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edges of the cracks and the sides of drilled holes are thoroughly oxidized (while fresh breaks on the same sherds show that wall interiors were not) indicates that such repairs were often, if not always, made prior to firing.

Several ceramic types, discussed at length in Chapter 7, are represented by the sherds. These include Goose Creek Plain and Goose Creek Incised and a new provisional type, Goose Creek Modified Lip (all made from sandy clay bodies), and the grog tempered types Baytown Plain, San Jacinto Incised and another provisional type, San Jacinto Modified Lip. Other types, only sparsely represented, include Harrison Bayou Incised, and a possible example of Maddox Engraved (types found in the Lower Mississippi Valley; Phillips 1970), and three vessels of Rockport Black-on-Gray, a central Texas coast type (Suhm and Jelks 1962).

Faunal Remains from the Block Excavation

As already noted, Zone 2 was characterized by an abundance of faunal bone and shells and shell fragments. Bone preservation was good, though virtually all bone was fragmentary, and many tiny fragments and splinters are not identifiable by species. Nonetheless, the excavation yielded a total of 8,428 specimens which can be identified at least at the level of genus. Molluscan remains are dominated overwhelmingly by the moderate salinity oyster, though four other bivalve species and four gastropod species are also represented in the sample. Shell was not as well preserved as bone; the weathered chalky condition of most shell is attributed to chemical breakdown under the saline soil conditions on Galveston Island. The quantities and species of bone and shell are listed in Table 5.6.

Fish remains (N=6,343) account for the majority (75%) of the faunal bone recovered. Species represented are sheepshead, black drum, spotted seatrout, sea catfish, gar, and stingray, variously identified on the basis of diagnostic head elements (bones, otoliths) or vertebra. Undifferentiated bony fish, excluding catfish, are represented by 2,365 vertebrae. These represent sheepshead, black drum, spotted seatrout and/or redfish, the vertebrae of which are indistinguishable. Catfish vertebrae, which are morphologically distinguishable from the other bony fish species, number 335.

Otoliths are greatly under-represented relative to bones. On the basis of factors discussed below, a minimum number of 114 bony fish is represented by bone, whereas only four sagittal otoliths (3 redfish, 1 sea catfish) were recovered from the Block Excavation. Since each individual fish cranium contains two sagittal otoliths, the expected number, based on bone quantities, is 228, or 57 times the number actually found. This is not attributable to cultural selection (i.e., removal of fish heads elsewhere), since mandibular elements, cranial fragments, gill plates and teeth are reasonably well represented. Rather, the dearth of otoliths is believed to be the result of extreme weathering. The specimens found were in very poor condition and barely recognizable as otoliths; they exhibited heavy surface attrition and had been bleached white, and were thus barely distinguishable from small, weathered shell fragments. On the other hand, otoliths found in pits or grave fill were in very good or even nearly pristine condition. This contrast suggests that otoliths left on prehistoric living surfaces were subject to chemical weathering that did not affect those which were protected by immediate burial. It is tentatively concluded that the saline conditions on the island contributed to deterioration of most otoliths to the point that their diagnostic surface morphology and overall shape (see Zimmerman et al. 1988) were obliterated.

Next to fish, mammals constitute the most abundantly represented taxa in the bone assemblage (N=1,885 bone specimens). The hispid cotton rat accounts for 1,038 of the identified bone specimens. The next most abundant is white-tailed deer; 158 identifiable bone elements and 687 longbone fragments from deer or deer-sized mammals were recovered. Nineteen specimens are bovid elements or fragments of bovid-sized longbones. Given that these elements were found with abundant Late Prehistoric debris, it is probable that bison, rather than domestic cattle, are represented by these specimens. The only other mammals represented are coyote (2 molars) and river otter (1 mandible fragment).

Bird species include the turkey vulture, little blue heron, duck, American coot and sage grouse. Reptiles are represented by turtles and snakes.

Considering that the Mitchell Ridge Site is located on a lagoonal shoreline, molluscs are not particularly abundant. Except for the thin oyster shell concentration designated as Feature 106, and the small concentrations of oyster shell representing hearth linings, shell debris was not particularly abundant in the Block Excavation; nothing approaching the density of a true shell midden was encountered (which proved generally to be the case at the site). Whole oyster shells and umbo fragments number 963, which

Table 5.6. Faunal elements, Block Excavation, Feature 9 and C. C. Area..

	Species	Element	C.C. Area	Feature 9	Block Excavation
MAMMALS n=3705	Bovid (*Bos/Bison*)	incisors			2
		molar fragments			4
		cuneiform		1	3
		magnum	1		
		astragalus			2
		bovid-sized longbone fragments	25		8
	White-tailed deer (*Odocoileus virginianus*)	antler fragments	6	15	22
		skull fragments		2	
		mandible fragments		2	
		teeth (upper)	3	3	12
		(lower)			6
		(indeterminate)	3	3	9
		tooth fragments	56	15	67
		scapula fragment			1
		rib fragments		6	5
		vertebra			1
		vertebra frag.			1
		unfused vertebra epipysis			1
					1
		proximal humerus			1
		right distal humerus frags.			2
		distal radius			1
		fawn distal radius			1
		proximal ulnae frag.			1
		cuneiforms			2
		proximal metapodial			2
		medial metapodial			1
		distal metapodials	2		2
		distal metapodial halves		2	4
		unfused distal metapodial halves			7
		distal tibia			1
		astragalus		1	1
		calcaneus			1
		phalanges	3		2
		proximal phalange			1
		medial phalange			1

Table 5.6, cont.

