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REPORTS

A Game String and Rabbit Stick Cache from Borrego Valley, San Diego County

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This report describes a game string and rabbit stick discovered cached together in the Borrego Valley of San Diego County. Perforated ceramic discs forming parts of the game string inspire the speculation that similarly shaped objects, including the so-called "spindle whorls" recovered in coastal southern California sites, functioned as procurement technology. Experimental archaeology does not support the hypothesis that the game string, along with the attached discs, functioned as a bola. Ethnographic notes on game strings and curved throwing sticks are also presented.

OVER 75 years ago, a game string with two ceramic discs attached and partially wrapped around a rabbit stick (also referred to as curved throwing sticks, nonreturn boomerangs, straight-on boomerangs, and curved killing sticks; see Fig. 1), was discovered at an unknown location in the Borrego Valley, San Diego County (Fig. 2), by a relic collector, Dr. Knox (J. Farmer, personal communication 1997). The artifacts are presently curated in the private museum of Justin Farmer, founder of the California Indian Arts Association. This report describes these two examples of procurement technology and provides ethnographic notes on game strings, as well as rabbit sticks. Experimental data are provided to support the hypothesis that the string was employed to transport game but was not used as adjunct equipment to facilitate either game capture or retrieval of the thrown weapon.

Further, the two ceramic discs forming part of the Borrego Valley game string hold functional implications for the similarly shaped and sized siltstone/sandstone "spindle whorls" recovered occasionally from coastal southern California archaeology sites. This study offers the view that the so-called "spindle whorls" were once associated with game string technology and probably did not serve as either counterweights hafted onto drill shafts or as ornamentation.

DESCRIPTIONS

The following is a description of the game string and rabbit stick from Borrego Valley. For the purpose of describing the Borrego Valley weapon, "rabbit stick" is the term that will be used in this report. However, when referring to the ethnographic literature on these types of artifacts (see below), the varied terminology of the literature will be utilized.

The String

The cordage of the game string (Fig. 1) is approximately 138 cm. long, two-ply, and z-twist (see Schulz 1977:31; Hurley 1979). Each ply is s-twist (J. Minar, personal communication 1997). It is manufactured of either yucca or agave fiber (see Hoover 1974:40). The wrapped segment accounts for about 30 cm. of the entire length. One length of the string runs 35 cm. away from the wrapping, and the other length runs 73 cm. A square knot (see Schulz 1977: 31) that repaired a break is located at one-third the distance from the end of the 73-cm. length of cordage.

Accelerator mass spectrometry analysis of the string yielded a radiocarbon date of 350 ± 30 RCYBP (Beta-98239). The one sigma calibrated results are A.D. 1485 to 1535 and A.D. 1545 to 1635. It is thus inferred that the cache was dis-

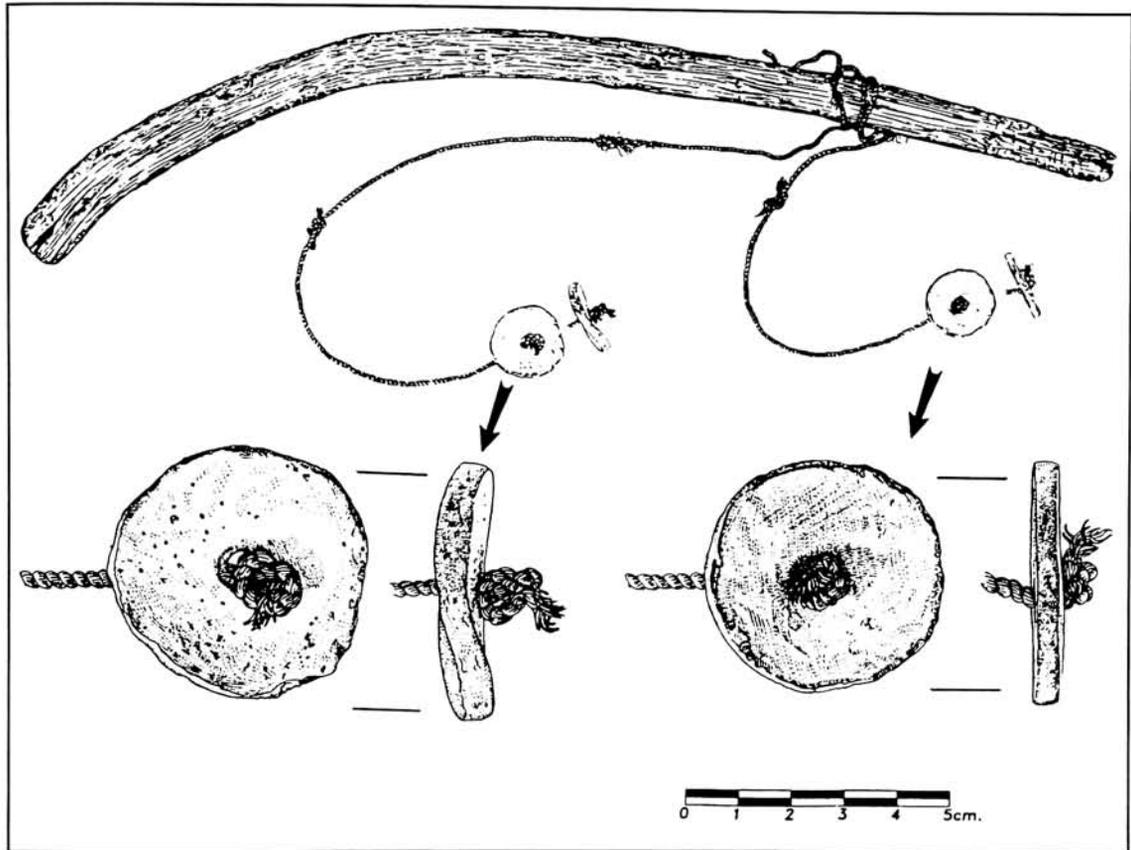


Fig. 1. Rabbit stick and game string from Borrego Valley, San Diego County. (Scale refers to inset of ceramic discs; full length of rabbit stick is 70.3 cm.)

covered in a rockshelter or similarly protected repository, for had the artifacts been directly exposed to the elements, the string would not have survived in such good condition.

The Ceramic Discs

Two discs fashioned from potsherds were strung through their biconically drilled holes onto the 3.1-mm. diameter cordage. Biconical drilling prevents spalling, an occurrence commonly resulting from drilling a hole entirely from one side (Bean et al. 1995:IX-64). The discs are free to slide along the string but are prevented from falling off by overhand knots (see Schulz 1977:31) at either end of the cordage. The edges of each sherd were chipped to a roughly circular form and subsequently ground

using an abrasive stone. No anvil marks appear on the inner surfaces of either disc.

The larger disc is of Colorado Buff ware, and the smaller is a type of Brown ware (R. Laska, personal communication 1997). The smaller disc was fashioned from a sherd that originated from the wall of a pot. The larger disc appears to have originated from the broadly constricting neck of a jar. Metric and nonmetric descriptions of the discs are given in Table 1.

