

Inferences Regarding Aboriginal Hunting Behavior in the Saline Valley, Inyo County, California

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THE documented use of stone "hunting blinds" behind which marksmen hid themselves "*ventre à terre*"¹ (Baillie-Grohman 1884: 168) waiting for sheep to be driven along trails, can be found in the writings of a number of early historians (Baillie-Grohman 1884; Spears 1892; Muir 1901; Bailey 1940). Recent archaeological discoveries of rock features believed to be hunting blinds at the Upper Warm Springs (Fig. 1) in Saline Valley, Inyo County, California, provide a basis to substantiate, build upon, and evaluate these observations and the ethnographic descriptions of hunting in the Great Basin (Steward 1933, 1938, 1941; Driver 1937; Voegelin 1938; Stewart 1941). An examination of these features, their location, orientation, and associations in conjunction with ethological attributes, strongly support the notion of a hunting function, and the argument is made that Desert Bighorn Sheep (*Ovis canadensis nelsoni*) were the primary target of this activity with perhaps a secondary emphasis on hunting of Pronghorn Antelope (*Antilocapra americana*).

Perhaps the earliest mention of hunting blinds in western North America, was made by

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a member of the 1861 Boundary Survey Party reconnoitering the Death Valley region. The chronicler observed:

... curious structures ... on the tops of round bald hills, a short distance to the northwest of the springs, being low walls of loose stones curved in the shape of a demilune, about ten feet in length and about three feet high ... There were twenty or thirty of them [Woodward 1961:49].

This paper discusses a series of 60 such piled-up boulder features recorded within a 1 km.² area at Upper Warm Springs (Fig. 2).

The same chronicler offered some tentative explanations as to their function:

... we took [them] to be graves, but which, as they face in one direction—that is to the northwest—were probably intended as lodging places to break the force of the violent prevailing winds; but why they should resort to the tops of these hills, and neglect the shelter of the numerous caverns and rocky crevices, is inexplicable. It may be that the bottoms have been subjected to deluges, and that it is to provide shelter during these overflows that the hills are chosen for the erection of these small parapets of stone; but the greatest probability is

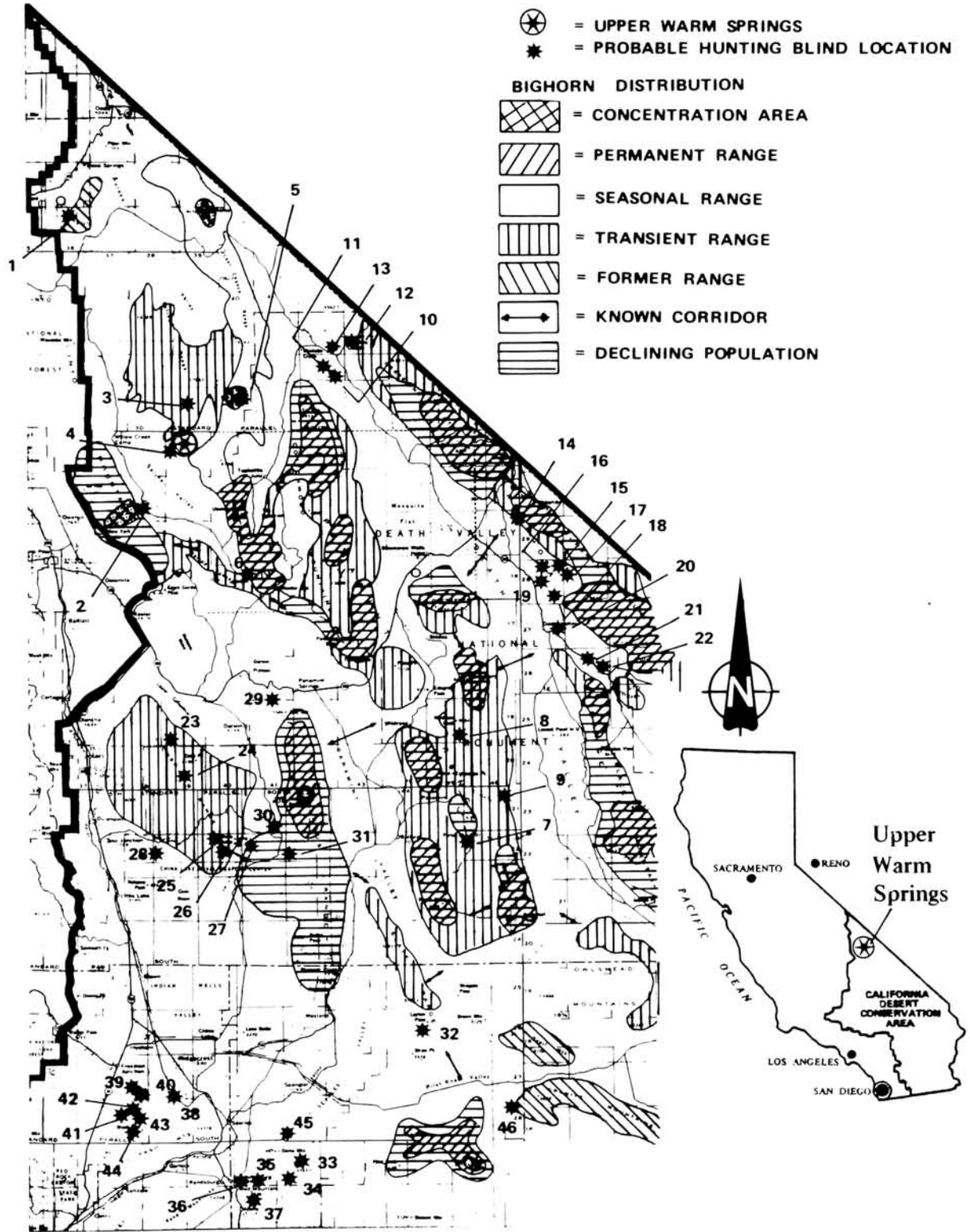


Fig. 1. Distribution of Hunting Blinds in the Southwest Great Basin (California) and Historic Bighorn Sheep Range.

that they are connected with some of their religious observances [Woodward 1961:49].

