

**Comparison between the PCDF/D impact on river sediments (Elbe) with that of the eggs of sea gulls from inshore areas of the North Sea and Baltic Sea**

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**Abstract**

In connection with the project on environmental specimen banking sediments of the river Elbe were investigated with respect to the PCDF/D impact. Samples were taken from the Czechoslovakian (CSFR) border up to the former section of the Federal Republic and the Democratic Republic of Germany. The pattern of the isomeric and homologues PCDF/D compounds shows some similarities with those from combustion processes. The eggs of sea gulls from inshore regions of the North Sea and the Baltic Sea were investigated to detect especially the pattern of the 2,3,7,8-isomers in the biological foodchain. A comparison of these results with the pattern of the sediments shows significant differences. This fact can be explained by the differences in the accumulation and metabolism of the individual furane and dioxin congeners.

**Introduction**

Due to the lipophilic and immobile properties and the resistance to biological degradation mechanisms the PCDF/D compounds accumulate in the ecosphere. They can be detected nearly in all matrices. The resulting pattern of the isomers and homologues cannot directly be assigned to particular emission sources.

In aquatic systems the pollutants are accumulated especially from river and sea sediments by microorganisms and by fish as the first links of the foodchain. The sea gull eggs represent a final link in this chain and therefore they lead to information about changes of the ratio between the isomers and homologues PCDF/D and furthermore if a different accumulation and metabolism of the individual congeners occurs.

To decide whether there are similarities in the PCDF/D pattern of the isomers and homologues of the sediment samples and the sea gull eggs those samples were analyzed and the results were compared. It has to be mentioned that the Elbe sediment samples may be transferred by the river Elbe into the great estuary region and into the open sea.

**Results and discussion**

The six sampling locations of the river sediments (Schmilka, Dresden, Barby, Magdeburg, Havelberg, Cumlosen) and the 4 sampling locations of the sea gull eggs in the North Sea (Mellum and Trischen) as well as in the Baltic Sea (Walfisch and Heuwiese) are represented in Fig. 1.

The PCDF/D concentrations in ng/kg and ng TE/kg (TE according to BGA/UBA-Germany) are indicated at each sampling location.

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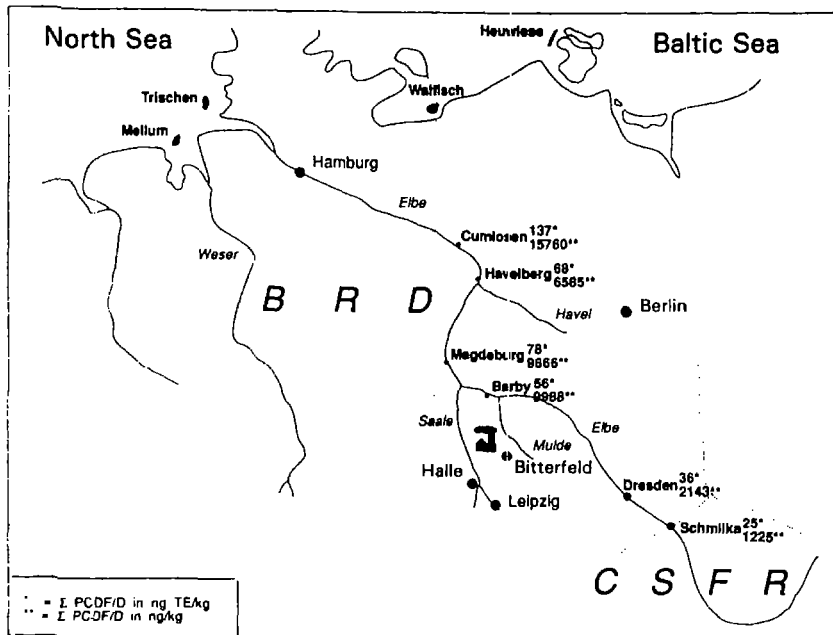


Fig. 1: Sampling locations

From Fig. 1 it can be drawn that the PCDF/D concentration of the river Elbe increases from the border of the CSFR. This fact is due to the entry of polychlorinated furanes and dioxins from the industrial areas around the towns Halle and Bitterfeld by the rivers Mulde and Saale.

The pattern of the homologues of the Elbe sediments is shown in Fig. 2.

