Palynology of the Devonian/Carboniferous boundary — a progress Report on Project B

By M. Streel

A more detailed report being presented at the Subcommission on Carboniferous Stratigraphy, this text will only summarize the most significant and new palynological available data. The results presented are twofold:
(1–5) New data from the type regions of Northern France, Belgium and Germany linked with new faunal evidences from the same region.
(6–7) New correlations between Western and Central United States and Europe based also on faunal and palynological evidences. We are indeed engaged in a process where faunal and palynological evidences are mutually self supporting.
On table 1, we have arranged the different paleontological criteria useful to delineate the Devonian/Carboniferous boundary, in an ascending stratigraphical order as they occur from the Upper Famennian (Fa2c) to the Middle Tournaisian (Tn2a).
New data are

1) *Pusillites-lepidophytus* assemblage found in the Etroeungt limestone at St. Hilaire, section Avesnois, France;

2) Base of the *pusillites-lepidophytus* assemblage from the Hastière section, a typical section of the Tn1a in the Dinant basin near Dinant, associated with a conodont fauna *costatus*. The succession 1/PLi earlier known in the Ourthe valley is now confirmed in the typical region.

3) Last *Hymenozonotriletes lepidophytus* poorly preserved (reworked?) specimens below a "primitive" *Siphonodella* in the first bed of the Hastière limestone in the parastratotype at Anseremme near Dinant.

First occurrence in a succession	Local first occurrence	Local last occurrence	Cephalopods	Conodonts	Forams	Spores	
	13				x		*Chernyshinella glomiformis* zone
12	12			x			"advanced" *Siphonodella*
	TE					x	*trivialis-explanatus* zone
	11		x				*Gattendorfia subinvoluta* (Lower cul)
10	10			x			*Siphonodella sulcata* zone
							base Carboniferous System Heerlen 1935
	9			x			"primitive" *Siphonodella* (See Sandberg, Streel and Scott, Krefeld meet.)
	8			x			*Protognathodus* Fauna
	PLs3					x	*pusillites-lepidophytus* zone, upper 3
	7		x				*Balvia prorsum*
	PLs2					x	*pusillites-lepidophytus* zone, upper 2
	6		x				*Cymaclymenia euryomphala*
PLs1	PLs1					x	*pusillites-lepidophytus* zone, upper 1
5	5	5			x		*Quasiendothyra kobeitusana*
PLm	PLm					x	*pusillites-lepidophytus* zone, middle
4			x				*Wocklumeria* zone (to VI)
3	3	3		x			*costatus ultimus* subzone
2	2				x		*Quasiendothyra communis radiata*
PLi	PLi					x	*pusillites-lepidophytus* zone, lower
1	1			x			*costatus* zone, lower
	VU	VU				x	*versabilis-uncatus* zone

Table 1. Main paleontological controls at Devonian-Carboniferous transition measures, in the Ardennes-Rhine basins.

4) *Pusillites-lepidophytus* assemblages, associated with an upper *costatus* conodont fauna, near the base of the 150 meters thick Seiler section (Western Germany).

5) A few spores including *H. lepidophytus* and *H. pusillites* and a new occurring species in that basin, similar to *Spinozonotriletes balteatus* in both Oese and Stockum sections (West Germany). At Oese, these spores occur in about 15 meters of sandstone intercalated between the Hangenberg Shales (with PLs 2 assemblage) and the first Carboniferous Limestone (with the succession 8/10). At Stockum, these spores occur with PLs 3 assemblage, associated with the Cephalopod *Balvia prorsum* and Conodont *Protognathodus* Fauna. Work in progress could provide here a more suitable limit for what has been named earlier the *trivialis-explanatus* assemblage.

6) The Sappington Fm of Wyoming and Montana (U.S.A.) contain a *pusillites-lepidophytus* assemblage where the list of species is very similar to PLs 2 assemblage contained in the Hangenberg Shales. It is associated with the "primitive" *Siphonodella* which, in the United States occurs, below the base of conodont *sulcata* zone.

