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THE LOWER FAMENNIAN AT THE SOUTHEASTERN BORDER OF THE DINANT BASIN (*)

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(3 figures dans le texte)

RÉSUMÉ

L'étude stratigraphique des dépôts sédimentaires du Famennien inférieur dans la partie sud-orientale du bassin de Dinant a permis de préciser ses limites inférieure et supérieure et de comparer les zonations à conodontes et à rhynchonellides, dont le diachronisme est bien marqué mais stable. La limite supérieure du Fammennien inférieur, basée sur la transition *crepida-rhomboidea* dans la zonation à conodontes, est précédée de peu par l'installation du facies d'Esneux, caractérisé par une association de rhynchonellides avec *Basilicorhynchus*. La limite Frasnien-Famennien est marquée dans la lithologie par une augmentation temporaire du contenu gréseux, et dans la paléontologie par un changement de faunes (conodontes, rhynchonellides, tentaculites). La Zone à *triangularis* inférieure, à la base du Famennien, équivaut probablement la partie basale de la Zone à *triangularis* moyenne.

ABSTRACT

A stratigraphical study of Lower Famennian deposits at the southeatern border of the Dinant tectonic basin allowed a comparison of the conodont and the rhynchonellid biozonation which showed the diachronism between these fossil guide groups. The lower and upper boundaries of the Lower Famennian substage are defined. The conodont distribution at the Frasnian-Famennian transition is discussed along with the value of the Lower *triangularis* conodont - Zone.

I. INTRODUCTION

A stratigraphical study of the Lower Famennian strata in the region of Hamoir (eastern border of the Dinant tectonic basin) is mainly based on the study of two fossil groups, the conodonts and the rhynchonellids. The stratigraphic succession of the rhynchonellids established by SARTENAER, has been recognized in all sections studied. The standard Upper Devonian conodont zonation originally established in Germany by ZIEGLER, has been recognized and specified in Belgium by COEN and MOURAVIEFF for Frasnian deposits and by BOUCKAERT and co-workers for Famennian deposits. Rich conodont faunas in the section studied allowed a detailed subdivision of the Lower Famennian strata to be made.

A correlation between the conodont and the rhynchonellid succession is shown in fig. 1. A certain diachronism between conodonts and the lithological units reflected by the rhynchonellids is evident. This is due to distribution differences between the

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fossil groups. The standard conodont succession is recognized world-wide, although species frequencies are influenced by local facies conditions. The rhynchonellid distribution is more directly controlled by geographical restrictions and facies conditions, at least at the species level. However, stable facies conditions during the Lower Famennian in the area studied impose only minor divergencies between conodont and rhynchonellid zone limits. Compared to the Lower Famennian conodont zonation, the installation of a new facies or the appearance of some new rhynchonellid species is generally recorded earlier in the north which is considered as more shallow and littoral, than in the south.

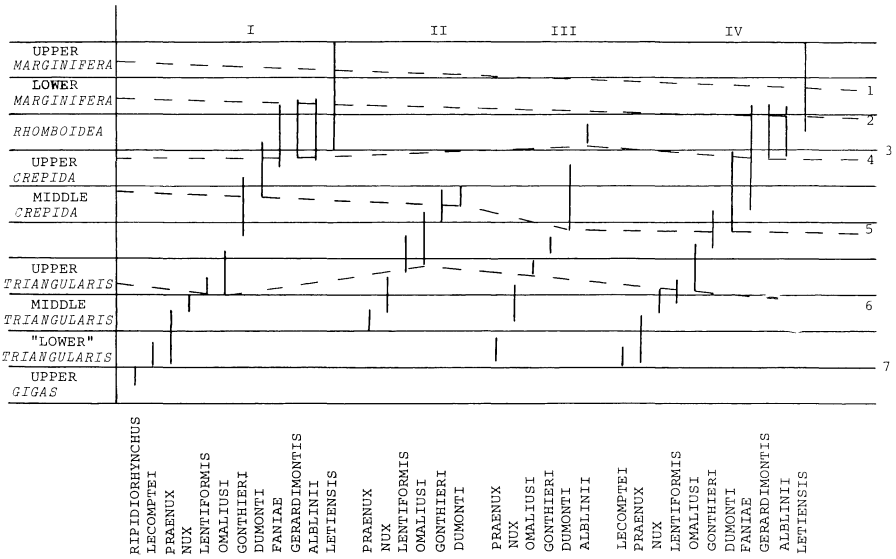

Fig. 1. — Correlation chart between conodont zonation and rhynconellid zonation in the Early Famennian (I = Sinsin-Haversin; II = Noiseux; III = Somme-Leuze; IV = Hamoir).

