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Spatial and temporal variability of the benthic foraminifera assemblage in a low salinity-marginal marine environment (Stavns Fjord, Denmark): a database for sea-level reconstruction

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Modern analogue faunal distribution is increasingly being used in fossil foraminiferal studies to provide quantitative estimates of ancient environmental conditions, requiring an accurate assessment of modern taphonomic assemblages. We analysed living (Rose Bengal stained) and dead benthic foraminiferal assemblages, including soft-walled monothalamous taxa, at six sites in Stavns Fjord in three different months (November 2011, May 2012 and June 2012). Five environmental variables were recorded: salinity, pH, loss on ignition, grain size and vegetation cover. The aim of this work was to create a foraminiferal database for sea-level reconstruction in the Kattegat area.

Stavns Fjord is a semi-enclosed shallow-water lagoon, located in the southern Kattegat (Denmark). The environment is microtidal and water levels on average vary between +0.16 and -0.15 m DVR 90. Stavns Fjord has a diverse living foraminiferal assemblage with 39 species identified, of which 32 are soft-walled species. The soft-wall foraminifera constitute more than $>$60% of the total assemblage except in the most landward station where their abundance varied between 0-18%. Most of the species counted in these samples are previously unreported from the Kattegat area; all are undescribed at the species level and in most cases also at the generic level. The dead foraminiferal assemblage yielded very low diversity assemblage with 6 agglutinated species (dominated by *J. macrescens* and *Trochammina inflata*) and one calcareous species (*Elphidium williamsoni*).

The marsh vegetational zonation in the area is compressed due to the small tidal range, but the living agglutinated and calcareous species still show a general distributional trend with *Jadammina macrescens* dominating landward and the calcareous species (*Elphidium williamsoni* and *Ammonia beccarii*) dominating in the seaward side. In the dead assemblage, the most landward station is still dominated by *J. macrescens* (abundance $>$ 508 individual/10 cm^2), whereas the other sites are barren or with less than 30 individual/10 cm^2. The landward edge of the transect shows the lowest interannual variability, varying from 128 to 152 individual/10 cm^2, where as higher interannual variability is recorded in the tidal mud stations further out in the lagoon.

Major taphonomic changes occurred during the transition from living to dead assemblage in the seaward station: all the soft-wall taxa disappear, and calcareous species, as well as many agglutinated species are affected by intensive *in situ* dissolution. Nevertheless the taphonomical assemblages still give a fairly reliable record of the ecology of the environments.

This study demonstrates that it is important to compare data on living and dead assemblages in order to evaluate the amount of information loss through taphonomic change, before quantifying paleoenvironmental variations.