ACORNS ON SLICKS?

CARMEN ZEPEDA-HERMAN

This paper presents the results of protein residue analyses on bedrock milling surfaces from a site near Tecate, California. As part of a data recovery program at CA-SDI-19,241, three protein residue samples were extracted from three bedrock milling slicks. The paper analyzes the assumption that lack of mortars implies no acorn processing.

BACKGROUND

The conventional wisdom in southern California archaeology is that mortars are the technology required for processing acorns. A recent investigation in San Diego challenges this assumption. This assumption is based on ethnographic accounts that state that acorns were processed in bedrock mortars (Hohenthal 2001:174-175; Luomala 1978:600; Shipek 1991:30; Sparkman 1908:194; Spier 1923:355; True 1993:1-3). Mortars were also used to hold grain, grind small seeds, and break up large chunks of clay (Cline 1980:49, 39) and for pounding animal meat (Shipek 1991:33; Sparkman 1908:198). D. L. True, on the other hand, suggested that small animals were pounded on milling stones, his term for slicks and basins. Flat grinding slabs were also used to pulverize clay into a fine powder to be used for making pottery according to T. Lucas (Cline 1980:39). Only one ethnographic account by T. Lucas suggests that acorns were processed on flat, smooth milling areas (Cline 1980:49). Finally, slicks and basins have been assumed to have been used to process hard seeds, fiber, and small animals (True 1993:16).

D. L. True's (1993) study along the upper and central San Luis Rey River in northern San Diego County is based on the assumption that slicks and basins were used for seeds and plants, while mortars were used for acorns. The study found that general processing sites consisted of different bedrock milling elements than those found at specialized acorn processing sites, and that through time subsistence activities focused on the acorn. True categorized sites based on their slick/basin versus mortar ratio. Type 1 sites were acorn-processing sites with dense concentrations of large, deep mortars. Type 2 sites were general processing/habitation villages with many mortars and associated basins, slicks, and combinations or superimposed configurations. Type 3 sites were generalized processing/small site contexts with some small to medium mortars and a greater number of slicks and basins. At Type 4 sites, processing of hard seeds, fibers, and small animals was emphasized. Type 4 sites were characterized by basins and slicks, with mortars, cupules, and combinations being rare or absent. Acorn processing was minimal.

According to True's study, SDI-19,241 is a Type 4 site at which acorn processing was minimal. SDI-19,241 was recorded in 2008 as a bedrock milling site with an artifact scatter consisting of debitage, two bifaces, one blade, two cores, two domed scrapers, utilized flakes, Tizon Brown Ware ceramic sherds, manos, one metate fragment, and one discoidal. There are a total of 14 bedrock milling features with 19 slicks.

In addition to ethnographic accounts, archaeological evidence for the use of mortars for pounding meat and either holding plants/seeds or grinding them has been demonstrated by three studies in southern California. A protein residue analysis study was completed on mortars and cupules at two sites in Anza-Borrego Desert State Park and basins at one site at Cuyamaca Rancho State Park. The results indicated that the mortars, cupules, and basins tested positive for cat, rabbit, sheep, mesquite, and capparidaceae plants that include bee plant, bladderpod, and stinkweed (Schneider and Bruce 2009). Two basins and one mortar from a site in Camp Pendleton reacted as positive for cactus, walnut, and aster (Becker 2009). Acorn antiserum was not available, and acorn therefore was not tested for in either of these two studies. The final study conducted protein residue analysis on one milling feature containing three mortars from a site in Riverside County. The results indicated that acorn and grasshoppers or crickets were processed in mortars (Glover et al. 2010).

METHODS

As part of a data recovery program, protein residue samples were extracted from three features (Features 1, 12, and 14) in order to identify what was being processed on the features (Figure 1) (Zepeda-Herman 2011). A protein residue kit was obtained from PaleoResearch Inc. in Golden, Colorado. A 2 g soil control sample was collected from the base of the boulder containing Milling Feature 12. The following describes the steps taken to extract a protein residue sample from well-used areas of each slick.

