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Note on *Orbitolinopsis kiliani* (PREVER)

By Jan Hofker jun. (The Hague)

With 3 figures in the text and 4 plates (I-IV)

Introduction

In recent publications on Lower Cretaceous Orbitolinidae the genus *Orbitolinopsis* is mentioned often and descriptions are given. Of this genus, established by SILVESTRI in 1932, the type-species is not known except for two specimens depicted by that author (1932, pl. IX figs. 14, 15, text-figs. 6, 7). Material from the type-locality at Voreppe (Isère, France) has been sampled by the present author from the marly intercalation at the base of the limestone which forms the cliff in the garden of the small chateau just N of that village. The author was informed that this garden is the 'Clos d'Agoût' mentioned by PREVER (1905, p. 470). In that publication two other localities are mentioned at which '*Chapmannia kiliani*' and '*Chapmannia silvestrii*' are found: one at the Col Vert, near Villard de Lans (Isère), and the other at Châtillon-le-Desert (Hautes Alpes).

Most of the material from the type-locality, unfortunately, is poorly preserved and therefore this description is based mainly on material from the same age (top of the Barremian or base of the Aptian) from the 'couche inférieure à Orbitolines' in the Gorges de la Bourne (sample 115115, HOFKER, 1963, p. 189), close to Villard de Lans.

I have to thank J.-P. THIEULOUY and J. BELLAMY, both from the Institut Dolomieu, Grenoble, for indicating to me the above mentioned localities.

Systematic description

Genus *Orbitolinopsis* SILVESTRI 1932

Orbitolinopsis kiliani (PREVER)

- 1905 *Chapmannia kiliani* PREVER, p. 470.
(?) — *Chapmannia silvestrii* PREVER, p. 470.
1932 *Orbitolina* (?) *kiliani* (PREVER), SILVESTRI, p. 159, text-figs. 6, 7, pl. IX figs. 14, 15.
— *Orbitolinopsis kiliani* (PREVER), SILVESTRI, p. 160. footnote.
MOULLADE, 1960, p. 190, pl. 3 figs. 6-12.
HOFKER, 1963, p. 232, pl. 23, figs. 1, 8, 9, 11.
1948 *Orbitolinopsis* sp., HENSON, p. 68, 69, pl. II fig. 11.
1959 *Orbitolinopsis* sp. forme B, THIEULOUY, p. 73, 74, pl. IV figs. 1, 2.
(?) 1960 *Orbitolinopsis flandrini* MOULLADE, forme B, p. 190, pl. 2 figs. 21-28.
— *Orbitolinopsis cuvillieri* MOULLADE, p. 190, pl. 2 figs. 1-7.
— *Orbitolinopsis* sp. aff. *kiliani* PREVER, MOULLADE, pl. 3 fig. 2.
1963 *Orbitolinopsis elongatus* DIENI, MASSARI & MOULLADE, p. 4, 6, pl. 1 figs. 1-4.
— *Orbitolinopsis subkiliani* DIENI, MASSARI & MOULLADE (pars), p. 6, 8, pl. I figs. 5, 6.
non — *Orbitolinopsis subkiliani* DIENI, MASSARI & MOULLADE, pl. I figs. 7, 8.

Description. Test conical or cylindro-conical, with convex, flat or concave cone-base; wall material microgranular calcitic, with little, if any, arenaceous material; a hyaline epidermis can be observed in many specimens (e.g. pl. II fig. 5).

