

‘Paleoekologická charakteristika vybraných localit brouskového horizontu’ by Mgr. Milan Libertín.

Report by Dr Christopher J. Cleal (National Museum Wales, Cardiff, UK).

I must first apologise for not being able to present this report in person and to thank Dr Opluštil for reading it out, on my behalf. The date decided on for this meeting unfortunately clashed with three other meetings to which I had long-standing commitments, and it proved impossible to fit in a visit to Prague around these. My failure to be here today I hope will not be taken as any sign of disrespect to you, or to the work of Libertín, which I hold in the highest esteem.

Milan Libertín is a member of the group of Czech specialists that has been making such a major contribution to Carboniferous palaeobotany in recent years. The group has been fortunate to have available one of the most important resources for Carboniferous palaeobotanical work – the tuff deposits that preserve *in situ* remains of the coal swamp vegetation, most notably the Whetstone Horizon in the Radnice Member. However, this is not just a case of a group of scientists being in the right place at the right time. These tuff floras have been known about for nearly two centuries and have been examined by many earlier palaeobotanists; but only recently has the full potential of these fossils started to be realised. The strength of the group is partly due to the individual skills of the members. However, another important factor is that the members of the group bring a range of different specialisms to the work, including morphological palaeobotany, cuticle studies, palynology, sedimentology and palaeoecology, which combine to provide a much deeper insight into this ancient vegetation.

Libertín is the youngest of the group but has already established himself as a key member. He played a central role in the excavations on the various Whetstone Horizon sites undertaken during the first decade of this century, and took a lead in the Štílec mine excavation (these excavations are described in detail in the first four papers that form this thesis). In this work, he was involved in the full range of scientific investigations that were undertaken. However, the aspect that he focussed on most intensively was the taxonomy of the non-fern pteridophytic plants, in particular the horsetails and the subarborescent club mosses, and especially the importance of the spores contained in their reproductive cones.

The nine papers that form the core of this thesis have all been published in international journals and so have been subject to the usual peer-review process. This has obviously ensured the quality of the individual studies and there is therefore little point in me commenting on this in detail. They are all important contributions to Carboniferous palaeobotany and should stand the test of time. I will, instead, mainly comment on certain more general aspects of the studies.

There has been a tendency in the past for palaeobotanists and palynologists to work separately, to the detriment of both fields. As pointed out in his 2008 sphenophyll fructifications paper, progress in understanding the taxonomy of these plants will only be possible through “collaboration between palaeobotanists and palynologists.” This is especially the case when dealing with adpression fossils, where the detailed anatomy of the cones can be difficult to see. However, simply improving the taxonomy of the fossil cones for the sake of it has only limited interest. The relative rarity of these cones compared to the foliage will make it very difficult to determine the distribution of the plant species in time and space based only on the occurrences of the cones. This information is critical for understanding the dynamics of this vegetation, which in turn is important for understanding the changing landscapes and climates. Libertín is clearly aware of this and makes an important contribution to determining the characters that can be used to distinguish more natural fossil species for *Sphenophyllum* foliage, so that we can get a better understanding of the biogeography and biostratigraphy of the parent plants.

Libertín also clearly makes the important point that such work will enable the taxonomy of the dispersed spores to be improved. There is a general tendency in Palaeozoic palynology to regard the taxonomy used for dispersed palynofloras as being almost totally artificial at most ranks. This was arguably legitimate in the early days of the study but is not so today. It is certainly now possible to assign a large proportion of the fossil genera of dispersed pollen and spores to Palaeozoic plant groups; this has been through a number of important studies on *in situ* pollen and spore studies, not least those of other members of the Czech team, Jiří Bek and Stanislav Opluštil. This has allowed the dispersed

palynological record to be studied in terms of changes in the overall composition of Palaeozoic vegetation. However, Libertín's work is starting to offer the possibility that a more detailed picture of the Palaeozoic vegetation may be obtainable from the dispersed palynological record. By using the *in situ* evidence to determine which palynological characters can be used to differentiate the biological species, it should be possible to emend the fossil taxonomy of the dispersed pollen and spores so that it reflects more closely the taxonomy of the parent plants, even to the level of being able to identify biological species purely from the dispersed record. Libertín has already made important contributions to this end in his studies on the sphenophylls, *Huttonia* and *Polysporia*, but there is much that still needs to be done on these and other groups, both in the Czech Republic and elsewhere in the world.

Another interesting aspect of Libertín's work is his integration of the dispersed and *in situ* palynological evidence to determine morphological difference at different levels of maturity. This is a persistent problem when trying to interpret the dispersed record using evidence from *in situ* pollen and spores; the former will be almost always fully mature, whereas the latter may well be immature. However, because the spore-bearing structures that Libertín has been studying are preserved in an essentially autochthonous setting, the associated dispersed spores will almost certainly be from the same plants. In his study of *Polysporia*, for instance, he was able to show that the *in situ* and dispersed megaspores would be assigned to the same dispersed fossil species, but that the former tended to be smaller, presumably reflecting their immaturity.

I just have the following brief questions for Libertín.

1. It is unusual to see such a small sphenophyte in the late Carboniferous coal floras as that which he briefly describes in the 2009 Štílec paper (the one with *Palaeostachya feistmantelii* cones). Does Libertín know of any other herbaceous calamitid sphenophytes from the late Carboniferous coal floras?
2. How many sphenophyte fossil-species can you recognise in the Whetstone Horizon floras based on the cones and how does this relate to the fossil-species based on the foliage? Will it ever be possible to recognise reasonably 'natural' fossil-taxa if only the foliage is preserved?
3. I have been told (by Cedric Shute, Natural History Museum, London) that it is possible to see considerable structural detail in transfers of sphenophyte cones, even when the coalification rank is quite high. Would it be possible to do such transfers on the Whetstone Horizon cones get better information about their structure?
4. Barry Thomas has shown the importance of stem cuticles in investigating the taxonomy of the arborescent lycophytes. Do you think it possible that the sporophyll blades from the cones would yield cuticles? How do you think these would relate to the stem cuticles? Do you think it will be possible to integrate the fossil taxonomies established for the stems and for the cones, to produce a more holistic fossil taxonomy for these fossils?

Libertín is to be congratulated on the excellent series of studies described in this thesis and which without doubt merit the award of the degree for which this has been submitted.

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