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ENCRUSTING GRAPTOLITES FROM THE MULDE BEDS OF GOTLAND

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Two species of the Crustoidea (*Bulmanicrusta latialata* Kozłowski, *Urbanekicrusta reversa* Mierzejewski) and three species of the Tuboidea (*Kozłowskitubus erraticus* (Kozłowski), *Epigraptus kozłowskii* Mierzejewski and *E. ex gr. bilinguis* (Kozłowski)) are reported from upper part of the Mulde Beds (upper Wenlock) of Gotland. Up to the present time, the first four species have been known from glacial boulders of Poland exclusively.

Key words: graptolites, taxonomy, Wenlock, Sweden.

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INTRODUCTION

Up to present time, crustoid and tuboid graptolites have been almost unknown from the Silurian of Gotland. Exceptional finds of isolated tuboid apertural processes were illustrated by Eisenack (1974). Moreover, the problematic organic microfossil *Xenocyathus stolonifer* Eisenack, described by Eisenack (1982) from Gotland, was recognized as an indeterminate fragment of a crustoid graptolite rhabdosome (Mierzejewski 1984).

The present paper deals with the Crustoidea and Tuboidea from the upper part of the Mulde Beds (upper Wenlock) of Gotland. The material investigated consists of specimens extracted with 10% formic and hydrochloric acids from limestone samples from Däpps 2 (for description of this locality see Laufeld 1974). Almost all species described here have been known from glacial boulders of Poland.

The material is stored at the Institute of Paleobiology of the Polish Academy of Sciences, Warsaw (ZPAL).

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SYSTEMATIC DESCRIPTION

Class Graptolithina Bronn, 1846
 Order Crustoidea Kozłowski, 1962
 Family Wimanicrustidae Bulman, 1970
 Genus *Bulmanicrusta* Kozłowski, 1962

Type species: Bulmanicrusta latialata Kozłowski, 1962.

Bulmanicrusta latialata scutellifera Kozłowski, 1962
 (pl. 12: 2a—c)

1962. *Bulmanicrusta latialata scutellifera* Kozłowski: 34, fig. 16, pl. 4.

Material.—A single fragment of a colony split down during the laboratory treatment (ZPAL G XI/1).

Description.—The specimen is entirely consistent with the description given by Kozłowski (1962).

Remarks.—Hitherto, the subspecies has been known exclusively from middle Ordovician glacial boulders (Kozłowski 1962). Similarly as another subspecies, *B. latialata latialata* Kozłowski (cf. Mierzejewski 1977), the subspecies in question was a long-lived and conservative taxon.

Occurrence.—Poland: Middle Ordovician glacial boulders. Sweden, Gotland: Däpps 2, Mulde Beds.

Family ?Hormograptidae Bulman, 1970
 Genus *Urbanekicrusta* Mierzejewski, 1986

Type species: Urbanekicrusta reversa Mierzejewski, 1986.

Urbanekicrusta reversa Mierzejewski, 1986
 (pl. 12: 1, fig. 1)

1986. *Urbanekicrusta reversa* Mierzejewski: 195, pl. 5.

Material.—Six isolated autothecae (ZPAL GXI/2).

Description.—Only one autotheca comprises both the erect and creeping part (fig. 1A). It is 0.85 mm in diameter and 0.16 mm in height (length of apertural processus 0.6 mm). The remaining specimens consist of only erect parts of autothecae; they are 0.13—0.15 mm in diameter and 0.5—0.8 mm in height (pl. 12: 1, fig. 1B).

Remarks.—The specimens correspond fully to the autothecae of the type material of the species, being only slightly smaller.

Occurrence.—Poland: Silurian glacial boulders. Sweden, Gotland, Däpps 2, Mulde Beds (upper Wenlock).

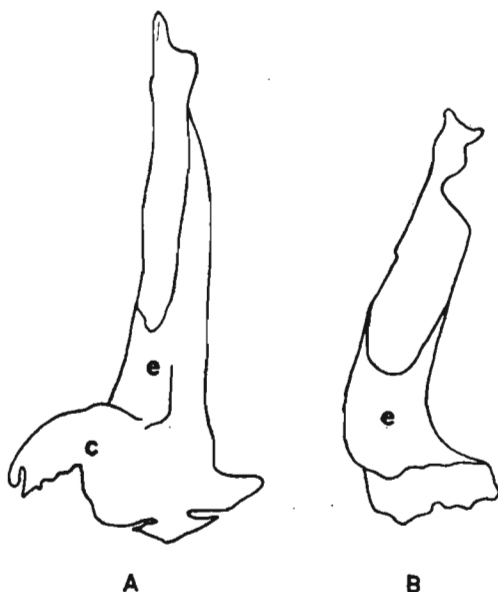


Fig. 1. *Urbanekicrusta reversa* Mierzejewski, 1986. Däpps 2, Gotland, upper part of Mulde Beds (upper Wenlock). Incomplete autothecae; c—creeping part, e—erect part, approx. $\times 75$. ZPAL GXI/2.

