

A REVIEW OF THE MESOZOIC OSTRACOD GENUS *LOPHOCY THERE* AND ITS CLOSE ALLIES

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ABSTRACT. The progonocytherid cytheracean ostracod genus *Lophocythere* and its immediate allies in the Jurassic are reviewed. All known species of 16 genera are considered. We consider that only eight of these genera (*Acanthocythere*, *Afrocytheridea*, *Aulacocythere*, *Fuhrbergiella*, *Lophocythere*, *Neurocythere*, *Terquemula* and *Trichordis*) remain valid; the eight rejected genera are *Crucicythere*, *Cuvillierella*, *Dhrumaella*, *Infacythere*, *Nophrecythere*, *Paralophocythere*, *Pokornya* and *Tropacythere*.

KEY WORDS: Mesozoic, Ostracoda, Progonocytheridae, Neurocytherinae, *Lophocythere*, systematic review.

As we demonstrated in an earlier review of another group of Mesozoic progonocytherid ostracods, those associated with the genus *Progonocythere* Sylvester-Bradley (Whatley and Ballent 1996), a large number of genera erected within the past 40 years or so have been discriminated on what we consider to be specific characters. In preparing various families of the Cytheracea for the revision of the ostracod Treatise, one of us (RCW), who is the coordinating author for the post-Palaeozoic part, has been struck by the very large number of monotypic, or virtually monotypic genera. These are new taxa erected on the most trivial criteria, such as the slightest morphological divergence from the pre-existing norms of a genus, notwithstanding that they may be represented by a single species. The inherent variation present in 'natural' genera is often overlooked, and the more sensible procedure of regarding newly discovered species as new morphological end members of an existing plexus of species is less commonly favoured. It sometimes seems that the expedient of emending an existing generic diagnosis is not known to those who create such taxa. It should be obvious that as we discover more species our morphological concept of a genus must expand, unless we are to have all too rigid a concept of it.

As we have pointed out previously (Whatley and Ballent 1996, p. 919), with ostracods, it is those taxa with prominent and complex ornamentation which are the candidates for this form of excessive generic 'splitting', while smooth ostracods, always difficult to deal with taxonomically, are much more stable. We wish that more authors understood the important difference between primary and secondary features in the ornament of Ostracoda and applied the philosophical principal that generic characters are of kind, while specific characters are of degree.

In this paper, we review the taxonomic status of 16 Mesozoic podocopinid genera (14 of the family Progonocytheridae, Neurocytherinae, and two hereby removed from the family) most closely related in their morphology to the genus *Lophocythere* Sylvester-Bradley, 1948 (Table 1). We find that the species of eight of these genera are readily referable to other genera within the complex and that only eight are valid. This, of course, is a matter of judgement. However, we have in the course of our study, examined and considered all of the species attributed to each of the original 16 genera. This is similar to the case of the genus *Progonocythere* Sylvester-Bradley, 1948 and its close allies in which in an earlier review (Whatley and Ballent 1996) we found that of the 12 genera considered, only five were valid. Sadly, this is not an uncommon phenomenon in the Treatise revision as a whole.

SYSTEMATIC PALAEOLOGY

In the Treatise revision, the Progonocytheridae will comprise only genera with entomodont/lobodont hinges (*sensu* Moore and Pitrat 1961; *non* Van Morkhoven 1962). The family will be divided into the

TABLE 1. The 16 genera considered here (14 are Progonocytheridae, Neurocytherinae, and two are hereby removed from the family) are arranged in date order, with type species and geographical distribution. The eight genera considered to be valid are written in bold.

Genus	Author and date	Type species	Stratigraphical and geographical distribution. New distributions resulting from this review in bold
Lophocythere	Sylester-Bradley, 1948	<i>Cytheridea ostreata</i>	Bathonian–Oxfordian: Britain, Europe, Uzbekistan, Volga region; Callovian: North America
Acanthocythere	Sylvester-Bradley, 1956	<i>Cythere sphaerulata</i>	Bathonian: England and Scotland
Fuhrbergiella	Brand and Malz, 1962	<i>F. gigantea</i>	Bajocian–Oxfordian: Britain, Germany, East Europe; Callovian–Oxfordian: Russia; Callovian–Kimmeridgian: North America
Trichordis	Grekoff, 1963	<i>T. praetexta</i>	Bajocian–Kimmeridgian: Madagascar, Tanzania, India, Saudi Arabia
Aulacocythere	Bate, 1963	<i>A. punctata</i>	Bajocian: Britain
Terquemula	Blaszyk and Malz, 1965	<i>T. parallela</i>	Bathonian: Britain, north-east Europe
Paralophocythere	Dépêche, 1969	<i>P. chonvillensis</i>	Bathonian–Callovian: Europe
Neurocythere	Whatley, 1970	<i>Cythere bradiana</i>	Bathonian–Kimmeridgian: Britain, Europe, Volga region ; Bajocian–Callovian: North America; Callovian–Oxfordian: India; Tithonian?: Czechoslovakia
Cuvillierella	Pokorny, 1971	<i>C. jeani</i>	Tithonian?: Czechoslovakia
Pokornya	Singh and Kulshreshtha, 1972	<i>P. kuldharensis</i>	Callovian–Oxfordian: India
Tropacythere	Gründel, 1973	<i>Lophocythere verrucosa</i>	Bajocian–Bathonian: Europe
Nophrecythere	Gründel, 1975a	<i>Lophocythere cruciata</i>	Bathonian–Oxfordian: Britain, Europe
Crucicythere	Malz, 1975	<i>Lophocythere cruciata</i>	Callovian: Europe
Infacythere	Gründel, 1975a	<i>Lophocythere dorni</i>	Upper Callovian: north-west Germany, Middle Jurassic: Volga region
Afrocytheridea	Bate, 1975	<i>A. laevigata</i>	Callovian: Tanzania, Madagascar , India, Tunisia, Syria; Callovian–Oxfordian and Kimmeridgian: Israel, Saudi Arabia; Lower Oxfordian: Somalia; Jurassic: Kenya; probably Neocomian: Argentina and South Africa
Dhrumaella	Dépêche, Le Nindre, Manivit and Vaslet, 1987	<i>Acanthocythere spiniscutulata</i>	Middle Jurassic: Europe, Saudi Arabia, Jordan, Israel

Progonocytherinae, comprising subovate to subtriangular genera with a convex dorsal margin and more or less strong ventro-lateral tumidity, such as *Progonocythere*, which were discussed by Whatley and Ballent (1996), and the Neurocytherinae Gründel, 1975a, which embraces less tumid, subrectangular to subquadrate genera, similar to those discussed here.

In order to facilitate comparison between them, the most important morphological characters of the 14 genera of Progonocytheridae included here are outlined in Table 2; those which we consider to be valid are in bold. The various genera are treated in their order of publication.

LOPHOCYTHERE Sylvester-Bradley, 1948

Remarks. Sylvester-Bradley (1948, p. 195, pl. 14, figs 1–4; pl. 15, figs 1–2) based the genus on *Cytheridea ostreata* Jones and Sherborn, 1888. Subsequently, a large number of species have been attributed to the genus. These fall into two groups on the basis of their ornamentation as first noted by Bate (1969, p. 390): ‘*Lophocythere* clearly contains two distinct morphological groups: the first centred around *Lophocythere ostreata* (Jones and Sherborn, 1888) with an L-shaped ridge extending around the anterior margin and bending back along the ventro-lateral margin and the second around *L. bradiana* (Jones, 1884), in which several ridges, usually three or four in number, extend across the lateral surface of the carapace’. Whatley (1970, p. 333) used these criteria to divide the genus into two subgenera: *Lophocythere* (*Lophocythere*) and *Lophocythere* (*Neurocythere*). *Neurocythere* was subsequently elevated to generic rank by Gründel (1973), and this was followed by Ware and Whatley (1980). *Lophocythere sensu lato* has been the subject of revision by Gründel (1973, 1975a) and Malz (1975), whose systematic conclusions are considered herein.

The present review of the genus involves an exhaustive examination of the many species attributed to *Lophocythere*. These differ considerably in size, shape, carapace outline and ornament and include numerous species which are best accommodated elsewhere. These latter are listed below (in date order of first citation or combination):

1. *Lophocythere bradiana* (Jones, 1884) Sylvester-Bradley, 1948 (pl. 14, figs 7–10; pl. 15, figs 8–11) from the English Bathonian. This is the type species of *Neurocythere* Whatley, 1970 (p. 336).
2. *Lophocythere carinilia* Sylvester-Bradley, 1948 (pl. 13, figs 6–7; pl. 14, figs 5–6) from the Upper Bathonian of Britain. Sylvester-Bradley, in his original description (p. 197) mentioned that ‘the median element of the hinge, is difficult to discern in this species. The anterior portion of the median groove of the right valve is very slightly wider than the posterior portion’. We agree with Malz (1975, pl. 3, fig. 19) who included this species in *Palaeocytheridea* Mandelstam, 1947, which is a protocytherid.
3. *Lophocythere caesa* Triebel, 1951 (pl. 48, figs 42–45) from the Middle Callovian of Germany, is *Neurocythere*.
4. *Lophocythere fuhrbergensis* Triebel, 1951 (pl. 48, figs 49–52) and *L. plena* Triebel, 1951 (pl. 49, figs 60–63) from the Upper Bathonian of Germany, are *Neurocythere*.
5. *Lophocythere flexicosta* Triebel, 1951 (pl. 48, figs 46–48) from the Lower and Middle Callovian of Germany, by virtue of the disposition of its primary ribs is accommodated in *Terquemula* (see below).
6. *Lophocythere cruciata cruciata* Triebel, 1951 (pl. 49, figs 53–56) and *L. cruciata franconica* Triebel, 1951 (pl. 49, figs 57–59), both from the Callovian of Germany, are *Neurocythere*.
7. *Lophocythere?* sp. 1 of Bartenstein and Brand 1951 (pl. 18, figs 115–120; pl. 19A, figs 67–70; pl. 20, fig. 23) from the Upper Valanginian–Lower Hauterivian of north-west Germany, is not *Lophocythere* and is probably *Acrocythere* Neale, 1960.
8. *Lophocythere?* sp. 1b of Bartenstein and Brand 1951 (pl. 20, fig. 24) from the Upper Valanginian of north-west Germany, is also better accommodated in *Acrocythere* Neale, 1960.
9. *Lophocythere dulcis* (Ljubimova, 1955) (of which *L. dorni* Lutze, 1960 is a junior synonym), from the Middle Jurassic of the Volga region, is here included in *Neurocythere* as are *Lophocythere attalica* (Mandelstam), *Lophocythere catephracta* (Mandelstam) and *Lophocythere rubra* (Mandelstam), all in Ljubimova 1955 (pl. 8, fig. 3a–b; pl. 8, fig. 4a–b; pl. 8, fig. 6a–b respectively), from the Callovian–Oxfordian of the Volga region of the former USSR.
10. *Lophocythere multicostata* Oertli, 1957 (pl. 4, figs 146–153) from the Upper Oxfordian of the Paris Basin, France is *Neurocythere*.
11. *Lophocythere elegans* Drexler, 1958 (pl. 24, fig. 5) from the Hettangian and Lower Sinemurian of Germany, on the

TABLE 2. The 14 genera of Progonocytheridae, Neurocytherinae considered here, giving author, date of publication, number of species and details of size and most important morphological characters. Valid taxa are in bold. The two genera herein removed from the family are not considered in this table.

Genus	Size (mm)	Shape	Ornament	Muscle scars	Hinge	Anterior rpc	Eye tubercle
<i>Lophocythere</i> Sylvester-Bradley, 1948 Approximately 27 spp.	L, 0.60–1.03 (0.81); H, 0.30–0.47 (0.38); W, 0.24–0.45 (0.34)	Elongate, subrectangular	Strong L-shaped rib around anterior margin, and extending along ventro-lateral margin. Valve surface reticulate, tuberculate or spinose	Four vertical/ oblique/ crescentic adductors/one oval frontal/ one small antero-ventral mandibular	Robust entomodont	Straight/well spaced, 6–8. Avestibulate	Prominent
<i>Acanthocythere</i> Sylvester-Bradley, 1956 3 spp.	Holotype: L, 0.52; H, 0.31; W, 0.31	Subrectangular/ subtrapezoidal, somewhat tapering posteriorly	Small papillae parallel to margins. Papillate ribs ventrally	Four vertical adductors/ one frontal, large, circular	Entomodont/ lobodont	Simple/sparse/ straight, c. 8. Avestibulate	Shiny, rather prominent
<i>Fuhrbergiella</i> Brand and Malz, 1962 Approximately 25 spp.	L, 0.53–1.20 (0.86)	Subrectangular/ almost subovate. Some spp. caudate. Compressed anteriorly	Mainly reticulate/costate	Four vertical/ crescentic adductors/one frontal/single weak mandibular	Entomodont	Straight/ simple, c. 8. Avestibulate	Indistinct. No internal ocular sinus
<i>Trichordis</i> Grekoff, 1963 Approximately 10 spp.	L, 0.42–0.68 (0.55); H, 0.23–0.38 (0.30); W, 0.26–0.32 (0.29)	Subrectangular/ subtriangular/ moderate tumid ventrolaterally	Three variably developed longitudinal ribs. Puncta parallel to margins	Four vertical oval adductors/ one rounded or V-shaped frontal	Entomodont, rather strongly developed	Straight/ simple, 8–14 (in type species with median or distal swelling). Avestibulate	Eye swelling variably developed
<i>Terquemula</i> Blaszyk and Malz, 1965 9 spp.	L, 0.47–0.75 (0.61); H, 0.31–0.39 (0.25); W, 0.36	Elongate-ovate/ subrectangular	Longitudinal ribs which parallel dorsal, ventral and posterior margins/and sometimes anterior. Intercoastal areas smooth, punctate; reticulate in <i>flexicosta</i> group. Some spp. acostate	Four vertical adductors/two irregular antero-dorsal antennal/single rounded antero-ventral mandibular	Entomodont	Few/distanced, 8–10. Avestibulate	Eye swelling distinct
<i>Paralophocythere</i> Dépêche, 1969 1 spp.	Female: L, 0.55; H, 0.35 Male: L, 0.70; H, 0.30	Elongate-ovate/ subrectangular	Three longitudinal ribs (much more clearly defined in RV)	No data	Robust entomodont. Secondary dorsal crenulation	Few/simple/ straight, 8–9. Avestibulate	Eye swelling distinct

