A NEW QUATERNARY OSTRACOD GENUS FROM ARGENTINA

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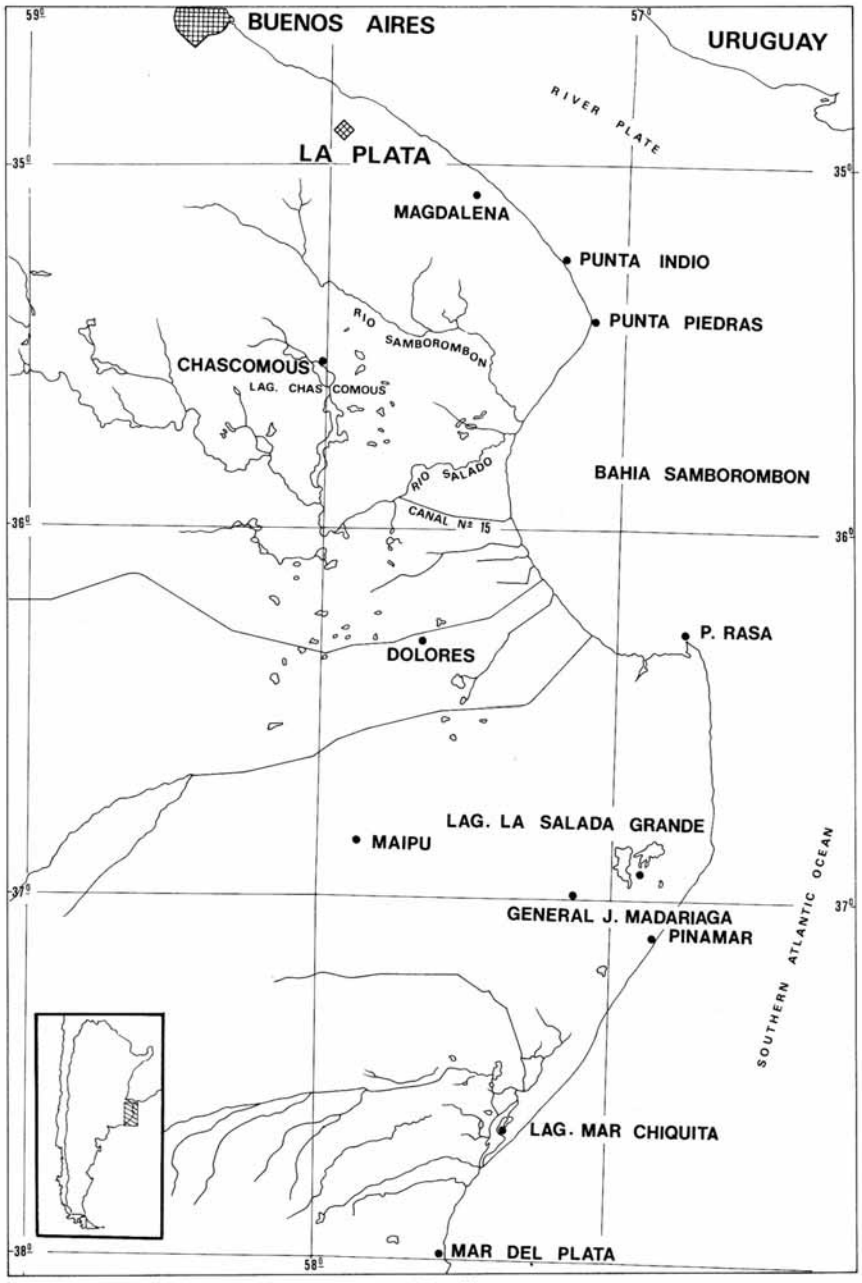
ABSTRACT. A new genus, *Pampacythere* (Limnocytheridae), is described from the so-called marine transgressions of Quaternary age in the *cordon-litoral* between Buenos Aires and Mar del Plata. The genus is based upon two species, *P. multiperforata* and *P. solum*. The relationships between *Pampacythere* and other members of the Limnocytheridae are discussed. It is concluded from an analysis of their faunal associations, with both ostracods and other invertebrates, that the environment in which the two species lived was of brackish-water, probably oligohaline to meiomesohaline.

THE Ostracoda herein described were encountered during a study of the micropalaeontology of the Quaternary deposits of the *cordon-litoral* which occur along the coastal periphery of the Province of Buenos Aires, between the cities of Buenos Aires and Mar del Plata (text-fig. 1).

The age and stratigraphy of the so-called marine deposits of the north-eastern and eastern parts of the Province of Buenos Aires remains uncertain, because there is no consensus of opinion about the position of the Plio–Pleistocene and the Pleistocene–Holocene boundaries (Pasqual and Fidalgo 1972). The problem is aggravated by the largely indigenous nature of both the invertebrate and vertebrate faunas which these deposits contain. Pasqual and Fidalgo (1972, table 1, pp. 212–213) give the different schemes outlined by Ameghino 1906, 1908, 1910; Rovereto 1914*a*, 1914*b*; Roth 1921; Kraglievich 1934; Simpson 1940; Frenguelli 1957, and also present their own views (table 2, p. 220 and table 3, p. 231). We do not wish to enter into this controversy but believe that the majority of the deposits are Holocene, or certainly not older than late Pleistocene. Since D'Orbigny (1835–1847) and Darwin (1846), these deposits, which consist mainly of silts, sands, and shell banks exhibiting varying degrees of consolidation, have been accepted as being of marine origin, based principally upon their content of molluscan and diatomacean fossils. Various authors, however, including Frenguelli (1950, p. 63) have indicated that at least some of the deposits are of estuarine origin. From our studies of the ostracoda, and to a lesser extent the foraminifera, using the methods of Whatley and Kaye (1971, p. 311), it has become evident that the majority of the biocoenoses we have been able to reconstruct pertain to oligohaline–meiomesohaline brackish-water conditions. At certain levels and in certain areas, especially in the north, freshwater biocoenoses predominate and biocoenoses indicating strongly brackish-water, approaching marine conditions (polyhaline), are also encountered. The levels in which these latter occur are almost always thin. They do not seem to occur north of about Canal No. 15, but increase in thickness and frequency towards Laguna Mar Chiquita (text-fig. 1). Over most of the area, the substantial number of marine ostracods present represent a thanatocoenosis because they do not show the population age structure indicative of a biocoenosis. The other invertebrates and diatoms were used by earlier workers

