

## D-2 Studies on Movements of Hazardous Chemicals in East-Asian Seas (Final Report)

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**Total Budget for FY1995 - FY1997** 102,096,000Yen (FY1997; 35,784,000Yen)

**Key Words** Hazardous Chemicals, East-Asian Seas, Spatial distribution, Bioaccumulation, , East China Sea

The objective of this research project is to clarify the seasonal and spatial distribution, chemodynamics, and bioaccumulation of hazardous chemicals in East Asian seas.

The results of this study are as follows.

(1) A continuous-extraction sampling system [MJM2] for hazardous chemicals was developed and set up on a ferry (Kurosiwo). The extraction rate of this system was over 90% and the detection limit in 50 L of extracted seawater was about 10  $\text{pgL}^{-1}$ . [MJM3] Hazardous chemicals were collected by solid-phase extraction and analyzed by the GC/MS-SIM method. Using this system on the ferry route from Osaka to Naha, we determined the levels of hazardous chemicals, such as trans-chlordane, which varied from the detection limit to 30  $\text{pgL}^{-1}$ , and  $\alpha$ -HCH and  $\beta$ -HCH, which ranged from 30 to 400  $\text{pgL}^{-1}$ . The spatial distribution of  $\beta$ -HCH was similar in all observations, while that of  $\alpha$ -HCH varied with weather conditions.

(2) Organohalogen and organotin compounds in seawater were measured to clarify the occurrence and behavior of these hazardous substances in East Asian seas. We developed a combination of GC and ICP-MS for the determination of organotins, in which the detection limit was improved by a factor of 100 [rw4]. The concentrations of organotins in the dissolved fraction were found to increase in the order: tri-<di-<mono-butyltin. Vertical profiles and isomer patterns of PCBs were determined. Principle component analysis indicated that PCB contamination in deepwater layers might have a different origin from that in the surface layer.

(3) The bioaccumulation of dioxins, coplanar-PCB and organotins through the food chain was studied by field survey and by rearing experiments using polychaetes. The results showed that TPT and coplanar-PCB were accumulated through the food chain, and that hazardous chemicals with large biomagnification factors were concentrated in higher trophic level organisms through the benthic food chain.

(4) The distribution of hazardous chemicals in the surface waters of the East China Sea was studied using a newly-designed sampling device. Several hazardous chemicals, such as HCHs, chlordane and nonachlore, were detected in seawater with this device. The level of HCHs showed a systematic increase from the continental slope towards the central shelf. There was a negative correlation between the surface concentration of HCHs and surface salinity in the East China Sea.

(5) An information infrastructure on hazardous chemicals was developed; in which we archived various monitoring and survey data, and relevant information on the East China Sea and its neighboring areas where pollution is increasing rapidly. A geographical information system (GIS) was developed for this purpose using ArcView3 and a digital map. Existing data, such as monitoring data of GEMS and food-residue data from prefectural public health laboratories, were mapped on digital maps and presented on our WWW pages.