10. UNMODIFIED MUSSEL SHELL REMAINS

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Introduction

This chapter presents a detailed study of shell remains, focusing on identified and unidentifiable bivalve (mussel) shell remains recovered during the 1998 excavations at Scattered Village. Analysis of fossil gastropod remains and modified fossil and nonfossil artifacts is presented separately, in Chapter 14. Our primary purpose here is to provide an inventory of freshwater mussel remains and taxa present in the site, and to explore variation in the use of freshwater shell resources during the period of site occupation. The current analysis and presentation are patterned closely after the treatment of mussel shell remains from On-A-Slant Village (Ahler and Ryser 1997b:391-401) and sites in the Highway 1806 Project (Ahler and Ryser 2000). At times, we draw directly on background information, statements of methodology, and organizational information presented in those two reports. Gail Ryser conducted virtually all of the taxonomic identifications and quantification of shell remains discussed below. Analysis of those data and writing of this chapter were conducted by Ahler; comparative comments regarding type collections were provided by Ryser.

Taxonomy

Reference guides for taxonomic identifications include Cvancara (1983), Burch (1973), and Oesch (1984). Taxonomic nomenclature follows Turgeon et al. (1988), revisions to the Anodontinae proposed by Hoeh (1990), and Turgeon et al. (1998). Ryser used a small reference collection developed in 1996 with assistance from Robert E. Warren, Illinois State Museum, during the study of Slant Village (Ahler and Ryser 1997b:391-401) as an important identification guide for the Scattered Village shell remains. Subsequent to the Slant Village study, and during the course of the Highway 1806 Project, Darcy Morey and Paul Parmalee examined about three dozen additional problematic specimens from site 32MO291 and kindly provided taxonomic information for those specimens. This information allowed refinement and expansion of the archaeological type collection used in the current study.

Midway during the course of the Scattered Village taxonomic study (March 1999), Ryser became concerned with the clarity of the distinction she had been making regarding *Lampsilis siliquoidea* versus *Lampsilis cardium*. To help resolve these concerns we sent 10 specimens of *Lampsilis* sp. to Robert Warren at the Illinois State Museum with a request for his assistance and guidance in distinguishing the two species based on those examples. Warren examined the specimens, made a determination of their taxonomic classification, and offered the information in Table 10.1 as a guide to distinguishing *L. siliquoidea* from *L. cardium* (Warren 1999). Warren noted that tooth robustness alone was not a good indicator, as the teeth of mature *L. siliquoidea* can be quite robust.

Table 10.1. Distinguishing features used as a guide for separating *L. siliquoidea* from *L. cardium* based on Warren (1999).

Feature	*L. siliquoidea*	*L. cardium*
beak sculpture	fine V-shaped bars	a few heavy, slightly undulating bars not drawn up in the middle into a distinct V
beak inflation	relatively compressed	relatively inflated
valve elongation	relatively elongate	relatively ovate
shell length (whole)	40-110 mm	88-125 mm
shell height (whole)	> 60 mm	< 60 mm
bivariate l / w plot	no overlap due to distinctive height measurements	

The information provided by Warren was consistent with features Ryser has been using to distinguish the two species. Archaeological specimens that were indeterminate on all or most of these variables were coded as *Lampsilis* sp. in the current study.

Subsequent to receipt of this information from Warren, and also while nearing the completion of taxonomic classification of the shell specimens (May 1999), Paul Picha of the State Historical Society of North Dakota kindly provided a second reference comparative collection of North Dakota mussel shells. These specimens were collected from various sources within the State of North Dakota by members of the North Dakota Game and Fish Department, and the collection was provided through assistance from Chris R. Grondahl of that department. Identifications were made by members of that department. These modern specimens were examined carefully by Ryser and were compared in detail with the archaeological specimens identified by Warren, Morey, and Parmalee that Ryser was using as a comparative reference collection. A few inconsistencies were apparent in the classification of the two collections. The following paragraphs summarize the results of Ryser's comparison of the two collections, focusing on species that occur in the Scattered Village assemblage.

