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CHAPTER 7
THE ARTIFACTS FROM OCCUPATION AREAS AT MITCHELL RIDGE SITE: DIMENSIONS OF TECHNOLOGY AND STYLE

General Characteristics of the Artifact Assemblage

On the whole, the artifact assemblage from the various occupation areas at Mitchell Ridge is similar to that previously summarized for the later Ceramic Period on the upper Texas coast by Aten (1979, 1983a). The findings from the 1970s and 1992 excavations are summarized in Table 7.1. Ceramics are overwhelmingly the most abundant class of artifact; nearly 25,000 potsherds, representing several hundred vessels, were recovered from the combined investigations of the 1970s and from the main excavations carried out in 1992. The next most abundant class of materials are the flaked lithic artifacts, with chert debitage numerically dominant and finished tools consisting mainly of arrowpoints and small drills/perforators. The bone and shell industries are quite limited, though the small samples contain a variety of artifact forms.

The lithics are of value in defining the chronology of site occupation. Since the great majority of stone projectile points are arrowpoints-- 68 whole and fragmentary specimens are in the combined 1992 and 1970s collections-- it is inferable that most of the occupation of the site took place during the Late Prehistoric. The most useful time markers among the arrowpoints are the Perdiz and Scallorn types, since these are solidly dated in the greater Texas area to ca. A.D. 1250/1330-1700 and A.D. 700/800-1250/1300, respectively (e.g. Prewitt 1981, 1985; Turner and Hester 1993). The Perdiz type greatly outnumbers Scallorn, so it is probably fair to infer that occupation at the site was most intensive during the Final Late Prehistoric Period, a suggestion which is, as noted earlier, supported by the combined radiocarbon data on occupational features and burials.

Functionally, the preponderance of arrowpoints among lithic tools points to some importance for hunting, which finds support in the fact that white-tailed deer is estimated to have contributed the greatest amount of dietary meat by weight to the diet, next to fish. In this light, the paucity of formal lithic butchering tools (1 bifacial knife from the 1970s excavation) is somewhat surprising, as is the scarcity of the unifacial end scrapers (1 specimen, also from the 1970s) generally though to have served in hide-working. Possibly, primary butchering and hide preparation were activities carried out elsewhere, at specialized hunting camps, most of which may have been located on the mainland.

Next to arrowpoints, small drills are the most abundant lithic form, represented by 33 specimens in the combined 1992 and 1970s collections. With the exception of four specimens from Feature 9, which could have served as arrowpoints, these implements probably were in fact used as drills or perforators, since they generally were probably too long and slender to have served well for high-impact penetration. Some specimens exhibit use-wear on lateral edges under low-power microscopy, whereas many others do not; perhaps the latter group represents frequent breakage, whereby many specimens were discarded before appreciable edge wear developed. The function of these implements is, as noted previously by Aten (1983a:252), somewhat problematic. Judging by the common lack of discernable edge wear, some must have been used on soft materials, such as hides. This may be particularly true for expanded-base specimens, since the form matches that of many of the chert perforators found in inland Late Prehistoric contexts (e.g. Prewitt 1981; Black 1986; Highley 1986; Johnson n.d.) which are often thought to have served in perforating hides of deer and bison. At least some of the cylindrical specimens, some of which do show edge-wear, were probably used to perforate hard materials such as wood, and it has been suggested by Campbell (1957) that such drills were used for making holes in shell beads. Aten (1983a) has suggested that small drills appear in the later part of the cultural sequence on the upper Texas coast, and the relative abundance of these items and our chronological data from Mitchell Ridge certainly do not contradict this general temporal placement.

Bone implements are relatively uncommon, consisting of eleven specimens from the 1970s work and ten from our 1992 excavations. Mundane tool forms include four awl fragments, a probable deer metapodial fleshing tool, two bone points, and two rectangular pieces of thick bone (probably bison longbone) with beveled edges which, as discussed earlier, may have been used to smooth surfaces of still-moist, unfired pottery. The dearth of awls, often the most common bone artifact in prehistoric assemblages, may reflect the use of the far more abundant flaked chert perforators for punching holes in

Table 7.1. Artifacts from occupation areas by material categories, 1970s and 1992 investigations.

	Block	Fea. 9	Bayou Lots	1970s (all)	TOTALS
Lithics					
Dart points fragments				2	2
Arrowpoints					
Perdiz	22	5		8	35
Probable Perdiz	2	1		3	6
Perdiz-like	2				2
Scallorn	1			1	2
Triangular				1	1
Sub-triangular		3		2	5
Bulbar stemmed		1			1
Lozenge-shaped	2	1		1	4
Cuney	1				1
Misc. fragments	2	1		3	6
Untyped	2	1		2	5
Drills/perforators					
Cylindrical	2			1	3
Expanded-base	2	1		7	10
Fragments	3	2		11	16
Drill/arrowpoints		4			4
Cores	1			1	2
Bifacial knife				1	1
Miscellaneous bifaces	4			2	6
Unifacial end scraper				1	1
Prismatic blades	17	4		16	37
Retouched flakes	7	5		9	21
Debitage	2241	465	2	434	3142
Rough/ground stone]					
Milling/abrading	2				2
Pumice abraders	1			1	2
Hammerstones	1			1	2
Bone					
Awls	3			1	4
Flesher(?)	1				1
Pottery tools (?)	1			1	2
Rectangular bone				2	2
Socketed point				1	1
Unsocketed point				1	1
Bird bone beads	3			5	8
Whistle frag.	2				2
Shell					
Whelk adze frag.				1	1
Bi-pointed columellae	4				4
Cut whelk shell	1				1
Whelk, chisel-like end				1	1
Perforated oyster	3				3
Possible oyster tool	1				1
Discoidal bead				1	1

Table 7.1, Continued.

