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Dwarfwedge

Raesly 1993

FINAL REPORT for a fact phase

Occurrence of Glochidia on Fishes Collected From Nanjemoy Creek and McIntosh Run, 1992

Small Procurement Contract # 17129

Submitted to:

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Introduction

The dwarf wedge mussel, Alasmidonta heterodon (Lea), is a federally endangered species occurring at four localities in Maryland. Historically, this freshwater mussel was once distributed from New Brunswick to North Carolina, occupying approximately 70 sites in 15 Atlantic Slope drainages (Moser 1991). Recent declines (Master 1986) have reduced the current distribution to 17 sites in seven drainages.

A number of factors have contributed to the decline of the dwarf wedge mussel, including pollution, sedimentation, channelization, development, dam construction, removal of riparian vegetation, and other anthropogenic disturbances (Moser 1991). These same factors are also adversely affecting many other species of North American freshwater mussels. Neves (1992) considers 43 percent of the nearly 300 species of unionids in North America to be endangered, threatened, or extinct. In Maryland, three species of unionids are endangered and three are listed as being of special concern (Gerberich 1984).

Recovery efforts for the dwarf wedge mussel and other species must include immediate habitat protection for extant populations. Also important is the identification of critical life-history parameters and ecological requirements, allowing natural resource managers to conserve these species. Unfortunately, however, little is known about the life histories of freshwater molluscs, including the dwarf wedge mussel. In particular, the host fishes for A. heterodon are unknown.

The purpose of this study was to determine which species of fishes in Nanjemoy Creek (Charles County) and McIntosh Run (St. Mary's County) are potential hosts of A. heterodon glochidia. Also, the reproductive period of the dwarf wedge mussel in these streams was investigated.

Materials and Methods

Fishes were collected by electrofishing from Nanjemoy Creek and McIntosh Run on two separate occasions (6-7 August and 10-11 October) in 1992. During each collection period, five sites in each drainage were sampled (Table 1). Within each drainage, at least two of the localities sampled had been previously identified as A. heterodon habitat.

A representative qualitative sample of fishes (Hocutt et al. 1974, Hocutt 1978) was collected from each site, fixed in the field in 10% formalin, and returned to the Frostburg State University Fish Museum for examination. All fishes were examined visually with a dissecting microscope and the presence of glochidia recorded. Although fish examination was not restricted to a single anatomical region, the gills and fin membranes were the primary focus of this study.

Results

A total of 2,387 fishes representing 24 species distributed among 12 families was captured during this study. A detailed breakdown of species by site and collection period is shown in Tables 2-5. The total number of individual fishes collected in October (1,020) was similar to the number collected in August (1,367),

indicating that the removal of fishes for the purposes of this survey did not significantly impact populations at these sites. The observed difference may actually be due to seasonal movements of fishes within the system. For example, the relative abundances some species increased between August and October (Amieurus nebulosus, Lepomis gibbosus), while others remained constant (Petromyzon marinus, Esox niger) or declined (Notropis procne, Etheostoma olmstedi). Additionally, two species (Morone saxatilis and Centrarchus macropterus) were captured in October that were not collected in August.

There were significant differences among species with respect to parasitism by glochidia for both collection periods (Table 6). In August, seven species had parasitism frequencies (percentage of individuals with glochidia) of 20% or higher. Of these, Notemigonus crysoleucas, Erimyzon oblongus, Lepomis auritus, Etheostoma olmstedi, and Lepomis gibbosus exhibited both relatively large population sizes and high parasitism rates. They are thus likely to be potentially important components of the life cycles of unionids found in these streams.

In October, six fish species had parasitism frequencies of 20% or higher. However, three of these six were represented by less than 20 total individuals in the 10 combined fall samples. Lepomis auritus, Etheostoma olmstedi, and Lepomis macrochirus were the only frequently parasitized species that were relatively abundant in the October samples. Tables 7-10 provide a more detailed

breakdown of parasitism frequency by sampling date, site, and species.

