ICHTHYOFAUNA OF TWO BEACHES IN THE OUTLET OF THE PARAGUAÇU RIVER - TODOS OS SANTOS BAY, BAHIA, BRAZIL

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INTRODUCTION

1 - Introduction

Coastal environments, as outlets and sandy beaches play important part in the biological cycles and are essential to the development of the fishing resources, acting as nursery and safe places for the development of the species of fish that there frequent. However, the maintenance of great numbers of individuals in these ecosystems is assured by the large amount food sources and by the great structural complexity which promotes the occurrence of several ecological niches (Odum & Herald, 1972).

The specific composition of the populations of estuarines fish constantly moves and drastically in reason of the variability the ambient conditions and the specific limits of tolerance certain species to the alterations in the environmental (Kennish, 1990). One of the largest difficulties in the study oh the ichthyofauna estuaries of tropical areas is to determine and to quantify the effects of the environmental parameters in the space - temporary variation of the composition of the ichthyological communities, because the biological interaction of those factors in given in way differentiated in each local one (Blaber, 2002). In the ecosystems estuarines, the distribution of the organisms is influenced, mainly, for the salinity, temperature and oxygen dissolved in the water (Reize, 1985).

The outlet of River Paraguaçu's channel, terminal area is responsible for the discharge of the fresh water that ties two different bays (Todos os Santos Bay and Iguape Bay) it is considered as an appendix of the great estuary associated to the Todos os Santos Bay (Barreto & Paredes, 1995) and it receives strong influence of the adjacent estuary. The outlet Paraguaçu River (Fig. 01) it is placed among the pairs of geographical coordinates (12º50'59. 7 "S; 38º47'46. 3 "W and 12º50'16. 3 "S; 38º48'49. 5W)

OBJECTIVES

In that sense, this paper offers an assessment of the effect of factors abiotics(temperature, pH, dissolved oxygen and salinity) and effects of the temporal variation in the structure and composition of the ichthyofauna of the outlet of the river Paraguaçu, as well as effects of the episode "red tide" in the ichthyological communities.

MATERIAL AND METHODS

2 - Material and Methods

2.1 - Field Collections

Biweekly collections of the day were accomplished among the months of June to December of 2005, with the total of two monthly collections. The collections were retaked in December of 2006 to April of 2007, contemplating the same methodological specifications of the collections accomplished in 2005, resulting in 30 samples. In each point of the area, two serial drag of 50 meters was accomplished each, with aid of otter trawl manual 15m x 2,0m and 12 mm mesh. Temperature, salinity, pH and dissolved oxygen were measured in the surface of the water of each point using mercury thermometer (resolution of $0{,}5^0$C), manual hydropathic (it climbs of 1 ppm), digital portable phmetro and digital portable oxímetro (resolution of 0,1 ppm) respectively.

2.2. - Processing of the collected material

In the laboratory, the fish were identified until the species level, measured (standard length) and weight (grams), besides classified as juvenile (immature) or adults (in reproductive activity), with base in the scale of development gonodal proposal for Vazzoler (1996). The fishs meet deposited in Museum of Zoology of the Universidad Federal da Bahia.

2.3 - Data processing

For each species, the degree of relative importance was calculated in whole period amostral through the occurrence

frequency (FO %). Where the species were classified in: accidental species that didn't surpass values above 25%, accessory species with values between 25% and 50% and dominant species with values above 50%. The following ecological indexes were used: wealth of Margalef, diversity of Shannon - Wiener and of equitatibility of Pielou (Pielou, 1969). The analysis of non parametric variance of Kruskal - Wallis (a <0,05) was used in the analysis of the temporary series of environmental data during the period of the study, followed by the tests of multiple comparisons of Dunn. Similar procedure was used in the comparison among the biological data. The test of Mann - Whitney (a <0,05) was used in the comparison of the biotcs and abiotcs data among the two points. The coefficient of correlation of Spearman was used with purpose of determining the association degree among biotcs and abiotcs data. The statistical analyses were accomplished through the program INSTAT. With base in the total values of referring captured copies to the months of collection in each point a similarity analysis was applied, with purpose of containing the months of collection with relationship its likeness. A grouping analysis was accomplished through the method of Ward's using the distance of Bray - curtis through the program PC - ORD© (Mccune & Grace, 2002).

