# *Sylonika* and *Kylonisa*, two new Palaeogene bryozoan genera (Cheilostomata, Skyloniidae)

A. J. Keij

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Two new genera belonging to the family Skyloniidae are introduced, i.e. *Sylonika* with one species *S. globuliformis* sp. nov. from the Lower Eocene, and *Kylonisa* with three species: *K. belgica* sp. nov. from the Middle Eocene, *K. nagappai* sp. nov. from the Middle — lower Upper Eocene and *K. triangularis* sp. nov. from the Middle Oligocene.

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## Introduction

I have recently monographed the genus *Skylonia* Thomas. It proved to range from the Middle Eocene to Late Miocene or probably even Pliocene. Amongst the *Skylonia* material which I received on loan from the British Museum (Natural History) on that occasion, two species were present which belong to a closely related genus. One of these was found by the late Dr Y. Nagappa in the Middle-lower Upper Eocene Prang Limestone of Assam, the other by Dr R. Lagaaij in Middle Eocene sediments at Nalinnes and Forest in Belgium (Fig. 3) and in a boring in Lybia. I have discovered a third species in the Middle Oligocene "Calcaire à Astéries" of Cambes (Gironde), SW France (Fig. 2). It appeared that Dr A. H. Cheetham had already found this last form in the Middle Oligocene of Gaas (Landes), also in SW France. These three species are presently referred to the new genus

*Kylonisa*, i.e. *K. belgica* from Belgium and Libya, *K. nagappai* from Assam and *K. triangularis* from France.

Furthermore, I came across a curious globular form, related to *Skylonia*, but even more to *Kylonisa* gen. nov., when investigating a Lower Eocene sample collected in 1957 by Dr J. E. Dollé at Horsarrieu (Landes) in SW France (Fig. 2). It is so different from both *Skylonia* and *Kylonisa* that the introduction of another new genus appears unavoidable, for which the name *Sylonika* is proposed. The names *Kylonisa* and *Sylonika* are both anagrams of *Skylonia*.

*Sylonika globuliformis* is so far the oldest representative of the skyloniids. As implied by its name, it has a globular or pyriform subcolony of rather variable

