

EARLY HOLOCENE VERTEBRATE FAUNA FROM CAVE OF THE CHIMNEYS (CA-SMI-603), SAN MIGUEL ISLAND, CALIFORNIA: PRELIMINARY RESULTS

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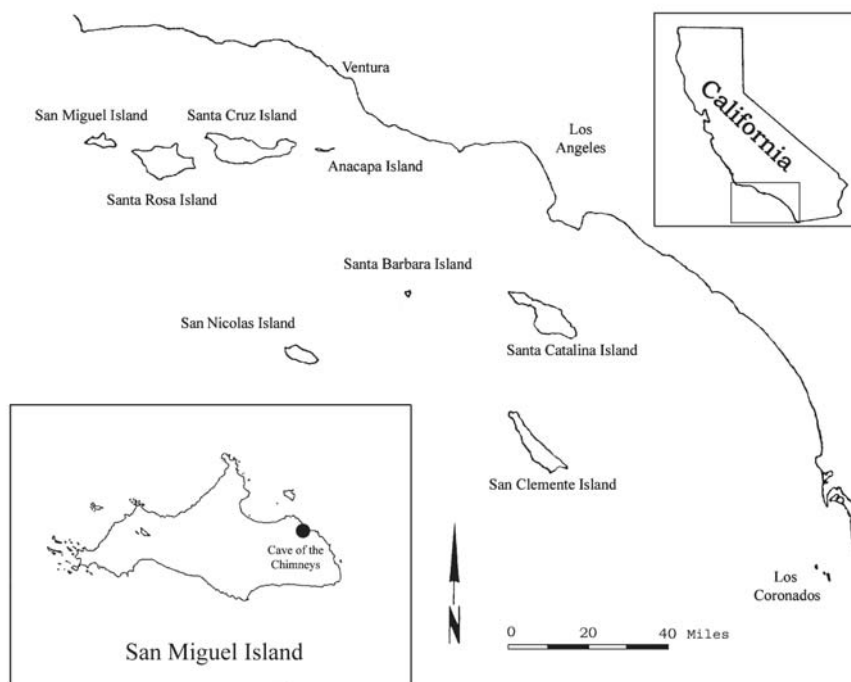
A sample of over 2,700 vertebrate faunal remains from deposits in Cave of the Chimneys dated between about 8400 and 7500 cal B.P. suggests that people occupying the cave hunted or collected a diverse array of birds, fish, and mammals. Bird and sea mammal bones were also used to make a variety of artifacts, including bipoints (gorges) for fishing and other activities. Shellfish, fish, bird, reptile or amphibian, and mammal bones recovered during exploratory excavations suggest that early New World people utilized a wide variety of marine and terrestrial resources. Many of the faunal remains, particularly rodents and reptiles, however, appear to have been naturally deposited, rather than the result of human activities.

Vertebrate fauna including sea mammals, fish, and birds played a fundamental role in native subsistence economies of coastal California. During the Early Holocene, however, vertebrates appear to have been largely a supplemental part of the diet, with shellfish often being the most important animal food category (Erlandson 1994). This appears to be related to the relative ease of procuring shellfish (see Erlandson 1994; Moriarty 1967), but the dearth of vertebrate faunal remains may also be related to bioturbation and other taphonomic factors that fragment and even destroy some bones. The lack of fine-mesh samples and exclusive reliance on small column samples also bias vertebrate assemblages (Erlandson 1994; Rick and Erlandson 2000).

In this paper, we describe a sample of vertebrate faunal remains, including fish, bird, reptile or amphibian, and mammal bones, obtained during exploratory excavations of Early Holocene deposits at Cave of the Chimneys on San Miguel Island (Figure 1). Due to the lack of burrowing rodents and the limited effects of weathering inside the cave, preservation of faunal remains and even perishable artifacts such as cordage is excellent. These unique preservation conditions provide an

ideal setting to investigate early Native American subsistence strategies, as well as taphonomic processes that affect faunal assemblages. We assess the economic and dietary significance of vertebrate fauna and discuss natural vs. cultural deposition of faunal remains from Early Holocene strata at Cave of the Chimneys. It should be noted that the Early Holocene deposits are also rich in rocky-coast shellfish (abalones, mussels, etc.), which appear to have dominated the diet.

Figure 1: Location of Cave of the Chimneys and the Santa Barbara Channel.



