METAL LEVELS AND FORAMINIFERA OCCURRENCE IN SEDIMENT CORES FROM GUANABARA BAY, RIO DE JANEIRO, BRAZIL

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Guanabara Bay is one of the most important centres of focus for environmental concern due to the constant aggression it has suffered. The bay receives inputs of untreated domestic and industrial wastes (including organic matter, oil, and heavy metals) from Rio de Janeiro, the second largest industrialized region of Brazil, which comprise around 10,000 plants (chemical, metallurgic), two harbours, shipyard, and oil terminals1. Granulometry, pH, and heavy metals are some abiotics factors that can cause decrease in the diversity and abundance of benthic foraminifera, which are small organisms living in sediments2. These microorganisms are used as bioindicators to evaluate natural changes or anthropogenic pollution. Four sediment cores were hand sampled in the Guanabara Bay during summer 2001, in areas with different anthropogenic influences. Sampling was carried out by using one meter long polyethylene tubes that were sliced in 2 cm layers. The elements As, Ba, Co, Cr, Fe, Sb, Sc and Zn were analyzed by instrumental neutron activation analysis. The sediment samples were irradiated at the IEA-R1 nuclear reactor at the Instituto de Pesquisas Energéticas e Nucleares. The measurements of the induced gamma-ray activity were carried out in a gamma ray spectrometer with an hyperpure Ge detector. All samples from the core were examined and faunal groups were identified and counted. Considering the comparison with element concentration levels in

shale3, the mean concentration in earth crust for sedimentary rocks, only As, Zn, and Cr can suggest contamination. Zinc presented higher values than the value accepted for shale in all cores analysed and mainly in the core C0, sampled at the northwest area, which includes the Duque de Caxias oil refinery zone. Chromium showed concentrations higher than in shale in the core C5, located in the central area, near Rio de Janeiro city, in the upper 20 cm and more than 10 times higher than shale in core C0, in depths from 30 to 48 cm. Arsenium exhibited higher levels than shale only in the first 8 cm of core C0. The elements Ba, Sb, Sc, Co, and Fe can be considered originated from the neighbouring lithologies. The total foraminifera specimens were very low in all cores. The foraminiferal assemblages had distinct diversity patterns related to the different regions of Guanabara bay. Foraminifera dominant species were Ammonia sp. and Triloculina sp, which are cited in the literature like opportunistic in coastal regions under stressed environment conditions caused by anthropogenic pollution2. In core C5, the concentrations of As, Cr, and Zn were higher in the top of the sediment core (0-15cm), indicating an anthropogenic contamination, originated probably from the industrial park of Rio de Janeiro city. In this sediment core, the dominant species was also Ammonia sp. In the northwestern area (C0), near to the oil refinery, the diversity was very low and dominant species abundance was higher (Ammonia tepida) in the first 5 cm of the core. High concentrations of Cr and Zn were obtained along the core and for As in the first 8 cm. For Cr, a tendency of increasing concentration with depth was observed. In this core, high metal concentrations and absence of benthic foraminifera were observed. Similar behaviour was observed by Vilela et al.4 in Guanabara bay. In core C1, sampled near the Niterói city, in the entrance of the bay, an area submitted to domestic and industrial sewages, the concentrations of Cr and Zn were lower than in cores C0

and C5, and were similar to literature values in this area4. On the other hand, the diversity of foraminifera species was higher and Triloculina sp. was dominant in this region. In core C3, a highly degraded mangrove area, the concentrations of Cr and Zn were relatively high, considering the low percentage of mud in the core samples (less than 43%), as far as elements are associated with the fine grained portion of the sediments5. In this core, few foraminifera were found, which indicates stressed environment conditions. Heavy metal pollution may be related to foraminifera absence and poor diversity but other factors such as organic matter and physical and chemical parameters must be considered in foraminifera assamblage in the study region.

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