Community ecology of the metazoan parasites of namorado sandperches, *Pseudopercis numida* Miranda-Ribeiro, 1903 and *P. semifasciata* Cuvier, 1829 (Perciformes: Pinguipedidae), from the coastal zone of the State of Rio de Janeiro, Brazil

Luque, JL.[a], Felizardo, NN.[b] and Tavares LER.[a]*

[a]Departamento de Parasitologia Animal, Universidade Federal Rural do Rio de Janeiro – UFRRJ,
CP 74508, CEP 23851-970, Seropédica, RJ, Brazil

[b]Curso de Pós-Graduação em Biologia Animal, Universidade Federal Rural do Rio de Janeiro – UFRRJ

*e-mail: jlluque@ufrrj.br

Abstract

One hundred and twenty-eight specimens of namorado sandperches, 62 *P. numida* and 66 *P. semifasciata*, collected between October 2002 and June 2003 off the Cabo Frio, Rio de Janeiro, Brazil (Lat 23° S and Long 42° W), were examined to study their metazoan parasites. Parasite communities of these fish were composed basically of endoparasites, mainly digenean and cestodes species, with low prevalence and abundance but having high parasite species richness values (at the component community level). Among these values, that found for *P. numida* is the highest so far recorded for marine fishes from the Neotropical Region. Thirty-nine species of metazoan parasites were collected: 36 from *P. numida* and 28 from *P. semifasciata*. Twenty-five parasite species were common to both species of namorado sandperches. *Pseudopercis numida* and *P. semifasciata* are new host records for all parasite species collected, with the exception of *Microcotyle pseudopercis*. *Choanodera* sp., *Leurodera decora*, *Neolebouria georgenascimentoi*, and *Proctoeces* sp. which were recorded for the first time in the South American Atlantic Ocean. *Gnathia* sp. from *P. numida* and *Scolex pleuronectis* from *P. semifasciata* were the species having the greatest dominance frequency. Parasite abundance in *P. numida* and *P. semifasciata* were positively correlated with the host total length. Only in *P. numida* was parasite species richness correlated positively with the host total length. No significant differences between endoparasite infracommunities of *P. numida* and *P. semifasciata* were detected. The ectoparasites of *P. numida* had higher values for parasite abundance, parasite richness, Brillouin index, evenness index, and Berger-Parker index than those of the ectoparasites of *P. semifasciata*. Comparisons among all ecto- and endoparasites showed the ectoparasites of *P. numida* as the most heterogeneous group. Low similarity values were observed among the three types of parasite infracommunities of the two hosts.

Keywords: parasite ecology, community structure, marine fish, Pinguipedidae, *Pseudopercis*, Brazil.

Ecologia da comunidade de metazoários parasitos dos namorados, *Pseudopercis numida* e *P. semifasciata* (Perciformes: Pinguipedidae), do litoral do estado do Rio de Janeiro, Brasil

Resumo

Cento e vinte e oito espécimes de namorados, 62 *P. numida* e 66 *P. semifasciata*, foram coletados entre Outubro de 2002 e Junho de 2003, provenientes de Cabo Frio, litoral do Estado do Rio de Janeiro, Brasil (Lat 23° S e Long 42° W), sendo necropsiados para estudo de seus metazoários parasitos. As comunidades parasitárias dos namorados foram compostas por espécies com baixa prevalência e abundância, mas caracterizadas por altos valores de riqueza de espécies (no nível de comunidade componente) e incluem basicamente endoparasitos, principalmente espécies de digenéticos e cestóides. A riqueza parasitária em *P. numida* foi registrada como a mais alta em peixes marinhos da região Neotropical. Trinta e nove espécies de metazoários parasitas foram coletadas: 36 em *P. numida* e 28 em *P. semifasciata*. *Pseudopercis numida* e *P. semifasciata* são novos registros de hospedeiros para todas as espécies coletadas com exceção de *Microcotyle pseudopercis*. As espécies *Choanodera* sp., *Leurodera decora*, *Neolebouria georgenascimentoi* e *Proctoeces* sp. foram registradas pela primeira vez no Oceano Atlântico Sul. *Gnathia* sp. em *P. numida*, e *Scolex pleuronectis* em *P. semifasciata* foram as espécies com maior freqüência de dominância. A abundância parasitária em *P. numida* e *P. semifasciata* foi correlacionada com o comprimento total dos hospedeiros. Apenas em *P. numida* a riqueza de espécies de parasitas estava correlacionada positivamente com o comprimento total do hospedeiro. As infracomunidades de ectoparasitos em *P. numida* tiveram valores mais altos na abundância parasitária, riqueza parasi-

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tária, índice de Brillouin, índice de uniformidade e Berger-Parker do que os ectoparasitos de *P. semifasciata*. Nenhuma diferença significativa entre as infracomunidades de endoparasitas foi detectada. Comparações entre ectoparasitos e endoparasitos amostrados indicaram os ectoparasitos de *P. numida* como o grupo mais heterogêneo. Baixos valores de similaridade foram observados entre os três tipos de infracomunidades de parasitas dos dois hospedeiros.

