Fundação Universidade Federal do Rio Grande
Departamento de Oceanografia
Laboratório de Ecologia de Invertebrados Bentônicos

BENTHIC COMMUNITY EVALUATION UNDER DREDGING STRESS CONDITION IN THE HARBOR OF RIO GRANDE

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INTRODUCTION

Benthic macrofauna and its relation with the bottom layer

They can be used in ambient monitoring better than other organisms due to their low mobility

INTRODUCTION

Studies concerning dredges impact – Different effects

Wildish & Thomas (1985) – Harbor of Saint John (Canada)

Marques *et al.* (1993) – Mondego estuary (Portugal)

Quigley & Hall (1999) – Blyth estuary (NE - England)

Kaplan *et al.* (1975); López-Jamar & Mejunto (1988) – Recovery

Lewis *et al.* (2001) – Bayou Texar estuary (EUA)

Guerra-García *et al.* (2003) – Harbor of Ceuta (N - Africa)

Thus, the effects of these operations need to be evaluated case-to-case

INTRODUCTION

Harbor of Rio Grande

- **License Operation given by the Brazilian Environmental Agency (IBAMA), since 1997**

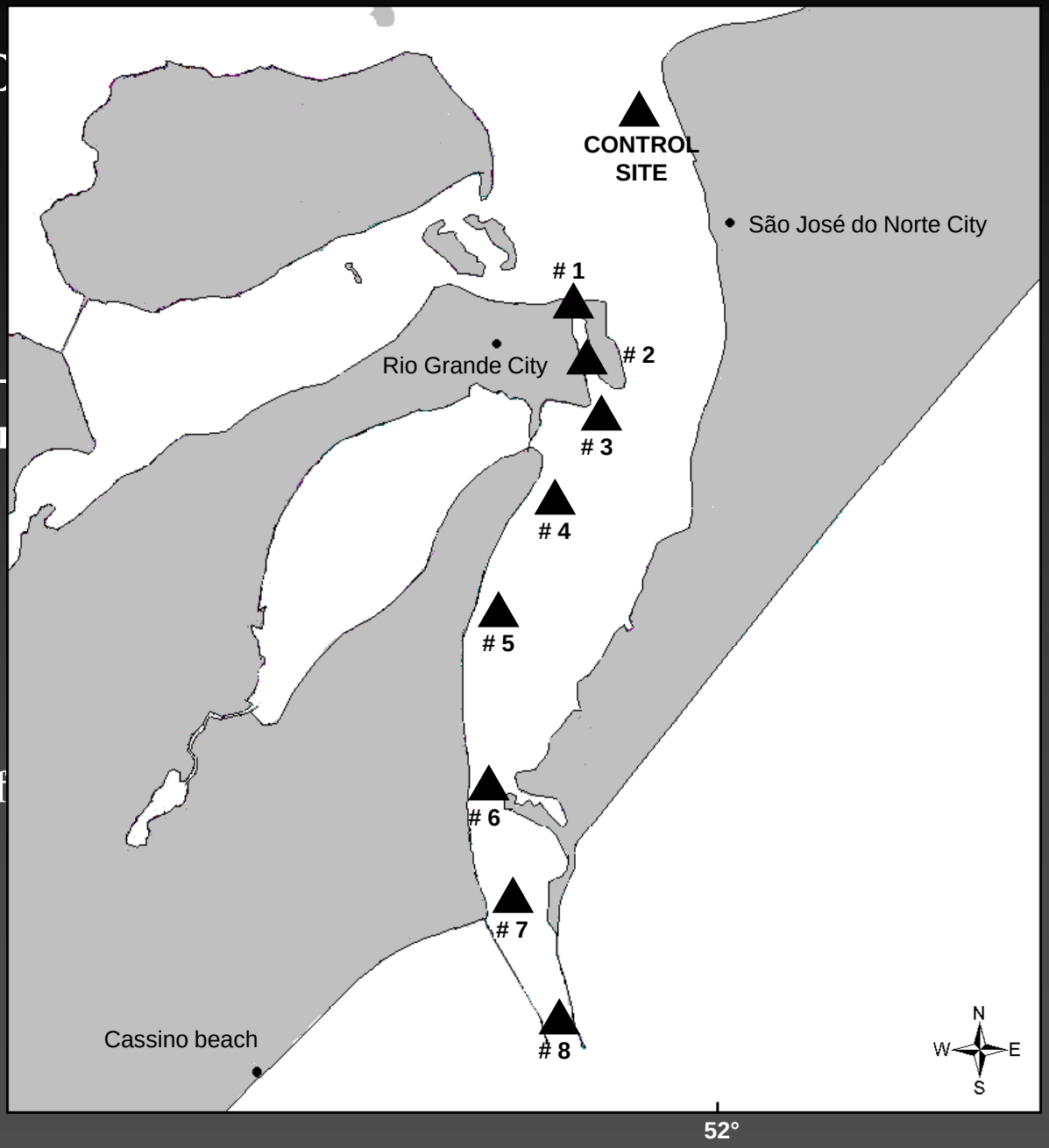
- **Monitored parameters in order to maintain these license:**

