

The Freshwater Mussels (Unionidae) of the Upper Ohio River, Greenup and Belleville Pools, West Virginia

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ABSTRACT

A preliminary survey of freshwater mussels inhabiting areas around the Ohio River islands of West Virginia was conducted in 1983 by the U.S. Fish and Wildlife Service, assisted by the West Virginia Department of Natural Resources. This survey concluded that the Greenup and Belleville pools displayed a far greater abundance and diversity of mussels than the remaining navigational pools along West Virginia, and warranted further investigation. During the spring and summer months of 1985, numerous collections were made at various points within the two navigational pools to expand the data previously collected. Twenty-four species of unionid mussels and *Corbicula* were collected from these areas, representing 16 and 23 species from the Greenup and Belleville pools, respectively. No species on the federal endangered species list were encountered, however four of the species collected are considered endangered by the State of Ohio.

INTRODUCTION

A very limited amount of freshwater mussel research has been performed on the mainstem Ohio River within West Virginia. The only recent studies were those conducted by Taylor (1980) and the U.S. Fish and Wildlife Service (1983) for the U.S. Army Corps of Engineers, Huntington District. Several of the major tributaries of the Ohio River have been surveyed by the West Virginia Department of Natural Resources, Division of Water Resources, in conjunction with a statewide inventory of mussel populations. These surveys include those by Zeto (1982) on the Monongahela River Basin, Schmidt *et al.* (1983) on the Little Kanawha River Basin, and Schmidt and Zeto (1983) on the Kanawha River. Other recent studies on these major Ohio River tributaries are those by Taylor (1983), Clarke (1982), and Morris and Taylor (1978), all on the Kanawha River. A review of literature records of the Muskingum River, Ohio has recently been prepared by Stansbery *et al.* (1985) for the U.S. Army Corps of Engineers, Huntington District.

It became evident from Taylor's 1980 Ohio River survey that a viable mussel population did exist in the river.

This work, however, was based mainly on the collection of shell material and did not actually locate live mussel beds. The work performed by the U.S. Fish and Wildlife Service in 1983 indicated the presence of several extensive mussel beds closely associated with the Ohio River islands. The present survey represents a joint effort by the U.S. Fish and Wildlife Service and the West Virginia Department of Natural Resources, Division of Water Resources. The information presented was collected in 1983 and 1985 from locations in the Greenup and Belleville pools of the Ohio River. These data indicate that several of the mussel species presumed extirpated from the river are still present in isolated areas.

STUDY AREA

The Ohio River adjacent to West Virginia extends from the Ohio-West Virginia-Pennsylvania state line (RM 40.1) to the common corner of Ohio-Kentucky-West Virginia (RM 317.1), forming the state's western boundary with Ohio. The 277 miles of the river along West Virginia are composed of eight navigational pools, including the Greenup and Belleville pools (figure 1).

The Greenup pool is formed at Greenup lock and dam at RM 341.0 near Greenup, Kentucky, and extends up-river into West Virginia. The pool is 61.8 miles long and terminates at RM 279.2 at the Gallipolis lock and dam. Numerous locations were surveyed in the Greenup pool for freshwater mussels during the survey, including the two sites reported here that were found to support significant populations of mussels. Site 1 is located at RM 292.4 along the right descending bank near Green Bottom, Cabell County, West Virginia (38°34'25"N, 82°17'34"W). The substrate consists of sand, gravel, cobble, and boulders. Site 2 is located at the head of Lesage Island (RM 289) near the common boundary of Mason and Cabell counties, West Virginia and Gallia County, Ohio (38°14'17"N, 82°14'54"W). Substrate at this location consists primarily of sand, gravel, and cobble.

