

Perspective: The macrofaunal activity effects on the ecosystem at extreme environments

*Robert Jenkins¹

1. School of Natural System, College of Science and Engineering, Kanazawa University

Drastic chemical reactions occurred at extreme environments such as vents, seeps and large organic-falls (e.g. whale-falls and sunken woods). The most of reactions thought to be performed by microbial activities at least at the close proximity of sediment-water interface. It would be true, however, the process will be enhanced by macrofaunal activities. I will demonstrate those macrofaunal activities and its behavior at the extreme environments.

The macrofauna adapted to those environments often have chemosymbiotic bacteria, which usually utilize sulfides and oxygen, for their food (or energy) source. Those macro-organisms have tolerant with high concentrations of hydrogen sulfide and low oxygen level, and thus, the organisms can take the symbiotic microbes to their favorable position (generally the position is equal to the redox boundary). In the case of vent shrimp *Rimicaris*, which have episymbiotic bacteria in their gill chambers, swims just around chimneys with active venting to keep their position to cultivate harboring bacteria.

In addition, the host macro-organisms would maintain the place of reactions, e.g. in their body or burrow, and pumping up/down fluids containing reductants/oxidants to control appropriate amount of chemical species for symbiotic microbes. Infaunal solemyid bivalves make Y-shaped burrow and they have ability to sucked oxygenated sea-water into the sediment and pumping up pore water which contains hydrogen sulfide through their burrow.

In other cases, bone-eating worms, e.g. *Osedax*, and boring bivalves mechanically and/or chemically decompose hard substrates, e.g. bones of whales and sunken wood, and accelerate decay of the large organic carcasses, e.g. whale carcasses, and sunken wood trunk, and create new environments for other organisms.

Some of those macrofaunal activities at the extreme environments have also been found in the fossil record and can be traced back more than 100 million years. However, long-term relationships between macro-organisms and microbes at extreme environments with chemical and physical aspects have been paid a little attention so far.

Keywords: Extreme Environment, Vent, Seep, Invertebrates