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PROBLEMATIC MICROFOSSILS FROM THE YPRES FORMATION OF BELGIUM

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ABSTRACT: Recent studies establish clearly that the Tertiary of Northern Europe and America is very rich in problematic calcareous microfossils.
In this publication one new genus, *Calvina* n. g. and seven new species, *Calvina kalloensis* n. sp., *Conicarcella capitiformis* n. sp., *Conicarcella variabilis* n. sp., *Pseudarcella trapeziformis* n. sp., *Spinarcella guttiformis* n. sp., *Yvonniellina concava* n. sp. and *Yvonniellina dimidiaglobosa* n. sp. are described from the Ypres Formation of Belgium. Some taxonomic changes are also proposed.

1. INTRODUCTION

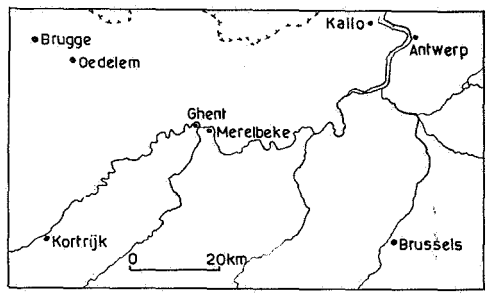
During the preliminary study of the foraminifera encountered in samples of the Ypres Formation from the Kallo boring and from Merelbeke several microorganisms of unknown affinities were met with. The present paper gives a description of these organisms. For purposes of comparison samples of the Clay of Asse at Oedelem were added to the study, as these deposits were known to contain also problematic microfossils, which have been discussed by KEIJ (1969 a, b; 1970).

2. LOCALITY DETAILS

Our specimens were encountered in Eocene strata from three Belgian localities (text fig. 1): Oedelem, Merelbeke and Kallo.

The locality at Oedelem is mentioned by GULINCK and VAN VOORTHUYSEN (1961) as excursion point 21 of the Seventh Micropaleontological Colloquium. It is a claypit of the N.V. Steenbakkerijen van Oedelem. The same locality is also mentioned by KEIJ (1969a, p. 5, fig. 1; 1969b, p. 21, fig. 1; 1970, p. 485) and by WILLEMS (in press, figs. 1,2).

The locality at Merelbeke does not exist any more. The samples were taken during the digging for the sluice of the « Ringvaart » of Gent. The exact localisation of the profile and the samples is given by DE CONINCK (1965, p. 7, fig. A) and by MOORKENS et al. (1966, p. 204, fig. 1).



Textfig. 1: Locality map.

The locality of Kallo is a boring, executed in 1964 by N.V. FORAKY (Brussels) for the Geological Survey of Belgium. It is situated near "Fort la Perle" (GULINCK, 1967, p. 111; DE CONINCK, 1968, p. 7, fig. 1; GULINCK, 1969, p. 3, fig. 1; Archives du Service géologique, n° 148/III — planchette 27E Beveren-Waas).

3. LITHOLOGICAL AND PALEONTOLOGICAL DETAILS OF THE STUDIED SAMPLES

At the locality of Oedelem the Clay of Asse (Bartonian age) is outcropping. Our samples were collected by T. MOORKENS who executed an auger boring in an abandonned quarry. Three meter under the present base of that quarry the so called "bande noire" was encountered. The "bande noire" is considered as the basal part of the Clay of Asse. Our samples were taken at −2,60 and −2,70 m. The sediment is a sandy glauconitic clay, very rich in foraminifera especially *Asterigerina*, *Bulimina* and *Spiroplectammina* as described by KAASSCHIETER (1961) and in ostracods (KEIJ, 1957). KEIJ (1969 a, b; 1970) lists the following problematic microfossils from this locality: *C. oedelemensis* KEIJ, *S. crenella* KEIJ, *S. batiformis* KEIJ, *D. eocenica* KEIJ and *V. gracilis* KEIJ. The lithology and the assemblage of foraminifera and ostracods suggest a depth of deposition of several tens of meters.

In the profile of Merelbeke problematic microfossils were found in sample ME 3. According to MOORKENS et al. (1966, p. 214) the foraminiferal and ostracodal fauna shows most affinity with those of the Sands of Mons-en-Pévèle as described by KAASSCHIETER (1961) and KEIJ (1957). The foraminiferal fauna is chiefly a benthonic fauna. Sample ME 3 is very rich in glauconite.

The samples from the boring of Kallo belong to the Sands of Mons-en-Pévèle and the Clay of Ypres (GULINCK, 1967).

The Sands of Mons-en-Pévèle (KA 239 till KA 259) are very finely stratified sands which become more silty towards the base. The Clay of Ypres (KA 260 till KA 378) consists of heavy clay, sometimes more silty, with bioturbations and some macrofossils (*Pecten*, *Amusium*, *Pinna*, *Turritella*). All samples are very rich in foraminifera (*Nonion*, *Cibicides*, *Textularia*, *Anomalina*, *Nummulites*, *Globigerina*) Ostracods are also encountered in several samples. (*)

(*) Data based on not published observations by the author.

4. TAXONOMIC NOTES

The Tertiary of Belgium and Northern France seems to be very rich in problematic microfossils. A lot of those microfossils are supposed to belong to the Tintinnids (TAPPAN & LOEBLICH, 1968). In the Clay of Ypres and the Sands of Mons-en-Pévèle from the boring of Kallo, eight species, of which five are new, and belonging to four different genera, were met with. These new species can easily be refered to some of the genera described by TAPPAN & LOEBLICH (1968) and KEIJ (1969a). However the diagnosis of one genus has to be complete with one new morphological feature. The specimens of two new species (*Y. concava* n.sp. and *Y. dimidiaglobosa* n.sp.) and the Kallo specimens belonging to *Y. feugueuri* (LE CALVEZ) were found to possess in the dorsal knob a pore and an internal channel which are in connection with the inner cavity. The genus *Yvonniellina* TAPPAN & LOEBLICH is showing thus the same structure as the other genera (*Conicarcella* KEIJ, *Pseudarcella* SPANDEL, *Remanellina* TAPPAN & LOEBLICH and *Tytthocorys* TAPPAN & LOEBLICH). Only the reticulate surface and the finely striated ventral part of the test are now characteristics which typify the genus *Yvonniellina* TAPPAN & LOEBLICH. The genus *Spinarcella* KEIJ might also be considered as belonging to the Tintinnida because of the test structure, which closely resembles the one in the Tintinnids.

The genus *Calvina* n. g. is related to *Triangulina* QUILTY which seems to have similarities to the Bryozoans (QUILTY, 1970).

5. DISTRIBUTION (table 1)

In the Clay of Asse from Oedelem we found three species that were already mentioned from this locality by KEIJ (1969a; 1970): *S. crenella* KEIJ, *S. batiformis* KEIJ, and *V. gracilis* KEIJ.

The Sands of Mons-en-Pévèle at Merelbeke are not very rich in problematic microfossils and yielded only two species: *C. variabilis* n. sp. and *S. guttiformis* n. sp.

etage	level	species	*P. trapeziformis* n.sp.	*Y. concava* n.sp.	*P. rhumbleri* SPANDEL	*Y. feugueuri* LE CALVEZ	*C. kalloensis* n.sp.	*V. gracilis* KEIJ	*C. capitiformis* n.sp.	*Y. dimidiaglobosa* n.sp.	*C. variabilis* n.sp.	*Tytthocorys* sp.	*S. guttiformis* n.sp.	*S. crenella* KEIJ	*S. batiformis* KEIJ
Clay of Asse (Barton For.)	OE	-2.60												f	f
		-2.70						r						a	a
		1													
		1													
		1													
		1													
		1													
Sands of Mons-en-Pévèle (Ypres For.)	ME	3 1									r		f		
		1													
		1													
		1													
	KA	248									f				
		250									f				
		254.5									V				
		257									V	r	f		
		1													
		1													
		266						r							
		1													
		1													
		292.5			V			f							
		294.5						r		r					
		297						r	r	f					
		301.5						r	f						
		303.6				f		r							
		306		r											
		308		r		f									
Clay of Ypres (Ypres For.)		310.8	r	f		r		r							
		312.5	r	f		f									
		315.5	V	f		a									
		318.5	f	f		r									
		321	r			f									
		323.5	a		r	a	a								
		329.5		r		r									
		330.5	V		f										
		335.5	r	r											
		1													
		1													
		1													
		350 1	r	r											
		1													
		1													
		1													
		378 1													
		1													
Sands of Oostende ter-Streep (Landen For.)		1													

TABLE 1. *Distribution of problematic microfossils from the Eocene of Belgium.*

r = means less then 5 specimens;
f = means more than 5 but less than 20 specimens;
a = means more than 20 but less than 50 specimens;
V = means more than 50 specimens;

The Sands of Mons-en-Pévèle at Kallo yielded the same species but in a greater number than at Merelbeke. We found also one specimen which probably belongs to the genus *Tytthocorys* TAPPAN & LOEBLICH.

