THE OSTRACOD GENERA *OGMOCONCHA* AND *PROCYTHERIDEA* IN THE LOWER JURASSIC

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Lower Jurassic ostracod faunas are dominated by species placed in the genera *Ogmoconcha* Triebel, 1941 and *Procytheridea* Peterson, 1954. Taxonomic problems associated with these taxa are described and discussed in order that they may be resolved in the near future.

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The majority of recorded Lower Jurassic faunas of Ostracoda (Arthropoda, Crustacea) have been described from Europe; and those faunas are dominated both in terms of numbers of species and numbers of individuals, by the healdiacean genus *Ogmoconcha* Triebel, 1941 and the cytheracean genus *Procytheridea* Peterson, 1954. It is therefore unfortunate that grave difficulties should be attendant upon the use of both of these taxa. The application of the name *Ogmoconcha* has been confused by a suggested, but as yet unproved, synonymy with the Triassic genus *Hungarella* Méhes, 1911, although there has until recently been little disagreement about the species belonging to the group in the Lower Jurassic. Until the synonymy is proved or refuted by examination of new material from the original localities of Méhes in Hungary it is preferable to use the name *Ogmoconcha* since that genus was described from the Lias δ of Germany and is definitely congeneric with a large group of Liassic species. The case of *Procytheridea* is less clear since doubt exists not only about the comparison of the type species with other species, but also as to whether the other species are congeneric with each other. The present paper is designed to focus attention on the twin problems of the use of the names *Ogmoconcha* - *Hungarella* and *Procytheridea* in the hope that the difficulties may soon be removed.

The Liassic faunas described are mainly from Germany and France, with a small number of accounts from other parts of Europe and the Soviet Union. The Lias in Denmark and southern Sweden has been rather neg-

lected until recently and in this context the work of Christensen (1962 and 1968) and Bertelsen & Michelsen (1970), together with Norling's (e. g. 1970) study of foraminifera from southern Sweden, is particularly welcome.

Ogmoconcha Triebel, 1941 and *Hungarella* Méhes, 1911

Amongst Liassic ostracods a large group of species is characterised by the following features: circular adductor muscle-scar pattern composed of numerous scars generally with larger ones within a ring of smaller ones, but fewer in number than those of typical *Healdia*; left valve larger than right valve, with a peripheral contact groove in the larger valve into which the margin of the smaller valve fits; a generally smooth, sub-ovate shell. This description includes some species which are distinguished by details of adductor muscle-scar pattern (Gründel, 1964 and 1970), but most of the species belong to the genus *Ogmoconcha* described from the Lias δ of Germany by Triebel (1941). However, the use of the name *Ogmoconcha* for Liassic species is confused by a suggested synonymy with *Hungarella* described from the Hungarian Trias by Méhes (1911).

Ogmoconcha is remarkable for its widespread and usually abundant occurrence in the Lower and Middle Lias. If any Lower or Middle Lias sediment contains ostracods then *Ogmoconcha* is almost invariably present, and in this respect has great potential as a stratigraphic indicator. Barbieri (1964) has used a species (under the name *Hungarella*) as a zone form for the Domerian in Sicily, i. e. *Hungarella hyblea* Barbieri, 1964. Similarly, Bertelsen & Michelsen (1970) have used *Ogmoconchella aspinata* (Drexler, 1958) in an assemblage zone for the correlation of part of the sequence in Boring Rødby No. 1 on Lolland with the German Lias α; the genus *Ogmoconchella* has since been abandoned (Gründel, 1970) and the species placed in *Hungarella*. *Ogmoconcha* is also the most widely known Liassic genus geographically, being recorded throughout north-west Europe and from the Lena Basin (Lev, 1958), Portugal (Ferreira, 1960), Spain (material in my personal collection) and Sicily (Barbieri, 1964). *Ogmoconcha* has a certain range of Rhætic (Upper Triassic) to basal Toarcian (Lower Jurassic). Until recently the genus was thought to have become extinct at the close of the Pliensbachian, but Plumhoff (1967) has discovered *Ogmoconcha* in the basal Toarcian (basal *tenuicostatum* Zone) of the Paris Basin, although it has not been found in the Toarcian type-section at Thouars or in the Aquitaine Basin. In north-western and south-western Germany the genus has not been recognised more than 150 cm above the base of the Toar-

cian. I have found a similar occurrence in Lincolnshire, England (recorded in Plumhoff, 1967, p. 563). The importance of Plumhoff's discovery lies in the fact that the Pliensbachian-Toarcian boundary represents an important faunal break for ostracods, foraminifera and other invertebrates (Hallam, 1961).

The name *Hungarella* was a conditional name proposed by Méhes (1911, p. 22), when describing Triassic ostracods from Bakony in Hungary, for the species *Bairdia*(?) *problematica* Méhes, 1911 which he felt might not be a true *Bairdia*. Included within this conditional genus were *B.*(?) *problematica* var. *reniformis* Méhes, 1911 and probably *B.*(?) *kochi* Méhes, 1911, a species with an apparently very similar muscle-scar pattern. Triebel (1941) described a genus from the Lias δ of Hannover which he called *Ogmoconcha*, with *O. contractula* Triebel, 1941 as type species. In 1950 this same author redescribed *Cypris amalthei* Quenstedt, 1858 from the Lias δ designating a lectotype for the species and assigning it to *Ogmoconcha*. Triebel's generic name was used by Usbeck (1952) for a species from the Lias α of Swabia, by Conti (1954) in the Hettangian of north Italy, by Drexler (1958) in the German Lias α, by Lev (1958) describing ostracods from north Russia, and by Apostolescu (1959) for species from the Paris Basin.

Apostolescu (1959, p. 804) noted that Dr. W. Klingler suspected a possible synonymy between *Ogmoconcha* and *Hungarella*; however, Pietrzenuk (1961) and several authors in the Colloque sur le Lias Français (1961) employed, apparently for the first time formally, Méhes' conditional name *Hungarella* for Lias ostracods first described as *Ogmoconcha*. Pietrzenuk describing the type species of *Ogmoconcha, O. contractula*, as *Hungarella contractula* (Triebel, 1941). Also in 1961, the Treatise on Invertebrate Paleontology (edited by Moore, 1961) authors regarded *Ogmoconcha* as a synonym of *Hungarella*, but Klingler (1962) used the name *Ogmoconcha*. Gründel (1964) in his study of *Healdia* notes (p. 463) that Frau Dipl.-Geol. E. Dreyer has been working on the genus and believes that the name *Hungarella* is not available. Dreyer (1967) uses *Ogmoconcha* for Sinemurian and Pliensbachian species from Brandenburg. A paper by Széles (1965) describes Carnian (Upper Triassic) ostracods from Nosztori-Tal, Hungary including *Hungarella problematica* Méhes; her line drawing differs from Méhes illustrations (as noted by Sohn, 1968, p. 63) but for that matter photographs of the type specimen (pl. 1 of this paper) also differ somewhat in shape from Méhes' illustrations. The important aspect of Széles' paper is that she suggests the synonymy of *Ogmoconcha* with *Hungarella*, but there is no evidence or discussion, nor is there any indication as to whether Széles had seen the type material of *Bairdia*(?) *problematica*. Széles' material may well belong to *Hungarella problematica* but that in itself is no evidence of

synonymy of the genus with *Ogmoconcha*. Gründel (1968 and 1970) uses the name *Hungarella* for Liassic species.

