

## Freshwater Mussel Surveys of the Big Darby Creek System in Central Ohio

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### Introduction

Big Darby Creek in central Ohio, for its size, has the greatest diversity of freshwater mussels in North America (Watters, 1994). Forty species have been reported from the system, including two federally endangered species, seven Ohio endangered species, four Ohio threatened species, and three Ohio special interest species. A survey in 1986 found 38 of these species (Watters, 1986), whereas a follow-up survey in 1990 found 35 (Watters, 1990). These surveys suggest that the fauna was declining, both in species richness and numbers of individuals. A third survey was conducted in 1995-1996 (Watters, 1996a). The purpose of these surveys was to establish baseline data against which future changes may be gauged.

Establishing baseline data for mussels in a watershed is difficult. Results are confounded by variations in water levels, collecting methods, and the constantly changing nature of the sites. Sites that once were soybean fields are now bedroom communities. Wooded riparian corridors are replaced by mowed, fertilized, insect-free lawns. Bridges are replaced or moved. Agricultural methods change on a regular basis. Thus the goal of baseline data may be unreachable, as the creek system rapidly changes.

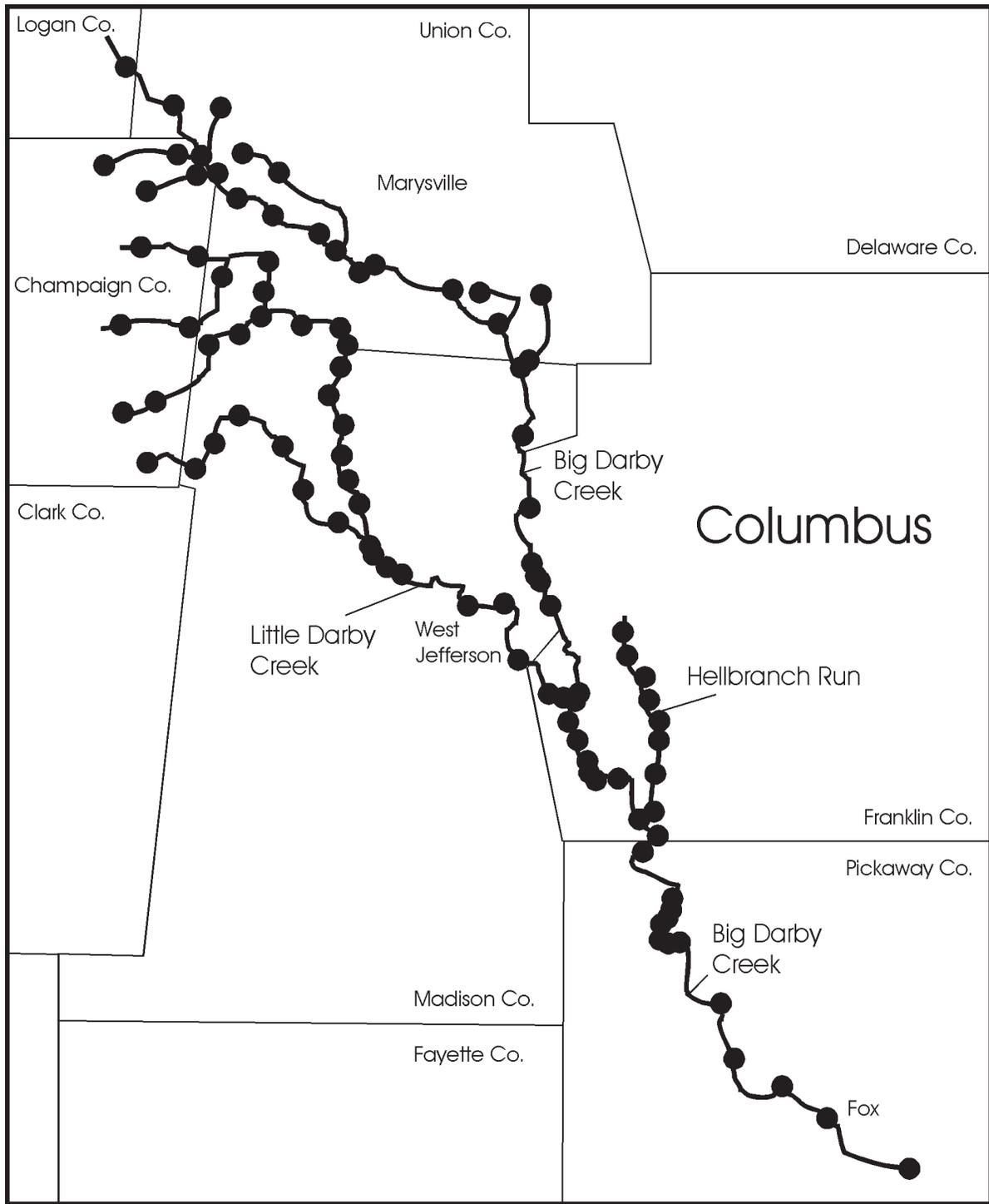
### Methods

One hundred sites were sampled over the three surveys (Figure 1). Sites were surveyed by wading, and glass-bottom buckets were used for locating mussels. All individuals, living, dead, and weathered, were collected and identified. All living animals were returned to the stream. Shells were kept as vouchers as needed and deposited at The Ohio State University Museum of Biological Diversity.

