OSTRACODA FROM THE SUTTERBY MARL (U. APTIAN) OF SOUTH LINCOLNSHIRE

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ABSTRACT. The ostracod fauna of the Sutterby Marl at its type locality is described and contrasted with faunas of other British Lower Cretaceous horizons. Twenty-five species and subspecies have been found, of which two species and two subspecies are considered new.

THE basal member of what Swinnerton (1935) has called the Langton Series is a marl which forms a prominent springline in the area around Spilsby. This, the Sutterby Marl, can be seen in the edge of a field near Sutterby (Grid. Ref. TF 726391) where ploughing has cut into a bluff formed by the overlying Carstone. The field has many specimens of the belemnite *Neohibolites ewaldi* scattered over it.

Whilst mapping the area in 1963, J. Newton-Smith, of Leicester University, dug a pit towards the bottom of the field and exposed a mottled yellow-brown marl containing many *N. ewaldi*. There was a line of phosphatic nodules towards the base. A stiff grey marl which underlay the nodules yielded no fossils, but the upper marls contained ostracoda when washed down. Samples were also obtained from a pit, higher up the field, dug in April 1964 by a party consisting of Newton-Smith, Kaye, Barker, and others. These later samples have produced the richest Aptian fauna yet found in Britain which is described below.

The original sample taken by Newton-Smith is equivalent to the lower of two samples collected in the later excavation. Twenty-five species and subspecies of ostracoda were recorded from the Sutterby Marl, of which two species and two subspecies are considered new.

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SYSTEMATIC DESCRIPTIONS

Order PODOCOPIDA
Suborder PODOCOPINA
Superfamily CYPRIDACEA
Family CYPRIDIDAE
Subfamily MACROCYPRIDINAE
Genus MACROCYPRIS Brady 1868

Macrocypris parva Kaye 1965*a*

1965*a* *Macrocypris parva* Kaye, p. 75, pl. 5, figs. 1, 2.

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Material. Three carapaces, BM Io 2712 from the Sutterby Marl, Sutterby, Lincs.

Remarks. The Sutterby findings extend the range of this species to the Upper Aptian. It has previously been recorded from the Hauterivian/Barremian of Speeton.

Family INCERTAE SEDIS
Genus KRAUSELLA Ulrich 1894

Krausella minuta Triebel 1936

Plate 48, figs. 12, 14

1936 *Krausella minuta* Triebel *in* Veen, p. 46, pl. 10, figs. 7–15.
1940 *Krausella minuta* Triebel; Bonnema, p. 115, pl. 3, figs. 32–34.
? 1946 *Krausella minuta* Triebel; Bold, p. 67, pl. 2, figs. 7*a*, *b*.

Material. Five carapaces and a single left valve from the Sutterby Marl, Sutterby, Lincs. BM Io 2694–6.

Measurements.

	Length	*Height*
Carapace Io 2694	0·50 mm.	0·30 mm.
Left valve Io 2695	0·45 mm.	0·28 mm.

Remarks. This small, distinctive species was first described by Triebel from the Lower Cretaceous of Germany, and later by Bonnema (1940) from the Upper Chalk. The valves are small and smooth with the left valve being much larger than the right. Hingement appears to be by simple overlap rather than by a definite tooth arrangement.

Family BAIRDIIDAE
Genus PONTOCYPRELLA Mandelstam 1956

Pontocyprella rara Kaye 1965*a*

Plate 49, figs. 6–12

1965*a* *Pontocyprella rara* Kaye, p. 74, pl. 5, fig. 14.

Material. Eighteen specimens from the upper sample and thirteen specimens from the lower sample BM Io 2662–9. Sutterby Marl, U. Aptian, Sutterby.

Measurements.

	Length	*Height*
L.V. Io 2662	0·85 mm.	0·45 mm.
R.V. Io 2665	0·85 mm.	0·40 mm.

Remarks. Pontocyprella rara has only been found before as a few specimens in the basal Lower Aptian (*bodei* zone) at Speeton, Yorkshire (Kaye 1965*a*). It is, however, one of the most abundant species in both of the Sutterby Marl samples. The Sutterby specimens are larger than the Speeton forms and the measurements of the latter approximate to those of the penultimate instars at Sutterby. Full details of the adults of the species can now therefore be given. The major distinguishing features are the median position of the greatest height and greatest width, and the angular posterior end. The ventral margin is straight in the left valves and concave in the right valves. The prolongation of the antero-dorsal margin so characteristic of the genus is well marked. Internally the most prominent features are the wide anterior and narrow posterior vestibules. Normal pore canals are small but rather abundant and well scattered over the lateral surface. The hinge consists of a long narrow bar in the right valves which

fit into a long smooth groove in the left valves. Above the bar in the right valve there is a narrow marginal shelf. The muscle scars form a small rosette below the centre of the valve. They consist of four scars, two elongate anterior scars with two oval scars, one postero-dorsal, and the other posterior of them.

Superfamily CYTHERACEA
Family CYTHERIDEIDAE
Subfamily SCHULERIDEINAE
Genus SCHULERIDEA Swartz and Swain 1946

Schuleridea derooi Damotte and Grosdidier 1963

Plate 49, figs. 16, 19–21

1963 *Schuleridea derooi* Damotte and Grosdidier, p. 154, pl. 1, figs. 4*a–i*.

Material. Thirty specimens from the Sutterby Marl, U. Aptian of Sutterby, BM Io 2673–7.

Remarks. This species is abundant throughout the Sutterby Marl and has been recorded from the Lower and Upper Aptian of the Isle of Wight and the Lower Aptian of the Paris Basin.

Genus DOLOCYTHERIDEA Triebel 1938

Dolocytheridea minuta Kaye 1963

Plate 48, figs. 15–17

1963*c* *Dolocytheridea minuta* Kaye, p. 34, pl. 1, figs. 4–5.
1965*b* *Dolocytheridea minuta* Kaye; Kaye, p. 37.

Material. Six specimens from the lower sample, Sutterby Marl, Sutterby BM Io 2697–9.

Remarks. This species though originally described from the Upper Hauterivian and Lower Barremian at Speeton has also been recorded from the Lower and Upper Aptian of the Isle of Wight and the Lower Aptian of the Paris Basin. It also occurs quite abundantly in the Gault Clay, Middle and Upper Albian, of southern England.

