A Comparative Analysis of Pollen from Millingstones from CA-RIV-102 (Hemet) and CA-RIV-150 (La Quinta)

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Abstract

Grading observations conducted at two separate southern California locations uncovered three millingstones. Two basin millingstones were recovered in Hemet at CA-RIV-102 and a milling slab was recovered from CA-RIV-150 near La Quinta. Pollen residues were recovered from the milling surfaces, and samples from all three items were analyzed by PaleoResearch Laboratories in Denver Colorado. Pollen analyses of this type provide insights as to the use of milling implements to exploit local botanical resources. Results of the pollen analysis suggest that much of the processing in the Hemet area consisted of grass seeds, whereas, near La Quinta, mesquite and screwbean were the dominant plant materials processed.

Introduction

The use of grading monitoring as a sampling tool in modern cultural resource management is a fairly common practice. Usually, grading monitoring is used as a device to mitigate impact to potential buried deposits that are not found during the previous testing and data recovery phases at an archaeological site. Grading monitoring is an active process that is often the last, in some cases the only, opportunity to cover large areas that are being lost to development. This active process consists of observing all areas cut during grading. This makes it particularly useful for recovery of buried features, monitor for possible human burials, and augmentation of artifact assemblage data that might otherwise be missed by a focused, site-specific, sampling strategy.

My experience has been that, in general, flake tools have low percentage of additional recovery during grading monitoring because of their small size, whereas ground stone artifact sample sizes can be substantially increased because of their relatively large size. This can have the potential to add to our understanding of plant exploitation during site occupancy, provided the monitor knows how, what, and why milling implement pollen samples should be taken. The analysis of samples from three millingstones from two sites in southern California is offered as an example of the potential benefit of this approach.

Background and Site Descriptions

CA-RIV-102

The earliest reports noted that bedrock features were present at CA-RIV-102 (see Fig. 1 for location). Demcak et al. (1992) has been relied on extensively for the following description. A general location was plotted by Eberhart in 1952 (described in Demcak et al. 1992). The location was indicated to be one mile west of the Ramona Bowl. In 1960, Watkins recorded a more precise location and in 1965, Haenszel traced the location to the foot of the hill at the end of Santa Fe Street (described in Demcak et al. 1992). The site occupies a wide area from an alluvial fan at the base of the Santa Rosa Hills, including numerous bedrock features, including cupules, mortars, millingstones, and slicks, continuing up onto the granitic bedrock outcrops. A large variety of prehistoric artifacts recovered from the site, including millingstones, handstones, mortars and pestles, projectile points (both darts and arrows), hammerstones, perforators, ceramics, and various religious and decorative items, indicate an unbroken occupation of the site from 500 B.C. to A.D. 1600 or possibly A.D. 1800 (Demcak et al. 1992). The environmental setting consists of Coastal Sage Scrub, Chaparral, Riparian and Grassland Communities (Demcak et al. 1992. p.4).

Because the site as a whole was located on at least three properties, cultural resource assessments, testing, and data-recovery were conducted as parcels of the site were slated for development. Various parts of the site were tested and reported on by Oxendine and Pink (1978), SRSI (Scientific Resource Surveys, Inc. 1980), Cerreto et al. (1991), and Demcak (1990). In 1992, Demcak et al. produced a final report on the testing, salvage, and monitoring on Tract 24714 (which is near the apex of the alluvial fan).

CA-RIV-150

First recorded by the Archaeological Survey Association of Southern California during the 1933-1935 survey, CA-RIV-150 (see Fig. 1 for location) has been called the “Happy Hunting Grounds Site” and by Schmidt as “Site I” (Jertberg and Rosenthal 1993). The site is situated in a stabilized dune field along the northwestern shoreline of the ancient Lake Cahuilla (Jertberg and Rosenthal 1993). The late prehistoric shoreline of Lake Cahuilla provided a productive environment for subsistence resource exploitation and was extensively utilized during prehistoric times. The biotic community in the surrounding study area today consists of Creosote Bush Scrub (Munz and Keck 1973), but prehistorically included a shoreline Freshwater Marsh Plant Community (Wilke 1976) along embayments of the lake that would have graded upslope away from the lake into the Creosote Bush Scrub Community (Jertberg and Rosenthal 1993). At the time work was conducted, the vegetation was degraded and lacked its natural diversity. The dominant plants were creosote and mesquite (Jertberg and Rosenthal 1993). Jertberg and Rosenthal (1993) placed the occupation of the site from A.D. 900-1500, making it contemporaneous with the last high stand of ancient Lake Cahuilla, and described it as an example of “merely one aspect of an intensively utilized area that encompassed the entire northwestern shoreline.” Artifacts recovered at the site included cottonwood triangular and desert side-notched points, ceramic Brown Ware sherds, pestles, handstones, milling slabs, a carrying net, a pumice abrader, bone awls, and shell beads. (Broeker and Padon 1993).