Pyganodon grandis: (Say 1829), giant floater

Nineteen specimens in the archaeological type collection were originally identified by R. Warren in the 1996 inquiry about mollusks from Slant Village. Characteristics include thin shell, double looped beak ridges, and beaks that extend slightly above the hinge line. Specimens used for the archaeological type collection are similar to the specimen received from SHSND and the diagnostic characteristics listed by Cvancara (1983) and Oesch (1984). Note: Several of the specimens examined by D. Morey (site 32MO291, Highway 1806 Project) and identified as *P. grandis* have beak ridges that appear more similar to the *Anodontoides ferussacianus* specimen originally identified as *A. ferussacianus* by R. Warren.

Anodontoides ferussacianus: (Lea 1834), cylindrical papershell

One specimen occurs in the type collection originally identified by R. Warren in the 1996 inquiry about mollusks from Slant Village. Characteristics include: beak inflated only slightly above hinge line, beak ridges bent sharply posterior forming a distinct angle (Cvancara 1983;

Oesch 1984). The specimen in the SHSND collection appears to be inflated at the beak similarly to *Pyganodon grandis,* with the beak ridges distinctly different from the *Anodontoides ferussacianus* specimen identified by Warren in 1996. In the SHSND specimen, the ridges appear double looped, but with angular characteristics bending posteriorly. The ridges appear very similar to the double-looped ridges on the *Pyganodon grandis* specimen. It is not possible to compare the shape of the shell as the specimen we have used, identified by Warren in 1996, consists of the anterior and posterior hinge portions only. Both specimens are thin shelled.

Lasmigona complanata: (Barnes 1823), white heelsplitter

Warren originally identified two specimens in our type collection in the 1996 inquiry about mollusks from Slant Village. Characteristics in specimens in both our type collection and the specimen provided by SHSND are consistent with the description provided by Oesch (1984). The characteristics include: a relatively thick shell, beak is small and not raised above the hinge line. Ridges are coarse and double looped. The beak cavity is shallow. The left valve has two variable pseudocardinal teeth. Both are grooved, the posterior one is more massive, and the anterior one is low and somewhat compressed.

Lampsilis siliquoidea: (Barnes 1823) fat mucket

Warren originally identified two specimens in the type collection in the 1996 inquiry about mollusks from Slant Village. In the 1999 communication with Warren, he explains that recent changes in nomenclature have contributed to some confusion in taxonomic identification. However, the species *L. siliquoidea* was not affected by these changes. [Although it should be noted that the SHSND specimen is labeled as *Lampsilis siliquoidea* (formerly *radiata*)]. Based on the 1999 communication (Table 10.1), Warren reports the morphologic characteristic of *L. siliquoidea* to include a compressed beak, with "multiple fine V shaped bars." The beak ridges of *L. siliquoidea* are contrasted with those of *Lampsilis cardium* that Warren reports to be "slightly undulating bars that are not drawn up in the middle in a distinct "V". Cvancara (1983) does not list *Lampsilis siliquoidea* but does list *Lampsilis radiata.* He describes the beak ridges as "fine, chevron-like." Ryser used this distinction as one of the characteristics for identification of *L. siliquoidea.* The *L. siliquoidea* received from SHSND is similar to the description given by Oesch (1984:213). [Fat Mucket *Lampsilis radiata leteloa* (Lamarck 1819)].

Lampsilis cardium (formerly *Lampsilis ovata)* (Rafinesque 1820), plain pocketbook

In the 1999 communication with R. Warren, he clarifies nomenclature confusion surrounding this species. The proper full scientific name for plain pocketbook is *Lampsilis cardium* (Rafinesque, 1820). The *Lampsilis ovata* identified by D. Morey is a burned specimen and not an adequate amount of the shell remains to compare it to the SHSND specimen in a meaningful way. Because of the fragmentary condition of the shells in the Scattered Village sample it is not possible to use the quantitative variable of shell length and width commonly used by Warren for identification. Overall shell shape of *Lampsilis siliquoidea* and *Lampsilis cardium* is distinctly different: the former shell oblong, elongate, ovate, the latter elliptical, ovate. Having received clarification from R. Warren mid-stream in the 32MO31 analysis concerning the two specimens *Lampsilis cardium* and *Lampsilis siliquoidea,* several specimens

from Scattered Village are classified as *Lampsilis* sp. We believe that the specimens classified in the genus *Lampsilis* have been done so as accurately as possible given factors involved.

Inconsistency among the collections centers on the specimen labeled as *Anodontoides ferussacianus* in the SHSND collection. This specimen may be misidentified or simply mislabeled. For the sake of consistency in data sets from archaeological sites, we therefore chose to place emphasis on the archaeological comparative collections for taxonomic identification purposes.