<i>Neurocythere</i> Whatley, 1970 Approximately 36 spp.	L, 0.50–0.90 (0.70); H, 0.26–0.49 (0.37); W, 0.25–0.36 (0.30)	Subrectangular/ subquadrate	Four longitudinal ribs/ intercostal reticulation/rarely smooth. Minor intercostal ribs. Ribs not paralleling end margins	Four vertical adductors/one large anterior/ one small antero-ventral scar	Robust entomodont. Accommo- dation groove in LV	Straight/well spaced. Usually no more than 8/ ranges to 15–16. Avestibulate	Circular/ovate glassy, prominent
<i>Cuvillierella</i> Pokorny, 1971 1 spp.	L, 0.66–0.70; H, 0.40–0.43	Subrectangular	Four longitudinal decayed, broken up ribs, intercostal reticulation	No data	Entomodont	Simple/thin, straight, 15–16. Avestibulate	Circular, prominent
<i>Pokornya</i> Singh and Kulshreshtha, 1972 3 spp.	L, 0.55–0.70 (0.62); H, 0.37–0.42 (0.39); W, 0.17–0.20 (0.18)	Subtriangular/ ovate. Ventral swelling	Three longitudinal swellings	Four vertical adductors/one V-shaped frontal	Entomodont	18–20 with a tendency to occur in pairs. Avestibulate	Eye swelling may be present
<i>Nophrecythere</i> Gründel, 1975a 9 spp.	L, 0.53–0.75 (0.64); H, 0.36–0.39 (0.37); W, 0.32–0.34 (0.33)	Subrectangular/ subquadrate	Four longitudinal ribs/ intercostal minor ribs/ intercostal reticulation	Four vertical adductors/one large anterior/ one small antero-ventral scar	Robust entomodont. Accommo- dation groove in LV	Straight/well spaced. No more than 8. Avestibulate	Circular, glassy, prominent
<i>Crucicythere</i> Malz, 1975 2 spp.	L, 0.62–0.79 (0.70); H, 0.41; W, 0.39–0.40 (0.38)	Subrectangular/ subquadrate	Four longitudinal ribs/ intercostal minor ribs/ intercostal reticulation	Four vertical adductors/one large anterior/ one small antero-ventral scar	Robust entomodont. Accommo- dation groove in LV	Straight/well spaced. No more than 8. Avestibulate	Circular, glassy, prominent
<i>Infacythere</i> Gründel, 1975a 1 spp.	L, 0.72–0.77; H, 0.34–0.39	Subrectangular	Four longitudinal ribs/ intercostal reticulation	No data	Entomodont	No data	Circular, glassy, prominent
<i>Afrocytheridea</i> Bate, 1975 Approximately 9 spp.	L, 0.60–0.82 (0.71); H, 0.32–0.47 (0.39); W, 0.34–0.42 (0.38)	Subrectangular/ tapering posteriorly/ dorsal margin sinuous	Smooth/reticulate forming antero-dorsally ridges/antero- dorsal furrow	No data	Entomodont	Curved/well spaced, c. 14. Avestibulate	Eye swelling
<i>Dhruaella</i> Dépêche, Le Nindre, Manivit and Vaslet, 1987 7 spp.	L, 0.52–0.63 (0.57); H, 0.32–0.41 (0.36); W, 0.22	Subtriangular/ subtrapezoidal	Subtriangular spinose ribs in inverted chevron	No data	Entomodont/ lobodont	Straight, sparse, c. 8. Avestibulate	Eye swelling

basis of its ornamentation of distinct, delicate vertical and its merodont hinge, is *Nanacythere* Herrig, 1969 (which Whatley and Boomer 2000 considered to be a junior synonym of *Eucytherura* Müller, 1894) while *Lophocythere bicostata* Drexler, 1958 (pl. 24, fig. 6) from the Hettangian and Lower Sinemurian of Germany is *Lophodentina* Apostolescu, 1959.

12. *Lophocythere oertlii* Bizón, 1958 (pl. 3, figs 6–8) from the Oxfordian of Calvados, France is *Neurocythere*.

13. *Lophocythere* sp. 1 Bizón, 1958 (pl. 3, fig. 2) from the Lower Oxfordian of Calvados, France belongs in *Neurocythere*.

14. *Lophocythere cruciata intermedia* Lutze, 1960 (pl. 34, figs 5–6) from the Middle Callovian of north-west Germany, is *Neurocythere*.

15. *Lophocythere cruciata triebeli* Lutze, 1960 (pl. 35, figs 1–4, 6) from the Upper Callovian of north-west Germany, is *Neurocythere*.

16. *Lophocythere cruciata oxfordiana* Lutze, 1960 (pl. 35, fig. 5) from the Lower Oxfordian of north-west Germany, is *Neurocythere*.

17. *Lophocythere dorni* Lutze, 1960 (pl. 36, figs 4–5) from the Upper Callovian of north-west Germany = *Lophocythere dulcis* (Ljubimova, 1955) (see Wienholz 1967, pl. 5, fig. 58), was designated by Gründel (1975a) as the type species of his genus *Infacythere*, which we consider a junior synonym of *Neurocythere* (see below).

18. *Lophocythere cruciata kimmeridgiensis* Guyader, 1966 from the Lower Kimmeridgian of France, is *Neurocythere*.

19. *Lophocythere flexicosta flexicosta* Triebel, 1951 of Lutze 1960 (pl. 35, fig. 8) and *L. flexicosta* subsp. A Lutze, 1960 (pl. 36, figs 2–3), both from the Callovian–Oxfordian of north-west Germany, are accommodated in *Terquemula* (see below).

20. *L. caesa caesa* Triebel, 1951 of Lutze 1960 (pl. 35, fig. 7) and *L. caesa* subsp. A Lutze, 1960 (pl. 36, fig. 1) from the Callovian–Oxfordian of north-west Germany, are species of *Neurocythere*.

21. *Lophocythere devexa* Grekoff, 1963 (pl. 2, figs 49–52) from the Middle Callovian of Madagascar, belongs in *Trichordis* Grekoff, 1963.

22. *Lophocythere* 323a Grekoff, 1963 (pl. 2, fig. 47), *Lophocythere* 323b Grekoff, 1963 (pl. 2, fig. 48) and *Lophocythere?* 4777 Grekoff, 1963 (pl. 3, figs 53–54) all from the Middle Callovian of Madagascar, are certainly not *Lophocythere*. We consider them to be *Afrocytheridea faveolata* Bate, 1975 (see Mette 1995; Rosenfeld and Honigstein 1998).

23. *Lophocythere septicostata* Bate, 1967 (pl. 15, figs 7–13; pl. 16, figs 1–4), from the Bathonian of Britain, is ornamented by a series of seven oblique longitudinal ribs which curve around and parallel the posterior margin. Anteriorly, they fuse together behind the compressed anterior marginal border so that only two reach that margin. Intercostal areas are punctate with large, circular, normal pore canal openings. This species combines features of *Neurocythere* Whatley and *Terquemula* Blaszyk and Malz but marginally more of the former, so we consider it *Neurocythere*.

24. *Lophocythere transversiplicata* Bate, 1967 (p. 53, pl. 16, figs 5–15) from the Bathonian of Britain has three longitudinal ribs converging towards the antero-ventral margin and an additional transverse rib which extends down from the region of the anterior cardinal angle to join the three longitudinal ribs. This species, which to a certain extent combines in its ornament features characteristic of both *Lophocythere* and *Neurocythere*, is here included in the latter.

25. *Lophocythere bipartita* Wienholz, 1967 (pl. 3, figs 24–26) and *L. composita* Wienholz, 1967 (pl. 3, figs 28–31) from the Callovian of north-west Germany, are both species of *Neurocythere*.

26. *Lophocythere dulcis* (Ljubimova, 1955) of Wienholz 1967 (pl. 5, figs 58–59), from the Callovian of north-west Germany, is *Neurocythere*.

27. *Lophocythere* cf. *carinilia* Sylvester-Bradley, 1948 of Blaszyk 1967 (pl. 7, figs 1–4) from the Lower and Middle Bathonian of Poland, has an antimerodont hinge and seems to be the protocytherid *Palaeocytheridea* Mandelstam, 1947.

28. *Lophocythere verrucosa* Blaszyk, 1967 (pl. 7, figs 5–7) from the Upper Bajocian and Lower Bathonian of Poland, was designated by Gründel 1973 (pp. 583–584) as type species of his genus *Tropacythere*, which is not Progonocytheridae and is possibly related to *Exophthalmocythere* Triebel, 1938 (see also Gründel 1975b, p. 37, where this author pointed out phylogenetic relations between *Tropacythere* and *Exophthalmocythere*).

29. *Lophocythere normanniae* Donze, 1968 (pl. 2, figs 18–28) from the Sinemurian of France has an antimerodont hinge, so is not *Lophocythere* nor Progonocytheridae, although we are unable to suggest a genus for it.

30. *Lophocythere elegans* Drexler, 1958, *Lophocythere* sp. 4076, *L.?* sp. 4061 of Michelsen (*in* Bertelsen and Michelsen 1970) and other species of *Lophocythere* retained in open nomenclature (*in* Christensen 1968) from the Lower Jurassic of southern Denmark, have been referred by Michelsen 1975 to *Nanacythere* (= *Eucytherura* Müller, 1894; see Whatley and Boomer 2000).

31. *Lophocythere* sp. 865 Christensen, 1968 from the Lower Jurassic of Denmark, is possibly *Procytherura* Whatley, 1970.

32. *Lophocythere?* sp. 866 Christensen, 1968 (pl. 23, fig. 26) from the Lower Jurassic of Denmark, characterized by three distinct longitudinal ribs and an antimerodont hinge, is possibly *Eucytherura* Müller, 1894.
33. *Lophocythere acutiplicata* (Jones and Sherborn) Bate, 1969 (pl. 1, fig. 8; pl. 12, figs 4–6) from the Bathonian of Britain is more strongly tapered posteriorly than most species of *Neurocythere*. Its hinge is ‘particularly delicate’ antimerodont (Bate 1969, pp.416–417) and if this were so it should be removed from the Progonocytheridae. However, we consider it to be an early species of *Neurocythere* with a very weak entomodont hinge.
34. *Lophocythere* sp. Bate, 1969 (text-fig. 12), from the Bathonian of Britain, is *Neurocythere*.
35. *Lophocythere cuvillieri* Dépêche, 1969 (pl.1, figs 8–9) from the Callovian of Lorraine, France, is *Neurocythere*.
36. *Lophocythere carinalis* Masumov, 1973 (pl. 4, figs 5–6) from the Oxfordian of Uzbekistan, was placed by Malz 1975 (p.132) in *Palaeocytheridea* Mandelstam, 1947, with which we agree.
37. *Lophocythere (Fastigatocythere) juglandica* (Jones, 1884) of Dépêche 1973 from the Middle Jurassic of Europe and Madagascar was assigned to *Fastigatocythere* by Wienholz (1967) (see Whatley and Ballent 1996, p. 921).
38. *Lophocythere (Fastigatocythere) juglandica malgachica* (Grekoff, 1963) of Dépêche 1973 was assigned by Wienholz (1967) to *Fastigatocythere* (see Whatley and Ballent 1996, p.921).
39. *Lophocythere (Fastigatocythere) bessinensis* Dépêche, 1973 (pl. 1, figs 3–8) and *Lophocythere (F.) rimosa* Dépêche, 1973 (pl. 1, figs 9–13), both from the Bathonian of France, are, in our opinion, *Neurocythere* (see Whatley and Ballent 1996, p. 931).
40. *Lophocythere senarensis* Masumov, in Masumov and Bykovskaya 1975 (pl. 6, figs 1–6); *Lophocythere cribosa* Masumov and Bykovskaya, 1975 (pl. 6, figs 7–9); *Lophocythere dedalea* Masumov, in Masumov and Bykovskaya 1975 (pl. 6, figs 10–13) and *Lophocythere tuarkirensis* Masumov and Bykovskaya, 1975 (pl. 6, fig. 14), all from the Lower Callovian of Tuar-Kyr, are *Neurocythere*.
41. *Lophocythere cruciata intermedia* (Lutze, 1960) of Bielecka *et al.* 1980 (pl. 67, fig. 1) from the Middle Callovian of Poland, is certainly *Neurocythere* (Whatley *et al.* 2001).
42. *Lophocythere cruciata intermedia* (Lutze, 1960) of Hergreen *et al.* 1983/84 (pl. 3, figs 1–5) and *Lophocythere cruciata intermedia* (Lutze, 1960) of Bielecka *et al.* 1988 (pl. 67, fig.1) from the Middle Callovian of Poland and the eastern Netherlands respectively, have been identified as *Neurocythere* by Whatley *et al.* (2001).
43. *Lophocythere cruciata oxfordiana* Lutze, 1960 of Kulshreshtha *et al.* 1985 (figs 8.7, 8.13–15) from the Callovian–Oxfordian of India, appears to have merodont hinge and it resembles *Procytheridea* Peterson, 1954 in shape. While uncertain of its generic status, it is not *Lophocythere* and probably not Progonocytheridae.
44. *Lophocythere jaisalmerensis* Kulshreshtha *et al.*, 1985 (figs 3.7, 3.10–13) from the Callovian–Oxfordian of India. With its three longitudinal ribs converging posteriorly and a vertical rib towards the anterior margin, intercostal area reticulate and ‘typically entomodont’ hinge it resembles *Trichordis* Grekoff, 1963.
45. *Lophocythere denticulata* Kulshreshtha *et al.*, 1985 (figs 8.8–12) from the Callovian–Oxfordian of India, seems in external characters to be *Neurocythere*. However, the hinge is described as being ‘well developed amphidont’. This is probably a mistake. We would expect it to be entomodont. We include it in *Trichordis* Grekoff, 1963 (see below).
46. *Lophocythere fulgurata* (Jones and Sherborn, 1888). This is a juvenile of *Fastigatocythere juglandica major* (Jones and Sherborn, 1888) (see Ware and Whatley 2002).

