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The Ordovician ostracodes established by Aurel Krause, Part II

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Abstract

The revision of ostracodes originally established by Aurel Krause is continued and finished with the description of the following species: *Primitia distans, P. elongata*, *P. cincta*, *P. excavata*, *P. papillata*, *P. plicata*, *P. schmidtii*, *Strepula limbata*, *S. simplex*, *Entomis obliqua*, *E. plicata*, *E. sigma*, *E. sigma ornata*, *E. simplex*, *E. trilobata*, *Beyrichia erratica*, *B. erratica granulosa*, *B. erratica acuta*, *B. harpa*, and *B. marchica lata*. Three of these species are younger primary homonyms. For *Beyrichia erratica granulosa* Krause, 1891 a respective decision of the ICZN according to art. 23.9.5 is presently unnecessary, because it has an older synonym (*Beyrichia grewingkii* Bock, 1867), and *Primitia excavata* Krause, 1892 has a younger synonym (*Laccochilina paucigranosa* Jaanusson, 1957). The third homonym, *Beyrichia marchica lata* Krause, 1891, is considered as a *nomen protectum*. *Entomis sigma ornata*, and *E. plicata* are presently considered as *nomina dubia*. Since the type material of the three species *P. distans*, *E. sigma*, and *E. simplex* is apparently lost, neotypes are designated.

Introduction

The revision of the Ordovician ostracodes described by Krause in the last quarter of the 19th century is finished herein with the description of the remaining species. Taxa neither regarded in the first (Schallreuter & Hinz-Schallreuter 2011a) nor in this part had been already revised elsewhere.

Abbreviations

C1, **C2**, **C3**, **C4** – cristae (on or originating from corresponding lobes); **GG** – Institut für Geographie und Geologie, Ernst Moritz Arndt-Universität Greifswald; **H** – height; **L** – length; **L1**, **L2**, **L3**, **L4** – lobes 1 – 4; **MB.** – Museum für Naturkunde Berlin; **PAN** – preadductorial node; **S1**, **S2**, **S3** – sulci 1 – 3; **syn.** (in the lists of synonyms) – quod vide for further synonymy.

Systematic palaeontology

Order **Beyrichiocopa** Pokorný, 1954
Suborder **Palaeocopa** Henningsmoen, 1953
Infraorder **Beyrichiomorpha** Henningsmoen, 1965
Superfamily **Eurychilinoidea** Ulrich & Bassler, 1923
Family **Oepikellidae** Jaanusson, 1957
Subfamily **Ampletochilininae** Schallreuter, 1975

Platybolbina Henningsmoen, 1953

Type species. *Primitia distans* Krause, 1889; by original designation.

Remarks. Kummerow (1933, p. 45) used the name *Platychilina* in connection with *Primitia distans* and *Pr. excavata* but neither presented a definition of the genus nor a designation of a type species (Henningsmoen 1954b, p. 85). This was done later with *Pr. elongata* Krause, 1891 by Kummerow (1939, p. 10). Having been unaware of this designation, Thorslund (1940, p. 169) defined the genus and selected *Pr. distans* as type species. Also Henningsmoen (1953b, p. 50) did not know Kummerow's (1939) paper (Henningsmoen 1954b, p. 86 footnote) when he considered *Primitia distans* as type species for *Platybolbina,* which replaced Thorslund's younger homonym *Platychilina*.

Platybolbina (Platybolbina) Henningsmoen, 1953

Definition. Lateral surface without reticulation but with pores or pustulae.

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Platybolbina (Platybolbina) distans (Krause, 1889)

Figures 1–2

1889 *Primitia distans* Krause: 6–7, 22, 24, pl. 1, figs 3a–b.
1895 *Primitia elongata semicircularis* Steusloff: 784, pl. 58, fig. 13.
1924 *Primitia distans*. – Kummerow: 409, 416, 421, 435–436, tab. p. 440 (no. 19).
1933 *Platychilina distans*. – Kummerow: 45, 53, (non fig. 2).
1934 *Coelochilina distans*. – Bassler & Kellett: 55, 246, 442.
1939 *Platychilina distans*. – Kummerow: 20.
1940 *Platychilina distans*. – Thorslund: 169, 170.
1953b *Platybolbina distans.* – Henningsmoen: 50.
1954b *Platybolbina* cf. *plana*. – Henningsmoen: 87–89, 97, tab. p. 101, pl. 3, figs 1–8.
1956 *Platybolbina* cf. *plana*. – Martinsson: 91, 105, pl. 1 figs 7–8, pl. 2, figs 9–11.
1959 *Platybolbina orbiculata* Sarv: 14–15, tab. 2, pl. 2, figs 10–11.
non 1962 *Platybolbina* cf. *plana*. – Sarv: 96, 101–102, 103, 127, tab. 1, pl. 1, figs 2–3.
1967a *Platybolbina* cf. *plana*. – Schallreuter: 616.
1972 *Platybolbina temperata*. – Pranskevichius: 10, 67, 198, tabs 1–2, fig. 6 (log), pl. 5, fig. 7.
1983 *Platybolbina orbiculata*. – Abushik & Sarv: 105, tab. p. 103, pl. 1, figs 1–2.
1986 *Platybolbina (Platybolbina)* cf. *distans*. – Schallreuter: 16 (1987b: 216), pl. 1 fig. 1.
1987a *Platybolbina (P.)* cf. *plana*. – Schallreuter: 30.
1992 *Platybolbina (Platybolbina) orbiculata*. – Sidaravičienė: 135–136, 243; tab. 2, pl. 34, figs 5–7.
? 1995 *Platybolbina (Platybolbina) orbiculata*. – Nõlvak, Meidla & Uutela: 8, tab. 2, pl. 3, fig. 3.
1996 *Platybolbina orbiculata.* – Meidla: 21, 22–23, 173, 185, 198; tabs 5–7, 9, text-figs 7, 9–13, 14 (cf.), 15–16, 18, 21–24, 26–29, 31–37, 40 (faunal logs), pl. 1, fig. 10.
1997 *Platybolbina orbiculata.* – Hints & Meidla in Raukas & Teedumäe: figs 50, 57 (faunal logs).
1998 *Platybolbina orbiculata*. – Põldvere, Meidla et al. in Põldvere et al.: fig. 8 (faunal log).

Holotype (monotypy). ♀ left valve – Figure 1; Krause 1889, pl. 1, figs 3a–b.

The holotype of *Pr. distans* is apparently lost. It was borrowed to Dr. Valdar Jaanusson in the middle of the 20th century but was not among the material returned from Uppsala to Berlin at the end of that century. From the material only a single photo given to the first author by Jaanusson (Figure 1) exists.

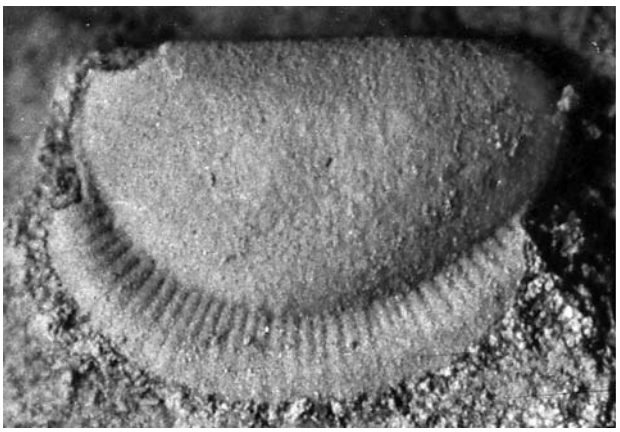


Figure 1. *Platybolbina (Platybolbina) distans* (Krause, 1889). Lost holotype, ♀ left valve, L 1.40 mm. Photo: Valdar Jaanusson.

Type locality and horizon. Presumably former gravel pit near Müggelheim, Müggel Isle (Berlin), Krause's glacial erratic boulder no. 301, late Late Ordovician (occurrence of the species in Estonia).

Neotype. Left ♀ valve GG 376–3 – Figure 2G.

Type locality and horizon of neotype. Beach at Vale, NW Gotland, glacial erratic boulder as beach boulder no. G287, Öjlemyr Flint.

Material. >300 specimens (neotype series) from glacial erratic boulder G287 and >500 specimens from boulders Val-34, Val-144, Val-160 and Wie-1.

Dimensions. The holotype is a ♀ LV and according to Jaanusson's photo and the given magnification 1.40 mm long. According to Krause (1889, p. 6) it is only 1.20 mm long, but his measurements proved to have been somewhat incorrect in some cases, e.g., *Laccochilina excavata* (see under *Laccochilina paucigranosa*).

Henningsmoen (1954b, p. 88) mentions adults up to about 2.00 mm (o.c., pl. 3, fig.2).

Definition. Adults 1.40–2.00 mm. Shape (L : H ratio) high to rather high. Anterior cardinal angle about 100°, posterior cardinal angle about 90°. Muscle spot in centre slightly shifted towards the anterior end. Velar frill of adults gradually terminating in the posteroventral region. Lateral surface with densely set pores except of smooth muscle spot and cardinal corner fields.

Remarks. Henningsmoen (1954b, p. 87) considered *Primitia plana* Krause, 1889 as a possible synonym of *Pr. distans*, the type-species of *Platybolbina*. However, despite this fact he described material from Norway as *Platybolbina* cf. *plana* (and not as *Pl*. cf. *distans*). Following him, *Pl. distans* was subsequently described several times by other authors (Martinsson, Sarv, Schallreuter) as *Pl.* (cf.) *plana*.

Revision of the type of *Primitia plana* revealed, that this species belongs to a different genus of quite another family (Schallreuter & Hinz-Schallreuter 2011a, pp. 67–68).

Platybolbina distans is one of the most frequent palaeocopes in the Baltoscandian late Late Ordovician. However, the hitherto figured material partly shows quite a great variation. The specimens from the Öjlemyr Flint of which some are figured herein, among them the neotype (Figure 2G), are of limited variety only concerning

▶

Figure 2. *Platybolbina (Platybolbina) distans* (Krause, 1889) from Öjlemyr Flint glacial erratic boulder (no. G287) of the Isle of Gotland, uppermost Ordovician (Pirgu or Porkuni Stage). **A.** Juvenile right valve (GG 376-1e) with distinct acroidal spines, L 0.61 mm; **B.** ♀ right valve (GG 376-2c) with weakly convex dolon dissolved partly into spines, L 1.57 mm; **C–D.** ♀ right valve (GG 376-2b) with weakly convex dolon, L 1.60 mm; **E–F.** ♀ right valve (GG 376-2a) with strongly convex dolon, L 1.51 mm; **G.** Neotype, ♀ left valve (GG 276-3) with weakly convex dolon, L 1.57 mm; **H.** Tecnomorphic right valve (GG 376-4a), L 1.50 mm; **I.** Tecnomorphic right valve (GG 376-1a), L 1.15 mm; **J.** ♀ left valve (GG 347-5b) with weakly convex dolon, L 1.67 mm; **K.** Juvenile right valve (GG 376-1b), L 0.50 mm. All specimens in lateral view except of H (interior view), D and F ventral views. All photographs are stereo-pairs with the exception of A. Scale bars equal 0.2 mm. L – length.

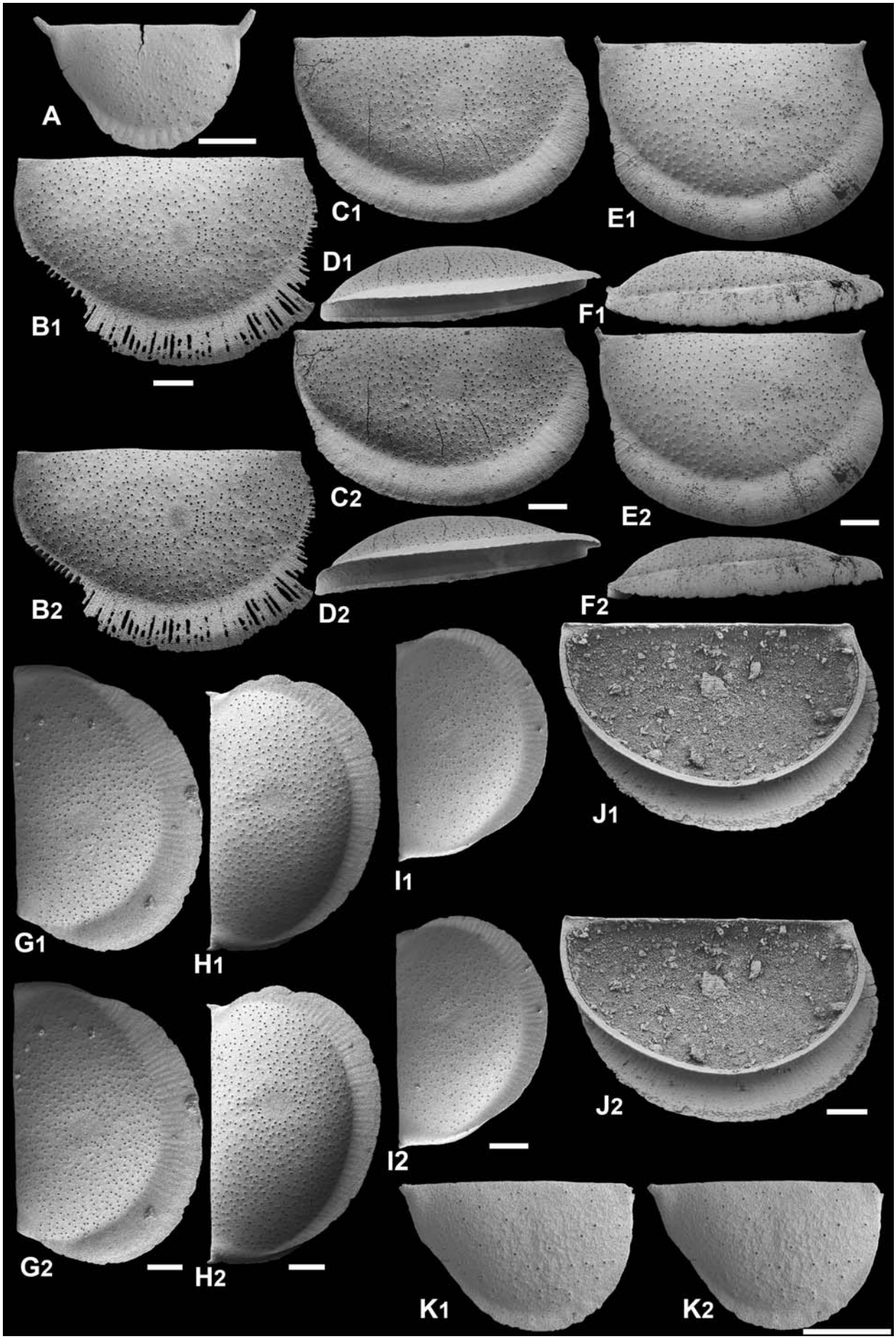


Table 1. Dimensions and ratios of *Platybolbina distans*. H_D: height of domicilium; L_D: length of domicilium; l: left; r: right. For further abbreviations, see text.