### Results and Discussion

Thirty-five species were found in the 1995-1996 survey, the same number (but not species) as found in 1990, but less than in the 1988 survey (Table 1). Nine listed species were encountered. Figure 2 depicts the species diversity site-by-site from mouth to headwaters by river mile (RM). Fewer species were found at most sites in 1990 and 1996 than in 1986. This may be due, at least in part, to the exceptional survey conditions in 1986. A severe drought in 1986 resulted in the stranding of numerous mussels, rendering collection extremely easy. By contrast, 1996 had above-normal precipitation. Although survey work was conducted to maximize the likelihood of encountering as many species as possible, no mussels were stranded or otherwise unburied. This alone probably accounts for some of the departure in terms of diversity of 1996 from 1986. Most of the species not encountered in 1996 were rare in 1986. The 1986 drought continued for several years and undoubtedly resulted in the death of a large portion of the mussel fauna.

The greatest diversity of mussels in Big Darby Creek occurs in the lower half of the main stem, from the Battelle-Darby Metro Park region to Fox (Figure 2). However, this area has experienced a pronounced increase in water turbidity. Several very rare species, including the Northern Riffleshell, which previously existed in this stretch, were not found in this survey. A number of areas have unusually low diversity. Hellbranch Run, with its runoff and sewage outfall problems, enters Big Darby Creek at ~RM 26. Its impact can be seen for several miles downstream. Other problem areas include the confluence of Buck Run, devoid of mussels for much of its length, and Big Darby at ~RM 65, and abandoned quarries at RM 45. Site 33 at Ohio Route 104 is a mystery. In 1988, 19 species were found there, but in 1990 and 1996, only two and six species, respectively. This area has a high fish diversity and suitable habitat is present. The near extirpation of mussels from this site has not been explained.



