

SVERIGES GEOLOGISKA UNDERSÖKNING

SERIE C NR 730

AVHANDLINGAR OCH UPPSATSER

ARSBOK 71 NR 5

ULF SIVHED

A LOWER JURASSIC OSTRACODE FAUNA
IN THE GANTOFTA BRICK PIT, SKÅNE,
SOUTHERN SWEDEN



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ABSTRACT

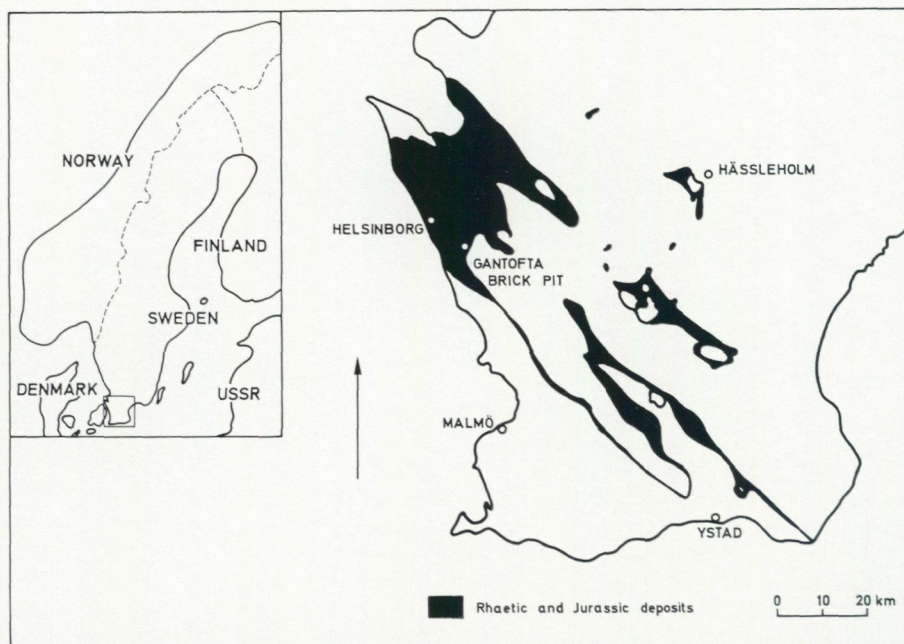
A Lower Jurassic ostracode fauna in the Gantofta Brick Pit is described. Fourteen species, including one new, are recorded and two ostracode zones are recognized, namely the *Cristacythere betzi* — *C. crassireticulata* and the *Ogmoconchella danica* Zones. The relation between carapace morphology and behaviour is discussed.

INTRODUCTION

Troedsson (1951, p. 245) described two species of the genus *Bairdia* from the Katslösa section. Norling (1972) noted the occurrence of several ostracode species in samples from the Lias of the Helsingborg area. The ostracode fauna in the Gantofta Brick Pit is the subject of this investigation.

The Gantofta Brick Pit is situated in the Helsingborg area (Text-fig. 1). The geographical location is described in the Appendix.

The Gantofta Brick Pit was described by Reyment (1969, pp. 208—216) and Norling (1972, pp. 22—23). Troedsson (1951, pp. 66—80) and Börlau (1973,



Text-fig. 1. The distribution of Rhaetic and Jurassic rocks at the base of the Pleistocene in Skåne (after Norling 1972). The inset map shows the position of Skåne relative to the rest of Sweden.

pp. 268—272) treated the geology in the Gantofta area. The Gantofta Brick Pit exposes Sinemurian sedimentary shale (Text-fig. 2). According to Börlau (1959, pp. 178—179), the upper part of the Döshult Formation (dark-grey, silty, claystone with ferruginous beds) and the basal part of the Pankarp Formation (brownish, greyish, and redbrownish claystones and clays) are represented. The sequence has a main dip of 25° to the south.

Norling (1972, pp. 22—23) treated the foraminiferal fauna obtained from a bed rich in *Gryphaea arcuata* (LAMARCK) present in the basal part of the sequence near the entrance of the Gantofta Brick Pit. According to Norling the foraminiferal fauna indicates an Early Sinemurian (Lias Alpha-3) age. The *Gryphaea arcuata* Bed represents the oldest sediments exposed in the pit. Reymont (1969, pp. 208—216) described an ammonite fauna containing *Asteroceras obtusum* (SOWERBY), *Promicroceras planicostum* (SOWERBY), and *Promicroceras sp.* *Asteroceras obtusum* is zonal denominator of the ammonite zone corresponding to the lower part of the Upper Sinemurian (Lias Beta-1b). The ammonite fauna was found about 35 m above the *Gryphaea arcuata* Bed. About 2 m above the bed with the ammonite fauna the Döshult Formation is followed by the Pankarp Formation according to Börlau (1959, pp. 178—179).

SERIES	STAGE	AMMONITE ZONES	FORMATION	OSTRACODE ZONES
LOWER JURASSIC	SINEMURIAN	β_2 Oxynotoceras oxynotum	PANKARP FORMATION	O. danica Zone
		β_1 Asteroceras obtusum		
		Euasteroceras turneri	DÖSHULT FORMATION	C. betzi - C. crassi - reticulata Zone
		Arnioceras semicostatum		
		α_3 Arietites bucklandi		

Text-fig. 2. Stratigraphical table of the Sinemurian in Skåne. The *Echioceras raricostatum* Zone, the uppermost ammonite zone in the Sinemurian, is not indicated in Skåne.

However, Larsen (1968, pp. 24—25) included the dark grey claystone of the sequence in the Pankarp Formation. He placed the boundary between the Pankarp and Döshult Formations at the top of the sandstone (the Döshult Sandstone) underlying the dark-grey claystone. Norling (1972, pp. 8—9) agreed with Börlau (1959, pp. 178—179) regarding the position of the boundary, whereas Michelsen (1975, p. 82) agreed with Larsen (1968, pp. 24—25).

The ostracode fauna treated in this paper was collected from the *Gryphaea arcuata* Bed and up to and including the bed containing *Asteroceras obtusum*. The samples were collected on the west side of the road leading down to the brick pit (sample numbers and location are given in Text-fig. 3).

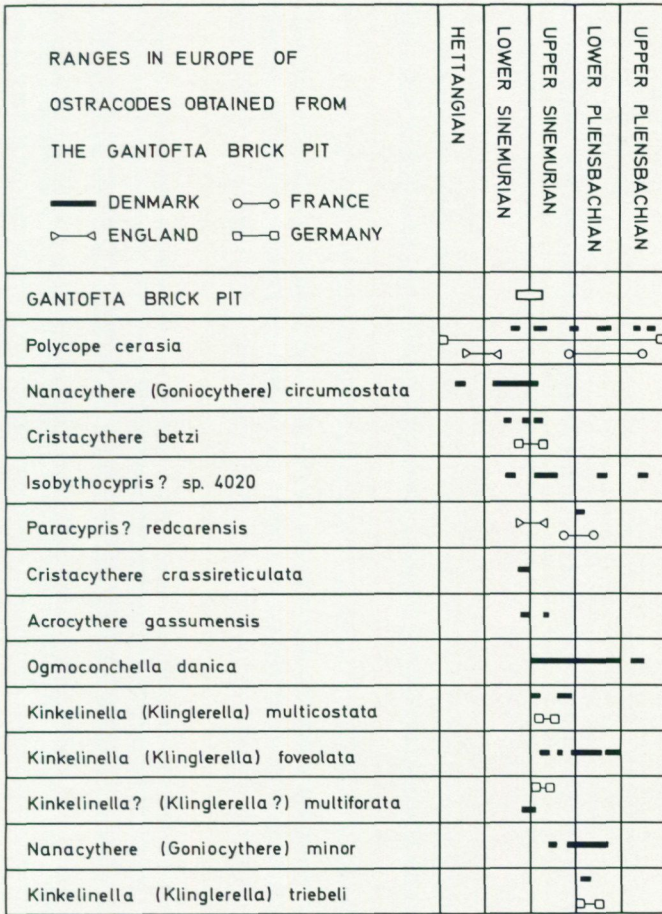
METHODS

Some 300 grammes of each sample were crushed to gravel-size. As a standard, 200 grammes of the crushed sample were treated.