To some extent this nomenclatorial dichotomy has been stimulated by the International Commission of Zoological Nomenclature and its ruling on conditional names. In the "Draft of English Text of the Règles Internationales de la Nomenclature Zoologique" of Bradley (1957), Article 6, Section 5 (c) states that conditional naming of a taxon does not prevent availability, and in the International Code (Stoll, 1961) Article 15 invalidates conditional names given since 1960 and Article 17 (8) rules that conditional naming prior to 1961 does not prevent availability. The 1958 Draft seems to have encouraged the first usage of *Hungarella* as the valid name for species previously placed in *Ogmoconcha* and this practice was confirmed by Morkhoven (1963, p. 23) who, without presenting any evidence, stated "*Since then (1958), the generic name Hungarella* replaces Triebel's name *Ogmoconcha.*" As it stands that statement is not really correct since definitive evidence of the synonymy has yet to be produced. Sohn (1968), working on Triassic Ostracoda, considers *Hungarella* and *Ogmoconcha* to be distinct genera and gives the former genus a range of Middle and Upper Triassic; however, the same author (1970) gives a range (p. 195, table I) for *Hungarella*? from Lower Triassic through into the post-Triassic.

Within the genus *Ogmoconcha* species differentiation tends to be difficult since, with certain exceptions, all the species are smooth and inflated. The exceptions are *Ogmoconcha nordvikensis* Lev, 1958 (which is tuberculate) and Ostracod Nr. 12 and Ostracod Nr. 13 of Klingler (1962) (which appear to belong to *Ogmoconcha* and which possess peripheral swellings). Normally species differentiation within this group is based upon a number of rather unsatisfactory criteria: *1)* Shape – in lateral and dorsal view, and especially of the anterior and posterior margins, and shape as a function of the position of the highest point on the dorsal margin. *2)* Overlap - degree of overlap and positions on margin where this is most strongly or weakly developed. *3)* Possession of marginal denticles, for example in *O. amalthei* (Quenstedt, 1858) and *O. hagenowi* Drexler, 1958. *4)* Morphology of contact groove. *5)* Size - may be useful but it may sometimes be difficult to distinguish small adults from instars of another species. Recognition of shape differences and similarities is a very subjective process and one which is, particularly in the case of this generic group, suitable for multivariate statistical analysis. The "theta-rho" system of Benson (1967) gives a graph of valve shape with reference to the adductor muscle-scars, but with the present relative ease of access to computer time it should be possible for palaeontologists to employ more sophisticated techniques to investigate simultaneously the complexities of multivariate populations.

The following species and sub-species have been placed in *Ogmoconcha*

or *Hungarella*, but many species remain undescribed and some have been placed in other genera. If a species has been placed in both genera it is listed below under the older or original assignment. Sohn (1968) provides an analysis of Triassic species. Abbreviations – (L) for Lower Jurassic (Hettangian to basal Toarcian) and (T) for Triassic:

Hungarella adenticulata Pietrzenuk, 1961 (L)
Hungarella aspinata (Drexler, 1958) in Gründel (1970) (L)
Hungarella bristolensis Anderson, 1964 (T)
Hungarella caudata Anderson, 1964 (T)
Hungarella elongata (Blake, 1876) in Anderson, 1964 (T, L)
Hungarella hyblea Barbieri, 1964 (L)
Hungarella kochi (Méhes, 1911) in Sohn, 1968 (T)
Hungarella martini Anderson, 1964 (T)
Hungarella moorei (Jones, 1894) in Anderson, 1964 (T, L)
Hungarella owthorpensis Anderson, 1964 (T)
Hungarella problematica (Méhes, 1911) in Széles, 1965 (T)
Hungarella reniformis (Méhes, 1911) in Sohn, 1968 (T)
Hungarella spinosa (Méhes, 1911) in Sohn, 1968 (T)
Hungarella transversa Gründel, 1970 (L)
Hungarella? pricei Sohn, 1968 (T)

Ogmoconcha aequalis Herrig, 1969a (L)
Ogmoconcha amalthei (Quenstedt, 1858) in Triebel, 1950 (L)
Ogmoconcha amalthei amalthei in Dreyer, 1967 (L)
Ogmoconcha amalthei intercedens Dreyer, 1967 (L)
Ogmoconcha amalthei circumvallata Dreyer, 1967 (L)
Ogmoconcha amalthei rotunda Dreyer, 1967 (L)
Ogmoconcha bispinosa (Gründel, 1964) in Herrig, 1969a (L)
Ogmoconcha contractula Triebel, 1941 (L)
Ogmoconcha ellipsoidea (Blake, 1876) in Lord, 1971 (L)
Ogmoconcha etaulensis Apostolescu, 1959 (L)
Ogmoconcha hagenowi hagenowi Drexler, 1958 (L)
Ogmoconcha hagenowi sinuosa Drexler, 1958 (L)
Ogmoconcha longula Lev, 1958 (L)
Ogmoconcha mouhersensis Apostolescu, 1959 (L)
Ogmoconcha nordvikensis Lev, 1958 (L)
Ogmoconcha olenekensis var. *olenekensis* Lev, 1958 (L)
Ogmoconcha olenekensis var. *plana* Lev, 1958 (L)
Ogmoconcha ornata Lev, 1958 (L)
Ogmoconcha ovata Lev, 1958 (L)
Ogmoconcha pseudospinosa Herrig, 1969a (L)
Ogmoconcha schneideri Lev, 1958 (L)
Ogmoconcha tigjanica Lev, 1958 (L)
Ogmoconcha? translucens (Blake, 1876) in Conti, 1954 (L)

This is not a suitable place to discuss in detail the taxonomic vicissitudes undergone by many of these species. A lot of them have been referred

both to *Ogmoconcha* and *Hungarella* by different authors or by the same author at different times. Some species were first described as belonging to *Healdia*, e. g. *H. aspinata* Drexler, 1958, or *Pseudohealdia* and have subsequently been placed in *Ogmoconcha* or *Hungarella*. The species *Pseudohealdia? bispinosa* Gründel, 1964 has been assigned successively to *Pseudohealdia, Ogmoconcha* and *Healdia*. Some impression of the taxonomic complexity may be gained from the work of Gründel (1970).

