

Miospore Biozonation in the Middle Devonian – Lower Carboniferous of Europe: its Application to Western Gondwana

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ABSTRACT

Different zonal concepts used in the definition of the standard miospore biozonation of the Devonian and Lower Carboniferous of Europe are compared and discussed. The interval zone is demonstrated to be the most suitable biozone type for correlations within the limits of a single phytozoogeographic province, where it can be easily compared with biozones based on other fossil groups. Essentially the same miospore interval zones are shared by Western Europe and portions of Western Gondwana (e.g., Brazil and North Africa) from at least Emsian to Tournaisian, thus demonstrating that both regions were parts of a single phytozoogeographic province from late Early Devonian to the Early Carboniferous. Despite this, small-scale endemism is detected in miospore assemblages from different parts of such major province.

Key words: miospores, Devonian, Carboniferous, Gondwana.

INTRODUCTION

Different major zonal concepts are in use in the miospore zonal schemes currently adopted for the Devonian and Lower Carboniferous of Europe.

Russian authors still favor a concept of assemblage zone based on, and generally named after the acme of characteristic species, whereas the true first occurrences of taxa are seldom taken into account. It is still largely applied to a Devonian phytozoogeographic area in the eastern part of northern Euramerica centered on the Devonian equator (Streel *et al.*, 1990).

The zonal concept employed by Richardson & McGregor (1986) is also the assemblage zone but defined by a combination of different criteria such as the co-occurrence of selected taxa, appearance of selected miospore structural or sculptural features and also the joint first occurrence of two selected species which give their name to the zone.

This last concept is claimed to be the only one which would allow correlation on a global scale. Indeed, it has been applied to different major phytozoogeographic provinces.

However, assemblage zones, whatever their definitions are, cannot be used for accurate correlations with faunal (i.e. conodont) zonation schemes now in use to characterize the newly defined chronostratigraphic units, just because the assemblage zone limits are not accurate.

For that reason, Streel *et al.* (1987) proposed, for the Devonian of the Ardennes-Rhenish regions, a zonal scheme using the interval zone concept and rejecting other criteria of correlation based on loosely defined Opper zones. The interval zone is defined as an interval between two biohorizons (Hedberg, 1976), each one defined by one single taxon. This biozone concept can be applied within the limits of single major phytozoogeographic prov-

inces, allowing unequivocal correlation with interval zones based on other fossil groups.

A similar scheme composed of several succeeding interval zones, defined as concurrent range zones based on first or last occurrences of one or, more often, two selected key species was proposed by Higgs *et al.* (1988) for the Lower Carboniferous of the British Isles.

During the last years some palynological investigations in North Africa (Streel *et al.*, 1988; Loboziak & Streel, 1989; Loboziak *et al.*, 1992) and Brazil (Loboziak *et al.*, 1988-1993) have shown that from at least Emsian to the Lower Carboniferous (Tournaisian) the succession of first occurrences of several characteristic species of the miospore biozonations developed in Western Europe was the same in those two distinct areas of the western part of Gondwana.

A quantitative approach based on the relative abundance of taxa first within Western Gondwana (Loboziak *et al.*, 1989), then between Western Gondwana and Southern Euramerica (Streel *et al.*, 1990) allowed the recognition of a remarkable uniformity of land plant vegetation (as deduced from the miospore record) and therefore of the climate from paleotropical to paleopolar realms during at least the Givetian and Frasnian periods. It was also demonstrated that Western Gondwana and Southern Euramerica constituted a single major phyto-geographic province during Middle and Late Devonian times.

On the other hand, those same studies have also demonstrated that certain species were found to be restricted to Western Gondwana, so indicating that some sort of provincialism was in effect in these regions. Such endemics, together with the criteria originally defined in Western Europe, represent good biostratigraphic markers in the Gondwana areas (Loboziak & Streel, 1995).

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