The Clay of Ypres at Kallo is very rich in problematic microfossils: eight species were found and the number of specimens is very high. The distribution of the microfossils allows us to distinguish zones in the Formation of Ypres. As the base of the Clay of Ypres is situated at --378 m (GULINCK, 1967) the first zone ranges between KA 378 and KA 350. This zone did not yield problematic microfossils and it is also very poor in calcareous foraminifera but it is very rich in arenaceous foraminifera. A second zone is situated between KA 350 and KA 305. It is very rich in problematic microfossils and also in foraminifera and ostracods. A third zone is situated between KA 305 and KA 290 and contains some problematic species. It is followed by a non-fossiliferous zone (KA 290 till KA 260). The transition between the Clay of Ypres and the Sands of Mons-en-Pévèle is marked by the appearance of three new species (*C. variabilis* n. sp., *Tytthocorys* sp. and *S. guttiformis* n. sp.) at level KA 257.

6. SYSTEMATIC DESCRIPTION

Order **Tintinnida** CORLISS 1955
Family **Codonellidae** KENT 1881
Genus *Conicarcella* KEIJ 1969
Conicarcella capitiformis n. sp.
(pl. 1, figs. 1,2; pl. 4, fig. 1)

Type-locality: Kallo, Belgium (textfig. 1)

Type-level: Clay of Ypres at Kallo.

Holotype: specimen KA 305.50/54; stored at the Laboratorium voor Paleontologie, R.U.G.

Paratypes: 12 other specimens from the same level; idem.

Diagnosis: Test cap shaped, wall smooth, dorsal part ending in laterally oriented knob which is very flat; ventral side consists of thick convex ring with a circular aperture in the centre.

Description: Test unilocular, wall calcareous, smooth, covered by fine depressions and pits, no perforations; dorsal side convex, ending in a laterally oriented knob bearing a small dorsal pore; ventral side separated from dorsal side by fine groove; basal periphery rounded; ventral side convex with a concave central part bearing a large circular aperture (0.03 till 0.06 mm).

Dimensions: dimensions of holotype: height of test 0.17 mm; diameter of test: 0.20 mm; diameter of aperture: 0.05 mm.

Dimensions of paratypes (in mm):

nr. specimen	height	diameter
KA 301.50/46	0.17	0.20
47	0.16	0.21
50	0.17	0.205
51	0.16	0.175
52	0.19	0.20
53	0.16	0.20
55	0.17	0.21
56	0.16	0.195
57	0.165	0.20
58	0.17	0.20
59	0.175	0.195
60	0.16	0.19

Remarks: *Conicarcella capitiformis* n. sp. can be easily distinguished from the other Conicarcellidae (*C. oedelemensis* KEIJ, *C. glabra* (SZCZECHURA) and *C. tongerenensis* WILLEMS). It has a smaller test and a laterally oriented knob.

Distribution: Clay of Ypres at Kallo.

Conicarcella variabilis n. sp.
(pl. 1, figs. 3,4; pl. 4, figs. 2,3)

Type-locality: Kallo, Belgium (text fig. 1).

Type-level: Sands of Mons-en-Pévèle, Kallo.

Holotype: specimen KA 257/25; stored at the Laboratorium voor Paleontologie, R.U.G.

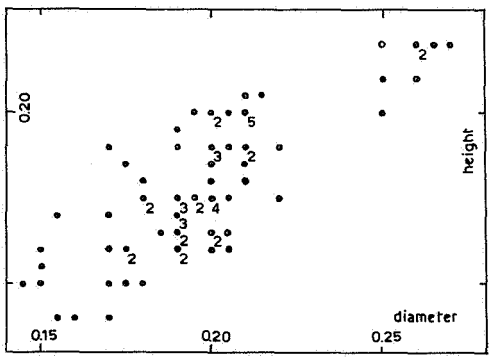
Paratypes: about 220 specimens of different levels from the Sands of Mons-en-Pévèle (table 1) at Kallo and Merelbeke; idem.

Diagnosis: Test triangular but asymmetric; dorsal side ending in sharp cone with pore; ventral side flat or slightly concave;

basal part of dorsal walls smooth but interrupted by irregular ridges converging towards the top.

Description: Test unilocular, triangular in shape but asymmetric; dorsal side convex, ending in sharp cone without knob but with a pore; wall calcareous, glassy and ornamented by depressions and knobs; some specimens have a reticulate surface caused by the depressions; basal part of dorsal side (1/5 till 1/3 of total height of test) very smooth, always covered by spaced and fine ridges converging towards the top; transition between dorsal and ventral part of test very sharp; ventral part flat or slightly concave, smooth and sometimes slightly striated, bearing in the centre a small circular aperture (0.02 - 0.04 mm); basal periphery rounded or oval.

Dimensions: see textfig. 2.



Textfig. 2: *C. variabilis* n.sp., size measurements on 50 tests from Kallo (KA 257).

Dimensions of the holotype: height of test 0.19 mm; diameter of test 0.20 mm; diameter of aperture 0.04 mm.

Remarks: *Conicarcella variabilis* n. sp. shows great variability in size (textfig. 2) and in ornamenations of the test. Some specimens have a reticulate surface and resemble closely *Y. campanula* (Le Calvez) but they differ from this species by the absence of a dorsal knob, the flat ventral side, the smooth basal part with ridges. *C. variabilis* n. sp. differs from *C. capitiformis* n. sp. by the form of the test which is more rounded in *C. capitiformis* n. sp., by the presence of the dorsal knob and the more convex ventral side in the last mentioned species. From the other Conicarcellidae as *C. oedelemensis* Keij, *C. glabra* (Szczechura) and *C. tongerenensis* Willems, *C. variabilis* differs by the smaller test, the lack of a dorsal knob, the lack of a basal ring around the test and the presence of ridges on the lower part of the text.

Some specimens (8 specimens from the KA 254 level) are much bigger than the common forms (textfig. 2) but they agree with the description given. A few specimens from the KA 248 and KA 250 level, ranging in the same dimensions as the common *C. variabilis* n. sp., have a more symmetric test.

Distribution: Sands of Mons-en-Pévèle at Kallo and Merelbeke.

Genus *Pseudarcella* Spandel 1909
emend. Lindenberg 1965

Pseudarcella rhumbleri Spandel
(pl. 1, fig. 5)

Pseudarcella rhumbleri Spandel, 1909; Le Calvez, 1959, p. 90, pl. 1, figs 12-14; Lindenberg, 1965, p. 20, figs. 1,2; Keij, 1969a, p. 6, fig. 2.

Remarks: About 70 specimens were found in three levels of the Clay of Ypres from the boring of Kallo, Belgium (table 1; textfig. 1). They are very well preserved and agree fairly well with the description and figures given by Lindenberg (1965) and Keij (1969a). One of our specimens is very transparent and shows a fine internal channel in the lateral tube. Our specimens are somewhat smaller than those described by Lindenberg (1965) (textfig. 3).

