AN ANALYSIS OF THE SHELLS OF FRESH-WATER MUSSELS GATHERED BY INDIANS IN SOUTHWESTERN ILLINOIS

MAX R. MATTESON
University of Illinois, Urbana

Introduction

Fresh-water mussels appear to have played an important role in the lives of the Indians who formerly occupied Illinois. The presence of shells in middens, mounds, and other structures associated with many ancient Indian villages is evidence that the clam was a highly desirable item as food. The valves were also utilized as hoes, utensils for eating, and sometimes as ornaments or, more commonly, as parts of them. Their abundance and the ease with which they could be gathered from the rivers added to their value.

Many of the shells which were discarded, regardless of the date, have remained intact, and thus identifiable to the present day. All have been covered with soil, usually through the flooding of a nearby stream. Shells least exposed to prolonged wet periods have disintegrated less than those located directly on a flood plain which is periodically inundated; also, the lower ground is more liable to be acidic, a condition which quickly destroys shells.

It has long been established that fresh-water mussels are often exacting in their habitat-demands, and, if not, they nevertheless exhibit strong habitat-preferences. One would never find *Elliptio dilatatus* in standing water with a silt substratum, nor *Anodonta grandis* in rapidly flowing water on a gravel-sand substratum. Certain mussels, for example, *Lampsilis siliquoidea,* are more tolerant in their requirements and can be found in unionid communities representing many ecological backgrounds.

Several years ago, a large number of shells which were once collected and the soft parts apparently eaten by Indians were identified by the author. They had been found in middens from a single Indian village (1953). It was evident that with the exception of a few species, the mussels represented a typical unionid community as found in a small river; further, the habitat-demands of most species grossly depicted the rate of flow, presence of gravel, mud, and several other stream characteristics which once must have been present. After describing the stream as it should have been formerly, a trip to the site revealed that the shore line and areas of the substratum, as described, were still in evidence. At present, the stream flows at least 15 feet below its former bed.

A collection from another village site farther down the stream was later identified and studied (1958). As was expected, the composition of the inventory revealed that both the species and the numbers of each were somewhat different from those recorded from the first location. Logically, the concept of the stream as it formerly existed was changed accordingly.

Before a description of a former river, as shown by mussels collected at the time involved, can be attempted, certain perquisites must be recognized. The Indians must not have shown discrimination during their collecting of clams for food. They also must have occupied a site long enough to have collected thoroughly, not only in shallow water but in deeper areas during periods of drouth. One may expect to find several forms which do not fit the general picture because, on occasion, mussels could have been carried comparatively long distances by canoe, or, perhaps, over land from a nearby stream of different dimensions.

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DESCRIPTION OF SITE

The shells were removed from a large refuse pile at the site of a former Indian village by McGregor. He has named the area the Chrisman Site. It is situated in Pike County, west of Meredosia, Illinois (T16NR-2WS2). It is about one and one-half miles from the west shore of the Illinois River and is two and one-half miles from the western edge of the flood plain. The terrain becomes very soft when wet and is completely flat. Running to the northeast, one-half mile west of the site, is a meandering, ancient bed of McGee's Creek. It now contains only standing water. The nearest point on this creek is at present roughly three miles from the site. Without doubt, the site has been flooded many times by the Illinois River.

A complete history of the site was presented by McGregor (1954). The shells were gathered 6,490 ±300 years ago by Indians belonging to the Archaic culture. The dates of all sites mentioned in this paper result from carbon^{14} determination obtained by McGregor.

Later, reference will be made to a collection from one other site on McGee's Creek (1958). The Irvin site (Late Hopewell culture, about 776 A. D.) is located one-half mile above the point where the stream enters the flood plain. Further anthropological features of this site have been described by McGregor (1958).

RESULTS

The shells were in various stages of decomposition. Many were softened to the extent that a valve would crumble under slight pressure. Valves of certain thick-shelled species fell apart so that several definite year's growths became separated. Other species slaked mostly at the periphery of the valve. Surprisingly, the umbos of several thin-shelled valves, all of one species (*Strophitus rugosus*), were identifiable. The posterior tips of valves of several species were gone, and their length could not be measured. It could not be decided whether this was done by Indians or by processes of erosion. Several hundred valves

had disintegrated to the extent that they could not be identified.

No terrestrial snails were found. The area has been flooded often, and, for this reason, has not been suitable for their habitation. Their absence also signifies that the Indians of this site did not eat them. Six shells of a large aquatic operculate snail, *Viviparus contectoides,* were identified. They may have been eaten, but, as the shells were still intact, they were more liable to have been carried accidentally with clams when the latter were gathered by hand and brought to the fire to be cooked. As pottery had not yet been invented, the means by which mussels were cooked remains a question.

