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The genus *Paracytheridea* (Ostracoda) in the Northern/Northwestern Brazilian continental shelf

Ivone Purper*
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SINOPSE

É feito o levantamento do gênero *Paracytheridea* Müller, 1894 na região norte/nordeste da plataforma continental brasileira. Foram encontradas cinco espécies, sendo três espécies novas: *Paracytheridea inflata* sp.nov., *Paracytheridea reticulata* sp.nov. e *Paracytheridea spinosa* sp.nov.

O gênero, na região estudada, concentra-se em sedimentos carbonáticos e as espécies que integram esta associação norte/nordeste tem uma distribuição geográfica que atinge a Lat.15°13'S.

ABSTRACT

The study of *Paracytheridea* Müller, 1894 in the northern/northwestern Brazilian continental shelf. The region presents five species, three of them being new ones: *Paracytheridea inflata* sp.nov., *Paracytheridea reticulata* sp.nov., and *Paracytheridea spinosa* sp.nov.

The genus is restricted to the carbonate facies and the geographic distribution of the species belonging to such northern/northwestern association is extended until Lat.15°13'S.

INTRODUCTION

The material under study proceeds from samples collected by the REMAC Project, co-ordinated by Petróleo Brasileiro S.A. (PETROBRAS) and by GEOMAR III from DHN (Diretoria de Hidrografia e Navegação da Marinha do Brasil), covering 7,408km of the Brazilian coast.

Due to the vast extent of the studied region and the great quantity of samples, the researches could be done in several stages.

So, the first paper, at genera level, showed the distribution of more than fifty genera, with their geographical ranges and the possible influence of temperature and salinity (Pinto et alii, 1974, 1978).

Following with the development of this project, subsequent studies have been made involving: *Puriana*, a genus restricted to the north

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ern/northwestern regions (Chukewiski & Purper, 1985a,b); *Pseudoceratina drogeri*, registered to the Holocene/Recent facies of reworked sediments in the northern region (Ornellas & Coimbra, 1985); *Orionina* and *Caudites* of all the Brazilian coast (Coimbra & Ornellas, 1986, 1987). These last two genera permitted ecological interpretations, with the recognition of three important associations (Coimbra & Ornellas, in press).

The studies on *Paracytheridea* were firstly made having in mind the expansion of *P. tschoppi* van den Bold, 1946 through Brazilian coast and the discussion of allied species *P. batei* Purper et Ornellas (Purper & Ornellas, in press). The genus occurs along all coast and, up to now, at least two distinct associations were determined: the association including the south species with greater and coarse carapaces and that of the north species with delicate valves (Purper & Ornellas, op.cit.).

This study completes the present knowledge on the northern/northwestern *Paracytheridea* species.

The type material is deposited in the Museu de Paleontologia of Universidade Federal do Rio Grande do Sul, Micropaleontologia, Ostracodes, under numbers MP-0-1075 to 1096.

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GENERAL COMMENTS

Although not much is known about the ecologic range of *Paracytheridea*, it is considered an epi-neritic genus, having a world-wide geographical distribution.

A brackishwater environment to the genus was only suggested to *P. troglodyta* Swain (Swain, 1955; Curtis, 1960) occurring in the Midbay subfacies of the San Antonio Bay and in East Mississippi Delta area and to *P. vandenboldi* Puri (Swain, op.cit.) occurring in the Lower bay sub-

facies of the San Antonio Bay. However, the species described as *Paracytheridea troglodyta* seems to have a greater relationship to *Perissocytheridea* rather than to *Paracytheridea*. This position was already considered by Swain (op.cit. p.625) where he says that "the generic position of this species is somewhat uncertain"... suggesting yet "a relationship to *Perissocytheridea*". If so, the aspect of a brackishwater environment is assumed to *Perissocytheridea* and not to *Paracytheridea*. On the other hand, *P. vandenboldi* Puri has been related mainly to the Miocene of the Atlantic coastal plain as those of Chesapeake Group, James River, VA, probably also in Maryland (Ulrich & Bassler, 1904); Choctawhatchee - Arca Zone (Hower et alii, 1935); Miocene of New Jersey, Maryland and Virginia (VA12-Yorktown) (Malkin, 1953). This last study (p.772) indicates to the ostracodes "a marine sublittoral to middle neritic environment, probably waters less than 150 meters in depth, of average salinity (35‰) and average calcium carbonate content". Kontrovitz (1978) follows Swain (1955) giving a brackishwater environment to *Paracytheridea* sp.cf. *P.vandenboldi* found in the Pleistocene of South Florida. Despite this, he assumes (p.135) "Ostracode occurrence data and petrological evidence indicate that the sediments were deposited under fully marine conditions at a water depth from 0 to 23 meters and in a tropical or subtropical climate regime".

To recent sediments Grossman (1967) mentions the occurrence of *Paracytheridea* sp.cf. *P. vandenboldi* in Pamlico Sound Region, North Carolina with salinity 24 to 35‰; depth, 3 to more than 91,40 meters; substrate, medium and fine sand.

The depth of water, a factor indirectly reflecting the amount of light penetration, and proximity to shore, appears to be one of the major factors influencing the distribution of recent ostracodes. *Paracytheridea* can be considered to be inhabiting a shallow water environment, varying depending on the species taken into account. The minor depth was given to *P. cf. P. tschoppi* (0.2 - 2.00m) living in the Veracruz- Anton Lizardo reefs, Mexico (Krutak, 1982) and the maximum to *P. tschoppi* (18-224m) registered by Purper & Ornellas (in press) in the northern / northwestern Brazilian continental shelf, having its greater abundance between 40-70 meters. Bonaduce, Masoli & Pugliese (1976) register (p.375) *P. aqabaensis* and *P. eilatensis* to 370m and juveniles until 600m in the Gulf of Aqaba (Red Sea) but they presume (p.404) that the samples deeper than 300m are particularly contaminated, considering those specimens as if they had been transported.

About the substrate, it seems to have a preference for the carbonate platforms and bioherms. *P. tschoppi* van den Bold, 1946 and *P. ed*

wardsi Teeter, 1975 in the Belize shelf (Teeter, 1975); *P. sp.cf. P.vandenboldi* Puri, 1953 in the Pleistocene fauna of South Florida (Kontrovitz, 1978); *P. inflata* sp.nov., *P. reticulata* sp.nov., and *P. spinosa* sp.nov., *P. tschoppi* van den Bold, 1946 and *P. batei* Purper & Ornellas (in press) in the northern/northwestern Brazilian continental shelf have been mentioned as occurring in carbonate sediments. *P. tschoppi* in the biota of the West Flower Garden Bank (Maddocks, 1974), *P. pseudoremanei* Bonaduce, Masoli, Minichelli & Pugliese, 1980 in the Gulf of Aqaba (Red Sea) and *P. cf. P. tschoppi* in the Veracruz-Anton Lizardo reefs, Mexico (Krutak, 1982) have a direct association with coral reef, (salinity 23,4 to 30,9‰), while Benson (1959) found *P. granti* LeRoy in Todos Santos Bay, Baja California, Mexico, in bottom types from coarse gravel and sand on the southwestern side of islands to very fine sand in the north eastern area of the bay. A direct association with a marine algae was mentioned by Bate, Whittaker & Mayes (1981) to *P. pinea* in Fernandina and Hood Islands and Mosquera Islet (Galapagos Islands).