**Figure 1.** Map of collection locations (solid circles) on Big Darby Creek and Little Darby Creek.

**Table 1.** Comparison of 1986, 1990, and 1996 surveys.

<b>Taxon</b>	<b>Common Name</b>	<b>Status</b>	<b>1986</b>	<b>1990</b>	<b>1996</b>
<i>Ligumia recta</i>	Black Sandshell	OT	X	X	
<i>Pleurobema clava</i>	Clubshell	FE, OE	X	X	X
<i>Lasmigona compressa</i>	Creek Heelsplitter		X	X	X
<i>Anodontoides ferussacianus</i>	Cylindrical Papershell		X	X	X
<i>Truncilla truncata</i>	Deertoe	OSI	X		
<i>Elliptio crassidens</i>	Elephant Ear	OE	X		
<i>Alasmidonta marginata</i>	Elktoe		X	X	X
<i>Lampsilis radiata luteola</i>	Fat Mucket		X	X	X
<i>Truncilla donaciformis</i>	Fawnsfoot	OT	X	X	X
<i>Lasmigona costata</i>	Fluted-shell		X	X	X
<i>Leptodea fragilis</i>	Fragile Papershell		X	X	X
<i>Pyganodon grandis</i>	Giant Floater		X	X	X
<i>Ptychobranchus fasciolaris</i>	Kidneyshell		X	X	X
<i>Toxolasma parvus</i>	Lilliput		X	X	X
<i>Quadrula quadrula</i>	Mapleleaf		X	X	X
<i>Epioblasma rangiana</i>	Northern Riffleshell	FE, OE	X	X	X
<i>Utterbackia imbecillis</i>	Paper Pondshell		X	X	X
<i>Quadrula pustulosa</i>	Pimpleback		X	X	X
<i>Potamilus alatus</i>	Pink Heelsplitter		X	X	
<i>Potamilus ohioensis</i>	Pink Papershell		X	X	X
<i>Tritogonia verrucosa</i>	Pistolgrip		X	X	X
<i>Lampsilis cardium</i>	Plain Pocketbook		X	X	X
<i>Unio merus tetralasmus</i>	Pondhorn	OT	X	X	
<i>Cyclonaias tuberculata</i>	Purple Wartyback	OSI	X	X	X
<i>Quadrula cylindrica</i>	Rabbitsfoot	OE	X	X	X
<i>Villosa iris</i>	Rainbow		X	X	X
<i>Villosa fabalis</i>	Rayed Bean	OE	X	X	X
<i>Obovaria subrotunda</i>	Round Hickorynut		X	X	X
<i>Pleurobema sintoxia</i>	Round Pigtoe		X	X	X
<i>Simpsonaias ambigua</i>	Salamander Mussel	OSI	X	X	
<i>Alasmidonta viridis</i>	Slippershell		X	X	X
<i>Epioblasma triquetra</i>	Snuffbox	OT	X	X	X
<i>Elliptio dilatatus</i>	Spike		X	X	X
<i>Strophitus undulatus</i>	Squawfoot		X	X	X
<i>Amblyma plicata</i>	Threeridge		X	X	X
<i>Fusconaia flava</i>	Wabash Pigtoe		X	X	X
<i>Megaloniais nervosa</i>	Washboard	OE	X	X	
<i>Lampsilis fasciola</i>	Wavy-rayed Lampmussel		X	X	X
<i>Lasmigona complanata</i>	White Heelsplitter		X	X	X
		<b>Total</b>	<b>38</b>	<b>35</b>	<b>35</b>

Status codes: FE - Federally endangered; OE - Ohio endangered; OT - Ohio threatened; OSI - Ohio special interest

In all, Little Darby Creek appears to be in better condition than Big Darby Creek. Beginning at Chuckery, a high diversity is maintained to West Jefferson, with few interruptions (Figure 3). The Federal endangered Clubshell and Ohio endangered Rabbitsfoot were found living and reproducing in this area at several sites, but nowhere else in the system. Areas of unusually low diversity included West Jefferson. At the site immediately above the town, 124 living or freshly dead individuals of 12 species were found. At the first site below the town, no living or freshly dead mussels were encountered, despite apparently good habitat.

