Determination of PBDEs in sediments of the Neva River, Russia

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Sediment samples from the Neva River, which flows from Ladoga Lake to Nevskaya Guba (part of the Gulf of Finland) and provides drinking water for 5 million inhabitants of the City of St-Petersburg (Leningrad Province of the Russian Federation), were analysed for the presence of polybrominated diphenyl ethers (PBDEs) using accelerated solvent extraction and gas chromatography/mass spectrometry. The city and its surroundings are home to a diverse array of industrial enterprises, including a substantial concentration of facilities engaged in the manufacture of electrical and electronic equipment. The manufacturing processes generate large quantities of waste, including large quantities of effluents which are discharged directly to the Neva River at various locations. Ten samples were analysed, nine of which represented sediments from the Neva riverbed and a single sample that was collected from one of the pipes discharging wastes into the Neva River. Fourteen PBDEs have been measured in the samples: BDE-17, BDE-28, BDE-47, BDE-66, BDE-85, BDE-99, BDE-100, BDE-138, BDE-153, BDE-154, BDE-183, BDE-197, BDE-207, and BDE-209. The $\sum_{14}$PBDEs in sediments ranged from 0.1 and 3.4 ng g^{-1} dry weight, with the highest concentration detected downstream of the main industrial area of St-Petersburg. The $\sum_{14}$PBDEs in solid deposits from the discharge pipe was 1.1 ng g^{-1} dry weight. The most prominent congeners were BDE-99 and BDE-47, which were detected in every sample, followed by BDE-100, BDE-154 and BDE-183 that were detected in the majority of the samples. A range of other persistent organic compounds has been qualitatively detected in the samples including PAHs, chlorinated benzenes and DDT metabolites. This paper presents for the first time quantitative data on the distribution of PBDEs in aquatic sediments from the Neva River, as well as qualitative information on the presence of other organic contaminants of interest.