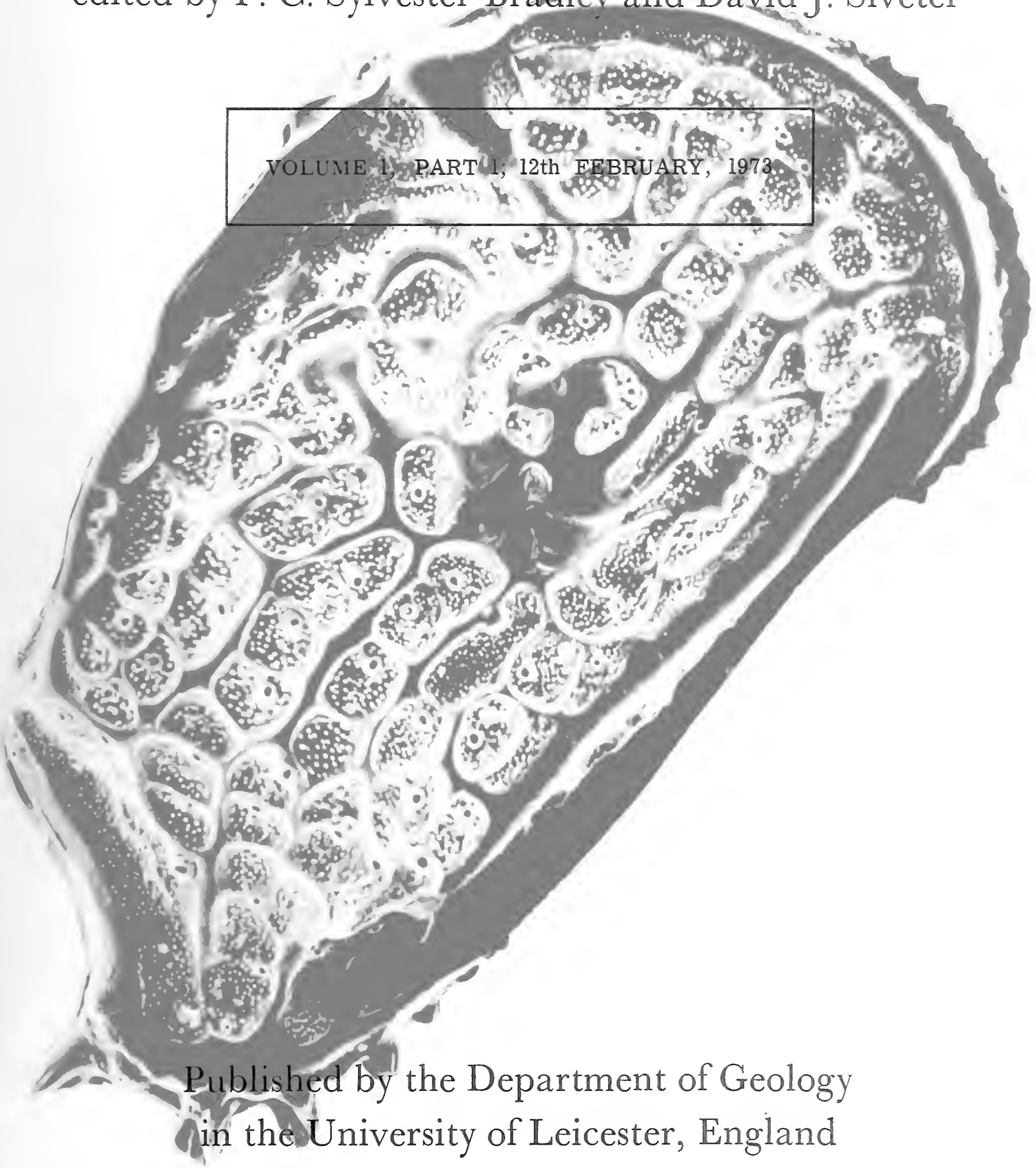
A Stereo-Atlas of Ostracod Shells

edited by P. C. Sylvester-Bradley and David J. Siveter



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INSTRUCTIONS TO AUTHORS

Contributions illustrated by scanning electron micrographs of Ostracoda in stereo-pairs are invited. Full instructions may be obtained on request from the Editors. Format should follow the style set by the majority of papers in this issue. The Editors should be consulted for advice before figures for plates are mounted. Descriptive matter apart from illustrations should be cut to a minimum; preferably each plate should be accompanied by one page of text only.

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STEREO-VIEWING FOR USERS OF THE ATLAS

In order to gain maximum information and benefit from the use of the *Stereo-Atlas* it is *essential* that the user view the micrographs stereoscopically. Small pocket-sized stereo-viewers are most suitable for this purpose; two suppliers of such viewers are given below.

C. F. Casella & Co. Ltd., Regent House, Britannia Walk, London, N1 7ND.
Pocket stereoscope, model T15010 (£1.00 each; excluding packing and carriage).

Air Photo Supply Corp., 158, South Station, Yonkers, New York 10705.
Pocket stereoscope, model PS-2 ($8.65 each; excluding postage and handling).

The scanning electron microscope in the Department of Geology of the University of Leicester was supplied by the Natural Environment Research Council under the terms of Grant No. GR/3/95 for the purpose of micropalaeontological research.

Plates printed by Broadwater Press Limited, Welwyn Garden City, Herts., England.

The *Atlas* is designed to be bound and stored in any one of three ways:

(a) in parts as issued;
(b) in loose-leaf binders, which will be made available with the publication of Vol. 1, Part 4;
(c) or with each leaf cut up into cards; each leaf is therefore ruled to facilitate trimming to any one of the three standard record-card sizes whose outlines are ruled on every leaf: A5 (210 mm × 148 mm); 8 × 5 in ; and 200 × 125 mm. Each card is numbered as a separate page, two pages to a leaf.

With the exception of the introductory article on "The New Palaeontography," all the contents are therefore printed on one side only, each page being numbered separately. Each page bears its number immediately following the name of the serial at the left of the top line; the number consists of three parts, the volume number, the article number, and the page number. Page numbers will run serially throughout the volume, and the sequence will normally run from the top half of the left leaf to the top half of the right leaf, followed by the bottom half of the left leaf and the bottom half of the right leaf. This sequence will not, however, apply to articles which are not illustrated (e.g. No. 2 of this volume on the U. D. Classification).

Each volume will be indexed in the normal way, but those subscribers who cut the leaves up into cards will no doubt arrange them according to their convenience. The U. D. classification (which appears on the left of the second line of the first page of each paper, and which is explained in Vol. 1, No. 2) is intended to facilitate such arrangements.

ant.	anterior, antero-
Brit. Mus. (Nat. Hist.)) BM(NH))	British Museum (Natural History)
car.	carapace
dors.	dorsal, dorsum, dorso-
ext.	external
int.	internal
juv	juvenile, instar
juv-1	(penultimate instar)
lat.	lateral
Lr.	Lower
lt.	left
LV	left valve
mag.	magnification
musc. sc.	muscle scar
Nat. Grid Ref.	National Grid Reference
obl.	oblique
post.	posterior, postero-
rt.	right
RV	right valve
S. N. P. A.	Société Nationale des Pétroles d'Aquitaine
sp.	species
spec.	specimen
Up.	upper
U. S. N. M.	United States National Museum
vent.	venter, ventral, ventro-
♀, ♂	female, male

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56.07.001.7:57.087

THE NEW PALAEONTOGRAPHY

by P.C. Sylvester-Bradley
(University of Leicester, England)

1. The Rejuvenation of an Ancient Discipline

Palaeontography has always been a part of palaeontology. As a term, it is used to denote the description of fossils as distinct from their interpretation. In practice, it has always included enough interpretation to lead to the nomenclature and classification of the fossils described, but no more. Palaeontography is not concerned with theories of evolution, with palaeogeographical reconstruction, with palaeoecological conclusions, or with stratigraphical correlation, although it frequently deals with ontogenetic, taxonomic, geographical or chronological variation.

An understanding of materials must precede their interpretation. Palaeontography is therefore the oldest part of palaeontology, and it might be thought that there is little that such an old discipline can supply to the present ferment of new ideas in the earth sciences. Three things have happened however which bid fair to rejuvenate this most senior branch of geology. The first has been a revolution in the techniques of illustration. The second is the result of the exponential increase in the volume of scientific literature. The third has grown from the power of the computer to assist statistical interpretation.

2. Techniques of Illustration

The first revolution that affected palaeontographical illustration arose from the invention of photography. The photograph provided an almost objective method of presenting information. In contrast and as a supplement, diagrams and sketches could be used as interpretative media. Surprisingly, the application of photographic techniques to various groups of fossils has proceeded most unevenly. In general, the smaller the fossil, the more difficult the problem of producing a three dimensional photograph. The principles of stereophotography were discovered very soon after the invention of photography itself, but their application to palaeontological material has been slow despite the large increase in amount of information that the method provides. The main problems in photographing small fossils arise from specular reflection and depth of focus. Coating the specimens to be photographed with fine-grained substances such as ammonium chloride, magnesium oxide, or silver, has been common practice for many years as a method of overcoming specular reflection, but the coating itself inevitably produces artifacts and hides detail. Depth of focus presents a greater problem, for though it can be increased indefinitely by reducing the aperture of the lens, this is at the expense of resolution. With specimens under the size of about 1mm the problem becomes acute, and an exact compromise must be sought between the depth of focus and resolution (TRIEBEL, 1947). Consequently, the microphotography of fossils has for long been a very skilled operation, and most of the work published has for long been of a standard far below that of the best practitioners. In some groups of fossils (notably the Conodonts) few photographs have ever been published which reproduce the amount of detail that can be made out under the microscope.

The second revolution, that overcame both the problems of specular reflection and depth of focus, came with scanning electron microscopy. It is now evident that even the best work of the best microphotographers fails to

reveal a great part of the information that the SEM makes available. Moreover, stereopairs and oblique close-ups make three dimensional representations particularly easy to obtain on the scanning electron microscope (SYLVESTER-BRADLEY, 1971).

The third revolutionary technique to affect palaeontography has been the application of stereo X-radiography to fossil material. Advances have been equally impressive with macroscopic material (ZANGERL, 1965; STUERMER, 1970) and with the projection X-ray microscope (BÉ, JONGEBLOED and McINTYRE, 1969). The combination of SEM and PXM has revealed a wealth of new and fascinating detail in all the groups of microfossils to which it has been applied. It is this new information which has brought palaeontography up-to-date, and which has posed questions which have never been posed before.

3. Palaeontographical Publication

Some publications have been exclusively palaeontographical. Indeed, the Palaeontographical Society was founded with the sole purpose of publishing descriptions of British fossils. But such exclusiveness has been rare. More normally, the systematic description of fossils has been accompanied by a section devoted to interpretative palaeontology. During the years, this practice has led to the rather unfortunate result of mixing two kinds of palaeontological information in such a way that the presence of the one hinders the retrieval of the other. Most readers are in fact searching a palaeontological paper either for its systematic contents or for its exposition of theory. Only a minority are looking for both things at the same time. Martinsson (1969) has advocated an effort to separate what he calls the "nomothetic" expression of ideas from "idiographic" palaeontography. The savage increase in volume of scientific publication that has characterised all fields of enquiry during the last few years has emphasised the need to re-think the purposes and methods of palaeontological publication, for pure palaeontography is best presented through quite different publishing media than that required for the elaboration of palaeontological theory. Palaeontography must rely increasingly on high quality illustration. Although the invention of a specialised jargon for the description of each fossil group has certain advantages, it has made the description of most fossils unintelligible to anybody who has not first mastered the highly specialised and esoteric language of the taxon in question. In contrast, the combination of illustration and an internationally agreed nomenclature breaks every language barrier. Zoological nomenclature and a wealth of illustration is perhaps the most international of all languages. The retrieval needs of taxonomy are also very different to those of theoretical palaeontology. In palaeontography we need to group together taxa according to a limited variety of parameters – taxonomic, geological, geographical, or ecological.

Most palaeontographical publication is at present sponsored by institutes or societies. In order to make their publications economically viable, they usually fix a periodical subscription, and try to include in their contents a wide range of interests in the hope of attracting as large a reading public as possible. The result of this system is that the specialist palaeontologist anxious to subscribe to a journal which publishes papers on his speciality must purchase with the papers that interest him a great deal of irrelevant matter. Most palaeontologists pay subscriptions to journals the majority of which they do not read. Surely this makes poor economic sense. It is proper that libraries should not limit their taxonomic coverage, but for the individual specialist it would be much better if he could just purchase the papers that interest him.

Palaeontography could well do with an entirely new publishing system. The format of the old-style monograph is cumbersome and lacks flexibility. Far better publish on cards of a standard size that can be sorted and arranged at the whim of the reader. Each taxon should be lavishly illustrated using the best three dimensional representation available and printed in high quality

collotype or lithography. Each taxon described should be offered for sale as an individual item, each species separately.

Maybe the economics of such a system will prove to be quite unrealistic, but if it can be made to work, it will provide a far better scientific tool than our present antiquated, over-loaded system.

4. Computerised Statistics

The description and quantification of variation is an essential but difficult aspect of palaeontography. Statistical methods have long been devised which allow the computation of confidence limits based on small samples. The application of the methods of numerical taxonomy (SOKAL and SNEATH, 1963) to palaeontography (KAESLER, 1967, 1969, 1970) has formalised a technique for applying computerised power to problems of classification. The computer can also be used to correlate other facets of palaeontography— geological, ecological and geographical — and can provide a substantial aid to retrieval.

If palaeontographic data is to be made available for computerised treatment, it needs to be expressed in numerical terms. Biometric tables suitable for numerical taxonomy can be constructed if techniques of measurement can be devised which can deal with samples of a sufficient size, but it must be admitted that these techniques are still in their infancy. Even more difficult is the expression of the other facets in numerical terms. So far as I know, the only systems which have been widely applied have been those designed to aid retrieval of geological bibliographic data, and these are employing the Universal Decimal Classification to translate the geological, geographical and ecological facets into numerical terms (SYLVESTER-BRADLEY, 1973).

Although, then, the computerisation of palaeontography is still in its experimental stage, there seems little doubt that it will become increasingly important in the years ahead (see, for example, HAY, 1971 and HUGHES, 1971).

5. A Venture in Palaeontography

The STEREO-ATLAS OF OSTRACOD SHELLS has been designed as a publishing venture to test the validity of some of the views put forward in this article. It is not likely that it will succeed in all that it sets out to do. But so urgent has the need become that it seems important that some attempt should be made to experiment with the new ideas.

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025.45:55/56:592/599

UNIVERSAL DECIMAL CLASSIFICATION AND RETRIEVAL OF TAXONOMIC DATA

by P.C. Sylvester-Bradley
(University of Leicester, England)

The *Stereo-Atlas of Ostracod Shells* is aiming to present taxonomic and palaeontological data in the most concise and most easily retrievable format possible. If the data are to be retrievable by computers, they need to be expressed in numerical form, and the most practicable classification scheme would seem to be that provided by the Universal Decimal Classification (UDC) (British Standards Institution, 1963). This scheme has been used in part, for example, by the American Geological Institute's "data bank" and by "Geosystems" in their attempt to devise a retrieval system for the whole of the earth sciences.

Though parts of the UDC classification can be used as they stand, other parts are completely unworkable either owing to initial misconceptions of the compiler, or owing to lack of revision during the years that have passed since the classification was first devised. Unfortunately the taxonomic classification of the Ostracoda is one such area.

The mechanism for accepting proposals for revision must necessarily, in an international system, be complex and time consuming. The only viable way of using UDC in this *Atlas* is to adopt where necessary proposed revisions although these have not yet been formally accepted by the *Fédération Internationale de Documentation*. The appended schedules A-D therefore set out the scheme as it will be used in the *Atlas*.

The classification adopted will be set out in the second line of the top left hand corner of the title page in each paper.

(a) The first set of figures will denote the taxonomic position of the species as indicated in Schedule A. The first five digits specify in UDC terms the Ostracoda. The remaining digits indicate the taxonomic position within the Ostracoda as as proposed in Schedule A. All taxonomic classifications are of course subject to revision and are in that sense controversial. The classification in this schedule is intended for retrieval. It is more important to have one that is generally available than one that is up to date. Accordingly it has been taken direct from the *Treatise* (MOORE, 1961, pp. Q99-100) without revision.

(b) The second term is placed in round brackets (parentheses) and indicates the geological horizon as shown in Schedule B.

(c) The third term is also placed in round brackets and indicates the geographical location as listed in Schedule C.

(d) The fourth term indicates the ecological situation or lithological type as appropriate. It is preceded by a colon (:) and may include a portion in round brackets indicating depth. If both ecological situation and lithological type are indicated the terms are connected with a plus (+) sign.

Thus in the paper on *Keijella hodgii* (Vol. 1, No. 9) the full UD classification reads:

595.337.14 (118.21/118.22) (560:161.036.36 + 454.4:161.012.43): 551.351 + 552.513

(a) *First term:* 595.337.14 (see Schedule A) indicates:
"Ostracoda, Podocopida, Cytheracea"
(b) *Second term:* (118.21/118.22) (see Schedule B) indicates:
"Miocene, Pliocene"
(c) *Third term:* (560:161.036.36 + 454.4:161.012.43) (see Schedule C) indicates:
"Turkey (Asia) at 036°E, 36°N and San Marino at 012°E, 43°N"
(d) *Fourth term:* 551.351 + 552.513 (see Schedule D) indicates:
"Shallow marine, sandstone"

ACKNOWLEDGMENT

Mr. G. A. Lloyd of FID has been kind enough to read through proofs of this paper, and has made helpful suggestions.

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SCHEDULE A (Taxonomic Position)

595.33	Ostracoda	595.337.11	Bairdiacea
.330	Archaeocopida	.12	Cypridacea
.335	Leperditicopida	.13	Darwinulacea
.336	Palaeocopida	.14	Cytheracea
.336.1	Beyrichicopina	.2	Metacopina
.11	Beyrichiacea	.21	Healdiacea
.12	Drepanellacea	.22	Quasillitacea
.13	Hollinacea	.23	Thlipsuracea
.14	Kirkbyacea	.3	Platycopina (Cytherellidae)
.15	Oepikellacea		
.16	Primitiopsacea	.339	Myodocopida
.17	Youngiellacea	.339.1	Myodocopina
.18	Punciacea	.11	Entomozoacea
.2	Kloedenellocopina	.12	Entomoconchacea
.21	Kloedenellacea	.13	Thaumatocypridacea
.22	Leperditellacea	.14	Cypridinacea
.23	Paraparchitacea	.15	Halocypridacea
.337	Podocopida	.2	Cladocopina (Polycopidae)
.337.1	Podocopina		

SCHEDULE B (Geological Horizon)

(113.2)	Cambrian
(113.22)	Lower Cambrian
(113.23)	Middle Cambrian
(113.24)	Upper Cambrian
(113.31)	Ordovician
(113.311)	Lower Ordovician
(113.312)	Middle Ordovician
(113.313)	Upper Ordovician
(113.33)	Silurian
(113.331)	Lower Silurian: Valentian, Llandoverian, Wenlockian
(113.332)	Middle Silurian: in America
(113.333)	Upper Silurian: Ludlovian, Downtonian
(113.4)	Devonian
(113.41)	Old Red Sandstone
(113.42)	Lower Devonian: Gedinnian, Coblenzian
(113.44)	Middle Devonian: Couvinian, Givetian
(113.45)	Upper Devonian: Frasnian, Famennian
(113.5)	Carboniferous
(113.51)	Lower Carboniferous: Mississippian
(113.52)	Upper Carboniferous: Pennsylvanian
(113.521)	Millstone Grit: Upper Namurian
(113.522)	Coal Measures: Westphalian
(113.523)	Stephanian
(113.59)	Permo-Carboniferous
(113.6)	Permian
(113.61)	Lower Permian: Wolfcampian, Leonardian, Sakmarian, Artinskian

SCHEDULE B (Geological Horizon) Continued

(113.63)	Upper Permian: Guadalupian, Ochoan, Kungurian, Kazanian, Tatarian, Zechstein
(115.3)	Permo-Triassic: New Red Sandstone
(115.4)	Karoo: Gondwana
(116)	Mesozoic
(116.1)	Triassic
(116.11)	Lower Triassic: Scythian, Werfenian, Bunter
(116.12)	Middle Triassic: Anisian, Ladinian, Virglorian, Muschelkalk
(116.13)	Upper Triassic: Carnian, Norian, Keuper
(116.14)	Upper Triassic: Rhaetic
(116.2)	Jurassic
(116.21)	Lower Jurassic: Liassic
(116.211)	Lower Liassic: Hettangian, Sinemurian
(116.212)	Middle Liassic: Pliensbachian, Carixian, Domerian
(116.213)	Upper Liassic: Toarcian, Whitbian, Yeovilian
(116.22)	Middle Jurassic
(116.221)	Aalenian

SCHEDULE B (Geological Horizon) Continued

(116.222)	Bajocian:
	Bathonian
(116.223)	Callovian
(116.23)	Upper Jurassic
(116.231)	Oxfordian
(116.233)	Kimmeridgian:
	Portlandian
	Purbeckian
	Volgian
	Tithonian
(116.3)	Cretaceous
(116.31)	Lower Cretaceous:
	Comanchean
(116.311)	Wealden:
	Berriasian
(116.312)	Valanginian:
	Hauterivian
	Barremian
	Trinity
	Fredericksburg
	Aptian
	Lower Greensand
(116.313)	Albian:
	Gault
	Upper Greensand
	Washita
(116.33)	Upper Cretaceous:
	Chalk
	Gulf
(116.331)	Cenomanian:
	Lower Chalk
	Dakota
(116.332)	Turonian:
	Middle Chalk
	Colorado
(116.333)	Senonian:
	Upper Chalk
	Austin
	Taylor
	Navarro
(116.333.1)	Coniacian
(116.333.3)	Santonian:
	Campanian
	Maestrichtian

SCHEDULE B (Geological Horizon) Continued

(116.333.5)	Danian
(117)	Cenozoic
(118)	Tertiary
(118.1)	Palaeogene:
	Nummulitic
(118.13)	Palaeocene:
	Midway
(118.131)	Montian
(118.132)	Thanetian
(118.133)	Sparnacian
(118.14)	Eocene
(118.141)	Ypresian:
	Cuisian
	Wasatchian
	Wilcox
(118.142)	Lutetian:
	Auversian
	Claiborne
(118.143)	Bartonian:
	Ludian
	Ledian
	Jackson
(118.15)	Oligocene
(118.151)	Tongrian:
	Lattorfian
(118.152)	Rupelian:
	Chattian
(118.2)	Neogene
(118.21)	Miocene
(118.211	Aquitanian:
	Burdigalian
(118.212)	Helvetian
(118.213)	Tortonian:
	Sarmatian
	Sahelian
	Pontian
	Meotian

SCHEDULE B (Geological Horizon) Continued

(118.22)	Pliocene	(119.3)	Glacial and interglacial:
(118.221)	Plaisancian		Sicilian
(118.223)	Astian		Tyrrhenian
(119)	Quaternary		Villafranchian
(119.1)	Pleistocene	(119.4)	Holocene:
(119.2)	Preglacial:		Postglacial
	Calabrian	(119.9)	Recent

SCHEDULE C (Geographic Location)

(a) *Oceans and Seas*

(261)	Atlantic Ocean	(261.5)	South Atlantic Ocean
(261.1)	North Atlantic Ocean		(generally)
	(generally)	(261.6)	West and South-West
(261.2)	North-East Atlantic		Atlantic
(261.24)	Baltic Sea	(261.7)	East and South-East
(261.26)	North Sea		Atlantic
(261.27)	Irish Sea and western	(262)	Mediterranean Sea
	waters of the	(262.1)	Western Mediterranean
	British Isles	(262.2)	Eastern Mediterranean
(261.28)	Bay of Biscay and ad-		(in general)
	jacent French and	(262.5)	Black Sea
	Spanish coastal	(262.8)	Inner seas of Eurasia
	waters	(265)	Pacific Ocean
(261.4)	North-West Atlantic	(265.1)	East and South-East
			Pacific

SCHEDULE C(Geographic Location) Continued

(a) *Oceans and Seas* continued

(265.2)	North and North-East	(267.7)	East and south-east
	Pacific		Indian Ocean
(265.5)	West and North-West	(268)	Arctic Ocean
	Pacific	(268.4)	European Arctic ocean
(265.7)	South and South-West	(268.5)	Asian Arctic Ocean
	Pacific	(268.7)	American Arctic ocean
(267)	Indian Ocean	(268.9)	Arctic Basin
(267.2)	West and south-west	(269)	Southern (Antarctic) Ocean
	Indian Ocean	(269.4)	Atlantic sector
(267.3)	North-western Indian	(269.5)	Pacific sector (of Ant-
	Ocean		arctic)
(267.6)	North-eastern Indian	(269.7)	Indian Ocean sector (of
	Ocean		Antarctic)

[If further subdivision is necessary it will follow the official UDC Schedules]

(b) *Land Areas*

(4)	Europe	(435.9)	Luxembourg
(411)	Scotland	(436)	Austria
(415)	Ireland	(437)	Czechoslovakia
(420)	England	(438)	Poland
(429)	Wales	(439)	Hungary
(430)	Germany	(44)	France
(430.1)	German Federal Republic	(45)	Italy
(430.2)	German Democratic Republic		