GG	valve	L	H	L:H	L_D	H_D	$L_D:H_D$	Figure
347-5b	♀ l	1.67	1.09	1.53	1.49	0.83	1.80	2J
376-3	♀ l	1.57	1.02	1.54	1.39	0.76	1.83	2G
376-2b	♀ r	1.60	1.03	1.56	1.45	0.80	1.80	2C–D
376-2c	♀ r	>1.57	1.08	>1.46	1.51	0.84	1.80	2B
376-4a	r	1.50	0.91	1.64	1.9	0.74	1.87	2H
376-2a	♀ r	1.51	1.06	1.43	1.39	0.81	1.72	2E–F
376-1a	r	1.15	0.74	1.55	1.05	0.61	1.72	2I
376-1e	r	0.61	0.40	1.53	0.60	0.34	1.77	2A
376-1b	r	0.50	0.32	1.53	0.47	0.28	1.71	2K

the length of the velar frill. The same applies for the material of glacial erratic boulders from southwestern Finland figured by Martinsson (1956, pls 1–2, figs 7–11) as *Pl.* cf. *plana*. However, the material coming from the uppermost Ordovician horizons 5a and 5b of different localities in the Oslo region and figured by Henningsmoen (1954b, pl. 3, figs 1–8) is highly variable. It is thus questionable whether or not all respective specimens belong to the same species or subspecies.

Meidla (1996, p. 22) assigned the material of Henningsmoen and of Martinsson to *Pl. orbiculata,* which he considered as a possible synonym of *Pr. plana*. He placed the specimen from the Öjlemyr Flint figured by Schallreuter (1986, pl. 1, fig. 1) as *Pl.* cf. *distans* only provisionally in *Pl. orbiculata*.

The holotype of *Pl. orbiculata* (Pirgu Stage, Estonia) agrees fairly well with the Öjlemyr Flint material except for the extension of the velar frill anteroventrally (Sarv 1959, pl. 2, fig. 10) and size (L 1.90 mm).

The only specimen figured by Meidla (1996, pl. 1, fig. 10) as *Pl. orbiculata* comes from the Vormsi Stage of Estonia, a ♀ RV (L 1.50 mm). It has a very long frill, which is rather broad and distinctly longer at both ends than in the Öjlemyr Flint material. It may therefore represent a new subspecies of *Pl. distans*.

Primitia elongata semicircularis Steusloff, 1895 is very probably a synonym of *Pr. distans* (Schallreuter & Hinz-Schallreuter 2011b, p. 129, tab. 1b).

Platybolbina cf. *plana*: Sarv, 1962 from the Porkuni Stage (F_{II}) of Estonia certainly does not belong to *Pl. distans* but represents a new species. The dolon is much longer, in particular posteriorly (Sarv 1962, pl. 1, figs 2–3). He mentioned *Pl. orbiculata* only from the Nabala to Pirgu Stages (Sarv 1959, p. 15), whereas Meidla (1996, p. 23) mentioned the taxon also from the Porkuni Stage. Since Meidla did not include Sarv's 1962 paper in his synonymy list (1996, p. 22), he obviously also considers Sarv's *Pl.* cf. *plana* not synonymous with *Pl. orbiculata*.

The designation of a neotype for *Pr. distans* is necessary because it is the type-species of *Platybolbina*, an important wide-spread genus mainly in Baltoscandia, but also elsewhere. The published material from outcrops in Baltoscandia came from different stratigraphic levels and localities and shows rather strong variation (see above). A specimen from one sample of the Öjlemyr Flint is part of a rich population with only little variation. This specimen seemed to be more appropriate and has, accordingly, been chosen as neotype. The conspecific material from various outcrops may, perhaps, represent different subspecies.

Although the holotype is not fully complete at both cardinal angles and either end of the velum, comparison with the neotype does not reveal fundamental differences. The size difference of both cardinal angles and the posterior margin extending obliquely to the straight dorsal margin are visible in both holotype and neotype as well as in the holotype of *Pl. orbiculata*. Since length and width of the velar frill are variable (Sarv 1959, pl. 2, fig. 10; Meidla 1996, pl. 1, fig. 10), this character is unsuitable to serve as distinguishing feature on the species level. Considering that any other competitive species is lacking and the wide occurrence of *Pl. orbiculata*, it is most likely that Krause's material yielded this species.

Comparison. The stratigraphically older *Pl. ampla* Jaanusson, 1957 is very high to high. In *Pl. ampla ampla* the posterior cardinal angle is smaller and the velar frill longer (Jaanusson 1957, pl. 3, figs 13–16), in *Pl. ampla restricta* Schallreuter, 1970 the frill has about the same extension as in typical specimens of *Pr. distans* (Schallreuter 1975, pl. 1, figs 7–9).

Pl. (Pl.) anguliacuta Schallreuter, 1971 from the Öjlemyr Flint differs mainly by the smaller cardinal angles, which are distinctly $<90°$ and by the longer dolon, which extends close to both cardinal corners.

Occurrence. Oandu (?), Rakvere to Porkuni Stages of Estonia, Latvia and Pskov district of Russia (Meidla 1996, p. 23), Nabala to Pirgu Stages of Lithuania (Sidaravičienė 1992, p. 136), Molodovo Formation of Podolia (Abushik & Sarv 1983, p.105), units 5a and 5b of Norway (Oslo-Asker, Ringerike) (Henningsmoen 1954b, p. 89).

Glacial erratic boulders (Geschiebe): Leptaena Limestone (Steusloff 1895, p. 784; Schallreuter & Hinz-Schallreuter 2011b, p. 129), Baltic Limestone (Ostseekalk) (Kummerow 1924, tab.; Martinsson 1956, p. 91, 105), Algae Limestone (Kummerow 1924, tab.), Öjlemyr Flint of the Isles of Gotland (Baltic Sea) (Schallreuter 1967a) and of Sylt (North Sea) (Schallreuter 1986).

Platybolbina (Platybolbina) elongata (Krause, 1891)

Figure 3A

1891b *Primitia elongata* Krause: 494, 516, pl. 30, fig. 4a–b.
1924 *Primitia elongata*. – Kummerow: 409, 416, 421, 435, 436, tab. p. 440.
1939 *Platychilina elongata.* – Kummerow: 19–20.
1954b *Platybolbina* cf. *elongata.* – Henningsmoen: 90–91, pl. 1, fig. 14.
1957 *Ectoprimitia* ? *elongata.* – Jaanusson: 259–260.
1962 *Platybolbina* ? *granifera* Sarv: 96, 102–104, 127, tab. 1, pl. 1, figs 4–8.
1969 *Ampletochilina* ? *elongata.* – Schallreuter: 345.
1969 *Ampletochilina granifera.* – Schallreuter: 345, 347–348.
1986 *Ampletochilina* ? *granifera.* – Schallreuter: 16 (1987b: 216), pl. 1, fig. 8.
1996 *Ampletochilina granifera.* – Meidla: 30, tabs 7–9, figs 24, 27(cf.), 29, 31–32 (faunal logs), pl. 3, figs 5–6.
2010a *Ampletochilina*? *granifera*. – Schallreuter & Hinz-Schallreuter: fig. 4h.

Holotype. Juvenile tecomorphic left valve, MB. HS 2011–1 – Figure 3A; Krause 1891b, pl. 30, figs 4a–b.

Type locality and horizon. Müggelheim, Berlin, Krause's glacial erratic boulder no. 667, late Harjuan.

Dimensions. Length (L) of holotype 1.03 mm. L of holotype of *P. granifera*, a ♀ left valve (Os 5140), without frill 1.78 mm (Sarv 1962, p. 103).

Definition. Length at least up to 1.90 mm. Outline slightly preplete. Cardinal angles about 100°. Muscle spot below mid-height. Velar frill extending from anterocentral region to posterocentral region, gradually terminating towards both ends. Lateral surface densely tuberculate.

Comparison. *Platybolbina* ? *granifera* Sarv, 1962 is considered as younger synonym of *Primitia elongata*. The holotype of *P. elongata* agrees very well with the holotype of *P.* ? *granifera*, particularly with the tecnomorph no. 5042 (Sarv 1962, pl. 1, figs 4, 6). A typical character is the position of the muscle spot below mid-height.

Sarv (1962, pp. 102–104) established *Platybolbina* ?*granifera* on the assumption that Krause's boulder with the holotype of *P. elongata* would be older. From the respective boulder, Krause (1891b, p. 494) only mentioned another taxon, the early Late Ordovician *Uhakiella granulosa*. However, it seems that he misidentified the species; more probably it represents *Uhakiella jonesiana* (= *Uhakiella magnifica* Sarv), which occurs in the late Late Ordovician together with *Pl.* ?*granifera.*

Remarks. *Primitia elongata* has been designated as type-species for *Platychilina* Kummerow, 1939 but *Platychilina* is a younger homonym. *Kummerowia* is not a substitute name for *Platychilina* as stated by Weyer & Becker (1991) but proposed as a new genus with *Platychilina praetexta* Kummerow, 1939 as type-species by Samoilova & Smirnova (Schallreuter 1994b, pp. 619–620) – a fact persistently refused by Becker (1997, p. 13; 1999, p. 27), which made a renewed statement of the facts necessary (Schallreuter 2000, pp. 835–836).

Pl. granifera was placed in *Ampletochilina* by the first author, but the dimorphism seems to be the same as in the type-species of *Pl. distans*. The antrum of the type-species of *Ampletochilina* is constructed much more complicated (Schallreuter & Hinz-Schallreuter 2010a, fig. 5c).

Kummerow mentioned *Platychilina elongata* several times and presented a drawing of what he considered as *Platychilina elongata* (Kummerow 1948, fig. 5). However, the figured specimen is a species of *Loculibolbina* Schallreuter, 1983 and he might have mixed several similar species under this name. Concerning his determinations he belongs to the so-called lumpers (Schallreuter & Hinz-Schallreuter 2010b, p. 62). He mentioned *Pl. elongata* from the "Algenkalk" ($\sim F_I$) and "Sonst. Grauen untersilurischen Kalken" (Ordovician limestones) (Kummerow 1924, p. 440).

Occurrence. Estonia: Vormsi ($F_I b$) – Porkuni Stages (F_{II}), Pskov Region: Pirgu Stage, Oslo Region: 5a–b. Glacial erratic boulders: Krause's boulder 667, Algae Limestone (Kummerow 1924, tab. p. 440), Öjlemyr Flint of the Isles of Gotland and Sylt.

Family **Eurychilinidae** Ulrich & Bassler, 1923
Subfamily **Chilobolbininae** Jaanusson, 1957

Laccochilina Hessland, 1949

Type species. *Eurychilina estonula* Öpik, 1935; by original designation.

Laccochilina (Laccochilina) Hessland, 1949

Laccochilina (Laccochilina) paucigranosa Jaanusson, 1957

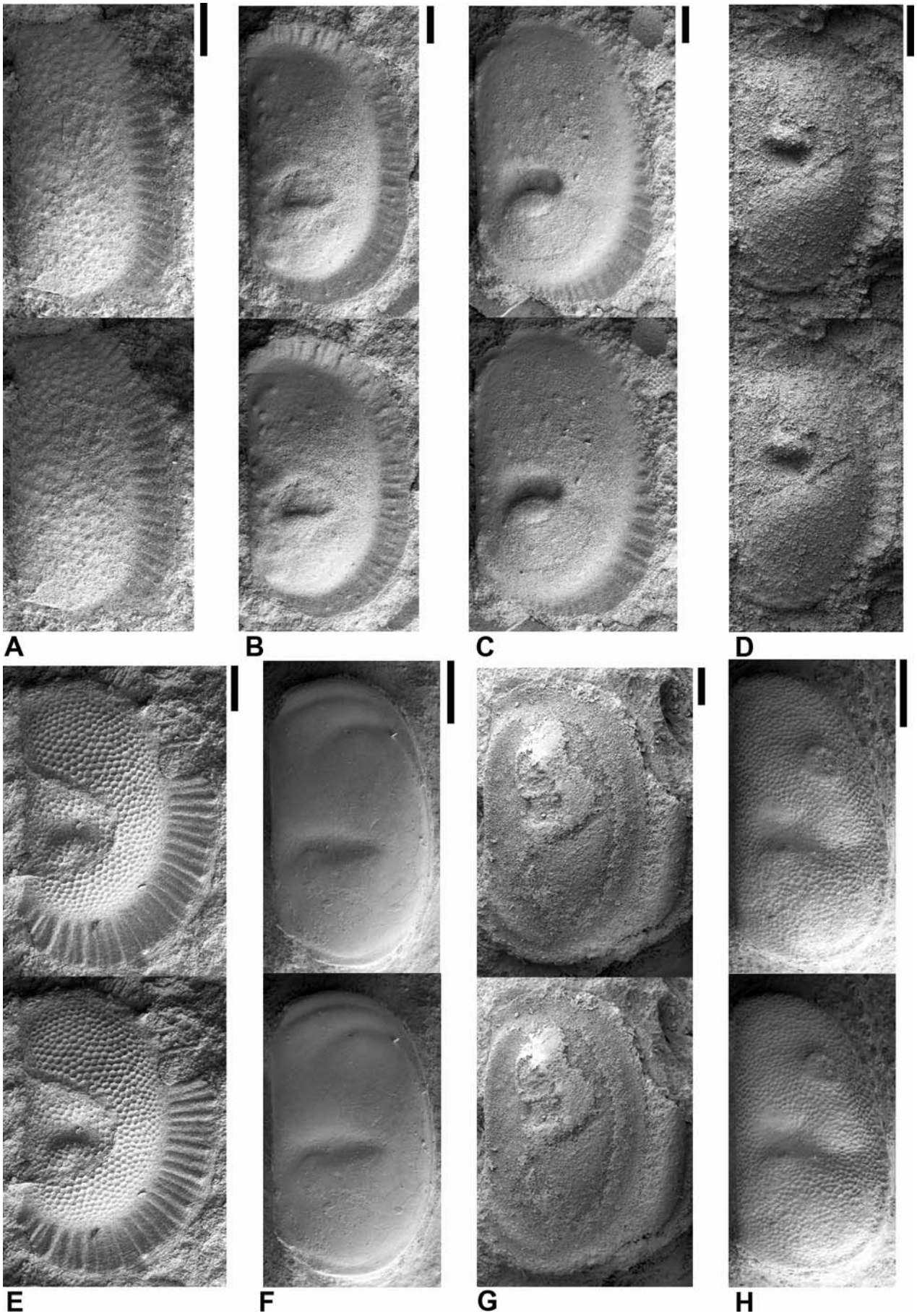
Figure 3B

Synonym. *Primitia excavata* Krause, 1892 (homonym).