Doubtful species. Lophocythere? aff. Ost. 1615a Buck of Lutze 1960 (pl. 37, fig.4) from the Upper Bathonian of north-west Germany is a doubtful species because it is not described and is very poorly illustrated.

Lophocythere? sp. of Mette 1993 (p.92, pl. 3, figs 13–14) from the Lower Callovian of northern Somalia, is ornamented by a ventro-lateral rib which antero-ventrally changes direction through 90 degrees to extend to the eye tubercle. In the posterior half of the valve, indistinct vertical ribs extend from a postero-dorsal tubercle. This could be a juvenile (length, 0.63–0.76 mm) of a species close to *L. propinqua* Malz, 1975. However, the caudal process rather resembles that of cytherurids.

Emended diagnosis. A large and robust, thick-shelled genus of Progonocytheridae, Neurocytherinae; carapace subrectangular, parallel-sided with little posterior convergence; anterior margin rounded, usually with prominent frill-like flange; posterior margin variably pointed in the region of mid-height; dorsal margin straight, sometimes obscured in part by lateral ornament; ventral margin straight or medianly concave, usually overhung, in lateral view, by the ventral rib; cardinal angles distinct. Valve surface strongly ornamented. Strong ventro-lateral rib which antero-ventrally changes direction through 90 degrees to extend to eye tubercle. Ventro-lateral part of this rib may be continuous or discontinuous and spinose or tuberculate. Remainder of valve surface strongly reticulate and bearing a number of short vertically aligned irregular ribs, tubercles or spines. The ornament is always the same in each valve. Hinge entomodont and robust. Eye tubercle distinct. Inner margin wide. Avestibulate. Radial pore canals straight

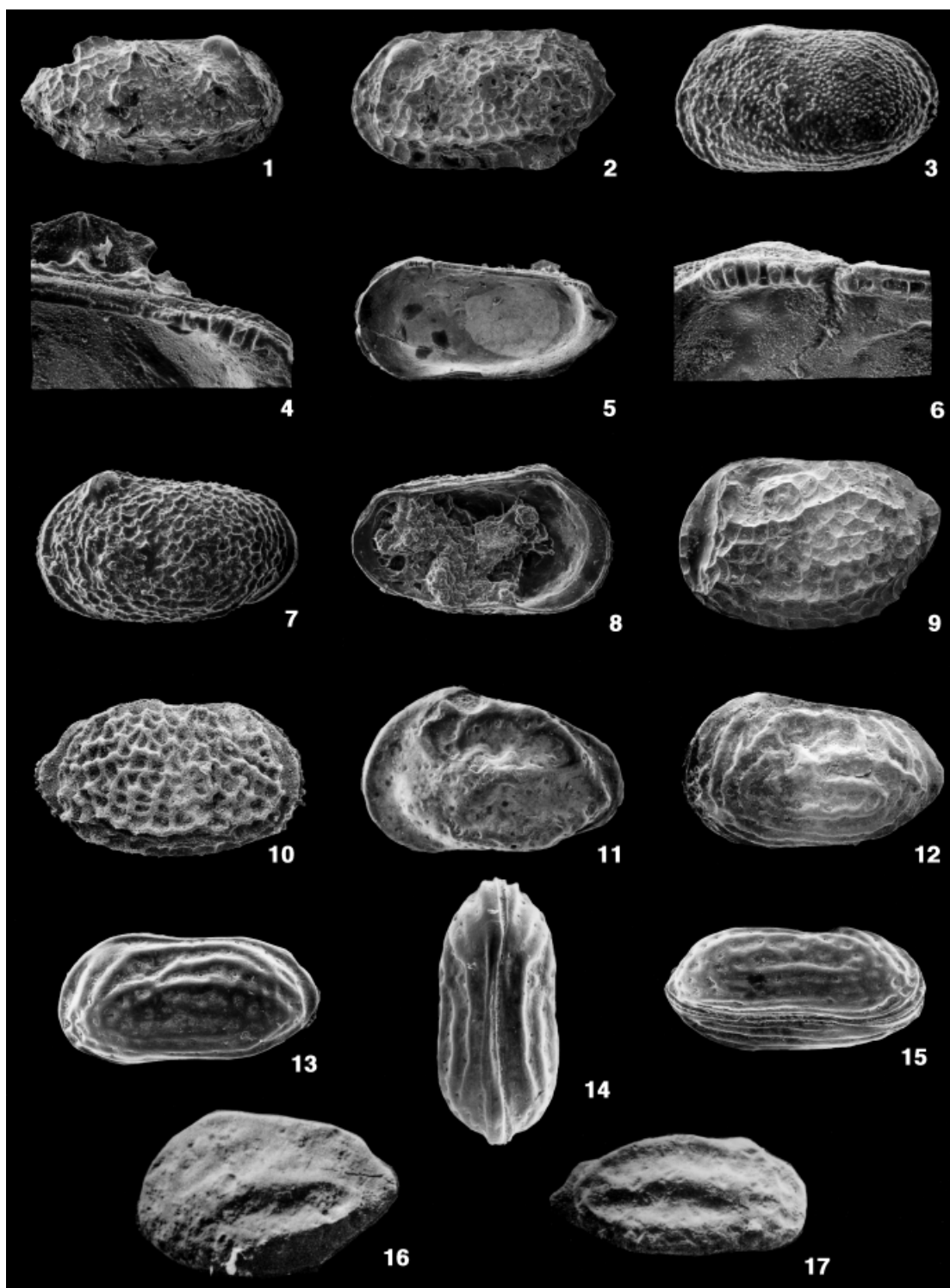
and well spaced; 6–8 anteriorly, 3–4 posteriorly. Muscle scars comprising a vertical, oblique or crescentic row of four adductors, one oval anterior and a smaller antero-ventral mandibular scar. Left valve larger than right, with strong dorsal overlap. Sexual dimorphism pronounced, males longer and proportionally less high than females. Juveniles, particularly the earlier growth stages, are subtriangular in lateral outline and have more angular cardinal angles and more acuminate posterior margins than adults.

Stratigraphical range and geographical distribution. *Lophocythere* species are conspicuous components of Middle and Upper Jurassic (from Bathonian to Oxfordian) marine ostracod assemblages in north-west Europe, including some described from Uzbekistan and the Volga region of the former USSR. One species is mentioned from the Callovian of the North Atlantic margin of North America (Ascoli 1988).

Valid species. We consider the following species and subspecies (listed in date order) to be valid members of *Lophocythere sensu stricto*. In this, and in all subsequent lists of valid species, an asterisk indicates a new combination: *L. ostreata* (Jones and Sherborn, 1888) Sylvester-Bradley, 1948, Bathonian, Britain (ex *Cytheridea*) (Pl. 1, figs 1–2, 4–6); *L. bicarinata* (Jones and Sherborn, 1888), Bathonian, Britain; *L. scabra* Triebel, 1951, Middle Callovian, Germany; *L. interrupta* Triebel, 1951, Middle Callovian, Germany; *L. interrupta interrupta* Triebel, 1951, Lutze 1960, Middle Callovian, north-west Germany; *L. scabra scabra* Triebel, 1951, Lutze 1960, Middle Callovian, north-west Germany; **L. interrupta directa* (Wienholz, 1967), Callovian, north-west Germany (ex *Fastigatocythere*); *L. carinata* Blaszyk, 1967, Lower Bathonian, Poland; *L. batei* Malz, 1975, Middle and Upper Bathonian, Britain; *L. propinqua*

EXPLANATION OF PLATE I

- Figs 1–2, 4–6. *Lophocythere ostreata* (Jones and Sherborn, 1888) (ex *Cytheridea*). 1, Bathonian, Yellow Fullers Earth, Midford, Bath, Somerset, England; The Natural History Museum, London, Department of Palaeontology, Sherborn Collection; holotype BMNH I 1833, right valve, external view; $\times 100$. 2, 4–6, Bathonian, Great Oolite, boueti Bed, Herbury, Dorset, England; The Natural History Museum, London, Department of Palaeontology, Sylvester-Bradley Collection. 2, plesiotype BMNH 41918, left valve, external view; $\times 110$. 5, plesiotype BMNH 41919, right valve, internal view; $\times 100$. 4, 6, same specimen, detail of posterior and anterior hinge respectively; both $\times 600$.
- Fig. 3. *Acanthocythere sphaerulata* (Jones and Sherborn, 1888) (ex *Cythere*); Bathonian, Yellow Fullers Earth, Midford, Bath, Somerset, England; The Natural History Museum, London, Department of Palaeontology, Sherborn Collection; holotype BMNH I 1835, left valve, external view; $\times 150$.
- Figs 7–8. *Protoacanthocythere faveolata* Bate, 1963; Middle Jurassic, Kirton-Lindsey, Lincolnshire, England; The Natural History Museum, London, Department of Palaeontology, Adams Collection; paratype BMNH Io 560, male left valve. 7, external view; 8, internal view; both $\times 130$.
- Fig. 9. *Fuhrbergiella gigantea* Brand and Malz, 1962 [ex *Fuhrbergiella* (*Fuhrbergiella*)]; Upper Bajocian, Germany; Senckenberg Museum, Department of Palaeontology, Frankfurt-am-Main; holotype SMF Xe 4004, female, left valve, external view; $\times 107$. (Courtesy of the Forschungsinstitut und Naturmuseum Senckenberg).
- Fig. 10. *Fuhrbergiella sauzei* Brand and Malz, 1962 [ex *Fuhrbergiella* (*Praefuhrbergiella*)]; Middle Bajocian, Germany; Senckenberg Museum, Department of Palaeontology, Frankfurt-am-Main; holotype SMF Xe 4001, female, right valve, external view; $\times 118$. (Courtesy of the Forschungsinstitut und Naturmuseum Senckenberg).
- Fig. 11. *Trichordis triangula* Bate, 1975; Middle or Upper Kimmeridge, sample B219, Mandawa Anticline, Tanzania, East Africa; The Natural History Museum, London, Department of Palaeontology, holotype BMNH Io 6105, female carapace, left lateral view; $\times 150$.
- Fig. 12. *Terquemula labyrinthica* Malz, in Blaszyk and Malz 1965; Upper Bathonian, north-west Germany; Senckenberg Museum, Department of Palaeontology, Frankfurt-am-Main; holotype SMF Xe 4984, female left valve, external view; $\times 157$. (Courtesy of the Forschungsinstitut und Naturmuseum Senckenberg).
- Figs 13–15. *Terquemula parallela* Blaszyk, in Blaszyk and Malz 1965; Upper Bathonian, Poland; Polish Academy of Sciences, Warsaw; holotype, O.III/1, male carapace; left lateral, dorsal and ventral views; all $\times 100$.
- Figs 16–17. *Neurocythere chonvillensis* (Dépêche, 1969) (ex *Paralophocythere*); Bathonian–Callovian, Chonville 1 well, Lorraine, France; Université Pierre et Marie Curie, Paris, Laboratoire de Micropaléontologie. 16, paratype FDO 12, Chonville 1 well, 363 m, female left valve, external view; $\times 80$. 17, paratype FDO12, Chonville 1 well, 364 m, male right valve, external view; $\times 64$ approximately (after Dépêche 1969, pl. 1, figs 4–5).



WHATLEY and BALLENT, Mesozoic ostracods

Malz, 1975, Upper Bathonian, Britain; *L. scabroides* Malz, 1975, Lower Bathonian, France; *L. karpinskyi* (Mandelstam, in Ljubimova 1955, pl. 8, fig. 5a–b) Malz 1975 (pl. 2, fig. 9), Middle Jurassic, Volga-Ural region; [*L. scabra bucki* Lutze, 1960 from the Middle Callovian of north-west Germany is a junior synonym of this species and *L. karaisensis* Masumov (see, Masumov 1973, pl. 4, fig. 4) from the Oxfordian of Uzbekistan was considered by Malz 1975 to be a junior synonym of *Lophocythere scabra bucki* Lutze, 1960]; **L. interrupta interrupta* Triebel, 1951 and **Lophocythere interrupta* subsp. A Lutze, 1960 of Hengreen *et al.* 1983/84 (pl. 4, figs 5–6; pl. 4, figs 8–9, respectively) from the Middle Callovian of the eastern Netherlands assigned by them to *Fastigatocythere*, are herein retained in *Lophocythere* (see also Whatley and Ballent 1996, p. 931); *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Bielecka 1980 and 1988, Middle Callovian, Poland; *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Hengreen *et al.* 1983/84, Middle Callovian, eastern Netherlands; *L. carinata carinata* Blaszyk, 1967 of Brand 1990, Upper Bathonian, north-west Germany; *L. carinata robusta* Brand, 1990, Upper Bathonian, north-west Germany; *L. fastigata* Brand, 1990 (as *L. fastigatum* in Brand 1990, p. 271), Upper Bathonian, north-west Germany; *L. bicornua* Brand, 1990, Upper Bathonian, north-west Germany; *Lophocythere* sp. A of Wakefield 1994, Bathonian, Isle of Skye, Scotland (see Wakefield 1995, p. 588); *L. interrupta interrupta* Triebel, 1951 of Witte and Lissenberg 1994, Callovian, central North Sea Graben, offshore Netherlands; *L. interrupta* subsp. A Lutze, 1960 of Witte and Lissenberg 1994, Middle Callovian, eastern Netherlands; *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Schudak 1994, Lower Oxfordian, north-west Germany; *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Gerasimov *et al.* 1996, Callovian, central Russia; *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Whatley *et al.* 2001, Middle Callovian, Calvert, England; *L. acrolophos* Whatley *et al.*, 2001, Middle Callovian, Calvert, England; *L. karpinskyi* (Mandelstam, in Ljubimova 1955) of Olempska and Blaszyk 2001, Upper Callovian, Poland.

ACANTHOCYHERE Sylvester-Bradley, 1956

Remarks. Sylvester-Bradley (1956, p. 12, pl. 1, figs 1–4) erected the genus with *Cythere sphaerulata* Jones and Sherborn, 1888 from the Bathonian of England as type species. He also included a new species from the same stratigraphical level, *Acanthocythere spiniscutulata* Sylvester-Bradley, 1956 (p. 13, pl. 1, figs 5–9). We agree with Van Morkhoven (1962, p. 264) that this latter species is not congeneric with the type species.

