Faunal colonization processes on organic and inorganic substrata at the Lucky Strike vent field on the Mid-Atlantic Ridge

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Despite the fragmented nature of hydrothermal vent fields, nascent vent sites are rapidly colonized by a pool of regional species. While succession of larger hydrothermal fauna is relatively well established, we lack information on the associated meiofauna in particular, on nematodes and copepods. The aim of the present study is to investigate the colonization process of organic and inorganic substrata by faunal assemblages deployed at the Eiffel Tower hydrothermal edifice on the Lucky Strike vent field (MAR), at varying distances from visible hydrothermal activity. Abundance and diversity of colonizing organisms are compared between our different pilot experiments (Cuvelier et al. 2014, Zeppilli et al. 2015, Plum et al. 2016, Zeppilli et al. in preparation).

In total, 46 copepod species were found in our substratum experiment, representing a 4-fold increase in copepod diversity in the LS vent field. Overall, the substrata harboured a very heterogeneous community including not only vent specific species but also uncommon copepod taxa that have not been described from vent sites. The community composition on the substrata changed gradually from active to inactive microhabitats along the gradient of temperature and fluid input, with an increasing heterogeneity and appearance of rare and exclusive species with decreasing fluid input. While showing lowest densities, slates exhibited highest copepod diversity across the activity gradient. High densities of juveniles and larval forms confirmed that copepod communities can be well established in a variety of microhabitats and are capable to spend their whole life cycle under extreme conditions.

For the nematodes, inorganic substrata were preferred near the vents, while organic substrata were rapidly colonized in areas not influenced by vent activity. Nematode females dominated almost at all sites while numerous females at the ovigerous stage and juveniles were reported near the vent emissions, suggesting that nematode populations were well reproducing after 9 months. Our data further suggest that inorganic substrata were preferred in the early succession stages, while organic ones required a longer term to be densely colonized. The type of substratum influenced significantly the composition of colonizing nematodes after 9 months, while after two years the structure of nematode communities was rather influenced by hydrothermal activity.

Macrofaunal results are being compiled and will be presented as well. To date, our result tend to suggest that environmental conditions appear to primarily drive community structure on substrata over time while the type of substrata would be secondary in explaining colonization patterns. In addition, the structure of community was significantly influenced by the deployment duration. Overall, this study significantly contributed to increase our knowledge on LS biodiversity and showed the potential of new hard substrata to increase local recruitment. Our future colonization experiments will be used to test some of the hypotheses that were raised and to propose a colonization model.