Species	Element	C.C. Area	Feature 9	Block Excavation
	distal phalange			1
	deer sized longbone fragments	241	69	697
Dog/Coyote *(Canis familiaris/ latrans)*	molar M1	1		
	phalange	1		
Coyote *(Canis latrans)*	upper premolar P4			1
	lower molar M1			1
Opossum *(Didelphis marsupialis)*	skull fragments		7	
	maxilla fragments		1	
	left mandibles		2	
	incisor		1	
	cervical vertebrae		3	
	thoracic vertebra		1	
	lumbar vertebrae		2	
	undetermined vertebrae		2	
	inominates (different sizes)		2	
	caudal vertebrae		9	
	scapulae		2	
	proximal ribs		6	
	medial ribs		1	
	distal ribs		5	
	whole rib		1	
	ulna		1	
	phalange		1	
	unidentified bone fragments		10	
River Otter *(Lutra canadensis)*	right mandible			1
Cotton rat *(Sigmodon hispidus)*	maxilla fragments	147	19	121
	upper incisors	22		38
	right mandibles	95	32	270
	left mandibles	88	32	297
	right/left mandibles	11	1	20
	lower incisors	17	2	60
	vertebrae	214	9	29
	ribs	2	1	1
	scapula fragment	1		
	humeri	182	4	41

Table 5.6, cont.

	Species	Element	C.C. Area	Feature 9	Block Excavation
		ulnae	45	1	1
		radii			2
		pelves	27		14
		femora	190	14	96
		unfused distal femur epiphyses	32		
		tibiae	106	8	48
		fibula		1	
		metacarpals/tarsals	3	1	
BIRDS	**Turkey Vulture** *(Cathartes aura)*	talon	1		8
	Little Blue Heron *(Florida caerulea)*	coracoid	1		
		carpometacarpus	3		
		tarsometatarsus			1
	Duck *(Anthya collaris)*	distal humeri			2
		ulna			1
	American Coot *(Fulica americana)*	coracoid	2		
		tarsometatarsus			1
	Sage Grouse *(Centrocerus urophasianis)*	distal humerus			1
REPTILES	**Alligator** *(Alligator mississippiensis)*	dermal scutes	8		
	Turtle (species unidentified)	carapace/plastron fragments	45	10	74
		vertebrae		1	1
	Rattlesnake *(Crotalus sp.)*	vertebrae	120	7	88
	Snake (species unidentified)	vertebrae	44		19
FISH	**Shark** (species unspecified)	tooth	1		

Table 5.6, cont.

	Species	Element	C.C. Area	Feature 9	Block Excavation
	Stingray (species unidentified)	spine			1
	Gar *(Lepisostens sp.)*	teeth	2		
		vertebrae	76	57	177
		scales	1404	1072	2282
	Black Drum *(Pogonias cronis)*	mandible fragments	19	47	63
		otoliths	1	2	
	Black Drum/ Sheepshead *(Pogonias cronis/ Archosargus robatocephalus)*	molars	209	33	921
	Sheepshead *(Archosargus probatocephalus)*	skull fragments	19	5	48
		mandible fragments		2	48
		teeth	33	6	37
		gill plates	3	8	53
		proximal fin spines	8	3	6
	Sea Catfish (Arius felis)	vertebrae	1216	22	335
		otoliths	45	7	1
	Spotted Seatrout *(Cynoscion nebulosus)*	mandible fragments	2		
		otoliths	2	1	
	Redfish *(Sciaenops ocellata)*	otoliths	5	4	3
	Unspecified	vertebrae	1976	541	2365
	Estimated unidentifiable small bone fragments		6730	2133	8426
MOLLUSCS	**Oyster** *(Crassostrea virginica)*	upper shells & umbos	26	32	296
		lower shells & umbos	40	42	431
		unidentified upper/ lower shells	11		236
	Sharkeye *(Polinices duplicatis)*	whole shells	1	2	7
		shell fragments	1		52
		whole shells		4	2
		shell fragments			19

Table 5.6, cont.

Species	Element	C.C. Area	Feature 9	Block Excavation
Atlantic Cockle *(Laevicardium robustum)*	whole shells		4	2
	shell fragments			19
Quahog *(Mercenaria sp.)*	whole shells	1	1	
	shell fragments	1		7
Rangia *(Rangia cuneata)*	whole shells	5		25
Rangia *(Rangia flexuosa)*	whole shells	5		
Florida Horse Conch *(Pleuroploca gigantes)*	whole shells	1		4
Lightning Whelk *(Busycon perversum)*	whole shells	1		1
	columella fragments	1		14
	whorl fragments	1		23
Disk Dosinia *(Dosinia discus)*	whole shell		1	
Atlantic Cyclinella *(Cyclinella tenuis)*	whole shell		1	
Whitened Dwarf Olive *(Olivella dealbata)*	whole shell	1		
Cross Barred Venus *(Chione cancellata)*	whole shell			1
Marsh Perrywinkle *(Littorina irrorata)*	whole shells	66	7	3

represents 86% of the total shell count (excluding the intensely burned and highly fragmented oyster shell in hearth linings). When other species are considered only in terms of the number of individual shells represented (i.e., as whole shells, umbo fragments or, in the case of gastropods, whole shells or columellae, each of which can be taken to represent one shell), oyster accounts for 95% of the sample. Bivalves include, other than oyster, Atlantic cockle, quahog, *Rangia cuneata* and cross-barred venus. Gastropod (univalves) species represented are sharkeye (moon snail), lightning whelk, Florida horse conch and marsh periwinkle.