Lab Methods and Data Recording

All shell was sorted from size grade G1-G3 waterscreen samples from all Priority 1 contexts, and identifiable unmodified and modified/fossil shell only was sorted from size grade G4 and G5 sample fractions from the same contexts. Shell remains from each context and each size grade from each provenience context (catalog number) were then separated into one of six classes: (1) unidentifiable bivalve pieces; (2) identifiable bivalve pieces; (3) nonfossil gastropod pieces; (4) modified pieces; (5) fossil (mostly gastropod) pieces; and (6) pill clams. ***Unidentifiable bivalve specimens*** are fragments of mussel shells that lack part or all of the diagnostic beak, umbo, and hinge portion of the shell and therefore cannot be confidently assigned to categories at the level of genus or species. ***Identifiable bivalves*** are generally those that retain all or a portion of the hinge feature (the beak or umbo portion) on the shell, and can include both fragmentary and complete valves. ***Nonfossil gastropods*** are freshwater or land snail shells, generally thin-walled in nature, which lack the chalky appearance of fossil gastropods. ***Modified shell*** includes whole and fragmentary disc beads, small pieces of dentalium, a pearl-like object, and any other shell items that appear to have been shaped in any fashion. ***Fossil shell pieces*** are characterized by a thicker wall and larger size in the case of gastropods and by a chalky rather than dense/compact texture. ***Pill clams*** are extremely small bivalves with a generally equidimensional form (see Cvancara 1983:Plate 3).

After the shell from a given context and size grade was sorted into the six classes noted above, we recorded for specimens in class 1 and classes 3 through 6 (all but the identifiable bivalves) the site number, catalog number, size grade, and class code on a data sheet for specimens in each class, along with the total count of specimens in that size grade/class and the combined weight of specimens in that size grade/class to 0.1 gram. For specimens with a weight of <0.1 gram (the lower limit on the electronic balance), a weight of 0.03 gram was entered in the database. We also recorded presence or absence of burning, such that burned and unburned specimens having all other information in common constitute separate lines of data in the database. For specimens in class 2, ***identifiable bivalve remains***, we conducted additional classification before data recording and made a concerted attempt to make a taxonomic identification using the reference materials noted previously. Such specimens were further sorted by taxon, side (left vs. right valve), portion, and burning, prior to recording total count and weight information for each sort set. All of these data were recorded on a single data sheet having variables of site, catalog number, size, class, burning, count, weight, taxon, side, portion, and comment, in that order.

Fossil specimens and modified specimens are analyzed in detail in Chapter 14, herein. No attempt was made to taxonomically identify the nonfossil gastropods or the pill clams. These specimens have been retained with the curated collection and are available for further study.

Bivalve Shell Remains

Table 10.2 provides a summary of count and weight data for all shell by class and size grade for the excavated study collection from Scattered Village (restricted to TP1 – TP4). Weight data are slight underestimates of actual weight, because they are computed by first rounding individual sample weights to the nearest whole gram (any individual data record with a weight of <0.5 gram is not included in the table). The counts for modified and fossil specimens differ slightly from those presented in Chapter 14, due to reclassification of two specimens presented as modified in this data set as unmodified fossils in Chapter 14, and due to application of G4 and G5 multipliers to create count estimates in Chapter 14. Altogether, the sample is dominated by unmodified, identifiable and unidentifiable mussel shells, with more than 1400 identifiable pieces being recorded, and with such material having a total weight of nearly 9.5 kg.

Table 10.2. General shell class frequencies according to size grade, with counts unadjusted by sampling multipliers, and total weight data (rounded to the nearest gram) for each class, Scattered Village (32MO31), 1998 excavated collection.

