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SEASONAL FLUCTUATIONS OF INDICES OF INFESTATION OF ECTOPARASITES OF THE FAMILY MUGILIDAE WITH EMPHASIS ON *MUGIL CUREMA* IN A TROPICAL ESTUARY (BRAZIL)

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Abstract

The seasonal changes of the aquatic environment affecting qualitative and quantitative parasitic indices of infection for ectoparasites of tropical Mugilidae fish are still little known. This study aimed at verifying the seasonality effect in the rates of infestations of ectoparasites of Mugilidae fish in an urban estuary in northeastern Brazil. 90 specimens of Mugilidae were sampled for each collection period (dry and wet) in the estuary of Pina Basin / Pernambuco, Brazil. The identification to species level and inspection for parasitological examination was performed in laboratory. The parasitological analysis resulted in the identification of 3851 individuals collected in the dry season, Monogenea

was the most abundant taxon with 1739 individuals (45.15%) of the total quantified parasites, parasitizing 28 (31%) out of the hosts analyzed. 2871 specimens were recorded in the rainy season, the class Myxosporea stood out with 2453 individuals (84.3%) of the total collected ectoparasites parasitizing 31 (34%) of the hosts analyzed. The copepod *Ergasilus lizae* had the highest prevalence in the dry season (43.50%). The protozoan *Myxobolus* sp. had the highest prevalence (35.20%), intensity (79.12) and mean abundance (27.8) in the rainy season. The seasonally influenced the indices of infestation of *Ligophorus* sp. and *Ergasilus lizae*. *Myxobolus* sp. had its prevalence influenced by seasonality. The seasonal effect is evident in the high indices registered for intensity and abundance of *Ligophorus* sp. in the dry period and *Myxobolus* sp. in the rainy season which would mean an indication of environmental impacts in the study area.

Key words: Bioindicator, Environmental health, Fish, Parasites

RESUMO

As mudanças sazonais do ambiente aquático que afetam qualitativa e quantitativamente os índices parasitários de infecção dos ectoparasitas de peixes Mugilidae tropicais ainda são pouco conhecidos. Assim o presente trabalho objetivou verificar o efeito da sazonalidade nos índices de infestações dos ectoparasitas de peixes Mugilidae em um estuário urbano no Nordeste do Brasil. Foram amostrados para cada período de coleta (seco e chuvoso) 90

espécimes de Mugilidae no estuário da Bacia do Pina/Pernambuco-Brasil, onde em laboratório foi realizada a identificação em nível de espécie e inspeção para pesquisa parasitológica. A análise parasitológica resultou na identificação de 3851 indivíduos coletados no período seco, Monogenea foi o táxon mais abundante com 1739 indivíduos (45,15%) do total de parasitos quantificados, parasitando 28 (31%) dos hospedeiros analisados. No período chuvoso foram registrados 2871 espécimes, onde a classe Myxosporea se destacou com 2453 indivíduos (84,3%) do total de ectoparasitas coletados, parasitando 31 (34%) dos hospedeiros analisados. O copepoda *Ergasilus lizae* apresentou a maior prevalência no período seco *(*43,50%). O protozoário *Myxobolus* sp. apresentou a maior prevalência (35,20%), intensidade (79,12) e abundância média (27,8) no período chuvoso. A sazonalidade influenciou os descritores ecológicos de *Ligophorus* sp*.* e. *Ergasilus lizae*. *Myxobolus* sp. teve sua prevalência influenciada pela sazonalidade. O efeito sazonal é evidente nos alto índices registrados para a intensidade e abundância de *Ligophorus* sp*.* no período seco e *Myxobolus* sp. no chuvoso o que significaria um indicativo de impactos ambientais na região estudada.

Palavras chave: Bioindicador, Parasitas, Peixe, Saúde Ambiental.

