VERTEBRATE FAUNA REMAINS

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ABSTRACT

An assemblage of over 4,000 non-human vertebrate faunal specimens were recovered from the ARCO Refinery Site in Carson, California. The collection represents not only terrestrial, marine, and avian wild animal taxa, but also domestic species such as sheep and cattle. The remains suggest that either the site is composed of two cultural components, one prehistoric and the other historic, or that the Native American population was in a transitional phase when their traditional diet was being supplemented, then replaced, by European resources.

INTRODUCTION

This paper provides a preliminary descriptive and interpretative summary of vertebrate faunal remains recovered from LAn-2682 (the ARCO Site) located in Carson, Los Angeles County, California. The principal objectives of this study are to determine what animals were most important in the diet of the site occupants and the relative importance of the various habitats that were exploited to obtain vertebrate fauna.

Taphonomy

Taphonomic factors greatly affect the preservation of bone specimens that are ultimately available for examination by the researcher. Individual bone element density is critical to bone survival in the soil. For instance, bird bone is fragile due to the thinning of bone cortex and pneumatization of some of the bones for lighter weight and greater lift. Butchering and cooking methods will further alter bone material. Large and medium size mammal bone often were shattered in order to remove the desirable marrow. Disposal methods remove additional bone, as does pH of the soil which can greatly alter or destroy many smaller bones or bone with less density. Recovery methods reduce the true sample of bone which can be accounted for in the living population. An unknown proportion of fish and other small bone passes through even 1/32 inch mesh. What remains is only an approximation of the fauna that may have been available to the prehistoric inhabitants of the site.

Quantification of the identified specimens reflects, but does not precisely measure, the intensity to which any given taxon may have been exploited by the prehistoric occupants.

METHODS

As with all other culturally related components, the faunal remains were recovered during dry sieving through 1/8 inch mesh and subsequently sorted during laboratory processing. Faunal specimens were assigned lot numbers that were equated with excavation levels. Mammal and bird bones were identified by Wayne H. Bonner. Fish specimens were identified by Sherri Andrews, reptile vertebrae by Diane F. Bonner.

Each specimen was identified to species level, bone element, and symmetry when possible. Evidence of burning, butchering, disease, or trauma was noted when evident. Determination of sex and age rarely was possible. Identification of non-cultural specimens (i.e. the remains of animals that died naturally and are not,

therefore, related to human exploitation) was attempted to reduce bias in the sample. In addition to faunal collections, references used for species identification included Cohen and Serjeantson (1986), Gilbert et al (1985), Glass and Thies (1997), and Olsen (1968, 1973). Current taxonomic order and nomenclature as published by Collins (1990), Howard and Moore (1991), Robins (1991), and Wilson and Reeder (1993) were used. Environmental habitats for fish species were adapted from Allen (1985).

The results were recorded on project sheets using a modified version of the University of California, Santa Barbara, coding system. The coded data were then entered into the project computer database, and tables of results were generated.

Raw specimen counts were used to calculate the number of identified specimens (NISP). Quantification by count of non-repetitive elements produced minimum number of individuals (MNI). When this was not possible, as in the case of most fish species, the number of vertebrae identified to a specific taxon was divided by the number of vertebrae known to occur in one individual of that taxon as documented by Clothier (1950) and Springer and Garrick (1964) to give rough estimates of MNI. Note that vertebral count is not as accurate as non-repetitive element counts, but it does suggest an estimate of the number of individuals present.

VERTEBRATE SAMPLE FROM LAN-2682

More than 4,000 faunal specimens were retrieved from LAn-2682. At least fourteen varieties of fish, nineteen genera of mammals, five taxa of birds, six forms of reptiles, and one genus of amphibians are represented in the collection. This is comparable to published results from nearby prehistoric sites (Table 1).

Of this sum, over 1,000 specimens represent the remains of animal life considered intrusive to the archaeological deposit. This includes rodents, shrews, snakes, and amphibians. Domestic genera such as sheep and cattle also would not have been associated with the prehistoric occupation of LAn-2682. In contrast, all marine fish and most of the bird groups can be considered present as a result of human occupation of the site. Another 2,000 animal bones were too fragmented for identification. Most of these are probably rodent remains.