	Block	Fea. 9	Bayou Lots	1970s (all)	TOTALS
Aboriginal Ceramics					
Potter's coil	1				
Potsherds	7,018	1,681	734	15,012	24,445
Glass					
Arrowpoint fragments	1			1	2
Flaked glass frags.	5			2	7
Patinated bottle frags.				13	13

soft materials such as hides. Non-mundane or ornamental bone items consist of a total of eight beads made from bird longbone sections and two fragments of bird bone whistles from the 1992 Block Excavation, and possibly the two rectangular bone pieces recovered during the 1970s.

Only 12 artifacts of modified shell are present in the combined collections. All but one are assumed to be tools, including a whelk adze fragment, four bi-pointed whelk columella sections, a section of cut whelk body whorl, a whelk shell with the constricted terminus beveled to a chisel-like edge, three perforated oyster shells, and a possible oyster shell cutting/scraping tool. In marked contrast to findings in certain burials at the site, shell ornaments are extremely rare, consisting of only a single discoidal bead of quahog(?) shell.

The paucity of shell tools is somewhat surprising, considering (a) the coastal location of the site and (b) the absence of locally available stone as raw material for tool production. In part, this is doubtless due to the absence or scarcity of certain mollusc species in the local estuarine environment, species which are known to have commonly served as raw materials on the central Texas coast, where higher average salinity conditions provided suitable habitats (e.g., lightning whelk and sunray venus clams; see Steele 1988; Ricklis 1990). However, the dearth of shell tools may also be more apparent than real. Oyster shell cutting tools are documented as part of the upper coast archaeological assemblage (Aten 1983a), and the fact that only a single possible example was identified at Mitchell Ridge (from the 1992 Block Excavation) may simply reflect the generally weathered condition of oyster shell at the site and the resultant difficulty in identifying the kind of surficial wear which would have been produced by utilization. Indeed, oyster shells could very well have been used as a common surrogate for chert in various cutting and scraping tasks.

The final non-ceramic artifact class consists of a few items of worked glass. The presence of two fragmentary arrowpoints, both of dark green bottle glass, clearly represents aboriginal occupation during the era of European contact, in the Protohistoric or the Early Historic Periods. The same can probably be said about the seven fragments of bottle glass which exhibit intentional edge-flaking for use as cutting/scraping tools. The thirteen unworked fragments of heavily patinated bottle glass probably also pertain to the contact period, since they stand out from modern glass fragments scattered across the site by virtue of their heavy oxidation, which in some cases has completely penetrated the thickness of the glass.

Pottery is abundant, as reflected not only in the total number of sherds recovered but also in the fact that the individual vessels represented (N = 600) are far more abundant than all other tool forms combined. This presumably reflects an emphasis on cooking, and may in fact correlate with the importance of fish in the meat diet, insofar as pottery vessels would have been well suited to boiling and thus to maximum use of fish meat and oils. The relative abundance of pottery may also point to fairly lengthy seasonal residences at the site, since the low-fire aboriginal ceramics probably would not have fared well under conditions of high mobility and frequent camp removals and may, therefore, have been more commonly used during periods of extended residence.

Flaked Chert and the Organization of Lithic Technology

The sample of flaked lithics from Mitchell Ridge provides a unique opportunity to explore the question of how aboriginal people organized the technology of lithic tool manufacture and use on an upper coast barrier island. The Texas coastal barriers are geologically devoid of workable stone, as are the sandy clays and clayey sands of the Beaumont and Lissie Formations of the mainland (Fisher et al. 1972), so that Mitchell Ridge is situated at a considerable distance from natural sources of lithic raw material. The present inquiry provides some degree of insight into how prehistoric peoples met the need for efficient tool technology when operating under the constraint of scarce raw material resources.

A number of researchers have examined various responses of hunting and gathering peoples to limited availabilities of tool raw material, proposing several compensatory responses to the problem. Binford (1979) has shown that when raw materials are distributed fairly evenly throughout the operational area of a population, the procurement of those materials and the manufacture of tools can be readily "embedded" within the seasonal round of mobility that is directed to procurement of food resources. However, in cases in which lithic raw materials are more localized, the scheduling demands of the food quest can create a logistical challenge, insofar as people must be in the right place at the right time to procure biotic resources and yet must also be able to procure sufficient tool raw material to maintain technological efficiency. Several strategies have been detected in the archaeological record by which this sort of problem was overcome. One such strategy is simply the curation and maintenance of tools with relatively long use-life (Schiffer 1975; Binford 1977; Bamforth 1986). Another was the creation of multi-purpose tools, by which a single tool with a reliably long use-life could serve a number of expectable tasks (Goodyear 1979; Bleed 1986; Kelly 1988). Finally, various kinds of tool refurbishing or rejuvenation served to extend the use-life of existing materials and thus postpone the need to return to the source areas for raw material (Wiant and Hassen 1985; Bleed 1986; Kelly 1988).

A recently published model of Late Prehistoric lithic technological organization on the central Texas coast (Ricklis and Cox 1993) provides a predictive framework for interpreting the flaked lithic assemblage at Mitchell Ridge within the regional spatial parameters of technological organization. Transferring the central coast model to the upper Texas coast is justified, since (a) native peoples of both regions operated within a mobile hunting and gathering adaptive system and had similar modes of transportation for movement of people and materials (i.e., foot travel and dugout canoes) (b) the environments of both areas are geologically and hydrologically similar, consisting, from the Gulf inland, of barrier systems, bay/lagoonal estuaries into which empty a series of subparallel streams, and a coastal plain consisting of the same geologic units parallel to the Gulf shore (i.e, the Beaumont and Lissie formations of Pleistocene fluvial-deltaic origin), and (c) chert color and cortex characteristics indicate that similar river cobbles were employed in the manufacture of tools on the central coast and at the Mitchell Ridge Site. In both regions, the closest sources of lithic raw materials would have been in fluvial settings where river downcutting was sufficiently deep to reach the chert gravels of the Upper Goliad formation, an accumulation of fluvial-deltaic deposits of Pliocene age; such locations would have been at some considerable distance from the modern shoreline, where the Beaumont and Lissie deposits are sufficiently thin to permit streams to downcut to and expose the underlying Upper Goliad gravels.

