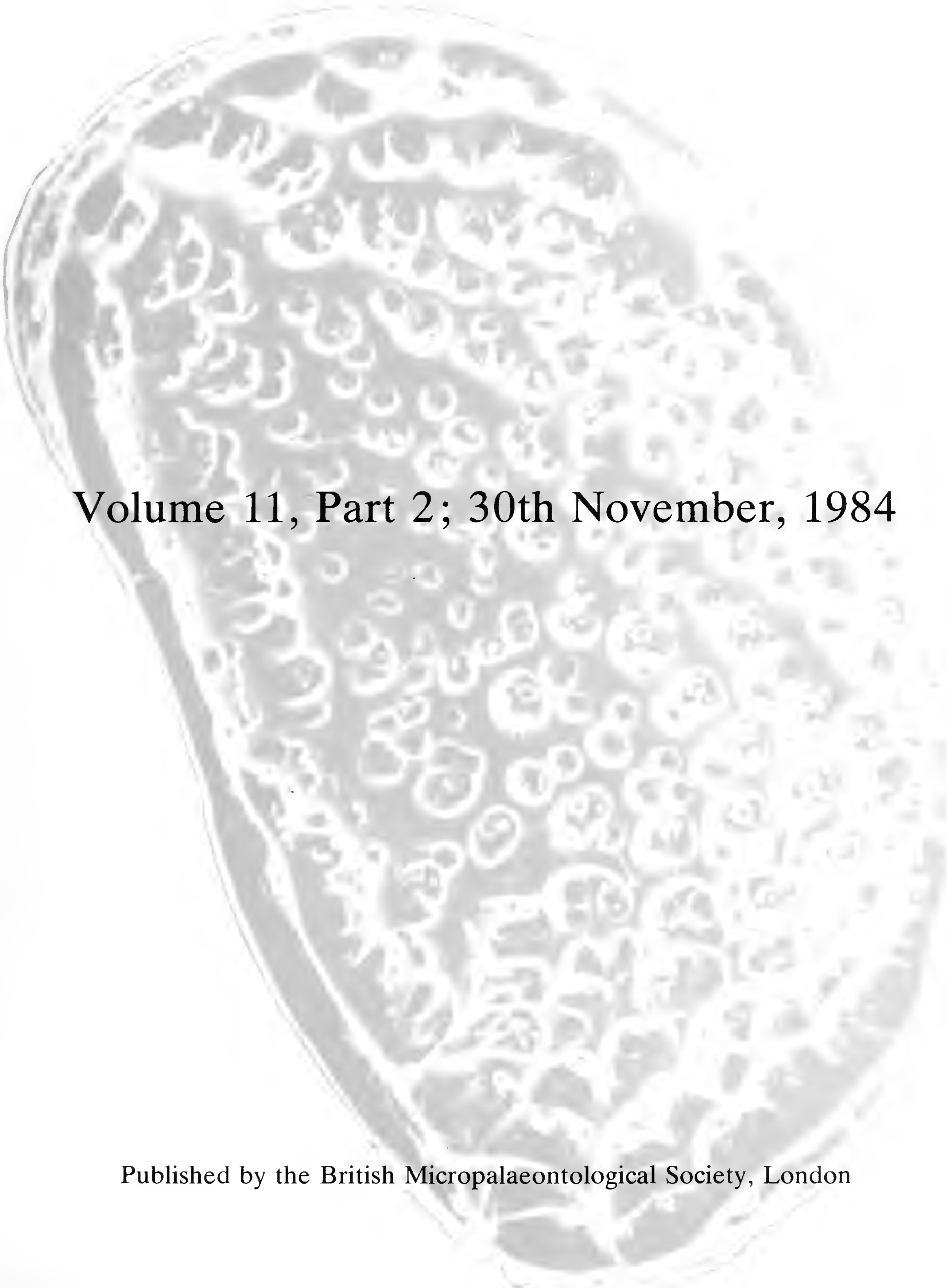
A Stereo-Atlas of Ostracod Shells

edited by R. H. Bate, D. J. Horne, J. W. Neale,
and David J. Siveter



Volume 11, Part 2; 30th November, 1984

Published by the British Micropalaeontological Society, London

Instructions to Authors

Contributions illustrated by scanning electron micrographs of Ostracoda in stereo-pairs are invited. Format should follow the style set by the majority of 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 of *Hemicythere villosa* (Sars, 1866)

Printed in the UK by UPS Blackpool Ltd., Stanley Road, Blackpool

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Volume 11, 1984

Part 1 (pp. 1–74); 29th June, 1984
Part 2 (pp. 75–150); 30th November, 1984

Published by the British Micropalaeontological Society, London

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595.337.14 (118.?15) (664 : 162.014.08) : 551.35

ON *LEOCYTHERIDEA POLLETI* KEEN gen. et sp. nov.

by M. C. Keen
(University of Glasgow, Scotland)

Genus *LEOCYTHERIDEA* gen. nov.

Type-species: *Leocytheridea polleti* sp. nov.

Derivation of name: Latin *Leo*, lion, referring to the "mountains of the Lion", the origin of the name Sierra Leone.

Diagnosis: Ovate lateral outline, left valve larger than right, males more elongate than females; surface smooth or pitted with prominent sieve-type normal pore canals; hinge antimerodont; inner margin broad and irregular, with a prominent anterior indentation, small anterior vestibule, and long sinuous radial pore canals; central muscle scars consist of vertical row of four scars with a single frontal scar.

Remarks: The inner margin and the sinuous radial pore canals are very similar to those of *Cytheretta*, but the hinge is entirely different. The hinge is somewhat similar to many genera of the Cytherideinae, such as *Clithrocytheridea*, and in general lateral outline the valves are similar to such genera as *Cyamocytheridea*, *Clithrocytheridea*, and *Ovocytheridea*. The anterior vestibule is similar to that of *Cyamocytheridea*. The hinge is similar to that of *Hemikrithe*, which also has an irregular inner margin; *Hemikrithe* differs in lateral outline, central muscle scars, and type of radial pore canals. Some species of *Parakrithe* have a similar appearance, but differ in the hinge and type of radial pore canals.

Explanation of Plate 11, 76

Figs. 1, 3, ♀ LV (**OS 12287**, 680μm long): fig. 1 ext. lat.; fig. 3 normal pore canal with sieve-plate destroyed; fig. 2, ♂ LV, ext. lat. (specimen destroyed, 700μm long); fig. 4, ♂ RV (**OS 12289**), normal pore canal with sieve-plate intact. All paratypes.
Scale A (100μm; ×107); fig. 1; scale B (100μm; ×101), fig. 2; scale C (5μm; ×2500), fig. 3; scale D (5μm; ×2000), fig. 4.

Remarks (contd.): *Leocytheridea* is placed in the Cytherideidae on account of lateral shape and ornamentation, hinge, and central muscle scars. The irregular inner margin and sinuous radial pore canals are different from other members of the subfamily Cytherideinae, while the muscle scars and radial pore canals differ from the Krithinae. There is therefore considerable doubt as to which family and subfamily the new genus should be assigned.

Leocytheridea polleti sp. nov.

Holotype: British Museum (Nat. Hist.) no. **OS 12288**; ♀ RV.

Type locality: Tertiary (Oligocene?) part of the Bullom Series from borehole SLBH9 near Hastings, Sierra Leone (Baker, C. D. & Bott, M. H. P. *Overseas Geol. & Min. Resources*, **8**, 260–278). Holotype from approximate depth of 110 feet; lat. 8° 24′ N, long. 13° 06′ W.

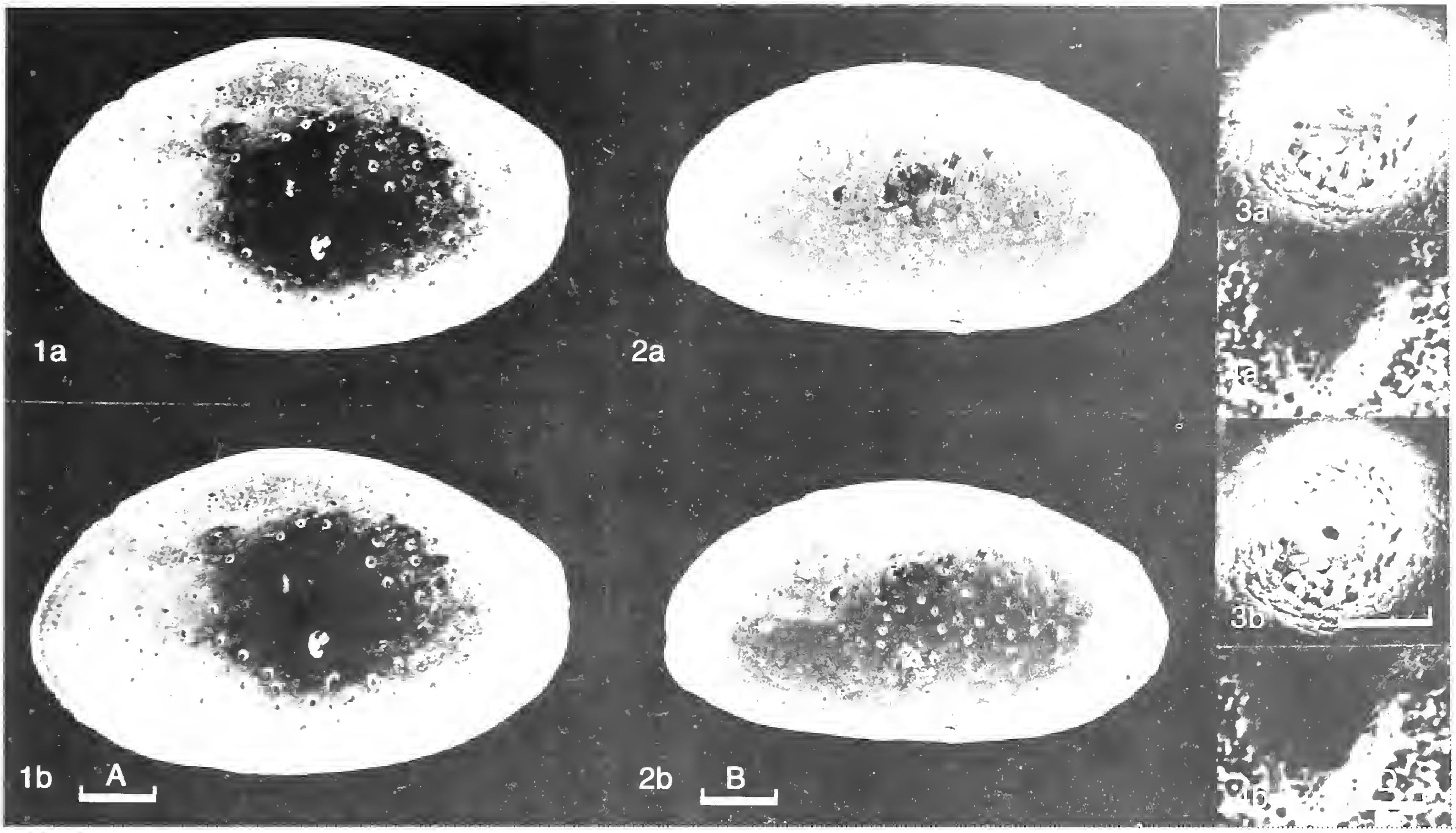
Derivation of name: In honour of J. D. Pollet, for his geological investigations in Sierra Leone.

Figured specimens: British Museum (Nat. Hist.) nos. **OS 12288** (holotype, ♀ RV, SLBH9–9: Pl. **11**, 78, fig. 1), **OS 12287** (♀ LV, SLBH9–12: Pl. **11**, 76, fig. 1), **OS 12289** (♂ RV, SLBH9–9: Pl. **11**, 78, figs. 2, 3), destroyed (♂ LV, SLBH9–9: Pl. **11**, 76, fig.2), **OS 12290** (♀ RV, SLBH9–9: Pl. **11**, 80, figs. 1, 2, 3, 4, Pl. **11**, 82, fig. 1), **OS 12291** (♀ RV, SLBH9–10: Pl. **11**, 82, figs. 2, 3), **OS 12292** (♀ LV, SLBH9–10: Pl. **11**, 82, fig. 4). All specimens are from the type locality; depths of samples in borehole as follows: SLBH9–9, 110 feet; SLBH9–10, 120 feet; SLBH9–12. 132–137 feet.

Diagnosis: Because this is the only species known so far, see generic diagnosis.

Explanation of Plate 11, 78

Fig. 1 ♀ RV, ext. lat. (holotype, **OS 12288**, 640μm long); figs. 2, 3, ♂ RV (paratype, **OS 12289**, 650μm long): fig. 2, ext. lat.; fig. 3, normal pore canals.
Scale A (200μm; ×94), figs. 1, 2; scale B (20μm; ×930), fig. 3.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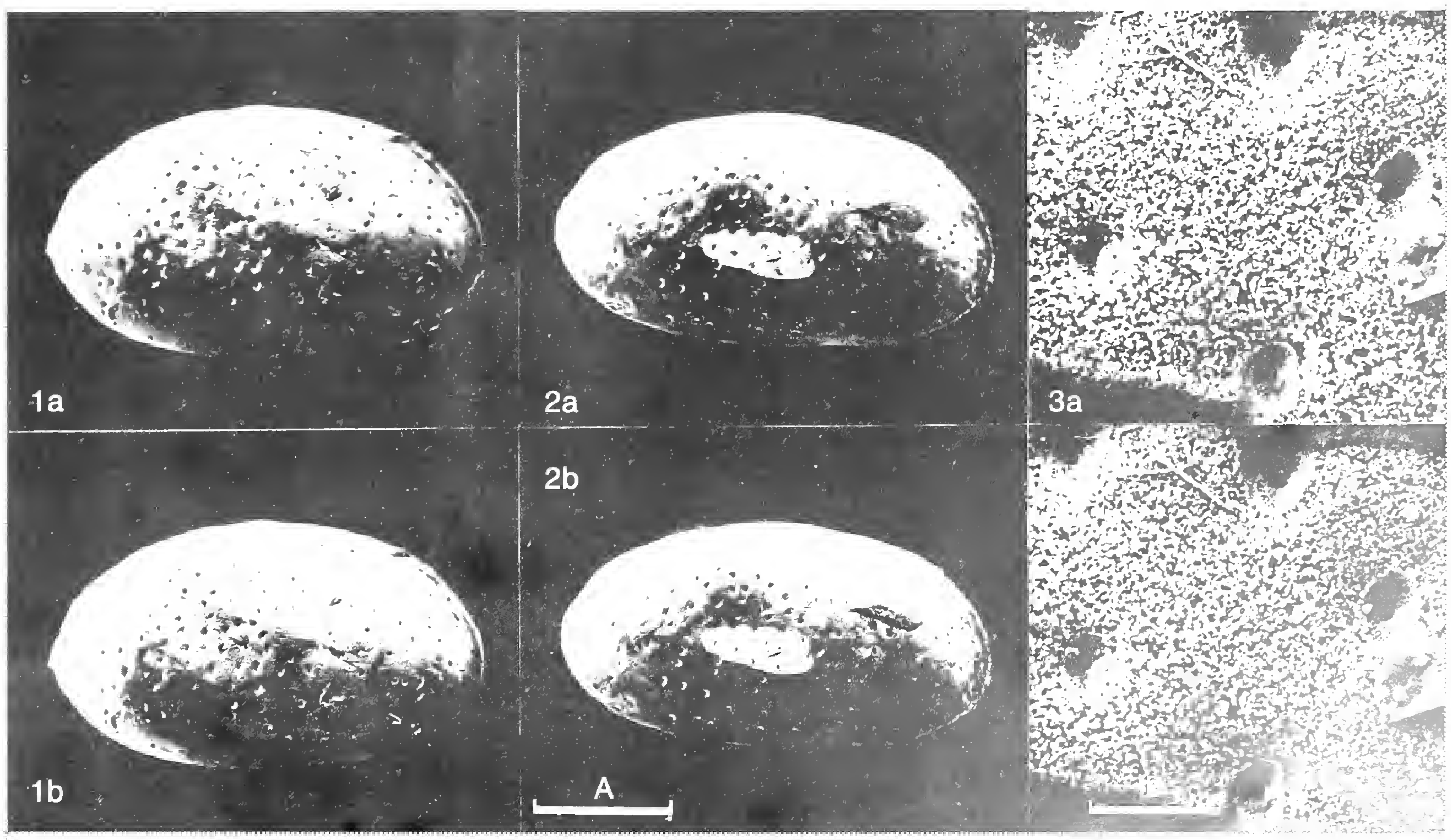
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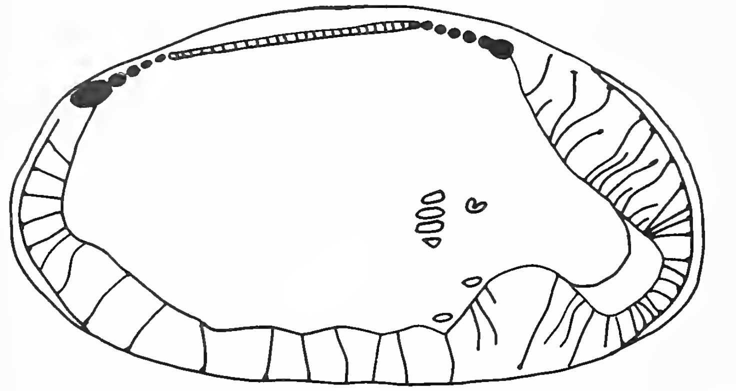
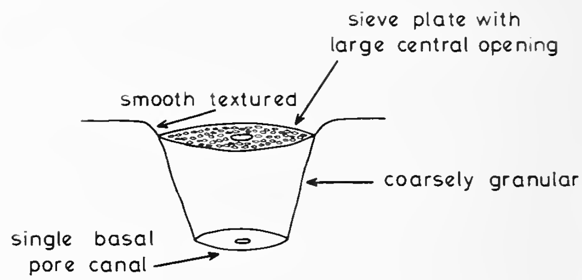


100 μm

Text-fig. 1, ♂ LV, int. lat. (**OS 12292**, 650μm long)



10 μm

Text-fig. 2, Diagrammatic sketch through a normal pore canal

Explanation of Plate 11, 80

Figs. 1–4, ♂ RV (paratype **OS 12290**, 660μm long): fig. 1, int. lat.; fig. 2, hinge; fig. 3, ant. hinge; fig. 4, post. hinge. Scale A (100μm; ×89), fig. 1; scale B (100μm; ×180), fig. 2; scale C (50μm; ×350). figs. 3, 4.

Remarks: There is variation in lateral outline, some specimens having a more arched dorsal margin than others (cf. Pl. **11**, 76, fig. 2 and Pl. **11**, 82, fig. 4; and Pl. **11**, 78, fig. 1 and Pl. **11**, 82, fig. 1); it seems unlikely that this character will be useful in species discrimination.

A slight hinge-ear tends to develop at the postero-dorsal angle of the left valve. The prominent normal pore canal openings give the surface a punctate appearance. The normal pore canals are sieve-type with a large central opening; the sieve plate is delicate and easily destroyed, leaving a pit with a large central opening at the base. There are about 100 normal pore canals.

The hinge is basically antimerodont; the right valve anterior tooth consists of five crenulations which become larger towards the anterior, the most anterior being quite large, bilobed, and almost like a small tooth in its own right; the situation is similar posteriorly, with four crenulations, the most posterior being larger. In the right valve the median element is a very shallow crenulate groove. Hinge of left valve is complementary.

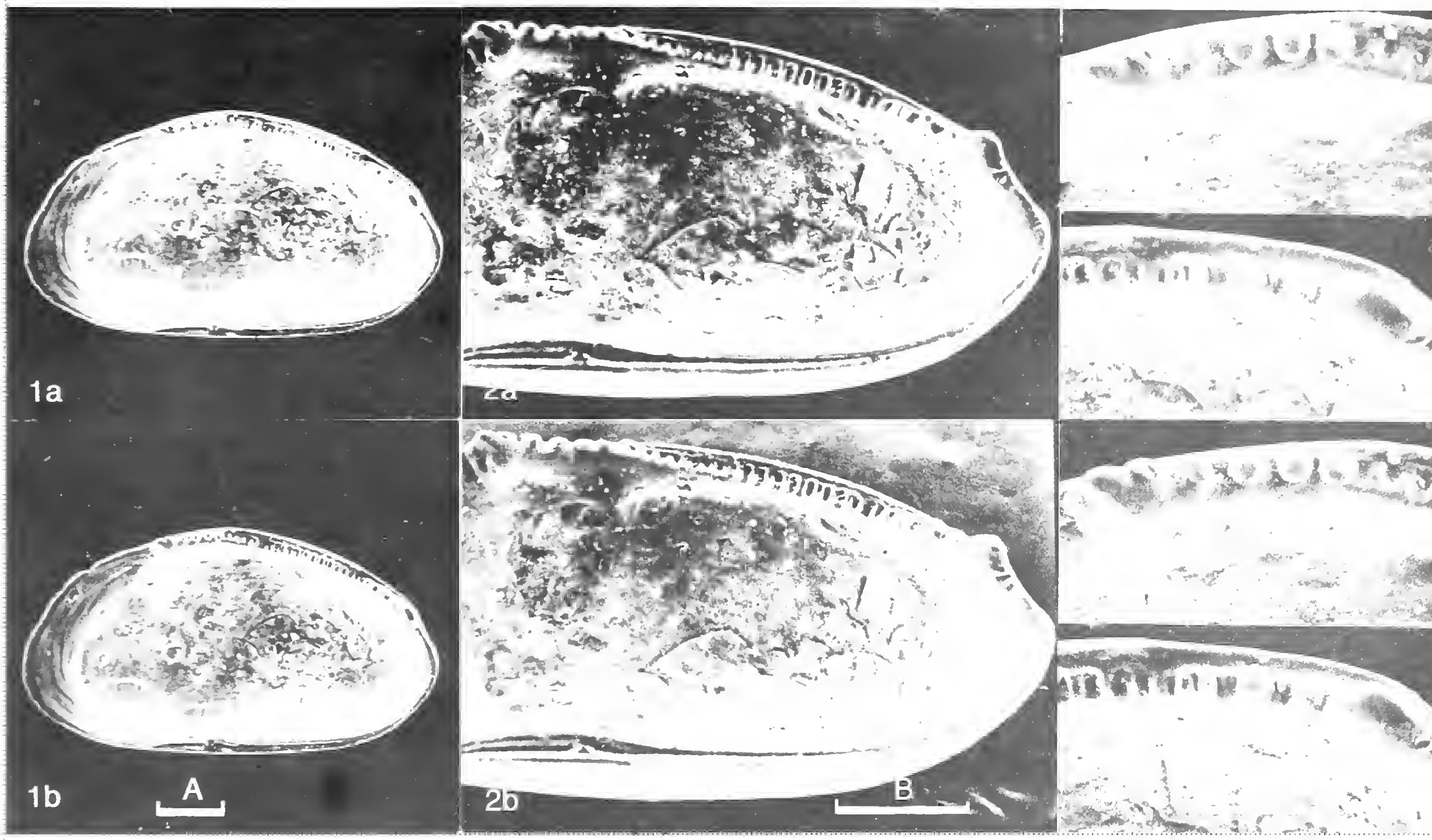
The line of the inner margin is irregular. There is a prominent indentation in the antero-ventral angle, with the production of a small vestibule. There are some 34 anterior radial pore canals, arranged in three groups: the dorsal group of 14 are long, sinuous, often crossing each other, with many false canals; the second group is developed around the antero-ventral indentation, where there are some 15 short, straight, canals; the third group is found along the ventral part of the antero-ventral indentation where the canals are long and sinuous. There are some eight ventral radial pore canals and eight posterior radial pore canals.

The central muscle scars consist of a vertical row of 4 scars with a single frontal scar; the latter is approximately oval with a tendency to become 'U'-shaped or even almost to split into two. Mandibular scars are present, the most ventral of which lies in an indentation of the ventral inner margin.

Distribution: Known only from the type locality.

Explanation of Plate 11, 82

Fig. 1, ♀ RV, int. musc. sc. (**OS 12290**); figs. 2, 3, ♀ RV (**OS 12291**, 640μm long): fig. 2, ext. dors.; fig. 3, int. musc. sc.; fig. 4, ♂ LV (**OS 12292**, 650μm long), lateral view in transmitted light. All paratypes.
Scale A (25μm; ×550), figs. 1, 3; scale B (100μm; ×103), figs. 2, 4.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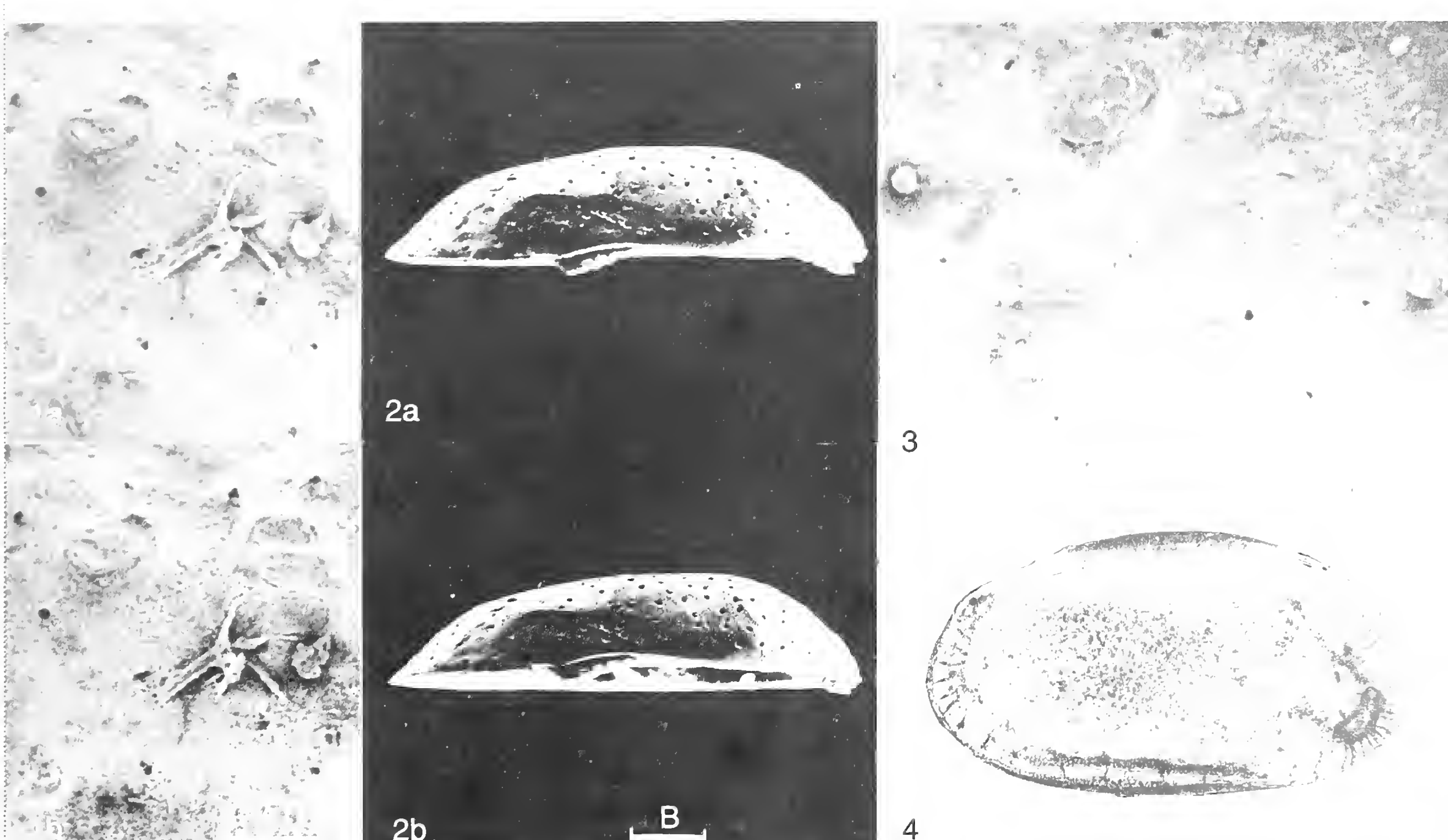
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595.337.14 (116.331–333.3) (567 : 161.047.30) : 551.35

ON *ARCHEOCOSTA ALKAZWINII* AL-BASHIR & KEEN

by J. M. T. Al-Bashir & M. C. Keen
(University of Glasgow, Scotland)

Genus *ARCHEOCOSTA* gen. nov.

