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Revue de micropaléontologie

Revue de micropaléontologie 59 (2016) 200–224

Original article

Cuvillierinella salentina (Foraminifera, Rhapydioninidae) and its kinship in the Western Mediterranean area during the Campanian–Maastrichtian

Cuvillierinella salentina *(Foraminifères, Rhapydioninidae) et ses proches en Méditerranée occidentale au Campanien–Maastrichtien*

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Abstract

Cuvillierinella salentina Papetti and Tedeschi, 1965 and its related species of the Rhapydioninidae family are widely distributed in the Western Mediterranean region by Campanian–Maastrichtian time. *C. salentina*, the type species of the genus, is studied in rich populations from its Italian type locality, and several other spots from Greece and Spain. It shows great variability: the well-known type coexists with streptospiral tests almost devoid of endoskeleton and wholly planispiral tests with fine mesh-like endoskeleton, as well as many intermediates. Such populations reflect the large capacity of evolution of at least the group of miliolids from which these populations are derived, if not the species itself. The genera *Murciella* and *Cyclopseudedomia* are probably the most direct offshoots, but other taxa appear to arise from this species or at least from the same stock of origin. In the same genus and at the same time (middle part of Campanian age, "CsB6a" zone), two new species are described, both hesitating between the streptospiral and planispiral coiling: – *C. fluctuans* nov. sp., from Greece, A tests being either streptospiral or planispiral, with primary and secondary chamberlets taking the aspect of polygonal isodiametric network and – *C. perisalentina* nov. sp., from Italy, with persistent streptospiral coiling and disordered arrangement of secondary chamberlets which allow us to consider its relation with species of the genus *Pseudochubbina*, hitherto of completely enigmatic origin. Assigned to the same genus, from Upper Campanian–Lower Maastrichtian time ("CsB6b" zone), *C.* aff. *pylosensis*, probably related to *C. pylosensis*, is studied from several populations, and constitutes, with the above mentioned species, what is called *C.* gr. *salentina*. Based on material from the CsB6b zone, the new genus *Metacuvillierinella* nov. gen. is introduced; *M. decastroi* nov. sp., type species of the new genus, known from Greece and Italy, shows characters common to *C.* gr. *salentina*, such as milioline to streptospiral nepionic coiling, large endoskeleton mesh, associated with some original characters, such as the unusual conjunction of the advolute coiling and absence of any final unrolling together with very low dimorphism of generation; this results in flat tests, often sigmoid shaped in axial section, very rare in the family. Thus, the genus *Cuvillierinella*, and especially *C. salentina*, appears as a possible source, or at least not far from the origin, of a number of taxa related to one another, constituting a large part of the Rhapydioninidae family. They are gathered together inside the new subfamily Cuvillierinellinae, distinct from the subfamily Rhapydionininae *sensu stricto* (comprising *Rhapydionina* and *Fanrhapydionina*) which makes a different and parallel branch, from Upper Campanian (CsB6b zone) to the end of Cretaceous time (CsB7 zone).

Keywords: Foraminifera; Alveolinacea; Rhapydioninidae; *Cuvillierinella salentina*; Uppermost Cretaceous (Campanian–Maastrichtian)

Résumé

Appartenant à la famille des Rhapydioninidae, *Cuvillierinella salentina* et les espèces apparentées sont largement répandues au Campanien–Maastrichtien dans la région méditerranéenne occidentale. *C. salentina*, l'espèce type du genre, est examinée à partir de riches populations provenant de sa localité type italienne et de plusieurs localités de Grèce et d'Espagne. On montre sa grande variabilité: formes streptospiralées presque dépourvues d'endosquelette et formes entièrement planispiralées à maille endosquelettique fine, outre de nombreux intermédiaires, coexistent avec le type bien connu. De telles populations témoignent de grandes capacités d'évolution, sinon de l'espèce même, du moins du groupe de Miliolidés dont ces populations sont issues. Les genres *Murciella* et *Cyclopseudedomia* en sont probablement les plus directs descendants, mais d'autres taxons en paraissent découler ou provenir du même stock d'origine. Dans le même genre et à la même époque

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http://dx.doi.org/10.1016/j.revmic.2016.04.002
0035-1598/