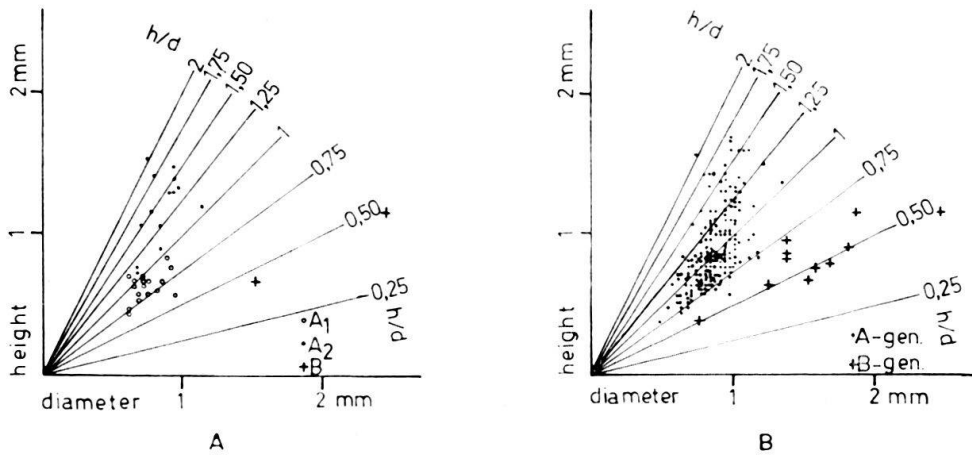


Fig. 1. Distribution of heights and diameters of *O. kiliani* in a sample from the Gorges de la Bourne. A: measured at oriented thin sections only. B: measured at complete specimens and thin sections.

Three forms can be distinguished: a microspheric generation and two megalospheric generations (A_1 and A_2). The B-generation has flatter tests than the A-generations. The maximum diameter found of microspheric tests is 2.5 mm, but the mean diameter is about 1.5 mm; the ratio height/diameter ranges between 0.45 and 0.75 (text-figs. 1, b). The A_1 -generation usually is the smallest of all three. The apex of its cone is rounded as in the B-generation and clearly shows the initial spiral. Its ratio height/diameter mainly varies between 0.75 and 1.15; the maximum diameter is about 1 mm, the maximum height about 0.8 mm. The A_2 -generation is easily distinguished from the A_1 -generation by its more pointed apex, caused by the small initial spiral, and by the fact that after forming a conical part, the diameter of the test remains more or less constant. So most specimens show a conical and a cylindrical part (text-fig. 2). The ratio height/diameter of the A_2 specimens mainly lies between 1 and 2, the maximum height found was 1.7 mm, but the mean height is about 1.2–1.3 mm; the diameter is rarely more than 1 mm.

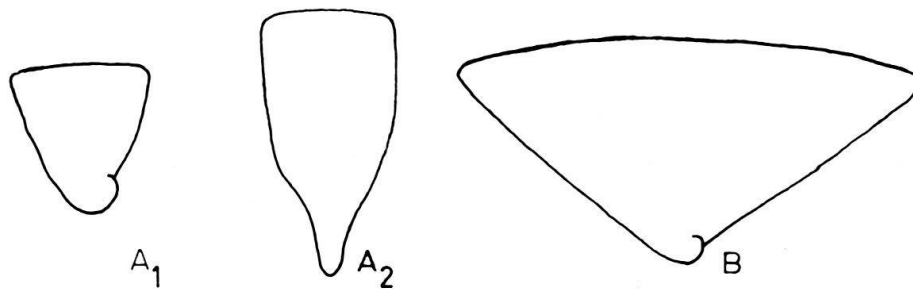


Fig. 2. External shapes of the three generations of *O. kiliani*.

The initial spiral of the B-generation seems to have about 2–3 whorls; a proloculus could not be measured because of the intricateness of the initial spiral.

Most specimens of both A-generations start with a strepto-spiral; only rarely is this spiral irregular plani-spiral (pl. IV fig. 5). Other specimens sectioned through the plane of symmetry of the last whorl, only show part of the initial spiral (e.g. pl. IV figs. 1, 6, 7). Sections at right angles to the plane of symmetry reveal the strepto-spiralling nature of the nepionic part of the test (pl. I fig. 6, pl. II fig. 2).

