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The Unionidae of the Chagrin River: The Remnant of a Molluscan Fauna[1]

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ABSTRACT. **The study of the distribution of the Unionidae of Ohio reveals information on the biogeography of this family that may be useful in the study of other groups of animals. Thirty sites on the Chagrin River and its major tributaries, the East and Aurora branches, were sampled for freshwater mussels during this study. A total of 268 specimens representing nine species of the family Unionidae were found. Living and/or freshly dead specimens of eight species were identified. Additionally, a single subfossil fragment of *Alasmidonta marginata* was taken, indicating that this species once occurred in the river. Three reaches of the Chagrin River system were found to support Unionidae: the Aurora Branch contained five species, the main stem of the Chagrin River below the town of Chagrin Falls contained five species, and the Chagrin River above Chagrin Falls contained seven species. The river above the falls contained the most significant proportion of the fauna in the system, with over 80% of all specimens collected from this reach, and suggests that the falls has not always acted as a barrier to distribution.**

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INTRODUCTION

The molluscan fauna of the Chagrin River was the subject of study nearly 30 years ago (Loos 1960). That study reported a fauna consisting of six species of aquatic gastropods and three species of bivalves, including two species of fingernail clams (Sphaeriidae) and one species of Unionidae, *Lampsilis ventricosa* (Barnes 1823). This species of mussel was found only in the lower reaches of the river and was described as rare wherever found. That study was conducted on the river below the town of Chagrin Falls, on the Aurora and East branches.

The primary purpose of the present study was to re-examine the unionid fauna of the Chagrin River previously studied by Loos (1960). This portion of the river has been designated as scenic by The Ohio Department of Natural Resources (ODNR). A secondary objective was to determine if unionid molluscs occur in the reach above Chagrin Falls. This reach is currently isolated from the rest of the system and has not been previously examined for Unionidae.

MATERIALS AND METHODS

Field collections were made from 30 sites distributed throughout the East Branch, the Aurora Branch, and the main stem of the Chagrin River (Fig. 1). Most collections were made while wading upstream or downstream from a bridge or other access point. A boat was used to locate suitable collecting localities downstream from the St. Rt. 87 bridge to the town of Chagrin Falls (Fig. 1, site 9). At each site, an effort was made to sample all accessible habitats for unionid molluscs. A hand-held glass-bottom bucket was used to facilitate hand collecting. All living specimens taken were identified in the field and returned to the stream. Ample dead shell material was taken to voucher the collections made. These shells have been deposited at The Ohio State University Museum of Zoology. Hoggarth (1990b) provides a complete account of the Unionidae collected during this study.

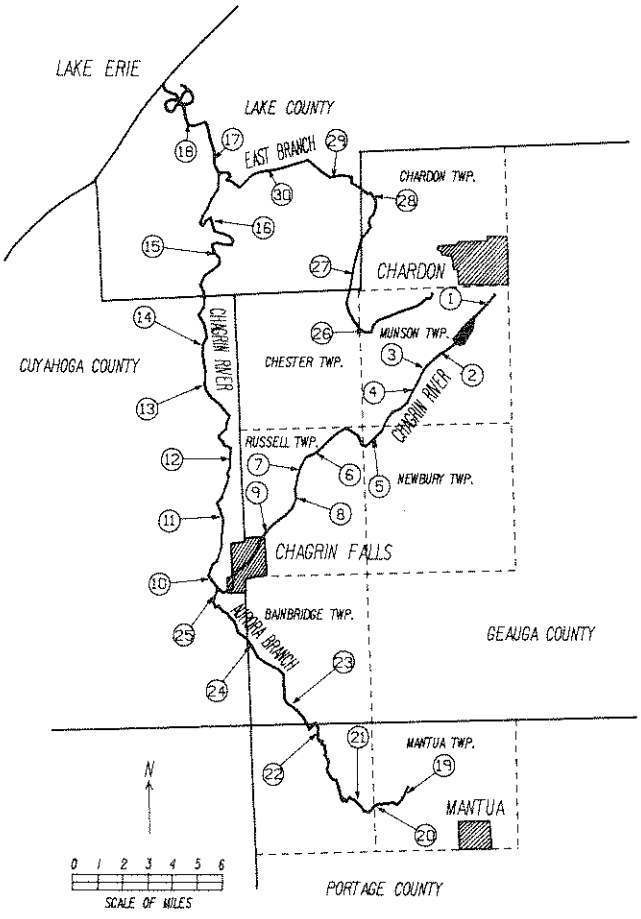

FIGURE 1. Distribution of collection sites on the Chagrin River (stations 1-18), the Aurora Branch (stations 19-25), and the East Branch (stations 26-30).