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

(460)	Spain	(519)	Korea
(468.2)	Gibraltar	(520)	Japan
(469)	Portugal	(529.1)	Taiwan: Formosa
(47)	U.S.S.R. [see (57)]	(53)	Arabian States: including Kuwait and Sheikdoms
(480)	Finland	(540)	India
(481)	Norway	(541.35)	Nepal
(485)	Sweden	(548.7)	Ceylon
(489)	Denmark	(549)	Pakistan
(491.1)	Iceland	(55)	Iran: Persia
(492)	Netherlands	(560)	Turkey (Asia) [see (496.1)]
(493)	Belgium	(564.3)	Cyprus
(494)	Switzerland	(567)	Iraq
(495)	Greece	(569.1)	Syria
(496.1)	Turkey (Europe)	(569.3)	Lebanon
(496.5)	Albania	(569.4)	Israel
(497.1)	Yugoslavia	(569.5)	Jordan
(497.2)	Bulgaria	(57)	Asiatic U.S.S.R.
(498)	Roumania	(581)	Afghanistan
(5)	Asia		
(510)	China		
(515)	Tibet		
(517)	Mongolia		

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

(591)	Burma	(664)	Sierra Leone
(593)	Thailand: Siam	(665.1)	Gambia
(595)	Malaysia	(665.2)	Guinea
(596/598)	Indochina	(665.7)	Portuguese Guinea
(596)	Cambodia	(666)	Liberia
(597)	Vietnam	(666.8)	Ivory Coast
(598)	Laos	(667)	Ghana
(6)	Africa	(668.1)	Togo
(611)	Tunisia	(668.2)	Dahomey
(612)	Libya	(669)	Nigeria
(620)	Egypt: U.A.R.	(671.1)	Cameroon Republic
(624)	Sudan	(671.8)	Equatorial Guinea
(63)	Ethiopia	(672.1)	Gabon
(64)	Morocco	(672.4)	Brazzaville: Congo Republic
(65)	Algeria	(673)	Angola
(661.2)	Mauritania	(674.1)	Central African Republic
(662.1)	Mali	(674.3)	Chad
(662.5)	Upper Volta	(675)	Zaire: Congo, Kinshasa
(662.6)	Niger	(675.97)	Burundi
(663)	Senegal	(675.98)	Rwanda

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

(676.1)	Uganda	(712.7)	Manitoba
(676.2)	Kenya	(713)	Ontario
(677)	Somalia	(714)	Quebec
(678)	Tanzania	(715)	New Brunswick
(679)	Mozambique	(716)	Nova Scotia
(680)	Republic of South Africa	(717)	Prince Edward Island
(681)	Botswana	(718)	Newfoundland
(683)	Swaziland	(719)	Labrador
(686.1)	Lesotho	(72)	Mexico
(688)	Namibia:	(728)	Central America
	South West Africa	(728.1)	Guatemala
(689.1)	Southern Rhodesia	(728.2)	British Honduras
(689.4)	Zambia	(728.3)	Honduras
(689.7)	Malawi	(728.4)	El Salvador
(691)	Madagascar:	(728.5)	Nicaragua
	Malagasy	(728.6)	Costa Rica
(7)	North America	(728.7)	Panama
(71)	Canada	(729)	West Indies
(711)	British Columbia	(729.1)	Cuba
(712.1)	Yukon	(729.2)	Jamaica
(712.2)	Northwest Territories	(729.3)	Dominican Republic
(712.3)	Alberta	(729.4)	Haiti
(712.4)	Saskatchewan	(729.5)	Puerto Rico

SCHEDULE C.(Geographic Location) Continued

(b) *Land Areas* continued

(729.61)	Bahamas	(759)	Florida
(729.72)	Leeward Islands	(761)	Alabama
(729.82)	Windward Islands	(762)	Mississippi
(729.87)	Trinidad	(763)	Louisiana
(729.9)	Bermuda	(764)	Texas
(73)	U.S.A.	(766)	Oklahoma
(741)	Maine	(767)	Arkansas
(742)	New Hampshire	(768)	Tennessee
(743)	Vermont	(769)	Kentucky
(744)	Massachusetts	(771)	Ohio
(745)	Rhode Island	(772)	Indiana
(746)	Connecticut	(773)	Illinois
(747)	New York	(774)	Michigan
(748)	Pennsylvania	(775)	Wisconsin
(749)	New Jersey	(776)	Minnesota
(751)	Delaware	(777)	Iowa
(752)	Maryland	(778)	Missouri
(753)	Washington D.C.	(781)	Kansas
(754)	West Virginia	(782)	Nebraska
(755)	Virginia	(783)	South Dakota
(756)	North Carolina	(784)	North Dakota
(757)	South Carolina	(786)	Montana
(758)	Georgia	(787)	Wyoming

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

(788)	Colorado	(883)	Surinam
(789)	New Mexico	(892)	Paraguay
(791)	Arizona	(899)	Uruguay
(792)	Utah	(91)	East Indies
(793)	Nevada	(910)	Indonesia
(794)	California	(911)	Borneo
(795)	Oregon	(911.13)	Brunei
(796)	Idaho	(911.14)	Sarawak
(797)	Washington State	(914)	Philippines
(798)	Alaska	(932/937)	Melanesia
(8)	South America	(931)	New Zealand
(81)	Brazil	(932)	New Caledonia
(82)	Argentina	(934)	New Hebrides
(83)	Chile	(94)	Australia
(84)	Bolivia	(941)	Western Australia
(85)	Peru	(942)	South Australia
(86)	Columbia	(943)	Queensland
(866)	Ecuador	(944)	New South Wales
(87)	Venezuela	(945)	Victoria
(881)	Guyana	(946)	Tasmania
(882)	French Guiana	(948)	Northern Territory

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

(95)	New Guinea	(969)	Hawaii
(96)	Polynesia	(988)	Greenland
(965)	Micronesia	(99)	Antarctic

[If greater subdivision of land areas than given in this Schedule is found useful in specific cases, it will be adopted from the official lists published by UDC]

(c) *Longitude and Latitude*

[Used in conjunction with sea or land areas in sections (a) and (b) above]

All places are first classified under 4 quadrants:

(161) North, and between long. 0° and 180° E of Greenwich
(162) North, and between long. 0° and 180° W of Greenwich
(163) South, and between long. 0° and 180° E of Greenwich
(164) South, and between long. 0° and 180° W of Greenwich

Each quadrant is then subdivided into 1° grid squares, indicated by five digits as follows:

(16X.YYY.ZZ), where X = the quadrant,
YYY = degrees of longitude of western boundary of grid,
and ZZ = degrees of latitude of southern boundary of grid.

SCHEDULE C (Geographic Location) Continued

(b) *Land Areas* continued

Examples:

(161.007.49) 1° grid delineated by 8°E, 49°N (Karlsruhe) at 8°27'E, 49°2'N.

(163.042.18) 1° grid delineated by 42°E, 18°S (Indian Ocean, Mozambique Channel) at 42°05'E, 17°55'S.

[If further subdivision is necessary it will follow the official UDC schedules (FID publ. no. 248/6:6, Sept., 1968)]

SCHEDULE D (Ecological situation or Lithological Facies)

:551.31	Terrestrial
:551.312	Freshwater
:551.312.1	Springs. Tufa
:551.312.2	Bogs. Marshes. Peat
:551.312.3	Fluviatile. Rivers
:551.312.4	Lacustrine. Lakes, ponds
:551.313.1	Brackish water
:551.313.2	Estuarine
:551.314	Supersaline
:551.35	Marine
:551.35(26.01)	Planktonic
(26.03)	Benthonic

SCHEDULE D (Ecological situation or Lithological Facies) Continued

:551.35(24.08.X)	Depth [X=depth in metres]
:551.351	Neritic, littoral (0-200 m)
.352	Bathyal (200-2000 m)
.353	Abyssal (over 2000 m)
:552.51	Arenaceous (sand, sandstone)
.52	Argillaceous (clay, shale)
.53	Evaporitic
.54	Calcareous (limestone, marl)
.55	Siliceous or silicified (chert)
.57	Carbonaceous (coal, lignite, peat)
.581	Diatomaceous earth
.583	Radiolarite
.585	Coral reefs, bioherms
.64	Phosphates, phosphatic [illegible]

[Combinations of these indications will be used thus:

:551.353 (26.03:24.08.3535)

"Marine, abyssal, benthonic, at depth of 3535 metres"]

595.337.14 (119.9) (267.25:163.043.18): 551.353 (24.08.1360)

ON *BYTHOCERATINA SCABERRIMA* (BRADY)

by Richard H. Benson
(Smithsonian Institution, Washington, D.C., U.S.A.)

Bythoceratina scaberrima (Brady, 1886)

Cytherura scaberrima Brady, *Les Fonds de la Mer*, vol. 4, p. 198, pl. 14, figs. 10, 11 (1886).
Cythere scaberrima Brady; Brady & Norman, *Scient. Trans. R. Dubl. Soc.*, ser. 2, vol. 4. p. 245, with figure unnumbered (1889).

Lectotype: Not yet designated.

Type localities: Recent, Atlantic Ocean, off west coast of Morocco; *Talisman* dredging, 7 August 1883 (3535 m depth) and 22 August 1883 (2995 m depth).

Explanation of Plate 1:3:24

Fig. 1, LV ext. lat.; fig. 2, LV int. lat.

Scale A (250 µm ; ×90), both figs.

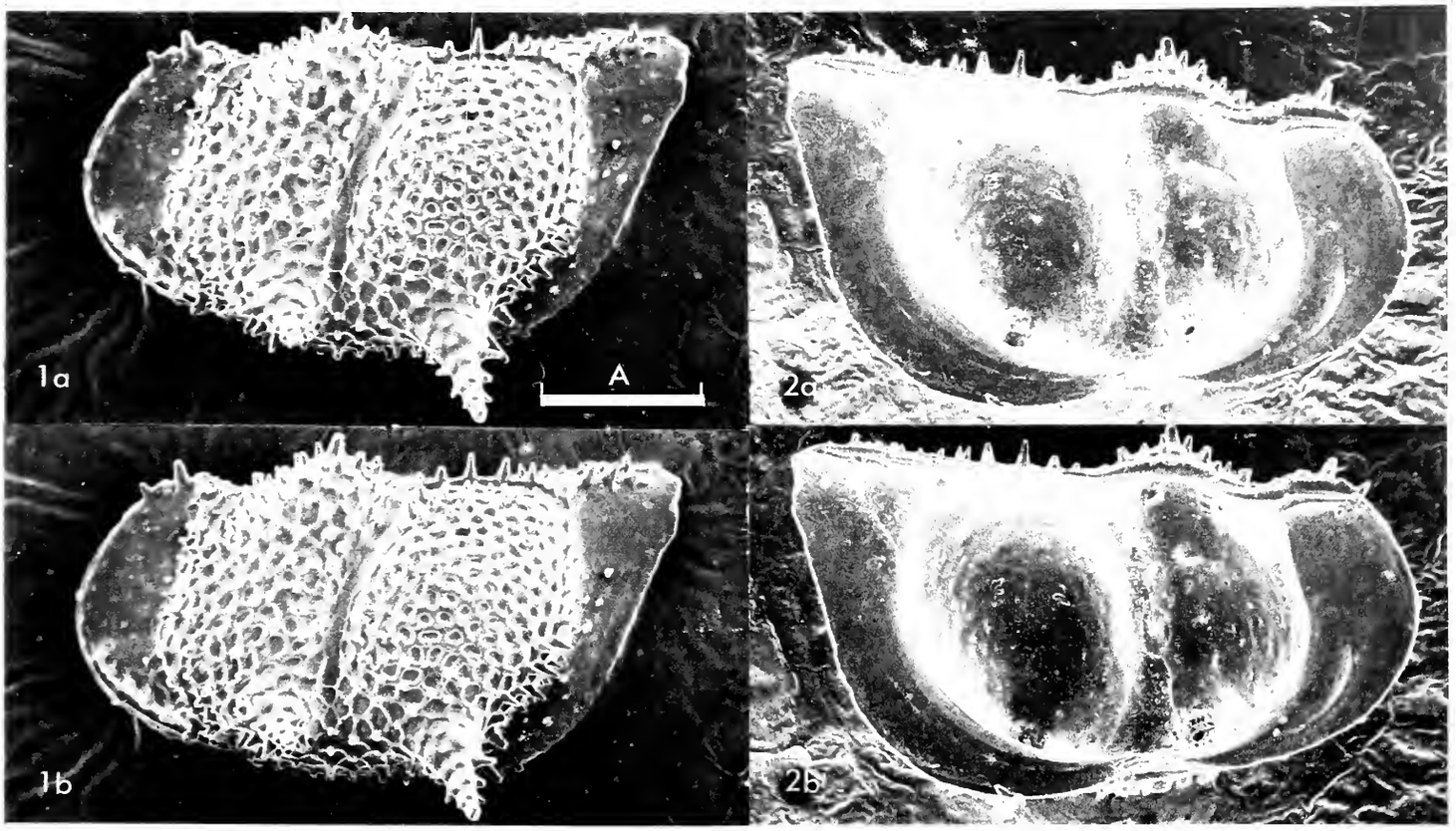
Figured specimens: U. S. N. M. 169420B (LV: Pl. 1:3:24, figs. 1, 2; Pl. 1:3:26, figs. 1, 2), 169420A (RV: Pl. 1:3:28, figs. 1-4), 180506 (RV: Pl. 1:3:30, fig. 1), 180505 (RV: Pl. 1:3:30, fig. 2). The specimen U. S. N. M. 169420A is broken. All specimens from station IIOE 407D (International Indian Ocean Expedition), Cruise 8, *R/V Anton Bruun*, Mozambique Channel. Depth 1360 m; long. 43°05'E, lat. 17°32'S. Collected by R. H. Benson.

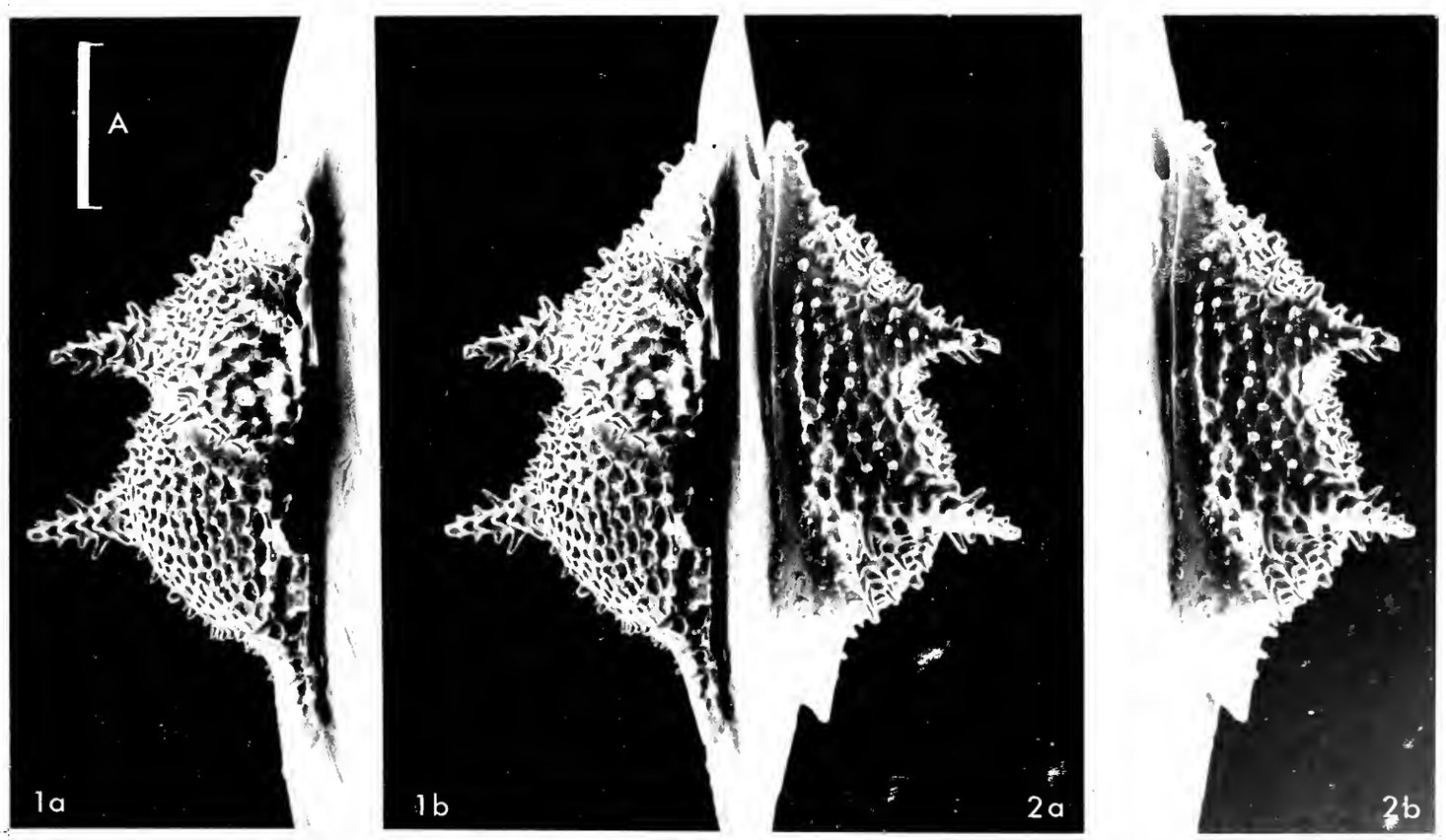
Diagnosis: Spinose and reticulate surface with two ventrolateral spines on each valve.

Explanation of Plate 1:3:26

Fig. 1, LV dors.; fig. 2, LV vent.

Scale A (250 µm ; ×90), both figs.


1a
A
2a
1b
2b


A
1a
1b
2a
2b

Explanation of Plate 1:3:28

Fig. 1, RV ext. lat.; fig. 2, RV post.; fig. 3, RV ext. lat., median sulcus; fig. 4, RV ext. lat., misshapen spines in median sulcus.

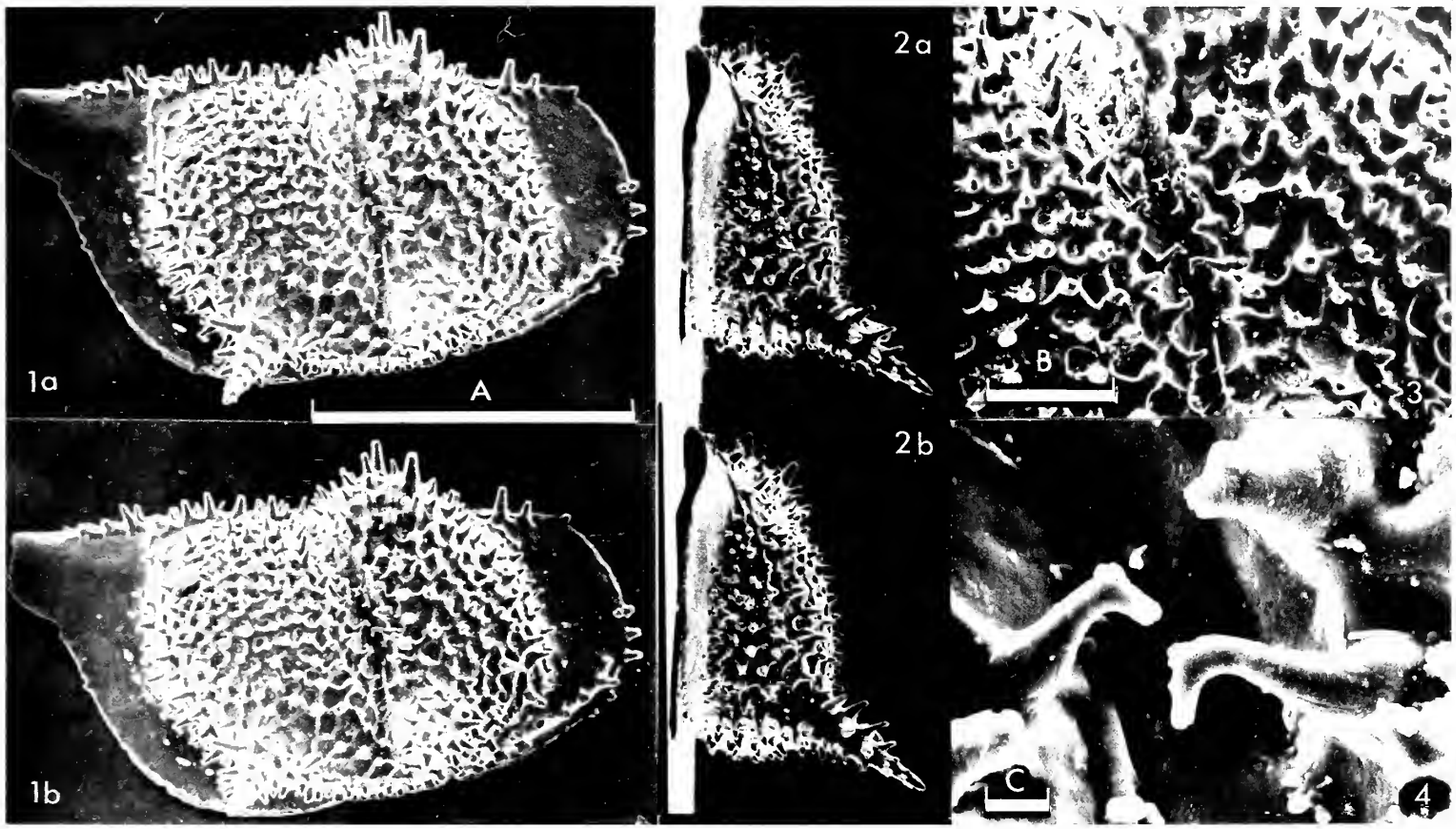
Scale A (500 µm ; ×90), figs. 1, 2; scale B (100 µm ; ×180), fig. 3; scale C (10 µm ; ×850), fig. 4.

Explanation of Plate 1:3:30

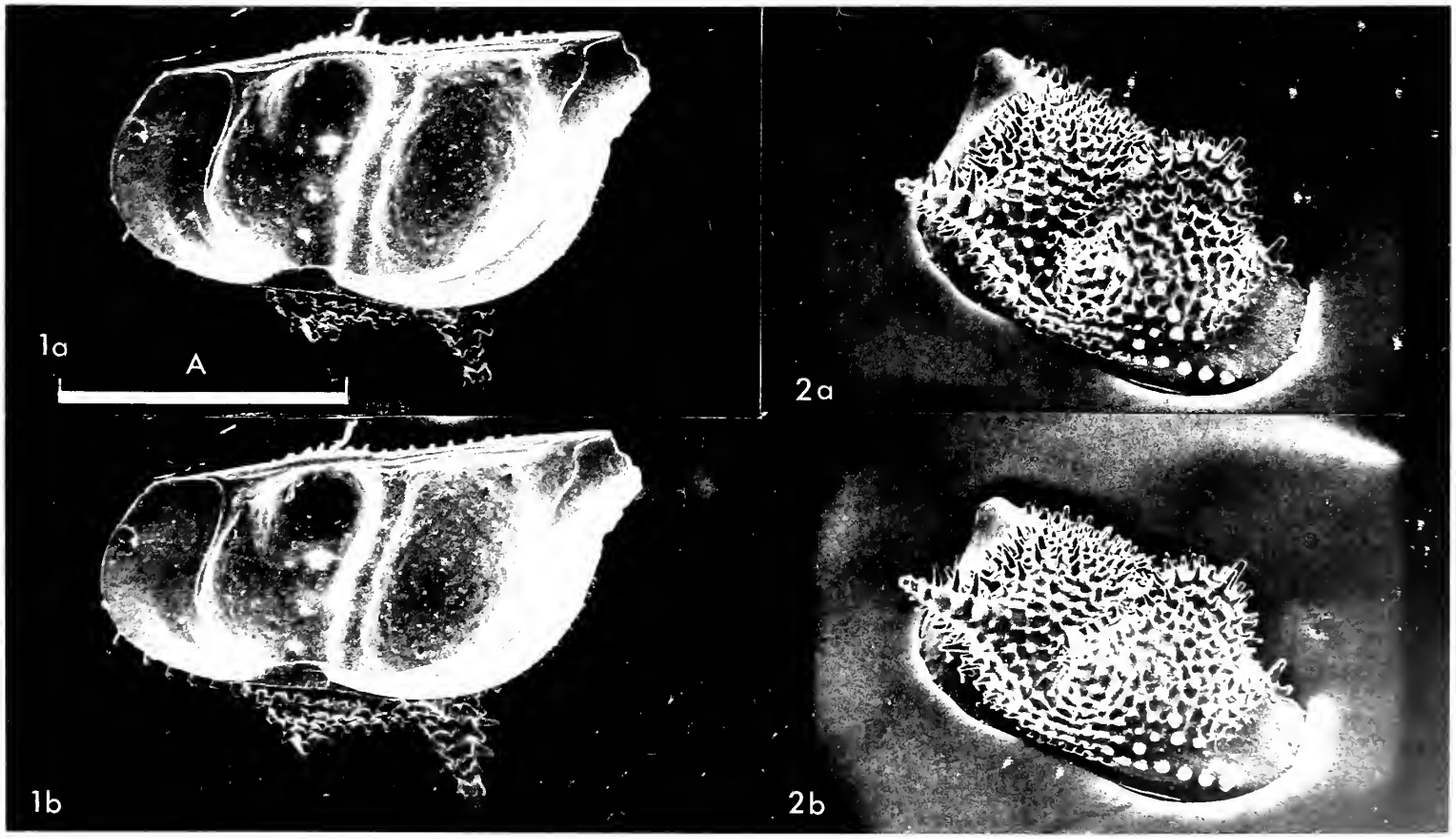
Fig. 1, RV int. lat.; fig. 2, RV ext. ant. vent. obl.