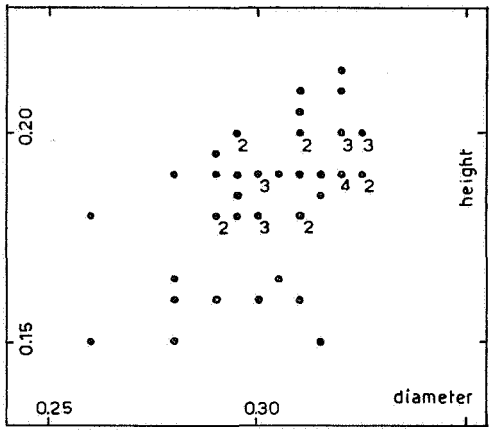
Distribution: Clay of Ypres at Kallo.

Pseudarcella trapeziformis n. sp.
(pl. 1, figs. 6-9; pl. 4, fig. 4)

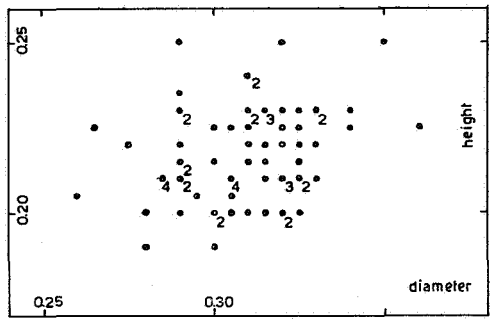
Type-locality: Kallo, Belgium (textfig. 1).

Type-level: Clay of Ypres at Kallo.

Holotype: specimen KA 315.90/56; stored at the Laboratorium voor Paleontologie, R.U.G.



Textfig. 3: *P. rhumbleri* SPANDEL, size measurements on 50 tests from Kallo (KA 292.50).



Textfig. 4: *P. trapeziformis* n.sp., size measurements on 72 tests from Kallo (KA 315.50).

Paratypes: about 100 specimens from different levels at Kallo (table 1); idem.

Diagnosis: Test smooth, trapezium shaped, top of test with lateral and small aperture; base with thick ring set off from dorsal side by groove.

Description: Test unilocular, generally trapezium shaped, sometimes bell or dome shaped; two specimens with a compressed dome shaped test were also found; dorsal side always convex except for bell shaped specimens which have concave lateral sides; wall smooth, covered with fine depressions and pits, no distinct perforations; dorsal side bearing at the top a lateral tube, with small aperture; sometimes the lateral tube is not completely developed and resembles a knob; dorsal side ornamented with radial striae around the lateral tube and extending over the upper dorsal test as fine grooves; ventral part of the test separated from dorsal part by a groove; ventral part consisting of an outer broad and thick ring bordered by a concave central plate, which is ornamented with fine radial striations and bearing in the centre a big round aperture; the diameter of the aperture varies between 0.06 and 0.12 mm with an average of 0.09 mm; basal periphery rounded or slightly oval.

Dimensions: textfig. 4.

Dimensions of holotype: height of test 0.21 mm; diameter of test 0.30 mm; diameter of aperture 0.09 mm.

Remarks: *Pseudarcella trapeziformis* n. sp. belongs to the genus *Pseudarcella* SPANDEL because of the smooth wall and the presence of the lateral tube. It differs from *P. rhumbleri* SPANDEL by the trapezium shaped test and by the localisation of the tube. In *P. rhumbleri* SPANDEL this tube is in the middle of the lateral wall while it is located at the end of the test in *P. trapeziformis* n. sp. Some dome shaped *P. trapeziformis* n. sp. specimens resemble closely elongate specimens of *P. rhumbleri* SPANDEL.

Distribution: Clay of Ypres at Kallo.

Genus *Tytthocorys* TAPPAN & LOEBLICH 1968

Tytthocorys sp.

(pl. 1, fig. 10)

Description: Test unilocular, cubic shaped, wall covered with slight depressions and knobs; dorsal part convex ending in short blunt aboral horn with pore and fine internal channel; basal part of dorsal side with high collar (0.03 mm); transition between dorsal and ventral part marked by sharp keel; ventral side flat and striated with the in centre a circular aperture.

Dimensions: height of test 0.175 mm; diameter of test 0.19 mm; aperture 0.05 mm.

Remarks: Our only *Tytthocorys* specimen differs from *Tytthocorys* TAPPAN & LOEBLICH by the flat ventral side.

Distribution: One species was met with in the KA 257 level in the Sands of Mons-en-Pévèle at Kallo.

Genus *Yvonniellina* TAPPAN & LOEBLICH 1968

Yvonniellina feugueuri (LE CALVEZ)

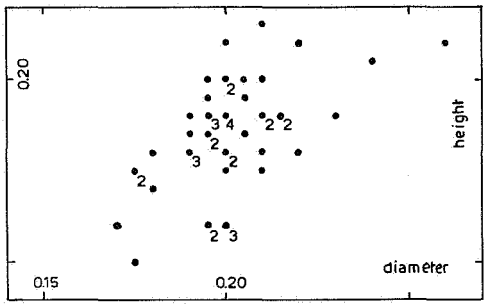
(pl. 2, figs. 1,2; pl. 4, fig. 5)

Pseudarcella feugueuri LE CALVEZ, 1959, p. 90, pl. 1, figs. 1,2.

Yvonniellina feugueuri (LE CALVEZ), TAPPAN & LOEBLICH, 1968, p. 1391, pl. 167, fig. 4.

Conicarcella feugueuri (LE CALVEZ), KEIJ, 1969a, p. 8, fig. 4.

Remarks: Specimens of *Y. feugueuri* (LE CALVEZ) were met with in different levels of the Clay of Ypres at Kallo (table 1). Our specimens resemble very well those described by LE CALVEZ (1959) in the shape of the test and the ornamentions. However they are much smaller (textfig. 5), as the diameter varies between 0.17 and 0.26 mm, with an average of 0.20 mm instead of 0.29 mm as in the specimens described by LE CALVEZ (1959). The height varies between 0.15 and 0.215 mm with an average of 0.185 mm (0.22 mm for the specimens of LE CALVEZ, 1959). The reticulate structure is sometimes difficult to observe and some specimens show a smooth test. The ventral side has a circular aperture but striations on the basal part are difficult to distinguish. Some specimens are covered by calcite overgrowths.



Textfig. 5: *Y. feugueuri* (LE CALVEZ), size measurements on 50 tests from Kallo (different levels)

Sections (pl. 2, fig. 2) of specimens of our *Y. feugueuri* (LE CALVEZ) show that these specimens possess a fine internal channel in the dorsal part of the test. That channel apparently ends in the dorsal knob but that dorsal knob is difficult to distinguish on the individuals studied.

Distribution: Clay of Ypres at Kallo.

Yvonniellina concava n. sp.

(pl. 2, fig. 3; pl. 4, fig. 6)

Type-locality: Kallo, Belgium (textfig. 1).

Type-level: Clay of Ypres at Kallo.

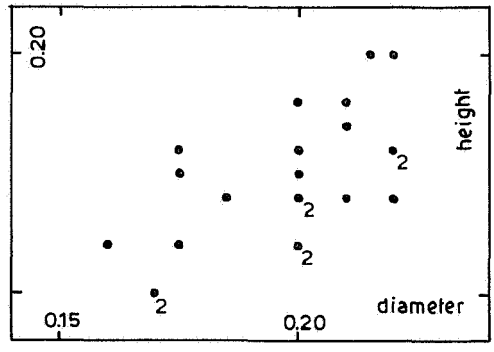
Holotype: specimen KA 318.50/16; stored at the Laboratorium voor Paleontologie, R.U.G.

Paratypes: about 20 specimens from different levels at Kallo (table 1); idem.

Diagnosis: Test unilocular, with concave lateral sides, dorsal part ending in a sharp dorsal point that is laterally oriented.

