VI. ARTIFACT ANALYSIS

The artifactual materials recovered from the Hinojosa site were divided into the following material classes: lithics, prehistoric ceramics, baked clay, modified bone and shell, and historic materials. The provenience of these materials can be found by referring to Appendix 1. Additional nonartifactual materials such as mussel shells, faunal remains, and soil samples are discussed in Section VII.

LITHICS

Lithic materials make up the bulk of the cultural debris recovered from 41 JW 8. This is particularly significant when one considers the fact that very few lithic resources are locally available, hence most of the lithic materials at the Hinojosa site were brought in from many kilometers away. This section provides a discussion of the lithic materials and sources used by the people that camped at 41 JW 8 and a descriptive classification of the recovered lithic artifacts.

LITHIC MATERIALS AND SOURCES

The Hinojosa site is located within an area of very limited lithic resources. The only usable lithic materials available within a kilometer of 41 JW 8 are calcium carbonate concretions and caliche exposed in erosional gullies on the ridge east of Chiltipin Creek. Over 99.9% of the lithic artifacts (not including burned rock) recovered from 41 JW 8 are made of siliceous lithic materials transported to the site from sources at least 35 km distant. To the north, the nearest sources of siliceous materials occur some 50 to 60 km away, along the Nueces River. To the south and southeast, surface exposures of siliceous materials do not occur. The two closest sources of siliceous materials are the Nueces River some 35 km to the east-northeast and northwestern Duval County some 45-50 km to the northwest of the Hinojosa site.

The Nueces River valley provides the nearest source of siliceous lithic material to 41 JW 8. Chandler (1984) has recently documented the occurrence of at least two lithic source areas along the Nueces River below Lake Corpus Christi. These two source areas, "pebble beach" and the "Piedras Crossing," have deposits of chert, silicified wood, and agate cobbles and gravels along with larger pieces of sandstone. Based on a sample collected by Chandler (on file CAR-UTSA), most of the cobbles are oblong shaped and relatively small (less than 15 cm in length). Chert colors range from tan to gray to brown with darker colored thin cortex layers. Fine-grained, unflawed chert cobbles are less common than flawed, variable grain, poor quality chert cobbles. The silicified wood from these sources is very friable and poorly suited for chipped stone tools. Unusual materials such as quartzite and volcanic rocks may occur in small quantities. Most of the chert materials found at 41 JW 8 were probably derived from sources along the Nueces River.

Hilltop gravel exposures occur in northwestern Duval County northwest of Freer as well as other areas of south Texas farther to the west and north of Freer. The hilltop gravel exposures represent the remnants of gravel lag

deposits left behind tens of thousands of years ago by long vanished rivers. Today these gravels often occur miles away from and many meters above any modern stream.

Present in these hilltop exposures are small well-rounded cobbles and pebbles of various lithic materials, including chert, silicified wood, chalcedony, and igneous rocks. Overall, the hilltop exposures offer a greater variety and higher quality of lithic materials than the Nueces River sources. Some overlap occurs. The Duval County cherts include the tan-gray-brown cherts typical of the Nueces River sources in addition to white chert and many exotic-colored cherts (red, yellow brown, and green). The fine-grained, glossy white chert seems to have been a favorite material based on surface collections in northwestern Duval County (41 DU 4, 41 DU 5, and 41 DU 6; notes on file CAR-UTSA) and in northeastern Duval County (McGraw, Van Note, and Jones n.d.). The silicified wood cobbles from Duval County tend to have more complete replacement by silica, hence they are less friable than the Nueces River samples collected by Chandler. The presence of white chert, exotic-colored chert, and igneous materials in low percentages at 41 JW 8 may suggest that the Duval County lithic sources were used less frequently than the Nueces River sources by the inhabitants of the Hinojosa site.

The following is a brief description of each distinctive lithic material found at 41 JW 8:

Chert: Also known as flint, chert is a cryptocrystalline siliceous material with conchodial fracturing properties that make it an ideal material for chipped stone tools. Most of the chert recovered from the Hinojosa site range from tan to gray to brown in color. The cortex layers are dark brown to almost black in color and tend to be thin and very hard. The curvature of the cortex on the flakes and cores from 41 JW 8 suggests that most chert cobbles were small in size. Artifacts and flakes of exotic-colored yellow brown chert were found in small numbers. Many flakes and most artifacts have glossy waxy surfaces and/or pink to purple tinges that indicate thermal alteration.