The key points of the central coast model can be summarized concisely here. As mentioned, lithic materials of useable size were not available along the coast, and could have been procured only at some distance inland, along streams. The small- to medium-sized chert cobbles at identified inland locations (some 60-70 km from the mainland shoreline) have fairly distinctive color and cortex, permitting the confident conclusion that virtually all tools and debitage from Late Prehistoric (Rockport Phase) sites were made of material from the known source area along the Nueces River.

As the cost of procurement and transport of raw material increased with increasing distance from/to known occupation sites, several strategies were employed to maintain the overall efficiency of tool technology. First, in response to the decreasing availability of lithic raw material with increasing distance of a given campsite from the lithic source area, the frequency of primary production of stone tools decreased. This is reflected in a linear, distance-related decrease in the ratio of flakes to tools, indicating that increasingly more tools were discarded (or removed from the technological system) that were made

Table 7.2. Flakes and flake fragments from the 1992 Block Excavation and Feature 9

	FLAKES							FLAKE FRAGMENTS			
	P	CP	S	T	Th	R	Total	P	S	T	Total
Block Excavation											
Totals	5	17	48	315	43	805	1233	21	123	864	1008
% of types internally	.41	1.38	3.89	25.55	3.49	65.29	100.02	2.08	12.20	85.71	99.99
Feature 9											
Totals	4	15	16	120	5	75	235	11	52	164	227
% of types internally	1.70	6.38	6.81	51.06	2.13	31.91	99.99	4.84%	22.91%	72.25%	100.00

P = Primary
CP = Cortex Platform
S = Secondary
T = Tertiary
Th = Thinning
R = Retouch

Table 7.3. Adjusted flake type numbers and percentages, numbers of formal lithic tools, and flake:tool ratio forcombined samples from 1992 Block Excavation and Feature 9.

	Whole Flakes				Flake Fragments			Totals	Formal Tools*
	P	S	T	TH	P	S	T		
Block Excavation	5	65	315	43	21	123	864	1436	43
Feature 9	4	31	120	5	11	52	164	387	20
Totals	9 2%	96 16%	435 74%	48 8%	32	185	1028	1823	63
P = primary; S = secondary, including cortex platform; T = tertiary; TH = biface thinning flakes * Formal tools include arrowpoints, drills, fragments of apparently finished miscellaneous bifaces.								Flake:tool ratio - 29:1	

at a given site (or introduced into the system).

With a decrease in the number of tools being introduced into the system, several compensatory strategies were employed with which to maintain technological efficiency, as follows:

1) Expedient use of an increasing proportion of available (on-site) chert debitage for various cutting and/or scraping tasks, effectively replacing formal tools (i.e, bifacial knives, unifacial end scrapers) with the use of flakes. This is indicated by a linear increase in the percentage of total flake samples which show evidence of edge utilization in the form of unintentional continuous edge microflaking.

2) Increasing rejuvenation/reworking of bifacial tools with increasing distance from the lithic source area. This is suggested to represent the curation and use-life extension of bifaces as compensation for the inability to introduce newly made pieces into the system as the availability of raw material decreased, in the manner suggested by Kelly (1988) for the Great Basin region. The increased edge rejuvenation of bifacial tools is indicated by a general linear increase in biface thinning flakes with increasing distance from the lithic source area. In this connection, it is important to note that the relative proportions of all other flake types (i.e., primary, secondary and tertiary) remain essentially unchanged with distance from the source, suggesting that, with the exception of increased edge rejuvenation of bifaces, the basic kinds of lithic reduction (while decreasing in absolute frequency) did not change proportionately.

3) Further evidence of curation and rejuvenation of existing tools is suggested by a linear decrease in the average length of Perdiz arrowpoints with increasing distance from the lithic source area. Perdiz points at or very near (within 1-5 km) the source average nearly 3 cm in length, and the length drops to approximately 2.4 cm in length at sites farthest (70 km) from the source. This is interpreted to represent reworking of points as a technique for use-life extension; whereas new points were easily made at campsites from which chert was easily procured, at sites some distance from the lithic source greater emphasis was placed on reworking of dull or broken points. The possibility that the decreasing average length represents manufacture of points from smaller flakes (reflecting increasing use of less than optimally-sized material away from the source) was considered, but this does not appear to be supported by the data on average flake lengths from the sampled sites. While there is an initial decrease in the