Family CYTHERURIDAE
Genus CYTHERURA Sars 1866

Cytherura reticulosa (Chapman 1894)

1894 *Cytheropteron reticulosum* Chapman, p. 692, pl. 33, figs. 6*a–c*.
1964*b* *Cytherura reticulosa* (Chapman); Kaye, p. 318, pl. 55, figs. 7, 9.

Remarks. This form occurs only rarely at Sutterby but is one of the most characteristic species of lower horizons in the Lincolnshire Lower Cretaceous.

Genus DOLOCYTHERE Mertens 1956

Dolocythere rara Mertens 1956

1956 *Dolocythere rara* Mertens, p. 192, pl. 10, figs. 33–37; pl. 13, figs. 91–93.
1964*b* *Dolocythere rara* Mertens; Kaye, p. 322, pl. 55, figs. 12, 14, 15.

Remarks. This species occurs rarely in the upper sample of the Sutterby Marl.

Genus ACROCYTHERE Neale 1960

Acrocythere hauteriviana (Bartenstein) 1956

1956 *Orthonotacythere hauteriviana* Bartenstein, p. 532, pl. 3, figs. 80, 81.
1960 *Acrocythere hauteriviana* Bartenstein; Neale, p. 213, pl. 3, figs. 7*a–b*, pl. 4, figs. 10, 14.

Remarks. A. hauteriviana has only been found rarely in the Sutterby Marl. It is extremely abundant at lower horizons in the 'Boreal' Lower Cretaceous of northern England.

Genus EUCYTHERURA Muller 1894

Eucytherura ornata Kaye 1964*a*

Plate 48, fig. 11

1964*a* *Eucytherura ornata* Kaye, p. 100, pl. 4, figs. 11–12.

Material. Two valves BM Io 2692–3 from the lower sample, Sutterby Marl, Sutterby, Lincs.

Measurements.

	Length	*Height*
L.V. Io 2692	0·32 mm.	0·17 mm.
R.V. Io 2693	0·32 mm.	0·17 mm.

Remarks. This species was only represented before by a single valve from the Barremian at Speeton. Its highly distinctive ornament is not comparable to any other species of this, or related, genera.

Genus CYTHEROPTERON Sars 1866
Subgenus CYTHEROPTERON Sars 1866

Cytheropteron (*C.*) cf. *inaequivalve* Bonnema 1941

Plate 48, figs. 8–10, 13

1941 *Cytheropteron inaequivalve* Bonnema, p. 27, pl. 6, figs. 24–28.

EXPLANATION OF PLATE 48

All figs. × 66.

Figs. 1–4. *Cytheropteron* (*Infracytheropteron*) *lindumensis* sp. nov. 1. L.V. (Holotype) lateral view, Io 2678. 2. R.V. (Paratype) lateral view, Io 2679. 3. R.V. (Paratype) lateral view, Io 2680. 4. L.V. (Paratype) lateral view, Io 2681.

Figs. 5, 7. *Cytheropteron* (*Eocytheropteron*) *nova reticulata* ssp. nov. 5. R.V. (Paratype) lateral view, Io 2683. 7. L.V. (Holotype) lateral view, Io 2684.

Fig. 6. *Cytheropteron* (*C.*) *rugosa* Kaye. 6. R.V. lateral view, Io 2686.

Figs. 8–10, 13. *Cytheropteron* (*C.*) *inaequivalve* Bonnema. 8. R.V. lateral view, Io 2687. 9. L.V. lateral view, Io 2688. 10. L.V. lateral view, Io 2689. 13. Carapace dorsal view, Io 2690.

Fig. 11. *Eucytherura ornata* Kaye. 11. L.V. lateral view, Io 2692.

Figs. 12, 14. *Krausella minuta* Triebel. 12. Carapace from right, Io 2694. 14. L.V. internal view, Io 2695.

Figs. 15–17. *Dolocytheridea minuta* Kaye. 15. L.V. lateral view, Io 2697. 16. R.V. lateral view, Io 2698. 17. L.V. internal view, Io 2699.

Figs. 18–22. *Orthonotacythere inversa tuberculata* Kaye. 18. R.V. lateral view, Io 2701. 19. L.V. lateral view, Io 2702. 20. L.V. lateral view, Io 2703. 21. L.V. internal view, Io 2704. 22. R.V. lateral view, Io 2705.

Figs. 23–25. ?*Stillina* cf. *fluitans* Bonnema. 23. L.V. lateral view, Io 2707. 24. L.V. lateral view, Io 2708. 25. R.V. lateral view, Io 2709.

Material. Eleven valves and one carapace BM Io 2687–91 from the Sutterby Marl, Sutterby, Lincs.

Measurements.

	Length	*Height*
L.V. Io 2688	0·37 mm.	0·23 mm.
R.V. Io 2687	0·37 mm.	0·23 mm.

Description. Valves small, elongate; dorsal margin arched in left valves but with weak cardinal angles in the right valves. Anterior margin broadly rounded, posterior margin angled at mid-height. A broad-based ventral alate expansion occurs directed posteriorly and tipped with a small spine. Lateral surface smooth. Duplicature moderately broad, crossed by few thick, straight radial pore canals. Normal pore canals not abundant, well scattered. Hinge crenulate, merodont.

Remarks. The Sutterby specimens are almost identical to the Chalk form *C. inaequivalve* Bonnema (1941) differing in the broad base of the alae. This feature gives the alae a more triangular appearance when viewed dorsally. *C.* (*C.*) *inaequivalve* differs from *C. v.-scriptum* Veen (1936), *C. nannisimum* Damotte and Grosdidier (1963), *C. reightonensis* Kaye (1964*a*) and other Cretaceous species in the lack of surface ornament and the type of alae.

Cytheropteron (*C.*) *rugosa* Kaye 1965*b*

Plate 48, fig. 6

1965*b* *Cytheropteron* (*C.*) *rugosa* Kaye, p. 38, pl. 8, figs. 4–5.

Material. One right valve BM Io 2686 from the upper sample, Sutterby Marl, U. Aptian, Lincs.

Remarks. This species is abundant in the Upper Aptian of the Isle of Wight and the Hauterivian and Barremian of Lincolnshire. The Sutterby specimen is identical in all its features.

Subgenus EOCYTHEROPTERON Alexander 1933

Cytheropteron (*Eocytheropteron*) *nova* Kaye 1964*a* ssp. *reticulata* ssp. nov.

Plate 48, figs. 5, 7

Holotype. A left valve BM Io 2684 from the Sutterby Marl, U. Aptian, Sutterby, Lincs.

Paratypes. Six specimens BM Io 2683–5 from the same sample.