Scale A (500 µm ; ×80), fig. 1; fig. 2 approx. same mag.

Stereo-Atlas of Ostracod Shells,1:3:28 *Bythoceratina scaberrima* (6 of 8)



Stereo-Atlas of Ostracod Shells,1:3:30 *Bythoceratina scaberrima* (8 of 8)



595.337.14 (118.213) (457.8:161.016.38): 551.35(26.03)

ON *CHRYSOCYTHERE CATAPHRACTA* RUGGIERI

by P.C. Sylvester-Bradley and G. Ruggieri
(University of Leicester, England, and University of Palermo, Italy)

Genus *CHRYSOCYTHERE* Ruggieri, 1962

Type-species (original designation): *C. cataphracta* Ruggieri, 1962

Chrysocythere cataphracta Ruggieri, 1962

Chrysocythere cataphracta Ruggieri, *Palaeontogr. ital.* vol. 56, mem. 2, pp. 26-28, pl. 2, figs. 11-13 (1962).

Holotype: Ruggieri coll. Sl. 1312.

Type Locality: Middle Miocene (Tortonian) from near Enna (GR 10161), Sicily.

Explanation of Plate 1:4:32

Fig. 1, LV ext. lat.; fig. 2, LV ext. lat., region of eye tubercle, showing fenestrate muri.

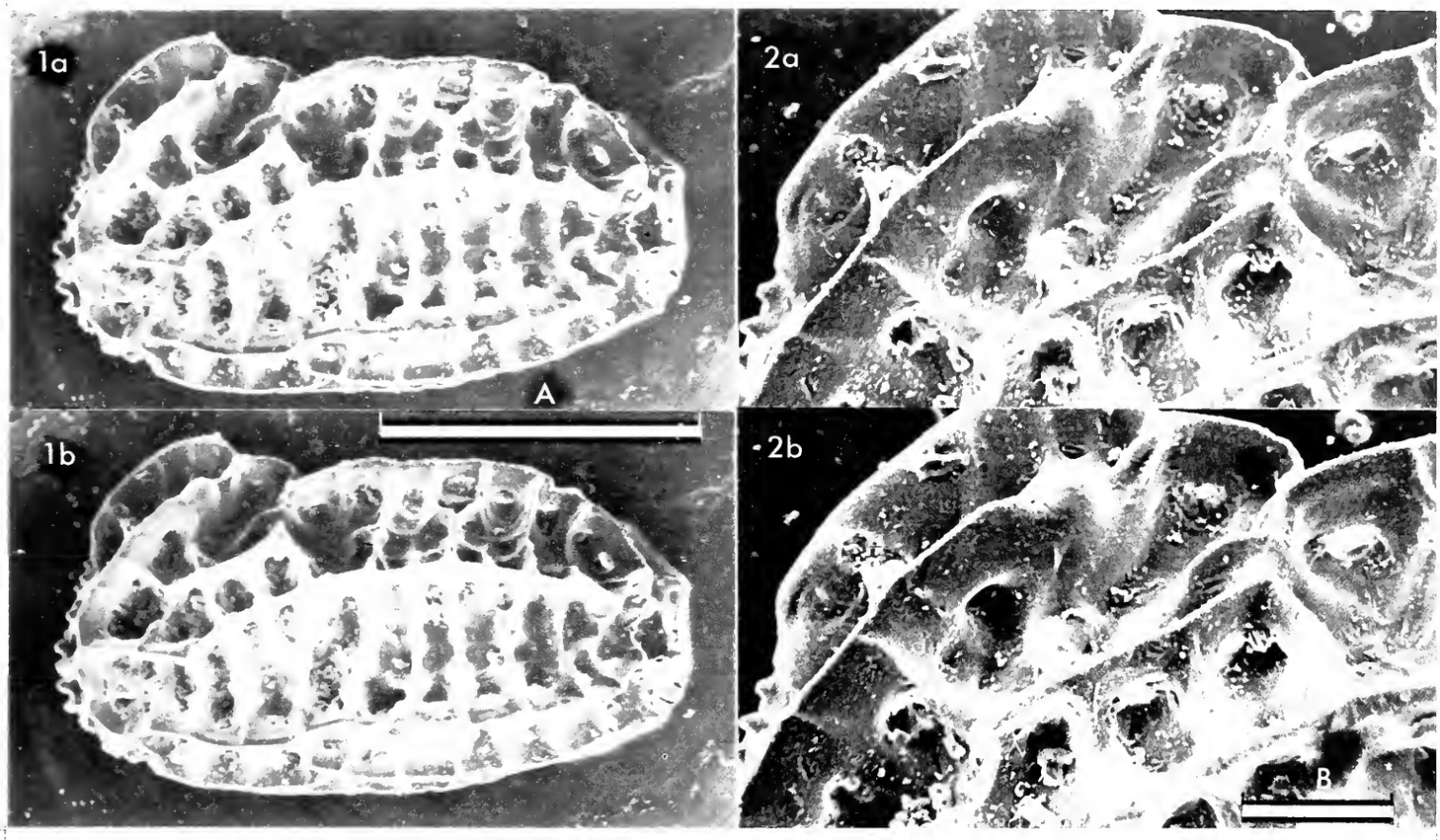
Scale A (500 µm ; ×90), fig. 1; scale B (100 µm ; ×210), fig. 2.

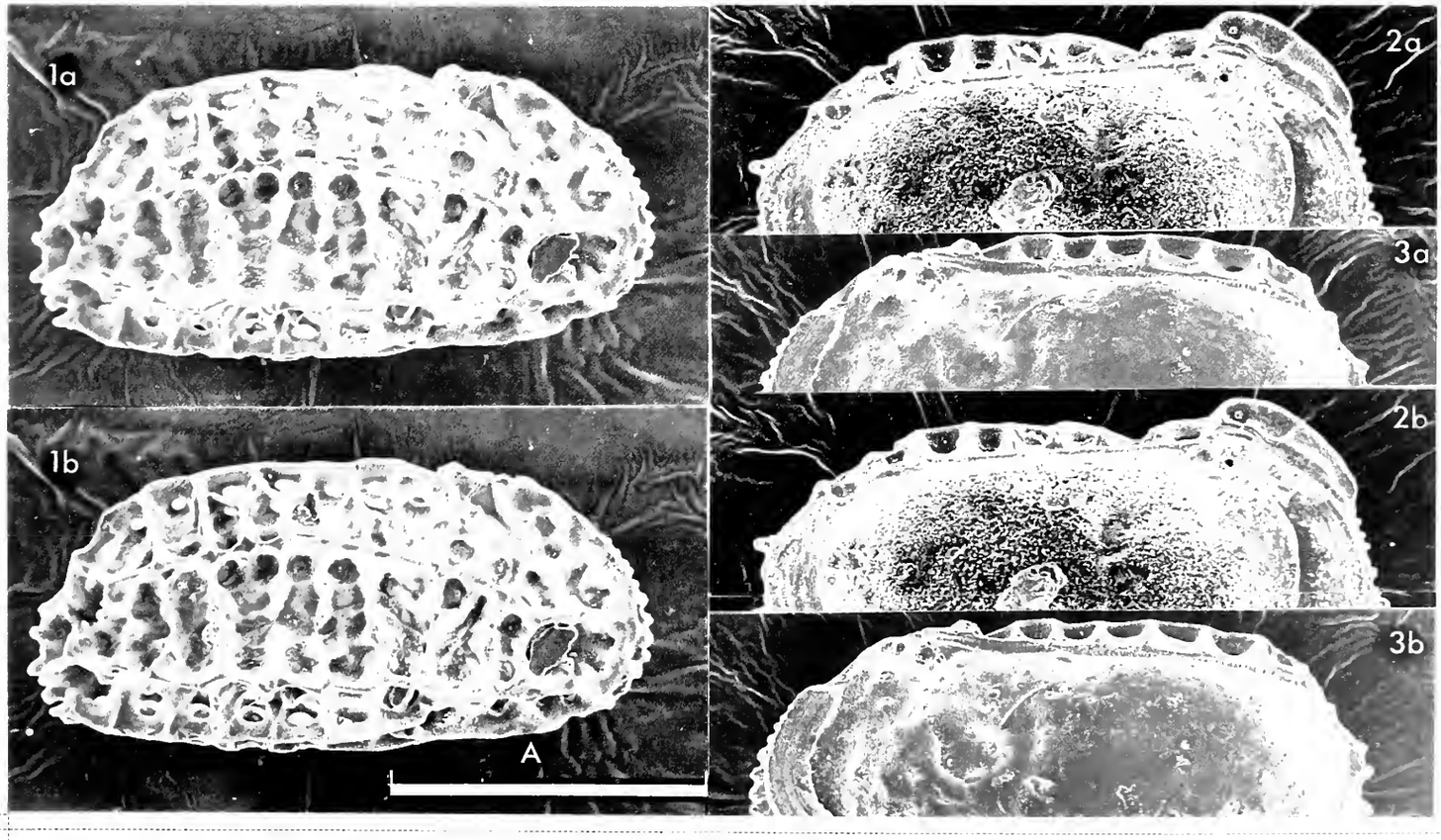
Figured specimens: Brit. Mus. (Nat. Hist.) IO 5540 (LV: Pl. 1:4:32, figs. 1, 2; Pl. 1:4:34, fig. 2) and IO 5541 (RV: Pl. 1:4:34, figs. 1, 3). Both from Middle Miocene (Tortonian) of Benestare, (approx. 16°10'E, 38°10'N), Calabria, Italy; collected by G. Ruggieri.

Explanation of Plate 1:4:34

Fig. 1, RV ext. lat.; fig. 2, LV int. lat., dors.; fig. 3, RV int. lat., dors., to show hinge.

Scale A (500 µm ; ×90), all figs.


1a
2a
A
1b
2b
B


1a
2a
3a
1b
2b
A
3b

595.337.14 (118.14) (611:262.1/2): 551.35

ON *LOCULICYTHERETTA (HEPTALOCULITES) CAVERNOSA* (APOSTOLESCU AND MAGNE)

by H. J. Oertli
(S. N. P. A., Centre de Recherches, 64001 Pau, France)

Loculicytheretta (Heptaloculites) cavernosa (Apostolescu and Magne, 1956)

Loxoconcha ? cavernosa Apostolescu & Magne, *Cah. géol. Thoiry*, vol. 34, p. 340f, pl. 1, figs. 7-9 [Females], (1956).

Holotype: Institut français du Pétrole, No. L. Alg./A-20 [I am very much indebted to Dr. N. Grekoff for having sent me type materials for comparison].

Type locality: Djebel Rherour (21 km SE Saint-Donat), Algeria.
Coord.: x = 811,85; y = 304,62
Upper Lutetian

Explanation of Plate 1:5:36

Fig. 1, ♀ LV, int. lat.; fig. 2, ♀ RV, int. lat.; fig. 3, ♀ car., rt. lat.; fig. 4, ♀ car., lt. lat.; fig. 5, ♀ car., lt. lat.; fig. 6, ♀ car. (same as fig. 4), lt. vent. lat. obl.

Scale A (1 mm ; ×70), figs. 1-3; scale B (1 mm ; ×60), figs. 4, 5; scale C (1 mm ; ×50), fig. 6.

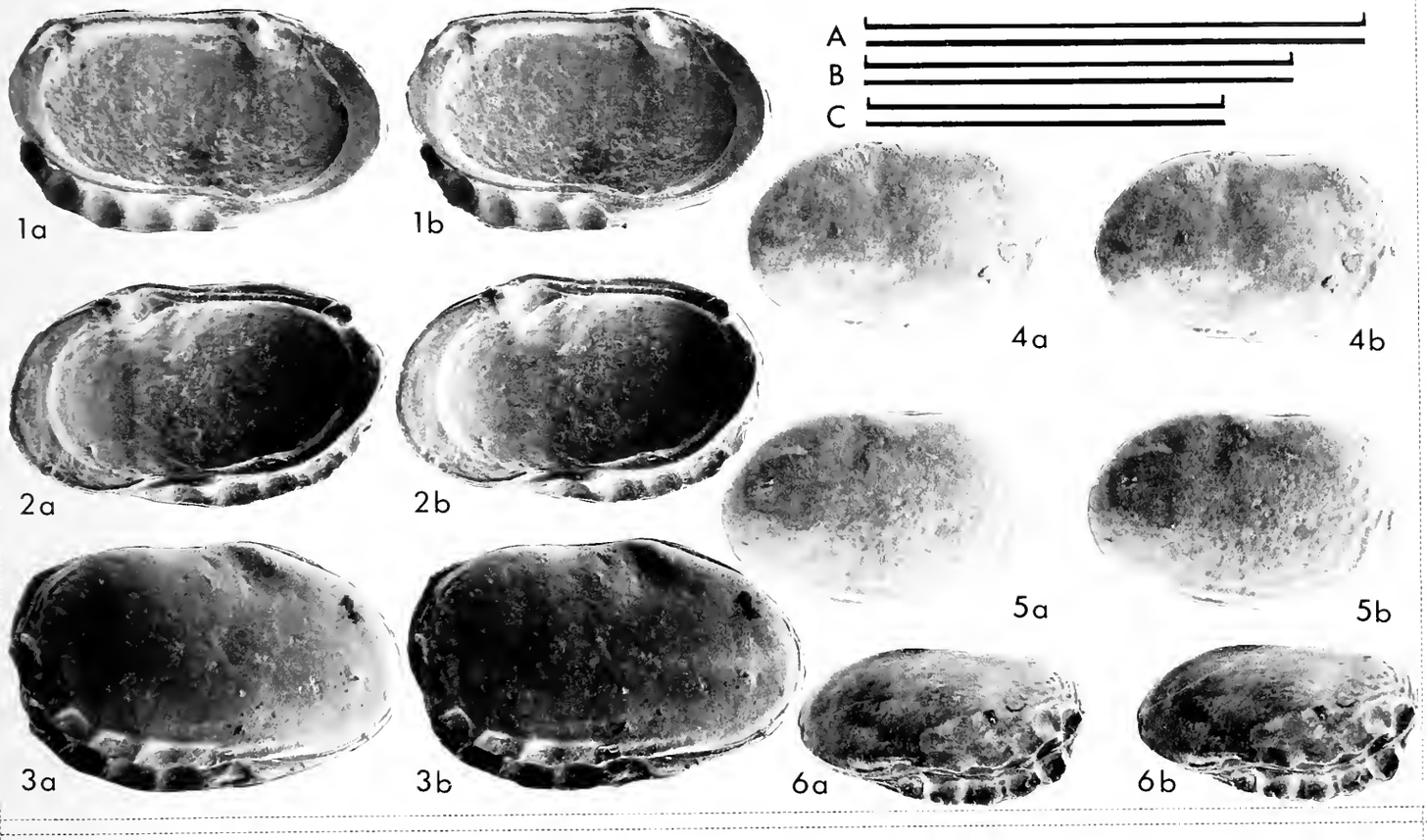
Figured specimens: Centre de Recherches SNPA, Pau, Nos. STER 22/II/4 (Pl. 1:5:38, fig. 5), 22/II/5 (Pl. 1:5:38, fig. 1), 22/II/8 (Pl. 1:5:38, fig. 4), 23/I/3 (Pl. 1:5:38, fig. 7), 23/III/3 (Pl. 1:5:36, fig. 1), 23/III/4 (Pl. 1:5:38, fig. 6), 23/III/5, (Pl. 1:5:36, fig. 2), 24/I/1 (Pl. 1:5:36, figs. 4, 6), 24/I/2 (Pl. 1:5:36, fig. 5), 24/I/4 (Pl. 1:5:36, fig. 3), 24/II/1 (Pl. 1:5:38, fig. 3), 24/II/3, (Pl. 1:5:38, fig. 2), and OC 3001 (Pl. 1:5:38, fig. 9). The specimen reproduced Pl. 1:5:38, fig. 8 has been lost.
All from Eocene sediments, drillings off Tunisia.

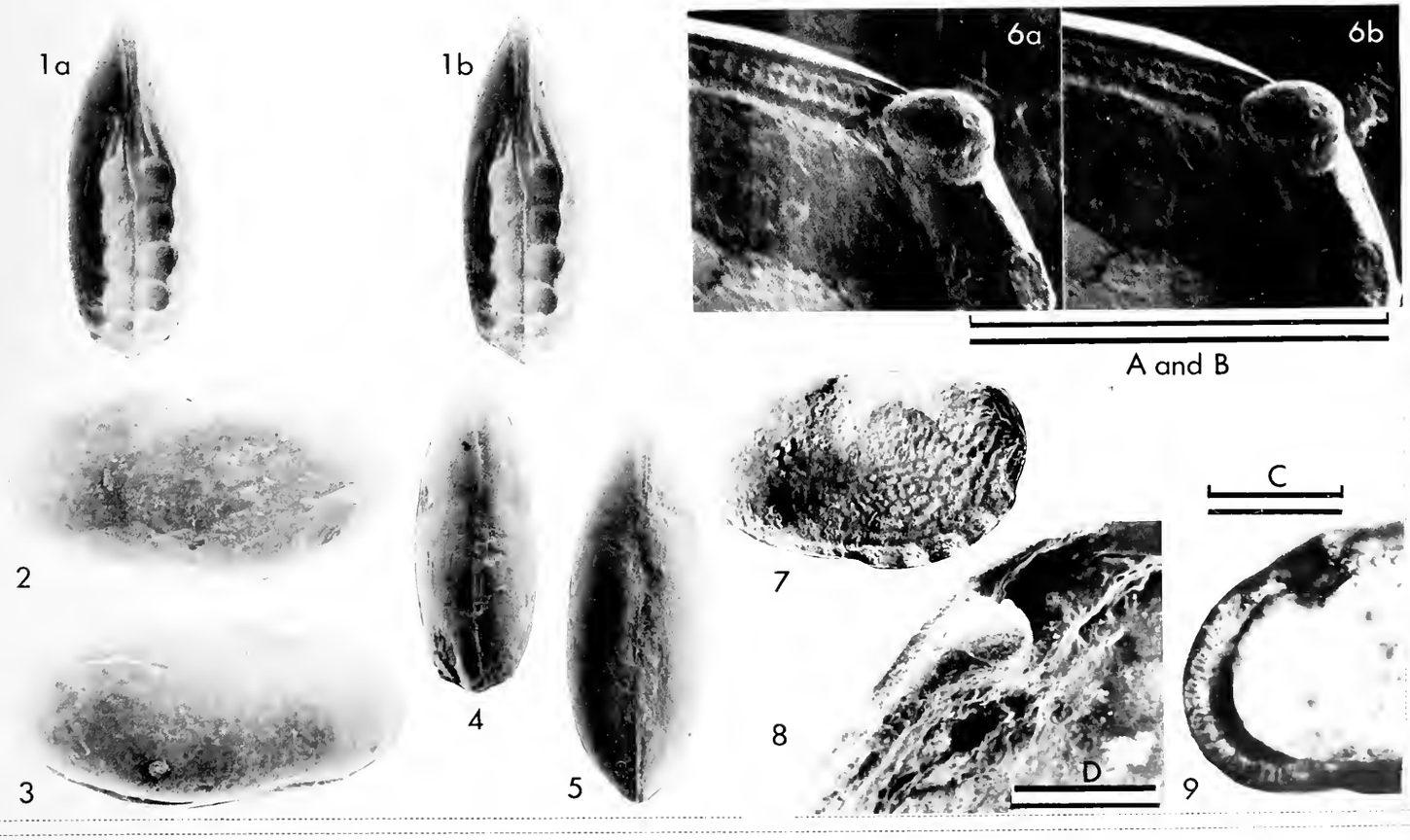
Diagnosis: Species relatively large for the genus, with six distinct loculi and smooth or (posteriorly) weakly-ornamented surface (compare Pl. 1:5:36, figs. 4, 5); posterior part relatively high. Length: ♀♀ 0.76-0.85 mm ; ♂♂ 0.95-1.05 mm.

Explanation of Plate 1:5:38

Fig. 1, ♀ car., vent.; fig. 2, ♂ car., lt. lat.; fig. 3, ♂ car., rt. lat.; fig. 4, ♀ car. dors.; fig. 5, ♂ car., vent.; fig. 6, ♀ RV, int. lat. (post. hinge element); fig. 7, ♀ car., lt. lat. (notice weak ornamentation in post.); fig. 8, ♀ LV, int. lat. (ant. hinge element); fig. 9, ♀ RV, int. lat.

Scale A (1 mm ; ×60), figs. 1-5, 7; scale B (250 µm ; ×240), fig. 6; scale C (250 µm ; ×80), fig. 9; scale D (100 µm ; ×210), fig. 8.


1a
1b
A
B
C
4a
4b
2a
2b
5a
5b
3a
3b
6a
6b


1a
1b
6a
6b
A and B
2
4
7
C
3
5
8
D
9

Remarks: Ruggieri (1963) erected the genus *Heptaloculites* for a relatively large Eocene species which he distinguished from his genus *Loculicytheretta* (1954) mainly by the smooth surface (he could not observe the interior of his specimens).
The study of Eocene material from drillings off Tunisia yielded 6 different species (3 unnamed) which proved useful for zonations (see Table below: their stratigraphic interest will be discussed in a paper to be published later on). The surface of these species varies from smooth to slightly and heavily reticulate, i.e. shows intermediates between smooth and well ornamented. The character of the hinge and the central muscle field are those of *L.(L.) pavonia* (Brady, 1866) (see MORKHOVEN, 1963, p. 130-134), but the marginal area is different: the Paleogene species have a well developed vestibulum, and the marginal pore canals are more numerous (about 30 in the anterior part, instead of about 20).

If the general aspect does not justify separating *Heptaloculites* from *Loculicytheretta*, the distinctly different marginal zone is, in my opinion, of subgeneric value. I therefore propose to consider *Heptaloculites* as a subgenus of *Loculicytheretta*. *Loculicytheretta* differs from *Basslerites (Loculiconcha)* Omatsola, 1970, by the different configuration of loculi area.
Geographic distribution of *Loculicytheretta:* Tethys (mainly Mediterranean area).
Stratigraphic range: Paleocene to Recent [*L. (Heptaloculites)*: Paleocene ? - Eocene, and possibly Lower Oligocene].
Ecology: Neritic - nearshore.

Table of known species of *Loculicytheretta*

Name	Stratigraphic range (provisional)	Geographic distribution	Length in mm	Surface	Number of loculi	Figured in *Stereo-Atlas*
L.(L.) pavonia (Brady, 1866)	Pliocene to Recent	Mediterranean area	♀♀ 0.58 - 0.65 ♂♂ 0.60 - 0.65	Ridges and pits	3 (deep)	
L.(L.) sp. (Morkhoven, 1963)	Subrecent	British West Africa	±0.75	Ridges and pits	6	
L.(Heptaloculites) cavernosa (Apostolescu & Magne, 1956)	Eocene	North Africa (on land and offshore)	♀♀ 0.76 - 0.85 ♂♂ 0.95 - 1.05	Smooth to very weakly reticulate (in the posterior part)	6	Pl.1:5:36 1:5:38
L.(H.) semirugosa (Apostolescu & Magne, 1956) syn: *Loxoconcha polita* (Apostolescu & Magne, 1956) [♂♂ of *semirugosa*]	Eocene	North Africa (on land and offshore)	♀♀ 0.70 - 0.83 ♂♂ 0.88 - 0.93	♀♀ weakly reticulate in the post. part ♂♂ may be punctuate in the central part	6	Pl.1:6:42
L.(H.) sp.A	Eocene	North Africa (off)	♀♀ 0.67 - 0.70 ♂♂ 0.78 - 0.82	Smooth	4	Pl.1:7:44
L.(H.) sp.B	Eocene	North Africa (on land and offshore)	♀♀ 0.52 - 0.56 ♂♂ 0.58 - 0.62	Ornamented overall: fine longitud. ridges pits	Prob. 4 (weakly developed)	
L.(H.) gortanii (Ruggieri, 1963)	Eocene	Sicily	♀♀ 0.84 - 0.90 ♂♂ ±0.92	Smooth	7	
L.(H.) sp.C	Eocene (and Paleocene ?)	North Africa (off)	♀♀ ±0.75 ♂♂ ±0.92	Reticulate Overall	? (weakly developed)	
L.(H.) semipunctata (Apostolescu & Magne, 1956)	Eocene	North Africa (on land and offshore)	♀♀ 0.67 - 0.77 ♂ ?	Smooth or or partially reticulate	7	

ON *LOCULICYTHERETTA (HEPTALOCULITES) SEMIRUGOSA* (APOSTOLESCU AND MAGNE)

by H. J. Oertli
(S. N. P. A., Centre de Recherches, 64001 Pau, France)

Loculicytheretta (Heptaloculites) semirugosa (Apostolescu and Magne, 1956)

Loxoconcha semirugosa Apostolescu & Magne, *Cah. géol. Thoiry*, vol. 34, p. 341, pl. 1, figs. 14, 15 [♀♀], (1956).

Loxoconcha polita Apostolescu & Magne, *Ibid.*, p. 341, pl. 1, figs. 12, 13 [♂♂], (1956).

Holotype: Inst. français du Pétrole, No. L.Alg./A-22. Koudiat el Kerboussa, 7 km NE Gounod. Coord.: x = 927,400; y = 344,210; Algeria. Upper Lutetian.

Figured specimens: S. N. P. A., Nos. STER 24/III/1 (figs. 1-3), 24/III/4 (fig. 5), 24/IV/1 fig. 6), 24/IV/3 (fig. 4), 25/I/2 (fig. 8), 25/I/3 (fig. 9), 25/I/4 fig. 7); all Pl. 1:6:42. All Eocene; drillings off Tunisia.