7) In the Mississippi Valley, the Saverton Shales contain a *pusillites-lepidophytus* assemblage with large specimens of *H. lepidophytus* (C zone) which correspond to PLi/m. It is associated with the American Conodont "*aculeatus*" zone.

These new data ascertain the biostratigraphical scheme as presented on Table 1.

A scheme of miospore zones for the British Dinantian

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With 2 figures

Abstract

Significant changes in the qualitative composition of miospore assemblages in British Dinantian rocks have been revealed by an examination of substantial stratal sequences. Based on the vertical range characteristics of the recorded taxa, eight miospore zones have been defined in the British region.

Introduction

Comprehensive schemes of miospore zones for the Dinantian have, until recently, been confined to the U.S.S.R. as described in the publications of Ishchenko (8) and Kedo (10). By contrast, many papers describing either stratigraphically restricted or geographically isolated assemblages from rocks of known or deduced Dinantian age have appeared in Western literature. Clearly the widespread development in Western European Dinantian successions of littoral-shelf limestones and the structural deformation which often characterises the neritic-culm facies, has provided unfavourable palynological source material. However, more recently Lanzoni and Magloire (36) from the Algerian Sahara and Jachowicz (35) from the Holy Cross Mountains, Poland have succeeded in determining successions of miospore assemblages of Dinantian age. A useful synthesis of these data has been given by Streel (25).

In Britain during the past fifteen years a series of publications has described assemblages which, whilst being well preserved and diversified, have either been representative of short stratigraphic intervals or have had only tentative correlative status with regard to macrofossil zones.

The present authors, in a coordinated programme partially financed by the Natural Environment Research Council and in collaboration with the Institute of Geological Sciences began work on selected substantial sequences in the British region.

The stratigraphical and geographical distribution of sequences which have been described in publications are shown in Text Figure 1 in relationship with the presently proposed zonal scheme and classical macrofossil schemes.

The Old Red Sandstone – Lower Limestone Shales successions of south-west Britain and southern Eire, described by Sullivan (26), Neves and Dolby (15), Dolby and Neves (6), Dolby (5) and Utting and Neves (29), have provided Famennian-Tournaisian boundary microfloras.

The advent of the Avonian limestone succession necessitated a transference of the investigation to the Calciferous Sandstone Measures of the Midland Valley of Scotland where long sequences of Lower Carboniferous strata are in a largely non-marine clastic facies with interleaved volcanics. Good correlation with macrofossils data is however only possible in the upper part of the section where the Viséan P_1/P_2 boundary is marked by the well defined Hurlet Limestone transgression.

By means of borehole cores and natural sections, an apparently complete sequence of miospore associations has been obtained from the Upper Old Red Sandstone – Carboniferous contact to the Namurian. Some aspects of these investigations have already been published Sullivan (27), Sullivan and Marshall (34), Neville (18), Clayton (3), Neves and Williams (31), Marshall and Williams (13) whilst others are currently in preparation (Neves and Ioannides on the Spilmersford Borehole, East Lothian (16)).

Based on a study of these assemblages and such associated macrofossil evidence as is available, eight miospore, concurrent range zones have been established, from lower Tournaisian (Tn1a) to basal Namurian (E_1). The two lowest zones have been defined in the Avon Gorge and Burrington Combe successions of Somerset. The succeeding five zones of the Calciferous Sandstone Measures in the Spilmersford Borehole, East Lothian and sections in adjoining areas are succeeded by the uppermost zone in the Lower Limestone and Limestone Coal Groups of Scotland and the Middle and Upper Limestone Groups of Northumberland. The base of the latter zone is possibly coincident with that of the *Rotaspora knoxi* zone (Assemblage Zone III) of Smith and Butterworth (24).

The scheme of zones is shown in Text Figure 2 which indicates the recorded ranges of stratigraphically restricted species. The zones are thus defined on the overlap characteristics of these ranges and are consequently concurrent range zones (Recommendation of the Stratigraphical Code Subcommittee of the London Geological Society 1967, p. 85). The style of zonal nomenclature is in accord with that used by Streel (25) for the Famennian and lower Tournaisian of the Ardenne-Rhine basin.