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Calcareous foraminifera from the Ordovician of Baltoscandia

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ABSTRACT—Ordovician erratic boulders from northern Germany have yielded uniserial calcareous foraminifers which were previously unknown from the Baltoscandian Ordovician. They represent at least two new species which are provisionally placed in the genus *Saccamminopsis* Sollas, 1921.

INTRODUCTION

Ordovician calcareous foraminifers are seldom recorded. According to Eisenack (1954) there are no indications of their presence in the Baltic Ordovician. Bykova (1956) described three species, referred by her to the Lagenidae, from the Middle Ordovician of Latvia: *Cochleatina plavinensis* Bykova, 1956, *Lagena cylindrica* Smith and *L. aranea* Bykova, 1956. *C. plavinensis* is a bryozoan not a foraminifer, and probably belongs to *Corynotrypa* Bassler (Loeblich & Tappan, 1964, p. C786). I have previously (1977) described the queried calcareous foraminifer *Glomovertella* ? *iecta* from a Baltic Middle Ordovician erratic boulder of northern Germany. This form is a member of the questionable order of foraminifera Reitlingerellida Vologdin, 1958. The specimens of *G.* ? *iecta* were preserved complete; previously, reitlingerellids were known only from thin sections. Another calcareous foraminifer is possibly that represented by the problematical microfossil, *Microancientia anularis* Schallreuter, 1980. Apart from these questionable forms, true calcareous foraminifers also occur rarely in the author's material of Ordovician erratic boulders from northern Germany; not only unichambered (by preservation) but also multichambered uniserial species which were hitherto unknown from the Ordovician (Eisenack, 1971, p. 355). The *Nodosaria*? (Ehrenberg, 1858a, b) from the Lower Ordovician is probably an inorganic, globular concretionary mass of glauconite as are *Dexiospira* and *Spirocerium* (Loeblich & Tappan, 1964, p. C786).

ORDOVICIAN CALCAREOUS FORAMINIFERA

The oldest known Ordovician calcareous foraminifer is, according to Loeblich & Tappan (1964, p. C135), *Saccamminopsis* Sollas, 1921 (family Moravamminidae, Parathuramminacea). The type-species, *Saccammina carteri* Brady, 1871, is from the Carboniferous and according to Cummings (1952, p. 223) is synonymous with another Carboniferous species, *Nodosaria fusulinaformis* M'Coy, 1849. Ordovician forms from the Girvan area of Scotland recorded by various authors are listed by Cummings (1952, p. 225) as *Saccamminopsis* cf. *fusulinaformis*. This is the oldest occurrence of foraminifera in Britain (Murray, 1981, p. 13). The Silurian specimens from the basal Wenlock Woolhope Limestone of Wych, Malvern in the Welsh Borderlands (Brady, 1888), are considered by Cummings (1952, p. 225) to be identical "with either Ordovician or Carboniferous examples of *Saccamminopsis*". The taxonomic position of the Ordovician specimens described by Bykova cannot be ascertained on the basis of the published figures.

The material described herein comes from cherty limestones and cherts found as erratic boulders in northern Germany and was etched out by Wetzel's method (Schallreuter, 1982). In the rocks with *Saccamminopsis*? *teschenhagensis*, the calcareous microfossils were preserved in calcareous form so that it was possible to dissolve the siliceous matrix using hydrofluoric acid (HF). The material of *Saccamminopsis*? *syltensis* is secondarily silicified; this is true also of *Microancientia anularis* Schallreuter, 1980 from the boulders of Sylt (those from Gotland are still calcareous as shown by EDAX analysis).

SYSTEMATIC DESCRIPTIONS

Suborder Fusulinina Wedekind, 1937
Superfamily Parathuramminacea Bykova, 1955
Family Moravamminidae Pokorný, 1951
Subfamily Earlandiinae Cummings, 1955
Genus *Saccamminopsis* Sollas, 1921

Saccamminopsis ? *syltensis* sp. nov.
(Pl. 1, figs. 2, 3, 6 (? figs. 1, 4, 5); Table 1)

Derivation of name. From the type locality.

Diagnosis. Length of chamber (including neck) *c.* 1.5 mm (holotype 1.54 mm long, 0.69 mm broad). Chamber more or less pear-shaped, neck of chamber very

long; about as long or longer than rest of chamber, and considerably narrower than greatest width of chamber.

Holotype. A single chamber, Geologisch-Paläontologisches Institut und Museum, University of Hamburg (GPIMH) no. 2565 – Pl. 1, figs. 3a, b.

