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In situ physiology and phylogenic diversity of *Beggiatoa* in hypersaline microbial mats

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Filamentous sulfide-oxidizing *Beggiatoa*-like bacteria were found to be abundant in microbial mats from a hypersaline lake in northern Spain, La Salada de Chiprana. The microbial mats in this permanent hypersaline ecosystem, with a size of 31 ha and a mean salinity of 8 %, are characterized by steep gradients of oxygen and sulfide due to high photosynthesis and sulfate reduction rates. To investigate the In situ role of *Beggiatoa* in the cycling of C-, N-, and S-compounds in their natural environment we combine microsensor-, radio isotope-, stable isotope-, and diverse molecular techniques. Microscopic analysis revealed the day and night depth distribution of a dominant morphotype in the mat. The filament diameter of this morphotype is 6 μm while its length varies from less than 1 mm to more than 10 mm, with an average length of 2.6 mm. The phylogenetic relationship of this morphotype with marine and freshwater species has to be approved by molecular analyses. The depth distribution and migration of the filaments as a physiologically response to changing environmental parameters like light intensity, concentration of oxygen, sulfide, nitrate and pH show some interesting results. The vertical distribution in illuminated mats shows highest abundances exactly at the oxic/anoxic interface at a depth of 8mm. However, after 14 hours dark incubation the filaments migrated only 2 mm upwards, while the oxic/anoxic interface moved to a depth of 1 mm. Nitrate concentration in the mats porewater, as measured by stable isotope analysis, was below 5μM and did not show a clear depth profile. Nitrate, therefore, does apparently not play an important role as external electron acceptor. Whether this morphotype is able to store nitrate intracellularly remains to be determined. Elemental sulfur profiles, however, matched the depth distribution of the *Beggiatoa*-like morphotypes. We therefore hypothesize that internally stored sulfur may act as electron acceptor for the oxidation of organic compounds during dark conditions, since no

other electron acceptor is apparently available. Thus, under light conditions, *Beggiatoa* oxidize sulfide to elemental sulfur with oxygen as electron acceptor, while under dark/anoxic conditions organic substrates are oxidized using intracellular stored sulfur as electron acceptor.