

The Ostracod genus *Majungaella* Grekoff in Argentina

Sara C. Ballent

Departamento de Paleozoología de Invertebrados, Museo de Ciencias Naturales de La Plata,
Paseo del Bosque s/n, La Plata, Argentina

Diana I. Ronchi

Biostratigraphical Consultant, 69, No. 1719, La Plata (1900), Argentina

Robin Whatley

Micropalaeontological Research Group, Institute of Earth Studies,
University of Wales, Aberystwyth, Dyfed SY23 3DB, U.K.

ABSTRACT

The status of the Upper Jurassic and Cretaceous progonocytherid ostracod *Majungaella*, which is strictly gondwanine in its distribution, is reviewed in respect of its presence in Argentina where it is shown to be restricted to Patagonia. Of the seven species recorded in Argentina, *M. pavta* sp. nov., *M. sp.* and *M. australis* Rossi de García and Proserpio seem to be restricted to southern South America. Four species, however, are of much wider occurrence: *M. santacruziana* (Rossi de García) also occurs in Australia and *M. hemigympnae* Brenner and Oertli, *M. praehegymnae* Valicenti and Stephens and *M. nematis* Grekoff, all originally described from southern Africa or Madagascar, are described from Argentina for the first time. The implications for intercontinental correlation and the reconstruction of palaeo-migration routes are discussed.

Key words: *Majungaella*, *Ostracoda*, *Systematics*, *Palaeogeography*, *Argentina*.

RESUMEN

EL género *Majungaella* Grekoff (Ostracoda) en Argentina. El 'status' del género *Majungaella*, ostrácodo progonocytherido del Jurásico Superior y Cretácico estrictamente gondwánico, es revisado de acuerdo a su distribución en Argentina donde el mismo ha demostrado estar restringido a la Patagonia. De las siete especies reconocidas en Argentina, *M. pavta* sp. nov., *M. sp.* y *M. australis* Rossi de García y Proserpio parecen estar restringidas a la parte sur de América del Sur, cuatro especies poseen una distribución más amplia: *M. santacruziana* (Rossi de García), presente también en Australia y *M. hemigympnae* Brenner y Oertli, *M. praehegymnae* Valicenti y Stephens y *M. nematis* Grekoff, todas descritas originalmente al sur de África o Madagascar, son registradas por primera vez en Argentina. Las implicancias en correlación intercontinental y la reconstrucción de rutas de paleomigración son discutidas en el presente estudio.

Palabras claves: *Majungaella*, *Ostracoda*, *Sistemática*, *Paleogeografía*, *Argentina*.

INTRODUCTION

The genus *Majungaella* was first described by Grekoff from the Upper Jurassic and Lower Cre-

taceous of Madagascar, the type species *M. perforata* Grekoff, 1963 (p. 1743, plate 5, Figs. 134-

140; plate 9, Figs. 230 and 233) ranges from the Kimmeridgian to the Tithonian. The same author also described a second species from Madagascar, *M. nematis* Grekoff, 1963 (p. 1744, plate 5, Figs. 141-145, plate 9, Figs. 213 and 232) which ranges from the Tithonian to the Valanginian.

In the original description *Majungaella* is diagnosed as having a robust carapace, with surface coarsely punctate and the anterior marginal zone with 14 to 20 marginal pore canals. Dingle (*in* Dingle and Klinger, 1972) and Bate (1975) considered these pore canals to increase in number from 14-20 in the Jurassic to 28-30 in the Cretaceous.

Rossi de García (*in* Malumián *et al.*, 1972) described the genus *Novocythere* (p. 271, plate 1, Figs. 7a-c) from the Albian of well SC-1 (Santa Cruz 1), Santa Cruz Province, southern Argentina, with *N. santacruziana* as type species. The same author (1977, p. 117) pointed out some aspects of its morphology, differentiating *Novocythere* from *Majungaella* Grekoff on the basis of its lacking eye tubercle, possessing an anterior vestibulum and having an increased number of anterior marginal pore canals. However, her type material shows a low elongate ocular swelling which the authors interpret as an eye tubercle, and there are species of *Majungaella* with anterior vestibulum (see *M. australis* Rossi de García and Proserpio, 1980). With reference to the number of the anterior marginal pore canals, *Majungaella* Grekoff was originally diagnosed as having in the anterior zone 14-20 marginal pore canals, whereas *Novocythere* Rossi de García has nearly 25. Whatley and Ballent (1996) concluded that an increase in number of the anterior marginal pore canals is not a character sufficient to separate genera; on the contrary, it is a signal of evolution within a genus.

