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Permalink

<https://escholarship.org/uc/item/6cs2c1xj>

Journal

Journal of California and Great Basin Anthropology, 37(1)

ISSN

0191-3557

Author

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Publication Date

2017

Peer reviewed

Mediating Women's Time Allocation Trade-offs: Basketry Cradle Technology in California and the Maintenance of Maternal Foraging Efficiency

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The study of ethnographic-period basketry disproportionately focuses on decorative baskets or utilitarian ones associated with the subsistence economy, and does not consider basketry technology from a behavioral-ecology perspective. The present study examines cross-cultural variation in basketry cradles in Central California, proposes a model of pre-contact diffusion of cradle technology across the Great Basin and California, and considers cradles as both a form of reproductive investment and a technology that attenuated foraging-opportunity costs for mothers of breastfeeding infants.

The primary focus of California basketry studies has been on decorative baskets and those manufactured for subsistence activities. However, prehistoric and ethnographic-period native Californians used basketry at all stages of life, including the care and transportation of infants and young children. At birth, infants were bathed in a basket, placed in a temporary receiving cradle, and subsequently swaddled in some form of cradle until becoming a toddler (Bibby 2004; Shanks 2006). Ethnographies of Central California groups reveal strong beliefs regarding the safe handling of infants to prevent death, illness, or mutilation; cradles ensured the physical safety and comfort of infants (Aginsky 1943; Essene 1942; Gifford and Kroeber 1937; Harrington 1942; Kroeber 1925; Voegelin 1942). Cradles were used universally across California, though structural and stylistic elements varied by group, as did the individual traditionally assigned responsibility for their manufacture.

Previous studies of California and Great Basin cradles have focused on stylistic elements, under the assumption that variation is primarily attributable to cultural differences. While cross-cultural stylistic varia-

tion is addressed here, the current study considers cradles as a form of reproductive investment and as a technology that partially mitigated the foraging-opportunity costs borne by mothers of breastfeeding infants by increasing the efficiency of infant transport and handling. This paper will provide an overview of cradle designs and construction with a focus on regional variation within Central California, trace the probable prehistoric diffusion and adoption of cradle styles in the region, and offer a behavioral-ecology interpretation of cradle use in Central California.

METHODS

In order to compile the ethnographic data necessary for a broad cross-cultural assessment of cradle styles and associated practices in Central California, the Culture Element Distribution (CED) lists compiled for Northeast California (Voegelin 1942), Pomo (Gifford and Kroeber 1937), Round Valley Yuki (Essene 1942), Central Sierra (Aginsky 1943), and Central California Coast (Harrington 1942) were consulted.

Tabulated CED data were supplemented with information from Kroeber's *Handbook of the Indians of California* (1925), chapters on each ethnolinguistic group from the *Handbook of North American Indians, Volume 8* (Heizer 1978), Shanks' *Indian Baskets of Central California* (2006), and Bibby's *Precious Cargo: California Indian Cradle Baskets* (2004). Data on the presence or absence of culture elements associated with cradles, drawn from a total of 40 groups from 18 tribal territories, were entered into a database compiled by the author, and organized by culture group. Table 1 below includes the criteria drawn from the CED lists for the cross-cultural evaluation of cradles made by the Costanoan/Ohlone, Coast Miwok, Salinan, Valley Miwok, Sierra Miwok, Foothill Maidu, Mountain Maidu, Valley Maidu, Foothill Nisenan, Mountain Nisenan, Coast Yuki, Yuki, Pomo, Hill Patwin, River Patwin, Lake Miwok, Nomlaki, and Wappo peoples. Additionally, cradles in the C. Hart Meriam Basketry Collection—housed at the University of California, Davis Museum of Anthropology—and attributed to Central California groups were studied by the author. The contact-era boundaries of the ethnolinguistic groups included in this study are noted below (Fig. 1), and are based on Golla (2011) and Heizer (1978).