As diagnosed, *Acanthocythere* is subrectangular with ‘surface more or less spiny’ (as in the type species) or subtrapezoidal with ‘ornament of subtriangular or diamond-shaped spinose ridge’ (as in *A. spiniscutulata*), eye tubercle and lobodont hinge. This consists of the anterior and anteromedian hinge-elements being clearly quadrilobate, the posteromedian bar/groove being smooth and the posterior tooth in the right valve a prominent, slightly curved, 5–7 dentate ridge set at a slight angle to the median element.

Malz (1958, p. 35) established *Unodentina* as a subgenus of *Acanthocythere* to accommodate species of similar aspect but with a smooth anterior and anteromedian hinge-element (this seems to describe an amphidont hinge). He included in *Acanthocythere (Unodentina)* the following species: *Macrodentina? spinosa* Schmidt, 1955 (as type species; see Malz 1958, p. 36, pl. 3, fig. 42) and *A. (U.) undata* Malz, 1958 (p. 36, pl. 3, figs 43–46) both from the Kimmeridgian of Germany. The range of *Acanthocythere sensu stricto* is Bajocian–Callovian, whereas species referred to *A. (Unodentina)* are all of Kimmeridgian age. This, together with the considerable difference in shape and ornament between the two groups of species, makes us consider that they are not congeneric. With an amphidont hinge, *Unodentina* is disqualified from membership of the Progonocytheridae and is hereby removed from the family.

Bate (1963, p. 195), due to the presence of a species within the English Bajocian that is somewhat similar to *A. sphaerulata* (Jones and Sherborn) except for the possession of an antimerodont hinge, erected the subgenus *Protoacanthocythere* with *A. (P.) faveolata* Bate as type species and emended the diagnosis of the genus accordingly. Because of its antimerodont hinge, *Protoacanthocythere* was subsequently elevated to generic rank by Dépêche 1969 (pl. 2, fig. 12), followed by Gründel 1975a (p. 364). However, we believe that this hingement disqualifies *Protoacanthocythere* from membership of the Progonocytheridae and hereby remove it from the family and emend the diagnosis of *Acanthocythere* accordingly.

The following species have been referred to *Acanthocythere (Protoacanthocythere)* (see Pl. 1, figs 7–8): *A. (P.) faveolata* Bate, 1963, Bajocian of England; *Protoacanthocythere* sp. of Dépêche 1969, Callovian of Lorraine; *A. (P.) cansona* Masumov, 1973 (p. 41, pl. 2, figs 10–11), Oxfordian of Uzbekistan; *A. (P.) archangelskyi* (Mandelstam, in Ljubimova 1955) and *A. (P.) milanovskyi* (Ljubimova, 1955), Middle Jurassic of Russia (see Neustrueva *et al.* 1999, p. 179).

We consider that the following taxa should be removed from *Acanthocythere* and accommodated elsewhere:

1. *Acanthocythere spiniscutulata* Sylvester-Bradley, 1956; this is probably *Fastigatocythere* Wienholz, 1967 although Dépêche *et al.* (1987) used it as type species for their genus *Dhrumaella*.
2. *Acanthocythere aardaensis* Basha, 1980 (p. 240, pl. 1, figs 13–15) from the Bathonian of Jordan. The hinge, allegedly lobodont, is neither described nor clearly figured. Rosenfeld *et al.* (1987a, pl. 3, figs 13–14) recorded this species from the Bathonian of Sinai, Egypt and considered it to be *Ektyphocythere* Bate, 1963. Dépêche *et al.* (1987, p. 234) recorded it from the Middle Jurassic of Saudi Arabia and included it in their genus *Dhrumaella*.
3. *Acanthocythere bakeri* Basha, 1980 (p. 240, pl. 2, figs 1–4) from the Bathonian of Jordan, is placed in *Fastigatocythere* Wienholz, 1967 by Rosenfeld *et al.* (1987a) who encountered it in the Bathonian of Sinai [see *F. bakeri* (Basha) of Rosenfeld *et al.* 1987a, p. 263, pl. 3, figs 1–8].
4. *Acantocythere multicostata* Dépêche, 1984 (*in* Dépêche 1985, p. 130, pl. 29, fig. 6) from the Middle Bathonian of Normandy, is *Fastigatocythere* Wienholz.
5. *Acantocythere robusta*, *A. blainvillensis*, *A. magna*, *A. escovillensis*, all Dépêche, 1984 from the Middle Bathonian of Normandy, are species which Dépêche *et al.* (1987) included in their genus *Dhrumaella* (see below).
6. *Acantocythere sphaerulata* Sylvester-Bradley, 1956 of Dépêche *et al.* 1987 (pl. 6, fig. 14) from the Bathonian of Calvados. This is certainly not synonymous with Sylvester-Bradley's species, which has a papillate ornament without ribs. We believe this to be an error by the authors and that it is probably a juvenile of *A. spiniscutulata* Sylvester-Bradley, which is the species illustrated in figure 15 of the same plate. We believe the genus to be *Fastigatocythere* Wienholz.
7. *Acantocythere alacer* Al Furaih (*in* Keen *et al.* 1994, pl. 16:3, fig. 15) from the Palaeocene/Lower Eocene of Saudi Arabia and Iraq belongs in Trachyleberididae.
8. *Acantocythere (Unodentina) spinosa* (Schmidt, 1955) and *A. (Unodentina) undata* Malz, 1958, both of Schudack 1994 (pl. 10, fig. 6) from the Upper Oxfordian–Lower Kimmeridgian of north-west Germany, are removed from Progonocytheridae (see above).

Doubtful species. *Acanthocythere?* sp. of Mette 1995 from the Middle–Upper Callovian of southern Tunisia (pl. 21, figs 5–6) is not described, only figured.

Emended diagnosis. Carapace of medium size; subrectangular to subtrapezoidal in lateral outline. Dimorphic. Broadly although obliquely rounded anteriorly and more narrowly rounded to somewhat tapering posteriorly. Dorsal margin straight or with slight median concavity, with prominent cardinal angles and ventral margin concave medianly. Left valve slightly larger than right. Subovoidal in dorsal view. Eye tubercle shiny, rather prominent. Surface ornamented with small papillae, each of which is perforated by a normal pore and which are concentrically disposed parallel to the margins peripherally and subperipherally, where they become papillate ribs, especially ventrally. One possible species is reticulate. Hinge entomodont/lobodont. Radial pore canals simple, sparse, straight, about eight anteriorly. Inner margin moderately wide, avestibulate. Four vertical adductors. Frontal scar, large, circular.

Stratigraphical range and geographical distribution. Bathonian, England and Scotland.

Valid species. We consider the following species to be valid members of *Acanthocythere*: *A. sphaerulata* (Jones and Sherborn, 1888) Sylvester-Bradley, 1956, Bathonian, England (ex *Cythere*) (Pl. 1, fig. 3); *A. elongata* Wakefield, 1994, Bathonian, Isle of Skye, Scotland; and *Acanthocythere?* sp. of Wakefield 1994, Bathonian, Isle of Skye, Scotland (see Wakefield 1995, p. 588).

FUHRBERGIELLA Brand and Malz, 1962

Remarks. This genus was erected by Brand and Malz (1962) to accommodate a number of large, subrectangular, strongly reticulate ostracods from the Bajocian and Bathonian. They all have straight dorsal, well-rounded anterior and pointed (sometimes acutely) posterior margins. The ventral margin is usually overhung by the valve surface in lateral view. The hinge is entomodont but the anteromedian element is not always strongly developed. Although there is no internal ocular sinus, many species have a

pseudo-eye tubercle. Some species somewhat resemble *Neurocythere* Whatley but have less well-developed ribs and lack the eye spot.

PRAEFUHRBERGIELLA Brand and Malz, 1962

Remarks. This subgenus was erected by Brand and Malz (1962) in the same paper in which they described *Fuhrbergiella*, using their new species, *Fuhrbergiella (Praefuhrbergiella) horrida* as type species. It is somewhat difficult to understand what relationship these authors considered the two taxa to have to one another, in that while they seemed to regard them as subgenera, elsewhere they implied that they are separate genera. However, we believe that because *Praefuhrbergiella* was recognized to some extent on stratigraphical grounds and that it otherwise differs only minimally (a slightly weaker hinge and marginally different expression of sexual dimorphism) that it should be subsumed within *Fuhrbergiella* and suppressed. Our emended diagnosis of *Fuhrbergiella* embraces species of *F. (Praefuhrbergiella)*.

We consider that the following taxa should be removed from *Fuhrbergiella* and accommodated elsewhere:

1. *Fuhrbergiella (P.) hieroglyphica* (Swain and Peterson, 1951) of Braun and Brooke 1992 (pl. 108, fig.2) from the Oxfordian of Western Canada, is *Pseudoperissocytheridea* Mandelstam, 1960.
2. *Fuhrbergiella (P.?)* sp. 45 (Brooke and Braun) in Braun and Brooke 1992 (pl. 107, fig. 27) from the Callovian of Saskatchewan. It resembles *Neurocythere*.
3. *Fuhrbergiella (P.)* sp. 60 (Brooke and Braun) in Braun and Brooke 1992 (pl. 107, fig. 30) from the Callovian of Saskatchewan is *Pseudoperissocytheridea* Mandelstam, 1960.
4. *Fuhrbergiella? (P.) heiroglyphica (sic)* (Swain and Peterson, 1951) of Swain 1998 (p. 147, pl. 2, figs 16–17; pl. 3, figs 1–2) from the Callovian–Kimmeridgian of Montana and Wyoming, is *Pseudoperissocytheridea* Mandelstam, 1960.

Doubtful species. *Fuhrbergiella (F.) primitiva* Brand and Malz, 1962 (pl. 2, figs 15–21) from the Middle Bajocian of Germany. This is possibly a species of *Palaeocytheridea* Mandelstam, 1947.

Fuhrbergiella sp. 4189 of Michelsen 1975 (p. 152, pl. 9, fig. 125) from the Aalenian of the Danish Embayment. It is only a left valve, broken and poorly preserved, which was compared with *F. (P.) sauzei* Brand and Malz, 1962 and with *F. (P.?) favosa* Plumhoff, 1963. Considering its poor preservation it is left under open nomenclature.

Fuhrbergiella cf. *arens* Bate, 1963 of Kulshreshtha *et al.* 1985 (figs 5.12–13) from the Callovian–Oxfordian of India. This species is only poorly figured (not described) and with a weak hinge that apparently is not entomodont, in which case it should be removed from the Progonocytheridae.

Emended diagnosis. Large to very large. Thick-shelled. Subrectangular to almost subovate. Anterior margin well rounded; posterior bluntly to acutely pointed. Dorsal margin straight to slightly concave medianly; ventral margin convex. End margins strongly laterally compressed, especially anteriorly. Ornament essentially reticulate and variably costate; some species tuberculate/spinose. No internal ocular sinus, but tubercle in ocular position often pronounced and enhanced by sometimes deep post-ocular sulcus. Hinge entomodont, varying from robust to feebly developed. Adductor scars a vertical or crescentic row of discrete scars with a single frontal scar and a single weak mandibular. Inner lamella wide, avestibulate. Radial pore canals straight, simple and well-spaced, approximately eight anteriorly. Sexual dimorphism not strongly pronounced; males more elongate than females.

Stratigraphical range and geographical distribution. The genus is common in the north European Bajocian and almost as common there in the Bathonian. It is notably less common in the Callovian and Whatley's (1970) record from the Upper Callovian and Lower Oxfordian of England and Scotland and that of Mandelstam (*in* Ljubimova 1955) from the Volga region of Russia, are the last records of the genus in Europe. The genus seems to be confined to the Upper Callovian–Lower Kimmeridgian in North America.

Valid species. We consider the following species/subspecies to be valid members of *Fuhrbergiella*: *F. archangelskyi* (Mandelstam, *in* Ljubimova 1955), Middle and Upper Callovian and Lower Oxfordian, Middle Volga and Syrt area,

Russia (ex *Palaocytheridea*); *Fuhrbergiella* (*Fuhrbergiella*) *gigantea* Brand and Malz, 1962, Upper Bajocian, Germany (Pl. 1, fig. 9); *F. (F.) gigantea gigantea* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) gigantea compressa* Brand and Malz, 1962, Upper Bathonian, Germany; *F. (F.) gigantea disjuncta* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) projecta* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) diagonalis* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) transversiplicata* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) transversiplicata transversiplicata* Brand and Malz, 1962, Upper Bajocian, Germany; *F. (F.) transversiplicata minuta* Brand and Malz, 1962, Lower Bathonian, Germany; *Fuhrbergiella* (*Praefuhrbergiella*) *horrida* Brand and Malz, 1962, Middle Bajocian, Germany; *F. (P.) horrida horrida* Brand and Malz, 1962, Middle Bajocian, Germany; *F. (P.) horrida bicostata* Brand and Malz, 1962, Lower Bajocian, Germany; *F. (P.) sauzei* Brand and Malz, 1962, Middle Bajocian, Germany (Pl. 1, fig. 10); *F. (P.) arens* Bate, 1963, Bajocian, Britain; *F. (P.) horrida* Brand and Malz, 1962 of Plumhoff 1963, Lower Bajocian, north-west Germany; *F. (P.) sauzei* Brand and Malz, 1962 of Plumhoff 1963, Middle Bajocian, north-west Germany; *F. (P.?) favosa* Plumhoff, 1963, Upper Aalenian–Lower Bajocian, north-west Germany; *F. (P.) minima* Bate, 1964, Bajocian, Britain; *F. (F.) gigantea quarta* Blaszyk, 1967, Middle Bathonian, Poland; *F. (F.?) concentrica* Blaszyk, 1967, Lower Bathonian, Poland; *F. (P.) lurica* Blaszyk, 1967, Lower Bathonian, Poland; *F. (P.) horrida horrida* Brand and Malz, 1962 of Whatley 1970, Upper Callovian–Lower Oxfordian, England and Scotland; *F. svetlani* Masumov, 1973 = *F. malzi* Masumov (see Masumov 1973, p. 50, pl. 4, figs 2–3), Lower Callovian, Uzbekistan; *F. reticulata* Dépêche, 1984 in Dépêche 1985, Upper Bathonian, Paris Basin; *F. horrida* Brand, 1962 (*sic*) of Dépêche 1985, Lower Callovian, Normandy; *F. cf. compressa* Brand and Malz, 1962 of Liebau 1987, Lower Bathonian, Germany; *F. gigantea cf. disjuncta* Brand and Malz, 1962 of Liebau 1987, Upper Bajocian, Germany; *F. aff. diagonalis* Brand and Malz, 1962 of Liebau 1987, Upper Bajocian, Germany; *F. (P.) sauzei* Brand and Malz, 1962 of Ohmert 1988, Lower Bajocian, south-west Germany; *F. (F.) gigantea compressa* Brand and Malz, 1962 of Brand 1990, Upper Bathonian, north-west Germany; *F. (P.) crowcreekensis* (Swain and Peterson, 1951) of Braun and Brooke 1992, Oxfordian, western Canada; *F. (P.) horrida horrida* Brand and Malz, 1962 of Witte and Lissenberg 1994, Callovian, central North Sea Graben, offshore Netherlands; *F. (P.) crowcreekensis* (Swain and Peterson, 1951) of Swain 1998, Callovian–Kimmeridgian, Montana and Wyoming; *F. (P.) sp. aff. F. (P.) crowcreekensis* (Swain and Peterson, 1951) of Swain 1998, Callovian–Kimmeridgian, Montana and Wyoming; *F. (P.) archangelskyi* (Mandelstam, in Ljubimova 1955) of Olempska and Blaszyk 2001, Upper Callovian, Poland.