Description: Test unilocular, triangular in section, concave lateral sides; wall calcareous, glassy, ornamented by depressions and knobs having a polygonal form; no perforations are visible; lower part of dorsal side is a broad convex ring, strongly ornamented; dorsal side ending in sharp, glassy point, laterally oriented and provided with a dorsal pore; transition between dorsal and ventral side marked by a slight keel; basal periphery rounded or slightly oval; ventral side with convex outer part and concave inner part bearing in the centre a small circular aperture (diameter varies between 0.02 and 0.03 mm); ventral side, especially inner part, having fine radial striae.

Dimensions: textfig. 6.



Textfig. 6: *Y. concava* n.sp., size measurements on 22 tests from Kallo (all levels).

Dimensions of holotype: height of test 0.20 mm; diameter of test 0.215 mm; diameter of aperture 0.03 mm.

Remarks: *Y. concava* n. sp. is easily to distinguish from *Y. feugueuri* (LE CALVEZ) by the shape of the test and the morphology of the ventral part of the test.

Distribution: Clay of Ypres at Kallo.

Yvonniellina dimidiaglobosa n. sp.
(pl. 2, figs. 4,5; pl. 4, fig. 7)

Type-locality: Kallo, Belgium (textfig. 1).

Type-level: Clay of Ypres at Kallo.

Holotype: specimen KA 297/33; stored at the Laboratorium voor Paleontologie, R.U.G.

Paratypes: 6 specimens from two levels of the Clay of Ypres at Kallo (table 1); idem.

Diagnosis: Test unilocular, half sphere shaped, ending in laterally oriented dorsal knob; ventral part concave.

Description: Test half sphere shaped, wall calcareous, glassy, covered by depressions and knobs showing a polygonal pattern; no perforations; dorsal part convex, ending in glassy knob, laterally oriented and provided with a dorsal pore; ventral side concave, smooth, sometimes striated and bearing in the centre a small circular aperture (0.02 - 0.03 mm).

Dimensions: dimensions of the holotype: height of test 0.15 mm; diameter of test 0.19 mm; diameter of aperture 0.02 mm.

Dimensions of paratypes (in mm):

nr. specimen		height	diameter
KA 294.50/16		0.17	0.195
KA 297	34	0.15	0.175
	36	0.13	0.195
	38	0.15	0.19
	39	0.14	0.17
	40	0.13	0.19

Remarks: *Y. dimidiaglobosa* n. sp. can be easily distinguished from other *Yvonniellina* species by the shape of the test and by the concave ventral part.

Distribution: Clay of Ypres at Kallo.

Genus *Spinarcella* KEIJ 1969

Spinarcella crenella KEIJ
(pl. 2, fig. 6; pl. 5, fig. 1)

Spinarcella crenella KEIJ, 1969a, p. 11, figs. 13-15.

Remarks: In the samples of the auger boring by T. MOORKENS at Oedelem (textfig. 1) about 30 well preserved specimens of this species were found. They resemble very well the figures given in KEIJ (1969a) and agree with the description given by the same author. In our specimens the dorsal spine is often broken; the length of the remaining spine part varies between 0.04 and 0.08 mm and never reaches 0.10 mm as stated by KEIJ (1969a). The total length (spine or remuant of spine included) of our specimens varies between 0.24 and 0.29 mm. The basal diameter of our specimens varies between 0.20 and 0.22 mm and the diameter of the aperture from 0.04 till 0.07 mm.

Distribution: Clay of Asse at Oedelem.

Spinarcella batiformis KEIJ
(pl. 2, fig. 7; pl. 5, fig. 2)

Spinarcella batiformis KEIJ, 1969a, p. 12, figs. 16,17.

Remarks: About 30 specimens belonging to this species were encountered in the samples also containing *S. crenella* KEIJ. They are well preserved and agree fairly well with the description and figures given by KEIJ (1969a). The distinction between *S. crenella* KEIJ and *S. batiformis* KEIJ is generally clear. Most specimens have a broken dorsal spine but a few specimens have still a complete spine which varies in length (0.10 till 0.15 mm). It shows an internal fine channel ending in a dorsal pore. The height of the test (spine or remuant of spine included) varies between 0.27 till 0.32 mm; the diameter between 0.16 and 0.21 mm; the diameter of the aperture between 0.03 and 0.06 mm.

Distribution: Clay of Asse at Oedelem.

Spinarcella guttiformis n. sp.
(pl. 2, figs. 8-10; pl. 5, fig. 3)

Type-locality: Outcrop near the "Ringvaart" at Merelbeke, near Gent, Belgium (textfig. 1).

Type-level: Sands of Mons-en-Pévèle at Merelbeke.

Holotype: specimen ME 3/5; stored at the Laboratorium voor Paleontologie, R.U.G.

Paratypes: 6 specimens from the Sands of Mons-en-Pévèle at Merelbeke (ME 3 level) and 6 specimens from the Sands of Mons-en-Pévèle at Kallo (KA 257 level); idem.

Diagnosis: Elongated test, ornamented with big round knobs, ventral aperture with smooth rim and sitting on raised collar; dorsal side ending in a small spine with a pore.

Description: Test drop-shaped, elongated; wall calcareous, translucid, ornamented with big round knobs mostly well developed but sometimes obsolete giving the dorsal test a smooth aspect; section round; wall is relatively thick; dorsal side with small glassy smooth spine, straight or slightly curved, showing a fine internal channel ending in the dorsal pore; mostly the dorsal spine is broken; ventral aperture is round with smooth rim and sitting on a short raised collar; aperture variable in diameter and surrounding ringlike rim.

Dimensions: Holotype: height of test 0.26 mm; diameter of test 0.16 mm; length of dorsal spine 0.05 mm; diameter of aperture 0.025 mm.

The height varies between 0.21 and 0.27 mm with an average of 0.255 mm; the diameter of the test varies between 0.15 and 0.19 mm with an average of 0.175 mm; the length of the spine is 0.05 mm for three tests with complete spine; the aperture varies between 0.02 and 0.03 mm.

Remarks: *S. guttiformis* n. sp. can be easily distinguished from *S. crenella* KEIJ and *S. batiformis* KEIJ by the more elongated test, the smaller dorsal spine, the rounded knobs and the aspect of the ventral aperture. *S. guttiformis* n. sp. resembles more *S. batiformis* KEIJ than *S. crenella* KEIJ.

Distribution: Sands of Mons-en-Pévèle at Kallo and Merelbeke.

INCERTAE SEDIS

Genus *Voorthuyseniella* SZCZECHURA 1969

Voorthuyseniella gracilis KEIJ

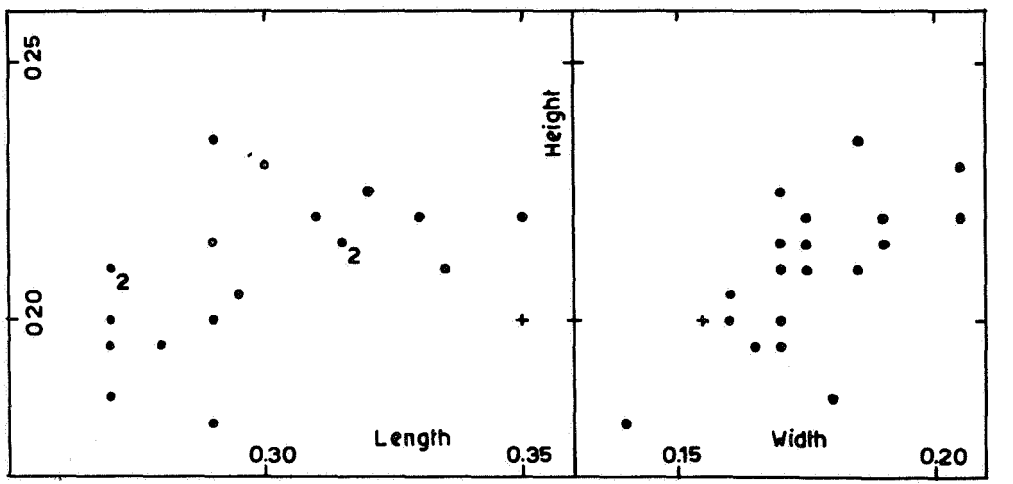
(pl. 3, figs. 1,2)

Voorthuyseniella gracilis KEIJ, 1970, p. 485, pl. 2, figs. 1-8.

