

A Stereo-Atlas of Ostracod Shells

edited by J. Athersuch, D. J. Horne, D. J. Siveter,
and J. E. Whittaker



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Instructions to Authors

Contributions illustrated by scanning electron micrographs of Ostracoda in stereo-pairs are invited. Format should follow the style set by the papers in this issue. Descriptive matter apart from illustrations should be cut to a minimum; preferably each plate should be accompanied by one page of text only. Blanks to aid in mounting figures for plates may be obtained from any one of the Editors or Editorial Board. Completed papers should be sent to Dr David J. Siveter.

The front cover shows a female left valve (**OS 13377**) of *Bromidella reticulata* Harris from the Simpson Group, middle Ordovician, Oklahoma, U.S.A. (see M. Williams & D. J. Siveter, *Stereo-Atlas Ostracod Shells*, **16**, 1–8, 1989).

ON *BROMIDELLA RETICULATA* HARRIS

by Mark Williams & David J. Siveter
(University of Leicester, England)

Genus *BROMIDELLA* Harris, 1931

Type-species (by original designation): *Bromidella reticulata* Harris, 1931.

Diagnosis: Adductorial sulcus deep. Preadductorial node well developed. Distinct dorsal ridge (plica), in lateral view extending along most of the dorsal surface to become confluent with anterior lobal area, and to form posterodorsal margin of the posterior lobal area. Dolon very convex, extends from anterior to ventral, or posteroventral region. Velum present as a narrow, subdued flange surmounted by a row of spines which may be reduced.

Remarks: Species of the genus *Eohollina* (assigned to the Family Sarvinidae; R. E. L. Schallreuter, *Geologie*, **15**, 7, 861, 1966) have previously been assigned to *Bromidella* (see Kay 1940, *op. cit.*). *Eohollinids* show considerable differences in the nature of lobation, ornament, and lack the dorsal plica. *Bromidella linnarsoni* Henningsmoen, 1948 (*Bull. geol. Instn Univ. Uppsala*, **32**, 416, pl. 25, fig. 11) lacks the dorsal plica, and has an anteriorly restricted dolon. It therefore should not be assigned to the genus. Figured specimens of *Bromidella? parsinoda* Kraft, 1962 (*op. cit.*, pl. 15, figs. 20, 21) appear to be the tecnomorphic valves of a *Bromidella* species.

The genus *Bromidella* most closely resembles *Uhakiella* Opik, 1937. In *Bromidella*, however, the plica is continuous along the whole of the dorsal margin, unlike *Uhakiella*. In addition the preadductorial node and adductorial sulcus of *Bromidella* are more pronounced.

Explanation of Plate 16, 2

Figs. 1–3, ♂ RV (OS 13379, 1.22 mm long excluding spines): fig. 1, ext. lat.; fig. 2, ext. lat. obl.; fig. 3, ext. vent. Fig. 4, ♂ RV, ext. lat. (MCZ 4630a, 1.32 mm long excluding spines).
Scale A (200 μm; ×48), figs. 1–3; scale B (200 μm; ×45), fig. 4.

Remarks (cont.): *Bromidella* is widespread, occurring in the middle Ordovician of North America and Baltoscandia.

Bromidella reticulata Harris, 1931

- 1931 *Bromidella reticulata* n. sp., R. W. Harris, *Okla. Geol. Surv. Bull.*, **55**, 93, pl. 14, figs. 6a, b.
1934 *Bromidella reticulata* Harris; R. S. Bassler & B. Kellett, *Geol. Soc. Am., Spec. Pap.*, no. 1, 223.
1936 *Bromidella reticulata* Harris; F. M. Swartz, *J. Paleont.*, **10**, no. 7, 548, pl. 78, figs. 12a, b.
1940 *Bromidella reticulata* Harris; G. M. Kay, *J. Paleont.*, **14**, no. 3, 263.
1950 *Bromidella reticulata* Harris; S. A. Levinson, *J. Paleont.*, **24**, 66, text-fig. 2.
1957 *Bromidella reticulata* Harris; V. Jaanusson, *Bull. Geol. Inst. Univ. Upps.*, **37**, 288, pl. 4, fig. 23.
1957 *Bromidella reticulata* Harris; R. W. Harris, *Okla. Geol. Surv. Bull.*, **75**, 236, pl. 8, fig. 3.
1962 *Bromidella reticulata* Harris; J. C. Kraft, *Geol. Soc. Am. Mem.*, **86**, 42.
1973 *Bromidella reticulata* Harris; R. E. L. Schallreuter *Palaeontographica*, (A), **144**, (1/3), 86.
1982 *Bromidella reticulata* Harris; M. J. Copeland, *Bull. Geol. Surv. Canada*, **347**, 10, pl. 2, figs. 20, 21.

Holotype: Museum of Comparative Zoology, Harvard University, U.S.A., no. 4630; female right valve.

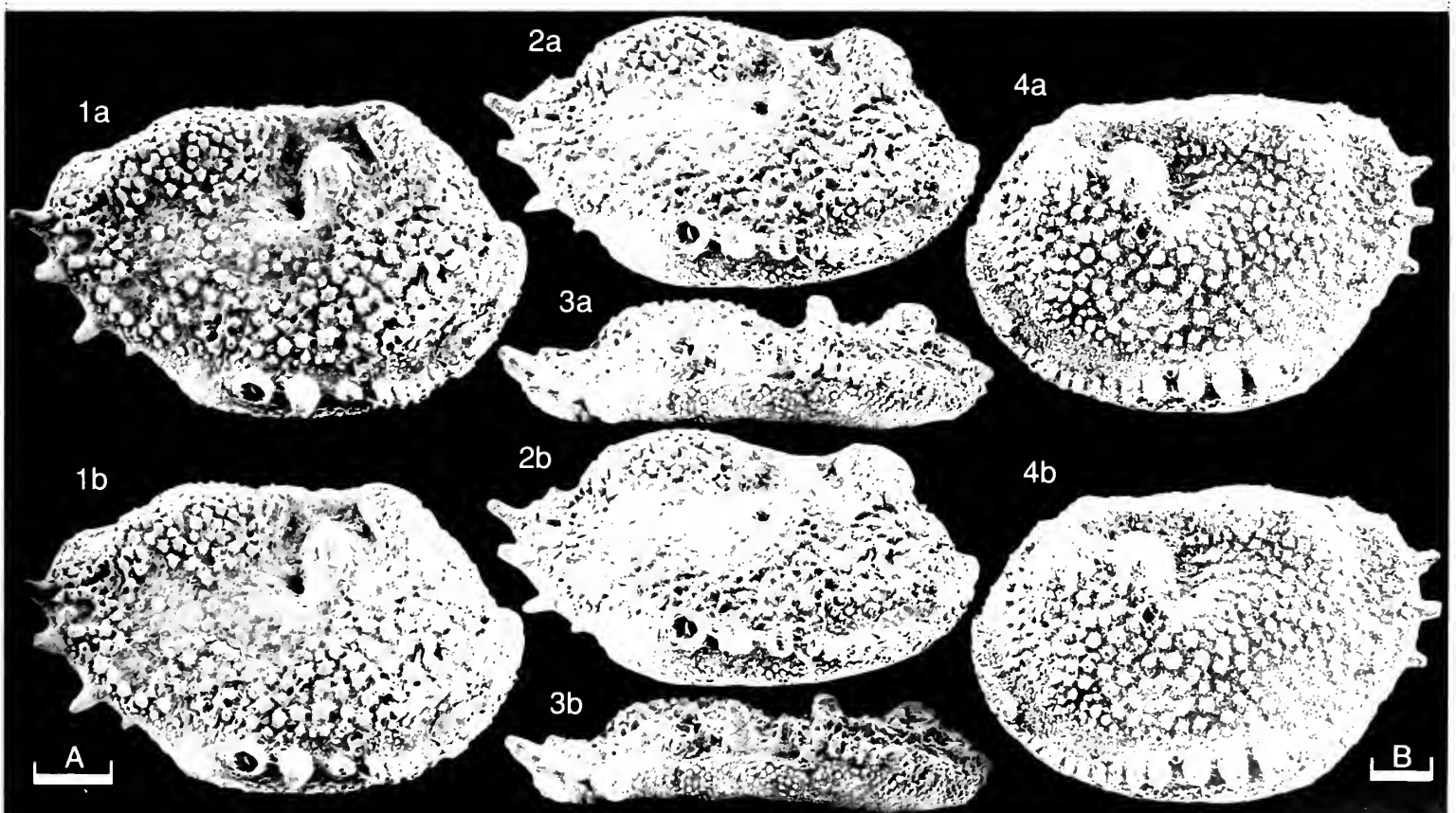
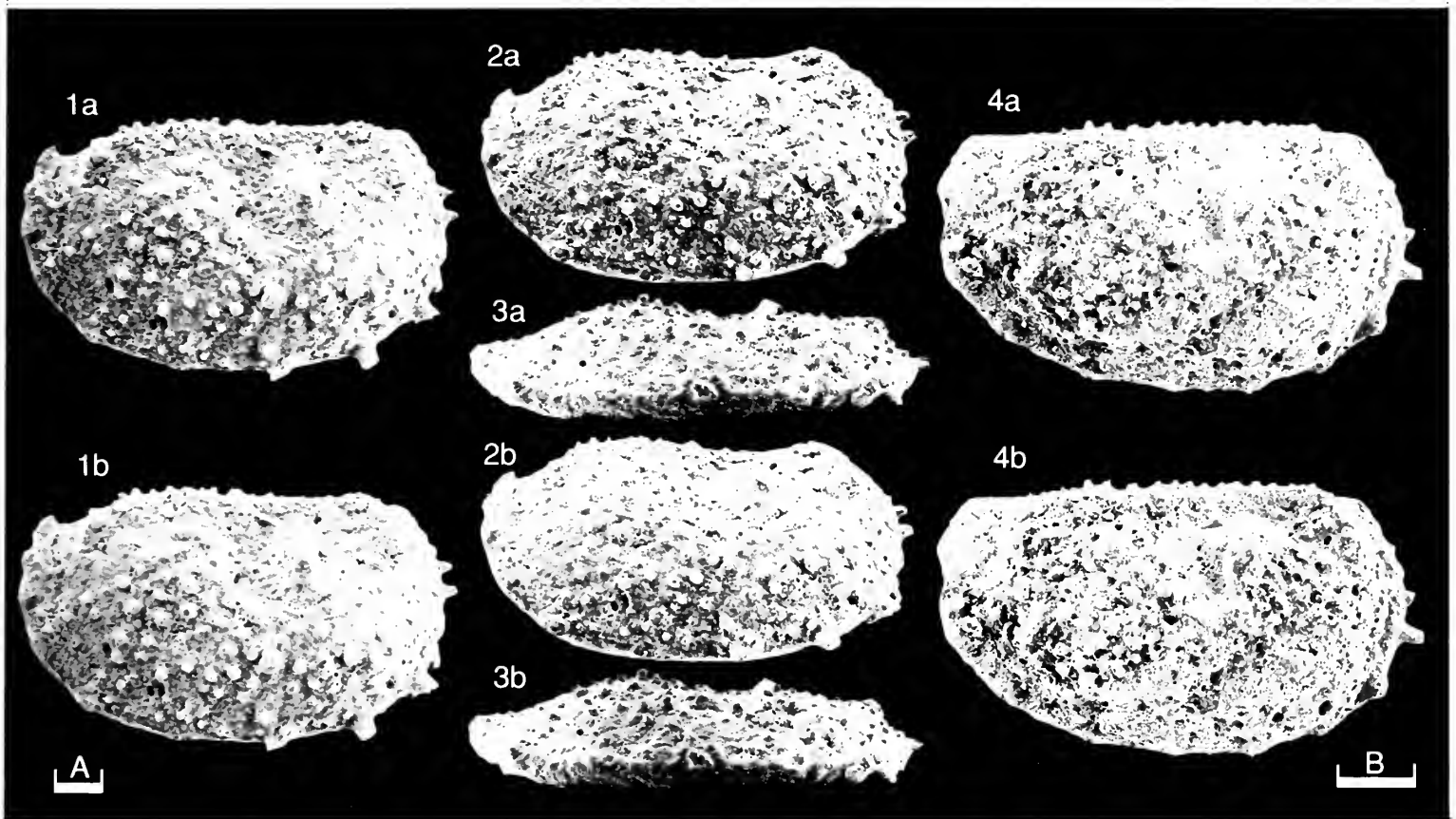
Type locality: From Decker's zone 36 (see Harris 1957 *op. cit.*), Bromide Formation (not the Tulip Creek Formation as stated in Harris *op. cit.*, see revised stratigraphy of R. Fay and A. Grafham, *Univ. Kansas Paleontol. contrib. Monograph*, **1**, 14, 1982), Simpson Group, middle Ordovician, U.S. Highway 99, Sec. 11, T. 1s, R3E, Arbuckle Mountains, Oklahoma, U.S.A.; approximately latitude 34° 35' N, longitude 96° 41' W.

Figured specimens: Harvard Museum of Comparative Zoology, U.S.A. nos. MCZ 4630; (♀ RV: Pl. 16, 4, figs. 1–3, Pl. 16, 6, figs. 1, 5), MCZ 4630a; (♂ RV: Pl. 16, 2, fig. 4). British Museum (Nat. Hist.), nos. OS 13377; (♀ LV: Pl. 16, 4, fig. 4, Pl. 16, 6, figs. 2, 4, Pl. 16, 8, figs. 1, 2), OS 13378 (♀ RV: Pl. 16, 6, fig. 3), OS 13379 (♂ RV: Pl. 16, 2, figs. 1–3, Pl. 16, 8, fig. 4), OS 13380 (♂ RV: Pl. 16, 8, fig. 3).

All figured specimens from the Bromide Formation. MCZ4630 (holotype) from type horizon and locality, MCZ4630a from Decker's zone 35 (see Harris *op. cit.*) at the type locality. Specimens

Explanation of Plate 16, 4

Figs. 1–3, ♀ RV (holotype MCZ 4630, 1.30 mm long excluding spines): fig. 1, ext. lat.; fig. 2, ext. lat. obl.; fig. 3, ext. vent. Fig. 4, ♀ LV, ext. lat. (OS 13377, 1.5 mm long excluding spines).
Scale A (200 μm; ×48), figs. 1–3; scale B (250 μm; ×40), fig. 4.



Figured specimens | OS 13377–79 collected approximately 55 m below the top of the Bromide Formation at the type locality. Specimen OS 13380 collected approximately 70 m below the top of the Bromide Formation, Rock Crossing, Criner Hills, Oklahoma, Sec. 35, T. 5s, R1E.

Diagnosis: Species of *Bromidella* in which the heteromorph has three distinct posterior spines, and a distinct row of spines ventrally on the dolon, becoming larger posteriorly. Dolon tapers slightly anterocentrally when viewed internally. Tecnomorphs with distinct, discrete spines occurring on the weak, ridge-like velum from the anterior to posterior cardinal corners; spines occasionally very long. Lobate area tuberculate throughout, sulci and dolonal surface are granulose.

Remarks: *B. reticulata* differs from *B. sarvi* (R. E. L. Schallreuter, *Stereo-Atlas Ostracod Shells*, 10, 25, 1983) principally by the reduced laterovelar furrow, by the more pronounced dorsal plica, by the disposition of the spines, and by the extension of the dolon posteroventrally. *B. spiveyi* Harris, 1957, from the McIish Formation of the Simpson Group, Oklahoma, is both smaller, less spinose, and more weakly ornamented than *B. reticulata*. In addition to the deep adductor sulcus, a shorter preadductor sulcus is present. This appears to be a feature of *Bromidella*, also observed in *B. sarvi* (Schallreuter 1983, *op. cit.*). A short, punctate, supravelar (hstial?) ridge is present anterocentrally in heteromorphs of *B. reticulata* (Pl. 16, 6, fig. 5) but is absent in tecnomorphs.

Levinson (1950, *op. cit.*) suggested that the hingement of the left valve of *B. reticulata* (right valve of Levinson = left valve herein) consisted of elongate cardinal sockets tapering to the centre of the valve with a ridge between them. The same features have been noted in the material we have examined. The hinge detail of the right valve was unknown to Levinson, but our material shows no ridges which might correspond to the sockets of the left valve. This may be a factor of preservation.

Distribution: *B. reticulata* is known only from the Tulip Creek and Bromide formations of the Simpson Group, middle Ordovician, Arbuckle Mountains, Oklahoma, U.S.A.

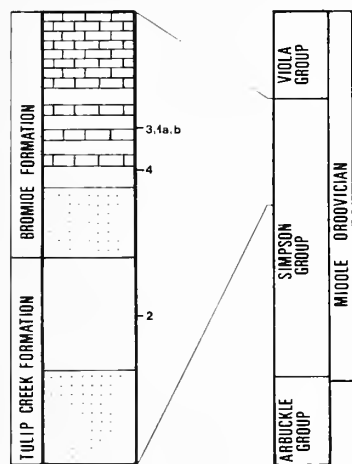
Explanation of Plate 16, 6

Figs. 1, 5 ♀ RV (holotype, MCZ 4630, 1.30 mm long excluding spines): fig. 1, ext. vent. detail; fig. 5, ext. post. Figs. 2, 4 ♀ LV (OS 13377, 1.5 mm long excluding spines): fig. 2, ext. lat. detail of ventral spines; fig. 4, int. lat. Fig. 3, ♀ RV, int. lat. (OS 13378, 1.4 mm long).

Scale A (100 µm; × 75), fig. 2; scale B (100 µm; × 110), fig. 1; scale C (200 µm; × 41), fig. 3; scale D (250 µm; × 34), fig. 4; scale E (200 µm; × 62), fig. 5.

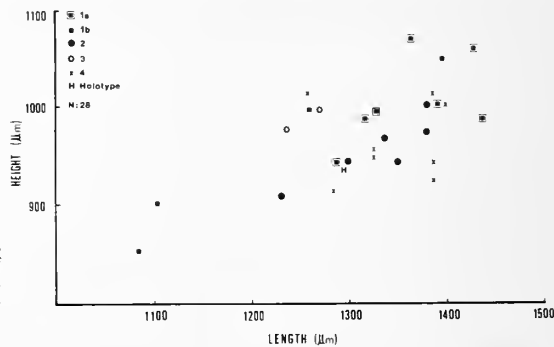
Stereo-Atlas of Ostracod Shell 16, 7

Acknowledgements: Dr J. Vannier (University of Leicester) for helpful discussion, and Dr J. Berdan (Smithsonian Institution, Washington) for loan of the types.

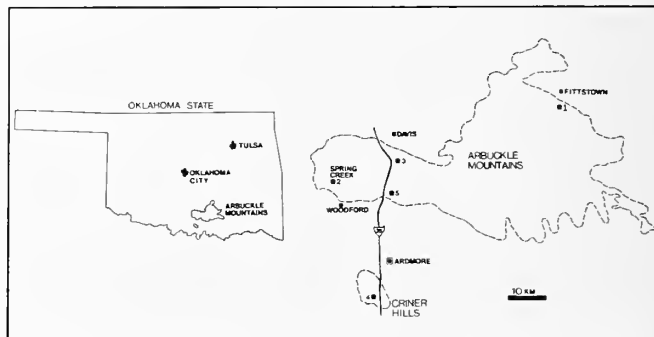


Text-fig. 1. Summary stratigraphic column for location of samples utilised in the population study of Text-fig. 2. Numbers also relate to the sample localities of Text-fig. 3.

Text-fig. 2. Population study of specimens recovered from a number of horizons in the Tulip Creek and Bromide formations (see Text-figs. 1, 3). The graph illustrates the similar size of specimens through time. Sample 1a shows two points which plot well below the main group of points. These may represent preadult dimorphism.

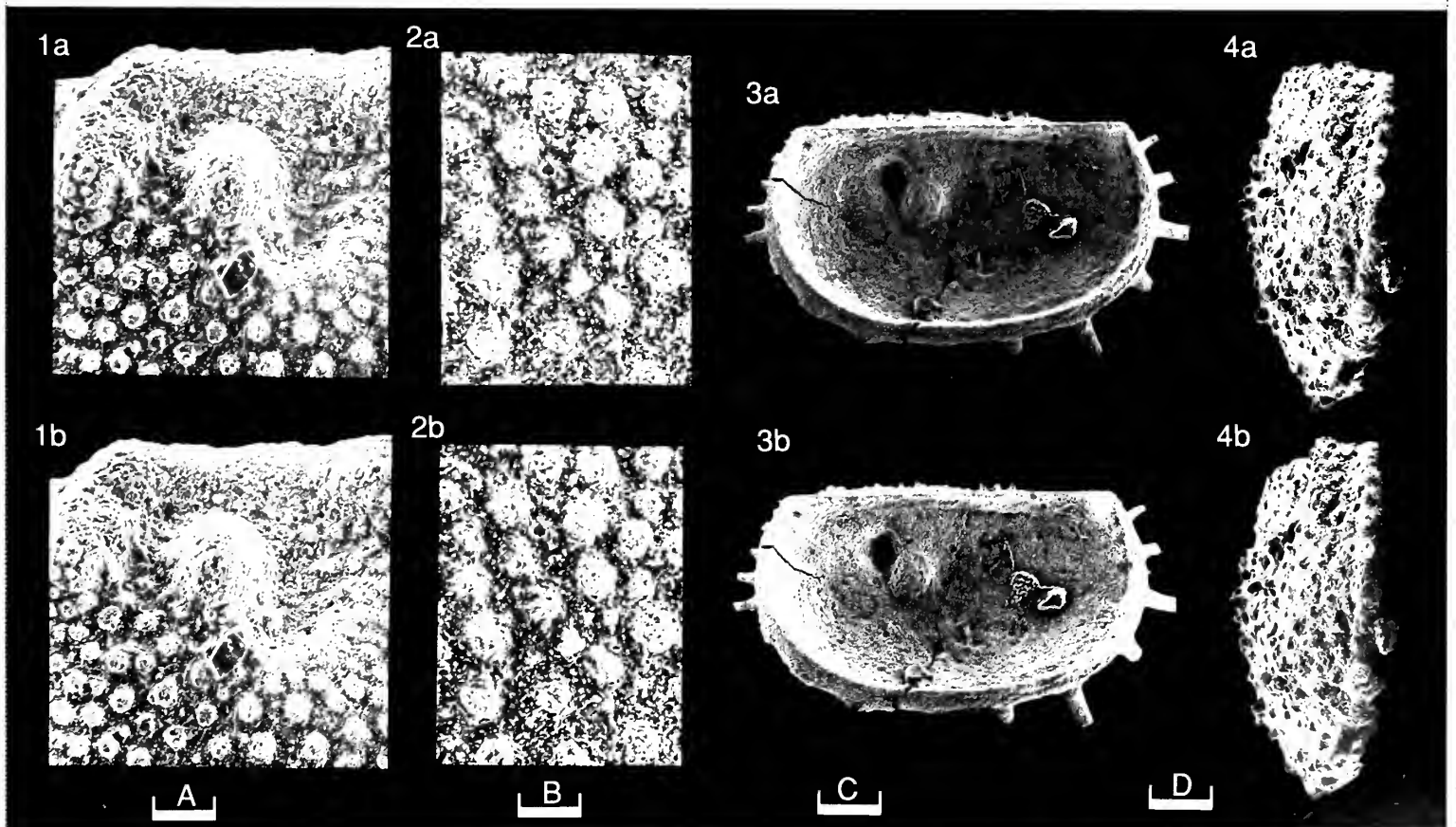
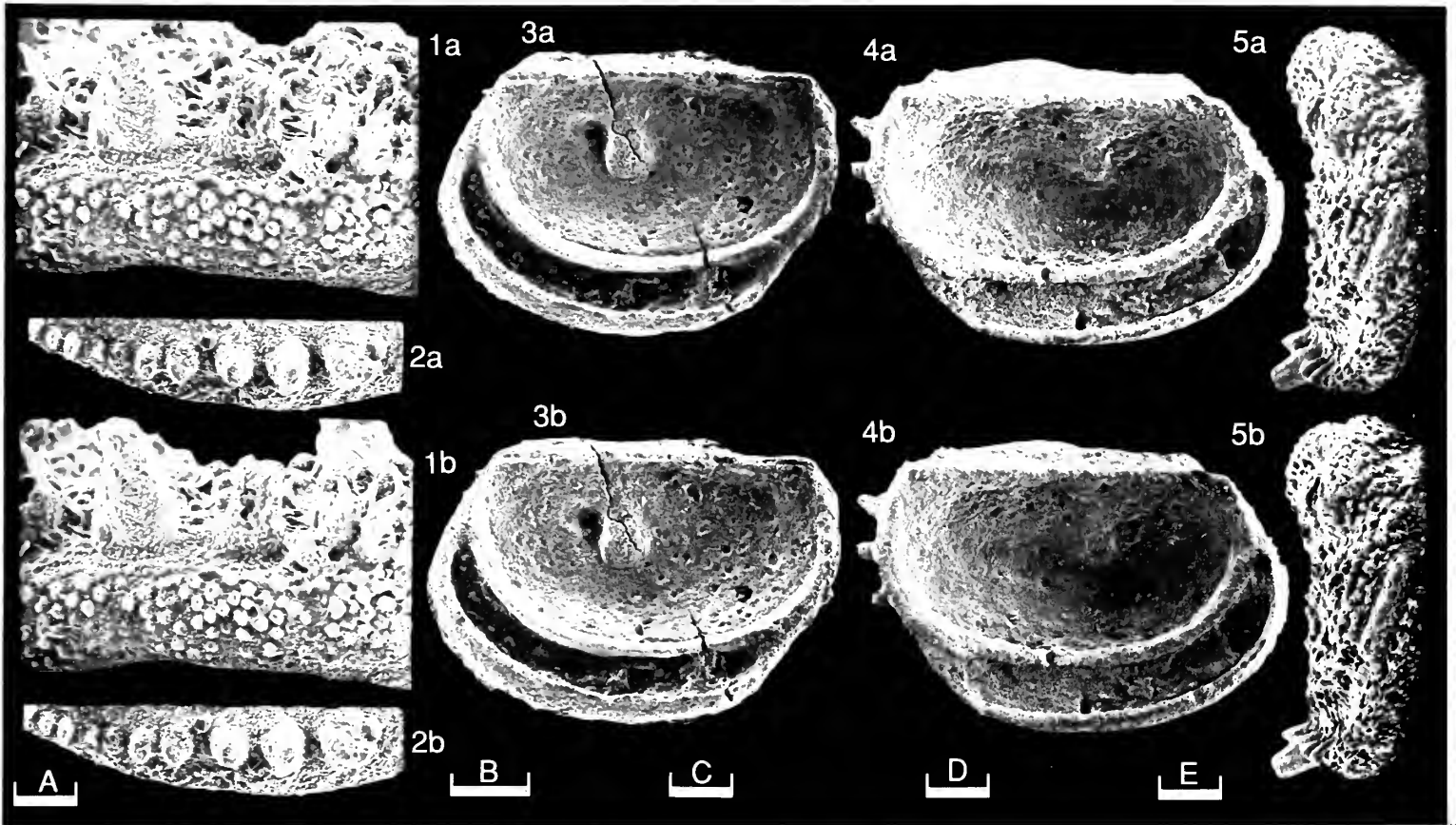


Text-fig. 3. Location of sampling localities in the Bromide and Tulip Creek formations, Simpson Group, middle Ordovician, Oklahoma, from which *B. reticulata* has been recovered: 1, Highway 99 section, S of Fittstown. 2, Spring Creek section N of Woodford on the Arbuckle Ranch. 3, N Interstate 35 road section. 4, Rock Crossing section, Criner Hills. 5, S Interstate 35 road section.



Explanation of Plate 16, 8

Figs. 1, 2 ♀ LV (OS 13377, 1.5 mm long excluding spines): fig. 1, ext. lat. detail of sulci; fig. 2, ext. lat. detail of ornament. Fig. 3, ♂ RV, int. lat. (OS 13380, 1.28 mm long excluding spines). Fig. 4, ♂ RV, ext. post. (OS 13379, 1.22 mm long excluding spines). Scale A (100 µm; × 75), fig. 1; scale B (50 µm; × 150), fig. 2; scale C (250 µm; × 41), fig. 3; scale D (150 µm; × 60), fig. 4.



ON *LOPHOCYPRIS SHULANENSIS* ZHANG & ZHAO gen. et sp. nov.

by Zhang Lijun & Zhao Yuhong
(Shenyang Institute of Geological and Mineral Resources, China & Nanjing Institute of
Geology and Palaeontology, China)

Genus *LOPHOCYPRIS* gen. nov.

Type-species: *Lophocypris shulanensis* sp. nov.

Derivation of name: Greek, meaning crest or ridge, referring to the surface crests, + *Cypris*.

Diagnosis: Large, heavily calcified carapace, subparallel dorsal and ventral margins in lateral view; dorsum straight, ventrum weakly concave in middle; anterior and posterior cardinal angles equal and obtuse; somewhat fusiform in dorsal view. LV larger and overlaps RV around entire margin. External surface with anterior and posterior marginal crests; between them an obvious concavity, in which a small lobe occurs in some species. Adont hinge, groove in LV. Marginal pore canals few, straight. Muscle scars small, five adductor scars close together, Cyprididae pattern; one ovate mandibular scar and a triangular frontal scar.

