

## Cable bacteria in Tokyo Bay sediment

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Previous *in situ* measurements of pH, O<sub>2</sub> and H<sub>2</sub>S pore water profiles in Tokyo Bay sediment have indicated electric currents coupling sulfide oxidation in anoxic layers with oxygen reduction at the surface [1]. In follow-up studies at the same locations we found populations of filamentous Desulfobulbacea closely related to those that have been observed to drive electric currents in laboratory incubations of defaunated, homogenized sulfidic sediment [2,3]. The sediment at the natural locations with these cable bacteria differed by harboring bioturbating animals (ophiuroids and polychaetes), abundant sulfide oxidizing, filamentous Beggiatoales, and a 1-3 cm thick suboxic zone with both ferric and ferrous iron minerals. Filament widths of the cable bacteria ranged from less than 0.5  $\mu\text{m}$  to more than 5  $\mu\text{m}$  with both between-filament variation and some within-filament variation. Measurements of electric fields confirmed activity of cable bacteria both *in situ* and in collected intact sediment cores, and significant lateral variation was found at both millimeter and meter scales. In the laboratory physical stability and enhanced oxygen concentrations in the overlying water could stimulate the activity several fold.

In conclusion, sustainable and morphologically variable populations of cable bacteria occur naturally in Tokyo Bay sediment, where they successfully withstand mechanical stress from burrowing animals, limitation of oxygen, and competition for sulfide from other filamentous bacteria and reactive iron oxides. Cable bacteria and electric currents may thus be much more widely distributed in oxygen-sulfide transition zones than expected before.

[1] Sayama (2011), *Goldschmidt2011*, 1804. [2] Pfeffer *et al* (2012), *Nature* **491**, 218-221. [3] Schauer *et al* (2014), *The ISME Journal*, 1-9