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TERRESTRIAL RESOURCE EXPLOITATION ON SANTA CRUZ ISLAND, CALIFORNIA: MACROBOTANICAL DATA FROM FOUR MIDDLE HOLOCENE SITES

Kristin M. Hoppa[1]

ABSTRACT.—On the northern Channel Islands, the occupation of interior sites during the Middle Holocene (6650–3350 cal BP) has been attributed, in part, to terrestrial resource exploitation. The presence of groundstone artifacts, particularly mortars and pestles, in Middle Holocene sites and burials supports the idea that plants were important during this time period. The current study presents macrobotanical data from 4 Middle Holocene sites on Santa Cruz Island. Of the 4 sites, 3 are located within the Central Valley, the island's most productive watershed; whereas the fourth site is located on a coastal bluff on the eastern end of the island. This arrangement allows for a comparison of contemporary coastal and interior sites. Although very few seeds were recovered from these samples, the results provide clues to seasonality of occupation and exploited habitats. The presence of seeds from medicinal plants at all 3 interior sites and the absence of seeds at the coastal site suggests that access to these resources played a role in settlement decisions. Though all of the plants recovered have medical uses in the ethnographic record, very few have any recorded use as food. This study contextualizes the macrobotanical results by addressing issues of preservation and recovery and by identifying areas for future research.

RESUMEN.—En las Islas del Canal del norte, la ocupación de sitios interiores durante el período Holoceno Medio (aproximadamente 6650–3350 antes del presente) se atribuyó, en parte, a la explotación de recursos terrestres. La presencia de artefactos líticos para molienda, en especial los morteros y el martillo pilón, en sitios y lugares de entierro del período Holoceno Medio confirma la idea de que, durante este período, las plantas fueron importantes. El presente estudio presenta información macrobotánica de 4 sitios del Holoceno Medio en la Isla Santa Cruz. Tres de los cuatro sitios están ubicados dentro del Valle Central, la línea divisoria más productiva de la isla, y el cuarto sitio está ubicado en un acantilado costero al extremo este de la isla. Esta disposición permite comparar los sitios interiores y costeros contemporáneos. A pesar de que se recuperaron muy pocas semillas de estas muestras, los resultados proporcionan señales de la estacionalidad de la ocupación y los hábitats explotados. La presencia de semillas de plantas medicinales en los 3 sitios interiores y la ausencia de semillas en el sitio costero, sugieren que el acceso a estos recursos jugaron un papel importante en las decisiones de asentamientos. Aunque todas las plantas que se recuperaron tienen usos medicinales en el registro etnográfico, muy pocas se utilizaron como alimento. Este estudio contextualiza los resultados macrobotánicos al abordar cuestiones de preservación y recuperación, y al identificar áreas sobre las que se sugiere continuar investigando en el futuro.

The northern Channel Islands have been occupied by the Chumash and their predecessors for more than 13,000 years (Johnson et al. 2000, Rick et al. 2001, Kennett 2005, Erlandson et al. 2011). The Middle Holocene (6650–3350 cal BP) was a period of transition marked by environmental change and cultural innovations, including the development of the mortar and pestle (5800–5000 cal BP) and the side-notched projectile point (5500–4500 cal BP; Glassow 1997a). Although early mortars and pestles may have been used to process a variety of foods—including wild cherry (*Prunus ilicifolia*), starchy roots, tubers, and corms (Glassow 1996, 1997a, Schroth 1996, Erlandson 1997)—the appearance of the basket hopper around 4000 cal BP suggests that people were processing acorns. Use of basket hoppers likely increased food-processing efficiency because "hoppers would reduce loss of seeds or nuts during milling" (Glassow 1997a:87–88). Whether acorn processing was associated with the earliest mortars and pestles or with the later advent of basket hoppers, the inclusion of this resource marked an expansion of Middle Holocene diet (Glassow 1997a); and the storability of this resource set the stage for cultural developments of the Late Holocene (see King 1990).