Adamczak (1967) has examined in detail the carapace morphology, with particular reference to the contact groove, of two metacopine species from the Silurian of Gotland. One species, *Silenis bassleri* (Sohn 1960), shows two small ridges internally close to the ventral margin of the left valve, while in the right valve there are two "tongue-shaped projections". Adamczak believes that the ridges were formed in response to the smaller right valve pushing into the left valve and that the process could eventually lead to the production of a contact groove in the larger valve. However, he does not suggest that all contact grooves in all groups of ostracod were formed in this way but postulates it for another species from Gotland which he describes in detail, *Kuresaaria gotlandica* Adamczak, 1967, which is remarkably similar to *Ogmoconcha*. The relevance of this work is with reference to his statement (Adamczak, 1967, p. 466) that "The contact groove is distinctly interrupted in the ventral part of the free margin. This interruption occurs, topographically, almost in the same place as the discontinuity between the anterior and posterior stop-ridges in *S. bassleri*". This interruption of the contact groove may be observed in a number of species of *Ogmoconcha*, e. g. *O. ellipsoidea* (Jones, 1872), frequently accompanied by a similar break at the anterior end of the dorsal margin. This interruption of the contact groove is not always complete but in most cases a definite weakening in the depth of excavation can be seen. Adamczak notes that this discontinuity of the contact groove disappears gradually so that in the Carboniferous, for example, *Healdia* has an uninterrupted contact groove. Thus the condition found in *Ogmoconcha* may be a reflection of early metacopine ancestry. Also, the dorsal portion of the contact groove in some *Ogmoconcha* species may appear tripartite where there are two arched socket-like sections of the groove with a lower groove between, similar structures can be found in Palaeozoic, especially healdiid, species. Further concerning the marginal area, the diagnosis for the Metacopina by Sylvester-Bradley (in Moore, 1961, p. Q358) states that the inner lamella is narrow, poorly developed or unknown, while Adamczak (1967, p. 469) redefines the Metacopina as lacking a calcified inner lamella. The difference is important as far as the family Healdiidae is concerned since it is usually thought to contain *Ogmoconcha* and the family is included in the Metacopina by the two authors in both definitions. In the wider sense of Sylvester-Bradley (in

Moore, 1961, p. Q359) the family may lack a separated calcified inner lamella, but a duplicature may be completely fused to the outer lamella so that a vestibule and other structures are absent. Triebel (1950) figures sections through the margins of two species of *Ogmoconcha*, in both these a plane of concrescence and some sort of calcified inner lamella are present, which, strictly, removes *Ogmoconcha* from the Metacopina according to Adamczak's definition; but, particularly on the evidence of the muscle-scars, this genus is metacopine. If the post-Palaeozoic suborder Platycopina (in which the contact groove is excavated in the inner lamella) is descended from the Metacopina via the Cavellinidae then it is quite reasonable that late metacopines should develop a primitive inner lamella. The work of Gramm (e. g. 1967) in documenting Triassic ostracod faunas in the Soviet Union, in particular the variation of muscle-scar patterns, and the relationship of the Metacopina and the Platycopina is very important in this context.

Gründel (1964) distinguished a number of Liassic metacopine genera by means of differences in the adductor muscle-scar patterns and was able (1964, fig. 6, p. 465) to demonstrate a lineage from *Healdia* in the Carboniferous to *Ogmoconcha* and *Pseudohealdia* in the Lower Jurassic with reduction in number of muscle-scars. The significance of the patterns was further discussed in a more general context by the same author in 1968. Since then it has become clear that the degree of variation in the patterns was greater than anticipated and as a result the two taxa *Ogmoconchella* and *Pseudohealdia (Ledahia)* have been abandoned (Gründel, 1970). It would seem at the present state of knowledge that the development of the adductor muscles of the ostracods in question was more complex than previously realised and consequently the feature should be used with care.

I am informed by Herr H. Kozur (D. D. R.) that the syntype of *Bairdia*(?) *problematica* Méhes, 1911 illustrated in plate 1 (and listed in Boda, 1964, p. 170 with one other, unnumbered, specimen) has been destroyed and that no other Méhes specimens remain. Kozur plans to erect a neotype in the course of his work on the Hungarian Triassic. It should be noted that the fauna described by Méhes (1911) appears to be contaminated with younger material, as does the foraminifera fauna (Sohn, 1968, p. 39). Thus our knowledge of *Hungarella* and its true interpretation and status is thoroughly unsatisfactory.

The definition of the Metacopina and the detailed discussion of the Liassic species is beyond the scope of this review. It is concluded that until the possible synonymy between *Ogmoconcha* and *Hungarella* is proved or disproved it is preferable to use the name *Ogmoconcha* for Liassic species congeneric with *Ogmoconcha contractula* Triebel, 1941, the type species of that genus.

Procytheridea Peterson, 1954

Peterson (1954) described *Procytheridea* from the Rierdon Formation (lower half of the Callovian) of south-central Montana and the "lower Sundance" part of the Sundance Formation of north-central Wyoming (the lower part of the formation is probably Bathonian to Lower Callovian in age, but Peterson regarded it as Callovian). Three species, *Procytheridea exempla* (the type species), *P. crassa* and *P. minuta* were placed in the genus. Subsequently, Loranger (1955) described *Procytheridea radvillia* from the Vanguard Formation (Callovian, Oxfordian and basal Kimmeridgian) of Saskatchewan. Wall (1960) has recorded these four species again from Saskatchewan; Peterson's species from the Callovian, with *P. exempla* ranging up into the Oxfordian, and *P. radvillia* from the Oxfordian together with another, unnamed, species. Examination of Peterson's illustrations (1954, pl. XIX, *P. exempla*, figs. 6–14, *P. crassa*, figs. 1–5, and *P. minuta*, figs. 15–19) and photographs of the three holotypes in this paper (pl. 1) indicates that neither *P. minuta* nor *P. crassa* is congeneric with the type species, *P. exempla*. The three species, as represented by the type material, differ so markedly in shape and ornament that it is thought unlikely that they all belong to the same genus. As described by Peterson and redescribed from Saskatchewan by Wall (1960), all three species possess antimerodont hingement. Peterson was only able to observe muscle-scars in *P. exempla* where a sub-vertical row of four scars was accompanied by two antennal scars anteriorly; Wall has observed a similar muscle-scar pattern in *P. minuta*. Loranger (1955) did not describe the muscle-scars in *P. radvillia* but Wall (1960, p. 144) mentions a sub-vertical row of four small scars which is probably an incomplete pattern. The available information about the four North American species of *Procytheridea* is inadequate and the relationships of these species will only be clarified by a re-investigation of the critical faunas from the original localities of Peterson in the United States. As far as this study is concerned it is sufficient to realise that the original species of *Procytheridea* are imperfectly known and that assignment of European species to this genus must therefore be regarded circumspectly. The palaeogeographic isolation of the type area does not preclude the genus occurring both in North America and in Europe.