1892 *Primitia excavata* Krause: 388, 399, pl. 21, fig. 13.
1896 *Primitia excavata*. – Koken: 382.
1918 *Primitia excavata*. – Kruizinga: 98–100.
1933 *Platychilina excavata*. – Kummerow: 45, 53.
1934 *Platychilina excavata*. – Kummerow: 502.
1934 *Eurychilina excavata*. – Bassler & Kellett: 55, 314, 443.
1957 *Laccochilina (Laccochilina) paucigranosa* Jaanusson: 243, 244–246, 431, tabs 3, 40, text-figs 11c, 14a–b, pl. 1, figs 12–17.
1993 *Chilobolbina* ? *excavata*. – Schallreuter: 16.

Holotype. Left ♀ valve, Museum of the Palaeontological Institute of the University of Uppsala no. B 287, Jaanusson 1957, pl. 1, figs 16–17.

Type locality and horizon. South Bothnian area, glacial erratic boulder of the *Crassicauda* limestone at Erken, Upland.



Lectotype of *Primitia excavata*. Tecnomorphic left valve, MB. HS 2011–2, Figure 3B ; Krause 1892, pl. 21, fig. 13.

Type locality and horizon of Primitia excavata. Former gravel pit near Müggelheim, Müggel Isle (Berlin); Krause's glacial erratic boulder no. 663, grey, dense limestone with *Steusloffia linnarssoni*; age presumably *Crassicauda* beds of Central and Southern Sweden.

Dimensions. Holotype of *L. paucigranosa* (right ♀ valve) L 1,34 mm, H 0.87 mm, specimen B 286 (left ♀ valve) L 1.50, H 0.95 mm (Jaanusson 1957, tab. 3, L computed after the figures on pl. 1).

Holotype of *Primitia excavata* L 1.47 mm (after Krause 1.20 mm).

Definition. Jaanusson 1957, p. 244 (diagnosis of *L. paucigranosa*).

Comparison. The holotype of *L. paucigranosa* (Jaanusson 1957, pl. 1, figs 16–17), a ♀ right valve, came from a glacial erratic boulder at Erken, Upland. The species is characterized by the large pit (S2), the narrow, low preadductorial node connected ventrally with a weak zygal ridge, the missing dorsal plica, and the distinct node near the anterior corner of the valve observed already by Jaanusson (1957, p. 245), which represents an eye tubercle (Schallreuter & Hinz-Schallreuter 2010d).

Remarks. *Primitia excavata* Krause, 1892 is an older synonym of *Laccochilina (Laccochilina) paucigranosa* Jaanusson, 1957. Since it has an older homonym (*Primitia excavata* Jones & Holl, 1869) the name is invalid although Jones & Holl (1886, p. 407) had already established a new genus (*Placentula*) for their species. Also being a homonym, it became renamed *Jonesites* by Coryell (1930).

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Figure 3. A. *Platybolbina (Platybolbina) elongata* (Krause, 1891). Holotype, juvenile tecomorphic left valve (MB. HS 2011–1), L 1.03 mm, Krause's glacial erratic boulder no. 667, age upper Harjuan; **B.** *Laccochilina (Laccochilina) excavata* (Krause, 1891). Lectotype, tecnomorphic left valve, (MB. HS 2011–2, L 1.47 mm, Krause's glacial erratic boulder no. 663, age presumably *Crassicauda* beds of Central and Southern Sweden; **C.** *Laccochilina (Prochilina) schmidtii* (Krause, 1889). Lectotype, tecnomorphic left valve (MB. HS 2011–3), L 1.47 mm, Krause's glacial erratic boulder no. 139, presumably *Crassicauda* limestone; **D.** *Laccochilina (Prochilina) schmidtii* (Krause, 1889), tecnomorphic right valve (MB. HS 2011–4), L 0.99 mm, Krause's glacial erratic boulder no. 292, presumably *Crassicauda* limestone; **E.** *Piretella limbata* (Krause, 1891). Holotype, tecnomorphic left valve (MB. HS 2011–5), L 1.23 mm, Krause's glacial erratic boulder no. 478, age *Schroeteri* or *Crassicauda* beds of Central and Southern Sweden; **F.** *Bolbina plicata* (Krause, 1891). Lectotype, tecnomorphic left valve (MB. HS 2011–8), L 0.85 mm, Krause's glacial erratic boulder no. 670, Harpa Limestone, Keila Stage (D2); **G.** *Vendona cincta* (Krause, 1889). Lectotype, ♀ right valve (MB. HS 2011–6), L 1.51 mm, Krause's glacial erratic boulders nos. 288, age presumably *Schroeteri* or *Crassicauda* Limestone of Sweden; **H.** *Ceratobolbina obliqua* (Krause, 1892). Holotype, tecnomorphic left valve (MB. HS 2011–23), L 0.81 mm, Krause's glacial erratic boulder no. 670, age Keila Stage (D2), Upper Ordovician. All boulders from Müggelheim (Berlin). All photographs in lateral view and stereo-pairs. Scale bars equal 0.2 mm. L – length.

Occurrence. Crassicauda limestone of Central and Southern Sweden, glacial erratic boulders of Northern Germany and Sweden (Upland).

Laccochilina (Prochilina) Jaanusson, 1957

Type species. *Primitia decumana* Bonnema, 1909; by original designation.

Laccochilina (Prochilina) schmidtii (Krause, 1889)

Figures 3C–D

Synonym. *Laccochilina (Prochilina) ostrogothica* Jaanusson, 1957.

1889 *Primitia Schmidtii* Krause: 10–12, 23–24, pl. 1, fig. 14.
1889 *Primitia Schmidtii* var. – Krause: 11, 23, pl. 1, fig. 15.
1891b *Primitia Schmidtii* var. – Krause: 509.
1941 *Craspedobolbina schmidtii.* – Schmidt: 6, 27–29 (non = "*dietri-dietrichi*").
1957 *Laccochilina (Laccochilina) schmidtii.* – Jaanusson: 243.
1957 *Laccochilina (Prochilina) ostrogothica* Jaanusson: 253–254, 250, tabs 7, 40, pl. 3, figs 5–8.

Lectotype. Tecnomorphic left valve, MB. HS 2011–3, Figure 3C; Krause 1889, pl. 1, fig. 14.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 139, probably *Crassicauda* limestone (because of the occurrence of its synonym *L. ostrogothica* in Sweden, Jaanusson 1957, p. 254).

Dimensions (without posterior spines). Lectotype L 1.47 mm, holotype of *L. (Prochilina) ostrogothica* (right ♀ valve) L 1.70 mm, H 1.16 mm, right ♀ valve from glacial erratic boulder Erken no. 10 (UM B 299) L 1.74 mm, H 1.18 mm (Jaanusson 1957, tab. 7, L computed after the figures on pl. 3).

Definition. Jaanusson 1957, p. 253, diagnosis of *L. (Prochilina) ostrogothica*.

Remarks. The similarity between lectotype and holotype of *L. ostrogothica* (Jaanusson 1957, pl. 3, figs 7–8) is expressed by the fact that both nominal species have a number of features in common such as a domicilium being highest behind the S2, a pit-like S2 and an vertically elongate PAN, a plica being developed only anterodorsally and posterodorsally, and a tuberculation, especially in the prolongation of the plica. This leaves hardly any doubt about their conspecifity – at least less than in other species.

The lectotype shows a weak furrow parallel to the free margin in the anterior half of the valve. Such a furrow has been rarely observed also in other species of different genera, such as *Platybolbina* (Kesling 1960, pl. 5, figs 1–2, pl. 7, fig. 3, pl. 8, figs 1–3), *Colacchilina* (Kesling et al. 1962, pl. 1, figs 13–14), or *Eurychilina* (Kraft 1962, pl. 11, fig. 2). It is assumed that this furrow was the result of temporary retention (of the kind observed in *Craspedobolbina clavata*, Martinsson 1962, fig. 24).

Comparison. L. (P.) decumana (Bonnema, 1909) differs mainly by the longer and narrower sulcus (Jaanusson 1957, pl. 3, figs 1–3; Sarv 1959, pl. 1, figs 14–17), *L. (P.) lateris* Schallreuter, 1965 mainly by the longer pli-

cal bows which are not partly dissected into tubercles (Schallreuter 1975, pl. 3, fig. 3).

Occurrence. Crassicauda limestone of Central and Southern Sweden, glacial erratic boulders of Northern Germany and Sweden (Upland).

Subfamily **Piretellinae** Öpik, 1937

Piretella Öpik, 1937

Type species. *Piretella acmaea* Öpik, 1937; by original designation.

Piretella limbata (Krause, 1891)

Figure 3E

1891a Strepula limbata. – Krause: 11 (*nomen nudum*).
1891b *Strepula limbata* Krause: 498, 516, pl. 31, fig. 13, explanation pl. 31: *Strepula reticulata* Krause.
1937 *Piretella reticulata* or *limbata.* – Öpik: 112 (or 48).
1985 *Piretella limbata.* – Sztejn: 60–61, 86, tabs 1–2, pl. 1, figs 1a–b.
1991 *Piretella limbata*. – Sztejn in Bednarczyk et al.: 151, pl. 73, figs 2–3.
2007 *Piretella limbata*. – Schallreuter & Hinz-Schallreuter in Schallreuter et al.: 292–293.
2011b *Piretella limbata*. – Schallreuter & Hinz-Schallreuter: 138, fig. 4.

Holotype (monotypy). Tecnomorphic left valve, MB.HS 2011–5, Figure 3E; Krause 1891b, pl. 31, fig. 13.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 478, light grey limestone ("Ordovician *Beyrichia* limestone") with *Steusloffia linnarssoni*, age (if the determination of *S. linnarssoni* is correct): *Schroeteri* or *Crassicauda* beds of Central and Southern Sweden.

Dimension. Holotype: L 1.23 mm.

Definition. ♀ around 1.51 mm. Parabolic-shaped crista starting rather close to the corner and being formed anterodorsally by both frill and lateral surface of the domicilium. Centrodorsal region without ridge or tubercles. Posteriorly, the velar frill almost reaches the transversal line through the posterodorsal corner.

Comparison. Piretella margaritata Öpik, 1937 differs from all known species of *Piretella* in having prominent tubercles along the centrodorsal margin, *P. acmaea* Öpik, 1937 in having a ridge in that part (Öpik 1937, pl. 4, figs 5–7). Krause's drawing (1891b, pl. 31, fig. 13) is somewhat incorrect – the crista begins at some distance from the anterodorsal corner rather than starting directly from it. This distance is smaller than in *P. oepiki* Thorslund, 1940 and *P. triebeli* Schallreuter, 1964 (Thorslund 1940, pl. 4, figs 1–5; Schallreuter 1975, pls 5–6). These species differ from each other mainly in size and in the length of the brood pouch. In *P. oepiki* the brood pouch is shorter and more distinctly separated at its ends (Thorslund 1940, pl. 4, figs 4–5) than in both *P. limbata* and *P. triebeli*. The frill is longer posteriorly and tubules of the frill are smaller and therefore, more closely set in *P. limbata* than in *P. triebeli* (Schallreuter & Hinz-Schallreuter 2011b, fig. 4; Schallreuter 1975, pls 5–6).

Apart from the wrong determination of *P. limbata* (as *P. reticulata*) from the Backsteinkalk (Schallreuter 1975, pp. 163, 165) *P. limbata* has been found until now only in borings from E Poland by Sztejn. She figured (1985, pl. 1, fig. 1b) for the first time a ♀ LV (L 1.51 mm) and the authors agree with her determination as *P. limbata*.

The material of Sztejn shows that the holotype is a larva but – in comparison with other species – quite a late instar (A-1 or A-2). The ontogeny of species displaying a centrodorsal crista (*P. acmaea*) or a row of tubercles (*P. margaritata*) has not been described, yet and it is therefore, unknown in which instar the centrodorsal ornament firstly appears. In *P. acmaea* it is present at least in A-1 (Öpik 1937, pl. 4, fig. 7; Sarv 1959, pl. 3, fig. 7). Therefore, it is rather certain that in *P. limbata* no cristal sculpture is developed centrodorsally. As shown by *P. margaritata* (Öpik 1937, pl. 4, fig. 5; Sarv 1959, pl. 3, figs 1, 3) the centrodorsal sculpture is in some distance from the dorsal margin and if present must be seen also in the holotype of *P. limbata* in which only the utmost dorsal border is embedded in rock.

Remarks. This opinion is not in accordance with Meidla, who considered the dorsal margin of the holotype being partly embedded in rock and thus, suggested to retain the name *limbata* for Krausés specimen only (pers. comm. 2011). However, the base of the posterodorsal bent of the crista, which is situated directly at or even slightly beyond the dorsal margin in other species (e.g. Öpik 1937, pl. 4, figs. 7; Schallreuter 1975, pl. 5, figs 1, 6, pl. 6, figs 1–2) is well-visible in the supplied stereomicrograph (Fig. 3E). Therefore, only a tiny part of the dorsal margin is covered by sediment. If tubercles were present they would be well-recognizable on the respective specimen since they occur in some distance from the hinge-line (Öpik 1937, pl. 4, fig. 5).

Occurrence. Uhaku and Kukruse Stages, W Podlaskian (E Poland), glacial erratic boulders of Northern Germany. The mentioning of the species from younger beds than Kukruse Stage up to Rakvere Stage by Sztejn (1985, p. 61) needs confirmation.

Superfamily **Hollinoidea** Swartz, 1936
Family **Tvaerenellidae** Jaanusson, 1957
Subfamily **Tvaerenellinae** Jaanusson, 1957

Vendona Schallreuter, 1988

Type species. Uhakiella (Vendona) ventrodolonata Schallreuter, 1988; by original designation.

Comparison. Vendona is very similar to *Uhakiella* but differs mainly by the strong dorsal plica.

Remarks. Originally, *Vendona* was proposed to be a subgenus of *Uhakiella* (Schallreuter 1988). Later, it

was considered as subgenus of *Eobromidella* (Schallreuter 1993, p. 104). However, recognition that the type-species of *Eobromidella* belongs to eurychilinids, the erection of a genus of its own became necessary (Schallreuter 1998, p. 87).

Vendona cincta (Krause, 1889)

Figure 3G

1889 *Primitia cincta* Krause: 7–8, 14, 23, 24, pl. 1, figs 4–5.
1891b *Primitia cincta*. – Krause: 516.
1896 *Primitia cincta*. – Koken: 381.
1934 *Eurychilina* (? *Chilobolbina*) *cincta*. – Bassler & Kellett: 55, 314, 440.
1941 *Primitia* ? (*vel Coelochilina* ?) *cincta*. – Schmidt: 28, 78.
1949 *Laccochilina cincta*. – Hessland: 258, 260, 264.
1949 *Laccochilina dorsoplicata* Hessland: 126, 259–261, 263, 400, pl. 6, figs 5–10.
1962 *Eobromidella cincta* (nomen dubium). – Jaanusson: 413.
1998 *Vendona cincta* nomen dubium. – Schallreuter: 87.
1998 *Vendona dorsoplicata*. – Schallreuter: 87, fig. 1.1.
1999a *Vendona quatuba* Schallreuter: 510–511.

