Depth-wise Microbiome and Isotopic Profiling of a Moderately Saline Microbial Mat in a Solar Saltern and Its Implications For Planetary Science

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Over the last few decades, geobiological research on microbial life forms sustaining in extreme environments have broadened our understanding on origin of life and extraterrestrial habitat where life could have developed. Man-made, saline to hypersaline systems are limiting in terms of supporting life; however, they host some uniquely adapted populations of microorganisms in the form of microbial mats, andeukaryotes such as algae and brine shrimp. Here we present results from microbiological and stable isotope investigations from two visually different microbial mats (termed 'white' and 'green') developing on the reservoir ponds (53 PSU) from the solar salterns of Tuticorin. Culture-independent 16S rRNA gene analysis revealed that both bacteria and archaea were extremely rich in their diversity along the vertical profile. The top layers had a higher representation of halophilic archaea*Halobacteriaceae*, phyla *Chloroflexi*, and class*Anaerolineae*, *Delta-* and *Gamma-Proteobacteria* than the deeper sections indicating that a salinity gradient exists within the mats. Limited presence of *Cyanobacteria* implied that eukaryotic algae and other phototrophs are the primary producers within the mat ecosystem .Finally, stable carbon and nitrogen isotopic compositions determined from both mat samples along the same vertical profile, showed that the $\delta^{13}C$ and $\delta^{15}N$ values increasedslightly with depth, ranging from -16.42 to -14.73‰, and 11.17 to 13.55‰, respectively. The isotopic signature along the microbial mat profile followed a pattern that is distinctive to the community composition and net metabolic activities, and could potentially be extended to other systems, especially ininterpreting fossil records.