Palavras-chave: ecologia parasitária, estrutura comunitária, peixes marinhos, Pinguipedidae, *Pseudopercis*, Brasil

1. Introduction

In the past two decades, several studies have focused on characteristics of the parasite communities of Neotropical marine fishes. Some of them included descriptive characteristics of the infracommunities (Luque, 2004) and, recently, other studies have appeared on biodiversity and component communities (Luque and Poulin, 2004; Luque et al., 2004) in the Brazilian marine fishes. Nevertheless, these studies are apparently insufficient in view of the high fish species biodiversity of the region and possible participation of these species in complex marine food webs. These webs are strongly affected by water currents, upwelling, and resurgence systems, which could be large-scale influences on the structure and composition of the parasite communities (Santos and Carbonel, 2000; Luque et al., 2004).

The namorado sandperches, *Pseudopercis numida* Miranda-Ribeiro, 1903 and *P. semifasciata* (Cuvier, 1829) are demersal non-migratory fishes found on rocky and sandy bottoms in coastal waters. These species are considered euryphagous predators, feeding mainly on benthic fishes and crustaceans (Menezes and Figueiredo, 1985; Elías and Rajoy, 1992; Froese and Pouly, 2005). The known geographical distribution of *P. numida* is restricted to southern Brazil from Rio de Janeiro to the State of Santa Catarina, while *P. semifasciata* is distributed from the State of São Paulo (Brazil) to the Gulf of San Jorge (Argentina) (Menezes and Figueiredo, 1985). Nevertheless, some records mention the presence of *P. semifasciata* in the State of Rio de Janeiro (Froese and Pauly, 2007).

Although these fishes are important economically, records of parasites of namorado sandperches are few. However, Amato and Cezar (1994) described the monogenean *Microcotyle pseudopercis* parasitic on *P. numida* and *P. semifasciata* from Rio de Janeiro, Brazil, and González and Tanzola (2000) recorded the copepod *Sarcotaces verrucosus* parasitic on *P. semifasciata* from the Gulf of San Matías, Argentina. Some studies on distribution, feeding habits, and reproductive aspects of namorado sandperches have been conducted by Elías and Rajoy (1992), Paiva and Andrade-Tubino (1998) and Venerus et al. (2005).

Position in the marine food web, lack of migratory habits, and the restricted known geographical distribution of namorado sandperches might influence the biodiversity and structure of their parasite communities. In this report, we analyze and compare the composition and the structure of metazoan parasite communities, at the component and infracommunity levels, of *P. numida* and *P. semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil.

2. Material and Methods

A total of 128 specimens of namorado sandperches, 62 *P. numida* and 66 *P. semifasciata* were examined for metazoan parasites. Fish were caught by long line at irregular intervals between October 2002 and June 2003 in Cabo Frio, Rio de Janeiro State, Brazil (Lat 23° S, and Long 42° W). They were identified according to Menezes and Figueiredo (1985). Sandperches were kept fresh or else deep frozen in plastic bags at –18 °C until examination. After defrosting each fish was measured. Specimens of *P. numida* measured 36-83 (mean = 47.7 ± 7.7 cm) and specimens of *P. semifasciata* 26-64 (mean = 38.7 ± 7 cm) in total length. Parasites were collected from the body surface, gills, branchial and body cavities, and viscera after examination under a stereoscopic microscope. Washings from gills and gut lumen were strained using a sieve (154 μm mesh size) to retain even the smallest parasites.

Following Bush et al. (1997), prevalence, intensity, and abundance were calculated for parasites of both fish species. For those parasite species with higher than 10% prevalence and common to two fish hosts (component species *sensu* Bush et al. (1990)), chi-squared analyses were used to test significant differences of parasite prevalence in the two species of sandperches. In addition, Student *t*-test on log $(x + 1)$ transformed data was used to analyze the effects of the fish host on the abundance of each parasite species (Zar, 1996). The variance-to-mean ratio of parasite abundance (index of dispersion) and the discrepancy index, computed using the program Quantitative Parasitology 3.0 (Rósza et al., 2000), were used to detect distribution patterns of the infrapopulations (Poulin, 1993).

The following community descriptors were calculated at the infracommunity level: number of parasite individuals (total abundance), species richness, Brillouin's diversity index (log 10 based), evenness associated with Brillouin's diversity index, Berger-Parker dominance index, and percentage of infracommunities in which either parasite species was dominant (dominance frequency). In addition, two measures of similarity, the Jaccard qualitative and the Sørensen quantitative indices, were calculated among infracommunities within and between host fish species (Magurran, 1988). These descriptors were used for all parasites combined, ectoparasites (monogeneans, hirudineans, and isopods), and endoparasites (trematodes, cestodes, acanthocephalans, and nematodes). The effects of host length on community descriptors were

evaluated using Student's *t*-test on log ($x + 1$) transformed data (abundance) and the Pearson correlation coefficient on angular-transformed data (prevalence) (Zar, 1996). Statistical significance level was established at p < 0.05.

