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Bioccumulation of contaminants in pelagic organisms, caged blue mussels and cod

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This short paper will present some preliminary results from the chemistry program of the BECPELAG Workshop. During seven research cruises in 2001 carried out as part of the workshop, pelagic organisms were collected for analyses of contaminants at four sites in the German Bight and at four sites in a downstream transect from an oil platform (Statfjord B) in the northern North Sea: zooplankton, fish larvae, mackerel (*Scomber scombus*), saithe (*Pollachius virens*) and herring (*Clupea harengus*). Blue mussels (*Mytilus edulis*) and cod (*Gadus morhua*) were caged in moorings placed at the same locations to monitor bioaccumulation and effects of contaminants.

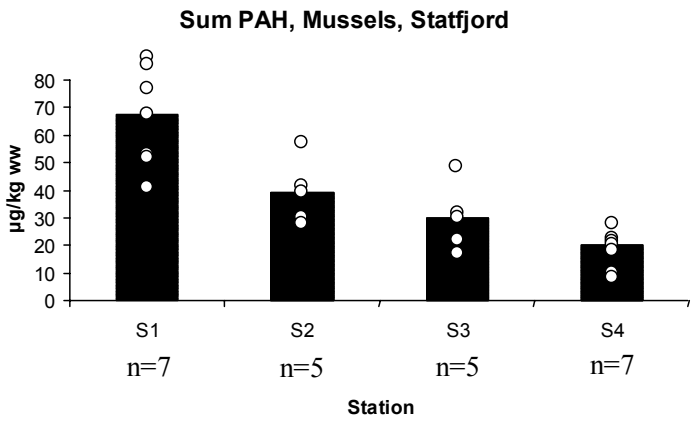
The organisms were analysed for metals (Cd, Cu, Hg, Ni, Pb, Zn) using ICP-MS. Polycyclic aromatic hydrocarbons (PAHs; 24 compounds) were analysed by GC/MS (EI). Organotin compounds (MBT, DBT, TBT, MPhT, DPhT, TPhT) were analysed by gas chromatography and atom emission detection. Polychlorinated biphenyls (PCBs, 9 congeners) were analysed by GC-ECD. Alkylphenols and brominated flame-retardants were analysed by GC/MS (negative chemical ionisation).

Some findings from the investigation will be presented and discussed with regard to the proximity of oil platforms and distance from the coast in the German Bight. Focus will be on results indicating contaminant gradients. Caged mussels in the Statfjord area showed an accumulation of PAHs, and the highest concentrations were found at the innermost station (500 m distance from Statfjord B) with an accumulation factor of approximately 3 compared to mussels at the reference site (Fig. 1a). The concentrations of PAHs in mussels decreased along the transect from the 500 m station from the platform to the stations at 2000 m and 10000m distance from Statfjord B. PAHs in zooplankton were detected at highest concentrations at the sampling site closest to the platform, indicating local inputs of contaminants in this area.

Mussels from the German Bight transect also showed a downward gradient of PAHs from the innermost station to the stations more distant from the coast (Fig. 1b). A similar picture was evident for PCBs in mussels from the German Bight (Fig. 2). PCBs were not analysed in mussels from the Statfjord area. Analyses of liver from caged cod in the German Bight and the Statfjord locations did not show any clear trend in concentrations of PCBs.

The highest concentrations of organic tin compounds were found in liver of mackerel sampled most close to the coast in the German Bight, with a downward gradient in mackerel sampled more distant from the coast. The trend is illustrated for tributyl tin (TBT) in Fig. 3. Levels of Hg were also highest in mackerel sampled at the innermost station in the German Bight. Concentrations of Ni in zooplankton were also elevated at the innermost station in the German Bight compared to offshore stations, indicating a contaminant gradient from the coast.

a.