INTRODUCTION

The teleosts of the family Mugilidae are a widely distributed fish group, comprising approximately 95 species. The wide distribution in Brazil, abundance in

the Northeast region and inhabit restricted areas such as estuaries, confers the *Mugil* spp. species characteristics so that their parasite fauna is used as a bioindicator of changes in the aquatic ecosystem. The diversity of parasites is positively correlated with the broad range of distribution of the host, because a more widely distributed host will find more species of parasites (GREGORY, 1990). The abundance of these fish can also be considered as an important feature in the selection of this group, whose parasitic fauna can be utilized as a signaling impact on coastal ecosystems. The diversity of parasites is positively correlated with the hosts' abundance (BELL & BURT, 1991). The fish fauna diversity of the northeastern coast is the subject of numerous studies due to the peculiarities of tropical and subtropical species that, coupled with the ecological profile of the region are favorable for fishing and fish farming activities. Among the works on mullets developed in Pernambuco are stood out those performed in the estuarine complex Canal Santa Cruz/Itamaracá (VASCONCELOS *et al*. 1990; MACEDO *et al*. 2000). Currently, there is a growing interest in understanding the diseases affecting fish of this family (FONSECA & PARANAGUÁ, 2000, BAKER *et al.* 2008, BLASCO-COSTA *et al.* 2009).

Theoretically, healthy ecosystems (unpolluted) reflect a parasite community with greater richness; but environments with high

levels of chemical pollution should limit species diversity of parasites (MARCOGLIESE *et al.* 2006). However, field surveys were conducted and the results show up contradictory, with some species responding to water pollution with decreased abundance and richness, as well as deformation of attachment body in case of monogeneans and other species increase in abundance (HUDSON *et al.* 2006). It is observed thereby that the host-parasite relationship (parasitism) can be used as a tool to detect changes in degraded ecosystems and may be an indicator of environmental contamination and environmental health (OVERSTREET, 1997). While good indicators of environmental stress, the parasites are also natural biological stressors (MACKENZIE *et al*. 1995) and multiple stressors, whether natural or anthropogenic, can interact with each other, and actually have negative synergistic effects stronger than either one alone (SIH *et al*. 2004). Another factor considered important and that can cause changes in host-parasite relationship is the seasonal changes in the environment. The presence or abundance of parasites is directly influenced by both the environment within the host and the ecosystem condition (KADLEC *et al.* 2003). For these reasons, the study of the ecological relationship between estuarine fish and parasite is of fundamental importance to environmental management measures. Results should provide information that will help meet the

integrity of aquatic ecosystems, providing grants that support measures for sustainable use of the environments in question, enabling the monitoring of effects of using the areas.

Considering these aspects, the present study aimed at determining the seasonal fluctuation of infestation of ectoparasites of Mugilidae in a tropical urban estuary by using the characterization of the parasitosis as a signal of trophic status of the coastal ecosystem studied. Finally to answer the question of change in rates of infestation of parasites was addressed the following question: Do prevalence, intensity and mean abundance have pronounced effects due to seasonal fluctuations?

MATERIALS AND METHODS

Study area

The Pina Basin (Fig. 1) is located in the coastal zone of the northeastern Brazilian state of Pernambuco, Tropical Atlantic; it has Humid hot tropical climate with rain in the autumn-winter, characterized by two distinct periods in the rainfall regime: a dry season, which extends from September to February (spring-summer) and a rainy season from March to August (autumn-winter). It is an estuarine area located inside the Port of Recife in full urban area (8°04'03''-8°05'06'' S; 34°52'16''-34°53'58''W). It is a dynamic environment in terms of hydrography, characteristic of the estuarine ecosystem, receiving discharges of industrial and domestic effluents and, by being a

port area, there is a constant boat traffic. This environment has a role of great socioeconomic importance, especially to the surrounding low-income population that takes its livelihood by collecting daily fish and shellfish (FEITOSA, 1999).

