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Pesquisas em Geociências, 19 (1): 94-105, Set./Dez., 1992.

Versão online disponível em:
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Publicado por
Instituto de Geociências

Data de publicação - Set./Dez., 1992.
Instituto de Geociências, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil

PESQUISAS, 19 (1): 94-105, 1992
ISSN 0100-5375

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Sub-Recent Ostracodes of the Tamandaré Bay, Northeastern Brazil - A Preliminary Report on Biofacies

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(Recebido em 12/06/92. Aceito para publicação em 18/09/92.)

Abstract — The study of sub-recent ostracodes from the Tamandaré Bay, Pernambuco State, Brazil, permitted the determination of an assemblage constituted by thirty genera and nineteen species and the record of indetermined taxa: two genera and twenty six species. Of the genera abundant in organic reefs and their associated environments, *Loxocorniculum*, *Xestoleberis*, and *Kotoracythere*, are also found here. On the other hand, *Triebelina* and *Paranesidea*, cited by other authors as characteristic of reefs, are very rare. This assemblage also allowed the recognizion of two biofacies that were compared with the foraminifer biofacies already defined for the same bay.

Resumo — O estudo dos ostracodes sub-recentes da Baía de Tamandaré, localizada no Estado de Pernambuco, permitiu a determinação de uma associação constituída de trinta gêneros e dezenove espécies e o registro de dois gêneros e vinte e seis espécies indeterminados. *Loxocorniculum*, *Xestoleberis* e *Kotoracythere*, abudantes em recifes orgânicos e ambientes associados, também ocorrem. Por outro lado, *Triebelina* e *Paranesidea*, citados por outros autores como característicos de recifes, são muito raros. Esta associação possibilitou a definição de duas biofácies que foram comparadas com três biofácies definidas anteriormente com foraminíferos, para a mesma área.

INTRODUCTION

The purpose of this paper is to determine the distribution of sub-recent ostracodes in the Tamandaré Bay (Fig. 1) and its relationships with three foraminifer biofacies and eight lithofacies proposed by Rebouças (1965/6). Although this study is concerned with "where" rather than "why" these extant taxa occur, many papers have shown the validity of taxonomic uniformitarianism at lower taxonomic levels for young rocks. Nineteen species and thirty genera were identified. Two genera and twenty-six species have yet not been determined. The preliminary analysis permitted to define the boundaries of the two major biofacies (Tbl. 3). At generic level, ostracode assemblages from this bay show close similarity to that ones found in the Central and South America Neogene sediments.

Previous studies

The study of the Brazilian marine sub-recent ostracodes started with the ostracodologists of the Instituto de Geociências, of the Universidade Federal do Rio Grande do Sul, with the analysis of the samples collected by the REMAC Project, covering 7.408 km of the coast registering the geographical range of about fifty genera (Pinto *et al.*, 1978). However, the study at specific level began with Chukewiski & Purper (1985 a, b) and Ornellas & Coimbra (1985). Up till now species have been described for the following genera: *Puriana*, *Pseudoceratina*, *Caudites*, *Paracytheridea*, *Orionina* and *Kangarina*. The species of *Actinocythereis*, *Urocythereis*, *Callistocythere* and of the Subfamily Coquimbinae have been studied by post-graduate students, but have not been published yet. Dias-Brito *et al.* (1988) presented an ecological model based on the distribution of ostracodes and foraminifers from the Sepetiba Bay, Rio de Janeiro State, but the ostracodes were identified mainly at generic level.

Description of the area

The Tamandaré Bay is located at Latitude 08°44' to 08°47'30"S and Longitude 35°05' to 35°07'W. It covers an area of about 3 km^2 and is a relatively well-rounded harbour, with an average depth of 7 meters (at most 10 meters). This bay is separated from the open sea by a line of organic reefs, which form a natural breakwater (Fig. 1). The climate of this region is warm and wet, with temperatures ranging from 25° to 30°C.

The lithofacies were defined by Rebouças (1965/6). The terrigenous deposits are practically restricted to the coast, while the bioclastic elements, derived from the marine contributions make up, almost entirely, the bottom deposits. Figure 1 shows the distribution of the eight lithofacies according to Rebouças. The marine salinity over the bottom of the Tamandaré Bay is consistently normal.

The extant life in this bay is very abundant: calcareous algae (chiefly *Halimeda*), briozoans, molluscs, corals, foraminifers, ostracodes, and many other micro and macroorganisms. Rebouças (*op. cit.*) identified the next three biofacies with foraminifers controlled by the sedimentary texture. The first one is restricted to terrigenous sand and terrigenous sand with biodetritus lithofacies. It has a very poor fauna consisting of *Pyrgo*, *Textularia*, *Quinqueloculina* and *Streblus*. The second one, found in the central part of the bay, is common to biodetritical sand with terrigenous and biodetritical very fine sand lithofacies and it is characterized by the following genera: *Elphidium*, *Bolivina*, *Spirillina*, *Discorbis*, *Nonion*, *Streblus*, and *Quinqueloculina*. The third one is near the organic reefs and presents the richest foraminifer association. *Amphisorus* is restricted to these medium and coarse biodetritic sands; *Peneroplis*, *Triloculina*, *Quinqueloculina*, *Nonion*, *Textularia*, *Streblus*, and *Discorbis* are common. The number of specimens of this biofacies is bigger when compared with the other two (Tbl. 4).