For each fish species, the average taxonomic distinctness (Δ^+) and variance in taxonomic distinctness (Λ^+) of the parasite component community were computed, following the procedures and taxonomies used by Luque et al. (2004).

3. Results

3.1. Component communities

Thirty-nine species of metazoan parasites were collected: 36 from *P. numida* and 28 from *P. semifasciata* (Table 1). *Pseudopercis numida* and *P. semifasciata* are new host records for all species collected with the exception of *Microcotyle pseudopercis*. Twenty-five parasite species were common to both species of namorado sandperches. *Choanodera* sp., *Leurodera decora*, *Neolebouria georgenascimentoi*, and *Proctoeces* sp. were recorded for the first time in the South Atlantic Ocean (Table 1). *Pseudopercis numida* showed higher parasite species richness than that of *P. semifasciata*, and the endoparasite group had a higher species richness than that of ectoparasites in the two hosts. Digeneans showed the highest species richness, with 14 species in *P. numida* and 13 in *P. semifasciata*, but represented only 5.4% and 14.9% of the total parasite specimens collected, respectively, while isopods (67.2%) and cestodes (41.2%) made up the majority of specimens collected in *P. numida* and *P. semifasciata*, respectively.

Gnathia sp. in *P. numida*, and *Scolex pleuronectis* in *P. semifasciata* were the species with the highest dominance frequency. All parasites had a typically aggregated distribution pattern and all species showed discrepancy index values higher than 0.6 (Table 2). Values of the two indices for parasite species common to the two host species showed no significant differences when tested with paired Student test ($t = 1.214$, p = 0.253 for variance-to-mean ratio; $t = –0.365$, p = 0.722 for discrepancy index). In *P. numida*, only two species showed a positive correlation between the hosts' total length and their prevalences, and five species showed positive correlation between the hosts' total length and abundance. In *P. semifasciata*, seven species showed positive correlation between the hosts' total length and abundance (Table 3). In comparing prevalence and abundance of the parasite species common to *P. numida* and *P. semifasciata* differences were detected in the prevalence of four species (didymozoid, *L. decora*, *Cucullanus carioca*, and *Gnathia* sp.), and in the abundance of five species (didymozoid, *L. decora*, *M. pseudopercis*, *Progrillotia dollfusi*, and *Gnathia* sp.) (Table 4).

Average taxonomic distinctness and variance values were similar for the parasite communities of *P. numida* ($\Delta^+ = 88.35$, $\Lambda^+ = 286.73$) and *P. semifasciata* ($\Delta^+ = 86.52$, $\Lambda^+ = 320.14$).

3.2. Infracommunities

All fishes studied were parasitized by one or more metazoan species. A total of 4,712 individual parasites were collected: 3,724 in *P. numida* and 988 in *P. semifasciata*, with mean total abundance of 60.1 ± 63.4 and 15 ± 12.1, respectively. The different species richness in *P. numida* and *P. semifasciata* were significant: 6.5 ± 2.5 (2-16) and 4.8 ± 2.1 (1-10), respectively (Table 5, Figure 1).

Parasite abundance in *P. numida* (r = 0.547, p < 0.001) and *P. semifasciata* (r = 0.313, p = 0.010) were positively correlated with the host's total length. But only in *P. numida* did parasite species richness correlate positively with the host's total length (r = 0.449, p < 0.001). Also, significant negative relationships of the total body length of *P. numida* with the evenness index ($r = –0.254$, p = 0.046), and significant positive ones between the total body length of *P. semifasciata* and the Brillouin index ($r = 0.255$, p = 0.045) were detected.

No differences between the endoparasite infracommunities of *P. numida* and those of *P. semifasciata* were detected (Table 5). The infracommunities of ectoparasites in *P. numida* had higher values for parasite abundance, parasite richness, the Brillouin index, evenness index, and the Berger-Parker index than the same for the ectoparasites of *P. semifasciata*. A high variability degree was observed in analyzing both the Jaccard and the Sørensen similarity indices (Figure 2 a-d) (see standard deviations), with the same trend being seen in both quantitative and qualitative comparisons.

Comparisons among all three infracommunities (ecto- and endoparasites, and total) showed those of the ectoparasites of *P. numida* as the most heterogeneous group, followed by the infracommunities that included all parasites in the same host. Low similarity values were observed between the three types of the parasite infracommunities of *P. numida* and *P. semifasciata* (Figure 2 a-d).