Krömmelbein (1975, p. 465, plate 3, Figs. 10-11; Figs. text. 3-4), described the genus *Tickalacythere* from the Albian-Cenomanian of the Great Artesian Basin, Queensland, Australia with *T. ticka* as type species. He created this genus in order to separate from *Majungaella* Grekoff some late Lower Cretaceous species having an increased number of anterior marginal pore canals (24-28) and a distinctly angled, but narrow posterior margin. In the authors' opinion, all these characters, in both *Novocythere* and *Tickalacythere* are specific and not generic. Consequently, Whatley and Ballent (1966) regarded *Novocythere* Rossi de García and *Tickalacythere* Krömmelbein as junior synonyms of *Majungaella* Grekoff and have emended its generic diagnosis

accordingly as presented below:

Genus *Majungaella* Grekoff, emended by Whatley and Ballent (1966) (Whatley *et al.*, 1994). 'Progonocytheridae with robust carapace; pyriform, subtriangular to trapezoidal in lateral view and postero-dorsally upturned; strongly convex in dorsal view. Lateral surface ornamented by coarse puncta in concentric pattern; ventral surface with longitudinal ribs; marginal denticles common especially anteriorly. Left valve larger than right. Eye tubercle and shallow post-ocular sulcus present. Hinge entomodont. Anterior marginal pore canals 14-28 or more in number. A very narrow anterior vestibulum may be present'.

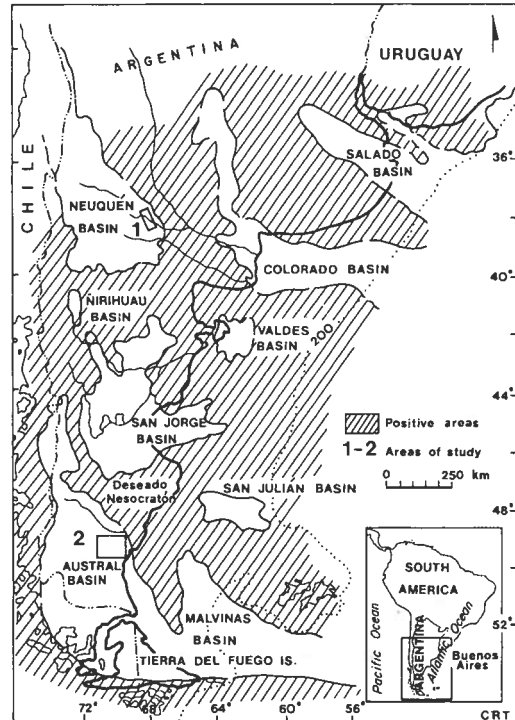
As a result of the emended diagnosis, species of *Majungaella* have been recognised from the Callovian to the Tithonian and the Albian of Tanzania, East Africa (Bate 1975, 1977; Bate and Bayliss, 1969); the Upper Jurassic to Valanginian of Madagascar (Grekoff, 1963); the late Jurassic and early Cretaceous of India (Guha, 1976; Neale and Singh, 1986); the Valanginian-Hauterivian and Albian-Cenomanian of South Africa (Dingle *in* Dingle and Klinger, 1972; Brenner and Oertli, 1976; McLachland *et al.*, 1976; Valicenti and Stephens, 1984; Dingle, 1984); Neocomian from DSDP 1249 (Leg 25), Mozambique Ridge (Sigal, 1974); the Albian-Cenomanian of eastern and South Australia (Krömmelbein, 1975, Scheibnerová, 1980) and the Upper Cretaceous of Western Australia (Bate, 1972; Neale, 1975). It has been cited (not figured) from probable Valanginian strata in southern Chile (Sigal *et al.*, 1970) and the Campanian-Maastrichtian of eastern Brazil (Krömmelbein, 1976).