Thermal alteration, or heat treatment, is the purposeful improvement of siliceous lithic materials through gradual and prolonged application of indirect heat (Purdy and Brooks 1971). Prehistoric heat treatment of siliceous materials was a very widespread practice in North America (Hester and Collins 1974; Epstein 1979). Black and McGraw (1985) provide references to the large body of literature that has been devoted to heat treatment. In general, heat-treated chert can be recognized by one or more of the following properties: (1) a change in color to a darker and/or redder (or pink or purplish) color; (2) a change to a waxy or greasy texture; and (3) a change in appearance to a vitreous (glassy) luster of all flaked surfaces except the relic surfaces in existence prior to heat treatment (Hester and Collins 1974; Skelton and Meredith 1977). These changes were noted on many chert artifacts from 41 JW 8, particularly the **Perdiz** arrow points.

White Chert: As mentioned, white chert has been observed to be a favored material type in southeastern Duval County (McGraw, Van Note, and Jones n.d.). It should be noted that McGraw, Van Note, and Jones (n.d.) refer to this material as white chalcedony even though it is not translucent. This

writer does not use the term "chalcedony" to refer to a totally opaque siliceous material.

White chert is comparatively rare at 41 JW 8 but it is an important lithic material for several of the bifacial tool types. The white chert recovered from 41 JW 8 is typically fine grain and glossy, with numerous tiny crystal-filled inclusions. The glossy appearance and sometimes greasy feel of many of the white chert artifacts may suggest heat treatment, although the raw material is glossier than most types of chert in south Texas.

Silicified Wood: Petrified or silicified wood is a lithic material formed by the replacement of wood by silica in such a way that the original form and cell structure are preserved. The Nueces River and Frio River valleys of south Texas are famous among rock collectors as source areas for silicified wood. A few chipped stone artifacts from 41 JW 8 are made from silicified wood.

Quartzite: Quartzite is a metamorphic rock that has a granular structure completely cemented by silica. Artifacts made from quartzite have a sparkley appearance due to the individual quartz grains visible within the matrix. The grain size and appearance of this material have given rise to the colloquial description "sugar quartzite" that is often applied to quartzite artifacts. In western south Texas, quartzite was frequently used for a specific lithic tool type, as defined by Hester, Gilbow, and Albee (1973), the **Clear Fork** tool. These authors suggested that quartzite was chosen over chert due to its hardness and durability. The source area for the small number of quartzite artifacts found at 41 JW 8 is not known.

Chalcedony: Chalcedony is a term used to describe a cryptocrystalline quartz that appears more translucent than ordinary chert. Chalcedony occurs in northwestern Duval County. A few artifacts and flakes made of chalcedony were recovered from 41 JW 8. Milky colored, semitranslucent chalcedony is known colloquially as "moonstone" by rock collectors (Black and McGraw 1985). Several flakes and bifacial fragments from 41 JW 8 are made from moonstone.

Calcium Carbonates: Calcium carbonate, $CaCO_3$ or calcite, is the rock-forming mineral that is the principal constituent of limestone and caliche. These rocks are the only naturally occurring lithic materials in northern Jim Wells County (except for pebble and sand-sized materials). Calcium carbonates were used for ground stone tools, abrading tools, and for hearth rocks at 41 JW 8. Erosional gullies on the ridges overlooking Chiltipin Creek east of the site provide exposures of calcium carbonate.

Sandstone: Sandstone is a sedimentary rock composed of cemented sand grains. Silica and calcium carbonate are common cementing agents. Surface exposures of sandstone occur along the Nueces River and in northwestern Duval County. Sandstone was the preferred material for ground stone tools at 41 JW 8 as well as many other southern Texas archaeological sites.

