13. MODIFIED BONE AND ANTLER REMAINS

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Introduction and Goals

In this chapter we discuss a sample of 1,008 modified bone and antler specimens recovered in the 1998 excavations at Scattered Village. This treatment is largely descriptive, and it has several goals:

1. To organize, illustrate, and describe the collection using a functional classification compatible with analysis of the contemporaneous collection from nearby Slant Village.
2. To provide details on certain aspects of artifact production technology that bear on interpretation of stone tool collections from the site.
3. To document use of metal versus stone tools in bone tool modification as a means of crosschecking the chronological placement for the site.
4. To examine changes in bone/antler tool function through time.
5. Compare the makeup of the Scattered Village collection with that from nearby Slant Village, a contemporaneous Mandan community.

Modified bone and antler specimens were segregated from the remainder of the vertebrate materials by Falk and persons working under his direction at the time that quantification and initial classification of all vertebrate materials occurred in Falk's laboratory in Sevierville Tennessee. Carl organized all modified specimens by general functional and morphological groupings and cleaned, labeled, and refitted fractured specimens to the extent possible. He assigned an individual specimen number to each modified artifact, and he recorded data on taxonomic classification, skeletal element, side, and element portion for each specimen. Taxonomic and related information were recorded in a Paradox database and were transmitted to Ahler and Kathryn Cruz-Uribe for their use. Taxonomic data have been incorporated by Cruz-Uribe into her analysis of other vertebrate materials from the site (Chapter 6). When received from Falk, Ahler examined the collection in detail, classified specimens according to detailed functional class and other attributes, and directed the recording of other information in the Flagstaff lab. Ahler checked the resulting database, organized materials for illustration, conducted data analysis, and wrote the following chapter.

Methods

Our analytic approach has been adapted directly from methods used in the detailed study of modified bone and antler specimens at nearby Slant Village (Ahler and Ryser 1997a). That work, in turn, built upon an earlier analysis of a sample of tools from Slant Village by Moore (1985). The current study, focused on Scattered Village, continues an emphasis in Knife/Heart regional investigations on elucidation of bone/antler tool production technology, function, and the role of Euroamerican trade metal artifacts in Native bone artifact production and replacement (topics addressed in the above works as well as in Weston 1986 and Weston and Ahler 1993).

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Table 13.1 presents the classification system and data recording scheme used in the current analysis. Most variables listed in that table were recorded in the format discussed by Ahler and Ryser (1997a). Any new attributes, variable code values, and variables used in the present study or altered from the method of recording used by Ahler and Ryser are italicized for emphasis in Table 13.1. For the Scattered study, we added a few ***specific functional classes*** and reorganized a few others. We narrowed the definition of class 0 to apply to items that appear to definitely be utilitarian or simply indeterminate in that regard, and we added a second indeterminate or unknown class (8) to specifically isolate artifacts that appear nonutilitarian in nature (e.g., fragments of highly fashioned or shaped artifacts) but still of unknown purpose. Within the domain of items of unspecified function we added a class, unspecified rib tool (54) to capture artifacts made on ribs and manufacturing waste from rib tools. A few new specific classes were added to accommodate specimens recognized in the current study: bird effigy (9), patterned pick (14), and bipolar anvil (18). We distinguished narrow antler bracelets, or strips (2) [abundant in the collection] from antler bracelets or wrist guards having a broader form (32) [one occurs in the collection]. We observed a large number of expedient pressure flaking tools, and we separated them into narrow-ended (43) versus broad-ended (39) specimens. We recognized an unusual but recurring tool form that we tentatively place within the class of artifacts involved in basketry or sewing (25).

Table 13.1. Summary of variables and attribute codes applied to modified bone and antler artifacts, Scattered Village (32MO31), 1998 excavation.

SPECNO	individual specimen number			
CATNO	catalog number			
SIZE	size grade	1-5 for G1-G5		
CERT	certainty that it is a tool			
	1	certain	2	uncertain
FUNC	functional class			
	0	unknown, ***utilitarian***	25	basketry/***weaving/sewing*** tool
	1	bead	26	Shaft straightener
	2	bracelet ***(strip)***	30	fishhook
	3	tube	31	projectile point
	4	gaming piece	32	***antler wrist guard/bracelet***
	5	whistle	39	***broad exped. pressure flaker***
	6	incised piece	40	scraper handle
	7	rattler	41	scraper - soft material
	8	***unknown, nonitilitarian***	42	scraper - resist material
	9	***effigy (bird)***	43	***narrow exped. pressure flaker***
	10	cultivating tool	44	surface burnisher
	11	chopper	45	expedient awl or punch
	12	expedient cutting tool	46	expedient digging tool
	13	abrader	47	beaver tooth adz
	14	***patterned pick***	48	expedient adz
	15	hammer/percussion (billet)	49	Used on pliable material
	16	bipolar wedge	51	flesher
	17	squash knife	54	***unspecified rib tool***
	18	***bipolar anvil***	56	handle portion of unspecified tool
	20	patterned awl or punch	57	***knife handle***
	22	patterned pressure flaker	58	unspecified antler tool/artifact
GENFUN	*grouped functional class*			
	1	*digging tools*	*5*	*other patterned tools*
	2	*patterned piercing tools*	*6*	*other expedient tools*
	3	*pressure flakers*	*7*	*ornamental and nonutilitarian*
	4	*fish hooks*	*8*	*unknown, utilitarian?*

Table 13.1. Summary of variables and attribute codes applied to modified bone and antler artifacts, Scattered Village (32MO31), 1998 excavation (concluded).

UPH	use-phase class				
	1	unfinished, useable	4	finished, not useable	
	2	unfinished, not useable	5	debris from manufacture	
	3	finished, useable	6	debris from resharpening	
MULT	multi-function	1 = 1st if multiple	2 = 2nd if multiple	3 = 3rd if multiple	
STME	stone or metal manufacture				
	0	indeterminate	***4***	***stone and metal***	
	1	stone	***blank***	***unexamined***	
	2	metal			
PATT	patterned or unpatterned				
	1	patterned	2	unpatterned (expedient)	
COMPL	tool part present				
	1	whole	5	medial segment	
	2	nearly whole	6	lateral fragment	
	3	proximal end	8	manuf. debris	
	4	distal end	9	indet. part	
PCT	percent of tool present	to nearest 5%			
	999 M	manuf debris			
BURN	burning				
	0	absent	1	present	
LGTH	*length of tool or tool fragment*	*whole mm*			
WDTH	*width of tool or tool fragment*	*whole mm*			
THCK	*maximum thickness*	*whole mm*			
WGT	weight	to 0.1 gram			
TAXON	*species or animal*	*taxon typed out*			
TAXON2	*species or animal*	*numerically coded*			
	1	large artiodactyl	31	*Canis* sp.	
	2	large artiodactyl?	32	*Canis* sp.?	
	3	small artiodactyl	33	*Vulpes velox*	
	4	small artiodactyl?	34	*Vulpes velox*?	
	5	large mammal	35	Canidae (indet. fox)	
	6	med. to large mammal	41	*Lepus* sp.	
	7	small to med. mammal	42	*Castor canadensis*	
	8	medium mammal	43	*Mustela* cf. *vison*	
	11	*Bison bison*	45	*Ursus* cf. *horribilis*	
	12	*Bison bison*?	71	mammal	
	13	*Cervus elaphus*	72	mammal?	
	14	*Cervus elaphus*?	81	bird	
	16	Cervidae	82	bird?	
	17	Cervidae?	83	Accipitridae	
	21	*Antilocapra americana*	84	Accipitridae (*Buteo* sp.?)	
	22	*Antilocapra americana*?	85	Buteoninae (eagle)	
	23	*Odocoileus* sp.	87	*Anas* sp.	
	24	*Odocoileus* sp.?	99	indeterminate	
ELEM	*element used for tool*	*element typed out*			
SIDE	*element side (left, right, etc.)*	*side typed out*			
PORTION	*element part used for tool*	*part typed out*			

For the present study, we renumbered the ***grouped functional class*** categories, to make generation of tables in SPSS a bit easier; content of this variable is fully relateable to the classes used by Ahler and Ryser. In the current study we made detailed observations about evidence for ***stone tool versus metal tool modification*** only for scapula hoes, and we left this variable blank for specimens unexamined in this regard. We recognized several tools that bore evidence of fabrication by both stone as well as metal tools (code 4). We recorded ***length, width,*** and

thickness data only for classes of artifacts and individual specimens where such data would be useful for characterizing the size and form of complete specimens. That is, highly fragmentary specimens were not extensively measured, and we relied on ***tool part present*** and ***percent of tool present*** to provide useful information on size and fragmentation. All specimens were weighed. In the current study, we did not systematically record data on the type of manufacturing technology or traces evident on each specimen (such as grinding, chopping, flaking, ring-snap, grove and splinter, etc.). Such information would undoubtedly be analytically useful, should a more leisurely examination of the collection allow its recording. In the current database, ***taxon, element, side***, and ***portion*** are spelled out and recorded in all caps. While useful for list printing, such data cannot easily be manipulated in SPSS files. Hence, we also developed a numerically coded list of taxonomic categories. In general, information on taxon, element, and portion is much more detailed than that reported by Ahler and Ryser.

Character and Content of the Collection

We restrict the present discussion to 1,008 recorded bone and antler artifact occurrences that are assigned to Priority 1 contexts and to TP1 – TP4. We analyzed but are here ignoring a small sample of artifacts from TP0 (temporally unassigned) or Priority 3 contexts that made their way through the artifact coding process. Tables 13.2 through 13.4 provide assorted information on the makeup of the sample. Grouped and specific functional classes form the organizational framework for data presentation, and Table 13.2 lists the 35 specific functional classes in the sample, organized by eight functional groups, displaying artifact counts according to use-phase class. Approximately one-quarter of the collection consists of manufacturing residue or specimens broken during manufacture, indicating that much of the process of fabricating bone tools and artifacts occurred on site and left its signature in the collection. Manufacturing information is concentrated only in certain classes of artifacts, however, and especially certain ones that involved trimming away parts of a natural bone element. Digging tools, one of the most abundant general functional groups in the sample, provide almost no manufacturing debris, largely because it cannot easily be distinguished from the fractured bone that makes up the subsistence residue in the site. Production of piercing tools, pressure flakers, fishhooks, and ornaments (beads, tubes, and antler bracelets) left behind abundant residue that is the analog of flaking debris in stone tool production (Table 13.2).

Table 13.3 inventories the taxonomic makeup of the collection according to grouped functional class. A large fraction of the sample cannot be very precisely identified according to taxon, but a few patterns are of note where species or genus can be determined with some certainty. Bison is heavily used for many tool and artifact types, and it is most specifically identifiable in the categories of digging tools (scapula hoes), several patterned forms, and a number of expedient tools that are large and are made from a large section of an element. Deer and pronghorn (particularly the metapodial bones) are most heavily used for production of piercing tools (awls). Wolf/coyote/dog (*Canis* sp.) is heavily involved in production of nonutilitarian items (especially tubes and beads made from metapodial bones). Altogether, bird bone constitutes less than 4% of the collection, and use of bird bone is concentrated in nonutilitarian items such as tubes and beads and in unspecified modified bone artifacts (most are simply polished long bone fragments). Elk, especially elk antler (most recorded as Cervidae

Table 13.2. Use-phase classification according to grouped and specific functional classes for modified bone and antler artifacts, Scattered Village (32MO31), 1998 excavations.

Generalized and Specific Functional Class	Use-Phase Class						Total	
	1 - unfin-ished, useable	2 - unfin., non-useable	3 - finished, useable	4 - finished, non - useable	5 - manuf. debris	6 - resharp. debris	n	%
Digging Tools								
10 cultivating tool			12	165	1		178	17.7
46 exp. digging tool			3	2			5	.5
Subtotal			*15*	*167*	*1*		*183*	*18.2*
%			*8.2*	*91.3*	*.5*		*100.0*	
Piercing Tools								
20 patt. awl/punch		9	13	52	6		80	7.9
45 exped. awl/punch			5	8			13	1.3
Subtotal		*9*	*18*	*60*	*6*		*93*	*9.2*
%		*9.7*	*19.4*	*64.5*	*6.5*		*100.0*	
Pressure Flakers								
22 patt. pressure flaker	1	4	6	38	3		52	5.2
39 broad exp. pressure fl.			7	2			9	.9
43 narrow exp. pressure fl.			9	10			19	1.9
Subtotal	*1*	*4*	*22*	*50*	*3*		*80*	*7.9*
%	*1.3*	*5.0*	*27.5*	*62.5*	*3.8*		*100.0*	
Fishhooks								
30 fishhook	1	7	1	14	21		44	4.4
Subtotal	*1*	*7*	*1*	*14*	*21*		*44*	*4.4*
%	*2.3*	*15.9*	*2.3*	*31.8*	*47.7*		*100.0*	
Other Patterned Tools								
13 abrader			5	2			7	.7
14 patt. pick		1	1	3		1	6	.6
15 hammer/billet				1			1	.1
17 squash knife	1	2	6	16			25	2.
25 basketry tool				5	1		6	.6
26 shaft straightener		1	2	3			6	.6
31 projectile point	1						1	.1
40 scraper handle			2	1		1	4	.4
47 beaver tooth adz			1				1	.1
51 flesher			3	5			8	.8
57 knife handle			4	10			14	1.4
Subtotal	*2*	*4*	*24*	*46*	*1*	*2*	*79*	*7.8*
%	*2.5*	*5.1*	*30.4*	*58.2*	*1.3*	*2.5*	*100.0*	
Other Expedient Tools								
16 bipolar wedge			2				2	.2
18 bipolar anvil			1				1	.1
41 scraper, on soft material			2	1			3	.3
42 scraper, on resist. mat'l			1	2			3	.3
44 surface burnisher			1	1			2	.2
48 exped. adz			7	4			11	1.1
50 exped. pick			4	6			10	1.0
Subtotal			*18*	*14*			*32*	*3.2*
%			*56.3*	*43.8*			*100.0*	

Table 13.2. Use-phase classification according to grouped and specific functional classes for modified bone and antler artifacts, Scattered Village (32MO31), 1998 excavations (concluded).

Generalized and Specific Functional Class	Use-Phase Class						Total	
	1 - unfin-ished, useable	2 - unfin., non-useable	3 - finished, useable	4 - finished, non useable	5 - manuf. debris	6 resharp. debris	n	%
Non-Utilitarian Items								
1 bead	6		60	86	41		193	19.1
2 bracelet	3	25	2	48	50		128	12.7
3 tube	1		11	1	1		14	1.4
4 gaming piece	1		3				4	.4
5 whistle				1			1	.1
8 nonutilitarian, unspecified	2	1	7	7			17	1.7
9 effigy (bird)				3			3	.3
Subtotal	*13*	*26*	*83*	*146*	*92*		*360*	*35.7*
%	*3.6*	*7.2*	*23.1*	*40.6*	*25.6*		*100.0*	
Miscellaneous								
0 unknown		9	1	60	21		91	9.0
54 unspec. rib tool		6		19	5		30	3.0
58 unspec. antler tool	1	2		3	10		16	1.6
Subtotal	*1*	*17*	*1*	*82*	*36*		*137*	*13.6*
%	*.7*	*12.4*	*.7*	*59.9*	*26.3*		*100.0*	
Total	18	67	182	579	160	2	1,008	100.0
	1.8	6.6	18.1	57.4	15.9	.2	100.0	

Table 13.3. Taxonomic classification of modified bone and antler artifacts according to grouped functional classes, Scattered Village (32MO31), 1998 excavations.

Taxon		Functional Group								
		1 Digging Tools	2 Piercing Tools	3 Pressure Flakers	4 Fishhooks	5 Other Patt. Tools	6 Other Exped. Tools	7 Non-Utilit. Items	8 Misc.	Total
large artiodactyl	n	112	12	59	1	51	19	4	35	293
	%	*61.2*	*12.9*	*73.8*	*2.3*	*64.6*	*59.4*	*1.1*	*25.5*	*29.0*
large artiodactyl?	n	24		6		5	1		3	39
	%	*13.1*		*7.5*		*6.3*	*3.1*		*2.2*	*3.9*
small artiodactyl	n		11	2	2	2				17
	%		*11.8*	*2.5*	*4.5*	*2.5*				*1.7*
small artiodactyl?	n		2							2
	%		*2.2*							*.2*
large mammal	n	3	3	4				8	3	21
	%	*1.6*	*3.2*	*5.0*				*2.2*	*2.2*	*2.1*
med. to large mammal	n	13	25	7	26	3	2	6	54	136
	%	*7.1*	*26.9*	*8.8*	*59.1*	*3.8*	*6.3*	*1.7*	*39.4*	*13.4*
small to med. mammal	n							5	5	10
	%							*1.4*	*3.6*	*1.0*
medium mammal	n				2	1		3	2	8
	%				4.5	1.3		.8	1.5	.8
Bison bison	n	29		1		9	10	1		50
	%	*15.8*		*1.3*		*11.4*	*31.3*	*.3*		*4.9*
Bison bison?	n				2					2
	%				*4.5*					*.2*

Table 13.3. Taxonomic classification of modified bone and antler artifacts according to grouped functional classes, Scattered Village (32MO31), 1998 excavations (continued).