	Size Grade					Total	%	Total	%
Type of Shell	1	2	3	4	5	n	n	Wt(g)	wt
Unidentifiable Bivalve	35	1,087	9,013			10,135	*85.4*	5,337	*54.9*
%	*.3*	*10.7*	*88.9*			*100.0*		*100.0*	
Identifiable Bivalve	171	630	587	53		1,441	*12.2*	4,153	*42.7*
%	*11.9*	*43.7*	*40.7*	*3.7*		*100.0*		*100.0*	
Gastropod (non-fossil)		4	3	11	13	31	*.3*	5	*.1*
%		*12.9*	*9.7*	*35.5*	*41.9*	*100.0*		*100.0*	
Modified	2	36	33	22		93	*.8*	169	*1.8*
%	*2.2*	*38.7*	*35.5*	*23.*		*100.0*		*100.0*	
Fossil		22	69	67	12	170	*1.5*	60	*.7*
%		*12.9*	*40.6*	*39.4*	*7.1*	*100.0*		*100.0*	
Pill Clam			1	1	1	3	*.1*	0	*.0*
%			*33.3*	*33.3*	*33.3*	*100.0*		*100.0*	
Total	208	1,779	9,706	154	26	11,873	*100.0*	9,724	*100.0*
%	*1.8*	*15.0*	*81.7*	*1.3*	*.2*	*100.0*		*100.0*	

Table 10.3 provides a summary of taxonomic classification data for the identifiable mussel remains (presented as NISP). Although six species occur in the sample, a single taxon, *Lampsilis siliquoidea,* dominates the collection with more than 86% of the identified specimens. If we consider the specimens identified as *Lampsilis* sp. as likely *L. siliquoidea*, then it is reasonable to suggest that this single taxon makes up about 94% of the total collection. Two

Table 10.3. Taxonomic frequencies (NISP) by size grade for identifiable bivalve shells only from time periods 1-4, Scattered Village (32MO31), 1998 excavations.

Taxon		Size Grade 1	2	3	4	Total n	Total %
Pyganodon grandis	n		3	9	9	21	*1.5*
	%		*14.3*	*42.9*	*42.9*	*100.0*	
Lasmigona complanata	n	12	35	10	3	60	*4.2*
	%	*20.0*	*58.3*	*16.7*	*5.0*	*100.0*	
Lampsilis siliquoidea	n	155	574	478	33	1,240	*86.2*
	%	*12.5*	*46.3*	*38.5*	*2.7*	*100.0*	
Lampsilis cardium	n			1		1	*.1*
	%			*100.0*		*100.0*	
Lampsilis sp.	n	2	15	86	8	111	*7.7*
	%	*1.8*	*13.5*	*77.5*	*7.2*	*100.0*	
Anodontoides ferussacianus	n			2		2	*.1*
	%			*100.0*		*100.0*	
Proptera laevissima	n	2	1			3	*.2*
	%	*66.7*	*33.3*			*100.0*	
Total	n	171	628	586	53	1,438	1,438
	%	*11.9*	*43.7*	*40.8*	*3.7*	*100.0*	*100.0*

Table 10.4. Information on shell completeness (portion present) and side according to taxon among identified bivalve shells in TP1 – TP4, Scattered Village (32MO31), 1998 excavations.

Taxon	Side	Portion Present: less than half	more than half	whole or nearly whole	Total
Pyganodon grandis	1 left	8	1		9
	2 right	12			12
	Total	*20*	*1*		*21*
Lasmigona complanata	1 left	23	8		31
	2 right	22	6		28
	Total	*45*	*14*		*59*
Lampsilis siliquoidea	1 left	345	235	60	640
	2 right	336	214	50	600
	Total	*681*	*449*	*110*	*1,240*
Lampsilis cardium	1 left	1			1
	Total	*1*			*1*
Lampsilis sp.	1 left	63	7		70
	2 right	37	4		41
	Total	*100*	*11*		*111*
Anodontoides ferussacianius	1 left	2			2
	Total	*2*			*2*
Proptera laevissima	1 left			1	1
	2 right		2		2
	Total		*2*	*1*	*3*

other taxa, *Lasmigona complanata* (4.2%) and *Pyganodon grandis* (1.5%), make up the balance of the remainder. Three other species are rare, with occurrences of three or less: *Proptera laevissima* (n=3); *Anodontoides ferussacianus* (n=2); and *Lampsilis cardium* (n=1). Table 10.4 provides summary data on degree of completeness among identified specimens, and the side of identified valves (left, right). We can provide a few additional comments on each species.

Lampsilis siliquoidea (Barnes 1823), the fat mucket, is the dominant species in the site sample (n = 1,240; 86.2%). This species has been previously discussed in North Dakota as *Lampsilis radiata* (Gmelin 1792) (Cvancara 1983:42-44). Cvancara reports that historically it is a common species throughout much of North Dakota, being found in large and small streams, lakes, and canals. This species is frequently reported in archaeological sites in North and South Dakota, with the shell commonly being used for shell scrapers (Cvancara 1983:Plate 2; Wood 1967:96; Warren 1998:5). This species is represented by two perforated valves in the modified shell collection (Chapter 14), and, given its dominance of the site sample, it is likely that some of the shell disks, shaped shell, and other modified pieces were also made from this species.