Volcanic Materials: Several hammerstone fragments and chipped stone tools from 41 JW 8 are made of purple or brown igneous (volcanic) material. The exact composition of these materials is unknown. The purple material has a finer matrix texture, smaller phenocrysts, and choncoidal fracturing. The

brown material has a coarser matrix texture with larger and more abundant phenocrysts and lacks chonchodial fracturing properties. The igneous materials from the Hinojosa site were probably derived from the northwestern Duval County source area.

LITHIC CLASSIFICATION SYSTEM

The lithic materials from 41 JW 8 are classified according to the morphological and technological attributes commonly used by archaeologists in the region. Most of the artifact classes and types have functional differences that are related to morphology and technology. In other words, most lithic artifacts were made a certain way in a certain shape to perform a specific task or range of tasks. Functional considerations for most of the finished artifact types are discussed in considerable detail based on microscopic wear pattern studies.

The classification of the 41 JW 8 lithics was simplified by the facts that only one cultural group is believed to be responsible for all the material and the range of artifact types is rather limited. This is in stark contrast to the situation often faced with multicomponent sites where the analyst must deal with lithics produced over thousands of years by many different groups (cf. Black and McGraw 1985).

The Hinojosa site lithic material can be divided into three major classes based on the degree and type of modification of the material. These classes are unmodified lithic material, chipped stone, and nonchipped modified stone. Each class can be divided into subclasses that can be divided into groups that can be divided into forms. The chipped stone class is much larger and more complex than any of the other classes. Table 1 shows the complete breakdown of the lithic classification system. Most artifact groups or forms were given alphanumeric artifact codes. The artifact codes are used where necessary throughout this report to simplify references to specific artifact types.

UNMODIFIED LITHIC MATERIAL

Pebbles, Rocks, and Gravels

Small quantities of rounded pebbles, gravels, flakes, and calcium carbonate rocks were found throughout the site deposits. The gravel-sized rocks (>64 mm) are almost all calcium carbonate concretions. These were most common in the lower excavation levels. The pebble-sized rocks (4-64 mm) are predominately stream worn (rounded to well-rounded) pieces of chert and other siliceous materials. These represent redeposited alluvial materials. Several unmodified calcium carbonate slabs 10-15 cm in diameter were recovered. These could represent incipient ground stone artifacts or, more likely, rocks brought to the site for use as hearth stones or anvils used to break open long bones. One slab was associated with Feature 3, a bone cluster.

TABLE 1. LITHIC CLASSIFICATION SYSTEM

Artifact	Artifact Code
UNMODIFIED LITHIC MATERIAL	
Pebbles, Rocks, and Gravels	
Asphaltum Pebble	
Burned Rock	BR
CHIPPED STONE	
Cores	C
Debitage	
Unmodified Debitage	
Flakes	
Primary	D1
Secondary	D2
Tertiary	D3
Chips	
Corticate	D4
Decorticate	D5
Chunks	D6
Modified Debitage	
Trimmed	MD1
Minutely Retouched and Utilized	MD2
Retouched Debitage with Concave Edge	MD3
Bifacial Artifacts	
Arrow Points	
Contracting Stem (**Perdiz**)	A1
Expanding Stem	A2
Triangular	A3
Fragments (unidentifiable)	A4
Finished Bifaces	
Beveled Knives	B1
Triangular	B2
Perforators	B3
Olmos Bifaces	B4
Fragmentary and Unfinished Bifaces	
Round Proximal	FB1
Miscellaneous Proximal Fragments	FB2
Miscellaneous Biface Fragments	FB3
Unifacial Artifacts	
End Scrapers	U1
Miscellaneous Scrapers	U2
NONCHIPPED MODIFIED STONE	
Ground Stone	MS1
Hammerstones	MS2
Abraders	MS3
Sandstone Pipe Bowl	MS4

A number of small flakes were recovered from the upper levels that have rounded edges and smoothed flake ridges. These seemingly appear to be stream-worn flakes. An alternative explanation that seems more likely in view of the ephemeral nature of Chiltipin Creek was suggested by Kenneth M. Brown. Brown (personal communication) has observed identically worn flakes eroding out of cow paddies (dung) in southern Texas. The flakes are apparently accidentally ingested by cattle while they are eating grasses growing on archaeological sites. The flakes become uniformly rounded and smoothed while passing through the bovine digestive system. The redeposited flakes become reincorporated into the site deposits as the cow dung breaks down. Tending to support this explanation are the facts that most of the worn flakes were recovered in the upper disturbed levels at 41 JW 8, and Clemente Hinojosa ran cattle on the property for many years.