TRICHORDIS Grekoff, 1963

Remarks. Grekoff, 1963 (p. 1742) described the genus *Trichordis* with *T. praetexta* from the Middle–Upper Bathonian of Madagascar as type species. This species is subrectangular in outline, ornamented with three variably developed longitudinal ribs and, as diagnosed, the hinge is lobodont in which the median element, apart from the two antero-median teeth, appears to be smooth (this hinge was considered by Bate 1975, p. 188, as modified entomodont).

Bate (1975) described *Trichordis triangula* from the Oxfordian–Kimmeridgian of Tanzania, East Africa, which differs from the type species in its much more triangular outline in lateral view and three well-developed ribs on the lateral surface. In addition, its hinge is clearly entomodont with a distinctly crenulate postero-median element. Nevertheless, Bate (p.188) considered that his Tanzanian species belonged in *Trichordis*, although he added that it might be necessary later to subdivide the genus. Following this suggestion, Khosla and Jakhar (1993), who studied the late Bathonian–Callovian ostracods of Kachchh (Kutch), India, subdivided the genus into subgenera: *Trichordis s.s.* (type species *T. (T.) praetexta* Grekoff) in which the median hinge element comprises two closely spaced anteromedian teeth and a long, smooth posteromedian bar and a new subgenus, *Trichordis* (*Paratrachordis*) (type species *T. (P.) triangula* Bate) with typical entomodont hinge (although the authors, on page 146, claimed that the hinge is lobodont). Khosla and Jakhar included in the latter subgenus the following species: *T. (P.) devexa* (Grekoff, 1963), *T. (P.) grumosa* (Ljubimova *et al.*, 1960) and *T. (P.) parvicarinata* Khosla and Jakhar, 1993. We believe that the erection of (*Paratrachordis*) serves no useful function, based as it is on relatively trivial differences from the type species of *Trichordis s.s.*, and advocate its suppression. The diagnosis of *Trichordis* is emended below to accommodate the three species concerned.

We consider that the following taxon is best removed from *Trichordis* and accommodated elsewhere:

Trichordis sp. cf. *T. praetexta crispa* Grekoff, 1963 of Guha 1976 (pl. 3, fig. 17) from the Upper Jurassic of India is certainly not *Trichordis*. It somewhat resembles *Afrococytheridea* Bate, 1975.

Synonymized genera. We consider *Pokornya* Singh and Kulshreshtha, 1972 from the Callovian–Oxfordian of India, to be a junior synonym of *Trichordis* (see below).

Emended diagnosis. Carapace of medium size, subrectangular to subtriangular in lateral view. Subovate and biconvex in dorsal view. Left valve larger than right valve. Moderately tumid ventro-laterally. Ornamentation of three variably developed longitudinal ribs on the lateral surface that vary in expression from merely swellings to sharp and prominent ribs. Weak puncta, disposed parallel to the margins, are superimposed on the primary ornament. Eye swelling more pronounced in some species than others. Hinge entomodont, rather strongly developed. In the type species, the median element in the left valve, apart from the two antero-median teeth, is smooth, in some others it is denticulate. Normal pores numerous, open, scattered. Inner lamella broad, avestibulate. Anterior marginal pore canals, 8–14, straight and simple (in the type species with a median or distal swelling; see Grekoff 1963, pl. 9, figs 227–228); posteriorly, 3–6 in number. Muscle scars, a row of four oval adductor scars and a rounded or V-shaped frontal scar.

Stratigraphical range and geographical distribution. The genus occurs commonly in the Middle and Upper Jurassic (Bajocian–Kimmeridgian) of Madagascar, Tanzania, India and Saudi Arabia.

Valid species. We consider the following species to be valid members of *Trichordis*: *T. praetexta* Grekoff, 1963, Middle–Upper Bathonian, Madagascar; *T. praetexta* var. *crispa* Grekoff, 1963, Middle Callovian, Madagascar; *T. triangula* Bate, 1975, Oxfordian–Kimmeridgian, Tanzania, East Africa (Pl. 1, fig. 11); *Trichordis* sp. 116, *Trichordis* sp. 1, *Trichordis* sp. 2 Dépêche *et al.*, 1987, Bajocian–Callovian, Saudi Arabia; *T. triangula* Bate, 1975, *T. devexa* (Grekoff, 1963) and *T. grumosa* (Ljubimova *et al.*, 1960) of Khosla and Jakhar, 1993, Upper Bathonian–Callovian of India [all ex *T. (Paratrachordis)*]; *T. praetexta* Grekoff, 1963 of Khosla *et al.* 1997, Upper Bathonian–Callovian, India; *T. devexa* (Grekoff, 1963) and *T. grumosa* (Ljubimova *et al.*, 1960) of Khosla *et al.* 1997, Upper Bathonian–Callovian of India [both ex *T. (Paratrachordis)*]; *T. cf. triangula* Bate, 1975 of Neale and Singh 1985, Callovian–Oxfordian, India; **T. kuldharensis* (Singh and Kulshreshtha, 1972), Callovian, India. (ex *Pokornya*) (Text-fig. 1); **T. sureshi* (Kulshreshtha *et al.*, 1985), Callovian–Oxfordian, India (ex *Pokornya*); **T. sahnii* (Kulshreshtha *et al.*, 1985), Callovian–Oxfordian, India (ex *Pokornya*); **T. denticulata* (Kulshreshtha *et al.*, 1985) and **T. jaisalmerensis* (Kulshreshtha *et al.*, 1985) of Khosla *et al.* 1997, Upper Bathonian–Callovian, India (both ex *Nophrecythere*); *T. parvicarinata* Khosla and Jakhar, 1993, Upper Bathonian–Callovian, India [ex *T. (Paratrachordis)*]; *T. parvicarinata* Khosla and Jakhar, 1993 of Khosla *et al.* 1997, Upper Bathonian–Callovian, India [ex *T. (Paratrachordis)*]; *T. gujaratensis* Khosla *et al.*, 1997, Upper Bathonian–Callovian, India.

AULACOCY THERE Bate, 1963

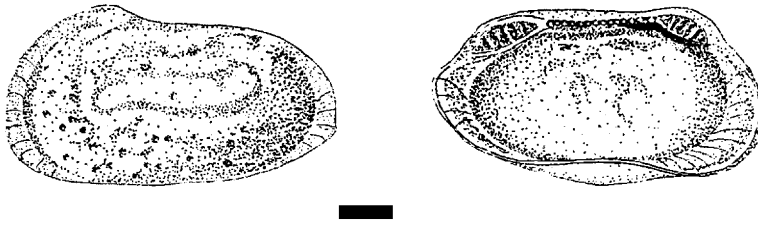
Remarks. The genus *Aulacocythere* was described by Bate (1963, p. 198) from the Bajocian of England, as a small to medium-sized (0.44–0.52 mm) Progonocytheridae. With its well-developed antimerodont hinge, it clearly is not a progonocytherid and is hereby removed from the family.

TERQUEMULA Blaszyk and Malz, 1965

Remarks. *Terquemula* was described by Blaszyk and Malz (1965) based on two species: the type species *T. parallela* Blaszyk and *T. labyrinthica* Malz (both in Blaszyk and Malz, 1965, pp. 444 and 447 respectively).

Malz (1975) considered *Neurocythere* Whatley, 1970 to be a junior synonym of *Terquemula*. Bate (1969, pp. 390–391) redescribed *Neurocythere bradiana* (Jones, 1884) with four major ribs converging towards the antero-ventral region but in 1978 (p. 238, pl. 7, figs 6, 9), following Malz (1975), assigned this species to *Terquemula*. In the same publication (Bate 1978, p. 246, pl. 11, figs 6–7) he illustrated *Terquemula bradiana* (Jones) morphotype B with broad ribs and smooth intercostal areas, and considered this an eco-morphotype.

Ware and Whatley (1980) outlined the differences between *Terquemula* and *Neurocythere*. In the type species *T. parallela*, from the Upper Bathonian of Poland, the intercostal areas are smooth or punctate rather than reticulate and the ribs are not disposed in an essentially longitudinal pattern, since posteriorly they curve around and parallel the posterior margin, rather than extending from or near it as in



TEXT-FIG. 1. *Trichordis kuldharensis* (Singh and Kulshreshtha, 1972) (ex *Pokornya*). Callovian, Kuldhar area, Jaiselmer, Rajasthan, India; Department of Geology, University of Lucknow, India; Paratype No. SJO/3, left valve, external and internal lateral views. Scale bar represents 100 μm . (After Singh and Kulshreshtha 1972, pl. 1).

Neurocythere. In *T. labyrinthica* Malz, from the Upper Bathonian of north-west Germany, the ribs are thicker and more sinuous than in the type species. Other species, such as *T. blakeana* (Jones, 1884), included by Gründel (1975a, p. 367) in his subgenus *Fossaterquemula*, have almost lost their ribs and are essentially punctate or pitted. Since there is a continuous morphological sequence between costate and punctate/pitted species of *Terquemula*, we are disinclined to employ *Fossaterquemula* and advocate its suppression.

Rosenfeld *et al.* (1987b) considered that *Terquemula*, as originally described, lacks an eye spot but pointed out that 'the type species of the genus, *T. parallela*, shows a distinct thickening of the anterior rib in the right valve' (p. 243). They emended the original description as follows: 'Eye-spot faint to moderate, best seen in right valves, developed as suboval, elongate thickening of the anterior rib'. They included several species in *Terquemula* that we do not accept (see below).

We consider that the following taxa which have been referred to *Terquemula* should be removed and accommodated elsewhere:

1. *Terquemula bradiana* (Jones, 1884) of Bate 1978 (pl. 7, figs 6, 9) from the Bathonian of England, is the type species of *Neurocythere* Whatley.
2. *Terquemula bradiana* (Jones, 1884) morphotype B of Bate 1978 (pl. 11, figs 6–7) from the Bathonian of England, is *Neurocythere* Whatley.
3. *Terquemula acutiplicata* (Jones and Sherborn, 1888) of Bate 1978 (pl. 7, figs 7–8) from the English Bathonian, is markedly tapered posteriorly, particularly in the right valve, and is ornamented by delicate irregular ribs with smooth intercostal areas. According to Bate 1969 (pp. 416–417), who designated lectotype and paralectotypes of this species, its hinge is antimerodont. However, we consider this to be a species of *Neurocythere* with a rather weak entomodont hinge.
4. *Terquemula* sp. Basha, 1980 (pl. 3, fig. 8) from the Bajocian of Jordan, is elongate subrectangular with polygonal reticulation. Although the author mentioned an entomodont hinge (not illustrated), it is not *Terquemula*. It resembles *Glabellacythere* Wienholz, 1967.
5. *Terquemula robusta* Sheppard, 1981 (pl. 8, figs 154–156) from the Upper Bathonian of England, is certainly *Neurocythere*.
6. *Terquemula* cf. *septicostata* (Bate, 1967) of Malz *et al.* 1985 (pl. 5, figs 47–49) from the Upper Bathonian of Sardinia, combines in its ornament features of both *Neurocythere* and *Terquemula*. However, because the longitudinal ribs do not curve and parallel the margin posteriorly, it is better accommodated in *Neurocythere*.
7. *Terquemula elegans* Dépêche, 1984 (in Dépêche 1985, pl. 30, fig. 8) from the Upper Bathonian of France and *T. bradiana* (Jones, 1884) of Dépêche 1985 (pl. 30, fig. 9) from the Lower Callovian of France, are both *Neurocythere*.
8. *Terquemula goldbergi* Rosenfeld and Gerry, in Rosenfeld *et al.* 1987a (pl. 6, figs 1–3), from the Bathonian of Sinai, Egypt, is subtriangular in outline, ornamented by ribs in an inverted chevron and with prominent eye tubercle and marked post-ocular sulcus, and is better accommodated in *Fastigatocythere* Wienholz, 1967.
9. *Terquemula gublerae* (Bizón, 1958) of Rosenfeld *et al.* 1987a (pl. 6, fig. 4) from the Callovian–Oxfordian of Sinai, Egypt, belongs in *Fastigatocythere* Wienholz, 1967.
10. *Terquemula gublerae* (Bizón, 1958) of Rosenfeld *et al.* 1987b (pl. 3, figs 9–10) and *T. cf. martini* (Bizón, 1958) of Rosenfeld *et al.* 1987b (pl. 3, fig. 8), both from the Oxfordian of Israel, are *Fastigatocythere* Wienholz, 1967.
11. *Terquemula multicostata* (Oertli, 1957) mentioned by Ascoli 1988 (p. 26) from the Oxfordian of the north Atlantic margin of North America, is *Neurocythere*.

12. *Terquemula fuhrbergensis* (Triebel, 1951) of Brand 1990 (pl. 15, fig. 21) from the Upper Bathonian of north-west Germany, is *Neurocythere*.

13. *Terquemula multicostata* (Oertli, 1957) of Schudack 1994 (pl. 17, fig. 6) from the Lower–Middle Oxfordian of north-west Germany, is *Neurocythere*.

