Fish and Mussel Surveys in Hudson Mills Metropark, Huron River

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For:

HURON-CLINTON METROPARKS

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Background photo: Survey site in the Huron River, Hudson Mills Metropark. **Left inset photo:** Wavy-rayed lampmussel (*Lampsilis fasciola*) with a zebra mussel (*Dreissena polymorpha*) attached, found during surveys. **Right inset photo:** Rainbow darter (*Etheostoma caeruleum*) found during surveys. Photographs on cover and in body of report by Pete Badra.

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Introduction

This project was requested by Huron-Clinton Metroparks to aid in the assessment of potential impacts of constructing a bridge across the Huron River within the Hudson Mills Metropark (Figure 1). Known occurrences for the state endangered northern madtom (*Noturus stigmosus*) and special concern purple wartyback (*Cyclonaias tuberculata*) were located close enough to the proposed construction site that there was concern for potential impacts to these species. Michigan Natural Features Inventory (MNFI) performed fish and mussel surveys at and around the potential construction site to determine what species were present and their relative abundance.

There are twenty-four families of fish native to Michigan. Nine species have been extirpated from the state, 8 are state-listed as endangered, 7 are state-listed as threatened, and 11 are currently of special concern. Fish are important components of aquatic ecosystems. They help process and cycle nutrients in aquatic systems, they can structure the biotic communities within rivers and lakes, and they aid in mussel dispersal. Because fish employ a variety of life history strategies, they are often good indicators of ecosystem integrity and water quality. Some fish are restricted in their movements and ecological requirements and hence can provide specific habitat or water quality information about a particular site; while other species have large-scale movements and hence can provide information at a broader scale.

There are nearly 300 species of freshwater mussels (Unionidae) in Eastern North America, with 45 species occurring in Michigan. Unionid mussels are of particular interest because of their unique life history, importance to aquatic ecosystems, use as indicators of change in water and habitat quality, and because they have undergone significant declines in range and status over the past century. The Asian clam (*Corbicula fluminea*) was introduced to North America in 1938 as a food species and has spread throughout the U.S. by being transported by people. Zebra mussels (*Dreissena polymorpha*) were introduced to North America in the 1980s by being transported in the ballast water of shipping vessels. The zebra mussel has had an economic impact on certain industries due to its habit of attaching to water intake pipes and other underwater structures in great numbers. Zebra mussels are also having a dramatic ecological impact on Michigan's lakes and rivers due to their consumption of plankton and ability to colonize other aquatic animals such as native freshwater mussels (Strayer 1999).

Unionid mussels require a fish host to complete their life cycle, whereas other bivalve families produce free-swimming larvae that develop into the adult form without a host. Eggs are fertilized and develop into larvae within the marsupial gills of the female unionid mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult form. Glochidia complete metamorphosis and drop off their host in the adult form after a period of time ranging from a week to several months, depending on the mussel species.

Since adult mussels move relatively little throughout their lifetime, the ride that glochidia get while attached to their fish host allows unionid mussels to migrate to new habitat and exchange individuals among populations. Individuals of many unionid species live to be 20 to 30 years of age, with some reaching 50 years or more. Annular rings on the outside of the shell can be counted to estimate the age of an individual. Without the presence of healthy fish host populations unionid mussels are unable to reproduce. Because unionids are sensitive to changes in habitat quality, the status of unionids can be indicative of the biological integrity of river ecosystems as a whole. Fish, mussels, and macroinvertebrates form an intricate community network that help define aquatic ecosystems, and every level is important for keeping the network fully functioning.

Methods

We sampled a reach of approximately 250 m for fish using a Smith-Root barge electrofisher around the proposed foot bridge site. Fish were identified, counted, and returned to the river; rare species were measured for length; and general habitat characteristics were recorded.