		Functional Group								
Taxon		1 Digging Tools	2 Piercing Tools	3 Pressure Flakers	4 Fishhooks	5 Other Patt. Tools	6 Other Exped. Tools	7 Non-Utilit. Items	8 Misc.	Total
Cervus elaphus	n		2			5		7	2	20
	%		*2.2*			*6.3*		*1.9*	*1.5*	*2.0*
Cervus elaphus?	n							1	1	2
	%							*.3*	*.7*	*.2*
Cervidae	n							111	6	117
	%							*30.8*	*4.4*	*11.6*
Cervidae?	n				1			3	1	5
	%				*2.3*			*.8*	*.7*	*.5*
Antilocapra americana	n		10							10
	%		*10.8*							*1.0*
Antilocapra americana?	n		1							1
	%		*1.1*							*.1*
Odocoileus sp.	n		2			2			3	7
	%		*2.2*			*2.5*			*2.2*	*.7*
Odocoileus sp.?	n		3							3
	%		3.2							.3
Canis sp.	n				2			52	4	58
	%				*4.5*			*14.4*	*2.9*	*5.7*
Canis sp.?	n							18		18
	%							*5.0*		*1.8*
Vulpes velox	n		1					27		28
	%		*1.1*					*7.5*		*2.8*
Vulpes velox?	n							6		6
	%							*1.7*		*.6*
Canidae (indet. fox)	n							9		9
	%							*2.5*		*.9*
Lepus sp.	n							2		2
	%							*.6*		*.2*
Castor canadensis	n					1				1
	%					*1.3*				*.1*
Mustela cf. vison	n							2		2
	%							*.6*		*.2*
Ursus cf. horribilis	n							1		1
	%							*.3*		*.1*
mammal	n	2	3		5			38	7	55
	%	*1.1*	*3.2*		*11.4%*			*10.6*	*5.1*	*5.4*
mammal?	n							3		3
	%							*.8*		*.3*
bird	n		2		1			5	7	15
	%		*2.2*		*2.3*			*1.4*	*5.1*	*1.5*
bird?	n		1		2			8	3	14
	%		*1.1*		*4.5*			*2.2*	*2.2*	*1.4*
Accipitridae	n							1	1	2
	%							*.3*	*.7*	*.2*
Accipitridae (Buteo sp.?)	n							1		1
	%							*.3*		*.1*
Buteoninae (eagle)	n							4		4
	%							*1.1*		*.4*

Table 13.3. Taxonomic classification of modified bone and antler artifacts according to grouped functional classes, Scattered Village (32MO31), 1998 excavations (concluded).

		Functional Group								
Taxon		1 Digging Tools	2 Piercing Tools	3 Pressure Flakers	4 Fishhooks	5 Other Patt. Tools	6 Other Exped. Tools	7 Non-Utilit. Items	8 Misc.	Total
Anas sp.	n							1		1
	%							*.3*		*.1*
indeterminate	n		15	1				33		49
	%		*16.1*	*1.3*				*9.2*		*4.8*
Total	n	183	93	80	44	79	32	360	137	1,012
	%	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Table 13.4. Completeness in modified bone and antler artifacts according to grouped functional classes, Scattered Village (32MO31), 1998 excavations.

		Tool Part Present								
Functional Group		1 whole	2 nearly whole	3 proximal end	4 distal end	5 medial segment	6 lateral fragment	8 manuf. debris	9 indet. part	Total
Digging Tools	n	15	4	6	8		1	1	148	183
	%	*8.2*	*2.2*	*3.3*	*4.4*		*.5*	*.5*	*80.9*	*100.0*
Piercing Tools	n	17	2	19	24	22		6	3	93
	%	*18.3*	*2.2*	*20.4*	*25.8*	*23.7*		*6.5*	*3.2*	*100.0*
Pressure Flakers	n	23	13	19	5	7	3	3	7	80
	%	*28.8*	*16.3*	*23.8*	*6.3*	*8.8*	*3.8*	*3.8*	*8.8*	*100.0*
Fishhooks	n	2	2	6	2	10		21	1	44
	%	*4.5*	*4.5*	*13.6*	*4.5*	*22.7*		*47.7*	*2.3*	*100.0*
Other Patterned	n	26	4	2	4	1	6	2	34	79
Tools	*%*	*32.9*	*5.1*	*2.5*	*5.1*	*1.3*	*7.6*	*2.5*	*43.0*	*100.0*
Other Expedient	n	18			1	2			11	32
Tools	*%*	*56.3*			*3.1*	*6.3*			*34.4*	*100.0*
Non-Utilitarian	n	93	11	30		36	31	93	66	360
Items	*%*	*25.8*	*3.1*	*8.3*		*10.0*	*8.6*	*25.8*	*18.3*	*100.0*
Miscellaneous	n	2				2		36	97	137
	%	*1.5*				*1.5*		*26.3*	*70.8*	*100.0*
Total	n	196	36	82	44	80	41	162	367	1,008
	%	*19.4*	*3.6*	*8.1*	*4.3*	*7.9*	*4.1*	*16.1*	*36.4*	*100.0*

in Table 13.3), is prominently represented in the production of nonutilitarian items (bracelets).

Table 13.4 illustrates data on the degree of fragmentation or portion of artifact present according to grouped functional classes. Overall, less than one-quarter of the artifacts have survived into the record in whole or nearly whole condition. There is a strong relationship between degree of fragmentation, artifact size, patternedness, and function. Large patterned artifacts such as digging tools tend to be the most completely fragmented in the extant collection. This is due in part to the stresses these tools endured during use, and is also due to the extent of resharpening through fracture as well as mere size and degree of wear that allow a single artifact

to be broken into literally dozens of functionally recognizable specimens. Fishhooks, although very small, are also highly fragmented, but in this case fracture has in part to do with their delicate nature and stress placed on them while in use.

Functional Class Descriptions

Digging Tools

One hundred eighty-three digging tools comprising 18% of the artifact sample occur in the collection. Among these, 178 or the vast majority are ***patterned digging tools***, consisting of 177 scapula hoes and fragments (e.g., Figure 13.1, Figure 13.2b-e) and one fragment of a bison frontal bone hoe (Figure 13.2f). Five ***expedient digging tools***, characterized by distinctive wear consisting of edge rounding, high gloss, and striations, occur in the collection (e.g., Figure 13.2g,h). Only a single piece of hoe manufacturing debris is recognized in the collection (Figure 13.2a). Figure 13.1 illustrates a particularly large sample of unbroken, use-phase class 3 scapula hoes found in pit Feature 175. This group of artifacts (Figure 13.1) apparently existed as a stored cache or assemblage available for continuing use in the storage feature. These specimens illustrate well the process of attrition and reuse on such specimens and the high degree of curation afforded this particular artifact class. Hafting was facilitated by securing a cord or binding through a notch cut in either lateral margin of the blade. In Figure 13a, these notches are clearly visible; on many fractured, reused, and resharpened specimens, multiple sets of notches were created as the broader and more distal part of the blade fractured away during use.

Close inspection of the single piece of manufacturing debris (Figure 13.2a) and many other specimens revealed some interesting details about the process of manufacture. A large number of specimens (n=55) retain distinctive scars from contact with a narrow-bitted stone punch that was used to fracture off the spine of the scapula and flatten the scar where the spine was removed. Scars from this particular kind of tool are abundant on many specimens (Figure 13.3, 13.4). In some cases, the placement and spacing of the scars suggests that the stone punch was held and placed by hand before being struck with a percussor; in other cases (E.g., Figure 13.3b), it appears that the stone tool must have been hafted as the point of a pick-like tool that was swung with force against the scapula spine, leading to many slightly glancing contacts and elongated gouges in the bone surface. The contact scar from the stone tool is typically 2-4 mm wide. We believe it likely that stone artifacts we have classified as bipolar core/punch/wedge/chisels (class 25) or simply punch/wedge/chisels (class 26) were used for this purpose.

Manufacturing traces from the use of metal tools of substantial size are also evident on a smaller number of the scapula hoes (n=9). Typically, these are overlapping, planar scars where the flat, straight edge of the metal tool was used to chop away bone mass and flatten the scapula surface by striking a low, glancing blow (Figure 13.5). A few hoes exhibit evidence of having been shaped with both stone punches and metal tools (e.g., Figure 13.4b). Several of the metal tool contact and cut marks are quite large, suggesting use of a fairly large and heavy piece of iron, much larger than anything recovered in the metal artifact assemblage. It is quite reasonable

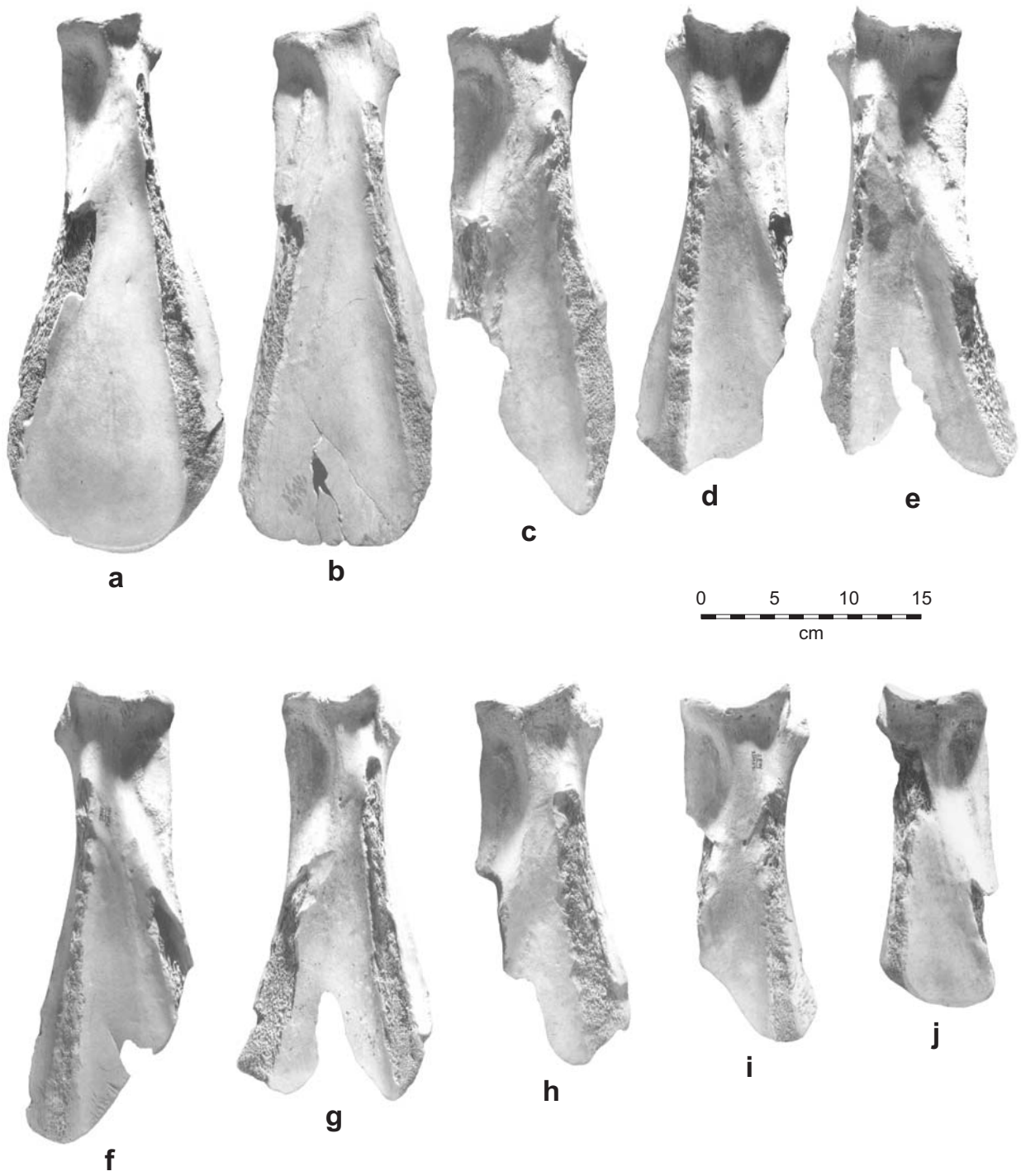

Figure 13.1. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-j: functional, use-phase class 3 scapula hoes found in Feature 175, illustrating shortening during use-life due to successive fracture and resharpening.

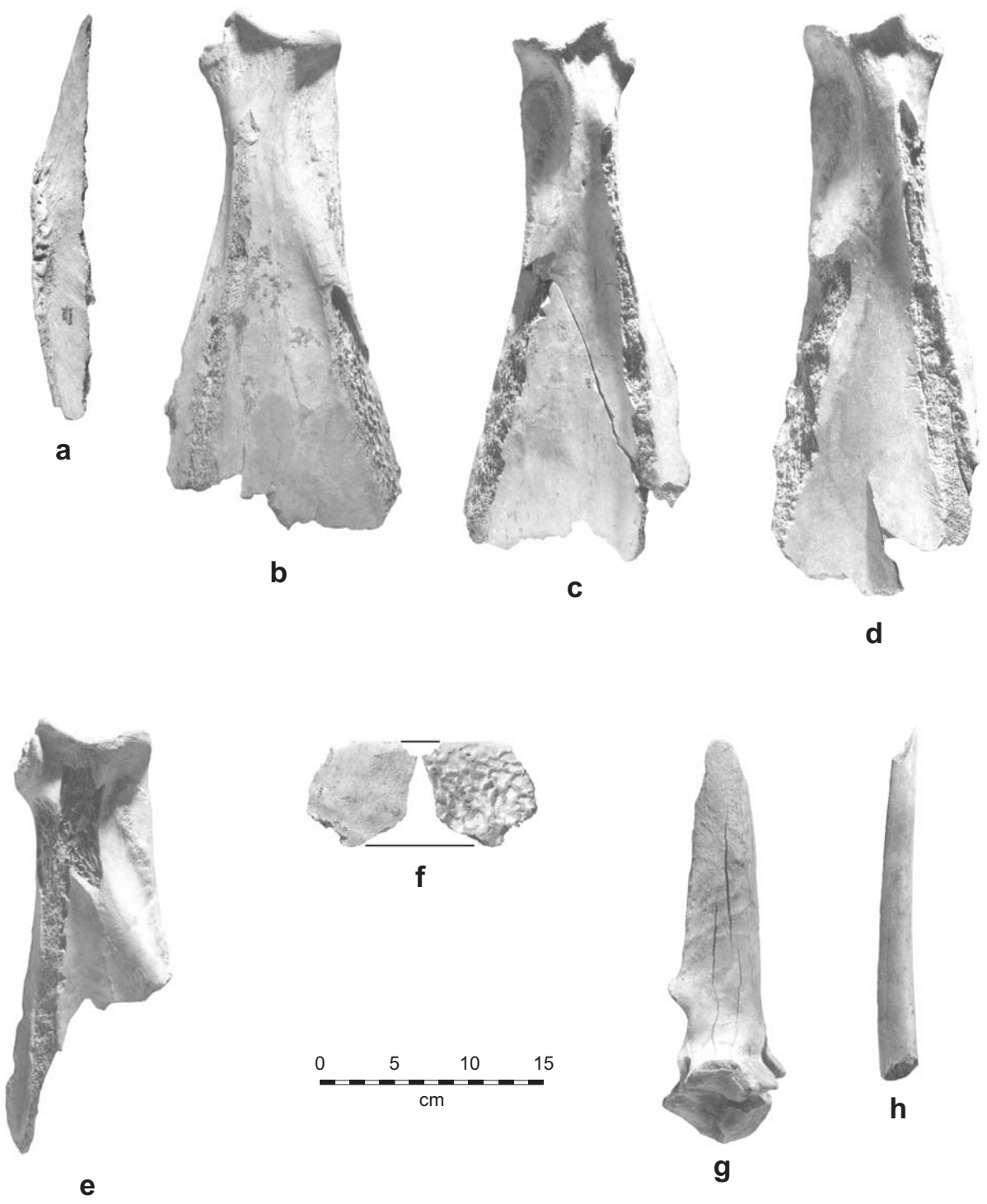

Figure 13.2. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-e: scapula digging tools, including manufacturing residue (a) and usable and discarded specimens; f: bison frontal bone digging tool; g,h: expedient digging tool.