The Rabbit Stick

The rabbit stick is generally lenticular in cross section with the inner edge somewhat more blunt than the outer edge. The grain of the wood follows the curvature. There is enough asymmetry to the stick in plan view that no met-

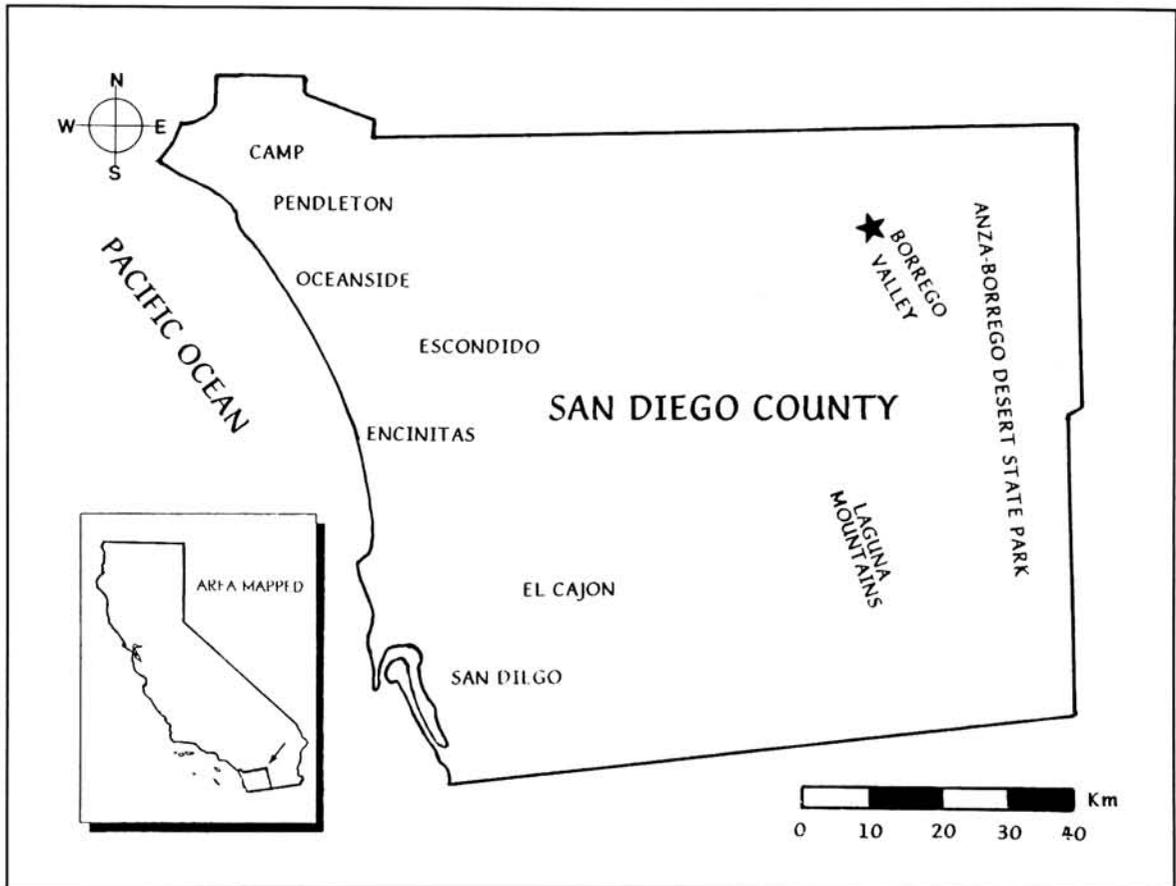


Fig. 2. Location of Borrego Valley, San Diego County.

ric curvature determination is possible, but the angle of bend calculates to 143° . The length is 70.3 cm., and the outer and inner arcs are 75.5 cm. and 71.0 cm., respectively. Maximum width of the handle is 29.5 mm., and maximum thickness is 14.8 mm. At the distal end of the forward wing, maximum width and thickness are 36.0 mm. and 15.0 mm., respectively. Transverse grooves running 9.4 cm. along the handle assured a better grip, facilitating control. In its desiccated condition, the stick weighs about 177 g. Assuming the wood to be either mesquite or oak, the original weight is estimated to have been about 235 ± 15 g., based on weights of the author's modern oak copies of this Borrego Valley specimen.

When the proximal end of the rabbit stick is held perpendicular to the horizon, with its handle pointed down and the inner edge facing the observer, the distal third (forward wing) of the weapon exhibits a noticeable clockwise twist. If this twist was not due to natural warping as the stick dissipated moisture and cracked, then the original owner may have twisted the forward wing to reduce lift in order to coax the weapon to fly in a straight line.

GAME STRINGS

Belts and/or strings were used to secure small game for transport by hunters in the Great Basin (e.g., Stewart 1941:275; Stewart 1941:369, 1942:248) and California (e.g., Hudson and

Table 1
DESCRIPTIONS^a OF BORREGO
VALLEY CERAMIC DISCS

	Specimen No. N288-004 3/3	Specimen No. N288213
Weight	14.9	17.9
Maximum diameter	45.2	49.0
Maximum thickness	5.8	7.0
Hole diameter		
Inner	6.2	5.9
Outer		
Inside surface	12.2	9.1
Outer surface	12.0	8.2
Color (Munsell)		
Outer surface	2.5 YR 6/4	5 YR 7/4
Inner surface	2.5 YR 4/2	5 YR 7/3
Hardness (Moh's Scale)	≈ 3	≈ 3

^a Measurements are in g. and mm.

Blackburn 1979:297, 303-304) culture areas. Although game belts are thicker than game strings, no precise distinction clearly separates the two.

Belts and strings are usually described as encircling the waist. Speculatively, the ornamental waist strings described by Pedro Font (Bolton 1931:250) and those listed by Harrington (1942:16) may also have served a game string function. Fernando Librado, Harrington's most knowledgeable Chumash informant (Blackburn 1975:18), described a half-inch to three-quarter-inch wide belt that wound around the waist two to three times. The head of the dead animal slipped under the belt (Hudson and Blackburn 1979:303) and was held by the tension of the belt against the hunter's body. A Barbareño woman, Luisa Ygnacio (Blackburn 1975), related to Harrington that hunters would return to Cieneguitas with rabbits or ground squirrels attached at their waists by a game string (Hudson and Blackburn 1979:297, 303).

A stereoscopic photograph (Fig. 3), probably taken by Charles Leander Weed (Palmquist 1979:94-95) circa 1864, shows a California Indian in the Sierra Nevada foothills carrying both

a ground squirrel and a rabbit, the latter secured by a game string that wraps around its head and apparently passes under the left arm to tie to the animal's hind legs behind the hunter's shoulder. Figure 4 shows a Washoe hunter in about 1920, possibly in the Carson Valley (Fowler 1986:83), with a game string that passes around his neck onto the shoulder opposite a large catch of rabbits. As late as the 1960s, Rufino Ochurte, a Kiliwa (northern Baja California) informant of Ralph Michelsen, transported small game tucked under his pants belt, which may have been only a rope (P. Chace, personal communication 1997). Some hunters might simply transport small prey by hand (Fig. 5).

