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Kingenella pseudohebertiana (PERON, 1894), a widely distributed Maastrichtian species

by Eric SIMON

Résumé

Des spécimens belges de *Terebratula pseudohebertiana* PERON, 1894 ont été étudiés et comparés à des spécimens polonais de *Kingenella kongieli* POPIEL-BARCZYK, 1968 d'une part et à des spécimens ukrainiens de *Kingenella nilssoni* (LUNDGREN, 1885) d'autre part. Il ressort de cette étude que ces trois espèces appartiennent au genre *Kingenella* POPIEL-BARCZYK, 1968. Il est également établi que l'on ne peut reconnaître pour ces trois brachiopodes qu' une seule espèce, les autres dénominations devenant synonymes. L'espèce valide est *Kingenella pseudohebertiana* (PERON, 1894). De plus, cette étude a permis de démontrer que *Magas nilssoni* LUNDGREN, 1885 n'est ni un *Kingenella* ni un *Magas* et qu'un nouveau genre devrait être décrit pour ce brachiopode lorsqu'un matériel suffisant sera disponible.

Mots-clefs: Brachiopodes, Terebratellidae, Crétacé, Maastrichtien, Europe.

Abstract

A study of the Belgian specimens of *Terebratula pseudohebertiana* PERON, 1894 was made in comparison with Polish specimens of *Kingenella kongieli* POPIEL-BARCZYK, 1968 and with Ukrainian specimens of *Kingenella nilssoni* (LUNDGREN, 1885). It is demonstrated that all these species fit in with the described genus *Kingenella* POPIEL-BARCZYK, 1968. It was also shown that no significant differences are visible between these species: only one species must be considered. The valid determination is *Kingenella pseudohebertiana* (PERON, 1894). This study indicates that *Magas nilssoni* LUNDGREN, 1885 is not a *Kingenella* or a *Magas* species. A new genus must be described for this brachiopod when more material becomes available.

Key-words: Brachiopods, Terebratellidae, Cretaceous, Maastrichtian, Europe.

Introduction

The genus *Kingenella* POPIEL-BARCZYK, 1968 (Family: Terebratellidae), originally concerns two different Upper Maastrichtian Polish species. The first one, *Kingenella kongieli* POPIEL-BARCZYK, 1968, from the Middle Vistula valley, is the type species of the genus *Kingenella*.

The second one, *Kingenella sp.*, which is not considered in the present paper, is a larger species from Nasiłow which is only represented by three specimens and a brachial valve. To improve the knowledge of this second species more material is needed.

Kingenella kongieli is a brachiopod which looks externally like a *Kingena lima* (DEFRANCE, 1828) but which is devoid of granules or pustules covering the shell surface. Moreover, *Kingenella kongieli* specimens show, internally, a typical terebratelliform loop completely different from the well known brachidium of *Kingena* DAVIDSON, 1852.

In *Kingenella*, outer and inner hinge plates are fused together forming a single platform attached on a median septum. Respectively, outer and inner hinge plates territories of this platform are separated by the bases of the crura.

No dental plates are observed in the ventral valve of *Kingenella* whereas dental plates are present in the species of the genus *Kingena*. Lower Maastrichtian brachiopods from Ciply (Province du Hainaut, Belgium) which are very similar to *Kingenella kongieli* were observed by myself in the collections of the Institut royal des Sciences naturelles de Belgique in Brussels.

As it will be seen in the systematic section of this paper, these brachiopods are obviously *Kingenella* specimens. However, this Belgian material was partly determined as *Terebratula Hebertiana* D'ORBIGNY, 1847 by CORNET (1874) [= *Kingena pentagulata* WOODWARD, 1833] and another part of this material was still undetermined.

PERON (1894) published a paper dealing with the Terebratulid brachiopods from Ciply in which an exhaustive description of these specimens similar to *Kingenella kongieli* was given. PERON already contested the opinion of CORNET and he stressed the absence of pustules on the shell surface. For this material, he described a new species called *Terebratula (Kingena) pseudohebertiana*.

In the Ukraine, KATZ (1974) described and illustrated a Lower Maastrichtian *Kingenella* from the Don Basin which was determined as *Kingenella nilssoni* (LUNDGREN, 1885). KATZ (1974) considered that the Ukrainian material was similar to *Magas nilssoni* LUNDGREN, 1885 which is a brachiopod from a Maastrichtian glauconitic chalk at Oppmanna (Sweden). Probably, KATZ did not observe the original *Magas nilssoni* and his opinion was only supported by a comparison between his material and the short description (the illustrations consisting of a

complete specimen and a broken dorsal valve) given by LUNDGREN. But POPIEL-BARCZYK, who had the opportunity to see this material from Ukraine in 1965, immediately pointed out that these specimens labelled as *Pseudomagas nilssoni* (LUNDGREN) were very similar to the Polish *Kingenella kongieli* [personal communication].

The result from these previous works is that a comparison between *Kingenella kongieli* POPIEL-BARCZYK, 1968 *Terebratula (Kingena) pseudohebertiana* PERON 1894, *Kingenella nilssoni* (LUNDGREN,1885) and *Magas nilssoni* LUNDGREN,1885 is necessary to find out if a revision within the genus *Kingenella* is needed or not.

Belgian material from Ciply, Polish material from the middle Vistula river valley and Ukrainian material from the Don Basin were studied.

Moreover, the original material of LUNDGREN (1885) consisting of a complete specimen and a dorsal valve of *Magas nilssoni* LUNDGREN,1885 were also studied.

These observations lead to the necessity of a revision inside the genus *Kingenella* and the present paper establish clearly the similarity between *Terebratula (Kingena) pseudohebertiana* PERON, *Kingenella kongieli* POPIEL-BARCZYK and *Kingenella nilssoni* LUNDGREN. Under this a point of view, only the species "*pseudohebertiana*" PERON (1894) remains valid, the other denominations being considered as synonyms. As a consequence, *Kingenella pseudohebertiana* (PERON) is therefore very widely distributed in Europe occurring in Belgium, Poland and the Ukraine.

Moreover, comments on the palaeoecology and on the stratigraphical use of this species are presented.

The relations between the Swedish *Magas nilssoni* and the genus *Kingenella* are also analysed in the following pages.

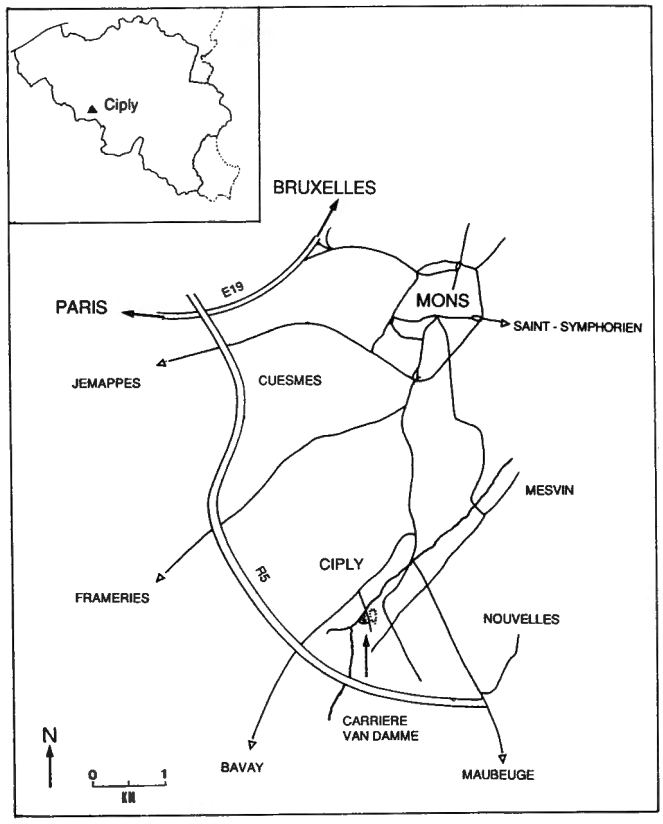

Fig. 1 — Map showing the localities in the Mons Basin where phosphatic chalk (upper part of the lower Lower Maastrichtian) is found.

Methods applied to the Belgian material

Most of the Belgian material corresponding to PERON's species *Terebratula (Kingena) pseudohebertiana* and used in this study are preserved in the collections of the Institut royal des Sciences naturelles de Belgique mainly among undetermined brachiopods.

A total of 148 pieces were recognized and among these only 8 specimens are labelled *Terebratula Hebertiana* D'ORBIGNY 1847.

Two adult specimens were found at Ciply in the Van Damme quarry (Fig. 1) which is the only available place for prospecting phosphatic chalk in this region.

The whole collection concerned was collected in the phosphatic chalk of Ciply (Mons Basin, Hainaut, Belgium) which is of Lower Maastrichtian age, *Belemnella obtusa* Zone (upper part of the lower Lower Maastrichtian) as proposed by ROBASZYNSKI & CHRISTENSEN (1989). The localities are Ciply, Mesvin and Spiennes. A map of this region is drawn on Fig.1.

