Mapping of coral reef habitats using WorldView-2 in Abrolhos, Brazil

María Laura Zoffoli[1], Milton Kampel[1], João Antônio Lorenzzetti[1]

[1]National Institute for Space Research, Av. dos Astronautas, 1758, São José dos Campos, Brazil
Corresponding author: lzoffoli@dsr.inpe.br

Objectives

The aim of this work was to perform an exploratory analysis to know the capabilities of WorldView-2 orbital sensor to coral reef habitat mapping, in a shallow reef in Abrolhos Bank, Brazil.

Approach

The Abrolhos Bank coral reef is the major biodiversity hot spot in the South Atlantic Ocean and hosts some endemic Cnidaria species (Figure1). This work was focused in Sebastiao Gomes reef. This is a shallow reef (0 - 20 m) and its shape is similar with a circle, which extension is about 3 km diameter. Geomorphology of Abrolhos Bank is simple: reef top (the bigger area in Sebastiao Gomes, who remains nearly expose in low tide), reef edge (with irregular shape) and reef wall (abrupt and quasi vertical).

Just a few of works in Abrolhos Bank have used remote sensing to benthonic substrate mapping. Here, we used a WorldView-2 image collected in Jan/25/2010. The WorldView-2 orbital sensor is a high spatial resolution (2 m) sensor, which has also a higher spectral resolution compared to other orbital sensors with similar spatial characteristics (8 multi-spectral bands). Despite its great potential for target discrimination coral reef mapping is still underexplored, as far as we are concerned. Digital numbers were converted to surface reflectance. Image segmentation was done followed by digital classification using an unsupervised ISOSEG algorithm (99% significance).