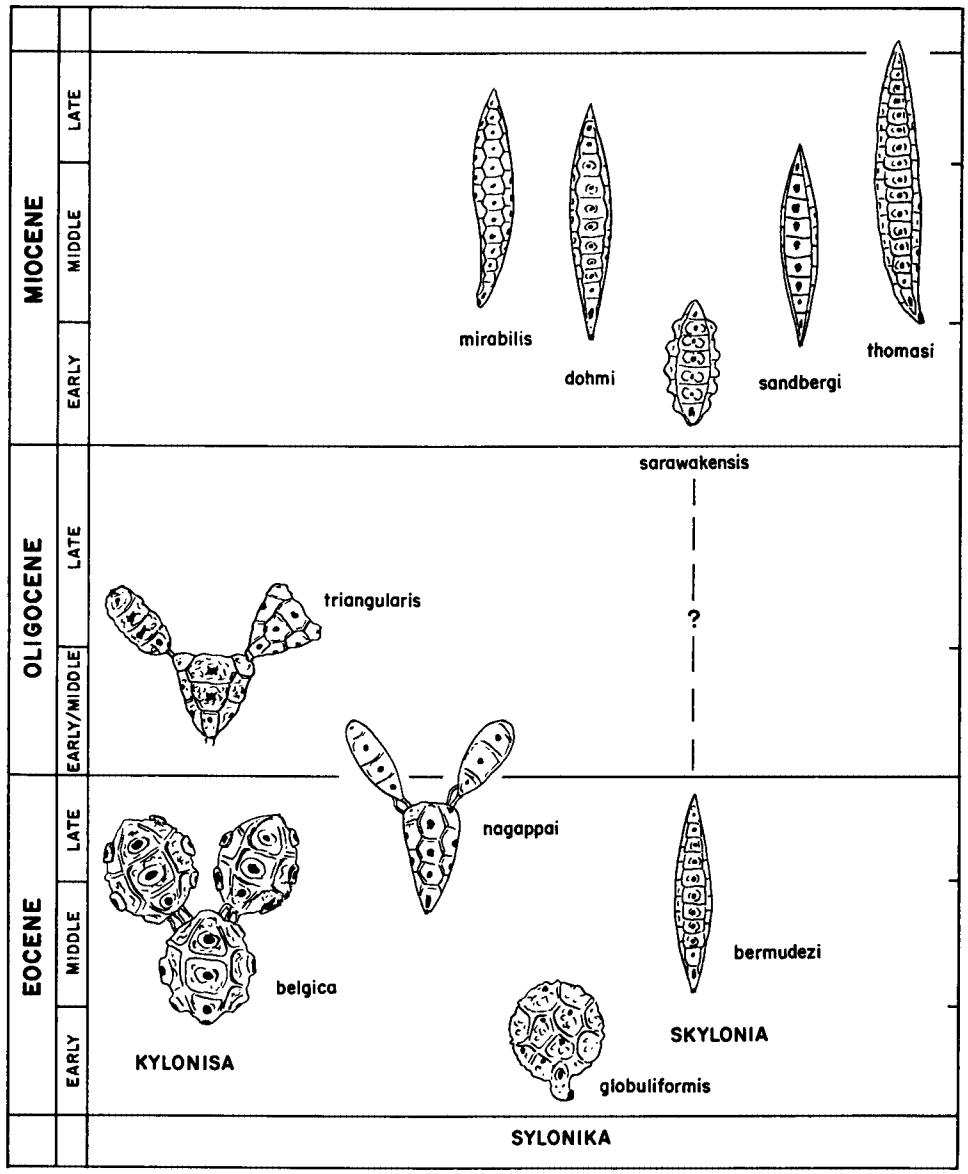


Fig. 1. Diagram showing shape and stratigraphic distribution of the various species of *Sylonika*, *Kylonisa* and *Skylonia*.

shape and consists of at least eight, but usually more, vertical rows of one to four zooecia. The oldest *Kylonisa* species, i.e. *K. belgica* from the Lower Lutetian of Belgium, has also rather globular internodes, which however are always consisting of only four vertical rows of three to four zooecia. The genus *Kylonisa* is characterised by jointed zoaria, whilst the specimens of *Sylonika* and *Skylonia* may have been single subcolonies, originally attached to a stolon system (Sandberg, 1963, p. 11). In view of the uncertain mode of growth, the term "zoaria" will be used for specimens of *Sylonika*. The oldest known *Skylonia* proper is *S. bermudezi* Keij from the Middle Eocene of Cuba and Mexico (Keij, in press).

I have previously compared the largely closed zooecia of *Skylonia* with their small central aperture to the "blind (sealed) zooecia" with their small central pore in other Anasca, and this could equally apply to *Kylonisa,* and perhaps to *Sylonika* as well. It was shown that at least in some anascan genera this sealing is cryptocrystal, i.e. it forms below the frontal membrane.

The stratigraphic range and the characteristic shape of the known skyloniid species have been set out in Fig. 1.

The skyloniids formed part of so-called bryozoan meadows, assemblages composed mainly of jointed species of genera such as *Nellia, Dittosaria, Vincularia, Poricellaria.*

*Acknowledgements*

Appreciation is expressed to the Keeper of the Department of Palaeontology, British Museum (Natural History), London, to the Oasis Oil Company of Libya and to Dr. A. H. Cheetham who put their collections at my disposal or who kindly contributed information on skyloniids. Without the long discussions with Dr R. Lagaaij, and his critical remarks and suggestions, this study would not have been completed, and so I am particularly grateful to him. The loan, by Prof. Dr. E. Voigt, of a Recent specimen of *Margaretta,* has also been most helpful.

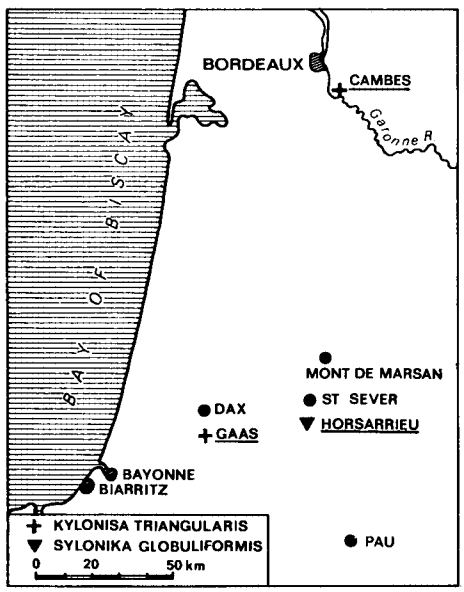


Fig. 2. Locality map of *Sylonika globuliformis* and *Kylonisa triangularis.*

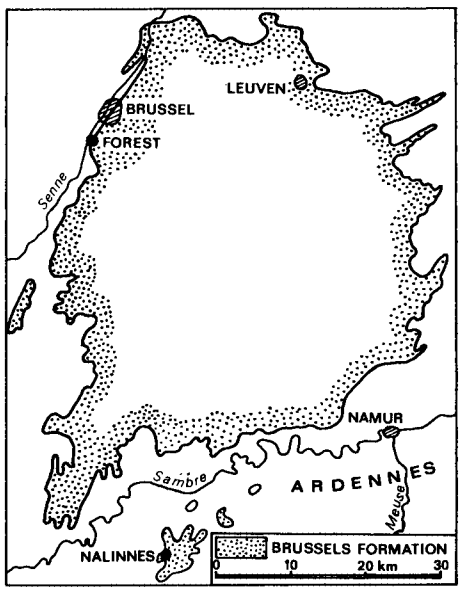


Fig. 3. Locality map of *Kylonisa belgica.*

*Deposition of the material*

The type material of *Kylonisa belgica* and *K. nagappai* belongs to the British Museum (Nat. Hist.), London (registration numbers D 51 890-51 937 and 46 714 -46 721). The types of *Sylonika globuliformis* and *Kylonisa triangularis* and duplicates of *K. belgica* have been deposited in the collections of the Rijksmuseum van Geologie en Mineralogie, Leiden (registration numbers RGM 172 548-172 562).