RABBIT STICKS

Coastal southern California peoples—Chumashan (Harrington 1942:15; Simpson 1961:54), Northern Uto-Aztecan (Davidson 1873:233; Sparkman 1908:198; James 1916; Kroeber 1925:632; Curtis 1970:8-9, 159; Duhaut-Cilly 1929:220; Drucker 1937; Priestly 1937:22; Heizer 1968:62), and Yuman (Spier 1923:337; Drucker 1941:99; Shippek 1968:35; Brandes 1970:86; Gendar 1995:86)—employed curved throwing sticks, as did desert groups such as the Kitane-muk (Harrington 1942:15), the Great Basin Chemehuevi (Galvin 1967:32; Sherer 1994:5), and the Cahuilla and Cupeño (Kroeber 1925:704; Bolton 1931:131; James 1960:58). The Tubatulabal in the southern Sierra Nevada lacked the implement (Voegelin 1938:13), as did the Owens Valley Paiute, Northern Paiute, and Western Shoshone to the north and east (Angulo and Freeland 1929; Kelly 1932; Stewart 1941; Stewart 1941) and most of the Southern Paiute (Stewart 1942). Southern Ute, however, employed a curved throwing stick (Gifford 1940:123).

The presence of rabbit sticks in all of southern California (Kroeber 1925:704), throughout northern Baja California (Clavigero 1937:100; Meigs 1939:28-29, 1972:36; Drucker 1941:99; Aschmann 1959:67), along Colorado River Yu-



Fig. 3. Stereoscopic photograph of California Indian transporting ground squirrel and rabbit; prey secured on game strings. Photograph taken circa 1864 and attributed to Charles Leander Weed. (From the author's collection.)

man territory (Kroeber 1925:632; Stewart 1947; Smith 1977), among some upland Yuman-speakers, such as the Yavapai (Gifford 1936:288; Khera and Mariella 1983:50; but see Gifford 1932:225), and in Puebloan cultures (Parsons 1918:384-385; Spier 1928:121; Harrington 1933:120; Gifford 1940:33, 123; Amsden 1949:73), most notably the Hopi (e.g., Stephen 1936:1:99-100; Gifford 1940:123; Kennard 1979:556-557), indicates possible widespread historical links. Navajos employed the weapon (see Spier 1928:121; Aleshire 1997:11), as did some Apaches (Gifford 1940:33), possibly as the result of Puebloan influence. Most of the archaeologically recovered specimens in the greater Southwest are those from Basketmaker contexts (Driver and Massey 1957:359), although it is not entirely clear whether the Basketmaker examples actually functioned to dispatch game (see Heizer 1942). In addition to the areas already men-



Fig. 4. Washoe hunter with prey secured by game string. Photograph taken circa 1920, possibly in the Carson Valley. (Courtesy of Library Special Collections Department, Lorenzo Creel Collection, University of Nevada, Reno.)

tioned, Driver and Massey (1957:358, Map 143) documented the use of nonreturn boomerangs for much of New Mexico, small areas of Colorado, Texas, and Northwestern Mexico, and many parts of Mesoamerica.

The primary use of curved throwing sticks was for food procurement, although Costansó reported the use of curved killing sticks in coastal southern California warfare (Priestly 1937:22). A Gabrielino/Juaneño informant of Harrington (1942:5) recounted the death of an American soldier at Tejon who had been struck with a nonreturn boomerang (J. P. Harrington [as cited in Hudson and Blackburn 1979:134]), and the weapon has been identified for a range of agonistic settings in northern Baja California (Aschmann 1959:68). The Southern Ute of the Great Basin (Gifford 1940:123) and Hopi (Stephen 1936:1:99-100; Gifford 1940:123) also employed the rabbit stick for fighting.

Targets included hares and rabbits (e.g., Meigs 1972:36; Driver and Massey 1957:359), coyotes, deer, pronghorn (Priestly 1937:22),

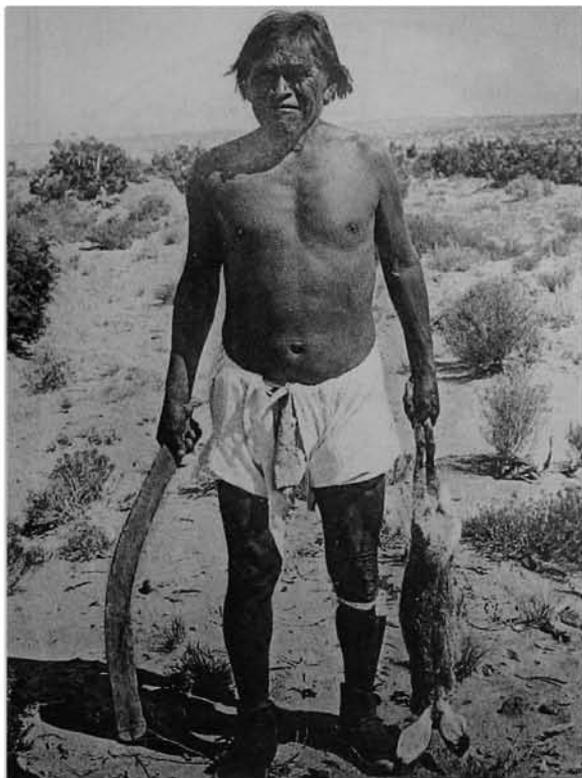


Fig. 5. Hopi hunter holding rabbit stick and prey. (Courtesy of the Southwest Museum, Los Angeles.)

mountain sheep (Spier 1923:337), and dogs (Gifford 1940:123). The pyrographic artwork in Figure 6, showing a hunter with two curved sticks approaching water birds standing in a marsh or grasslands environment, supports Kroeber's (1925:817) belief that birds may have been hunted with the weapon. Curtis (1970:9) reported that the Luiseño killed ducks with rabbit sticks. However, Meigs (1972:36) reported that at La Huerta, nonreturn boomerangs were not hurled at flying birds.

Rattlesnakes, a recurring danger for native peoples (e.g., Aschmann 1966:56; see also Kroeber 1928:345-346), could be severed by the weapon (Brandes 1970:86). Rabbit sticks decorated to represent serpents (Fig. 7) (see Hoffman 1885:29-30) possibly communicated an imitative principle connected to protecting people from

venomous snakes or, just as speculatively, the imagery may have associated the lethal strike of a hungry snake with the bone breaking power of a curved killing stick, thereby magically assuring success in the hunt.

One diarist with the 1769 Portolá Expedition, Pedro Fages (Fages 1844:163-164; Priestly 1937:22), observed that curved throwing sticks were fashioned of hard woods. Mesquite, oak, dogwood, cat's claw, ironwood, and ribbonwood are mentioned in the literature (e.g., Hoffman 1885:29-30; Barrows 1900:50; Gifford 1936:288; Rogers 1942:1 [as cited in May 1975:17]; Bean and Saubel 1972:31, 94-95; Meigs 1972:36).