Asphaltum Pebble

A small pebble-sized piece of asphaltum was found at 41 JW 8 (Lot 372). This piece is rounded and measures about 8 mm in length and weighs 0.2 g. The smooth, rounded exterior gives the pebble a natural weathered appearance identical to modern examples of asphaltum that are often found along the beaches of the Texas coast. Under 20-30X magnification, small subrounded to well-rounded quartz sand grains were observed embedded in microscopic folds in the asphaltum. It is suggested that this artifact represents beach asphaltum collected by or traded to the inhabitants of the Hinojosa site. Asphaltum decoration has been documented on several artifact classes present at the site, including pottery and the sandstone pipe. Asphaltum pieces have been recovered from several inland sites in south Texas, including two Late Archaic sites in the Choke Canyon Reservoir area, 41 MC 55 (Hall, Black, and Graves 1982) and 41 LK 201 (Highley 1986).

Burned Rock

Burned calcium carbonate rocks occurred in comparatively high frequencies in the site deposits. Most of the rocks are quite small in size (less than 5 cm in diameter). The larger burned rocks were usually associated with cluster features. It is suggested that most of the burned rocks are remnants of rocks used to line or outline hearth features. It is possible that some burned rocks represent discarded boiling stones, but the extremely fragile nature of most of the calcium carbonate material in the area casts doubt on this possibility.

CHIPPED STONE

(C) Cores (N=35; Fig. 3)

A core is the portion of a chert cobble that remains after the removal of one or more flakes. In other words, cores are the by-product of flake production. Cores tend to be blocky in shape and lack the carefully shaped two-sided configuration of bifaces. Cores can be sorted into a number of categories based on attributes, such as the number of flake removals (scars),

direction of flake removals, size, and types of flake platforms. The cores from 41 JW 8 are only sorted by size because very little variation or distinct patterning of other attributes was observed. The cores are sorted into size classes based on the minimum diameter: three cores are less than 2.5 cm in diameter, 29 are between 2.5 and 5 cm in diameter, and three cores are between 5 and 7.5 cm in diameter. Table 2 presents attribute data for each core.

The 35 cores recovered from 41 JW 8 could almost all be categorized as "exhausted cores." That is to say, almost all possibilities for useful flake removal have been exhausted. The Hinojosa site cores can be further characterized as generally small in size with multidirectional flake removals. Single facet and natural platform types are the most common, but multifaceted platforms are also present.

The collection of cores from 41 JW 8 can be characterized as a group of small exhausted cores that have had every useful flake removed from every possible platform and direction. The cores represent the maximum utilization of a scarce resource. Several of the hammerstones from 41 JW 8 are recycled exhausted cores. In contrast, sites in areas with plentiful chert, such as the sites in the Choke Canyon Reservoir area (Hall, Black, and Graves 1982), often have larger cores that were discarded long before they were exhausted. Five of the cores appear to be modified; one by hammerstone wear and four by trimming. These represent recycled artifacts.

Debitage

The definition of debitage is the fragments of chipped stone that are removed from larger pieces of chert such as cores or bifaces. Most of the debitage represent the waste products of chipped stone tool manufacture. Unmodified debitage pieces are the fragments of chert that lack definite evidence of modification. Modified debitage pieces are the fragments of chipped stone that have been further chipped or altered through use.

Unmodified Debitage

The unmodified debitage category includes all chipped stone debris that lacks evidence of modification (further chipping or use). This debris is sorted into the following: primary flakes, secondary flakes, tertiary flakes, corticate chips, decorticate chips, and chunks. The two considerations used to distinquish between the debitage groups are whether or not a piece of debitage has a platform (flake vs. chip) and how much cortex remains on the exterior (ventral) flake or chip surface. A flake is a purposefully removed piece of chipped stone that has a striking platform, a bulb of percussion, and dorsal (exterior) and ventral (interior) surfaces. A chip is a flake fragment that lacks a striking platform.

