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# Freshwater Mussels (Mollusca: Unionidae) of the Middle Branch, North Fork Vermilion River, Illinois/Indiana

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## ABSTRACT

The Vermilion River drainage, especially the North Fork Vermilion River, supports one of the most diverse mussel faunas in Illinois. During 1996-1998, a survey was conducted in the Middle Branch, the largest tributary of the North Fork. Twenty-two species were recorded as extant in the river, including 9 state-threatened or endangered species. The federally endangered clubshell (*Pleurobema clava*), which was believed to be extirpated from the state, was discovered in the Middle Branch. Two other species (slippershell (*Alasmidonta viridis*) and kidneyshell (*Ptychobranchus fasciolaris*)) not recorded from the North Fork drainage in recent surveys were also documented. The Middle Branch supports Illinois' only known population of the clubshell, the state's best remaining populations of 4 other state-listed species, and has a species richness and abundance comparable to larger high-quality streams in the state. The Middle Branch supports the most biologically significant mussel fauna in Illinois.

## INTRODUCTION

The Vermilion River (Wabash River drainage) is one of the most biologically rich aquatic communities in Illinois. The watershed historically supported 98 fish and 45 mussel species (Illinois Natural History Survey Fish Collection data; Cummings and Mayer, 1997). Currently, 74 fish and 34 mussel species remain extant in the drainage, making it one of the state's most significant biological resources (Page, et al. 1992).

The North Fork Vermilion River is known to support more state-listed threatened or endangered aquatic species than any other medium-sized river in Illinois (Endangered Species Protection Board, 1993). Surveys in 1997 in the North Fork watershed documented the existence of 23 mussel species, including 5 state-listed species (Cummings, et al., 1998a). The 1997 survey, however, failed to locate live individuals of 6 other listed species, including the federally endangered clubshell (*Pleurobema clava*), that were historically present (Baker, 1922; Suloway, et al. 1981). As a result, the clubshell was

thought to have been extirpated from the river and Illinois. The continued presence of 5 other species, including the state listed slippershell (*Alasmidonta viridis*) and kidneyshell (*Ptychobranchus fasciolaris*), was considered uncertain.

Based on spot collections, the Middle Branch appeared to support a mussel fauna similar to the main stem North Fork in diversity, including 4 state-listed species: wavyrayed lampmussel *(Lampsilis fasciola*), purple lilliput (*Toxolasma lividus*), rainbow (*Villosa iris*), and little spectaclecase (*Villosa lienosa*) (Schanzle, IDNR, unpubl. data; Cummings, et al. 1998a). Following the recommendations of Cummings, et al. (1998a), a systematic mussel survey of the Middle Branch was conducted with a special emphasis on rare species.

## LOCATION

The Middle Branch is the largest tributary of the North Fork Vermilion River. It begins about 4 miles (6.4km) southeast of Cheneyville, northeastern Vermilion County, Illinois, and flows southwesterly and southerly to its confluence with the North Fork, 1 mile (1.6km) west of Alvin. Its only major tributary, Jordan Creek (also known as East Branch on some maps) begins in western Indiana and empties into the Middle Branch 1.5 miles (2.4km) northwest of Alvin (Fig. 1). The Middle Branch is 17.3 miles (27.8km) in length and drains an area of 43 $mi^2$ (111$km^2$) in Illinois; Jordan Creek is 7.2 miles (11.6km) long and has a watershed of 22 $mi^2$ (57$km^2$) in Illinois (Illinois Department of Natural Resources, 1999a). A significant portion of the watershed lies in Indiana. Both are third-order streams until their confluence where the Middle Branch becomes a fourth-order stream.

In-stream habitats consist of well-developed pool-riffle-run systems, particularly in downstream reaches. Substrates are predominantly sand and gravel with occasional areas of silt in slack water or cobble in runs and riffles. The watershed is primarily agricultural; row crops account for approximately 87% of the land cover (Illinois Department of Natural Resources, 1999b). A few sections of these streams have been channelized and drainage tile outflow occurs nearly basin-wide. Permanent vegetation cover along the riparian corridors, in the form of pasture, hay, idle ground, or riparian buffer strips, is more notable here than elsewhere in east-central Illinois (RES, pers. obs.). Lower stream reaches, particularly below the confluence, support a well-developed woody riparian corridor.