Three transect searches were performed to sample the mussel community. Each transect included the full width of the river and measured 128 meters^2 in area. Transects were located approximately 50 downstream of the proposed bridge site, at the proposed bridge site, and approximately 50 meters upstream of the proposed bridge site. This placement of transects will allow for a before and after assessment of impacts due to bridge construction if the bridge is built.

Glass bottom buckets were used to aid in the detection of mussels. A flag was placed by each live unionid mussel detected. When each transect was completed mussels were identified to species, measured for length, width and thickness, and placed back in the substrate where they were found. When possible, the number of annual rings was counted to estimate age of the individual. The number of live zebra mussels attached to each live individual was recorded when present. Empty shells were also identified to species. The substrate within each transect was characterized by estimating the percent composition of each particle size class (boulder>256mm, cobble 256-64mm, pebble 64-16mm, gravel 16-2mm, sand 2-0.0625mm, and silt ,0.0625mm)(Hynes 1970).

Figure 1. Survey site in Hudson Mills Metropark. Base map from Huron-Clinton Metroparks.

Results

Eighteen species of native fish were collected on November 3, 2005. No exotic fish species were found. Rainbow darters, northern hog suckers, greenside darters, and rock bass were the most commonly collected species (Table 1). We collected four northern madtoms, a state-listed endangered species, and seven brindled madtoms, a special concern species (Table 2). The special concern brindled madtom is distinguished by the dark bar on their adipose fin that extents to fin margin (Figure 2) and they have no pair of light spots anterior to dorsal fin (Figure 3). The state endangered northern madtom is distinguished by the dark bar on their adipose fin that does not extend to fin margin (Figure 4) and they have a pair of light spots just anterior to dorsal fin (Figure 5)(Bailey *et al.* 2004). Both madtoms have serrated pectoral fin spines on the anterior and posterior edges which can be faintly seen in Figures 3 and 5. The stretch of river at the proposed bridge site is dominated by flat rocks, a mixture of sand and gravel, and macrophytes which provides good hiding places for the listed species (Table 3).

Mussel surveys were completed on October 19 and November 3, 2005. Nine native unionid mussel species were found including the state threatened wavy-rayed lampmussel (*Lampsilis fasciola*) (Figure 6) and four species of special concern (purple wartyback (*Cyclonaias tuberculata*) (Figure 7), elktoe (*Alasmidonta marginata*), slippershell (*Alasmidonta viridis*), and rainbow (*Villosa iris*)) (Table 4). The exotic zebra mussel and Asian clam were found live in all three transects. Live zebra mussels were found attached to three unionid species including purple wartybacks and wavy-rayed lampmussels (Table 5). All live unionid mussels and shells were returned to the spot where they were found. Substrate in transects 1and 2 was 35% pebble, 25% gravel, 30% sand, and 10% silt. Substrate in transect 3 was 5% cobble, 40% pebble, 25% gravel, 20% sand, and 10% silt.

Discussion

The fish community is quite diverse at the proposed bridge site and reflects a high quality riverine community. Northern hog suckers and many darter species are considered intolerant to pollution and are hence indicators of good water quality. Madtoms are generally difficult to capture due to their secretive nature and their tendency to hide under rocks and among vegetation (Goodchild 1993, Parker and McKee 1987). Much of the published literature about these species suggests that they are infrequently captured and when they are, in very small numbers (1-2 individuals). Hence, we were quite surprised to collect so many individuals of each species. This suggests that the reach of river that we sampled is quality habitat for these species. There appears to be reproduction of both the northern and brindled madtom in the area, due to the relatively small

Table 1. Fish species and percent relative abundance.

