Community Ecology of the Metazoan Parasites of Pink Cusk-eel, *Genypterus brasiliensis* (Osteichthyes: Ophidiidae), from the Coastal Zone of the State of Rio de Janeiro, Brazil

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Fifty-five specimens of pink cusk-eel, Genypterus brasiliensis *Regan, 1903 (Osteichthyes: Ophidiidae) collected from the coastal zone of the State of Rio de Janeiro, Brazil (approx. 21-23°S, 41-45°W), from September 2000 to January 2001, were necropsied to study their parasites. All fish were parasitized by one or more metazoan. Fourteen species of parasites were collected.* G. brasiliensis *is a new host record for nine parasite species. The larval stages of cestodes and the nematodes were the majority of the parasite specimens collected, with 38.4% and 36.5%, respectively.* Cucullanus genypteri *was the dominant species with highest prevalence and/or abundance. The parasites of* G. brasiliensis *showed the typical overdispersed pattern of distribution. Six parasite species showed correlation between the host's total body length and prevalence and abundance. Host sex did not influence prevalence and parasite abundance of any parasite species. The mean diversity in the infracommunities of* G. brasiliensis *was H= 0.364 ± 0.103, with correlation with the host's total length and without differences in relation to sex of the host. One pair of adult endoparasites (*C. genypteri *and* A. brasiliensis*) showed positive covariations between their abundances. Negative association or covariation was not found. Differences between the qualitative and quantitative aspects of the parasite community of* G. brasiliensis *from Rio de Janeiro and Argentina suggest the existence of two population stocks of pink cusk-eel in the South America Atlantic Ocean.*

Key words: parasite ecology - community structure - marine fish - Ophidiidae - *Genypterus brasiliensis* - Rio de Janeiro - Brazil

Genypterus brasiliensis Regan, 1903 is a demersal gadiform fish, found on soft mud bottoms (depth range 60-200 m), with a known distribution from Rio de Janeiro, Brazil to Uruguay (Figueiredo & Menezes 1978). The pink cusk-eel is very common in the southern Brazilian coastal zone and is a commercially important species.

From Brazil, studies on the parasite fauna of *G. brasiliensis* are scarce. Pereira Jr. (2000) provided new morphologic data on the cestode *Anonchocephalus chilensis* (Riggenbach 1896), a species redescribed anteriorly by Suriano and Labriola (1998) based upon specimens collected from *G. blacodes* (Forster, 1801). From Argentina, some records of parasites of *G. brasiliensis* were made by Sardella et al. (1997, 1998) and Navone et al. (1998). Quantitative aspects of the parasites of *G. brasiliensis* were studied by Sardella et al. (1998) from Argentina.

Other *Genypterus* species from South America were studied for quantitative aspects of their parasites in Vergara and George-Nascimento (1982) for *G. chilensis* (Guichenot, 1848), George-Nascimento and Huet (1984) for *G. maculatus* (Tschudi, 1846), and Riffo (1994), and Sardella et al. (1998) for *G. blacodes* from Chile and Argentina, respectively.

In this report, we analyze the metazoan parasite community of *G. brasiliensis* from the coastal zone of the State of Rio de Janeiro, at the component and infracommunity levels, and compare our results with those on parasite communities of congeneric species from South American Atlantic and Pacific Ocean.

MATERIALS AND METHODS

We examined 55 specimens of *G. brasiliensis* from September 2000 to January 2001. Local fishermen collected fish from coastal zone of the state of Rio de Janeiro (21-23°S, 41-45°W), Brazil. These fish were identified according to Figueiredo and Menezes (1978) and measured 29-70 cm (mean = 42.6 ± 8.5 cm) in total length. The average total length of male (49.1 ± 4.9 cm, n = 17) and female (49.9 ± 8.8 cm, n = 24) fishes in the study sample were not significantly different ($t = -0.246, P = 0.807$). Sex could not be determined in the other 14 fish examined.