The first substantial interior sites generally appear on the Channel Islands during the

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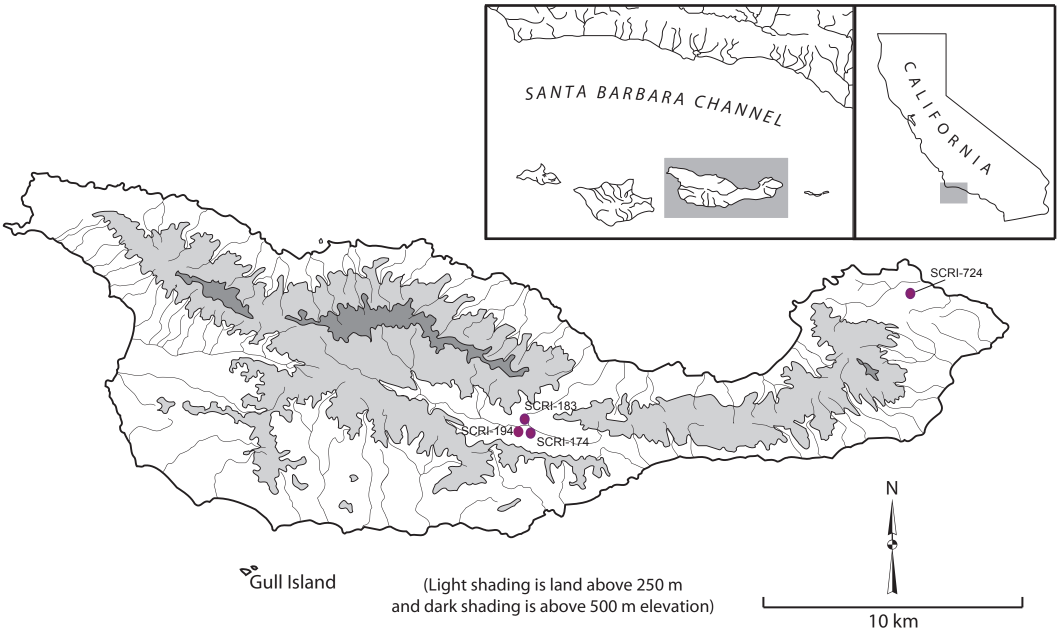

Fig. 1. Location of study sites.

Middle Holocene (6650–3350 cal BP; Kennett 2005:129). However, a series of sites recently dated to the Terminal Pleistocene and currently located along the coast were as much as 1–7 km from the coast at the time they were occupied, suggesting the use of the island interior extending back to 13,000–11,000 cal BP (Erlandson et al. 2011). Although paleoenvironmental records indicate severe aridity throughout western North America during much of the Middle Holocene, the northern Channel Islands do not appear to have been affected (Kennett et al. 2007). Explanations for interior occupation include terrestrial resource exploitation, as well as use of the interior for travel routes or defensive purposes (see Orr 1968, Glassow 1993, 1997b, Kennett 2005, Perry and Delaney-Rivera 2011). The increasing importance of terrestrial resources also has been inferred from the presence of groundstone artifacts, particularly the mortar and pestle (Hollimon 1990, Timbrook 1993, Perry 2003), as well as the high levels of groundstone present in Middle Holocene burials (Hollimon 1990). Despite the presumed importance of terrestrial resources, there have been very few archaeobotanical studies, particularly of Middle Holocene deposits (Gill 2013). The following study draws on archaeobotanical data from 1 coastal and 3 interior Middle Holocene sites on Santa Cruz Island to (1) explore the role of terrestrial resources at coastal and interior sites and (2) test the hypothesis that interior sites are related to plant exploitation (Fig. 1).

METHODS

The macrobotanical data in this study come from 4 Middle Holocene sites (Table 1) excavated by Jennifer Perry in 2007 and 2008 (Perry and Delaney-Rivera 2011, Perry and Hoppa 2012). Site CA-SCRI-724 is located on a bluff above Scorpion Anchorage on eastern Santa Cruz Island at 170 m elevation. This site is approximately 130 × 115 m and is <60 cm deep. Sites CA-SCRI-174, CA-SCRI-183, and CA-SCRI-194 are all located in the Central Valley of Santa Cruz Island. CA-SCRI-174 is located atop a small mound at 80 m elevation and is approximately 50 × 40 m and <50 cm deep. CA-SCRI-183 is located above a small drainage with nearby oak trees at 60 m elevation; it is approximately 60 × 60 m and is <60 cm deep. CA-SCRI-194 is located on a small mound at 90 m elevation and is approximately 50 × 40 m and <60 cm deep. The Central Valley is the largest and most productive watershed on the island (Kennett 2005), and it

TABLE 1. Radiocarbon dates for study sites.