Lectotype (des. Jaanusson 1962, p. 413). ♀ right valve, MB. HS 2011–6, Figure 3G, Krause 1889, pl. 1, fig. 4. Brood pouch broken partly away anteriorly – apparantly later because it is present in Krause's figure.

Type locality and horizon. Müggelheim, Berlin. Krause's glacial erratic boulder no. 288. Age presumably *Schroeteri* Limestone of Sweden.

According to Krause (1889, pp. 8, 23) reddish marly limestone with *Sphaerexodus* sp., *Agnostus glabratus*, *Leperditia* sp., *Primitia bursa* (?), *Strepula lineata* (?), *Beyrichia complicata* (?). In another paper Krause (1891b, p. 516) mentioned *P. cincta* together with *Steusloffia linnarssoni* and *Tallinnella marchica*. These species indicate different ages – C_Ib-c or $B_{III}\beta$-C_Ia (Schallreuter 1993, p. 49, 74) – i.e., they do not occur together and at least one species had been wrongly determined, possibly *T. marchica*, because other species of *Tallinnella* co-occur with *S. linnarssoni* in the *Schroeteri* Limestone (Jaanusson 1957, tab. 40, p. 433).

Dimension. Length of lectotype 1.51 mm.

Definition. ♀ up to 1.51 mm. Pit (S2) distinct and slightly oblique, PAN relatively large. Dorsal plica prominent and long with ends bending down in ventral direction, centrodorsally slightly bow-like. Tecnomorphs with broad, indistinctly striated velar flange. Long false brood pouch, reaching until the posteroventral region. Lateral surface with fine granules.

Comparison. Jaanusson (1962, p. 413) considered *Primitia cincta* as a *nomen dubium*. However, since the important taxonomic features are observable, the species is a valid taxon. It is considered to be synonymous to *Laccochilina dorsoplicata* Hessland, 1949, which Hessland (1949, p. 260) himself regarded "... to be closely related".

The holotype of *L. dorsoplicata* is a tecnomorphic right valve (length 1.46 mm) from the lower part of Hessland's stratum RII (Upper Red) while the lectotype of *V. cincta* is a female valve. This permits only a direct comparison of the non-dimorphic features. In this context it turned out that Hessland's drawing of the holotype is somewhat incorrect: the PAN looks smaller than it really is, the plica is more straight (in particular centrodorsally, where it is slightly narrower), and the bend of the plica is more angular anterodorsally (Hessland 1949, p. 6, fig. 6; Schallreuter 1998, fig. 1.1.). Both types are similar in the distinct, slightly oblique pit and large PAN, the long dorsal plica being bow-shaped centrodorsally and curving down at either end. The long brood pouch has the same extension posteriorly like the female valve figured by Hessland (1949, pl. 6, fig. 7a), so that there is hardly any doubt about their conspecifity.

The second specimen figured by Krause (MB. 2011–7; Krause 1889, pl. 1, fig. 5) came from another glacial erratic boulder of the so-called Red *Orthoceras* Limestone (no. 327) and therefore, does not belong to the type-series. The latter comprises exclusively material of the same boulder, so that the above mentioned specimen of boulder no. 327 cannot be taken into consideration.

The specimen figured as *Eobromidella dorsoplicata* by Schallreuter (1994a, pl. 12, fig. 1), the holotype of *Vendona quatuba* Schallreuter, 1999, is considered herein only as a subspecies of *Vendona cincta*.

Vendona ventrodolonata (Schallreuter, 1988) from an early Viruan (*Schroeteri* beds of Sweden, Schallreuter 1993, p. 43) glacial erratic boulder of possibly the same age (occurrence of *Steusloffia linnarssoni*) differs in having a smaller PAN, a centrodorsally more straight plica, a narrower tecnomorphic velum, and a coarser surface reticulogranulation (Schallreuter 1988, figs 1–2; 1993, pl. 53a, figs 1–3).

In *Vendona cicatriosa* (Sarv, 1959) (BIIIβ, Estonia) a PAN is lacking, the pit-like sulcus is smaller and rounded, the plica is straight centrodorsally, the tecnomorphic velar flange small, and the lateral surface granulated (Sarv 1959, pl. 4, figs 1–4 ; Schallreuter 1993, pl. 45a, fig. 3).

Subfamily **Bolbininae** Ivanova, 1979

Bolbina Henningsmoen, 1953

Type species. *Bollia ornata* Krause, 1897; by subsequent designation (Schallreuter 2000, p. 834).

Bolbina plicata (Krause, 1892)

Figure 3F

1892 *Primitia plicata* Krause: 386–387(? partim), 399 (? partim), pl. 22, fig. 1.
1973 *Bolbina plicata*. – Schallreuter: 67–68, 70, fig. 12.
1985 *Bolbina plicata*. – Schallreuter: 103–104, 122, 134, tab.1, pl. 2, fig. 4, pl. 8, fig. 2, (p. 103 syn.).
1990 *Bolbina plicata*. – Meidla et al. in Aru et al.: fig. 28.
1993 *Bolbina plicata*. – Schallreuter: 14, tab. 1.
1995 *Bolbina plicata*. – Nõlvak et al.: 8, 18, tab. 3, pl. 3, fig. 18.
1996 *Bolbina plicata*. – Meidla: 74–75, figs 5, 10–11, 20–23 (faunal logs), tabs 4, 9 (p. 207), pl. 14, fig. 5.

Lectotype (des. Meidla 1996, p. 75). Tecnomorphic left valve, MB. HS 2011–8, Figure 3F; Krause 1892, pl. 22, fig. 1.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 670, *Harpa* Limestone, Keila Stage (D_{II}).

Dimensions. Lectotype L 0.85 mm. Anteriorly incomplete right ♀ valve (GG 400–3242; Schallreuter 1985, pl. 8, fig. 2) >1.20 mm.

Definition. Schallreuter 1985, p. 103.

Remarks. Schallreuter 1985, p. 104.

Occurrence. Estonia: Rakvere to Vormsi Stages (E – FIb). Glacial erratic boulders: N Germany: Keila Stage (D_{II}), SW Finland: Rakvere (E).

Brevibolbina Sarv, 1959

Type species. *Brevibolbina dinorpha* Sarv, 1959; by original designation.

Brevibolbina papillata (Krause, 1892)

Figure 4A

1892 *Primitia papillata* Krause: 387–388, 399, pl. 22, fig. 7.
1896 *Primitia papillata*. – Koken: 382.
1934 *Primitia papillata*. – Bassler & Kellett: 55, 452.
1981 *Brevibolbina pontificans* Schallreuter: 61–62, 64–65, 66, figs. 2–3.
1981 *Brevibolbina fissurata* Schallreuter: 61, 65–67, figs. 4–5.
1986 *Brevibolbina pontificans*. – Schallreuter: 6, 20 (1987b: 206, 220), pl. 3, fig. 10.
1992 *Brevibolbina pontificans*. – Sidaravičienė: 85–86, 237, tab. 2, pl. 22, figs 3–5.
1996 *Brevibolbina pontificans*. – Meidla: 43, 183, 185, 190, 192, figs 8, 27(cf.)–28, 34, 38, 40 (logs), tabs 7, 9 (p. 204), pl. 6, fig. 8.

?*Holotype*. Left tecnomorphic (♂?) valve, MB. HS 2011–9, Figure 4A; Krause 1892, pl. 22, fig. 7.

Type locality and horizon. Müggelheim, "yellowish sandy-calcareous glacial erratic boulder" or "glacial erratic boulder with *Beyrichia rostrata*", early (?) Late Ordovician (Krause 1892, pp. 288, 399).

Definition. Length at least up to 0.85 mm. Shape moderately high to moderately long. Outline subpostplete. Sigmoidal sulcus (S2) developed as V-shaped pit behind cone-like PAN, situated just above midline and very weak in ventral part between PAN and posteroventral lobe. Elongate posteroventral lobe directed posterodorsally and continued anteriorly until S2 by an indistinct bend. Surface finely reticulate accommpanied by some scattered tubercles.

Comparison. The holotype resembles *B. fissurata* Schallreuter, 1981 mainly in the development of the sulcus but differs in the more elongate shape and subpostplete outline, which may be special features of adult males (Schallreuter 1981, figs 4–5). In its fine reticulation and tuberculation it resembles *B. pontificans* Schallreuter, 1981 (Schallreuter 1981, fig. 3 left). Meidla (1996, p. 43) considered *B. pontificans* and *B. fissurata* to be synonymous, and it now seems that both are synonyms of *B. papillata*.

Meidla (1996) considered differences between *B. pontificans* and *B. fissurata* as intraspecific variation but they may have significance at subspecies level. The development of the posteroventral lobe with a ridge on its top differs in both taxa: it is ridge-like in *B. fissurata*, but spine-like in *B. pontificans* where the ridge starts already at the dolon (Schallreuter 1981, figs 2, 4; Meidla 1996, pl. 6, fig. 8). Although the top of the posteroventral lobe is broken away in the holotype of *B. papillata* it seems to be more similar to *B. pontificans* than to *B. fissurata*. Therefore, the latter might be regarded as a subspecies of *B. papillata*.

The holotype of *B. dimorpha altonodosa* Sarv, 1959 differs in the smooth surface and in the anteriorly shorter brood pouch (Sarv 1959, pl. 25, figs 12–13). Contrary to the above mentioned *B. pontificans*, the posteroventral ridge on the lobe starts above the dolon. The specimens assigned to *B. dimorpha altonodosa* and figured by Meidla (1996, pl. 6, figs 6–7), however, display some tubercles on the surface.

Occurrence. Pirgu Stage of Estonia, late Pirgu Stage, Taučionys and the bed above of Taučionys (Nadtauchenskaya sloi) of Lithuania.

Superfamily **Tetradelloidea** Swartz, 1936
Family **Ctenonotellidae** Schmidt, 1941
Subfamily **Tallinnellinae** Schallreuter, 1976
= ? Ctenonotellinae Schmidt,1941

Tallinnella Öpik, 1937

Type species. *Tallinnella dimorpha* Öpik, 1937; by original designation; = *Beyrichia marchica angustata* Krause, 1891.

Tallinnella lata (Krause, 1891)

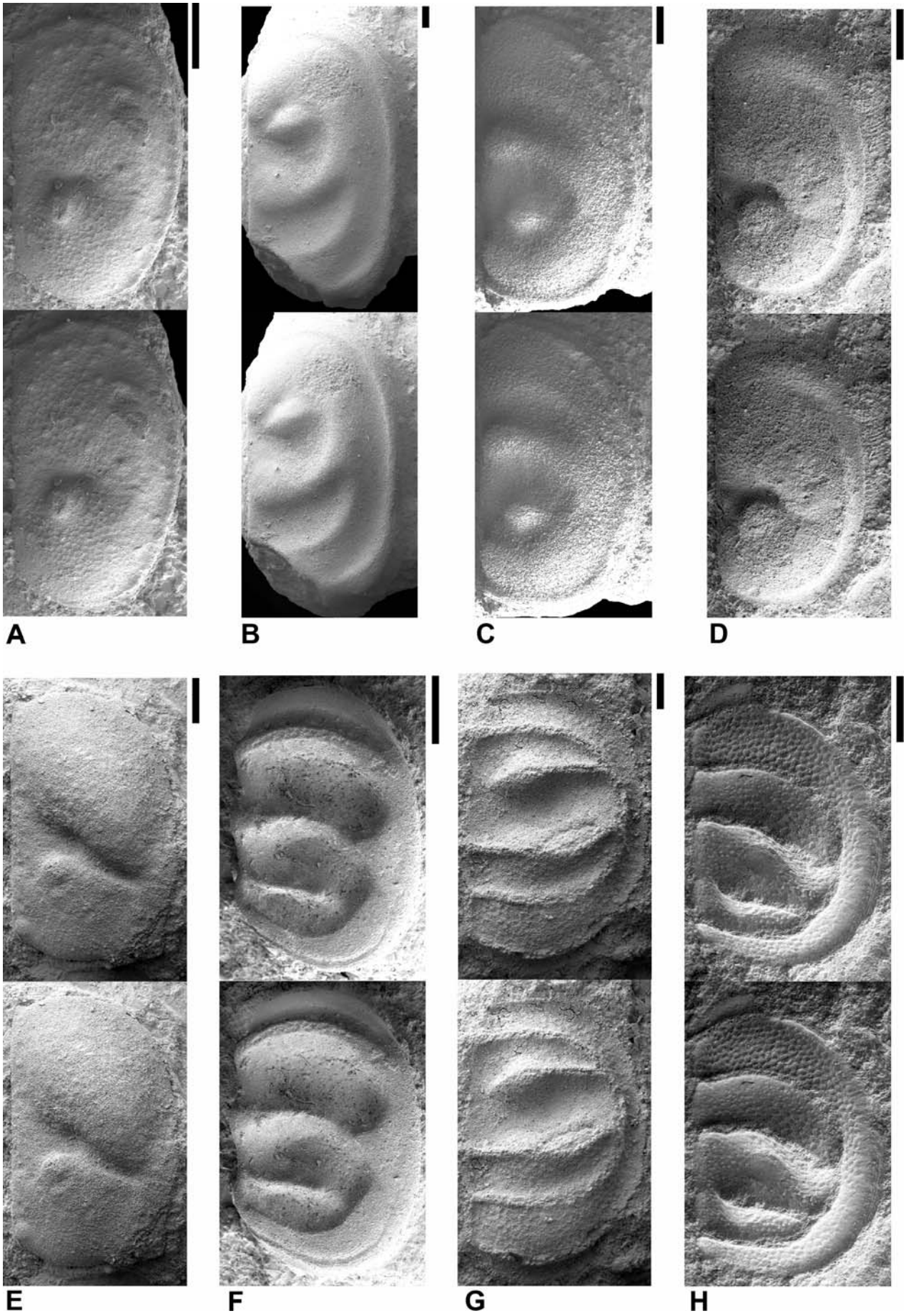
Figures 4B–C

Synonym. *Tallinnella sebyensis* Jaanusson, 1957.

1889 *Beyrichia marchica* – Krause: 19–20 (pars).

►

Figure 4. A. *Brevibolbina papillata* (Krause, 1892). Holotype, tecnomorphic left valve (MB. HS 2011–9), L 0.85 mm, Krause's glacial erratic boulder no. 615, age presumably lower Upper Ordovician; **B–C.** *Tallinnella lata* (Krause, 1891). Lectotype, posterodorsallly incomplete right valve (MB. HS 2011–10), and juvenile left valve (MB. HS 2011–12), L 2.54 mm, and 1.52 mm, Krause's glacial erratic boulders nos. 425 and 427, age *Schroeteri* Limestone of Sweden; **D.** *Collibolbina*? *plicata* (Krause, 1892). Lectotype, steinkern of a ♀ left valve (MB. HS 2011–24), L 1.00 mm, Krause's glacial erratic boulder no. 616, upper Upper Ordovician; **E.** *Vittella ornata* (Krause, 1891), ♀ left valve (MB. HS 2011–25), L 1.15 mm, Krause's glacial erratic boulder no. 687, age unknown; **F.** *Tetrada (Tetrada) harpa* (Krause, 1892). Lectotype, ♀ left valve (MB. HS 2011–12), Krause's glacial erratic boulder no. 587, Harpa Limestone (Keila Stage, D2); **G.** *Rigidella erratica* (Krause, 1889). Lectotype, tecnomorphic right valve (MB. HS 2011–14), L 0.88 mm, Krause's glacial erratic boulder no. 140, Lanna Limestone; **H.** *Rigidella krauseana* (Schmidt, 1941). Holotype, tecnomorphic left valve (MB. HS 2011–15), L 0.85 mm, Krause's glacial erratic boulder no. 133, exact age unknown. All boulders from Müggelheim (Berlin) except of I which comes from Rixdorf (= Neukölln, Berlin). All photographs in lateral views and stereo-pairs. Scale bars equal 0.2 mm. L – length.