Emended diagnosis. Medium-sized to large. Elongate-ovate or subrectangular in outline, with greatest height at anterior cardinal angle; may be noticeably constricted mid-dorsally and mid-ventrally. Anterior margin broadly but obliquely rounded. Posterior margin narrowly rounded, apex at or slightly above mid-height. Postero-lateral part of carapace swollen, overreaching ventral margin. Eye swelling distinct. Biconvex in dorsal view with anterior and posterior margins somewhat compressed. Valve surface variably ornamented with longitudinal ribs which curve around posteriorly and parallel the posterior margin and which anteriorly may become disposed parallel to the margin behind the compressed marginal area. In costate species, intercostal areas are smooth, punctate and never reticulate, except in the *flexicosta* species group. Other species lack costae and are pitted or with large, sunken normal pore canal openings, or with a broad feeble reticulation. Hinge entomodont. Avestibulate. Marginal pore canals few and distanced, 8–10 anteriorly and three posteriorly. Muscle scars of type A Bate, 1963 (p. 180). Sexual dimorphism pronounced.

Stratigraphical range and geographical distribution. Confined to the Bathonian of Britain and north-east Europe.

Valid species. We consider the following species to be valid members of *Terquemula*: *T. blakeana* (Jones, 1884) of Bate 1969, Bathonian, England; *T. parallela* Blaszyk, in Blaszyk and Malz 1965, Upper Bathonian, Poland (Pl. 1, figs 13–15); **T. flexicosta* (Triebel, 1951), Lower and Middle Callovian, Germany (ex *Lophocythere*); **T. flexicosta flexicosta* (Triebel, 1951) of Lutze 1960, Callovian–Oxfordian, north-west Germany (ex *Lophocythere*); *T. labyrinthica* Malz, in Blaszyk and Malz 1965, Upper Bathonian, north-west Germany (Pl. 1, fig. 12); *T. flexicosta lutzei* (Whatley, 1970), Upper Callovian, Great Britain [ex *Lophocythere (Neurocythere)*]; **T. flexicosta* (Triebel, 1951) of Gründel 1973, Callovian and Oxfordian, Germany, France and Britain; **T. flexicosta* (Triebel, 1951) of Gründel 1975a, Callovian and Oxfordian, Germany, France and Britain (ex *Nophrecythere*); *T. flexicosta lutzei* (Whatley, 1970) of Kilenyi 1978, Upper Callovian, England and Scotland; *T. blakeana* (Jones, 1884) of Dépêche 1985, Upper Bathonian, France; *T. flexicosta lutzei* (Whatley, 1970) of Dépêche 1985, Lower Callovian, France; *T. labyrinthica* Malz, 1965 of Brand 1990; Upper Bathonian, Germany; **T. flexicosta labyrinthos* Whatley *et al.*, 2001, Middle Callovian, Calvert, England (ex *Neurocythere*); *T. lutzei* (Whatley, 1970) of Olempska and Blaszyk 2001, Upper Callovian, Poland.

PARALOPHOCY THERE Dépêche, 1969

Remarks. The genus *Paralophocythere* was erected by Dépêche 1969 (p. 268) with *Paralophocythere chonvillensis* from the Bathonian and Callovian of Lorraine as type species.

As diagnosed *Paralophocythere* is medium-sized to large, elongate-ovate to subrectangular, with greatest height at anterior cardinal angle. Anterior margin broadly but obliquely rounded, tapering towards posterior margin with apex at mid height. Left valve larger than right and of different outline. In the left valve the dorsal margin is straight to weakly convex; in the right valve the dorsal rib overreaches the respective margin. Ornamented by three longitudinal ribs, much more clearly defined in the right valve, which curve around posteriorly and anteriorly and parallel the respective margins. Dorsal rib, indistinct in the left valve. Anterior and posterior marginal areas, punctate or reticulate. Eye swelling distinct. Hinge entomodont and robust with five teeth anteriorly and six posteriorly in the right valve, with secondary dorsal crenulation. Median element with 3–4 strong teeth anteriorly, following by eight small teeth in left valve. Avestibulate. Marginal pore canals simple, straight and few in number, 8–9 anteriorly and 4–6 posteriorly. Sexually dimorphic, males longer than females.

According to Dépêche (1969) *Paralophocythere* is intermediate between *Lophocythere* and *Protocythere*. Its hinge is essentially entomodont in type, like that of *Lophocythere*, from which it differs in the presence of secondary dorsal crenulation. It shares with *Protocythere* the ornamental pattern of three longitudinal ridges or swellings, and the secondary dorsal of the terminal teeth, and differs in the absence of an antero-dorsal ‘ear’ in the left valve. In our view, the type species of this genus is simply a species of

Neurocythere in which the ventral rib is suppressed and which happens to have dorsally incised terminal teeth. There are not enough grounds for a new genus and those resemblances it may have to the Protocytheridae are superficial. We advocate that the taxon should be suppressed and its type species subsumed into *Neurocythere*.

The following species have been referred to *Paralophocythere*:

1. *Paralophocythere chonvillensis* Dépêche, 1969, Bathonian–Callovian, Lorraine. This, the type species, we include in *Neurocythere* (Pl. 1, figs 16–17).
2. *Paralophocythere frentzeni* Malz, 1972 (pl. 1, figs 1–5; pl. 2, figs 6–11), Bathonian, Germany. This is *Fastigatocythere* Wienholz.
3. *Paralophocythere frentzeni* Malz, 1972 of Dépêche 1985 (pl. 29, fig. 19) from the Upper Bathonian of Lorraine, may not be Malz's species. It is also probably *Fastigatocythere* Wienholz.
4. *Paralophocythere chonvillensis* Dépêche, 1969 of Dépêche 1985 (pl. 29, fig. 20) from the Middle Bathonian of the Paris Basin, seems not to be the same species as the type material of Dépêche 1969 (pl. 1, figs 1–2, 4–5) in that the three longitudinal ridges clearly curve around and parallel the anterior and posterior margins, behind the compressed marginal areas. This resembles some species of *Terquemula*.
5. *Paralophocythere* cf. *chonvillensis* Dépêche, 1969 of Dépêche 1985 (pl. 29, figs 21–22) from the Middle Bathonian of Normandy. It is ornamented by a series of longitudinal ridges which curve and parallel around the posterior margin; anteriorly, some of them reach the respective margin. Intercostal areas are strongly punctate. It is almost certainly *Neurocythere septicosta* (Bate, 1967) (this paper).

NEUROCYTHERE Whatley, 1970

Remarks. This genus was originally designated as a subgenus of *Lophocythere* Sylvester-Bradley, 1948 by Whatley 1970 (p. 336) with *Cythere bradiana* Jones, 1884 as type species. Whatley distinguished two groups of species: (1) *Lophocythere* (*Lophocythere*) as diagnosed above, and (2) *Lophocythere* (*Neurocythere*) characterised by four longitudinal ribs (dorsal, median, ventro-lateral, ventral), and (usually) reticulate intercostal areas. *Neurocythere* was subsequently elevated to generic rank by Gründel (1973), followed by Ware and Whatley (1980).

Malz (1975) suggested that *Neurocythere* and *Terquemula* are congeneric. However, in *Terquemula*, especially in the type species *T. parallela* Blaszyk, the intercostal areas are smooth or pitted rather than reticulate and the ribs are not disposed in an essentially longitudinal manner; posteriorly, for example, they curve around and parallel the posterior margin, rather than extend anteriorly from or near it as in *Neurocythere*. Furthermore, in some species of *Terquemula* (ex subgenus *Fossaterquemula*) such as *T. blakeana* (Jones, 1884) the ribs have been almost lost, to be replaced by longitudinally disposed pits or puncta. Malz (1975, p. 125) chided Whatley (1970) for not realizing its close relationship to *Terquemula* when he erected *Neurocythere* as a subgenus of *Lophocythere*. In answer to this, Ware and Whatley (1980, p. 206) responded: 'If the relationship is so clear, it is surprising that Blaszyk and Malz in 1965 did not include in their new genus *Terquemula* any of the species of *Lophocythere* later to be assigned to *Neurocythere*'. We recognize here that the two genera are closely related but believe the consistent differences in their primary ornament are the basis on which they should be separated.

Gründel (1973, p. 583) diagnosed *Neurocythere* as possessing three longitudinal ribs and listed several species. The same author (Gründel 1975a, pp. 365–366) subsequently subdivided *Neurocythere* into two subgenera considering *Neurocythere* (*Neurocythere*) to be characterised by more than three longitudinal ribs and *Neurocythere* (*Nophrecythere*) characterised by three longitudinal ribs, embracing essentially 'cruciate' and 'flexicostate' species of *Neurocythere*. However, all the species concerned have four primary horizontal ribs (dorsal, median, ventro-lateral and ventral) as can be seen in any of the subspecies of *Neurocythere cruciata* (Triebel, 1951), the taxon used by Gründel as the basis for *Nophrecythere*. Similarly, in the case of *Lophocythere flexicosta* (Triebel, 1951) and other 'flexicostate' species that were included by Gründel (1975a, p. 366) in *Nophrecythere* on the basis of their possession of only three longitudinal ribs, they actually possess dorsal, median (although this is rather short), ventro-lateral and ventral ribs. However, since their ribs parallel the anterior margin antero-laterally, rather than terminate at it, we include them in *Terquemula*. Other species placed by Gründel, and some subsequent authors, in

Nophrecythere are mainly subrectangular and their appearance is like typical *Neurocythere*. We strongly advocate that *Nophrecythere*, as a junior synonym of *Neurocythere*, should be suppressed. As argued below, *Crucicythere* Malz, 1975 and *Infacythere* Gründel, 1975a, are also junior synonyms of *Neurocythere*.

Gründel (1975a, p. 369, fig. 8) derived *Lophocythere* from *Praefurhbergiella* Brand and Malz, 1962, a proposition we are unable to accept. In the same figure, he derived *Nophrecythere* from *Grammanicythere* Gründel, 1975a and *Neurocythere* from *Donzocythere* Gründel, 1975a, which is not a logical phylogeny because *Nophrecythere* is considered to be a subgenus of *Neurocythere*.

Doubtful species. *Neurocythere? kirtlingtonense* Ware and Whatley, 1980 (pl. 2, figs a–h) from the Upper Bathonian of Britain is assigned only tentatively to the genus. We believe that, although four longitudinal ribs and intercostate reticulation are present, both the anterior and the posterior margins are atypically compressed and lack ornament, and the posterior margin is unusually rounded with respect to the species of *Neurocythere*. In some respects the morphological features of this species resemble the genus *Fissocythere* Malz, 1959. However, the characteristic posterodorsal loop and the strongly inflated anterior marginal rib are absent. Also, the species is very small and delicate compared with the members of *Fissocythere*, which is not in the Progonocytheridae.

Synonymised genera. The diagnosis of *Neurocythere* is herein emended to accommodate the species of *Infacythere* Gründel, 1975, *Nophrecythere* Gründel, 1975a, *Crucicythere* Malz, 1975, *Cuvillierella* Pokorný, 1971 and *Paralophocythere* Dépêche, 1969 (the type species), which we regard as its junior synonyms.

Emended diagnosis. Progonocytheridae, Neurocytherinae ranging in size from small to large. Subrectangular to subquadrate, left valve larger than the right, often with strong dorsal overlap. Dorsal and ventral

EXPLANATION OF PLATE 2

Figs 1–3. *Neurocythere bradiana* (Jones, 1884). 1–2, (ex *Cythere*); Bathonian, Great Oolite, Richmond Boring, at 1205 ft (367 m); The Natural History Museum, London, Department of Palaeontology, Judd Collection. 1, lectotype designated by Bate (1969), BMNH In 42372, male carapace, left view; $\times 120$. 2, paralectotype, BMNH Io 3627, male carapace, right lateral view; $\times 120$. 3, (ex *Lophocythere*); Bathonian, Great Oolite, boueti Bed, Herbury, Dorset, England; The Natural History Museum, London, Department of Palaeontology, Sylvester-Bradley Collection; plesiotype BMNH In 41926, ? female right valve, external view; $\times 130$.

Figs 4–6. *Neurocythere cruciata* (Triebel, 1951) (ex *Lophocythere*, *Nophrecythere*, *Crucicythere*); Lower–Middle Callovian, Germany; Senckenberg Museum, Department of Palaeontology, Frankfurt-am-Main. 4, 6, paratype SMF Xe 1822, female right valve, detail of anterior and posterior hinge, respectively; both $\times 438$. 5, holotype SMF Xe 1820, female carapace, right lateral view; $\times 127$. (Courtesy of the Forschungsinstitut und Naturmuseum Senckenberg).

