Ostracodes (Crustacea) from Cananéia-Iguape estuarine/lagoon system and geographical distribution of the mixohaline assemblages in southern and southeastern Brazil

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ABSTRACT. The ostracode assemblages from Cananéia-Iguape estuarine/lagoon system (southernmost State of São Paulo) are here discussed in detail for the first time. Thirty-four sites, approximately 1 km equidistant, were sampled along the system, including the Cananéia Sea, Pequeno Sea, Cubatão Sea, Ribeira de Iguape River and Itapitangui River. The ostracodes throughout this area have poor assemblages, with a total of 662 specimens of dead and living organisms. The majority of the ostracode fauna is composed of euryhaline species, as follows: *Cyprideis multidentata* Hartmann, 1955 (174 specimens), *Minicythere heinii* Ornellas, 1974 (54 specimens), *Tanella gracilis* Kingma, 1948 (96 specimens) and *Whatleyella sanguinettiae* Coimbra, Carreño & Ferron, 1994 (226 specimens). Although there are few studies on the Brazilian mixohaline ostracode faunas, including the euryhaline marginal marine taxa, the published data show that the group is best known in the south and southeast regions. Based on this review and with the new data presented in this paper, the geographical distribution of eight mixohaline key species in southern and southeastern Brazil is also discussed.

KEYWORDS. Ostracoda, geographical distribution, ecology, marginal environments, Brazil.

RESUMO. Ostracodes (Crustacea) do sistema estuarino-lagunar de Cananéia-Iguape e distribuição geográfica das assembléias mixoalinas do sul e sudeste do Brasil. As assembléias de ostracodes do sistema estuarino-lagunar de Cananéia-Iguape são pela primeira vez aqui discutidas em detalhe. Foram coletadas amostras em trinta e quatro pontos, eqüidistantes aproximadamente 1 km, incluindo o mar de Cananéia, mar Pequeno, mar de Cubatão, rio Ribeira de Iguape e rio Itapitangui. A ostracofauna mostrou-se pouco abundante e diversificada, contabilizando um total de apenas 662 espécimens entre vivos e mortos. As espécies mais abundantes são eurihalinas: *Cyprideis multidentata* Hartmann, 1955 (174 espécimens), *Minicythere heinii* Ornellas, 1974 (54 espécimens), *Tanella gracilis* Kingma, 1948 (96 espécimens) e *Whatleyella sanguinettiae* Coimbra, Carreño & Ferron, 1994 (226 espécimens). Embora existam poucos estudos sobre ostracodes mixohalinos no Brasil - inclusive dos táxons marinhos marginais tipicamente eurihalinos - uma revisão bibliográfica exaustiva mostrou que eles são melhor conhecidos nas regiões sul e sudeste. Com base nesta revisão e nos novos dados aqui apresentados, discute-se a distribuição geográfica das oito espécies mais características das áreas mixohalinas do sul e sudeste do país.

PALAVRAS-CHAVE. Ostracoda, distribuição geográfica, ecologia, ambientes marginais, Brasil.

The Brazilian coast exhibits different types of paralic environments: linear and small estuaries, complex estuarine-lagoon systems, close or open lagoons, large tide-plains, swamps and deltas. These coastal ecosystems are inhabited by important groups of benthic invertebrates, ostracodes being among the most common and abundant. Typically, the mixohaline species of ostracodes tolerate the high salinity changes of these coastal regions. Being sensitive to environmental changes, these microcrustaceans have carapaces that are relatively easily diagnosed (*i.e.*, with great morphologic variability), are abundant, small, easy to collect, thus allowing low cost analyses and easy storage. Due to all these characteristics, the ostracodes have been identified as one of the best benthic organisms for environmental analyses (Ruiz *et al.*, 2000; Palacios-Fest *et al.*, 2001).

However, most of the studies dealing with Recent and sub-Recent Brazilian ostracodes have been focused on the taxonomy and zoogeography of shelf marine assemblages (Aiello *et al.*, 2004; Coimbra *et al.*, 2004). The bathyal and the mixohaline Ostracoda assemblages have scarcely been investigated (Würdig, 1988; Bergue *et al.*, 2006).

The present paper represents a contribution to the knowledge of the Brazilian mixohaline Ostracoda, and in particular those assemblages living in the Cananéia-Iguape esturine/lagoon system in the southern State of São Paulo, reported here for the first time. The geographical distribution of the mixohaline dominant species recorded throughout the southern and southeastern Brazilian coast is discussed.