Water quality	**Sediment quality**
Geochemical analysis	**Ecotoxicology tests**
Mammal, fish and bird's diversity and abundance	**Benthic community (which concerns the present study)**

OBJECTIVE

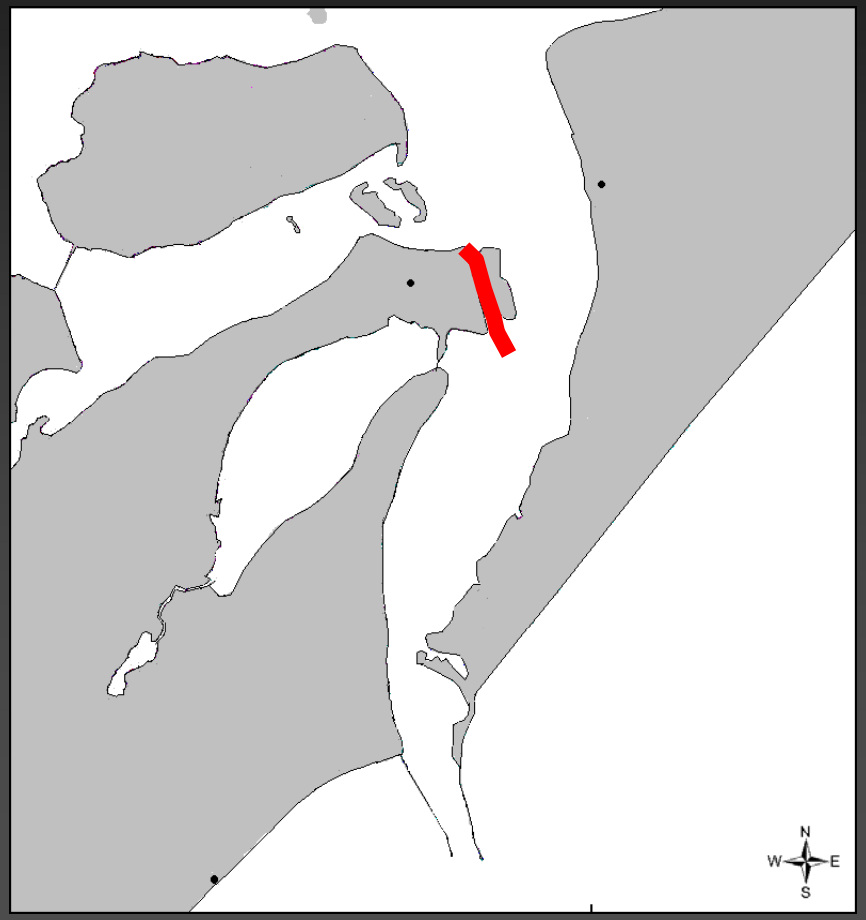
Evaluate the benthic community from the Rio Grande's harbor channel, analyzing the possible effects caused by the dredge operations accomplished in the year 2000, and also their recovery 1 year after the end of these operations

