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# A late Maastrichtian species of *Gisilina* (Brachiopoda, Chlidonophoridae) from the Maastricht area (The Netherlands, Belgium) first illustrated by FAUJAS DE SAINT-FOND

by Eric SIMON

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## Abstract

In the early nineteenth century, Faujas de Saint-Fond illustrated numerous species of brachiopod from the Maastricht area (southern Limburg, The Netherlands). Amongst these, two specimens subsequently held to be conspecific, were selected by von Schlotheim as types of his *Terebratulites chrysalis*. To date, one of these is considered by many authors to be the original illustration to *Terebratulina chrysalis* (VON SCHLOTHEIM, 1813); the other specimen illustrated by Faujas appears to have fallen into oblivion. Similar forms have now been recognised in the Meerssen Member (Maastricht Formation, late Maastrichtian) as exposed in the Maastricht area, and are here described as a new species of *Gisilina*.

**Keywords:** Brachiopoda, Cretaceous, late Maastrichtian, The Netherlands, taxonomy.

## Résumé

Au début du dix-neuvième siècle, Faujas de Saint-Fond illustra de nombreuses espèces de brachiopodes collectées dans la région de Maastricht (Limbourg du Sud, Pays-Bas). Parmi ces spécimens, deux ont été simultanément choisis par von Schlotheim en 1813 comme types de *Terebratulites chrysalis*. L'un d'eux est reconnu aujourd'hui comme illustration originale de *Terebratulina chrysalis* (VON SCHLOTHEIM, 1813) tandis que le second est tombé dans l'oubli. C'est ce dernier qui a été retrouvé dans la calcarénite de Meerssen des environs de Maastricht (Formation de Maastricht, Maastrichtien Supérieur) et qui est décrit dans cet article comme nouvelle espèce de *Gisilina*.

**Mots-clefs :** Brachiopoda, Crétacé, Maastrichtien terminal, Pays-Bas, taxinomie.

## Introduction

Numerous specimens of late Maastrichtian brachiopods collected at the St. Pietersberg and environs (Maastricht, The Netherlands) were first illustrated by FAUJAS DE SAINT-FOND (?1803, pls 26, 27). Two of these (pl. 26, figs. 7 and 9) are here considered in more detail. FAUJAS (?1803, pp. 159-160) interpreted these two as distinct species describing the specimen shown in fig. 7 as a « *jolie petite térébratulite* » which reminded him of an (unknown) extant species from the Adriatic Sea. The other specimen (fig. 9) was characterised differently. FAUJAS (?1803, p. 160) compared it to a species represented in « *fig. 6a, b et c, planche 241 de l'Encyclopédie* » (The "Encyclopédie" cited here is the "Encyclopédie ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers of DIDEROT & D'ALEMBERT published between 1751 and 1765 with 11 volumes of plates published between 1762 and 1772).

As FAUJAS did not follow the Linnaean binomial classification, it was VON SCHLOTHEIM (1813) who erected several new brachiopod species, referring directly to the original illustrations in FAUJAS. Amongst these new species is *Terebratulites chrysalis*. VON SCHLOTHEIM (1813, p. 113), referring to FAUJAS's pl. 26, figs 7 and 9, appears to have lumped these two specimens despite the fact that the illustrations provided by FAUJAS are very distinctive. Later, BRONN (1838) accepted VON SCHLOTHEIM's judgement, and cited, in his own description of *Terebratula chrysalis* (VON SCHLOTHEIM, 1813), FAUJAS pages 154-160 and pl. 26, figs. 7 and 9.

Moreover DAVIDSON (1852) added to the confusion surrounding species of *Terebratulina* then known from the 'chalk'. *Terebratulina chrysalis* was lumped with *T. striata* (WAHLENBERG, 1821), *T. striatula* (MANTELL,

1822) and *T. defrancii* (BRONGIART, 1822). Citing FAUJAS, DAVIDSON (1852, p. 35) referred to the two specimens illustrated in pl. 26, figs. 7 and 9. However, when citing VON SCHLOTHEIM (1813), DAVIDSON (1852, p. 35) referred to the specimen illustrated in FAUJAS's pl. 26, fig. 7 only.

It should be noted that it was VON BUCH (1835, p. 227), who restricted the species name *"Terebratula" chrysalis* (VON SCHLOTHEIM, 1813) to fig. 9 in FAUJAS, and that ROEMER (1841, p. 40, n° 22) and VON HAGENOW (1842, p. 538, n° 9) later accepted this view.

