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## Mid-lower bathyal benthic foraminifera of the Campos Basin, southeastern Brazilian margin: Biotores and controlling ecological factors

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The benthic foraminiferal assemblages recovered from forty-one surface sediment samples of the Campos Basin, southeastern Brazilian continental margin, were analyzed to interpret their distribution patterns and controlling ecological factors (environmental gradients). Living and dead specimens of benthic foraminifera were selected for identification and quantitative multivariate analyses from the >63 $\mu\text{m}$  size fractions. Q-mode cluster and canonical correspondence analyses show the clear dissimilarity between samples/faunal assemblages located on the middle (750–1050 m water depth) and lower slope (1350–1950 m water depth). R-mode cluster and canonical correspondence analyses reveal two major foraminiferal groups characterizing these environmental settings.

The first group, dominated by *Globocassidulina subglobosa*, is present in the shallower regions studied (middle bathyal), and is characterized by the influence of the Antarctic Intermediate Water, with total phosphate values varying between 1.27  $\mu\text{mol.kg}^{-1}$  and 2.29  $\mu\text{mol.kg}^{-1}$ . Sediments are sandy with highly variable organic carbon content (between 2.2  $\text{mg.g}^{-1}$  and 18.1  $\text{mg.g}^{-1}$ ). The dominance of different species of the genus *Bolivina*, *Cassidulina laevigata* and *Globocassidulina subglobosa* on the middle slope, and their association with *Cibicidoides kullenbergi*, *Epistominella exigua* and *Uvigerina proboscidea*, seems to indicate seasonally variable organic matter fluxes, with strong bottom currents and apparently oxic bottom waters.

The second group, dominated by *Bolivina* spp., occurs predominantly at the deeper stations sampled (lower bathyal), under the domain of the North

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Atlantic Deep Water. The sediments exhibit in general high mud and relatively high organic carbon contents. The total phosphate values measured in the water column vary between  $1.09 \mu\text{mol.kg}^{-1}$  and  $2.3 \mu\text{mol.kg}^{-1}$ . The faunal assemblage is preferentially composed of epifaunal or shallow infaunal deposit feeders (e.g., *Bolivina* spp., *Eponides weddellensis*, *Lenticulina cultrata*) and suspension feeders, adapted to the oligotrophic, epipelagic conditions and high dissolved-oxygen levels of the bottom waters (e.g., *Rhabdammina* spp., *Rhizammina* sp.). The assemblage seems to reflect a more stable ocean floor in the deeper region of the basin, probably due to decreased current velocities, reflected in a relative increase in the mud and organic carbon contents of the sediment, and the widespread oligotrophic oceanic conditions under the dominance of the North Atlantic Deep Water. The common occurrence of *Rhizammina* spp. could also suggest substrates with little reworking by deposit feeders in deeper areas of the basin.

Food supply, energy state (substrate stability) at the benthic/pelagic boundary and the grain size (sand/mud content ratio) of the substrate seem to be the most important environmental gradients controlling the distribution patterns of the benthic foraminiferal assemblages in the deep sea of the Campos Basin.