Material. 6 large (typical) single chambers (nos. 2564, 2565, 2568, 2580, 2581, 2584) and more than 30 small single chambers (nos. 2563, 2566, 2567, 2582, 2885 – 2590 = *S.*? sp. cf. *syltensis*) from 6 erratic boulders from the type locality (boulders Sy1, Sy2, Sy56, Sy83, Sy97, Sy115).

Locality and horizon. Near Braderup, Isle of Sylt (North Sea), Schleswig-Holstein, Germany. Erratic boulder (no. Sy1) from the Upper Kaolinsand (Lower Pleistocene). Origin: presumably the region of the Hall Banks, N. or N.E. of the Isle of Gotland (Baltic Sea). Öjlemyrflint (Braderup type), Porkuni-Stage (F_2) or possibly Pirgu-Stage (F_1c) of Estonia, Uppermost Harjuan (Upper Ordovician) (Schallreuter, 1979).

Dimensions. See Table 1.

Remarks. Most of the specimens clearly show two apertures, as in the type-species (Brady, 1871, p. 183) but no connected chambers have been observed. Specimen no. 2582 (Pl. 2, fig. 4), which comes from the same boulder as no. 2566 (Pl. 1, fig. 4), is possibly an intermediate form between a single chamber and a row of chambers.

The type-species of *Saccamminopsis*, *Saccammina carteri* Brady, 1871, is much larger (average long diameter of the chambers = about 3.2 mm); its chambers are, as a rule, fusiform, sometimes subspherical or pyriform, and the neck is much shorter than in *S.*? *syltensis* (Brady, 1871, pl. XII, fig. 2; Loeblich & Tappan, 1964, p. fig. 232.1) The test of *S. carteri* was originally regarded as agglutinated but restudy by Sollas showed that it was originally calcareous; secondary silicification and infilling had caused the labyrinthic appearance (Loeblich & Tappan, 1964. p. C319).

S. fusulinaformis sensu Cummings, 1952 from the Ordovician is the same size (1.6 mm, range: 1.3 – 1.7 mm) but cannot be compared with *S.*? *syltensis* because of the lack of plates or figures.

S.? *syltensis* was found in three boulders (Table 1). In all samples large forms are accompanied by similar but smaller forms which are here referred to as *S.*? sp. cf. *syltensis* (Pl. 1, figs. 1, 4, 5), and which may represent the A form of *S.*? *syltensis*. The length of the small forms varies from about 0.35 – 0.45 mm. The Middle Ordovician *Lagena cylindrica* sensu Bykova, 1956 is of about the same size (0.48 mm) and similar to slender variants of *S.*? cf. *syltensis* (compare Pl. 1. fig. 5 with Bykova, 1956, pl. II, fig. 1).

Table 1. Dimensions of *Saccaminopsis*? *syltensis* sp. nov.