Type-species: *Archeocosta alkazwinii* sp. nov.

Derivation of name: Greek *arche*, beginning; referring to the first or earliest of the *Costa* group.

Diagnosis: Trachyleberidinae with four longitudinal ridges, ventral ridge often indistinct on left valve; no sub-central tubercle; reticulate ornamentation; carapace subrectangular in lateral view with prominent anterior hinge ear in left valve, and pointed posterior end; males larger and more elongate than females; hinge amphidont/heterodont.

Remarks: *Archeocosta* is thought to belong to a group of costate ostracods which characterised the late Cretaceous and Palaeogene shallow marine waters of the southern shores of Tethys. *Paracosta* Siddiqui, 1971 and *Paleocosta* Benson, 1977 are other members of the group which are found in West and North Africa, the Middle East, and Pakistan. *Archeocosta* (Cenomanian-Santonian) is considerably older than *Paracosta* and *Paleocosta* (Maastrichtian-Oligocene) and may be ancestral to them. These ostracods have a dorsal ridge, two median ridges, and a marginal ventral ridge; Paracosta and *Paleocosta* frequently develop a short fifth ridge between the two median ridges, a feature not seen in *Archeocosta*. It needs to be emphasised that the ventral ridge is very close to the ventral margin, but it is this ridge that is continuous with the anterior and posterior marginal rims; the lower median ridge might be confused with the normal position of the ventral ridge, and it is not continuous with the marginal rims. *Paracosta* and *Paleocosta* differ from each other principally in the strength of ornamentation, *Paleocosta* having more prominent longitudinal ridges with coarser and

Explanation of Plate 11, 84

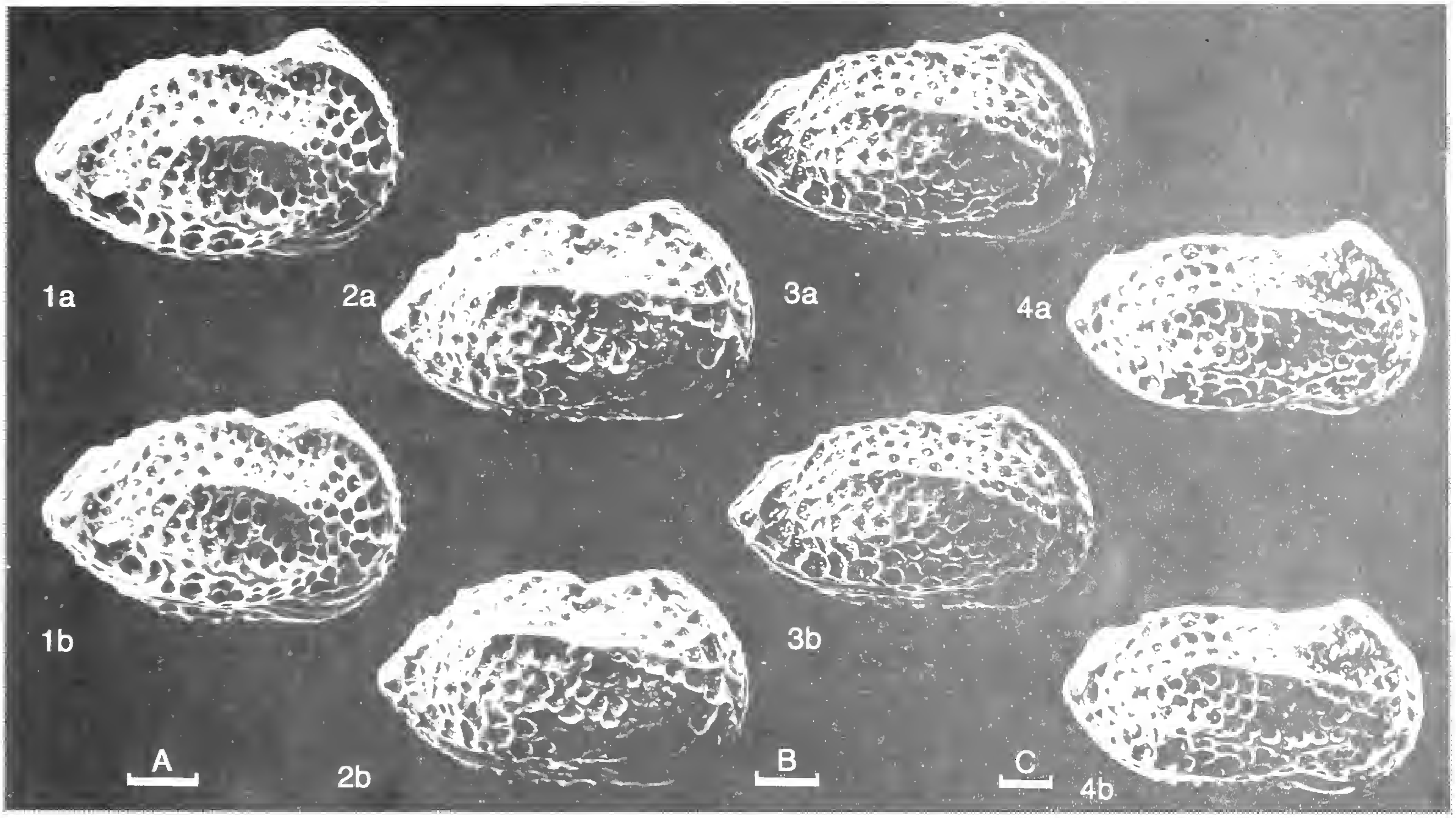
Fig. 1, ♀ car., ext. rt. lat. (**OS 12293**, 540μm long); fig. 2, ♀ car., ext. rt. lat. (holotype, **OS 12294**, 630μm long); fig. 3, ♀ car., ext. rt. lat. (**OS 12295**, 620μm long); fig. 4, ♂ car., ext. rt. lat. (**OS 12299**, 720μm long).
Scale A (100μm; ×94), fig. 1; scale B (100μm; ×82), figs. 2, 3; scale C (100μm; ×69), fig. 4.

Remarks (contd.): more regular intercostal reticulation. Al-Sheikhly ('Maastrichtian-Upper Eocene Ostracoda of the subfamily Trachyleberidinae from Iraq, Jordan and Syria'; unpublished Ph.D. thesis, Univ. of Glasgow 1980) considered such differences to warrant subgeneric distinction only.

Archeocosta is similar to these two taxa in many details, including the presence of a short eye-rib, two small ridges bifurcating from the posterior end of the dorsal ridge, the distribution of pore cones, and internally the crescentic anterior tooth of the right valve. It differs in the asymmetry of the valves, whereby the ventral ridge is always distinct in the right valve but not always easily seen in the left; in having a shorter and less prominent ridge running from the eye-tubercle towards the sub-central area; in frequently having two ridges running from the anterior end of the upper median ridge; and in the absence of any clear bifurcation at the posterior end of the upper median ridge. Internally *Archeocosta* differs in having a smooth hinge bar, unlike the crenulate bar of *Paracosta* and *Paleocosta*. There is a possibility that the smooth hinge bar of *Archeocosta* could be due to preservation because individual specimens of the two other genera may have smooth hinge bars on this account, and specimens which may be conspecific with *A. alkazwinii* have been described by Sayyab ('Cretaceous Ostracoda from the Arabian Gulf Area'; unpublished Ph.D. dissertation, State University of Iowa, 1956) with a crenulate hinge bar (see *A. alkazwinii* below). Most species of *Paracosta* and *Paleocosta* also have a narrow anterior vestibule, a feature not observed so far in *Archeocosta*. *Cythereis* Jones, 1849 differs in having only three longitudinal ridges, a prominent sub-central tubercle, and denticulate anterior and posterior hinge elements. *Dumontina* Derro, 1966 differs in outline, lacks a hinge-ear, has less prominent and a more irregular number of longitudinal ridges, and has denticulate or lobate anterior and posterior hinge elements. *Trachyleberidea* Bowen, 1953 differs in having a sharply pointed posterior end, only three longitudinal ridges, and lobate terminal hinge elements. *Hazelina* Moos, 1966 has only three longitudinal ridges which tend to be thicker, the median ridge curves upwards at the posterior to join the dorsal ridge, has a subcentral tubercle, and has lobate terminal hinge elements. *Costa* Neviani, 1928 differs in the presence of only three longitudinal ridges and the frequent discontinuity of the antero – marginal rim.

Explanation of Plate 11, 86

Fig. 1, ♂ car., ext. rt. lat. (**OS 12303**, 680μm long); fig. 2, ♂ car., ext. rt. lat. (**OS 12304**, 652μm long); fig. 3, ♂ car., ext. lt. lat. (**OS 12305**, 680μm long); fig. 4, ♀ car., ext. lt. lat. (**OS 12296**, 582μm long).
Scale A (100μm; ×76), figs. 1–3; scale B (100μm; ×88), fig. 4.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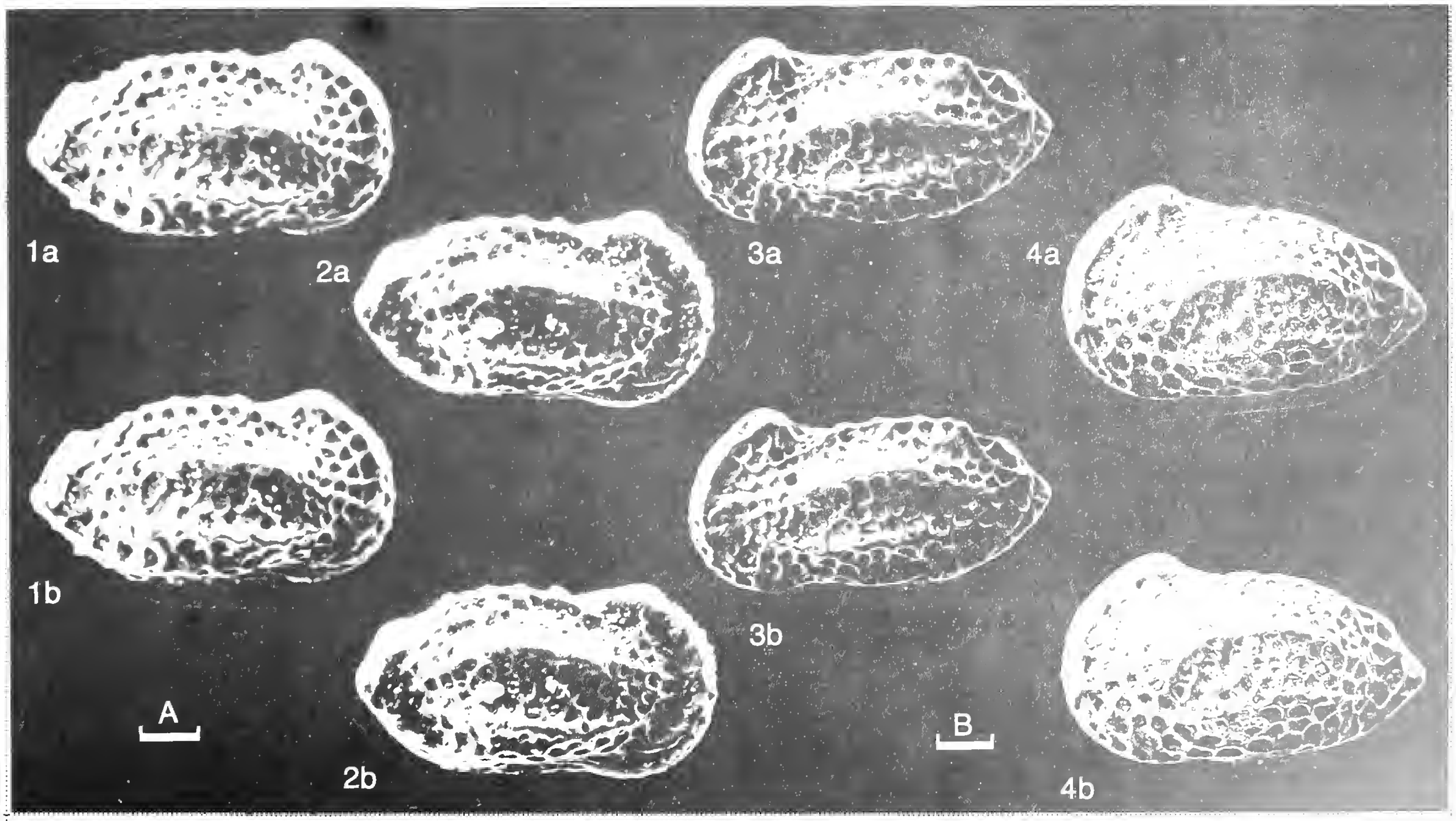
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Archeocosta alkazwinii sp. nov.

Holotype: British Museum (Nat. Hist.) no. **OS 12294**; ♀ carapace.

Type locality: South Rumaila Well-104, south eastern Iraq, lat. 30°05′E, long. 47°23′N; Khasib Formation, Lower Coniacian, drilling depth of 2386 m.

Derivation of name: After Zakariyy Al-Kazwini, a famous thirteenth century Arab cosmologist and geographer.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. **OS 12293** (♀ car., depth 2386 m: Pl. **11**, 84, fig. 1; Pl. **11**, 88, fig. 5), **OS 12294** (holotype, ♀ car., depth, 2386 m: Pl. **11**, 84, fig. 2), **OS 12295** (♀ car., depth 2414 m: Pl. **11**, 84, fig. 3), **OS 12299** (♂ car., depth 2392 m: Pl. **11**, 84, fig. 4), **OS 12305** (♂ car., depth 2400 m: Pl. **11**, 86, fig. 3), **OS 12296** (♂ car., depth 2412 m: Pl. **11**, 86, fig. 4), **OS 12297** (♀ car., depth 2416 m: Pl. **11**, 88, fig. 1), **OS 12301** (♂ car., depth 2424 m: Pl. **11**, 88, fig. 3), **OS 12310** (♀ car., depth 2386 m: Pl. **11**, 88, fig. 4), **OS 12309** (♀ car., depth 2392 m: Pl. **11**, 88, fig. 6), **OS 12307** (♀ RV, depth 2416 m: Pl. **11**, 90, fig. 3), **OS 12308** (♀ LV, depth 2414 m: Pl. **11**, 90, fig. 4); all from the Khasib Formation of South Rumaila Well-104. Specimens **OS 12303** (♂ car., depth 2362 m: Pl. **11**, 86, fig. 1), **OS 12300** (♂ car., depth 2348 m: Pl. **11**, 88, fig. 2), **OS 12306** (♂ car., depth 2348 m: Pl. **11**, 90, fig. 1), and **OS 12302** (♂ car., depth 2342 m: Pl. **11**, 90, fig. 2) are from the Tanuma Formation of South Rumaila Well-104. **OS 12304** (♂ car., depth 4420 ft: Pl. **11**, 86, fig. 2) is from the Khasib Formation of Kifl Well-2.

Diagnosis: Because this is the only species so far known, see generic diagnosis.

Remarks: The dorsal ridge bears some prominent pore cones which sometimes give it a sinuous appearance; it bifurcates at the posterior, the lower branch being a short curved ridge ending at the "terminus" pore cone. The upper median ridge is variable in length and prominence, and in most specimens thickening of the anterior reticulation muri form two thin ridges running from the anterior end of the upper median ridge towards the anterior margin. The reticulation between the two median ridges varies in strength between specimens. The marginal ventral ridge is only clearly seen on the right

Explanation of plate 11, 88

Fig. 1, ♀ car., ext. lt. lat. (**OS 12297**, 640 μm long); fig. 2, ♂ car., ext. lt. lat. (**OS 12300**, 720 μm long); fig. 3, ♂ car., ext. lt. lat. (**OS 12301**, 742 μm long); fig. 4, ♀ car., ext. vent. (**OS 12310**, 630 μm long); fig. 5, ♀ car., ext. dors. (**OS 12293**, 540 μm long); fig. 6, ♀ car., ext. dors. (**OS 12309**, 630 μm long). Scale A (200 μm; × 82), figs. 1, 5; scale B (200 μm; × 72), figs. 2–4, 6.

Remarks (contd.): valve of both males and females; at the posterior it is continuous with the posterior marginal rim; at the anterior it converges towards the lower median ridge and in some specimens a branch of it is continuous with the anterior marginal rim. The reticulation varies in strength between specimens at both the anterior and posterior. There is no true sub-central tubercle, although some specimens show a slight prominence where the upper median ridge bifurcates at the anterior. Eye tubercle prominent. 6–10 anterior and 5–6 posterior denticles. Pore cores often prominent.

Internally, the marginal area is broad, there are no vestibules, the selvage is distinct. The hinge of the right valve has a crescentic-shaped smooth anterior tooth with a higher conical dorsal part and a lower ventral part extending below the postjacent socket, the latter being deep, smooth, and rounded; the median groove appears to be smooth; the posterior tooth is a large hemispherical boss; the hinge of the left valve is complementary. The muscle scars could not be observed.

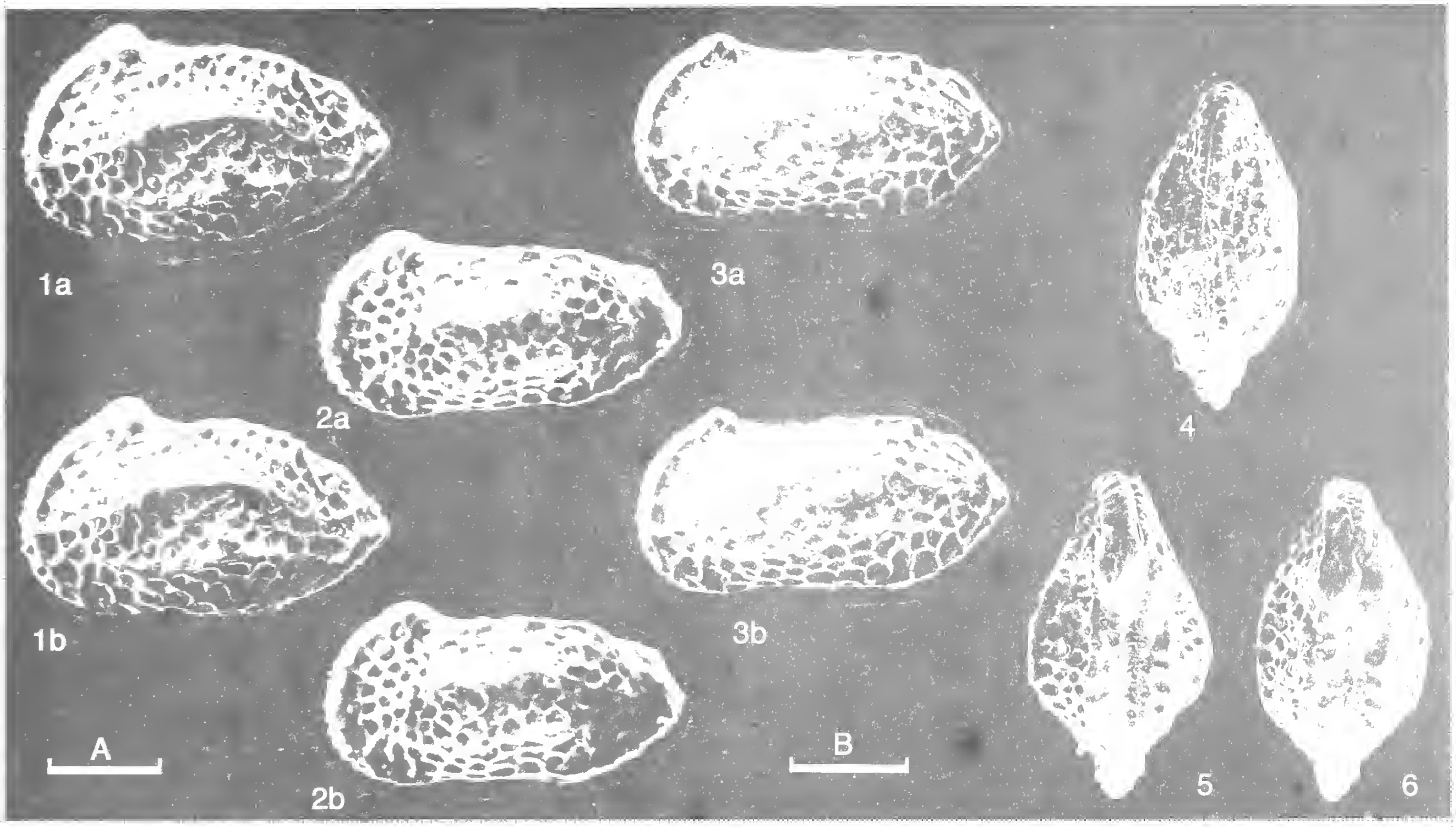
A. alkazwinii is probably synonymous with '*Mesocythereis reticulata*' Sayyab M.S. (86–87, pl. 3, figs. 23, 24, text-fig. 20) from the Upper Cretaceous of the Arabian Gulk, although Sayyab describes a crenulate hinge bar and a reniform posterior tooth. *Paracosta declivis* Siddiqui, 1971, the type-species of the genus from the Upper Eocene of Pakistan differs in the absence of a hinge ear and the presence of a much longer upper median ridge. *Paracosta arabica* (Bassiouni, 1969) from the Palaeocene-Eocene of N. Africa and the Middle East differs in having a more bluntly rounded posterior margin, a weak hinge ear, and less prominent longitudinal ridges.

A alkazwinii shows considerable range in size, with females varying between 540 μm and 640 μm in length and males between 630 μm and 750 μm. The size distribution is continuous, with no obvious groupings, and smaller and larger individuals may occur in the same sample (compare Pl. **11**, 84 fig. 1, a small form L = 540 μm, with the holotype, Pl. **11**, 84, fig. 2, L = 630 μm). The smaller individuals have the same ornamentation as the larger, are heavily calcified, and have a fully developed amphidont hinge. It is felt justified to regard them as adult and not a case of precocious sexual dimorphism, but it is impossible to determine whether the size variation is an environmental or genetic phenomenon.

Distribution: Turonian to Coniacian of Iraq.

Explanation of Plate 11, 90

Fig. 1, ♂ car., ext. lt. lat. (**OS 12306**, 700 μm long); fig. 2, ♂ car., ext. lt. lat. (**OS 12302**, 630 μm long); fig. 3, ♀ RV, int. lat. (**OS 12307**, 630 μm long); fig. 4, ♀ LV, int. lat. (**OS 12308**, 630 μm long). Scale A (200 μm; × 74), fig. 1; scale B (200 μm; × 81), figs. 2–4.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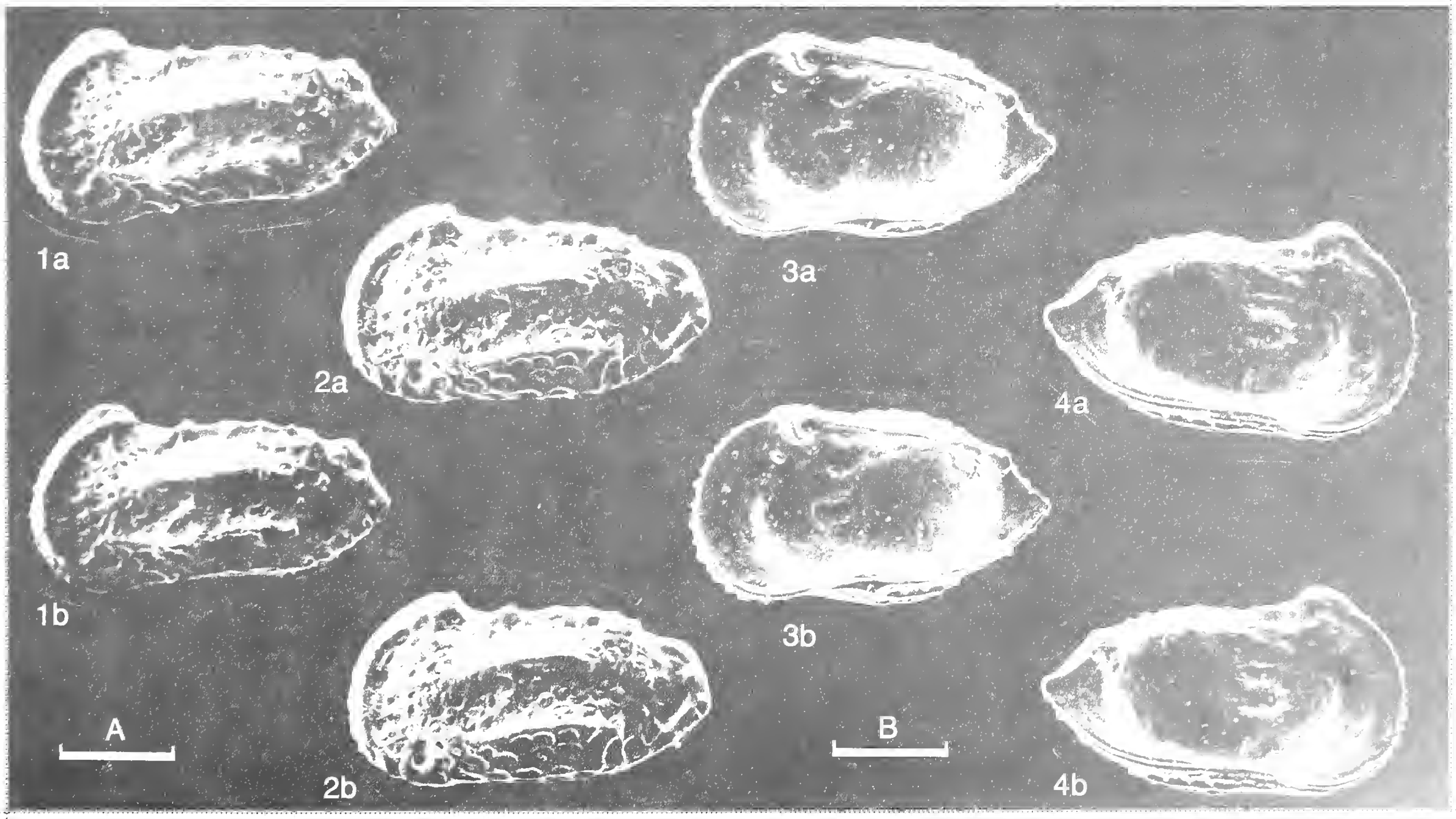
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595.337.14 (118.15) (430.1: 161.006.51 + 161.007.53 + 161.008.52 + 161.009.51) : 551.35 (24.08.5–20) + 552.51

ON *SCHULERIDEA (AEQUACYTHERIDEA) OCULATA* MOOS

by Roseline H. Weiss
(Geological Institute, University of Cologne, Germany)

Schuleridea (Aequacytheridea) oculata Moos, 1970

1894 *Cytheridea perforata* (Roemer); E. Lienenklaus, *Z. dt. geol. Ges.*, **46**, 225, pl. 15, fig. 5 (*pars*).
?1958 *Schuleridea perforata* (Roemer); C. Ellerman, *Fortschr. Geol. Rheinld. Westf.*, **1**, 210.
?1963 *Aequacytheridea perforata* (Roemer); van den Bold, *Neues Jb. Geol. Paläont. Mh.*, **1963**, 114.
1970 *Schuleridea (Aequacytheridea) oculata* sp. nov. B. Moos, *Geol. Jb.*, **88**, 296, pl. 29, figs. 6–12.
1975 *Schuleridea (Aequacytheridea) oculata* Moos; M. Faupel, *Göttinger Arb. Geol. Paläont.*, **17**, 27, pl. 8, figs. 1a–b.
?1980 *Schuleridea oculata* Moos; H. Uffenorde, *Neues Jb. Geol. Paläont. Mh.*, **1980**, 119.
1981 *Schuleridea (Aequacytheridea) oculta* Moors; H. Uffenorde, *Palaeontographica Abt. A*, **172** (4–6), 142, pl. 2, figs. 1, 4.
1983 *Schuleridea (Aequacytheridea) oculata* Moos; R. H. Weiss, *Palaeontographica Abt. A*, **182** (1–3), 50, pl. 1, figs. 1–7, pl. 2, figs. 1–7, pl. 3, figs. 1–4, text-fig. 1.

