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Biostratigraphy and Palaeobiogeography of Early Devonian ostracodes from the Ibarmaghian Faunal Province

DOJEN, C.

Westfälische Wilhelms-University, Institute for Geology and Paleontology, Corrensstr. 24, D-48149 Muenster, Germany; *c.dojen@uni-muenster.de*

Up to now, no global zonation with ostracodes exists for Early Devonian, and as a consequent the ostracodes of this time interval are frequently considered to be of little or only regional biostratigraphical significance. But this seems to be due to inadequate knowledge: the existing scattered stratigraphical and geographical data on ostracodes of different facies do not yet provide a stable biostratigraphical subdivision. Additionally, unwitting taxonomic lumping and the inability of precise age-assignments generate the impression that taxon ranges of Early Devonian ostracodes are too long for biostratigraphical use. The existence of "true" long-ranging taxa without apparent morphological changes in the carapace is not denied, but many of them might be taxonomic groups enclosing very similar taxa. More systematic studies on well-dated ostracode successions especially on the global stratotype sections (cf. GROOS-UFFENORDE *et al.* 2000) and, if necessary, the age-revision of known faunas is required. Initial work of this kind reveals some potential for biostratigraphical zonation. Although the development of ostracode biostratigraphy is slowing down because many beds rich in ostracodes have no conodonts, it also means that ostracodes will become a vital source of auxiliary information for correlating these beds. As many studies of global change turn to the isotopic record of ancient oceans, there is a premium on having independent and more precise biostratigraphical constraints on the correlation of short-term isotope anomalies and paleobiological indicators of environmental change.

In this talk, conodont dated biostratigraphical results from a detailed taxonomic study of benthic ostracodes from Celtiberia (Eastern Iberian Chains and Eastern Guadarrama) and from an initial study on hemipelagic ostracodes from the Spanish Pyrenees is presented; additional ostracode data especially from the Ibarmaghian Faunal Province *sensu* PLUSQUELLEC 1987 (=Mauro-Ibero-Armorica *sensu* CARLS 1988) are used for an intrabasinal application.

The studied ostracodes from Celtiberia are of an early Lochkovian to Zlichovian age. Correlations with other age-revised benthic ostracode collections revealed that 12 species have comparatively short ranges and occur in at least two distant paleogeographical areas. Amongst these, *Placentella heraultiana* GROOS-UFFENORDE, 1979 is considered as an index fossil for the *gronbergi* to *nothoperbonus* conodont zone (Zlichovian); it is reported with ranges within this short time interval from the Eastern Iberian Range, the Montagne Noire, and from Morocco. The occurrences and revised ranges of an additional 25 long-ranging taxa are documented. Amongst these, the relation between the Pragian ostracode faunas from Celtiberia and Armorica are very close: One third of the ostracodes described from Armorica occur in practically coeval strata of Celtiberia. The relations to North Africa are not that close: although there are 17 common taxa in Celtiberia and North Africa, only three are from coeval strata. However, this However, this may merely reflect poor knowledge of pre-Emsian ostracodes from Africa. Besides, 38 short-ranging taxa only known from Celtiberia provide regional biostratigraphical data.

Early Lochkovian to earliest Pragian ostracodes from hemipelagic facies of the Spanish Pyrenees are documented here for the first time. These well-dated taxa show a remarkable biostratigraphical succession: In almost every conodont zone some taxa newly appear and others disappear. Most of these taxa are new species and have short ranges. This relatively high number of short-ranging taxa that so far exclusively are known from the Pyrenees reflects the inadequate taxonomic database for Lochkovian and Pragian ostracodes. We

expect to find many of them in coeval strata of similar sedimentary facies, especially in Armorica, N-Africa and Nevada.
The ostracodes from Spain provide a conodont-dated data-baseline for a future zonation of the Early Devonian with ostracodes. It might not have the resolving power of conodont-zonation, but will nonetheless allow an improved age assignment in the absence of conodonts or similar index fossils. But further studies on ostracodes with independent and detailed age control and a thorough study of long-ranging taxa and taxonomic groups are required to improve the biostratigraphical application of Early Devonian ostracodes.