Table 1

**CRADLE-RELATED CULTURE ELEMENTS INCLUDED IN THE CEDS USED FOR
CROSS-CULTURAL EVALUATION OF CRADLE PRACTICES IN CENTRAL CALIFORNIA**

Cradle Type	Features	Carrying Method	Manufacturer
Sitting	Double warp	Tumpline	Females
Deep type	Vertical warp	Carried across chest	Mother
Toe/Slipper type	Hood	Carried across forehead	Older female relative
Lying	Sex-specific design	Carried on hip	Male
Y-frame	Toys/decorative additions		Father
Kite frame	Sex-specific items		
Cane Hook			

Some Central California groups, specifically the Huchnom and Esselen, were not included in this study, as there was insufficient ethnographic data on the cradles utilized by these peoples, as well as a paucity of cradles attributed to these groups in museums or personal collections. Additionally, the Yokuts were not included in the study as their basketry technology and social organization were more closely aligned with Southern California traditions (Bettinger 2015; Shanks 2010).

RESULTS

Despite variation in cradle styles, the use of a receiving cradle was nearly universal in Central California. Immediately post-partum, infants were bathed in warm water, swaddled, and placed in a temporary first cradle manufactured from soft, flexible tule, or placed in a twined tray (Bibby 2004). A more permanent cradle was subsequently manufactured or completed—if already underway—for the infant. Native American groups within Central California made variants of two major cradle styles—sitting and lying.

There is marked asymmetry in the descriptive data on cradle types in the ethnographic record, as well as in the availability of cradles for modern evaluation in ethnographic-period basketry collections. For this reason, some cradle descriptions below are briefer than others.

Sitting Cradles

Deep Sitting Cradles. The Pomo and their neighbors, the Yuki, Patwin, Lake Miwok, Nomlaki, and Wappo, made a deep, U-shaped cradle (Figures 2 and 3) using willow warps and a bound weave with double-half hitches of cordage, sinew, or string (Bibby 2004; Essene

1942; Gifford and Kroeber 1937; Kroeber 1925; Shanks 2006; Voegelin 1942). Regional variation existed among the Pomo in the treatment of the warps forming the back of the cradle (Bibby 2004; Shanks 2006; Smith-Ferri 1996). Back warp ends were either bound at the bottom in the interior and covered with soft swaddling or diapering material, bound on the exterior in the back of the cradle, or formed a series of concentric U-shapes (Bibby 2004; Shanks 2006). A hoop, typically of oak, was attached horizontally at the top of the cradle. Strings of shell beads, miniature baskets, or a stuffed deer scrotum were traditionally hung from the oak hoop for the infant's entertainment, and were reported to inspire girls to be good weavers and gatherers, and boys to excel at hunting (Bibby 2004; Gifford and Kroeber 1937; Shanks 2006). The infant was diapered with soft tule fluff or moss, swaddled, and lashed into the cradle with sinew, string, or buckskin in a seated position (Bibby 2004; Essene 1942; Gifford and Kroeber 1937; Kroeber 1925; Voegelin 1942).

Toe Sitting Cradles. Ethnographic accounts of the Coast Yuki indicate they were manufacturing the Athabascan toe style of sitting cradle during the nineteenth and early twentieth century (Gifford and Kroeber 1937). Toe sitting cradles resemble wedge-like slippers, with the toe portion closed off by an open-work twined sitting platform (Figures 2 and 4). The warps contributing to the base and sides of the cradle form a squared-off U-shape, while the back is formed by vertical warps. Wefts are widely spaced and paired in groups of three horizontal bands with alternative slants. There are no data regarding the materials used by the Coast Yuki to manufacture cradles; however, Bibby (2004) suggests that among Athabascan groups making toe sitting cradles,