Explanation of Plate 11, 92

Fig. 1, ♂ car., ext. dors. (**GIK 932–1205**, 925μm long); fig. 2, ♂ car., ext. vent. (**GIK 932–1208**, 938μm long).
Scale A (100μm; ×101), figs. 1, 2.

Holotype: Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, Typk.-No. **6999**; ♀ RV. [Paratypes: No. **6998**, ♀ LV, and No. **7000**, ♀ car.].

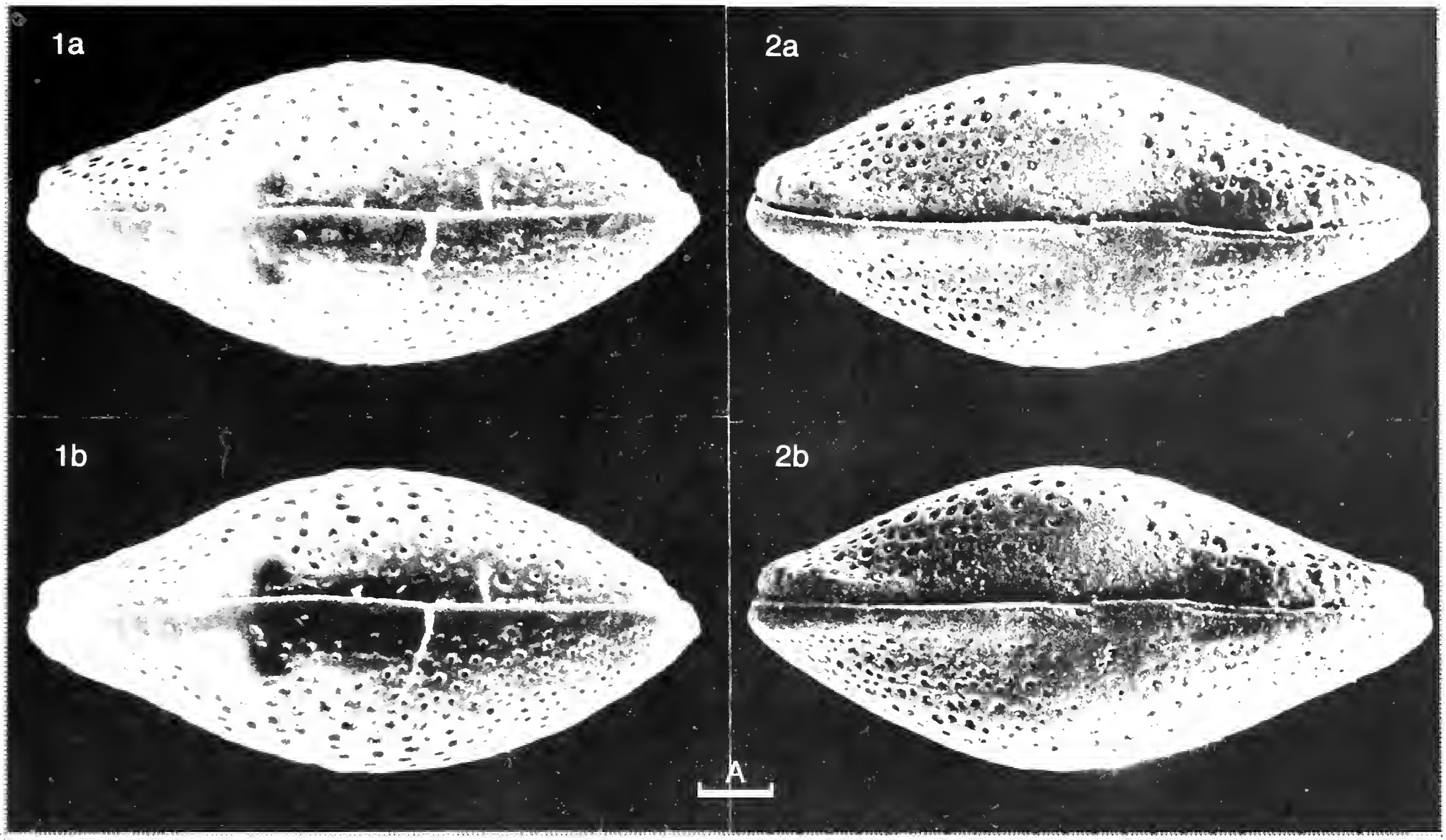
Type locality: Astrup near Osnabrück, West Germany. Upper Oligocene.

Figured specimens; Geological Institute, University of Cologne, nos. **932 –1201** (♀ LV:Pl. **11**, 98, fig. 1), **932 –1202**(♀ LV:Pl. **11**, 94, fig. 1), **932 –1202** (♀ RV:Pl. **11**, 96, fig. 1), **932 –1205** (♂ car.:Pl. **11**, 92, fig. 1), **932 –1207** (♂ LV: Pl. **11**, 94, fig. 2), **932–1208** (♂ car.: Pl. **11**, 92, fig. 2), **932–1211** (♂ LV: Pl. **11**, 98, fig. 2), **932–1212** (♂ RV: Pl. **11**, 96, fig.2).

All specimens were collected by Prof. E. K. Kempf in 1961 at a depth of 54.2–55.5 m from shaft Tönisberg near Krefeld, Germany (German Nat. Grid Ref.: R 34033, H 97555; long. 6° 29′ E, lat. 51° 25′ N); Upper Oligocene; *Sphenolithus ciperoensis* zone (NP25) according to Benedek & Müller (*N. Jb. Geol. Paläont.*, Mh., **1974**, 388); fine sand (grain size 0.2–0.06 mm = 92.5%) according to Kempf (*Niederrhein*, **35**, fig. 2, 1968); shallow marine (5–20 m water depth) according to Goerlich (*Fortschr. Geol. Rheinld. Westf.*, **1**, 220, 1958).

Explanation of Plate 11, 94

Fig. 1, ♀ LV, ext. lat. (**GIK 932–1202**, 875μm long.); fig. 2, ♂ LV, ext. lat. (**GIK 932–1207**, 925μm long). Pl. **11**, 94, fig. 1 and Pl. **11**, 96, fig. 1 represent both valves of a single carapace.
Scale A (100μm; ×93), figs. 1, 2.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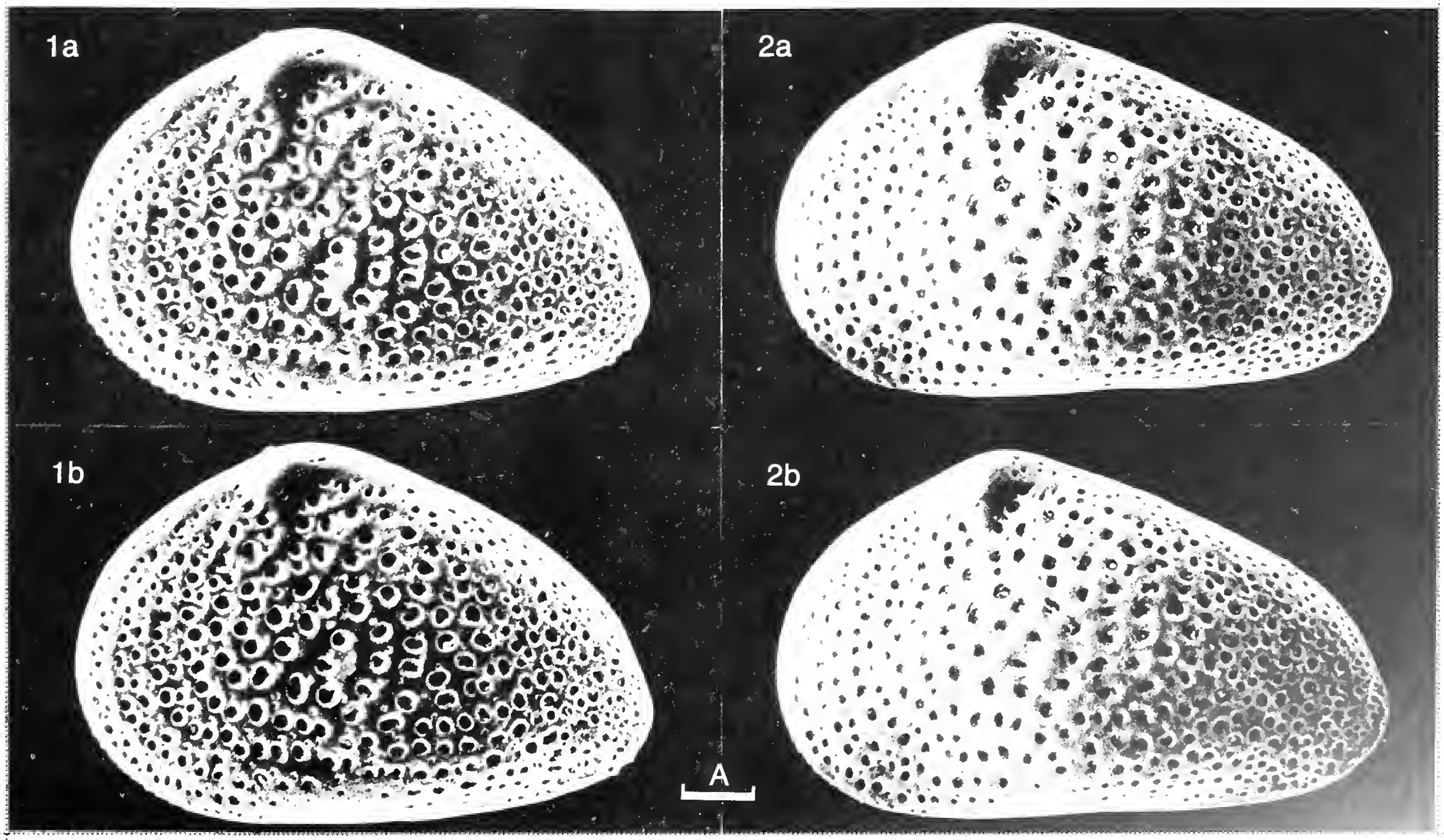
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Size: (A)

Sex	N	x̄	L (μm) Min	Max	x̄	H (μm) Min	Max	x̄	L/H Min	Max
♀♀ RV	20	846	813	875	521	500	550	1.620	1.535	1.676
♂♂ RV	9	883	850	900	509	500	525	1.738	1.657	1.776
♀♀ LV	24	885	838	925	585	550	625	1.514	1.458	1.565
♂♂ LV	15	922	875	950	556	525	588	1.659	1.616	1.705

(B)

Sex	N	x̄	L (μm) Min	Max	x̄	W (μm) Min	Max	x̄	L/W Min	Max
♀♀ car.	9	897	875	925	456	450	475	1.970	1.944	2.000
♂♂ car.	4	925	913	938	422	413	425	2.194	2.176	2.212

Table 1. Measurements on specimens (N = no. of specimens; x̄ = mean; L = length; H = height; W = width); A = valves, B = carapaces.

Diagnosis: In the lateral view valves subtriangular, anterior end broadly rounded, posterior end narrowly rounded ventrally. Both valves with small peripheral nodes along the anterior and posterior margins. Left valve considerably larger than right valve, overlapping it on all sides. Surface of the valves coarsely pitted; eye-tubercles distinct. In dorsal view carapaces subrhomboidal to elongate-fusiform.

Explanation of Plate 11, 96

Fig. 1, ♀ RV, ext. lat. (**GIK 932–1202**, 850μm long); fig. 2, ♂ RV, int. lat. (**GIK 932–1212**, 875μm long).
Scale A (100μm; ×93), figs. 1, 2.

Remarks: Sexual dimorphism pronounced. Shell morphotype B more elongate, lower and in dorsal view narrower than morphotype A. As the genus *Schuleridea* is not yet represented by living species, it is supposed that the males are represented by Morphotype B.

The hinge is divided into three elements in each valve. The terminal elements are dentate plates (RV) or loculate sockets (LV); the median element is subdivided into three parts – proximal, central and distal. The proximal and distal parts are smooth; the proximal part, however, being much broader than the distal part. The central parts – a groove (RV) or a ridge (LV) – are furnished with fine striations, and form a part of the opening mechanism (discussed in detail by Weiss 1983).

Numerous, funnel-type normal pores open on elevated parts of the shell. Marginal pore-canals are also very numerous (approx. 60 anteriorly). They reach the outer surface distally of the flange and their openings on the exterior surface of the shell form a zigzag line.

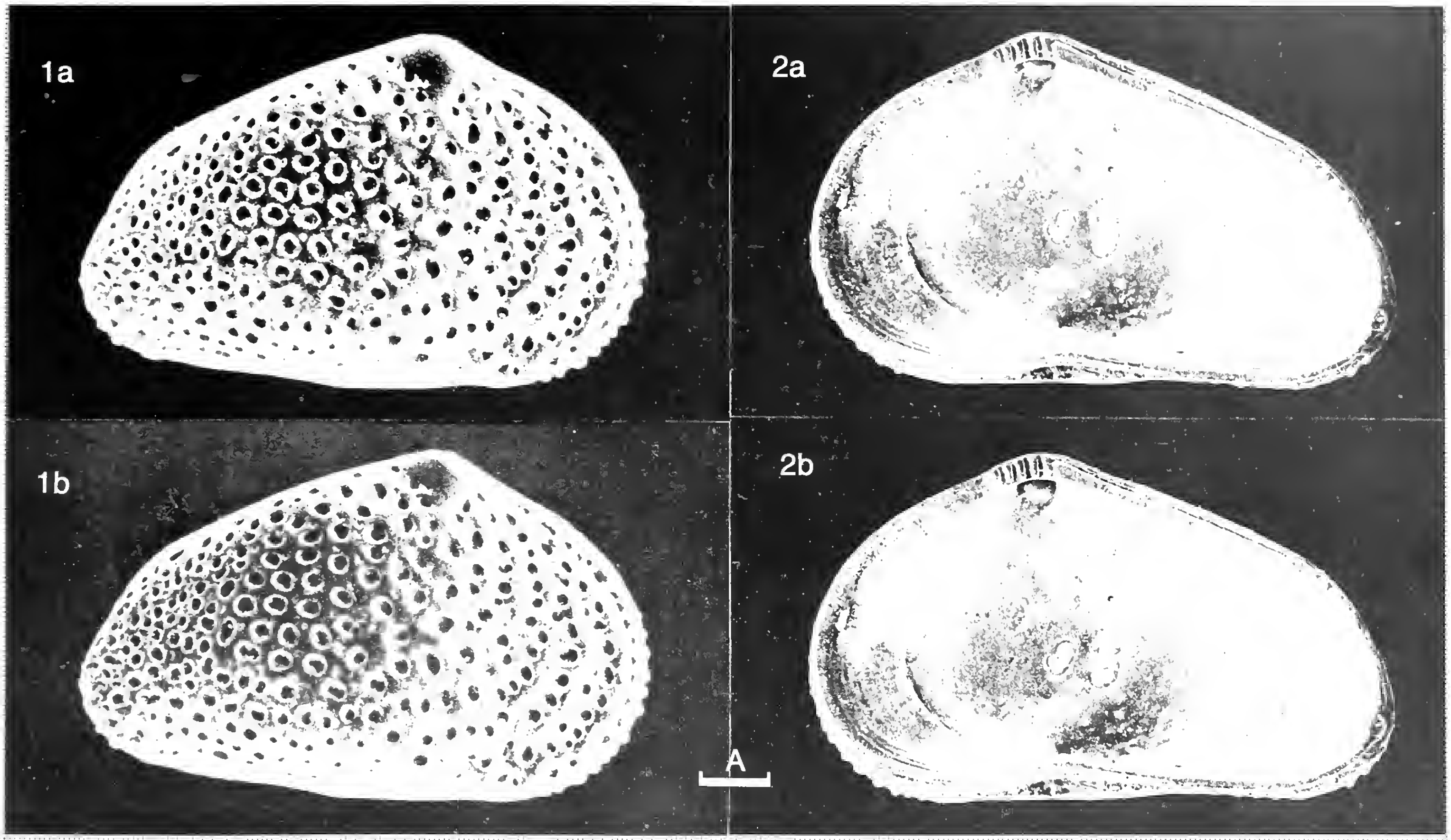
Line of concrescence and inner margin are very slightly separated along the anterior margin.

Distribution: Upper Oligocene: Astrup near Osnabrück, Germany (Lienenklaus 1894, Moos 1970, op. cit.); Doberg near Bünde, Germany (Lienenklaus 1894, Moos 1970, op. cit.); Shaft Kapellen (Lower Rhine Basin), Germany (Ellerman 1958, Moos 1970, op. cit.); Shaft Rossenray (Lower Rhine Basin), Germany (van den Bold 1963); Shaft Tönisberg (Lower Rhine Basin), Germany (Weiss 1983); Kassel, Germany (Moos 1970 op. cit.); Volpriehausen near Uslar (boring), Germany (Moos 1970, op. cit.); Höllkopf near Glimmerode (Basin of Kassel), Germany (Faupel 1975, op. cit.); Niedersachsen (borings), Germany (Uffenorde 1980, 1981, op. cit.).

Acknowledgement: Thanks are due to the Deutsche Forschungsgemeinschaft for providing the Cambridge Stereoscan 180.

Explanation of Plate 11, 98

Fig. 1, ♀ LV, int. lat. (**GIK 932–1201**, 825 μm long); fig. 2, ♂ LV, int. lat. (**GIK 932–1211**, 913 μm long). Pl. **11**, 96, fig. 2 and Pl. **11**, 98, fig. 2 represent both valves of a single carapace.
Scale A (100μm; ×93), figs. 1, 2.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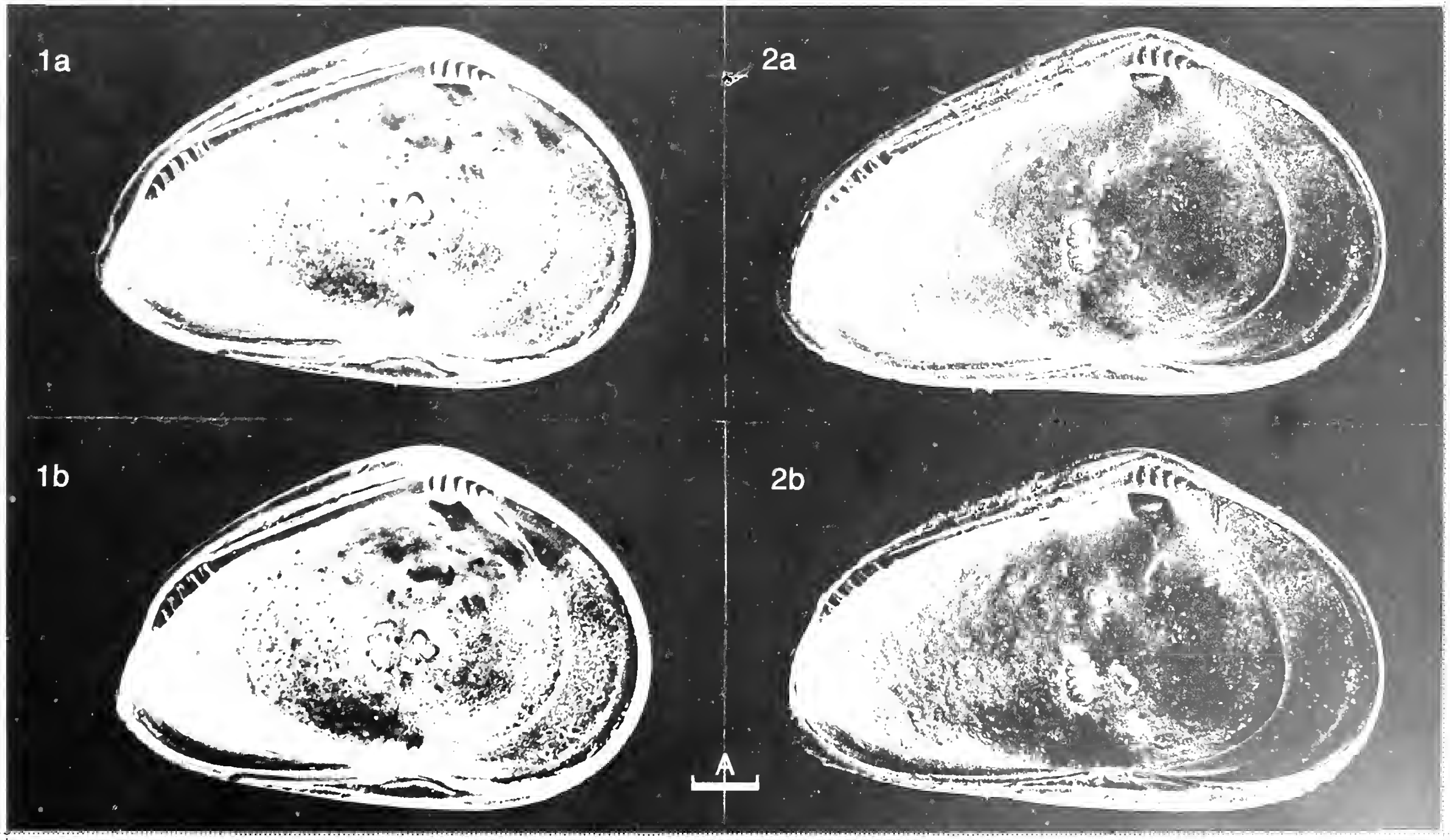
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Stereo-Atlas of Ostracod Shells 11 (19) 99-102 **(1984)**
595.337.14 (119.9) (267.8 : 161.050.26) : 551.351

ON *LOXOCONCHA MULTIORNATA* BATE & GURNEY

by Ali A. F. Al-Furaih
(King Saud University, Riyadh, Saudi Arabia)

Loxoconcha multiornata Bate & Gurney, 1981

1971 *Loxoconcha ornatovalvae* Hartmann; R. H. Bate, *Bull. Centre Rech. Pau-SNPA*, suppl. **5**, 245, 246, 248, 250, pl. 1, figs. 1k, 2k, pl. 2, fig. 3k, pl. 3, figs. 2k, 3k; *non L. ornatovalvae* Hartmann, 1964.
1978 *Loxoconcha* sp.A, S. P. Jain, *Bull. Ind. Geol. Assoc.*, **11**(2), 126, fig. 5A.
1981 *Loxoconcha (Loxoconcha) multiornata* sp. nov. R. H. Bate & A. Gurney, *Bull. Br. Mus. nat. Hist. (Zool.)*, **41** (5), 236, 238, figs. 1A-J, 2A.

Holotype: BM(NH) no. **1980.236**, ♂ carapace.
[Paratypes: nos. **1980.237-243**].
Type locality: Abu Dhabi Lagoon (24° 32′N, 54° 27′E), marine, sublittoral; Recent.
Figured specimens: King Saud University coll. nos. **KSU.G.OS 218** (♀ RV: Pl. **11**, 100, fig. 1), **KSU.G.OS. 219** (♂ RV: Pl. **11**, 100, fig. 2), **KSU.G.OS 220** (♂ LV: Pl. **11**, 100, fig. 3), **KSU.G.OS 221** (♂ LV: Pl. **11**, 102, figs. 1, 3), **KSU.G.OS 222** (♂ RV:Pl. **11**, 102 fig. 2). All the figured specimens are from the Jazīrat Tarūt coast of the Arabian Gulf, approx. lat 26° 35°N, long. 50° 05′E; Recent, marine.

Explanation of Plate 11, 100

Fig. 1, ♀ RV, ext. lat. (**KSU.G.OS. 218**, 460μm long); fig. 2, ♂ RV, ext. lat. (**KSU.G.OS. 219**, 480μm long); fig. 3, ♂ LV, ext. lat. (**KSU.G.OS. 220**, 480μm long).
Scale A (100μm; ×137), fig. 1; scale B (100μm; ×125), figs. 2, 3.

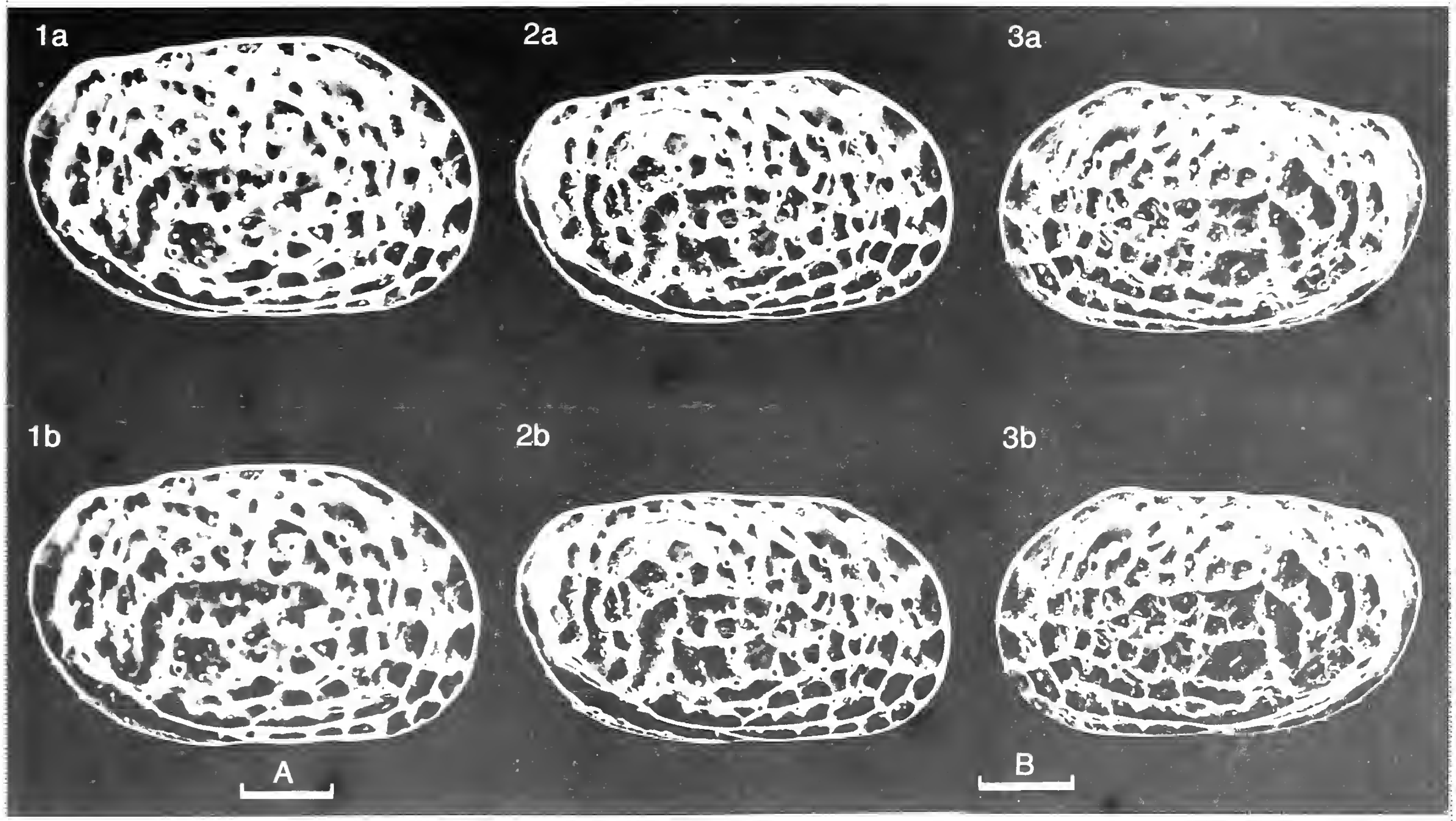
Diagnosis: A small (< 500μm long) species of *Loxoconcha* with straight parallel dorsal and ventral margins. Surface ornamentation consists of coarse, deep reticulations with tendency toward development of irregular ribbing pattern. There is a well developed eye tubercle and strong sexual dimorphism.