## METHODS

Live mussels and shells of dead individuals were surveyed at 8 sites along the Middle Branch and 10 sites along Jordan Creek during 1996-1998 (Fig. 1). Each site was sampled by hand for 1-3 man-hours depending on stream size, habitat complexity, and number of mussels present. Special emphasis was placed on habitats likely to support live mussels, especially rarer species. Voucher specimens were collected and placed in the Mollusk Collection of the Illinois Natural History Survey, Champaign, Illinois. Nomenclature follows Turgeon, et al. (1998).

## RESULTS

Twenty-two species were collected from 18 sites in the Middle Branch and Jordan Creek; all 22 were recorded in Middle Branch and 20 were recorded in Jordan Creek (Table 1). The lilliput (*Toxolasma parvus*) and rabbitsfoot (*Quadrula cylindrica*) were the only species not collected alive. The lilliput is a small species and can easily be overlooked by hand sampling. It was found as shells at 5 of 18 sites in the survey. Its distribution and abundance in Illinois suggest that it is extant in the Middle Branch (Cummings and Mayer, 1997).

Of the 22 species recorded, 9 are listed as threatened or endangered by the state of Illinois (Herkert, 1992; Herkert, 1999). The clubshell is also listed as federally endangered (USFWS, 1997). Of the 9 listed species, only the rabbitsfoot was not collected alive. A shell was collected in Middle Branch. The state endangered rabbitsfoot is still present in the North Fork just below the confluence with the Middle Branch (Cummings, et al., 1998a). It is possible this species is extant in the lower reaches of the Middle Branch.

Cummings, et al. (1998a) provided detailed historical reviews for all state-listed species known from the North Fork drainage. That review covered 8 of the 9 species documented from the Middle Branch. The species accounts that follow provide information that updates these previous accounts. The purple wartyback (*Cyclonaias tuberculata*) was listed as state-threatened after publication of Cummings, et al. (1998a) and a brief review for this species follows.

The most widespread species, present at 10 or more sites, were giant floater (*Pyganodon grandis*), fatmucket (*Lampsilis siliquoidea*), Wabash pigtoe (*Fusconaia flava*), creeper (*Strophitus undulatus*), plain pocketbook (*Lampsilis cardium*), little spectaclecase (*Villosa lienosa*), slippershell *(Alasmidonta viridis*), creek heelsplitter (*Lasmigona compressa*), threeridge (*Amblema plicata*), and cylindrical papershell (*Anodontoides ferussacianus*) (Table 1). Most of these species are widespread and common in Illinois. The little spectaclecase and slippershell are state-listed, and their general distribution throughout the Middle Branch drainage is exceptional.

The most abundant species found were fatmucket, creeper, giant floater, and Wabash pigtoe, accounting for 83% of all live individuals found. These species are all common and widely distributed in Illinois (Cummings and Mayer, 1997).

## DISCUSSION

Based on comparisons with other Illinois drainages, the Middle Branch supports one of the most diverse mussel faunas in the state (Table 2). Species richness is comparable with those of larger, high-quality river systems, especially considering that the latter provide habitat and potential fish hosts for species that the Middle Branch does not support. With the exception of the entire Vermilion River watershed, the Middle Branch supports more rare species than any other drainage in Illinois, regardless of size.

**Federally Endangered Species**

Clubshell. This species was thought to have been extirpated from Illinois by Cummings, et al. (1998a) after extensive surveys of historical locations. Prior to this survey, the clubshell was last recorded alive in Illinois in the North Fork near Alvin in 1958 (Matteson, Univ. Illinois., unpublished 1956-1958 survey). Only a fresh dead shell (tissue still attached) found at the same site in 1980 indicated the species might still be extant in the state. A live individual collected from the Middle Branch in 1998 not only restores the species to the state's fauna but, at a total length of 4.5 cm, suggests successful reproduction in the past decade.

**Illinois Endangered Species**

Wavyrayed lampmussel. This species was found alive at six sites during 1996-1998. Currently restricted in Illinois to the Vermilion River drainage, the Middle Branch support the largest remaining population of this species in Illinois.