- The milling slick and gloves were rinsed with deionized water.
- Approximately 1 ml of Tris/Triton solution was dripped onto the slick using a new glass pipette.
- The milling slick was scrubbed with a sonic toothbrush with a new toothbrush head. Approximately 2 ml of deionized water were added while sonicating the milling slick to help with the wash process. The sonic toothbrush and solution created suds (Figure 2).
- During the scrubbing process, the water and suds were collected using a new plastic transfer pipette and placed into a 50 ml plastic screw-top sample container.
- After the suds turned bright white, the milling slick was rinsed with water to remove all the suds, and the water was collected. Total collected water and suds for each milling slick amounted approximately to 7.5 ml.

New nitrile (latex-free) gloves, toothbrush heads, plastic collecting pipettes, and 50 ml sample containers were used for each milling slick in order to avoid contamination. The three samples were mailed with cold packs to the PaleoResearch Laboratory.

PaleoResearch used an immunologically based technique called cross-over immunoelectrophoresis to analyze the wash waters. In this method, a known antibody is used to detect an unknown antigen. An antigen is the protein that adheres to the artifact or bedrock milling feature. Antisera from 16 mammals, one insect, seven fish, and three plant species were used to test the samples (Yost and Kovacik 2011).

RESULTS

Table 1 lists the antisera and results. The protein residue analysis yielded one positive result for acorn, indicating that acorns were being processed at Feature 12 (Figure 3). The soil control sample taken near Feature 12 tested negative to acorn, suggesting that Feature 12 was not contaminated and thus the results are reliable. The study indicates that acorns were one of the foods being processed on slicks at SDI-19,241. The other two features were negative for all antisera.

CONCLUSIONS

The results of the protein residue analysis challenge the assumption that acorns were not processed on slicks. It is clear from the ethnographic accounts and past protein residue analyses that additional protein residue analyses on slicks, basins, and mortars are needed in order to determine if the bedrock milling slick from SDI-19,241 is 1) unique in that acorns were processed on it, or 2) typical of slicks and basins in San Diego County. In addition, future protein residue analyses should include plants such as sage, buckwheat, manzanita berries, toyon berries, grasses, and those from the sunflower family, since these plants were eaten by prehistoric peoples. These plants were not tested for by the laboratory

