

Municipal wastewater can result in a dramatic decline in freshwater fishes: a lesson from a developing country



Impacts of ineffective wastewater management on the biodiversity of receiving waters in developing countries are poorly documented. Using a before-after-control-impact methodology, we measured the effects of untreated wastewater release on the fish community in the Barnoi River, Bangladesh. In 2006, prior to untreated wastewater discharge, fish abundance, species richness and water quality were similar across sampling sites. In 2016, after 8 years of wastewater release to the downstream reach, fish abundance and species richness were reduced by >47% and >35% respectively at downstream sites compared to unaffected upstream sites and >51% and >41% lower respectively compared to the pre-wastewater discharge period. The wastewater impact was particularly severe during months of low discharge (October–December). Water transparency, dissolved oxygen and pH were lower ($P < 0.001$) at impacted downstream sites compared to upstream sites. Nineteen species (41.3% of all species we recorded) are threatened in Bangladesh and the abundance of these species, except one, decreased significantly ($P < 0.05$) at the

impacted sites. We recommend improved wastewater management by applying primary treatment facilities and incorporating reedbed filtration as a mean of biological treatment, into the canals carrying wastewaters. The success of such measures should be tested with fish species that were most responsive to wastewater, using the indicator species concept.

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