Dietary Inferences Derived from the Faunal Sample

Based upon the raw counts of faunal specimens recovered, it is impressionistically apparent that fish and mammals comprised the bulk of the meat diet during the occupation(s) represented by the findings in the Block Excavation. It is also apparent that species diversity is rather limited, with most of the mammalian meat provided by deer, hispid cotton rats and probably bison, and only a few species of fish. In order to define more precisely the relative importance of the different taxa, the contribution of each to the overall meat diet must be quantified.

Essentially, two approaches to the problem of determining dietary significance of taxa are possible. Both have the final goal of determining the weight of useable meat contributed by species or groups of species, but the methodologies are significantly different. The first involves calculation of the minimum number of individuals (MNI) represented by a given taxa. The MNI is calculated on the basis of the fewest number of animals of a species which could be represented by the identified bone elements within the sample. Once the MNI has been determined, the represented biomass is calculated using (a) an estimated average weight of an individual, and then (b) estimating the percentage of total body weight which is useable meat (e.g. White 1953; Grayson 1978; Klein and Cruz-Uribe 1984).

The alternative approach is to calculate biomass directly as an relationship between bone weight and total body weight (Reitz et al. 1987). With this method, the weight of archaeological bone is employed in an allometric formula to derive the biomass of the living species. Thus, for a given mass of deer bone, for example, it is possible to predict within reasonable margins of error the amount of meat represented by the bone. This method has the primary advantage of avoiding reliance on estimations of average weight, which can vary according to the age/sex of the animal as well as regional differences in size. It also avoids a potentially significant problem inherent in MNI estimates, that the number of individuals may be under- or over-estimated according to cultural selection or archaeological sampling biases.

The MNI method is employed here because of the problems inherent in predicting the weight of fish using bone weight. As a general principle, the larger the animal, the greater the proportion of total body weight contributed by the skeleton, since greater mass requires heavier skeletal support. Conversely, a small animal has a proportionately greater mass of soft tissue in relation to the skeletal mass. An adult deer, then, will have a very different proportion (much less) of meat mass to skeletal mass than will an adult rabbit. Once the bones of different sized mammals are identified and separated by species, it is possible to predict soft tissue mass according to a constant formula, and the prediction should fall within an acceptable margin of error for that species. In the case of fish, however, the wide range in body mass among adults makes such a prediction less reliable. Unlike other animal classes, fish do not attain a more or less constant mature body size, but continue to grow in size and weight throughout their life cycle. An adult black drum, for instance, may weigh 3 kg. at 3-4 years of age and as much as 12 kg. at 20 years of age (an age not uncommonly attained by the species (e.g., Beckmann et al. 1988a).

In order for the allometric method to produce reasonably reliable results on fish, therefore, it is as important to know the approximate age of the fish as which species are represented. Since there may be a wide range in ages represented, from juveniles to old adults, such determinations would have to be made for individual fish on the basis of the size of individual bone elements, a daunting prospect in a highly mixed and fragmented archaeological faunal sample. If fish remains comprised only a minor part of the total sample, this would not present a serious problem. At a site such as Mitchell Ridge, however, the abundance of fish bone precludes accurate results.

The MNI method is thus used here, but it is emphasized that the results should be viewed with caution, insofar as they probably provide a gross approximation of prehistoric dietary reality. The taphonomic and sampling problems with the MNI approach have been discussed at length by various researchers (e.g. Grayson 1979, 1984; Binford 1981; Butzer 1982:191-198; Klein and Cruz-Uribe 1984).

The working assumption that MNI accurately represents the proportional dietary importance of different taxa can be questioned on the basis of (a) selective transport/deposition of different anatomical parts of animals by site occupants, (b) post-depositional disturbance of site deposits (e.g. removal of anatomical parts by scavenging carnivores), or (c) bias due to inadequate sampling of the archaeological deposit. Any or all of these variables can render the MNI of a given taxa a significant under-representation which means, concomitantly, that other species are over-represented.

In the case of the Block Excavation, post-depositional disturbances are probably not a significant problem, judging from the fact that there is almost no indication of scavenging in the form of carnivore gnaw marks on bones. Sampling bias in the archaeological recovery is probably not a serious problem either, at least in the case of shellfish and fish remains, since these categories are represented by large numbers of specimens dispersed throughout the excavated area. The same probably holds true for the white-tailed deer and hispid cotton rat remains, which are fairly abundantly distributed throughout the entire excavation. Sampling bias could be of significance in the case of the far less abundant bird and reptile remains. However, the fact that these taxa are poorly represented in the faunal samples from other parts of the site suggests that the low representation is real, rather than an artifact of the limited extent of the Block Excavation.