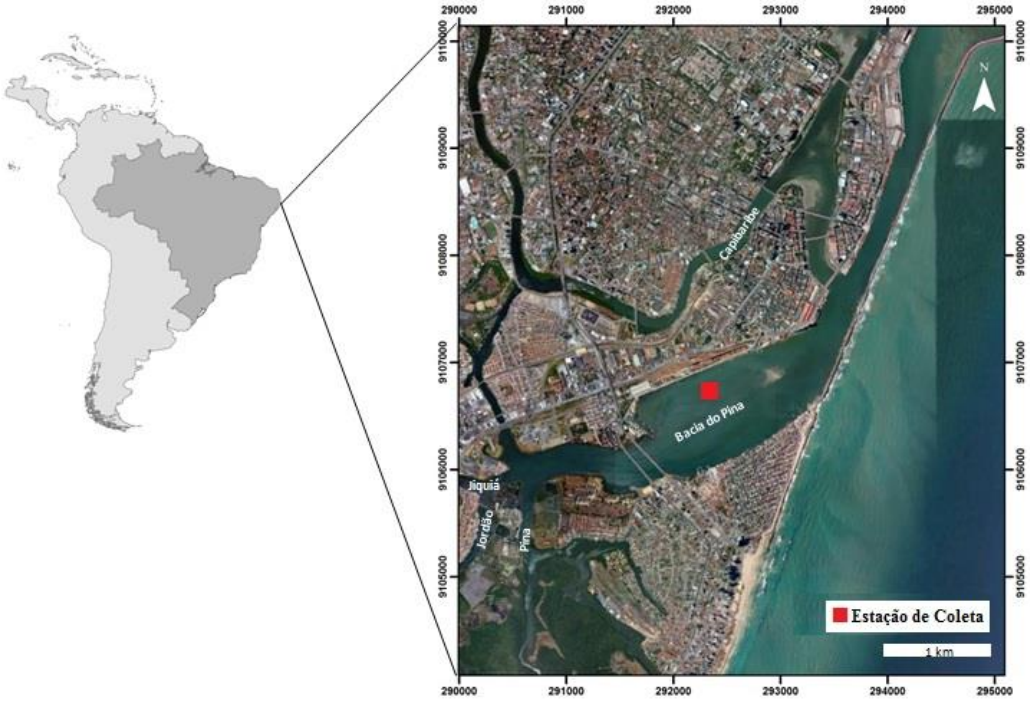

Figure 1 - Map Pina Basin with emphasis on the collection station. Source: Google Earth. (Modified by the author / Accessed 1/12/12).

Sampling strategy - the ichthyological material was composed of fish samples of the family Mugilidae from Pina Basin. Samples were collected using gillnets and “sauneira” vessel, 90 specimens of mullets in the dry season (October, November and December 2011) and 90 specimens in the rainy season (June, July and

August 2012), collecting 30 individuals per month, totaling 180 fish. After capture, the specimens were cooled and packed in Styrofoam boxes with ice at approximately 8°C and transported to the laboratory Zooplankton UFPE for measurement, weighing and necropsy. In the laboratory, the fish were measured with the aid of caliper, weighed on a precision balance (Bel - Electronic balance - max - 500g) placed in individual plastic bags and frozen (-20°C) until the time of collection and processing of parasitological samples. The parasitological samples were collected and processed based on the methodology recommended by protocols of Amato *et al*. (1991) and Eiras *et al*. (2006).

Data Analysis - the ecological characterization of parasitosis (indices of infestation) detected (prevalence, intensity and mean abundance) followed the methodology proposed by BUSH *et al*. (1997). The components of parasitic infrapopulations were classified according to Bush & Holmes (1986): Central species = prevalence exceeding 66%; Secondary Species = prevalence between 33 and 66% and Satellite Species = prevalence below 33%. Aiming at comparing the indices of infestation of ectoparasites between the dry and rainy periods, the chi-square test was used for the prevalence and the Student t test to compare the intensity and mean abundance of each ectoparasite identified. Comparison tests

