

Assessing the dynamics of particulate organic matter and potentials of hypoxia formation in oyster farms of Shizugawa Bay

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Hypoxia in bottom water has been a major environmental problem in inner bays. To conserve coastal marine ecosystems, it is necessary to enhance understanding of effects of human activities including aquacultures on material dynamics linking with hypoxia formation. To understand effects of oyster farming on the dynamics of particulate organic matter (POM) and potentials formation of the hypoxia in bottom water, biochemical compositions and oxygen consumption rate of POM were examined in Shizugawa Bay of northeastern Japan. We analyzed POM for carbon and nitrogen stable isotopes and fatty acid markers to evaluate the relative contributions of POM with various spatial and biological origins. The effects of oyster farms were evaluated by comparing compositions of POM between inside and outside oyster farms. Our results showed that in summer the oxygen consumption rate of POM was greater compared with the other seasons and also positively related to the content of algal fatty acid markers. POM derived from algal blooms in spring to summer seasons may be attributable to the higher oxygen consumption rates. Inside the oyster farms, the proportion of algal fatty acid markers was generally lower, and the degradability of suspended POM was considered to be lower. The relationship between bacterial fatty acid markers and oxygen consumption was also weaker in the farms. However, it was found that the POM deposition flux was generally several times greater inside the oyster farms, so the oyster farming possibly lead to accumulation of substantial POM on the bottom sediment and promotes hypoxia formations.

Keywords: oyster farm, phytoplankton, oxygen depletion, fatty acid marker

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