

SUMMARY OF DATA ON TOXICITY EQUIVALENTS FROM PCDF/PCDD AND NON-ORTHO PCB IN MARINE ORGANISMS AND SEDIMENTS FROM NORWAY

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1. Introduction

In recent years the Norwegian State Pollution Monitoring Programme, sponsored by the State Pollution Control Authority, has included observations of polychlorinated dibenzofurans/dibenzo-p-dioxins (PCDF/PCDD) in several areas outside the influence from known point sources. In some of these studies non-ortho PCBs (no. 77, 126, 169) have also been analyzed. The main aim has been to establish reference values for comparison with contaminated sites and as basis for classification of environmental quality.

2. Materials and methods

Composite samples of seafood organisms and sediments have been analyzed for PCDF/PCDD and non-ortho PCB according to methods described in ¹⁾. The biota samples in the main has been based on 20 specimen of cod (*Gadus morhua*), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*), eel (*Anguilla anguilla*), sea trout (*Salmo trutta*), herring (*Clupea harengus*), mackerel (*Scomber scombrus*), edible crab (*Cancer pagurus*), and horse mussel (*Modiolus modiolus*). For samples of the common mussel (*Mytilus edulis*) and shrimps (*Pandalus borealis*), respectively 50 and 100 individuals have been bulked.

The data reported here are selected from ²⁾, to which it is referred for references, and are supplemented with the latest data from the heavily contaminated Frierfjord area ³⁾. Most of the data have only been reported in Norwegian.

For PCDF/PCDD TEQ has been calculated according to the Nordic model ⁴⁾, for non-ortho PCB after Ahlborg et al. ⁵⁾.

3. Results

The results are presented in figure 1 (fish) and figure 2 (shellfish and mixed soft bottom fauna). Data from two heavily contaminated sites, the Frierfjord area and the navy base Haakonvern, are in most

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cases given separately. The other row markings usually represent several localities. Two separate markings in the same row show concentrations from uncontaminated, respectively contaminated areas. Point markings indicate single or extreme values. In cases of registrations from several years only the most recent data are included.

As stated above one of the aims of the Norwegian State Pollution Monitoring Programme is to establish general reference values for the coastal environment of Norway. The upper limit of this interval of values for TEQ_{PCDD/FD} (Table 1) are estimated from records in relatively pristine surroundings and termed "high diffuse background levels" (i.e. outside the traceable influence from point sources).

For surface sediments 5 - 10 ng TEQ_{PCDD/FD}/kg d.w. appears to be the upper limit of merely diffuse loading ^{2,6}).

So far registrations of non-ortho PCB are too few to allow establishment of reference values.

Table 1. Reference values (see text) for TEQ_{PCDD/FD} in marine seafood and indicator species from Norway, ng/kg w.w.

Species/tissues	TEQ ref. values ng/kg
Cod (<i>Gadus morhua</i>), liver	10 - 20
" " " fillet	0.1
Flounder (<i>Platichthys flesus</i>), fillet	0.1 - 0.2
Eel (<i>Anguilla anguilla</i>), fillet	≈ 2
Herring (<i>Clupea harengus</i>), fillet	1 - 2
Mackerel (<i>Scomber scombrus</i>), fillet	≈ 1
Edible crab (<i>Cancer pagurus</i>), hepatopancreas	10 - 20
Common mussel (<i>Mytilus edulis</i>), soft parts	0.1 - 0.2

From figures 1 - 2 it appears that in some cases the upper limits of "normal" levels (Table 1) are exceeded by 1 - 2 orders of magnitude or even more. The present contamination level in cod liver from the innermost part of the Frierfjord area nevertheless has decreased about 90% after about 99% reduction in load from 1990 ³). In 1975, before any waste treatment, the TEQ concentration in cod liver was nearly 500 times higher than the maximum in figure 1, cf ⁷). In surface sediments of the Frierfjord the TEQ_{PCDD/FD} still is about 1000 times higher than the reference value of 5 - 10 ng/kg d.w. ⁸).

