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New Ostracodes of the Endemic Fauna of the Pebas Formation, Upper Amazon Basin, Brazil

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Abstract — Four new species of ostracodes of the Upper Amazon Basin, Pebas Formation, Pliocene? are described: *Cyprideis anterospinosa, Chlamydocytheridea kotzianae, Cytheridea marginuspinosa* and *Cytheridea minipunctata*. A mixoaline environment is infered by the morphological characteristics, mainly by the hinge. The fauna is endemic and do not present any evidence of transportation. Some ecological aspects and correlation related to the fauna of Brazil as well as that of the Peru and Colombia are discussed.

Resumo — São descritas quatro espécies novas de ostracodes da Bacia do Alto Amazonas. Formação Pebas, Pliocene?, *Cyprideis anterospinosa, Chlamydocytheridea kotzianae, Cytheridea marginuspinosa* e *Cytheridea minipunctata*. Infere-se um ambiente mixoalino através de características morfológicas, principalmente da charneira tratando-se de fauna endêmica, sem evidências de transporte. São discutidos alguns aspectos ecológicos da fauna do Brasil assim como do Perú e da Colômbia, com a qual pode ser correlacionada.

INTRODUCTION

The study of this endemic and very interesting fauna of ostracodes of the Upper Amazon Basin had its first start with the material proceeded from three drill cores — CPCAN-I (Tamanduá), CPCAN-II (Poreré), CPCAN-III (São Paulo de Olivença) and one outcrop from Benjamin Constant (Purper, 1977, 1979).

Later on, receiving new material from CPRM (Companhia de Pesquisa de Recursos Minerais) other six wells have being studied (1-AS-1-AM, 1-AS-4-AM, 1-AS-32-AM, 1-AS-33-AM, 1-AS-36-AM and 1-AS-51-AM) bringing new usefull data to taxonomy, paleogeography, ecology, stratigraphy and evolutionary trend (Purper & Pinto, 1983).

Similar material of that of Brazil was studied by Sheppard & Bate (1980), about Plio-Pleistocene ostracodes from the Upper Amazon of Colombia and Peru. The concomitance of the studies of Purper (1979) and Sheppard & Bate (1980), where the two papers present different taxonomic classification from the same material, brought some problems of taxonomic aspects. Purper & Pinto (1985) solved this problem discussing the valid names to the genera at the same time that gave new ecological and evolutionary aspects to the material.

Due to the richness of the material, the study is being developed in several stages.

TAXONOMY

Super Família Cytheracea Baird, 1850
Família Cytherideidae Sars, 1925
Sub Família Cytherideinae Sars, 1925
Cyprideis Jones, 1875.
Cyprideis anterospinosa Purper & Ornellas, sp. nov.
Plate 1, Figures 1-6

Derivatio nominis: due to the presence of several spines on the anterior margin.
Holotypus: Female RV UFRGS nº MP-O-1231
Paratypi: Males and females nº MP-O-1232 to nº MP-O-1236
Locus typicus: Well 1-AS-32-AM (122m), Upper Amazon Basin, Brazil.
Stratum typicum: Pebas Formation — Pliocene?

Diagnosis: Anterior margin with several spaced spines. Surface punctate. Sexual dimorphism strong.

Description — Female: Subrectangular valves in lateral view; dorsal margin of the right valve smoothly arc hed while that of the left valve is almost straight from the anterior cardinal angle to the posterior one; anterior margin rounded, presenting several spaced spines. Ventral margin of the right valve almost straight, ventral margin of the left valve bulgy. Posterior margin of the right valve somewhat truncated with small spines on the postero-ventral corner, posterior margin of the left valve rounded. Greatest height of the right valve is about the median portion, about half the length; on the left valve at the anterior middle portion, larger than half the length. Ovoid elongate in dorsal view; greastest width behind mid-length. Hinge with anterior and posterior strongly crenulate teeth in the right valve, bipartite median element with a short, narrow, shallow, little crenulate antero-median groove and an elongate crenulate postero-median bar. Hinge of the left valve with complementary elements. Wide inner lamella with regular outline, wider anteriorly. Line of concrescence and inner margin coincident. Numerous simple and bifurcate porecanals, regularly disposed. Valve surface punctate. Muscle scars with four vertical unequal scars; frontal scar V-shaped.