[Palaeontology, Vol. 17, Part 3, 1974, pp. 669–684, pls. 96–97.]



TEXT-FIG. 1. Locality map.

to label many of these deposits as marine. However, the great majority of these whose ecology is known from studies on living forms, are able to tolerate, or indeed flourish under brackish-water conditions.

Localization of the type material. The type locality for *Pampacythere* is centred on Laguna Salada Grande, some 15 km to the north-east of the town of General Madariaga (text-fig. 1). Here, from the banks and from sediment cores taken through the bed of the large brackish-water lake of this name, five samples were processed by Lic. N. V. Dangaus.

The nature and level of the samples is as follows:

Sample	Position in relation to water level of the lake	Lithology
PA/A	+0·30 metres	Clayey silt with molluscan remains
S.G. 7	−0·30 metres	Clayey silt with molluscan remains
S.G. 5	−1·20 metres	Clayey silt
S.G. 1	−2·50 metres	Sandy silt
S.G. 2	−3·40 metres	Sandy silt

Pampacythere multiperforata and *P. solum* were both found in all of these samples except S.G. 1. These deposits are considered by Dangaus (verb. comm. 1973) to belong to the *Piso Querandinense* (Querandinian Stage) which is considered by most authors, including ourselves, to be of early Holocene age. Some authors, however, refer this stage to the upper part of the Pleistocene.

One or both species have also been found in various other localities at more or less the same stratigraphical level and in similar sediments, especially in the area around Canal No. 15 and in cores taken through the bed of Laguna de Chascomous (text-fig. 1).

DISCUSSION OF THE LIMNOCYTHERIDAE

Including *Pampacythere* there are sixteen described genera of Limnocytheridae known to the authors. *Bisulcocypris* (Pinto and Sanguinetti 1958) being here considered synonymous with *Theriosynoecum* Branson (1936) and the subgenus *Limnocythere* (*Denticulocythere*) of Carbonnel and Ritzkowski (1969) being considered as warranting generic status. In addition there are a number of other taxa within the family which probably warrant reconsideration as new genera, such as the material described as '*Gomphocythere*' from the Neocomian of Argentina (Musacchio 1970).

The other fifteen genera are:

1. *Limnocythere* Brady 1868. Tertiary (?Oligocene) to Recent. Cosmopolitan. Fresh and slightly brackish-water.
2. *Afrocythere* Klie 1935. Recent. Africa. Freshwater.
3. *Cytheridella* Daday 1905. Tertiary (?Oligocene) to Recent. South America, Caribbean (Van den Bold 1971), ?Europe (Carbonnel and Ritzkowski 1969). Freshwater to brackish-water (Van den Bold 1971).
4. *Elpidium* F. Müller 1880. Recent. South America. Freshwater.
5. *Cordocythere* Danielopol 1965. Oligocene (Carbonnel and Ritzkowski 1969) to Recent. Europe. Freshwater.

6. *Gomphocythere* Sars 1924. Pleistocene to Recent. Europe (Wicher 1957), Africa, South America, New Zealand, Australia. Freshwater.
7. *Leucocythere* Kaufmann 1892. Recent. Europe. Freshwater.
8. *Metacypris* Brady and Robertson 1870. Pleistocene and Recent. Cosmopolitan. Freshwater.
9. *Neolimnocythere* Delachaux 1928. Recent. South America. Freshwater.
10. *Paracythereis* Delachaux 1928. Recent. South America. Freshwater.
11. *Pseudolimnocythere* Klie 1938. Recent. Europe. Freshwater (Subterranean).
12. *Theriosynoecum* Branson 1936. Triassic (Gerry and Oertli 1967) to Lower Cretaceous. Cosmopolitan. Freshwater.
13. *Paralimnocythere* Carbonnel 1965. Miocene to Recent. Europe. Freshwater.
14. *Denticulocythere* Carbonnel and Ritzkowski 1969. Oligocene. Europe. Freshwater.
15. *Cladarocythere* Keen 1972. Eocene to Oligocene. Europe. Brackish-water.

Only *Theriosynoecum* and the last two genera are extinct and only *Limnocythere*, *Cytheridella*, *Cordacythere*, and the last three genera have a fossil history extending back beyond the Pleistocene. If *Theriosynoecum* is indeed a member of the same family as the younger genera, one must expect eventually to encounter taxa bridging the gap between the Lower Cretaceous and the first appearance of species which can be assigned with reasonable certainty to living genera in the Eocene and Oligocene. Certain forms from the Upper Jurassic and Cretaceous, such as, for example *Limnocythere fragilis* Martin (1940), bear a certain resemblance to later members of *Limnocythere* s.s. and require further examination to ascertain their true affinities. Also Keen (1972, p. 287) mentions the fact that *Limnocythere* sp. A (Bate 1965) from the Middle Jurassic (Bathonian) of Oxfordshire, may perhaps belong in *Cladarocythere*.

