

THE OSTRACOD GENUS *NEOCYTHERE* IN THE SPEETON CLAY

by P. KAYE

ABSTRACT. Six species of the genus *Neocythere* Mertens are described from the Barremian and Albian beds in east Yorkshire. Three species are new, one of which is the earliest known occurrence of the genus. The genus *Centrocythere* is regarded as a subgenus of *Neocythere* s.l.

THE material which forms the basis for this paper is part of a large fauna from the upper part of the Speeton Clay studied as the topic for a thesis at the University of Hull.

The bulk of the material is of Albian age and in some cases has been obtained from inland exposures. The upper Red Chalk at Speeton is extremely hard, but the equivalent strata inland is found to be softer and easier to break down. The species have, however, all been recorded from Speeton, but are generally poorly preserved. Away from the coast exposures are very rare and samples have only been obtained from South Cave near Market Weighton (Grid Ref. 925326) and West Heslerton near Malton (Grid Ref. 913769).

The Albian strata at Speeton falls into two divisions: a thin series of grey-green marly clays comparable to the Gault Clay of the south of England and a thick sequence of Red Chalk. There is a gradual transition in colour and lime content between the two divisions, and an exact boundary is hard to draw. At the base of the Gault Clay there is a 6-inch seam of glauconitic clay and phosphatic nodules known as 'The Greensand Streak'. This seam is underlain by dark clays of Aptian age, and it has yielded fragments of ammonites indicative of the *regularis* Subzone. Apart from belemnites, the Gault and Red Chalk are almost barren of macrofossils, and consequently detailed zoning has been impossible. The author, in his observations over the last five years, has found the lithological section, published by C. W. Wright in Swinnerton's *Monograph of Lower Cretaceous Belemnites*, to be extremely sound.

All of the specimens are catalogued and deposited in the collection of the Department of Geology at Hull (HU).

SYSTEMATIC DESCRIPTIONS

Family PROGONOCYTHERIDAE Sylvester-Bradley 1948

Genus NEOCYTHERE Mertens 1956

Type species. *Neocythere vanveeni* Mertens 1956.

This genus was erected by Mertens (1956) for forms similar to *Cythere concentrica* Reuss, but having an amphidont hinge and an accommodation groove in the left valve. There is a great deal of uncertainty about the interpretation of the forms related to this group, and, until quite recently, all Cretaceous ostracoda having concentric ornament and slight ventral tumidity were referred to *Cythere concentrica* Reuss. Mertens

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has done extensive work on these forms and has redescribed Reuss's types. Unfortunately, the material was not well enough preserved, particularly the hinge structure, to allow correct generic assignment, and the species, together with related forms named for the first time, were left tentatively in the genus '*Cythere*'. Mertens did, however, distinguish two new genera, *Neocythere* and *Centrocythere*, on the basis of the hinge structure.

On examination of the hinge of species referred to the genus '*Cythere*', it is found

	BARREMIAN			APTIAN			ALBIAN		
	L.	M.	U.	L.	M.	U.	L.	M.	U.
<i>Neocythere</i> (N) <i>protovanveeni</i> sp.nov.‡	—	—							
<i>N.</i> (N) <i>vanveeni</i> MERTENS 1956 *								—	—
<i>N.</i> (P) <i>Physocythere</i> <i>semilaeva</i> sp.nov.‡									—
<i>N.</i> (P) <i>hieroglyphica</i> sp.nov.‡									—
<i>N.</i> (P) <i>lingenensis</i> MERTENS 1956 *								—	—
<i>N.</i> (<i>Centrocythere</i>) <i>denticulata</i> MERTENS *									—
<i>Neocythere</i> <i>sculpta</i> (CORNUEL)1846 *	—	—	—	—	—	—			
<i>Neocythere</i> <i>mertensi</i> OERTLI 1958 *						—			
' <i>Cythere</i> ' <i>favosa</i> MERTENS 1956 *							—		
' <i>Cythere</i> ' <i>semiconcentrica</i> MERTENS *								—	
' <i>Cythere</i> ' <i>steghausi</i> MERTENS 1956 *									—

Species of Progonocytheridae from the Speeton Clay and equivalent beds in N.W. Europe.
 † = Speeton & NW. Europe, * = NW. Europe only, ‡ = Speeton only.