The first ecological approach of Brazilian Ostracoda populations from transitional environments was on living mixohaline Ostracoda from the channel from the estuarine/lagoon system of Tramandaí (State of Rio Grande do Sul) to the Atlantic Ocean (Ornellas, 1974). This association is dominated by *Cyprideis* spp., *Perissocytheridea kroemmelbeini* Pinto & Ornellas, 1970, *Cytherura* sp., and *Minicythere heinii* Ornellas, 1974. The same ostracode species were found by Ornellas (1974) in samples of dry sediments of the southernmost mixohaline channel in the Patos Lagoon, state of Rio Grande do Sul.

Ornellas (1974) reported in Laguna town, State of Santa Catarina, the same living mixohaline assemblage. It is important to note that empty carapaces and valves of marine ostracodes, in particular of *Cytheretta punctata* Sanguinetti, 1979, have been recorded at Tramandaí, Patos Lagoon and Laguna town.

WÜRDIG (1983, 1988), WÜRDIG & FREITAS (1988), WÜRDIG *et al.* (1990) and WÜRDIG & PINTO (1999) have published on the systematics, biology and ecology of the fresh-water and mixohaline ostracodes from the estuarine/lagoon system of Tramandaí. In these papers several freshwater species are described. Data on seasonal and geographical distribution of each species in relation to temperature, salinity, pH, and types of substrate were provided by those authors, enabling the recognition of four ostracode associations: polyhaline (18 - 35‰), mesohaline (0.5 - 18‰), oligohaline (< 3‰), and limnic (with 0‰). Those authors included the polyhaline and the mesohaline species in the typically mixohaline assemblage which comprises *Cyprideis riograndensis* Pinto & Ornellas, 1965, *C. salebrosa hartmanni* Ornellas & Würdig, 1983, *M. heinii*, *P. kroemmelbeini* and *Cytherura purperae* Ornellas & Fallavena, 1978.

At Sepetiba Bay, situated near Rio de Janeiro City, DIAS-BRITO *et al.* (1988) recognized ten ostracodes and seven foraminifera biofacies. From the ten ostracode biofacies, those authors considered four as typically mixohaline and two as having lower variations in salinity. On the basis of these biofacies, DIAS-BRITO *et al.* (1988) considered the area as a lagoonar ecosystem dominated by six euryhaline species: *Perissocytheridea* sp. 1, *C. riograndensis*, *C. salebrosa hartmanni*, *Minicythere* **aff.** *M. heinii*, *Callistocythere* sp. 1 and *Tanella* sp., being *Perissocytheridea* sp. 1 the most abundant and widely distributed throughout the bay.

GHISELLI JR. *et al.* (2001) presented a first approach of the ecology of marine and mixohaline ostracodes from the Bertioga channel, near Santos City, southern State of São Paulo. The 5,589 identified specimens are distributed, both in the summer and in the winter, into three main areas throughout the Bertioga channel, with the most abundant and diverse occurrence in the northern area, dominated by a marine influx. The marine assemblages were concentrated in the two mouths of the channel, where the water presents few salinity changes along the year. The dominant species was *Cytheretta punctata* Sanguinetti, 1979 (2,036 specimens) followed by *Cytherella* sp., *Callistocythere litoralensis* (Rossi de García, 1966) and *Caudites ohmerti* Coimbra & Ornellas, 1987. In the central area, typically mixohaline, the dominant species were *C. salebrosa hartmanni* and *Cyprideis* **cf.** *C. maxipunctata* Sanguinetti *et al.*, 1992, whereas *Whatleyella sanguinettiae* Coimbra, Carreño & Ferron, 1994, *P. kroemmelbeini* and *M. heinii* were less abundant. Recently, R. Ghiselli Jr. (pers. comm.) recorded the presence of *Cyprideis* spp. in mixohaline areas of the Paranaguá Bay, state of Paraná.

