

硫黄同位体比から見る深海冷湧水生物群集の動態

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Pore water samples were collected at the same patch in the largest *Calyptogena* community at the Hatsushima Site, Sagami Bay, Central Japan (34°59.9'N, 139°13.6'E; 1,146 m deep) nearly once a year by *SHINKAI 2000* for 11 years from 1986 to 1996 in order to clarify materials and fluxes which support the active *Calyptogena* community, based on chemical and isotopic compositions of pore water samples. Pore water samples were squeezed at six depths from 0 to 45 cm below the sediment water interface with an *in situ* pore water squeezer for a submersible (ISPS-S) from the same patch till 1990. Portions of pore water samples recovered from ISPS-S were stored in a refrigerator after appropriate chemical treatments for later chemical and isotopic analyzes: major cations and anions, nutrients, DIC and its $\delta^{13}\text{C}$ and $\Delta^{14}\text{C}$ values, methane and its $\delta^{13}\text{C}$ value and $\delta^{34}\text{S}$ values of sulfate and hydrogen sulfide. $\delta^{34}\text{S}$ values of gills of *Calyptogena* sampled at each dive were also measured.

In pore water samples collected during Dive 720 (November 26, 1993), sulfate decreased remarkably below 9 cm depth and showed quite low minimum values between ca. 20 and 40 cm depth. Inversely hydrogen sulfide increased remarkably to a maximum value of 13.8 mM at 36 cm depth, and methane increased remarkably from 529 nmol/kg at 0 cm to 125,200 nmol/kg at 36 cm depth and decreased to 6850 nmol/kg at 45 cm depth. These methane concentrations were two to four orders of higher than that in usual deep and bottom waters of Sagami Bay (4-5 nmol/kg). The chemical stoichiometry and quite low $\delta^{13}\text{C}$ value of DIC such as -42 ‰ proved that microbial sulfate reduction using methane as reductant takes place quite actively at ca. 20 - 40 cm depth just beneath the living giant clams. The $\delta^{13}\text{C}$ values of methane increased from -82 ‰ at 0 cm depth to -68 ‰ at 45 cm depth. Such low $\delta^{13}\text{C}$ values indicate that the methane is microbial origin. The quite low $\Delta^{14}\text{C}$ value of DIC (-938 ‰) at 36 cm depth suggests that the methane used for microbial sulfate reduction was very old and might be supplied from the deep layer.

Apparent isotope fractionation factor of sulfur (α') through microbial sulfate reduction in the pore waters has been estimated from the relationship between sulfate concentration and sulfur isotope ratio of pore water sulfate. The sulfur isotope ratio in gills of *Calyptogena* changed reversely to estimated α' value. These results indicate that the activity of the patch of *Calyptogena* at the Hatsushima Site increased from 1986, showed the highest activity in 1993 and after that it decreased.

Reference:

Masuzawa, T., U. Tsunogai and T. Nakatsuka (1998) Variation in the activity of a deep-sea *Calyptogena* community off Hatsushima Island, Sagami Bay, Japan, based on pore water geochemistry. Abstracts of International Workshop on Extreme Marine Environments, 19-22 November 1998, GEOMAR, Keel, Germany, p.34.