MATERIAL AND

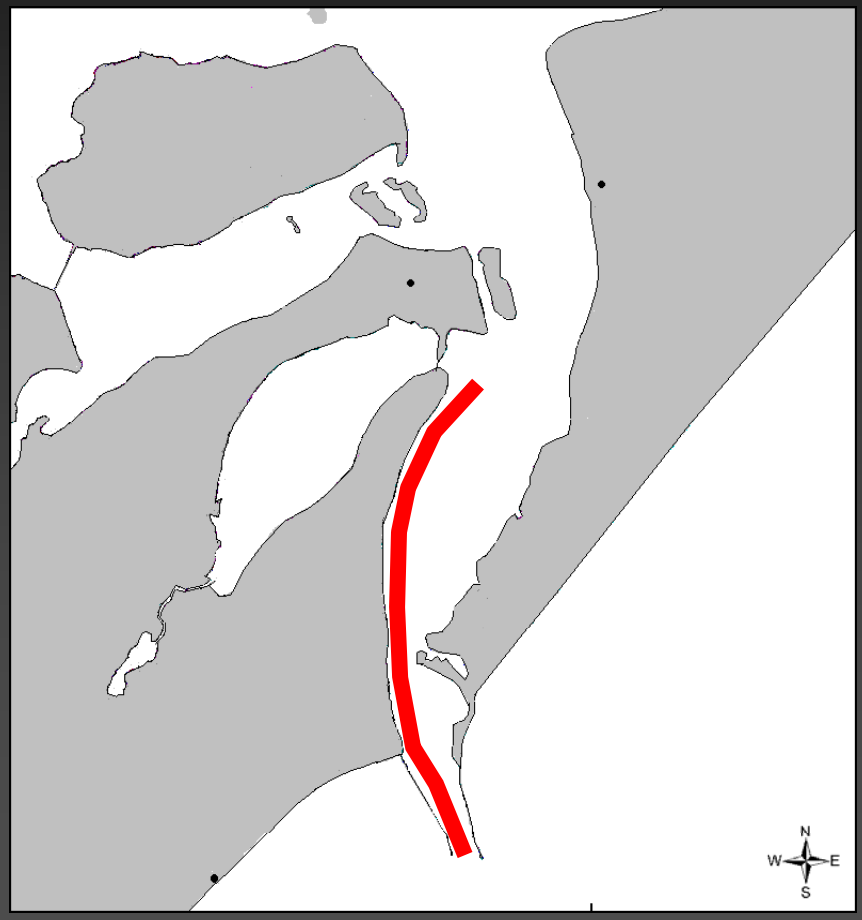


MATERIAL AND METHODS

Dredging operations during the year 2000 removed about 2.330.000 m³ of sediment (mostly silt and clay)



Winter (dredged area: from #1 to #3)



Spring (from #4 to #8)

BIOTIC AND ABIOTIC SAMPLES

5 seasonal cruises:
Summer, Autumn, Winter
and Spring 2000 plus Winter 2001

Salinity measured at each site

3 biological samples per site

***van Veen* grab**
(0.08 m^2)

Nylon sieve
(500 µm mesh size)

Stereomicroscope
identification

DATA ANALYSIS

Benthic macroinvertebrate density expressed in Ind.$(m^2)^{-1}$

Ordination analysis (Multi Dimensional Scaling – MDS)
and CLUSTER hierarchical dendrogram:
log (X+1) transformed data and Bray-Curtis similarity matrix

Kruskal – Wallis' Non-Parametric variance analysis
(Unifactorial / $p < 0.05$)