The ostracodes identified by ORNELLAS (1974), DIAS-BRITO *et al.* (1988), WÜRDIG (1983, 1988), WÜRDIG & FREITAS (1988) and WÜRDIG *et al.* (1990) were examined by the first author. The comparison between some species identified by those authors in open nomenclature (or erroneously) and the same species identified in this work, reveals some discrepancies. *Perissocytheridea* sp. 1 and *Perissocytheridea* sp. 2 from DIAS-BRITO *et al.* (1988) are herein identified as *Perissocytheridea kroemmelbeini* Pinto & Ornellas, 1970, while *Perissocytheridea* sp. 3 fits in with *Whatleyella sanguinettiae* and *Cyprideis riograndensis* Pinto & Ornellas, 1965 is a junior synonym of *Cyprideis multidentata* Hartmann, 1955. On the other hand, *Callistocythere* sp. 1 is conspecific with *Callistocythere ornata* (Hartmann, 1956) (COIMBRA *et al.*, 1994); *Cytherura* sp. is better identified as *Cytherura purperae* Ornellas & Fallavena, 1978; *Cytheretta* sp. fits in with *Cytheretta punctata* Sanguinetti, 1979; and *Cyprideis* spp. represent a group of two species, *Cyprideis multidentata* Hartmann, 1955 and *Cyprideis salebrosa hartmanni* Ornellas & Würdig, 1983.

MATERIAL AND METHODS

Ostracodes used for the present study came from samples taken from a marginal marine environment, the Cananéia-Iguape estuarine/lagoon system (Lat. ~ 25°S), located in São Paulo near the border with the state of Paraná (Fig. 1) and extensively described by EICHLER *et al.* (1995) and MIRANDA *et al.* (2002). This system is dominated by mangroove swamps in its edges, being the species *Laguncularia racemosa*, *Rhizophora magle*, and *Avicennia shauleriana* the most abundant. There are north, center and south connections with the Atlantic Ocean throughout the Icapara, Cananéia (Fig. 1) and Ararapira mouths, respectively. The Trapandé Bay, which is bounded to the south by the Cardoso Island and to the north by the Cananéia Island, has the greatest marine influx in this system. Three water bodies ranging approximately from 1 to 3 km in width and with a mean depth of 6 m constitute the system: the Cubatão Sea, Cananéia Sea and Pequeno Sea (separated from the ocean by the Comprida Island) (Fig. 1).

The system at the northern area receives freshwater from the Vale Grande stream, artificially opened in 1830, which connects the Ribeira de Iguape River to the Pequeno Sea. The whole area is subject to a very high rainfall regime throughout the year that contributes with a significant volume of freshwater to the system. The tidal regime in the system is semi-diurnal with measured amplitude of 0.82 cm. The marine inflow comes into the system through the Cananéia mouth and the tidal wave goes into the esturine/lagunar system following two ways: one toward the Cananéia Sea, and the other, toward the Cubatão Sea throughout the Trapandé Bay. The tidal wave that penetrates the Icapara mouth in the north, reaches the Pequeno Sea in its southernmost portion at the Tombo Rock, and then the wave flood process is finished.

Thirty-four sites, equidistant approximately 1 km, were sampled in Cananéia-Iguape system, including the Cananéia Sea, Pequeno Sea, Cubatão Sea, Ribeira de Iguape River (reaching the Vale Grande stream) and

Itapitangui River (Fig. 1). All 34 sites were located in the main water circulation channels, and were sampled in November 1994, employing a Petersen grab. Two samples, number 1 and 28, were discarded due to problems of contamination in the field. Of the 32 remaining samples, only 18 contained ostracodes, with a total of 662 specimens.

At each station 150 ml of sediment were collected from the superficial layer and stored in bottles with two drops of buffered formaldehyde (4%), for the study of living ostracodes. For the grain size analysis we used 30 g of sediment and followed the methodology proposed by SUGUIO (1973). One third of the fraction was also separated for the organic carbon analysis based on the method of GAUDETTE *et al.* (1974). The measures of pH, temperature and salinity were taken monthly in 1994 at each station, according to the usual methods of aquatic ecology.

The statistical analyses of multiple correlation were processed in the program Statistics for Windows 2.0, with the index of Spearman. Only the values of *p* for alpha < 5% were considered. The diversity was measured by the equation of Shannon-Weaver (DOOD & STANTON JR., 1981).

The material used in this study is held in the collections of the Instituto Oceanográfico, Universidade de São Paulo, Section of Microfossils.

RESULTS

The salinity in the study region showed higher values in the areas under marine influence, *viz*. the Trapandé Bay, Cubatão Sea and Cananéia Sea (Fig. 2). The salinity decreased between the Pequeno Sea and the mouth of the Ribeira de Iguape River. In samples 24, 25, 26, 27 and 28, collected in the Ribeira de Iguape River, typically limnic conditions prevailed. In the Itapitangui River the salinity also diminished upstream, but it never reached zero. Sample 11, the most distant of the mouth of the Itapitangui River, registered a salinity of 11‰.