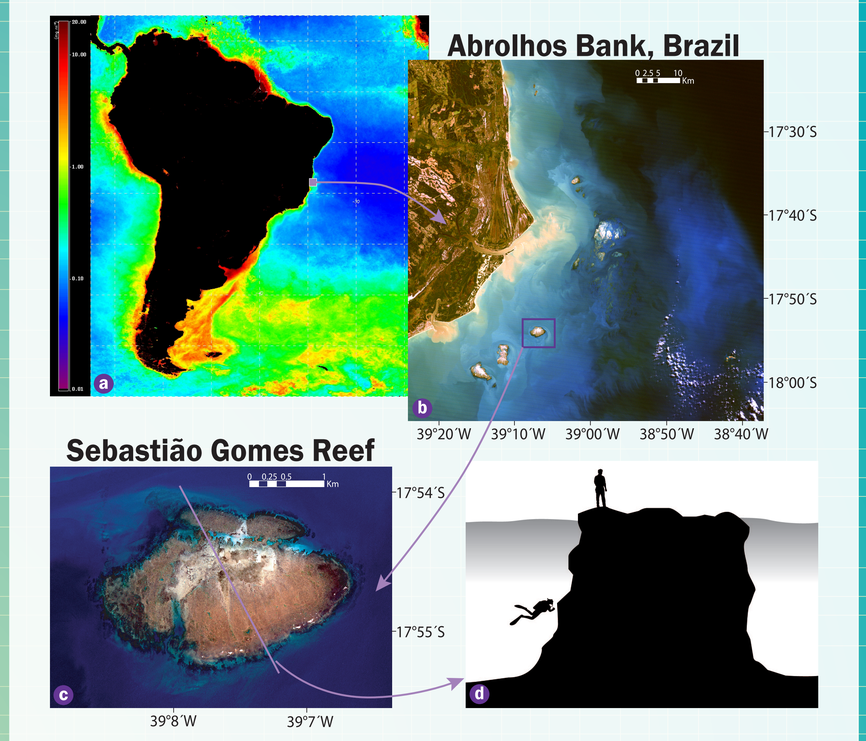
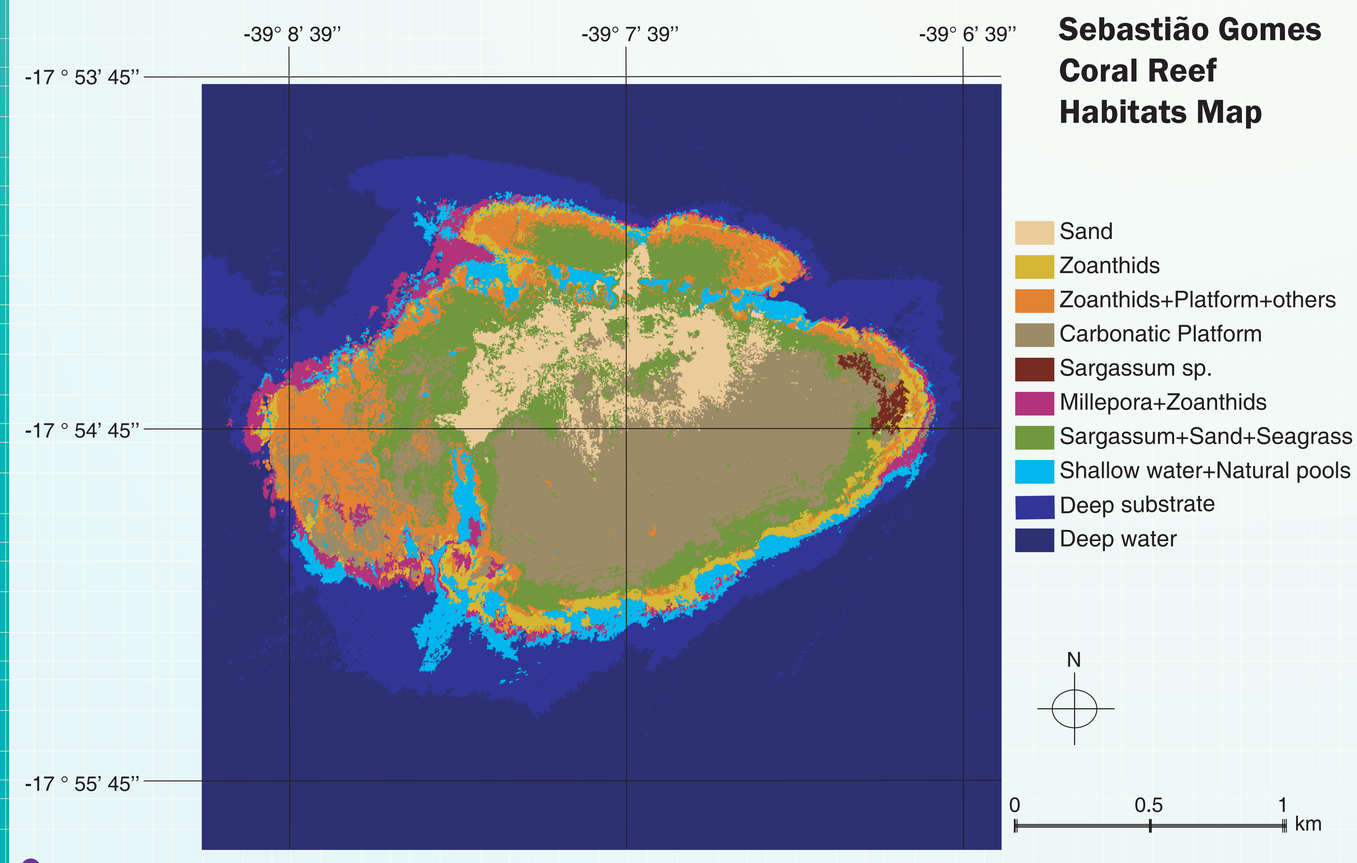


Figure 1: The Abrolhos Bank coral reef in a Landsat-5 image, quasi true color composition (321) (b) and its regional localization in South America (a). Sebastiao Gomes Reef in a WorldView-2 image, quase true color composition (532) (c) and cross-section of Sebastião Gomes reef (d).