Analysis of Similarity (ANOSIM) and Similarity
Perceptual (SIMPER) tests

STATISTICA® 6.0, PRIMER® 5.4.2 e BioEstat® 3.0 software

RESULTS and DISCUSSION

Salinity

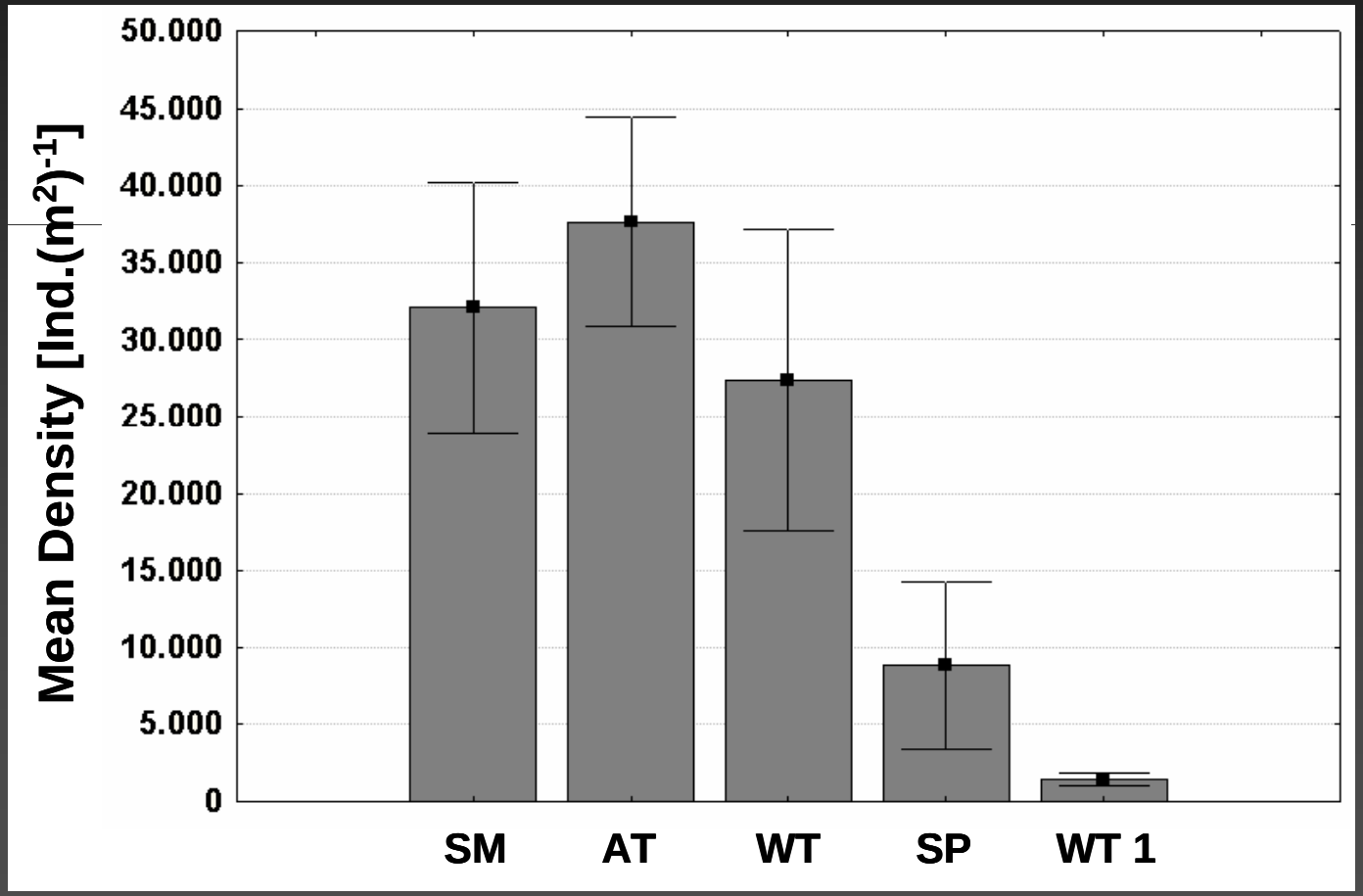
SM = summer 2000; AT = autumn 2000; WT = winter 2000; SP = spring 2000; WT 1 = winter 2001

	SM	AT	WT	SP	WT 1
# CONTROL SITE	35	2	0	0	20
# 1	27	4	0	0	24
# 2	29	2	5	0	18
# 3	28	2	0	0	23
# 4	25	3	0	0	27
# 5	28	2	0	0	25
# 6	35	2	0	0	25
# 7	35	2	0	0	27
# 8	35	2	0	0	25

