

A MULTIPROXY APPROACH OF THE LATE HOLOCENE EVOLUTION OF THE PARATI-MIRIM RIA, SOUTHERN COAST OF THE RIO DE JANEIRO STATE, BRAZIL

Sousa, S.H.M.¹; Nagai, R.H.¹; Yamashita, C.¹; Endo, C.A.K.¹; Salaroli, A.B.¹; Rodrigues, I.M.M.¹; Figueira, R.C.L.¹; Chiessi, C.M.²; Mahiques, M.M.¹

¹Instituto Oceanográfico, Universidade de São Paulo; ²Escola de Artes, Ciências e Humanidades, Universidade de São Paulo
Praça do Oceanográfico, 191, 05508-120, São Paulo, SP. e-mail: smsousa@usp.br

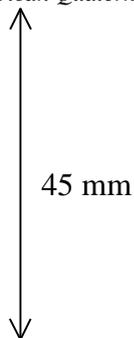
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1. INTRODUCTION

Coastal system analogs to the Rias Baixas from the NW Iberian Peninsula occur in the southern coast of the Rio de Janeiro state. These systems, denominated Mamanguá (23°17'S and 44°38'W) and Parati-Mirim (23°14'S and 44°40'W) Rias (Figure 1), exhibit elongated morphology, similar to a drowned channel that favors the continuous deposition of muddy sediments. These systems are different in length and width, the Parati-Mirim has 7 km of length and 1.4 km of width whereas the Mamanguá system has 11 and 2.6 km, respectively. Depths of up to 20 m have been observed in the Mamanguá Ria. These geomorphological features, as well as the coast line orientation in the area of study are tectonically controlled by two orthogonal faults oriented SW-NE and SE-NW. The analogy of these systems to the Iberian Rias Baixas is not restricted to the morphology, but also to environmental favorable conditions to gas accumulation found in both areas (Garcia-Garcia et al., 1999; Garcia-Gil, 2003). Due to their depositional characteristics (i.e., fine sediments undisturbed by post-depositional processes) these systems represent potential sites for high temporal resolution environmental reconstructions.

2. MATERIAL AND METHODS

In the Parati-Mirim Ria, a 128 cm core was collected (MAM07 - 23°14,639'S and 44°40,421'W) at 3 m water depth (Figure 1). The core was then subsampled in regular 2 cm intervals. Radiometric datings by AMS ¹⁴C were performed at Beta Analytic Inc. (USA). These analyses were carried on sediment samples distributed along the core at 50 cm intervals. Ages were calibrated using the Calib software, 6.0 version, available at <http://calib.qub.ac.uk/calib/> (last access: May/2011), with the standard marine correction



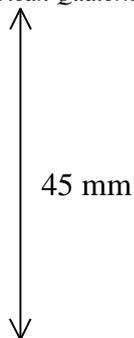
MARINE09 (Reimer et al., 2009), using the regional reservoir effect of $\Delta R = 82 \pm 46$ (Angulo et al., 2005).



Figure 1- General configuration of the Mamanguá (to the South) and Parati-Mirim (to the North) Rias and the location of core MAM07 (red circle).

Sedimentological (grain size), geochemical (calcium carbonate content - CaCO_3 , total organic carbon TOC, total nitrogen - N_{tot} , $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in the bulk organic matter) and micropaleontological (benthic foraminifera) data were obtained. Grain size analyses were performed in samples after carbonate removal using a Malvern Mastersizer 2000. Approximately 0.2 g of dry sediment from each sample was treated with 1 N HCl in order to remove calcium carbonate and was then analyzed. TOC and N_{tot} contents and the isotopic analyses were performed using the EA Costech elemental analyzer, coupled with a Finnigan IRMS Delta V Plus. Benthic foraminifera tests were picked and counted, providing density data (benthic foraminifera specimens in 10 cm^3 of sediment) throughout the core and identified with the support of specific literature.

3. RESULTS AND DISCUSSION



The radiometric data reveal a marine record that covers the last 2200 years (Figure 2). The lithologic description of MAM07 reveals muddy sediments from the base of the core up to 50 cm depth, showing massive structure. This unit is overlain by sediments with possible gas escape structures at approximately 50 cm of the sedimentary column. Grain size data show the prevalence of the silt fraction throughout the core. Conspicuous changes in the geochemical parameters and benthic foraminifera community are observed at approximately 1000 cal yr B.P.. Between 2200 and 1000 cal yr B.P., CaCO_3 contents range from 22,0% to 25,15%, which are relatively higher than in the last 1000 years (17,24% to 19,98%). TOC, N_{tot} contents and the isotopic ratios ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) present an overall increase trend from 2200 cal yr B.P. towards the Present. It is important to highlight the decreasing trend observed for the C/N ratio values during the last 1000 years, which goes from 12 to 8 (Figure 2).

Marked changes in the benthic foraminifera assemblages can also be observed at 1000 cal yr B.P.. Between 2200 cal yr B.P. and 1000 cal yr B.P., the benthic foraminifera assemblage is composed predominantly by species characteristic of coastal environments such as *Buliminella elegantissima*, *Bolivina pulchella*, *Elphidium* spp. and *Pseudononion* spp.. After 1000 cal yr B.P. there is a decrease of these species density and a dominance of an assemblage typical of shelf environments composed predominantly by *Discorbis* spp., *Fissurina* spp., *Globocassidulina* spp., *Islandiella norcrossi* and *Planulina* spp..