Diagnosis. A subspecies of *C.* (*Eo.*) *nova* Kaye with a row of prominent square reticulations along the crest of the alae.

Measurements.

	Length	*Height*
L.V. Io 2684 (holotype)	0·62 mm.	0·37 mm.
R.V. Io 2683 (paratype)	0·62 mm.	0·37 mm.

Description. This subspecies is almost identical with *C.* (*Eo.*) *nova* s.str. from the Hauterivian and Barremian at Speeton (Kaye 1964*a*) differing principally in having a prominent row of large square reticulations along the crest of the ventral alate expansion. The Sutterby subspecies is a little larger and has the alate expansion rather more drawn out and not quite as symmetrically rounded. They are almost certainly derived from *C.* (*Eo.*) *nova* s.s.

Subgenus INFRACYTHEROPTERON Kaye 1964

Cytheropteron (*Infracytheropteron*) *exquisita* Kaye 1964

1964*a* *Cytheropteron* (*Infracytheropteron*) *exquisita* Kaye, p. 105, pl. 5, figs. 9–10.

Material. Two carapaces BM Io 2711 from the Sutterby Marl, Sutterby, Lincs.

Cytheropteron (*Infracytheropteron*) *lindumensis* sp. nov.

Plate 48, figs. 1–4

Holotype. A left valve BM Io 2678 from the Upper Aptian, Sutterby Marl, Sutterby, Lincs.

Paratypes. Six adult valves and one juvenile BM Io 2679–81 from the same sample.

Diagnosis. A small smooth species of *Cytheropteron* (*Infracytheropteron*) with a strongly arched dorsal margin in the right valve and an asymmetrical lateral alate expansion.

Measurements.

	Length	*Height*
Holotype L.V. Io 2678	0·41 mm.	0·25 mm.
Paratype R.V. Io 2679	0·42 mm.	0·25 mm.

Description. Valves small, laterally compressed. Dorsal margin strongly arched in the right valves, weakly arched in the left valves. Greatest height at one-third length. Anterior margin broadly rounded, posterior margin angled at mid height. Lateral surface smooth, inflated with an alate expansion ventro-laterally. No median sulcus. Alate expansion low, asymmetrical, and weakly directed postero-ventrally. Ventral surface smooth. Duplicature fairly broad, crossed by few straight thick radial pore canals, six anteriorly, three posteriorly. Normal pore canals not abundant, concentrated along the crest of the ala. The hinge in the left valve consists of a broad marginal bar which fits into a prominent open-ended furrow in the right valve. Above the median furrow in the right valve is a strong curved marginal bar which fits above the bar of the left valve. The median bar of the left valve has terminal gaps to accommodate the margin of the right valve.

Remarks. This species differs from the only other member of the subgenus, *C.* (*I.*) *exquisita* Kaye (1964*a*), in being larger and having a smooth lateral surface. The hinge, inflation, shape of the dorsal margin and relative inflation of the lateral surface above the alae are the easiest distinguishing features of the species from members of related subgenera.

Genus STILLINA Laurencich 1957

? *Stillina* cf. *fluitans* (Bonnema) 1941

Plate 48, figs. 23–25

1941 *Cytheropteron fluitans* Bonnema, p. 27, pl. 6, figs. 29–36.

Material. Eleven somewhat fragmentary valves BM Io 2707–9 from the Sutterby Marl, Sutterby, Lincs.

Measurements.

	Length	*Height*
L.V. Io 2707	0·42 mm.	0·22 mm.

Description. This small highly distinctive species has previously only been recorded from

the Upper Chalk but one of us (P.K.) has found it abundantly throughout the Gault Clay (M. and U. Albian) of southern England.

The valves are very strongly compressed laterally and have a spine-like ventral ala. Posterior to the ala there is a prominent spine lying somewhat beyond the inflated area on the valve margin. It tends to be directed ventrally rather than ventro-laterally as in the case of the ala. The posterior is drawn out into a long upturned caudal process; the anterior margin is strongly denticulate.

The duplicature is broad and crossed by few straight radial pore canals. There is in most Chalk and Albian specimens a prominent eye tubercle and keel-like ridge along the dorsal margin. These features tend to be absent in the Aptian specimens and in certain specimens from the higher horizons but may be a dimorphic characteristic. The hinge is merodont to weakly amphidont in the Aptian specimens but is more strongly amphidont in later forms. The anterior tooth in the right valve is knob-like whilst the median elements are not strongly divided. Though the external features are identical the hinge differs from that of true *Stillina*. As, however, the specimens do not fit into any other described genus they are left tentatively in that genus. Fuller description of the more abundant Albian material may finally resolve the difficulties.

Genus ORTHONOTACYTHERE Alexander 1933

Orthonotacythere inversa tuberculata Kaye 1963

Plate 48, figs. 18–22

1963*e* *Orthonotacythere inversa tuberculata* Kaye, p. 436, pl. 61, figs. 11, 15, 16.

Material. Fifteen specimens from the Sutterby Marl, U. Aptian, Sutterby. BM Io 2701–6.

Remarks. This form is the youngest member of a morphological sequence of subspecies of *Orthonotacythere inversa* (Cornuel) 1846 found in the Speeton clay. It occurs in the Upper Barremian at Speeton and its range is extended by the Sutterby findings into the Upper Aptian. The dominant ornamental features of the subspecies are the pronounced ventral longitudinal ribbing and tuberculation, differing from the other subspecies of *O. inversa* in the lack of vertical costation on the lateral surface. *O. inversa tuberculata* differs from the species of *Orthonotacythere* found in the Aptian of the Isle of Wight such as *O. atypica* Kaye (1965*b*) and *O. catalaunica* Damotte and Grosdidier (1963) in details of the ornament, particularly the costation.

Orthonotacythere sp. B

Plate 49, figs. 17, 18

Material. Six valves and fragments from the Sutterby Marl, Upper Aptian, at Sutterby, Lincs. BM. Io 2670–2.

Measurements.	*Length*	*Height*
L.V. Io 2670	at least 0·70 mm.	0·45 mm.

Description. A species of *Orthonotacythere* with a deep vertical median sulcus and a pronounced ventral longitudinal ridge. The valves are rather large and are devoid of reticulation. A weak swelling occurs in the antero-dorsal region, probably representing

the eye tubercle and associated tubercle but the rest of the lateral surface is smooth. The ventral longitudinal ridge is high and keel-like. It is ventrally arcuate and is thickened in places giving a somewhat fluted effect. It is not tuberculate. Two short, slightly oblique longitudinal ridges run below the major rib on the ventral undersurface. The internal features are identical to other members of the genus.

