

## **Eutrophication and AAP bacteria: changes in the contribution of AAP bacteria to microbial dynamics and carbon cycle in response to trophic status**

*Joint international project of the National Marine Fisheries Research Institute, Poland,  
the Institute of Microbiology, Czech Academy of Sciences, Czech Republic,  
and Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Germany.*

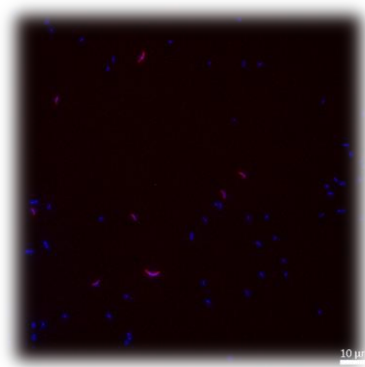
Imagine diving into a serene lake, the water teeming with life not just visible to the naked eye but also microscopically. Beneath the surface, a bustling metropolis of bacteria plays a crucial role in keeping the aquatic world alive and thriving. However, this delicate balance is under threat due to human activities, leading to issues like pollution and eutrophication, which is essentially the aquatic version of over-fertilization.

At the heart of this story are the unsung heroes of our aquatic ecosystems: the aerobic anoxygenic phototrophic (AAP) bacteria. These tiny organisms are like hybrid engines of the microbial world. Unlike their purely heterotrophic relatives, who solely feast on organic matter, AAP bacteria have the superpower to harness energy from sunlight, thanks to their built-in solar panels: bacteriochlorophyll-containing reaction centres. This unique ability gives them a leg up in the competitive aquatic environment, especially during the lush periods of phytoplankton blooms, where they can constitute up to 20-30% of all bacteria.

Phytoplankton blooms, those sudden explosions of algae that can turn water a vivid green, are a feast time for AAP bacteria. They thrive on the organic matter these algae release, playing a pivotal role in the microbial loop – a crucial recycling process that ensures the flow of energy and nutrients up the food chain.

However, the balance of this microscopic world is sensitive to the levels of nutrients like carbon and phosphorus in the water. These elements, often spiked by agricultural runoff and pollution, can lead to eutrophication, transforming clear waters into choked, algae-filled environments. This study focuses on understanding how eutrophication impacts the AAP bacteria community and activity, and, consequently, the entire carbon cycle in aquatic environments.

By shedding light on these tiny powerhouses and their struggle in the face of environmental stress, we hope to understand better how to protect our precious water bodies from the impacts of human activity. This research is not just about bacteria; it's a story about the health of our planet's aquatic environments and, ultimately, our own.



Photograph of AAP (pink) and heterotrophic bacteria taken with Zeiss microscope. Magnification 1000×.