Normally, the angle of bend of nonreturn boomerangs is broadly curvilinear, although the Gabrielino example discovered in Santiago Canyon in 1872 (Fig. 8a) exhibits an unusual elbow shape at the intersection of the fore and aft wings. The irregularly shaped Luiseño specimen shown in Figure 8b also exhibits an unusual bend which probably reflects the shape of the branch from which the weapon was constructed. In all examples observed for this study, the direction of the wood grain followed the curved plane of the weapon, a consequence largely due to cutting a stave from natural wood elbows, as where a root emerges from a trunk (see Rieser 1992:28) and/or bending a stave during manufacture (see Meigs 1939:28).

The terminus of the forward wing of a curved throwing stick is often rounded and blunt (Figs. 1, 5, 8a, 9a), but many exhibit a pyramidal or otherwise pointed end (Figs. 6, 9b-c, 10a-c), by some accounts intended to pierce animals (see Spier 1923:337). The forked terminus of one Luiseño example (Fig. 8b) is perhaps unique. Blunt and straight proximal ends are relatively scarce (Fig. 10d).

Hurled edgewise with sidearm motion (Priestly 1937:22; Brandes 1970:86; Kennard 1979:557), and with the anterior wing directed inward (e.g. Aschmann 1959:68), the weapons sailed

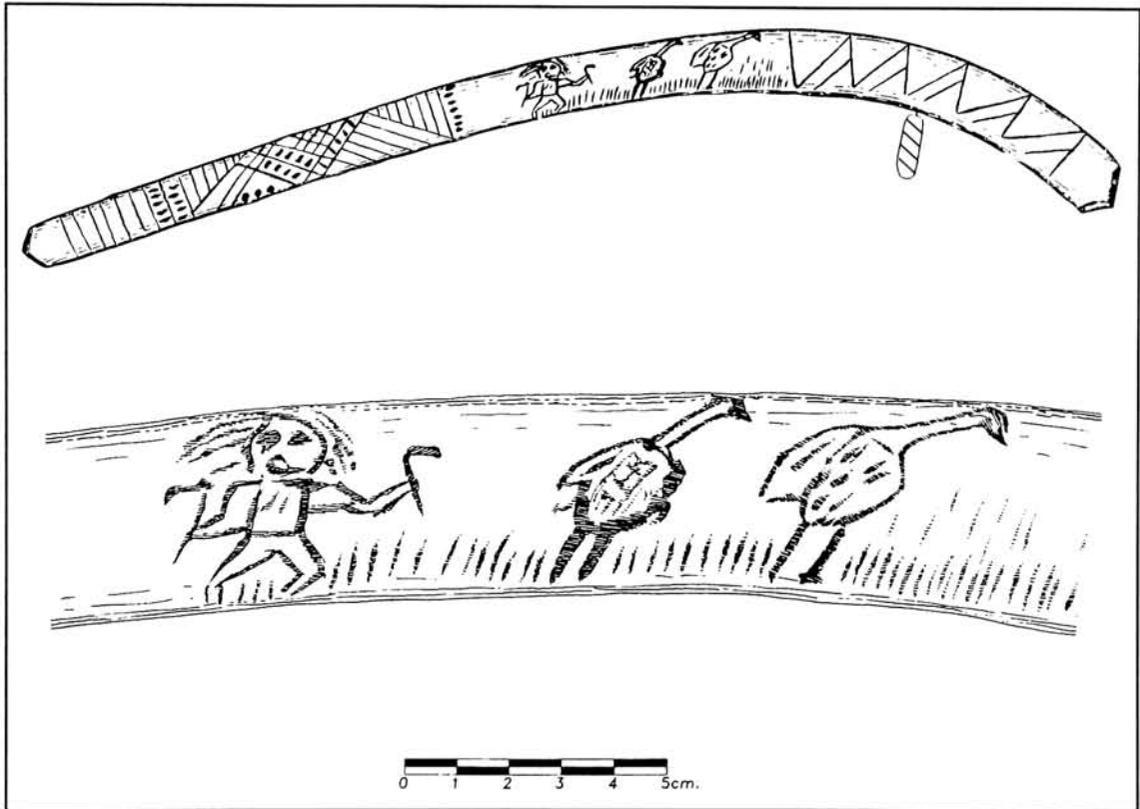


Fig. 6. Luiseno rabbit stick with pyrographic artwork depicting hunter with two weapons stalking two birds. (Courtesy of the San Diego Museum of Man.) (Scale refers to inset of artwork; full length of rabbit stick is 71.4 cm.)

low to the ground to intercept rabbits, hares, and other small game (Hoffman 1885:29-30; Aschmann 1959:68; Meigs 1972:36). Overhand, or end-over-end throws, were relatively ineffective (see Allen 1992:33).

The cross section of a curved throwing stick is roughly lenticular (Wray 1983:839), but the weapon may have a slight airfoil shape that would cause lift, thereby counteracting gravitational forces (Walker 1901:340; see also Thomas 1983; Kern 1995:73). Loss of kinetic energy toward the end of a flight causes an elevation drop, and the deviation right or left (right-handed throw and left-handed throw, respectively) occurs as a function of the proportionally greater decrease in rotational speed against speed of forward propulsion (Bahn 1995:562). The

reader interested in engineering the perfect straight-on boomerang is referred especially to the *Bulletin of Primitive Technology* (e.g., Allen 1992; Anonymous 1992; Callahan 1992; Foresi 1992; Rieser 1992; Kern 1995).

Costansó noted that throwing sticks flew farther than a thrown rock (Brandes 1970:86). With rotating wings generating lift to extend flight, curved killing sticks also have greater range than spears or clubs (Wray 1983:839; Bahn 1987:388; Rieser 1987:35). Costansó further marveled at the accuracy of the technology (see also Meigs 1972:36). Since a rabbit stick cuts an approximately one-meter swath per single rotation as it flies forward, the hunter is afforded great latitude in aim compared to hurling a spear or rock (Rieser 1987:35-36). Increasing

