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Diversity and structure of the stomatopod (Crustacea) community on the Amazon continental shelf

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ABSTRACT. The present study aimed to characterize the biodiversity of the Stomatopoda species found off the coast of the northern Brazilian states of Amapá and Pará, within the region's Exclusive Economic Zone. Two distinct sectors were surveyed, to the north and to the south of Cape Norte. The specimens were collected during fishery surveys carried out between 1996 and 1998 by the Revizee Program, using bottom shrimp trawl nets. The specimens were identified at the Crustaceans Laboratory of the Center for Research and Management of Fishery Resources of the Northern Coast and the Carcinology Laboratory of the Federal Rural University of Pernambuco. The 189 identified specimens represented *Lysiosquilla scabricauda* (Lamarck, 1818) (n = 2), *Parasquilla meridionalis* Manning, 1916 (n = 1), *Squilla empusa* Say, 1818 (n = 6), and *Squilla lijdingi* Holthuis, 1959 (n = 180). Only three species were collected in each of the survey sectors, with *L. scabricauda* and *S. lijdingi* being captured in both sectors. *Squilla lijdingi* was dominant in both sectors, whereas the other species were considered to be rare. *Squilla lijdingi* was very frequent in the northern sector, although the other stomatopods were infrequent. In the southern sector, *L. scabricauda* was sporadic, *S. empusa* was frequent, and *S. lijdingi* was very frequent. A significant difference was observed in the number of specimens captured in both sectors. The Shannon index was 0.6144 bits.ind^{-1} for the northern sector and 0.2708 bits.ind^{-1} for the southern one, whereas equitability was 0.3876 in the North and 0.1708 in the South. The stomatopods were collected at depths between 32 and 109 m, and were captured primarily on gravelly bottoms in the northern sector, and on muddy substrates in the southern sector. Stomatopods were more abundant in the northern sector during the dry season from June to November, whereas they were more common in the South during rainy season, from December to May.

KEY WORDS. Mantis shrimp; northern coast of Brazil; Revizee Program; Stomatopoda.

The diversity of a biological community may be influenced by the dispersal of its component organisms, which may be permanent, temporary or transitional residents (Myers 1997). Thus, biodiversity assessments allow the quantification of the ecological role of different biotypes through the understanding of species abundance (Izsák & Papp 2000).

Coastal and oceanic environments contain a large portion of the planet's total biodiversity. However, most of these systems suffer some level of anthropogenic impact, which has reduced the availability of previously abundant resources to fisheries, sometimes to critical levels. Alterations in the biological diversity of these ecosystems caused by socioeconomic activities represent an increasingly serious threat to sustainable development.

No other group of plants or animals is as diverse, in morphological terms, as the extant crustaceans (Martin & Davis 2001). The sub-phylum Crustacea contains about 67,829 species (Bueno 2007), of which at least 450 are mantis shrimp or stomatopods (Order Stomatopoda Latreille, 1817, Superorder Hoplocarida Calman, 1904) (Ahyong 2001). The first two cephalic somites of these animals, are mobile (Gomes-Corrêa 1999) with the first (ophthalmic) supporting a pair of pedunculate eyes with corneas at the distal extremities. The shape and the position of these structures are important taxonomic diagnostic traits.

Stomatopods crustaceans are distributed over a wide area, primarily in tropical and subtropical regions of the Atlantic (western and eastern), eastern Pacific, and Indopacific oceans (Viana *et al*. 1998). They are essentially marine organisms, rarely found in brackish waters. Mantis shrimps may be found at a variety of depths and at the bottom. Some species inhabit burrows in sand or mud, together with other stomatopods; or live commensally with other animals (Gomes-Corrêa 1999). Soares *et al*. (1999) recorded stomatopods in the diet of the ray *Rioraja agassizii* (Müller & Henle 1841).

In South America, Stomatopods have been studied in Suriname and French Guiana (Takeda 1983), and in southern (Gomes-Corrêa 1999), southeastern (Tavares & Mendonça-Júnior 1997, Rodrigues & Young 2005), northeastern (**Coelho & Santos** 2003), and northern Brazil (Viana *et al.* 1998, Cutrim *et al.* 2001, Silva *et al.* 2002, 2003).

The Brazilian government has created a Program for the Assessment of the Sustainable Potential of the Living Resources of the Exclusive Economic Zone (EEZ), the Revizee Program. The Revizee Program aimed to assess the sustainable potential of living resources in the EEZ, in order to define management policies. The Revizee Program had its origin in the United Nations Convention on the Law of the Sea (MMA 2006). The present study analyzes the stomatopods collected during the Revizee Program in northern Brazil.

