Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS27-P03 Room:Convention Hall Time:May 19 18:15-19:30

The ecological role of green sulfur bacteria in the chemocline of Lake Suigetsu

Yumi Mori[1*], Ryuji Kondo[1]

[1]Department of Marine bioscience Fukui Prefectural University

Phototrophic sulfur bacteria are characterized by their oxidation of reduced sulfur compounds, which serve as electron donors during carbon fixation and anoxygenic photosynthetic growth in aquatic environments when the anoxic layers containing reduced sulfur compounds are exposed to light. Phototrophic sulfur bacteria often form dense blooms in the oxic-anoxic interfaces of stratified lakes. Furthermore, a high level of carbon fixation was detected at the oxic-anoxic interface in some meromictic lakes, indicating that phototrophic sulfur bacteria contribute significantly to primary production during the anaerobic carbon cycle. However, there is no evidence about in situ CO_2 fixation by phototrophic sulfur bacteria and the importance of CO_2 fixation by phototrophic sulfur bacteria in environment is still speculative. Lake Suigetsu is a meromictic lake, which is characterized by a permanent chemocline at a depth of 3-8 m that separates the oxic low salinity mixolimnion from the anoxic saline sulfidogenic monimolimnion. Green sulfur bacteria dominated at the chemocline of the Lake Suigetsu through the year. In this study, we evaluate the contribution of phototrophic sulfur bacteria to carbon fixation in the Lake Suigetsu.

The identity of active CO_2-fixing bacteria in the chemocline was assessed by DNA-stable isotope probing. The water at the chemocline was incubated with ^{13}C-labelled sodium bicarbonate and under light or dark condition. The community composition of active CO_2-fixing bacteria was revealed by analysis of ^{13}C-labelled DNA fractions. The diversity of 16S rRNA gene was analyzed using clone libraries. And productivity was measured in light or dark conditions by ^{14}C method.

Chemotrophic carbon fixation accounted for about 80% of the carbon fixation rate in the chemocline. This indicates the contribution of chemotrophic bacteria to carbon fixation was larger than phototrophic bacteria in the chemocline. Clone sequences related to sulfide-oxidizing *Thiomicrospira* and sulfur-reducing *Thioreductor* were frequently recovered from ^{13}C-DNA fraction library under dark condition, suggesting that these bacteria assimilate CO_2 using sulfur compounds in the water in the dark. Most of 16S rDNA sequences amplified from ^{13}C-DNA under light condition were related to the genera *Chlorobium*. This indicated green sulfur bacteria assimilate CO_2 in the light. And sulfur-disproportionating *Desulfocapsa* also recovered from ^{13}C-DNA fraction library under light condition. Although *Desulfocapsa* grow chemolithotrophically, clones related to *Desulfocapsa* did not detect from in dark incubation. In light condition, green sulfur bacteria also main bacteria and they accumulate elemental sulfur on its cell surface coupled with photosynthesis. We speculated *Desulfocapsa* use sulfur deposited on green sulfur bacteria as energy source for CO_2 fixation.

This study indicated that green sulfur bacteria fix carbon in the chemocline. And chemolithotrophic bacteria also play a significant role in the anaerobic CO_2 fixation in the chemocline of Lake Suigetsu. Our results suggest new ecological role of green sulfur bacteria serving energy for chemotrophic bacterial CO_2 fixation.

Keywords: meromictic lake, CO2 fixation, green sulfur bacteria, stable isotoping method