Lasmigona complanata (Barnes 1823), the white heelsplitter, has a modest presence in the site sample (n = 60; 4.2%). In North Dakota, this species has been reported historically from both large and small streams (Cvancara 1983:37-38). This is a fairly large, thick-walled species (Cvancara 1983:Plate 12 illustrates a specimen ca. 12 cm in length). This is a heavier and thicker-walled species than *Lampsilis siliquoidea* and *Pyganodon grandis*, and this taxon was more frequently used in Plains Village archaeological contexts for scrapers (see Cvancara 1983:Plate 2; Warren 1994:2, 1998:5) or as raw material for disks and beads (Wood 1967:96; Ahler 1977b:118; Picha 1980:687-689). One heavily modified valve classified as a shell scraper is assigned to this species (Chapter 14), and it is probable that several of the thicker shell disks and shaped pieces were also made from this species.

Pyganodon grandis (Say 1829), the giant floater, has a minor presence in the site sample (n = 21; 1.5%). This species has been previously discussed in North Dakota as *Anodonta grandis* (Say 1829) (Cvancara 1983:34-35). Historically, it is the most frequently occurring mussel species in North Dakota, collected in North Dakota predominantly in small streams but also in large streams and one lake (Cvancara 1983:35-36). The shell is quite fragile with a typical wall thickness of 2-3 mm. In other archaeological site samples, this species was infrequently selected as raw material for production of beads, disks, or tools (see discussion in Warren 1998), although it has been suggested that fragments of this shell might be desired for their reflective and iridescent qualities (see discussion in Ahler 1977b:118). No modified specimens in the present sample are identified as belonging to this species.

Proptera laevissima (Lea 1830), the fragile heelsplitter, has a rare presence in the site sample (n=3, 0.2%). Identification of this species is based on information in Cvancara (1983); this taxon is not listed in Turgeon et al. (1998). Cvancara (1983:47) notes that some workers assign such specimens to *Leptodea fragilis*, and gives his reasons for preferring the taxon *P. laevissima,* centering on features of reproductive parts. Cvancara notes that this species is rare in North Dakota, and is found in the lower reaches of a few western tributaries of the Missouri River (Knife, Heart, and Cannonball Rivers). This species was not reported from collections at nearby Slant Village (Ahler and Ryser 1997b) and 32MO291 (Ahler and Ryser (2000), and

Warren (2000) reports only one specimen from several village sites in the Cannonball and Grand-Moreau regions in North and South Dakota.

Anodontoides ferussacianus (Lea 1834), the cylindrical papershell, is rare at the site (n=2; 0.1%). Cvancara (1983:36-37) notes that this species occurred throughout the state of North Dakota in historic times, and that it occurs primarily in small streams but is found in large streams and lakes, as well. It is a small, thin-walled species (Cvancara 1983:Plate 1 illustrates a specimen 7 cm in length), and presumably one not highly attractive for purposes of bead, disk, or scraper manufacture.

Lampsilis cardium (Rafinesque 1820), the plain pocketbook, is represented in the site sample by a single specimen. In archaeological contexts in the Dakotas, what we here call *L. cardium* has frequently been classified as *L. ovata* and sometimes classified as *L. ventricosa* or *L. ovata ventricosa* (Warren 1999) (e.g., Griffin 1984:84; see Cvancara 1983:42). Cvancara (1983:41) reports that this species [he uses *L. ovata*] occurs primarily in eastern North Dakota and in the Knife and Heart River systems in the central part of the state, and that North Dakota may be near the western margin of the species' natural range. In North Dakota, this species has been reported exclusively in larger streams (Cvancara 1983:42), while elsewhere it has been reported in streams of varying size as well as lakes. This species is only occasionally reported in archaeological contexts where it is generally a minority taxon (e.g., Griffin 1984:84), and it occasionally is reported in the form of modified shell (Thiessen 1995:Table 47). Warren (2000) reports minor occurrences in six of eight village sites he studied in the Cannonball and Grand-Moreau regions in North and South Dakota. The rare occurrence of *L. cardium* at Scattered Village appears consistent with the level and frequency of reporting in other archaeological contexts in the Dakotas.