## Systematic descriptions

Order Cheilostomata Busk, 1852
Suborder Anasca Levinsen, 1909
Family Skyloniidae Sandberg, 1963

### Genus *Sylonika* gen. nov.

*Name* — anagram of the generic name *Skylonia*.
*Type species* — *Sylonika globuliformis* sp. nov.

*Diagnosis* – Skyloniidae with globular or pyriform "zoarium", consisting of eight or more rows of three or four zooecia. Zooecia hexagonal externally, with raised rim and small distal aperture. No ovicells or avicularia present.

*Range* – Lower Eocene.

*Distribution* – So far known only from the type locality in the Aquitaine Basin, SW France.

*Remarks* – *Sylonika* has characteristics in common with both the genus *Skylonia* Thomas (Eocene – Pliocene), and the genus *Kylonisa* gen. nov. (Eocene – Oligocene) (see Table 1, p. 7). All three genera have "zoaria" or internodes composed of quadrangular to hexagonal zooecia surrounded by a more or less conspicuous raised edge. *Sylonika* and *Skylonia* may have had terminal, globular, or fusiform subcolonies, probably attached to a stolon system. *Kylonisa* probably had an articulated, dichotomously branching zoarium and so far no single initial zooecium has been observed.

The aperture of *Kylonisa* and *Skylonia* is centrally placed and surrounded by a conspicuous raised rim. The aperture of *Sylonika* is situated towards the distal side of the zooecium. So far, no semicircular opercular scar, ovicell or avicularium has been observed in any of the three genera.

*Kylonisa* and *Skylonia* invariably have four vertical rows of zooecia, but *Sylonika* has eight or more rows.

It is conceivable that in the Early Eocene *Kylonisa* and *Skylonia* originated from *Sylonika* by reduction of the number of vertical rows of zooecia. *Skylonia* continued to form single spindles, whilst *Kylonisa* became a jointed form.

*Sylonika globuliformis* sp. nov.
Pl. 1, figs. 1-8.

*Type locality* — Marlpit of Sourbet, near Horsarrieu in the area of St. Sever (Landes), SW France (Fig. 2) (outcrop 16 of Colloque de Micropaléontologie — Aquitaine, Sept. 1957).
*Type stratum* — Marls of Ypresian age.
*Holotype* — specimen RGM 172 548.
*Paratypes* — 23 „zoaria" from the type locality (RGM 172 549 — 172 551).

*Diagnosis* – "Zoarium" globular, consisting of eight or more vertical rows of three to four zooecia; proximal end bent sidewards; frontal closure, proximally to aperture, ornamented.

*Description* – "Zoarium" globular of pyriform, 0.65 to 0.73 mm in diameter, with the proximal end tapering into a curved, smooth tube with its opening sidewards. Some "zoaria" show more clearly than others that they have been attached (to a stolon system?) by a non-calcareous tube entering the crooked and tapering proximal end (Pl. 1, figs. 3 and 4) of the initial zooecium. Usually this basal zooecium features several rootlet pores (Pl. 1, figs. 2, 3, 4 and 8). Many of the "zoaria" are irregularly shaped, some high and narrow (Pl. 1, fig. 8), others resembling partly collapsed balloons.

The number of vertical rows of zooecia is not less than eight, but generally more, with a maximum of thirteen. The number is difficult to assess since frequently one or two additional zooecia are intercalated in the area of maximum width.

The external shape of the zooecia is basically hexagonal, but due to their often irregular arrangement, four- or five-sided zooecia occur as well. Their edges are often very high and sharp-edged (Pl. 1, fig. 3), or as is more usual in the larger specimens, low and somewhat knobbly (Pl. 1, figs. 1 and 4). If not entirely occluded, the apertures are very small (diameter 0.013 to 0.02 mm) and circular and situated near the distal end. They are generally surrounded by an irregular pattern of low knobs and ridges (Pl. 1, figs. 1, 2, 4 and 5).

*Remarks* – Striking characteristics of this species are its irregular shape, the inconsistent number of vertical rows of zooecia and the irregular shape of the zooecia.