Discounting intrusive taxa, rabbits and hares collectively are the most significant group represented at the site in terms of NISP. Deer also appear to have been an important resource, as were sharks and rays. These resources were supplemented by a variety of medium sized terrestrial mammals and the occasional marine mammal. By projected meat weight, deer would have provided the greatest source of protein, followed by fish.

Faunal identification and interpretation has not been completed. Finite tabulations of species for MNI, therefore, are not available at this time.

INTERPRETATION

Terrestrial Habitats

The mammal, bird, and reptile species represented in the sample suggest that a diverse biotic community existed in the near vicinity of LAn-2682 (Tables 2, 3, and 4). This diversity reflects the biotic zones typical of a major river drainage system such as the Los Angeles River would have been during the prehistoric period.

Marine Habitats

Fish remains recovered from LAn-2682 suggest that a number of marine habitats were exploited
(Table 5).

One way to deal with the occurrence of fish species in multiple habitats is to combine the habitats into categories (Table 6) using habitat characteristics such as distance from the shore (nearshore or offshore) and substrate type (rocky, soft or none) (see Allen 1985 for habitat characteristics).

The ability to assign species to habitat categories allows some quantification of the

degree to which various habitat categories were exploited for fish.

Results to date suggest that the residents of LAn-2682 were relying heavily on the nearshore, soft substrate (B/E, HNSB, and OC). The Offshore, soft substrate (SB) also appears to have been important for exploiting resources, as were the offshore or nearshore rocky substrate (SRRF and KB) habitats.

SUMMARY

Habitat Use

The data suggest that the prehistoric residents of the ARCO Site were exploiting an extensive variety of habitats in around the Los Angeles River flood plain, Wilmington Lagoon, and San Pedro Bay (Figure 1). Given the location of this site it is not surprising that the native population would have relied more heavily on the wetlands than the resources of the outer coast. In terms of faunal richness the nearshore habitats, which includes BE, HNSB, IT, SRRF, and OC, was providing the greatest variety of fish species for LAn-2682. However, it would appear that the prehistoric inhabitants also were exploiting habitats which were less convenient. The offshore habitats (KB, MW, and PEL) also were fished, but in less diversity and quantity than the nearshore habitats.

Exploitation of the available fish populations would have necessitated various means of capture. The most easily exploited would have been those which could have been captured by hand. In contrast, the specimens frequenting the kelp beds and other offshore habitats would have required a more labor-intensive and organized effort. Some form of water craft is required to reach the offshore kelp beds. This could have been in the form of rafts or boats. Once in the kelp beds, nets and seines would have been useless in the dense underwater vegetation. Spears, fish gorges and/or hook and line would have produced the best efforts. Table 7 lists the procurement techniques that were likely used to capture the major fish species identified at the ARCO site.

Birds could have been captured with nets or bow and arrow or spear. Their great numbers, especially during the winter months, would have provided a readily accessible and dependable source of protein for the prehistoric inhabitants of San Pedro Bay.

Rodents, if indeed they were exploited, could have been successfully hunted using traps and snares. Larger game could have been hunted with spears, bow and arrow, or nets. Pond turtles could have been captured by hand.

It would appear that rabbits and hares were an important resource not only for their protein, but also for fur. These small mammals could have been captured with minimal labor and would have been available in large numbers throughout the entire year. In contrast marine mammals would have required intense labor skills and a greater risk of failure and/or risk of injury. According to the ethnographic record deer were an important source of protein for the population, which also would have required some stealth for successful capture. Other small and medium-sized mammals would have provided a supplement to the diet, but most likely never in significant numbers.

SEASONALITY

In order to investigate increasing sedentism, it is important to determine whether sites were occupied year-round or seasonally. One method of seasonal determination is based on the presence of seasonally-specific animals such as certain bird taxa that are known to reside in the general area only during specific times of the year. Another method involves examination of growth rings in fish otoliths to determine season of death.

Several seasonally specific water bird taxa are represented at LAn-2682. At least two of these, pintail duck and Canada goose, are strictly winter visitors. These species generally arrive in November and leave in March. We may, therefore, state that LAn-2682 probably was occupied during these months. Blue-winged teal is transitory, while mallard and red-tailed hawk are year-round residents.