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TABLE 1

Distribution of the Unionidae of the Chagrin River. Collection sites represented by the numbers are shown in Figure 1.

Species	Collection Sites																											
	Chagrin River																		Aurora Branch						East Branch			
	above the falls									below the falls																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Anodontinae																														
Anodonta imbecillis																						X								
Anodonta g. grandis		X			X				X											X		X								
Anodontoides ferussacianus		X	X	X	X	X	X	X	X													X								
Strophitus u. undulatus			X			X	X				X	X	X			X														
Alasmidonta marginata														X																
Lasmigona costata		X	X			X	X	X	X		X																			
Lasmigona compressa			X			X	X	X	X											X	X									
Lampsilinae																														
Lampsilis r. luteola		X				X	X	X	X		X	X		X		X	X	X				X								
Lampsilis ventricosa							X				X					X	X	X												

X = the presence of living molluscs or dead shell material at the site.

RESULTS

The unionid fauna of the Chagrin River is composed of nine species representing two subfamilies of freshwater mussels (Table 1). Eight species were found in the main stem of the river, and five were taken from the Aurora Branch. No specimens of Unionidae were located in the East Branch where substrates, composed either of bedrock or unstable and unconsolidated sediments, provide unsuitable habitat for these molluscs.

Only 12 specimens were located in the Aurora Branch. *Anodonta imbecillis* Say 1829, *Anodontoides ferussacianus* (Lea 1834), and *Lasmigona compressa* (Lea 1829) accounted for seven of these specimens. These species are encountered often in headwaters situations. The other two species, *Anodonta grandis grandis* Say 1829 and *Lampsilis radiata luteola* (Lamarck 1819), were widely distributed throughout this system and accounted for the remaining five specimens taken from the Aurora Branch.

The remaining 256 specimens were collected from the main stem of the river. Only 30 of these specimens, 26 of which were subfossil or very old dead shells, were taken below the town of Chagrin Falls. The remaining 226 specimens were found upstream of the falls.

Lampsilis r. luteola comprised the largest percentage of

TABLE 2

Percent composition of the Unionidae of the Chagrin River.

Species	Living	Dead	Total	Percent
Lampsilis r. luteola	40	31	71	26.5
Lasmigona costata	25	41	66	24.6
Anodontoides ferussacianus	20	27	47	17.5
Lasmigona compressa	15	12	27	10.0
Anodonta g. grandis	8	14	22	8.2
Strophitus u. undulatus	2	17	19	7.1
Lampsilis ventricosa	0	14	14	5.2
Anodonta imbecillis	0	1	1	0.4
Alasmidonta marginata	0	1	1	0.4
Totals	110	158	268	100.0

the unionid fauna in the Chagrin River (Table 2). This widely distributed species represented 26.5% of the fauna. The other most common species, *Lasmigona costata* (Rafinesque 1820), *A. ferussacianus, L. compressa,* and *A. g. grandis* were more limited in distribution and, together with *L. r. luteola,* comprised 86.9% of the Unionidae found. Two other species, *Strophitus undulatus undulatus* (Say 1817) and *L. ventricosa,* were widely distributed in the system, but uncommon. Only a single specimen each of *A. imbecillis* and *Alasmidonta marginata* Say 1818 was found. The specimen of *A. marginata* was a fragment of a very old dead shell and, therefore, does not indicate a current extant population. The specimen of *A. imbecillis* was freshly dead, indicating that habitat conditions were suitable for the species and that an unfound population of this species may occur in the river.

DISCUSSION

Loos (1960) considered the molluscan fauna of the Chagrin River to be depauperate compared to adjacent stream systems. The much greater gastropod diversity of the Cuyahoga River (Davis 1951), plus the greater bivalve diversity of the West Branch of the Mahoning River (Swart 1940), supported that conclusion. It is unfortunate that Loos did not sample the single reach of the Chagrin River system that supports a sizable molluscan fauna.

