

Monitoring of Persistent Organic Contaminants in Sediments along the Pearl River Delta, China

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Abstract

The Pearl River Delta (PRD), which covers an area of 41 000 km² with a population of 42 million, is the largest estuary in southern China. Rapid increases in industrialization and urbanization since the 1980s have resulted in excessive release of pollutants into the estuary. Persistent organic pollutants such as PCB, PAH, OC pesticides are of great concern due to their occurrence in high concentrations even in remote locations. Some of these compounds are known to have endocrine disrupting effects that can interfere with the reproductive cycles of humans and wildlife. In order to identify the pollution sources within the PRD, it is necessary to elucidate the distribution of pollutants in various environmental compartments. The determination of concentrations of these compounds in sediments will help in understanding the extent of contamination and the accumulation characteristics of the PRD aquatic ecosystem. In the present study, sediment samples were collected from 16 locations within the PRD region, and analyzed for PCBs, PAHs and OC pesticides.

Keywords: Pearl River Delta; Polychlorinated biphenyls; Polycyclic aromatic hydrocarbons; Organochlorines; Petroleum hydrocarbons; Sediments

The Pearl River Delta (PRD) covers a land area of 41 000 km², has a population of 42 million and is the fastest developing region in the world. The rapid increase in industry, agriculture, municipal development, chemical use and the population has led to pollution. A wide variety of contaminants enter and threaten the coastal environment. Persistent organic pollutants such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), organochlorine (OC) pesticides and petroleum hydrocarbons (PHCs) occur in high concentrations and are, therefore, of particular concern (Fu et al., 2001; 2003). Some of these compounds are endocrine disrupters that interfere with reproduction. In order to identify the pollution sources within the PRD, it is necessary to elucidate the distribution of pollutants in various environmental

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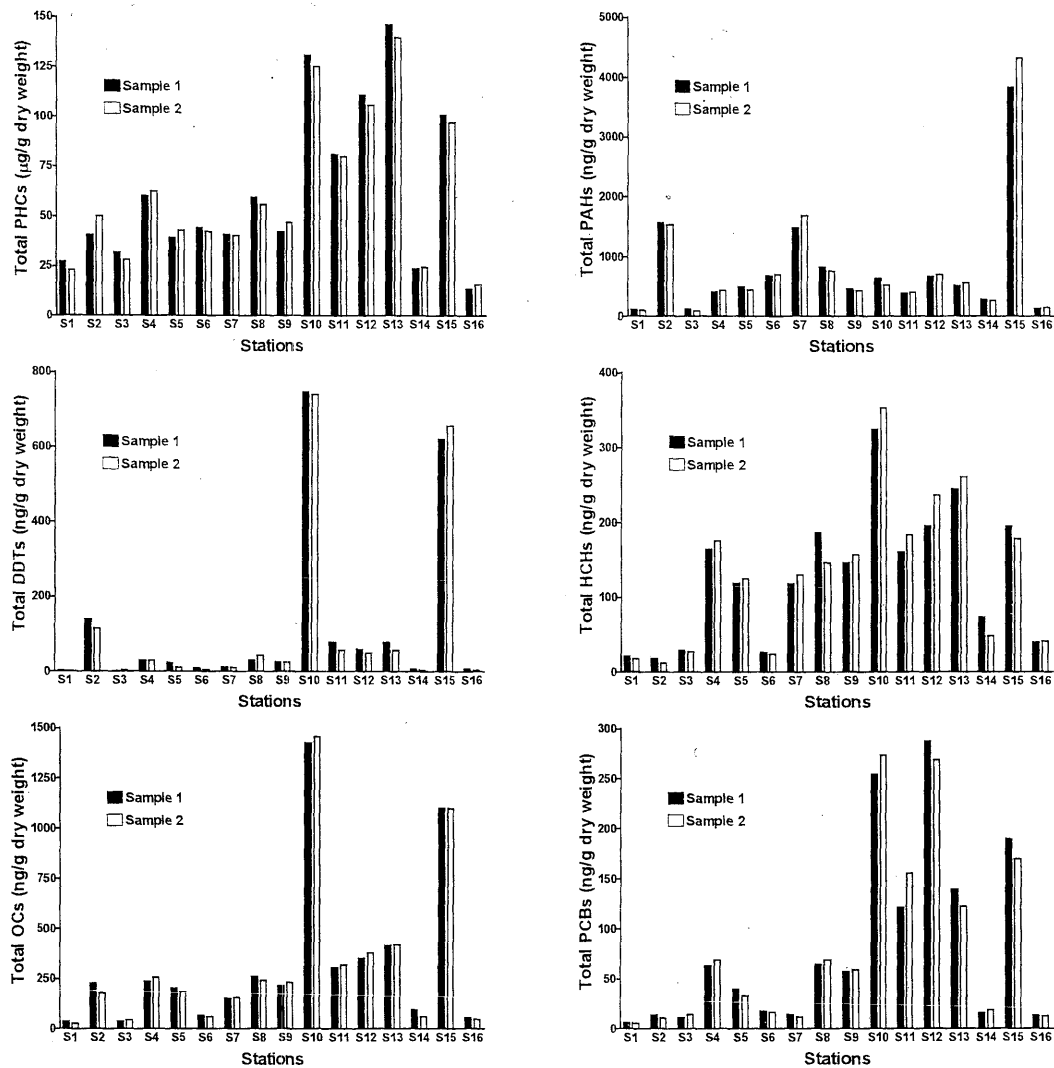


Fig. 2. Concentrations of contaminants in sediments collected in the PRD.