It is notable that of the 16 genera in the family, 4 are Cosmopolitan, or virtually so; 6 are confined to Europe and the remaining 6 to the Southern continents. Of these, *Afrocythere* is known only from Africa, and *Cytheridella*, *Elpidium*, *Paracythereis*, *Neolimnocythere*, and *Pampacythere* are confined to South America. *Cytheridella* in fact is also recorded from the Caribbean (Van den Bold 1971) and there is also a somewhat doubtful record of this genus from the Oligocene of France (Carbonnel and Ritzkowski 1969). The importance of South America as an area of considerable divergence within the Limnocytheridae is evident in these figures.

Pampacythere seems to be most closely allied to the *Cladarocythere*, *Gomphocythere*, *Cytheridella*, *Elpidium* group than to the other limnocytherids. Pinto and Sanguinetti (1958, 1962), Pinto and Purper (1970), and Danielopol (1969) have discussed the nature of the generic relationships within the family. Detailed comparisons between *Pampacythere* and other genera of the Limnocytheridae are difficult to make since modern studies, particularly of the pores, are lacking for the other genera.

ECOLOGY OF *PAMPACYTHERE*

At the type locality, the genus occurs in association with the following ostracods which exhibit a population age structure indicative of a biocoenosis. These are in approximate order of abundance: *Cyprideis multidentata* Hartmann 1955, *Callistocythere nucleoperiscum* Whatley and Moguilevsky (in press), *Perissocytheridea* sp. cf. *P. krommellbeini* Pinto and Ornellas 1970, *Limnocythere neotropica* Klie 1934, *Limnocythere* sp., and *Cyprideis saetosa* Hartmann 1955.

All these species are typical of brackish-water environments today, although the presence of the two *Limnocythere* species would seem to indicate a substantial degree of freshwater influence. *Cyprideis multidentata* (which the authors consider to be synonymous with *C. riograndensis* Pinto and Ornellas 1965) was first described from essentially brackish-water environments along the coast of Brazil, and later by Pinto and Ornellas (1965) from a brackish-water environment in southern Brazil with a salinity range of 6·10–29·11‰. Pinto and Ornellas (1970) record *Perissocytheridea krommelbeini* from the same locality and salinity range, and one of the present authors (R. C. W.) has recovered this species from a number of brackish-water localities in the Argentine. *Callistocythere nucleoperiscum*, whilst common in marine littoral environments, also penetrates into brackish-waters in substantial numbers, in the Argentine at the present day.

Also occurring with the above fauna are rare freshwater elements such as *Ilyocypris gibba* (Ramdohr 1808), *Chlamydotheca alegrensis* Tressler 1949, *Cyprinotus similis* Wierzejski 1892, *Cyprinotus incongruens* (Ramdohr 1808), and *Cypridopsis assimilis* Sars 1901 (Ramirez 1967), all of which present a population age structure indicative of a thanatocoenosis rather than a biocoenosis. Marine elements include species of the following genera which also, since they occur rarely and without more than one, or at most two, growth stages are considered as being of an introduced nature: *Xestoleberis*, *Loxoconcha*, *Patagonacythere*, *Procythereis*, *Leptocythere*, *Cytheretta*, ?*Triginglymus*, *Semicytherura*, *Microcytheridea*, *Hemicytherura*, *Cytheropteron*, *Cushmanidea*, *Hulingsina*, *Munseyella*, *Parakrithella*, *Paradoxostoma*, and *Pellucistoma*.

Foraminifera include, in approximate order of abundance, the following species: *Elphidium discoidale* (d'Orbigny) 1840, *Ammonia becarii parkinsoniana* (d'Orbigny) 1840, *Elphidium gunteri* Cole 1931, *E. galverstonensis* Kornfield 1931, and *E. advenum* (Cushman 1922). In some samples *Bucella frigida* Cushman 1921 also occurs abundantly. This association of Foraminifera is thought to represent brackish-water.

The molluscs, which at the type locality occur mainly as embryos or as fragments of larger shells are also, according to Ageitos de Castellanos (1967, verb. comm. 1973), in the association in which they occur, indicative of brackish-water. They are: *Littoridina parchappii* (d'Orbigny) 1835, *L. australis* (d'Orbigny) 1835, *Mactra isabelleana* d'Orbigny 1846, *Tagelus plebeius* (Solander) 1786, and *Eurodona mactroides* Daudin 1802. Taken together, all this evidence is overwhelmingly indicative of a brackish-water environment, probably within the oligo–meiomesohaline range. Detailed reconstructions of the various palaeoenvironments we have encountered will be published by the Ministry of Public Works of the Province of Buenos Aires (LEMIT). Here we can postulate that during the deposition of the sediments from which we have recovered *Pampacythere*, in the area of Laguna Salada Grande, a lagoonal environment prevailed. Our reconstruction implies the existence to the north of an estuary, probably very similar to that of the present-day River Plate, and in this area being of polyhaline salinity, separated from a shallow lagoon by sand or shell banks. It is evident that the lagoon had freshwater draining into it from the south and west and was periodically subject to the influence of more highly saline waters from the closely adjacent estuary.

From an analysis of the Argentine Recent marine Ostracoda being carried out by

one of the authors (R. C. W.), we conclude, by comparison with those which occur in these deposits, that slightly warmer waters prevailed than at the present day. Most of the marine species recovered, today live more commonly along the southern coast of Brazil than along the north-eastern coast of the Argentine.