In Argentina, *Majungaella* has so far been recorded from the Valanginian of the Austral Basin (Kielbowicz *et al.*, 1983); Albian (as *Novocythere* Rossi de García) of the same basin (Rossi de García *in* Malumián *et al.*, 1972; Ronchi and Angelozzi, 1994) and the Upper Cretaceous of Chubut Province (Rossi de García and Proserpio, 1980). According to its geographical distribution, *Majungaella* Grekoff is restricted to southern Gondwanaland.

The purpose of this paper is to present the most up-to-date information about the presence of *Majungaella* in Argentina, to describe and illustrate appropriately the new species and to discuss their value in correlation both within southern Argentina and other localities along the southern margins of Gondwana. A complementary description and the corresponding synonymy of *M. santacruziana* (Rossi de García) are also included.

THE SPECIES

Seven species of this genus have been recognised in Argentina: *Majungaella pavta* sp. nov.; *Majungaella hemigympnae* Brenner and Oertli, *Majungaella praehemigympnae* Valicenti and Stephens, *Majungaella nematis* Grekoff, *Majungaella santacruziana* (Rossi de García), *Majungaella* sp. and *Majungaella australis* Rossi de García and Proserpio. Text-Fig. 1 shows the location of the basins in the Argentinian Patagonia from which these species have been recovered: Neuquén Basin (central-western) and Austral Basin (southern), one species has been recorded from outcrops in central-northern Chubut Province. The figured specimens in this paper are deposited in the Dirección Nacional del Servicio Geológico, Buenos Aires, Argentina (SGN) and the Museo de Ciencias Naturales de La Plata, Argentina-Sección Micropaleontología- (MLP-Mi) under their respective catalogue numbers. The suprageneric classification followed is that proposed in Moore and Pitrat (1961). In the systematic descriptions, the following abbreviations are used: L- length; H- height; W- width and the following size convention is employed: very small (<0.4 mm), small (0.4-0.5 mm), medium (0.5-0.7 mm), large (0.7-0.9 mm), very large (>0.9 mm).



Text-FIG. 1. Main sedimentary basins of southern South America (after Malumián and Ramos, 1984).

SYSTEMATIC DESCRIPTIONS

Class Ostracoda Latreille, 1806

Order Podocopida Müller, 1894

Suborder Podocopina Sars, 1866

Superfamily Cytheracea Baird, 1850

Family Progonocytheridae Sylvester-Bradley, 1948

Genus *Majungaella* Grekoff, 1963

Type species: *Majungaella perforata* Grekoff, 1963, Portlandian, Madagascar.

***Majungaella pavta* sp. nov.**

Plate 1, Figs. 1-5

Derivatio nominis: the specific name refers to the aboriginal Mapuche word pavta meaning tumid, inflated.

Material: 15 carapaces.

Dimensions (mm): holotype MLP-Mi 886 (Plate 1, Fig. 1) L- 0.640; H- 0.400; W- 0.410; Paratype MLP-

Mi 887 (Plate 1, Fig. 2) L- 0.500; H- 0.325; W- 0.290; Paratype MLP-Mi 888 (Plate 1, Fig. 4); L- 0.540; H- 0.325; W- 0.330; Paratype MLP-Mi 889 (Plate 1, Fig. 3); L- 0.530; H- 0.360; W- 0.305; Paratype MLP-Mi 891 (Plate 1, Fig. 5); L- 0.590; H- 0.350; W- 0.310.

Holotype: MLP-Mi 886, female carapace figured in Plate 1, Fig. 1 from well YPF.PC.Nq.EC 26 (El Caracol, Neuquén Province, Argentina), 1,925 m below surface.