Remarks: About 20 specimens were found in different levels of the upper part of the Clay of Ypres at Kallo. One specimen was also found in the Clay of Asse at Oedelem. All this material agrees fairly well with the description and the figures given by KEIJ (1970).

Dimensions: textfig. 7.

Distribution: Clay of Asse at Oedelem
Clay of Ypres at Kallo



Textfig. 7: *V. gracilis* KEIJ, size measurements on 20 tests from Kallo (.) and Oedelem (+).

Genus *Calvina* n. g.

Type-species: *Calvina kalloensis* n. sp.

Diagnosis: Test triangular in shape with one obtuse angle and bearing a small pore; test subdevided internally in four chambers; every chamber bearing a large aperture; wall consisting of radial calcite.

Remarks: *Calvina* n. g. resembles *Triangulina* QUILTY in shape but the arrangement of the chambers and the presence of an aperture in every chamber indicate a generic difference.

Calvina kalloensis n. sp.
(pl. 3, figs. 3,4; pl. 5, figs. 4,5)

Type-locality: Kallo, Belgium (textfig. 1).

Type-level: Clay of Ypres at Kallo.

Holotype: specimen KA 323.50/1; stored at the Laboratorium voor Paleontologie, R.U.G.

Paratypes: About 30 specimens from the same level; idem.

Diagnosis: Test triangular in shape, nearly equilateral with two relatively sharp basal angles and a more blunt top, bearing a small pore; test divided externally by flush sutures and internally by septa into four chambers all bearing a big oval aperture.

Description: Test triangular in shape, nearly equilateral (the difference between the three sides is not more than 0.05 mm), sometimes the base is smaller, sometimes longer than the other sides; the angles are approximately 60°; test convex except near the angles where it becomes concave; wall translucent, smooth, covered with depressions of which it is difficult to identify their character; some depressions are probably caused by boring microorganisms (pl. 5, figs. 4a, 5a) because of their irregular shape and dispersion; smaller openings of regular shape are sometimes visible (pl. 5, fig. 5b) and may be perforations.

Sutures flush, but well visible, straight or curved; sutures devide the test in four chambers: a basal chamber, a top chamber and two lateral chambers; every chamber is visible on both sides of the test; the two lateral chambers are identical, the top chamber is smaller, the basal chamber is bigger than the two lateral chambers; the lateral chambers are ellipsoid, the basal and top chamber are polygonal; the greater part of the lateral chambers is situated at the back side; the projection of the longest axis of the lateral chambers on the basal plane forms an angle with the longest axis of the basal face; the top angle shows a fine internal channel ending in a small circular aperture. In every chamber one big aperture is visible (length varies between 0.04 and 0.09 mm); the top chamber has an aperture at the frontside but for all other chambers the aperture is visible from front and back side; the area around the aperture is covered by fine grooves. The apertures are oval but one end is more angular than the other.

In the top chamber a fine groove may sometimes be visible at the sharper angle of the aperture; this groove is running to the apex but mostly it splits into two grooves bordering the area bearing the pore. The lateral apertures are parallel to the longest axis of the lateral chambers. Internal septa have the same arrangement as the external sutures but are thinner than the wall of the test; furthermore they are covered with fine depressions (perforations?) and are bilamellar i.e. each lamella belongs to one chamber only; no trace of distinct proloculus can been seen.

Dimensions: textfig. 8.

Holotype: length of basal side 0.59 mm; height (from base to apex) 0.54 mm; width (from back to front side) 0.34 mm.

Remarks: All specimens of *C. kalloensis* n. sp. are very similar except for the dimensions (textfig. 8). No specimens were encountered at other levels than level 323.50 of the Clay of Ypres.

Distribution: Clay of Ypres at Kallo.

ACKNOWLEDGMENTS

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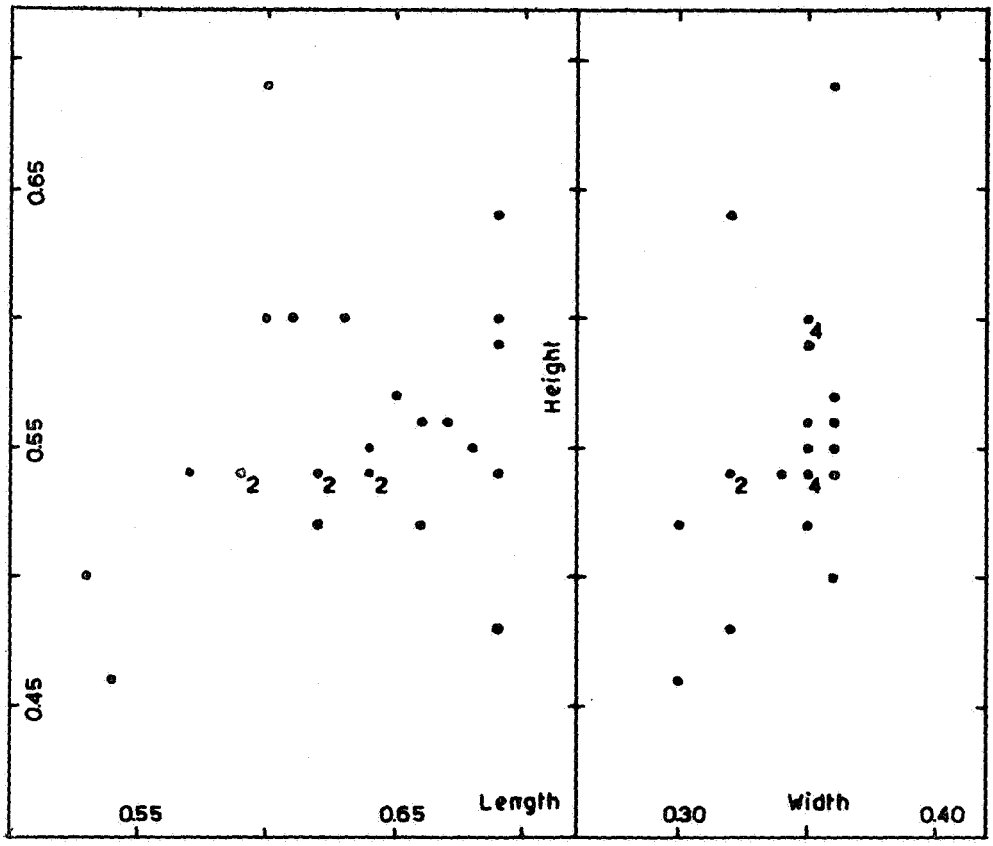

Textfig. 8: *C. kalloensis* n.sp., size measurements on 25 tests from Kallo (KA 323.50).

versiteit Gent) allowed us to use the scanning beam electron microscope. The practical work of photographing the specimens was done by Mr. A. Bielen. Part of this study was done under the auspices of the I.R.S.I.A.

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Laboratorium voor Paleontologie, Rijksuniversiteit Gent.

Université Nationale du Congo, Campus universitaire de Kinshasa, Département de Géologie, Kinshasa XI.

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PLATES

Note: The numbers of the photographs refer to the catalogue of negatives at the "Laboratorium voor Electronenmicroscopie", Rijksuniversiteit Gent.

PLATE 1

Fig. 1: *C. capitiformis* n.sp., holotype, specimen KA 301.50/54; a, lateral side; b, ventral side (×200).
Fig. 2: *C. capitiformis* n.sp., paratype, specimen KA 301.50/46; oblique section (× 200).
Fig. 3: *C. variabilis* n.sp., holotype, specimen KA 257/25; a, lateral side; b, ventral side (× 200).
Fig. 4: *C. variabilis* n.sp., paratype, specimen KA 254.50/16; oblique section (× 200).
Fig. 5: *P. rhumbleri* SPANDEL, specimen KA 292.50/1; a, lateral side; b, ventral side (× 116).
Fig. 6: *P. trapeziformis* n.sp., holotype, specimen KA 315.90/56; a, lateral side; b, ventral side (×116).
Fig. 7: *P. trapeziformis* n.sp., paratype, specimen KA 330.50/13; lateral side (× 116).
Fig. 8: *P. trapeziformis* n.sp., paratype, specimen KA 330.50/5; lateral side (× 116).
Fig. 9: *P. trapeziformis* n.sp., paratype, specimen KA 330.50/31; oblique section (× 116).
Fig. 10: *Tytthocorys* sp., specimen KA 257; a, lateral side; b, ventral side (× 200).

