

Microbial communities of heliothermal saline lakes having different ecological state

Tamás Felföldi^{1,2,*}, Attila Szabó², Balázs József Nagy², Boglárka Somogyi³, Lajos Vörös³,
Károly Márialigeti², István Máthé¹

¹Department of Bioengineering, Sapiientia Hungarian University of Transylvania, Piața Libertății 1, 530104 Miercurea Ciuc, Romania

²Department of Microbiology, Eötvös Loránd University, Pázmány Péter stny. 1/c, 1117 Budapest, Hungary

³Balaton Limnological Institute, Hungarian Academy of Sciences, Klebelsberg Kuno u. 3, 8237 Tihany, Hungary

*e-mail: tamas.felfoldi@gmail.com

INTRODUCTION

Some of the saline lakes possess a special thermal stratification, called heliothermy, when solar heating generates an underwater temperature maximum. Heliothermy is the result of the stratification of water layers with different salinities, i.e. the deeper zones have extremely high salt content due to the direct contact with the salt bed, while the surface layer is slightly saline due to the freshwater input from rainfall and in some cases from creeks. Although there are not so much heliothermal lakes worldwide (e.g. Solar Lake in Egypt, Ekho Lake in Antarctica, Hot Lake in Washington, U.S.), it was recently discovered that the Transylvanian Region in Romania has several of them.

OBJECTIVES

Since microbiological studies of heliothermal lakes are relatively scarce, in July 2013, three deep (>15 m), heliothermal, saline lakes were studied, which had different human impact, to explore their taxonomic composition.

LAKE FĂRĂ FUND

in Ocna Sibiului
natural conservation area
no human impact



LAKE URSU

in Sovata
the largest heliothermal salt lake in Europe
used as a health spa during summer