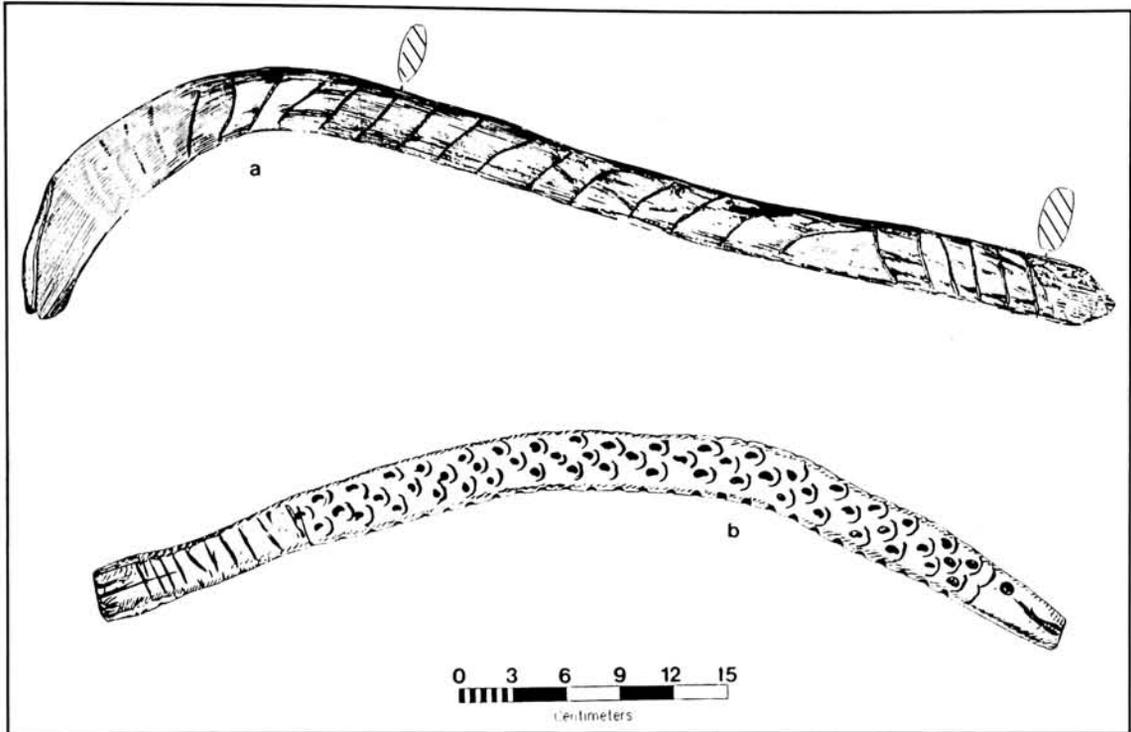


Fig. 7. Curved throwing sticks decorated to represent snakes: (a) Luiseño, Cupeño, or Diegueño stick collected by Charles Lummis (courtesy of the Southwest Museum, Los Angeles); (b) Gabrielino rabbit stick (courtesy of the Natural History Museum of Los Angeles County).

the range of rocks, spears, or clubs, which lack the lift of nonreturn boomerangs, necessitates aiming these projectiles high and throwing with great force, a formula for reducing accuracy. The alternative would be for the hunter to approach quarry closely, a difficult achievement where the landscape affords little or no concealment (Rieser 1987:35-36). Thus, curved throwing sticks are comparatively effective especially in open or semidesert terrain (Callahan 1992:25; see also Meigs 1939:29).

In some areas, bushes and high grass that would impede the flight of curved killing sticks might be opened up with fire. Crespi reported that the Portolá expedition in Luiseño country encountered "some mesas covered with dry grass, in parts burned by the heathen for the purpose of hunting hares and rabbits . . ." (Bolton 1971:132). Where plant cover was com-

paratively dense, advantage probably went to the bow and arrow over the rabbit stick for reasons paralleling those proposed in King's (1989:8-9) comparison of atlatl weaponry against bow and arrow technology. Using bows, hunters can minimize their movement, allowing arrows to be shot from concealment and from a number of positions. Mixed country, open in some places but brushy and grassy elsewhere, might encourage a hunter to carry both kinds of weapons. Sparkman (1908:198) believed that Luiseño rabbit hunters transported the bow and arrow and the curved killing stick at the same time in preparation for either game standing still or quarry that was moving. Figure 11 records Hopi hunters from Oraibi in pursuit of quarry with bows and arrows as well as rabbit sticks.

Curved throwing sticks usually disable or kill prey by blunt trauma, their spinning wings gen-

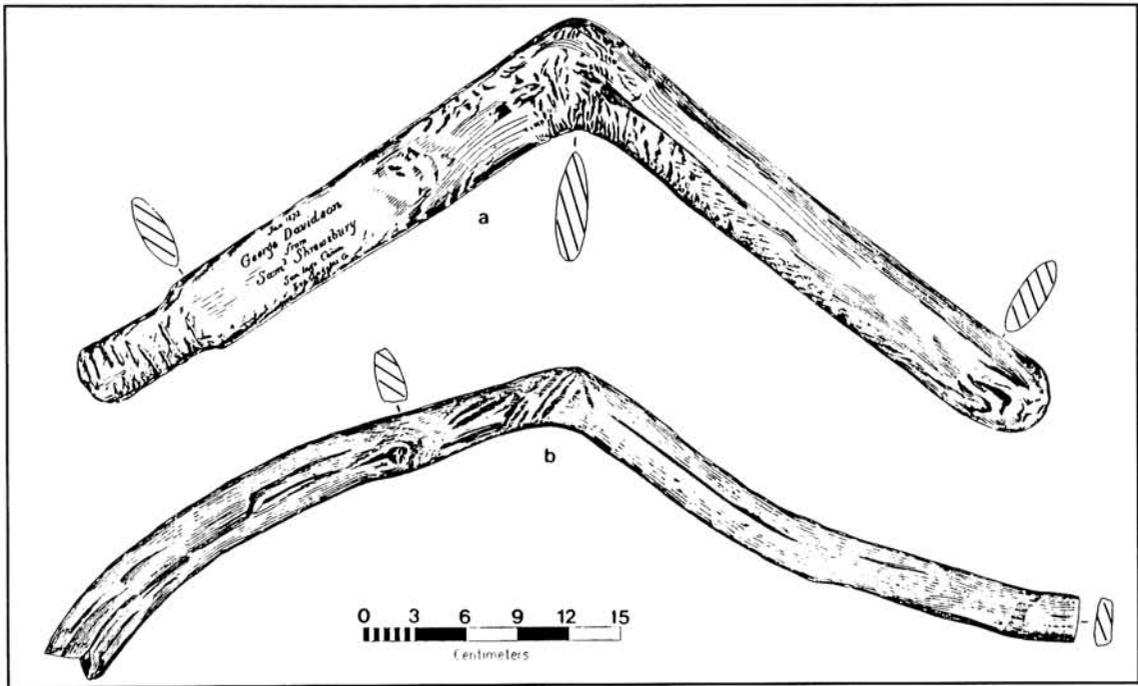


Fig. 8. Unusual shaped curved throwing sticks: (a) Gabrielino nonreturn throwing stick found in Santiago Canyon (present-day Orange County) in 1872 (courtesy of the Phoebe Hearst Museum of Anthropology, University of California, Berkeley); (b) Luiseño nonreturn throwing stick collected by Philip Steadman Sparkman (courtesy of the Southwest Museum, Los Angeles).

erally producing more impact damage to crush bones than the forward velocity of the weapon (Callahan 1992:25). Some weapons employed a sharp inner, or forward, edge that cut like a knife (Meigs 1939:29; Aschmann 1959:68). Fages (1844:163-164) reported that an edge might be inset with sharp flints, although for this study no specimen was encountered that indicated this design in any museum or private collection. Parenthetically, Hattori and Tuohy (1988) suggested that crescents may have been hafted as side blades on nonreturn boomerangs.

