## D-2.4 Study of Organic Pollutants using A Newly Developed Sampling System in the East China Sea

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**Abstract**

Distribution of organic pollutants in the surface water of the East China Sea was studied using a newly-designed sampling device during May, 1996 and July-August, 1997. As a result, several harmful materials such as hexachlorocyclohexane (HCHs), chlordane and nonachlore were detected in the sea water. Although the concentration of the organic pollutants was low in our sampling area (central shelf to the continental slope area), HCHs showed a systematic increase from the continental slope (Kuroshio water) towards the central shelf (Continental Shelf Water indicated by having low salinity). This suggests that the river discharge was one of the sources of the organic pollutants in the East China Sea.

**Key words :** East China Sea, Organic Pollutants, Clean Sampling System, Water Type

### Introduction

The East China Sea is characterized by its receipt of a large volume of materials from two large rivers, the Changjiang and the Yellow River, and the influence of the Kuroshio Current. Examining the source of supply and behavior of hazardous chemical pollutants are essential for preserving environmental conditions of the East China Sea. However there was lack of observational data on hazardous chemicals in sea water, because the concentration of pollutants were usually very low. The objective of this study is to develop an extraction sampling system and to determine the distribution of hazardous chemical in the East China Sea.

### Method

A newly-designed extraction sampling system of hazardous chemical with a polyurethane form solid phase extraction method was tested on *R/V Yoko-Maru* of the Seikai National Fisheries Research Institute to confirm the usefulness of our device for detecting pollutants in sea water (fig. 1). Concentrations of pollutants in the surface water, together with the temperature and salinity were measured on the F-line and at Stn. b during May 18-19, 1996 and at the a, F, 9, 10' and 12 lines during July 28 - Aug. 4, 1997 in the East China Sea (fig. 2). Total volume and flow rate of samples were 100 L (2 L/min.) in May, 1996 and 50 L (1 L/min.) in July - Aug., 1997. Hazardous chemicals are analyzed by the GCMS-SIM method.

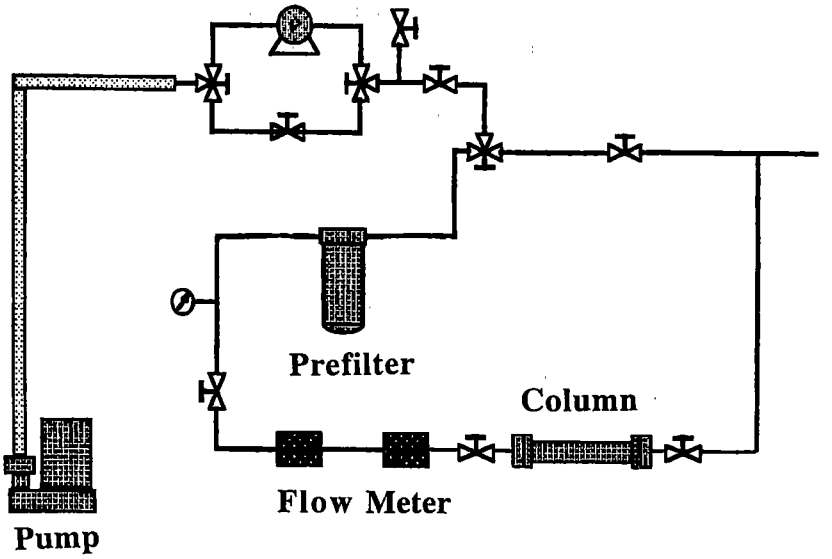


Fig. 1 Schematic diagram of the extraction sampling system.