In another instance, Spears (1892:73) reported that prospectors watched the Indians construct these rock features with a great deal of apprehension. They jumped to the conclusion that the Indians were building forts to protect their mines of fabulous wealth and were preparing to attack the White travelers. Clearly, then, a good deal of lore and mystique surrounded the earliest accounts of these features.

THE LOCAL ENVIRONMENT

Saline Valley is situated in the southwestern Great Basin in east-central California. It is bounded by the Inyo Mountains on the west, the Panamint Range on the east, the Saline Range on the north, and the Nelson Range on the south. Upper Warm Springs is located along the corridor connecting the northeastern extension of Saline Valley to the southern end of Eureka Valley. Low hills, forming part of the Saline Range, partially surround the study area on the west, north, and northeast. These hills are bisected by a wash opening on a broad alluvial fan. A low-lying, north-south ridge parallels this wash, terminating at two hillocks referred to as "Arrow Makers Knoll" (Baldwin 1931). This ridge separates the broad alluvial fan on the east from the mounded deposits of salts formed by discharging hot springs on the west. Three springs are west of the ridge and an equal number lie to the east (Fig. 1). The southern foothills of the Saline Range, adjacent to Upper Warm Springs, are characterized by Pleistocene volcanic basalts adjoining Paleozoic limestone deposits.

The study area is dominated by Creosote Bush (*Larrea tridentata*), Burro-Weed (*Ambrosia dumosa*), Desert Holly (*Atriplex hymenelytra*), with minor quantities of Screwbean Mesquite (*Prosopis pubescens*), Honey Mesquite (*P. glandulosa*), cottonwood (*Populus* sp.), various cacti, and other desert plants.

DESCRIPTION OF FEATURES

The stone features around the Upper Warm Springs were placed along low rock escarpments, rocky crags and eminences, and even on the alluvial fan. Some are found on gentle rises above the springs or in the open areas surrounding them. Architecturally, the features are simple, consisting of basalt boulders or natural blocks of travertine piled two or three courses high (Fig. 3). The rock features are constructed in circular, semi-circular, and horseshoe-shaped alignments, and rectilinear and curvilinear arrangements, oftentimes incorporating stone outcrops (Fig. 4). The 60 recorded features range from 60 cm. to 4.2 m. across (maximum interplanar dimension) ($\bar{X} = 1.75$ m., $S = 78$ cm.), and from 25 cm. to 1.2 m. in maximum height ($\bar{X} = 60$ cm., $S = 19$ cm.). Two multiple rock features are characterized by small, contiguous "hollowed out" spaces that could be manned by more than one hunter (Fig. 2, 1a-c, 13a-d). At least three solitary features are also large enough to have concealed more than one individual.

Data on location differentiate the rock features and assist in determining the relation of the stone structures to the other archaeological sites present. Many of the stone features are positioned in ways that seem to maximize use of natural landforms for purposes of concealment or as vantage points. For example, there are features located on alluvial fans where cobble/boulder "alignments" due to hydraulic flow are common, the latter serving to conceal the man-made features located in their midst. Stone features located on bluffs or prominent hills afford a commanding view of the lowland areas. These latter features appear designed to monitor movements in the flats, particularly where they overlook the water sources.

Most of the 60 rock features overlook or adjoin existing game trails (Fig. 2). The distance of these features from recognized game