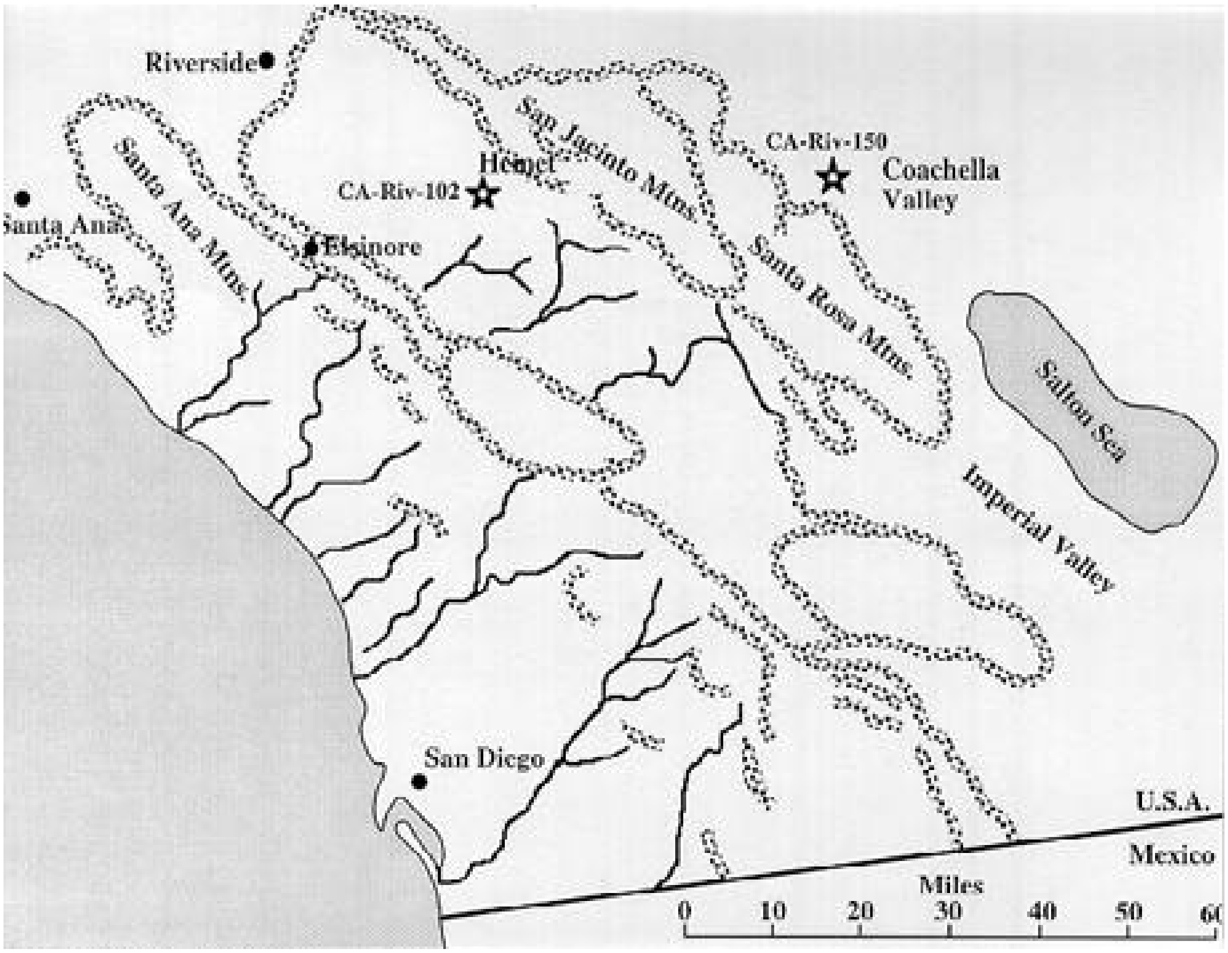

Fig. 1. Location of Sites.