Paratypes: MLP-Mi 887, juvenile carapace, well YPF.Nq.PC.Nq.EL a-9 (Entre Lomas, Neuquén Province, Argentina), 1,850 m below surface; MLP-Mi

888, female caparace, well YPF.PC.Nq.EL a-9 (Entre Lomas, Neuquén Province, Argentina), 1,850 m below surface, MLP-Mi 889, female carapace, well YPF.PC.Nq.EL a-1 (Entre Lomas, Neuquén Province, Argentina), 2,049 m below surface; MLP-Mi 890, female carapace well YPF.PC.Nq.EC 24 (El Caracol, Neuquén Province, Argentina), 1,910-1,920 m below surface, MLP-Mi 891, female carapace, well YPF.PC.EL a-1 (Entre Lomas, Neuquén Province, Argentina), 1,935 m below surface.

Type locality and type level: well YPF.PC.Nq.EC 26 (El Caracol, Neuquén Province, Argentina), 37°50'S; 68°30'W, 1,925 m below surface, Loma Montosa Formation, Valanginian.

Age and distribution: the species occurs in the Valanginian from wells of the Entre Lomas area, Neuquén Basin, Argentina.

Diagnosis: a medium sized tumid species of *Majungaella*, with convex dorsal margin, an almost umbonate apex and a characteristic steep declining toward the posterior. Ornamented by fine concentric ribs, subparallel to margins. Primary intercostal and second-order reticulation also present.

Description: carapace robust and medium sized, tumid and markedly inaequivalve with left valve larger than right. Triangular to subtriangular in lateral view. Greatest length in the lower third; greatest height almost coincident with mid-length. Subovoidal in dorsal view. greatest width median. Anterior margin obliquely rounded with the apex pointing downwards. The dorsal margin is convex, with an almost umbonate apex and a steep decline towards the posterior. The posterior cardinal angle is more pronounced in the left valve. Ventral margin concave, medianly obscured by valve tumidity. Left valve larger than right and overlapping dorsally. In dorsal view, the carapace is ovoid with maximum width at mid-length. The surface of the valves is covered with fine concentric ribs, subparallel to margins. Primary reticulation situated between ribs. Second-order reticulation occurs in the solum of the primary reticule; four divisions in each solum are observed with SEM. Three longitudinal ribs ornament the ventral area. Dimorphic, female proportionally shorter and wider than the male. Internal features not observed.

Remarks: *Majungaella pavta* sp. nov. resembles *Majungaella witenhagensis* (Dingle, 1969) emended diagnosis by Valicenti and Stephens, 1984 (p. 198, Plate. 9, Figs. 5-10, Plate 10, Figs. 1-5) from the

Upper Valanginian and Hauterivian of the Sundays River Formation, South Africa. They are distinguished by the fact that the new species is smaller, the greatest height is almost coincident with mid-length, its compressed periphery and the posterior margin is subangular with the bluntly downwards pointed apex. An ocular swelling and a post-ocular depression are present in the South African species.

***Majungaella hemigympnae* Brenner and Oertli, 1976**

Plate 1, Fig. 6

Majungaella hemigympnae Brenner and Oertli, 1976, p. 504, Plate 6, Figs. 1-4; Plate 8, Fig. 5.

Repository and dimensions (mm): MLP-Mi 892, from well Q.SC.ELM 38 (Estancia La Magie, Santa Cruz Province), 1,520 m below surface; L- 0.740; H- 0.490; W- 0.500.

Age and distribution: it has been reported from the Portlandian? to Berriasian of the Brenton Beds at Knysna and the Berriasian? to Valanginian of the Outenique Basin (McLachlan *et al.*, 1976), the Hauterivian of the Algoa Basin and the late Aptian of Zululand (Dingle, 1984), all in South Africa. *M. hemigympnae* has been recognised from the Valanginian-Hauterivian in the Argentinian part of the Austral Basin.

Remarks: this is a medium to large species of *Majungaella* subtriangular to subtrapezoidal in lateral view, with the greatest height just behind $\frac{1}{3}$ length at the anterior cardinal angle, very distinct posterior cardinal angle and with a faint ornamentation of small ribs extending parallel to the ventral outline, mainly in the posterior part of the carapace and irregular ornamentation in the central area.

