# QUATERNARY NON-MARINE OSTRACODS FROM LAKE BEDS IN NORTHERN PATAGONIA

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**ABSTRACT**

Eleven species of non-marine cytheracean and cypridacean Ostracoda are recorded from a series of lake beds with different climatic histories, in a West to East transect across the north-western part of Río Negro Province in northern Patagonia. Five species, *Limnocythere patagonica, L. rionegroensis, Eucypris virgata, E. labyrinthica* and *Ilyocypris ramirezi* are designated as new. One species, *Kapcypridopsis* sp. is left in open nomenclature while *Eucypris fontana* (Graf), *E. virens* (Jurine), *Candonopsis brasiliensis* Sars, *Cypridopsis intermedia* Sars and *Sarcypridopsis aculeata* (Costa) are known species. The palaeosalinity tolerances of the various species is discussed in relationship to the history of the respective lakes.

**Keywords: Argentina, Northern Patagonia, freshwater Ostracoda, Quaternary, new taxa.**

**RESUMEN**

Se identificaron once especies de ostrácodos de agua dulce, pertenecientes a las superfamilias Cypridacea y Cytheracea extraídos de muestras de fondos de lagos que representan diversas condiciones climáticas pasadas. El muestreo se estableció a lo largo de una transecta trazada de Este a Oeste en el noroeste de la provincia de Río Negro, en el Norte de Patagonia, Argentina. De las once especies, las siguientes cinco se reconocen como especies previamente descritas: *Eucypris fontana* (Graf), *E. virens* (Jurine), *Candonopsis brasiliensis* (Sars) y *Sarcypridopsis aculeata* (Costa); una especie, *Kapcypridopsis* sp. se deja con nomenclatura abierta y las cinco restantes se identificaron como especies nuevas: *Limnocythere patagonica, L. rionegrensis, Eucypris virgata, E. labyrinthica* y *Ilyocypris ramirezi.* Se discute la tolerancia a la salinidad de las diferentes especies en relación con la historia de los respectivos lagos.

**Palabras clave: Argentina, norte de Patagonia, Ostracoda de agua dulce, Cuaternario, taxones nuevos.**

## INTRODUCTION

The area of study is in the form of a W-E transect across the north-western part of Río Negro Province in northern Patagonia, from Mount Tronador in the Andes to the area of Lake Cari-laufquen Grande on the Patagonian Steppe (Fig 1).

As originally conceived, the project was to study modern freshwater lakes in the Pre-Andes, saline lakes in the western Patagonian Steppe and salt pans further east towards the Atlantic coast. This paper presents the ostracod fauna encountered to date from cores taken in bogs and lakes from El Trébol, Mallín Aguado, Lago Seco, Los Juncos and La Salina. Salt pans as such have not yet been drilled but will be the subject of a future programme. Details of the lakes, the cores and the distribution of the ostracods are given in Whatley & Cusminsky (1995) and by Cusminsky (in press) and for two of the principal localities, in Figs. 2 and 3 herein.

The cores were taken by members of the Argentine Antarctic Institute and PROGEBA using a Wiecovski corer.

Details of the various cores are as follow:

| Name | Location | Length of core (m) | Code |
|---|---|---|---|
| El Trébol II | Lat. 41°00'S Long. 71°50'W | 11 | T II |
| Mallín Aguado | Lat. 41°0'S Long. 71°29'W | 14 | MA |
| Lago Seco | Lat. 41°01'S Long. 71°02'W | 9 | LS |

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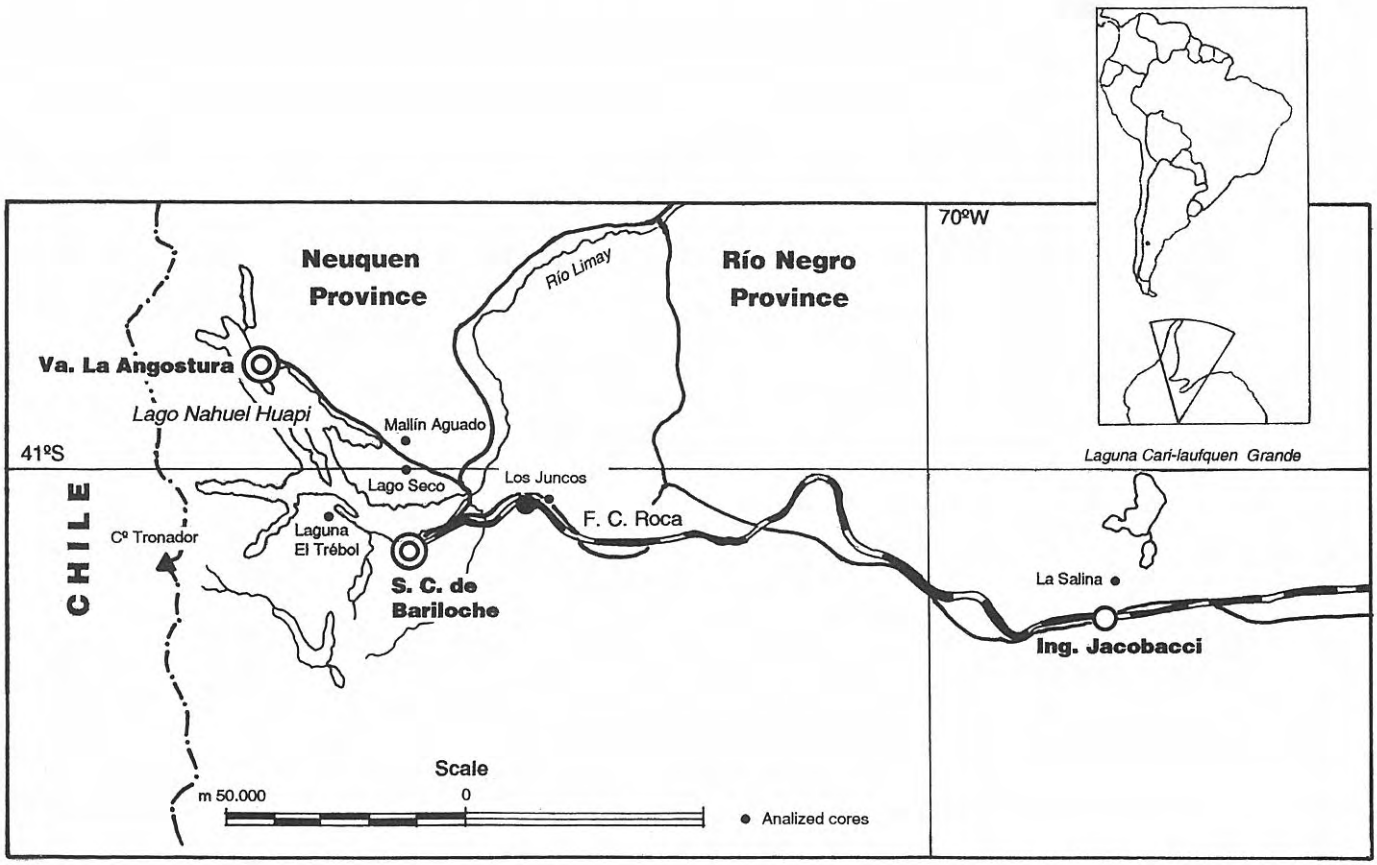