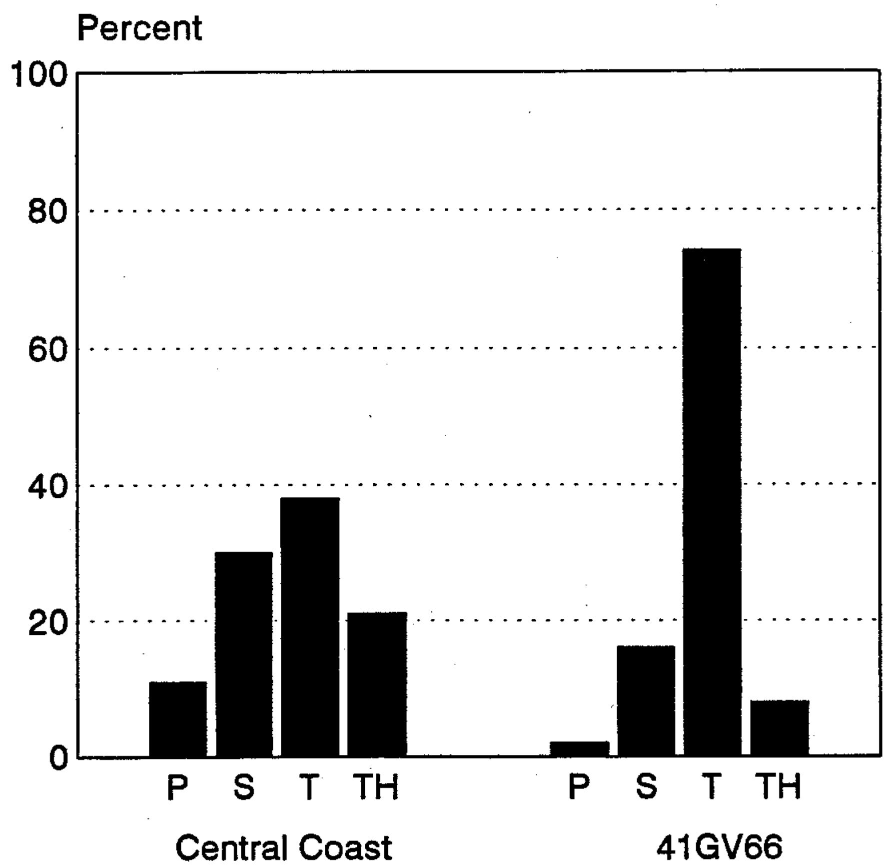

Figure 7.1. Bar graph showing percentages of flake types (primary, secondary, tertiary and thinning) for combined central Texas coast sites (from Ricklis and Cox 1993) and Mitchell Ridge. Note very low proportion of primary and secondary flakes relative to tertiary flakes at Mitchell Ridge.

average length of whole flakes between the source area and a point some 28 km from the source, beyond that point average flake length remains virtually unchanged (at approximately 2 cm), regardless of greater of lesser distance from the lithic source. This is interpreted to reflect use of somewhat larger cobbles at sites at or near the source, and transport of smaller cobbles to sites at some distance, but not transport of cobbles whose sizes fell below a certain threshold of utility (see discussion in Ricklis and Cox 1993). Thus the fact that the average length of Perdiz points continues to decrease to the maximum distance from the lithic source would appear to be an independent variable, one which reflects reworking of the points rather than the size of available flakes for point production.

4) Finally, beyond a certain distance from the lithic source area, the organization of lithic technology *per se* apparently became sufficiently inefficient that surrogate raw materials for tool production had to be brought into the system. These materials consisted of estuarine shell, primarily lightning whelk and sunray venus clamshells. Plotting of the geographic distributions of formal shell tools (whelk adzes, sunray venus knives/scrapers) from Late Prehistoric contexts proved most interesting in this regard: These tools are found on sites along small streams devoid of lithic raw materials (the Aransas River, Oso Creek) and at shoreline locales far removed from the lithic source area, but not at Late Prehistoric sites on the lower Nueces River, where relatively low cost procurement of raw material could be had by direct canoe travel to and from the source area (see Ricklis and Cox 1993, Figure 2).

In sum, the data from the central coast point to three modes of behavior which came into play sequentially as the cost of raw material procurement and transport increased with distance. *Mode I* involved the primary manufacture of lithic tools, and this decreased in importance with increasing distance

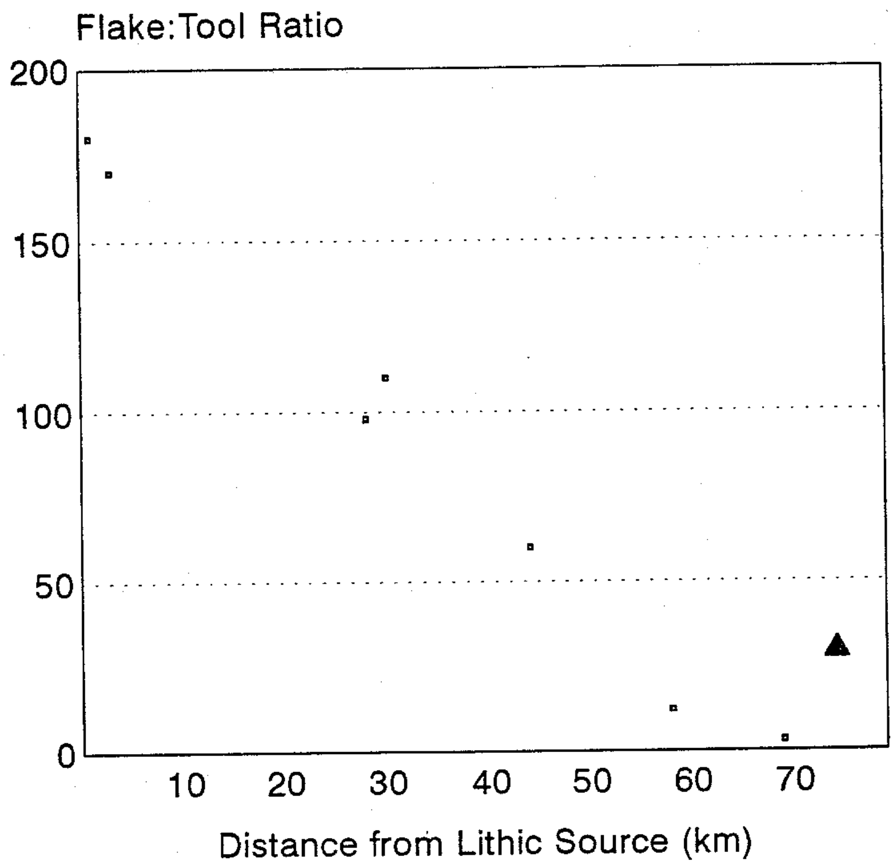

Figure 7.2. Scatter diagram showing relation between flake:tool ratio and distance from lithic source area on central Texas coast (from Ricklis and Cox 1993) and the Mitchell Ridge Site (black triangle).

from the source area. *Mode II* entailed the several techniques of material use-life extension (use of unmodified flakes for cutting/scraping, edge-rejuvenation of bifaces, resharpening of arrowpoints). *Mode III* involved the substitution of shell as a surrogate tool material, inferably when Modes I and II no longer met the adaptive requirements of the technological system.