1 — base of Souverain Pré lithofacies (according to D. & D., 1976)
2 — oolite (according to D. & D., 1976)
3 — limit Lower/Upper Famennian (according to B., S. & T., 1968)
4 — base of the *gerardimontis* (rhynchonellid)-Zone
5 — base of the *dumonti* (rhynchonellid)-Zone
6 — base of the *omaliusi* (rhynchonellid)-Zone
7 — limit Frasnian/Famennian (according to B., M. ,S., T. & Z., 1972)

An important interruption in the faunal content at the Frasnian-Famennian stage limit is also reflected by a sudden change in the conodont frequency distribution pattern at the form genus and species level, which is not without implications for the biozonation. This interruption is also perceptible in the lithofacies.

II. LOCALITIES

All data come from the southeastern part of the Dinant tectonic basin. Observations from other areas are only confirmatory (Hony in the northeastern part; Houyet in the southern part and Silenrieux-Cerfontaine in the northwestern part of the Dinant basin).

Data from the Sinsin-Haversin area have been given by DREESEN and DUSAR, 1975 and by the Guidebook Excursion I-4 of the International Symposium on Belgian micropaleontological limits, Namur 1974, eds. BOUCKAERT and STREEL. Data from the Noiseux section (168E 25-26) by the Namur Sympsoium Guidebook, Exc. 1-5. Data from the Somme-Leuze borehole by BOUCKAERT and HERMAN, 1973. Data from the Hamoir area by the Namur Symposium Guidebook Exc. 1-7 and in unpublished descriptions of numerous outcrops on sheets Hamoir, Ferrières, Grand Han, stored in the Archives of the Belgian Geological Survey.

III. THE LOWER-UPPER FAMENNIAN SUBSTAGE LIMIT (Fa1/Fa2)

The Lower-Upper Famennian limit is drawn at the base of the *rhomboidea* conodont-Zone (BOUCKAERT, STREEL and THOREZ, 1968), which was correlated by the same authors with the limit between the Mariembourg and Esneux Formations (« assises ») as described by GOSSELET and MOURLON.

The base of the *Basilicorhynchus basilicus gerardimontis*-Zone which in the sections studied is immediately preceded (Aye 356 b = Tige de Hogne) or followed (Hamoir) by the appearance of *Evanescirostrum alblinii*, and followed by the appearance of the « *Camarotoechia* » *letiensis* group, occurs in the upper part of the Upper *crepida*-Zone which is still situated in the Lower Famennian. In some sections such as Haversin Les Basses, Hamoir Néblon 158W 763 (Namur Symposium Guidebook, Exc. 1-8) and 158W 60 = 1i, this base occurs in an interval-zone without *Palmatolepis crepida* and before the appearance of *P. rhomboidea*.

It is associated with a gradual increase of psammitic sandstone beds indicating the Esneux Formation which remains predominantly shaly. In this way, a parallellism of the base of the Esneux lithofacies with the base of the *Basilicorhynchus basilicus gerardimontis*-Zone is preferable.

In the region of Haversin, two different facies were observed in the Upper *crepida*-Zone : a nothern sandy facies (Esneux type) with *Basilicorhynchus* and associated rhynchonellids (*Cavatisinurostrum faniae*, *Evanescirostrum* and « *Camarotoechia* » *letiensis*) in Les Basses comparable to the facies of the Hamoir region; a southern shale facies (Mariembourg type) with *Ptychomaletoechia dumonti* associated with *Evanescirostrum* without *Basilicorphynchus* in Tige de Hogne. This clearly shows the relation between rhynchonellid associations and facies, and the diachronism with the conodont biozonation (DREESEN and DUSAR, 1975).

A formal subdivision of the Lower Famennian shales in two units, the « assise de Senzeilles » with *Ptychomalectoechia omaliusi* and the « assise de Mariembourg » with *P. dumonti*, is not practicable in the area studied. No important differences in lithofacies were discovered, while the beds containing the two guides form only a minor part of the complete Lower Famennian succession.

IV. THE FRASNIAN-FAMENNIAN STAGE LIMIT

The limit at the base of the Famennian stage is drawn at the base of the *triangularis* conodont-Zone in conformity with the proposition by BOUCKAERT *et al* (1972) at the Hony reference section. Limits based on other fossil groups are found at the same level. The first appearance of *Pampoecilorhynchus praenux* and *P. lecomptei* is nearly simultaneous with that of *Palmatolepis triangularis*. This limit is evident

in all parts of the Dinant tectonic basin, especially in its southeastern part. It is however too clear-cut and too uniform, resulting obviously from some widespread disturbances tectonic or otherwise, with impact on sedimentation and biofacies. At the top of the Frasnian deposits and continuing into the lowermost Famennian strata, numerous lenticular and nodular calcpsammitic beds were seen (more clayey limestone in southern sections such as Noiseux and Sinsin). They separate the two stages in which the shales are rather similar (Barvaux type, SARTENAER 1974). A new fauna appears together with this facies change, as illustrated by conodonts and rhynchonellids, whereas other faunas vanish such as the tentaculites which were recovered from heavy residues of dissolved limestones. Some solitary corals are still observed in the Barvaux type shales just below the installation of the new facies with calcpsammitic layers (Hamoir 158W 143). Rare dwarfish forms of solitary corals reappear in the Upper Famennian from the Esneux beds upwards (Hamoir 158W 855, top *rhomboidea*-Zone).