In order to disintegrate the samples, they were dried (105° C, 24 hours) and petrol was added. After 24 hours in petrol, boiling water was added. The samples were sifted through a sieve (71 μ m) in gently running water. The residues were then dried and the ostracodes were picked and sorted from the fractions larger than 0.1 mm.

REMARKS ON THE OSTRACODE VALVES

Most of the ostracode valves have a relatively smooth surface. The ribs of the sculpture are commonly stronger on ostracodes collected in the Gantofta section than on those from other areas, as for instance on the ostracodes from the Danish Embayment treated by Michelsen (1975). Valves from the Öresund area are in some cases exceptions. This might be due to the physical and chemical conditions in the sediment after the valves were buried. The valves are often brown or



Text-fig. 4. Ranges in Europe of ostracodes obtained from the Gantofta Brick Pit.

yellow; in some cases, they are pyritized. This must be caused by diagenetic influence. Herrig (1975, pp. 671—678) pointed out that the effects mentioned are due to reducing conditions in the embedding sediment.

STRATIGRAPHICAL CONCLUSIONS BASED ON THE OSTRACODE FAUNA

The ostracode species obtained from the Gantofta Brick Pit, and their occurrence in the section treated, are given in Text-fig. 3.

The *Cristacythere betzi* — *C. crassireticulata* Zone (Michelsen 1975, pp. 26—28) is established through the occurrence of the zonal denominators. *C. betzi*

occurs throughout the treated sequence, whereas *C. crassireticulata* is restricted to the lower part of the section (samples Nos. 7, 15, and 16). According to Michelsen, the present ostracodal zone corresponds to the upper part of the Lower Sinemurian.

In the Öresund area, the lithology of the Lower Jurassic is very close to that of corresponding levels in the Gantofta area. The Gantofta fauna of the *Cristacythere betzi* — *C. crassireticulata* Zone has yielded four species that also occur at the same stratigraphical level in the Öresund borings Nos. 8, 9, 10, and 14 (Michelsen 1975, pp. 82—84, Text-fig. 21). The species in common are *C. betzi*, *C. crassireticulata*, *Nanacythere (Goniocythere) circumcostata*, and *Acrocythere gassumensis*.

Sample No. 16 also contains *Ogmoconchella danica*, a species used as zonal denominator by Michelsen (1975, pp. 28—38). The *O. danica* Zone ranges from the Upper Sinemurian to the Lower Pliensbachian.

Michelsen (1975, pp. 28—32) includes a lower subzone, the *Progonoidea reticulata* Subzone in the *O. danica* Zone. However, *P. reticulata* has not been recorded in the Gantofta section. The Gantofta fauna in the *O. danica* Zone contains six species that also occur at the same stratigraphical level in the Öresund borings Nos. 9, 10, and 14 (Michelsen 1975, pp. 82—84, Text-fig. 21). The species in common are *C. betzi*, *C. crassireticulata*, *Kinkelinnella (Klinglerella) multicostata*, *K. (K.) triebeli*, *N. (G.) circumcostata*, and *O. danica*.

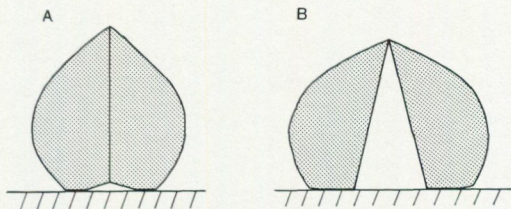
As the top of the section is made up of the bed containing *A. obtusum* (Reyment 1969, pp. 209), restricted to the lower Upper Sinemurian, the stratigraphical range of the studied section is now fairly well established (see Text-fig. 3).

The European stratigraphical ranges of the ostracodes obtained from the Gantofta section are given in Text-fig. 4. Most of the species listed are restricted to the Danish Embayment and to Germany. Two forms are also recorded from England and France; namely, *Polycope cerasia* and *Paracypris? redcarensis*.

LINKING CARAPACE OUTLINE TO MODE OF LIFE

As reported by many ostracodologists, a relation exists between the mode of life, the habitat, and the morphology of the carapace among ostracodes. It is difficult to draw any precise conclusions by studying fossil material, but when comparing with recent material, it might be possible to get an approximate picture of how the ostracodes lived.

Sars' (1921—1928) studies on ostracode faunas in the North Atlantic Ocean around Norway and Greenland and also his studies on fresh-water forms from Norway in several cases provide data on both ostracode environment and behaviour.



Text-fig. 5. Diagrammatic illustration of an open (A) and a closed (B) carapace resting on a plane substratum. Redrawn from Henningsmoen (1965).

Elofson's (1941) paper on marine ostracodes from around the Swedish coast i. a. pays attention to the relation between shape of carapace, depth, and substratum.

Benson (1961, pp. 56—63) described different morphological features connected with different modes of life. He distinguished two types of ostracodes, viz. swimmers and crawlers.

Characteristic features for crawlers (ostracode crawlers are those that move around on the bottom and are able to swim only for short distances) are a highly ornamented and heavy carapace with a flattened ventral side and supporting structures, such as spines and tubercles (Benson 1961, p. 60). Another important feature is a low centre of gravity (Henningsmoen 1965, p. 381).

Studies on the Gantofta species seem to support the above observations. The species of the genera *Cristacythere* and *Kinkelinella* are highly ornamented, and their carapaces are heavy with flattened ventral sides. In cross-section, the carapaces show a sub-triangular outline (Text-fig. 5). Their centre of gravity seems to be low. When placing the closed carapaces with the ventral side down on a plane surface, they show striking stability (Text-fig. 5 A). When opening their carapaces, as necessary for moving around, they were in a more stable position than when the carapaces were closed (Text-fig. 5 B). Henningsmoen (1965, p. 378) made the same observations on palaeocope ostracodes and suggested that these forms crawled around on the sea bottom. The ventral surface of the discussed species in Gantofta, has longitudinal ribs. If the ostracodes crawled around on a muddy bottom, the longitudinal ribs might have made them more stable in their direction of movement. In conclusion it seems highly probable that individuals belonging to the genera mentioned crawled around on the bottom.

Nanacythere (*Goniocythere*) *circumcostata* differs from the previously mentioned forms in having a short spinelike extension posteroventrally. This species was probably also adapted to crawling on the bottom. However, its carapace is fairly thin, which suggests that it was a good swimmer. Benson (1961, p. 61) pointed out that a thin carapace is characteristic of free-swimming forms.

Sars (1922, p. 32) described the mode of living of *Polycope orbicularis*. At a

depth of 10—25 m, if the bottom is sandy and covered by a thin layer of mud, this species swims briskly around. It is possible that the behaviour of *P. cerasia* found in the Gantofta section was similar to that of *P. orbicularis*. The latter differs from *P. cerasia* in having a smooth carapace, whereas *P. cerasia* has an ornamented one.

