SEMI-MULTILAMELLAR GROWTH IN *Reptomulticavaca alhamensis*, A NEW CYCLOSTOME (BRYOZOA) SPECIES FROM THE TORTONIAN OF ALHAMA DE GRANADA (S. SPAIN)

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**ABSTRACT**

In the Tortonian beds of Alhama de Granada within the Granada Basin several large, oblate to spheroid, bryozoan colonies are found belonging to a new species of Cyclostomata. *Reptomulticavaca alhamensis* nov. sp. presents a semimultilamellar growth in contrast with the prevailing clear multilamellar growth in other *Reptomulticavaca* and related genera. Like *R. multigemmata*, this species buds axially.

Keywords: Cyclostomata (Bryozoa), Tortonian, Granada basin, subcolonies, lamellar growth.

**RESUMEN**

En el Tortoniense de Alhama de Granada se encuentran zoarios centimétricos de briozoos ciclostomados que pertenecen a *Reptomulticavaca alhamensis* nov. sp. El análisis de su crecimiento permite observar que se produce por un haz de zoecios que crecen en dirección distal y producen luego expansiones superpuestas de zoecios. Este crecimiento puede ser llamado semimultilaminar en oposición al claro crecimiento multilaminar con formación de subcolonias totalmente superpuestas que se observa en diversas especies próximas, abundantes, sobre todo, en el Cretácico.

Palabras clave: Briozoos Ciclostomados, Tortoniense, Depresión de Granada, subcolonias, crecimiento laminar.

**INTRODUCTION**

Large multilamellar cyclostome colonies are abundant in Mesozoic strata and their complex organization has been discussed by recent authors (Hillmer, 1971; Hillmer, Gautier and McKinney, 1975; Nye and Lemone, 1978; Pitt and Taylor, 1990; Walter, 1989 and 1991). There are also some manticulate multilamellar forms in Cenozoic, such as, for example, those described in the Neogene from Western France (Canu et Lecointre, 1933-34; Buge, 1957; Tillier, 1975).

In the Tortonian sequences (Upper Miocene) of the Granada Basin there are some manticulate, almost multilamellar zoaria of one cyclostome species not known at present. Because of its characteristic arrangement of zooecia, and the special kind of subcolonies of which it is constituted, its full description is particularly interesting. This description may add new insights to the discussion quoted above.

**STRATIGRAPHY**

The samples were collected in the Lower Tortonian, near Alhama de Granada (Fig. 1) at the Southwestern boundary of the Granada Basin. These oblate to spheroid colonies were accompanied by other bryozoan colonies, planar, rotating spherical (ectoproctoliths or bryoliths) and toeshaped. All these forms are found in a sandy formation corresponding to a shoreline and shoreface to shelf environments (Fig. 2). The detailed stratigraphic situation and the sedimentary meaning of this and the other associated forms are discussed in Reguant et al. (1986-87, 1991).

**SYSTEMATIC**

Ordre CYCLOSTOMATA Busk, 1852
Suborder TUBULIPORINA Milne-Edwards, 1838
   Family Diaperoeciidae Canu, 1918
   Genus *Reptomulticavaca* D’Orbigny, 1852
   *Reptomulticavaca alhamensis* n. sp.
      Pl. I and II

*Derivatio nominis*: From the locality of the specimens studied, Alhama de Granada (Granada, South Spain).

*Stratum*: Tortonian.

*Material*: 12 colonies, in some cases fragmentary, labelled as: R9205; R9206; R9207; R9208; R9215; R9216; R9217; R9218; R9222; R9223; R9224; R9225.

2 thin sections belonging to other specimens labelled as: R9201; R9212.
Holotype: R9217 (Pl. I, Fig. 4).
Paratypes: R9201 y R9224.

**Diagnosis:** Zoarium large, massive, monticulate, semimultilamellar, consisting of flabelliform subcolonies growing in the central part by axial budding and interconnected at many levels by lateral extensions made up of fused layers of zooecia. Gynozoocoea at the edge of the central part.