Site	Level (cm)	Measured age	Conventional date BP	Cal BP (2σ)	Laboratory no. (material; year)
CA-SCRI-174	10–20	4300 ± 50	4720 ± 60	4840–4500	Beta-222702 (Shell; 2006)[a]
CA-SCRI-174	20–30	5580 ± 120	6020 ± 130	6470–5910	Beta-225908 (Shell; 2007)[a]
CA-SCRI-174	30–40	4700 ± 40	5110 ± 40	5310–5040	Beta-225909 (Shell; 2007)[a]
CA-SCRI-183	10–20	3930 ± 60	4270 ± 60	4280–3880	Beta-228026 (Shell; 2007)[a]
CA-SCRI-183	30–40	4110 ± 60	4520 ± 60	4600–4230	Beta-228027 (Shell; 2007)[a]
CA-SCRI-194	20–30	4080 ± 60	4490 ± 60	4560–4200	Beta-228601 (Shell; 2007)[a]
CA-SCRI-194	40–50	4530 ± 70	4940 ± 70	5240–4800	Beta-228602 (Shell; 2007)[a]
CA-SCRI-724	20–30	5170 ± 60	5550 ± 60	5870–5570	Beta-222704 (Shell; 2006)[b]
CA-SCRI-724	30–40	5280 ± 50	5720 ± 50	5990–5730	Beta-222705 (Shell; 2006)[b]
CA-SCRI-724	50–60	5450 ± 70	5900 ± 80	6280–5890	Beta-226843 (Shell; 2007)[b]

[a]Hoppa and Perry 2010
[b]Perry and Hoppa 2012

TABLE 2. Soil sample characteristics.

Sample	Depth (cm)	Soil volume (L)	Sample weight (g)
CA-SCRI-724	0–50	20	297.11
CA-SCRI-174	0–40	16	449
CA-SCRI-183	0–50	20	138.65
CA-SCRI-194	0–50	20	82.84
Off-Site Auger 724	0–30	2.4	38.87
Off-Site Auger 174	0–30	2.4	53.49

supports a much wider array of plant species than do coastal areas. The 3 interior sites included in this study are similar in size, depth, and density; and they represent the type of interior sites presumed to be related to terrestrial resource exploitation (Glassow 1993, Kennett 2005, Perry and Delaney-Rivera 2011). CA-SCRI-724 is similar in depth but has a greater size and density of shell that is typical of coastal sites.

Faunal data indicate that the occupants of the 3 Central Valley sites relied heavily on shellfish and fish obtained from nearshore habitats (Perry and Delaney-Rivera 2011:116), similar to those species abundant in the assemblage at coastal CA-SCRI-724 (Perry and Hoppa 2012). Though site CA-SCRI-724 was <1 km from the productive kelp forests at Scorpion Anchorage, coastal access from the Central Valley sites requires a round trip journey of 10–15 km (Perry and Delaney-Rivera 2011:117). As noted by Perry and Delaney-Rivera (2011:116), "Ethnographically important resources in [the Central Valley] include plants such as acorns (*Quercus* spp.), wild cherry (*Prunus ilicifolia*), corms and bulbs (i.e., blue dicks [*Dichelostemma* spp.], wild onion [*Allium* spp.], mariposa lily [*Calochortus* spp.]), and various grasses." To explore whether these resources influenced Central Valley settlement decisions and to test the assumption that interior sites are linked to terrestrial resource exploitation, this study compares archaeobotanic assemblages from the 3 Central Valley sites to the coastal site.

