

The Unionid (Mollusca: Bivalvia) Fauna of the Kankakee River in Illinois

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ABSTRACT: A study of unionid mollusks (mussels) was conducted at 13 sites in the Kankakee River in Illinois in 1978 to assess the present species composition, abundance and distribution and to examine the changes that have occurred in the mussel fauna. Thirty-seven species of mussels have been recorded from the Kankakee River basin in Illinois since 1906. The number of species in the river has steadily declined since 1906 and fewer species were found at all comparable sites in 1978 than in previous studies. The upstream section of the river suffered a significant decline between 1960 and 1978. Potential factors responsible for the reduced fauna are pollution, overharvest and habitat destruction.

INTRODUCTION

Serious depletions of the mussel fauna have been documented for several rivers in the U.S.A. By 1971, 39% of the original fauna of the Ohio River system was tinct or in danger of becoming extinct (Stansbery, 1971). By the 1970s commercially valuable mussels in the Tennessee River valley had been virtually eliminated (Kruholz *et al.*, 1970). Streams in Illinois have experienced a similar decline. Twenty-species of mussels have been extirpated from the Illinois River since the late 18 (Starrett, 1971). Several species are no longer found in the Rock River (Mil 1972) and the Vermilion River (Suloway, 1975). Because excellent historical information on the mussels of the Kankakee River in Illinois was available, a faunal study was undertaken in 1978. The objectives of the study were to assess the present status of the mussel fauna and to determine changes that have taken place in the mussel fauna of the Kankakee River in Illinois.

The Kankakee River is one of the most scenic rivers in Illinois. Originating in South Bend, Indiana, the river flows W for 240 km where it joins the Des Plai River in Illinois to form the Illinois River. In Illinois, the river is 95 km long, 270 m wide and up to 5 m deep. Originally the Kankakee basin was a vast prairie. In Indiana, the river was extensively dredged in the early 1900s to improve agricultural drainage and now is a straight, sand-bottomed drainage ditch. The river has remained largely in its natural state in Illinois. Most of the river in Illinois is on or near bedrock; sand, gravel and cobble are the predominant overlying substrates.

The mussels of the Kankakee River have been studied intermittently since about the turn of the century. F. C. Baker (1906) published the first available information concerning the mussels of the Kankakee River in Illinois, which consisted of a species list provided by two conchologists, Handwerk and Ferriss. Handwerk and Ferriss apparently worked only the downstream section (Will County) and the specific years of their work are not available. During 1909, Wilson and Clark (1912) sampled seven areas in Illinois by handpicking and examining piles of shells left by peafowl and predators. Parmalee (unpublished) sampled one downstream area (near Interstate 55 bridge) in 1953 and 1955. M. R. Matteson (unpublished) collected at three upstream sites (state line, Momence and 9 m E Kankakee) in 1960 handpicking at each site for 3 hr. Brice and Lewis (1977) sampled at Custer Park in 1976 by handpicking and scuba diving.

METHODS AND STUDY AREA

Thirteen sites were sampled by handpicking in the autumn of 1978. Atten

were made to sample all habitats at each site including pools, riffles, backwaters and vegetated areas. Because the water was low it was possible to sample a transect across the river at many sites. Sample efforts varied from 1-1/3 to 4 man-hr at each site. All mussels listed from a site were found alive. Voucher specimens were deposited in the Illinois Natural History Survey. River depth, width, substrate, aquatic vegetation and nearby land use were noted at each site.

Several sites sampled in the present study corresponded to those sampled in the previous studies (Fig. 1). The first upstream area sampled in 1909 was actually the