The bottom water temperature varied from 27.7°C in January to 19.8°C in July (Fig. 3). The values of pH, that regulate the amount of available $CaCO_3$ in the environment, did not present major changes in the study. The average value of 7 throughout an annual period suggests that it does not influence the precipitation of the ostracode carapaces in the region (Fig. 4).

The studied region shows a predominance of sandy sediments, with the exception of five samples (4, 20, 21, 27 and 31) where bottom sediments are muddy silt. The highest value of TOC (Total Organic Matter) was 17.9% in sample 4 (Trapandé Bay), and the least in sample 22 (Pequeno Sea), with only 1.67%.

The distribution of ostracodes throughout the Cananéia-Iguape region reveals poor assemblages both in specimens and species, with a total of 662 specimens (Tab. I). Most of them correspond to euryhaline species, as discussed by COIMBRA *et al.* (1994) and WÜRDIG (1988). They are *Cyprideis multidentata* (174 specimens), *Minicythere heinii* (54 specimens), *Tanella gracilis*, Kingma, 1948 (96 specimens) and *Whatleyella sanguinettiae* (226 specimens). Very few living or empty carapaces and valves of typically marine genera such as *Copytus*, *Cytherella*, *Cytheretta*, *Cytherois*, *Cytherura*, *Hemicytherura*, *Hulingsina*, *Keijella*, *Loxoconcha*, *Neocaudites*, *Neocytherideis*, *Papillosacythere*, *Pellucistoma* and *Semicytherura* were collected in the Trapandé Bay, and most of them had characteristics of post-mortem transport. Two allochthonous empty carapaces of the fresh-water genus *Ilyocypris* were found in typically mixohaline areas. The most frequent species throughout the study area was *Whatleyella sanguinettiae*, present in nine of the 18 samples with ostracodes. Its highest occurrence was in the Trapandé Bay where 212 specimens, from a total of 226, were recorded, representing 34% of the total ostracode relative abundance in the area. It is considered as the dominant species in the Cananéia-Iguape system (Tab. I, Fig. 5). Also abundant throughout the area are *Cyprideis multipunctata*, *Tanella gracilis* and *Minicythere heinii*, which, together with *W. sanguinettiae*, are considered characteristic of mixohaline assemblage.

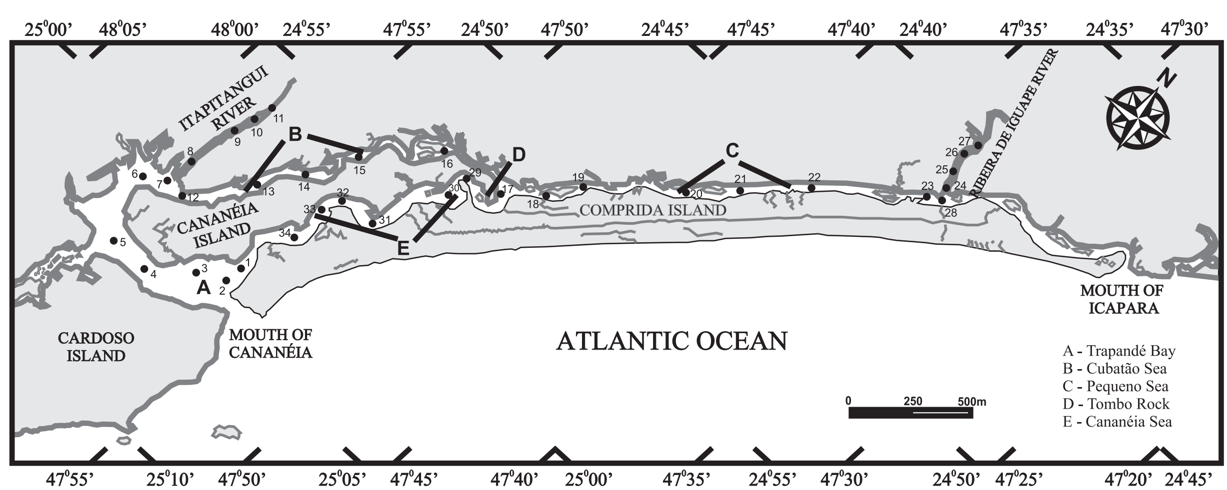

Fig. 1. Location of the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil. 1-34, samples sites.

