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Freshwater Biodiversity Threatened by Climate Change

A recent research project has addressed the losses in freshwater biodiversity under plausible climate change and water consumption scenarios. About half of the investigated rivers worldwide would experience reduced water availability due to both global warming and withdrawal of water for human needs. By 2070, in these drying rivers, loss in local fish species would range from less than 4% to more than 22% with a maximum of 75% loss in the most affected rivers.

Over the past 30 years, freshwater species have declined faster compared to terrestrial or marine species. Unfortunately, growing evidence indicate that this trend is likely to persist in the future. On one hand, freshwater ecosystems will probably further suffer from invasive species and land use changes. On the other hand, freshwater biota is likely to be impacted by the predicted reduction in water availability driven by increased water consumption for human uses and indirectly related to global climate change.

In order to promote the efficient management of freshwater biodiversity and eventually inverse its decline, there is an urgent need to provide solid estimations of fish species losses under plausible climate change and water consumption scenarios.

In response to this need, a team of international experts used two scenarios from the Intergovernmental Panel for Climate Change (IPCC) to cover a large range of possible climate change outcomes. For the first time, they combined these scenarios with a global hydrological model to estimate possible losses in river water availability due to climate change and trends in water consumption. Linking the obtained results to known relationships between fish species and changes in water availability, they investigated the riverine fish richness over the next 70 years in more than 300 worldwide riverine basins.

In both scenarios, their calculations showed that by 2070, water availability would decrease up to 80% in more than 130 investigated rivers with available fish data. About half of these rivers were predicted to lose more than 10% of their fish species when climate change and water consumption impacts were considered. A maximum of 75% of local fish losses were calculated for Cauvery, Parnaiba, and San Tiguel rivers.

The effect of climate change was the most important factor of freshwater fish loss under the scenarios, while anthropogenic water withdrawal contributed much less to species loss (an additional 0–5%). However, in regions where substantial irrigation has occurred in the past and is expected to increase (e.g., Southern Asia, and the Middle East), water consumption is particularly important for fish biodiversity decline.

According to the authors, these forecasts are underestimates of fish losses because many other important drivers were not included in the calculations (e.g. introduced species, reductions in channel-flood-plain connectivity).

In any event, the scientists argue that along with the international efforts to minimize global warming, reducing water consumption could be an initial conservation strategy to prevent the predicted loss of fishes worldwide.

Source:Xenopoulos M.A et al (2005)"Scenarios of freshwater fish extinctions from climate change and water withdrawal" Global Change Biology 11 (10): 1557-1564.
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