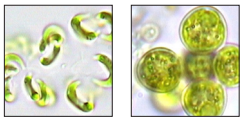
40th International Conference of the Polish Phycological Society



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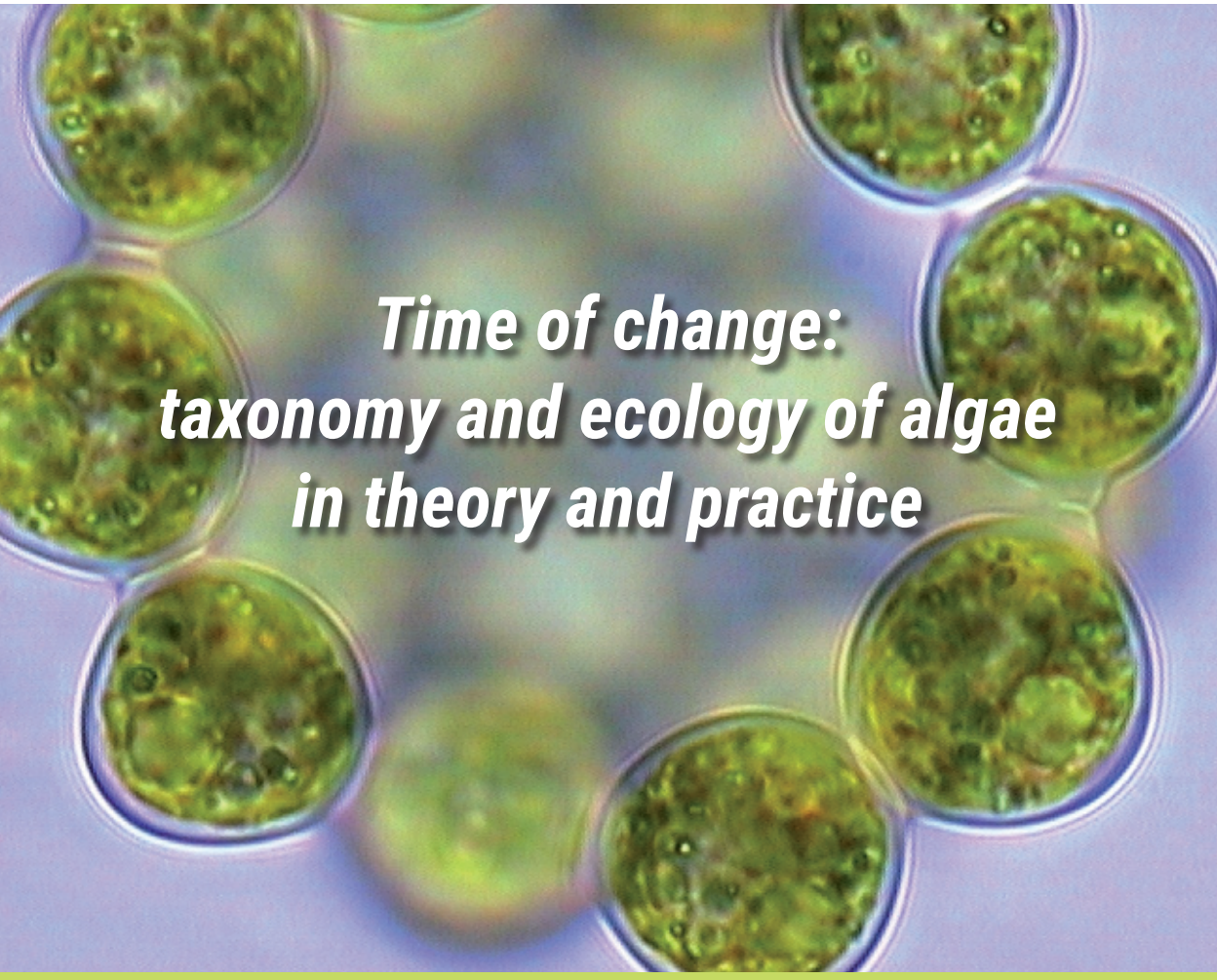


