Impact of sediment resuspension on POM properties in the water column revealed by AA molecular indicators
Hossen Shipan1, Zhuo-Yi Zhu2, Sheikh AftabUddin3, You-You Hao1, Li-Yang Yang4
1 State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200241, China
2 School of Oceanography, Shanghai Jiao Tong University, Shanghai 200030, China
3 Institute of Marine Sciences, University of Chittagong, Chittagong-4331, Bangladesh
4 College of Environment and Safety Engineering, Fuzhou University, Fuzhou, Fujian, PR China

Abstract

The sediment resuspension was significantly higher during October (45%: bivalves harvest) and January (37%: layer harvest) than during July (21%, bivalves culture).

Amino acids molecular indicators were applied to reveal the POM properties and Degradation Index (DI) value in July (0.18 ± 1.27) and DI value during January (-0.92 ± 0.39) and October (-0.90 ± 0.50). This indicates the less degradation of POM in July and more degradation in January and October.

Introduction

Sediment resuspension impact on marine biogeochemistry and ecosystem in the coastal environments.

Shellfish’s culture activities accelerate the sedimentation of particulate matter in water bodies and increase the active organic matter components at the bottom of the sediments.

Under the influence of factors such as natural conditions (such as wind, waves, tides, etc.), human factors (artificial dredging, trawl fishing, shipping, etc.), and biological disturbance (benthos boroholes, etc.), sediments are raised, Re-enter the water body through resuspension, and then the migration and secondary deposition of chemical substances occur (Booth et al., 2000; Jags et al., 1993) before finally burying into deep sediments, this resuspension process may even be repeated many times.

Objectives

1. Examine the changes in the quantity and quality of POM in a typical coastal culture area of shellfish and layer, using a combination of elemental, isotopic, and AA molecular indicators.
2. Assess the influence of sediment resuspension on POM and thus the sustainability of aquaculture. The results would be helpful for a better understanding of the biogeochemical processes and ecosystem sustainability in the coastal environment under intense aquaculture activities.

Materials and Methods

Water samples were collected from Dinghai Bay during January, July, and October, 2020.

The sampling periods in July, October, and January corresponded to representative seasons of the shellfish growing, after the shellfish harvest, and during the layer harvest, respectively.

For measuring POC, 513C, PN, 515N; used elemental analyzer.

Using high performance liquid chromatography to determination of amino acid sample & chlorophyll a. Amino acid base-extracted POM were measured following the method (Fitznar et al., 1999; Kaiser and Benner, 2005)

Using Continuous flow automatic analyzer to determine the nutrient salt samples.

Discussion

In summary, through the survey of three seasons in 2020, we found that Dinghai Bay has stronger on-site productivity in July, which is synchronized with the vigorous growth of shellfish in July.

Based on the analysis of the degradation activity of organic matter, our investigation also shows that the disturbance of the sediment-water system by shellfish farming. But the seasonality of resuspension is mainly in January and October.

In the non-aquaculture season, the organic matter with stronger degradation characteristics has stronger carbon sink characteristics, and may be transported to the sediment or the open sea.

The release and high proportion of ammonia nitrogen in water caused by aquaculture activities is an environmental problem that needs attention.

Results

For any suggestion/query: shipanims@stu.ecnu.edu.cn

References


Conclusions

Acknowledgements

Thank Zhang Zhihao and Fang Futao for helping field work.

Thank omega group and Mr. DF Chen for field work assistance.

Project funding: 项目来自：低氧面上；深水