***Majungaella praehegymnae* Valicenti and Stephens, 1984**

Plate 1, Fig. 7

Majungaella A Kielbowicz *et al.*, 1983, Plate 10, Fig. 13. *Majungaella praehegymnae* Valicenti and Stephens, 1984, p. 200, Plate 10, Figs. 6-11; Plate 11, Fig. 1.

Repository and dimensions (mm): MLP-MI 893 from well Q.SC.ELM 38 (Estancia La Magie, Santa Cruz Province), 1,520 m below surface; L- 0.615; H- 0.400; W- 0.330.

Age and distribution: *M. praeheimgymnae* occurs in the Upper Valanginian of the Sunday River Formation, South Africa; it was illustrated by Kielbowicz *et al.* (1983) from the Valanginian of the marine beds of the Springhill Formation in the Argentinian part of the Austral Basin; and it has been recognised in the Valanginian-Hauterivian of well of the same basin (this paper).

Remarks: this species is medium in size, subtrapezoidal in lateral view and with the surface ornamented by large puncta, faintly developed ribs and weak reticulation. It closely resembles *Majungaella hemigymnae* Brenner and Oertli, 1976 from the same South African basin. Nevertheless, it is distinguished by the fact that the former is smaller, smoother and proportionally higher than the latter, which, in addition, has the anterior margin more rounded and the greatest height situated more anteriorly.

***Majungaella nematis* Grekoff, 1963**

Plate 1, Fig. 8

Majungaella nematis Grekoff, 1963, p. 1744, Plate 5, Figs. 141-145; Plate 9, Figs. 213-232.

Majungaella nematis Grekoff, 1963. Brenner and Oertli, 1976, Plate 5, Figs. 11-12.

Repository and dimensions (mm): MLP-Mi 894 from well Q.SC.EML 38 (Estancia La Magie, Santa Cruz Province), 1,520 m below surface; L- 1.010; H- 0,655; W- 0,650.

Age and distribution: the species was described from the Portlandian-Valanginian of Madagascar and is also known from the Upper Valanginian to Hauterivian (McLachlan *et al.*, 1976) and late Aptian to early Cenomanian of Zululand (Dingle, 1984), both in South Africa; early Cretaceous of the Banni borehole, Kutch, India (Guha, 1976) and Neocomian of DSDP 249, Mozambique Ridge (Sigal, 1974). *M. nematis* Grekoff is a very scarce species in the Valanginian-Hauterivian of the Argentinian part of the Austral Basin.

Remarks: a typical robust and large to very large species with a coarse concentrically arranged pattern of ornamentation which extends ventrally parallel to the outline. The specimens from the Hauterivian of the Algoa Basin (South Africa) of Brenner and Oertli, 1976 are more elongate and posteriorly acuminate compared to the original description by Grekoff.

***Majungaella santacruziana* (Rossi de García, 1972)**

Plate 1, Figs. 9-11

Novocythere santacruziana Rossi de García, 1972.

Malumián *et al.*, p. 271, Plate 1, Figs. 7a-c.

Tickalaracythere scheibnerovae Krömmelbein, 1975, p. 467, Plate 4, Figs. 12-13, Figs. text 5-6.

Tickalaracythere scheibnerovae Krömmelbein, 1975. Scheibnerová, 1980, Plate 14, Fig. 1.

Repository and dimensions (mm): MLP-Mi 895 from well YPF.SC.ALEP e-2 (Laguna El Palo, Santa Cruz Province), 1,856-1,865 m below surface (Plate 1, Fig. 9); L- 0,890; H- 0,575; W- 0,530; MLP-Mi 896 from well YPF.SC.ALEP e-2 (Laguna El Palo, Santa Cruz Province), 1,847-1,856 m below surface (Plate 1, Fig. 10); L- 0,870; H- 0,560; W- 0,540; MLP-Mi 897 from well YPF.SC.ALEP e-2 (Laguna El Palo, Santa Cruz Province), 1,877-1,886 m below surface (Plate 1, Fig. 11); L- 0,795; H- 0,520; W- 0,500.