The analysis included only parasite species with prevalence greater than 10% (Bush et al. 1990). The variance to mean ratio of parasite abundance (index of dispersion) was used to determine distribution patterns and tested by the *d* statistical index (Ludwig & Reynolds 1988). The dominance frequency and the relative dominance (number of specimens of one species/total number of specimens of all species in the infracommunity) of each parasite species were calculated according to Rohde et al. (1995). Spearman's rank correlation coefficient (r_s) was calculated to determine possible correlations between the host's total body length and abundance of parasites. Pearson's correlation coefficient (r_s) was used as an indication of the relationship between the host's total body

length and the prevalence of parasites, with previous arc-sine transformation of the prevalence data (Zar 1996). The possible influence of host sex on abundance and prevalence of parasites was tested using the Z normal approximation to the Mann-Whitney test and the chi-square test, respectively. Parasite species diversity was calculated using the Brillouin index (H), because each fish analyzed corresponded to a fully censused community (Zar 1996). The probable variation of diversity in relation to host sex (Mann-Whitney test) and to host total length (Spearman's rank correlation coefficient) was tested. For each infracommunity, the evenness (Brillouin-based evenness index) was calculated. The possible interspecific association between concurrent species was determined using the chi-square test. Possible covariation among the abundance of concurrent species was analyzed using the Spearman rank correlation coefficient. Ecological terminology follows Bush et al. (1997). Statistical significance level was evaluated at $P \leq 0.05$.

Qualitative and quantitative comparisons between parasites from *Genypterus* species inhabiting the Argentina (Sardella et al. 1998), Brazil (present report) and Chile (Vergara & George-Nascimento 1982, George-Nascimento & Huet 1984, Riffo 1994), were made using the Sorenson similarity coefficient (Neraasen & Holmes 1975) and the Percent similarity coefficient (Holmes & Podesta 1968), respectively.

Voucher specimens of helminths and hirudineans were deposited in the Coleção Helmintológica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil; copepods were deposited in the Coleção de Crustacea do Museu Nacional (MNRJ), Quinta da Boa Vista, Rio de Janeiro, RJ, Brazil. Voucher specimens of *G. brasiliensis* were deposited in the Coleção Ictiológica do Museu Nacional (MNRJ), Quinta da Boa Vista Rio de Janeiro, RJ, Brazil (see Table I).

RESULTS

Component community - Fourteen species of metazoan parasites were collected (Table I). *G. brasiliensis* is a new host record for *Acanthocolpus brasiliensis* Fernandes and Souza, 1973; *Pseudempleurosoma gibsoni* Santos, Mourão and Cárdenas, 2001; *Lacistorhynchus* sp., *Nybelinia* sp., *Scolex pleuronectis* Müller, 1788; *Corynosoma australe* Johnston, 1937; *Polymorphus* sp., *Contracaecum* sp., and *Procamallanus* sp. The majority of the parasites specimens collected were cestodes (38.4%), followed by the nematodes (36.5%). *Cucullanus genypteri* Sardella, Navone and Timi, 1997 was the predominant species, with 1,312 specimens collected (35.6% of all parasites); and showed the highest values of mean relative dominance and frequency of dominance (Table II). Host length was significantly correlated with: (a) abundance, positive for *A. brasiliensis* and *C. genypteri*; (b) prevalence, positive for *S. pleuronectis*; negative for *Lacistorhynchus* sp.; (c) both abundance and prevalence, were positive for *Contracaecum* sp. and chondracanthid not identified (Tables III, IV). Host sex did not influence parasite prevalence or mean abundance of any species. The parasite community of *G. brasiliensis* showed low similarity with the parasite communities of the other *Genypterus* species from South America (Table V).