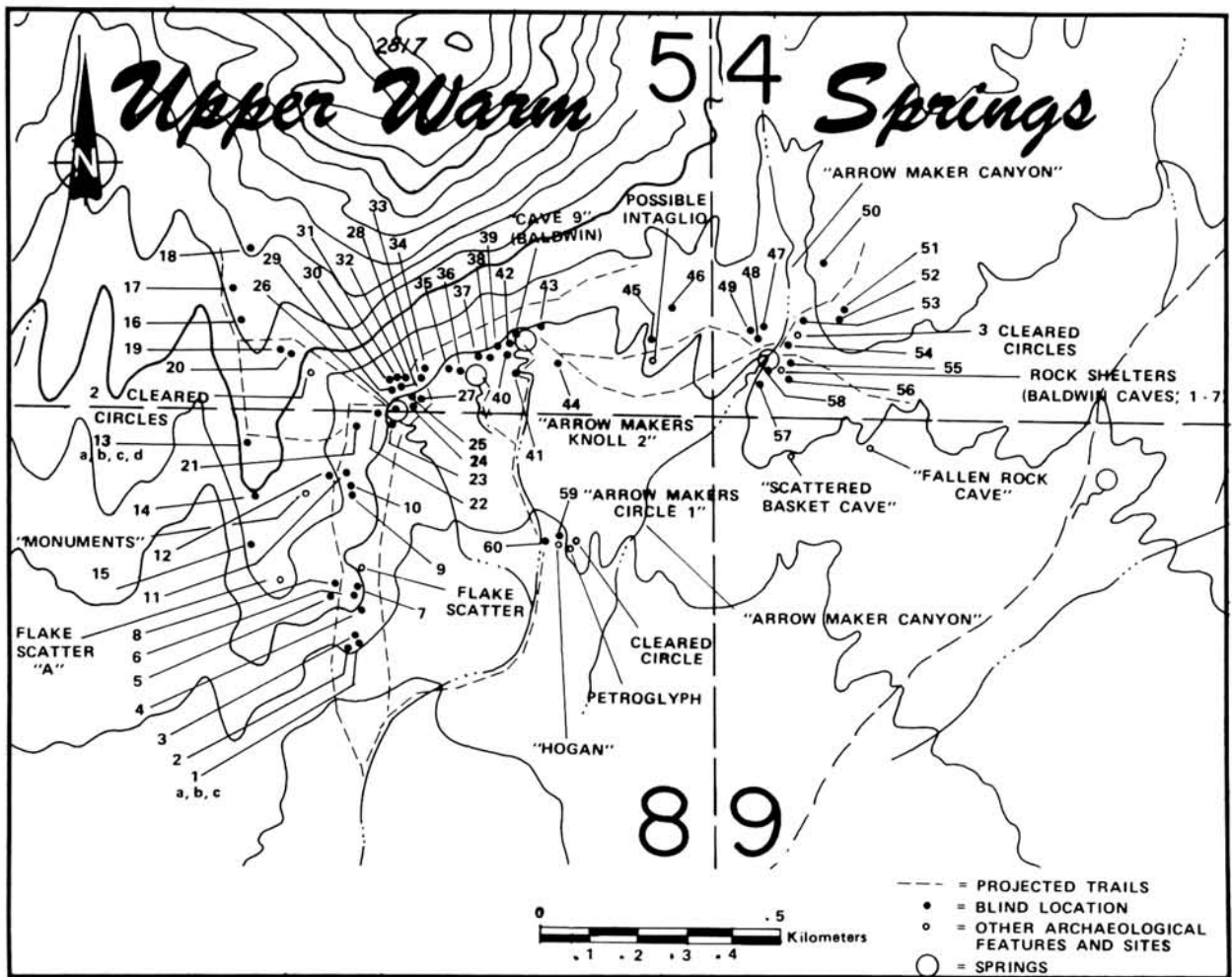


Fig. 2. Distribution of Hunting Blinds, Trails and Other Features. Upper Warm Springs, Saline Valley, Inyo County, California.

trails varies from several meters to 130 m., with a majority located within 20 m. of modern trails. The springs are currently used by some of the approximately 350 feral burros that roam the floor of the Saline Valley (Savercool 1977). There is some indication that other trails were used by game in the past. Along the base of the hills on the west side of the study area and on the ridge above, faint paths are present that may represent abandoned game trails. One of these faint paths, which was traced, passes directly alongside four stone features not in direct association with any existing game trails.

There is a question of the degree of correspondence between modern game trails and aboriginal/historic ones. The modern game trails possibly vary in number and exact location from the aboriginal/historic ones, but judging from the deposits of travertine, the springs have been present at least since the advent of the Holocene, and game animals have certainly frequented the spot for a very long time.

Spatial distribution is important as a means of assessing the probable function of the rock features. Two observations are particularly relevant. First, although distance between



Fig. 3. Horseshoe-shaped hunting feature (number 44) constructed of blocks of travertine. Upper Warm Springs, Saline Valley, Inyo County, California.

individual structures varies from a few to several hundred meters, the rock structures closest to the springs tend to be more clustered. Second, there appears to be a direct correlation between the distance of features from existing game trails relative to their distance from springs. In other words, the greater the distance of a given feature from the nearest spring (as measured along a trail), the farther that structure tends to be from the trail (as measured to its nearest point). This supports the notion of disparate functions for rock structures situated at various distances from springs. One possibility is that the features farthest from the springs (and therefore farthest from the trails), are observational/signaling stations, while those closest to the springs (and therefore

closest to the trails) are the actual ambush locations. The features that would most likely have functioned as observational/signaling stations are those on Fig. 2 numbered 1, 7, 10, 13 a-d, 18, 50, 51 and 52. An alternate explanation for the features farthest from the springs is that they were also ambush locations situated to help ensure killing an animal even if a herd was alarmed before it reached the watering spot. The Indians would certainly have been very familiar with the habits of the animals they were hunting and would have located their hunting facilities accordingly.

The orientation of the stone features is also relevant for determining their function. Where openings are present, they are oriented so they face away from the nearest game trail. They

appear to be designed to conceal the hunter from game either approaching or leaving the springs, although there are one or two exceptions. The latter may have been oriented with respect to trails no longer visible.

ASSOCIATED ARTIFACTS AND FEATURES

The only artifacts found in direct association or within 10 m. of the rock features were debitage (stone flakes), a few cores, a hammerstone, some bifacially and unifacially flaked tools (including projectile points and possible knives), a glass trade bead, and a possible "spirit stick." The only associated features include a single grinding slick near one of the boulder structures (Fig. 2, 2) and an incipient

slick near another (Fig. 2, 4).

Where debitage was observed, it generally consisted of retouch flakes of chalcedony, chert, and obsidian. Its significance is most likely that of "... demonstrating that waiting huntsmen often whiled away the hours fashioning arrowpoints and other stone tools" (Wallace 1976:152). Heizer and Baumhoff (1962:43) note a similar paucity of remains at such sites in Nevada.

The diagnostic artifacts (Table 1) recovered from the Upper Warm Springs features include 13 projectile points (Figs. 5, 6) and one white, opaque glass trade bead (Fig. 6). The possible temporal range represented is *ca.* 4000 B.C. to the historic period, but all the time-diagnostic artifacts except one post-date *ca.* 1200 B.C. (Bettinger and Taylor 1974). The glass bead



Fig. 4. Hunting feature (number 60) incorporating stone outcrop. Upper Warm Springs, Saline Valley, Inyo County, California.

