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INTRODUCTION

Plant Use by Complex Hunter-Gatherers: Paleoethnobotanical Studies in California

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Food is one of the most tangible, persistent, and engrained elements of cultural behavior in any given society, past or present. Subsistence systems in California have been greatly elucidated in the past two decades through the study of the continually expanding archaeobotanical record. This special section of the *Journal of California and Great Basin Anthropology* (Volume 36, Nos. 1 and 2) situates paleoethnobotany in California by highlighting the research currently being conducted by scholars working in various coastal, island, and inland settings in the state. The California archaeobotanical record offers significant insights into the evolution of intensive plant exploitation by sedentary hunter-gatherers who maximized their use of a well-endowed but highly diverse environment. The breadth of papers presented here demonstrates the range of research issues that have been addressed using California archaeobotanical data, and suggests what that record might contribute to the resolution of archaeological problems in similar contexts elsewhere.

California archaeologists often use the terms ethnobotany, paleoethnobotany, and archaeobotany interchangeably in discussing the study of archaeological plant remains. However, these three terms are not synonymous. Here, the term ethnobotany is used to describe studies of plants used by the ethnohistoric populations living in an area. Paleoethnobotany is the "analysis and interpretations of archaeobotanical remains to elucidate the interaction between human populations and plants" (Hastorf and Popper 1988:ix). Ford (1979:299) defines archaeobotany as the recovery and identification of plants, while paleoethnobotany is the analysis and interpretation of the archaeobotanical remains. In the present context we follow Ford (1979) and Hastorf and Popper (1988), and refer to archaeobotanical studies as the retrieval and analysis of microbotanical and macrobotanical remains. Microbotanical remains, such as pollen, phytoliths, and starch, are not readily visible to the naked eye. Macrobotanical remains include the carbonized remains of seeds, nuts, roots, other plant parts, and wood charcoal.

HISTORY OF CALIFORNIA PALEOETHNOBOTANY

If one considers the rich ethnohistoric and ethnographic record that emphasizes the critical role played by wild plants in fulfilling the bulk of Native Californian subsistence needs (e.g., Baumhoff 1963; Kroeber 1925), it is surprising to see that the importance of paleoethnobotany has only been realized in the past two decades. This is especially true since the study of plant remains from California archaeological sites can document the key role of plants in the rise of the intensive, sedentary adaptive strategies that supported some of the densest populations of hunter-gatherers in the world. Paleoethnobotany can address the time depth of this heavy reliance on plants, and determine where

long-term stability or changes in plant use occurred. Paleoethnobotany can also illuminate the cultural and geographic variability in plant use in a culturally heterogeneous and spatially variable environment (Wohlgemuth 2004a). Other topics in California hunter-gatherer research that paleoethnobotany can elucidate include the degree and time depth of landscape and resource management techniques such as managed burning (Anderson and Rosenthal 2015; Cuthrell 2013; Hammett 1997; Lightfoot et al. 2013), or resolve questions involving the possibility of an undocumented indigenous development of native domesticates in prehistory (e.g., Bean and Lawton 1973)—or its documentation in historic times (Reddy 2015).

California paleoethnobotany has lagged behind that practiced in other areas of the world for several reasons, including a disinterest in plant remains on the part of many archaeologists, and an absence of a widely-recognized research issue—like the origin or spread of agriculture—that could be addressed utilizing plant remains. Lacking a clear research agenda or set of goals, the initial efforts made in the 1970s were few in number and were plagued by inconsistencies in sampling techniques, flotation procedures, and a scarcity of expertise in identification. These early studies were largely ignored as appendices in reports, produced sparse and often poorly identified finds, and are of little utility today.

The first inroads occurred in 1981 in conjunction with investigations at the Late Period and early Historic-era inland Chumash village of CA-LAN-229 in Malibu Creek State Park, where robust and well-preserved plant remains were systematically collected from all excavated contexts (Hammett 1991; Hammett and Wohlgemuth 1982). Unfortunately, the project report languished in gray literature obscurity and had little impact on field sampling and research procedures in California. We consider the research carried out in upland Shasta County by Basgall and Hildebrandt (1989) and Wohlgemuth (1989) as the first in California that incorporated the systematic collection and analysis of plant remains to address broad research issues of changing plant use over time. Despite very poor faunal preservation in acidic soils in a mixed coniferous habitat, large volumes of sediment (1,340 liters) from four sites were flotation-processed and yielded sufficient remains of acorns, pine nuts, and manzanita to demonstrate that acorns had been eaten for at least 5,000 years, but were intensively used only during the last 1,000 years (Wohlgemuth 1989).