Difficulties arise in attempts to apply the previous argumentation to other forms in the Gantofta section.

DESCRIPTION OF THE SPECIES

Order Podocopida MÜLLER, 1894

Suborder Podocopina SARS, 1866

Superfamily Bairdiacea SARS, 1888

Family Bairdiidae SARS, 1888

Genus *Isobythocypris* APOSTOLESCU, 1959

Isobythocypris? sp. 4020 MICHELSEN, 1975

Plate I, Figs. 5—6.

1975 *Isobythocypris?* sp. 4020 MICHELSEN. — pp. 127—128, Pl. 2, Figs. 14—16.

MATERIAL. — 18 complete carapaces in samples Nos. 13, 14, 47, and 48.

DESCRIPTION. — See Michelsen 1975, pp. 127—128.

REMARKS. — Like the material investigated by Michelsen (1975, pp. 127—128), the Gantofta material is partly poorly preserved. As only complete carapaces are found, no inner structures can be observed.

DISTRIBUTION. — Lower Sinemurian to Upper Pliensbachian in Denmark (Michelsen 1975, p. 128).

Superfamily Cypridacea BAIRD, 1845

Family Paracyprididae SARS, 1923

Genus *Paracypris* SARS, 1866

Paracypris? *redcarensis* (BLAKE, 1876)

Plate I, Figs. 1—2.

1876 *Bairdia redcarensis* BLAKE. — p. 431, Pl. XVII, Fig. 4.

1975 *Paracypris?* *redcarensis* (BLAKE). — Michelsen, pp. 134—135, Pl. 4, Figs. 48—49 (inclusive synonymy through 1973).

MATERIAL. — 3 complete carapaces in sample No. 7.

ORIGINAL DIAGNOSIS. — "Carapace more than half as broad as long, not very inflated, uniformly convex on the dorsal side" (Blake 1876, p. 431).

DESCRIPTION. — See Michelsen 1975, pp. 134—135.

MEASUREMENTS. — The carapaces in sample No. 7 are 0.38 mm long and 0.18 mm high.

DISTRIBUTION. — Lower Pliensbachian in Denmark (Michelsen 1975, p. 135), Lias Alpha in England (Blake 1876, p. 460), Lotharingian to Pliensbachian in France (Apostolescu 1959, p. 806; Viaud 1963). The species has also been recorded from the Lower Toarcian of France (Oertli & Grosdidier 1961, p. 460).

Superfamily Cytheracea BAIRD, 1850

Family Progonocytheridae SYLVESTER-BRADLEY, 1948

Subfamily Protocytherinae LYUBIMOVA, 1955

Genus *Acrocythere* NEALE, 1960

Acrocythere cf. *gassumensis* MICHELSEN, 1975

Plate I, Figs. 3—4.

cf. 1975 *Acrocythere gassumensis* MICHELSEN. — pp. 153—154, Pl. 7, Figs. 97—100; Pl. 8, Figs. 117—119 (inclusive synonymy through 1973).

MATERIAL. — 2 complete carapaces in sample No. 13.

ORIGINAL DIAGNOSIS. — "An *Acrocythere*-like species characterized by a sculpture with a strong broad rib and knots, and with a distinct reticulation. Ventrally on the lateral surface there is a longitudinal rib with terminal elevations. Ventrally to the eye spot a strongly elevated area occurs. Near the posterior cardinal angle there are two distinct knots. The entire lateral surface, including ribs and knots, is covered by a reticulation of sharp and rather strong ribs forming a hexagonal pattern" (Michelsen 1975, p. 153).

DESCRIPTION. — See Michelsen 1975, pp. 153—154.

MEASUREMENTS. — The Gantofta specimens are 0.38 mm long and 0.18 mm high.

REMARKS. — The dorsal knob on the posterior lateral surface is missing. The ventral longitudinal rib extends posteriorly in a short spinelike prolongation and anteriorly in a longitudinal lobe. The specimens obtained from the Gantofta section are larger than those examined by Michelsen (1975, pp. 153—154). This would indicate that the Gantofta specimens are adults and that the specimens in the material of Michelsen (1975, pp. 153—154) are larval forms.

The specimens of "*Cythere terquemiana*" JONES 1872 by Lord (1971, pp. 657—658, Pl. 123, Figs. 6—8) remind of the specimens of *A. cf. gassumensis* obtained from the Gantofta section. The dorsal margin has the same outline. The rims bordering the anterior and posterior margins in "*C.*" *terquemiana* are absent in *A. cf. gassumensis*. The posteroventral spinelike extension is identical in both species. The specimens of "*C.*" *terquemiana* are larger than the Gantofta specimens.

DISTRIBUTION. — Sinemurian in Denmark (Michelsen 1975, p. 154).

Genus *Cristacythere* MICHELSEN, 1975

Cristacythere betzi (KLINGLER & NEUWEILER, 1959)

Plate I, Figs. 7—11; plate II, Figs. 20, 21.

1959 *Procytheridea betzi* KLINGLER & NEUWEILER. — pp. 374—376, Pl. 13, Figs. 1—5, 9.

1975 *Cristacythere betzi* (KLINGLER & NEUWEILER). — Michelsen pp. 163—165, Pl. 10, Figs. 143—147; Pl. 11, Figs. 159—171. Text-fig. 27 (inclusive synonymy through 1973).

MATERIAL. — 8 complete carapaces, 8 left valves, and 6 right valves in samples Nos. 1, 2, 4, 28, 34, 36, and 57.

ORIGINAL DIAGNOSIS. — "Eine Art der Gattung *Procytheridea* mit einer sehr leicht erkennbaren Längsrippenskulptur. Zwischen den rundlichen Rippen sind durch feine Leistchen vergitterte, breite und schmalere Täler vorhanden. Der Vorderrand ist in der unteren Hälfte stärker gerundet, der Dorsalrand lang und fast gerade sowie schwach nach hinten abfallend, der Hinterrand etwas unter der Mittellinie des Gehäuses eng gerundet und die Ventralnaht durch die gebauchten Ventralflächen in Seitenansicht verdeckt" (Klingler & Neuweiler 1959, pp. 374, 376).

DESCRIPTION. — See Michelsen 1975, pp. 163—164.

REMARKS. — The description given by Michelsen (1975, pp. 163—164) differs from that of Klingler & Neuweiler (1959, p. 376). Michelsen (1975, p. 164) described the hinge in the right valve as having seven teeth posteriorly and six teeth anteriorly. Klingler & Neuweiler (1959, p. 376) described a hinge with six teeth both anteriorly and posteriorly. In Plate II, Figs. 20—21, the posterior part of the hinge in the right valve displays seven teeth.

The Gantofta specimens are higher than the specimens described by Michelsen (1975, Text-fig. 27) but have the same length.

DISTRIBUTION. — Sinemurian in Denmark (Michelsen 1975, p. 165), upper part of Lower Sinemurian and lower part of Upper Sinemurian in north-west Germany (Klingler & Neuweiler 1959, p. 374 and Klingler 1962, p. 81), lower part of Upper Sinemurian in north-east Germany (Dreyer 1965, p. 503).

Cristacythere crassireticulata MICHELSEN, 1975

Plate II, Figs. 19, 22.

1975 *Cristacythere crassireticulata* MICHELSEN. — pp. 168—170, Pl. 10, Fig. 153; Pl. 12, Figs. 179—185 (inclusive synonymy through 1973).

