

# Modern Stromatolites from Lagoa Salgada, Brazil: Role of Methanogens in Carbonate Precipitation

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Stromatolites are laminated structures dating from 3.5 Ga, which represent the earliest evidence of life preserved in the geological rock record. Thus, the study of their modern analogues can furnish important information concerning the microbial processes involved in ancient biomineralization. Modern trapping and binding stromatolites from Shark Bay (Western Australia) and Highborne Cay (Bahamas) are used to interpret the environmental conditions of biogeochemical processes leading to calcification, but these do not represent the full range of environmental conditions existing in early Earth history.

Herein, we report a preliminary molecular characterization of the microbial mat from stromatolites collected from a coastal lagoon, Lagoa Salgada, Brazil. Mat samples were analysed using microbiological and genomic techniques. Following GenBank BLAST [1] the obtained genome sequences show similarities to Cyanobacteria (*Chroococciopsis*, *Oscillatoriales* and *Gloeotheca*), sulfur-reducing bacteria (*Desulfomicrobium*) and methanogens (*Methanosarcina*). The recognition of methanogenic bacteria is consistent with the  $\delta^{13}\text{C}$  measurements from distinct Ca-Mg carbonate laminae [2]. Very positive  $\delta^{13}\text{C}$  values, ranging from 10 to 20 ‰ PDB, suggest methanogenic processes to be the main carbon source for the carbonate ions incorporated into the laminae. Future research will attempt to elucidate the biogeochemical processes and archaeal strains of importance in the microbial mat community, with regard to potential carbonate mineral precipitation under specific environmental conditions. The initial results demonstrating the potential participation of methanogens in the formation of the Lagoa Salgada stromatolites may represent what might have been an important process in the anoxic Archean environment.

[1] <http://blast.ncbi.nlm.nih.gov/Blast.cgi>

[2] Och, L. Stromatolites through time: A comparative study of Archaeal, Triassic, and modern stromatolites. Diploma thesis, ETH Zurich, 2007.