Diagnosis: Medium-sized to large sp.; 6 loculi; a low post. ♀ surface weakly ribbed and pitted in post. (especially above loculi); ♂ smooth or weakly pitted in centre. Length: ♀♀ 0.70-0.83 mm ; ♂♂ 0.88-0.93 mm.

Remarks: Differs from *L. cavernosa* (probably its descendant) in size, ornament, a lower more elongate post., and having a regular, convex venter. "*L. polita*" is ♂ of *L. semirugosa* (cf. shape & size).

Explanation of Plate 1:6:42

Figs. 1-3, ♀ car.: fig. 1, lt. lat.; fig. 2, lt. vent. lat. obl.; fig. 3, lt. post. vent. obl.; fig. 4, ♂ car., lt. lat.; fig. 5, ♀ car., rt. lat.; fig. 6, ♂ car., rt. lat.; fig. 7, ♂ car., vent.; fig. 8, ♀ RV, dors.; fig. 9, ♀ car., vent.
Scale A (500 µm ; ×60), figs. 1-8; scale B (500 µm ; ×70), fig. 9.

ON AN UNNAMED SPECIES OF *LOCULICYTHERETTA (HEPTALOCULITES)*

by H. J. Oertli
(S. N. P. A., Centre de Recherches, 64001 Pau, France)

Loculicytheretta (Heptaloculites) sp. A

Localities: Wells offshore, Gulf of Gabes, Tunisia; Lutetian.

Figured specimens: S. N. P. A., Nos. STER 22/III/1 (fig. 5), 22/III/2 (fig. 4), 22/IV/3 (fig. 8), 22/III/6 (figs. 3, 7), 22/III/7 (figs. 1, 2), 22/III/9 (fig. 6); all Pl. 1:7:44.

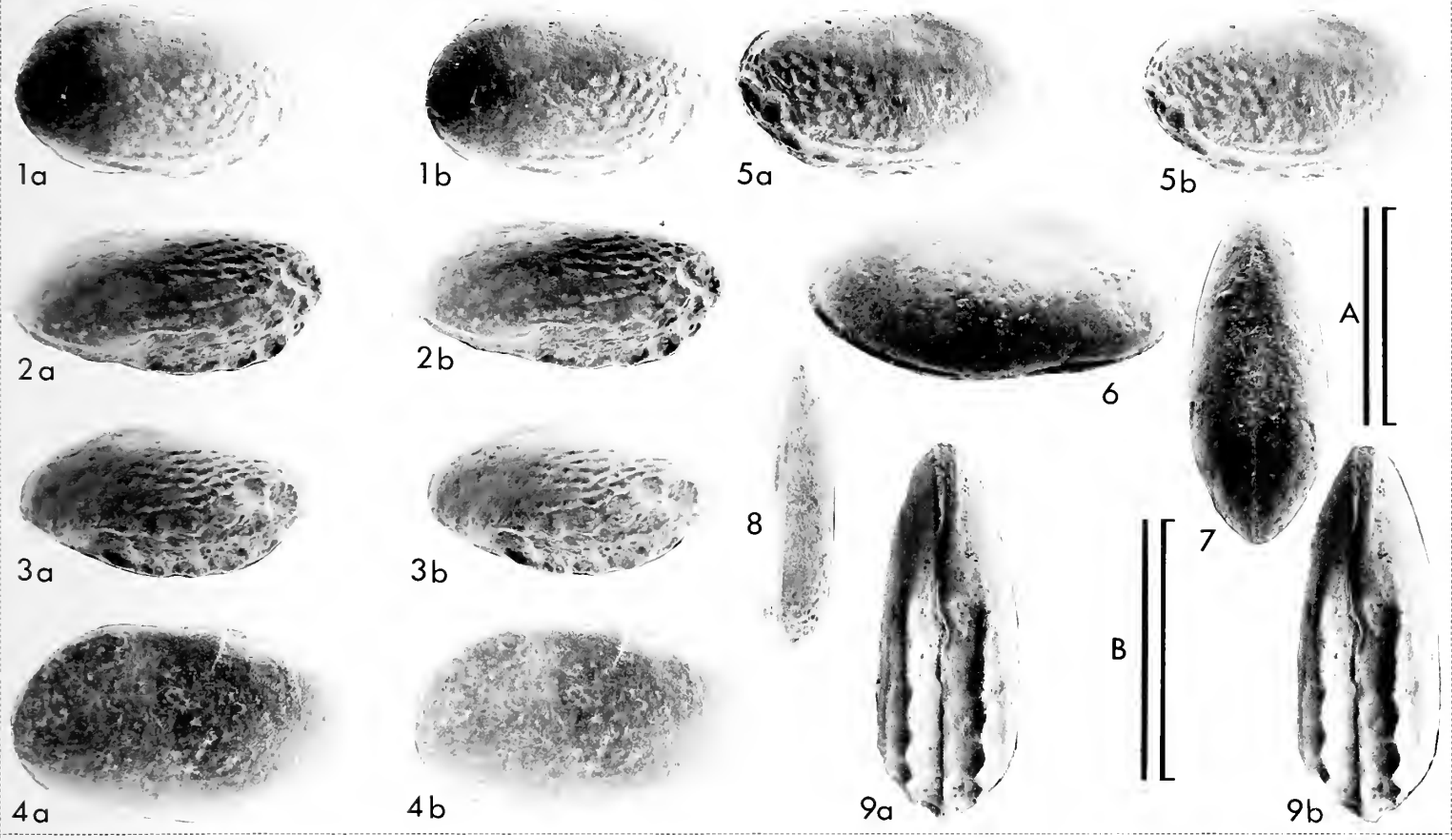
Remarks: Medium-sized, elongate species with 4 well developed loculi and smooth surface. Length: ♀♀ 0.67-0.70 mm ; ♂♂ 0.78-0.80 mm. It is easily distinguished from its nearest relatives with a smooth surface [*L. (H.) cavernosa* and *L. (H.) gortanii*] by the smaller number of loculi and the elongate shape. Although I have examined several hundred specimens of this species, for reasons of petroleum exploration it is not possible to specify locality details; the species is left unnamed.

Explanation of Plate 1:7:44

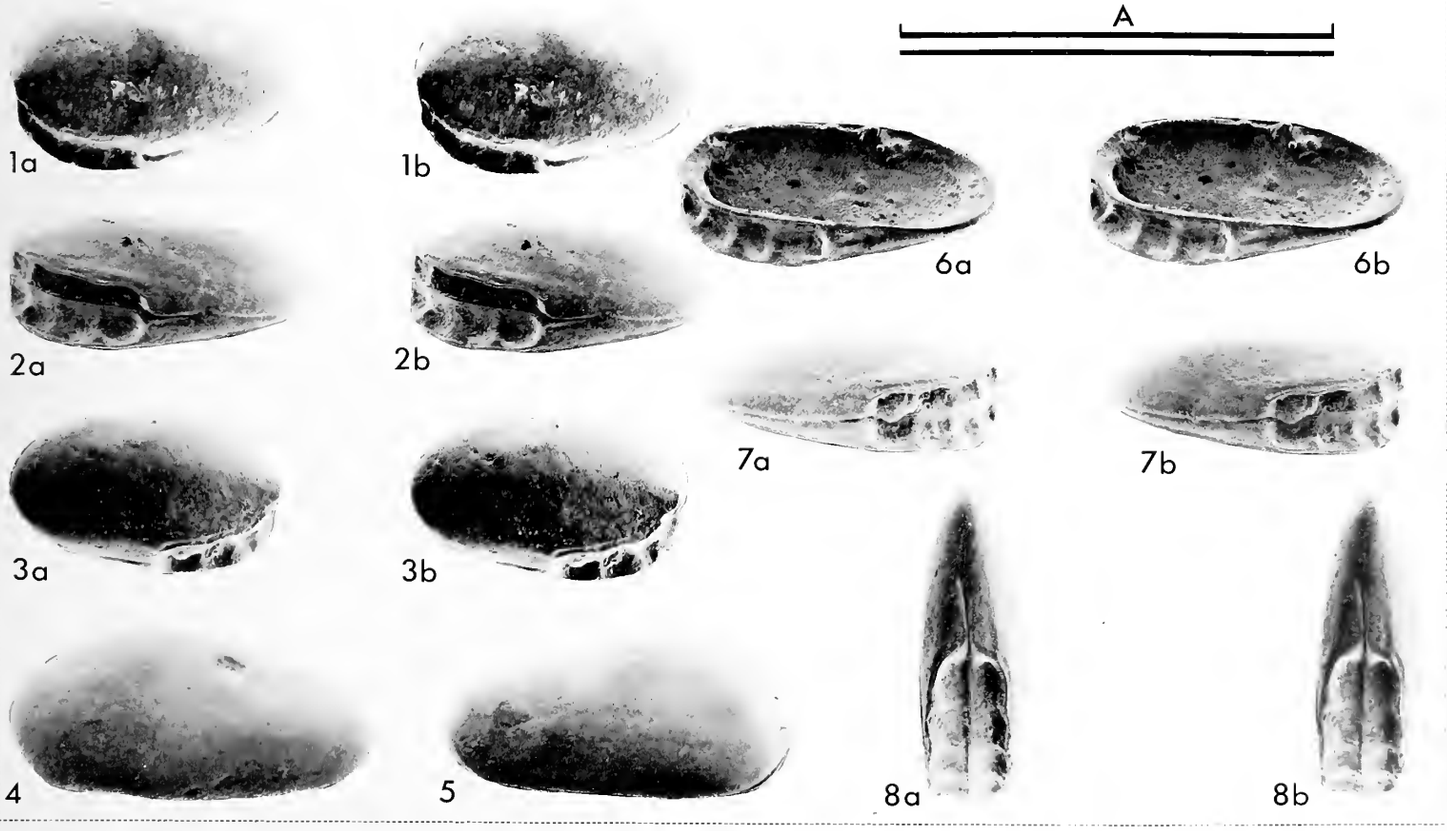
Figs. 1-3, ♀ car.: fig. 1, rt. lat.; fig. 2, rt. vent. lat. obl.; fig. 3, lt. lat.; fig. 4, ♂ car., rt. lat.; fig. 5, ♂ car., lt. lat.; fig. 6, ♀ LV, int. vent. lat. obl.; fig. 7, ♀ car., lt. vent. lat. obl.; fig. 8, ♀ car. vent.

Scale A (1 mm ; ×60), all figs.

Stereo-Atlas of Ostracod Shells, 1:6:42 *Loculicytheretta semirugosa* (2 of 2)



Stereo-Atlas of Ostracod Shells, 1:7:44 *Loculicytheretta* sp. A (2 of 2),



595.336.11 (113.331) (424.5:162.003.52): 551.35 + 552.542

ON *STREPULA CONCENTRICA* JONES AND HOLL

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

Genus *STREPULA* Jones and Holl, 1886

Type-species (subsequent designation by Miller, 1892):
S. concentrica Jones and Holl, 1886

Strepula concentrica Jones and Holl, 1886

Strepula concentrica sp. nov. T. R. Jones & H. B. Holl, *Ann. Mag. nat. Hist.*, ser. 5, vol. 17, p. 404, pl. XIII, fig. 6 (tecnomorph, lectotype), *non* fig. 1 (1886).
Strepula irregularis sp. nov. T. R. Jones & H. B. Holl, *Ann. Mag. nat. Hist.*, ser. 5, vol. 17, p. 404, pl. XIII, figs. 7 (♀, lectotype), 8 (1886).
Strepula concentrica Jones & Holl; A. Martinsson, *Bull. geol. Inst. Univ. Uppsala*, vol. XLI, p. 198, figs. 2 E-F, 89A, 90, 92 A-B (1962).

Explanation of Plate 1:8:46

Figs. 1-4, ♂ car.: fig. 1, ext. lt. lat.; fig. 2, ant. obl. lt. lat.; fig. 3, lt. lat. syllobium; fig. 4, crista on lt. lat. reticulate syllobium.

Scale A (250 µm ; ×75), fig. 1; scale B (250 µm ; ×50), fig. 2; scale C (100 µm ; ×120), fig. 3; scale D (50 µm ; ×315), fig. 4.

Lectotype: British Museum (Nat. Hist.) No. IN 52531 (Smith coll. No. 55_3). A tecnomorphic carapace.

Type locality: Wenlock Series, near Woolhope, Herefordshire, England.

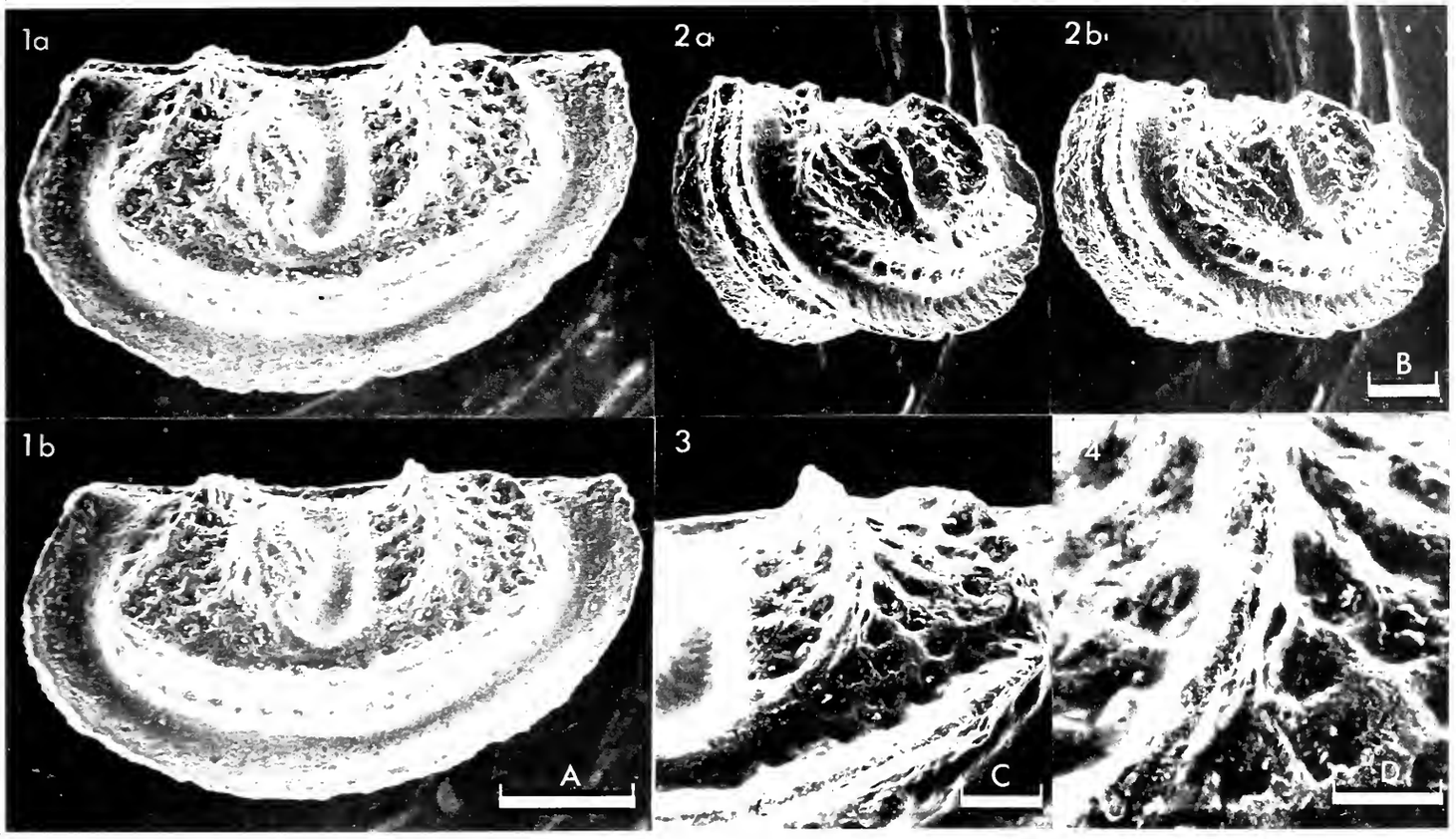
Figured specimens: Brit. Mus. (Nat. Hist.) Nos. IO 4755 (♂ car.: Pl. 1:8:46, figs. 1-4; Pl. 1:8:48, figs. 1, 2), and IO 4756 (♀ RV: Pl. 1:8:50, figs. 1-3; Pl. 1:8:52, figs. 1, 2). Both specimens are from a thin shale band near the base of the Wenlock Limestone. Locality: a small, disused quarry on the north side of the A. 458 road, top of Harley Hill, approximately ¾ mile north-west of Much Wenlock, England. (National Grid Reference SJ 61010034). Collected by David Siveter, 1970.

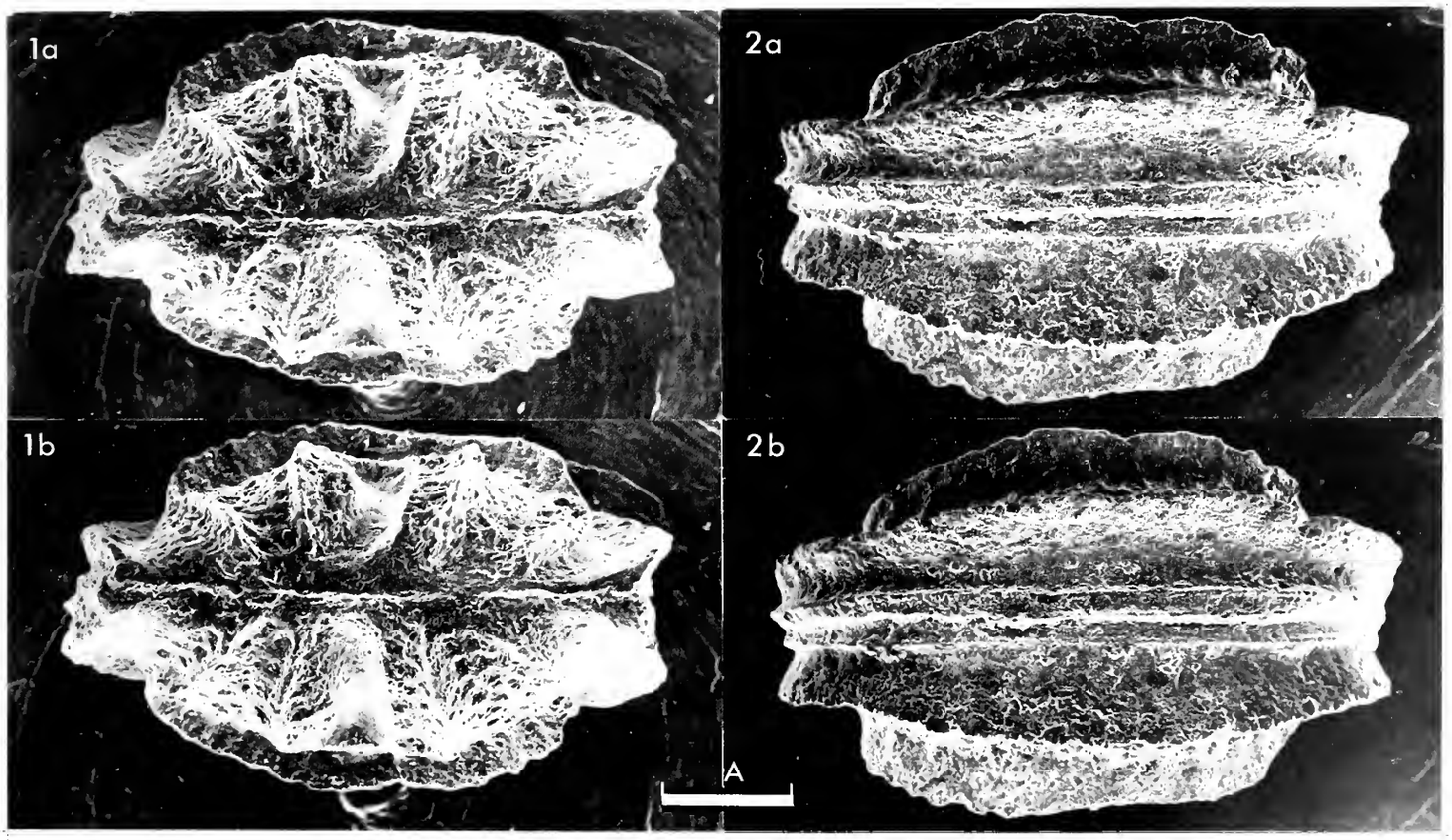
Diagnosis: *Strepula* sp. having cristae on the syllobium, preadductorial node, anterior lobe and crumina. All lobes are reticulate. The tecnomorphic velum shows very faint tubules and is otherwise smooth.

Explanation of Plate 1:8:48

Figs. 1, 2, ♂ car.: fig. 1, ext. dors.; fig. 2, ext. vent.

Scale A (250 µm ; ×75), figs. 1, 2.


1a
2a
2b
B
1b
3
4
A
C
D


1a
2a
1b
2b
A

Remarks: Martinsson *(op. cit., p.25)* designated lectotypes for *S. concentrica* and *S. irregularis* and demonstrated that they are conspecific. Weyant (1965, *Bull. Soc. linn. Normandie*, vol. 6, pp. 77, 81) erected *Strepula platyloba* and *S. rouaulti* from the Middle Siegenian of Cotentin, France. From the figures, it seems to me that these two species and *S. concentrica* are not congeneric. There appear to be significant differences in cruminal morphology, lobation and ornamentation. The type species would then remain the only described species of *Strepula*.

S. concentrica occurs in the Silurian inliers of the Welsh borderlands and West Midlands of England; for example, Dudley, Woolhope and the Wenlock Edge area. It is known from the top of the Wenlock Shale (Tickwood Beds) and throughout the Wenlock Limestone.

Explanation of Plate 1:8:50

Figs. 1-3, ♀ RV: fig. 1, ext. lat. detail of adductorial sulcus and adjacent lobes; fig. 2, ext. lat.; fig. 3, ext. post.

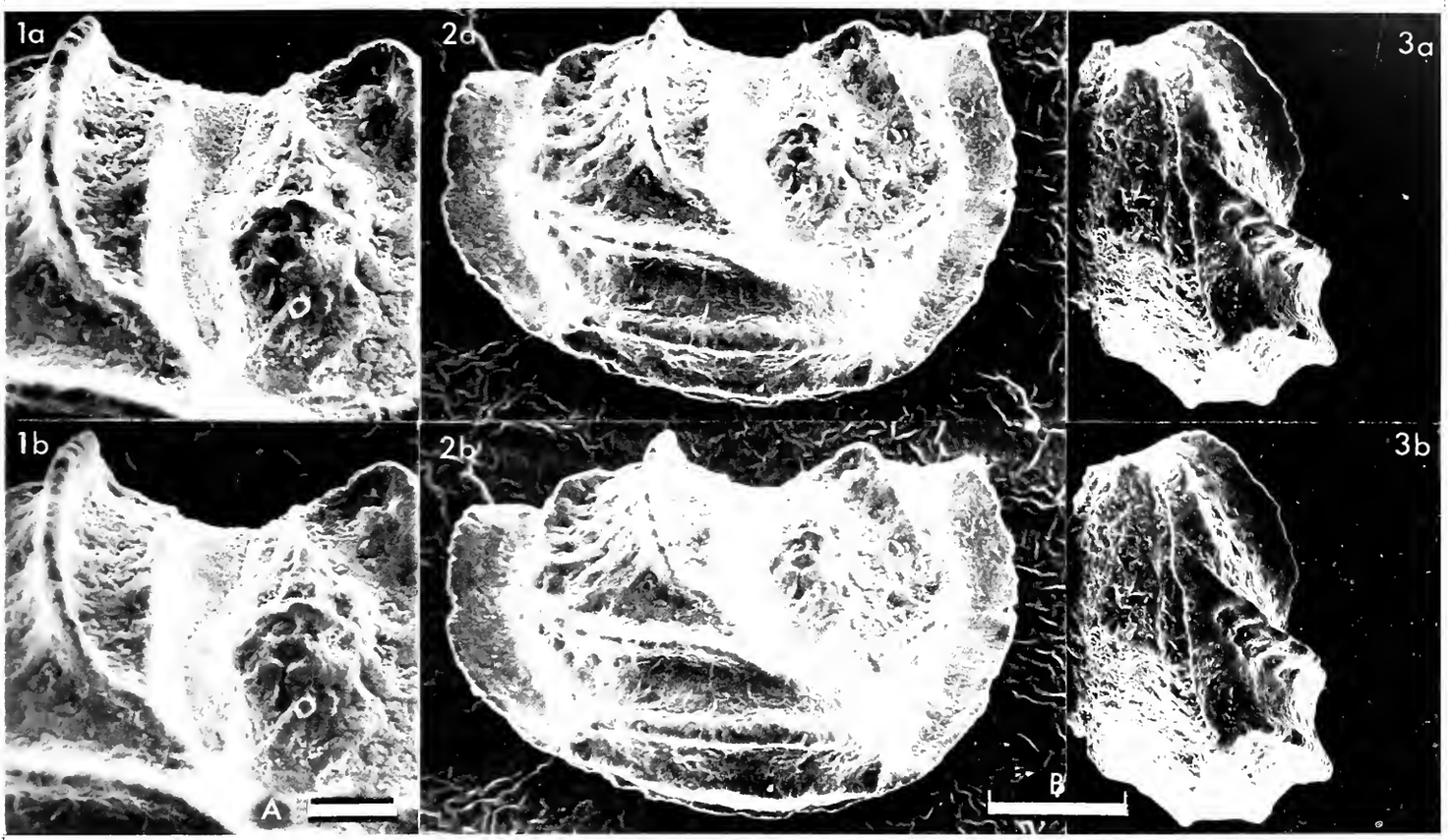
Scale A (100 µm ; ×120), fig. 1; scale B (250 µm ; ×75), figs. 2, 3.