WIND (1953, p. 79) designated as lectotype of *Terebratulina chrysalis* the specimen illustrated in pl. 26, fig. 9 in FAUJAS. STEINICH (1965, pp. 53, 66) accepted the same FAUJAS's figure as original illustration for *T. chrysalis*. For the specimen illustrated in fig. 7, STEINICH (1965, p. 66) noted that it was probably not *T. chrysalis* but more likely a cancellothyridid very near to *Terebratulina longicollis* STEINICH, 1965. No subsequent author has referred to this specimen.

Careful screening for microbrachiopods of samples taken from the Meerssen Member (Maastricht Formation, late Maastrichtian) in the Maastricht area, has now resulted in the discovery of several specimens matching closely the one illustrated in FAUJAS (pl. 26, fig. 7). Since intact brachidia are known from this material, it can be assigned with confidence to the genus *Gisilina* STEINICH, 1965, and in fact represents a new species.

## Material and methods

FAUJAS's material was collected from near Maastricht (southern Limburg, The Netherlands), in part of the St Pietersberg quarry now incorporated into the ENCI quarry (Heidelberg Cement Group). In those days, only subterranean galleries existed and merely late Maastrichtian biocalcarenites, now assigned to the Nekum Member and lower portion of the overlying Meerssen Member, were accessible. To date, the sequence exposed at the ENCI quarry includes also early Maastrichtian strata (Gulpen Formation, Vijlen Member). For a more detailed discussion of lithostratigraphic units, facies interpretation and biozonation, reference is made to JAGT (1999, pp. 27-31), who also provided a map showing the location of the various quarries and outcrops in southern Limburg (The Netherlands) and in the provinces of Limburg and Liège (NE Belgium).

All fossils collected by FAUJAS (and his assistants) were sent to Paris, to be housed in the Muséum National d'Histoire Naturelle. Currently, the vertebrate collection of FAUJAS has been retrieved and is, in part, on exhibit, while invertebrate material appears to have been lost (J.-M. Pacaud, pers. comm., 2004). In view of this, the material referred to in the present paper from the work of FAUJAS was not available for study. However, it is clear that the pictures in plates 26 and 27 were drawn with precision. Species such as *"Trigonosemus" pectiniformis* (VON SCHLOTHEIM , 1813) (see FAUJAS, pl. 27, fig. 5), *Thecidea papillata* (VON SCHLOTHEIM, 1813) (see FAUJAS, pl. 27, fig. 3), *Thecidiopsis digitata* (J. DE C. SOWERBY, 1823) (see FAUJAS, pl. 26, fig. 16) and the juvenile specimen of *Terebratulina chrysalis* (VON SCHLOTHEIM, 1813) represented in pl. 26, fig. 9 are easily recognised. This observation makes it very likely that the specimen illustrated in pl. 26, fig. 7 has also been carefully represented, and drawn under magnification (c. 8 x). Since all details of costal ornament of the juvenile *T. chrysalis* (fig. 9) are rendered accurately, we can safely assume that similar care was taken when drawing details of fig. 7.

Collections held at the Natuurhistorisch Museum Maastricht (NHMM) have been screened with the aim to find brachiopod specimens matching this drawing. Samples collected from the Meerssen Member, with relatively high numbers of *T. chrysalis*, have received particular attention. *Terebratulina chrysalis* is fairly common, mainly as juveniles (hundreds of specimens are available), but complete growth series have also been observed. This check has resulted in the discovery of several brachiopods perfectly matching the specimen shown in pl. 26, fig. 7 of FAUJAS, in a sample from the L. Blezer Collection, from the Meerssen Member at the former Blom quarry (Berg en Terblijt, east of Maastricht, The Netherlands). This sample contains seven articulated individuals of the new species, amongst 150 specimens of *T. chrysalis*.

Subsequently, additional material (three articulated specimens, including an early juvenile, and three isolated ventral valves) from the lowest portion of the Meerssen Member at Kanne (province of Limburg, NE Belgium; J.W.M. Jagt Collection) was added. The new species appears to be rather small in comparison to *T. chrysalis*. However its scarcity in collections screened may be explained by its small size (maximum 5 mm in length).

Specimens described below have been cleaned in an ultrasonic bath; often a brachidium is preserved which is easily visible through the foramen. Two shells have been opened for SEM examination of brachidium structure, and this has enabled assignment of this material to the genus *Gisilina*. Measurements have also been taken and scatter diagrams drawn.

Suprafamilial classification follows WILLIAMS *et al.* (1996) and WILLIAMS *et al.* (2000, pp. 22-27) and hierarchy within the superfamily Cancellothyridoidea THOMSON, 1926 follows LEE *et al.* (2006, pp. H2145-2151).