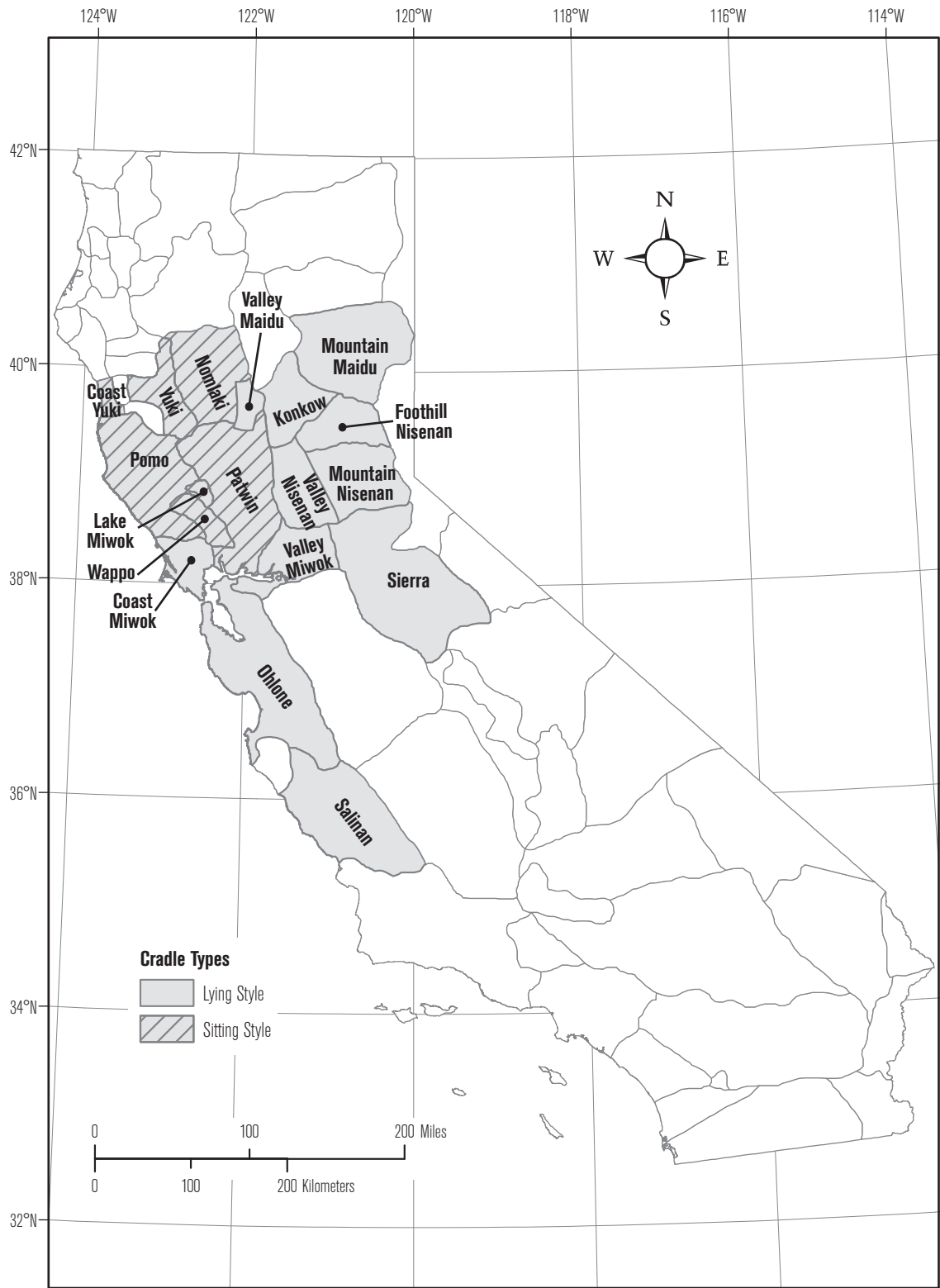


Figure 1. Ethnolinguistic map depicting Central California groups included in the study. Boundaries from Heizer (1978) and Golla (2011). All groups included in the study are shaded, and those using the sitting-style are cross-hatched. Although labeled here as Konkow for clarity and consistency with modern sources, this culture area was apparently subsumed under Valley Maidu in the CED for the region.

