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PLENARY LECTURES

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Plenary lecture

A 'life aquatic' with microbes: swimming through the last decades in microbial ecology with picocyanobacteria

Over the course of my career, aquatic microbial ecology came a long way. I believe that looking back to this history – not with nostalgia, but with the curiosity of the scientist – can help us move forward more mindfully, and better appreciate recent transformations in our understanding of microorganisms. With this lecture, then, I would like to retrace some of the most significant steps in the last decades in this field

through my own research experience. Walking from molecular biology and its related 'omics' to their complex relations with biogeochemistry and ecology, exciting cognitive leaps have revealed an unexpected complexity to microbial worlds, one that we are still working hard to understand. To guide us through this history, I follow a group of microorganisms that accompanied me in my work: the tiny cyanobacteria, picosized cells who crucially shaped planet Earth as we know it, and who keep informing its transformations today. Starting from their long evolutionary history – and the ways we came to unfold them, I will then consider their ecological roles and implications, from communities to single-cells, and from lakes to one of the most surprising marine environments – the Black Sea: picocyanobacteria still have much to teach us!

Biosketch

I am senior research scientist associated at the Institute of Water Research (IRSA – CNR) of Verbania. I have been the leader scientist of the Aquatic Microbial Laboratory and responsible for the Radiochemistry Laboratory at the IRSA Institute. My research interests deal with the trophic interactions in the microbial food chain of subalpine, alpine and andine lakes in the frame of organic carbon cycle. In recent years, my research expanded towards the phylogeny, the ecophysiology and the biodiversity of freshwater picocyanobacteria in deep lakes and in the euxinic Black Sea. I devoted particular attention to morphological and physiological changes in picocyanobacteria populations triggered by climatic and environmental stressors, such as high PAR, UV radiation and predation. At the same time to enrich the knowledge of picocyanobacteria phylogeny (clade 5) and better understand the evolutionary reconstruction of marine, euryhaline and freshwater species I isolated and purified around 100 *Synechococcus* and *Cyanobium* strains from lakes all over the world, and also from the Black Sea. At present, the collection of freshwater picocyanobacteria at IRSA Institute is one of the few in the world, enriched with strains isolated from other colleagues, and many of the strains have been sequenced for the whole genome. One of my latest research interest was to study the isolation of *Synechococcus* strains in the mesopelagic zone of the Black Sea. The in-depth study with laboratory experiments revealed the ability of those *Synechococcus* strains to survive in the mesopelagic zone by carrying out fermentation and to maintain the capacity for photosynthesis. I have also broadened my interests in the ecology and diversity of bacterioplankton, particularly Thaumarchaeota and CL500-11 lineage of phylum *Chloroflexi*, inhabiting the oxygenated hypolimnion. I directed and coordinated several national and international research projects, being responsible scientist for many international cooperation between CNR and the corresponding research organizations in Hungary, Czech Republic, Argentina, Bulgaria. I tutored several master and PhD theses in Italy and others European countries. I was external professor in Picoplankton Ecology courses at Parma University, and undertook courses for PhD students at the UNAM, Mexico. I am Associate Editor of the Journal of Limnology and I authored more than 200 journal publications and several book chapters on picocyanobacteria ecology.

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Selected publications

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