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# Chitinozoan Type Specimens in the F.H. Cramer Collection at the Geological Survey of Austria

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3 Text-Figures, 3 Plates

*Palynomorphs*
*Type Specimens*
*Pennsylvania*
*China*
*Spain*
*Lower Palaeozoic*
*Paleontological collection*

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## Chitinozoen Typusexemplare in der F. H. Cramer-Sammlung an der Geologischen Bundesanstalt

### Zusammenfassung

Die Sammlung von Fritz H. Cramer, die sich seit 1990 an der Geologischen Bundesanstalt in Wien (GBA) befindet, umfasst tausende Dauerpräparate mit Acritarchen, Chitinozoen und Sporen aus dem Altpaläozoikum verschiedener Kontinente, weiters zahlreiche Aufbereitungsrückstände und Gesteinsproben. Bei der genauen Durchmusterung aller in Frage kommenden Präparate konnten 21 der 46 von Cramer und seinen Co-Autoren beschriebenen Chitinozoen-Holotypen wiedergefunden werden (von 2 Arten konnten nur die Paratypen lokalisiert werden). Von diesen wurden im Durchlichtmikroskop Farbfotos angefertigt. Sie werden hier zusammen mit den Daten der Originalabbildungen, den Angaben über Typus-Schichten und -Lokalitäten, den Nummern der Präparate-Boxen, den Präparate-Nummern und den Englandfinder-Angaben zu den einzelnen Objekten präsentiert. Weiters wird angeführt, ob noch Probenmaterial und/oder Aufbereitungsrückstände der Proben, aus denen die Chitinozoen-Holotypen gewonnen wurden, vorhanden sind.

### Abstract

The collection of Fritz H. Cramer, with thousands of permanent slides (containing Lower Paleozoic acritarchs, chitinozoans and spores from several continents) and with numerous organic residues and rock samples, has been housed at the Geological Survey of Austria (GBA) since 1990. The slides were examined for Cramer's 46 chitinozoan holotypes, of which 21 were recovered (of two species only paratypes were found). Of these, colour photographs were made using a transmitting light microscope. They are presented here in combination with the published data of the type figures, the indications of the type strata and type localities, the collection numbers of the cases in which the slides are stored, the slide numbers and the Englandfinder data of the types. Furthermore, information is provided about whether rock material and/or organic residues of the type samples are available.

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## Introduction

From the early sixties to the late seventies of the 20th century, Fritz H. CRAMER, frequently in co-authorship with his wife Maria del Carmen R. DIEZ, published numerous articles on Lower Paleozoic palynomorphs (acritarchs, chitinozoans and spores), including hundreds of new species.

In 1990, after CRAMER's retirement from scientific work, the Geological Survey of Austria (GBA) acquired his complete collection. This comprised thousands of permanent slides, organic residues in small tubes and rock samples. The whole collection has been carefully examined and rearranged by the present author and its contents documented.

One aim of the reorganisation was to identify the slides with the chitinozoan holotypes in the collection. This turned out to be difficult, as in CRAMER's publications up to 1967, information concerning the sample numbers of the holotypes was frequently incorrect or missing.

Moreover, it has been discovered that many holotypes are missing. All but one of the slides with the 18 chitinozoan holotypes of CRAMER (1964) are missing and are now regarded as lost (see PRIEWALDER, 1997: General Remarks, p. 75); only the slide with *Sphaerochitina llorona* has been found.

From the eight holotypes in CRAMER (1967), only 1 holotype and 2 paratypes have been found again *(Conochitina lagenoforma*, *C. parvidecipiens* [paratype], *Plectochitina* ? *taugourdeauii* [paratype]). In contrast, the slides with the holotypes in CRAMER (1969) and (1970) *(Conochitina* ? *monterrosae* and *Angochitina sinica*, respectively) have been identified without difficulty. One of the 8 holotypes in CRAMER & DIEZ (1978) has not been found *(Sphaerochitina gerardis)* and finally all ten holotypes in DIEZ & CRAMER (1978) have been identified.

The decision to publish a special volume dealing exclusively with fossil holotypes in the GBA collections has been used to re-photograph the chitinozoan holotypes of CRAMER and his co-workers with a modern equipment, since the original figures frequently are of poor quality. In several cases, the colour photographs presented here might contribute to a better understanding of the original definition of the species.

PRIEWALDER (1997) carried out SEM-studies on the chitinozoans from sample 813 of CRAMER (1964), which came from the uppermost San Pedro Formation of the La Vid de Gordón section in the Cantabrian Mountains in Spain. PRIEWALDER (1997) identified neotypes for 3 species for which the holotypes had been lost: *Plectochitina carminae* CRAMER, 1964, *P. rosendae* CRAMER, 1964 and *Pseudoclathrochitina carmenchui* (CRAMER, 1964). These species are also included in this work.

If rock material and/or organic residues of the samples from which the holotypes were derived are present in the collection, this has been mentioned in the remarks. However, note that the residues might be spoiled, since SEM-examination of the chitinozoans of sample 813 (PRIEWALDER, 1997) revealed that the fossils from this residue were covered by a film of unknown composition and were thus not suitable for morphological studies. Note also that in most cases only small pieces of the rock samples are available.

The slides of the CRAMER collection have been deposited in 152 boxes and stored together with the organic residues, as a separate constituent of the micropaleontological collection of the GBA, with the sample numbers and slide numbers given by CRAMER. However, for the sake of efficient recovery, the slides with the chitinozoan holotypes have in addition been given slide numbers of the GBA collections (GBA 2009/031/1–25).