General Recovery Procedures

My general procedures for recovery of milling equipment for pollen analysis require whole millingstones, and possibly handstones, found milling surface face-down. Face-down milling surfaces are less likely to have been affected by air-borne pollen since their emplacement than face-up surfaces because the millingstone itself serves to protect the pollen adhering to the milling surface. My experience is that, during grading monitoring, handstones are less often found *in situ* with their milling surfaces face-down. In addition, their milling surfaces are convex in shape so, even face-down, the milling surface is less protected from contamination than is the concave milling surfaces of millingstones.

When found, the millingstones are covered in situ with a protective material. This material can consist of large geological soil sample plastic bags or aluminum foil. The idea is to allow as little modern pollen to come into contact with the specimens as possible. Once the item is uncovered, it is left in place until supplies are gathered. It is then removed into a protective container. A soil sample, approximately two cups in volume, is acquired with a clean trowel from directly beneath the item and a similar-size control sample is collected from the undisturbed soil nearby (generally from 50 to 200 cm away). While it is stored, care must be taken to insure that the samples do not become contaminated by modern air-borne pollen. If some contamination still does occur, research labs can allow for it if they have been notified in advance of their pollen analysis. For best results, the pollen sample should be processed within a year of recovery to prevent deterioration of the pollen by fungi and other contaminants.

Sample Recovery and Processing

CA-RIV-102

In August of 1991, while I was monitoring grading operations for Archaeological Resource Management, Inc., in the city of Hemet, California (site CA-RIV-102), two granite basin millingstones were discovered with their milling surfaces face-down. They had been uncovered in this inverted position by the grading equipment. Once uncovered, they were left undisturbed, in-place, until appropriate equipment could be gathered for their retrieval. Two large geological soil bags were used to double-bag the two basin millingstones to insure their protection. A soil sample was collected from beneath both items and a control sample was collected approximately 200 centimeters to the north of the first millingstone. This control sample was used during the analysis of both millingstones since they were recovered from about the same level and general area. The first millingstone was found with a whole handstone that was apparently tucked up inside the basin (Fig. 2).

The millingstones were prepared with the aid of Dr. Betsy Lawlor of the University of California, Riverside, using the procedures described by Pearsall (1989). This included the removal of excess soil prior to performing pollen washes. The milling surface of each of the basins were first tested with hydrochloric acid (HCl) for effervescence of caliche coating the surface. Any caliche coating would cement the pollen to the milling surface, complicating sample recovery. Since this test indicated no caliche coating, the residue was rinsed with distilled water into a large plastic basin and pipetted into clean test tubes and centrifuged at 300 RPM for five minutes to concentrate the residue. The two samples were then sent to PaleoResearch Laboratories for pollen analysis.

