodes?); they are also much smaller than as figured by KIDSTON in his *H. acuta* from Gr. Britain. Under the generic name of *Hymenotheca* in KIDSTON's sense are therefore to be included only two species: *H. acuta* KIDST. and *H. globulifera* NĚMEJC. Thus all POTONIÉ's species for which this generic term was originally proposed, represent evidently quite different fern genera. The generic term *Hymenotheca* as now defined is therefore to be written as *Hymenotheca* KIDST. (non POT.) emend. NĚMEJC.

But the generic term of *Hymenotheca* even in this new very restricted sense seems to call for a new revision because KIDSTON's figures of his *H. acuta* do not exhibit clearly the position of the sporangia i. e. whether they are really terminal organs or whether they are attached to the tops of the veinlets on the ventral side of the lacinae. A revision of this British species from this point of view is therefore highly desirable and I suppose that it would be best to restrict this generic term still narrower and to keep it only for species provided by really terminal sporangia (like in the mentioned bohemian species of *H. globulifera* NĚMEJC) and to create eventually for species in which the sporangia do not occupy such a terminal position another special generic term.

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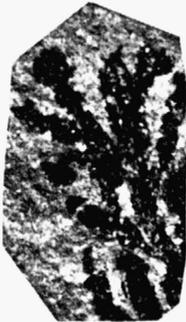
#### Explanation of the Plate XX.

##### *Hymenotheca globulifera* NĚMEJC:

- Fig. 1 and 2. Fragments of fertile pinnae. — Loc.: Coal mines „Na Brantech“ at Lubná (near Rakovník). — Hor.: Whitish fire clays („brousky“) of the Upper Radnice coal measure series. — Nat. size.
- Fig. 3 and 4. Sporangia bearing leaf lacinae of the specimens of fig. 1 and 2 enlarged. — Fig. 3 :  $\times 3$ , fig. 4 :  $\times 4$ .
- Fig. 5, 6 and 7. Fragments of fertile pinnae. — Loc.: Coal and fire clay mines „Rako“ at Lubná (near Rakovník). — Hor.: Gray, very fine grained shales of a thin coal seam between the Lubná coal measure series and the Upper Radnice coal measure series. — Nat. size.
- Fig. 8 and 9. Sporangia bearing pinnules of the specimen of fig. 7, enlarged. —  $\times 4$ .
- Fig. 10. Transfer preparation of the spore mass contained within the sporangia of the specimens of fig. 1 and 2. —  $\times 180$ .



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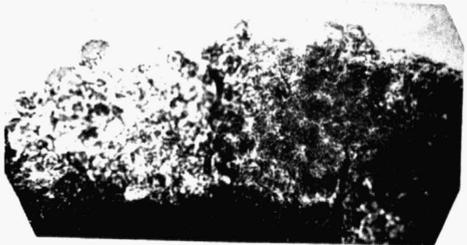
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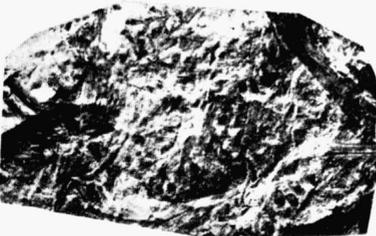
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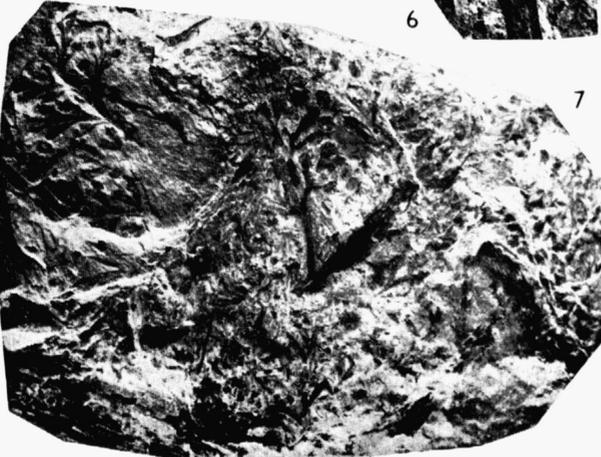
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F. N ě m e j e:  
On *Hymenotheca globulifera* NĚMEJČ, a sphenopteroid fern of the Westphalian of central Bohemia

František Němec :

## O *Hymenotheca globulifera* NĚMEJC, sphenopteroidním vestfálském kapradí ve středních Čechách

V předloženém článku je probrána morfologie plodních orgánů vestfálské sphenopteroidní kapradiny *Hymenotheca globulifera* NĚMEJC známé z důlu v okolí Lubné u Rakovníka (lubenský obzor; westfál C). Je poukázáno obzvláště na původní terminální postavení jejich velkých oválných sporangií. Na konci je připojeno několik poznámek týkajících se některých taxonomických otázek pojících se k tomuto typu kapradin.

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