Much more problematical are the probable bison remains since, unlike the case of small animals, a single individual can contribute significantly to the total meat weight estimate derived from the excavated bone sample. If the presence of the few bison bone fragments in the Block Excavation were counted as an MNI of one, the result would almost certainly be a gross over-representation of the dietary significance of bison relative to other species. In other words, if the bones of a single bison were scattered over an area considerably larger than that of the excavation, the quantities of bones of much more abundant and more evenly distributed species within that same large area would be much greater and the MNI would be proportionately much higher relative to bison than that for only the Block Excavation.

Another source of potential bias in the case of bison derives from the large size of the animal. Bison likely did not inhabit Galveston Island, and could have been procured only on the coastal prairies of the mainland (as was clearly the case represented in the De Bellisle account of 1720, cited in Chapter 4). The size and weight of a bison would have precluded transport of whole carcasses and, once an animal was killed, it would have been either consumed at the kill site or butchered so that meat or transportable parts could be taken elsewhere. Thus bison meat would have reached the Mitchell Ridge Site only in butchered form, and much of the animal may have been divided and taken elsewhere (either to other locations or to unexcavated parts of the Mitchell Ridge Site). The few bones found in the Block Excavation could thus represent only a fraction of a single animal.

Given these kinds of problems, bison is excluded from the estimates of total meat weight derived from analysis of the Block Excavation material. It must, therefore, be kept in mind that the total contribution of terrestrial game to the meat diet is accordingly somewhat under-represented.

The MNI, estimated useable meat weight, and the percentage of the useable weight from each species are presented in Table 5.7, along with data for other faunal samples from the site. The estimated useable meat weight for a given species in based on (a) the total estimated average live weight for an individual of the species, (b) the percentage of that weight which is useable meat, and (c) a multiplication of the useable meat weight per individual by the MNI for the species.

Weights of "average" individuals are derived from various sources. Redfish and black drum both weigh approximately 3.5 kg upon reaching maturity (Beckmann et al. 1988), and this figure is employed here. Weights for other fish species are general estimates derived from Compton (1975) and Hoese and Moore (1977). Since oysters make up by far the greatest bulk of the shellfish species represented, only the weight of oysters is considered significant, in view of the very approximate values which can be derived for even the abundantly represented taxa. An average meat weight value of 15 grams is given to oysters, based on averages of uncooked oyster meat weights from modern Galveston Bay oysters (Ricklis 1990:215).

Average weights of individual mammals and birds are derived from White (1953) and Prange et al. (1978). Most of the weights for mammals follow White, with the exception of white-tailed deer, which in general are smaller in Texas than in the more northern latitudes from which White's estimate of 200 pounds (91 kg) was apparently derived. Observations on deer growth patterns on the coastal prairie of San Patricio County, Texas indicate average weights of 43 kg and 63 kg for mature does and bucks, respectively (Knowlton et al. 1978). The average of these figures, 53 kg., is used here for archaeological deer bone with fused epiphyses (indicating mature animals). In the case of juveniles, weights are estimated

Table 5.7. Data on faunal samples from three areas, Mitchell Ridge Site, showing major species, estimated meat weight in grams per individual, MNI, total estimated meat weight (g) based on MNI, and % of total meat weight for the area.

Taxa		C.C. Area			Feature 9			Block Exc.		
	Ind. meat wt.	MNI	Est. Wt.	%	MNI	Est. Wt.	%	MNI	Est. Wt.	%
Deer	26,500	1	26,500	15.0	1	26,500	36.2	4	94,500	30.5
Dog/Coyote	5,650	1	5650	3.2						
Coyote	5.650							1	5,650	1.8
River Otter	5,650							1	5,650	1.8
Cotton Rat	140	101	14,140	8.0	33	4,620	6.3	307	42,980	13.9
Turkey Vulture	1,650	1	1,650	.9				1	1,650	.5
Little Blue Heron	3,500	2	7,000	3.7				1	3,500	1.1
Duck	700							2	1,400	.5
American Coot	700							1	1,400	.5
Sage Grouse	630							2	1,260	.4
Alligator	10,000	1	10,000	5.6						
Turtle	420	1	420	.2	1	420	.6	1	420	.1
Snakes	800	3	2,400	1.4	1	800	1.1	2	1,600	.5
Gar	5,000	3	15,000	8.4	3	15,000	20.4	7	35,000	11.3
Sea Catfish	220	25	5,500	3.1	4	880	1.2	7	1,540	.5
Unspecified fish	1,292	83	87,814	49.7	23	24,334	33.2	99	104,742	33.8
Oyster	15	46	690	.4	42	630	.9	549	8,235	2..7

on the basis of data in Knowlton et al. (1978).

MNI are determined for mammals and birds on the basis of the maximum number of right or left side specimens of a particular bone element. In the case of white-tailed deer, duplicate elements are considered to represent at least two different individuals when one of the group has unfused epiphyses and thus clearly represents a younger animal.