In the Trapandé Bay, where the marine inflow is greater, epineritic species as *Cytheretta punctata*, *Keijella dyction* (Bold, 1966) and *Loxoconcha bullata* Hartmann, 1956 occurred with 17, 35 and 15 specimens, respectively. Other marine species represent only 5% of the total studied here, and all of them have allochthonous characteristics as mentioned above.

The correlation between environmental factors and biological ones shows that the salinity is the factor with greatest influence on the ostracode population structure. The sediments, depth, temperature and pH played a minor role in the distribution and abundance of these assemblages (Tab. II).

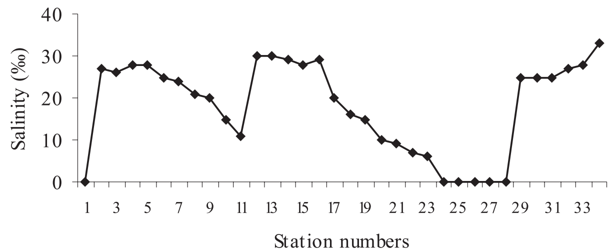

Fig. 2. Bottom salinities along the year of 1994 in the studied samples of the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil.

Table I. Ostracode distribution in the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil. * = sample with juveniles.

Stations	Depth (m)	Nº of Specimens	Nº of Species	Shannon-Weaver index	*C. multidentata*	*C. punctata*	*Copytus* sp.	*Cytherella* sp.	*Cytherois* sp.	*Cytherura* sp.	*Hemicytherura* sp.	*Hulingsina* sp.	*Ilyocypris* sp.	*K. dictyon*	*L. bullata*	*M. heinii*	*N. triplistriatus*	*Neocytherideis* sp.	*P. parallela*	*P.* **cf.** *elongata*	*Semicytherura* sp.	*T. gracilis*	*W. sanguinettiae*
2	5.5	15	6	1.54	2	5								1	1								5
3	6.7	73	7	1.29	29*	5*		1						4					1			2*	31*
4	10	87	8	1.39	22*								1	4*	1			1	1			20*	37*
5	15.3	205	12	1.50	7*	7*	3*	1	7		1	7*		26*	9*		1					51*	104*
6	1.5	10	4	1.28	2										4							1*	3*
7	7	0																					
8	3	0																					
9		0																					
10	1	82	5	1.00	44*											30*				1	1		6*
11		36	3	0.92	16*											17*					3*		
12	11	1	1																				1*
13	3.5	20	5	1.31	8										1	1						4	7*
14	2.5	0																					
15	2.7	4	3		1			1														2	
16	4.5	7	2	0.41	6*										1								
17	4	0																					
18	4.4	21	1		21*																		
19	2.1	2	1		2*																		
20	3.8	1	1											1									
21	4.9	0																					
22	4	2	2	0.69	1								1									1	
23	1.8	1	1																				
24	5.5	0																					
25	6	0																					
26	6.9	0																					
27	6	0																					
28		0																					
29	3	0																					
30	1.6	1	1						1														
31	2	0																					
32	3.7	3	1																			3	
33	1.4	0																					
34	4	64	8	1.42	13*	1						1			2*	6*		1				12*	32*
TOTAL					174	18	3	3	8	1	2	4	2	38	22	54	1	2	2	1	5	96	226

Table II. Significant correlations between biological and environmental factors (for values of $p \leqslant 5\%$) along the year of 1994 in Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil (Di, diversity; Ab, abundance; Do, dominance; Eq, equitability).

	W. sanguinettiae	*L. bullata*	*C. punctata*	*C. multidentata*	*K. dictyon*	*T. gracilis*	*Neocytherideis* sp.	*P. paralella*	*Hemicytherura* sp.	Di	Ab	Do	Eq
Depth	0.29												
Salinity	0.61	0.61	0.41	0.50	0.46	0.44	0.35	0.35	0.35	0.53	0.61	0.39	0.39
°C		-0.46	-0.41						-0.34				
pH													
Clays												0.38	

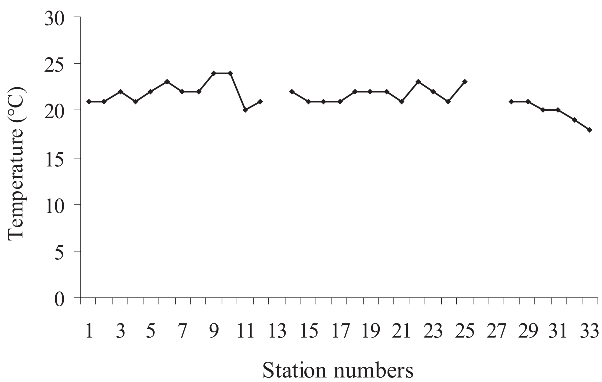

Fig. 3. Bottom temperatures along the year of 1994 in the studied samples of the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil.