Remarks: On the basis of the adductor muscle scar pattern, the new genus is put in the Family Cyprididae. It is distinguished, by the anterior and posterior crests, from *Ilyocyprimorpha* Mandelstam, 1956 from the Lower Cretaceous of the USSR and Mongolia; the latter has strong spines and lobes on the external surface, and a small concavity is located in the anterodorsal area of some species. Nevertheless, the two genera are similar in terms of valve overlap, hinge and marginal pore canals, and are therefore considered to be closely related. *Cypridea? dissona* Netchaeva, 1959 (*Monogr. Inst. Geol. Miner. P.R.C. Ser. B, Strat. & Palaeont.*, 1, (2), 17, pl. 4, fig. 4) differs from typical *Cypridea* and should be placed in *Lophocypris*.

Explanation of Plate 16, 10

Fig. 1, car., RV, ext. lat. (paratype, SG130355, 720 μ m long), fig. 2, car., vent. (holotype, SG130354, 700 μ m long), fig. 3, LV, ext. lat. (paratype, SG130356, 670 μ m long).
Scale A (250 μ m; $\times 100$), figs. 1–3.

Lophocypris shulanensis sp. nov.

Holotype: Shenyang Institute of Geological and Mineral Resources, China; no. SG130354; carapace.
[Paratypes: nos. SG130355–SG130361; two carapaces and five valves].

Type locality: Section at Shuiqiliu town, Shulan County, Jilin Province, NE China (lat. 44°23' N, long. 126°55' E); silty mudstone of Nenjiang Formation (Upper Cretaceous), non-marine.

Derivation of name: From the type locality.

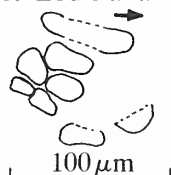
Figured specimens: Shenyang Institute of Geological and Mineral Resources, nos. SG130354 (holotype, car.: Pl. 16, 10, fig. 2), SG130355 (paratype, car.: Pl. 16, 10, fig. 1), SG130356 (paratype, LV: Pl. 16, 10, fig. 3), SG130357 (paratype, LV: Pl. 16, 12, fig. 3), SG130358 (paratype, car.: Pl. 16, 12, fig. 2), SG130359 (paratype, RV: Pl. 16, 12, fig. 1). All from the type locality and horizon.

Diagnosis: Carapace large (650–720 μ m), subreniform in lateral view. Asymmetrical fusiform in dorsal view. LV higher posteriorly than RV. Posterior marginal crest more prominent in LV, anterior one more prominent in RV. Inner lamella moderately broad with anterior and posterior vestibula.

Remarks: *L. shulanensis* was probably derived from *Ilyocyprimorpha*, a genus which appeared in the early Cretaceous and was distributed in Northeast Asia. *L. shulanensis* differs from *L. dissona* (Netchaeva, 1959) (*op. cit.*) in lacking a median lobe between the two marginal crests.

Distribution: Found in the Shuiqiliu area of Shulan County, Jilin Province, NE China, in the Nenjiang Formation (late Cretaceous), which is about equal to the Cenomanian Stage in Europe.

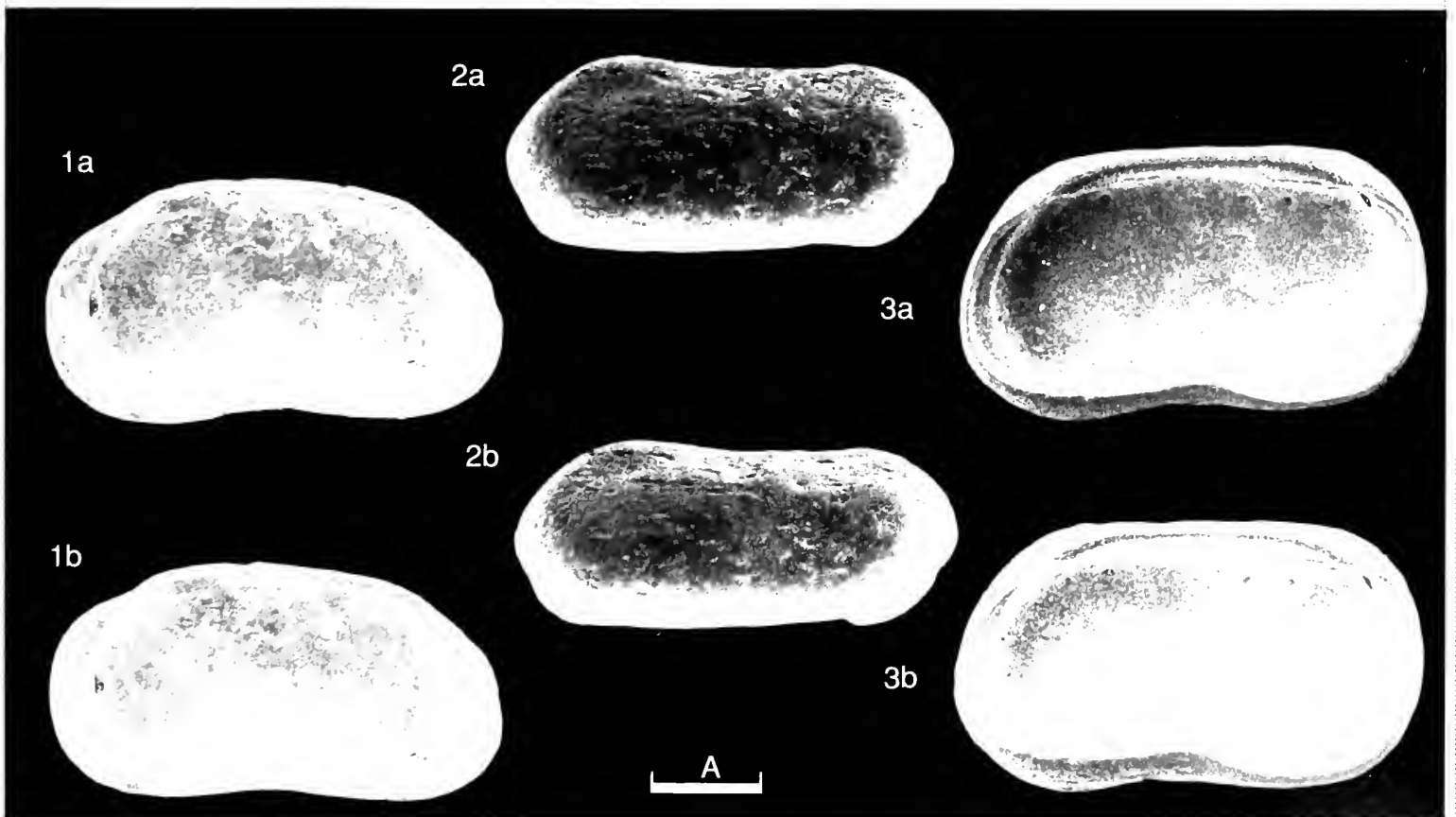
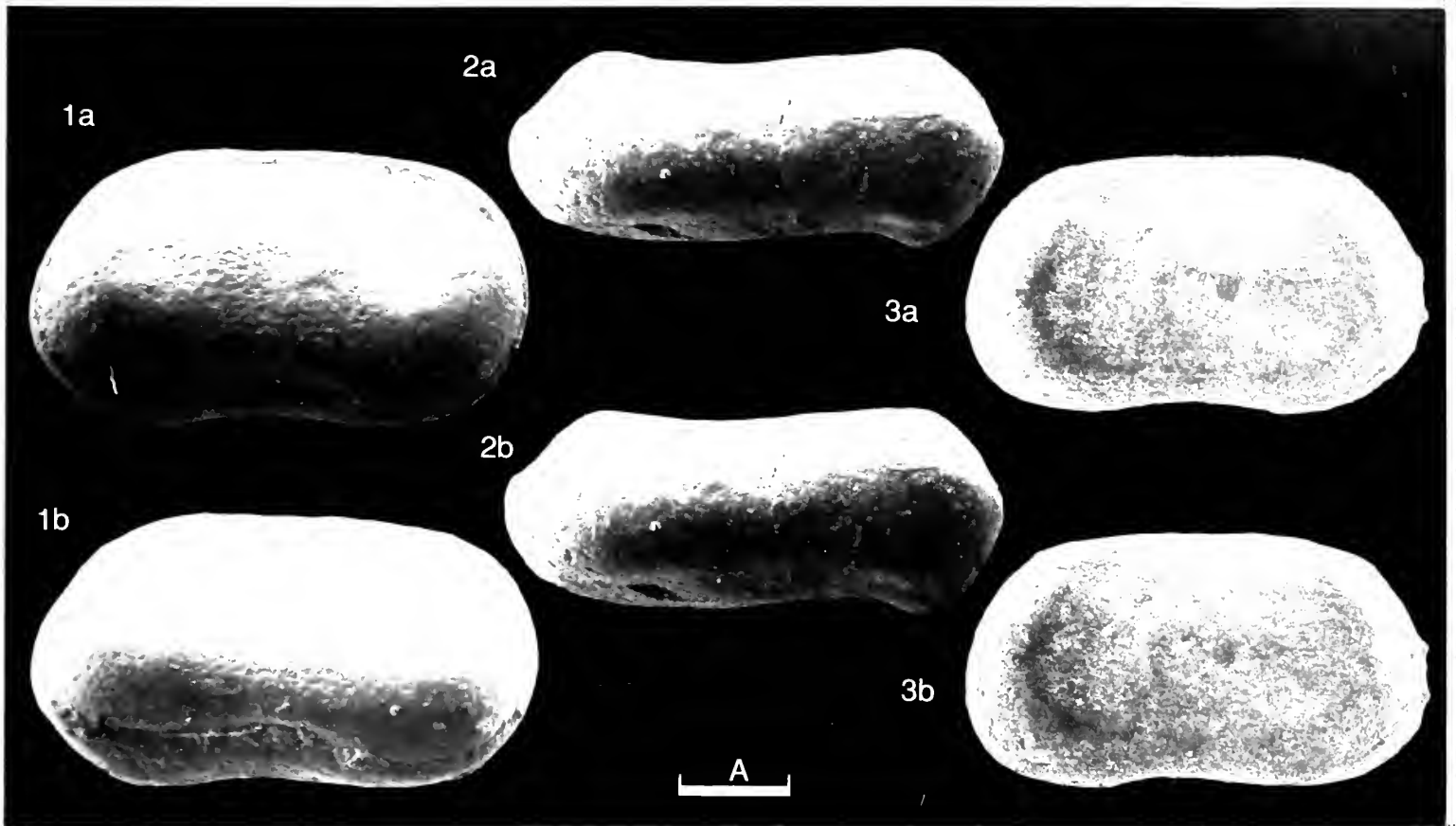
Acknowledgement: This paper was undertaken while a visiting research scholar in the Department of Geosciences, Northeast Louisiana University, Monroe, Louisiana, USA.



Text-fig. 1. Muscle-scar pattern, LV, SG130357.

Explanation of plate 16, 12

Fig. 1, RV, int. lat. (paratype, SG130359, 650 μ m long), fig. 2, car., dor. (paratype, SG130358, 625 μ m long), fig. 3, LV, int. lat. (paratype, SG130357, 650 μ m long).
Scale A (250 μ m; $\times 100$), figs. 1–3.





ON *DABASHANELLA RETROSWINGA* HUO, SHU & FU

by Zhao Yuhong & Tong Haowen
(Institute of Geology & Palaeontology, Academia Sinica, Nanjing, China
& Department of Oceanogeosciences, Tongji University, Shanghai, China)

Dabashanella retroswina Huo, Shu & Fu, 1983

- 1983 *Dabashanella retroswina* sp. nov. Huo, Shu & Fu, in: Huo Shicheng et al., *Jl. Northwest University*, **40**(3), 68–69, pl. 5, figs. 14–17, text-fig. III–27.
1985 *Xinjiangella venustois* Jiang & Xiao in: Huo Shicheng et al., *Cambrian Bradoriida of S China*, 184–185, pl. 36, figs. 1–4, Northwest University Pub. House, China.
1987 *Dabashanella retroswina* Huo, Shu & Fu, 1983; Tong Haowen, *Acta Micropalaeontologica Sinica*, **4**(4), 433–434, pl. 1, figs. 3–10; pl. 2, figs. 1–8.

Holotype: Department of Geology, Northwest University, Xian City, Shaanxi Province, People's Republic of China; coll. no. ZX001.

Type locality: Xiaoyang Section, Zhenba Town, Shaanxi Province, People's Republic of China; approx. lat. 32° 29' N, long. 107° 56' E; Shuijingtuo Formation, early Cambrian.

Figured specimens: Department of Geology, Northwest University, Xian, Shaanxi Province, People's Republic of China, coll. nos: ZX010a (car.: Pl. 16, 14, fig. 1), ZX010b (car.: Pl. 16, 14, fig. 2), ZX010c (car.: Pl. 16, 14, fig. 3), ZX010d (car.: Pl. 16, 16, fig. 1), ZX010e (car.: Pl. 16, 16, fig. 2) and ZX010f (car.: Pl. 16, 16, fig. 3). All from the type formation and locality.

Explanation of Plate 16, 14

Fig. 1, car., LV ext. lat. (ZX010a, 690 µm long); fig. 2, car. vent (ZX010b, 620 µm long); fig. 3, car., RV ext. lat. (ZX010c, 520 µm long).

Scale A (200 µm; ×115), fig. 1; Scale B (200 µm; ×77), fig. 2; scale C (200 µm; ×142), fig. 3.

Diagnosis: Small to medium in size (500–700 µm long). In lateral view dorsum straight, ventral margin somewhat semicircular. Single spines located at both cardinal corners. Height/length ratio of 0.5–0.6. Carapace somewhat inflated (width). No hinge structure observed. Along the ventral margin, there seems to be a weak marginal ridge. No internal structure observed (material consists of carapaces).

Remarks: This species is very similar to *Dabashanella hemicyclia* Huo, Shu & Fu, 1983 (*Jl. Northwest University*, **40**(3), 68–69, pl. 5, figs. 18–20, text-figs. III–26), but in the latter the lateral view of the shell outline is more semicircular (with height/length ratio of 0.6–0.7) and the shell is not so distinctly swollen. *D. retroswina* is different from *Vestrogothia spinata* Müller, 1979 (*Lethaia*, **12**(1), 4, fig. 1) in that it has no hinge structure, no long ventral spines and its margin is smoother. *D. retroswina* differs from *Vestrogothia granulata* Müller in that it has anterior and posterior short dorsal spines, has a high height/length ratio of the shell, lacks surface ornamentation and has no muscle scars. Compared with *Hesslandona necopina* Müller, 1979 (*Lethaia*, **12**(1), 6, figs. 7a–c), *D. retroswina* lacks a hinge structure. *D. retroswina* is distinct from *Falites fala* Müller, 1979 (*Lethaia*, **12**(1), 8, figs. 10a–c) in that the latter has a shorter dorsal margin.

More than 100 specimens (juveniles and adults) from Zhenba Town have been measured and the statistics support that there were seven stages in the ontogeny of *D. retroswina*.

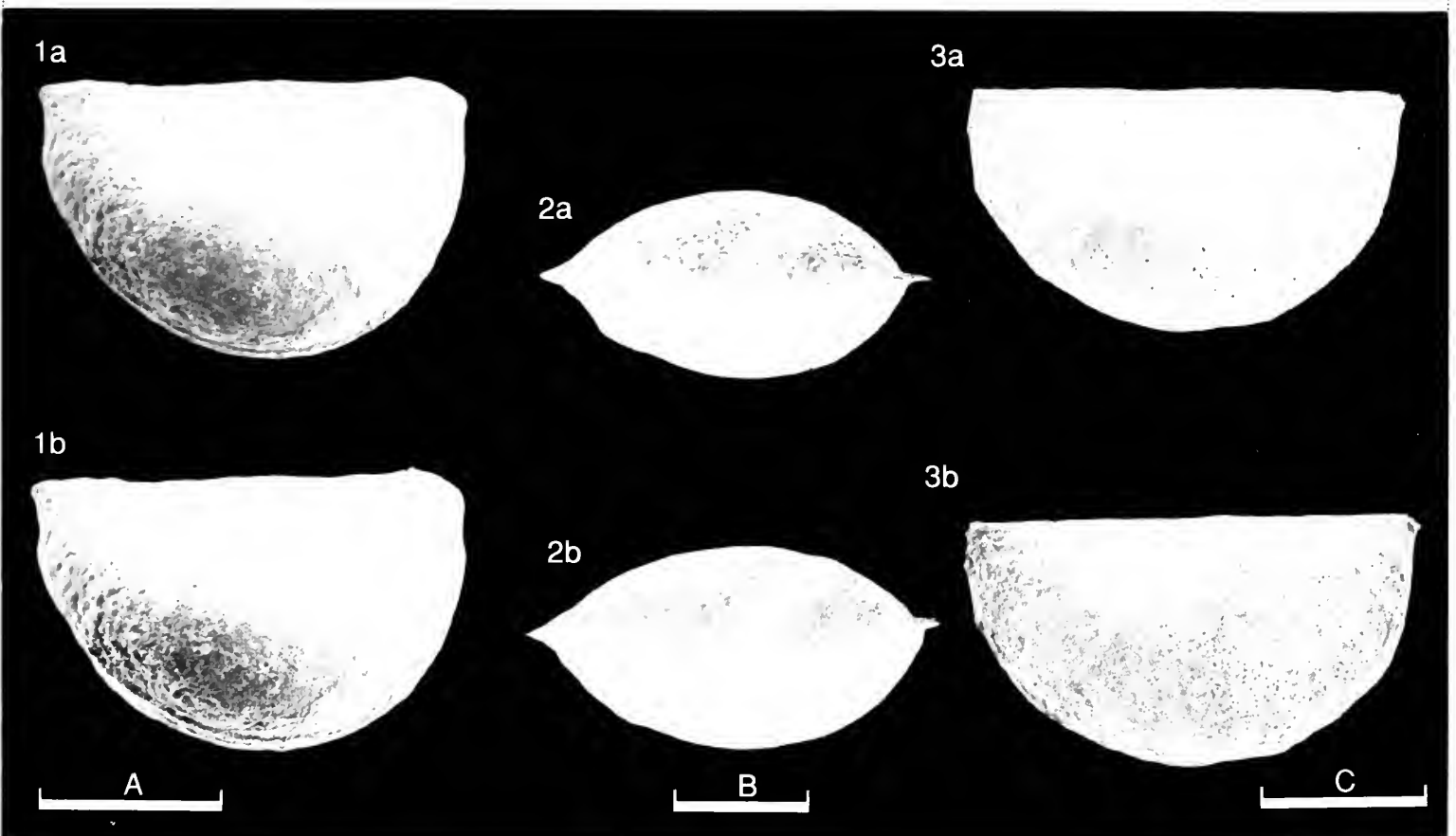
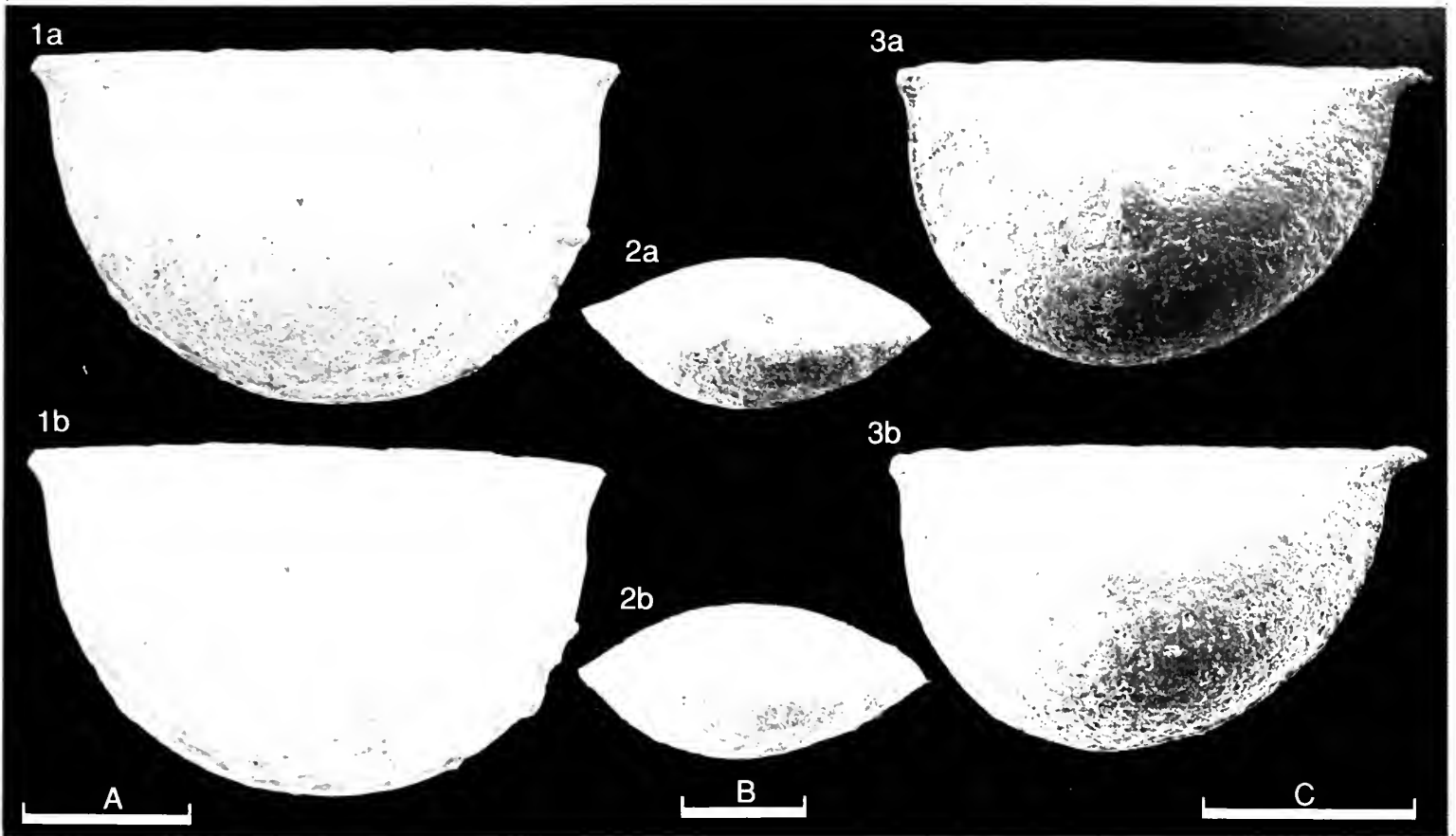
Distribution: Xiaoyang section of Zhenba Town, South Shaanxi Province and Wushi County, Xinjiang, China. Early Cambrian in age.

Acknowledgment: Dr. M. Kontrovitz, Geosciences Department of Northeast Louisiana University, U.S.A., is thanked for helping with the S.E.M. and for reading the text.

Explanation of Plate 16, 16

Fig. 1, car., LV ext. lat. (ZX010d, 480 µm long); fig. 2, car. dors. (ZX010e, 600 µm long); fig. 3, car., RV ext. lat. (ZX010f, 540 µm long).

Scale A (200 µm; ×125), fig. 1; scale B (200 µm; ×95), fig. 2; scale C (200 µm; ×115), fig. 3.



ON *PROGONOCY THERE LEVIGATA* BATE

by Matthew I. Wakefield & David J. Siveter
(University of Leicester, England)

Progonocythere levigata Bate, 1967

1967 *Progonocythere levigata* sp. nov. R. H. Bate, *Bull. Br. Mus. nat. Hist. (Geol.)*, **14**, no. 2, 45–46, pl. 10, figs. 10–14, pl. 11, figs. 1–9.

1978 *Progonocythere levigata* Bate; R. H. Bate, in: R. H. Bate & E. Robinson (eds), *A Stratigraphical Index of British Ostracoda*, *Geol. J. Spec. Issue*, **8**, 228, pl. 12, figs. 10–12.

Holotype: British Museum (Nat. Hist.), no. **Io 2419**; ♀ LV.

Type locality: Portland Cement Quarry, Ketton, Northamptonshire, England; National Grid Reference: SK 972 058; lat. 0° 33' W, long. 52° 38' N, Bed 5 (of C. J. Aslin in: P. C. Sylvester-Bradley & T. D. Ford (eds.), *The Geology of the East Midlands*, 224–225, table 14, 1968). Upper Estuarine Series, Bathonian.

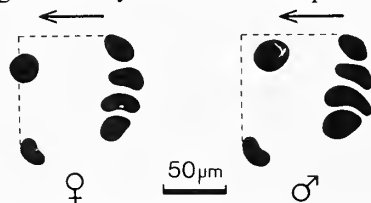
Figured specimens: British Museum (Nat. Hist.) nos. **Io 2419** (holotype, ♀ LV: Pl. 16, 18, figs. 3, 7), **Io 2420** (paratype ♀ RV: Pl. 16, 20, fig. 3), **OS 13373** (♀ RV: Pl. 16, 20, figs. 4, 6), **OS 13374** (♂ car.: Pl. 16, 20, figs. 1, 5), **OS 13375** (♂ RV: Pl. 16, 20, fig. 2), **OS 13376** (♀ car.: Pl. 16, 18, figs. 1, 2, 5, 6). All specimens except for the holotype and the paratype are from the basal 10 cm of Bed 4 of J. E. Andrews (*Aspects of Sedimentary Facies and Diagenesis in Limestone-Shale Formations of the Middle Jurassic Great Estuarine Group, Inner Hebrides*, Unpubl. PhD Thesis, University of Leicester, 1984.); Duntulm Formation, Great Estuarine Group, Bay River Section, Loch Bay Inlier, Trotternish, Skye, lat. 5° 34' W, long. 57° 29' N.

Explanation of Plate 16, 18

Fig. 1, ♀ car., ant. (**OS 13376**, 881 µm long); fig. 2, ♀ car., ext lat. (**OS 13376**); fig. 3, ♀ LV, int. lat. (holotype, **Io 2419**, 818 µm long); fig. 4, ♀ LV, ext. lat. (**Io 2419**); fig. 5, ♀ car., dors. (**OS 13376**); fig. 6, ♀ car., vent. (**OS 13376**); fig. 7, ♀ LV, ornament and sieve pores (**Io 2419**). Scale A (250 µm; ×85), figs. 1, 2, 4–6; scale B (100 µm; ×200), fig. 3; scale C (10 µm; ×1000), fig. 7.

Diagnosis: *Progonocythere* with subquadrate/elongate punctate carapace. Puncta contain well developed sieve plates. Small marginal denticles may occur anteriorly at about mid-height (four) and also posteroventrally (2–3) usually on the right valve only (modified from Bate 1967, *op. cit.*).

Remarks: *P. levigata* displays sexual dimorphism. Adults of the Scottish specimens are consistently larger than their English counterparts, particularly the males. The entomodont hinge has 6–7 teeth posteriorly and 6–7 teeth anteriorly; occasionally teeth may be bifid. The median bar may have up to five anterior teeth. The frontal scar in the female is lower and sited more anteriorly (Text-fig. 1), particularly in the English specimens studied. *P. levigata* resembles *Progonocythere cristata* Bate, 1963 (*Bull. Br. Mus. nat. Hist. (Geol.)*, **8**, no. 4, 191–193, pl. 4, figs. 5–15, pl. 5, figs. 1–6) but does not have the ventrolateral overhang of the latter. The type-species, *Progonocythere stilla* Sylvester-Bradley, 1948 (see C. Mayes, *Stereo-Atlas Ostracod Shells*, **2**, 173–180, 1975), is distinguished by its truncated posterior margin (Bate 1967, *op. cit.*).



Text-fig. 1. Central muscle scar complex of *P. levigata* (from **OS 13373** and **OS 13375**).