Age and distribution: Albian-Cenomanian of the Great Australian Basin (Krömmelbein, 1975; Scheibnerová, 1980); Albian from wells in the Austral Basin, Argentina (Rossi de García *in* Malumián *et al.*, 1972; Ronchi and Angelozzi, 1994). The species appears in significant numbers associated with the index planktonic Albian foraminifer *Globigerinelloides gyroidinaeformis* Moullade and Albian species of *Lingulogavellina* Malapris.

Complementary description: a large to very large and robust species, pyriform, subtrapezoidal in lateral view and postero-dorsally upturned. Anterior margin very broadly, but asymmetrically rounded; posterior margin strongly upturned with subdorsal apex and very long, convex postero-dorsal slope. Dorsal margin sloping strongly to the posterior. Ventral margin obscured by considerable valve tumidity. In dorsal view, medianly inflated and anteriorly very compressed. Three longitudinal ribs per valve ornament the ventral area. A low, elongate eye swelling is present. Left valve slightly larger than right with dorsal overlap. Lateral surface ornamented by a coarse and polygonal reticulation in concentric pattern. Secondary reticulation and punctuation occur in the solum of primary reticular. Strongly dimorphic, female proportionally shorter, higher and wider than male. Some internal details which have been observed in the type material (SNG 1761 to 1764) are: hinge entomodont and robust; in

the right valve, the anterior terminal element has five denticles and the antero-median element bears four loculi. Inner lamella wide anteriorly with small vestibulum. Normal pore canals numerous (nearly 25).

Remarks: as it was already pointed out by Rossi de García, 1977 (p. 120), *Tickalaracythere scheibnerovae* Krömmelbein is a junior synonym of *Majungaella santacruziana* (Rossi de García). Some authors, such as McLachlan *et al.* (1976, p. 501), synonymised *Majungaella santacruziana* (Rossi de García) with *Majungaella nematis* Grekoff from the Hauterivian of wells of the Algoa Basin (Southern Africa). At the same time, Brenner and Oertli (*op. cit.*) placed in doubt the formerly Aptian-Albian age of the Argentinian species, which today is unquestionably Albian due to the associated ammonites and index planktonic foraminifers (cf. Malumián, 1990). *M. nematis* Grekoff *sensu* Brenner and Oertli, 1976 (Plate 5, Figs. 11-12) and *sensu* McLachlan *et al.*, 1976 (Plate 15, Figs. 14-15) is more elongate in lateral view and has different ornamentation; its posterior margin is angular with apex slightly below mid-height, whereas *M. santacruziana* is typically postero-dorsally upturned with subdorsal apex. Dingle, 1984 (p. 147) also synonymised *M. nematis* Grekoff from the Aptian-Cenomanian of Zululand, Southern Africa with *M. santacruziana*. Dingle did not describe this material, but the specimen illustrated in his figure 17D (a carapace in left lateral view) seems to agree with the original description by Grekoff. However, the specimen of figure 17E (internal view of a left valve) appears *M. santacruziana*-like because it is proportionally higher than *M. nematis* and characteristically postero-dorsally upturned with subdorsal apex.

***Majungaella* sp.**

Plate 1, Fig. 12

Repository and dimensions (mm): MLP-MI 901 from well Q.SC.EF x-2 (El Fabre, Santa Cruz Province), 1,090-2,100 m below surface, L- 0,930; H- 0,660; W. 0,530.

Age and stratigraphical distribution: Santonian-Campanian from wells in the Argentinian part of the Austral Basin.

Description: a very large species with subtriangular outline. Anterior margin very broadly but asymmetrically rounded; posterior margin strongly upturned with sub-dorsal apex and very long, convex postero-dorsal slope. Dorsal margin sloping strongly to the posterior, in right valve overhung mid-dorsally by ornament. Ventral margin very convex. Greatest height just anterior of mid-length. In dorsal view, medianly inflated and anteriorly compressed. Low, elongate eye swelling. Left valve slightly larger than the right. Coarse concentric ornament with an irregular reticula parallel to valve margin; secondary reticulation poorly developed. The anterior and posterior peripheral areas bear an almost celate ornamentation.