The slides with the neotypes (PRIEWALDER, 1997), however, are part of the GBA collection and have been kept under the slide numbers GBA 1997/1/1–3. The rock samples have been packed in eight wooden cases and deposited in the case storage of the GBA, under the key word "CRAMER".

All the light microscope photographs were taken with a digital camera (Canon PowerShot S80) on a transmitting light microscope (Leitz Ortholux II). For the SEM-pictures the JEOL JSM 200 Scanning Electron Microscope at the Institute of Geosciences, University of Rennes, was used.

## Description of the Chitinozoan Types

### Preliminary Notes

Note that this paper is not a systematic revision of the chitinozoan holotypes in the CRAMER collection. Instead, its aim is to combine in one article all the available types with the relevant data given in the original descriptions and to present better quality light microscope photographs of the fossils.

The holotypes, neotypes and paratypes described here are cited under their original generic names (except for *Pseudoclathrochitina carmenchui)* and are arranged in alphabetic order of the names of the genera. This chapter is followed by an alphabetic list of the species names.

### Description

#### *Ancyrochitina ancyrea* var. *mileches* CRAMER & DIEZ, 1978

(Pl. 1, Fig. 2a, b)

Coll. no. of the slide: GBA 2009/031/24.

CRAMER collection at GBA: Box 113 – Slide 760370-C1 – Englandfinder L.43.

Type level: Furada Formation (middle shale portion, sample 760370), early Ludlow.

Type locality: Outcrop about 1 km west of Soto de los Infantes, Province of Oviedo, Spain.

Type figure: Cramer & Diez, 1978, p. 163, Pl. 2, Fig. 11.

**Remarks:**
It is not clear whether the outcrop from which sample 760370 comes is situated east or west of the village Soto de los Infantes, because in the description of *Plectochitina filigrana* (Cramer & Diez, 1978, p. 174), from the same sample, the locality is given as "outcrop about 1 km east of Soto de los Infantes".

The slide number for the holotype given in Cramer & Diez, 1978 (slide 760370-C5) is incorrect.

Vesicle length of the holotype (this paper): 157 µm (in Cramer & Diez, 1978: Not stated).

### *Ancyrochitina cantabrica* Cramer & Diez, 1978
(Pl. 2, Fig. 3a–c)

Coll. no. of the slide: GBA 2009/031/11.

Cramer collection at GBA: Box 77 – Slide 6542-C1 – Englandfinder N.48.

Type level: San Pedro Formation (sample 6542), middle Gedinnian.

Type locality: Outcrop west of the village Torrestío, Province of León, Spain.

Type figure: Cramer & Diez, 1978, p. 163, Pl. 7, Fig. 12.

**Remarks:**
Vesicle length of the holotype (this paper): 243 µm (Cramer & Diez, 1978: Not stated).

Rock sample and residue available.

### *Ancyrochitina dunensis* Cramer & Diez, 1978
(Pl. 1, Fig. 7a–c)

Coll. no. of the slide: GBA 2009/031/19.

Cramer collection at GBA: Box 107 – Slide 760163-C1 – Englandfinder V.27.

Type level: San Pedro Formation (sample 760163), Silurian Devonian boundary.

Type locality: Outcrop west of Geras de Gordón, on the path along the River Casares, Province of León, Spain.

Type figure: Cramer & Diez, 1978, p. 164, Pl. 4, Fig. 10, 13.

**Remarks:**
Vesicle length of the holotype (this paper): 115 µm (Cramer & Diez, 1978: Not stated).

### *Ancyrochitina gonzali* Diez & Cramer, 1978
(Pl. 1, Fig. 6a–b)

Coll. no. of the slide: GBA 2009/031/13.

Cramer collection at GBA: Box 94 – Slide 71035-C1 – Englandfinder F.37.2.

Type level: La Vid Shales (Sample 71035).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 206, Pl. 1, Fig. 5.

**Remarks:**
Vesicle length of the holotype (this paper): 120 µm (Diez & Cramer, 1978: 94 µm).

Rock sample available.

### *Angochitina laevigata* Diez & Cramer, 1978
(Pl. 3, Fig. 7a–b)

Coll. no. of the slide: GBA 2009/031/4.

Cramer collection at GBA: Box 50 – Slide 71027-C1 – Englandfinder E.32.

Type level: La Vid Shales (sample 71027).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 208, Pl. 1, Fig. 28.

**Remarks:**
Vesicle length of the holotype (this paper): 112 µm (Diez & Cramer, 1978: 88 µm).

Rock sample available.

### *Angochitina sinica* Cramer, 1970
(Pl. 3, Fig. 2a–c)

Coll. no. of the slide: GBA 2009/031/6.

Cramer collection at GBA: Box 56 – Slide 6295-A1 – Englandfinder G.31.4.

Type level: Probably Devonian (sample 6295).

Type locality: Latitude 25° North, longitude 103°48' East; south of Luliang, 57 km east of Kunming; Yunnan Province, China.

Type figure: Cramer, 1970, p. 1123, Pl. 151, Fig. 5.

**Remarks:**
Vesicle length of the holotype (this paper): 143 µm (Cramer, 1970: Not stated).

Rock sample and residue available.

### *Angochitina tridigitifera* Diez & Cramer, 1978
(Pl. 1, Fig. 4a–c)

Coll. no. of the slide: GBA 2009/031/14.

Cramer collection at GBA: Box 94 – Slide 71037-C1 – Englandfinder R.49.2.