Hypothetically, if the occupants of the Mitchell Ridge Site were employing a similar kind of technological organization, the various lithic data sets should conform to expectations for a site at the far limits of the lithic procurement/transport system. Although the spatial distributions of chert sources have not been precisely defined for the upper coast, the geologic variables are essentially the same as for the central coast, and Mitchell Ridge was doubtless far removed from lithic source areas, which must have been situated considerably inland along major rivers such as the Brazos and the Trinity. Predictably, then, the lithic data sets used in the central coast study should show the following characteristics for Mitchell Ridge:

1. The ratio of flakes to formal tools should be low, reflecting a relatively high incidence of discard of exhausted or broken tools to on-site production of new tools;

2. There should be a high percentage of utilized flakes in the entire flake sample, indicative of a heavy reliance on expedient use of debitage for cutting/scraping tasks as compensation for a shortage of useable formal tools;

3. The breakdown of flakes into types should show a relatively high percentage of biface thinning flakes, as formal bifacial tools are resharpened or reworked to extend tool use-life;

4. The average length of Perdiz arrowpoints should be relatively short, reflecting frequent resharpening of dulled/damaged arrowpoints as a technique for extending use-life;

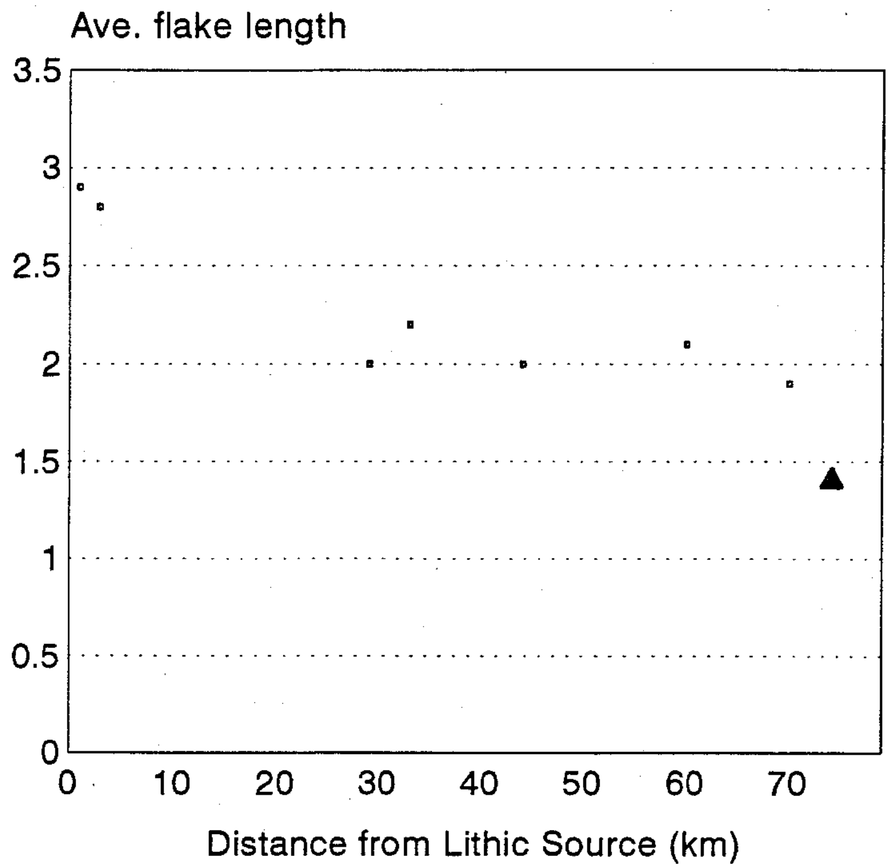

Figure 7.3. Scatter diagram showing relation between average flake length and distance from lithic source area on central Texas coast (from Ricklis and Cox 1993) and the Mitchell Ridge Site (black triangle).

5. There should be significant use of shell as a surrogate material for chert.

Combining the well-provenienced debitage samples from the 1992 investigations of the Block Excavation and Feature 9 for analysis, it is apparent that certain of these expectations are met, while others are not. The breakdown of debitage into flake types for these two areas is shown in Table 7.2. Whole flakes sort into primary flakes (100% of dorsal surface is cortex), flakes with cortex platforms (usually otherwise non-cortical), secondary flakes (with some part of the dorsal surface consisting of cobble cortex), tertiary (interior flakes with no cortex remaining), biface thinning flakes (lipped interior flakes) and small retouch flakes (.75 cm or less in length, interior flakes representing, for the most part, tool edge retouch). Whole flakes are here defined as specimens retaining the striking platform and bulb of percussion, though the distal end is broken off in some cases. Table 7.2 also shows the breakdown by types of flake fragments, defined here as fragments from which the proximal end bearing the platform and bulb is missing.