Kidneyshell. The kidneyshell has not been reported alive in the Vermilion drainage since 1980 (Suloway, et al., 1981). Cummings, et al. (1998a) described its status in the North Fork Vermilion River as uncertain. A single live individual was found in 1998, confirming the kidneyshell's presence in the drainage. It may also persist in the lower Middle Branch, where limited collecting has been performed to date.

Rabbitsfoot. This species has not been found alive in the Middle Branch. A collection of paired valves and limited survey efforts in the lower reaches where suitable habitat may exist suggest the species may still be present.

Purple lilliput. This small species is currently known in Illinois only from the North Fork drainage and a single site in Big Grande Pierre Creek in Pope County (Cummings, et al., 1998a; INHS Mollusk Collection data). It has been found alive at one station in the North Fork proper and three locations in the Middle Branch, suggesting the latter supports the best remaining population in Illinois.

Rainbow. Like the purple lilliput, the rainbow is likely restricted to the North Fork Vermilion River drainage, although there have been recent reports of live specimens collected in the Fox River drainage in northern Illinois, where it had been known historically. The documentation of five live individuals and its presence at five different sites suggest that the Middle Branch supports the best population of this species in Illinois.

Little spectaclecase. This species, though uncommon, is widely distributed in the Middle Branch drainage, particularly in Jordan Creek. The little spectaclecase is currently known only from the Embarras and Vermilion rivers, where it is sporadic in occurrence (Cummings and Mayer, 1997) and the Little Vermilion River drainage where it is fairly common upstream of the Georgetown Reservoir (Cummings, et al., 1998b). The Middle Branch supports one of the best populations in Illinois.

**State Threatened Species**

Slippershell. Prior to this survey, the only live records for this species in the entire Vermilion drainage were from Bean Creek, a tributary of the Middle Fork River, in 1989 (Cummings, et al., 1998a). The species is widely distributed in the Middle Branch and,

due to its small size, may be more common than indicated as suggested by high numbers of dead shells in Jordan Creek in Indiana (RES, pers. obs.).

Purple wartyback. Historically known from 12 drainages in the state, it is now found only in three: Vermilion, Kankakee, and Ohio River proper. The Ohio River population is threatened by zebra mussels and may not be viable. The purple wartyback was collected alive in Jordan Creek and was recently documented from the lower reaches of the Middle Branch (Szafoni, unpubl. data).

## CONCLUSIONS

The Middle Branch supports the single most biologically significant mussel fauna in Illinois. A total of 22 species, including 9 federal/state-listed species, are known from the stream. Eight of the listed species are still extant. The Middle Branch supports Illinois' only population of the federally listed clubshell, the state's best populations of the state endangered wavyrayed lampmussel, purple lilliput, and rainbow, and one of the largest populations of the state endangered little spectaclecase. Further, two other species considered uncommon to rare in Illinois, the creek heelsplitter (*Lasmigona compressa*) and fluted shell (*Lasmigona costata*), are also present in the stream, with the former present in significant numbers (Table 1).

Equally notable is the distinct possibility that no species has been extirpated from the drainage to date. With the exception of the lilliput and rabbitsfoot, which likely still persist in the Middle Branch, all known species are still extant. Given significant mussel population declines and species extirpation in Illinois (Cummings and Mayer, 1997) and nationwide (Williams, et al., 1993), the existence of a such potentially complete fauna is remarkable.

High mussel diversity is frequently associated with high fish diversity (Watters, 1992). Several rare fishes (e.g., eastern sand darter, *Ammocrypta pellucida*) are known from the North Fork drainage (INHS Fish Collection data) and may exist in Middle Branch. A comprehensive fish survey along with a greater effort to sample mussels in more remote reaches, will provide better information on the distribution, abundance, and biological significance of this outstanding aquatic resource.