SYSTEMATIC DESCRIPTIONS

Subclass OSTRACODA Latreille, 1806
Order PODOCOPIDA Müller, 1894
Suborder PODOCOPINA Sars, 1866
Superfamily CYTHERACEA Baird, 1850
Family LIMNOCYTHERIDAE Klie, 1938
Genus PAMPACYTHERE gen. nov.

Type species. Pampacythere multiperforata sp. nov.

Diagnosis. Thin shelled. Dimorphic, with males longer and proportionally less high and less tumid than females. Left valve larger than right. Anterior margin rounded. Posterior margin bluntly pointed at or below mid-height. Dorsal margin straight, or posteriorly arched in females. Not strongly flattened ventrally. With two weak antero-ventrally directed sulci on the antero-lateral surface, behind the anterior cardinal angle and just in front of mid-length respectively. Surface smooth to 'wrinkled'. Normal pores large, numerous and comprising 3 or 4 variants of simple open and sieve-type pores, occurring in chain-like groups of 2 or 3 pores subparallel to the margins of the carapace. Hinge modified lophodont with a posteriorly lobate median element in the left valve. Adductor muscle scars comprise a vertical or slightly oblique line of 4 scars with a more or less heart-shaped frontal scar. Two well-developed mandibular scars occur *en echelon* below and anterior to the adductors and a number of dorsal scars above.

Discussion. From *Gomphocythere*, *Pampacythere* differs in outline and in lacking a well-defined flattening of the ventral surface. From *Cytheridella* it differs in being more posteriorly acuminate and more rounded anteriorly, in the nature of its hingement and in lacking an interior vestibule and an internal elevation in the region of the muscle scars. From *Elpidium* it differs in shape and outline, in lacking a strongly flattened ventral surface and substantially in terms of hingement. From *Cladarocythere* it differs in lacking reticulate ornament, crenulate terminal, and a completely crenulate median hinge element and in possessing an undivided frontal scar. In overall shape, the nature of the sexual dimorphism, the nature of the inner lamella and in their ecology, the two genera are very similar. From all these genera, and apparently from all other members of the family, *Pampacythere* differs in possessing numerous very large normal pore canals, both of simple and sieve type, arranged in 'chains' of groups of two or three pores forming subparallel rows. It also differs in exhibiting a hinge with a strongly lobate postero-median element in the left valve and in being generally acuminate posteriorly. Apart from *Cladarocythere* the only other members of the family which bear any resemblance to *Pampacythere* in terms of shape and outline, are certain species of *Limnocythere*, such as *L. trapeziformis* Staplin 1963 and *L. ornata wabashensis* Staplin 1963 from the Pleistocene of Illinois. This

resemblance, however, is thought to be totally superficial and coincidental. *Pampacythere* bears a strong, but quite superficial, resemblance to certain species of *Paracyprideis* Klie (1930), such as *P. rarefistulosa* Linenklaus from the Oligocene of Belgium. This resemblance is in shape and also in the similarity, size, and disposition of the normal pores. However, *Pampacythere* does not exhibit the large vestibule characteristic of *Paracyprideis*, and also differs in hingement and musculature.

Considering the fact that very few Quaternary invertebrates are extinct, *Pampacythere* is very probably a living genus. The authors, however, despite collecting from numerous localities with similar environmental conditions to those under which we suppose the fossil material to have lived, have failed to encounter it.

Pampacythere multiperforata sp. nov.

Plate 96, figs. 1–21

Holotype. Female right valve, MLP 11954.

Derivato nominis. From the large number of normal pores which perforate the carapace of this species.

Type level and locality. Sample S.G. 7, Laguna Salada Grange, Province of Buenos Aires, Argentina.

Material. Some 200 specimens, mainly open valves.

Dimensions.

	Length (mm)	Height (mm)	Width (mm)
Holotype	0·77	0·38	0·14
Paratypes (from the same sample as the Holotype)			
Female right valve. MLP 11955	0·77	0·38	0·15
Male left valve. MLP 11956	0·89	0·41	0·20
Female left valve. MLP 11958	0·73	0·36	0·17
Male right valve. MLP 11959	0·75	0·37	0·14
Female right valve. MLP 11960	0·69	0·35	0·16
Male right valve. MLP 11962	0·72	0·35	0·15

Diagnosis. Pampacythere with carapace strongly perforated by four different types of normal pore canals arranged in groups of two or three pores to form chain-like rows subparallel to the margins of the valve. Dorsal margin straight in both sexes; acuminate postero-ventrally. Hinge with strongly crenulate to lobate postero-median element in the left valve, above which is a shelf-like accommodation groove.

