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Distribution of *Micropogonias furnieri* (Pisces: Sciaenidae) in the Sepetiba Bay, Rio de Janeiro, Brazil

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Abstract: Distribution of *Micropogonias furnieri* in the Sepetiba Bay, an ecosystem highly important as rearing ground for this species that represents 5.8% of the numerical catches by otter trawling, was analyzed based in monthly and bi-monthly samplings from two programmes (beach seines = continental margin; and otter trawl = inside of the Bay), over three annual cycles, between 1993 and 1997. Spatial comparisons were assessed by dividing the Bay in two zones for the beach seines (inner and outer Bay) and three zones for the otter trawl (inner, central and outer Bay), following depth, salinity and transparency gradient, as well as for the influence of the sea. Beach seines (30 m extension, a 10 m length x 2.5 m of height x 7 mm mesh) and otter trawls were used. Trawls covered 1.5 km and the boat (net mouth 8 m, mesh size 12 mm between opposites knots in the cod). Temperature (ºC) and salinity (p.s.u.) were taken in each sampling; depth (m) and transparency (m) were measured during the trawl. Fish from beach seine were basically young-of-the-year; in the trawl they were individuals of larger size with total length varying from 70 mm to 300 mm. Spatially, highest CPUEs were found for the continental margin in the inner Bay, and for the inside Bay, in the inner and central zones. Highly significant correlations were detected among *M. furnieri* abundance and low salinity, transparency and depth in the inner Bay, with no defined pattern for the continental margin. Temporally, differences in fish abundance were shown only for the second annual cycle (1996) for the continental margin, with peaks in September/October.

Key words: Fish ecology, fish occurrence, coastal fishes, white croaker, bays, environmental variables.

Micropogonias furnieri is a widely distributed coastal species and plays an important economic role in Brazilian fisheries. In the Bay of Sepetiba, south of the State of Rio de Janeiro (22°54’-23°04’ S; 43°34’-44°10’ W) it ranks among the most common species, occupying the 4th place in otter trawl numerical abundance, contributing to 5.8% of the total number of fish, being present in about 68.0% of the samples (Araújo *et al.* 1998).

The Bay is characterized by presenting different habitats (channel zone, shallows, mangroves and sandy beaches), that are used by *M. furnieri* in different phases of life cycle. High abundance of juveniles (Total lenght < 50 mm) have been recorded at several shallow areas of the continental margin of the Bay (Araújo *et al.* 1997, Pessanha *et al.* 2000), indicating the importance of this habitat during the first period of its cycle.

The use of estuaries and semi-enclosed bays by *M. furnieri* was described by Barbieri (1986), focusing in spatial and seasonal movement of the juveniles in estuaries, following spawning in the coastal areas nearby, with larvae and youths penetrating into estuaries through intrusions of salted water, and moving to shallow areas where they found shelter and food availability. Geracitano (1998) defined ‘Ontogenetic Units’ to demonstrate that *M. furnieri* uses the area the whole year, shifting in space and feeding over time, showing a high adaptability to the high salinity variations, with juveniles arriving at the estuary in the summer, recruiting to areas of low depth, and migrating to deeper areas in Autumn-Winter. Changes in feeding habits following growth increase were reported by (Gonçalves 1997) who defined 4 "Trophic Units" for this species.

The objective of the present work is to describe spatial variations in the occurrence of *M. furnieri* and eventual influences of the environmental variables in the Sepetiba Bay.

MATERIALS AND METHODS

Two annual fish sampling programmes, one beach seine, and the other, otter trawl, were carried out. The first was performed by monthly samplings, between July 1993 and June 1994, and bi-monthly, from January 1996 to December 1997, while the latter, monthly, between July 1993 and June 1994, and bi-monthly, between August 1994 and July 1996.

A 10 m length, 2.5 m height, and 7 mm mesh size beach seine net was used, with 3 pseudo-replications at each sampling site, with the seine being performed parallel to the coast line at depth about 1.5 m, covering an extent of approximately 30 m. Bottom trawl tows were against current, of 30-min duration on the bottom, at a towing speed of approximately 1.5 knots and a tow distance of 1500 m, thus defining the unit effort. The trawl had a 8-m headline, 11 m ground rope, 2.5 cm stretched mesh line on each side, and 1.2 cm mesh cod-end liner. Following each sampling, hydrographic data were taken from bottom waters collected by Van Dorn bottle device, including temperature and salinity by an American Optic's refractometer. Transparency was recorded using a Secchi dish (in cm) and depth was determined with a weighted line marked in 10 cm intervals.