In the case of fish, MNI is derived from counts of vertebrae. Most species known to be represented by diagnostic cranial elements (black drum, redfish, seatrout, sheepshead) have 24 vertebrae per individual. Since the vertebrae of these species are indistinguishable, MNI is determined for the combined species by dividing the number of vertebrae in the sample by 24. Catfish vertebrae can be differentiated on the basis of shape; MNI for catfish is obtained by dividing the number of recovered vertebrae by 49, the number in each individual fish. The use of elements other than vertebra is deemed less reliable, since otoliths (which are species-diagnostic) are clearly greatly under-represented and other cranial elements are, for the most part, too fragmented for reliable identification.

An inherent limitation in the use of vertebrae is that the species represented, which have a considerable divergence in size and weight, must be lumped together, producing an MNI for the combined group (listed as "undifferentiated fish" in Table 5.7) rather than for each species. The meat weight derived from the undifferentiated category is based on an average of common adult weights for each species, which is calculated on the basis of the common weights given in Chapter 2 (black drum, 3.5 kg; redfish 3.5 kg; sheepshead 2.0 kg; spotted seatrout .4 kg). This expressed as the formula $W = .55 \times 1/4(D_w + R_w + S_w + T_w)$, where W is the weight value given to each individual fish and D_w, R_w, S_w and T_w represent the respective common weights for individual adult black drum, redfish, Sheepshead and seatrout. The value of .55 represents the percentage of body weight (55%) which is useable meat, as generally ascribed to fish (Geiger and Borgstrom 1962:31). This gives an individual unspecified fish weight of 1,292 g ($W = .55 \times .25[3500g + 3500g + 2000 g + 400 g]$, or $W = .55 \times 2350$, or $W = 1292.5$.

As may be seen in Table 5.7, the results of these calculations show fish as a major component of the meat diet in terms of useable meat, with the combined species (gar, catfish, unspecified) comprising 45.6% of the meat weight represented by all taxa. Mammals are of about equal importance, comprising 48.0% of the total meat weight. White-tailed deer is by far the most important mammal, but hispid cotton rats comprise a significant 13.9% of the total meat weight (as discussed below, the approximately isomorphic distributions of rat bones with the bones of other taxa indicate that rat bones are a component of occupational debris, and that this species was a food resource). Other mammals, birds and reptiles combined comprise only 6.7% of the total, and oysters are of minor importance, comprising 2.7% of the total.

In sum, it is apparent that the faunal remains from the Block Excavation represent a subsistence focus on a rather narrow range of species; two species of mammals and as few as five species of fish (gar, black drum, redfish, sheepshead and seatrout) provided the overwhelming bulk of the consumed meat.

Debris Class Distributions and Inferences Concerning Spatial Patterning of Activities

Because Zone 2 was vertically discrete, it was initially inferred that little displacement of cultural debris had taken place since the Late Prehistoric occupation represented in the Block Excavation. As excavation proceeded, this inference was supported by the various features, the clearly definable edges of which suggested little post-depositional disturbance by biophysical agents. Prior to the beginning of excavation, it was decided to record the precise vertical and horizontal locations of in situ debris as it was exposed by troweling, under the working assumptions that (a) the locations of artifacts and faunal materials were for the most part the result of one or another kind of prehistoric human activity, and that, consequently (b) piece-plotting of individual items on an excavation map might permit reconstruction of patterns of debris disposal which would reflect the spatial patterning in prehistoric activities.

A second method of plotting debris class distributions involves definition of relative horizontal densities by 2x2-meter excavation units. Though less precise than the piece-plotting method, this proved to be, in some ways, more informative.

It should be noted at this point that there was no discernable vertical patterning of debris. As mentioned earlier, Zone 2 was excavated in 5-cm arbitrary levels (generally there were 3 such levels in each unit); this was done so that differences in horizontal distributions within a single debris class might be discerned through comparisons of 5-cm level maps for a given excavation unit. However, discernable fall into either the Goose Creek, Baytown Plain, or San Jacinto typological groupings. Thirty-one (81.6%), of the vessels were undecorated and seven (18.4%) bore some form of decoration. The ceramics are discussed in greater detail in Chapter 7.

Lithics

Lithic artifacts include 13 arrowpoints and arrowpoint fragments, 7 small quasi-cylindrical drills (some of which may actually be small arrow points), four small prismatic blades, a small biface, three utilized and five retouched flakes, 465 pieces of chert debitage, and 10 pumice nodules.

In contrast to the findings in the Block Excavation, where the arrowpoint sample was clearly dominated by the Perdiz type, the arrow points from Feature 9 are typologically quite heterogeneous (see Tables 5.12). The Perdiz type is represented by one complete specimen (Figure 5.33, a) and three stem fragments. A fourth possible Perdiz (Figure 5.33, d) consists of a short blade fragment with prominent barbs (1 is broken off) and a break at the juncture of what was a fairly narrow stem. Nearly as abundant are small, thin subtriangular (rounded-base) arrowpoints, of which three specimens were recovered (Figure 5.33, e, f, h). The Bulbar stemmed type (see Corbin 1974; Turner and Hester 1993) is represented by one specimen. A single small lozenge-shaped point (Figure 5.33, g) completes the list of specimens which can be identified as to form. An additional specimen (Figure 5.33, b) is complete but appears to be unfinished; the final form is thus indeterminate, although it clearly was intended to have a stem. Another unfinished specimen (not illustrated) is a flake, 17 mm long, which bears only what appears to be an unfinished pressure flaked stem. A single distal fragment is poorly formed and may represent an arrowpoint broken during the manufacturing process.