The collection includes 32 species of 20 genera; it represents the most shells that have been recovered and identified from a site of a former Indian village in Illinois (Table 1).

TABLE 1.—Species of Unionids Found at Chrisman Site, Illinois.

	Number of identifiable valves	Number for height only	Number of complete valves	Mean for height only (in cm.)	Mean for height (complete valves, in cm.)	Mean for length (in cm.)	Percent of total population
Elliptio dilatatus (Rafinesque), 1820	808	427	299	3.0	3.1	6.2	29.3
Fusconaia undata (Barnes), 1823	369	213	93	3.2	3.2	3.5	13.4
Quadrula pustulosa (Lea), 1831	329	122	43	3.7	3.6	3.8	11.9
Fusconaia ebenus (Lea), 1831	260	92	37	3.8	3.8	4.1	9.4
Actinonaias carinata (Barnes), 1823	257	122	18	4.6	4.5	6.7	9.3
Amblema peruviana (Lamark), 1819	189	68	16	4.0	3.8	5.0	6.9
Quadrula metanevra (Rafinesque), 1820	119	60	15	4.0	4.0	4.7	4.3
Quadrula nodulata (Rafinesque), 1820	77	30	7	3.5	3.3	3.6	2.8
Amblema plicata (Say), 1817	65	12	0	3.8	.....	.....	2.4
Plethobasus cyphyus (Rafinesque), 1820	31	23	1	4.4	3.5	4.5	1.1
Ligumia recta (Lamark), 1819	30	9	2	3.9	3.8	8.9	1.1
Obliquaria reflexa (Rafinesque), 1820	30	21	0	3.0	.....	.....	1.1
Quadrula quadrula (Rafinesque), 1820	29	15	7	3.3	3.2	3.6	1.1
Plagiola lineolata (Rafinesque), 1820	27	17	10	3.9	3.9	5.2	1.0

TABLE 1 (cont.)

	Number of identifiable valves	Number for height only	Number of complete valves	Mean for height only (in cm.)	Mean for height (complete valves, in cm.)	Mean for length (in cm.)	Percent of total population
Lampsilis siliquoidea (Barnes), 1823	23	8	2	3.9	4.0	7.3	.83
Lampsilis ventricosa (Barnes), 1823	23	1	0	4.0	.....	.....	.83
Cyclonaias tuberculata (Rafinesque), 1820	15	10	0	5.1	.....	.....	.54
Amblema costata (Rafinesque), 1820	14	4	0	4.4	.....	.....	.51
Tritogonia verrucosa (Rafinesque), 1820	14	5	5	4.0	4.0	6.1	.51
Truncilla truncata (Rafinesque), 1820	13	10	0	3.2	.....	.....	.47
Fusconaia flava (Rafinesque), 1820	6	4	2	2.8	2.7	3.3	.22
Lampsilis anodontoides (Lea), 1831	6	1	1	3.2	3.2	6.7	.22
Lasmigona costata (Rafinesque), 1820	4	2	1	4.6	4.5	8.8	.14
Obovaria olivaria (Rafinesque), 1820	4	2	0	3.8	.....	.....	.14
Obovaria subrotunda (Rafinesque), 1820	4	0	0	.....	.....	.....	.14
Megalonaias gigantea (Barnes), 1823	3	3	1	5.3	5.0	6.9	.11
Pleurobema coccineum (Conrad), 1836	3	2	1	3.2	2.3	3.0	.11
Strophitus rugosus (Swainson), 1822	3	0	0	.....	.....	.....	.11
Actinonaias ellipsiformes (Conrad), 1836	1	1	1	2.3	2.3	3.8	.04
Arcidens confragosus (Say), 1830	1	1	1	4.0	4.0	5.5	.04
Elliptio crassidens (Lamark), 1819	1	0	0	.....	.....	.....	.04
Micromya iris (Lea), 1830	1	1	1	2.4	2.4	4.9	.04
Totals	2759	1286	564				100.00

Discussion

Of the list (Table 1), the following mussels are found primarily in large rivers, although they may enter the mouths of smaller tributaries for varying distances: *F. undata, F. ebenus, A. peruviana,* and *A. plicata.* These mussels require a firm substratum, but silt may either cover the surface or be mixed with it. These species constitute 32% of the population and were probably taken mostly from the Illinois River.

Q. nodulata, P. cyphyus, O. reflexa, P. lineolata, M. gigantea, and *E. crassidens* are found in large rivers usually, but it has been observed that they will ascend rivers considerably farther than those previously mentioned. Because of this, it seems probable that most of this group which constitutes 6% of the collection, came from the Illinois River or the lower reaches of McGee's Creek. All prefer a firm substratum.

