



Evaluation of the Ph.D. Thesis of Izabela Mujakić

The Ph.D. Thesis of Izabela Mujakić is entitled

Ecology of Gemmatimonadota

and it is comprised of four peer reviewed articles in international journals. Her first first-author paper was

**Mujakić, I., Andrei, A-Ş., Shabarova, T., Fecskeová, L.K., Salcher, M.M., Piwosz, K., Ghai, R., Koblížek, M. (2021) Common presence of phototrophic Gemmatimonadota in temperate freshwater lakes. mSystems 6:e01241-20. (IF = 7.32).
<https://doi.org/10.1128/mSystems.01241-20>.**

and here she analysed the abundance, phylogeny and genome content of Gemmatimonadota in freshwater lakes, a habitat which had previously not been studied in depth and was interesting because two of the six known isolates were from freshwater lakes and the first isolate harboring both the photosynthesis gene cluster and the proteorhodopsin gene was also isolated from a freshwater lake. She reconstructed 45 freshwater Gemmatimonadota MAGs and for the first time detected them in the Římov reservoir using CARD-FISH.

This work was further extended in her second first-author paper, a review where she extracted the information on Gemmatimonadota in all environments from the literature:

**Mujakić, I., Piwosz, K., Koblížek, M. (2022) Phylum Gemmatimonadota and Its Role in the Environment. Microorganisms, 10, 151. (IF = 4.92).
<https://doi.org/10.3390/microorganisms10010151>**

In her last first-author paper Izabela analysed all available meta-genome assembled genomes (MAGs) of Gemmatimonadota from the literature and from her own work and provided an in depth analysis of genome content of Gemmatimonadota in rela-

tion to their environment and phylogenetic position. This paper was meanwhile accepted for publication:

Mujakić, I., Cabello-Yeves, P.J., Villena-Aleman, C., Piwosz, K., Rodriguez-Valera, F., Pica-zo, A., Camacho, A., Koblížek, M.: Multi-environment ecogenomics analysis of the cosmopolitan phylum Gemmatimonadota, Microbiology Spectrum (IF=9.043), accepted for publication.

Finally, Izabela contributed to a fourth study, which focused on the aerobic anoxygenic phototrophs among Gemmatimonadota in freshwater lakes:

Villena-Aleman, C., **Mujakić, I.**, Porcal, P., Koblížek, M. & Piwosz, K. (2023) Diversity dynamics of aerobic anoxygenic phototrophic bacteria in a freshwater lake. Environmental Microbiology Reports, 15(1), 60–71. (IF = 4.0) <https://doi.org/10.1111/1758-2229.13131>

Presenting three accepted first author papers in a Ph.D. speaks for itself. Taken together, the four papers fully warrant the title "Ecology of Gemmatimonadota" of this thesis. Izabela also provided a clear and well-researched introduction, where she covered all major aspects of microbial ecology, particularly the various methods that are being used and the roles microbes play in biogeochemical cycles, with a focus on aerobic anoxygenic photosynthesis. The limitations of this study are the general limitations faced by microbial ecologists trying to understand the role of microbes in the environment:

- Are isolates representative of the abundant phyla of the group under study?
- Are there characteristic functions of Gemmatimonadota compared to other phyla, e.g. Proteobacteria?
- How could you decide if a particular strain is truly freshwater or rather washed into the lake from the surrounding land and rivers?
- How can functions be inferred from metagenomic data, and which problems arise?
- Is it possible to determine the gene content of the ancestor of Gemmatimonadota? Was it an aerobic anoxygenic phototroph?
- How sure are you that Gemmatimonadota do not fix CO₂?

I unanimously recommend acceptance of the Ph.D. of Izabela Mujakić.

Sincerely,



Prof. Dr. Irene Wagner-Döbler