For comparability with the samples from the central coast, some adjustments are required. In the analysis of the central coast materials, only flakes recoverable on 1/4-inch screen were used. Therefore, in order to achieve comparable results with the Mitchell Ridge material, retouch flakes are eliminated from present consideration; in general these would not have been recovered on 1/4-inch screen. Second, cortex platform and secondary flakes were combined into the single category of "secondary flakes" for the central coast material, so this procedure is followed here for the Mitchell Ridge flakes. Finally, for determination of flake:tool ratios in the central coast analysis, both whole flakes and flake fragments were combined for a total flake count; again, this procedure is followed here for Mitchell Ridge. The results of these

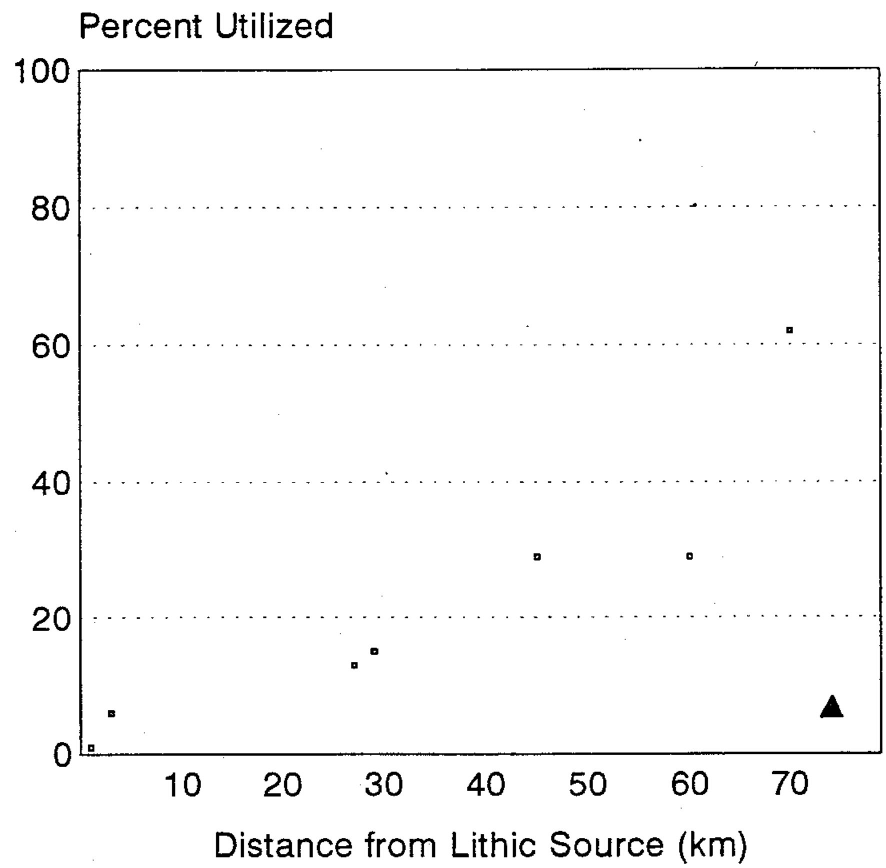

Figure 7.4. Scatter diagram showing relation between percent of flakes utilized and distance from lithic source area on central Texas coast (from Ricklis and Cox 1993) and the Mitchell Ridge Site (black triangle).

adjustments of the Mitchell Ridge flake data are presented in Table 7.3.

Having thus created comparability in the data, the various lithic data sets from the central coast and Mitchell Ridge can be compared, and inferences can be drawn concerning similarities and possible differences in lithic technological organization, as follows:

Flake type percentages. As already mentioned, with the exception of thinning flakes, the proportion of which varies a good deal, the flake type percentages (based on whole flakes) from the sampled central coast sites shows little variation. As may be seen in the comparative graph, Figure 7.1, the percentage breakdown of flake types at Mitchell Ridge contrasts markedly with the combined samples from nine sites on the central coast (combining all site data for the central coast is justifiable, since there is relatively little variability in the flake type percentages; see Ricklis and Cox 1993). At the combined central coast sites, primary flakes account for 11% of the total, secondary flakes are 30%, tertiary 38%, and biface thinning flakes 21%. At Mitchell Ridge, primary flakes account for a mere 2% of the total, secondary flakes are 16%, thinning flakes only 8%, so that the great majority, 74%, are tertiary flakes.

Very generally, the kinds of flakes and their relative numerical significance reflect the kinds of lithic reduction carried out at a given site (e.g. Collins 1975; Ensor and Roemer 1988). However, considering the Mitchell Ridge data in terms of spatial context-- that is, as representing one segment of the aboriginal operational area-- it would probably be erroneous to conclude that the discrepancies in the data reflect different kinds of lithic technology. Certainly, the kinds of finished tools at Mitchell Ridge are the same as on the central coast (i.e., Perdiz points made on flakes, small drills, occasional bifacial tools), so it is apparent that the end goals of lithic reduction were essentially similar in both areas. Also, as noted above, the environmental parameters of technological organization, and the kinds of raw materials