ENVIRONMENTAL CONTEXT AND CHRONOLOGY

Cave of the Chimneys, a large rockshelter about 10 m deep and up to 12 m wide, is located roughly 12 m above an isolated and rugged stretch of rocky coast on the northeast shore of San Miguel Island. The cave appears to have been formed during the Pleistocene by marine erosion associated with a high interglacial sea stand. Cave of the Chimneys faces due east and is sheltered from the strong northwesterly winds that buffet San Miguel Island much of the year (Johnson 1972:63). A skylight or “chimney” approximately 1.5 m wide and a large opening at the cave mouth provide ample light into most of the shelter. Although the floor of the cave slopes relatively steeply towards the ocean, archaeological deposits appear to be located beneath much of the cave floor. The deposits have been somewhat reduced by erosion and other natural disturbances.

Seven discrete archaeological components, with up to 2 m of midden accumulation, have been identified in the cave. The deposits exhibit excellent preservation and stratigraphic integrity. The vertebrate faunal remains discussed in this paper are from Strata 6 and 7 obtained during exploratory excavations in 1998. These excavations recovered approximately .039 m³ of sediments from Stratum 6 and .038 m³ from Stratum 7, dated between about 8400 and 7500 cal B.P. (Table 1). All of the ¹⁴C dates are from single shell fragments, and stratigraphic reversals in some dates suggest that the two strata have been mixed to some extent. It is likely that this disturbance was related to occupational activities towards the end of the Early Holocene occupation.

VERTEBRATE FAUNA FROM CAVE OF THE CHIMNEYS

All of the faunal remains discussed here were identified using comparative collections housed in the departments of anthropology at the University of Oregon and the University of California, Santa Barbara. Identifications were made to the most specific taxon possible, but due to similarities in the physical appearance of bones from closely related animals, most identifications were made to genus, family, or more general categories. The faunal remains were quantified using NISP, weight, and MNI estimates as outlined in Grayson (1984), and all faunal remains were analyzed for evidence of butchering, processing, and digestive traces. NISP, weight, and MNI for the vertebrate remains from Strata 6 and 7 are presented in Table 2, but we treat these two strata as one component due to the exploratory nature of our research and the small size of the samples. It should be emphasized that our analysis of the Cave of the Chimneys fauna is ongoing and our current results are preliminary.

Mammals

Roughly 1,798 specimens (21.35 g) of mammal bone were recovered from Strata 6 and 7, comprising about 65 percent of the vertebrate NISP and 35 percent of the weight. Most (93 percent by weight) of the mammal remains are from rodents, which judging by the lack of burning appear to have been deposited naturally in the cave. Some of these remains may have been deposited by owls that roosted in the cave when humans were not occupying it (see Walker 1980:707). Although analysis of the rodent remains is ongoing, they appear to be primarily the San Miguel Island deer

Table 1: A radiocarbon chronology for early Holocene components from Cave of the Chimneys.

Site	Provenience	Lab Number	Material Dated	14C Age	13C/12C Adjusted	Calendar Age Range (cal BP) ^a
SMI-603	Unit 1, Str. 6	Beta-129099	Olivella Bead	6890 ± 70	7300 ± 70	7480 (7560) 7610
	Unit 1, Str. 6	Beta-136695	Black abalone	7440 ± 60	7880 ± 60	8010 (8110) 8170
	Unit 1, Str. 6	Beta-122712	Black abalone	7690 ± 80	8120 ± 80	8280 (8350) 8410
	Unit 1, Str. 7	Beta-122713	Black abalone	7220 ± 70	7650 ± 70	7790 (7870) 7950
	Unit 1, Str. 7	Beta-136696	Black abalone	7310 ± 80	7740 ± 80	7870 (7950) 8030

All dates were calibrated using Calib 4.1 (Stuiver and Reimer, 1993, 1999). A DR of 225 ± 35 years was used for all shell samples, and ¹³C/¹²C ratios were either determined by the radiocarbon labs, or an average of +430 years was applied (Erlandson 1988).

mouse (*Peromyscus maniculatus streatoris*), and possibly the now-extinct shrew (*Sorex ornatus*) and giant deer mouse (*P. nesodytes*) (see Walker 1980).