Explanation of Plate 1:8:52

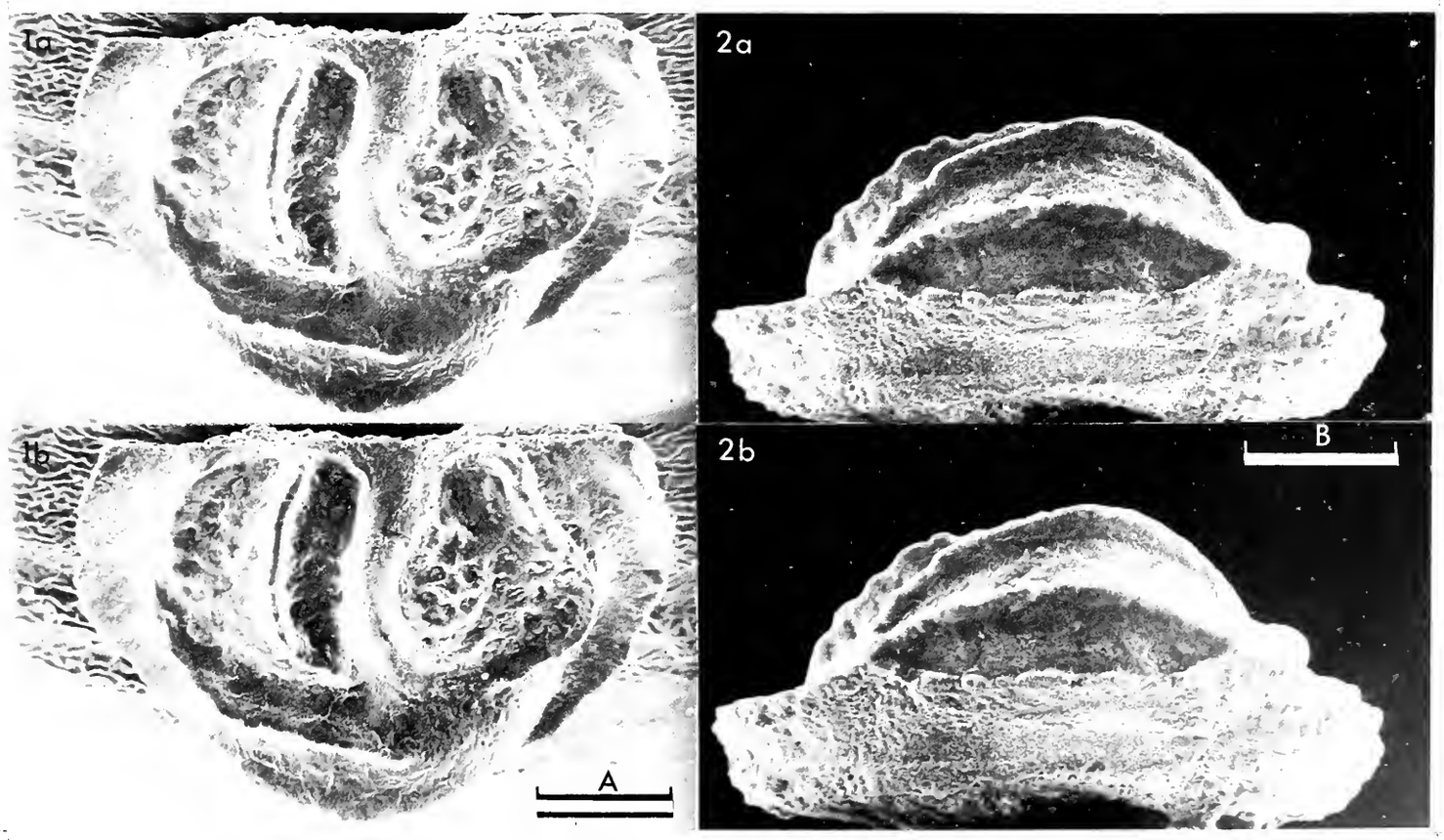
Figs. 1, 2, ♀ RV: fig. 1, ext. dors. obl.; fig. 2, ext. vent.

Scale A (250 µm ; ×75), fig. 1; scale B (250 µm ; ×85), fig. 2.

Stereo-Atlas of Ostracod Shells,1:8:50 *Strepula concentrica* (6 of 8)



Stereo-Atlas of Ostracod Shells,1:8:52 *Strepula concentrica* (8 of 8)



595.337.14 (118.21/118.22) (560:161.036.36 + 454.4:161.012.43): 551.351 + 552.513

ON *KEIJELLA HODGII* (BRADY)

by Neriman Doruk
(University of Leicester, England)

Genus *KEIJELLA* Ruggieri, 1967

Type-species (original designation): *Cythere hodgii* Brady, 1866

Diagnosis: Like *Ruggieria*, but without ventral carina, and bearing one or more external slots, which are internally expressed by oval swellings. In some species the slots are confined to one valve (usually the rt.). Terminal hinge elements of *Keijella* more elongate than in *Ruggieria*.

Keijella hodgii (Brady, 1866)

Cythere hodgii G. S. Brady, *Trans. zool. Soc. Lond.*, vol. 5, p. 373, pl. 59, figs. 3a, b, (1866).
Ruggieria (Keijella) hodgii (Brady); G. Ruggieri, *Riv. ital. Paleont. Stratigr.* vol. 73, no. 1, p. 362, figs. 21-23 (1967).

Explanation of Plate 1:9:54

Fig. 1, ♂ RV, ext.; fig. 2, ♀ LV, ext.; fig. 3, ext. view of slot ornamentation; fig. 4, int. view of slot ornamentation.

Scale A (500 µm ; ×70), fig. 1; scale B (500 µm ; ×80), fig. 2; scale C (10 µm ; ×2000), fig. 3; scale D (10 µm ; ×1000), fig. 4.

Holotype: Brady's specimen is apparently lost (K. G. McKenzie, pers. comm.).

Type locality: Sponge sand, the Levant (Eastern Mediterranean); recent.

Figured specimens: Brit. Mus. (Nat. Hist.) IO 4763 (RV: Pl. 1:9:54, figs. 1, 3), IO 4764 (LV: Pl. 1:9:54, figs. 2, 4; Pl. 1:9:56, fig. 1), IO 4765 (RV: Pl. 1:9:56, fig. 2) and IO 4766 (RV: Pl. 1:9:56, fig. 3). IO 4763 from road cutting (base of section), about 1 km SW of Babatorun, Turkey (approx. long. 36°15'E, lat. 36°04'N). IO 4764 and IO 4765 from road section (3 m above base), 2 km S of Com, Turkey (approx. long. 36°15'E, lat. 36°02'N). Turkish specimens from Upper Miocene yellow sandstone with foraminifera and molluscs; presumed shallow marine. IO 4766 coll. G. Ruggieri from San Marino, Italy (approx. long. 12°26'E, lat. 43°56'N); Upper Tortonian - Lower Pliocene.

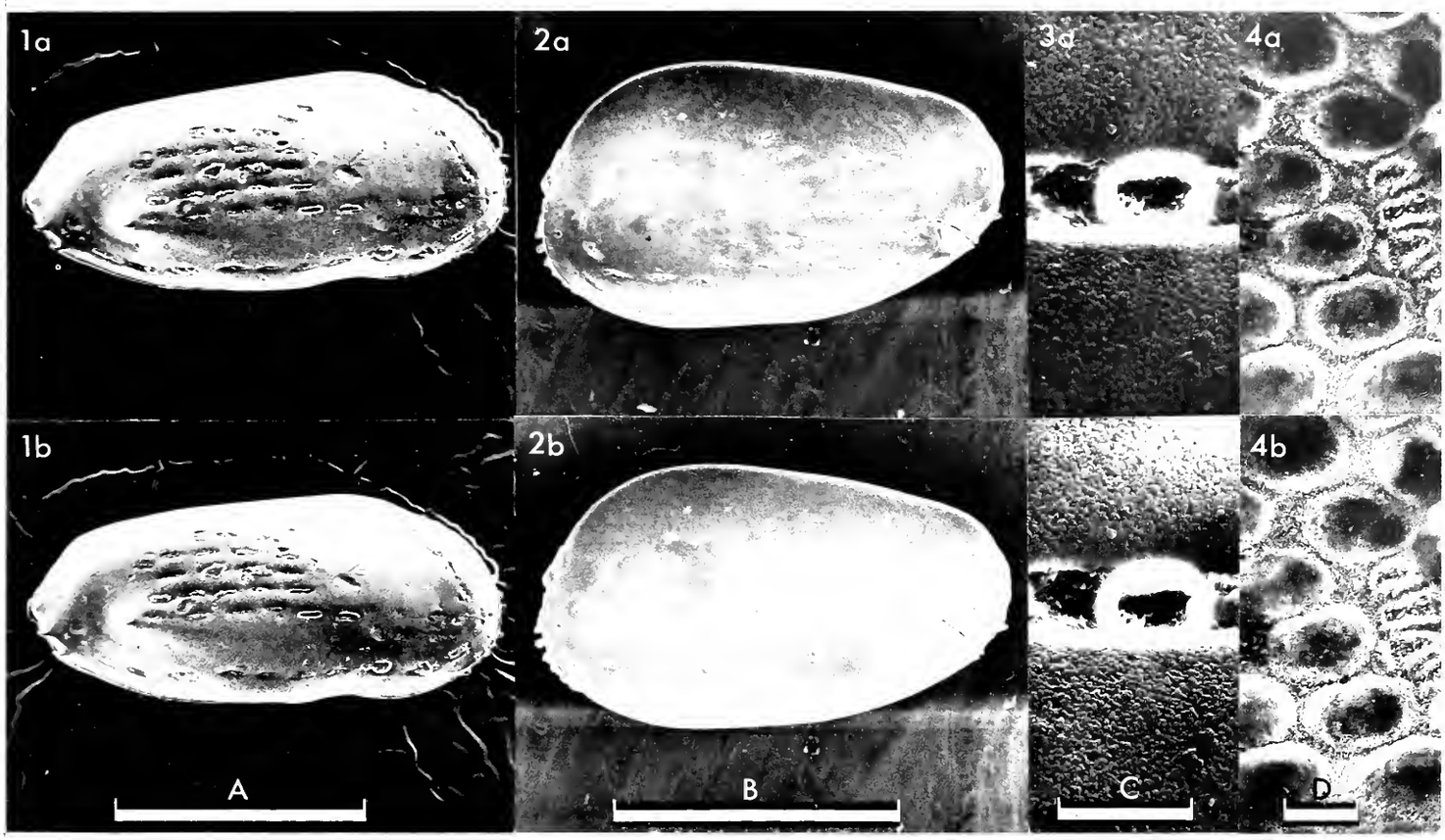
Diagnosis: Pronounced lateroventral spine; 20-30 slots normally present, number of slot-rows variable (2-8) on both valves. Shape diagnostic.

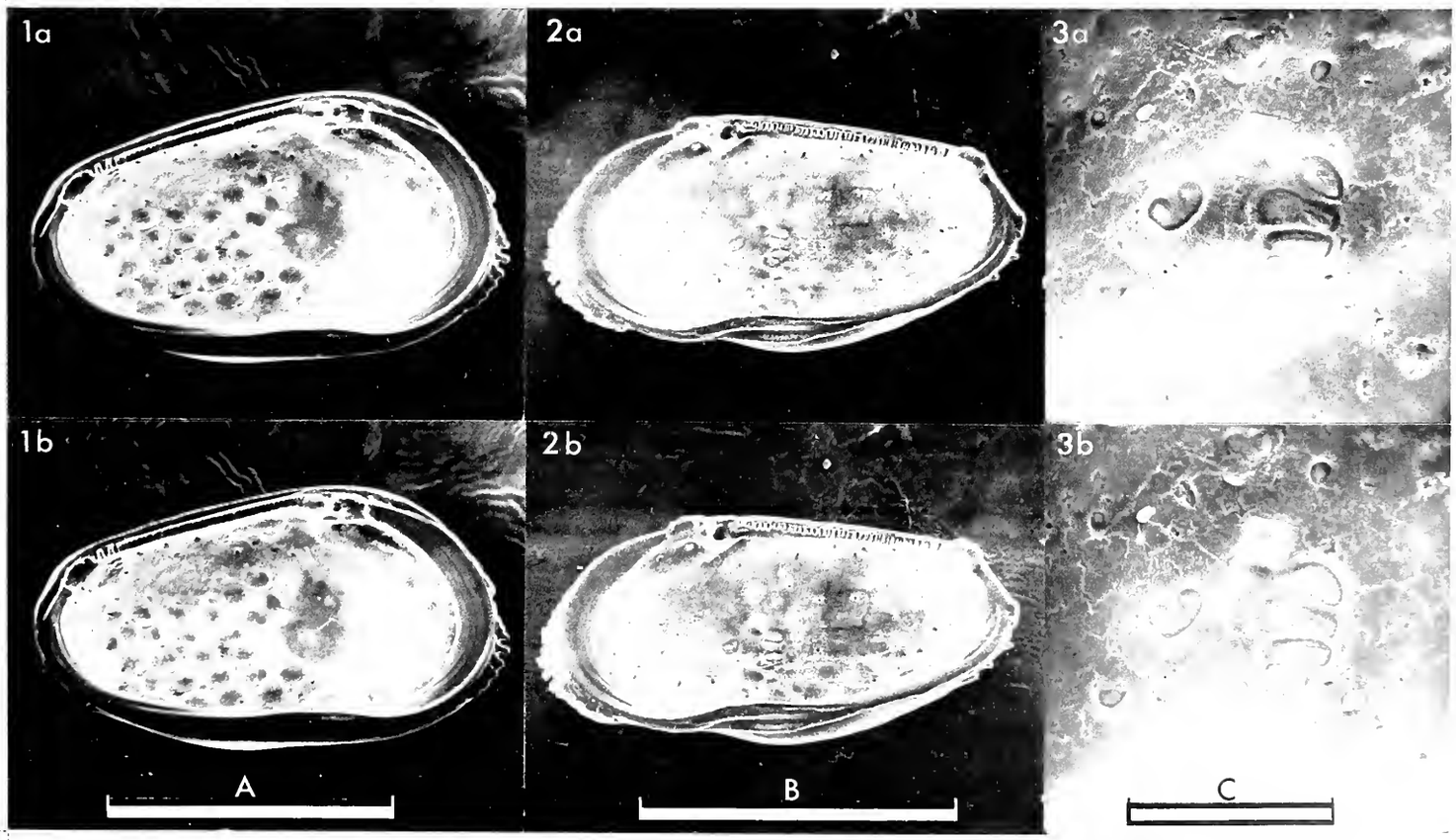
Remarks: Ruggieri (1967) distinguished *Keijella* as a subgenus of *Ruggieria* on the basis of a narrow vestibule. In my experience, this cannot be used as a diagnostic character. Dimorphism pronounced, ♂♂ more elongate than ♀♀ . Recent: Eastern Mediterranean (BRADY, 1866). Tortonian: Scrivia, Italy (CAPEDER, 1902); Marecchia, Italy (RUGGIERI, 1967); different localities of Adana and Antakya regions, Turkey.

Explanation of Plate 1:9:56

Fig. 1, ♀ LV, int.; fig. 2, ♀ RV, int.; fig. 3, RV, int. musc. sc.

Scale A (500 µm ; ×82), fig. 1; scale B (500 µm ; ×90), fig. 2; scale C (100 µm ; ×280), fig. 3.


1a
2a
3a
4a
1b
2b
3b
4b
A
B
C
D


1a
2a
3a
1b
2b
3b
A
B
C

595.337.14 (118.213) (560:161.035.37): 551.351 + 552.542

ON *KEIJELLA PROCERA* DORUK sp. nov.

by Neriman Doruk
(University of Leicester, England)

Keijella procera sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) IO 4767, ♂ RV.

Type locality: A road cutting between Adana and Salbaş, beside Çakit stream about 5 km east of Salbaş, Turkey. Approx. long. 35°10'E, lat. 37°07'N. Tortonian.

Derivation of name: Latin, "slender".

Figured specimens: Brit. Mus. (Nat. Hist.) IO 4767 (RV: Pl. 1:10:58, fig. 1; Pl. 1:10:60, fig. 2) and IO 4768 (LV: Pl. 1:10:58, fig. 2; Pl. 1:10:60, figs. 1, 3). Both from type locality in grey marl with abundant foraminifera and molluscs, presumed shallow marine. Specimen IO 4768 has been broken after preparation and photography.

Explanation of Plate 1:10:58

Fig. 1, ♂ RV, ext.; fig. 2, ♀ LV, ext.

Scale A (500 µm ; ×108), figs. 1, 2.

Diagnosis: Elongate with smooth surface and marginal but no lateral spines.

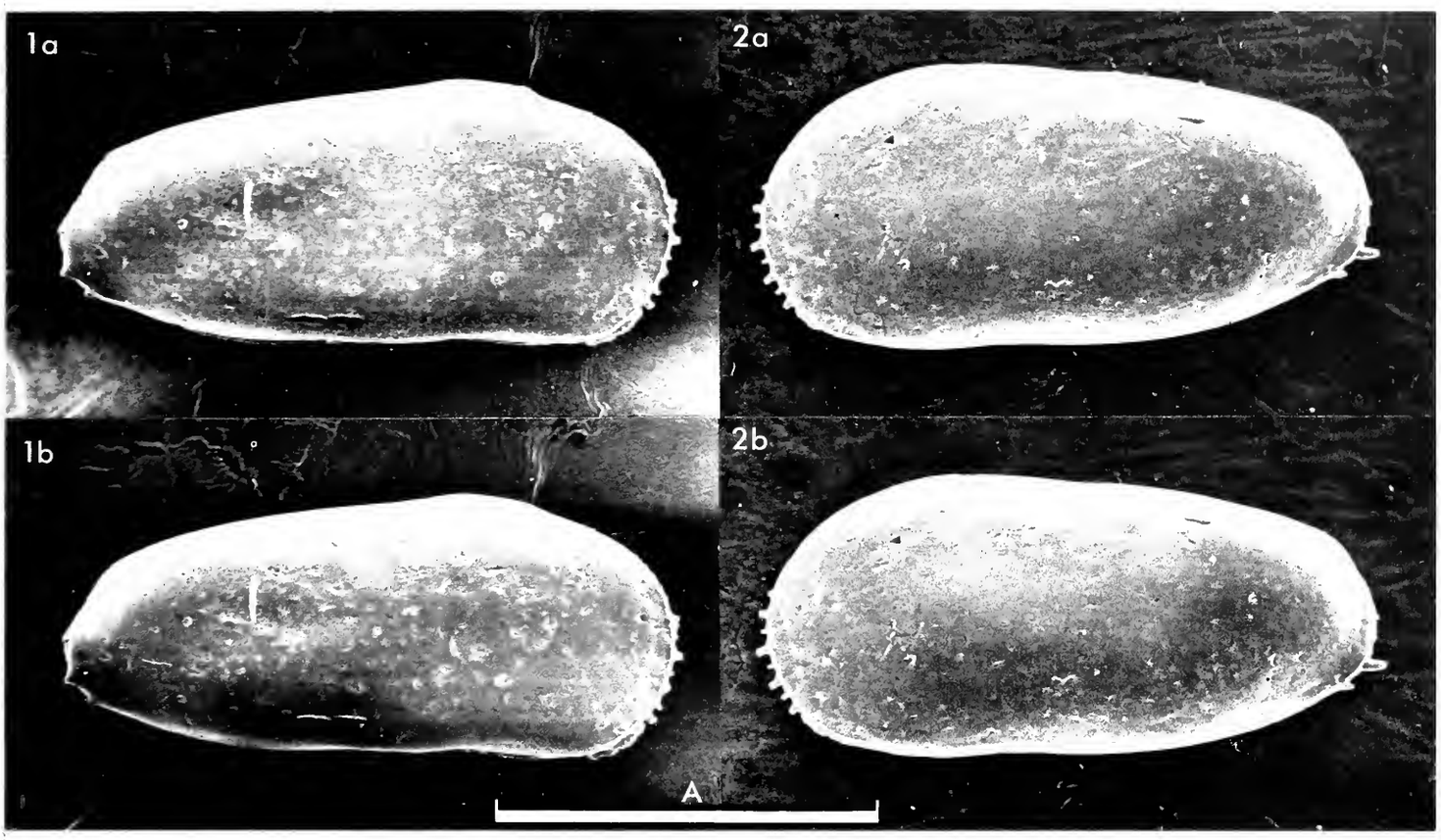
Remarks: Two or three slots developed along venter of rt. valve (normally missing on lt. valve). Sexual dimorphism slight, males more elongate than females. Distribution: Tortonian of Adana region, Turkey.

Explanation of Plate 1:10:60

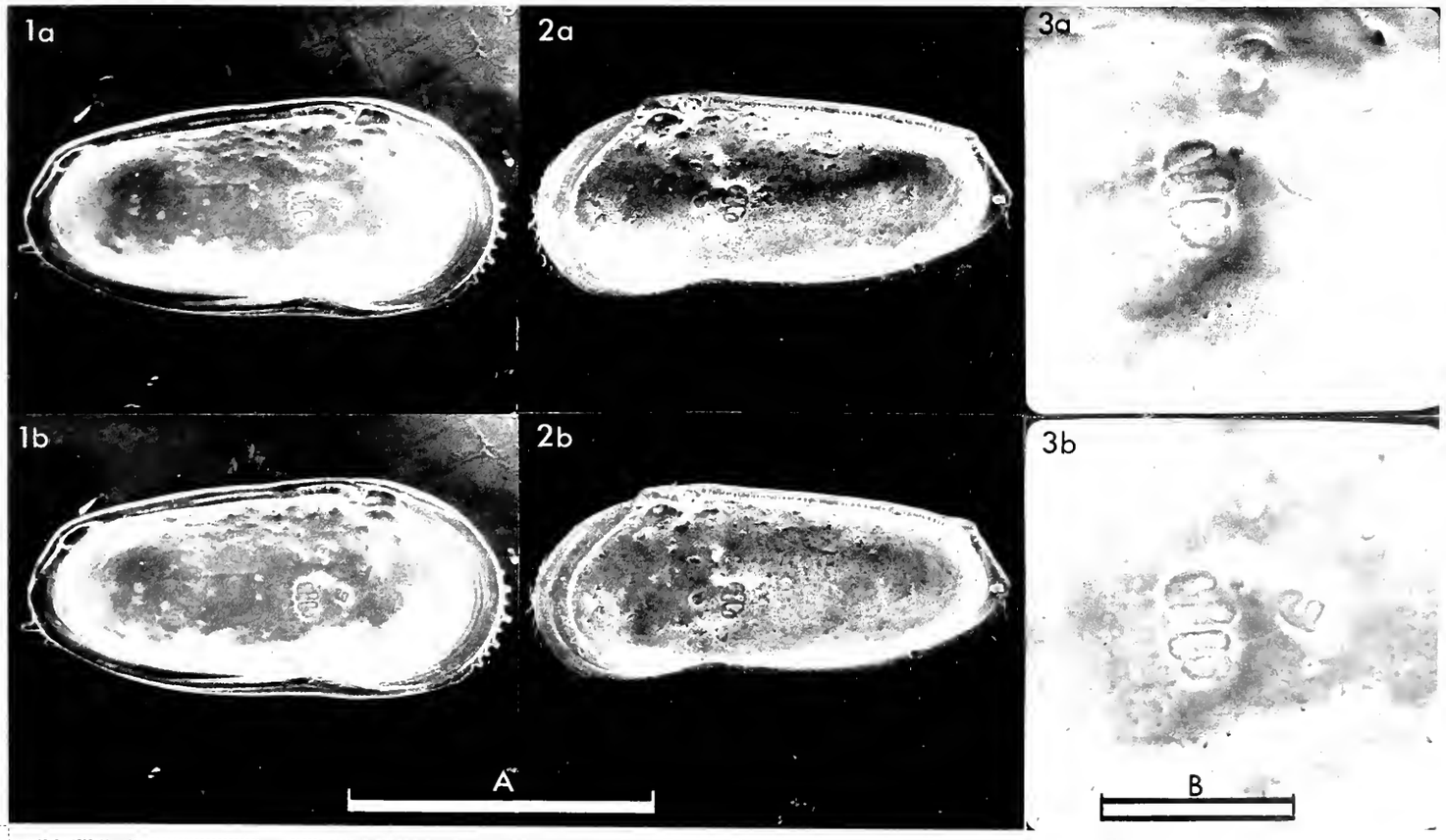
Fig. 1, ♀ LV, int.; fig. 2, ♂ RV, int.; fig. 3, LV, int. musc. sc.

Scale A (500 µm ; ×86), figs. 1, 2; scale B (100 µm ; ×280), fig. 3.

Stereo-Atlas of Ostracod Shells, 1:10:58 *Keijella procera* (2 of 4)



Stereo-Atlas of Ostracod Shells, 1:10:60 *Keijella procera* (4 of 4)



595.337.14 (18.21) (560:161.034.37): 551.351 + 552.542

ON *KEIJELLA CLAUDA* DORUK sp. nov.

by Neriman Doruk
(University of Leicester, England)

Keijella clauda sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) IO 4772.