**Figure 1.** Location map of the sampling region in Neuquen and Río Negro provinces, Argentina.

| | | | |
|---|---|---|---|
| Los Juncos | Lat. 41°03'S<br>Long. 71°02'W | 2 | J |
| La Salina | Lat. 41°16'W<br>Long. 69°32'W | -1 | S |

## METHODS

For the study of the Ostracoda, samples were taken from the various cores at intervals which were regular except at changes in lithology. The samples were washed gently with water over a 230 mesh (63 μ). (Whatley & Cusminsky, 1995).

The fauna was separated into the various species and each species separated into sexes and the various instars. On the basis of detailed counts of each species from each sample, a quantitative analysis was made. For each sample, a calculated number of individuals per 10 grams of sediment was achieved which enabled the calculation of the incidence and relative abundance of each species in each sample.

The types (and figured specimens) are deposited in the Micropaleontology collections of the Museo de La Plata, La Plata, Argentina.

## PREVIOUS RESEARCH

In investigating the present fauna, the authors have made use of the considerable literature on Recent South American non-marine Ostracoda and have made use of a very valuable preprint by Martens & Behen in the form of a checklist of species and genera from the area.

Very few works exist on Quaternary non-marine Ostracoda from southern South America. Those which the authors have consulted are: Bertels & Martínez (1990), Purper & Pinto (1980), Zabert (1981) and Zabert & Herbst (1986). The first of these studies deals with a marginal marine fauna from the southern part of the Province of Buenos Aires, the second is from Bolivia and the last two are from the northern half of Argentine, from Chaco and Entre Ríos provinces respectively.

## SYSTEMATIC DESCRIPTIONS

PHYLUM CRUSTACEA Pennant, 1777
CLASS OSTRACODA Latreille, 1806
ORDER PODOCOPIDA Müller, 1894
SUBORDER PODOCOPINA Sars, 1866
Superfamily **CYTHERACEA** Müller, 1896
Family **Limnocytheridae** Klie, 1939
Genus *Limnocythere* Brady, 1868

### *Limnocythere patagonica* sp. nov.

Pl. I, figs. 1-5

**Derivatio nominis:** With reference to the fact that the type locality of the species is on the northern Patagonian Steppe.

**Holotypus:** A female RV MLP 184 (Pl. I, fig. 1).

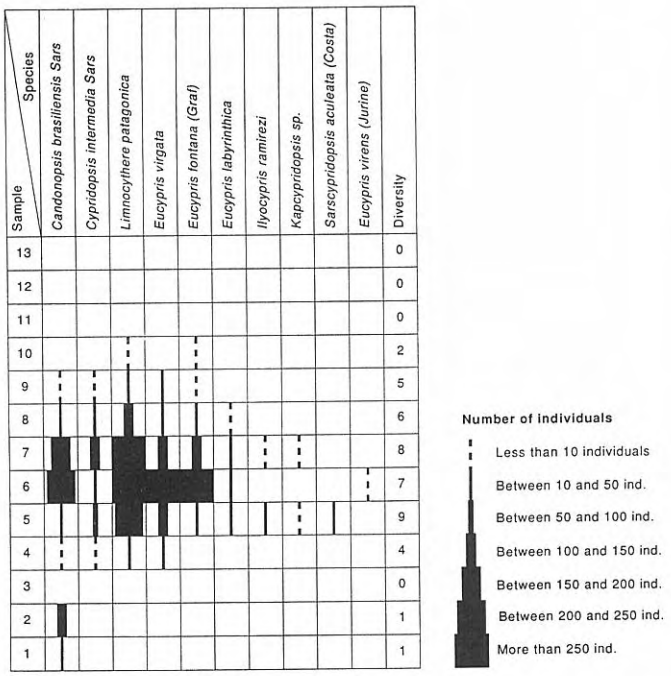


**Figure 2.** The distribution and abundance of the Ostracoda from the core taken at Los Juncos.

**Material**: 1618 adult and juvenile valves.

### Type locality and level

Los Juncos Lake, Estación Perito Moreno, Río Negro Province, Argentina. Sample 6, 100 cm from top of the core. Lat. 41°03'S; Long. 71°0' W.

### Diagnosis

A medium to large species of *Limnocythere* characterised by its very elegant and delicate reticulation which appears to have been draped over the carapace. Each fossa is hexagonal and minutely, secondarily reticulate.

### Description

Medium to large, subrectangular. Males longer and proportionally less high than females. Anterior margin very broadly rounded; posterior bluntly pointed above mid-height, with oblique posterodorsal and straight to gently rounded postero-dorsal slope. Dorsal margin long and straight to slightly convex. Ventral margin with strongly rounded anterior part but straight and keel like posterior of the oral incurvature. Right valve very slightly larger than left valve. The anterior margin area is laterally compressed. Two medium sulci, which do not extend to mid-height occur antero-dorsally and are divided by a low hemispherical swelling. Two similar swellings occur on the anterior and posterior flanks of the two sulci respectively. A swelling occurs below the posterior sulcus. A strong broad swelling parallels the anterior margin and ventrally becomes a weak alar ridge terminating in a swelling in the posterior 1/3. A prominent swelling occurs postero-ventrally. The entire lateral surface is covered by an elegant and delicate reticulation which appears as through it had been draped

