Evaluation of nutrient sources of the biological community in the Shinkai Seep Field, Southern Mariana Forearc using C, N and S stable isotopes

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The Shinkai Seep Field (SSF), located in the inner trench slope of the southern Mariana Trench, ~80 km northeast of the Challenger Deep, is a serpentinite-hosted chemosynthesis-based community composed mainly of *Calyptogena* bivalves. It has been considered that the community is supported by the following mechanism; serpentinization of mantle peridotite produces CH_4-rich fluids, and anaerobic oxidation of CH_4 by sulfate-reducing bacteria (SRB) generates H_2S. Then, sulfide-oxidizing bacteria (SOB) oxidize the H_2S in order to obtain energy and produce organic matter (Ohara et al., 2012). However, there have been no geochemical studies on the energy and nutrient sources supporting this community. Therefore, the purpose of this study is to elucidate nutrient sources of the community in SSF using C, N, and S isotope analyses.

Nine animal species and particulate organic matter (POM) obtained around the colony and sediments obtained beneath the colony by *Shinkai* 6500 during YK13-08 cruise were analyzed. The animal samples were used to measure C, N, and S isotopes of their soft tissues, and the POM and sediment samples were measured total organic carbon (TOC) and total nitrogen (TN) and their isotope ratios. Acid volatile sulfide (AVS) was extracted from the sediment samples to measure its concentration and sulfur isotopic ratio.

TOC and AVS concentration increased with decreases in their isotopic ratios, suggesting that SOB produces organic matter using H_2S derived from SRB activity in sediment beneath the colony. Because isotopic ratios of POM are within the range of the common marine phytoplankton, it is thought that the POM was produced within the phobic zone by photosynthesis.

$\delta^{13}C$ value of *Calyptogena* bivalves within the range of a typical chemosynthesis-based animals relying on SOB for a nutrient source, while $\delta^{34}S$ value is approximately equal to that of AVS in the sediment. Thus, the energy source supporting the bivalves is H_2S derived from SRB activity. Also, isotopic composition of the amphipod, polychaete, and anthozoan samples show intermediate values between the POM and sedimentary organic matter, suggesting that the nutrient sources of these organisms are organic matter derived from both photosynthetic and chemosynthetic productions. The sibogrinid has clearly different isotope composition, implying that this organism relies on SOB using the different carbon fixation pathway and/or methanotroph as nutrient sources.

Keywords: isotopic composition