The remains of large mammals are relatively rare. Six small, highly fragmented pieces may be from sea mammals, but a precise identification is not currently possible. Finally, two small pieces of large land-mammal cortical bone are probably deer. One of these specimens is burnt on one half of the bone, suggesting that it was processed for consumption, for making bone tools, or both. Since deer and other large terrestrial mammals did not live on the island prehistorically, the presence of these deer-bone fragments indicates trade or transport from the mainland. A deer metapodial was also recovered from the overlying Middle Holocene Stratum 5, suggesting that these elements were probably a valued material for making awls, gorges, and other bone tools.

Reptiles and Amphibians

Only 79 reptile or amphibian bones from at least three individuals were recovered from the Early Holocene deposits. These make up only about 3 percent of the vertebrate NISP and 2 percent of the weight. Many of these remains may have been deposited naturally in the cave rather than by human activities. The reptile or amphibian remains have not yet been identified to specific taxa, but it is probable that they are from the Channel Islands slender salamander (*Batrachoseps pacificus pacificus*), the island western fence lizard (*Sceloporus occidentalis becki*), or the southern alligator lizard (*Elgaria multicarinatus*), all of which are found on the island today (Schoenherr et al. 1999:269-270).

Birds

Seventy-three pieces of bird bone (10.53 g) were recovered from the Early Holocene strata, making up roughly 3 percent of the vertebrate NISP and 17 percent of the weight. Two cormorant elements were identified in Stratum 7, and a synsacrum and carpometacarpus are probably from an auklet or murrelet, but due to a lack of comparative specimens a precise identification for these two elements is not currently possible. A number of birds, including cormorants, crows, and sea gulls, inhabit this part of the island today, and it is probable that many of the bird bones were deposited naturally in the cave. The proximal end of a cormorant ulna

recovered in Stratum 7, however, appears to have been an awl or borer. The element is missing the tip, but is similar to cormorant ulna awls recovered from Daisy Cave (Guthrie 1980:696), and from Middle Holocene deposits on San Nicolas Island (Vellanoweth 1996). It is also possible that cormorants were used for their feathers (Guthrie 1980:696). In Early Holocene deposits at Daisy Cave, located on the east side of Bay Point, Erlandson et al. (2004) identified a bone-tool-making complex that relied primarily on bird bones for the manufacture of bipoints (gorges) for fishing (see Rick et al. 2001). Only one bipoint was recovered from Cave of the Chimneys, but a similar industry may have existed at this site.

Fish

Fish remains are relatively abundant, comprising approximately 29 percent of the vertebrate NISP and 46 percent of the weight. A total of 804 fish bones were recovered, approximately 99 percent of which were from teleosts. Only two undifferentiated elasmobranch

Table 2: NISP, Weight (g), and MNI of vertebrate faunal remains from Stratum 6 and 7^a.

^a Based on 3.2 mm recovery and all weights in grams.

Stratum	6		7		Total		MNI
	NISP	Wt.	NISP	Wt.	NISP	Wt.	
Taxon							
Bird							
Bird undifferentiated	40	2.68	31	2.62	71	5.30	1
<i>Phalacrocorax</i> spp. (cormorant)--	--	--	2	5.23	2	5.23	1
Subtotal	40	2.68	33	7.85	73	10.53	2
Mammal							
Sea mammal	4	.19	2	.88	6	1.07	1
Large land mammal (deer)	2	.49	--	--	2	.49	1
Rodent	857	9.29	933	10.50	1790	19.79	54
Subtotal	863	9.97	935	11.38	1798	21.35	56
Reptile/Amphibian							
Undifferentiated	24	.28	55	.80	79	1.08	3
Fish							
Clupeidae (herring, sardine)	--	--	5	.05	5	.05	1
Cottidae							
<i>Scorpaenichthys marmoratus</i> (cabezon vertebrae)	1	.91	4	1.43	5	2.34	1
<i>Scorpaenichthys marmoratus</i> (cabezon cranial)	1	.42	1	.82	2	1.24	--
Embiotocidae							
surfperch (cranial)	2	.10	3	.19	5	.29	1
surfperch (vertebrae)	3	.07	5	.23	8	.30	--
Hexagrammidae (greenling)	--	--	1	.02	1	.02	1
Labridae							
<i>Semicossyphus pulcher</i> (sheephead cranial)	--	--	2	.56	2	.56	1
<i>Semicossyphus pulcher</i> (sheephead vertebrae)	--	--	1	1.38	1	1.38	1
Scorpaenidae							
<i>Sebastes</i> spp. (vertebrae) (rockfish)	--	--	1	.23	1	.23	1
<i>Sebastes</i> spp. (cranial)	--	--	5	.98	5	.98	1
<i>Sebastes</i> spp. (cranial)	--	--	3	.71	3	.71	--
Stichaeidae (prickleback)	1	.31	3	.60	4	.91	1
Teleost undifferentiated	141	4.05	619	14.51	760	18.56	--
Teleost subtotal	149	5.86	653	21.71	802	27.57	9
Elasmobranch undifferentiated	1	.23	1	.05	2	.28	1
Fish subtotal	150	6.09	654	21.76	804	27.85	10
Bone undifferentiated	--	--	2	.05	2	.05	--
Total	1077	19.02	1679	41.84	2756	60.86	71

