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Abstract

The assessment and comparison of food webs across various hydrothermal vent sites can enhance our understanding of ecological processes involved in the structure and function of biodiversity. The Menez Gwen, Lucky Strike and Rainbow vent fields are located on the Azores triple junction of the Mid-Atlantic Ridge. These fields have distinct depths (from 850 to 2320 m) and geological contexts (basaltic and ultramafic), but share similar faunal assemblages defined by the presence of foundation species that include *Bathymodiolus azoricus*, alvinocarid shrimp and gastropods. We compared the food webs of 13 faunal assemblages at these three sites using carbon and nitrogen stable isotope analyses (SIA). Results showed that photosynthesis-derived organic matter is a negligible basal source for vent food webs, at all depths. The contribution of methanotrophy *versus* autotrophy based on Calvin-Benson-Bassham (CBB) or reductive tricarboxylic acid (rTCA) cycles varied between and within vent fields according to the concentrations of reduced compounds (e.g. CH_4, H_2S). Species that were common to vent fields showed high trophic flexibility, suggesting weak trophic links to the metabolism of chemosynthetic primary producers. At the community level, a comparison of SIA-derived metrics between mussel assemblages from two vent fields (Menez Gwen & Lucky Strike) showed that the functional structure of food webs was highly similar in terms of basal niche diversification, functional specialization and redundancy. Coupling SIA to functional trait approaches included more variability within the analyses, but the functional structures were still highly comparable. These results suggest that despite variable environmental conditions (physico-chemical factors and basal sources) and faunal community structure, functional complexity remained relatively constant among mussel assemblages. This functional similarity may be favoured by the propensity of species to adapt to fluid variations and practise trophic flexibility. Furthermore, the different pools of species

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