MATERIAL. — 4 complete carapaces, 6 left valves, and 5 right valves in samples Nos. 7, 15, and 16.

ORIGINAL DIAGNOSIS. — "A species of the genus *Cristacythere* with an elongate-oval outline. The sculpture of the lateral surfaces consists of strong ribs forming a polygonal pattern. Longitudinal ribs occur along the ventral margin. One or two oblique ribs run from the anterior margin towards the dorsal margin" (Michelsen 1975, p. 169).

REMARKS. — The lengths and heights of the Gantofta specimens do not differ from the measurements in the material treated by Michelsen (1975, p. 170). No adults were found in the Gantofta material.

Michelsen (1975, p. 169) suggested that the muscle scar area consists of a vertical and slightly arched row of spots. In the Gantofta material the adductor muscle scars have been studied. They form a vertical row of four elongated spots (see Plate II, Fig. 22).

DISTRIBUTION. — Lower Sinemurian to lowermost part of Upper Sinemurian in Denmark (Michelsen 1975, p. 170).

Genus *Kinkelinella* MARTIN, 1960

Subgenus *Kinkelinella* (*Klinglerella*) ANDERSON, 1964

The *Kinkelinella* (*Klinglerella*) *glabellata* group of MICHELSEN, 1975

Kinkelinella (*Klinglerella*) *multicostata* (KLINGLER & NEUWEILER, 1959)

Plate II, Figs. 13, 14, 17.

1959 *Procytheridea multicostata* KLINGLER & NEUWEILER. — pp. 385—386, Pl. 16, Figs. 48—60.

1975 *Kinkelinella* (*Klinglerella*) *multicostata* (KLINGLER & NEUWEILER). —

Michelsen, pp. 186—187, Pl. 16, Figs. 242—244 (inclusive synonymy through 1973).

MATERIAL. — 2 complete carapaces in sample No. 32.

ORIGINAL DIAGNOSIS. — "Eine langgestreckte Art der Gattung *Procytheridea* mit einer vorherrschend mit Längsrippen gekennzeichneten Skulptur; zwischen den Rippen sind feine, niedrigere Qursepten zu erkennen. Die Skulptur ist auf die Mitte der Lateralfächen beschränkt, Vorder- und Hinterende sowie die Dorsalfächen sind glatt" (Klingler & Neuweiler 1959, pp. 385—386).

DESCRIPTION. — See Klingler & Neuweiler 1959, p. 187.

DISTRIBUTION. — Upper Sinemurian in Denmark (Michelsen 1975, p. 187), lower part of Upper Sinemurian in Germany (Klingler & Neuweiler 1959, p. 386).

Kinkelinella? (Klinglerella?) multiforata (KLINGLER & NEUWEILER, 1959)
Plate III, Fig. 23.

1959 *Procytheridea multiforata* KLINGLER & NEUWEILER. — pp. 376—378, Pl. 13, Figs. 6, 7, 8, 10.

1962 *Procytheridea multiforata* KLINGLER & NEUWEILER. — Klingler, pp. 81—82, Pl. 12, Fig. 6.

1968 *Procytheridea multiforata* KLINGLER & NEUWEILER. — Christensen, Pl. 23, Fig. 17.

MATERIAL. — 1 left valve in sample No. 28.

ORIGINAL DIAGNOSIS. — "Eine Art der Gattung *Procytheridea* mit einem Filigranwerk von gebogenen Rippen, zwischen denen die gerundeten Interkostalfelder von zahlreichen, löcherartigen Vertiefungen übersät sind; die Skulptur der rechten Klappe ist der von *bipartita* sehr ähnlich, während die der linken sehr entscheidend abweicht. Gehäuse gedungen mit abfallendem Dorsalrand, ventrale Schalen-teile überhängend, Vorder- und Hinterrand wenig abgesetzt und in Dorsalansicht vorspringend; Ventralflächen unregelmässig längsgerippt" (Klingler & Neuweiler 1959, p. 377).

DESCRIPTION. — See Klingler & Neuweiler 1959, p. 377.

REMARKS. — For discussions of the genus and the subgenus, see Michelsen (1975, pp. 160—162; p. 178; pp. 181—182). As the inner features are unknown, the form is only tentatively referred to the genus *Kinkelinella* and the subgenus *Klinglerella*.

DISTRIBUTION. — Uppermost part of Lower Sinemurian to lowermost part of Upper Sinemurian in Denmark (Christensen 1968, Pl. 23), lower part of Upper Sinemurian in Germany (Klingler & Neuweiler 1959, p. 377).

Kinkelinella (Klinglerella) triebeli (KLINGLER & NEUWEILER, 1959)

Plate III, Figs. 25, 26.

1959 *Procytheridea triebeli* KLINGLER & NEUWEILER. — pp. 381—382, Pl. 13, Figs. 11—16; Pl. 14, Figs. 17—18.

1975 *Kinkelinella (Klinglerella) triebeli* (KLINGLER & NEUWEILER). — Michelsen, pp. 187—188, Pl. 15, Figs. 218—220; Pl. 16, Figs. 245—247 (inclusive synonymy through 1973).

MATERIAL. — 4 complete carapaces and 3 right valves in samples Nos. 29, 30, 35, and 51.

ORIGINAL DIAGNOSIS. — "Eine Art der Gattung *Procytheridea* mit retikulierter Oberfläche bei vorherrschenden Längsrippen; zwischen den Längsrippen und den niedrigeren Querrrippen sind die Felderböden mit ungezählten Grübchen bedeckt. Im Bereich des vorderen Schlosszahnes ist eine längliche Vertiefung mit nur zarter Skulptur ausgebildet, die schräg nach vorn unten zieht und sich kurz vor der Mittellinie der Klappen verliert. Die rechten Klappen sind im dorsalen Bereich zwischen der vorderen und hinteren Schlosszahnregion aufgebläht. Eine geringe Ausprägung von Augenknoten ist vorhanden" (Klingler & Neuweiler 1959, p. 381).

DESCRIPTION. — See Klingler & Neuweiler 1959, p. 381.

REMARKS. — The Gantofta specimens are smaller than those described by Klingler & Neuweiler (1959, p. 382) but equal in size to the specimens described by Michelsen (1975, Pls. 15 and 16).

DISTRIBUTION. — Lower part of Upper Sinemurian in Denmark (Michelsen 1975, p. 188), lower part of Upper Sinemurian in Germany (Klingler & Neuweiler 1959, p. 382).

The *Kinkelinella (Klinglerella) bipartita* group of MICHELSEN 1975

Kinkelinella (Klinglerella) foveolata MICHELSEN, 1975

Plate II, Figs. 15, 16, 18. Text-fig. 6.

1975 *Kinkelinella (Klinglerella) foveolata* MICHELSEN. — pp. 189—192, Pl. 21, Figs. 331—335; Pl. 22, Figs. 347—352. Text-fig. 36 (inclusive synonymy through 1973).

MATERIAL. — 53 complete carapaces, 24 left valves, and 25 right valves in samples No. 33, 53, and 54.

ORIGINAL DIAGNOSIS. — "A species of the subgenus *Kinkelinella* (*Klinglerella*) with an oval to subtriangular outline in lateral view. The sculpture on the ventral and posterior sections of the shell consists of rather strong, longitudinal ribs; on the anterodorsal section of wavy and oblique ribs. The area between the ribs is ornamented with numerous pits" (Michelsen 1975, p. 190).

DESCRIPTION. — See Michelsen 1975, pp. 190—191.