For spatial comparisons, the study area was divided in two zones (inner zone, near to continental drainage influence, and outer zone, close to the sea influence), for beach seine (continental margin), and in three zones (inner, central and outer zones), for the otter trawl (inside Bay), according to the depth, transparency and salinity gradient, that increases from the inner to the outer zone (Fig. 1).

All the fish were fixed in formalin 10% and lately measured at the total length, counted and weighted. Fish abundance was assessed as capture per unit effort (CPUE) both as number of individuals and biomass (g/sample). Biomass was not considered in this study, once its values closely matched number of individuals, so, CPUE is expressed as the numeric abundance. Spatial comparisons of relative abundance and environmental variables were tested by analysis of variance (ANOVA) at 95% level of confidence ($p < 0.05$), followed by *a posteriori* Tukey test. To address the ANOVA assumptions of normality and homocedasticity, raw data were previously $\log_{10}$ transformed $\log (X + 1)$, where X it is the raw value.

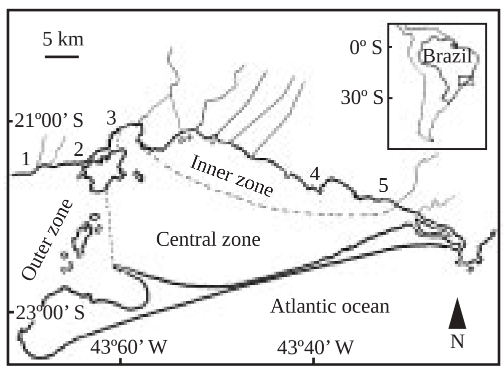

Fig. 1. Study area, with indication of the sampling sites in the continental margin [outer zone (1): sites 1, 2 and 3; inner zone (2): sites 4 and 5] and inside Bay [outer (1), central (2) and inner (3) zones].

RESULTS

Environmental variables: Three-way analysis of variance was used to compare environmental variables among zones, months and annual cycles. As it was shown several significant interactions among these three factors, each annual cycle was taken separately for assessing two-way zone and bi-monthly factors of variation.

Temperature: An evident pattern of seasonal variation ($p < 0.05$) among with highest values in January/February (overall averages: 27.6-34.0°C) and lowest in July/August (overall average: 20.5-23.72°C) in the continental margin, with these pattern being consistent over the three annual cycle (Table 1). In deeper areas inside the Bay, highest values occurred in March/April (overall averages: 25.1-28.95°C), and the lowest in September/October (overall averages: 20.6-23.4°C) with these pattern being consistent over three years of study.

They were not significant differences in temperature averages among the two zones in the first and second annual cycles for the continental margin; on the other hand, in the third annual cycle the outer zone (average: 25.87°C) showed lower temperature ($p < 0.05$) than the inner zone (average: 28.7°C) (Table 2). There were no differences among zones inside the Bay for any annual cycle (Table 3).

Salinity: No evident seasonal differences in salinity were shown among in the continental margin ($p > 0.05$), except for the 1996, when significant lowest values (average: 21.2 p.s.u.; $p < 0.05$) in January/February, coinciding high rainfall period. In deeper areas inside the Bay differences averages were shown ($p < 0.05$) in 1994/95 and l995/96, with higher values in May/Juny (overall averages: 29.5-34.0 p.s.u.) and lower in September/October (overall averages: 22.3-34.0 p.s.u.). No spatial difference was recorded ($p > 0.05$) between the two zones in the continental margin. On the other hand, inside the Bay, higher values in the outer zone (overall averages: 32.1-33.1 p.s.u.) were recorded when compared to the inner zone (overall averages: 29.7 – 31.0 p.s.u.), in the 1994/95 and 1995/96 ($p < 0.05$; Table 3).

Depth: A well defined depth gradient in the Bay ($p < 0.05$), with higher depths in the outer zone (overall averages: 8.3-14 m) and

TABLE 1

Summary of environmental variables for the continental margin of the Sepetiba Bay