RESULTS AND DISCUSSION

3 - Results and Discussion

Were captured 2059 fishs, distributed like this: 1351 (65,42%) in the point an and 708 (34,58%) in the point two, Were captured 58 species corresponding to 32 families of fish. The dominant families were Carangidae with 13,8% of the species, Engraulidae and Gerreidae with 6,9% each and Achridae with 5,2%, you join those families they added 32,8% of the captured assembly of fish. In the study area, the largest capture was of *Sphoeroides greeleyi*, with 297 individuals, proceeded by *Eucinostomus argenteus* with 168, *Albula vulpes* with 167 and *Haemulon steindachneri* with 127. The species *Lutjanus alexandrei*, *Myrophis punctatus*, *Anchoa tricolor*, *Pellona harroweri*, *Cynoscion leiarchus* e *Lobotes surinamensis* just happened in the point one. There was not capture of species in the point two than differed of the found in the point one. All the exclusive species of the point one they didn't surpass 0,15% of the total. With base in the evaluation of the maturation stadiums of the adult individuals, they seem to use the area, in the reproductive period, the species *Sphoeroides greeleyi*, *Sphoeroides testudineus*, *Cetengraulis edentulos* e *Eucinostomus argenteus*.

There was significant difference among the points evaluating the number of capture copies (p=0,02), being the point one with 65,6% of the collected fish, while the point two answered for 34,4% of the captures. With relations the size, the fish they presented an average in the standard length of 69,34 ±15,45mm, with variation of 10 up to 385 mm. Most of the copies presented standard length of 41 to 85 mm, with a larger frequency in the class of size from 48 to 61. In the points sampling, the fish in juvenile apprenticeship dominated the captures along the studied period, representing 78% of the individuals approximately. In relation to the occurrence frequencies, of the four more abundant species *Sphoeroides greeleyi*, *Eucinostomus argenteus*, *Albula vulpes* e *Haemulon steindachneri*, all presented perseverance above 70% of presence in the samples, together with *Achirus lineatus* and *Diapterus rhombeus* specimens of great perseverance, even so of smaller numeric abundance. *Pellona harroweri* and *Cynoscion leiarchus* just appeared once in the captures. Still in relation to the use of the habitat evaluating FO%, the accidental considered species dominated the assembly with 56,9% of the total, followed by the dominant species (27,6%) and of the accessory ones with 15,5%.

Evaluating the correlation between the parameters abiotics and the abundance of the fish per moment amostral there was positive and significant correlation in: dissolved oxygen (r = 0,673; p=0,038). For the other analyzed parameters there was not significance of the correlation coefficient. The monthly medium captures in number of copies as well as the weight averages for capture presented significant temporary variation (p=0,02), with three groups of responsible months for that difference, evidencing dry, rainy stations and period of the red tide already the wealth indexes and diversity presented significant differences among the months of collection (p=0,04). That difference was attributed to the collections of the red tide.

The similarity analysis among the months (combined samples) it separated the fifteen referring collections to each point in three main groups. In the samples of the two points the first denominated "A"it includes the months corresponding at the end of the rainy period where happened the smallest captures in individuals, biomass and wealth index. A second denominated "B", formed by the months that correspond to the dry period where happened larger captures in number of individuals and biomass as well as larger wealth indexes in relation to the previous group. A third group, called of "C"it contained the collections that included March to April of 2007 being the period that happened the phenomenon of the "red tide"in the western area of Todos os Santos bay, representing the smallest captures, smaller diversity indexes and wealth as well as reduced biomass values.