elements were recovered from Strata 6 and 7, and approximately 67 percent of the fish remains by weight consist of unidentifiable spines and bone fragments. Of the total fish sample, 32 percent (by weight) of the bones were identified to family, genus, or species ($n = 42$). Although only a small number of identifiable fish elements were recovered, the presence of vertebrae, dentaries, premaxillae, parasphenoids, a single otolith, and other cranial elements suggest that primarily whole fish were being deposited at the site.

At least seven different types of teleosts were identified in the assemblage, and two elements were from an unidentified elasmobranch. Together surfperch, rockfish, and cabezon contribute 67 percent of the identified teleost NISP and 65 percent of the weight. California sheephead and a large prickleback, the latter of which closely resembles a monkeyface eel in the UCSB collection, are also represented. Five clupeid vertebrae were identified, and it is possible that if 1.6-mm residuals had been obtained these small fish would be more abundant. It is also possible that some of these small fish were deposited by sea birds or as animal stomach contents rather than by humans, although no unequivocal signs of digestion were noted.

The identified fish remains suggest that the Early Holocene occupants of Cave of the Chimneys fished primarily in nearshore-rocky and kelp-bed habitats. These environments are found immediately adjacent to the site today and it is likely that the situation was similar during the Early Holocene. A variety of methods may have been used to obtain fish, including gorge and line. Nets, such as a small dip net, were probably also used to capture small fish and to haul in larger taxa. A preliminary analysis of fish remains from the Middle and Late Holocene components suggests that many of the same taxa were also caught later in time (Vellanoweth et al. 2000).

DISCUSSION AND CONCLUSIONS

Analysis of faunal materials from Cave of the Chimneys indicates that people subsisted largely on rocky intertidal shellfish, supplemented by fish, birds, and small amounts of sea mammal. A preliminary dietary reconstruction using the weight method for Cave of the Chimneys suggests that fish provided approximately 20 percent of the edible meat represented in the small Early Holocene sample, with shellfish contributing 75 percent, and birds and sea mammals combining for 5 percent. These data are roughly comparable to patterns noted by Erlandson (1991, 1994) for the mainland coast of California, where

shellfish dominate the faunal assemblage. The specific make-up of resources, however, is quite different.

Most of the Early Holocene faunal remains from Cave of the Chimneys are from marine fauna. Our data confirm an observation noted by Erlandson et al. (1999) for SRI-6, a 9,300-year-old site on Santa Rosa Island, where marine vertebrate and invertebrate specimens are primarily those from rocky intertidal environments (e.g., California mussels, turban, abalones, rockfish, sheephead, etc.). In contrast, the vast majority of shellfish and fish from early sites along the Santa Barbara mainland coast appear to have come from estuarine environments (Erlandson 1994). The variability of Early Holocene subsistence strategies indicates that early Pacific Coast peoples were adept at foraging in a variety of marine environments (Rick 1999).

The vertebrate faunal remains from Cave of the Chimneys are also relatively similar to remains recovered from nearby Daisy Cave. At that site, Early Holocene deposits contain *Peromyscus nesodytes*, *P. maniculatus streatoris*, and *Sorex ornatus* (Walker 1980), at least 54 species of bird, primarily cormorant (Guthrie 1980), and at least 18 distinct fish taxa (Rick 1999; Rick et al. 2001). Similar to Cave of the Chimneys, Daisy Cave also contains only limited evidence of sea mammal exploitation. Our preliminary analysis of the Cave of the Chimneys vertebrate fauna suggests that the assemblage is extremely rich and capable of yielding a diverse body of information on the subsistence practices of people who occupied the cave, as well as the biological history of the cave and adjacent area.

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