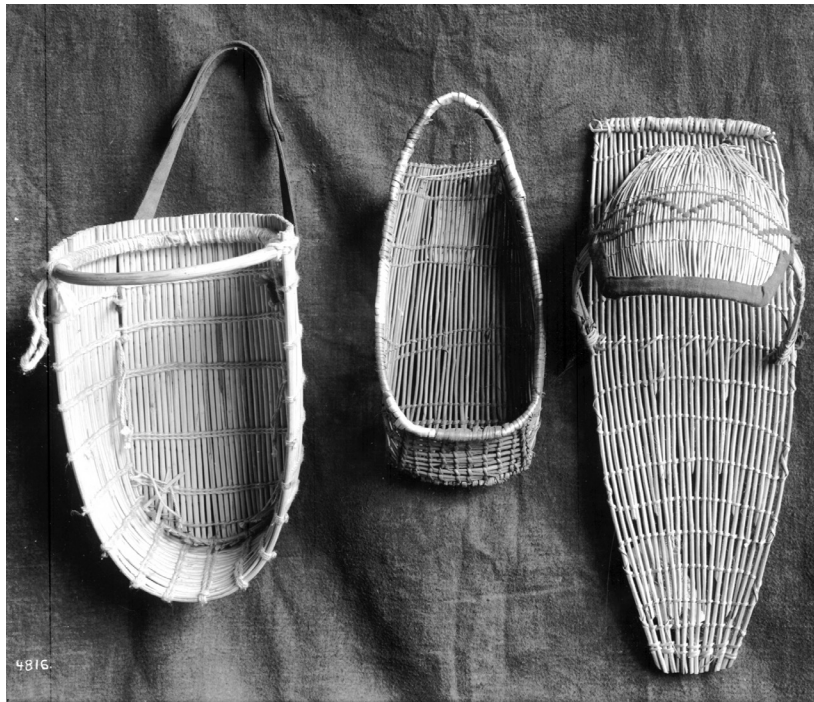


Figure 2. Three primary types of cradles used in Central California, including (from left to right) the deep sitting cradle, the toe sitting cradle, and the kite frame style of lying cradle. Photograph by Charles C. Pierce (1900). Digitally reproduced by the USC Digital Library from the California Historical Society Collection at the University of Southern California.



Figure 3. Deep sitting cradle. Unidentified woman and child, Yokayo Rancheria. Photograph by H. W. Henshaw (1892). Collection of the Grace Hudson Museum and Sun House, City of Ukiah California (Accession #15249).

hazel was used for both the warps and wefts, and the oval rim was wrapped with split, baked pine roots.

Lying Cradles

Y-Frame. The Ohlone, Coast Miwok, Salinan, Valley Miwok, and Mountain Maidu used a Y-frame lying cradle (Aginsky 1943; Bibby 2004; Harrington 1942; Shanks 2006; Voeglin 1942). The frames were often a forked black-oak branch, with a twined back between the arms of the ‘Y,’ made with willow warps and wefts of peeled redbud, willow, or baked, split pine root (Fig. 5) (Bibby 2004; Shanks 2006). A twined hood was attached to a rod, which was arched between the tops of the forked frame; among the Valley Miwok and Mountain Maidu, hood designs were an indicator of the sex of the child (Aginsky 1943; Bibby 2004; Harrington 1942; Shanks 2006; Voeglin 1942).

Cane Hook. The Sierra Miwok manufactured a lying cradle with a frame comprised of two parallel bent sticks, which resemble walking canes (Fig. 6) (Aginsky 1943;

Bibby 2004). The top hooks of the canes formed the frame for a removable twined hood with designs signaling the sex of the infant (Aginsky 1943). The twined back warps were horizontally oriented sticks or shoots (Bibby 2004).