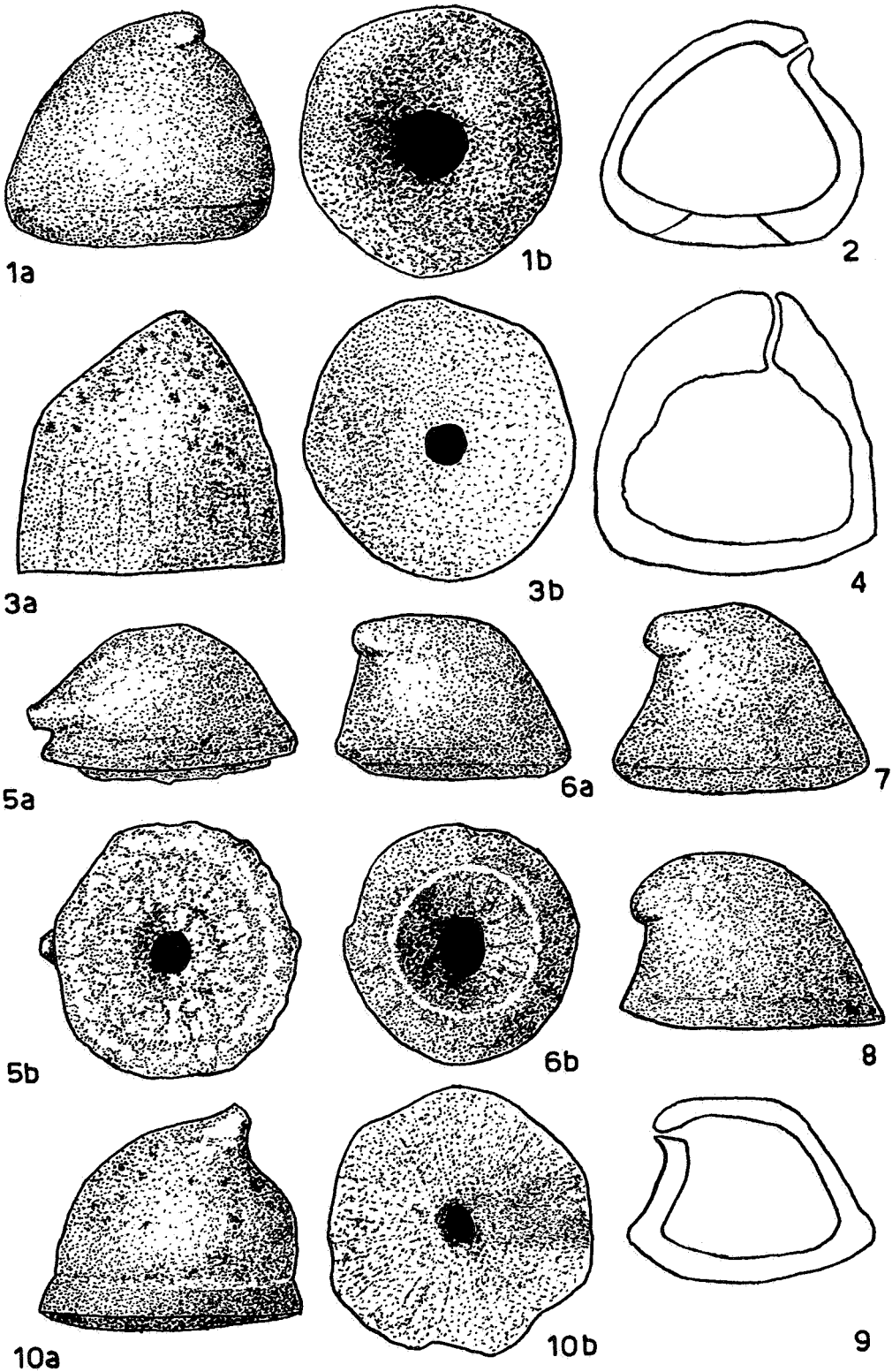
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PLATE 2

Fig. 1: *Y. feugueuri* (LE CALVEZ), specimen KA 321/24; lateral side (× 200).
Fig. 2: *Y. feugueuri* (LE CALVEZ), specimen KA 312.50/57; section (× 200).
Fig. 3: *Y. concava* n.sp., holotype, specimen KA 318.50/16; a, lateral side; b, ventral side (× 200).
Fig. 4: *Y. dimidiaglobosa* n.sp., paratype, specimen KA 297/39; section (× 200).
Fig. 5: *Y. dimidiaglobosa* n.sp., holotype, specimen KA 297/33; a, lateral side; b, ventral side (× 200).
Fig. 6: *S. crenella* KEIJ, topotype, specimen OE 2.60/23; a, lateral side; b, ventral side (× 120).
Fig. 7: *S. batiformis* KEIJ, topotype, specimen OE 2.70/41; a, lateral side; b, ventral side (× 120).
Fig. 8: *S. guttiformis* n.sp., holotype, specimen ME 3/5; a, lateral side; b, ventral side (× 160).
Fig. 9: *S. guttiformis* n.sp., paratype, specimen ME 3/3; a, lateral side; b, ventral side (× 160).
Fig. 10: *S. guttiformis* n.sp., paratype, specimen ME 3/8; section (× 160).

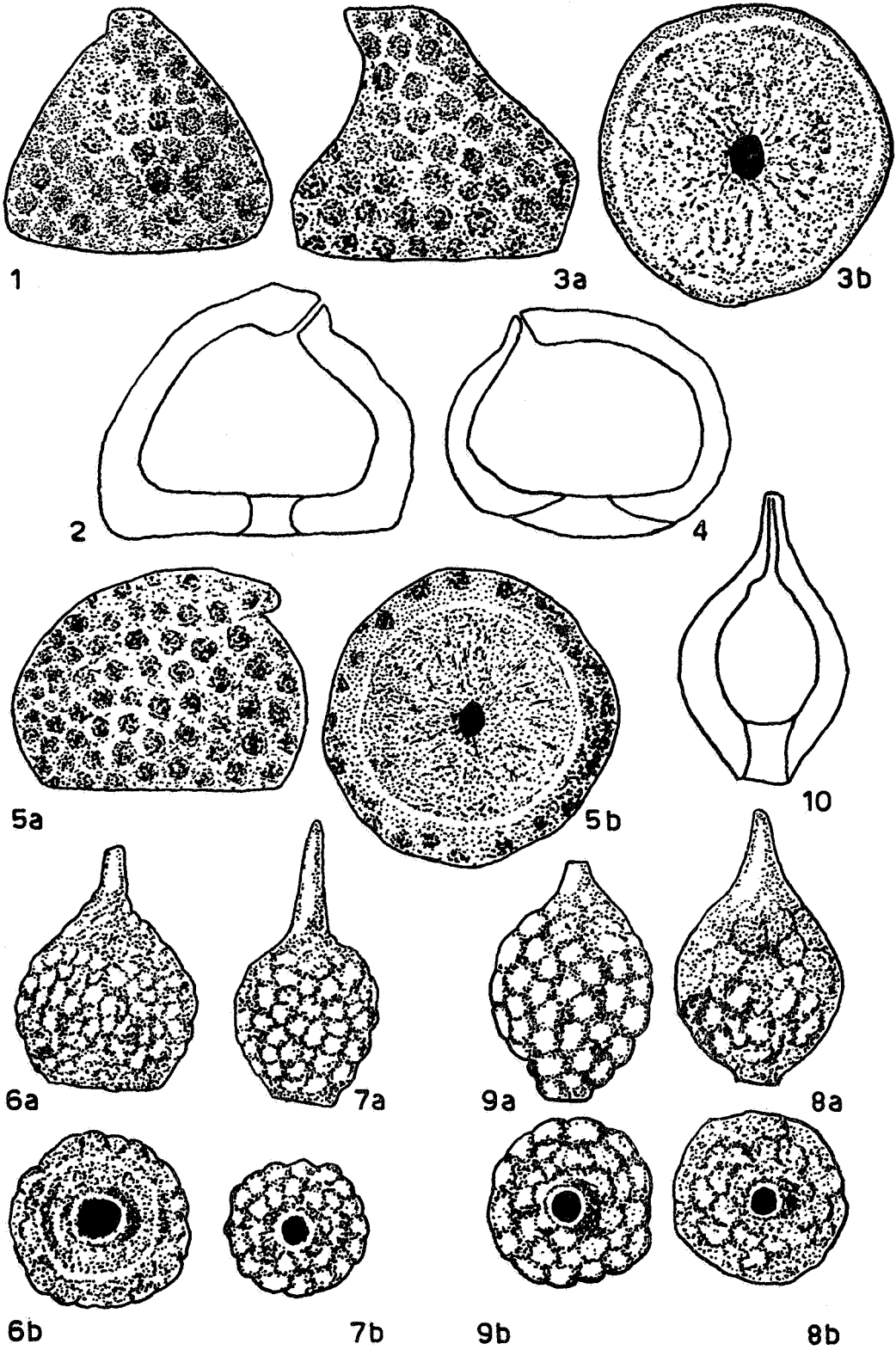
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PLATE 3

