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The Freshwater Naiads, Bivalvia: Unionidae, of the Blue River, a Southern Indiana Tributary of the Ohio River

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Introduction

Freshwater bivalve mussels of the family Unionidae have been in existence since early Mesozoic times in the lakes and rivers of North America (2). In the last century to the present time, these naiads have been exploited first by the pearl button industry and more recently by the Japanese cultured pearl industry. This commercial exploitation along with impoundments, clear-cutting, siltation, and pollution has resulted in decreased bivalve diversity in many streams. Since many bivalve species are extinct or virtually so, most environmental biologists feel that an immediate accounting is essential if we are to preserve the remaining species.

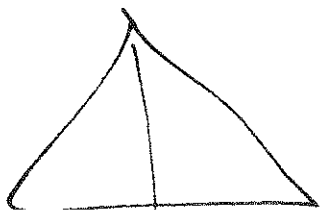
Because of channelization and impounding of water, current naiad faunas of our larger rivers are different from those present at the turn of the century (3). Some smaller streams, however, may not have been so severely altered. Thus, a logical conservation approach would be to concentrate on protecting smaller streams which may be serving as refugia for rare and endangered species.

In Indiana, most published work dealing with unionids is concerned with the naiad faunas of the larger rivers (1, 4). Very little is known about the molluscan faunas in the smaller streams and rivers, especially those located in southern Indiana. The purpose of this study was to inventory the freshwater bivalves inhabiting the Blue River, a southern Indiana tributary of the Ohio River.

Description of Study Area

Situated within unglaciated middle and upper Mississippian bedrock of extreme south central Indiana, the Blue River is unique because the main stream has few surface tributaries (Figure 1). The watershed of the Crawford Upland and Mitchell Plain physiographic regions is characterized by numerous sinkholes. Areas of sinkhole plains collect the available surface water into subterranean systems which eventually re-emerge near the Blue River as karst springs. The largest karst spring in the area is Harrison Spring which empties into the Blue River near White Cloud (Figure 1). In addition, solution of limestone over the years has produced a substantial number of cave systems. Indiana's best known caves, Marengo Cave and Wyandotte Cave, are located within the watershed.

The Blue River is a fourth order stream with typical alternating riffles and pools. Most riffles have significant quantities of limestone boulders and rubble while the pools have bottoms comprised of limestone boulders, rocks, gravel, sand and silt. Water willow, *Dianthera americana*, commonly forms dense stands along many riffles during the summer months. Riparian trees form a significant canopy with sycamore being the most common streamside tree. In general, the stream water quality is relatively