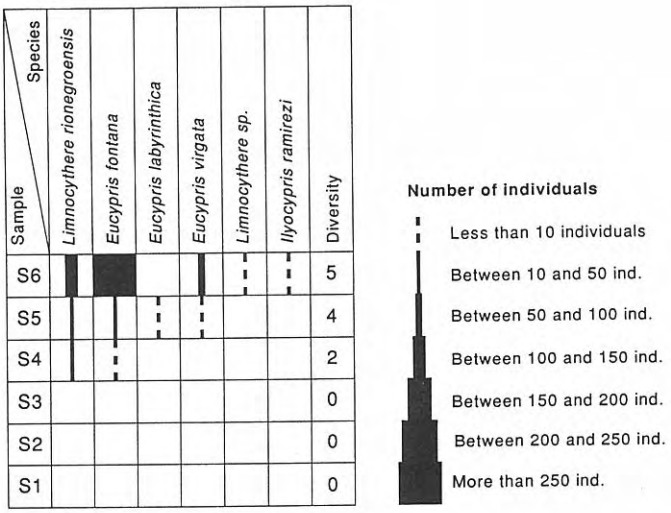


**Figure 3.** The distribution and abundance of the Ostracoda from the core taken at La Salina

over the carapace. The reticulation is fairly regular and each fossa is more or less hexagonal and minutely secondarily reticulate. The muri bear a smooth central ridge and are minutely spinose on their flanks. Normal pore canals occur in very small, somewhat stellate conuli, both in the solae and conjuntively. All of the latter seem to be simple but, in internal view several large pores can be seen which may represent sieve pores. These, however, were not certainly identified externally. Internal features as for genus. Hinge lophodont. Inner lamella very weak and often not preserved; wide anteriorly and posteriorly narrow elsewhere. Radial pore canals straight, simple and few in number. Juvenile (A-1) with very flared anterior margin, more prominent antero-dorsal swellings and much less regular reticulation.

### Dimensions (mm)

| | | | L | H |
|---|---|---|---|---|
| Holotype female | LV | MLP 184 | 0.70 | 0.31 |
| Paratype female | RV | MLP 185 | 0.68 | 0.32 |
| Paratype male | RV | MLP 186 | 0.72 | 0.35 |
| Paratype male | RV | MLP 187 | 0.78 | 0.35 |
| Paratype A-1 Juv | LV | MLP 188 | 0.62 | 0.31 |

### Distribution

All specimens from type locality. Confined to the type locality where it occurs in samples 4 to 10 (Fig. 2).

### Remarks

This species is somewhat similar to *Limnocythere reticulata* Sharpe, 1897 of Zabert (1981), from non-marine Quaternary deposits in the western part of Chaco Province in northern Argentina. However, the latter species in much smaller (0.37 mm calculated from illustrations in Zabert, 1981) and has a much less well-defined ornamentation with inter-reticular papillae. *Limnocythere paranaensis* Ferguson, 1967 a Recent species from the Province of Santa Fé, Argentina is too poorly described or illustrated to be compared. The present species differs from the three species (*L. grafi, L.*

*jobimi* and *L. variabilis*) described by Purper and Pinto (1980) from the Quaternary of Bolivia in the form of the median sulci, the lack of a well-developed marginal rim and in the nature of its ornament.

## *Limnocythere rionegroensis* sp. nov.
Pl. I, figs. 6-10

1990 *Limnocythere* sp. aff. *L. bradbury* Forester, 1985; Bertels & Martínez, 2, fig. 12.

**Derivatio nominis:** Named for the Province of Río Negro, the most northern of the three Patagonian provinces in which the type locality occurs.

**Holotypus:** Female RV MLP 201 (Pl. I, fig. 6).

**Material:** 102 adult and juvenile valves.

**Type locality and level**

Lago La Salina, 150 Km East of San Carlos de Bariloche, Río Negro Province, Argentina. Lat. 41°16'S; Long. 69°32'W. Sample 6, top of core, dark, smelly mud.

**Diagnosis**

A medium sized species of *Limnocythere* characterised by strongly developed reticulate ornament which covers the entire caparace with the exception of a very large and prominent smooth antero-dorsal tubercle.

**Description**

Medium. Sub-ovate to sub-triangular. Strongly sexually dimorphic. The male is longer, less strongly ornamented, more rounded posteriorly and has a much better developed postero-ventral keel than the female. Anterior margin well rounded; posterior margin bluntly pointed a little below mid-height, postero-dorsal slope straight, oblique, postero-ventral slope rounded. Dorsal margin straight, sloping posteriorly; ventral margin with broad oral incurvature . Ornament of strong reticulation with, apart from the area parallel to the anterior margin where they parallel that margin, the long axes horizontal. A large smooth tubercle occurs antero-dorsally which is surrounded posteriorly, ventrally and antero-dorsally by sulci. The anterior margin is enhanced by a weak parallel rib from which short plications extend to the margin. Normal pore canals seemingly simple, occurring on the muri. Internal features as for genus. Hinge lophodont. Inner lamella rather narrow. Radial pore canals rather short, straight with some 7 anteriorly. The juveniles have a more open and secondarily punctate reticulum.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Holotype female | RV | MLP 201 | 0.60 | 0.31 |
| Paratype female | LV | MLP 202 | 0.68 | 0.36 |
| Paratype male | RV | MLP203 | 0,67 | 0,33 |
| Paratype male | LV | MLP 204 | 0,67 | 0,31 |
| Paratype juv A-1 | LV | MLP205 | 0.54 | 0.28 |

**Distribution**

All the recovered specimens of this species from the type locality were female. At Lago Cari-laufquen (in a paper in preparation by the authors) both males and females occur together.

**Remarks**

This species occurs only as females at La Salina. Nearby Quaternary samples from Lago Cari-laufquen, the subject of subsequent papers, contain both males and females. The two male paratypes are from the latter locality. This species is very similar to *Limnocythere bradburyi* Forester, 1985 from the Quaternary of the United States and the Recent of Mexico. The presents species is considerably smaller, however, has less concentrically orientated reticulation and lacks any crenulation of the median hinge element. The present species differs from *L. patagonica* sp. nov. in size and ornamentation. *Limnocythere* sp. aff. *L. bradbury* Forester of Bertels and Martínez (1990) from the Quaternary of the southern part of the Province of Buenos Aires is a juvenile of this species. The species differs from any of the three species of *Limnocythere* described by Purper and Pinto (1980) from the Quaternary of Bolivia in its coarse ornament, lack of a strongly-developed marginal rim and in the nature of its median sulci.