The A₁-generation has a small proloculus (about 30 μ in diameter); the nepionic spiral contains about 2–4 whorls. In some specimens of the A₂-generation a large chamber was found at the apex of the cone. Fig. 2 of pl. III shows such a specimen, sectioned perpendicular to the last whorl of the spiral. In this case the large chamber at the apex looks like a chamber of the initial spiral; as this chamber is sectioned parallel to its floor and ceiling (if one may call them so in that position), it necessarily has a circular cross-section because of its position at the pointed apex. Fig. 1, pl. III shows a similar specimen, but apparently an initial spiral cannot be observed. A close observation shows the chambers in the apex to be asymmetric and it might be possible that a spiral is present at the left of the apex, coiling in a plane at right angles to the photograph. During the sectioning of the specimen of pl. III fig. 5 it was observed that it has a globular chamber at its apex, so in this case a megalospheric proloculus at the apex of the test is demonstrated with certainty.

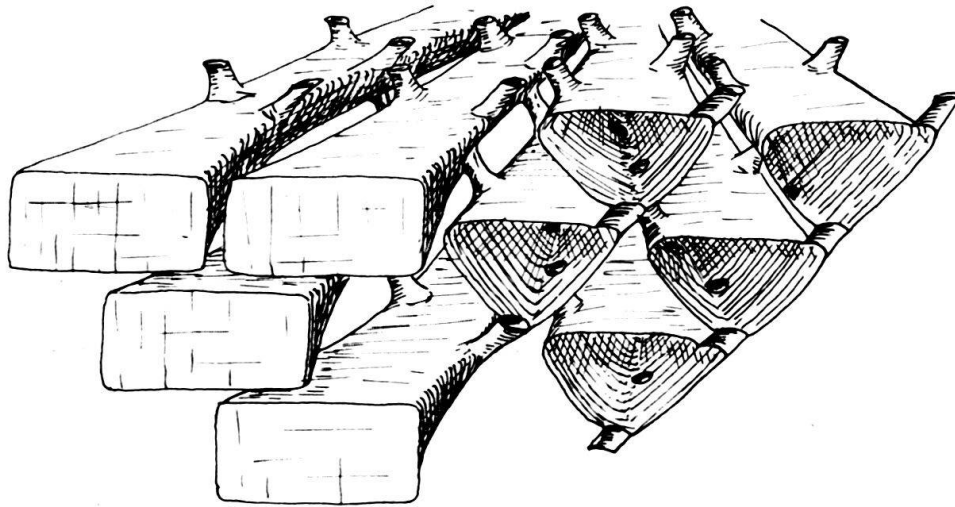


Fig. 3. Drawing of the chamber passages of *O. kiliani* and the oblique stolons that interconnect them.

The neanic chamber layers of *O. kiliani* are saucer-shaped and uniserially arranged. They resemble the structure of the chambers of *Orbitolina* (e.g. HOFKER, 1963, p. 206–210), but are less intricate. Each chamber layer roughly can be subdivided into a marginal, a radial and a reticulate (central) zone, although it is rarely possible to indicate the position of the limits of these zones. No horizontal plates are found in the marginal zone, and between the main partitions vertical plates can be observed in a few specimens only (pl. IV fig. 3). In the marginal zone, close to the cone-surface, the chamber passages are rectangular in cross-section,

but going inside they are rapidly becoming triangular (text-fig. 3). This explains why horizontal sections which are not quite parallel to the septa, show main partitions which appear to bifurcate towards the interior (pl. III figs. 6, 7). The small oblique stolons, which interconnect the chamber layers, cause a faint 'zig-zag' appearance of the main partitions in horizontal sections (pl. II fig. 4). It can be observed in tangential and subaxial sections, that the main partitions and the chamber passages in the radial zone alternate in position in successive chamber layers (pl. IV fig. 2). In the central zone the radial partitions anastomose to form a reticulate structure. The cellules in the reticulate zone are interconnected by openings which lie within the chamber layers.