California paleoethnobotanical research made progress in fits and starts in the late 1980s and early 1990s. Plant macrofloral data from the Gilroy area were a key source of information to demonstrate the recent adoption of wetland resources in interior settings (Hildebrandt 1997). During the same period, an unpublished (although still occasionally cited) paper called attention to the importance of small seeds in interior settings (Miksicek 1991), and Hammett (1991) made the first attempt to document native managed-burning practices in California with macrofloral data. The last two were worthy efforts, but neither adequately controlled the temporal dimension, and the identification of nutshell (especially acorn) was problematic, making the conclusions about the importance of small seeds relative to nuts problematic as well.

More recent research relying on well-dated and robust assemblages of plant remains from over 100 archaeological sites and 1,000 flotation samples in central California has identified several widespread patterns, but has also revealed highly variable sequences in differing zones within the region. The earliest and most complex record of intensified plant use is from interior reaches of the Bay Area and the Sacramento Valley, documenting an intensification of acorn use by perhaps 4,000 B.P., but small seed intensification only after ca. 1,000 B.P. Plant resource intensification was later (ca. 600 B.P.) and was limited to acorns in the Sierra Nevada foothills and Redding locality, but there is little or no evidence of intensification in the interior South Coast Ranges and on the outer coast (Wohlgemuth 1996, 2004a, 2010).

Southern California paleoethnobotanical data remain largely unsynthesized, but notable high points include trans-Holocene patterns in the use of geophytes and small-seeded plants on the Channel Islands (Gill 2014, 2015, and this volume; Reddy and Erlandson 2012; Thakar 2014), and the possible role of plants in inter-group exchanges of subsistence resources among the interior Chumash (Wohlgemuth 2004b). Systematic paleoethnobotanical studies in coastal southern California (particularly San Diego County) did not start until the mid-1990s (Klug and Popper 1995; Reddy 1996), and have largely remained peripheral to other analytical studies.

TOWARDS AN INTEGRATED CALIFORNIA PALEOETHNOBOTANY

We hope that the articles in this special section of the *Journal* demonstrate the relevance of archaeobotanical data and collections for addressing broad research topics in California archaeology. The focus of most of the articles presented here is on macrofloral remains, which is not surprising given the decades of research and low-tech approach involved. Macrofloral studies have and will continue to address topics relating to human-resource interactions and niche construction. Maximizing the research potential of California paleoethnobotany mandates incorporating systematic sampling procedures that are sufficient to recover a meaningful number of identificationsfrom the full range of contexts discovered in demonstrably single-component deposits. This is usually readily achieved at large and recent prehistoric village sites with dense middens, but much larger sediment samples must be processed from sparser older sites and short-term seasonal encampments. While appropriate sampling has become a part of most field projects in central California, the lack of paleoethnobotanical integration into most field projects in southern California remains troubling, and limits fascinating comparisons of cultural trajectories in the two regions. Archaeologists in southern California must step up. Once this occurs, the divergence between central and southern California can be resolved through integrating the masses of project-related data into pan-regional databases that can encompass the spatial and temporal variability in plant use; this space-time matrix is key to future studies that will incorporate multiple data sets and address large-scale research issues.

Integrating microbotanical remains, notably starch grains, with macrofloral data has great promise for improving our understanding of the past use of plants in California. This is particularly the case when macrofloral data are lacking, as in older collections where macrofloral data and sediment samples are absent, or where only surface collections are available. The potential of microbotanical data is also limited to contexts anchored in time to single-component assemblages. In conjunction with the knowledge gained from prior and ongoing macrofloral studies, microbotanical data will provide a fuller understanding of the range of past plant use in California. Paleoethnobotanical data will continue to make major contributions to California archaeology, but will be most informative when integrated with information on faunal remains, artifacts, and—where sanctioned by native descendants—isotopic dietary signatures in human remains.

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