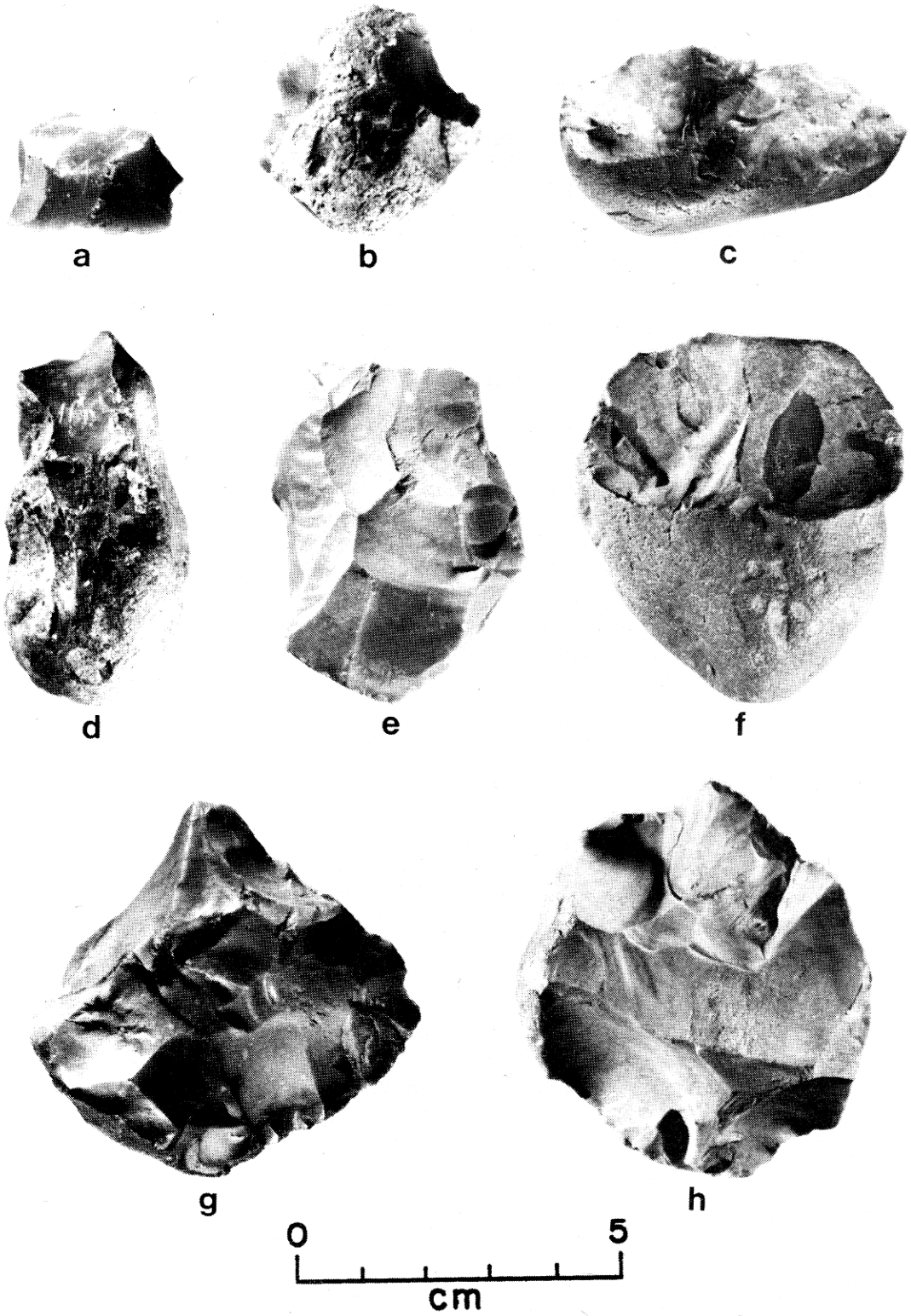

Figure 3. **Cores (C).** Lot numbers: a, 195; b, 285; c, 179; d, 189; e, 437; f, 342; g, 264; h, 344.

