

Taxonomic reassessment of four larger benthic Foraminifera (soritoids and orbitolinids) described from the Lower to mid-Cretaceous shallow-water carbonates of Iraq

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ABSTRACT: Four Cretaceous foraminifers belonging to the subfamilies Pseudorhapydioninae, Orbitolininae and Dictyoconinae are here taxonomically revised: *Pseudorhipidionina tubaensis*, *Bicyclina rifaiensis*, *Orbitolina arcuala*, and *Simplorbitolina nakhali*. It is revealed that they should be considered junior synonyms of several existing species or inaccurately defined for specific identification. The new nominal names introduced to indicate such synonyms are invalidated, thus they are to be considered as *nomen nudum*.

Keywords: Foraminifera, taxonomy, Cretaceous, Shallow-water Carbonates, Middle East

INTRODUCTION

The Cenomanian shallow-water carbonates of Middle East contain several soritoids (Henson 1948; Hamaoui 1964; Saint-Marc 1975) that can be included into the subfamily Pseudorhapydioninae Consorti et al. These are represented by *Cyclodonia iranica* Hamaoui 1964; *Edomia reicheli* Henson 1948, *Pseudorhapydionina dubia* De Castro 1972 and *Praetaberna bingistani* (Henson 1948) as well as two species of the genus *Pseudorhipidionina* De Castro 1972 (see De Castro 2006; Consorti et al. 2016a). A couple of papers (Mohammed 2006; 2007) have dealt with such an argument introducing two new pseudorhapydioninids from the Cenomanian carbonates of Iraq actually referred to a new genus: *Bicyclina* (type species *B. rifaiensis*, Mohammed 2006); and to a new species of the genus *Pseudorhipidionina* (De Castro 1972): *Pseudorhipidionina tubaensis* Mohammed 2007. Although the lack of designating a depository for the type material in both Mohammed's publications is a fact that *per se* would lead to the invalidation of those taxa, we believe that their identification is inconsistent and not uniform with the taxonomic parameters established for the subfamily Pseudorhapydioninae (Consorti et al. 2016a, b), leading to invalidation.

Lower to Mid-Cretaceous orbitolinid-bearing shallow-water carbonates ("Orbitolina Limestones") are equally widely distributed in the Middle Eastern realm (e.g., Henson 1948; Schroeder et al. 2012; Schlagintweit and Wilmsen 2014). By studying these foraminiferal associations from Iraq, Mohammed (2002; 2012) introduced two new species: *Orbitolina arcuala* and *Simplorbitolina nakhali*. A careful revision of both original descriptions and published figures that accompanied these identifications testifies that the two taxa should be considered junior synonyms of species previously described.

PSEUDORHAPYDIONINAE

Bicyclina rifaiensis Mohammed 2006

Bicyclina rifaiensis Mohammed 2006 has been described from the Mishrif limestone (Late Cenomanian) of southern Iraq, with the type species into *Cyclodonia iranica* Hamaoui 1964 (with no further indications), which is a well-established, valid, taxon. All the "*Bicyclina*" figured in plate 1 of Mohammed (2006) should be in fact referred to *Cyclodonia iranica* as they display all the morphological parameters established by Hamaoui (1964). Thus, in our point of view there was no need to introduce such a new genus when mentioning in the synonym list the type of a previously established valid genus that must be considered with priority. The plate 2 of Mohammed (2006) is instead composed of two different clusters referable to *Praetaberna bingistani* (Mohammed 2006; pl. 2; figs. 1, 4, 5; see Consorti et al. 2015) and *Cyclodonia iranica* (Mohammed 2006; pl. 2; figs. 2, 3, 6, 7). In establishing *Cyclodonia*, Hamaoui (1964; pl. 2, fig. 15) also reported gen. aff. *Cyclodonia* sp. on the basis of two orders of thinner beams with respect to *Cyclodonia*, which bears only one order of regularly-spaced thick beams. This is arguably the key affirmation that pushed Mohammed (2006) to introduce "*Bicyclina*". The architectural feature of gen. aff. *Cyclodonia* sp. against "*Bicyclina*" is in fact observable in some sections figured by both authors. However, in our point of view this feature, which is debatable on its generic significance, still needs a solid constraint, and requires to be eventually verified with additional material cut under controlled-oriented sections, which are currently unavailable.

