

## DIOXINS IN THE BALTIC SEA HERRING

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**Introduction.** The Baltic Sea is almost totally enclosed by land, and only connected to the North Sea by narrow and shallow straits around Denmark and Sweden. It takes tens of years for all the water in the closed system to be renewed. In addition, the Baltic Sea is the final destination of discharges and land run-off from many highly industrialized countries (Roots, 1996). Fourteen countries lie within the catchment area of the Baltic Sea (Holoubek, et al., 2000). The aim of this study was to determine the content of two compounds, which preserve in the nature, are especially toxic and accumulate in the nature – polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). PCDD and PCDF have never been produced internationally and have never served any useful purpose.

**Material and method.** To determine the toxicants contents in the Baltic herring samples were collected from the four areas of Estonian coastal waters (table 1) – Eastern and Western part of the Gulf of Finland, Gulf of Riga and Central Baltic in March 2002. (Roots, et al., 2002). The Baltic herring was chosen as the fish under study because it is economically most important species of fish. For analysis of fish muscle, the epidermis and subcutaneous tissue should be carefully removed from the fish. Samples should be taken under the red muscle layer. In order to ensure uniformity of samples, the right side dorso-lateral muscle should be taken as sample (HELCOM COMBINE Programme). Because there no facilities for analysing dioxins and furans in Estonia the analysis of the Baltic herring samples was ordered from the Institute of Ecological Chemistry of the National Research Centre for Environment and Health in Neuherberg (Germany). The Centre has been accredited in Germany for determination of dioxins (accreditation license No. DAC-P-0141-01-00 valid through 21. 11. 2006).

**Results.** Dioxins concentration grows significantly with increasing of age/measures of the Baltic herring. It may be assumed that the dioxins concentration in the Baltic herring is lower than the high contents found during the 1980s (Olsson, et al, 2002), however, depending on the fattiness of the fish it is dangerously near to the threshold set by the European Union. Concentrations of dioxins in herring vary regionally (Figure 1).

**Conclusion.** Of the eight Baltic herring samples taken from four regions of Estonian coastal waters during the spring 2002 was below the internationally permitted threshold – 4 pg/g per wet weight, in which case the content of toxicants in the food does not cause symptoms of illness in case of people.

Table 1. Dioxin concentration (pgTEQ/g, WHO 1998) in the muscle tissue of the baltic herring in the Estonian coastal waters (Roots, et al., 2002)

Region	Number of the fish in sample	Age ( years )	Lipid ( % )	Concentration Lipid weight	Concentration Wet weight
Gulf of Finland Eastern part	32	5	2,1	61,0	1,3
	66	3	1,9	33,9	0,6
Gulf of Finland Western part	24	5	1,8	91,2	1,6
	24	3-4	2,1	90,0	1,9
Gulf of Riga	33	4-7	2,7	64,2	1,7
	59	2	2,0	30,9	0,6
Open sea Central Baltic Sea	49	3	1,9	44,6	0,9
	17	7-8	2,3	115,0	2,6

## References

- Holoubek, I., Holoubkova, I., Hilcherova, K., Kohoutek, J., Kocan, A., Falandysz, J & Roots, O. 2000. Persistent, Bioaccumulative and Toxic Chemicals in the Central and Eastern European Countries – State-of-the-Art Report, DIOXIN 2000, Organohalogen Compounds, v. 46, pp.346 – 348.
- Olsson, M., Bignert, A., Aune, M., Haarich, M., Harms, U., Korhonen, M., Poutanen, E., Roots, O and Sapota, G. 2002. Organic Contaminants. Baltic Sea Env. Proc., HELCOM, No.82B, pp. 133 – 140.
- Roots, O. 1996. Toxic chlororganic compounds in the ecosystem of the Baltic Sea. Estonian Environment Information Centre, Tallinn, 144p.
- Roots, O., Otsa, E., Lahne, R. and Simm., M. 2002. Determination of dioxins in the baltic herring. - In: 28<sup>th</sup> Estonian Chemistry Days. Abstracts of Scientific Conference, Tallinn, pp. 128-129.
- The Baltic Marine Environment 1999-2002. 2003. Persistent Organic Pollutants (POPs). Baltic Sea Environment Proceedings No.87, HELCOM, 31 – 32.

Figure 1. Dioxin concentrations in the Baltic herring (Sources: The Baltic Sea Environment, 2003, Swedish EPA and Estonian data Roots, et al., 2002).