— Male: It differs from the female, in lateral view because it is narrower, more elongate and it is more

pointed posteriorly. In dorsal view it presents the anterior and posterior borders pointed.

Dimensions: Female RV MP-O-1231 L 0,9114mm; H 0.4312mm. Female LV MP-O-1232 L 0.8134mm; H 0,4580mm. Female carapace MP-O-1233 L 0,8232mm; H 0,4508mm; W 0,3724mm. Male RV MP-O-1234 L 0,9212; H 0,4312mm; LV MP-O-1235 L 0,9212mm; H 0,4508m; Male carapace MP-O 1236 L 0,9212mm; H 0,4508mm; W 0,3724mm.

Discussion: This new species is different from all the already known species of *Cyprideis* in the outline and in the punctate surface of the carapace.

Occurrence: Well 1-AS-32-AM (122m), Upper Amazon Basin, Brazil.

Chlamydocytheridea kotzianae Purper & Ornellas, sp. nov.

Plate 1, Figures 7-9.

Derivatio nominis: In honour to Professor Sônia C. Bender Kotzian from the Universidade Federal do Rio Grande do Sul.
Holotypus: Female, LV UFRGS nº MP-O-1237
Paratypus: Male carapace MP-O-1238
Locus typicus: Well 1-AS-32-AM (26m), Upper Amazon Basin, Brazil.
Stratum typicum: Pebas Formation, Pliocene?

Diagnosis — Anterior margin spreaded up, tending to become inclined upward in the males. Surface smooth. Numerous, long and ramified porecanals. Anteriorly, the selvage and the flange are very well apart leaving between them a broad flange groove. Sexual dimosphism strong.

Description — Female: Subrectangular in lateral view, dorsal margin approximately, straight, bent from the anterior to the posterior cardinal angles, anterior margin wholy spreaded up, continuing dorsaly in a straight line till the anterior cardinal angle. Posterior margin curved in a regular line from the dorsal to the ventral border. Ventral margin slightly sinuous, greatest height at the anterior half almost equal to half length. Hingement merodont. In the right valve, laminate anterior and posterior teeth strongly crenulate and the groove slightly crenulate. Hinge-elements in the left valve complementary. Broad inner lamella on the anterior region. Line of concrescence apart from the inner margin forming the vestibule. Anterior marginal porecanals ramified, some branched. Muscle scars with four vertical unequal scars; frontal and mandibular scars elongate.

— Male: In lateral view it is narrower, more elongate than the female and present the anterior margin spreaded up, tending to become inclined upward. In dorsal view it is ovoid-shaped having the right valve more narrower than the left one.

Dimensions: Female LV MP-O-1237 L. 1,1368mm; H 0,6174mm. Male carapace MP-O-1238 L 0,9212mm; H 0,4508mm; W 0,3920mm.

Discussion: It differs from *Chlamydocytheridea machadoi* Purper, 1979 as it has the anterior margin spread up tending to become inclined upward in the males.

Occurrence: Well 1-AS-32-AM (26m), Upper Amazon Basin, Brazil.

Cytheridea graciosa Purper, 1979

Plate 1, Figures 10-15

Chytheridea sp. D. Purper, 1977. Sixth Intern. Ostracod. Symposium, Saalfelden. p. 362-363.
Cytheridea graciosa Purper, 1979. *Pesquisas* 12, p. 229-230, pl. 3, figs. 1-9.
Topotypi: Males and females valves and carapaces MP-O-1239 to MP-O-1244.
Locus: Well 1-AS-1-AM (15.40mm).
Stratum: Pebas Formation — Pliocene?

Dimensions: Female RV MP-O-1240 L 0,8526mm; H 0,4606mm. Female LV MP-O-1239 L 0,8624mm; H 0,4704mm. Female carapace MP-O-1241 L 0,8624mm; H 0,4704mm; W 0,3742mm. Male RV MP-O-1243 L 0,8722mm. H 0,4312mm. Male LV MP-O-1242 L

Plate 1

Cyprideis anterospinosa Purper & Ornellas, sp. nov.

