**Key message**

Based on data from the Nordic countries there are elevated levels of heavy metals and organic micropollutants in several lakes. In a few cases, fish are so contaminated, that it is recommended they are not eaten.

**Figure 1: Lead concentration (μg/l) in lakes in the Nordic countries autumn 1995**

<table>
<thead>
<tr>
<th>Pb µg/l</th>
<th>% obs. in the range</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.30</td>
<td>67%</td>
</tr>
<tr>
<td>0.30 - 0.50</td>
<td>14%</td>
</tr>
<tr>
<td>0.50 - 0.70</td>
<td>7%</td>
</tr>
<tr>
<td>&gt;0.70</td>
<td>12%</td>
</tr>
</tbody>
</table>

Sources: Skjelkvåle et al. (2001)
Notes: Denmark 1996, Sweden 2000
**Results and assessment**

**Policy relevance:**

The main policies that are relevant to the control of hazardous substances are The Dangerous Substances Directive (76/464/EEC) (and its daughter directives) and the Water Framework Directive (2000/60/EC).

**Policy context:**

The Dangerous Substances Directive required the drawing up of a list of dangerous substances (candidate list I). This contained 132 substances of which 18 were subsequently placed into List I, the rest were considered to be List II. The aim was to eliminate pollution from List I substances and reduce pollution from List II substances.

Article 16 paragraph 2 of the Water Framework Directive required the setting up of a list of priority substances. There are 32 substances or groups of substances on the priority list and the Commission will apply Europe-wide Environmental Quality Standards (EQS's) and Emission Limits (the Dangerous Substances Directive allowed countries to do either). This priority list replaces the 1982 ‘candidate list 1’ from the Dangerous Substances Directive. The Commission has also identified a subset of the priority list of substances where discharges, emissions or losses should cease or be phased out in no longer than 20 years.

**Environmental context:**

There are estimated to be between 20 000 to 70 000 different chemicals on the market. Many of these will end up in the aquatic environment, and in many cases have potentially harmful effects on aquatic biota and man. Many slowly degrade and accumulate in the environment and along food chains. It is important, therefore, that the levels of these potentially harmful substances are monitored in the environment.

Many metals and organic micropollutants are sparingly soluble in water. They adhere to suspended matter and eventually deposit on the sediment. Many substances are also bioaccumulating. Because of these properties, the highest concentrations of hazardous substances are usually found in sediment and in tissue of biota. Samples of sediment and biota hold information on the pressure from hazardous substances, integrated over a longer period.

**Assessment:**

There is limited information on hazardous substances in European lakes. The most comprehensive information is from the Nordic countries.

Under the “Nordic lake survey” 1995, the heavy metal concentrations in the water of 3 000 lakes were measured, giving an overview of occurrences in different parts of the Nordic countries. The concentrations of lead (Pb) are low (< 0.3 µg/l) in many cases, particularly in the north and areas of high altitude and, therefore, low population density and low consumption of gasoline, which is a major source of lead pollution. In the southern areas of the countries, there are often elevated concentrations of up to 1-10 µg/l. This is the case, in particular, in south-western Norway due to high deposition from long-range air pollution. Cadmium and zinc follow a similar general geographical distribution whereas the occurrence of other heavy metals are to a higher extent determined by bedrock geology in combination with indirect effects from acidification.

A survey in the late 1990s on hazardous substances in lake fish, showed that levels are generally low with a few exceptions. In fish from the large lakes Mjøsa and Randsfjorden, there were elevated levels of PCBs and DDTs, particularly in predatory fish such as trout and burbot. The livers of burbot in Mjøsa had also very high concentrations of brominated flame retardants and the trout in lake Mårvatn the trout contained high concentrations of dioxins. These examples of contamination in specific lakes are most likely caused by local point sources, but there is also a general trend for higher concentrations of both organic pollutants and mercury in southern Norway than in the north. Due to the contamination of fish it has been recommended that pregnant women should not eat large specimens of certain predaceous fish species, and that the liver of burbot from certain lakes should not be eaten at all.
Sub-indicator: Concentrations of hazardous substances in lake fish

Key message

☺ The concentrations of banned substances such as PCB and DDT appear to be decreasing.

Figure 2: PCB and DDT in pike from lake Storvindeln

Assessment of the sub-indicator

In a number of Swedish lakes, the concentrations of some hazardous substances in fish tissue have been monitored since the late 1960s. There has been a decrease in the persistent pollutants PCB and DDT (including derivatives), but also α-HCH and HCB have fallen. Contrary to this, the concentrations of brominated flame retardants in lake Bolmen have been stable after an increase during the 1970s. While PCB and DDT are found in the highest concentrations in southern Sweden where they have been used most intensely, the more volatile HCH and HCB are found in similar concentrations throughout the country due to long-range air transport.

References


Data

Background data not easily accessible; held by the researchers.
**Meta data**

**Technical information**
1. Data source: national SoE
2. Description of data: differ from country to country
3. Geographical coverage: Nordic countries
4. Temporal coverage: 1965-
5. Methodology and frequency of data collection: Ad hoc
6. Methodology of data manipulation, including making ‘early estimates’: no further data manipulation.

**Quality information**
7. Strength and weakness (at data level): At national level data are good and indicative, but the comparability between countries is difficult, in particular if extended to larger parts of Europe.
8. Reliability, accuracy, robustness, uncertainty (at data level): Published national data are generally good. However, concentrations close to the detection limit are relatively less accurate.
9. Overall scoring (give 1 to 3 points: 1=no major problems, 3=major reservations):
   - Relevancy: 1
   - Accuracy: 1
   - Comparability over time: 1
   - Comparability over space: 3

**Further work required**
More data is needed to give a European overview.