

DETERMINATION of PCDD/Fs, PBDD/Fs, PBDEs, PAHs, PCBs, ORGANOCHLORINE PESTICIDES and HEAVY METALS in VARIOUS FISH SPECIES FROM TURKEY

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Background and Objectives

In this study PCDD/Fs, PBDD/Fs, PBDEs, PAHs, PCBs, OCL pesticides and heavy metal levels in various wild fish species from freshwater and marine of Turkey were determined within the scope of a study visit at RIKILT Institute of Food Safety in the Netherlands. The goal of this study was to get more insight in the levels of contamination in fish exported from Turkey to Europe which is of great importance for Turkey as well as for European consumers.

Study Design and Methods

Pooled samples of Sole (*Solea solea* L.1758), Bluefish (*Pomatomus saltator* L.1758), Mackerel (*Scomber scombrus* L.1758) caught from Mediterranean Sea, and Eel (*Anguilla anguilla* L.1758) caught from Bafa Lake located in Western Anatolia in November-2009 were analysed.

For the determination of PBDD/Fs, PCDD/Fs, PCBs and PBDEs, fat extraction (1) was followed by clean-up via an automated system (Power-Prep)². Measurement for PBDD/Fs, PCDD/Fs and PCBs was done on GC-HRMS at 10000 resolution. Determination of PBDEs was carried out on GC-MS/NCI (3,4). Also for these samples the CALUX bio-assay⁵ was applied.

For the determination of PAHs and organochlorine pesticides, fat extraction (1) was followed by clean-up via Gel Permeation Chromatography (3,4). Measurement for PAHs was done after additional clean-up using an alumina column on GC-HRMS at 12000 resolution on GC-HRMS. Organochlorine pesticides were determined on GC x GC-TOF-MS^{3,4}. PBDD/Fs, PCDD/Fs, PCBs, PBDEs and PAHs were quantified according to isotope dilution and organochlorine pesticides according to external standards.

The determination of Heavy metal was performed after microwave acid digestion (6) on ICP/MS. Quantification was done according to an external calibration curve.

Results

PBDD/Fs levels in the analysed pooled fish samples are lower than LOQ except for 2,3,7,8-TBDF; 1,2,3,4,6,7,8-HpBDF; 2,3,7,8-TBDD; 1,2,3,7,8-PeBDD in eel and HBDF in sole. Total PBDD/Fs, PCDD/Fs, PCDD/Fs, dl-PCBs and total indicator PCB results are given in Figure 1. Total dioxin and dioxin-like PCB results for all fish species are below the maximum limits as described in EU legislation. CALUX results are comparable with GC-HRMS results. 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; 1,2,3,7,8-PeCDD and 2,3,7,8-TCDD are the most dominant dioxin congeners for all fish species except sole in which all dioxin congeners are below LOQ. Non-ortho PCBs 126 and 77 and mono-ortho PCB 118 and indicator PCB 153 are the dominant PCB congeners. PAH results are given in Figure 2. The most dominant PAH congener is in all fish species phenanthrene. Benzo-a-pyrene which is the only PAH congener having a maximum limit in EU legislation were in all fish species below the LOQ. PBDE results are given in Figure 3 and the results in general are quite low. Heavy metal results are given in Figure 4. All reported levels are in all fish species below the EU legislation limits. Results for the organochlorine pesticides are given in Figure 5, all results were quite low. The results for the sample eel are comparable with the contamination in eel from the Netherlands (7).

