

## 9. Summary

### **Accumulation of organochlorines and nitro-musks in the aquatic food chain**

Organochlorines (OC) and nitro-musks were analysed in sediment and fish (homogenized whole-fish samples) from the lake Hohner See in central Schleswig-Holstein and in fish otters (*Lutra lutra* L.), which originated from the whole state. The fish belonged to different trophic levels: *Esox lucius* (pike), *Perca fluviatilis* (perch), *Abramis brama* (bream), *Gymnocephalus carnuus* (ruffe) and *Scardinius erythrophthalmus* (rudd).

In all analyzed samples similar patterns of the 24 chlorinated hydrocarbons and nitro-musks were found. The concentrations ( $\mu\text{g}/\text{kg}$  dry weight) in sediment were between 0,02 ( $\alpha$ -HCH) and 24,6 (PCB-153). The mean value of the sum of OC was 50.

The contamination with persistent OC in fish showed considerable fluctuations with lower levels in coarse fish and higher levels in predatory fish.

Rudd and ruffe showed contamination levels ( $\mu\text{g}/\text{kg}$  dry weight) between 0,13 (HCB) and 17,7 (PCB-153), pike, perch and bream from 0,08 ( $\alpha$ -HCH) to 97,6 (PCB-153).

Fish otter (*Lutra lutra* L.) showed contamination levels of more than 50 mg OC/kg lipid weight, which is considered as the marginal value for reproduction failure in mink. The concentrations in muscle, liver and fat were in the range between 9,5 and 100 mg/kg lipid weight (corresponding to 0,08  $\mu\text{g}/\text{kg}$  dry weight [ $\alpha$ -HCH] to 36.980  $\mu\text{g}/\text{kg}$  dry weight [PCB-153]).

In all samples, highly chlorinated PCB-congeners (especially PCBs-153, 138, 180 and 170) were found in much higher concentrations than lower chlorinated ones. PCB-153 could be identified as the congener with the highest level in all matrices, followed by PCBs-138 and -180. An exception in all cases was PCB-138 in the liver of the otters, where it showed the highest concentration detected, pointing to organ specific accumulation.

Species-specific differences were also detected, e.g. no indication of a contamination with  $\beta$ -HCH in fish nor with musk-xylol, PCB-149 and PCB-151 in otter.

In general, between 1997 and 1999 the OC concentrations in fish from Hohner See slightly decreased, the difference is statistically significant.

Also this study confirms that highly lipophilic xenobiotics accumulate much higher in organism at the top of the aquatic food chain (otter) than in organism lower down the food chain (fish).

The aquatic food chain sediment : fish : otter accumulates the xenobiotics analysed in the ratio 1 : 6 : 15 (based on dry weight), from coarse fish to predatory fish 1 : 5; between muscle, liver and adipose tissue of the otters the ratio was 1 : 3 : 5.

A reintroduction of otter into the biotop Hohner See is critical since actual concentrations of xenobiotics, like PCB, still are threatening their reproduction (JENSEN et al., 1977) and are leading to immunosuppression (OSTERHAUS et al., 1997). A further decrease of OC and other xenobiotics is imperative for a successful reimmigration of otter in the future.