The state of preservation is quite good and 82 intact specimens were measured (Fig. 2) for their length, width, thickness, the length of their dorsal valve, the length of

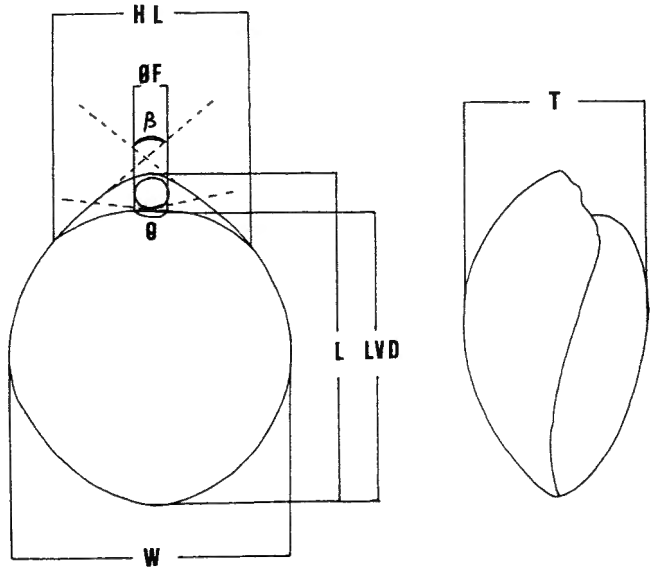

Fig. 2 — Schematic view of a *Kingenella* showing the morphological characteristics measured in this paper (in mm). L = length, LDV = length of the dorsal valve, W = width, HL = width of the hinge line, ØF = diameter of the foramen, T = thickness. ß = apical angle (in °). θ = hinge sides angle (in).

Table 1 — *Kingenella pseudohebertiana* (PERON, 1894). - Morphological characters measured on 82 specimens collected in Ciply, Hainaut, Belgium. The length, the width, the thickness, the length of the dorsal valve, the width of the hinge line, the diameter of the foramen, the apical angle (ß) and the hinge sides angle (θ) are measured.

	Length (mm)	Width (mm)	Thickness (mm)	Length DV (mm)	Hinge length (mm)	Ø foramen (mm)	β (°)	θ (°)
Maximum	25.8	21.4	15.9	23.1	11.8	3.9	116	156
Minimum	10.2	9.7	5.4	9.1	4.0	1.3	74	129
Mean	17.3	14.4	9.7	15.5	6.8	2.3	94.5	143.1
St. Deviation	3.328	2.563	2.193	3.089	1.491	2.023	7.790	7.250
Stand. Err. ±	0.368	0.283	0.242	0.341	0.165	0.223	0.86	0.801

their hinge line, the diameter of their foramen, their apical angle (ß) and hinge angle (θ). The results are indicated in Table 1.

Serial transverse sections were made and each section obtained was photographed and then redrawn. The density of punctae per mm^2 was also determined.

Attention was given as to the presence of spicules.

THE BELGIAN MATERIAL PRESERVED IN PARIS

The collection of PERON (1894) is preserved at the "Muséum national d'Histoire naturelle" in Paris. Eighteen specimens (reference: M.N.H.N. - L.P. S.09899) of *Terebratula (Kingena) pseudohebertiana* from this collection and two specimens figured by PERON in his paper (reference: M.N.H.N. - L.P. S.09918) were observed. This allows me to designate the lectotype for this species. Two additional specimens (reference: M.N.H.N. - L.P. B.18011) from the collection DE MORGAN found in.Ciply were also studied.

THE POLISH MATERIAL

It consists of 109 specimens of *Kingenella kongieli* described by POPIEL-BARCZYK in 1968 (MZ VIII Bra 411; 566-569; 891-894) from Nasiłow, Bochotnica and Puławy in the middle Vistula river valley where these *K. kongieli* were discovered.

A map of the Polish places cited in this paper is drawn in POPIEL-BARCZYK (1968, fig. 1 p. 5). Most of these specimens have been collected from a hard limestone (local horizon "y"). Only 8 specimens were found in the phosphorite layer (local horizon "z"). Following the opinions of POŻARYSKI (1938), BŁASZKIEWICZ (1980) and MACHALSKI & WALASZCZYK (1987) these local horizons are from the Upper Maastrichtian age.

THE UKRAINIAN MATERIAL

A collection of 225 specimens labelled *Kingenella nilssoni* and described by KATZ in 1974 are preserved in the Department of Geology of the University of Kharkov (n° 7094). They were collected from the Don Basin (South-East Ukraine) in a calcareous and glauconitic sand. KATZ (1974) considered this deposit to be of Lower Maastrichtian age from the *Belemnella lanceolata* Zone.

Although the matrix filling the shells is composed of a coarse sand, the specimens are well preserved and the structure of the loop is often visible. Some specimens dissected by KATZ show very well preserved spicules.

The taxonomy here follows the Treatise on Invertebrate Palaeontology, volume H, Brachiopoda (MUIR-WOOD, STEHLI, ELLIOTT & HATAI in MOORE, 1965) whereas the terminology of WILLIAMS & ROWELL (1965) was followed. The synonymy list is presented following the recommendations of MATTHEWS (1973).

Systematic description

Phylum Brachiopoda DUMERIL, 1806
Class Articulata HUXLEY, 1869
Order Terebratulida WAAGEN, 1883
Suborder Terebratellidina MUIR-WOOD, 1955
Superfamily Terebratellacea KING, 1850
Family TEREBRATELLIDAE KING, 1850
Genus *Kingenella* POPIEL-BARCZYK, 1968

Type species *Kingenella kongieli* POPIEL-BARCZYK, 1968

ORIGINAL DIAGNOSIS OF THE GENUS
[in POPIEL-BARCZYK, 1968 p. 73]

"Shells biconvex, round or transversely oval in outline, with smooth or slightly capillate surface, without granulation. Dorsal septum reaches a length, equalling more than a half of the brachial valve length. Deltidial plates not fused together. Hinge teeth devoid of dental plates. Cardinal process vestigial. In adult specimens, loop reaches a "terebratelliform" stage. Spicules present."

ADDITIONAL COMMENTS

The genus *Kingenella* was established to avoid confusion with brachiopods of the genus *Kingena* DAVIDSON, 1852. POPIEL-BARCZYK (1968) noted the lack of pustules on the shell surface and stressed the higher density of punctae per square mm in *Kingenella* which was quoted as from 150 to 300. In the genus *Kingena* the density of punctae is lower (between 40 to 70 per sq. mm).

The specimens of *Terebratula (Kingena) pseudohebertiana* PERON, 1894 from the Ciply area in Belgium and the specimens of *Kingenella nilssoni* (LUNDGREN,1885) described by KATZ, 1974 from the Don Basin in Ukraine fit the original diagnosis of the genus *Kingenella*.

All the typical external and internal characters of the genus are observed in the Belgian and the Ukrainian material. The only slight difference observed concerns the general outline of the shell. Many Belgian specimens and some Ukrainian ones are not round or transversely oval as indicated in the original diagnosis. They are elongated and longitudinally oval or even subpentagonal. This is due to the fact that the Polish *Kingenella kongieli* are young adults whereas in Belgium fully adult and even gerontic specimens are commonly encountered. It can be concluded that the Belgian and the Ukrainian material presented in this paper are typical *Kingenella* specimens.

The determination *Terebratula (Kingena) pseudohebertiana* PERON, 1894 can thus be revised to become: *Kingenella pseudohebertiana* (PERON, 1894).

RESULTS OBTAINED WITH THE BELGIAN MATERIAL

Kingenella pseudohebertiana (PERON, 1894).
Plate 1, Fig. 1-6, Plate 2, Fig. 1-4 and Plate 3, Fig. 6-7

v	1874	*Terebratula Hebertiana* d'Orb. - CORNET, p. 576.
v *	1894	*Terebratula (Kingena) pseudohebertiana* - PERON, p. 14, pl.V, fig. 16 - 22.
v	1935	*Kingena lima* Defr. - KONGIEL, p. 41, pl. V (VIII), fig. 7a-c, 8a-c, 9a-c.
	1938	*Kingena lima* Def. - POŻARYSKI, p.20
	1965	*Pseudomagas nilssoni* - MAKRIDIN & KATZ, p. 105 [*nomen nudum]*
v	1968	*Kingenella kongieli* sp. nov. - POPIEL-BARCZYK, p. 73, pl. XIX, fig. 1-4 and fig. 6-9, pl. XX, fig. 6a-b, *non* pl. XIX, fig. 5.
v	1974	*Kingenella nilssoni* (Lundgren, 1885) - KATZ, p. 267, pl. 87, fig. 16a-c.
v	1984	*Kingenella kongieli* Popiel-Barczyk - POPIEL-BARCZYK, p. 250, pl. CLII, fig. 3-4.

Derivatio nominis: which is like *Terebratula Hebertiana* D'ORBIGNY. PERON built this species name for correcting the older proposition of CORNET (1874).

MATERIAL STUDIED

Total amount of specimens studied: 170.

148 specimens all collected in the Phosphatic Chalk of Ciply and conserved at the Institut royal des Sciences naturelles de Belgique in Brussels are considered for this study. Among these, 82 intact specimens were measured (Table 1).

89 specimens collected in Ciply.

4 specimens collected in Mesvin.

13 specimens collected in Spiennes.

42 specimens without precise locality.

2 pieces found by myself in the Van Damme quarry at Ciply.

18 specimens from PERON's collection collected at Ciply and preserved at the Muséum national d'Histoire naturelle in Paris.

2 specimens from the DE MORGAN's collection collected at Ciply and also in the Muséum national d'Histoire naturelle in Paris.