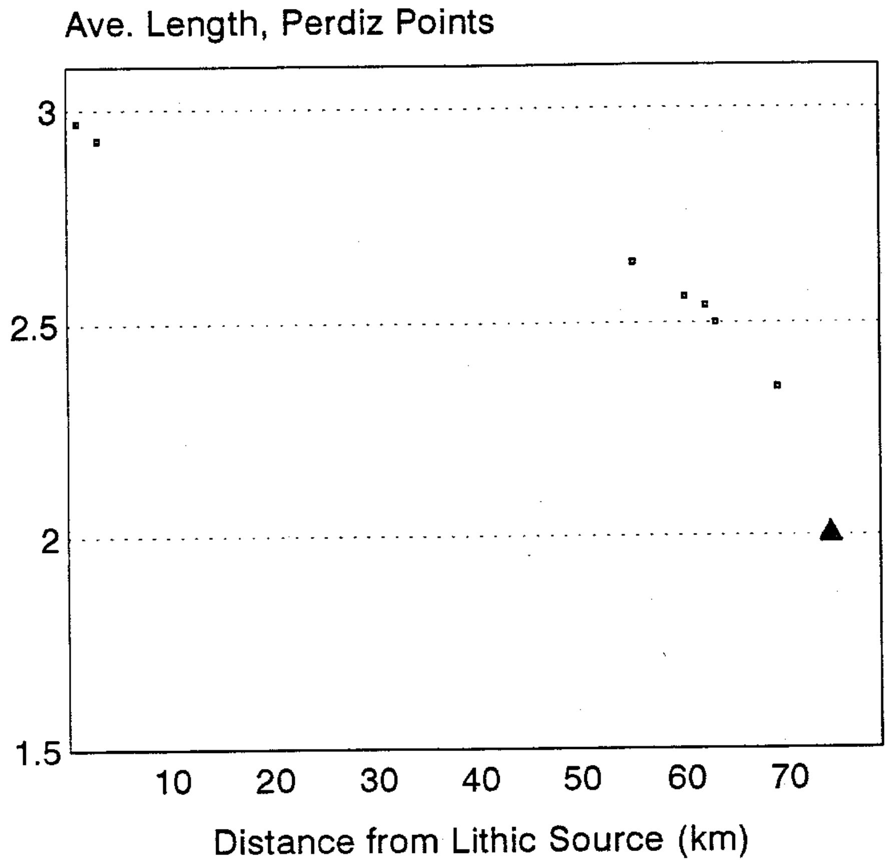

Figure 7.5. Scatter diagram showing relation between average length of Perdiz arrowpoints and distance from lithic source area on central Texas coast (from Ricklis and Cox 1993) and the Mitchell Ridge Site (black triangle).

commonly available, were basically the same.

More likely, the data on flake types from Mitchell Ridge can best be explained, not as representing a different kind of technological organization, but as reflecting a different point on an analogous, distance/cost-related continuum, one in which distance and therefore cost of procurement/transport of raw material was even greater than represented by the data from the central coast sites. For example, the lower percentage of primary flakes could very well indicate that raw material (whole cobbles) rarely reached the site prior to some degree of initial reduction, an inference which is certainly not contradicted by the dearth of chert cores at the site. The relatively high percentage of tertiary (non-cortical) flakes at Mitchell Ridge is in accord with this suggestion, since production of flakes for manufacture of tools such as arrowpoints and drills would have involved mainly the use of material which had already been subjected to some initial reduction (i.e., removal of cobble cortex). Finally, the low percentage of biface thinning flakes could reflect the fact that bifacial tools were generally exhausted by the time they reached the island; that is, there simply were fewer bifaces left to rework than was the case at campsites closer to lithic source areas. The data from the central coast also suggest this kind of pattern, since those sites farthest from the source area have lower percentages of thinning flakes than sites at intermediate distances (Ricklis and Cox 1993).

Flake:Tool Ratio. In the combined lithic samples from the Block Excavation and Feature 9, the ratio of flakes to chipped stone tools is 29:1. In terms of the central coast model, this is similar to sites located away from the lithic source area, as can be expected at a barrier island location (see Figure 7.2).

Average Flake Length. As mentioned above, beyond 25 km or so from the lithic source area, the average flake length at central coast sites is consistently about 2 cm, and this may be a result of the use of cobbles of optimal size for transport and reduction, in the sense that complete cobbles could optimize the choices available to the flint knapper and, at the same time, larger cobbles would have been heavier and, in the aggregate, less efficient to move from one place to another. At Mitchell Ridge, the average flake length is markedly shorter, at 1.38 cm (see Figure 7.3). This can be inferred to reflect either (a) use of even smaller cobbles than may have generally been used on the central coast, or (b) more frequent reworking of previously worked cobbles and tools and a concomitantly less frequent use of whole cobbles. The latter possibility seems the more likely in light of the very low percentage of primary flakes and the rarity of cores at the site compared to the combined sample from the central coast (the ratio of all flakes to cores from the 1992 work at Mitchell Ridge is 1571:1; the ratio in the combined central coast samples is 165:1). Alternatively, the occupants of Mitchell Ridge may have been forced to extend the use of raw material by transporting and then further reducing flakes, in addition to finished tools.

Percent of Flakes Utilized. Once again, the data from Mitchell Ridge diverge from those for the central coast (Figure 7.4). Given its barrier island location, the site should expectably have a very high percentage of flakes with evidence of edge utilization. This is not the case; the combined percentage from the Block Excavation and Feature 9 is only 5.9% (as compared to percentages ranging from about 30% to over 60% at sites in the central coast area which are over 40 km from the lithic source; see Ricklis and Cox 1993, Fig. 5). The Mitchell Ridge figure is remarkably low, and approximates the percentages of flakes utilized at central coast sites which are at or very near the lithic source. One explanation for this is that daily activities at Mitchell Ridge simply involved little in the way of cutting or scraping tasks. Intuitively, this seems unlikely; hunting, fishing, and food processing tasks were clearly important, and all would have required the making and/or repair of appropriate gear. While this could account for some of the discrepancy, perhaps a more satisfactory explanation is that the majority of flakes available as potential expedient tools were simply too small/thin for effective utilization.

Average Length of Perdiz Arrowpoints. The data from Mitchell Ridge do conform to expectations in this case (Figure 7.5). The average length of whole Perdiz (including "Perdiz-like") arrowpoints is 2.0 cm, shorter than any of the averages for sites on the central coast, which range from just under 3.0 cm at the lithic source to 2.34 cm at the site farthest from the source (Site 41NU219 on Padre Island, 70 km from the source). A marked emphasis on resharpening and, perhaps in this case, manufacture of points from smaller-than-usual flakes, is suggested.