TEXT-FIG. 1

that they differ from *Neocythere* in being symmetrical merodont and in having no accommodation groove. Though these differences do occur, it is not, in the author's opinion, sufficient to warrant generic separation. It has been shown on many occasions that the hinge in ostracods is unreliable as a basis for higher taxonomic division, and therefore to split this group of very similar ostracoda on that basis is considered unwise. It is proposed, therefore, to include all these forms under the genus *Neocythere* s.l. and to create new subgenera for the different hinge varieties. *Neocythere* s.s. is used for forms having an amphidont hinge, whilst the new subgenus *Physocythere* is erected for the forms grouped by Mertens under '*Cythere*' and having a merodont hinge. On the same basis, the genus *Centrocythere*, which differs from *Neocythere* s.s. only in the nature of the anterior tooth in the right valve, is therefore included as a subgenus of *Neocythere* s.l.

The ranges of the species of *Neocythere* found at Speeton together with related forms are given in text-fig. 1.

Subgenus *NEOCY THERE* Mertens 1956

Type species. *Neocythere vanveeni* Mertens 1956.

Diagnosis. A subgenus of *Neocythere* s.l. including forms similar to the genotype having an inflated, ventrally tumid carapace. The hinge in the right valve consists of two terminal crenulate teeth, between which is a locellate furrow deepened at its anterior end to form a smooth circular socket. The left valve is complementary, and possesses a distinct accommodation groove above the median element.

Neocythere (Neocythere) vanveeni Mertens 1956

Plate 41, figs. 23, 25

Cythere concentrica Dupper 1952, p. 106, pl. 4, fig. 14.

Neocythere vanveeni Mertens 1956, p. 205, pl. 12, figs. 72-78; pl. 14, figs. 100-2.

Material. Mounted specimens HU 17.C.10.1-10, from 1 foot above the Greensand streak, Middle Albian at Speeton.

Measurements	Length	Height	Total width
Male carapace	0.65 mm.	0.35 mm.	0.42 mm.
Female carapace	0.65 mm.	0.38 mm.	0.42 mm.

Description. Carapace rounded, inflated, ventrally tumid. Greatest height at one-third length, greatest width at mid-length. Dorsal margin strongly arched in the left valve, but straight with marked cardinal angles in the right valve. Ventral margin straight or slightly convex, being obscured in lateral view by the prominent ventral tumidity. Anterior margin rounded, slightly asymmetrical ventrally; posterior margin forming a blunt point at mid-height.

The surface is ornamented with concentric ribs, which parallel the anterior, ventral, and posterior margins. These ribs are rounded and prominent ventrally, but elsewhere are rather indistinct. There are three major concentric ribs, but many other subsidiary ribs are enclosed within them. The ventral surface is crossed by several strong longitudinal ribs. A low, rounded muscle node occurs just in front of the centre of the lateral surface.

A narrow duplicature occurs with a steep drop into the inflated interior of the valve. Inner margin and line of concrescence coincide. Radial pore canals short, straight, and few in number. Normal pore canals numerous, concentrated along the crests of the concentric ribs.

The hinge of the right valve consists of two bar-like terminal teeth divided into four or five distinct lobes. These teeth are separated by a long, straight furrow, which is coarsely crenulate and deepened at its anterior end, to form a smooth oval socket. In the left valve there are two long, shallow, crenulate sockets, partially open to the interior of the valve, and separated by a long, high, prominent median bar. This bar is denticulate and often enlarged at its anterior end into a boss-like tooth. Above the median bar lies a broad, shallow accommodation groove.

Sexual dimorphism is well marked, with the females being higher than the males.

Juveniles are common, and differ from the adult principally in the fact that the hinge is symmetrical, merodont in all the instars, and also in the fact that the ornament is much less strongly developed. Certain of the earliest moults appear smooth. A constant

feature of the hinge in all the instars is the presence of an accommodation groove in the left valve. The muscle node is also more prominent in many of the moult stages.

Remarks. *Neocythere vanveeni* is easily recognized by the smoothly arched dorsal margin in the left valve, and by its hinge. The amphidont nature of the hinge is not always apparent in the left valve, but can always be seen in the right. The presence of the accommodation groove is diagnostic.