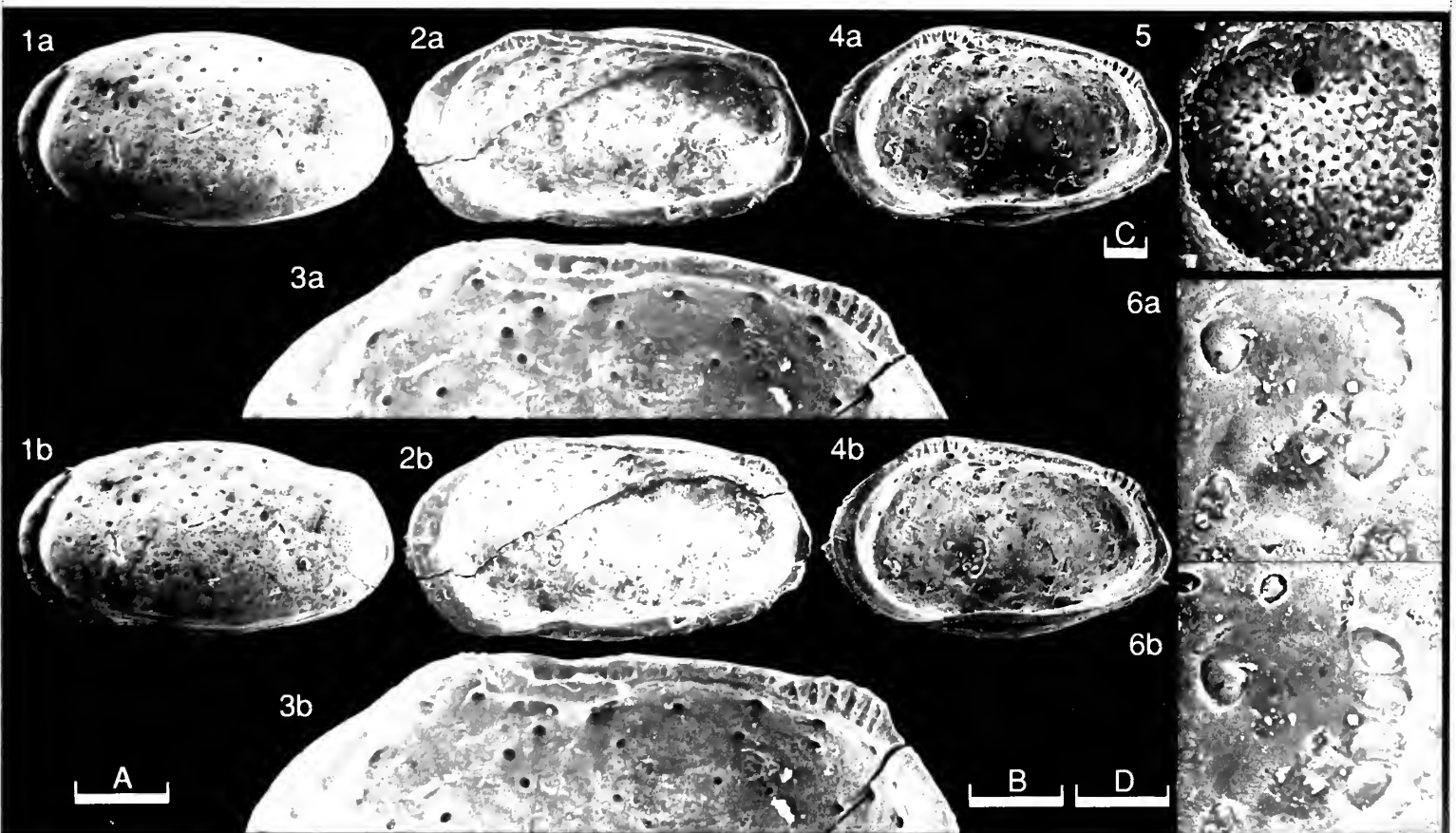
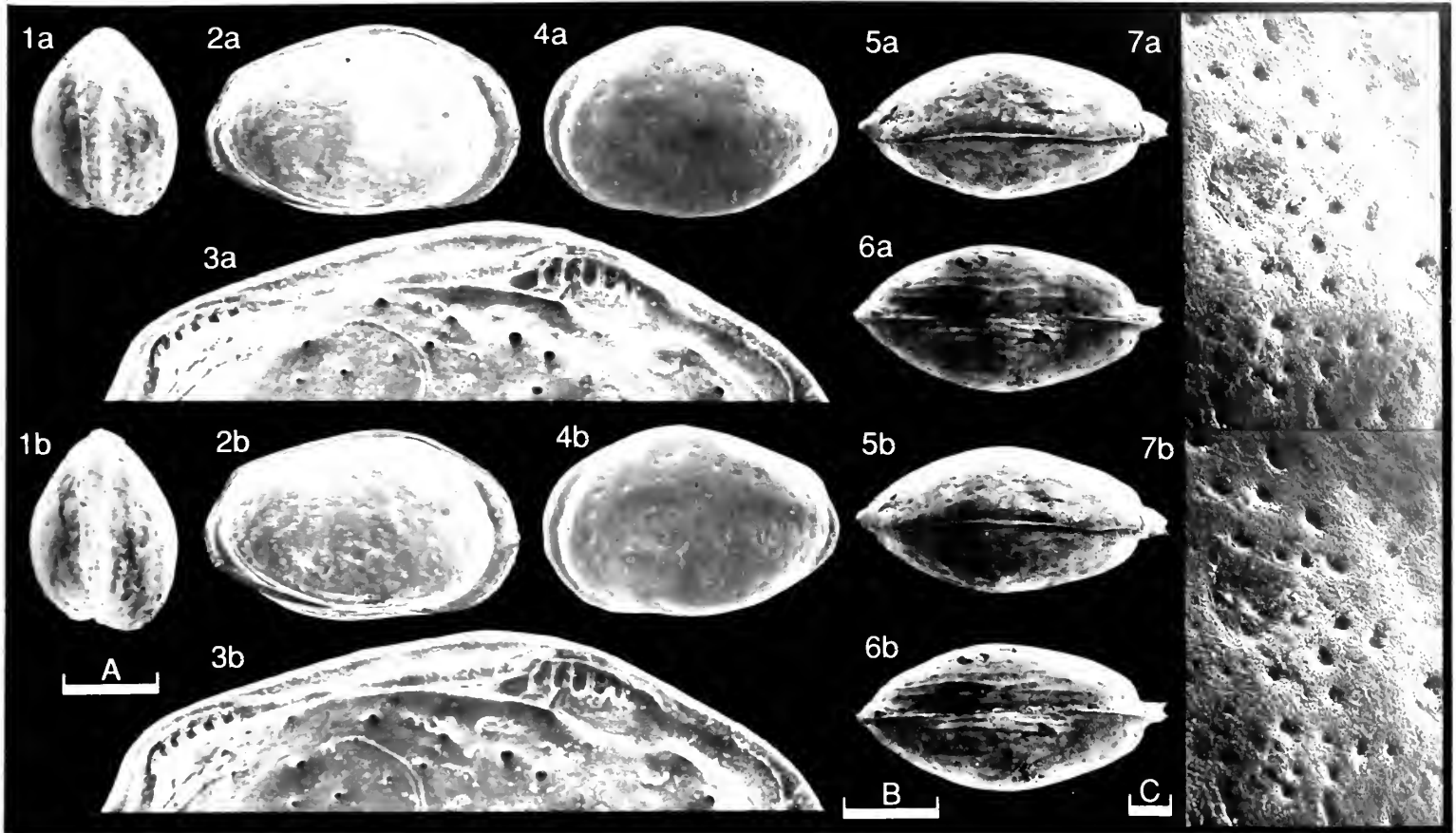
Distribution: A marine to marginal marine species. Found in the middle Jurassic *Procerites progradilis* Zone (not *Procerites hodsoni* zone as shown by Bate 1978, *op. cit.*) of the Upper Estuarine Series, Ketton, Northamptonshire, England and the Duntulm and Kilmaluag formations, Great Estuarine Group, Trotternish, Skye, Scotland (Wakefield in prep.).

Acknowledgement: M. I. Wakefield thanks NERC & BP for CASE studentship support.

Explanation of Plate 16, 20

Fig. 1, ♂ car., ext. lat. (**OS 13374**, 1018 µm long); fig. 2, ♂ RV, int. lat. (**OS 13375**, 1073 µm long); fig. 3, ♀ RV, int. lat. (paratype, **Io 2420**, 827 µm long); fig. 4, ♀ RV, int. lat. (**OS 13373**, 872 µm long); fig. 5, ♂ car., eccentric sieve plate (**OS 13374**); fig. 6, ♀ RV, muscle scars (**OS 13373**).

Scale A (250 µm; ×85); figs. 1, 2, 4; scale B (100 µm; ×200), fig. 3; scale C (1 µm; ×4900), fig. 5; scale D (50 µm; ×400), fig. 6.



ON *BYTHOCERATINA GOBANENSIS* REYMENT & REYMENT sp. nov.

by Richard A. Reyment & Eva R. Reyment
(University of Uppsala, Sweden)

Bythoceratina gobanensis sp. nov.

Holotype: Department of Historical Geology and Palaeontology, University of Uppsala; Palaeontological Museum, specimen **PM:ATLM-1**, a right valve.

Type locality: Subsurface of North Atlantic Ocean, Goban Spur, Site 548A of DSDP leg 80, lat. 48° 54.95' N, long. 12° 09.84' W; Late Maastrichtian (zone of *Globigerina mayaroensis*).

Derivation of name: From the type locality.

Figured specimens: Palaeontological Museum, University of Uppsala, Sweden, nos. **PM:ATLM-1** (holotype, RV:Pl. 16, 22, fig. 1), **PM:ATLM-2** (LV: Pl. 16, 22, fig. 3), **PM:ATLM-3** (LV: Pl. 16, 22, fig. 2), **PM:ATLM-4** (LV: Pl. 16, 24, fig. 2), **PM:ATLM-5** (LV: Pl. 16, 24, fig. 3), **PM:ATLM-6** (LV: Pl. 16, 24, fig. 4), **P:ATLM-7** (RV: Pl. 16, 24, fig. 1). All from the type locality; **PM:ATLM-1**, -6 and -7 are from sample 64–65 cm, **PM:ATLM-2** and -3 are from sample 85–86 cm and **PM:ATLM-5** derives from sample 14–15 cm. These are the sample definitions used for designating levels in DSDP borehole 548A.

Explanation of Plate 16, 22

Fig. 1, RV, ext. lat. (**PM:ATLM-1**, 675 µm long); fig. 2, LV, ext. lat. (**PM:ATLM-3**, 530 µm long); fig. 3, juv. LV, dors. (**PM:ATLM-2**, 355 µm long).

Scale A (100 µm; ×85), figs. 1, 2; Scale B (50 µm; ×200), fig. 3.

Diagnosis: A *Bythoceratina* with upwardly directed caudal process in adults. Stout ventrolateral spine ornamented with concentrically arranged beads located along fine riblets. Surface of lateral lobes bearing beaded, hexagonal ornamental pattern. Anteroventral area of both valves with beaded hexagonally arranged riblets. Muscle-scar configuration typical of genus. Hinge-bar vaguely crenulated to smooth. Line of concrescence deviating from anterior inner margin in most specimens; more strongly so in right valves.

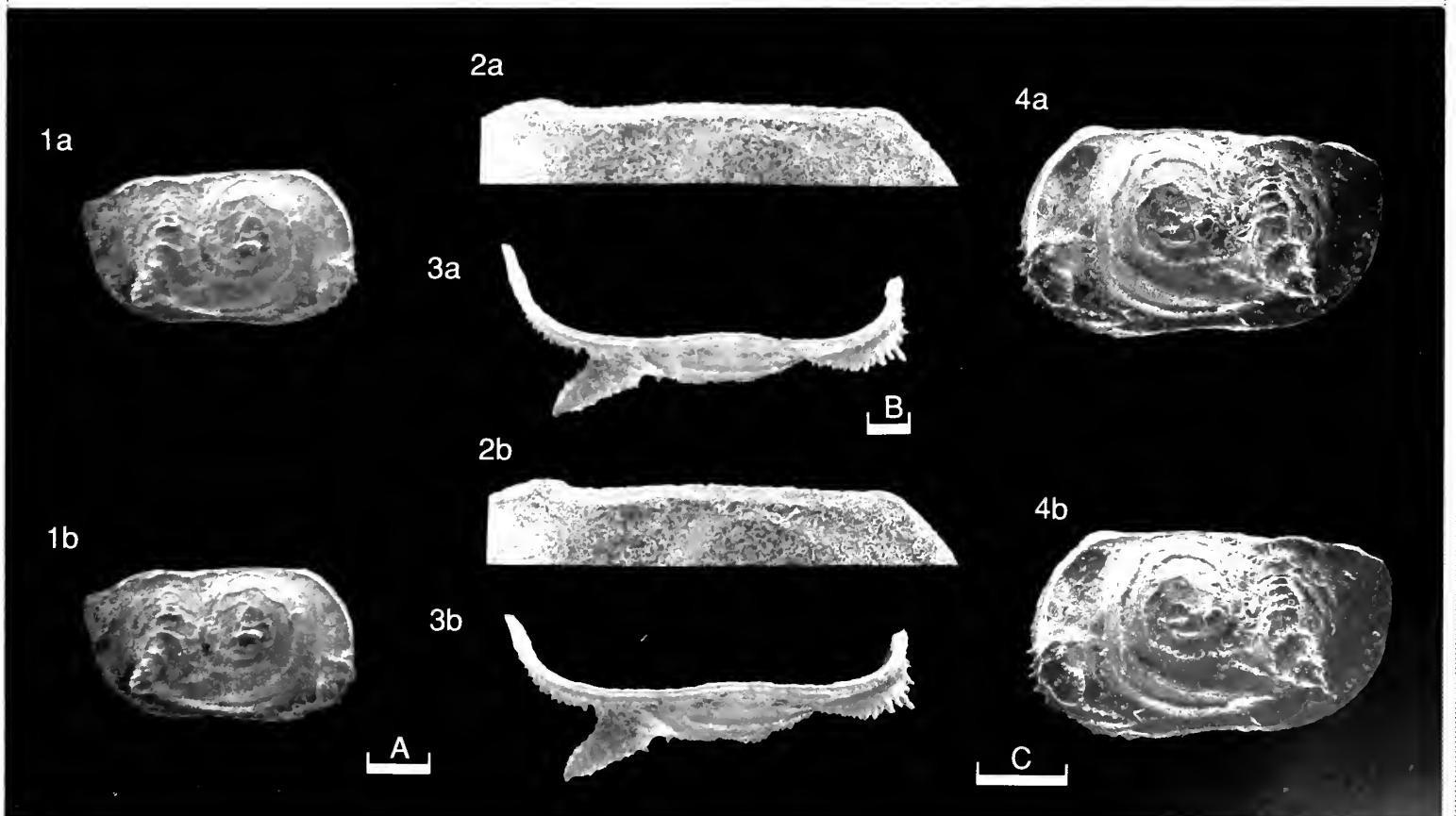
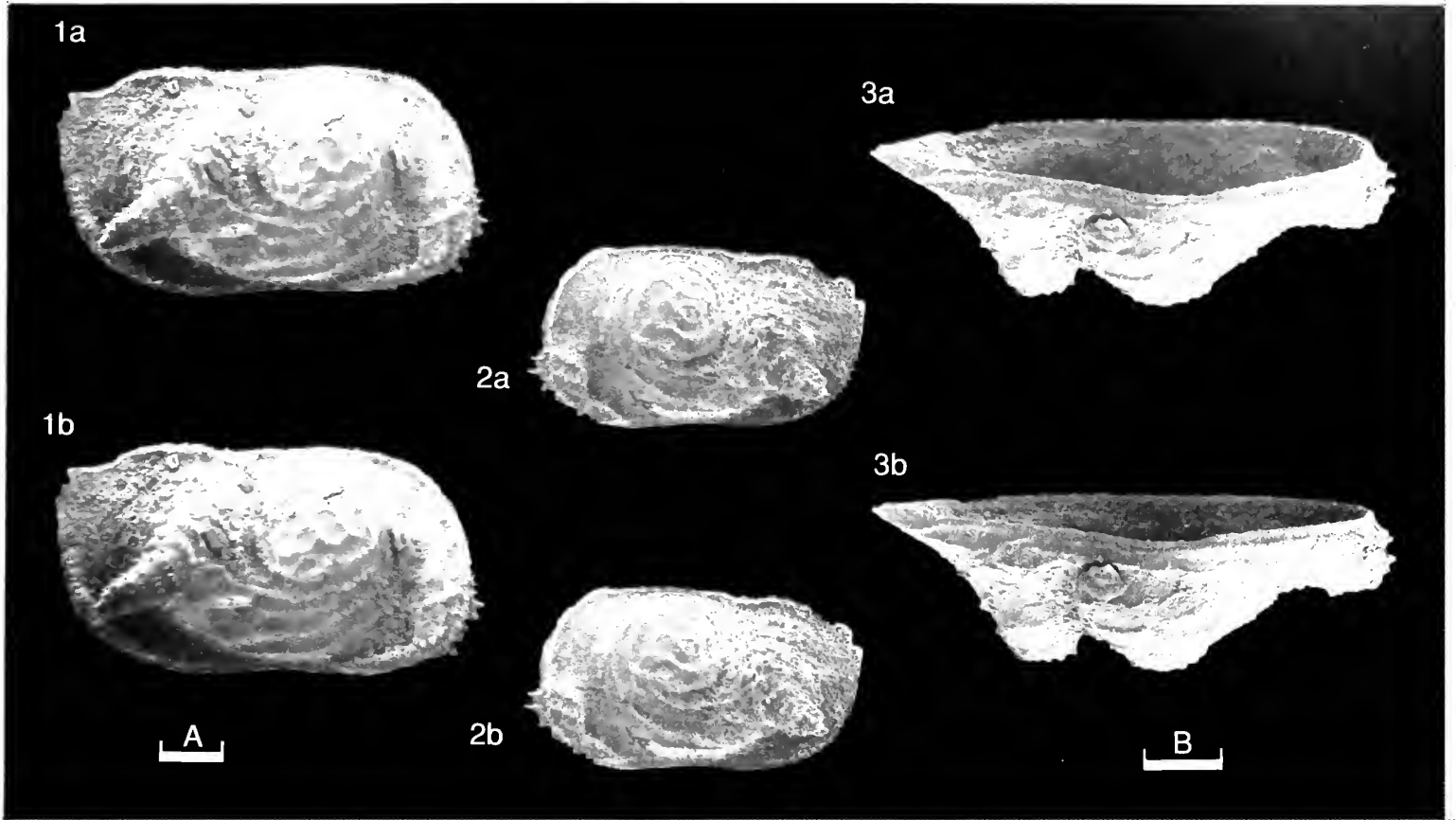
Remarks: The relationship between *Bythoceratina* Hornibrook, 1953 and *Monoceratina* Roth, 1928 is not clear. The main diagnostic feature said to separate these two genera is the presence of a crenulated median ridge and terminal teeth in *Bythoceratina*; the hinge in the material referred to here is only vaguely notched. *Bythoceratina gobanensis* sp. nov. differs from all species figured by Hornibrook (*Palaeontological Bulletin* No. 18, Geological Survey of New Zealand, 62–65, 1953) in details of the ornament. It is similar in general appearance to *Bythoceratina umbonatoides* (Kaye, 1964) as illustrated by J. W. Neale (*in*: R. H. Bate & E. Robinson, (eds.) *A Stratigraphical Index of British Ostracoda, Geol. J. Spec. Issue*, 8, pl. 14, figs. 2–6, 1978), but differs in the nature of its concentric, beaded ornament. The genus *Bythoceratina* seems to have its main distribution in the Southern Hemisphere.

Distribution: Late Maastrichtian, North Atlantic, palaeodepth estimated at 500–600m.

Explanation of Plate 16, 24

Fig. 1, juv. RV, ext. lat. (**PM:ATLM-7**, 450 µm long); fig. 2, juv. LV, hinge (**PM:ATLM-4**, 350 µm long); fig. 3, juv. LV, detail of ventral margin (**PM:ATLM-5**, 670 µm long); fig. 4, juv. LV, ext. lat. (**PM:ATLM-6**, 440 µm long).

Scale A (100 µm; ×85), figs. 1, 3; scale B (50 µm; ×200), fig. 2; scale C (100 µm; ×110), fig. 4.



ON *FALLATICELLA SCHAEFERI* SCHALLREUTER

by Roger E. L. Schallreuter
(University of Hamburg, German Federal Republic)

Genus *FALLATICELLA* Schallreuter, 1984

Type-species (by original designation): *Fallaticella schaeferi* Schallreuter, 1984

Diagnosis: Small to medium-sized (c. 1 mm long) beyrichiacean. Slightly preplete, domicilium subamplete. Unisulcate, sulcus (S2) moderately long, comma-like; in its ventral half slightly above mid-height an elliptical muscle-spot. Distinct preadductorial node and broad syllobium; syllobium at dorsal margin weakly rounded. Small velar flange very close to contact plane, broadest anteroventrally. Marginal sculpture as a similar but smaller flange in posterior half, with a row of puncta on its lower side. Females with an elongate crumina in anteroventral region, not very distinctly separated from lateral surface of domicilium. Crumina bordered by a ridge internally. Shell reticulate on lateral surfaces of domicilium and crumina. Ventral surface of crumina weakly reticulate.

Remarks: *Fallaticella* is considered to display cruminal dimorphism and as such is the oldest known cruminate (and, therefore, beyrichiacean) ostracod.

There are two existing models for the origin of the crumina. In Kesling's (*Contr. Mus. Paleont. Univ. Mich.*, 14 (6), 1957) model the space of the crumina is of antral origin, whereas in Martinsson's explanation (*Bull. geol. Instn Univ. Uppsala*, 41, 1962) the cruminoïd space marks a 'new' evolutionary event and is formed by an expanded tubule of the velum. In both models the internal opening of the crumina originates by a secondary perforation. The conditions in *Fallaticella* indicate another possible way of forming a crumina: the migration of the antral opening, internally, over the free margin of the valve. The crumina in this model is of antral origin.

Explanation of Plate 16, 26

Figs. 1–5, ♀ RV (AGH 30/1, 955 µm long): fig. 1, ext. lat.; fig. 2, ext. ventrolat.; fig. 3, ext. ant.; fig. 4, ext. dors. (70°); fig. 5, ext. vent., detail.
Scale A (100 µm; ×100), figs. 1–3; scale B (100 µm; ×75), fig. 4; scale C (50 µm; ×230), fig. 5.

Remarks (cont.): In this derivation a secondary perforation to the crumina is not necessary but a new free margin in that part of the valve is necessary, because the free margin is (in an evolutionary sense) 'pushed' into the domicilium, thus forming an inner ridge-like fence to the crumina (Pl. 16, 28, fig. 2).

Fallaticella schaeferi Schallreuter, 1984

1984 *Fallaticella schaeferi* n. sp., R. E. L. Schallreuter, *N. Jb. Geol. Paläont. Abh.* 169 (1), 26, 27–28, figs. 3, 1–2.

1986 *Fallaticella schaeferi* Schallreuter; R. E. L. Schallreuter, in: U. von Hacht, *Fossilien von Sylt*, 2, pl. 6, fig. 2.

1989 *Fallaticella schaeferi* Schallreuter; R. E. L. Schallreuter, *Geschiebekunde aktuell*, 5 (1), 3–4, fig. 2.

Holotype: University of Hamburg, Geologisch-Paläontologisches Institut und Museum, **GPIMH 2800**; right tecnomorphic valve anteriorly incomplete.

Type locality: Beach NW Häftings, Gotland (Baltic Sea), Sweden; approximately lat. 57° 53' N, long. 18° 37' E. Öjlemyrflint erratic boulder (no. G7, Schallreuter coll.); PIRGU (F1c) or Porkuni state (F2), Ashgill Series, late Ordovician. Area of origin: presumably the Baltic Sea N of Gotland.

Figured specimens: University of Hamburg, Geologisch-Paläontologisches Institut und Museum, Archiv für Geschiebekunde (AGH) nos. **G30/1** (♀ RV: Pl. 16, 26, figs. 1–5), **G30/2** (♀ RV: Pl. 16, 28, figs. 2–4), **G30/3** (tecnomorphic LV: Pl. 16, 28, fig. 1) and **G30/4** (tecnomorphic LV: Pl. 16, 28, fig. 5).

All specimens are from an Öjlemyrflint erratic boulder (no. **Val-34**, Schallreuter coll.), Isle of Gotland (Baltic Sea), Sweden; Upper Ordovician.

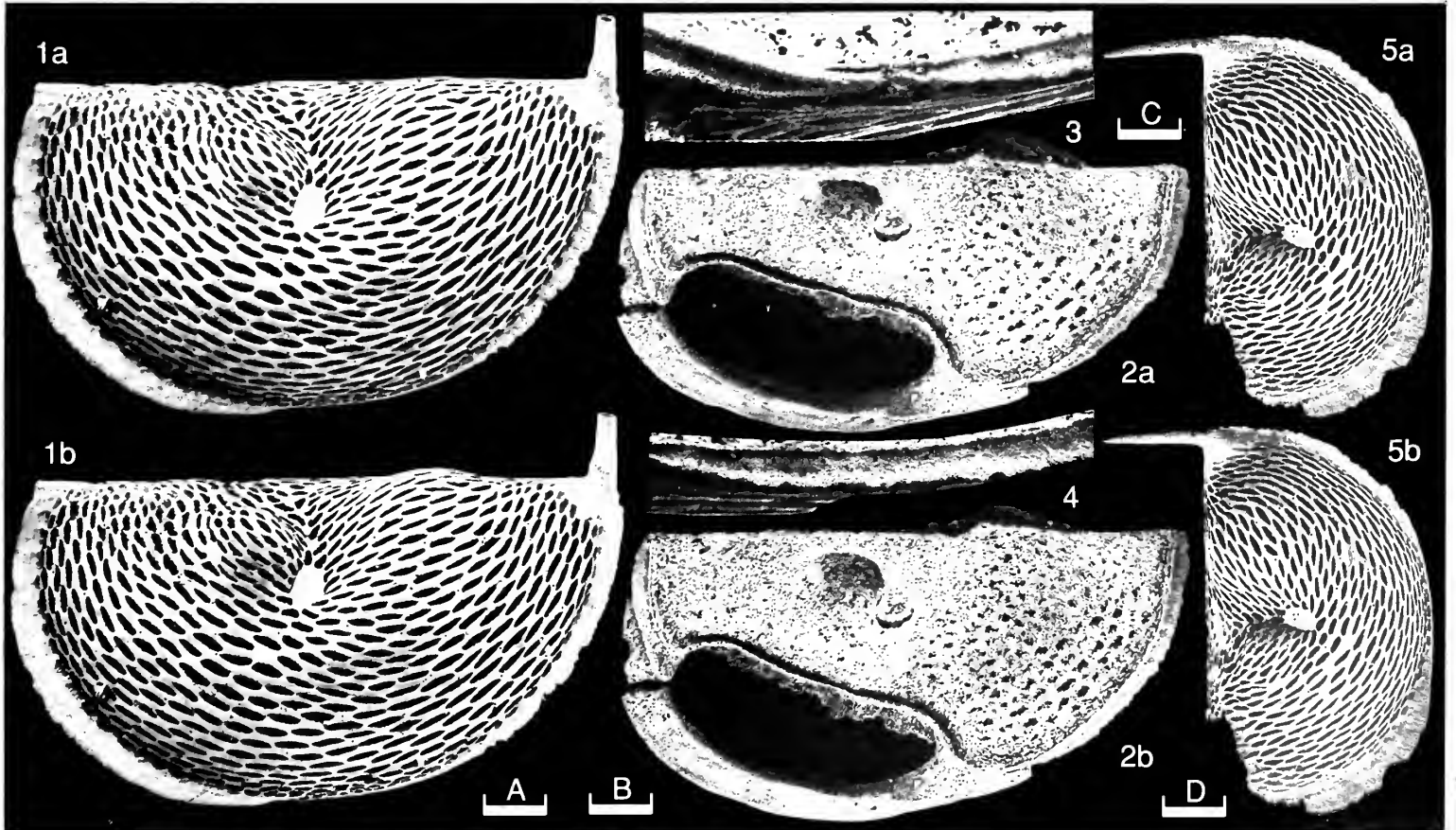
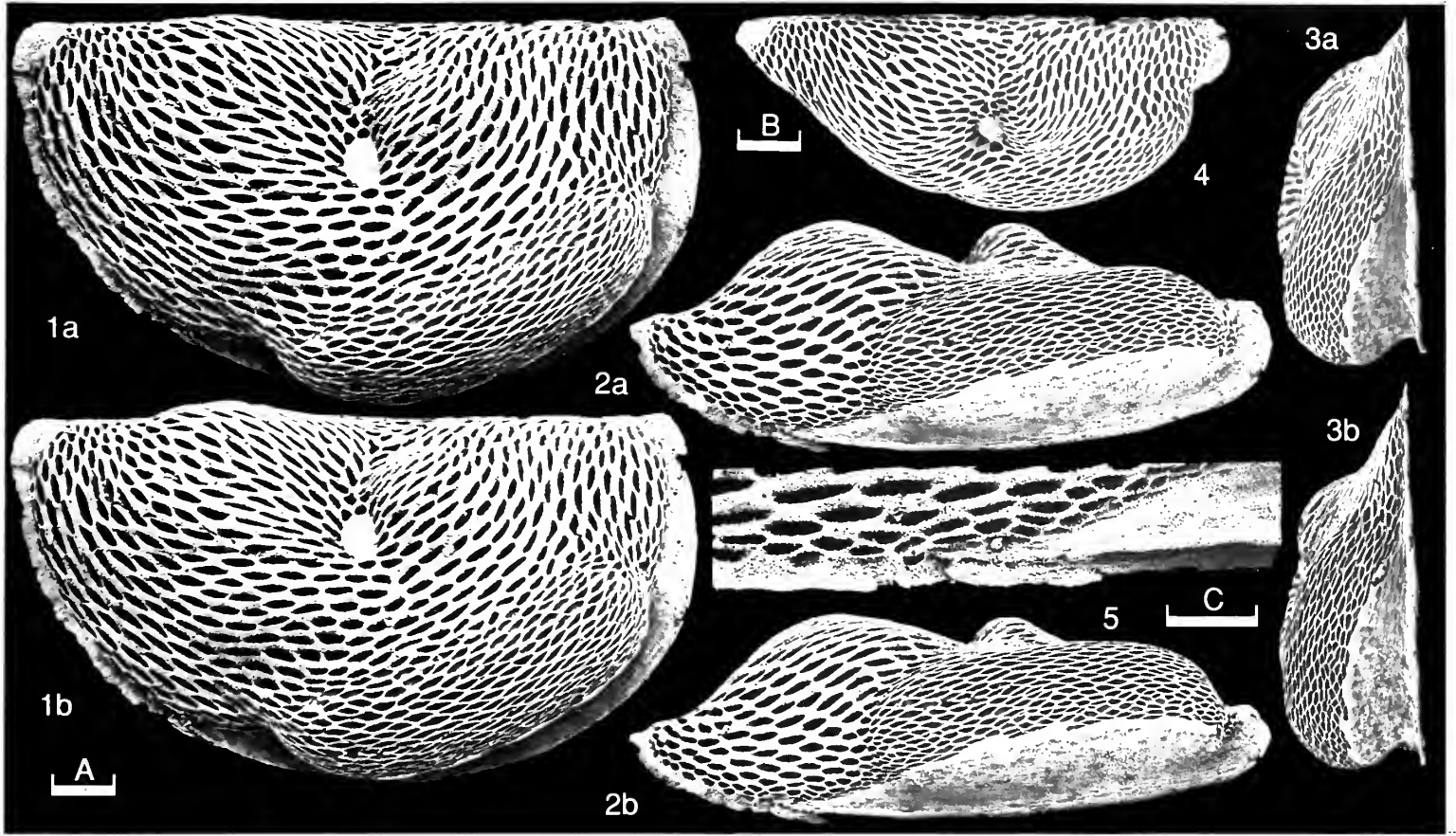
Diagnosis: Females c. 0.95 mm long. Shape (Gestalt) moderately high to moderately long, domicilium moderately to rather long. Lumina of reticulation elongate parallel to free margin.

