

The Influence of River on Cd Contents in Jiaozhou Bay

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Abstract: Based on the investigation data on Cd in Jiaozhou Bay in May, July and November 1987, this analyzed the contents, distributions, pollution levels and sources of Cd. Results showed that Cd contents were 0.07–0.68 $\mu\text{g L}^{-1}$, and were meeting Grade I in according to National Standard of China for Seawater Quality (GB3097–1997), indicated that this bay had not been heavily polluted by Cd in 1987. River was the unique Cd source, whose source strengths were 0.12–0.68 $\mu\text{g L}^{-1}$. In generally, Cd's pollution level in the inflow rivers of Jiaozhou Bay was very low in 1987, and the influence of rivers on Cd contents in this bay was still very weak in 1987.

Keywords: Cd, Contents, Distributions, Sources, River, Jiaozhou Bay

1. INTRODUCTION

Cd is one of the heavy metal widely used in industry, agriculture and everyday life, and is also one of the critical heavy metal due to the high toxicity. A large amount of Cd-containing wastes were generated and discharged to rivers, and marine bays since ocean is the sink of various pollutants. Hence, it is necessary to understanding the distribution, pollution level and sources of Cd in the marine environment.

Jiaozhou Bay is a semi-closed bay located in Shandong Province, eastern China, and has been polluted by various pollutants including Cd [1-6]. Based on the investigation data on Cd in Jiaozhou Bay in May, July and November 1987 in Jiaozhou Bay, the aim of this paper was to analysis the content, pollution level, and sources of Cd, and to provide basis for the research and pollution control countermeasures.

2. MATERIAL AND METHOD

2.1 Study area

Jiaozhou Bay is located in the south of Shandong Province, eastern China ($35^{\circ}55'-36^{\circ}18' N$, $120^{\circ}04'-120^{\circ}23' E$), with the total area and average water depth of 446 km^2 and 7 m , respectively. This bay is a typical of semi-closed bay connected to the Yellow Sea in the south, with a bay mouth with of 3 km . There are a dozen of rivers including Dagu River, Haibo River, Licun River and Loushan River etc., all of which are seasonal rivers [11-12].

2.2 Data collection

The investigation on Cd in surface waters in Jiaozhou Bay was carried on in May, July and November 1987 in three investigation sites (i.e., 2031, 2032, 2033, 2034, 2035, 2047) (Fig. 1). Cd in waters was sampled and monitored follow by National Specification for Marine Monitoring [13].

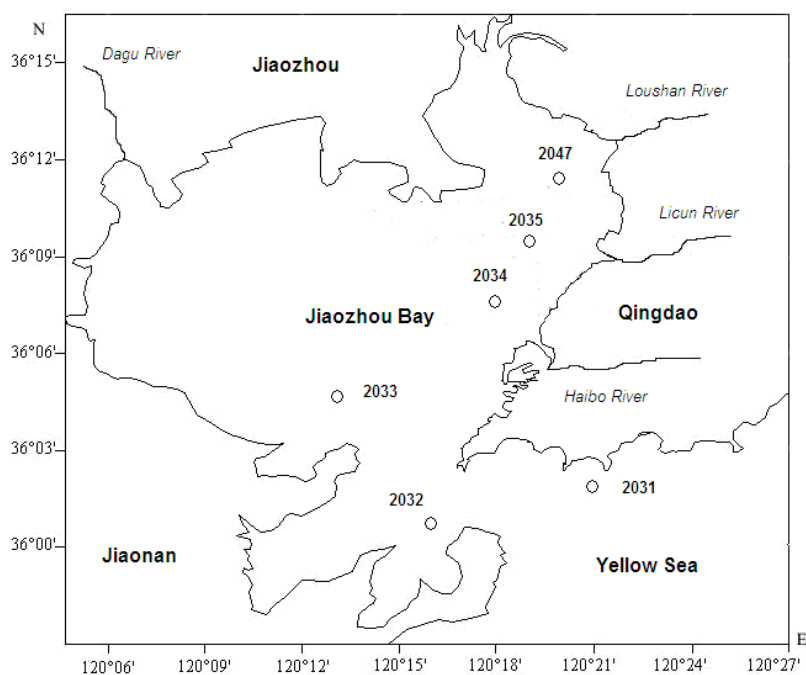


Fig.1 Geographic location and sampling sites of Jiaozhou Bay

3. RESULTS

3.1 Contents of Pb

Cd contents in surface waters in Jiaozhou Bay in May, July and November 1987 were $0.09-0.68 \mu\text{g L}^{-1}$, $0.08 \mu\text{g L}^{-1}$ and $0.07-0.12 \mu\text{g L}^{-1}$, respectively (Table 1). In according to National

Standard of China for Seawater Quality (GB3097-1997), Cd contents were meeting Grade I ($1.00 \mu\text{g L}^{-1}$).

