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Pollutants distribution mediated by microorganisms activity in saline wetlands (Laguna Honda, Eastern Guadalquivir Basin, Spain)

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This research has revealed the effect of microbial communities on the distribution of pollutants in sediments from saline wetlands. Laguna Honda is a representative saline wetland at the eastern end of the Guadalquivir Depression receiving pollutants from olive cultivation. The studied sediments are characterized by a high relative abundance of methane-generating microorganisms from diverse bacterial and *Archaeas* communities. These communities share saline environments with microorganisms related to methane generation (e.g. *Anaerolineales*). In sulfide zones, Dehalococcoidia and *Anaerolineae* play an important role at the end of the organic matter degradation process and indirect reduction of Fe^{3+}. Furthermore, some of the organisms associated with methane production (e.g., Fam. *Anaerolineaceae*) can act as biogeochemical bridges for C and S transformations in sediments, establishing syntrophic relationships with other groups of bacteria, such as sulfur-reducing bacteria (SRB) and sulfur-oxidizing bacteria (SOB) affecting the cycling of other elements in sediments (e.g., Ca and Fe). SRB are present in all the samples studied, which justifies the presence of Fe, Cu, Mn and Hg-sulfides. The combined effect of SRB and methanogenic bacteria influence the aragonite precipitation associated with sulfides. Furthermore, the presence of sulfides in Laguna Honda sediments could also be promoted by the existence of magnetotactic bacteria (genera *Magnetovibrio* and *Candidatus_Omnitrophus*). SOB communities from Laguna Honda are more abundant in emerged or shallower sediments. *Campylobacters* only appear in samples with greater aerial exposure (genus *Sulfurovum*), while SOB belonging to C. *Gammaproteobacteria* are better represented in periodically emerged sediments with the genera *Thiobacillus*, *Thioalkalispira-Sulfurivermis*, Candidatus *Thiobios* and other purple S bacteria from the Fam. *Chromatiaceae*. SOB can drive microbial oxidation of sulfides that promote metal mobilization processes. Finally, the presence of bacterial groups under heavy metal stress (*Luteolibacter*), able to transport heavy metals (Maricaulis) and adapted to hypersaline environments (members of the *Vibrionaceae*, *Spirochaetaceae* and AKAU356 families) played a fundamental role in the development of metal (Au) accumulations in the sediments emerged from the lake wetland.

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