BALTIC SEA ENVIRONMENT PROCEEDINGS

No. 85

RADIOACTIVITY IN THE BALTIC SEA 1992-1998

HELSINKI COMMISSION
Baltic Marine Environment Protection Commission

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7 RADIONUCLIDES IN BIOTA

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Levels of radionuclides in biota of marine origin are linked to the corresponding levels in sea water and sediment via accumulation through food chains. The complexity of food chains increases with the trophic level of the species considered. Fish, the most important biota type in the Baltic Sea for human consumption, accumulate most of the radionuclides from their food, rather than directly from the water.

Baltic Sea biota received the most important contribution to their radionuclide levels following the Chernobyl accident in 1986, predominantly in the form of ^{137}Cs and ^{134}Cs. The ratio ^{134}Cs/^{137}Cs in biota agrees very well with that of Chernobyl fallout. Time trends for ^{137}Cs in fish did not always closely follow the corresponding trends in sea water. The high trophic level species, including predators such as cod and pike, showed the highest ^{137}Cs levels, but with some delay compared to sea water in reaching maximum values after 1986. In the long term, ^{137}Cs time trends in biota evidently follow the trends in sea water.

The levels of ^{137}Cs in fish samples (mainly herring and pike) from the northern regions of the Baltic Sea, where the initial concentrations in sea water were the highest after Chernobyl, have decreased since the end of the 1980s. Levels of ^{137}Cs in herring and pike from the Bothnian Bay approached 20 and 40 Bq kg^{-1}, respectively. Slightly lower values were observed in the Gulf of Finland. Figure 7.1 contains data on ^{137}Cs in herring caught in the Baltic Sea during the period 1984-1998.

In the Baltic Proper, the area with the highest production of fish for human consumption, levels of ^{137}Cs in fish increased until the beginning of the 1990s and then decreased gradually. In more southerly waters, where the network of sampling stations is densest, ^{137}Cs levels in herring and cod varied between 10 and 20 Bq kg^{-1} in the second half of the 1990s. Benthic flat-fish and small sprats showed lower values of around 10 Bq kg^{-1} in the 1990s.

Fish from the Belt Sea showed lower values. Average ^{137}Cs levels in herring have been below 3 Bq kg^{-1} since 1990, at levels previously observed during the period 1965-1974. Similar trends were observed for plaice. ^{137}Cs levels in cod stayed at around 10 Bq kg^{-1} after 1987, at levels nearly twice as high as those observed during the period 1965-1974.

Fish from the Kattegat area showed the lowest ^{137}Cs levels: below 4 Bq kg^{-1} for herring and cod from about 1990 onwards, with no obvious impact from the Chernobyl accident.

Marine algae (*Fucus vesiculosus*) from nuclear power plant (NPP) monitoring stations in the Baltic Sea, used as a bio-indicator of radionuclides in the Baltic Sea, show low activities of radionuclides representing NPP discharges, such as ^{60}Co, ^{58}Co, ^{54}Mn, ^{65}Zn, and ^{110m}Ag. Some of these radionuclides were also found in samples of benthic animals (e.g. *Mytilus edulis, Macoma baltica, Saduria entomon*). ^{137}Cs concentrations in *Fucus vesiculosus* from various parts of the Baltic Sea closely followed the ^{137}Cs time-trend for surface sea water.

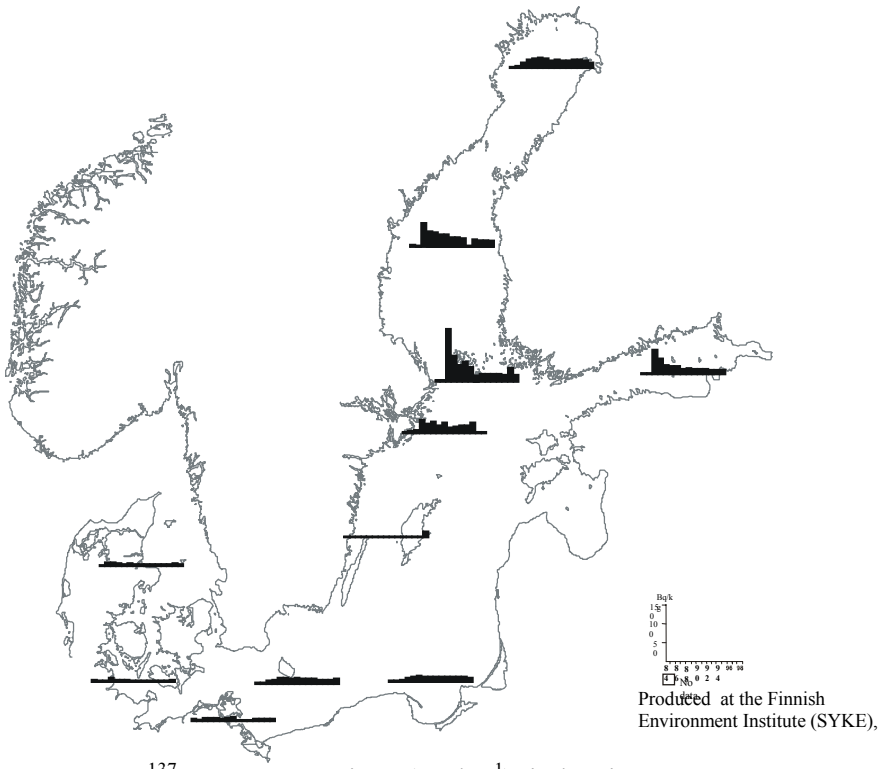

Figure 7.1 ^{137}Cs concentrations (Bq kg^{-1}) in herring, 1984-1998