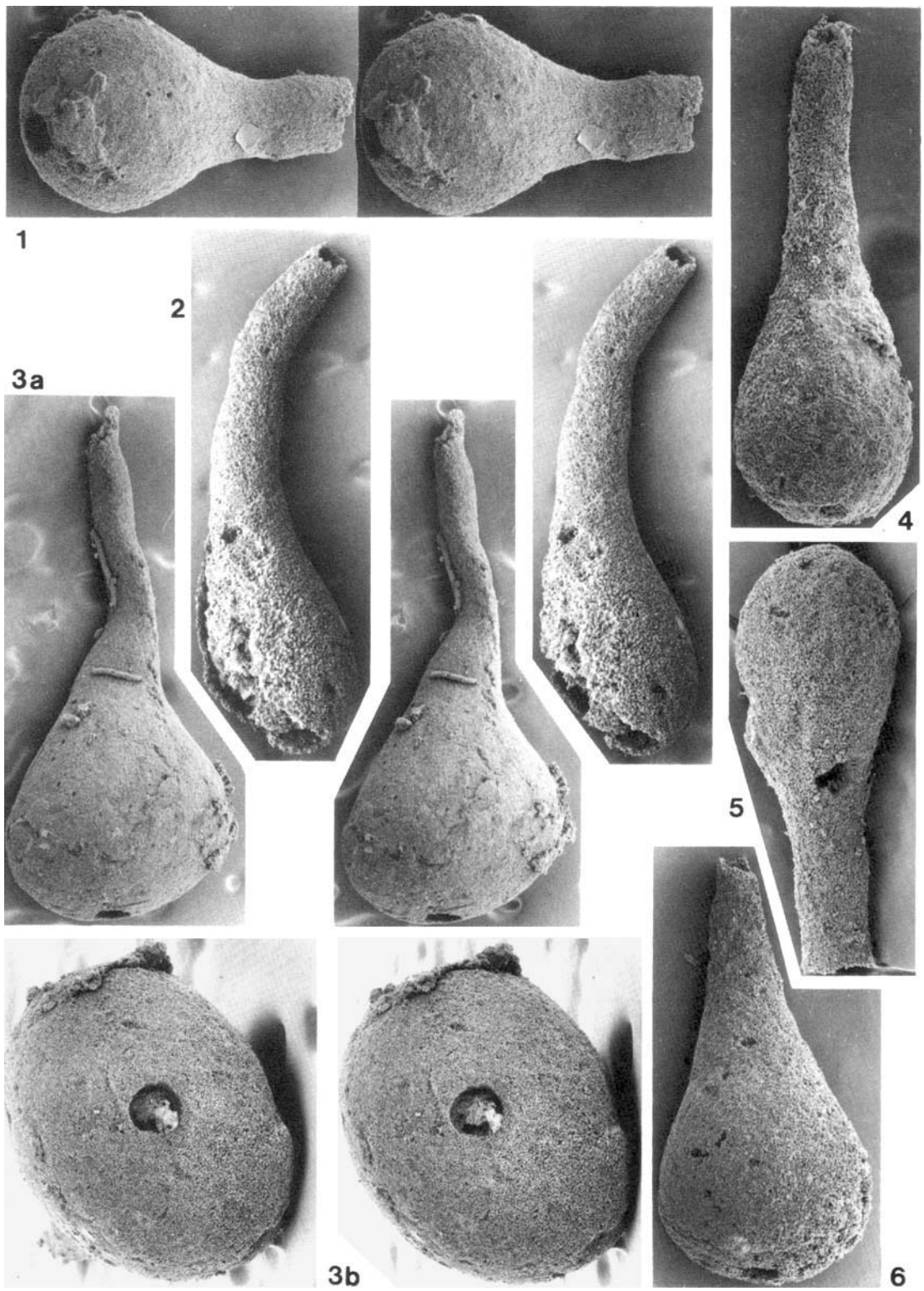
Specimen GPIMH no.	from boulder	L	L_n	W	W_n	L : W	$L_n : (L - L_n)$	W : W_n	Pl. 1, fig.
2565*	Sy1	1.54	0.90	0.69	0.12	2.23	0.59	0.18	3a-b
2580	Sy115	1.51	0.61	0.52	0.14	2.89	0.40	0.22	
2581	Sy56	1.49	0.81	0.52	0.16	2.87	0.54	0.32	
2564	Sy115	1.42	0.73	0.44	0.17	3.22	0.52	0.39	2
2568	Sy115	(>1.05)	(>0.39)	0.50	0.10	?	?	0.20	6

L = length, W = width, n = neck of chamber; dimensions in mm.
*holotype

Explanation of Plate 1

Figs. 1, 4, 5. *Saccamminopsis*? sp. cf. *syltensis* (= A form of *S.*? *syltensis*?): fig. 1, stereo-pair, GPIMH 2563 (× 150); fig. 4, GPIMH 2566 (× 175); fig. 5, GPIMH 2567 (× 175). Öjlemyrflint erratic boulder no. Sy1 (figs. 1, 5) and Sy115 (fig. 4) of the Upper Kaolinsand (Lower Pleistocene) near Braderup, Isle of Sylt (North Sea).

Figs. 2, 3, 6. *Saccamminopsis*? *syltensis* sp. nov.: fig. 2, stereo-pair, GPIMH 2564 (× 55); fig. 3, stereo-pairs, holotype GPIMH 2565 (3a × 55, 3b × 75); fig. 6, GPIMH 2568 (× 65). Boulders Sy1 (fig. 3) and Sy115 (figs. 2, 6).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3a
4
5
3b
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Saccamminopsis ? teschenhagensis sp. nov.
(Pl. 2, figs. 1, 2 (? figs. 3, 5), Table 2)

Derivation of name. From the type locality.

Diagnosis. Length of holotype (4 chambers, first chambers missing) 2.42 mm. Chambers becoming longer in oral direction and wider with nearly constant length: width ratio (mean 1.4). Chambers egg-shaped with blunt end up or elliptical; neck of chambers only short and relatively broad (2/5 – 3/5 of the greatest width of chamber). Holotype with a broad round aperture at the top of the final chamber (width about 1/4 of the width of the chamber).