It is observed that most of the dominant species belongs the few groups taxonomic, many of which mentioned for tropical areas. In general terms, the results obtained in the outlet of the Paraguaçu river resemble each other the those registered, previously, in the beach of Itapema, more area to the north of BTS (Lopes *et al.*, 1999). Comparing the two studies, as the prevalence, so much of species as of family, it is similar, with the variations could be attributed the differences between the used nets and the effort amostral, mainly concerning the number of collections. In Lopes *et al.*, ,(1999) the collections were accomplished in biweekly intervals, the same frequency used in that work, even so the sampling period understood August of 1995 to October of 1997. In that studie Lopes *et al.*, (1999) registered the occurrence of 70 species, which 60% happened in the present study.

Blaber & Blaber (1980) they affirm that you set with calmer and shallow waters, of little depth and abundant vegetation,

they constitute high productivity, being considered ideals for creation of juvenile fish for they supply protection and food. Laegdsgarrd & Johnson (2001), to the they simulate in laboratory the structure of growth of mangroves using rootses and artificial pneumatophore, they verified that these, when they allow the growth of algae, they cart the accumulation of small spineless, attracting up to four times more juvenile fish than in not structured atmospheres being then considered important areas for feeding of a lot of species of fish. This verification presents for the first time for Todos os Santos bay the regional artificial potential attractiveness of the fishing ones in harboring communities of fish temporarily, since in that study the assembly ichthyc was composed by 78% in juvenile ways.

The lack of correlation of the parameters abitics with the ichthyofauna was also shown by Oliveira *et al.,* , (2008) in close area in the Todos os Santos Bay, it is believed that the superficial mensuration of those parameters doesn't explain the variability well in the system. The abundance of the ichthyofauna presented a pattern of temporary variation in relation to the number of copies and the biomass. Studies accomplished in similar coastal areas don't find that pattern (Spach *et al.,* , 2004; Oliveira *et al.*, 2008). Araújo *et al.*, (1997) explains that in tropical and subtropical coastal atmospheres, us which the salinity is relatively stable and the seasonal variations of the non wide temperature, as shown in the present study, a pattern of the distribution of the abundances less defined related with the sazonalidade is waited. That significant difference can be attributed to the collections that marked the period of the red tide with reduction in all the studied biological parameters.

The phenomenon of the "red tide" of the excessive increase of the dinoflagellate *Gymnodinium sanguineum* (Doucette & Harrison, 1999) in the western waters of BTS due to conditions favorable oceanographic (appropriate brightness, offer of nutrients, low speed of superficial currents and reduced predators number) it caused high death toll of marine organisms in the area. In high density (approximately three millions cell for liter) hose dinoflagellate produced great amounts of organic matter, causing obstruction of the gills of aquatic organisms, taking them to die for asphyxia, the situation was worsened by the reduction of the available oxygen in the water in function of the decomposition of the generated organic matter (ASCOM/CRA, 2007). That impact was felt by the community ichthyc of the area tends *Centegraulis edentulus* as main species of that disaster. Analyzing the number of collected copies as well as the diversity and wealth, it can be noticed an accentuated reduction of those indexes in the period in that happened the bloom of those organisms. At the end of April of 2007 it was noticed a sensitive increase in the analyzed ecological indexes, due to the attenuation of the red tide the effect.

CONCLUSION

4-Conclusion

In spite of the environmental differences, mainly with relationship to the local dynamics, with the point 1 (Barra of Paraguaçu) in an area with smaller hidrodinamism and, as result, presenting less rude sediments and, probably some differences in the community bentonic, what would imply in differences in the food readiness, specifically in the studied period the two areas seem to be used by associations of fish with the same composition in species. Differences exist among the studied seasonal periods, mainly associated with the phenomenon of the "red tide", standing out the impact of that event in the local ichthyofauna.

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