

Side scan sonar mapping of seafloor depressions in the Abrolhos shelf, Brazil

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Abstract

Seafloor depressions have been mapped during side scan sonar surveys along the Abrolhos shelf, eastern Brazilian coast. A total of 35 of these structures were mapped, showing circular or semicircular formats. They are found on depths from 26 to 64 meters, their diameter range from 17 to 55 meters, and their internal depth varies from 8 to 44 meters. Preliminary side scan and morphological results suggest that these features are pockmarks associated with hard carbonate beds.

Introduction

Seafloor circular depressions, locally denominated as "buracas" (holes), occur along the Abrolhos shelf and are known to be important marine habitats for a number of fish species and lobsters (*Panulirus argus* e *Panulirus echinattus*) (Figure 1). These habitats are not included in Marine Protected Areas (MPAs) and scientific understanding about these features is insufficient. Therefore, the buracas are a very interesting and important scientific target for multidisciplinary projects in order to improve our knowledge about their origin and dynamics.

Method

Side scan sonar surveys were undertaken along E-W transects, from the inner shelf to the shelf break. A Edgetech 4100 side scan system with a 272TD towfish were used, with a Skipper 417 echosounder and positions were acquired with a GPS. Side scan were operated in 100 kHz and the swath was 200 and 400m. Side scan data was processed with SonarWis Map4 software, georeferenced mosaics were produced and exported as *GeoTiff* images with a resolution of 1.0 m/pixel. Images were then interpreted using a GIS software (ArcGIS 9.2). In order to undertake a morphological analysis of the depressions, the buracas were treated in the GIS software as shapes with morphological attributes (dimensions, area, depth, etc).

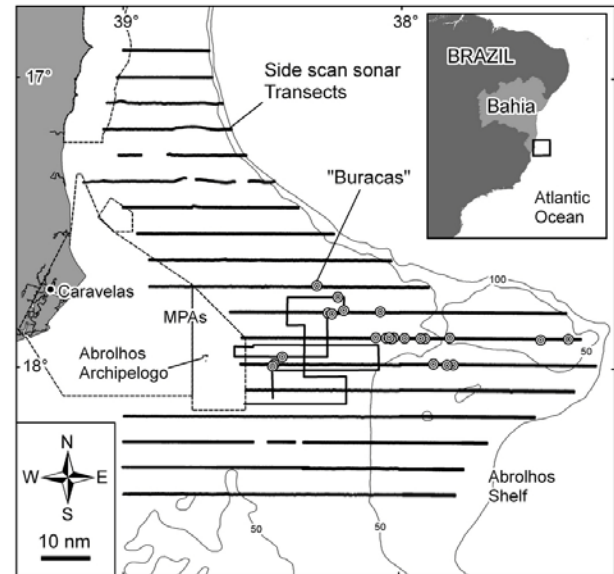


Figure 1: Location of side scan sonar transects and depressions ("buracas").

Results and Discussion

The buracas observed herein are concentrated in the North-eastern part of the Abrolhos shelf between depths of 26 and 64 m. The observed features are about 43-110 nm from the shoreline (Figure 1). A total of 35 structures were mapped. They are circular to semi-circular, isolated or grouped, as shown in the sonograms (Figure 2). Their diameter ranges from 17 to 55 m and their depth varies from 8 to 44 m (Figures 3 and 4). No correlation was observed between water depth and the diameter of the buracas (Figure 4). Morphological analysis shows that the buracas are very similar to pockmarks as described by Hovland and Judd (1988). These authors described pockmarks as craters in the seabed formed by fluid escape processes (gas and/or water) from soft sediments. The main difference from what has been observed in the Abrolhos shelf, is that the buracas occur in hard carbonate bottom. In order to elucidate the origin and formation of these very important and significant features, it will be necessary to carry out a seismic survey together with *in situ* observations (ROV, methane sensor-MET, etc.).

