Geophysical Research Abstracts
Vol. 18, EGU2016-322-1, 2016
EGU General Assembly 2016

Selective responses of benthic foraminifera to thermal pollution

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Predictions of future climate and recent observations point towards a trend of rising temperatures in the Middle East region. The temperature rise propagates into the marine environment, with shallow, coastal ecosystems being most affected. An ideal model system to study the effect of increased temperatures in coastal ecosystems is presented by benthic foraminifera. The persistent of thermohaline pollution at a site along the northern coast of Israel, attributed to a power and desalination plant, is used as a natural laboratory to evaluate the effects of rising temperature and salinity on benthic foraminifera living in shallow hard bottom habitats.
Biomonitoring of the disturbed area and a control station shows that elevated temperature is a more significant stressor than salinity. The deleterious effect of extreme temperatures is indicated by a decrease in numerical abundances and reduced species richness, eventually leading to substantial changes in community composition. Critical temperature thresholds were observed at 30˚C and 35˚C, the latter observed by the most thermally tolerant species *Pararotalia calcariformata*, the only symbiont bearing species observed within the heated area.
Common species of the shallow hard bottom habitats are almost absent from the most extreme site indicating that they presently live very close to their upper temperature threshold, and that excess warming will likely impede their future survival in the Eastern Mediterranean. Several of these species are either proven or suspected to be tropical Lessepsian. Thus, considering present models of expected north-western future expansion of Lessepsian species in the Mediterranean, our study show that it is important to consider excess warming as a major stressor that will limit their distribution.