The first record of *Procytheridea* in Europe was that of Klingler & Neuweiler (1959) who described fifteen species from the Lias β of Germany. These fifteen species differ in shape and ornament from *P. exempla* (the only species we can safely regard as a member of the genus *Procytheridea*), although antimerodont hingement is a feature in common as is muscle-scar pattern. Peterson did not observe the marginal pore canals in his specimens but Howe (in Moore 1961, p. Q330) notes that *Procytheridea* has

"few canals"; Klingler & Neuweiler's species possessed straight canals with six to nine anteriorly and three to five posteriorly. A moderate to strong reticulation was included by Peterson in the generic diagnosis but this certainly does not apply to all the Liassic species assigned to *Procytheridea.* Since 1959 many European species have been placed in the genus and a list, probably not a comprehensive one, is given below. It will be seen that at the present the genus has a range in Europe from the Hettangian to Valanginian.

P. betzi Klingler & Neuweiler, 1959	Lias α and β	Germany
P. multiforata Klingler & Neuweiler, 1959	Lias β	Germany
P. reticulata Klingler & Neuweiler, 1959	Lias β	Germany
P. triebeli Klingler & Neuweiler, 1959	Lias β	Germany
P. glabellata Klingler & Neuweiler, 1959	Lias β	Germany
P. laqueata Klingler & Neuweiler, 1959	Lias β	Germany
P. vulgaris Klingler & Neuweiler, 1959	Lias β	Germany
P. multicostata Klingler & Neuweiler, 1959	Lias β	Germany
P. bipartita Klingler & Neuweiler, 1959	Lias β	Germany
P. variabilis Klingler & Neuweiler, 1959	Lias β	Germany
P. spinaecostata Klingler & Neuweiler, 1959	Lias β	Germany
P. acuticostata Klingler & Neuweiler, 1959	Lias β	Germany
P. sulcata Klingler & Neuweiler, 1959	Lias β	Germany
P. perplexa Klingler & Neuweiler, 1959	Lias β	Germany
P. harpa Klingler & Neuweiler, 1959	Lias β and γ	Germany
P. luxuriosa Apostolescu, 1959	L. Sinemurian	France
P. vitiosa Apostolescu, 1959	U. Sinemurian	France
P. *undata* Apostolescu, 1959	U. Sinemurian	France
P. plicata Apostolescu, 1959	U. Sinemurian	France
P. vermiculata Apostolescu, 1959	U. Sinemurian	France
P. magnycourtensis Apostolescu, 1959	Toarcian	France
P. bernierensis Apostolescu, 1959	Toarcian	France
P. sermoisensis Apostolescu, 1959	Toarcian	France
P. martini (Bizon, 1958) in Oertli, 1959a	Oxfordian	France and Switzerland
P. gublerae (Bizon, 1958) in Oertli, 1959a	Oxfordian	France and Switzerland
? P. arcuatocostata Martin, 1960	Toarcian	Germany
P. bucki Bizon, 1960	Toarcian	France
P. rugosa Bizon, 1960	Toarcian	France
P. champeauae Bizon, 1960	Domerian	France
P. parva (nom.nov. for *P. minuta* of Oertli, 1959b) Oertli, 1960	U. Bathonian	France
P. vitilis Apostolescu, Magné Malmoustier, 1961	Toarcian	France
P. hoffmanni Brand, 1961	Bajocian	Germany
P. triangula Brand, 1961	Bajocian	Germany

P. brevicosta Brand, 1961	Bajocian	Germany
P. (Kinkelinella) intermedia Gramann, 1962	U. Sinemurian	Germany
P. (Progonoidea) auleata Gramann, 1962	U. Sinemurian	Germany
P. (Pleurifera) harpa harpoidea Gramann, 1962	L. Pliensbachian	Germany
P.? tatei Gramann, 1962	L. Pliensbachian	Germany
P.? apostulescui Gramann, 1962	L. Pliensbachian	Germany
P. adunca Plumhoff, 1963	Aalenian and Bajocian	Germany
P. minima Plumhoff, 1963	Aalenian and Bajocian	Germany
P. oblonga Plumhoff, 1963	Aalenian	Germany
P. pinguis Plumhoff, 1963	Aalenian	Germany
P.? punctulata Plumhoff, 1963	Aalenian and Bajocian	Germany
P.? gibbosa Plumhoff, 1963	Aalenian	Germany
P.? inflata Plumhoff, 1963	Aalenian	Germany
P.? ventriosa ventriosa Plumhoff, 1963	Toarcian and Aalenian	Germany
P.? ventriosa angulata Plumhoff, 1963	Toarcian, Aalenian & Bajocian	Germany
P. adunca Fischer, 1963	Toarcian	Germany
P. ventriosa Fischer, 1963	Toarcian	Germany
P. tuberculata Donze, 1965	Valanginian	France
P. grezzanensis Masoli, 1966	Domerian	Italy
P. marrocui Masoli, 1966	Domerian	Italy
P. praeluxuriosa Donze, 1966	Hettangian	France
P. cf. *glabra* Viaud, 1963 MS. in Donze, 1966	Hettangian	France
P. czestochowiensis Blaszyk, 1967	Bajocian and Bathonian	Poland
P. ketzinensis Dreyer, 1967	U. Sinemurian	Germany
P. vitilis furcata Wienholz in Stoermer & Wienholz, 1967	Toarcian	Germany
P. mandelstami Wienholz in Stoermer & Wienholz, 1967	Toarcian	Germany
P. oblonga levis Stoermer in Stoermer & Wienholz, 1967	Aalenian	Germany
P. (Progonoidea) labyrinthica Stoermer in Stoermer & Wienholz, 1967	Aalenian	Germany
P.? pseudocrassa Wienholz, 1967	Callovian	Germany
P. laneuvevillae Donze, 1967	U. Sinemurian	France
P. lotharingiae Donze, 1967	U. Sinemurian	France
P.? gibber Donze, 1968	L. Sinemurian	France
P. osmanvillae Donze, 1968	L. Sinemurian	France
P. medioreticulata Michelsen in Bertelsen & Michelsen, 1970	Lias α	Denmark

There are also two records from outside North America and Europe, viz:

P. grossepunctata (Chapman, 1904) in Kellett & Gill, 1956	Jurassic	Australia
P. dorsoangulata Grekoff, 1963	Bathonian	Madagascar
P. inhopyensis Grekoff, 1963	Callovian	Madagascar

Amongst Liassic procytherids, Gramann (1962) considered that three subgenera could be distinguished: *Procytheridea (Kinkelinella), P. (Progonoidea)* and *P. (Pleurifera).* The latter two were new but *Kinkelinella* had been described previously as a new genus by Martin (1960), with *K. tenuicostati* Martin, 1960 from the *tenuicostatum* Zone of the borehole Bockstedt 24, near Bremen, as type species. Martin (1960, p. 130) distinguished *Kinkelinella* from *Procytheridea* by means of the hingement, hemimerodont in the former genus as opposed to antimerodont in the latter. However, Gramann (1962) described *Kinkelinella* as having antimerodont hingement, i. e. the median element of the hinge being a denticulate bar and a locellate groove in the left and right valve respectively, whereas in a hemimerodont hinge the median elements are smooth. On this basis, Plumhoff (1963, p. 30) stated that *Kinkelinella* and *Procytheridea* are congeneric. It would seem that the fundamental difference between the two genera as given by Martin was based on a feature poorly preserved in the original material. However, *Kinkelinella* has come to be considered a valid genus in its own right (e. g. Malz, 1966), distinct from *Procytheridea* and known in the Toarcian, Aalenian and Bajocian of Europe. *Kinkelinella* is particularly distinguished by almost alate ventral inflations and well developed anterior and posterior marginal rims, two features which together with a strong reticulate ornament provide a morphological unity in which *P. exempla* (and the other North American species) does not belong (see, for example, Malz, 1966, Tafel 48). The rather alate form may be an expression of the animal's adaptation to rest on a very soft substrate by reducing the load:area ratio; the genus was most abundant during the Toarcian when sedimentation was dominantly of an argillaceous nature. *Procytheridea triangula* Brand, 1961 was designated type species of *Ektyphocythere* by Bate (1963a), but the latter is considered a subjective synonym of *Kinkelinella* by Malz (op. cit.).

Gramann (1962) placed *Procytheridea harpa* Kingler & Neuweiler, 1959 in his subgenus *P. (Pleurifera)* and created a new subspecies called *P. (Pleurifera) harpa harpoidea.*

While describing German Aalenian and Bajocian ostracods, Plumhoff (1963) included the species *Procytheridea adunca* and *P.? ventriosa* which he attributed to Fischer (1963), but since Plumhoff's publication predated that of Fischer (April and June respectively) the species are Plumhoff's. Bate (1963b) has placed *P.? ventriosa* in *Praeschuleridea* and Malz (1966) has placed *P. adunca* in *Kinkelinella.* The subspecies *Procytheridea? ven-*

triosa angulata Plumhoff, 1963 was made *Praeschuleridea angulata* (Plumhoff, 1963) by Malz (1966) and *Procytheridea ventriosa* (as described by Fischer, 1963) made into a new species *Praeschuleridea gallemannica* by the same author. Two species of *Procytheridea* from the Lias of the Paris Basin by Apostolescu (1959), *P. magnycourtensis* and *P. bernierensis* (and perhaps also Ostracoda G of Apostolescu) probably belong in *Praeschuleridea* also, but unfortunately Apostolescu did not describe the marginal pore canals, muscle-scar pattern or hingement of these species.

Procytheridea adunca (as described by Fischer, 1963) was not the same species as that described under that name by Plumhoff, and Malz (1966, p. 389) has given Fischer's species a new name and placed it in *Kinkelinella* as *K. fischeri.* Malz regards the following species as belonging to *Kinkelinella* with the type-species, *K. tenuicostati*, and *K. fischeri: P. adunca* (of Plumhoff), *P. minima, P. triangula* and *P. sermoisensis.* A number of species thus belong in *Kinkelinella.* It should be noted that the species *P. sermoisensis* has suffered a variety of interpretations. The specimens figured originally by Apostolescu (1959, pl. III, fig. 37–38) must be regarded as the species *sensu-stricto* since Bizon (1960) figured a wide range of ornament and to some extent of shape within this species. Fischer (1966) has discussed the variation as shown by Bizon and concludes that more than one species is involved. Ostracoda I Apostolescu, 1959 is a good example of a separate species which resembles *P. sermoisensis* which also should be placed in *Kinkelinella. Procytheridea sermoisensis* as figured by Oertli (1963, pl. XXII, item f) from Mâcon has been incorporated in *K. fischeri* (Malz, 1966, p. 389).

Donze (1966) compares a species from the Lias of Ardèche with *Procytheridea glabra* Viaud, 1963, the latter species having been described in an unpublished dissertation of the University of Bordeaux the material of Viaud should be formally described.

The species *? Procytheridea arcuatocostata* Martin, 1960 is a junior synonym of *P. champeauae* Bizon, 1960 since they are the same species and the former was published in June and the latter in March. The species is very similar to *P. vitilis* Apostolescu et. al. (1961) but has a markedly different outline when viewed dorsally.

Procytheridea ? apostulescui Gramann, 1962 has been made the type species of the genus *Gramannella* by Lord (1972) which also includes *Procytheridea ? tatei.*

Procytheridea has been recorded twice from areas outside Europe and North America; from Madagascar by Grekoff (1963) who has described two species, and from Australia by Kellett & Gill (1956) who considered two previously described varieties to be male and female of a species which was named *P. grossepunctata* (Chapman, 1904). Kellett & Gill (1956, p.

126) noted that Peterson (1954) in his original description of *Procytheridea* had called the elongate forms female whereas the conventional interpretation, when other evidence is lacking, is to consider the more elongate forms male. For this reason the holotypes of Peterson's three species are called female in the explanation of plate 1 although Peterson had called them male.