## Taxonomic description

Phylum Brachiopoda DUMÉRIL, 1806
Subphylum Rhynchonelliformea WILLIAMS *et al.*, 1996
Class Rhynchonellata WILLIAMS *et al.*, 1996
Order Terebratulida WAAGEN, 1883
Suborder Terebratulidina WAAGEN, 1883
Superfamily Cancellothyridoidea THOMSON, 1926
Family Chlidonophoridae MUIR-WOOD, 1959
Subfamily Chlidonophorinae MUIR-WOOD, 1959
Genus *Gisilina* STEINICH, 1963

*Type species*: *Terebratula gisii* ROEMER, 1841

***Gisilina souparti*** n. sp.
Pl. 1, 2; Tables 1, 2; Text-Fig. 1

1803(?) — Térébratulite – FAUJAS DE SAINT-FOND, p. 159, pl. 26, fig. 7.
*pp* 1813 — *Terebratulites chrysalis* – VON SCHLOTHEIM, E.F., p. 113 (cit. FAUJAS, 1803?, pl. 26, fig. 7).
*non* 1813 — *Terebratulites chrysalis* – VON SCHLOTHEIM, E.F., p. 113 (cit. FAUJAS, 1803?, pl. 26, fig. 9).
1838 — *Terebratula chrysalis* – BRONN, p. 651 (cit. FAUJAS pp. 154-160, pl. 26, fig. 7).
*non* 1838 — *Terebratula chrysalis* – BRONN, p. 651 (cit. FAUJAS pp. 154-160, pl. 26, fig. 9).
*pp* 1852 — *Terebratulina striata* – DAVIDSON, p. 35 (cit. FAUJAS, pl. 26, fig. 7).
*non* 1852 — *Terebratulina striata* – DAVIDSON, p. 35 (cit. FAUJAS, pl. 26, fig. 9).

*Diagnosis*
Small-sized, slightly ventri-biconvex *Gisilina* with elongate outline. Both valves with ornament of (8)-12-(14) strong costae. Costae straight, never bifurcated, carrying thick annular knobs, highly developed, on ventral valve and thick knobs, less developed, on dorsal valve. Interspaces rather wide, with smooth shell surface. Anterior commissure rectimarginate, rarely unisulcate. Lateral commissure straight, becoming ventrally concave in gerontic specimens. Beak strong, straight. Foramen large, circular, submesothyrid, not attrite. Deltidial plates short but robust, triangular, anteriorly protruding and disjunct. Dorsal valve ears ornamented with maximum two rows of thick pustules. Pedicle collar short, clearly developed. Internal anterior commissural margins marked by very strong costal imprints. Cardinal process elliptical, wide. Crural process stout, convergent. Loop chlidonophorid with transverse band ventrally directed.

*Derivatio Nominis*
Dedicated to the memory of my friend, Mr. Georges Soupart, who died at Ciply (Belgium) on 24 August 2005 while collecting fossil brachiopods with me; material collected by him has contributed greatly to a better knowledge of Maastrichtian brachiopod faunas in the Mons Basin (southern Belgium).

*Locus Typicus*
The former Blom quarry, Berg en Terblijt (southern Limburg, The Netherlands).

*Stratum Typicum*
Meerssen Member (Maastricht Formation, late Maastrichtian; *Belemnitella junior* and *Belemnella (Neobelemnella) kazimiroviensis* Zones).

*Type*
The holotype (Pl. 2, Fig. 3a-f; Table 1) is a fully adult specimen housed in the collections of the Natuurhistorisch Museum Maastricht (NHMM BL 0357- 87), from level IVf-4, Meerssen Member at the former Blom quarry, Berg en Terblijt (southern Limburg, The Netherlands). Morphological characters measured are listed in Table 1.

*Description*
Outline – Adult shells have an elongated outline in dorsal view with a L/W ratio varying between 1.18 and 1.71 (mean value of 1.41). The maximal width is just anterior of mid-length. In lateral view, the shell has a lenticular outline and is slightly ventri-biconvex with

| HOLOTYPE | W mm | L mm | T mm | LDV mm | WH mm | ØF mm | Costae W | Costae DV | L/W | T/W | LDV/W | WH/W | ØF/W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NHMM BL 0357-87 | 4.1 | 6.6 | 2.6 | 5.5 | 2.9 | 0.90 | 15 | 14 | 1.61 | 0.63 | 1.34 | 0.71 | 0.22 |

Table 1 — Measurements (in mm) and their rations of the holotype of *Gisilina souparti* n. sp., a complete, articulated specimen (NHMM BL 0357-87) from the Meerssen member at the former Blom quarry, Berg en Terblijt (southern Limburg, The Netherlands); **VV**: ventral valve; **DV**: dorsal valve; **L**: length; **W**: width; **T**: thickness of shell; **LDV**: length of dorsal valve; **WH**: width of hinge line; **ØF**: diameter of foramen.