MATERIAL AND METHODS

The study area encompasses the coast of the northern states of Amapá and Pará (Fig. 1), which are part of the Brazilian EEZ. Based on physiographic characteristics of this area, we traced a line starting from Cape Norte (00°59'09"N, 49°57'02" W) at an angle of approximately 45°. By doing so, we divided the study area into two sectors: northern (NS) and southern secto (SS), using the ArcGis 9.3 program (Esri 2008).

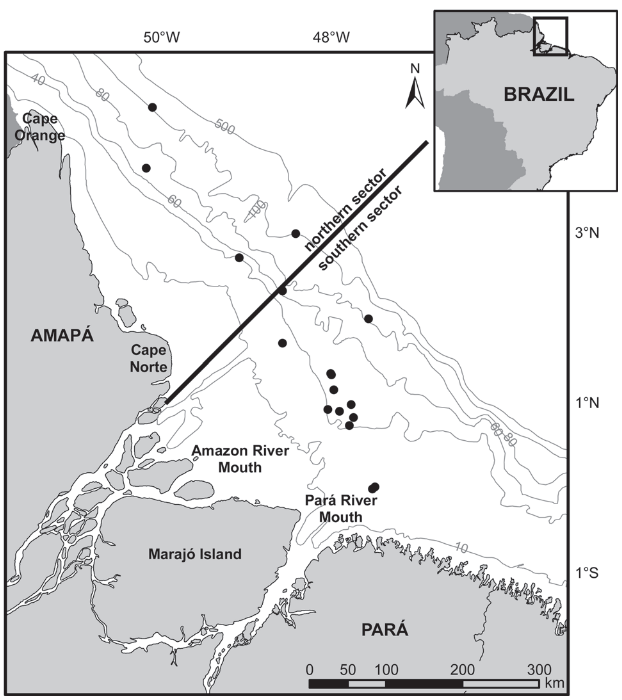


Figure 1. Map of the study area, showing sampling points with stomatopod occurrence and the division between the northern and southern sectors. The specimens were captured in shrimp trawl nets during the Revizee Program between 1996 and 1998.

The United Nations Convention on the Law of the Sea establishes that "The exclusive economic zone is an area beyond and adjacent to the territorial sea ..." (UNCLOS 1982: article 55) and "...shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured" (UNCLOS 1982: article 57). In the present study, the Amazon continental shelf was defined as the shelf itself and the adjacent oceanic area (slope and rise).

Hauls were part of the activities of the Revizee Program in the northern Brazilian coast between 1996 and 1998. For this study, we considered only the hauls in which stomatopods were collected. The experimental fisheries were conducted by the Center for Research and Management of Fishery Resources of the Northern Coast (CEPNOR), using the research vessel Almirante Paulo Moreira. Diurnal trawls were conducted between 06:00 a.m. and 5:59 p.m., and nocturnal catches between 6:00 p.m. and 05:59 a.m.

The stomatopods analyzed were captured using bottom shrimp trawl nets, similar to those used by the local industrial shrimp fleet, with rectangular wooden doors and iron plates. The collected specimens were stored on ice in individually-identified baskets, labeled with date, trawl number, and geographic position. The initial and the final depth of each trawl, and type of sediment, were also recorded. As most of the sediments were classified as "indeterminate", the classification proposed by Figueiredo-Júnior *et al.* (2008) was used for data analysis. Once landed, the specimens were stored in a cold storage chamber until analysis.

Specimens were identified at the CEPNOR Crustaceans Laboratory and at the Carcinology Laboratory of the Federal Rural University of Pernambuco, using the studies of Manning (1978) and Takeda (1983) as references. The species were classified according to Martin & Davis (2001). Some specimens were deposited at the CEPNOR Crustaceans Laboratory, under specific deposit numbers (Tab. I).

Table I. Codes of the recipients containing specimens of *Lysiosquilla scabricauda*, *Parasquilla meridionalis*, *Squilla empusa*, and *Squilla lijdingi*, captured in NS and SS with shrimp trawl nets during Revizee Program, between 1996 and 1998.

Sector	Species	Collection number
NS	*Lysiosquilla scabricauda*	92.1.2 A
SS	*Parasquilla meridionalis*	93.1.1 A
	Squilla lijdingi	94.1.2 K e 94.1.2 O
	Lysiosquilla scabricauda	92.1.2 D
	Squilla empusa	94.1.1 A e 94.1.1 B
	Squilla lijdingi	94.1.2 A e 94.1.2 D

The relative abundance of taxa was given by their percentage contribution to the sample: $A = (n \times 100)/N$; where n is the number of individuals by superfamily, family or species, and N is the total number of stomatopods captured.

The frequency of occurrence of the different species, expressed as percentage, was obtained by the following formula: $F = (p \times 100)/P$; where p is the number of trawls containing the species, and P is the total number of trawls containing stomatopods.

