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Conference Abstract

Mechanistic insights into freshwater biodiversity loss: How functional traits drive aquatic plant invasions in the Lake Taihu Drainage Basin, China

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Abstract

Our research investigates the transformation of aquatic plant diversity in the Lake Taihu drainage basin (LTDB), located in one of China's most developed regions. We focused on the impacts of three major invasive species that now dominate the aquatic plant community in LTDB: water hyacinth (*Eichhornia crassipes*), Carolina fanwort (*Cabomba caroliniana*), and alligator weed (*Alternanthera philoxeroides*).

The floating *E. crassipes* stands out by its unique poly-herringbone root-branching system, which significantly enhances its nutrient uptake efficiency resulting in rapid growth. The dense floating mats block sunlight and deplete oxygen, ultimately smothering submerged plants and benthos and culminating in severe biodiversity loss. Furthermore, with climate warming, the overwintering success of *E. crassipes* is increasing, potentially facilitating a life-history shift from annual to perennial, thereby enhancing its persistence and invasiveness.

The submerged *C. caroliniana* has similarly become a major threat in the LTDB due to its ability to form dense, monospecific communities, particularly under low light conditions. This species is highly resistant to native herbivores and has traits, including rapid proliferation through stem fragmentation, that favour growth under fluctuating

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environmental conditions. Propagation by stem fragmentation complicates management, and it is likely that *C. caroliniana* has not yet reached its distributional limit in the LTDB.

The success of the amphibious *A. philoxeroides* in urban wetlands highlights its ability to exploit disturbed and eutrophic environments, allowing it to outcompete native plants. We found that zeatin and purine metabolism in the leaves are key indicators of its invasion success. Notably, these metabolomic traits appear to play a more significant role in the species' invasiveness than morphological leaf functional traits.

Beyond individual characteristics of these species, our studies suggest that the interplay between anthropogenic eutrophication and climate-induced life-history shifts creates a perfect opportunity for aquatic invasions. These findings provide a practical basis for focusing management efforts on invasive aquatic plants in the LTDB.

Keywords

Aquatic plant diversity, biological Invasions, Lake Taihu drainage basin, *Cabomba caroliniana* (Carolina fanwort), *Eichhornia crassipes* (Water hyacinth), alligator weed (*Alternanthera philoxeroides*), functional traits, leaf metabolomics

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Conflicts of interest

The authors have declared that no competing interests exist.