Macrobotanical samples for CA-SCRI-174, CA-SCRI-183, CA-SCRI-194, and CA-SCRI-724 consisted of bulk 20 × 20-cm column samples (~16–20 L) excavated in arbitrary 10-cm levels to sterile, ranging from 40 to 50 cm deep (Table 2). Off-site samples (~2.4 L) from the east end and the Central Valley were analyzed to assess the potential for charred seeds from natural occurrences such as fire (see Minnis 1981). Samples were processed using a Flote-Tech machine-assisted flotation device and size-sorted (2.0 mm, 1.4 mm, and <1.4 mm) through geological sieves. Faunal remains and wood charcoal were pulled from the 2.0-mm level only. Nutshell was pulled from the 2.0-mm level, and from smaller fractions only if nutshell was not present in the 2.0-mm level. Seeds were pulled from all levels. Wood charcoal was weighed but not counted, whereas all seeds were weighed and counted. All carbonized plant material was identified to the lowest taxonomic level possible using a seed identification manual (Martin and Barkley 2000) and the comparative collection in the Integrative Subsistence Laboratory at the University of California, Santa Barbara.

RECOVERED PLANTS AND ETHNOBOTANICAL USES

The floated samples (20 L total) from coastal site CA-SCRI-724 contained minimal plant material. The only identifiable seed was fringed

TABLE 3. Summary of recovered plants.

	SCRI-174	SCRI-183	SCRI-194
0–10 cm	<0.01 g Wood, 2 *Chenopodium* sp.	0.03 g Wood, 2 *Nicotiana clevelandii,* 1 c.f. *Mimulus* sp., 1 unidentified seed	<0.01 g Wood, 1 c.f. Asteraceae, 2 unidentified seeds
10–20 cm	<0.01 g Wood, 1 *Chenopodium* sp.	0.01 g Wood, 24 *Silene laciniata*	0.01 g Wood
20–30 cm	0.06 g Wood, 17 *Hypericum* sp., 1 *Achillea millefolium*	<0.01 g Wood	<0.01 g Wood
30–40 cm	0.05 g Wood, 1 *Polygonum* sp.	<0.01 g Wood, 1 unidentified seed	<0.01 g Wood, 1 *Malosma laurina*
40–50 cm	0.01 g Wood	<0.01 g Wood	

TABLE 4. Summary of ethnographic uses for recovered plants.

Scientific name	Common name	Use as food	Use as medicine
Mimulus sp.	Monkeyflower		To cure kidney, urinary problems, or diarrhea; as a poultice; to reduce fevers; for nervous disorders; to regulate menstrual periods; to curtail hemorrhages; as an eyewash[b]
Malosma laurina	Laurel sumac	Fruits (ground into a flour)[c]	As a tea to ease menstrual cramps[a]
Hypericum spp.	St. Johnswort	Roots (fresh, dry, or ground into a flour)[b]	To treat sores, wounds, and cuts[b]
Silene laciniata	Fringed Indian pink		To induce menstruation; as a poultice on open sores[d]
Nicotiana clevelandii	Tobacco		As an emetic; as a poultice; to treat stomachaches[d], headaches, bites, sores, cuts, rheumatic pains, and nasal congestion[b]
Achillea millefolium	Common yarrow		As a poultice for cuts; to treat toothaches, stomachaches, headaches, colds, hemorrhaging, sore eyes, rattlesnake bites, sprains, bruises, skin irritations, bladder and kidney problems[b]
Polygonum spp.	Knotweed	Seeds, young shoots, young leaves[b]	To treat skin problems, toothaches, sores and boils[c]

[a]Adams and Garcia 2006
[b]Strike 1994
[c]Timbrook 1990
[d]Timbrook 2007

Indian pink, or catchfly (*Silene laciniata*). Although fringed Indian pink does not appear to be a food source, it may have been used medicinally by the Chumash to induce menstruation (Timbrook 2007:210). In this context, however, the seed is likely an incidental inclusion, as it also appeared in the off-site sample. The off-site sample also contained small amounts of charcoal, suggesting burning. These results suggest that at this location, plants were either not an important dietary component or not recovered due to preservation or sampling issues.

