Joannea Geol. Paläont. 11: 185-188 (2011)

Ostracod associations (marine and nonmarine) from the Lower Cretaceous of the Iberian chain (eastern Spain) and their biostratigraphical potential

Michael Schudack & Ulla Schudack

In many areas of middle and western Europe, the more basal (in some areas also middle) parts of the Lower Cretaceous are largely composed of nonmarine deposits, which interfinger with marine sediments to a certain (and often minor) extent. Stratigraphy and correlations within these strata are always problematic, as significant marine guide fossils are mostly lacking. Therefore, nonmarine ostracods, spores and pollen and members of the charophyte family Clavatoraceae are particularly useful for biostratigraphic correlations.

We have studied Lower Cretaceous ostracods (marine and nonmarine) from 34 sections of the Iberian chain or, geologically speaking, the Iberian basin (eastern Spain), in order to contribute to the chronostratigraphic correlation of the various predominantly nonmarine lithostratigraphic units in the Cameros, Maestrazgo, and South Iberian sub-basins (and the Central Iberian high in between).

As a result, we have combined 87 ostracod species from 22 genera to 11 associations, each typical for certain stratigraphic levels (mostly stages) and ecologies. Nonmarine associations (dominated by the genera *Cypridea* and *Theriosynoecum*) prevailed from the Berriasian to the Barremian interval, whereas marine-brackish associations (much more diverse on the generic level) prevailed during the Aptian and Albian, and to a lesser extent during the Berriasian and Barremian (Schudack & Schudack 2009a). These correlations have been based upon extensive systematic studies and revisions of various ostracod groups and genera (Schudack & Schudack 2009b; Schudack, in review a, b). The 11 typical associations are (from Schudack & Schudack 2009a):

1. Berriasian freshwater association (in order of abundance): *Theriosynoecum forbesii*, *Cypridea tumescens praecursor*, *Fabanella boloniensis*, *Rhinocypris jurassica*, *Scabriculocypris trapezoides*, *Mantelliana perlata*, *C. tumescens tumescens*, *C. tuberculata*, *C. granulosa*, *C. dunkeri carinata*, *C.* aff. *valdensis*.

2. Berriasian mixed brackish-marine association (in order of abundance): *Asciocythere* cf. *circumdata*, *Macrodentina* (*Dictyocythere*) ex gr. *mediostricta transfuga*, *Protocythere* cf. *camberiensis*, *Fabanella boloniensis*.
3. Late Berriasian freshwater association (chronostratigraphically more refined, in order of abundance): *Cypridea tumescens tumescens*, *C. tuberculata*, *Theriosynoecum forbesii*, *C.* aff. *parallela*, *Th. vincentei*, *C. tumescens praecursor*, *C. laevigata* var. *laevigata*, *Th. varians*, *Th. iberica*, *C. dolabrata*, *C. bispinosa*, *C.* aff. *valdensis*.
4. Valanginian freshwater association (in order of abundance): *Theriosynoecum triangula*, *Fabanella boloniensis*, *Cypridea brevirostrata*, *Th. linaria*, *C. tuberculata*, *C. soriana*, *C. bispinosa*.
5. Hauterivian mixed brackish-marine association (in order of abundance): *Macrodentina* (*Dictyocythere*) ex gr. *mediostricta transfuga*, *Fabanella boloniensis*, *Paranotacythere* (*P.*) aff. *anglica*.
6. Hauterivian-Barremian freshwater association (in order of abundance): *Cypridea demandae*, *Theriosynoecum iberica*, *C. piedmonti*, *Th. fittoni*, *Th. castellana*, *Fabanella boloniensis*, *C. procera*, *C. isasae*, *C. clavata*, *C. cidacosia*, *C. turgida*, *C. modesta*, *C. cornuta*, *C. aragonensis*, *Th. stupenda*, *C. pseudomarina*.
7. Late Hauterivian – Early Barremian freshwater association (chronostratigraphically more refined, in order of abundance): *Theriosynoecum iberica*, *Cypridea isasae*, *C. clavata*, *C. modesta*, *Fabanella boloniensis*, *C. cornuta*, *C.* aff. *valdensis*, *Th. castellana*, *C. demandae*, *C. cidacosia*, *Th. fittoni*, *C. turgida*, *C. tuberculata*, *C. piedmonti*, *C. aragonensis*.
8. Barremian freshwater association (chronostratigraphically more refined, in order of abundance): *Theriosynoecum fittoni*, *Cypridea* aff. *valdensis*, *C. pseudomarina*, *C. brendae*, *C.* aff. *alta*, *C. clavata*.
9. Barremian mixed brackish-marine association (in order of abundance): *Macrodentina* (*Dictyocythere*) ex gr. *mediostricta transfuga*, *Fabanella boloniensis*, *M.* (*D.*) *gibbera*.
10. Aptian marine association (in order of abundance): *Cythereis* (*Rehacythereis*) cf. *btaterensis torifera*, *Platycythereis algarvensis*, *Protocythere* cf. *aptensis*, *Asciocythere algarvensis*, *Schuleridea posterospinata*, *S. hexagonalis*, *Paranotacythere* (*P.*) *catalaunica*, *Macrodentina* (*Dictyocythere*) *gibbera*, *A. cinctorensis*.
11. Albian marine association (in order of abundance): *Cytherella* cf. *ovata*, *Matronella matronae*, *Platycythereis* cf. *degenerata*.