4. Discussion

Parasite communities of the namorado sandperches studied are characterized by the presence of species with low prevalence and abundance, and by high values of parasite species richness in the component communities. These communities are composed basically of endoparasites, mainly digenean and cestodes species. The parasite species richness value found in *P. numida* is the highest recorded for any marine fish from the Neotropical region. An explanation for such a high value could be the feeding habits of these sandperches and their position in the local marine food web; however, information on the subject is relatively scarce. According to Haimovici et al. (1996) and Paiva and Andrade-Tubino (1998), *P. numida* prefer feeding on fish and crustaceans. Elías and Rajoy (1992) studied the feeding habits of *P. semifasciata* from Argentina and recorded 34 food items in the stomachs of sandperches, mainly fishes (14 spp.) and crustaceans

Table 1. Prevalence (p), mean intensity (MI), mean abundance (MA) and site of infection (SI) of the metazoan parasites of *Pseudopercis numida* and *Pseudopercis semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil. Standard deviation follows of mean values.

Parasites	Pseudopercis numida			Pseudopercis semifasciata			
	p (%)	MI	MA	p (%)	MI	MA	SI
Digenea							
Bucephalus sp. CHIOC Nº 36675	-	-	-	7.6	1	0.1 ± 0.3	Intestine
Choanodera sp. CHIOC Nº 36653	4.8	1	0.05 ± 0.2	1.5	1	0.02 ± 0.1	Intestine
Digenea gen. sp. 1 (juvenile) CHIOC Nº 36677	-	-	-	4.6	1	0.05 ± 0.2	Mesenteries
Digenea gen. sp. 2 (juvenile) CHIOC Nº 36650	1.6	1	0.02 ± 0.1	-	-	-	Mesenteries
Digenea gen. sp. 3 (juvenile) CHIOC Nº 36651	3.2	1.5 ± 0.7	0.05 ± 0.3	-	-	-	Mesenteries
Digenea gen. sp. 4 (juvenile) CHIOC Nº 36652	1.6	1	0.02 ± 0.1	1.5	1	0.02 ± 0.1	Mesenteries
Digenea gen. sp. 5 (juvenile) CHIOC Nº 36690	-	-	-	1.5	1	0.02 ± 0.1	Mesenteries
Immature didymozoid CHIOC Nº 36654/36681	41.9	3.0 ± 3.6	1.3 ± 2.7	18.2	2.1 ± 1.8	0.4 ± 1.1	Intestine
Hemiurinae gen. sp. CHIOC Nº 36655/36680	9.7	3.2 ± 2.2	0.3 ± 1.1	18.2	3.3 ± 4.9	0.4 ± 1.1	Intestine
Lecithochirium microstomum CHIOC Nº 36656/36676	16.1	2.6 ± 2.1	0.4 ± 1.3	21.2	1.2 ± 0.8	0.3 ± 0.6	Stomach
Leurodera decora CHIOC Nº 36657/36679	17.7	2.5 ± 1.7	0.4 ± 1.2	34.9	1.6 ± 0.9	0.6 ± 0.9	Intestine
Neolebouria georgenascimentoi CHIOC Nº 36658	1.6	1	0.02 ± 0.1	-	-	-	Intestine
Parahemiurus merus CHIOC Nº 36659/36682	6.5	1.5 ± 0.6	0.1 ± 0.4	15.2	1.2 ± 0.4	0.2 ± 0.5	Stomach
Proctoeces sp. CHIOC Nº 36660/36686	1.6	1	0.02 ± 0.1	3	1	0.03 ± 0.2	Intestine
Prolecitha brasiliensis CHIOC Nº 36661/36678	4.8	1	0.05 ± 0.2	1.5	1	0.02 ± 0.1	Intestine
Opecoeloides sp. CHIOC Nº 36662/36687	1.6	1	0.02 ± 0.1	3	1	0.03 ± 0.2	Intestine
Stephanostomum sp. CHIOC Nº 36663	3.2	1	0.03 ± 0.2	-	-	-	Intestine
Monogenea							
Anoplodiscus longivaginatus CHIOC Nº 36664	3.2	1	0.03 ± 0.2	-	-	-	Gills
Neobenedenia sp. CHIOC Nº 36666/36683	1.6	1	0.02 ± 0.1	3	1	0.03 ± 0.2	Gills
Encotyllabe sp. CHIOC Nº 36665	1.6	1	0.02 ± 0.1	1.5	1	0.02 ± 0.1	Gills
Microcotyle pseudopercis CHIOC Nº 36667/36688	62.9	7.2 ± 8.9	4.5 ± 7.9	59.1	2.5 ± .2.1	1.5 ± 2.1	Gills
Pseudempleurosoma gibsoni CHIOC Nº 36668/36685	4.8	1	0.05 ± 0.2	21.2	1.6 ± .0.9	0.3 ± 0.8	Stomach
Cestoda							
Callitetrarhynchus gracilis (plerocercoid) CHIOC Nº 36669	1.6	1	0.02 ± 0.1	-	-	-	Mesenteries

Table 1. Continued...