Remarks: The external morphology of this species somewhat resembles *L. kitanipponica* Ishizaki, 1971, but differs in having a reticulate surface with irregular ribbing pattern. *L. ornatovalvae* Hartmann, 1964 very closely resembles *L. multiornata* but is differentiated by its less prominently developed dorsal ridge. Furthermore, the two species differ in details of ornamentation, particularly in the ribbing pattern.

Distribution: *L. multiornata* has been found on the west coast of India (Jain, *op. cit.*) and in the Arabian Gulf (Bate & Gurney, *op cit.*, and herein).

Explanation of Plate 11, 102

Figs. 1, 3, ♂LV (**KSU.G.OS.221**, 480μm long): fig. 1, int. lat., fig. 3, int. musc.sc.; fig. 2, ♂RV, int. lat. (**KSU.G.OS.222**, 480μm long).
Scale A (100μm; ×140), figs. 1, 2; scale B (25μm; ×600), fig. 3.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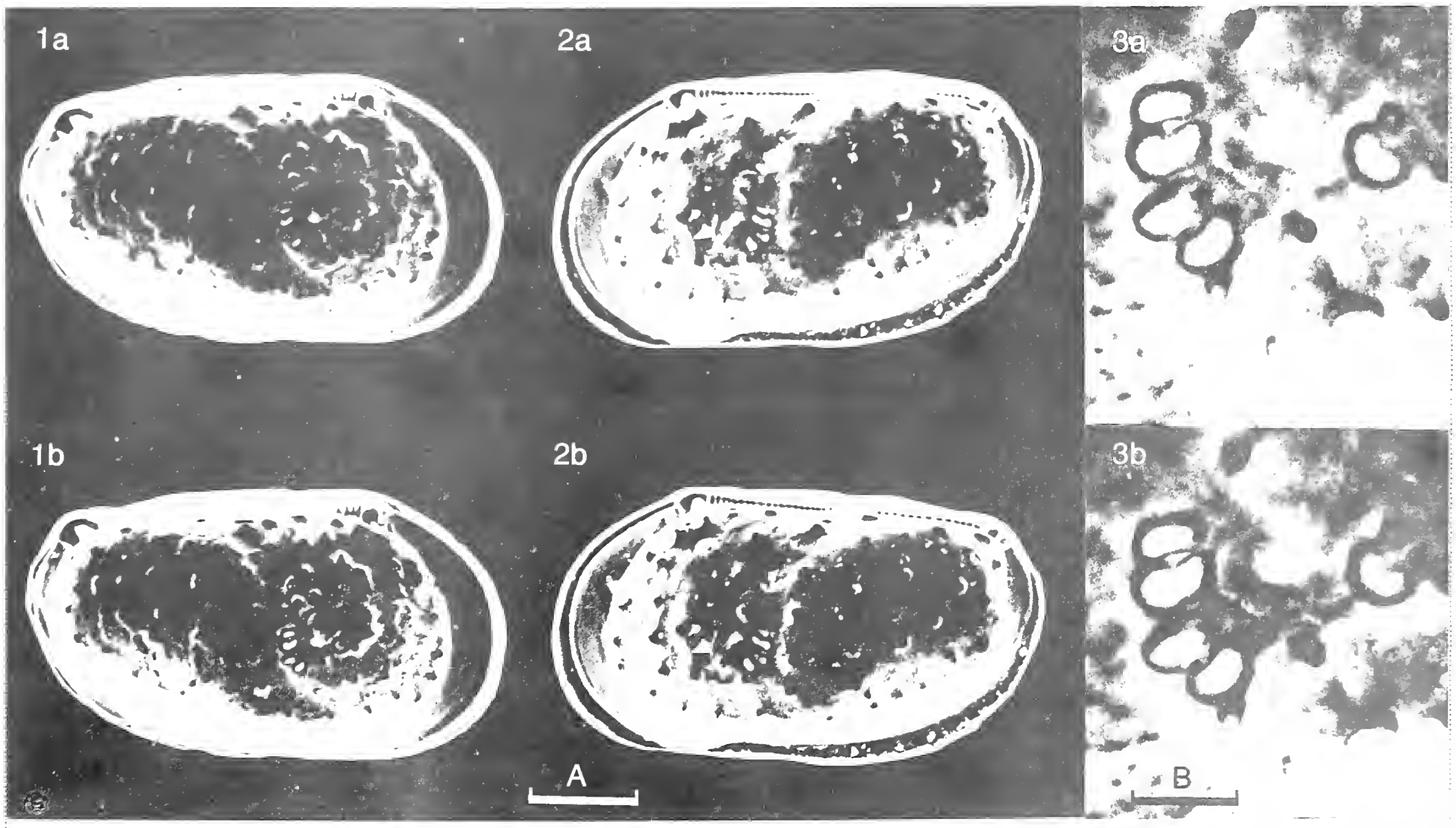
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Stereo-Atlas of Ostracod Shells 11 (20) 103-106 **(1984)**
595.337.14 (119.9) (267.8 : 161.050.26) : 551.351

ON *LOXOCONCHA UNDULATA* AL-FURAIH sp. nov.

by Ali A. F. Al-Furaih
(King Saud University, Riyadh, Saudi Arabia)

Loxoconcha undulata sp. nov.

1971 *Loxoconcha* sp. C.; R. H. Bate, *Bull. Centre Rech. Pau SNPA*, suppl. **5**, 246, 250, pl. 3, figs. 2n, 3n.
1981 *Loxoconcha (Loxoconcha) indica* Jain; R. H. Bate & A. Gurney, *Bull. Br. Mus. nat. Hist. (Zool.)*, **45**(5), 240, 241, figs. 5A-H; *non Loxoconcha megapora indica* Jain, 1978.

Holotype: King Saud University coll. **KSU.G.OS. 210**; ♀ RV.
Type locality: Jazīrat Tarūt coast, Arabian Gulf (approx. lat. 26° 35′N, long. 50° 05′E); Recent, marine.
Derivation of name: Latin *undulatus*, wavy; referring to the fancied resemblance of the anterior and posterior ornamentation to a wavy sea.
Figured specimens: King Saud University coll. nos. **KSU.G.OS. 210** (holotype, ♀ RV: Pl. **11**, 104, fig. 1), **KSU.G.OS. 211** (♂ LV: Pl. **11**, 104, figs. 2, 3), **KSU.G.OS. 212** (♀ LV: Pl. **11**, 106, fig. 1), **KSU.G.OS. 213** (♂ RV: Pl. **11**, 106, figs. 2, 3). All the figured specimens are from the type locality.

Explanation of Plate 11, 104

Fig. 1, ♀ RV, ext. lat. (holotype, **KSU.G.OS. 210**, 445 μm long); figs. 2, 3, ♂ LV (**KSU.G.OS. 211**, 470 μm long): fig. 2, ext. lat.; fig. 3, ext. lat., detail showing sieve-plate.
Scale A (100 μm; ×150), fig. 1; scale B (100 μm; ×140), fig. 2; scale C (10 μm; ×1900), fig. 3.

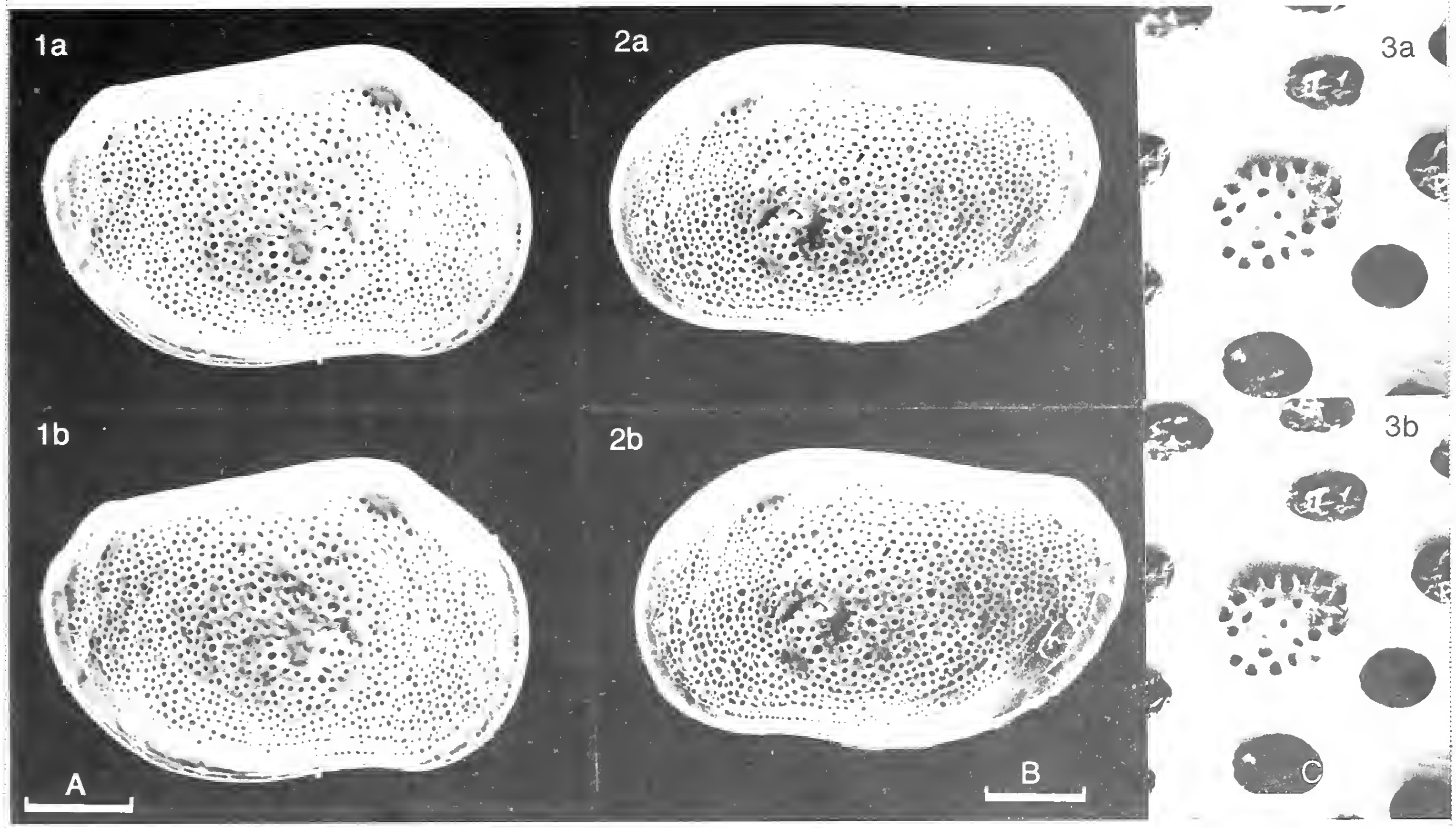
Diagnosis: Carapace subrhomboidal in lateral view. Dorsal margin very slightly concave just posterior to the middle. Ventral margin sinuous, concave anterior to the middle. Shell surface punctate with scattered rounded sieve pores. Eye spot low but distinct.

Remarks: This species was first recorded in the Arabian Gulf by Bate (1971) and described and illustrated by Bate & Gurney (1981), but they considered it conspecific with *Loxoconcha megapora indica* Jain, 1978, from the west coast of India. *L. indica* differs in having a straight dorsal margin, less distinct posterior cardinal angle and a much more finely punctated surface. Furthermore, *L. undulata* has a more broadly convex postero-ventral margin and the eye tubercle is situated in a lower position. The present species is somewhat similar to *L. matagordensis* Swain, 1955, from San Antonio Bay, Texas coast, but differs in having a more distinct posterior cardinal angle. *L. pseudovelata* Stancheva, 1964, from the Upper Miocene of Bulgaria is very closely related species but differs in details of outline and having reticulate surface.

Distribution: *L. undulata* has been found at several localities in the Arabian Gulf (Bate & Gurney, *op. cit.*, and herein).

Explanation of Plate 11, 106

Fig. 1, ♀ LV, int. lat. (**KSU.G.OS. 212**, 460 μm long); figs. 2, 3, ♂ RV (**KSU.G.OS. 213**, 495 μm long): fig. 2, int. lat.; fig. 3, int. musc. sc.
Scale A (100 μm; ×145), fig. 1; scale B (100 μm; ×140), fig. 2; scale C (25 μm; ×440), fig. 3.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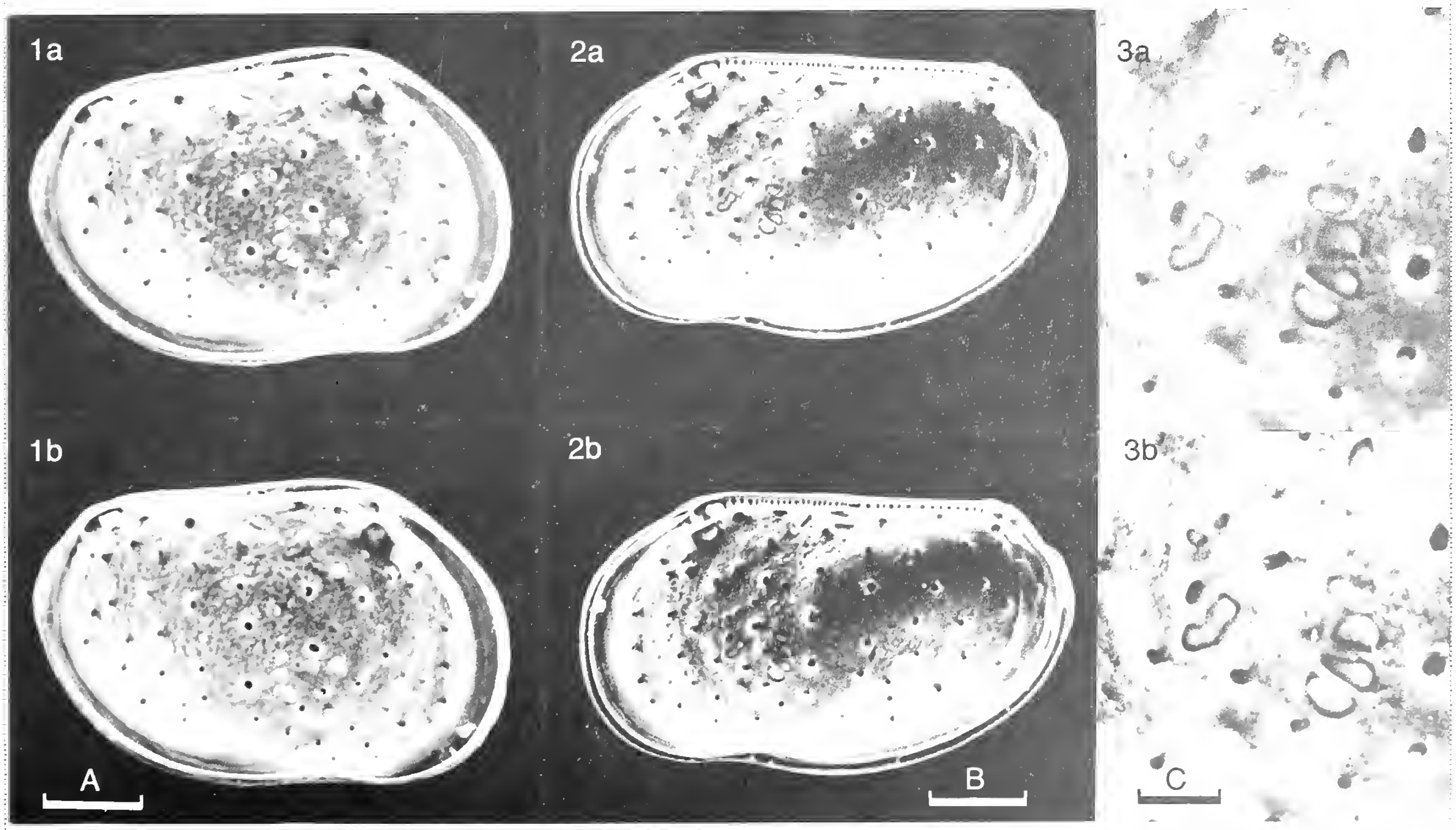
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595.337.14 (119.9) (267.8 : 161.050.26) : 551.351

ON *LOXOCONCHA AMYGDALANUX* BATE & GURNEY

by Ali A. F. Al-Furaih
(King Saud University, Riyadh, Saudi Arabia)

Loxoconcha amygdalanux Bate & Gurney, 1981

1971 *Loxoconcha* sp. B.; R. H. Bate, *Bull. Centre Rech. Pau-SNPA*, suppl. **5**, 245, 246, 248, pl. 1, fig. 2m, pl. 2, fig. 3m.
1977 *Loxoconcha* sp. A.; K. H. Paik, *Meteor Forsch-Ergebnisse*, **28**, 56, 58, pl. 6, figs. 112-114.
1981 *Loxoconcha (Loxoconcha) amygdalanux* sp. nov., R. H. Bate & A. Gurney, *Bull. Br. Mus. nat. Hist. (Zool)*, **41**(5), 242, 243, figs. 5I,J; 6A-K; 8A-C.

Holotype: BM(NH) no. **1980. 258,** ♂ RV.
[Paratypes: Nos: **1980. 257, 259-263, 269, 430**].

Type locality: Abu Dhabi Lagoon (24° 23′N, 54° 27′E); marine, sublittoral; Recent.

Figured specimens: King Saud University coll. nos. **KSU.G.OS. 214** (♀ RV : Pl. **11**, 108, fig. 1), **KSU.G.OS. 215** (♂ LV: Pl. **11**, 108, figs. 2, 3), **KSU.G.OS. 216** (♀ LV: Pl. **11**, 110, fig. 1), **KSU.G.OS. 217** (♂ RV: Pl. **11**, 110, figs. 2, 3). All the figured specimens are from the Jazīrat Tarūt coast of the Arabian Gulf, approx. lat. 26° 35′N, long. 50° 05′E; Recent, marine.

Explanation of Plate 11, 108

Fig. 1, ♀ RV, ext. lat. (**KSU.G.OS. 214**, 480 μm long); figs. 2, 3, ♂ LV (**KSU.G.OS. 215**, 500 μm long): fig. 2, ext. lat.; fig. 3, ext. lat., detail of ornament and sieve-plates.
Scale A (100 μm; × 140), fig. 1; scale B (100 μm; × 130), fig. 2; scale C (10 μm; × 970), fig. 3.

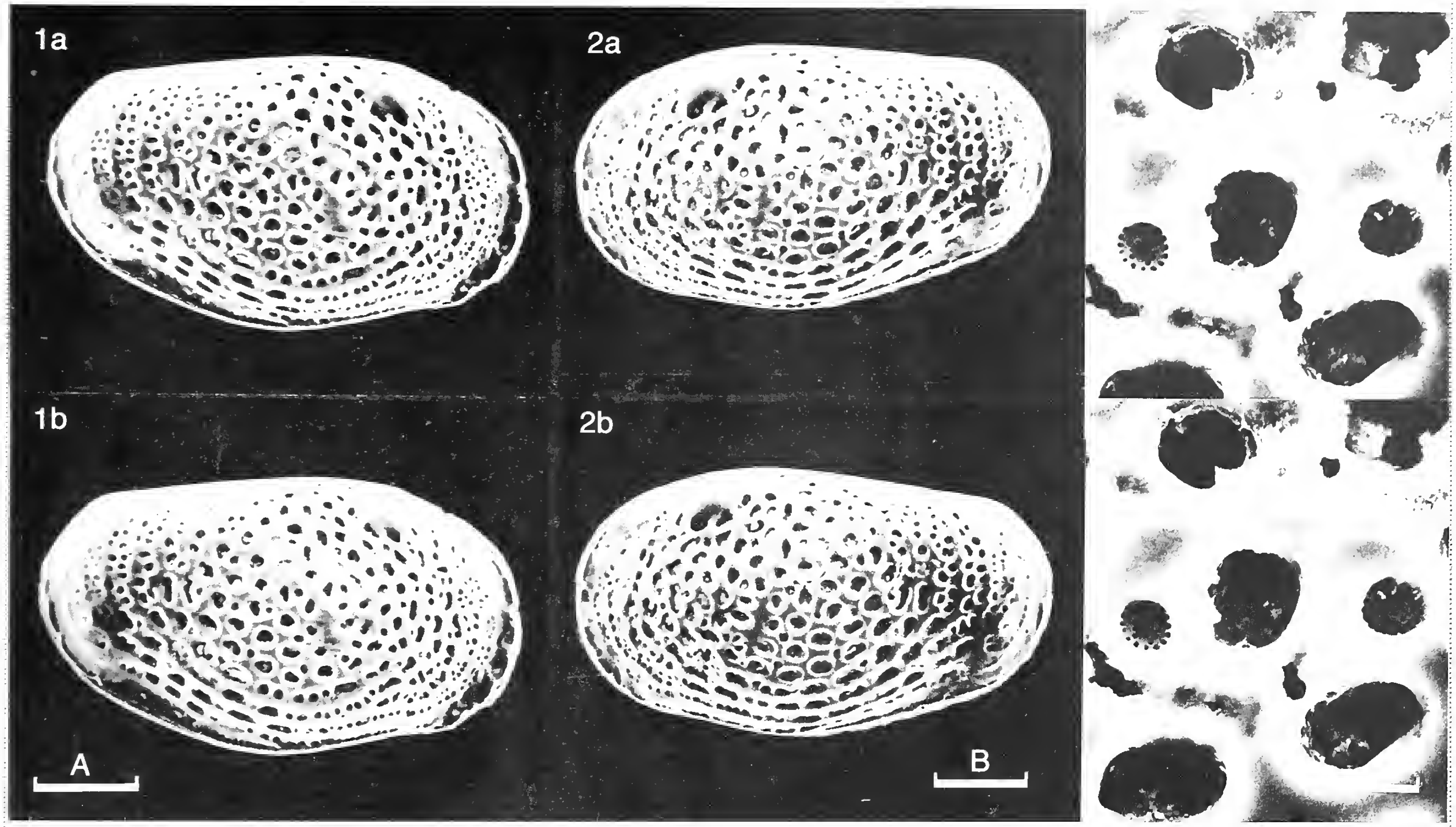
Diagnosis: *Loxoconcha* species with elongate carapace and distinct posteroventral depression. Shell surface reticulate with concentrically arranged fossae. Fossae are coarser in the middle portion of the carapace, finer towards anterior and posterodorsal.

Remarks: This species is unlikely to be confused with other described species of the genus. It has a distinct outline and coarse ornamentation, particularly in the centre of the carapace.

Distribution: This species has so far only been found in the Arabian Gulf (Bate & Gurney, op. cit. and herein) and the Gulf of Oman (Paik, op. cit.).

Explanation of Plate 11, 110

Fig. 1, ♀ LV, int. lat. (**KSU.G.OS. 216,** 480 μm long); figs. 2, 3, ♂ RV (**KSU.G.OS. 217**, 505 μm long): fig. 2, int. lat.; fig. 3, int. musc. sc.
Scale A (100 μm; × 138), fig. 1; scale B (100 μm; × 130), fig. 2; scale C (25 μm; × 633), fig. 3.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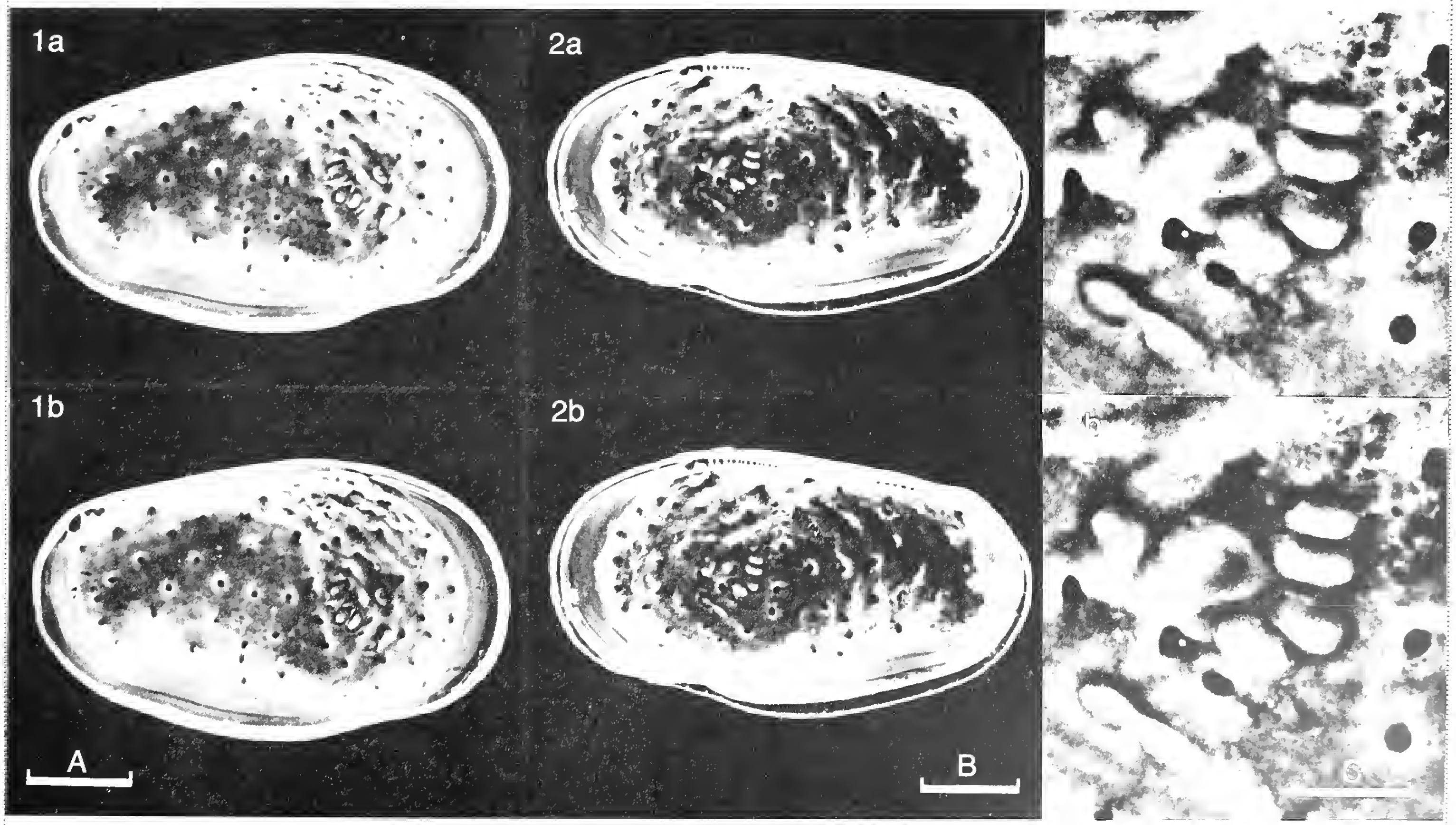
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ON *RAIMBAUTINA HAMMANNI VANNIER* gen. et sp. nov.

by Jean Vannier
(University of Rennes, France)

Genus *RAIMBAUTINA* gen. nov.
Type-species: *Raimbautina hammanni* sp. nov.

