Diversity and natural distribution of electricity-generating cable bacteria in the seafloor

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Very recently, long filamentous so-called “cable bacteria” have been discovered in marine sediments that are able to generate and mediate the transport of electrons across centimeter-scale distances. These electrogenic bacteria make that the ocean floor operates like a natural battery, and thus cable bacteria have an enormous potential for novel bio-electric applications. Cable bacteria belong to the family Desulfobulbaceae and have been identified in sulphide-rich coastal environments. Because cable bacteria have only been recently discovered, they remain enigmatic in many aspects. The goal of this Master thesis project is to gain a better understanding of their distribution in the natural environment as well as their phylogenetic diversity.

Enumeration of cable bacteria is evaluated using fluorescent in situ hybridisation with a probe specific for the family Desulfobulbaceae in combination with the filamentous growth form of the cable bacteria. Cable bacteria abundance will be quantified at different depths to yield distribution profiles in the sediment.

The phylogenetic diversity of cable bacteria will be studied by extending the currently small number of available full 16S rRNA sequences. Sediment samples in which cable bacteria have been detected from a wide variety of locations worldwide will be used to amplify the 16S rRNA gene region using primers applicable for the Desulfobulbaceae family. The extended dataset will be used to investigate the phylogenetic affiliation and evolutionary relationships of cable bacteria.

Keywords: cable bacteria; long-distance electron transport; natural abundance; fluorescent in situ hybridisation; phylogenetic diversity; 16S rRNA gene