Remarks. This species though represented by few generally broken specimens and therefore not completely described or named is undoubtedly distinct. It shows considerable similarities to *O. inornata* Kaye (1965*b*) from the Upper Aptian of the Isle of Wight but differs in the keel-like nature of the ventral rib and the antero-dorsal tuberculation. The lack of reticulation and poor tuberculation distinguish it from all other described species of the genus.

Family BYTHOCYTHERIDAE
Genus MONOCERATINA Roth 1928

Monoceratina tricuspidata (Jones and Hinde) 1890

Plate 48, fig. 13

1890 *Cytheropteron cuspidatum tricuspidata* Jones and Hinde, p. 38, pl. 3, figs. 6, 7.
1936 *Monoceratina tricuspidata* (Jones and Hinde); Veen, pp. 42, 43, pl. 2, figs. 4–11.
1940 *Monoceratina tricuspidata* (Jones and Hinde); Bonnema, p. 40, pl. 6, figs. 77–80.
1941 *Monoceratina tricuspidata* (Jones and Hinde); Triebel, p. 353.
1964*c* *Monoceratina tricuspidata* (Jones and Hinde); Kaye, p. 56, pl. 3, figs. 7, 8.

Material. Eight specimens and fragments from the Sutterby Marl, U. Aptian, Sutterby, Lincs. BM Io 2657–8.

Measurements.	*Length*	*Height*
R.V. Io 2657	0·62 mm.	0·27 mm.

Remarks. This species has previously been recorded only from the Upper Chalk and its range is therefore considerably extended. One of us (P.K.) has, however, specimens of this species from the Cambridge Greensand (U. Albian) in his collections. The Sutterby specimens match the ornament and other features of the Chalk forms exactly.

EXPLANATION OF PLATE 49

All figs. × 50.

Figs. 1–5. *Protocythere mertensi langtonensis* ssp. nov. 1. L.V. (Holotype) lateral view, Io 2651. 2. Carapace (Paratype) dorsal view, Io 2652. 3. L.V. (Paratype) lateral view, Io 2653. 4. R.V. (Paratype) lateral view, Io 2654. 5. L.V. (Paratype) internal view, Io 2655.

Figs. 6–12. *Pontocyprella rara* Kaye. 6. L.V. lateral view, Io 2662. 7. Carapace dorsal view, Io 2663. 8. L.V. lateral view, Io 2664. 9. R.V. lateral view, Io 2665. 10. R.V. lateral view, Io 2666. 11. R.V. internal view, Io 2667. 12. L.V. internal view, Io 2668.

Fig. 13. *Monoceratine tricuspidata* (Jones and Hinde). 13. R.V. lateral view, Io 2657.

Figs. 14, 15. *Neocythere* (*Physocythere*) cf. *bordeti* Damotte and Grosdidier. 14. L.V. lateral view, Io 2659. 15. R.V. lateral view, Io 2660.

Figs. 16, 19–21. *Schuleridea derooi* Damotte and Grosdidier. 16. Female R.V. lateral view, Io 2673. 19. Male R.V. lateral view, Io 2674. 20. Female L.V. lateral view, Io 2675. 21. Male L.V. lateral view, Io 2676.

Figs. 17, 18. *Orthonotacythere sp. B.* 17. R.V. lateral view, Io 2670. 18. R.V. lateral view, Io 2671.

Family PROGONOCYTHERIDAE
Subfamily PROGONOCYTHERINAE
Genus NEOCYTHERE Mertens 1956
Subgenus PHYSOCYTHERE Kaye 1963*a*

Neocythere (*Physocythere*) cf. *bordeti* (Damotte and Grosdidier) 1963

Plate 49, figs. 14, 15

1963 *Centrocythere bordeti* Damotte and Grosdidier, pp. 156–7, pl. 2, figs. 8*a–h*.

Material. Fifteen specimens from the Sutterby Marl, U. Aptian, Sutterby, Lincs. BM Io 2659–61.

Measurements.	*Length*	*Height*
Male L.V. BM Io 2659	0·57 mm.	0·35 mm.

Remarks. The Sutterby specimens agree well with Damotte and Grosdidier (1963) forms from the Lower Aptian of the Paris Basin in all details but hingement. The latter authors state that the species has a characteristic *Centrocythere* type hinge which from Mertens's (1956) description of the type species should be amphidont with a high step-like anterior tooth and a divided posterior tooth separated by a weakly crenulate furrow in the right valves, a broad accommodation groove being present above the median element in the left valves.

In the Sutterby specimens the hinge is merodont with a strongly crenulate median element in the left valve and a wide marginal shelf. The anterior and posterior teeth in the right valve are both strongly subdivided. On this basis the specimens fall better within the subgenus *Physocythere* than in *Centrocythere*.

Subfamily PROTOCYTHERINAE
Genus PROTOCYTHERE Triebel 1938

Protocythere derooi Oertli 1958

Plate 50, figs. 6, 8, 9, 11

1958 *Protocythere derooi* Oertli, p. 1509, pl. 6, figs. 129–43.
1965*b* *Protocythere derooi* Oertli; Kaye, p. 44, pl. 6, fig. 10.

Material. Six specimens from the lower sample, Sutterby Marl, U. Aptian, Sutterby, Lincs. BM Io 2637–41.

Measurements.	*Length*	*Height*
Female L.V. Io 2633	0·67 mm.	0·39 mm.
Female R.V. Io 2632	0·61 mm.	0·33 mm.

Remarks. This species, first recorded from the Upper Aptian of SE. France, has also been found in the Upper Aptian of the Isle of Wight. Its most diagnostic feature is the cross-rib joining the median and dorsal longitudinal ribs posteriorly.

Protocythere mertensi Kaye 1963*d* ssp. *langtonensis* ssp. nov.

Plate 49, figs. 1–5

Holotype. A left valve BM Io 2651 from the upper sample of the Sutterby Marl, Sutterby, Lincs.

Paratypes. Seven valves and one carapace BM Io 2652–6 from the same sample.

Diagnosis. A subspecies of *Protocythere mertensi* being much smaller in size and having a less well developed muscle node than the species sensu stricto.

Measurements.

	Length	*Height*
L.V. Holotype Io 2651	0·75 mm.	0·42 mm.
R.V. Paratype Io 2654	0·73 mm.	0·35 mm.