PERFORATED DISCS

In island and coastal southern California archaeology, crudely circular, biconically drilled discs (usually siltstone, rarely sandstone, never ceramic) are labeled "spindle whorls" (Fig. 12) (e.g., Jones 1956:233; Ross 1970:52-53, 68-69;

Koerper and Drover 1983:24-25; Cottrell and Del Chario 1984:45; Barter 1991:75-76), yet all of Harrington's (1942:25) Salinan, Chumash, Kitanemuk, Fernandño, and Gabrielino informants denied that spindle whorls were used to make cordage. The "spindle whorl" label derives only from superficial resemblances to whorls attaching to spindles found elsewhere and employed to form and twist yarn or cordage in hand spinning. In the Southwest, true spindle whorls (generally ceramic) are modeled with careful attention to symmetry (e.g., Di Peso 1979:98; Roessel 1983:594).

Another class of objects, which are basically circular, edge-ground, and biconically drilled potsherds (rarely nonceramic, but see Schwartz et al. [1979:74]), are labeled possible spindle whorls (e.g., Martin et al. 1949:178-179; Gladwin et al. 1975:243; Haury 1978:252, 269), or,

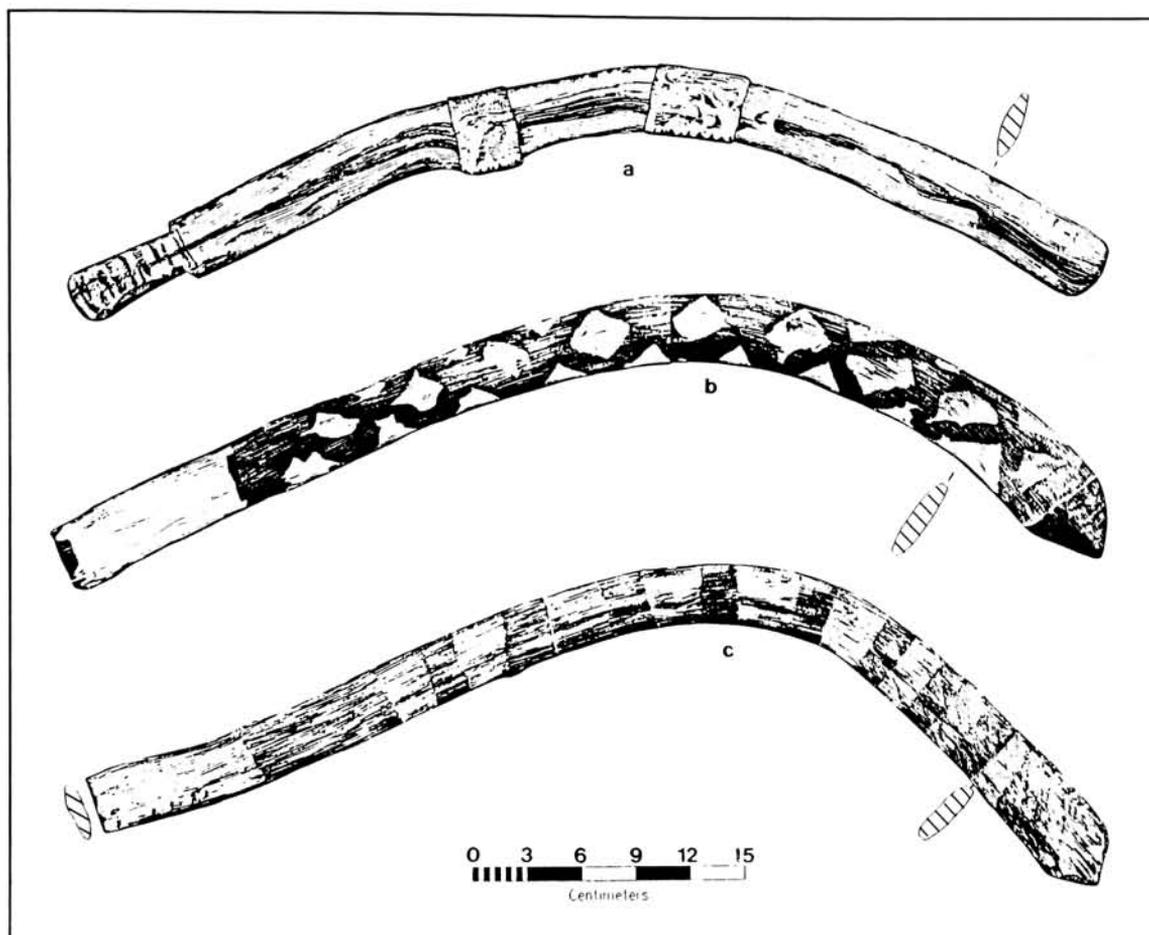


Fig. 9. Curved throwing sticks: (a) Hopi (Shungopovi) stick used by Ned Lomayestewa; note leather strapping to repair split wood (courtesy of the San Diego Museum of Man); (b) Luiseño (courtesy of the San Diego Museum of Man); (c) Diegueño stick collected by Dr. L. A. Wright (courtesy of the Southwest Museum, Los Angeles).

more cautiously, “perforated discs” (Haury 1978:252, 269). Speculation abounds as to their use, and of special note is a report that one perforated sherd disc (Sinagua culture) was recovered strung on a thong held in place by a knot (McGregor 1965:381). Perforated ceramic discs were employed in a Pima guessing game (Russell 1908:177-178) and a Zuni board game (Culin 1907:799-800). They have also been used as lids for ceramic jars (Bayman et al. 1996:133-134). Perforated discs with either an off-center hole (Haury 1978:252) or eccentrically placed

perforations (Gladwin et al. 1975:243) are probably not spindle whorls.

It has been proposed that the siltstone and sandstone spindle whorls from coastal southern California sites might serve as Late Prehistoric Period time markers (see Chace 1974:108). They are, however, encountered in early Milling Stone Horizon contexts as at CA-Ora-64 (Drover et al. 1983:10), and at CA-Ora-119-A they seem to appear in Intermediate and possibly Late Prehistoric period levels (Koerper and Drover 1983:25). Twenty-two “spindle whorls” were recov-