Remarks: It is questionable whether the second species described by Schallreuter (1984, *op. cit.*: *F.?* *bulbata*) belongs to the same genus.

Distribution: Until now known only from Öjlemyrflint (Upper Ordovician) erratic boulders of the Isles of Gotland (Baltic Sea) and Sylt (N Sea).

Explanation of Plate 16, 28

Fig. 1, tecnomorphic LV, ext. lat. (AGH 30/3, 875 µm long); figs. 2–4, ♀ RV (AGH 30/2, 940 µm long): fig. 2, int. obl.; fig. 3, detail of posteroventral portion of contact margin; fig. 4, detail of lower side of marginal flange with row of puncta; fig. 5, juv. LV, ext. lat. (AGH 30/4, 715 µm long).
Scale A (100 µm; ×100), fig. 1; scale B (100 µm; ×85), fig. 2; scale C (50 µm; ×200), figs. 3, 4; scale D (100 µm; ×75), fig. 5.



ON *COLUMATIA VARIOLATA* (JONES & HOLL)

by Robert F. Lundin & David J. Siveter
(Arizona State University, Tempe, USA & University of Leicester, England)

Genus *COLUMATIA* gen. nov.

Type-species: *Primitia variolata* Jones & Holl, 1865

- Derivation of name:* Latin *colum*, sieve; referring to the punctate surface of the valves. Gender, feminine.
Diagnosis: Punctate, laterally flattened ostracods with sharply impressed elongate to pit-like S2; right valve overlapping left along entire free margin. Right valve with contact groove which is confluent with hinge groove at posterior end of hinge. Hinge straight but shorter than carapace. Adductorial sulcus distinctly represented interiorly in the form of a ridge. Hinge and contact margin of left valve is represented by simple edge.
Remarks: *Columatia* is related to (the ? platycope) *Neckajatia* Schallreuter, 1974 (*Geol. För. Stock. Förh.*, **96**, 278) but differs from it in being distinctly unisulcate. *Neckajatia* is essentially nonsulcate but some species have an incipient adductorial sulcus (R. F. Lundin, in: T. Hanai *et al.* (eds.), *Evolutionary Biology of Ostracoda, Develop. Palaeont. Stratigr.*, Amsterdam, **11**, 1055, 1988).
Columatia is reserved for species in which the adductorial sulcus is sharply impressed into the lateral surface of the valves. Thus defined, the genus is known at present with certainty from the

Explanation of Plate 16, 30

Fig. 1 RV, int. lat. (ASU X-85, 808 μ m long); fig. 2 car., ext. lt. lat. (ASU X-105, 714 μ m long); fig. 3, LV, int. lat. (ASU X-84, 771 μ m long).
Scale A (200 μ m; \times 82), fig. 1; scale B (200 μ m; \times 94), fig. 2; scale C (200 μ m; \times 83), fig. 3.

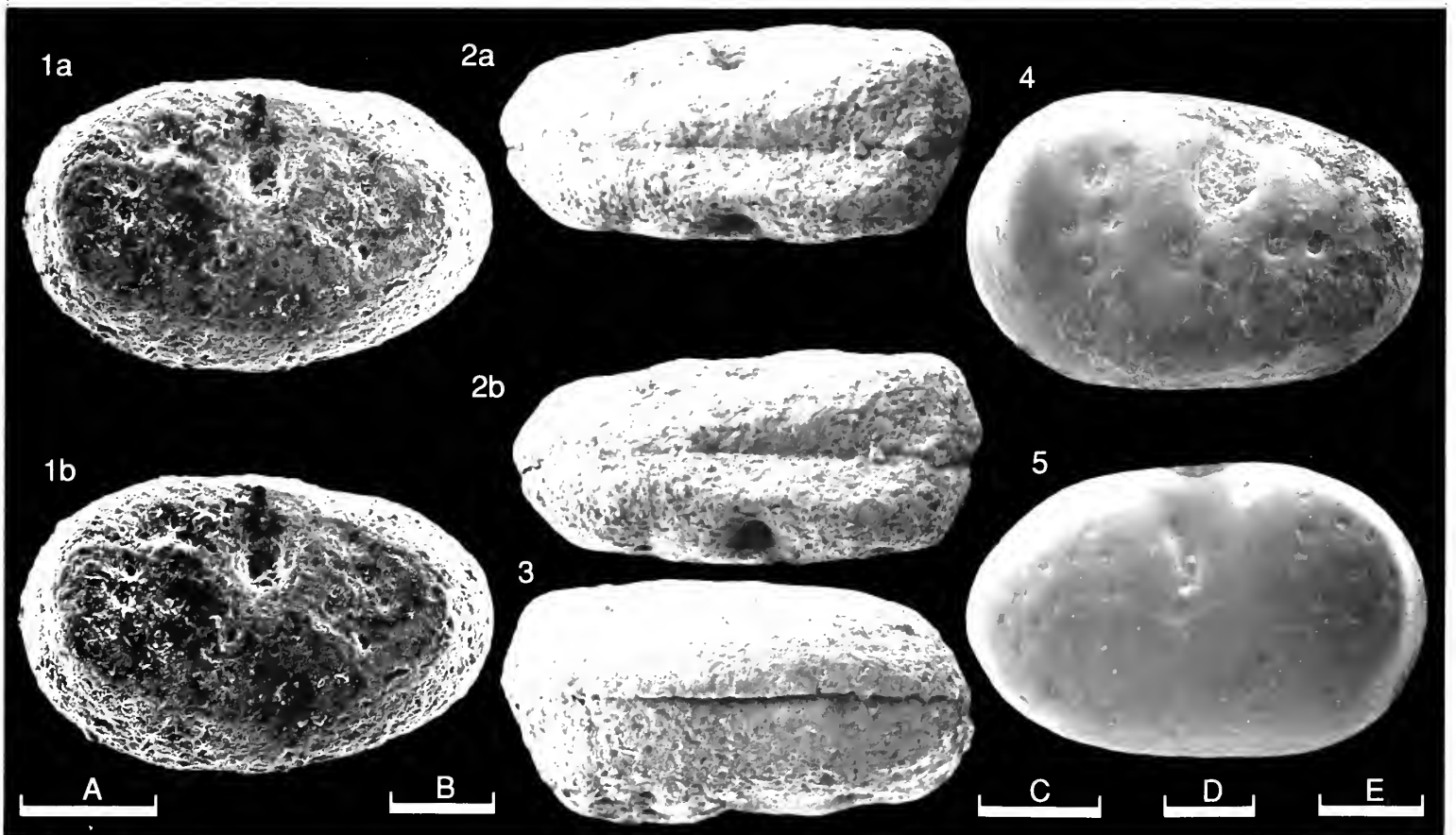
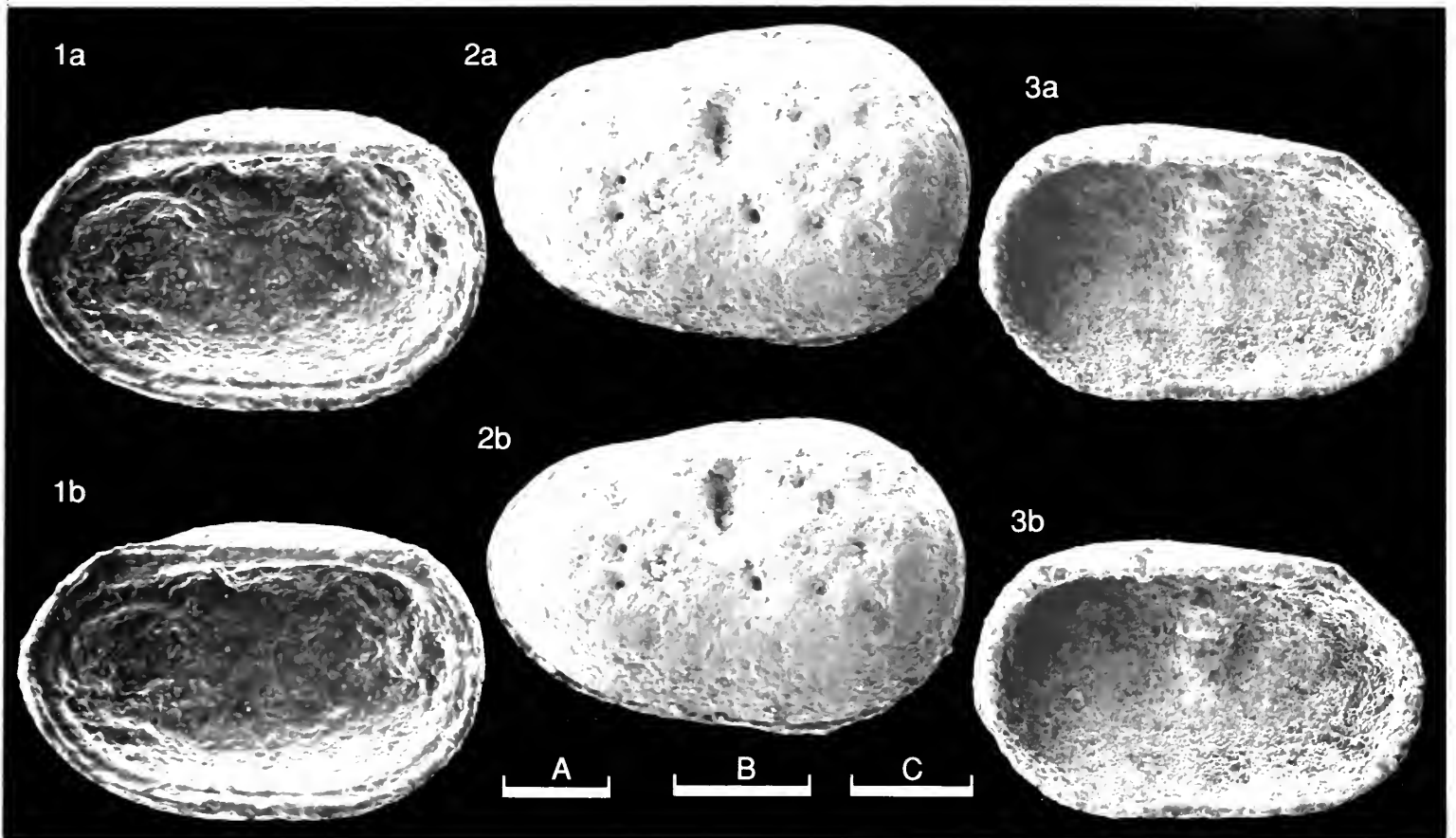
- Remarks (cont.):* type-species and its subjective synonyms. *Primitia humilis* Jones & Holl, 1886 and *Primitia fabulina* Jones & Holl, 1886 (both *Ann. Mag. nat. Hist.*, (5), **17**) are not considered to be members of the genus. However, the unrevised *Primitia bonnemai* Swartz, 1936 (*J. Paleont.*, **10**), from the Wenlock Series Mulde Beds of Gotland, Sweden, is a potential member of the genus *Columatia*.
The genus occurs in the Silurian Wenlock and Ludlow series of the Welsh Borderland of England.

Columatia variolata (Jones & Holl, 1865)

- 1865 *Primitia variolata*, sp. nov. T. R. Jones & H. B. Holl, *Ann. Mag. nat. Hist.*, (3), **16**, 418, pl. 13, figs. 6a., b. (= BMNH I 2073).
1865 *Primitia variolata*, var. *paucipunctata*. T. R. Jones & H. B. Holl, *Ann. Mag. nat. Hist.*, (3), **16**, 419, pl. 13, figs. 6c, d (= BMNH I 2090).
1886 *Primitia paucipunctata*, Jones & Holl; T. R. Jones & H. B. Holl, *Ann. Mag. nat. Hist.* (5), **17**, 409, pl. 14, figs. 3a, b (= BMNH In 52421 and In 52420 respectively).
1988 "*Primitia*" *variolata* Jones & Holl; R. F. Lundin, in: T. Hanai *et al.* (eds.), *Evolutionary Biology of Ostracoda, Develop. Palaeont. Stratigr.*, Amsterdam, **11**, 1052, 1055, pl. 1, fig. 8, pl. 2, figs. 3, 5, 7, 9.
Lectotype: British Museum (Nat. Hist.) no. I 2073; left valve exposed on matrix. Lectotype designated herein; from H. B. Holl collection. Specimen illustrated by Jones & Holl, 1865, pl. 13, figs. 6a, b.
Type locality: According to Jones & Holl (1865, 419) the type specimen is from the Silurian "Woolhope Limestone, west of the Wych, Malvern". However, for reasons given below (see Remarks), we do not believe that the lectotype is from the (basal Wenlock) Woolhope Limestone Formation. British Museum (Nat. Hist.) register data for the lectotype is: "Woolhope Limestone, Malvern Tunnel".

Explanation of Plate 16, 32

Fig. 1, RV, ext. lat. (ASU X-107, 770 μ m long); fig. 2, car., ext. dors. (ASU X-106, 902 μ m long); fig. 3, car., ext. vent. (ASU X-81, 789 μ m long); fig. 4, RV, ext. lat. (BMNH I 2090, 1000 μ m long); fig. 5, LV, ext. lat. (lectotype, BMNH I 2073, 760 μ m long).
Scale A (200 μ m; \times 85), fig. 1; scale B (200 μ m; \times 73), fig. 2; scale C (200 μ m; \times 84), fig. 3; scale D (200 μ m; \times 64), fig. 4; scale E (200 μ m; \times 84), fig. 5.



Figured specimens: Arizona State University (ASU), Department of Geology nos. **X-85** (RV: Pl. 16, 30, fig. 1), **X-105** (car.: Pl. 16, 30, fig. 2), **X-84** (LV: Pl. 16, 30, fig. 3), **X-107** (RV: Pl. 16, 32, fig. 1), **X-106** (car.: Pl. 16, 32, fig. 2), **X-81** (car.: Pl. 16, 32, fig. 3). British Museum (Nat. Hist.) nos. **I 2090** (RV exposed: Pl. 16, 32, fig. 4), **I 2073** (lectotype, LV exposed: Pl. 16, 32, fig. 5).

X-81, 84, 85, 106 and 107 are from the Much Wenlock Limestone Formation at Lincoln Hill near Ironbridge, Shropshire, England; approx. lat. 52° 38' N, long. 2° 30' W. **X-105** is from the Farley Member, Coalbrookdale Formation at Harley Hill, 1.2 km W of Much Wenlock, Shropshire; approx. lat. 52° 36' N, long. 2° 34' W. **I 2090** (= Jones & Holl 1865, *op. cit.*, pl. 13, figs. 6c, d) is reported from "Woolhope Limestone, west of the Wych, Malvern" and **I 2073** from "Woolhope Limestone, Malvern Tunnel" (see Remarks); approx. lat. 52° 05' N, long. 2° 20' W; both Hereford & Worcester. All specimens Wenlock Series, Silurian.

Diagnosis: As for the genus. *Columatia* is currently monotypic. For dimensions see Text-fig. 1.

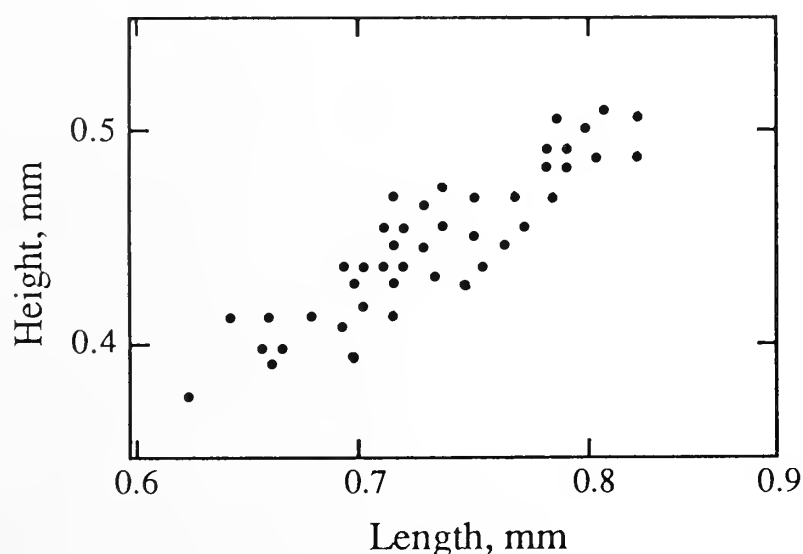
Remarks: The size, depth and number of puncta on the lateral surface of the valve is variable. In some cases this variation is due to factors of preservation. Valve height-length ratio also is variable but is not obviously sex-related.

Jones & Holl (1865, *op. cit.*) reported this species from the "Woolhope Limestone, west of the Wych, Malvern", Hereford & Worcester. However, we believe that their collections must have come from the Much Wenlock Limestone Formation of that area because dozens of our samples from the lower Wenlock strata of the Welsh Borderland, including the Woolhope Limestone Formation in the Malvern Hills area and its coeval equivalents throughout the Welsh Borderland, have not yielded a single specimen of this species. On the other hand, the species is common in the Much Wenlock Limestone Formation both in Shropshire and other samples of upper Wenlock strata from numerous localities in the Malvern Hills area of the Welsh Borderland.

The specimens of *C. variolata* figured under *Primitia paucipunctata* Jones & Holl by Jones & Holl in 1886 (*op. cit.*, pl. 14, figs. 3a, b) are British Museum (Nat. Hist.) specimens **In 52421** and **In 52420** respectively.

Distribution: Known from numerous samples from many Silurian localities throughout the central and northern Welsh Borderland area. Found in the upper part of the Coalbrookdale Formation and the Much Wenlock Limestone Formation; Homerian Stage, Wenlock Series. Also ranges into the overlying Lower Elton Formation, Ludlow Series.

Acknowledgements: The authors gratefully acknowledge NATO support for their collaborative research programme. R. F. Lundin also thanks the College of Liberal Arts and Science, Arizona State University for its support.



Text-fig. 1. Size dispersion diagram of 44 left valves of *C. variolata* from a single sample (RFL no. 13, ASU X-108), from Lincoln Hill, near Ironbridge, Shropshire, England.

ON MICROCHEILINELLA DISTORTA (GEIS)

by Robert F. Lundin
(Arizona State University, Tempe, U.S.A.)

Genus *MICROCHEILINELLA* Geis, 1933

Type-species (by original designation): *Microcheilus distortus* Geis, 1932

Diagnosis: Bairdiacean genus with distinctly asymmetrical carapace. left valve overlaps right along entire free margin; maximum width posterior, width nearly as great or greater than height. Shell without tubules. Hinge straight and essentially parallel to longitudinal axis of carapace.

Remarks: Lundin (in: T. Hanai et al. (eds.), *Evolutionary Biology of Ostracoda, Develop. Palaeont. Stratigr., Amsterdam*, **11**, 145–157, 1988) has discussed in detail the difference between *Microcheilinella* and *Tubulibairdia* Swartz, 1936. Whether species with calcified inner lamellae are members of *Microcheilinella*, as reported by Gramm (*Paleont. J.*, **9**, 354–360, 1975), is a question of taxonomic significance placed on that particular character. In contrast to what Shaver (in: R. C. Moore (ed.), *Treatise Invert. Paleontol.*, Pt. **Q** (3), 387, 1961) thought, the type-species of *Microcheilinella* does not have calcified inner lamellae.

Microcheilinella distorta (Geis, 1932)

1932 *Microcheilus distortus* sp. nov.; H. L. Geis, *J. Palaeont.*, **6**, 182, pl. 25, figs. 15a, b.

1933 *Microcheilinella distorta* (Geis); H. L. Geis, *J. Paleont.*, **7**, 112.

1934 *Microcheilinella distorta* (Geis); R. S. Bassler & B. Kellett, *Geol. Soc. Amer. Spec. Paper*, **1**, 42, fig. 20:5.

1960 *Microcheilinella distorta* (Geis); I. G. Sohn, *U.S. Geol. Surv. Prof. Paper*, **330-A**, 75, pl. 5, fig. 13.

1961 *Microcheilinella distorta* (Geis); R. H. Shaver, in: R. C. Moore (ed.), *Treatise Invert. Paleontol.*, Pt. **Q** (3), 387, figs. 310A:3, 310B:3.

1988 *Microcheilinella distorta* (Geis); R. F. Lundin, in: T. Hanai et al. (eds.), *Evolutionary Biology of Ostracoda, Develop. Palaeont. Stratigr., Amsterdam*, **11**, 152, pl. 2, figs. 1–10, 17, 18, 22.

Explanation of Plate 16, 36

Fig. 1, 2 (holotype, **UI M366**, 675 μm long); fig. 1, car., ext. rt. lat.; fig. 2, car., ext. lt. lat. Figs. 3, 4 (paratype, **UI M367a**, 675 μm long); fig. 3, car., ext. rt. lat.; fig. 4, car., ext. lt. lat. Scale (200 μm ; $\times 89$), figs. 1–4.

Stereo-Atlas of Ostracod Shells 16, 37

Microcheilinella distorta (3 of 4)

Holotype: Department of Geology, University of Illinois, Urbana, Illinois (UI), U.S.A. no. **M366**; carapace.

[Paratypes: Three known; two are illustrated herein (**M367a** and **M367b**), the third has been sectioned (see Lundin, *op. cit.*, pl. 2, figs. 6–10, 17)].

Type locality: Railroad cut at Spergen Hill, Norris, Washington County, Indiana, U.S.A.; approximately lat. 38° 36' N, long. 86° 00' W. Salem Limestone, Visean Series, Carboniferous.

Figured specimens: Department of Geology, University of Illinois, Urbana (UI), nos. **M366** (holotype, car.: Pl. 16, 36, figs. 1, 2), **M367a** (paratype, car.: Pl. 16, 36, figs. 3, 4; Pl. 16, 38, fig. 1), **M367b** (paratype, car.: Pl. 16, 38, figs. 2–5). All topotype specimens.

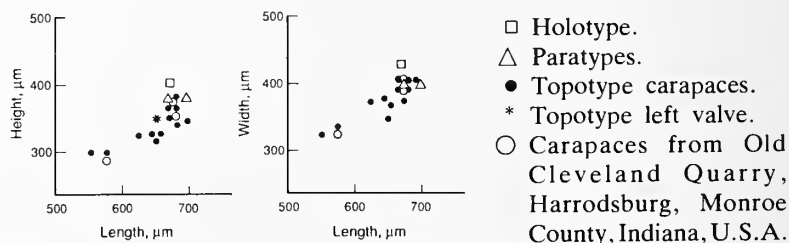
Diagnosis: *Microcheilinella* species with dorsum and venter essentially parallel as viewed laterally. Small, width greater than height, maximum width distinctly posterior to midlength. Hinge channel poorly developed; bow-shaped projection poorly to moderately developed. Surface smooth; tubules and calcified inner lamellae not present. Muscle scars unknown.

Remarks: Lundin's (*op. cit.*) discussion is pertinent to our understanding of the shell structure and contact margin features of the species.

Distribution: Known only from the type locality and three others in that area (Geis 1932, *op. cit.*).

Acknowledgements: Support of the College of Liberal Arts and Sciences, Arizona State University and from NATO is gratefully acknowledged.

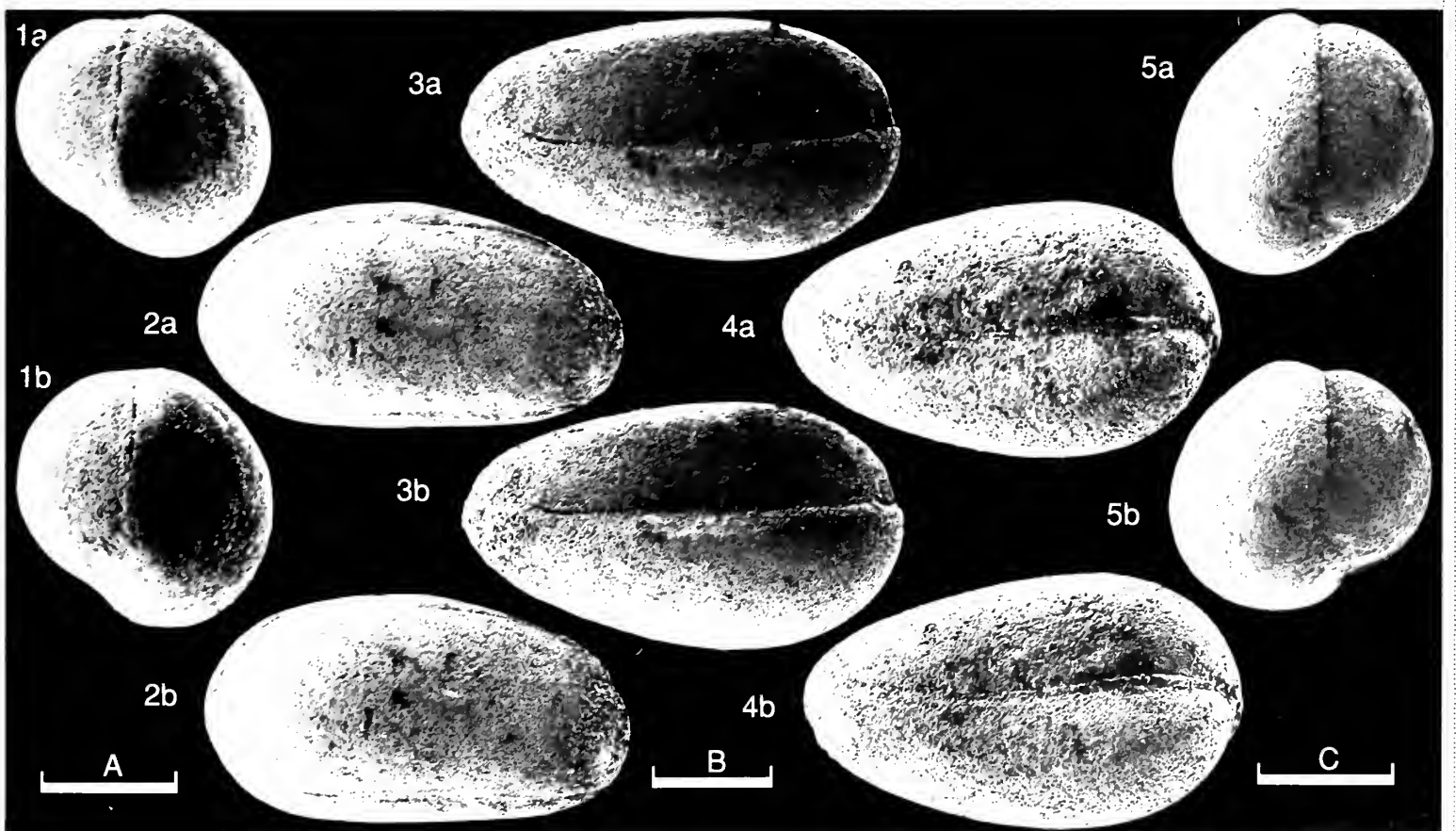
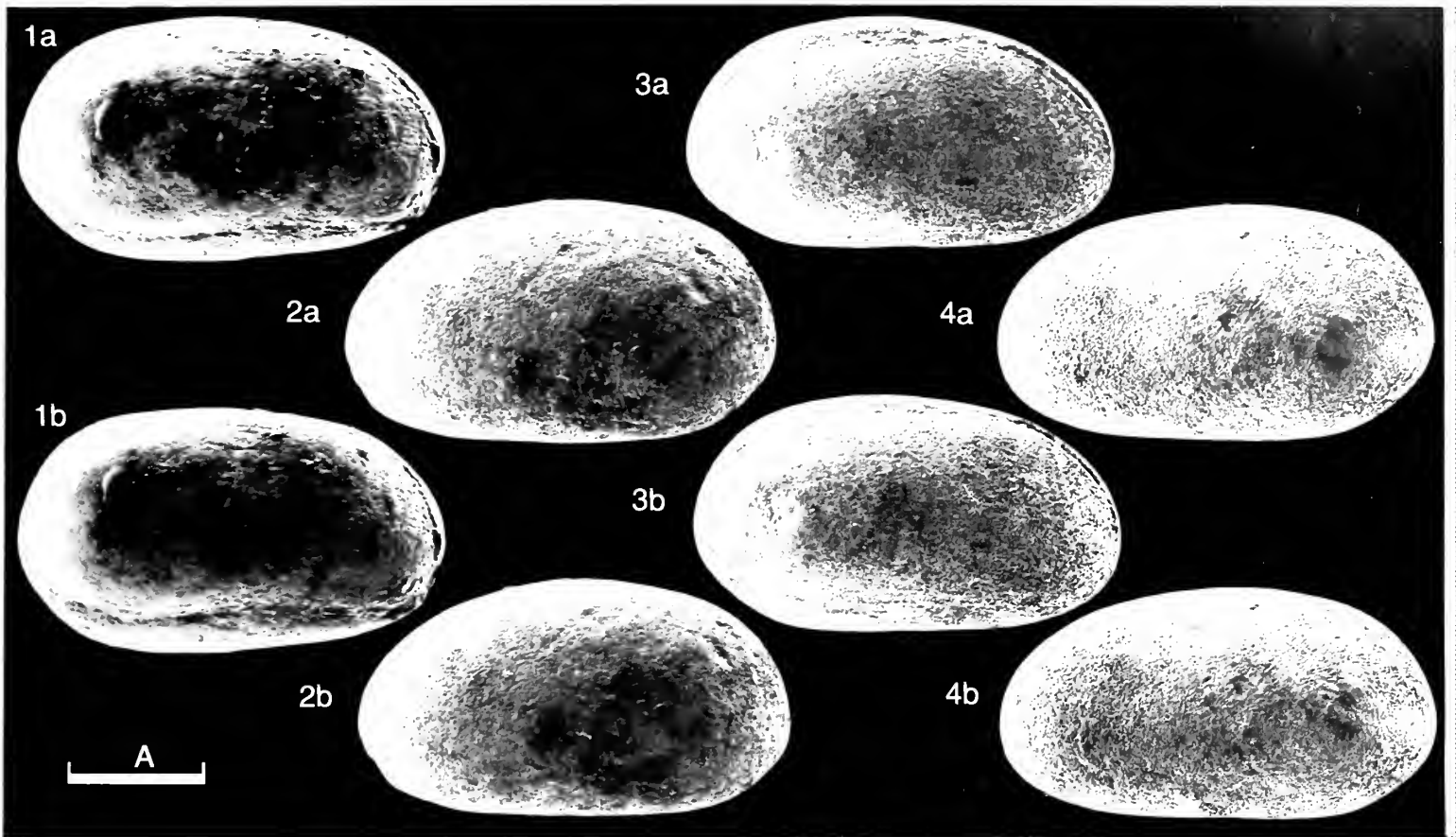
Text-fig. 1 Size dispersion diagrams for 18 carapaces and one left valve of *M. distorta*.