The frequency of parasitism differed significantly between the two streams. The percentage of all individuals harboring glochidia exceeded 30% in Nanjemoy Creek on both sampling dates (Table 11). In MacIntosh Run, however, parasitism rates were less than 14%. In both streams, parasitism frequency declined in October. This decline was not significant in Nanjemoy Creek; a greater seasonal reduction in parasitism frequency occurred in MacIntosh Run.

Within a stream, considerable differences existed among sites with respect to the number of fishes with glochidia (Table 11). Sites identified as "good mussel sites" by eminent malacologist Laurie MacIvor had the highest frequencies of parasitism. For example, within the Nanjemoy Creek system, site 4, located downstream of the culvert on Hancock Run Road and currently owned by The Nature Conservancy, had parasitism frequencies of 45.3 and 42.9% in August and October, respectively. These were the highest values recorded in this study. Similarly, site 2 in McIntosh Run had the highest parasitism frequencies in this drainage.

Species-specific parasitism frequencies changed significantly between August and October for some fishes, while remaining constant for others. For example, golden shiners (Notemigonus crysoleucas) and creek chubsuckers (Erimyzon oblongus) were heavily parasitized in August, with 76 and 62% of the individuals harboring glochidia,

respectively (Table 6). In October, none of the golden shiners were parasitized, and only 8% of the creek chubsuckers had glochidia. Chain pickerel (Esox niger) and margined madtom catfish (Noturus insignis) displayed the opposite temporal trend, while parasitism frequencies of redbreast sunfish (Lepomis auritus) and tessellated darters (Etheostoma olmstedi) remained constant and high in both sampling periods (Table 6).

Discussion and Preliminary Conclusions

The results presented above are based solely on the presence/absence of glochidia. No effort was made to distinguish between the glochidia of Alasmidonta heterodon and other mussels, such as Elliptio complanata. Given the large population sizes of the latter species in the study streams, the majority of the glochidia detected in this survey are likely to be E. complanata. Because of this, it is quite possible that the fish host(s) of A. heterodon are not the most heavily parasitized species.

With this consideration in mind, I present the following general conclusions based on the data collected in 1992:

(1) In Nanjemoy Creek and McIntosh Run, the redbreast sunfish (L. auritus) and the tessellated darter (E. olmstedi) are important fish hosts of freshwater mussels. The percentages of individuals harboring glochidia were high during both sampling periods and these fishes were common at most sampling stations.

(2) The overall frequency of parasitism did not change between August and October 1992. The most likely explanation for this observation is that mussels in these streams are reproductively active over long periods of time. This seems to be the case for most species of North American unionids (Clark 1981). An alternative, but less likely, explanation is that mussel species differ with respect to reproductive period, and although no temporal fluctuations in parasitism frequency occur, different glochidia are present at different times.

(3) Some species of fishes had significantly higher frequencies of parasitism in one sampling period than the other (Table 6).

(4) Parasitism frequencies were 2-3 times higher in Nanjemoy Creek than in MacIntosh Run during both sampling periods.

(5) Parasitism frequencies were highest at sites that were designated as "good mussel sites" on the basis of previous <u>in situ</u> visual inspections by L. MacIvor.

Literature Cited

Gerberich, A.G. 1984. The endangered and threatened freshwater mollusks of Maryland. Pages 245-266 in A.W. Norden, D.C. Forester, and G.H. Fenwick, eds., Threatened and endangered plants and animals of Maryland. Maryland Nat. Heritage Prog., Spec. Publ. 84-I.

Hocutt, C.H. 1978. Fish. Pages 8-103 in W.T. Mason, Jr., ed., Methods for the assessment and prediction of mineral mining impacts on aquatic communities: a review and analysis. U.S. Fish & Wildl. Serv., Harpers Ferry, West Virginia.