TABLE 2. CORE ATTRIBUTE DATA

Lot Number	Size Class	Cortex	Flake Removals	Removal Direction	Platform Types	Modification
56	2	1	2	3	2, 3	3
62	2	2	2	3	2	1
62	2	1	3	1	2, 1	1
62	2	1	3	3	2, 3	1
62	3	1	3	3	2	1
74	1	1	2	3	2	1
107	3	1	3	3	1, 2	1
110	2	2	3	2	2	2
124	2	1	3	3	1, 2, 3	1
131	2	1	3	3	1, 2	1
142	2	2	2	2	2, 3	1
173	2	1	3	3	2	1
179	2	1	3	2	2, 3	1
189	2	1	1	1	1	1
195	1	2	3	3	2, 3	1
240	2	1	2	3	1, 2	2
240	2	1	3	3	2, 3	1
264	2	1	3	3	1, 2	1
281-10	2	1	3	3	1, 2	2
284	2	1	2	3	1, 2	1
285	2	1	3	3	1, 2	1
312	2	1	2	3	1, 2	1
313	2	1	2	3	1, 2	1
320	2	1	3	3	2, 3	1
321	1	2	3	3	2, 3	1
326	2	2	3	3	2, 3	1
335	2	1	3	3	2	1
342	2	1	1	1	1	1
344	2	1	2	3	1, 2	1
344	3	1	3	3	1, 2	1
417	2	1	2	3	1, 2	1
437	2	1	3	3	2, 3	1
438	2	2	3	3	2, 3	1
515	2	1	2	3	2	2
519	2	1	2	3	2	1

Size
1 = <2.5 cm
2 = 2.5-5 cm
3 = 5-7.5 cm
4 = >7.5 cm

Cortex
1 = present
2 = absent

Flake Removals
1 = 1-2
2 = 2-5
3 = >5

Removal Direction
1 = single direction
2 = bidirectional
3 = multidirectional

Platform Types
1 = natural
2 = single facet
3 = multifacet

Modification
1 = none
2 = trimming
3 = hammerstone

(D1) Primary Flakes (N=103)

Primary flakes are the first flakes removed from a chert cobble. They have cortex (the weathered exterior surface of a cobble) entirely covering the ventral surface. Small patches of missing cortex from the ventral face were disregarded when it was obvious these patches were the result of platform shatter or postchipping damage.

(D2) Secondary Flakes (N=1564)

Secondary flakes have cortex only on a portion of the ventral surface or on the platform. As the name implies, secondary flakes are removed from chert cobbles after the primary flakes and usually before the tertiary flakes.

(D3) Tertiary Flakes (N=3585)

Tertiary or interior flakes do not have any cortex. Tertiary flakes are commonly smaller and much more numerous than primary or secondary flakes.

(D4) Corticate Chips (N=2319)

Corticate chips have some cortex on the ventral surface.

(D5) Decorticate Chips (N=4507)

Decorticate chips do not have any cortex.

(D6) Chunks (N=246)

Chunks are angular pieces of chipped stone that do not have a platform or well-defined ventral or dorsal surfaces. Chunks are often battered chert pieces that are no longer recognizable as chips or flakes. Chunks can also represent angular shatter fragments created when flawed chert is knapped.

Modified Debitage

The modified debitage category consists of flakes, chips, and chunks with edges that have been altered or modified after removal from the parent mass (core or biface). The regional literature contains a number of analytical or descriptive terms that have been applied to modified debitage, including trimmed flakes, retouched flakes, utilized flakes, and edge-damaged flakes. The view taken here is that it is difficult if not impossible to easily distinguish between flakes with minutely retouched edges, flakes with utilized edges (worn through use), and flakes with damaged edges. Detailed wear pattern studies would be necessary to begin to meaningfully differentiate between these categories of edge modification.

Flake edges are characteristically sharp, thin, and fragile. Many factors unrelated to prehistoric culture cause damage to flake edges, such as agricultural modification (clearing and plowing), cattle and horse tromp, trowel damage, screen damage, and bag damage. Recent edge modifications, such as that occurring during excavation, typically result in fresh looking broken edges. Obviously recent edge-damaged debitage was purposefully disregarded during the sorting process. Similarly, debitage with random nicks or irregular broken edges were not considered modified. Tiny chips with very small amounts of edge modification were also disregarded. The intent was to categorize as modified only those pieces of debitage that were prehistorically and purposefully modified.

