

Topic: Biotic Compartments: levels, trends, effects
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The session consists of 18 presentations on biomonitoring of PCDD/Fs, PCBs and organochlorine pesticides in fish, mussels, turtles, birds and plants. A major theme of the 8 platform presentations is temporal trends in contaminant levels. This is an important topic because of the need to determine if sources and emissions of POPs are being reduced.

Levels and trends of PCBs, pp'-DDT, pp'-DDE and pp'-DDD (Σ DDT) and polybrominated diphenyl ethers (PBDEs) were studied in archived samples of marine mussels (*Mytilus edulis*) collected in the Bay of Seine from 1981 to 2003. The overall trend of concentrations of the studied contaminants, with the exception of PBDE, showed a significant decrease during the studied period of time but the differences between individual congeners were large. For the dominating PBDE congeners (BDE-47, BDE-99 and BDE-100), the levels increased rapidly from 1986.

A 10 year monitoring study of eels (*Anguilla anguilla*) in Flanders, Belgium analysed 2000 individual samples originating from 260 different localities in Flanders, including rivers, canals, polder waters and closed water bodies, taken from 1994 to 2002. Results show that on 80 % of all sampled location the Belgian PCB-standard for fish (75 ng/g BW) is exceeded; 2) in the north-western part of Flanders is a severe lindane-contamination; 3) many long time prohibited pesticides are still found in considerable amounts in our food-chain; 4) several locations contain high to very high concentrations of brominated flame retardants.

Caged freshwater mussels (*Anodonta piscinalis*) were used to monitor PCDDs, PCDFs, PCBs, PBDEs and polychlorinated naphthalenes (PCNs) in two Finnish watercourses. The main aim of the study was to investigate the contamination of two rivers by dioxins and by other less studied contaminants, PBDE and PCN. The levels and congener profiles of the major PCBs differed slightly between the two sites. The higher prevalence of the less chlorinated PCBs in the mussels incubated in the River Kymijoki refers to different PCB sources between the River Vuoksi.

The bivalve (*Tapes philippinarum*) was used to monitor PCDD/F, PCB dioxin-like and HCB in the Lagoon of Venice. The relationship between POPs in sediment and bivalves was determined. The results supported the hypothesis that the sediment was the main source of clam contamination and suggested the presence of a quantitative relationships between the TCDD TEQ concentrations in the abiotic and biotic compartment.

A study of green turtle (*Chelonia mydas*) in Queensland, Australia provided baseline concentrations and exposure pathways of these reptiles to PCDD/Fs. Spatial distribution of OCDD concentrations (and % total organic carbon in sediments was analyzed using a Geographic Information System. Generally, higher concentrations were found in the river sediments and western bay sites compared to the eastern bay, with an average 5.4-fold increase in OCDD concentration from west to east, indicating a predominant riverine transport of sediment/soil associated PCDD/Fs into the marine system. Also, differences in the percent contribution of the different congeners were observed between western and eastern sites.

Differences in PCDD/F concentrations and congener profiles in the southern and northern Baltic Sea were investigated using herring (*Clupea harengus*). The study concluded that Baltic herring from the Bothnian Bay contain higher levels of PCDD/F due to slower growth. The lipid content did not affect the differences.

Skipjack tuna (*Katsuwonus pelamis*) were used to examine the global ocean contamination by PCDD/Fs and co-planar PCBs. These fish were collected from the Pacific, south Atlantic and Indian Oceans. Higher contamination of PCDD/Fs was found in tuna from waters around temperate Asian regions e.g. south China Sea and East China Sea suggesting these chemicals are being generated in highly industrialized regions bordering these seas.

Retrospective Monitoring of PCDDs, PCDFs, and PCBs in pine- and spruce-shoots from 1985 to 2003 was conducted using samples from the German Environmental Specimen Bank. In spruce shoots the sum of the 6 indicator PCBs (#28, 52, 101, 138, 153, 180) decreased more than 50 % from 1985 to 1999 and increased in the last few years, meanwhile PCDD/Fs and the 12 WHO-PCBs decreased about 75 % from 1985 to 1999. In pine shoots PCDD/Fs decreased from 1991 to 1995 by about 40 %, then leveled off, and increased in 2003. Dioxin-like PCBs decreased only about 30 % over this period.

Ten posters in this session describe biomonitoring using fish, birds and plants. Fish contamination with DDT due to malaria control in the Brazilian Amazon was examined using samples collected over a 12 year period from 1990 to 2002. DDT concentrations were found in the range of 3 to 54 ng/g dry weight and showed a decreasing trend over this time period.

Recent results for toxaphene in fish in Germany are discussed. Levels of toxaphene congeners (P26, P50, and P62) were measured in fresh and smoked fish samples using GC-high resolution electron ionization mass spectrometry. Concentrations ranged between ND and 0.25 mg/kg (lipid based).

Depuration of PCBs and DDTs was studied in mullet (*Mugil cephalus*) that were captured and fed uncontaminated food for up to 270 days. Liver and muscle were assayed for EROD activity and the concentration of PCBs. The results indicate that, in general, there was absence of elimination after 21 days. Elimination only occurred in muscle after 120 days. The decreasing time of elimination was not related to decreasing chlorine content of PCB congeners. Tri- and tetrachlorobiphenyls were eliminated in muscle 33-60% after 120 days, while the other congeners decreased more than 64%.

Sea bass (*Dicentrarchus labrax*) from two fish farms in Portugal were analysed for PCBs and DDT residues to determine the influence of fish size and diet on levels of these contaminants. Diet was shown to be a significant factor explaining differences in biomagnification factors for PCBs and p,p'-DDE between the fish farms.

Accumulation of PCBs was studied in the freshwater fish, crucian (*Carassius auratus*), from the Han River and the Kum River, in Korea. PCB congener profiles varied among sites. Total PCB levels measured in fish collected in 2002 showed a significant decrease from those obtained in year 2000.

Four year trends of PCDD/Fs and PCBs in crucian were determined at 16 sites along the 4 major river systems and several small scaled rivers and a wetland in the years 2000-2003 in Korea. Results showed a decreasing trend for PCDD/Fs even though the level in 2003 is slightly higher than that of 2002. The total level of coplanar-PCBs, however did not change clearly in the years 2002 and 2003.

PCDD/Fs, PCBs and DDT-related compounds were determined near a municipal solid waste incinerator in Spain using black kites (*Milvus migrans*) as sentinel organism. The authors concluded that organochlorine compounds, mainly PCBs, could be compromising the survival of the black kite population monitored in this study.

Bioaccumulation profiles of POP's were determined in great cormorants (*Phalacrocorax carbo*) from Japan. The PCDD/Fs were the lowest accumulants that

contributed 0.01% (liver) and 0.003% (egg) to the total POPs measured in organs of cormorants. The CB-126 concentrations in liver and egg of cormorants analyzed in this study were several folds greater than that induced EROD activity. Although the authors did not measure the total PCBs, they argued that CB-126 can be used as indicator isomer for EROD activity in birds.

Patterns and concentrations of PCBs and organochlorine pesticides were determined in one-year and two-year old pine needles collected in Croatia. The patterns of organochlorine compounds in one year and two-year old needles were similar but the levels in two year old needles are higher due to longer exposure to air pollution.

Plant and soil samples were used, respectively, as short-term and long-term monitoring media for PCDD/Fs near a hazardous waste incinerator in Catalonia, Spain. Lower concentrations were found in soil samples from 2003 compared to those 1998 while plant material showed less change. The PCDD/F congener profile in plants was very similar to that found in soils with OCDD predominating.