With respect to the species of the present work, no temperature or salinity measurements were taken, but a normal marine salinity can be assumed for they are no tidal species.

The distribution of the recent species suggests that the species of this genus, with few exceptions, has their larger occurrence in normal marine salinity waters, occurring in the belt of a tropical or subtropical climate regime.

SYSTEMATIC

Sub Classis Ostracoda Latreille, 1806
Ordo Podocopida Müller, 1894
Sub-Ordo Podocopina Sars, 1866
Super-Familia Cytheracea Baird, 1850
Familia Cytheruridae Müller, 1894

Genus *Paracytheridea* Müller, 1894

Paracytheridea inflata Purper et Ornellas sp.nov.
Pl.1, fig.1-12

Derivatio nominis: due to the tumid shape of the carapace

Holotypus: Female, left valve MP-0-1075

Paratypi: Females, males and juvenile instars MP-0-1076 to MP-0-1083

Locus typicus: REMAC Project Leg 5A, sample 3562 Lat.3°22'N; Long.

48°53'W northern/northwestern Brazilian continental shelf.

Stratum typicum: Recent

DIAGNOSIS Tumid, stout carapace; low ridges. Median ridge runs gently, crossing through antero-median portion, ending in the postero-median region. Circular ridge surrounding the subcentral tubercle.

DESCRIPTION Carapace subrectangular in lateral view; ovate in dorsal view; anterior margin regularly rounded and posterior with the caudal process of the right valve ending in a more acute angle than that of the left one; dorsal margin straight; strongly flattened ventrally; ocular tubercle inconspicuous; in dorsal view alar processes parallel to each other, covering more than 2/3 of the length; small spine-like protuberance between the caudal process and the wing. Valves with low ridges running gently through anterior/posterior regions. The median one with a terminal downward inflection; gentle reticulations over the swollen posterodorsal area. No hinge-ear. Hinge with serrate small anterior tooth and a biggest posterior one in the right valve. Median bar, in the left valve, heavily crenulate. Muscle scars difficult to observe due to heavy ornamentation, but four central scars and one rounded anteriorly could be seen (Pl.1, fig.3). Wide duplicature without vestibule. Radial pore canals scarce. Females more inflated and greater than the males.

DIMENSIONS: Female left valve MP-0-1075: L 0.653; H 0.38. Female right valve MP-0-1076: L 0.608; H 0.319; Carapace MP-0-1079: L 0.608; H 0.319; W 0.410; Male left valve: MP-0-1078: L 0.554; H 0.296; Male right valve MP-0-1077: L 0.532; H 0.266; Right valve MP-0-1080: L 0.577; H 0.296; Left valve MP-0-1081: L 0.592; H 0.304; Juvenile left valve MP-0-1082: L 0.39; H 0.205; Juvenile right valve MP-0-1083: L 0.39; H 0.197.

DISCUSSION *Paracytheridea inflata* sp.nov. has some similarity to *P. reticulata* sp.nov. as both have the tumid and stout aspect. However, *P. inflata* has low ridges with the main one running to the posterior region, while in *P. reticulata* the ridges are more nitid and the main one runs to the dorsal region. Unlike *P. reticulata*, *P. inflata* has no reticulate surface and no evident eye-spot. In dorsal view *P. inflata* presents the alar process almost straight, while *P. reticulata* has it sinuous, with the terminal point outside directed.

DISTRIBUTION Brazilian continental shelf, northern/northwestern region.
REMAC Project Leg 4 - samples 3364(128m); 3368(33m).
REMAC Project Leg 5 - samples 3433(21m); 3459(31m);
REMAC Project Leg 5A - samples 3562(95m); 3581(37m).
REMAC Project LEg 6 - samples 3601(51m); 3606(71m); 3607(70m); 3608(66m);

3609(55m); 3610(55m); 3611(55m); 3612(55m); 3616(40m); 3636(55m); 3637(55m); 3646(44m); 3679(11m); 3685(49m); 3686(113m); 3689(51m); 3690(80m); 3699(35m); 3700(33m); 3704(57m); 3705(62m); 3706(26m); 3709(18m); 3721(68m); 3724(13m); 3743(15m).

REMAC Project Leg 7 - sample 3763(25m).

GOMAR III - samples G-148(60m); G-149(59m); G-150(84m); G-151(92/84m); G-152(125m); G-153(85m); G-166(68m); G-169(170/114m); G-185(90/86m); G-186(84/88m); G-188(88m); G-189(77/69m); G-203(71m); G-213(113m); G-215(132/122m); G-217(101m); G-218(92m); G-2469(70m); G-2471(86m); G-2528(60m).

Paracytheridea inflata has a depth range 11-170m with a greater abundance between 31/80m, occurring in the carbonate facies.

MATERIAL 177 valves and 2 adult carapaces including males, females and juvenile instars.

Paracytheridea reticulata Purper et Ornellas, sp.nov.

Pl.2, fig.1-10

Derivatio nominis: due to the reticulation of the valves

Holotypus: Left valve MP-0-1084

Paratypi: Right and left valves of adult and juvenile instars MP-0-1085 to MP-0-1089

Locus typicus: REMAC Project Leg 6, sample 3686 Lat.02°07'S; Long. 40°28'W northern/northwestern Brazilian continental shelf.

Stratum typicum: Recent

DIAGNOSIS Tumid carapace with reticulate surface. High ridges; the main one bifurcates medially, reaching upwardly the posterodorsal swelling in an oblique line.

DESCRIPTION Carapace subrectangular in lateral view; anterior margin regularly rounded, posterior one with triangular caudal process in the right valve; subtruncate in the left valve. Dorsal margin sinuous due to the posterodorsal swelling in the right valve and eye tubercle in the left valve; strongly flattened ventrally. Alar process covering 2/3 of the length and, in dorsal view, sinuous with the terminal point outside directed. Valves with particularly evident ridges and reticulations. Antero-median ridge bifurcates reaching upwardly the posterodorsal swelling and the alar process downwardly. Eye Tubercle and hinge-ear present, more evident in the left valve. Hinge with posterior tooth bigger than the anterior, in the right valve; median bar, in the left valve, heavily crenulate. Muscle scars not clear, being very difficult to observe

due to heavy ornamentation. Wide duplicature without vestibule. Radial pore canals scarce. Sexual dimorphism not observed.

