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Benthopelagic megafauna assemblages of the Rio Grande Rise (SW Atlantic)

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ABSTRACT

The Rio Grande Rise (RGR) is a large and geomorphologically complex structure of the deep SW Atlantic Ocean. In 2013, the 600 − 1200 m deep plateau of the most prominent topographic component of the RGR (named Alpha) was explored during two dives of the manned submersible Shinkai 6500 (30°22′15″S − 36°02′02″W and 31°05′58″S − 34°02′40″W). Video profiles recorded during these dives were analyzed for description of benthopelagic megafauna (fish and crustaceans) assemblages, and quantitative assessment of structuring factors (depth, topography and habitat types). Fishes represented over 92% (462) of all benthopelagic megafauna, divided into 11 orders and 17 families. Over half of fish records were Macrouridae, Synaphobranchidae and Chaunacidae. Megafauna abundance varied at different spatial scales, being higher in shallower habitats (~600 m) dominated by branched suspension feeders (mostly sponges and cnidarians). Beta-diversity and community structure were related to habitat diversity. Because the RGR is vast and may comprise numerous distinctive habitats associated with depth, topography and water mass dynamics, fauna diversity may be high and patchy.

1. Introduction

Biodiversity patterns and ecological processes of seamounts, ridges and other topographic features of the deep ocean have been increasingly reported worldwide (Schlacher et al., 2010; Ramirez-Llodra et al., 2010) but some major geographic gaps exist. One of them is the SW and tropical Atlantic where only a few seamounts and ridges (e.g. around St. Peter's and St. Paul's islets and the Vitoria-Trindade seamount chain) have been studied (Lavrado and Ignacio, 2006; O'Hara et al., 2010; Pinheiro et al., 2015; Nunes et al., 2016). Elsewhere in the SW Atlantic the knowledge of the deep-sea fauna is generally poor (Clark et al., 2010a; Perez et al., 2012). Recently, however, perspectives of deep-sea mineral exploration have motivated studies on the biodiversity of a prominent geological structure known as the Rio Grande Rise (RGR) (Perez et al., 2012; Kitazato et al., 2017; Hajdu et al., 2017; Cardoso et al., 2017).

This massive structure extends for nearly 480,000 km^2, halfway between the South American continental margin and the Mid-Atlantic ridge, comprising three contiguous areas that elevate 1.5 − 3.5 km above the seafloor and a complex of surrounding seamounts. Its geological origin is associated with intense basalt flow produced by volcanism at the Mid-Atlantic ridge 89–78 million years ago (O'Connor and Duncan, 1990; Ussami et al., 2012). As the South Atlantic expanded, the basaltic plateau was separated and spread between South America and Africa, forming two "sister" topographic features, the Walvis Ridge and the Rio Grande Rise. Subsequent geological events shaped the RGR to its present geomorphology and substrate type configuration (Fig. 1), including: thermal subsidence, new volcanism in the Eocene Period (30–50 ma) that raised again the structures above sea level, erosion and shallow water sedimentation, and new subsidence to current depths (Ussami et al., 2012).

Throughout their geological formation, the RGR and Walvis Ridge have affected circulation patterns of the deep-water masses of the Atlantic, the North Atlantic Deep Water and the Antarctic Bottom Water (Morozov et al., 2010; Pérez-Días and Eagles, 2017), and may have had an important role in deep-sea faunal connectivity (Perez et al., 2012). Biological data on the RGR, however, has been historically scarce and limited to ichthyological reports produced during Russian fishing explorations in the 1960s through 1980s (reviewed by Clark et al., 2007 and Perez et al., 2012). These reports highlighted faunal similarities between the RGR and the Walvis Ridge, mostly associated with the dominance of subtropical-temperate species that occur circumglobally in the southern hemisphere (Parin et al., 1995). In recent years, however, the need to improve the understanding on biological and

