THE DISTRIBUTION OF FRESHWATER MUSSELS AND THE REPRODUCTIVE STATUS OF THE ENDANGERED DWARF WEDGEMUSSEL (*Alasmidonta heterodon*) IN THE MILL RIVER WATERSHED IN HATFIELD, WHATELY, DEERFIELD, AND CONWAY, MASSACHUSETTS

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Progress since the last report has been in the form of preliminary analysis of survey data, exploration of potential threats and factors affecting the distribution of mussels in the Mill River watershed, and planning and preparing for the 1999 field season.

PRELIMINARY ANALYSIS OF SURVEY DATA

The 9 species of freshwater mussels found in the Mill River make that river tied for first for species richness in the state. The other river is the Mill River in Northampton and Williamsburg. However, the Hatfield/Whately Mill River has a higher species diversity, which incorporates species richness with abundance and distribution. The Northampton/Williamsburg Mill River has the highest species richness (8) for a single location (at Arcadia Wildlife Sanctuary), but 7 species are restricted to below the first dam and only 2 species occur in the rest of the river. Mussels in the Hatfield/Whately Mill River have a more even distribution. Only 2 species are restricted to below the Hatfield dam, while 3 species are found only above the dam. Four sites, both above and below the Hatfield dam, have 7 species. Abundance of rare species is higher in the Hatfield/Whately river.

Using multiple correlation analysis, groups of mussel species have been found to associate with each other in the Mill River (Hatfield/Whately). The distributions of three species, *Lampsilis radiata, Pyganodon cataracta,* and *Ligumia nasuta*, are significantly correlated with each other and associate in deeper, slower habitat above active or abandoned beaver dams or other deep pools. Two species, *Anodonta implicata* and *Alasmidonta undulata* were also significantly correlated with each other. Both are restricted to the stretch of river below the dam in Hatfield. The hosts for *A. implicata* are the anadromous blueback herring, shad, and alewife. *A. undulata* may be invading or recolonizing the river from the Connecticut River or a remnant population. *Alasmidonta heterodon* was loosely correlated with *Strophitus unudulatus* and *Margaritifera margaritifera* in more shallow, sandy stretches.

A total of 233 individuals of *Alasmidonta heterodon* were measured with calipers. The data were grouped into four locations from upstream to downstream as follows:

above Christian Lane, Great Swamp Brook to Christian Lane, above West Brook, and Chestnut Street to I-91. Analysis of variance revealed a significant ($p < 0.001$) size gradient from larger individuals averaging 35.1 mm upstream (above Christian Lane) to smaller individuals averaging 27.6 mm downstream (Chestnut Street). The population is also highest at the two upstream sites. The results are an important indication of demographic patterns which may be explained by contradictory phenomena with very different management implications. The population could be healthy and expanding with younger individuals downstream. Conversely, the smaller individuals downstream could exhibit stunted growth in response to environmental constraints, or the larger individuals upstream may be the result of an aging population with low recruitment.

The Mill River flows over the bed of the ancient glacial Lake Hitchcock. Using ArcInfo GIS and Topo, geological features of the river bed were analized in relation to the river's location within the lake bed. The profile and distance tools in Topo revealed the proximity of the river to the steeply sloping west bank of the lake (Fig. 1 & 2). The river runs along the base of the bank at the site where the density of *Alasmidonta heterodon* is highest. At this location, varved clays from the lake are evident along the river bank. Further downstream, the river meanders into the flat bed of the lake. Using the distance tool in ArcInfo, a straight line was placed between two points along the river at a location above channelized stretch of the river and as well as at the location of highest *A. heterodon* density below Christian Lane. The length of the river between intersections of the straight line was divided by the length of the straight line between the same intersections to obtain a "meandering ratio". Using a Wilcoxon Signed Rank test, the ratio was significantly higher at the downstream site where the river meandered through the lake bed silts. The result indicates the river meanders more in an area where the banks are presumably less stable. The implications are that depositional habitat and deeper pools on the meanders may be more common downstream.

Preliminary estimates of tesselated darter density indicate the darters are as abundant in high *A. heterodon* density sites (Christian Lane) as in low density sites (Chestnut Street). Using mark-recapture and electroshocking, estimates ranged from 60 to 100 darters per 50 meters of river. Observations while snorkeling, however, suggest that darters may be less abundant in deep pools (2 meters). Forty-four darters were marked with florescent latex dye in fall 1998 below Christian Lane and another 30 below Chestnut St. More will be marked in 1999 to examine the movement patterns of darters during the glochidial release period of *A. heterodon*. One marked darter from below Christian Lane was found above Christian Lane nearly 800 meters upstream from its inititial capture site. However, the movement may not have occured during the glochidial release period.

1999 FIELD SEASON OBJECTIVES

1. Inspect *A. heterodon* individuals for gravid females and calculate the percentage of gravid females at the 4 sites differing in length and abundance (above Christian Lane, Great Swamp Brook to Christian Lane, above West Brook, and Chestnut Street to I-91).
2. Collect drift net samples twice a week from April to July at the 4 locations and inspect contents for glochidia. Determine number of glochidia per volume of water filtered.
3. Examine tesselated darters caught weekly by hand in 50 meter stretches at the 4 sites for the occurrence of encysted glochidia from May to July. Record the number of fish infected and the number of cysts per infected fish.
4. Mark tesselated darters in a 40 meter stretch (4 continuous 10 meters blocks) in one location in May/June and resample area, as well as above and below, in July. Determine percentage of darters recaptured within and outside original marking area and how far they traveled. Use regression analysis to estimate their dispersal potential during the glochidial release period.
5. Survey areas not covered in 1998 in August/September.
6. Collect habitat data at the 4 locations (average depth, velocity, substrate, bank stability, canopy cover/riparian vegetation, distance to Lake Hitchcock bank/shore, meandering ratio) in August/September.