LECTOTYPE: The original specimens of PERON (1894), represented in fig. 18-22 pl. V, are in the Institut de Paléontologie of the Muséum national d'Histoire naturelle in Paris. PERON did not designate a holotype. For this reason the dissected specimen represented in fig. 21 and 22 pl. V is now chosen as lectotype. Its reference number is: M.N.H.N. - L.P. S.09918.

Locus typicus: Ciply, Hainaut, Belgium.
Stratum typicum: Upper part of the lower Lower Maastrichtian.

ORIGINAL DESCRIPTION in PERON (1894), p. 14.

"Coquille courte, presque aussi large que longue et subarrondie, présentant cependant des variations très amples dans la forme, qui est parfois un peu allongée et ovale, parfois retrécie à la partie postérieure.

Les individus, larges et arrondis, sont en général peu épais, la valve perforée plus bombée que l'autre.

Bord frontal étroit; bord palléal parfois un peu tronqué, mais jamais sinueux.

Commissure des valves simple, droite, se déroulant dans un même plan.

Crochet court, large, obtus, non recourbé, très largement et obliquement tronqué, bordé latéralement par des carènes courtes et peu prononcées.

Ouverture relativement très grande, incomplètement visible du côté de la petite valve, échancrant le deltidium et découvrant la petite valve.

Deltidium large, apparent sur les côtés du crochet, peu élevé, garni de chaque côté de deux rainures assez profondes.

Les pièces médianes manquent presque toujours et le foramen s'étend jusqu'à la petite valve, divisant le deltidium en deux parties.

Surface des valves ne montrant ni double pli, ni stries longitudinales, mais garnie de lamelles d'accroissement imbriquées, saillantes, nombreuses et, le plus souvent, assez régulièrement équidistantes.

Nous n'avons pu obtenir l'appareil interne au complet, mais quelques individus évidés nous ont montré: 1° sur la grande valve, une dent robuste, élargie, épaisse de chaque côté du deltidium; 2° sur le milieu et fixé au crochet de la petite, un plateau cardinal déprimé, pentagonal, portant de chaque côté une rainure étroite et profonde qui se prolonge dans la pointe

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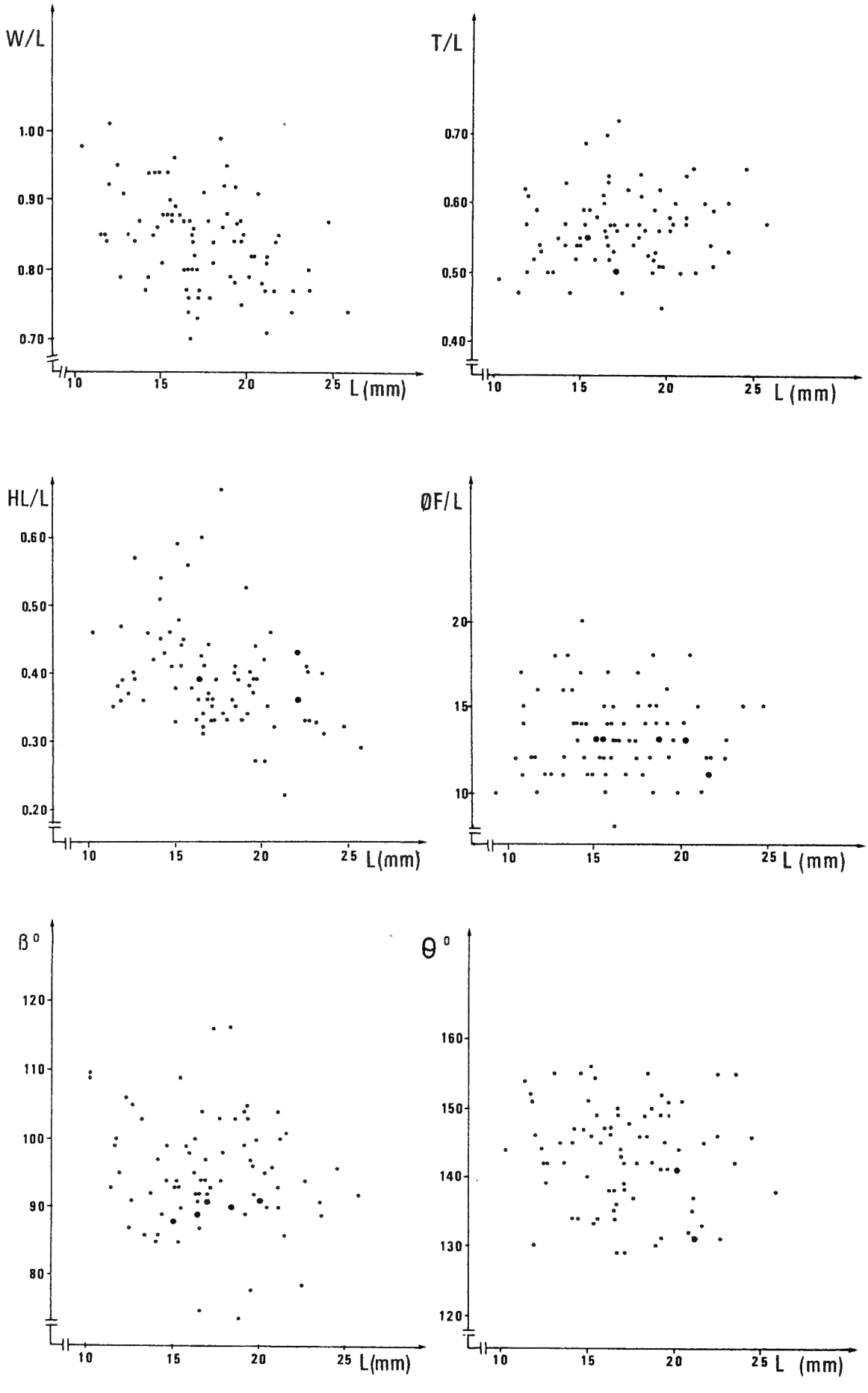
Fig. 3 — Scatter diagrams of *Kingenella pseudohebertiana* (PERON, 1894). L = length, W = width, HL = width of the hinge line, ØF = diameter of the foramen, T = thickness. ß = apical angle (in °). θ = hinge sides angle (in °).
The ratios W/L, T/L, HL/L and F/L are illustrated. The length is taken into account and not the width because the length increases regularly during the growth whereas the width fluctuates less than the length. The ratios ß/L and θ/L are also represented.


W/L
1.00
0.90
0.80
0.70
10
15
20
25
L (mm)
T/L
0.70
0.60
0.50
0.40
10
15
20
25
L (mm)
HL/L
0.60
0.50
0.40
0.30
0.20
10
15
20
25
L (mm)
ØF/L
20
15
10
10
15
20
25
L (mm)
β°
120
110
100
90
80
10
15
20
25
L (mm)
θ°
160
150
140
130
120
10
15
20
25
L (mm)

crurale, sur laquelle devaient se souder les bras réfléchis qui font défaut dans ces individus. Le plateau cardinal s'appuie en son milieu sur un septum haut, mince, soudé au milieu de la petite valve et se prolongeant sur les trois quarts de la longueur de cette valve. Test finement et distinctement ponctué, mais, sur aucun échantillon, nous ne distinguons la granulation particulière qui caractèrise les Brachiopodes du groupe de *Terebratula lima* et *T. Heberti*.''

ADDITIONAL DESCRIPTION

External characteristics

Though the description given by PERON is very precise, it is based only on a small number of specimens (23). The results presented in Table 1 give the maximum, minimum and mean values for all the morphological characteristics measured on 82 specimens.

The scatter diagrams illustrated on Fig. 3 give the ratio width length (W/L) to length (L in mm), the ratio thickness length (T/L) to length, the ratio hinge line length (HL/L) to length and the ratio diameter of the foramen length (ØF/L) to length. The relations between the apical angle (ß in °) and the length, and between the hinge sides angle (θ in °) and the length are also indicated on Fig. 3.

The ratio W/L has a mean value of 0.84, a minimum value of 0.70 and a maximum value of 1.01. This indicates that generally the outline is slightly elongate. A subpentagonal outline is commonly seen. Young specimens show a more subcircular outline whereas gerontic ones have a more elongated aspect. When growing, the shell becomes more and more elongated. In the juvenile stages the shell is tranversely oval, then it changes to a subcircular aspect at the young adult stage and later the shell shows a continuous elongation until the gerontic stage. This growth process is illustrated in Fig. 4 for the largest and the most gerontic specimen observed. The largest width is situated in the middle of the shell but for young adult specimens the largest width occurs nearer the cardinal margin.