Fig. 1 — Female left valve in lateral view. MP-O-1232
Fig. 2 — Female right vale in lateral view. MP-0-1231
Fig. 3 — Male left valve in lateral view. MP-0-1234
Fig. 4 — Male right valve in lateral view. MP-0-1235
Fig. 5 — Female carapace in dorsal view. MP-0-1233
Fig. 6 — Male carapace in dorsal view. MP-0-1236

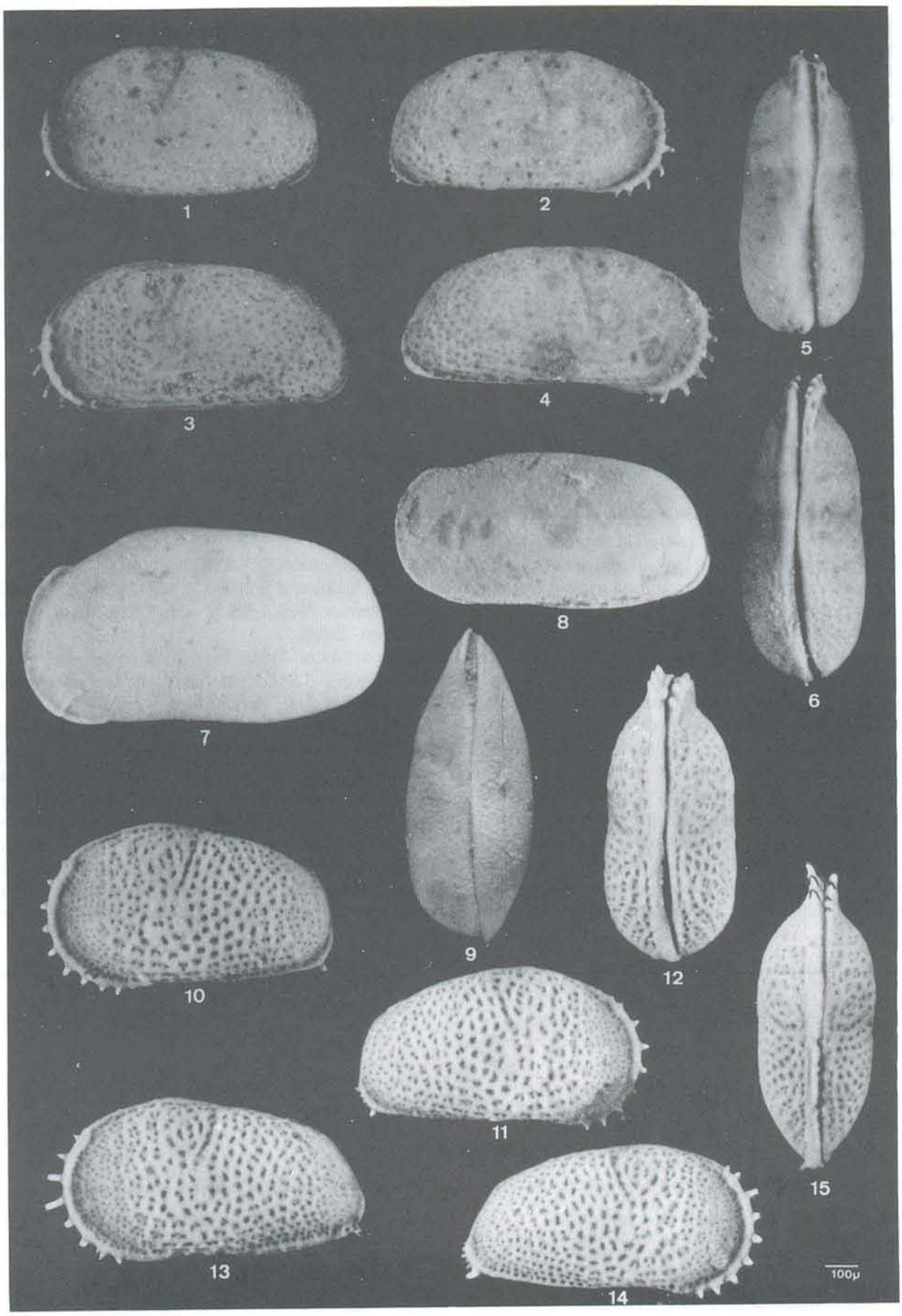
Chlamydocytheridea kotzianae Purper & Ornellas, sp. nov.