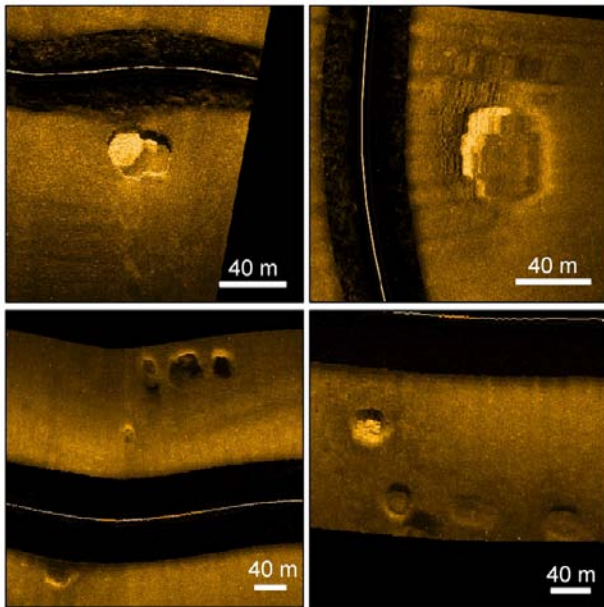


Figure 2: Sonograms showing the seafloor depressions (buracas)

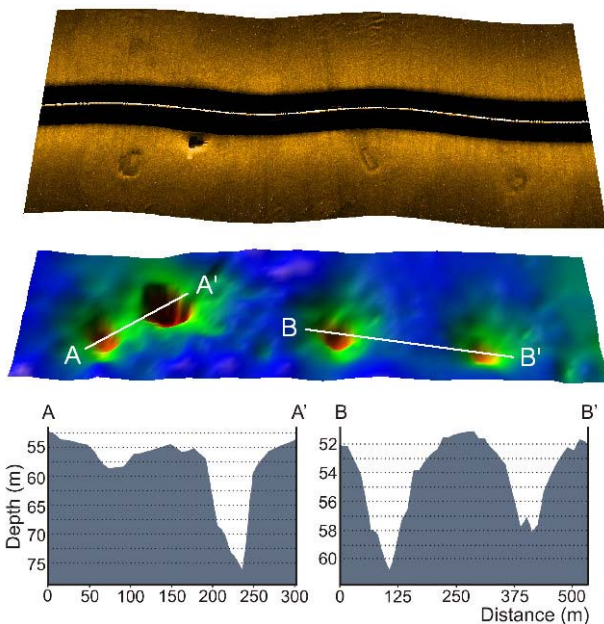


Figure 3: Example of sonogram, DEM and bathymetric profile over the depressions.

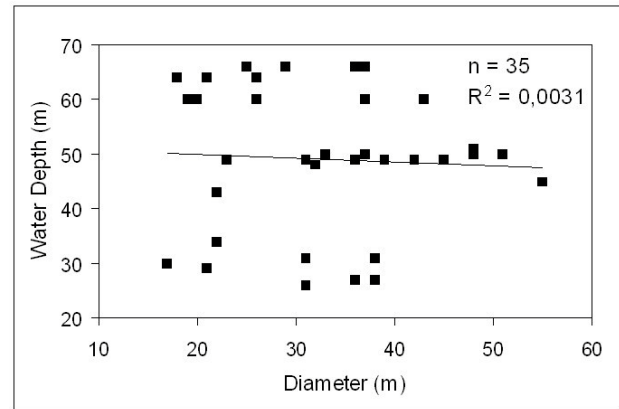


Figure 4: Correlation between water depth and Diameter of the buracas.

Conclusions

Circular seabed depressions were mapped along the northern Abrolhos shelf. These features resemble worldwide described pockmarks, but their occurrence is associated to hard carbonate beds. Further work has to be carried out in order to investigate their origin.

Acknowledgments

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References

Hovland, M. and A.G Judd, 1988, *Seabed Pockmarks and Seepages*. Graham and Trotman, London, 293 pp.