Description. The specimens of this subspecies are closely similar to *P. mertensi* s.s. Kaye (1963*d*) but are smaller and differ in minor features of the ornament. The muscle node is poorly developed in *P. mertensi langtonensis* whilst the reticulate ornament runs uninterrupted across the crests of the longitudinal ribs. The ventral rib is less inflated and the ventral margin is longer and straighter than in *P. mertensi* s.s. The dorsal rib is also less convex and the eye tubercle less well developed than in the latter subspecies.

Internally the major difference is the small number of radial pore canals (8–9 anteriorly) in *P. mertensi langtonensis* compared with the large number (twenty anteriorly) characteristic of *P. mertensi* s.s.

Remarks. This species is obviously very closely related to *P. mertensi* s.s. which occurs in the Lower Albian (*ewaldi* Marl) at Speeton and is presumably ancestral to it.

It is also closely similar to the Apto/Albian form *P. gaultina* Kaye (1963*d*) but lacks the characteristic anterior marginal ridge. From *P. tricostata* Triebel (1940) it differs in the smaller size and in the junction of the median and ventral ridges anteriorly.

Family TRACHYLEBERIDIDAE
Subfamily TRACHYLEBERIDINAE
Genus CYTHEREIS Jones 1849

Cythereis bekumensis Triebel 1940

Plate 50, figs. 13–16

1940 *Cythereis bekumensis* Triebel, p. 188, pl. 4, figs. 45–46, pl. 10, fig. 107.
non 1956 *Cythereis* aff. *bekumensis* Triebel; Deroo, p. 1518, pl. 4, fig. 58.

Material. Six specimens BM Io 2646–50 from the lower sample, Sutterby Marl, Sutterby, Lincs.

Measurements.

	Length	*Height*
Male L.V. Io 2649	0·95 mm.	0·50 mm.
Female L.V. Io 2648	0·87 mm.	0·50 mm.
Female R.V. Io 2646	0·87 mm.	0·46 mm.

EXPLANATION OF PLATE 50

All figs. × 50.

Figs. 1–5, 7. *Cythereis sutterbyensis* sp. nov. 1. Male L.V. (Holotype) lateral view, Io 2630. 2. Male R.V. (Paratype) lateral view, Io 2631. 3. Female R.V. (Paratype) lateral view, Io 2632. 4. Female L.V. (Paratype) lateral view, Io 2633. 5. Male R.V. (Paratype) internal view, Io 2634. 7. Male L.V. (Paratype) internal view, Io 2635.

Figs. 6, 8, 9, 11. *Protocythere derooi* Oertli. 6. L.V. lateral view, Io 2637. 8. L.V. lateral view, Io 2638. 9. R.V. lateral view, Io 2639. 11. R.V. lateral view, Io 2640.

Fig. 10. *Cytherella ovata* (Roemer). 10. R.V. lateral view, Io 2642.

Fig. 12. *Cytherelloidea* cf. *ovata* Weber. 12. R.V. lateral view, Io 2644.

Figs. 13–16. *Cythereis bekumensis* Triebel. 13. R.V. lateral view, Io 2646. 14. R.V. lateral view, Io 2647. 15. L.V. lateral view, Io 2648. 16. L.V. lateral view, Io 2649.

Remarks. The major distinguishing features of this species are the strong lateral compression, the prominent muscle node and short weak median rib. The intercostal areas are weakly reticulate whilst the anterior marginal rib is well marked. The dorsal and ventral longitudinal ribs are keel-like, but postero-ventral inflation is very weak.

C. bekumensis is similar to *C. bartensteini* Oertli (1958) but is larger and less inflated and not as strongly ornamented. It differs from *C. geometrica* s.s. Damotte and Grosdidier (1963) in being larger, reticulate, and having the ribs keel-like rather than rounded.

Cythereis sutterbyensis sp. nov.

Plate 50, figs. 1–5, 7

Holotype. A male left valve BM Io 2630 from the upper sample, Sutterby Marl, U. Aptian, Sutterby, Lincs.

Paratypes. Five valves and one carapace BM Io 2631–6 from the same sample.

Diagnosis. A large species of *Cythereis* with heavily calcified valves. Median rib short, spined, separated from the prominent muscle node. Lateral surface weakly reticulate.

Measurements.

	Length	*Height*
Holotype male L.V. Io 2630	1·12 mm.	0·60 mm.
Paratype female L.V. Io 2633	1·05 mm.	0·64 mm.
Paratype male R.V. Io 2634	1·07 mm.	0·59 mm.
Paratype female R.V. Io 2632	1·00 mm.	0·59 mm.

Description. Valves large, very strongly built. Dorsal and ventral margins straight converging posteriorly. Cardinal angles well marked, greatest height at a quarter length. Anterior margin broadly rounded; posterior triangular, angled ventrally. Lateral surface moderately inflated and weakly reticulate. Dorsal and ventral ridges prominent and wrinkled. Median ridge very short with a series of spines on its crest, separated anteriorly from the high, ridged muscle node. Anterior and posterior marginal ridges well marked and bearing small tubercles. Eye tubercle prominent, anterior margin denticulate.

Interior of valves characteristic of genus. Hinge strongly developed, terminal teeth in right valve, high with subdivisions on crest.

Remarks. The most obvious characteristics of this species are its large size and strong build. It is closest in arrangement of the ornament to *C. geometrica fittoni* Kaye (1965*b*) differing principally in the greater prominence of the ribs and reticulation.

Suborder PLATYCOPINA
Family CYTHERELLIDAE
Genus CYTHERELLA Jones 1849

Cytherella ovata (Roemer) 1840

Plate 50, fig. 10

1840 *Cytherina ovata* Roemer, p. 104, pl. 16, fig. 21.
1849 *Cytherella ovata* (Roemer); Jones, p. 28, pl. 7, figs. 24*a–g*.
1890 *Cytherella ovata* (Roemer); Jones and Hinde, p. 44, pl. 3, figs. 48–54.
1956 *Cytherella ovata* (Roemer); Deroo, pp. 1508, 1523, pl. 1, figs. 4–6.
1958 *Cytherella ovata* (Roemer); Oertli, p. 1502, pl. 1, figs. 10–29.

Material. Twenty-three specimens from the lower sample, Sutterby Marl, Sutterby, Lincs. BM Io 2642–3.

Measurements.

	Length	*Height*
R.V. Io 2642	0·90 mm.	0·57 mm.