Fig. 7 — Female left valve in lateral view. MP-0-1237
Fig. 8 — Male carapace showing the left valve. MP-0-1238
Fig. 9 — Male carapace in dorsal view. MP-0-1238

Cytheridea graciosa Purper, 1979

Fig. 10 — Female left valve in lateral view. MP-0-1239
Fig. 11 — Female right valve in lateral view. MP-0-1240
Fig. 12 — Female carapace in dorsal view. MP-0-1241
Fig. 13 — Male left valve in lateral view. MP-0-1242
Fig. 14 — Male right valve in lateral view. MP-0-1243
Fig. 15 — Male carapace in dorsal view. MP-0-1244

I. Purper and L. P. de Ornellas. PLATE I



0,9212mm; H 0,4704mm. Male carapace MP-O-1244 L 0,9016mm; H 0,4410mm; W 0,3430mm.

Remarks — Purper (1979) describing this new species represented only a right valve of a female and the left valve of a male because the material was not abundant in the Well CPCAN-III-São Paulo de Olivença. The richness of the ostracodes in the Well 1 AS-1-AM permited to be found various valves of males and females as well as complete carapaces.

Cytheridea marginuspinosa Purper & Ornellas, sp. nov.

Plate 2, Figures 1-6

Derivatio nominis: due to the presence of several spines on the anterior margin.
Holotypus: Female RV UFRGS nº MP-O-1245.
Paratypi: Males and females MP-O-1246 to MP-O-1250.
Locus typicus: Well 1-AS-32-AM (84m), Upper Amazon Basin, Brazil.
Stratum typicum: Pebas Formation — Pliocene?

Diagnosis — Subequal valves, anterior margin with long spaced spines. Surface strongly punctate. Conspicuous dorsal sulcus sinuously disposed. Sexual dimorphism strong.

Description: Female — Subrectangular in lateral view, dorsal margin smoothly arched. Anterior margin rounded, presenting several long spaced spines. Ventral margin somewhat sinuous presenting a concavity near the selvage lip in the right valve. Posterior margin regularly rounded presenting little spines on the postero ventral corner of the right valve. Greatest height on the anterior middle, larger than half the length. Ovoid in dorsal view, greatest width behind mid-lenght. Hinge with anterior and posterior teeth on the right valve, strongly crenulate, presenting between them the bipartite median element. This one is divided in a small anterior portion with negative and shallow elements and in a larger posterior portion with positive elements. Hinge-elements in the left valve complementary. Wide inner lamella with regular outline, wider anteriorly. Numerous simple and bifurcate porecanals, regularly disposed. Surface strongly punctate. Conspicuous dorsal sulcus sinuously disposed. Muscle scars with four vertical unequal scars; frontal scar V-shaped.

— Male. It differs from the female, in lateral view because it is narrower, more elongate and is more pointed posteriorly. In dorsal view it presents the anterior and posterior borders pointed.

Dimensions: Holotypus — Female RV MP-O-1245 L 0,8918mm; H 0,4704mm. Paratypus — Female LV MP-O-1246 L 0,9506mm; H 0,5292mm. Female carapace MP-O-1247 L 0,9212mm; H 0,5292mm; W 0,4116mm. Male RV MP-O-1248 L 0,9800mm; H 0,4704mm. Male LV MP-O-1249 L 1,0192mm; H 0,5194mm. Male carapace MP-O-1250 L 0,9212mm; H 0,4508; W 0,3724mm.

Discussion: This species somewhat resembles *C. graciosa* Purper, 1979. But it differs from that species because it has the cardinal posterior angle less prominent, the anterior border is much downwardly inclined and the type of punctation is quite different.

Occurrence: Well 1-AS-32-AM (84m), Upper Amazon Basin, Brazil.