Family	Species	Common name	Relative abundance
Cyprinidae	*Campostoma anomalum pullum*	Central stoneroller	0.01
	Nocomis biguttatus	Hornyhead chub	0.03
	Notropis rubellus	Rosyface shiner	0.01
	Notropis stramineus	Sand shiner	0.01
	Pimephales notatus	Bluntnose minnow	0.07
Catostomidae	*Catostomus commersoni*	White sucker	0.01
	Hypentelium nigricans	Northern hog sucker	0.13
Ictaluridae	*Ameiurus natalis*	Yellow bullhead	0.01
	Noturus miurus (SpC)	Brindled madtom	0.04
	Noturus stigmosus (E)	Northern madtom	0.04
Cottidae	*Cottus bairdii*	Mottled sculpin	0.03
Centrarchidae	*Ambloplites rupestris*	Rock bass	0.11
	Micropterus dolomieu	Smallmouth bass	0.08
	Micropterus salmoides	Largemouth bass	0.01
Percidae	*Etheostoma blennioides*	Greenside darter	0.12
	Etheostoma caeruleum	Rainbow darter	0.25
	Etheostoma nigrum	Johnny darter	0.01
	Percina caprodes semifasciata	Northern logperch	0.02

Table 2. Minimum and maximum lengths of *Notrurus miurus* (brindled madtom) and *Noturus stigmosus* (northern madtom) found during fish surveys.

Species	Common name	Minimum length (mm)	Maximum length (mm)
Noturus miurus	Brindled madtom	37	66
Noturus stigmosus	Northern madtom	39	96

Figure 2. Brindled madtom (*Noturus miurus*), side view.

Figure 3. Brindled madtom (*Noturus miurus*), dorsal view.

Figure 4. Northern madtom (*Noturus stigmosus*), side view.

Figure 5. Northern madtom (*Noturus stigmosus*), dorsal view.

Table 3. Habitat descriptors for reach sampled during fish surveys.

Habitat metric	value
Average width (m)	43
Average depth (m)	0.5
Proportion of riffle/run/pool habitat (%)	0/100/0
Proportion of of reach vegetated (%)	50
Percent Cobble	15
Percent Gravel	30
Percent Sand	55
Percent Marl	2.5

Figure 6. Wavy-rayed lampmussel (*Lampsilis fasciola*) with a zebra mussel (*Dreissena polymorpha*) attached.

Figure 7. An empty purple wartyback shell (*Cyclonaias tuberculata*) with caddisfly larvae (Helicopsychidae).

individuals we collected. The area around the proposed bridge has quality rocky substrates with little or no siltation. This area provides many hiding places for the madtoms, under rocks and among vegetation, and likely provides high quality spawning gravels for other native species in the river. A record for the state endangered silver shiner (*Noturus photogensis*) was documented about 1km from the survey site in 1951. Though none were found in our survey there is some potential that a population could exist within Hudson Mills Metropark.

The proposed foot bridge would have a direct negative effect on a stretch of high-quality habitat for northern madtom, bridled madtom, and many other native fish species. The rocky substrates and macrophyte beds will be disturbed and potentially removed or degraded during and after the installation of the bridge. Other potential effects include siltation issues downstream and restriction of fish movements. However, if substrate is not removed from the river, most of these impacts will be temporary. We would expect that the fish species can move out of the impact area during construction and move back into the area after construction, as long as the high quality substrates are still available. Long term negative effects to the madtom populations within the Huron River are unlikely if this project is completed quickly while taking every step possible to minimize habitat degradation issues; however little is known about these species and so the true affects to the madtom populations are really unknowable.

The mussel community documented in Hudson Mills contains a very high proportion of rare and declining unionid species. Five of the nine species found were either state threatened or special concern. The populations supported by this river reach are important for the conservation of unionids in Michigan. An occurrence for wavy-rayed lampmussel was last observed in this reach in 1940. This likely reflects a lack of surveys between then and our current survey effort rather than the absence of the species during that time. Relatively recent occurrences for purple wartyback were recorded in this river reach in 1986. A much higher density for this species was documented then (45 live individuals in 144m^2) as compared to our survey. This may be due, in part, to negative impacts from zebra mussels over the past 20 years. Over 60% of the purple wartybacks found had at least one live zebra mussel attached and nearly 50% of all live unionid mussels had at least one zebra mussel attached. Impacts from zebras mussels are a serious threat to these populations.

