



# Spatial variations and relationships of phosphorus and bacterial communities in water and sediments in Xiangxi river

Jie Wen

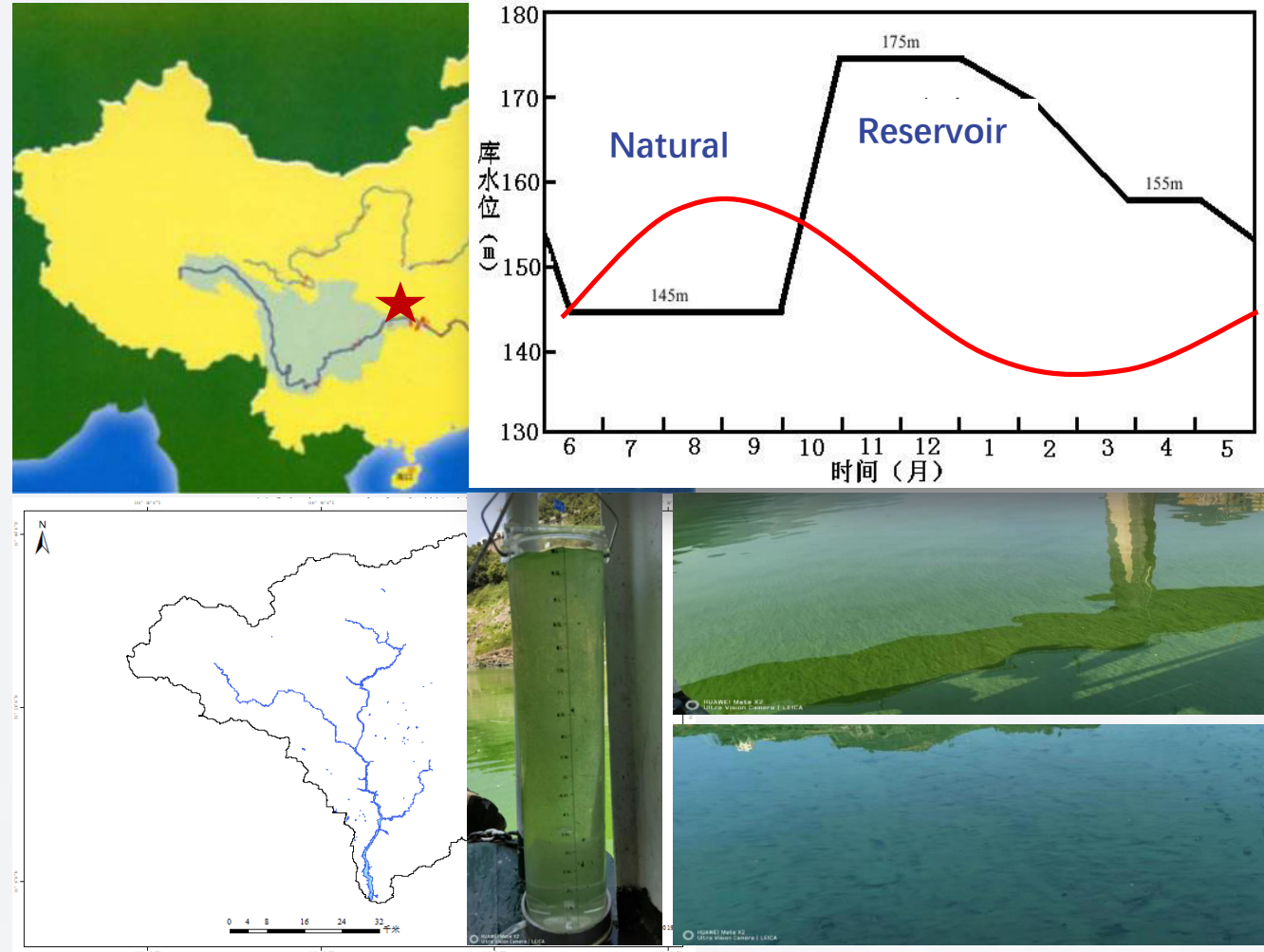
China Institute of Water Resources and  
Hydropower Research

# Content

- **Background**
- **Materials and methods**
- **Results and discussion**
- **Conclusion**

## Study site:

- Xiangxi river is a tributary of Yangtze river of China
- Xiangxi River is located at the head of the Three Gorges Dam
- The operation of the Three Gorges reservoir has changed the natural fluctuation of the river
- Tributary environment gets worse, and the bloom occurs frequently