Superfamily **CYPRIDACEA** Baird, 1845
Family **Ilyocyprididae** Kaufmann, 1900
Subfamily **Ilyocypridinae** Kaufmann, 1900
Genus *Ilyocypris* Brady & Norman, 1889

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**Plate I**

Unless otherwise stated, all views external lateral

1-5 *Limnocythere patagonica* sp. nov. 1. Holotype, female LV, MLP 184, x71.5. 2. Paratype, male RV, MLP 186, x69.5. 3. Paratype, male RV, MLP 187, x64. 4. Paratype, female RV, MLP 185, x73.5. 5. Paratype, A-1 juvenile LV, MLP 188, x67.5.

6-10 *Limnocythere riograndensis* sp. nov. 6. Holotype, female RV, MLP 201, x83. 7. Paratype, female LV, MLP 202, x73.5. 8. Paratype, male LV, MLP 204, x87.5. 9. Paratype, male RV, MLP 203, x74.5. 10. Paratype, A-1 juvenile LV, MLP 205, 87.5.

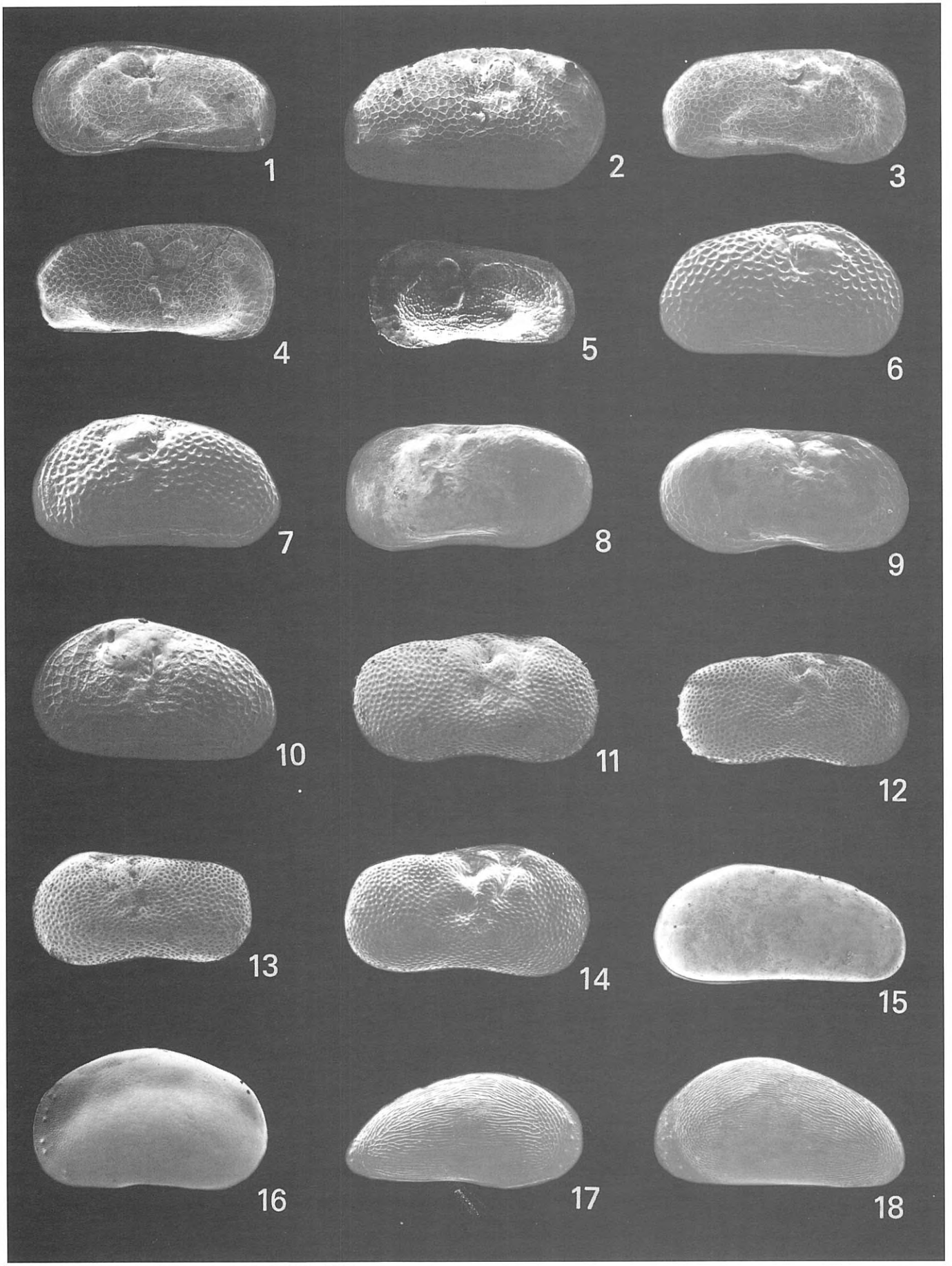
11-14 *Ilyocypris ramirezi* sp. nov. 11. Holotype, female RV, MLP 189, x59. 12. Paratype, male RV, MLP 190, x59.5. 13. Paratype, male LV, MLP 191, x58. 14. Paratype, juvenile A-1, MLP 192, x69.5.

15 *Candonocypris brasiliensis* Sars, 1901. RV, MLP 193, x57.4

16 *Eucypris virens* (Jurine, 1820). Female RV, MLP 194, x23.5

17-18 *Eucypris virgata* sp. nov. 17. Holotype, RV, MLP 206, x58. 18. Paratype, LV, MLP 207, x43.

**Plate I**



## *Ilyocypris ramirezi* sp. nov.
Pl. I, figs. 11-14

?1967 *Ilyocypris gibba* (Ramdohr, 1808); Ramírez, 21, pl. 2, figs. 4-9.
1981 *Ilyocypris gibba* (Ramdohr, 1808); Zabert, pl. 1, fig. 4, pl. 2, fig 8. (=*Ilyocyris, bradyi* Sars, 1890).
1990 *Ilyocypris gibba* (Ramdohr, 1808); Bertels & Martínez, pl. 1, fig. 16.