Some "zoaria" are of very irregular shape, resembling partly collapsed balloons. However, as they are fully calcified and do not show evidence of post-depositional breakage or deformation, this irregularity is apparently a primary feature. Frontal calcification was obviously a process which set in soon after the zooecia were complete, as only in one specimen two distal zooecia with wide-open opesiae were found (Pl. 1, fig. 7). In *Skylonia*-species I found either completely calcified spindles or others with all zooecia wide open (Keij, 1972). In *Encicellaria hofkeri* Keij this process of frontal calcification was seen to proceed in a distal direction, as several spindles were found in halfway stages of calcification (Keij, 1969).

Genus *Kylonisa* gen. nov.

*Name* — anagram of the generic name *Skylonia*.
*Type species* — *Kylonisa belgica* sp. nov.

*Diagnosis* – Skyloniidae with the zoarium consisting of short internodes, widest

above the middle, with four rows of three to five zooecia each. Raised rim around zooecium and another one around circular to transversely elongate aperture. One or more frontal pores in both the frontal and dorsal proximal zooecium, and also in the distal kenozooecia of the lateral rows. No ovicells or avicularia present.

*Range* – Middle Eocene to Middle Oligocene.

*Distribution* – Belgium, France, Libya and India (Assam).

*Remarks* – *Kylonisa* is closely related to *Skylonia* Thomas. Both genera have quadriserially arranged zooecia which mostly have calcified frontal closures with only a small, circular to transversely elongate, aperture in the centre, surrounded by a more or less conspicuous rim. In both genera rootlet pores are generally present in the proximal and distal zooecia (Table 1, p. 7).

The spindles of *Skylonia* are fusiform, widest in the middle, and consist of six to fifteen zooecia per longitudinal row. They all develop from a single proximal anascaform zooecium. *Kylonisa* differs mainly in having dichotomously branching, articulated zoaria. The individual internodes are globular to triangular in shape, always widest above the middle and they have only three to five zooecia per longitudinal row. An anascaform initial zooecium, as in *Skylonia*, would conceivably occur only in the basal internode and has so far not been found.

The distal zooecia of the two lateral rows are kenozooecia bearing a more or less protruding basis rami which served as the articulation basis for the distally succeeding internode. As seen from above, the arrangement of the two distal zooecia alternating with the two kenozooecia with their bases rami, is reminiscent of the distal view of the internodes of *Tetraplaria*, another quadriserial articulated genus.

*Kylonisa belgica* sp. nov.
Pl. 2, figs. 1-4.

*Type locality* — Sandpit near Nalinnes village (at 100 m South and 650 m East of the church-tower), Hainaut Province, Belgium (Texfig. 3) (see Kaasschieter, 1961, p. 84, or Pt. 14 of excursion of 7th European Micropal. Colloquium, 1961).
*Type stratum* — Sands of Brussels, of Early Lutetian (Middle Eocene) age.
*Holotype* — internode, RGM 172 552.
*Paratypes* — 30 specimens from the same locality (British Museum (Nat. Hist.) D 51 908 — 51 937) and 30 internodes or fragments from the Sands of Lede (Upper Lutetian) at Forest, SW Brussels (Pt. 17 of Excursion of 7th European Micropal. Colloquium, 1961), and 123 internodes and or fragments of Lower Lutetian of Nalinnes (RGM 172 553-172 559).

*Diagnosis* – Short club-shaped or pyriform internodes with three or four zooecia per vertical row, and a conspicuous apertural rim.

*Description* – Internodes of two shapes occur together. One is club-shaped, generally with four zooecia per vertical row, and with distinctly raised edges around the zooecia (Pl. 2, fig. 2). The apertures are mostly transversely elongate and have a well-developed raised rim. The other form is short, thick-set, widest near the apex and shows some resemblance to a chinese lantern (Pl. 2, fig. 1). It has three zooecia per vertical row and more circular apertures than the first form. The raised apertural rim and the raised edges around the zooecia are heavier and here is often additional frontal ornamentation.

Table 1

| | *Sylonika* | *Kylonisa* | *Skylonia* |
|---|---|---|---|
| Zoaria jointed | — | + | — |
| spindle-shaped | — | — | + |
| globular | + | + | — |
| club-shaped / triangular | — | + | — |
| with proximal curvature | + | — | + |
| proximal anascaform zooecium | — | — | + |
| distal bases rami | — | + | — |
| rootlet pores proximally | + | + | + |
| rootlet pores distally | — | + | + |
| Zooecia — number of vertical rows | ≥ 8 | 4 | 4 |
| number per vertical row | 1-4 | 3-5 | 6-15 |
| ovicells or avicularia | — | — | — |
| Apertures central | — | + | + |
| distal | + | — | — |
| raised apertural rim | — | + | + |

+ : present
— : absent

The small, triangular distal kenozooecia of the lateral rows, which served as the articulation bases for the succeeding internodes, feature three to six frontal pores, arranged in a crescent-shaped row around the proximal side of the undivided basis rami (Pl. 2, figs. 3a, 4b).

