TITLE: DIVERSITY AND DISTRIBUTION OF PROKARYOTES IN THE MESOPELAGIC ZONE OF THE SANTOS BASIN - BRAZIL

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ABSTRACT:

The twilight zone extends between 200 m and 1000 m depth of the ocean water column and has been suggested to play a major role in the carbon cycle. Evidence shows that microbial activity significantly contributes to the vertical flux of organic matter. Therefore, understanding nutrient cycles in this environment is essential to assess the impact of the increasing atmospheric carbon dioxide levels in the carbon pump. The Santos Basin, located in the Southeast-South region of Brazil, is the largest offshore sedimentary basin in the country and has a major role in oil and natural gas production. As part of the Santos Project – Santos Basin Environmental Characterization, coordinated by the IO-USP in cooperation with PETROBRAS/CENPES, an energy company, we characterized the diversity of prokaryotes found at 250 m and 900 m of depth in the mesopelagic zone of Santos Basin, which are under the influence of the South Atlantic Central Water and Atlantic Intermediate Water, respectively. Water samples were collected during winter and spring of 2019 from 19 oceanographic stations across the basin. The regions V3 and V4 of 16S rRNA gene were sequenced using the Illumina platform and a total of 7709 different ASVs of bacteria and archaea were assigned to 56 phyla, 469 families, and 809 genera. Both depths shared 1312 (17%) of these ASVs, whereas 3023 were found only at 250 m and 3374 were unique at 900 m. All samples were dominated by members of chemosynthetic Nitrosopumilales (Nitrososphaeria), followed by heterotrophic Pelagibacterales (Alphaproteobacteria) and heterotrophic Alteromonadales (Gammaproteobacteria). Following these groups, the representatives of the order Flavobacterales were more abundant at 250 m while Pirellulales prevailed at 900 m. The analysis of alpha diversity showed higher species diversity at 250 m. Beta diversity analysis using the Bray-Curtis dissimilarity index showed marked community differences between depths, whilst the Weighted-UniFrac index presented a subtle division between these groups. Results indicate that, despite sharing a significant number of ASVs, most communities are adapted to the unique conditions of the different depths studied in the mesopelagic zone. The most abundant orders reported here are known by their substantial role in the global ocean carbon cycle and were previously observed in the mesopelagic zone of the northeast of the Brazilian ocean region, which is influenced by the same water masses we addressed.

Keywords: mesopelagic realm, bacterioplankton, biological pump, carbon cycle

Development Agency: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)