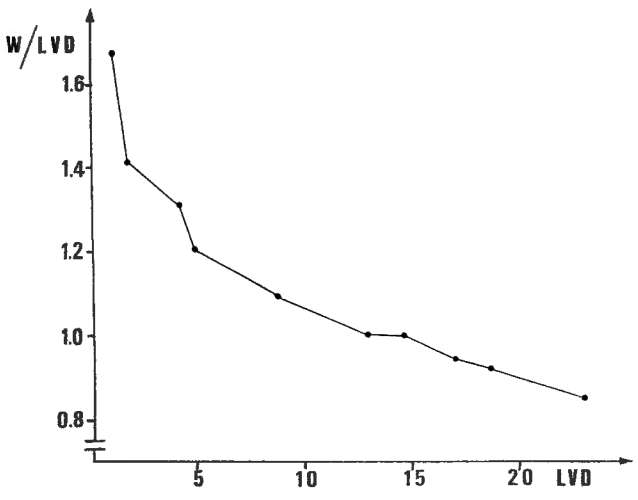


Fig. 4 — Growth process of the shell of *Kingenella pseudohebertiana* (PERON, 1894). The ratio width of the dorsal valve (in mm) to length of the dorsal valve (in mm) is taken into account. The measures are made on the dorsal valve of the largest specimen observed in Ciply. The graph indicates that the shell is tranversely oval at the youngest stage of growth. Later, an elongation takes place and the ratio W/LDV is continuously decreasing.

The ratio T/L has a mean value of 0.56, a minimum value of 0.45 and a maximum value of 0.72. This indicates that the shell is relatively thick. All the specimens are strongly biconvex in lateral profile with the ventral valve more convex than the dorsal valve. The shell is smooth but strong growth lines, well visible in lateral profile, are encountered in all the specimens.

The ratio HL/L has a mean value of 0.40, a minimum value of 0.22 and a maximum value of 0.67. This ratio decreases slightly during the growth of the shell.

The beak ridges are poorly developed and the beak is obtuse. The beak is generally truncated but some specimens have a slightly recurved beak. This means that the ventral cardinal area is apsacline to slightly anacline.

The ratio ØF/L has a mean value of 0.13, a minimum value of 0.08 and a maximum value of 0.20. The round or oval hypothyridid foramen is relatively large. It extends until the dorsal valve because the deltidial plates are disjunct. On the other hand, the deltidial plates are separated from the interarea by a relatively deep groove.This feature, which was already emphasized by PERON (1894 p. 14), is observed on all the specimens investigated.

The apical angle (ß in °) has a mean value of 94.5°, a minimum value of 74° and a maximum value of 116°. For most of the specimens, the value of the apical angle varies between 85° and 105°. Lower or higher values are more exceptionnal.

The hinge sides angle (θ in °) is quite wide and it fluctuates between 129° and 156° with a mean value of 143°.

There is no significant relation between ß and the length of the specimen and no relation between θ and the length of the specimen.

The shell is densely punctated. The density of pores (*punctae*) is very high and in all cases higher than the density observed for *Kingena* species. The density of the pores is often around 200 pores/mm^2 and it can even reach 300 pores/mm^2.

Internal characteristics

The ventral valve exhibits a short pedical collar. The hinge teeth are small but relatively thick. The lack of

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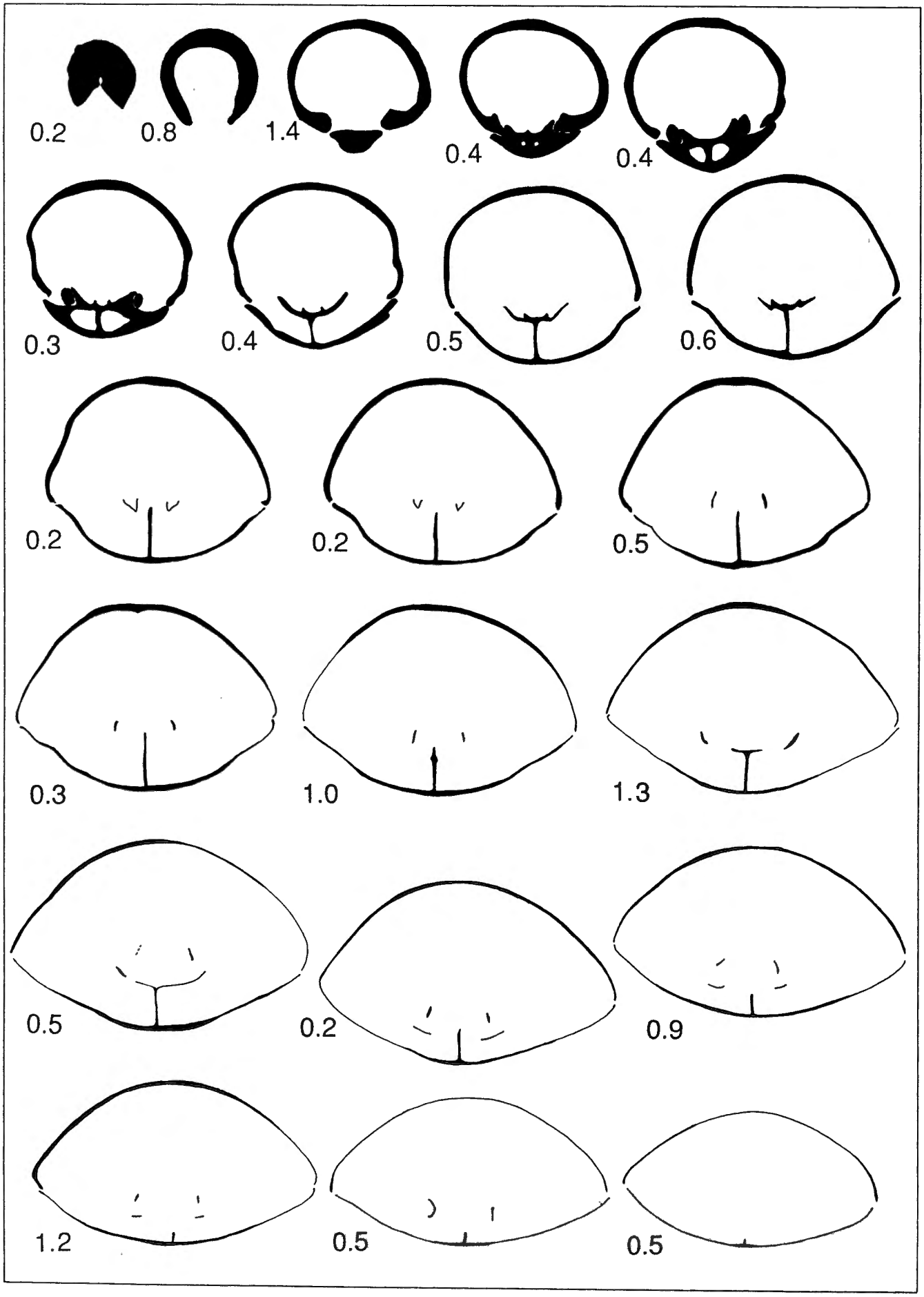
Fig. 5 — Serial sections in *Kingenella pseudohebertiana* (PERON, 1894). An adult specimen from Ciply is represented (maximal width of the specimen: 13.5 mm). These results are very similar to the serial sections obtained by POPIEL-BARCZYK (1968, fig. 30a, p. 76).


0.2
0.8
1.4
0.4
0.4
0.3
0.4
0.5
0.6
0.2
0.2
0.5
0.3
1.0
1.3
0.5
0.2
0.9
1.2
0.5
0.5

dental plates is a very important characteristic which prevents any confusion with the genus *Kingena*. The thickness of the valve is relatively weak.

Dissected specimens showed part of the structure of the brachidium present in the dorsal valve. Serial sections were made to confirm the structure of the brachidium (Fig. 5).

In the cardinal region the outer and inner hinge plates are fused together and a flat trough (or platform) is observed. A vestigial cardinal process is present. The platform is supported by the well developed dorsal septum. This septum is very long and in all cases longer than half the length of the dorsal valve. The dental sockets are not deep but the inner socket ridges are relatively well developed.The crura are short and V-formed. They point slightly ventrally. The crural processes are short and inclined towards the septum. The loop is terebratelliform. The descending branches of the loop join the septum at its maximum height by means of connecting bands. The ascending branches of the loop are oriented backwards. A tranverse band, situated upon the connecting bands, joins the two ascending branches of the loop.

The lack of juvenile specimens do not permit the drawing of the ontogenesis of the brachidium. A research project on the microbrachiopods of Ciply is presently in progress and it is hoped to find juveniles of *Kingenella* for this study which will be published later.

COMPARISON WITH OTHER SPECIES

The lack of pustules on the external surface of the shell, the lack of dental plates in the ventral valve and the terebratelliform type of the loop prevent all possible confusion with representatives of the genus *Kingena* DAVIDSON.

A more detailed comparison must be made with the following species.

Kingenella kongieli POPIEL-BARCZYK, 1968
Plate 2, Fig. 5-6.

MATERIAL INVESTIGATED: 109 specimens from the Muzeum Ziemi in Warsaw.

HOLOTYPE: M. Z. VIII bra. 411/7 illustrated in POPIEL-BARCZYK, 1968. pl. XIX, fig. 1 a-d.

Stratum typicum: Upper Maastrichtian, hard limestone, (local horizon "y").
Locus typicus: Nasiłow on the Vistula, Poland.

These Polish specimens, extensively studied by POPIEL-BARCZYK (1968, p. 73-78), are extremely similar to the specimens of *Kingenella pseudohebertiana* (PERON, 1894) described above. All the external characteristics fit in with the variations observed for the specimens of Ciply. POPIEL-BARCZYK did not describe the presence of the groove separating the deltidial plates from the interarea. The present author confirmed the existence of this feature on the Polish specimens. The similarity between Belgian and Polish specimens is observed for the internal characters. The structure of the fused outer and inner hinge plates, resulting in a flat trough or platform, was carefully compared and no significant difference could be established.