DIMENSIONS Left valve MP-0-1084: L 0.592; H 0.326; Right valve MP-0-1085 L 0.577; H 0.304; Right valve MP-0-1086 L 0.562; H 0.288; Left valve MP-0-1087 L 0.592; H 0.334; Juvenile left valve MP-0-1088: L 0.501; H 0.266; Juvenile right valve MP-0-1089: L 0.471; H 0.243

DISCUSSION *Paracytheridea reticulata* sp.nov. has some similarity to *P. inflata* mainly in the tumid and stout shape. Details about the differences are given in the discussion of *P. inflata*.

DISTRIBUTION Brazilian continental shelf, northern/northwestern region. REMAC Project Leg 5A - samples 3559(15m); 3562(95m); 3607(70m); 3686(113m); 3705(62m).

Paracytheridea reticulata has a depth range 15-113m with a greater abundance at 113m, in the carbonate facies.

MATERIAL 24 adult valves and few juvenile instars.

Paracytheridea spinosa Purper et Ornellas sp.nov.

Pl.3, fig.1-13

Derivatio nominis: due to the spine-like structure of the ridges

Holotypus: Left valve MP-0-1090

Paratypi: Right and left valves of adult and juvenile instars

MP-0-1091 to MP-0-1096

Locus typicus: REMAC Project Leg 6 - sample 3605 Lat.00°28'N, Long. 45°27'W northern Brazilian continental shelf

Stratum typicum: Recent

DIAGNOSIS Ridges not continuous, ending in spines. Antero-median ridge ending in the subcentral tubercle in a V-shape. Horseshoe ridge above the anterior crenulate socket.

DESCRIPTION Carapace elongate, in lateral view; anterior margin obtusely rounded and posterior ending with an acute dorsal caudal process much pointed in the right valve; dorsal margin almost straight with exception of the prominent anterior hinge-ear very well developed in the left valve; alar process acuminate and arrowhead-shaped, very much expanded laterally. Valves with discontinuous ridges, ending in spine-like structure. Delicate reticulation between the ridges. Antero-median ridge ends in the subcentral tubercle in a V-shape. Spine-like ridges much developed in the

posterodorsal swelling (pl.3, fig.6). Horsehoe ridge above the anterior crenulate socket. Well developed spine near the caudal process and a blade-shaped structure below the wing. Hinge with elongate, crenulate anterior tooth in the right valve, smaller than the posterior one; median bar, in the left valve, heavily crenulate. Muscle scars not clear, being very difficult to observe due to the heavy ornamentation but four central and one anterior scars could be seen. Sexual dimorphism not observed.

DIMENSIONS Left valve MP-0-1090: L 0.577; H 0.311; Right valve MP-0-1091 L 0.547; H 0.288; Left valve MP-0-1092: L 0.547; H 0.304; Right valve MP-0-1093: L 0.539; H 0.273; Left valve MP-0-1094: L 0.577; H 0.334; juvenile Left valve MP-0-1095: L 0.471; H 0.235; juvenile right valve MP-0-1096: L 0.440; H 0.228.

DISCUSSION The surface ornamentation, with discontinuous spine-like ridge, is very particular in *Paracytheridea spinosa* sp.nov., being distinguished from any species of the genus. The outline of the right valve is the only aspect similar to (the right valve of) *Paracytheridea pseudoremanei* Bonaduce, Masoli, Minichelli & Pugliese, 1980, but the ornamentation surface and the posterodorsal inflation are quite different.

DISTRIBUTION Brazilian continental shelf, northern region.

REMAC Project Leg 6 - samples 3605(76m); 3606(71m); 3607(70m); 3608(66m); 3609(55m); 3612(55m); 3672(60m); 3686(113m); 3689(51m); 3734(62m).

GEMAR III - samples G-148(60m); G-149(59m); G-185(90/86m); G-187(90m); G188(88m); G-189(77/69m); G-200(92m); G-203(71m); G-211(224/183m); G-2471(86m); G-2522(84/87m).

Paracytheridea spinosa sp.nov. has a depth range 55-224m with a greater abundance between 60-90m, occurring in the carbonate facies.

MATERIAL 141 valves, including adult and juvenile instars.

ECOLOGICAL COMMENTS ON THE *PARACYTHERIDEA* OF THE NORTHERN/NORTHWESTERN BRAZILIAN COAST

Paracytheridea tschoppi van den Bold, 1946, *P. batei* Purper et Ornellas (in press), *P. inflata* sp.nov., *P. reticulata* sp.nov. and *P. spinosa* sp.nov. occur in the northern/northwestern Brazilian continental shelf in carbonate deposits, particularly along the continuous external platform.

Water depth ranges from 11 to 224m and the preferential depth of the species seems to be between 30/90m, with exception of *P. reticulata*, found at 113m in greater number.

The genus, in the studied region, is associated to 40 genera and, among 91 samples (from Leg 6 which is the most representative one), *Paracytheridea* is the most frequent, occurring in 50 samples. Another genera very well represented, associated to *Paracytheridea* are: *Paranesidea* (46 samples), *Xestoleberis* (44 samples), *Coquimba* (37 samples), *Neonesidea* and *Puriana* (34 samples), *Mutilus*, *Cytherelloidea* and *Caudites* (29 samples), *Loxoconcha* and *Macrocyprina* (28 samples), *Semicytherura* (25 samples), *Argilloecia* (20 samples), *Callistocythere*, *Echinocythereis* and *Triebelina* (18 samples). In a minor number: *Kangarina* and *Hemicytheridea* (16 samples), *Propontocypris* (15 samples), *Cytheropteron* and *Paracypris* (14 samples), *Henryhowella* (11 samples), *Phlyctocythere* (8 samples), *Pellucistoma* and *Cytherella* (7 samples), *Buntonia*, *Cativella* and *Monoce ratina* (6 samples), *Cushmanidea* (5 samples), *Microcythere* and *Pterygocythereis* (4 samples), *Krithe* (3 samples), *Sclerochilus* and *Tracheleberis* (2 samples), *Bythocythere*, *Cytherura*, *Eucytheridea*, *Orionina*, *Paradoxostoma* and *Perissocytheridea* (1 sample).

Comparing this association with those registered both to the Atlantic and Pacific tropical, and subtropical belt, a greater similarity with those of the Atlantic was observed, having with it a greater number of common genera, occurring in similar substrate. This fact was noted by Chukewiski & Purper (1985b) when the study of *Puriana*, suggesting that the Caribbean faunule might extend as far as the north/northwest coast of Brasil.

CONCLUSIONS

1. *Paracytheridea*, in the northern/northwestern Brazilian continental shelf is represented by *P. tschoppi* van den Bold, 1946, *P. batei* Purper et Ornellas (in press), *P. inflata* sp.nov., *P. reticulata* sp.nov. and *P. spinosa* sp.nov. Their occurrence is related to the carbonate sediments and are confined to the tropical/subtropical climate regime.
2. The association presents greater proximity to the Caribbean faunule rather than to the Pacific one.