In sum, the combined lithic data from Mitchell Ridge, when placed against the central coast findings, suggest that the aboriginal occupants of the site were operating at the extreme limits of efficiency in terms of the organization of lithic technology. While at a general level the same kinds of responses can be inferred-- all involving some sort of extension of material or tool use-life-- at Mitchell Ridge the problems of material shortage seem to have been even more severe than at sampled sites on the central coast. This is reflected in (a) smaller average lengths of flakes and Perdiz arrowpoints, (b) a nearly complete absence of cores, (c) an extremely low percentage of primary flakes (suggesting virtual non-availability of unmodified raw material), (d) a low percentage of thinning flakes indicating little emphasis on biface refurbishing, perhaps because bifaces had already been exhausted before people reached the site (which is congruent with the generally low incidence of bifacial tools at the site), and (e) a surprisingly low incidence of utilized flakes, which is interpreted to reflect the generally very small size of the available flakes. The stress on the technological system must have been further compounded by the dearth of shell material suitable as surrogate material for tool production, assuming that oyster shell was not used far more frequently than can be discerned from the weathered shells characteristic of the site.

These inferences must all be tested by generation of comparable data from other sites in the upper coast region. However, on the working assumption that Mitchell Ridge is in fact one end member of the same sort of spatially determined decision-making process which has been identified on the central coast, it is predictable that sources of lithic raw material are even farther removed (by distance or some other constraining factor) than from sites in the latter area. If all of this is confirmed by additional lithic research in the region, it is noteworthy that it did not seem to ultimately inhibit intensive use of the island locale. Presumably, less than optimal efficiency in lithic technological organization was deemed tolerable by the site's occupants in view of what were probably abundant and readily procured estuarine food resources. The scheduling requirements of biotic resource procurement must have been given higher priority that optimal availability of lithic resources. This is in effect the ultimate implication of the central

coast study, in which it was found that sequential shifts in Mode I, II, and III technological behavior operated independently of the subsistence and settlement pattern, which was geared to take advantage of the seasonal and spatial occurrence of important food resources (Ricklis and Cox 1993). Central coast lithic technology operated in an essentially satisficing mode, insofar as settlement pattern was structured in response to the requirements of food procurement rather than the availability of raw materials for tools. On the whole, the same appears to have been the case at Mitchell Ridge.

Aboriginal Ceramics at Mitchell Ridge: Toward an Understanding of Technology and Style

Counting the 24,476 potsherds from the 1970s and the 1992 excavations, plus an additional 2,107 potsherds surface-collected from across the site during 1992, we have a total sample of 26,583 sherds from the Mitchell Ridge Site. This constitutes the largest ceramic sample from a single site on the upper Texas coast, and is in fact over 60% larger than the combined pottery sample from various Galveston Bay area sites that was available to Aten for his seminal studies of regional ceramic typology (Aten 1983a). As such, the pottery from Mitchell Ridge represents an unusually good opportunity to examine upper coast ceramics from the perspectives of both technological and stylistic attributes, and to attempt to (a) systematically describe these attributes and (b) discern temporal and spatial variabilities which may in turn have implications for understanding diachronic and synchronic cultural patterns.

Ceramic analyses presented in the course of archaeological research on the upper Texas coast have generally relied on classification of pottery on the basis of a single technological attribute, namely, the kind of aplastic inclusions included in the potter's clay. The most fundamental typological distinctions developed by Aten (1979, 1983a; Aten and Bollich 1969) were made on the basis of the presence/absence of the two major aplastics, sand and grog (crushed sherd) temper, as well as the much less common crushed bone temper. Therefore, excepting certain minor types in the Early Ceramic Period (e.g. Tchefuncte types, O'Neal Plain, Mandeville Plain), the most basic typological distinctions are based primarily on three different kinds of temper. Sherds in which the sole aplastic consists of sand have been assigned to the Goose Creek typological series; those with grog temper have been designated Baytown Plain or San Jacinto Incised, depending, respectively, on whether they pertain to undecorated or decorated vessels. The relatively uncommon bone tempered sherds have not been assigned a formal typological designation, but have been lumped into a generic bone tempered category which is believed to pertain largely to the more recent part of the ceramic continuum (Aten 1983a).

As a consequence of the emphasis on the technological attribute of temper, stylistic attributes have been relegated to secondary status in the classification of upper coast pottery. Since virtually all vessels are of simple, functional bowl or jar forms, there appears to have been little if any stylistic expression in vessel shapes. Style in upper coast pottery thus must be identified on the basis of surface decoration, which usually takes the form of geometric patterns of incised lines, to which are sometimes added secondary decorative elements executed with small punctations (Suhm and Jelks 1962; Aten 1983a; Black 1989). Most ceramic taxonomy has first sorted sherds according to the technological attribute of temper, and then further subdivided samples according to the sole criteria of the presence or absence of these kinds of decorative elements. Thus, with the minor mentioned exceptions of certain early types, all sherds with sand as the sole aplastic are categorized first as Goose Creek, and subsequently designated as Goose Creek Plain or Goose Creek Incised on the basis of the presence/absence of decoration. In the case of grog tempered pottery, plain sherds are typed as Baytown Plain and decorated ones as San Jacinto Incised. Bone tempered ware has generally been lumped into as single more or less residual category, without formal typological recognition of the presence or absence of decoration.

The secondary status attributed to style in Aten's taxomony is highlighted by the fact that the same designs occur on the two major decorative types, Goose Creek Incised and San Jacinto Incised. In both types decoration consists of various combinations of horizontal, vertical or oblique incisions generally confined to a band just below the vessel rim (Aten 1983a). Further indication of the paucity of attention paid to style is the fact that sherds are classified as Goose Creek Incised or San Jacinto Incised solely on the basis of the presence or absence of incised decoration; no consideration has been to systematic analysis of patterned variability of decorations.

In part, the inattention to stylistic variability is probably due to small samples of decorated sherds at many sites. As a general rule, only a minority of vessels produced by upper coast potters were