*Dimensions* – Holotype – height: 0.64 mm, max. width : 0.57 mm. The internodes vary in dimensions between – height: 0.51 mm and width: 0.47 mm for small globular specimens, to – height: 0.92 mm and width: 0.49 mm for longer, drawn-out specimens. The height / width ratio of most internodes is between 1 and 1½, and of the remainder between 1½ and 2.

*Remarks* – The frontal pores which occur in crescent-shaped pattern below the basis rami of the triangular, distal kenozooecia are interpreted as rootlet pores and their presence supports the view that *Kylonisa* could have had dichotomously branching, jointed colonies. A parallel is found in articulated extant genera, e.g. *Margaretta* and *Cellaria,* in which a bundle of rootlets, emanating from a semicircular row of pores, spans the decalcified portion of the joint (Pl. 3, fig. 8).

In the Libyan Middle Eocene of Oasis Oil Co. of Libya's well H. 1-32 at 820-830 feet depth, a closely related, if not identical, species was found. As only one internode of this form (Pl. 2, figs. 4a-b) is available, its identity can only be fully established when more material becomes available.

*Kylonisa nagappai* sp. nov.
Pl. 2, figs. 5-8.

*Name* — in honour of the late Dr Yedatore Nagappa, who discovered the species.
*Type locality* — Rongbinggiri (N 25° 29′ — E 90°37′), Garo Hills in Central Assam, India.
*Type stratum* — Prang Limestone, of Middle Eocene to early Late Eocene age (Nagappa, 1959, p. 163, fig. 11).
*Holotype* — internode D 51890.
*Paratypes* — 25 internodes, all from the same sample (D 51 891 — 51 907, 46 714 — 46 721).

*Diagnosis* – *Kylonisa* with club-shaped internodes, consisting of two vertical rows of four zooecia and two rows of five.

*Description* – The internodes are predominantly club-shaped, reaching their maximum width above the middle. In distal view they are generally nearing elliptical shape (Pl. 2, fig. 8). The narrow, rounded lateral sides consist of rows of five zooecia, the fourth being the largest and widest; the triangular fifth zooecium, situated at the shoulder of the internode, is a kenozooecium bearing the undivided basis rami for the succeeding internode. The flattened frontal and dorsal sides of the internode each consist of four zooecia, which gradually increase in size from the proximal triangular zooecium to the more rectangular to hexagonal third and fourth zooecia. No definite rootlet pores were observed, with the exception of a single, not always distinct, pore below the slightly protruding basis rami of the small, triangular kenozooecia terminating the lateral rows (Pl. 2, fig. 5b).

The external shape of the zooecia changes from triangular in the proximal zooecium, to rectangular or hexagonal in the succeeding ones, with the exception of the terminal kenozooecia on the narrow sides of the internodes. All the zooecia have raised edges forming conspicuous ridges. The aperture is circular to transversely elliptical and is surrounded by a thick, rounded rim.

The apex of the internodes is formed by the straight distal boundaries of the last zooecia on the flattened sides of the internodes. In the more rounded specimens the four end-zooecia form an X-shaped suture (Pl. 2, fig. 8).

Dimensions: The length of the more or less incomplete internodes varies from 0.55 to 0.76 mm, their maximum width from 0.29 to 0.34 mm, and their minimum width from 0.27 to 0.30 mm.

*Remarks* – The slender internodes of *Kylonisa nagappai* are the smallest known so far in the genus. Those of *K. belgica*, although more or less of the same length, are more robust and globular.

*Kylonisa triangularis* sp. nov.
Pl. 3, figs. 1-7.

*Type locality* — Quarry at Cambes (Gironde), approx. 15 km Southeast of Bordeaux on the right bank of the Garonne River, SW France.
*Type stratum* — Marl lens in the "Calcaire à Astéries" of Stampian or Middle Oligocene age (for more details see: Drooger, Kaasschieter and Keij, 1953).
*Holotype* — specimen RGM 172 560.
*Paratypes* — 18 specimens from the same loclity (RGM 172 561 — 172 562).

*Distribution* – The species also occurs in the Stampian of Gaas (Landes), (approx. 12 km South of Dax, SW France).

*Diagnosis* – *Kylonisa* with zoarium consisting of triangular, flattened internodes, each composed of four rows of three zooecia with ornamented or sometimes smooth, frontal closures.