Cytheridea minipunctata Purper & Ornellas, sp. nov.

Plate 2, Figures 7-12

Derivatio nominis: Due to the special type of ornamentation.
Holotypus: Female RV UFRGS nº MP-O-1251
Paratypi: Males and females MP-O-1252 to MP-O-1256
Locus typicus: Well 1-AS-32-AM (117m), Upper Amazon Basin, Brazil.
Stratum typicum: Pebas Formation - Pliocene?

Diagnosis — Subequal valves, surface characteristicaly minipunctate. Sexual dimorphism strong.

Description: Female — Subrectangular in lateral view, dorsal margin smoothly arched. Anterior margin rounded, presenting several spaced spines. Ventral margin almost straight. Posterior margin somewhat truncate presenting small spines on the posteroventral corner of the right valve. Greatest height on the anterior middle, equal to half the length. Ovoid in dorsal view, greatest width behind mid-length. Hinge with anterior and posterior teeth on the rigth valve, strongly crenu-

Plate 2

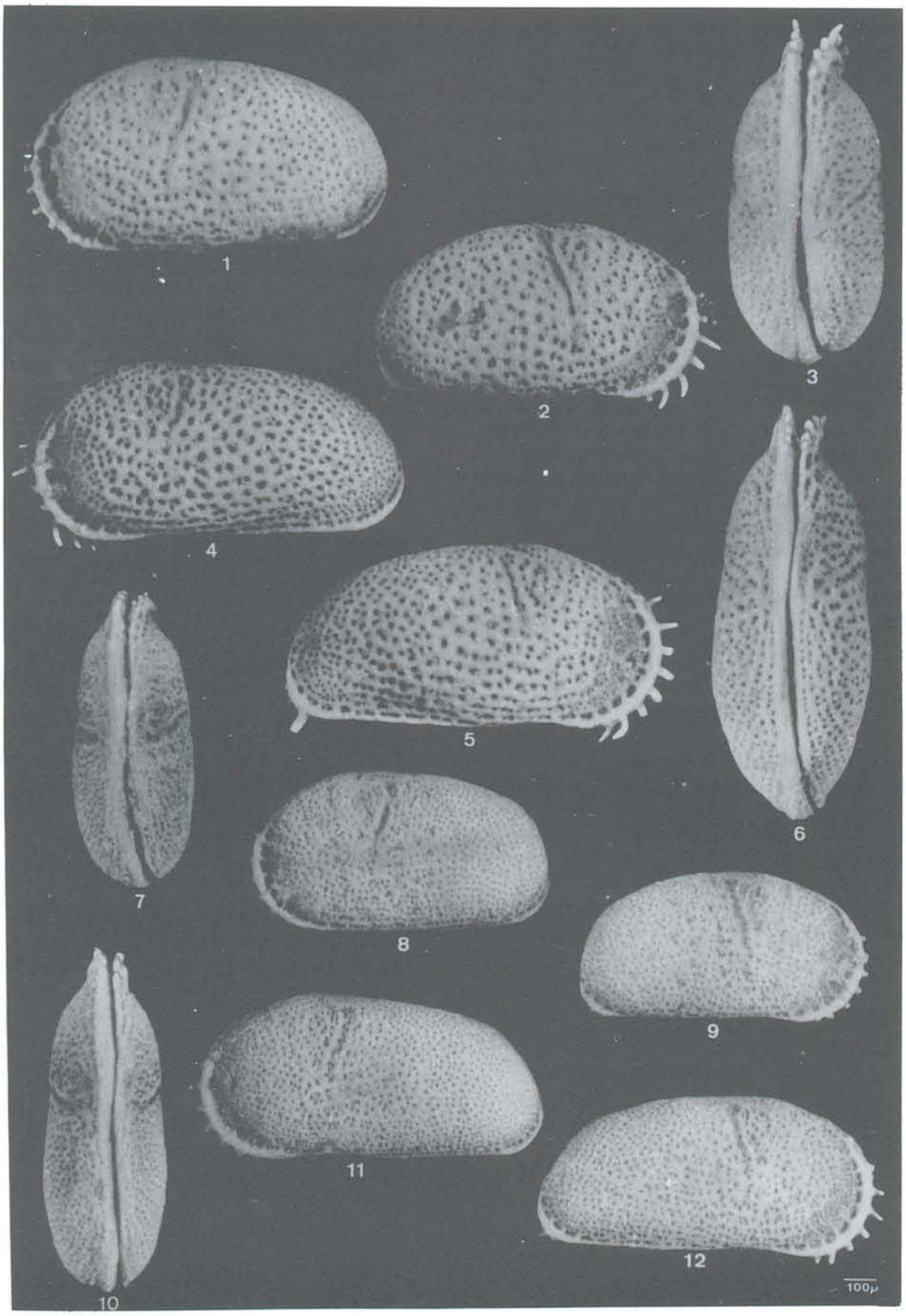
Cytheridea marginuspinosa Purper & Ornellas, sp. nov.

