DISTRIBUTION AND ACCUMULATION
OF TOTAL ORGANIC CHLORINE AND
CHLOROPHENOL COMPOUNDS IN THE
SEDIMENTS OF LAKE ETELÄ-SAIMAA,
FINLAND

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INTRODUCTION
Lake Etelä-Saimaa receives the waste water load of the woodprocessing industry in Lappeenranta, Joutseno and Imatra. The total organic chlorine (TOCl) and chlorophenol load from the pulp bleaching of the pulp mills in Lappeenranta and Joutseno was estimated to be 2290 kg/d and 19.7 kg/d in 1986, respectively (Seppälä and Kansanen 1987).

The aims of this study were:
(1) to define the area of distribution of the effluents on the basis of sediment parameters, and
(2) to estimate the accumulation rate of TOCl and chlorophenols to the lake bottom, and
(3) to study the occurrence of various chlorophenol compounds in the sediments.

MATERIAL AND METHODS
Short (11-53 cm) sediment cores were taken by using a Kajak-type gravity corer and a slicing device at 46 sampling sites in Lake Etelä-Saimaa. Water content, loss-on-ignition, total-nitrogen and organic carbon were analyzed from the uppermost cm of the sediment. Inorganic chlorine and TOCl were determined by potentiometric titration-wet combustion method. Polychlorinated phenols, guaiacols and catechols were analyzed by gas-liquid chromatography. The dating of two selected cores was based on the Pb-210 chronology.

RESULTS AND CONCLUSIONS
* Representative sediment core samples can be taken from accumulation bottoms. In the study area 24 of the 46 cores were classified as transportation profiles.
* The flow-through and sediment mixing clearly improve the redox conditions of the heavily loaded bottoms of eastern Pien-Saimaa.
* The organic content together with the carbon-nitrogen ratio of the sediment are rough parameters, which indicate allochthonous sedimentation of wastes from woodprocessing industry or log floating.
* TOCl content of the accumulation bottoms shows clearly the areas which are affected by the effluents from the pulp bleaching. TOCl content of the transportation bottoms varies irregularly resulting in limited information value.
* Of the chlorinated phenolic compounds 3,4,5-trichloroguaiacol and tetrachloroguaiacol seem to be most resistant bleaching residues indicating industrial impact on sediments. Penta- and tetrachlorophenols are common in sediments, but they may also have other sources than the waste waters.
* History of pulp bleaching was studied and the sedimentation rate was determined by the Pb-210-method in sediment profiles.
* It was roughly estimated that the total amount of TOCl and chlorophenols accumulating annually to the sediments of the study area is about 5 % and 0.2 % of the total load from pulp-bleaching, respectively (cf. Seppälä and Kansanen 1987).

References