The results were classified according to Santos (2000). For abundance, the categories were dominant (above 50%), abundant (30-50%), uncommon (10-29%), and rare (below 10%). For frequency, they were very frequent (above 70%), frequent (30-70%), infrequent (10-30%), and sporadic (below 10%).

Differences in the total number of specimens captured between the study sectors (NS and SS) were tested using χ^2, with á = 0.05. Species richness was provided by a simple species count, as suggested by Krebs (1985) and Ricklefs (2003).

Shannon diversity index (H') was calculated for the study period as a whole. This approach assumes that the samples were obtained randomly from a theoretically infinite population, and thus, that all the species are represented in the sample (Tischer & Santos 2003). Equitability (J') was also calculated considering the entire study period. This index varies from 0 to 1, with values above 0.5 indicating that the species are well distributed, and those below 0.5, a poor distribution of species (Tischer & Santos 2003).

In order to evaluate whether the species found in both study sectors had the same distribution patterns, the following variables were analyzed: I) depth (Nittrouer *et al.* 1986): inner shelf (up to 40 m), mid-shelf (40-60 m), outer shelf (60-100 m), and slope (100-200 m); II) sediment type (Figueiredo-Júnior *et al.* 2008): sand, gravelly sand, muddy sand, gravel, and mud; 3) season (Oliveira *et al.* 2007): rainy season (high water), from December to May, and dry season (low water), from June to November.

The specimens were sexed based on their diagnostic traits. In males, there is a pair of tubular copulatory appendices at the base of the last pair of pereiopods, which are normally visible in juveniles. In females, genital openings are paired submedian structures located on the ventral surface of the sixth thoracic somite (Gomes-Corrêa 1999). Total length (TL) was measured from the anterior edge of the rostral plate to the posterior extremity of the telson. The mean and range total length values were determined separately for males and females. The length of samples with only one specimen was considered the maximum value. Student's two-tailed t was used to compare mean length between the sexes, with $\alpha = 0.05$ (Ivo & Fonteles-Filho 1997). The test was run in BioEstat 5.0 program (Ayres *et al.* 2007).

Possible deviations in the sex ratio were tested using χ^2, with $\alpha = 0.05$ in a 2 x 2 contingency table. However, the test was only applied when the total number of specimens was at least 40, based on the recommendation of Legendre & Legendre (1998), who considered sample size to be adequate when it is at least ten times greater than the number of cells in the contingency table (in this case, four).

Data were considered simultaneously for the calculation of relative abundance, frequency of occurrence, and ecological indices, as well as bathymetric distribution, type of sediment, sex ratio, and total length.

RESULTS

The stomatopods collected in this study belong to three superfamilies – Lysiosquilloidea Giesbrecht, 1910, Parasquilloidea Ahyong & Harling, 2000, and Squilloidea Latreille, 1802. The first of these three superfamilies contributed 5.56% of the specimens collected in the northern sector and 0.58% in the southern sector, while the second was collected only in the northern sector, where it contributed 5.56% of the specimens. Squilloidea was represented by the majority of the specimens collected in the southern (99.42%) and northern (88.88%) sectors. While two squilloid species were collected in the southern sector, only one was recorded in the northern sector.

The stomatopods collected belong to three families – Lysiosquillidae Giesbrecht, 1910, Parasquillidae Manning, 1995, and Squillidae Latreille, 1802 – and three genera, *Lysiosquilla* Dana, 1852; *Parasquilla* Manning, 1961, and *Squilla* Fabricius, 1787. The family Parasquillidae was collected only in the northern sector, whereas Squillidae was more abundant in the southern sector (99.42%) (Fig. 2).

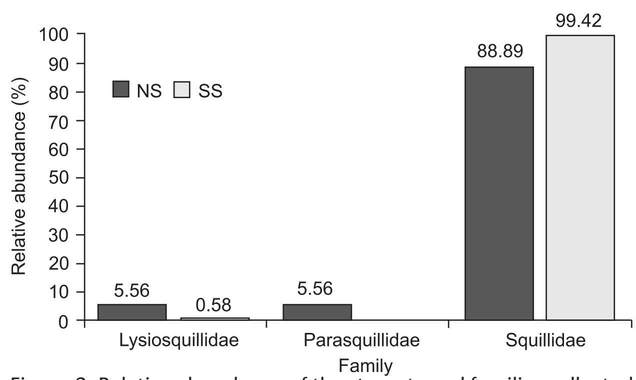


Figure 2. Relative abundance of the stomatopod families collected in NS and SS with bottom shrimp trawl nets during the Revizee program between 1996 and 1998.