Infracommunities - All fish were parasitized by at least one parasite species. A total of 3,677 individual parasites was collected, with mean of 66.8 parasites/fish. The values of the dispersion for the ectoparasites and endoparasites were 75.293 ($d = 79.835$) and 5.083 ($d = 13.085$), respectively. Relationships between the total parasite abundance and the host's total body length ($r_s = 0.604$, P < 0.001) of fish were observed. The mean parasite species richness 4.1 ± 1.2 (2-7), was correlated with the host's total body length ($r_s = 0.281$, $P < 0.037$). Three hosts (5.4%) were infected by 2 parasite species and 16 (29.2%), 19 (34.5%), 10 (18.2%), 3 (5.4%) and 4 (7.3%) had multiple infections with 3, 4, 5, 6 and 7 parasite species, respectively. The mean parasite species diversity (H) was 0.364 ± 0.103 and the maximum diversity was 0.589. The Brillouin-based evenness index (J) had a mean of 0.665 ± 0.118. Parasite diversity was correlated to the host's total body length ($r_s = 0.319$; $P < 0.017$) and no significant differences ($t = 0.846$, $P = 0.407$) in parasite diversity were observed between male ($H = 0.432 \pm 0.064$) and female ($H = 0.401 \pm 0.089$) hosts.

Parasite infracommunities were separated into two groups – adult endoparasites (digeneans and nematodes) and larval stages of endoparasites (cestodes, acanthocephalans and nematodes) – to determine possible interspecific associations. Ectoparasites were not included in this analysis because only one species (an unidentified chondracanthid) showed prevalence higher than 10%. Among all the parasite species, only one species pair of adult endoparasites, *A. brasiliensis-C. genypteri*, shared significant positive covariation ($r_s = 0.618$, $P = 0.001$).

DISCUSSION

Quantitative aspects and composition of the parasite community of *G. brasiliensis* from Rio de Janeiro can be compared with the results obtained from other *Genypterus* species from South America. The pseudophyllidean *A. chilensis* is a conspicuous parasite of *Genypterus* species. This parasite has high prevalence and abundance values in *G. maculatus*, *G. chilensis*, *G. blacodes*, and *G. brasiliensis* (from Argentina) by Vergara and George-Nascimento (1982), George-Nascimento and Huet (1984), Riffo (1994), and Sardella et al. (1998). Pereira Jr. (2000) observed *A. chilensis* parasites in *G. brasiliensis* from the southern Brazilian coastal zone. These results contrasted with results obtained from *G. brasiliensis* from Rio de Janeiro, where specimens of *A. chilensis* were not found. This suggest a possible distribution gradient of *A. chilensis*, species restricted to Austral region of South Pacific and Atlantic Ocean into Neotropical Region. The known distribution of *G. brasiliensis* is restricted to Rio de Janeiro and Gulf of San Jorge (Argentina); thus, the samples of specimens of *G. brasiliensis* studied in the present work are from the equatorial limit of this distribution.

According to data of Suriano and Labriola (1998), the "system" *Genypterus-Anonchocephalus* is restricted to the Southern Hemisphere, because the *Genypterus* species were influenced by the circumpolar Antarctic current and dispersed *Anonchocephalus* species from Pacific to Atlantic. However, our data (absence of *A. chilensis*) from

G. brasiliensis showed that the limit of this possible dispersion might be the austral limit of the known distribution of *G. brasiliensis*.

Recently, *A. chilensis* was subject of successive taxonomic studies. Gulaiev and Tkachev (1988) described specimens of *A. chilensis* from *G. blacodes* from New Zealand. Suriano and Labriola (1998) redescribed *A. chilensis*, emended *Anonchocephalus*, and proposed a second species, *A. patagonicus*, from Argentina. Pereira Jr. (2000) also redescribed *A. chilensis* and emended *Anonchocephalus* with specimens collected from *G. brasiliensis* from the State of Rio Grande do Sul, Brazil. The specimens of *A. chilensis* described by Suriano and Labriola (1998) differ from those described by Pereira Jr. (2000) by the characteristics of the cirrus armature, and possibly one of them representing another species of *Anonchocephalus*. The elucidation of these taxonomic controversies requires additional information related to biogeography and dispersion of the system *Genypterus-Anonchocephalus*.

