Depth-dependent changes in nitrogen fixation and related organisms in mangrove sediments

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Abstract

Diazotrophs, microorganisms that “fix” atmospheric nitrogen into ammonia that plants can use, are important members of mangrove ecosystems. Diazotrophic community structure and nitrogen fixation rates are strongly regulated by the environment, but how they change with sediment depth remains unclear. To find out, a new study investigated biological nitrogen fixation in sediment cores taken from a mangrove ecosystem in China. The results showed that diazotroph diversity decreased with depth, and salinity was the main factor that influenced the diazotrophic community structure. Communities above vs. below 50 cm were markedly different. In sediments shallower than 50 cm, *Anaeromyxobacter*, *Rubrivivax*, *Methylocystis*, *Dickeya* and *Methylobacter* dominated, while *Agrobacterium* and *Azotobacter* dominated from 50 to 100 cm. The nitrogen fixation rate and the abundance of nitrogen fixation genes increased with depth, while the abundance of genes related to nitrification and denitrification decreased. Metagenomic analyses revealed that deep-sediment diazotrophs could survive in low-oxygen environments and obtain nutrients from various sources. Although additional research is needed, the results provide new insights into nitrogen fixation in mangrove sediments and reveal depth-dependent changes that may help ensure nitrogen availability in deep mangrove sediments.