(partie moyenne du Campanien, zone «CsB6a»), sont décrites deux espèces nouvelles, hésitant entre les enroulements streptospiralé et planispiralé: *C. fluctuans* nov. sp., de Grèce, dont les tests A sont soit streptospiralés, soit planispiralés, à logettes primaires et secondaires prenant un aspect de réseau à mailles polygonales isodiamétriques et *C. perisalentina* nov. sp. d'Italie, dont l'enroulement streptospiralé persistant et la disposition désordonnée des logettes secondaires permettent de suspecter des relations avec les espèces du genre *Pseudochubbina*, d'origine jusqu'à présent entièrement énigmatique. Dans le même genre encore, mais plus tardive (partie supérieure du Campanien et partie basale du Maastrichtien, zone «CsB6b»), *C.* aff. *pylosensis* proche mais mieux caractérisée que *C. pylosensis* est étudiée à partir de plusieurs populations. L'ensemble des espèces précédemment citées correspond à l'entité nommée *Cuvillierinella* gr. *salentina*. De la zone «CsB6b», est créé le nouveau genre *Metacuvillierinella* nov. gen. *M. decastroi* nov. sp., l'espèce type du nouveau genre, connue de Grèce et d'Italie, associe des caractères communs aux espèces de *C.* gr. *salentina*, tels que l'enroulement népionique streptospiralé à miliolin et l'endosquelette à large maille, à des caractères originaux, tels que l'insolite concomitance de l'enroulement advolute à l'absence de tout déroulement final et le très faible dimorphisme de générations. Une telle association de caractères n'est connue chez aucune des populations plus anciennes ou contemporaines de la famille; il en résulte des tests très plats, souvent d'allure sigmoïde en section axiale, également sans équivalent dans la famille. Ainsi, *C. salentina* apparaît comme à l'origine, ou proche de l'origine, de tout un ensemble de taxons clairement apparentés entre eux constituant une grande partie de la famille Rhapydioninidae; on les réunit au sein de la nouvelle sous famille Cuvillierinellinae, formant une branche parallèle à celle de la sous famille Rhapydionininae *sensu stricto* (réunissant *Rhapydionina* et *Fanrhapydionina)* du Campanien supérieur (zone CsB6b) à la fin du Crétacé (zone CsB7).

Mots clés : Foraminifères ; Alveolinacea ; Rhapydioninidae ; *Cuvillierinella salentina* ; Crétacé terminal (Campanien–Maastrichtien)

1. Introduction

This work is the second of the "memoirs" of a geologist who, during his career, has had the opportunity to meet, fortuitously at first, then intentionally, many representatives of the family Rhapydioninidae, part of the super family Alveolinacea. This family was almost unknown in the mid 1960s and its rare identified members were not properly understood at that time. This discretion appears linked to very narrow ecological requirements, confining the group in restricted circulation platform environments, poorly represented in the fossil record. The counterpart of this confinement is that in favorable environments, protected from competition, populations grow abundantly and provide exceptional opportunities to study. A few morphologically distinct species, represented by several populations in a somewhat broad area lend themselves to confrontations from which emerge the immutable and more versatile characters submitted to ecology and evolution. Such an attempt was previously outlined (Fleury, 2014) about the relatives of *Rhapydionina liburnica* (Stache, 1889) and will be developed below for the species of the genus *Cuvillierinella* Papetti and Tedeschi, 1965 and its affiliate *Metacuvillierinella* nov. gen.

2. Abbreviations

In order to summarize the uncertainties of attribution, or the relationships between taxa, the following formulas are used: "aff." reports on probable differences with the named species, although affinities between them cannot be suspected, "spp." (in the figures) refers to several species belonging to the same genus, without risk of ambiguity, "gr." corresponds to a group of species of the same genus, of which other independent species are also known.

With reference to the reproductive cycle of foraminifera, as it is usual, tests of megalospheric generation are called "A" and tests of microspheric generation are called "B". Some abbreviations are unique to this work. Biozones related to confined environments of the Adriatico-Aegean platforms are baptized "CsB", and they are illustrated below. Furthermore, some recurrent composed terms are used in the text and the figures: UUT means Uncoiled Uniserial Termination (pseudoevolute or evolute, cylindrical or flaring), the final stage of many tests; SAR means Slow Axial Rotation, a special case of streptospiral coiling, illustrated particularly by species of the genera *Pseudochubbina* and *Metacuvillierinella* nov. gen.; SSC means Scattered Secondary Chamberlets, describing the disordered appearance of chamberlets imbedded in the "central endoskeleton" when well differentiated "floors" are missing (see Section 5).

3. Materials and methods

The two genera that are the subject of this study are mainly prevalent in the internal areas of carbonate platforms in the vicinity of the Adriatic, more rarely in the Eastern Mediterranean, approximately as *Rhapydionina* (see Fleury, 2014, fig. 2) and also in Spain (Province of Murcia). The studied material is part of collections gathered by the author during a period of about twenty years, on the occasion of field expeditions funded by the University of Lille 1 and several formations associated with the French Centre National de la Recherche Scientifique (CNRS). It is made up of populations chosen as to be the most significant among those encountered mainly in mainland Greece and Italy. In addition, some studied samples are donations or loans due to several colleagues whose names will be mentioned on the occasion. The whole material is composed of thin sections carved from disaggregation-resistant limestones. These slices are brought together in a collection, where they are identified by a sample number preceded by a group of 3 letters peculiar to various locations in Greece (see Fig. 1), or the letter I for Italy. A collection number, also inscribed on each glass blade, preceded by the initials of the author (JJF), can be found either in the summary table of