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A new *Parastriatopora* species (Anthozoa, Tabulata) from the Lower Devonian of Colle (Spain, Cantabrian Mountains)

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Abstract. The paleontological collection of the Museo Geominero (Madrid) houses a new species of the tabulate coral *Parastriatopora*. It comes from the Lower Devonian of Colle (Prov. León) and probably originates from one of the biostromal levels in the upper part of the Valporquero Formation and the lower part of the Coladilla Formation (Upper Emsian). The new species, described under open nomenclature as *Parastriatopora* sp., is characterized primarily by its very large corallites and calices: the 5 to 7-cornered calices are 3.5–6.9 mm in diameter (mostly 5.5–6.0 mm). Furthermore, it shows very interesting paleobiogeographical relationships, because the morphologically closest related species is *Parastriatopora gigantea* (Knod 1908) from the Lower Devonian of Bolivia. *Parastriatopora* sp. could be an example of a close relationship between the Cantabrian Mountains and America during the Emsian.

Key words: Anthozoa, biogeography, Lower Devonian, systematics, tabulate corals

Introduction

Parastriatopora is a genus of ramose tabulate corals that is widespread in Silurian and Lower Devonian strata of Australia, Asia, Europe, North Africa, and America. However, only relatively few *Parastriatopora* specimens are known from Spain: *Parastriatopora* ex gr. *annulata* (Le Maître 1952) has been found in the Lower Devonian of the Cordoba Province (Crousilles et al. 1978, Lafuste et al. 1992). Tourneur and Fernández-Martínez (1991) found *Parastriatopora cantabrica* Tourneur and Fernández-Martínez 1991 in the Emsian (Lower Devonian) of the Cantabrian Mountains. May (1993, p. 87–88) describes *Parastriatopora fallacis* Yanet 1968 and *Parastriatopora obsoleta* Dubatolov 1969 from the Emsian of Asturias.

Consequently, the finding of a new *Parastriatopora* species in the collections of the Museo Geominero in Madrid is of particular interest. Even though only one specimen is known to exist, the exact lithostratigraphical level of which is not fully known, this species is of remarkable size and shows very interesting paleobiogeographical relationships that justify a description of this new species.

The Museo Geominero contains very important historical collections of fossils from Spain and the Western Sahara (Rabano and Arribas 1997). These collections are registered in an exemplary manner in the well-developed database (Rabano and Arribas 1997, p. 14), which makes them easily accessible for scientific research. However, the Paleozoic corals and stromatoporoids have not yet been revised.