Order *Tuboidea* Kozłowski, 1938
 Family *Cyclograptidae* Bulman, 1938
 Genus *Epigraptus* Eisenack, 1941
 (Synonym *Idiotubus* Kozłowski, 1949)

Type species: Epigraptus bidens Eisenack, 1941.

Epigraptus kozłowskii Mierzejewski, 1978
 (pl. 13: 4—5, fig. 2)

- ? 1971. *Idiotubus* sp.; Kozłowski: 316, fig. 2.
- ? 1974. ?*Epigraptus* sp.; Eisenack: 672, fig. 18.
- ? 1977. *Idiotubus*; Andres: 76, figs. 27—28.

1978. *Epigraptus kozłowskii* Mierzejewski: 568, pl. 26: 1, figs. 5—6.

Material.—Ten isolated autothecae and autothecal apparatuses (ZPAL GXI/3).

Description.—The investigated specimens are entirely consistent with the description given by Mierzejewski (1978). All types of apertural apparatuses, i.e. A—G, are represented in the material. Apertural processes of the type C with fused upper margins are observed in the single case (fig. 2B).

Occurrence.—Poland: Ludlow glacial boulders. Sweden, Gotland: Däpps 2, Mulde Beds (upper Wenlock).

Epigraptus ex gr. *bilinguis* (Kozłowski, 1949)
 (pl. 13: 3)

Material.—Erect part of an autotheca (ZPAL GXI/4).

Description.—The specimen attains 1.2 mm in height and 0.2 mm in diameter. Both the apertural processes are identical. They are well developed and linguiform.

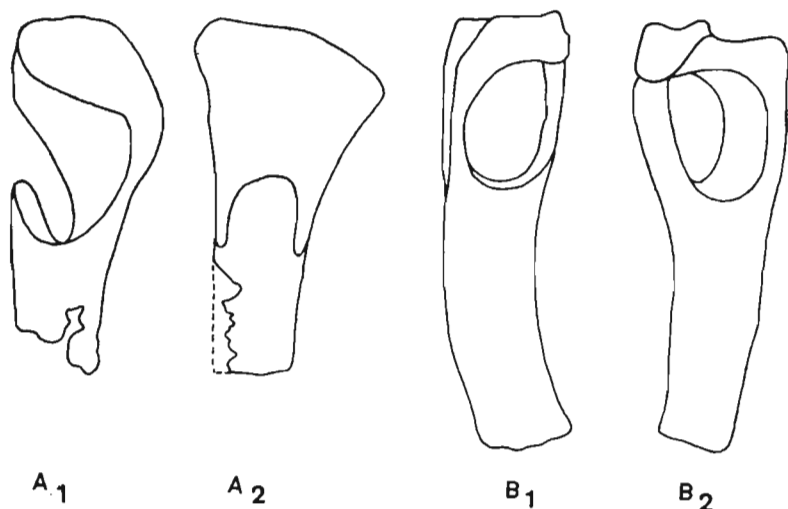


Fig. 2. *Epigraptus kozlowskii* Mierzejewski, 1978. Däpps 2, Gotland, upper part of Mulde Beds (upper Wenlock). Distal parts of autothecae. A₁-A₂ distal part of an autotheca with non-fused apertural processes (two views). B₁-B₂ distal part of an autotheca with fused apertural processes (two views). ZPAL GXI/3.

Remarks.—The investigated specimen resembles strikingly the lower Ordovician species, *E. bilinguis* (Kozłowski). The writer does not assign it to the latter species because of the high variability in apertural processes of *Epigraptus* Eisenack and the scarcity of material.

Genus *Kozlowskitubus* Mierzejewski, 1978

Type species: Dendrotubus erraticus Kozłowski, 1963.

Kozlowskitubus erraticus (Kozłowski, 1963)

(pl. 13: 1—2)

1963. *Dendrotubus erraticus* Kozłowski: 104, figs. 1—15.

1978. *Kozlowskitubus erraticus* (Kozłowski): Mierzejewski: 572, pl. 26: 3.

Material.—Two rhabdosomes (ZPAL GXI/5, 6).