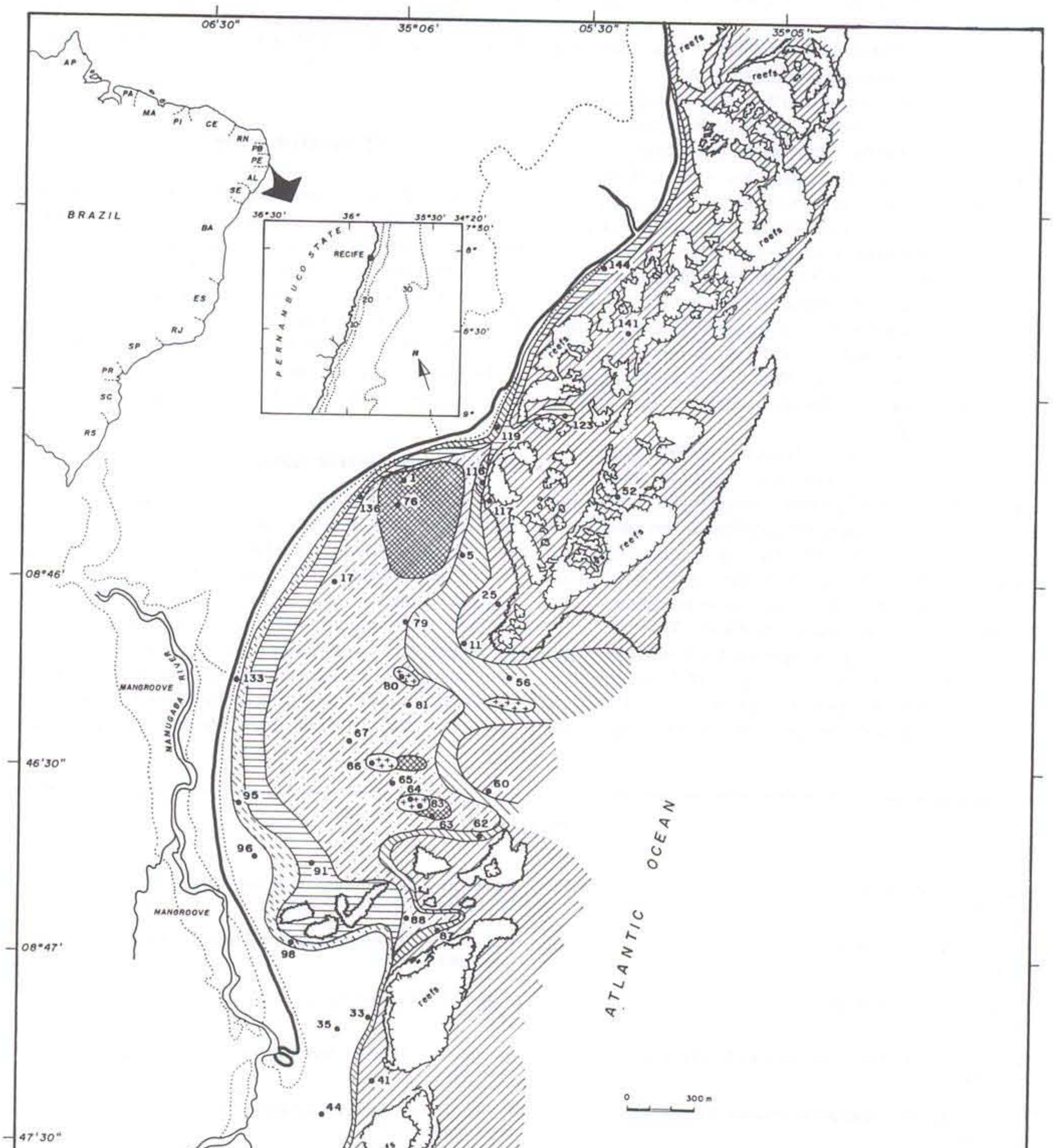


Figure 1 — Lithofacies map and ostracode samples location (adapted from Rebouças, 1965/6)

- Biodetritic sand ooze (BSO)
- Biodetritic muddy sand (BAS)
- Terrigenous sand (TS)
- Terrigenous sand with biodetritus (TSB)
- Biodetritic sand with terrigenous (BST)
- Biodetritic very fine sand (BVFS)
- Biodetritic medium sand (BMS)
- Biodetritic coarse sand (BCS)

MATERIAL AND METHODS

The material used in this study was collected by Diretoria de Hidrografia e Navegação (DHN) da Marinha do Brasil and by the Instituto Oceanográfico da Universidade Federal de Pernambuco. The sampling was done with a clamshell-snapper grab.

Unfortunately, only thirty seven samples were available for the present study which includes three barren samples and four with only allocthonous juvenile specimens (Fig. 1). All ostracodes were picked from dry sediments weighing from three up to six grammes, and mounted by conventional micropaleontological techniques. Occurrence of species were recorded in terms of single valves and these were plotted on Table 1. In order to avoid repetition in the tabulation, only adult specimens were used in this phase of the study.

The total populations of adult ostracodes in the sample range from 1 to 122. Most populations are rather small; remarkable exceptions to this are the stations 05, 11, 76 and 116.

A series of criteria (Whatley, 1988) applied in distinguishing authoctonous and allocthonous assemblages among sub-recent ostracodes, show that some post-mortem transportation has taken place, and that some sub-recent assemblages do not represent the living assemblages from which they were originated. When this phenomenon occurs these specimens have not been used for delineating biofacies (Tbl. 1).

The constancy of the species has been calculated by the following formula: C = p . 100/P, where p = number of samples where the species occur; P = total number of analysed samples. On the other hand, the dominance has been calculated by the formula: D = t . 100/T, where t = total specimens of each species; T = total number of specimens (Tbl. 2).

The ostracodes specimens of the present study are deposited in the Museu de Paleontologia da Universidade Federal do Rio Grande do Sul, Ostracoda, under numbers MP-O-1367 to MP-O-1411.

OSTRACODE BIOFACIES

The ostracode distribution data in the Tamandaré Bay show that the assemblages represent two major biofacies which include (1) a terrigenous coarse sand with very rare assemblages, and (2) a carbonate one where the ostracode diversity and abundance are bigger. This second biofacies may be further subdivided on the basis of minor faunal differences. Unfortunately, in view of the little number of samples, it has not been possible to define the subdivision of the carbonate biofacies.

Biofacies A - Terrigenous

This biofacies (Tbl. 3) is distributed along the coast and is made up of coarse and medium size sand (TS) and terrigenous sand with biodetritus (TSB), generally barren of ostracodes. The samples were collected from a depth ranging from 0.9 to 3.8m. *Triebelina sertata* Triebel, 1948, an abundant species in reef areas, is restricted to this biofacies and represented by very rare specimens. *Macrocyprina* sp. and *Coquimba* sp. have one third of its specimens in Biofacies A. *Keijcyoidea praecipua* (Bold, 1963) and *Paracytheridea* spp., abundant

Plate 1

Figure 1 — *Xestoleberis* sp. 1
Left valve.

