Rivers and Streams

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Fish Species of Greatest Conservation Need in Iowa's Non-Wadeable Rivers: Distribution, Relative Abundance, and Relations with In-stream Habitat and Potential Movement Barriers

The first objective in this project was to determine the historic changes in fish distributions and in fish assemblage structure. To accomplish this objective, comparisons of species occurrences in five focal river systems were made between a historic and a recent assessment period. Trends in the distribution of 126 species were judged using iterative resampling methods and changes in species composition were determined using multivariate approaches. As expected, temporal changes in fish assemblage structure were apparent across rivers, yet the magnitude of these changes varied within and among river systems. Fish assemblages in the Des Moines, Iowa, and Cedar rivers showed significant temporal change in species composition; whereas species composition exhibited little change (i.e., potential persistence) in the Wapsipinicon River and the changes in the Maquoketa River were inconclusive. Among these rivers, the species in the Des Moines River showed the most decline (~50% of its species). With the exception of the Maquoketa River, spatial patterns of temporal turnover have indicated that the majority shifts in species composition have occurred in lower reaches of these rivers which are connected to the Mississippi River. Species that have declined across river systems were primarily characterized as backwater-phytophilic species and some fluvial specialists; whereas, species that have expanded their occurrence were mainly characterized as macrohabitat generalists. Findings from this study can aid in re-evaluating the conservation status of riverine fishes in Iowa and help to reprioritize conservation efforts needed for monitoring and rehabilitating specific lotic habitats.

The second objective of this project was to evaluate the influence dams and other environmental characteristics on fish assemblage structure in nonwadeable rivers. In the 2010 and 2011 field seasons, comprehensive fish assemblage and environmental data were collected from 33 sample reaches in the Cedar and Iowa rivers. These data were analyzed using canonical correspondence analysis (CCA) to identify associations between fish assemblage structure and environmental variables operating across multiple spatial-scales (reach-scale, dam-related, and landscape-scale). Separate CCAs (11 models) were created for each gear type and assemblage descriptor (taxonomic and functional). Partial CCAs were then used to partition assemblage variation explained by the environmental variation associated with each spatial-scale and by individual environmental variables. Partial CCAs indicated that fish assemblage structure was explained by reach-scale habitat characteristics in 11 models and by dam-related and landscape-scale characteristics in 9 models. Despite the contributions from dams and the landscape, assemblage variation was mostly explained by reach-scale habitat in the majority of models. Mean annual discharge and percentage of shoreline rip-rap were amongst the reach-scale variables that explained highest proportions of fish assemblage variation. In particular, discharge gradients largely corresponded to variation in life history strategies. Although reach-scale habitat accounted for a high proportion of fish assemblage variation, dams and landscape still accounted for considerable amounts of assemblage variation. Important dam-related variables such as mainstem fragment length and distance to downstream impoundment provided consistent explanations of taxonomic and functional patterns not explained by reach-scale habitat. Additionally, the distribution of several species were determined to be truncated by dams in both rivers (eight in the Cedar River and 11 species in the Iowa River) indicating that dams are acting as barriers to fish dispersal.