Food Webs in Deep-Sea Chemosynthetic Ecosystems, the Missing Link between the Structure and Function of Biodiversity

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Food web research unifies the biodiversity and ecosystem function problematics in a unique conceptual framework fostering our understanding of ecological drivers within ecosystems. This research is articulated along two main research axes: the food web topology and the functional structure. The topology of food webs seeks to describe and understand the diversity of primary producers and their contributions to consumer diet, the inter-specific trophic links and the energy flux between trophic groups. The functional complexity is assessed at the scale of communities or populations to quantify the diversity, specialization and redundancy of ecological niches that are defined by environmental conditions as well as trophic and non-trophic interactions. Food web studies of chemosynthetic ecosystems, characterized by unique constituents, proprieties and environments are highly needed in the context of climate change and resource exploitation. To date, our knowledge relies mostly on bulk- stable isotope analyses (SIA) that are powerful tools to discriminate basal sources, trophic levels or even habitat components of species which together define the “realized” trophic niche of species. These methods show several limitations for a fine characterization of the food web topology. Complementary approaches that may overcome these limitations are still scarcely used and need validation within these ecosystems. While the study of functional complexity in chemosynthetic ecosystems is in its infancy, recent studies comparing functional complexity among contrasted habitats or ecosystems based on SIA have provided a great step forward to the understanding of ecological processes driving species co-existence and ecosystem functions. This presentation will discuss the current state of food web research in hydrothermal vent and cold seep ecosystems based on recent results and open towards methodological and conceptual perspectives in the field.