Figure 2 — *Xestoleberis* sp. 2
Left valve.

Figure 3 — *Xestoleberis* sp. 3
Left valve.

Figure 4 — *Kotoracythere inconspicua* (Brady, 1880)
Left valve.

Figure 5 — *Loxocorniculum tricornatum* Krutak, 1971
Left valve.

Figure 6 — *Loxocorniculum* sp. cf. *L. lenticuloides* Swain & Gilby, 1974
Right valve.

Figure 7 — *Mutilus splendideornatus splendideornatus* Hartmann, 1974
Right valve.

Figure 8 — *Caudites obliquecostatus* Bold, 1963
Right valve.

Figure 9 — *Caudites exmouthensis* Hartmann, 1978
Left valve.

Figure 10 — *Caudites nipeensis* Bold, 1946
Left valve.

Figure 11 — *Caudites seminudus* Whatley & Keeler, 1989
Right valve.

Figure 12 — *Caudites* sp.
Left valve.

Figure 13 — *Tenedocythere transoceanica* (Teeter, 1975)
Left valve.

Figure 14 — *Orionina bradyi* Bold, 1963
Right valve.

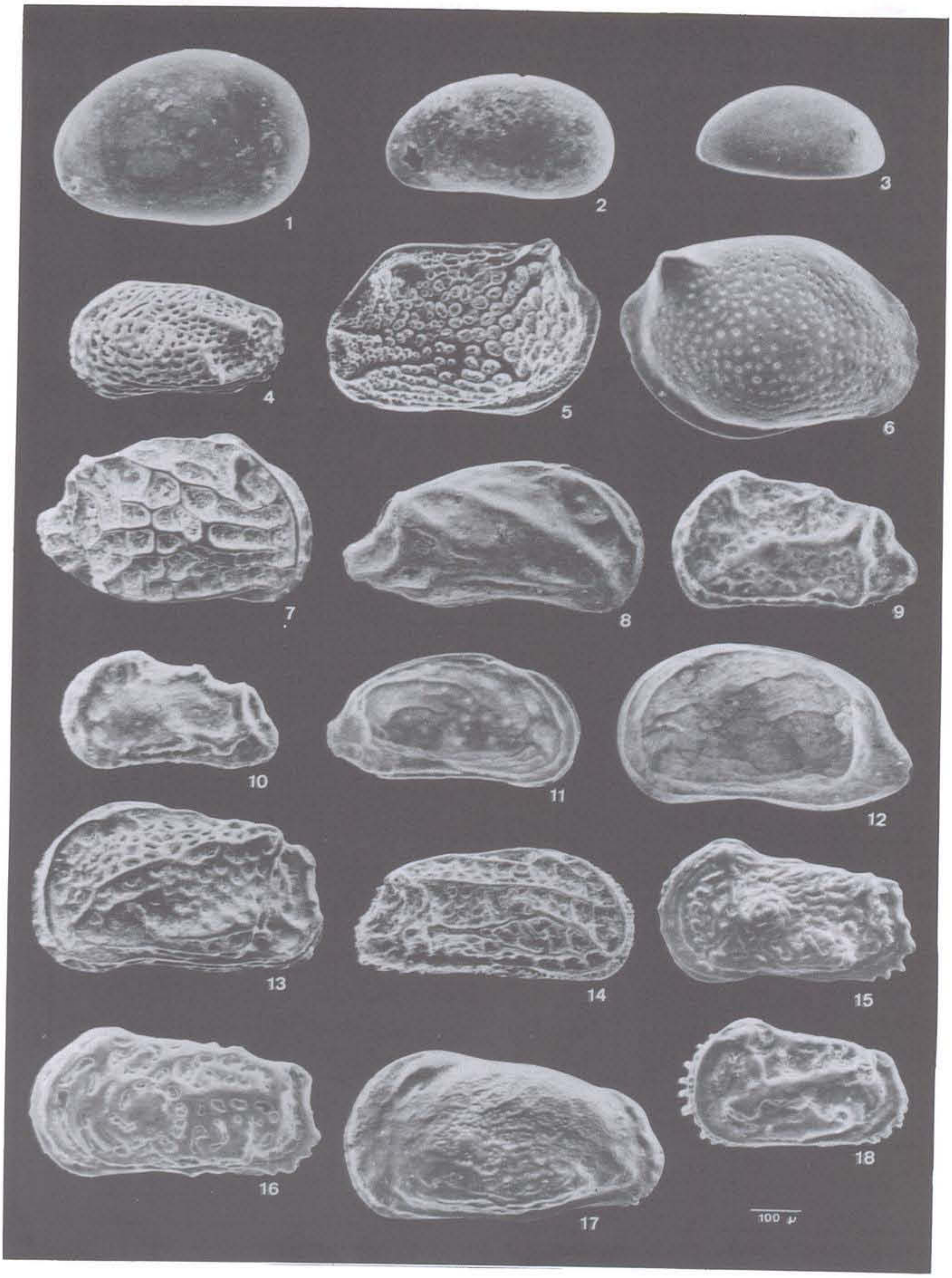
Figure 15 — *Cornucoquimba* sp.
Left valve.

Figure 16 — *Coquimba* sp.
Left valve.

Figure 17 — Gen. et sp. ind. 1
Left valve.

Figure 18 — *Neocaudites triplistriatus* (Edwards, 1944)
Left valve.

PLATE 1



in Biofacies B, can occasionally occur in Biofacies A. *Glyptobairdia coronata* (Brady, 1870) is represented by only three adult specimens from which one occurs in this biofacies.

Biofacies B - Carbonate

This biofacies (Tbl. 3) is found from the central bay area to the coral reef area. The depth ranges from 3.0 (close to a reef) to 9.4 m (going into open sea). According to Rebouças (1965/6) the reefs are formed mainly by calcareous algae and by some corals. *Halimeda* is the most abundant alga, and responsible for the major biogenic contribution to the formation of the bottom deposits. Among the corals, *Millepora*, *Mussa*, *Porites* and *Siderastrea* are outstanding live forms found on the reef side exposed to the waves.