The sudden change in the conodont frequency distribution is well illustrated by two sections already published in the Namur Symposium Guidebook, Noiseux (Exc. 1-5) and Hamoir-Xhignesse (Exc. 1-7) (figs. 2-3).

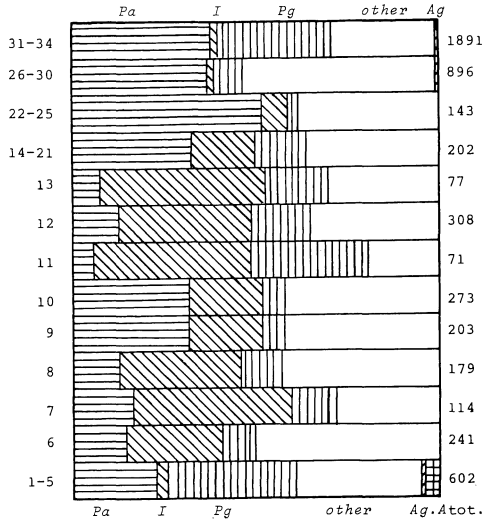

Fig. 2. — Frequency distribution in % of some conodont form-genera in the Noiseux section (Guidebook Namur, 1-5); on the left side sample numbers.

1-5 : Upper *gigas*-Zone
6-21 : Middle *triangularis*-Zone
22-25 : Upper *triangularis*-Zone
26-30 : Lower *crepida*-Zone
31-34 : Middle *crepida*-Zone

Ancyrodella, *Ancyrognathus* in its Frasnian forms and the *Palmatolepis subrecta* group disappear completely at the Frasnian-Famennian boundary (boundary between nos. 5 and 6 at Noiseux, between nos. 4 and 5 at Xhignesse). They are replaced by representatives of the *Palmatolepis triangularis* group and especially by an outburst of *Icriodus* which makes up nearly 50 % of the total conodont fauna in some beds. *Icriodus* is considered as an indicator for shallow water facies (SEDDON and SWEET,

1971). The proportion of *Icriodus* diminishes gradually in younger strata and reaches a minimum in the *crepida*-Zone.

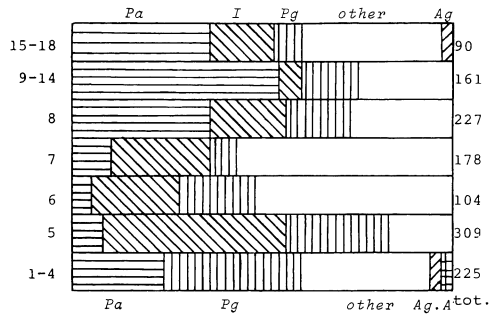

Fig. 3. — Frequency distribution in % of some conodont form-genera in the Hamoir-Xhignesse section (Guidebook Namur, 1-7); on the left side sample numbers.

1-4 : Upper *gigas*-Zone
5-6 : « Lower » *triangularis*-Zone
7-14 : Middle *triangularis*-Zone
15-18 : Upper *triangularis*-Zone

Noiseux on a more southern position and less sandy in facies, has yielded proportionally more Palmatolepids (15 % in the has yielded proportionally more Palmatolepids (15 % in the south to 8 % in the north) and less Icriodids (± 30 % to ± 40 %).

The Uppermost *gigas*-Zone known in Germany, is lacking in Belgium, or is incorporated in the upperpart of the *gigas*-Zone. Its guide *Palmatolepis linguiformis* has never been recorded as a result of the less favorable facies.

The Lower *triangularis* Zone as it is recognized in different Belgian sections (association of *Palmatolepis triangularis* without *P. delicatula* nor Frasnian forms) probably equals the German Middle *triangularis*-Zone. This is due to a delay in the appearance of *Palmatolepis delicatula* which indicates the Middle *triangularis*-Zone. This delay is not observed in the Noiseux section where conodonts and especially the Palmatolepids are more abundant at these levels. Hence a higher probability in the Noiseux section of finding specimens of a new species normally rare at the point of first appearance.

This interpretation could have some implications for an international correlation of these strata. However these may be few because of the extreme shortness of the time-span involved.

V. CONCLUSIONS

In the area studied, differences resulting from diachronism between conodont and rhynchonellid zones remain rather minor during the Lower Famennian. Each zonation can be substituted for by the other without too many stratigraphical problems.

The Lower-Upper Famennian limit is somewhat preceded by the Famenne-Esneux lithostratigrphical limit. The value of the Lower *triangularis*-Zone at the base of the Famennian stage in Belgium is questionable.

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