Remarks. According to HENSON (1948, p. 68), *O. kiliani* is the only species which can be regarded as the type-species of *Orbitolinopsis*. PREVER (1905, p. 470) mentioned two species which are found at Voreppe: *Chapmannia kiliani* and *Chapmannia silvestrii*. No descriptions or figures are given in that publication (in fact they are nomina nuda), so it is not clear how they should be distinguished. Probably the difference in shape of the two A-generations led him to the conclusion that two different species were present.

The specimens depicted by SILVESTRI (1932, text-figs. 6, 7, pl. IX figs. 14, 15) and which he called *O. kiliani*, clearly show a structure which is also present in the specimens from Voreppe and the Gorges de la Bourne. Therefore it seems justified to call these forms *O. kiliani* and to discard *O. silvestrii* as a nomen nudum.

The variation in shape and size of *O. kiliani* justifies including many other specimens of *Orbitolinopsis* in *O. kiliani*. The specimens described by HENSON (1948, p. 68, 69, pl. II fig. 11) as *Orbitolinopsis* sp. and by THIEULOY (1959, p. 73, 74, pl. IV figs. 1, 2) as *Orbitolinopsis* sp. forme B, most likely can be regarded as *O. kiliani*.

MOULLADE (1960) and DIENI, MASSARI & MOULLADE (1963) established several new species of *Orbitolinopsis*, which were mainly distinguished by means of external dimensions. These publications give the impression that the specimens were measured in thin rock sections; as one can never be completely certain of the orientation of the specimens in such sections, measurements are not very accurate and their importance should not, in my opinion, be so stressed as has been done by MOULLADE and his co-workers. Moreover, the shape and size of most Orbitolinidae to a certain extent seem to be governed by ecological factors.

O. cuvillieri MOULLADE certainly is identical with *O. kiliani*. *O. flandrini* MOULLADE forme B might be juvenile specimens of *O. kiliani*; a specimen of *O. kiliani* sectioned at about half the height of the test (pl. III fig. 6) shows a structure which resembles the horizontal sections depicted by MOULLADE (1960, pl. 2 figs. 25–28). The structure of *O. flandrini* MOULLADE forme A is not quite clear. The horizontal sections (1960, pl. 2 figs. 18–20) certainly show features of *Orbitolinopsis* and some axial sections show the same (pl. 2 figs. 10, 17). The other vertical sections, however, might just as well be sub-axial or even tangential sections of *Coskinolina sunnilandensis* MAYNC. Also, it is not certain whether the horizontal sections are of the same forms as the vertical sections.

O. elongatus DIENI, MASARI & MOULLADE (1963, p. 4, 6, pl. I figs. 1–4) consists of forms which are identical to the A₂-generation of *O. kiliani*. *O. subkiliani* DIENI,

MASSARI & MOULLADE (1963, p. 6, 8, pl. I figs. 5, 6) is identical to the A₁-generation. Some specimens of *O. subkiliani* (pl. 1 figs. 7, 8), however, show a structure which resembles *Simplorbitolina manasi* Rat. The same is found in specimens of '*Orbitolinopsis* aff. *kiliani* PREVER' depicted by BASSOULLET & MOULLADE (1962, pl. 1 figs. 1-7).

O. aquitanica SCHROEDER & POIGNANT (1964) is closely related to *O. kiliani*. Generally it is smaller and the structure of its chamber layers is simpler than in *O. kiliani*. According to SCHROEDER (p. 556) vertical partitions should be present in the marginal zone of *O. kiliani*, but that is certainly not the case in most specimens and cannot be regarded as a diagnostic character for the species. Therefore the distinction between the species remains vague.