$p < 0.05$

RESULTS and DISCUSSION

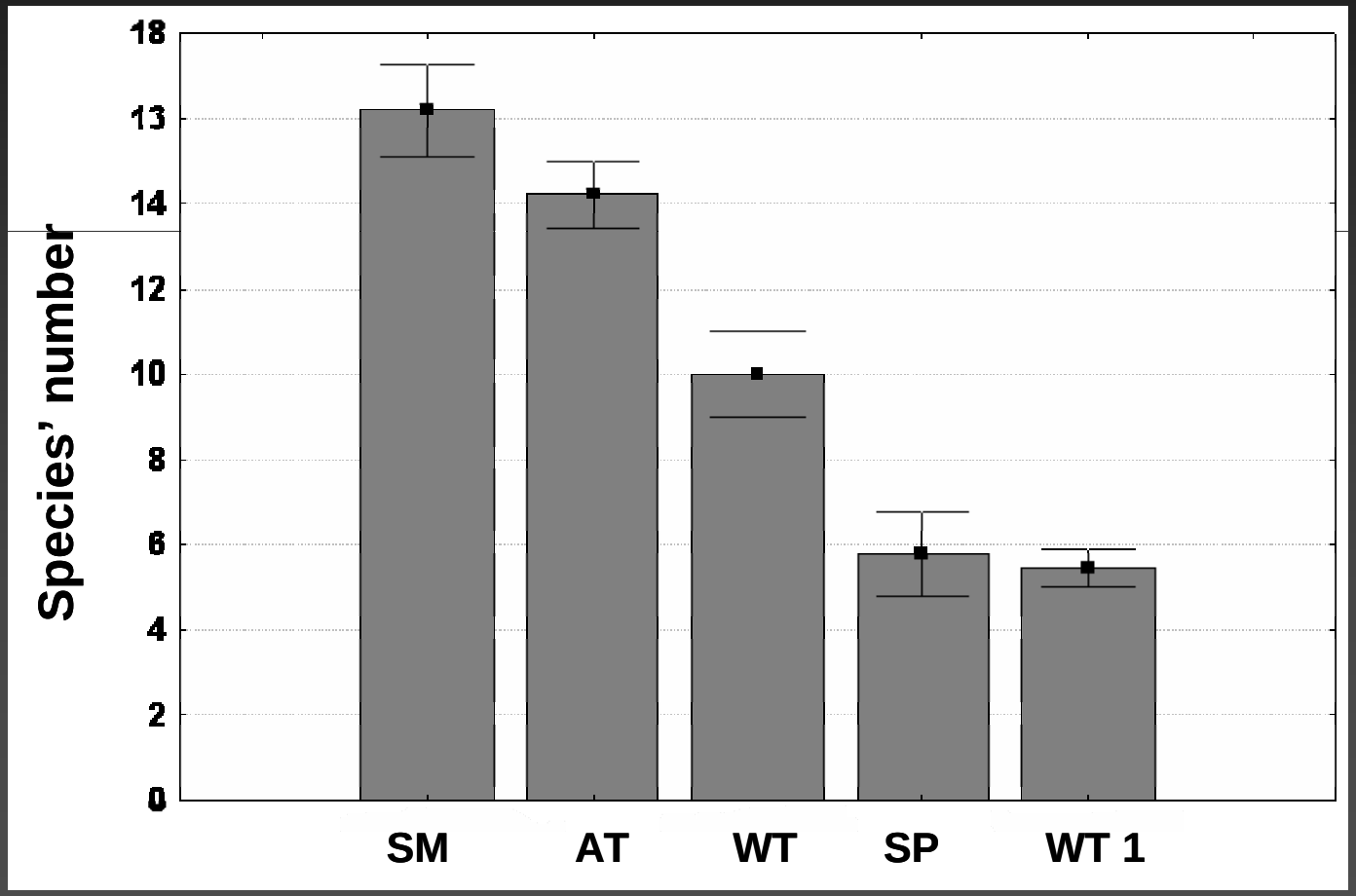
Macrofaunal Density



$p < 0.05$

RESULTS and DISCUSSION

Species' number



RESULTS and DISCUSSION

Some macrozobenthic species and their dominance perceptual

Heleobia australis (Gastropod) 98.23%

Heteromastus similis (Polychaete) 0.66%

Sigambra grubei (Polychaete) 0.33%

Nephtys fluviatilis (Polychaete) 0.14%

Anachis isabellei (Gastropod) 0.12%

Kalliapseudes schubartii (Tanaid) 0.06%

RESULTS and DISCUSSION

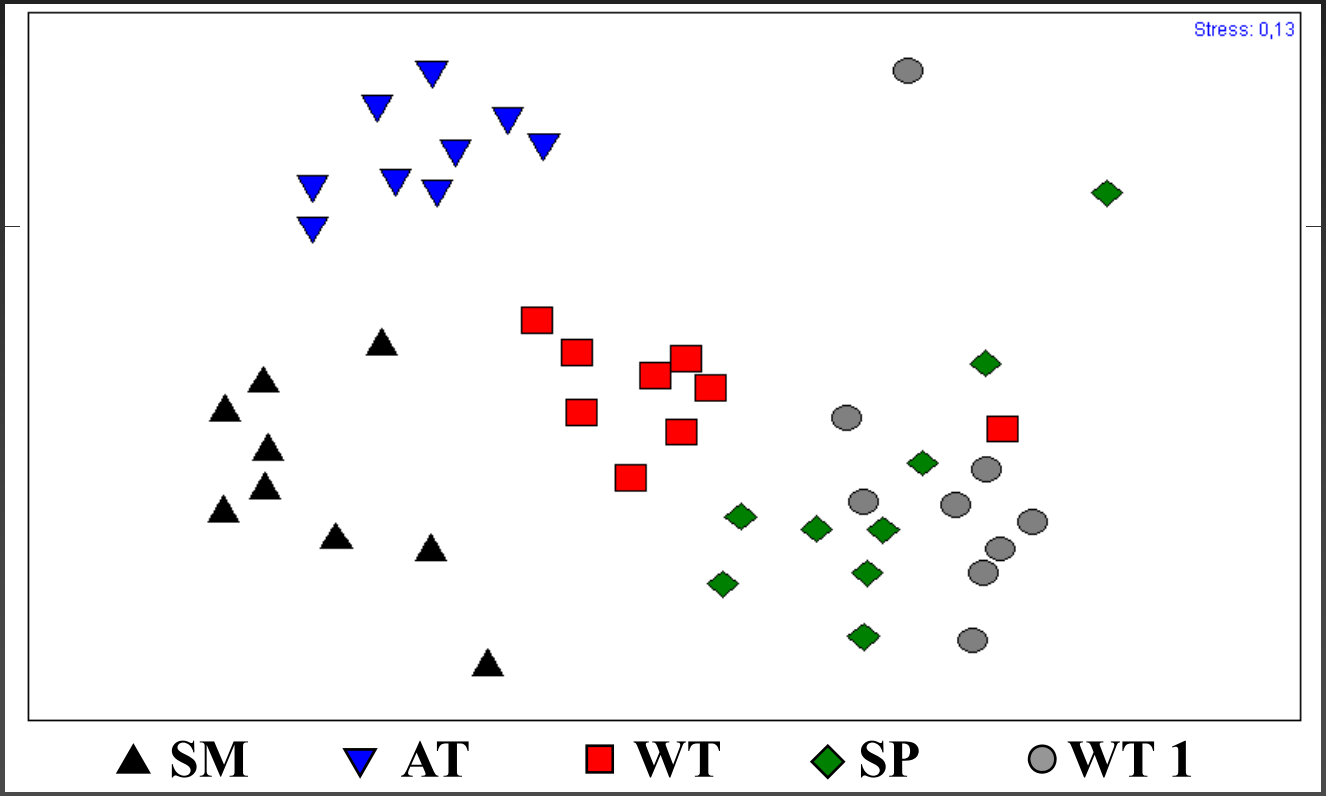
Both summer and autumn 2000 presented high density and diversity values (of marine species mainly), followed by an abrupt diminution of these community attributes in the subsequent seasons (winter and spring)

The changes in the estuarine salinity (zero values) can be responsible for these community reductions, specially concerning the gastropod *H. australis* (the dominant specie)

The winter 2001, saltier than the former winter and spring, also affected the community structure, favoring the marine species more than the estuarine ones

RESULTS and DISCUSSION

Seasonal MDS



All seasons were different (p = 0.01 / R = 0.738)