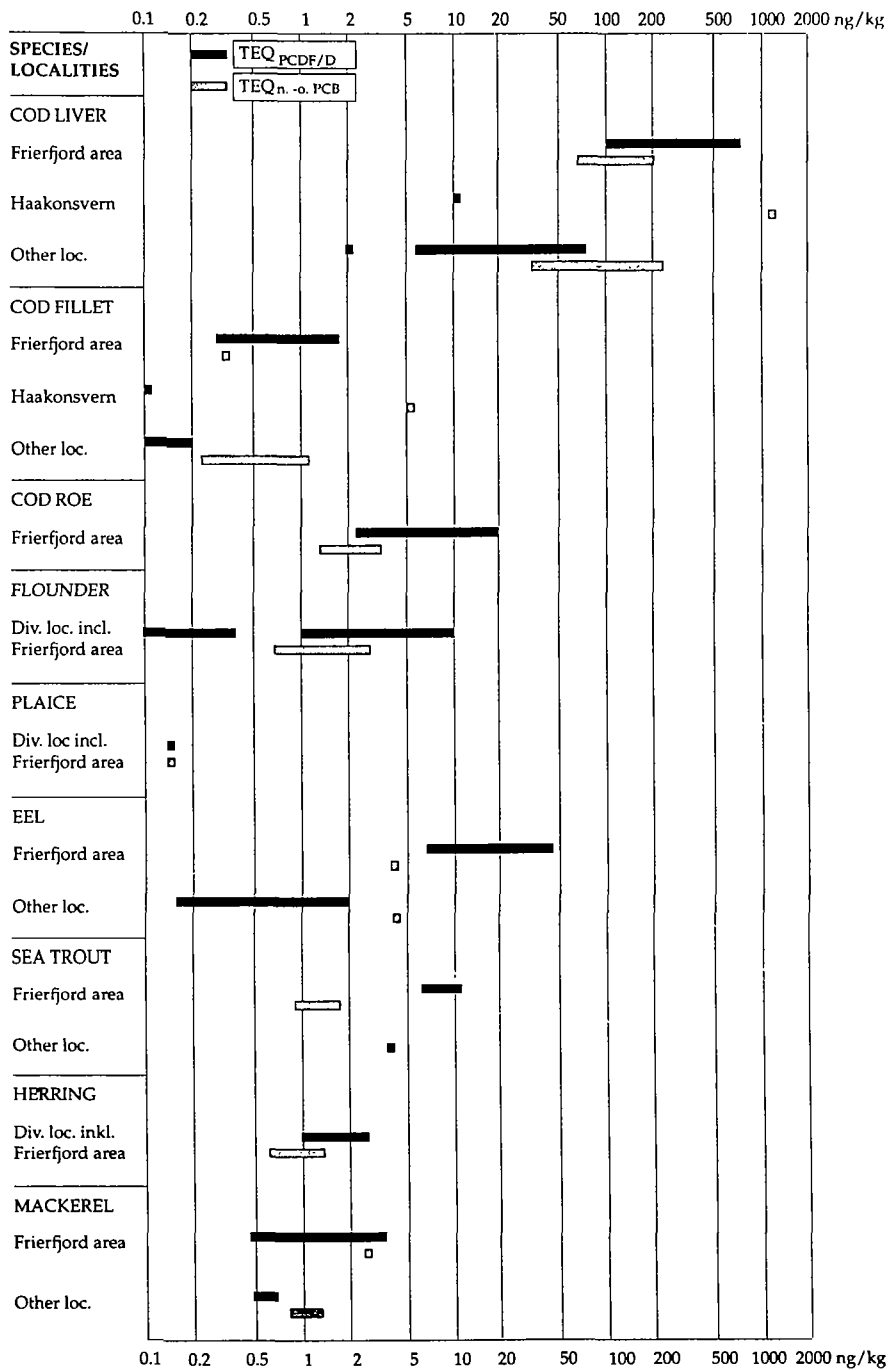


Figure 1. Selected data on TEQ_{PCDF/D} and TEQ_{n.-o. PCB} in marine fish (fillet when not otherwise stated) from Norway 1988 - 1994, ng/kg w.w. See text.

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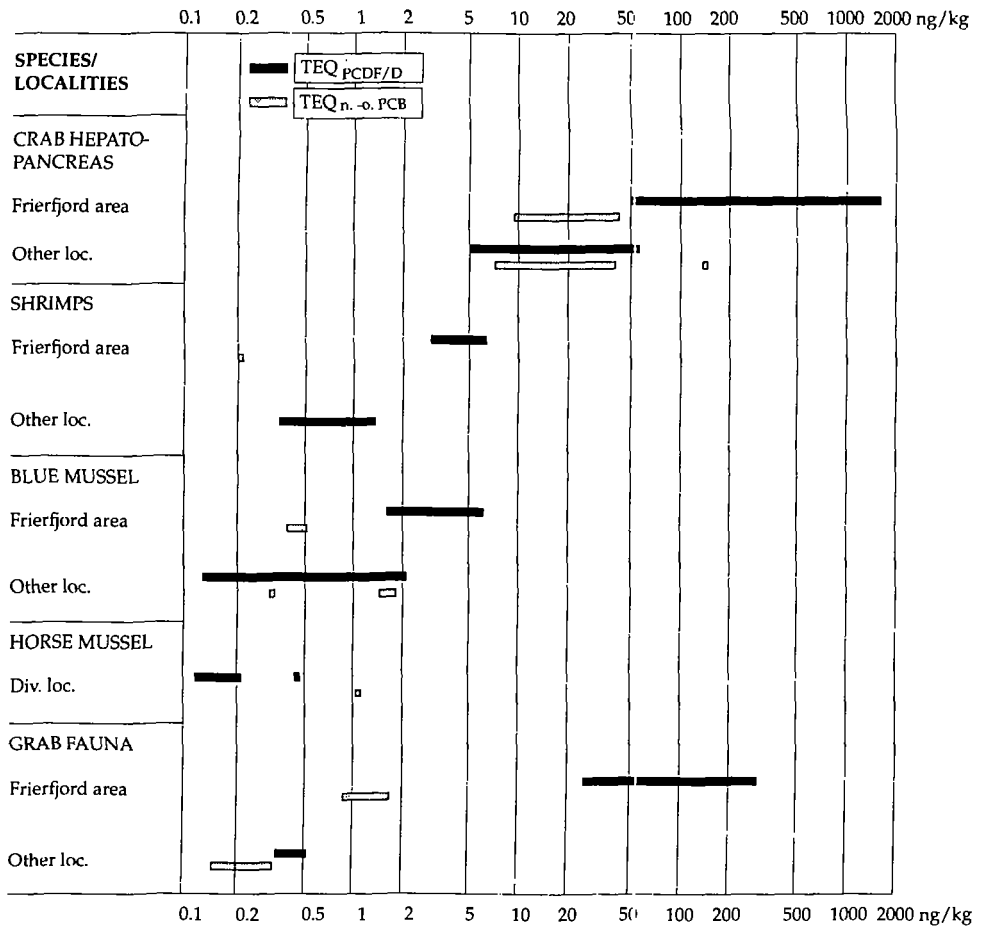


Figure 2. Selected data on TEQ_{PCDF/D} and TE_{n-o PCB} in marine invertebrates from Norway 1987 - 1994, ng/kg w.w. See text.

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