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2012, *Oceanography* 25(1):246–255, <http://dx.doi.org/10.5670/oceanog.2012.23>

Energy Transfer Through Food Webs at Hydrothermal Vents: Linking the Lithosphere to the Biosphere

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Abstract

Tectonic and volcanic processes that drive hydrothermal fluid flow and influence its chemistry also regulate the transfer of energy to hydrothermal vent ecosystems. Chemoautotrophic bacteria use the chemical energy generated by mixing the reduced chemicals in hydrothermal fluids with deep-ocean ambient seawater to fix inorganic carbon and produce biomass. These and other microbes, or their products, are then consumed by other organisms, which are subsequently consumed by other organisms. The connections between nutritional sources and consumers form a complex food web that links the lithosphere to the biosphere at hydrothermal vents. This article traces the path of energy transfer from geochemical to biological processes in hydrothermal vent food webs and explores the implications of changes in hydrothermal fluid flux on food web structure. One of the goals of studying food webs at hydrothermal vents is to develop better predictions of community resilience to disturbance and the relationships between community structure and ecosystem function, including productivity and nutrient cycling. In addition, improved understanding of energy transfer through hydrothermal vent food webs is critical for constructing models of chemical fluxes from chemosynthetic-based ecosystems to the open ocean.

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Govenar, B. 2012. Energy transfer through food webs at hydrothermal vents: Linking the lithosphere to the biosphere. *Oceanography* 25(1):246–255, <http://dx.doi.org/10.5670/oceanog.2012.23>.

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