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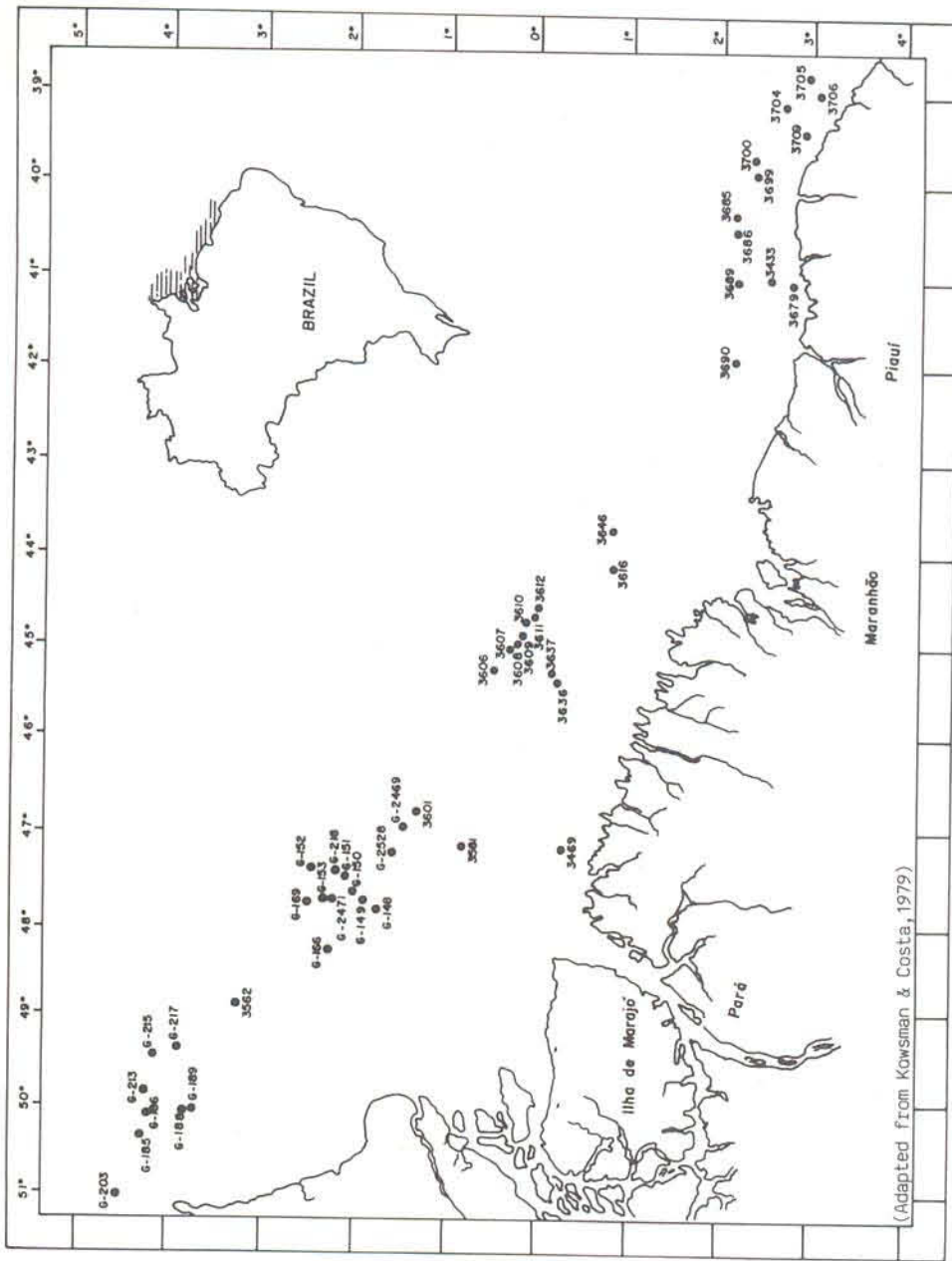


Fig. 1 - Map of occurrence of *Paracytheridea inflata* Purper et Ornellas, sp. nov. (Part 1)

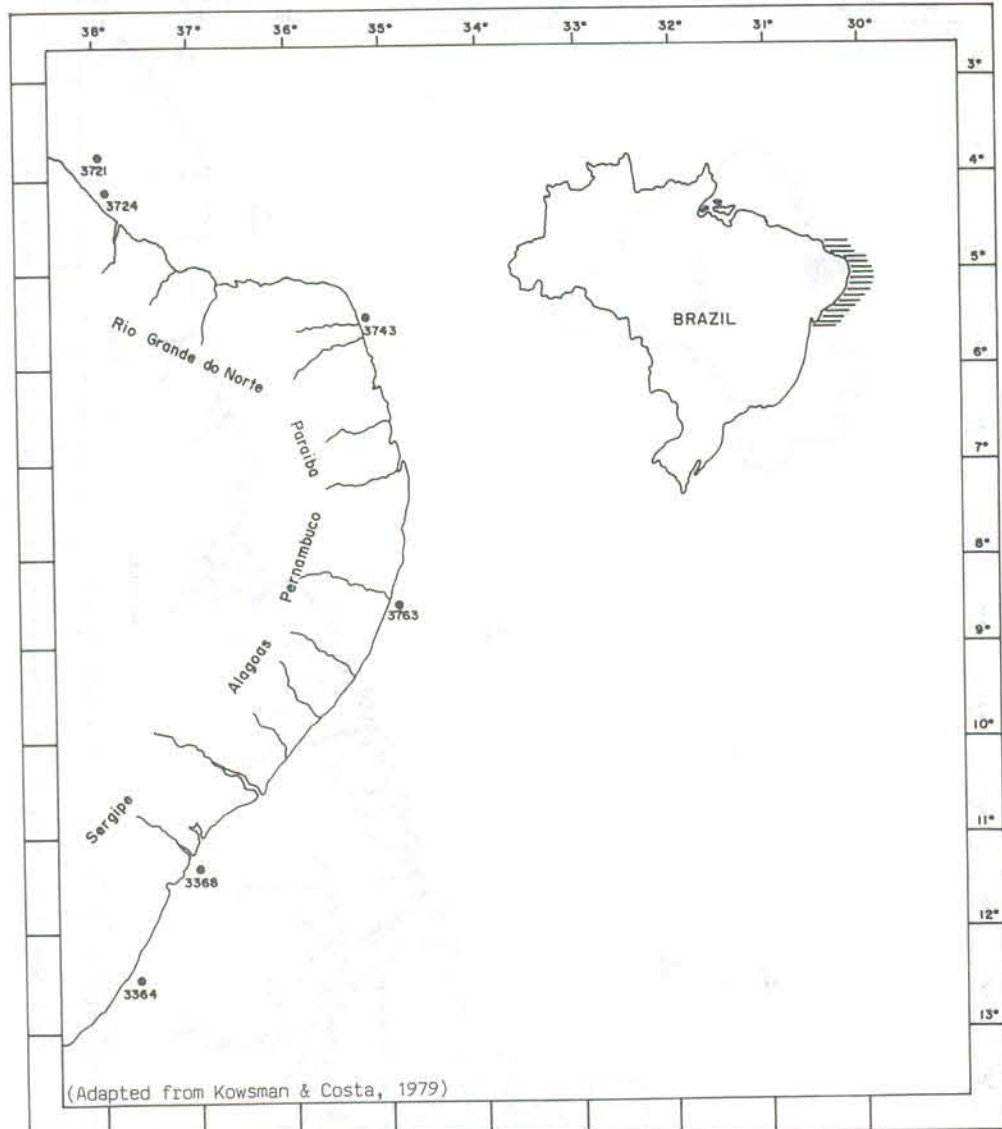


Fig. 2 - Map of occurrence of *Paracytheridea inflata* Purper et Ornellas, sp.nov. (Part 2)