**Derivatio nominis:** In honour of Dr. Fernando Ramírez, in recognition of his important work on Argentine non-marine Ostracoda.

**Holotypus:** Female RV, MLP 189 (Pl. I, fig 11).

**Material**: 22 adult and juvenile valves.

**Type locality and level**
Los Juncos Lake. Estación Perito Moreno, Río Negro Province, Sample 6, 100 cm from top of core. Lat. 41°03'S; Long. 71°0'W.

**Diagnosis**
A large species of *Ilyocypris* with subdued swellings and sulci in the antero-dorsal region, sub-marginal spinose tubercles anteriorly and posteriorly and a regular reticulum of sub-rounded to sub-cribrose fossae.

**Description**
Large, subrectangular. Sexual dimorphism not observed. Anterior margin rounded, posterior rounded in ventral part, straighter dorsally. Dorsal margin rather sinuous; ventral strongly biconvex above a mid-length concavity. Ornament of regularly, mainly concentrically disposed reticulae; fossae principally circular to sub-ovate centrally and antero-dorsally cribrose. The genotypic tubercles of the species are low, rounded and weakly reticulate. A row of spines, most of which are pointed, enhances the anterior margin; a blunter row of six spines occurs at a little distance from the posterior margin. In juveniles, the cribrose genotypic tubercles and sulci are more prominent. Normal pore canals few, perforating small conuli. Internal features as for genus. Inner lamella relatively narrow but well developed. Adductor scars, a tightly compact group of seven scars in two rows.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Holotype female | RV | MLP 189 | 0.85 | 0.45 |
| Paratype male | RV | MLP 190 | 0.84 | 0.41 |
| Paratype female | LV | MLP 191 | 0.86 | 0.45 |
| Paratype Juvenile A-1 | RV | MLP 192 | 0.72 | 0.38 |

**Distribution**
In the present study, the species occurs in the beds of both Los Juncos (Sample 5, 6, 7) and La Salina lakes (Sample 6) (Figs. 2,3).

**Remarks**
This species is possibly the same as that described by Ramírez (1967) from the Laguna de Monte, Buenos Aires Province as *I. gibba* although his material (calculated from the illustration at 0.97 mm) is considerably larger than the present material. Bertels and Martínez (1990) described the species from Quaternary deposits in the south of Buenos Aires province. The present species differs from *Ilyocypris gibba* (Ramdohr) in its larger size and in lacking either long or pointed genotypic tubercles antero-dorsally.

Family **Candonidae** Kaufmann, 1900
Genus *Candonopsis* Vavra, 1891

## *Candonopsis brasiliensis* Sars, 1901
Pl. I, fig. 15

*1901 *Candonopsis brasiliensis* Sars, 45, pl. 8, figs. 21, 22.
1981 *Candona elliptica* Furtos, 1933; Zabert, 79, pl. 1, fig. 2; pl. 2, figs 6a,b,c.
1986 *Candona elliptica* Furtos, 1933; Zabert & Herbst, 216, fig. 8a,b; Pl. 3, figs. 17a,b.
1990 *Candonopsis brasiliensis* Sars, 1901; Bertels & Martínez, pl. 1, fig. 9.

**Material**: 600 adult and juvenile valves.

**Diagnosis**
A large elongate and subtriangular species of *Candonopsis* with greatest height in posterior third and more broadly rounded posteriorly than anteriorly. Inner lamella rather narrow but regular.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Figured specimen | RV | MLP 193 | 0.87 | 0.41 |

**Distribution**
In this study this species occurs in Los Juncos lake, (Samples 1, 2, and 4 to 9). (Fig. 2).

**Remarks**
This species, originally described live from Brazil by Sars (1901), has been previously recorded from the non-marine Quaternary of Argentina by Zabert (1981) from western Chaco Province and by Zabert and Herbst (1986) from Entre Ríos Province. Bertels and Martínez (1990) record it from the Quaternary of the south-western part of the Province of Buenos Aires. The present record is, by some 270 km, the most southerly for this species.

Family **Cyprididae** Baird, 1845
Subfamily **Cypridinae** Baird, 1845
Genus *Eucypris* Vávra, 1891

## *Eucypris virens* (Jurine, 1820)
Pl. I, figs. 16

*1820 *Monoculus virens* Jurine, 174, pl. 18, figs. 15-16.
1868 *Cypris virens* (Jurine); Brady, 364, pl. 23, figs. 23-32.

1900 *Cypris virens* (Jurine); Müller, 62, pl. 15, figs. 1-4, 7-10, 16-18.
1947 *Eucypris virens* (Jurine); Bronshtein, 141, fig. 44, 1-7, pl. 4, fig. 8.

**Material**: 4 adult valves.

**Diagnosis**

A very large species of *Eucypris* characterised by its short subrectangular shape, its very sub-umbonate dorsal margin with pointed extremity, broadly rounded anterior and more bluntly rounded posterior. Most of caparace smooth but anterior marginal area delicately punctate and bearing 4 pustulose spines.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Figured specimen | LV | MLP 194 | 2.11 | 1.05 |

**Distribution**

This species occurs in Los Juncos Lake, (Sample 6). (Fig. 2).

**Remarks**

This is probably the first record of this large and conspicuous species from South America. It is widespread in Russia, extending east of the Urals and from all of Western Europe, North America and Greenland. This is a spring and early summer form in shallow water rich in plants.

## *Eucypris virgata* sp. nov.

Pl. I, figs. 17, 18; Pl. II, figs. 1-3

**Derivatio nominis:** Latin from the nature of the ornament.

**Holotypus:** RV MLP 206 (Pl. I, fig 17).

**Material**: 1046 adults and juveniles valves.

**Type locality and level**

La Salina Lake, Cari-Laufquen area 150 km East to San Carlos de Bariloche, Río Negro Province. (Sample 6).

**Diagnosis**

A large species of *Eucypris* characterised by its rather narrowly rounded anterior margin and very pointed posterior, virgate ribbing, and marginal reticulation and pustule like tubercle.