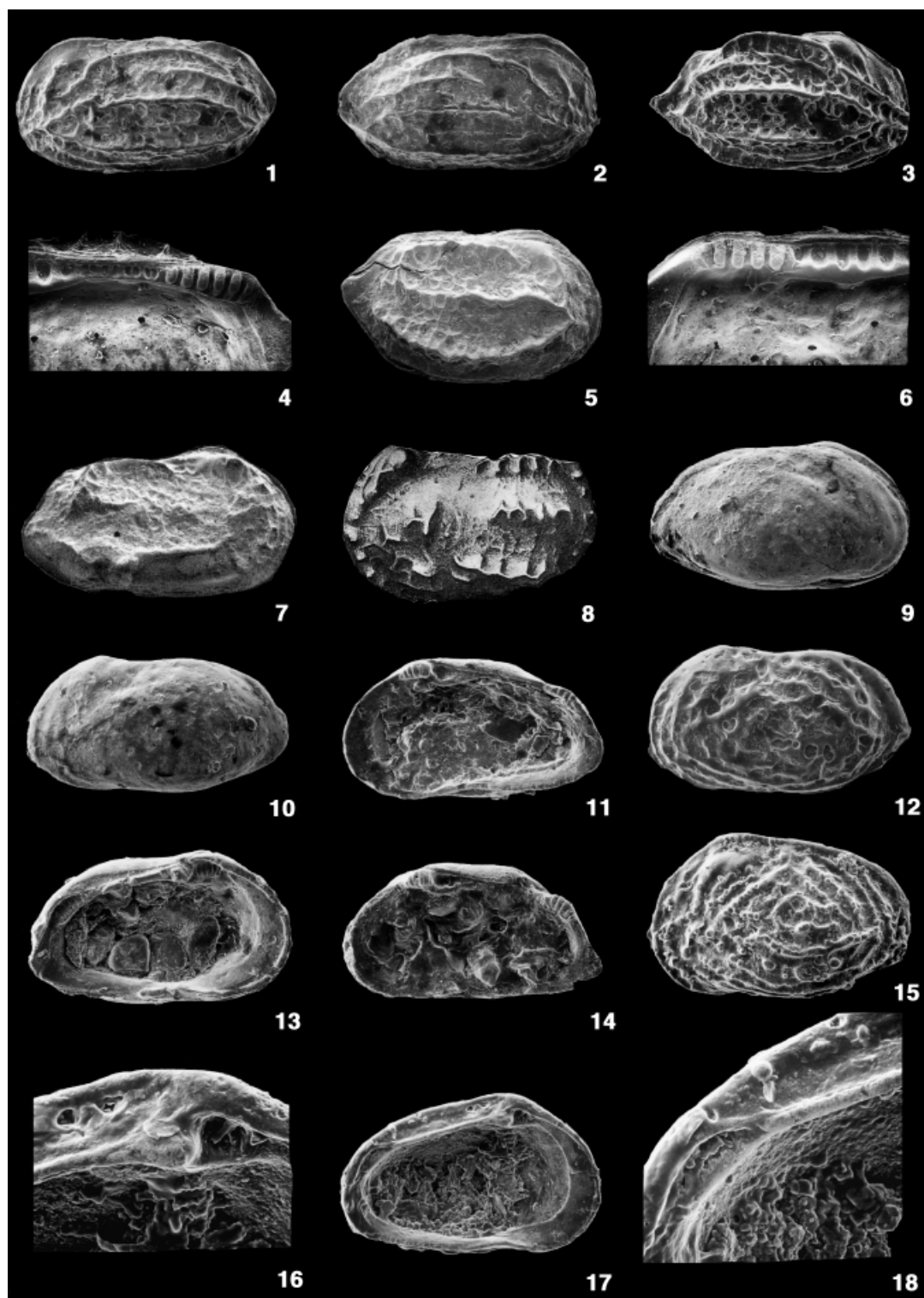
Fig. 7. *Neurocythere dorni* (Lutze, 1960) (ex *Lophocythere*, *Infacythere*); Upper Callovian, north-west Germany; Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover; holotype, BfB, Hann. 2675, carapace, right lateral view; $\times 50$.

Fig. 8. *Neurocythere jeani* (Pokorný, 1971) (ex *Cuvillierella*); Tithonian?, Souteska, Czechoslovakia; Charles University, Prague, Department of Palaeontology, holotype, PFUK 0–326, left valve, external view; c. $\times 66$ (after Pokorný 1973, pl. 6, fig. 1).

Figs 9–11. *Afrocytheridea laevigata* Bate, 1975; Middle Callovian, sample B66, Wami River, Tanzania; The Natural History Museum, London, Department of Palaeontology, Bate Collection. 9, holotype, BMNH Io 6122, female carapace, right lateral view. 10, paratype, BMNH Io 6124, male carapace, left lateral view. 11, paratype BMNH Io 6126, female, right valve, internal view; all $\times 100$.

Figs 12–14. *Afrocytheridea faveolata* Bate, 1975; Callovian, sample B97, Mandawa Anticline, Tanzania; The Natural History Museum, London, Department of Palaeontology, Bate Collection. 12, paratype, BMNH Io 6133, male left valve, external view. 13, paratype, BMNH Io 6129, female left valve, internal view. 14, paratype, BMNH Io 6131, female right valve, internal view; all $\times 100$.

Figs 15–18. *Fastigatocythere? spiniscutulata* (Sylvester-Bradley, 1956) (ex *Acanthocythere*); type species of *Dhrumaella* Dépêche *et al.* (1987); Bathonian, Fullers Earth, Fosse Way Mine, near Bath, western England; The Natural History Museum, London, Department of Palaeontology, holotype BMNH In 42435, left valve. 15, 17, external and internal views; both $\times 130$. 16, 18, detail of anterior and posterior hinge respectively; both $\times 500$.



WHATLEY and BALLENT, Mesozoic ostracods

margins straight and almost parallel or with ventral margin strongly concave medianly. Anterior margin broadly to obliquely rounded. Posterior margin caudate with apex either almost coincident with mid-height, or above mid-height and upturned. Subovate in dorsal view with parallel or rounded lateral margins. Eye spot circular, glassy and prominent. Surface ornament essentially of four longitudinal ribs (dorsal, median, ventro-lateral, ventral), with reticulate or very rarely smooth intercostal areas. These ribs may or may not reach the anterior margin, but never parallel the end margins. Minor horizontal ribs may lie between the major ribs and other minor, vertical ribs may interconnect them. An anterior marginal parallel rib extends from the eye tubercle, connecting mid and ventral ribs. The ventral rib may extend in a shallow curve from the ventral part of the caudal process to an antero-ventral position. The dorsal rib may overreach the dorsal margin and may or may not pass dorsal to the eye tubercle; this phenomenon may differ in the valves of the same carapace. A small rib associated with the eye tubercle may be present. Hinge entomodont, normally robustly developed with distinct differentiation of the median element. Accommodation groove in left valve. Marginal areas wide; avestibulate. Radial pore canals straight, well-spaced, usually no more than eight (one species with 15–16) anteriorly or four posteriorly. Muscle scars of four vertical adductors with a large anterior and a much smaller antero-ventral scar. Sexual dimorphism usually pronounced; males longer and proportionally less high than females.

Stratigraphical range and geographical distribution. The genus ranges from the Bajocian to the Kimmeridgian and Tithonian? (Pokorný 1971), being particularly important in the Bathonian, Callovian and the lower and middle parts of the Oxfordian in Britain and north-west Europe, where it often dominates the ostracod fauna. It is also represented in the Middle Jurassic of the Volga region (Mandelstam *in* Ljubimova 1955; Masumov and Bykovskaya 1975) and in the Bajocian–Callovian of North America (Sherrington and Lord 1975; Ascoli 1988). There is one reference from the Callovian–Oxfordian of India (Kulshreshtha *et al.* 1985). Its abundance, wide lateral distribution and diversity of relatively short-lived species render it of considerable importance as a zonal indicator and for general purposes of correlation.

Valid species. We consider the following species to be valid members of *Neurocythere* and each subsequent valid record is noted: *N. bradiana* (Jones, 1884), Bathonian, Britain (see Bate 1969, pl. 3, figs 3, 5–6; text-fig. 3, lectotype) (ex *Cythere*, *Lophocythere*, *Terquemula*) (Pl. 2, figs 1–3); *N. cruciata alata* Whatley, 1970, Upper Callovian, Britain; *N. minuta* (Peterson, 1954) Sherrington and Lord, 1975, Callovian, North America (ex *Procytheridea*); **N. caesa* (Triebel, 1951), Middle Callovian, Germany (ex *Lophocythere*); **N. fuhrbergensis* (Triebel, 1951), Upper Bathonian, Germany (ex *Lophocythere*); **N. plena* (Triebel, 1951), Upper Bathonian, Germany (ex *Lophocythere*); **N. cruciata cruciata* (Triebel, 1951), Callovian, Germany (ex *Lophocythere*, *Nophrecythere*, *Crucicythere*) (Pl. 2, figs 4–6); **N. cruciata franconica* (Triebel, 1951), Callovian, Germany (ex *Lophocythere*); **N. dulcis* (Ljubimova, 1955), Middle Jurassic, Volga region of the former USSR (ex *Lophocythere*, *Infacythere*) (= *N. dorni* Lutze, 1960); **N. attalica* (Mandelstam, *in* Ljubimova 1955), Callovian–Oxfordian, Volga region of the former USSR (ex *Lophocythere*); **N. catephracta* (Mandelstam, *in* Ljubimova 1955), Callovian–Oxfordian, Volga region of the former USSR (ex *Lophocythere*); **N. rubra* (Mandelstam, *in* Ljubimova 1955), Callovian–Oxfordian, Volga region of the former USSR (ex *Lophocythere*); **N. multicostata* (Oertli, 1957), Upper Oxfordian, Paris Basin, France (ex *Lophocythere*); **N. oertlii* (Bizon, 1958), Oxfordian, Calvados, France (ex *Lophocythere*); **Neurocythere* sp. 1 (Bizon, 1958), Lower Oxfordian, Calvados, France (ex *Lophocythere*); **N. cruciata intermedia* (Lutze, 1960), Middle Callovian, north-west Germany (ex *Lophocythere*); **N. cruciata triebeli* (Lutze, 1960), Upper Callovian, north-west Germany (ex *Lophocythere*); **N. cruciata oxfordiana* (Lutze, 1960), Lower Oxfordian, north-west Germany (ex *Lophocythere*); **N. dorni* (Lutze, 1960), Upper Callovian, north-west Germany (ex *Lophocythere*, *Infacythere*); junior synonym of *N. dulcis* (Ljubimova, 1955) (Pl. 2, fig. 7); **N. cruciata kimmeridgensis* (Guyader, 1966), Lower Kimmeridgian, France (ex *Lophocythere*); **N. caesa caesa* (Triebel, 1951) of Lutze 1960, Callovian–Oxfordian, north-west Germany (ex *Lophocythere*); **N. caesa* subsp. A. Lutze, 1960, Callovian–Oxfordian, north-west Germany (ex *Lophocythere*); **N. transversiplicata* (Bate, 1967), Bathonian, Britain (ex *Lophocythere*); **N. bipartita* (Weinholz, 1967), Callovian, north-west Germany (ex *Lophocythere*); **N. composita* (Weinholz, 1967), Callovian, north-west Germany (ex *Lophocythere*); **N. acutiplicata* (Jones and Sherborn, 1888) Bate 1969, Bathonian, Britain (ex *Cytheridea*, *Lophocythere*, *Terquemula*); **Neurocythere* sp. (Bate, 1969, text-fig. 12), Bathonian, Britain (ex *Lophocythere*); **N. cuvillieri* (Dépêche, 1969), Callovian, France (ex *Lophocythere*); **N. cruciata alata* (Whatley, 1970) [ex *Lophocythere* (*Neurocythere*)]; *N. cruciata intermedia* Lutze, 1960, *N. cruciata oxfordiana* Lutze, 1960, *N. cruciata cruciata* Triebel, 1951 of Whatley 1970 [ex *Lophocythere* (*Neurocythere*)]; **N. jeani* (Pokorný, 1971), Tithonian?, Czechoslovakia (ex *Cuvillierella*) (Pl. 2, fig. 8); **N. bessinensis* (Dépêche, 1973), Lower Bathonian, France (ex

Lophocythere (*Fastigatocythere*), *Nophrecythere*); **N. rimosa* (Dépêche, 1973), Lower Bathonian, France [ex *Lophocythere* (*Fastigatocythere*), *Nophrecythere*]; *N. cruciata* Triebel, 1951 aff. *oxfordiana* Lutze, 1960 of Pokorny 1973, Tithonian? Czechoslovakia (ex *Lophocythere*); **N. pavlovi* (Ljubimova, 1955) of Dépêche, 1973, Lower Callovian, Russia (ex *Lophocythere*); *Neurocythere bipartita* (Wienholz, 1967), *N. bradiana* (Jones, 1884), *N. caesa* (Triebel, 1951), *N. composita* (Wienholz, 1967), *N. cruciata* (Triebel, 1951), *N. cruciata cruciata* (Triebel, 1951), *T. cruciata franconica* (Triebel, 1951), *N. cruciata intermedia* (Lutze, 1960), *N. cruciata oxfordiana* (Lutze, 1960), *N. cruciata triebeli* (Lutze, 1960), *N. fuhrbergensis* (Triebel, 1951), *N. multicostata* (Oertli, 1957) and *N. plena* (Triebel, 1951), all of Gründel 1973, Callovian and Oxfordian, Germany, France and Britain; *N. bradiana* (Jones, 1884) of Gründel 1975a; type species; *Neurocythere cruciata* (Triebel, 1951), *N. cruciata alata* (Whatley, 1970), *N. cruciata cruciata* (Triebel, 1951), *N. cruciata franconica* (Triebel, 1951), *N. cruciata intermedia* (Lutze, 1960), *N. cruciata oxfordiana* (Lutze, 1960), *N. cruciata triebeli* (Lutze, 1960), *N. cuvillieri* (Dépêche, 1969), *N. plena* (Triebel, 1951) and *N. transversiplicata* (Bate, 1967) all of Gründel 1975a, Callovian and Oxfordian, Germany, France, Britain (ex *Nophrecythere*); **N. senarensis* (Masumov, in Masumov and Bykovskaya 1975), **N. cribosa* (Masumov and Bykovskaya, 1975), **N. dedalea* (Masumov, in Masumov and Bykovskaya 1975) and **N. tuarkirensis* (Masumov and Bykovskaya, 1975), Lower Callovian, Tuar-Kyr, Russia (ex *Lophocythere*); *N. cruciata cruciata* (Triebel, 1951) of Kilenyi 1978, Callovian–Oxfordian, Britain (ex *Nophrecythere*); *N. cruciata oxfordiana* (Lutze, 1960) of Kilenyi 1978, Callovian–Oxfordian, Britain (ex *Nophrecythere*); *N. cruciata alata* (Whatley, 1970) of Kilenyi 1978, Callovian–Oxfordian, Britain (ex *Nophrecythere*); *N. cruciata intermedia* (Lutze, 1960) of Kilenyi 1978, Callovian–Oxfordian, Britain (ex *Nophrecythere*); **N. robusta* (Sheppard, 1981), Upper Bathonian, England (ex *Terquemula*); *N. denticulata* (Kulshreshtha *et al.*, 1985), Callovian–Oxfordian, India (ex *Lophocythere*); *Neurocythere?* sp. 2244 Buck of Liebau 1987, Middle Bajocian, Germany; *N. cf. caesa* (Triebel, 1951) of Liebau 1987, Middle Bathonian, Germany; **N. plena* (Triebel, 1951) of Brand 1990, Upper Bathonian, north-west Germany (ex *Nophrecythere*); *N. aff. minuta* (Peterson, 1954) of Braun and Brooke 1992, Bajocian–Callovian, western Canada; *N. bipartita* Wienholz, 1967 of Witte and Lissenberg 1994, Middle Callovian, offshore Netherlands; *N. cruciata oxfordiana* (Lutze, 1960) of Schudack 1994, Oxfordian, north-west Germany (ex *Crucicythere*); *N. catephracta* (Mandelstam, in Ljubimova 1955) and *Neurocythere* sp. both of Neustrueva *et al.* 1999, Middle Jurassic of Russia (ex *Nophrecythere*); *Neurocythere* gr. *cruciata* (Triebel, 1951) of Schudack and Schudack 2000, Upper Callovian–Oxfordian, southern Germany (ex *Crucicythere*); *N. dorni* (Lutze, 1960) of Schudack 1994, Callovian–Lower Oxfordian, north-west Germany (ex *Infacythere*); *N. acuticaudata* Whatley *et al.*, 2001, Middle Callovian, Calvert, England; *N. caesa warei* Whatley *et al.*, 2001, Middle Callovian, Calvert, England; *N. cruciata intermedia* (Lutze, 1960) of Whatley *et al.* 2001, Middle Callovian, Calvert, England; *N. triebeli* (Lutze, 1960) and *N. intermedia* (Lutze, 1960) both of Olempska and Blaszyk 2001, Upper Callovian, Poland (ex *Nophrecythere*).