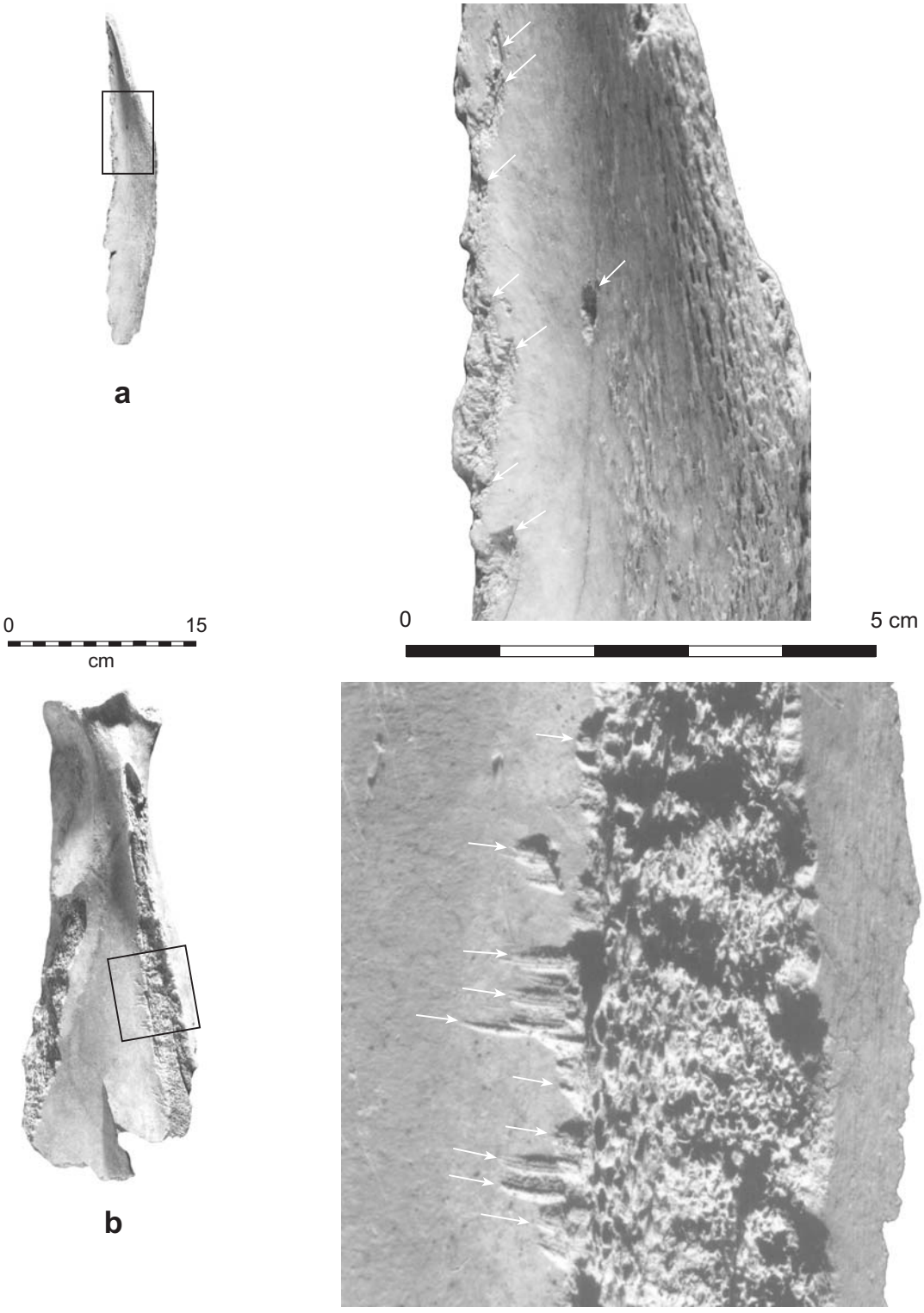

Figure 13.3. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a: scapula spine removed during manufacture showing scars from stone tool punch marks; b: detail of stone tool punch marks used for spine removal on scapula hoe.

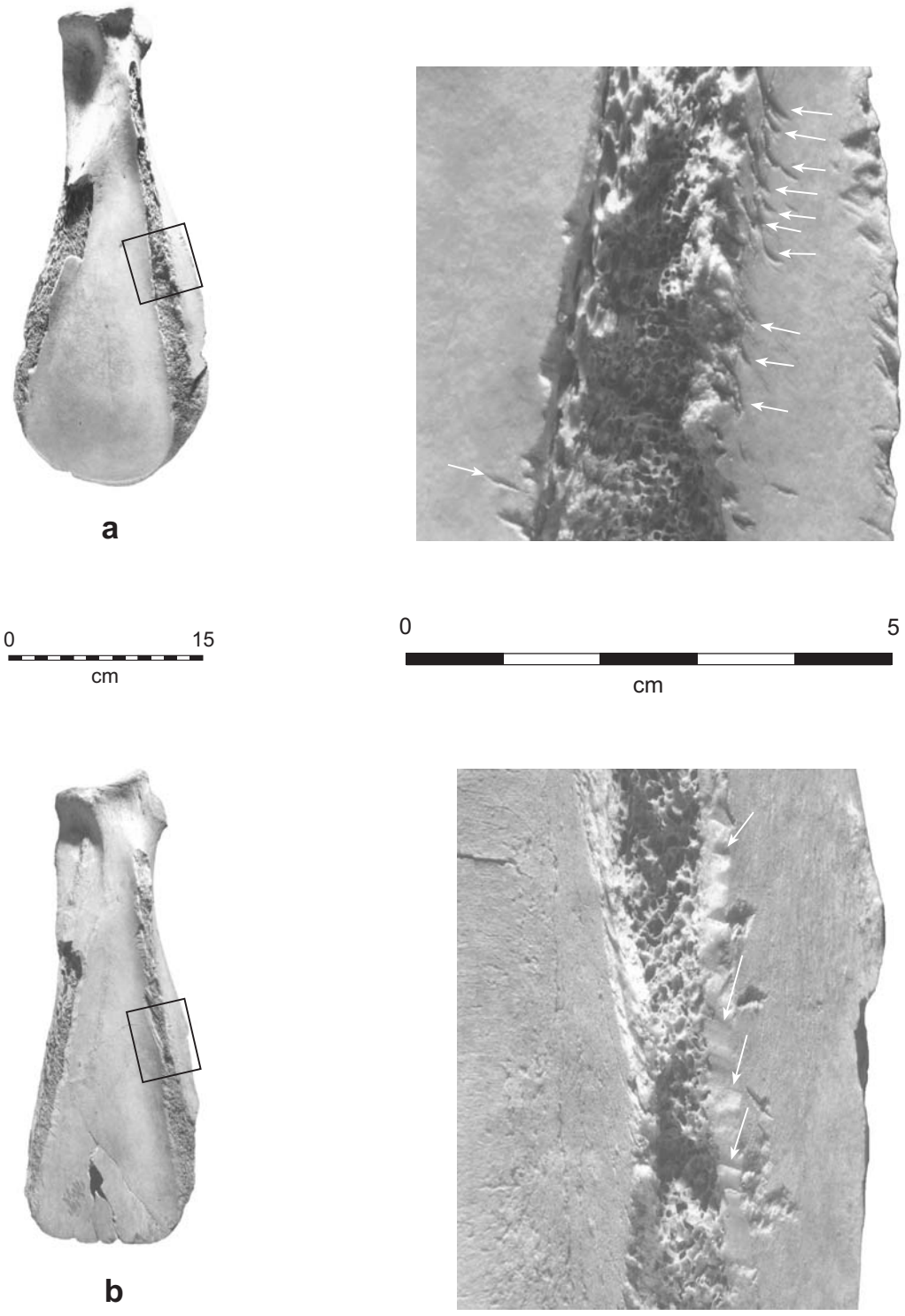

Figure 13.4. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a: detail of scapula digging tool showing stone tool punch marks from spine removal; b: detail of scapula hoe showing combination of detail from stone tool punch marks and planar scars from a metal tool used in spine removal.

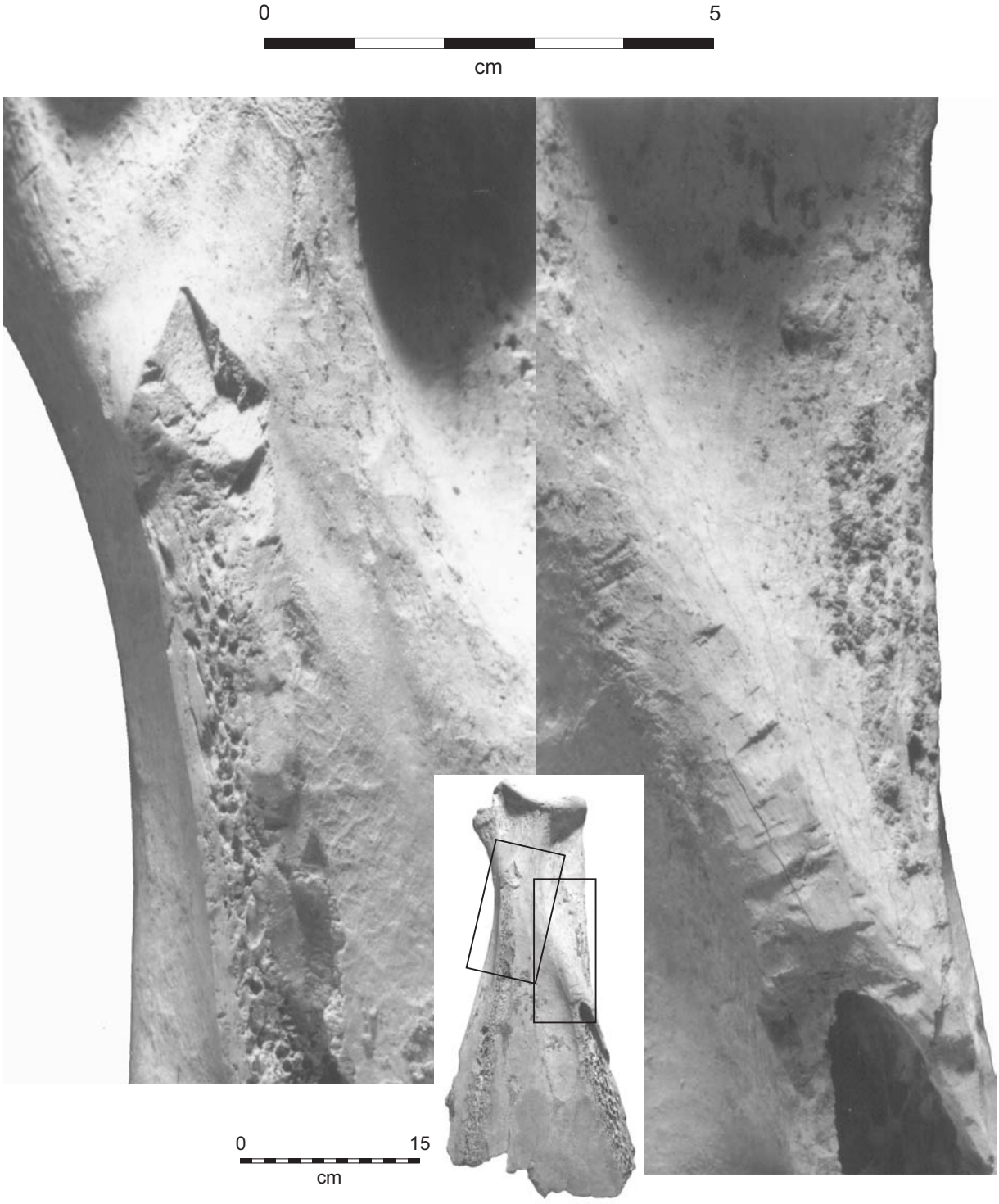

Figure 13.5. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. Detail of scapula hoe showing numerous overlapping planar scars from metal tool used in spine removal and thinning.

that the largest iron tools were uncommon and highly valued, and they would not have found their way into the archaeological deposits until exhausted beyond possibility of reuse.

Piercing Tools

There are 93 piercing tools in the collection, with the majority (n=80) consisting of ***patterned awls*** and the remainder (n=13) ***expedient awls/punches***. Remnants from manufacture (n=9) and specimens broken during fabrication (n=6) are relatively common (Table 13.2) (e.g., Figure 13.6a-c) and provide clear evidence for a common manufacturing process for the patterned specimens. Most patterned specimens are made from the metacarpal or metatarsal bone of pronghorn or deer. Using the groove and split technique, the element was grooved or slotted longitudinally in several places and a single element was then split apart into pieces for four or more awls. The linear grooves must have been cut with a sharp, stout, pointed stone tool. A unifacial beak could have been used for this purpose, but such specimens are rare in the collection. More likely, radial break pieces or bipolar splinters were used for this purpose, but were altered so little in the process that few have been recognized as slotting tools. Several finished specimens exhibit remnants of the splitting grooves along their lateral margins (e.g., Figure 13.6d,f). A few patterned awls were made from bird bone (Figure 13.6j,k), and bird elements were probably fashioned in the same manner. The patterned awls typically exhibit a high degree of smoothing and polish from both use and prehension over the entire tool surface, including at the tapered tip as well as across the blunt end of the artifact. Expedient awls/punches are far less formalized in shape, and generally consist of bone splinters, fragments, or even whole elements with a convenient pointed shape that was modified into a perforating tool with minimal grinding and sharpening (Figure 13.7d-f). A few antler tines with abrasion and smoothing heavily concentrated at the tip (Figure 13.7g,h) are classified as expedient awls or, more likely, punches used to perforate or indent semi-resistant work material.

Pressure Flakers

Three kinds of pressure flaker (n=80) occur in the collection (Table 13.2). The most common one (n=52) is the ***patterned pressure flaking tool*** made from a stout section of bison or other large mammal rib (Figure 13.8). There is considerable evidence in the collection for the method of manufacture for these specimens. They were typically made from a long section of rib that was split, with the exterior portion being used for the tool. The rib was narrowed by removal of marginal bone from repeated blows from a stone punch. Scars from stone punches exist on several specimens (Figure 13.8a,b,h), being very similar to the fabrication marks on scapula hoes. In this case, the blows from the punch are placed very close together and are struck into the face of the rib near its margin, chipping away mass bit by bit. Figure 13.8h shows a long section of rib partially shaped but not further finished. After the appropriate tool width was achieved, the finished tool was formed by coarsely grinding the chipped edges and the cancelleous tissue on the split face. The ends of the pressure flaker were ground into functional form by coarse abrasion. Some finished patterned pressure flakers were apparently quite long when first made, as evident from pieces that probably reflect only halves of complete specimens (e.g., Figure 13.8c,d,h). A used pressure flaker is characterized by smoothing and a low degree of polish along its length, apparently from prehension, except for on the blunt end surfaces which are the business end(s) of the tool. The blunt ends are always characterized by coarse scarring

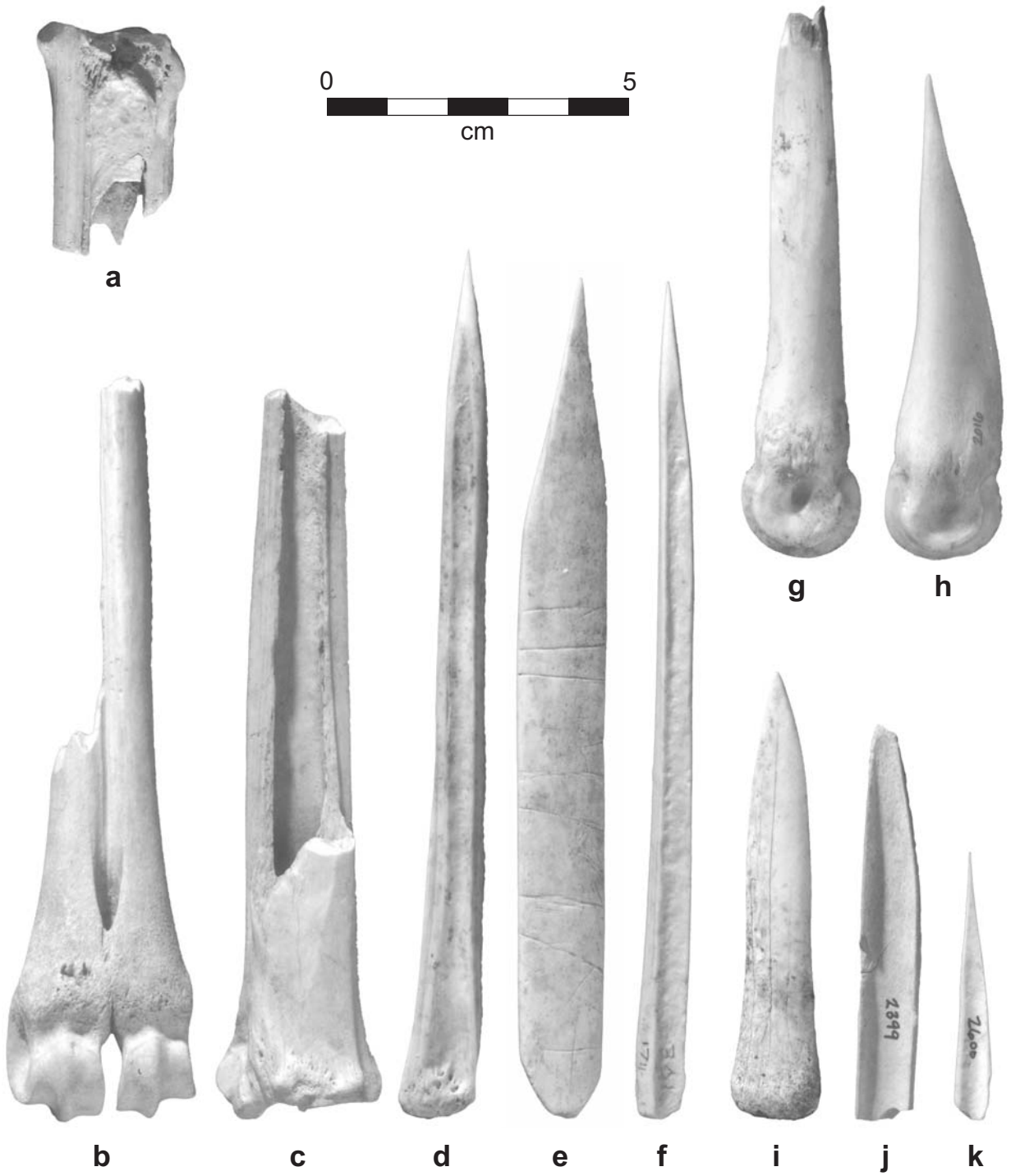

Figure 13.6. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. Patterned bone awls. a: manufacturing waste; b,c, specimens broken during manufacture; d-i: usable specimens; j,k: fragments of bird bone specimens.