The nematode *Cucullanus genypteri* is a common parasite of neotropical *Genypterus* species. Vergara and George-Nascimento (1982) studied a sample of *G. chilensis* from Talcahuano, Southern Chile, with results similarly to ours. *Cucullanus* sp. (= *C. genypteri*) showed high values of prevalence and abundance (72.5%, 3.6), with differences among male and female host specimens, due to differences between body size of the hosts, which were not analyzed by the authors. Later, George-Nascimento and Huet (1984) studied 80 specimens of *G. maculatus* from the same locality and recorded low values of prevalence and mean abundance (8%, 0.1) of *Cucullanus* sp. (=

TABLE I

Prevalence, intensity, mean intensity, mean abundance, and site of infection of the metazoan parasites of *Genypterus brasiliensis* from the coastal zone of the State of Rio de Janeiro, Brazil

Parasites	Prevalence (%)	Intensity	Mean intensity	Mean abundance	Site of infection
Digenea					
Acanthocolpus brasiliensis (CHIOC 34569)	91	1-121	17.2 ± 26	15.6 ± 25.2	Intestine
Monogenea					
Pseudempleurosoma gibsoni (CHIOC 34570)	9.1	1-4	1.6 ± 1.3	0.1 ± 0.6	Gills and pharynx
Eucestoda					
Lacistorhynchus sp. (larval) (CHIOC 34571)	49.1	1-16	4.8 ± 4.2	2.3 ± 3.8	Mesenteries
Nybelinia sp. (larval) (CHIOC 34572)	7.3	1-2	1.2 ± 0.5	0.1 ± 0.3	Mesenteries
Scolex pleuronectis (CHIOC 34573)	87.3	1-340	26.6 ± 54.6	23.2 ± 51.7	Intestine
Acanthocephala					
Corynosoma australe (cystacanth) (CHIOC 34574)	3.6	-	1	< 0.1	Mesenteries
Polymorphus sp. (cystacanth) (CHIOC 34575)	12.7	1-2	1.4 ± 0.5	0.2 ± 0.5	Mesenteries
Nematoda					
Contracaecum sp. (larval) (CHIOC 34650)	11	1-8	3.6 ± 3.5	0.3 ± 1.4	Mesenteries
Cucullanus genypteri (CHIOC 34654)	100	1-156	23.8 ± 26.7	23.8 ± 26.7	Intestine
Hysterothylacium sp. (larval) (CHIOC 34652)	1.8	-	1	< 0.1	Mesenteries
Procamallanus sp. (CHIOC 34653)	7.3	1-3	1.7 ± 0.9	0.1 ± 0.5	Intestine
Pseudoterranova sp. (larval) (CHIOC 34651)	5.4	1-3	1.6 ± 1.1	0.1 ± 0.4	Mesenteries
Hirudinea					
Piscicolid not identified (CHIOC 34682)	1.8	-	1	< 0.1	Gills
Copepoda					
Chondracanthid not identified (MNRJ 15.337)	25.4	1-13	2.7 ± 3.2	0.6 ± 1.9	Gill rakers, tong and bucal cavity

C. genypteri), and George-Nascimento and Muñoz (1997) obtained prevalence of 59.7 and abundance of 1.4 in the same host and locality. Riffo (1994) and Sardella et al. (1998) recorded high prevalence and abundance values of *C. genypteri* parasitic in *G. blacodes*, an amphi-oceanic species, from Southern Chile and Argentina, respectively. Sardella et al. (1997, 1998) recorded low values of prevalence (9.7%) and mean abundance (0.3) of *C. genypteri* in *G. brasiliensis* from Argentina. The highest prevalence (100%) and mean abundance (23.8) values were obtained for *C. genypteri* parasitic in *G. brasiliensis* from Rio de Janeiro.

