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Early Cretaceous planktonic foraminifera from the Tethys: the Upper Aptian, planispiral morphotypes with elongate chambers

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Abstract

Early Cretaceous planktonic foraminiferal assemblages include rare planispiral and pseudoplanispiral morphotypes with elongate chambers that BouDagher-Fadel et al. assigned to *Schackoina* or accommodated in the new genus *Claviblowiella*. New findings of well-preserved planktonic foraminiferal faunas from the Lesches en Diois (SE France) section, the Cismon core (NE Italy), the Calabianca (NW Sicily) section and the Upper Aptian of Deep Sea Drilling Project (DSDP) Site 545 drilled off Morocco, have allowed a better understanding of the morphological features of these rare, unevenly distributed taxa. Our data demonstrate that each small planispiral species with globular chambers has a corresponding "clavate" morphotype which (as the "normal" forms) exhibits a smooth, finely perforate wall. Consequently, the latter have been assigned here to the genus *Globigerinelloides* and treated as subspecies of the "non-clavate" taxa. The (clavate) subspecies belonging to the genus *Globigerinelloides* here retained are *G. duboisi sigali* Longoria, *G. maridalensis elongatus* subsp. nov., *G. blowi lobatus* subsp. nov. and *G. paragottisi clavatus* subsp. nov., while *Globigerinelloides minai* Obregòn de la Parra is not retained. In addition, a new genus, *Pseudoschackoina*, type species *Planomalina saundersi* Bolli (senior synonym of *Hastigerinoides cepedai* Obregòn de la Parra, has been formalised for individuals possessing elongate, pointed, laterally compressed chambers, bearing tubulospines arranged on a pseudoplanispiral (dysaxial) coiling mode. Stratigraphically, in the sections studied the first taxon to appear is *Pseudoschackoina saundersi*, in the uppermost part of the Selli Level (=OAE1a), immediately followed, just above the OAE1a, by all the "clavate" globigerinelloidids. Regarding the last occurrences, *Pseudoschackoina saundersi* and *G. maridalensis elongatus* disappear in the lower part of the *Globigerinelloides algerianus* Zone, *Globigerinelloides paragottisi clavatus* at the top of the same zone, while *Globigerinelloides blowi lobatus* and *G. duboisi sigali* range up to the lower part of the *Ticinella bejaouaensis* Zone.

Keywords: Planktonic foraminifera; *Globigerinelloides*; *Pseudoschackoina*; *Claviblowiella*; Upper Aptian; Selli Level (OAE1a); Italy; Sicily; France; Offshore Morocco

1. Introduction

Planispiral and pseudoplanispiral planktonic foraminiferal morphotypes with elongate chambers of Early Cretaceous age have been known since 1959 when Bolli (1959) and Obregòn de la Parra (1959) erected the species *Planomalina saundersi* and *Hastigerinoides cepedai*, respectively. Longoria (1974) included these two "clavate" taxa in the genus *Globigerinelloides* Cushman and ten Dam, 1948. Sigal (1979) maintained Obregòn's species *cepedai* in the genus *Hastigerinoides* (erroneously reported as *Hastigerinelloides* in pl. 3), whereas Banner and Desai (1988) attributed Bolli's species *saundersi* to the genus *Blowiella*. With the exception of Sigal (1979), the other authors did not take into account the presence

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of elongate chambers in the planispiral plexus in discriminating at genus level (Longoria, 1974; Banner and Desai, 1988). BouDagher-Fadel et al. (1997) upgraded the taxonomic value of chamber elongation within the planispiral group and erected the new genus *Claviblowiella* for these morphotypes. However, this genus was not regarded as valid by Moullade et al. (2002), who stated that in the absence of other morphological and/or microstructural features, the elongation of the chambers alone cannot be applied in discriminating at genus level.