Pseudorhipidionina tubaensis Mohammed 2007

Pseudorhipidionina tubaensis has been introduced figuring clusters of previously described taxa to which, by priority, it must be considered their junior synonym. Figures 1, 2, 4, 5 and

8 of plate 1 in Mohammed (2007) should be assigned to *Praetaberrina bingistani*; whereas figures 6 and 9 of plate 1 (Mohammed, 2007) can be referred to *Cycledomia iranica*. Although the foraminifer visible in figures 3 and 7 of plate 1 may barely resemble *Pseudorhipidionina murgiana* (Crescenti), we are of the opinion to exclude such an assignment, at least for the moment, especially owing to the occurrence of few central pillars (see De Castro 2006 for a comparison).

ORBITOLINIDAE

Orbitolina arcuala Mohammed 2012

Orbitolina arcuala was described from the “Late Albian” of the Maaddud Formation of southern Iraq (Mohammed 2012). The species is reported to be characterized “by the presence of a depression on one side near the embryonic area and by the presence of a perfect, well-developed periembryonic area”. First of all, we have to state that the genus *Orbitolina* Orbigny does not possess a peri-embryonic area (or zone) like *Palorbitolina* Schroeder, 1963. Instead, the genus *Orbitolina* is characterized by a proloculus overlain by a supraembryonic zone and underlain by a subembryonic zone reduced in thickness compared to the former (Schroeder 1962, 1985a).

Also the dimensions of the embryo are not in the range as reported from other *Orbitolina* species. Mohammed (2012) reported proloculus diameter of 0.15 mm, and a width of the whole embryo of 0.33–0.4 mm, whereas the corresponding values from other species (*concava*, *sefini*, *duranddelgai*) are 0.2–0.4 mm and 0.5–1.1 mm respectively (Schroeder 1985). Instead, the values indicated for “*Orbitolina arcuala*” fit with those of *Mesorbitolina texana* (Roemer) (see Schroeder 1985b). The sections cutting the embryo of “*O. arcuala*” display that both sub- and supraembryonic zones are equally developed as is typical for the genus *Mesorbitolina* Schroeder 1962 (e.g., Fig. 1A). The most characteristic section displayed by Mohammed (2012, fig. 3.4) is the transverse section re-illustrated herein Fig. 1B showing the proloculus surrounded by the subdivided subembryonic zone (compare Schroeder 1985b, pl. 36, figs. 6–9). Based on these observations, “*Orbitolina arcuala*” is here considered a junior synonym of *Mesorbitolina texana* (Roemer) (Fig. 1). This assignment also challenges the “Upper Albian” age, as *M. texana* is known to range from the upper Aptian to middle Albian (e.g., Schroeder 1985b).

Simplorbitolina nakhali Mohammed 2002

Simplorbitolina nakhali was described from the Albian of Iraq (Sarmord, Shuaiba, Nahr Umr formations; Mohammed 2002) with six different sections. *S. nakhali* should differ from other species of the genus *Simplorbitolina* “by the central position of its embryonic apparatus”. In fact, just one megalospheric specimen showing dimly recognizable an embryonic chamber in subapical position was illustrated (Mohammed 2002, pl. 1, fig. 1). As no detail (magnified view) of the embryo was provided, no more information is available. In fact, the genus *Simplorbitolina* has a simple embryo disposed in a short spire (Ciry and Rat 1953; Schroeder 1985c; Schlagintweit et al. 2021). Depending on the section plane, the embryo may appear eccentrically or even in an apical position (perpendicular to spiral plane). We therefore consider the specific independence of the Iraqi form inaccurately proven in terms of systematic micropaleontology. The transverse section of an unusual large specimen (diameter >2 mm) of “*S. nakhali*” shown in pl. 1, fig. 5 belongs in our opinion to *Paleodictyoconus actinostoma*

Arnaud-Vanneau and Schroeder, a species common in the Sarmord Formation where it has been described as *Sayyabellus scutulus* by Mohammed (2003) (see Schlagintweit 2020). Last but not least, the stratigraphic setting of “*S. nakhali*” is not well constrained, about 115 below an assemblage of *Orbitolinopsis simplex* Henson (= lower Aptian) and *Orbitolina sefini* Henson (= upper Albian–lower Cenomanian) (see Masse and Schroeder and Neumann 1985 for stratigraphic ranges).

