

Estuarine sediments after cod spawning

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Introduction: The Institute of Marine Research (IMR) in Norway has since the late 80's spawned cod in a closed estuarine, Paris estuarine, for a research project. The facilities were closed in 2015 and NGI was hired in 2016 to evaluate the sediment quality in the estuarine.

What makes this project special is the high level of control with sources of pollutants. The sources can be divided into three groups:

- Running the facilities
- Production in the facilities
- External sources

Examples of sources that are active when running the facilities are; a small boat with an outboard engine (PAH, TBT, Cu), zink anodes at the installations (Zn), and chemical treating of the nets to prevent fouling (TBT, Cu)

During production at the facilities, sources of pollutants can be fertilization (nutrients), fishmeal (Zn), and rotenone to remove predators (rotenone).

The estuary is only connected to the surrounding waterbody through a narrow canal in the south. This means that external sources of pollutants to the estuarine must either be from just outside the canal, airborne or from land next to the estuary.

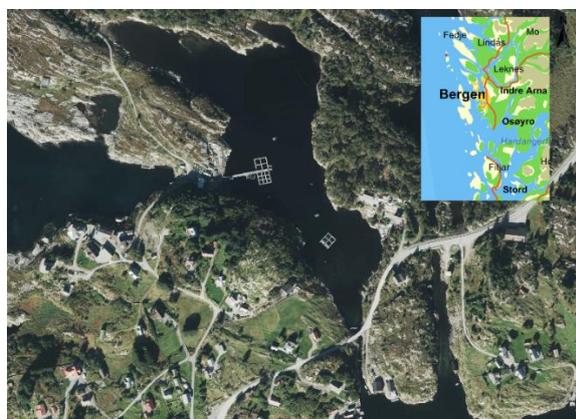


Fig. 1: The Paris estuarine.

Methods: The IMR did sediments sampling in March and June in 2015, and NGI did additional sampling in October 2016. The samples were

analyzed for As, Pb, Cd, Cr, Cu, Hg, Ni, Zn, PAH-16, PCB-7, TBT, TOC, rotenone, water content and grainsize.

Results: The sediment analyses showed elevated levels of Zn, TBT and some individual PAHs. In addition, very high levels of TOC and water content were also measured.

Discussion: The high level of TOC and water content can be explained with the high production of algae. The dead algae has deposited on the seafloor.

Elevated levels of Zn are most likely a result of the usage of fishmeal, which can contain up to 200 mg/kg Zn. The average concentration in the sediments was 166 mg/kg in October 2016. In addition to Zn from fishmeal, there has been mounted zink anodes on some of the installations.

Several boats are kept right outside the canal that connects the estuary to the surrounding water masses. In October 2016 one sediment sample was taken in this area. This sample showed very high TBT concentrations, 1700 µg/kg TBT. The average TBT concentration in the estuary sediments is 35 µg/kg. Therefore, it is highly likely that the sediments outside the canal are the source of TBT in the estuary.

The high level of some individual PAHs are then the only matter left to explain. The only known source for PAH in the estuary is the small boat with a small outboard engine. The estuary is located in a sparsely populated area, with no obvious source of PAHs.

During this field work, an area just next to the shoreline in the estuary was observed where waste had been burned. Employees at the research facility had reported strong smelling fires at the same spot.

If the PAH are pyrogenic they would most likely be bound more strongly to the particles and would not be as available for the ecosystem. To decide if this is the case we performed pore water analysis on a sediment sample from the estuary. Results will be available in February.