Type locality: A road cutting 100 m north of Takanli in Mersin region, Turkey. Approx. long. 34°35'E, lat. 37°55'N. Upper Miocene.

Derivation of name: Latin *claudus*, "lame", referring to asymmetric swelling on rt. valve.

Figured specimens: Brit. Mus. (Nat. Hist.) IO 4771 (RV: Pl. 1:11:62, fig. 1), IO 4772 (LV: Pl. 1:11:62, fig. 2; Pl. 1:11:64, figs. 1, 3) and IO 4733 (RV: Pl. 1:11:64, fig. 2). All from type locality, marl with molluscs, presumed shallow marine.

Explanation of Plate 1:11:62

Fig. 1, ♂ RV, ext.; fig. 2, ♀ LV, ext.

Scale A (500 µm ; ×130), fig. 1; scale B (500 µm ; ×140), fig. 2.

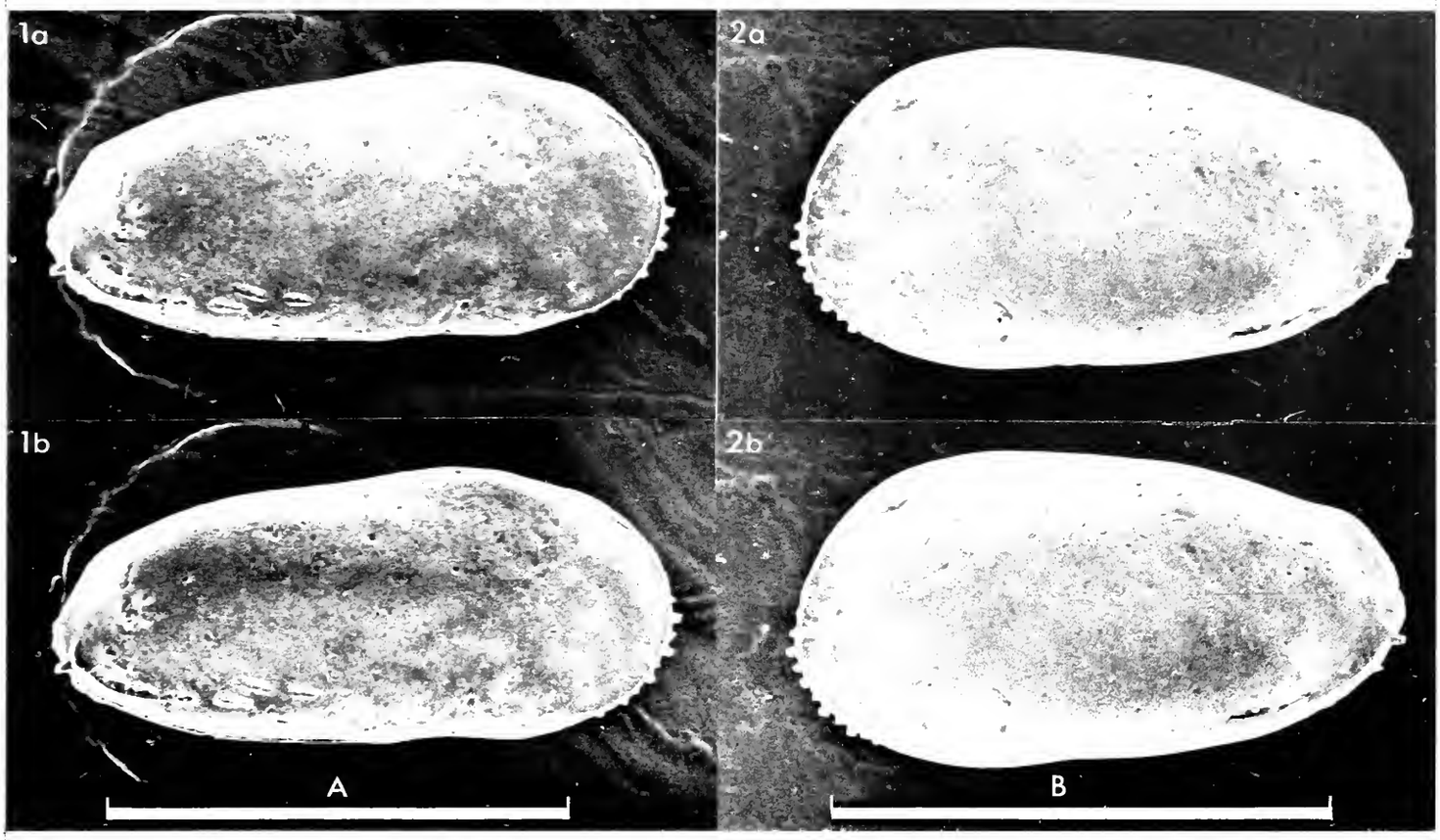
Diagnosis: Shape diagnostic, rt. valve (but not lt.) tumid in posterodorsal third; 2-10 slots.

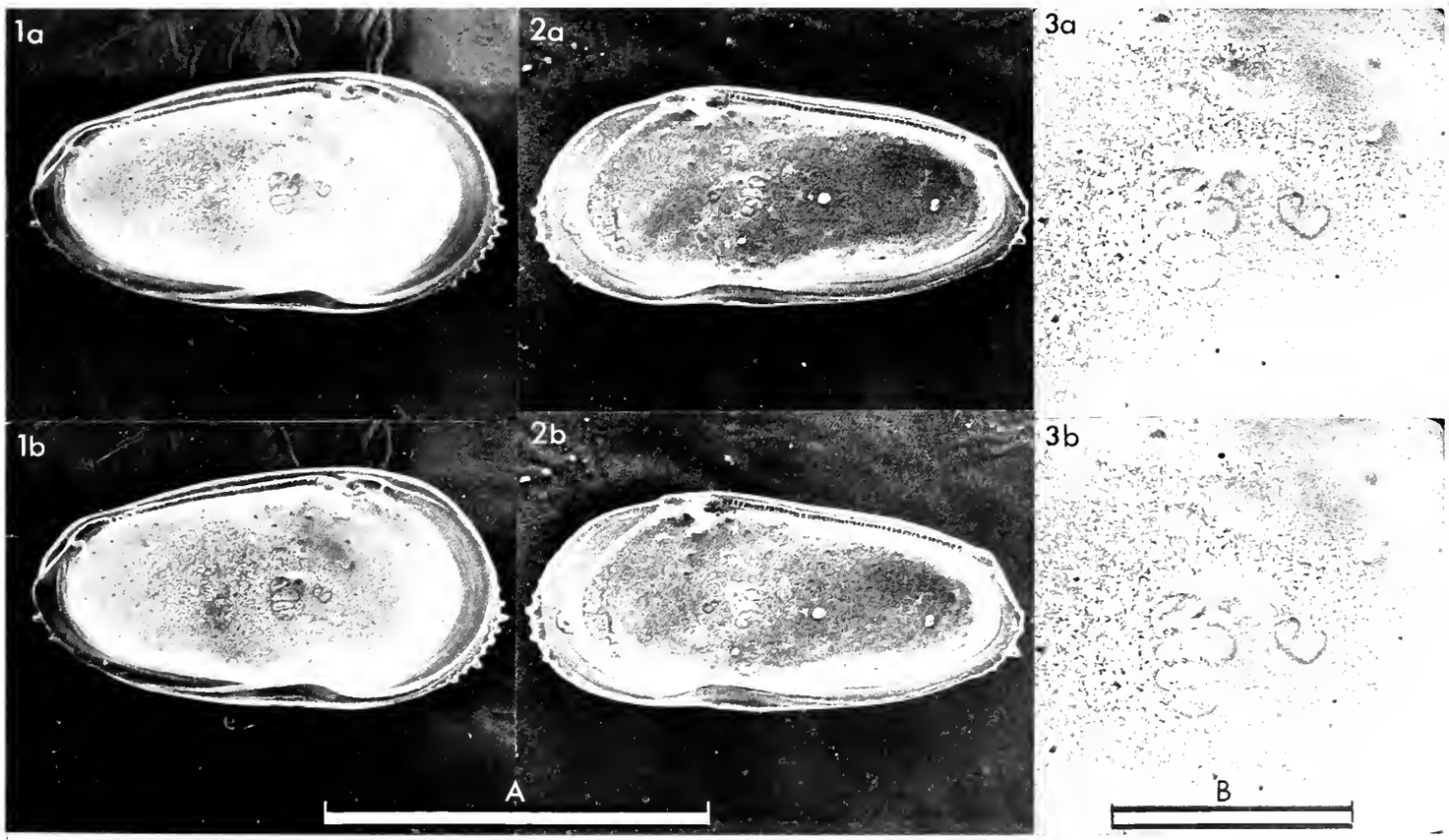
Remarks: Posteroventral spine present or absent in either or both valves. Slots variable: 4-10 in rt. valve, 1-3 in lt. valve, usually concentrated in posteroventral region. Sexual dimorphism distinct, males more elongate than females. Distribution: Upper Miocene of Mersin region, Turkey.

Explanation of Plate 1:11:64

Fig. 1, ♀ LV, int.; fig. 2, ♀ RV, int.; fig. 3, LV, int. musc. sc.

Scale A (500 µm ; ×106), figs. 1, 2; scale B (100 µm ; ×333), fig. 3.


1a
2a
1b
2b
A
B


1a
2a
3a
1b
2b
3b
A
B

595.337.14 (18.213) (560:161.035.37): 551.351 + 552.542

ON *KEIJELLA DOLABRATA* DORUK sp. nov.

by Neriman Doruk
(University of Leicester, England)

Keijella dolabrata sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) IO 4770.

Type locality: A road cutting between Adana and Salbaş, beside Çakit stream 5 km east of Salbaş, Turkey. Approx. long. 35°10'E, lat. 37°07'N. Tortonian (Upper Miocene).

Derivation of name: Latin, "axe-shaped".

Figured specimens: Brit. Mus. (Nat. Hist.) IO 4769 (RV: Pl. 1:12:66, fig. 1; Pl. 1:12:68, fig. 2) and IO 4770 (LV: Pl. 1:12:66, fig. 2; Pl. 1:12:68, figs. 1, 3). Both from type locality; rt. valve from the base, lt. valve from the top of the same section. Presumed shallow marine, grey marl with abundant foraminifera and molluscs.

Explanation of Plate 1:12:66

Fig. 1, ♂ RV, ext.; fig. 2, ♀ LV, ext.

Scale A (250 µm ; ×136), fig. 1; scale B (250 µm ; ×120), fig. 2.

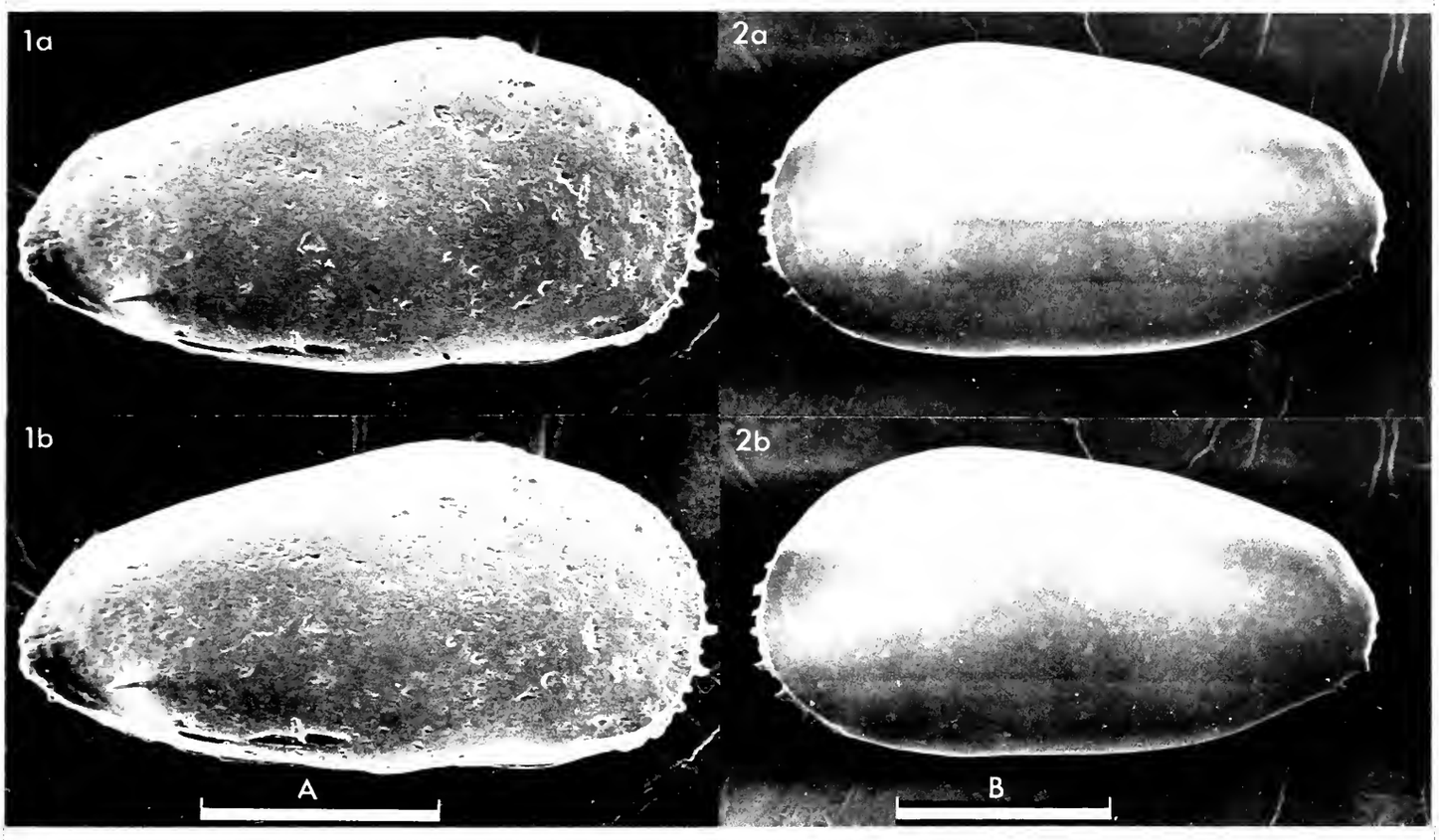
Diagnosis: Shape diagnostic, tapering towards narrow posterior. Carapace smooth, tumid.

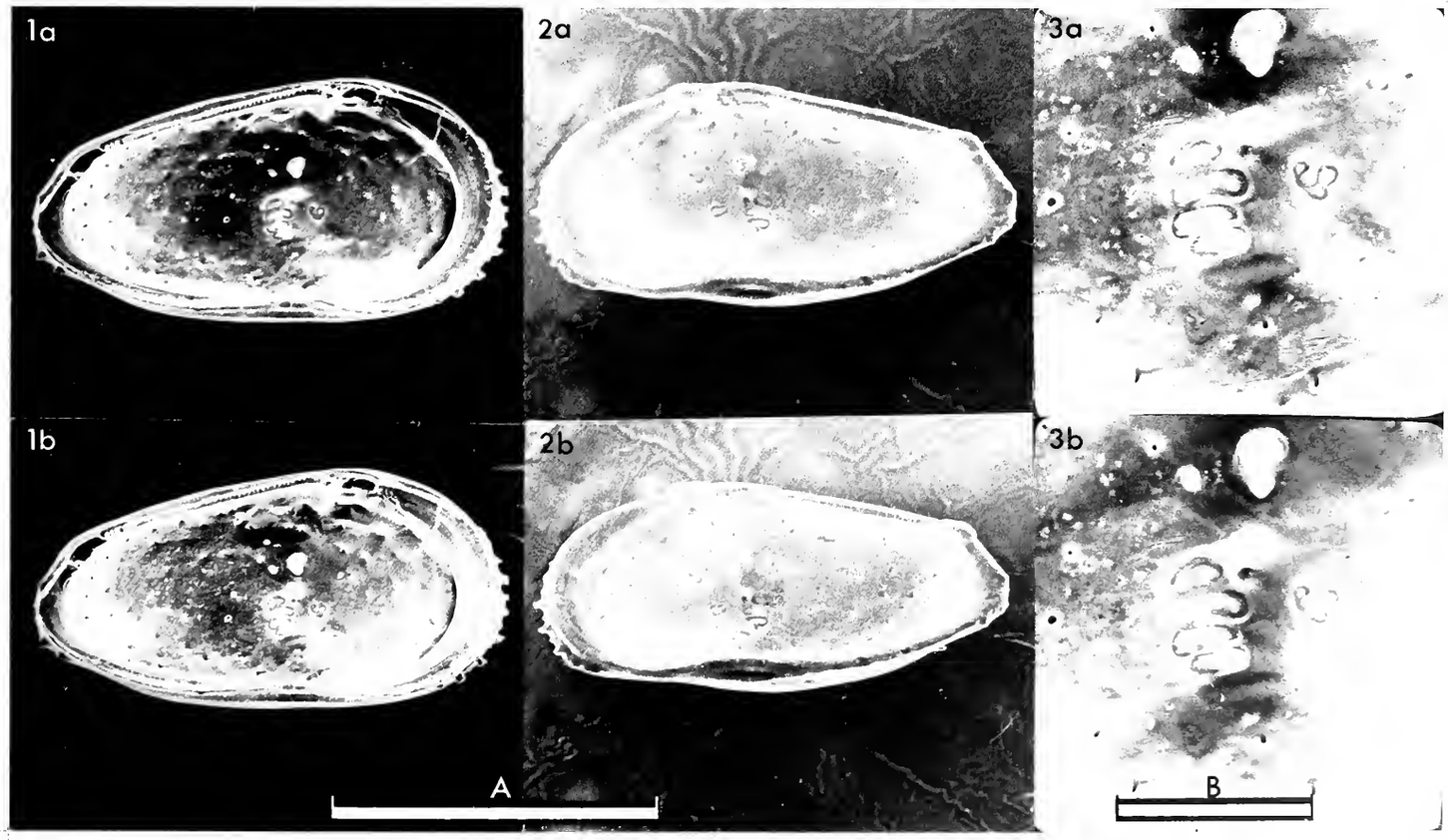
Remarks: Rt. valve with or without posteroventral spine. Two or three slots confined to rt. valve. Some lt. valves of immature specimens have a posteroventral spine. Sexual dimorphism slight, females more swollen and a little shorter than males. Distribution: Tortonian of Adana region, Turkey.

Explanation of Plate 1:12:68

Fig. 1, ♀ LV, int.; fig. 2, ♂ RV, int.; fig. 3, LV, int. musc. sc.

Scale A (500 µm ; ×90), figs. 1, 2; scale B (100 µm ; ×257), fig. 3.


1a
2a
1b
2b
A
B


1a
2a
3a
1b
2b
3b
A
B

595.337.14 (116.233) (423.3:162.002.50): 551.312

ON *TIMIRIASEVIA PUNCTATA* CLEMENTS sp. nov.

by R. G. Clements
(University of Leicester, England)

Timiriasevia punctata sp. nov.

Timiriasevia cf. *mackerrowi* Bate; Anderson *in* F. W. Anderson & R. A. B. Bazley, *Bull. geol. Surv. Gt. Br.*, 34, p. 133, figs. 12, 13 (1971).

Holotype: Brit. Mus. (Nat. Hist.) IO 5590, ♀ RV.

Type locality: Cliff section, SE side of Peveril Point, Durlston Bay, Dorset, England; Nat. Grid Ref.: SZ 04027861. Bed DB244(c)* (sample no. 2); part of bed 91 of Damon (1884, *Geology of Weymouth*, etc., Weymouth & London). Up. Cypris Clays & Shales, Up. Purbeck Beds, *Cypridea setina* Zone, Lr. Cretaceous.

Figured specimens: BM(NH) IO 5590 (Pl. 1:13:70, fig. 2), IO 5591 (Pl. 1:13:70, fig. 1), IO 5592 (Pl. 1:13:72, fig. 1), IO 5593 (Pl. 1:13:72, fig. 2), IO 5594 (Pl. 1:13:72, fig. 3), IO 5595 (Pl. 1:13:74, fig. 1; Pl. 1:13:76, fig. 5), IO 5596 (Pl. 1:13:74, fig. 2; Pl. 1:13:76, fig. 7), IO 5597 (Pl. 1:13:74, fig. 3; Pl. 1:13:76, fig. 6), IO 5598 (Pl. 1:13:76, figs. 2-4), IO 5599 (Pl. 1:13:76, fig. 8); all from same sample as holotype. IO 5600 (Pl. 1:13:70, fig. 3) from bed DB241*, part of Damon's bed 89; IO 5601 (Pl. 1:13:76, fig. 1) from bed DB244(b)*, part of Damon's bed 91.

Explanation of Plate 1:13:70

Fig. 1, ♀ LV, ext.; fig. 2, ♀ RV, ext.; fig. 3, ♀ RV, ext.

Scale A (200 µm ; ×135), fig. 1; scale B (200 µm ; ×125), figs. 2, 3.

Diagnosis: Carapace sub-ovate, greatest height in third quarter from anterior. Broad, low, rounded costae separated by narrow lines of puncta. Costae sub-parallel to margins, concentric about a sub-triangular posterocentral lateral area, more marked and asymmetrical towards ventral and posterior margins. Flange, narrow. Accommodation groove in larger, lt. valve; smaller, similar structure in rt. valve.

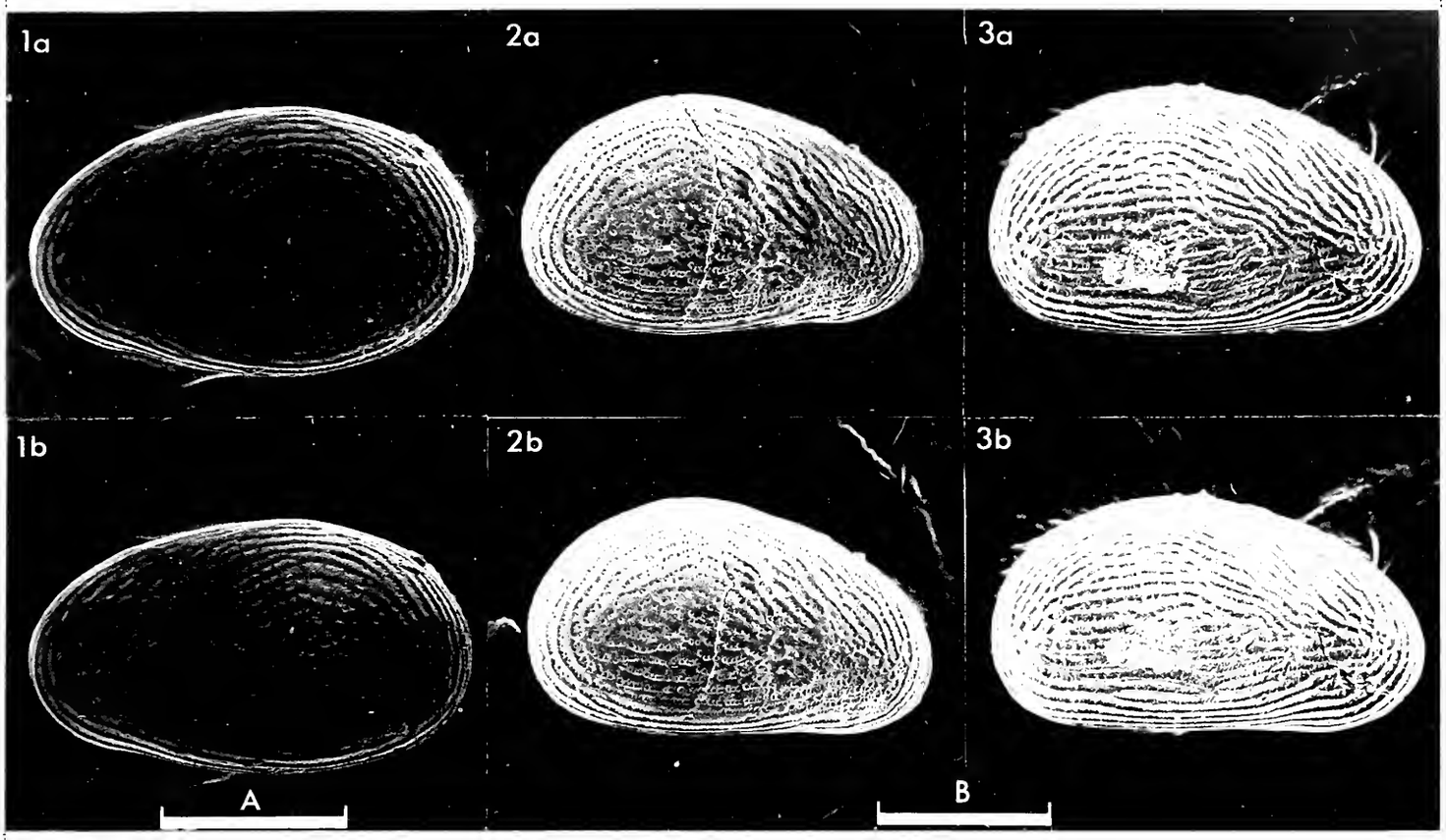
Remarks: Prominence of costae varies; some specimens are sub-reticulate. Adductor muscle scars in second quarter from anterior. Line of concrescence and inner margin coincident except for narrow anterior vestibule. Anterior radial pore canals straight, simple, about 6-7 in vestibule. Dimorphism marked; presumed ♀ posteriorly inflated. Largest measured specimen (IO 5598), 0.52 mm long. Greatest height distinctly anterior in early instars; approximately mid-line in ultimate instar; muscle scars in instars sub-central. The species is specially common in biomicrites (often argillaceous, and gastropod-rich) and calcareous clays, and is associated with *Cypridea* spp. (abundant to common), *Rhinocypris jurassica* (Martin) (common to abundant), *Darwinula* spp. (few to common) and more rarely *Theriosynoecum striata* (Martin); the usually abundant gastropods are dominantly *Viviparus* sp., and more rarely *Theodoxus* (?) *fisheri* Arkell, *Planorbis fisheri* Arkell and *Physa bristovii* Phillips. This suggests a low salinity non-marine environment.

