

Response of benthic foraminifera to phytodetritus in the eastern Arabian Sea under low oxygen conditions

Annekatrien Enge (1), Julia Wukovits (1), Wolfgang Wanek (2), Margarete Watzka (2), Ursula Witte (3), William Hunter (4), and Petra Heinz (1)

(1) Department of Palaeontology, University of Vienna, Vienna, Austria (annekatrien.enge@univie.ac.at), (2) Department of Microbiology and Ecosystem Research, University of Vienna, Vienna, Austria, (3) School of Biological Sciences, Queen's University Belfast, Belfast, United Kingdom, (4) Oceanlab, University of Aberdeen, Newburgh, Aberdeenshire, United Kingdom

At water depths between 100 and 1500 m a permanent Oxygen Minimum Zone (OMZ) impinges on the sea floor in the eastern Arabian Sea, exposing benthic organisms to anoxic to suboxic conditions. The flux of organic matter to the sea floor is relatively high at these depths but displays seasonal variation. Deposition of relatively fresh phytodetrital material (phytoplankton remains) can occur within a short period of time after monsoon periods. Several organism groups including foraminifera are involved to different extent in the processing of phytodetritus in the OMZs of the northern Arabian Sea. A series of in situ feeding experiments were performed to study the short-term processing (< 11 days) of organic carbon, nitrogen and nutritional demands of foraminifera at different oxygen concentrations on the continental margin in the eastern Arabian Sea. For the experiments, a single pulse of isotopically labeled phytodetritus was added to the sediment along a depth transect (540-1100 m) on the Indian Margin, covering the OMZ core and the lower OMZ boundary region.

Uptake of phytodetritus within 4 days shows the relevance of phytodetritus as food source for foraminifera. Lower content of phytodetrital carbon recorded in foraminifera from more oxygenated depths shows greater food uptake by foraminifera in the OMZ core than in the OMZ boundary region. The foraminiferal assemblage living under almost anoxic conditions in the OMZ core is dominated by species typically found in eutroph environments (such as Uvigerinids) that are adapted to high flux of organic matter. The elevated carbon uptake can also result from missing food competition by macrofauna or from greater energy demand in foraminifera to sustain metabolic processes under hypoxic stress. Variable levels and ratios of phytodetrital carbon and nitrogen indicate specific nutritional demands and storage of food-derived nitrogen in some foraminifera species under near anoxia where the mean phytodetrital nitrogen content in foraminifera was elevated. In summary, foraminifera dominate the short-term processing of phytodetritus by fauna in the OMZ core but are less important in the lower OMZ boundary region of the Indian margin as a result of biological interactions and changes in the distribution of individual foraminiferal species.