1891b *Beyrichia marchica* Krause var. *lata* Krause: 499, 516–517, pl. 31, fig. 15 (non fig.14 = *Tallinnella* sp.).
1893 *Beyrichia marchica* var. *lata*. – Kiesow: 7, 73.
1908 *Tetradella marchica lata*. – Ulrich & Bassler: 306.
1918 *Beyrichia marchica lata*. – Kruizinga: 98, 100.
1934 *Tetradella marchica lata*. – Bassler & Kellett: 71, 482.
1953b *Tallinnella marchica lata*. – Henningsmoen: 39, 41.
1957 *Tallinnella lata*. – Jaanusson: 341 (cf.: 352–353; tab. 40, pl. 9, fig. 11).
1957 *Tallinnella sebyensis* Jaanusson: 341, 350–352, tab. 40, text-fig. 35b, pl. 9, figs 12–13.
1992 Tallinnella lata. – Sidaravičienė: 108.
1993 *Tallinnella lata* (Krause, 1891). – Schallreuter: 14, 47, tab. 6.
1993 *Tallinnella sebyensis*. – Schallreuter: 43, 47, 50–51, 246, pl. 49b, fig. 2 (p. 50 syn.).

Lectotype (des. herein). Posterodorsally incomplete right valve, MB. HS 2011–10 – Figure 4B; Krause 1891b, pl. 31, fig. 15.

Type locality and horizon. Müggelheim. Krause's glacial erratic boulder no. 425; age: like *Schroeteri* Limestone of Sweden.

Definition. Jaanusson 1957, p. 350 (diagnosis of *Tallinnella sebyensis*).

Remarks. Beyrichia marchica lata Krause, 1891 (*Tallinnella lata*) is a younger primary homonym of *Beyrichia maccoyana lata* Reuter, 1885 (*Beyrichia lata*) (Schallreuter 1993, p. 14). Because the taxa are not considered to be congeneric since 1908, the younger homonym has not automatically to be replaced (IRZN Art. 23.9.5). The case should be referred to the Commission and in the meantime, the prevailing usage of the name is maintained.

Tallinnella lata is considered herein as *nomen protectum* (ICZN Art. 57.2.1), because the older homonym (*Beyrichia lata*) according to Art. 23.9.1.1 with the restrictions mentioned in Art. 23.9.6 had not been used as a valid name.

Art. 23.9.1.2. demands "the junior synonym or homonym has been used for a particular taxon, as its presumed valid name, in at least 25 works, published by at least 10 authors in the immediately preceding 50 years and encompassing a span of not less than 10 years". This is not true for *T. lata* but contrary to extant species this article is completely illusionary at least for certain fossil groups, such as Palaeozoic ostracodes and therefore, not applicable.

The other specimen figured by Krause (Krause 1891b, pl. 31, fig. 14) (Fig. 3C) which came from another glacial erratic boulder (no. 427, Red *Orthoceras* Limestone) differs in having less oblique anterior lobes, which may represent a larval character.

Occurrence. Sweden: *Schroeteri* Limestone, Middle Ordovician. Glacial erratic boulders of N Central Europe (Netherlands – Gdańsk).

Tetrada Neckaja in Abushik et al., 1958

Type species. *Tetradella memorabilis* Neckaja, 1953; by original designation.

Tetrada (Tetrada) Neckaja in Abushik et al., 1958

Tetrada (Tetrada) harpa (Krause, 1892)

Figure 4F

1892 *Beyrichia (Tetradella) harpa* Krause: 394, 399, pl. 22, fig. 15.
1985 *Tetrada harpa*. – Schallreuter: 99, 101–102, 108–109, 126, tab. 1, pl. 4, fig. 13 (syn.).
1992 *Tetrada (Tetrada) harpa*. – Schallreuter & Kanygin: 120.
1996 *Tetrada (Tetrada) harpa*. – Meidla: 46, fig. 7 (faunal log), pl. 7, fig. 7.

Lectotype. ♀ left valve, MB. HS 2011–12, Figure 4F; Krause 1892, pl. 22, fig. 15.

Krause (1892, pp. 383–384, 394) mentioned this species from two boulders numbered 587 and 670. Due to the greater faunal complexity Schallreuter (1985, p. 108) proposed to choose the lectotype from boulder no. 670. Since only the figured specimen of Krause seems to have survived, a specimen from boulder 587 must be determined as lectotype.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 587.

Definition. Schallreuter 1985, p. 108.

Comparison. Schallreuter 1985, p. 108–109.

Occurrence. Estonia, Lithuania, NW Byelorussia: Keila Stage, Latvia: Keila and Oandu Stages. N Germany: glacial erratic boulders (*Harpa* Limestone).

Subfamily **Ctenentominae** Schmidt, 1941
= Steusloffiinae Schallreuter,1966

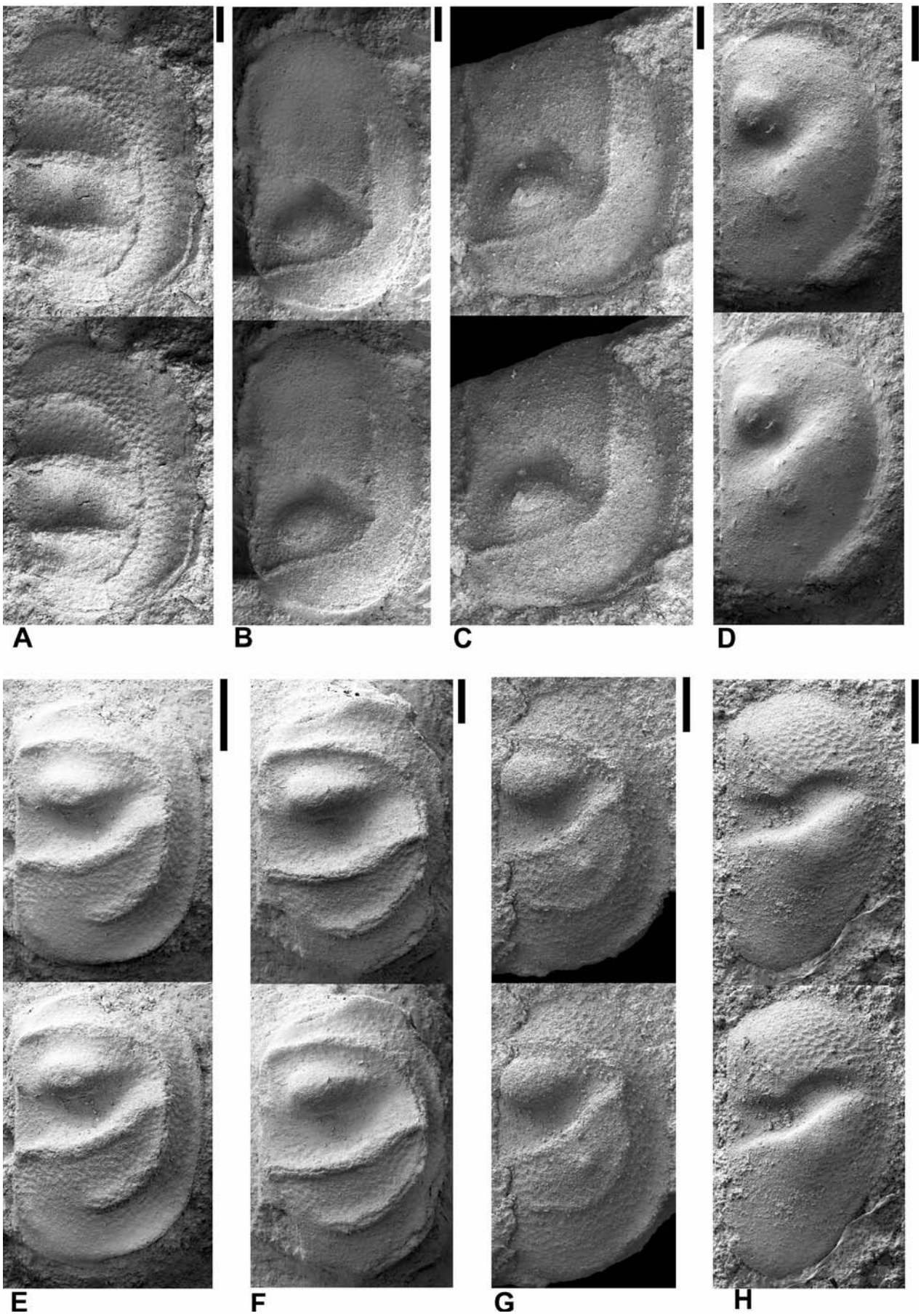
Piretopsis (Protallinnella) granulosa (Krause, 1891)

Figure 5A

Synonym. *Beyrichia grewingkii* Bock, 1867, type-species of *Protallinnella* Jaanusson, 1957.

►

Figure 5. A. *Piretopsis (Protallinnella) granulosa* (Krause, 1891). Lectotype, tecnomorphic left valve (MB. HS 2011–13), Krause's glacial erratic boulder no. 123, "Glaukonitkalk" (glauconite limestone), age B_{II}, Middle Ordovician; **B–C.** *Steusloffia simplex* (Krause, 1891). Lectotype, tecnomorphic left valve (MB. HS 2011–16), and posterior imcomplete left valve (MB. HS 2011–17), L 1.56 mm, and 0.98 mm, Krause's glacial erratic boulders nos. 432, and unknown, presumably *Schroeteri* Limestone of Sweden; **D.** *Steusloffia trilobata* (Krause, 1892). Lectotype, right valve (MB. HS 2011–21), L 0.93 mm, Krause's glacial erratic boulder no. 663, age unknown; **E.** *Asteusloffia acuta* (Krause, 1891). Lectotype, anteriorly incomplete right valve (MB. HS 2011–18), L 1.06 mm, Krause's glacial erratic boulder no. 479, Middle Ordovician; **F.** *Asteusloffia acuta* (Krause, 1891), right valve (MB. HS 2011–19), L 1.15 mm, boulder no. 479; **G.** *Asteusloffia acuta* (Krause, 1891), juvenile right valve (MB. HS 2011–20), L 0.78 mm, origin unknown; **H.** ?*Vittella sigma* (Krause, 1889), tecnomorphic right valve (MB. HS 2011–22), L 0.81 mm, Krause's glacial erratic boulder no. 321, age unknown. All boulders from Müggelheim (Berlin) except of A which comes from the Mark Brandenburg or part of Berlin belonging to the Mark at that time, and possibly C, F and G (origin unknown). All photographs in lateral views and stereo-pairs. Scale bars equal 0.2 mm. L – length.



1889 *Beyrichia erratica* var. – Krause: 18–19, 23, pl. 2, fig. 6.
1891b *Beyrichia erratica* var. *granulosa* Krause: 500, 516–517.
1993 *Piretopsis (Protallinnella)* ? *granulosa* (Krause, 1891) (prim. homonym), *Piretopsis (Protallinnella) grewingkii*. – Schallreuter: 14, 31–32, 60–63, 164, 178, pl. 8b, fig. 1, pl. 15a ,fig. 4, (pp. 60–61 syn.).

Lectotype (des. herein). Left valve, MB. HS 2011–13, Figure 4A; Krause 1889, pl. 2, fig. 6.

Type locality and horizon. Mark Brandenburg or part of Berlin belonging to the Mark at that time. Krause's glacial erratic boulder no. 123, "Glaukonitkalk" (glauconite limestone), B_{II}, Middle Ordovician.

Remarks. Öpik (1935, p. 10, 35) and Sarv (1959, p. 54) considered *Beyrichia erratica granulata* (recte *granulosa*) as a younger synonym of *Beyrichia grewingkii* Bock, 1867. Schmidt (1941, p. 40) drew attention to the fact that *Beyrichia erratica granulosa* is a younger primary homonym of *Beyrichia granulosa* Hall, 1876 (recte 1879) (Kempf 1986, p. 112; 1988, p. 138).

Rigidella Öpik, 1937

Type species. Steusloffia mitis Öpik, 1935; by original designation.

Definition. Small. Quadrilobate and quadricristate, L1 and L4 very weak or missing, L2 and L3 distinct, L2 forming a ± distinct oval PAN and L3 a long lobe or only a ± distinct posteroventral lobe. All lobes with ventrally connected cristae; C1, C3 and C4 also connected dorsally by a plica. Dolon weakly convex. Surface reticulate.

Comparisons. Rigidella resembles the closely related *Tallinnellina*. The holotypes of both type-species are based on larvae.

The holotype of *R. mitis* is a left valve (L 0.60 mm) with prominent PAN, L3 long and distinct, cristae ridge-like (C1, C2, C4) with C3 being probably broken away (Öpik 1935, pl. 1, fig. 5; Sarv 1959, pl. 14, fig. 8).

The holotype of *Tallinnellina teres* (Hessland, 1949) is a right valve (L 0.91 mm) with indistinct velar sculpture (Schallreuter 1999b, pl. 1, fig. 5). L2 developed as drop-like node, L3 as long, curved lobe separated from the weaker L4 by a distinct S3. Lobes without cristae. The ontogenetic development of *T. teres* is unknown, but in tecnomorphs of the better known *T. murus* Schallreuter, 1993 of about the same size as the holotype of *T. teres* the cristae are still not developed (Schallreuter 1993, pl. 15). It is quite likely, that they appear in *T. teres* like in *T. murus* also only in older tecnomorphs and adults. The development of the cristae is equal in both genera, but in *Rigidella* they appear earlier during ontogeny. Another difference between both genera refers to dimorphism, if the interpretation of *Tallinnellina murus* as a typical member of the genus by Schallreuter is correct. In *Tallinnellina* the dimorphism is very strong, in *Rigidella* only weak.

Generally, the quadrilobate pattern is more originate in *Tallinnnellina* with strictly vertically arranged cristae. By contrast, *Rigidella* is a more advanced form expressed by the stronger development of the central lobes (PAN and L3), which make the cristate pattern increasingly indistinct.

