

STEPHANIAN FLORAS IN THE COAL DISTRICTS OF CZECHOSLOVAKIA IN THE LIGHT OF NEW GEOLOGICAL INVESTIGATIONS

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ABSTRACT

Several most recent geological investigations, especially in the N. part of the Plzeň coal-basin have shown that various coalseams, previously regarded as Upper Stephanian really belong to a much deeper horizon, being enclosed within the so called Lower Red Beds (i.e. the uppermost part of the Westphalian till the Lower Stephanian). This discovery led the author to a new evaluation of the various Stephanian floras in the Czechoslovakian coal basins. Four different biostratigraphically well-defined plant assemblages have been distinguished here during the time space between the uppermost Westphalian (i.e. the Nýřany coal series) and the Permian.

DURING the past century two different opinions concerning the biostratigraphy of the coalbearing zones between the Westphalian and the Permian in central Bohemia have been expressed: The first by D. Štúr (1874) who distinguished two (resp. three) palaeofloristically well defined coal-measure zones, a lower zone called the Vísky or Zeměchy horizon and two higher zones called the horizon of Rosice and that of Kounov. The other view was expressed by O. Feistmantel, who regarded all these coal-bearing beds as more or less equivalent and belonging to only one biostratigraphically well defined coal series. All later geologists and palaeontologists (A. Frič, C. Purkyně, W. Petrascheck, L. Čepěk as well as the author of this article) assumed till past years the point of view of O. Feistmantel. The respective coal series was called the Upper Grey Beds or the Kounov (rep. Liny) coal-measure series, and because the fossil floras accompanying the coal seams assigned to these beds at various places contain many plants characteristic of the Upper Stephanian in France or Germany (including e.g. *Walchia*, *Sphenopteris germanica*, *Callipteridium*

gigas and *C. trigonum*, *Odontopteris subcrenulata*, *Mixoneura neuropterooides*, *Alethopteris bohémica*, *Pecopteris feminaeformis*, *Linopteris germari*, *Sphenophyllum oblongifolium* and *longifolium*, *Sigillaria brardi* and *ichthyolepis* a.o.) it was regarded as of Upper Stephanian age. We have assumed that in Central Bohemia there exists between the uppermost Westphalian coal-bearing (and therefore also fossiliferous) beds (the Nýřany coal-measures of the Lower Grey Beds) and the just mentioned Kounov coal-measure series a rather long time space, represented by the so-called Lower Red Beds (regarded as nearly barren i.e. containing no workable coal seams) and corresponding approximately to the Lower and Middle Stephanian. The presumption was therefore established, that in Central Bohemia no Lower Stephanian flora comparable to those of the Intrasudetian (Lower Silesian) coal-basin (Svatonovice beds) or of the coal-measure series of Toroňa in E. Slovakia are to be found at all. Various differences in the composition of the respective local floras (e.g. the lack of *Pecopteris feminaeformis*, of *Walchia* a.o.) were explained as more accidental features or features caused by local ecological conditions.

Several most recent geological researches, especially those by J. Dvořák and J. Pešek (1961) in the north part of the Plzeň coal district, have shown that many of the coal seams, previously regarded as equivalents of the Kounov coal measures (i.e. of Upper Stephanian age), are really essential part of some deeper zones, being in fact enclosed within the Lower Red Beds (i. e. between the Westphalian series and the Upper Stephanian series.) The different floristical character of certain Stephanian coal-seams in central Bohemia may also be easily explained by this last mentioned

fact. We have to do with somewhat older floras than those of the really Upper Stephanian Kounov coal-measures. I suppose therefore (F. NĚMEJC, 1962) that we have to abandon the traditional point of view of O. Feistmantel and to return to the old and nearly forgotten conception of D. Štúr (1874).

According to the above mentioned geological data and conformably with all my previous palaeofloristical researches (F. NĚMEJC, 1935, 1951) we may at present distinguish at least the following four different bio-stratigraphically justifiable plant assemblages hitherto recognized in the Stephanian beds of Czechoslovakia:

1. Plant assemblages of the deeper Stephanian beds (resp. transition horizon between the Westphalian D and the Lowermost Stephanian) containing no *Pecopteris feminaeformis* Brongn.