Remarks. This well-known Aptian/Albian species is particularly abundant in the lower sample at Sutterby but is rather rare in the upper one. The specimens correspond exactly with those found in the Albian both at Speeton and in southern England.

Genus CYTHERELLOIDEA Alexander 1929

Cytherelloidea cf. *ovata* Weber 1934

Plate 50, fig. 12

1963*b* *Cytherelloidea* cf. *ovata* Weber; Kaye, p. 116.

Material. Two pre-adult specimens from the upper sample, Sutterby Marl. BM Io 2644–5.

Remarks. These two juvenile specimens are undoubtedly identical to the forms described as *C.* cf. *ovata* from the basal Aptian at Speeton. They have a weaker dorsal rib, and a more arcuate median rib than true *C. ovata* Weber (1934) and also have the ventral rib poorly connected posteriorly.

CONCLUSIONS

The Sutterby Marl is quite rich in ostracoda, twenty-five species and subspecies being represented. Twenty of these species have been recorded in the Cretaceous elsewhere in the British Isles, two species and two subspecies being new, one species being left unnamed. The Sutterby fauna is closely similar to the pre-Aptian 'Boreal province' faunas found at Speeton, Yorkshire and from Lincolnshire. Of the twenty known species in the Sutterby Marl, twelve are known from these 'Boreal' pre-Aptian deposits. Similarities to the top Barremian and basal Aptian faunas at Speeton are very close with characteristic species such as *O. inversa tuberculata* and *Pontocyprella rara* being particularly well represented. A correlation between faunas in the 'Boreal' province is only to be expected but more striking is the dissimilarity between the fauna of the Sutterby Marl and the *ewaldi* Marl (L. Albian at Speeton). No species are common to these two units which have been regarded as equivalent by previous authors. Geographical considerations could perhaps account for this but the close similarities between the Sutterby and earlier Speeton faunas seems to discount it. Ecological differences are possible but again unlikely between two very similar clay horizons. A time as well as space difference seems the most likely explanation plus perhaps uplift along the Market Weighton axis in Aptian times (see Kaye 1964*d*).

Though having essentially a 'Boreal' fauna the Sutterby Marl shows some similarities to the Aptian of southern England. Eight species recorded at Sutterby are also present in the U. Aptian of southern England; three of these being found in the Bargate Beds near Guildford and six in the Upper Aptian of the Isle of Wight.

These similarities add weight to the theory of connexion of the 'Tethyan' and 'Boreal' seas during the Aptian through the English Midlands (Kaye 1964*b*, 1965*b*). The three species common to the Sutterby Marl and Bargate Beds of Surrey, *Cytherura reticulosa*

(Chapman), *Dolocythere rara* Mertens, and *Acrocythere hauteriviana* (Bartenstein) are all well-known 'Boreal' forms and seem to indicate a southward migration in Upper Aptian times. The Isle of Wight Aptian has six species in common with the Sutterby Marl. The three species found in the Lower Aptian are also found in the Upper Aptian in the island and there is therefore no evidence of a Lower Aptian connexion of the two seas. Three of the six U. Aptian species, common to both the Isle of Wight and Sutterby: i.e. *Schuleridea derooi*, *Neocythere* (*Ph.*) *bordeti*, and *Protocythere derooi*, are 'Tethyan' forms well known from the Aptian of the Paris Basin and indicate northward migration whilst the remaining three species *Dolocytheridea minuta*, *Dolocythere rara*, and *Cytheropteron* (*C.*) *rugosa* are 'Boreal' species and indicate southward migration. *Dolocytheridea minuta* is somewhat anomalous for though being a characteristic Hauterivian and Barremian 'Boreal' form it is also known from the Lower Aptian of the Isle of Wight and the Paris Basin. Some migration route must therefore have been open to it in Lower Aptian times, presumably through S. Germany. Interchange of species does seem conclusive in the Upper Aptian but full mixing of the faunas is not likely, only a few forms having penetrated from one province to another. Ecological considerations and relative competition can perhaps account for this.

The Sutterby fauna does not persist into the Gault seas, only five Sutterby species being found in the Albian. Five species are also common to the Sutterby Marl and the Chalk. Three of these species *Cytheropteron* (*C.*) *inaequivalve*, ?*Stillina* cf. *fluitans* and *Monoceratina tricuspidata* are characteristic Chalk forms though the latter two have been recently found by one of the authors (Kaye) in the Gault clay. This great extension of the range of these species is rather striking but the alate nature of all three may point to some ecological factor. Alate or ventrally expanded species are very common in the Sutterby Marl, with members of genera such as *Cytheropteron*, *Monoceratina*, *Orthonotacythere*, and *Cythereis* being particularly prominent. They also form a large proportion of Chalk ostracod fauna.

Slight differences do occur between the two samples taken in the Sutterby Marl. The upper sample is richer in species and numbers than the lower one and in general most of the species found rarely in the lower one are more abundant in the upper one. The most distinctive differences between the two samples are the great abundance of *Cytherella ovata* in the lower sample when it is rare in the upper sample and also the absence of *Cythereis bekumensis* and *Protocythere derooi* from the upper sample. The latter two species seem to be replaced at the higher horizon by *Cythereis sutterbyensis* and *Protocythere mertensi langtonensis* which are absent from the lower sample.

Correlation of the Sutterby Marl with other Cretaceous horizons in Britain is difficult and its exact zonal horizon is not clear. The bulk of the Marl is Upper Aptian whilst the phosphate nodule bed contains ammonites indicating many Lower Aptian horizons (Casey 1961, pp. 570–1). The Marls above contain ammonites of the genus *Colombiceras*, only known elsewhere in this country from the Aptian of Upware which is itself of questionable horizon. It is likely that the basal Upper Aptian in southern England is the time equivalent of the Sutterby but the difference in lithology and difference in faunal province make exact correlation difficult. The Aptian in Yorkshire is very thin and the greatest similarities are between the Sutterby Marl and the pre-Aptian (plus basal Aptian *bodei* zone) at Speeton, rather than with the *ewaldi* Marl. The latter deposit has, however, only proved fossiliferous in its upper few feet where a lower Albian microfauna quite

