Oral session

STABLE ISOTOPE COMPOSITION OF SEDIMENTARY MATTER: THE RESULT OF SEVERAL ENVIRONMENTAL PROCESSES

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Coastal waters are important as nursery ground for marine organisms and also as filed for aquaculture. The carrying capacity of cultured organisms can be limited by the amount of nutrients or organic materials it can utilize. But coastal marine environments are easily degraded by organic loadings from human activities including aquaculture especially in enclosed waters. Therefore it is necessary to elucidate and control the flux of organic matter for sustainable fisheries and conserve environments in enclosed waters. To analyze sedimentary matter can give us the information of the particulate organic matter (POM), which has significant roles in coastal material circulation. In this study we conducted stable isotope analysis of the sedimentary matter to determine the origin of POM. We emphasize the usability of sulfur isotope analysis adding to traditional carbon and nitrogen isotope analysis.

Sediment traps were deployed approximately once a month, from 2003/12 to 2005/9, at three points (near the margin, 2m in depth; at the center of the bay, 2m and 15m in depth) in Otsuchi Bay, a semi-closed bay of northeastern Japan. There are intensive aquaculture of seaweed (*Undaria*) and bivalves (scallops and oysters) in the bay. δ^{13}C, δ^{15}N andδ^{34}S ratios of sedimentary matter, macroalgae, and terrestrial material (riverine POM and upland vegetation) were measured to determine the sources of sedimentary matter. Upland material showed lower stable isotope value averages (δ^{34}S=-1.5‰, δ^{15}N =1.5‰ and δ^{13}C=-26.1‰) than marine material (δ^{34}S=19.0‰, δ^{15}N =4.8‰ and δ^{13}C=-19.5‰), especially for δ^{34}S. Stable isotope values of sedimentary matter varied seasonally and spatially. High δ^{34}S values (around 19‰) occurred at the center of the bay from spring to early autumn, when in situ data and satellite images have shown high chlorophyll *a* concentration in the water. At the beginning of the bloom, in April for both 2004 and 2005, there was a peak of δ^{13}C values around -18‰, that rapidly decreased in the following months, in both years. Alternation of species, nutrient depletion or change in cellular growth rate are possible explanations. On the other hand, δ^{15}N values were stable around 5.0‰ from April to September in 2004, but oscillated between 3.2‰ to 7.2‰ during the same months in 2005. This could be due to abundant inorganic N in 2004 and scanty in 2005. δ^{34}S values of the same period were lower in 2005, an indication of lower phytoplankton contribution to sedimentary matter, possibly because of nutrient limitation. In late autumn and winter, when phytoplankton was scarce, δ^{34}S values were low (from 9‰ to 14‰). This could be consequence of riverine material input or resuspension of bottom sediments, which should have very lowδ^{34}S values as result of bacterial activity in anoxic conditions. Near the margin, macroalgae was the main responsible for injection of material in sedimentary matter, as higher δ^{15}N and δ^{13}C values compared to the center of the bay suggest. Macroalgal contribution was restless along the year (always high δ^{34}S values, around 19‰), in accordance with macroalgal production that is known to occur year round in Otsuchi bay. However, phytoplankton contribution was big enough to mask that of macroalgae from April to June in 2004, and in April of 2005.

In summary, phytoplankton bloom, its development and limitation by nutrients, macroalgal production, riverine material input and bottom sediment resuspension were all inferred to affect isotopic quality of sedimentary matter. The relative importance of resuspended bottom sediment and direct riverine input should be addressed in a future reserach. Further, the analysis of stable isotope composition of primary consumers is expected to clarify which material is incorporated in the food web, and the possible consequences for coastal aquaculture.