Riverine fish numbers increase amidst environmental challenges

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Surprising trends in the abundance and species richness of riverine fish across the globe have been unveiled in a new study.

Until now, it was a common scientific belief that increases in species richness and abundance in freshwater ecosystems were as a result of the recent improvement of water quality in historically industrialized regions.

The new research, led by academics at the University of Sheffield in collaboration with Illinois State University, the University of Tennessee and University of Washington, has since found the increase in river fish diversity is not as a result of ecosystem recovery, as previously thought, but as a result of the increasing dominance of non-native species.

The study, published in *Nature Ecology & Evolution*, uncovered an average increase in community abundance of 13% per decade and a 7% increase in species richness.

However, the study also revealed a 30% average decline in riverine fish community similarity per decade.

Exploring the impact of human activities on river ecosystems over time, researchers found that areas suffering from environmental degradation experience quicker transformations in river fish communities. The study highlights how the combination of land degradation and the introduction of non-native species by humans contributes to this accelerated change.

This trend becomes more pronounced in areas where human impacts have recently intensified. Initially, human actions harm habitats, causing a decline in the number and abundance of native species.

Over a more extended period, these activities lead to the introduction of non-native species, either intentionally or unintentionally, such as through fishing or aquaculture. These non-native species thrive in degraded ecosystems and can outcompete native species that are less adapted to such conditions.

Rivers, lakes, and wetlands, covering less than 1% of the Earth's surface, are home to approximately 10% of known species, including one-third of all vertebrates. Despite their ecological importance and contribution to essential resources like food, water, and energy, freshwater systems face mounting threats from human activities.

Alain Danet, postdoctoral research associate at the University of Sheffield and lead author of the study, said, "In the midst of the current biodiversity crisis due to human activities, characterizing local biodiversity changes across the world is essential to assess the level of ecosystem degradation, to evaluate the effectiveness of environmental policy, and to take adequate conservation measures.

"We want to shed light on how biodiversity is changing and why it's important to pay attention to the specific species present in different environments. Our research shows that although there is an overall increase in the number of species over time, accompanied by rapid species replacement, many of these new species are not native and can adapt to damaged environments.

"Contrary to the idea that more species always means a healthier ecosystem, our findings indicate that the reported increases may not be good news for ecosystems impacted by human activities."

More information: Alain Danet et al, Past and recent anthropogenic pressures drive rapid changes in riverine fish communities, *Nature Ecology & Evolution* (2024). DOI: 10.1038/s41559-023-02271-x

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