The specimens found here are seen to be rather smaller than those found by Mertens in Germany. It is therefore possible that no adult specimens have been found. The largest forms are rare, and the bulk of the material found belongs to the early instars. This fact is borne out by the poor sexual dimorphism shown, and the less strongly developed hinge than the German forms.

Neocythere (Neocythere) protovanveeni sp. nov.

Plate 41, figs. 1-3, 5, 6

Holotype. A female right valve from 14 feet above the base of 'Lower B' (Lower Barremian) at Speeton, no. HU 17.C.11.1.

Other material. Three paratypes mounted as HU 17.C.12.1-3.

Diagnosis. A species of *Neocythere* s.s. basically similar to *N. vanveeni* but having the dorsal margin of the left valve less arched, and the posterior margin more bluntly pointed.

	<i>Measurements</i>	<i>Length</i>	<i>Height</i>	<i>Total width</i>
Holotype female right valve, HU 17.C.11.1.		0.65 mm.	0.37 mm.	0.20 mm.
Paratype male left valve, HU 17.C.12.1.		0.67 mm.	0.41 mm.	0.20 mm.

Description. Carapace rounded, inflated, ventrally tumid. Greatest height at one-third length, greatest width at mid-length. Dorsal margin of the left valve slightly arched, but with a flattened central portion. Dorsal margin of the right valve straight, with marked cardinal angles. Ventral margin convex, but obscured in its central portion by the ventral tumidity. Anterior margin rounded ventrally asymmetrical; posterior margin forming a blunt point at mid-height. Muscle node not well defined. Surface ornamented with concentric ribs, which are most prominent ventrally and arranged as in *N. vanveeni*. The dorsal third of the valve is, however, noticeably smooth. Internal features are identical to *N. vanveeni*. Radial pore canals are short, straight, and number ten anteriorly and four posteriorly. Normal pore canals are numerous and arranged along the crests of the concentric ribs. Hinge identical to *N. vanveeni*, having the median element noticeably subdivided, but with a deeper and narrower accommodation groove in the left valve.

Remarks. This species is very similar to *N. vanveeni*, to which it is almost certainly related. It differs in the nature of the dorsal margin, in the width and depth of the accommodation groove in the left valve, and also in the shape of the posterior margin.

Subgenus *PHYSOCYHERE* subgen. nov.

Type species. '*Cythere*' *lingenensis* Mertens 1956.

Diagnosis. A subgenus of *Neocythere* s.l., showing the characteristic inflated ventrally tumid shape of the genus, but differing from *Neocythere* s.s. in the structure of the hinge.

The hinge is symmetrical, consisting in the right valve of two strong, terminal, crenulate cusps separated by a long, straight locellate groove. In the left valve there is no accommodation groove, but a wide shelf occurs above the median element sloping down to the dorsal margin. The hinge elements as a whole are much stronger than in *Neocythere* s.s.

Neocythere (Physocythere) lingenensis Mertens 1956

Plate 41, figs. 15-22, 24

'*Cythere*' *costata* Mertens 1956, p. 190, pl. 9, figs. 27-30; pl. 10, figs. 31-32.
non *Cythere costata* M'Coy 1844, p. 165, pl. 23, fig. 11.
'*Cythere*' *lingenensis* Mertens 1958, p. 359.

Material. Mounted specimens HU 17.C.13.1-7 from the Middle Albian at Speeton.

Measurements	Length	Height	Total width
Female carapace	0.69 mm.	0.39 mm.	0.41 mm.
Male carapace	0.73 mm.	0.39 mm.	0.41 mm.

Description. Carapace egg-shaped, inflated, ventrally tumid. Greatest height at one-quarter length, greatest width at mid-length. Dorsal margin straight or slightly concave; ventral margin convex. The tumidity is not strong enough to obscure the ventral margin. Anterior margin broadly rounded, slightly asymmetrical ventrally; posterior margin triangular, forming a blunt point at mid-height. A muscle node is not developed.

