Natural Water-purification System Observed in a Shallow Coastal Lagoon Matsukawa-ura, Japan

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Field surveys and *in situ* experiments have been conducted in a shallow area Matsukawa-ura to evaluate the biological efficiencies of shallow-water areas for use in preserving coastal ecosystems. Matsukawa-ura is a sandy shallow lagoon located in the northeastern part of Fukushima Prefecture, Japan, being ca. 5 km long (north to south) and ca. 1 km wide (east to west). The Uda River flows into this enclosed sea area as a major fresh-water source. Water in the enclosed area is exchanged with that of Pacific Ocean only through a small channel 80 m wide. One inlet and one outlet make the water and nutrient flow of the Matsukawa-ura simple enough to evaluate the natural water-purification function within the area. Bivalves are dominant macrobenthos in sandy shallow areas. The suspension-feeding bivalves increase the sedimentation rate of particulate matter and significantly reduce the plankton biomass. In this context, bivalves can clear the water column in shallow areas. High densities of bivalves not only remove materials from the water column, they also release a large amount of inorganic nutrients back into the water column as excretion. The regeneration of inorganic nitrogen by bivalves re-stimulate primary production of seaweed and phytoplankton. Therefore, we must take the nutrient uptake by seaweed into account to evaluate the natural water-purification function in shallow areas.

In Matsukawa-ura, the suspension-feeding bivalves *Ruditapes philippinarum* and *Crassostrea gigas* were observed as the dominant animals; total biomass (in terms of wet weight) of them were estimated from their distribution pattern in the area to be 2,920 t and 2,341 t, respectively. Contributions of seaweed species in the nitrogen cycle were examined quantitatively by field surveys and *in situ* experiments carried out in Matsukawa-ura. *Ulva pertusa* and *Zostera marina* were the dominant species during the summer season, and their standing crops were estimated to be 291 t and 199 t, respectively in Matsukawa-ura. *Monostroma latissimum* has been cultured in the area during the winter season, and its standing crop was estimated to be 370 t. The DIN (dissolved inorganic nitrogen) uptake rate was determined for *U. pertusa* and *Z. marina* by *in situ* experiments during the summer season. The rate was also determined for *M. latissimum* during the winter season.

An ecological model was calculated based on the observed data set which included a nutrient load from the river and a nutrient exchange through the channel. Calculated results showed that a significant amount of particulate organic matter was removed by the bivalve filtration and that the DIN removal by the seaweeds had a considerable rate to that for the tidal exchange. The natural water-purification system may act as the controlling factor in the material cycles in Matsukawa-ura.