Holotype. A 4-chambered specimen, GPIMH no. 2570 – Pl. 2, fig. 1.

Material. 10 specimens from boulder 14B2 (nos. GPIMH 2570 – 2579) and 1 specimen from boulder 1B10 (no. 2569). The holotype is the most complete specimen. The other specimens are fragmentary rows comprising 1–4 more or less complete chambers.

Locality and horizon. Teschenhagen near Stralsund, Pomerania, Germany. Erratic boulder (no. 14B2). Origin: presumably from the bottom of the Baltic Sea, N. of the Isle of Gotland and S. of Åland-Is. Backsteinkalk of 14B2-type. Idavere-Stage (C_3) or Johvi-Stage (D_1) of Estonia = Lower Upper Viruan (Middle Ordovician) (Schallreuter, 1970 : 65).

Dimensions. See Table 2.

Remarks. The specimen from boulder 1B10 (Pl. 2, fig. 2) exhibits no broad aperture at the end of the final chamber, only a fine perforation; at the other (broken) end the test is open to full width. In one specimen with two chambers (GPIMH 2573) the upper chamber shows (besides the normal neck) a short second neck-like projection with a broken end indicating bifurcation similar to that in the specimen of *S. carteri* figured by Brady (1871, pl. II, fig. 2, right; right; Loeblich & Tappan, 1964, fig. 232.1, 3rd chain from left).

Some of the smaller specimens from boulder 14B2 are distinguished from the typical specimen by having more slender chambers and broader necks between the chambers (Pl. 2, fig. 3) The length of the chamber varies between 0.21 and 0.35 mm and is not very different between chambers of a row (2 or 3); the length: width ratio varies between 1.53 and 2.56. It is at present hard to say whether they represent more juvenile parts of rows or whether they belong to another species; they are therefore referred to here as *S.*? sp. cf. *teschenhagensis*.

Saccamminopsis carteri is much larger. The chambers of a row are all of about the same size (hence the questionable generic assignment of the new species) and the necks between the chambers are very thin (Brady, 1871, pl. XII, fig. 2; Loeblich & Tappan, 1964, fig. 232.1).

Table 2. Dimensions of *Saccaminopsis*? *teschenhagensis* sp. nov.

GPIMH 2570 (holotype) (Plate 2, fig. 1)					GPIMH 2569 (Plate 2, fig. 2)				
L	W	W_n	L:W	W:W_n	L	W	W_n	L:W	W:W_n
0.72	0.53	0.24	1.36	0.45					
0.65	0.50	0.19	1.30	0.38	0.65	0.46	0.27	1.41	0.59
0.58	0.41	0.15	1.41	0.37	0.58	0.45	0.27	1.29	0.60
0.46	0.29	0.12	1.59	0.41	0.46	0.36	0.23	1.28	0.64

L = length, W = width, n = neck of chamber; dimensions in mm.