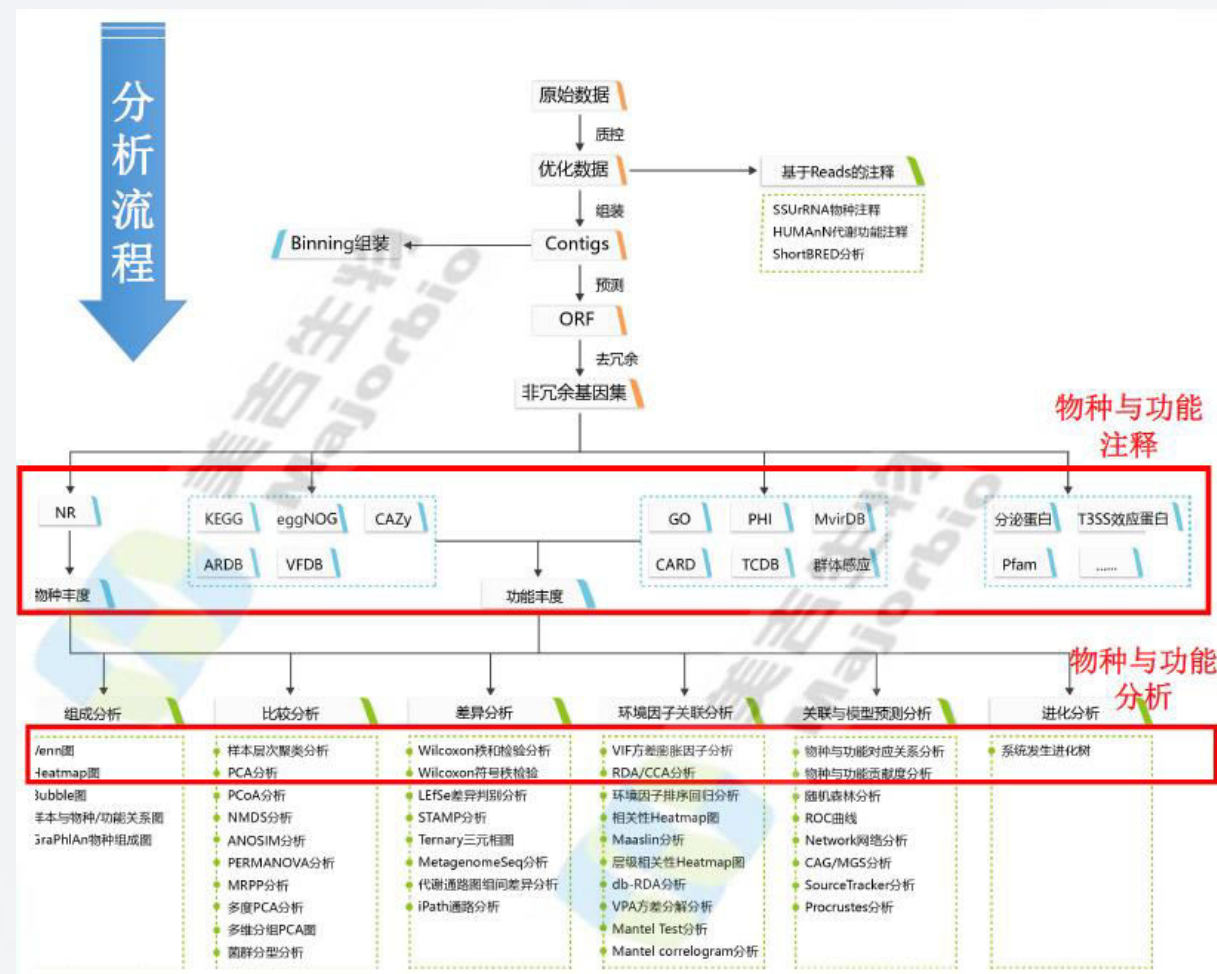


## Research on Xiangxi river:

- The processes and dynamics of blooms
- Spatiotemporal variations of P and N.
- Distribution characteristics of heterotrophic bacteria and inorganic phosphorus bacteria

## Microbial diversity, Metagenomics analysis:

- Species and functional composition analysis
- Sample and comparative analysis
- Analysis of species and functional differences
- Correlation analysis of environmental factors



Metagenomics analysis

## Study site and location:

- The typical tributary of Xiangxi river
- XX00-XX09

## Boat:

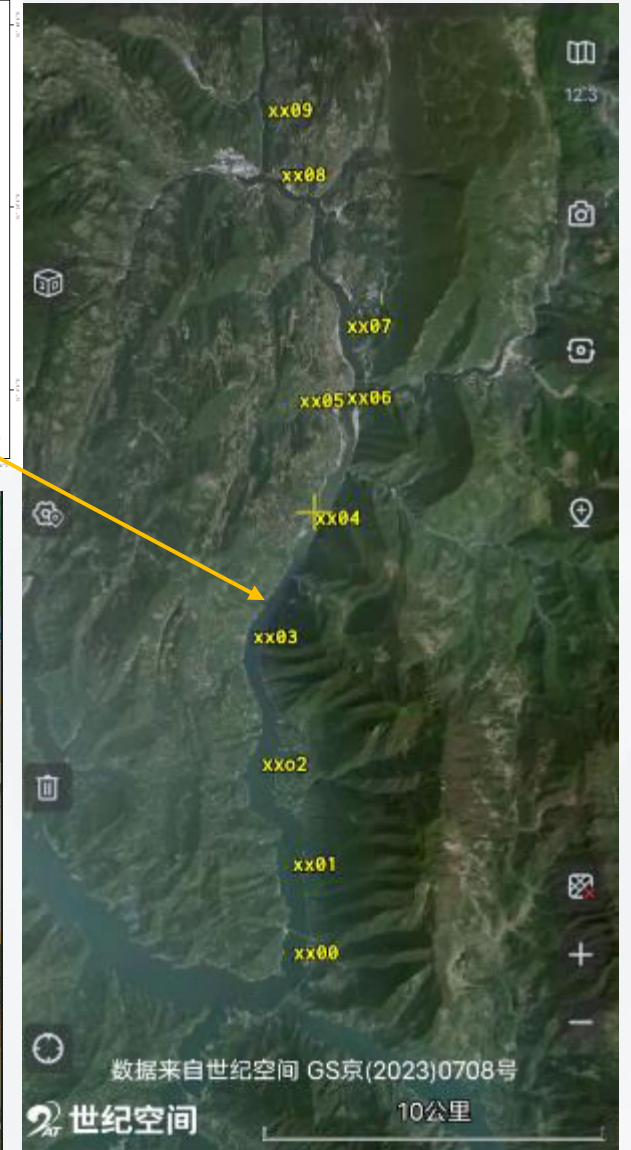
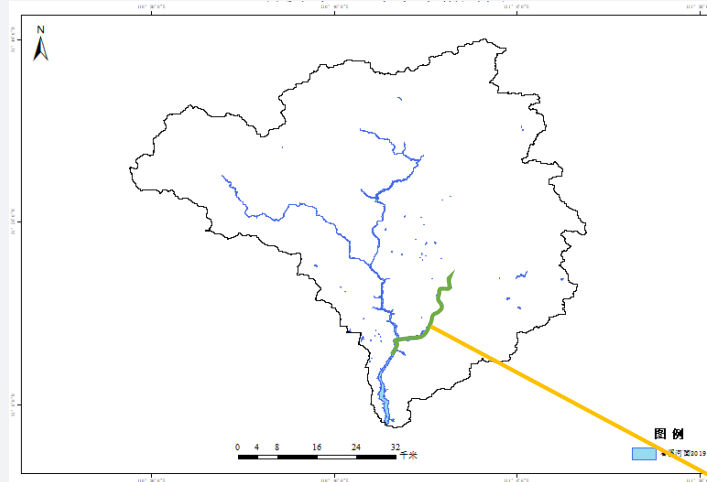
- Research ship number six