Hocutt, C.H., R.L. Kaesler, M.T. Masnik, and J. Cairns, Jr. 1974. Biological assessment of water quality in a large river system: an evaluation of a method for fishes. Arch. Hydrobiol. 74:448-462.

Master, 1986.

Moser, G.A. 1991. Dwarf wedge mussel (Alasmidonta heterodon) recovery plan. U.S. Fish & Wildl. Serv., Newton Corner, Massachusetts.

Neves, R.J. 1992. The status and conservation of freshwater mussels (Unionidae) in the United States. Abstract. Sixth Ann. Mtg. Soc. Cons. Biol., Blacksburg, Virginia.

Table 1. Collection sites for fishes in August and October 1993.

Nanjemoy Creek

Site No.	Location
1	Beaverdam Creek at bridge on Liverpool Point Rd. west of Nanjemoy, MD
2	Beaverdam Creek at culvert on Adams-Willett Rd. west-southwest of Nanjemoy, MD
3	Nanjemoy Creek upstream of culvert on Hancock Run Rd. west of Grayton, MD
4	Nanjemoy Creek downstream from culvert on Hancock Run Rd. west of Grayton, MD
5	Hancock Run at Rt. 6 bridge near intersection with Rt. 425

McIntosh Run

Site No.	Location
1	McIntosh Run at Rt. 5 bridge west of Leonardtown, MD
2	McIntosh Run along Maypole Rd. 0.7 miles from intersection with Rt. 5, west of Leonardtown, MD
3	McIntosh Run at bridge on McIntosh Rd. north-northwest of Tintop Hill, MD
4	Mill Creek approximately 0.1 miles above confluence with McIntosh Run
5a	McIntosh Run upstream of confluence with Miski Run (August only)
5b	McIntosh Run upstream from Rt. 5 bridge west of Leonardtown, MD (October only)

Table 2. Fishes collected from Nanjemoy Creek and its tributaries in early August 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus		1	1	4	
Anguilla rostrata	1	8	22	11	1
Esox niger	3	2	2	2	3
Umbra pygmaea	5	3	2	5	2
Notemigonus crysoleucas	10		3	8	26
Notropis amoenus					
Notropis hudsonius					
Notropis procne					
Catostomus commersoni					
Erimyzon oblongus	8	5	6	17	14
Ameiurus nebulosus					
Noturus insignis			6	11	
Aphredoderus sayanus	1				
Gambusia affinis					
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus	16	19	9	2	42
Lepomis auritus			49	52	
Lepomis cyanellus			1		
Lepomis gibbosus	5		1	1	13
Lepomis gulosus	6	3	1	3	6
Lepomis macrochirus			3		
Micropterus salmoides					1
Etheostoma olmstedi		10	20	22	

Table 3. Fishes collected from McIntosh Run and its tributaries in early August 1992.

Species	Site Number				
	1	2	3	4	5a
Petromyzon marinus	7	3	4	4	
Anguilla rostrata	33	20	15	15	
Esox niger	2	1	7	6	
Umbra pygmaea	9	8	35	37	
Notemigonus crysoleucas			2	2	
Notropis amoenus		5			
Notropis hudsonius				2	
Notropis procne	13	65	36	47	66
Catostomus commersoni					
Erimyzon oblongus	1	4	5		
Ameiurus nebulosus					
Noturus insignis	2	14	4	10	
Aphredoderus sayanus	3	6	17	14	
Gambusia affinis	2				
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus					
Lepomis auritus	7	12	5	15	
Lepomis cyanellus	8	4			
Lepomis gibbosus	5	3	7	34	
Lepomis gulosus					
Lepomis macrochirus	1	1		12	
Micropterus salmoides					
Etheostoma olmstedi	35	55	15	55	