TEMPERATURE	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
Outer zone						
1993/94	ns	ns	ns	22.0±1.1	22.8±0.9	27.8±2.1
	30.0±0.8	28.5±1.1	23.4±0.3	ns	ns	ns
1996	32.4±1.1	28.3±1.0	23.4±0.3	20.5±0.3	24.2±0.5	25.5±1.1
1997	27.6±1.1	27.2±0.8	22.6±1.3	23.7±0.2	26.1±0.8	28.0±1.1
Inner zone						
1993/94	ns	ns	ns	23.2±0.9	24.0±1.9	29.6±1.5
	32.9±0.8	28.4±0.3	28.4±0.3	ns	ns	ns
1996	30.5±0.7	27.6±1.9	24.4±0.6	20.3±0.9	26.0±0.7	29.6±1.6
1997	34.0±1.6	27.8±1.7	26.3±2.9	22.0±0.6	28.7±2.1	33.4±0.6
SALINITY						
Outer zone						
1993/94	ns	ns	ns	28.3±1.2	22.5±3.2	28.8±0.7
	29.3±1.2	24.8±1.7	26.8±2.9	ns	ns	ns
1996	23.1±0.9	20.6±1.4	24.8±5.2	30.2±3.7	27.3±2.8	29.8±1.5
1997	27.6±1.2	28.0±0.9	28.9±1.2	25.1±2.5	25.6±2.9	24.7±3.3
Inner zone						
1993/94	ns	ns	ns	25.5±4.7	27.0±0.7	25.5±3.5
	28.8±1.5	28.8±0.6	27.0±3.4	ns	ns	ns
1996	22.5±0.1	22.3±0.6	21.7±6.2	25.3±3.7	21.3±3.5	29.5±0.9
1997	21.8±4.5	28.0±1.0	24.9±2.6	30.0±0.0	20.9±0.9	24.5±3.2

Average ± standard error. ns = no sample

TABLE 2

F-values from ANOVA and Tukey test differences for environmental variables in the continental margin of the Sepetiba Bay

Variables	Bi-monthly B	Zone Z	Interaction B x Z	Tukey
Temperature				
1993/94	29.47**	ns	ns	B: 3,4,5<1,2,6
1996	5.90**	ns	ns	B: 2,3,4,5,6<1
1997	18.83**	17.68**	3.78**	B: 3,4<5<1,2,6; Z: 1<2
Salinity				
1993/94	ns	ns	ns	
1996	5.39**	ns	ns	B: 1<2,3,4,5,6
1997	ns	ns	ns	

TABLE 3

F-values from ANOVA and Tukey test differences for environmental variables inside the Sepetiba Bay

Variables	Bi-monthly B	Zone Z	Interaction BxZ	Tukey
Temperature				
1993/94	4.89**	ns	ns	B: 5<1,2,3
1994/95	61.06**	ns	2.99*	B: 4<5<1,3,6<2
1995/96	51.09**	ns	ns	B: 4<5,6<1,3<2
Salinity				
1993/94	ns	ns	ns	B: 1,2,3<6<4,5; Z: 2,3<1
1994/95	12.60**	5.99**	ns	B: 2<1<3<5,6<4; Z: 3<1,2
1995/96	21.85**	57.52**	ns	
Depth				
1993/94	ns	39.06**	ns	Z: 3<1,2
1994/95	ns	15.71**	ns	Z: 3<1,2
1995/96	ns	30.81**	ns	Z: 3<1,2
Transparency				
1993/94	5.30**	27.04**	ns	B: 1,5,6<2,4; Z: 3<1,2
1994/95	3.61*	3.48*	ns	B: 5<6; Z: ns
1995/96	2.80*	8.66**	ns	B: ns; Z: 3<1

lower depths in the inner zone (overall averages: 2.5-8.25 m; Table 4).

Transparency: Overall, higher transparency ($p < 0.05$) were recorded in the outer zone (overall averages: 2.16-6.16 m) and lower in the inner zone (overall averages: 0.5-2.5 m), for the three yeas of study. In 1993/94 highest values occurred in July/August (average: 6.2 m) and lowest in November/December (average: 1.0 m), while in 1994/95 highest records occurred in November/December (average: 4.23 m) and the lowest in September/October (average: 0.5 m). In 1995/96 no seasonal differences were found (Table 4).