**Description**

A large, almost drop-shaped species of *Eucypris*. Anterior margin rather narrowly rounded; posterior bluntly pointed with apex just above ventral margin. Dorsal margin gently convex and sloping, without cardinal angles, to the end margins; ventral margin gently convex about a mid-length oral incurvature. Surface covered with a virgate pattern of numerous fine ribs with many anastomoses which phase into a concentrically orientated reticulation at the end margins. Several pustule like tubercles occur at the anterior and posterior margins. Marginal area well-developed. Radial pore canals few, small simple and lipped. Ornament of juveniles the same but with secondarily punctate intercostal region. Internal features as for genus. Sexual dimorphism not detectable.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Holotype | RV | MLP 206 | 0.86 | 0.41 |
| Paratype | LV | MLP 207 | 1.17 | 0.6 |
| Paratype | RV | MLP 208 | 1.3 | 0.6 |
| Paratype Juvenile A-1 | RV | MLP 209 | 0.76 | 0.39 |
| Paratype Juvenile A-2 | LV | MLP 210 | 0.61 | 0.31 |

**Distribution**

This species occurs in cores from La Salina Lake (Samples 5 and 6) and Los Juncos Lake, (Samples 4 to 9), (Figs. 2,3).

**Remarks**

This species is distinguished from *E. sarsi* Daday 1902 [= *E. fontana* (Graf)] from the Recent of southern Patagonia in shape and size. The latter species has its highest point more posterior than the present species. Although Daday's illustrations are very poor, his material seems to have a similar type of ornament. The species differs from *E. labyrinthica* sp. nov. in its stronger ornament and its more elongate shape and pointed posterior. Although the adults of this species are quite distinctive and demonstrate clear adult characteristics, especially with respect to the nature of the inner lamella, the juveniles are rather similar to those illustrated by De Deckker (1981) as juveniles of *E. fontana* (Graf). The present authors have no doubt, however, that the specimens which we illustrate as adults and juveniles of *E. virgata* sp. nov. are members of the same ontogenetic sequence and that the juveniles of *E. fontana* are quite distinct.

## *Eucypris labyrinthica* sp. nov.

Pl. II, figs. 4-8

**Derivatio nominis:** Latin. With reference to the complex ornamentation of this species.

**Holotypus:** ?Female LV MLP 211. (Pl. II, fig. 4).

**Material**: 93 adult and juvenile valves.

**Type locality and level**

Los Juncos Lake, Estación Perito Moreno, Río Negro Province, Argentina Lat. 41°03' S, Long. 71°0' W. (Sample 7).

**Diagnosis**

A large species of *Eucypris*, very thin-shelled and with narrow and delicate inner lamella. Ornament a very delicate but complex concentric reticulum. Numerous small tubercles on the anterior and posterior marginal areas.

**Description**

A large, rather pear shaped species of *Eucypris* with very thin shell, narrow and delicate inner lamella. Sexual dimorphism not observed. Anterior margin broadly rounded with extremity at mid-height; posterior a narrow, blunt termination with sub-ventral apex. Dorsal margin sub-umbonate with greatest height at anterior 1/3 length and sloping strongly to the posterior; ventral margin with slight incurvature at about mid-length. Ornament a delicate but complex reticulum which is approximately concentric in that the long axes of the fossae are mostly parallel to the nearest margin. Surface of solum smooth unless bearing very small simple pore conuli; centrally the fossae are infilled over the adductor scars. Numerous small pustulate tubercles occur on both end marginal areas. Internal features as for genus. Inner lamella very delicate. Juvenile (A-1) with stronger muri in reticulum.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Holotype | RV | MLP 211 | 0.78 | 0.45 |
| Paratype | RV | MLP 212 | 0.80 | 0.47 |
| Paratype | LV | MLP 213 | 0.59 | 0.35 |
| Paratype | LV | MLP 214 | 0.84 | 0.47 |
| Paratype Juvenile | RV | MLP 215 | 0.53 | 0.32 |

**Distribution**

Los Juncos Lake, (Samples 5 to 8). (Fig. 2).

**Remarks**

This species is very similar to *E. virgata* sp. nov. but differs in that, in the adult of *E. labyrinthica* the ornament is much more delicate and labyrinthine. Juveniles specimens of *E. labyrinthica* are however, more similar to *E. virgata* in ornament. The two species also differ in shape. Whereas *E. virgata* is very elongate and pointed posteriorly, *E. labyrinthica* is shorter, higher and much less pointed posteriorly. *E. sarsi* Daday (1902), from the Recent of southern Patagonia, seems to have a much wider ventral concavity and to have its dorsal apex more posterior in position.

## *Eucypris fontana* (Graf, 1931)

Pl. II, figs. 9-14

1902 *Eucypris sarsi* Daday, 294-296, pl. 15, figs. 1-7, text-figs. 2a-c.

*1931 *Cypris fontana* Graf, 186, fig. 1.

1972 *Eucypris sarsi* Daday; Farkas, 140-141, figs. 1-5.

1981 *Eucypris fontana* (Graf); De Deckker, 87-92, pls. 8, 90, text-figs 1, 2.

**Material**: 1143 adult and juvenile valves.

**Description**

Very large, subovate. Male less globose than female. Anterior margin broadly rounded but with long antero-dorsal slope; posterior margin downturned in female, in both sexes bluntly rounded with sub-ventral apex. Dorsal margin symmetrically arched in female, more broadly convex in male; ventral margin straighter in male than in female. RV> LV. Lateral surface with fine, almost ghost-like reticulation and traces of secondary punctuation. This ornament is most conspicious at the margins and is concentrically disposed. The extreme rim of the anterior margin is plicate. Small pustulose tubercles occur on the anterior-marginal area. Internal features as for the genus. Juveniles more strongly reticulo-punctate.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Female | RV | MLP 195 | 1.35 | 0.81 |
| Male | LV | MLP 196 | 1.43 | 0.76 |
| Female | RV | MLP 197 | 1.29 | 0.68 |
| Male | RV | MLP 200 | 1,40 | 0.74 |
| Juvenile | A-1 | MLP 198 | 0.87 | 0.50 |
| Juvenile | A-2 | MLP 199 | 0.54 | 0.32 |

**Distribution**

This species occurs in the Los Juncos core (samples 5 to 10) and La Salina Lake (samples 4 to 6) (Figs. 2, 3).

**Remarks**

This is the second largest species of *Eucypris* in the study. It can be distinguished from all the other species by its size, being smaller only than *E. virens*. Graf's original material from South Georgia is considerably smaller (1.10-1.25 mm) than the present material or that from Signy Island in the Antarctic described by De Deckker. We follow Martens & Behen (in prep) in placing *E sarsi* Daday from the Recent of Patagonia within the present species.

