Diablo Canyon Archaeology: Trans-Holocene Faunal Exploitation Along the Central California Coast

Abstract

The objectives of the Diablo Canyon Archaeology project were to (1) refine the dating of archaeological sites CA-SLO-2 and CA-SLO-585; (2) identify the mammal, bird, and fish bones from these sites; (3) employ the resulting temporally controlled faunal matrix to improve understanding of California's earliest coastal inhabitants and (4) address issues of nearshore ecology related to prehistoric human predation on sea otters and abalone as represented in the faunal record. The project was supposed to result in a published peer-reviewed paper and possible participation in a symposium on restoration ecology.

Project R/CZ-187
Diablo Canyon Archaeology, 2004-2007
Project Leader: Terry Jones, Department of Social Sciences, California Polytechnic State University, San Luis Obispo, CA 93407

Narrative

The objectives of the Diablo Canyon Archaeology project were to (1) refine the dating of archaeological sites CA-SLO-2 and CA-SLO-585; (2) identify the mammal, bird, and fish bones from these sites; (3) employ the resulting temporally controlled faunal matrix to improve understanding of California's earliest coastal inhabitants and (4) address issues of nearshore ecology related to prehistoric human predation on sea otters and abalone as represented in the faunal record. The project was supposed to result in a published peer-reviewed paper and possible participation in a symposium on restoration ecology.

All of the project's immediate objectives have been accomplished. Identification of all of the elements in the massive faunal collection (CA-SLO-2 alone produced 10,605 fish bones and 14,264 bird and mammal bones) was completed in 2005 and the temporally controlled faunal matrix was finalized in 2006. One paper (Jones et al. 2007) is in press, another is under review at the leading archaeology journal in North America (Jones et al. n.d.a), and a third was rejected by *Science* and is being revised for submission to *Nature* (Jones et al. n.d.b). Nonetheless, the Diablo data set is so large and so remarkable in so many ways that the full implications of all of the findings have not yet been discussed in print. It will be several years before all aspects of the study are fully reported to scholarly and other audiences.

Of course, not all aspects of the project went entirely as planned nor are the resulting data perfect. In order to establish the age of the oldest sea otter remains, we originally planned to obtain radiocarbon dates directly from bones. Unfortunately, bones from the sites' deepest levels proved to have insufficient quantities of collagen for radiocarbon dating. Their unsuitability for dating was only recognized after some funds were expended in futile attempts to obtain dates. In general, dating the two sites proved to be more expensive than anticipated because of the problems with lack of collagen and the need to use small samples of shell for dates (smaller samples are more expensive). While we originally hoped to obtain a total of 50 radiocarbon dates (25 from each site), we ended up with a total of 38, with 28 from CA-SLO-2 and 10 from CA-SLO-585. As the study progressed, it became apparent the faunal assemblage from the former site was considerably larger than the latter, and a decision was made to therefore focus the most effort on CA-SLO-2. Five dates were previously available from this site and the resulting total of 33 documents four periods of intermittent occupation between 8300 B.C. and A.D. 1769. The site is the second oldest coastal midden on the California mainland (older sites are known on the islands), and it has the largest faunal assemblage for any site of its age in California.

The 190 specimens identified from the basal component show an emphasis on black-tailed deer (*Odocoileus hemionus*) (NISP=17; 40%), cottontail rabbit (*Sylvilagus* sp.) (NISP=8; 19%), and the extinct flightless duck (*Chendytes lawi*) ((NISP=8; 19%). Aquatic birds overall, including the sooty shearwater (*Puffinus griseus*) and the flightless duck account for 37% of the NISP. Exploitation of the flightless duck was most likely accomplished with watercraft since this highly vulnerable aquatic species could not have existed on the mainland and was probably adapted to predator-free islands and offshore rocks.

Fish remains at CA-SLO-2 were dominated by cabezon (*Scorpaenichthys marmoratus*; NISP=18), lingcod (*Ophiodon elongates*; NISP=6), and rockfishes *(Sebastes* sp.; NISP=6). All of

these fishes are today common on the rocky reefs, stony bottom shelves, and kelp forests along the exposed coast near Diablo Canyon.

The high frequency of deer bones was also unexpected given that other early Holocene sites in the region show a greater abundance of rabbits. A number of authors have generalized that early Holocene people in California purposely emphasized the trapping of small and medium-sized game (Hildebrandt and McGuire 2002; McGuire and Hildebrandt 1994; 2005; Fitzgerald and Jones 1999; Jones et al. 2002) over the hunting of deer, but the Diablo Canyon findings stand in contrast with such generalizations. The Diablo Canyon people trapped rabbits and collected aquatic birds from offshore rocks using watercraft, but they were also heavily involved in deer hunting.

