

THE FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) OF PIGEON CREEK, A SMALL SOUTHWESTERN INDIANA TRIBUTARY OF THE OHIO RIVER

Dale D. Edwards
Department of Biology
University of Evansville
Evansville, Indiana 47722

ABSTRACT: A survey of unionid mussels at three sites in Pigeon Creek in southwestern Indiana was conducted during the fall of 1997. This survey represents the first published report of unionid mussels from this waterway. Six species of mussels were collected from Pigeon Creek; *Leptodea fragilis*, *Lasmigona complanata*, and *Quadrula quadrula* were the most common and abundant species. An unpublished survey of the mussels of Pigeon Creek conducted in 1908 listed five species of unionids. Three of the five species of mussels collected in that survey, *Amblema plicata*, *Lampsilis teres*, and *L. siliquoidea*, were not found in the present study. *Arcidens confragosus* and *Q. quadrula* were common to both surveys. Hydrological changes to Pigeon Creek may be responsible for the differences in the mussel fauna between these two surveys.

KEYWORDS: Hydrological changes, Pigeon Creek, Indiana, unionid mussels.

INTRODUCTION

The United States harbors a diverse assemblage of freshwater mussels (Unionacea), representing an estimated 227 species in 44 genera (McMahon, 1991) distributed primarily throughout the Mississippi River drainage and the river systems of the eastern United States (Neves, 1993). Throughout this century, the freshwater mussel fauna of the United States has experienced precipitous declines. Of the nearly 300 species that are recognized, approximately 10% are presumed extinct and an estimated 20% are federally listed as endangered or threatened (U.S. Fish and Wildlife Service, 1996).

The factors responsible for the decline of freshwater mussels in the United States are numerous, yet they typically can be correlated with anthropogenic impacts, including commercial exploitation (Neves, 1987; Cummings and Mayer, 1992), habitat loss and degradation (Ortman, 1909; Coon, *et al.*, 1977; Neves, 1987), and the invasion of exotic species (Schloesser and Kovalak, 1991; Hunter and Bailey, 1992). Hydrological and ecological changes to freshwater habitats also have had negative effects on fishes, and Neves (1993) speculates that these changes could result in the loss of potential fish hosts that are crucial to the life cycle of most unionids.

The demise of freshwater mussels is particularly evident in the Midwest. For example, of the 80 unionid species that have been recorded for Illinois, only 59 species remain (Cummings and Mayer, 1996). Schuster (1988) and Cicerello, *et al.* (1991) reported 85 species of unionids for Kentucky, while historical records have listed as many as 103 species in that State. Although 76 species of mussels have historically occurred in Indiana waters, as few as 50 species currently persist (Anderson, *et al.*, 1993). Moreover, a report by the U.S. Fish and Wildlife Service (1996) indicated that 12 of the surviving species in Indiana are endangered. The decline of Midwestern mussels is particularly disturbing given the limited assessment of the current status of the mussel fauna of this region. Many waterways in the Midwest have not been surveyed adequately, and, even in those instances in which they have, the checklists of mussels that have been generated often are based on surveys conducted tens of years ago. Freshwater habitats in the Midwest are in a position to lose numerous mussel populations, including threatened or endangered mussel species whose presence and abundance have never been determined.

Mussel surveys conducted in Indiana often are antiquated, dating back to the early to middle 1900's (Call, 1900; Daniels, 1903; Goodrich, *et al.*, 1944). Surveys over the last 30 years have focused primarily on the faunas of larger rivers, such as the White and Wabash Rivers (Krumholz, *et al.*, 1970; Meyer, 1974) as well as the Ohio River (Taylor, 1979). Although information pertaining to the mussel faunas of small streams (Taylor, 1982; Weilbaker, *et al.*, 1985; Harmon, 1989, 1992) and medium-sized tributaries (Cummings and Berlocher, 1990) in certain regions of Indiana has increased, the majority of small streams in southwestern Indiana have not been sampled. In this study, I address the present status of the mussel fauna of Pigeon Creek, a tributary of the Ohio River in southwestern Indiana. With the exception of an unpublished report of mussels collected from Pigeon Creek by Paul Bartsch of the U.S. Bureau of Fisheries in 1908, no additional information regarding the mussel fauna of this waterway is available.