The comparison between our serial sections (Fig. 5) and the serial sections given by POPIEL-BARCZYK (1968, p. 76, fig. 30a) shows a high level of similarity.

The Polish material is a collection of young adult specimens. No gerontic or juvenile specimens were collected there. The "juvenile specimen" in pl. XIX, fig. 5 a-b (POPIEL-BARCZYK, 1968) is not a *Kingenella* but an *Argyrotheca sp.*

When young adult specimens from Belgium and from Poland are compared, there is nothing which could distinguish the *Kingenella kongieli* from the *Kingenella pseudohebertiana* and these species must be considered as synonyms.

Kingenella nilssoni (LUNDGREN, 1885)
in KATZ (1974, p. 267, pl. 87, fig. 16 a-c).
Plate 3, Fig. 1-2 and Plate 4, Fig. 1-6

MATERIAL OBSERVED: 225 specimens from the University of Kharkov, Ukraine.

ORIGIN: Don Basin, South-East Ukraine

STRATIGRAPHY: Lower Maastrichtian, *B. lanceolata* Zone.

This very rich material is well preserved and sometimes large parts of loops can be seen in dissected specimens.

The general outline, form of the beak, smooth shell exhibiting thick growth lines, porosity of the shell and disposition of the deltidial plates limited by a deep groove along the interarea are similar to the characteristics encountered with *Kingenella pseudohebertiana* from Belgium and from Poland. The internal characters are also similar; the loop is of the same type as seen on Pl. 4, Fig. 1, 3. It is not possible to separate this material from the Belgian and Polish material. It is advisable to put *Kingenella nilssoni* (LUNDGREN) in synonymy with *Kingenella pseudohebertiana* (PERON). The considerable similarity of "*nilssoni* " species (labelled then as *Pseudomagas nilssoni*) and *Kingenella kongieli* was also noted by POPIEL-BARCZYK in 1965 when she studied this material in Kharkov [personal communication].

It must be noted that the Ukrainian material is very interesting for studying the variation of the platform issuing from the fused outer and inner hinge plates. The platform can be flat or deeply concave. The two extreme possibilities are shown in Pl. 4, Fig. 2 and Fig. 3. It was also observed, in some specimens, that the dorsal septum can project beyond the cardinal platform surface. In this case the platform is divided by the dorsal septum.

In 1974, KATZ erroneously assigned this material to *Magas nilssoni* LUNDGREN, 1885. Although a superficial similarity with this Swedish material is evident, a detailed comparison with the specimens of LUNDGREN demontrates that *Magas nilssoni* cannot be considered as a *Kingenella* species.

Magas nilssoni LUNDGREN, 1885
Plate 3, Fig. 3-5.

MATERIAL OBSERVED: The holotype; 1 dorsal valve with intact cardinal region and crura, from the Geologisk Institut of Lund under the reference: LO 695 T.

A paratype: 1 complete specimen from the Geologisk Institut of Lund under the reference: LO 696t.

ORIGIN: Oppmanna (Sweden)

STRATIGRAPHY: Maastrichtian.

The complete specimen was measured and the results are given in Table 2. The general outline is subcircular, the shell is biconvex and smooth except for the thick growth lines which are clearly visible. The beak is erect and not truncated. The deltidial plates are small, protruding dorsally, and disjunct.

The foramen is relatively large and reaches the posterior part of the dorsal valve. A small cardinal process is internally visible.

The porosity of the shell has a high density (± 140 pores/ mm^2). These aspects are quite similar to those observed in *Kingenella* species. But in *Magas nilssoni*, the triangular area is flat with sharp beak ridges.

On the contrary, in *Kingenella* specimens the area is slightly curved and limited by rounded beak ridges.

On the holotype of LUNDGREN the cardinal region is clearly visible. Strong inner socket ridges are present. Outer and inner hinge plates are also fused for developing a platform. But the hinge plates are thicker and the resulting fused structure has a very special aspect, completely different from the structure observed in *Kingenella* (Pl. 3, Fig. 5).

In *Magas nilssoni* each pair of fused outer and inner hinge plates form a trough. Moreover, the inner hinge plates are medially fused together giving a roof-shaped structure (inner hinge plates are pointing ventrally). This roof-shaped structure is above the dorsal septum without any contact to it.

The crura and the strong descending branches of the loop are pointing dorsally and they are not V-shaped. On the contrary they show a subcircular section.

The posterior part of the dorsal septum, independant of the cardinal platform,is strongly thickened.

In *Kingenella pseudohebertiana* the outer and inner plates are thinner. The fused inner hinge plates are directed dorsally and are in contact with the dorsal septum. The crura are V-shaped and the descending branches of the loop are fragile and slightly ventrally oriented. The posterior part of the dorsal septum is not thickened.

The complete loop of *Magas nilssoni* is unknown but it is certain that its structure is different from those of *Kingenella*.

Despite its external similarity with *Kingenella*, *Magas nilssoni* LUNDGREN cannot be placed in this genus. For obvious reasons, it is not possible to classify this brachiopod as a species of the genus *Magas* SOWERBY, 1816. It is preferable to establish a new genus for this LUNDGREN's species, however more material is needed.

Conclusions

From the study of the Belgian, Polish and Ukrainian material originally determined as *Terebratula (kingena) pseudohebertiana* PERON, 1894, *Kingenella kongieli* POPIEL-BARCZYK, 1968 and *Kingenella nilssoni* (LUNDGREN, 1885), it is concluded that all these species are representatives of the genus *Kingenella*. The comparison between these specimens shows that only one species can be recognized, no significant distinctions being observed among them. Due to nomenclative rules, the species *Kingenella pseudohebertiana* (PERON, 1894) is the valid determination, the others becoming synonyms. LUNDGREN's species, *Magas nilssoni*, is not recognized as a *Kingenella* species nor as a *Magas* species. A new genus must be established for this Swedish brachiopod when more material will be available.

Kingenella pseudohebertiana is a widely distributed species in Europe and, presently, all the specimen collected are of Maastrichtian age. Its stratigraphical range extends from the *Belemnella lanceolata* Zone in the Don

Table 2 — *Magas nilssoni* LUNDGREN, 1885. - Morphological characters measured on a complete specimen from the LUNDGREN's collection. (N LO 696t, Geologisk Instit. Lund, Sweden. The length, the width, the thickness, the length of the dorsal valve, the width of the hinge line, the diameter of the foramen, the apical angle (ß) are measured.

Specimen of Lundgren	Length (mm)	Width (mm)	Thickness (mm)	Length DV (mm)	Hinge length (mm)	Ø foramen (mm)	β (°)
LO 696 t	19.3	17.8	9.6	17.1	10.5	2.7	125

Basin area (Ukraine) until the *Belemnitella junior* Zone in the middle Vistula river valley (Poland). In Belgium it has been collected in the *Belemnella obtusa* Zone in Ciply. It is also worthwhile to note that this brachiopod was only collected in non-white chalk facies. In Belgium it is present in the phosphatic chalk of Ciply. In Poland it was collected in a hard limestone and in a phosphorite layer. In Ukraine, the sediment is a calcareous yellow sand. *Kingenella pseudohebertiana* can thus be considered presently as a Maastrichtian indicator for non-white chalk facies.

Further investigations in other Maastrichtian deposits are presently in progress and it is hoped that the distribution of *Kingenella pseudohebertiana* will be completed in the near future.

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References

BŁASZKIEWICZ, A., 1980. Campanian and Maastrichtian Ammonites of the Middle Vistula River Valley, Poland: a stratigraphic-palæontogical study. *Prace Instytutu Geologicznego*, **12**: 1-63.

CORNET, F. L., 1874. Compte-rendu de l'excursion du 31 août aux environs de Ciply. *Bulletin de la Société géologique de France*, **3** (2): 567 - 577.

DAVIDSON, T., 1852. A Monograph of the British Fossil Brachiopoda. Part II. The Palaeontographical Society ed. London, 117 pp., 12 pls.

DEFRANCE, M. J. L., 1828. *Terebratula lima. Dictionnaire des Sciences naturelles*, **53**: 1-156.

DUMERIL, A. M. C., 1806. Zoologie analytique ou méthode naturelle de classification des animaux. Allais, Paris, XXIV + 344 pp.

HUXLEY, T. H., 1869. An introduction to the classification of animals. (John Churchill & sons), London, 147 pp.

KATZ, Y., *in* BLANK, M. Ia., KRIMHOLTS, G. Ia., NAIDIN, D.P., SAVCZINSKAJA, O. V., 1974. ''Atlas of the Upper Cretaceous Fauna of the Donbass''. Ministerstvo Vishnevo i srednevo spetsialnovo obrazovania UkrSSR, Komunarskii gornometallurgicheskii institut. 639 pp., 128 pls., 69 text-figs., Moscow (Nedra), [in Russian].

KING, W., 1850. A monograph of the Permian fossils of England. *Palaeontographical Society*, Mon. 3: xxxvii + 258 pp.

KONGIEL, R., 1935. W sprawie wieku ''siwaka'' w okolicach Pulaw. - Contribution à l'étude du ''siwak'' dans les environs de Puławy (Plateau de Lublin). T*ravaux de la Société des Sciences et des Lettres de Wilno*, **9** (19): 1-59.