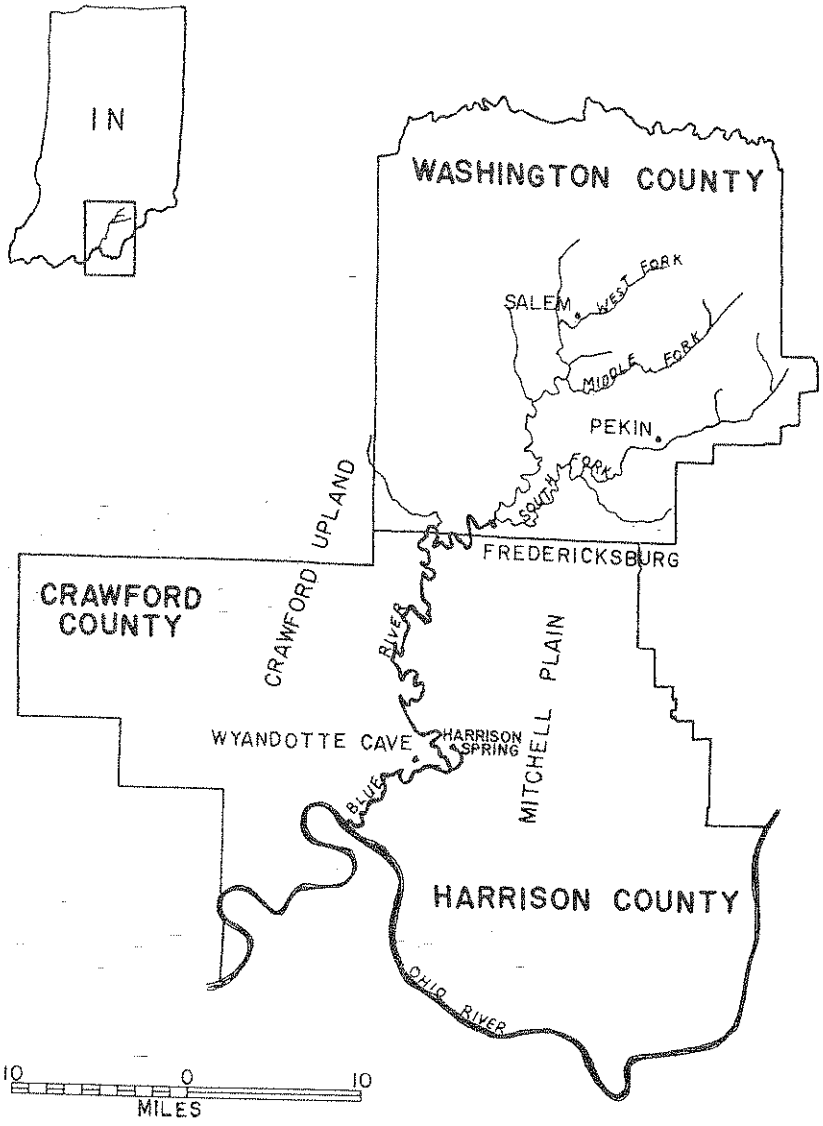
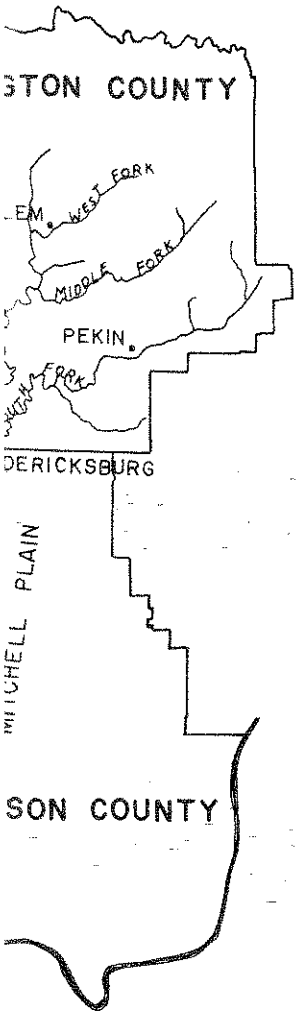


FIGURE 1. Map of the Blue River, a southern Indiana tributary of the Ohio River. Bivalves were taken from almost every accessible location along the river. The area from Wyandotte Cave to the Ohio River was collected via SCUBA and snorkeling. Much of the remainder of the main stream was collecting during float trips. Collections were terminated at Salem on the West Fork and Pekin on the South Fork where no specimens were found. Collections summarized in Table 1 included 9 collections in the main stream from the mouth to Fredericksburg, 7 collections in the upper Blue from Fredericksburg to Salem, and 9 collections in the South Fork from Fredericksburg to Pekin.



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good with high oxygenation, but the water has exceptional clarity only in the fall during periods of low discharge.

Methods

Bivalve specimens were taken from 25 stations using handpicking, snorkeling, and SCUBA. Raccoon and muskrat middens were also reliable sources of fresh shells. In addition, some shells were retrieved from the area of an old button factory located near the mouth of the river. Normally, only fresh shells were retained. Weathered or subfossil shells were noted and discarded. Fresh shells and living specimens were transported to the laboratory, cleaned, and identified. Voucher specimens have been placed in the museums at The Ohio State University and Marshall University. Dr. David H. Stansbery of The Ohio State University Museum of Zoology verified the identifications. A species list with number of specimens and locality descriptions for each station has been placed on file with the Indiana Natural Heritage Program in Indianapolis.

Results and Discussion

Thirty-seven species of unionids plus the exotic Asiatic clam, *Corbicula*, were taken from the Blue River system (Table 1). Of these, 30 species were found in the

TABLE 1. Summary of unionid mussels taken from the Blue River, a southern Indiana tributary of the Ohio River. Based on 25 collections in 1984. A = abundant, C = common, R = rare, L = living specimen taken, WS = weathered shell, E = proposed endangered by Indiana Department of Natural Resources, T = proposed threatened, SC = proposed special concern.