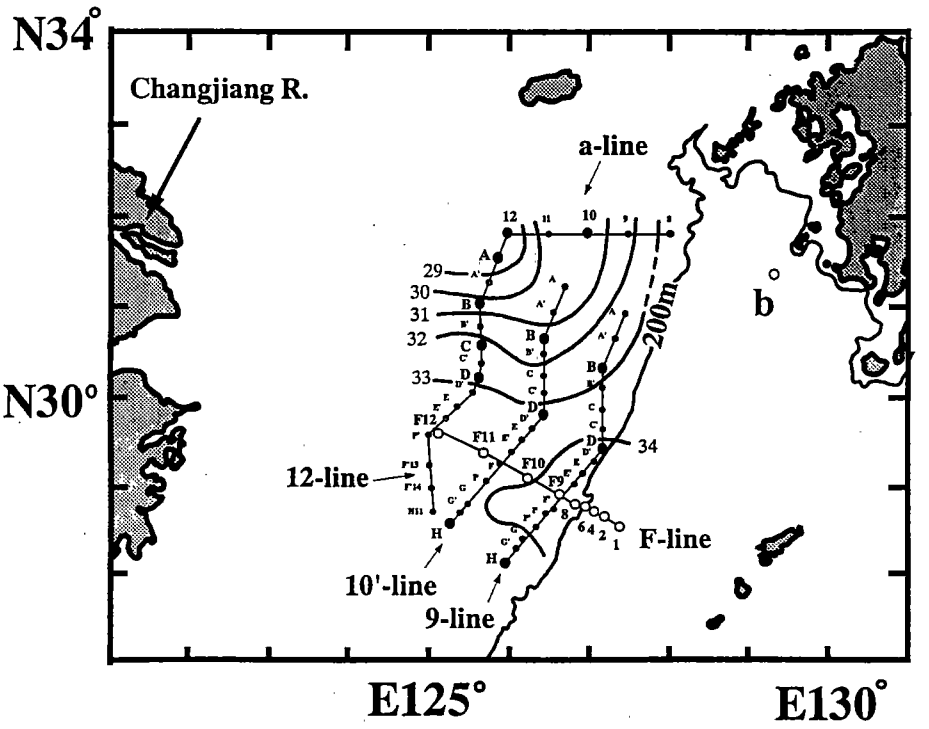


Fig. 2 Locations of the sampling sites in the East China Sea.
(Distribution of surface salinity in July-Aug., 1997 is also shown.)

**Results and Discussion**

In a field, we connected 2 columns in series and calculated the recovery rate of our system. The recovery rate was over 90 % and this suggests that our device is effective for detecting pollutants in sea water.

More than 30 samples of surface water were collected in the East China Sea from the continental shelf to the Okinawa Trough. Organic halide chemicals such as hexachlorocyclohexane (HCHs), chlordane and nonachlore were detected in all samples. In May, 1996, although the concentrations were lowest off Kyushu (stn. b), 20～70 pg/L level of HCHs were determined in all the samples. However the concentrations of chlordane and nonachlore were almost at the detection limit of this system (Fig. 3). In July-Aug., 1997, about a one order magnitude higher level of HCHs ( $\alpha$ -HCH of 12～144 pg/L, $\beta$ -HCH of 65～458 pg/L and $\gamma$ -HCH of 9～89 pg/L) than in May, 1996 were determined on the continental shelf and high concentrations of chlordane (trans-chlordane of 5～52 pg/L and cis-chlordane of 3～30 pg/L) and nonachlore (trans-nonachlore of 4～35 pg/L and cis-nonachlore of 1～13 pg/L) were also determined (Fig. 4).