MEASUREMENTS AND STATISTICS (in mm). — One thousand grammes from sample No. 54 were treated. The arithmetical means (\bar{x}), the standard deviations (s), and the observed range of measurements (O. R.) are shown (N = number of measurements). Only complete carapaces are measured. Text-fig. 6 shows the relation between numbers, lengths and heights.

	\bar{x}	s	O. R.
MALES (N=20)			
Length	0.692	0.047	0.65—0.78
Height	0.381	0.021	0.35—0.40
FEMALES (N=20)			
Length	0.629	0.016	0.60—0.40
Height	0.367	0.015	0.35—0.38

REMARKS. — The arithmetical means calculated on carapaces from adults (A) in sample No. 54 (see above and Text-fig. 6) are higher than those given by Michelsen (1975, p. 191) from the Öresund No. 12 boring. However, he mentioned that the arithmetical means compared with other samples seem to be too low. The instars A-1 and A-2 also display the same difference from Michelsen's material.

DISTRIBUTION. — Upper part of Upper Sinemurian and Pliensbachian in Denmark (Michelsen 1975, p. 192).

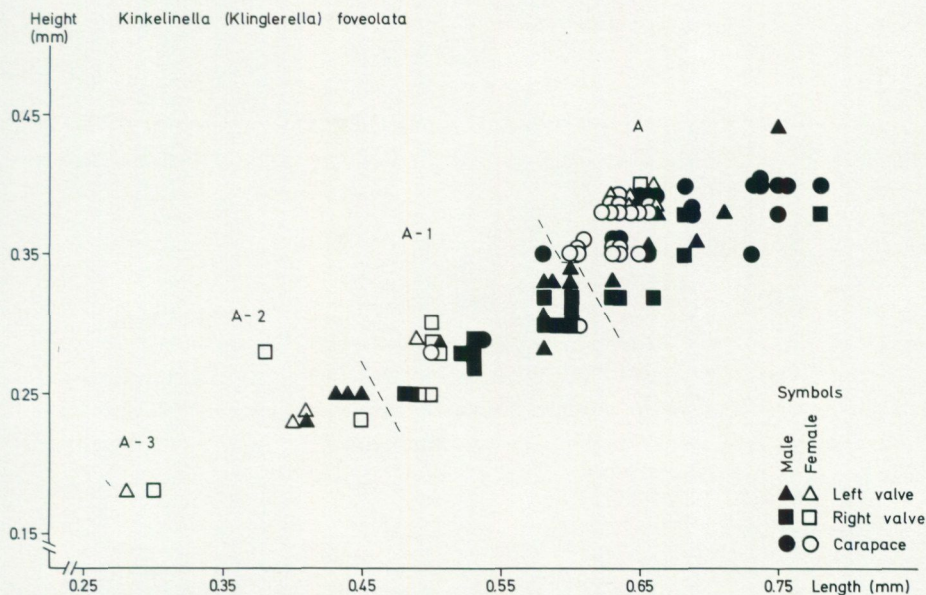
Genus *Nanacythere* HERRIG, 1969

Subgenus *Nanacythere* (*Goniocythere*) MICHELSEN, 1975

Nanacythere (*Goniocythere*) *circumcostata* MICHELSEN, 1975

Plate II, Fig. 12.

1975 *Nanacythere* (*Goniocythere*) *circumcostata* MICHELSEN. — pp. 201—204, Pl. 17, Figs. 259—267; Pl. 18, Figs. 280—283. Text-fig. 35 (inclusive synonymy through 1973).



Text-fig. 6. Scatter diagram showing relations between numbers, lengths, and heights for *Kinkelinella* (*Klinglerella*) *foveolata*. Sample No. 54.

MATERIAL.— 4 complete carapaces, 3 left valves, and 3 right valves in samples Nos. 13, 15, 16, 34, 36, and 45.

ORIGINAL DIAGNOSIS. — "A species of the subgenus *Nanacythere* (*Goniocythere*) characterized by a sculpture of strong ribs. On the posterior third of the valve the ribs are more or less vertical and parallel. On the anterior third they are oblique, from the dorsal margin to the anteroventral part of the valve. Between these two groups of ribs is found one rib forming a closed, roughly oval form. Some of the anterior and posterior ribs are connected to ribs parallel with the ventral margin. Distinct intercostal cross-ribs occur" (Michelsen 1975, p. 202).

DESCRIPTION. — See Michelsen 1975, pp. 202—203.

REMARKS. — The specimens do not differ in lengths and heights from those described by Michelsen (1970, p. 38; 1975, p. 203), but the adults differ in having a small latitudinal spinelike extension posteroventrally.

DISTRIBUTION. — Hettangian to lower Upper Sinemurian in Denmark (Michelsen 1975, p. 204).

Nanacythere (Goniocythere) cf. minor MICHELSEN, 1975

Plate III, Fig. 24.

cf. 1975 *Nanacythere (Goniocythere) minor* MICHELSEN. — pp. 207—209, Pl. 18, Figs. 284—285; Pl. 19, Figs. 303—307 (inclusive synonymy through 1973).

MATERIAL. — 2 right valves in sample No. 13.

ORIGINAL DIAGNOSIS. — "A small species of the subgenus *Nanacythere (Goniocythere)*. The lateral surface is strongly inflated ventrally, forming a horizontal ridgelike edge. The sculpture consists of vertical ribs in the dorsal part of the lateral surface; below, in a zone above the ridge-like edge, the ribs form a polygonal pattern. Between the edge and the ventral margin, there are three to four fine longitudinal ribs" (Michelsen 1975, p. 208—209).

DESCRIPTION. — See Michelsen 1975, p. 208—209.

MEASUREMENTS. — One of the Gantofta specimens has a calculated length of 0.36 mm and a height of 0.17 mm. The other specimen is too poorly preserved to be measured.

REMARKS. — The ribs of the specimens from the Gantofta section are strong. The specimens are poorly preserved. The sculpture and the outline of the valves are close to *N. (G.) minor*. However, one of the valves is larger than the specimens measured by Michelsen (1975, p. 209).

DISTRIBUTION. — Upper part of Upper Sinemurian and Pliensbachian in Denmark (Michelsen 1975, p. 209).

Suborder Metacopina SYLVESTER-BRADLEY, 1961

Superfamily Healdiacea HARLTON, 1933

Family Healdiidae HARLTON, 1933

Genus *Ogmoconchella* GRÜNDEL, 1964

Ogmoconchella danica MICHELSEN, 1975

Plate III, Figs. 31—33.

1975 *Ogmoconchella danica* MICHELSEN. — pp. 243—247, Pl. 31, Figs. 451—453; Pl. 32, Figs. 456—462; Pl. 33, Figs. 476—484; Pl. 34, Figs. 485—489; Pl. 41, Figs. 574—577. Text-figs. 42—43.

MATERIAL. — 63 complete carapaces, 3 left valves, and 4 right valves in samples Nos. 16, 18, 24, 25, 26, 28, 29, 30, and 37.

ORIGINAL DIAGNOSIS. — "A species of the genus *Ogmoconchella* with an evenly rounded outline. The posterior end is well-rounded, only slightly extended ventrally. The external surface is smooth or faintly furrowed; there is no external lamella on the anterior margin" (Michelsen 1975, p. 244).

DESCRIPTION. — See Michelsen 1975, p. 244.

DISTRIBUTION. — Upper Sinemurian to lower part of Upper Pliensbachian in Denmark (Michelsen 1975, p. 247).

Ogmoconchella? scanica n. sp.