Explanation of Plate 16, 38

Fig. 1, car., ext. ant. (paratype, **UI M367a**, 400 μm wide). Figs. 2–5 (paratype, **UI M367b** 700 μm long): fig. 2, car., ext. rt. lat.; fig. 3, car., ext. dors.; fig. 4, car., ext. vent.; fig. 5., ext. post.

Scale A (200 μm ; $\times 90$), figs. 1, 5; scale B (200 μm ; $\times 85$), fig. 2; scale C (200 μm ; $\times 87$), figs. 3, 4.



ON *SINESSITES HISPANICUS* BECKER

by Gerhard Becker
(University of Frankfurt, German Federal Republic)

Genus *SINESSITES* Becker, 1981

Type-species (by original designation): *Sinellites hispanicus* Becker, 1981

Diagnosis: Unilobate amphissitid genus with distinct subcentral node, but without dorsal surface (“dorsal shield”) or lateral structures (shoulders, lateral carinae). 1–2 adventral structures developed; in lateral view the velum curves above the dorsum at both cardinal angles.

Distribution: Western Europe; Frasnian, Upper Devonian.

Sinellites hispanicus Becker, 1981

1981 *Sinellites hispanicus* sp. nov. G. Becker, *Palaeontographica*, A, 173, 30, tab. 2, pl. 2, figs. 13–24.

1982 *Sinellites hispanicus* Becker; G. Becker, *Palaeontographica*, A, 178, tab. 2.

Holotype: Forschungs-Institut Senckenberg, Frankfurt am Main, German Federal Republic, no. SMF Xe 11191; an adult RV.

Explanation of Plate 16, 40

Fig. 1, adult RV, ext. lat. (holotype, SMF Xe 11191, 1070 μ m long). Figs. 2, 3, adult LV (paratype, SMF Xe 11195, 890 μ m long): fig. 2, adductor muscle scar; fig. 3, int. lat.
Scale A (300 μ m; \times 80), figs. 1, 3; scale B (100 μ m; \times 190), fig. 2.

Type locality: Natural outcrop at unnamed pass, S “Summit 1839m”, about 4km SW of Posada de Valdeón, Montó Region, Cantabrian Mountains, Provincia de León, N Spain; lat. 43° 04' N, long. 04° 54' W. Gray marls with limestone nodules, upper Cardaño Formation (do I), Frasnian, Upper Devonian.

Figured specimens: Forschungs-Institut Senckenberg (SMF), Frankfurt am Main, German Federal Republic, nos. SMF Xe 11191 (adult RV, holotype: Pl. 16, 40, fig. 1, Pl. 16, 42, figs. 1, 2), SMF Xe 11195 (adult LV, paratype: Pl. 16, 40, figs. 2, 3).

All of the figured specimens are topotype material.

Diagnosis: Thin-shelled, weakly reticulated *Sinellites* species with a small subcentral node. Inner carina only developed mid-ventrally. Lateral surface of the carapace has scattered papillae. Adductor muscle scar a distinct pit.

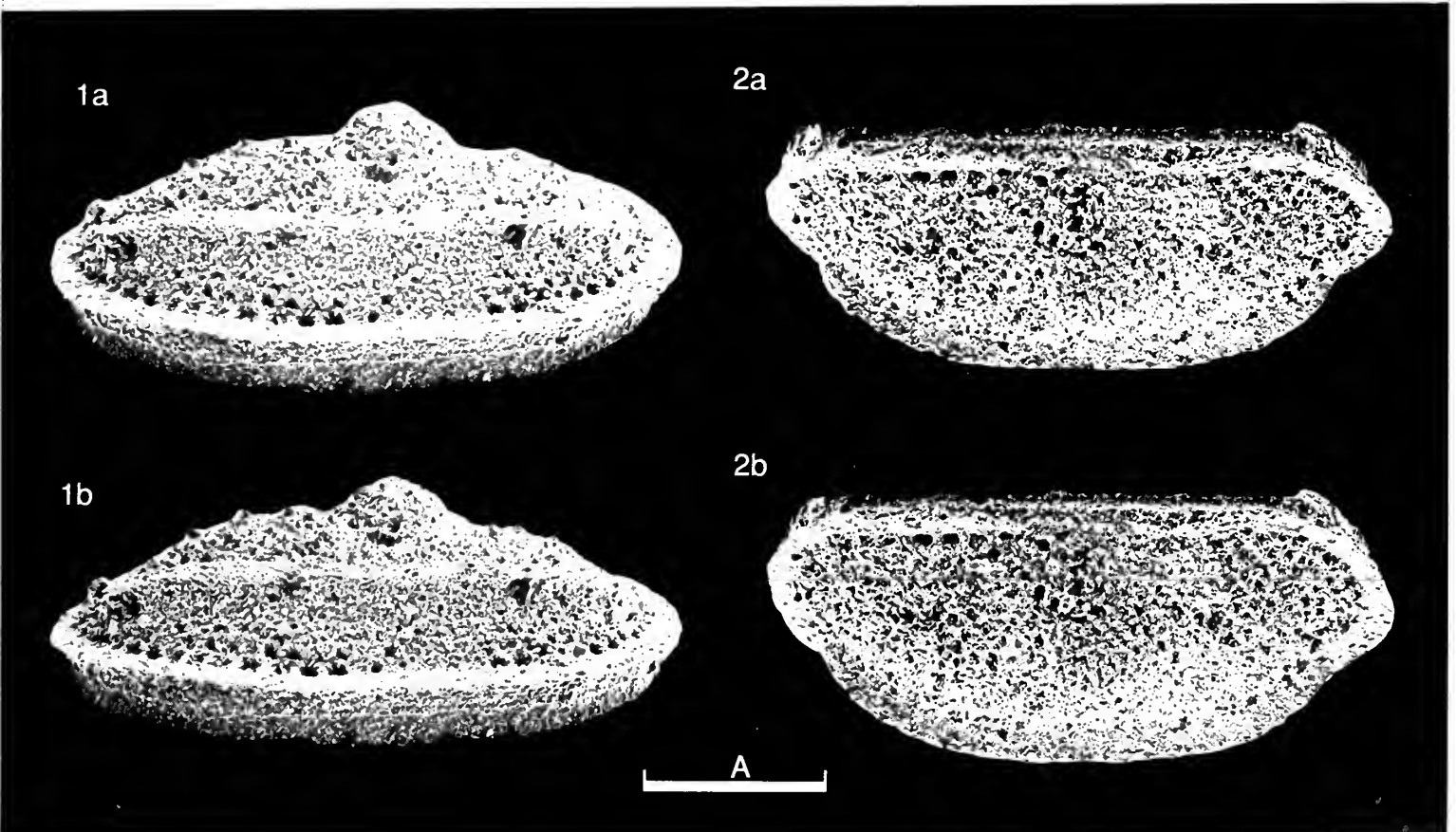
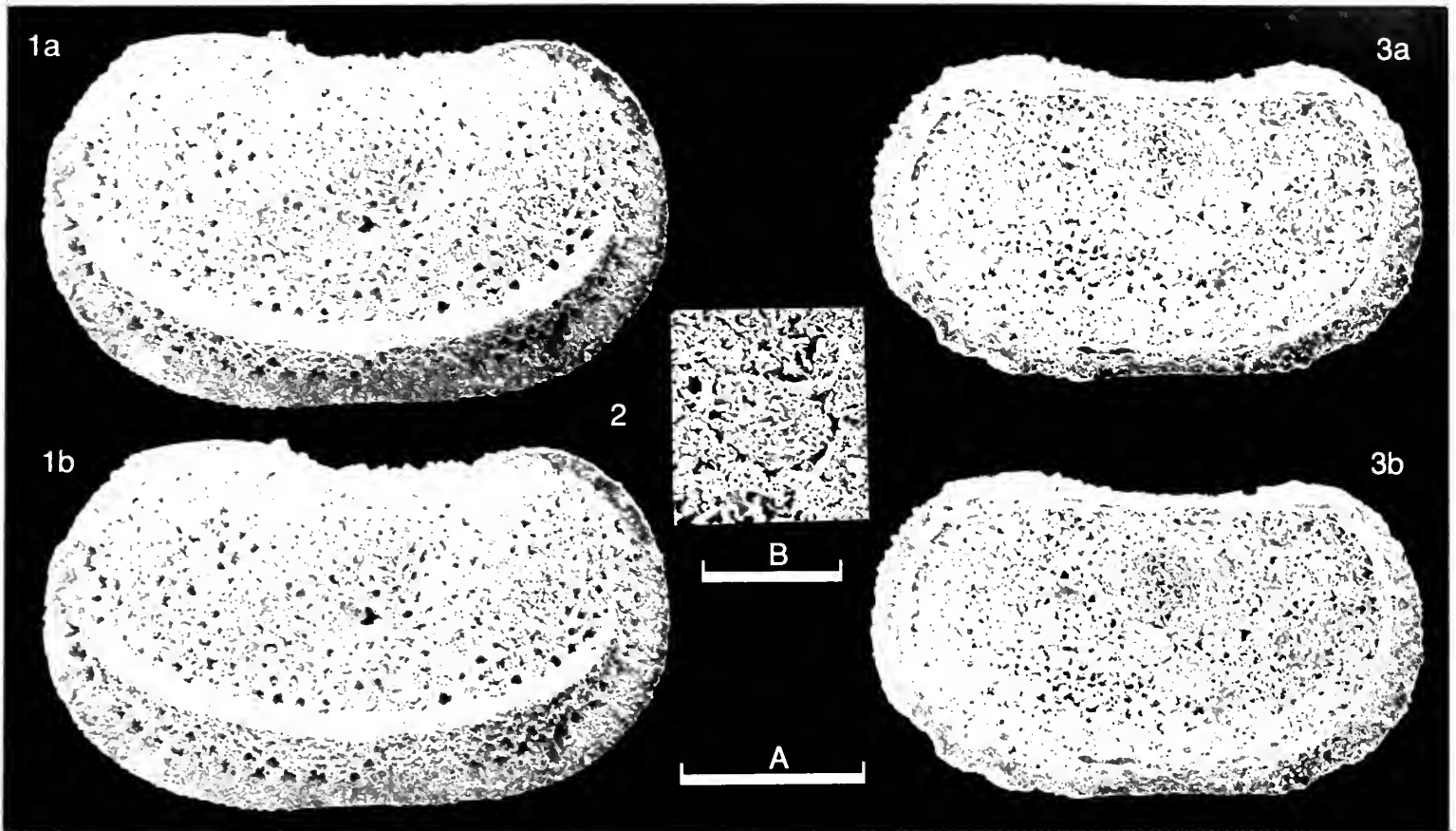
Remarks: *Sinellites hispanicus* resembles those species of *Amphissites* Girty, 1910 (= *Amphissitidae* Knight, 1928, Kirkbyacea Ulrich & Bassler, 1906, *Palaeocopida* Henningsmoen, 1953) with a comparatively small and ornamented subcentral node and which are abundant in the Upper Devonian and Lower Carboniferous of Central Europe. However, the lateral valve structures and the dorsal surface characteristics of *Amphissites* are lacking in *Sinellites*.

S. hispanicus is considered to be a benthic or perhaps even a nectobenthic species.

Distribution: Southern Cantabrian Mountains, N Spain; Upper Cardaño Formation, Frasnian, Upper Devonian.

Explanation of Plate 16, 42

Figs. 1, 2, adult RV (holotype, SMF Xe 11191, 1070 μ m long): fig. 1, ext. vent. obl.; fig. 2, ext. dors. obl.
Scale (300 μ m; \times 80), figs. 1, 2.



ON *KULLMANNISSITES KULLMANNI* BECKER

by Gerhard Becker
(University of Frankfurt, German Federal Republic)

Genus *KULLMANNISSITES* Becker, 1981

Type-species: (by original designation): *Kullmannissites kullmanni* Becker, 1981

Diagnosis: Unilobate amphissitid genus with comparatively small subcentral node and antero- and posterodorsal more or less conspicuous spines. 1–2 adventural structures (velum, carina) developed.

Distribution: Western and Central Europe; Frasnian–Famennian, Upper Devonian.

Kullmannissites kullmanni Becker, 1981

1981a *Kullmannissites kullmanni* sp. nov. G. Becker, *Palaeontographica*, A, 173, 31, 32, tab. 2, pl. 4, figs. 11–18.

1981b *Kullmannissites kullmanni* Becker; G. Becker, *Senckenberg. leth.*, 62, 181, text-fig. 3.

1982 *Kullmannissites kullmanni* Becker; G. Becker, *Palaeontographica*, A, 178, tab. 2.

Holotype: Forschungs-Institut Senckenberg, Frankfurt am Main, German Federal Republic, no. SMF Xe 11204; an adult LV.

Explanation of Plate 16, 44

Fig. 1, adult LV, ext. lat (holotype, SMF Xe 11204, 1270 μm long). Figs. 2, 3, adult RV, (paratype, SMF Xe 11210, 1260 μm long): fig. 2, adductor muscle scar; fig. 3, int. lat.

Scale A (300 μm ; $\times 60$), figs. 1, 3; scale B (100 μm ; $\times 150$), fig. 2.

Type locality: Natural outcrop at E side of “Collado de Anzo”, about 4 km SW of Posada de Valdeón, Montó Region, Cantabrian Mountains, Provincia de León, N Spain; lat. 43°04' N, long. 04°54' W. Yellowish marls with limestone nodules, Vidrieros Formation (do III–IV), Famennian, Upper Devonian.

Figured specimens: Forschungs-Institut Senckenberg (SMF), Frankfurt am Main, German Federal Republic, nos. SMF Xe 11204 (adult LV, holotype: Pl. 16, 44, fig. 1; Pl. 16, 46, figs. 1, 2), SMF Xe 11210 (adult RV, paratype: Pl. 16, 44, figs. 2, 3). Geologisch-Paläontologisches Institut, Frankfurt am Main (GPIF), no. GPIF Cr 14/12 (adult RV, paratype: Pl. 16, 46, fig. 3).

All of the figured specimens are topotype material.

Diagnosis: Thin-shelled, weakly reticulate *Kullmannissites* species. Subcentral node indistinct and flat, button-like. Only velar structure developed and posterodorsally confluent with large spine; also a large anterior spine. Site of muscle scar represented externally by a deep pit.

Remarks: *Kullmannissites kullmanni* Becker, 1981 belongs to the family Amphissitidae Knight, 1928 (Kirkbyacea Ulrich & Bassler, 1906, Palaeocopida Henningsmoen, 1953). The nearest related species are *Limbatula* [= *Kullmannissites*] *mediocera* Blumenstengel, 1965, with a spinose node, and *Amphissites* [= *Kullmannissites*] *bispinosus* Blumenstengel, 1965, with an inner carina. Both are from the Upper Devonian (do I and do III, respectively) of the Thuringian Schiefergebirge, Germany. Also similar but having only a posterodorsal spine is *Kullmannissites* ? *solus* Becker, 1981, from do III–V of the S Cantabrian Mountains, N Spain, and most probably from do V of Moravia, Czechoslovakia.

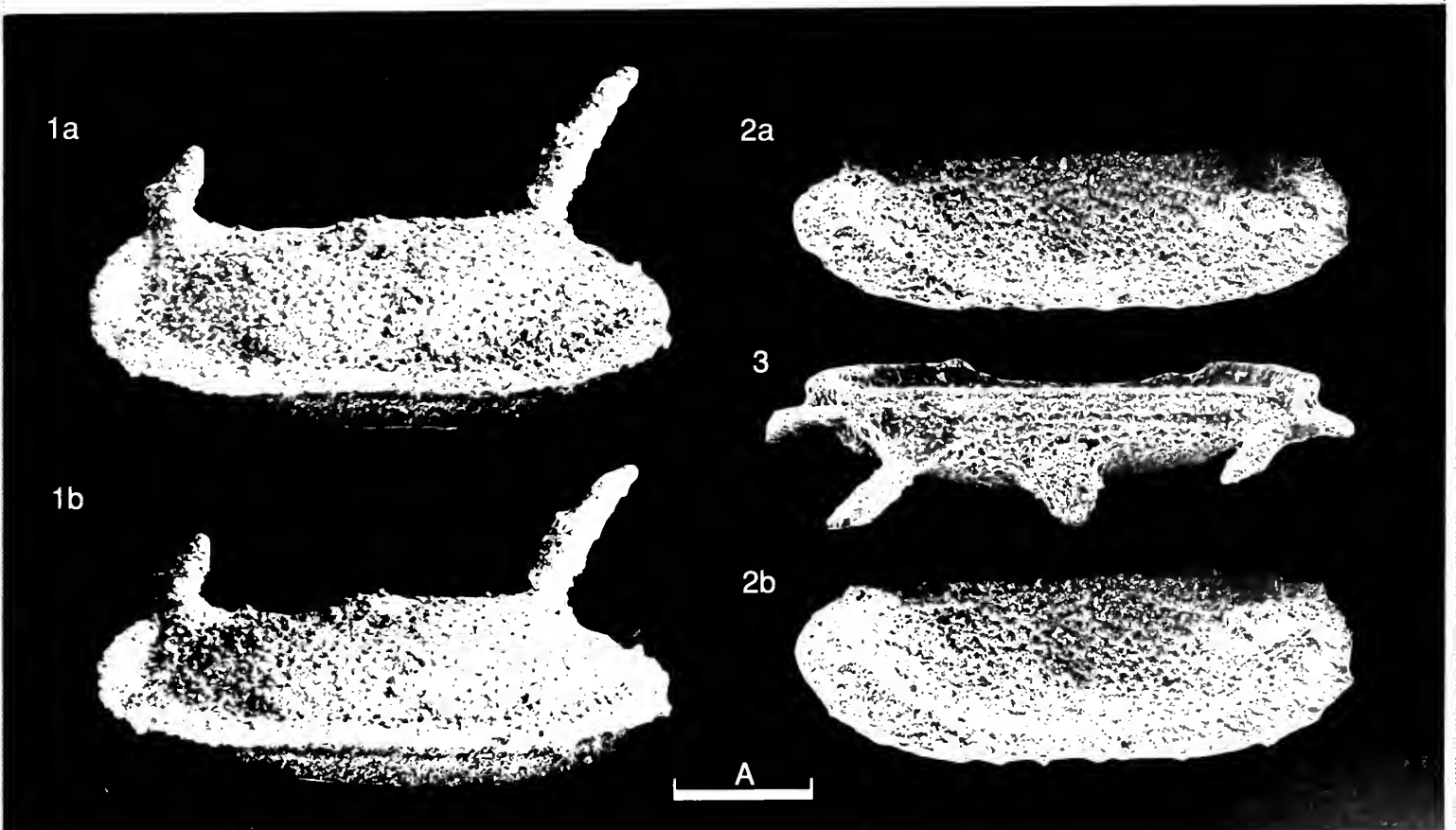
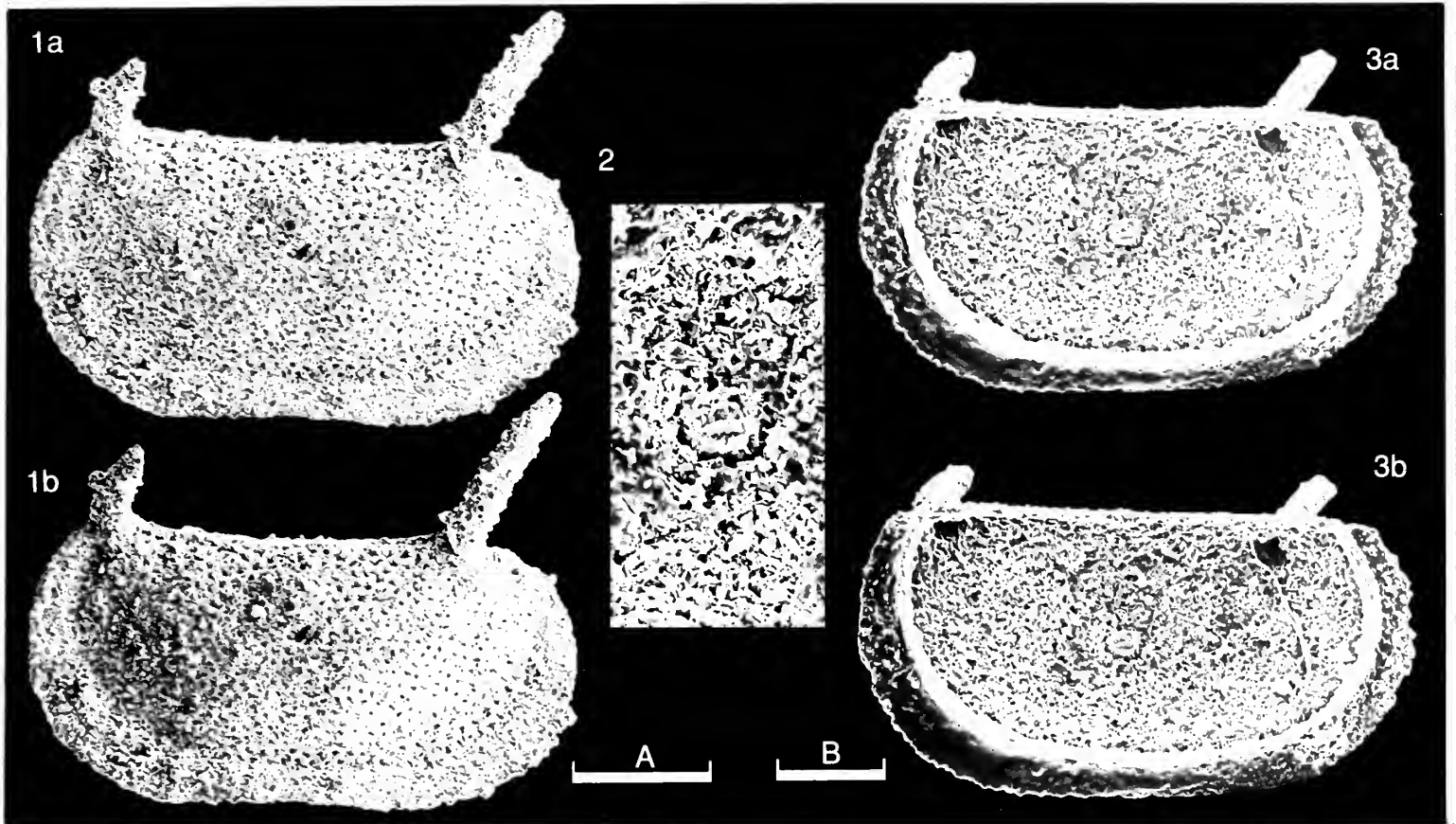
K. kullmanni is considered to be a nectobenthic species.

Distribution: Cantabrian Mountains, N Spain; Vidrieros Formation, Famennian, Upper Devonian.

Explanation of Plate 16, 46

Figs. 1, 2, adult LV (holotype, SMF Xe 11204, 1270 μm long): fig. 1, ext. vent. obl.; fig. 2, dors. obl. Fig. 3, adult RV, dors. (paratype, GPIF Cr 14/12, 1350 μm long).

Scale (300 μm ; $\times 60$), figs. 1–3.



ON *VITISSITES COMTEI* BECKER

by Gerhard Becker
(University of Frankfurt, German Federal Republic)

Genus *VITISSITES* Becker, 1981

Type-species (by original designation): *Vitissites comtei* Becker, 1981.

Diagnosis: Bilobate amphissitid (?) genus with inflated subcentral node on transversely broadened base and elongated, less conspicuous posteroventral node; only velar structure developed.

Distribution: W Europe; Upper Emsian, Lower Devonian.

Vitissites comtei Becker, 1981

1981 *Vitissites comtei* sp. nov. G. Becker, *Senckenberg. leth.*, **62**, 179, 180, text-fig. 2, pl. 1, figs. 1–9.

Holotype: Forschungs-Institut Senckenberg, Frankfurt am Main (SMF), German Federal Republic, no. **SMF Xe 12204**; an adult carapace.

Type locality: Road cut 1 km E the village of La Vid, upper Esla Valley, S Cantabrian Mountains, Provincia de León, N Spain; lat. 42° 50' N, long. 5° 38' W. Dark grey marls, La Vid Formation (unit 2), Upper Emsian, Lower Devonian.

Explanation of Plate 16, 48

Fig. 1, adult car., rt. lat. (holotype, **SMF Xe 12204**, 1380 µm long); fig. 2, juv. RV, ext. lat. (paratype, **GPIF Cr 15/1a**, 890 µm long); fig. 3, juv.? RV, ext. lat. (paratype, **SMF Xe 12206**, 1170 µm long).
Scale A (300 µm; ×48), figs. 1–3.

Figured specimens: Forschungs-Institut Senckenberg (SMF), Frankfurt am Main, German Federal Republic, nos. **SMF Xe 12204** (adult car., holotype: Pl. 16, 48, fig. 1), **SMF Xe 12206** (juv.? RV, paratype: Pl. 16, 48, fig. 3), **SMF Xe 12211** (adult RV, paratype: Pl. 16, 50, figs. 1–5). Geologisch-Paläontologisches Institut Frankfurt (GPIF), Frankfurt am Main, no. **GPIF Cr 15/1a** (juv. RV, paratype: Pl. 16, 48, fig. 2). All of the figured specimens are topotype material.

Diagnosis: Thick-shelled, smooth (?), preplete *Vitissites* species with an asymmetrical subcentral node on posteriorly elongated base and a comparatively low, long and curved posteroventral node; muscle scar a weak, smooth spot.