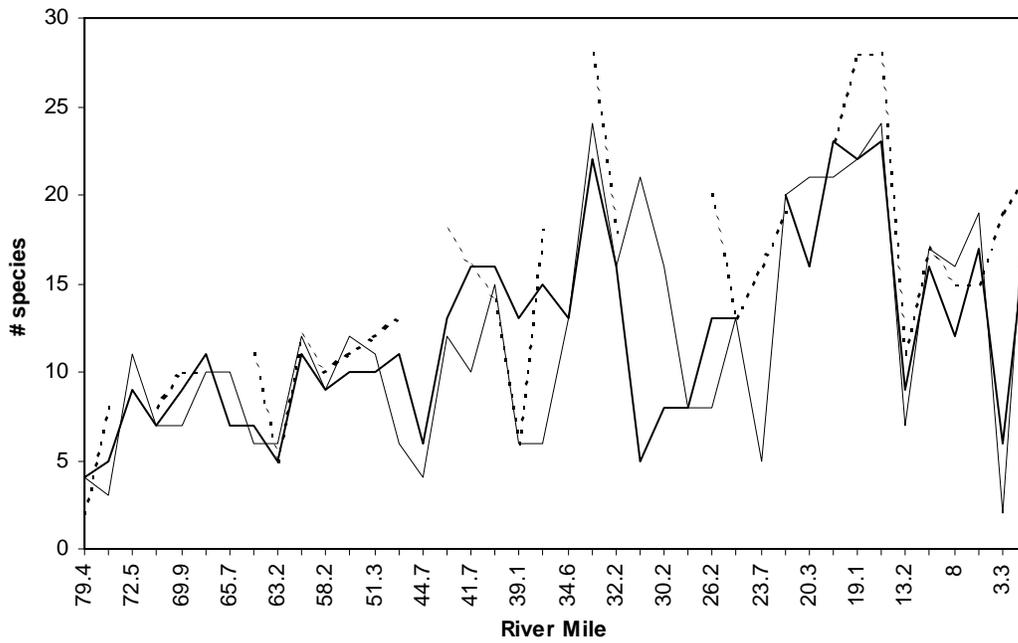


Figure 2. Big Darby Creek - number of species by river mile. Heavy line - 1996. Light line - 1990. Dashed line - 1986.

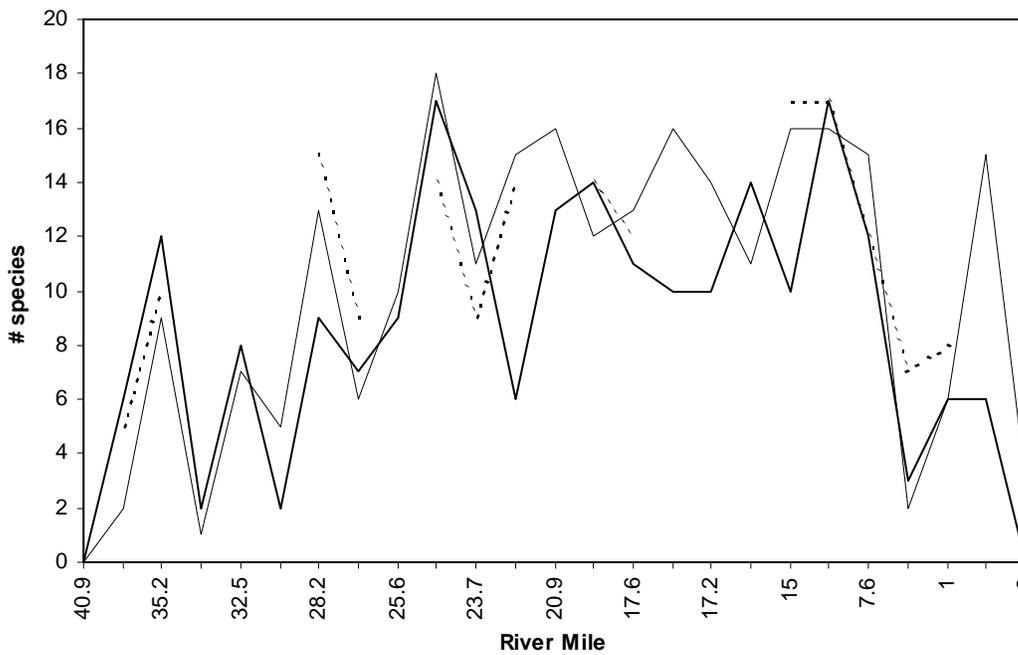


Figure 3. Little Darby Creek - number of species by river mile. Heavy line - 1996. Light line - 1990. Dashed line - 1986

Several tributaries no longer support any mussels at their downstream sites. Buck Run historically has had problems with livestock-induced runoff and pollution. Hellbranch Run lacks any evidence that mussels ever existed in its lowest stretch, where portions of the creek were buried under more than a foot of wastewater treatment effluent. The rare Pondhorn Mussel, known in the system only from this tributary, apparently has been extirpated.