Derivation of name: In honour of Raimbaut de Vaqueiras (1155-1207), french troubadour. Gender feminine.

Diagnosis: Median-sized palaeocope; adults 1-1.3 mm long (without the posteroventral spine). Two lobal areas (L3 + L4 & L1 + L2) occur either side the main sulcus (S2) which is slightly sigmoidal. L3 is oblique to the dorsal margin and has a well-marked swelling in its ventral part. Anterior lobal area (L1 + L2) with a distinct preadductorial node (L2). Posterior lobe (L4) is a low swelling and poorly defined. Velum represented anteriorly by a curved, shield-like flange extended into a spine, joined to the lobal area (ventral part of L2) by a connecting strut. Long spine, itself spinose, occurs postero-ventrally and projects posteriorly. Laterovelar furrow well developed.

Remarks: *Raimbautina* gen. nov. differs from all other known genera by its very distinctive posteroventral spine and its shield-like velvar flange tapering towards the posterior and connected to the anterior lobal area.

Raimbautina shows some morphological similarities in its velum, lobes and sulci with certain genera belonging to the Family Ctenonotellidea Schmidt, 1941. *Bilobatia* (cf. Schallreuter, *Stereo-Atlas of Ostracod Shells*, **9**, 1982), *Rakverella* (cf. Schallreuter, *Palaeontographica* A, **153**, 1976) and *Schallreuteria* (cf. Siveter, *Stereo-Atlas of Ostracod Shells*, **9**, 1982) have a velar sculpture (female valves) comparable to that of *Raimbautina*. As far as lobal and sulcal morphology is con-

Explanation of Plate 11, 112

Figs. 1-3, LV (holotype, **IGR 5700/A2**, 1255 μm long): fig. 1, ext. lat.; fig. 2, ext. dors. obl., fig. 3, ext. vent. obl.
Scale A (250 μm; $\times$70), figs. 1-3.

Remarks (contd.): cerned, *Raimbautina* displays both wehrliine and ctenonotelline characteristics: lobe L3 is strongly developed and lobe L4 is poorly defined.

At present *Raimbautina* is monotypic and any possible dimorphism of the genus is unknown.

Raimbautina hammanni sp. nov.

Holotype: Institut de Géologie, University of Rennes (IGR), coll. no. **5700/A2**, LV.

[Paratypes: IGR coll. nos. **5700/B1**, LV; **5701/A**, RV; **5710/A1**, LV; **30270/4**, RV; **30336/1**, RV].

Type locality: Siltstones and mudstones on the path leading to the farm of l'Aubaudais, Guichen, Ille-et-Vilaine, France; lat. 47° 58′ 8″ N, long. 1° 44′ W. Traveusot Formation, Llandeilo Series, Ordovician.

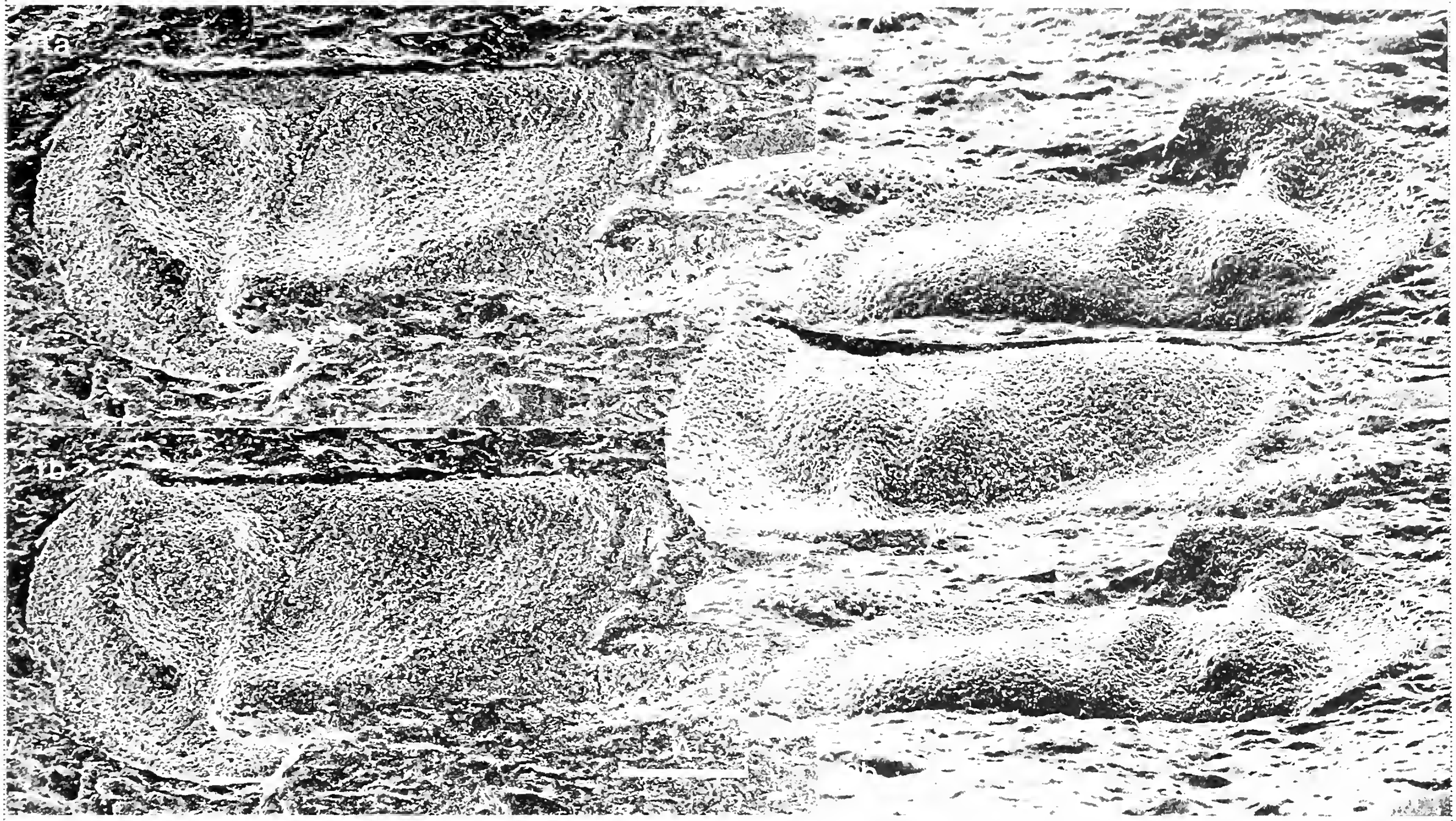
Derivation of name: In honour of Dr. W. Hammann, University of Würzburg, West Germany.

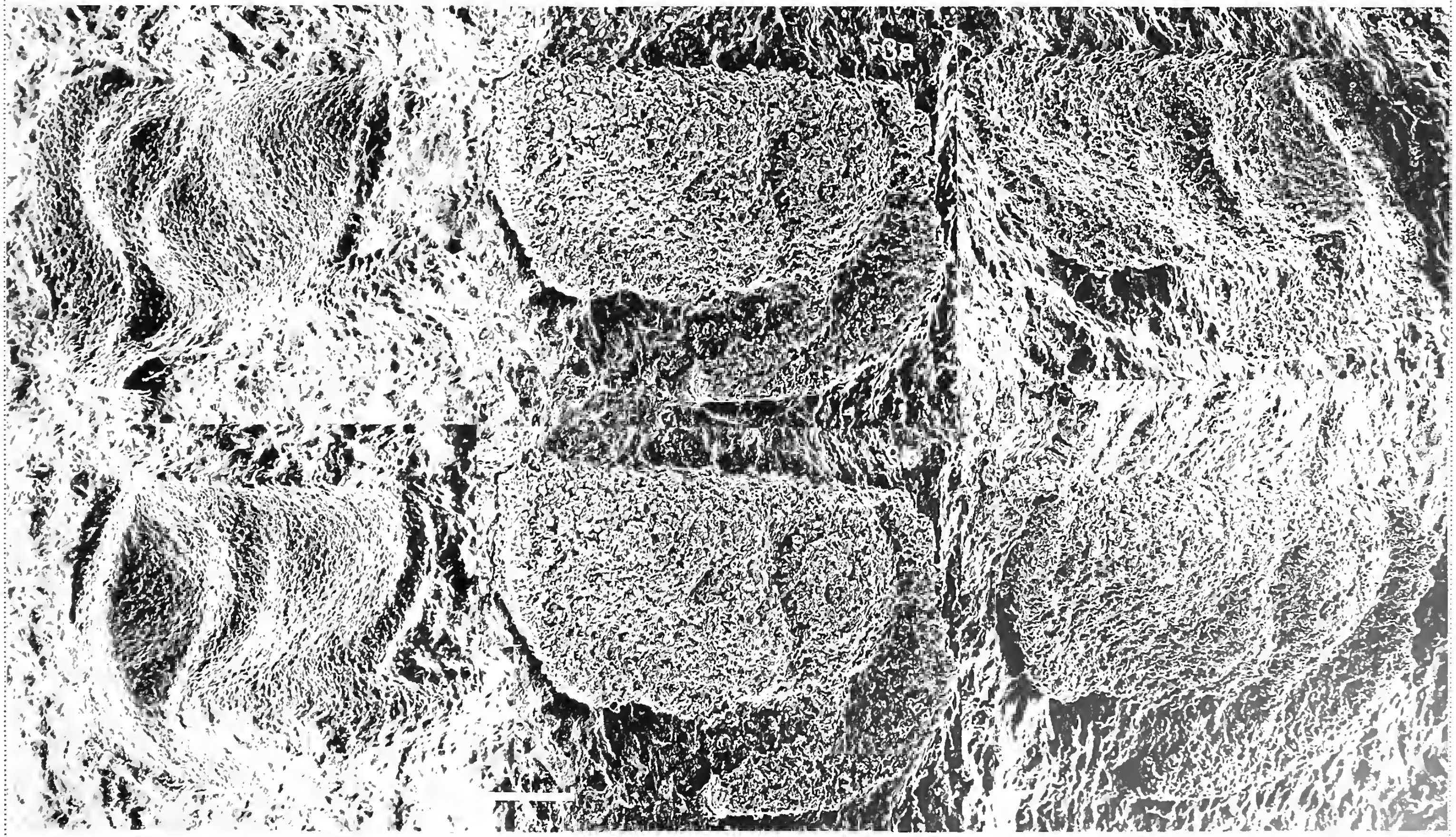
Figured specimens: Institut de Géologie, University of Rennes (IGR), coll. nos. **5700/A2** (holotype, RV: Pl. **11**, 112, figs. 1-3; Pl. **11**, 114, figs. 1, 2), **5701/A** (RV: Pl. **11**, 114, figs. 3-5), and **5700/B1** (LV: Pl. **11**, 116, figs. 1-3; Pl. **11**, 118, figs. 1, 2). All specimens are from the type-locality. All the figured specimens are latex casts taken from external moulds.

Diagnosis: As for the genus.

Explanation of Plate 11, 114

Figs. 1, 2, LV (holotype, **IGR 5700/A2**): fig. 1, ext. post. obl.; fig. 2, ext. ant. obl. Figs. 3-5, RV (paratype, **IGR 5701/A**, 955 μm long): fig. 3, ext. lat.; fig. 4, ext. ant. obl.; fig. 5, ext. post. obl.
Scale A (250 μm; $\times$70), figs. 1-5.





Remarks: From a structural point of view, the posteroventral spine and the frontal velar flange of *Raimbautina hammanni* are surely not merely simple ornamental features. The function of such velar projecting structures can be interpreted in a number of possible ways (Text-figs. 1a-c):

1. The two enormously long spines on the posteroventral part of each valve may have served as posterior supporting points when the animal was resting on the substrate with the carapace closed (Text-Fig. 1b). Added to the contact points of the frontal velar flanges, they would act as stabilizing structures. The frontal velar flanges extend both ventrally and laterally outward and the two posterior spines are projected and divergent towards the posterior. The supporting plane would be wider when the carapace was slightly open, as in a feeding or active attitude. The fact that a strong connection occurs between the velar flange and L2 supports this hypothesis. Such a strengthening structure lies just above a possible contact point with the substrate. This interpretation is consistent with a benthic mode of life.

2. The posteroventral spines (projected backwards, provided with secondary spines) suggest a defensive function whether the animal was resting on the sea-floor in contact with its frontal flanges, or was crawling on the substratum, or was swimming (Text-figs. 1a, c).

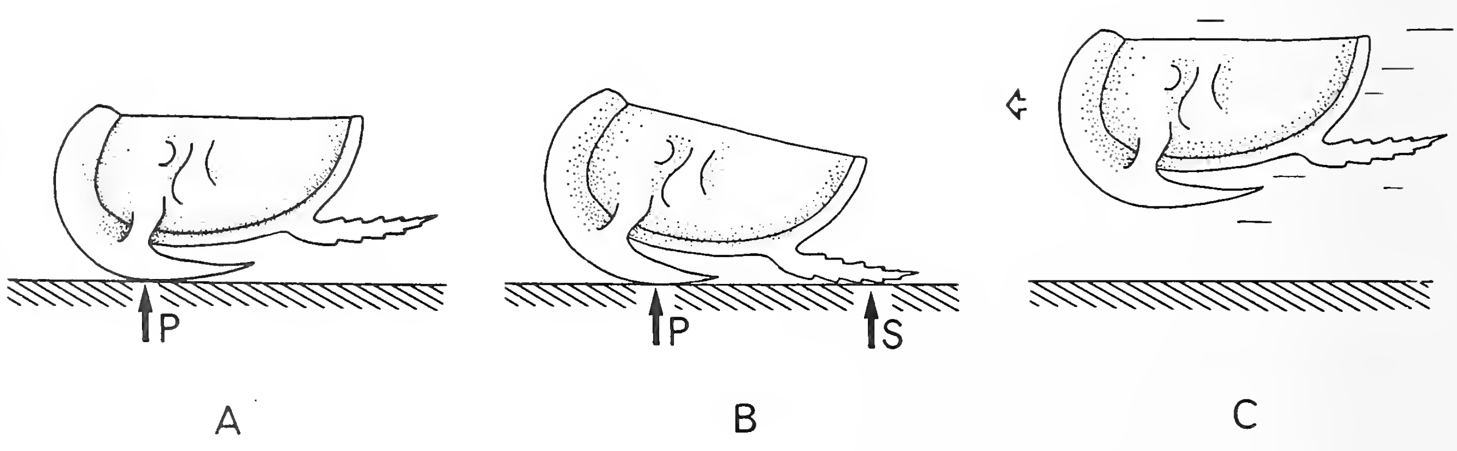
3. The posteroventral spines of *Raimbautina hammanni* are not hollow projections (in contrast to the dorsal spines of genera such as *Aechmina*) and cannot be considered as buoyancy organs. Nevertheless, their position might suggest that they served as lateral stabilizing structures during swimming. Despite its unhydrodynamically-shaped carapace, an occasional swimming mode of locomotion near the bottom may have been aided by such projecting structures (Text-fig. 1c).

Distribution: In the Armorican Massif, France, *Raimbautina hammanni* occurs in several localities south of Rennes (Martigné-Ferchaud synclinorium) near the type locality at Guichen, Ille-et-Vilaine. It is also known from one locality in Normandy (Ger, Manche) and from one locality in the Laval synclinorium at Andouillé, Mayenne.

R. hammanni has also been obtained from the Iberian peninsula: from the eastern part of the Sierra Morena, central Spain, near Corral de Calatrava (Ciudad Real district), and from the Toledo Mountains at a locality between Puerto Rey and Puerto de San Vicente. All middle Ordovician.

Explanation of Plate 11, 116

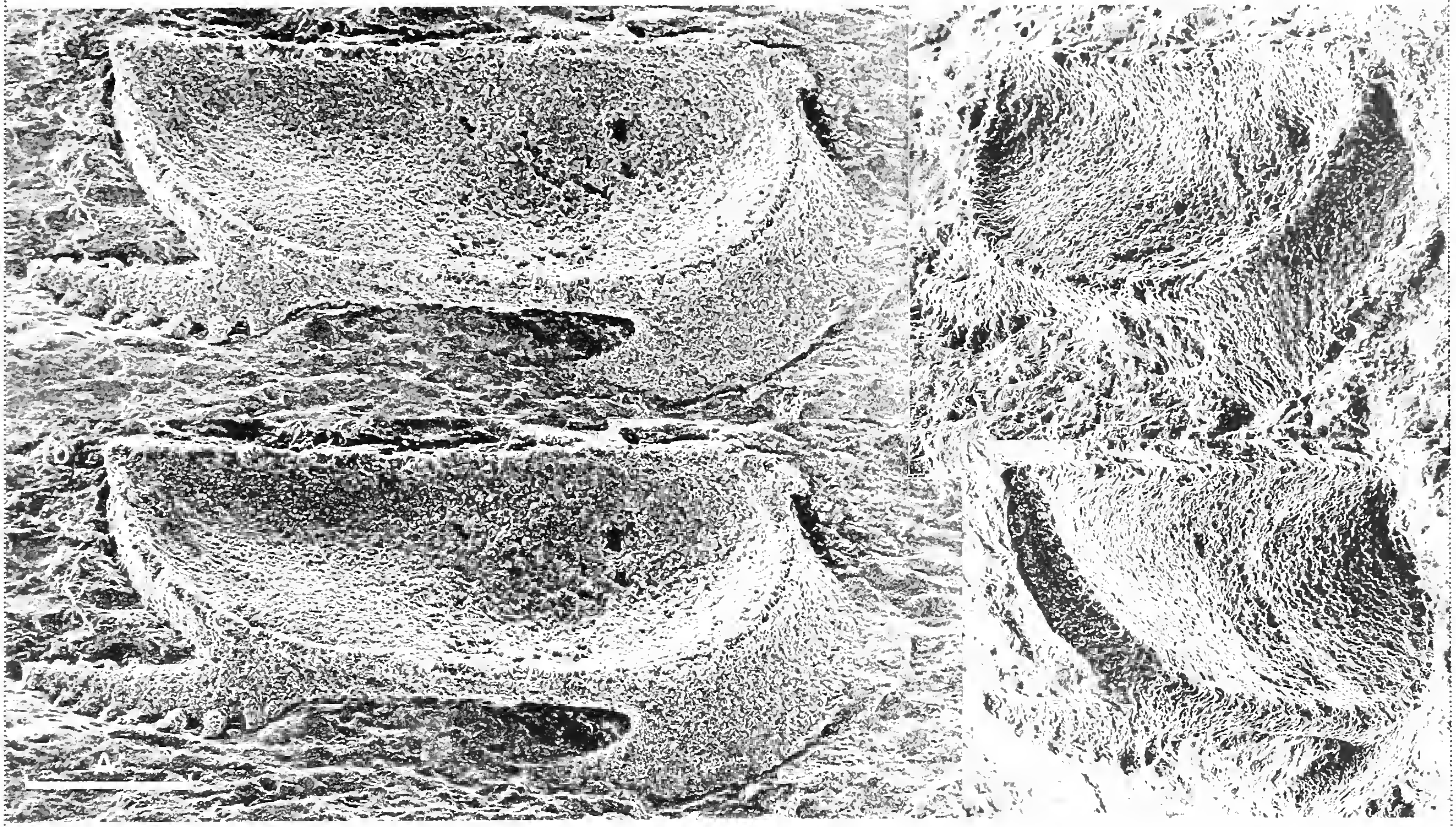
Figs. 1-3, LV (paratype, **IGR 5700/B1**, 1185μm long): fig. 1, int. lat.; fig. 2, int. ant. obl.; fig. 3, int. post. obl.
Scale A (250μm; $\times$90), figs. 1-3.

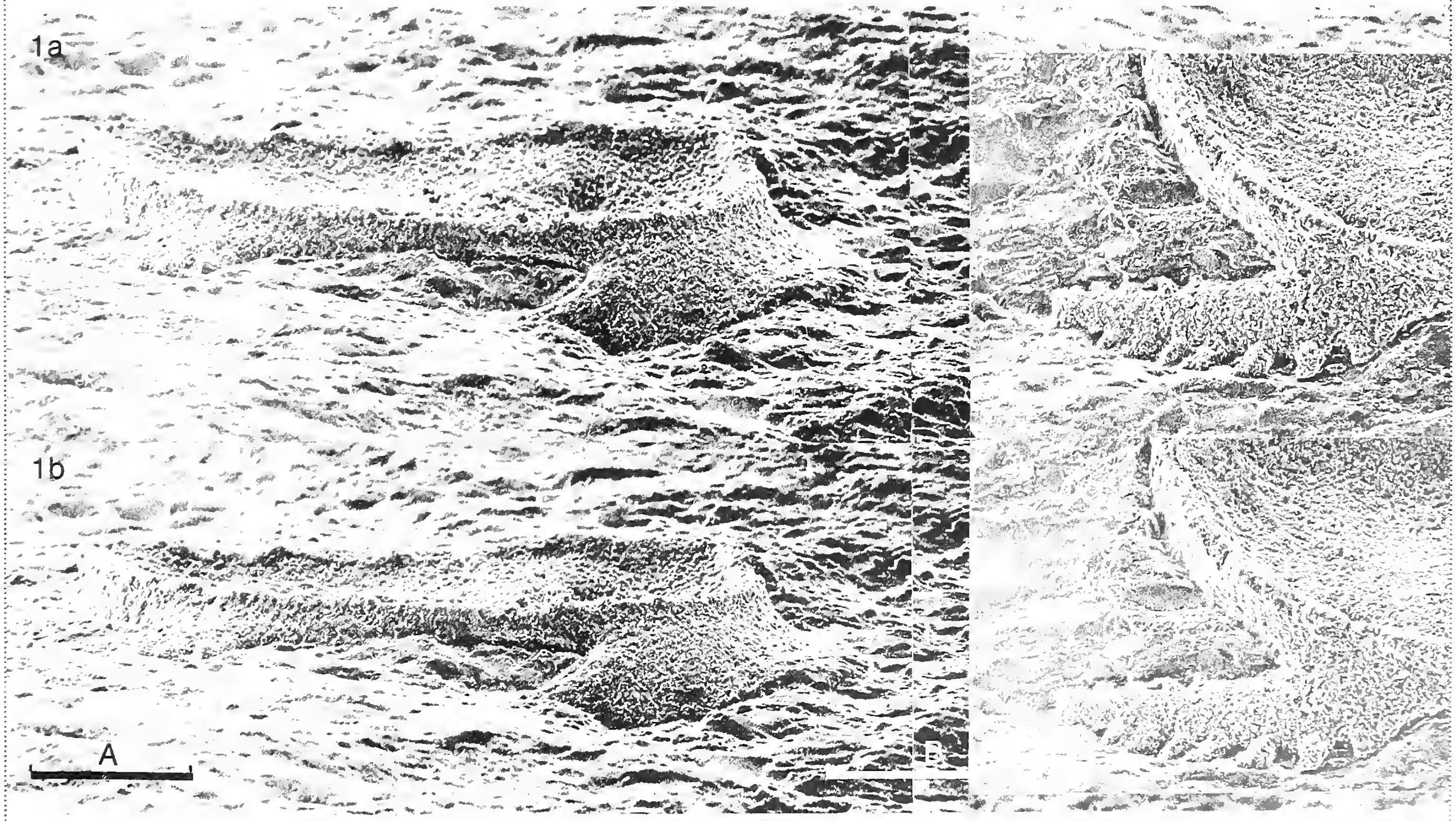


Text-fig. 1. *Raimbautina hammanni* gen. et sp. nov. Three possible life attitudes.
A-B: the ostracod is resting on the substrate (P = anterior supporting points; S = posterior supporting points). Position A suggests an active attitude, in contrast to position B.
C: the animal is swimming near the substrate.

Explanation of Plate 11, 118

Figs. 1, 2, LV (paratype, **IGR 5700/B1**): fig. 1, int. vent. obl.; fig. 2, vent. obl., detail showing postero-ventral spine.
Scale A (250 μm; $\times$90), fig. 1; scale B (250 μm; $\times$120), fig. 2.

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Stereo-Atlas of Ostracod Shells 11 (23) 119–122 (**1984**)
595.336.12 (113.311) (44 : 162.001.48) : 551.35 + 552.52

ON *THIBAUTINA ROREI* VANNIER gen. et sp. nov.

by Jean Vannier
(University of Rennes, France)

Genus *THIBAUTINA* gen. nov.

Type-species: *Thibautina rorei* sp. nov.

Derivation of name: In honour of Thibaut de Navarre (1201–1253), poet, trouvère, King of Navarre. Gender feminine.

Diagnosis: Small (length < 0.8 mm) smooth binodicope; amplete. Short dorsal margin (length < 0.75 mm); hypocline dorsum. Figure-of-eight-shaped ridge, rounded in tranverse section and 'open' dorsally, on valve lateral surface; in the medio-ventral part of the valve this ridge forms a bulb-like elevation. Sulcus S2 perpendicular to dorsal margin, wide, short and deep. In the central part of the valve, this sulcus is symmetrically extended into two narrow divergent depressions, giving an inverted-Y form. Marginal surface undifferentiated, convex or flat anterodorsally and posterodorsally.

Remarks: *Thibautina* gen. nov. is comparable to several Ordovician genera such as *Pedomphalella* Swain & Cornell *in* Swain 1961, *Kinnekullea* Henningsmoen, 1948, *Jonesites* Coryell, 1930 and *Cincinnaticoncha* Warshauer, 1981, all belonging to the Superfamily Aechminacea Bouček, 1936. These genera have some important features in common with *Thibautina*: small-sized valves, length rarely exceeding 1 mm; and an arched ridge, rounded in section, more or less developed on the valve lateral surface. Nevertheless, *Thibautina* is distinguished from other genera by its crescent-shape ridge and its inverted-Y depression in the dorsal half of the valve. In many species of *Pedomphalella*, such as *Pedomphalella egregia* from the Caradocian of Baltoscandia (cf. Schallreuter, *Ber. deutsch. Ges. geol. Wiss, A. Geol. Paläont.* **13**, pl. 2, fig. 2, 1968), the peripheral ridge overhangs a wide circular depression on the valve lateral surface, in contrast to that of *Thibautina rorei*.

Explanation of Plate 11, 120

Figs. 1–5, RV (holotype, **IGR 5183/A1**, 640 μm long) : fig. 1, ext. lat.; fig. 2, ext. vent. obl.; fig. 3, ext. dors.; fig. 4, ext. post. obl.; fig. 5, ext. ant. obl.

Scale A (250 μm; × 100), figs. 1–5.