In the course of their respective works on Bajocian and Rhaetic ostracods both Bate and Anderson have commented upon the taxonomic position of *Procytheridea*. Bate (1963a, p. 213), after examining specimens of *P. exempla* and *P. crassa*, concluded that many European species were not congeneric with *P. exempla* and pointed out that *P. crassa* was not congeneric with the type-species either, so that European forms placed in *Procytheridea* by virtue of a resemblance to *P. crassa* are not true members of the genus. I believe that the same applies to species which resemble *P. minuta*, e. g. *P. harpa* Klingler & Neuweiler, 1959. Bate's genus *Ektyphocythere* and its possible synonymy with *Kinkelinella* has been referred to above, but Bate (1963a, p. 214) listed a number of *Procytheridea* species with a basic ornamental pattern of triangular ribs in common which might belong to *Ektyphocythere*, and these species certainly do not belong in *Kinkelinella* even if the type species of *Ektyphocythere* does. In a later paper, Bate (1963b) has described *Micropneumatocythere* which he considers may contain *P. crassa* Peterson, 1954, and also (1965) *Cloughtonella* which probably contains *Procytheridea hoffmanni* Brand, 1961. Anderson (1964) regards *Procytheridea sensu-stricto* as a post-Liassic genus and thinks that Lower Jurassic species can be placed in *Kinkelinella* or in his genus *Klinglerella* (type-species *Procytheridea glabellata* Klingler & Neuweiler, 1959); he also divides into three groups based on ornamental variation the species described by Klingler & Neuweiler (1959), Apostolescu (1959) and Martin (1960), two groups being regarded as belonging to *Klinglerella* and the third to *Kinkelinella*. A similar group based on ornamental similarities is formed by the species possibly belonging to *Ektyphocythere* listed by Bate (1963a, p. 214) as all possessing a distinctive triangular pattern of ribs, but in some of the species the ornament is not strongly triangular (*P. triebeli, P. laqueata* and *P. spinaecostata*) and in the other cases the triangular pattern is developed in several different ways. It is acknowledged that a number of Liassic species have a fundamentally triangular ornament but this must not be regarded as a sole basis for linking them together, the dangers of too great a reliance upon ornament being well known.

Jurassic ostracods from Israel have been figured by Mayne (1966), some of which from the Callovian and Oxfordian were thought to have affinities with *P. exempla* and some from the Bajocian with *P. crassa*. As yet there is apparently no convincing record of *Procytheridea* outside North America. The North American Jurassic "Sundance Sea" in which *Procytheridea* lived

was very isolated with access from the west only, although that in itself is not evidence against the genus having originated in Europe at an earlier time.

Concluding Remarks

The ostracods discussed in this paper are of great importance in the context of Lower Jurassic faunas and for this reason it is particularly desirable that their taxonomy should be clarified. Pending the redescription and refiguring of *Bairdia*(?) *problematica* Méhes, 1911 (= *Hungarella*) with particular reference to any calcified inner lamella and to the muscle-scar pattern and if possible statistical analysis of variation, it is preferable to call Lower Jurassic species which are congeneric with *Ogmoconcha contractula* Triebel, 1941 (type species of *Ogmoconcha*) by the generic name *Ogmoconcha* rather than *Hungarella* since the synonymy of the two genera is unproved. Concerning the genus *Procytheridea,* it is concluded that is does not occur in the Lias and may not even be present in Europe since no convincing record is as yet forthcoming. Species assigned to the genus belong to *Kinkelinella, Klinglerella, Micropneumatocythere, Pleurifera, Progonoidea, Gramannella,* (?) *Cloughtonella* and several other undescribed genera. The North American species of *Procytheridea* require revision and the European species should be critically re-examined.

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Dansk sammendrag

Ostracod-faunaer fra Nedre Jura domineres af arter tilhørende slægterne *Ogmoconcha* Triebel, 1941 og *Procytheridea* Peterson, 1954. Disse slægters taxonomiske stilling er problematisk. Der er stort set enighed om arterne inden for slægten *Ogmoconcha,* men anvendelsen af slægtsnavnet er vanskeliggjort ved en antaget, men endnu ikke bevist,

synonymi med den Triassiske slægt *Hungarella* Méhes, 1911. Indtil denne synonomi er bevist eller tilbagevist, ved undersøgelse af nyt materiale fra Méhes' originallokaliteter i Ungarn, foretrækkes det at bruge navnet *Ogmoconcha* for Liassisk materiale. Dels blev slægten beskrevet fra det tyske Lias δ, dels er et stort antal Lias arter utvivlsomt congenetiske med den. Når det gælder *Procytheridea*, er forholdet endnu mindre klart. Der hersker ikke blot tvivl om ligheden mellem typearten og andre arter, men også om hvorvidt disse andre arter overhovedet tilhører samme slægt. En kritisk undersøgelse af arter henført til slægten *Procytheridea* er stærkt påkrævet.

References

Adamczak, F. 1967: Morphology of two Silurian metacope ostracodes from Gotland. *Geol. För. Stockholm. Förh.* **88,** 462–475.

Anderson, F. W. 1964: Rhaetic Ostracoda. *Bull. geol. Surv. Gt. Br.* **21,** 133–174.

Apostolescu, V. 1959: Ostracodes du Lias du bassin de Paris. *Revue Inst. fr. Pétrole* **14,** 795–826.

Apostolescu, V., Magné, J. & Malmoustier, G. 1961: Quelques espèces nouvelles d'Ostracodes du Toarcien de Thouars (Deux-Sèvres). *In* Colloque sur le Lias Français. *Mémoires du Bureau de Recherches Géologiques et Minières* no. **4,** 399–405.

Barbieri, F. 1964: *Hungarella hyblea* nuovo Ostracode del Domeriano. *Ateneo parmense* **35** (suppl. I), 1–7.

Bate, R. H. 1963 a: Middle Jurassic Ostracoda from north Lincolnshire. *Bull. Br. Mus. nat. Hist. (Geol.)* **8,** 173–219.

Bate, R. H. 1963 b: Middle Jurassic Ostracoda from south Yorkshire. *Bull. Br. Mus. nat. Hist. (Geol.)* **9,** 19–46.

Bate, R. H. 1965: Middle Jurassic Ostracoda from the Grey Limestone Series, Yorkshire. *Bull. Br. Mus. nat. Hist. (Geol.)* **11,** 73–133.

Benson, R. H. 1967: Muscle-Scar Patterns of Pleistocene (Kansan) Ostracodes. *In* Essays in Paleontology and Stratigraphy, Raymond C. Moore Commemorative Volume, *Univ. Kans. Dep. Geol. Special Publication* **2,** 211–241.

Bertelsen, F. & Michelsen, O. 1970: Megaspores and Ostracods from the Rhaeto-Liassic Section in the Boring Rødby No. I, Southern Denmark. *Danm. geol. Unders.* række II, **94,** 1–60.

Bizon, J. J. 1960: Sur quelques Ostracodes du Lias du bassin parisien. *Revue Micropaléont.* **2,** 203–211.

Blake, J. F. 1876: *In* Tate, R. & Blake, J. F.: *Thr Yorkshire Lias.* London. (Ostracoda pp. 429–435).

Blaszyk, J. 1967: Middle Jurassic ostracods of the Czestochowa region (Poland). *Acta palaeont. pol.* **12,** 1–75.

Boda, J. (editor) 1964: Catalogus Originalium Fossilium Hungariae. Pars Zoologica. *Magy. allami. földt. Intez.* Budapest.

Bradley, J. C. 1957: Draft of English Text of the »Règles Internationales de la Nomenclature Zoologique«. *Bull. zool. Nomencl.* **14,** 1–285.