All bony fish (teleosts) possess bony tissue,

called otoliths, which serve to maintain equilibrium. Otoliths grow by the superposition of calcium carbonate layers interspersed with layers of protein. A pair of these deposits ("growth rings") are formed each year. The winter ring is called an annulus (Rojo 1991:124). Although all bony fish possess otoliths many are too small for recovery in 1/8 inch mesh. Those large enough to be recovered provide a major source of information on seasonal activity at archaeological sites.

Five fish otoliths were recovered from LAn-2682. Based on previous studies by Richard Huddleston (1985), fish were likely captured during the summer months.

The faunal evidence, therefore, suggests that LAn-2682 was occupied during the entire year by at least some residents.

CONCLUSION

Like other estuarine environments along the southern California coast, the Wilmington-San Pedro wetlands possessed a complex ecosystem which supported abundant and diverse flora and fauna. Faunal availability and diversity varied seasonally and annually, with winter months exhibiting the greatest avian populations and summer months providing the largest fish populations. A rich diversity of mammalian species also was on hand.

This diversity of resources permitted a comparatively dense zone of human occupation surrounding Wilmington Lagoon during the Late Prehistoric and Protohistoric Periods.

Reconstructing the paleoenviroment of the Wilmington Lagoon/Los Angeles River drainage is crucial to understanding subsistence patterns of the prehistoric inhabitants living along the southern Los Angeles County coast.

Impact to the wetlands and surrounding areas by harbor construction and mass urban development have largely destroyed the natural habitats that once existed in the southern portion of Los Angeles County. That faunal diversity has been irreversibly altered, but investigation of faunal remains from archaeological deposits in the area not only helps to reconstruct the diet of the prehistoric inhabitants, but also to assist in suggesting the rich and diverse biozones that once existed in Wilmington Lagoon and along the San Pedro Bay coast.

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COMPARISON OF FAUNAL COLLECTIONS FROM SOUTHERN LOS ANGELES COUNTY SITES

SPECIES	COMMON NAME	LAn-138:1	LAn-138:2	LAn-283	LAn-702	LAn-2682
FISH						
Squatina californica	angel shark		X	X	X	X
Prionace glauca	blue shark					X
Mustelus henlei	brown smoothhound					X
Triakis semifasciata	leopard shark	X	X		X	X
Platyrhinoides triseriata	thornback	X				
Rhinobatis productus	shovelnose guitarfish	X	X		X	X
Urolophus halleri	round stingray					X
Myliobatis californicus	bat ray	X		X	X	X
Leuresthes tenuis	California grunion			X		
Porichthys myriaster	specklefin midshipman			X		
Porichthys notatus	plainfin midshipman					X
Paralabrax clathratus	kelp bass					
Atractoscion nobilis	white seabass	X				
Cynoscion parvipinnus	shortfin corbina				X	
Genyonemus lineatus	white croaker			X	X	
Roncador stearnsii	spotfin croaker			X	X	
Umbrina roncador	yellowfin croaker				X	
Sphyraena argentea	California barracuda				X	X
Seriola lalandi	yellowtail					X
Semicossyphus pulcher	California sheephead	X	X	X		X
Euthynnus pelamis	skipjack tuna				X	
Paralichthys californicus	California halibut	X			X	X
BIRD						
Gavia immer	common loon	X			X	
Gavia arctica	arctic loon	X				
Podiceps caspicus	eared grebe	X				
Fulmarus glacialis	fulmar	X			X	
Phalacrocorax penicillatus	Brandt's cormorant	X				
Spatula clypeata	shoveler	X				
Chendytes lawi	diving duck	X				
Athya affinis	lesser scaup	X				
Melanitta perspicillata	surf scoter	X	X		X	
Buteo jamaicensis	red-tailed hawk	X			X	X
Larus	undiff. gull		X			
Tyto alba	barn owl	X				
Asio otus	long-eared owl	X				
Anas acuta	pintail					X
Anas discors	blue-winged teal					X
Anas platyrhynchos	mallard					X
Anas cf. streptera	gadwall				X	
Anser sp.	undiff. geese					X
Branta canadensis	Canada goose				X	X
Mareca	undiff. widgeon				X	
Phasianus cf. colchicus	ring-necked pheasant				X	
Gallus domesticus	domestic chicken			X		
Agelaius	undiff. blackbird				X	
Ardea	undiff. heron				X	
Fulica	coot				X	

Walker 1951; Butler 1974; Allen 1980

Table 1a.