Four mantis shrimp species were identified. Lysiosquillidae: *Lysiosquilla scabricauda* (Lamarck, 1818); Parasquillidae: *Parasquilla meridionalis* Manning, 1916; Squillidae: *Squilla empusa* Say, 1818, and *Squilla lijdingi* Holthuis, 1959. The latter was the most common, with 95.24% of the specimens, followed by *S. empusa*, with 3.17%, *L. scabricauda*, with 1.06%, and *P. meridionalis*, with 0.53%.

The specimens were captured in 20 hauls carried out during eight fishery surveys. Hauls lasted between 30 minutes and 5 hours and 30 minutes, half of which were conducted during the day, and the other half, during the night (Table II).

Table II. Fishery survey (FS), haul (H), location, sediment type, depth, trawling duration (TD), period of the day (P), i.e., night (n) or day (d), and number of stomatopods (N) captured in the NS and SS with bottom shrimp trawl nets during the Revizee Program between 1996 and 1998.

FS	H	Date	Sector	Latitude	Longitude	Sediment	Depth	TD	P	N
I	5	02/09/1996	NS	02°41’N	49°04’W	muddly sand	52	3 h 30 min	n	4
I	11	05/09/1996	SS	01°20’N	48°00’W	mud	48	5 h 30 min	n	2
II	4	05/10/1996	NS	03°45’N	50°10’W	gravel	75	1h	d	10
II	7	07/10/1996	NS	03°12’N	49°17’W	gravel	81	1 h	d	1
II	8	07/10/1996	NS	02°58’N	48°25’W	gravelly sand	63	1 h	d	2
II	9	08/10/1996	SS	00°53’N	47°54’W	mud	41	1 h	n	33
III	10	18/11/1996	SS	02°18’N	48°34’W	sand	65	3 h	n	2
III	15	20/11/1996	SS	01°08’N	47°58’W	mud	45	5 h	n	4
III	18	21/11/1996	SS	00°58’N	47°56’W	muddy sand	49	4 h 30 min	d	3
IV	11	13/12/1996	SS	00°43’N	47°47’W	muddy sand	37	1 h	n	7
V	10	13/05/1997	SS	00°00’N	47°29’W	mud	36	1 h	d	61
V	11	14/05/1997	SS	00°49’N	47°44’W	muddy sand	42	1 h	d	5
VII	5	14/03/1998	NS	04°28’N	50°06’W	gravelly sand	109	30 min	n	1
IX	4	30/04/1998	NS	02°18’N	48°34’W	sand	65	1 h	n	2
IX	6	01/05/1998	SS	01°41’N	48°34’W	mud	41	1 h	d	22
IX	11	03/05/1998	SS	01°58’N	47°33’W	gravelly sand	76	1 h	d	1
IX	13	07/05/1998	SS	01°19’N	47°59’W	mud	49	1 h	n	22
IX	14	10/05/1998	SS	01°08’N	47°58’W	mud	46	1 h	d	3
X	7	01/06/1998	SS	00°54’W	48°02’W	mud	32	1 h	n	1
X	8	02/06/1998	SS	00°01’S	47°31’W	mud	37	1 h	d	3
Total										189

Three stomatopod species were recorded in each of the two sectors. Only *L. scabricauda* and *S. lijdingi* were captured in both study sectors (Fig. 3).

Except for *S. lijdingi,* which was dominant in both sectors, stomatopods were rare throughout the study area (Table III). Similarly, only *S. lijdingi* was considered very frequent in both sectors, *S. empusa* was frequent in the southern sector and the other species were infrequent or sporadic (Table IV).

The number of stomatopods was significantly different between the northern and southern sectors (Table V).

The Shannon index was 0.6144 bits.ind^{-1} for the northern sector and 0.2708 bits.ind^{-1} for the southern sector. Equitability was 0.3876 in the northern sector and 0.1708 in the southern sector (Table VI).

The stomatopods were collected at depths between 32 and 109 m (Fig. 4). In the northern sector, they were more common in the outer shelf (60-100 m), whereas in the southern sector, they were more common in the mid-shelf (40-60 m).

Lysiosquilla scabricauda was collected at 60-100 m in the northern sector, but in shallower waters in the southern sector. A similar pattern was observed for *S. lijdingi*, the a larger number of specimens being captured at 60-100 m in the northern sector and between 40 and 60 m in the southern sector (Figs 4 and 5).

Table III. Relative abundance classification for stomatopod species captured in NS and SS with bottom shrimp trawl nets during Revizee Program between 1996 and 1998.