(a) Plant assemblages containing among various *Pecopteris* species (*P. polypodiioides* Sternb., *P. nyřanensis* NĚmejc, *P. unita* Brongn., cf. *candolleana* Brongn., *P. polymorpha* Brongn. a.o.) and *Dicksonites pluckeneti* Schl. still *Mixoneurae* of the aff. of *M. ovata* Hoffm. as well as many species of rhytidolepous *Sigillariae*, but no *S. brardi* Brongn. Further characteristic types are *Pecopteridium costei* Zeill., *Odontopteris genuina* Gr. Eury, *Linopteris neuropteroides minor* Pot., *Hymenophyllites bronni* Gutb., *Diplomema busqueti* Ren. et Zeill., *Sphenophyllum emarginatum* Brongn. and *oblongifolium* Germ. et Kaulf., *Asterophyllites equisetiformis* Schl., *Annularia stellata* Schl. and *sphenophylloides* Zenker, *Lepidophloios laricinus* Sternb. and some rare *Lepidodendra*. We meet this flora in the coal-measure series of Svatoňovice in the Intrasudetian (Lower Silesian) coalbasin perhaps several rather thin coal seams between the Nyřany coal series and Štúr's Víska (or Zeměchy) coal horizon in central Bohemia also belong to this horizon.

(b) A slightly younger plant assemblage, similar to the foregoing one, in which *Mixoneurae* of the aff. of *M. ovata* Hoffm. and rhytidolepous *Sigillariae* are already missing (or very rare). This flora accompanies the coal seams of Štúr's Víska (or Zeměchy) coal horizon in central Bohemia; it was not yet stated in the Intrasudetian coal basin. It also corresponds to the

coal measures of the Toroňa coal district in E. Slovakia.

2. Plant assemblages of the higher Stephanian beds containing *Pecopteris feminaeformis* Brongn. and *Sigillaria brardi* Brongn. very often also *Walchia*s as well as *Samaropsis moravica* Helmh. and rare *Sphenopteris germanica* Weiss. and *Odontopteris subcrenulata* Rost. *Alethopteris bohemia* Franke is also very common with *Linopteris germari* Giebel. and various *Callipteridia* (*C. trigonum* Franke, *gigas* Gutb. and *pteridium* Gutb.).

(a) An older flora characterised by the absence of true *Odontopteris minor* Bgt. (instead of it a similar form *O. intermedia* NĚmejc is to be found here). This flora corresponds to the coal-seams of the Upper Grey Beds (Kounov coal-measure series) in central Bohemia and the Radvanice series in the Intrasudetian coal basin.

(b) A younger flora characterised by the very abundant occurrence of *Odontopteris minor* Brongn. as well as of *O. osmundaeformis* Schl. *Callipteridia* become rather rare here; on the other hand rare occurrence of true *Callipteris* species may be stated. Flora of this type accompanies the coal measures of the Rosice and Oslavany coal basin in central Moravia as well as the "Walchienflöz" of the Intrasudetian coalbasin (very similar but rather incompletely known plant assemblages, in which till present no true *Callipteris* species were found at all, are to be stated also at several places in Bohemia in the uppermost Stephanian beds: certain coal seams at Klobuky near Slaný as well as at Peklov near Český Brod.).

The composition of the Stephanian floras is on the whole very similar to that of the Stephanian floras of the coal districts of central France. The floras of the deeper horizons (1a and 1b) are comparable with plant assemblages known from the Assize de Rive de Gier, those of the higher zones partly with plant assemblages of the Serie de Saint Etienne (our flora 2a), and partly with plant assemblages of the Serie d' Aavaize (our flora 2b). The oldest flora of all (the flora of the Svatoňovice beds, i.e. 1a) indicates a transition to our uppermost Westphalian floras. The youngest Stephanian flora (2b, i. e. the flora of the coal measures of Rosice and Oslavany) on the other hand already indicates a transition to the Permian floras.

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