Changes of the chemosynthetic communities through the Phanerozoic

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1.Chemosynthetic community

Recently, unique communities characterized by such organisms as vestimentiferan tubeworms and Calyptogena (Bivalvia) have been found near cold seep sites and hydrothermal vent sites around mid-oceanic ridges, trenchs and continental slopes throughout the world's oceans, where the water supplied from hydothermal vents, cold seeps and ground water seeps is rich in sulphide and methane. In fact, their background is closely related with tectonic activity and environmental change on the Earth. These communities have been known to occur from Ordovician to modern marine sediments. It's quite important to know the historical changes of the community structure and their environmental backgrounds as a basis fro researches on the evolution life and the Earth System.

2. Oldest chemosynthetic microbial community

Recent studies of molecular systematics have demonstrated that the bacteria and archaea living near the hydrothermal vents were branched near the root of the universal phylogenetic tree (Woese, 1990; Stetter, 1996). This finding strongly suggests that the first organisms appeared in the hydrothermal conditions. Actually, Rasmussen (2000) found filamentous microbial fossils from 3.2 Ga old hydrothermal vent deposits, indicating that chemosynthetic ecosystem already exist at least 3.2 Ga before the present.

3. Oldest chemosynthetic community

There are a few reports of fossil chemosynthetic communities from the Cambrian deposits that consist of mega benthos, such as trilobites and sponges (Fortey, 2000; Steiner et al., 2001). However, a question still remains for their nature as fossil chemosynthetic communities. Reliable record of oldest mega-chemosynthetic community is a brachiopod dominant community from the Middle Ordovician (Hovland, 1989). The community is colonized and occurs in association with carbonate rocks, as in living chemosynthetic communities.

4. Changes of the chemosynthetic communities through the Phanerozoic

Three main taxa consisting of known fossil mega-chemosynthetic communities are tubeworms, brachiopods and bivalves. Tubeworms commonly occur in the Silurian and younger marine deposits, especially in hydrothermal vent deposits. Brachiopods are the main constituent in the Paleozoic chemosynthetic communities, but they become decline in the Mesozoic and younger fossil communities and never occur in Recent. By contrast, bivalve mollusks become dominant in post Jurassic fossil chemosynthetic communities. Cenozoic to recent are prosperous age for them.

Frequencies of occurrence of fossil chemosynthetic community in each period are probably related with global tectonic events and paleoenvironmental backgrounds. Strength of methane seepage appears to be an important controlliry factor for the distribution and duration of chemosynthetic communities.