In contrast, more macrobotanical remains were recovered from each of the Central Valley sites. These remains suggest that interior peoples exploited terrestrial resources, although plants may have been valued more for their medicinal properties than for their contribution to diet (Tables 3, 4). The floated samples (16 L total) from CA-SCRI-174 contained a single seed from the goosefoot family (Chenopodiaceae), as well as common knotweed (*Polygonum* sp.), common yarrow (*Achillea millefolium*), and St. Johnswort (*Hypericum* sp.). Although none of these plants were important food sources, they all have recorded medicinal uses. Goosefoot seeds recovered in these samples were identifiable only to family, but they could be either pitseed goosefoot (*Chenopodium berlandieri*), the leaves of which were eaten by the Chumash, or soap plant (*Chenopodium californicum*), which was used to make soap and a medicinal tea that served as an emetic or expectorant (Timbrook 2007:55–56). Knotweed

(*Polygonum* spp.) has no recorded uses among the Chumash, although Strike (1994:115) notes its use as a food and medicinal source for other California Native Americans. Common yarrow was used medicinally by the Chumash (Timbrook 1990:252) and other California native peoples (Strike 1994:3) but has no recorded use as food. Finally, although St. Johnswort has no recorded use among the Chumash, Strike (1994:74) notes that other California native peoples used the roots for food and medicine (Table 4). No species of St. Johnswort are currently known to occur on Santa Cruz Island; however, 2 species occur on the mainland (Junak 1995). It is possible that this plant existed on the island in the past or arrived from the mainland through trade, as has been inferred from the recovery of black walnut (*Juglans californica*) at CA-SCRI-240 (Martin and Popper 2001).

The samples from CA-SCRI-183 (20 L total) contained 2 tobacco seeds (*Nicotiana clevelandii*) and 1 monkeyflower seed (*Mimulus* sp.), as well as 2 unidentifiable seeds. Also present in the samples were 24 fringed Indian pink seeds; however, as at CA-SCRI-724, these seeds are likely incidental inclusions since they were also present in the off-site samples. It is difficult to discern whether fringed Indian pink seeds are carbonized without breaking them open. Although some of those broken were carbonized, others were not, suggesting that the count may include modern, uncarbonized incidentals. The tobacco seeds recovered may have been related to both medicinal and ceremonial purposes. Timbrook (2007:127) notes that "tobacco was the only recreational drug used by the Chumash, though it also had ritual and medicinal applications." Though monkeyflower does not have any recorded use among the Chumash, Strike (1994:92) reports that it was used by other California Native Americans for both food and medicine (Table 4).

The sample from CA-SCRI-194 (20 L total) contained 1 sunflower family (Asteraceae) seed and 1 laurel sumac (*Malosma laurina*) seed, as well as 3 unidentifiable seeds. Laurel sumac fruits were ground into flour by the mainland Chumash (Timbrook 1990), and Adams and Garcia (2006:2) report that this plant was used by California Native Americans as a tea to ease menstrual cramps. This plant is not known to occur on Santa Cruz Island (Junak 1995), but it does occur on the mainland and the southern Channel Islands. Like *Hypericum* sp., it is possible that laurel sumac existed on Santa Cruz Island in the past or was brought in through trade.

Off-site samples all contained a small amount of carbonized plant material. They contained both carbonized and uncarbonized fringed Indian pink (*Silene laciniata)* and goosefoot family (Chenopodium) seeds, demonstrating that these plants grow on site (or arrive through natural seed rain). Thus their presence in the archaeological samples (even charred) may be incidental.

INTERPRETATIONS

Although the density of seeds in the analyzed assemblages was low, those seeds recovered provide information on seasonality and habitat exploitation and on the way terrestrial resources may have factored into settlement and subsistence decisions. The most surprising result is that most of the plants recovered have known ethnographic uses as medicine. It is possible that plants known for medicinal properties were used as food at these sites, and indeed many plants are recorded as both. Nonetheless, there is a notable absence of plants that would be considered staple foods. If Central Valley sites were positioned to take advantage of terrestrial resources, one would expect a greater representation of these resources. Groundstone artifacts are present at all 4 sites, with no significant difference in densities between the coastal and interior sites. Though the overall density of seeds is low, it is worth noting that all 3 interior sites contained seeds and the coastal site did not, suggesting that plants were of greater importance, although not necessarily as food.