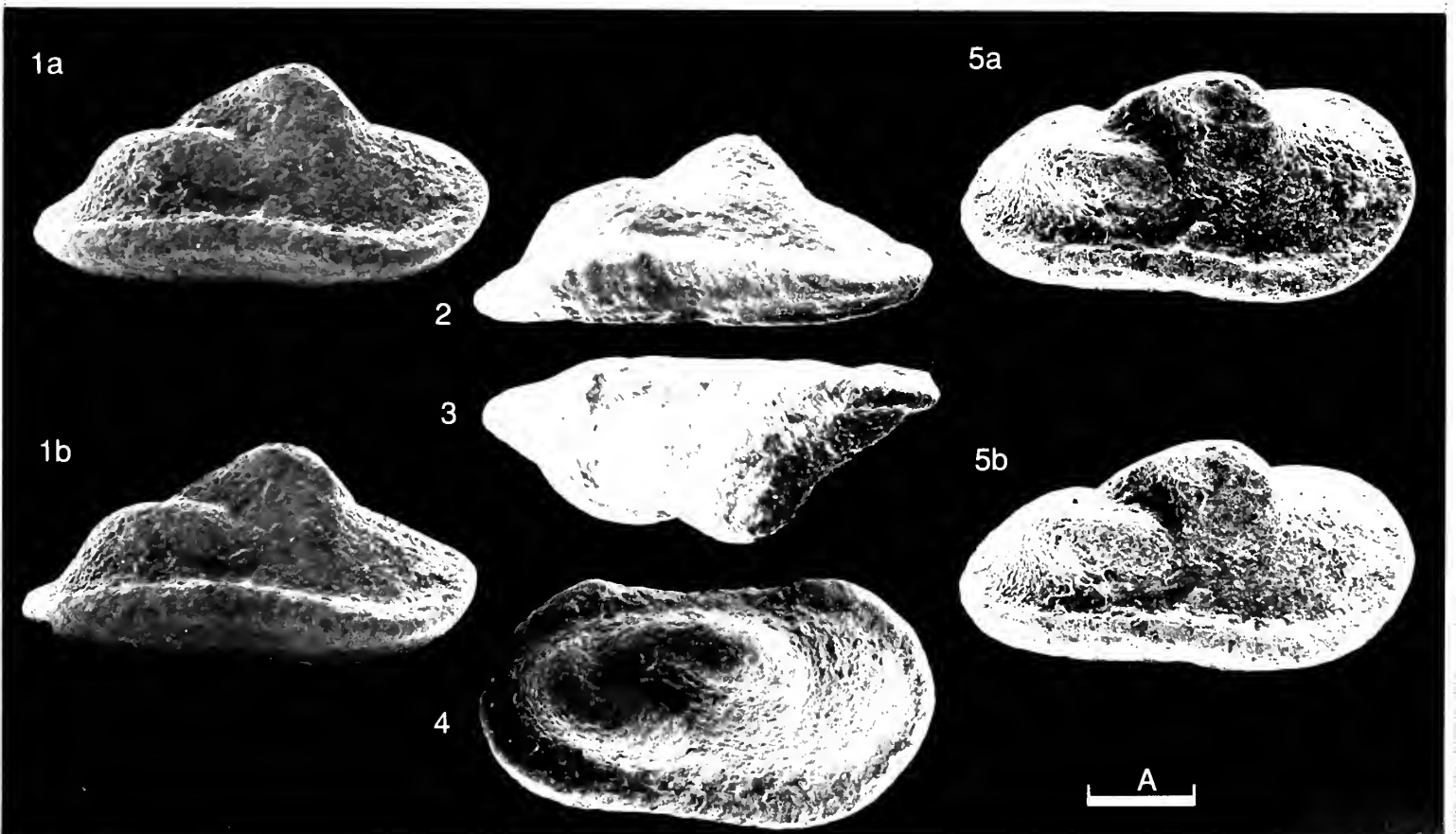
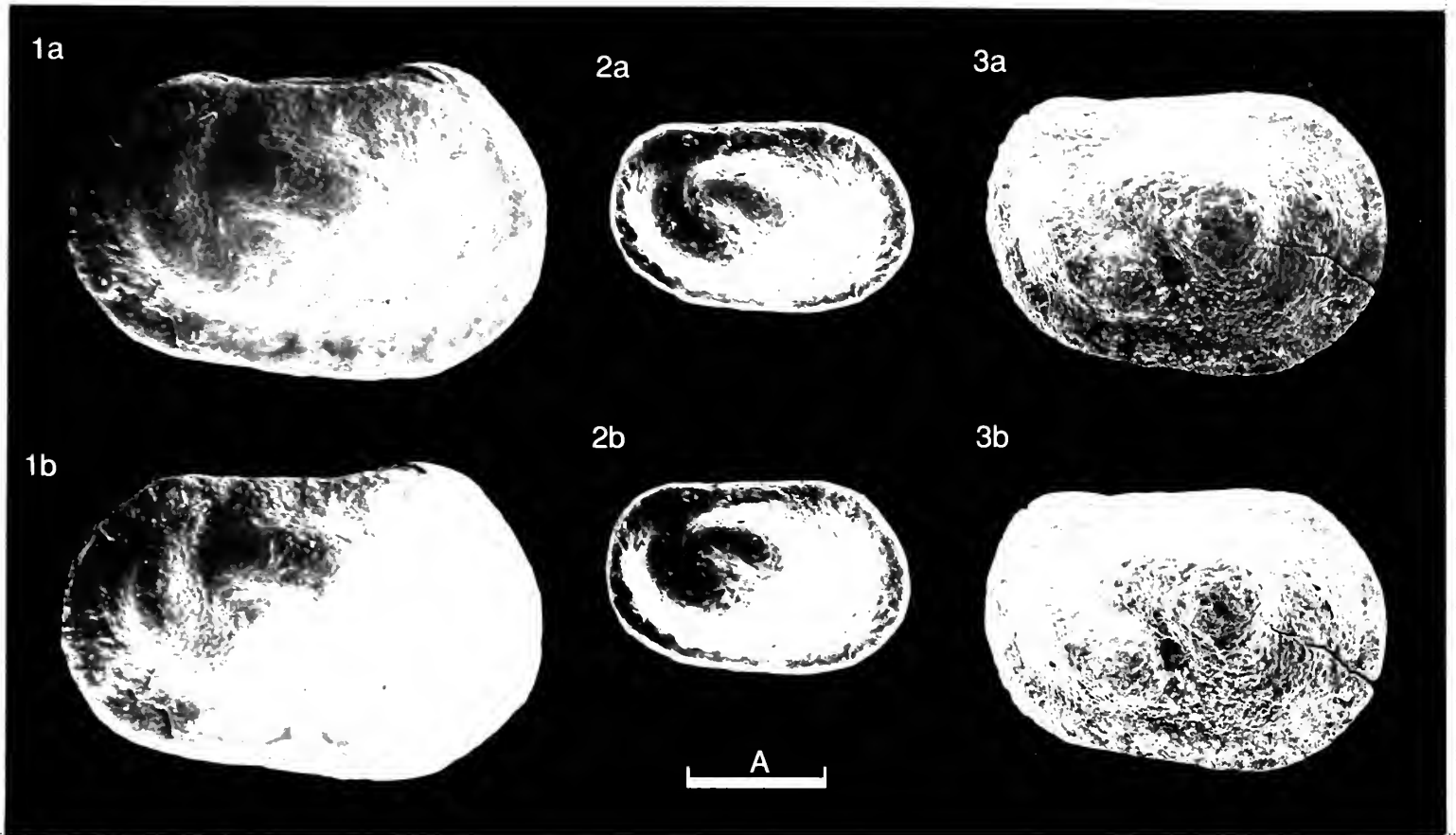
Remarks: *Vitissites comtei* Becker, 1981 was previously placed in the family Amphissitidae Knight, 1928 (Kirkbyacea Ulrich & Bassler, 1906, Palaeocopida Henningsmoen, 1953) by Becker (1981, 178) because of the transversely elongated, subcentrally situated node and (therefore) the lack of an S2. The orientation of the carapace seems a little difficult, but the higher end must be anterior (preplete outline) and the subcentral node is (as in Amphissitidae) situated in front of the valve mid-length.

The most closely related species is believed (Becker 1981, 178, 180) to be "*Kegelites*" *polonicus* Olempska, 1979 from the Middle Devonian (Givetian) of the Polish Mittelgebirge. The binodal nature of the carapace may reveal binodicopid (bolliid) ancestors. *V. comtei* is believed to be a benthic species.

Distribution: Cantabrian Mountains; La Vid Formation, Upper Emsian, Lower Devonian.

Explanation of Plate 16, 50

Figs. 1–5, adult RV (paratype, **SMF Xe 12211**, 1310 µm long): fig. 1, vent. obl.; fig. 2, vent.; fig. 3, dors.; fig. 4, ext. lat.; fig. 5, ext. lat. obl.
Scale A (300 µm; ×48), figs. 1–5.



ON *RISHONA EPICYPHA* (KESLING & KILGORE)

by Gerhard Becker & Franciszek Adamczak
(University of Frankfurt, German Federal Republic
& University of Stockholm, Sweden)

Genus *RISHONA* Sohn, 1960

Type-species (by original designation): *Bairdia gibbera* Kesling & Kilgore, 1952 [non Morey, 1935] = *Bairdia epicypha* Kesling & Kilgore, 1955.

Diagnosis: Thin-shelled, smooth and inequivalved podocopid (?) genus with long straight hinge and more or less convex free margin; left valve larger and overlapping right valve, especially mid-ventrally with large bow-shaped projection.

Distribution: Arctic and W Canada;? late upper Emsian, Lower Devonian; early Eifelian and Givetian, Middle Devonian. Michigan, U.S.A.; upper Eifelian, Middle Devonian. Holy Cross Mountains, Poland; early Eifelian, Middle Devonian. New South Wales, Australia; early Emsian, Lower Devonian.

Rishona epicypha (Kesling & Kilgore, 1955)

- 1952 *Bairdia gibbera* sp. nov. R. V. Kesling & J. E. Kilgore, *Contr. Mus. Paleont. Univ. Mich.*, **10**, 1, 14, pl. 4, figs. 9–17.
1955 *Bairdia epicypha* nom. nov. R. V. Kesling & J. E. Kilgore, *J. Paleont.*, **29**, 189.
1960 *Rishona epicypha* (Kesling & Kilgore); G. Sohn, *U.S. Geol. Surv. prof. Paper*, **330-A**, 79, pl. 5, figs. 22–26.
1973 *Rishona epicypha* (Kesling & Kilgore); F. Adamczak & M. Weyant, *Senckenberg. leth.*, **53**, 527–528, 532, pl. 2, fig. 2, text-figs. 6–7.

Explanation of Plate 16, 52

Fig. 1, adult car., rt. lat. (holotype, **MPUM 28024**, 1900 μm long); fig. 2, juv. car., rt. lat. (paratype, **MPUM 28020**, 1470 μm long); fig. 3, adult car., rt. lat. (paratype, **MPUM 28021**, 1970 μm long).
Scale A (300 μm ; $\times 35$), figs. 1–3.

Holotype: Museum of Paleontology, University of Michigan, Ann Arbor, Michigan, U.S.A., no. **28024**; an adult carapace.

Type locality: Road cut and ditch, West Long Lake Road, 0.5 mile S of LeRoy's Resort, Presque Isle County, Michigan, U.S.A.; lat. 45° 13' N, long. 83° 29' W. Dark gray shales, *Cyrtina umbonata alpenensis* beds, Genshaw Formation, upper Eifelian, Middle Devonian.

Figured specimens: Museum of Paleontology, University of Michigan (MPUM), Ann Arbor, Michigan, U.S.A., nos. **MPUM 28024** (adult car., holotype: Pl. 16, 52, fig. 1; Pl. 16, 54, figs. 5–6), **MPUM 28020** (juv. car., paratype: Pl. 16, 52, fig. 2; Pl. 16, 54, fig. 3), **MPUM 28021** (adult car., paratype: Pl. 16, 52, fig. 3; Pl. 16, 54, fig. 4), **MPUM 28023** (adult car., paratype: Pl. 16, 54, figs. 1–2).

All topotype material.

Diagnosis: *Rishona* species with carapace outline subtrapezoidal in lateral view, anterior margin gently rounded, posterior part of the carapace acuminate.

Remarks: Adamczak & Weyant (1973, *op. cit.*) gave an alternative, reversed (dorsal-ventral) orientation of the carapace, indicating the strong overlap of valves as being ventral in position (also other Podocopida, e.g. Pachydomellidae).

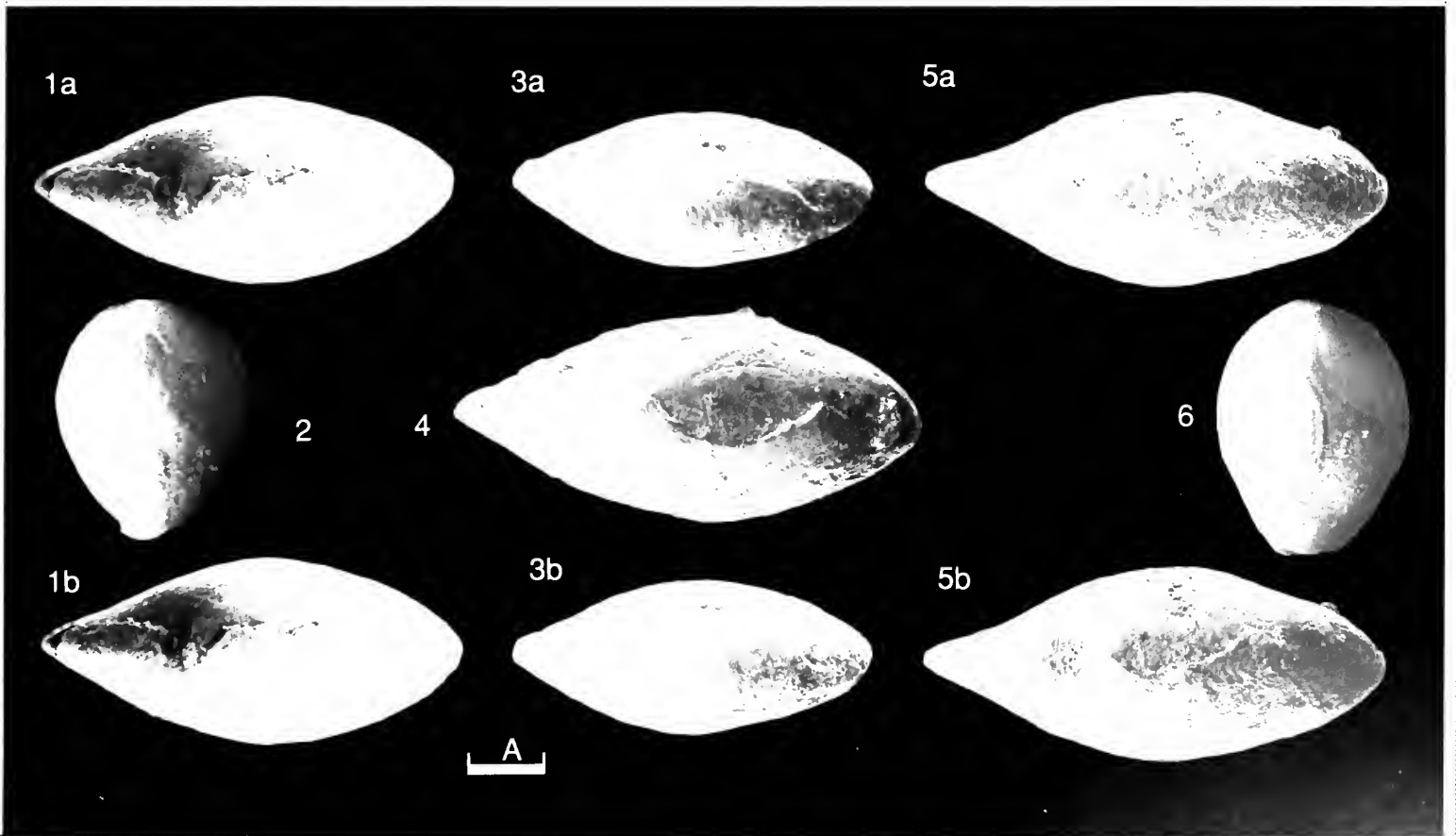
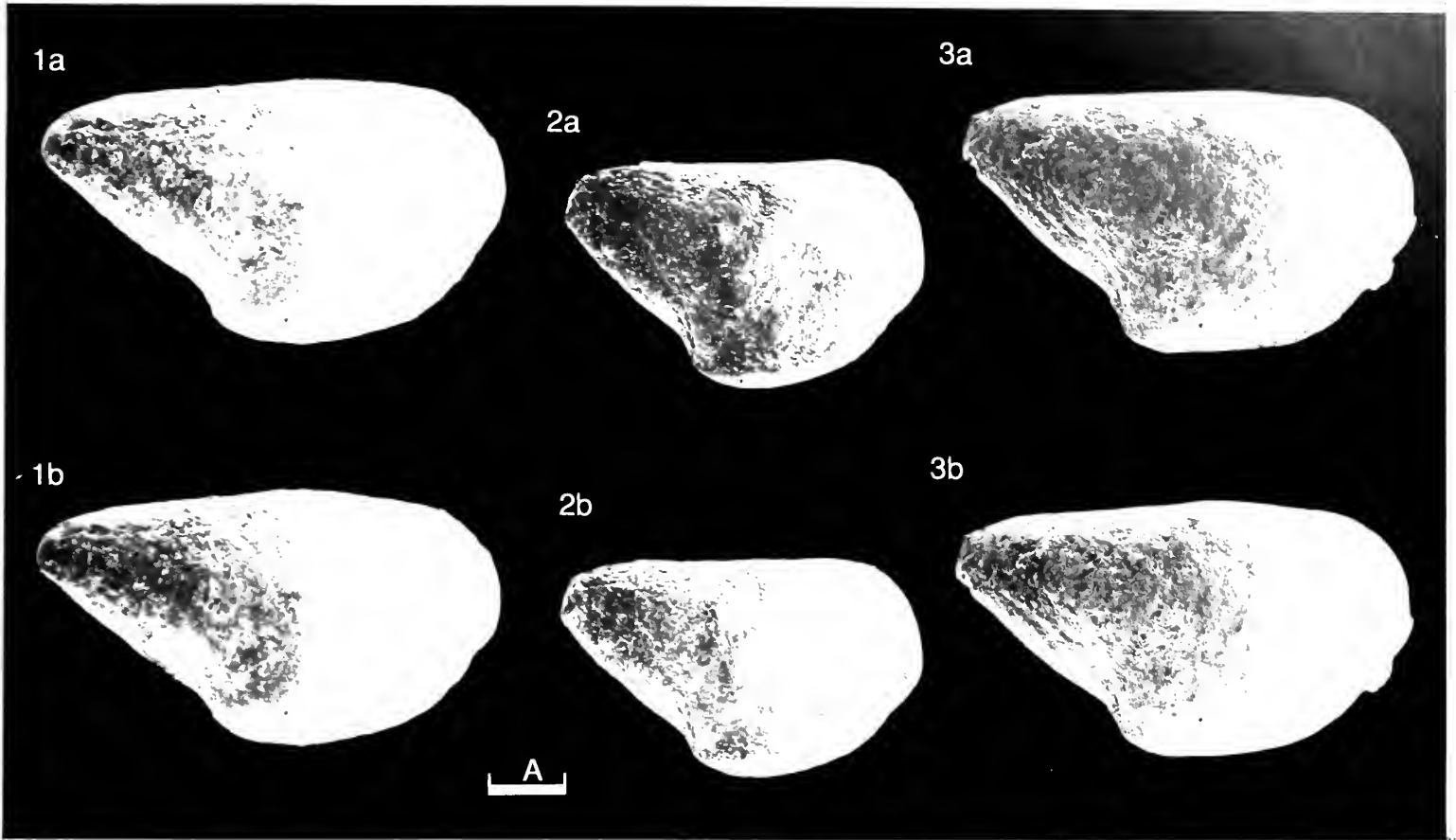
In *R. tumida* (Lower or Middle Devonian, Canadian Arctic Archipelago) Adamczak & Weyant reported vascular markings and domiciliar sexual dimorphism (1973, text-fig. 2, pl. 2, figs. 3, 4). The former had been believed to be (probable) blood canals, which interpretation was called in question by Sohn (*J. Res. U.S. geol. Surv.*, **2**, 6, 725, 1974).

The true systematic position of *Rishona* is not known (? Podocopida, incertae superfamili). Ecologically, *R. epicypha* is presumably a pelagic or at least a nectobenthic species.

Distribution: Canadian Arctic Archipelago, Ellesmere Island; Blue Fiord Formation, late upper Emsian or early Eifelian, Lower or Middle Devonian. Michigan, U.S.A.; Genshaw Formation, upper Eifelian, Middle Devonian.

Explanation of Plate 16, 54

Figs. 1–2, adult car. (paratype, **MPUM 28023**, 1730 μm long): fig. 1, vent.; fig. 2, post.; fig. 3, juv. car., vent. (paratype, **MPUM 28020**, 1470 μm long); fig. 4, adult car., vent. (paratype, **MPUM 28021**, 1970 μm long); figs. 5–6, adult car. (holotype, **MPUM 28024**, 1900 μm long): fig. 5; vent.; fig. 6 ant.
Scale A (300 μm ; $\times 35$), figs. 1–6.



ON *CHINOCYHERE CURVISPINATA* SU sp. nov.

by Su Deying

(Chinese Academy of Geological Sciences, Beijing, China & University of Hull, England)

Chinocythere curvispinata sp. nov.

Holotype: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, no. 8.22; adult LV.
Type locality: Beihuai Borehole X5 (Nanning No. 2), Nanning, Guangxi Province, S China (lat. 22° 50' N, long. 108° 19' E), depth 55–56 m. Plio-Pleistocene, non-marine.

Derivation of name: A reference to the prominent curved spines on the surface of the carapace.

Figured specimens: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, nos. 8.22 (holotype, LV: Pl. 16, 56, figs. 3, 4; Pl. 16, 58, fig. 1), 8.23 (RV: Pl. 16, 56, figs. 1, 2; Pl. 16, 58, figs. 2, 3).

No. 8.22 is from the type locality and horizon; no. 8.23 from Borehole X8 (Yongning No. 2), Yongning, Guangxi Province (lat. 22° 45' N, long. 108° 26' E), depth 63–64 m (Plio-Pleistocene).

Diagnosis: Carapace elongate rounded-triangular in lateral view, tapering strongly posteriorly; dorsal margin straight, marked anterior cardinal angle; posterior margin rounded, anterior margin rounded with infracurvature. Each valve with three curved, hollow spines, reticulate surface and shallow anterodorsal and centrodorsal sulci.

Explanation of Plate 16, 56

Figs. 1, 2, RV, (8.23, 550 μ m long): fig. 1, ext. lat.; fig. 2, dors.; figs. 3, 4, LV, (holotype, 8.22, 570 μ m long): fig. 3, dors.; fig. 4, ext. lat.

Scale A (100 μ m; \times 115), figs. 1–4.

Remarks: The genus *Chinocythere* Li & Lai, 1978, described from Eocene to Oligocene deposits of the coastal region of Bohai, is similar to *Limnocythere* Brady, 1868, but differs in having a hinge which in the right valve has two conical or peg-like teeth separated by a groove (this accommodates the margin of the left valve which forms a bar that expands slightly at each end (Pl. 16, 58, fig. 1)). In lateral view the valves taper more than in *Limnocythere* and tend to be thicker. The muscle scar pattern shows the vertical row of four adductors typical of the Limnocytheridae. The Cretaceous genus *Vlakomia* Gramm, 1966 agrees well in hinge structure but is much less elongate and has the tuberculate ornamentation concentrated in the ventral part of the valve.

The present species is probably closest to *C. validispinata* Hou & Shan, 1978 (*In*: Bojie (ed.), *Early Tertiary Ostracode Fauna from the Coastal Region of Bohai*, Science Press, Beijing, 151, pl. 71, figs. 2–5) in its hinge structure and general shape, but the latter differs in its small cone-shaped spine in the posterior part of the valve, two small short spines centroventrally and in the posterior sulcus extending to below mid-height. *C. curvispinata* also has some affinity with *C. quadrinodosa* Geng & Shan, 1978 (*In*: Bojie, *op. cit.*, 161, pl. 78, fig. 3) in hinge structure and number of spines, but Geng & Shan's species has a subrectangular shell in side view, the posterior sulcus extends ventrally to below mid-height, there is a short spine at the anterior cardinal angle, two thick spines centroventrally and a few weakly-developed anterior marginal denticles.

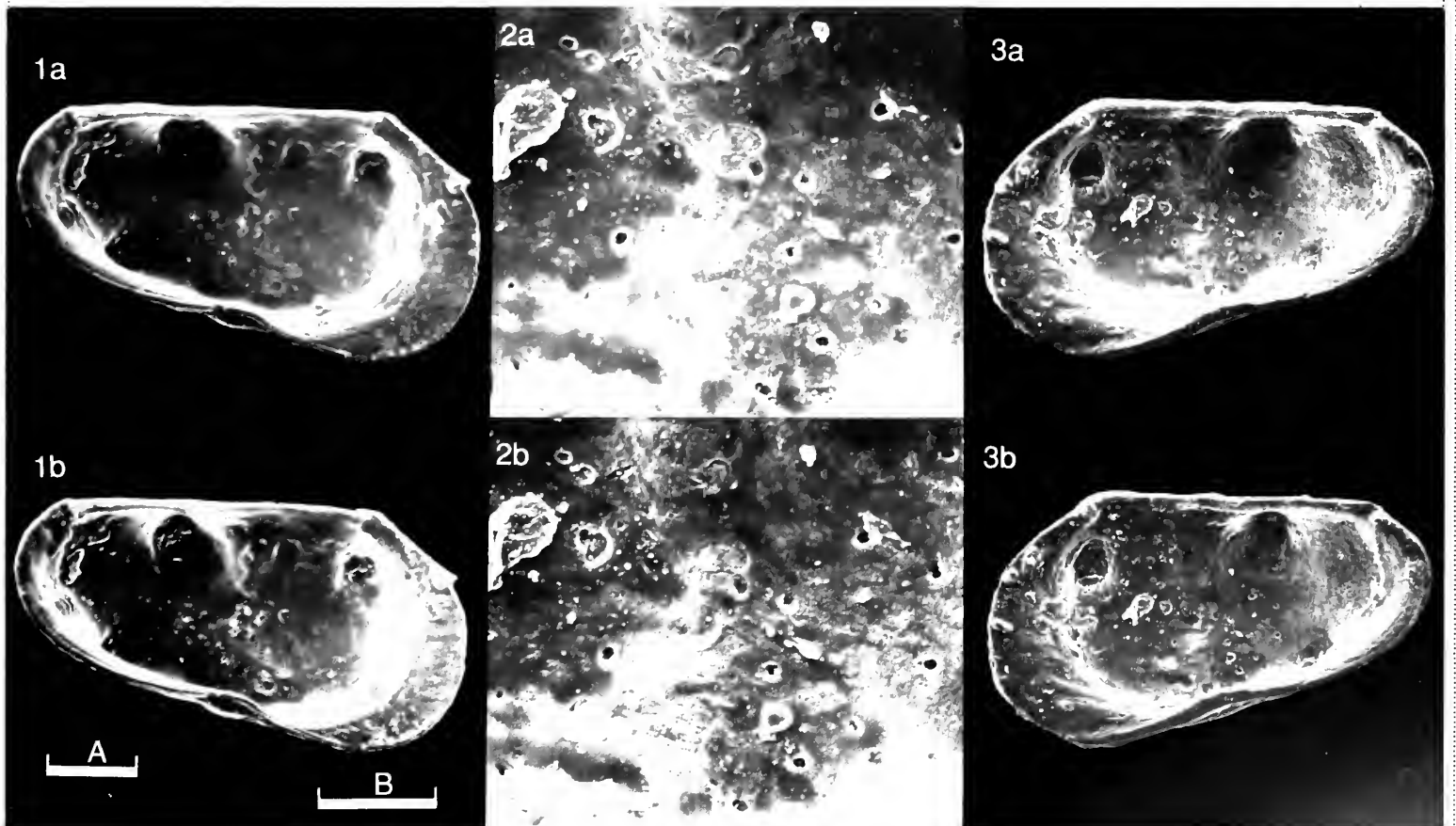
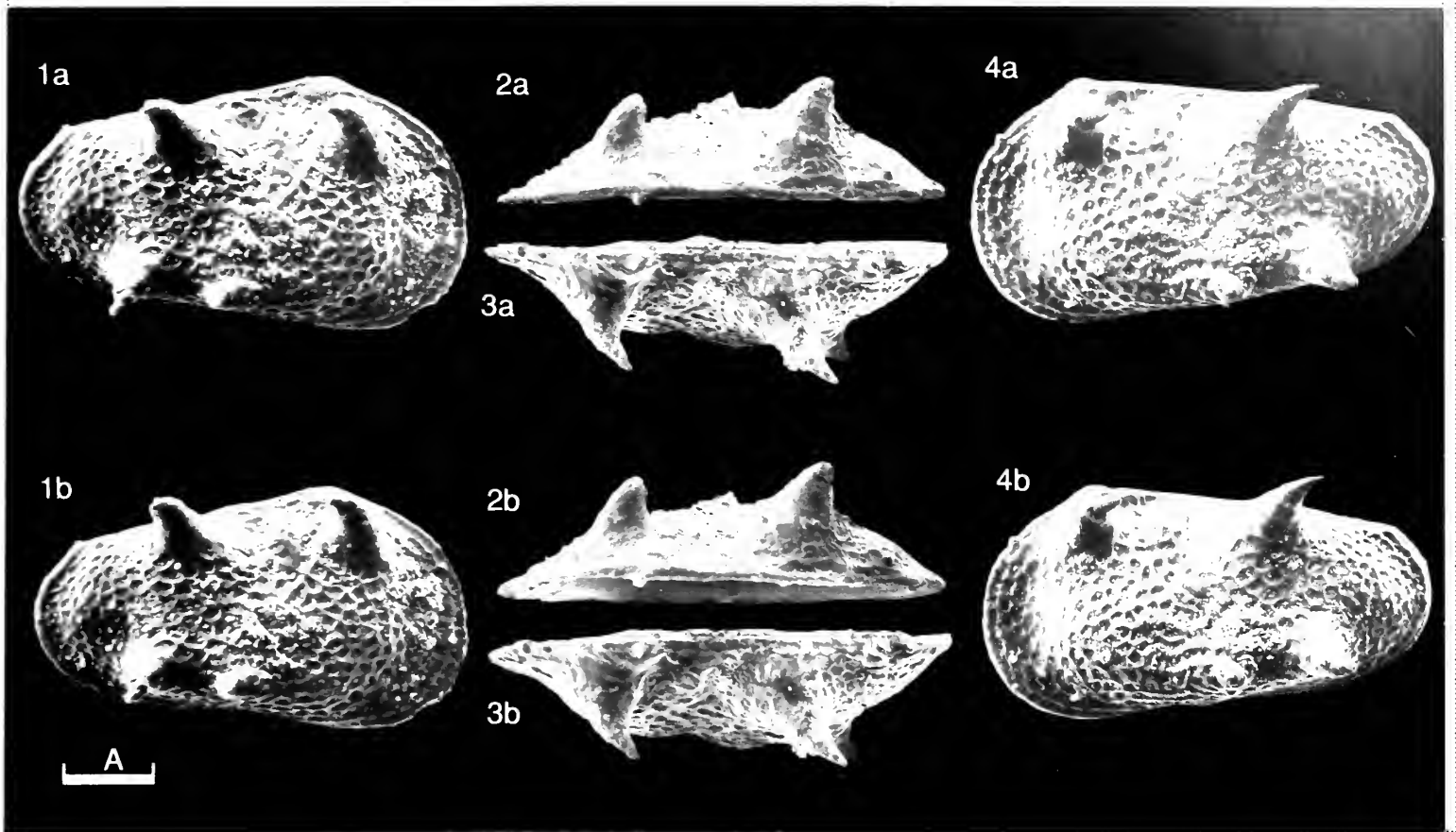
Distribution: Plio-Pleistocene of Guangxi Province, S China; non-marine.