TABLE 4

Summary of environmental variables inside the Sepetiba Bay, average±standard error

Temperature	Sep/Oct	Nov/Dec	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug
Outer zone						
1993/94	20.6±2.7	23.5±0.6	23.2±0.8	25.1±1.1	24.7±0.1	23.6±0.5
1994/95	23.4±0.2	24.1±0.1	25.0±0.1	27.4±0.4	24.6±0.2	22.3±0.2
1995/96	22.5±0.2	22.3±0.2	24.6±0.2	26.2±0.8	23.6±0.0	21.6±0.1
Central zone						
1993/94	21.4±0.0	23.9±0.4	24.3±0.2	25.5±0.9	25.2±0.1	24.5±1.9
1994/95	22.3±0.2	24.5±0.3	25.8±0.1	28.1±0.1	24.5±0.3	22.0±0.0
1995/96	22.3±0.2	22.5±0.3	24.8±0.3	25.3±0.6	23.7±0.0	20.8±0.0
Inner zone						
1993/94	22.5±0.3	23.4±0.7	25.8±1.0	27.3±1.1	26.3±0.3	22.6±1.6
1994/95	24.3±0.2	26.5±0.9	25.2±0.0	28.9±0.0	24.9±0.1	21.0±0.7
1995/96	22.5±0.1	22.0±0.0	25.4±0.2	28.3±0.6	24.6±0.1	20.4±0.3
Salinity						
Outer zone						
1993/94	32.2±0.2	30.4±0.4	31.1±0.7	32.2±0.7	31.3±0.2	30.6±0.5
1994/95	34.0±0.0	32.3±0.2	29.6±0.2	31.0±0.5	32.3±0.2	33.3±0.2
1995/96	22.5±0.2	34.0±0.0	31.6±0.2	30.6±0.5	34.0±0.0	34.3±0.7
Central zone						
1993/94	30.5±0.3	30.0±0.7	30.7±1.1	31.6±1.0	31.0±0.7	29.7±0.5
1994/95	33.0±0.7	31.0±0.7	29.0±0.7	31.0±0.7	30.0±0.0	32.0±0.0
1995/96	22.3±0.2	33.5±0.3	31.0±0.7	30.0±0.0	34.0±0.0	34.0±0.0
Inner zone						
1993/94	27.7±2.5	30.0±0.0	29.0±1.1	29.0±1.7	29.3±0.6	29.0±1.4
1994/95	32.0±0.0	31.0±0.7	30.5±0.3	29.5±0.3	31.0±0.7	33.0±0.7
1995/96	22.5±0.1	30.0±0.0	30.5±0.3	26.0±0.0	29.5±0.3	31.0±0.7
Depth						
Outer zone						
1993/94	12.7±3.4	8.3±10	9.3±1.4	11.0±1.5	14.0±1.6	9.1±1.7
1994/95	10.3±0.7	11.0±1.8	9.1±0.9	9.5±2.5	9.5±2.3	11.8±2.5
1995/96	10.6±1.7	10.1±1.8	10.6±1.5	10.6±2.3	12.0±0.9	8.5±0.6
Central zone						
1993/94	7.6±0.9	9.0±0.0	8.5±0.8	8.3±1.3	9.7±0.8	9.7±1.3
1994/95	8.5±2.4	8.5±1.4	9.0±1.4	8.5±1.7	6.0±0.0	10.5±1.0
1995/96	8.5±2.4	10.0±2.1	10.0±1.4	8.0±1.4	9.5±1.0	7.5±1.0
Inner zone						
1993/94	3.8±0.1	3.5±1.0	4.3±0.9	5.6±1.6	3.4±0.3	4.7±0.5
1994/95	4.0±0.0	3.2±0.5	8.2±0.8	4.0±0.0	5.0±1.0	3.5±0.3
1995/96	4.7±0.1	2.8±0.4	4.0±1.4	2.5±0.3	3.2±0.1	4.2±0.1
Transparency						
Outer zone						
1993/94	2.6±0.4	3.4±0.3	3.3±0.2	4.3±0.2	4.2±0.3	6.1±2.4
1994/95	2.7±0.1	4.2±0.4	2.1 ±0.3	2.4±0.0	2.5±0.2	3.0±0.4
1995/96	3.1±0.4	2.2±0.2	3.0 ±0.5	5.0±0.0	4.8±0.1	4.3±0.9
Central zone						
1993/94	1.7±0.3	3.0±0.5	3.4±0.4	3.9±0.5	3.5±0.3	2.4±0.3
1994/95	2.5±0.3	4.2±0.1	3.2±0.7	2.0±0.1	2.3±0.2	2.1±0.1
1995/96	2.5±0.3	2.0±0.0	2.8±0.0	2.0±0.0	3.5±0.3	3.5±0.3
Inner zone						
1993/94	1.2±0.3	1.0±0.2	1.3±0.1	2.4±0.2	1.6±0.6	2.2±0.1
1994/95	0.5±0.3	2.5±0.3	2.2±0.5	1.5±0.1	2.5±0.0	1.9±0.1
1995/96	1.5±0.3	0.9±0.1	1.5±0.3	1.0±0.0	2.2±0.1	1.6±0.4