The Belleville pool originates at Belleville lock and dam at RM 203.9 at Belleville, Wood County, West Vir-

ginia. The pool terminates upriver at the Willow Island lock and dam, and has a total length of 42.1 miles. Five sites were chosen from those surveyed for inclusion in this report. Site 3 is located farthest down-river of the Belleville pool sites. It is situated at the head and back channel of Neal Island near Parkersburg, Wood County, West Virginia at RM 181.1 to RM 182 (39°18'37"N, 81°33'24"W). Substrate varies from sand, gravel, and cobble at the island head to a combination of silt, sand, and gravel in the back channel. Site 4 is situated below the toe of Vienna (Halfway) Island near Vienna, Wood County, West Virginia (39°20'22"N, 81°33'26"W). The mussel bed extends from RM 179 to RM 179.9, and has a substrate consisting of sand, gravel, and cobble. Site 5 is located at the head of Vienna (Halfway) Island, extending into the back channel of the island. This site is also located near Vienna, Wood County, West Virginia at RM 178.1 (39°21'24"N, 81°32'28"W). The substrate is mainly composed of silt, sand, and gravel. Site 6 extends from above the head of Muskingum Island (RM 175.2) through its back channel and onto the toe of the island (RM 177.4), where the bed is situated near the navigation channel. Muskingum Island lies approximately 3 miles northeast of Vienna, Wood County, West Virginia (39°22'00"N, 81°32'19"W). This island back channel has substrate consisting primarily of silt, sand, and gravel. Site 7 lies entirely in the back channel of Marietta (Buckley) Island at RM 169.1 near Williamstown, Wood County, West Virginia (39°23'14"N, 81°24'43"W). The substrate at this site is composed of silt, sand, and gravel. Sampling sites are depicted in figure 1.

METHODS

Sampling sites were chosen by one of two methods. The first method involved "follow-up" surveys of areas sur-

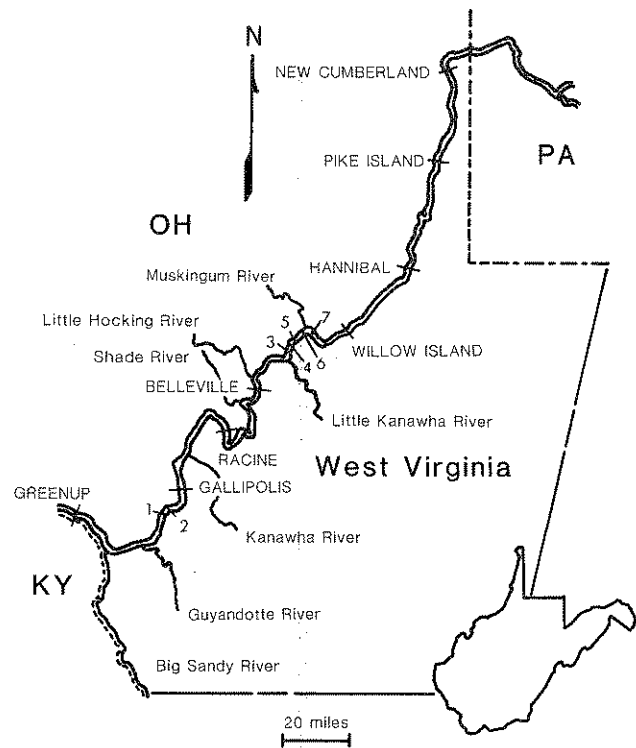


Figure 1. Ohio River, West Virginia. Sampling sites are indicated. Specific locations are identified in text.

rounding the Ohio River islands. The initial study of these island areas was conducted by the U.S. Fish and Wildlife Service (1983), and indicated that several of these island areas in the Greenup and Belleville pools had a very rich mussel fauna. The second method of site selection was simply choosing areas in the river associated

Table 1. Freshwater mussels of the Ohio River, Greenup pool, West Virginia.