Acknowledgements: I wish to express my sincere gratitude to the K. C. Wong Foundation for providing a Royal Society Fellowship which enabled me to study in Hull.

Explanation of Plate 16, 58

Fig. 1, LV, int. lat. (holotype, 8.22, 570 μ m long); figs. 2, 3, RV (8.23, 550 μ m long): fig. 2, detail of muscle scar pattern; fig. 3, int. lat.

Scale A (100 μ m; \times 115), figs. 1, 3; scale B (50 μ m; \times 350), fig. 2.



ON *CHINOCY THERE SHAJINGENSIS* SU sp. nov.

by Su Deying

(Chinese Academy of Geological Sciences, Beijing, China & University of Hull, England)

Chinocythere shajingensis sp. nov.

Holotype: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, no. 8.17; adult ♀ RV.
Type locality: Borehole X8 (Yongning No. 2), Yongning, Guangxi Province, S China (lat. 22° 45' N, long. 108° 26' E) depth 61–62m. Plio-Pleistocene, non-marine.

Derivation of name: From its abundant occurrence in boreholes in the vicinity of Shajing village near the town of Nanning.

Figured specimens: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, nos. 7.20 (♀ LV: Pl. 16, 60, fig. 3), 7.21 (juv. car.: Pl. 16, 62, fig. 2), 8.13 (♀ car.: Pl. 16, 62, fig. 3), 8.14 (♀ RV: Pl. 16, 62, fig. 4), 8.15 (♀ LV: Pl. 16, 62, fig. 1), 8.17 (holotype, ♀ RV: Pl. 16, 60, fig. 1), 8.19 (♂ LV: Pl. 16, 60, fig. 2).

All from Borehole X8 (Yongning No. 2) (lat. 22° 45' N, long. 108° 26' E); 61–62m (8.17, holotype), 63–64m (8.19), 88–89m (7.20, 7.21, 8.13, 8.14); Plio-Pleistocene.

Diagnosis: Reticulate *Chinocythere* with well-developed, sausage-like ventral ridge, large upright posterodorsal tubercle immediately behind the median sulcus and smaller, round tubercle between the median and anterodorsal sulci. Strong sexual dimorphism, presumed males being more elongate and much rarer than the females.

Explanation of Plate 16, 60

Fig. 1, ♀ RV, ext. lat. (holotype, 8.17, 590 μm long); fig. 2, ♂ LV, ext. lat. (8.19, 710 μm long); fig. 3, ♀ LV, ext. lat. (7.20, 600 μm long).

Scale A (100 μm; × 100), figs. 1–3.

Remarks: *C. shajingensis* is closest to *C. alata* Shan & Zhao as figured by Hou *et al.* (In: Bojie, (ed.), *Early Tertiary Ostracode Fauna from the Coastal Region of Bohai*, Science Press, Beijing, 167, pl. 65, figs. 10–12, 1978) in hinge and ornamentation but is much more elongate, the anterior margin is more broadly rounded, it tapers posteriorly and the ventral swelling does not affect the outline. It also has some affinity with *Phacocythere inflata* Guan, 1978 (*Paleontological Atlas of Central South China* 4. *Micropalaeontology*, Geological Publishing House, Beijing, 278, pl. 73, figs. 4–7) in its general pattern of ornamentation but differs from the latter in tapering strongly posteriorly whilst in Guan's species the height is maintained at the posterior cardinal angle and it only has one sulcus anteromedianly. *C. shajingensis* is also reminiscent of *Limnocythere? williamsi* Swain, 1947 (*J. Paleont.*, 21, 527, pl. 77, figs. 30–33) from the Upper Tertiary of Utah in general ornamentation, but in Swain's species the median sulcus extends ventrally to below mid-height, the anterior margin is more evenly rounded and in lateral view the shell does not taper so strongly posteriorly.

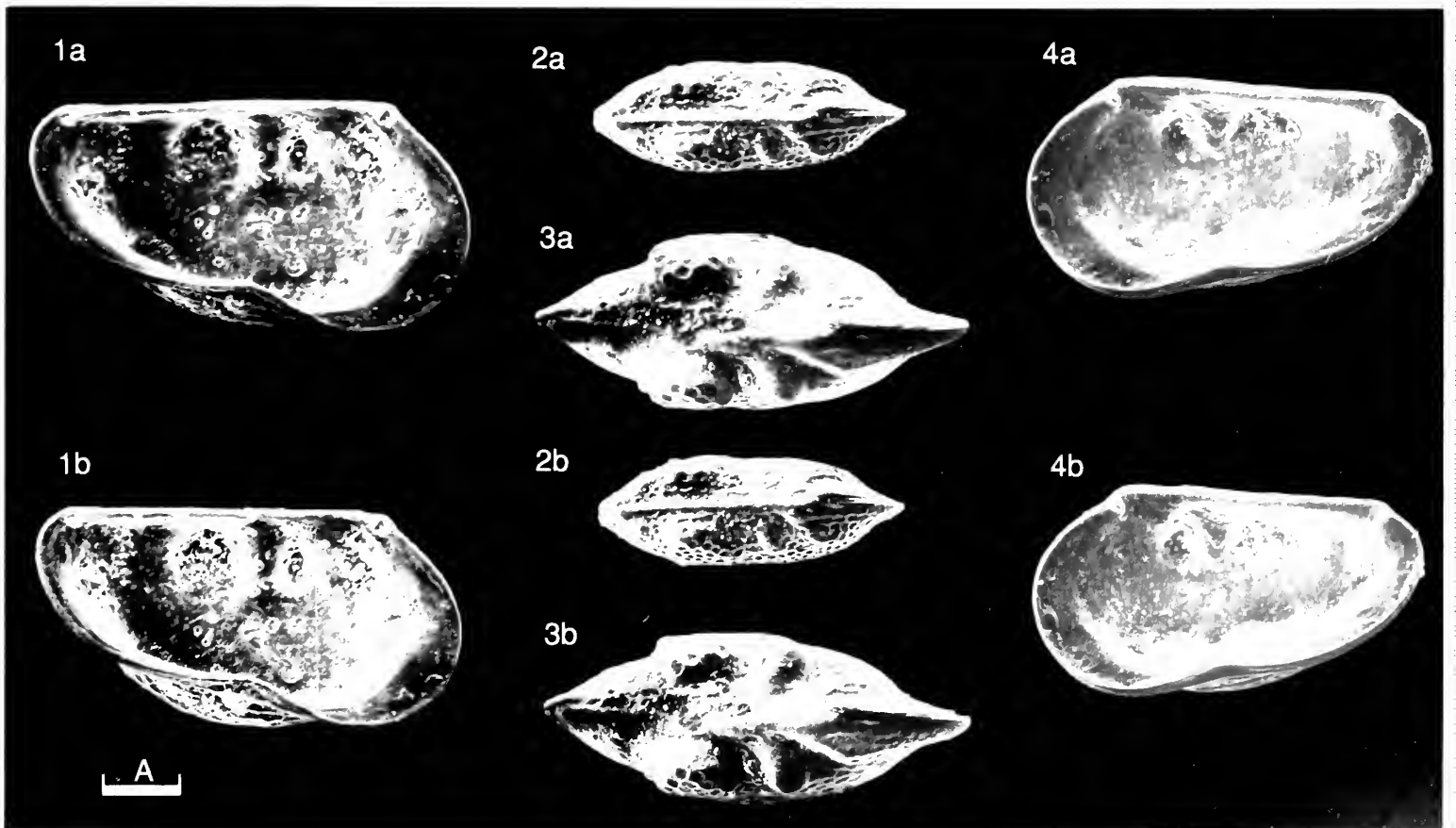
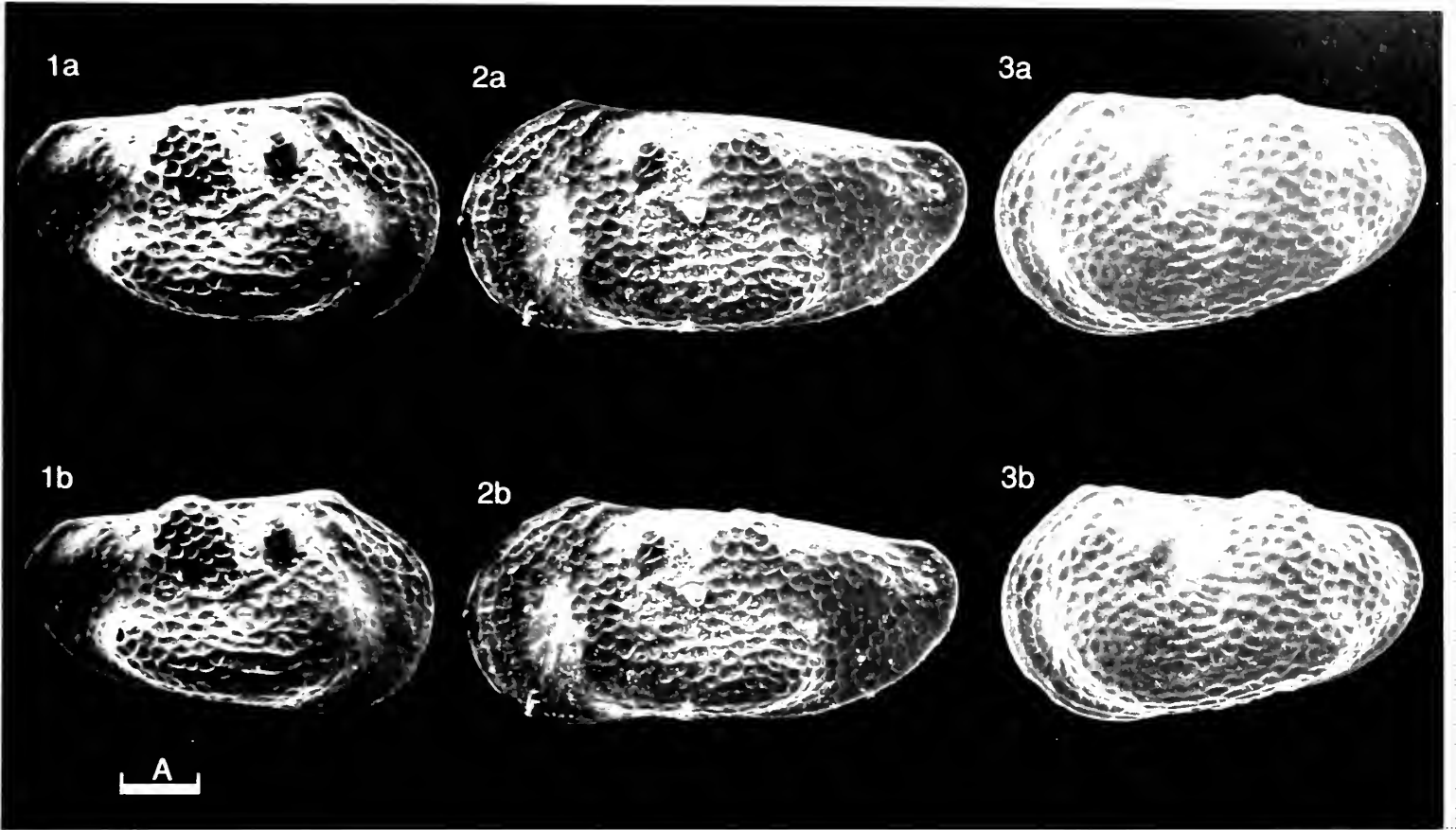
Distribution: Plio-Pleistocene in boreholes in Guangxi Province, S China: X4 (Nanning no. 1), X5 (Nanning no. 2), X6 (Nanning no. 3), X7 (Yongning no. 1), X8 (Yongning no. 2); non-marine.

Acknowledgements: I wish to express my sincere gratitude to the K. C. Wong Foundation for providing a Royal Society Fellowship which enabled me to study in Hull.

Explanation of Plate 16, 62

Fig. 1, ♀ LV, int. lat. (8.15, 620 μm long); fig. 2, juv. car., dors. (7.21, 440 μm long); fig. 3, ♀ car., dors. (8.13, 610 μm long); fig. 4, ♀ RV, int. lat. (8.14, 570 μm long).

Scale A (100 μm; × 100), figs. 1–4.



ON *CHINOCYHERE TUBERCULATA* SU sp. nov.

by Su Deying

(Chinese Academy of Geological Sciences, Beijing, China & University of Hull, England)

Chinocythere tuberculata sp. nov.

Holotype: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, no. 7.11; ♀ RV.

Type locality: Borehole X8 (Yongning No. 2), Yongning, Guangxi Province, China (lat. 22°45' N, long. 108°26' E), depth 99–100 m. Plio-Pleistocene, non-marine.

Derivation of name: In reference to the prominent tubercles developed on the valve surface.

Figured specimens: Institute of Geology, Chinese Academy of Geological Sciences, Beijing, nos. 7.11 (holotype, ♀ RV: Pl. 16, 64, figs. 1, 2; Pl. 16, 66, fig. 4), 7.12 (♂ LV: Pl. 16, 64, figs. 4, 5; Pl. 16, 66, fig. 1), 7.13 (♀ car.: Pl. 16, 64, fig. 3; Pl. 16, 66, fig. 3), 7.16 (♂ LV: Pl. 16, 66, fig. 2).

No. 7.11 from the type locality and horizon; nos. 7.12, 7.13 and 7.16 from Beihuai Borehole X5 (Nanning No. 2), Guangxi Province (lat. 22°50' N, long. 108°19' E), depths 50–58 m; Plio-Pleistocene, non-marine.

Diagnosis: *Chinocythere* with reticulate surface, four cone-shaped tubercles dorsally, one elongate rib and one columnar tubercle ventrally. Muscle scar pattern consists of a slightly oblique vertical row of four undivided adductor scars located at mid-length of the shell, two mandibular scars and at least four dorsal scars (see Pl. 16, 66, fig. 1).

Explanation of Plate 16, 64

Figs. 1, 2, ♀ RV, (holotype, 7.11, 470 μm long): fig. 1, ext. lat.; fig. 2, dors.; fig. 3, ♀ car., lt. lat. (7.13, 450 μm long); figs. 4, 5, ♂ LV, (7.12, 475 μm long): fig. 4, ext. lat.; fig. 5, dors.

Scale A (100 μm; ×135), figs. 1–5.

Remarks: In January 1978 Li & Lai described the new genus *Chinocythere*, with *C. xinzhensis* as the type species (In: Bojie, (ed.), *Early Tertiary Ostracode Fauna from the Coastal Region of Bohai*, Science Press, Beijing, 149, pl. 70, figs. 1–4; pl. 82, figs. 2, 3; pl. 83, figs. 1, 2). In February 1978, Guan published the new genus *Tuberochithere* (type species *T. tunliensis*) from Oligocene deposits in the Nanning area (Guan *et al.*, *Paleontological Atlas of Central South China 4. Micropalaeontology*, Geological Publishing House, Beijing, 275–6, text-fig. 66, pl. 72, figs. 19–20; pl. 73, figs. 1–3, 1978). It has not been possible to establish valid differences between these two genera and so the present species is referred to *Chinocythere* which has priority by one month.

C. tuberculata agrees well in hinge structure with *T. nanningensis* Guan, 1978 (*op. cit.*, 276–7, pl. 72, fig. 18) except that in Guan's species the valve surface is smooth, the posterior sulcus extends ventrally to below mid-height and there are three elongate tubercles centroventrally with fine spines on the top of the tubercles. There are no other species of close affinity.

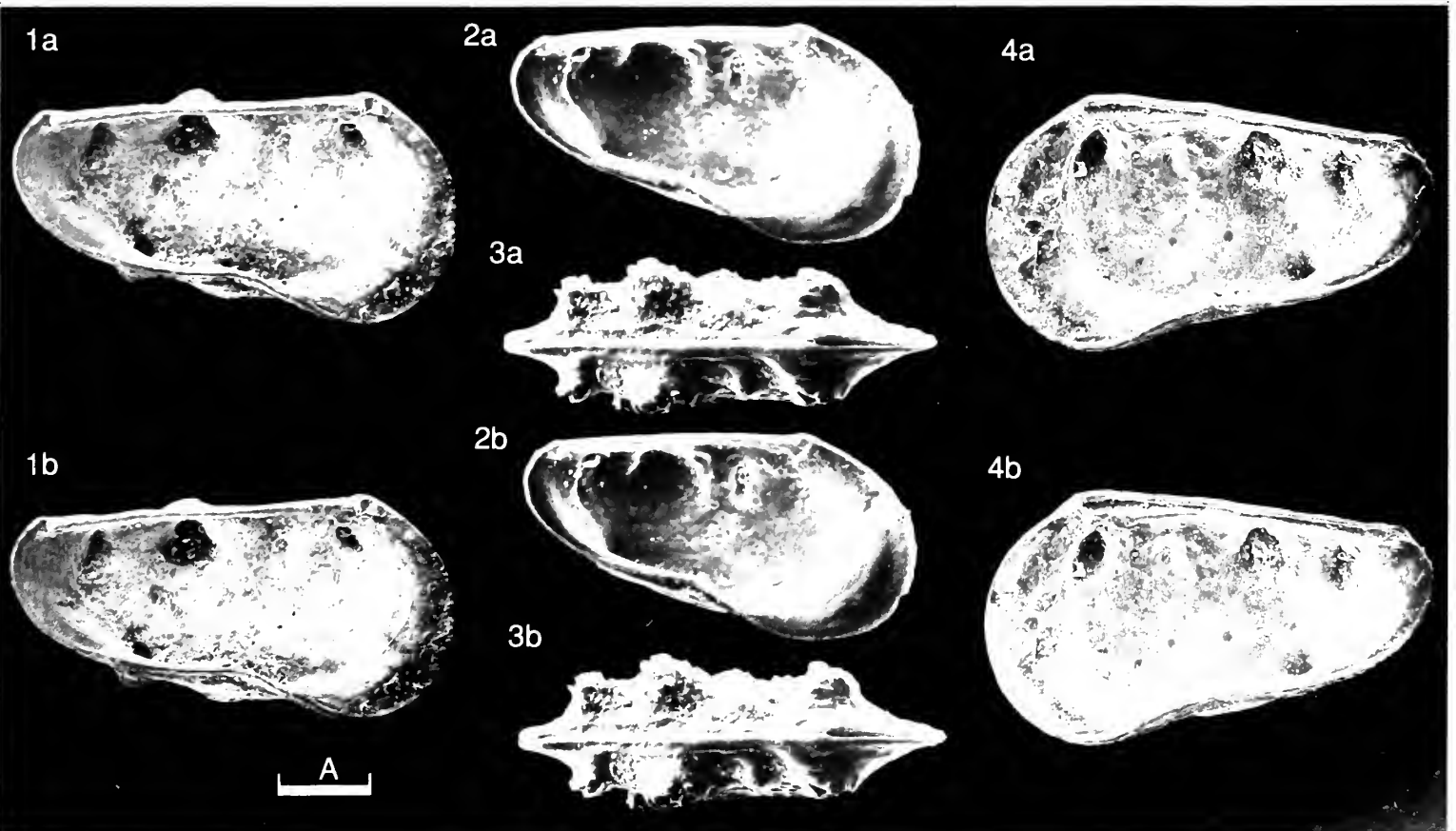
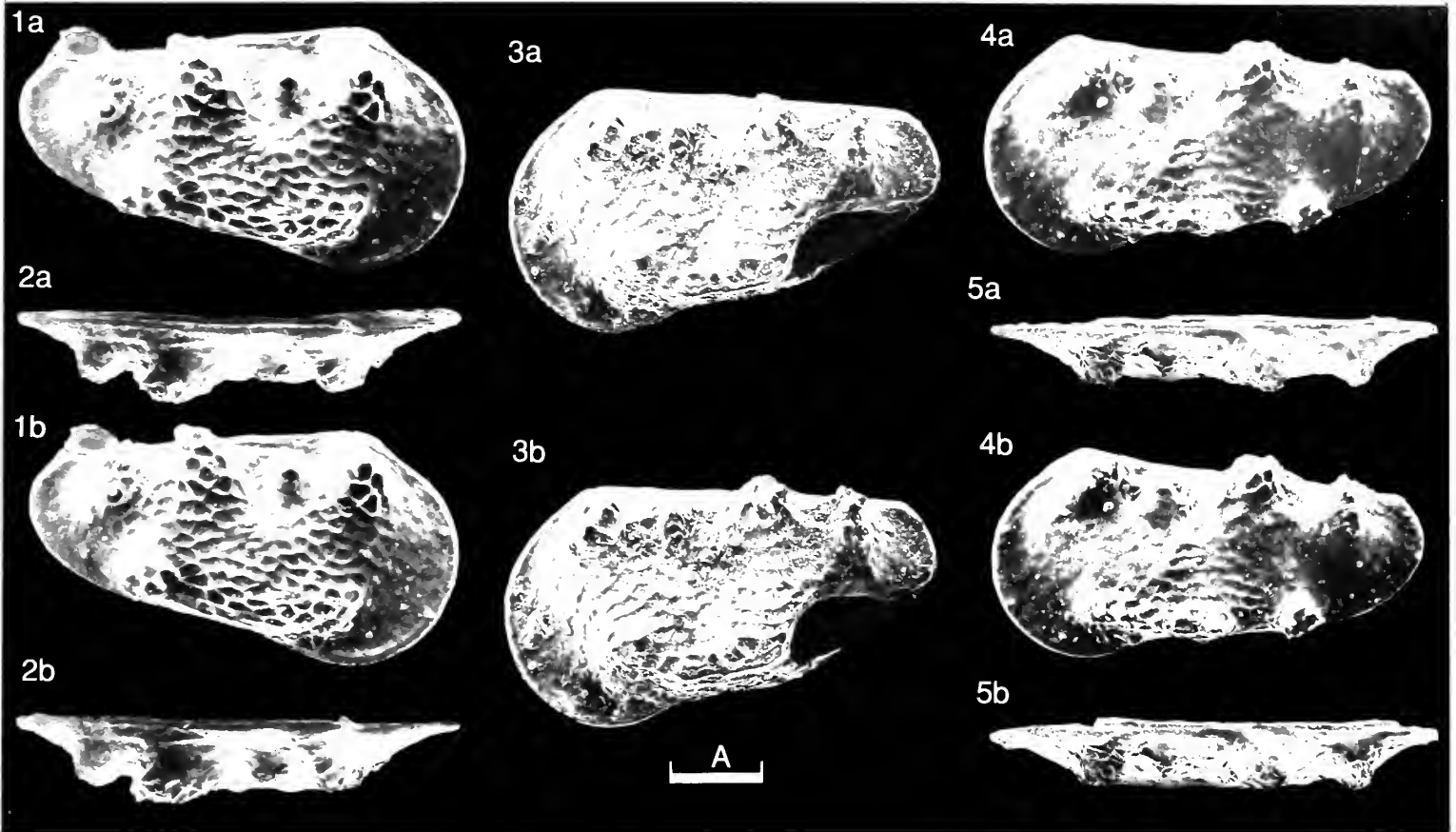
Distribution: Plio-Pleistocene of Guangxi Province, S China; non-marine.

Acknowledgements: I wish to express my thanks to the K.C. Wong Foundation who kindly provided a Royal Society Fellowship for me to study in Hull.

Explanation of Plate 16, 66

Fig. 1, ♂ LV, int. lat. (7.12, 475 μm long); fig. 2, ♂ LV, int. lat. (7.16, 425 μm long); fig. 3, ♀ car., dors. (7.13, 450 μm long); fig. 4, ♀ RV, int. lat. (holotype, 7.11, 470 μm long).

Scale A (100 μm; ×135), figs. 1–4.



ON *TUBEROLOXOCONCHA TUBEROSA* (HARTMANN)

by David J. Horne
(Thames Polytechnic, England)

Genus *TUBEROLOXOCONCHA* Hartmann, 1974

Type-species (by original designation): *Loxoconcha tuberosa* Hartmann, 1954.

1974 *Tuberoxococoncha* gen. nov. G. Hartmann, *Annls Spéleol.*, **28** (for 1973), 426.

Diagnosis: Small loxoconchid genus (carapace <400µm long), ovate to subrectangular in lateral view, ornamented with concentrically arranged pits and ribs. In dorsal view, anterior and posterior extremities pointed, greatest width around mid-length. Sieve pores flush with the external surface of the valves. Hinge smooth henodont: in RV, an elongate posterior tooth and a median to anterior groove; in LV, a posterior socket and a smooth median bar, thickening and faintly notched anteriorly. Inner lamella broad, particularly anteriorly; anterior inner margin with an almost straight section. Anterior and posterior vestibula present; marginal pore canals moderate in number (about 10–20 anteriorly), simple or branching. Four adductor muscle scars in a vertical row, a U-shaped frontal scar and a prominent circular fulcral point. Weakly dimorphic: male carapace smaller than female. Appendages slender; antennula with six podomeres, of which 4 and 5 are fused and together are longer than 6, bearing thin, flexible setae; antenna with two terminal chelate setae; branchial plate on maxillula with a single reflexed seta; setal formulae of basal podomeres of legs: (1+1:1(or 2?):1), (1+1:1:1), (1+1:1:1).

Explanation of Plate 16, 68

Figs. 1–3, ♀ (1989.538, 320µm long): fig. 2, LV, ext. lat.; fig. 3, LV, ext. lat., detail of anteroventral region; fig. 3, RV, ext. lat.; figs. 4, 5, ♂ RV (1989.539, 290µm long): fig. 4, ext. lat.; fig. 5, detail of posteroventral region.
Scale A (100µm; ×200), figs. 1, 3, 4; scale B (10µm; ×750), figs. 2, 5.

Remarks: *Tuberoxococoncha* belongs to the subfamily Pseudolimnocytherinae (erected as a family by G. Hartmann & H. S. Puri, *Mitt. hamb. zool. Mus. Inst.*, **70**, 29, 1974) of the family Loxoconchidae Sars, 1926. The closely related genus *Pseudolimnocythere* Klie, 1938 (*Zool. Anz.*, **123**, 150, 151) (type species *P. hypogea* Klie, 1938; *op. cit.*, 151–155, figs. 7–16) has a similar henodont hinge (D. L. Danielopol, *Bijdr. Dierk.*, **50**, 243–291, 1980) but differs in having a shorter posterior hinge tooth in the right valve, an evenly concave anterior inner margin, sunken or recessed sieve pores, and an antennula with podomere 6 longer than 4 and 5 together (for further discussion of their affinities see Danielopol, *op. cit.*). Both genera are interstitial, but species of *Pseudolimnocythere* inhabit freshwater, while those of *Tuberoxococoncha* are apparently confined to marine-brackish conditions.