## Sampling time:

- July, 2022

## Members:

- Teacher and students from IWHR.



## Water quality detection:

- On-line water quality monitoring

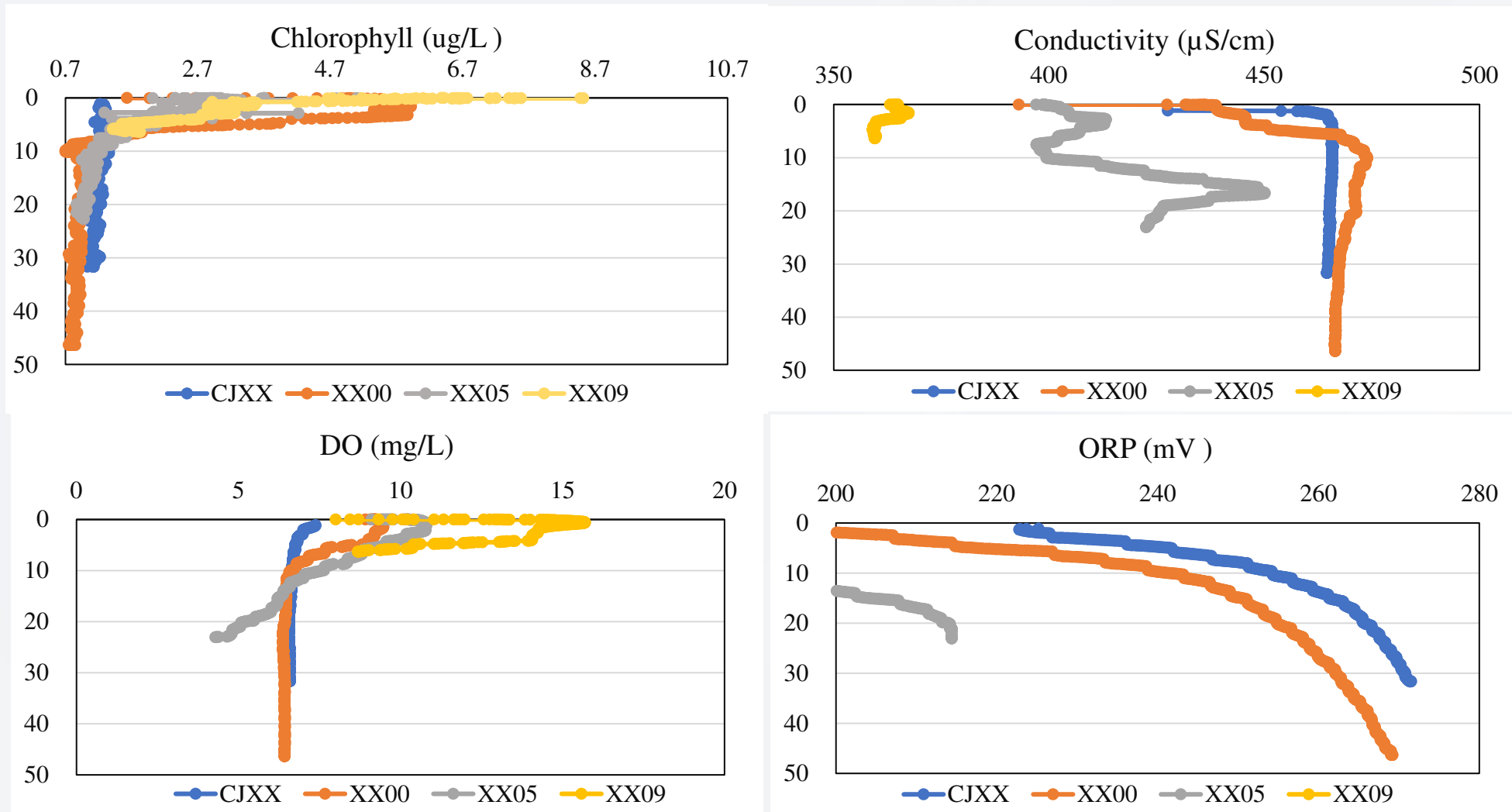
## Sample Collections:

- Water samples: Total Phosphorus (TP) 、  
Dissolved Total Phosphorus (DTP) 、 phosphate、  
Dissolved phosphate
- Sediment and water filter membrane samples:  
Species diversity and metagenomic sequencing.