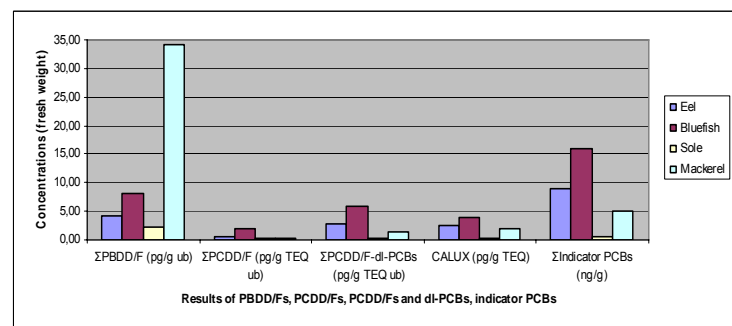


Figure 1. Results of PBDD/Fs, PCDD/Fs, PCDD/Fs and dl-PCBs, indicator PCBs (fresh weight)

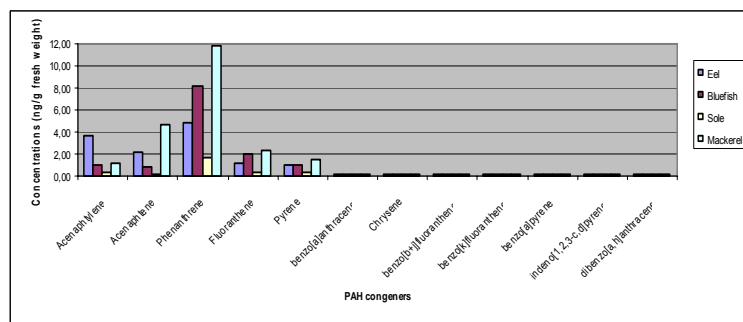


Figure 2. Results of PAHs (ng/g fresh weight)

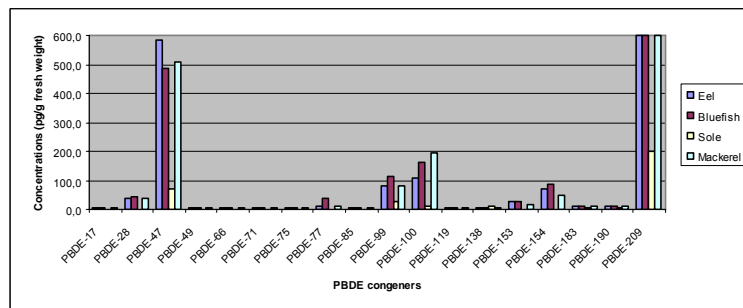


Figure 3. Results of PBDEs (pg/g fresh weight)

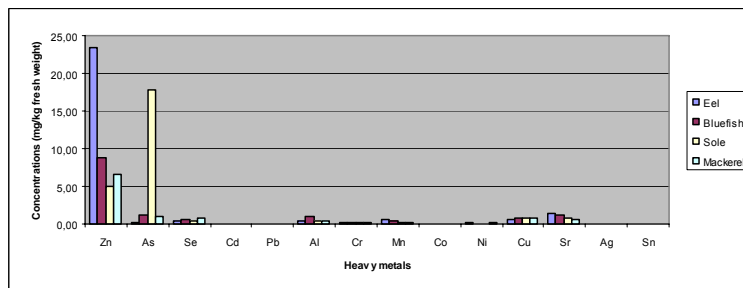


Figure 4. Results of heavy metals (mg/kg fresh weight)

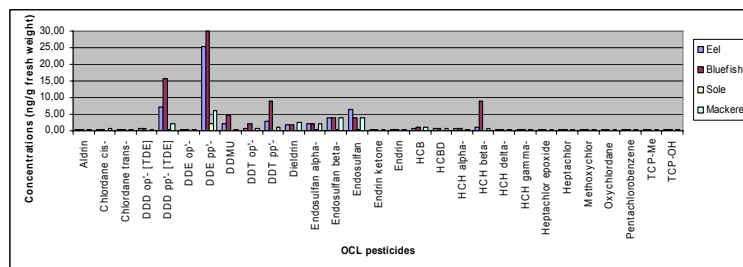


Figure 5. Results of organochlorine pesticides (ng/g fresh weight)

Conclusions

Based on the research carried out it can be concluded that levels of contaminants in fish caught in Turkey are relatively low. In general it can be stated that the in this study for all fish species reported low levels indicates the absence of remarkable environmental pollution in these fishing areas.

Acknowledgements

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