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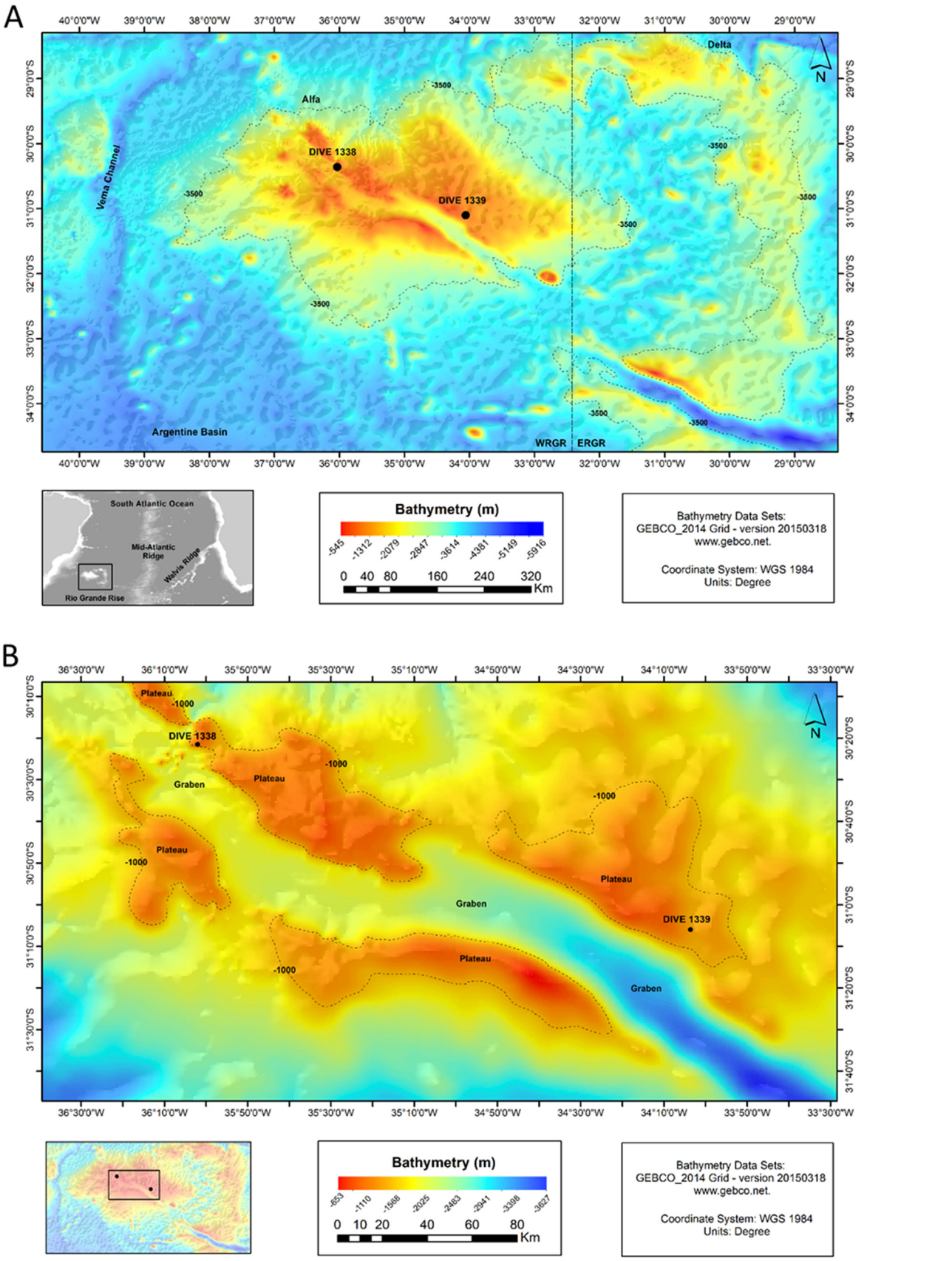

Fig. 1. Rio Grande Rise bathymetry map with location of two dives conducted by the submersible Shinkai 6500 in 2013 during the 'Iatá- Piúna' expedition (1338 and 1339). (A) General view of Alpha, (B) detail of Alpha's plateau. WRGR, Western Rio Grande Rise; ERGR, Eastern Rio Grande Rise.