Parasites	*Pseudopercis numida*			*Pseudopercis semifasciata*			
	p (%)	MI	MA	p (%)	MI	MA	SI
Nybelinia sp. (plerocercoid) CHIOC 36673	3.2	1	0.03 ± 0.2	-	-	-	Mesenteries
Progrillotia dollfusi (plerocercoid) CHIOC Nº 36684	71	2.8 ± 2	2 ± 2.2	65.2	4.7 ± 6.5	3.1 ± 5.7	Mesenteries
Scolex pleuronectis CHIOC Nº 36670/ 36689	43.6	16.2 ± 38.2	7 ± 26.2	53	5.8 ± 6.8	3.1 ± 5.7	Intestine
Acanthocephala							
Gorgorhynchus sp. CHIOC Nº 36671	30.7	5 ± 3.7	1.5 ± 3.1	-	-	-	Intestine
Heterosentis sp. CHIOC Nº 36672	22.6	4.1 ± 4.2	0.9 ± 2.6	-	-	-	Intestine
Nematoda							
Anisakis sp. (larval)	4.8	1.7 ± 0.6	0.1 ± 0.4	-	-	-	Mesenteries
Paracapillaria argentinensis CHIOC Nº 35454/ 35460	17.7	3.6 ± 2.3	0.7 ± 1.7	7.6	6.4 ± 5.2	0.5 ± 2.1	Intestine
Cucullanus carioca CHIOC Nº 35452	32.3	4.1 ± 4.3	1.3 ± 3.1	54.6	2.9 ± 4	1.6 ± 3.3	Intestine
Dichelyne sp.	8.1	1.6 ± 1.3	0.1 ± 0.6	10.6	1.6 ± 1	0.2 ± 0.6	Intestine
Hysterothylacium sp. (larval) CHIOC Nº 35453	43.6	2 ± 1.6	0.9 ± 1.4	22.7	2.5 ± 1.3	0.6 ± 1.2	Mesenteries
Procamallanus sp. CHIOC Nº 35461	1.6	1	0.02 ± 0.1	4.6	1.7 ± 0.6	0.1 ± 0.4	Intestine
Raphidascaris sp. (larval) CHIOC Nº 35451	25.8	3.8 ± 5.4	1 ± 3.2	24.2	4.5 ± 8.8	1.1 ± 4.7	Mesenteries
Terranova sp. (larval)	4.8	1.3 ± 0.6	0.1 ± 0.3	1.5	1	0.02 ± 0.1	Mesenteries
Hirudinea							
Piscicolidae gen. sp. CHIOC Nº 35459	6.5	1	0.1 ± 0.3	3	1	0.03 ± 0.2	Gills
Isopoda							
Cymothoidae gen. sp. CHIOC Nº 35457	37.1	2 ± 1.3	0.8 ± 1.3	-	-	-	Nasal cavity
Gnathia sp. (larval) CHIOC Nº 35458	100	36.2 ± 51.5	36.2 ± 51.5	13.6	5.1 ± 5.1	0.7 ± 2.5	Gills

(7 spp.), which are potential intermediate hosts of endoparasite species whose life cycles consist of long-lived larval stages within intermediate and paratenic hosts (Marcogliese, 2001, 2002, 2004). The presence of some larval helminths suggested the possibility of sandperches also occupying an intermediate level in the marine food web, mainly in the early stages when crustaceans are their preferred food item (Elias and Rajoy, 1992). Luque et al. (2004) listed parasite richness values ranging from 3 to 28 for 50 fish species from Rio de Janeiro. Eight of these hosts showed richness values equal to or higher than 20. Some demersal and benthic fishes had the highest richness values of this region, e.g., *Micropogonias furnieri* (28), *Dactylopterus volitans* (27), and *Mugil platanus* (25) (Knoff et al., 1997; Alves and Luque, 2001; Cordeiro and Luque, 2005).

With respect to the high abundance values recorded for some ectoparasite species, these might be related to the population density increase of namorado sandperches in offshore reproductive grounds (Venerus et al., 2005), which might facilitate transmission of ectoparasites with a direct life-cycle. The dominant ectoparasite species *Gnathia* sp. is a temporary fish parasite whose life-cycle and ecology are little known. However, adults of the species are generally abundant in the intertidal zones (Smit et al., 2003).

Aggregated distribution of the parasite populations is considered one of the most common features of metazoan parasite infections (Poulin, 1993). In the present study, two aggregation measures were used: the variance-to-mean ratio and a discrepancy index. The latter is a measure of the disparity between the observed and uniform distributions of the parasite population in host samplings, with values ranging from 0 to 1 (Poulin, 1993). Values obtained from these two indices revealed a high aggregation level, confirming a characteristic typical of

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Table 2. Values of variance to mean ratio of parasite abundance (ID) and index of Discrepancy (D) of the metazoan parasites of *Pseudopercis numida* and *P. semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil.

