

## **D-2 Evaluation of Material Circulation and the Biological Uptake and Accumulation of Pollutants in Marine Ecosystems**

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**Total Budget for FY1990-FY1994** 318,443,000 Yen (FY1994; 74,473,000 Yen)

**Key Words** Marine Pollution, Monitoring System, Organotin, Heavy Metals, Chlorinated Organic Compounds, Bioaccumulation

Marine pollutants due to hazardous wastes and chemical substances are liable to be accumulated in marine ecosystems and finally cause a serious effect to human life. It is important, therefore, to evaluate the material circulation and the biological accumulation of the pollutants in marine ecosystems. The purpose of this project is to develop the analytical and monitoring methods of marine ecosystems and to clarify the mechanism of accumulation to the sediments and marine mammals. The following results were obtained:

- 1) To clarify emission sources of marine pollutants, fingure printing methods using lead isotope ratio or isomeric pattern of organochlorine compounds were developed. The lead isotope ratio in the coastal seawater samples is thought to be influenced by industrial activities. The isomer patterns turned out to be specific to each emission source. The major source of PCN in the industrial area was regarded to be technical products. More than two hundred marine bottom surface and core sediments collected from the southeastern coastal margin of the Sea of Japan were analyzed for heavy metals. Mercury, Pb and Zn are through to be a result of recent environmental pollutions. By analyzing organic halogens, the sediment in coastal areas was found to be highly influenced by human activities.
- 2) Thirty-seven elements in Zooplankton, fry and pelagic eggs were analyzed. A selective HNO<sub>3</sub>-digestion method was used for discriminating the inorganic impurities incorporated in organs. Bay planktons were more contaminated than open-sea planktons. By comparing the slopes of the MKT-plots, bioaccumulation of heavy metals from zooplankton to fry and from fry to pelagic eggs was thought to occur through the marine food-chain.
- 3) Pollution status of northern fur seals and sea turtles by heavy metals and of sea birds by plastic pellets were examined. A monitoring method using northern fur seals hair was developed for heavy metals in wild animals without kill. Toxic contaminants such as organochlorines and heavy metals are more highly concentrated in marine mammal tissue by power of three to seven compared with seawater level. Butyltin compounds were detected in almost all the animals, indicating the worldwide dispersion. A prominent contamination of organochlorines was found in tropical regions and a very slow declining trend of contamination in the marine environment was elucidated.
- 4) About 30 species of squids around the Japan and from the world oceans, the concentrations of organotin compounds, artificial radionuclides, heavy metals and PAHs in livers were determined. The concentrations of these pollutants were higher in northern hemisphere than in the southern hemisphere, and the highest near the Japanese coast. Bioaccumulation factor for TBT, PCB and Co was estimated to be about 10<sup>4-5</sup> and that for Ag was about 10<sup>7</sup>.