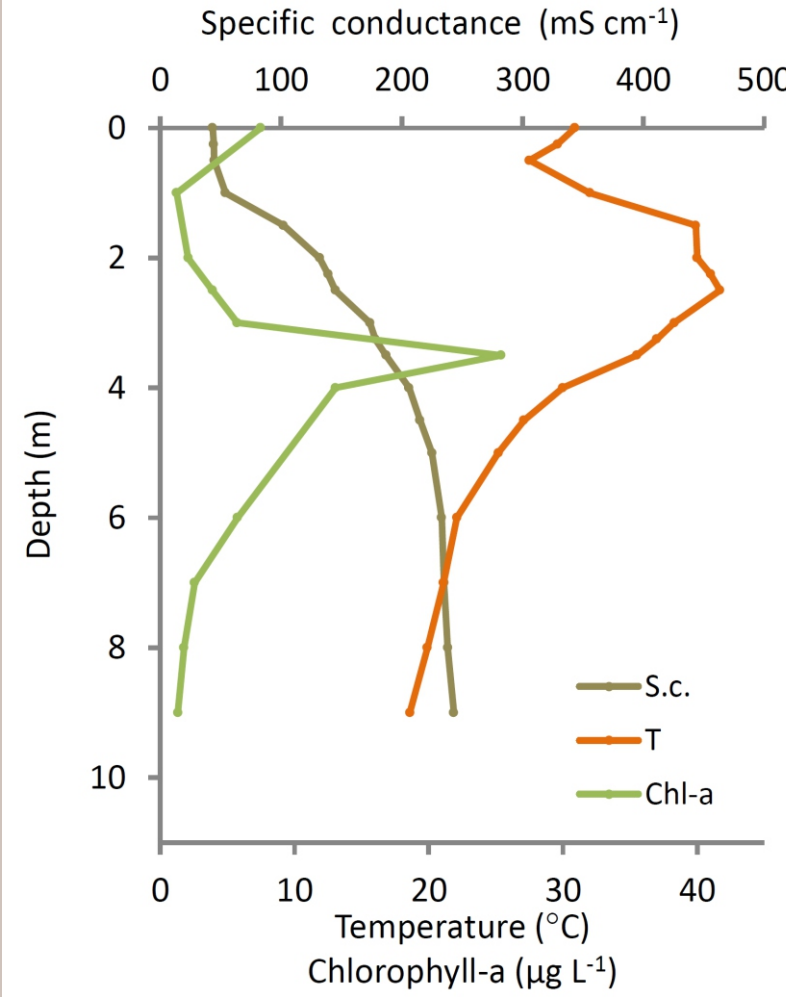
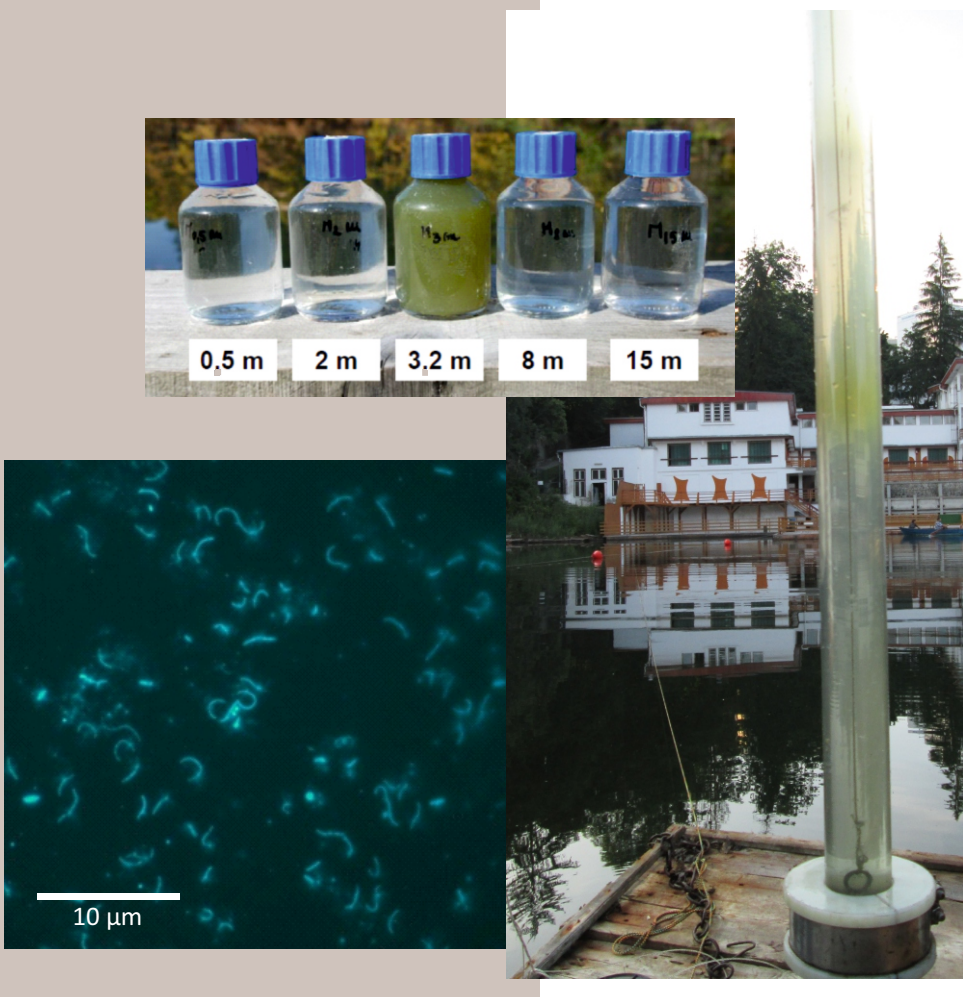