Isotopic ($\delta^{13}\text{C}$ e $\delta^{15}\text{N}$) values and the C/N ratio reveal a relatively higher continental organic matter input into the Parati-Mirim Ria between 2200 cal yr B.P. and 1000 cal yr B.P.. These data are corroborated by the occurrence of the species *Buliminella elegantissima* and *Pseudononion* spp. that are considered to be indicative of environments with high input of continental organic matter and strong salinity changes (Burone and Pires-Vanin, 2006). Towards the Present, the increase of the isotopic ratios and the decrease in the C/N ratio suggest a more efficient input of phytoplanktonic organic matter. This is also supported by the presence of species indicative of higher marine productivity and/or the occurrence of pulses of phytodetritus such as *Globocassidulina* spp. and *Islandiella norcrossi* (Nagai et al., 2009; Erbelein and Mackensen, 2006).

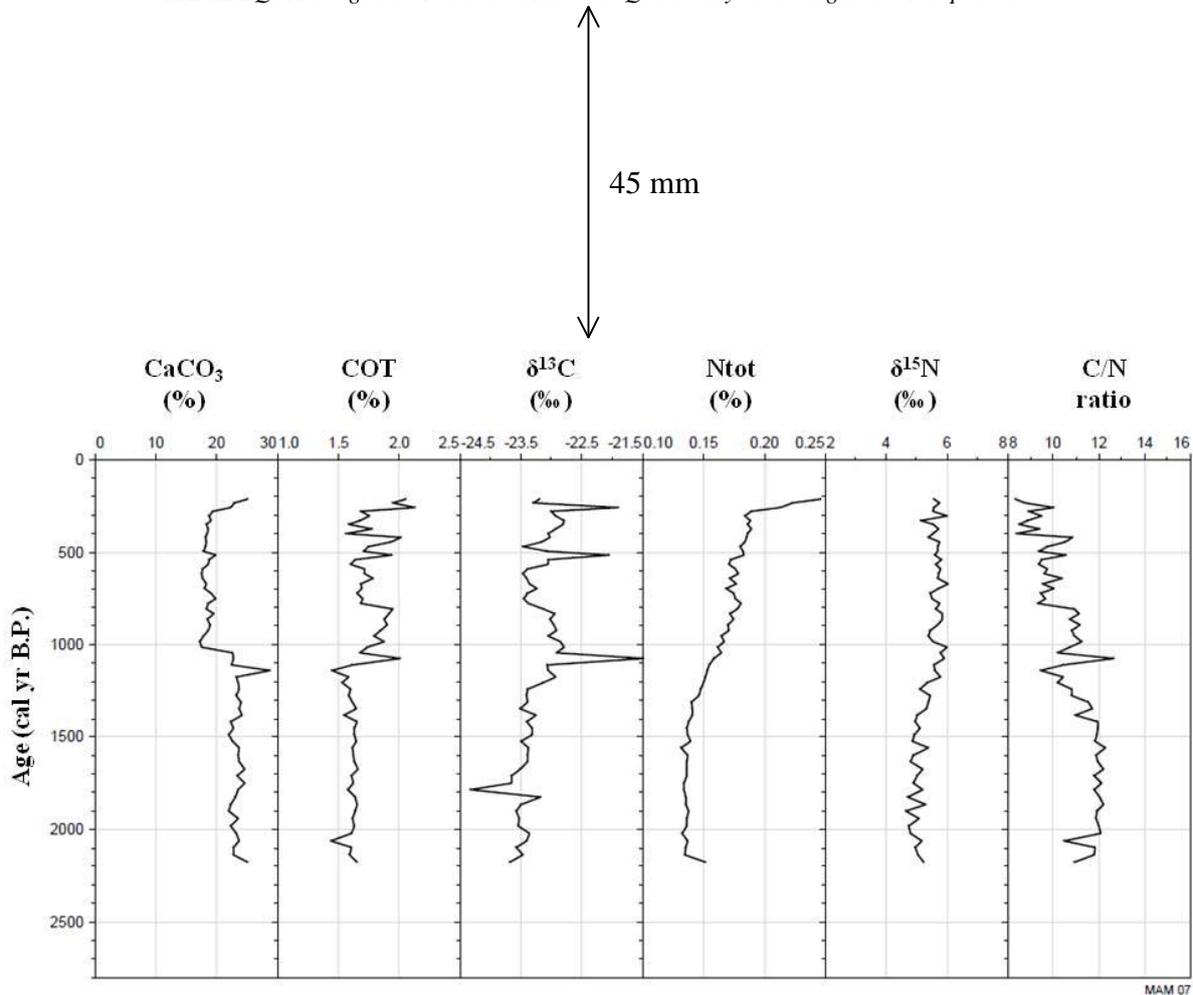
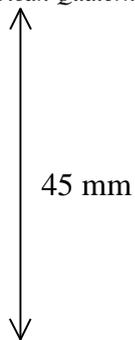


Figure 2 – Along core distribution of CaCO₃, TOC and N_{tot} contents, δ¹³C, δ¹⁵N and C/N ratio.

The relatively higher productivity phase recorded in the Parati-Mirim Ria during the last 1000 years may be related to: (i) changes in the adjacent shelf hydrodynamics; (ii) changes in the input of terrigenous sediments and nutrients; and (iii) combined changes in the adjacent shelf hydrodynamics and in the input of terrigenous sediments and nutrients. These alternatives will be critically discussed in our presentation in which our data will be compared to other regional paleoclimatic and paleoceanographic records.

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