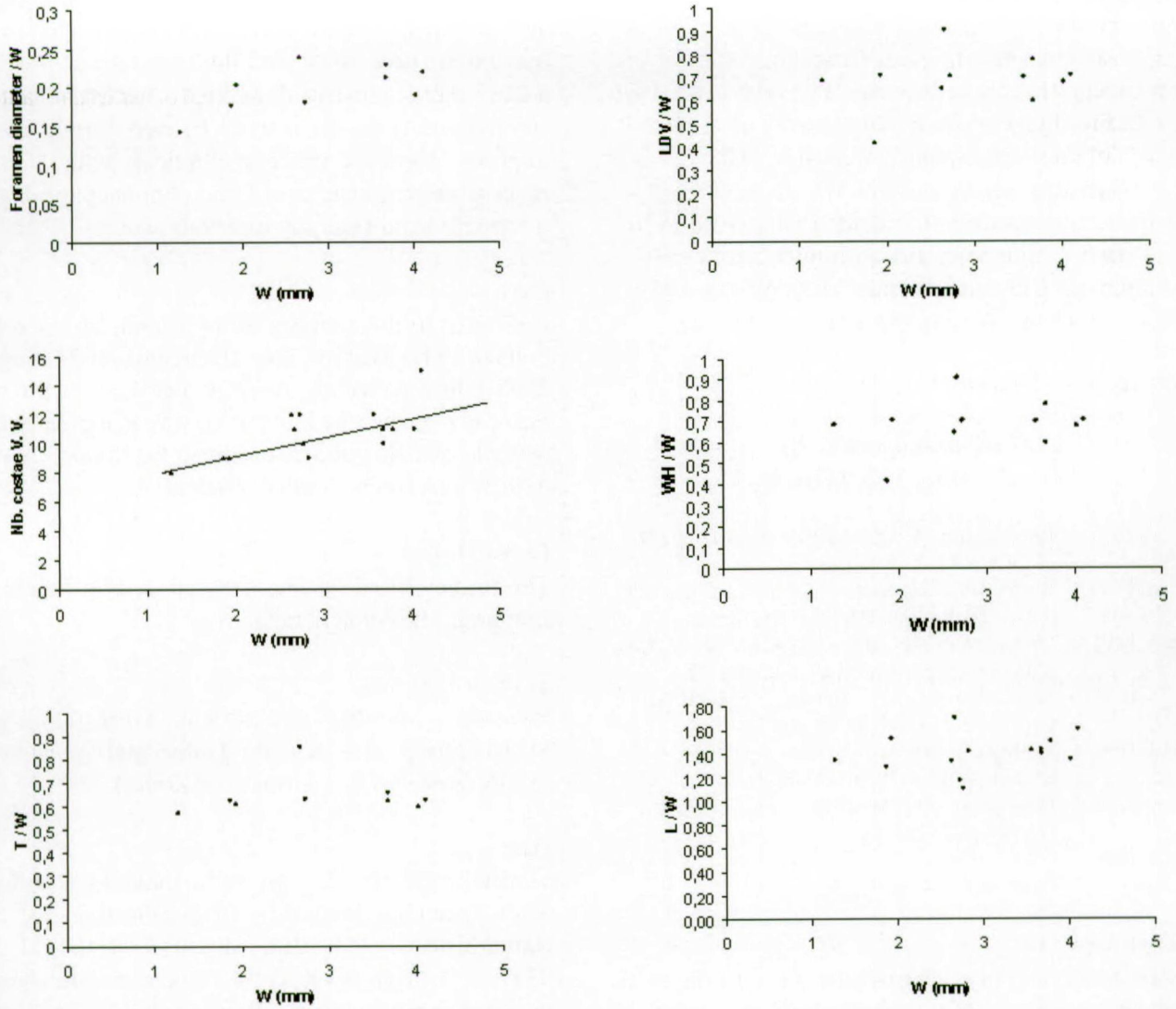


Fig. 1 — Scatter diagram for *Gisilina souparti* n. sp. from the Meerssen member (Maastricht Formation, late Maastrichtian) at the former Blom quarry, Berg en Terblijt (southern Limburg, The Netherlands) and at Kanne (province of Limburg, NE Belgium); **L**: length (mm); **W**: width (mm); **LDV**: length of dorsal valve (mm); **T**: thickness of shell (mm); **WH**: length of hinge line (mm). Relationships between ratios L/W and width, T/W and width, foramen diameter/W and width, LDV/W and width, WH/W and width, diameter of foramen/W and width are illustrated. The relationship between the number of costae (ventral valve) and width has been calculated ($y = 1.38x + 6.63$ with $r = 0.68$).