Scientific name[1]	Main Stream	Upper Blue	South Fork
Anodonta grandis	R	CL	R
Strophitus undulatus	—	R	—
Alasmidonta marginata	R	—	—
Alasmidonta viridis	CL	AL	A
Simpsonaias ambigua	—	—	RSC
Lasmigona complanata	R	—	—
Lasmigona costata	CL	CL	R
Magnonaias nervosa	R	—	—
Tritogonia verrucosa	CL	—	R
Quadrula quadrula	R	—	—
Quadrula metanevra	R	—	—
Quadrula pustulosa	CL	—	—
Amblema plicata	AL	AL	AL
Fusconaia maculata	—	—	RT
Fusconaia flava	R	—	—
Cyclonaias tuberculata	CL	—	R
Pleurobema clava	RWSE	—	—
Pleurobema cordatum	RSC	—	—
Pleurobema rubrum	RWSE	—	—
Elliptio crassidens	RL	R	—
Elliptio dilatata	CL	AL	AL
Ptychobranchus fasciolaris	CL	R	R
Obliquaria reflexa	CL	—	—
Actionaias carinata	—	R	—
Obovaria subrotunda	—	—	R
Obovaria retusa	RWS	—	—
Truncilla truncata	R	—	R
Truncilla donaciformis	—	—	R
Leptodea fragilis	—	—	R

TABLE 1.—Continued

Scientific name[1]	Main Stream	Upper Blue	South Fork
Potamilus alatus	AL	—	R
Potamilus ohiensis	RLE	—	—
Ligumia recta	R	—	—
Villosa iris	CL	CL	C
Villosa lienosa	R	R	R
Lampsilis r. luteola	AL	AL	AL
Lampsilis fasciola	R	—	—
Lampsilis ventricosa	AL	CL	R
Corbicula = Asiatic clam[2]	AL	CL	AL
Total	30	13	19

(1) Scientific names according to D.H. Stansbery, The Ohio State Univ.
(2) Exotic species widespread in Indiana waters not included in count.

main stream. Although the species composition gradually changed as discharge decreased, the most abundant species in the main stream were *Lampsilis ventricosa, L. radiata luteola,* and *Potamilus alatus.* Species diversity decreased in the forks of the river with 13 species taken from the upper Blue River-west fork and 19 species noted in the south fork (Table 1). *Amblema plicata, Alasmidonta viridis, Elliptio dilatata,* and *Villosa iris* were the most abundant forms in the branches of the river.

Several naiads taken during this study have been placed on the proposed endangered, threatened, and species of special concern list recently published by the Indiana Department of Natural Resources (designated E, T or SC in Table 1). Of the six designated species, all except *Potamilus ohiensis* were represented by a single valve. Several *P. ohiensis* shells including a living specimen found near Wyandotte Cave were taken from the main stream. Since this species normally inhabits larger streams, the Blue River may, in fact, be providing refuge for this endangered mussel.

The paucity of recent comparative mussel abundance data for Indiana indicates the need for additional inventories of Indiana bivalves. In 1966 and 1967, Krumholz *et al.* (2) covered over 500 miles of the Wabash and White Rivers and found only 30 species in 99 collections. It should be noted, however, that Krumholz was studying commercial exploitation of large river species. This coupled with the fact that only living specimens were recorded probably accounts for the low species number. In our study, we recorded only 15 species of living shells (Table 1). More recently, Taylor (4) in his collections of nearby Indian Creek found only 15 species at 7 locations.

In contrast to Krumholz *et al.* (2) species list which, as expected, is typically Wabash in nature, our profile is more Ohioan in nature. The recorded diversity is similar to the species composition of Kentucky streams such as the Salt River and Floyd's Fork which are also tributaries of the Ohio River (3). As the largest southern Indiana tributary of the Ohio River, the Blue River could conceivably harbor the largest mussel assemblage of this type in the state of Indiana. For this reason and because the river may be acting as a refuge for the endangered *Potamilus ohiensis*, the main portion of the Blue River should be provided with continual protection so that the existing habitats can be maintained.

Acknowledgments

This research was supported by a grant-in-aid from Indiana University Southeast and a travel grant from the Indiana Natural Heritage Program. Dr. David H. Stansbery of the Ohio State University Museum of Zoology verified our identifications.

Upper Blue	South Fork
—	R
—	—
—	—
CL	C
R	R
AL	AL
—	—
CL	R
CL	AL
13	19

Univ.
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