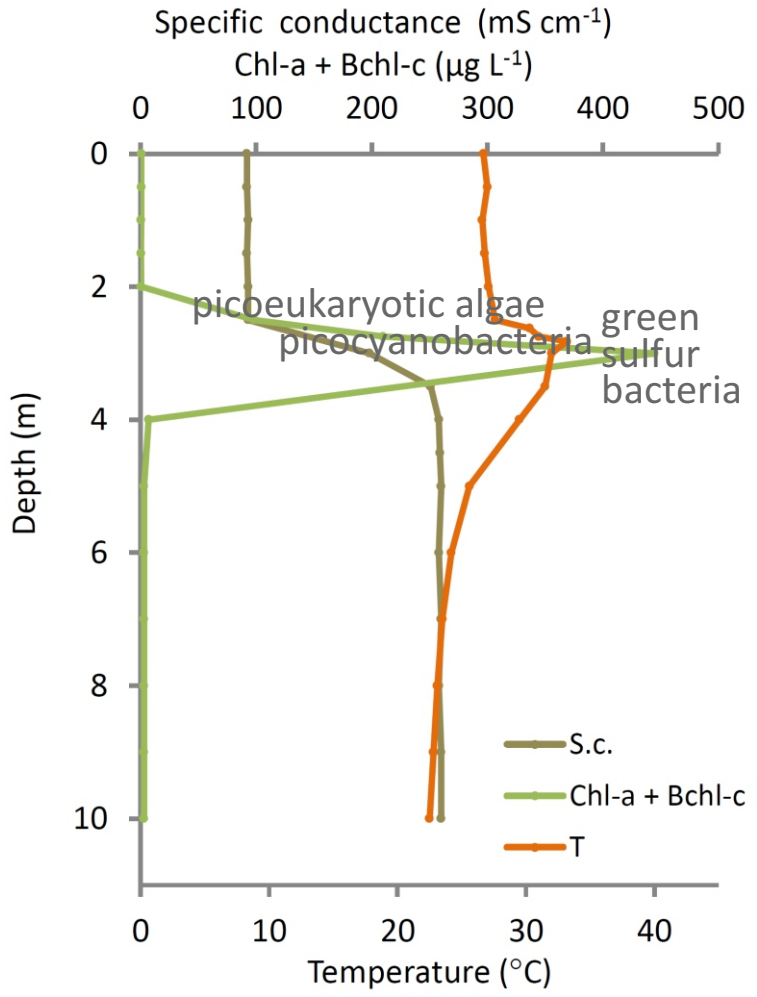
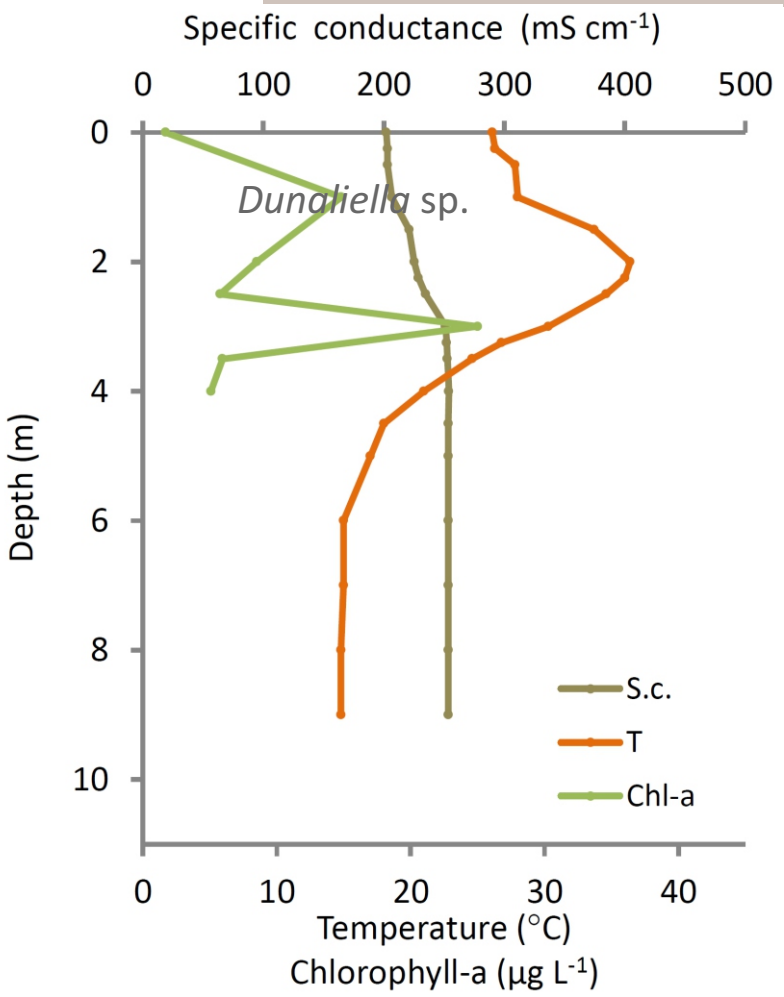