Description. Large. Subrectangular. Males longer and proportionally less high than females. Left valve larger than right. Overlap (only seen in juveniles since adult carapaces have not been found), occurs postero-ventrally and along the anterior part of the dorsal margin. Anterior margin broadly rounded with extremity at about mid-height; posterior margin strongly asymmetrical, the ventral part being narrowly rounded whilst the postero-dorsal slope is long and straight or slightly concave; extremity below mid-height. Dorsal margin long and straight or with slight concavity behind mid-length. Ventral margin biconvex with median concavity overhung by the slight ventral tumidity of the valve. Posterior cardinal angle more strongly marked than anterior. Greatest length below mid-height; greatest height usually at the anterior cardinal angle, although this is only a little greater than that at the posterior and in

some specimens the height is the same at each angle. Surface strongly punctate, particularly posteriorly where the undulations between the punctae impart to the valve surface a 'wrinkled' appearance, although the surface between the punctae is generally smooth. A weak ridge extends from the anterior cardinal angle to an antero-ventral position, paralleling the anterior margin. The immediate antero-marginal border is strongly laterally compressed. Two feeble oblique sulci occur, behind the anterior cardinal angle and mid-dorsally respectively, which both extend antero-ventrally for a short distance. Normal pores comprise four types: 1, single open pores without lip (Pl. 96, fig. 6); 2, semicircular sieve plate with small well-spaced circular openings (Pl. 96, fig. 3); 3, semicircular to irregular sieve plates of very closely spaced large polygonal holes resembling honeycomb; 4, sieve plate of type 2 but with a single larger open pore perforating the plate at one edge (Pl. 96, fig. 8), or more or less centrally (Pl. 96, fig. 2). These four pore types correspond approximately to types A, B, B, and C of Puri and Dickau (1969) respectively. Types 2 and 3 seem to be rarer than the others and also differ in not occurring in a depression as do the others. Pores of types 2–4 occur flush with the outer lateral surface of the valve, and are open internally (Pl. 96, fig. 7). In transparent specimens the pores can be seen to occur in groups of two or three, and sometimes more, in chain-like rows which, especially antero-ventrally and ventrally, are subparallel to the valve margin. All pores are relatively large and occur in greatest density in the posterior half of the valve. Approximately 120 pores occur in each valve and their position is very constant between different specimens. Eye spot absent. In some specimens there is a star-shaped depression on the outer lateral surface in the region of the adductor muscle scars (Pl. 96, fig. 1). Inner lamella relatively narrow, and only slightly wider postero-ventrally than elsewhere. Line of concrescence and inner lamella coincide throughout. Radial pore canals thin and regularly spaced. Anteriorly there are between 14 and

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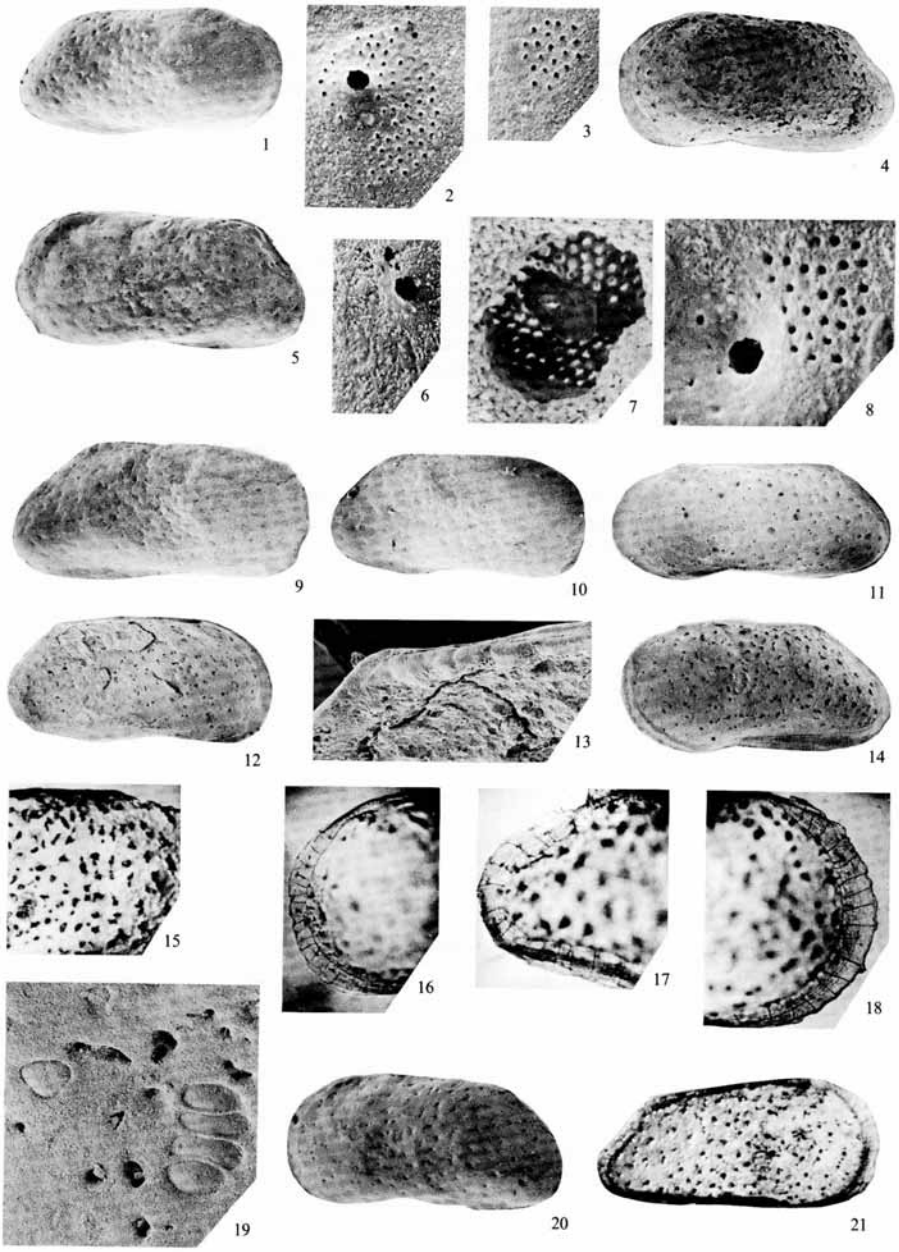
EXPLANATION OF PLATE 96