| *Gisilina souparti* n. sp. | W mm | L mm | T mm | LDV mm | WH mm | ØF mm | Costae W | Costae DV | L/W | T/W | LDV/W | WH/W | ØF/W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 14 | 14 | 9 | 11 | 11 | 9 | 14 | 11 | 14 | 9 | 11 | 11 | 9 |
| Minimum | 1.3 | 1.7 | 0.8 | 1.5 | 0.5 | 0.18 | 8 | 8 | 1.18 | 0.58 | 0.98 | 0.42 | 0.14 |
| Mean | 2.98 | 4.19 | 1.84 | 3.41 | 2.04 | 0.59 | 10.7 | 10.1 | 1.41 | 0.65 | 1.16 | 0.69 | 0.20 |
| Maximum | 4.1 | 6.6 | 2.6 | 5.5 | 2.9 | 0.90 | 15 | 14 | 1.71 | 0.86 | 1.34 | 0.91 | 0.24 |

Table 2 — Minimum, maximum and mean values obtained from measurements (in mm) and their ratios of material of *Gisilina souparti* n. sp. described in the present paper (all specimens housed in the collections of the Natuurhistorisch Museum Maastricht); **VV**: ventral valve; **DV**: dorsal valve; **L**: length; **W**: width; **T**: thickness of shell; **LDV**: length of dorsal valve; **WH**: width of hinge line; **ØF**: diameter of foramen.

a strong convexity of both ventral and dorsal valves. Valve convexity increases with shell size. In anterior and posterior view, the shell presents an oval outline. This species often developed an asymmetrical shell (Pl. 2, Fig. 1a-c). In dorsal view, shells can be curved to the left or to the right. Juveniles are less elongated and more subtriangular, with the largest width located more anteriorly. The anterior commissure is rectimarginate or occasionally slightly unisulcate. The lateral commissure is ventrally concave.

Ventral valve – In ventral view, the umbo is very obtuse, rounded. In all valves studied the umbo appears intact, not worn. Generally, the posterior part of the valve is always better preserved or less eroded than the anterior part. The valve widens out from the umbo, mainly in its anterior portion, so that the maximal width is placed anterior to mid-valve. This valve is ornamented with a low number of strong costae. The number of costae can be as low as 8 but it reaches 12 and exceptionally 14 in a larger specimen. Costae are ornamented with very strong annular knobs broadening out regularly down to the anterior commissure (Pl. 2, Figs. 2c, 3c, 3f). The relative thickness of these knobs is variable, decreasing anteriorly. For this reason, more ovoid, thick knobs are developed in the posterior part of the valve, whereas thinner, annular, disc-shaped knobs occur near the anterior commissure. In some shells, the anterior part of the shell surface exhibits smooth costae devoid of any ornament whereas the posterior part of the shell surface is covered with thick annular knobs (Pl. 1, Fig. 1a, c). This special development appears fairly common, having been already observed in two specimens in the limited material now available. The holotype (Pl. 2, fig. 3) also exhibits slighter knobs on the anterior part of its costae. This character can thus be considered as typical for this species.

The interspaces between costae are smooth. As the width of the costae increases very slowly towards the anterior part of the valve, the relative width of the interspaces increases much more in the anterior part of the valve than in its posterior part.

The straight beak is short and truncate. The interarea is very narrow. The submesothyrid, large, and perfectly circular, foramen is limited by short but very strong, triangular, disjunct deltidial plates, protruding anteriorly. The foramen shows a mean value of 0.20 for the ØF/W ratio.

The teeth possess a swollen base and are very small, smooth, posteriorly oriented and terminate with a blunt tip (Pl. 1, Fig. 1k). Negative grooves corresponding to the costae are clearly visible on the internal valve floor (Pl. 1, Fig. 1j). These grooves become stronger along the anterior commissure giving rise to a denticulate internal commissure margin.

Dorsal valve – The dorsal valve has an elongated, oval outline and is convex in lateral profile. The ears are clearly developed in this species and are ornamented with one or two rows of thick, subspherical pustules. Ears development increases the value observed for the hinge line (WH in mm). A relatively high mean value of 0.69 for the WH/W ratio (fluctuating between 0.42 and 0.91) is observed for *G. souparti* n. sp.