The principal characteristics of this biofacies are the *Loxocorniculum tricornatum* Krutak, 1971 constancy and dominance, followed by *Xestoleberis* spp. and *Kotoracythere inconspicua* (Brady, 1880). *Paracytheridea* spp. and *Mutilus splendideornatus splendideornatus* Hartmann, 1974 have shown a relatively high constancy, but a low dominance (Tbl. 2).

The bairdiidae and the genus *Caudites* show great morphological variation. However, they occur in a very small number.

The carbonate biofacies, with its various substrata, great faunal diversity and relative environment stability, allows the development of different ecological niches. This makes some species dependent (or at least more abundant) to certain areas with characteristic sediment texture features. There is greater diversity (28 species) and greater number of specimens in the biodetritic

OSTRACODES / SAMPLE	01	05	11	17	25	35	41	44	48	52	56	60	62	63	64	65	66	67	76	79	80	81	83	87	88	91	95	96	98	116	117	119	123	133	136	141	144	TOTAL OF ADULT SPECIMENS
DEPTH (m)	6.9	5.1	7.7	5.5	3.7	0.9	?	?	?	?	8.5	9.4	?	8.2	7.4	7.3	6.8	6.5	6.4	7.1	7.0	8.1	8.2	?	?	3.8	1.9	2.1	0.9	3.0	3.0	3.1	?	?	?	2.7	?	
NUMBER OF ADULT SPECIMENS	66	118	101	20	48	11	0	1	–	–	4	3	17	4	0	3	28	17	122	62	21	30	3	6	11	29	0	0	5	111	–	63	10	9	1	1	11	
NUMBER OF SPECIES	20	17	15	28	16	4	1	1	–	–	18	1	10	11	2	7	16	20	22	19	22	13	13	5	10	15	1	1	17	16	–	15	9	6	6	4	21	
FAMILY XESTOLEBERIDIDAE *Xestolebis* spp.	18*	18*	33*	•	5*	•	•	–	–	–	•	–	1*	1*	–	1*	3*	1*	41*	10*	•	4*	•	2*	•	3*	–	–	1*	6*	–	6*	5*	•	•	•	6*	165
FAMILY PECTOCYTHERIDAE *Kotoracythere inconspicua*	2*	14*	4*	•	–	–	–	–	–	–	1	–	–	•	–	–	–	•	31*	1*	•	1*	•	–	4*	2*	–	–	•	31*	–	6*	–	•	•	•	6*	96
FAMILY LOXOCONCHIDAE *Loxocorniculum tricornatum*	11*	21*	28*	11*	24*	1*	–	–	–	–	•	–	4	1*	•	2*	7*	4*	4*	27*	9*	7*	•	1*	3*	16*	•	–	•	7*	–	1*	1*	–	1*	•	•	191
Loxocorniculum sp. cf. *L. lenticuloides*	2*	21*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2*	–	–	•	–	–	–	•	–	–	–	4*	–	1*	–	•	–	–	•	30
FAMILY HEMICYTHERIDAE *Mutilus splendideornatus*	5*	4*	4*	•	3*	–	–	–	–	–	•	–	2*	•	–	–	–	•	3*	12*	3*	1*	–	–	1*	1*	–	–	•	2*	–	3*	•	–	–	–	•	44
Caudites obliquecostatus	•	4*	–	•	•	–	–	–	–	–	1	–	–	–	–	•	–	•	•	–	•	2*	•	–	–	2*	–	–	•	–	–	7*	•	–	–	–	•	16
Caudites exmouthensis	–	3	–	–	2	–	–	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	•	–	–	–	–	–	–	–	–	6
Caudites nipeensis	–	2	–	–	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	•	4	–	4	–	–	–	•	•	10
Caudites seminudus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	1
Caudites sp.	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Tenedocythere transoceânica	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	•	1
Orionina bradyi	1*	3	4	•	4	–	–	–	–	–	–	–	–	–	–	•	•	•	•	–	•	–	1	–	–	•	–	–	•	27*	–	–	•	–	•	–	•	40
Coquimba sp.	–	–	–	•	•	–	–	–	–	–	•	–	2	–	–	–	–	•	•	•	1*	–	–	–	–	–	–	–	2*	8*	–	•	–	4	•	–	•	17
Cornucoquimba sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	2
Neocaudites triplistriatus	–	6	–	2	3	–	–	–	–	–	•	–	–	–	–	–	2	–	–	•	•	–	•	–	–	•	–	–	–	–	–	9	•	–	–	–	•	22
Gen. et. sp. ind. 1	4*	–	4*	•	•	–	–	–	–	–	•	–	1	•	–	•	2*	•	•	•	•	4*	•	–	•	•	–	–	•	–	–	–	–	–	–	–	–	15
FAMILY NEOCYTHERIDEIDAE *Copytus* sp.	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	3	–	5*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8
FAMILY CYTHERIDAE *Neomonoceratina mediterranea*	•	–	–	•	–	–	–	–	–	–	–	–	–	•	–	–	–	8*	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
FAMILY CYTHERURIDAE *Cytherura* sp.	3	5*	–	4*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	19
Semicytherura spp.	•	–	5	•	–	–	–	–	–	–	•	–	–	–	–	–	4*	•	9*	•	•	–	•	–	•	•	–	–	•	–	–	–	–	–	•	–	•	18
Gangamocytheridea sp. cf. *G. dyction*	9*	–	3	•	2	–	–	–	–	–	–	–	–	–	–	–	3	–	7*	1*	•	–	–	–	–	–	–	–	•	2	–	–	–	–	–	–	–	27

Table 1 — Ostracode distribution in the Tamandaré Bay. * Occurrence of adults and juvenile instars. • Occurrence of juvenile instars.