UNNAMED LAKE

in Ocna Mureș
highly polluted, was formed in 2010 due to the collapse of a salt mine-shaft that entombed a complete supermarket



Vertical gradients: steep stratification with a transition zone at 2-4 m with the highest temperature (32.8-41.7 °C) and the characteristic increase of salinity (up to 260 mS cm⁻¹)



Pyrosequencing revealed the dominance of phyla Bacterioidetes, Cyanobacteria, Proteobacteria, Firmicutes (and additionally Chlorobi in Lake Ursu)

The euphotic zone (around 3 m depth) was dominated with different phototrophic taxa:

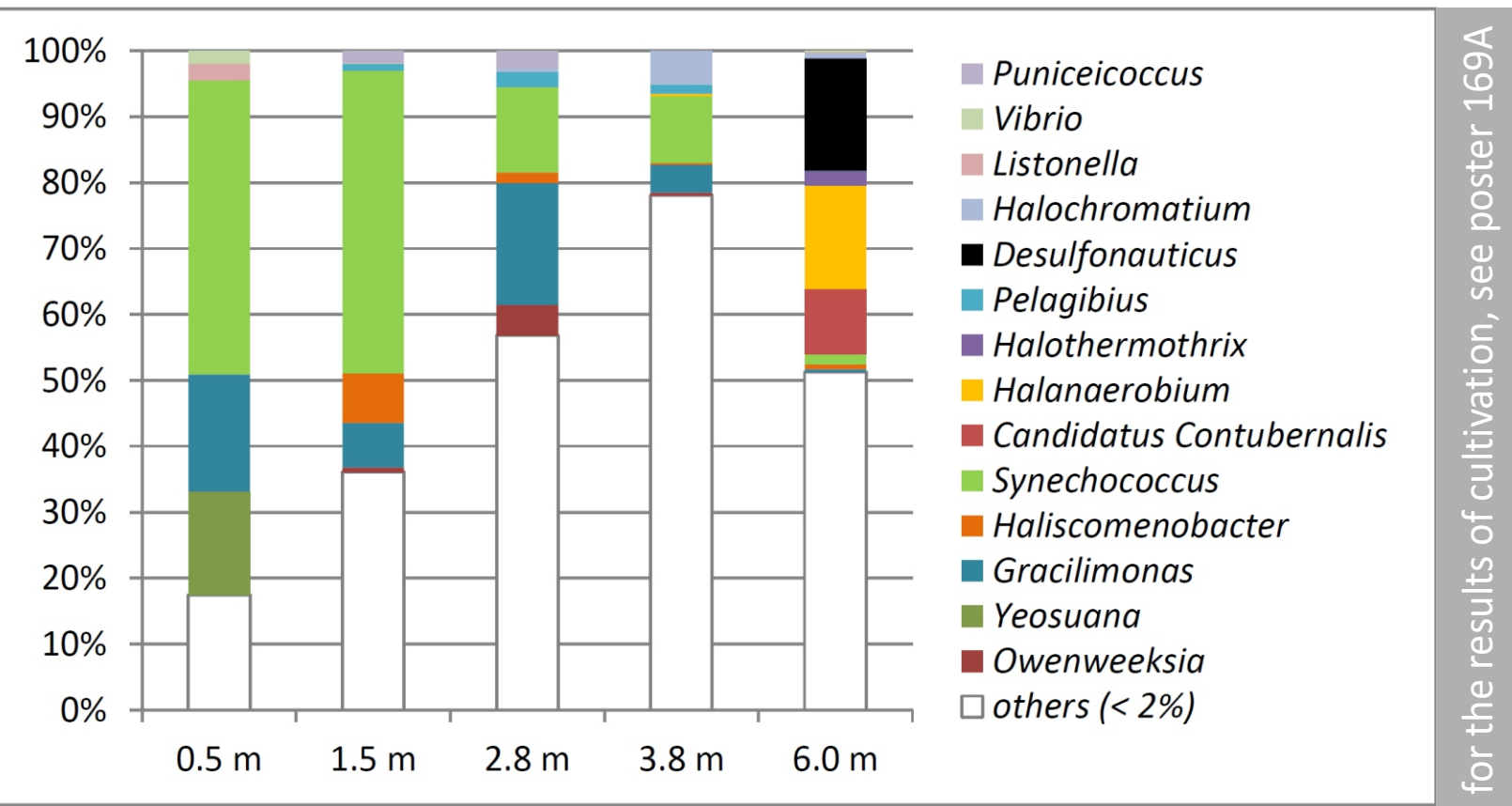
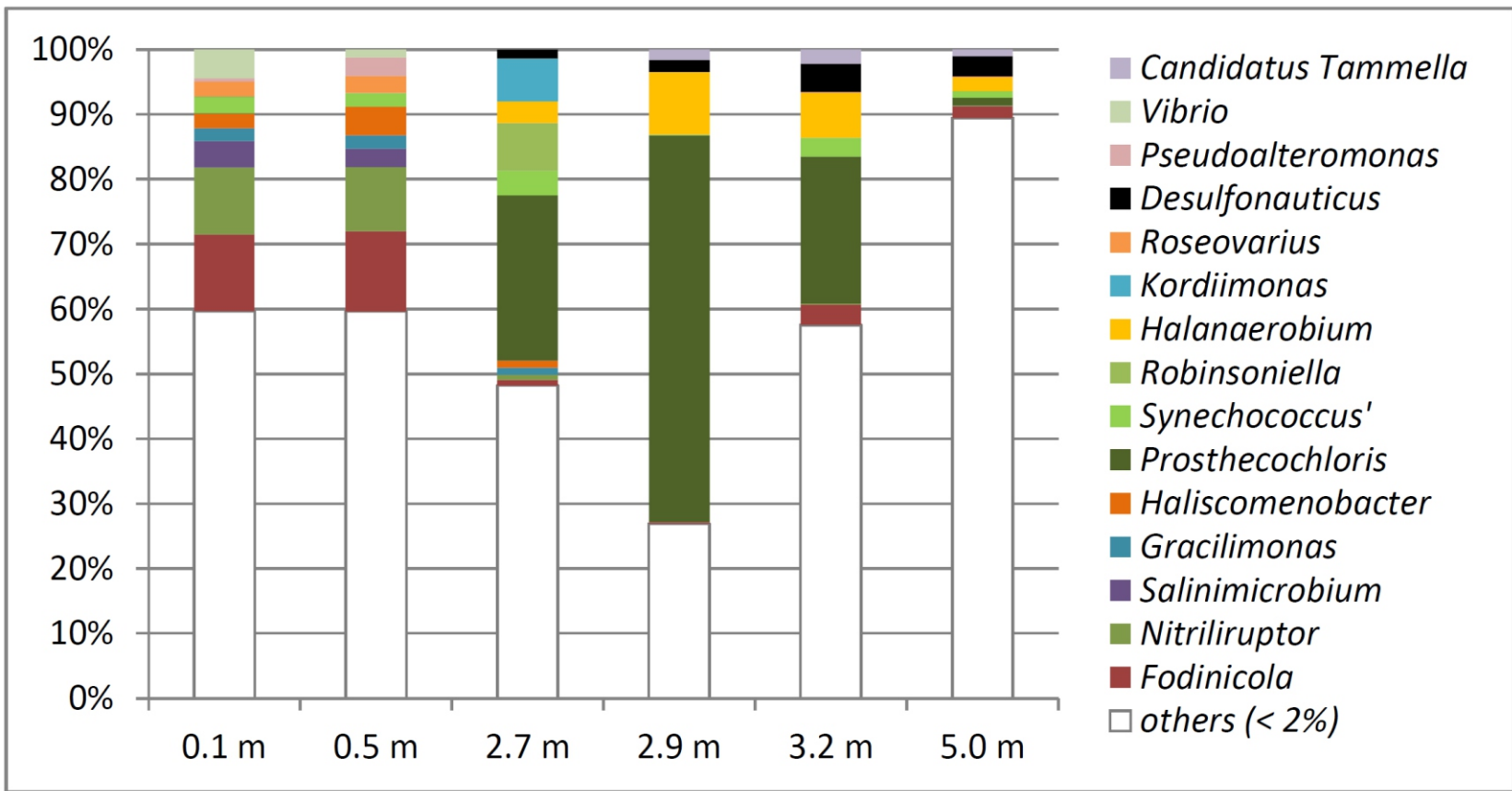
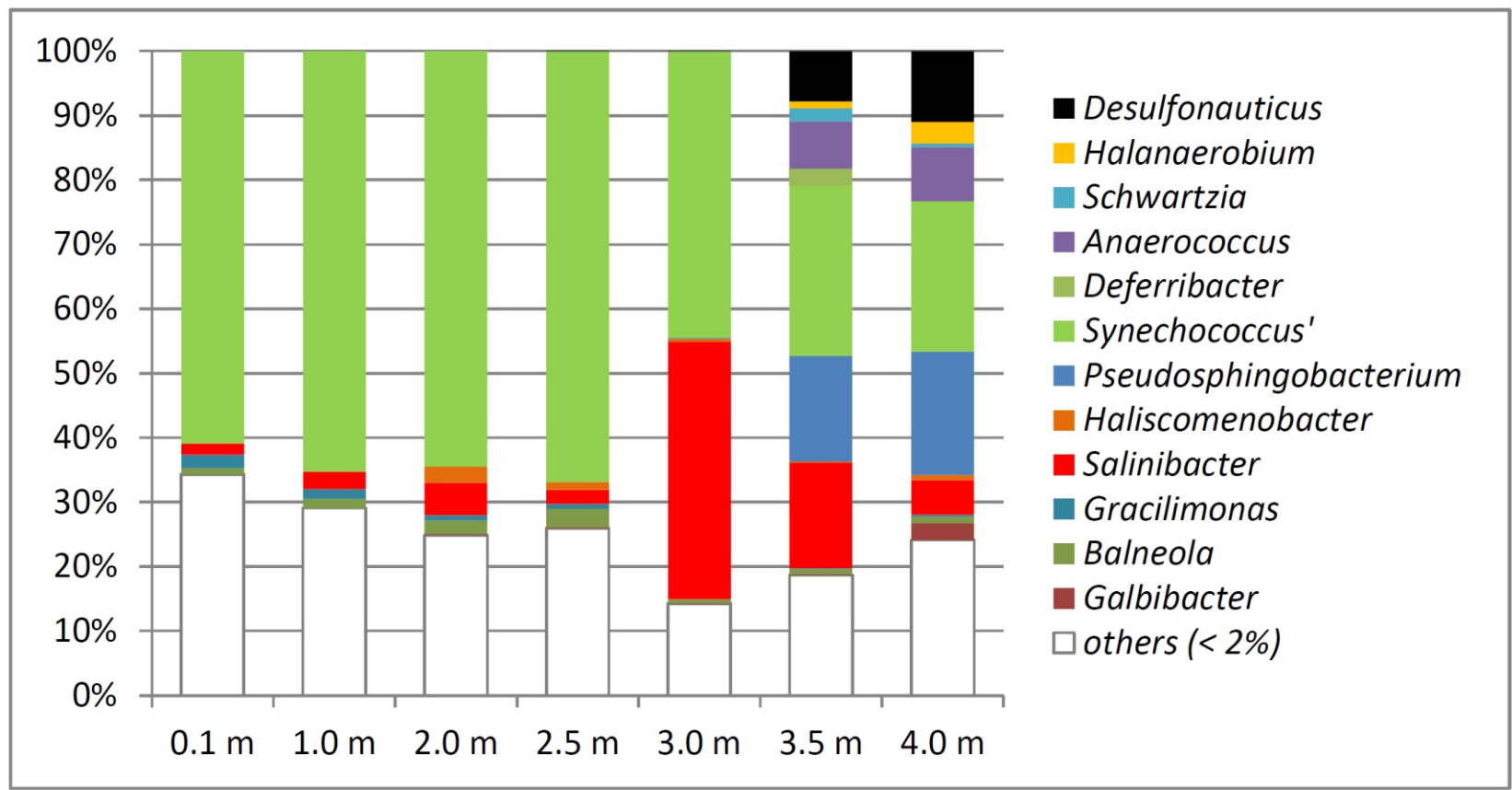
genus *Salinibacter*

(red-colored bacterium with a light-driven proton-pump)

genus *Prosthecochloris*

(anaerobic green sulfur bacterium)

cyanobacteria (*Synechococcus*) and eukaryotic algae
(oxygenic phototrophs)



CONCLUSIONS

Vertical physico-chemical gradients had significant effect on the composition of microbial communities, moreover our results have shown that heliothermal saline lakes may harbor remarkably different microbial communities, even if their general limnological features are similar and if they are located geographically close to each other.

ACKNOWLEDGEMENTS

This study was supported by the Romanian National Authority for Scientific Research CNCS-UEFISCDI (grant PN-II-RU-TE-2012-3-0319).

for the results of cultivation, see poster 169A