The development of costae is similar to that on the ventral valve. However, for adult shells, costal ornament comprises weaker knobs which are also less annular. The interspaces are also smooth and become very wide near the anterior commissure. In juveniles, the ornament retains very large knobs but their less annular outline is already visible at this stage of growth.

The hinge line is relatively wide in this species. This is clearly shown by the value of the WH/W ratio which is relatively high (Table 1).

The inner socket ridges are high and straight and the outer socket ridges are lower but clearly developed. The sockets are rather deep. A wide, half-elliptical cardinal process is developed. This structure is more easily seen under binocular than with a SEM scanning. Negative prints of the costae are also visible on the internal valve floor and they produce a denticulate internal commissure margin. Crural processes are are acutely pointed when intact (Pl. 2, Fig. 1b) and very thick in this species (0.74 mm long and 0.33 mm wide) and they are not united to form a ring-like loop. The transverse band is ventrally arched with a low fold.

## Comparison with other species of *Gisilina*

Two Maastrichtian species can be assigned with certainty to the genus *Gisilina* as their brachidia are known and have been illustrated, namely *G. gisii* (ROEMER, 1841) and *G. jasmundi* STEINICH, 1965. The former is common in lower Maastrichtian chalks of northern Europe, having been reported in Germany from Rügen (STEINICH, 1965, pp. 100-109; text-figs. 130-148; pl. 14, figs. 2, 3a-d; pl. 15, figs. 1-7) and Aachen (Simon, unpublished data), and from Norfolk, England (JOHANSEN & SURLYK, 1990, pp. 849-850, pl. 6, figs. 3-5). *G. jasmundi* is less common

and has been recorded from the lower Maastrichtian of Rügen (STEINICH, 1965), of Denmark (JOHANSEN, 1987) and of Norfolk (JOHANSEN & SURLYK, 1990, p. 850, pl. 6, fig. 6).

*Gisilina gisii* – In dorsal view, *G. gisii* (ROEMER, 1841) has a more subcircular outline and is more convex in lateral profile. The lateral commissure in this species is ventrally convex. The costae are wide and separated by narrow interspaces. Costal ornament consists of more discrete knobs. Sometimes, specimens of *G. gisii* have near-smooth costae. The foramen is relatively smaller and the beak is more erect.

*Gisilina jasmundi* – At first glance, this is much more similar. However, *Gisilina jasmundi* STEINICH, 1965 is more regularly oval in outline with its greatest width placed at mid-dorsal valve. In lateral profile, it is slightly dorsi-biconvex and the convexity of both valves is rather low. The anterior commissure is slightly parasulcate. The number of costae is higher, between 12 and 18. The foramen is relatively smaller with a mean value of 0.15 for the ØF/W ratio (STEINICH, 1965 p. 113, text-fig.159). The ears are smaller, with a WH/W ratio varying between 0.45 and 0.65 (STEINICH, 1965, p. 112, text-fig. 149).

Comparison with *Terebratulina faujasii* – Superficially, the early Maastrichtian *Terebratulina faujasii* (ROEMER, 1841) might be confused with *Gisilina souparti* n. sp. as this micromorphic species exhibits a similarly large, circular foramen associated with a shell surface covered with straight, non-bifurcated costae ornamented with thick knobs. The knobs observed on the ventral valve costae are also annular. However, the two species can be easily distinguished by their brachidium. *Terebratulina faujasii* has a complete ring loop (STEINICH, 1965, pl. 9, fig. 8) whereas the crural processes remain free in the loop of *G. souparti* n. sp. The latter is also much more elongated in the adult growth stage and the ears on the dorsal valve are much larger. The annular knobs visible on ventral valve costae are also less spaced in *G. souparti* n. sp.

*Occurrence*

Late Maastrichtian of southern Limburg (The Netherlands) and of Kanne, province of Limburg (NE Belgium), known to date exclusively from the Meerssen Member (Maastricht Formation).

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## Explanation of the plates

### PLATE 1

*Gisilina souparti* n. sp., paratype (NHMM BL 0357-83), from level IVf-4 of the Meerssen Member (Maastricht Formation, late Maastrichtian) at the former Blom quarry, Berg en Terblijt, southern Limburg, The Netherlands. Complete articulated specimen.
**1a**: dorsal view; **1b**: lateral view; **1c**: ventral view; **1d**: anterior view; **1e**: posterior view; **1f**: dorsal valve with loop in ventral view; **1g**: detail of loop in ventral view; **1h**: detail of loop in oblique lateral view; **1i**: detail of loop in anterior view; **1j**: ventral valve in dorsal view; **1k**: detail of an obtuse tooth.