Parasites	Pseudopercis numida		Pseudopercis semifasciata	
	ID	D	ID	D
Immature didymozoid	5.845	0.780	3.230	0.876
Hemiurinae gen. sp.	3.883	0.914	9.335	0.903
Lecithochirium microstomum	3.796	0.889	1.471	0.810
Leurodera decora	3.209	0.872	1.544	0.731
Parahemiurus merus	-	-	1.169	0.856
Microcotyle pseudopercis	13.714	0.707	2.852	0.643
Pseudempleurosoma gibsoni	-	-	1.785	0.832
Progrillotia dollfusi	2.532	0.553	10.427	0.678
Scolex pleuronectis	97.232	0.882	10.569	0.744
Gorgorhynchus sp.	6.221	0.792	-	-
Heterosentis sp.	7.357	0.866	-	-
Paracapillaria argentinensis	4.426	0.859	-	-
Cucullanus carioca	7.233	0.812	8.571	0.739
Dichelyne sp.	-	-	1.954	0.908
Hysterothylacium sp.	2.390	0.713	2.532	0.822
Raphidascaris sp.	10.247	0.871	19.905	0.893
Cymothoidae gen. sp.	2.149	0.737	-	-
Gnathia sp.	73.295	0.615	9.049	0.917

Table 3. Values of Pearson's correlation coefficient (r) to evaluate possible relationships among the host total length and prevalence and abundance of the metazoan parasites of *Pseudopercis numida* and *P. semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil.

Parasites	Pseudopercis numida		Pseudopercis semifasciata	
	Prevalence	Abundance	Prevalence	Abundance
Immature didymozoid	0.877	0.291*	0.942	0.220
Hemiurinae gen. sp.	-	-	–0.413	0.066
Lecithochirium microstomum	–0.885	–0.132	0.452	0.207
Leurodera decora	0.961*	0.343*	–0.938	–0.229
Parahemiurus merus	-	-	0.593	–0.144
Microcotyle pseudopercis	0.948*	0.473*	0.792	0.346*
Pseudempleurosoma gibsoni	-	-	–0.909	–0.24
Progrillotia dollfusi	–0.74	–0.211	0.375	0.257*
Scolex pleuronectis	0.979*	0.235	0.112	–0.244*
Gorgorhynchus sp.	0.661	–0.042	-	-
Heterosentis sp.	0.744	0.032	-	-
Paracapillaria argentinensis	0.886	0.238	-	-
Cucullanus carioca	0.909	0.326*	0.875	0.351*
Dichelyne sp.	-	-	0.471	0.219
Hysterothylacium sp.	0.605	–0.007	0.246	0.269*
Raphidascaris sp.	0.716	0.241	0.287	0.263*
Cymothoidae gen. sp.	–0.621	0.229	-	-
Gnathia sp.	-	0.419*	0.569	0.352*

*significant values.

metazoan parasite populations. Apparently, neither of the two host species has been affected by the aggregation level of the species composing the parasite communities, because no significant differences were detected in the variance/mean ratio and discrepancy index between the parasite species common to both. This finding raises the possibility of patterns similar to those of the two sympatric and congeneric species hosting local parasite fauna.

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Table 4. Values of Chi-square χ^2 and Student t tests for comparisons of prevalence and abundance of component parasite species of *Pseudopercis numida* (Pn) and *P. semifasciata* (Ps) from the coastal zone of the State of Rio de Janeiro, Brazil.

Parasites	χ^2		*t*	
Immature didymozoid	8.64*	Pn > Ps	2.84*	Pn > Ps
Hemiurinae gen. sp.	1.91	-	−1.02	-
Lecithochirium microstomum	0.54	-	0.18	-
Leurodera decora	4.80*	Pn < Ps	−1.58	-
Microcotyle pseudopercis	0.20	-	2.5*	Pn > Ps
Progrillotia dollfusi	0.50	-	−34.0*	Pn < Ps
Scolex pleuronectis	1.15	-	0.57	-
Cucullanus carioca	5.63*	Pn < Ps	−1.26	-
Hysterothylacium sp.	6.29	-	1.48	-
Raphidascaris sp.	0.04	-	−0.25	-
Gnathia sp.	93.1*	Pn > Ps	15.3*	Pn > Ps

*significant values.

Table 5. Characteristics of the metazoan parasites infracommunities found in *Pseudopercis numida* and *P. semifasciata* from the costal zone of the State of Rio de Janeiro, Brazil. *t* = values of the Student test to comparison between the two hosts.