PROGRAMME & Abstract book

Ministerstwo Edukacji i Nauki

Doskonała Nauka

PTF Polskie Towarzystwo Fykologiczne

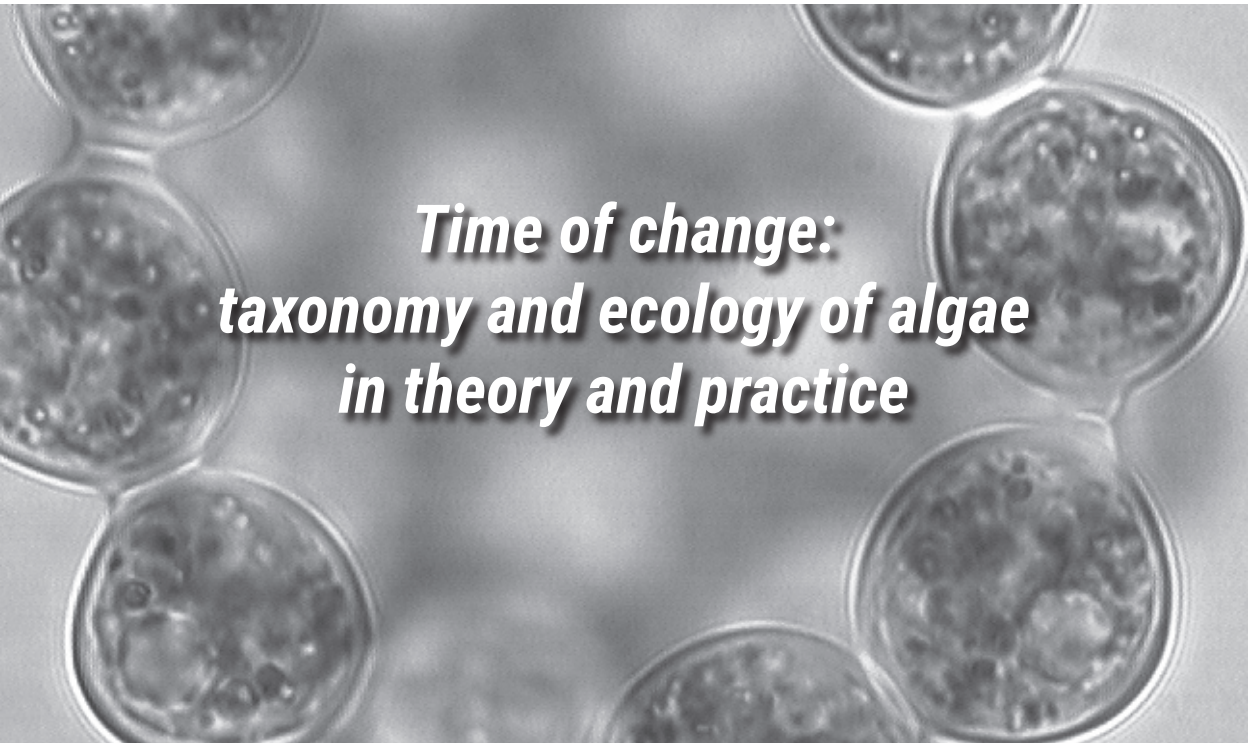
Uniwersytet Kazimierza Wielkiego w Bydgoszczy

40th ICPPS

23-26.05.2023

BYDGOSZCZ – WĄDZYŃ

40th International Conference of the Polish Phycological Society



PROGRAMME & Abstract book

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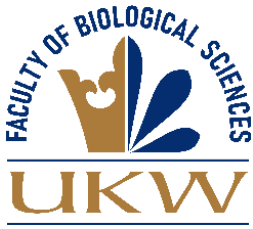

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Projekt pt. „40. Międzynarodowa Konferencja Polskiego Towarzystwa Fykologicznego", został dofinansowany w ramach programu Ministerstwa Edukacji i Nauki pod nazwą „Doskonała Nauka" w ramach modułu „Wsparcie konferencji naukowych". Wartość dofinansowania: 236 500,00 PLN, całkowita wartość 296 500,00 PLN.