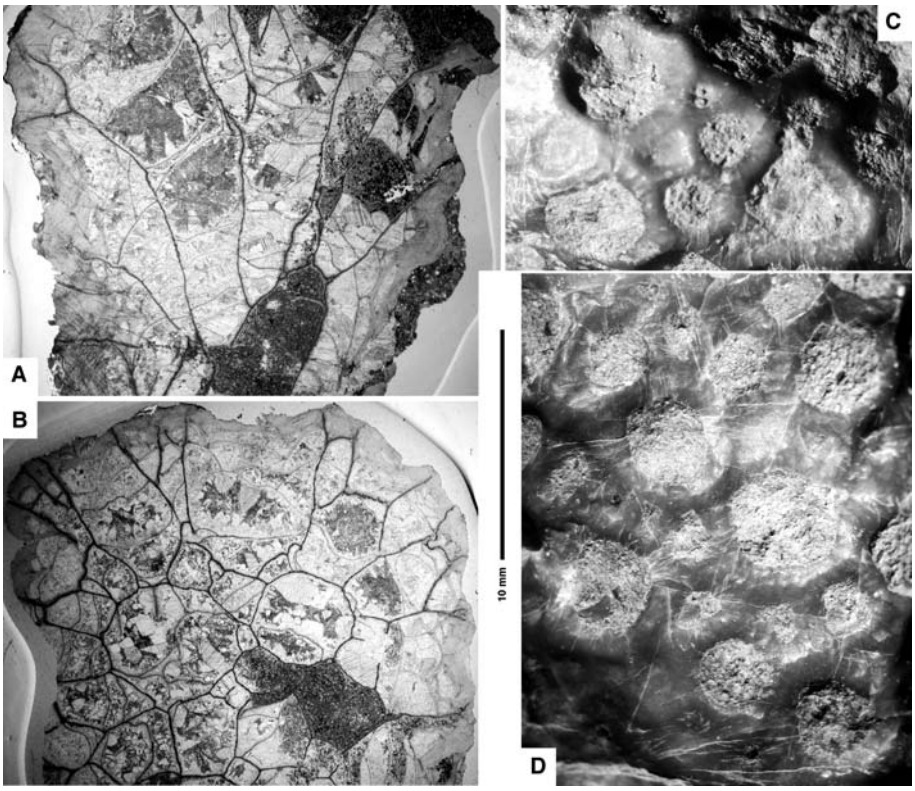

Figure 1. *Parastriatopora* sp., stock no. 791D, Upper Emsian of Colle (Province León). The scale is 10 mm long. A – longitudinal thin section. B – transversal thin section. C, D – surface of the branch, showing calices.

Systematic description

Class Anthozoa Ehrenberg 1834
Subclass Tabulata Milne-Edwards and Haime 1850
Order Favositida Wedekind 1937
Family Parastriatoporidae Chudinova 1959

Parastriatopora Sokolov 1949

Type species: *Parastriatopora rhizoides* Sokolov 1949.

Diagnosis and geographical and stratigraphical distribution see Hill (1981, p. 586–588) and May (1993, p. 86–87). A synonymy list of the genus *Parastriatopora* is given by May (1993, p. 86).

Remarks: Genus *Argentinella* Fernández-Martínez, Plusquellec and Tourneur 2002, with the type species *Favosites argentina* Thomas 1905, is closely related to *Parastriatopora. Argentinella* is distinguished by its marked development of the septal elements from typical *Parastriatopora* species (Fernández-Martínez et al. 2002).

Parastriatopora sp.

Diagnosis: A species of *Parastriatopora* in which 5 to 7-cornered calices are 3.5–6.9 mm in diameter (mostly 5.5–6.0 mm diameter). The branch has a diameter of about 30 mm. Within the outermost 1.5–2.5 mm of the branch, the corallite walls and tabulae are strongly thickened by skeletal substance showing secondary lamellation. No septal elements occur apart from weak septal ridges in the calice. Mural pores are rare and are about 0.2 mm in diameter. Horizontal skeletal elements dominate the central part of the branch tabulae, while the peripheral part of the branch is dominated by bubble-like tabellae.

Material: Only one incomplete corallum exists. This is the reason for describing this new species only under open nomenclature. The specimen is stored in the paleontological collection of the Museo Geominero (Madrid) under the stock no. 791D. Photographs are shown in Fig. 1.

Provenance of the material: Due to the fact that the corallum was collected before 1900, we know only that it came from the Devonian of Colle (Prov. León). Colle is a small village on regional road LE-3143, approximately 5 km east of Boñar.

On the slope of the hill where the church of Colle is situated, there is an outcrop that has been famous since the 19th century for the quality and wealth of its fossil deposits. Modern descriptions of this locality are given in Fernández et al. (1995, p. 43), García-Alcalde (1999), and Schröder and Soto (2003). In this locality the upper part of the Valporquero Formation and the lower part of the Coladilla Formation emerge, which is the upper part of the La Vid Group. The sequence belongs to the Upper Emsian (Fernández et al. 1995, García-Alcalde 1999, García-Alcalde et al. 2002), and contains several biostromal levels built by rugose and tabulate corals. Further information about these biostromal levels can be found in Fernández et al. (1995, p. 43), Méndez-Bedia et al. (1994, p. 162), Soto (1982 and 1986, p. 29) and Stel (1975).

Parastriatopora sp. originates very probably from one of these biostromal levels in the upper part of the Valporquero Formation and the lower part of the Coladilla Formation (Upper Emsian).