Figure 13.7. Photographs of modified bone and antler tools, Scattered Village (32MO31), 1998 excavations. a-c: extensively shaped basketry or weaving tools; d-f: expedient bone awls or punches; g,h: antler tines used expediently for perforating or punching.

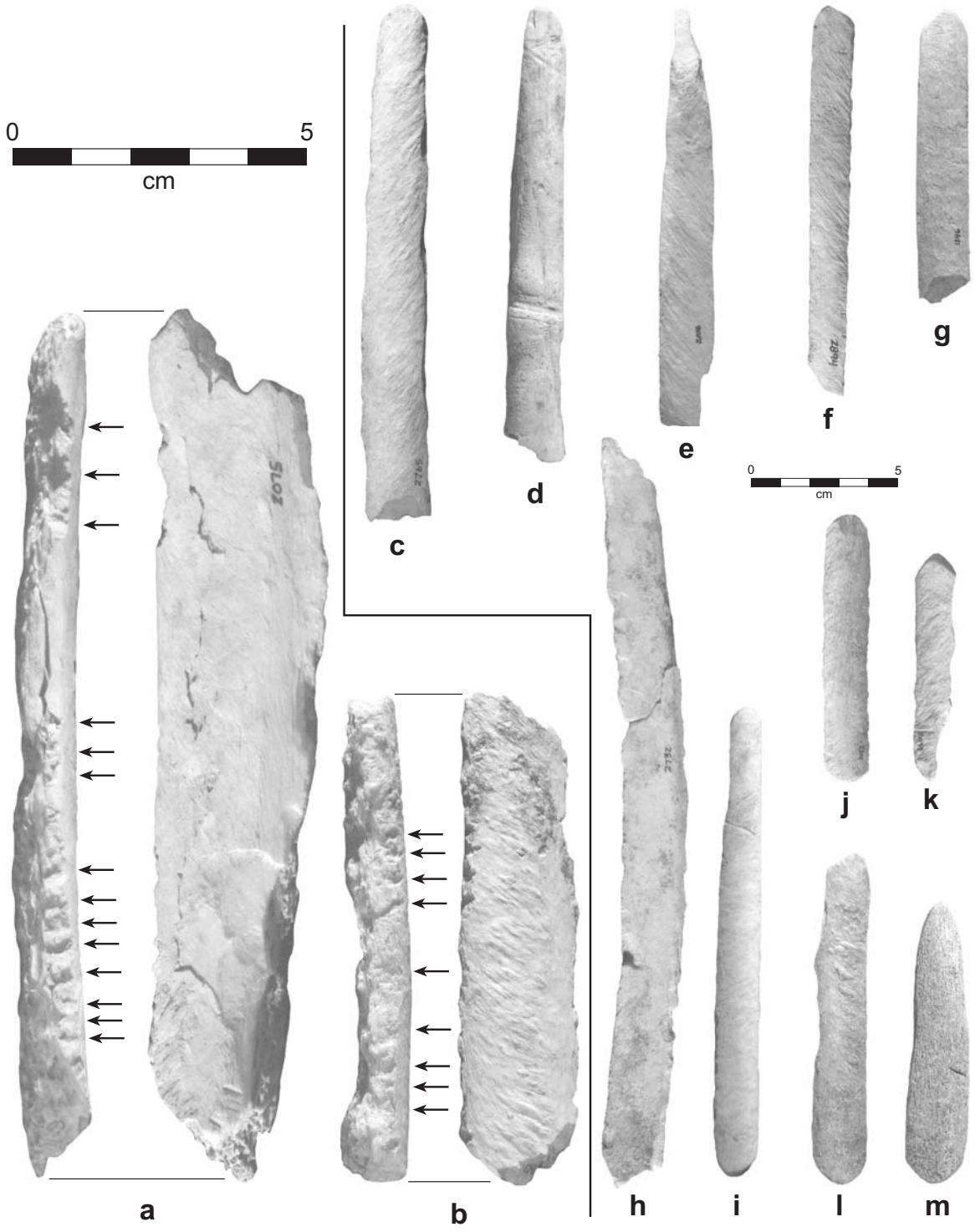

Figure 13.8. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. Patterned pressure flakers in various stages of manufacture. a,b: manufacturing waste and breakage showing detail of stone tool punch marks used to narrow the specimen; c-g; ends of long, broken specimens; h: unfinished specimen; i-m: finished, usable specimens.

and abrasion, from a combination of intentional grinding to achieve or maintain the optimal contact surface and from contact with the stone artifact that was pressure flaked. We did not see flint or chert chips embedded in the working ends of these tools, but a more systematic microscopic examination and study with an SEM would undoubtedly reveal such irrefutable evidence of tool function as has been done with sheep horn flakers in the Southwest (Geib 2000). Nearly all of the patterned pressure flakers are characterized by broad contact areas on one or both ends, indicating use for robust flake removal (one exception, with a narrowed tapered flake tip, is shown in Figure 13.8e). Patterned flakers do not occur in combination with bone awls or any other tool form.

Expedient pressure flakers (Figure 13.9) are identified by a lack of lateral and facial shaping and the presence of a blunt, use-scarred end, worn from contact with a chipped stone tool margin. We have divided these into two specific functional classes based on the width and robustness of the working end. ***Broad-tipped expedient pressure flakers*** (n=9) have relatively robust working ends and were apparently used for indelicate stone tool shaping (Figure 13.9a-d). Some of these are rather robust tools, overall, consisting of lengths of rib that would have allowed substantial leverage and force when in use. ***Narrow-tipped expedient pressure flakers*** (n=19) appear as they are named, and in some cases have very narrow working ends with a scarred contact surface only 2-3 mm in width (Figure 13.9e-i). One can imagine that such tools would have been useful or even necessary for such specialized tasks as flaking the notches into arrowpoints. One very interesting artifact (Figure 13.13.e) involves both a narrow-tipped flaker and broad-tipped flaker on opposite ends of an arrowshaft straightener.

Certain kinds of distributional and association studies should prove fruitful with these specimens, but were not pursued in this report. If the patterned pressure flakers were used selectively for a particular kind of stone tool modification (for example, sharpening end scrapers), then this should be demonstrable through studies of spatial association between bone tools, stone tools, and certain kinds and types of flaking debris. If narrow-tipped pressure flakers are in fact useful for arrowpoint manufacture, a predicable association should occur in the archaeological context between such tools and waste from arrowpoint production.

Fishhooks

Fishhooks are relatively common in the sample (total n=44), and pieces of manufacturing residue and fragments of specimens broken during manufacture are more common than finished specimens (Table 13.2). A typical manufacturing process involved isolation of a section of mammal long bone diaphysis of suitable thickness and durability, then gradual isolation of the hook form through a combination of drilling and carving away of unwanted material. Drill holes and partially isolated and reduced shank pieces are evident in broken incomplete specimens (Figure 13.10e-g). Our identification of manufacturing residue pieces is somewhat speculative; we have included the proximal end of a *Canis* sp. femur (Figure 13.10b), because the shaft diameter and wall thickness match that in several hooks and the femur shaft would have been much larger than any beads or tubes in the collection. A single fishhook blank, not completely finished, occurs in the sample (Figure 13.10i), as does a single finished and unbroken hook (Figure 13.10j). The shank part of finished hooks was sometimes scored for more secure

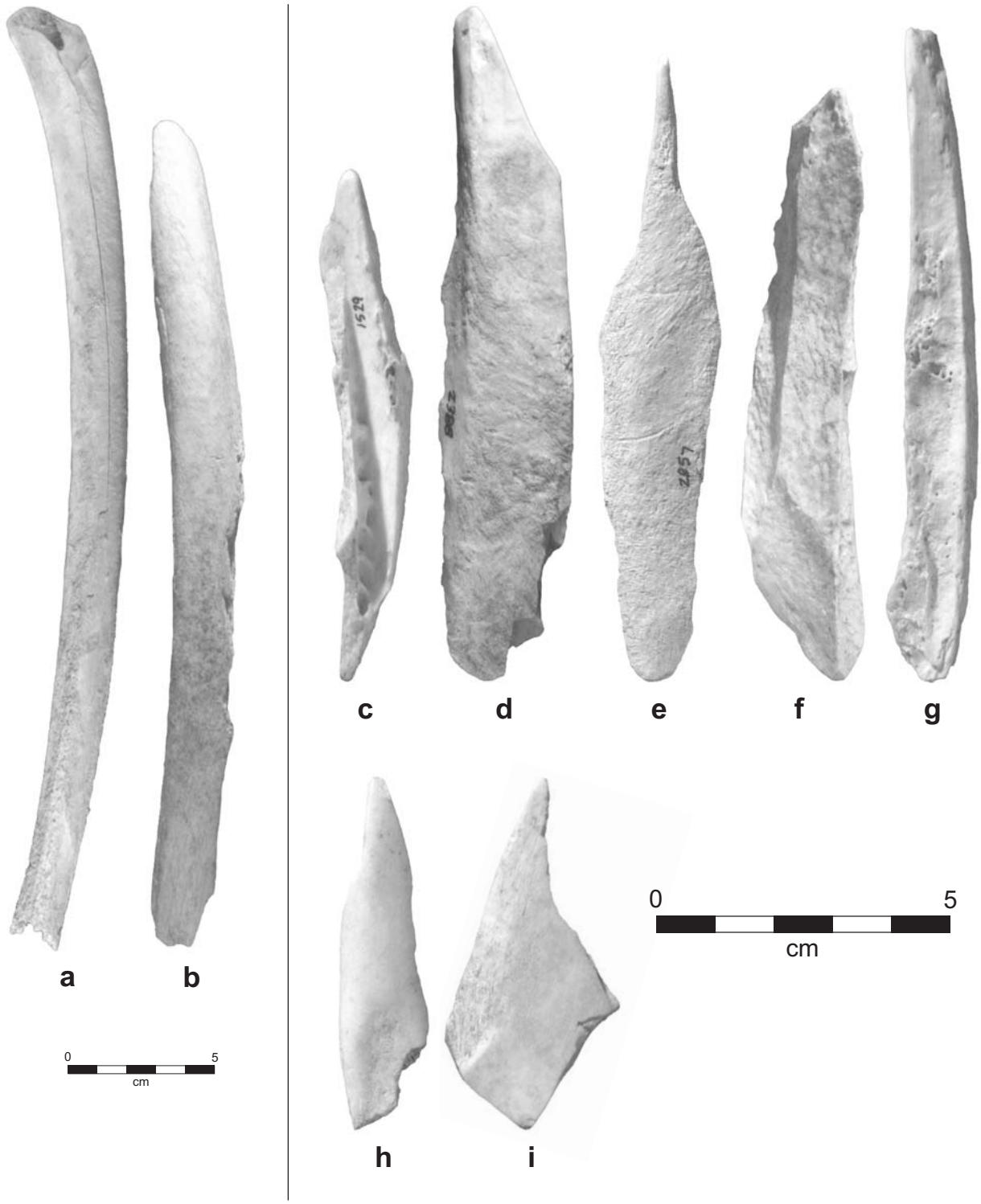

Figure 13.9. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-d: expedient pressure flakers with broad tips; e-i: expedient pressure flakers with narrow tips.

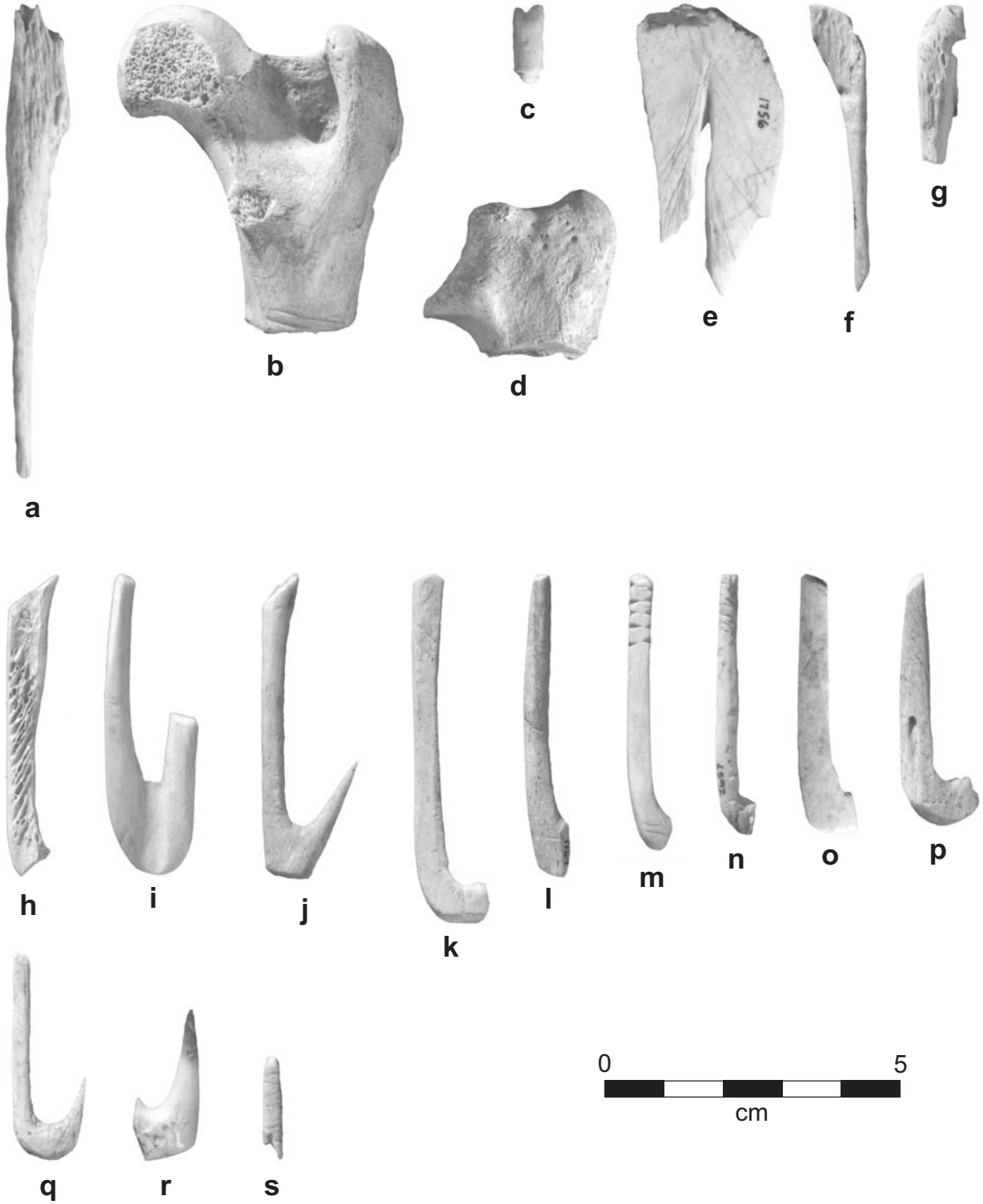

Figure 13.10. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. Fishhooks in various stages of manufacture and use. a-d: manufacturing waste; e-h: hooks broken during manufacture; i: unfinished hook; j: finished, useable hook; k-s: broken discarded specimens.

attachment to a line, but often was left unscored but sometimes expanding in diameter near the attachment end.

Other Patterned Tools

Eleven more specific functional classes are placed within this general group that broadly consists of utilitarian items that required substantial modification for fabrication and that also occur in relatively small numbers. Most of these artifacts occur as whole or fragmentary, finished specimens, although small numbers of manufacturing debris and failures occur in some classes (Table 13.2).

We have tentatively identified what we are calling ***basketry tools*** in the current collection (n=6). Though some are fragmentary, all specimens are similar in form and appear to be a specialized implement. They are typically made on a heavy rib or vertebral spine section or long bone shaft piece that retains cancellous tissue on one face. The tool has a flattened cross section, an even more flattened and rounded proximal end, and a distinctly flattened bluntly pointed element on the opposite end (Figure 13.7a-c). The flattened shape of the pointed end distinguishes these artifacts from those classified as awls. All surfaces of these tools are heavily shaped and very smooth, indicating intensive use and handling. The ends lack scarring that is apparent on pressure flakers, and the pointed end lacks concentrated polishing wear that is common on the working ends of awls.

Abrading tools made from sections of cancellous tissue found within the ends of large long bones occur in small numbers (n=7). These occur in two forms. One is small flat section or shaped piece that consists of nothing but cancellous tissue (Figure 13.11 a-c,f,g); these would be quite versatile, with abrading surfaces on all facets, but they are not particularly sturdy. The other form is larger and consists of less completely shaped, hand-sized long bone portions (humerus and femur pieces; Figure 13.11d,e) that are more sturdy implements. Tools of the latter form are typically called hide grainers, used ethnographically in one or more stages of hide thinning and softening.

A single specimen is identified as a ***hammer*** or ***billet*** (Figure 13.11h). It consists of a short basal section cut from the butt of a deer antler. The articular end has been evenly shaped and the marginal burrs reduced. We infer that this is a freehand percussion tool used in flintknapping.

Several whole and fragmentary ***squash knives*** occur in the collection (n=25; Table 13.2). A few complete specimens indicate that some newly made artifacts were roughly square in shape, having been cut from the thinnest and broadest part of a bison or elk scapula, with one of the four margins carefully thinned and sharpened by scraping and abrasion. Four complete specimens (Figure 13.12) were found in pit Feature 132 (Block 9), and a similar square specimen was found in pit Feature 68 (Block 2).