Kite Frame. The Valley Maidu and the Foothill and Mountain Nisenan used a variant of the lying cradle labeled by ethnographers as a “kite frame” due to its resemblance to a flying kite. The main lying element of the cradle is wide at the top and narrows dramatically towards the base (Aginsky 1943). The back portion of this cradle is composed of flat, parallel, vertically-oriented warps, with either twined weft elements or half hitches (Aginsky 1943; Bibby 2004; author’s observations). The infant is lashed to the lying element with buckskin laces (Bibby 2004). The Foothill and Mountain Nisenan reportedly added twined hoods to kite frame lying cradles, though these did not indicate the sex of the infant (Aginsky 1943). The kite frame cradle utilized in Central California closely resembled those manufactured by the Mono, Washoe, and Paiute (Figures 2 and 7; Aginsky 1943; Bibby 2004).



Figure 4. Toe sitting cradle. *Madonna of the Redwood Empire* photographic postcard. Courtesy of the California History Room, California State Library, Sacramento, California.

DISCUSSION

Introduction and Spread of Cradle Styles in Prehistoric Central California

Archaeological evidence suggests that the lying type of cradle originated among groups in the Southwest (Bibby 2004; Piper 2000, 2002), and was imported to Central and Southern California (via the Great Basin) by ancestors of the Maidu and Miwok (Shanks 2006). Linguistic evidence and basketry technology indicate that as these

populations moved over the Sierras, through the Central Valley, and into the southern portion of the Bay Area, they brought variants of the lying cradle with them (Bibby 2004; Foster 1996; Moratto 1984; Shanks 2006). The groups occupying this migration route at European contact—the Ohlone, Coast and Valley Miwok, Salinan, Valley and Mountain Maidu, and the Foothill and Mountain Nisenan—all used lying cradles. The importation of cradle styles likely co-occurred with the Miwok and Maidu introduction of Great Basin coiled basketry to Central California, as suggested by Shanks (2006). This hypothesis is supported by ethnographic evidence that the Miwok and Maidu were the only groups in Central California to use the hood design and decoration to indicate the sex of the infant (Aginsky 1943; Voegelin 1942). Sex-specific hood design is a nearly universal practice among Great Basin and Southern California groups.

The deep sitting cradle likely originated with the Pomo, who had the greatest stylistic diversity in the type, and subsequently radiated outwards to the Yuki, Patwin, Lake Miwok, Nomlaki, and Wappo, as occurred with other Pomo basketry practices. The Pomo and their neighbors, who manufactured the deep sitting-style cradle, were among the last, and northernmost, groups to adopt coiling after that technology was introduced to California by Miwok and Maidu ancestral populations migrating from the Great Basin (Shanks 2006). The late adoption of coiling and the maintenance of deep-sitting cradle styles among the Pomo, Yuki, Patwin, Lake Miwok, Nomlaki, and Wappo demonstrate the strong cultural influence wielded by the Pomo, and lend support to the theory that the lying cradle type was introduced to California, along with coiled basketry, by waves of migration over the Sierra Nevada mountains from the Great Basin.

The Coast Yuki adoption of twined toe sitting cradles may be attributed to late period Athabascan incursions in Northern California and the northern-most portion of Central California, adjacent to Yuki territory. Athabascan



Figure 5. Y-frame cradle. Yokuts Indian wife and children of the chief at the Tule River Reservation, near Porterville, California. Photograph by George Wharton James (circa 1900). Digitally reproduced by the USC Digital Library from the California Historical Society Collection at the University of Southern California.

groups and their Algonquian neighbors in Northern California and Southern Oregon used this style of cradle universally (Bibby 2004; Driver 1961). The Coast Yuki likely produced Pomoan-style deep sitting cradles prior to Athabascan migration into their territory.