between means were applied only in the most abundant mullet species. Only the common parasites in the host in both periods studied were compared. The QP3.0 (Quantitative Parasitology) was used as resource in the analyses. Aiming at comparing the populations of ectoparasites among collection periods (Factor: seasonality), the Analysis of Similarity was performed designated ANOSIM (CLARKE & GREEN, 1988). When the ANOSIM indicates significant differences between the groups sampled, it is applied to exploratory analysis of Similarity Percentages (CLARKE & WARWICK, 2001), SIMPER, it will indicate the contribution of species to the mean similarity (Bray-Curtis) within each group and to the mean dissimilarity (Bray-Curtis) between pairs of groups. The ecological terminology used is that recommended by BUSH *et al.* (1997). The analysis included only species with prevalence ≥ 10% (component community) BUSH *et al*. (1990). The level of statistical significance was $p \leq 0.05$.

RESULTS

In total, we collected and analyzed 180 fish of the genus *Mugil*. The analysis of the ichthyological samples resulted in the identification of three teleosts belonging to the Mugilidae family: *Mugil curema* (Valenciennes, 1836), *Mugil liza* (Valenciennes, 1836), *e Mugil trichodon* (Poey, 1875) (Fig. 2). In terms of abundance, *Mugil curema* stood out both in the dry (N = 78) and rainy seasons (N = 88).

The species *Mugil trichodon* did not occur in the rainy period.

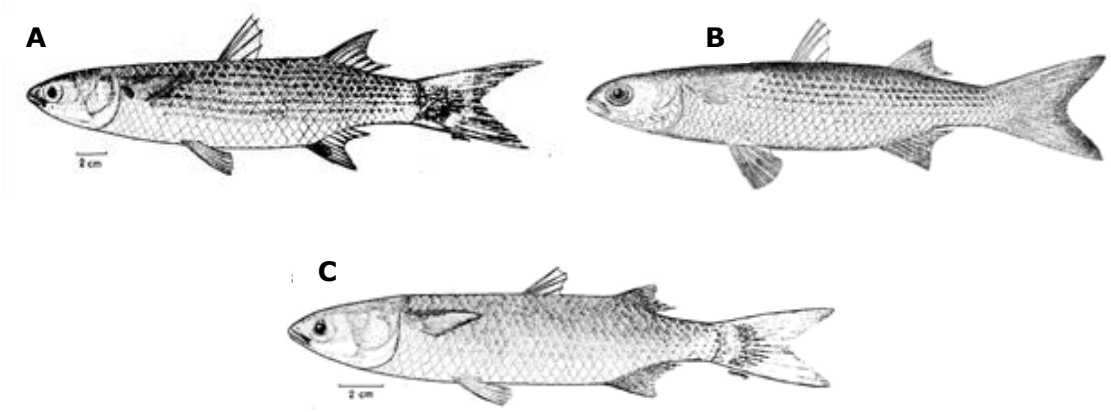

Figura 2 - Amostragem ictiológica do estuário da Bacia do Pina (2011 - 2012) Família Mugilidae: a) *Mugil liza* Valenciennes, 1836(curimã); b) *Mugil curema* Valenciennes, 1836 (tainha); c) *Mugil trichodon* Poey, 1876 (saúna). Fonte: PAIVA, 2006

Among the species of mullets that occurred during the dry season, *Mugil curema* showed the highest relative to the mean total length (24.2 ± 4.7 cm) and weight (152.3 ± 84.2 g) (Table I). In the rainy season occurred only the species *M. liza* and *M. curema*, being the second represented by only two individuals, with higher values for the mean

length (24 cm) and weight (138.8 g). In the dry and rainy seasons were not observed significant differences for the variables length and weight in *Mugil curema*.

Qualitative analysis of the parasitological samples resulted in the identification nine species of ectoparasites (Table II). *Mugil curema* had the highest percentage of infected individuals in both the dry period (74%) and rainy seasons (59%), hosting a greater variety of species.

Table I - Values for the n (individuals sampled), minimum, maximum, mean and standard deviation (SD) of the parameters total length (cm) and weight (g) for species of the Mugilidae family captured in the Pina Basin during the dry and rainy periods (2011- 2012).