Fig. 1 — Female left valve in lateral view. MP-0-1246
Fig. 2 — Female right valve in lateral view. MP-0-1245
Fig. 3 — Female carapace in dorsal view. MP-0-1247
Fig. 4 — Male left valve in lateral view. MP-0-1249
Fig. 5 — Male right valve in lateral view. MP-0-1248
Fig. 6 — Male carapace in dorsal view. MP-0-1250

Cytheridea minipunctata Purper & Ornellas, sp. nov.

Fig. 7 — Female carapace in dorsal view. MP-0-1253
Fig. 8 — Female left valve in lateral view. MP-0-1252
Fig. 9 — Female right valve in lateral view. MP-0-1251
Fig. 10 — Male carapace in dorsal view. MP-0-1256
Fig. 11 — Male left valve in lateral view. MP-0-1255
Fig. 12 — Male right valve in lateral view. MP-0-1254

PLATE II



senting between them the bipartite median element. This one is divided in a small anterior portion with negative and shallow elements and a larger posterior portion with positive elements. Hinge-elements in the left valve complementary. Wide inner lamella with regular outline, wider anteriorly. Numerous simple and bifurcate porecanals, regularly disposed. Surface characteristicaly minipunctate. Conspicuous dorsal sulcus sinuously disposed. Muscle scars with four vertical unequal scars; frontal scar V-shaped.

— Male. It differs from the female, in lateral view because it is narrower, more elongate and is more pointed posteriorly. In dorsal view it presents the anterior and posterior borders pointed.

Dimensions: Holotypus — Female RV MP-O-1251 L 0,8232mm; H 0,4214mm. Paratypi — Female LV MP-O-1252 L 0,8526mm; H 0,4606mm. Female carapace MP-O-1253 L 0,8428mm; H 0,4508; W 0,3528mm. Male RV MP-O-1254 L 0,9408mm; H 0,4410mm. Male LV MP-O-1255 L 0,9800mm; H 0,4704mm. Male carapace MP-O-1256 L 0,9604mm; H 0,4606mm; W 0,3626mm.

Discussion: In the outline, *Cytheridea minipunctata* sp. nov. somewhat resembles *Cytheridea marginuspinosa* sp. nov. But it differs from that species because it has as very characteristic surface forme by minipuncturae. Its size is also different being shorter than *C. marginuspinosa*.

Occurrence: Well 1-AS-32-AM (117m), Upper Amazon Basin, Brazil.

COMMENTS

The great difficulty to infer the environment of the Pebas Formation ostracodes is the fact that they belong to an endemic fauna. This was observed to the ostracodes and to the molluscs (Purper, 1977, 1979; Purper & Pinto, 1983, 1985; Sheppard & Bate, 1980; Verissimo Costa, 1980).

Structural details influenced by salinity include them in the mesohaline environment. They have usually thick shells, the ornamentation is weak, often punctate. Most of the species belongs to the Cytheridae. The hinge is merodont or modified amphidont. No extensive transport of the material is envisaged as it is common to find all the juvenile instars together to adult forms.

The Colombian and the Peruvian samples (Sheppard & Bate, 1980) present great similarity to the Brazilian ones, being considered of the same stratigraphical position and of the same environment of deposition.

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