
Multispecies fish passage behaviour in a vertical slot fishway on the Richelieu River, Quebec, Canada

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Summary

A shift from target species to ecosystem restoration has generated interest in developing fishways capable of passing entire fish communities, but evaluations of these fishways are lacking. The researchers examined passage success and passage duration of fish using a vertical slot fishway at a low head dam on the Richelieu River in Quebec, Canada that annually passes in excess of 35 species of fish. Passage efficiency was highly variable among species; however, it was >50% for five of the species represented in this study. Passage duration was likewise very variable both among and within species. Although this fishway design was not uniformly successful in passing all fish species, this study does reveal the species that have problems with ascent and estimates the time spent in the fishway, which is an important component of passage delay.

Dams associated with hydropower production or water management can serve as barriers to fish migration resulting in changes to fish community structure and system productivity. Fishways represent one possible solution to overcome fish migration obstacles, although much of the current knowledge about fishway design and success is based on research conducted on high priority species such as salmon. Further, fishway evaluations frequently concentrate on documenting species captured in a fishway trap, rather than evaluating the passage efficiency and fishways reported to successfully pass entire fish communities are rare.

The potential for hydropower expansion or upgrading of existing facilities further highlights the need to provide science to support future fishway design. Specifically, the researchers were interested in determining passage efficiency and duration among species at this site, to ascertain whether this fishway design could serve as a model for warm water community passage. The current study design did not enable quantification of fishway attraction efficiency or the number of migrating individuals congregating downstream of the fishway. Results indicated that delayed re-entry and passage occurred for numerous species. Delayed migrants are thought to use more energy due to repeated, unsuccessful attempts at fishway passage. The variability in passage success and duration observed in the study did not appear related to the differential life history strategies of the species examined. The reproductive fate of individuals used in the current study remains unknown, which is an important knowledge gap in this and other fishway studies.

This study supplemented existing trap capture information and identified marked differences of passage efficiency and passage duration among species, which could not be explained by migratory tendencies. This information is crucial to inform future management of aquatic resources as the ecological consequences of failed reproduction, stemming from an inability to reach spawning grounds, can have severe ecosystem consequences. Of particular interest were the numerous delays and low passage efficiency of many catostomids (i.e. suckers). The information presented here could be useful for refining future design to facilitate passage with minimal delay.