The plants recovered from the Central Valley sites (CA-SCRI-174, CA-SCRI-183, and CA-SCRI-194) indicate that those sites were occupied from early spring through late fall (Table 5). It is possible those sites were also occupied during winter but that plants were not collected then, or that indicative seeds did not preserve or were not recovered. Similarly, it is difficult to say whether the lack of seeds at CA-SCRI-724 indicates that occupants were not exploiting terrestrial resources, as the lack may simply reflect poor preservation/recovery.

Nonetheless, the spring–fall signatures suggest that Central Valley sites were occupied

TABLE 5. Seasonality of recovered plants.

Scientific name	Common name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mimulus sp.	Monkeyflower[b]			X	X	X	X	X	X	X	X		
Malosma laurina	Laurel sumac[a]		X	X	X	X							
Hypericum spp.	St. Johnswort[a]						X	X	X	X			
Silene laciniata	Fringed Indian pink[b]				X	X	X	X	X				
Nicotiana clevelandii	Tobacco[b]			X	X	X	X	X	X	X			
Achillea millefolium	Common yarrow[b]		X	X	X	X	X						
Polygonum spp.	Knotweed[b]				X	X	X	X	X	X	X		
Chenopodium berlandieri	Goosefoot[b]			X	X	X	X	X	X	X			

[a]Calflora 2013
[b]Junak et al. 1995

(or returned to) throughout much of the year and that plants with economic value (both as food and medicine) were brought to the sites. Indeed, the habitats of species identified show a range of plants from chaparral, coastal bluff/sage scrub, woodland, grassland, and riparian habitats (Table 6). Though the Central Valley sites currently would be classified as grasslands, they could have been wetter during the time of occupation. In addition to natural climatic changes, these sites all lie near the main ranch used during the historic ranching period. Ranching activities, including livestock grazing and small-scale viticulture as well as the introduction of nonnative species, have lowered the water table and altered the overall landscape. The diversity of plants on the island was likely much higher prior to the introduction of nonnative species and this prior plant diversity may also explain the presence of seeds such as laurel sumac and St. Johnswort. Whether or not these sites were native grasslands at the time of occupation, the reliable fresh water in the Central Valley provides nearby riparian habitats; and the surrounding mountain slopes transition into sage scrub, chaparral, and even woodland habitats. The diversity of terrestrial habitats represented in the scant macrobotanical assemblage is just one indicator of human movement across a variety of ecosystems on the prehistoric landscape.

LIMITATIONS OF THE MACROBOTANICAL RECORD

Despite the presence of groundstone and the interior location of 3 of these sites, unexpectedly low numbers of seeds were recovered. These results could indicate that (1) plants were not as important to the Middle Holocene diet as previously presumed (although they still may have been important as medicine); (2) plants were consumed but not prepared in ways that would favor preservation (i.e., they were not cooked/carbonized); or (3) there was overall poor preservation of seeds due to the age of the deposits or soil conditions.

The presence of groundstone at each of these sites suggests that terrestrial resources were exploited (e.g., with a digging-stick weight) and processed (e.g., with manos/metates or mortars/pestles) on-site; however, microbotanical analysis of these artifacts is necessary to provide direct evidence of what they were being

TABLE 6. Habitat of recovered plants.

Scientific name	Common name	Chaparral	Coastal bluff/ sage scrub	Woodland	Grassland	Riparian
Achillea millefolium	Common yarrow[b]	X	X	X	X	
Hypericum spp.	St. Johnswort[a]	X		X		X
Polygonum spp.	Knotweed[b]				X	X
Silene laciniata	Fringed Indian pink[b]	X	X	X	X	
Chenopodium berlandieri	Goosefoot[b]		X			X
Mimulus sp.	Monkeyflower[b]	X	X	X		X
Nicotiana clevelandii	Tobacco[b]		X			

[a]Calflora 2013
[b]Junak et al. 1995

used to process. It seems more likely that plants were exploited, but perhaps in ways that made them unlikely to preserve. If people were focused on roots, bulbs, or corms (as the presence of digging-stick weights would suggest), it is less likely these resources would be evident in the macrobotanical record given their soft tissue and lack of seeds (although some corms have been recovered from other sites on the northern islands; see Reddy and Erlandson 2012; Gill 2013).

