Estimating Mussel Reproduction Using Historical Fish Collections in the Upper Mobile Basin Watershed

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Abstract

Freshwater mussels can filter between 15 and 45 L of water a day (Strayer 2008). In some North American rivers this accounts for almost 90 % of the total water volume. As a result, the conservation of mussel communities is critical to the maintenance of water quality and the overall health of freshwater ecosystems. North American freshwater mussels (Family: Unionidea) share a unique life history trait - each species possesses a parasitic larval life stage, called a glochidium which is required to complete reproduction. Glochidia attach to the gills of host fishes before dropping to the substrate where they develop into adults. Human activities such as impoundment have been associated with declining mussel populations, possibly by disrupting at least one component of the mussel-fish interaction. To test this hypothesis and evaluate water quality as a function of this species interaction we are studying mussel-fish associations of the Tombigbee and Buttahatchie Rivers in Northeastern Mississippi. We are working to assess mussel reproduction before and after impoundment in these systems with the help of museum collections.

Materials and Methods

All fish specimens have been preserved by the Mississippi Museum of Natural Science (MMNS) in a 90% ethanol solution. Fish specimens are removed from the solution and measured from the front of the head to the end of the caudal peduncle. Measurements are rounded to the nearest five millimeters. Pharyngeal gill arches are removed from the specimens using standard dissecting forceps and scissors. Each specimen is then tagged and replaced in the preservation jar. The pharyngeal gill arches are dissected into the eight individual gill arches. Glochidial cysts are then identified on the gill arches by examination using a dissecting microscope. Glochidial numbers are recorded per gill arch. Gill arches are then placed in scintillation vials containing 90% ethanol solution for preservation.

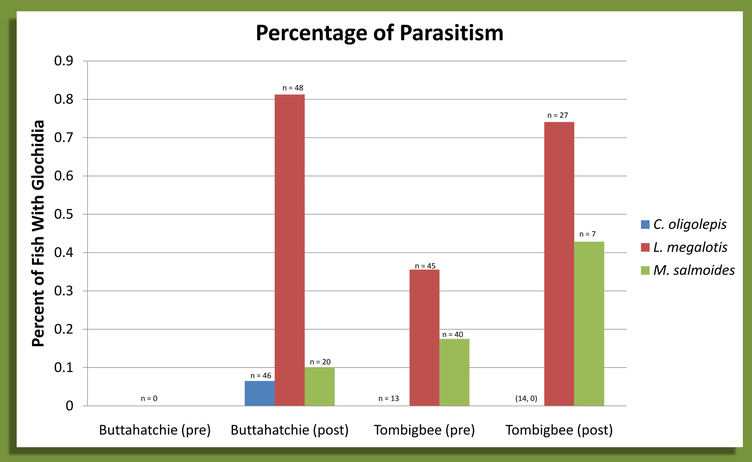
Acknowledgements

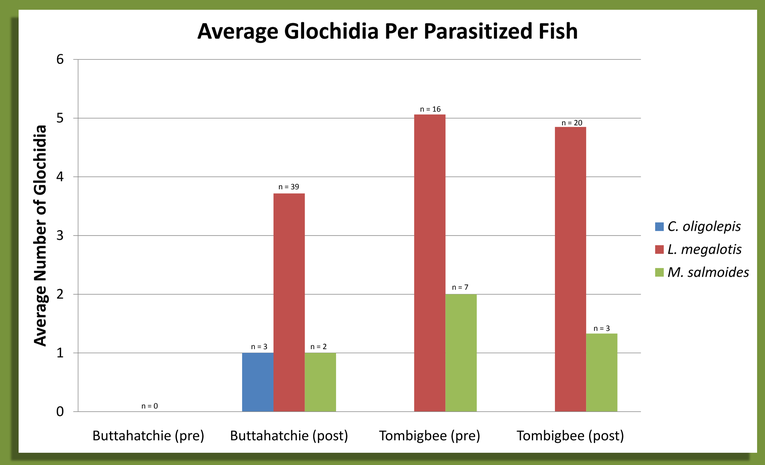
Many thanks to the Mississippi Museum of Natural Science for providing the specimens for our research. Special thanks to Anastasia Woodward and Joyce Follows for their help in collecting data. Support was provided by the NGI Watershed Modeling to Enhance Coastal Ecosystems Project.

References

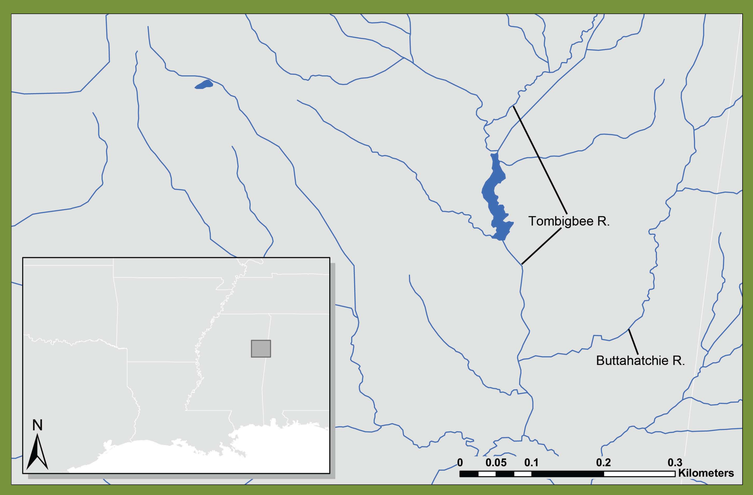
1. Strayer, David L. (2008) Freshwater Mussel Ecology. University of California Press. Berkeley and Los Angeles, California.
2. Haag WR, Warren ML (1997) Host fishes and reproductive biology of 6 freshwater mussel species from the Mobile Basin, USA. *Journal of the North American Benthological Society,* **16,** 576-585.

Results





Preliminary data from the Tombigbee River suggest that the glochidial load on parasitized fish was stable or decreased slightly after impoundment, but that a greater proportion of fish were infested. This pattern was consistent for both the longear sunfish (*L. megalotis*) and the largemouth bass (*M. salmoides*). This suggests either a greater rate of contact between these host species and the mussels that utilize them or a greater rate of "success" in establishing infection after contact (*i.e.*, the fishes' immune response to glochidial infestation has generally been decreased).



A Map of the areas from which the fish collections used in this study have been made. The Buttahatchie remains a relatively undisturbed lotic system, while the Tombigbee has been highly altered.

Future Directions

The parasitic life stage of North American Unionids required for successful reproduction. We are currently working to increase the pre-impoundment samples in order to have two streams which we can compare. While it is dangerous to interpret the pre- and post-impoundment patterns with the current sample size, it is clear from the data which we currently have that the mussel species that remain are utilizing a greater proportion of their host populations. If this pattern remains the same as we improve our sample size we will also identify other infections present in each host population. This will help us to ascertain whether the differences observed are more likely a function of increased host-parasite contact rates, or a decrease in the fishes' immune response as a function of water quality.