New Experimental Approach to Nitrogen Release from the Marine Sediments

Tamiji Yamamoto*, Osamu Matsuda* and Hidetaka Takeoka**
**Hiroshima University, Japan*
***Ehime University, Japan*

In recent years, load of organic substances from the land into the coastal areas of Japan has decreased by the legal regulation. However, a large bulk of organic matter accumulated on the seabed can be the principal source of nutrient supply for the overlying water column in the eutrophic coastal environments. Therefore, in such marine ecosystem, the contribution of nitrogen flux from the bottom sediment should be revaluated particularly in the viewpoint of material circulation.

Conventional methods to measure the nitrogen release from the bottom sediment were (1) to calculate from the gradient of nutrient concentrations between the interstitial water of the sediment and the overlying water, (2) to obtain from the change in nutrient concentration of the overlying water during the incubation period of sediment core, and (3) to observe the change in nutrient concentration in the chamber (*e.g.* bell jar) settled on the seabed *in situ*. In these conventional methods, water movement above the sediment has not been taken into consideration. In the present study, we measure the nitrogen release using a new theory-oriented experimental system in which the movement of the overlying water is incorporated.

Ammonia-N release measured by the experimental system varied seasonally from 7.21-77.5 mgN m^{-2} d^{-1}, and was highest in summer. Nitrite- plus nitrate-N also showed the maximum release in summer ranging 12.9-97.3 mgN m^{-2} d^{-1}, and which were 1-2 orders higher than the estimated values by the conventional method (1). As for the release of dissolved total nitrogen (DTN), 195-1132 mgN m^{-2} d^{-1} was obtained. The contribution of DTN flux from the bottom sediment is greater than 90 % in the entire loads of nitrogen to the water column of the semi-closed experimental field, Etauchi Bay in the Seto Inland Sea. The results obtained with the new experimental system reveal the importance of physical process, *i.e.* the movement of the overlying water of the sediment, on the nitrogen release mechanism from the bottom sediment, and also emphasize the importance of nitrogen load from the bottom sediment in such the eutrophicated coastal marine ecosystem.