Sector	Species	Relative abundance (%)	Classification
NS	*L. scabricauda*	5.56	rare
	P. meridionalis	5.56	rare
	S. lijdingi	88.89	dominant
SS	*L. scabricauda*	0.58	rare
	S. empusa	3.51	rare
	S. lijdingi	95.91	dominant

Table IV. Frequency of occurrence classification for stomatopod species captured in the NS and SS, based on trawls conducted during the Revizee Program between 1996 and 1998.

Sector	Species	Frequency relative (%)	Classification
NS	*L. scabricauda*	20.00	infrequent
	P. meridionalis	20.00	infrequent
	S. lijdingi	80.00	very frequent
SS	*L. scabricauda*	7.69	sporadic
	S. empusa	30.77	frequent
	S. lijdingi	92.31	very frequent

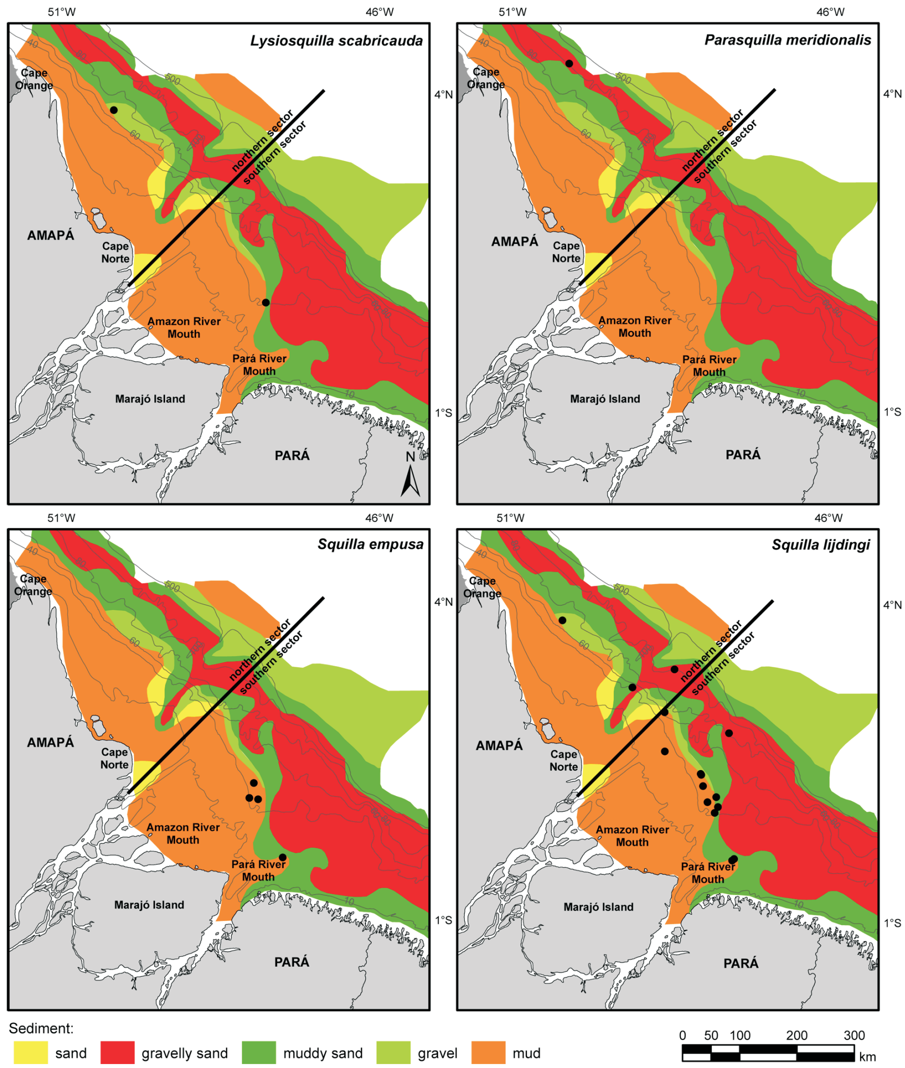
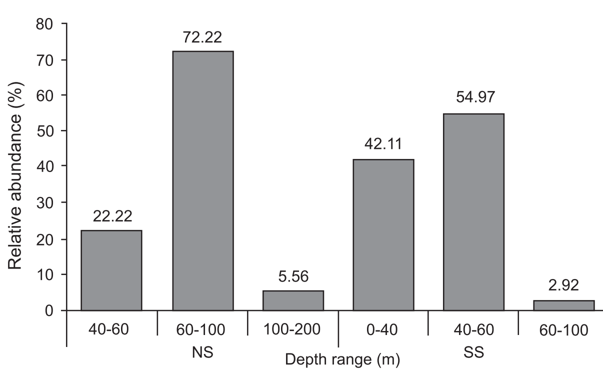


Figure 3. Sampling points at which *Lysiosquilla scabricauda*, *Parasquilla meridionalis*, *Squilla empusa*, and *Squilla lijdingi* were captured in NS and SS with bottom shrimp trawl nets during Revizee Program between 1996 and 1998.