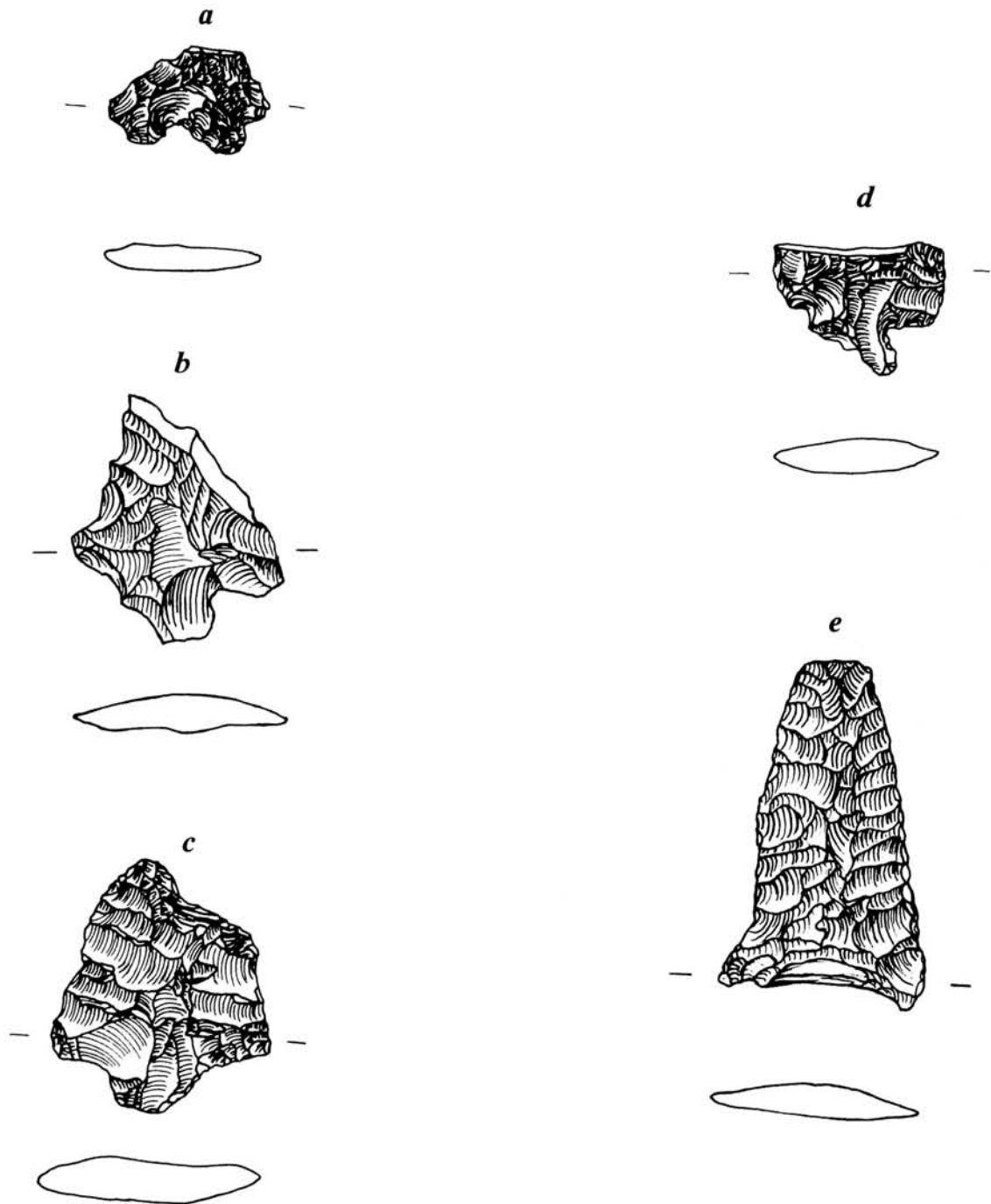


Fig. 5. Projectile points associated with Upper Warm Springs, a, "Pinto"; b-c, Elko Contracting Stem; d, Elko Eared; e, Elko Series. All points drawn actual size (see accompanying table).