The terms, small river, middle-sized river, and large river, have been used previously by several authors when dealing with stream ecology. An exact definition of these terms is impossible; however, a large river condition could be described as the lower extremities of the large rivers which arise in Illinois, the Illinois River, and the great rivers bordering most of the state. A middle-sized river condition could be considered as a river less than 125 feet in width and usually wadeable. A small river is usually less than 50 feet in width and easily wadeable. The headwaters of a river include streams 15 feet or less in width and relatively shallow.

Other than several exceptions which will be mentioned later, the rest of the mussels are to be found equally in small and medium-sized rivers. Although occasionally found on a soft silt or mud substraum, this entire group demands a firm anchorage which may be composed of gravel, sand-gravel, or occasionally hard clay; however, there often is a thin layer of silt in contact with the shell. This group constitutes 29% of the population.

In Illinois, *L. recta* occupies only rapidly flowing streams of all sizes. It probably was found near *E. dilatatus.*

A. costata, T. truncata, P. coccineum, and *S. rugosus* are usually considered small river forms, although the latter two will descend considerable distances, while *A. costata* can often be found in the creeks which form headwaters of a river.

A favorite location for *L. anodontoides* is a firm substratum, slightly covered with silt, next to a steep bank, and in from two to five feet of water. This situation may well have existed at intervals while the stream flowed through the flood plain. *A. confragosus* probably occupied the same habitat; however, this mussel can be found in almost a completely soft substratum usually near rocks or other projections from the bottom.

A. ellipsiformes and *M. iris* are usually considered head-water forms, but often are found in rapidly running water, even in middle-sized rivers.

O. olivaria and *O. subrotunda* are never found in large numbers, and are scattered in middle- or large-sized rivers. They could have come from either the lower portion of

McGee's Creek or the Illinois River.

Several questions have arisen concerning the collection. In the community represented here, there should have been many more shells of *P. coccineum*. Present-day collections of mussels from river sites comparable to this one show that one mussel, *Lasmigona complanata* (white heel-splitter), must have been present. Why it was not in the collection is a matter for speculation. It must have been ignored for some reason; perhaps it was considered not palatable, or, perhaps, some taboo prevented its being taken from the water. Parmalee (1956) also found only four of this species among 1,934 valves representing several sites, which is a very untrue representation, as was the author's in light of comparable unionid communities as they exist today.

E. crassidens has been present in two of the sites studied from McGee's Creek. Its presence has not been recorded in Illinois during modern time. It prefers rapidly moving water with gravel substratum.

E. dilatatus was present in unusual numbers and alone forms 29% of the collection. As will be seen later, this fact is important in visualizing the edge of the flood plain as it must have existed at the time in question. This mussel is found where the current is strong and there is a firm substratum of gravel or gravel-sand. The author's largest present-day collection of this species was obtained where a small river was flowing rapidly down a gentle slope. Often 10 specimens could be gathered in one square yard of river bottom.

Today, McGee's Creek is a small stream, almost dry in the summer, and it flows between steep banks averaging 15 feet in height for at least 15 miles before it enters the flood plain of the Illinois River. Its original condition at two sites before it entered the flood plain has been reconstructed by the author (1953, 1958). At present, it meanders sluggishly through an almost level flood plain. Several beds, formed at various times since the Indians of the Chrisman site gathered clams, have been abandoned by the stream.

After examining the habitat- demands of those species in the collection which occupied McGee's Creek about 6,500 years ago, one can reconstruct the stream of that time from a point just previous to its union with the Illinois River. Its stream bed immediately before entering the flood plain was at least 20 feet higher than that of today. This has been indicated on an analysis of the Irvin site (1958). Upon leaving the higher land, the stream then flowed down a comparatively steep incline perhaps one-fourth mile in length to the flood plain; the inclined portion has since been carried downstream by the Illinois River forming the present-day bluffs. This assumption is verified by the unusual number of individuals of one species and the presence of several others which demand rapidly moving water, as would be true when the stream flowed down the inclined surface.

After the stream reached the flood plain, it must have approached the Illinois River with a definite current, without undue meandering, over a rather firm substratum of

gravel or sand-gravel, and with only a thin layer of silt covering the bottom near its junction with the Illinois River. It must have been comparable to a small to medium-sized river of today. An analysis of the habitat-demands of the other clams found in the stream support this opinion. All demand firm bottom and definite current. The complete lack of *Leptodea fragilis, Proptera laevissima, Anodonta corpulenta, A. gigantea,* and others which are usually found in a mud or silt substratum and slowly moving water also demonstrate the absence of this condition in it and the shallow areas of the Illinois River. The flood plain itself has probably changed little as shown by the fact that at least a portion of the deposit of shells, including many artifacts, was still present recently. The bluffs at the edge of the flood plain and the heavily silted areas in both the creek and river which are present there today have been formed in the last 6,500 years.

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