Environmental conditions shaping microbial mat community of the karst spring

# Kolda A.(1), Petrić I.(2), Žutinić P.(3), Mejdandžić M.(3), Goreta G.(4), Gottstein S.(3), Ternjej I.(3), Gligora Udovič M.(3)

(1) Laboratory for Aquaculture and Pathology of Aquatic Organisms, Department for Marine and Environmental Research, Ruđer Bošković Institute, Bijenička 54, 10 000 Zagreb, Croatia

(2) Laboratory for Analytical Chemistry and Biogeochemistry of Organic Compounds, Department for Marine and Environmental Research, Ruđer Bošković Institute, Bijenička 54, 10 000 Zagreb, Croatia

(3) Department of Biology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, 10 000 Zagreb, Croatia

(4) Public Institution "National Park Krka", Trg Ivana Pavla II br. 5, 22 000 Šibenik, Croatia

### ABSTRACT

Microbial mats are vertically stratified microbiomes consisting of benthic communities growing on solid substrates. They include communities of functionally distinct groups, largely consisting of prokaryotic *Bacteria*, *Archaea* and oxygenic filamentous phototrophic *Cyanobacteria* capable of thriving in extreme environmental conditions. Krčić is an intermittent karst spring situated in the Dinaric region of Croatia, characterized by high water-level fluctuations and long drought periods. Its physical and chemical properties support growth of specific microbial mat community capable of surviving such extreme hydrological events. We collected samples during different seasons and hydrological regimes in 2014 and 2015 in order to investigate the microbial mat diversity and understand the correlation of its genetic mark-up with environmental conditions. Genotypic diversity of *Cyanobacteria* was studied using specific primers amplifying ITS region, while *Bacteria* were studied using 16S rRNA as a phylogenetic marker. Analysis showed that *Cyanobacteria* was a predominant group in microbial mat (>50%), followed by *Proteobacteria* (*α-Proteobacteria*), *Planctomycetes* (*Planctomycetaceae*), *Bacteroidetes* (*Cytophagaceae*) and *Verrucomicrobia* (*Verrucomicrobiaceae*). During stable hydrological conditions a relatively constant microbial community was established, while summer conditions and long drought had a drastic effect on the community structure with enrichment of *Firmicutes* and *Actinobacteria* taxa and changes in abundances of dominant taxa*.* Detailed analysis revealed a switch in the cyanobacterial composition with *Phormidium/Microcoleus* genera being replaced with species closely related to *Chroococcidiopsis*, a desiccation-tolerant, endolithic cyanobacterium. Moreover, during stable community periods most of the cyanobacterial sequences related to uncultured Antarctic species, further implying that this ecosystem may comprise a unique assemblage of microbial species.

**Keywords**: microbial mat, *Cyanobacteria*, karst spring, NGS, ITS, 16S rRNA

#### Section: 5) Microbial behavior in aquatic systems: from individual cells to communities

#### Type of presentation: Poster