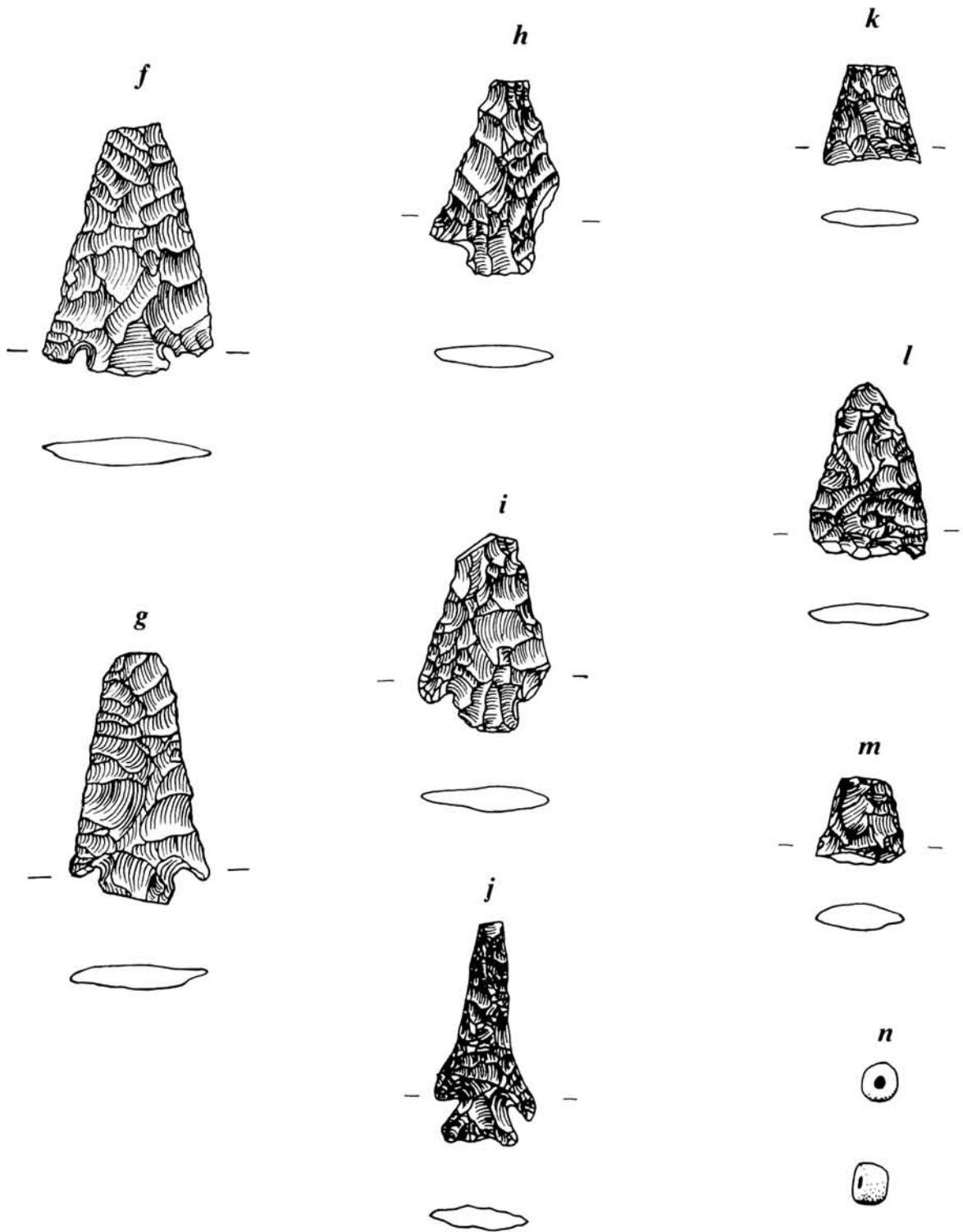


Fig. 6. Projectile points and bead associated with Upper Warm Springs. f-g, Eastgate Expanding Stem; h-i, Rose Spring Corner-notched; j, Rose Spring/ Eastgate Series; k, Cottonwood Triangular; l-m, Cottonwood Series; n, glass bead. All artifacts drawn actual size (see accompanying table).

Table 1
TEMPORAL INDICATORS

Fig. Reference	Association	Distance/Direction From Nearest Rock Feature	Diagnostic Artifact Type	Material	Time Period	Dates ^a
Fig. 5, a	Flake Scatter "A"	—	"Pinto"	Obsidian	Little Lake	4000-1200 B.C.
Fig. 5, b	RF ^b 32	10 m. NNE	Elko Contracting Stem	Chert	Newberry	1200 B.C.-A.D. 600
Fig. 5, c	RF 21	4 m. E	Elko Contracting Stem	Chert	Newberry	1200 B.C.-A.D. 600
Fig. 5, d	RF 8	26 m. E	Elko Eared	Chert	Newberry	1200 B.C.-A.D. 600
Fig. 5, e	RF 47	112 m. NNW	Elko Series	Obsidian	Newberry	1200 B.C.-A.D. 600
Fig. 6, f	RF 8	13 m. ENE	Eastgate Expanding Stem	Chert	Haiwee	A. D. 600-1300
Fig. 6, g	RF 1	14 m. NW	Eastgate Expanding Stem	Jasper	Haiwee	A. D. 600-1300
Fig. 6, h	RF 38	12 m. WNW	Rose Spring Corner-notched	Obsidian	Haiwee	A. D. 600-1300
Fig. 6, i	RF 1	—	Rose Spring Corner-notched	Quartzite	Haiwee	A. D. 600-1300
Fig. 6, j	RF 52	100 m. S	Rose Spring/ Eastgate Series	Jasper	Haiwee	A. D. 600-1300
Fig. 6, k	RF 28	—	Cottonwood Triangular	Chert	Marana	A. D. 1300-historic
Fig. 6, l	RF 21	40 m. E	Cottonwood Series	Chalcedony	Marana	A. D. 1300-historic
Fig. 6, m	RF 32	2 m. N	Cottonwood Series	Jasper	Marana	A. D. 1300-historic
Fig. 6, n	RF 49	—	Bead	White, opaque glass	—	ca. A. D. 1850 ^c

^a Dates from Bettinger and Taylor (1974)

^b Rock Feature

^c Date from Hunt (1960)

was the only artifact found at one rock structure (Fig. 2, 49).

In a slight overhang (Fig. 2, "Cave 9") immediately below one of the rock features (Fig. 2, 42), a stick was discovered with side branches trimmed and dulled and most of the bark missing. It was 61.5 cm. long and 1.8 cm. in diameter, and was wedged into a crevice in the wall. Meighan (1953:175) recorded similar features in the Coville Rock Shelter, approximately 22 km. southeast of the Upper Warm Springs. Meighan cites Campbell (1931) who also found such items. Campbell claims that these sticks were "spirit protectors" or taboo signs to guard the cave against robbery. What function the stick served at this site, however, is unclear.

INTER-SITE PATTERNING

An important consideration is the relation of the rock features to the other sites in the general area.

Three loci have been identified at the Upper Warm Springs that were probably seasonally occupied habitation sites based on the presence of midden, surface artifacts, and/or structural features. All are located to the east and southeast of "Arrow Makers Canyon" (Baldwin 1931). Not only are the habitation sites situated slightly away from the two nearest springs, but these springs are peripheral to the main concentration of rock emplacements taking all of them into account. It appears that the aboriginal inhabitants intentionally minimized domestic activity around the three western springs. A possible explanation is that in order to avoid alarming game that came to water and feed at the springs, habitation sites were situated at a "safe" distance. Coombs (1979:7), for instance, found that the highest densities of prehistoric sites in relation to springs in the California Desert occur immediately at the spring or at a distance of 0.6 mile to 1.0 mile away. This bimodal distribution suggests that some springs were used predominantly for

hunting and others for permanent water and vegetable resources. In addition, with a seasonal emphasis on spring-side hunting, habitation would have been possible at the springs during the alternate or non-hunting seasons of the year. Coombs' finding provides support for the idea that the Upper Warm Springs was used primarily for hunting.

A number of cleared circles, that may have been temporary camps, are scattered throughout the area. In all cases they too are located away from the springs.

A number of non-habitation loci are found in close proximity to the rock features. Most are lithic workshops related to tool manufacture. With the exception of a large workshop area at Arrow Makers Knoll, all are small loci. These loci seem randomly distributed with respect to the rock features.