Description.—The specimen no. ZPAL GXI/5 (pl. 13: 1) is a young colony composed of a sicula, an autotheca and a bitheca. The sicula attains 392 μm in height, 153 μm in width of prosicular base and 62 μm in width of metasicular part. The specimen no. ZPAL GXI/6 (pl. 13: 2) is an older colony, provided with four autothecae and several bithecae. The distal part of the autotheca shown in pl. 2: 2b is built of microfusellar tissue; average width of microfuselli is 3.5 μm and of fuselli 5.3 μm .

Remarks.—Both specimens correspond fully to the specimens described from glacial boulders (Kozłowski 1963, Mierzejewski 1978), only the sicula is smaller than the siculae described by Kozłowski and the microfusellar tissue has not been observed so far in *K. erraticus*.

Occurrence.—Poland: Ordovician and Silurian glacial boulders. Sweden, Gotland: Däpps 2, Mulde Beds (upper Wenlock).

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PIOTR MIERZEJEWSKI

GRAPTOLITY INKRUSTUJĄCE Z WARSTW MULDE GOTLANDII

(pls. 12, 13; figs 1, 2)

Streszczenie

Dwa gatunki Crustoidea (*Bulmanicrusta latialata* Kozłowski i *Urbanekicrusta reversa* Mierzejewski) oraz trzy gatunki Tuboidea (*Kozłowskitubus erraticus* (Kozłowski), *Epigraptus kozłowskii* Mierzejewski i *E. ex gr. bilinguis* Kozłowski) zostały znalezione w warstwach Mulde (górný wenlok) Gotlandii. Z wyjątkiem *E. ex gr. bilinguis*, wszystkie opisane formy znane były dotąd tylko z głazów narzutowych z obszaru Polski.

EXPLANATION OF PLATES 12—13

All specimens from Däpps 2 (Gotland), upper part of Mulde Beds (upper Wenlock).

Plate 12

Urbanekicrusta reversa Mierzejewski, 1986

1. Erect part of autotheca: *a* general view, approx. $\times 115$, and *b* details of fuselli arrangement, approx. $\times 315$. ZPAL GXI/2.

Bulmanicrusta latialata acutellifera Kozłowski, 1962

2. Apertural apparatus in *a* dorsal and *b* ventral views, $\times 100$; *c* creeping part of autotheca with stolothechal stolon (st), ventral view, $\times 100$. ZPAL GXI/1.

Plate 13

Kozłowskitubus erraticus (Kozłowski, 1963)

1. Young colony composed of sicula (s), autotheca (a) and bitheca (b): *a* general view, $\times 65$, *b* distal part of autotheca, $\times 180$. ZPAL GXI/5.
2. Adult colony composed of several thecae, in *a* general view (*a*—autotheca), $\times 65$ and *b* distal part of autotheca (X—boundary between fusellar and micro-fusellar tissues), $\times 180$. ZPAL GXI/6.

Epigraptus ex gr. bilinguis (Kozłowski, 1949)

3. Erect part of autotheca, $\times 100$. ZPAL GXI/4.

Epigraptus kozłowskii Mierzejewski, 1978

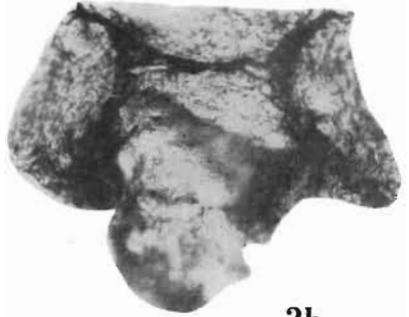
- 4—5. Apertural apparatuses, $\times 100$. ZPAL GXI/3.



1a



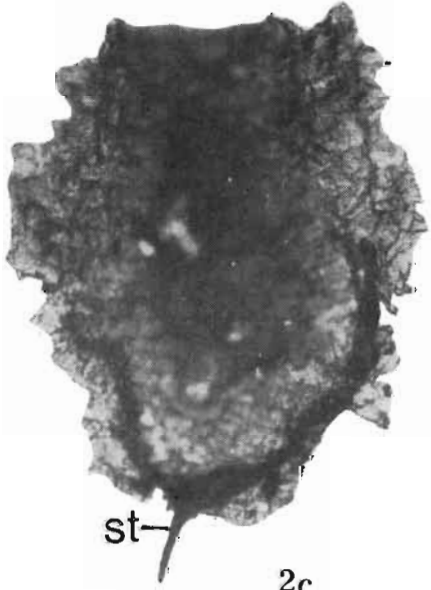
2a



2b



1b



st

2c