Przedmiotem programu Doskonała Nauka jest wsparcie podmiotów systemu szkolnictwa wyższego i nauki oraz innych jednostek organizacyjnych działających na rzecz upowszechniania nauki w realizacji projektów mających na celu prezentację osiągnięć naukowych, w tym najnowszych wyników badań naukowych lub prac rozwojowych, poprzez organizację konferencji naukowych oraz wydawanie monografii naukowych.

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The cell count estimation results of several experts were surprisingly good, which suggests that this capability can be improved, and estimation bias can be reduced to a level acceptable for water-quality estimations.

Results of the LIFE project "Algae - Economy Based Ecological Service of Aquatic Ecosystems/ Glony - Gospodarka ekologiczna" LIFE17 ENV /LT/000407

Elżbieta Wilk-Woźniak*, Edward Walusiak, Małgorzata Łaciak, Wojciech Krztoń, Martyna Budziak

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The main goal is to clean water bodies of excess cyanobacteria and algae biomass and use the biomass for bioproducts. The second goal is to disseminate knowledge about cyanobacterial blooms to the general public. The Institute of Nature Conservation team has worked on four water bodies affected by cyanobacterial blooms. We used traditional methods, as well as remote methods (Unmanned Aerial Vehicles, Satellite images) for monitoring of an oxbow lake, two artificial ponds and an artificial reservoir. In the summer of 2022, 300 kg of cyanobacteria biomass was collected by AS – a harvester constructed by Lithuanian partners. We will discuss the results of traditional monitoring in terms of predominant cyanobacteria (*Aphanizomonenon flos-aquae*, *Microcystis* spp., *Anabaena* spp.) and the amount of nutrients and toxins in the plankton biomass. We will also discuss the results of mapping cyanoblooms in Poland. The project is led by the Nature Research Centre, and the Institute of Nature Conservation of the Polish Academy of Sciences in Kraków and Adam Mickiewicz University in Poznań are co-beneficiaries.

Data were collected as part of the project "Algae Service for LIFE" (LIFE17 ENV /LT/000407) supported by the EU LIFE programme and co-financed by the Ministry of Environment of the Republic of Lithuania, the National Fund for Environmental Protection and Water Management in Poland, and the project partners. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and view expressed therein lies entirely with the authors. For more information, see the website:
https://algaeservice.gamtostyrimai.lt/category/be-kategorijos-en/
and the film:
https://www.youtube.com/watch?v=XGMveE3jRzg&t=5s

Toxicity analysis of *Raphidiopsis raciborskii*

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Raphidiopsis raciborskii is a planktonic, freshwater cyanobacteria capable of producing cyanotoxins. Although the species was first noticed in tropical regions at the beginning of the 20th century, the geographic range of the species has spread significantly into the temperate zone over the years. The reasons for the expansion of this species are commonly related to eutrophication, climate change and phenotypic plasticity. Furthermore, *R. raciborskii* can have a predominance in successive expansion due to its ability to produce toxins. Therefore, the aim of the study was: to examine the capability of *R. raciborskii* strains to produce cylindrospermopsin (CYN), microcystins (MCs), anatoxin-a (ATX-a); and to assess the toxicity effect. The presence of toxins was detected using the ELISA test method. The toxic effect was determined based on the viability of *Daphnia magna* and *Thamnocephalus platyurys*. The results of this study showed none of the investigated strains was capable of producing CYN, MCs or ATX-a. However, the research showed a significantly negative impact on the viability of *Daphnia magna*. The research also evidenced that *Daphnia magna* was more sensitive than *Thamnocephalus platyurys*. These results may contribute to better understanding of the impact of *R. raciborskii* on crustaceans.

The research was executed as part of the project "MINIGRANT" from the Programme: Passport to the future nr POWR.03.02.00-00-I006/17 carried out by Faculty of Biology at Adam Mickiewicz University in Poznań (Poland).