*Description* – The zoarium consisted of triangular, flattened internodes, 0.53 to 0.665 mm high and 0.41 to 0.625 mm wide, bearing four rows of three, rarely four, zooecia. The distal kenozooecia of the lateral rows form bulbous protrusions, giving the internodes their typical triangular outline in frontal and dorsal view. The proximal end of each internode is quadripartite (Pl. 3, fig. 2c). The non-ornamented internodes have small frontal and dorsal rectangular proximal zooecia, with a relatively large longitudinally elongate aperture (Pl. 3, figs. 4 and 5). The small rectangular proximal zooecia of the frontal and dorsal rows of the ornamented internodes bear a single proximal frontal pore (Pl. 3, figs. 1a and 2a); an additional distal one occurs occasionally (Pl. 3, fig. 7). The succeeding zooecia widen considerably and are irregularly hexagonal in outline. The zooecia in the larger internodes are ornamented frontally with an irregular pattern of low, rounded ridges with depressions of various sizes in between (Pl. 3, figs. 1, 2 and 7), those of the smaller segments being smooth or nearly so (Pl. 3, figs. 4 and 5). The apertures are variable and pass from small and longitudinally elongate in the proximal zooecium, to fairly large and transversely elongate in the distal zooecium. In half the number of internodes examined the apertures are irregular in shape (Pl. 3, figs. 1 a-b), because the ends of the ornamentation ridges project into the apertures. The bulbous distal chambers of the lateral rows of the ornamented internodes have a larger, often strongly protruding (Pl. 3, fig. 3), central opening, partly surrounded on its proximal side by several smaller pores (Pl. 3, fig. 5). The protrusion constitutes the articulation basis (basis rami) for the distally succeeding internode; although this point is not easily established, it was probably also subdivided (Pl. 3, fig. 2b), and its four (?) parts might have matched the quadripartite opening in the proximal end of the next internode (Pl. 3, fig. 2c). The smaller pores are interpreted as rootlet pores, and so are the one or two pores in the proximal frontal and dorsal zooecia – of the distally succeeding internodes – to which these rootlets were connected. The less heavily calcified and generally smaller, smooth internodes lack rootlet pores both in the proximal zooecia of the frontal and dorsal rows and in the kenozooecia of the lateral rows (Pl. 3, fig. 4). Presumably these internodes originated from the growing tips of the colony, where the need for additional strengthening of the joints would not have existed.

*Remarks* – Dr A. H. Cheetham found a single specimen of *Kylonisa triangularis* in the Stampian at Gaas (approx. 12 km South of Dax on the road to Cagnotte, in a field 250 m East of this road), and kindly allowed me to compare this specimen with my material from Cambes. It proved identical in every respect. The species is apparently very rare at Gaas, and I failed to find more specimens in samples collected at this locality.

A few specimens of *Kylonisa belgica* of the Belgian Lower Lutetian at Nalinnes show a tendency to become somewhat triangular in outline in frontal view, a trend more clearly developed in the slender, club-shaped Middle Eocene *Kylonisa nagappai* from Assam. In *K. triangularis*, the youngest known representative of this curious genus, this trend apparently reaches its climax.

It occurs as a rare element in an extremely rich bryozoan assemblage, with *Vincularia, Nellia, Poricellaria, Pasythea, Crisia* and *Scrupocellaria*, all articulated,

erect branching forms. Amongst the Foraminifera polymorphinids, many with fistulose end-chambers, *Halkyardia* and weed-attached anomalinids are conspicuous. *Bairdia*-species and *Aequacytheridea cambesiensis* (Keij) are common ostracodes. Most likely a shallow-water, rather high-energy environment was the habitat in which this fauna lived.

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PLATE 1

Figs. 1-8. *Sylonika globuliformis* gen. nov. et sp. nov. (80 ×).
All figures: Lower Eocene, Horsarrieu, France.

1a-b. Distal and proximal view of large "zoarium" (holotype). (RGM 172 548).

2. Moderate-sized "zoarium" with malformed proximal end. (RGM 172 549).

3. Small "zoarium" with raised and narrow zooecial boundaries. The proximal end is open on two sides (one opening showing on the right hand side). (RGM 172 549).

4. Heavily ornamented "zoarium" with initial zooecium bearing rootlet pores. (RGM 172 549).

5a-b. Two zooecia with ornamentation proximal to the distally placed aperture.