Type level: La Vid Shales (sample 71037).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 209, Pl. 1, Fig. 31.

**Remarks:**
Vesicle length of the holotype (this paper): 129 µm (Diez & Cramer, 1978: 108 µm).

Rock sample available.

### *Angochitina turdela* Diez & Cramer, 1978
(Pl. 3, Fig. 6)

Coll. no. of the slide: GBA 2009/031/15.

Cramer collection at GBA: Box 94 – Slide 71035-C1 – Englandfinder G.28.

Type level: La Vid Shales (sample 71035).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 209, Pl. 1, Fig. 33.

**Remarks:**
The slide number for the holotype given in Diez & Cramer, 1978 (slide 71037-C1) is incorrect.

Vesicle length of the holotype (this paper): 98 µm (Diez & Cramer, 1978: 90 µm).

Rock sample available.

### *Conochitina lagenoforma* Cramer, 1967
(Pl. 2, Fig. 5a–b)

Coll. no. of the slide: GBA 2009/031/10.

Cramer collection at GBA: Box 76 – Slide 861-A6 – Englandfinder P.34.1.

Type level: Formigoso Formation (sample 861).

Type locality: Aralla de Luna section; second outcrop of the San Pedro Formation on the left side of the dirt road (from Villamanín by Cubillas [de Arbas] and Aralla [de Luna] to road C-623) after the topographically lowermost hairpin curve, running from Aralla (de Luna) to Cubillas (de Arbas); Cantabrian Mountains, Province of León, Spain.

Type figure: Cramer, 1967, p. 90, Pl. 2, Fig. 35.

**Remarks:**
Vesicle length of the holotype (this paper): 129 µm (Cramer, 1967: Not stated).

### *Conochitina* ? *monterrosae* Cramer, 1969
(Pl. 2, Fig. 7a–c)

Coll. no. of the slide: GBA 2009/031/3.

Cramer collection at GBA: Box 24 – Slide 6012-P7 – Englandfinder G.26.4.

Type level: Rose Hill Formation (120 feet below the top, sample 6012), upper lower Silurian.

Type locality: Outcrop near Millerstown (road excavation project for Route 22 north of Millerstown), Pennsylvania, USA.

Type figure: Cramer, 1969, p. 490, Pl. 70, Fig. 16.

**Remarks:**
Vesicle length of the holotype (this paper): 77 µm (Cramer, 1969: Not stated).

Residue available.

### *Conochitina parvidecipiens* Cramer, 1967
(Pl. 2, Fig. 2)

Coll. no. of the slide: GBA 2009/031/1.

Cramer collection at GBA: Box 4 – Slide 916-A5 – Englandfinder K.25.

Level of the paratype: Formigoso Formation (sample 916).

Type locality: El Tueiro section in the southernmost outcrop of the Formigoso Formation at the east side of road C-630, north of the village Villasimpliz (de Gordón); Cantabrian Mountains, Province of León, Spain.

Holotype figure (Holotype not found): Cramer, 1967, p. 91, Pl. 2, Fig. 26.

Paratype figure: Cramer, 1967, Pl. 2, Fig. 27.

**Remarks:**
The holotype is not in slide 0917–A5, as mentioned by Cramer, 1967 (p. 91).

Vesicle length of the paratype (this paper): 203 µm (vesicle lengths for the species in Cramer 1967: 220–280 µm).

### *Gotlandochitina labdata* Diez & Cramer, 1978
(Pl. 3, Fig. 5a–b)

Coll. no. of the slide: GBA 2009/031/20.

Cramer collection at GBA: Box 110 – Slide 760332-C2 – Englandfinder U.38.4.

Type level: La Vid Shales (sample 760332).

Type locality: 1.5 km N of Barrios de Luna, on the road C-623 (locality 760328: 42°51’16” N / 05°52’00” W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 210, Pl. 1, Fig. 39.

**Remarks:**
Vesicle length of the holotype (this paper): 154 µm (Diez & Cramer, 1978: 144 µm).

Residue available.

### *Linochitina chalata* Diez & Cramer, 1978
(Pl. 1, Fig. 5a–b)

Coll. no. of the slide: GBA 2009/031/21.

Cramer collection at GBA: Box 110 – Slide 760333-C2 – Englandfinder U.29.1.

Type level: La Vid Shales (sample 760333).

Type locality: 1.5 km N of Barrios de Luna, on the road C-623 (locality 760328: 42°51’16” N / 05°52’00” W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 210, Pl. 2, Fig. 58.

**Remarks:**
Total length of the holotype, including carina (this paper): 109 µm (Diez & Cramer, 1978: 90 µm).

Residue available.

### *Linochitina diegui* Diez & Cramer, 1978
(Pl. 2, Fig. 8a–c)

Coll. no. of the slide: GBA 2009/031/16.

Cramer collection at GBA: Box 94 – Slide 71032-C1 – Englandfinder E.21.3.

Type level: La Vid Shales (sample 71032).

Type locality: Argovejo (locality 71022: 42°54’07” N / 05°06’55” W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 211, Pl. 2, Fig. 55.

**Remarks:**
Total length of the holotype, including carina (this paper): 117 µm (Diez & Cramer, 1978: 99 µm).

### *Plectochitina carminae* Cramer, 1964
(Text-Fig. 1)

Coll. no. of the slide: GBA 1997/1/1 – Englandfinder M.35.3.