LUNDGREN, B., 1885. Undersökningar öfver Brachiopoderna i Sverges Kritsystem. *Ur Lunds Universitets Årsskrift*, **20**, 1-71.

MACHALSKI, M. & WALASZCZYK, I., 1987. Faunal condensation and mixing in the uppermost Maastrichtian / Danian Greensand (Middle Vistula Valley, Central Poland). *Acta Geologica Polonica*, **37** (1-2): 75-91.

MAKRIDIN, W. P. & KATZ, J. I., 1966. Some questions on the methodology of Palaeographical research [in Russian] *in* Organisms and environment in geological time. Nauka ed., 98-114.

MATTHEWS, S. C., 1973. Notes on Open Nomenclature and on Synonymy Lists. *Palaeontology*, **16** (4): 713-719.

MUIR-WOOD, H., 1955. A history of the classification of the phylum Brachiopoda. 124 pp, British museum (Natural History), London.

MUIR-WOOD, H. MM, STEHLI, F. G., ELLIOTT, G. F. & HATAI, K. 1965. in MOORE, R. C. (ed.). Treatise on Invertebrate Paleontology (H) Brachiopoda. 927 pp. Geological Society of America & University of Kansas Press, Lawrence.

d'ORBIGNY, A., 1847. Paléontologie Française. Terrains Crétacés. **4**: 390 pp. Paris.

d'ORBIGNY, A., 1851. Paléontologie Française. Terrains Crétacés. Paris. Atlas: 109 pls. Paris.

PERON, M. A., 1894. Les Brachiopodes du terrain Crétacé supérieur de Ciply (Belgique). *Association Française pour l'Avancement des Sciences*, **23**: 1 - 15.

POPIEL-BARCZYK, E., 1968. Upper Cretaceous Terebratulids (Brachiopoda) from the Middle Vistula Gorge. *Prace Muzeum Ziemi*, **12**: 3-86.

POPIEL-BARCZYK, E., 1984. Typ Brachiopoda. *in* Budowa geologiczna Polski. III. Atlas skamienialosci, czesc 2c, Mesozoik, Kreda, L. Malinovska ed., 342-358. Warszawa.

POPIEL-BARCZYK, E., 1989. Type Brachiopoda *in* Geology of Poland, III, Atlas of Guide and characteristic fossils, 2c, Mesozoic, Cretaceous. L. Malinowska, ed. Warsaw, 240-251.

POŻARYSKI, W., 1938. Stratygrafia Senonu w przełomie wisły miedzy Rachowem i Puławami. *Państwowy Instytut Geologiczny*, **6**: 1-147.

ROBASZYNSKI, F. & CHRISTENSEN, W. K., 1989. The Upper Campanian - Lower Maastrichtian chalks of the Mons basin, Belgium: a preliminary study of belemnites and foraminifera in the Harmignies and Ciply areas. *Geologie en Mijnbouw*, **68**: 391 - 408.

SOWERBY, J., 1812-1822. The Mineral Conchology of Great Britain, II. London, 251 pp.

WAAGEN, W. H., 1883. Salt Range Fossils, Part 4 (2) Brachiopoda. *Memoirs of the Geological Survey of Palaeontologica Indica*, **13** (1): 391-546.

WILLIAMS, A. & ROWELL, A. J., 1965. Brachiopod anatomy and morphology. In MOORE, R. C. (ed). Treatise on Invertebrate Paleontology (H) Brachiopoda. 1: H6 - H155. Geological Society of America & University of Kansas Press, Lawrence.

WOODWARD, S. P., 1833. Outline of the geology of Norfolk. Norwich, 54 pp.

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Explanation of Plates

PLATE 1

Kingenella pseudohebertiana (PERON, 1894)

Locality: Ciply, Hainaut, Belgium.
Stratigraphy: Phosphatic chalk of Ciply, upper part of the lower Lower Maastrichtian. *Belemnella obtusa* Zone.

Fig. 1a — Lectotype from PERON's collection preserved at the Muséum national d'Histoire naturelle in Paris (n° S.09918). Dorsal valve showing the dorsal septum and the fused inner and outer hinge plates (cardinal platform). This specimen is also illustrated in PERON (1894), plate V, fig. 21. (magnification: x 2,35).

Fig. 1b — Lectotype from PERON's collection preserved at the Muséum national d'Histoire naturelle in Paris (n° S.09918). Ventral valve, interior view. This specimen is also illustrated in PERON (1894), plate V, fig. 21. (magnification: x 2,35).

Fig. 2a — Complete specimen from PERON's collection preserved at the Muséum national d'Histoire naturelle in Paris (n° S.09918). Dorsal view. This specimen is also illustrated in PERON (1894), plate V, fig. 18. This is a fully adult specimen. (magnification: x 2.35).

Fig. 2b — Complete specimen from PERON's collection preserved at the Muséum national d'Histoire naturelle in Paris (n° S.09918). Lateral profile. This specimen is also illustrated in PERON (1894), plate V, fig. 19. This is a fully adult specimen. (magnification: x 2.35).

Fig. 3 — Young adult specimen from CORNET's collection, preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB - IST n° 10630). (magnification: x 2). a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

Fig. 4 — Gerontic specimen very similar to the specimens described by PERON (1894). CORNET's collection, preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10631). (magnification: x 2). a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

Fig. 5 — Adult specimen with a subpentagonal outline. The dorsal septum is clearly visible through the shell. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10632). (magnification: x 2). a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

Fig. 6 — Young adult very similar to the Polish specimens described by POPIEL-BARCZYK, 1968 under the name *Kingenella kongieli*. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10633). (magnification: x 2). a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

PLATE 2

Kingenella pseudohebertiana (PERON, 1894)

a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

Fig. 1 — Fully adult specimen showing discrete growth lines. Phophatic chalk of Ciply without precise locality, upper part of the lower Lower Maastrichtian. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10634). (magnification: x2).

Fig. 2 — Gerontic specimen which is the largest observed. The graph on Fig. 5 is made with the measures taken on the dorsal valve of this specimen. Phophatic chalk of Ciply, upper part of the lower Lower Maastrichtian without precise locality. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10635). (magnification: x2).

Fig. 3 — Ventral valve seen in oblique view to show the absence of dental plates. Ciply. Phosphatic chalk, upper part of the lower Lower Maastrichtian. From the CORNET's collection, preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10636). (magnification: x2).

Fig. 4 — Macrophotography of the foramen and of the deltidial plates from an adult specimen. Ciply. Phosphatic chalk, upper part of the lower Lower Maastrichtian. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10637). (magnification: x 6.5).

Fig. 5 — Young adult specimen with a subcircular outline from Nasiłow, Poland. Upper Maastrichtian, local horizon ''y''. It was originally described by POPIEL-BARCZYK (1968) as *Kingenella kongieli*. Preserved at the Muzeum Ziemi in Warsaw (n° M. Z. VIII Bra. 411/9). (magnification: x 1,75).

Fig. 6 — Young elongated specimen from Nasiłow, Poland. Upper Maastrichtian, local horizon ''y''. It was originally described by POPIEL-BARCZYK (1968) as *Kingenella kongieli*. Preserved at the Muzeum Ziemi in Warsaw (n° M. Z. VIII Bra. 894). (magnification: x 1,75).

PLATE 3

a: dorsal view. b: ventral view. c: lateral profile. d: anterior view. e: posterior view.

Fig. 1 — *Kingenella pseudohebertiana* (PERON, 1894) from the Svetlichnaya river valley, Donbass, South-East Ukraine. Young adult with a subcircular outline. This specimen was originally described as *Kingenella nilssoni* (LUNDGREN, 1885) by KATZ (1974). Lower Maastrichtian, *Belemnella lanceolata* Zone. Preserved at the University of Kharkov. (magnification: x2).

Fig. 2 — *Kingenella pseudohebertiana* (PERON, 1894) from the Svetlichnaya river valley, Donbass, South-East Ukraine. Young adult with an elongated outline. This specimen was originally described as *Kingenella nilssoni* (LUNDGREN, 1885) by KATZ (1974). Lower Maastrichtian, *Belemnella lanceolata* Zone. Preserved at the University of Kharkov. (magnification: x2).

Fig. 3 — *Magas nilssoni* LUNDGREN, 1885. Original and complete specimen from LUNDGREN's collection. Locality: Oppmanna (Sweden). Maastrichtian. Preserved at the Geologisk Instit. of Lund, Sweden.(n° LO 696 t). (magnification: x 1.9). This brachiopod is not a *Kingenella species*.

Fig. 4 — *Magas nilssoni* LUNDGREN, 1885. Holotype of LUNDGREN. Dorsal valve showing the dorsal septum and the cardinal platform. Note the median roof-shaped structure built by the fused inner hinge plates. Locality: Oppmanna (Sweden). Maastrichtian. Preserved at the Geologisk Instit. of Lund, Sweden.(n° LO 695 T). (magnification: x 1.9). This brachiopod is not a *Kingenella species*.

Fig. 5 — *Magas nilssoni* LUNDGREN, 1885. Holotype of LUNDGREN. Anterior view of the cardinal platform. The median roof-shaped structure built by the fused inner hinge plates is clearly visible. The platform is not fixed to the posterior part of the dorsal septum. (magnification: x 7.6).