Species	Site number		Total number collected	Percent relative abundance
	1	2		
<i>Strophitus undulatus undulatus</i> (Say, 1817)		1 [†]	1	0.26
<i>Lasmigona complanata</i> (Barnes, 1823)		2	2	0.53
<i>Quadrula quadrula</i> (Rafinesque, 1820)	14	87	101	26.65
<i>Quadrula metanevra</i> (Rafinesque, 1820)	10	28	38	10.03
<i>Quadrula pustulosa pustulosa</i> (Lea, 1831)	13	20	33	8.71
<i>Amblema plicata plicata</i> (Say, 1817)	3	10	13	3.43
<i>Fusconaia flava</i> (Rafinesque, 1820)		1	1	0.26
<i>Plethobasus cyphus</i> (Rafinesque, 1820)		7	7	1.85
<i>Pleurobema cordatum</i> (Rafinesque, 1820)	14	2	16	4.22
<i>Elliptio crassidens crassidens</i> (Lamarck, 1819)	103	8	111	29.29
<i>Obliquaria reflexa</i> (Rafinesque, 1820)	1	8	9	2.37
<i>Actinonaias ligamentina carinata</i> (Barnes, 1823)	9		9	2.37
<i>Leptodea fragilis</i> (Rafinesque, 1820)		2	2	0.53
<i>Potamilus alatus</i> (Say, 1817)	1	2	3	0.79
<i>Ligumia recta</i> (Lamarck, 1819)	2	1	3	0.79
<i>Lampsilis ventricosa</i> (Barnes, 1823)	26	4	30	7.92
Total	11	15	379	100.00

NOTE: *Corbicula* sp. was also found at each sampling location.
[†] Fresh dead shell.

Table 2. Freshwater mussels of the Ohio River, Belleville pool, West Virginia.

Species	Site number					Total number collected	Percent relative abundance
	3	4	5	6	7		
<i>Anodonta imbecillis</i> (Say, 1829)	1	1		1		3	0.27
<i>Anodonta grandis grandis</i> (Say, 1829)				1 ¹	1 ¹	2	0.18
<i>Strophitus undulatus undulatus</i> (Say, 1817)		1		1		2	0.18
<i>Lasmigona complanata</i> (Barnes, 1823)	4	1	1	3		9	0.82
<i>Magnonaias nervosa</i> (Rafinesque, 1820)			4			4	0.36
<i>Quadrula quadrula</i> (Rafinesque, 1820)	67	339	89	273		768	69.63
<i>Quadrula metanevra</i> (Rafinesque, 1820)	1	12		6		19	1.72
<i>Quadrula pustulosa pustulosa</i> (Lea, 1831)	1	14	2	24	6	47	4.26
<i>Amblema plicata plicata</i> (Say, 1817)	8	82	10	49	11	160	14.51
<i>Fusconaia flava</i> (Rafinesque, 1820)	5 ¹			5 ¹		10	0.91
<i>Plethobasus cyphus</i> (Rafinesque, 1820)		1				1	0.09
<i>Pleurobema cordatum</i> (Rafinesque, 1820)		3		1		4	0.36
<i>Elliptio crassidens crassidens</i> (Lamarck, 1819)		1				1	0.09
<i>Unio merus tetralasmus</i> (Say, 1831)			1			1	0.09
<i>Obliquaria reflexa</i> (Rafinesque, 1820)	2	15		4		21	1.90
<i>Actinonaias ligamentina carinata</i> (Barnes, 1823)				1		1	0.09
<i>Obovaria subrotunda</i> (Rafinesque, 1820)		2		3		5	0.45
<i>Truncilla donaciformis</i> (Lea, 1827)	3	7	3	2		15	1.36
<i>Leptodea fragilis</i> (Rafinesque, 1820)	3	1	1	1	1	7	0.64
<i>Potamilus alatus</i> (Say, 1817)	3	5	3 ¹	4		15	1.36
<i>Potamilus ohioensis</i> (Rafinesque, 1820)	1			1 ¹		2	0.18
<i>Lampsilis radiata luteola</i> (Lamarck, 1819)		1 ¹				1	0.09
<i>Lampsilis ventricosa</i> (Barnes, 1823)	1	1		3		5	0.45
Total	13	17	9	18	4	1103	99.99

NOTE: *Corbicula* sp. was also found at each sampling location.