Tuberoxococoncha tuberosa (Hartmann, 1954)

- 1954 *Loxoconcha tuberosa* sp. nov. G. Hartmann, *Vie Milieu*, **4** (for 1953), 248, 250, figs. 5a–i.
non 1967 *Loxoconcha tuberosa* Hartmann; F. E. Caraion, *Fauna Republicii Socialiste România*, **4**, *Crustacea*, **10** (*Ostracoda*), 109–111, fig. 31A–I, Bucarest.
?1971 *Hirschmannia?* sp.; P. J. Barbeito-Gonzalez, *Mitt. hamb. zool. Mus. Inst.*, **67**, 310, pl. 34, figs. 1j, 2j.
?1972 *Loxoconcha?* *tuberosa* Hartmann; H. Uffenorde, *Göttinger Arb. Geol. Paläont.*, **13**, 86, pl. 3, fig. 9.
1974 *Tuberoxococoncha tuberosa* (Hartmann); G. Hartmann, *Annls Spéleol.*, **28**, 426.

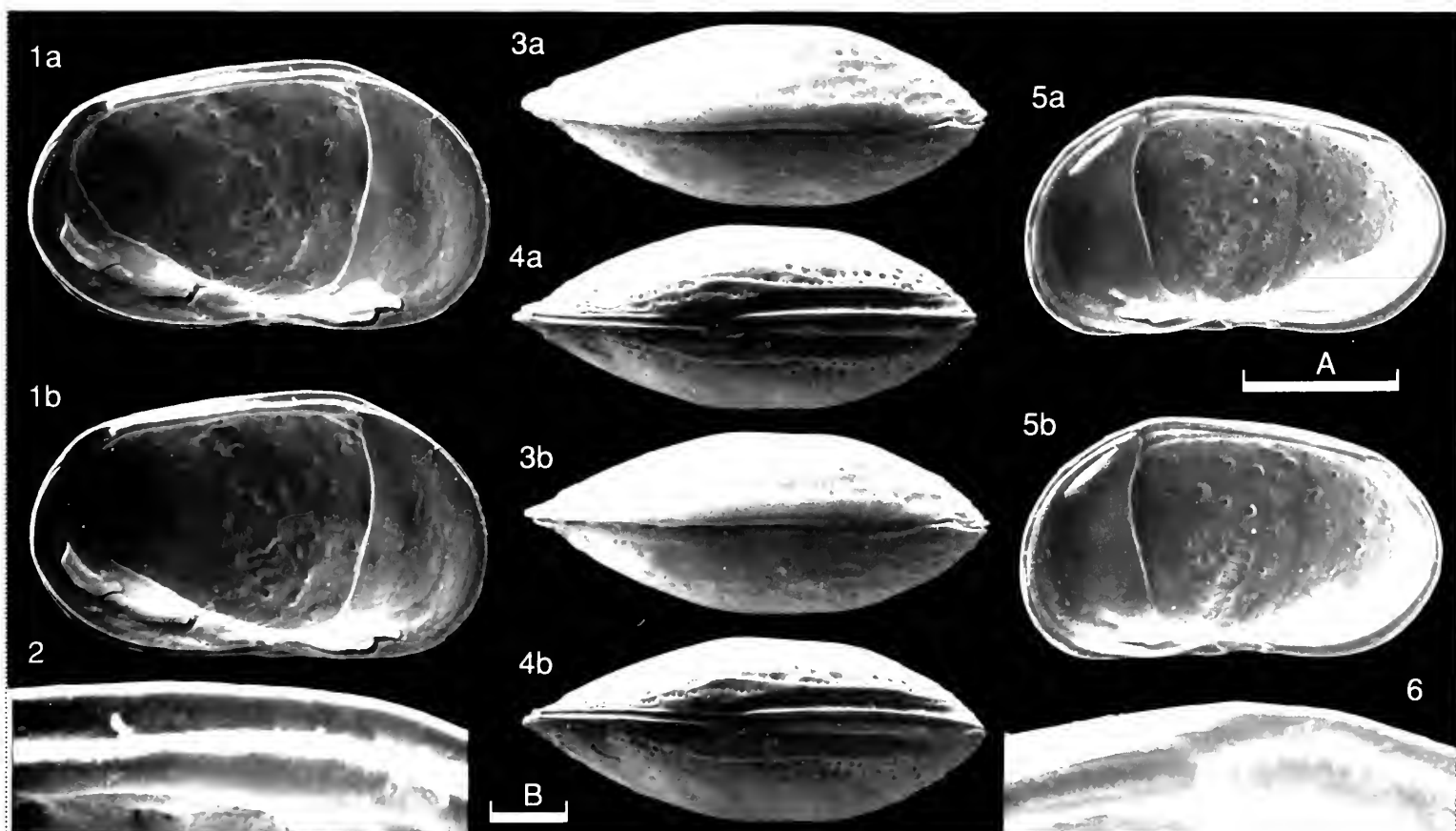
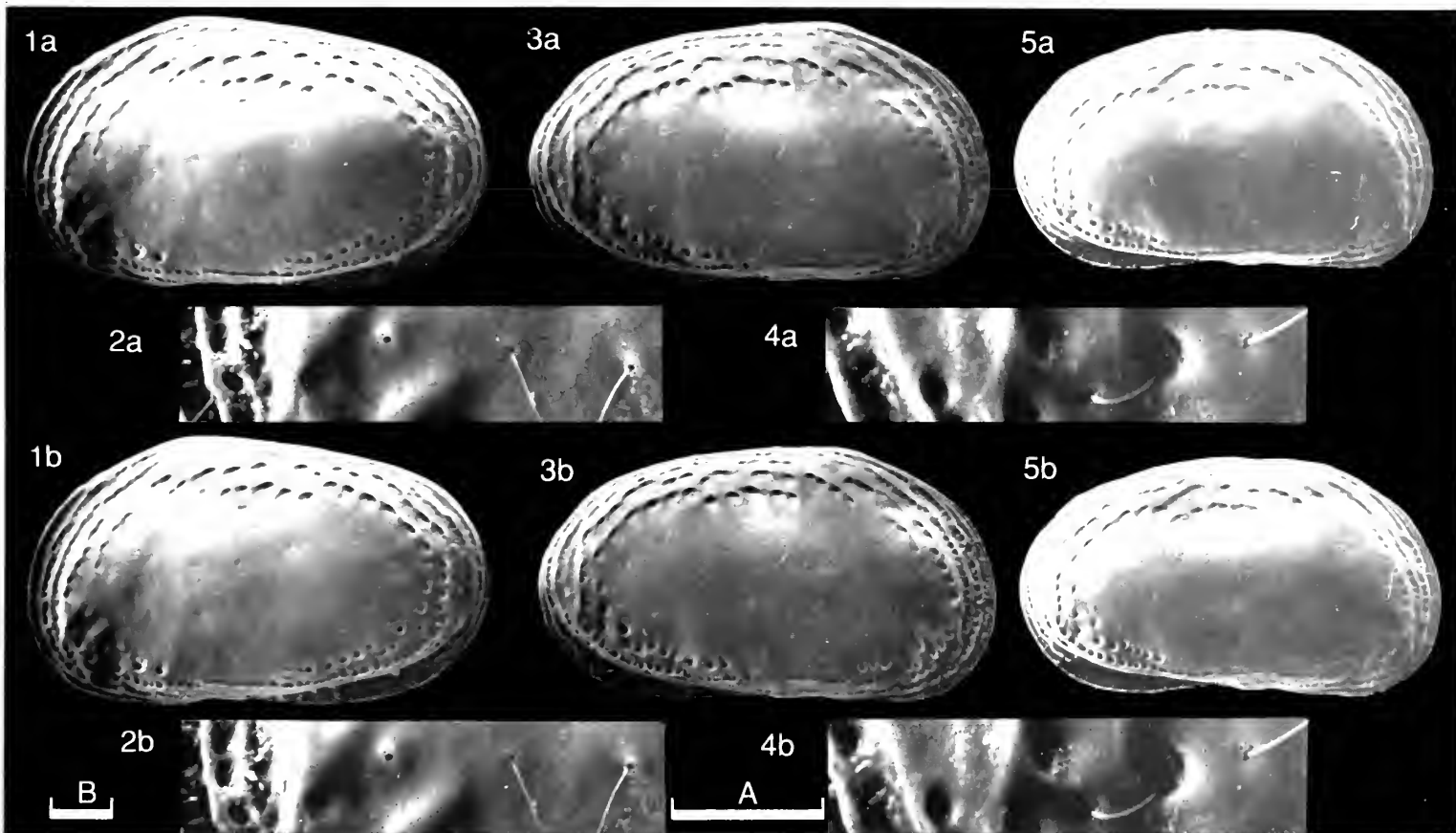
Syntypes: Universität Hamburg Zoologisches Institut und Zoologisches Museum no. **K-28145** (several decalcified carapaces with appendages), **K-28145A** (♂ appendages dissected and illustrated herein).

Type locality: Banyuls-sur-mer, S France (lat. 42° 29' N, long. 3° 08' E); marine, littoral, interstitial, Recent.

Figured specimens: British Museum (Nat. Hist.) nos. **1989.538** (♀; LV, Pl. **16**, 68, figs. 1, 2; Pl. **16**, 70, figs. 1, 2; Text-fig. 1b, 1c; RV: Pl. **16**, 68, fig. 3), **1989.539** (♂; RV: Pl. **16**, 68, figs. 4, 5; Pl. **16**, 70, figs. 5, 6; LV: Text-fig. 1a), specimen lost subsequent to photography (♀: Pl. **16**, 70, figs. 3, 4). Universität

Explanation of Plate 16, 70

Figs. 1, 2, ♀ LV (1989.538, 320µm long): fig. 1, int. lat.; fig. 2, detail of anterior hinge; figs. 3, 4, ♀ (specimen lost, 320µm long): fig. 3, car. dors.; fig. 4, car. vent.; figs. 5, 6, ♂ RV (1989.539, 290µm long): fig. 5, int. lat.; fig. 6, detail of posterior hinge.
Scale A (100µm; ×200), figs. 1, 3, 4, 5; scale B (10µm; ×1000), figs. 2, 6.



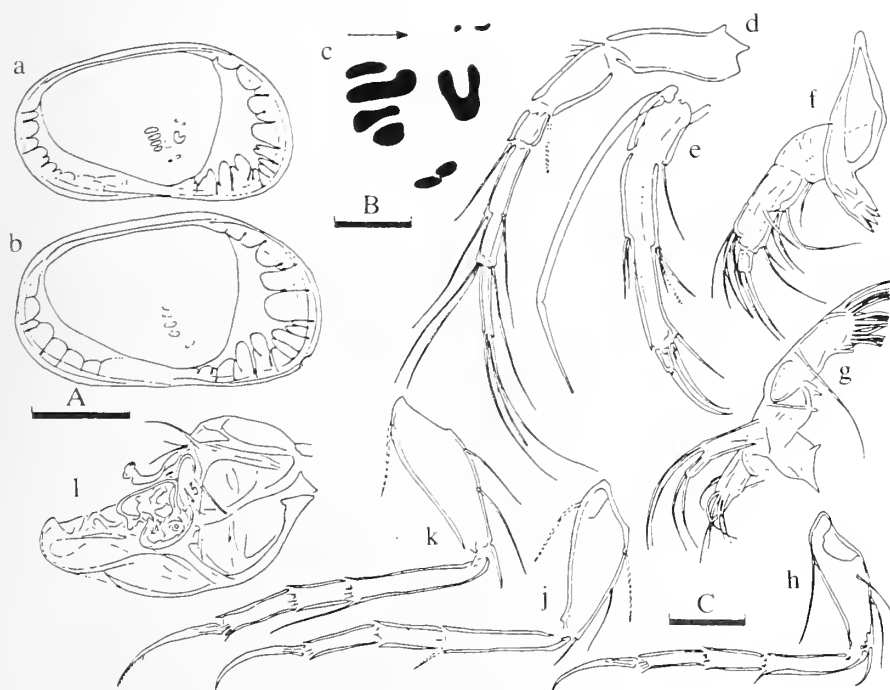
Hamburg Zoologisches Institut und Zoologisches Museum no. **K-28145A** (syntype, ♂ appendages: text-fig. 1d–l).

Universität Hamburg specimen from **K-28145** (syntypes), kindly provided by Prof. Dr. G. Hartmann. All others collected from littoral sand at the type locality on 25th July 1981 by D. L. Danielopol, who subsequently recorded a salinity of 40 ‰ there in May 1985.

Diagnosis: Carapace subrectangular, L/H ratio approx. 1.8; anterior and posterior margins evenly rounded; dorsal margin almost straight, ventral margin weakly sinuous; dorsal and ventral margins slightly convergent towards the posterior; posteroventral margin strongly compressed. Lateral outline in dorsal view rounded with pointed extremities, the anterior more acutely so, and almost straight sections medianly. External ornament of rounded, obliquely indented fossae on the marginal surfaces of the valves, arranged along the inner edges of concentric ribs; dorsally the fossae are confined to the upper third of the valves; median surfaces smooth except for sieve pores. 15–20 marginal pore canals anteriorly, of varying length and irregularly branching, particularly in the anteroventral quadrant. Male copulatory appendage moderately broad with a curved, beak-like distal process.

Remarks: The species illustrated by Barbeito-Gonzalez (*op. cit.*) from the eastern Mediterranean and by Uffenorde (*op. cit.*) from the Adriatic resemble *T. tuberosa* in valve shape and details of the vestibula and marginal pore canals, but cannot be confidently assigned to that species since in neither case were external ornament or the male copulatory appendages illustrated. At least two other (as yet undescribed) species live in the Mediterranean (D. L. Danielopol, pers. comm.) and a third, *T. atlantica* Horne (*Stereo-Atlas Ostracod Shells*, 16, 73–76, 1989) occurs on N Atlantic coasts; all three may be distinguished from *T. tuberosa* by carapace outline, surface ornament and the shape of the male copulatory appendage. The species illustrated by Caraion (*op. cit.*) from the Black Sea is more elongate than *T. tuberosa* and has a differently shaped male copulatory appendage; it may be conspecific with *Tuberoxococoncha nana* (Marinov, 1962) (see E. I. Schornikov, in: F. D. Mordukhai-Boltovskoi (ed.), *Identification key to the fauna of the Black and Azov Seas*, 2: *Free living invertebrates. Crustacea*, 200, pl. 26, fig. 3, Kiev: "Naukova Dumka").

Distribution: Recent: western Mediterranean, marine, littoral, interstitial.



Text-fig. 1: a, ♂ LV, int. lat., viewed in transmitted light (1989.539); b, ♀ LV, int. lat., viewed in transmitted light (1989.538); c, central muscle scars, ♀ LV (1989.538); d–l, ♂ appendages (K-28145A; setae indicated with broken lines not observed, but added by reference to Hartmann's original description); d, antennula; e, antenna; f, mandible; g, maxillula (inner two endites broken off during dissection); h, first leg; j, second leg; k, third leg; l, copulatory appendage.

Scale A = 100 μm (a, b) scale B = 25 μm (c), scale C = 25 μm (d–l).

ON *TUBEROLOXOCOCONCHA ATLANTICA* HORNE sp. nov.

by David J. Horne
(Thames Polytechnic, England)

Tuberoloxococoncha atlantica sp. nov.

Holotype: British Museum (Nat. Hist.) no. 1989.540; ♀ RV and appendages.

[Paratypes: 1989.541–546.]

Type locality: Beach N of Carragh an t-Sruith, Isle of Jura, W Scotland (lat. 55° 55' N, long. 6° 07' W); marine intertidal algae with considerable quantities of trapped sand, Recent.

Derivation of name: Referring to the occurrence of this species on both sides of the N Atlantic.

Figured specimens: British Museum (Nat. Hist.) nos. 1989.540 (holotype, ♀ RV: Pl. 16, 74, fig. 3), 1989.541 (paratype, ♂ RV: Pl. 16, 74, fig. 1), 1989.542 (paratype, ♀ car.: Pl. 16, 74, fig. 2), 1989.543 (paratype, ♂ car.: Pl. 16, 76, fig. 2), 1989.544 (paratype, ♂ LV: Pl. 16, 76, fig. 3), 1989.545 (paratype, ♂ LV: Text-fig. 1a), 1989.546 (paratype, ♂ appendages: Text-fig. 1b, 1c). Universität Hamburg Zoologisches Institut und Zoologisches Museum no. K-32169 (♀ RV: Pl. 16, 76, fig. 1). The holotype was collected by J. E. M. Horne at the type locality in September 1981, the paratypes by the author in August 1980; a salinity of 33‰ was recorded by the author in September 1987. K-32169, from Canoe Beach, Nahant, Massachusetts, USA (lat. 42° 26' N, long. 70° 53' W) was kindly provided by Prof. Dr G. Hartmann.

Diagnosis: Carapace subovate, L/H ratio approx. 1.6; anterior and posterior margins evenly rounded; dorsal margin gently arched, ventral margin weakly sinuous; dorsal and ventral margins slightly convergent towards the posterior; posteroventral margin strongly compressed. Outline in dorsal view evenly rounded laterally with pointed extremities, the anterior more acutely so. External

Explanation of Plate 16, 74

Fig. 1, ♂ RV, ext. lat. (paratype, 1989.541, 300 µm long); fig. 2, ♀ car., dors. (paratype, 1989.542, 340 µm long); fig. 3, ♀ RV, ext. lat. (holotype, 1989.540, 310 µm long).

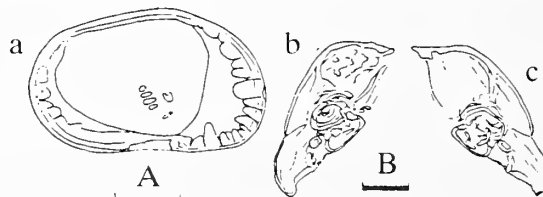
Scale A (100 µm; ×200), figs. 1–3.

Stereo-Atlas of Ostracod Shells 16, 75

Tuberoloxococoncha atlantica (3 of 4)

Diagnosis (cont.): ornament of rounded, shallow fossae arranged concentrically around the marginal surfaces of the valves, with faint concentric ribs anteriorly and posteroventrally; in the dorsomedian region the fossae extend almost halfway down the valves, elsewhere the median surfaces are smooth except for sieve pores. 15–20 marginal pore canals anteriorly, of varying length, the majority concentrated in the anteroventral quadrant. Male copulatory appendage rather narrow with a curved, beak-like distal process.

Remarks: *T. atlantica* is less elongate than *T. tuberosa* (Hartmann, 1954) (see D. J. Horne, *Stereo-Atlas Ostracod Shells*, 16, 67–72, 1989) and the two also differ in details of ornament and the shape of the male copulatory appendage. A further possible difference is in the shape of the anterior vestibulum: in the type specimens of *T. atlantica* it is broader, and the marginal pore canals correspondingly shorter, in the anteroventral quadrant (e.g., Text-fig. 1a), while in *T. tuberosa* it is narrowest anteroventrally. However, specimens of *T. atlantica* from Kennedy's Pass, near Ballantrae, SW Scotland (lat. 55° 12' N, long. 4° 55' W) (collected in April 1974 by M. C. Keen) include one or two individuals in which the anterior vestibulum is more like that of *T. tuberosa*; this might be a variable feature in species of *Tuberoloxococoncha*, as it is in at least one species of the closely related *Pseudolimnocythere* Klie, 1938 (see D. L. Danielopol, *Bijdr. Dierk.*, 50, fig. 20, 1980).



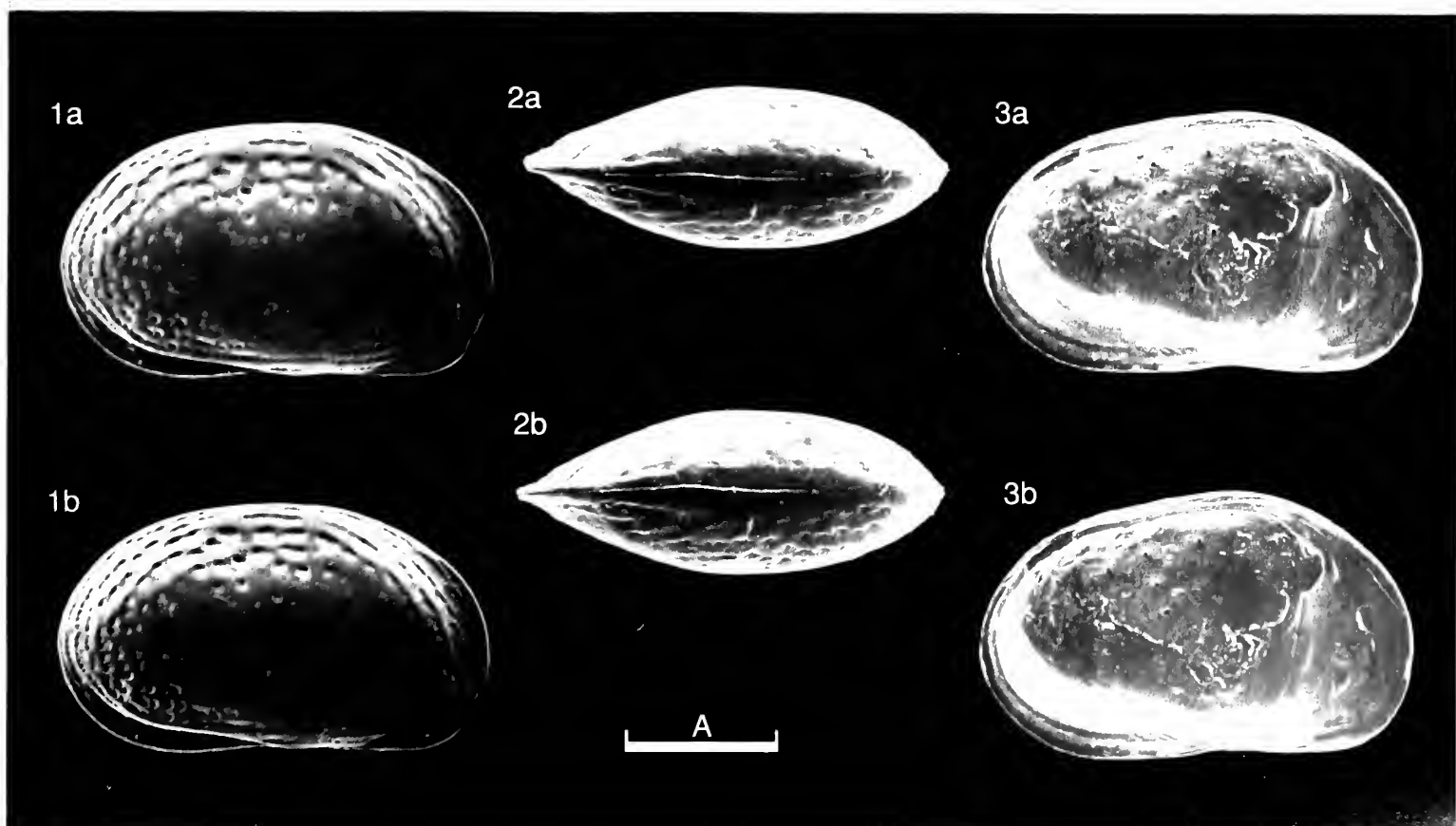
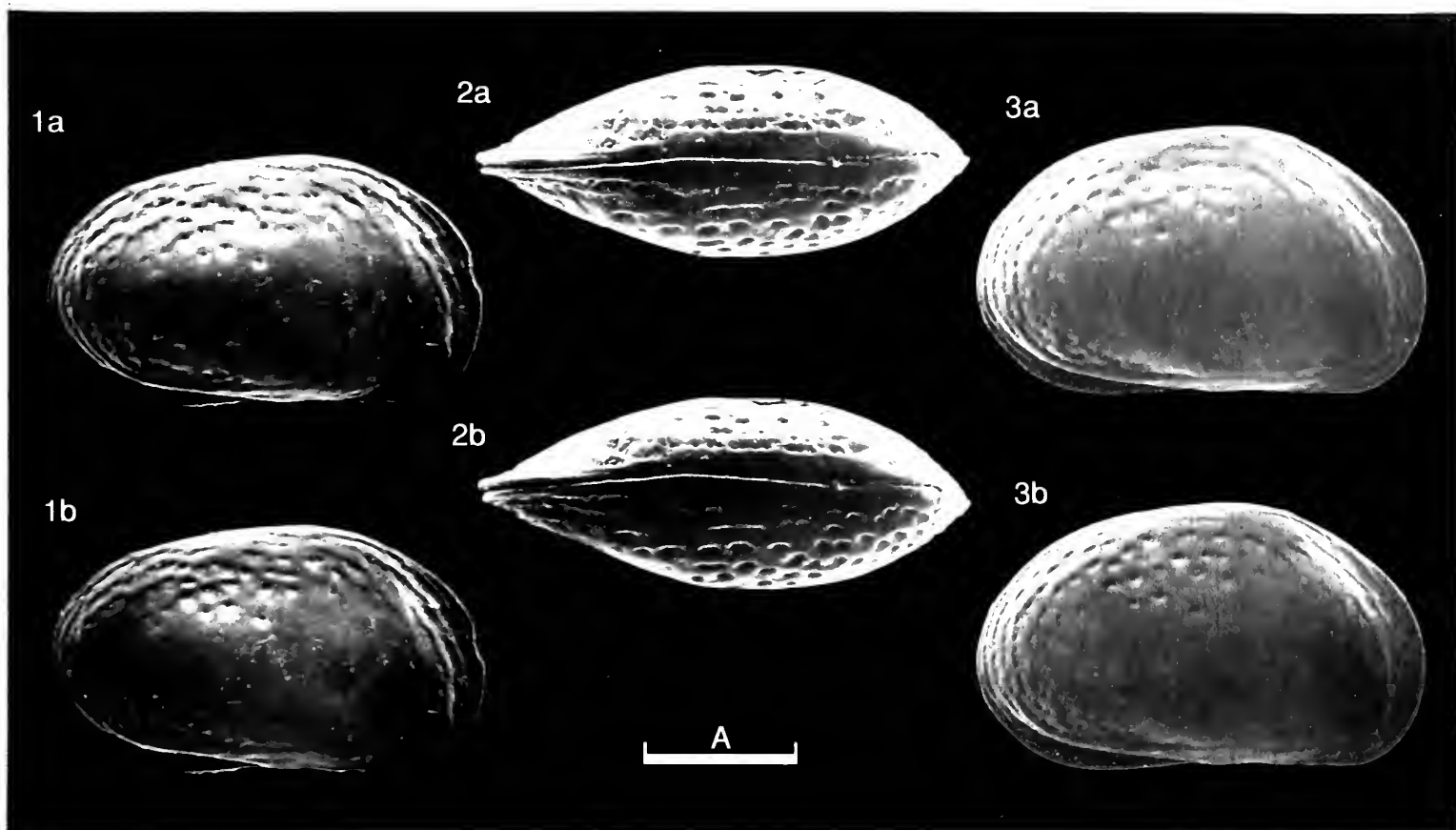
Text-fig. 1: a, ♂ LV, int. lat. viewed in transmitted light (paratype, 1989.545); b, c, ♂ copulatory appendages (paratype, 1989.546). Scale A = 100 µm (a); scale B = 25 µm (b, c).

Distribution: Recent: marine, littoral, interstitial, eastern and western N Atlantic; so far known only from two localities in W Scotland and one in Massachusetts, USA (detailed herein).

Explanation of Plate 16, 76

Fig. 1, ♀ RV, ext. lat. (K-32169, 300 µm long); fig. 2, ♂ car., dors. (paratype, 1989.543, 290 µm long); fig. 3, ♂ LV, int. lat. (paratype, 1989.544, 300 µm long).

Scale A (100 µm; ×200), figs. 1–3.



ON *BUNTONIA BRUNENSIS* ŘÍHA

by Jaroslav Říha
(Moravian Museum, Brno, Czechoslovakia)

Buntonia brunensis Říha, 1985

- 1985 *Buntonia brunensis* sp. nov. J. Říha, *Cas. morav. Mus. Brno*, **70**, 61–65, text-figs. 1–5, pl. 1, figs. 2–6, pl. 2, figs. 7–12, pl. 3, figs. 1–4.
1988 *Buntonia brunensis* Říha sp. nov. (*sic*); J. Říha, *Stereo-Atlas Ostracod Shells*, **15**, 133–136.

Remarks: The author wishes to point out that since this species was originally described by him in 1985 (*op. cit.*), his 1988 (*op. cit.*) citation of it as “sp. nov.” was in error, and a ♂ ? RV (MM VI-13-1/3) was incorrectly referred to as holotype (it is, in fact, a paratype). The originally designated holotype, a carapace (MM VI-13-1/1), was not illustrated in the 1988 paper. The opportunity is also taken here to correct the mis-spelling of the generic name in the latter publication.

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