No evidence of zebra mussels was found in the system. Zebra mussels have been recorded from the Scioto River and neighboring Hargus Lake. As a tributary of the Scioto River, the Darby Creek system is thus exposed to potential infestation. It is not clear whether zebra mussels can successfully colonize a free-flowing creek such as Big Darby. Certainly the construction of an impoundment on or adjacent to the Darby system would greatly increase the chances of zebra mussel invasion.

Big Darby Creek is internationally known as a high-quality freshwater ecosystem. Single sites in the drainage have more species than all of Europe. Conservation efforts from wildlife agencies, conservation groups, and private citizens have frequently collided with the plans of developers, industry, and urbanization that encroach on the Darby system. As with most fragile habitats, it is not a single problem that destroys it, but the cumulative effect of numerous insults and injuries. Already these effects are visible, such as in the declining numbers and diversity of the Darby organisms.

### Listed Species Accounts

Black Sandshell, *Ligumia recta*, an Ohio threatened species, was found living in the 1988 survey, but not in 1990 or 1996. It has never been common in the system, although its proposed hosts, various sunfish and bass, are present (Steg and Neves, 1997).

Clubshell, *Pleurobema clava*, a Federal and Ohio endangered species, was encountered as weathered shells at all but the extreme headwater sites. It was found living or freshly dead in the middle reach of Little Darby Creek, where it is not uncommon. Several size classes were encountered. Hosts include the common Striped Shiner and Blackside Darter (Watters and O'Dee, 1997).

Deertoe, *Truncilla truncata*, an Ohio special interest species, was rare in 1988 and was not found in subsequent surveys. It is a large river species. Hosts include Sauger and Drum (Wilson, 1916), which may have introduced this mussel from the Scioto River.

Elephant ear, *Elliptio crassidens*, another large river species, is endangered in Ohio. A single weathered shell was found in 1990. Hosts include Skipjack Herring (Howard, 1914). The Elephant Ear probably was never a common, reproducing resident of the Darby system.

Fawnsfoot, *Truncilla donaciformis*, an Ohio threatened species, is very rare in Big Darby Creek. A single weathered shell was found in 1996. Sauger and Drum are hosts (Surber, 1913). As with the Deertoe, it probably was introduced from the Scioto River.

Northern riffleshell, *Epioblasma torulosa rangiana*, a Federal and Ohio endangered species, was historically common in Big Darby Creek mainstem. Although not encountered in 1996, it was found subsequently in the Battelle-Darby Metro Park region. Its numbers have steadily declined. Hosts include several darters and Mottled Sculpin (Watters, 1996b).

Snuffbox, *Epioblasma triquetra*, an Ohio endangered species, was once common in the lower mainstem of Big Darby Creek. It has become rare as its numbers dramatically decline. Logperch is a reported host (Hill, 1986).

Washboard, *Megaloniaias nervosa*, an Ohio endangered species, occasionally is encountered in Big Darby Creek. These are all old, single individuals and probably represent stray occurrences. Many fishes are known as hosts.

Pondhorn, *Uniomerus tetralasmus*, is threatened in Ohio, and known from only a few locales in the state. It historically lived in Hellbranch Run, but, curiously, nowhere else in Big Darby. It has been extirpated from the system. Golden Shiner is the only host reported (Stern and Felder, 1978).

Purple Wartyback, *Cyclonaias tuberculata*, an Ohio special interest species, was uncommon as living and freshly dead specimens in the middle mainstem. It does not appear to be reproducing. Known hosts are catfishes.

