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Infaunal and megafaunal benthic community structure associated with cold seeps at the Vestnesa Ridge (79 N°)

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Cold seeps are locations where hydrocarbons, sulfide or reduced compounds emanate from the seafloor, which may fuel chemoautotrophic production and form additional hard bottom substrate through carbonate precipitation. Chemosynthetic symbiosis, trophic interactions, and additional bottom substrate types can provide a heterogeneous environment for deep-sea organisms supporting macrofaunal communities including increased biodiversity and biomass. We combined quantitative benthic faunal samples with sea floor photographs from an active, methane seeping pockmark at Vestnesa Ridge (1200 meters depth) to examine community structure and biodiversity in a high Arctic deep cold seep. Quantitative data were compared with samples from the nearby inactive Svyatogor Ridge (1577-1706 meters depth). We measured highly elevated methane concentrations (up to 100x background levels) in the sediment at Vestnesa Ridge. Faunal abundance, species richness and biomass were significantly higher at the Vestnesa pockmark compared to inactive Svyatogor Ridge. Seabed photos from Vestnesa Ridge reveal high megafaunal diversity and biomass and cold seep features including carbonate crust and microbial mats. Our observations indicate that chemoautotrophic production enhances deep-sea biomass and diversity at Vestnesa Ridge. The focused methane emissions create a heterogeneous deep-sea habitat for chemo-associated organisms coexisting with heterotrophic conventional fauna in a high Arctic seep.

Keywords: Arctic, benthic ecology, biodiversity, chemosynthesis, methane