COMPARISON OF FAUNAL COLLECTIONS FROM SOUTHERN LOS ANGELES COUNTY SITES

SPECIES	COMMON NAME	LAn-138:1	LAn-138:2	LAn-283	LAn-702	LAn-2682
MAMMAL						
Sorex orantus	ornate shrew					X
Scapanus latimanus	broad-handed mole	X			X	
Canis latrans	coyote		X			X
Canis sp.	undiff. dog	X			X	X
Urocyon cineroargenteus	gray fox					X
Ursus americanus	black bear					X
Procyon lotor	racoon					X
Enhydra lutris	sea otter	X		X	X	
Mustela frenata	long-tailed weasel					X
Taxidea taxus	badger	X			X	
Mephitis mephitis	striped skunk					X
Zalophus californianus	California sea lion	X				X
Arctocephalus philipi	southern fur seal	X	X	X		
Phoca cf. vitulina	harbor seal				X	X
Sciurus griseus	western gray squirrel					X
?Dipodomys	undiff. kangaroo rat				X	
Microtus californicus	California vole				X	X
Perognathus sp.	undiff. pocket mouse				X	
Peromyscus cf. maniculatus	deer mouse				X	X
Reithrodontomys megalotis	western harvest mouse				X	
Spermophilus beecheyi	Calif. ground squirrel	X			X	X
Thomomys bottae	valley pocket gopher	X			X	X
Lepus californicus	black-tailed jackrabbit	X		X	X	X
Oryctolagus cinicullus	domestic rabbit			X		
Sylvilagus audubonl	desert cottontail	X		X		X
Sylvilagus cf. bachmani	brush rabbit				X	X
Odocoileus heminous	mule deer	X			X	X
Bos taurus	domestic cattle			X	X	X
Ovis aries	domestic sheep			X		X
Delphinlae	dolphin family	X				
REPTILE/AMPHIBIAN						
Bufo boreas	western toad				X	X
Clemmys marmorata	pond turtle				X	X
Coluber constrictor	western racer				X	X
Pituophis melanoleucus	gopher snake					X
Lampropeltis getula	common kingsnake					X
Thamnophis sirtalis	comon garter snake					X
Crotalus viridis	undiff. rattlesnake				X	X

Table 1b.

Walker 1951; Butler 1974; Allen 1980

HABITATS REPRESENTED BY MAMMALIAN TAXA IDENTIFIED FROM LAN-2682

SPECIES	COMMON NAME	HABITAT
Sorex orantus	ornate shrew	St Mr
Ursus americanus	black bear	Fr Mr Ow Rp Rv St Wd
Procyon lotor	raccoon	Rp Wo
Mustela frenata	long-tailed weasel	All
Mephitis mephitis	striped skunk	Rp Wo
Canis latrans	coyote	All
Urocyon cineroargenteus	gray fox	Ch Wo
Zalophus californianus	California sea lion	Marine
Phoca vitulina	harbor seal	Marine
Sciurus griseus	western gray squirrel	Ow
Microtus californicus	California vole	Gr
Peromyscus cf. maniculatus	deer mouse	All dry
Spermophilus beecheyi	California ground squirrel	Gr
Thomomys bottae	valley pocket gopher	Ps
Lepus californicus	black-tailed jackrabbit	Gr
Sylvilagus audubonl	desert cottontail	Ch, Gr
Odocoileus heminous	mule deer	Gr Wo Fr Ch Sc Rp Wd
Bos taurus	domestic cattle	Gr
Ovis aries	domestic sheep	Gr
All All habitats	Gr Grasslands	Rp Riparian
Ch Chaparral	Sc Scrub	Rv Rivers
St Streams	Mr Marshes	WdWoodlands
Fr Forests	Ow Oak woodlands	

Table 2.