Remarks: *Majungaella* sp. strongly resembles *M. santacruziana* (Rossi de García) (Albian of the same basin), from which may have evolved. Nevertheless, they differ in details of the ornamentation. A characteristic feature of the former species is the irregular concentric reticulation, poorly developed secondary reticulation and anterior and posterior peripheral celate areas, which are absent or weaker in the latter. *M. santacruziana* has a regular polygonal reticulation and is more strongly secondarily reticulate/punctate. Because only a few specimens have been recovered, the species is left in open nomenclature.

***Majungaella australis* Rossi de García and Proserpio, 1980**

Plate 1, Fig. 13

Majungaella australis Rossi de García and Proserpio, 1980, p. 27, Plate 3, Figs. 3, 4, 7.

Repository and dimensions (mm): SGN 224. Holotype, left valve, L- 1,020; H- 0,670.

Age and distribution: *M. australis* occurs in the Upper Campanian?-Maastrichtian from outcrops of the Chubut Province, Argentina (nearly 43°33'S; 69°W).

Remarks: this is a very large and robust species, subtrapezoidal in lateral view and ornamented by coarse and polygonal reticulation in a concentric pattern; small papillae in the intersection of the primary reticulae are also present.

DISCUSSION

Majungaella pavta sp. nov. is the only representative of the genus in the Neuquén Basin which extended, in a NNW direction from southern Neuquén (Argentina) to the latitude of Copiapó and perhaps to Antofagasta (Chile). During Tithonian-Hauterivian time, the sea invaded central-west Argentina from the west and northwest and formed an embayment, the Neuquén Embayment, with a large eastward expansion. In the southern margins of the Neuquén Embayment, nearshore deposits were formed (*i.e.*, Loma Montosa Formation = dolomites with evaporitic and pelitic-sandy intercalations) (cf. Riccardi, 1988). This restrictive environment with salinity fluctuations could have favoured the endemism of certain ostracods, in spite of the strong resemblance between the Neocomian of South Africa and Argentina which share several species of *Sondagella* and *Rostrocytheridea*, both of Dingle (cf. Musacchio, 1979).

The Austral or Magallanes Basin extended, in a NNW-SSE direction, over most of southern Patagonia (Argentina and Chile) south of 47°S and was formed in late Jurassic time. Subsidence was followed by marine transgressions and resulted in continued sedimentation throughout the late Jurassic and Cretaceous (Springhill and Palermo Aike Formations) (cf. Riccardi, 1988). In this basin, six species of *Majungaella* Grekoff have been recognised; their geographical distribution and stratigraphical ranges are indicated in table 1.

At high latitudes in the Southern Hemisphere, during the late Mesozoic there seems to have been an eastward flow of water in the belt of the westerly winds. The presence of such a West Wing Drift type cool current comparable with that of today's coming from Australasia is evidenced by the similarities of the present species of *Majungaella* of early Cretaceous age as indicated in table 1. Similarly, other authors have remarked on the many parallels between the Cretaceous benthonic foraminifers and ostracods (cf. Sigal *et al.*, 1970, Scheibnerová, 1981; Dingle, 1982) and macrofossils (Gordon, 1973; Riccardi, 1991) of Australia, New Zealand, South and East Africa, Madagascar, India, Western Australia and southern South America. Throughout the Santonian-Maastrichtian, all regions located in high southern latitudes (southern Patagonia, Antarctica, Australasia) continued under the influence of relatively cool current somewhat similar to the present West Wind Drift (Gordon, 1973). However, the changing positions of the continents and the global marine transgression which reached a peak at this time produced a different configuration of lands and sea, including the complete opening of the Atlantic, which reduced the incidence of specific communality between the various continental blocks, but maintained generic level comparisons (*e.g.*, *Majungaella* sp. and *M. australis*).