Brand, E. 1961: *In* Brand, E. & Malz, H.: Drei neue *Procytheridea*-Arten und *Ljubimovella* n. g. aus dem NW-deutschen Bajocien. *Senckenberg. leth.* **42,** 157–173.

Chapman, F. 1904: On some Foraminifera and Ostracoda from Jurassic (Lower Oolite) strata, near Geraldton, Western Australia. *Proc. R. Soc. Vict.* **16,** 187–206.

Christensen, O. B. 1962: Ostracodtyper fra Keuper-Rhaet i dybdeboringerne ved Harte og Ullerslev. *Meddr dansk geol. Foren.* **15,** 90–98.

Christensen, O. B. 1968: *In* Larsen, G., Christensen, O. B., Bang, I. & Buch, A.: Øresund, Helsingør-Hälsingborg Linien. *Danm. geol. Unders.*, rapport **I,** 53–62.

Conti, S. 1954: Stratigrafia e paleontologia della Val Solda (Lago di Lugano). *Memorie descr. Carta geol. Ital.* **30,** 1–248.

Donze, P. 1965: Espèces nouvelles d'ostracodes des couches de base du Valanginien de Berrias (Ardèche). *Trav. Lab. Géol. Univ. Lyon N. S.* **12,** 87–107.

Donze, P. 1966: Ostracodes de l'Hettangien entre Aubenas et Privas (Ardèche). *Trav. Lab. Géol. Univ. Lyon N. S.* **13,** 121–139.

Donze, P. 1967: Les ostracodes du sondage de Laneuveville-Devant-Nancy (Lotharingien de la région type). *Sci. de la Terre* **XII,** 71–92.

Donze, P. 1968: Espèces nouvelles d'ostracodes du Lias inférieur Normand. *Bull. Soc. Linn. Normandie* **10,** 78–87.

Drexler, E. 1958: Foraminiferen und Ostracoden aus dem Lias alpha von Siebeldingen/ Pfalz. *Geol. Jb.* **75,** 475–554.

Dreyer, E. 1967: Mikrofossilien des Rät und Lias von SW-Brandenburg. *Jb. Geol.* **I,** 491–531. (year given as 1965.)

Ferreira, J. M. 1960: News Report – Portugal. *Micropaleontology* **6,** 125.

Fischer, W. 1963: Neue Arten der Ostracoden-Gattung *Procytheridea* Peterson 1954 aus dem Oberen Lias Schwabens. *Neues Jb. Geol. Paläont. Mh.* **6,** 295–300.

Fischer, W. 1966: Zur Variationsbreite fossiler Ostracoden. *Neues Jb. Geol. Paläont. Abh.* **125,** 212–215. (Festband Schindewolf.)

Gramann, F. 1962: Skulptierte Ostracoden aus dem niederrheinischen Lias. *Fortschr. Geol. Rheinld Westf.* **6,** 185–198.

Gramm, M. N. 1967: [Rudimentary muscle-scars in Triassic *Cytherelloidea* (Ostracoda)]. *Dokl. Akad. nauk SSSR* **173,** 931–934. (In Russian.)

Grekoff, N. 1963: Contribution a l'étude des ostracodes du Mésozoïque moyen (Bathonien- Valanginien) du bassin de Majunga, Madagascar. *Revue Inst. fr. Pétrole* **18,** 1709–1762.

Gründel, J. 1964: Zur Gattung *Healdia* (Ostracoda) und zu einigen verwandten Formen aus dem unteren Jura. *Geologie* **13,** 456–477.

Gründel, J. 1968: Zur Gliederung der Familie Healdiidae (Ostracoda) und zu ihrer Stellung innerhalb der Ordnung Podocopida. *Ber. deutsch. Ges. geol. Wiss.* **A 13,** 225–232.

Gründel, J. 1970: Die Ausbildung der Muskelnarben an liassischen Vertretern der Healdiidae (Ostrac.). *Freiberger ForschHft.* C 256, 47–63.

Hallam, A. 1961: Cyclothems, Transgressions and Faunal Change in the Lias of North-West Europe. *Trans. Edinb. geol. Soc.* **18,** 124–174.

Herrig, E. 1969 a: Ostracoden aus dem Ober-Domérien von Grimmen westlich von Greifswald. Teil I. *Geologie* **18,** 446–471.

Herrig, E. 1969 b: Ostracoden aus dem Ober-Domérien von Grimmen westlich von Greifswald. Teil II. *Geologie* **18,** 1072–1101.

Jones, T. R. 1872: On some Bivalve Entomostraca from the Lias (»Infralias«) of Yorkshire. *Q. Jl. geol. Soc. Lond.* **28,** 146–147. (Appendix to Blake, J. F.: On the Yorkshire Infralias.)

Jones, T. R. 1894: On the Rhætic and some Liassic Ostracoda of Britain. *Q. Jl. geol. Soc. Lond.* **50,** 156–168.

Kellett, B. & Gill, E. D. 1956: Review of Western Australian Ostracod Types of Jurassic Age in the National Museum of Victoria, Australia. *Austral. J. Sci.* **18,** 125–126.

Klingler, W. 1962: Lias Deutschlands. *In* Simon, W. & Bartenstein, H. (editors) *Leitfossilien der Mikropaläontologie,* 73–122. Berlin.

Klingler, W. & Neuweiler, F. 1959: Leitende Ostracoden aus dem deutschen Lias beta. *Geol. Jb.* **76,** 373–410.

Lev, O. M. 1958: [The Lower Jurassic Ostracoda of the Nordvik and Lena-Olenck areas]. *Nauchno-issled. Inst. geol. Arct.* **12,** 23–49. (In Russian.)

Loranger, D. M. 1955: Paleogeography of some Jurassic microfossil zones in the southern half of the western Canada basin. *Proc. geol. Ass. Can.* **7,** 31–60.

Lord, A. R. 1971: Some Lower Lias Ostracoda from Yorkshire. *Palaeontology* **14,** 642–665.

Lord, A. R. 1972: *Wicherella* and *Gramannella,* two new genera of Lower Jurassic Ostracoda (Crustacea). *Palaeontology* **15,** 187–196.

Malz, H. 1966: Zur Kenntnis einiger Ostracoden-Arten der Gattungen *Kinkelinella* und *Praeschuleridea. Senckenberg. leth.* **47,** 385–404.

Martin, G. P. R. 1960: *In* Hoffmann, K. & Martin, G. P. R.: Die Zone des *Dactylioceras tenuicostatum* (Toarcian, Lias) in NW- und SW-Deutschland. *Paläont. Z.* **34,** 103–149.