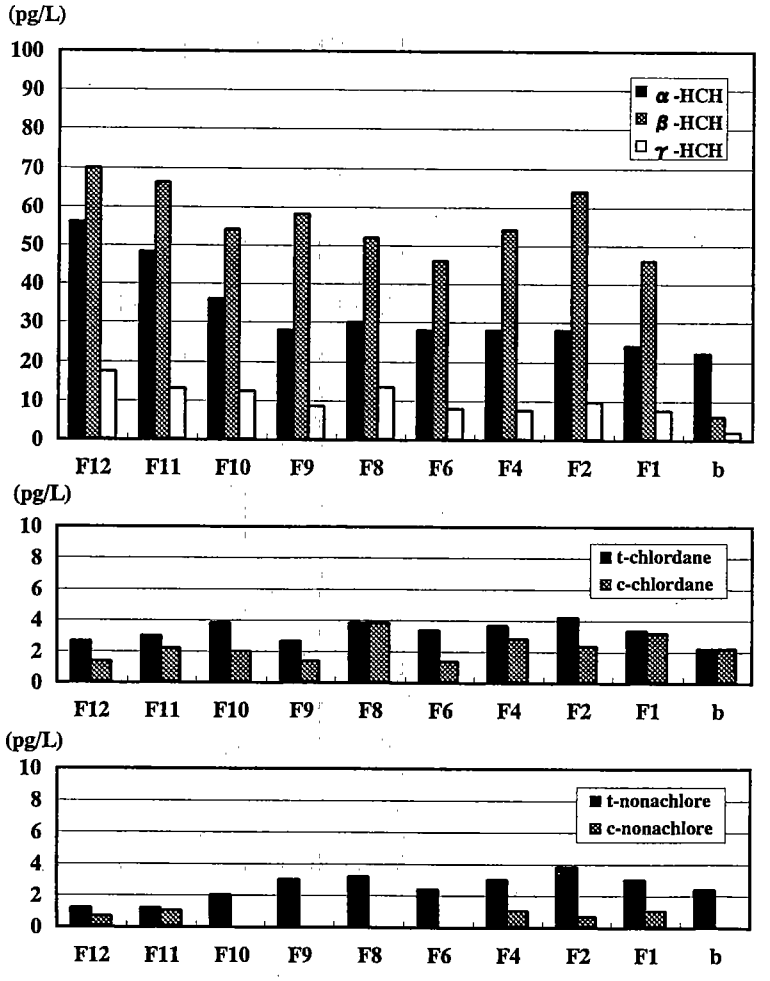


Fig. 3 Organic halide chemicals in the surface water in May, 1996.