OSTRACODES / SAMPLE	01	05	11	17	25	35	41	44	48	52	56	60	62	63	64	65	66	67	76	79	80	81	83	87	88	91	95	96	98	116	117	119	123	133	136	141	144	TOTAL OF ADULT SPECIMENS
DEPTH (m)	6.9	5.1	7.7	5.5	3.7	0.9	?	?	?	?	8.5	9.4	?	8.2	7.4	7.3	6.8	6.5	6.4	7.1	7.0	8.1	8.2	?	?	3.8	1.9	2.1	0.9	3.0	3.0	3.1	?	?	?	2.7	?	
NUMBER OF ADULT SPECIMENS	66	118	101	20	48	11	0	1	–	–	4	3	17	4	0	3	28	17	122	62	21	30	3	6	11	29	0	0	5	111	–	63	10	9	1	1	11	
NUMBER OF SPECIES	20	17	15	28	16	4	1	1	–	–	18	1	10	11	2	7	16	20	22	19	22	13	13	5	10	15	1	1	17	16	–	15	9	6	6	4	21	
FAMILY PARACYTHERIDEIDAE *Paracytheridea* spp.	•	2*	5*	1*	1*	–	–	–	–	–	4	–	5*	2*	–	•	•	•	•	5*	3*	3*	1*	•	1*	1*	–	–	2*	6*	–	4*	•	2	–	1*	5*	54
FAMILY TRACHYLEBERIDIDAE *Puriana variabilis*	–	4	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	•	–	•	•	–	–	–	–	–	–	–	•	9*	–	18	4	–	–	–	•	35
Cletocythereis sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	1
Echinocythereis ? sp.	–	–	•	–	–	–	–	–	–	–	•	3	1	–	–	–	–	•	–	•	1	–	–	–	2*	–	–	–	–	–	–	–	–	–	–	–	•	7
Gen. et sp. ind. 2	2*	–	–	•	•	–	–	–	–	–	–	–	–	•	–	–	–	•	4*	–	•	1	–	–	•	2*	–	–	–	1*	–	–	–	–	–	–	–	10
FAMILY LEPTOCYTHERIDEIDAE *Keijia demissa*	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2*	–	–	–	–	–	–	•	–	–	•	4	–	–	–	–	–	–	–	6
Callistocythere sp.	2*	–	2	1*	–	–	–	–	–	–	–	–	–	–	–	–	3*	•	–	–	–	2*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10
FAMILY PARADOXOSTOMATIDAE *Paradoxostoma* sp.	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	•	•	•	–	–	–	–	–	–	–	–	–	–	•	–	–	–	–	–	–	•	1
Pellucistoma sp.	•	–	–	1	–	–	–	–	–	–	–	–	•	–	–	•	–	–	5*	–	–	•	–	–	–	2*	–	•	–	–	–	–	•	–	–	–	–	8
FAMILY MACROCYPRIDIDAE *Macrocyprina* sp.	–	–	2*	•	–	8*	–	–	–	–	•	–	2	•	–	–	–	2*	•	5	1	3*	1*	–	•	–	–	–	–	–	–	–	–	–	–	–	–	24
FAMILY BAIRDIIDAE *Neonesidea* sp1	1*	–	2*	1*	4*	–	–	–	–	–	•	–	–	•	–	–	•	–	•	•	•	–	–	–	–	–	–	–	•	•	–	–	–	–	–	–	–	8
Neonesidea sp2	4	4*	–	•	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8
Glyptobairdia coronata	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	3
Paranesidea sp.	–	–	–	1*	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Paranesidea sp. cf. *P. bensoni*	–	4*	3*	•	•	–	–	–	–	–	–	–	1	–	•	–	•	1*	–	•	2*	1*	1*	–	–	•	–	–	•	–	–	1*	–	•	–	–	–	13
Triebelina sertata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	1	–	–	–	–	3	–	–	–	4
FAMILY CYTHERELLIDAE *Keijcyoidea praecipua*	–	2*	2	•	–	2	–	–	–	–	•	–	•	–	–	–	–	•	–	1*	1*	–	•	2	•	–	–	–	1	•	–	–	–	–	–	–	•	11
FAMILY PONTOCYPRIDIDAE *Argilloecia* sp1	2*	1	–	•	•	–	–	–	–	–	•	–	–	–	–	•	–	–	2*	•	•	2*	•	1*	–	–	–	–	–	–	–	1*	–	–	–	–	–	9
Argilloecia sp2	–	1	–	–	–	–	–	–	–	–	–	–	1*	–	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2

Table 1 – (continuation)

medium sand (BMS) that occurs near the reefs. *Kotoracythere inconspicua* (Brady, 1880), *Loxocorniculum* sp. cf. *L. lenticuloides* Swain & Gilby, 1974, *Neocaudites triplistriatus* (Edwards, 1944), *Orionina bradyi* Bold, 1963, *Puriana variabilis* Chukewiski & Purper, 1985, *Paranesidea* sp. cf. *P. bensoni* Teeter, 1975 are much more abundant in this lithofacies. *Caudites exmouthensis* Hartmann, 1978, *Caudites nipeensis* Bold, 1946, *Caudites* sp. and *Argilloecia* sp.2, besides being rare, are only found in this lithofacies.

The BVFS lithofacies, restricted to the central area of the bay, has only twenty species. *Tenedocythere transoceanica* (Teeter, 1975) and *Paradoxostoma* sp., both represented for just one adult specimen, seem restricted to this substratum. *Neomonoceratina mediterranea* (Ruggieri, 1953) is almost exclusive to this lithofacies.

The transition area between the two biofacies presents biodetritic sands with terrigenous (BST). These sediments are coarser than BMS and BVFS, showing great decrease in diversity, reduced to only ten species. *Macrocyprina* sp. is more abundant in this transition area.

The biodetritic coarse sands (BCS), very common in the greatest part of the bay reef area, were not enough sampled thus, not allowing the confirmation of the data furnished by the two samples here considered.

Sixteen species, generally represented by one or two specimens, were recorded in the spots with biodetritic sand ooze (BSO). *Caudites seminudus* Whatley & Keeler, 1989 and *Cletocythereis* sp. are restricted to this lithofacies.

The biodetritic muddy sands (BAS) are found in deeper areas and present a well diversified and locally abundant ostracofauna. There is no particular species of this lithofacies, although *Cytherura* sp. and *Gangamocytheridea* sp. cf. *G. dyction* Bold, 1963, be more abundant in this substratum.