Plate III, Figs. 27—30, Text-fig. 7.

DERIVATION OF THE NAME. — The type locality is situated in Skåne (Scania).

HOLOTYPE. — A carapace. No. LO 4881T in the type collection of the Department of Historical Geology and Palaeontology, University of Lund.

TYPE LOCALITY. — The Gantofta Brick Pit.

TYPE STRATUM. — Sample No. 19. Claystone, silty, dark-grey. The lower part of the *O. danica* Zone; lowermost Upper Sinemurian.

MATERIAL. — 41 complete carapaces in samples Nos. 19, 24, 25, 28, and 29.

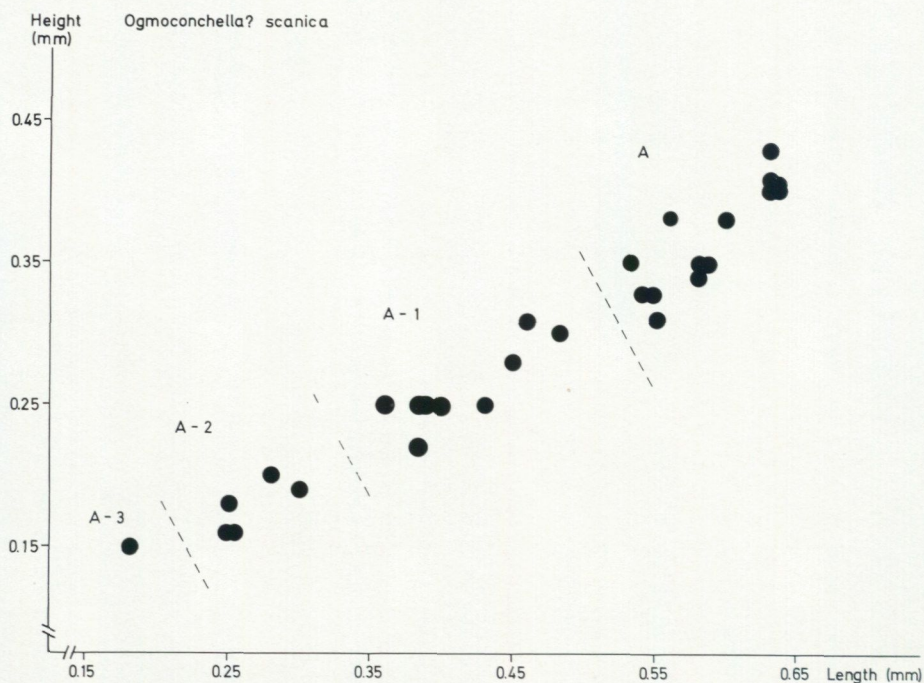
DIAGNOSIS. — A species of *Ogmoconchella?* Outline elongated in a lateral view. Anterior end well rounded and slightly extended. Posterior end well rounded ventrally and straight dorsally. External surface smooth.

DESCRIPTION. — In a lateral view, the outline is oval with the greatest height about two thirds of the length from the anterior end. The outline in a dorsal view is elongated, more rounded posteriorly than anteriorly and concave just behind the mid-point.

The dorsal margin is arched with a bend about two thirds of the length from the anterior end. The dorsal margin is straight from the bend to the rounded, somewhat elongated anterior margin. The posterior margin is ventrally rounded and dorsally straight. The ventral margin is straight on the left valve and slightly concave on the right valve. The left valve is larger than the right valve, which it overlaps along the ventral margin.

The internal features are not observed.

MEASUREMENTS AND STATISTICS (in mm). — The arithmetical means (\bar{x}), the standard deviations (s), the observed range of measurements (O. R.), the number of measured carapaces (N) and the growth factors (G) in sample No. 19 are



Text-fig. 7. Scatter diagram showing relations between numbers, lengths, and heights for *Ogmococonchella? scanica*. Sample No. 19.

shown below. Text-fig. 7 shows the relation between numbers, lengths, and heights.

Length:	A	A-1	A-2
O. R.	0.53—0.63	0.36—0.48	0.25—0.30
N	15	9	5
\bar{x}	0.58	0.41	0.26
s	3.9	4.5	2.6
G		1.41	1.57

Height:	A	A-1	A-2
O. R.	0.31—0.43	0.23—0.31	0.16—0.20
N	15	9	5
\bar{x}	0.37	0.26	0.17
s	3.3	2.5	1.8
G		1.42	1.52

REMARKS. — As the inner features are unknown, the form is only tentatively referred to the genus *Ogmococonchella*. Only complete carapaces are found in sample No. 19. Different instars (A-1, A-2, and A-3) are also recognized.

Order Myodocopida Sars, 1866
Suborder Cladocopina Sars, 1866
Family Polycopidae Sars, 1866
Genus *Polycope* Sars, 1866

Polycope cerasia Blake, 1876

Plate III, Fig. 34.

1876 *Polycope cerasia* Blake. — p. 434, Pl. 17, Fig. 16.

1975 *Polycope cerasia* Blake. — Michelsen, pp. 258—259, Pl. 39, Figs. 550—554 (inclusive synonymy through 1973).

MATERIAL. — 2 carapaces in samples Nos. 46 and 54.

ORIGINAL DIAGNOSIS. — "Carapace, circular, compressed, small, hinge-area small, ventral side with a produced lip; ornamentation, a series of fine ridges and pits running from back to front, bowing out in the centre; when seen transversely, it appears only irregularly pitted. The hingeline is straighter than in *P. orbicularis* (Sars)" (Blake 1876, p. 434).

DESCRIPTION. — See Lord 1971, p. 645.

REMARKS. — As mentioned by Michelsen (1975, p. 259) "the sculpture is a reticulation of rather sharp ribs forming a polygonal (often hexagonal) pattern".

DISTRIBUTION. — Lower Sinemurian to Upper Pliensbachian in Denmark (Michelsen 1975, p. 259), Hettangian to Toarcian in Germany (Fischer 1961, p. 500), Upper Hettangian to lower part of Lower Sinemurian in England (Lord 1971, p. 645), Upper Lotharingian to Pliensbachian in France (Viaud 1963). Recorded also from the Upper Carixian to Lower Domerian of France (Donze 1967, p. 73).

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APPENDIX

GANTOFTA BRICK PIT. UC 6325 0645 (UTM co-ordinates). Topographical map sheet 3 C Helsingborg SV. Geological map sheet Aa 74 Helsingborg.

Brick pit c. 100 m west of the main road between Vallåkra and Gantofta belonging to the Höganäs company. About 600 m south of Gantofta.

Stratigraphical range: Döshult Formation and Pankarp Formation (upper Lower Sinemurian — lower Upper Sinemurian).

References: Reymont 1951, pp. 208—209; Norling 1972, pp. 22—23; Börlau 1973, pp. 268—271.

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PLATES I—III

PLATE I

Figs. 1, 2. *Paracypris? redcarensis* (BLAKE 1876).

1. Carapace, right side. Sample No. 7. SEM X 124.
2. Carapace, dorsal view. Sample No. 7. SEM X 124.

Figs. 3, 4. *Acrocythere cf. gassumensis* MICHELSEN 1975.

3. Carapace, right side. Sample No. 13. SEM X 122.
4. Carapace, dorsal view. Sample No. 13. SEM X 143.

Figs. 5, 6. *Isobythocypris? sp. 4020* MICHELSEN 1975.

