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Assimilation of carbon and nitrogen from dissolved and particulate material in the Mid-Atlantic Ridge deep sea hydrothermal mytilid *Bathymodiolus azoricus*: use of stable isotopes

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Mussels from the Azores Triple Junction deep sea hydrothermal vents at the Mid-Atlantic Ridge (MAR) have the ability to supplement their symbiotically acquired carbon and nitrogen by feeding on particulate and, possibly, dissolved organic material (POM and DOM, respectively). Scanning electron microscopy enabled us to identify diatoms, foraminifera and silicoflagellates in the stomachs of *Bathymodiolus azoricus* from Lucky Strike (1700 m depth) and Menez Gwen (840 m depth). Particles collected by a sediment trap at Lucky Strike and Menez Gwen showed low δ^{13}C signatures of $\sim$ –25 and –29‰, and δ^{15}N values around –2.7‰ at both sites. This indicates that POM at MAR vent sites could consist of a mixture of chemosynthetically-derived organic matter (sulphide- and methane-oxidising bacteria) and phytodetritus. Particulate nutrition is thus not limited to sea-surface derived material. Using stable isotope tracer experiments in the LabHorta aquarium facility at atmospheric pressure with ^{13}C- and ^{15}N-labelled marine cyanobacteria or a labelled amino-acid mixture,

we demonstrated for the first time the assimilation of POM and DOM in all tissues of *B. azoricus*. The rates of carbon assimilation were quantified under POM and DOM concentrations similar to those measured near the natural mussel beds. Overall, our results underline the importance of dissolved and particulate heterotrophic nutrition of both chemo-autotrophic and photosynthetic origin in *B. azoricus*.