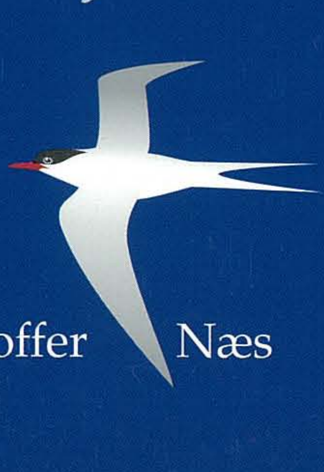
The Distribution and effects on Norwegian fjord and coastal ecosystems of polycyclic aromatic hydrocarbons (PAHs) generated by the production of primary aluminium and manganese alloys



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Abstract

Discharges of polycyclic aromatic hydrocarbons (PAHs) generated by the production of primary aluminium and manganese alloys have been a serious environmental problem in Norwegian fjords and coastal waters. Scientists have been performing environmental assessments in the receiving waters from these production plants for more than twenty-five years, detecting high PAH concentrations in sediments and biota. Most of the assessments have been limited to individual recipient bodies of water. No previous projects have evaluated the results from a holistic point of view, that is, as an integrated analysis within the same ecosystem compartment (for example, inter-fjord sediment to sediment comparison) or between different compartments (e.g. sediments to organisms within and between fjords). Over the past decade, changes in production processes, the installation of scrubbers etc. have drawn attention to the need for a broad-based evaluation of the ecological fate and effects of present and past PAH discharges.

Accordingly, the main objective of this study has been to provide a comprehensive environmental risk assessment of discharges to marine waters of PAHs generated by the production of primary aluminium and manganese alloys. This has been accomplished by studying PAHs in dissolved, colloidal and particulate states in waste and recipient waters, the accumulation of PAHs in bottom sediments and littoral indicator organisms, and the effects of PAHs on benthic fauna at the community and cellular levels. Most of the data have been collected in the course of 25 years of monitoring, although new data have been collected to fill in knowledge gaps. To a large extent, numerical treatment has employed multivariate techniques such as principal component analysis, redundancy analysis and canonical correspondence analysis.

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