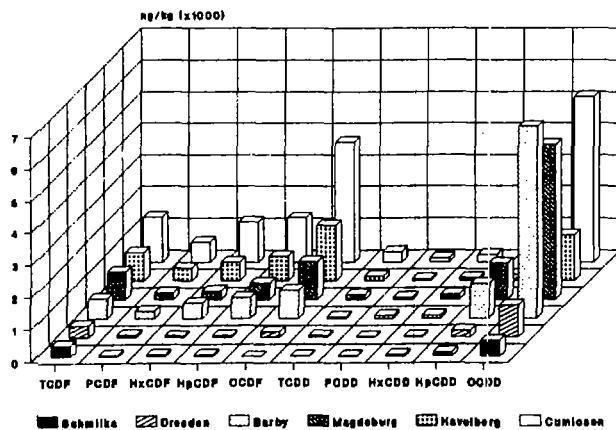


Fig. 2: Pattern of the homologues of the Elbe sediments

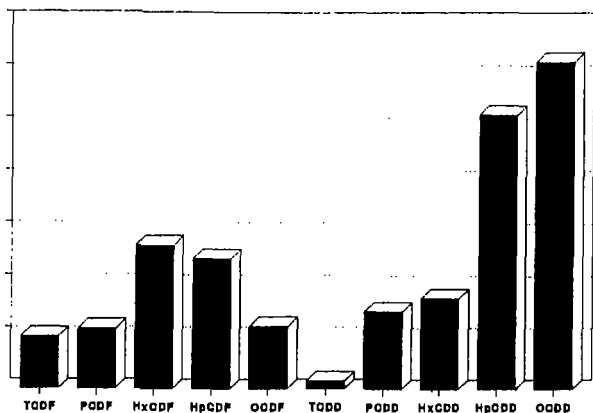


Fig. 3: Pattern of the homologues of a fly ash [1]  
(relative percentage, maximum value at 100%)

All pattern are similar to those resulting from combustion processes for example from a fly ash (compare Fig. 3). Figure 4 shows the isomeric 2,3,7,8-pattern of the Elbe sediments. Corresponding with the pattern of the homologues of the river sediments the concentrations of the substituted 2,3,7,8-congeners are as high as they are in the patterns of combustion processes. A great part consists of 2,3,7,8-TCDF.

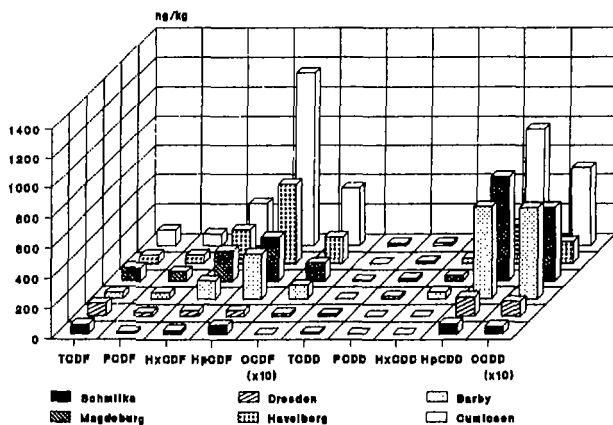


Fig. 4: 2,3,7,8-isomeric pattern of the Elbe sediments (The 2,3,7,8-congeners of each group are summarized)

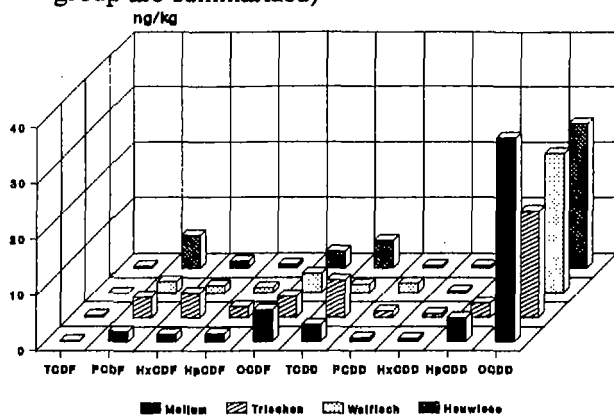


Fig. 5: 2,3,7,8-isomeric pattern of the eggs of sea gulls (The 2,3,7,8-congeners of each group are summarized)

A comparison between the 2,3,7,8-isomers of the sea gull eggs from the North Sea and Baltic Sea with the river sediments leads to significant differences. There are low concentrations of 2,3,7,8-TCDF and high levels of 2,3,7,8-TCDD in the sea gull eggs. Compared with the river sediments the distribution of the individual congeners in the sea gull eggs is more inhomogeneous. The reported results can be explained by the different accumulation and metabolism procedures of the various substituted PCDF/D compounds. Additionally, the 2,3,7,8-isomeric pattern of the sea gull eggs may be due to other unknown pathways of the entry of pollutants.

Samples of sea gull eggs from the North Sea (Mellum and Trischen) from the years 1988 to 1991 were available. The concentrations of PCDF/D decreased significantly from 1988 to 1990 (see Fig 6).

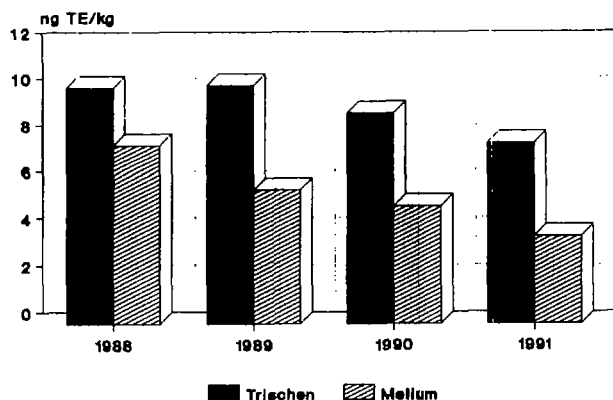


Fig. 6: Concentrations of PCDF/D in the eggs of sea gulls

To give a more detailed interpretation of the problems as described above, further investigations of other river sediments (Weser) and other biological specimen should be analyzed.

### References

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