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Table 1. Frequency and abundance of mussels in Middle Branch (MB) and its tributary, Jordan Creek (JC), North Fork Vermilion River drainage, Illinois and Indiana. Frequency expressed as the number and percent of sites at which a species was found (live or as a shell) (N = 8 for Middle Branch; N = 10 for Jordan Creek); abundance expressed as the total number of live individuals recorded. (ST = state threatened, SE = state endangered, FE = federally endangered.)

| **Species** | **Freq MB** | **Freq JC** | **Abund MB** | **Abund JC** | **Total Abund** |
|---|---|---|---|---|---|
| AMBLEMINAE | | | | | |
| *Amblema plicata* - threeridge | 3 (37%) | 7 (70%) | 7 | 61 | 68 |
| *Cyclonaias tuberculata* - purple wartyback [ST] | 1 (12%) | 1 (10%) | 1 | 0 | 1 |
| *Fusconaia flava* - Wabash pigtoe | 5 (62%) | 10 (100%) | 76 | 110 | 186 |
| *Pleurobema clava* - clubshell [FE, SE] | 1 (12%) | 1 (10%) | 1 | 0 | 1 |
| *Pleurobema sintoxia* - round pigtoe | 1 (12%) | 3 (30%) | 1 | 4 | 5 |
| *Quadrula cylindrica* - rabbitsfoot [SE] | 1 (12%) | 0 (0%) | 0 | 0 | 0 |
| ANODONTINAE | | | | | |
| *Alasmidonta viridis* - slippershell [ST] | 7 (87%) | 5 (50%) | 8 | 3 | 11 |
| *Alasmidonta marginata* - elktoe | 2 (25%) | 4 (40%) | 2 | 6 | 8 |
| *Anodontoides ferussacianus* - cylindrical papershell | 8 (100%) | 5 (50%) | 17 | 9 | 26 |
| *Lasmigona complanata* - white heelsplitter | 2 (25%) | 4 (40%) | 1 | 8 | 9 |
| *Lasmigona compressa* - creek heelsplitter | 6 (75%) | 4 (40%) | 14 | 13 | 27 |
| *Lasmigona costata* - fluted shell | 2 (25%) | 3 (30%) | 3 | 2 | 5 |
| *Pyganodon grandis* - giant floater | 8 (100%) | 10 (100%) | 182 | 25 | 207 |
| *Strophitus undulatus* - creeper | 6 (75%) | 8 (80%) | 33 | 183 | 216 |
| LAMPSILINAE | | | | | |
| *Lampsilis cardium* - plain pocketbook | 6 (75%) | 4 (40%) | 47 | 11 | 58 |
| *Lampsilis fasciola* - wayrayed lampmussel [SE] | 3 (37%) | 6 (60%) | 14 | 4 | 18 |
| *Lampsilis siliquoidea* - fatmucket | 7 (87%) | 10 (100%) | 429 | 197 | 626 |
| *Ptychobranchus fasciolaris* - kidneyshell [SE] | 1 (12%) | 0 (0%) | 1 | 0 | 1 |
| *Toxolasma lividus* - purple lilliput [SE] | 2 (25%) | 5 (50%) | 1 | 4 | 5 |
| *Toxolasma parvus* - lilliput | 2 (25%) | 3 (30%) | 0 | 0 | 0 |
| *Villosa iris* - rainbow [SE] | 4 (50%) | 2 (20%) | 5 | 2 | 7 |
| *Villosa lienosa* - little spectaclecase [SE] | 4 (50%) | 9 (90%) | 3 | 11 | 14 |

Table 2. A comparison of stream length in miles (km), watershed area in miles$^2$ (km$^2$), species richness (live post-1969), and number of state- and federally listed species for the Middle Branch and other high-quality Illinois streams. Data are only for the Illinois portions of these streams. [Data from IDNR (1999), Cummings and Mayer (1997), and this study.]

| River | Length | | Watershed Area | | # Mussel Species | # Listed Species |
|---|---|---|---|---|---|---|
| | mi | (km) | mi$^2$ | (km$^2$) | | |
| Middle Branch | 24 | (39) | 65 | (168) | 22 | 9 |
| North Fork, Vermilion River | 62 | (100) | 294 | (762) | 23 | 9 |
| Vermilion River | 257 | (414) | 1,478 | (3,831) | 34 | 10 |
| Mackinaw River | 128 | (206) | 1,138 | (2,950) | 24 | 1 |
| Kankakee River | 58 | (93) | 2,163 | (5,607) | 27 | 5 |
| Embarras River | 189 | (304) | 2,673 | (6,929) | 32 | 3 |
| Illinois River | 272 | (438) | 24,810 | (64,310) | 26 | 1 |

Figure 1. Collecting sites in Middle Branch and Jordan Creek, North Fork Vermilion River, Illinois, 1996-1998.