Explanation of Plate 1:13:72

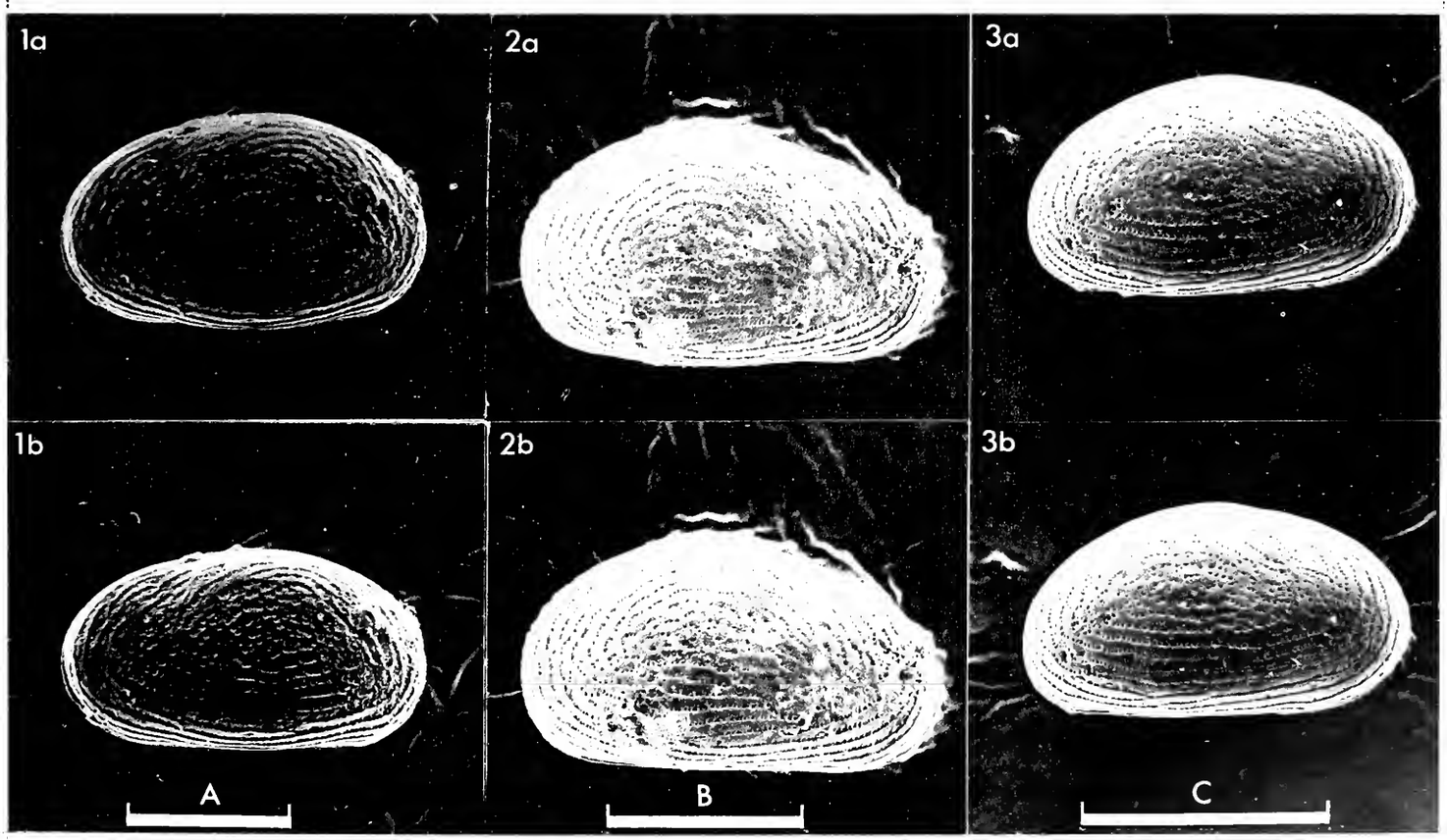
Fig. 1, ♂ LV, ext.; fig. 2, ♂ RV, ext.; fig. 3, juv RV, ext.

Scale A (200 µm ; ×135), fig. 1; scale B (200 µm ; ×145), fig. 2; scale C (200 µm ; ×180), fig. 3.

Stereo-Atlas of Ostracod Shells, 1:13:70 *Timiriasevia punctata* (2 of 8)



Stereo-Atlas of Ostracod Shells, 1:13:72 *Timiriasevia punctata* (4 of 8)



Affinities: *T. mackerrowi* Bate (1965, *Palaeontology*, 8, pp. 756-758, pl. III, figs. 2-12; Bathonian) differs in lateral and dorsal outline; lacks punctation; has marked posteroventral extension of flange.
T. crustiformis Mandelstam (1960, *in* P. S. Ljubimova *et al.*, *Trud. vses. nef. -nauch. issled. geol. Inst.* [VNIGRI], 160, pp. 67-69, pl. VIII, figs. 1a, b; Callovian) apparently lacks punctation.
T. polymorpha Mandelstam (1955, *in* L. I. Galeeva, *Ostrakody melovykh otlozheniy Mongolśkoy Narodnoy Respubiki*. Gostoptekhizdat, Moscow (?), p. 61, pl. XV, figs. 4a, b, B; Lower Cretaceous) differs in lateral and dorsal outline; has regular reticulate ornament.
T. principalis Ljubimova (1956, *Trud. vses. nef. -nauch. issled. geol. Inst.* [VNIGRI], 93, pp. 129-130, pl. XXIV, figs. 1a, b, 2a, b; Upper Cretaceous) differs in dorsal outline, and is apparently a distinctly larger species.
T. sp. (Anderson 1967, *in* F. W. Anderson *et al.*, *Bull. geol. Surv. Gt. Br.*, 27, pp. 171-235) and *T.* cf. *mackerrowi* Bate (Anderson 1971) from the Purbeck Beds of S. England probably belong to the present species.

Distribution: Ranges through the greater part of the *Cypridea vidrana* Zone (upper Middle Purbeck Beds) and the *C. setina* Zone (Upper Purbeck Beds) of Durlston Bay, where it is most abundant in the latter zone. See Anderson (1971) for further details of occurrence.

Explanation of Plate 1:13:74

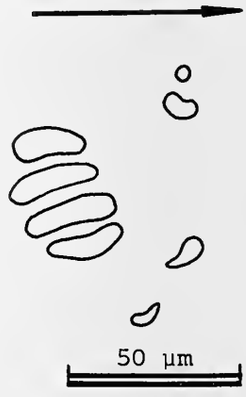
Fig. 1, ♂ LV, int.; fig. 2, ♂ RV, slightly obl. int.; fig. 3, ♀ LV, int. musc. sc.

Scale A (200 µm ; ×155), fig. 1; scale B (200 µm ; ×140), fig. 2; scale C (50 µm ; ×580), fig. 3.

Measurements of *T. punctata* from Durlston Bay. (All rt. valves).

Bed No.*	Sex	No. spms.	Length (mm) Mean	Length (mm) Std. devtn.	Height (mm) Mean	Height (mm) Std. devtn.	Length/Height Mean	Length/Height Std. devtn.
DB244c	♂♂	8	0.401	0.018	0.246	0.016	1.633	0.043
	♀♀	6	0.433	0.017	0.264	0.013	1.682	0.060
DB244b	♂♂	8	0.398	0.012	0.243	0.010	1.641	0.028
	♀♀	29	0.450	0.017	0.268	0.010	1.677	0.050
DB242	♂♂	11	0.394	0.016	0.235	0.007	1.673	0.051
	♀♀	12	0.421	0.018	0.250	0.011	1.692	0.045

* Clements MS. See fig. A35 of Clements *in* J. C. W. Cope, *et al.*, 1969. *International Field Symposium on the British Jurassic. Excursion no. 1. Guide for Dorset and South Somerset*. Geology Dept., University of Keele, 71 pp.

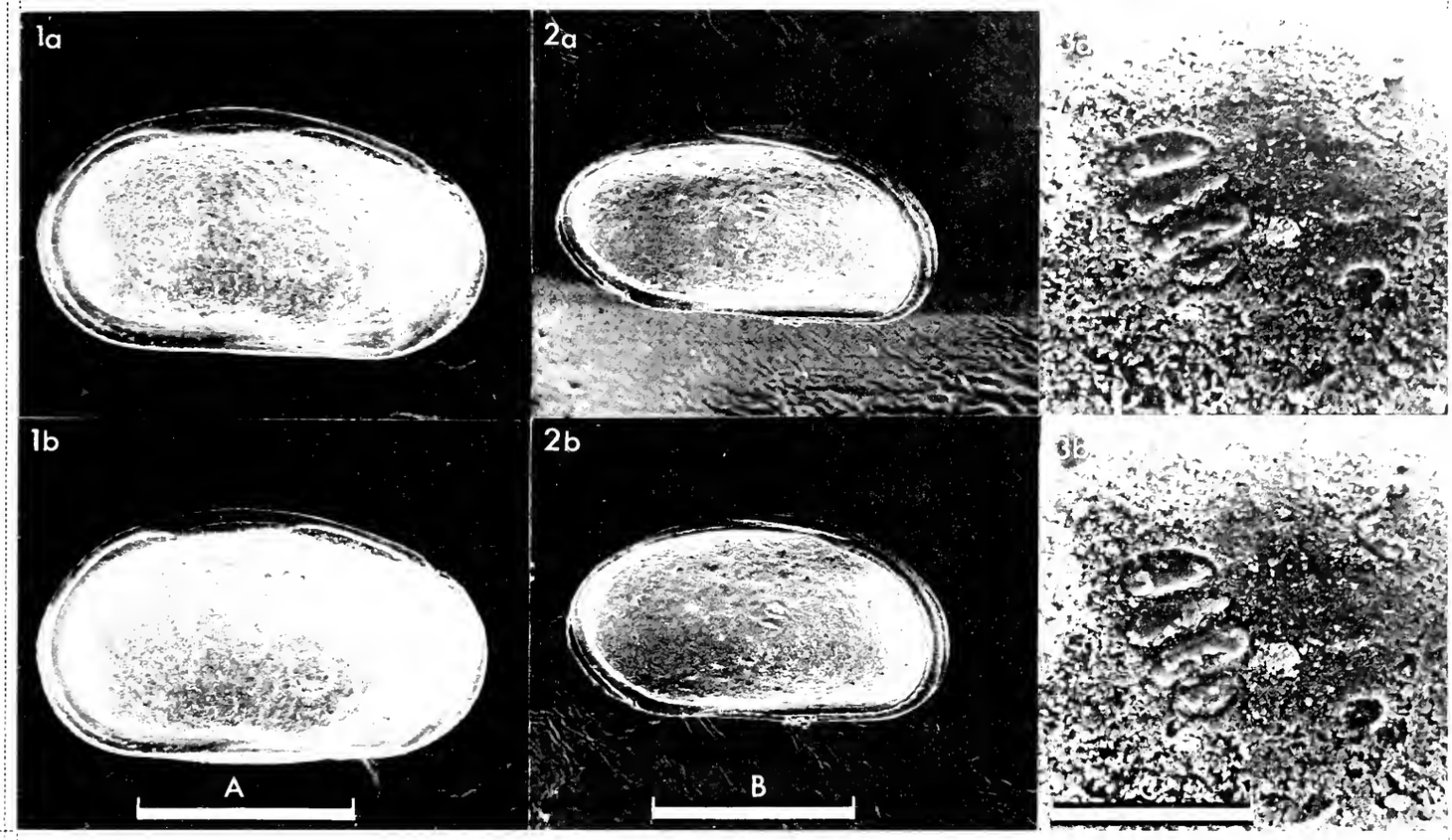


Muscle scar, based on IO 5595 (♂ LV)

Explanation of Plate 1:13:76

Fig. 1, ♀ car., dors.; fig. 2, ♀ car., vent.; fig. 3, ♀ car., ant.; fig. 4, ♀ car., post.; fig. 5, ♂ LV, vent. ext.; fig. 6, ♀ LV, obl. vent. int.; fig. 7, ♂ RV, vent. ext.; fig. 8, ♀ RV, obl. vent. int.

Scale A (100 µm ; ×90), fig. 1; scale B (100 µm ; ×75), fig. 2; scale C (100 µm ; ×70), figs. 3, 4; scale D (100 µm ; ×155), fig. 5; scale E (100 µm ; ×115), fig. 6; scale F (100 µm ; ×150), fig. 7; scale G (100 µm ; ×130), fig. 8.


1a
2a
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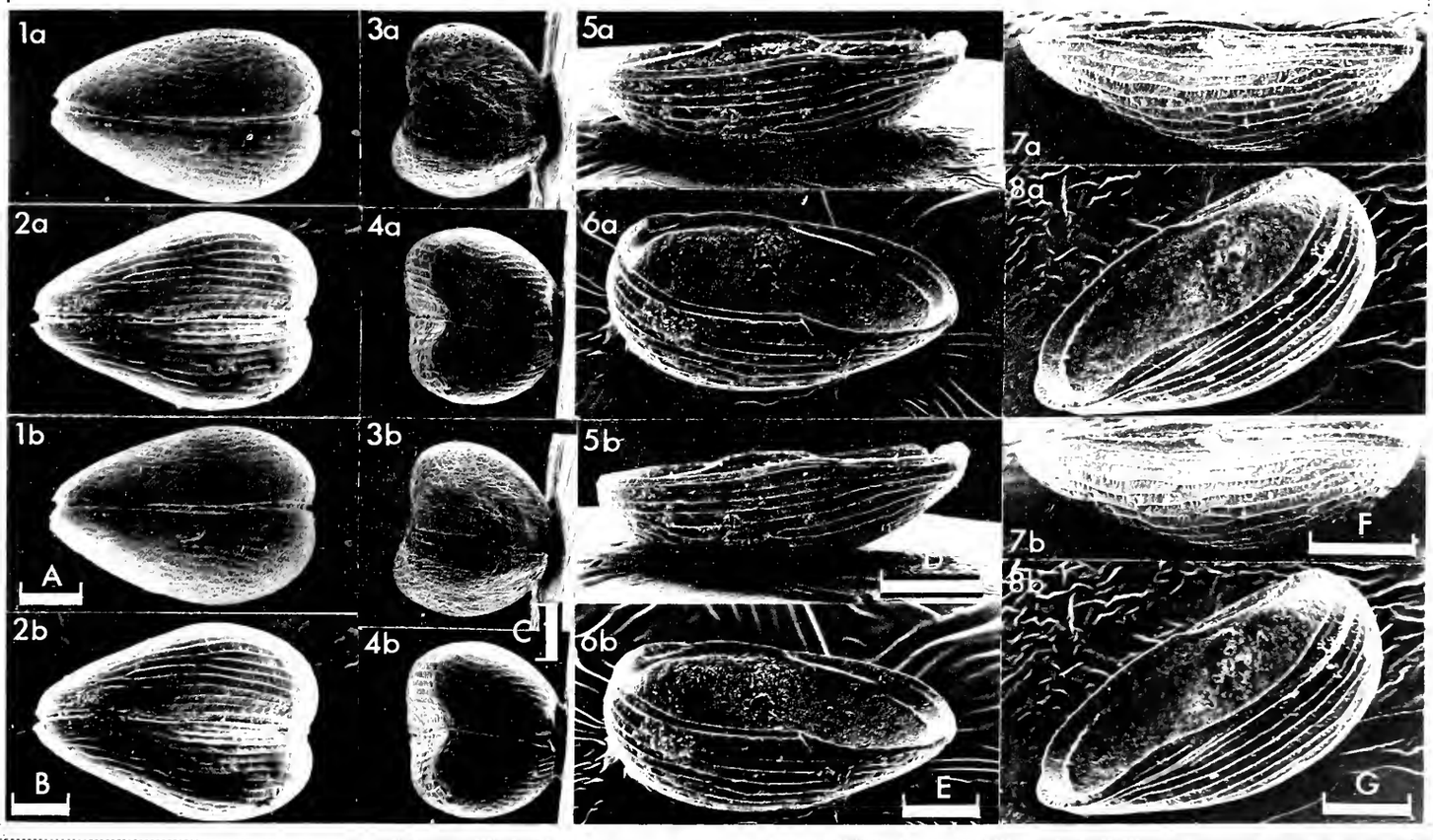
1b
2b
3b
A
B
C


1a
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4a
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8a
1b
3b
5b
7b
8b
2b
4b
6b
A
B
C
D
E
F
G

595.337.14 (119.9) (261.268:162.003.50): 551.351

ON *HEMICYTHERURA CELLULOSA* (NORMAN)

by John E. Whittaker
(British Museum (Natural History), London)

Genus *HEMICYTHERURA* Elofson, 1941

Type-species (designated by Elofson, 1941): *Cythere cellulosa* Norman, 1865

Hemicytherura cellulosa (Norman, 1865)

Cythere cellulosa sp. nov. A. M. Norman, *in*: G. S. Brady, *Nat. Hist. Trans. Northumb.*, vol. 1, pt. 1, p. 22, pl. V, figs. 17-20; pl. VI, fig. 17 (1865).
Cytherura cellulosa (Norman); G. S. Brady, *Trans. Linn. Soc. Lond.*, vol. 26, p. 446, pl. XXIX, figs. 47-50, 60 (1868).
Cytherura concentrica Brady, Crosskey & Robertson *(Pars)*; G. S. Brady & A. M. Norman, *Scient. Trans. R. Dubl. Soc.*, ser. 2, vol. 4, p. 201, pl. XVII, figs. 28, 29 (= juveniles); *non* pl. XIX, figs. 3, 4 (1889).
Cytheropteron (Hemicytherura) cellulosa (Norman); O. Elofson, *Zool. Bidr. Upps.*, vol. 19, p. 314 (1941).
Hemicytherura cellulosa (Norman); I. Yassini, *Bull. Inst. Géol. Bassin Aquitaine*, no. 7, p. 94 (1969). (q.v. for full synonymy).

Explanation of Plate 1:14:78

Fig. 1, ♀ car., ext. lt. lat.; fig. 2, ♂ car., ext. rt. lat.

Scale A (100 µm ; ×240), figs. 1, 2.

Syntypes: Material from two of Norman's type localities, Berwick-on-Tweed and Lamlash Bay (Isle of Arran), has been located in the Norman Collection (1911.11.8) of the Brit. Mus. (Nat. Hist.). The numbers are M.3665 and M.3666 respectively. A lectotype will be chosen, and more details given in a forthcoming paper.

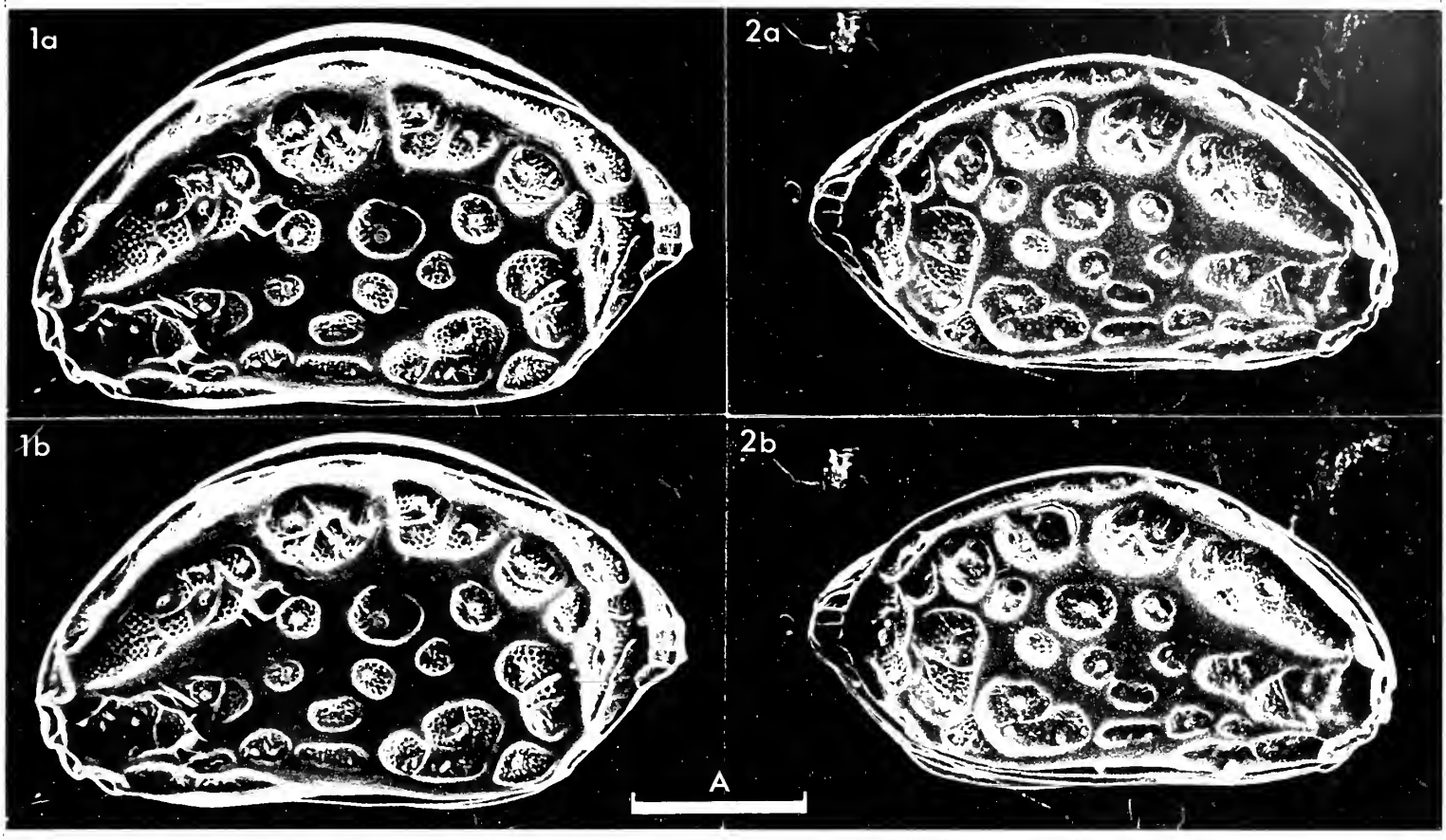
Figured specimens: Brit. Mus. (Nat. Hist.) nos., 1972.11.6.1 (♀ car.: Pl. 1:14:78, fig. 1), 1972.11.6.2 (♂ car.: Pl. 1:14:78, fig. 2; Pl. 1:14:80, figs. 2, 3), 1972.11.6.3 (♀ LV: Pl. 1:14:80, fig. 1), 1972.11.6.4 (juv-1 car.: Pl. 1:14:82, figs. 2, 3), 1972.11.6.5 (juv-1 LV: Pl. 1:14:82, fig. 1), 1972.11.6.6 (juv-1 RV: Pl. 1:14:84, fig. 1), 1972.11.6.7 (juv-2 car.: Pl. 1:14:84, fig. 2), and 1972.11.6.8 (juv-3 car.: Pl. 1:14:84, fig. 3). Recent. From littoral and sub-littoral marine-algae at various stations in Weymouth Bay, Southern England (approx. long. 2°21-25'W, lat. 50°38'N). Collected by J.E. Whittaker, 1968-69. The ostracods were living at the time of collection.