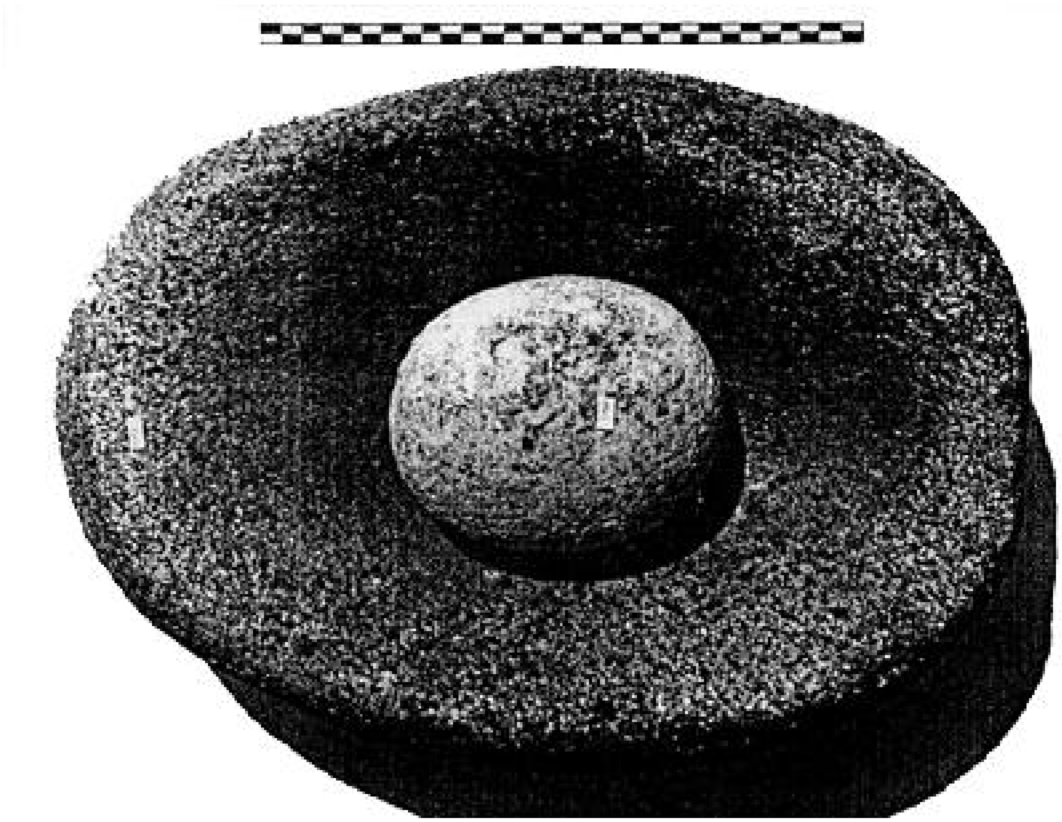

Fig. 2. Millingstone #1, recovered from CA-RIV-102.

CA-RIV-150

In January of 1993, a broken schist milling slab was recovered by Gale Broeker and myself while monitoring grading operations at a portion of CA-RIV-150, in La Quinta, for LSA Associates (Fig. 3). As with the millingstones recovered from CA-RIV-102, the milling surface was found inverted, once the millingstone was uncovered by the grading equipment. This item was similarly left in place until supplies could be gathered for its protected collection, for possible pollen analysis. In this case, aluminum foil was used as a protective covering. A soil sample was collected from immediately beneath the milling surface of the milling slab, as well as a control sample from 50 cm to the east. This item appeared to have broken sometime after it had been left, possibly by the grading equipment (the break isn't visible in Fig. 3). It is a common practice for milling implements to be cached at a location that is reoccupied on a regular basis, or at places of residence.

Fig. 3. Milling slab recovered from CA-RIV-150.

Pollen Analysis

Laboratory analysis of the pollen samples was conducted by PaleoResearch Laboratories. The methods and results of the analysis were provided as unpublished letter reports (Cummings 1992, 1993). The standard laboratory preparation technique for the removal of pollen from the medium in which it is mixed (sand, silt, and clay) is by chemical extraction based on flotation. This process was developed to aid pollen extraction where the preservation was less than ideal and pollen diversity was low. The soil control pollen sample is used as a record of naturally-occurring pollen. It is the difference between the control sample and the millingstone wash that is used to interpret processing activities (Cummings 1992). For a complete description of the process applied by PaleoResearch Laboratories, see Demcak et al. (1992).

The microbotanical analysis conducted by PaleoResearch Laboratories (Cummings 1992) suggests that the most probable resource processed on the CA-RIV-102 basin millingstones was grass seeds, for both had elevated starch with hylum counts (Fig. 4). It was also suggested (Cummings 1992) that an Onagraceae family (evening primrose) was processed on millingstone #1 (based on its presence on the millingstone but not on the control sample or millingstone #2) and *Cylindropuntia* (cholla cactus) and that possibly *Dodecatheon* (shooting star) roots were processed with millingstone #2, based on the similarity of a single starch grain to a reference sample of *Dodecatheon* (see also Table 1 for common names). Cummings (1992) noted, however, that no comprehensive morphological key for roots and tubers containing starch has been compiled, so this latter identification should be considered as tentative. The pollen evidence for the CA-RIV-150 milling slab (Fig. 5) suggested probable utilization to grind *Prosopis* (mesquite, screwbean), because of the three- to four-times elevated counts in both the pollen wash and the soil sample collected just beneath the milling slab relative to values from the control sample.