Do initial circumstances forge endpoint effects? The influence of climatic conditions on carbon, nitrogen and microcystin concentration in plankton biomass

Martyna Budziak*, Wojciech Krztoń, Edward Walusiak, Małgorzata Łaciak, Elżbieta Wilk-Woźniak

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Cyanobacterial blooms are predicted to proliferate in freshwaters as a consequence of climatic changes and increasing anthropogenic disturbances. As they become more intense and longer-lasting, we expect concentrations of

cyanotoxins to increase. In freshwaters, microcystins are the most commonly detected group of toxins. Their presence is one of the most concerning environmental problems, especially during cyanobacterial blooms, due to their detrimental effects on aquatic food webs. Although the environmental factors that regulate microcystin synthesis remain unclear, some findings suggest that increased N availability is responsible for increased production of this class of toxins. It is also suggested that climatic factors such as temperature or wind speed may lead to short-term spikes in toxin production. In this study we analysed whether the total concentration of microcystins in plankton biomass is correlated with carbon and nitrogen content as well as with seasonal temperature, wind speed, cloud cover and precipitation.

The results showed a steady decrease in concentration of microcystins in plankton biomass in successive years with the highest records in 2019 and lowest in 2022. We noted a decrease of nitrogen and carbon content in plankton biomass (mg/kg). Moreover, total concentration of microcystins was significantly correlated with carbon and nitrogen ($p<0.05$) content in the planktonic biomass. The temperature was observed to be significantly positively correlated with content of C and N in plankton biomass ($p<0.05$) but only in the pre-bloom season (April, May, June). Conversely, we observed that wind speed was negatively impacting N and C content in plankton biomass ($p<0.05$) during the bloom period (July, August, September, October).

Our results highlight the magnitude of climate changes that influence toxin-producing taxa and indicate the importance of the impact of environmental factors in the pre-blooming period. Therefore, it is important to track and understand the relationship between climate change and cyanobacterial blooms to develop effective strategies for managing and mitigating their impacts.

Data were collected as part of the project "Algae Service for LIFE" (LIFE17 ENV /LT/000407) supported by the EU LIFE programme and co-financed by the Ministry of Environment of the Republic of Lithuania, the National Fund for Environmental Protection and Water Management in Poland, and the project partners. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and view expressed therein lies entirely with the authors.

Bloom-forming cyanobacteria can produce a wide range of cyanotoxins, such as hepatotoxic microcystins (MCs), neurotoxic anatoxins, and many other biologically active metabolites harmful to living organisms, including humans. Bacterial degradation of MCs has been broadly described, but studies mostly concern particular strains isolated from natural aquatic environments. The present study focuses on the biodegradation of three microcystin variants (MC-RR, -LR and -LF) after nine-day incubation with a community of microorganisms (bacteria and algae) associated with the macrophyte *Spirodela polyrhiza*. NGS-based microbiome profiling of these consortia showed that there were no statistically significant differences in the qualitative structure of bacterial communities in particular experimental variants after exposure to MCs. In all variants, Proteobacteria (known as MC-degraders) predominated (comprising ≥80% of the total relative bacterial abundance), with the highest share in variants with MC-LR, followed by MC-RR and MC-LF. Bacteroida and Firmicutes reached 7.6 to 14.9% and 2 to 6.4%, respectively. The strongest biodegradation rate was observed for MC-RR, followed by MC-LR. No statistically significant decrease in the concentration of MC-LF was found. Decomposition products were detected *via* the LC-MS/MS technique: three dominant degradation products (m/z 984, 969 and 615) were detected for MC-RR and two for MC-LR (m/z 968 and 653). No degradation products of MC-LF were found. The results showed that MC-LF was the most stable and resistant MC variant under experimental conditions. No bioaccumulation of MCs or their biodegradation products in *S. polyrhiza* was observed. The findings show that the microorganisms associated with *S. polyrhiza* are able to biodegrade MC variants in different biochemical pathways. Therefore, further studies on the potential of MC-degraders related to aquatic plants are required.

The research was partially supported by the National Science Centre, grant number 2019/03/X/NZ8/01442.