CONCLUSIONS

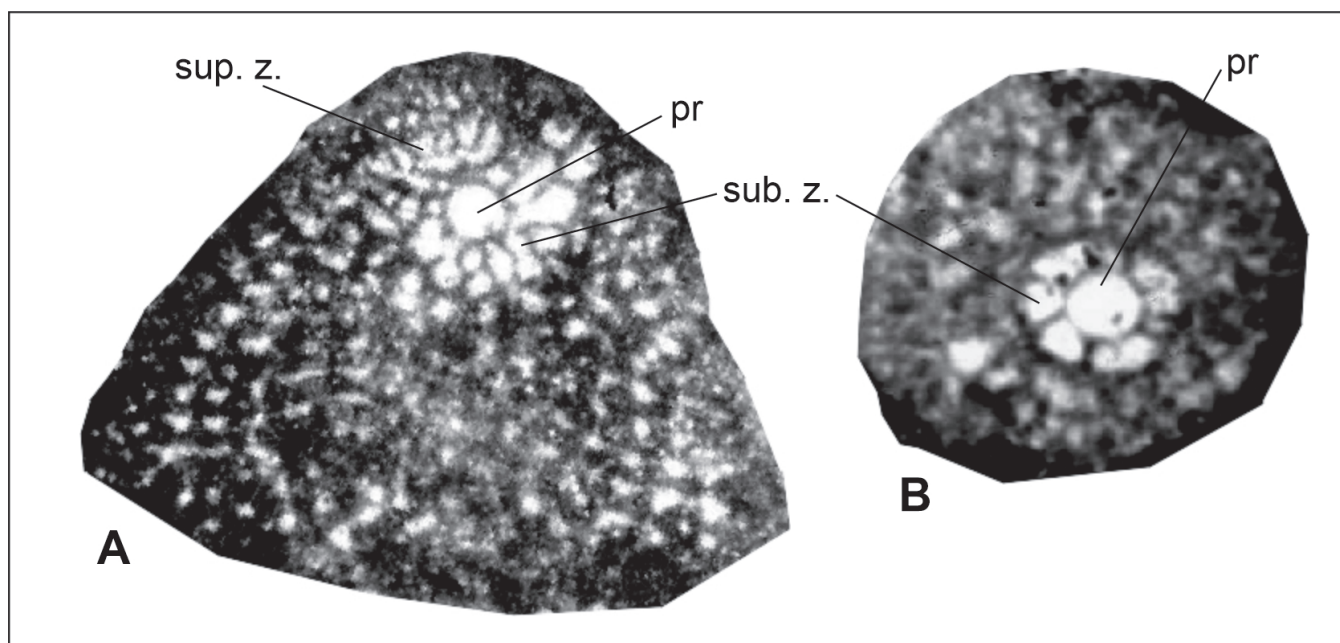
The genus “*Bicyclina*” is invalidated by *Cycledomia iranica* having priority. We believe that *Pseudorhipidionina tubaensis* is a junior synonym of both *Cycledomia iranica* and *Praetaberrina bingistani*. *Orbitolina arcuala* is here considered as a junior synonym of *Mesorbitolina texana*. The inaccurately described *Simplorbitolina nakhali* is herein considered a mixture of different taxa among *Paleodictyoconus actinostoma*.

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TEXT-FIGURE 1

Mesorbitolina texana (Roemer) from the Lower Cretaceous of Iraq. A, oblique section of a megalospheric specimen showing proloculus (pr) supra- and subembryonic zones (sup. Z. and sub. Z.). B, slightly oblique transverse section of the megalospheric embryo (extracted and modified from Mohammed 2012, fig. 2.3 and 2.4).

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