### PLATE 2

*Gisilina souparti* n. sp.

All material from level IVf-4, Meerssen Member (Maastricht Formation, late Maastrichtian) at the former Blom quarry, Berg en Terblijt, southern Limburg, The Netherlands.

Fig. 1 — Paratype (NHMM BL 0357- 82); complete articulated, asymmetrical specimen; **1a**: dorsal view; **1b**: detail of loop seen in anterior view; 1c: ventral view.

Fig. 2 — Paratype (NHMM BL 0357- 84); complete, larger, articulated specimen (x 20); **2a**: dorsal view; **2b**: lateral view; **2c**: ventral view; **2d**: anterior view; **2e**: posterior view; **2f**: detail of costal ornament of dorsal valve near the ear).

Fig. 3 — Holotype (NHMM BL 0357- 87); complete fully adult, articulated specimen; **3a**: dorsal view; **3b**: lateral view; **3c**: ventral view; **3d**: anterior view; **3e**: posterior view; **3f**: detail of costal ornament of ventral valve in posterior part of shell.

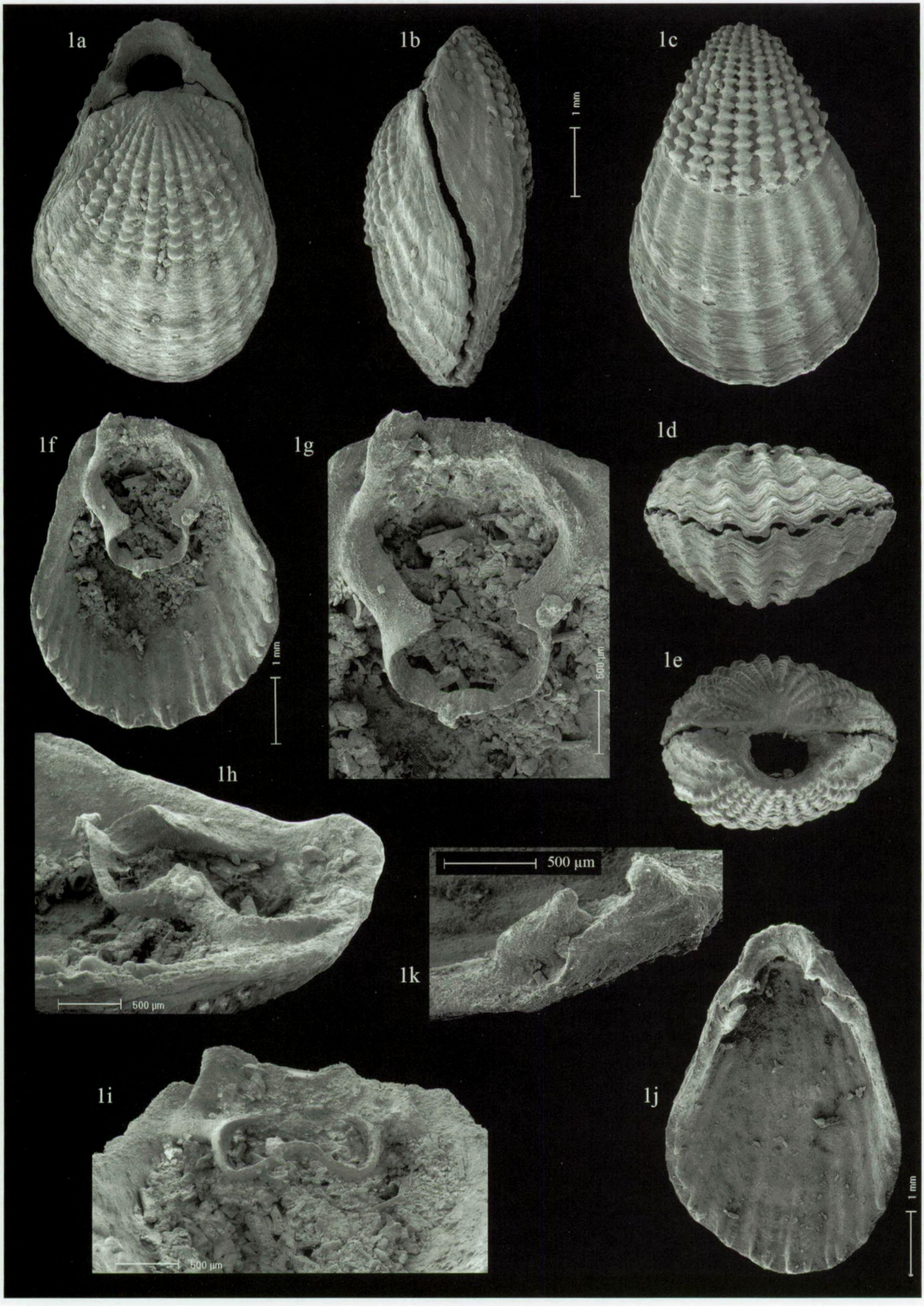
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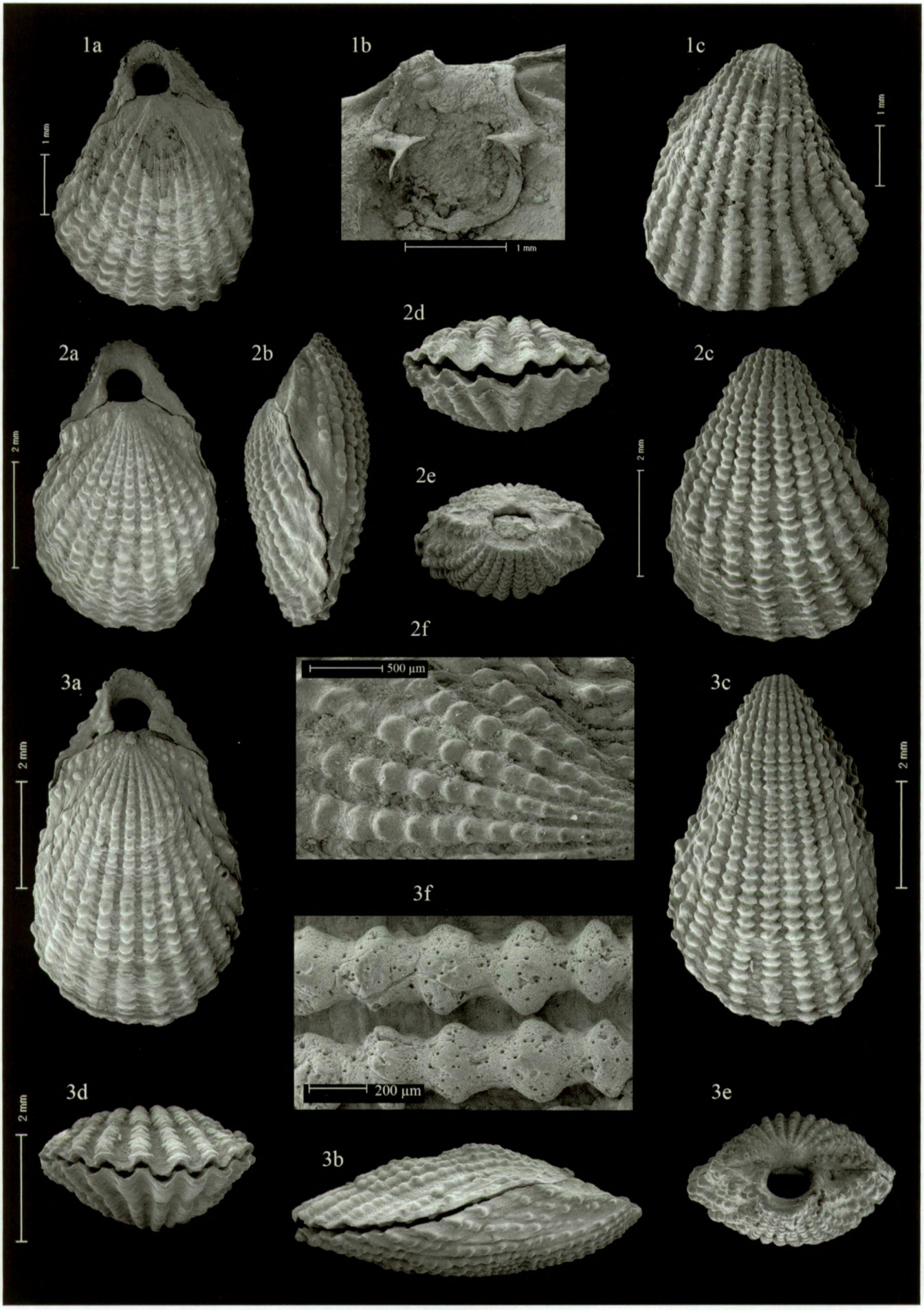
PLATE 1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3c
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3f
200 µm
3d
2 mm
3b
3e

PLATE 2