DK+ Microbial Nitrogen Cycling
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"Distribution and seasonality of Thaumarchaeota populations in the South Atlantic Bight"

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Abstract

Thaumarchaeota closely related to *Nitrosopumilus maritimus* accounted for a significant fraction of the transcripts in metatranscriptomes from Georgia, USA, coastal waters collected in August 2008. Subsequent observations indicated that a mid-summer peak was a regular feature of Thaumarchaeota abundance at this site. Net growth rates of the Thaumarchaeota population immediately preceding this peak approach 0.4 d^{-1}. A survey of the South Atlantic Bight (SAB) revealed that the population was restricted to turbid, nearshore and inshore waters, although a distinct population of Water Column Group B Thaumarchaeota was identified at depth off the shelf break. We considered that the inshore peak might be a manifestation of increased bioturbation and sediment resuspension accompanying summer increases in fiddler crab populations; however, sediment and water column Thaumarchaeota populations were phylogenetically distinct. The mid-summer peak occurred during a period of extremely low concentrations (sub-fM) of free Cu(II), suggesting that this population has an efficient mechanism for accessing ligand-bound Cu(II) from the environment. Analysis of several years of data lead us to conclude that spatial distribution of Thaumarchaeota populations in the SAB are controlled by water column turbidity, while seasonality of the inshore population is controlled by water temperature. The peak in Thaumarchaeota abundance coincided with elevated nitrite concentrations (to 14 μM) in the same samples. Similar mid-summer nitrite peaks observed in other systems suggest that the two steps of nitrification are decoupled at water temperatures >20 °C, with implications for nitrogen processing in estuaries under altered thermal regimes. Current studies seek to identify the mechanism for the apparent oxidation of covalently-bonded organic N by Thaumarchaeota populations.

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