DESCRIPTION OF THE STUDY AREA

Pigeon Creek is situated in the Wabash Lowland Region of southwestern Indiana. The creek originates in Warrick County near Princeton, Indiana, and flows south for approximately 64 km before joining the Ohio River at Evansville, Vanderburgh County, Indiana. The headwaters of Pigeon Creek flow through agricultural lands, while the middle and lower regions flow through areas of extensive coal mining and the city of Evansville, respectively. The creek is a relatively slow-flowing, turbid stream, whose bottom is composed primarily of mixed mud with occasional patches of sand and gravel.

Pigeon Creek has occasionally been dredged to improve agricultural drainage and, as a result, has experienced periods of increased siltation. In addition, the creek reportedly receives pollution both from the overflow of city sewers and illegal dumping. Extensive assessments of the water quality of Pigeon Creek

were conducted in the early 1990's, and, with few exceptions, the levels of inorganics and organics in the creek were within the ranges considered acceptable by standard water quality criteria. However, coliform bacterial counts were exceedingly high (more than 75% above the established water quality criterion of 200 coliforms/100 mL; Burkemier, pers. comm.). While pollution from the aforementioned sources continues to beleaguer Pigeon Creek, a few attempts have been made to improve its water quality. Most recently, members of the Pigeon Creek Greenway Passage have voluntarily removed a substantial amount of refuse that had been dumped into the lower regions of creek in the city of Evansville.

MATERIALS AND METHODS

Mussels were sampled at three localities in the lower region of Pigeon Creek in Vanderburgh County: the canoe launch (87°34'25" W, 38°00'15" N), Garvin Park (87°34'10" W, 37°59'07" N), and under the bridge on Stringtown Road (87°33'46" W, 38°00'51" N). The canoe launch was sampled on 14 October 1997, while mussels were surveyed at Garvin Park and the Stringtown bridge on 26 and 28 October 1997, respectively. The sites were approximately three to four kilometers apart and were chosen primarily because they were easily accessible. Mussels were collected at each site for approximately one hour. Mussels were collected by hand and were transported to the laboratory at the University of Evansville for identification. Dr. Kevin Cummings of the Illinois Natural History Survey verified the identifications. In the laboratory, the length of each mussel was measured to the nearest 0.1 mm using vernier calipers. With the exception of voucher specimens, the mussels were returned to where they were originally collected. Voucher specimens have been deposited in the Invertebrate Museum at the University of Evansville and in the Illinois Natural History Survey Mollusk Collection. A species list with numbers of specimens was submitted to the Biodiversity and Natural Areas Committee of Indiana.

RESULTS AND DISCUSSION

The three Pigeon Creek collecting sites yielded a total of six species of unionid mussels (Table 1). A total of 58 mussels was collected during approximately three hours of sampling. Species prevalence ranged from a low of three species under the bridge at Stringtown Road to a high of six species from the canoe launch. The canoe launch site also yielded the highest number of individuals ($n = 30$), while the fewest number of individuals was recovered from the Stringtown Bridge location ($n = 4$). The most common species found throughout the stream were *Leptodea fragilis* and *Quadrula quadrula*. One specimen of *Arcidens confragosus* was collected at the canoe launch and represents the only occurrence of this species in the present survey. *Lasmigona complanata* and *L. fragilis* were the most abundant species at the canoe launch, accounting for 36.7% and 33.3% of the collection, respectively. The Garvin Park location was dominated by *L. fragilis* and *Q. quadrula*, and these species accounted for 50% and 25% of the individuals that were collected at that site.