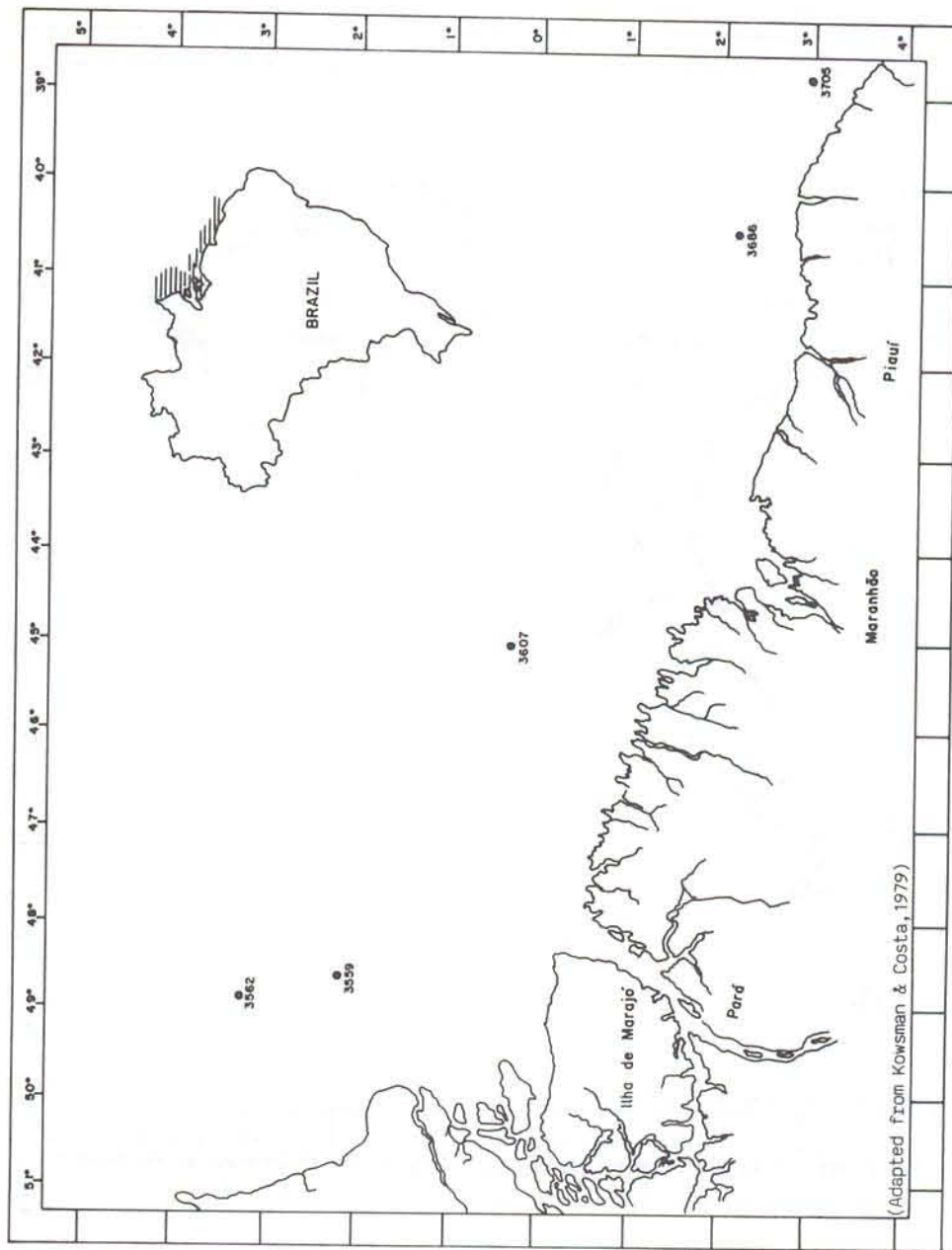


Fig. 3 - Map of occurrence of *Paracytheridea reticulata* Purper et Ornellas, sp. nov. (Part 1)