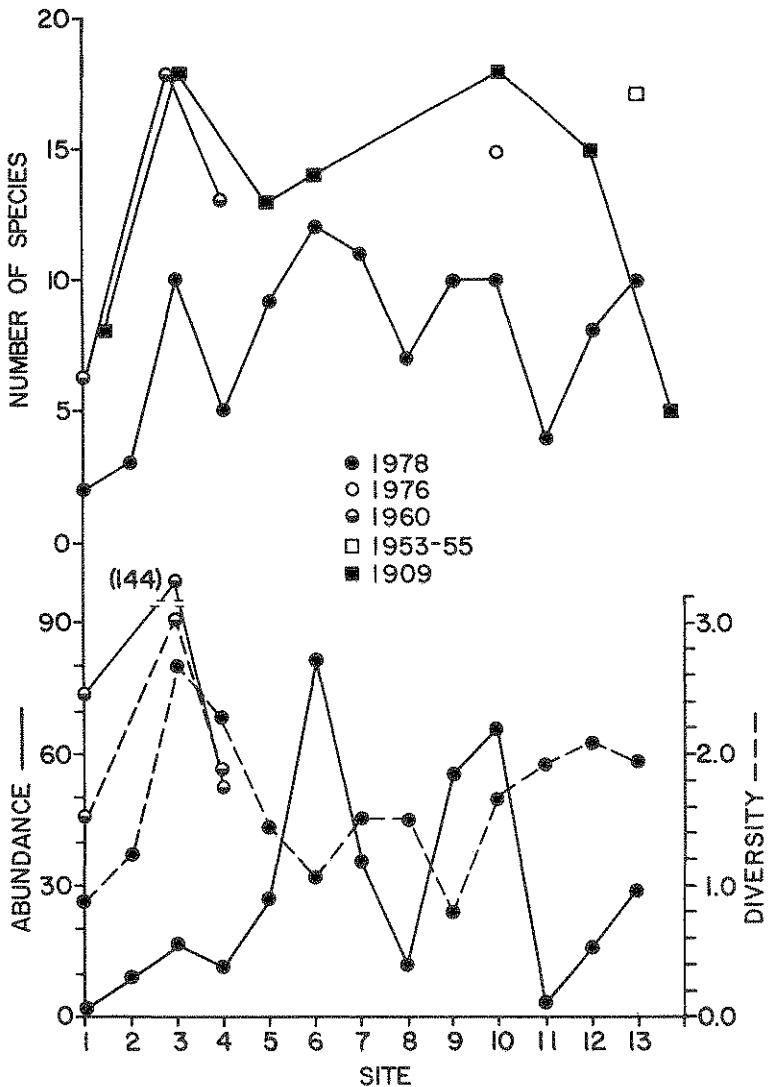


Fig. 1.—Number of species, abundance (individuals collected/hour) and diversity index of mussel communities at sites in the Kankakee River in Illinois. Site numbers refer to 15 collection sites

stretch of river from sites 1 to 3 (in the present study) but is plotted as a single in Figure 1.

RESULTS

In 1978, 20 species of mussels were found in the Kankakee River in Illinois (Table 1). *Actinonaias carinata*, a species associated with riffles, was the most abundant species, comprising 67% of the individuals collected. The most widely distributed species, *Lampsilis radiata siliquoidea*, was found at all sites. *Megalonaias gigantea* was found in the river for the first time in 1978.

In 37 man-hr of sampling 1006 individuals were collected in 1978. The number of individuals collected at a site ranged from 5-197. Mussel communities at sites 1, 4, 8 and 11 were characterized by a combination of low relative abundance (individuals collected/hour) and diversity (Shannon Index, see Lloyd *et al.*, 1968). Moderate abundances and diversities were found at sites 5, 9 and 12; and relative

TABLE 1.—Species of mussels collected in various years in the Kankakee River in Illinois. Data from 1978 is given as number of individuals at a site.* Nomenclature conforms to Birstein (1975)

	1906**	1909	1953-55	1960	1
Species present in 1978					
<i>Actinonaias carinata</i>	+	+	+	+	
<i>A. ellipsiformis</i>		+		+	
<i>Alasmidonta marginata</i>		+	+	+	
<i>Amblyema plicata</i>	+	+	+	+	
<i>Anodonta grandis grandis</i>		+		+	
<i>A. imbecillis</i>	+				
<i>Cyclonaias tuberculata</i>	+	+	+	+	
<i>Elliptio dilatata</i>	+	+	+	+	
<i>Fusconaia flava</i>	+	+	+	+	
<i>Lampsilis ovata</i> ****		+	+	+	
<i>L. radiata siliquoidea</i>	+	+	+	+	
<i>Lasmigona complanata</i>		+	+	+	
<i>L. compressa</i>				+	
<i>L. costata</i>	+	+	+	+	
<i>Ligumia recta</i>	+	+	+	+	
<i>Megalonaias gigantea</i>					
<i>Pleurobema cordatum</i>	+	+	+	+	
<i>Quadrula metanevra</i>	+	+		+	
<i>Q. pustulosa</i>	+	+	+	+	
<i>Q. quadrula</i>	+	+	+	+	
Species not present in 1978					
<i>Carunculina parva</i>	+				
<i>Cumberlandia monodonta</i>	+				
<i>Ellipsaria lineolata</i>	+				
<i>Lampsilis orbiculata</i> ****	+				
<i>Leptodea fragilis</i>	+				
<i>Obliquaria reflexa</i>	+				
<i>Simpsoniconcha ambigua</i>	+				
<i>Tritogonia verrucosa</i>	+				
<i>Truncilla donaciformis</i>	+				
<i>T. truncata</i>	+				
<i>Obovaria olivaria</i>	+	+			
<i>Proptera alata</i>	+	+			
<i>Dysnomia triquetra</i>	+		+		
<i>Fusconaia undata</i>	+	+	+		
<i>Plethobasus cyphus</i>	+	+			+
<i>Villosa iris</i>	+	+	+		+
<i>Strophitus undulatus</i>		+			
Total species	29	23	17	20	
Number of sites collected	***	***	2	3	

large abundances and diversities were found at sites 3, 6, 7, 10 and 13.