Fish distribution: Similarly to environmental variables, relative abundance of fish, expressed as CPUE, was compared for every year, considering zones and bi-monthly as factors. Fish captured by beach seine in the continental margin were basically young-of-the-year, with total length (TL) varying from 10 mm to 60 mm. In the otter trawl inside the Bay, fishes showed larger size ranging between TL 70 mm to 300 mm. No differences in relative abundance ($p > 0.05$) were found seasonally, in 1993/94 and 1997. In 1996 an exceptional peak of abundance were recorded in September/October, with such values not been recorded in other period of study (Tables 5 and 6). In deeper areas inside the Bay, no significant differences were recorded in the abundance seasonally over the three yeas studied (Table 7).

TABLE 5

F-values from ANOVA and Tukey test differences for CPUE in the continental margin the Sepetiba Bay

Variables	Bi-monthly B	Zone Z	Interaction BxZ	Tukey
Number				
1993/94	2.48*	30.53**	2.48*	B: ns; Z: 1<2
1996	16.80**	36.22**	16.80**	B: 1,2,3,4,6<5; Z: 1<2
1997	ns	11.72**	ns	Z: 1<2
Biomass				
1993/94	ns	26.80**	ns	Z: 1<2
1996	11.19**	26.32**	11.19**	B: 1,2,3,4,6<5; Z: 1<2
1997	2.46*	13.67**	2.49*	B: ns; Z: 1<2

TABLE 6

F-values from ANOVA (one way) and Tukey test differences for CPUE in the continental margin in 1996, in Sepetiba Bay

Variables	Bi-monthly		Tukey
	Zone-1	Zone-2	
Number	ns	10.50**	Z2: 1,2,3,4,6<5
Biomass	ns	6.99**	Z2: 1,2,3,4,6<5

TABLE 7

F-values from ANOVA and Tukey test differences for CPUE in the inside Sepetiba Bay

Variables	Bi-monthly B	Zone Z	Interaction BxZ	Tukey
Number				
1993/94	ns	7.38**	ns	Z: 1<3
1994/95	ns	4.54**	ns	Z: 1<3
1995/96	ns	3.99*	ns	Z: 1<2
Biomass				
1993/94	ns	12.55**	ns	Z: 1<2,3
1994/95	ns	5.93**	ns	Z; 1<3
1995/96	ns	8.92**	ns	Z: 1<2

Spatially, highest CPUEs were recorded in the inner zone for the continental margin ($p < 0.05$) for all the study period (Fig. 2A). Inside the Bay, highest CPUE occurred in the innner zone in 1993/94 and 1994/95, and in the central zone in 1995/96 (Fig. 2B).

Relationship between environmental variables and fish abundance: No evident significant correlations were detected between fish abundance (CPUEs) and the environmental variables for the continental margin, according to Spearman correlation coefficients. On the other hand, negative correlations between CPUE and the environmental variables of salinity, transparency and depth were found inside the Bay. Temperature, despite of its seasonal variation, did not show any significant correlation with fish abundance (Table 8).

TABLE 8

Spearman correlation coefficient between environmental variables and fish abundance in the Sepetiba Bay

Variables	Number / sample	Biomass (gram/sample)
Continental margin		
Temperature	0.009	0.011
Salinity	-0.039	-0.041
Inside the Bay		
Temperature	0.093	0.075
Salinity	-0.286**	-0.254**
Depht	-0.431**	-0.399**
Transparency	- 0.393**	-0.354**

** Significant at 99% level of confidence

Fig. 2. A. Spatial variation in relative abundance of *Micropogonias furnieri* in the continental margin of the Sepetiba Bay, in three years of study. B. Spatial variation in relative abundance of *Micropogonias furnieri* in the inside Sepetiba Bay in three years of study.

Spatial inverse relationship between fish abundance and salinity, transparency and depth matched the found by ANOVA, inside the Bay, with fish concentrating in the inner and central zones.

DISCUSSION

In the early life cycle, *M. furnieri* underwent a large amount of environmental changes when they penetrate very changeable areas such estuaries or enclosed bays coming from a more stable nearby coastal zones, where spawning take place. This natural movement occurs as eggs and early larval stages (Castello 1986, Vazzoler 1991). In rearing grounds such as estuaries and bays, environmental variables are much unstable due to the proximity of continental drainage and antrophic influences, such as industrial plant development and cities which carry into the aquatic ecosystem all sort of effluent.