Rabbitsfoot, *Quadrula cylindrica cylindrica*, an Ohio endangered species, was found living or freshly dead at three Little Darby Creek sites. It has been extirpated from Big Darby Creek proper. This species appears to be reproducing, based on the several size classes and juveniles found in this survey. Hosts are probably species of shiners and chubs (Yeager and Neves, 1986).

Rayed bean, *Villosa fabalis*, an Ohio endangered species, and former Federal Category 2 species, was found as weathered shells in much of the Big Darby mainstem. It has been extirpated from most of its range in North America. The Tippecanoe Darter is believed to be a potential host.

Salamander mussel, *Simpsonaias ambigua*, an Ohio special interest species, and former Federal Category 2 species, was found as a freshly dead shell at a single site (T17). Its only known host, the Mudpuppy (Howard, 1915), was not encountered in 1996.

Museum records exist for two species not found in any of the three surveys discussed here. The Mucket, *Actinonaias ligamentina*, is common in many parts of Ohio, but peculiarly absent from Big Darby Creek. The Ridged Pocketbook, *Lampsilis ovata*, an Ohio endangered species, is known only from subfossil specimens and is presumed to be extirpated from the system.

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### Literature Cited

- Hill, Donley M. 1986.** Cumberlandian Mollusks Conservation Program, activity 3: Identification of fish hosts. Office of Natural Resources and Economic Development. Tennessee Valley Authority. Knoxville, Tennessee. 57 p.
- Howard, Arthur D. 1914.** Experiments in propagation of fresh-water mussels of the *Quadrula* group. Report of the U.S. Commissioner of Fisheries for 1913, Appendix 4:1-52 + 6 plates [Issued separately as U.S. Bureau of Fisheries Document 801].
- Howard, Arthur D. 1915.** Some exceptional cases of breeding among the Unionidae. Nautilus 29: 4-11.
- Steg, Michelle B. and Richard J. Neves. 1997.** Fish host identification for Virginia listed unionids in the upper Tennessee River drainage. Triannual Unionid Report 13: 34.
- Stern, Edward M. and Darryl L. Felder. 1978.** Identification of host fishes for four species of freshwater mussels (Bivalvia: Unionidae). American Midland Naturalist 100: 233-236.
- Surber, Thaddeus. 1913.** Notes on the natural hosts of fresh-water mussels. Bulletin of the Bureau of Fisheries 32: 103-116 + 3 plates [Issued separately as U.S. Bureau of Fisheries Document 778].
- Watters, G. Thomas. 1986.** A survey of the unionid molluscs of the Big Darby Creek system in Ohio. Final Report to the Ohio Chapter of The Nature Conservancy. 149 p.
- Watters, G. Thomas. 1990.** 1990 Survey of the unionids of the Big Darby Creek system. Final Report to the Ohio Chapter of The Nature Conservancy. Columbus, Ohio. 118 p.
- Watters, G. Thomas. 1994.** Unionidae of the Big Darby Creek system in central Ohio, USA. Malacological Review 27: 99-107.
- Watters, G. Thomas. 1996a.** 1996 Freshwater mussel survey of Big Darby Creek. Final Report to the Ohio Chapter of The Nature Conservancy. Columbus, Ohio. 4 p. + 2 appendices.
- Watters, G. Thomas. 1996b.** Hosts for the Northern Riffle Shell (*Epioblasma torulosa rangiana*). Triannual Unionid Report 10: 14.
- Watters, G. Thomas and Scott H. O'Dee. 1997.** Identification of potential hosts. Triannual Unionid Report 13: 38-39.
- Wilson, Charles B. 1916.** Copepod parasites of fresh-water fishes and their economic relations to mussel glochidia. Bulletin of the Bureau of Fisheries 34: 333-374 + 15 plates [Issued separately as U.S. Bureau of Fisheries Document 824].
- Yeager, Bruce L. and Richard J. Neves. 1986.** Reproductive cycle and fish hosts of the Rabbit's Foot Mussel, *Quadrula cylindrica strigillata* (Mollusca: Unionidae) in the Upper Tennessee River drainage. American Midland Naturalist 116: 329-340.