On the western side of the study area, another site associated with the rock features is composed of small rock piles (Fig. 2, "Monuments"). They are in a desert pavement setting and consist of generally fewer than five rocks piled together—as many as 50 piles were noted. Similar occurrences have been reported elsewhere in Saline Valley: 16 km. southwest of the Upper Warm Springs, at Hunter Canyon (Crowley 1980) and 1.5 km. north of Upper Warm Springs (Baldwin 1931). The significance of these rock clusters and their association with proposed hunting features is unknown.

An apparent intaglio is located within 40 m. of a rock feature (Fig. 2). A single petroglyph (56 cm. X 36 cm.) was found 30 m. east of Arrow Makers Knoll on a dolomite boulder. A highly stylized design has been pecked through a light brown (not desert varnished) surface. Highly varnished surfaces suitable for petroglyph manufacture are present on the hill marking the western boundary of the study area. The virtual absence of petroglyphs in the study area is thus noteworthy and will be discussed later.

The only evidence of historic habitation is

a rock slab and earth covered circular domed structure with vestibule that outwardly resembles a Navajo hogan. Baldwin makes no mention of this feature in his 1931 manuscript. He did document the archaeological remains at Arrow Makers Knoll adjacent to which this "hogan" is situated, and a post-1931 date seems reasonable. It is conceivable that the structure was built and occupied by remnant Shoshone people.

COMPARATIVE DATA

The crude stone structures referred to in the literature as hunting blinds have a wide distribution in the southwest Great Basin (Fig. 1; Table 2). Many such features have been recorded in Death Valley National Monument, mostly by William J. Wallace (1968*a, b*; 1973; 1976; 1977). His 1976 article is especially useful since it describes these features in detail and references the earliest accounts of them. Other published accounts of hunting blinds from Death Valley include Hunt (1960), who reports 29 sites, and Craib (1978), who accounts for 17 additional stone features. Isolated blinds are also reported for Death Valley (Wallace and Taylor 1955; Wallace 1968*b*). The Bureau of Land Management's Desert Planning Staff documented the existence of numerous additional hunting blind locations in the southwest Great Basin. In the Saline Valley, Crowley (1980) recorded eight blinds at Hunter Canyon, and one more 8 km. north of the Upper Warm Springs. The Hunter Canyon rock features are located adjacent to many bighorn sheep petroglyphs and provide the best associational evidence that sheep were hunted in Saline Valley. A probable hunting feature was also noted (Crowley 1980) by a spring near Grapevine Canyon at the south end of Saline Valley.

Small rock-piled circular enclosures have been observed at the entrances to narrow gorges and on the rocky crags of Coso and

Silver peaks in the Coso Range of Inyo County (Grant, Baird, and Pringle 1968). These were interpreted as mountain sheep hunting blinds, an interpretation supported not only by location with respect to terrain but also by association of petroglyphs depicting mountain sheep and sheep hunting scenes.

Recent work in the southwest Great Basin has resulted in the documentation of new blind locations (WESTEC Services 1979; Clewlow *et al.* 1980). There are also numerous reports of hunting features from Nevada (Heizer and Baumhoff 1962; Hagerty 1970; Nissen 1974; Thomas 1976). Additional features have been recorded outside the Great Basin, including eastern Wyoming (Renaud 1931), Baja California (Ritter 1977), and the Upper Snake and Salmon River country of Idaho (Butler 1978).

EARLY HISTORIC ACCOUNTS

Some early historians chronicle the hunting of mountain sheep from "specialized rude stone constructions" (Renaud 1931) similar to those described above.

John R. Spears, a reporter for the *New York Sun*, described rock structures in Death Valley and their function in hunting bighorn sheep:

These sheep find their feed on the benches and gulches of the mountain side and, while eating, it is said, they never look upward. But when they are alarmed they fly to the top, and if there is a ridge there, follow it to the highest peak. Having observed this peculiarity, the Paiutes build blinds on the ridgetop runways. They started in during the fall of 1891 to build a number of such blinds on crests overlooking several Death Valley trails. . . . The blinds were in all cases semicircular walls of stone . . . when all preparations were complete, [the Indians] posted their best marksmen in the blinds while the others chased the sheep up to the slaughter [1892:73].

Table 2
HUNTING BLIND LOCATIONS IN THE SOUTHWEST GREAT BASIN (CALIFORNIA)

Fig. 1	Ref. No.	Mountain Range/Location	Reference
		Inyo Mountains	
1		Corral Springs	County Site Files
2		Hunter Canyon	Crowley 1980
		Saline Range	
3		Inyo-1839	BLM Saline Planning Unit
4		Upper Warm Springs	BLM Saline Planning Unit
		Panamint Range	
5		Dry Mountain	BLM Saline Planning Unit
6		Grapevine Canyon	Crowley 1980
7		Mormon Gulch	BLM Panamint Planning Unit
8		Wildrose Canyon (Death Valley)	Wallace and Taylor 1955
9		Quartzite Spring (Death Valley)	Hunt 1960
10		Mesquite Springs (Death Valley)	Wallace 1968 <i>a</i>
11		N. Mesquite Springs (Death Valley)	Wallace 1968 <i>a</i>
		Grapevine Mountains	
12		Scotty's Castle (Death Valley)	County Site Files
13		Grapevine Springs (Death Valley)	Wallace 1968 <i>a</i>
		Funeral Mountains	
14		"Hunting Blind" Springs (Death Valley)	Craib 1978
15		Table Spring (Death Valley)	Hunt 1960
16		W. Table Spring (Death Valley)	County Site Files
17		Scraper Spring (Death Valley)	Hunt 1960
18		Nevares Spring (Death Valley)	Hunt 1960; Wallace 1973
19		NW Nevares Spring (Death Valley)	County Site Files
20		Texas-Travertine Springs (Death Valley)	Hunt 1960
21		W. Navel Spring (Death Valley)	Hunt 1960
22		Navel Spring (Death Valley)	County Site Files
		Coso Range	
23		Upper Centennial Spring	BLM Darwin Planning Unit
24		Coso Peak (China Lake)	Grant, Baird, and Pringle 1968
25		Petroglyph Canyon (China Lake)	Grant, Baird, and Pringle 1968
26		Sheep Canyon (China Lake)	Grant, Baird, and Pringle 1968
27		Renegade Canyon (China Lake)	Grant, Baird, and Pringle 1968
28		S. Sugarloaf Mountain (China Lake)	Clewlow, Wells, and Whitley 1980
		Argus Range	
29		Darwin Falls	BLM Darwin Planning Unit
30		Junction Ranch (China Lake)	Grant, Baird, and Pringle 1968
31		Carricut Lake (China Lake)	Grant, Baird, and Pringle 1968