Remarks (contd.): Species of *Jonesites* such as *Jonesites obliquus* from the upper Ordovician of the USSR (cf. Neckaja, *Trudy̆ vses neft. naučhno-issed, geol. -razv. Inst.*, **20**, 251, pl. 3, fig. 11, 1966), and species of *Kinnekullea* such as *Kinnekullea thorslundi* from the uppermost Caradocian of Sweden (cf. Henningsmoen, *Bull. geol. Instn Univ. Upsala*, **32**, 414, pl. 27, figs. 7–9, 1948), have an incomplete ridge parallel to the free margin and in many cases it is connected with node(s) near the dorsal margin. In the American *Cincinnaticoncha* (cf. type-species *C. pedigera* Warshauer, *J. Paleont.*, **55**, pl. 1. figs. 13–19, 1981) the ridge is prominent and arched dorsally (as in *Thibautina rorei*), but is developed as an horizontally-disposed J-shaped lobe in contrast to that of the Armorican species. Two species belonging to the genus *Rivillina* Vannier, 1983, from the Ordovician of France (Armorican Massif) and Spain (cf. Vannier, *Alcheringa*, **7**, 1983), also exhibit a ridge of a similar type to that of *Thibautina rorei*, but the shape and extent of the ridge differs between the two genera.

Thibautina rorei sp. nov.

Holotype: Institut de Géologie, University of Rennes (IGR), coll. no. **5183/A1**; RV.
[Paratypes: IGR coll. nos. **5181/A12**, RV; **5184/B1**, RV; **5184/C**, RV; **5180/A**, RV].

Type locality: Bed with phosphatic pebbles within the siltstones and mudstones of the Domfront section (samples DF-9), Orne, France (cf. F. Paris, *Mém. Soc. géol. minéral. Bretagne*, **26**, 1981); lat. 48°36′24″N, long. 0°41′6″ W. Lower part of the Pissot Formation, Llanvirn Series, Ordovician.

Derivation of name: In honour of Cipriano de Rore (1516–1565), Italian musician of the Renaissance.

Figured specimens: Institute de Géologie, University of Rennes (IGR) coll. nos. **5183/A1** (holotype, RV: Pl. **11**, 120, figs. 1–5) and **5184/C** (RV : Pl. **11**, 122, figs. 1–3). Both from type locality; latex casts.

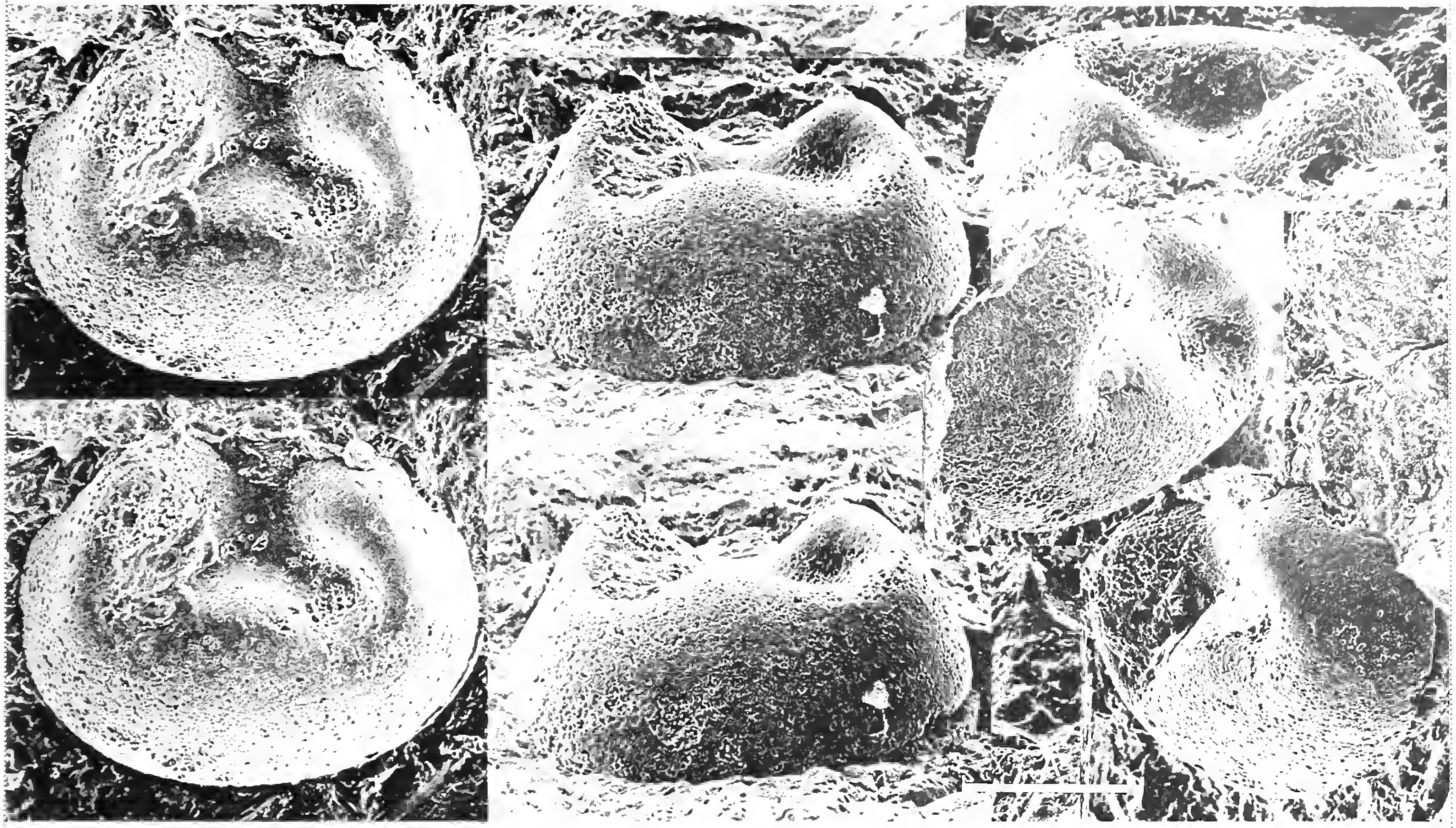
Diagnosis: As for the genus. Monotypic.

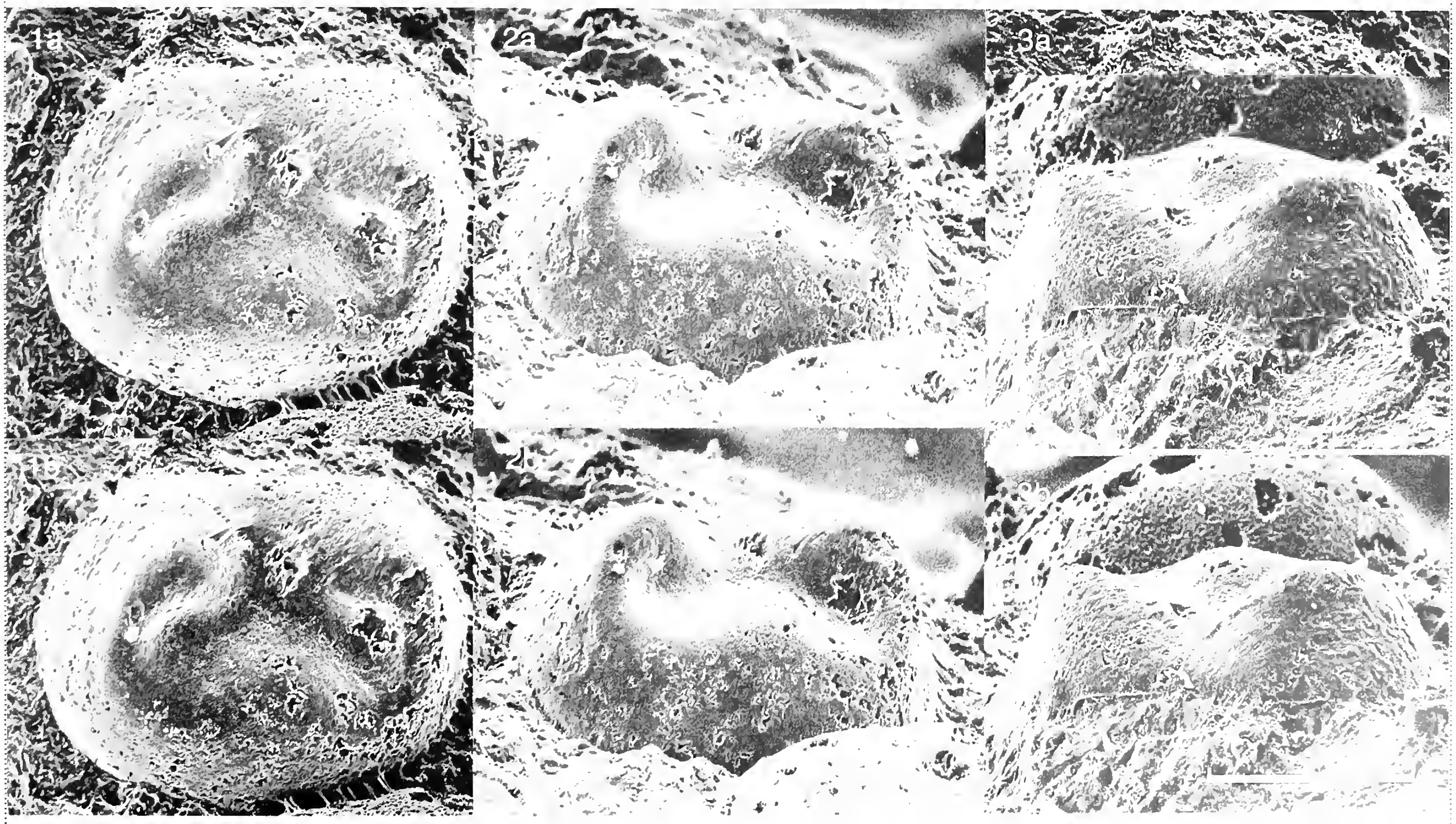
Distribution: At present, known only from the siltstones and mudstones of the type locality.

Explanation of Plate 11, 122

Figs. 1–3, RV (paratype, **IGR 5184/C**, 650 μm long) : fig. 1, ext. lat.; fig. 2, ext. vent. obl.; fig. 3, ext. dors.

Scale A (250 μm; × 110), figs. 1–3.




1a
2a
3a

595.336.13 (113.313) (437 : 161.014.50) : 551.351

ON *PLATYBOLBINA RUNICA* SCHALLREUTER & KRŮTA sp. nov.

by Roger E. L. Schallreuter & Miroslav Krůta
(University of Hamburg, German Federal Republic & Academy of Sciences, Prague, Czechoslovakia)

Platybolbina runica sp. nov.

Holotype: National (Národní) Museum, Prague, Czechoslovakia, (NM) no. **22740**; ♀ LV (on rock). [Paratype: nos. NM **22741** (steinkern) and **22742** (valve on rock)].

Type locality: Jezerce, Nusle, Prague; lat. 50° 5.5′N, long. 14° 28.5 E. Králův Dvůr Stage, upper Ordovician.

Derivation of name: Rune, old Nordic – germanic letter; alluding to the scars in the muscle spot.

Figured specimens: NM nos. **22740** (holotype, ♀ LV: Pl. **11**, 124, figs. 1, 2), **22741** (steinkern of paratype, juv. tecnomorphic RV: Pl. **11**, 126, figs. 1, 2) and **22742** (valve of paratype in the counterpart of rock: Pl. **11**, 124, fig. 3; Pl. **11**, 126, fig. 3). All from the type locality.

Diagnosis: Species of *Platybolbina* with a medium-sized muscle spot in a sulcal depression which continues dorsally in an anterodorsal direction. Dolon weakly convex. Reticulation pattern moderately coarse. Females *c.* 2.24 mm long.

Explanation of Plate 11, 124

Figs. 1, 2, ♀ LV (holotype, **NM 22740**, 2.24 mm long): fig. 1, int. lat.; fig. 2, photographical 'cast' of fig. 1; fig. 3, juv. tecnomorphic RV, int. lat., ornament behind muscle spot, photographical 'cast' (paratype, **NM 22742**, 1.66 mm long).
Scale A (250 μm; ×37.5), figs. 1, 2; scale B (100 μm; ×90), fig. 3.

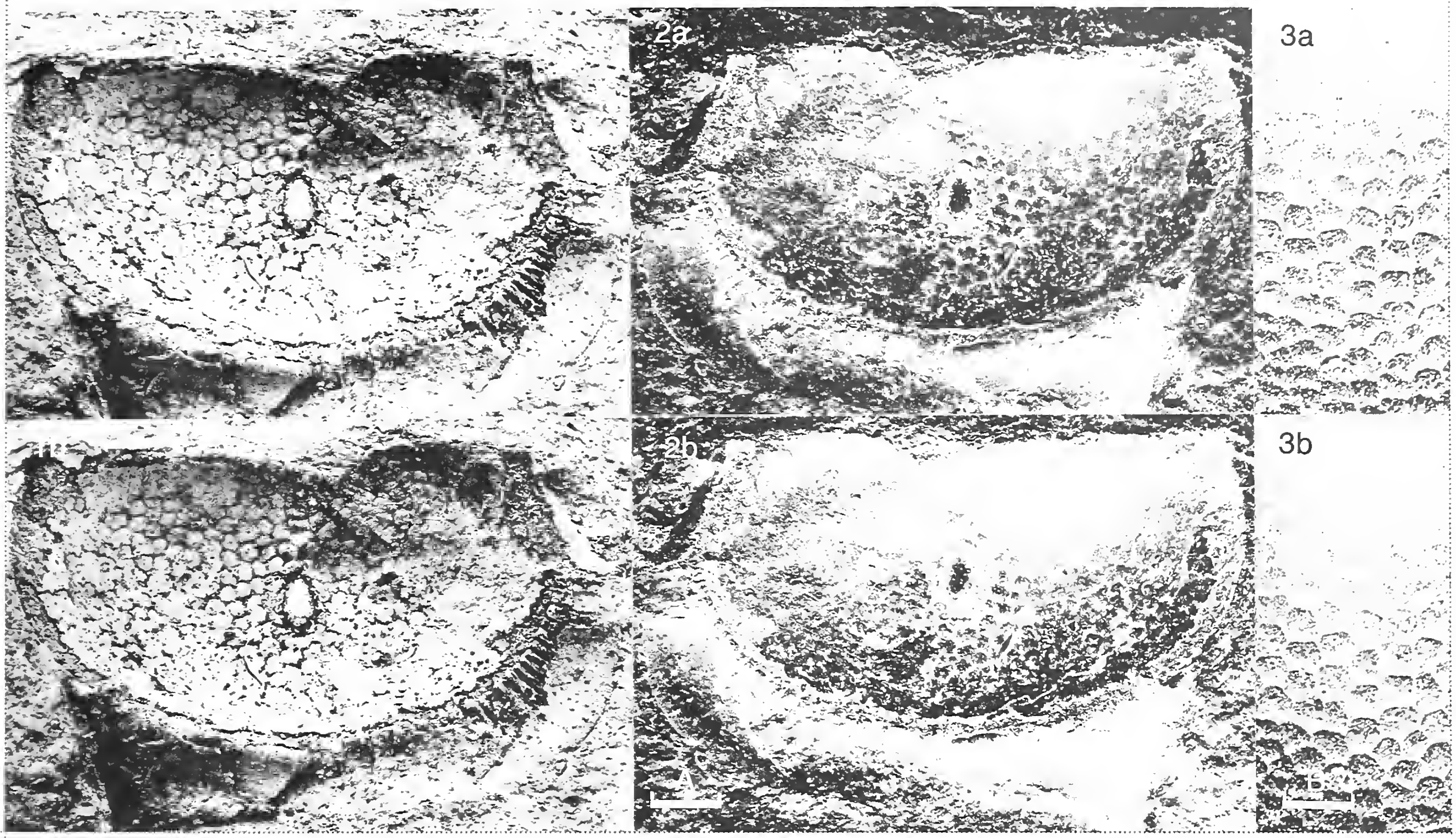
Remarks: The only two known valves of *P. runica* show only the inside of the shell and the exact nature of the external morphology of the shell is unknown. *P. runica* is clearly a member of *Platybolbina* but a subgeneric assignment, to either *P. (Reticulobolbina)* or *P. (Rimabolbina)* (cf. Schallreuter, *Geologie* **18**, 877, 1969) is not possible because it is not yet known whether its muscle spot possesses a fissum or not. *P. runica* is the largest known species of *Platybolbina*. The previous known largest reticulate species is *P. (Reticulobolbina) temperata* Sarv, the holotype of which, a female valve, is 1.70 mm long (Sarv, *Eesti NSV Tead. Akad. geol. Inst. Uurim.*, **1**, 39, 1956). The largest known species of *P. (Rimabolbina)*, a subgenus known only from middle Ordovician, is *P. (R.) omphalota* Kesling (1.88 mm long; see Kesling, *Contr. Mus. Paleont. Univ. Mich.*, **15**, 368, 1960). Contrarary to *P. runica*, both *P. omphalota* and *P. temperata* have very fine reticulation (Kesling, op. cit., pl. 8, figs. 4-6; Sarv, *Eesti NSV Tead. Akad. geol. Inst. Uurim.*, **4**, pl. 2, figs. 2-3; Schallreuter, *Palaeontographica* (A), **180**, pl. 27(13), fig. 6, 1983).

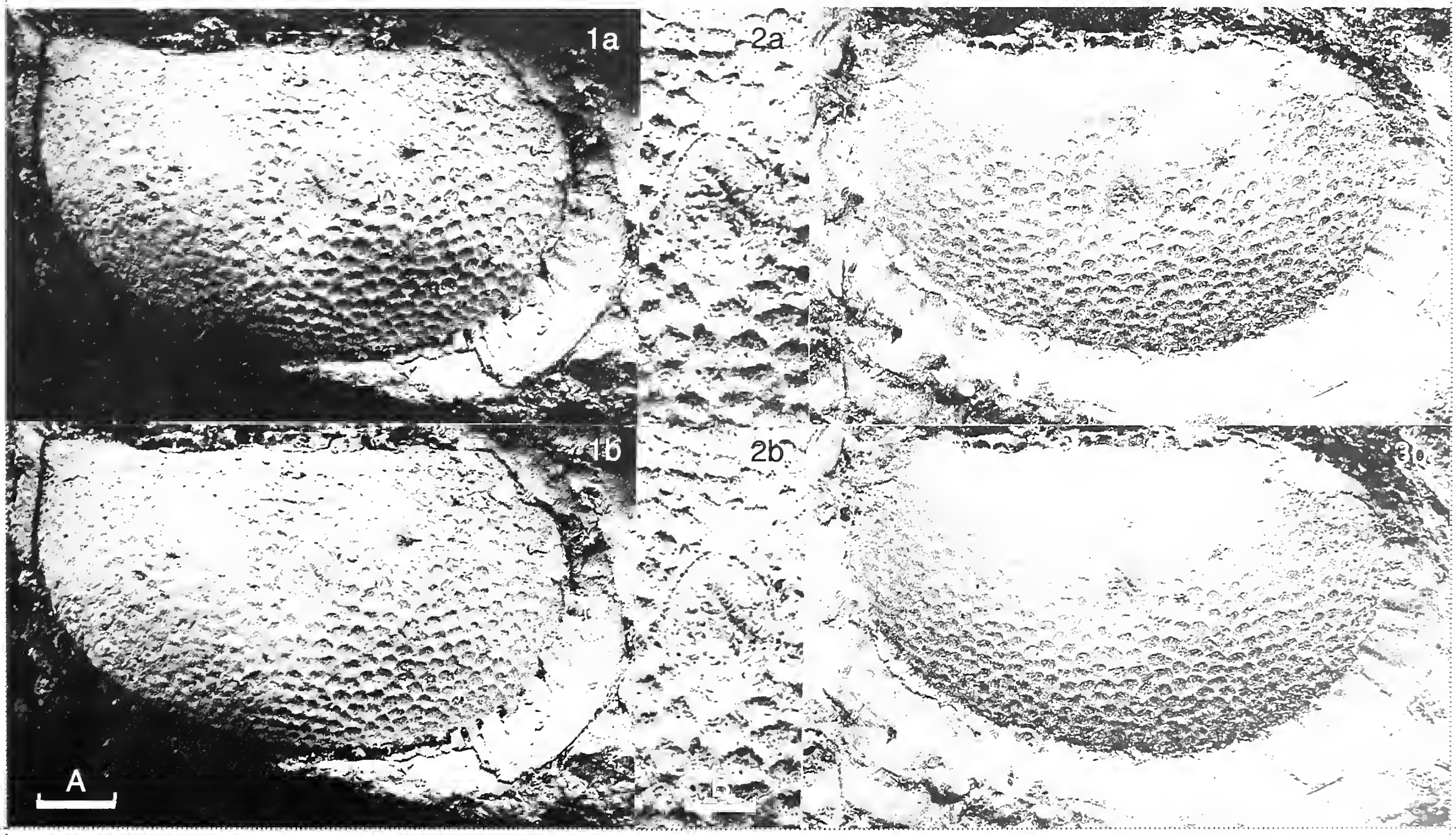
The muscle spot in the paratype (Pl. **11**, 126, figs. 1-3) shows tiny impressions which could possibly represent individual attachment points of the adductor muscle scar. They appear to be arranged with one long oblique scar above several smaller attachment points, an arrangement which differs from that of *P. (Reticulobolbina) integra* (Schallreuter, op. cit., 878) which has a complex of many small scars. The small pit-like impression in front of the dorsal end of the muscle spot (see Pl. **11**, 126, figs. 1-3) may represent an accessory muscle scar. It has a comparable position to the frontal group of muscle scars of other ostracodes.

Distribution: Known only from type locality; upper Ordovician.

Explanation of Plate 11, 126

Figs. 1-3, juv. tecnomorphic RV (paratype **NM 22741-2**): figs. 1, 2, steinkern showing domicilium and anteroventral part of velum (**NM 22741**): fig. 1, ext. lat.; fig. 2, muscle spot; fig. 3, photographical 'cast' of the counterpart in rock (**NM 22742**), int. lat.
Scale A (250 μm; ×49), figs. 1, 3; scale B (100 μm; ×95), fig. 2.


2a
3a
2b
3b


1a
2a
1b
2b
A

Stereo-Atlas of Ostracod Shells 11 (25) 127–136 (**1984**)
595.336.13 (113.312) (437 : 161.014.49) : 551.351 + 552.51

ON *PIRETOPSIS (CERNINELLA) BOHEMICA* (BARRANDE)

by R. E. L. Schallreuter, David J. Siveter & M. Kruta
(University of Hamburg, West Germany, University of Leicester, England & Academy of Sciences, Prague, Czechoslovakia)

Genus *PIRETOPSIS* Henningsmoen, 1953

1953 *Piretopsis* gen. n.; G. Henningsmoen, *Norsk Geol. Tidsskr.*, **32**, 43.
1957 *Protallinnella* nov.; V. Jaanusson, *Bull. geol. Instn Univ. Uppsala*, **37**, 353.

Type-species (by original designation): *Piretopsis donsi* Henningsmoen, 1953

Subgenus *CERNINELLA* Přibyl, 1966

1966 Cerninella gen. n.; A. Přibyl, *Časopis národního muzea, odd. přírod.*, **135**, 201.

Type-species (by original designation): *Beyrichia bohemica* Barrande, 1872

Diagnosis: See 'species diagnosis'. The subgenus is considered monotypic.

Remarks: Přibyl (1966) designated *Beyrichia bohemica* as the type-species of *Cerninella*. From the genera he compared with *Cerninella*, the baltoscandian *Protallinnella* Jaanusson is the most similar. However, this applies more to those *Protallinnella* species described by Sarv (*Eesti NSV Tead. Akad. Geol. Inst. Uurim.* **13**, 166–171, 1963) than to the type-species *P. grewingki* (Bock, 1867), which is the oldest representative of the genus and which differs from *Cerninella* notably by its vertical lobes/cristae and relatively narrow S3 (see Öpik, *Publ. Geol. Inst. Univ. Tartu*, **44**, pl. 2, fig. 1a). In *'B'. bohemica* (middle Ordovician, Bohemia), S3 is very broad and the anterior lobes/cristae are oblique to the dorsal border. The other, slightly younger (upper Volkhovian/lower and middle Kundan) species of

Explanation of Plate 11, 128

Fig. 1, ♀ RV, ext. lat. (**GPIMH 2948b**, 3.47 mm long, excluding spines); fig. 2, posteriorly incomplete tecnomorphic LV, ext. lat., covered anteroventrally by the ♀ RV of fig. 1 (**GPIMH 2948a**, 3.24 mm long).
Scale A (500 μm; ×26), figs. 1, 2.

Remarks (contd.): *Protallinnella* described by Sarv (op. cit.), and *Tetradella salopiensis* Harper, 1947 from the Caradoc of Shropshire, assigned to *Cerninella* by Přibyl (1966, 203), form a gradual morphological transition series between the type-species of *Protallinnella* and *Cerninella* (cf., for example, Sarv, op. cit., pl. 4, figs. 5 – 10 and Siveter, *Geol. J.* Spec. Issue **8**, 51, pl. 2, figs. 2–4, 1978). Thus, it is considered not possible to separate *Cerninella* as a distinct genus. This would blur not only its assumed natural relationships but also its phylogenetic and palaeogeographic implications.

Přibyl (1966, 202) assumed that *Cerninella* originated from *Protallinnella* (or related forms such as *Tallinnellina*). This seems to be correct. The stratigraphical occurrences and adult lengths of the relevant species agree with the morphological changes from oldest to youngest species: *P. grewingki,* Middle Volkhovian (1.30 mm); *P. loennaensis*, Upper Volkhovian (1.70 mm); *P. salopiensis*, Costonian (2.93 mm); *P. bohemica*, Vinice Stage (3.72 mm). *P. bohemica* appears, as expected, to be a morphologically advanced form. However, at the present state of knowledge it is hard to say whether it originates in a direct line from typical *Protallinnella* species or whether it forms a separate branch justifying a distinct subgenus. For the present *Cerninella* is retained at subgeneric level.