HABITATS AND SEASONALITY OF BIRD SPECIES REPRESENTED AT LAN-2682

SPECIES	COMMON NAME	HABITAT	RESIDENCE
Anas acuta	pintail	Fp Fm Mc Mm Ob Ix	Winter Resident
Anas discors	blue-winged teal	Fp Fm	Transient
Anas platyrhynchos	mallard	Fp Fm Fs Fw Ob	Year-round
Branta canadensis	Canada goose	Fm Mc Mm Gr Ix	Winter Resident
Buteo jamaicensis	red-tailed hawk	Sc Dg Db Gr Mv Irb	Year-round
Fp ponds/lakes	Mc salt marsh channels	Db brush/sage	Irb irrigated farms
Fm marshes	Mm salt march mudflats	Dc chaparral	
Fs shorelines	Mv marsh vegetation	Gr grassland	
Fw freshwater	Ix island regularly occurring	Ob coastal bays	

Table 3.

HABITATS AND SEASONALITY OF REPTILE SPECIES REPRESENTED AT LAN-2682

SPECIES	COMMON NAME	HABITAT	RESIDENCE
Clemmys marmorata	southwestern pond turtle	Fp Rp	Year-round
Coluber constrictor	western racer	Ch Ow	Year-round
Crotalus viridis	pacific rattlesnake	All	Year-round
Lampropeltis getula	common kingsnake	All	Year-round
Pituophis melanoleucus	gopher snake	All	Year-round
Thamnophis sirtalis	common garter snake	Ch Gr Sc Wd	Year-round
Fp ponds/lakes	Rp riparian	Ch chaparral	Ow oak woodlands
Gr grasslands	Sc scrub	Wd woodlands	All all habitats

Table 4.

Habitat Groups of Fish Species from LAn-2662

Nearshore Soft Substrate (BE, HNSB, OC)	
Squatina californica	angel shark
Mustelus henlei	brown smoothhound shark
Rhinobatos productus	shovelnose guitarfish
Myliobatis californica	bat ray
Urolophus halleri	round stingray
Porichthys notatus	plainfin midshipman
Paralichthys californicus	California halibut
Nearshore, Rocky Substrate (IT, SRRF)	
Triakis semifasciata	leopard shark
Offshore, Rocky Substrate (KB)	
Semicossyphus pulcher	California sheephead
Sphyraena argentea	California barracuda
Offshore, Soft Substrate (SB)	
Porichthys notatus	plainfin midshipman
Offshore, No Substrate (MW, PEL)	
Prionace glauca	blue shark
Triakis semifasciata	leopard shark
Seriola lalandi	yellowtail

*Habitats adapted from Allen (1985); Nomenclature from Robins (1991)

Table 5.

FISH HABITAT GROUPS (Adapted from Allen 1985)

Category	Habitats
Nearshore, Soft Substrate	Bay/Estuary (BE), Harbor/Nearshore Soft Bottom (HNSB), Open Coast (OC)
Nearshore, Rocky Substrate	Intertidal (IT), Shallow Rocky Reef (SRRF)
Offshore, Rocky Substrate	Kelp Bed (KB), Deep Rocky Reef (DRRF)
Nearshore and Offshore, Rocky Substrate	Shallow Rocky Reef, Kelp Bed (SRRF/KB)
Offshore, Soft Substrate	Soft Bottom (SB)
Offshore, No Substrate	Mid-water (MW), Pelagic (PEL)

Table 6.

LAN-2682 Fish Capture Methods

Scientific Name	Common Name	Hook & Line	Seine	Hand	Spear
Squatina californica	Pacific angel shark	X			
Mustelus henlei	brown smoothhound	X	X		
Triakis semifasciata	leopard shark	X	X		
Prionace glauca	blue shark				X
Rhinobatus productus	shovelnose guitarfish			X	X
Urolophus halleri	round stingray				X
Myliobatis californica	bat ray				X
Porichthys notatus	plainfin midshipman	X			
Seriola lalandi	yellowtail	X			
Sphyraena argentea	California barracuda	X			
Semicossyphus pulcher	California sheephead	X			X
Paralichthys californicus	California halibut	X	X		

Adapted from Huddleston 1985

Table 7.

Figure 1. General Location of CA-LAn-2682 (the ARCO SITE) showing extensive wetlands existing one hundred years ago. USGS Redondo Calif. (1896) and Downey, Calif.(1896) 15 Minute Quads. 1:62,500.