Intrasite Variation

Mussel shell remains were common in all excavated contexts, and abundant in some. One feature, in particular, deserves mention, this being Feature 121 in Block 3. This feature consisted entirely of a small concentration of relatively complete mussel valves (see discussion and illustration in Chapter 2). This feature was of interest, in part because it was found "suspended" within the fluffy sediment unit in Block 3, and its mere presence there argues against this sediment unit consisting entirely of turbated deposits. Because time period is unassigned for fluffy sediment contexts, shells in this feature were studied but not included in the foregoing data tables. Thirty-six identifiable valves occur in the feature. Of these, 35 are *Lampsilis siliquoidea* (16 left, 19 right) and one is *Lampsilis cardium* (right). [The latter specimen doubles the count of this species in the site sample.] Twenty-seven valves are whole or nearly whole, and eight consist of more than half the shell. Two specimens exhibit faint traces of red pigment. The origin or purpose of this feature remains unknown.

The distribution of taxa by time periods TP1 – TP4 is shown in Table 10.5 (NISP data). Specimens not classified to species (*Lampsilis* sp.) are omitted from the table. Although *Lampsilis siliquoidea* dominates the site sample, there is some internal variation by time period

Table 10.5. Taxonomic frequency (NISP) for identified bivalves by time period, Scattered Village (32MO31), 1998 excavations. Counts top; percentages middle, and standardized cell residual at bottom. Residual values >+1.0 are shaded for emphasis.

	Time Period				
Taxon	1 later postcontact	2 earlier postcontact	3 later precontact	4 earlier? precontact	Total
Pyganodon grandis	5	16	0	0	21
Lasmigona complanata	20	40	0	0	60
Lampsilis siliquoidea	625	569	16	30	1,240
Lampsilis cardium	0	1	0	0	1
Anodontoides ferussacianius	2	0	0	0	2
Proptera laevissima	0	2	0	1	3
Pyganodon grandis	*.8%*	*2.5%*	*.0%*	*.0%*	*1.6%*
Lasmigona complanata	*3.1%*	*6.4%*	*.0%*	*.0%*	*4.5%*
Lampsilis siliquoidea	*95.9%*	*90.6%*	*100.0%*	*96.8%*	*93.4%*
Lampsilis cardium	*.0%*	*.2%*	*.0%*	*.0%*	*.1%*
Anodontoides ferussacianius	*.3%*	*.0%*	*.0%*	*.0%*	*.2%*
Proptera laevissima	*.0%*	*.3%*	*.0%*	*3.2%*	*.2%*
Pyganodon grandis	-1.7	1.9	-.5	-.7	
Lasmigona complanata	-1.7	2.2	-.9	-1.2	
Lampsilis siliquoidea	.6	-.7	.3	.2	
Lampsilis cardium	-.7	.8	-.1	-.2	
Anodontoides ferussacianius	1.0	-1.0	-.2	-.2	
Proptera laevissima	-1.2	.5	-.2	3.5	
Total	652	628	16	31	1,327
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*

(X^2=35.428, df=15, p=.002). Specifically, *P. grandis* and *L. complanata* have unusually high frequencies in TP2. The rare species, *A. ferussacianus* and *P. laevissima*, have statistically high occurrences in TP1 and TP4, respectively. These patterns probably reflect specific collecting events confined to individual time periods, and therefore may simply mirror stochastic variation.

An equally interesting question regarding mussel shell use is whether the relative focus on mussel resources in general changes during the period of site occupation. The answer to this is best sought through shell density data rather than species occurrence. Table 10.6 presents data on the total weight of bivalve shell remains by periods TP1 – TP4, as well as excavated volume data and weight density data computed from a combination of weight and volume information. From this information, it is quite clear that there is a very strong trend in which the intensity of use of shell remains increases steadily through time. A mean density value of 70 grams per cubic meter pertains for TP4 and TP3 combined (contemporaneous samples), and this density increases three-fold in TP2 and two-fold again in TP1. Shell is roughly six times as common in the latest period as it is in the earliest.

Table 10.6. Data on the weight of bivalve shell remains according to time period (grams), with computation of shell density by time period, Scattered Village (32MO31), 1998 excavations.