Table 4. Fishes collected from Nanjemoy Creek and its tributaries in early October 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus					
Anguilla rostrata	1	3	6	4	
Esox niger	3	3	3	1	2
Umbra pygmaea	7	3		4	
Notemigonus crysoleucas	6	1	3	7	11
Notropis amoenus					
Notropis hudsonius					
Notropis procne					
Catostomus commersoni				2	
Erimyzon oblongus		3	14	17	11
Noturus insignis			5	10	
Amieurus nebulosus				32	
Aphredoderus sayanus		3		1	
Gambusia affinis					
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus	6	15	5	5	29
Lepomis auritus		1	58	78	
Lepomis cyanellus					
Lepomis gibbosus	3	1	95	39	14
Lepomis gulosus	2	5		2	3
Lepomis macrochirus			11	6	3
Micropterus salmoides		4	2	4	
Etheostoma olmstedi		5	5	4	

Table 5. Fishes collected from McIntosh Run and its tributaries in early October 1992.

Species	Site Number				
	1	2	3	4	5b
Petromyzon marinus	2	3	2	10	8
Anguilla rostrata	7	3	4	4	18
Esox niger			2	4	2
Umbra pygmaea	2	1		4	1
Notemigonus crysoleucas					
Notropis amoenus		1			
Notropis hudsonius					
Notropis procne	14	6	4	10	21
Catostomus commersoni					
Erimyzon oblongus				1	
Noturus insignis		2	1	2	6
Amieurus nebulosus					
Aphredoderus sayanus	2	4		6	5
Gambusia affinis				1	
Morone saxatilis	2				
Centrarchus macropterus				2	
Enneacanthus gloriosus					
Lepomis auritus	1	3		4	13
Lepomis cyanellus	6	1	2		12
Lepomis gibbosus	20	18	5	39	50
Lepomis gulosus	1				
Lepomis macrochirus	7	2	3	9	9
Micropterus salmoides				1	
Etheostoma olmstedi	11	13	1	11	24

Table 6. Percentages of individuals within a species harboring glochidia by sampling date. The number of individual fish examined (N) is indicated in parentheses.

	August	October
Petromyzon marinus	4% (26)	16% (25)
Anguilla rostrata	- (140)	2% (47)
Esox niger	- (29)	20% (20)
Umbra pygmaea	1% (107)	- (22)
Notemigonus crysoleucas	76% (51)	- (28)
Notropis amoenus	80% (5)	- (1)
Notropis hudsonius	- (2)	
Notropis procne	4% (225)	2% (55)
Catostomus commersoni	- (1)	- (2)
Erimyzon oblongus	62% (60)	8% (49)
Noturus insignis	- (56)	15% (26)
Amieurus nebulosus	- (1)	- (51)
Aphredoderus sayanus	4% (45)	5% (18)
Gambusia affinis	- (2)	- (1)
Morone saxatilis		- (2)
Centrarchus macropterus		50% (2)
Enneacanthus gloriosus	14% (88)	13% (61)
Lepomis auritus	50% (152)	63% (158)
Lepomis cyanellus	- (13)	- (21)
Lepomis gibbosus	29% (72)	11% (284)
Lepomis gulosus	- (19)	- (13)
Lepomis macrochirus	28% (18)	24% (50)
Micropterus salmoides	- (1)	71% (7)
Etheostoma olmstedi	32% (254)	39% (77)

Table 7. Percentage of fishes collected from Nanjemoy Creek with glochidia present in early August 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus		-	-	-	
Anguilla rostrata	-	-	-	-	-
Esox niger	-	-	-	-	-
Umbra pygmaea					
Notemigonus crysoleucas					
Notropis amoenus					
Notropis hudsonius					
Notropis procne					
Catostomus commersoni				-	
Erimyzon oblongus	-	20	83	88	79
Noturus insignis			-	-	
Amieurus nebulosus					
Aphredoderus sayanus	-				
Gambusia affinis					
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus	-	5	67	-	12
Lepomis auritus			58	72	
Lepomis cyanellus			-		
Lepomis gibbosus	20		100	100	62
Lepomis gulosus	-	-	-	-	-
Lepomis macrochirus			100		
Micropterus salmoides					-
Etheostoma olmstedi		-	10	9	