¹ Fresh dead shell.

with the force of the thalweg, mainly river bends. River bends are generally "clean-swept" by the river's current and are likely areas for mussels to populate, especially near the outside of the turn.

The primary method of sampling was by brailing, utilizing both dovetail and crowfoot brail hooks. Shallow water and the shoreline were also surveyed for fresh-dead shells and midden piles. However, at the sites surveyed the vast majority of the mussel beds were located in 12–18 feet of water. As material was collected in the field, a preliminary species list was compiled on site. A suitable number of individuals were retained for positive identification and as voucher specimens. These have been accessioned in the Ohio State University Museum of Zoology. Dr. David Stansbery aided in the identification of the specimens.

RESULTS

A total of 24 species of freshwater unionid mussels as well as the Asiatic clam *Corbicula* were collected from the areas surveyed. The Greenup pool (table 1) supported 16 species of mussels, with the dominant species *Elliptio crassidens crassidens* and *Quadrula quadrula* having respective relative abundances of 29.29 and 26.65% of the population sampled. A significant portion of the mussel fauna in this pool was also comprised of *Quadrula metanevra* and *Quadrula pustulosa pustulosa*, representing

10.03 and 8.71% of the sample, respectively. The population of Site 1 was dominated by *E. c. crassidens*, while *Q. quadrula* was dominant at Site 2. The occurrence of *E. c. crassidens* at Site 1 represented the most significant population of this species, once thought to be extirpated from the upper Ohio River, in this portion of the river.

The Belleville pool was apparently more diverse in species composition than the Greenup pool, supporting 23 species of unionid mussels, in addition to *Corbicula* (table 2). By far the dominant species in the Belleville pool was *Q. quadrula*, which had a relative abundance of nearly 70%, followed by *Amblema plicata plicata*, comprising 14.51% of the population. This situation also held true for individual site analyses of areas 3, 4, 5, and 6. At Site 7, however, a drastic decrease of species diversity and total population was apparent, as only four species were collected at this site. Investigation of numerous sites in the remaining 7 miles (RM 162–169) of the Belleville pool above Site 7 indicated that this region of the Ohio River was nearly devoid of unionids. Only a few (< 10) specimens of *Q. quadrula* and *A. p. plicata* were taken in this upper 7 mile reach of the Belleville pool.

DISCUSSION

The authors believe the greater species diversity in the Belleville pool is influenced by several factors. Several

major rivers (Muskingum and Little Kanawha) enter the Ohio River in the Belleville pool close to the study areas. These rivers contain significant mussel populations (Schmidt *et al.*, 1983; Stansbery *et al.*, 1985) which undoubtedly have contributed to the Ohio River fauna. The Belleville pool also contains numerous islands within its boundaries. The back channels of these islands not only provide a refuge from navigational and dredging impacts, but also provide a variety of habitats for mussel populations. In comparison, the tributaries of the Greenup pool are believed to have little influence on the Ohio River mussel populations, and there is also far less island habitat in this pool.

In comparing the relative abundances of the mussel populations in the two pools surveyed, it is very apparent that the Greenup pool has a more evenly dispersed faunal representation than the Belleville pool. This may be attributed to the smaller amount of industrialization and somewhat isolated condition existing in the study area of the Greenup pool, resulting in fewer negative impacts to the river.

Several species collected during this survey had been presumed extirpated from the Ohio River in West Virginia (Taylor, 1980). These species are: *Elliptio crassidens crassidens*, *Actinonaias ligamentina carinata*, *Plethobasis cyphyus*, *Ligumia recta*, *Truncilla donaciformis* (later reported present by Taylor, The Ohio River Biology Symposium, Huntington, WV, 1984). Four of the species collected, *Quadrula metanevra*, *Plethobasis cyphyus*, *Pleurobema cordatum*, and *Potamilus ohioensis*, are considered endangered by the State of Ohio (Stansbery, 1976). No species listed as endangered by the federal government were encountered.

ACKNOWLEDGEMENTS

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