UAV monitoring of blue-green algae blooms in freshwater ecosystems

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Cyanobacterial blooms are a widespread phenomenon naturally occurring in different types of water bodies. Recently observed climatic changes and

increasing human impact lead to the intensification and proliferation of cyanobacterial blooms, and as a consequence – severe reduction in water quality and changes in functioning of freshwater ecosystems. A common indicator of a cyanobacterial bloom is a change in water colour to blue-green, due to pigments of the growing cyanobacteria. Remote-sensing technologies installed in satellites or unmanned aerial vehicles (UAVs) can be used to detect and monitor cyanobacterial blooms in water bodies. Satellites equipped with sensors can capture the reflectance properties of water and identify the presence of pigments specific to cyanobacteria. This allows for the monitoring of large water bodies and the detection of cyanobacterial blooms before they become visible to the naked eye. Remote-sensing data can also provide information on the spatial extent and temporal dynamics of blooms, which can be useful for understanding the underlying causes and for developing management strategies. Using remote-sensing technologies, scientists and managers can better monitor and understand the impacts of cyanobacterial blooms on freshwater ecosystems and take necessary actions to mitigate their negative effects on water quality and aquatic biodiversity. The aim of our study was to develop an index for cyanobacterial blooms detection using UAVs. Searching and monitoring cyanobacterial blooms using UAVs offers the possibility to better assess this phenomenon, including in poorly-accessible water bodies. To develop the index, we settled 30 frames floating on the surface of an oxbow lake (Tyniec oxbow lake, S Poland). We measured the reflectances, chlorophyll-*a (chla)* and phycocyanin (PC) concentrations using multiparameter probe. Statistical analyses of the results allowed development of an index based on Red Edge 740 nm and 717 nm and NIR 842 nm spectral bands. The correlation of the index with PC concentration measured *in situ* was estimated as +70%.

Data were collected as part of the project "Algae Service for LIFE" (LIFE17 ENV /LT/000407) supported by the EU LIFE programme and co-financed by the Ministry of Environment of the Republic of Lithuania, the National Fund for Environmental Protection and Water Management in Poland, and the project partners. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and view expressed therein lies entirely with the authors.

How familiar are you with cyanobacterial blooms? The survey results

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Citizen science has become a very popular form of collaboration between scientists and citizens. However, to be a "citizen scientist" requires a certain level of knowledge. To find out what the level of knowledge about cyanobacterial blooms is, we conducted a survey asking questions about blooms, toxins, how people find out about blooms, whether they feel well-informed, etc. We received 1028 responses from Europe and Asia. Most of the participants were from Poland and Lithuania, the rest from Ukraine, San Marino, Spain, Czech Republic, France, Germany, China, Kazakhstan, Qatar, South Korea, Turkey, Bosnia and Herzegovina, Estonia and Belarus. More than half of the respondents know what a cyanobacterial bloom is and have seen them. Also, more than half of the respondents knew about cyanotoxins and their negative effects on cattle, domestic animals, domestic birds, poultry, fish, and pets (e.g., dogs). We found that people get their knowledge about blooms from daily newspapers and magazines, popular magazines, the Internet, news portals, social networks, seminars, meetings and lectures. However, most is from TV, radio, daily newspapers and seminars. We will discuss other aspects of the survey, including age and educational background. The results of the survey will be helpful in preparing and disseminating information about cyanobacterial blooms, where they occur, why they form, and their impact on the ecosystem and society.

Data were collected as part of the project "Algae Service for LIFE" (LIFE17 ENV /LT/000407) supported by the EU LIFE programme and co-financed by the Ministry of Environment of the Republic of Lithuania, the National Fund for Environmental Protection and Water Management in Poland, and the project partners. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and view expressed therein lies entirely with the authors.

What are *Fragilaria capucina* and *F. vaucheriae*?

Agata Z. Wojtal[1*], Agnieszka Pociecha[1], Magdalena Grabowska[2], Magdalena Toporowska[3], Ewa A. Dembowska[4], Olha Kryvosheia-Zakharova[1], Stanisław Chmiel[5], Dariusz Ciszewski[6], Włodzimierz Margielewski[1], Jacek Różkowski[7]

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