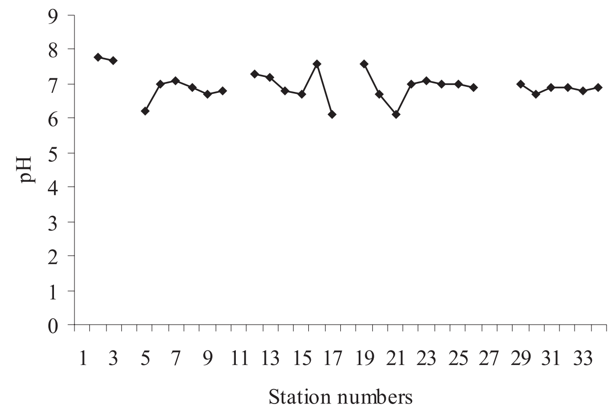

Fig. 4. The average values of pH along the year of 1994 in the studied samples of the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil.

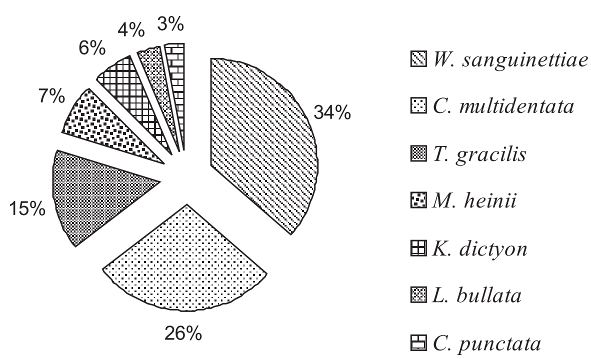

Fig. 5. The most abundant ostracode species in the Cananéia-Iguape estuarine/lagoon system, São Paulo, Brazil. See text for species names.

DISCUSSION

Due to the scarcity of papers dealing with the study of Brazilian mixohaline ostracodes, there is a discontinuous record on the geographic distribution of some ecologically more restricted species throughout the south and southeast of Brazil. It is evident that the distribution of different species are largely related to temperature variations occurring in lagoons and estuaries in the southern coastal regions of the two southernmost states of Santa Catarina and Rio Grande do Sul. In these two states the seasonal variation is very marked. During the summer the temperature can reach up to 38°C and frequently it is not less than 30°C during the day. In the winter the coastal regions of these two states have large temperature variations, ranging from less than 10°C at night and up to 20°C at midday. These seasonal changes cause significant oscillations in the water temperature of the estuarine/lagoon systems in the southern extreme of the country, as already discussed by WÜRDIG (1983, 1988). Besides, this coastal region is under great marine influence of cold waters coming from southern South America.

Whatleyella sanguinettiae is the most ubiquitous and abundant ostracode species both in the Sepetiba Bay (State of Rio de Janeiro) and in the Cananéia/Iguape estuarine/lagoon system, where the seasonal bottom salinity variations are more pronounced than in the Bertioga channel (Tab. III). As a warm water species, it is absent in the colder southernmost coastal region of Brazil.

In spite of its absence from the States of Santa Catarina and Rio Grande do Sul, the warm water cosmopolitan ostracode *Tanella gracilis* shows a wide distribution, being formerly recorded in the Pacific Ocean since the Neogene (Sumatra and Java). It is a very common species in bays and epineritic marine environments and very scarce in mixohaline waters. In accordance with its fossil record, it seems that this latter environment was colonized during the Quaternary.