Sites with predominantly sand substrates (1, 2 and 4) supported relatively poor communities based on abundance and diversity data. Sites below dams (6 and 1) and in riffles (3, 5, 10 and 13) generally supported relatively large and diverse faunas although the riffle at site 8 sustained a poor fauna. Communities in pools or r

TABLE 1.—(continued)

	1978											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>Actinonaias carinata</i>			24		63	161	79	27	111	132		24
<i>A. ellipsiformis</i>						2		1		3		10
<i>Alasmidonta marginata</i>			1				5					
<i>Amblyma plicata</i>								1	3	26	1	10
<i>Anodonta grandis grandis</i>					5		1	1				
<i>A. imbecillis</i>												2
<i>Cyclonaias tuberculata</i>							1			1		
<i>Elliptio dilatata</i>			1			1				1		
<i>Fusconaia flava</i>				8						1		
<i>Lampsilis ovata****</i>	5	6	4		2	2	2			1	1	1
<i>L. radiata siliquoides</i>	2	9	12	7	4	4	1	1	3	2	1	2
<i>Lasmigona complanata</i>			7	10	4	2						1
<i>L. compressa</i>					1							1
<i>L. costata</i>			2		1		3	2				1
<i>Ligumia recta</i>		1			2	4	2	2	1	1		
<i>Megalonaias gigantea</i>						1						
<i>Pleurobema cordatum</i>			1			1			1	2		
<i>Quadrula metanevra</i>			5		3	1	1			3		
<i>Q. pustulosa</i>			9	13	2	9	9	3	1	17		1
<i>Q. quadrula</i>							1			10		
<i>Carunculina parva</i>												
<i>Cumberlandia monodonta</i>												
<i>Ellipsaria lineolata</i>												
<i>Lampsilis orbiculata****</i>												
<i>Leptodea fragilis</i>												
<i>Obliquaria reflexa</i>												
<i>Simpsoniconcha ambigua</i>												
<i>Tritogonia verrucosa</i>												
<i>Trunculla donaciformis</i>												
<i>T. truncata</i>												
<i>Obovaria olivaria</i>												
<i>Proptera alata</i>												
<i>Dynomia triquetra</i>												
<i>Fusconaia undata</i>												
<i>Plethobasus cyphus</i>												
<i>Villosa iris</i>												
<i>Strophitus undulatus</i>												

*Collection site localities and man-hours of sample time are as follows: 1-½ km downstream Ind. border, T31N, R15E, NE ¼, NE ¼, Sec. 19 (3 hr); 2-6 km E Moomence, T31N, R14E, ¼, NW ¼, Sec. 22 (2 hr); 3- in SW Moomence, T31, R13E, SW ¼, NW ¼, Sec. 24 (4 hr); 4- 9 km E Kankakee, T30N, R12W, SW ¼, SE ¼, Sec. 6 (4 hr); 5- upstream of bridge Aroma Park, T30N, R13W, NE ¼, NW ¼, Sec. 23 (3 hr); 6- downstream of dam in K kakee, T30N, R13W, NW ¼, SW ¼, Sec. 5 (2-1/3 hr); 7- across from mouth of Davis Cr T31N, R11E, SE ¼, NE ¼, Sec. 23 (3 hr); 8- at Langham Island at Altorf, T31N, R11E, ¼, NW ¼, Sec. 9 (3 hr); 9- downstream of Warner Bridge in Kankakee River State P T32N, R10E, SE ¼, SE ¼, Sec. 36 (2-¼ hr); 10- upstream of bridge at Custer Park, T3 R10E, NW ¼, NW ¼, Sec. 19 (3 hr); 11- 2-½ km NW Custer Park, T32N, R9E, SE SW ¼, Sec. 12 (1-1/3 hr); 12- downstream of dam at Wilmington, T33N, R9E, Sec. 35 & (3 hr); 13- upstream of Interstate 55 bridge, T33N, R9E, SW ¼, Sec. 10 (3 hr)

**Publishing date was 1906; no collection date is given

***Specific sites not given

****The form of *L. ovata* encountered in this study is also known as *L. ventricosa* and the *L. orbiculata* is also known as *L. higginsii*

generally ranked low in terms of abundance and/or diversity (sites 1, 2, 4 and 1 except for sites 7 and 9 which supported relatively good communities.

