

organochlorine pesticides compounds detected ranged from 0.1 to 8.3 ng · g⁻¹ 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 PO₄, 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 α -, β -, γ -isomer were also detected in the range of nd – 7.15 ng/g dw. At the West Coast, β -HCH was higher than the other isomers. On the other hand, γ -HCH was the major isomer at the East Coast. Concentrations of chlor-dane compounds were nd – 3.15 ng/g dw. Oxychlor-dane and

heptachlor epoxide, and metabolites of chlordane compounds were also detected. DDT concentrations at two stations in the Pusan Bay exceed the ERM level (51.7 ppb) but the contamination levels of other sites were lower than the

guidelines. Lindane concentrations were lower than the ERM level (0.99 ng/g) except four stations of the Pusan and Ulsan Bay.

Degradation of Coastal Habitats and Aquatic Resources in the Upper Bay of Bengal: Is Aquatic Pollution to Blame?

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Discharge of freshwater runoff from many rivers is a dominant factor that influences the dynamics of the coastal and marine ecosystem of Bangladesh. The marine and brackish water environment is threatened by different types of pollutants dumped directly or washed down through a large number of rivers and tributaries throughout the country before emptying into the Bay of Bengal. Reduced flows in a dry season lessen abilities of the Ganges River to dilute and disperse pollutants in drainage from the whole areas including upstream regions in India, Nepal, Bhutan and China. Most of the pollutants are in sediment form, deriving from the municipal and industrial wastes, agrochemical residues and pollutants discharged from ships and boats.

Since the Green Revolution of the late 70's, the use of agrochemicals both inorganic fertilizers and pesticides, has increased by 400%. It has been estimated that about 2000 t/year of pesticide residues are added to coastal waters through rivers at present. More than 900 polluting industries directly or indirectly discharge their untreated liquid and solid wastes into brackish water bodies. The Karnaphuli and the Rupsa-Bhrab rivers, which receive effluents from more than 300 industries in Chittagong and Khulna, are major carriers of in-

dustrial contaminants including Ammonia, Chromium, Mercury, Phenols and DDT. Reports about fish kills as well as mortality of post-larvae and juveniles in nursery grounds are available. The key endangered species that have water-based habitats include crocodiles, turtles, Gangetic dolphins, fish, water birds and otters.

The mangroves are at a point of severe depletion due to over-exploitation by an increasing population and greater demands for forest products. Ecological changes caused by biotic and edaphic factors as well as the horizontal expansions of shrimp farming have further exacerbated the situation. Small-scale and artisan type of fisher folk operating in estuaries and neritic waters have caused overexploitation of shrimp post-larvae, juveniles and pre-adults as well as fin fish to meet the increasing demands of export and a burgeoning population.

Flood control dykes and river dams have also affected the marine ecosystem. Overall ecological degradation reduced tidal plains and damages to the habitual nursery grounds as well as the natural fishery stocks have been immediate results. The consequences of pollution and the long-term effects on sea level rise by the global greenhouse effects are serious concerns in the near future.

Biogeochemical Circulation of C–N–P in the Ocean and the Environment

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International Geosphere-Biosphere Programme (IGBP) was started in 1988 as one of the world-wide projects in the field of environmental problems under the organization of the International Council of Scientific Unions (ICSU). Prior to this, the two projects were launched, which are; SCOPE (Scientific Committee on Problems of the Environment) in

ICSU; and MAB (Man and the Biosphere) in UNESCO.

Biogeochemistry has been emphasized as the leading discipline particularly in IGBP, and therefore, the global distribution and circulation of chemical elements including nutrients have been investigated from the viewpoint of geochemistry.