A small number of ***shaft straighteners*** occur in the collection (n=6). These are large mammal ribs bearing one or more symmetrical holes ca. 1.0 cm in diameter (Figure 13.13). One specimen is particularly informative regarding manufacturing technology. This specimen bears

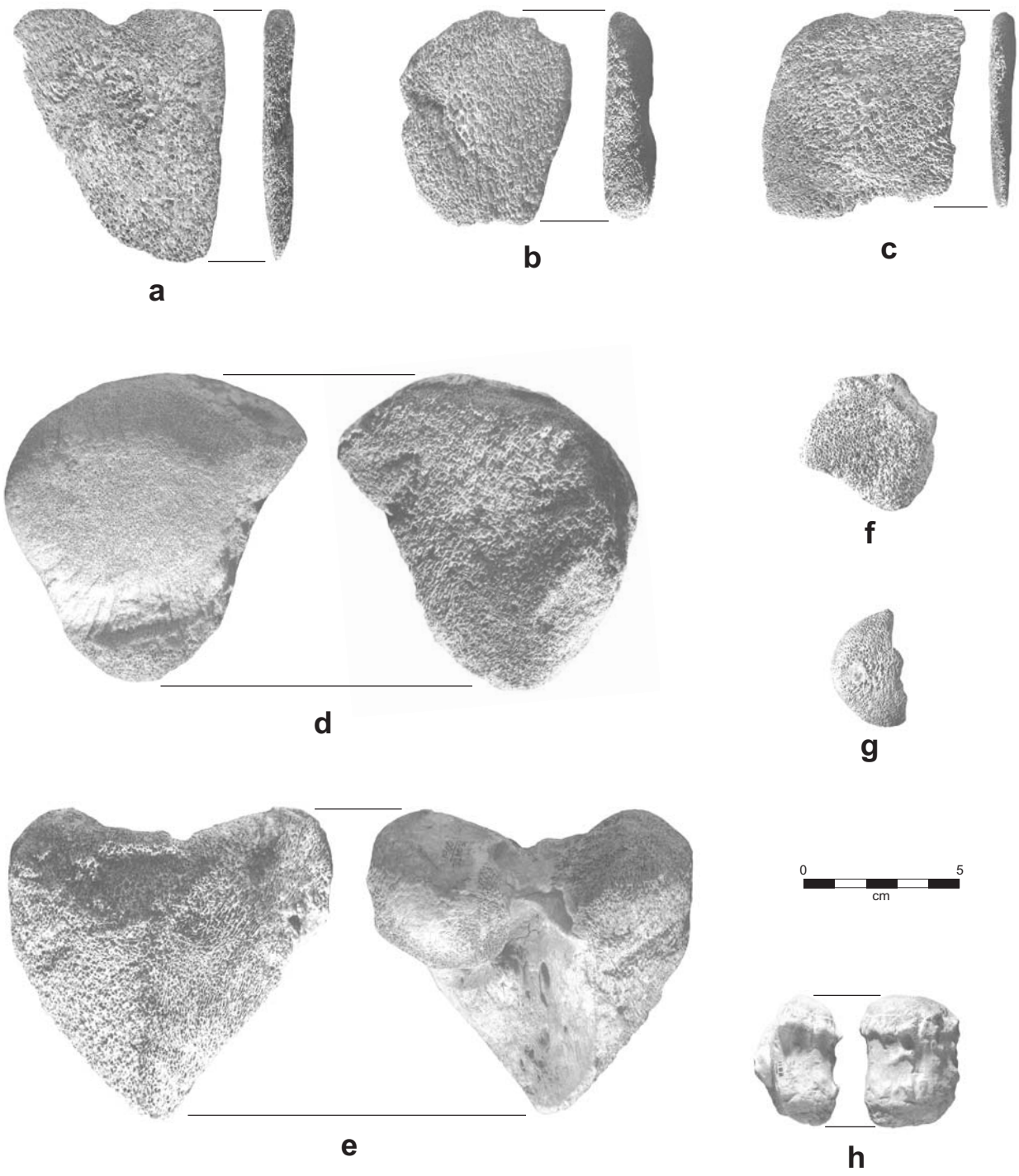

Figure 13.11. Photographs of modified bone and antler tools, Scattered Village (32MO31), 1998 excavations. a-g: patterned abraders made on large pieces of cancellous tissue; h: basal section of antler shaped and used as a hammer or billet.

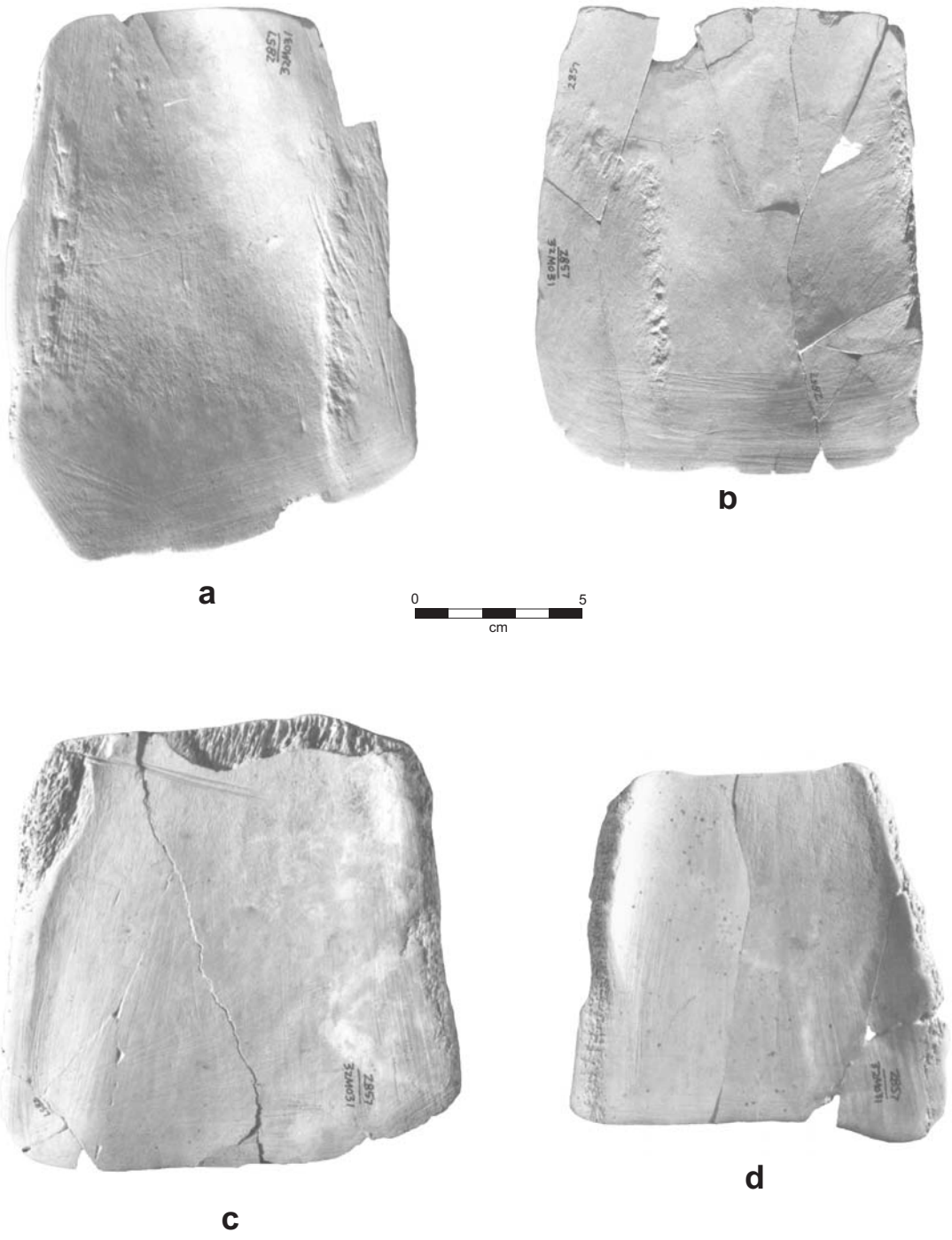

Figure 13.12. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-d: complete, usable squash knives from Feature 132; all breakage is post-depositional.

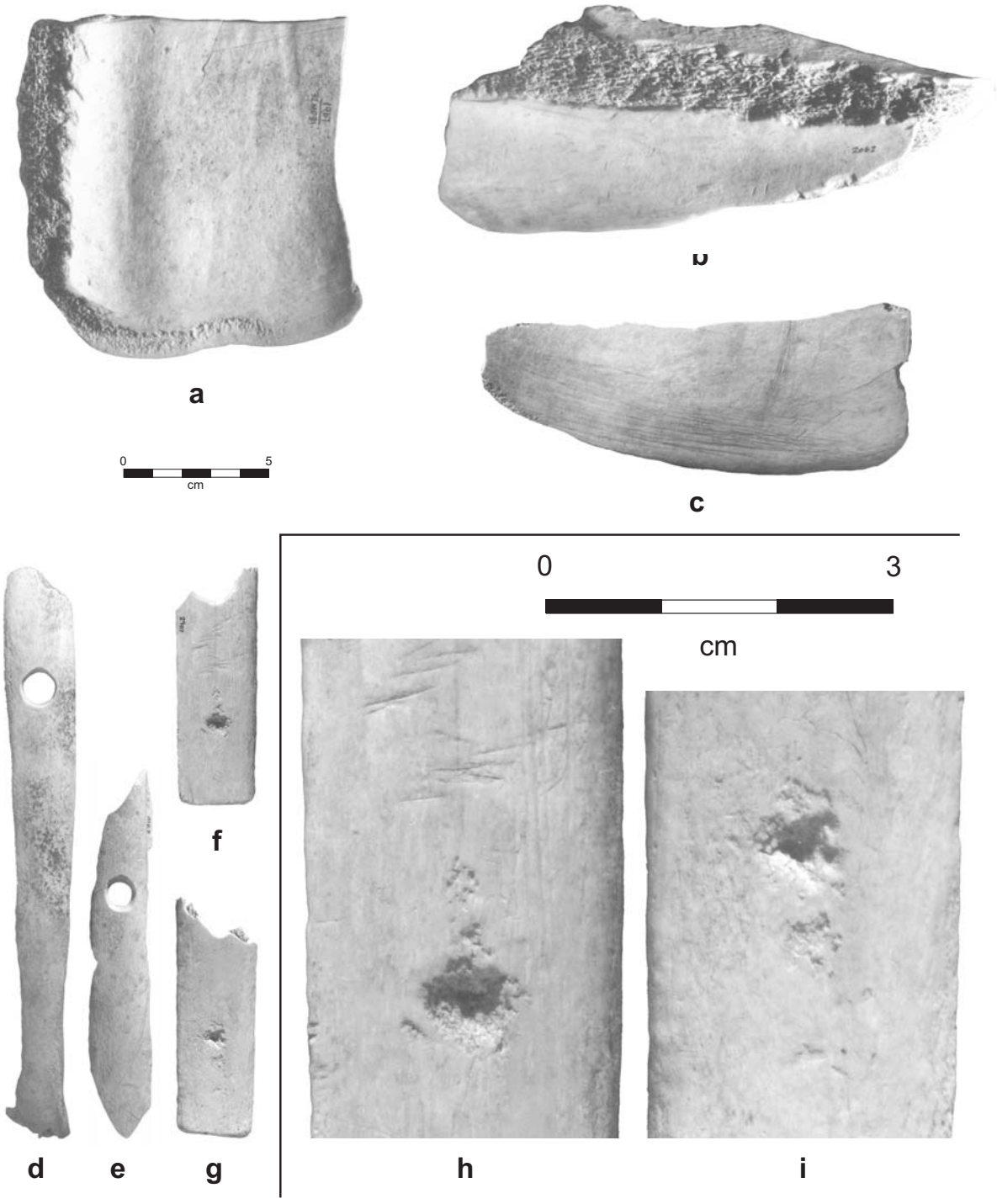

Figure 13.13. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-c: squash knives, complete and fragmentary; d-g: arrowshaft straighteners; (e) is also an expedient pressure flaker on both ends; (f) and (g) are opposite faces of same specimen; h,i: detail of opposite faces showing partial perforation created with stone punch, and possible metal knife cut marks in (h).

small depressions interpreted to be the start of new holes on opposite faces (Figure 13.13h,i); these pits were apparently made with the pointed end of a stone punch. Again, a bipolar percussion core or splinter would have functioned well for this purpose. One particular tool combines a shaft straightening hole with a narrow-bitted pressure flaker and a broad-bitted pressure flaker at either end (Figure 13.13e).

A small number of ***patterned picks*** occur in the collections (n=6). These are all made on massive sections of bone (one bison radius and one large mammal scapula are identified) that is shaped by percussion flaking into a linear form (Figure 13.14e,f). The presence of percussion flaking and shaping distinguishes these tools from expedient picks (discussed below). Typically, the slightly narrower or bluntly pointed end of the specimen exhibits rounded abrasion and distally concentrated wear, in addition to axially directed impact fractures, indicating that the tool was used in a pick-like fashion to penetrate relatively hard work material. One specimen is classified as resharpening debris and consists of the distal end of a pick that has been removed by ring and snap fracture (Figure 13.14f).

Four ***elk antler scraper handles*** occur in the collection (Figure 13.14a,b). Two complete useable specimens were found in pit Features 142 (Block 6) and 175 (Block 9). All working ends (n=3) appear to have been fitted for stone scraper bits, based on the concave nature of the area where the bit or blade fits into the handle (see Figure 13.14a). Two of these occur in postcontact contexts (TP1 and TP2) while the other is from a TP4 context. One specimen assigned to TP4, presumably precontact in age, is a portion of a scraper apparently cut from the main handle with blows from a heavy metal tool (Figure 13.14a); it also bears cut marks or light chop marks that appear to be from contact with a metal blade. This specimen was found deep within Block 1, and suggests that some contexts assigned a precontact age based on the absence of associated metal and glass beads may in fact be postcontact in age (see following discussion).

Portions of several ***metapodial fleshing tools*** used in hide preparation occur in the sample (n=8). These are made on bison (n=4), elk (n=1) and unidentified large artiodactyl metatarsals that bear a cut and beveled working end. One specimen was recovered as a complete, articulated lower leg assemblage consisting of metatarsal, calcaneum, astragalus, and associated tarsals found together in pit Feature 106 (Block 3).

Several ***knife handles*** occur in the collection (n=14) (Figure 13.15a-e). These are made on large mammal (probably bison) ribs and vertebral spines. Typically, the margin near one end is slotted to receive and hold a cutting blade. Several handles that are more complete bear very narrow slots indicating that they were used with metal blades. Several split, fragmentary specimens bear rust stains, indicating that they were also used with an iron blade. A small knife comprised of a broken rib handle and iron blade was found on the floor of the earthlodge in Block 6 (Figure 13.15e). Only one specimen classified as a knife handle was considered as indeterminate regarding the type of blade used in the specimen (metal or stone).

Two artifacts unique to the collection are included in this general functional class. One is a shaped and sectioned piece of antler tine tentatively classified as an unfinished ***projectile point*** (Figure 13.15f). This artifact resembles in size a finished, barbed projectile found at Slant

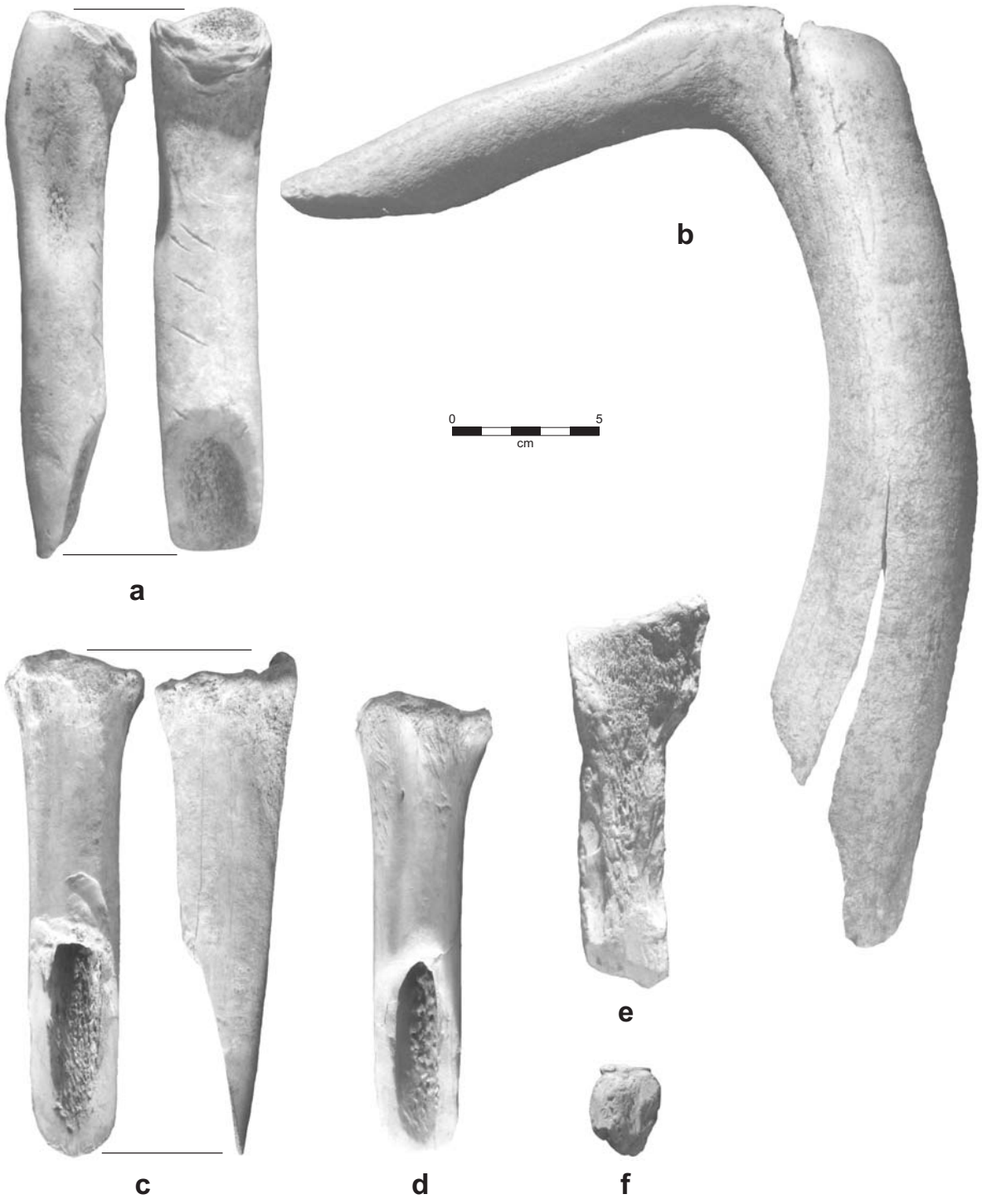

Figure 13.14. Photographs of modified bone and antler tools, Scattered Village (32MO31), 1998 excavations. a: portion of antler scraper handle, intentionally removed; b: antler scraper handle; c,d: fleshers; e: patterned pick; f: working end of patterned pick, intentionally removed.

