# Prokaryotic diversity in the extreme lakes of Turkey, SW Anatolia, Turkey

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The Lake District, located in the SW Anatolia region of Turkey, hosts a number of lakes with unique water chemistry. Among them, Lake Acigol, Lake Salda and Lake Yarisli display extreme biogeochemical conditions. In terms of their water chemistry and diverse prokaryotic community, each lake sets a great example for microbially mediated reactions (e.g carbonate precipitation). Lake Acigol (average pH around 8.6) is known for hypersaline and alkaline water chemistry. Lake Salda (average pH around 9.1) is known for its hydromagnesite beaches, clayey-hydromagnesite shoreline and ancient-modern stromatolite formations as well as being a model for Mars. For the first time, Lake Yarisli having alkaline conditions with an average pH value of 9.5 is investigated for its geochemistry and geobiology during this study. Algal bloom and well developed cyanobacterial mats are visible on shallow waters along the Eastern shoreline of the lake. In scope of elucidating complex bio/geochemical reactions that regulate C, S and O cycles in the extreme conditions of these lakes, water, surface sediment and shallow core samples were collected. For the first time, prokaryotic diversity of Lake Acigol, Salda and Yarisli were determined by Next-Generation Sequencing (NGS) during this study (Balci et al., 2013).

Preliminary results revealed the total number of bacterial classes determined for Lake Acigol, Lake Salda and Lake Yarisli as 22, 19 and 19; respectively. Lake Acigol, Salda and Yarisli are mostly dominated by bacterial classes of Alphaproteobacteria (68.2%, 25.6% and 1.9%; respectively), Cyanobacteria (10.2%, 5.3% and 92.9%; respectively), Bacilli (9.6%, 23.7% and 0.45%; respectively), Gammaproteobacteria (6.1%, 39.6% and 4.3%; respectively) and Actinobacteria (2.7%, 1.8% and 0.06%; respectively). The total number of archaeal classes determined for Lake Acigol, Lake Salda and Lake Yarisli are 8, 7 and 6; respectively. Common most dominant archaeal classes of Lake Acigol, Lake Salda and Lake Yarisli are comprised of Methanobacteria (51.7%, 76.1% and 61.2%; respectively), Halobacteria (48%, 21.4% and 38.5%; respectively), Thaumarchaeota (0.002%, 1.4% and 0.02%; respectively), Thermoplasmata (0.1%, 0.8% and 0.1%; respectively) and Methanomicrobia (0.1%, 0.06% and 0.2%; respectively). Numerous numbers of bacterial and archaeal classes determined in the lakes are indicators of diverse biogeochemical cycles in such extreme conditions. Elucidating survival strategies of microorganisms in such extreme conditions may provide valuable information about extraterrestrial life. In this respect, *Carnobacterium viridians,* previously used as model microorganism for Mars (Nicholson et al., 2013),identified in sediments of Lake Salda may hold important implications for extraterrestrial research.

**Key words:** Lake Acigol, Lake Salda, Lake Yarisli, Turkey, extreme lakes, biogeochemistry, carbonate biomineralization, Next-Generation Sequencing, extremophiles

## References

Balci et al. (2013). Experimental investigation of microbial influences on carbonat precipitation in evaporatic environments: A Case Study, Acı gol, Denizli. TUBITAK (The Scientific and Technological Research Council of Turkey) Grant to N. BALCI (113Y464).

Nicholson, W.L., Krivushin, K., Gilichinsky, D., Schuerger, A.C. (2013). Growth of Carnobacterium spp. from permafrost under low pressure, temperature, and anoxic atmosphere has implications for Earth microbes on Mars. *Proc. Natl. Acad. Sci. USA., 110*(2), 666-671, January 8.