	Period Dry **Total length (cm)**					Period Rainy **Total length (cm)**				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
M. curema	78	15	33	24.2	±4.7	88	15.5	28	23.5	±3.1
M. liza	9	15.5	29	20.2	±3.6	2	23	25	24	
M. trichodon	3	13	17	15.6	±2.3					
	Dry **Weight (g)**					Rainy **Weight (g)**				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
M. curema	78	27	353.27	152.2	±84.3	88	29	226.67	135.5	±49.9
M. liza	9	27.44	240.57	85.59	±60.5	2	126.6	151	138.8	
M. trichodon	3	18.1	38.2	29.9	±10.5					

Table II - Qualitative analysis of parasitological samples for *Mugil curema, Mugil liza* and *Mugil trichodon* captured in the Pina Basin during the dry and rainy seasons (2011-2012) **- P –presence of parasite; A – absence of parasite.**

	Mugil curema		*Mugil liza*		*Mugil trichodon*
ECTOPARASITE	Dry	Rainy	Dry	Rainy	Dry
Myxobolus sp.	P	P	A	A	A
Ligophorus sp.	P	P	P	P	A
Microcotilidae	P	P	A	A	A
Bomolochus nitidus Wilson, 1911	P	P	P	A	A
Acanthocolax sp.	P	A	A	A	A
Ergasilus lizae Kroyer, 1863	P	P	P	A	P
E. atafonensis Amado & Rocha, 1995	P	P	P	A	P
E. bahiensis Amado & Rocha, 1995	P	P	P	A	P
E. caraguatatubensis Amado & Rocha, 1995	P	P	P	A	P
Lernaeenicus longiventris Wilson, 1917	P	P	P	A	P

In the dry period, 3851 individuals were identified, Monogenea being the majority taxon with 1739 specimens (45.15%) of all ectoparasites collected, parasitizing 28 (31%) of the hosts analyzed. In the rainy season were collected 2871 specimens. During this period the taxon with greater numerical representation was Myxosporea with 2453 individuals (84.3%) of all ectoparasites collected, parasitizing

31 (34%) of the hosts analyzed. When analyzed by number of parasite species found, *M. curema* was most often infected in both sampled periods by only one parasite species (Fig. 3). Among the captured individuals of the species *Mugil liza* in the dry period (n = 9), six subjects had varying levels of infection (1 to 7 parasite species) and three were not parasitized. In the rainy season we found only one individual parasitized by three species of parasites

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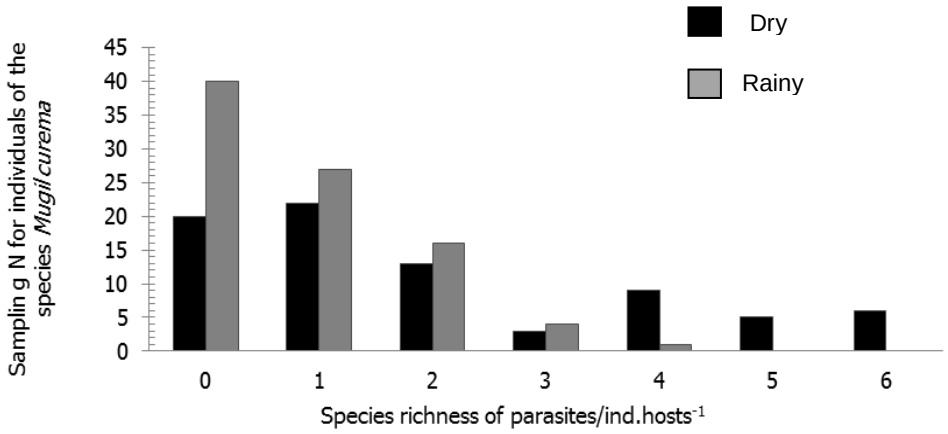

Figure - 3 - Species richness of parasites per host in *Mugil curema* collected in the estuary Pina Basin during the dry and rainy seasons (2011-2012).