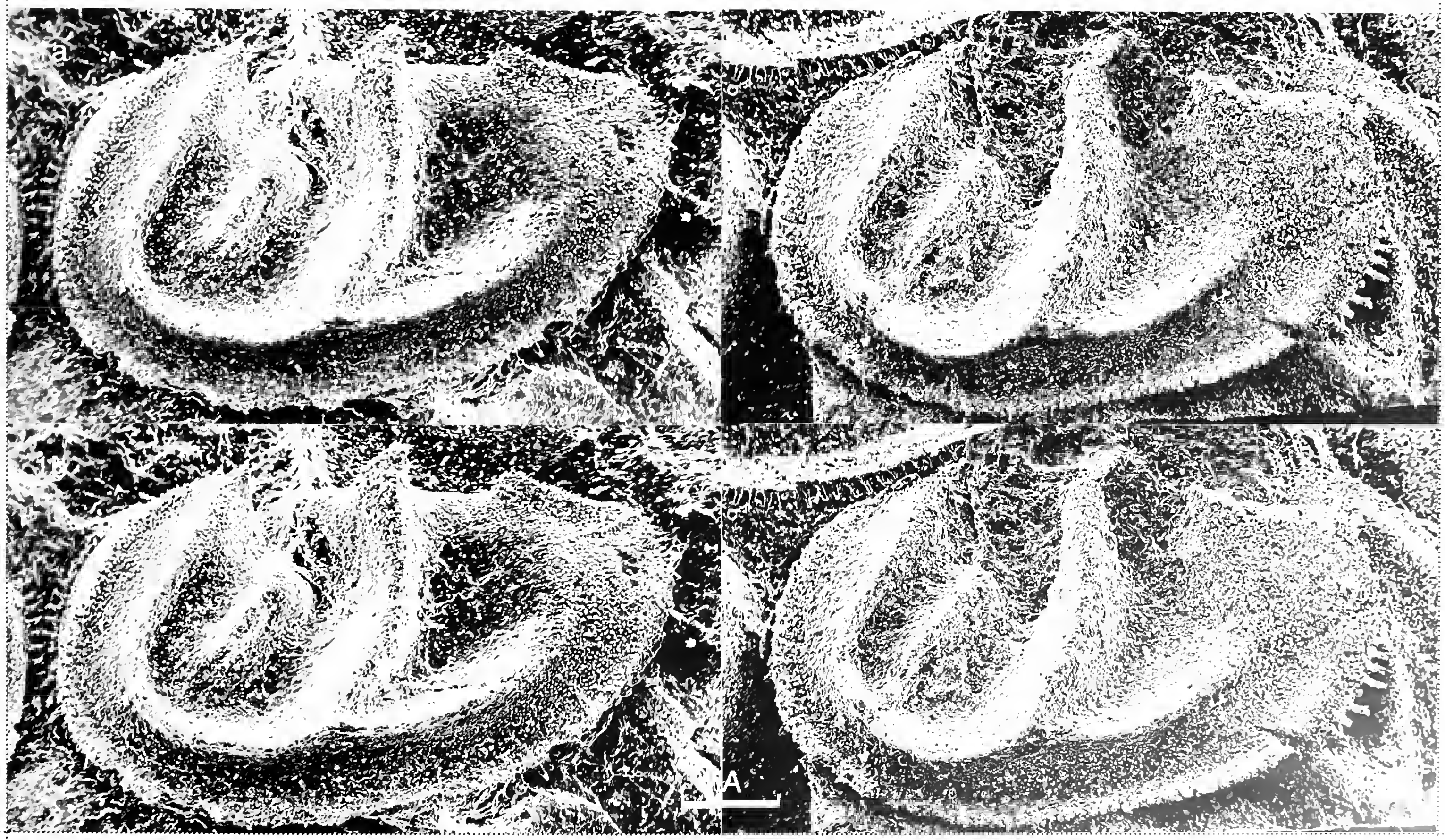
The systematic position of the Bohemian material which Přibyl (1966) assigned to *Cerninella complicata* is also uncertain. The real *Beyrichia complicata* Salter, 1848, from the Llandeilo of Wales, has an anterior antrum like the type-species of *Tallinnella* and belongs to a new tallinnelline genus (Siveter, in press; cf., op. cit. 49, pl. 1, figs. 7, 8). The dimorphism of Přibyl's Bohemian material is unknown, but could possibly also belong to a tetradellid such as *Ogmoopsis*. If, however, the material does belong to *Cerninella* s.s. it would represent the oldest known species (Šarka Stage, upper lower or lower middle Ordovician) and would justify the subgeneric status of that taxon.

A feature of *Cerninella* is the parable-like confluent C1 + C3, a pattern also present in the hitherto monotypic *Piretopsis* (middle Ordovician, 4aβ, of the Oslo Region), a genus which seems to be closely related to *Protallinnella*. *Piretopsis* differs from both *Protallinnella* and *Cerninella* by

Explanation of Plate 11, 130

Fig. 1, tecnomorphic LV, ext. lat. (**GPIMH 2949**, 2.94 mm long, excluding spines); fig. 2, tecnomorphic LV, ext. lat. (**GPIMH 2950**, 3.05 mm long, excluding spines). Scale A (500 μm; ×28.5), figs. 1, 2.


1a
2a
1b
2b


A

Remarks (contd.): lacking C2, and also from *Cerninella* by its smaller S3. The "horn-like L1" of *Piretopsis* resembles the bulb-like L1 of internal moulds of *Cerninella* (Přibyl, op. cit., pl. 1(15), figs. 1, 2, 1966). Like *Cerninella*, *Piretopsis* is at present best considered a monotypic subgenus. *Piretopsis* was originally placed by Henningsmoen within the Piretellinae. Schallreuter (*Geologie*, **15**, 200, 204, 1966) assigned *Piretopsis* to the Steusloffiinae and assumed an origin from *Tallinnella*. However, more probably, *Piretopsis* originates from *Protallinnella* in the lower Ordovician.

The short, isolated C2 of *P. (Cerninella)* has an homeomorphic equivalent in *Steusloffia*, a genus which probably originated from *Rigidella*. In *Rigidella*, as in *P. (Protallinnella)*, C2 is still connected with the other cristae (cf. Schallreuter, *Palaeontographica A* **153**, text-fig. 6, 1976; Jaanusson, op. cit., text-fig. 35D, 1957).

Distribution: *P. (Piretopsis)*: middle Ordovician (4a**b**) of Oslo Region. *P. (Cerninella)*: see type-species. *P. (Protallinnella)*: lower Ordovician (upper Oeland: B_2**b**–B_3**b**) of Baltoscandia, middle Ordovician (Costonian) of Welsh Borderland; also middle Ordovician (Llandeilo) of Morocco (J. Vannier, pers. comm.).

Piretopsis (Cerninella) bohemica (Barrande, 1872)

1855 *Beyrichia Bohemica*, Barrande, MS; T. R. Jones, *Ann. Mag. nat. Hist.*, (2) **16**, 91 (*nom. nud.*).
1868 *Beyrichia Bohemica*, Barr.; J. J. Bigsby, *Thesaurus Siluricus*, 72§, 199 (*nom. nud.*).
1872 *Beyrichia Bohemica*. Barr.; J. Barrande, *Système Silurien* (I) **Suppl. 1**, 492, 497, 498–9, 500, pl. 26, figs. 13a–d, pl. 34, figs. 18–22.
1876 *Beyrichia Bohemica*, Barr.; G. le G. de Tromelin & P. Lebesconte, *Assoc. Franc. avancement sci. C.R.* **4me** *sess. Nantes* (1875), 638.
1889 *Beyrichia Bohemica* Barrande; A Krause, *Z. Dt. geol. Ges.*, **41**, 20.
1889 *Beyrichia Bohemica* Barrande; A. Krause, *Sber. Ges. naturf. Freunde Berlin*, **1889** (1), 15.

Explanation of Plate 11, 132

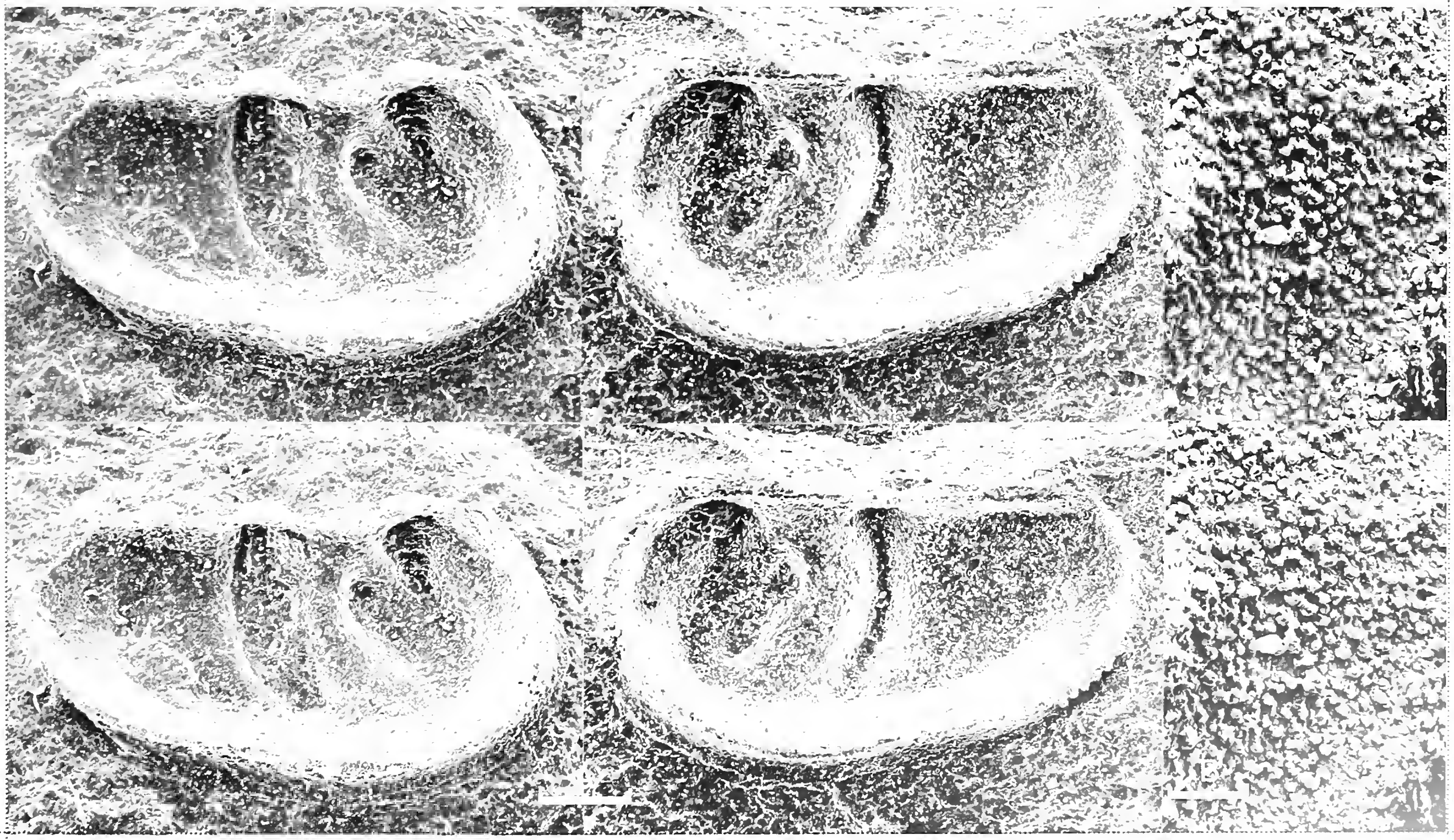
Fig. 1, tecnomorphic RV, ext. vent. obl. (**GPIMH 2951**, visible part 2.68 mm long, excluding spines); fig. 2, ♀ RV, ext. vent. obl. (**GPIMH 2952**, visible part 2.75 mm long); fig. 3, ♀ RV, ext. ant. (**GPIMH 2948b**).
Scale A (500μm; ×27), figs. 1, 2; scale B (500μm; ×22.5), fig. 3.

1896 *Beyr. Bohemica* Barr. (= *Tetradella*?); G. Gürich, *Verh. Russ.-Kaiserl. miner. Ges.*, **32**, 388.
1908 *Tetradella bohemica* (Barrande); E. O. Ulrich & R. S. Bassler, *Proc. U.S. natn. Mus.*, **35**, 306.
1934 *Tetradella bohemica* (Barrande); R. S. Bassler & B. Kellett, *Spec. Pap. geol. Soc. Am.*, **1**, 54, 479.
1941 *Tetradella bohemica* (Barrande 1872); E. A. Schmidt, *Abh. Senck. Naturf. Ges.*, **454**, 40, 41, 43–44 (all *pars*); *non* 40, 41, 43–44 (all *pars*), 30, 47, 64, pl. 2, figs. 11–13 (all = *Tallinnella*? *hloubetinensis* Jaanusson, 1957).
1954 *Beyrichia bohemica* Barr.; D. D. Hughes, *Micropaleontologist*, **8**(3), 41.
1957 *Tallinnella*? *bohemica* (Barrande, 1872); V. Jannusson, *Bull. geol. Instn Univ. Uppsala*, **37**, 342, 343, text-fig. 36, pl. 10, fig. 3 (probably = Pl. **11**, 130, fig. 1 herein).
1962 *Tetradella bohemica* (Barrande); A. H. Müller & H. Zimmermann, *Aus Jahrmillionen Tiere der Vorzeit*, 387, fig. 140, Jena.
1963 *Tetradella bohemica* (Barrande); A. H. Müller, *Lehrbuch der Paläozoologie*, **2**(3), fig. 44B (= Müller & Zimmermann, op. cit., fig. 140), Jena.
1966 *Tetradella*? *bohemica* (Barrande, 1872); A. Přibyl *in* Z. Špinar *et al.*, *Systematická paleontologie bezobratlých*, 684, text-fig. X-116 (= Müller & Zimmerman, op. cit., fig. 140), Prague.
1966 *Tallinnella bohemica* (Barr.); V. Havlíček & J. Vaněk, *Sborník geol. věd* (*P*), **8**, 32, 53, 55.
1966 *Cerninella (Cerninella) bohemica* (Barrande, 1872); A. Přibyl, *Čas Národního Muzea, odd, přírod.*, **135**, 201, 202, 203, 204–5, 206, 207, pl. 1(15), figs. 1, 2, pl. 2(16), figs. 1–3, text-fig. 2a–b.
1978 *Tetradella bohemica* (Barrande); A. H. Müller, *Lehrbuch der Paläozoologie*, **2**(3), fig. 55 (= Müller, op. cit., fig. 44B), 2nd edit. Jena.
1979 *Cherninella bohemica* (Barrande, 1872); V. A. Ivanova, *Trudy Paleont. Inst. Akad. nauk SSSR*, **172**, 168.
1979 *Cerninella bohemica* (Barrande, 1872); A. Přibyl, *Sborník Národního Muzea* (B), **33** (for 1977), 54, 63, 67, 108. 112, table between 112 & 113, pl. 4, figs. 1–2 (= Přibyl, op. cit., pl. 2(16), figs. 2, 3), text-figs. 3.1–2 (= Přibyl, op. cit., text-figs. 2b, 2a), 11.1–2 (= Přibyl, op. cit., pl. 1(15), figs. 1, 2), 16.1 (text-fig. 11.2 = part of 16.1).
1983 *Cerninella bohemica* (Barrande, 1872); C. R. Jones & David J. Siveter, *Stereo-Atlas Ostracod Shells*, **10**, 7.

Explanation of Plate 11, 134

Fig. 1, ♀ LV, int. lat. (**GPIMH 2953**, 3.40 mm long, inclusive of dolon); fig. 2, ♀ RV, int. lat. (**GPIMH 2954**, 2.96 mm long, excluding spines and dolon); fig. 3, tecnomorphic LV, ext. lat., ornament on posterior lobe (**GPIMH 2949**).
Scale A (500μm; ×23), figs. 1, 2; scale B (100μm; ×110), fig. 3.


2a
2b
3a
3b
B



Lectotype: National Museum, Prague; internal mould, ♀ LV (not carapace as stated by Schmidt 1941). On a piece of almost black mudstone, no. **L 10010** [ex. CD 805, Inv. no. 1700]; figured by Müller & Zimmermann 1962, Müller 1963, 1978 and Přibyl *in* Spinar (loci cit.). Designated by E. A. Schmidt 1941, op. cit., 43; Barrande 1872, op. cit., pl. 34, figs. 19, 20; Přibyl 1966, op. cit., text-fig. 2a (drawing), pl. 1(15), fig. 1 (right hand side) [= Přibyl 1979, op. cit., text-fig. 3.2 and 11.1 (right hand side) respectively]. Barrande's drawing of the specimen chosen as lectotype does not agree in all details with the specimen considered as the lectotype by Přibyl but the latter is in all probability the type.

[Paratypes: 4 further pieces of rock, with many internal and external moulds, nos. **L 10009** (part and counterpart), **L 10011–L 10013**. Pieces **L 10009** and **L 10011** are black mudstone; **L 10012** and **L 10013** consist of a mica- and limonite-rich dark-grey mudstone in which the ostracode shells are replaced by limonite, and presumably come from another horizon].

Type locality: Vinice Formation, Caradoc. Trubín, near Králův Dvůr, Bohemia; lat. 49°3′N, long. 14°2′E.

Figured specimens: Geologisch-Paläontologisches Institut und Museum, University of Hamburg (**GPIMH**) nos. **2948a** (tecnomorphic LV: Pl. **11**, 128, fig. 2), **2948b** (♀ RV: Pl. **11**, 128, fig. 1; Pl. **11**, 132, fig. 3), **2949** (tecnomorphic LV: Pl. **11**, 130, fig. 1; Pl. **11**, 134, fig. 3), **2950** (tecnomorphic LV: Pl. **11**, 130, fig. 2), **2951** (tecnomorphic RV: Pl. **11**, 132, fig. 1), **2952** (♀ RV: Pl. **11**, 132, fig. 2), **2953** (♀ LV: Pl. **11**, 134. fig. 1) and **2954** (♀ RV: Pl. **11**, 134, fig. 2). All **GPIMH** numbers refer to 'Silcoset' casts from the slab of black mudstone no. **Ar 39170**, Paleozoologiska sektionen, Naturhistoriska Riksmuseet, Stockholm; from the Vinice Formation, Caradoc Series of the type locality. The slab contains many external and a few internal moulds of *P. (C.) bohemica*, together with single valves of *Hastatellina* sp., *Disulcinoides* ? sp. and *Parapyxion* ? sp. Cast no. **2949** is probably of the same valve, on **Ar 39169**, as that figured by Jaanusson (1957).

Diagnosis: *Piretopsis (Cerninella)* species with very broad S3 and bulb-like L1 and L3 at the dorsal border. C1 and C3 form a parable-like crista distinctly oblique (in anteroventral direction) to the dorsal margin, where each has a sharp cusp-like termination. C2 normally isolated from C1 + C3, dorsally extending to the mid-dorsal half of the valve. C4 connected with C1 + C3 at a distinct angle, and absent dorsally except for a plica-like cusp at the dorsal margin. Velum is a rather narrow flange, sometimes undulate, from anterodorsal corner to gradual posterocentral termination. Velar dimorphism: dolon narrow, weakly convex; antrum very shallow. Marginal sculpture formed by a row of spines. Tiny spines along all parts of velar edge except dolon.

Remarks: *P. (C.) bohemica* is the youngest and largest (3.72 mm) *Piretopsis* species, differing from congeneric species mainly by its very broad S3, its oblique anterior lobes/cristae and its normally isolated C2. In the type-species, *P. (Piretopsis) donsi* (adult length 2.3 mm), C2 seems to be missing whereas in all *P. (Protallinnella)* species C2 is still connected with C1 + C3 and more or less perpendicular to the dorsal margin. In *P. (Protallinnella) salopiensis* (Harper, 1947) the anterior cristae are already slightly oblique to the dorsal margin. Furthermore, C4 in *P. (P.) donsi* is separated from C1 + C3 but complete, in *P. (Protallinnella) tricostata* (Sarv, 1963) it is absent, and in *P. (C.) bohemica* it is still connected with C1 + C3 but is lacking dorsally except for a plica-like cusp which resembles that of *P. (Protallinnella) loennaensis* (Sarv, pl. 4, figs. 5–8, 10, 1963).

Velar dimorphism in *P. (C.) bohemica* is weakly developed and is very similar to that of the steusloffiine *Pseudostrepula* (cf. Pl. **11**, 128, figs., 1, 2 with Schallreuter, *Geologie* **15**, pl. 4, figs. 1, 2, 1966 or *Palaeontographica A* **180**, Pl. 25(11), figs. 4, 5, 1983). In the type-species of *P. (Piretopsis)* and *P. (Protallinnella)* the dolonal antra seem to be broader and therefore more distinct (Öpik, op. cit., pl. 2, fig. 1b; Henningsmoen, op. cit., pl. 2, fig. 7). Reduced velar dimorphism during phylogeny also occurs in other steusloffiines (eg *Steusloffia*, Jaanusson, op. cit., 339).

On **Ar. 39170** one tecnomorph, much smaller than all the sympatric *P. bohemica* valves, is distinguished mainly by the total absence of cristae and its highly spinose lobes and velum. It may be conspecific with *P. bohemica*, but this is not certain owing to the lack of intermediate sized larvae.

Distribution: With certainty only from the type locality. Recorded (material not seen) from elsewhere in Czechoslovakia from Černin and other localities in the Vinice Fm (= Černín Fm) and from the underlying Letná Fm (lower Caradoc) of Blýskava, Chrustenice, Dlouhá hora, Petrovka, Drábov and possibly Běřín and other localities (Přibyl, 205, 1966); also from the underlying Libeň Fm, upper Llandeilo (Havlíček & Vaněk, op. cit., 53).

Acknowledgements: RELS is indebted to the *Deutsche Forschungsgemeinschaft (DFG)* for supporting the investigation. DJS gratefully acknowledges an exchange visit under the auspices of the *Royal Society* and the *DFG* in cooperation with the *GPIMH*. MK thanks the *Czechoslovakian Academy of Sciences* and the *GPIMH* for making the collaborative study possible.

ON *BAIRDOPPILATA KALAKOTENSIS* SINGH & TEWARI

by John W. Neale & Pratap Singh
(University of Hull, & 33 Khur Bura, Dehra Dun, India)

Bairdoppilata kalakotensis Singh & Tewari, 1966

1966 *Bairdoppilata kalakotensis* sp. nov. P. Singh & B. S. Tewari *in* B. S. Tewari & P. Singh, *Cent. Advan. Study in Geology, Panjab University, Chandigarh*, **3**, 118, pl. 1, figs. 1a-d.

?1968 *Bairdoppilata jaswanti* sp. nov. S. N. Singh & Misra, *J. Pal. Soc. India*, **11**, 26, pl. 11, fig. 1, *non.* pl. 10, figs. 9, 10.

Holotype: University of Lucknow, India, coll. no. **L.U. 216**.
[Paratype: **L.U. 217**].

Type locality: Sample 22; dark grey, fossiliferous, argillaceous limestone of the Kalakot Formation, Subathu Group, late early Eocene. About 150ft. above road level in a cliff on the western side of the road leading to Gua from Beragua and situated at a distance of about 800 feet S15°W from the opening of the Beragua Mine in the Kalakot Coalfield (Survey of India topographic sheet 43K/8), Nawshera and Rajouri Tehsils of Poonch District, Jammu and Kashmir State, India (Text fig. 1).

Figured specimens: University of Lucknow, India, nos. **L.U. 216** (holotype, car. Pl. **11**, 138, figs. 1, 2; Pl. **11**, 140, fig. 2) and **L.U. 217** (car.: Pl. **11**, 140, figs. 1, 3). Both from the type locality.

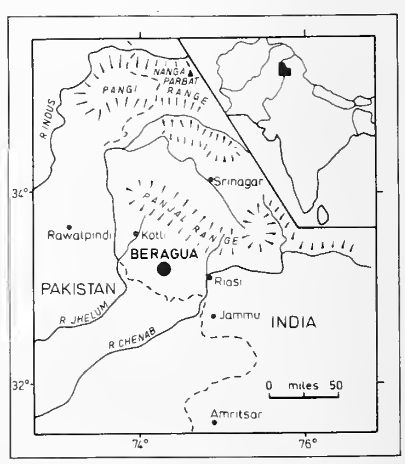
Diagnosis: Carapace large, subtriangular. Dorsal margin arched, ventral margin convex. Upper half of anterior end rounded, posterior end somewhat drawn out below middle line. Left valve larger, anterodorsal overlap quite pronounced as compared to posterodorsal and mid-dorsal, ventral overlap pronounced. Teeth distinct on anterodorsal and posterodorsal angles. Highest in middle; lateral outline in dorsal and ventral views strongly convex, dorsal margin on anterior side curved and ventral margin strongly curved in middle region.

Explanation of Plate 11, 138

Figs. 1, 2, car. (holotype, **L.U. 216**, 1330μm long): fig. 1, ext. rt. lat.; fig. 2, ext. lt. lat.
Scale A (200μm; ×132), figs. 1, 2.

Remarks: This species is close to *Bairdia subdeltoidea* (Munster) of Latham (*Trans. R. Soc. Edin.*, **59**, 39-40 1938), from the Palaeocene of Pakistan. Latham's form (length = 1340μm) is similar in size but differs in being higher anteriorly with a steeper anterodorsal slope and less concave anterodorsal and more convex anteroventral margins in the right valve. The apparent projection of the posterior end of the right valve in Latham's specimen appears due to the absence of the left valve extremity because of breakage (as ascertained by optical microscopy). *Bairdia subdeltoidea* (Oligocene of W Germany) differs from both in its shorter, straighter anterodorsal margin and less sloping centrodorsal margin and Latham's form will eventually need a new name. *Bairdoppilata poddari* Lubimova & Mohan (*Bull. Geol. Min. Met. Soc. India*, **22**, 21-22, 1960) is higher in proportion to length and otherwise differs in much the same way as *B. subdeltoidea*. In 1972 Khosla (*Micropaleontology*, **18**, 484) referred S. N. Singh and Misra's *B. jaswanti* (Eocene Fuller's Earth, Kolayatji area, Bikaner, Rajasthan) to *B. poddari*. However, Singh and Misra's second figured specimen (p. 11, fig. 1) is closer to *B. kalakotensis* and in view of the length they give for *B. jaswanti* (950μm) could be a juvenile of the present species. We have not examined the originals so place it only questionably in the synonymy of *Bairdoppilata kalakotensis*. The typical subtriangular carapace shape, the very steep posterodorsal and steep anterodorsal slopes of the dorsal margin and all round overlap of the left valve allow *Bairdoppilata kalakotensis* to be distinguished from the associated *Bairdia beraguaensis*, *Bairdia kalakotensis* (see *Stereo-Atlas of Ostracod Shells* **11**, 141-144 & 145-148 respectively) and *Bairdia jammmuensis* Singh & Tewari.

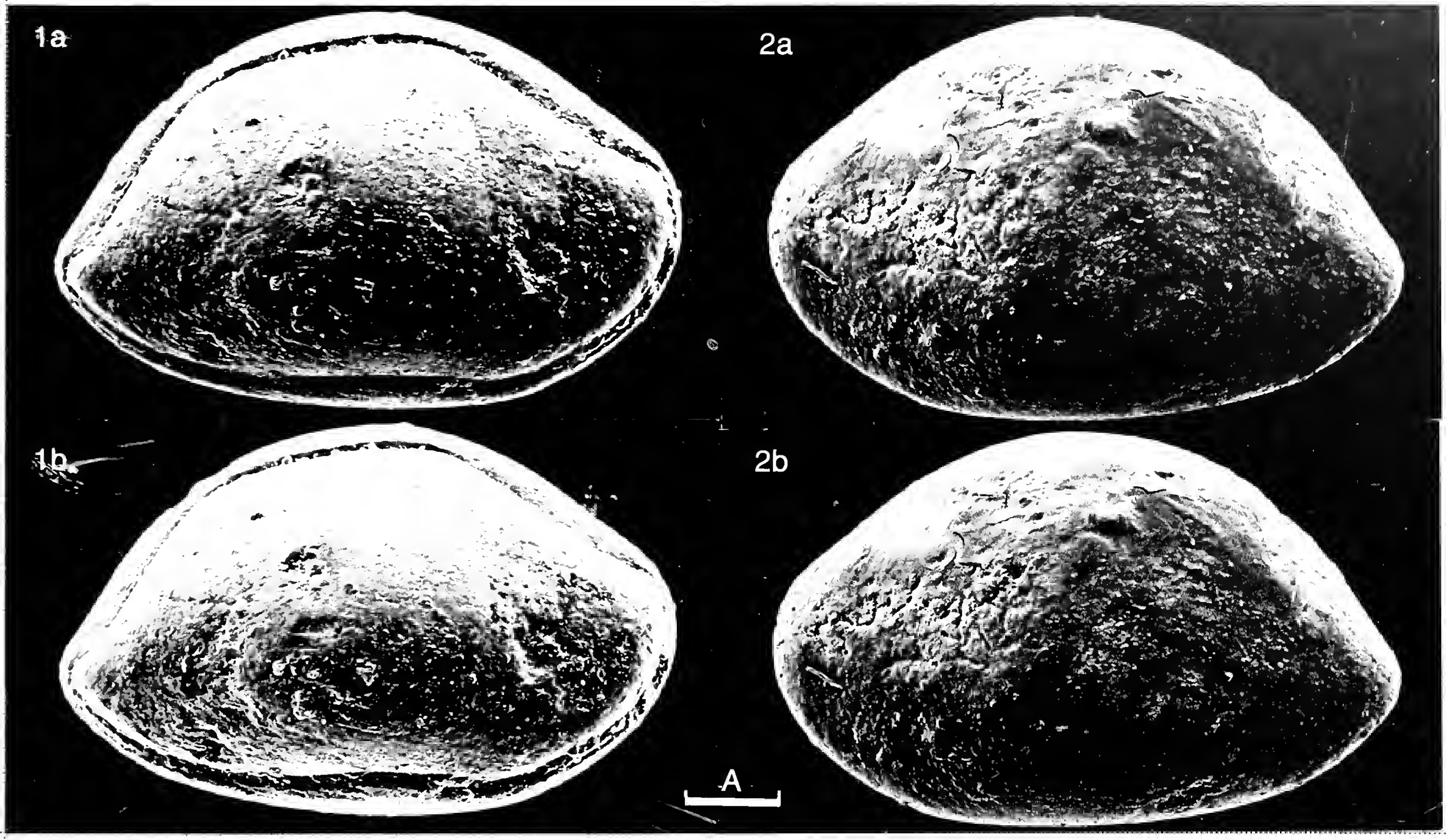
Distribution: Late early Eocene Kalakot Formation, Subathu Group, Jammu and Kashmir State. Also the Ghotaru no. 1 well of Rajasthan (in prep.).