## Water Quality:

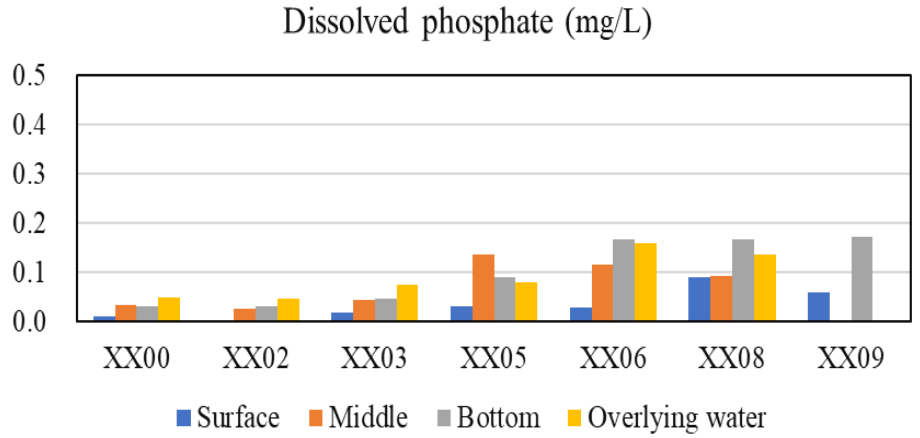
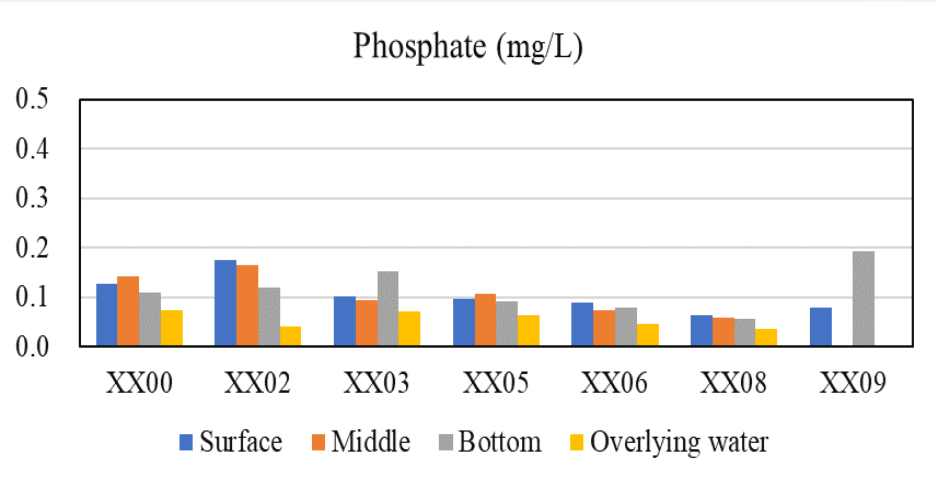
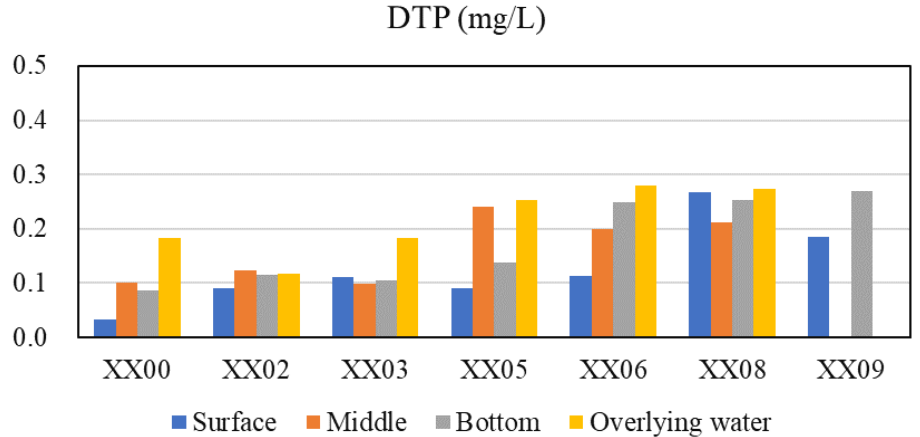
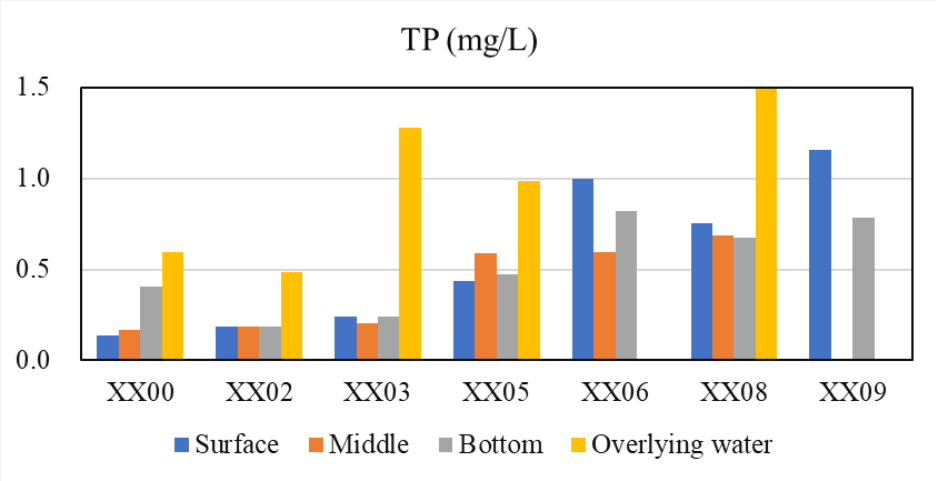
- Chlorophyll and DO were higher in the surface 10cm, and decreased with the depth.
- From the estuary to the upstream, the value of conductivity and ORP decreased markedly.