Characteristics	*Pseudopercis numida* (n = 62)	*P. semifasciata* (n = 66)	*t*
All species			
Parasite species richness	36	28	-
Total number of specimens	3724	988	-
Mean species richness	6.45 ± 2.45 (2-16)	4.76 ± 2.07 (1-10)	−4.18*
Mean total abundance	60.07 ± 63.45 (4-274)	14.97 ± 12.05 (1-57)	−7.83*
Mean Brillouin index	0.43 ± 0.17 (0.1-0.82)	0.38 ± 0.18 (0-0.69)	−1.69
Mean evenness index	0.62 ± 0.19 (0.56-0.88)	0.69 ± 0.25 (0-0.95)	1.34
Dominant species	*Gnathia* sp.	*Scolex pleuronectis*	-
Mean Berger-Parker's index	0.58 ± 0.2 (0.21-0.95)	0.52 ± 0.22 (0.2-1)	−1.57
Endoparasite species			
Parasite species richness	29	23	-
Total number of individuals	1144	820	-
Mean species richness	4.34 ± 2.41 (0-14)	3.79 ± 1.8 (0-8)	1.033
Mean total abundance	18.45 ± 27 (0-170)	12.42 ± 11.15 (0-54)	1.356
Mean Brillouin index	0.35 ± 0.2 (0-0.83)	0.31 ± 0.17 (0-0.64)	1.127
Mean evenness index	0.6 ± 0.31 (0-0.96)	0.62 ± 0.31 (0-0.95)	1.056
Dominant species	*Scolex pleuronectis*	*Scolex pleuronectis*	-
Mean Berger-Parker's index	0.53 ± 0.23 (0.21-1)	0.54 ± 0.23 (0.18-1)	−0.222
Ectoparasite species			
Parasite species richness	7	5	-
Total number of individuals	2580	168	-
Mean species richness	2.11 ± 0.83 (1-5)	0.99 ± 0.85 (0-4)	8.049*
Mean total abundance	41.6 ± 56.9 (1-267)	2.6 ± 3.2 (0-15)	12.040*
Mean Brillouin index	0.11 ± 0.09 (0-0.36)	0.03 ± 0.08 (0-0.38)	4.871*
Mean evenness index	0.32 ± 0.32 (0-0.98)	0.13 ± 0.29 (0-0.89)	4.159*
Dominant species	*Gnathia* sp.	*Microcotyle pseudopercis*	-
Mean Berger-Parker's index	0.84 ± 0.15 (0.5-1.0)	0.67 ± 0.44 (0.33-1)	3.368*

*significant values.

Pseudopercis numida and *P. semifasciata* are distributed along the coastal zone of State of Rio de Janeiro. Sympatric species are expected to show some degree of similarity in their community composition (in the case of ectoparasites) because of possible contact of the host populations, as well as similarity in food spectra (in the case of endoparasites). Mean values of the similarity indices between *P. numida* and *P. semifasciata* were lower than 0.2, showing the same pattern for qualitative and quantitative similarity, with no significant differences between groups consisting of both ecto- and endoparasites. Similarity was even higher at the component community level. The same was previously observed for various taxonomically related or congeneric species of marine fishes from Rio de Janeiro (Luque et al., 1996; Takemoto et al., 1996; Luque and Alves, 2001; Alves et al., 2004; 2005) and might support similar use by the local pool of parasite species, facilitated in the case of the sandperches by their sedentary habits and restricted geographic distribution. Since *P. numida* and *P. semifasciata* have overlapping geographical distribution, this could contribute to increased dispersion of some specialist parasites, as has been observed for the monogenean *Microcotyle pseudopercis*, in a way similar to those mentioned by Suriano and Labriola (1999) and Alves et al. (2004) for the specialist monogenean *Diclidophoroides maccallumi*, which is parasitic in two congeneric species of the Brazilian codling (*Urophycis* spp.).

In the present study, host size was not always correlated with the prevalence and abundance of the parasite species, while at the infracommunity level the total number of parasite individuals, in addition to their
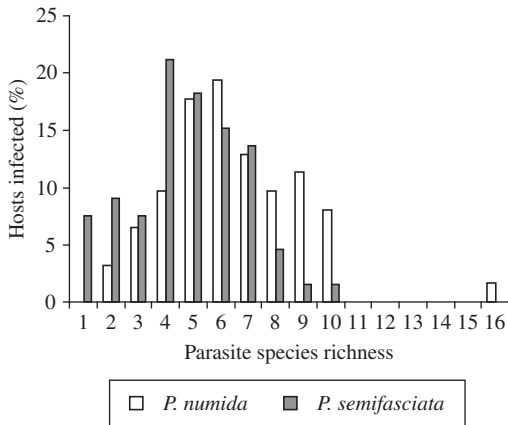