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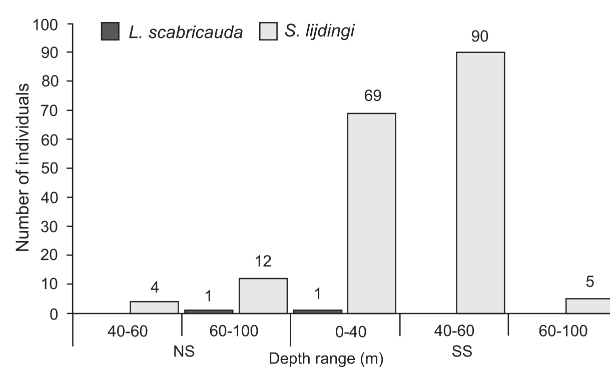

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Figures 4-5. Relative abundance of stomatopods (5) and number of stomatopods representing the species common to both study sectors (6) captured with bottom shrimp trawl nets during the Revizee Program (1996-1998) according to depth classes in NS and SS.

Stomatopods were collected primarily on gravel bottoms in the northern sector, and on muddy sediments in the southern sector (Fig. 6).

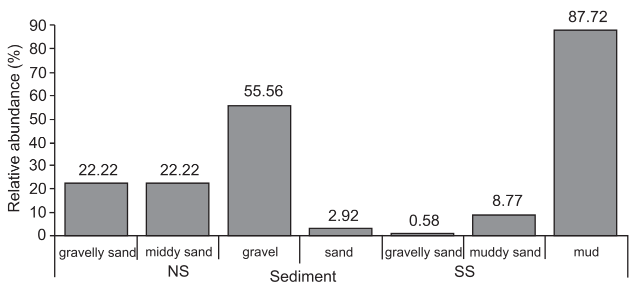

Figure 6. Relative abundance of stomatopod species captured in sediments in the NS and SS with bottom shrimp trawl nets during the Revizee Program between 1996 and 1998.

Lysiosquilla scabricauda occurred only on gravelly substrates in the northern sector, and only on muddy sand in the southern sector. By contrast, *S. lijdingi* was found mainly on muddy sand in the northern sector and on mud in the southern sector (Fig. 7).

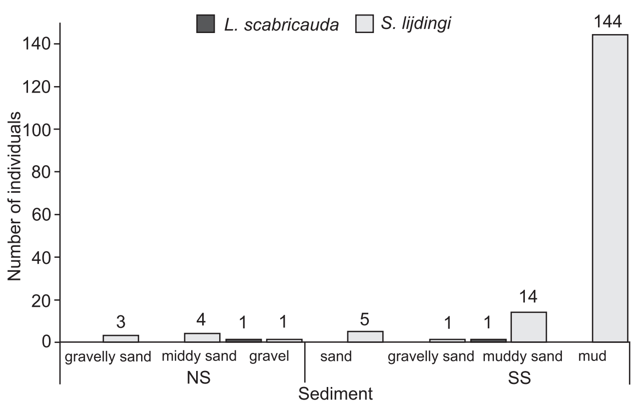

Figure 7. Number of stomatopods representing the species common to both study sectors captured with bottom shrimp trawl nets during the Revizee Program (1996-1998), captured on different types of sediment in the NS and SS.

In the northern sector, stomatopods were more abundant in the dry season, whereas in the southern sector, they were more abundant in rainy season (Fig. 8).

In the northern sector, *L. scabricauda* was captured only during the dry season, but only in the rainy season in the southern sector. Similarly, *S. lijdingi* was collected only during the dry season in the northern sector, and was more abundant during the rainy season (Figs 8 and 9).

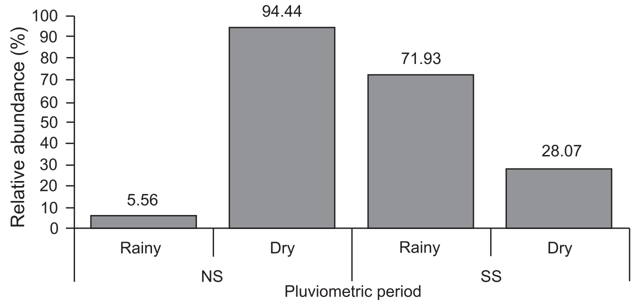

Figure 8. Relative abundance of all the stomatopod species collected during the different seasons in the NS and SS with bottom shrimp trawl nets during Revizee Program (1996-1998).

