

Variety of impacts of the freshwater-derived nutrients on the marine ecosystem

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The discharge of terrestrial freshwater and associated nutrients to coastal areas is considered to increase the growth of planktonic and benthic algae which in turn increases the biomass of filter feeders and the other fishery resources. However, species of the primary producers and their biomass that can receive the positive influence from the freshwater discharge are not consistent depending on many environmental factors: benthic substrate, residence time of the water mass, limiting nutrients, light intensity (turbidity), salinity and existence of dormant cyst etc. Furthermore, the impact from the increased phytoplankton will not be always positive. Some species enhance the growth rate of bivalves and zooplanktons as food sources, but the others damage the growth of the organisms severely by its toxins.

Rapidly grown phytoplankton during rainy season due to nutrient-rich freshwater could also contribute to the formation of the hypoxic water mass. Because organic matters derived from phytoplankton are generally labile components, they are accumulated and decomposed by bacteria under the thermocline in summer. Many studies suggest that the content of silica frustules, sulfur compounds such as dimethylsulfoniopropionate (DMSP) and other compounds varies depending on phytoplankton species and environmental conditions, which means that the decomposition rate and oxygen consumption rate in the water column should vary as well. Although this hypoxic water is known to cause mass mortality of benthic organisms, our recent studies suggest that the anaerobic autotrophic bacterial mat itself can be a potential food source for benthic filter feeders and the other organisms at a higher trophic level.

Therefore, to evaluate the impact of freshwater discharge on the fishery resources, it is important to consider various environmental changes and carefully monitor the marine environments in the long-term.

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