EXPLORING INSHORE/OFFSHORE PATTERNS OF VARIABILITY IN SOFT-SEDIMENT MACROFAUNAL ASSEMBLAGES IN THE OLIGOTROPHIC RED SEA

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Abstract
Information available for soft-sediments in the oligotrophic Red Sea is almost inexistent. To contribute to a better knowledge of the inshore/offshore patterns of macrobenthic diversity, biological and environmental samples were taken twice in the winter of 2014. Stations were established at increasing depths (~22° N) in two areas: i) inshore (lagoon; three stations); and ii) offshore (nearby coastal area; nine stations). Macroinvertebrate abundance and number of taxa decreased with depth, which was found to be one of the main drivers structuring the distribution patterns of benthic assemblages. Compared to other regions, assemblages were characterized by high biodiversity and low abundances, hence high equitability, which may result from the oligotrophic conditions and low levels of anthropogenic disturbance in the study area.

Keywords: Biodiversity, Sediments, Red Sea

The Red Sea is a semi-enclosed sea connected to the Mediterranean Sea through the Suez Canal. Like the Mediterranean, it is an oligotrophic environment but experiencing higher salinity (37-42) and temperature (21-32°C) (1). Despite these extreme conditions, high levels of biological diversity have been reported. This study provides new insight into the patterns of spatial variation in macrobenthic assemblages across an inshore/offshore gradient in the Red Sea. This study comprises two main areas: an inshore area (a coastal lagoon), and the nearby coastal area. Three stations were established in the lagoon, two in seagrass meadows (mainly *Enhalus acoroides*) and one in the channel (10m depth) that connects the lagoon to the coastal area. Nine stations were established towards the offshore from 25 to 90m. We identified 1161 organisms (133 taxa, 110 families and 10 phyla).

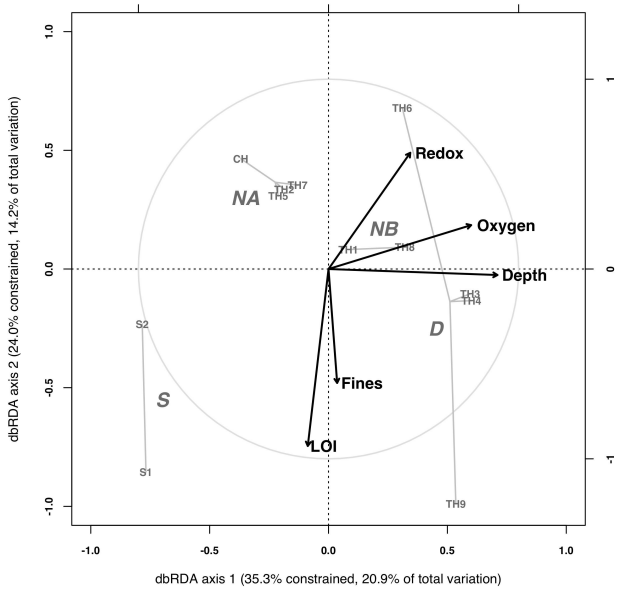

Fig. 1. Distance-based redundancy analysis (dbRDA) ordination plot based on a set of environmental variables and macroinvertebrate data the Red Sea (Thuwal, Saudi Arabia).

The distance-based redundancy analysis (dbRDA, Fig. 1) results showed that environmental gradients explained a significant part of the biological variability (59.3%). Depth was the main environmental driver, separating the stations into five assemblages: seagrass meadows (S), associated to high percentage of fines and organic matter content (LOI), two groups in the nearshore (NA and NB) and offshore deeper stations (D). Higher abundance and number of taxa were recorded in seagrass meadows and group NA, decreasing towards the deepest stations (D) (Fig. 2). It is worth noting that, as depth can be related to changes in the environment that may be reflected in the physical stress by the wind and waves (2 and references therein), one cannot assume it is the sole "causative" effect of the animal distributions.

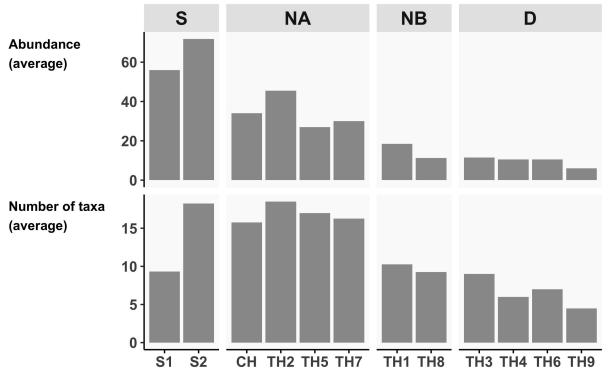

Fig. 2. Distribution patterns of abundance and number of taxa in the study area.

Several taxa, namely Lumbrineridae, Eunicidae, Cirratulidae, Capitellidae and Callianassidae are present at all sampled depths. Sipunculida were present in most stations but were more abundant in the seagrass meadows.
Some taxa were mainly associated with the nearshore areas, namely the polychaete families Amphinomidae, Magelonidae, the crustaceans Macrophthalmidae, and *Ampelisca* spp., as well as the sea urchins *Metalia persica* and *Paraster gibberulus*. The molluscs *Barbatia foliata*, Veneridae sp., and *Ancilla* sp. were associated to the seagrass meadows, which may be related to the trapping effect of the plants. In opposition to most studies from temperate regions, abundances were comparably low. Being one of the few studies undertaken in this sub-tropical sea, the present study makes a relevant contribution to the ecological and environmental drivers of the soft-sediment assemblages and provides baseline data that can be used in future monitoring. At the regional level, these baseline data will help assessing the ecological impacts resulting from the expansion of nearby urban areas that are expected to occur in the near future.

References
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