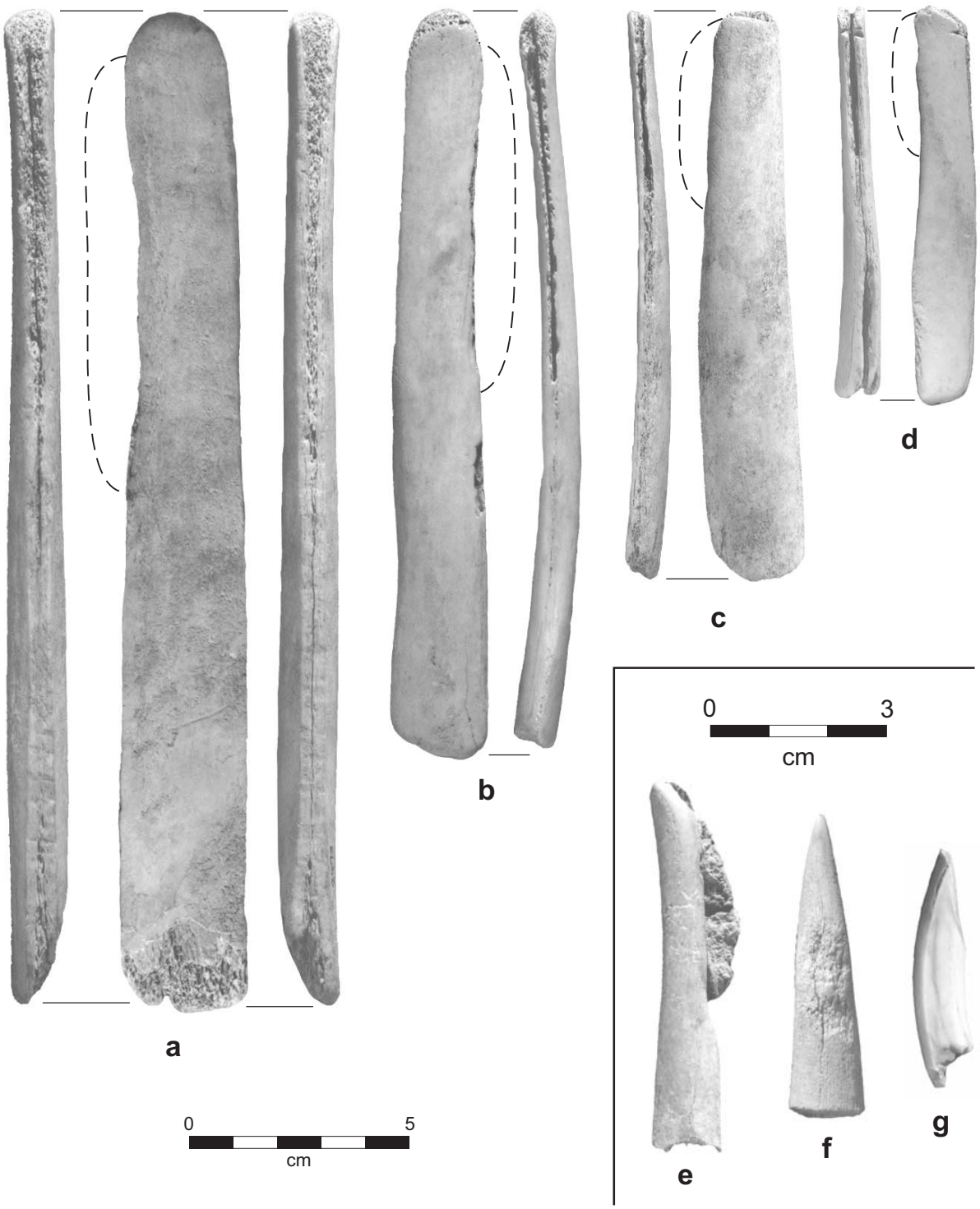

Figure 13.15. Photographs of modified bone and antler tools, Scattered Village (32MO31), 1998 excavations. a-d: rib and spine knife handles fitted for metal blades; e: iron blade in rib handle; f: unfinished antler projectile point; g: beaver incisor adzing tool.

Village (Ahler and Ryser 1997a:Figure 61m). A shaped piece of a beaver incisor is classified as an ***incisor chisel or adzing tool*** (Figure 13.15g).

Other Expedient Tools

This grouped functional class contains a relatively small number (n=32) of items assigned to seven more specific functional variants based largely on use-wear. All have in common a lack of detailed shaping or manufacturing effort.

Two ***bipolar wedges or punches*** occur in the collection (Figure 13.16k). Each consists of a short, linear segment of bone marked on both ends by crushing and impact fracturing directed along the long axis of the specimen. One specimen is interpreted as the ***anvil or platform for bipolar percussion*** involving a stone tool or core (Figure 13.20a). It occurs in combination with a shaped gaming piece and bears at least three linear puncture marks where the stone core rested against the bone when struck by a percussor.

Six specimens are interpreted as expedient scraping tools, with three used to ***scrape soft material*** (Figure 13.16i) and three used to ***scrape resistant material*** (Figure 13.16g,h). Use-wear is restricted to a sharp fractured edge on these specimens, and the functional distinction is based on degree of smoothing in combination with transverse striations across the working edge. Two items are classified as ***surface burnishers***. These consist of sections of large mammal rib bearing a broad area of abrasive smoothing on the convex surface. They have the appearance of having been rubbed against soft, pliable work material.

Several ***expedient adzes*** (n=12) (Figure 13.16d-f) exhibit a concentrated and localized area of smoothing and polish at a fracture margin near one rounded and tapered end. The use-wear is generally facially concentrated, as well. It appears that these tools were pushed against a soft, pliable work surface. Several ***expedient picks*** also occur in the sample (n=11). These typically consist of a stout section of rib, spine, or long bone with a sharp end derived from spiral fracture, and with localized rounding wear and impact damage on the pointed end (Figure 13.16a-c). These tools appear to have been briefly used to punch or penetrate with force some relatively resistant work material. Wear on these specimens resembles that on patterned picks, but they lack extensive shaping prior to use.

Non-Utilitarian Items

A large number of non-utilitarian items occur in the recovered collection (n=360), comprising about one-third of the total modified bone and antler sample. The vast majority of these are items of personal adornment that include bone beads and tubes and antler bracelets. A few more specific functional classes occur in low frequencies, with some of these being artifacts possibly involved in ceremony or ritual. The general functional class also includes a residuum of modified pieces that, by their nature and form, appear not to have been utilitarian specimens but which are of unknown specific function.

A large sample of ***bone beads*** (n=193) and a smaller set of similar ***bone tubes*** (n=14) occur in the collection. The distinction between these two classes is based largely on shape, with

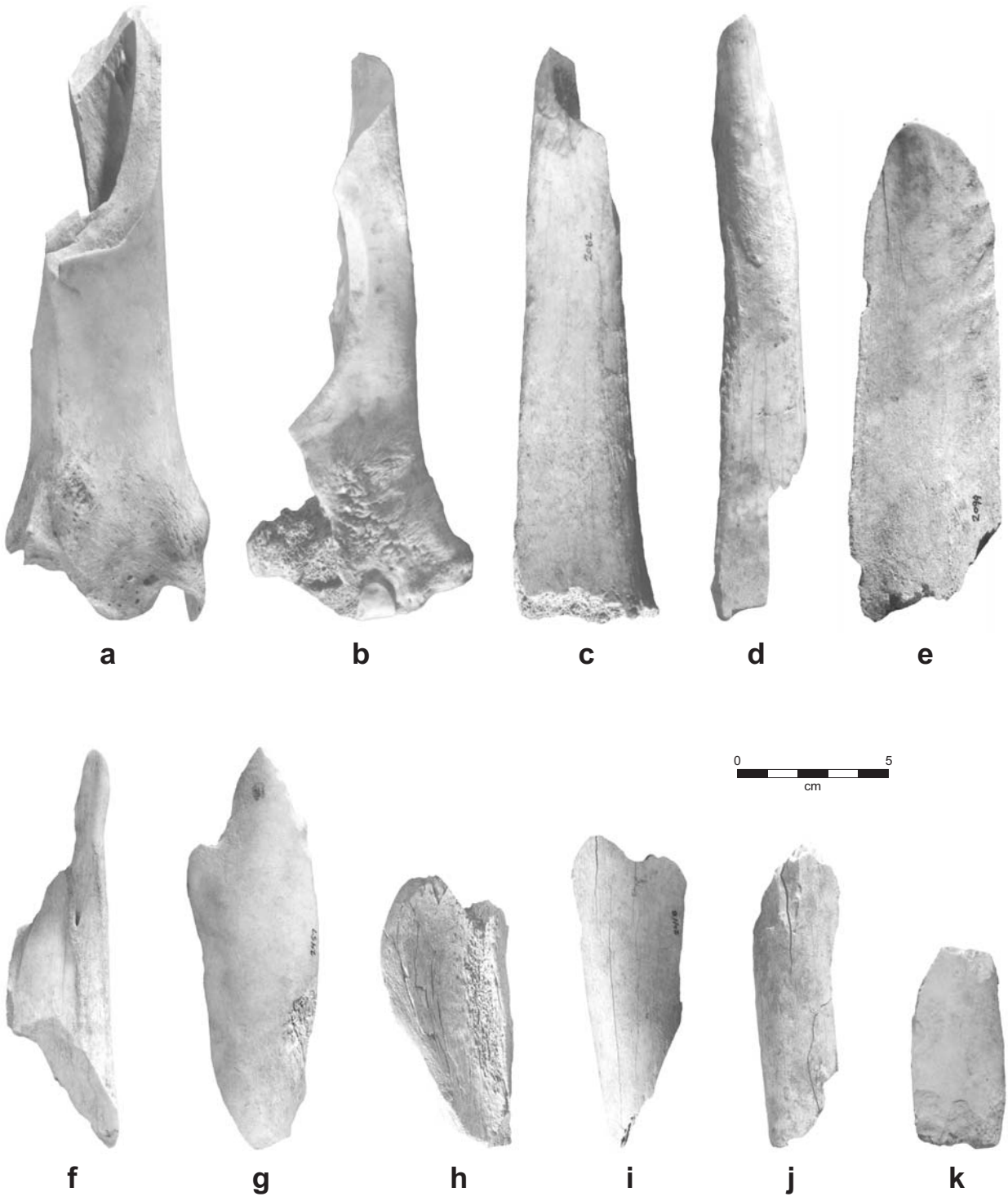

Figure 13.16. Photographs of expedient bone tools, Scattered Village (32MO31), 1998 excavations. a-c,j: expedient picks; d-f: expedient adzes; g,h: scrapers used on hard material; i: scraper used on soft material; k: bipolar punch or wedge.

tubes having a length that is more than three times the diameter of the specimen (Figure 13.17a-n), and with beads having a lower ratio of length-to-diameter (Figure 13.17o-aa). This distinction was made judgmentally, rather than by computation, so the separation between these two classes is valid but perhaps not precise. A fairly large fraction of the collection (Table 13.2) consists of manufacturing debris from such specimens, with such artifacts comprised of articular ends of small bone elements removed from the shaft by groove and snap technique (Figure 13.17dd-nn). Unfinished specimens (Figure 13.17bb,cc) and manufacturing debris, in particular, provide a great deal of information about the taxa selected for production of beads and tubes. *Canis* sp. and *Canis* sp. ? accounts for about 32% of the total sample, with metapodial bones being the element of choice. *Vulpes velox* and indeterminate fox are used for about 20% of the specimens, with metapodials as well as a large number of other elements also having been selected. Rabbit (*Lepus* sp.) is confirmed in two specimens. Bird bone occurs in nearly 9% of the sample. The remainder of the specimens (roughly one-third), including many of the finished, fragmentary specimens, cannot be classified by taxa beyond the level of medium or small mammal.

A well-developed industry involving production of ***antler bracelets*** occurs in the site collections. The finished product consists of a delicate, curved, C-shaped artifact usually 3-6 mm wide, less than 5 mm thick, and 15-20 cm in length that was perforated to one or both ends for purposes of string attachment and tying around the arm or wrist (Figure 13.19a-i). End perforations are made by drilling or boring, or less commonly by grooving from both faces with a pointed instrument such as a graver (see variants in Figure 13.19). Occasionally one end was cross-grooved or notched to facilitate tying.

The manufacture of antler bracelets occurred on-site, and the process of manufacture is well documented in the extant collection. Stock for the bracelets was a large section or beam of antler, probably that of elk. A large, relatively flat section of the beam was isolated and cut out, and then was smoothed on the exterior and thinned by scraping on the interior to produce a relatively thin, elongated section about 5 mm thick. Examples of stock sections for bracelet production are shown in Figure 13.18a,b. Long, parallel-sided strips of antler were then cut from the longer margins of this stock piece, using the groove and splinter technique. The pointed end of a narrow, sharp stone tool was apparently used for this purpose. A beak or stout graver could be used for this purpose, but only one beak was found in the stone tool collection. We suggest that bipolar percussion splinters, in unretouched form, were probably used for this work, with little use-wear being left on the stone tool. Figure 13.18c shows a complete antler strip removed from the stock piece in this fashion, and specimens (d)-(g) in the same figure are pieces of manufacturing residue from antler strip production.