Distribution. *O. kiliani* is found in the Euro-Asian part of the Thetys province. Nearly always it occurs together with *Orbitolina lenticularis* (form-group I), but some samples from Switzerland (e.g. Amden) indicate that *O. lenticularis* might have been able to live at higher latitudes than *O. kiliani*. In SW-France *O. kiliani* is found in large quantities in the 'Couches inférieures à Orbitolines', a marly intercalation in the upper part of the urgonian limestones. According to many authors (e.g. Lexique Stratigraphique, fasc. 4a, vol. IV, p. 365) it marks the top of the Barremian. It is generally assumed that this layer is of the same age over a large area in SE-France; however, at the Col des Contrabandiers (E of Annecy) this layer contains *Deshayesites weissii* (see MORET & DELAU, 1960) and probably also *Heteraster oblongus* (DELUC) (pers. observ.), both indicating Lower Aptian. GIGNOUX (1950, p. 440) states that the lower *Orbitolina*-marls contain a fauna typical of the base of the Aptian (see also GOGUEL, 1947). A Lower Aptian age is assigned to the 'Untere Orbitolinenschichten' from Switzerland, so it is possible that the lower *Orbitolina*-marls are older in the SW of SE-France than they are in the NE of that region.

In the vicinity of Grenoble, the lower *Orbitolina*-marls show the same typical microfauna at all localities visited by the author. At Voreppe, the Gorges de la Bourne and at La Charniaz, on the road Alby-Le Châtelard, this fauna consists of:

- Orbitolina lenticularis* (BLUM.), form-group I
- Coskinolina sunnilandensis elongata* MOULLADE (= *C. maynci* CHEVALLIER)
- Orbitolinopsis kiliani* (PREVER)
- Choffatella decipiens* SCHLUMBERGER
- Trocholina infracretacea* NOTH
- Cuneolina hensoni* DALBIEZ
- Gavelinella barremiana* BETTENSTAEDT
- Pseudocyclamina* sp. (probably a new form)
- Quinqueloculina* sp.
- Lenticulina* sp.
- Ammobaculites* sp.

This microfauna also points to the top of the Barremian or the base of the Aptian.

MOULLADE (1963, fig. 3) states that *O. kiliani* is found throughout the Barremian. SCHROEDER (1964a, fig. 1, 1964b, p. 468, 472), however, only found it in the upper part of the Barremian and in the Lower Aptian, an opinion confirmed by my own observations.

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Plate I

Fig. 5 $\times 75$, all other specimens $\times 100$. All specimens are of the A_1 -generation.

Figs. 1, 3, 5. Axial sections. Voreppe.

Figs. 2, 4. Axial sections. Gorges de la Bourne.

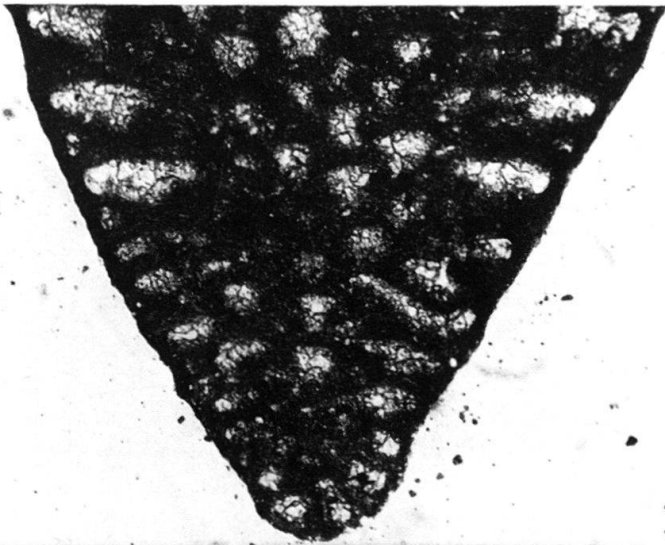
Fig. 6. Tangential section at right angles to the last whorl of the initial spiral. Gorges de la Bourne.



1



2



3



4



5



6

Plate II

Figs. 5 and 6 $\times 100$, all other figures $\times 50$.