SPECIES	CONSTANCY %	DOMINANCE %
Loxocorniculum tricornatum	61.8	20.1
Xestoleberis spp.	55.9	17.4
Paracytheridea spp.	52.9	5.6
Mutilus splendideornatus splendideornatus	38.2	4.7
Kotoracythere inconspicua	35.3	10.2
Macrocyprina sp.	23.5	2.5
Paranesidea sp. cf. *P. bensoni*	23.5	1.4
Gangamocytheridea sp. cf. *G. dyction*	20.6	2.8
Keijcyoidea praecipua	20.5	1.2
Orionina bradyi	17.6	4.2
Argilloecia sp. 1	17.6	0.9
Loxocorniculum sp. cf. *L. lenticuloides*	14.7	3.2
Caudites obliquecostatus	14.7	1.7
Coquimba sp.	14.7	1.8
Neocaudites triplistriatus	14.7	2.3
Gen. et sp. ind. 1	14.7	1.6
Gen. et sp. ind. 2	14.7	1.1
Callistocythere sp.	14.7	1.1
Cytherura sp.	11.8	2.0
Puriana variabilis	11.8	3.7
Neonesidea sp. 1	11.8	0.8
Caudites exmouthensis	8.8	0.6
Caudites nipeensis	8.8	1.1
Semicytherura sp.	8.8	1.9
Echinocythereis ? sp.	8.8	0.7
Pellucistoma sp.	8.8	0.8
Glyptobairdia coronata	8.8	0.3
Cornucoquimba sp.	5.9	0.2
Copytus sp.	5.9	0.8
Neomonoceratina mediterranea	5.9	0.9
Keijia demissa	5.9	0.6
Neonesidea sp. 2	5.9	0.8
Triebelina sertata	5.9	0.4
Argilloecia sp. 2	5.9	0.2
Caudites seminudus	2.9	0.1
Caudites sp.	2.9	0.1
Tenedocythere transoceanica	2.9	0.1
Cletocythereis sp.	2.9	0.1
Paradoxostoma sp.	2.9	0.1
Paranesidea sp.	2.9	0.1

Table 2 — Ostracode species: constancy and dominance.

DISCUSSION AND CONCLUSIONS

Rebouças (1965/6) proposed three biofacies with foraminifers. Comparing the two biofacies (A and B) defined in the present study, with the three of Rebouças, at first it is observed that there is a perfect correlation between Biofacies A and Rebouças Biofacies 1. On the other hand, the limits of the Biofacies B are the result of joining Biofacies 2 to Biofacies 3 of that author (Tbl. 4). However, Rebouças (*op. cit.*) restricted Biofacies 2 to the central area of the bay, where the waters are calm and the sediments are of the BST and BVFS type; and Biofacies 3 to the area closer to the reefs, where sediments of the BMS and BCS type predominate.

These results do not match exactly the results obtained with the ostracodes. Although it is believed that if the number of samples available for this study had been bigger it would have been possible to subdivide Biofacies B, this subdivision probably would not join the ostracofauna found in BMS and in BCS into one biofacies. The ostracode assemblages are much more diversified and abundant in BMS than in BCS. There is a much greater affinity between the faunas present in BMS and in BVFS than between these with the BCS fauna.

Comparing the foraminifers and ostracodes ecological models proposed by Dias-Brito *et. al.* (1988) for the non-reef Sepetiba Bay, Rio de Janeiro State, with the results obtained in this research, it is clear that there is not a good correspondence between them. Dias-Brito *et. al.* concluded that the biofacies established on foraminifers are closely comparable with those of the ostracode biofacies. This correspondence does not occur in the Tamandaré Bay reef.

Plate 2

Figure 1 — *Copytus* sp.
Left valve.

Figure 2 — *Neomonoceratina mediterranea* (Ruggieri, 1953)
Left valve.

Figure 3 — *Cytherura* sp.
Left valve.

Figure 4 — *Semicytherura* sp. 1
Right valve.

Figure 5 - *Semicytherura* sp. 2
5a — Left valve.
5b — Right valve. Detail of the posterior inner margin.

Figure 6 - *Semicytherura* sp. 3
6a — Right valve.
6b — Right valve. Detail of the posterior inner margin.

Figure 7 — *Semicytherura* sp. 4
Right valve.

Figure 8 - *Semicytherura* sp. 5
8a — Right valve.
8b — Right valve. Internal view.

Figure 9 — *Gangamocytheridea* sp. cf. *G. dyction* Bold, 1963
Left valve.

Figure 10 — *Puriana variabilis* Chukewiski & Purper, 1985
Right valve.

Figure 11 — Gen. et sp. ind. 2
Left valve.