CUVILLIERELLA Pokorny, 1971

Remarks. This monotypic genus was based on *C. jeani* Pokorny, 1971 from the presumed Tithonian of Czechoslovakia. We believe *C. jeani* to be *Neurocythere* with rather decayed and broken up ribs and have subsumed it under the latter genus and advocate that *Cuvillierella* be suppressed.

POKORNAYA Singh and Kulshreshtha, 1972

Remarks. The genus *Pokornya* was erected by Singh and Kulshreshtha (1972, p. 185) with *P. kuldharensis*, from the Callovian of India, as type species. Kulshreshtha *et al.* (1985, pp. 143–144) described two new species, *P. sureshi* and *P. sahnii*, from the Callovian–Oxfordian of India. As diagnosed, *Pokornya* is thick, triangular, ovate, with a ventral swelling. In the type species, the ornament is described as: ‘surface uneven, a few vertical ridges running parallel to the anterior margin and a ventrolateral ridge form [sic] pits’ (Singh and Kulshreshtha, 1972, p. 186). In the figured specimens of the type species (pl. 1, figs 1–6), an uneven surface with three longitudinal swellings are observed, instead of the pattern of ribs mentioned by the authors. The normal pore canals are numerous and scattered; 18–20 anterior marginal pore canals, with a tendency to occur in pairs, and 4–6 posteriorly. The hinge, while allegedly amphidont/archidont, is clearly entomodont. The authors compared their new genus with *Progonocythere* Sylvester-Bradley on the basis of the hinge and with *Protocythere* Triebel, by virtue of its similar shape, ornamentation and number of marginal pore canals. However, we consider *Pokornya* to be synonymous with *Trichordis* Grekoff, 1963 and its species are hereby transferred to that genus (see above).

TROPACYTHERE Gründel, 1973

Remarks. Gründel (1973, pp. 583–584) based his genus *Tropacythere* on *Lophocythere verrucosa* Blaszyk, 1967 (pl. 7, figs 5–7) from the Upper Bajocian and Lower Bathonian of Poland. This is subrectangular elongate with surface ornamented by tubercles of variable size and height, concentrated mostly around the periphery of the valve. Since its hinge is diagnosed as of merodont type by Blaszyk (1967, p. 30, pl. 7, figs 5a, 6b), the species is removed from Progonocytheridae and is possibly related to *Exophthalmocythere* Triebel, 1938 (see also Gründel 1975b, p. 37, where this author pointed out phylogenetic relations between *Tropacythere* and *Exophthalmocythere*).

NOPHRECYTHERE Gründel, 1975a

Remarks. *Nophrecythere* Gründel, 1975a was erected, with *Lophocythere cruciata* Triebel, 1951 (see Gründel 1975a, p. 365) as type species, to embrace essentially ‘cruciate’ and ‘flexicostate’ species of *Neurocythere* at the subgeneric level. This taxon has subsequently been elevated to generic rank by some authors such as Kilenyi (1978, p. 284, pl. 11), although he regarded ‘flexicostate’ species as best accommodated in *Terquemula* Blaszyk and Malz, 1965 (see Kilenyi 1978, p. 286, pl. 12, figs 1–4).

Liebau (1987) used *Nophrecythere* gr. *alata* Whatley, 1970 to embrace cruciate forms which, in addition, are characterized by a strongly alate ventro-lateral rib (see *Neurocythere cruciata alata* Whatley, 1970). This group, however, is accommodated within *Neurocythere* as originally diagnosed and we do not recognize the need to employ *Nophrecythere* either as a subgenus of *Neurocythere* or as a genus in its own right and recommend that it be suppressed.

The following species have been referred to *Nophrecythere*:

1. *Nophrecythere rimosa* (Dépêche, 1973) and *Nophrecythere bessinensis* (Dépêche, 1973) of Bate, 1978 (pl. 6, figs 8–10 and pl. 6, figs 11–13, 16, respectively), both from the Bathonian of Britain, which are *Neurocythere*.
2. *Nophrecythere rimosa* (Dépêche, 1973) and *Nophrecythere bessinensis* (Dépêche, 1973) in Dépêche 1985 (pl. 30, figs 2 and 3 respectively), both from the Lower Bathonian of France, which are included in *Neurocythere*.
3. *Nophrecythere cruciata cruciata* (Triebel, 1951), *N. cruciata oxfordiana* (Lutze, 1960), *N. cruciata alata* (Whatley, 1970) and *N. cruciata intermedia* (Lutze, 1960) all of Kilenyi 1978 (p. 284, pl. 11) from the Callovian–Oxfordian of Britain, which are *Neurocythere*.
4. *Nophrecythere orientalis* Neale and Singh, 1985 (pl. 3, fig. 1), from the Callovian of India, most closely resembles a member of the Cytheruridae.
5. *Nophrecythere plena* (Triebel, 1951) of Brand 1990 (pl. 15, fig. 20) from the Upper Bathonian of north-west Germany, is *Neurocythere*.
6. *Nophrecythere denticulata* (Kulshreshtha *et al.*, 1985) and *Nophrecythere jaisalmerensis* (Kulshreshtha *et al.*, 1985), both of Khosla *et al.* 1997 (pl. 5, figs 1–2 and pl. 5, figs 3–5, respectively) from the Upper Bathonian–Callovian of India, closely resemble *Trichordis* Grekoff, 1963.
7. *Nophrecythere whatleyi* Khosla and Jakhar, in Khosla *et al.* 1997 (pl. 5, figs 6–7) from the Upper Bathonian–Callovian of India. Its type species is *Lophocythere* 323b Grekoff, 1963, which we include in *Afrocytheridea faveolata* Bate, 1975 (see above).
8. *Nophrecythere catephracta* (Mandelstam, in Ljubimova 1955) of Neustrueva *et al.* 1999 (pl. 32, fig. 7) and *Nophrecythere* sp. of Neustrueva *et al.* 1999 (pl. 33, fig. 1), both from the Middle Jurassic of Russia, are included in *Neurocythere*.
9. *Nophrecythere triebeli* (Lutze, 1960) and *Nophrecythere intermedia* (Lutze, 1960) both of Olempska and Blaszyk 2001 (fig. 8A–I and fig. 9A–H, respectively) from the Upper Callovian of Poland, are included in *Neurocythere*.

CRUCICYTHERE Malz, 1975

Remarks. Malz (1975, p. 125) erected the genus *Crucicythere*, with *Lophocythere cruciata* Triebel, 1951 as type species. It was intended to include all species belonging to the *cruciata* group. In the present review, we consider these species, as originally diagnosed, to belong to *Neurocythere*, and that *Crucicythere* Malz is a junior synonym of *Neurocythere* Whatley.

In addition, *Crucicythere* is partially included in *Neurocythere* (*Nophrecythere*), which was erected by Gründel 1975a to embrace essentially ‘cruciate’ and ‘flexicostate’ species (although both *Crucicythere*

and *Nophrecythere* were published in 1975, the publication dates confirm that *Nophrecythere* has priority). Species included in *Crucicythere* are transferred to *Neurocythere* (see above).

INFACYTHERE Gründel, 1975a

Remarks. The genus *Infacythere* was described by Gründel (1975a, p. 366) with *Lophocythere dorni* Lutze, 1960 from the Upper Callovian of north-west Germany as type species. The genus was erected to accommodate two species: *Lophocythere dorni* Lutze, 1960 (pl. 36, figs 4–5) and *Lophocythere dulcis* (Ljubimova, 1955) from the Middle Jurassic of the Volga region. These two species, according to Wienholz (1967; see pl. 5, figs 58–59) are synonymous. In this we concur.

Gründel (1975a) distinguished *Infacythere* from *Neurocythere* essentially in the pattern of the longitudinal ribs; the median rib is short, the ventral rib does not reach the anterior margin, and there is an anterior rib, which extends parallel to the same border from near the eye spot to an antero-ventral position. This pattern is entirely consistent with the diagnosis of *Neurocythere*. We have, therefore, placed the two species of *Infacythere* within *Neurocythere*.

AFROCYTHERIDEA Bate, 1975

Remarks. The genus was first described by Bate (1975) with *Afrocytheridea laevigata* as type species (p. 195, pl. 8, fig. 14; pl. 9, figs 1–4). Bate also described *A. faveolata*, both species occurring in the Middle Callovian of Tanzania. Subsequently, the genus was also recorded in the Callovian–Oxfordian of Israel, Tunisia, Somalia and Saudi Arabia (see distribution).

Afrocytheridea was placed by Bate in the Cytherideidae; however, it is clearly a progonocytherid. In the type species the hinge was diagnosed as lobodont (see Bate 1975, p. 195, text-fig. 12) which has, in the left valve, a smooth median element that is anteriorly expanded, ‘although details of the median element are obscured owing to the state of preservation’ (Bate 1975, p. 196). In *A. faveolata*, although the author claimed that the hinge is lobodont, it can be seen (Bate 1975, p. 196, text-fig. 13) to be lobodont/entomodont (median element denticulate with two antero-median teeth in the left valve; antero-median socket bifurcate in the right valve).

We emend the diagnosis as follows:

Emended diagnosis. Carapace large, thick-shelled, subrectangular, tapering posteriorly. Left valve larger than right. Dorsal margin sinuous. Conspicuous antero-dorsal furrow below convex, projecting, anterior cardinal angle. Eye swelling distinct. Shell surface smooth or reticulate with a concentric major reticulum forming ridges antero-dorsally and secondary reticulae. Normal pore canals large, widely spaced. Anterior marginal pore canals curved, approximately 14 in number. Hinge entomodont. Duplicature of moderate width. Avestibulate. Sexual dimorphism pronounced; males markedly more elongate than females.

Stratigraphical range and geographical distribution. *Afrocytheridea faveolata*, the most widely distributed species, has been recorded from the Callovian of Tanzania (Bate 1975), Tunisia and Syria (Kuznetsova and Dobrova 1995), the Callovian–Oxfordian and Kimmeridgian of Israel (Rosenfeld and Honingstein 1991, 1998) and Saudi Arabia, and the Lower Oxfordian of Somalia (Mette 1993). The genus has also been mentioned (not illustrated) from the Jurassic of Kenya (cf. Bate 1977, p. 238). It may also be represented in the Callovian of Madagascar (see above, *Lophocythere?* 4777 Grekoff, 1963); likewise, the species figured (although not described) as *Trichordis* sp. cf. *T. praetexta crispata* Grekoff, 1963 of Guha (1976, pl. 3, fig. 17), *Progonocythere implicata* Ljubimova and Mohan, in Ljubimova *et al.* 1960 of Kulshreshtha *et al.* 1985 (figs 7, 11–12) and *Progonocythere banniensis* Neale and Singh, 1985 (pl. 3, fig. 2) from the Callovian of India, are all probably *Afrocytheridea faveolata*. However, the genus possibly ranges up into the Neocomian in South Africa and Argentina, since Whatley and Ballent (1996, p. 924) have considered some species better removed from *Progonocythere* and accommodated in *Afrocytheridea*.

Valid species. We consider the following species to be valid members of *Afrocytheridea*: *A. laevigata* Bate, 1975, Middle Callovian, Tanzania (Pl. 2, figs 9–11); *A. faveolata* Bate, 1975, Middle Callovian, Tanzania (Pl. 2, figs 12–14); *Afrocytheridea?* sp. Neale and Singh, 1985, Callovian, India; *A. faveolata* Bate, 1975 and *A. aff. faveolata* Bate, 1975

of Dépêche *et al.* 1987, Callovian–Oxfordian, Saudi Arabia; *A. faveolata* Bate, 1975 of Rosenfeld and Honigstein 1991, Callovian–Oxfordian, southern Israel; *A. somaliensis* Mette, 1993, Lower Oxfordian, northern Somalia; *A. faveolata* Bate, 1975 of Mette 1995, Middle–Upper Callovian, Tunisia; *A. faveolata* Bate, 1975 of Rosenfeld and Honigstein 1998, Kimmeridgian, Israel.

The species *Progonocythere reticulata* Dingle, *in* Dingle and Klinger 1972 (pl. 17, figs d–i) and *in* McLachlan *et al.* 1976 (pl. 16, figs 1–2) from the Upper Jurassic and Valanginian, respectively, of South Africa and *Progonocythere cf. reticulata* Dingle *sensu* Musacchio 1981 (pl. 2, fig. 12) from the Valanginian of west-central Argentina and possibly conspecific with Dingle’s species, are only tentatively accommodated in *Afrocytheridea* since they differ in lateral and dorsal shape from Bate’s genus. They have the anterior margin obliquely rounded with the apex pointing downwards, the dorsal margin convex, rather sinuous and subovoidal in dorsal view.

DHRUMAELLA Dépêche, Le Nindre, Manivit and Vaslet, 1987

Remarks. Dépêche *et al.* 1987, on studying Jurassic ostracods from Saudi Arabia, created the genus *Dhrumaella* with *Acanthocythere spiniscutulata* Sylvester-Bradley, 1956 as type species, which is probably *Fastigatocythere* Wienholz (see above and Pl. 2, figs 15–18).

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