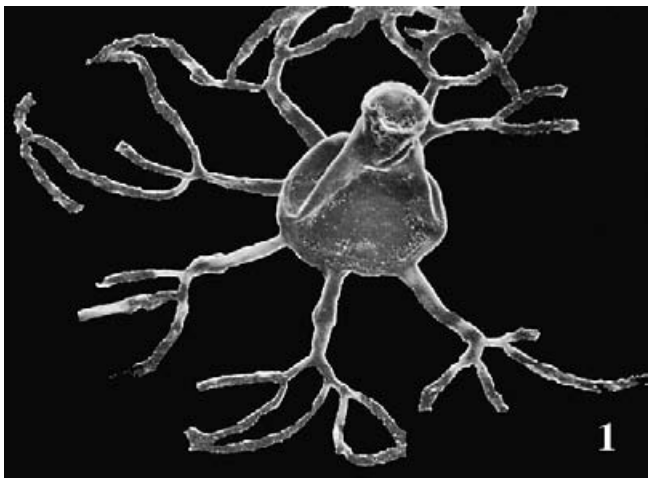
Type level: San Pedro Formation (uppermost shale intercalation, sample 813), *Margachitina elegans* biozone, Pridoli.

Type locality: La Vid de Gordón section, Cantabrian Mountains, Province of León, Spain.

Holotype figure (Holotype lost): Cramer, 1964, p. 346, Pl. 20, Fig. 21.

Neotype figure: Priewalder, 1997, p. 77, Pl. 2, Fig. 1; Pl. 4, Fig. 1, 7, 8.

**Remarks:**
Vesicle length of the neotype: No data, as measurement is not possible because of the specimen's compression in the direction of the symmetry axis.




Text-Fig. 1.
*Plectochitina carminae* CRAMER, 1964. SEM-photo; x 235 (from PRIEWALDER, 1997).

### *Plectochitina filigrana* CRAMER & DIEZ, 1978
(Pl. 1, Fig. 8a–b)

Coll. no. of the slide: GBA 2009/031/25.

CRAMER collection at GBA: Box 113 – Slide 760370-C5 – Englandfinder X.12.1.

Type level: Furada Formation (middle shale portion, sample 760370), early Ludlow.

Type locality: Outcrop about 1 km east of Soto de los Infantes, Province of Oviedo, Spain.

Type figure: CRAMER & DIEZ, 1978, p. 174, Pl. 2, Fig. 1.

**Remarks:**
It is not clear whether the outcrop from which sample 760370 comes is situated east or west of the village Soto de los Infantes, because in the description of *Ancyrochitina ancyrea* var. *mileches* (CRAMER & DIEZ, 1978, p. 163), from the same sample, the locality is given as "outcrop about 1 km west of Soto de los Infantes".

Vesicle length of the holotype (this paper): 109 µm (CRAMER & DIEZ, 1978: Not stated).

### *Plectochitina irregularis* CRAMER & DIEZ, 1978
(Pl. 3, Fig. 4a–c)

Coll. no. of the slide: GBA 2009/031/12.

CRAMER collection at GBA: Box 77 – Slide 6538-C2 – Englandfinder R.39.3.

Type level: San Pedro Formation (uppermost shale intercalation, sample 6538), late Gedinnian.

Type locality: Outcrop west of Torrestío, Province of León, Spain.

Type figure: CRAMER & DIEZ, 1978, p. 173, Pl. 1, Fig. 1, 2.

**Remarks:**
Vesicle length of the holotype (this paper): 151 µm (CRAMER & DIEZ, 1978: Not stated).

Rock sample and residue available.

### *Plectochitina rosendae* CRAMER, 1964
(Pl. 2, Fig. 9a–c)

Coll. no. of the slide: GBA 1997/1/3 – Englandfinder N.37.4.

Type level: San Pedro Formation (uppermost shale intercalation, sample 813), *Margachitina elegans* biozone, Pridoli.

Type locality: La Vid de Gordón section, Cantabrian Mountains, Province of León, Spain.

Holotype figure (Holotype lost): CRAMER, 1964, p. 347, Pl. 20, Fig. 7.

Neotype figure: PRIEWALDER, 1997, p. 77, Pl. 4, Fig. 3.

**Remarks:**
Vesicle length of the neotype: 142 µm.

### *Plectochitina* (?) *taugourdeauii* CRAMER, 1967
(Pl. 3, Fig. 3a–b)

Coll. no. of the slide: GBA 2009/031/2.

CRAMER collection at GBA: Box 4 – Slide 909-A2 – Englandfinder N.27.

Level of the paratype: Formigoso Formation (sample 909).

Type locality: El Tueiro section in the southernmost outcrop of the Formigoso Formation at the east side of road C-630 north of the village Villasimpliz (de Gordón); Cantabrian Mountains, Province of León, Spain.

Holotype figure (Holotype not found): CRAMER 1967, p. 127, Pl. 4, Fig. 96.

Paratype figure: CRAMER 1967, p. 127, Pl. 4, Fig. 92.

**Remarks:**
The holotype is not in slide 909–A2, as stated by CRAMER, 1967 (p. 127).

Most probably the paratype on Pl. 4, Fig. 92 is the real holotype, not only because of its correct slide number, but also because the vesicle length given for the holotype (270 µm) applies to this object, whilst the other one (Pl. 4, Fig. 96, designated as holotype) is much smaller.

Vesicle length of the paratype (this paper): 270 µm (of the holotype in CRAMER, 1967: 270 µm).

Residue available.

### *Plectochitina variabilis* CRAMER & DIEZ, 1978
(Pl. 3, Fig. 1a–c)

Coll. no. of the slide: GBA 2009/031/17.