Construction of the proposed bridge would have direct negative impacts on unionid mussels

Table 4. Numbers of unionids (#), relative abundance (RA), and density (D=individuals/m^2) recorded in each transect. (S=species represented by shell only; L=live individuals found).

		Transect 1			Transect 2			Transect 3		
Species	Common Name	#	RA	D	#	RA	D	#	RA	D
Alasmidonta marginata (SpC)	Elktoe	1	0.13	0.01	S(3)			S(2)		
Alasmidonta viridis (SpC)	Slippershell	S			S(1)			S(2)		
Cyclonaias tuberculata (SpC)	Purple wartyback	3	0.38	0.02	5	0.71	0.04	3	0.33	0.02
Elliptio dilatata	Spike	2	0.25	0.02	2	0.29	0.02	1	0.11	0.01
Lampsilis fasciola (T)	wavy-rayed lampmussel	2	0.25	0.02	S(4)			5	0.56	0.04
Lampsilis ventricosa	Pocketbook	S						S		
Ptychobranchus faciolaris	Kidney-shell	S			S					
Strophitus undulatus	Strange floater	S						S		
Villosa iris (SpC)	Rainbow	S(6)			S(2)			S(4)		
Total # individuals and density		8		0.06	7		0.05	9		0.07
# species live		4			2			3		
# species live or shell		9			7			8		
Corbicula fluminea	Asian clam	L			L			L		
Dreissena polymorpha	Zebra mussel	L			L			L		

Table 5. Zebra mussel (*Dreissena polymorpha*) colonization data, including the number of unionids colonized per site (ucz), mean number of zebra mussels per colonized unionid (zm/u), and the percentage of individuals at a site colonized by zebra mussels (%cu).

		Transect 1			Transect 2			Transect 3		
Species	Common Name	ucz	zm/u	%cu	ucz	zm/u	%cu	ucz	zm/u	%cu
Alasmidonta marginata (SpC)	Elktoe							1	1	100
Alasmidonta viridis (SpC)	Slippershell									
Cyclonaias tuberculata (SpC)	Purple wartyback	3	1.6	60	2	2.5	66	2	3.5	66
Elliptio dilatata	Spike							1	4	50
Lampsilis fasciola (T)	Wavy-rayed lampmussel				2	2.5	40			
Lampsilis ventricosa	Pocketbook									
Ptychobranchus faciolaris	Kidney-shell									
Strophitus undulatus	Strange floater									
Villosa iris (SpC)	Rainbow									
Total		3	1.6	43	4	2.5	44	4	3	50

located immediately at the bridge site (Transect 2). This includes the state threatened wavy-rayed lampmussel and the special concern purple wartyback. Temporary indirect negative impacts (i.e. increased silt) could potentially affect mussels downstream of the construction site. One possible action for minimizing potential negative impacts from bridge construction would be to collect all live mussels from the immediate construction site and relocate them some distance upstream. Negative impacts to unionid mussels from construction of a bridge would likely be relatively small compared to the ongoing impact from zebra mussels and large scale manipulations of water flow in the Huron River.

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Literature Cited

Bailey, R.M., W.C. Latta, and G.R. Smith. 2004. An atlas of Michigan fishes with keys and illustrations for their identification. Miscellaneous publications, No. 192, Museum of Zoology, University of Michigan, Ann Arbor, MI.

Goodchild, C.D. 1993. Status of the northern madtom, *Noturus stigmosus*, in Canada. Canadian Field-Naturalist 107:417-422.

Hynes, H. B. N. 1970. The Ecology of Running Waters. Liverpool University Press, Liverpool, pg. 24.

Parker, B. and P. McKee. 1987. Status of the brindled madtom, *Noturus miurus*, in Canada. Canadian Field-Naturalist 101:226-230.

Strayer, D. L. 1999. Effects of alien species on freshwater mollusks in North America. Journal of the North American Benthological Society 18:74-98.