



The response of living benthic foraminifera to environmental geochemistry in the Kiel Bight, south Baltic Sea: preliminary results

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The study of benthic foraminifera distribution and environmental conditions carried out in the two fairly closed and shallow (from 2 to 28 meters deep) bays of the Kiel Bight. The Kiel Fjord is quite anthropogenic loaded for the last 50th years by town infrastructure, shipyards, military and sport harbours and high traffic through the Kiel Canal that leads to trace metals and oil pollution. The Flensburg Fjord is a resort area with only yacht traffic and small towns on shore. We monitored living benthic foraminiferal assemblages in the bays between December 2005 and June 2006. For this purpose, 90 sediment samples (uppermost first cm) were taken in the Kiel Fjord and 32 in the Flensburg Fjord. Together with the sampling of foraminifera environmental data on salinity, temperature and oxygen content of the near-bottom waters were obtained. In sediments Corg, SiO₂ and chlorophyll *a* as well as trace metals (Cu, Zn, Pb, Sn) content were measured.

Though high organic carbon content in sediments of both fjords favorable oxygen conditions were revealed. C/N ratio showed high input of organic matter from the land. Positive correlation between SiO₂, Corg and chlorophyll *a* and abundance of benthic foraminifera was revealed. Analysis of sand/mud content in sediments, salinity and oxygen together with foraminifera abundance did not give any results. Cu, Zn, Pb and Sn were mostly bound with organic matter and accumulate in inner part of the both Fjords. Though generally the highest concentrations of trace metals characterized the Kiel Fjord, in the innermost part of the Flensburg Fjord the extremely high concen-

trations of lead and zinc were revealed. Compared to the data of 1970th trace metals contents grew half as much again.

In the Kiel Fjord the highest abundance of foraminifera fauna was typical for the central fjord with its decrease toward the outer part; the maximum species value was 7 with average 4-5. Compared to previous data from 1950s and 1960s the significant changes in assemblage composition and abundance were registered. *Elphidium excavatum*, *Ammotium cassis*, and *E. incertum* dominated the living fauna in the 1960ies and 1970ies. Our study revealed a predominance of *E. excavatum* subspecies. Arenaceous species disappeared in samples from the Kiel Fjord taken in 2005 though they were common before 1990ies here. *Ammonia beccarii* frequent in 2005 was rare in the Kiel Fjord during the 1940ies to 1990ies. The average abundance in the inner Kiel Fjord was up to 10 times higher in 2005/2006 than in the 1960ies to 1990ies. Also malformations of foraminiferal tests (mostly *Ammonia beccarii* and *Elphidium* sp.) were observed up to 13% in inner Kiel Fjord and up to 7% in samples, taken near fish farm and destroyed oil pier, possibly due to a high level of trace metals or organic enrichment. Trace metals content slightly negatively correlated with foraminifera abundance and positively – with the abnormal tests amount.

In the Flensburg Fjord only a third of samples was analyzed: in principal foraminifera abundance increased to the outer marine part of the Fjord and was a little higher than in the Kiel Fjord. In living fauna *Elphidium excavatum* subspecies and *Elphidium incertum* were prevailed, but on some stations *Elphidium incertum* and *Elphidium asklundi* dominated. In the sediments taken in outer part of the fjord the arenaceous species were found. Also malformations of foraminiferal tests (mostly *Elphidium incertum* and *Ammonia beccarii*) were observed up to 14% in the inner Flensburg Fjord and up to 8% in samples, taken in the south-eastern Fjord. Here the concentrations of pesticide decay products and organic compounds with tin were still high due to intensive agriculture in 1970ies.

The difference in the species composition of the two fjords can be explained by various depth and salinity conditions as well as different anthropogenic load. Though the highest values of malformed tests are definitely corresponded to the most polluted by trace metals stations it can be also result of organic enrichment or changes in salinity due to saltwater inflows from the Kattegat. Thus the distribution of foraminifera in the Kiel and Flensburg Fjords is controlled by both natural and anthropogenic factors; none of them does not seem to be leading. We are still working at sampled material that probably helps to see the new relationships between foraminiferal assemblages and environmental parameters. The work was done mainly in IFM-Geomar, Kiel, Germany supported by DAAD scholarships for young researchers.