CRAMER collection at GBA: Box 94 – Slide 71046-C1 – Englandfinder V.43.4.

Type level: San Pedro Formation (middle shale part of exposure, sample 71046), latest Ludlow or earliest Gedinnian.

Type locality: Argovejo, Province of León, Spain.

Type figure: CRAMER & DIEZ, 1978, p. 175, Pl. 7, Fig. 4.

**Remarks:**
Vesicle length of the holotype (this paper): 148 µm (CRAMER & DIEZ, 1978: Not stated).
Rock sample and residue available.

### *Pseudoclathrochitina carmenchui* (Cramer, 1964)
(Text-Figs. 2, 3)


Text-Fig. 2.
*Pseudoclathrochitina carmenchui* (Cramer, 1964). SEM-photo; x 560 (from Priewalder, 1997).


Text-Fig. 3.
Detail of Text-Fig. 2; bottom of the vesicle. x 610 (from Priewalder, 1997).

Coll. no. of the slide: GBA 1997/1/2 – Englandfinder L.39.3.

Type level: San Pedro Formation (uppermost shale intercalation, sample 813), *Margachitina elegans* biozone, Pridoli.

Type locality: La Vid de Gordón section, Cantabrian Mountains, Province of León, Spain.

Holotype figure (Holotype lost): Cramer, 1964, p. 346, Pl. 24, Fig. 18.

Neotype figure: Priewalder, 1997, p. 78, Pl. 1, Figs. 2, 6; Pl. 5, Figs. 8, 9.

**Remarks:**
Vesicle length of the neotype: 99 µm.

### *Sphaerochitina llorona* Cramer, 1964
(Pl. 2, Fig. 1)

Coll. no. of the slide: GBA 2009/031/9.

Cramer collection at GBA: Box 68 – Slide 1170-11 – Englandfinder A.39.

Type level: San Pedro Formation (sample 1170), Ludlow.

Type locality: Oblanca de Luna, Province of León, NW Spain.

Type figure: Cramer, 1964, p. 352, Pl. 23, Fig. 3.

**Remarks:**
Vesicle length of the holotype (this paper): 179 µm (Cramer, 1964: Not stated).

### *Sphaerochitina minima* Diez & Cramer, 1978
(Pl. 1, Fig. 1a–c)

Coll. no. of the slide: GBA 2009/031/22.

Cramer collection at GBA: Box 112 – Slide 760383-C1 – Englandfinder L.23.4.

Type level: Nieva Formation (sample 760383).

Type locality: 3km west on local road C-633, from Belmonte to Las Estacas (locality 760383: 43°17'35" N / 06°14'25" W), Province of Oviedo, Spain.

Type figure: Diez & Cramer, 1978, p. 212, Pl. 2, Fig. 70.

**Remarks:**
Vesicle length of the holotype (this paper): 252 µm (Diez & Cramer, 1978: 224 µm).

Residue available.

### *Sphaerochitina ricardi* Diez & Cramer, 1978
(Pl. 1, Fig. 3a–c)

Coll. no. of the slide: GBA 2009/031/5.

Cramer collection at GBA: Box 50 – Slide 71028-C1 – Englandfinder P.44.4.

Type level: La Vid Shales (sample 71028).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 212, Pl. 2, Fig. 79.

**Remarks:**
Vesicle length of the holotype (this paper): 171 µm (Diez & Cramer, 1978: 134 µm).

Rock sample available.

### *Urochitina abelgensis* Diez & Cramer, 1978
(Pl. 2, Fig. 6a–b)

Coll. no. of the slide: GBA 2009/031/18.

Cramer collection at GBA: Box 94 – Slide 71032-C1 – Englandfinder O.43.

Type level: La Vid Shales (sample 71032).

Type locality: Argovejo (locality 71022: 42°54'07" N / 05°06'55" W), Province of León, NW Spain.

Type figure: Diez & Cramer, 1978, p. 213, Pl. 2, Fig. 81.

**Remarks:**
Total vesicle length of the holotype, including peduncle (this paper): 130 µm (Diez & Cramer, 1978: 99 µm).

Rock sample available.

### *Urochitina santullanensis* Cramer & Diez, 1978
(Pl. 2, Fig. 4a–b)

Coll. no. of the slide: GBA 2009/031/23.

Cramer collection at GBA: Box 112 – Slide 760118-C1 – Englandfinder Q.38.

Type level: Black shales outcropping topographically below slightly ferruginous quartzitic sandstone (sample 760118), early Givetian.

Type locality: Path west of the village of Valle de Santullán, Province of Palencia, Spain (coordinates: 42°55'49" N / 4°20'20" W).

Type figure: Cramer & Diez, 1978, p. 177, Text-Fig. 8 (specimen on the left).

**Remarks:**
The slide number for the holotype given in Cramer & Diez, 1978 (slide 760118-B2) is incorrect.

Vesicle length of the holotype (this paper): 146 µm (Cramer & Diez, 1978: Not stated).