Ornament consists of a reticulate honeycomb-like network of ridges covering the lateral surfaces. This network is bordered by three major concentric ribs paralleling the anterior, ventral, and posterior margins. These are most strongly developed ventrally, and often have the uppermost rib accentuated into a keel-like prolongation which forms an ear-like projection when the valve is viewed dorsally. A series of longitudinal ribs

EXPLANATION OF PLATE 41

All figures $\times 50$

- Figs. 1-3, 5, 6. *Neocythere (Neocythere) protovanveeni* sp. nov., Barremian. All figured specimens from 14 feet above the base of Lower 'B' at Speeton. 1, Right valve female (holotype) lateral view HU. 17.C.11.1. 2, Right valve female (holotype) internal view HU. 17.C.11.1. 3, Left valve male (paratype) lateral view HU. 17.C.12.1. 5, Carapace (paratype) dorsal view HU. 17.C.12.2. 6, Carapace (paratype) ventral view HU. 17.C.12.2.
- Figs. 4, 7. *Neocythere (Physocythere) semilaeva* sp. nov., Upper Albian, South Cave. 4, Left valve (holotype) lateral view HU. 17.C.16.1. 7, Carapace (paratype) from right HU. 17.C.17.1.
- Figs. 8-12, 14. *Neocythere (Physocythere) hieroglyphica* sp. nov. 8, Left valve (holotype) dorsal view HU. 17.C.14.1. 9, Right valve lateral view HU. 17.C.15.1. 10, Left valve (holotype) lateral view HU. 17.C.14.1. 11, Right valve dorsal view HU. 17.C.15.1. 12, Right valve internal view HU. 17.C.15.1. 14, Left valve (holotype) internal view HU. 17.C.14.1.
- Fig. 13. *Neocythere ? (Centrocythere) denticulata* Mertens, Upper Albian. Carapace from left HU. 17.C.18.1.
- Figs. 15-22, 24. *Neocythere (Physocythere) lingenensis* Mertens, Middle Albian. 15, Left valve female dorsal view HU. 17.C.13.1. 16, Right valve male lateral view HU. 17.C.13.3. 17, Left valve female lateral view HU. 17.C.13.1. 18, Right valve male dorsal view HU. 17.C.13.3. 19, Right valve female internal view HU. 17.C.13.2. 20, Female carapace ventral view HU. 17.C.13.4. 21, Female carapace dorsal view HU. 17.C.13.4. 22, Right valve female lateral view HU. 17.C.13.2. 24, Left valve female internal view HU. 17.C.13.1.
- Figs. 23, 25. *Neocythere (Neocythere) vanveeni* Mertens, Middle Albian. 23, Right valve female lateral view. HU. 17.C.10.1. 25, Left valve female lateral view HU. 17.C.10.2.

crosses the ventral surface. Duplicature narrow, dropping steeply into the inflated interior of the valve. Inner margin and line of concrescence coincide.

The hinge of the right valve consists of two bar-like teeth divided into four or five lobes. These teeth are separated by a long, straight locellate furrow. In the left valve there are two elongated divided sockets separated by a long straight denticulate bar. Above the bar, there is a broad flat shelf sloping to the dorsal margin but no accommodation groove.

Remarks. This species can be differentiated from other members of the group by the shape of the dorsal margin and by the ornament.

Neocythere (Physocythere) hieroglyphica sp. nov.

Plate 41, figs. 8-12, 14

Holotype. A left valve from the Red Chalk, bed N4 at West Heslerton, no. HU 17.C.14.1.

Other material. Specimens no. HU 17.C.15.1-6, from the uppermost Red Chalk at South Cave.

Diagnosis. A species of the subgenus *Physocythere* having a straight to concave dorsal margin, and an ornament of ridges arranged in a hieroglyphic pattern.

<i>Measurements</i>	<i>Length</i>	<i>Height</i>	<i>Total width</i>
Holotype left valve, HU 17.C.14.1	0.69 mm.	0.46 mm.	0.26 mm.
Right valve, HU 17.C.15.1.	0.73 mm.	0.39 mm.	0.24 mm.

Description. Carapace strongly inflated, ventrally tumid. Greatest height at one-quarter length, greatest width at mid-length. Dorsal margin straight or slightly concave with rounded cardinal angles. Ventral margin convex, and obscured in its central portion by the ventral tumidity. Anterior margin rounded, ventrally asymmetrical; posterior margin triangular, forming an acute upturned point at mid-height. There is usually a flattened rim along the dorsal margin, particularly in the left valves.

