Trophic structure and energy flow in a shallow-water hydrothermal vent, offshore northeastern Taiwan

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Shallow-water hydrothermal vent ecosystems are distinct from the deep-sea counterparts in receiving both chemosynthetic and photosynthetic productions. The contribution of each on trophic structure and energy flow is poorly examined. This study conducts a thorough isotopic analysis across the whole spectrum of biological components, combined with a Bayesian-based isotopic mixing model to disentangle the trophic relationships and quantify the chemoautotrophic energy flow in a shallow-water hydrothermal vent off the Kueishan Island. On the basis of obtained isotopic compositions and isotopic mixing model calculation, zooplankton and epibenthic crustaceans, as the fundamental consumers in this shallow-water hydrothermal ecosystem, assimilated the vent fluid POM by 38% to 51% of their diets. For comparison, the vent obligate crabs *Xenograpsus testudinatus* ingested vent fluid POM (10% to >90%) directly in parallel with crustacean corpses by various proportions. The well overlapped nitrogen isotopic compositions among most macroinvertebrates further suggest a weak prey-predator relationship and low trophic complexity in this system. Overall, this result demonstrated that heterotrophic consumption of vent fluid POM mediates the energy transfer from vent chemoautotrophy to the upper trophic level of the food web. Both chemosynthetic and photosynthetic productions contribute the shallow-water hydrothermal vent ecosystem.