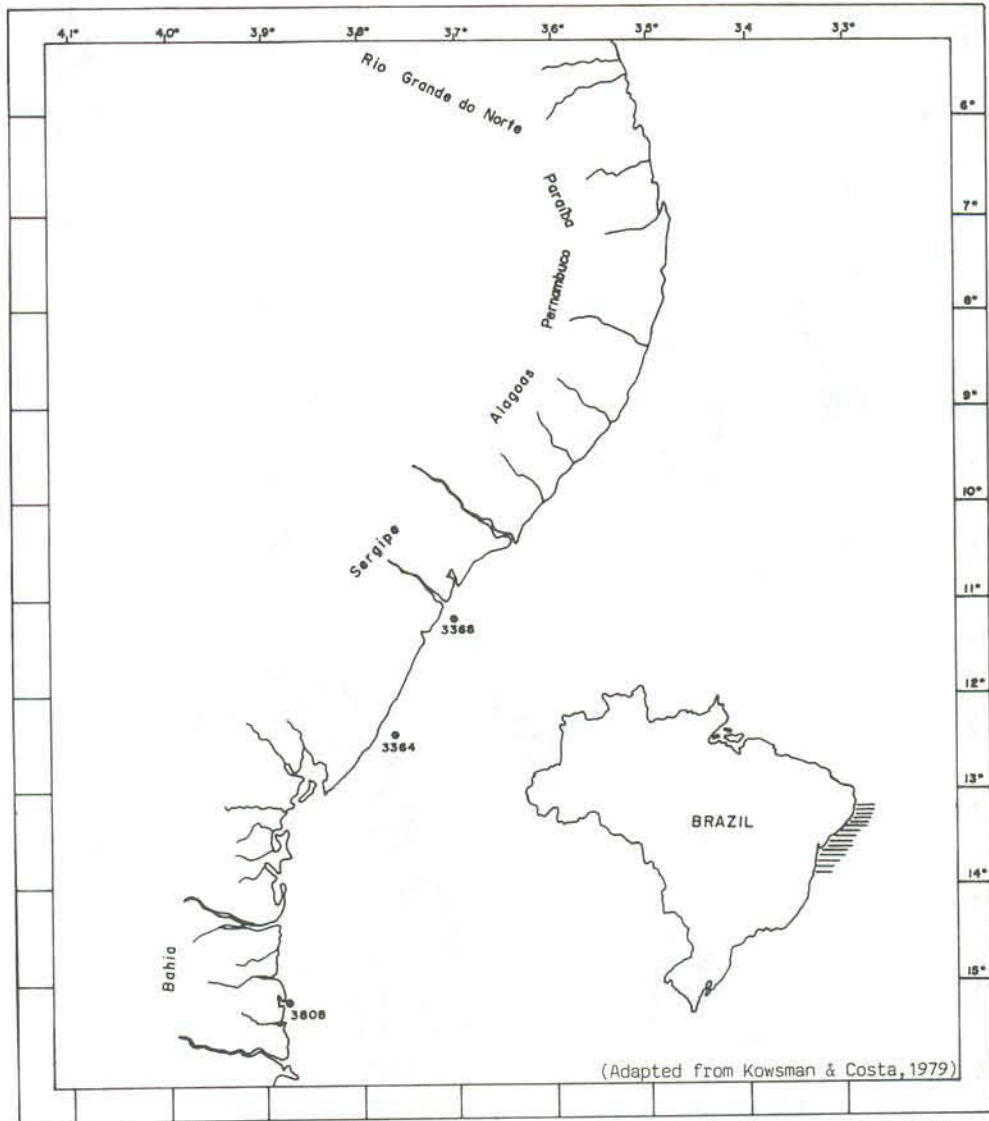


Fig. 4 - Map of occurrence of *Paracytheridea reticulata* Purper et Ornellas, sp. nov. (Part 2)

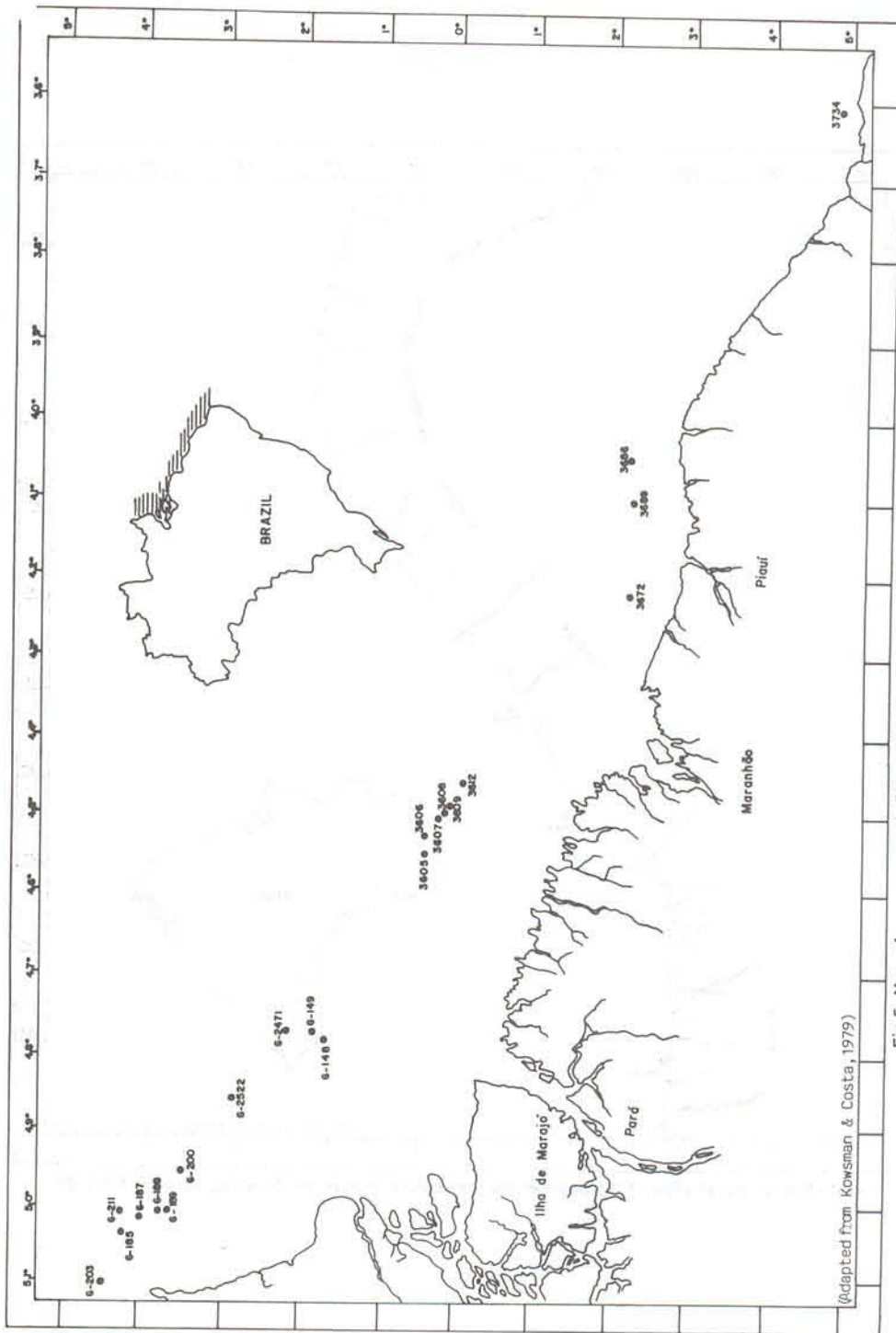


Fig. 5 - Map of occurrence of *Paracytheridea spinosa* Purper et Ornelas, sp. nov.

Plate 1

Paracytheridea inflata Purper et Ornellas sp.nov.
Northern/northwestern Brazilian continental shelf

- Fig. 1 Female left valve MP-0-1075 Sample 3562 Leg 5A
- Fig. 2 Female right valve MP-0-1076 Sample 3606 Leg 6
- Fig. 3 Muscle scars of a female right valve MP-0-1076
- Fig. 4 Male right valve MP-0-1077 Sample 3608 Leg 6
- Fig. 5 Male left valve MP-0-1078 Sample 3433 Leg 5
- Fig. 6 Carapace in dorsal view MP-0-1079 Sample G-149 GEOMAR III
- Fig. 7 Internal view of a right valve MP-0-1080 Sample 3704 Leg 6
- Fig. 8 Internal view of a left valve MP-0-1081 Sample 3704 Leg 6
- Fig. 9 Hinge elements of the right valve MP-0-1080
- Fig. 10 Hinge elements of the left valve MP-0-1081
- Fig. 11 Left valve of a juvenile MP-0-1082 Sample 3608 Leg 6
- Fig. 12 Right valve of a juvenile MP-0-1083 Sample 3608 Leg 6