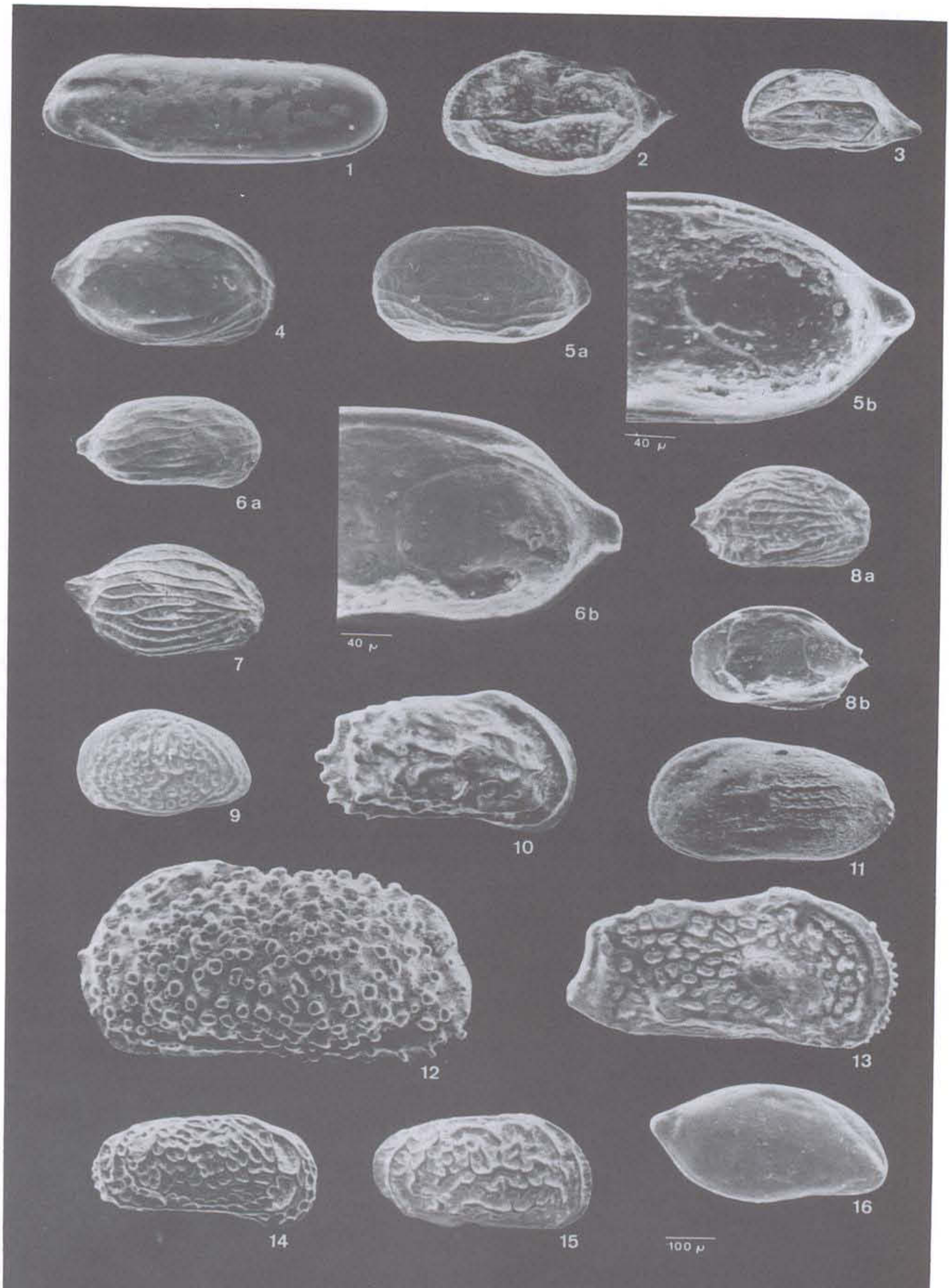
Figure 12 — *Echinocythereis* ? sp.
Left valve.

Figure 13 — *Cletocythereis* sp.
Right valve.

Figure 14 — *Keijia demissa* (Brady, 1868)
Right valve.

Figure 15 — *Callistocythere* sp.
Right valve.

Figure 16 — *Pellucistoma* sp.
Right valve.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BIOFACIES	A - (Terrigenous)		B - (Carbonate)					
LITHOFACIES	TS	TSB	BST	BVFS	BMS	BCS	BAS	BSO
SPECIES								
Triebelina sertata	—							
Macrocyprina sp.	—							
Keijcyoidea praecipua	—				—			
Coquimba sp.	—	—			—			
Paracytheridea spp.	—	—	—	—	—		—	—
Xestoleberis spp.			—	—	—	—	—	—
Loxocorniculum tricornatum			—	—	—	—	—	—
Kotoracythere inconspicua			—	—	—		—	
Gen. et sp. ind. 2			—					—
Puriana variabilis			—		—			
Pellucistoma sp.			—				—	
Mutilus spl. splendideornatus				—	—	—	—	—
Neocaudites triplistriatus				—	—	—	—	
Caudites obliquecostatus				—	—	—		
Callistocythere sp.				—	—		—	—
Gen. et sp. ind. 1				—	—		—	—
Cytherura sp.				—	—		—	
Paranesidea cf. *P. bensoni*				—	—			—
Argilloecia sp. 1				—	—		—	
Echinocythereis ? sp.				—				
Neomonoceratina mediterranea				—				
Gangamocytheridea sp. cf. *G. dyction*					—	—	—	—
Caudites exmouthensis					—	—		
Neonesidea sp. 1					—	—		
Neonesidea sp. 2					—		—	
Keijia demissa					—			—
Orionina bradyi						—	—	
Caudites nipeensis						—		
Semicytherura spp.							—	—
Copytus sp.							—	—

Table 3 — Ostracode Biofacies in the Tamandaré Bay: distribution of the most important species.

There are many genera abundant in organic reefs and their associated environments, specially *Loxocorniculum*, *Xestoleberis*, and *Kotoracythere*, which are also found in the Tamandaré Bay. On the other hand, *Triebelina* and *Paranesidea*, although they have been cited by other authors (Teeter, 1975; Bonaduce *et. al.*, 1980; Whatley & Watson, 1988; Tabuki & Nohara, 1990) as characteristic of this environment, they are very rare in the Tamandaré Bay.

At last, *Keijia demissa* (Brady, 1868), *Kotoracythere inconspicua* (Brady, 1880), *Triebelina sertata* Triebel, 1948, *Tenedocythere transoceanica* (Teeter, 1975), and *Neomonoceratina mediterranea* (Ruggieri, 1953) are widespread species, occurring in the Indo-Pacific as well as in the Caribbean areas. On the other hand, according to Whatley & Keeler (1989), *Caudites exmouthensis* Hartmann, 1978 and *Mutilus splendideornatus splendideornatus* Hartmann, 1974 are known only for La Reunión Islands (Southwestern Indian Ocean), Australia, Malasia and the Java Sea and *Caudites seminudus* Whatley & Keeler, 1989 is registered only for La Reunión Islands. This is the first record of their presences in Brazilian waters.

Plate 3

Figure 1 — *Paradoxostoma* sp.
Right valve.

Figure 2 - *Macrocyprina* sp.
2a — Left valve.
2b — Right valve. Internal view.

Figure 3 — *Neonesidea* sp. 1
Right valve.

Figure 4 — *Neonesidea* sp. 2
Right valve.

Figure 5 — *Paranesidea* sp.
Left valve.

Figure 6 — *Glyptobairdia coronata* (Brady, 1870)
Right valve.

