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Microbiome screening out of the suitcase lab as indicator for fish welfare in aquaria

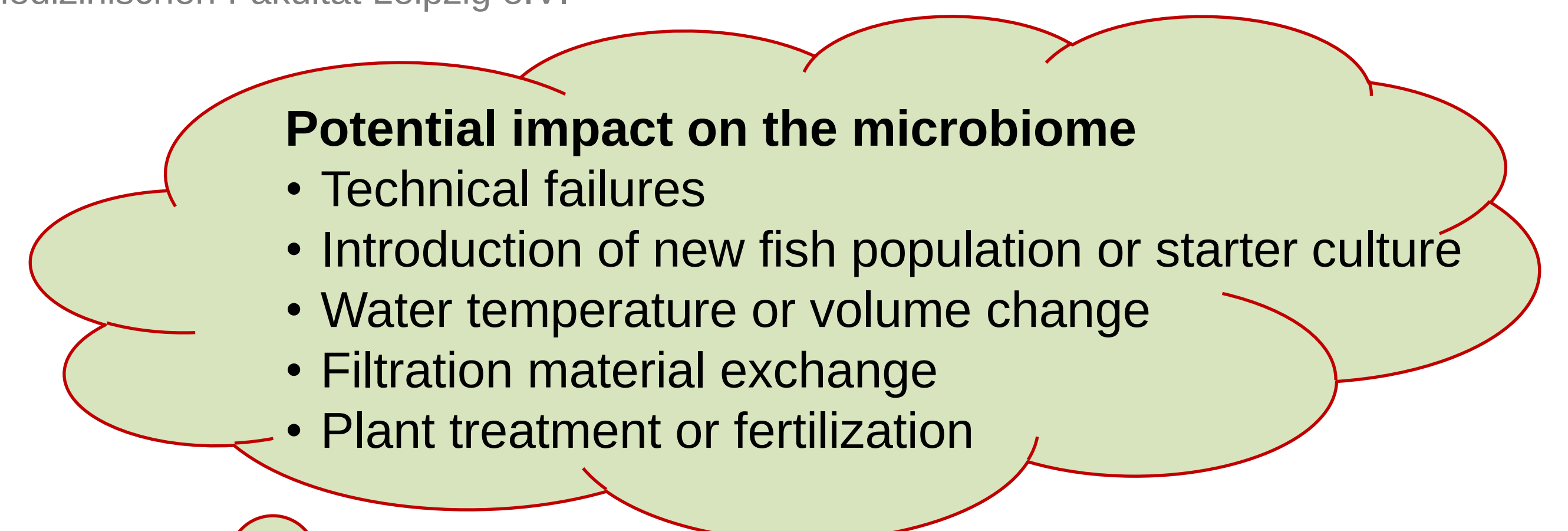
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Introduction

- Fish excretion, -food and decaying plants lead to the release of toxic compounds such as ammonia.
- Compound metabolism by bacteria is essential for returning nitrogen back to the food chain and ensuring fish welfare.
- Together with other bacteria, viruses and microorganisms, these essential bacteria form and inhabit a microbial community, which is influenced by many factors leading to a change in its composition and size.
- Determining changes in the microbial community and the total bacterial count (tbc) can give an indication of fish welfare and the quality of the aquatic environment.



Potential impact on the microbiome

- Technical failures
- Introduction of new fish population or starter culture
- Water temperature or volume change
- Filtration material exchange
- Plant treatment or fertilization

