

Organic matter loadings in an aquaculture ground of shellfish

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Summary

Organic matter loadings and dissolved oxygen concentration in bottom waters were examined in an aquaculture ground of shellfish. Field observation was conducted in spring, summer and autumn in Otsuchi Bay, a subarctic ria in the Sanriku coast, where intensive aquaculture of a scallop *Patinopecten yessoensis* and an oyster *Crassostre gigas* was conducted. Sinking flux of organic matter, mainly composed of fecal matter was higher under culture rafts of the oyster than under those of the scallop. The flux under the oyster rafts was $21.6 \text{ mgC m}^{-2} \text{ d}^{-1}$ on average for spring and summer, while that under the scallop rafts was $7.75 \text{ mgC m}^{-2} \text{ d}^{-1}$. The mean flux outside the raft area was $5.75 \text{ mgC m}^{-2} \text{ d}^{-1}$. Oxygen consumption rate of bottom seawater taken under the scallop rafts as determined by dark bottle incubation ranged from 0.26 to $3.07 \text{ mg L}^{-1} \text{ d}^{-1}$ with a mean of $1.49 \text{ mg L}^{-1} \text{ d}^{-1}$. The mean rate implied rapid depletion of dissolved oxygen near the bottom in 5 days. However, *in situ* dissolved oxygen was never exhausted in summer varying between 4.34 and $7.19 \text{ mg L}^{-1} \text{ d}^{-1}$. *In situ* continuous monitoring showed steady but slow decrease in dissolved oxygen in summer at a mean rate of $0.0409 \text{ mg L}^{-1} \text{ d}^{-1}$. The rate suggested it took 160 days to produce anoxic water. These observations indicated continuous supply of dissolved oxygen through water flow along the bottom was considerable and maintained the oxygen field in summer. The continuous monitoring of temperature, salinity and dissolved oxygen showed frequent occurrence of inflow of subsurface water from outside the bay along the bottom. Wind-induced circulation, density current and internal tide were considered to be responsible for the inflow of the outside water along the bottom. Although *in situ* current meters were placed at the entrance of the bay during the field experiment, the instruments are not recovered due to a crash with a fishing boat. They are laid on the bottom. We keep trying to recover the sensors to conduct further analysis on the relationship between oxygen supply and water flow.