The Behavioral Ecology of Cradles

Ethnographic evidence from Central California, as well as from other foraging populations, indicates that nursing infants accompanied their mothers during their daily foraging bouts (Aginsky 1943; Blurton Jones et al. 1994; Essene 1942; Gifford and Kroeber 1937; Harrington 1942; Howell 2010; Hrdy 1999; Kroeber 1925; Marlowe 2005; Voegelin 1942). Among modern ethnographic groups, women typically carry infants in a sling during travel to a foraging site, as well as during gathering and processing activities (Blurton Jones 2005; Hawkes

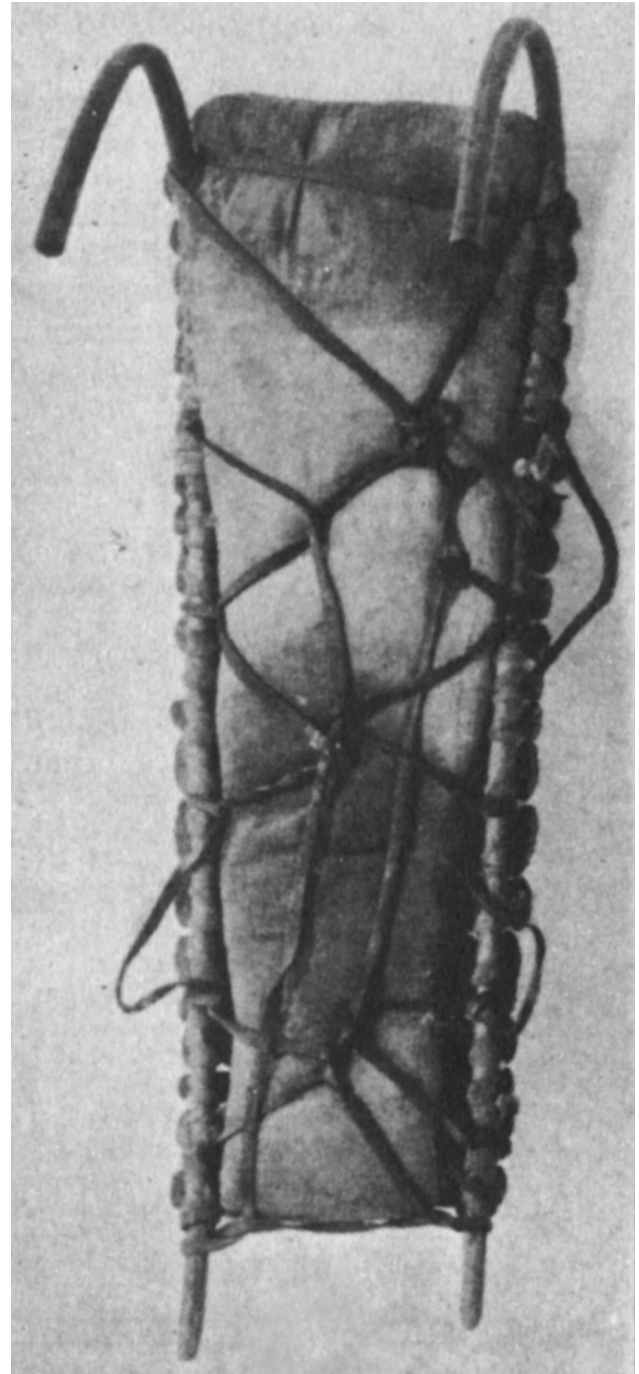


Figure 6. Cane hook cradle from Kroeber (1925:446, Plate 39F).

et al. 1997; Howell 2010; Hurtado et al. 1992; Konner 2005; Tucker and Young 2005). This has the advantage of maintaining mother-infant proximity for safety and regular feedings, but increases caloric expenditures for the mother and decreases her work capacity. Time and



Figure 7. Kite frame cradle. Suzie and Sadie McGowan, Mono Lake Paiute. Photograph by J. T. Boysen (1900). Courtesy of the Yosemite National Park Archives, Museum, and Library.

energy spent carrying an infant while actively foraging cannot also be allotted to food procurement.