Masoli, M. 1966: Specie nuove di Ostracodi del Domeriano di Verona – *Procytheridea grezzanensis* e *Procytheridea marrocui. Studi trent. Sci. nat.* **A 43,** 211–219.

Maync, W. 1966: Microbiostratigraphy of the Jurassic of Israel. *Bull. geol. Surv. Israel* **40,** 1–56.

Méhes, G. 1911: Über Trias-Ostrakoden aus dem Bakony: Resultate der Wissenschaftlichen Erforschung des Balatonsees. *Balaton-Ausschusse der Ung. Geographischen Gesellschaft. Band 1, Teil I, Anhang Band 3, Palaeontologie der Umgebung des Balatonsees,* **6,** 1–38. Wien.

Moore, R. C. (editor) 1961: *Treatise on Invertebrate Paleontology.* Q, Arthropoda **3,** Crustacea, Ostracoda. xxiii + 442 pp. Kansas Univ. Press.

Morkhoven, F. P. C. M. van, 1963: *Post-Palaeozoic Ostracoda.* **II.** Generic Descriptions. 478 pp. Amsterdam.

Norling, E. 1970: Jurassic and Lower Cretaceous stratigraphy of the Rydebäck-Fortuna borings in southern Sweden. *Geol. För. Stockh. Förh.* **92,** 261–287.

Oertli, H. J. 1959 a: Malm-Ostrakoden aus dem schweizerischen Juragebirge. *Denkschr. schweiz. naturf. Ges.* **83,** 1–44.

Oertli, H. J. 1959 b: Les ostracodes du Bathonien du Boulonnais I. Les »Micro-Ostracodes«. *Revue Micropaléont.* **2,** 115–126.

Oertli, H. J. 1960: *Procytheridea parva,* nouveau nom pour *Procytheridea minuta* Oertli, 1959. *Revue Micropaléont.* **3,** 70 only.

Oertli, H. J. 1963: *Faunes d'Ostracodes du Mésozoïque de France/Mesozoic ostracod faunas of France.* 57 pp. Leiden.

Peterson, J. A. 1954: Jurassic Ostracoda from the »lower Sundance« and Rierdon formations, western interior United States. *J. Paleont.* **28,** 153–176.

Pietrzenuk, E. 1961: Zur Mikrofauna einiger Liasvorkommen in der Deutschen Demokratischen Republik. *Freiberger ForschHft.* **C113,** 1–129.

Plumhoff, F. 1963: Die Ostracoden Oberaalenium und tiefen Unterbajocium (Jura) des Gifhorner Troges, Nordwestdeutschland. *Abh. senckenb. naturforsch. Ges.* **503,** 1–100.

Plumhoff, F. 1967: Die Gattung *Aphelocythere* (Ostracoda) im NW-europäischen Jura und zur Entwicklung der Mikrofauna am Übergang Domerium/Toarcium. *Senckenberg. leth.* **48,** 549–577.

Quenstedt, F. A. 1858: *Der Jura.* vi + 842 pp. Tübingen.

Sohn, I. G. 1960: Paleozoic species of *Bairdia* and related genera. *Prof. Pap. U. S. geol. Surv.* **330–A.**

Sohn, I. G. 1968: Triassic ostracodes from Makhtesh Ramon, Israel. *Bull. geol. Surv. Israel* **44,** 1–71.

Sohn, I. G. 1970: Early Triassic Marine Ostracodes from the Salt Range and Surghar Range, West Pakistan. *In* Stratigraphic Boundary Problems: Permian and Triassic of West Pakistan. *Univ. Kans. Dep. Geol. Special Publication* **4,** 193–206.

Stoermer, N. & Wienholz, E. 1967: Mikrobiostratigraphie an der Lias/Dogger-Grenze in Bohrungen nördlich der Mitteldeutschen Hauptscholle. *Jb. Geol.* **I,** 533–591. (year given as 1965.)

Stoll, N. R. (Chairman, Editorial Committee) 1961: *International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology.* xviii + 176 pp. London.

Széles, M. 1965: Ostracodák a Bakonyi Nosztori-Völgy felsökarni rétegeiböl. *Földt. Közl.* **XCV,** 412–417.

Triebel, E. 1941: Zur Morphologie und Ökologie der fossilen Ostracoden. Mit Beschreibung einiger neuer Gattungen und Arten. *Senckenbergiana* **23,** 294–400.

Triebel, E. 1950: Die taxonomische Stellung der Ostracoden-Gattung *Ogmoconcha* und der Lectotypus von *O. amalthei. Senckenbergiana* **31,** 113–120.

Usbeck, I. 1952: Zur Kenntnis von Mikrofauna und Stratigraphie im unteren Lias alpha Schwabens. *Neues Jb. Geol. Paläont. Abh.* **95,** 371–476.

Wall, J. H. 1960: Jurassic Microfaunas from Saskatchewan. *Rep. Dep. Miner. Resour. Sask.* **53,** 1–229.

Wienholz, E. 1967: Neue Ostracoden aus dem norddeutschen Callov. *Freiberger Forsch Hft.* **C213,** 23–51.

Plate 1

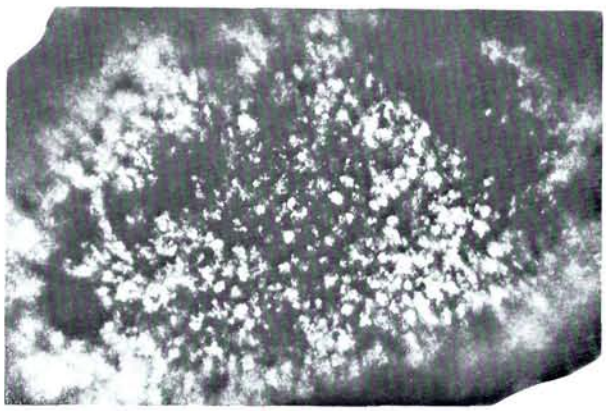
Fig. 1. *Bairdia*(?) *problematica* Měhes, 1911. Interior of Syntypus T. 685. ÁFI (Boda, 1964, p. 170).
1A: Valve showing an indistinct adductor muscle-scar pattern. × 100.
1B: Enlargement of central area of valve.

Photographs by the Magyar Állami Földtani Intézet, Budapest.

Fig. 2–4: Holotypes of the species originally placed in *Procytheridea* by Peterson (1954). All × 100.
2: *Procytheridea exempla* Peterson, 1954.
Holotype, female, U.S.N.M. 117930 (Right view).
3: *Procytheridea crassa* Peterson, 1954.
Holotype, female, U.S.N.M. 117927 (Right view).
4: *Procytheridea minuta* Peterson, 1954.
Holotype, female, U.S.N.M. 108602 (Left view).

Photographs by the Smithsonian Institution, Washington.

1A



1B

2

3

4