

INTEGRATED APPROACH ON CORAL REEF HEALTH ASSESSMENT: THE CASE
STUDY OF SOUTHWESTERN ATLANTIC OFFSHORE ARCHIPELAGOS

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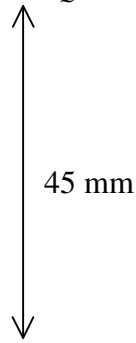
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Abstract. *Benthic conditions that support coral reef populations are evidenced by foraminifera, which contribute to the carbonate factory and can determine the ecological status of coral reef benthic ecosystems. Their functional groups have been used to calculate the FORAM Index (FI, Hallock and others, 2003) based on total counts (living and dead) that indicate whether an environment is suitable to support symbiont-bearing populations. Sediment was sampled from two archipelagos located 14 degrees of latitude apart offshore of NE Brazil. These archipelagos harbor important coral reef communities, including the Archipelago of Fernando de Noronha (FN) (30°51'S - 32°26'W) and the Abrolhos Archipelago (ABa) and Parcel (ABp) (17°58'S - 38°42'W). By using the taphonomy of Amphistegina spp., and living counts compared with foraminiferal-based FI in 2005, with short time series (2002-2009) of percent cover of corals allowed assessing the coral reef health. Results indicated that FI at AB was good (>4), but no living Amphistegina was found, possibly indicating no favorable conditions. This integrated approach in coral reefs of the Southwestern Atlantic helped to map risk areas. These findings indicate that palimpsest sediment can disguise FI so that, in some cases, the index fails to correlate with coral reef coverage. A more realistic approach can be obtained by using the living counts of Amphistegina and their taphonomy to augment the ecological results from the FI.*

Key-Words: FORAM Index, Amphistegina, coral cover, taphonomy, Southwestern Atlantic.



1. INTRODUCTION

The stress and regeneration capacity of coral reef populations to impacts caused by several agents, mainly those related to sea surface temperatures (SST) has been a concern of the scientific community in the face of climatic variations and changes that are likely to occur in the near future (Berkelmans and Willis, 1999; Pandolfi and others, 2003; Hendy and others, 2003; McClanahan and others, 2005; Thornhill and others, 2006; Bruno and Selig, 2007). The aim of this study is to test the applicability of taphonomy and counts of living specimens of *Amphistegina* spp., the FORAM Index (Hallock and others, 2003), and time series of coral cover to determine coral reef environmental health status on two offshore archipelagos of southwest Atlantic (Fig. 1).

2. RESULTS

2.1 Noronha

Living *Amphistegina*, their taphonomy, FORAM Index, on both seasons can be indicating threshold conditions of stress or sedimentation by strong currents.

Amphistegina was the dominant large benthic foraminifera (LBF) at all sites and therefore the best indicator in FN contributing from 10% to 35% of total foraminifers fauna.

The FI presented values above three for the majority of samples, what can be associated with good coral coverage with the exception of the deepest station of Transect 2 in summer and the shallowest of Transect 3 in winter. Coral and algal cover (mean of the years 2002-2008) presented high mean values of hard coral cover at stations in Transect 2, with 38% at Ze Ramos (2_6), 53% at Sancho (2_12), and 30% at Laje Dois Irmãos (2-20) No significant differences were found in mean coral cover between years for those sites (KW, $p=0.2204$; KW, $p=0.7114$; KW, $p=0.079$).

2.2 Abrolhos

A high proportion of broken, deformed and no living *Amphistegina* were found on both sampling periods everywhere in AB.

Low FI occurred during summer and winter at the same stations. The FI presented the highest values ($6 < FI < 9$) at the shallow stations around the ABa than near the ABp. At deep stations, the indices were low, indicating marginal to favorable conditions.

Mean hard coral cover (data from 2002 to 2009) for ABa and ABp included 13% for 1-6 and 17% for 3-6 and 2-6. At Parcel high values were found for Abrolhos 04 (27%), 3-20 (30%), Debora (33%) and Barracuda (36%). For ABa no variation in coral cover was found between years for 1_6, for which samples were available for all years, (KW, $p=0.4063$) but a significant increase between years was observed for the ABp Debora chapeirão site (KW, $p=0.0152$).

45 mm

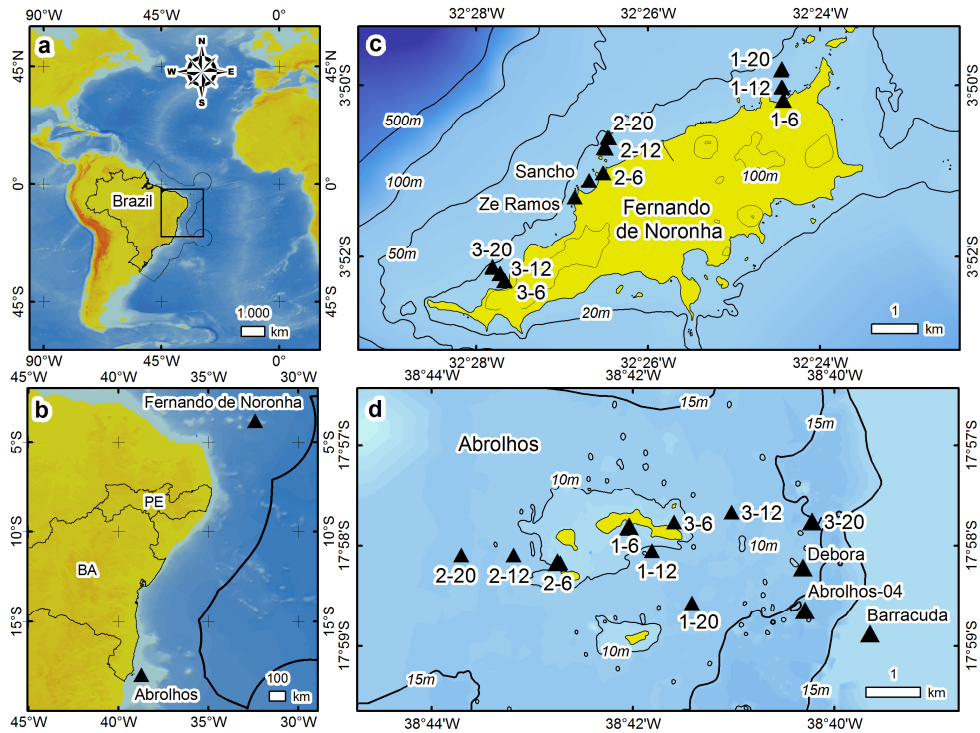


Figure 1: (a) Location map of the Atlantic Ocean black box is detailed in (b) which shows FN and AB locations and the states of Pernambuco (PE) and Bahia (BA). Sampling stations and depth for FN (c) and Abrolhos archipelago and parcel (d).

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