One might assume that the upper Chagrin River would not have a diverse molluscan fauna because it is isolated from the remaining basin. Furthermore, given that numbers of species generally decline as one progresses upstream, it could be assumed that this reach would have a much less diverse fauna than downstream. However, if this reach had been associated with some other drainage system, such as that suggested for the upper Cuyahoga - West Branch Mahoning River (Dexter et al. 1951), or if the unionid fauna gained access to this reach before the falls became a barrier, then the former assumptions would not hold.

Either of these avenues of distribution, association with another drainage basin or the establishment of the fauna before the falls became a barrier to distribution, could have played a role in establishing the unionid fauna above Chagrin Falls. The upper Cuyahoga River and the Chagrin River above Chagrin Falls have seven species in common and 70% community similarity (Huehner 1985, Hoggarth 1990 a, b). The index of community similarity was derived by dividing the total number of shared species by the total number of combined species (Table 3). The upper Chagrin and the upper Cuyahoga Rivers have a higher percent similarity than the upper Chagrin River has with any other portion of its current drainage basin. However, this similarity may be the result of the presence of headwaters species, living in the upper Cuyahoga and Chagrin rivers, that would not be expected in the lower reaches of either river. Furthermore, the presence of *L. ventricosa,* upstream and downstream of Chagrin Falls, supports the conclusion that the falls has not always been a barrier to unionid distribution.

Whatever the source of the Unionidae of the upper Chagrin River, it is apparent that this unexpected fauna has been isolated since the river established its current drainage pattern. Any threat that reduces habitat diversity, water quality, or substrate stability in this reach has the potential to significantly reduce species diversity in the entire system. Therefore, the protection of the Unionidae of the Chagrin River can best be accomplished by protecting the river above the falls.

TABLE 3

Unionidae of selected streams that originate in Portage and Geauga counties.

Species	CRB	ARB	CRA	CUY	WBM
Anodonta imbecillis		X		X	
Anodonta g. grandis		X	X	X	X
Anodontoides ferussacianus		X	X	X	X
Strophitus u. undulatus	X		X	X	X
Alasmidonta marginata	X				
Lasmigona complanata		X	X	X	
Lasmigona costata	X		X	X	
Lasmigona compressa		X	X	X	
Obovaria subrotunda					X
Potamilus alatus					X
Ligumia nasuta				X	
Lampsilis r. luteola	X	X	X	X	X
Lampsilis ventricosa	X		X		

X - Represents the occurrence of this species in the river. CRB - Chagrin River below Chagrin Falls (this study), ARB - Aurora Branch of the Chagrin River (this study), CRA - Chagrin River above Chagrin Falls (this study), CUY - Cuyahoga River above Kent (Huehner 1985, Hoggarth 1990a), WBM - West Branch of the Mahoning River (Swart 1940).

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LITERATURE CITED

Davis, A. F. 1951 Mollusks of the Cuyahoga drainage system. M. S. Thesis, Kent State Univ., Kent, OH. 65 p.

Dexter, R. W., L. A. Swart, and A. F. Davis 1951 Comparison of the mollusks in adjacent Ohio River and Lake Erie drainage systems. Amer. Malacological Union Annual Reports, for 1951: 2–3.

Hoggarth, M. A. 1990a A study of the Unionidae of the upper Cuyahoga River. Final Report to the OH Dept. Natur. Res., Div. Natur. Areas and Preserves. 18 p.

———— 1990b A study of the Unionidae of the Chagrin River. Final Report to the OH Dept. Natur. Res., Div. Natur. Areas and Preserves. 23 p.

Huehner, M. K. 1985 A survey of the unionid mussel species of the upper Cuyahoga River. Final Report to the OH Dept. Natur. Res., Div. Natur. Areas and Preserves. 20 p.

Loos, P. M. 1960 Mollusks of the Chagrin River, Ohio. M. S. Thesis, Kent State Univ., Kent, OH. 47 p.

Swart, L. H. 1940 An ecological survey of the mollusks of the West Branch of the Mahoning River. M. S. Thesis, Kent State Univ., Kent, OH. 60 p.