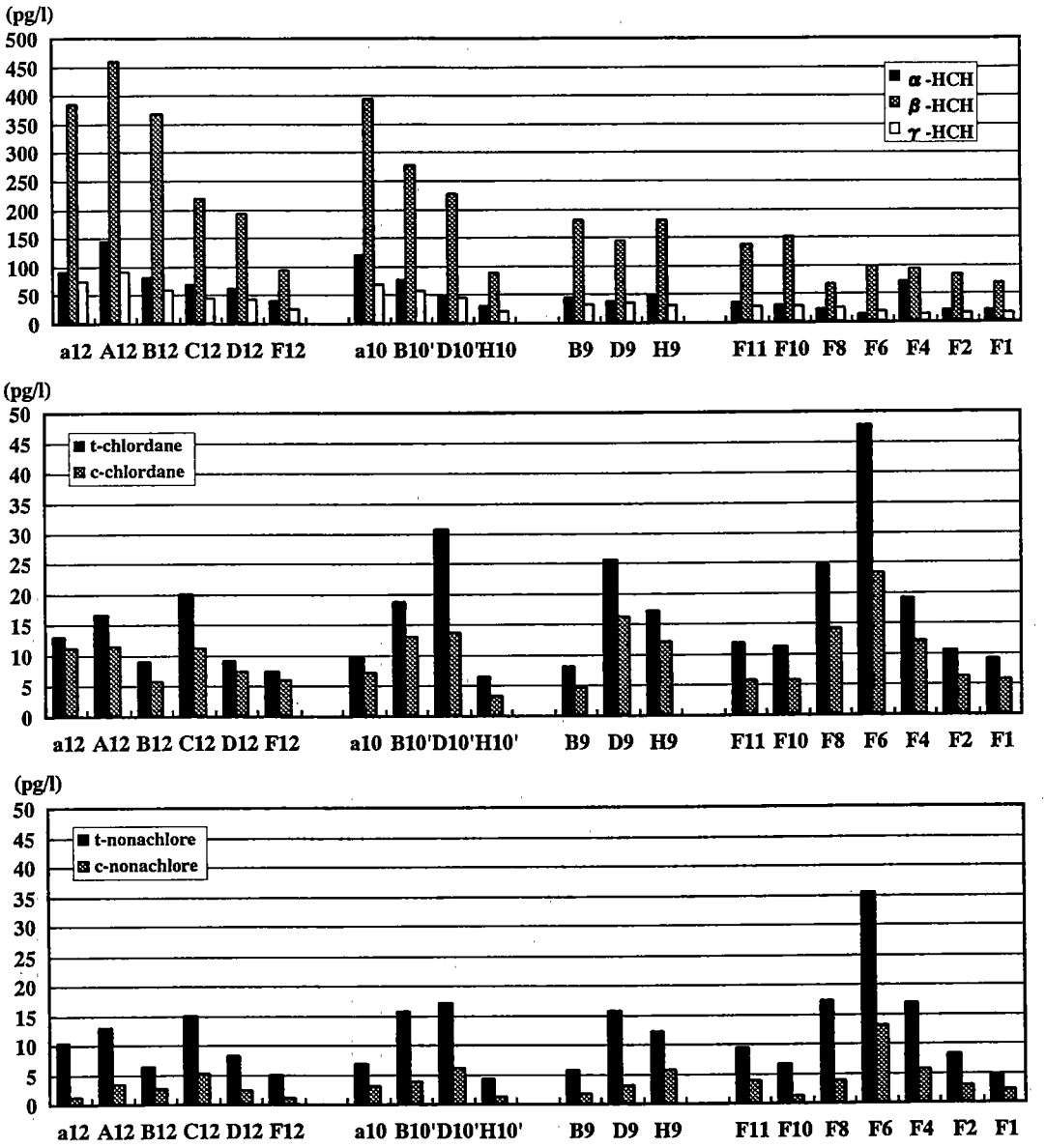


Fig. 4 Organic halide chemicals in the surface water in July-Aug., 1997.

The concentration of HCHs was highest in the low salinity water (<28.6 PSU) around the north-eastern part of our observation area in July-Aug. 1997. Although the distribution patterns of pollutants were complex, concentration of HCHs increase from the continental slope (Kuroshio water) towards the central shelf (Continental Shelf Water indicated by having low salinity) and became highest in the area offshore of Changjiang (about 400 km east from the Changjiang river mouth). Fig. 5 shows the relationships between HCHs and salinity in the surface water during July-Aug. 1997.

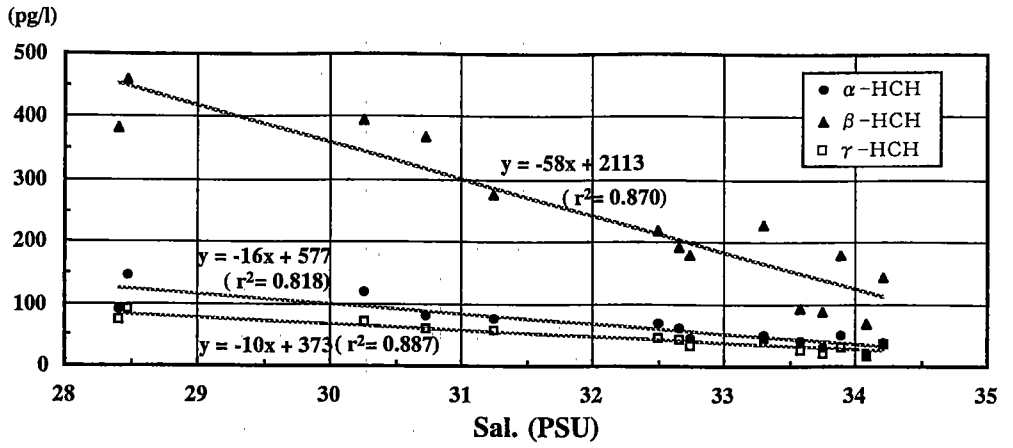


Fig. 5 Relationships between HCHs and the salinity in the surface water in July-Aug., 1997.

As a result, there was a negative correlation between the surface concentration of HCHs and the surface salinity in the East China Sea. The content of each isomer during July-Aug. 1997, were 19±6 % of α-HCH, 68±5 % of β-HCH and 13± 3 % of γ-HCH, respectively. β-HCH were more abundant than other isomers, because of the melting point of each isomer is 158℃, 312℃ and 113℃, respectively. β-HCH generally remain in aqueous solution. In fresh water β-HCH remain more than other isomers. This implies that the HCHs were supplied from the Changjiang fresh water and were washed out into the continental shelf area. The spatial distribution patterns of HCHs were not so different between two observation periods. The concentrations of β-HCH at F10-F12 during July-Aug. 1997, however, were more than twice that of in May 1996. Because the peak discharge from the Changjiang usually occurs from late June to August[1], the organic pollutants transported by the river water probably increased in summer and have much effect on our observation area.

Further, although the concentrations of chlordane and nonachlore were higher during July-Aug. 1997, the spatial distribution was shown to be random and we could not clarify any special trends. We clearly need to samples this area further.

## References

1) Beardsley, R. C., R. Limeburner, H. Yu and G. A. Cannon (1985) Discharge of the Changjiang (Yangtze River) into the East China Sea. *Continental Shelf Res.*, **4**, 57-76.