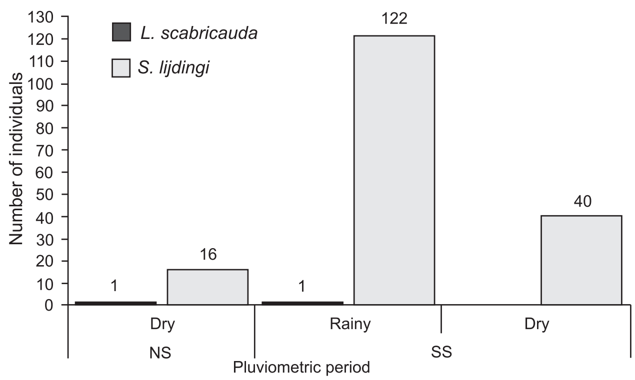

Figure 9. Number of specimens of *L. scabricauda* and *S. lijdingi* captured with bottom shrimp trawl nets during the Revizee Program (1996-1998) in the rainy and dry seasons in the NS and SS.

Table V. Number of stomatopods collected in NS and SS with bottom shrimp trawl nets during Revizee Program between 1996 and 1998.

Number of individuals			χ^2
NS	SS	Total	
18	171	189	123.86*

* significant (α = 5%).

Table VI. Ecological indices for stomatopods collected in the NS and SS with bottom shrimp trawl nets during the Revizee Program between 1996 and 1998. (H') Shannon diversity index, (J') equitability).

Sector	Richness	Number of individuals	H'	J'
NS	3	18	0.6144	0.3876
SS	3	171	0.2708	0.1708

The sex ratio was calculated only for *S. lijdingi*, and significant differences were found in both survey sectors (Table VII). In the northern sector, only one individual was not sexed, whereas in the southern sector, the sex of 49 specimens was not determined. Ovigerous females were observed only in the southern sector, where two individuals were found together at a depth of 36 m on muddy sediment during the rainy season.

Table VII. Sex ratio of Squilla lijdingi specimens collected with bottom shrimp trawl nets during the Revizee Program (1996-1998) in NS and SS.

Species	Sector	Number of individuals			Sex ratio (M:F)	χ^2
		Male	Female	Total		
S. lijdingi	NS	2	13	15	0.15	8.07*
S. lijdingi	SS	45	70	115	0.64	5.43*

* significant (α = 5%).

Only a single male *L. scabricauda* specimen was collected in each sector. The largest specimen was collected in the northern sector (Table VIII). The smallest *S. lijdingi* specimens for males and females were collected in the northern sector and the largest in the southern sector (Table VIII). The variation in mean total body length for males and females was tested (*t*) just for *S. lijdingi*, although no significant difference was found between the study sectors (Table IX).

DISCUSSION

The present study focused on the stomatopod species captured with bottom shrimp trawls off the Cape Norte at the mouth of the Amazon River. The areas to the north and south of Cape Norte were considered to be distinct sectors, considering the role of the Amazon as a zoogeographic barrier. The formation of a salt wedge by the discharge of this river, together with strong currents, may have contributed to the absence of certain species in the different study areas – i.e., *S. empusa* absent from northern sector, and *P. meridionalis* absent from the southern sector. While Lysiosquilloidea and Squilloidea were represented in both sectors, Parasquilloidea was recorded only in the southern sector.

According to the classification of Martin & Davis (2001), the order Stomatopoda is divided into seven superfamilies – Bathysquilloidea Manning, 1967, Erythrosquilloidea Manning & Bruce, 1984; Eurysquilloidea Ahyong & Harling, 2000, Gonodactyloidea Giesbrecht, 1910, Lysiosquilloidea Giesbrecht, 1910, Parasquilloidea Ahyong & Harling, 2000, and Squilloidea Latreille, 1802. In the present study, only the Lysiosquilloidea, Parasquilloidea, and Squilloidea were recorded.

Martin & Davis (2001) also identified 15 families, which are distributed among the superfamilies as follows – Bathysquilloidea (Bathysquillidae Manning, 1967 and Indosquillidae Manning, 1995), Gonodactyloidea (Alainosquillidae Moosa, 1991, Hemisquillidae Manning, 1980, Gonodactylidae Giesbrecht, 1910, Odontodactylidae Manning, 1980, Protosquillidae Manning, 1980, Pseudosquillidae Manning, 1977, and Takuidae Manning, 1995), Erythrosquilloidea (Erythrosquillidae Manning & Bruce, 1984), Lysiosquilloidea (Coronididae Manning, 1980, Lysiosquillidae Giesbrecht, 1910, Nannosquillidae Manning, 1980, and Tetrasquillidae Manning & Camp, 1993), Squilloidea (Squillidae Latreille, 1802), Eurysquilloidea (Eurysquillidae Manning, 1977), and Parasquilloidea (Parasquillidae Manning, 1995). In the present study, only three of these families were observed.