6. Half-section through "zoarium", showing communication pores in the walls between the zooecia. (RGM 172 551).

7. Two distal zooecia with wide open opesiae (RGM 172 549).

8. Long and slender "zoarium" with initial zooecium bearing rootlet pores. (RGM 172 549).

PLATE 1

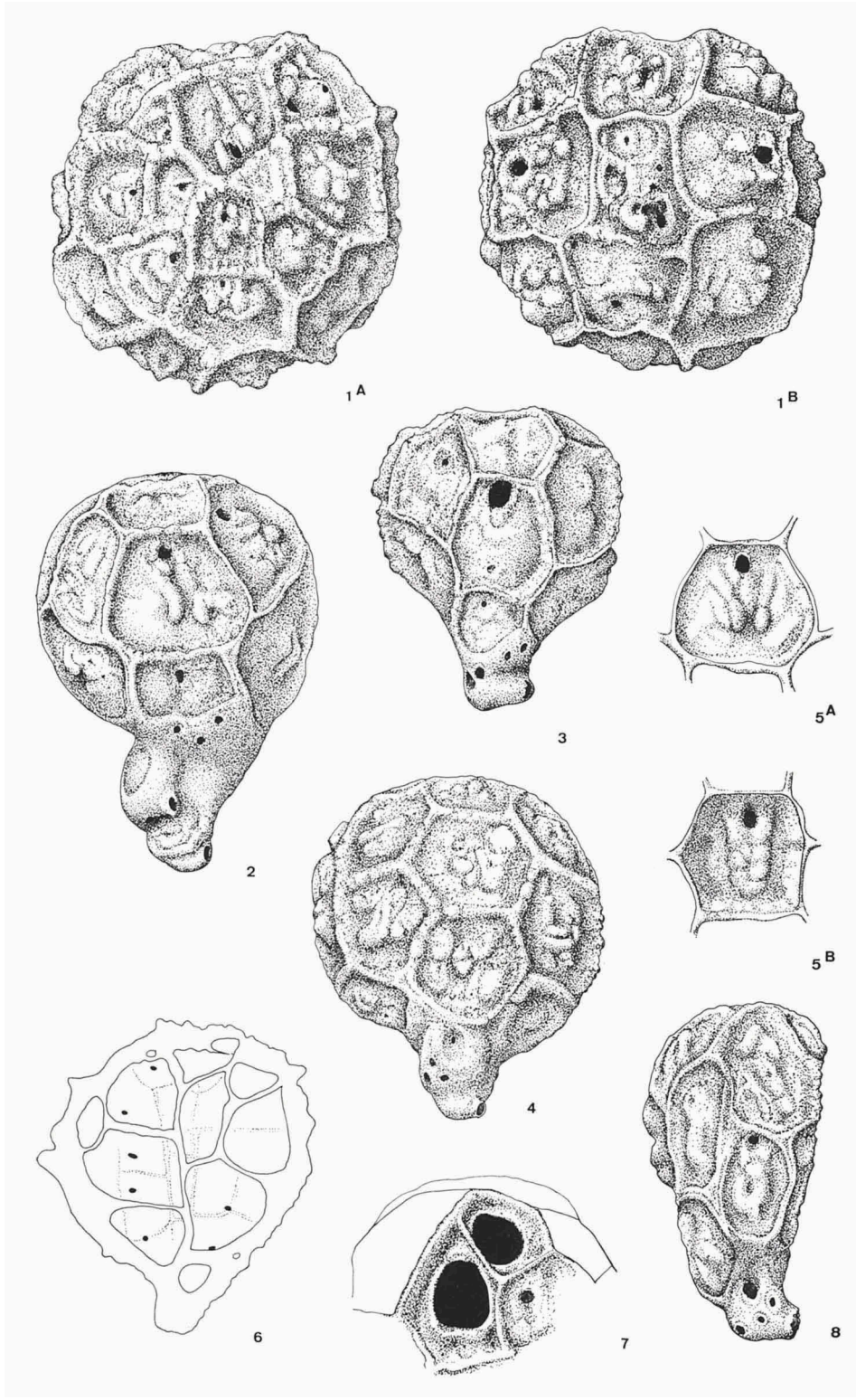

PLATE 2

Figs. 1-4. *Kylonisa belgica* gen. nov. et sp. nov. (80 ×).
Figures 1-3: Lower Lutetian of Nalinnes, Belgium.
Figure 4: Middle Eocene, Libya.

1. Frontal view of ornamented internode (holotype). (RGM 172 552).

2a-b. Lateral and distal view of a rather elongate internode without characteristic ornamentation. (RGM 172 553).

3a-b. Distal view (a) of internode, showing alternation of autozooecia and kenozooecia, the latter bearing a basis rami partially surrounded by a proximal crescent of rootlet pores; and proximal view (b) of the same internode. (RGM 172 553).

4a-b. Lateral view (a) of ornamented internode; and distal view (b) of the same internode (cf. fig. 3a).

Figs. 5-8. *Kylonisa nagappai* gen. nov. et sp. nov. (80 ×).
All figures: Middle-lower Upper Eocene, Assam, India.

5a-b. Frontal view (a) of internode (holotype); and lateral view (b) of the same specimen, showing lateral row of zooecia terminating in kenozooecium (D 51 890).

6. Frontal view of internode.

7. Distal view of internode, showing alternation of autozooecia and kenozooecia, the latter bearing a small circular basis rami.