Fig. 1: *V. gracilis* KEIJ, topotype, specimen OE 2.70/46; dorsal (a), lateral (b), ventral (c) and end views (d, e,) of test (× 160).

Fig. 2: *V. gracilis* KEIJ, specimen, KA 266/1; dorsal (a), lateral (b) and ventral (c) views of test (× 160).

Fig. 3: *C. kalloensis* n.sp., holotype, specimen KA 323.50/1; a, front side; b, back side (× 80).

Fig. 4: *C. kalloensis* n.sp., paratype, specimen KA 323.50/39; section (× 80).

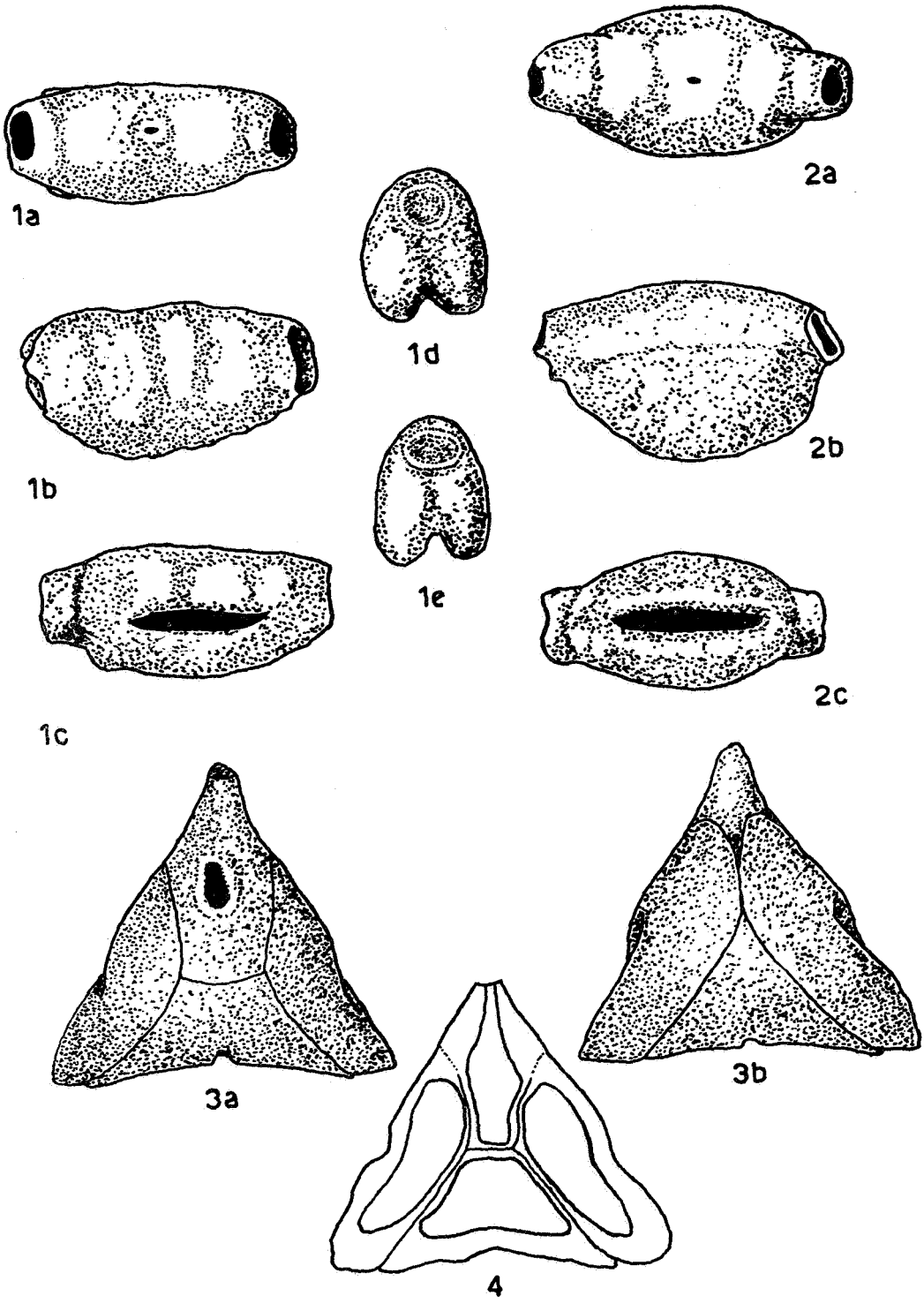
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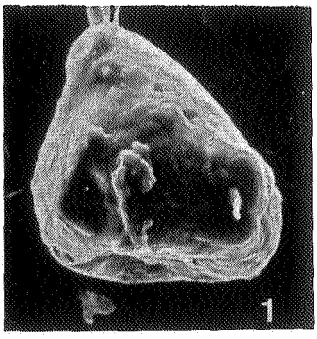
PLATE 4