Once isolated and cut from the main stock piece, each strip was further thinned, narrowed, and evenly shaped by scraping action, probably with a flake tool. It is possible that at least one end of the straight antler strip was perforated at this time, to facilitate tying and holding the specimen (now a bracelet blank) while the scraping and reduction process occurred. The shaping and thinning process focused on the main body of the strip, but not on the ends. After the bracelet was shaped to the desired width and thickness, it was either bent into a curved form, then shortened to the desired length, or first shortened and then bent. Many examples of end pieces cut off of shaped strips occur in the collection, and several occur in pairs that appear to

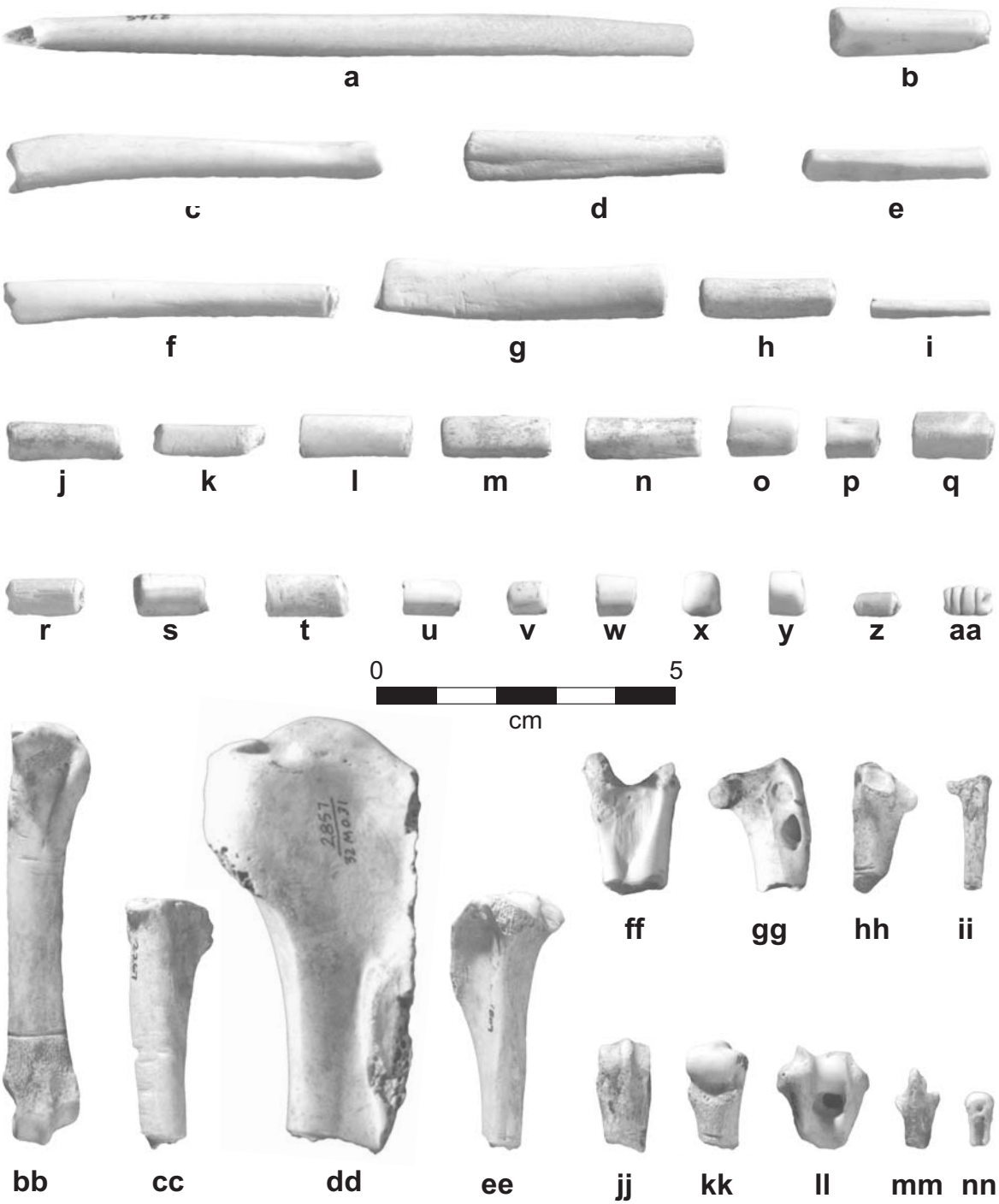

Figure 13.17. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. a-n: tubes; o-aa: beads; bb,cc: unfinished tubes/beads; dd-nn: manufacturing residue from tubes/beads.

Figure 13.18. Photographs of modified antler artifacts, Scattered Village (32MO31), 1998 excavations. a,b: thinned antler sections from which bracelet strips are cut; c: unfinished bracelet strip; d-g: bracelet strip end pieces and manufacturing residue; h: bracelet strip broken during manufacture.

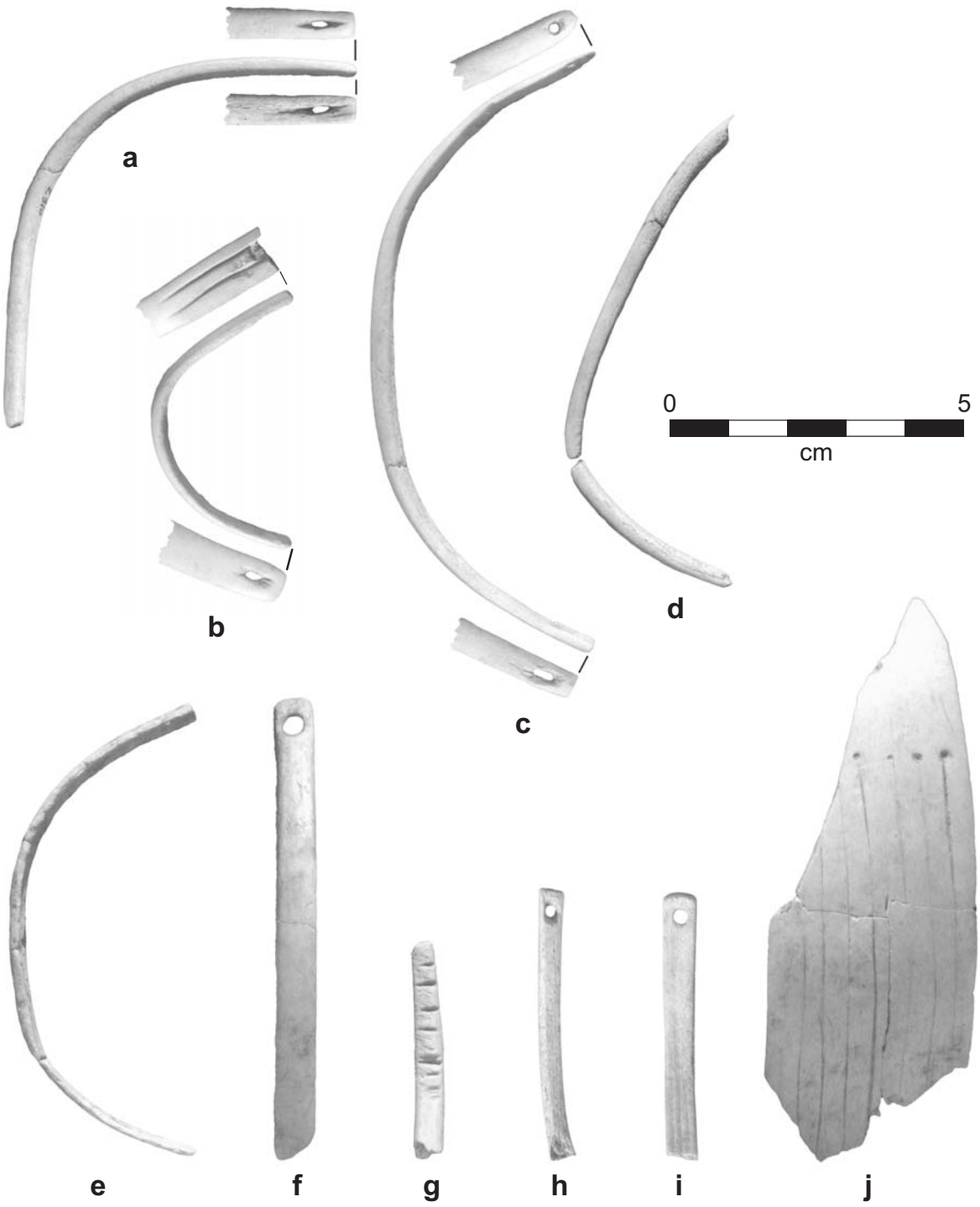

Figure 13.19. Photographs of modified antler artifacts, Scattered Village (32MO31), 1998 excavations. a-g,i: finished antler strip bracelets, showing details of shape and finishing; specimen (c) is complete; h: bracelet broken in manufacture; j: broad antler bracelet or wrist guard.

represent both ends of a single bracelet blank removed and discarded at the same time. Typically, neither end of the blank was well finished, and both ends were cut off before final bracelet production occurred. Some end pieces were removed by a ring and snap technique, while others were chopped off with a blow from a sharp chisel-like implement (probably a stone tool). Several chopped-off end pieces, in particular, exhibit deformation where the chisel blow occurred, much as we would expect to see on a dense piece of green wood. Several fractured specimens that broke during bending (e.g., Figure 13.18h) also exhibit a frayed or splintered bending break much like one would see on a flexible piece of green wood.

These fracture and deformation features indicate that the antler strip was much more pliable and less brittle while being worked than one might expect in a piece of raw, fresh antler. Many years ago, one of us (SAA) was told that antler could be made pliable and easily shaped and cut by soaking it is a weak acid such as vinegar. Edholm (1995:73) states that soaking is water for a few days is sufficient to soften antler for purposes of working and straightening. It is quite likely that antler strips at Scattered Village were softened in some fashion before shaping, and particularly before bending of the bracelet took place. As noted previously, the entire production sequence from development of stock pieces to strip production, shaping, cutting to length, bending, finishing, use, and final discard, occur in the excavated sample. Such materials could form the basis for both more focused study of antler technology as well as an attractive museum exhibit.

Four items interpreted as ***gaming pieces*** occur in the collection. Three of these are very similar (Figure 13.20a-c) and are made from a section of long bone shaft that was roughly fractured into and elongated oval shape and that were subsequently smoothed on all surfaces by light abrasion and rubbing. These artifacts appear to be heavily handled and evenly worn and rounded all over; they lack spatially concentrated attrition that one would expect from an with a utilitarian function. We suggest that these are gaming pieces, similar to shaped stone pieces in purpose, in which the easily recognized interior and exterior surfaces comprised a “heads” and a “tails” side in a game of chance. A fourth item is also classified as a gaming piece (Figure 13.20d). It consists of small heavily shaped disk that is smooth on one face and that bears six parallel incised lines on the opposite face.

One artifact is a large section of bird long bone that retains a portion of a cut, angular opening at one fractured end. This is possibly a fragment of a ***bird bone whistle*** (not illustrated). Three artifacts are classified as ***bird head effigies***. The most intact specimen is a complete head section broken at the neck (Figure 13.20e). The eye is represented by a drilled perforation, and the bill is short and robust, resembling that of a parrot or raptor. Incised marks beneath the bill probably represent color bands or plumage. The back or the head has a crested, angled shape, and the neck is about half as wide as the head. The crest is marked by four short incised lines that also probably reflect color markings or shape in the plumage. A second specimen is less complete (Figure 13.20g) but has very similar features including a drilled eyehole and angled crest with incised edge markings. A third specimen (Figure 13.20f) is a heavily burned, dense worked bone fragment that appears to also be the crested, incised margin of a bird head effigy much like the other two. All of these artifacts are carved in detail with features that probably represent plumage and morphology for a particular kind of bird, although we were unable to identify the species that may be represented.

Figure 13.20. Photographs of modified bone and antler artifacts, Scattered Village (32MO31), 1998 excavations. a-d: bone gaming pieces; a: also is a bipolar anvil; e-g: bone bird head effigies, (f) is burned; h-q: non-utilitarian items of unknown function; h: cut tooth; i: cut paired mink (?) mandibles; l; heavily shaped and snapped antler piece; r: possibly utilitarian item of unknown function.

The remaining specific functional class in this group is a catchall labeled ***nonutilitarian items of unspecified function***. It includes items that, because of morphology or raw material, are not thought to be everyday tools, but are of unknown specific function. Several of these are illustrated in Figure 13.20h-q. Illustrated specimens include the lower incisor tooth of a large artiodactyl that has a small notch cut in its occlusal margin (Figure 13.20h); the distal ends of an apparent matched pair of mink (?) mandibles that have been grooved and snapped from the main part of each mandible (Figure 13.20i); a small, cylindrical section of bone with a spiral groove carved into its surface (Figure 13.20j); a small cylinder of dense bone with a bluntly tapered pointed end, lacking polish as in an awl or use-wear from pressure flaker use (Figure 13.20k); a piece of carefully shaped and finely pointed antler that has been grooved, snapped, and then burned, with the pointed end being circular in cross section and the proximal fragment being square in cross section (Figure 13.2-0l); a shaped piece of scapula blade with a linear groove partially cut through one surface (Figure 13.20m); a ground and flattened *Canis* sp. upper canine (Figure 13.20m); a section of heavily shaped antler with two drilled holes (the roles resemble those in the bird head effigies) (Figure 13.20o); a polished eagle wing element (Figure 13.20p); and, a rounded and heavily shaped fragment of dense bone that, in workmanship, resembles the bird head effigy pieces (Figure 13.20q).

A very remarkable specimen in this specific group is a heavily worked bear mandible [probably grizzly bear, based on size; *Ursus* cf. *arctos (horribilis)*] (Figure 13.21) found in pit Feature 120 (Block 9). The body of the mandible has been flattened and shaped on all faces into a slightly tapered form with a rectangular cross section, as if it were to fit into a tapered socket of some kind. This shaping by grinding occurred with the premolars and molars in their sockets, as indicated by the roots of some of these teeth still in place. The large canine tooth is fractured but appears to have been unmodified. The purpose of this artifact is not certain. Brower illustrates two specimens made in a very similar fashion that were dug from purported Mandan villages near Heart River (1904:xxvi, 96); he interprets them as knife handles based on a drawing of a Mandan specimen with a steel blade that he attributes to Prince Maximilian (Brower 1904:xxiii). A painting by Bodmer (Thomas and Ronnefeldt 1976:96) depicting a battle involving Assiniboins, Crees, and Blackfeet in 1833 at Fort McKenzie (present-day Montana) depicts a combatant wielding a steel bladed knife having an apparently similar handle. Thus, it is possible that the modified bear mandible is in fact part of a knife handle, and an artifact used by multiple ethnic groups in the Northern Plains.

Unillustrated artifacts in this specific group include a single complete metatarsal of a *Canis* sp. with a polished shaft; a heavily polished and burned distal fragment of a *Canis* sp. metapodial; two fragments of antler thought to be stock or remnants for production of nonutilitarian antler artifacts; and a distal phalange of a bison that is heavily polished on one face. One piece of worked antler placed in this group is illustrated because it is rather unusual (Figure 13.19j), but it does not occur in the tabulations because it is from a Priority 3 context in Block 5. This appears to be a fragment of an archer's wrist guard or a broad bracelet.

Miscellaneous and Unclassified specimens

The remaining modified bone and antler specimens in the collection (n=137) are all unclassified regarding specific function and are thought to possibly have been associated with or

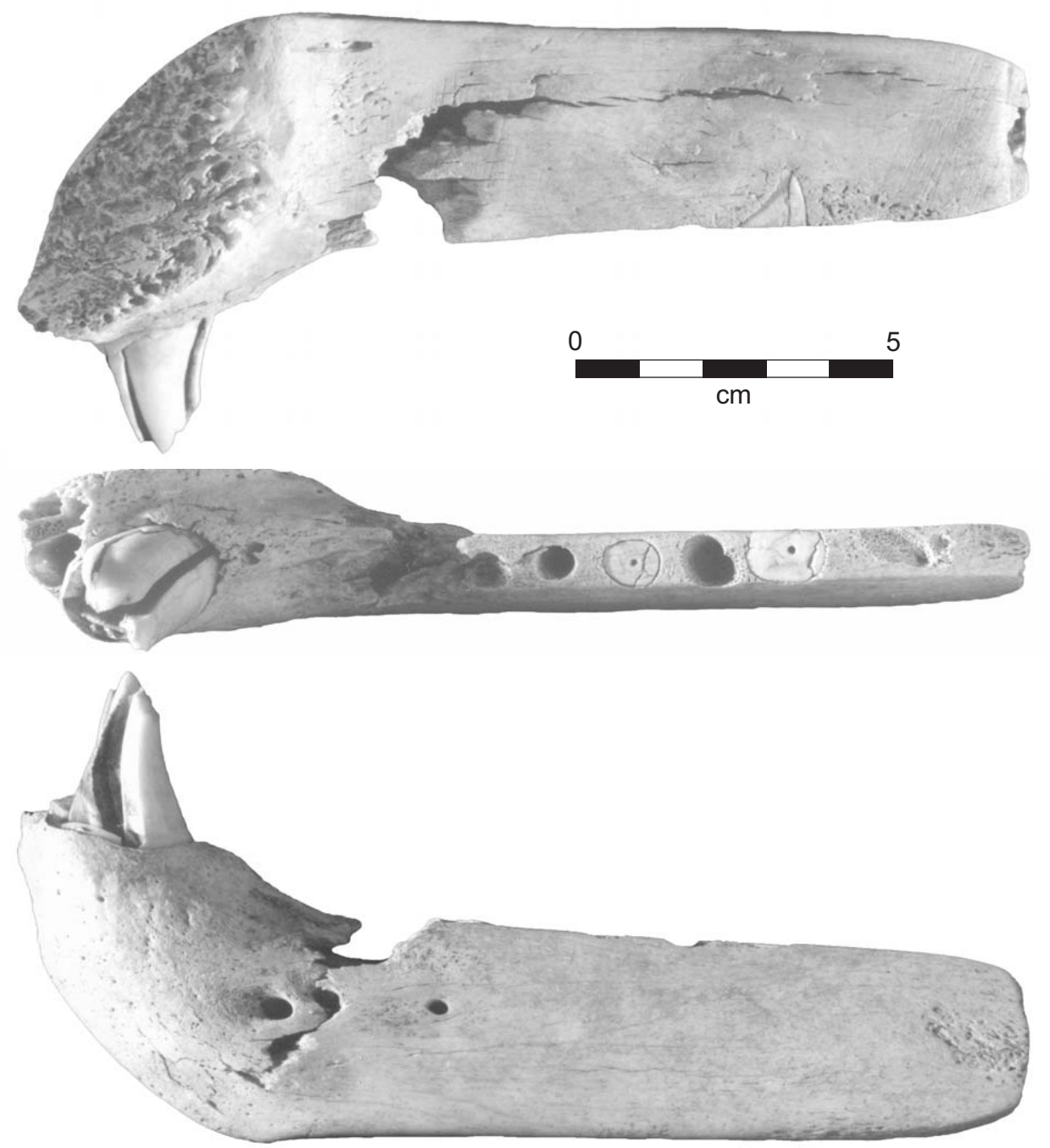

Figure 13.21. Photographs of modified bone tools, Scattered Village (32MO31), 1998 excavations. Heavily ground and shaped grizzly bear mandible, of uncertain function, from Feature 120.

fragments of utilitarian tools of some kind. These are placed in three more specific groups based on material or element: ***unspecified rib artifacts***; ***unspecified antler artifacts***; and ***other items of unknown function*** (neither ribs nor antler pieces) (Table 13.2). About 40% of these items as a whole appear to be specimens broken during manufacture or manufacturing debris of some kind (cut, sawn, and intentionally or inadvertently broken-off pieces). Most of the remainder are small fragments of larger tools that exhibit polish, abrasion, or other kinds of use-wear, but which cannot be more specifically identified. A single illustrated specimen is a splinter of mammal bone that is intentionally rounded and blunted on both ends and which retains faint incisions encircling the central part of the artifact. The incisions may be related to tying with cordage. The function of this item is unclear, although it could have been a prop in a small, deadfall animal trap. The expedient nature of this specimen suggests it had a utilitarian function.