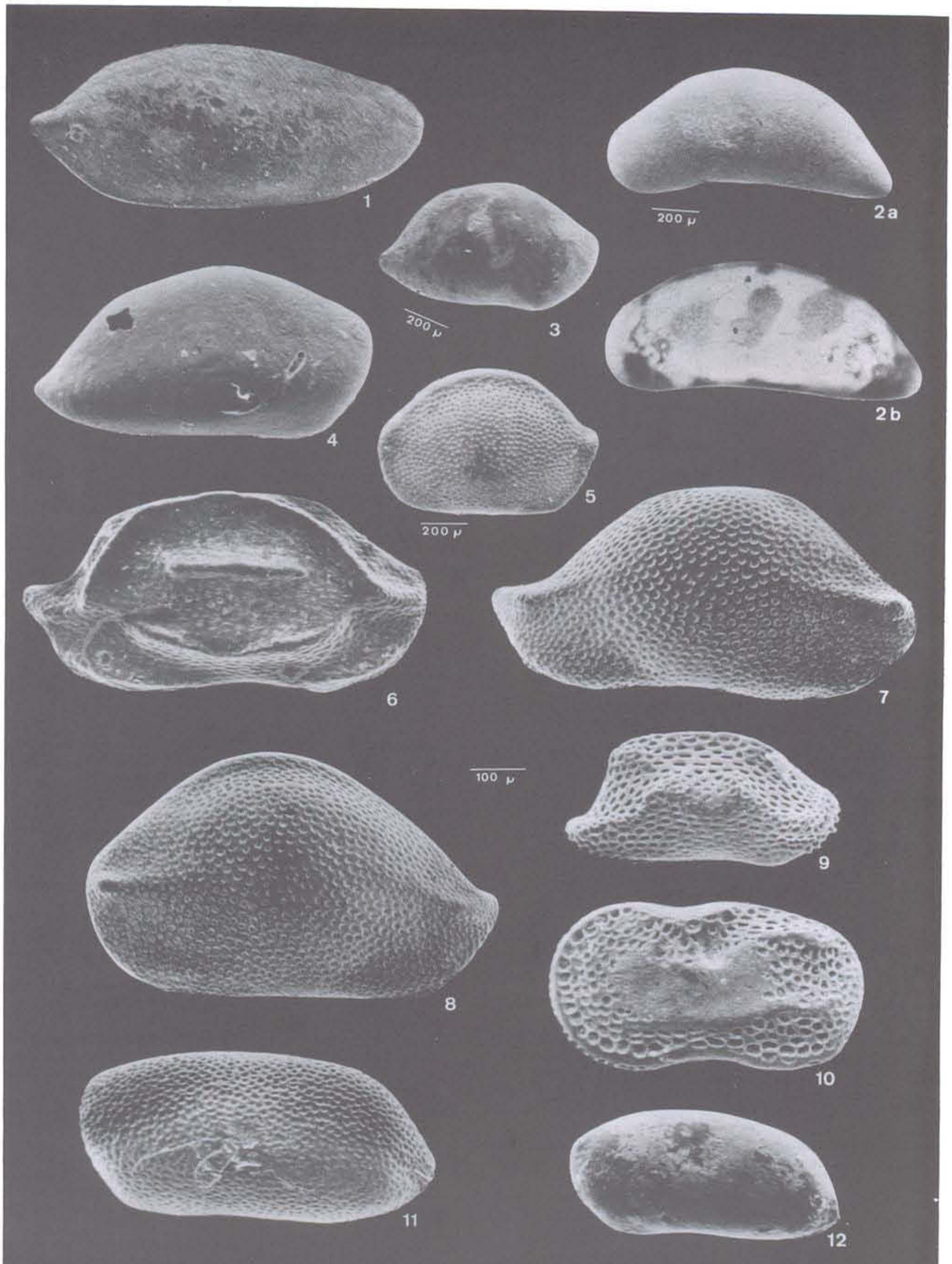
Paranesidea sp. cf. *P. bensoni* Teeter, 1975
Figure 7 — Right valve.
Figure 8 — Left valve.

Figure 9 — *Triebelina sertata* Triebel, 1948
Right valve.

Figure 10 — *Keijcyoidea praecipua* (Bold, 1963)
Left valve.

Figure 11 — *Argilloecia* sp. 1
Left valve.

Figure 12 — *Argilloecia* sp. 2
Left valve.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<table>
<tr><th>FORAMINIFER BIOFACIES (Rebouças 1965/6)</th><th>ASSEMBLAGES</th><th>OSTRACODE BIOFACIES</th><th>ASSEMBLAGES</th></tr>
<tr><td>1</td><td>Pyrgo
Textularia
Quinqueloculina
Streblus</td><td>A (Terrigenous)</td><td>Triebelina sertata
Macrocyprina sp.
Keijcyoidea praecipua
Coquimba sp.
Paracytheridea spp.</td></tr>
<tr><td>2</td><td>Elphidium
Bolivina
Spirilina
Discorbis
Nonion
Streblus
Quinqueloculina</td><td rowspan="2">B (Carbonate)</td><td rowspan="2">Keijcyoidea praecipua
Coquimba sp.
Caudites nipeensis
Echinocythereis ? sp.
Neomonoceratina mediterranea
Orionina bradyi
Gen. et sp. ind. 2
Puriana variabilis
Neonesidea sp. 1
Caudites exmouthensis
Semicytherura spp.
Pellucistoma sp.
Copytus sp.
Keijia demissa
Neonesidea sp. 2
Paranesidea sp. cf. P. bensoni
Argilloecia sp. 1
Caudites obliquecostatus
Cytherura sp.
Callistocythere sp.
Gen. et sp. ind. 1
Neocaudites triplistriatus
Gangamocytheridea sp. cf. G. dyction
Mutilus splendideornatus splendideornatus
Kotoracythere inconspicua
Paracytheridea spp.
Loxocorniculum tricornatum
Xestoleberis spp.</td></tr>
<tr><td>3</td><td>Amphysorus
Peneroplis
Triloculina
Quinqueloculina
Nonion
Textularia
Streblus
Discorbis</td></tr>
</table>

Table 4 — Comparison between foraminifer and ostracode biofacies.

Acknowledgements — Thanks to Dr. Lilia Pinto de Ornellas (UFRGS) for furnishing the material to study and also for comments and discussions; to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS) for their continuous support to the authors' researches; and to Édson Marcelo dos Santos who typed the text.

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