On the contrary, *Cytherura purperae* seems to be restricted to the south with records that include from the mouth of Patos Lagoon (Lat. 32°06'S), Rio Grande do Sul, throughout the mixohaline environments nearby Laguna town (Lat. 28°29'S), Santa Catarina. Moreover, *Cyprideis maxipunctata*, a late Pliocene/Pleistocene species known from the Pelotas Basin (Rio Grande do Sul), was recorded (identified as *C.* **cf.** *C. maxipunctata*) for the first time living in the mixohaline area of the Bertioga Canal by GHISELLI JR. *et al.* (2001). If in fact

Table III. Geographic distribution of the more typical mixohaline species along the South/Southeast coastal regions of Brazil. (States: RJ, Rio de Janeiro; SP, São Paulo; SC, Santa Catarina; RS, Rio Grande do Sul).

Localities (from north to south)	Dominant species in the mixohaline waters	Other frequent ostracod species
Sepetiba Bay (near Rio de Janeiro town, RJ) Dias-Brito *et al.* (1998); Coimbra *et al.* (1994)	*Whatleyella sanguinettiae* *Cyprideis multidentata*	*Cyprideis salebrosa hartmanni* *Perissocytheridea kroemmelbeini* *Minicythere heinii* *Tanella gracilis*
Bertioga Channel (near Santos town, SP) Ghiselli Jr. *et al.* (2001)	*Cyprideis* **cf.** *C. maxipunctata* *Cyprideis salebrosa hartmanni*	*Perissocytheridea kroemmelbeini* *Whatleyella sanguinettiae*
Cananéia/Iguape Estuary (SP)	*Whatleyella sanguinettiae*	*Cyprideis multidentata* *Minicythere heinii* *Tanella gracilis*
Laguna (SC) Ornelas (1974)	*Cyprideis multidentata* *Cyprideis salebrosa hartmanni*	*Perissocytheridea kroemmelbeini* *Minicythere heinii* *Cytherura purperae*
Tramandaí Estuarine/Lagoon System (RS) Ornelas (1974); Würdig (1983, 1988); Würdig & Freitas (1988); Würdig *et al.* (1990); Würdig & Pinto (1999)	*Cyprideis multidentata* *Cyprideis salebrosa hartmanni* *Cytherura purperae*	*Perissocytheridea kroemmelbeini* *Minicythere heinii*

these two taxa are the same species then this new record suggests migration during the Quaternary, from south (today absent) to the north, where it is now extant. On the other hand, more eurythermic species as *Cyprideis multidentata, Cyprideis salebrosa hartmanni, Minicythere heinii* and *Perissocytheridea kroemmelbeini* are recorded in both south and southeast mixohaline areas of the Brazilian coast. Würdig (1983) presents an interesting discussion on the ecology of these species in the Tramandaí estuarine/lagoon system in the State of Rio Grande do Sul. The geographic distribution (see Tab. III) of this group comprising the eight more typically mixohaline ostracode species along the South and Southeast of Brazil.

Cyprideis salebrosa is a pandemic species with two subspecies, one South American and the other known from the Caribbean and North America (Sandberg, 1964) where this species has its older record (Pliocene, Florida). The South American subspecies *C. s. hartmanni* is distributed from Argentina (Ramirez, 1967; Ferrero, 1996) to the State of Rio de Janeiro (Dias-Brito *et al.*, 1988). This species and *Cyprideis multidentata* are more abundant in mixo-mesohaline to mixo-euhaline waters, although they have been sparsely recorded in mixo-oligohaline to limnic environments. Nevertheless, *Cyprideis multidentata* possesses more tolerance to euhaline waters, with records of living populations in the littoral marine environments from Brazil and Argentina. As a fossil it is recorded from the Quaternary of Brazil and Argentina (Bertels & Martinez, 1990).

Finally, although the genus *Callistocythere* is more common in the epineritic and circumlittoral marine environments, two species have been recorded living in littoral marine environments from southern and southeastern Brazil. *Callistocythere ornata*, a euryhaline species widely distributed in the shallow and warm marine waters from the northern and northeastern of Brazil (Coimbra *et al.*, 1995), has its southern geographical limit in the mixohaline areas into the Sepetiba Bay (Coimbra *et al.*, 1994). On the other hand, *Callistocythere litoralensis* occurs along the south shelf of the Southwestern Atlantic and at least in two mixohaline areas: the cold waters of the Uruguayan/ Argentinean estuary of La Plata (Whatley & Moguilevsky, 1975) and in the Sepetiba Bay (Coimbra *et al.*, 1994). Moreover, this species is absent from the other mixohaline environments studied herein. The shelf marine distribution and fossil record of these two species of *Callistocythere* are discussed by Coimbra *et al.* (1995).

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