Fig. 6 — *Kingenella pseudohebertiana* (PERON, 1894) from Ciply, phosphatic chalk, upper part of the lower Lower Maastrichtian. Detailed ventral view of the cardinal platform. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST - n° 10637). (magnification: x 7.6).

Fig. 7 — *Kingenella pseudohebertiana* (PERON, 1894) from Ciply, phosphatic chalk, upper part of the lower Lower Maastrichtian. Detailed anterior view of the cardinal platform. Note that the fused inner hinge plates are fixed to the posterior part of the dorsal septum. Preserved at the Institut royal des Sciences naturelles de Belgique in Brussels (IRScNB IST n° 10637). (magnification: x 7.6).

PLATE 4

Fig. 1 — *Kingenella pseudohebertiana* (PERON, 1894). from the Svetlichnaya river valley, Donbass, South-East Ukraine. Young adult specimen showing a large part of its brachidium. A part of the ascending branch of the loop and the transverse band are lacking. This specimen was originally described as *Kingenella nilssoni* (LUNDGREN, 1885) by KATZ (1974). Lower Maastrichtian, *Belemnella lanceolata* Zone. Preserved at the University of Kharkov. (magnification: x 6.9).

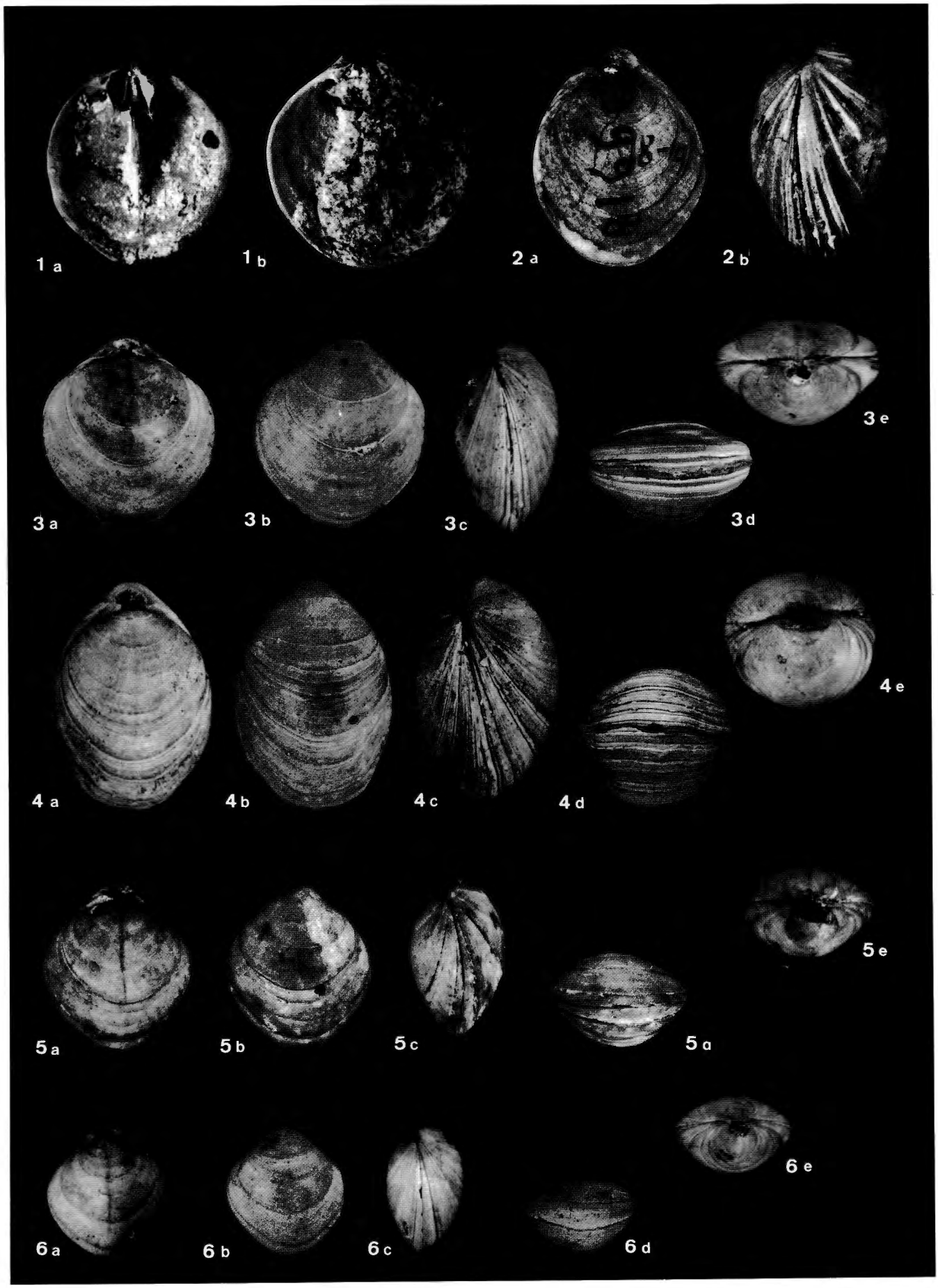
Fig. 2 — *Kingenella pseudohebertiana* (PERON, 1894). from the Svetlichnaya river valley, Donbass, South-East Ukraine. Adult specimen showing its cardinal platform and the crura. This specimen was originally described as *Kingenella nilssoni* (LUNDGREN, 1885) by KATZ (1974). Lower Maastrichtian, *Belemnella lanceolata* Zone. Preserved at the University of Kharkov. (magnification: x 7.4).

Fig. 3 — *Kingenella pseudohebertiana* (PERON, 1894). from the Svetlichnaya river valley, Donbass, South-East Ukraine. Dorsal valve in ventral view. This specimen has an abnormal outline due to a stress during its growth. A large part of its brachidium is clearly visible. This specimen was originally described as *Kingenella nilssoni* (LUNDGREN, 1885) by KATZ (1974). Lower Maastrichtian, *Belemnella lanceolata* Zone. Preserved at the University of Kharkov. (S.E.M.: scale bar = 1 mm).

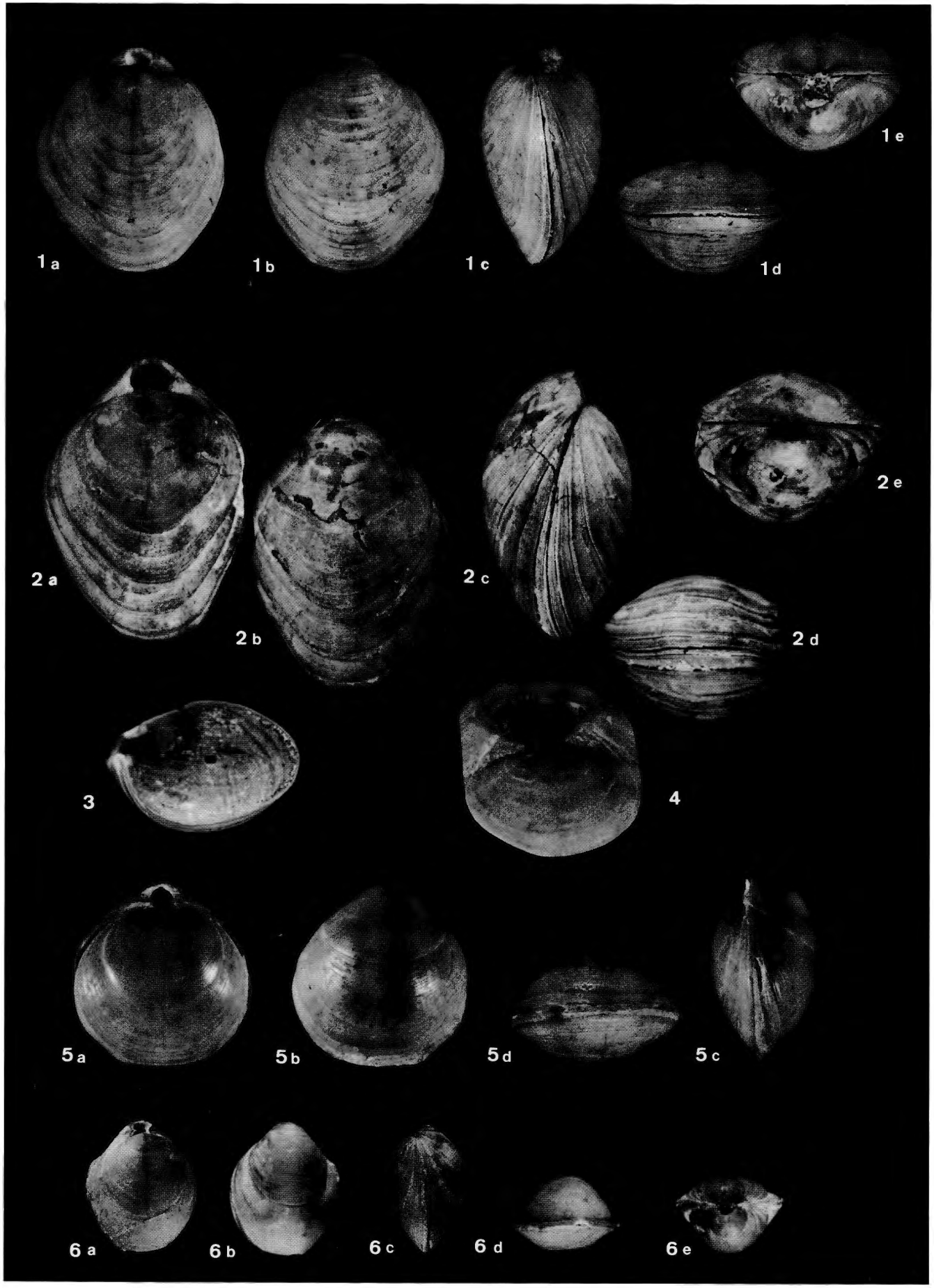
Fig. 4 — *Kingenella pseudohebertiana* (PERON, 1894) from the Svetlichnaya river valley, Donbass, South-East Ukraine. Dorsal valve in ventral view. Detailed view of the cardinal platform. This is the same specimen which is represented in Fig. 2. (S.E.M.: scale bar = 1 mm).