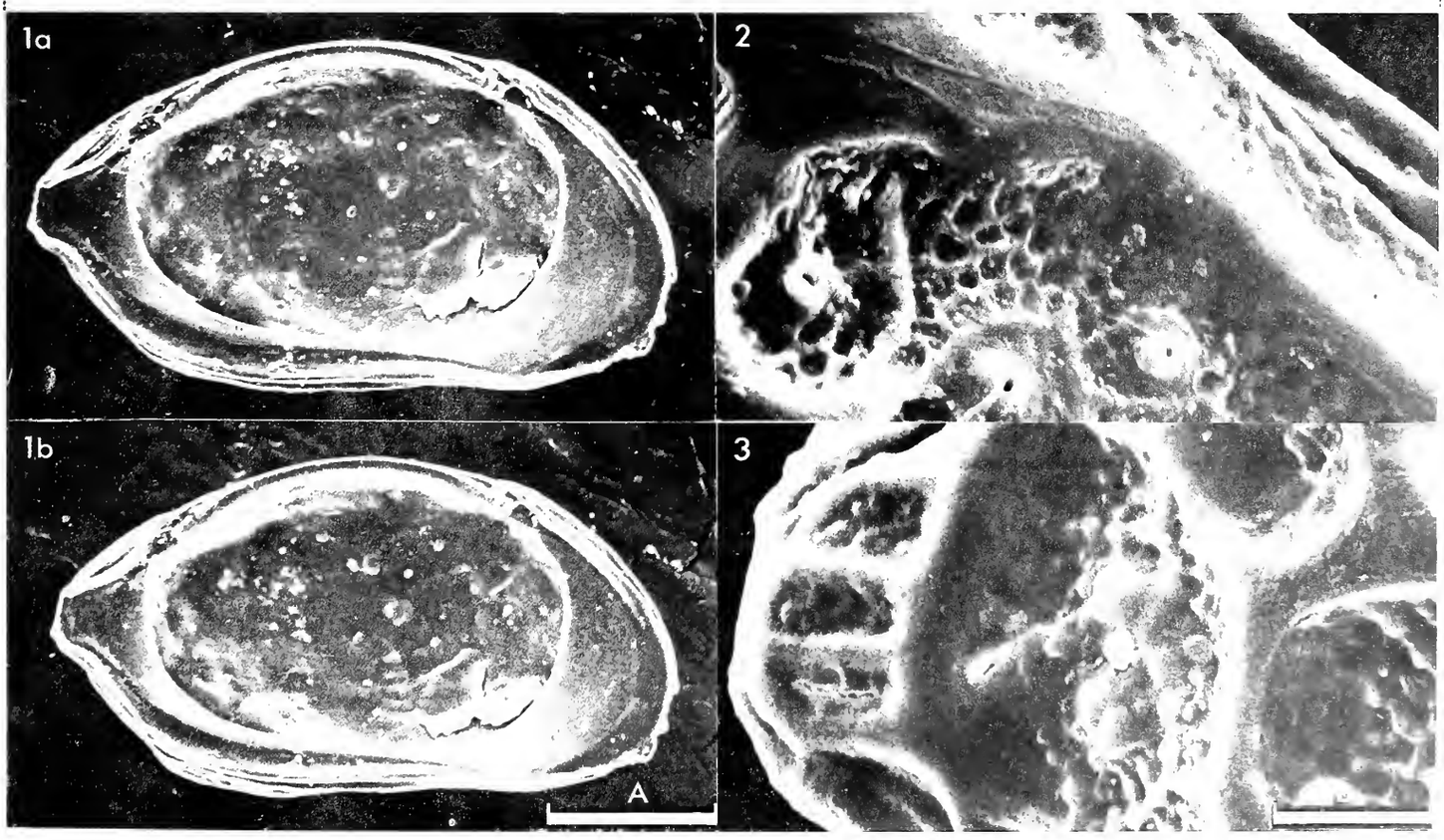
Diagnosis: Adult carapace massive, very small (<0.4 mm long). Large fossae in posterior two-thirds of valves characteristically sub-rounded. No projecting marginal ridges.

Explanation of Plate 1:14:80

Fig. 1, ♀ LV, int. lat. Figs. 2, 3, ♂ car.: fig. 2, detail of ant. dors. region; fig. 3, detail of mid-post. region.

Scale A (100 µm ; ×240), fig. 1; scale B (25 µm ; ×1100), figs. 2, 3.


1a
2a
1b
2b
A


1a
2
1b
3
A

Remarks: In 1889, Brady & Norman (*op. cit.* p. 202) described a small punctate ostracod with faint concentric striae which they tentatively assigned to *Cytherura concentrica* Brady, Crosskey & Robertson, 1874 (*Palaeontogr. Soc.*, p. 194). Some of these specimens are housed in the Brit. Mus. (Nat. Hist.) Norman Coll. 1911.11.8., nos. M.3616-18, M.3620. They were at first thought by these writers to be the instars of *Cytherura nigrescens* (Baird, 1838) until they found the true instars of the latter. Moreover, at the time, it was also doubted that they were juveniles of *C. concentrica* as ... (p. 202) ... "no unmistakeable *C. concentrica*, closely agreeing with the fossil types (0.6 mm long) have been found in our seas. The small form must for the present be left in doubt."

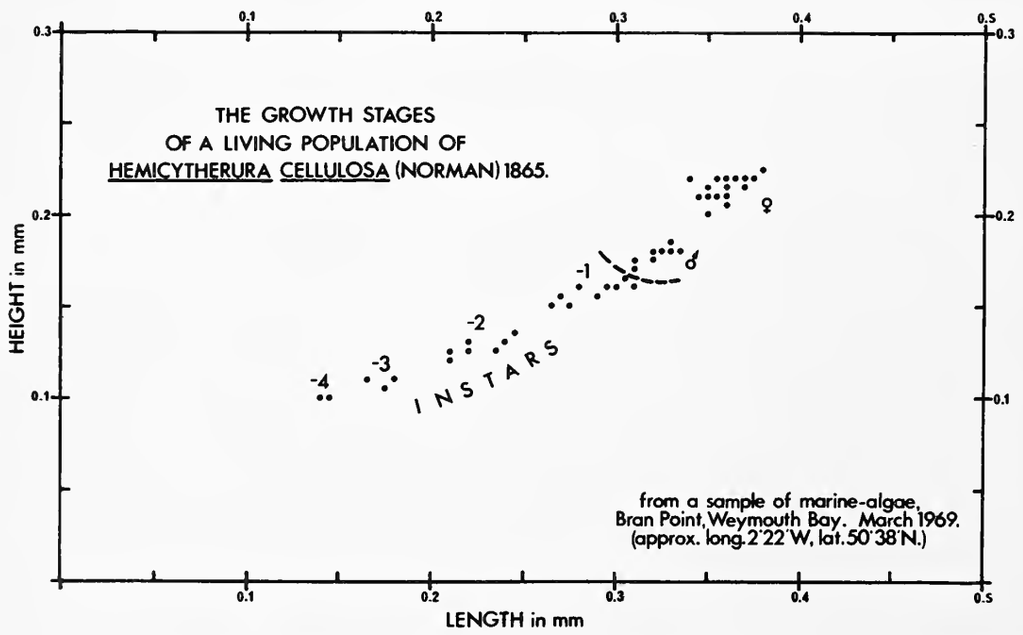
This very same form has now been encountered in large numbers in samples collected from Weymouth Bay where in many cases only adults of *H. cellulosa* were otherwise present. It therefore seems certain that it is the instar of this strikingly ornate species.

As far as I am aware there is no other reported occurrence of the final moult being responsible for the introduction of virtually all the ornament to the shell. In other highly ornate adults (e.g. species of *Callistocythere* and *Carinocythereis*) the detail has been added gradually with each growth stage. It would now be interesting to investigate living populations of the Mediterranean species of *Hemicytherura* to ascertain if a similar phenomenon occurs and whether it may be unique to this genus.

Explanation of Plate 1:14:82

Fig. 1, juv-1 LV, ext. lat. Figs. 2, 3, juv-1 car.: fig. 2, detail of ant. dors. region; fig. 3, detail of mid-post. region.

Scale A (100 µm ; ×240), fig. 1; scale B (25 µm ; ×1100), figs. 2, 3.



ECOLOGY:

A marine, phytal species. H. cellulosa was collected by the author from a large number of types of filamentous marine-algae during the five seasons, summer 1968 - summer 1969, in his study area along the Dorset coast of S. England.

It was particularly common at the more exposed stations and was found living to a depth of 3½ fathoms. The recorded salinity and water-temperature variation was 28-35‰ and 5-19°C respectively.

DISTRIBUTION:

The coasts of N.W. Europe. Reliable living records from the Bay of Biscay to W. Norway. Supposed Mediterranean specimens need careful comparison with H. videns (G.W. Müller).

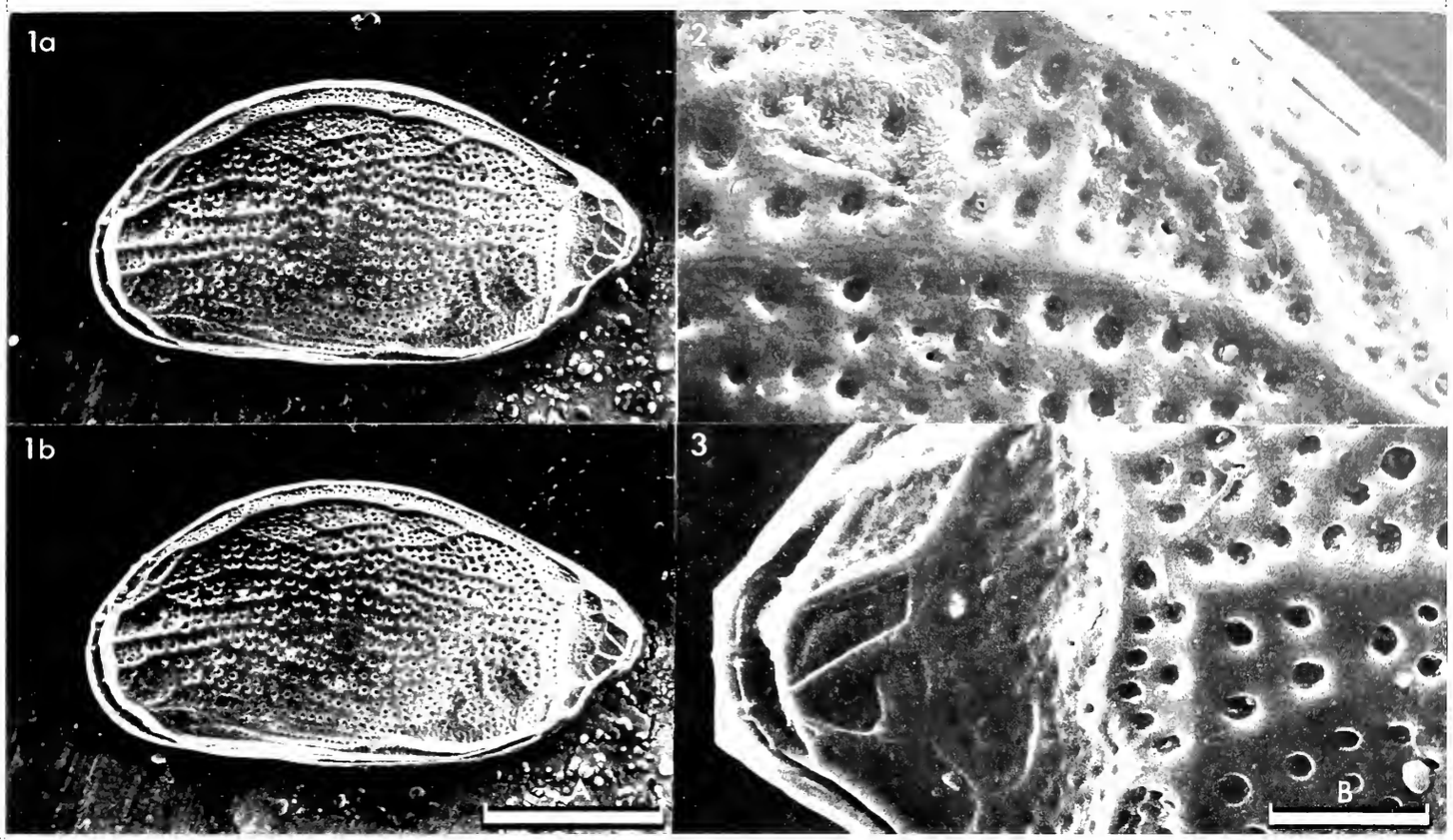
RANGE:

Pleistocene-Recent.

Explanation of Plate 1:14:84

Fig. 1, juv-1 RV, int. lat.; fig. 2, juv-2 car., ext. rt. lat.; fig. 3, juv-3 car., ext. rt. lat.

Scale A (100 µm ; ×240), figs. 1-3.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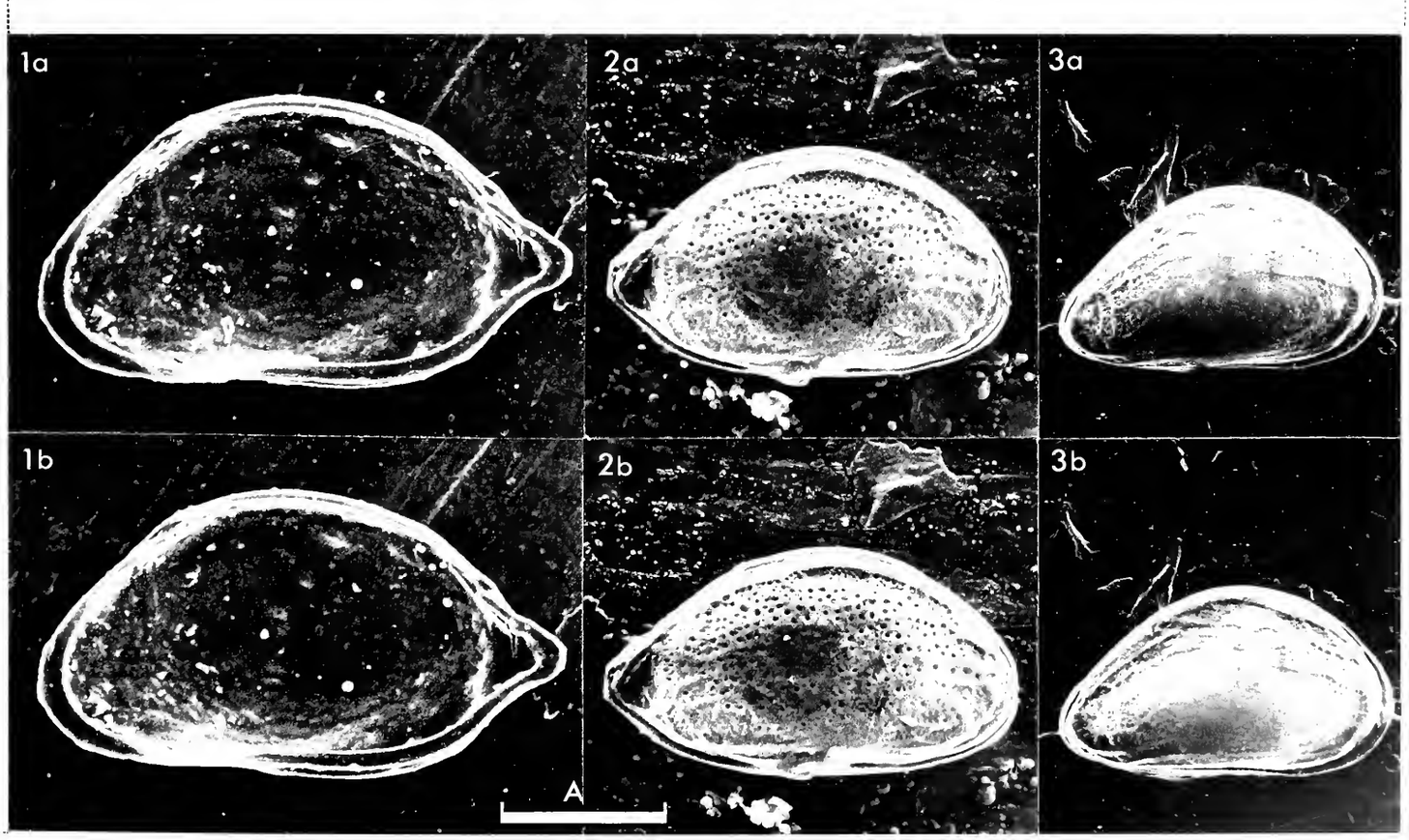

1a
2a
3a
1b
2b
3b
A

595.337.12 (119.3) (424.6:162.003.52 + 430.1:161.008.50): 551.312 + 552.57

ON *ILYOCYPRIS QUINCULMINATA* SYLVESTER-BRADLEY sp. nov.

by P. C. Sylvester-Bradley
(University of Leicester, England)

Ilyocypris quinculminata sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) IO 5542 (RV).

Type locality: Pleistocene (Hoxnian Interglacial) of Lowe's Pit, Trysull, Staffordshire (Section A of A. V. Morgan, "The glacial geology of the area north of Wolverhampton, England", *Phil. Trans. R. Soc. B*, in press). Approx. long. 2°13'W, lat. 52°33'N; Nat. Grid Ref.: SK 84829478. Calcareous silt with freshwater fauna; Morgan infers body of still or quietly moving water.

Derivation of name: Latin, "five-peaked."

Figured specimens: Brit. Mus. (Nat. Hist.) IO 5542 (RV: Pl. 1:15:88, figs. 2, 3); the specimen of Pl. 1:15:86, figs. 2, 3 has been broken; both from type locality. IO 5544 (RV: Pl. 1:15:86, fig. 1) and IO 5545 (LV: Pl. 1:15:88, fig. 1) from Wohnbach, near Berstadt, Germany, lat. 50°26'N, long. 8°50'E (Middle Pleistocene, Braunkohle opencast quarries). See W. Boenigk, *et al.*, in *Abh. hess. Landesamt. Bodenforschung* for 1973.

Explanation of Plate 1:15:86

Fig. 1, RV ext.; fig. 2, LV ext.; fig. 3, LV ext., to show spines.

Scale A (500 µm ; ×60), fig. 1; scale B (500 µm ; ×57), fig. 2; scale C (100 µm ; ×320), fig. 3.

Diagnosis: Punctate, each valve decorated with about 140 conical spines with an average height of about 65 µm. The diameter of the base of each spine is a little less than its height (see Pl. 1:15:86, fig. 3). Five hollow, conical eminences of larger size form a W - pattern, the three dorsal being about 200 µm, the anteroventral about 80 µm, and the posteroventral about 100 µm in diameter.

Remarks: This species, discovered by Dr. A. V. Morgan in deposits (dated on palynology as Hoxnian) from the English Midlands, was subsequently recognised by Dr. E. K. Kempf of the Geological Institute of the University of Cologne, as present also in the Middle Pleistocene (Hoxnian or older) of Germany. The species is easily recognisable and appears to be extinct; it may prove a useful index for the Middle Pleistocene.

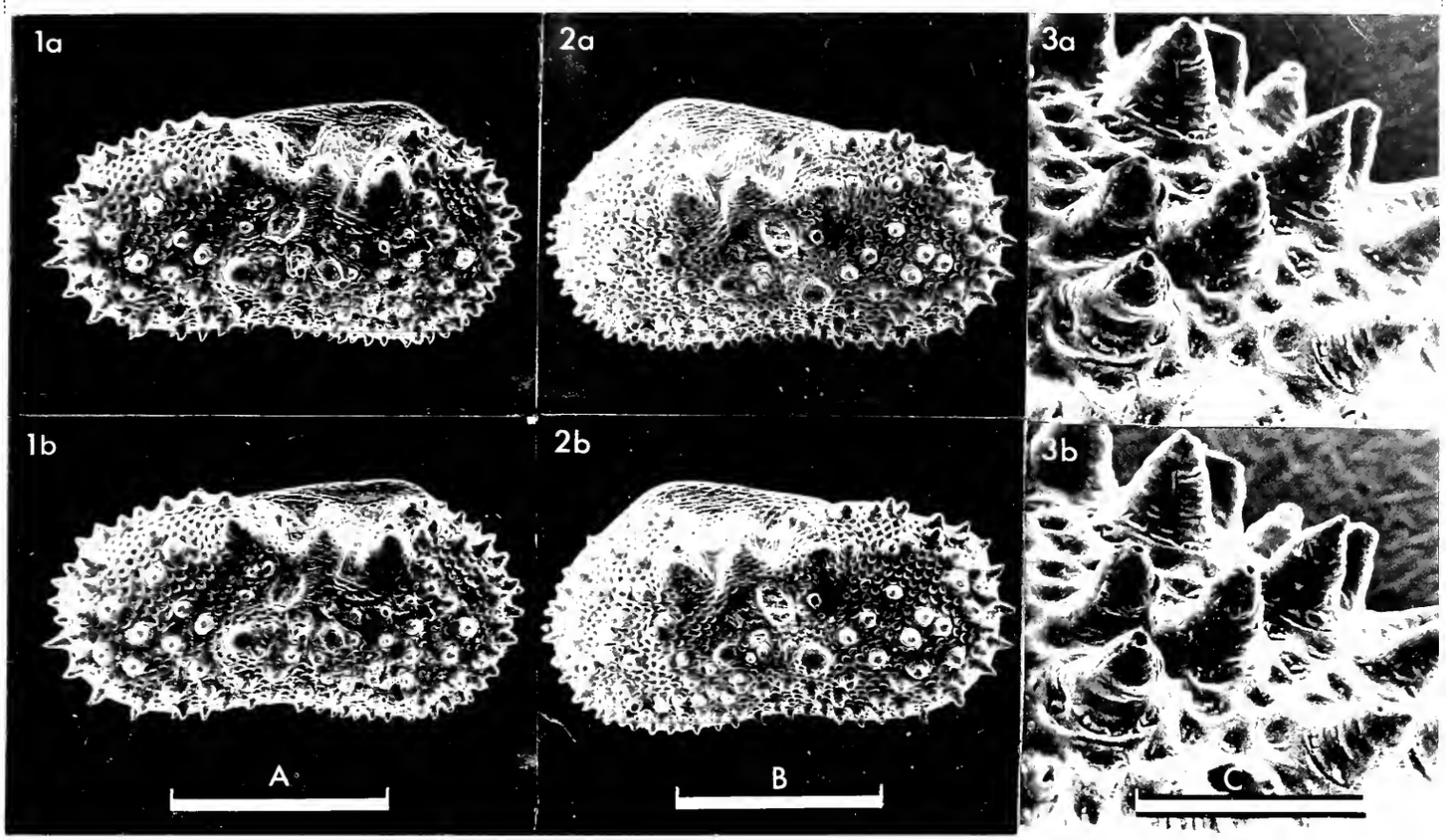
I would like to thank Drs. Morgan and Kempf for the donation of specimens now deposited in the British Museum (Natural History).

I. quinculminata has some resemblance in ornament to *I. hartmanni* Lerner-Seggev (1968, *Israel J. Zool.*, vol. 17, pp. 117-143; Recent, Lake Tiberias, Israel). It differs in shape, the spines are larger, and there are more of them (*I. hartmanni* has only about 80 spines, and some specimens also lack the median-dorsal eminence).

Explanation of Plate 1:15:88

Fig. 1, LV int.; fig. 2, RV int.; fig. 3, RV int., to show central musc. sc. field.

Scale A (500 µm ; ×62), fig. 1; scale B (500 µm ; ×65), fig. 2; scale C (100 µm ; ×325), fig. 3.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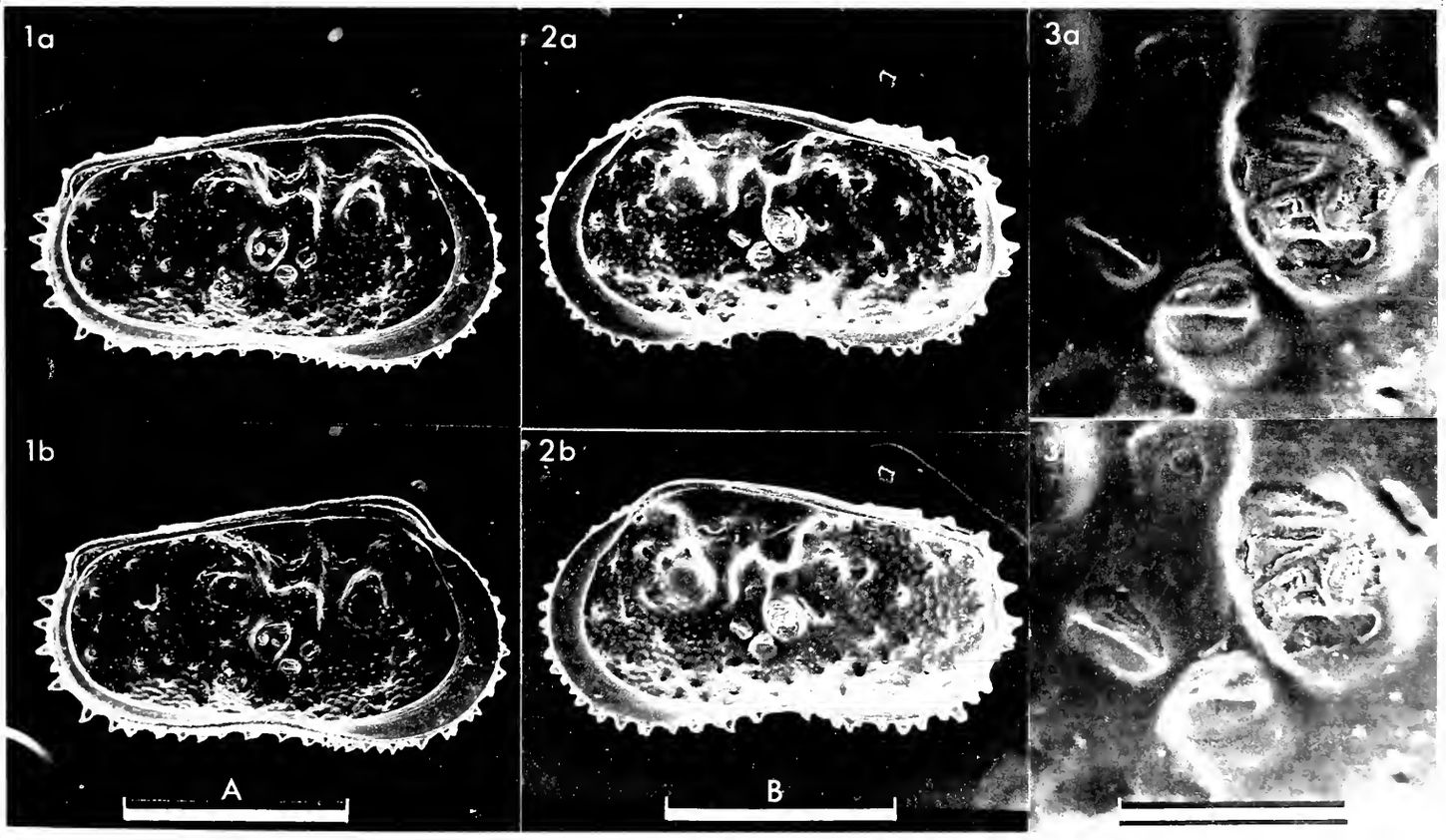
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3a
1b
2b
3b
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B

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