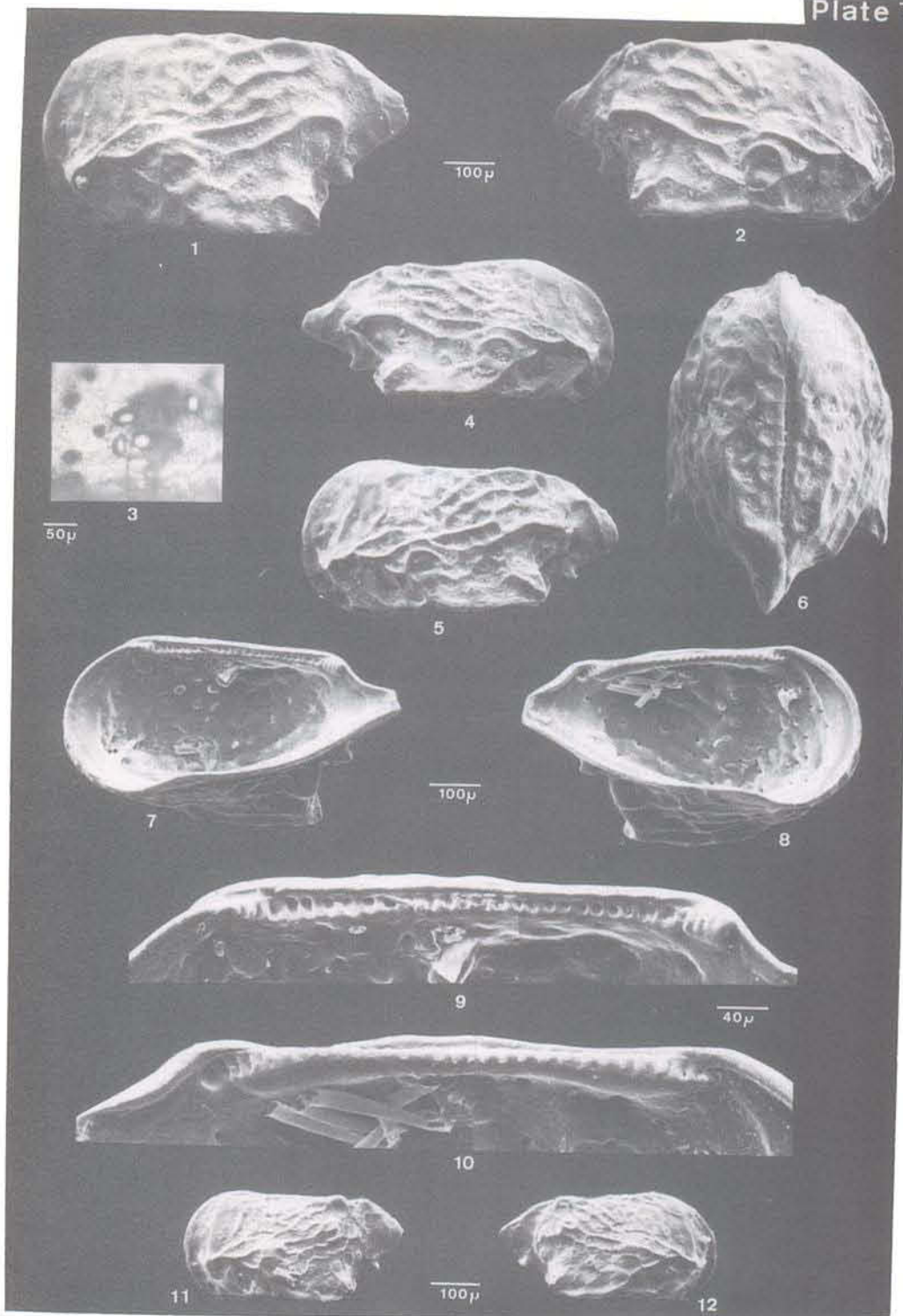
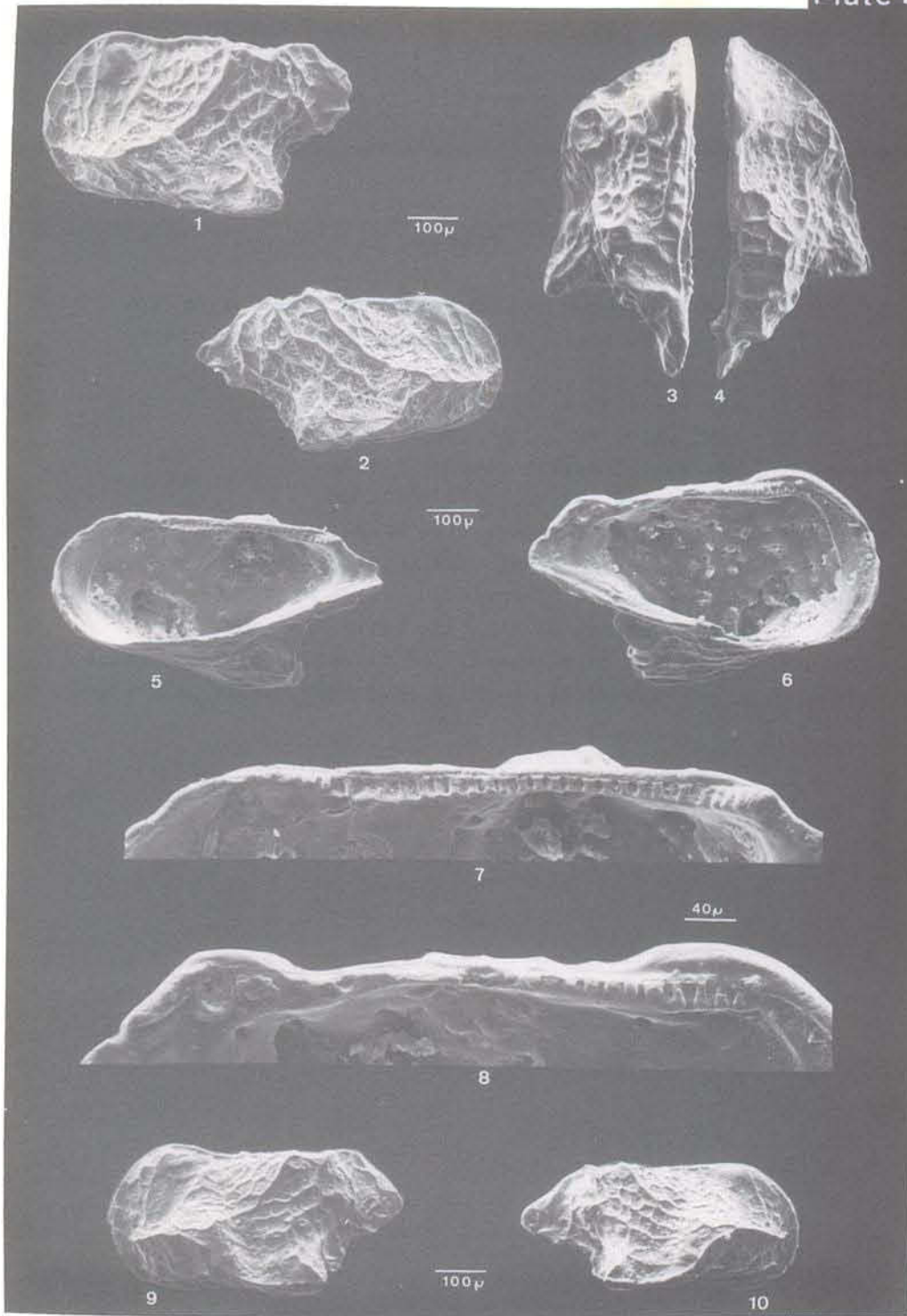