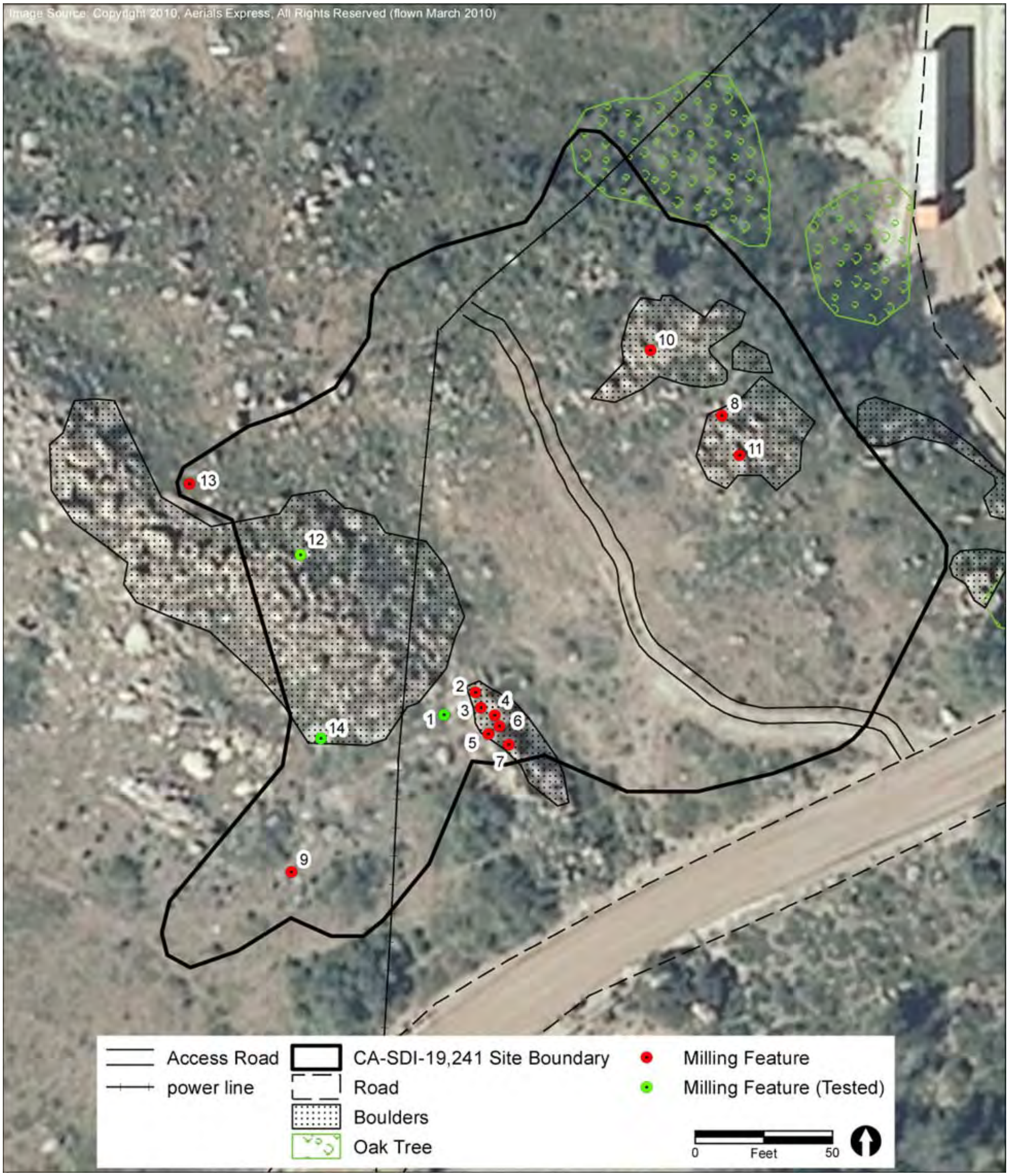

Figure 1. Location of tested milling features.

Figure 2. Scrubbing slick with sonic toothbrush and Tris/Triton and de-ionized water solution.

conducting the current analysis; the analysis was limited to only three plant types (acorn, agave, and yucca) eaten by prehistoric peoples. Nonetheless, the results of this investigation are significant to regional research issues regarding subsistence patterns in San Diego. The implications of this study suggest that acorns may have been processed more extensively than previously thought at bedrock milling sites with or without mortars.

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Table 1. List of antisera used to test washes.

ANTISERUM	POSSIBLE RESULTS	POSITIVE REACTION
	ANIMALS	
Bear	Black bear, brown bear, grizzly, polar bear	-
Bison	Bison, domestic bovids	-
Bovine	Domestic bovids, bison	-
Cat	Domestic cat, mountain lion, bobcat, lynx, other wild cat species	-
Chicken	Domestic chicken, partridge, quail, grouse, ptarmigan, pheasant	-
Deer	White tail deer, mule deer, elk, moose, caribou, wapiti	-
Dog	Domestic dog, coyote, wolf, fox	-
Duck	Duck, goose, pigeon, domestic turkey, wild turkey	-
Goat	Pronghorn, mountain goat, domestic goat	-
Grasshopper	Insects in the order of Orthoptera such as grasshopper, cricket, locust	-
Guinea pig	Guinea pig, porcupine, beaver, squirrel family	-
Human	Human	-
Mouse	Members of New and Old World rats and mice family	-
Rabbit	Rabbit, jackrabbit	-
Rat	Members of New and Old World rats and mice family	-
Sheep	Domestic sheep, Bighorn sheep	-
Turkey	Domestic turkey, wild turkey, ducks	-
	FISH	
Altantic croaker	Perciformes order	-
Bay anchovy	Engraulidae family	-
Catfish	Catfish, carp	-
Gizzard shad	Gizzard shad	-
Sturgeon	Acipenseridae family	-
Striped bass	Perciformes order	-
Trout	Salmonidae family	-
	PLANTS	
Acorn	Acorn	Feature 12
Agave	Agave, yucca, camas, aloe, and members of the agave and lily families	-
Yucca	Agave, yucca, camas, aloe, and members of the agave and lily families	-


Figure 3. Overview of Milling Feature 12, looking south.