5. Carapace, right side. Sample No. 24. SEM X 127.
6. Carapace, dorsal view. Sample No. 24. SEM X 133.

Figs. 7—11. *Cristacythere betzi* (KLINGLER & NEUWEILER 1959).

7. Left valve, external view. Sample No. 34. SEM X 82.
8. Right valve, internal view. Sample No. 54. SEM X 70.
9. Right valve, external view. Sample No. 34. SEM X 118.
10. Carapace, dorsal view. Sample No. 1. SEM X 83.
11. Carapace, ventral view. Sample No. 1. SEM X 90.

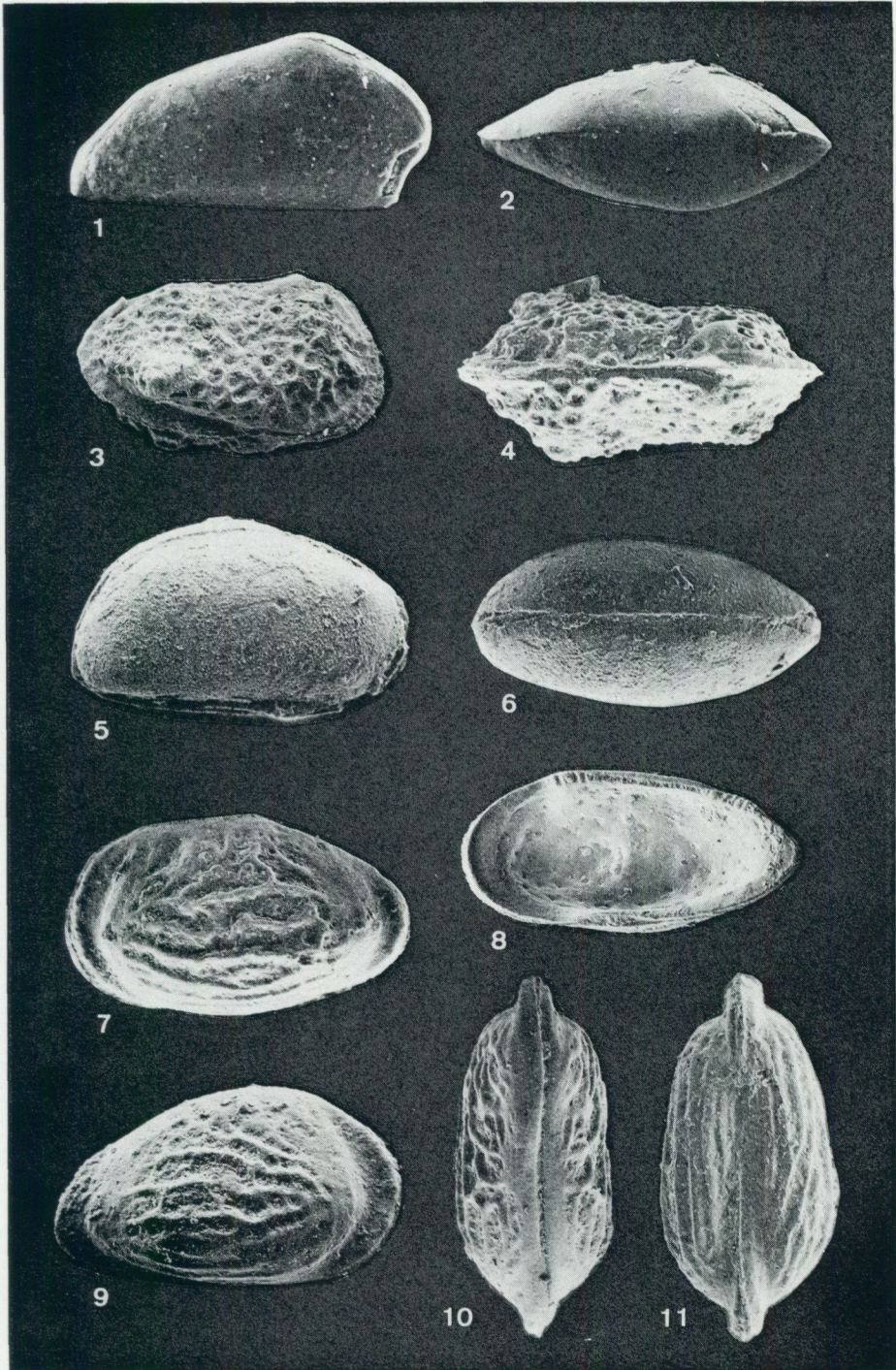


PLATE II

Fig. 12. *Nanacythere (Goniocythere) circumcostata* MICHELSEN 1975.
Right valve, external view. Sample No. 16. SEM X 147.

Figs. 13, 14, 17. *Kinkelinella (Klinglerella) multicostata* KLINGLER & NEUWEILER 1959).

13. Carapace, left side. Sample No. 32. SEM X 87.

14. Carapace, dorsal view. Sample No. 32. SEM X 84.

17. Carapace, ventral view. Sample No. 32. SEM X 88.

Figs. 15, 16, 18. *Kinkelinella (Klinglerella) foveolata* MICHELSEN 1975.

15. Carapace, male, left side. Sample No. 54. SEM X 65.

16. Carapace, female, dorsal view. Sample No. 53. SEM X 81.

18. Carapace, female, right side. Sample No. 54. SEM X 88.

Figs. 19, 22. *Cristacythere crassireticulata* MICHELSEN 1975.

19. Right valve, external view. Sample No. 7. SEM X 126.

22. Right valve, internal view. Detail with the muscle scar. Sample No. 7. SEM X 1200.

Figs. 20, 21. *Cristacythere betzi* (KLINGLER & NEUWEILER 1959).