Table 2 (continued)

Fig. 1	Ref. No.	Mountain Range/Location	Reference
		Slate Range	
32		Early Spring (Mojave "B" Range)	WESTEC Services 1979
		Almond Mountain	
33		SBr-1029	BLM Red Mountain Planning Unit
34		SBr-3113	BLM Red Mountain Planning Unit
		Red Mountain	
35		Squaw Spring	BLM Red Mountain Planning Unit
36		SBr-1059	BLM Red Mountain Planning Unit
37		SBr-1061	BLM Red Mountain Planning Unit
		El Paso Mountains	
38		S. Terese	Tom Chapman, pers. comm. 1980
39		Black Hills #1	Tom Chapman, pers. comm. 1980
40		Black Hills #2	Tom Chapman, pers. comm. 1980
41		Black Hills #3	Tom Chapman, pers. comm. 1980
42		Black Hills #4	Tom Chapman, pers. comm. 1980
43		Black Hills #5	Tom Chapman, pers. comm. 1980
44		Black Mountain	Tom Chapman, pers. comm. 1980
		Lava Mountains	
45		Bedrock Spring	Tom Chapman, pers. comm. 1980
		Granite Mountains	
46		NE, NE Myrick Spring (Fort Irwin)	Carolyn Shepherd, pers. comm. 1980

In the same year Vernon Bailey, a biologist for the U.S. Department of Agriculture's "Death Valley Expedition," noted the presence of hunting blinds in the mountains around Death Valley:

At some of the springs high up on both the Panamint and Funeral mountains old blinds built of stone walls were near enough to water for safe bow and arrow shooting of the mountain sheep when they came to drink. As these sheep, before rifles were brought to bear on them, must have been abundant they were probably the main meat supply of the Indians [Bailey 1940:10].

The historic record is not rich in the description of hunting techniques employed by Native Americans. One of the best descriptions, however, was provided by the naturalist John Muir:

On the tops of nearly every one of the Nevada mountains that I have visited, I found small nestlike enclosures built of stone, in which I afterwards learned, one or more Indians would lie in wait while their companions scoured the ridges below, knowing that the alarmed sheep would surely run to the summit, and when they could be made to approach with the wind they were shot at short range [Muir 1901: 320-321].

Edward Nelson (1922:132) provides a good description of the potentially devastating effects of human predation on bighorn populations in Baja California, probably by modern hunters using rifles:

Mountain sheep are peculiarly endangered . . . owing to their habit of going in bands and drinking at certain watering places, where hunters lie in wait behind blinds built of loose stones and kill individuals of all ages and sexes, often in a few minutes destroying an entire band. I have been informed of one party having killed more than 100 sheep in this manner to make dried meat during a single season.

Judging from the hunting techniques employed by the Indians, there apparently was a much higher density and wider distribution of mountain sheep at the time the observations were made. Phrases such as "chased the sheep" and "scoured the ridge" suggest a careless approach to stalking game, which probably was not the case. The accounts also imply a sound familiarity with habits of large mammals, in these instances, mountain sheep.

ETHNOGRAPHIC DESCRIPTIONS

The Panamint Shoshone, also referred to as the Koso (Coso) and Shoshone of eastern California (Grosscup 1977:109) occupied the whole of the Saline Valley (Steward 1938:71). The Panamint Shoshone are generally described as having incorporated an area ". . . from the Sierra Nevadas on the west to the Amargosa Desert of eastern Nevada on the east, and from Owens and Fish Lake Valley in the north to an ill-defined boundary in the south shared with southern Paiute groups" (Grosscup 1977:109).

Among Shoshonean groups, the independent economic unit was, of necessity, the individual family (Steward 1938). People relied principally on vegetal resources; game was distinctly of secondary importance although it required much of the hunters' time. The most

permanent association of families occurred during the winter months.

Steward grouped neighboring winter villages whose members presumably associated with one another into "districts" (1938:77), of which he recognized four for the Panamint Shoshone. These differ only slightly from the five sub-groups identified by Driver (1937:58). The Saline Valley district includes four principal winter villages, located in Hunter Canyon, at Waucoba Spring, at Goldbelt Spring and in Cottonwood Canyon. The former two are located along the eastern base of the Inyo Mountains, while the latter two are in the Panamint Range.

Panamint Shoshone territory was characterized by Kroeber (1925:589) as the most thinly populated area of California. An informal census placed the number of persons living in Saline Valley at 65 (Steward 1938:48) for the period 1870-1880. These estimates may be misleading for earlier periods. This figure does serve as a relative indicator of how many people might have participated in communal activities. In rare instances, individuals or families from the northern Death Valley villages (e.g., Grapevine Canyon, Surveyor's Well) may have augmented the total number of people available for cooperative undertakings in Saline Valley. They were known to have participated in rabbit drives and fall festivals held in the mountains separating Saline, Death, and Panamint valleys (Steward 1938:80). The extent to which the sub-groups cooperated with one another is unknown, although Saline Valley Shoshone occasionally traveled up to 75 miles to participate in communal antelope hunts near Brown, 10 miles south of Little Lake (Steward 1938:82).