Finally, it is possible that preservation was low due to the age of these deposits and soil conditions or due to recovery methods. As noted by Gill (2013:313), of the 8 sites on Santa Cruz Island for which paleobotanical data are available, 7 date to the Late Holocene and only 1 (CA-SCRI-109) to the Early/Middle Holocene (see Glassow et al. 2008), for which preservation was not particularly good. This study of 5 Early Holocene sites from Santa Cruz Island yielded a similarly low density of seeds (Hoppa 2012). The high level of calcium carbonate in shell middens creates highly alkaline soil conditions, which can help preserve shell and bone but can damage plant remains (Braadbaart et al. 2009). Other potential factors contributing to preservation levels could be flotation method (machine-assisted rather than bucket flotation) or laboratory methods. For example, samples were not dried prior to flotation, which could have increased recovery of wood charcoal or nutshell (see Wohlgemuth 1984). More likely, taphonomic processes are contributing to low levels of preservation at these sites. Glassow et al. (1988:68) note that the impact of mechanical weathering on marine shell may be more severe at sites with brief episodes of occupation. Given the fragility of charred seeds in comparison to marine shell, it would seem that weathering results would be even more severe for these plant remains. However, the shell recovered from these deposits did not show signs of extreme weathering.

FUTURE RESEARCH

Ideally, excavation of larger samples from a greater number of Middle Holocene sites will generate an expanding body of macrobotanical evidence. The low density of seeds in the deposits included in this study suggests that larger samples are necessary to acquire a meaningful seed assemblage. Previous macrobotanical studies on Santa Cruz Island (e.g., Gummerman 1992, Martin and Popper 1999, 2001, Popper 2003) have often used samples with fewer than 20 L of soil. Though small samples may be sufficient for high-density deposits, particularly those from more recent contexts, larger samples may be required for older, lower density deposits. Finally, microbotanical analysis of both phytoliths and starch grain residues from the surface of ground stone artifacts could provide additional direct evidence for use of ground stones and plants not likely to be preserved in the macrobotanical record (e.g., starchy tubers). Analysis of larger floatation samples and ground stone recovered from sites in this study is currently underway in the Integrative Subsistence Laboratory at University of California, Santa Barbara. Combining macro- and microbotanical analysis will allow a more complete understanding of prehistoric plant use and will yield a better data set for testing the hypothesis that interior sites were used to exploit terrestrial resources.

CONCLUSIONS

Given the recovery of medicinal plants at each of the Central Valley sites, the exploitation of terrestrial resources likely played a role in settlement decisions, even if those resources were not important to the diet. In addition to medicinal uses, plants may have been collected for industrial purposes (e.g., as materials for baskets, ropes, or nets). The evidence for various other activities, including manufacturing of lithics, beads, and basketry and processing with groundstone, suggests that these sites were not simply logistical areas for terrestrial resource exploitation. Other factors, including the presence of reliable fresh water and the protection from coastal weather, may have made the Central Valley a desirable settlement location (see Perry and Delaney-Rivera 2011), but the low density of plant remains does not support the notion that the interior was occupied for the purpose of exploiting plant foods. The collection of medicinal plants may have been made more convenient only by interior settlement location. As noted by Perry and Delaney-Rivera (2011:117), "The current data suggest that the Central Valley was occupied on a regular basis as part of the seasonal foraging rounds of Middle Holocene populations because of the intersection of desirable resources, routes, and possibly even weather conditions." Given the limited work conducted at interior sites and the potential significance to understanding Middle Holocene settlement patterns, future research in the Central Valley will help elucidate a variety of issues of broad archaeological significance.

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