Letters of Intent: Endeavour
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Fungal biodiversity associated with hydrothermal vents

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Studies of hydrothermal vent ecosystems have resulted in extraordinary insights into biotic systems in environments characterized by lack of light and with high pressures and temperatures. Many of the microbes and invertebrates are unique and endemic to vents. Consequently, there have been great strides in our understanding of biotic chemical cycling, biodiversity, phylogeny and life in "stressed" environments. The important efforts in microbiology, which have centered on prokaryotes and their roles in inorganic cycling, have provided the tools for an examination of another niche in the food web: specifically the role of the fungi, which are heterotrophic eukaryotes.

In terrestrial, nearshore marine and aquatic systems, fungi are major recyclers of organic material and the producers of high protein, vitamin rich biomass that is a primary food source for meiofauna and subsequently to secondary consumers such as large invertebrates, fishes and birds. Significant examples are lignocellulose degradation in terrestrial forests and mangrove leaf decomposition in tropical intertidal environments. Fungi in vent systems are anticipated to have a similar role in vent systems: recycling of 1) organic material formed as a result of prokaryotic activity and 2) large amounts of particulate and dissolved organic material that is swept through the turbulent expelled vent fluids.

Fungi are known to inhabit the deep sea and our studies will be the first to explore fungi in hydrothermal vent systems. Collections will be made at two sites on the Juan de Fuca Ridge: the Endeavor segment and the Axial Volcano. Collections will be from the submersibles Alvin or Jason using standard titanium Major samplers, gas tight samplers and General Oceanics sterile bag samplers. Background collections of surrounding waters will be collected from shipboard hydrocasts using sterile bag samplers. Culturable species will be grown and isolated using growth media and temperatures ambient to the collection sites. Species will be identified with standard phenotypic and molecular techniques. Uncultured populations will be determined through extraction of total genomic DNA, cloning and sequencing methods.

Our primary samples of hydrothermal vent discharge fluids will be obtained from Endeavour and/or 9°50'N EPR through participation on cruises to one or both of these sites in Yr 1 and 2 of the proposed project. Our project will collaborate closely with other IS projects involved with vent fluid geochemical and microbiological sampling and analyses (e.g., the Lutz et al. proposal for 9°50'N EPR). We will also seek supplemental samples from other hydrothermal systems (e.g., Guaymas Basin) on a cruise-of-opportunity basis. Our field requirements are amenable to sailing on an ancillary basis with nearly any manned or unmanned submersible program. Our sample volume requirements are also modest so it should be possible to obtain adequate samples without interfering with other cruise sampling requirements. We are requesting 2 dives to cover the time cost of our sampling. Optimally, these dives would be pooled with other dives on a submersible cruise to promote efficient, shared dives for most effective interdisciplinary sampling.