SPECIES	UPPER APTIAN SUTTERBY, LINCS	UPPER APTIAN SURREY	LOWER APTIAN ISLE OF WIGHT	UPPER APTIAN ISLE OF WIGHT	PRE APTIAN N. ENGLAND	ALBIAN ENGLAND	POST ALBIAN BRITISH ISLES
Cytherella ovata (Roemer)	X					X	X
Cytherelloidea cf. ovata Weber	X				X		
Macrocypris parva Kaye	X				X		
Pontocyprella rara Kaye	X				X		
Krausella minuta Triebel	X				X		X
Schulerídea derooi D.&G.	X		X	X			
Dolocytheridea minuta Kaye	X		X	X	X	X	
Cytherura reticulosa (Chapman)	X	X			X		
Eucytherura ornata Kaye	X				X		
Cytheropteron (C) inaequivalve Bonnema	X						X
Cytheropteron (C) rugosa Kaye	X			X	X		
C. (Eocytheropteron) nova reticulata sp.nov.	X						
C.(Infracytheropteron) exquisita Kaye	X				X		
C.(Infracytheropteron) lindumensis sp.nov.	X						
? Stillina cf. fluitans Bonnema	X					X	X
Dolocythere rara Mertens	X	X		X		X	
O. inversa tuberculata Kaye	X				X		
Orthonotacythere sp. B	X						
Monoceratina tricuspidata (Jones & Hinde)	X					X	X
Neocythere (Ph.) cf. bordeti (D.&G)	X		X	X			
Acrocythere hauteriviana (Bartenstein)	X	X			X		
Protocythere derooi Oertli	X			X			
Protocythere mertensi langtonensis sp.nov.	X						
Cythereis bekumensis Triebel	X				X		
Cythereis sutterbyensis sp. nov.	X						

Known distribution of species of Ostracoda found in the Sutterby Marl

TEXT-FIG. 1.

unlike the Sutterby one is found. The Sutterby Marl is, therefore, either absent at Speeton or represented in the barren lower layer of the *ewaldi* Marl. *Neohibolites ewaldi* though giving its name to the lithological unit is never common at Speeton but is very abundant at Sutterby and it is by no means certain that the specimens found at the two localities are conspecific. The absence of the Carstone at Speeton and its prominence overlying the Sutterby Marl in Lincolnshire may indicate geographical separation of the two areas possibly due to uplift along the Market Weighton axis. The relationship of the *ewaldi* Marl to the Carstone is problematical, particularly as the Carstone itself is diachronous and it is likely that the upper fossiliferous portion of the *ewaldi* Marl is equivalent to part of the Carstone. The Carstone has, however, yielded a Middle Albian ostracod fauna at Melton in South Yorkshire and may be represented in part by the 'Greensand Streak' at Speeton and basal sands at West Heslerton (see Kaye 1964*d*). The absence of the Gault and the thin Red Chalk in Lincolnshire may bear out this suggestion.

The distribution and range of the ostracoda found at Sutterby are shown on text-fig. 1.

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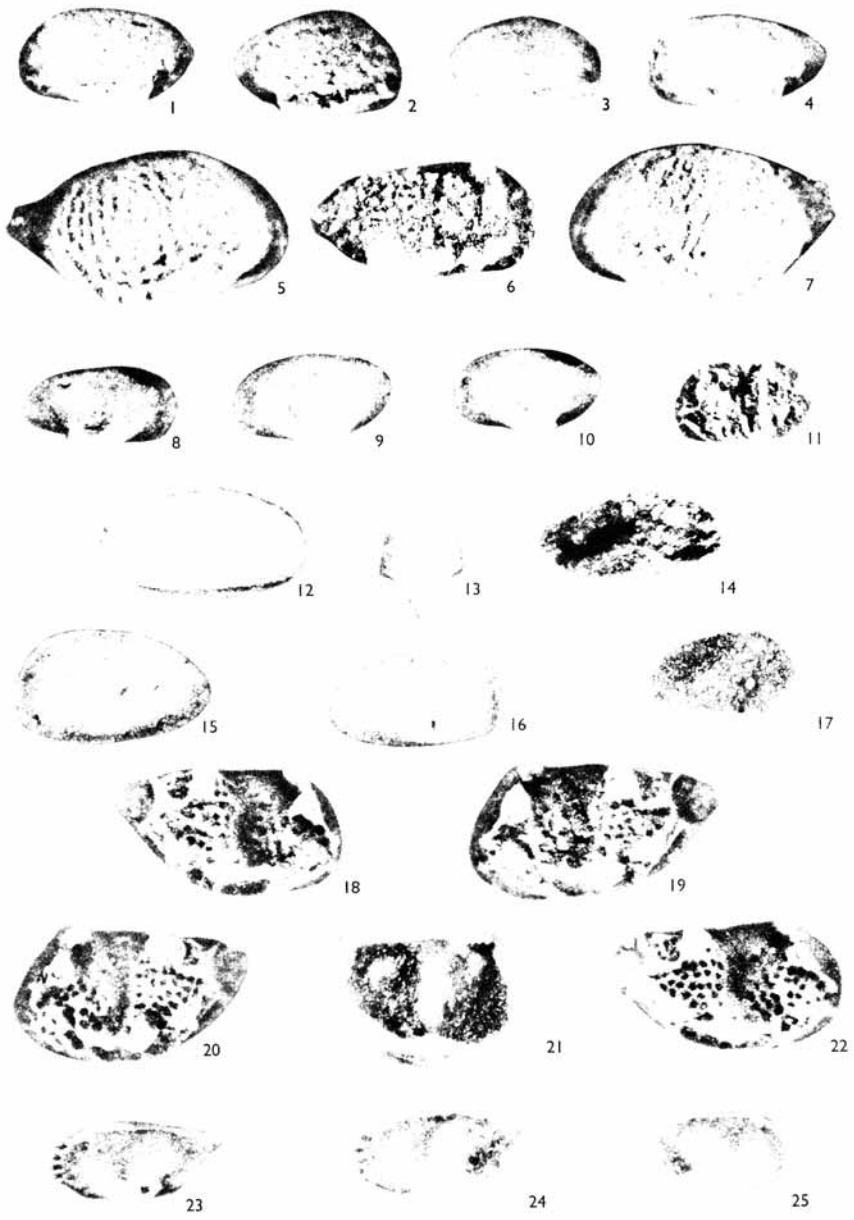