Figs. 1–21. *Pampacythere multiperforata* gen. et. sp. nov. 1–3, holotype MLP 11954, female R.V. Stereoscan micrographs, external views. 1, outer lateral view, × 120. 2, sieve plate of type 4 (a large open pore perforating subcentrally a sieve plate of type 2), × 6000. 3, type 2 sieve plate, × 120. 4, paratype MLP 11955, female R.V. Stereoscan micrograph, internal view, × 120. 5, 6, paratype MLP 11956, male L.V. Stereoscan micrographs, external views. 5, outer lateral view, × 120. 6, type 1 open pore, × 2000. 7, 11, 19, paratype MLP 11957, female R.V. Stereoscan micrographs, internal views. 7, sieve type pore, × 6000. 11, internal view, × 120. 19, adductor and frontal scars, × 600. 8, paratype MLP 11958, female L.V. Stereoscan micrograph, external view. Type 4 sieve plate (sieve plate of type 2 with open pore to one side), × 12 000. 9, paratype MLP 11959, male R.V. Stereoscan micrograph, outer lateral view, × 120. 10, paratype MLP 11960, female R.V. Stereoscan micrograph, outer lateral view, × 120. 12, 13, paratype MLP 11961, female L.V. Stereoscan micrographs, internal views. 12, internal view, × 120. 13, posterior terminal and postero-median hinge elements, × 12 000. 14, paratype MLP 11962, male R.V. Stereoscan micrograph, internal view, × 120. 15, 16, paratype MLP 11963, female R.V. Transmitted light photo-micrographs. 15, external view to show distribution of the normal pore canals, × 240. 16, internal view of anterior margin, × 240. 17, paratype MLP 11964, male L.V. Transmitted light photo-micrograph, internal view of posterior margin, × 240. 18, paratype MLP 11965, male R.V. Transmitted light photo-micrograph, external view of anterior margin, × 240. 20, paratype MLP 11966, female L.V. Stereoscan micrograph, outer lateral view, × 120. 21, paratype MLP 11967, male L.V. Transmitted light photo-micrograph, internal view, × 120.



WHATLEY and CHOLICH, *Pamparythere*

17, together with 2 or 3 false canals which sometimes cross the true canals. Between 12 and 15 canals occur posteriorly of which those in the postero-ventral part are paired or bunched (Pl. 96, fig. 17), and diverge in the form of an inverted 'V'. Selvage feeble and sub-peripheral. Ventral locking structures poorly developed. Hinge modified lophodont. In the right valve the anterior terminal element is a weak smooth bar, apparently formed by the edge of the valve being bent inwards. The posterior terminal element is similar, but shorter and weaker. The median element is a narrow smooth groove, well marked antero-medianly but becoming weaker posteriorly until immediately behind mid-length, where it widens and deepens and becomes loculate. This groove is somewhat overhung dorsally but is largely open to the interior ventrally. The dorsal edge of the valve is obliquely crenulate. In the left valve the terminal elements are completely open to the interior. The median element is, in its anterior part, a thin smooth bar which widens and becomes divided into four or five large lobes posteriorly (Pl. 96, fig. 13). Above the median element is a narrow shelf-like accommodation groove. Adductor muscle scars comprise a slightly oblique line of four scars of which the two central ones are more elongate than the dorsal and ventral scars. Anteriorly and more dorsal to the most dorsal adductor, is a 'heart'-shaped frontal scar. Below this frontal scar and more ventral than the most ventral adductor, occur two mandibular scars arranged *en echelon*. Dorsal and antero-dorsal to the adductors occur four or five dorsal scars.

Ontogeny. (Specimens from sample S.G. 7.)

	Length		Height	
Instar −1				
11 right valves	Range 0·61–0·68	Mean 0·64	Range 0·305–0·35	Mean 0·32
8 left valves	Range 0·65–0·69	Mean 0·66	Range 0·30–0·33	Mean 0·31
Instar −2				
3 right valves	Range 0·58–0·60	Mean 0·59	Range 0·29–0·305	Mean 0·30
4 left valves	Range 0·57–0·60	Mean 0·59	Range 0·28–0·32	Mean 0·30
Instar −3				
1 left valve	0·51		0·27	

Pampacythere solum sp. nov.

Plate 97, figs. 1–16

Holotype. Female right valve, MLP 11968.

Derivato nominis. From the resemblance of the female of this species to the sole of a shoe.

Type level and locality. Sample S.G. 7, Laguna Salada Grande, Province of Buenos Aires, Argentina.

Material. Some 150 specimens, mostly valves.

Dimensions.

	Length (mm)	Height (mm)	Width (mm)
Holotype	0·75	0·36	0·14
Paratypes (from the same sample as the Holotype)			
Male left valve. MLP 11969	0·72	0·35	0·15
Male left valve. MLP 11971	0·69	0·35	0·12
Female left valve. MLP 11976	0·76	0·37	0·155

Diagnosis. Pampacythere with strong dimorphism expressed in the degree of arching of the dorsal margin. In the female, the posterior part of the dorsal margin is strongly arched; in the male it is straight or virtually so. Surface smooth to 'wrinkled' and not strongly punctate. Normal pores of three types and arranged in subparallel chain-like rows formed of groups of normally three pores. Left valve without accommodation groove. Frontal scar 'heart'-shaped in the horizontal rather than the vertical sense.