Table 1: Pollen types and common names.

Scientific Name	Common Name
Arboreal Pollen:	
Alnus	Alder
Cercidium	Paloverde
Juniperus[3]	Juniper
Olneya	Ironwood
Pinus[1,2,3]	Pine
Prosopis[3]	Mesquite
Quercus[1,2]	Oak
Salix[1,2]	Willow
Non-Arboreal Pollen:	
Cheno-ams[1,2,3]	Includes amaranth and pigweed family
Asteraceae:	Sunflower family
Compositae:	
Artemisia[1,2]	Sagebrush
Low-spine[1,2,3]	Includes ragweed, cocklebur, etc.
High-spine[1,2,3]	Includes aster, rabbitbrush, snakeweed, sunflower, etc.
Tubuliflorae[1,2]	Includes eroded Low- and High-spine

Table 1. Pollen types and common names, continued

Scientific Name	Common Name
Ephedra nevadensis-type	Mormon tea
Ephedra torreyena-type[3]	Mormon tea
Euphorbia	Spurge
Poaceae	Grass family
Larrea	Creosote
Eriogonum[1,2]	Wild buckwheat
Gramineae[1,2]	Grass family
Malvaceae	Mallow family
Onagraceae[1]	Evening primrose family
Polemoniaceae	Phlox family
Collomia	Collomia
cf. Ipomopsis	
Phlox/Microsteris	Phlox/
Sphaeralcea	Globe mallow
Typha[3]	Cattail
Cylindropuntia[2]	Cholla cactus
Rhus trilobata	Squawberry
Rosaceae[1,2]	Rose family
Solanaceae[1]	Potato/tomato family
Indeterminate[1,2]	
Starches and Spores:	
Starch w/Hylum	
Solid starch[1,2]	
Monolete[1]	
Selaginella densa[1,2]	

[1]Millingstone 1, [2]Millingstone 2, CA-RIV-102; [3]Millingstone, CA-RIV-150.

