HOST SPECIFICITY AND LARVAL DEVELOPMENT OF THE ENDANGERED MUSSEL.

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FUNDING: U. S. Fish and Wildlife Service and La Crosse National Fishery Research Laboratory.

OBJECTIVES:

1. To provide a comprehensive review of the literature concerning the reproductive development, host specificity, and glochidial development of Lampsilis higginsi and closely related species of mussels.

2. To develop a method of distinguishing glochidia of L. higginsi from those of closely related species.

3. To develop in vitro culture capabilities using glochidia of L. ventricosa or another mussel closely related to L. higginsi.

PROGRESS:

The dissertation will be completed and the doctorate degree will be conferred at the end of the summer semester. The abstract of the dissertation follows:

The freshwater unionid mussel, Lampsilis higginsi, is the primary endangered mussel of the Upper Mississippi River (UMR), and information on its early life history is scarce. In this study, the glochidial and parasitic stage of L. higginsi were analyzed to provide information on the early life history of this mussel. The glochidia of L. higginsi and three related species, L. radiata siliquoidea, L. ventricosa, and Ligumia recta, were compared using light microscopy, morphometrics, and scanning microscopy. The glochidia of L. higginsi were morphometrically similar to those of the related species; however, the species can be distinguished using scanning electron microscopy of the position hinge ligament and width of the dorsal ridge width. Fifteen species of fishes were tested for four separate trials. The following were found to produce at least one juvenile mussel in artificial infection studies: northern pike (Esox lucius), brook stickleback (Culea inconstans), bluegill (Lepomis macrochirus), green sunfish (L. cyanellus), largemouth bass (Micropterus salmoides), smallmouth bass (M. dolomieui), yellow perch (Perca flavescens), walleye (Stizostedion vitreum vitreum). Northern pike and bluegill produced only one juvenile each in two trials. Juveniles were recovered 14-24 days post-infection in each trial. In studies of the number of juveniles produced per number of glochidia attached per fish, smallmouth bass ranked highest with a transformation percentage of 7.68, followed by green sunfish (2.43%) and bluegill (0.00038%). Artificial infection was found to be more efficient than in vitro cultivation for production of Lampsilis juvenile mussels under our laboratory conditions. Transformation in artificial medium average 1.28 juveniles per plate, with a percent transformation of 1.05 in 87 replicate

plates. Transformation averaged 15-23.8 juveniles per fish on artificially infected yellow perch, largemouth bass, and walleye.

The pathogenesis associated with glochidiosis caused by Lampsilis radiata siliquoidea in a suitable host (walleye) and an unsuitable host (common carp) was compared using light and transmission electron microscopy. In the walleye gill tissue, hyperplasia in the interlamellar spaces and proliferation of chloride cells was evident by 2 hr post-infection. Epithelia of the gills layers were separated from the basal lamina, increasing the lamellar width and the secondary blood space. Transformed cells, containing distended and swollen mitochondria and endoplasmic reticula, became increasingly numerous throughout the first 24 hrs of infection. Cells filled with debris were found beginning 4 hr post-infection. Encapsulation of glochidia was completed by 4-6 hr post-infection at a temperature of about 12 degrees Celsius. By 24-48 hr, the capsule was thinner and more compact and the cells composing it had new cell junctions. Fibrous tissue appeared in cells of the capsule at 48 hr and increased in abundance to the end of the infection. Excystment appeared to occur by thinning of the capsule aided by movement of the juvenile. The majority of the glochidia attached to the carp gills did not fully encapsulate. Partial capsular growth was evident in some but the portions of the capsule distal to the bite consisted of necrotic cells and cell debris. A few complete capsules were found between 12-48 hr post-infection; however, all glochidia were sloughed by 60 hr post-infection. Hyperplasia was slightly more extensive in carp than in walleye and this may have aided glochidial sloughing. Some samples of infected carp gills had areas of extreme hyperplasia and a pocket of exudate material where the glochidia appeared to have been sloughed. Blood smears showed no increase in the leucocyte count; however, a greater number of heterophil type cells was found in the immediate vicinity of the glochidium than were found in the walleye samples and in control carp samples.

FUTURE PLANS:

Diane's final exam date is September 4, 1987. She has accepted employment with USFWS, National Feshery Research Center, LaCrosse, WI and will begin September 15, 1987.

NATIVE GRASS PASTURE REESTABLISHMENT WITH PRESCRIBED BURNING AND ATRAZINE.

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