Seven specimens have been classified as "drills" (see Table 5.13). One of these (not illustrated) is a roughly rectangular flake, 20 x 16.5 mm, from which the drill bit appears to have been broken off; this piece is believed to have been an expanded-base drill similar to those recovered in the Block Excavation. Two specimens (see Figure 5.33, l) are medial fragments of long, narrow drills or perforators with lenticular cross-sections. Four other specimens (Figure 5.33 j, k) are much shorter relative to their widths, and may be short drills or small arrowpoints.

The dimensions of the four small prismatic blades from Feature 9 are presented in Table 5.14. Other lithic items include five flakes bearing edge retouch, and four flakes which appear to be utilized, judging by continuous microflaking along one face of one edge.

Debitage consists entirely of cherts of the same gray, brown, and yellowish colors described above for the sample from the Block Excavation. The sample includes 235 flakes, 227 flake fragments (pieces missing the proximal ends with platforms and bulbs of percussion), and three small amorphous chunks. Among the specimens retaining the proximal ends, four (1.7%) are primary cortex flakes, 15 (6.38%) are flakes with cortex platforms, 16 (6.81%) are secondary flakes, 120 (51%) are interior or tertiary flakes, 5 (2.13%) are biface thinning flakes and 75 (31.9%) are very small (less than .75 cm long) retouch flakes. Of the 227 flake fragments, 11 (4.8%) are primary, 52 (22.9%) are secondary and 164 (72.25%) are tertiary. The implications of these percentages for understanding the organization of lithic technology are discussed in Chapter 7.

As was the case in Zone 2 in the Block Excavation, small lumps of asphaltum and pumice were scattered throughout the fill of Feature 9. The 56 asphaltum lumps are generally sub-spherical and range in size from just under 1 cm to 2.5 cm in diameter. The 10 pieces of pumice are in the form of rounded pebbles 1.5 - 3 cm in length; none show evidence of artificial modification.

Faunal Remains from Feature 9

The listing of faunal remains from Feature 9 is presented in Table 5.6. A total of 2,116 bone specimens are identified by taxa. An additional 2,133 very small fragments and splinters, recovered mostly during water screening operations, are estimated on the basis of the ratio of weight to numbers of specimens determined for three representative unit levels, and extrapolation of an estimated numerical total for the total weight of such fragments from the entire feature. Ninety identifiable molluscan shell were recovered; the great majority (74 specimens) are oyster (*Crassostrea virginica*).

Forty-seven bone elements of opossum are listed in Table 5.6. These are believed to represent the natural death of a single individual animal, since the bones have a "fresh" appearance and are not fragmented, as is most of the faunal bone confidently believed to represent prehistoric meat procurement (e.g. deer, fish bones). Thus the opossum, though listed in Table 5.6, is not included in the estimations of useable meat weight.

The Faunal sample from Feature 9 is roughly similar to that from the Block Excavation, insofar as the bones of fish, hispid cotton rats and white-tailed deer comprise the great majority of the specimens. As was the case in the Block Excavation, deer bones are highly fragmented (see Table 5.8), with many specimens exhibiting "green" bone spiral fractures. Most fish bone is also very fragmentary, so that identification at the species level is not possible in the majority of cases. Otoliths and various bone elements indicate that gar, black drum, redfish, spotted seatrout, sheepshead and sea catfish are represented.

Minimum numbers of individuals (MNI) were calculated using the procedure discussed above for the faunal sample from the Block Excavation. As may be seen in Table 5.7, MNIs for mammals include one deer and 33 hispid cotton rats. MNIs of 1 hardshell, terrestrial turtle and 1 rattlesnake account for the very limited representation of reptiles. Fish MNI are comprised of three gar, four marine catfish and 23 "undifferentiated".

The combined fish MNIs account for the greatest part (54.8%) of the total estimated useable meat weight, followed by deer (36.2%) and hispid cotton rat (6.2%). Oysters, with an MNI of 42, provided an estimated 630 g of useable raw meat, or only 0.9% of the total. The turtle and snake comprised the small balance of 1.7%.

The Chronological Placement of Feature 9

As noted above, small bits of wood charcoal were present in the feature fill. Two samples, each consisting of small localized clusters of charcoal, were collected from the southern part of the feature, one from Level 1 (0-10cm below the exposed surface of the feature) and one from Level 2 (10-20 cm). Both were submitted to Beta Analytic, Inc. for radiocarbon assay.

The sample from Level 1 (Beta-53671) assayed modern, with no measurable age. Since this charcoal was gathered near the top of the pit, it is interpreted as modern charcoal associated with the late historic occupation of the site, evidence of which was found near Feature 9 in the form of modern trash pits.