The modified debitage pieces from 41 JW 8 are described in three groups. It should be noted that overlap occurs between the first group, trimmed debitage, and some of the minimally modified unifaces. It should also be noted that occasional trimmed flakes appear to have specialized morphological attributes, for example, a beaked projection. These are not assigned to a separate group due to the very small number of artifacts in question.

(MD1) Trimmed Debitage (N=51)

Trimmed debitage pieces, for the purpose of definition, are considered those flakes, chips, and chunks that have flaked edges with at least five **en echelon** (side by side) flake removals at least 2 mm in length. If flake removals cover most of both faces, then the artifact is considered a biface. If the flake removals are only on one face and form a regular edge that significantly alters the original shape of the flake, then the artifact is considered a uniface. This category commonly includes both incipient bifaces that were never completed and flakes with one or more regular edges that have been flaked to form a working tool edge. It is often difficult to distinguish between these two categories.

The MD2 category (minutely retouched and utilized debitage) is by far the most numerous type of trimmed debitage in the Hinojosa site lithic collection. All types of flakes and chips are purposefully trimmed. Trimmed chunks are uncommon. Larger flakes, particularly secondary flakes, tend to be carefully trimmed more often than smaller tertiary flakes and chips.

(MD2) Minutely Retouched and Utilized Debitage (N=776)

The MD2 category contains flakes, chips, and chunks with edges that have minute retouch, utilization, or edge damage for at least five continuous millimeters. In other words, pieces of debitage with irregular edge modification are not included. This group forms the most numerous tool category at 41 JW 8. MD2 specimens are believed to represent informal flake tools. These informal flake or debitage tools are simply pieces of debitage that were picked up from discarded waste and used with little or no special preparation. Typically, these tools may have been used to perform cutting, incising, scraping, and sawing functions for a limited time (single use episodes?) and then discarded. The specific function that a given tool was used for is difficult to determine even with microwear analysis, due to the

very short-term nature of most of the hypothesized tool functions. A flake used for two minutes to sharpen a stick is not going to develop much wear.

All types and sizes of debitage occur in the MD2 category. Due to the ephemeral nature of the modification, many pieces of debitage classified as unmodified would probably be classified as minutely retouched and utilized if examined under magnification.

(MD3) Retouched Debitage with Concave Edge (N=43)

The MD3 category consists of modified debitage specimens that have a retouched concavity (semicircular notch) on at least one edge. Flakes or chips with irregular concavities or concavities formed by a single blow are not included in this group. Similar artifacts are usually referred to as "spoke shaves." It is often suggested that spoke shaves were used to smooth arrow shafts. The 41 JW 8 MD3 specimens are not uniform and vary considerably in the size and shape of the concave edge.

Bifacial Artifacts

Bifaces are two-sided pieces of chert that have been shaped by flaking on both faces. Most of the bifaces from 41 JW 8 are flake bifaces. That is to say, the bifaces were made from flake blanks rather than from an entire cobble (core biface). This is evidenced by the overall small size of most of the bifacial artifacts and the presence of flat flake plane remnants on many specimens. A few of the larger bifaces may be core bifaces.

The bifacial artifacts are divided into several functional and morphological groups. The smallest bifaces are arrow points. The distinctive size and shape of the arrow points from 41 JW 8 leave little doubt as to their functional identification. The larger complete bifaces and fragments of complete bifaces are described under the heading "Finished Bifaces." Four morphologically distinct groups of finished bifaces are defined. These four groups represent tool types that have been previously recognized in southern Texas. Functional differences are suggested for most groups based on morphology and microscopic examination although some functional overlap occurs.

The remaining bifacial artifacts are unfinished and fragmentary and do not fit into well-defined groups. These are divided into groups based on general morphological similarities. These bifacial artifacts were not microscopically examined.

Arrow Points

(A1) Contracting Stem (Perdiz) (N=99)

The A1 category consists of complete and identifiable fragments of small contracting stem arrow points (Figs. 4; 5,a-n). The blades are triangular with straight or rarely concave (recurved) or convex edges. The distal tips