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Foraminifera as health bioindicators in nearshore and offshore Brazilian coral reef sediments

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Coral reefs are among the most ecologically diverse ecosystems on Earth, where the occurrence of symbiotic relationships allows recycling and efficient use of limited nutrient resources. Current problems related to coral reefs include physical, chemical and biological damage caused by anthropogenic influences or natural impacts, in addition to temperature oscillations. The present work is part of PROBIO, a major program sponsored by the Brazilian Environmental Ministry. PROBIO has an objective of identifying along the Brazilian coastline possible bioindicators of climatic changes, and subsequently applying them as powerful tools for monitoring programs and coastal management. This paper is one of the results of the FOCO Project (sponsored by PROBIO), in which we present the application of the FORAM INDEX (FI) mapping impact fronts using GIS at a 1:25,000 scale. The FI is applied to four different Brazilian coral reef systems, APA Costa dos Corais (PE) and Porto Seguro (BA) coastal areas, as well as in offshore reefs from Fernando de Noronha (PE) and Abrolhos Bank (BA), in order to verify and compare health conditions. A total of 72 reef sediment samples were collected and 18 geochemical analyses conducted for each area in January 2005 and July 2005, to account for summer and winter seasonal variability. Samples were collected using scuba equipment, and parameters measured on-site included visibility, water temperature, salinity and dissolved oxygen, both at the surface and at depth, while sampled sediments were analyzed for carbonate, phosphorus, and organic matter, as well as

mineralogy and grain size. At the laboratory, foraminifera were identified under a stereomicroscope to the specific level. After that, foraminifera genera were separated into functional groups and submitted to the index, with values ranging from 2.0 to 9.07, as in the Abrolhos Bank reefs. The environmental protection area at APA Costa dos Corais had the worst FI values (2.26-6.70) in comparison to the other areas. This may be explained by tourism pressures, a fishery and loss of biodiversity, which contributes physically to damaging the coral colonies, and by the historical culture of sugar cane plantations that supply an excess of nutrients and organic matter to rivers which reach this site. The results suggest that foraminifera can be used not only as a low cost bioindicator to evaluate the health of Brazilian reefs but also as a powerful tool for coastal management.