Figure 1. Distribution of species richness in the parasite infracommunities of *Pseudopercis numida* and *P. semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil.
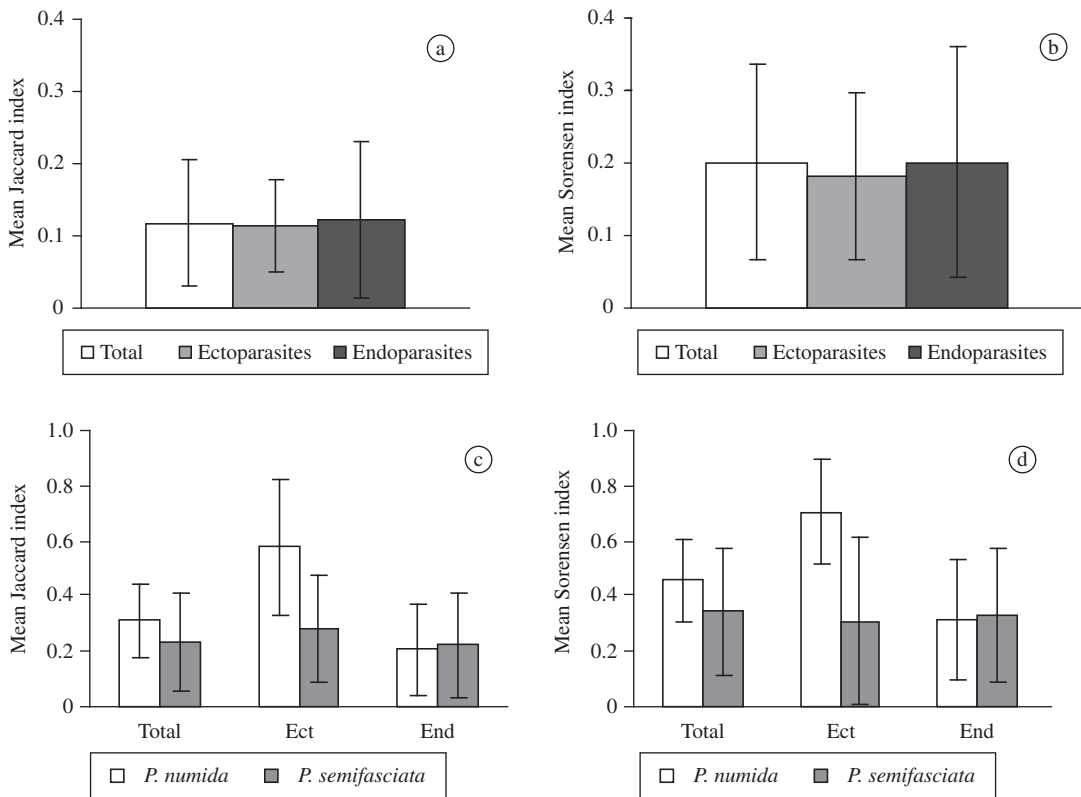

Figure 2. Similarity indexes of parasite infracommunities of *Pseudopercis numida* and *P. semifasciata* from the coastal zone of the State of Rio de Janeiro, Brazil. a) qualitative similarity between *P. numida* and *P. semifasciata*, b) quantitative similarity between *P. numida* and *P. semifasciata*, c) qualitative similarity within each fish host; and d) quantitative similarity within each fish host.

diversity and richness, generally presented positive relationships with host size. As pointed out by Poulin (2000), these patterns cannot be generalized because in many host-parasite species systems the correlations are positive but weak and nonsignificant. Also, ontogenetical changes in feeding behavior might influence parasite prevalence and abundance in the different host size classes (Saad-Fares and Combes, 1992). In contrast, at the component community level, size proved to be the main predictor of total parasite species richness in marine fish from the Brazilian littoral, since its host is the best measure of total nutrient or energy amounts available for parasite exploitation (Luque et al., 2004).

Significant differences were detected between total abundance and parasite species richness in *P. numida* and *P. semifasciata*, with higher values being detected for *P. numida*. These values (shown in Table 5) were notably influenced by differences between the descriptor values of ectoparasite infracommunities, which also demonstrated higher homogeneity in their composition. However, these results could be influenced by the host size differences (*P. numida* showed a mean host size higher than that of *P. semifasciata*). Moreover, possible differences, which might originate in the dynamic of the host populations, local presence of ectoparasite free-living larval stages, specificity, and immunological aspects should be not discarded. These factors could also explain differences in parasite species populations infecting the two host species: of the six parasite species showing prevalence and/or abundance differences in *P. numida* and *P. semifasciata*, three showed higher values in the first, and three in the second.

In order to compare parasite communities of namorado sandperches with those of other recently studied marine fish species from Rio de Janeiro, average taxonomic distinctness and variance of taxonomic distinctness were calculated (see Luque et al. 2004). Values indicated by the average taxonomic indices and their variances were not very different between the two species of sandperches, and they were lower than those of the majority of the 50 fish species studied by Luque et al. (2004). As remarked by Luque et al. (2004), previous studies have focused almost exclusively on parasite species richness as a measure of parasite diversity. However, species richness is not necessarily a measure of all biodiversity facets, which is demonstrated by the fact that many fish species with high species richness values do not show higher values of taxonomic distinctness. This situation is reinforced by the parasite communities of *P. numida* and *P. semifasciata*, species with high values of parasite richness, but whose taxonomic composition shows few differences.

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