Isotopic diagnoses of the clam and the tubeworm from oceanic chemosynthetic communities around Hatsushima, Sagami-Bay, Japan

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Organic matter produced by chemosynthetic microbes in hydrothermal vents or cold seeps mainly sustains chemosynthetic communities. However, photosynthetically produced organic matter from overlying water column potentially contributes to the chemosynthetic communities as carbon source. To evaluate the carbon source of chemosynthetic communities, we determined nitrogen isotopic compositions (d15N) of individual amino acids, Radiocarbon (D14C) and stable carbon isotopic compositions (d13C) of a clam (*Calyptogena sp.*) and a tubewarm (*Alaysia sp.*) collected from a cold seep at Hatsushima Station, Sagami Bay, Japan (35.00'N, 139.15'E, 1162-1172m).

The d15N values of phenylalanine (Phe) in animals are almost equal with that of the base of food chain, while predation increases the d15N of glutamic acid (Glu) by approximately 8.0 per mill (e.g. Chikaraichi et al. 2007). Therefore amino acids d15N of animals can be a useful tool to investigate food web structures. The obtained d15N-Phe of the clam's gill and the tubeworm's body (trophosome), in which chemosynthetic microbes (sulfur-oxidizing bacteria) lived symbiotically, are almost equal with the d15N-Phe of the tissues without symbiont (the clam's adductor muscle and the tubeworm's tube, respectively). In contrast, Glu of the gill and the body are 7.1 per mill and 6.1 per mill depleted in 15N relative to that of the adductor muscle and the tube, respectively. These results suggest that they strongly depend on the organic matter chemosynthetically produced by the symbiotic microbes.

Both D14C and d13C can be utilized as indices of carbon sources and carbon assimilating pathway. This is due to carbon assimilation does not change D14C, whereas each carbon assimilating pathway changes d13C by each value. Masuzawa et al. (1995) reported that vertical profile of D14C and d13C of pore water DIC in sediments in the cold seep around Hatsushima could be explained by mixing between DIC in bottom seawater and DIC from thermogenic methane oxidation. The obtained D14C and d13C of the tissue clam and the tubeworm suggest that DIC in bottom water rather than that from methane oxidation dominates as a carbon source. The results also suggest that their symbiotic microbes use different carbon fixation pathways (maybe the Calvin cycle and the rTCA cycle, respectively).

Chikaraishi et al. (2007) *Mar. Ecol. Prog. Ser.* 342, 85-90.
Masuzawa et al. (1995) *Radiocarbon* 37, 2, 617-627.