Traditionally, most biostratigraphers believe that marine ostracods are generally better index (or guide) fossils than nonmarine ones, mainly for long-distance correlations (merely local biozonations, such as those for the NW German or English Wealden Basins, are not under focus here).

However, various authors have strengthened – and proved – the biostratigraphic usability of nonmarine ostracods, or at least certain groups, even for continent-to-continent correlations for Upper Jurassic and Lower Cretaceous strata during recent years (e.g., Schudack et al. 1998, Horne 2003, Sames 2010, Sames et al. 2010).

For eastern Spain, our new ostracod-based age determinations and correlations are very consistent with most of the previous correlative charts, as based upon other biostratigraphic data, mainly from charophytes, but also from few marine fossils in marine intercalations, and upon depositional sequence stratigraphy. This is, besides other arguments, also a validation of our metholodical approach. In a few cases, however, our results are more or less different from those of established charts, namely in the eastern Cameros sub-basin (the Urbión group considered Late Berriasian in age instead of Valanginian-Barremian, and the Enciso group considered Late Valanginian-Barremian instead of Late Barremian-Aptian), in the northeastern Maestrazgo sub-basin (the Polacos Formation considered Late Berriasian-Early Hauterivian instead of Late Berriasian only), and in the uppermost part of the Lower Cretaceous in the South Iberian sub-basin (the Contreras and El Caroig Formations considered Albian instead of Aptian).

As a consequence, we are convinced that the usability of ostracod biostratigraphy in the Lower Cretaceous of eastern Spain has a great potential, and conclude that, if treated with great care especially under consideration of the biogeography and reproduction/dispersal strategies of the various groups, it should be given priority over pure lithostratigraphic correlations in conflicting cases.

References

Horne, D.J. (2003): Key events in the ecological radiation of the Ostracoda. – In: Park, L. & Smith, A.J. (eds.): Bridging the gap - Trends in the ostracode biological and geological sciences. – The Paleontological Society Papers, 9: 181-201, Pittsburgh.

Sames, B. (2010): To correlate or not to correlate - that is not the question anymore! Continental Late Jurassic to Early Cretaceous supraregional correlation based on freshwater to brackish-water ostracodes. – Palaios, 25(1-2): 3-5, Tusla.

Sames, B., Cifelli, R.L. & Schudack, M. (2010): The nonmarine Lower Cretaceous of the North American Western Interior foreland basin: New biostratigraphic results from ostracod correlations and their implications for paleontology and geology of the basin – an overview. – Earth Science Reviews, 101: 207-224, Amsterdam.

Schudack, U. (in review a): Species-groups of the genus *Cypridea* Bosquet, 1852 (Ostracoda, Crustacea) from the nonmarine Lower Cretaceous of the Iberian Basin (Eastern Spain).

Schudack, U. (in review b): Non-Cypridean Ostracoda from the Lower Cretaceous of the Northwestern and Southeastern Iberian Ranges and Maestrazgo, Spain.

SCHUDACK, U. & SCHUDACK, M. (2009a): Ostracod biostratigraphy in the Lower Cretaceous of the Iberian chain (eastern Spain). – Journal of Iberian Geology, 35(2): 141-168, Madrid.

SCHUDACK, U. & SCHUDACK, M. (2009b): On the taxonomy of the species *Cypridea setina* Anderson, 1939 and *Cypridea laevigata* Dunker, 1846 (Ostracoda, Crustacea) from the Early Cretaceous of Europe - a special note on systematical inconsistencies. – Berliner paläobiologische Abhandlungen, 10 (Keupp-Festschrift): 311-320, Berlin.

SCHUDACK, M., TURNER, C. & PETERSON, F. (1998): Biostratigraphy, paleoecology, and biogeography of charophytes and ostracodes from the Upper Jurassic Morrison Formation, Western Interior, U.S.A. – Modern Geology, 22: 379-414, New York.

Authors addresses:
Michael Schudack & Ulla Schudack
Freie Universität Berlin, Institut für Geologische Wissenschaften, Fachrichtung Paläontologie, Malteserstr. 74-100, D-12249 Berlin, Germany
schudack@zedat.fu-berlin.de