Chlorophyll、Conductivity、DO and ORP in the research area

## Water Quality:

- From the estuary to the upstream, the value of total phosphorus and dissolved of total phosphorus increased markedly
- TP and DTP in water samples collected from the bottom layer and the overlying sediment was higher compared to the samples from surface and middle layer.



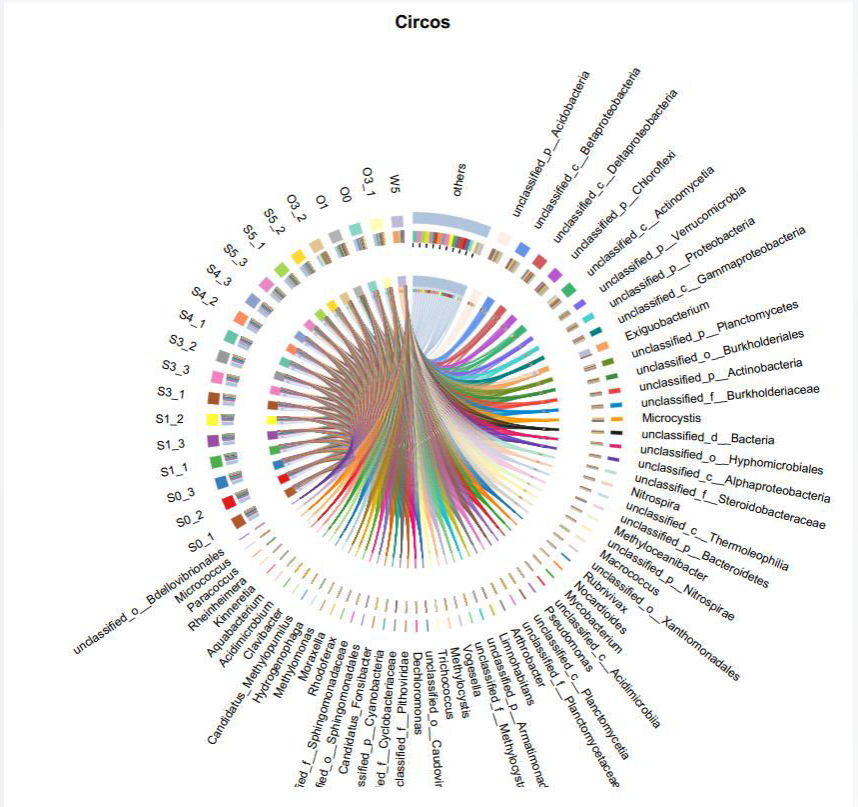
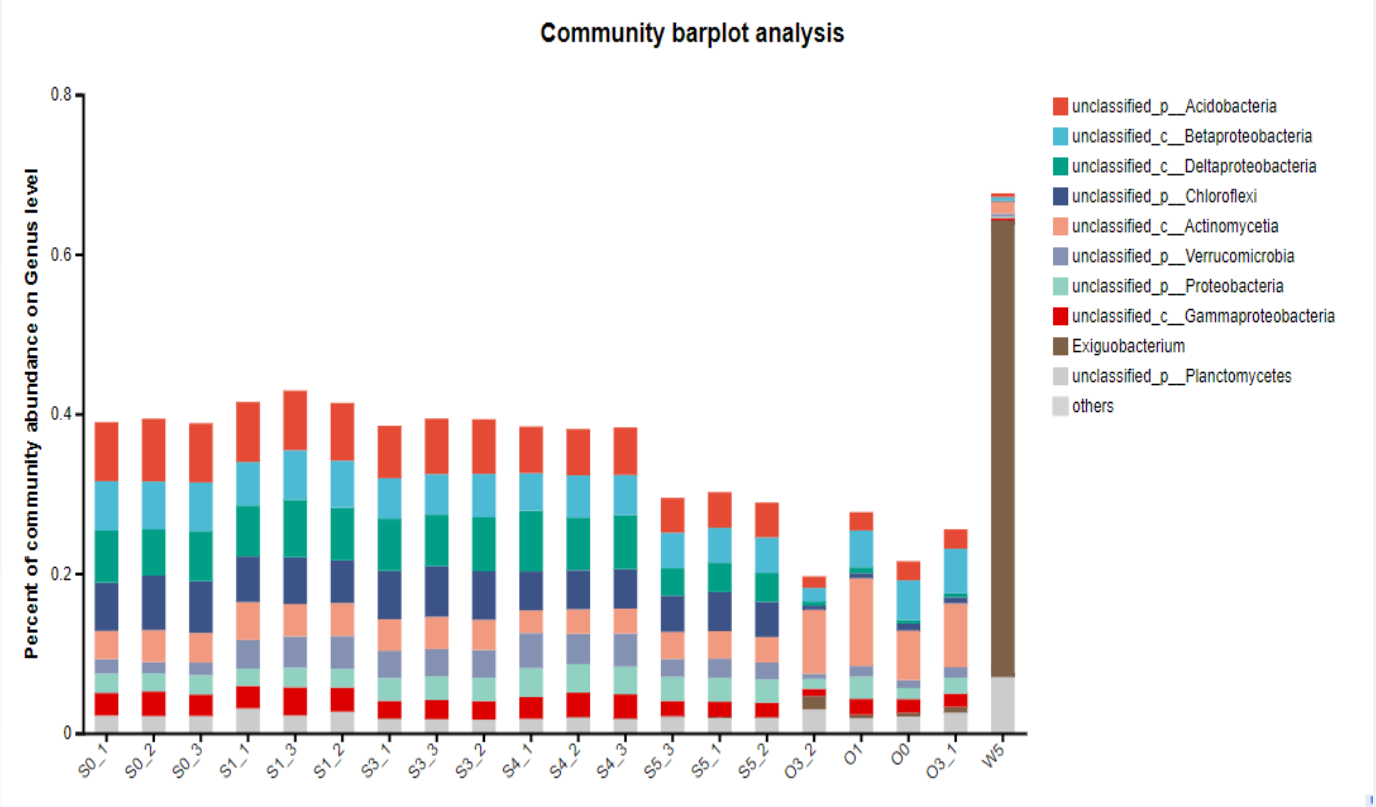
TP、DTP、Phosphate and Dissolved phosphate in the research area