As regards the palaeobiogeography in the late Silurian to Early Devonian, the question whether there has been a large and deep Rheic Ocean between Laurussia and Gondwana is still in discussion. Some models postulate wide oceans and drifting terranes. But palaeomagnetic scenarios and palaeobiogeographic data are in contrast. It has been assumed in many papers that the Rheic Ocean formed a paleogeographical barrier and thus, Gondwana had no common beyrichioidean ostracode faunas with Laurussia before the Emsian. The appearance of ostracodes – in particular the beyrichoideans – in Gondwana at this time should testify the closure of the ocean. Although some paleogeographic reconstructions consider common ostracodes in Laurussia and the Perigondwanan areas Armorica and Perunica in the Lochkovian, they do not refer to occurrences in Gondwana. However, several publications describe late Silurian to Pragian beyrichoideans from Gondwana and adjoined Terranes, thus questioning the existence of the Rheic Oceans at this time (DOJEN 2009).

New ostracode data from NE-Iberia and from the Arabian platform (SE Turkey) as well as re-dated occurrences from NW Africa suggest efficient migration paths in shallow neritic environments between Laurussia and (Peri-)Gondwana: Early Devonian benthic ostracodes from the Eastern Iberian Chains and Eastern Guadarrama show close relations especially to faunas from NW Africa and Armorica, thus corroborating the continuity of the Ibarmaghian faunal province at this time. But, the occurrence of the beyrichoidean ostracode *Zygobeyrichia* s.l. from the middle Lochkovian (*Ancyrodelloides trigonicus – Masaraella pandora*-beta conodont zone) onward disproves an Early Devonian "Rheic Ocean" between Baltica-Avalonia and "Perigondwana". *"Zygobeyrichia"* is also reported from Saharan localities of Lochkovian age (LE FÈVRE 1964), but there are hardly more reports of relevant pre-Emsian ostracodes from Africa. But this poor information does not consequently signify paleogeographical distance. Several Saharan brachiopod faunas that have been considered as "Emsian", are now turning out to be even Early Siegenian. Therefore, a revision of the "Emsian" ages of Saharan ostracode faunas is necessary. A new ostracode fauna of late Silurian age has recently been discovered from the Fetlika Valley in the Hazro Anticline (SE Turkey), thus from the north-eastern border of Gondwana. The ostracode associations consist mainly of beyrichioids represented by several new taxa of the subfamily Amphitoxitidinae, which show strong affinities to late Silurian ostracode taxa from Baltica-Avalonia. Similarly, Amphitoxitidinae are described from the north-western border of Gondwana, from South America (e.g., VANNIER *et al*. 1995).
On the whole, the distribution of Early Devonian ostracodes corroborates not only the continuity of the Ibarmaghian faunal province: The presence of pre-Emsian beyrichioids in Perigonwanan areas such as Celtiberia and also along the northern border the Gondwanan mainland (South-America, North-Africa, Arabian platform) evidence against a mature ocean which separates Gondwana from Baltica-Avalonia from the late Silurian onward. Other possibilities such as island hoping or dispersal via other marine hosts are unlikely because of the assumed distance of about 2500 km between the land masses. Other palaeontological evidence such as the distribution of shallow marine brachiopods corroborates the opinion of a wide shallow marine area instead of a large Rheic Ocean.

References

CARLS, P. (1988): The Devonian of Celtiberica (Spain) and Devonian Paleogeograpy of SW Europe. – *In*: MCMILLAN, N.J., EMBRY, A.F. & GLASS, D.J. (eds): Devonian of the World, Canadian Society of Petroleum Geologists Memoirs, Calgary, 14 (1): 421-466.

DOJEN, C. (2009): Late Silurian and Early Devonian Beyrichioidea from Gondwana and Perigondwanan Terranes and their Palaeobiogeographical Implications. – Bulletin de la Société géologique de France, 180 (4): 215-221.

GROOS-UFFENORDE, H., LETHIERS, F. & BLUMENSTENGEL, H. (2000): Ostracodes and Devonian Stratigraphy. – Courier Forschungs Institut Senckenberg, 220: 99-111.

LE FÈVRE, J. (1964): Succession d´associations d´ostracodes et de conodontes dans le Silurien, le Dévonien inférieur et l´Eifélien de quelques coupes de France et du Sahara. – Mémoires du Bureau de Recherches Geologiques et Minières, 33: 373-389.

PLUSQUELLEC, Y. (1987): Révision de *Michelina transitoria* KNOD, 1908 (Tabulata, Dévonian de Bolivie). – Annales de la Societe Geologique du Nord, CV, 249-252.

VANNIER, J.M.C., RACHEBOEUF, P.R. & BENEDETTO, J.L. (1995): Silurian to Early Devonian ostracodes from South America (Argentinia, Bolivia): Preliminary Investigations. – Journal of Paleontology, 69 (4): 752-771.