The zoarium consists of subcolonies interconnected in many levels by lateral extensions constituted by fused layers of zooecia (Pl. I, Figs. 1, 4). Each level represents one stage of growth and thus the colony, as a whole, seems to be multilamellar. In fact, the central growth-line of the subcolony is not subdivided, and there are no subcolonies superimposed as in many similar species. The chronological order of growth produces subcircular to polygonal, hat-shaped surface lumps, each corresponding to distinct subcolonies. Firstly, the growth is central through especially elongated zooecia. The lateral budding then creates the connecting layer between adjacent subcolonies (Pl. II, Figs. 1, 3).

In the central part of the subcolony, zooecia are long, subcylindrical and with a subparallel arrangement, forming a tight bundle (Pl. I, Fig. 2). In contrast, the zooecia of the connecting layers are shorter and in more regularly parallel disposition (Pl. I, Fig. 5). The diaphragms are present only in some long zooecia.

Transversal sections show that in the central part occurs axial budding (Hillmer, Gautier and McKinney, 1975) each zooecium producing 4 (or nearly 4) new zooecia. In transversal section, the starting axial budding outlines star-like patterns (Pl. II, Fig. 4). In the connecting layers the budding is lateral.

Zooecial aperture, not easily visible because of deficient preservation, is circular. It presents a distinct ring surrounded by a furrow separating the zooecium from the interzooecial filled space between adjacent zooecia (Pl. II, Fig. 2). No kenozoocoea.

Gynozoocoea, only seen in longitudinal section as swollen.

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**Plate I**

1 Near complete longitudinal thin section of colony R9201.
2 Enlarged part of Fig. 1 showing the central growing parts of the colony without distinct lamination.
3 External view of colony R9224.
4 Longitudinal section of colony R9217 (Holotype) showing the solid aspect of central growth area and multilamellar aspect in interconnecting layers.
5 Enlarged part of Fig. 1 showing interconnecting layers with a clear multilamellar aspect.
areas crossed by some normal zoecia, are located from the edge of the central part of the subcolony to the connecting layers of zoecia (Pl. II, Fig. 4). They open to the voids between two adjacent superimposed connecting layers.

**Biometrics:** All biometric results are given in millimeters and in the following order: (number of measurements) arithmetic mean (standard deviation); range.

**Zoaria measurements**
- **DM:** maximum diameter (long axis).
- **dm:** minimum diameter (intermediate axis)
- **h:** height (short axis).

This vertical life-position is assumed by some evidence in the field, and also by the arrangement of the bundles. However, these colonies may have rotated in their first life stages when they were smaller.

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**DISCUSSION**

*Reptomulticava radioporoidea* Canu et Lecointre, 1934,

3 Schematic drawing of the terminal stage of growth and of the relationship of two adjacent hat-shaped monticules.
4 Enlarged part of the thin section of colony R9201 showing gynozoecia (upper arrow) and (in transversal section) star-like patterns within the zoecia and four new zoecia arising from one zoecium by axial budding (lower arrow).
from the Middle Miocene of the Western France is a close species but, after an examination of the types conserved in the Muséum National d'Histoire naturelle (Paris), and the revision by Tillier (1975) it becomes clear that it is a different species. R. radioporoidea does not present the clear distinction between an area of tight bundles and an area of interconnecting zoecia layers. Then the meaning of monticula is slightly different. The buds occur laterally in the confluence of four zoecia and not by axial budding (cfr. Fig. 24 of Tillier op. cit.). In addition the diaphragms are abundant. In some aspects of budding there are important similarities from R. radioporoidea and the very well described cretaceous American species Reptomitulicava texana (Nye and Lemoine, 1978).

Two cretaceous species are particularly close to our species: Semimitulicava marginata (Canu and Bassler) as described by Pitt and Taylor (1990) and Reptomitulicava multigemnata Hillmer (1971). Semimitulicava differs from Reptomitulicava by having kenozoecia. On the other hand, S. marginata and also R. multigemnata have subcolonies clearly superimposed, in contrast to the species described here. In addition, in R. alhamensis degenerative zoecia has not been seen before the axial budding as in R. multigemnata.

Finally it is interesting to observe the budding of the superimposed subcolonies by the zoecia of the underlying subcolony which crosse the boundaries of the clearly multilamellar zoaria of Reptomitulicava heteropora (Roemer, 1839) from Valanginian of the Jura region (Walter, 1991). This arrangement has some similarity with that observed in R. alhamensis, but also in this case there is a clear superimposition of the subcolonies, as in other forms discussed here.

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BIBLIOGRAPHY


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