George-Nascimento and Muñoz (1997) studied the specificity and host suitability of *C. genypteri* in *G. blacodes, G. chilensis* and *G. maculatus* from the Southeastern Pacific Ocean. They concluded that *C. genypteri* is more specific to *G. blacodes* because of the highest prevalence and abundance. This species was also the most suitable host because of a higher fecundity of the nematode. George-Nascimento and Muñoz (1997) also stated that differences in prevalence and abundance among host species can be explained by differences in the habitats, bathymetric distribution and diet of the hosts. These quantitative differences will be explained only with better knowledge of the life cycle of *C. genypteri* and additional information on the population features of the intermedi-

ate host (as yet unknown). The highly values of prevalence and abundance of *C. genypteri* obtained from *G. brasiliensis* from Rio de Janeiro showed that postulates of George-Nascimento and Muñoz (1997) should be re-examined.

Some parasites of gadiform fishes have been shown to have co-evolved with their hosts and their distribution is strongly influenced by the distribution of the host species. Paterson and Poulin (1999) stated that chondracanthid copepods showed a close co-evolutionary association by comparing host and parasite phylogenies. According to Kabata (1992) the distribution of the copepod *C. genypteri* Thomson, 1889 was determined by the migration of *G. blacodes* from Pacific of South America, along the coast of Antarctica to New Zealand, and Australia (Villalba & Fernández 1985, Etchegoin & Sardella 1989). The specific identification of the chondracanthid parasite (apparently a lernantomine species) of *G. brasiliensis* is necessary to clarify the distribution of the chondracanthid species in the Neotropical *Genypterus*, as was done for the chondracanthid species parasitic on the gadiform *Merluccius* Rafinesque, 1810 by Kabata and Ho (1981) and Etchegoin et al. (1997). Similar analysis has been applied to copepods of the genus *Sphyrion* Cuvier, 1830 by Ho (1992), but, the species *S. laevigatum* (Quoy and Gaimard, 1824) parasitic on the other Neotropical

TABLE II

Frequency of dominance and mean relative dominance of the metazoan parasites of *Genypterus brasiliensis* from the coastal zone of the State of Rio de Janeiro, Brazil

Parasites	Frequency of dominance	Frequency of dominance shared with one or more species	Mean relative dominance
Acanthocolpus brasiliensis	7	2	0.205 ± 0.180
Lacistorhynchus sp.	2	1	0.300 ± 1.257
Scolex pleuronectis	12	2	0.026 ± 0.247
Polymorphus sp.	0	0	0.004 ± 0.012
Contracaecum sp.	0	0	0.005 ± 0.019
Cucullanus genypteri	30	3	0.441 ± 0.221
Chondracanthid not identified	0	0	0.026 ± 0.135

TABLE III

Prevalence and mean abundance of metazoan parasites of *Genypterus brasiliensis*, from the coastal zone of the State of Rio de Janeiro, Brazil, in relation to total body length of hosts

	Class I (29-42 cm tl) (n = 28)		Class II (42.5 -55.5 cm tl) (n = 24)		Class III (> 56 cm tl) (n = 3)	
	P(%)	MA	P(%	MA	P(%)	MA
Acanthocolpus brasiliensis [a]	82	9.9 ± 22	100	19.4 ± 20	100	55.6 ± 60.7
Lacistorhynchus sp. [a]	53.6	5.9 ± 4.6	50	3.4 ± 2.9	0	0
Scolex pleuronectis [a]	85.7	33.6 ± 72.7	87.5	16.7 ± 23.9	100	40.7 ± 40.2
Polymorphus sp.	7.1	1.5 ± 0.7	21	1.4 ± 0.5	0	0
Contracaecum sp. [a]	3.6	1	16.7	2.7 ± 3.5	33	7
Cucullanus genypteri [a]	100	9.6 ± 6.4	100	29.9 ± 14.1	100	107.6 ± 51
Chondracanthid not identified [a]	14.2	1.2 ± 0.5	29.2	1.8 ± 0.8	100	6.7 ± 5.5