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**Plate II**

Unless otherwise stated, all views external lateral

1-3 *Eucypris virgata* sp. nov. 1. Paratype, RV, MLP 208, x38.5. 2. Paratype, juvenile A-1, MLP 209, x65.5. 3. Paratype, juvenile A-2, MLP 210, x75.5.

4-8 *Eucypris labyrinthica* sp. nov. 4. Holotype, RV, MLP 211, x64. 5. Paratype, RV, MLP 212, x62.5. 6. Paratype, LV, MLP 213, x84.5. 7. Paratype, LV, MLP 214, 59.5. 8. Paratype, juvenile A-1, MLP 215, x94.

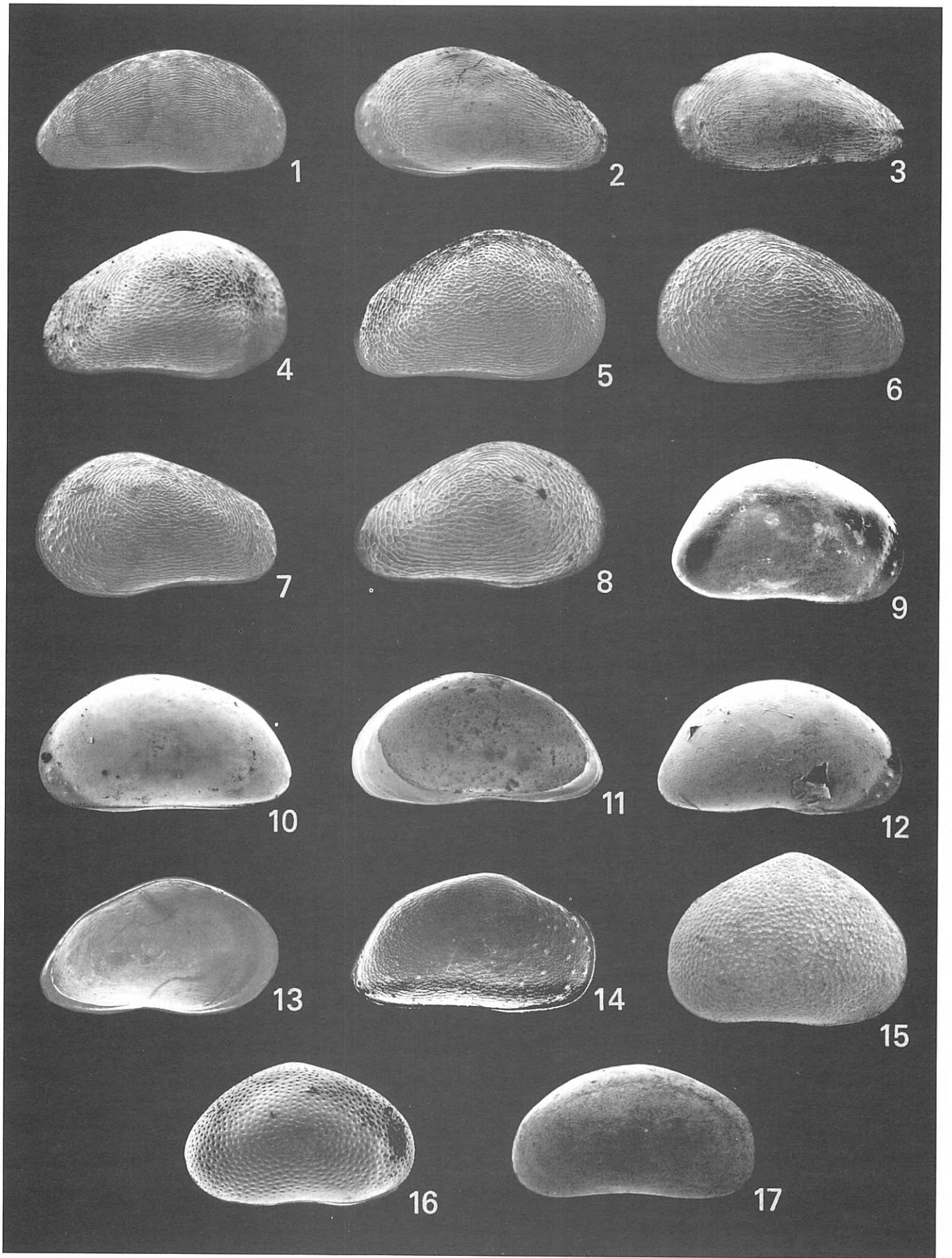
9-14 *Eucypris fontana* (Graf, 1931). 9. Female RV, MLP 195, x37. 10. Male LV, MLP 196, x35. 11. Female RV (internal view), MLP 197, x38.5. 12. Male RV, MLP 200, x35.5. 13. Juvenile A-1 (internal view), MLP 198, x57.5. 14. Juvenile A-2, MLP 199, x92.5.

15 *Sarscypridopsis aculeata* (Costa, 1852); RV, MLP 216, x73.5.

16 *Cypridopsis intermedia* Sars, 1924; RV, MLP 217, x74.5.

17 *Kapcypridopsis* sp., LV, MLP 218, x91.

**Plate II**



Genus *Sarscypridopsis* McKenzie, 1977

## *Sarscypridopsis aculeata* (Costa, 1852)

Pl. II, fig. 15

*1852 *Cypridopsis aculeata* Costa, 7, text-fig. 5a.
1977 *Sarscypridopsis aculeata* (Costa); McKenzie, 47.
1990 *Sarscypridopsis aculeata* (Costa); Bertels & Martínez, pl. 7, fig.6.
1990 *Pleisiocypridopsis aculeata* (Costa); Henderson, 216, fig.96.

**Material**: 33 adult and juvenile valves.

**Diagnosis**

Medium sub-triangular in adults, triangular in juveniles. In dorsal view, more acuminate anteriorly than posteriorly. Dorsal margin very strongly arched and anterior margin very broadly rounded. Right valve larger than left with anterior dorsal and ventral overlap. Ornament of dense circular puncta.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Figured specimens | RV | MLP 216 | 0.68 | 0.48 |

**Distribution**

Los Juncos core, Estación Perito Moreno, Río Negro Province (Sample 5) (Fig. 2).

