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Control of Benthic Community Structure in the Deep Sea: Predation at Hydrothermal Vents and Cold Seeps

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Factors structuring shallow-water communities (e.g., physical stress, predation) are likely to be important in structuring deep-sea communities. Biotic mechanisms structuring community zonation upon extant communities have not been experimentally examined in deep-sea chemosynthetic habitats (i.e., hydrothermal vents and cold seeps), though one recent study has examined the effects of predation upon recruiting communities at hydrothermal vents. Both the availability of chemosynthetically derived primary production and physical stress (bottom-up control) determine community structure at vents and seeps, but the influence of predation (top-down control) upon adult mussel-bed communities remains unresolved. Recent work suggests that there may be an influence of predation upon vent communities, but the evidence supporting this assertion is scant. Thus, we propose to conduct manipulative experiments that examine the influence of biotic forces, specifically predation, at deep-sea vents and seeps.

We propose a series of manipulative experiments to be conducted at replicate sites at four locations that each reside in separate biogeographical zones, two deep-sea hydrothermal vent communities (East Pacific Rise, and Mid-Atlantic Ridge), and two cold seep communities (Blake Ridge Diapir and Florida Escarpment). We will use the following methods: (1) a quantitative manipulative caging experiment comparing uncaged, full cage, and partial cage plots using deployment by DSV ALVIN; and (2) a video survey, time-lapse photography, and collection of predators (including gut content analyses) from mussel bed communities. These objectives will address the causal mechanisms producing community zonation within vents and seeps.