The sample from Level 2 (Beta-53672) yielded an uncorrected age of 380+/-70 B.P., which corrects for 13C to 360+/-70 B.P. Calibrated dendrochronologically, a 1-sigma calendar date range of A.D. 1448-1644 is obtained, with intercept points at A.D. 1511, 1600 and 1616. The range falls mostly within the Protohistoric Period, with the early end extending back slightly into the Final Late Prehistoric. This appears to be a satisfactory date for the kinds of artifacts recovered, and is accepted as a reasonably accurate chronological placement of Feature 9 and its contents. This sample and that from Level 1 each consisted of relative concentrations of charcoal bits, localized within areas approximately 20 cm in diameter, and were thus spatially discontinuous, so it is assumed that the Level 2 sample had not been significantly contaminated by the historic charcoal which clearly had intruded into the top 10 cm of the feature fill.

Accepting the assay from Level 2 as reliable, it is apparent that Feature 9 post-dates the main occupation in the Block Excavation by about 200 years. This temporal divergence may be reflected in the differences in arrowpoint types; whereas the Block Excavation arrowpoints consisted overwhelmingly of Perdiz and Perdiz-like points (24 of 29 specimens, or 83%), Perdiz points comprised less than half of the arrowpoints from Feature 9 (4 of 9 specimens, or 44 %). The nine morphologically identifiable arrow points from Feature 9 are a small sample, so firm conclusions concerning chronological change in arrowpoint types should be avoided. It is interesting and perhaps significant, however, that seriation of arrowpoint types on the central Texas coast suggests a relatively late placement for Bulbar Stemmed points (Corbin 1974), and that unstemmed arrowpoints may increase in relative abundance in Protohistoric times in east Texas (Turner 1978, Fig. 33). The typological differences between the Block Excavation and Feature 9 at least suggest that the Perdiz type, dominant during the Final Late Prehistoric, was giving way to other types during the Protohistoric Period.

Other Aboriginal Pits in Area 3

Feature 8

a loop handle. The shell tempered sherd is very small (max. length 15 mm), so nothing can be said about vessel form. Aside from being the only shell tempered sherd from the site, it is also unusual insofar as the paste is devoid of sand. The vessel wall was quite thin (sherd thickness is 3 mm). The color is a light brown throughout (Munsell 7.5YR6/3), except for dark gray smudging on the exterior. The exterior surface is smoothed, the interior burnished. In color, surface finish, and tempering, this sherd resembles much of the Mississippian pottery of the Lower Mississippi Valley (e.g. Phillips 1970) and Caddoan pottery of northeast Texas and adjacent portions of Louisiana and Arkansas (e.g. Suhm and Jelks 1962). It may represent an imported pot from one of those areas.

The other unusual sherd is also of virtually certain non-local origin. It consists of a small part of a vessel wall which retains part of a simple loop handle, a form of ceramic appendage that is non-existent among the aboriginal ceramics indigenous to the Texas coast (cf. Suhm and Jelks; Aten 1983a; Ricklis 1990). The section of vessel wall is too small (maximum length 28 mm) to indicate anything of vessel form. In cross section the attached handle is round, with a diameter of 14.5 mm). Surface color, interior and exterior, is oxidized to a reddish yellow (Munsell 5YR6/6), while the vessel wall and handle cores are gray. The paste contains both sand and grog. The sherd is much harder than the local native-made ceramics, suggesting the use of a different clay. The origin of this piece is uncertain, though the form, hardness and presence of grog tempering are suggestive of some of the Mississippian ceramics of the Lower Mississippi Valley area (Phillips 1970).

Faunal Remains

Because the C. C. Area retains the most complete provenience of the areas investigated during the 1970s, and also because it appears to have been the most productive of the areas, it was decided to use a faunal sample from that area for analysis. The same procedures were followed as have been described above for the 1992 Block Excavation and Feature 9, in order to produce comparable results and thus permit assessment of the degree of similarity or difference in the faunal remains from three separate areas of the site. The analyzed sample was selected from 12 1-m^2 excavation units in the central part of the C. C. Area. The ultimate goal of this procedure is to determine whether the recurrent occupations of the Mitchell Ridge Site involved essentially similar kinds of resource procurement, or whether subsistence practices may have significantly varied. The working assumption here is that if there were significant variability in subsistence activities during different occupations, this could be reflected in significant spatial variations in the kinds and/or proportions of faunal materials across the site, assuming that individual occupational episodes were not so extensive as to encompass all of the investigated areas.

The results of these analyses have been presented in Tables 5.6 and 5.7. Table 5.6 (p.89) presents the counts of individual identifiable bone elements by taxa, and Table 5.7 (p.96) indicates how these quantifications translate into minimum numbers of individuals (MNI) and estimates of meat weight, according the principles already discussed for the Block Excavation.

At a general level, it is apparent that the subsistence practices represented in the C. C. Area were essentially the same as those indicated by the faunal sample from the Block Excavation and Feature 9. In terms of estimated meat weight, the combined fish species were significant taxa in all three areas, representing 61.2%, 54.8% and 45.6 % of the total weights for the C. C. Area, Feature 9, and the Block Excavation, respectively. Mammals have respective percentages of total estimated meat weight of 26.2%, 42.5% and 48.0%. The primary mammalian food species in all areas was white-tailed deer, with hispid cotton rat consistently of secondary importance. Reptiles and birds combined comprise only a small fraction of the estimated meat weight in all areas, though at 11.8% they are better represented in the C. C. Area than Feature 9 or the Block Excavation (0.6% and 3.6% respectively); the difference is largely accounted for by the presence of an MNI of one alligator in the C. C. area, suggesting that sampling bias accounts for the discrepancy.