Rigidella erratica (Krause, 1889)

Figure 4G

1889 *Beyrichia erratica* Krause: 18–19, 23, 24 (all partim), pl. 2, fig. 7.
1935 *Tetradella* ? *erratica.* – Öpik: 11, 36.
1957 *Tallinnellina* ? *erratica.* – Jaanusson: 354.
1993 *Rigidella krauseana.* – Schallreuter: 66 (pars), 150, 152 (pars), pl. 1b, fig. 2, pl. 2a, fig.1.
1993 *Rigidella vadosa* Schallreuter: 31, 64, 67, 170, pl. 11a, fig. 2.
2001 *Rigidella mitis*. – Tinn & Meidla: 130, 135, tab. 1 (partim), figs 2–3 (faunal logs), 4b.
2004 *Rigidella mitis*. – Tinn & Meidla: 208, 210, 221, text-figs 2–3, pl. 1, fig. 2–3.

Lectotype (des. Öpik 1935, p. 11). Tecnomorphic right valve, MB. HS 2011–14, Figure 4G; Krause 1889, pl. 2, fig. 7.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 140, Red Orthoceras Limestone (ROL), presumably Lower ROL, same age as Lanna Limestone of Central Sweden, early Middle Ordovician.

Deposits of the Central Baltoscandian confacies belt are characterized by widespread red sediments (Jaanusson 1982, p. 6). Based on its colour the so-called *Orthoceras* Limestone of Middle/early Late Ordovician was subdivided in Sweden into four sections such as Lower Red, Lower Grey, Upper Red and Upper Grey *Orthoceras* Limestone (Hessland 1949, p. 103). This division was also applied for respective glacial erratic boulders in Northern Germany. The Lower Red Limestone is also known as *Limbata* Limestone (Hessland 1949, p. 104). Later its name was changed into Lanna Limestone and compared with the Volkhovian (Jaanusson 1982, fig. 4). The overlying Holen Limestone (= "Vaginatum" Limestone; Jaanusson 1982, p. 18) is also red in south-central Sweden (e.g., Tinn & Meidla 2001, p. 129) but lacks any *Rigidella* species (Tinn & Meidla 2001, fig. 2). Therefore, Krausés boulder no. 140 is considered to be of the same age like the Lanna Limestone.

Dimension. Lectotype: L 0.88 mm. Holotype of *R. vadosa* L 0.81 mm. ♀ right valve no. A16–8 0.91 mm (Schallreuter 1993, p. 152).

Definition. Length up to 0.91 mm. PAN and L3 only weak, C3 and C4 dorsally vertical.

Remarks. From three different glacial erratic boulders (Figs 4G–H, 5A) Krause (1889, pl. 2, figs 6–8) figured three valves as *B. erratica*. One specimen he determined as "var."; which Öpik (1935b, p. 11, 36) regarded as "... the true *Tetradella grewingki*" (recte *grewingkii*) (= *Protallinnella g.*). Also, the "holotype" of *erratica* he (Öpik 1935b) considered "... likewise a true *Tetradella*". The third specimen (Krause 1889, pl. 2, fig. 8) Öpik (1935b) assigned to his *Rigidella mitis*, but Schmidt (1941, p. 40) considered it as a different species: *Rigidella krauseana.*

R. erratica belongs to the genus *Rigidella* rather than to *Tetradella. R. mitis* (= *R. plattformis* Schallreuter, 1993) differs from *R. erratica* mainly by the broad PAN, the long L3, which is lobe-like also in its dorsal part. It is situated close to C4 and separated from the latter by a narrow furrow only (Öpik 1935, pl. 1, fig. 5; Sarv 1959, pl. 14, fig. 8; Schallreuter 1993, pl. 9a, figs 1–3, pl. 9b, figs 1–4, pl. 20b, figs 2–4, pl. 22b, figs 1, 2l). In *R. mitis* the L3 and L4 are obliquely directed towards the dorsal margin while they are verti-

cally arranged in *R. erratica*. In this respect, *R. erratica* resembles more *Tallinnellina*, e.g., *T. viridis* (Schallreuter 1993, pl. 11a, fig. 1). Already Jaanusson (1957, p. 354) had tentatively placed *erratica* within *Tallinnellina*. *T. viridis* is transitional to *R. erratica*, but differs from the latter by its more originate quadrilobate pattern.

Specimens from glacial erratic boulder Gra-90–13 figured as *R. krauseana* by Schallreuter (1993, pl. 1b, fig. 2, pl. 2a, fig. 1) in fact represent *R. erratica*. Due to the isolated C2, a straight C3 and the uniform postsulcal lobe it is unclear, whether or not the other figured specimens (Schallreuter 1993, pl. 2a, figs 2–3) belong to that species.

Tinn & Meidla (2004, pl. 1, figs 2–3) figured two valves of *Rigidella* from two different localities (Lanna Limestone of Hällekis, and Volkhov Stage of Lava, St. Petersburg region) as *R. mitis*. The valves differ by the arrangement of the posterior ridges: vertical in the specimen from Hällekis, oblique in the valve from Lava (like in the holotype from Ülgase, Estonia). The latter represents *R. mitis* but the specimen from Hällekis *R. erratica*.

Rigidella vadosa Schallreuter, 1993 is considered here as a synonym of *R. erratica*.

Occurrence. Known until now only from glacial erratic boulders of Northern Germany.

Rigidella krauseana (Schmidt, 1941)

Figure 4H

1889 *Beyrichia erratica*. – Krause: pl. 2, fig. 8.
1935 *Steusloffia* sp. – Öpik: 11, 36.
1941 *Rigidella krauseana* Schmidt: 40.
1993 *Rigidella krauseana*. – Schallreuter: 30, 64, 66 (partim), 154, 164, 166, pl. 3a, figs 1–3, pl. 3b, fig. 2.
1993 *Rigidella krauseana falx* Schallreuter: 31, 64, 66–67, 164, 166, pl. 8a, figs 2–4, pl. 9a, fig. 4.

Holotype. Tecnomorphic left valve, MB. HS 2011–15, Figure 4H; Krause 1889, pl. 2, fig. 8.

Type locality and horizon. Rixdorf (Neukölln), Berlin; Krause's glacial erratic boulder no. 133.

Dimension. Holotype: L 0.85 mm.

Definition. Strong oval PAN. Ventral part of L3 forming a distinct posteroventral lobe. S3 rather broad. C3 and C4 dorsally vertical.

Remarks. The species resembles *R. erratica* by the vertically directed dorsal portions of both C3 and C4, but L3 is more uniform and S3 relatively small in *R. erratica*. *R. krauseana* resembles *Tallinnellina viridis* in having a broad S3.

Tinn & Meidla (2001, tab. 1) considered *R. krauseana* and *R. plattformis* as synonyms of *R. mitis*. *R. plattformis* is indeed a synonym of *R. mitis*, but *R. krauseana* is a different species. This is clearly documented by glacial erratic boulder Ahl-87–153, in which both species occur together. The several valves of both species illustrated by Schallreuter (1993, pls 8a, 9) clearly show the differences: the distinctly long L3 with obliquely running C3 and C4 in *R. mitis*, and in *R. krauseana* the special posteroventral development of L3 with vertically extending C3 and C4, the latter being evenly curved anteriorly.

Tinn & Meidla (2001, tab. 1) also considered the younger *R. rudolphi* to be synonymous to *R. mitis*. However, it differs distinctly from that species by the nearly or totally missing separated L3 and the larger, broader, oval PAN (Schallreuter 1993, pl. 33a; 1994a, pl. 17, figs 1–2). It undoubtedly originated from *R. erratica* evidenced by proterogenetic transitional specimens (Schallreuter 1993, pl. 2a, figs 2–3).

Rigidella krauseana falx Schallreuter, 1993 is considered here as a synonym of *R. krauseana krauseana*.

Occurrence. Known until now only from glacial erratic boulders of Northern Germany.

Steusloffia Ulrich & Bassler, 1908

Type species. *Strepula linnarssoni* Krause, 1989; by original designation.

Steusloffia simplex (Krause, 1891)

Figures 5B–C

1891a *Strepula simplex*. – Krause: 11 (nomen nudum).
1891b *Strepula simplex* Krause: 498–499, 516, pl. 31, fig. 12.
1908 *Beyrichia* (*Steusloffia*) *simplex*. – Ulrich & Bassler: 286, 328, pl. 38, fig. 3.
1934 *Steusloffia simplex*. – Bassler & Kellett: 71, 476, 477.
1937 *Strepula simplex* = probably Steusloffia. – Öpik: 50, 114.
1957 *Steusloffia simplex*. – Jaanusson: 359.

Lectotype. Tecnomorphic left valve, MB. HS 2011–16, Figure 5B; Krause 1891b, pl. 31, fig. 12.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 432. Reddish-grey limestone with *Primitia cincta*.

Definition. At least up to 1.56 mm. C1 forming a crista perpendicular to dorsal margin and anterior of PAN. The latter passes into a crista (C3) with a relatively acute angle and runs parallel to the dorsal margin up to the posteroventral region. C2 and C4 lacking. (C4 may be present in possible larger instars).

Comparison. Jaanusson (1957, p. 359) assumed that this species was "... probably erected on a young instar". Compared with *Steusloffia costata* it would represent the A^{-3} Stage (L 1.39 mm, plica, C1/C3vent.) (Hinz-Schallreuter & Schallreuter 1998, fig. 81b). It resembles especially larvae of *S. multimarginata* Öpik, 1937. From the slightly larger larvae figured by Jaanusson (1957, pl. 10, figs 13–14) *S. simplex* differs by the missing C2; furthermore, the ridge formed by C1 and C3 has fairly straight branches enclosing a blunt angle. By contrast, the ridge in *S. multimarginata* is evenly curved.

Steusloffia humilis Öpik, 1937 which also has been probably erected on a young instar (Jaanusson 1957, p. 359), is considered to be synonymous with *S. rigida*

Öpik, 1937 by Sarv (1959, p. 86). The holotype of *S. humilis* resembles *S. simplex* in size (1.6 mm) and similar development of the C1 + C3, but differs by the development of C2 and C4 as well as by the node-like (or spine-like?) posterior end of C3 (Öpik 1937, pl. 4, fig. 3).

Steusloffia neglecta (Stage E) differs from *S. simplex* mainly in having a C2 developed on the PAN and in a C4, which appears already in younger instars (Sarv 1959, pl. 15, figs 5, 7–8; Meidla 1996, pl. 7, fig. 1). The C3 forms the posterior bow of the parabolic-shaped crista and is not a branch parallel to the dorsal margin as in *S. simplex*.

It might be possible that the taxon represents a special branch within the phylogenetic development of *Steusloffia*, which is still unknown from outcrops in Baltoscandia. Presently the name is confined only to the two of Krause's specimens.

Steusloffia trilobata (Krause, 1892)

Figure 5D

1892 *Entomis trilobata* Krause: 391, 399, pl. 22, fig. 11.
1908 *Beyrichia trilobata.* – Ulrich & Bassler: 286.
1934 *Beyrichia trilobata.* – Bassler & Kellett: 55, 208, 307.

Holotype (monotypy ?). Right valve, MB. HS 2011–21, Figure 5D; Krause 1892, pl. 22, fig. 11.

Type locality and horizon. Former gravel pit near Müggelheim, Müggel Isle (Berlin); Krause's glacial erratic boulder no. 663, grey, dense limestone with *Steusloffia linnarssoni*; age presumably *Crassicauda* beds of Central and Southern Sweden (Jaanusson 1957, p. 369; the *Schroeteri* beds are usually red coloured).

Definition. Length at least up to 0.93 mm. Distinct PAN and posteroventral lobe between broad sulcus. Dorsal plica indistinct. Narrow flange-like velum from anterodorsal to posteroventral region. Surface with few tubercles.

Remarks. The only available specimen (L 0.93 mm) seems to be not adult. In its sulcus and distinct PAN and posteroventral lobe it resembles certain steusloffiines.

Steusloffia is characterized by a plica and several cristae, which are subsequently formed during the ontogenesis. In small larvae, these sculptures are missing (except for the spine of the posteroventral lobe), so that they are similar to *S. trilobata* (Hinz-Schallreuter & Schallreuter 1998, fig. 81a).

The various specimens of *Steusloffia linnarssoni* figured by Schallreuter (1993, pl. 39b, fig. 3, pl. 49a, fig. 4, pl. 54a, fig. 1) represent different ontogenetic stages (L 1.50, 1.61, and 2.25 mm resp.) having cristae of a different degree of completeness. Compared with these specimens, the lectotype of *Entomis trilobata* probably represents a younger instar, in which the cristae are still not developed – like larval stage V of *Steusloffia costata* (Hinz-Schallreuter & Schallreuter 1998, fig. 81a). Therefore, *S. trilobata* is probably a younger synonym of *S. linnarsoni* Krause, 1889. Presently the name is confined to Krause's specimen, only.

The species name *trilobata* was chosen by Krause (1992, p. 391) due to gross morphological similarity to Silurian beyrichiids ("... typische Dreitheilung der obersilurischen Beyrichien ...") with their L1, L2 + syllobium, which agrees with L1, L2 + L3/L4 in *Steusloffia*.

Asteusloffia Schallreuter, 1993

Type species. *Strepula lineata separata* Steusloff, 1895; by original designation; = *Beyrichia erratica acuta* Krause, 1891.

Asteusloffia acuta (Krause, 1891)

Figures 5E–G

1891a *Beyrichia erratica acuta*. – Krause: 12 (nomen nudum).
1891b *Beyrichia erratica acuta* Krause: 499–500, 516, pl. 31 fig. 18.
1993 *Asteusloffia acuta*. – Schallreuter: 14, 34–36, 40, 68, 70–72, 210, 218, 220, 226, pl. 31a, figs 1–2, pl. 31b, fig. 1, pl. 35b, fig. 1, pl. 36a, figs 3–4, pl. 39a, figs 1–3, (p. 70–71 syn.).
1994a *Asteusloffia acuta*. – Schallreuter: 504, 510, 514, 516, 518, 520, pl. 5, fig. 2, pl. 9, figs 4–5, pl. 11, fig. 3, pl. 12, fig. 2, pl. 13, fig. 1, pl. 14, figs 1–2.
1998 *Asteusloffia acuta*. – Põldvere et al.: fig. 6.
1999 *Asteusloffia acuta*. – Tinn & Meidla: 29, fig. 1 (faunal log), pl. 1, fig. 5.
2001 *Asteusloffia acuta*. – Tinn & Meidla: 135, tab. 1 (partim), fig. 2 (faunal log), 4a.
2002 *Asteusloffia acuta*. – Tinn: 11, 26, 39, 40, tabs 1 (p. 21), 3, figs 6(9), 7, 9 (faunal log).
2004 *Asteusloffia acuta*. – Tinn & Meidla: 208, 210, 221, tabs 2–3, figs 2–3, pl. 1, fig. 4. (in Tinn 2002: 25, figs 2–3, tabs 2–3, appendix 2, pl. 1, fig. 4).
2011a *Asteusloffia acuta acuta*. – Schallreuter & Hinz-Schallreuter: 68, 70, figs 3c–d.