Table 1. A list of unionid mussel species recorded from Pigeon Creek at three collecting sites. Included in the table is an unpublished list of mussels reported by Bartsch in 1908 from Warrick and Vanderburgh Counties, Indiana. A "+" indicates that the mussel was present at the site, and a "-" indicates its absence. Values in parentheses indicate the number of mussels collected at the site during one hour of sampling.

Species	Current Collecting Sites			Bartsch's 1908 Survey
	Canoe Launch	Gavin Park	Stringtown Bridge	
<i>Arcidens confragosus</i>	+ (1)	-	-	+ (?)
<i>Lasmigona complanata</i>	+ (11)	+ (1)	-	-
<i>Leptodea fragilis</i>	+ (10)	+ (12)	+ (1)	-
<i>Pyganodon grandis</i>	+ (2)	+ (4)	-	-
<i>Quadrula quadrula</i>	+ (5)	+ (6)	+ (2)	+ (?)
<i>Tritogonia verrucosa</i>	+ (1)	+ (1)	+ (1)	-
<i>Amblema plicata</i>	-	-	-	+ (?)
<i>Lampsilis siliquoidea</i>	-	-	-	+ (?)
<i>Lampsilis teres</i>	-	-	-	+ (?)

In his unpublished report, Bartsch noted that he had collected five species of unionids from Pigeon Creek in Vanderburgh and Warrick Counties in 1908 (Table 1). Voucher specimens from this survey were deposited in the Smithsonian's National Museum of Natural History (NMNH) and the University of Michigan Museum of Zoology (UMMZ). *Arcidens confragosus* (NMNH 677551) and *Q. quadrula* (UMMZ 66103) were collected in both the present survey and the survey performed by Bartsch. Three additional species reported by Bartsch, *Amblema plicata* (NMNH 677198), *Lampsilis teres* (NMNH 677201), and *Lampsilis siliquoidea* (NMNH 677063), were not collected in the present survey. Unfortunately, Bartsch's unpublished report does not provide information regarding sample sizes, duration of sampling, and sampling locations, making it difficult to draw any additional comparisons between these two surveys.

Differences in species composition between the present survey and that of Bartsch may reflect differences in the sampling locations and/or sampling procedures used in these two surveys. Additional factors may also have contributed to the observed differences. Because Pigeon Creek has undergone substantial changes in water quality since Bartsch's 1908 survey, including an increase in siltation due to stream channelization and an increase in sewage, agricultural, mine acid, and landfill run-off (Schultheis, *et al.*, 1987), the observed differences could quite easily be attributed to any of these conditions. A comparison of the species that comprise the mussel fauna from these two surveys may lend some credence to this notion. Although Bartsch reported finding *A. plicata* or *L. teres*, I did not encounter either of these mussels. Both of these species are, based on field observations, suspected of being intolerant to changes in water quality (Cummings, pers. comm.). The differences observed between the two surveys

might also be due to changes in the availability of fish hosts. The potential role of fish hosts in the distribution of these mussels will be difficult to prove. Although data exist regarding the distribution and relative abundance of potential fish hosts for *A. plicata* and *L. teres* in Pigeon Creek during the 1980's (Schultheis, *et al.*, 1987), to my knowledge, no comparable data on the availability of fish hosts for these mussels are available from the time of Bartsch's survey. The present survey encountered species (*e.g.*, *L. complanata*, *Pyganodon grandis*, and *L. fragilis*) that are characteristically associated with disturbed or degraded habitats (Cummings, pers. comm.). The absence of *L. siliquoides* from the present survey represents an exception to this general pattern since this mussel species is known to be widely dispersed in all types of lakes and streams throughout Indiana and other regions of the Midwest (Goodrich and van der Schalie, 1944; Cummings and Mayer, 1992). Obviously, more information regarding the sensitivity or tolerance of the aforementioned mussels to various hydrological changes would be required before they could be implicated in playing a role in influencing the mussel fauna that inhabits Pigeon Creek.

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