morphology. This study showed that morphology, cell size and temperature can all affect the response of strains and species to light. It highlights the need to understand strain variation and how this affects their response to environmental constraints in order to improve prediction of cyanobacterial bloom formation and community structure.

## 28-O Functional traits of lake phytoplankton across europe and their response to environmental gradients.

*Giuseppe Morabito [1] - Gabor Borics [2] - Jordi Catalan [3] - Ute Mischke [4] - Agnieszka Pasztaleniec [5] - Birger Skjelbred [6]*

*Institute For Ecosystem Study, ISE CNR, Verbania, Italy [1] - Hungarian Academy of Sciences, Danube Research Institute, Debrecen, Hungary [2] - Spanish National Research Council, Centre for Advanced Studies of Blanes, Blanes, Spain [3] - Leibniz-institute of Freshwater Ecology and Inland Fisheries, Department I - Ecohydrology, Berlin, Germany [4] - Institute of Environmental Protection, NRI, Department of Freshwater Assessment Methods and Monitoring, Warsaw, Poland [5] - Norwegian Institute for Water Research - NIVA, Center For Freshwater Research, Oslo, Norway [6]*

We analyzed the distribution of nine phytoplankton functional traits (unicellular shape, non-filamentous colonial shape, filamentous colonial shape, presence of flagella, potential heterotrophy, size larger than 40 µm, nitrogen fixation, presence of silicified structures, presence of gas vacuoles) and their dominance along environmental gradients in lakes across Europe. The analysis is based on phytoplankton composition and water chemistry data extracted from pan-European databases compiled for the WFD intercalibration process and the EU Rebecca and WISER projects. The working database includes 831 lakes for phytoplankton data and 408 lakes for abiotic variables, mainly from Northern and Central Europe. Spatial and environmental relationships among samples were explored using several and complementary statistical techniques. Most of the phytoplankton traits are present across a wide spectrum of environmental conditions and their trait distribution was not independent of the geographic position. A key driver appears to be a combined effect of trophic status and lake morphology (high depth-low chlorophyll, vs high chlorophyll-low depth), particularly for traits such as the presence of gas vacuoles and nitrogen fixation capacity.

## 28-O Phenotypic plasticity in *Chlamydomonas reinhardtii*: an adaptive response to copper stress.

*Giulia Cheloni, Vera I Slaveykova*

*Institute F. A. Forel, University of Geneva, Geneva, Switzerland)*

Microorganisms have developed multiple strategies to face adverse environmental conditions and maintain cellular homeostasis. Phytoplankton are characterized by a great phenotypic plasticity and amazing morphological variability, both playing a primary role in the acclimation to changing environments. Besides dealing with changes in environmental parameters, phytoplankton might have to face the presence of micropollutants. If only few data are available about morphological variability as a function of environmental conditions, even less is known about changes in phenotypic plasticity as adaptive responses to micropollutant stress. We thus had a retrospective look at our phytoplankton environmental toxicology data under a "morphological" perspective. The results that we present here highlight the change in cell size of the green alga *Chlamydomonas reinhardtii* in presence of sub-toxic concentrations of copper. Changes in *C. reinhardtii* traits upon exposure to increasing copper concentrations were monitored via flow cytometry and microscopy. Flow cytometry revealed a shift in the size of the *C. reinhardtii* population exposed to copper concentrations higher that 5 µM. The shift in size was observed starting from 48 hours incubation and reached a maximum after 96 hours. Parallel microscopic inspection revealed larger cells after 48 hours and colony formation starting from 72 hours incubation. Colonies attained a size of more than 40 µm, containing 16 or more cells after 96 hours incubation. The primary cell size of this strain ranges between 4 and 6 µm. When colonies were harvested, rinsed and inoculated in fresh medium without copper *C. reinhardtii* cells reverted to their unicellular lifestyle. *Chlamydomonas* palmelloid (colony) formation is a poorly understood phenomenon that was previously reported under adverse environmental conditions and predator pressure. More work is currently performed to investigate whether palmelloid formation is associated to lower cellular stress and/or to lower intracellular copper content. In fact, if the high surface-to-volume ratio of small cells confer and advantage for nutrients uptake, the low surface-to-volume ratio of big cells or colonies might represent an advantage in presence of harmful chemicals. From an ecotoxicological perspective, the observed phenotypic plasticity of *C. reinhardtii* in presence of copper might have important outcomes on the current knowledge of metals effects on the food chain.