In summary, relatively high concentrations of persistent organic pollutants (POPs) were detected in sediments within the PRD region. The main sources are believed to be the discharges of industrial, domestic and agricultural wastes from Zhujiang River and Shiziyang River. The transport of POPs within PRD is heavily influenced by local runoff and the seasonal discharge from the Pearl River. Further studies should focus on identifying sources of these contaminants.

References

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compartments. The determination of concentrations of these compounds in sediments will help in understanding the extent of contamination and the accumulation characteristics. In the present study, sediment samples were collected from 16 locations within the PRD region (Fig. 1). Samples were analyzed for PHCs by GC-FID, PAHs by GC-MSD, and PCBs and OC pesticides by GC-ECD.

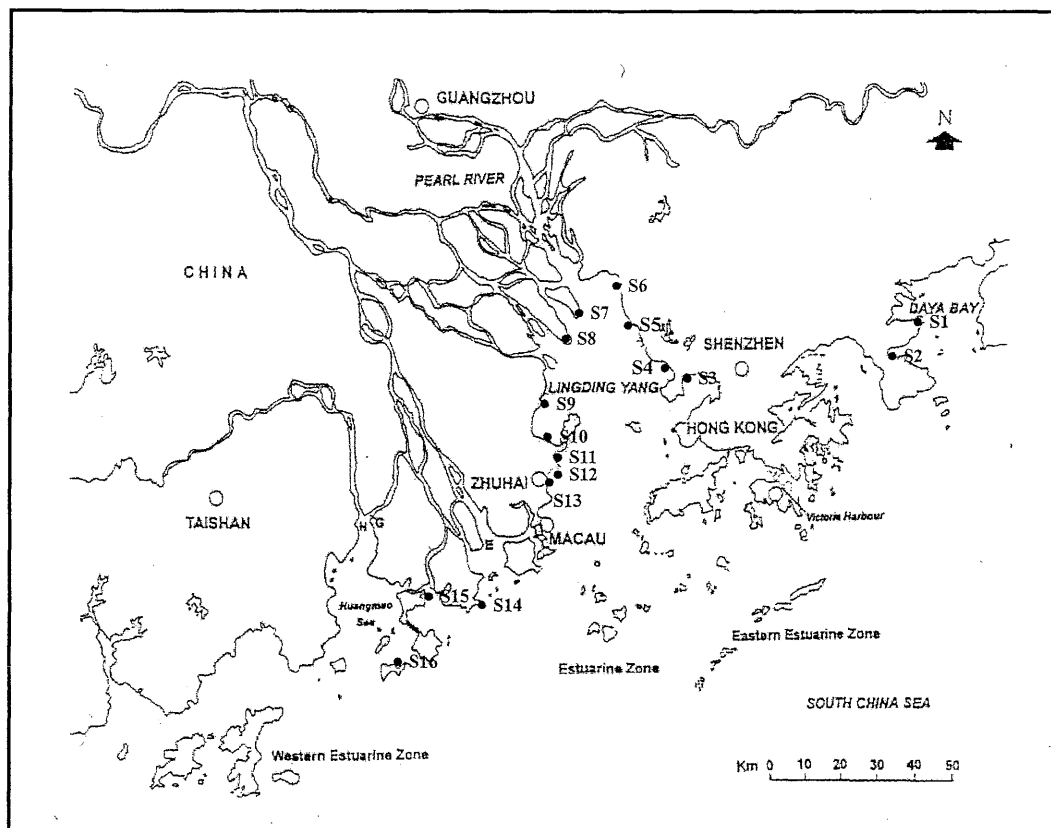


Fig. 1. Map of the PRD showing sediment sampling sites.

Sediment samples collected from the PRD were contaminated with varying concentrations of persistent organic compounds. Among the sampling stations, S10 and S15 were most contaminated (Fig. 2). These results indicate the presence of serious pollution sources in these areas. Although the production and usage of DDT have been officially halted in China since 1983, the conversion of agricultural lands to commercial uses may have accelerated the remobilization of buried OC pesticides, thereby, accounting for the high concentrations of DDT at S10 and S15. The major sources of PAHs in S15 were of petrogenic origin. Sediments from S13 (Fig. 2) contained the highest concentrations of total PHCs. This may be the result of heavy sea traffic between Macau and Hong Kong.

Levels of dioxin-like compounds in the sediment samples were also evaluated by luciferase *in vitro* cell bioassay using the H4IIE rat hepatoma cell line system. Levels of dioxin-like activities were generally low, and the spatial patterns were consistent with those exhibited by PAHs and OCs.