Submerged macrophyte biodiversity buffers impact of eutrophication stress on ecosystem functioning

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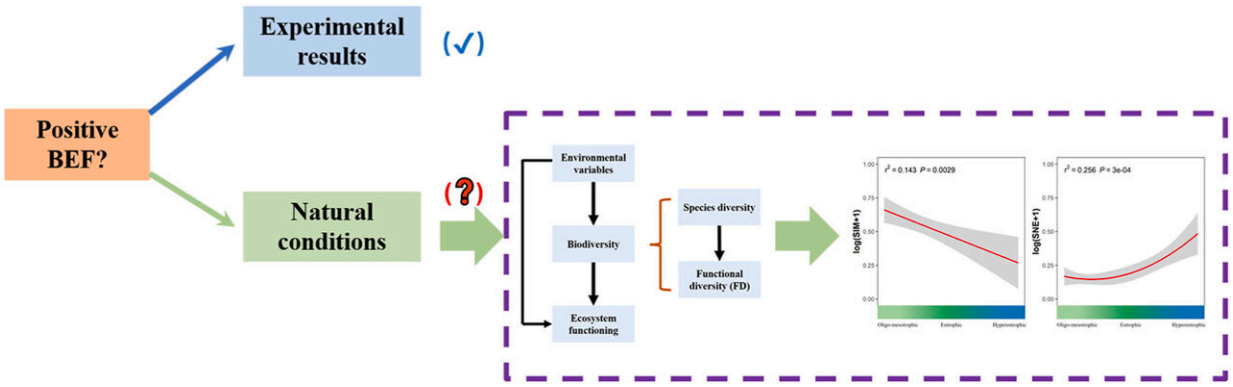

Graphical abstract. Credit: *Environmental Pollution* (2022). DOI: 10.1016/j.envpol.2022.120210

Biodiversity conservation aims to preserve the ecosystem functions embedded in different species. The positive relationship between biodiversity and ecosystem functioning (BEF) has been proven in experiments. However, the relationship remains uncertain in the natural environment.

The species number and distribution area of submerged macrophytes have suffered severe declines due to eutrophication over the past decades.

Submerged vegetation restoration is an important technology for improving lake aquatic ecology, but usually only one or two species, such as Vallisneria natans or Hydrilla verticillate, were selected in this process. It is of great significance to investigate the effect of submerged macrophytes biodiversity on ecosystem functioning under eutrophication pressure for the aquatic ecology restoration of lakes in China.

In a recent study published in *Environmental Pollution*, a research group led by Prof. Cao Te from the Institute of Hydrobiology (IHB) of the Chinese Academy of Sciences demonstrated that submerged macrophytes biodiversity has a positive impact on ecosystem functioning under eutrophication, and identified that functional diversity index has the strongest explanatory power for ecosystem functioning.

Based on extensive field sampling data of submerged macrophytes communities including 49 lakes and reservoirs in the Yunnan-Guizhou Plateau, Southwest China, the researchers found that species richness and functional diversity can contribute to ecosystem functioning in a direct or indirect way by constructing a structural equation model, but nitrogen nutrition has the negative impact on ecosystem functioning.

To find out which biodiversity index has the strongest predictive power for ecosystem functioning, the researchers regressed ecosystem functioning with three biodiversity indexes, i.e., species richness, functional diversity and beta diversity. The results showed that the adjusted R2 (i.e., explanatory rate of the regression models) of the regression analysis between functional diversity and ecosystem functioning was the strongest.

Finally, the researchers demonstrated that communities can maintain ecosystem functioning by changing community functional composition or the relative importance of "niche complementarity" or "selection effects" through the principal component analysis (PCA) and the linear

and quadratic regression.

These findings provide a scientific basis for the restoration and management of lakes, i.e., submerged vegetation restoration should week out the previous single species restoration patterns, and switch to a diverse cultivation pattern to improve lake water quality.

More information: Hao Wang et al, Biodiversity buffers the impact of eutrophication on ecosystem functioning of submerged macrophytes on the Yunnan-Guizhou Plateau, Southwest China, *Environmental Pollution* (2022). DOI: 10.1016/j.envpol.2022.120210

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