- Figs. 1, 5. Axial sections of specimens of the A_1 -generation. Gorges de la Bourne.
- Figs. 2–4. Horizontal sections. Fig. 4: microspheric specimen. Figs. 2, 4: Gorges de la Bourne, Fig. 3: Voreppe.
- Figs. 6, 7. Axial sections of microspheric specimens. Gorges de la Bourne.

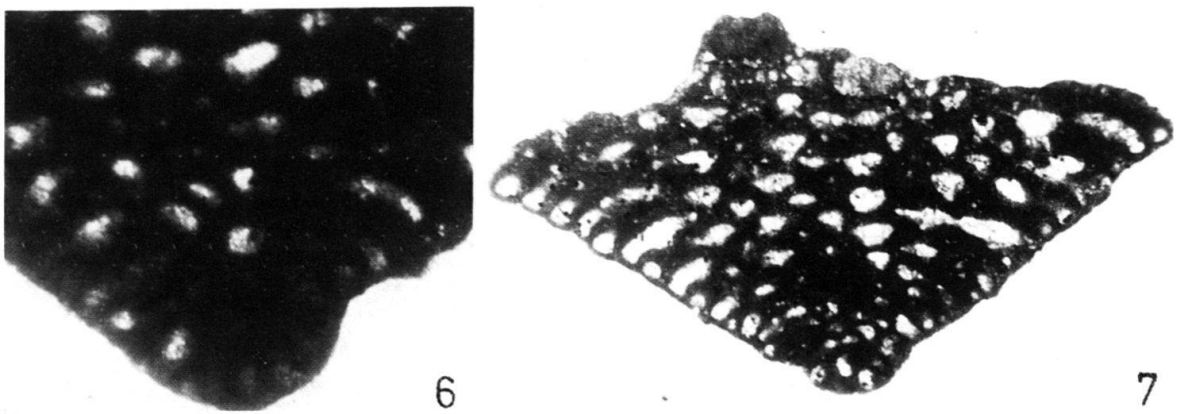
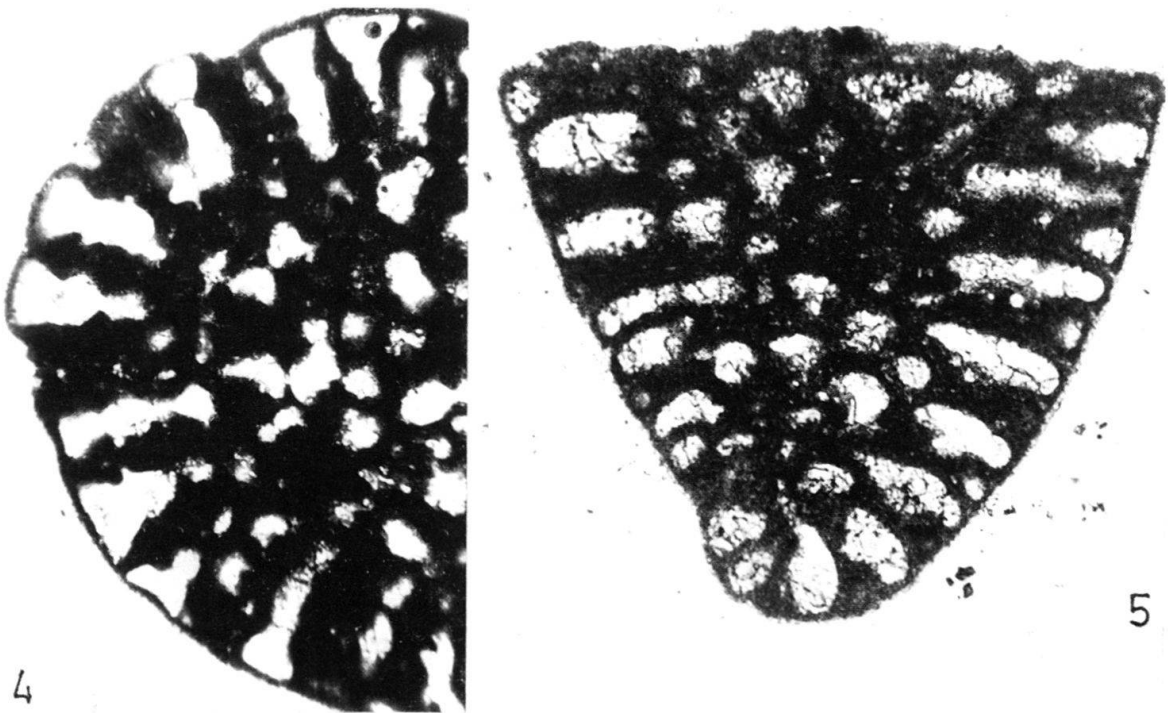
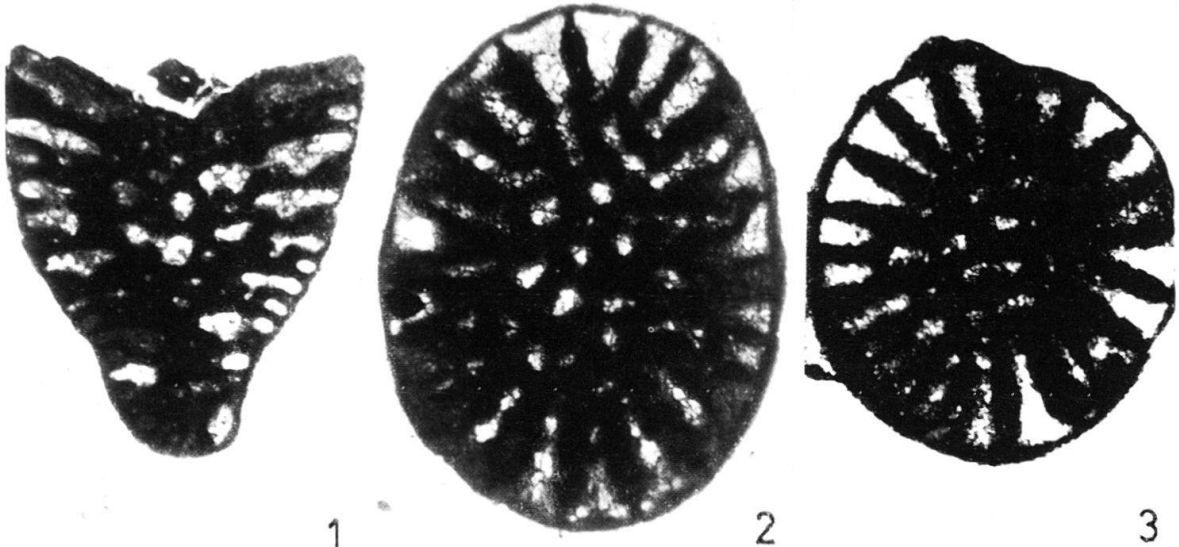


