Vent Ecology Working Group

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The understanding of vent ecology requires contributions from and interactions among a wide range of biological disciplines as well as chemists, geologists, and physical oceanographers. The current composition of the hydrothermal vent community at a given vent site is the result of very complex interplay among the evolutionary history of the taxa, the present-day interactions among species (symbiosis, predation, competition etc), and the physiological adaptations of each of the species to the challenging environmental conditions encountered at deep-sea hydrothermal vents. The composition of a particular community at a given point within a vent site (at a particular point in time) will reflect all of the above as well as the recent hydrothermal history of that source of vent effluent, potentially stochastic recruitment and predation events, and a variety of other biological interactions that may change during the life of the relatively ephemeral vent communities.

Over the past 30 years most publications on hydrothermal vent fauna have been based on experiments/analyses done on board ship. By far the majority of the later has been done on frozen of fixed material, although a significant minority of these studies has been done on live animals under simulated deep-sea conditions. Very few laboratories in only a few countries have the capability to conduct these types of live animal experiments.

A variety of excellent publications based on in situ observations and measurements have described the patterns of community composition and animal distributions at vents. However determining the processes that produce these patterns require experimental manipulations on the sea floor and these experiments require a significant input of time with expensive submersible assets at sites where the patterns are already well documented. Relatively few manipulative ecological experiments have been done at vents, but we have reached the point in our understanding of these communities that these types of experiments are required to move our science forward.

There are currently only a handful of laboratories around the world that are developing the use of high-throughput molecular approaches (proteomics, genomics, transcriptomics) for the study of vent biology. These approaches are also very costly in development time, equipment and expendable supplies.

A primary goal of the Vent Ecology working group will be to foster cutting edge collaborations and other studies that will contribute to our understanding of the ecology of hydrothermal vents. For example, high throughput molecular analysis of samples from in situ manipulative ecology experiments or ship-board physiological ecology studies would allow one to link gene expression patterns with ecological and or physiological behavior. Expanded collaborations between geologists, chemists and ecologists are necessary to understand the changes in vent communities we see over time at all intensively studied sites and close interactions between the vent ecology and biogeochemical WGs will continue to facilitate this.

The group will also work to encourage and facilitate international collaborations and sharing of samples to maximize the scientific return from the resources available to our community and minimize our collective impact on vent communities. With the number of known sites still increasing, and large expanses of the oceanic ridge system still unexplored, no single research group can hope to visit all new sites or study all taxa, In order to get the most information from valuable samples and data (both for cost and environmental impact considerations), we need to actively facilitate the sharing of samples and open access to data.

We will also encourage and facilitate sharing of collection and monitoring instruments and methodology in order to allow more robust comparisons between studies and meta-analyses of data.. Use of similar collection equipment for community analyses would greatly facilitate understanding of global biogeographic patterns as well as potential links between different types of foundation fauna or substrate types and the species richness and diversity of communities. The development of better instruments to analyze the environmental conditions around metazoan communities in real time and to monitor these conditions over time are essential to our understanding of the abiotic relationships of the taxa with their surroundings. We need to remain proactive in guiding development and use of sensors that will provide the most biologically relevant data. We see this as another areas of significant interaction and synergy with the Biogeochemistry WG.

A final mandate of the Vent Ecology WG will be to provide a wide international expertise base for input on matters relating to environmental issues at vents. The recently released Statement of Responsible Research Practices at Vents was a good start and established IR as a recognized source of input to the International Sea Bed Authority, WWF, and NOAA. With the increased interest in mining of hydrothermal ores, and also the general increase in global awareness of the value of biodiversity and “the existence of the deep sea” it is important that the vent ecology WG provide expertise and support to the IR StCom on these issues.

A Theoretical Institute will be proposed about two years after the beginning of this WG specifically focused on the ecology of hydrothermal vents. Although IR already supports the Hydrothermal Vent and Cold Seep Biology Symposium, this meeting is not focused on Ecology or vents, does not entrain geologists or chemists, and does not include workshops and round-tables that would help us to challenge our assumptions and change the directions of future research.

Because of the international implications of much of the work of this WG, its mandate will include maintaining representation of biologists from many countries in its membership and will thus be larger than other IR WGs. To insure close interaction and share expertise with the biogeochemical interactions WG, the chair of that committee will be an ex-officio member of the Vent Ecology WG.