Stone versus Metal Modification

To evaluate the occurrence of stone versus metal tool modification in the production of bone and antler artifacts we examined and recorded such modification for all specimens in functional class 10, scapula digging tools. Artifacts in this class are large, require substantial removal of mass during manufacture, and would have been amenable to the use of metal tools for their production, if such tools had been present. Thus, evidence for metal tool use is often unequivocal in these artifacts (see Figures 13.5). Similarly, in this particular collection, these same artifacts also exhibit clear evidence of modification by stone tools in the form of marks left by a stone punch (see Figure 13.3) and in some cases the use of both stone and metal tools is evident on the same artifact (e.g., Figure 13.4a).

Previous studies (Weston and Ahler 1993; Moore 1985; Ahler and Ryser 1997a) have demonstrated that evidence for use of metal tools in bone/antler tool modification increases through time, presumably in correspondence with increasing access to metal through the encroaching and expanding fur trade system. Thus, we expect there to be a correlation between the frequency of occurrence of metal modification in the Scattered Village bone tool sample and the time periods we have developed, because the latter are based on the relative abundance of trade artifacts in various site contexts. Table 13.5 presents the distribution of metal versus stone tool modification occurrences, for scapula digging tools only, according to time period. The predicted increase in the frequency of occurrence of metal modification is not apparent in this table. TP4 does lack evidence for metal tool modification, but low frequencies of metal modification occur in all other time periods (X^2=11.826, df=9, p=.223). Refining the analysis by omitting indeterminate specimens from the tabulation and by collapsing metal and metal + stone classes into a single class does not change the overall pattern and the apparent random distribution according to chi-square analysis. Another interesting aspect of this data set is that two tools modified by metal occur in contexts assigned to TP3, an analytic unit devoid of trade artifacts and therefore presumed to be precontact in age.

To further explore the distribution of indirect evidence for presence of metal artifacts according to analytic units, we bring into the picture all other tools in the assemblage for which metal tool modification or association was documented. These are selective examples such as the knife handles that are clearly fitted for metal blades or that have metal oxide stains on them, and artifacts such as the scraper handle in Figure 13.14a that is so clearly modified by a metal

Table 13.5. Distribution stone and metal modification marks on scapula digging tools according to time period, Scattered village (32MO31), 1998 excavations. Chi-square = 11.827, df=9, p=.223.

		Stone or Metal Manufacture				
Time Period		0 Indeterminate	1 Stone	2 Metal	4 Stone & Metal	Total
1 later postcontact	n	42	19	2	3	66
	%	*63.6*	*28.8*	*3.0*	*4.5*	*100.0*
2 early postcontact	n	60	23	2		85
	%	*70.6*	*27.1*	*2.4*		*100.0*
3 late precontact	n	14	4	1	1	20
	%	*70.0*	*20.0*	*5.0*	*5.0*	*100.0*
4 early precontact	n	2	5			7
	%	*28.6*	*71.4*			*100.0*
Total	n	118	51	5	4	178
	%	*66.3*	*28.7*	*2.8*	*2.2*	*100.0*

Table 13.6. Distribution of tools with stone (only) versus metal (with or without stone) modification marks on all recorded bone and antler tools according to time period, Scattered Village (32MO31), 1998 excavations. Chi-square=1.241, df=3, p=.743.

		Collapsed Stone/Metal		
Time Period		1 Stone Only	2 Metal or Metal and Stone	Total
1 later postcontact	n	19	9	28
	%	*67.9*	*32.1*	*100.0*
2 early postcontact	n	24	9	33
	%	*72.7*	*27.3*	*100.0*
3 late precontact	n	4	3	7
	%	*57.1*	*42.9*	*100.0*
4 early precontact	n	5	1	6
	%	*83.3*	*16.7*	*100.0*
Total	n	52	22	74
	%	*70.3*	*29.7*	*100.0*

chopping tool. Table 13.6 provides the distribution of all such artifact occurrences, combined with the data on scapula hoes, while omitting indeterminate hoe specimens and unexamined artifacts, and while collapsing the categories "metal" and "metal and stone" into a single class. This table indicates 18 occurrences of metal modification in postcontact age analytic units (TP1 and TP2), three metal occurrences in TP3, and one in TP4.

The TP4 artifact is the metal-cut antler scraper handle in Figure 13.14a that was found in Feature 66 in Block 12 (Cat No. 2907). This feature was a basin-shaped borrow area at the base of the midden in this area that was filled with trash, and it is in the stratigraphically earliest part of the site deposits. The catalog number for this artifact was assigned in the lab, as there was confusion and duplication of catalog numbers in the field for portions of the feature excavated in different squares. In addition, this feature was vandalized over a weekend before excavation was completed. The catalog number assigned to this artifact was not associated with the vandalized fill, however, which was excavated separately. Excavation records do not note this artifact in the appropriate square, but do make reference to an "elk antler flesher" in an adjacent square.

Therefore, some degree of confusion surrounds the precise context of this specimen, although there seems to be little reason to believe that it came of any context other than the base of the midden in Block 1. The presence of metal modification on this artifact clearly calls into question the precontact age attributed to TP4.

One TP3 artifact is the large thoracic spine knife handle shown in Figure 13.15a that was clearly constructed for a metal blade. This artifact was found in level 7 in square 498NE449 in Block 5. Levels 1-6 in the same square were assigned to TP2 based on the presence of sparse trade artifacts, and levels were assigned to TP3 because they lacked trade artifacts and appeared to comprise a distinct stratigraphic unit. The presence of this artifact suggests, foremost, that at least some of the sediment we assigned to TP3 in Block 5 should in fact be placed in TP2. Because this artifact occurs near the boundary between the two analytic units, the effect of this error, if it is an error, is probably minor.

Another TP3 artifact is a nearly complete scapula hoe found in pit Feature 133 in Block 9 and is, in fact, our illustrated example of a hoe modified by metal tools shown in Figure 13.5. While this feature lacks trade artifacts, the presence of this artifact clearly indicates that its assignment to a precontact age context and analytic unit is in error. It would be more accurately assigned to TP2 than TP3. Documentation of metal marks on this artifact came too late in the overall project history to make the appropriate change in analytic unit assignments.

The final TP3 artifact consists of a hoe fragment with unequivocal metal modification marks that was found in level 3 in square 497.2NE425.3 in Block 7. This context was assigned to TP3 based on absence of trade artifacts. The presence of this specimen indicates that this context, and the massive in-fill layer in Block 7 in general, is perhaps better considered a part of TP2 rather than TP3.

In sum, data on metal modification in bone/antler artifacts provides little direct support for the general chronological structure for the site based on the density of trade beads and pieces of trade metal. There is no correlation between the relative frequency of metal modification in bone tools and the general density of trade items in various contexts. In addition, at lest three specific contexts in Blocks 5, 7, and 9 assigned a precontact age on the basis of absence of trade artifacts in fact have metal-modified bone/antler specimens in association and are therefore postcontact in age. One specimen assigned to TP4, although associated with confusing excavation records, also probably indicates an incorrect age classification for the deepest sediments in Block 1. These findings suggest that true precontact age deposits in the site may constitute an even smaller fraction of the total excavated site volume than we presently have assumed. It is quite probable that precontact age deposits in the site lie on the cusp of the introduction of trade items into the region, and that the initial period of site occupation may have occurred closer to AD 1600 than to AD 1550, as presently interpreted.

Intrasite Variation

Intrasite variation is confined to the study of functional class distributions across time periods for the site (now tempered with knowledge that the precontact – postcontact distinction is somewhat compromised). Chi-square analysis of the distribution of specific functional classes according to time period indicates a random relationship between the two variables (X^2=115.387,

df=105, p=.230). Table 13.7 provides a tabulation of grouped functional classes by time period and illustrates the only patterning in the data that might be meaningful. Although categories such as fishhooks and nonutilitarian items show a remarkably constant occurrence through time, digging tools and piercing tools exhibit internally consistent trends through time (although not statistically significant; X2=29.046, df=21, p=.113). Cultivating tools increase steadily in relative abundance through time, being twice as common in the latest period as in the earliest period. This suggests an increased emphasis on horticulture through time at the site. In contrast, piercing tools (awls) show a steady decrease through time, with TP1 percentages being roughly half of the TP4 percentages. Bone awls are a tool type previously shown to rapidly drop from the artifact inventory during the postcontact period, presumably being replaced quite rapidly by counterparts made from trade metal (Weston and Ahler 1993; Ahler and Ryser 1997a). It is quite probable that the data in Table 13.7 document a similar replacement process at Scattered Village. Interestingly, both of the time trends illustrated in Scattered data, for horticultural tools and bone awls, are mirrored in the temporal sequence at nearby and contemporaneous Slant Village (Ahler and Ryser 1997a:384).

Table 13.7. Distribution of grouped functional classes for modified bone and antler artifacts according to time period, Scattered Village (32MO31), 1998 excavations.

		Time Period				
Functional Group		1 later postcontact	2 early postcontact	3 late precontact	4 early precontact	Total
Digging Tools	n	69	86	20	8	183
	%	*22.3*	*18.3*	*13.7*	*9.8*	*18.2*
Piercing Tools	n	21	46	16	10	93
	%	*6.8*	*9.8*	*11.0*	*12.2*	*9.2*
Pressure Flakers	n	26	28	20	6	80
	%	*8.4*	*5.9*	*13.7*	*7.3*	*7.9*
Fishhooks	n	13	21	6	4	44
	%	*4.2*	*4.5*	*4.1*	*4.9*	*4.4*
Other Patterned Tools	n	24	35	9	11	79
	%	*7.8*	*7.4*	*6.2*	*13.4*	*7.8*
Other Expedient Tools	n	9	17	6		32
	%	*2.9*	*3.6*	*4.1*		*3.2*
Non-Utilitarian Items	n	104	171	54	31	360
	%	*33.7*	*36.3*	*37.0*	*37.8*	*35.7*
Miscellaneous	n	43	67	15	12	137
	%	*13.9*	*14.2*	*10.3*	*14.6*	*13.6*
Total	n	309	471	146	82	1,008
	%	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

External Comparisons

Detailed comparisons are restricted to functional class occurrences for Scattered Village and for comparable time periods at nearby Slant Village (periods 2 and 3, ca. AD 1575-1725) as reported by Ahler and Ryser (1997a). Data on grouped functional classes, displayed in Table 13.8, illustrate the major contrasts between the two villages. The modified bone/antler assemblages are quite distinct from one another. Prominent differences exits in expedient tools that are four times as abundant at Slant Village and non-utilitarian items that are nearly twice as

abundant at Scattered Village. The differences in expedient tools may be partially attributed to analytic methodology because (1) expedient tools are very difficult to recognize with certainty in any collection, and (2) different analysts sorted out the expedient tools in the respective collections (Falk for Scattered Village, and a combination of Ahler, Lisa Blackford, Gail Ryser, and Sarah Moore for Slant Village, with Ahler checking the decisions of Blackford, Ryser, and Moore). Even if we leave the expedient tools out of the inter-village comparisons, the remaining contrasts between villages are prominent and warrant discussion.

Table 13.8. Comparison of grouped functional class frequencies according to site. Chi-square=78.955, df=6, p=.000). Counts top, percentages middle, standardized cell residual values, bottom. Cells with residual values >+1.0 shaded for emphasis.

	Site		
Functional Group	1 Slant Village	2 Scattered Village	Total
Digging Tools	38	183	221
Piercing Tools	29	80	109
Pressure Flakers	8	80	88
Fishhooks	6	44	50
Other Patterned Tools	16	79	95
Other Expedient Tools	38	45	83
Non-Utilitarian Items	37	360	397
Digging Tools	*22.1*	*21.0*	*21.2*
Piercing Tools	*16.9*	*9.2*	*10.5*
Pressure Flakers	*4.7*	*9.2*	*8.4*
Fishhooks	*3.5*	*5.1*	*4.8*
Other Patterned Tools	*9.3*	*9.1*	*9.1*
Other Expedient Tools	*22.1*	*5.2*	*8.0*
Non-Utilitarian Items	*21.5*	*41.3*	*38.1*
Digging Tools	.3	-.1	
Piercing Tools	2.6	-1.2	
Pressure Flakers	-1.7	.8	
Fishhooks	-.8	.3	
Other Patterned Tools	.1	.0	
Other Expedient Tools	6.6	-2.9	
Non-Utilitarian Items	-3.5	1.6	
Total	172	871	1,043
	100.0	*100.0*	*100.0*

As noted, non-utilitarian items are distinctly more common in Scattered than at Slant Village. Beads/tubes and antler bracelets make up the majority of this grouped functional class. Overall, combined beads and tubes comprise ca. 20.5% of the Scattered Village collection compared to only 11.9% of the Slant Village sample. The difference in antler bracelets is even more striking, with such artifacts comprising 12.7% of the Scattered Village sample and only 3.2%, or one-fourth as much, of the Slant Village collection. Insofar as bipolar artifacts are used in part for working of antler, this difference correlates well with differences in occurrence of bipolar stone tools in the two collections (see Chapter 12).

Other differences between the sites are not so striking but are still of note and are probably of significance. Piercing tools (predominantly bone awls) are much more common at Slant Village than at Scattered Village (nearly 17% versus 9%). This probably reflects very real differences in emphasis on leather working and possibly weaving at the two sites, with these activities being much more important at Slant Village. In direct contrast, pressure flaking tools are twice as abundant at Scattered Village as at Slant Village (9% vs. less than 5%) (Table 13.8). Fishhooks are slightly more common in occurrence at Scattered Village, and cultivating and digging tools are slightly more common at Slant Village (Table 13.8).

External comparisons involving data from Hidatsa sites are difficult to make, due to differing analytic methods applied to various assemblages. Data discussed in Ahler and Ryser (1997a:387-388) are not precisely controlled for time, but offer some basis for discussion. The Hidatsa sites (Big Hidatsa and Lower Hidatsa data combined) are marked by higher percentages of patterned pressure flakers and lower percentages of piercing tool than Slant Village. These same contrasts have been pointed out between Scattered Village and Slant Village, and it therefore appears that Scattered Village is similar to the Hidatsa sites at Knife River in regard to piercing and pressure flaking tools. The Hidatsa sites in general, however, exhibit much lower frequencies of both antler bracelets and bone beads/tubes than are seen at Scattered Village. Thus, Scattered Village stands apart from all others in the emphasis placed on production and use of bone ornaments in the forms of beads and tubes and antler ornaments in the form of bracelets.

Summary and Conclusions

1. The Scattered Village modified bone and antler industries are well developed and involve systematic production of many different artifact classes in both utilitarian and nonutilitarian realms. Nearly all of these classes have functional equivalents in other studied Plains Village sites. Unusual items in the collection include bird head effigies and a worked grizzly bear mandible.

2. Several production technologies provide clear linkages to the use of stone artifacts, among these being probable use of bipolar splinters and cores for slotting/grooving work in antler bracelet production and use of bipolar stone punches for production of both scapula hoes as well as patterned pressure flakers made from large mammal ribs.

3. Complete manufacturing sequences are present in the Scattered Village collection for antler bracelet production and for rib pressure flaker production. Each of these artifact classes could form the basis for more detailed studies of production sequences and technology, perhaps as graduate thesis studies. Similarly, each of these artifact classes and excavated specimens could readily be used for development of museum displays on the subject of bone and antler artifact production.

4. Use of metal tools is evident in a substantial number of modified bone and antler specimens in the Scattered Village sample, but, contrary to expectations, such evidence does not correlate well with the time periods for the site developed from trade artifact density data.

5. The distribution of metal-modified bone/antler artifacts indicates that some of our time period assignments based on trade artifact density are in error, and also indicates that the

initial date of site occupation may have occurred closer to AD 1600 than AD 1550 as we had inferred based largely on radiocarbon data.

6. Within the site, cultivating tools increase in importance through time while piercing tools decrease markedly in relative frequency through time. These changes are thought to reflect in part increased focus on horticulture as well as the impact of bone awl replacement by implements tipped with trade metal.

7. The Scattered Village collection differs sharply from that at nearby and contemporaneous Slant Village in several aspects of tool function. Bone beads/tubes, antler bracelets, and pressure flaking tools are much more common at Scattered Village. Awls and expedient tools are more common at Slant Village.

8. Scattered Village stands well apart from both Slant Village as well as the Hidatsa sites at Knife River in regard to strong emphasis on ornament production and use. The assemblage at Scattered reflects a well-developed Plains Village bone/antler industry integrated with a horticultural lifeway; it does not particularly suggest an assemblage made by people still adapting to horticulture and use of bison bone for relevant tool production. Detailed comparative, intersite technological studies involving, especially, use of bipolar artifacts for scapula hoe and pressure flaker production could prove very informative regarding the origins and ethnic affiliation of Scattered Village residents.