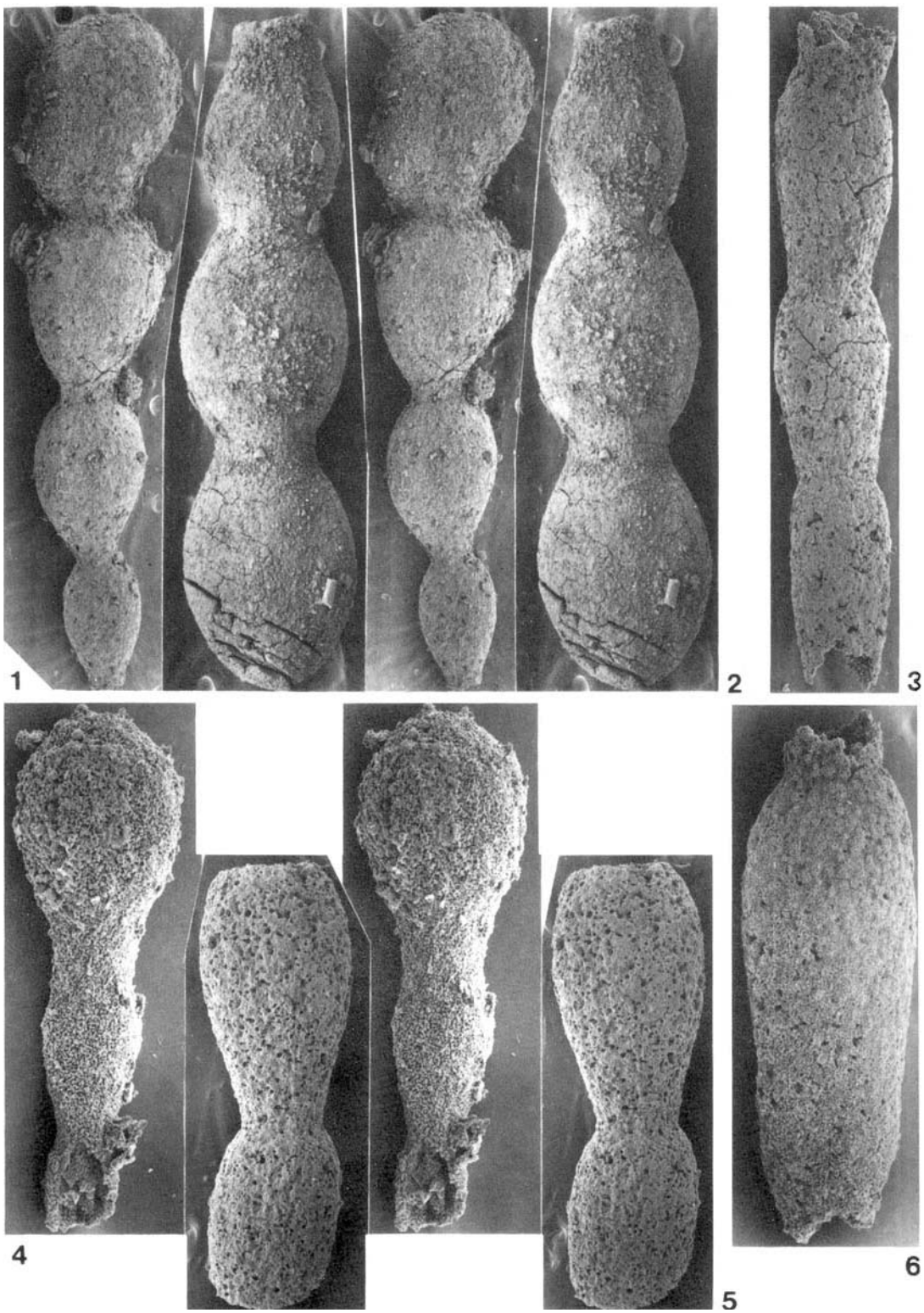
Explanation of Plate 2

Figs. 1, 2. *Saccaminopsis*? *teschenhagensis* sp. nov.: fig. 1, stereo-pair, holotype, GPIMH 2570 (× 45), Backsteinkalk erratic boulder no. 14B2 from Teschenhagen near Stralsund, Pomerania, northern Germany; fig. 2, stereo-pair, specimen GPIMH 2569 (upper end down) (× 60), boulder no. 1B10 from Dornbusch, Isle of Hiddensee (Baltic Sea), Pomerania (age: Lower Upper Viruan, Upper Dalby Formation of Sweden, Middle Ordovician; origin: Sweden (Schallreuter, 1970; 1973; p. 65).

Figs. 3, 5. *Saccaminopsis*? sp. cf. *teschenhagensis* sp. nov.: fig. 3, specimen GPIMH 2571 (× 130), Backsteinkalk erratic boulder no. 14B2; fig. 5, stereo-pair, specimen GPIMH 2572 (× 130), boulder no. 14B2.

Fig. 4. *Saccaminopsis*? sp. cf. *syltensis*? sp. nov.: stereo-pair, specimen GPIMH 2582 (upper end down) (× 240), Öjlemyrflint erratic boulder no. Sy115, Upper Kaolinsand (Lower Pleistocene), near Braderup, Isle of Sylt (North Sea).

Fig. 6. *Saccaminopsis*? sp. nov. A. Specimen GPIMH 2583 (× 150), Öjlemyrflint erratic boulder no. Sy 115.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REFERENCES

Brady, H.B. 1871. On *Saccammina Carteri*, a new Foraminifer from the Carboniferous Limestone of Northumberland. *Ann. Mag. Nat. Hist.*, London, (4) **7** (39), 177–184, pl. 12.

Brady, H.B. 1888. Note on some Silurian Lagenae. *Geol. Mag. N. Ser.*, London, (3) **5** (11), 481–484, pl. 13.