P: prevalence; MA: mean abundance; *a*: differences of the parasite prevalence and abundance among the three length classes are significant, tl: total length of hosts

TABLE IV

Spearman's rank correlation coefficient (r_s) and Pearson's correlation coefficient (r) values used to evaluate possible relationships among the total length of *Genypterus brasiliensis*, abundance and prevalence of the components of its parasite community from the coastal zone of the State of Rio de Janeiro, Brazil

Parasites	r_s	P	r	P
Acanthocolpus brasiliensis	0.550 [a]	< 0.001	0.707	0.182
Lacistorhynchus sp.	-0.178	0.191	-0.884 [a]	0.046
Scolex pleuronectis	0.105	0.442	0.926 [a]	0.024
Polymorphus sp.	0.163	0.231	-0.268	0.662
Contracaecum sp.	0.281 [a]	0.037	0.898 [a]	0.038
Cucullanus genypteri	0.782 [a]	< 0.001	—	—
Chondracanthid not identified	0.345 [a]	0.009	0.891 [a]	0.042

[a]: significant values; P: significance level

Genypterus is absent in the samples of *G. brasiliensis* from Rio de Janeiro. The presence of a highly co-evolved parasite system including *Genypterus* species, was also illustrated for helminths by Villalba and Fernández (1986), using the complex of species of sanguinicolid *Aporocotyle* Odhner, 1900 recorded from the Chilean species of *Genypterus*. Sanguinicolids were no recorded parasitic in *G. brasiliensis*.

Vergara and George-Nascimento (1982) and George-Nascimento and Huet (1984) recorded the caligid copepod *Lepeophtheirus yañezi* Stuardo & Fagetti, 1961 as the dominant species in *G. chilensis* and *G. maculatus* from southern Chilean coastal zone. According to Vergara and George-Nascimento (1982) this pattern was originated by the demersal characteristic of the *G. chilensis*. Caligid copepods were not found in *G. brasiliensis*. Apparently, distribution of *L. yañezi* is restricted to *Genypterus* species from South American Pacific Ocean. George-Nascimento and Huet (1984) recovered *L. yañezi* from *G.*

maculatus, but Riffo (1994) and Sardella et al. (1998) did not find this copepod in either *G. blacodes* or *G. brasiliensis*.

Helminth larval stages (trypanorhynch, polymorphid acanthocephalan and anisakids) are common in Neotropical *Genypterus* species (Torres & González 1978, Carvajal & Campbell 1979, Vergara & George-Nascimento 1982, George-Nascimento & Huet 1984, Riffo 1994, Sardella et al. 1998) which suggests the possibility that *Genypterus* species play an intermediate position in marine trophic web. Histopathology of anisakids parasitic in the liver of *Genypterus* sp. from Chile was described by Torres and González (1978) who recorded atrophy, edema, and necrosis of the liver parenchyma. We did not observe this type of infection.

Navone et al. (1998) described larval and adult stages of the anisakid *Hysterothylacium aduncum* (Rudolphi, 1802) from *G. blacodes* and *G. brasiliensis*, from Argentina, with high values of parasite prevalence and abundance, contrasting with low values detected in *G. brasiliensis* from Rio de Janeiro. Also, in the pink cuskeel from Brazil, only third stage larvae of *H. aduncum* were found. According to Navone et al. (1998), differences in the prevalence and abundance of *H. aduncum* between *G. blacodes* and *G. brasiliensis* from Argentina were attributed to possible differences in the feeding habits and habitat partitioning among hosts (George-Nascimento 1987). Feeding behaviour is known for most Neotropical *Genypterus* species (Bahamonde & Zavala 1981, Renzi 1986, Chong & Aguayo 1990), but *G. brasiliensis* is an exception. Differences in feeding behavior in the sympatric *G. maculatus*, *G. chilensis* and *G. blacodes* are attributed to their different bathymetric distributions, and might influence the composition and structure of parasite communities.