Table 1 The pollution level of Cd in Jiaozhou bay in May, July and November 1987

	May	July	November
Content / $\mu\text{g L}^{-1}$	0.09—0.68	0.08	0.07—0.12
Grade	I	I	I

3.2 Distributions of Pb

In May 1987, high value of Cd contents were occurred in Site 2035 in the estuary of Licun River in the northeast of the bay ($0.68 \mu\text{g L}^{-1}$), and there was a high value region around Site 2035. The contour lines were forming a series of semi-concentric circles that decreasing from the high value center to the bay mouth ($0.09 \mu\text{g L}^{-1}$). In November 1987, high value of Cd contents were occurred in Site 2034 in the estuary of Haibo River in the northeast of the bay ($0.12 \mu\text{g L}^{-1}$), and there was a high value region around Site 2034. The contour lines were forming a series of parallel lines that decreasing from the high value center to the estuary of Loushan River ($0.08 \mu\text{g L}^{-1}$) (Fig. 2).



Fig. 2 Horizontal distributions of Cd in Jiaozhou Bay in November 1987/ $\mu\text{g L}^{-1}$

4. DISCUSSION

4.1 Pollution level of Cd

In May 1987, highest Cd content ($0.68 \mu\text{g L}^{-1}$) was in the estuary of Licun River, while in other regions Cd contents were very low ($0.09 \mu\text{g L}^{-1}$). In July 1987, Cd contents were very low in all of the study area ($0.08 \mu\text{g L}^{-1}$). In November 1987, highest Cd content ($0.12 \mu\text{g L}^{-1}$) was in the estuary of Haibo River, while in other regions Cd contents were very low ($0.07 \mu\text{g L}^{-1}$). Cd contents in different sampling sites and months were $0.07\text{--}0.68 \mu\text{g L}^{-1}$, and were meeting Grade I in according to National Standard of China for Seawater Quality (GB3097—1997), indicated that this bay had not been heavily polluted by Cd in 1987.

4.2 Sources of Pb

In May 1987, high value of Cd contents were occurred in the estuary of Licun River in the northeast of the bay, and Cd contents were decreasing along with the flow direction of Licun River, indicated that river was the unique Cd source, and the source strength was $0.68 \mu\text{g L}^{-1}$. In November 1987, high value of Cd contents were occurred in the estuary of Haibo River, and Cd contents were also decreasing along with the flow direction of Licun River, indicated that river was the unique Cd source, and the source strength was $0.12 \mu\text{g L}^{-1}$. Hence, it could be defined that river was the unique source of Cd, and the source strength was $0.12\text{--}0.68 \mu\text{g L}^{-1}$. In generally, Cd's pollution level in the Inflow Rivers of Jiaozhou Bay was very low in 1987, and the influence of rivers on Cd contents in this bay was still very weak in 1987.

5. CONCLUSION

Cd contents in surface waters in Jiaozhou Bay in May, July and November 1987 were $0.09\text{--}0.68 \mu\text{g L}^{-1}$, $0.08 \mu\text{g L}^{-1}$ and $0.07\text{--}0.12 \mu\text{g L}^{-1}$, respectively, and were meeting Grade I ($1.00 \mu\text{g L}^{-1}$) in National Standard of China for Seawater Quality (GB3097-1997). River was the unique source of Cd, and the source strength was $0.12\text{--}0.68 \mu\text{g L}^{-1}$. Cd's pollution level in the Inflow Rivers of Jiaozhou Bay was very low in 1987, and the influence of rivers on Cd contents in this bay was still very weak in 1987.

ACKNOWLEDGMENTS

This research was sponsored by the China National Natural Science Foundation (31560107), Doctoral Degree Construction Library of Guizhou Nationalities University, Education Ministry's New Century Excellent Talents Supporting Plan (NCET-12-0659) and Research Projects of Guizhou Nationalities University ([2014]02), Research Projects of Guizhou

Province Ministry of Education (KY [2014] 266), Research Projects of Guizhou Province Ministry of Science and Technology (LH [2014] 7376).

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