Lectotype (designated by E. A. Schmidt 1941, p. 40, non Henningsmoen 1954a, p. 53 as mentioned by Jaanusson 1962, p. 413): anteriorly incomplete right valve, MB. HS 2011–18, Figure 5E; Krause 1891b, pl. 31, fig. 18.

Type locality and horizon. Müggelheim. Krause's glacial erratic boulder no. 479, a glauconitic limestone, presumably Kunda Stage (B_{III}), Middle Ordovician.

Dimensions. Lectotype L 1.15 mm, paratype (MB. HS 2011–19) L 1.06 mm.

Remarks. The type specimens are presumably not adult because the species is recorded with a length of at least 1.56 mm (Schallreuter 1993, p. 71, 220, pl. 36a, fig. 3).

Krause's collection contains also a right larval valve (presumably from another boulder), which is characterized by a tubercle in the position of the posteroventral lobe between C3 and C4. Previously, these forms were considered as a possible subspecies of its own (*A. acuta* ssp. n. A) (Schallreuter 1993, p. 71, pl. 35b, fig. 1). However, since this tubercle is not visible in the largest specimen in one sample (glacial erratic boulder no. Ahl-97–122, Schallreuter 1993, pl. 36b, fig. 3) but distinct in smaller individuals (Schallreuter 1993, pl. 35b, fig. 1, pl. 36b, fig. 4) it may represent a larval feature – comparable to the posteroventral spine in other genera (e.g., *Uhakiella jaanussoni*, Schallreuter 1973, pl. 18, figs 8–9). Also in other boulders the tubercle occurs

preferably in larvae (Schallreuter 1994a, pl. 9, fig. 5, pl. 11, fig. 3). However, the distance between C3 and C4 is narrower in the type specimens than in specimens with a posteroventral tubercle. Whether or not the third specimen represents a different species or subspecies from a different stratigraphic level and/or region can be evidenced only in the frame of further investigations based on more material.

Family **Tetradellidae** Swartz, 1936
= Sigmoopsidae Henningsmoen, 1953
Subfamily **Perspicillinae** Schallreuter, 1967
Tribe **Ceratobolbinini** Schallreuter, 1983

Ceratobolbina Jaanusson, 1966

Type species. *Sigmobolbina monoceratina* Jaanusson, 1957 = nom. nov. pro *Entomis obliqua kuckersiana* Bonnema, 1909; by original designation.

Ceratobolbina obliqua (Krause, 1892)

Figure 3H

Synonym. *Sigmobolbina allikuensis* Sarv, 1959.

1892 *Entomis obliqua* Krause: 388, 399, pl. 22, fig. 10.
1966 *Ceratobolbina obliqua*. – Jaanusson: 17.
1982 *Ceratobolbina allikuensis*. – Schallreuter: 31–33, 48, tab. 11, pl. 9, figs 1–7 (p. 31–32 syn.).
1985 *Ceratobolbina obliqua*. – Schallreuter: 113–114, 130, tab. 1, pl. 6, fig. 2 (p. 113 syn.).

Holotype (monotypy ?). Left tecnomorphic valve, MB. HS 2011–23 – Figure 3H; Krause 1892, pl. 22, fig. 10.

Krause did not mention the number of specimens at his disposal. The revison is based on the figured specimen only.

Type locality and horizon. Müggelheim. Krause's glacial erratic boulder no. 670, Keila Stage (D_{II}), Late Ordovician.

Dimensions (L H in mm – L : H). Holotype: 0.81 – 0.42 – 1.93. *Sigmobolbina monoceratina allikuensis*, holotype ♀ left valve: 0.92 – 0.51 – 1.80, left valve Os 2269 (Sarv 1959, p. 126): 0.98 – 0.52 – 1.88.

Definition. Schallreuter 1982, p. 32 (definition of *C. allikuensis*).

Remarks. The holotype agrees very well with the tecnomorph of *Ceratobolbina allikuensis* described by Schallreuter 1982 (no. 17/3) and confirms the presumed synonymy of *Sigmobolbina allikuensis* Sarv, 1959 and *Entomis obliqua* (Schallreuter 1982, p. 31, 1985, p. 114). The sulcus is very characteristic in being deep, square- and pit-like in its dorsal part, weak and comma-like in its ventral part (Figure 3E; Schallreuter 1982, pl. 9, figs 1, 5). *C. allikuensis* is also finely reticulated, as documented by coated specimens, while uncoated specimens appear smooth. In tecnomorphs the posteroventral lobe terminates in a short spine. In females the spine is incorporated into the histium. Tecnomorphs have a velum formed as keel-like ridge, which is shorter in specimen 17/3 because of its smaller size (0.58 mm). The holotype of *C. allikuensis* came from the Jõhvi Substage (D_I) of Estonia. From the Keila Stage (D_{II}) of Estonia the species seems to be unknown but Sidaravičienė (1979, fig. 1, 1992, p. 231) mentioned it from Lithuania from the earliest D_{II} or border D_I/D_{II}.

Subfamiliy **Glossomorphitinae** Hessland, 1954

Collibolbina Schallreuter, 1964

Type species. *Lomatobolbina collis* Schallreuter, 1964; by original designation.

Collibolbina simplex (Krause, 1892)

Figure 6

Synonym. *Ctenentoma plana* Hessland, 1949 (Neckaja 1953, p. 346).

1892 *Entomis simplex* Krause: 390, 399, pl. 21, fig. 6.
1967b *Collibolbina simplex*. – Schallreuter: 442.
1994a *Collibolbina plana*. – Schallreuter: 496, 498, 526, 528, 506, 514, 518, 520, pl. 6, fig. 1, pl. 11, fig. 4, pl. 13, fig. 3, pl. 14, figs 3–5 (pp. 526, 528 syn.).
1998 Aulacopsis simplex. – Põldvere et al.: fig. 6.
1999 *Aulacopsis simplex*. – Tinn & Meidla: 29, fig. 1 (faunal log), pl. 1, fig. 2.
2001 *Aulacopsis simplex*. – Tinn & Meidla: 132, 135, tab. 1 (partim), fig. 2 (faunal log), 4e.
2002 *Aulacopsis simplex*. – Tinn: 23, 26, 35, 39, 40, tab. 1 (p. 22), 3, figs 6(8), 7, 9 (faunal log).
2003 *Aulacopsis simplex*. – Tolmacheva et al.: fig. 2, 5 (faunal logs).
2004 *Aulacopsis simplex*. – Tinn & Meidla: 208, 210, 221, tabs 2–3, figs 2–3, non pl. 1, fig. 14 (= *A. monofissurata*) (in Tinn 2002: 10, 25, figs 2–3, tabs 2–3, appendix 2, non pl. 1, fig. 14).

Holotype (monotypy). Left valve – Krause 1892, pl. 21, fig. 6. The original was borrowed around the year 1960 to Dr. Jaanusson, Uppsala, who photographed the specimen (Schallreuter 1994a, p. 528), but it was not among the material returned to Berlin at the end of the last century and is seemingly lost.

Neotype. Anterodorsally incomplete right ♀ valve, GG 400-G123–9 – Schallreuter 1994a, pl. 6, figs 1l,v,a.

Locality and horizon of neotype. Black *Orthoceras* Limestone ($B_{III}\beta$), Middle Ordovician, local glacial erratic boulder Gis-84, Gislövshammar, Scania (beach boulder). On the basis of ostracodes and conodonts the age of the boulder could be determined very precisely as coming from the uppermost part of the Komstad Limestone of Scania (Schallreuter 1994a, p. 495), whereas determinations of the respective

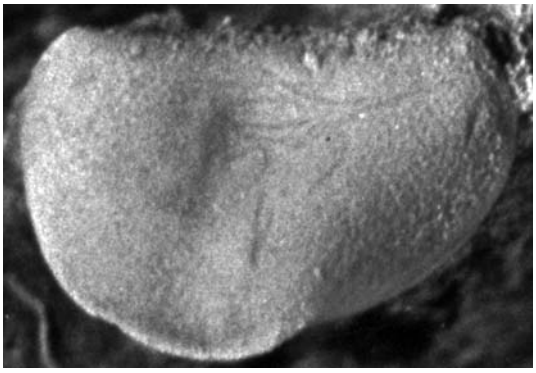


Figure 6. *Collibolbina simplex* (Krause, 1892). Lost holotype, ♀ left valve, L ~1.10 mm. Photo: Lembit Sarv. L – length.

substages in the type area of the Volkhov Stage could be problematical (Meidla, pers. comm.).

Definition. Schallreuter 1994a, p. 528.

Comparison. The species differs from the other species of the genus mainly by the weak S2.

Entomis simplex is considered as a synonym of *Ctenentoma plana* Hessland, 1949 as was already recognized by Neckaja (1953, p. 346).

Tinn & Meidla (2001, tab. 1) considered *Aulacopsis monofissurata* Hessland, 1949 as a synonym of *C. simplex* – a species characterized by a distinct, narrow, long sulcus (Hessland 1949, pl. 7, figs 9–11; Schallreuter 1994a, pl. 19, figs 3–4). The ♀ right valve from the Holen Limestone of Hällekis figured by Tinn & Meidla (2001, fig. 4e) as *Aulacopsis simplex* is indeed *C. simplex*, but the tecnomorphic left valve from the same locality and limestone (Tinn & Meidla 2004, pl. 1, fig. 14) referred to *Aulacopsis simplex* is *de facto Aulacopsis monofissurata*. Maybe the authors consider both species as "terminal members of the variation range" of one species. In order to prove that, it is necessary to investigate a rich population of one sample with support of statistical methods. Material from different samples, of course, may cause the impression of broad variation, in particular if the species are closely related and very probably descending from each other, like *C. plana* and *A. monofissurata*.

Thus, *A. monofissurata* and *C. simplex* fall in overlapping part of normal distributions of Gauss – comparable to overlapping graphs of e.g. the shape in *Parapyxion subovata* and *Pariconchoprimitia conchoidea* (Schallreuter et al. 2007, fig. 7).

The holotype of *C. plana* is slightly younger than the holotype of *A. monofissurata*. The sulcus is weaker in *C. plana* and it is very probable that *C. plana* originates from *A. monofissurata* by further reduction of the sulcus. To use species for high-resolution biostratigraphy very careful taxonomic investigations are required and lumping would be inappropriate.

Occurrence. Schallreuter 1994a, p. 528.

Collibolbina? *plicata* (Krause, 1892)

Figure 4D

1892 *Entomis plicata* Krause: 390–391, 399, pl. 22, fig. 8.
1908 *Beyrichia plicata*. – Ulrich & Bassler: 293, fig. 28.
1934 *Beyrichia* (?) *plicata*. – Bassler & Kellett: 55, 203, 305.
1993 *Pelecybolbina* ? *plicata*. – Schallreuter: 16.

Lectotype (des. herein): Steinkern of left ♀ valve, MB. HS 2011–24, Figure 4D; Krause 1892, pl. 22, fig. 8.

Type locality and horizon. Müggelheim. Krause's glacial erratic boulder no. 616, a grey, somewhat sandy limestone with *Kiesowia dissecta*, Late Ordovician.

Definition. Length at least up to 1.00 mm. Sigmoidal sulcus distinct in dorsal part behind the broad flat PAN and very weak in ventral part. Admarginal antrum in antero- and centroventral region. Marginal sculpture developed as a row of spines.

Remarks. The respective illustration and text by Krause (1892) only partly accord with the present specimen. The latter was the only remaining piece in the collection and marked as being the figured specimen. The posteroventral protuberance visible on Krause's figure and on which the designation of the genus *Pelecybolbina* was based is not present on the lectotype. Also, the second furrow mentioned in the text (Krause 1892, p. 391), which is to start from the posterior cardinal corner forming a small seam ("Saum") at the posterior margin as well as the small node between PAN and dorsal border are hardly visible. But in size and other features such as the steep ventral surface, which passes posteriorly into an increasingly flattened furrow, the lectotype agrees with the description. The sharp ventral ridge possibly was the reason for the species' ethymology.

Centroventrally, the lectotype exhibits a part of the posteroventral flange-like marginal row of long spines which is typical for members of the family Tetradellidae (Jaanusson 1957, pl. 12, fig. 13; Schallreuter 1983, pl. 4, figs 2–3; 1984, pl. 4, figs 1–2).

The systematic position of the species is unclear. Concerning its hook-like sulcus it is similar to *Lomatobolbina* (= *Seviculina*, Schallreuter & Hinz-Schallreuter 2010c, p. 115). The latter also has a marginal sculpture developed as a row of spines but differs in the special posteroventral development of the L3 and in its biantral antrum.

In its high position of the adventral ridge and the admarginal antrum *Collibolbina* ? *plicata* resembles *Collibolbina*, which has, however, a ridge rather than a marginal row of spines and additionally differs also in the general shape of its broader sulcus (Schallreuter 1983, pl. 1).

Presently, the authors regard the species as *nomen dubium*.

Vittella Schallreuter, 1964

Type species. *Vittella vittensis* Schallreuter, 1964; by original designation.

Vittella sigma (Krause, 1889)

Synonym. *Ctenentoma canaliculata* Hessland, 1949.

1889 *Entomis sigma* Krause: 12–13, 23–24; pl. 1, figs 11–12.
1953a *Sigmobolbina sigma*. – Henningsmoen: 208.
1957 *Sigmobolbina sigma*. – Jaanusson: 390.
1993 *Sigmobolbina* ? *sigma*. – Schallreuter: 13.
1994a *Vittella canaliculata*. – Schallreuter: 506, 526 (syn.), tab. 1, pl. 6, fig. 2.
2001 *Entomis sigma*. – Tinn & Meidla: 132, 135, tab. 1, figs 2–3 (faunal logs), 4s-t.
2004 *Entomis sigma*. – Tinn & Meidla: 208, 210, 221, tabs 2–3, figs 2–3, pl. 1, figs 16–17.

Neotype. ♀ left valve, GG 400-G123–10, Schallreuter 1994, pl. 6, fig. 2.

Locality and horizon of neotype. As for the neotype of *Entomis simplex*.

Remarks. Tinn & Meidla (2001, 2004) figured two specimens from the Holen Limestone of Hällekis as *Entomis sigma* among them also a ♀ valve. The ♀ valve (Tinn & Meidla 2001, fig. 4t; 2004, pl. 1, fig. 17) resembles very much the neotype which had originally been determined as *Vittella canaliculata* (Hessland, 1949) by Schallreuter (1994a).

The holotype of *V. canaliculata* (Hessland 1949, pl. 7, fig. 7) also seems to be a ♀ valve but is distinctly preplete. By contrast, both the neotype and the ♀ valve of Tinn & Meidla are amplete, like the specimens of *E. sigma* figured by (Krause 1889, pl. 1, figs 11–12). If the difference in the outline is not caused by distortion the holotype of *V. canaliculata* might rather represent an own subspecies than being consubspecific with the neotype of *E. sigma*.