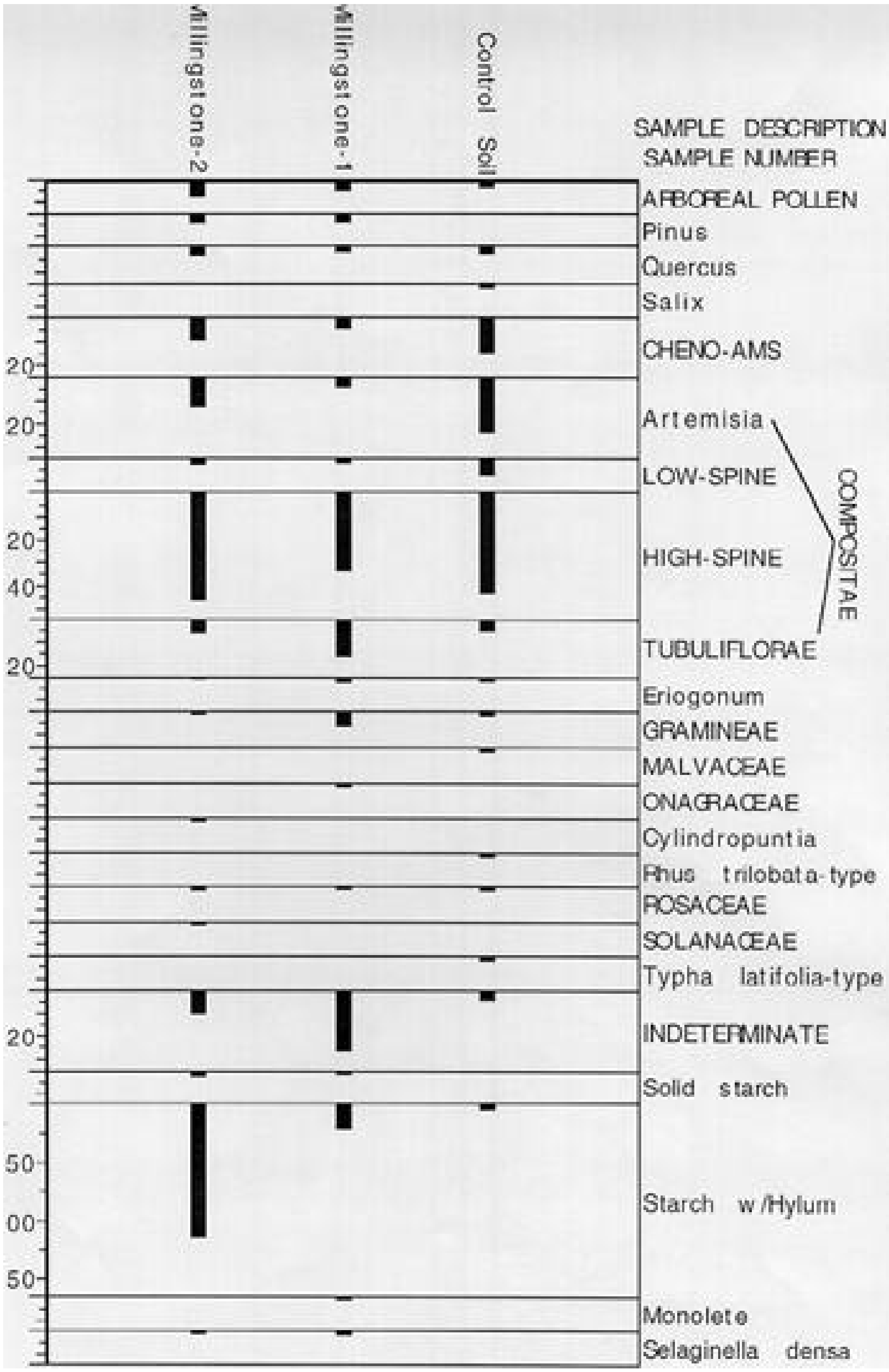

Fig. 4: Pollen abundances for CA-RIV-102.