Cradles in California were carried by the mother with a tumpline during daily activities, and then propped against a tree or rock, hung from or tied to a tree, or—in the case of forked-based cradles—stuck vertically in the ground, enabling the infant to observe his or her mother’s activities while in an upright position and being close at hand for nursing (Aginsky 1943; Bibby 2004; Essene 1942; Gifford and Kroeber 1937; Harrington 1942; Kroeber 1925; Voegelin 1942). This feature of California cradles effectively maintained infant safety and proximity for feeding, yet would have resulted in reduced maternal efforts during active foraging.

Human behavioral-ecology studies of hunter-gatherer groups note a significant drop in women’s foraging efficiency during their reproductive years and demonstrate that females devote precious energy and time to the gestation, lactation, and care of offspring. As a result, females pay high foraging-opportunity costs during these years (Blurton Jones et al. 1989; Borgerhoff Mulder 1992; Hawkes et al. 1997; Hurtado et al. 1992; Kaplan et al. 2000; McDade 2001). Even in hunter-gatherer societies where women contribute more calories to the subsistence economy than men, as is hypothesized for Late Period Central California, men’s foraging efficiency increases relative to their caloric expenditures during their reproductive years (Bettinger 2015; Kaplan et al. 2000; Wallace 1978).

This reduced female foraging efficiency resulting from investments in offspring, especially breastfeeding infants, would have presented California women engaged in an intensive subsistence economy with a time-allocation trade-off that was partially ameliorated by cradle technology. Cradles allowed the mother increased freedom of movement during foraging bouts and food processing activities. Cradles also reduced maternal caloric expenditures by making infant transport more efficient and by permitting women to safely leave infants nearby while working, rather than carrying an infant for the duration of her foraging activities. Additionally, cradling infants may facilitate short term, alloparental care between feedings, further aiding mothers’ foraging or food processing efficiency. It is therefore not surprising that a high degree of investment went into a technology that facilitated the maintenance of foraging efficiency. Cradles, as with all basketry types, require careful and precise gathering and preparation of plant materials, as well as technical expertise in manufacturing methods (Bibby 2004; Shanks 2006).

Women were the primary weavers in Central California cultures, as well as the primary caretakers of infants (Aginsky 1943; Essene 1942; Gifford and Kroeber 1937; Harrington 1942; Kroeber 1925; Voegelin 1942). Across California, men’s involvement in basket making was generally restricted to the manufacture of rough, open-work twined traps used in their hunting and fishing pursuits (Kroeber 1925; Shanks 2006). However, among the groups who used the Pomoan deep sitting-cradle, men were the primary cradle-makers at European

contact (Bibby 2004; Essene 1942; Gifford and Kroeber 1937; Kroeber 1925; Shanks 2006; Voegelin 1942). Unsurprisingly, this style of cradle capitalizes on many of the same techniques used by men to manufacture fish and hunting traps, and the result more closely resembles these utilitarian baskets than do other cradle styles.

Among the Pomo, Yuki, Patwin, Lake Miwok, Nomlaki, and Wappo, women contributed a larger proportion of gathered plant foods—primarily acorns and small seeds—relative to men's provisioning of meat and fish (Bettinger 2012, 2015; Wallace 1978). These groups employed the male-made Pomo-style deep sitting cradle (Bibby 2004; Essene 1942; Gifford and Kroeber 1937; Kroeber 1925; Shanks 2006; Voegelin 1942). Men may have maximized net acquisition rates of calories at the household level by investing in cradle manufacture at the birth of a child in order to increase the foraging efficiency of their mate, who contributed the greater balance of resources to the household subsistence economy.