Plate III

- Figs. 1–5. Axial sections of specimens of the A_2 -generation. Fig. 2: sectioned at right angles to the last whorl of the initial spiral. Fig. 5: Col des Contrabandiers, Annecy (Hte Savoye, France); all other specimens: Gorges de la Bourne. Figs. 1, 5: $\times 100$; figs. 2, 4: $\times 75$; fig. 3: $\times 50$.
- Figs. 6, 7. Horizontal sections. Fig. 6: $\times 50$; fig. 7: $\times 100$. Gorges de la Bourne.

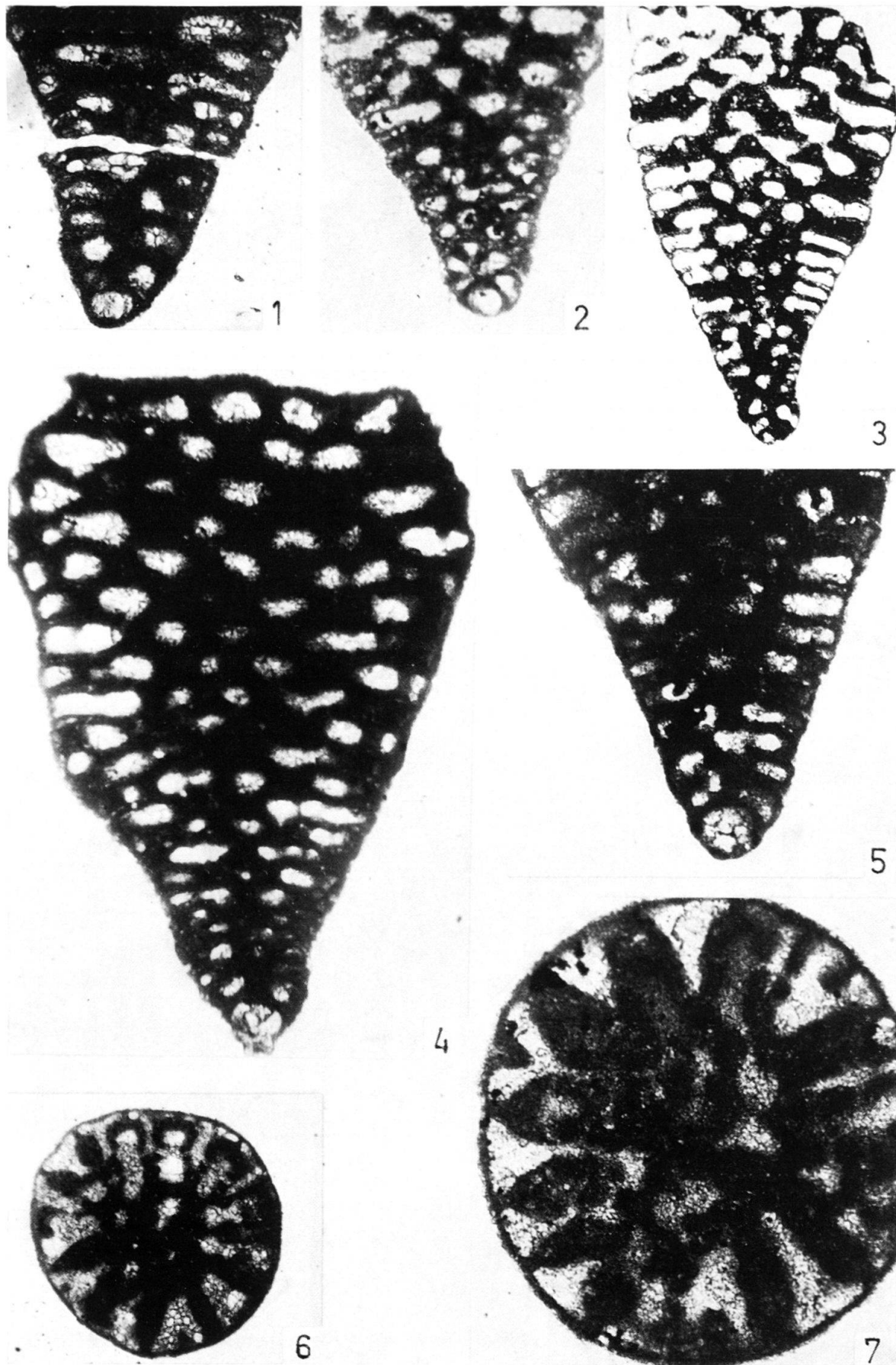


Plate IV

Figs. 1, 5–7. Axial sections of A₁-specimens, ×100. Gorges de la Bourne.

Fig. 2. Tangential section showing the triangular cross-sections of the chamber passages Gorges de la Bourne. ×100.

Figs. 3, 4. Horizontal sections. Fig. 3: Gorges de la Bourne; fig. 4: Voreppe. ×50.

