



CLIMATE CHANGE THREATENS FRESHWATER FISH IN BRAZIL

Emilly Layne Martins do Nascimento¹, Fabrício Barreto Teresa²

¹ *Universidade Estadual de Goiás, Laboratório de Biogeografia e Ecologia Aquática, Goiás, Brasil*

² *Universidade Estadual de Goiás, Laboratório de Biogeografia e Ecologia Aquática, Goiás, Brasil*

E-mail: emillylayne32@gmail.com

Resumo: Brazil contains one of the most diverse freshwater fish faunas in the world, including many endemic and threatened species whose persistence depends on specific climatic and hydrological conditions. In this study, we modeled the current and future climatic suitability of 101 endangered and restricted-range freshwater fish species across Brazil using high-resolution CHELSA projections under three emission scenarios: SSP1-2.6, SSP3-7.0, and SSP5-8.5. Our results indicate a consistent and severe contraction in climatic suitability throughout the twenty-first century. Across scenarios and time periods, between 63 and 66 species are projected to lose all climatically suitable area within the modeled region, suggesting a high risk of climate-driven regional extinction. Although some species exhibit localized gains, these are limited and do not offset projected losses, which intensify under higher emission scenarios and toward the end of the century. To ensure ecological realism, dispersal was constrained to hydrologically connected level 8 watersheds, and we quantified centroid displacement, climate exposure, and vulnerability. Species unable to keep pace with shifting climatic suitability experienced the greatest net losses, underscoring that climate change alone represents a substantial threat to most threatened freshwater fish species in Brazil. Our findings reveal widespread reductions in suitable climatic conditions across multiple hydrographic regions, with especially severe impacts under high-emission scenarios. These projected contractions highlight the vulnerability of freshwater fishes to ongoing climatic changes and emphasize the importance of incorporating climate adaptation into conservation planning. By combining species distribution models with hydrological constraints and future climate projections, this study provides a national-scale assessment of extinction risk and spatial redistribution patterns for threatened freshwater fishes in Brazil under future climate change.

Palavras-chave: *climatic suitability; emission scenarios; endangered species; hydrological connectivity.*