The species *Mugil trichodon* occurred only in the dry season with three individuals and only two of them were parasitized with infection levels equal to 1 and 5 species of parasites. The quantity of parasites

species in *Mugil curema was* not correlated significantly with the host total length. Regarding the parasitosis characterization, the Copepoda *Ergasilus lizae* Kroyer, 1863, had the highest prevalence (43.50%) during the dry season with a representation of 551 individuals classified according to their community status as a secondary species. *Ligophorus* sp. was the ectoparasite with highest intensity (71.5) and mean abundance (22), and representation of 1733 individuals. In the rainy season *Myxobolus* sp. had the highest prevalence (35.20%), intensity (79.12) and mean abundance (27.8) with a representation of 2453 individuals and being characterized as a secondary species according to its community status. We recorded seven individuals belonging to (Plathyhelminthes phylum, class Monogenea, family Microcotilidae), six in the dry season and one in the rainy season. The individuals in this family had low values on the prevalence of infection (dry = 3.80%; rainy = 1.13%), mean intensity (dry = 2, rainy = 1) and mean abundance (dry and rainy < 0.1) in both periods studied (Table III).

Seasonality directly influenced the Indices of infestation of species *Ligophorus* sp. and *Ergasilus lizae*. The Copepoda *Lernaeenicus longiventris* showed no significant differences to its parasitic indices (prevalence, intensity and mean abundance). Among ectoparasites analyzed, *Ergasilus lizae* showed strong differences for prevalence (chi-square p = 0.000), mean intensity (t = -2.763 - p = 0.0395) and mean abundance (t = -3.462 - p = 0.0180). *Myxobolus* sp. showed no significant difference for the mean abundance and intensity (Table - IV).

Table – III. Mean of intensity and abundance in both periods studied

	PREVALENCE	**MEAN INTENSITY**	**MEAN ABUNDNCE**
ECTOPARASITE	Chi-square	t-test	t-test
Myxobolus sp.	*p* = 0.01*	t = 0.230 ; *p* = 0.84	t = 1.139 ; *p* = 0.28
Ligophorus sp.	*p* = 0.01*	t = - 2.563 ; *p* = 0.03*	t = 2.724 ; *p* = 0.04*
Ergasilus lizae	*p* = 0.00*	t = -2.763 ; *p* = 0.03*	t = -3.462 ; *p* = 0.01*
L. longiventris	p = 0.672	t = -1.984 ; *p* = 0.05	t = -1.505 ; *p* =0.15

Note: * Significant

Table – IV - Results of Chi-square Student t-test for prevalence, mean intensity and abundance of ectoparasites in *Mugil curema* collected from Pina Basin during the dry and rainy seasons (2011-2012).

Mugil curema	**Prevalence (%)**		**Mean intensity**		**Mean abundance**		**Community status**	
	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy
Ectoparasites								
Myxobolus sp.	17.90	35.20	66.9	79.12	12.01	27.8	Satellite	Secondary
Ligophorus sp.	30.70	14.70	71.5	20.3	22	3.01	Satellite	Satellite
Microcotilidae	3.80	1.13	2	1	<0.1	<0.1	Satellite	Satellite
B. nitidus	8.90	4.50	3.2	2.25	0.29	0.1	Satellite	Satellite
Acanthocolax sp.	10.20	-	4.5	-	0.46	-	Satellite	Satellite
E. lizae	43.50	14.70	14.1	4.69	6.16	0.69	Secondary	Satellite
E. atafonensis	30.70	5.60	9.6	4.8	2.96	0.27	Satellite	Satellite
E. bahiensis	17.90	2.20	5.07	3	0.91	<0.1	Satellite	Satellite
E. caraguatatubensis	21.70	3.40	6.9	5.6	1.51	0.19	Satellite	Satellite
Lernaeenicus longiventris	24.30	21.50	2.8	1.84	0.7	0.39	Satellite	Satellite