Lateral surfaces strongly ornamented with a pattern of concentric ribs enclosing an irregular, hieroglyphic-like pattern of ridges. These concentric ribs radiate from the centre of the dorsal margin, and parallel the other three margins, being most prominent ventrally. Several sinuous ridges run from the centre of the dorsal margin, across the lateral surface, branching and forming the hieroglyphic-like pattern with the concentric ribs. The marginal areas are smooth. Inner margin and line of concrescence coincide. Radial pore canals short and straight, numbering eight anteriorly and three posteriorly. Normal pore canals large, but rather rare; situated along the crests of the concentric ribs.

Hinge very strongly built. In the right valve there are two large, elongated terminal cusps, each divided into five lobes. They are separated by a long, straight locellate furrow open ventrally, but bordered dorsally by a smooth bar. In the left valve there are two large, strongly divided sockets separated by a long, straight denticulate bar. Above the median element there is a broad, flat shelf sloping down to the dorsal margin.

Remarks. *N. (P.) hieroglyphica* appears to be restricted to the Red Chalk. It differs from the other members of the group in the ornament, the greater inflation, and the strong hinge.

Neocythere (Physocythere) semilaeva sp. nov.

Plate 41, figs. 4, 7

Holotype. A left valve from the uppermost Red Chalk at South Cave; no. HU 17.C.16.1.*Other material.* Five paratypes mounted as HU 17.C.17.1-5.

<i>Measurements</i>	<i>Length</i>	<i>Height</i>	<i>Total width</i>
Left valve holotype, HU 17.C.16.1.	0.60 mm.	0.39 mm.	0.26 mm.

Description. Only left valves and one complete carapace of this species are known, and therefore internal details of the right valves are lacking.

Carapace rounded, strongly tumid ventrally. Greatest height and width at mid-length. Dorsal margin of the left valve strongly arched, forming a broad obtuse angle at about the centre of the valve. Ventral margin convex, but obscured in lateral view by the tumidity. Anterior margin broadly rounded, posterior margin subtriangular, forming a rounded point at mid-height. The lateral surfaces are largely smooth, but show traces of concentric ribbing. A large inflated rib follows the ventral margin and can be vaguely traced around the edge of the lateral surface. This ridge is swollen ventro-laterally almost forming alaeform expansions. The ventral surface is smooth.

The hinge of the left valve consists of two strong divided terminal sockets separated by a long, straight denticulate bar. Above the median element there is a broad, flat shelf.

Occurrence. This species is only known from the Red Chalk (Upper Albian).*Remarks.* *N. (P.) semilaeva* differs from the other species of the genus in the shape of the dorsal margin, the prominent ventral rib, and the smooth dorso-lateral surface.

Subgenus CENTROCYTHERE Mertens 1956

Subgenotype. *Centrocythere denticulata* Mertens 1956.*Diagnosis.* A subgenus of *Neocythere* s.l. showing the usual inflated shape and ventral tumidity, but having a characteristic hinge arrangement. In the right valve the anterior tooth is step-like, the back portion being twice as high as the front. The posterior tooth is crenulate, and the median element consists of a locellate furrow, deepened at its anterior end to form a smooth socket. There is an accommodation groove above the median element in the left valve.*Neocythere ? (Centrocythere) denticulata* Mertens 1956

Plate 41, fig. 13

? Cythere punctatula Jones 1849, p. 11, pl. 1, fig. 2a-n.*Centrocythere denticulata* Mertens 1956, p. 204, pl. 11, figs. 66-71; pl. 14, figs. 97-99.*Brachycythere concentrica* (Reuss); Deroo 1956, p. 1512, pl. 3, figs. 35, 36.*Material.* Five carapaces, from the Red Chalk at Speeton.*Diagnosis.* As only complete carapaces have been found, details of the hinge are unknown and the material is therefore only tentatively referred to this subgenus. It is placed here on a basis of the shape of the dorsal margin and posterior end, and also on the ornamentation.

<i>Measurements</i>	<i>Length</i>	<i>Height</i>	<i>Total width</i>
Carapace, HU 17.C.18.1.	0.60 mm.	0.39 mm.	0.35 mm.

