Review: Biomanipulation of fish assemblages as a lake restoration technique

Ray W. Drenner¹ and K. David Hambrigg²

With 5 figures and 2 tables

Abstract: We searched the limnological literature to assess the success of biomanipulation projects with respect to improvement of water quality in culturally eutrophic lakes and reservoirs. We reviewed 41 biomanipulation experiments (from 63 published papers/books) involving the reduction of zooplanktivorous and benthivorous fish abundances in 39 lakes. We divided the experiments into five categories based on the type of biomanipulation performed: piscivore stocking, piscivore stocking + partial fish removal, partial fish removal, elimination of fish, and elimination of fish followed by restocking. We judged success (consistently successful, partially successful, unsuccessful) by changes in water quality variables; primarily phytoplankton or chlorophyll biomass and water transparency, during the post-implementation period of each study. The percentage of consistently successful manipulations varied with approach: piscivore stocking (28.6 %), piscivore stocking + partial fish removal (60.0 %), partial fish removal (90.0 %), elimination of fish (40.0 %), and elimination of fish followed by restocking (66.7 %). Overall, 61 % of the biomanipulations were consistently successful in improving water quality, with most successful attempts involving small, shallow lakes (<25 ha, mean depth <3 m). Only 14.6 % of the biomanipulations were unsuccessful in improving water quality for at least one year. Biomanipulations resulting in increased abundances of Daphnia and macrophytes were most likely to achieve stable clear water states and maintain improved water quality.

each natural or man caused perturbation to a lake is to some extent a novel experiment because no two lakes are identical…

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Authors’ addresses: Biology Department, Texas Christian University, Fort Worth, Texas 76129, U.S.A.
²Israel Oceanographic and Limnological Research, Kinneret Limnological Labora-
tory, PO. Box 345, Tiberas, 14102, Israel.

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