# Results and discussion

## Microbial diversity:

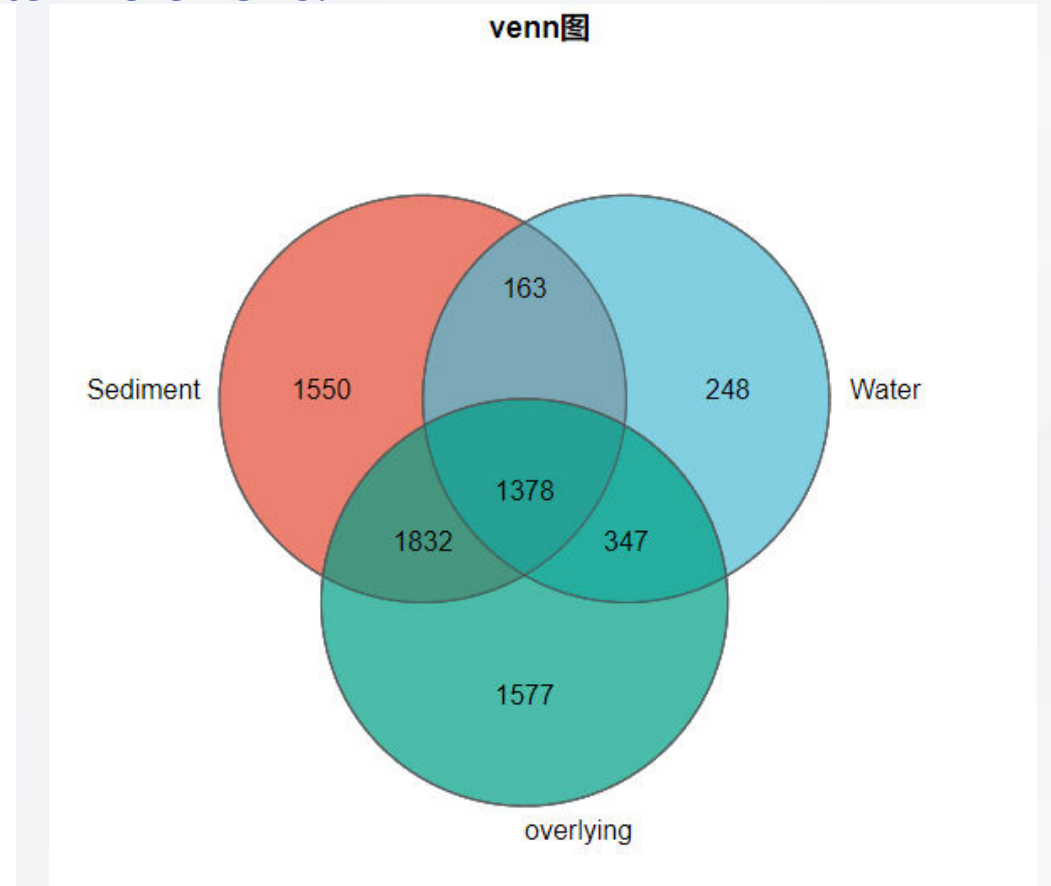
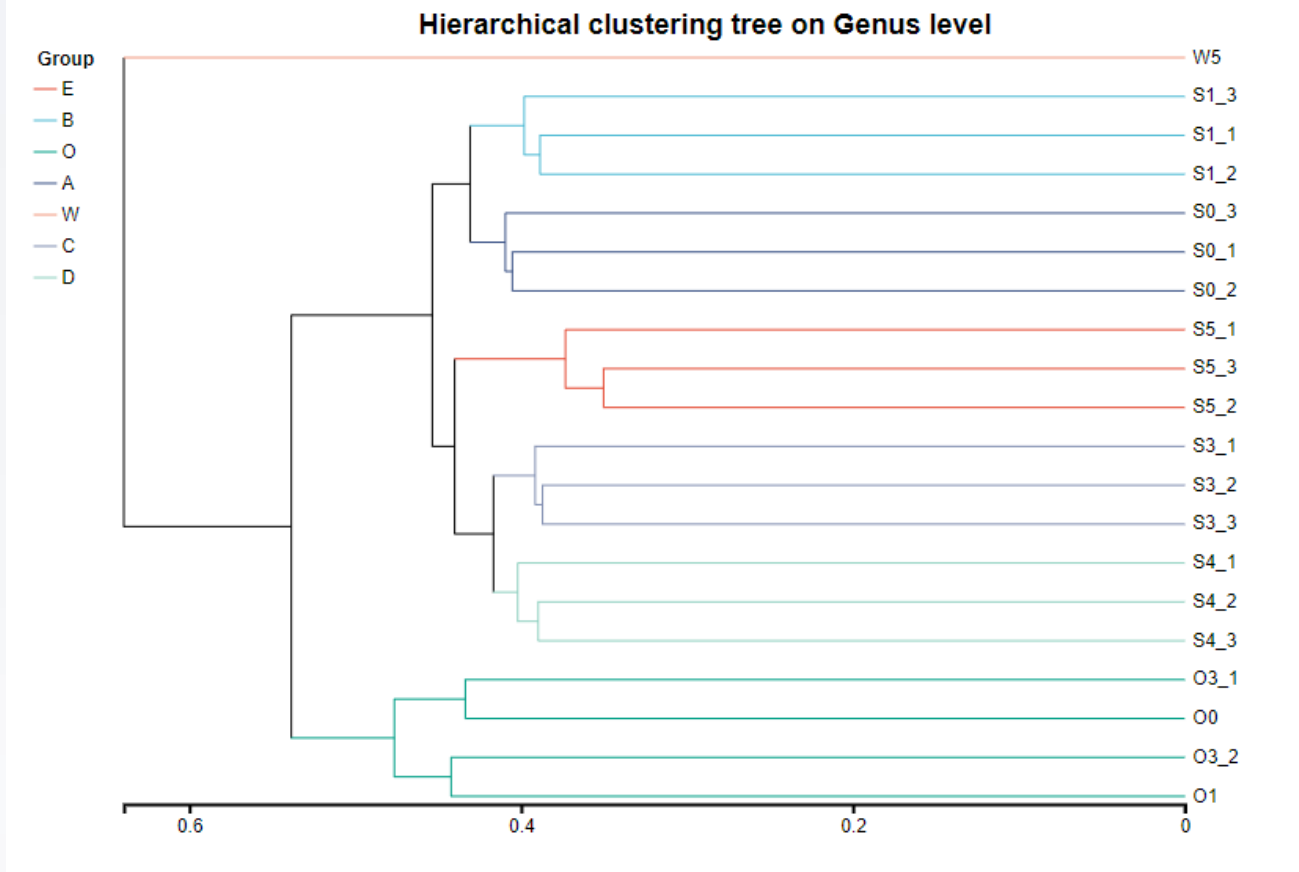
➤ The Acidobacteria, Betaproteobacteria, Chloroflexi, Actinomycetia, exiguobacterium, etc. were the most relatively abundant bacterial.