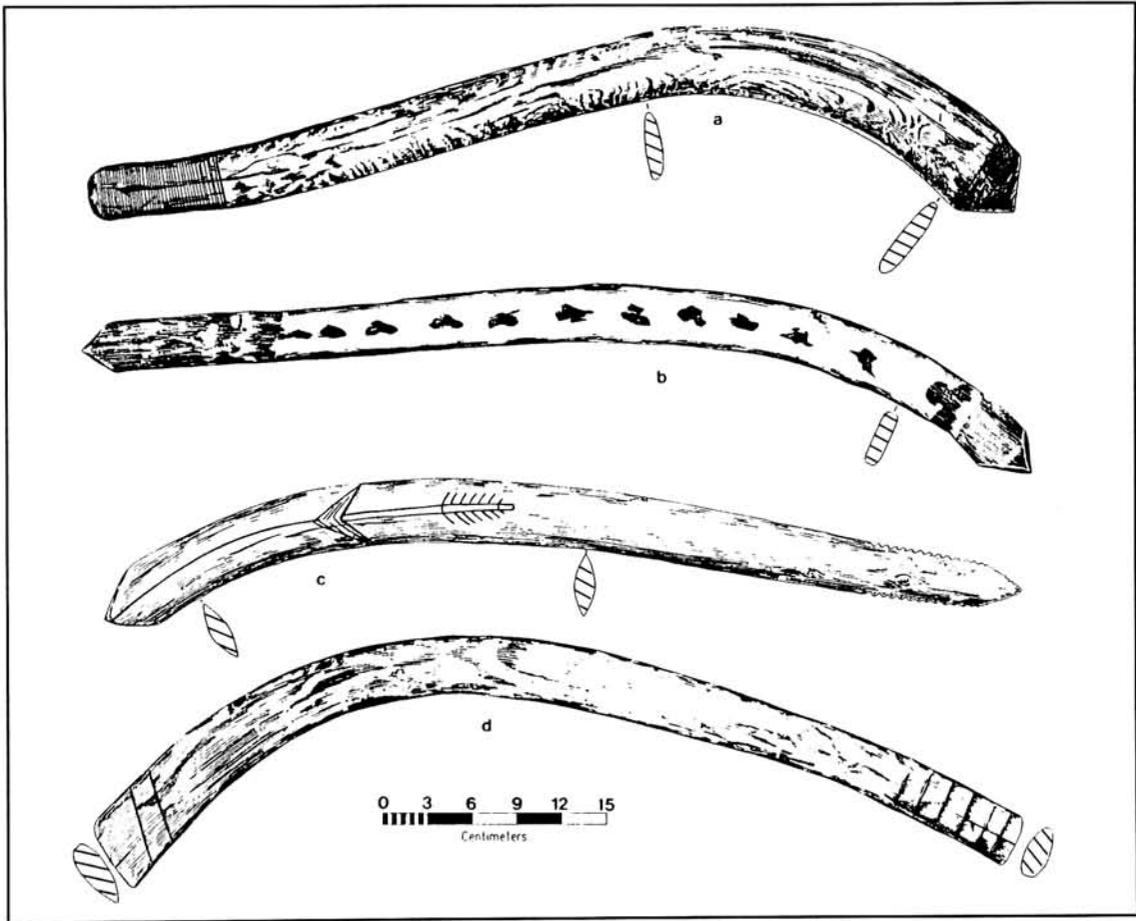


Fig. 10. Curved throwing sticks: (a) Gabrielino, discovered in Santiago Canyon, Orange County, in 1872 (courtesy of the Phoebe Hearst Museum of Anthropology, University of California, Berkeley); (b) Diegueño (courtesy of the San Diego Museum of Man); (c-d) Unknown (courtesy of the Santa Ysabel Indian Museum, Mission Santa Ysabel, San Diego County).

ered at CA-Ora-378, some of them uniconically drilled (Koerper 1995). The greater part of the occupation at CA-Ora-378 occurred during the Intermediate and early Late Prehistoric periods.

It has been assumed that this artifact type, with its low quality of workmanship, often irregular outline, and low-quality material, disqualified it for consideration as ornamental (Koerper and Drover 1983:24-25). If they are flywheels for drill shafts, as has been proposed (Koerper and Drover 1983:25; Drover et al. 1983:10), why the choice of such a light materi-

al? Given their relative softness, it seems that had they been hafted firmly to a shaft, the initial perforation would approximate a straight drilled appearance, but no such tell-tale attribute has been observed. Lacking the tight fit of a straight drilled disc, some sort of adhesive would be necessary to hold flywheels in place, but the prehistoric adhesive of choice along the coast, asphaltum, was never detected on any "spindle whorl" examined by the author. The hole was most probably threaded, not hafted.

The same line of reasoning argues against the



Fig. 11. Hunters from Oraibi, circa 1900, with bows and arrows and rabbit sticks, Sumner W. Matteson, photographer. (Courtesy of the Milwaukee Public Museum.)

disc as a toy top (see Culin 1907:735-748), although some ceramic disc tops in the Southwest (Drucker 1941:130, 193), Great Basin (Stewart 1942:291), and Baja California (Meigs 1939:43) were fashioned out of potsherds. “Buzzes,” a kind of whirling toy, which have been documented as such, are shown with two holes, although a disc with a single hole can be made to perform as a “buzz” (Culin 1907:751-756; see also Oxendine 1988:126-127).

The discs are not shaped like any illustrated trigger for a snare (e.g., Hudson 1976; Hudson and Blackburn 1979) and, on the basis of form and size, appear too unwieldy to be release mechanisms. The closest analogue to the so-called siltstone and sandstone “spindle whorls”

are the perforated disc accoutrements to the probable game string from Borrego Valley.

EXPERIMENTAL ARCHAEOLOGY

No evidence indicates that the Borrego Valley string ever fastened directly to the rabbit stick. The condition of the string reveals only that it had wound tightly against the weapon. If the cordage at one time was secured to the weapon, it is possible that the string and disc combination served in one of two ways as an adjunct to curved throwing stick technology.

The first hypothesis proposes that the discs had a bola-like function, perhaps to entangle small game, impeding their escape or making direction of flight easy to follow as the weapon