DISCUSSION

During the past 100 years, 37 species of mussels have been reported from the Kankakee River and its tributaries in Illinois (Table 1). Prior to 1906, 29 species were reported in the river and its tributaries in the downstream section of the river by Baker (1906). In 1909, 23 species were collected in the river with one additional species being found in a tributary (Wilson and Clark, 1912). In 1978, 20 species were collected.

Sixteen species reported by Baker in 1906 were not found in the 1970s. Ten of these species were not found after 1906, two were not found after 1909, two were not found after 1955 and two were not found after 1960, indicating a severe reduction in the mussel fauna at about the turn of the century and a gradual decline over the past 70 years.

Some or all of the 10 species not found after 1906 may have existed in small numbers or have been extirpated by the time of Wilson and Clark's survey in 1909. Records from the Illinois River indicate these 10 species were rare or on the decline in the upper Illinois River in the early 1900s (Starrett, 1971). Baker's information may have included species found in tributaries, but Wilson and Clark did not find any of these species in the tributaries they sampled.

Based on available historic and current information, several species of mussels reported or once reported from the Kankakee River in Illinois could presently be considered uncommon or localized in Illinois and in some cases the United States. Among species found previous to but not in 1978, *Cumberlandia monodonta*, *Lampsilis orbiculata* and *Simpsoniconcha ambigua* are extremely restricted in their distribution or have entirely disappeared, and *Dysnomia triquetra*, *Villosa iris* and *Plethambasus cyphus* are becoming uncommon and more restricted in distribution in Illinois. At present, *L. orbiculata* is designated an endangered species by a federal agency, and *C. monodonta* and *S. ambigua* are considered rare and endangered in the United States (Stansbery, 1971). Among species found in 1978 in the Kankakee River, *Lasmigona compressa* and *Ligumia recta* could be considered uncommon and on the decline in Illinois.

At all comparable sites, fewer species were found in 1978 than in 1909, 1953-4 and 1960 (Fig. 1). Between 1909 and 1978, the upstream section (sites 1-5) apparently lost seven of 20 species and the downstream section (sites 6-13) lost five of 22 species.

Between 1960 and 1978 a significant decline in the mussel fauna occurred in the upstream section (Fig. 1). All species were reduced in abundance. The four most abundant species in 1960, *Actinonaias carinata*, *Elliptio dilatata*, *Lampsilis radiata* and *Quadrula pustulosa*, suffered a 90% reduction in abundance by 1978. The area upstream from site 3, which has historically supported relatively small mussel communities, is supporting fewer species now; Wilson and Clark (1912) found eight species in 1909, six species were collected in 1960 and three species were found in 1978. The community at site 3 was reduced from 18 to 10 species between 1960 and 1978, with an 85% reduction in abundance despite a more intensive sampling effort in 1978. Eight fewer species were found at site 4 in 1978 than in 1960 with a 73% reduction in abundance despite a more intensive sampling effort.

The general decline in the mussel fauna of the Kankakee River in Illinois may be due to several factors. Commonly cited factors such as pollution, overharvest and habitat destruction could be operating in the Kankakee River. Domestic and industrial pollution as well as fertilizer and pesticide run-off may have occurred in the

river. From the early to mid-1900s shells from Illinois streams, including the Kankakee River, were sold to the pearl button industry (Smith, 1919). In the past years, mussels have been harvested from the Kankakee River for sale to the cultured pearl industry in Japan. Habitat changes in Illinois have consisted mainly of construction and possibly increased sedimentation.

Sedimentation, especially by sand, is of particular concern in the Kankakee River upstream of Kankakee. Stream-flow alterations caused by dredging and channelization in Indiana may be increasing the sediment load in Illinois. At present, silt is the predominant substrate of long stretches of the river upstream of Kankakee and moving sand bars have been observed in this area. Because shifting substrates are highly restrictive to the establishment, maintenance and growth of mussel communities (Parmalee, 1967), mussels are rare on rolling sand (Murray and Leonard 1962). Areas in the Kankakee River with predominantly sand substrates (sites 2 and 4) have supported relatively small communities in 1909, 1960 and 1978, suggesting that these areas have not been suitable for large communities since at least the early 1900s. Damage to upstream communities is evidenced by the steady decline in the number of species since 1909 and the severe reduction in abundance between 1960 and 1978. That the rate of decline has been greater upstream than downstream suggests additional factors—sedimentation possibly being one—are operating in the upstream section of the river in Illinois. However, the lack of historical information on substrate composition allows only speculation as to changes that may have occurred on substrates in the Kankakee River in Illinois. Future stream alterations such as those presently proposed in Indiana (snag removal, bank clearing, and additional channelization) may provide the opportunity for in-depth study of the effect of sand sedimentation on natural mussel communities.

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