This paper deals with a taxonomic revision of the Early Cretaceous planispiral and pseudoplanispiral taxa with elongate chambers alternatively reported as *Planomalina* (Bolli, 1959), *Hastigerinoides* (Obregòn de la Parra, 1959), *Globigerinelloides* (Longoria, 1974), *Blowiella* (Banner and Desai, 1988), and finally *Claviblowiella* (BouDagher-Fadel et al., 1997). The morphological features of each "clavate" morphotype are accurately described and illustrated.

2. Material, methods and geological settings

The study material is the same as that used for the revision of the leupoldinids and small and large globigerinelloidids (Verga and Premoli Silva, 2002, 2003a, b) and consists of over 300 samples from the Cismon core (Venetian Alps, NE Italy), the Calabianca section (NW Sicily), the Lesches en Diois section (SE France), and the Upper Aptian of Deep Sea Drilling Project (DSDP) Site 545 drilled off Morocco (Hinz et al., 1984). The location, geological settings and main lithologies of these sections and cores were reported by Verga and Premoli Silva (2002, 2003a,b), to which reference should be made for detailed descriptions and location maps.

The planktonic foraminifera described here were extracted from softer lithologies from all the successions mentioned above through washing and sieving (>140, >104 and >40 mm meshes) according to standard foraminiferal preparation; in addition, some silica-replaced specimens were extracted from the radiolarian layers of the Cismon core using the extraction procedure for radiolarians (see Verga and Premoli Silva, 2002).

The number of specimens extracted from washed samples was very variable from sample to sample due to either poor sample disaggregation or preservation. Consequently, the abundance of each species with respect to the total assemblages could only be estimated and therefore expressed in the range charts by frequency classes (per sample) as follows: 1 specimen, very rare (vr); 2–3 specimens, rare (r); 4–5 specimens, rare to few (r/f); 6–8 specimens, few (f); 9–12 specimens, few to common (f/c); 13–16 specimens, common (c); 17–20 specimens, common to abundant (c/a); 21–25 specimens, abundant (a); >25 specimens, very abundant (va). The occurrence of species in thin section was expressed by an asterisk in the range charts.

The stratigraphic range of the planispiral and pseudoplanispiral morphotypes with elongate chambers was also reconstructed. Their stratigraphic distribution both in the Cismon core and the Calabianca section is calibrated to the nannofossil zonation. In the Cismon core it is also calibrated to the magnetostratigraphic scale (Erba et al., 1999).

The planktonic foraminiferal zonation scheme used in the present study is based mainly on Longoria's (1974), Caron's (1985) and Robaszynski and Caron's (1995) schemes, modified by Premoli Silva and Sliter (1999).

3. *Claviblowiella* versus *Globigerinelloides*

Our data demonstrate that (1) the Lower Cretaceous planispiral morphotypes with elongate chambers all possess a smooth, finely perforate wall texture like the other small, few-chambered *Globigerinelloides* (see Verga and Premoli Silva, 2003a); and (2) all the small globigerinelloidids (*G. blowi, G. duboisi, G. maridalensis,* and *G. paragottisi*) may give rise to a "clavate" morphotype, some of which are described here for the first time.

Therefore, in agreement with Moullade et al. (2002), we do not retain the genus *Claviblowiella* as the presence of elongate chambers alone cannot be used in discriminating at genus level. Moreover, on the basis of our observations (see point 2 above), we re-include all the planispiral specimens with elongate chambers in the genus *Globigerinelloides*, treating them as subspecies of the "non-clavate" taxa.

4. Previous authors of species-level taxa

As recorded in several other genera, discrimination at species level between planispiral individuals with elongate chambers is affected by great uncertainties mainly related to poor descriptions and illustrations of the type materials. This has frequently resulted in the attribution of holotypes and paratypes with similar morphology to different taxa and, conversely, of holotypes and paratypes differing in their morphology to the same species; moreover, the infrequency of these morphologies in the geological record has for a long time prevented an accurate analysis of their morphological features, frequently leading to erroneous species attributions.

The original taxonomic notes of previous authors concerning the smooth, finely perforate planispiral species with elongate chambers, with our critical comments added are schematically reported in Table 1.