The proportional representation of fish in the C. C. Area is higher than the other two areas, and mammals, conversely have a lower representation. This may indicate that fishing, while apparently consistently of considerable importance, varied in significance. There are no radiometric chronological data for the C. C. Area, but most of the arrowpoints recovered are of the Perdiz type, suggesting that most of the occupation pertained to the Final Late Prehistoric or Protohistoric Periods. Although the available data are sorely limited, it can thus at least be suggested that the possible differences in the significance of fish as opposed to mammals do not reflect any major long-term trends in subsistence patterns. It is perhaps more likely that there were stochastic variations in the relative availabilities of different classes of food resources during different occupational episodes. Nonetheless, the most basic points which emerge from the comparative intrasite faunal analyses is that fish were highly significant, along with mammals, and that mammalian meat weight was consistently provided mainly by deer, and secondarily by hispid cotton rat.

Seasonality

Little data on seasonality can be gleaned from the findings made during the 1970s excavations. Several small bags of oyster shell were present in the extant collection, but the shells are too weathered for seasonality readings. Three otoliths (one each of spotted seatrout, redfish and marine catfish), all from the C. C. Area, are unweathered and therefore suitable for seasonality determination. These were cross-sectioned and examined under 20X microscopy. Season of death is estimated on the degree of growth beyond the final winter interruption growth ring of the otolith (see Smith 1983; Prewitt 1987; Ricklis 1988, 1990; Eling et al. 1993 for discussions of methodology). The spotted seatrout appears to have died in the middle of the annual growth cycle, suggesting a summer death. The redfish and the catfish otoliths both ceased growth on the winter growth interruption ring, suggesting winter deaths.

Chronology

A total of nine samples were submitted during the 1970s for radiocarbon dating to the Radiocarbon Laboratory, The University of Texas at Austin. Five of these (TX-2599 through TX-2603) were run on a "charcoal-like substance" which, as mentioned above, was actually natural asphaltum. Ages ranging from 32,500/-2610 B.P. to 40,000+ years were obtained, as is expectable as the upper limit for the radiocarbon method when applied to natural petroleum. It is clear that the asphaltum nodules commonly found as a component of the general occupational debris were mistaken for wood charcoal, with the result that the assays are obviously useless.

Four additional samples, one of charcoal and three of oyster shell, were also assayed, and these produced apparently reliable and useful results. One oyster and one charcoal sample were submitted for assay as a paired sample; both were extracted from "Feature 10", a hearth exposed by mechanical blading in "Trench 5" one of the machine-excavated trenches in the Corral Area (Atkins n.d.). The charcoal sample (TX-2605) produced an age of 780+/-150 B.P., and the oyster shell yielded an age of 510+/-50 B.P. Both dates are reported in the summary manuscript by Atkins (n.d.) without indication that any corrections for 13C or calibrations were carried out. A check of the laboratory files (Melissa Winans, pers. comm, 1994) indicated that this is indeed the case on these and all other samples from the 1970s excavations.

Since our 1992 radiocarbon assays on oyster shell indicated that 370 years should be added to uncorrected oyster shell assay results (see discussion in Chapter 5), this correction factor is added to the raw ages on shell dates obtained during the 1970s. This seems justified by the fact that the same factor was determined by mass spectrometry for the oyster samples from both Features 106 and 114 in the Block Excavation, and similar correction factors have been obtained on estuarine shells from the Corpus Christi Bay area (Ricklis and Cox 1991; Ricklis 1993a). Using this factor, then, the shell age, TX-2606, corrects to 880+/-50 B.P., which calibrates (Stuiver and Reimer 1993) to a 1-sigma calendar date range of A.D. 1051-1226, with an intercept at A.D. 1275. The charcoal date is calibrated uncorrected, since wood charcoal generally requires a correction for 13C of only about 25 years. Directly calibrated from the raw radiocarbon age of 780+/-150 B.P., a 1-sigma calendar date range of A.D. 1052-1385, with an intercept at A.D. 1176, is obtained. The 1-sigma date ranges are thus in mutual agreement, suggesting that the two samples constitute a valid pair, which places the hearth in the latter part of the Initial Late Prehistoric or early part of the Final Late Prehistoric.

The two other samples consisted of oyster shells. Both came from features which, although there are no extant field notes, can be suspected to have been shell lined hearths. Sample TX-2598 ("Feature 28") produced an uncorrected age of 230+/-70 B.P., which, using a factor of 370 years, corrects to 600+/-70 B.P. This in turn calibrates to a 1-sigma calendar date range of A.D. 1300-1416, with intercepts at A.D. 1328, 1333 and 1395. The other shell sample (from Feature 27), TX-2603, yielded an uncorrected age of 50+/-50 B.P. which corrects to 420+/-50 B.P. and calibrates to a 1-sigma date of A.D. 1438-1611, with an intercept at A.D. 1454.