Among other Central California groups, where women's foraging efforts still constituted a substantial contribution to the subsistence economy, older female relatives were as likely to manufacture a cradle for an infant as was the mother herself (Aginsky 1943; Essene 1942; Voegelin 1942). Among the groups utilizing the Pomo-style deep sitting cradle, older women—like fathers—may not have been the prime contributors of food resources to the household economy, in this case due to the physical challenges accompanied by senescence. Aiding a younger, reproductive-aged female through cradle manufacture would have a similar effect to men doing so for their mates.

Paying a short-term hunting or fishing opportunity cost, in the case of fathers, or a foraging opportunity cost in the case of older female relatives, associated with making a cradle would have been outweighed by the benefits of a technology that allowed a mate or prime-age female relative to more efficiently gather and process the plant resources central to the subsistence economy in Late Period and early Colonial California.

CONCLUSIONS

Ethnographic evidence from California, including Culture Element Distribution (CED) lists and private and museum basketry collections, indicates that the use of cradle

technology across California at European contact was a nearly universal trait, despite cross-cultural variation in styles and manufacturing materials and methods. Both sitting- and lying-style cradles ensured the safe care of infants and attenuated time allocation conflicts between women's foraging activities and parental investment by freeing women's hands and permitting mothers to set their cradled child, oriented vertically, nearby while they gathered or processed food. This was likely especially important among the groups in California who most heavily relied on women's contributions to the subsistence economy.

Studying archaeological and contact-era material culture, like cradles, associated with the direct care of and investment in children, can advance our growing understanding of the relationships between foraging behavior, reproductive investment strategies, and settlement patterns in California prehistory (see Greenwald et al. 2016; Jackson 2004; McGuire and Hildebrandt 2004; Whelan et al. 2013; Whitaker and Byrd 2014). Unfortunately, the ethnohistorical and ethnographic records are diminished in value by an incomplete knowledge of the day-to-day lives of women and young children, partly due to the failure of predominantly male ethnographers to consider their importance. Additionally, nineteenth and early twentieth century European and Euro-American collectors of California basketry directed their attentions primarily towards ornamental baskets and decorated or finely-woven utilitarian baskets, rather than less ornate but highly functional utilitarian baskets like cradles.

The rarity of organic materials in the archaeological record in California also presents difficulties. Regions with superior organic preservation, like the Great Basin and the Southwest, can improve our understanding of the relationships between cradle technology and women's labor. For example, Piper (2000, 2002) notes dramatic shifts in cradle style and the appearance of cranial deformation associated with the transition from Basketmaker III (A.D. 500–750) to Pueblo I (A.D. 750–900) in the Southwest. She hypothesizes that the shift from the mixed foraging/agriculture subsistence strategy employed by late Basketmaker peoples to the intensive maize agriculture employed by Puebloans triggered a transition from mothers carrying infants in upright cradles during foraging activities to women using less mobile lying-style cradles oriented horizontally during

intensive maize processing. This shift meant that infants spent extended periods of time on their backs, leading to the hallmark cranial deformation noted by archaeologists among Puebloan peoples (Piper 2000, 2002).

In addition to a reliance on ethnographic and cross-cultural archaeological data and studies of the contact-era cradles themselves for a better understanding of how this technology helped women and their mates negotiate trade-offs between foraging efficiency and childcare, future research should be directed towards experimental studies to (1) test women's gathering and processing output with and without cradle technology, and (2) ascertain the time investment necessary for the manufacture of various cradle styles, from the material gathering stage to completion.

ACKNOWLEDGEMENTS

I thank Ralph Shanks, my mentor in basketry studies, whose knowledge of and enthusiasm for Native California baskets is unparalleled, as is the support he gives to his students. I also thank Gregory R. Burns for support, feedback, and help in creating Figure 1. Lastly, I am grateful to Lisa Deitz and Elizabeth Guerra, who manage the C. Hart Merriam Basketry Collection at the University of California, Davis Anthropology Museum.

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