Description: Before the preparation of both thin sections, *Parastriatopora* sp. was a 67 mm long fragment of an isolated, well-preserved branch of 33 mm in maximum diameter. The surface of the branch is a little worn. However, some calices show faint, radially oriented septal ridges. The calices are polygonal and of very different diameters: 4-cornered calices are 3.2–4.5 mm in diameter, and the 5 to 7-cornered calices are 3.5–6.9 mm in diameter (mostly 5.5–6.0 mm).

The transversal thin section through the branch shows that in the middle of the branch the corallites have a polygonal to rounded polygonal outline. New corallites originate by peripheral intracalicular increase, and are about 0.9 mm in diameter. The large corallites, 4.4–5.5 mm in diameter in the middle of the branch, and 4.5–6.4 mm in the peripheral part of the branch, come slowly to the surface and intersect it at an acute angle. In the middle of the branch, the observed corallite diameters vary between 0.9 mm and 5.5 mm. In the peripheral part of the branch, smaller corallites of 1–4.5 mm diameter occur between the larger corallites.

Within the largest part of the branch, the common wall between the corallites is only 0.06–0.16 mm thick with a broad dark median suture.

The longitudinal thin section of the branch shows that in a relatively broad zone in the middle of the branch the corallites run more or less parallel to its longitudinal axis. Approximating to the surface of the branch the corallite bends slowly. Close to the surface the corallites have diameters of 4–6 mm. Mural pores are rare and are about 0.2 mm in diameter.

In the central part of the branch among the horizontal skeletal elements tabulae dominate, which are horizontal or slightly inclined and slightly curved in an irregular undulating manner. Bubble-like tabellae occur only occasionally. The distance between the tabulae in the central part of the branch varies between 0.4 mm and 3.5 mm. At a distance of 10 mm the number of tabulae amount to 6–11.

In the peripheral part of the branch, bubble-like tabellae dominate. The distance between the tabellae in the peripheral part of the branch varies between 0.3 mm and 1.6 mm. In most parts of the branch, the horizontal skeletal elements are microcrystalline and thin (only 0.015–0.040 mm thick).

In the outermost part of the branch a 1.3–3.8 mm (mostly 2–2.5 mm) thick stereozone has developed. The skeletal elements (walls, tabellae, and tabulae) are thickened within this stereozone by a skeletal substance showing secondary lamellation (Hill 1981, p. 454). The horizontal skeletal elements are especially thickened by a secondary lamellate skeletal substance lying on the upper side of the thin microcrystalline skeletal element. These layers are

mostly 0.03–1.2 mm thick. However, one coherent thickening can be up to 2.0 mm thick.

Neither in the transversal thin section nor in the longitudinal thin section do any septal elements occur.

Comparisons: The branch shows the typical characteristics of the genus *Parastriatopora* Sokolov, 1949. *Argentinella argentina* (Thomas 1905) from the Lochkovian of Argentina, the type species of the closely related genus *Argentinella* Fernández-Martínez, Plusquellec and Tourneur 2002, shows some similarity, but is clearly distinguished by its strongly developed septal elements and smaller calices (Fernández-Martínez et al. 2002).

The branch shows greater diameters of corallites and calices than on any other species of *Parastriatopora.* Consequently, it is considered as a new species. However, because of the lack of material, it is named under open nomenclature *Parastriatopora* sp. Most species of *Parastriatopora* need not be compared with *Parastriatopora* sp., because the diameter of their corallites and calices is less than half that of *Parastriatopora* sp. For example, the calices are 0.75–2.4 mm in diameter in *Parastriatopora fallacis* Yanet 1968 and *Parastriatopora obsoleta* Dubatolov 1969 from the Emsian of Asturias (May 1993, p. 87–88).

Parastriatopora sp. demonstrates the closest similarity to *Parastriatopora gigantea* (Knod 1908) from the Pragian or Emsian of Bolivia (Tourneur et al. 2000). *Parastriatopora gigantea* (Knod 1908) is distinguished by a combination of the following features. On the one hand, *P. gigantea* has smaller corallites and calices (Tourneur et al. 2000). The corallites are only up to 3.8 mm diameter in the middle of the branch (Tourneur et al. 2000, p. 712). Even though the 6 to 8-cornered calices in *P. gigantea* have a maximum diameter of 7.5 mm (Tourneur et al. 2000, p. 715), the average diameter of the 6 to 8-cornered calices in *P. gigantea* is only 4–5.1 mm (Tourneur et al. 2000, Fig. 6). On the other hand, the stereozone in the outermost part of the branch is much broader in *P. gigantea*.

