

## Using High-Throughput Sequencing & Time Series Analysis to Explore the Change of Micro-Ecosystem in Aquariums

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With the progress of management technology on culture environment of aquarium, the correlation between microorganism and culture management has been improved. Researches on micro-ecology formed by various kinds of microorganisms in the environment has been a hot research topic recently. Currently, there are several research problems in the study of microorganism in aquarium, including sampling methods, range of identification, ecology predication.

In this study, detection of aquatic water and the original source water was conducted in two different kinds of aquariums in China, Beijing aquarium (inland areas) and Qingdao aquarium (coastal areas) for a period of 18 months. The aquariums detected were all over 1,000 tons, including freshwater aquaculture ponds and marine aquaculture ponds, inside impounding reservoirs and the sea water outside aquariums. We use the high-throughput sequencing technology to detect and classify all microbial species in the studied water environment to further assess the microbial safety and stability in the current water body. According to the result, a time series model for the aquarium microecology was established.

Our results indicate that, 1) A total of 1840 genus microorganism were identified, including 41 Resident genus and 52 normal Pathogenic bacteria. According to the management records, the abundance of regular detected pathogenic bacteria such as *Escherichia coli* and *Vibrio* were lower in aquarium. 2) Significant micro-ecology was identified in different circulating water system (seawater versus freshwater) and different part of circulating water system (Ponds/ Cistern/ Source water) based on the high-throughput sequencing results and prediction of PICRUST ecology model. 3) Based on the model formed by the difference of abundance of microorganism, our data could be used to predict the micro-ecology of circulating water system, laying the foundation for the intervention and guidance of further microorganism adjustment and controlling. Ultimately, a healthy micro-ecological culture environment will be established through rational management.