**Remarks**

This is a very well known species which is distributed throughout Europe, Asia and Africa. It has been previously recorded in the Quaternary of Argentina by Bertels & Martínez (1990), from Bahía Blanca in the southern part of Buenos Aires Province. In Britain, it is common around the coast, living in brackish ponds ditches and marshes. It has also been recorded in high salinity athalassic environments. Males are unknown (Henderson, 1990).

Family **Cypridopsidae** Kaufmann, 1960
Subfamily **Cypridopsinae** Bronshtein, 1947
Genus *Cypridopsis* Brady, 1867

## *Cypridopsis intermedia* Sars, 1924

Pl. II, fig. 16.

**Material**: 200 adult and juvenile valves.

**Description**

A medium to large species of *Cypridopsis* with sub-umbonate dorsal margin. Anterior margin narrowly rounded, posterior broader. Strongly inflated and sub-circular in dorsal view. Ornament of deep circular puncta, orientated about mid-point.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Figured specimens | RV | MLP 217 | 0.67 | 0.40 |

**Distribution**

Los Juncos Lake, Estación Perito Moreno, Río Negro Province, (Samples 4 to 9) (Fig. 2).

**Remarks**

Species of *Cypridopsis* are difficult to identify from the caparace shape. We believe that our species is probably not the same as that described by Ramírez (1967) from the Recent of Buenos Aires Province as *C. assimilis* Sars, 1924. His species is much larger (0.90 mm) and ours lacks the 24 tubercles along the anterior margin of the right valve. *Cypridopsis vidua* Zabert, 1981, from the Quaternary of Chaco Province and *C. vidua* Zabert and Herbst, 1986, from the Quaternary of Entre Ríos Province are both probably the same species as the present one but there is insufficient data to be certain.

Genus *Kapcypridopsis* McKenzie, 1977

## *Kapcypridopsis* sp.

PL. II, fig. 17

1990 *Kapcypridopsis* sp. Bertels & Martínez, pl. 1, fig. 17.

**Material**: 8 adult and juvenile valves.

**Description**

A medium sized rather thick-shelled, smooth species. Sublunate in lateral view with anterior margin more narrowly rounded than posterior. Dorsal margin broadly convex, ventral margin broadly concave.

**Dimensions** (mm)

| | | | L | H |
|---|---|---|---|---|
| Figured specimen | LV | MLP 218 | 0.55 | 0.29 |

**Distribution**

This species occurs in Los Juncos lake, Estación Perito Moreno, Río Negro Province. (Samples 5 and 7) (Fig. 2).

**Remarks**

This species seems to be identical to that described by Bertels & Martínez (1990) from the Quaternary of the southern part of the Province of Buenos Aires, near Bahía Blanca, in alluvial plain sediments. *Heterocypris? cochabambaensis* Purper and Pinto, 1980 from Quaternary interglacial deposits of Bolivia is very similar in shape but the mean length of its type material is >1.0 mm, twice the length of the present species.

# DISTRIBUTION OF THE OSTRACODA

The geographical and stratigraphical distribution of the fauna is dealt with in detail by Whatley & Cusminsky (1995) but in that paper, all the taxa described herein as new are in *nomina aperta*. The distribution of the Ostracoda in two of the cores in which they occur in greatest abundance is discussed here.

Fig. 2 shows the distribution and abundance of the Ostracoda recovered from Los Juncos. At the very base of the core *Candonopsis brasiliensis* is encountered in samples 1 and 2 and this is evidently an opportunistic species in this environment. The succeeding sample 3 is entirely barren of ostracods which is not surprising since it contains gypsum crystals and was evidently evaporitic, formed when the lake was subject to desiccation. Sample 4 shows an increase in specific diversity to four, with the addition of *Cypridopsis intermedia, Limnocythere patagonica* and *Eucypris virgata*; all in very low numbers. Sample 5 sees something of an increase in abundance in most of the pre-existing species, plus the addition in low numbers of a further five species (*Eucypris fontana, Eucypris labyrinthica, Ilyocypris ramirezi, Kapcypridopsis* sp. and *Sarscypridopsis aculeata*) making a total simple species diversity of 9 species. In terms of abundance, sample 6 represents the acme for the fauna of the core, although the species diversity declines to 7 species. In sample 6 *Eucypris virens* appears for the only time. Two of the species absent in sample 6 are Lazarus taxa, *Ilyocypris ramirezi* and *Kapcypridopsis* sp., both reappear in sample 7, which has a simple species diversity of 8 but also shows a considerable abundance decline. Finally, in sample 10 only two species survive, *Limnocythere patagonica* and *Eucypris fontana*, both in very low numbers. Samples 11-13, in the upper part of the core are all barren.

Simple species diversity declines to 6 in sample 8 and to 5 species in sample 9, but the most notable feature of these two samples is the very substantial decline in abundance. Because diversity and abundance both decline, it does not seem that sedimentary dilution is the cause of either decline or local extinction. The epifaunal species *Candonopsis brasiliensis* and *Limnocythere patagonica* range throughout the core but between samples 4 and 10, there is little difference in the abundance profile of those species which are unable to swim and those which are accomplished swimmers (*Cypridopsis intermedia, Sarcypridopsis aculeata, Eucypris* spp., and *Ilyocypris ramirezi*). The most probable cause of decline of the fauna at the top of the core is either a lowering of the pH or increased desiccation.

Fig. 3 shows the distribution and abundance of the Ostracoda in the core from La Salina. These samples represent no more than a pilot study taken in the area of a very large late Pleistocene lake complex, the detailed study of which will be the subject of subsequent research.

In La Salina, the first 3 samples are barren of ostracods and we interpret this as being due to the sediments being of evaporitic origin. Sample S4 is the first to contain ostracods of two species, *Limnocythere patagonica* and *Eucypris fontana,* both in low numbers. In sample S5, *Eucypris labyrinthica* and *Eucypris virgata* join the fauna, all four species being rather sparsely represented. Although *Eucypris labyrinthica* disappears in the top sample of the core, *Limnocythere* sp., which will be described in a subsequent publication, and *Ilyocypris ramirezi* occur in the core for the first and last time. In this sample, *Eucypris fontana* is extremely abundant and *Limnocythere rionegroensis* is abundant.

More details of the distribution of the Ostracoda and environmental reconstructions are given in Whatley & Cusminsky (1995).

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