Description. Medium to large. Males more elongate and less high than females. Left valve larger than right. Anterior margin broadly rounded with extremity at about mid-height. Posterior margin rounded with a convex postero-ventral and a straight or slightly concave postero-dorsal slope; apex at or just below mid-height. Dorsal margin long and straight in left valves, especially males; in right valves, especially females, it is strongly arched in its posterior part. Ventral margin biconvex about a concavity which is antero-median in right valves and median in left valves. Greatest length at about mid-height; greatest height at the posterior cardinal angle; greatest width in the posterior third of the valve. Anterior cardinal angle subrounded especially in right valves, posterior cardinal angle strongly marked. Surface smooth to 'wrinkled'. Eye spot absent. A poorly defined rib extends from the anterior cardinal angle subparallel to the anterior margin and separates the strongly laterally compressed anterior marginal border from the more elevated lateral surface. The anterior marginal border bears 8–10 weakly developed short tubercules which extend on to the flange. Two short and poorly defined oblique sulci extend antero-ventrally from just behind the anterior cardinal angle and mid-dorsally respectively. The remainder of the shell surface is smooth or 'wrinkled'-up between the pore depressions. Normal pores occur in groups of normally three closely spaced pores of which the centre one is often the smallest. In some parts of the shell they appear to be fused and present a 'dumb-bell'-like appearance (Pl. 97, fig. 8). Some pores are single, but all are orientated in more or less distinct chain-like rows which ventrally are sub-parallel to the ventral margin and which postero-medianly are sub-vertical. The following types of normal pores have been observed: 1, single open pores without lips (Pl. 97, fig. 12); 2, semi-circular to oval sieve plates perforated by mostly circular well-spaced holes, the size of which often diminishes towards the periphery (Pl. 97, fig. 12); 3, semi-circular, oval or 'butterfly'-shaped sieve plates bearing a single, sub-central or peripheral, larger open pore (Pl. 97, figs. 9, 12). These pores correspond approximately to types A, B, and C of Puri and Dickau (1969) respectively. Pore type 3 always occurs in a depression, whereas the remainder are flush with the outer lateral surface of the valve. Type 2 pores seem to occur frequently in association with the 'butterfly'-shaped pores of type 3 (Pl. 97, fig. 12) and this figure also shows the frequent association of type 2 with type 1 pores (type D of Puri and Dickau 1969). All the sieve type pores have the sieve plate on the outer lateral surface and are open internally (Pl. 97, fig. 16). Some specimens exhibit an irregular star-shaped depression on the outer lateral surface in the position of the adductor muscle scars. Inner lamella relatively narrow; widest postero-ventrally. Line of concrescence and inner lamella coincident throughout. Radial pore canals thin and evenly spaced. There are between fifteen and seventeen anteriorly which are almost all slightly concave upwards, and with at least

one canal in all individuals bifurcate. Seven canals occur posteriorly and a similar number postero-ventrally. Selvage sub-peripheral, becoming peripheral mid-ventrally. Hinge modified lophodont. In the right valve the terminal elements are smooth, weak elongate ridges formed by the infolding of the edge of the valve, the posterior being the more strongly developed. The median element is a smooth narrow bar, deepest and widest at its extremities especially posteriorly. In the left valve the terminal elements are smooth sockets, the anterior of which is open internally, the posterior being more strongly developed and partially enclosed to the interior. The median element is a smooth or weakly and irregularly crenulate bar. It is slightly expanded antero-distally and posteriorly it becomes strongly lobate. Accommodation groove absent. Muscle scars similar to those of *P. multidentata* except that the frontal scar is 'heart'-shaped in the horizontal rather than the vertical sense, in that the indentation occurs anteriorly and not dorsally.

Ontogeny. (Specimens from sample S.G. 2.)

