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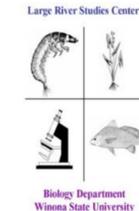
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TEMPORAL CHANGES IN FISH ASSEMBLAGES FOLLOWING HYDROLOGICAL DISTURBANCE

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Objectives

This project examined the role of hydrological disturbance in shaping the composition of fish assemblages by examining total number of fish, species diversity, and number of species following a flood pulse in the Upper Mississippi River. The study focused on slackwater patches with differing durations of hydrological connections to channels, which creates different levels of disturbance.

Methods

Study Area

Six slackwater habitats were sampled three times from June through August 2012. Habitats chosen were 1 - 2 hectares in size and were surrounded by forest. Forests in the area were dominated by cottonwoods (*Populus deltoides*) and silver maples (*Acer saccharinum*; Delong and Thorp 2006).

Sample Methods

- Fyke nets and boat electrofishing were used to collect fish.
- Fish were identified and counted.
- Diversity was calculated using Shannon-Wiener Index.
- Hydrological connection was determined by using GIS and digital elevation maps to determine minimum elevation for a site to be receiving channel water and the surface elevation of water. Data were obtained from the US Geological Survey and US Army Corps of Engineers.
- Number of days connected prior to sampling presents the number of days since 1 April where there was a hydrological connection prior to the first sample run and the number of days connected from the last time a site was sampled to the next sample (runs 2 and 3).
- Relationships between total number of fish, diversity, and number of species were examined using linear regression. The BEST procedure of Primer was used to determine which physical and hydrological measures of patches best explained fish community composition.

Study Area

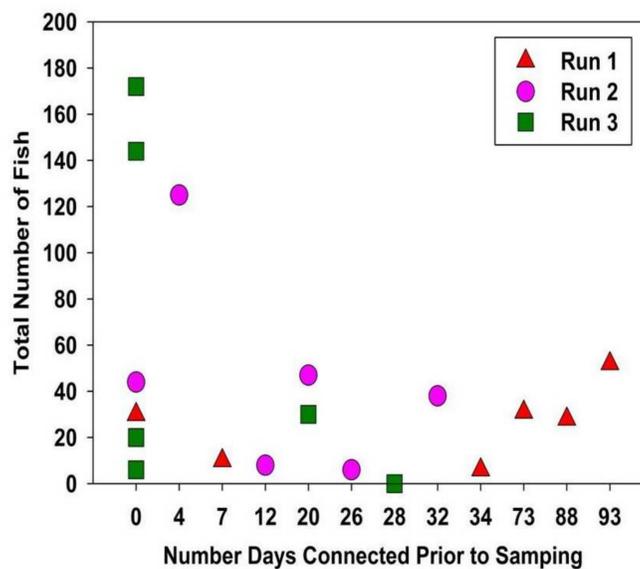


Figure 1. Number of days each habitat was inundated prior to all three sample runs and total number of fish during each sample period in each habitat on the Upper Mississippi River from Alma, WI to Lacrosse, WI. June-August 2012

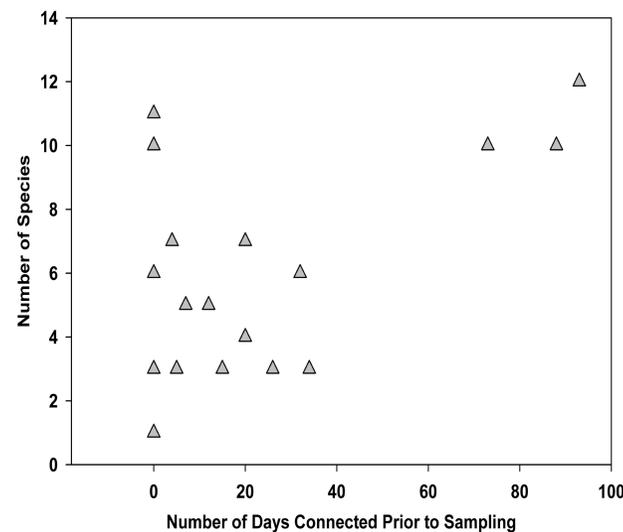


Figure 2. Relationship between number of days connected before sampling versus number of species in habitat when sampled in the Upper Mississippi River from Alma, WI to Lacrosse, WI. June-August 2012.

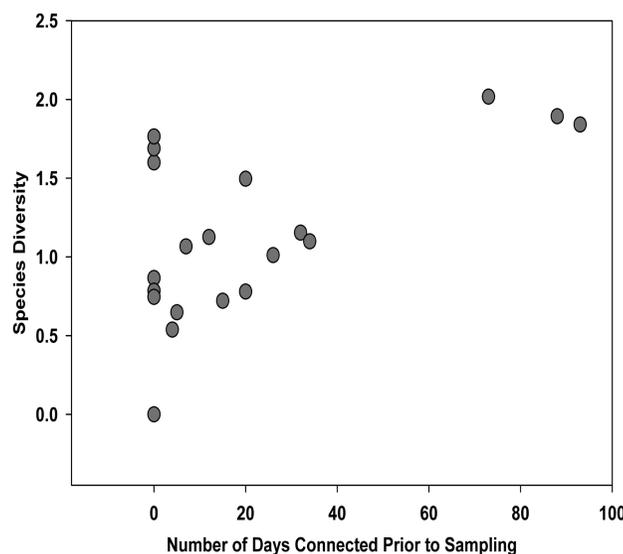


Figure 3. Relationship between number of days connected prior to sampling and species diversity of habitats in the Upper Mississippi River from Alma, WI to Lacrosse, WI. June-August 2012.

Results

- There was no pattern between number of days connected and number of fish present in the habitats when examined for the entire sample period (Figure 1).
- While not significant, there was a general pattern where the longer a habitat was connected to a channel the greater the number of species present (Figure 2).
- Species diversity also exhibited this similar, but also non-significant, pattern (Figure 3).
- Primer analysis indicated that turbidity alone accounted for the pattern observed in community structure but it only accounted for a small part of the variation in species composition and abundance ($\rho = 0.229$).

Conclusions

- There is a sufficient pattern emerging to conclude that disturbance from hydrological connection does influence community organization in slackwater patches of a floodplain river.
- While duration of connection is one factor, the failure to identify strong relationships suggests other factors play a role in conjunction with hydrological connection.
- Geomorphic complexity and habitat heterogeneity of individual patches may influence the species using a slackwater patch during connection and their abundance (Zeug and Winemiller 2008).
- Inherent physical-chemical conditions of slackwaters may be a factor, especially with regard to the potential for these to buffer physical-chemical character of incoming channel water.

Literature Cited

- Delong, M.D. and J.H. Thorp. 2006. Significance of instream autotrophs in trophic dynamics of the Upper Mississippi River. *Oecologia* 147:76-85.
- Winemiller, K.O. and S.C. Zeug. 2008. Relationships Between Hydrology, Spatial Heterogeneity, and Fish Recruitment Dynamics in a Temperate Floodplain River. *River Research and Applications* 24:90-102.

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