## Alphabetic List of Species


*abelgensis, Urochitina,* Diez & Cramer, 1978 p. 236
*ancyrea* var. *mileches, Ancyrochitina,* Cramer & Diez, 1978 p. 232
*cantabrica, Ancyrochitina,* Cramer & Diez, 1978 p. 233
*carmenchui, Pseudoclathrochitina,* (Cramer, 1964) p. 236
*carminae, Plectochitina,* Cramer, 1964 p. 234
*chalata, Linochitina*, Diez & Cramer, 1978 p. 234
*diegui, Linochitina*, Diez & Cramer, 1978 p. 234
*dunensis, Ancyrochitina,* Cramer & Diez, 1978 p. 233
*filigrana, Plectochitina,* Cramer & Diez, 1978 p. 235
*gonzali, Ancyrochitina,* Diez & Cramer, 1978 p. 233
*irregularis, Plectochitina,* Cramer & Diez, 1978 p. 235
*labdata, Gotlandochitina,* Diez & Cramer, 1978 p. 234
*laevigata, Angochitina,* Diez & Cramer, 1978 p. 233
*lagenoforma, Conochitina,* Cramer, 1967 p. 234
*llorona, Sphaerochitina,* Cramer, 1964 p. 236
*minima, Sphaerochitina,* Diez & Cramer, 1978 p. 236
*monterrosae, Conochitina* ?, Cramer, 1969 p. 234
*parvidecipiens, Conochitina,* Cramer, 1967 p. 234
*ricardi, Sphaerochitina,* Diez & Cramer, 1978 p. 236
*rosendae, Plectochitina,* Cramer, 1964 p. 235
*santullanensis, Urochitina,* Cramer & Diez, 1978 p. 237
*sinica, Angochitina,* Cramer, 1970 p. 233
*staplinis, Hoegisphaera,* Cramer,1966 p. 242
*taugourdeauii, Plectochitina* (?), Cramer, 1967 p. 235
*tortugaides, Hoegisphaera,* Cramer, 1966 p. 242
*tridigitifera, Angochitina,* Diez & Cramer, 1978 p. 233
*turdela, Angochitina,* Diez & Cramer, 1978 p. 233
*variabilis, Plectochitina,* Cramer & Diez, 1978 p. 235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Manuskript bei der Schriftleitung eingelangt am 2. März 2010

# Plate 1

Fig. 1: *Sphaerochitina minima* DIEZ & CRAMER, 1978.
a) Lateral view. x 255.
b) Detail of Fig. 1a: Spiny ornamentation of the chamber wall. x 1100.
c) Detail of Fig. 1a: Spiny ornamentation of the wall close to the aperture. x 1320.

Fig. 2: *Ancyrochitina* var. *ancyrea mileches* CRAMER & DIEZ, 1978.
a) Lateral view. x 340.
b) Detail of Fig. 2a: Processes around the aperture. x 570.

Fig. 3: *Sphaerochitina ricardi* DIEZ & CRAMER, 1978.
a) Lateral view. x 315.
b) Detail of Fig. 3a: Spiny ornamentation of the wall close to the aperture. x 450.
c) As Fig. 3b, but different focus level: bifurcated spines. x 560.

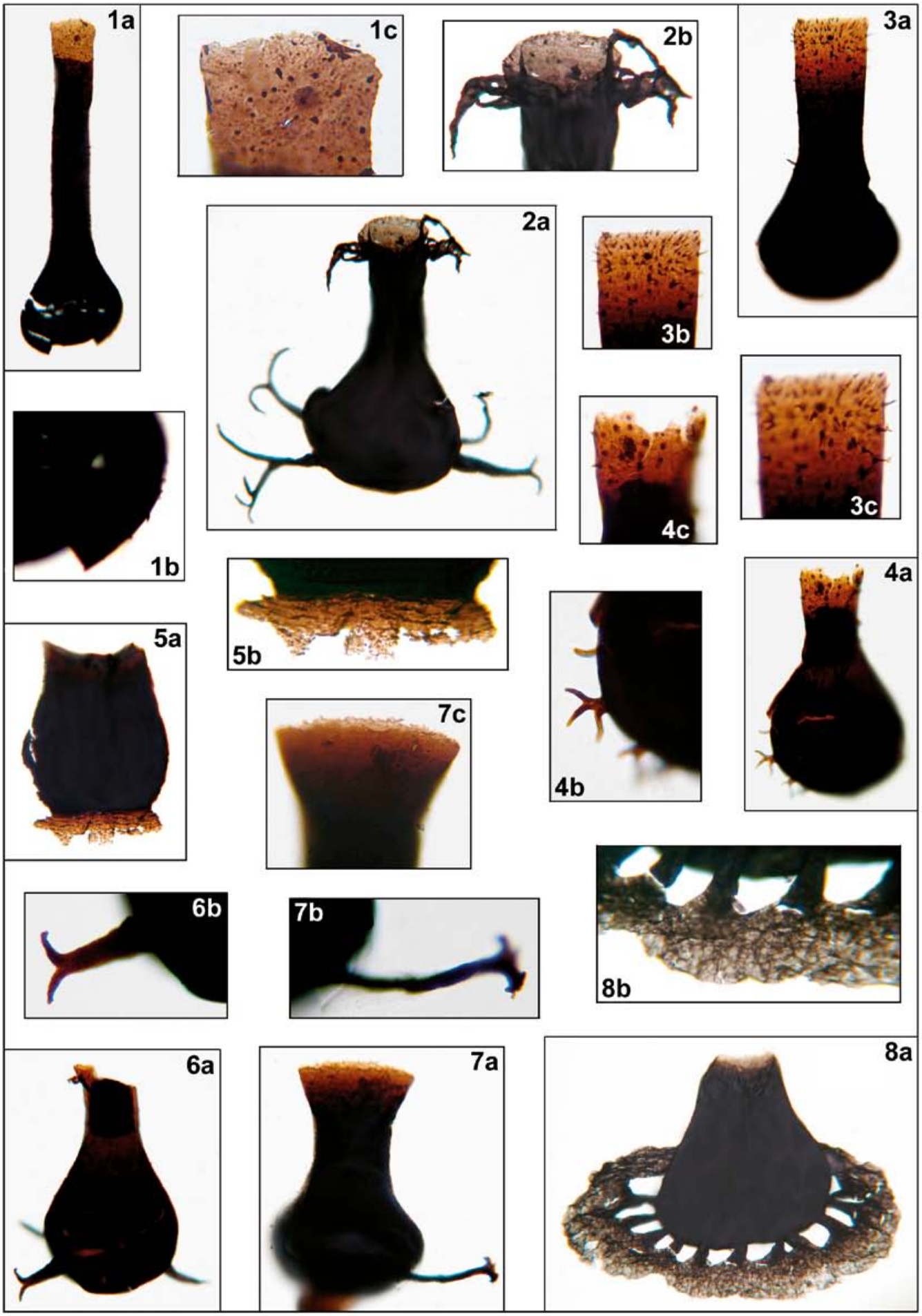
Fig. 4: *Angochitina tridigitifera* DIEZ & CRAMER, 1978.
a) Lateral view. x 345.
b) Detail of Fig. 4a: Ornamentation of the chamber wall. x 730.
c) Detail of Fig. 4a: Spiny ornamentation of the wall close to the aperture. x 600.