The use of only one type of fishing apparatus and the frequency of the surveys may have influenced the number of species recorded during the present study. The same four species recorded here were also found by Takeda (1983) in French Guiana and Suriname, and by Silva *et al.* (2002, 2003) in the northern coast of Brazil. However, based on REVIZEE surveys in northern Brazil, Viana *et al.* (1998) recorded only three stomatopod species, and Cutrim *et al.* (2001) reported only two species from an area identified as "Lixeira".

Table VIII. Descriptive statistics for *Lysiosquilla scabricauda* and *Squilla lijdingi* specimens captured in the NS and SS with bottom shrimp trawl nets during Revizee Program (1996-1998). (SD) Standart deviation.

Specie	Sector	Male					Female				
		Minimum	Average	Maximum	SD	N	Minimum	Average	Maximum	SD	N
L. scabricauda	NS	–	–	20.40	–	1	–	–	–	–	0
L. scabricauda	SS	–	–	9.50	–	1	–	–	–	–	0
S. lijdingi	NS	5.20	7.35	9.50	3.04	2	4.20	6.17	8.50	1.27	12
S. lijdingi	SS	5.30	6.77	9.70	0.89	41	4.50	6.69	9.10	0.84	59

Table IX. Comparison between mean total body lengths recorded for male and female stomatopods collected with bottom shrimp trawl nets in the NS and SS.

Sector	Male	N	S_2	Female	N	S_2	Gl	t_{cal}	t_{tab}	Hypothesis
NS	7.35	2	9.25	6.16	12	1.64	12	-1.03	2.576	Accept H_0
SS	6.77	41	0.79	6.69	59	0.70	98	-0.45	2.576	Accept H_0

Zoogeography attempts to explain the distribution of animal species, their dispersal patterns, and the factors determining these patterns. The absence of a given species from an area in which similar animals occur may be due to the presence of a barrier to dispersal or competition from resident populations. Geological changes have been responsible for many recorded shifts in the distributions of both plant and animal species (Hickman-Júnior *et al.* 2003).

Almeida *et al.* (2007) recorded a total of 41 stomatopod and decapod crustacean species off the coast of Ilhéus (Bahia, Brazil), including three squillids – *Gibbesia neglecta* (Gibbes, 1850); *Squilla obtusa* Holthuis, 1959, and *Alima hieroglyphica* (Kemp, 1911).

Material collected during Revizee Program led to the first records of occurrence of three stomatopod species in Brazilian waters – *S. empusa* in Pará (Viana *et al.* 1998), *Squilla edentata* (Lunz, 1937) in Bahia, and *Odontodactylus havanensis* (Bigelow, 1893) in Espírito Santo (Rodrigues & Young 2005). *Squilla lijdingi* was also the most abundant species recorded by Viana *et al.* (1998), Cutrim *et al.* (2001), and Silva *et al.* (2003).

Equitability in the two survey sectors was below 0.5, which indicates that the different species are poorly distributed within the study area. It is the result of the occurrence of an abundant species – *S. lijdingi* – which dominated the taxocoenosis of the study area (95.24%).

The inner shelf is covered by recent deposits of fluvial mud in Amapá, shifting to transgressive quartz sands, which outcrop on the continental shelf of Pará and Maranhão. The inner shelf also presents isolated deposits of fluvial sand, which form elongated plumes of material emanating outwards from the mouths of the Amazon and Pará Rivers (Kowsman & Costa 1979, Coutinho 1996).

As stomatopods dwell in burrows and cavities (Caldwell & Dingle 1976), the sedimentary structure described by Kuehl *et al.* (1982, 1986) for the Amazon continental shelf may be favorable to this group. Kuehl *et al.* (1982, 1986) described a region of bioturbated muds, also called mottled mud, where biological structures, such as tubes and burrows, were observed and the sediments were extensively reworked by benthic macrofauna.

The mixture of freshwater discharge with oceanic waters at the mouth of the Amazon River results in the formation of an extensive area of low salinity, even during the period of minimum discharge. This is due to the waves that are formed by the winds generated over the Amazon continental shelf (Silva *et al.* 2001). The maximum discharge of the Amazon River coincides with the rainy season, and the lowest discharge with the dry season. Given this, the Amazon River plume, formed by the river's discharge, reaches its maximum level in March-May, receding to a minimum in June-December (Lentz 1995). Despite this marked seasonality in local conditions, our samples did not show a clear pattern of seasonal variation in the occurrence of the most common species.

The maximum total body length recorded in the present study for *Lysiosquilla scabricauda* is within the range reported by Manning (1978), who mentions a total length of 30 cm.

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