Results

Spectral classes were assigned to 10 thematic classes: deep water, shallow water/natural pools, deep substrate, sand, carbonatic platform+exposed rocks, predominance of Zoanthids, Sargassum sp.+ sand+seagrass, predominance of Millepora+Zoanthids, Zoanthids+Carbonatic Platform+sponge+some corals and predominance of Sargassum sp. (Figure 2).



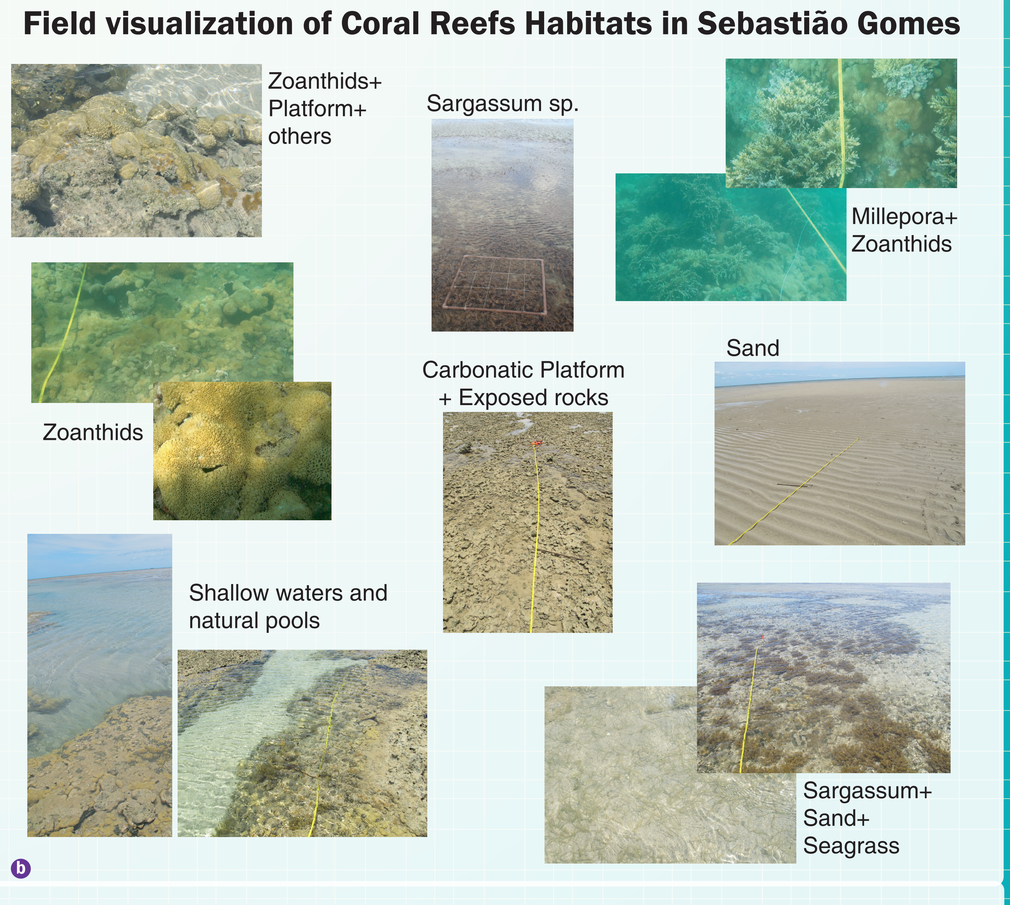


Figure 2: Coral Reefs habitats map of Sebastião Gomes, in the Abrolhos Bank, produced from WorldView-2 image (a) and visualization at field of its main classes identified (b)

Major Conclusions

Using a simple methodology, WorldView-2 produced a more detailed map than other previous maps in the area obtained from IKONOS and Landsat imagery, indicating a better performance with more information of the benthic habitat. Further work concern field validation of this preliminary classification.

Acknowledgments: The authors acknowledge to DigitalGlobe for providing the WorldView-2 image used here. This work was financial supported by Rede-Abrolhos and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)