Fig. 5: *Linochitina chalata* DIEZ & CRAMER, 1978.
a) Lateral view. x 360.
b) Detail of Fig. 5a: Membranous carina. x 740.

Fig. 6: *Ancyrochitina gonzali* DIEZ & CRAMER, 1978.
a) Lateral view. x 370.
b) Detail of Fig. 6a: Bifurcated process on the left chamber margin with tiny bifurcations at the tips. x 860.

Fig. 7: *Ancyrochitina dunensis* CRAMER & DIEZ, 1978.
a) Lateral view. x 390.
b) Detail of Fig. 7a: Process on the right chamber margin. x 770.
c) Detail of Fig. 7a: Distal part of the neck. x 630.

Fig. 8: *Plectochitina filigrana* CRAMER & DIEZ, 1978.
a) Lateral view. x 345.
b) Detail of Fig. 8a: Detail of the spongy carina. x 800.



# Plate 2

Fig. 1: *Sphaerochitina llorona* CRAMER, 1964.
Lateral view. x 275.

Fig. 2: *Conochitina parvidecipiens* CRAMER, 1967.
Lateral view. x 295.

Fig. 3: *Ancyrochitina cantabrica* CRAMER & DIEZ, 1978.
a) Lateral view. x 260.
b) Detail of Fig. 3a: Cell-like processes on the left chamber margin. x 820.
c) Detail of Fig. 3a: Distal part of the neck. x 650.

Fig. 4: *Urochitina santullanensis* CRAMER & DIEZ, 1978.
a) Lateral view. x 340.
b) Detail of Fig. 4a: Thin-walled copula. x 960.

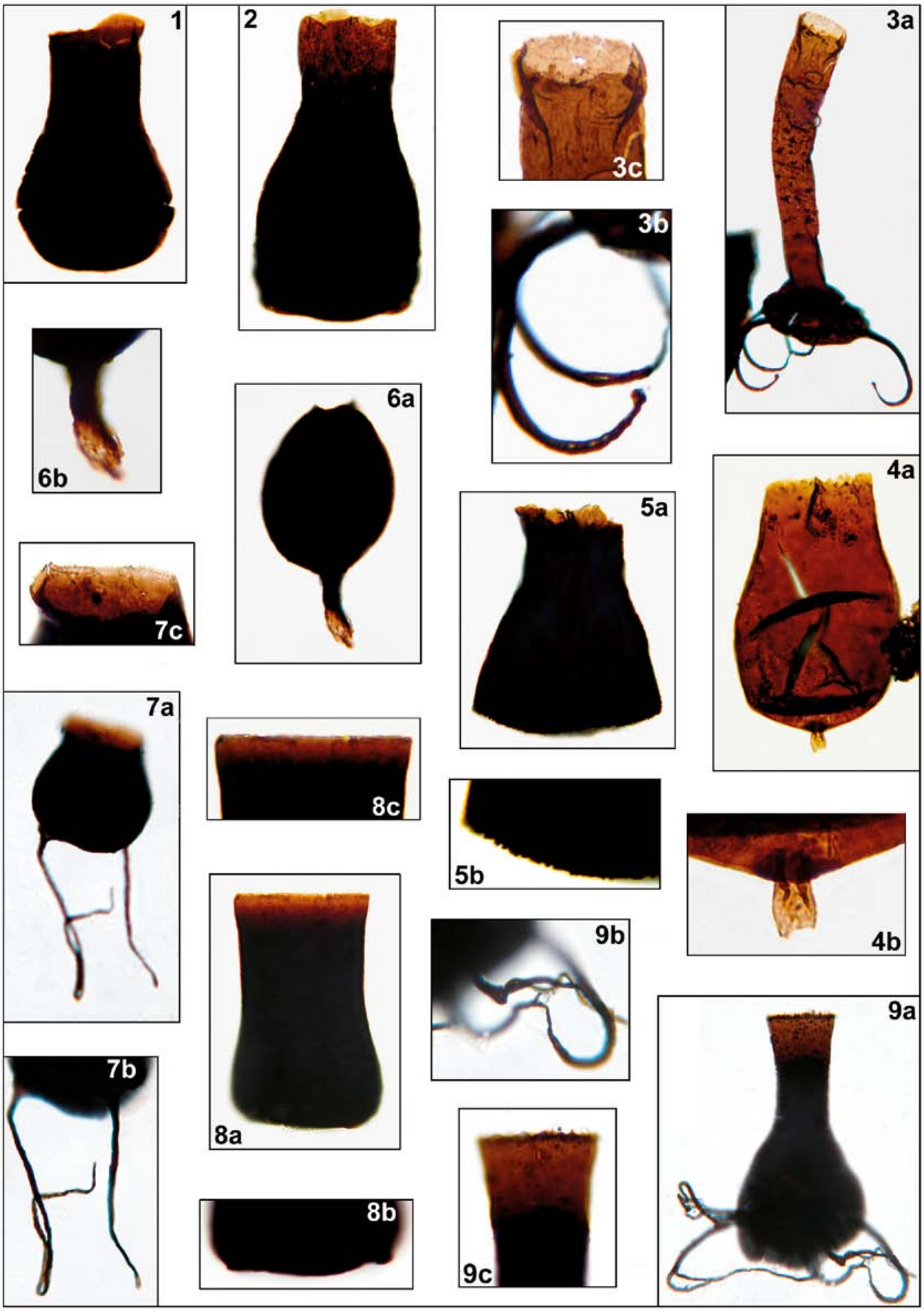
Fig. 5: *Conochitina lagenoforma* CRAMER, 1967.
a) Lateral view. x 345.
b) Detail of Fig. 5a: Verrucate ornamentation on the basal margin. x 720.