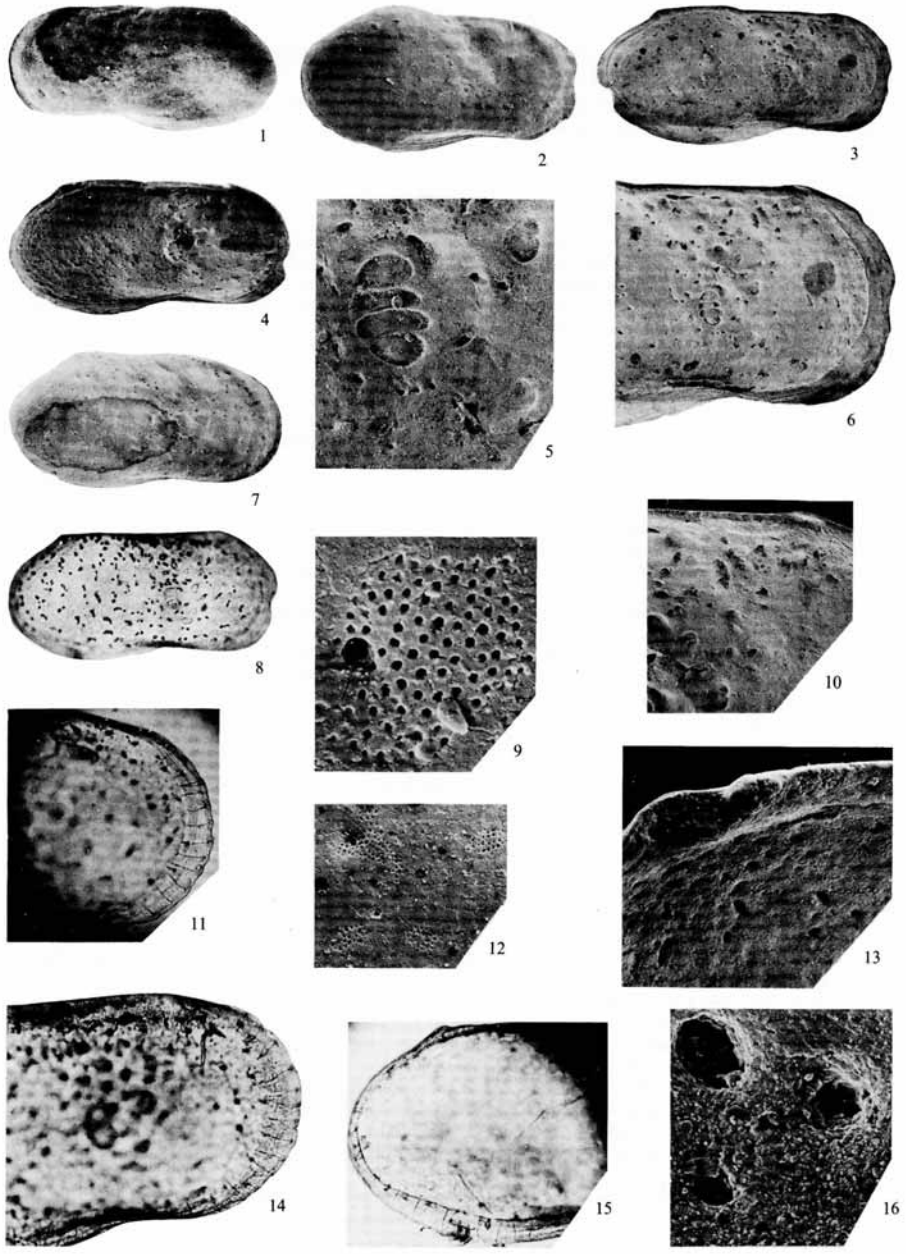
	Length (mm)		Height (mm)	
Adult				
9 right valves	Range 0·68–0·85	Mean 0·78	Range 0·32–0·45	Mean 0·38
10 left valves	Range 0·69–0·95	Mean 0·74	Range 0·32–0·45	Mean 0·39
Instar −1				
13 right valves	Range 0·62–0·685	Mean 0·66	Range 0·29–0·345	Mean 0·32
10 left valves	Range 0·62–0·69	Mean 0·66	Range 0·30–0·345	Mean 0·32
Instar −2				
1 right valve	0·56		0·28	
2 left valves	Range 0·57–0·59	Mean 0·58	Range 0·26–0·285	Mean 0·27

Remarks. Pampacythere solum differs from *P. multiperforata* in the following major characteristics: it is smoother and less strongly punctate; it is arched dorsally in the female; the left valve does not have an accommodation groove; the frontal scar is 'heart'-shaped in the horizontal rather than the vertical sense.

Deposition of material. Holotypes and paratypes are deposited in the collections of

EXPLANATION OF PLATE 97

Figs. 1–16. *Pampacythere solum* gen. et. sp. nov. 1, paratype MLP 11969, male L.V. Stereoscan micrograph, outer lateral view, ×120. 2, 9, 12, holotype MLP 11968, female R.V. Stereoscan micrographs, external views. 2, outer lateral view, ×120. 9, type 3 sieve plate, ×6000. 12, normal pores of types 1, 2, and 3, ×2000. 3, 5, 6, and 10, paratype MLP 11970, male L.V. Stereoscan micrographs, internal views. 3, internal view, ×120. 5, adductor, frontal and mandibular scars, ×600. 6, anterior part of valve, ×400. 10, anterior part of hinge, ×600. 4, 13, paratype MLP 11971, male L.V. Stereoscan micrographs, internal views. 4, internal view, ×120. 13, posterior terminal and postero-median hinge elements, ×1200. 7, paratype MLP 11972, female R.V. Stereoscan micrographs, outer lateral view, ×120. 8, 15, paratype MLP 11973, male L.V. Transmitted light photo-micrographs, external views. 8, outer lateral view to show distribution of the normal pores, ×120. 15, posterior margin, ×240. 11, paratype MLP 11974, female R.V. Transmitted light photo-micrograph, external view of anterior margin, ×240. 14, paratype MLP 11975, female R.V. Transmitted light photo-micrograph of anterior part of valve, external view, ×240. 16, paratype MLP 11976, female L.V. Stereoscan micrograph, internal view of two sieve type pores and one open normal pore, ×3000.



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the Catedra de Micropaleontología, División de Paleozoología, Museo de La Plata, to which the numbers prefixed MLP apply.

Topotype collections have been sent to the British Museum (Natural History) and the United States National Museum, Washington.

Acknowledgements. The authors acknowledge the help of the following from the Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata: Lic. Nauris Dangaus, Lic. Mirta Lagreca, Dra. Zulma Ageitos de Castellanos, Lic. Celia Gaillard de Dangaus, Lic. Martha Ferrario, and Lic. Hugo Valicenti. We also thank the Consejo Nacional de Investigaciones Científicas y Técnicas of the Argentine Republic for permission to use their Scanning Electron Microscope and for financial support for one of the authors (R. C. W.), and the Laboratorio de Ensayo de Materiales e Investigaciones Tecnologicas, of the Ministry of Public Works of the Province of Buenos Aires, also for financial assistance. We are grateful to Drs. Arturo Amos and Alberto Riccardi for their constructive criticisms, and to Dra. Irma Lucia Costa for assistance in many matters.

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Manuscript received 4 September 1973