TABLE 1. STRATIGRAPHICAL AND GEOGRAPHICAL DISTRIBUTION OF THE SPECIES OF *MAJUNGAELLA* RECOGNISED IN THE ARGENTINIAN PART OF THE AUSTRAL BASIN.

Upper Campanian-Maastrichtian	<i>M. australis</i>	Argentina
Santonian-Campanian	<i>Majungaella</i> sp.	Argentina
Albian	<i>M. santacruziana</i>	Australia, Argentina
Valanginian-Hauterivian	<i>M. nematis</i>	Madagascar, India, South Africa, Mozambique Ridge, Argentina
	<i>M. praehemigymnae</i>	South Africa, Argentina
	<i>M. hemigymnae</i>	South Africa, Argentina

CONCLUSIONS

The seven species of *Majungaella* Grekoff recognised from the central-western and southern Argentina have proved to be useful local markers and their stratigraphical ranges are:

Majungaella pavta sp. nov.: Valanginian;

M. nematis Grekoff, *M. hemigympnae* Brenner and Oertli and *M. praememigympnae* Valicenti and Stephens: Valanginian-Hauterivian;

M. santacruziana: Albian;

Majungaella sp.: Santonian-Campanian;
M. australis Rossi de García y Proserpio: Upper Campanian?-Maastrichtian.

The strong resemblance between the Argentinian species of *Majungaella* and those of the Cretaceous in other gondwanide localities confirm once again the short marine routes of communication and, consequently, that faunal exchanges were relatively easy at this time.

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PLATE 1

(Scale bar: Figs. 1-7 and details of ornamentation=0.100 mm; Figs. 8-13=0.250 mm)

Figures

1-5

***Majungaella pavta* sp. nov.** Valanginian
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1. Holotype MLP-Mi 886, female carapace, left view, well YPF.PC.Nq.EC 26 (1,925 m below surface).
2. Paratype MLP-Mi 887, juvenile carapace, left view, well YPF.PC.Nq.EL a-9 (1,850 m below surface).
3. Paratype MLP-Mi 889, carapace, left view, well YPF.PC.Nq.ELa-1 (2,049 m below surface).
4. Paratype MLP-Mi 888, carapace, a: left view, well YPF.PC.Nq.EL a-9 (1,850 m below surface).
5. Paratype MLP-Mi 891, carapace, right view well, YPF.PC.Nq.EL a-1 (1,935 m below surface).

6

***Majungaella hemigymnae* Brenner and Oertli.** Valanginian-Hauterivian
p. 48

6. MLP-Mi 892, carapace, left view, well Q.SC.ELM 38 (1,520 m below surface).

7

***Majungaella praehegymnae* Valicenti and Stephens.** Valanginian-Hauterivian
p. 48

7. MLP-Mi 893, carapace, left view, well Q.SC.ELM 38 (1,520 m below surface).

8

***Majungaella nematis* Grekoff.** Valanginian-Hauterivian
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8. MLP-Mi 894, carapace, right view, well Q.SC.ELM 38 (1,520 m below surface).

9-11

***Majungaella santacruziana* (Rossi de García).** Albian
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9. MLP-Mi 895, carapace, a: left view, b: dorsal view, well YPF.SC.ALEP e-2 (1,856-1,865 m below surface).
10. MLP-Mi 896, carapace, left view and detail of ornamentation, well YPF.SC.ALEP e-2 (1,847-1,856 m below surface).
11. MLP-Mi 897, juvenile carapace, right view, well YPF.SC.ALEP e-2 (1,877-1,886 m below surface).

12

***Majungaella* sp.** Campanian-Santonian
p. 50

12. MLP-Mi 901, carapace, right view, well Q.SC.EF x- 2 (1,090-2,100 m below surface).

13

***Majungaella australis* Rossi de García and Proserpio.** Upper Campanian-Maastrichtian
p. 50

13. Holotype SGN 224, left valve a- external view; b- internal view and detail of ornamentation.

PLATE 1