CONCLUSIONS

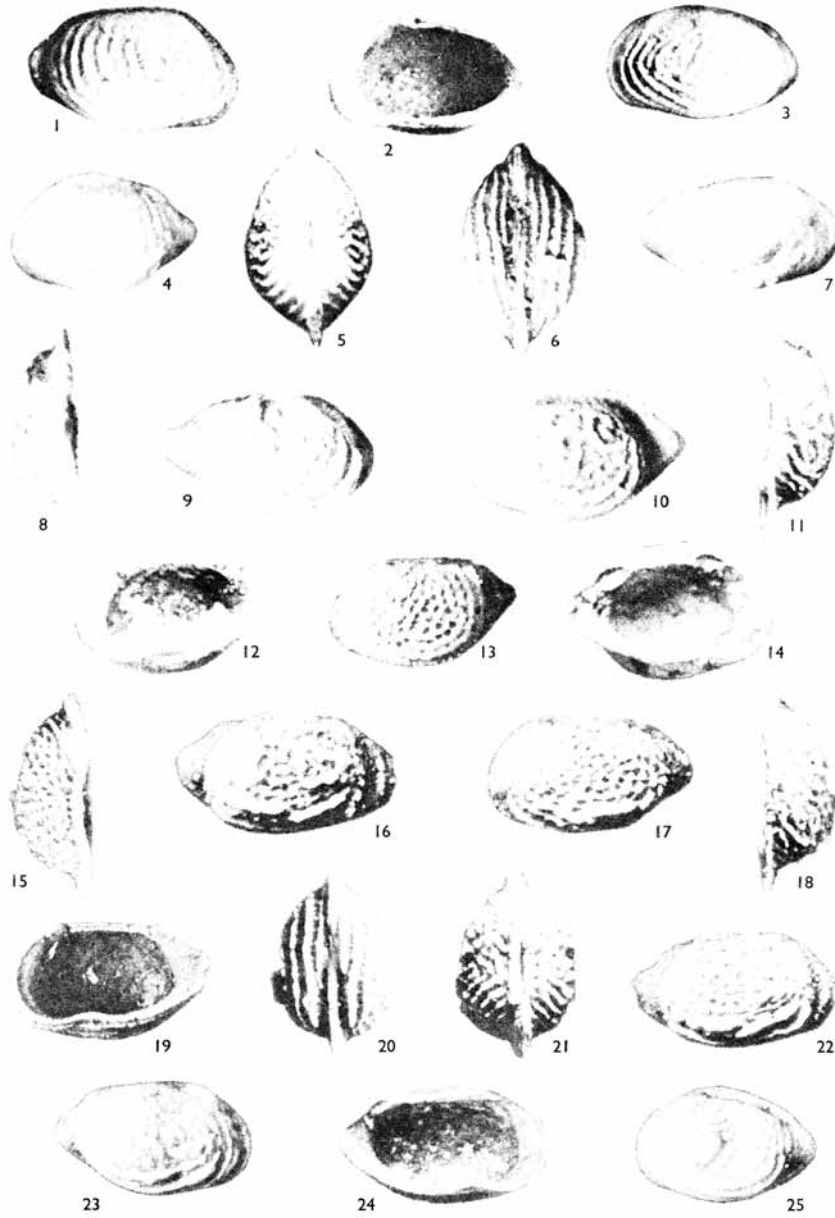
The genus *Neocythere* has been subdivided into three subgenera on a basis of hinge structure. The subgenera are all represented in the Speeton Clay, and are of similar shape and ornamentation. Five of the six species are of Albian age. Of these, three are restricted to the Upper Albian, but the other two are also found in the Middle Albian. *Neocythere* (*Neocythere*) *Protovanveeni* sp. nov. occurs in the Lower Barremian and is the lowest form of the genus in the Cretaceous yet described, though the author has in his possession specimens of this, or a closely related form, from the Hauterivian Tealby Clay of Lincolnshire. It is possibly ancestral to the other forms, but, as the genus is absent or very rare from the Middle and Upper Barremian, Aptian, and Lower Albian, this cannot be proved with certainty. Of the six species, three are new, two belong to known German species, and one is tentatively compared to a known species.

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