

## Contamination by Persistent Chlorinated Endocrine Disrupters in Cetaceans from the North Pacific and Asian Coastal Waters

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To elucidate the global distribution and toxicological impacts of persistent organochlorines (OCs) on cetaceans, the present study determines the concentrations of organochlorine pesticides such as DDT and its metabolites (DDTs), hexachlorocyclohexane isomers (HCHs), hexachlorobenzene (HCB), chlordane compounds (CHLs), PCBs including toxic coplanar congeners and the two newly identified contaminants, *tris*(4-chlorophenyl)methane (TCPMe) and *tris*(4-chlorophenyl)methanol (TCPMOH) in the blubber of 10 species of adult male odontoceti cetaceans collected from several locations in the North Pacific Ocean and coastal waters of Japan, Hong Kong, Philippines and India during 1985–1997. Greater DDT concentrations were found in cetaceans from the Japan Sea, coastal waters of Hong Kong and India, indicating notable marine pollution in industrialized Asian nations and current usage of DDTs in the tropical region. In general, cetaceans inhabiting cold and temperate waters contained relatively higher concentrations of PCBs, HCHs, CHLs and HCB as compared with those from tropical regions, reflecting atmospheric transport from the tropical sources to the north-

ern sinks. Latitudinal distribution of TCPMe and TCPMOH in cetaceans was similar to that of DDTs, suggesting less transportable nature of these compounds in the marine environment. Penta- and hexa-chlorobiphenyls were the predominant PCB congeners, accounting for about 70% of the total PCBs. 2,3,7,8-tetrachlorodibenzo-*p*-dioxin equivalents (TEQs) of non- and mono-*ortho* coplanar PCBs in the blubber of cetaceans ranged from 36 (in spinner dolphin from Philippines) to 510 pg/g wet wt (in hump-backed dolphin from Hong Kong). Toxic evaluation of coplanar PCBs using TEQ concept indicates an increasing impact on cetaceans from mid-latitudes. Mono-*ortho* congener IUPAC 118 or non-*ortho* congener IUPAC 126 was estimated to have the greatest toxicity contribution. The estimated TEQ concentrations in the blubber of some cetacean species exceeded the level associated with immunosuppression in harbour seals. In general, spatial distribution of OCs in cetaceans suggests that tropical and sub-tropical region is a major emission source for higher latitudes.

## Monitoring of Organochlorine Pesticides Residues in Green Mussels (*Perna viridis*) from the Coastal Area of Thailand

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The utilization of organochlorine pesticides for pest control has been of great interest because of the contamination of biological organisms by its residues in the environment. Green Mussel (*Perna viridis*) samples were monitored as a bioindicator for the assessment of water quality in coastal waters

along the Gulf of Thailand. Thirty-six samples were collected from 12 stations during 1997–1999 and were analyzed for 26 organochlorine pesticide compounds. This paper focuses on contamination by organochlorine pesticide residues in green mussel (*Perna viridis*) during 1997–1999. The levels of all

organochlorine pesticides compounds detected ranged from 0.1 to 8.3 ng · g<sup>-1</sup> wet weight and recovery varied between 75–95%. The concentration of organochlorine pesticides residues in green mussel were lower than the maximum residue limit

for aquatic animals recommended by the Ministry of Public Health of Thailand. Contamination by organochlorine pesticides residues in this area decreased during 1989 and 1999.

## Water Quality Monitoring Program of Coastal Waters of Manado City, North Sulawesi, Indonesia

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Some parts of coastal waters of North Sulawesi are under pressure, which was escalated from numerous development programs. However, information of water quality for coastal waters is very limited. The most recent study indicates that polluted coastal waters locate around urban areas of Manado City, the capital of North Sulawesi. The major pollutant sources are houses, daily stores, markets, factories, and agriculture in the hinterland.

Another source of pollution is small-scale gold mining activities. About fourteen sites of small-scale gold mining, which use mercury in the gold extraction process, are also widely distributed. The potential effects of mercury from the small-scale gold mining onto human and environmental health were considered by the Natural Resources Management Program and Yayasan Bina Cipta AquaTech as a major threat that requires attentions from the public and government.

The water quality problems in coastal waters of Manado City, which may be a result of system failures or deliberate practice present a very useful case study to show how similarly coastal environmental challenges across the region can be better assessed, mitigated, and controlled in the future. Monitoring a program is required to provide the public and government with descriptive information on the status of

water quality within the coastal waters of Manado City, focusing on contamination pathways of small-scale gold mining, agriculture, and domestic wastes as non-point sources pollutants. Such information will be useful for determining if there are significant water quality changes through time, and for the general policy direction of water quality managements.

The study area to be concerned is the North Sulawesi waters as a whole. But, we will begin by focusing on a limited area of coastal waters of Manado City to allow repeated samplings over a number of years. A sampling area will be broken down into five smaller components which associate with five rivers. About four sampling sites will be positioned within each component to account contamination pathway. Sampling will be conducted at least twice a year to represent condition during dry and wet seasons.

Water and sediment samples will be taken and several important physical and chemical parameters will be measured at each sampling point. Biological samples (fish and mollusk) will also be taken from estuary and coastal area. Parameters to be analyzed in the monitoring program are: pH, DO, COD, Turbidity, Salinity, Suspended Solid, Total N, Total PO<sub>4</sub>, Coliform, Pesticide (Organochlorine), T-Hg, and R-Hg.

## Distribution of Organochlorine Pesticides and PCBs in Surface Sediments of Coastal Korea

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As a part of Mussel Watch Program, distribution of organochlorine pesticides and PCBs in sediments of three coasts and five major bays were investigated. PCB concentrations were in the range of 0.04–199 ng/g dw. Average PCB concentrations were highest in the Pusan Bay. At most of study areas, concentrations of PCBs exceeded the guidelines of EAC (ecotoxicological assessment criteria) suggested by OSPAR. But at only one station in Pusan, PCB concentrations were higher than the ERM level (189 ng/g). At Kwangyang, Ulsan, Kyunggi Bay and the other coastal areas, contamina-

tion levels were lower than ERL. Concentrations of DDT and its metabolites, DDD, DDE ranged from nd to 135 ng/g dw and the highest concentration was detected in the Pusan Bay. DDT compositions (DDT/[DDD+DDE]) were highest in the Ulsan Bay, which means recent usage of DDT. HCH compounds including  $\alpha$ -,  $\beta$ -,  $\gamma$ -isomer were also detected in the range of nd – 7.15 ng/g dw. At the West Coast,  $\beta$ -HCH was higher than the other isomers. On the other hand,  $\gamma$ -HCH was the major isomer at the East Coast. Concentrations of chlor-dane compounds were nd – 3.15 ng/g dw. Oxychlor-dane and