Experiment workflow

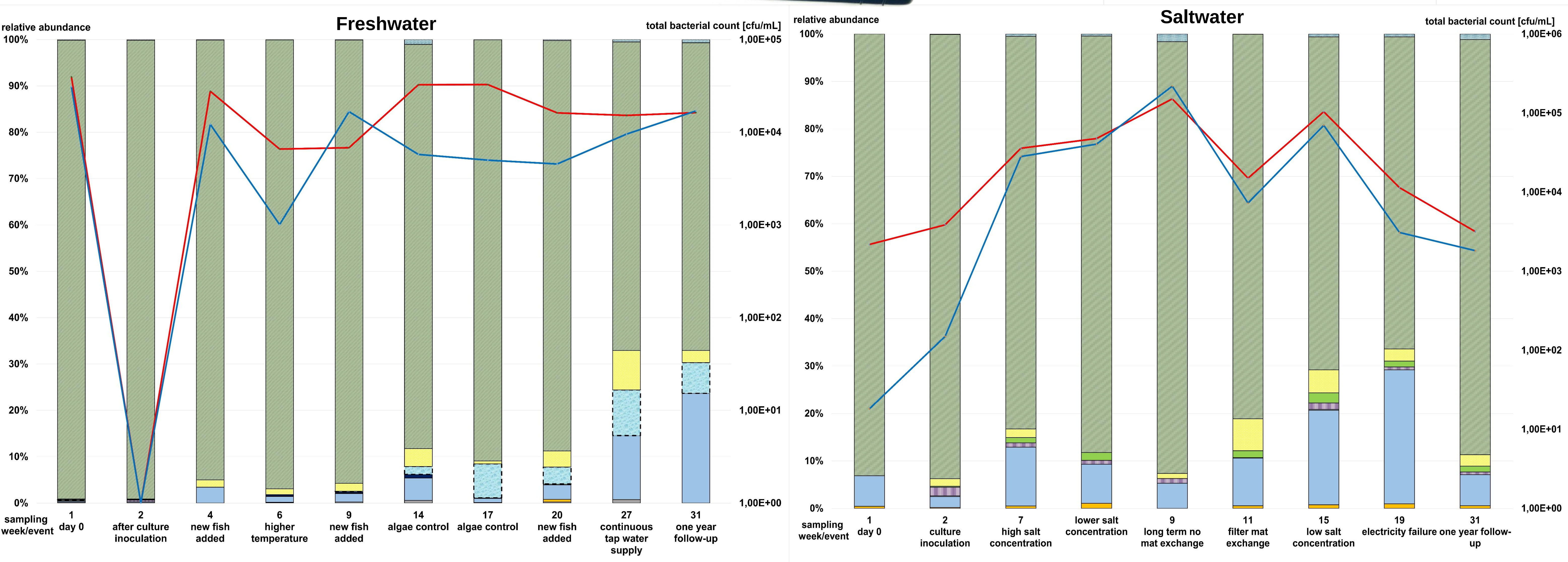
- Weekly filter and water sample collection from October - December 2021 (week 1-10) and biweekly collection from January - October 2022 (week 11-30)
- Nucleic acids purified using a commercial magnetic beads-based isolation kit
- Two different microbiological culture methods used for the colony forming units (CfU) count and tbc calculation
- DNA sequenced using 16S Barcoding Kit (SQK-16S024) and MinION Mk1c device (Oxford Nanopore Technologies)
- Taxonomical analysis performed using the EPI2ME™ software and phylum and family relative abundance calculated

Taxon	Cumulative Reads
Proteobacteria	850,776
Bacteroidetes	171,602
Nitrospirae	82,104
Planctomycetes	57,874
Firmicutes	31,775
Deinococcus-Thermus	5,771
Acidobacteria	4,179
Actinobacteria	3,285
Cyanobacteria	3,200
Armatimonadetes	2,234
Chloroflexi	2,000
Ignavibacteriae	1,881

Proteobacteria
Planctomycetes
Nitrospirae
Bacteroidetes
Firmicutes
Actinobacteria

Aim

Assessment of microbiome changes in aquatic systems and its correlation to various environmental influences



Contact

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Conclusion

- The microbiome can be easily analyzed by combining rapid Nanopore sequencing and deployable mobile "suitcase" laboratory
- It can serve as a potential indicator of significant environmental alterations in aquatic systems, which leads to an improvement of fish welfare