Approaches for studying fish production: Do river and lake researchers have different perspectives?

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Abstract--Biased perspectives of fisheries researchers may hinder scientific progress and effective management if limiting factors controlling productivity go unrecognized. We investigated whether river and lake researchers used different approaches when studying salmonid production and whether any differences were ecologically supported. We assessed 564 peer-reviewed papers published between 1966 and 2012 that studied salmonid production or surrogate variables (e.g., abundance, growth, biomass, population) and classified them into five major predictor variable categories: physical habitat, fertility (i.e., nutrients, bottom-up), biotic, temperature, and pollution. The review demonstrated that river researchers primarily analyzed physical habitat (65% of studies) and lake researchers primarily analyzed fertility (45%) and biotic (51%) variables. Nevertheless, understudied variables were often statistically significant predictors of production for lake and river systems and, combined with other evidence, suggests that unjustified a priori assumptions may dictate the choice of independent variables studied. Broader consideration of potential limiting factors on fish production, greater research effort on understudied genera, and increased publication in broadly scoped journals would likely promote integration between lentic and lotic perspectives and improve fisheries management.

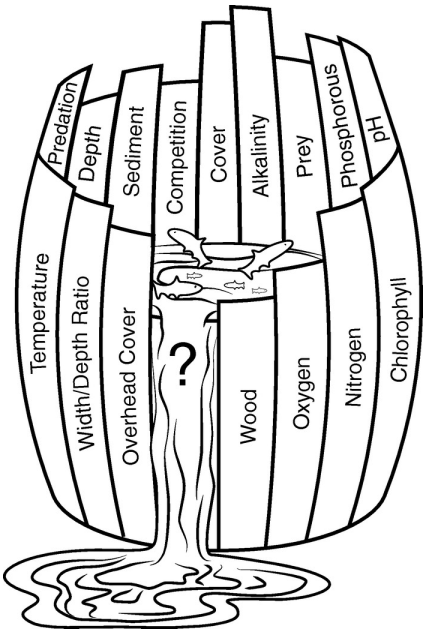

Fig. 1. Liebig–Sprengel's barrel showing how different independent predictor variables might influence fish production. In this conceptualization, the most limiting resource (e.g., wood, nitrogen) or the dominant control factor (e.g., temperature, predation) is the one that actually controls fish production. Fishery researchers may design studies without really evaluating what the most important predictor variables are for fish production.

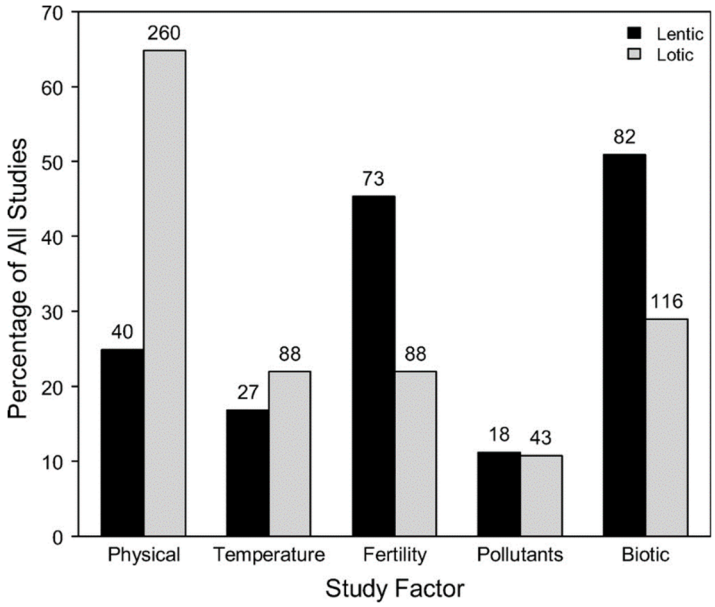

Fig. 4. Percentage of studies that examined different major categories of predictors of fish production in lentic (lakes and reservoirs) and lotic (streams and rivers) systems. The term fertility refers to nutrient and prey abundance variables and is considered synonymous with "bottom-up" controls. Within each system (lentic or lotic), percentages sum across study factors to more than 100% because researchers sometimes studied variables in more than one category. Numbers above histogram bars show the total count of papers for each category.

Keywords: review, fish, production, aquatic, ecosystem, lake, reservoir, stream, river, creek, pond, growth, cover, habitat, competition, sediment, predation, temperature, wood, CWD, oxygen, nutrients, phosphorus, chlorophyll, phytoplankton, periphyton, algae, alkalinity, pH, substrate, management, fishing, angling, pollution, velocity, water, salmonid, trout, charr, salmon