Parastriatopora sanjuanina Fernández-Martínez, Plusquellec and Tourneur, 1999 from the Lochkovian of Argentina (Fernández-Martínez et al. 1999) is more closely related to *Parastriatopora gigantea* (Knod, 1908) than to *Parastriatopora* sp.: The calices of *P. sanjuanina* are only up to 6 mm in diameter, and the stereozone in the outer part of the branch is broad and well developed (García-López and Fernández-Martínez 1995, p. 178–180, Fig. 3 and Fernández-Martínez et al. 1999). Furthermore the branches of *P. sanjuanina* are only 7–20 mm thick.

Parastriatopora cantabrica Tourneur and Fernández-Martínez 1991 from the Emsian (Lower Devonian) of the Cantabrian Mountains is very similar to *Parastriatopora* sp., but has significantly smaller corallites and calices: the largest calices are 3.5–4.5 mm (maximum 5.0 mm) in diameter, and the biggest corallites are 2.0–4.5 mm in diameter (Tourneur and Fernández-Martínez 1991). Furthermore, the peripheral stereozone is slightly differently developed: the stereozone is broader, but the skeletal elements are less strongly thickened by a secondary lamellate skeletal substance than in *Parastriatopora* sp.

Dubatolov (1980, p. 110, Plate 11, fig. 3) describes from the Rudny Altai a similar coral as *Parastriatopora* sp. that has calices of 4.0–5.0 mm in diameter. Consequently, the calices are significantly smaller than in here described *Parastriatopora* sp.

Parastriatopora grandissima Dubatolov in Dubatolov and Spasskij 1964 is another species from the Lower Devonian of Siberia that is similar to *Parastriatopora* sp. However, in *Parastriatopora grandissima* the large corallites are only 2.2–3.0 mm in diameter (Dubatolov and Spasskij 1964, p. 121–123, Plates 4–6).

Parastriatopora annulata (Le Maître 1952) and *Parastriatopora floralis* (Le Maître 1952), two species from the Lochkovian and Pragian of Algeria, show some similarity to *Parastriatopora* sp., but the corallites in the peripheral part of the branch have diameters of only 2.1–4.0 mm, and the stereozone in the outer part of the branch is broader than in *Parastriatopora* sp. (for details see: Le Maître 1952, p. 67–68, Plates 5, 6, 9 and Plusquellec 1976, p. 206–208).

The *Parastriatopora* ex gr. *annulata* (Le Maître 1952) found in the Lower Devonian of the Cordoba Province (Crousilles et al. 1978; Lafuste et al. 1992) is very similar to the both Algerian species. It is clearly distinguished from *Parastriatopora* sp. by its smaller corallite diameter and the broader stereozone (Lafuste et al. 1992, p. 6, Fig. 1).

Conclusions

The finding of *Parastriatopora* sp. is very remarkable. It is not only the *Parastriatopora* species with the greatest diameter of the corallites and calices, but it also shows very interesting paleobiogeographical relationships: The morphologically closest related species is *Parastriatopora gigantea* (Knod 1908) from the Pragian or Emsian of Bolivia. It would be plausible to construct a phylogenetic sequence from *Parastriatopora sanjuanina* Fernández-Martínez, Plusquellec and Tourneur 1999 from the Lochkovian of Argentina via *P. gigantea* to *Parastriatopora* sp. In this case, *Parastriatopora* sp. would be an example of close relationships between the Cantabrian Mountains and America during the Emsian – a phenomenon which Soto (1979, 1982) and Fernández-Martínez and Tourneur (1995) were able to observe in different groups of rugose and tabulate corals.

However, the possibility cannot yet be excluded that *Parastriatopora* sp. is derived from *Parastriatopora cantabrica* Tourneur and Fernández-Martínez 1991 or other unknown Lower Devonian *Parastriatopora* species of the Cantabrian Mountains.

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