Text-fig. 1. Location of type locality.

Explanation of Plate 11, 140

Figs. 1, 3, car., (paratype, **L.U. 217**, 1450 μm long): fig. 1, ext. rt. lat.; fig. 3, vent.; fig. 2, car., ext. dors. (holotype, **L.U. 216**, 1330 μm long).
Scale A (200 μm; ×62), fig. 1; Scale B (200 μm; ×43), figs. 2, 3.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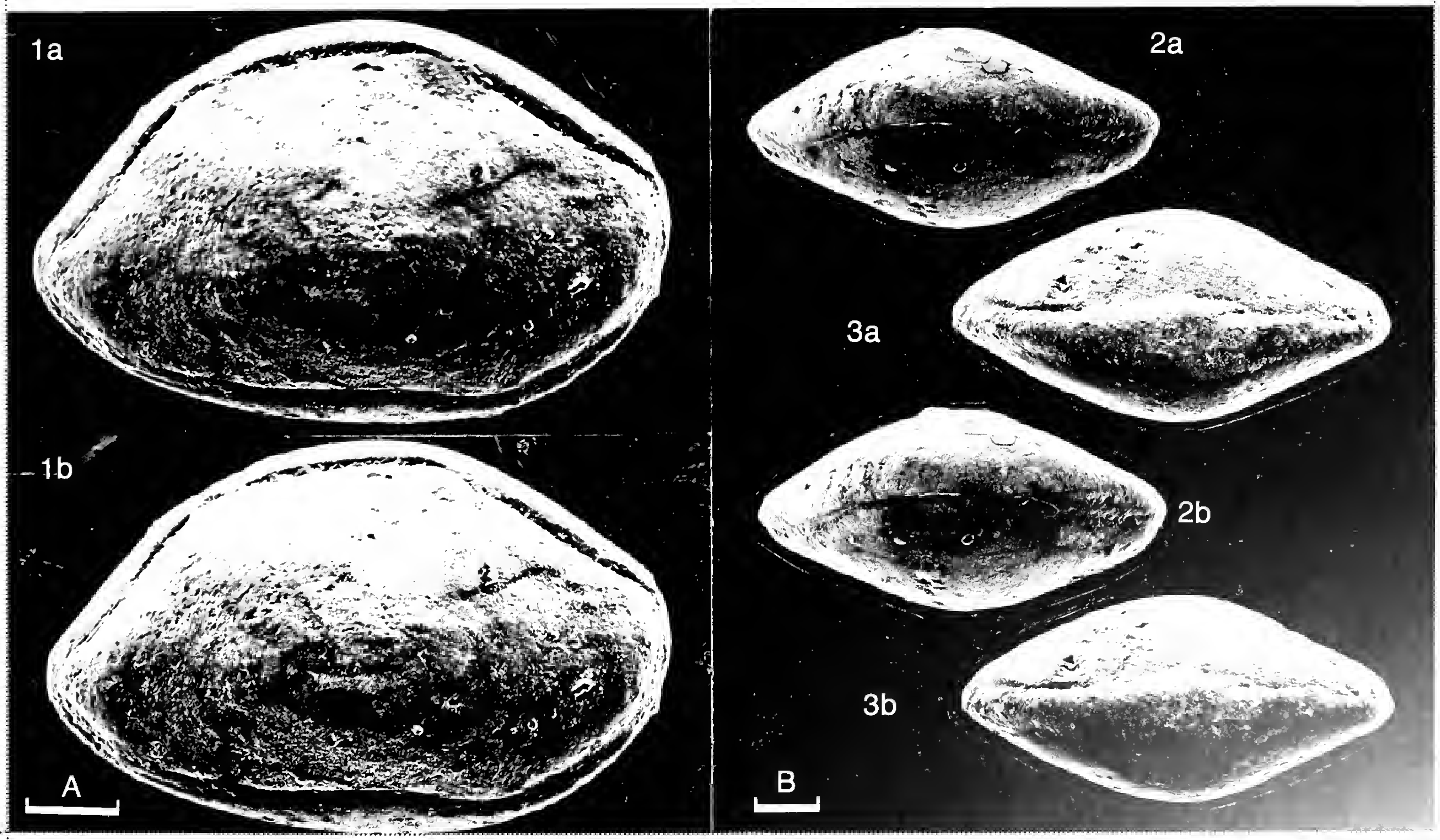
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595.337.11. (118.14) (540 : 161.074.33) : 551.35 + 552.54

ON *BAIRDIA BERAGUAENSIS* SINGH & TEWARI

by Pratap Singh
(33 Khur Bura, Dehra Dun, India)

Bairdia beraguaensis Singh & Tewari, 1966

1966 *Bairdia beraguaensis* sp. nov. P. Singh & B. S. Tewari *in* B. S. Tewari & P. Singh, *Cent. Advan. Study in Geology, Panjab University, Chandigarh*, **3**, 119, pl. 1, figs. 4a-d.

Holotype: University of Lucknow, India, no. **L.U. 214**.
[Paratype: **L.U. 215**].

Type locality: Sample 22; dark grey, fossiliferous, argillaceous limestone of the Kalakot Formation, Subathu Group, late early Eocene. About 150ft above road level in a cliff on the western side of the road leading to Gua from Beragua and situated at a distance of about 800 feet S15°W from the opening of the Beragua Mine in the Kalakot Coalfield (Survey of India topographic sheet 43K/8), Nawshera and Rajouri Tehsils of Poonch District, Jammu and Kashmir State, India (see Neale & Singh, *Stereo-Atlas of Ostracod Shells*, **11**, 139, text-fig. 1).

Figured specimens: University of Lucknow, India, nos. **L.U. 214** (holotype, car.: Pl. **11**, 142, fig. 1; Pl. **11**, 144, fig. 2) and **L.U. 215** (car.: Pl. **11**, 142, fig. 2; Pl. **11**, 144, figs. 1, 3). Both specimens are from the type locality.

Explanation of Plate 11, 142

Fig. 1, car., ext. rt. lat. (holotype, **L.U. 214**, 1005 μm long); fig. 2, car., ext. lt. lat. (paratype, **L.U. 215**, 1002 μm long). Scale A (200 μm; ×99), figs. 1, 2.

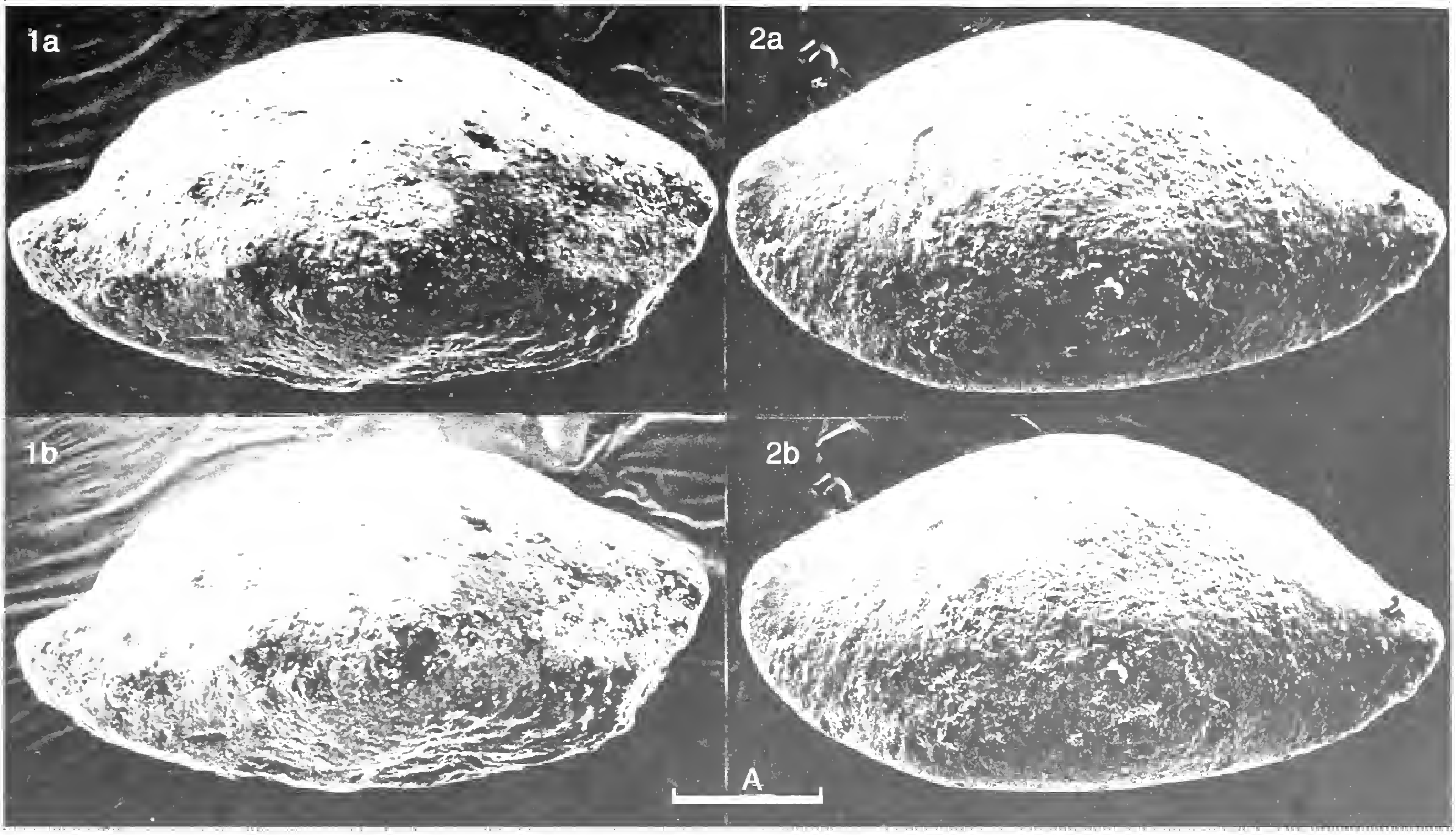
Diagnosis: Carapace elongate. Dorsal margin subarched, anterodorsal margin slightly concave, posterodorsal margin markedly concave, mid-ventral margin slightly convex. Angularly rounded anterior end, posterior and constricted and produced. Larger left valve overlaps right valve along dorsal and mid-posterior to mid-ventral regions. Height is half length, highest at mid-length. Lateral outline in dorsal and ventral views convex with both ends compressed, dorsal and ventral margins slightly curved.

Remarks: Bairdiacea are particularly well represented in the Eocene of Jammu and Kashmir State, this species being one of six recorded (see Tewari & Singh, op. cit.). *B. beraguaensis* differs from *Bairdoppilata kalakotensis* Singh & Tewari, *Bairdia kalakotensis* Singh & Tewari (see *Stereo-Atlas of Ostracod Shells* **11**, 137-140 & 145-148 respectively) and *Bairdia jammuensis* Singh & Tewari in its prominent beak-like projection at the posterior end.

Distribution: *Bairdia beraguaensis* occurs in the late early Eocene Kalakot Formation of the Subathu Group exposed in Jammu & Kashmir State, India.

Explanation of Plate 11, 144

Figs. 1, 3, car. (paratype, **L.U. 215**, 1002 μm long): fig. 1, ext. rt. lat.; fig. 3, ext. vent. Fig. 2, car., ext. dors. (holotype, **L.U. 214**, 1005 μm long).
Scale A (200 μm; ×99), fig. 1; Scale B (200 μm; ×70), fig. 2; Scale C (200 μm; ×66), fig. 3.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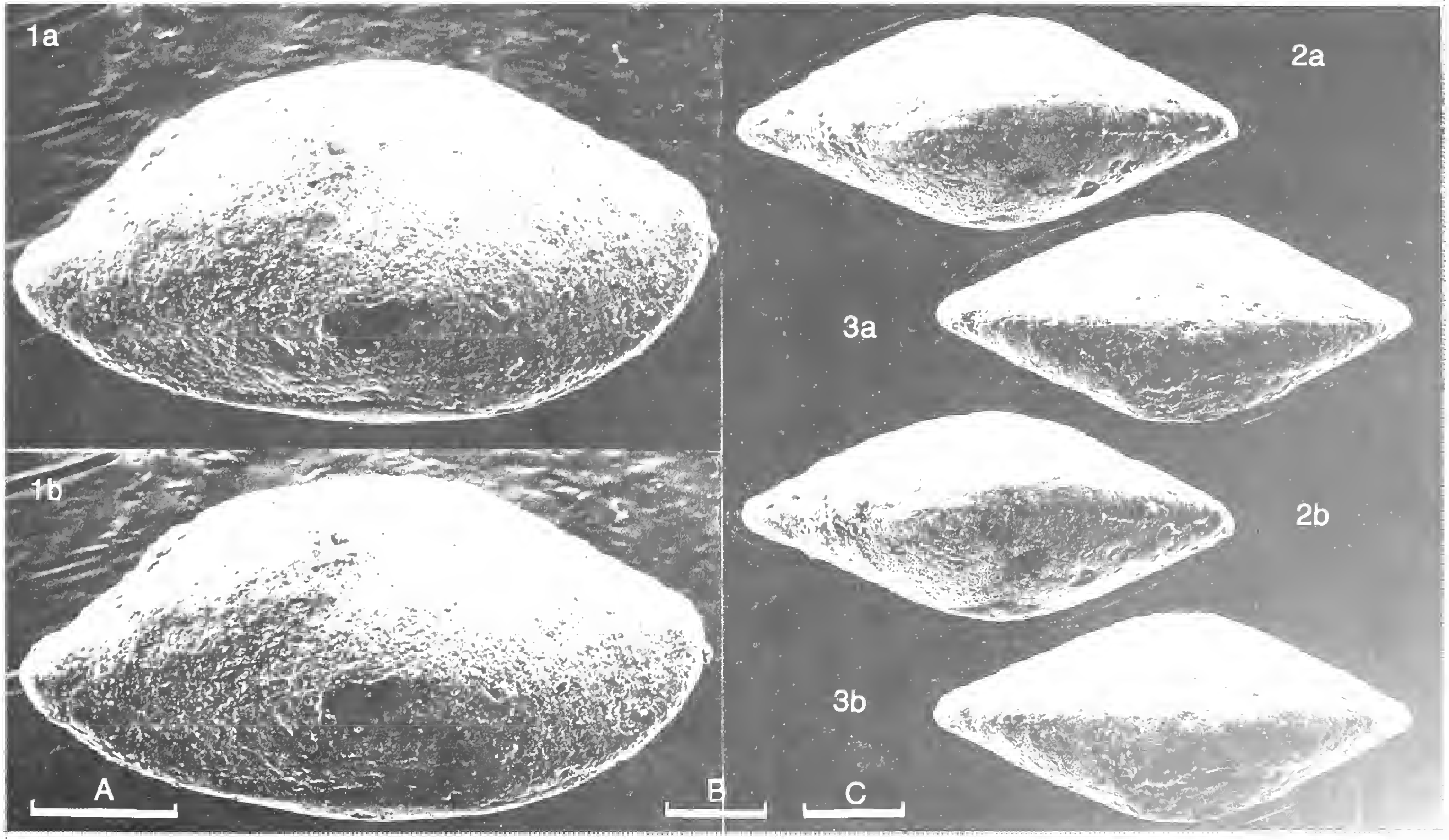
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Stereo-Atlas of Ostracod Shells 11 (28) 145-148 **(1984)**
595.337.11. (118.14) (540 : 161.074.33) : 551.35 + 552.54

ON *BAIRDIA KALAKOTENSIS* SINGH & TEWARI

by Pratap Singh
(33 Khur Bura, Dehra Dun, India)

Bairdia kalakotensis Singh & Tewari, 1966

1966 *Bairdia kalakotensis* sp. nov. P. Singh & B. S. Tewari *in* B. S. Tewari & P. Singh, *Cent. Advan. Study in Geology, Panjab University, Chandigarh,* **3**, 118, pl. 1., figs. 2a-d.

Holotype: University of Lucknow coll. no. **L.U. 210**.
[Paratype: **L.U. 211**].

Type locality: Sample 22; dark grey, fossiliferous, argillaceous limestone of the Kalakot Formation, Sabuthu Group, late early Eocene. About 150ft above road level in a cliff on the western side of the road leading to Gua from Beragua and situated at a distance of about 800 feet, S15°W from the opening of the Beragua Mine in the Kalakot Coalfield (Survey of India topographic sheet 43K/8), Nawshera and Rajouri Tehsils of Poonch District, Jammu and Kashmir State, India (see Neale & Singh, *Stereo-Atlas of Ostracod Shells* **11**, 139, text-fig. 1).

Figured specimens: University of Lucknow, India, nos. **L.U. 210** (holotype, car.: Pl. **11**, 146, figs. 1, 2; Pl. **11**, 148, figs. 2, 3) and **L.U. 211** (car.: Pl. **11**, 148, fig. 1). Both specimens are from the type locality.

Explanation of Plate 11, 146

Figs. 1, 2, car. (holotype, **L.U. 210**, 800μm long): fig. 1, ext. rt. lat.; fig. 2, ext. lt. lat.
Scale A (200μm; ×118), figs. 1, 2.

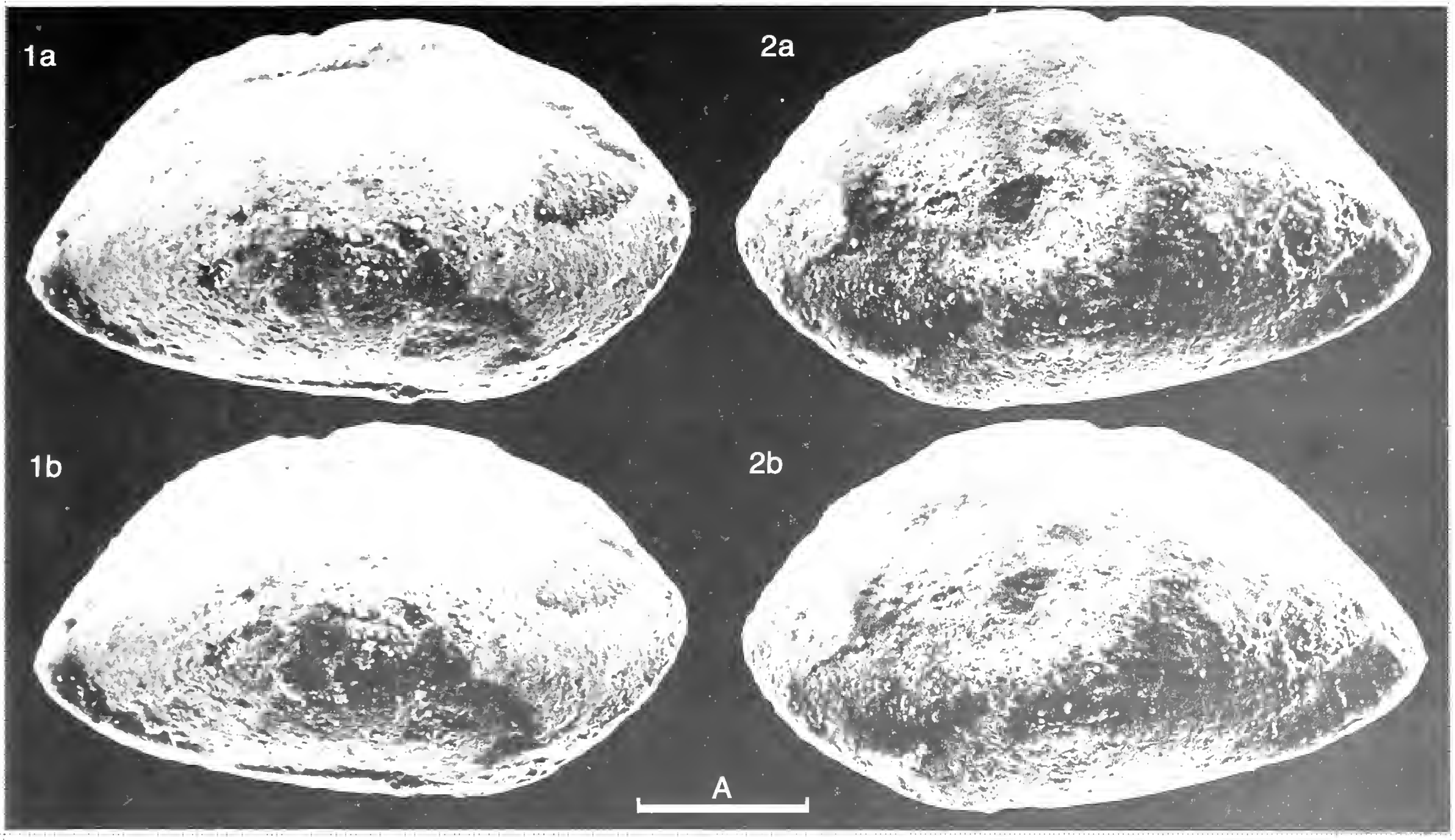
Diagnosis: Carapace elongate. Dorsal margin sub-arched, posterodorsal slope long and somewhat concave in posterior region, ventral margin fairly straight and inclined upward anteriorly, making pronounced anteroventral angle. Anterior end broadly rounded, posterior end angularly rounded. Left valve larger than right and overlaps all along dorsal margin and mid-ventral margin. Height is half length; highest part of carapace at mid-length. Carapace ovate in dorsal and ventral views, compressed at anterior and posterior ends; dorsal and ventral margins curved. Valves punctate.

Remarks: *B. kalakotensis* differs from *B. beraguensis* Singh & Tewari (see *Stereo-Atlas of Ostracod Shells* **11**, 141-144, 1984) in not having a beak like projection at the posterior end, and its more arched dorsal margin and convex ventral margin distinguish it from *B. jammuensis* Singh & Tewari. Its elongate carapace in lateral view and its broadly rounded anterior end separate *Bairdia kalakotensis* from *Bairdoppilata kalakotensis* Singh & Tewari (see *Stereo-Atlas of Ostracod Shells*, **11**, 137-140, 1984).

Distribution: *Bairdia kalakotensis* occurs in the late early Eocene Kalakot Formation of the Subathu Group exposed in Jammu and Kashmir State, India.

Explanation of Plate 11, 148

Fig. 1, car., ext. rt. lat. (paratype, **L.U. 211**, 840 μm long); figs. 2, 3, car. (holotype, **L.U. 210**, 800 μm long): fig. 2, ext. dors.; fig. 3, ext. vent.
Scale A (200 μm; ×116), fig. 1; Scale B (200 μm; ×91), fig. 2; scale C (200 μm; ×98), fig. 3.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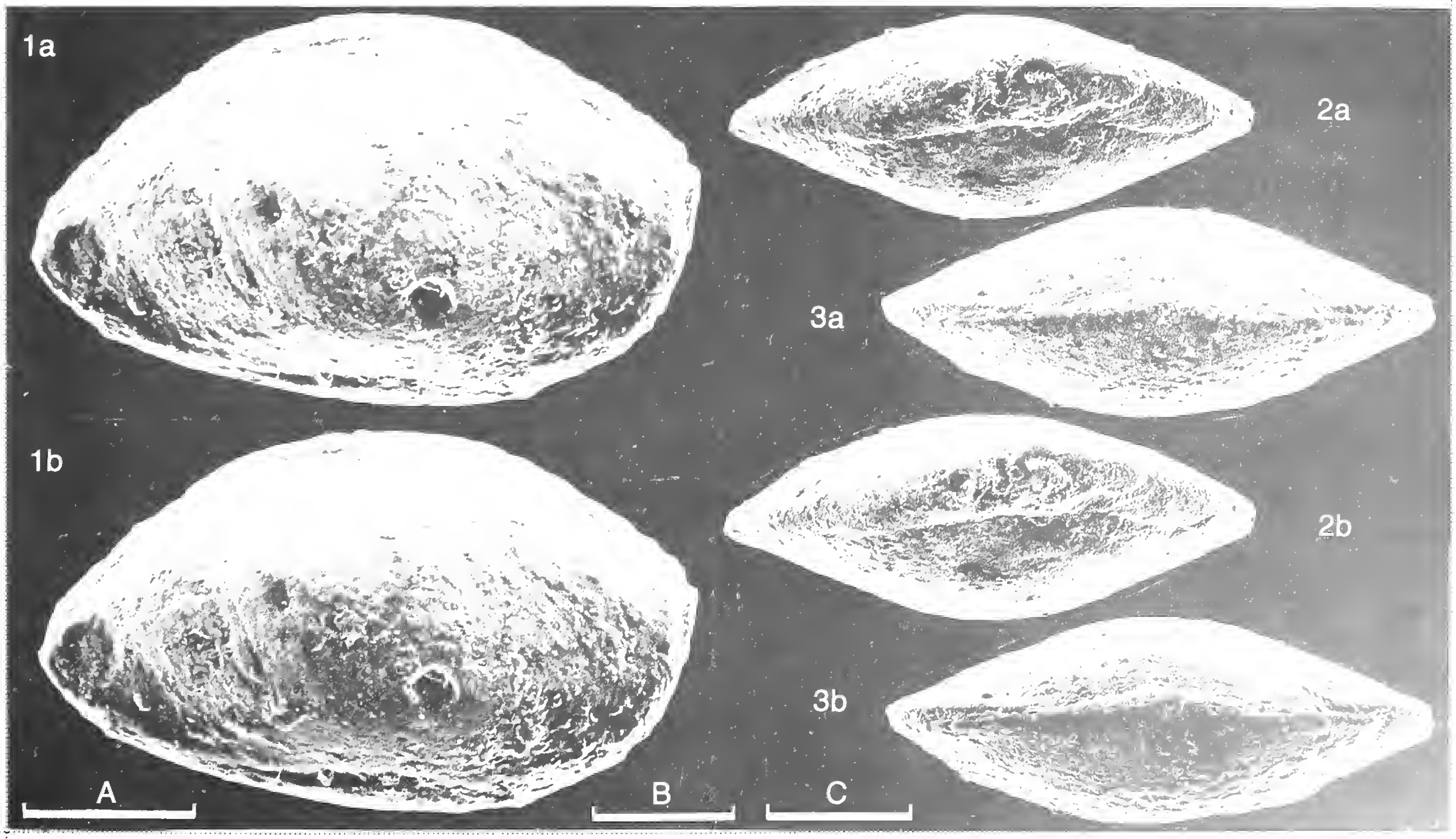
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