The sample of *G. brasiliensis* studied by Sardella et al. (1998) from Argentina, was collected from the austral limit of the known distribution of *G. brasiliensis* whereas

TABLE V

Values of the Sørenson similarity coefficient (S) and Percent similarity coefficient (PS) among parasite communities of the congeneric species of *Genypterus*, from Argentina, Brazil and Chile

	G. brasiliensis (present report)	
	S	PS
G. blacodes (Argentina, data from Sardella et al. 1998)	53.8	27.8
G. blacodes (Chile, data from Riffo 1994)	44.4	25.9
G. chilensis (Chile, data from Vergara & George-Nascimento 1982)	33.4	26.9
G. maculatus (Chile, data from George-Nascimento & Huet 1984)	40	7.8
G. brasiliensis (Argentina, data from Sardella et al. 1998)	30.7	5.8

the sample we studied was collected from Rio de Janeiro at the equatorial limit. Different values of parasite indices in endoparasites of *G. brasiliensis* from Argentina and Brazil, might indicate differences in the alimentary spectrum. Another difference in the composition of the parasite community of Neotropical *Genypterus*, is the presence of monogeneans in *G. brasiliensis* which is the only species of the genus with records for monogeneans. Also, the presence of the trematode *Acanthocolpus brasiliensis* in *G. brasiliensis* from Rio de Janeiro, contrasted with the presence of *Lecithochirium genypteri* Lühe, 1901, a trematode recorded in the other species of *Genyterus*. The values of the similarity indices between the two samples of *G. brasiliensis* (Brazil-Argentina) are low. Major differences in the prevalence and abundance of the shared parasite species also were recorded. This suggests the possibility of the existence of two distinct host populations, one at the austral limit of known distribution, with high parasite similarity with *G. blacodes* and the species of southern Pacific Ocean, and another on the equatorial limit, with parasite species no recorded from the other *Genypterus* species as *A. brasiliensis* and *P. gibsoni*. Parasitological studies of samples of *G. brasiliensis* from other localities are necessary to confirm this hypothesis.

Other patterns were detected in the parasite community of *G. brasiliensis* from Rio de Janeiro. The endoparasite dominance was recorded also in *G. blacodes* by Riffo (1994) and Sardella et al. (1998), and in some demersal marine fishes from Rio de Janeiro (Silva et al. 2000, Alves & Luque 2001, Alves et al. 2001, Tavares et al. 2001).

At the infracommunity level, the correlation of parasite prevalence and abundance, with the size of the host, is another characteristic of the parasite community of *G. brasiliensis* from Rio de Janeiro. Sardella et al. (1998) showed similar results obtained from a sample of *G. brasiliensis* from Argentina. This is a pattern widely recorded in marine fishes from Rio de Janeiro (Alves & Luque 2001), and documented with numerous cases in freshwater and marine fishes from other latitudes (Luque et al. 1996). However, according some authors (Saad-Fares & Combes 1992, Poulin 2000) this pattern can not be generalized because in many host-parasite species systems the correlation is positive but weak and non-significant.

The absence of correlations in the size of the parasite infrapopulations with the sex of the fish host is another pattern widely documented, and generally is a consequence of the absence of sexual differences in some biological aspects of the fish (Luque et al. 1996). The scarcity of the interspecific associations in the parasite infracommunities is a pattern characteristic of the majority of marine fishes studied (Rohde et al. 1995). According to Poulin (2001), experimental evidence from concomitant infections of captive hosts under laboratory conditions, and field evidence on patterns of richness and co-occurrence of parasite species from wild-caught hosts are necessary for determine the real role of interspecific interactions in the structure of parasite communities.

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