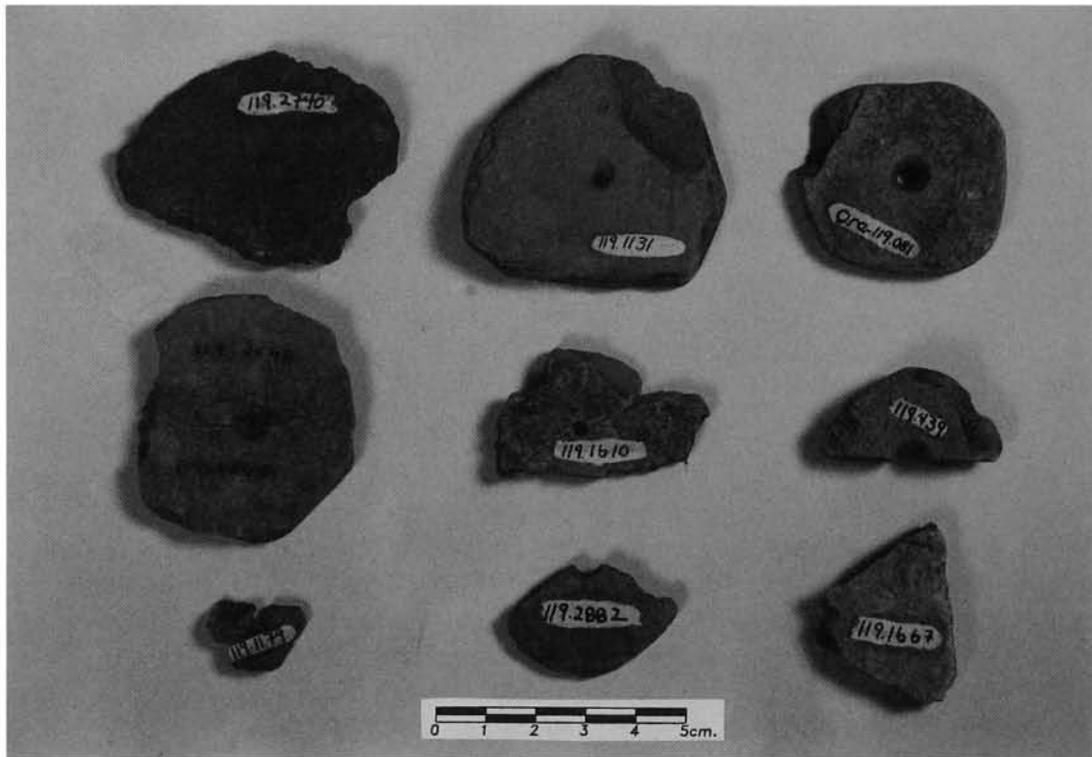


Fig. 12. "Spindle whorls" recovered from CA-Ora-119-A.

dragged behind the animal. In the second hypothesis, the suggested function of the "bolas" is that they caused entanglement of the string on surfaces of brush, preventing a rabbit stick from penetrating into dense growth where it would be lost from sight. If the cordage had never actually been fastened to the curved throwing stick, the association of these two artifacts and ethnographic/historical descriptions would favor the proposition that the item had functioned as a game string.

In the brief history of experimental archaeology in southern California, there have been studies of material culture relating to food procurement, including fishhooks (Hoover 1973:6), watercraft (e.g., Erlandson and Ringer [MS] [as cited in Hudson and Blackburn 1979:332-333]), and stone projectiles (e.g., Schroth 1994). Curved throwing sticks and game strings are now added to the list.

Experimental archaeology was employed to gain insights bearing on the above hypotheses. Over 25 curved throwing sticks were replicated using high quality oak, duplicating the morphologies of a variety of museum specimens (shown in Figs. 6, 7a, 8a, 9, and 10). The Borrego Valley specimen (Fig. 1) also served as a model for reproductions. The major concession with regard to accuracy of manufacture was that wood grain never followed the curve of any stick, thereby imparting a structural weakness to the rabbit stick but having no effect on trajectory.

When the sticks were thrown with string and replicated ceramic discs attached, centrifugal forces pulled the string outward from the center of rotation, but once a stationary target was intercepted, discs and string did not effectively wrap or entangle the simulated prey. Further, bolas adversely impacted the projectiles' trajectory, invariably causing the weapon to twist

along its long axis. With the flat upper and lower surfaces nonparallel to the plane of rotation, the stick flutters, often flipping face-over-face and crashing well short of the target. Whether the "bolas" were hand held or allowed to dangle freely, the attachment became an awkward distraction when the weapon was launched. Besides, in practiced hands, rabbit sticks thrown without the experimental cordage and discs performed accurately, obviating the need for any adjunct technology. Indeed, the attachment seemed to provide some protection against loss when the hunting tool was hurled into stands of brush, but hardly enough protection to counterbalance the negative consequences for the throwing action when string and discs were attached.

When experimental cordage and discs were used to secure simulated prey (e.g., stuffed toy animals), a probable function of the discs was revealed. Ceramic discs do provide a surface against which string can be hitched around itself and drawn taut, eliminating the need to knot the string to hold objects in place. Because the discs can move freely along the string, quick adjustments are possible to accommodate the addition of subsequently dispatched prey.

SUMMARY AND CONCLUDING REMARKS

Meighan (1959:28-29) believed the Borrego sector to be the most intensely looted area of California. Documenting the Borrego Valley rabbit stick and probable game string salvages some benefit from the adverse consequences of relic hunting in that region. In addition, the description of this specimen reinforces what is already known about the spatial distribution and morphology of the weapon type. Finally, the experimental archaeology discussed herein, coupled with ethnohistoric and ethnographic observations, allows for the reasonable inference that the cordage with strung ceramic discs found with the throwing stick functioned for the transport of small game animals.

From coastal southern California, perforated siltstone/sandstone discs of roughly similar dimensions to those of the Borrego Valley specimens, most of them biconically drilled, have occasioned speculation regarding function, as have similar artifacts from Ventura County (Leonard 1966:228) and Monterey County (Pohorecky 1976:16, 48), as well as from the Southwest (e.g., Martin et al. 1949:178-179; Gladwin et al. 1975:243; Haury 1978:252, 269). A close analogue is provided by the discs on what is herein identified as a game string, an observation with implications for interpretations of prehistoric procurement behavior.

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Middle Holocene Ceramic Technology on the Southern California Coast: New Evidence from Little Harbor, Santa Catalina Island

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A recently discovered collection of fired clay artifacts from the Little Harbor Site (CA-SCAI-17) on Santa Catalina Island establishes that an indigenous ceramic craft had developed on the Channel Islands of Southern California by hunter-gatherer-fishers during the Middle Holocene, possibly as early as 5,000 years ago. This predates any influence from the Southwest and is coeval with the earliest ceramics discovered in the western hemisphere. The Little Harbor fired clay objects

appear to be associated with a similar ceramic technology that is being revealed at some Southern California mainland coastal sites, especially in Orange and Riverside counties to the east. If so, the Little Harbor collection of fired clay artifacts supports the idea of a dynamic Middle Holocene socioeconomic interaction sphere connecting the southern Channel Islands and the mainland.

EARLY ceramic technology has evoked little attention from archaeologists working in coastal southern California. Ceramic artifacts occur with low frequency in this area, and many of those recovered in the past lacked reliable provenience or chronological context. California archaeology has also been constrained by the belief that ceramic technology was a Late Prehistoric Period development in California, diffused from Southwestern cultures primarily associated with sedentary lifestyles or incipient agriculture requiring storage vessels and pots (Rogers 1936; Meighan 1954; Shepard 1971; Dillon 1993).

A newly discovered collection of fired clay artifacts from the Little Harbor site (CA-SCAI-17) on Santa Catalina Island (Fig. 1) establishes that an indigenous ceramic craft was developed on the western margin of southern California by hunter-gatherer-fishers during the Middle Holocene, possibly as early as 5,000 years before present (B.P.). This predates any influence from the Southwest and is coeval with the earliest ceramics found in the western hemisphere (Rice 1987:7, 20). The Little Harbor fired clay objects appear to be linked to a similar (and possibly older) ceramic technology coming to light at some southern California mainland coastal sites, especially in Orange and Riverside counties directly east of Santa Catalina Island. If this is accurate, the Little Harbor collection of fired clay artifacts supports the concept of a dynamic Middle Holocene socioeconomic interaction sphere connecting the southern Channel Islands and the mainland.