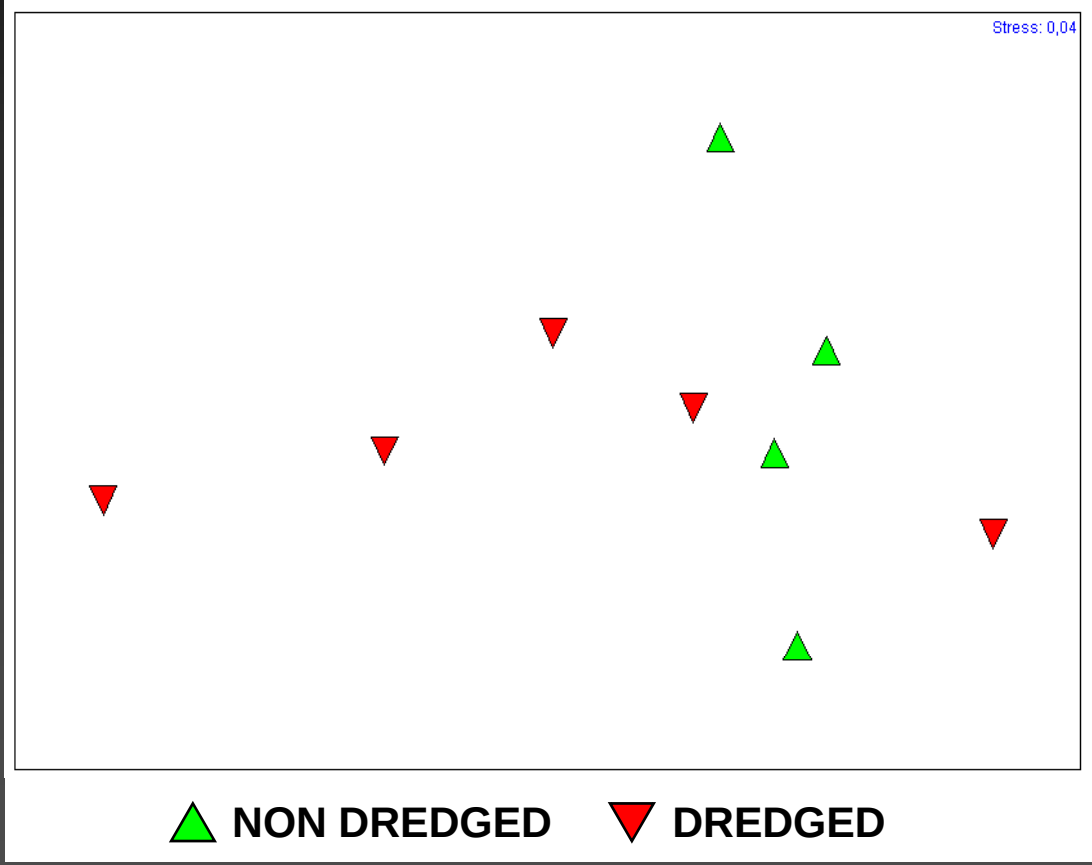
RESULTS and DISCUSSION

Dredge MDS – Winter 2000

p = 38.1% / R = 0.031

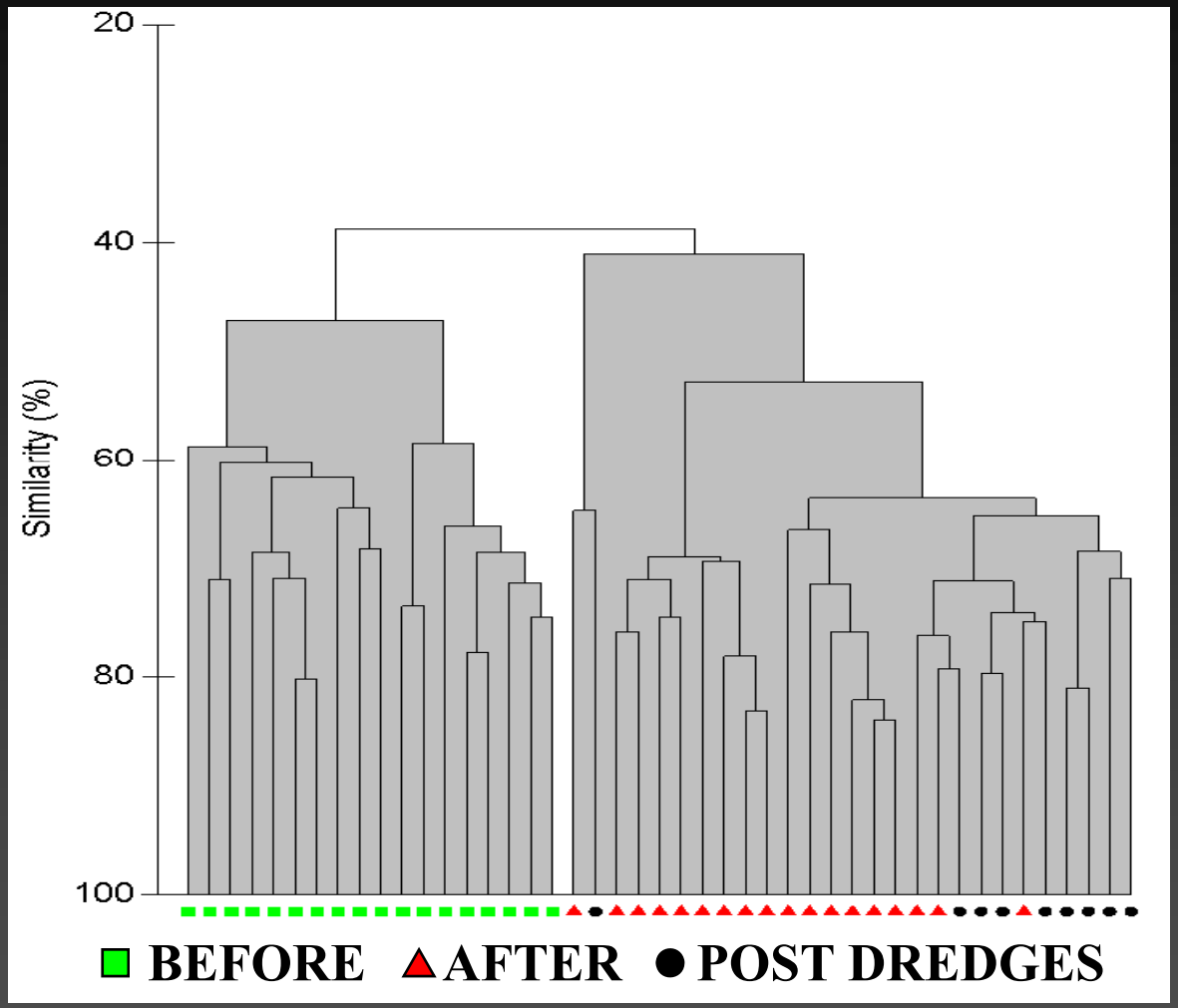
RESULTS and DISCUSSION

Dredge MDS – Spring 2000



p = 29.4% / R = 0.075

CLUSTER, ANOSIM and SIMPER Analysis – Before, After and Post Dredging



DREDGE OPERATIONS	ANOSIM		SIMPER (Bray-Curtis dissimilarity)
	p (%)	R	
GLOBAL	0.1	0.575	
BEFORE x AFTER	0.1	0.645	*Heteromastus similis* (P - 9.74%); *Sigambra grubei* (P - 7.40%); *Anachis isabellei* (G - 5.48%)
BEFORE x POST DREDGE	0.1	0.905	*Sigambra grubei* (P - 9.56%); *Heleobia australis* (G - 8.42%); *Heteromastus similis* (P - 8.20%)
AFTER x POST DREDGE	2.1	0.184	*Heleobia australis* (G - 10.88%); *Heteromastus similis* (P - 9.18%); *Anachis isabellei* (G - 7.86%)

RESULTS and DISCUSSION

Dredge effects

The multivariate analysis (both MDS and CLUSTER) indicated no dredge effects upon the macrozoobenthic association's structure

The differences found concerning the dredging periods (before, after and post dredges) were due to the presence or absence of the main specie *H. australis* and the marine species (*S. grubei* and *A. isabellei*)

RESULTS and DISCUSSION

The estuarine salinity seems to play an important rule about the density and diversity of the benthic community in the harbor of Rio Grande, stronger than that caused by the sediment disturbance and removal (the dredge operations main effect)

However, a continuous monitoring is necessary including a long period without dredges, in order to accurate the interpretations about the seasonal and natural behavior of the benthic community and their response to the dredges

ACKNOWLEDGEMENTS

FURG

LABORATÓRIO DE ECOLOGIA DE INVERTEBRADOS BENTÔNICOS

Porto do Rio Grande

SUPRG

BENTHIC INVERTEBRATE ECOLOGY Lab.

Thanks for your attention!

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