Bykova, E. V. 1956. Foraminifery ordovika i silura Sovetskoj Pribaltiki. *Tr. VNIGRI, n. s.*, Leningrad, **98** (= *Mikrofauna SSSR*, **8**), 6–37, 5 pls., 1 table.

Cummings, R.H. 1952. *Saccamminopsis* from the Silurian. *Proc. Geol. Ass.*, London, **63** (3), 220–226, 1 fig., 1 table.

Ehrenberg. 1858a. Über fortschreitende Erkenntniss massenhafter mikroskopischer Lebensformen in den untersten silurischen Thonschichten bei Petersburg. *Mber. K. Preuß.*) *Akad. Wiss. Berlin*, **1858** (5), 295–311 (volume for 1859).

Ehrenberg.1858b. Erläuterung der auf Tafel I. abgebildeten untersilurischen Grünsand-Polythalamien. *Mber. K. Preuß Akad. Wiss. Berlin*, **1858** (6), 337, pl. I, (volume for 1859).

Eisenack, A. 1954. Foraminiferen aus dem baltischen Silur. *Senckenberg. leth.*, Frankfurt am Main, **35** (1/2), 51–72, 5 pls., 1 fig.

Eisenack, A. 1971. Die Mikrofauna der Ostseekalke (Ordovizium) 3. Graptolithen, Melanoskleriten, Spongien, Radiolarien, Problematika nebst 2 Nachträgen über Foraminiferen und Phytoplankton. *Neues Jb. Miner. Geol. Paläont. Abh.*, Stuttgart, **137** (3), 337–357, 62 figs.

Loeblich, A.R. & Tappan, H. 1964. Protista 2 Sarcodina *Chiefly "Thecamoebians" and Foraminiferida. In* Moore, R.C. (Ed.), *Treatise on Invertebrate Paleontology, Pt. C*, **1**, XXXI + C1 – 510a, figs. 1–399; **2**, II + C511 – C900, figs. 400–653, Univ. Kansas Press.

Martinsson, A. 1981. Conifers, rotifers and foraminifers. *Lethaia*, Oslo, **14** (2), 82.

M'Coy, F. 1849. On some new genera and species of Palaeozoic Corals and Foraminifera. *Ann. Mag. Nat. Hist.*, London, (2), **3** (14), 119–136, 5 figs.

Murray, J.W. 1981. Pre-Carboniferous faunas. *In* Jenkins, D. G. & Murray, J.W. (Eds.), *Stratigraphical Atlas of Fossil Foraminifera*, 13–14. Ellis Horwood Ltd., Chichester for the British Micropalaeontological Society.

Schallreuter, R. 1970 Alter und Heimat der Backsteinkalkgeschiebe. *Hercynia N.F.*, Leipzig, **6**, [1969] (3), 285–305, 3 figs., 3 tables.

Schallreuter, R. 1973. Tvaerenellidae (Ostracoda, Palaeocopina) aus Backsteinkalk-Geschieben (Mittelordoviz) Norddeutschlands. *Palaeontographica* (A), Stuttgart. **144** (1/3), 55–111, pls. 16–25, 19 figs., 19 tables.

Schallreuter, R. 1977. Eine neue fragliche kalkschalige Foraminifere aus einem mittelordovizischen Geschiebe Norddeutschlands. *Paläont. Z.*, Stuttgart, **51** (3/4), 227–233, pls. 21–22.

Schallreuter, R. 1979. Ordovizische Problematika, I. *Melopetasus* gen. n. *Paläont. Z.*, Stuttgart, **53** (1/2), 129–135, 7 figs.

Schallreuter, R. 1980. Ostrakoden aus dem Sularpschiefer (Mittelordoviz) von Schonen (Schweden). *Palaeontographica* (A), Stuttgart, **169** (1/3), 1–27, 9 pls., 4 figs., 5 tables.

Schallreuter, R. 1980. Ordovizische Problematika, II. *Microancienta* gen. *Paläont. Z.*, Stuttgart, **54** (3/4), 313–318, 3 figs., 1 table.

Schallreuter, R. 1982. Extraction of ostracods from siliceous rocks. *In* Bate, R.H., Robinson, E. & Sheppard, L.M. (Eds.), *Fossil and Recent Ostracods*, 169–176, 2 pls. Ellis Horwood Ltd., Chichester for the British Micropalaeontological Society.

Sollas, W.J. 1921. On *Saccammina carteri* BRADY, and the Minute Structure of the Foraminiferal Shell. *Q. Jl. geol. Soc. Lond.*, **77** (3 = 307), 193–212, pl. 7, 7 figs.