The figured tecnomorphic RV, MB. HS 2011–22 (Fig. 5H) is not identical with the RV figured by Krause (1889, pl. 1, fig. 12), and therefore, is questionable to belong to the type-series. Judging from his drawing Krause's figured RV is amplete, has a high shape (L : H 1.57) and a narrow laterovelar furrow close to the free margin. The specimen figured here is preplete, rather high (L : H 1.67), has a velum highly positioned at the marginal surface anteroventrally and lacks a laterovelar furrow.

Vittella ornata (Krause, 1891)

Figure 4E

1891b *Entomis sigma* Krause var. *ornata* Krause: 509, 518–519, pl. 32, fig. 19.
1892 *Entomis sigma* var. *ornata*. – Krause: 391.
1934 *Ctenobolbina sigma ornata*. – Bassler & Kellett: 55, 254, 306.
1993 *Oepikium* ? *ornata.* – Schallreuter: 14.

Lectotype. Not designated here, because it is uncertain whether or not the left ♀ valve, MB. HS 2011–25 (Fig. 4E), belongs to the type-series. Sometime the original may be re-discoverd or a better typical specimen will be found, more suitable for the designation of a neotype.

Type locality and horizon. Müggelheim, Berlin; Krause's glacial erratic boulder no. 687.

Dimension. ?Syntype: L 1.15 mm.

Definition. Length at least up to 1.15 mm. Domicilium broadly rounded posteriorly. S2 long and slightly sigmoidal, centrally of medium width, ventrally narrow. Small PAN. Dolon short. Weak laterodolonate furrow. Few scattered tubercles particularly near dorsal margin.

Remarks. The respective specimen figured by Krause, a tecnomorphic right valve (L 1.07 mm according to figure and magnification) seems to be lost. The only specimen in the collection under this name is a left ♀ valve (L 1.15 mm). The tubercles along the dorsal margin are not very distinct and not so regularly arranged as in Krausés specimen. He (Krause 1891b, p. 509) compared this specimen with the second figured specimen of *Laccochilina schmidtii*, in which the tubercles are also not so regularly arranged (Fig. 3C). Therefore, Krause's drawing of the figured *V. ornata* may be somewhat idealistic.

There are only few species in the Baltoscandian Ordovician displaying a row of spines or tubercles at the dorsal margin such as *Ctenonotella elongata* Öpik, 1937 with long spines at the dorsal margin, or *P. margaritata* Öpik, 1937 with prominent granules along the centrodorsal margin (Öpik 1937, pl. 4, fig. 5; Sarv 1959, pl. 11, figs 15–16, pl. 3, figs 1, 3). These species differ from each other distinctly in both lobation and ornamentation.

Comparison. Most similar to the figured specimen is the certainly congeneric Baltoscandian species *V. papillosa* (Schallreuter, 1994) from the Black Orthoceras Limestone, which is slightly smaller (holotype 0.93 mm), but with dorsally broader and ventrally narrower sulcus. It has a slightly longer dolon (especially anteriorly), an evenly papillose surface ornamentation and no dorsal row of tubercles (Schallreuter 1994a, pl. 15, figs 1–2).

Vittella sigma differs by the broader sulcus, the anteriorly longer dolon and the velar ridge forming behind the dolon a distinct laterovelar furrow (Schallreuter 1994a, pl. 6, fig. 2l).

In *V. craspedota* Jaanusson, 1957 the sulcus is more strongly sigmoidal, the dolon longer, and the posteroventral lobe carries a short spine (Jaanusson 1957, pl. 12, figs 9–12).

Presently, the authors regard the respective species as *nomen dubium*.

Epilogue

In the last quarter of the 19th century Krause established 56 new species from glacial erratic boulders of Berlin and the Mark (Brandenburg). Subsequently, most species have been recorded from outcrops and borings in Baltoscandia. However, there are still some species, which are unknown, yet in Baltoscandia, among them, e.g. so large-sized species like *Snaidar radians* (Krause, 1892). They may have not been found until now, but may also originate from outcrops at the bottom of the Baltic Sea or completely eroded deposits of Baltoscandia.

Most of Krausés figured specimens survived war and post-war times, but few material became lost after the war (*Primitia distans*, *Entomis simplex*, *E. sigma*). For these species neotypes were designated. In some other cases, specimens in the collection marked as the original of a figured specimen were apparently changed (? *E. plicata, E. sigma ornata*).

From a total of 61 of Krause's species (including the species described in 1897) one has an older synonym (*B. erratica granulosa*), three taxa are synonyms of other species also erected by Krause (*Beyrichia mamillosa*, *Entomis trilobata*, *Primitia binodis* Krause, 1897). Many species have younger synonyms.

Table 2. The species of Krause revised in this paper and their synonyms. G: number of Krause's geschiebe with the type specimen. Type species in bold. References: [1] Jaanusson 1962, [2] Henningsmoen 1954, [3] Neckaja 1953, [4] Schallreuter & Hinz-Schallreuter 2011b.

Krause's species	year	G	actual combination	synonyms (*valid as subspecies)	reference
Primitia distans	1889	301	***Platybolbina d.***	*Primitia elongata semicircularis* Steusloff, 1895	[4] p. 129, table 1b
				Pl. orbiculata Sarv, 1959	here
Pr. elongata	1892	667	*Platybolbina e.*	*Pl. ? granifera* Sarv, 1962	here
Pr. excavata (homonym)	1892	663	*Laccochilina e.*	*L. paucigranosa* Jaanusson, 1957	here
Pr. schmidtii	1889	139	*Laccochilina (Prochilina) s.*	*Laccochilina (Prochilina) ostrogothica* Jaanusson, 1957	here
Pr. cincta	1889	288	*Vendona c.*	*Laccochilina dorsoplicata* Hessland, 1949	here
				**V. quatuba* Schallreuter, 1999	
Pr. plicata	1892	670	*Bolbina p.*	—	
Pr. papillata	1892	615	*Brevibolbina*	*B. pontificans* Schallreuter, 1981	here
				**B. fissurata* Schallreuter, 1981	
Pr. obliqua	1892	670	*Ceratobolbina o.*	*Sigmobolbina monoceratina allikuensis* Sarv, 1959	here
Strepula limbata	1891	478	*Piretella l.*	—	
S. simplex	1891	432	*Steusloffia s.*	—	
Beyrichia marchica lata (homonym)	1891	427	*Tallinnella lata*	*Tallinnella sebyensis* Jaanusson,1957	here
B. harpa	1892	587	*Tetrada h.*	—	
B. erratica granulosa (homonym)	1891	123	*Piretopsis (Protallinnella) g.*	*Beyrichia grewingkii* Bock, 1867	Öpik 1935
B. erratica	1889	140	*Rigidella e.*	*R. vadosa* Schallreuter, 1993	here
B. erratica acuta	1891	479	*Asteusloffia a.*	*Steusloffia polynodulifera* Hessland, 1949	[1] p. 413
Entomis trilobata	1892	663	*Steusloffia t.*	*Strepula linnarssoni* Krause, 1889	here
E. sigma	1889	321	*Vittella s.*	*Ctenentoma canaliculata* Hessland, 1949	here
E. simplex	1892	650	*Collibolbina s.*	*Ctenentoma plana* Hessland, 1949	[3] p. 346
E. plicata	1892	616	*Collibolbina ? p.*	—	
E. sigma ornata	1891	687	*Vittella o.*	—	

Table 3. Species of Krause (1889–1892) not revised in this paper and their synonyms. G: number of Krause's geschiebe with the type specimen. Type species in bold. References: [1] Schallreuter 1993, [2] Schallreuter 1975, [3] Schallreuter 1976, [4] Schallreuter 1991, [5] Meidla 1996.

Krause's species	year	G	actual combination	synonyms	References
Beyrichia marchica	1889		*Tallinnella m.*		[1]
B. palmata	1889		*Brezelina p.*		[1]
B. radians	1892	587	***Snaidar r.***		[3]
Entomis flabellifera	1892	670	*Oepikium f.*	*Biflabellum reticulatum* Öpik, 1937, *B. crista* Öpik, 1937	[2]
E. quadrispina	1892	670	***Quadritia q.***		[3]
Kloedenia ? globosa	1889		*Bolbina? g.*	*Bolbina? excessa* Sarv, 1959	[4]
Primitia jonesii (homonym)	1889		*Uhakiella jonesiana*	*Mirochilina jonesiana* Schmidt, 1941 (nom. n.) *Uhakiella magnifica* Sarv, 1959	[5]
P. corrugata	1892		***Ectoprimitia c.***	*Parabolbina costata* Meidla, 1983	[1] [5]
P. umbonata	1892		***Cystomatochilina u.***		[1]
Strepula linnarssoni	1889		***Steusloffia l.***		[1]

Four of Krause's species names are younger homonyms. *Primitia jonesii* was renamed by Schmidt (1941). The renaming of *B. erratica granulosa* is not necessary at present because it has an older synonym. Also, the renaming of *Primitia excavata* is unnecessary since a younger synonym exists. *Beyrichia marchica lata* is considered here as a *nomen protectum*.

Some of Krause's species have not been revised in the frame of the present paper, but are listed in Table 3 and in table 1 of Part I (Schallreuter & Hinz-Schallreuter 2011a), because they were previously described in detail by other authors including the first author.

Some of the revised species (for example, *Collibolbina* ? *plicata*), which have not been discovered from outcrops are only insufficiently known and more material is required to clear up their precise systematic position. In many cases, the type is the only available specimen at present. It is mostly not an adult, which results

Table 4. List of the originals of the *Museum für Naturkunde* Berlin (MB.) figured/mentioned in Part I (Schallreuter & Hinz-Schallreuter 2011a) and Part II (this study)

MB. HS	species	type	Krause:pl.fig.	Part-fig.
2010–1	*Tvaerenella plana*	holotype?	1889:1.1	I – 2A
2010–2	*Signakiella signata*	lectotype	1892:21.4	I – 1D
2010–3	*Kiesowia dissecta*	holotype	1892:21.3	I – 2B
2010–4	*Kiesowia mamillosa* (= *K. dissecta*)	holotype	1892:22.14	I – 2D
2010–5	*Vauscripta v-scripta*	lectotype	1889:1.18	I – 1G
2010–6	*Bromidella* cf. *kohtlensis*		1889:1.17	I – p. 65
2010–7	*Euprimites intermedius*	lectotype	1889:1.16	I – 2F
2010–8	*Tvaerenella tuberculata*	lectotype	1892:21.8	I – 2E
2010–9	*Oepikella canaliculata*	lectotype	1892:21.1	I – 1A
2010–10	*Oepikium antiquatum*	holotype	1889:1.13	I – 1B
2010–11	*Asteusloffia lineata*	lectotype	1889:2.3	I – 3B
2010–12	*Uhakiella granulosa*	lectotype	1889:2.2	I – 1F
2010–14	*Bilobatia bidens*	lectotype	1892:22.12	I – 3F
2010–15	*Duplexibollia duplex*	holotype	1892:21.7	I – 1C
2010–16	*Balticella globifera*	holotype	(1892:22.9)	I – 2H
2011–1	*Platybolbina elongata*	holotype	1891:30.4a–b	II – 3A
2011–2	*Laccochilina (L.) excavata*	lectotype	1892:21.13	II – 3B
2011–3	*Laccochilina (Prochilina) schmidtii*	lectotype	1889:1.14	II – 3C
2011–4	*Laccochilina (Prochilina) schmidtii*		1889:1.15	II – 3D
2011–5	*Piretella limbata*	holotype	1891b:31.13	II – 3E
2011–6	*Vendona cincta*	lectotype	1889:1.4	II – 3G
2011–7	*Vendona cincta*		1889:1.5	
2011–8	*Bolbina plicata*	lectotype	1892:22.1	II – 3F
2011–9	*Brevibolbina papillata*	holotype	1892:22.7	II – 4A
2011–10	*Tallinnella lata*	lectotype	1891b:31.15	II – 4B
2011–11	*Tallinnella* sp.		1891b:31.14	II – 4C
2011–12	*Tetrada (T.) harpa*	lectotype	1892:22.15	II – 4F
2011–13	*Piretopsis (Protallinnella) granulosa*	lectotype	1889:2.6	II – 5A
2011–14	*Rigidella erratica*	lectotype	1889:2.7	II – 4G
2011–15	*Rigidella krauseana*	holotype	1889:2.8	II – 4H
2011–16	*Steusloffia simplex*	lectotype	1891b:31.12	II – 5B
2011–17	*Steusloffia simplex*			II – 5C
2011–18	*Asteusloffia acuta*	lectotype	1891b:31.18	II – 5E
2011–19	*Asteusloffia acuta*			II – 5F
2011–20	*Asteusloffia acuta*			II – 5G
2011–21	*Steusloffia trilobata*	lectotype	1892:22.11	II – 5D
2011–22	*Vittella sigma*		(1889:1.12 lost)	II – 5H
2011–23	*Ceratobolbina obliqua*	holotype?	1892:22.10	II – 3H
2011–24	*Collibolbina* ? *plicata*	lectotype	1892:22.8	II – 4D
2011–25	*Vittella ornata*	?syntype	(1891:32.19 lost)	II – 4E

in unknown dimorphism and therefore, systematic position.

Some synonymous nominal species are considered to be valid on the subspecies level, particularly in those cases, where certain features are constant within a population. These taxa may have microstratigraphic or palaeobiogeographic significance – especially for glacial erratic boulder research (Geschiebeforschung). In this respect, lumping would be less helpful, as was already stated by Richter & Richter (1954, p. 46): "*Bei solcher Sorgfalt ist ein zu strenges Unterscheiden immer der harmlosere Fehler; denn er kann die Erkenntnis nur verzögern. Voreiliges Zusammenwerfen der Arten verfälscht die Erkenntnis und verwickelt die Stratigraphie in hartnäckige und schwer zu berichtigende Fehler*" (A careful splitting is always less harmful, because it may only somewhat retard cognition. By contrast, lumping falsifies cognition and results in stratigraphical errors, which are difficult to correct.)

The five species described by Krause (1897) from a glacial erratic boulder of the Netherlands whose types are in Leiden have not been revised herein. One of these species (*Primitia binodis*) is figured in Part I (Schallreuter & Hinz-Schallreuter 2011a) as a younger synonym of a species Krause.

Certainly, some of Krause's originals are not of best preservation and the information about where the boulders came from are mostly rather limited, corresponding to the state of science at that time. Krause deposited his material apparantly in a Museum in Berlin and the fate of the material did not lay in his responsibility. Retaining the names to Krause's specimens only would certainly faciliate taxonomic work but would contradict the *Principle of Priority*. Synonymization of some of his species in this paper is based on the present state of knowledge. If this were correct or incorrect must be proven in future based on more and better material, but certainly not on opinions only.

Corrections in Part I (Schallreuter & Hinz-Schallreuter 2011a)

p. 57, tab. 2, 3rd line from below:
Duplexibollia instead of ***Duplexi bollia***
p. 60, 19th line from below: **1891** instead of **1889**
p. 68, Figure 3 1st line: holotype instead of lectotype
p. 73, 22nd line from below: **2H** instead of **2.8**

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