The Analysis of Similarity-ANOSIM (Sampling = fish; factor = seasonality) confirmed a statistically significant effect ($P < 0.01$) of seasonality on community composition of ectoparasites of *M. curema* where the (Global R - R = 0.057 characterizes this community as composed of barely separate groups). The exploratory analysis of similarity percentages - SIMPER (Sampling = fish; factor = seasonality) regarding the mean similarity of the groups shows the

dry period receiving high contribution of *Ergasilus lizae* (30.53%) to the group similarity, having *Ligophorus* sp. as complementary (moderate contribution). In the rainy season there is dominance of *Myxobolus sp*. (71.74%) and moderate contribution of *Lernaeenicus longiventris* (13.60%). Exploratory analysis SIMPER (Sampling = fish; factor = seasonality) regarding the dissimilarity of the groups, shows high values of dissimilarity between ectoparasites *Myxobolus* sp. (30.06%)*; Ligophorus* sp. (20.74%); *Ergasilus lizae* (18.70%) *and Lernaeenicus longiventris* (13.22%). The lowest dissimilarity value occurs for *Ergasilus atafonensis* (7.75%).

DISCUSSION

This study was the first to highlight and analyze the seasonality of parasite communities of mullets in a Brazilian tropical urban estuary. The high values recorded for prevalence, intensity and mean abundance of most ectoparasites of *Mugil curema* in the dry highlight the importance of these organisms to the these fish ecology. The Monogenea *Ligophorus* sp. was first recorded in Brazil, and for the first time parasitizing *M. curema*.

The estuary of Pina Basin is subject to strong anthropogenic pressure, making the environment degraded and polluted by sewage and industrial waste. This environmental pressure creates a great stress on the fish populations, compromising the immune

responses and becoming the parasite indexes higher, confirming that reported by MACKENZIE *et al*. (1995). Thus, the study of the seasonal behavior of parasitic infections may contribute to assessment of the environmental status of coastal ecosystems, as well as the use of parasite species as indicators of environmental impacts. However, it is recorded that the combination of parasitological indexes with data abiotic explains the occurrence of changes in the natural behavior of aquatic ecosystems and break in equilibrium parasite/host/environment.

Numerous studies have examined the effects of environmental stress on populations and communities of parasites, but few have combined parasitology with other fields of study in an interdisciplinary approach (MARCOGLIESE *et al*. 2006).

Studies carried out in the Canal de Santa Cruz and Suape (Pernambuco - Brazil) examined the rates of parasitic infection of copepod parasitizing fishes from Mugilidae, Centropomidae and Guerreidae and found that mullets stood out for being the most abundant fish in the study area and more parasitized and *M. curema* had the highest number of infected individuals (FONSECA, 2003). Similar observation was recorded for Pina Basin. Many parasites are specialized to live only in specific parts of their hosts (target habitats) (BEGON *et al,* 2007). Gills were the preferred parasitic site of the

ectoparasites of *M.curema.* A similar occurrence was observed in the gills of *Mugil platanus* on the coast of the state of Rio de Janeiro (KNOFF *et al*. 1994). The predilection of the parasites by this organ would be explained by the rich blood supply and oxygen, but also due to the accumulation of mucus and edible debris even generating competition.

It was observed that among the copepods identified *Ergasilus lizae and Ergasilus atafonensis* showed high prevalence in *M. curema* in the dry season. According to Amado (1992), *E. lizae* is considered a cosmopolitan species, parasitizing mullets from different parts of the world, having been cited parasitizing fish in Europe, Asia and the Americas. A study conducted in the coastal waters of Rio Grande do Norte investigated the crustacean ectoparasites of *Mugil curema* and recorded the copepod *E. lizae* occurring only during the rainy season and with low prevalence (3.23%) (CAVALCANTI *et al*. 2011). In Joyuda lake, Puerto Rico, an investigation on the temporal infection of dynamics of metazoan parasites in *Mugil curema,* recorded *Ergasilus lizae* occurring in the rainy season with high prevalence (60%), the author reported that this pattern seems to be more related to a migratory behavior of adult fish than related to hydrological and seasonal conditions (GARCIA & WILLIAMS 1985). The aforementioned studies do not corroborate the data recorded in the Pina Basin.