Table 8. Percentage of fishes collected from McIntosh Run with glochidia present in early August 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus	-	-	-	-	17
Anguilla rostrata	-	-	-	-	-
Esox niger	-	-	-	-	-
Umbra pygmaea					
Notemigonus crysoleucas					
Notropis amoenus		80			
Notropis hudsonius				-	
Notropis procne	8	5	3	2	6
Catostomus commersoni					
Erimyzon oblongus	100	75	20		
Noturus insignis	-	-	-	-	-
Amieurus nebulosus					-
Aphredoderus sayanus	-	-	6	7	-
Gambusia affinis	-				
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus					
Lepomis auritus	-	8	40	13	15
Lepomis cyanellus	-	-			
Lepomis gibbosus	-	-	57	15	33
Lepomis gulosus					
Lepomis macrochirus	-	-		8	100
Micropterus salmoides					
Etheostoma olmstedi	60	54	-	20	24

Table 9. Percentage of fishes collected from Nanjemoy Creek with glochidia present in early October 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus					
Anguilla rostrata	-	-	-	25	
Esox niger	100	33	-	-	-
Umbra pygmaea	-	-		-	
Notemigonus crysoleucas	-	-	-	-	-
Notropis amoenus					
Notropis hudsonius					
Notropis procne					
Catostomus commersoni				-	
Erimyzon oblongus	33	-	-	6	18
Noturus insignis			40	20	
Amieurus nebulosus			-		
Aphredoderus sayanus		-	-		
Gambusia affinis					
Morone saxatilis					
Centrarchus macropterus					
Enneacanthus gloriosus	-	-	60	40	10
Lepomis auritus		1	58	80	
Lepomis cyanellus					
Lepomis gibbosus	33	100	15	10	64
Lepomis gulosus	-	-		-	
Lepomis macrochirus			54	67	-
Micropterus salmoides			50	100	
Etheostoma olmstedi		-	40	25	

Table 10. Percentage of fishes collected from McIntosh Run with glochidia present in early October 1992.

Species	Site Number				
	1	2	3	4	5
Petromyzon marinus	50	33	-	20	-
Anguilla rostrata	-	-	-	-	-
Esox niger			-	-	-
Umbra pygmaea	-	-		-	-
Notemigonus crysoleucas					
Notropis amoenus		-			
Notropis hudsonius					
Notropis procne	-	-	-	10	-
Catostomus commersoni					
Erimyzon oblongus				-	
Noturus insignis		-	-	-	-
Amieurus nebulosus			-		
Aphredoderus sayanus	-	-		17	-
Gambusia affinis				-	
Morone saxatilis	-				
Centrarchus macropterus				-	
Enneacanthus gloriosus					
Lepomis auritus	-	-			
Lepomis cyanellus	-	-	-		-
Lepomis gibbosus	-	6	-	5	-
Lepomis gulosus	-				
Lepomis macrochirus	-	-	33	-	11
Micropterus salmoides				100	
Etheostoma olmstedi	60	69	-	-	-

Table 11. Percentages of all individuals (all species) harboring glochidia by site and sampling period. The number of fishes examined (N) is indicated in parentheses.

Site #	August	October
Nanjemoy Creek		
1	5.5% (55)	16.1% (31)
2	3.9% (51)	6.7% (30)
3	38.4% (125)	29.5% (227)
4	45.3% (139)	42.9% (184)
5	42.6% (108)	19.2% (73)
Mean =	33.9%	30.6%
McIntosh Run		
1	18.0% (127)	9.3% (75)
2	22.9% (201)	19.3% (57)
3	7.3% (150)	1.7% (60)
4	9.4% (255)	7.2% (111)
5a	11.8% (153)	----
5b	----	7.6% (170)
Mean =	13.8%	8.5%