Fig. 6: *Urochitina abelgensis* DIEZ & CRAMER, 1978.
a) Lateral view. x 360.
b) Detail of Fig. 6a: Broken peduncle. x 630.

Fig. 7: *Conochitina* ? *monterrosae* CRAMER, 1969.
a) Lateral view. x 320.
b) Detail of Fig. 7a: Processes on the chamber margin. x 390.
c) Detail of Fig. 7a: Collarette with crenulate rim. x 580.

Fig. 8: *Linochitina diegui* DIEZ & CRAMER, 1978.
a) Lateral view. x 385.
b) Detail of Fig. 8a: Basal part of the chamber with short carina. x 490.
c) Detail of Fig. 8a: Aperture with tiny perforations along the rim. x 560.

Fig. 9: *Plectochitina rosendae* CRAMER, 1964.
a) Lateral view. x 340.
b) Detail of Fig. 9a: Cell-like processes on the right chamber margin. x 570.
c) Detail of Fig. 9a: Aperture with crenulate rim. x 600.



# Plate 3

Fig. 1: *Plectochitina variabilis* CRAMER & DIEZ, 1978.
a) Lateral view. x 325.
b) Detail of Fig. 1a: Process at the right chamber margin. x 700.
c) Detail of Fig. 1a: Processes at the left chamber margin. x 690.

Fig. 2: *Angochitina sinica* CRAMER, 1970.
a) Lateral view. x 345.
b) Detail of Fig. 2a: Neck with prosom. x 590.
c) Detail of Fig. 2a: Chamber with dense spiny ornamentation. x 450.

Fig. 3: *Plectochitina* (?) *taugourdeauii* CRAMER, 1967.
a) Lateral view. x 240.
b) Detail of Fig. 3a: Broken process at the right chamber margin. x 840.

Fig. 4: *Plectochitina irregularis* CRAMER & DIEZ, 1978.
a) Lateral view. x 320.
b) Detail of Fig. 4a: Detail of the process at the right chamber margin (in the background). x 970.
c) Detail of Fig. 4a: Processes at the right chamber margin (in the front). x 620.

Fig. 5: *Gotlandochitina labdata* DIEZ & CRAMER, 1978.
a) Lateral view. x 320.
b) Detail of Fig. 5a: Multirooted spines on the neck. x 700.

Fig. 6: *Angochitina turdela* DIEZ & CRAMER, 1978.
Lateral view. x 335.

Fig. 7: *Angochitina laevigata* DIEZ & CRAMER, 1978.
a) Lateral view. x 395.
b) Detail of Fig. 7a: Spine with bifurcated tip on the left flanc. x 980.

Fig. 8: *Hoegisphaera staplinis* CRAMER, 1966.
a) Normal view. x 710.
Coll. no. of the slide: GBA 2009/031/7. CRAMER collection at GBA: Box 62 – Slide 22354-5-1 – Englandfinder O.41.1.
Type level: San Pedro Formation (sample 22354), middle shale, Ludlow to Lower Gedinnian (?).
Type locality: Near Valporquero de Torio (first, and topographically lowermost, exposure of the San Pedro Formation at the right hand of the country road from La Venta to Valporquero), Cantabrian Mountains, Spain.
Type figure: CRAMER, 1966, p. 78, Pl. 1, Fig. 3.
Diameter = 52 µm.
b) As Fig. 8a, but different focus level. x 725.

Fig. 9: *Hoegisphaera tortugaides* CRAMER, 1966.
a) Normal view. x 785
Coll. no. of the slide: GBA 2009/031/8. CRAMER collection at GBA: Box 62 – Slide 22354-5-7 – Englandfinder O.20.
Type level: San Pedro Formation (sample 22354), middle shale, Ludlow to Lower Gedinnian (?).
Type locality: Near Valporquero de Torio (first, and topographically lowermost, exposure of the San Pedro Formation at the right hand of the country road from La Venta to Valporquero), Cantabrian Mountains, Spain.
Type figure: CRAMER, 1966, p. 80, Pl. 1, Fig. 2.
Diameter = 50 µm.
b) As Fig. 9a, but different focus level. x 820.