Microbial diversity analysis results

## Clustering tree analysis:

- Microbial populations at the same site were similar.
- The common Genus of water, sediment and overlying water were 1378.

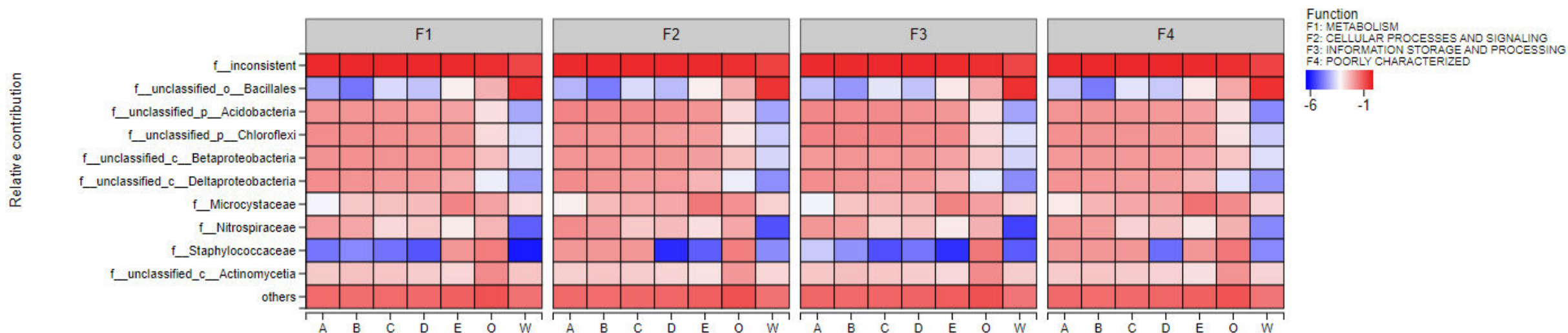


# Results and discussion

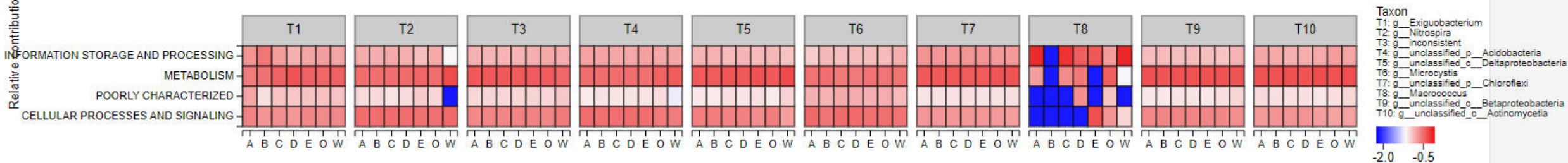
## Function contribution analysis:

- For water samples, Bacillales(革兰氏阳性细菌, 如李斯特菌和葡萄球菌等)played most important roles in metabolism(新陈代谢), cellular processes and signaling(细胞生化过程和信号), information storage and processing.
- For most of the microorganism, metabolism contributed the most in most of the samples.

Heatmap of species and functional contribution analysis

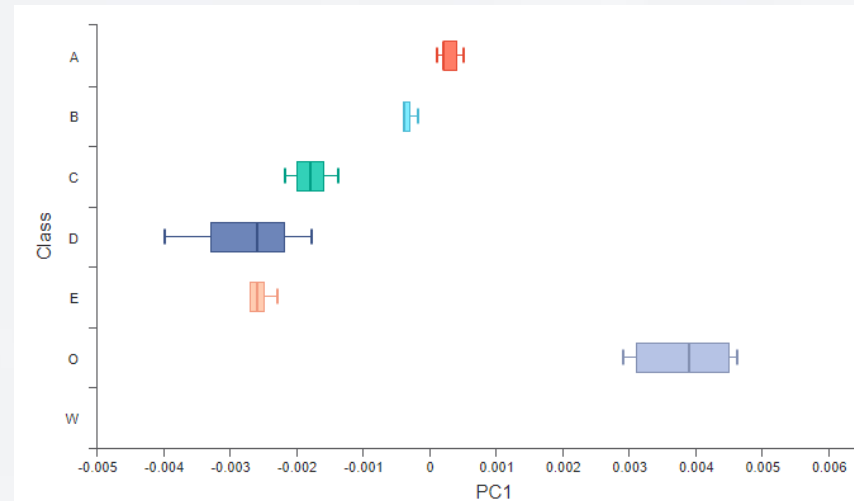
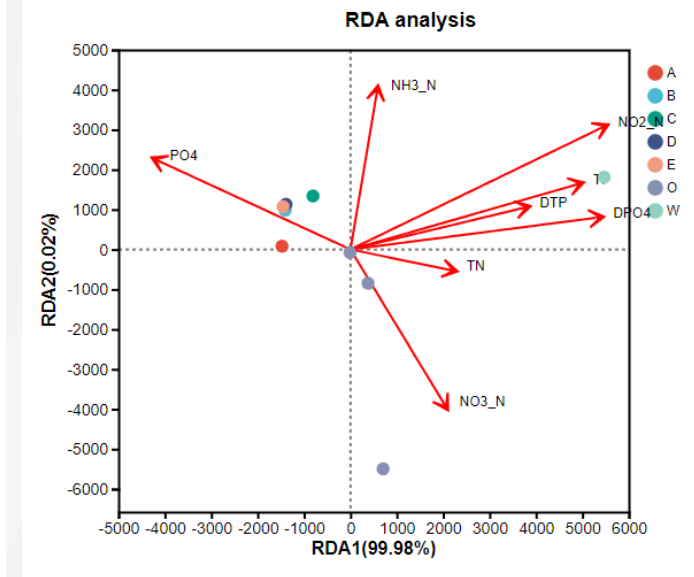
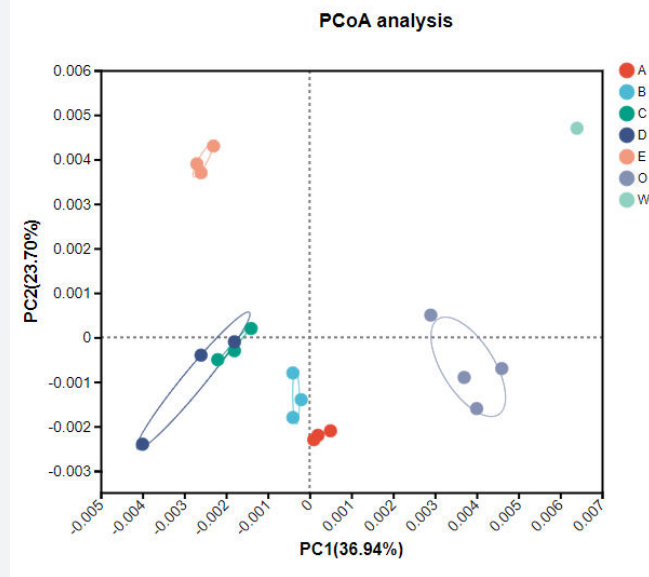


Heatmap of species and functional contribution analysis



# Conclusion

- From the estuary to the upstream, the value of TP and DTP increased markedly, while the value of conductivity and ORP decreased.
- TP and DTP in bottom layer and the overlying sediment was higher compared to the samples in surface and middle layer, however, Chlorophyll and DO were higher in the surface 10cm .
- The horizontal difference is greater than the vertical difference in microbial diversity.
- Water environment influenced the microorganism diversity and distribution. There was a positive correlation between dissolved total phosphorus and microorganisms in water.



PCoA and  
RDA analysis



Thank You for Your Attention!

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