

Diversity, distribution, and morphological deformities among living Foraminifera in hypersaline Salwa Bay, Saudi Arabia

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The Arabian Gulf is considered a naturally stressed environment due to extremes of salinity and summer temperatures. Anthropogenic influences such as rapid urbanisation projects, maritime transport, and large numbers of desalination plants and oil-related activities compounds the problem. Foraminifera are known to be resilient under such stressful conditions. The purpose of our study is to document the foraminiferal diversity and abundance in the hypersaline Salwa Bay area, near the Saudi Arabian-Qatar Border. We expect the foraminiferal fauna in Salwa Bay to be adapted to extremes in salinity, and we wish to document any species that might be endemic or uniquely adapted to the area. Shannon-Wiener index, relative abundance, species richness, and the percentage of morphological deformities were determined for samples collected from the bay. Salwa Bay is the most saline extension of the Arabian Gulf with high salinity, water temperature and evaporation rate, which is attributed to slow flushing rates, coral reef barriers and higher residency time of the water. Environmental parameters measured at the time of collection were depth (10-110 cm), salinity (52.6–53.0) total dissolved solids (48.8-49.4 g/l), and temperature (27–27.6°C).

The foraminiferal assemblages in Salwa Bay are dominated by porcelaneous foraminifera, which include *Peneroplis pertusus*, *Peneroplis planatus*, *Coscinospira hemprichii* and *Coscinospira acicularis*. The most common species across the sampled transect is *Peneroplis pertusus*. Hyaline species were also found, but agglutinated foraminifera are absent. Diversity in Salwa Bay is lower compared with localities that have “normal” salinity, and many of the foraminifera display conspicuous morphological deformities. Approximately 55% of the assemblage exhibits mild to severe deformities such as fusion of two adults or double tests, protuberance on the spiral side, abnormal arrangement of the chambers, abnormal shape of the proloculus and modification of the coiling plane in several chambers. We speculate that the combination of high summer temperatures and salinities may be the main cause of the deformities and comparatively low diversity.