8. Distal view of elliptical internode (cf. fig. 7).

PLATE 2

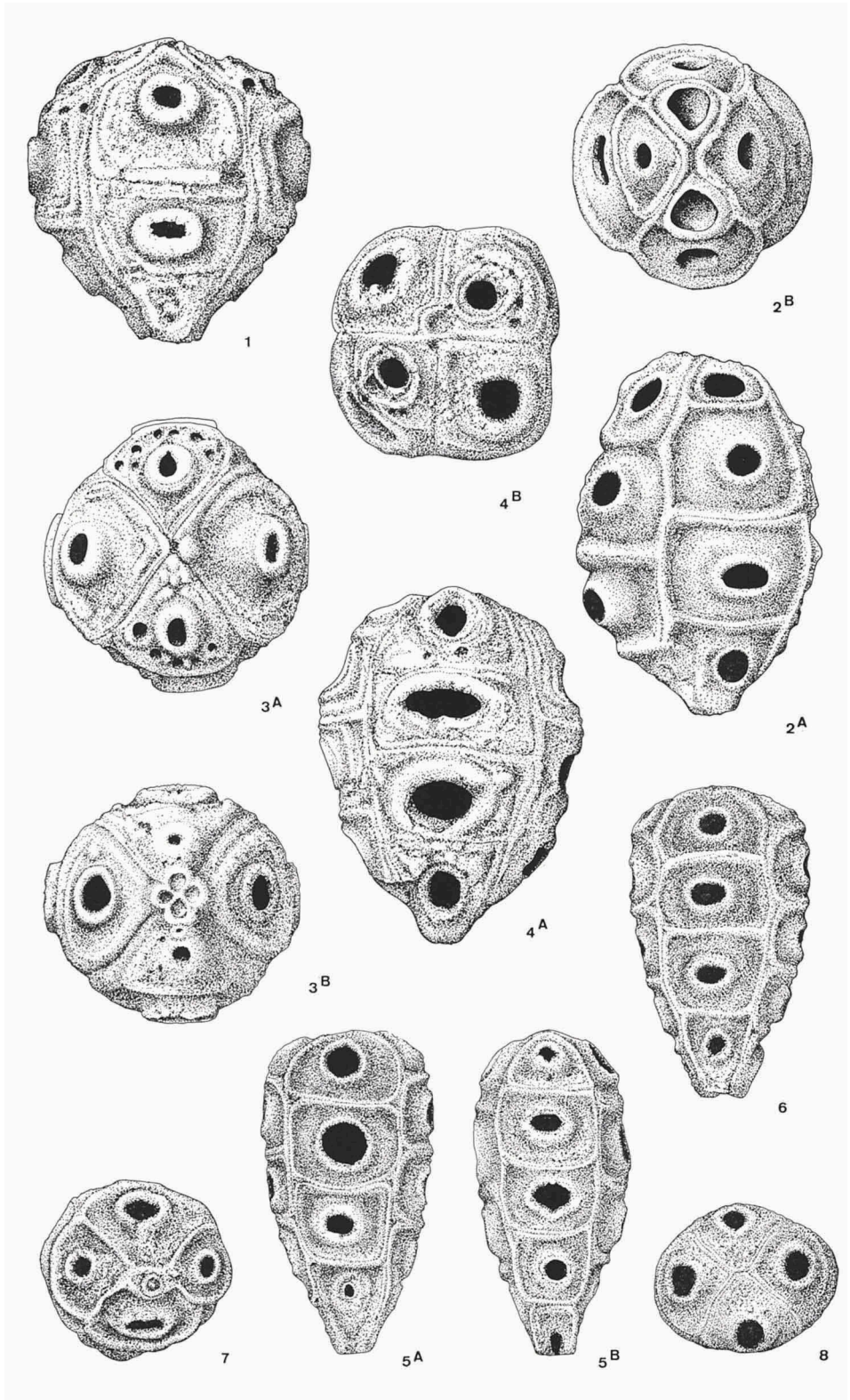

PLATE 3

Figs. 1-7. *Kylonisa triangularis* gen. nov. et sp. nov. (80 ×).
Figures 1-6: Middle Oligocene of Cambes, France.
Figure 7: Middle Oligocene of Gaas, France.

1a-b. Frontal and lateral view of ornamented internode (holotype). Note deformation of apertures. (RGM 172 560).

2a-c. Frontal, distal and proximal view of ornamented internode. (RGM 172 561).

3. Distal kenozooecium of lateral row, with strongly protruding basis rami. (RGM 172 561).

4. Frontal view of smooth and smaller internode, with raised rims around the zooecia. Note lack of rootlet pores on the distal kenozooecia. (RGM 172 561).

5. Distal view of terminal kenozooecium of a lateral row, showing the proximal crescent of rootlet pores around the basis rami. (RGM 172 562).

6. Proximal part of smooth internode, showing proximal frontal zooecium without rootlet pore(s). (RGM 172 561).

7. Frontal view of ornamented internode with fairly large apertures.

Fig. 8. *Margaretta cereoides* (Ellis & Solander) (20 ×).
Recent, 3 km West of Tripoli, Libya (coll. Voigt).

Detail of the mode of branching. Parts of two branched-off internodes are shown, each connected with the mother internode by a chitinous tube entering their single proximal zooecium. In the lower branch the connection is further secured, and partly obscured, by a number of rootlets given off by rootlet pores. In the upper branch no rootlets have developed.

PLATE 3