Fig. 1: *C. capitiformis* n.sp., paratype, specimen KA 301.50/49; lateral side, ph. 14755 (× 200).
Fig. 2: *C. variabilis* n.sp., paratype, specimen KA 257/9; lateral side, ph. 14756 (× 200).
Fig. 3: *C. variabilis* n.sp., paratype, specimen KA 257/10; a, lateral side, ph. 14758 (× 200); b, ventral side, ph. 14757 (× 1000).
Fig. 4: *P. trapeziformis* n.sp., paratype, specimen KA 330.50/29; a, lateral side, ph. 14763 (× 150); b, dorsal side (pore), ph. 14764 (× 500).
Fig. 5: *Y. feugueuri* (Le Calvez), specimen KA 323.50/54, lateral side, ph. 14765 (× 200).
Fig. 6: *Y. concava* n.sp., paratype, specimen KA 318.50/17; lateral side, ph. 14768 (× 200).
Fig. 7: *Y. dimidiaglobosa* n.sp., paratype, specimen KA 297/38, lateral side, ph. 14767 (× 200).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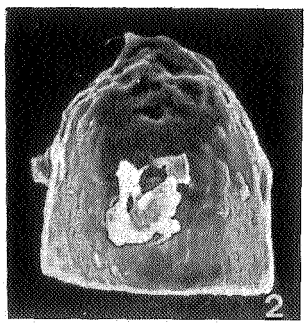
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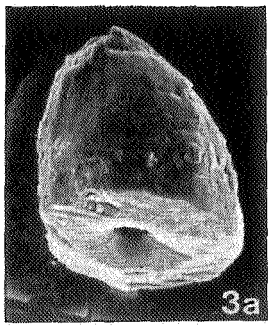
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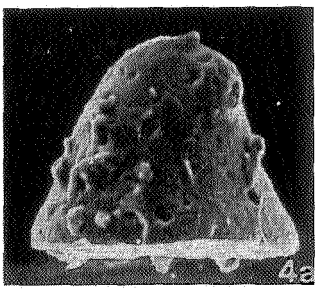
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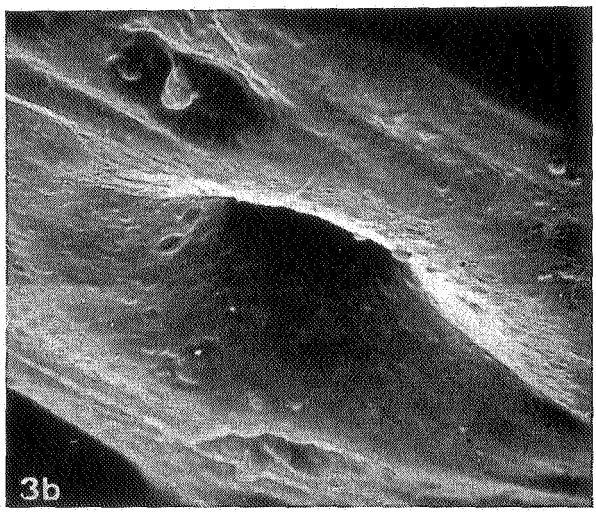
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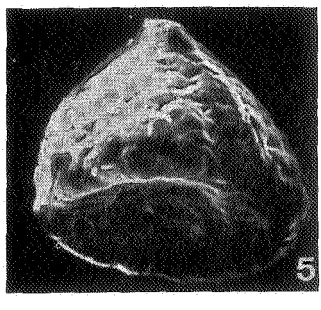
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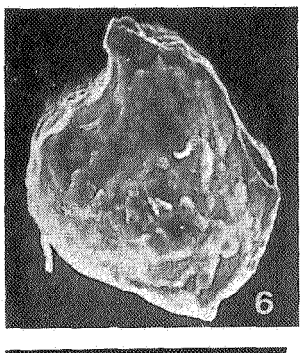
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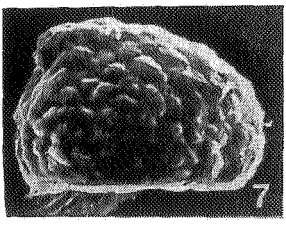
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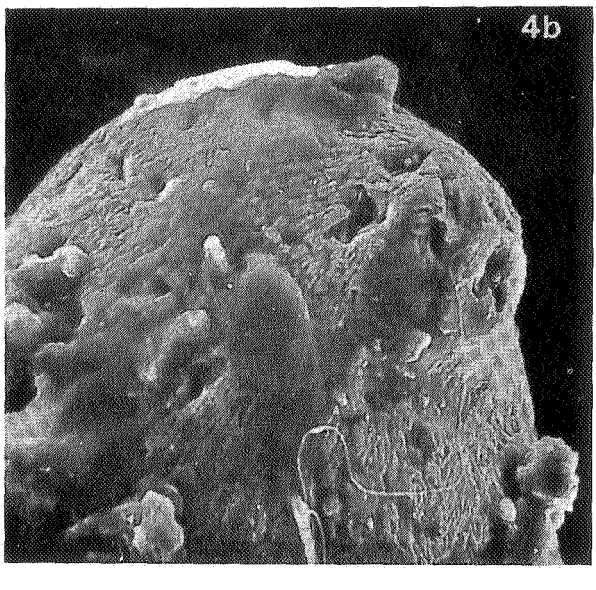
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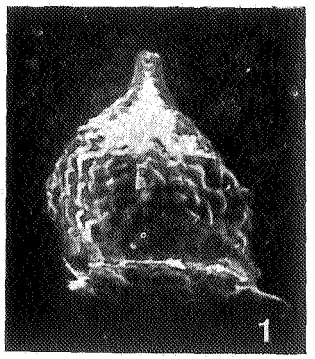
PLATE 5

Fig. 1: *S. crenella* KEIJ, topotype, specimen OE 2.60/19, lateral side, ph. 14769 (× 155).
Fig. 2: *S. batiformis* KEIJ, topotype, specimen OE 2.60/46, lateral side, ph. 14770 (× 155).
Fig. 3: *S. guttiformis* n.sp., paratype, specimen ME 3/2; a, lateral side, ph. 14771 (× 220).
Fig. 4: *C. kalloensis* n.sp., paratype, specimen KA 393.50/14; a, front side, ph. 8391 (× 100); b, lateral side, ph. 8322 (× 100).
Fig. 5: *C. kalloensis* n.sp., paratype, specimen KA 323.50/15; a, front side, ph. 8324 (× 100); b, aperture in top zone, ph. 8324 (× 500).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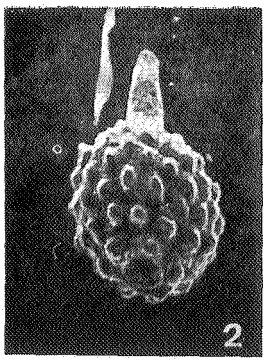
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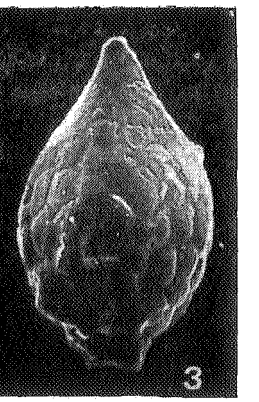
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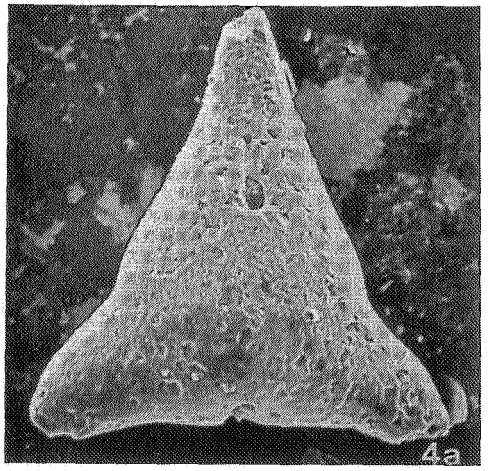
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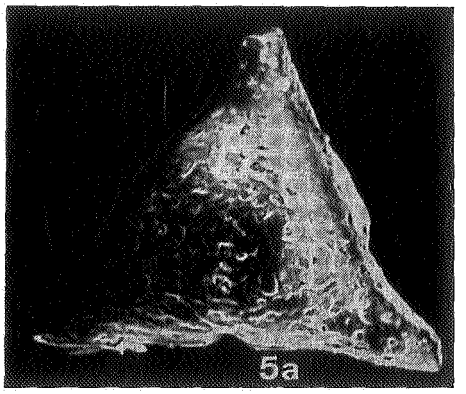
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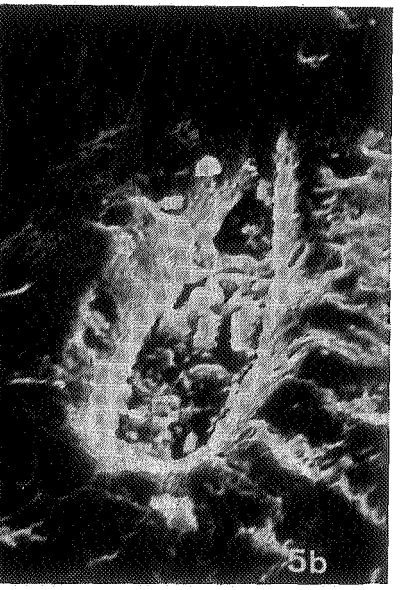
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