20. Right valve, internal view. Sample No. 34. SEM X 101.

21. Right valve, internal view. Detail with the posterior part of the hinge. Sample No. 34.
SEM X 1017.

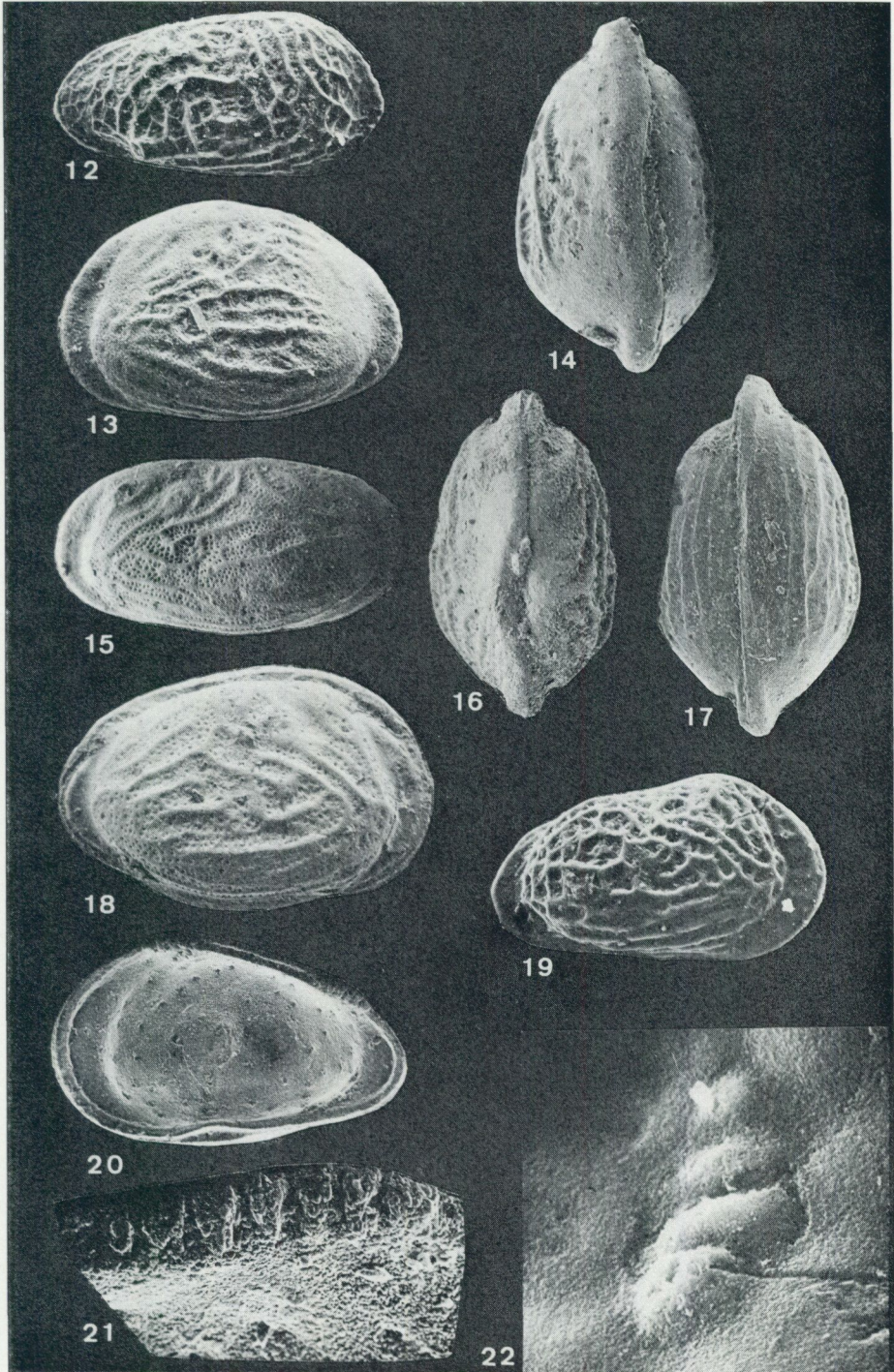


PLATE III

Fig. 23. *Kinkelinella?* (*Klinglerella?*) *multiforata* (KLINGLER & NEUWEILER 1959).
Left valve, external view. Sample No. 28. SEM X 103.

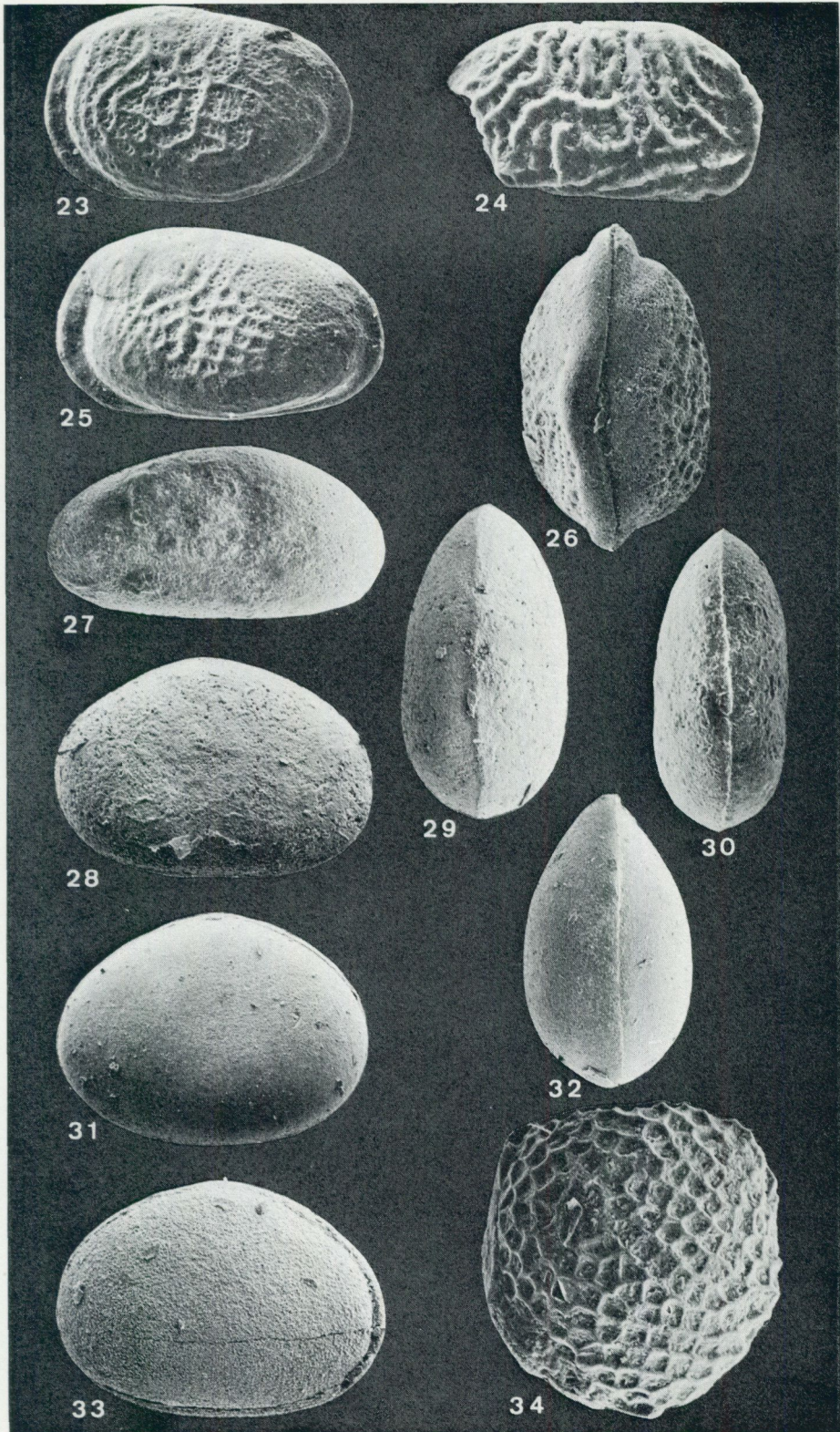
Fig. 24. *Nanacythere* (*Goniocythere*) *cf. minor* MICHELSEN 1975.
Right valve, external view. Sample No. 13. SEM X 144.

Figs. 25, 26. *Kinkelinella* (*Klinglerella*) *triebelsi* (KLINGLER & NEUWEILER 1959).
25. Right valve, external view. Sample No. 29. SEM X 77.
26. Carapace, dorsal view. Sample No. 35. SEM X 82.

Figs. 27–30. *Ogmoconchella?* *scanica* n. sp.
27. Carapace, left side. Holotype. Sample No. 19. SEM X 100.
28. Carapace, right side. Sample No. 24. SEM X 138.
29. Carapace, dorsal view. Sample No. 24. SEM X 135.
30. Carapace, dorsal view. Holotype. Sample No. 19. SEM X 113.

Figs. 31–33. *Ogmoconchella danica* MICHELSEN 1975.
31. Carapace, left side. Sample No. 30. SEM X 111.
32. Carapace, dorsal view. Sample No. 30. SEM X 123.
33. Carapace, right side. Sample No. 18. SEM X 97.

Fig. 34. *Polycopse cerasia* BLAKE 1876. Carapace, left side. Sample No. 54. SEM X 179.



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