Plate 2

Paracytheridea reticulata Purper et Ornellas sp.nov.
Northern/northwestern Brazilian continental shelf

- Fig. 1 Left valve MP-0-1084 Sample 3686 Leg 6
- Fig. 2 Right valve MP-0-1085 Sample 3686 Leg 6
- Fig. 3 Left valve, dorsal view MP-0-1084
- Fig. 4 Right valve, dorsal view MP-0-1085
- Fig. 5 Right valve, internal view MP-0-1086 Sample 3686 Leg 6
- Fig. 6 Left valve, internal view MP-0-1087 Sample 3686 Leg 6
- Fig. 7 Hinge elements of the right valve MP-0-1086
- Fig. 8 Hinge elements of the left valve MP-0-1087
- Fig. 9 Left valve of a juvenile MP-0-1088 Sample 3607 Leg 6
- Fig. 10 Right valve of a juvenile MP-0-1089 Sample 3607 Leg 6



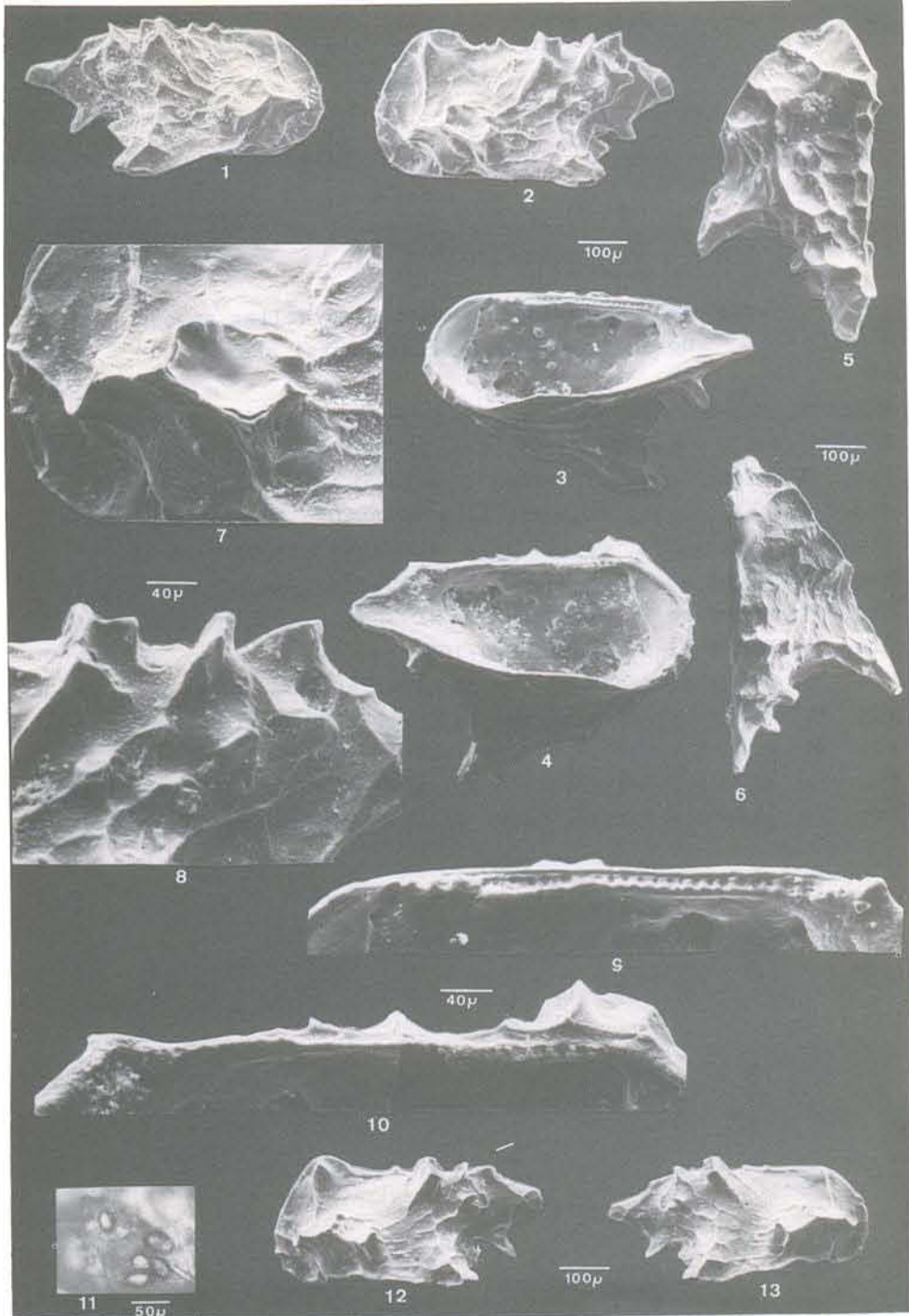


Plate 3

Paracytheridea spinosa Purper et Ornellas sp.nov.
Northern Brazilian continental shelf

- Fig. 1 Right valve MP-0-1091 Sample 3721 Leg 6
- Fig. 2 Left valve MP-0-1090 Sample 3605 Leg 6
- Fig. 3 Right valve, internal view MP-0-1091
- Fig. 4 Left valve, internal view MP-0-1094 Sample 3606 Leg 6
- Fig. 5 Left valve, dorsal view MP-0-1092 Sample 3609 Leg 6
- Fig. 6 Right valve, dorsal view MP-0-1093 Sample 3605 Leg 6
- Fig. 7 Anterior V-shape ridge MP-0-1090
- Fig. 8 Spine-like ridges MP-0-1090
- Fig. 9 Hinge elements of the right valve MP-0-1091
- Fig. 10 Hinge elements of the left valve MP-0-1094
- Fig. 11 Muscle scars of a left valve MP-0-1094
- Fig. 12 Juvenile instar, left valve MP-0-1095 Sample 3608 Leg 6
- Fig. 13 Juvenile instar, right valve MP-0-1096 Sample 3608 Leg 6