Ergasilus atafonensis was described by Amado & Rocha (1995) parasitizing mullets in brackish environments of Rio de Janeiro, Rio Grande do Sul, São Paulo, Bahia, Alagoas, Sergipe, Maranhão and Pará. It was investigated the prevalence (31%) and mean intensity (14.4) of this ectoparasite in *Mugil curema* collected in Santa Cruz Channel and prevalence (47.2%) and mean intensity (17.27) of this copepod collected in *M. curema* area of Suape (environment mischaracterized by human impacts), in both estuaries the high parasitic index values were recorded for the rainy season (FONSECA, 2003). Data presented do not support those verified in the Pina Basin. Morphologically, it was observed that species *Ergasilus bahiensis and Ergasilus caraguatatubensis* have the same parasitic adaptations of ergasilids, but particularly comparing them with *E. lizae and E. atafonensis*, it is questioned whether smaller antennas, more inflated bodies and apparently heavier of these species hinder their attachment to the host reflecting the low parasite indexes compared to other ergasilids identified in this work.

Natural changes in the environment associated with toxic effects caused by contaminants in parasites and their hosts can cause variations in parasitic infrapopulations (POULIN, 1995). Parasite with direct life cycle, as in the case of protozoa and

monogeneans, have their infrapopulations increased due to an effect attributed to the involvement of host immune responses (MACKENZIE *et al.*1995). *Ligophorus* Euzet & Suriano, (1977) comprises 29 parasite species in mullet fish. The monogenean *Ligophorus* sp. was first identified parasitizing *M. curema* in Brazil and the state of Pernambuco, with high mean intensity (71.5) of infection during the dry and rainy season (20.3). A study conducted on *Mugil curema* in Margarida Island (Venezuela) recorded *Ligophorus mugilinus*, the author reports the seasonal nature of the prevalence of the parasite, with peaks of infection in August / summer (prevalence = 100% and the mean intensity = 4.76) and November / autumn (prevalence = 100%, mean intensity = 16.94) (FUENTES & NAZIR 1990). In Brazil, the genus *Ligophorus* had only been identified in *M. liza*, as recorded in the Guandu River, southeastern Brazil (ABDALLAH *et al.* 2009). Monogeneans representative of the Microcotilidae family were first recorded in mullets from Pernambuco estuaries. These occurred only on *M. curema* both in the dry and rainy seasons, with higher prevalence in the dry season. Representatives of this family were recorded in *Mugil curema* from Joyuda Lake, Puerto Rico (GARCIA & WILLIAMS 1985). Parasites of the phylum Myxozoa Grasse, 1970 are among the most important pathogens of fish. The highest prevalence was recorded for the

ectoparasite *Myxobolus* sp. during the rainy season in *Mugil curema* individuals, but the infection potential of the species assessed by the intensity of infection was noted in both periods studied demonstrating the commitment of the estuarine waters of the Pina Basin. The study of the effect of eutrophication, pollution and fragmentation on the parasite community of *Rutilus rutilus and Perca fluviatilis* in four lakes in central Finland, Canada recorded increased prevalence and intensity of ectoparasites of fish in eutrophic lakes (VALTOKEN & KOSKIVAARA 1997). An increased prevalence of protozoan *Trichodina* sp. in January and May (88%) and mean intensity in May (70.4) were significantly higher than during the summer months in the waters polluted with nitrites, nitrates and phosphates in the eastern coast of the Black Sea (OGUT & PALM 2005). The data obtained in this work are a current reference that the seasonal effect on parasitological indexes of *M. curema.* The increase in the infectious potential of monogenetic (dry season) and Protozoa class Myxosporea (rainy season) indicate an impairment of water quality of the estuary of the Pina Basin all year round and suggests that the indices of parasitic infestation of the species *Ligophorus* sp. and *Myxobolus* sp. can be used to monitor the health of the ecosystem.

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