Fig. 5 — *Kingenella pseudohebertiana* (PERON, 1894) from the Svetlichnaya river valley, Donbass, South-East Ukraine. A detailed lateral view of one crus with a part of the descending branch of the loop. Same specimen represented in Fig. 2 and Fig. 4. (S.E.M.: scale bar = 1 mm).

Fig. 6 — *Kingenella pseudohebertiana* (PERON, 1894) from the Svetlichnaya river valley, Donbass, South-East Ukraine. A detailed view of the punctae observed on the internal valve floor of the specimen represented in Fig. 3. (S.E.M.: scale bar = 0.1 mm).



E. SIMON — Plate 1.



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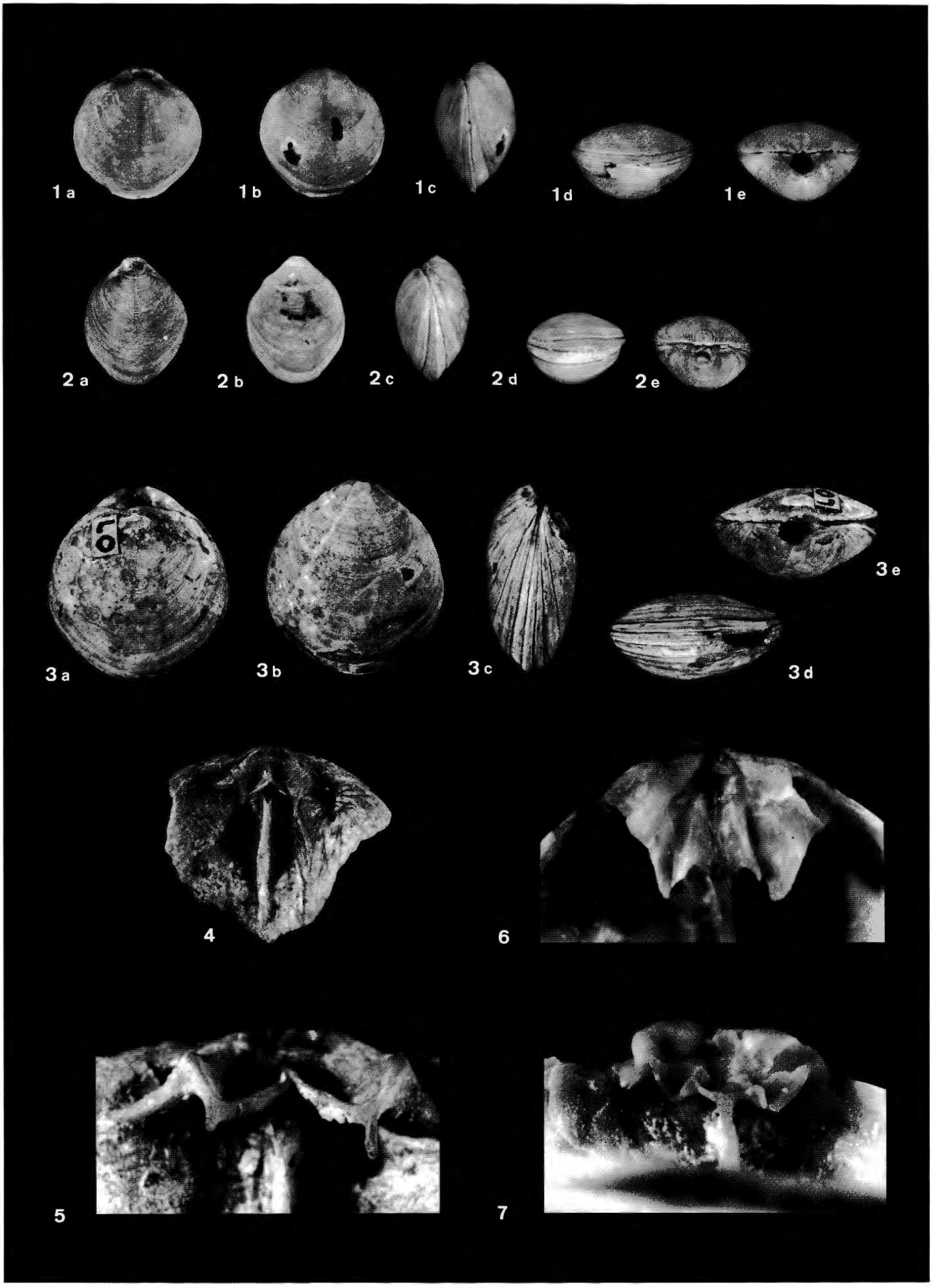
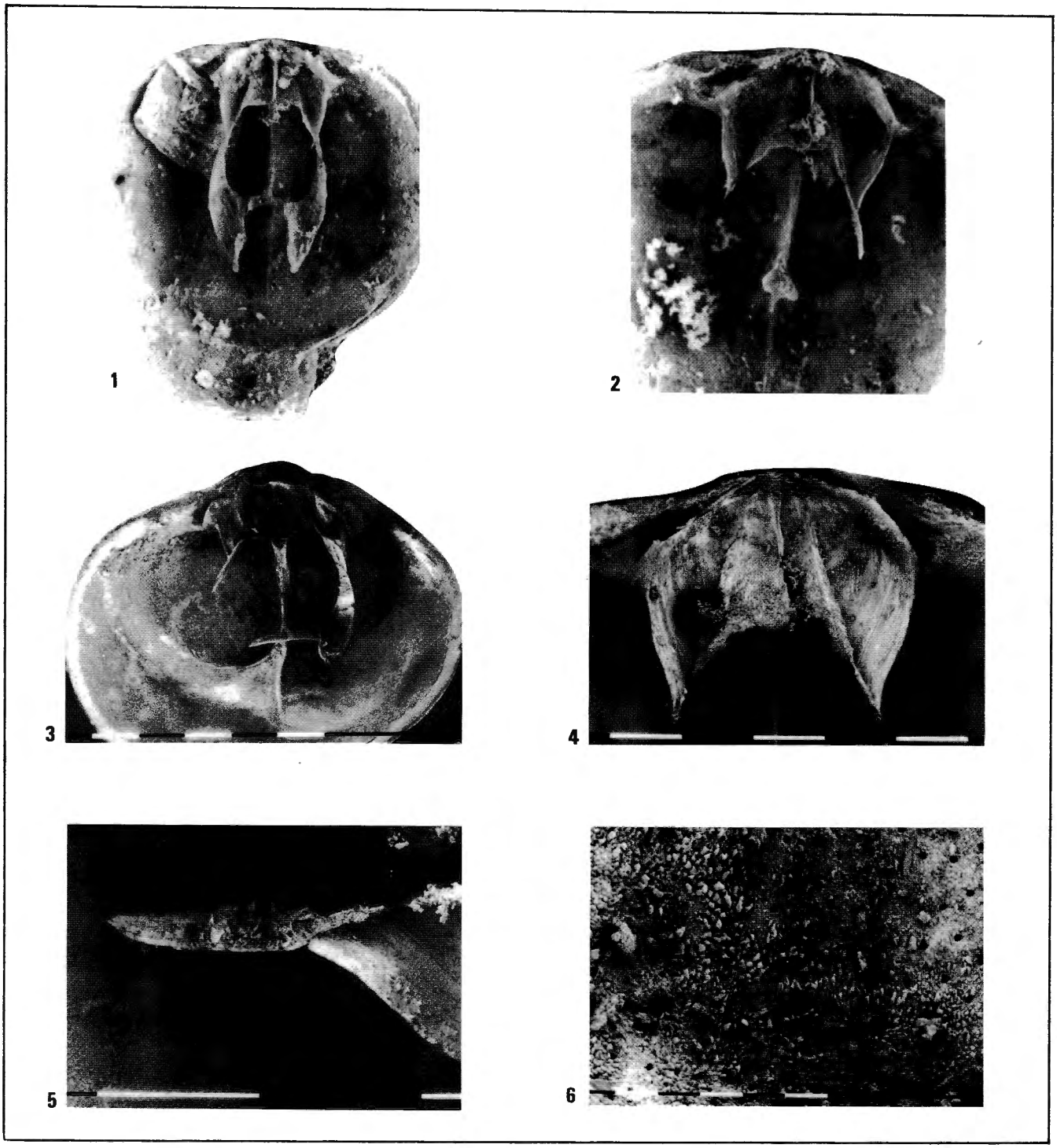


E. SIMON — Plate 3.



E. SIMON — Plate 4.