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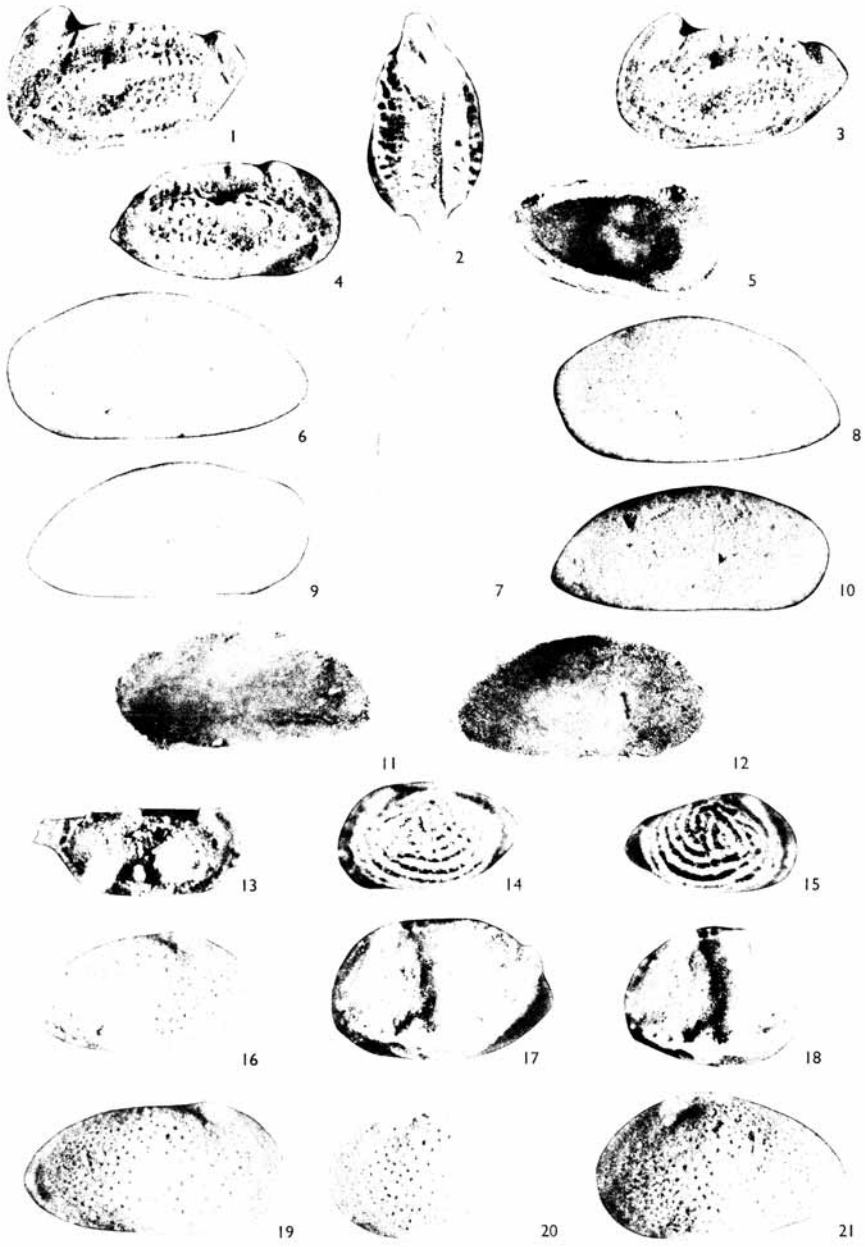

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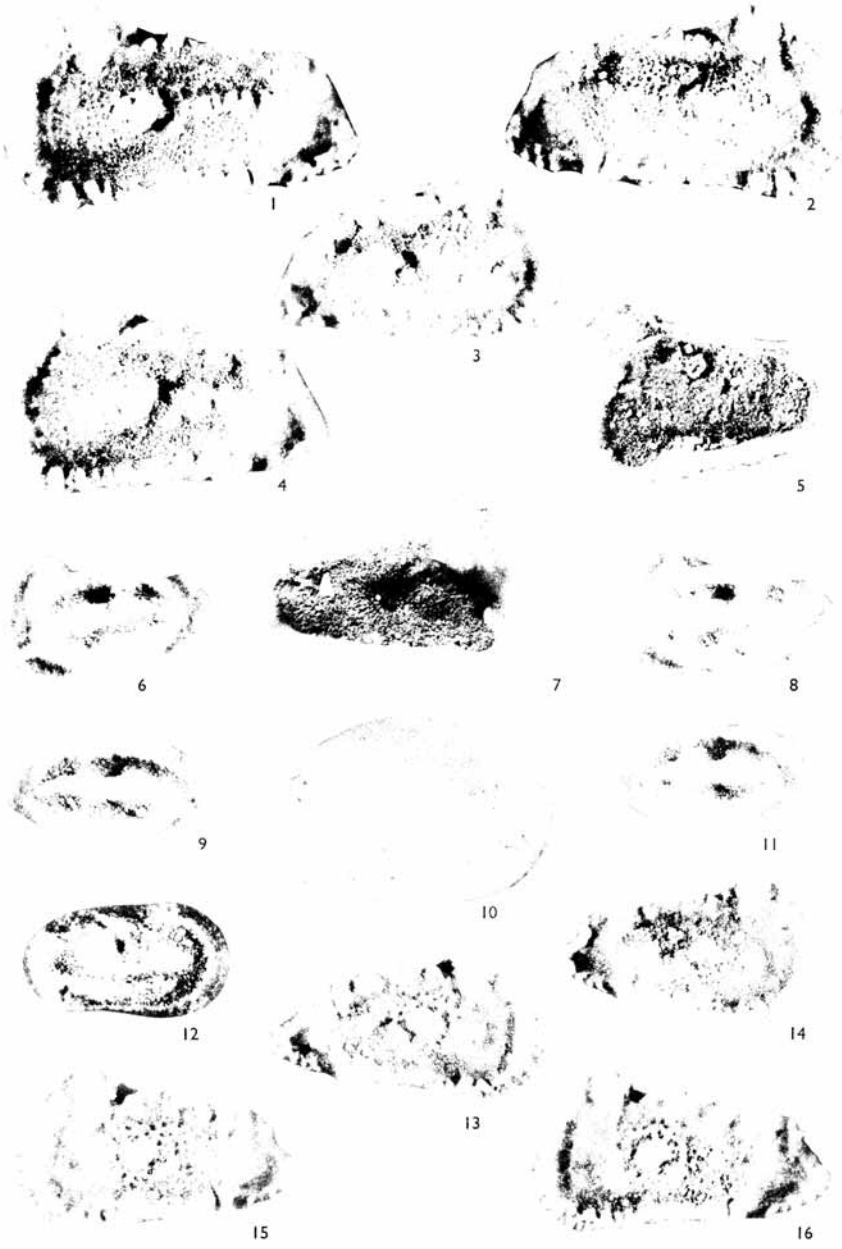

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