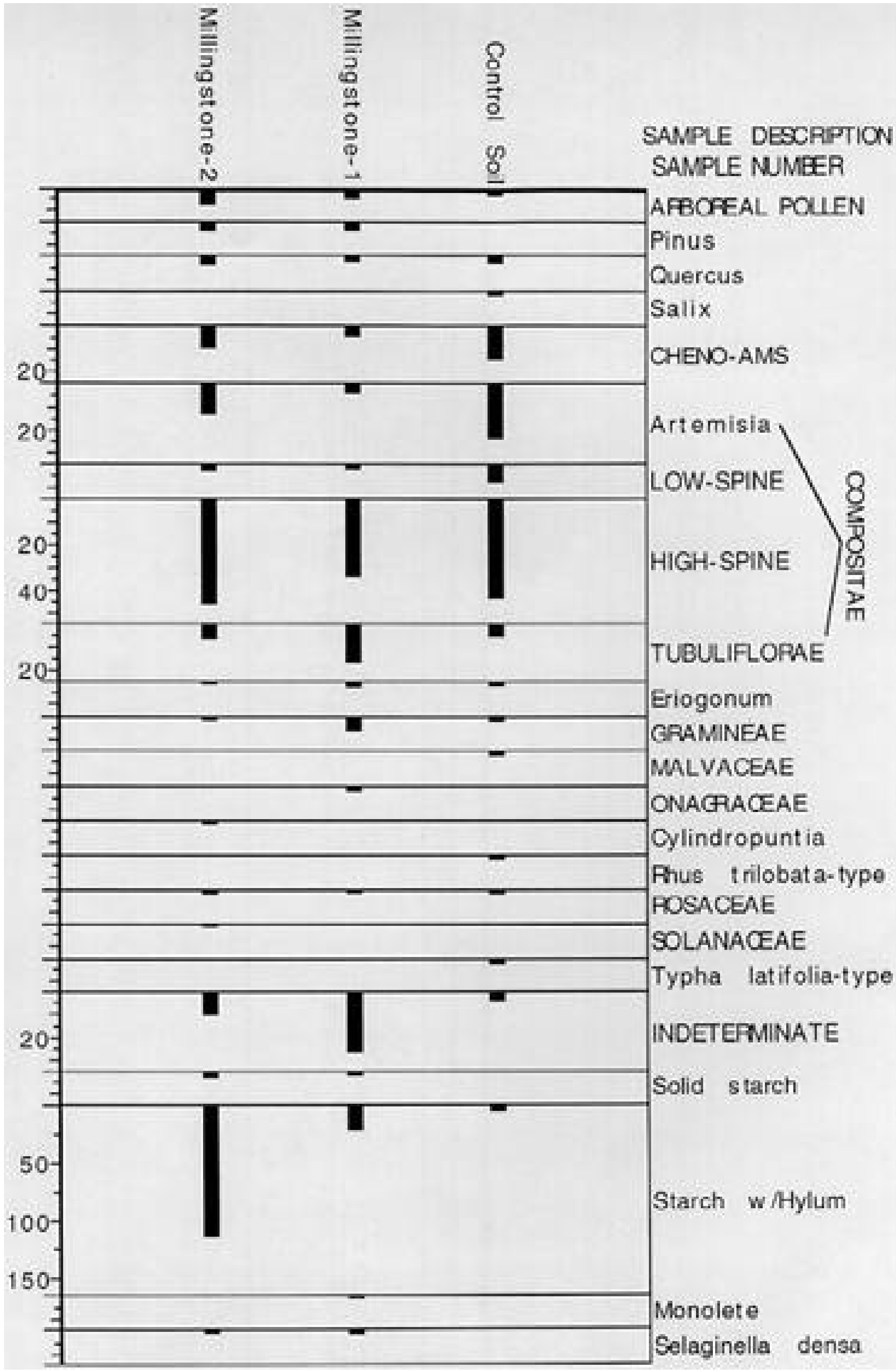

Fig. 5: Pollen abundances for CA-RIV-150.

The use of grasses and mesquite by prehistoric inhabitants of southern California is well-documented. Although grasses are generally suggested to have been ground on millingstones, mesquite is most often associated with mortar and pestle processing (Ebeling 1986). It's recovery on a metate may suggest that, in this case, mesquite was first pounded in a mortar and pestle and later ground on a metate, or the metate was the most accessible processing tool at this location. A complete search of the ethnographic literature on plant use is beyond the scope of this paper. Recent work on the subject includes that of Ebeling (1986), Lawlor (1995), and Schroth (1996). Ebeling (1986) noted the use of evening primrose as a potherb. He also noted that both Buckhorn cholla (*Opuntia acanthocarpa*) and Jumping cholla (*Opuntia bigelovii*) fruits were gathered and either eaten fresh or dried for storage by the Cahuilla. Schroth (1996) notes that cholla seeds were parched and then ground. Although no specific references to milling of shooting star root were found, the ethnographic literature does not provide a complete record of plant use by native peoples. It is not implied in this paper that the recovery of trace amounts of these plant materials from these millingstones should lead to the conclusion that they were used to grind cholla and shooting star plant materials. The results of this investigation are, for the most part, what would be predicted based on the botanical resources available and the ethnographic record. This work has provided a useful substantiation of this kind of analysis, and lends support to the suggestion that other resources may have been used that were not predicted.

Discussion and Conclusions

Non-sedentary peoples do not live in stagnant environments. When reoccupying a site, people may use different specific locations in a general area from one year to the next. This makes development of strategies for retrieval of adequate information during testing and data recovery difficult. Currently, sampling strategies are used to evaluate site integrity or resource potential. Sample sizes are, in most cases, small and often provide a narrow picture of reconstructed life ways, particularly with regard to milling implement studies. Grading monitoring has been used as a tool that cultural resource managers apply in different ways, usually as a source of feature retrieval, though occasionally as a means to mitigate concerns of Native Americans about burial recovery. It is also often used as a spot-checking device to discover undetected buried resources. This is particularly useful on sites for which fluvial or alluvial and aeolian process have quickly covered artifacts cached for further retrieval.

Like studies of flake tools, milling implements can be used to reconstruct subsistence patterns. Predictions of which food stuffs were used can be made by an examination of the particular tool. For example, although an arrow point cannot magically state "I was shot successfully at a deer," its morphology can tell us that it was probably used to try to acquire a meat resource. It is the reconstruction of the faunal remains, in conjunction with the ethnographic record, that gives us clues as to the specific dietary content. Interpretation of the specific resource processed with milling implements is similarly based on ethnographic resources and macrobotanical studies. However, since the preservation of macrobotanical samples is fraught with problems (e.g., see Pearsall 1989:440-441), pollen analyses of the type described in this report provide an additional tool that can help refine and expand our interpretation of the use of milling implements.

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