	Time Period				
Type of Shell	1 later postcontact	2 earlier postcontact	3 later precontact	4 earlier? precontact	Total
Unidentifiable bivalve	2,494	2,264	187	392	5,337
Identifiable bivalve	2,003	2,016	43	89	4,151
Total	4,497	4280	230	481	9488
Excavated Volume, m^3	9.625	18.830	5.658	4.444	38.557
Density, g / m^3	467	227	41	108	

External Comparisons

Comparable mussel shell taxonomic data exist for two nearby sites that have been studied in a manner similar to Scattered Village. These are the assemblages from roughly contemporaneous Slant Village (Ahler and Ryser 1997b) and somewhat earlier site 32MO291 (AD 1400s; Ahler and Ryser 2000). Table 10.7 summarizes taxonomic frequency data for these three collections (NISP).

Table 10.7. Taxonomy and frequencies of identified bivalve mollusks (Family Unionidae), for three comparative study sites near Heart River.

	Scattered Vill.		Slant Village		Site 32MO291	
Taxon	N	%	N	%	N	%
Subfamily Anodontinae						
Anodontoides ferussacianus (Lea 1834) cylindrical papershell	2	0.1%	2	0.7%	93	11.0%
Lasmigona complanata (Barnes 1823) white heelsplitter	31	4.2%	12	4.3%	8	0.9%
Pyganodon grandis (Say 1829) giant floater	21	1.5%	256	91.8%	715	84.6%
Subfamily Lampsilinae						
Lampsilis siliquoidea (Barnes 1823) fat mucket [and *L.* sp.]	1351	93.9%	9	3.2%	28	3.3%
Lampsilis cardium (ovata) (Rafinesque 1820) pocketbook	1	0.1%	0	0.0%	1	0.1%
Leptodea fragilis (Proptera laevissima) fragile heelsplitter	3	0.2%	0	0.0%	0	0.0%
Total	1438	100.0%	279	100.0%	845	100.0%

From these data, it is clear that the three site assemblages differ strongly in species composition. Slant Village and site 32MO291 are quite similar, being dominated by *Pyganodon grandis*. Scattered Village, in contrast, is heavily dominated by a single species *Lampsilis*

siliquoidea. In a recent paper, Warren (2000) has noted a pattern involving eight study sites in the Cannonball and Grand-Moreau regions in which east-bank sites (of the Missouri River) are dominated by *Pyganodon grandis* while west-bank sites are dominated by *Lampsilis siliquoidea*. Warren suggests that this pattern is due to the different hydrology of tributary streams flowing into the east and west sites of the Missouri River, respectively, and ultimately reflects differences in habitat of the respective dominant species. The Slant Village and site 32MO291 data run directly counter to the pattern noted by Warren, in that both sites are west-bank and are dominated by *Pyganodon grandis*. Thus, the situation and its explanation are probably much more complex than what is proposed by Warren. Nonetheless, Warren may be on the right track, because even the three west-bank sites compared in Table 10.7 differ greatly regarding proximity to a tributary of the Missouri River. Scattered Village lies directly on the Heart River, while both Slant and site 32MO291 lie a few km south of the mouth of the Heart and are not close to any tributary streams larger than very small creeks. It is reasonable that occupants of Scattered Village obtained mussels from the Heart River, but it is not clear where residents of Slant Village and 32MO291 collected mussels (from oxbow lakes on the Missouri River floodplain?)

Summary

The mussel shell sample from TP1 – TP4 at Scattered village consists of about 9.5 kg of shell remains, comprising more than 11,500 pieces including 1,438 identifiable valves or valve fragments. The collection is dominated by a single species, *Lampsilis siliquoidea*, which makes up an estimated 94% of the sample by count. Five other species occur in modest to minor proportions in the collection. Statistically significant variation occurs in the species composition of the sample according to time period, with the second and third most common species (*Lasmigona complanata* and *Pyganodon grandis*) being especially concentrated in TP2 deposits. The meaning of this, if any, is not clear. There is a very strong time trend in the mussel data that indicates greatly increased use of bivalve resources later in time. The mussel assemblage from Scattered Village differs markedly from assemblages from nearby Slant Village and site 32MO291, which are both dominated by *Pyganodon grandis* rather than *Lampsilis siliquoidea.* The reason for this is not clear, but it may have to do with relative proximity to a major tributary stream entering the Missouri River.