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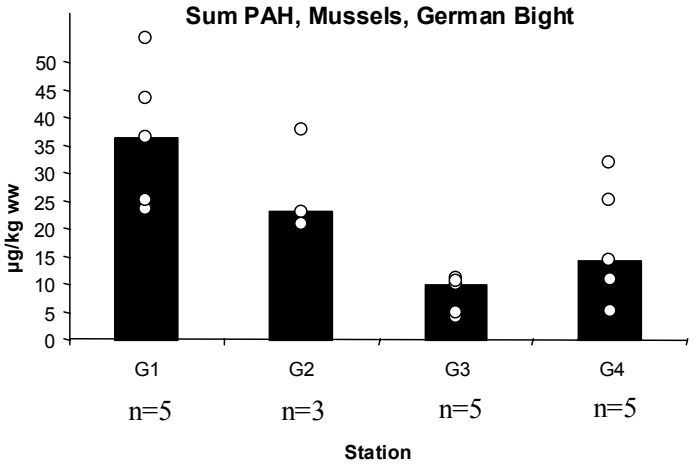

Figure 1. Median concentrations of Sum PAH (24 components) in caged mussels from the Statfjord area (a) and the German Bight (b). Individual observations are superimposed.

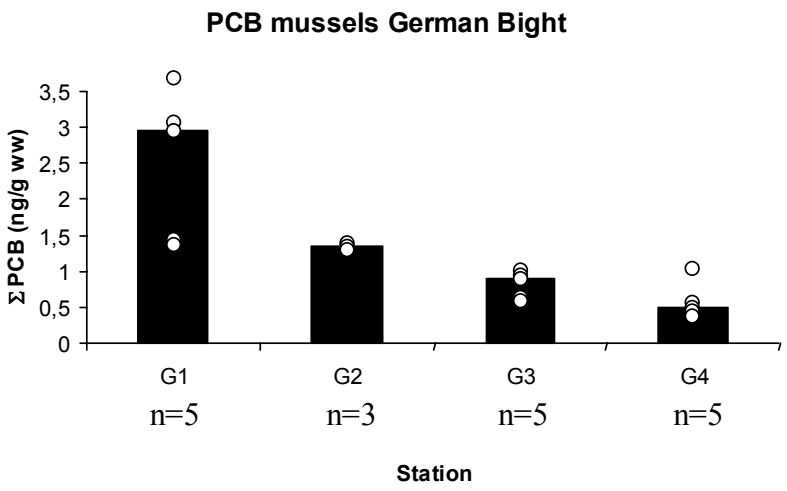

Figure 2. Median concentrations of Sum PCBs in caged mussels from the German Bight. Individual observations are superimposed.

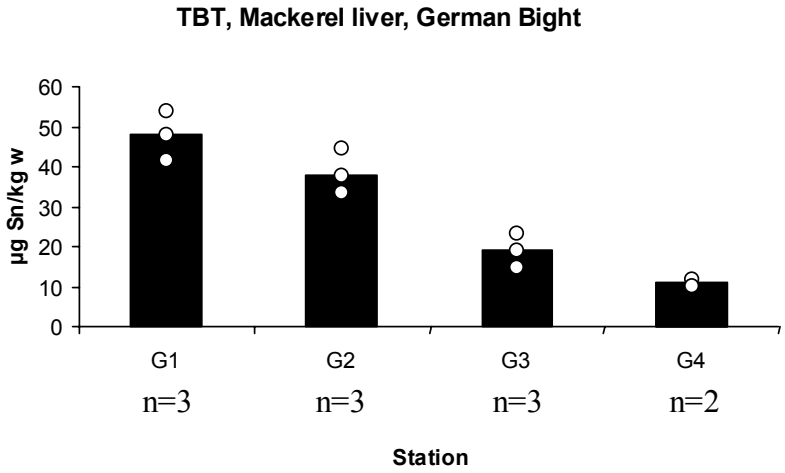

Figure 3. Median concentrations of TBT in mackerel (liver) from the German Bight. Individual observations are superimposed.

Keywords: bioaccumulation, contaminants, pelagic ecosystem, caging

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