Overall, the combination of deer, fish, and flightless duck bones seem to represent an intriguing adaptation that was heavily focused on the interface between land and sea along the coastline of the northeastern Pacific. This adaptation is seen as consistent with a coastal migration route into the New World (Jones et al. 2007).

The flightless duck bones themselves were wholly unexpected, and led project research in an unanticipated direction. Using the grant funds, we directly dated two bones of this species, which was the first time this had ever been done. We then contacted other researchers who had uncovered flightless duck bones in California and convinced them to date bones as well. We now have a data base of all radiocarbon dates obtained directly from flightless duck bones and associated dates. These show that the bird was initially exploited over 11,000 years ago on San Miguel Island and that it was rendered extinct by about 2500 years ago. The flightless duck is the only unequivocal human-caused pre-industrial extinction in North America and it took 8500 years of exploitation for it to happen. This raises serious questions about the feasibility of humans causing the terminal Pleistocene megafauna extinctions since those seem to have occurred rapidly. We hope to raise this issue in the revised version of a manuscript that was rejected by *Science.*

Finally, we have the issue of the exploitation of sea otters over time at Diablo Canyon. This study is still underway as we enlisted the help of a DNA analyst to determine the sex of the sea otter bones represented at Diablo, and this time-consuming analysis is not yet complete. Ordinarily sea otter sex cannot be determined from fragmentary skeletal remains. So far, the pattern in otter remains is intriguing relative to both abalone and the flightless duck. Exploitation of the sea otter is not evident until Component II (7000 year ago) after which it increases at the same time that exploitation of the flightless duck decreased (as the species was being hunted into extinction). It seems that prehistoric hunters replaced one species hunted with watercraft with another. Over the rest of the Holocene, exploitation of sea otters gradually increased at the same time that exploitation of abalone increased. It appears that prehistoric hunters were able to increase their harvest of abalone by regularly culling the otter population although this seems to have had no impact on the overall otter population. We are waiting to learn the sex of tge sea otter bones in order to better understand the exploitation patterns, and we also hope to discuss our findings with marine biologists before drawing final conclusions.

References Cited

Fitzgerald, Richard T., and Terry L. Jones
1999 The Milling Stone Horizon Revisited: New Perspectives from Northern and Central California. *Journal of California and Great Basin Anthropology* 21:65–93.

Hildebrandt, William R. and Kelly R. McGuire
2002 The Ascendance of Hunting During the California Middle Archaic: An Evolutionary Perspective. *American Antiquity* 67:231–256.

Jones, Terry L., Richard T. Fitzgerald, Douglas J. Kennett, Charles H. Miksicek, John L. Fagan, John Sharp, and Jon M. Erlandson
2002 The Cross Creek Site (CA-SLO-1797) and its Implications for New World Colonization. *American Antiquity* 67:213–230.

Jones, Terry L., Richard T. Fitzgerald, and Judith F. Porcasi
2007 The Cross Creek-Diablo Canyon Complex of South Central California: Mid-latitude Pacific Foragers at the Pleistocene-Holocene Boundary. In *Maritime Adaptation and Seaside Settlement in the North Pacific during the Pleistocene-Holocene Transition.* Edited by Jim Cassidy, Robert Ackerman, and Irina Ponkratova *Journal of North Pacific Prehistory* 2, In press.

Jones, Terry L., Judith F. Porcasi, Jereme Gaeta , and Brian F. Codding
n.d. a The Diablo Canyon Fauna: A Coarse-grained Record of Trans-Holocene Foraging from the California Mainland. Manuscript submitted to *American Antiquity*.

Jones, Terry L., Judith F. Porcasi Jon M. Erlandson, Herb Dallas Jr., Thomas A. Wake, and Rae Schwaderer
n.d.b 8000 Years of Human Exploitation Caused Extinction of the Flightless Sea Duck (*Chendytes lawi*). Manuscript under revision.

McGuire, Kelly R., and William R. Hildebrandt
1994 The Possibilities of Women and Men: Gender and the California Millingstone Horizon. *Journal of California and Great Basin Anthropology* 16:41–59.
2005 Re-Thinking Great Basin Foragers: Prestige Hunting and Costly Signaling during the Middle Archaic Period. *American Antiquity* 70:695-712