In the Bay of Sepetiba, most white croaker were comprised by individuals in first years of life, as the youths and/or sub-adults, concentrated in the innermost Bay area, characterized by existence of protected zones and marked organic enrichment due to organic input more conspicuous in the inner zone, due to urban and industrial contribution (Coelho and Carvalho 1973). Organic input given overall fair environmental conditions can increase phyto and zooplankton production allowing opportunist species such as white croaker to coexist in high numbers despite environmental quality changes, peculiar in the inner zone, when compared with the highly stable outer zone, close to the sea limit.

The use of Sepetiba shallows and sandbanks by young-of-the-year (LT = 30-90 mm), associated with food availability was very peculiar for Sepetiba Bay. Gonçalves (1997) reported that in this phase the white croaker change its feeding habit from zooplanktonphagic to microbenthofagic, as larvae and juvenile penetrate in the estuary from bottom marine currents influx intrusion to the shallows where they recruit in smaller depth, where they find shelter and feed; afterwards they reach larger sizes and move into deeper zones. Barbieri (1986) also suggests that larger individuals (TL > 100 mm) move away from shallow areas, being captured for otter trawl. This pattern in the early life cycle coincided with the found in the present work, where most juveniles were recorded in the inner zone at the continental margin of the Bay, when they show TL < 60 mm. These juveniles are common all year round, being scarce or poorly represented, in the summer, indicating a wide recruitment period probably from a ample reproduction period. Geracitano (1998) studying movements of white croaker in Patos Lagoon’ estuary observed that recruits are strongly associated to otter trawl during Summer, and presented a wide distribution in the estuary. Differences between populations or fish stocks between those area, more characteristically temperate warm, and tropical characteristic of Bay of Sepetiba, could be associated to such differences temporal pattern of recruitment. Vazzoler (1991) suggested that there are two different white croaker populations in South-Southeast Brazilian coast, with different life cycle, naming the white croaker population I, to the stock distributed between parallel 23 and 29º S, where Sepetiba Bay is included, and the population II, those distributed between the parallel 29 and 33º S, where the reproductive period occur mainly in the Spring/Summer.

Larger sized fish (TL > 70 mm) from otter trawl also concentrated in inner Bay, being present in high abundance over all year round. Such individuals, come from the continental margin where they spend the first months of life, moving afterwards to deeper zones inside the Bay. The absence of seasonality in this group of fish, and the marked spatial separation, with highest occurrence in low depths, transparencies and salinities of the inner zone of the Bay seems to be the strategy of use the Sepetiba Bay by this species. Other areas in South of Brazil, on the other hand, are characterized by high seasonal occurrences of this species, in high number mainly in Spring/Summer as found by Geracitano (1998).

RESUMEN

Se analizó la distribución de Micropogonias furnieri en la Bahía Sepetiba, un ecosistema altamente importante como lugar de crianza de esta especie que representa 5.8% de las capturas numéricas por redes de arrastre, basado en muestreos mensuales y bimensuales de dos programas (redes de playa = margen continental; y redes de arrastre = dentro de la Bahía), en tres ciclos anuales, entre 1993 y 1997. Las comparaciones espaciales se hicieron dividiendo la Bahía en dos zonas para las redes de playa (Bahía interna y externa) y tres zonas para las redes de arrastre (Bahía interna, central y externa), de acuerdo a profundidad, salinidad y gradiente de transparencia, así como la influencia del mar. Se usaron redes de playa (30 m de extensión, 10 m de largo x 2.5 m de alto x 7 mm de poro) y redes de arrastre. Los arrastres cubrieron 1.5 km y el bote (boca de malla 8 m, tamaño de poro 12 mm entre nudos opuestos en la bolsa. En cada muestreo se tomó la temperatura (ºC) y la salinidad (p.s.u.); la profundidad (m) y la transparencia (m) se midieron durante el arrastre. Los peces de las redes de playa fueron básicamente los juveniles-del-año; en las redes de arrastre fueron individuos de mayor tamaño con una longitud total variando de 70 mm a 300 mm. Espacialmente, se encontraron mayores CPUEs para el margen continental en la Bahía interna y para dentro de la Bahía en las zonas interna y central. Se encontraron correlaciones altamente significativas entre la abundancia de *M. furnieri* y baja salinidad, transparencia y profundidad dentro de la Bahía interna, sin ningún patrón definido para el margen continental. Temporalmente, se mostraron diferencias en la abundancia de los peces solo en el segundo ciclo anual (1996)para el margen continental, con picos en setiembre/octubre.

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