The ethnographic accounts of Panamint Shoshone hunting activities (Driver 1937; Steward 1938) are generally lacking in detail. Steward's (1938:81-82) consultants mention antelope hunts to the south of Little Lake, to the south of Owens Lake, and to the north end of

Saline Valley. Steward's (1938:82) account of the Little Lake Shoshone antelope hunts described eight or ten men, perhaps aided by fire, driving the animals into a corral built of posts spaced about 20 feet apart and covered with brush. The corral had a wide opening but no wings. However, Steward (1938:33) indicates that, for the most part, deer and mountain sheep were taken through the perseverance of a single hunter or small groups of men, while antelope were hunted communally. Steward states that hunting methods varied by herd size and type of animal. Deer and mountain sheep more often ran in small bands, and antelope formed small herds of between 100 and 300 animals (Steward 1938:34). However, Baillie-Grohman (1884:163) indicated that although bighorn sheep usually were found in groups of 6-10 or 12 animals, he had seen herds of between 50 and 60 individuals. Elsewhere, there is mention of 30 mountain sheep being killed in one drive (Chalfant 1930). Contrary to what Steward's consultants claimed, larger herds of bighorn sheep may have been accessible for communal hunts. At the time Steward did his fieldwork and within his consultants' lifetimes, possibly these large herds were severely depleted or no longer existed.

Driver's (1937:61) Panamint Shoshone consultants indicated that mountain sheep were driven to hunters concealed behind blinds on mountain tops, along trails or overlooking canyons. In some instances, fire may have been used to drive the game. Where "trailing" was employed, a single hunter followed the game until he could obtain a shot (Driver 1937:110). A poisoned arrow smeared with decayed blood from an animal's heart was probably used (Wallace 1977:41; Grosscup 1977:124). Other techniques included ambushing and driving sheep over cliffs (Steward 1941:220). Regarding the latter technique, Butler (1978:54), noted the use of poisoned sticks, pointed and placed vertically at a spot where the sheep was expected to jump from above. Dogs were used

to drive or trail the animals (Driver 1937:61; Steward 1941:220). Enclosures, traps, nets, and snares were believed to be largely ineffective in hunting mountain sheep. Thumping logs together (Steward 1941:220) or pounding a moccasin against a rock (Steward 1941:329; Steward 1941:423) are said to have attracted bighorn. Thinking other rams were fighting, the animals came to investigate and were killed by concealed hunters.

That Steward's informants did not emphasize communal sheep hunting does not mean that their predecessors were similarly disposed because detailed accounts of techniques for antelope and deer hunting are also lacking. Although antelope were present in the low hills between Saline and Eureka valleys (Steward 1938:79), they were considered too rare to warrant communal hunts outside the central and southern parts of Shoshone territory. Antelope hunting, particularly, seems to have been associated with much magico-religious activity. Deer were too scattered and too swift and agile to be driven into corrals or over cliffs according to Steward (1938:218). Saline Valley people hunted deer mostly in the Inyo Mountains (Steward 1938:77).

It is reasonable to assume that the hunting techniques described by Steward and Driver reflect a shift away from communal hunting as a result of drastic reductions in animal herds. This is suggested by Geist (1967), who studied habits of mountain sheep bands in the Pacific Northwest. He remarks on the inflexibility of their feeding habits and attributes these habits to their social organization. Due to excessive human predation, the death of the older animals results in a loss of the knowledge of the migratory routes. Once this happens, the bighorn will not reoccupy their former ranges, and they adapt to new territory very slowly.

Panamint Shoshone consultants do not refer to the distance at which game could be shot with a bow and arrow. However, Pope's (1962) experiments with aboriginal flight

arrows constructed by Ishi found them to be very effective to distances of 30 to 40 yards (27-37 m.) even though the American Indian bow was found to be generally inferior to a modern hunting bow. One of Voegelin's (1938:12) Tubatulabal consultants, however, stated that when using a sinew-backed bow, a deer could be hit, but not killed, at a distance of 180 m. (600 ft.). The rest of the day was spent chasing the animal which was generally killed the following morning. Nissen (1974:57) conducted an experiment using a 33-pound-test bow shooting a 29-inch arrow from behind a blind. She found that "from the ridge top near the stone circles, the arrows hit about 30 to 50 feet [9 to 15 m.] to the west of the ridge on the floodplain, probably with enough force to wound an animal." Hagerty (1970:5) records the distance of two talus depression hunting blinds from game trails at approximately 12 m. Estimates from Upper Warm Springs place most blinds within 20 m. of existing trails.

It is generally assumed that when antelope and deer were hunted communally, the hunt took place during the early spring and in the fall, when they were migrating along known routes (Steward 1938:175). The only mention of when bighorn were hunted was "In December . . . when rams were dueling during the mating season" (Steward 1938). Fall festivals may have been another occasion for communal bighorn hunts.

DISCUSSION

Based on the presence of the large number of hunting blinds, one may hypothesize that hunting at Upper Warm Springs was a communal activity requiring many individuals. The complex spans a period from *ca.* 1200 B.C. to the ethnographic present, although sporadic use before then is possible. The frequency of these communal events may have depended on when the last hunt took place and the location of other activities in the seasonal round.

Human predation in aboriginal times is known to have severely depleted the antelope herds (Egan 1917:238-241). The Saline Valley is a deep, relatively narrow, open valley with few natural outlets, an excellent place to drive antelope. This may have been responsible for their elimination there at a comparatively early date as Shoshone consultants claimed occurred in the Deep Creek area of Utah (Egan 1917:238-241).

Considering the large number of stone facilities present at the Upper Warm Springs and the fact that, aboriginally, game could have approached the springs along many of the same trails used by burros today (Fig. 2), it is reasonable to hypothesize that not all of the stone facilities were used simultaneously even during communal hunts. For example, a system or chain of observational/signaling posts to provide advance warning on herd movements could allow for rapid deployment of hunters along the trails. Fewer individuals positioned strategically could kill approaching game far more efficiently. At the Upper Warm Springs, the evidence for use of such a system is found among the blinds positioned farthest from the springs, which are also found to be farthest from the existing game trails. The distance of these blinds from the trails is generally greater than the 30 to 40 yards (27-37 m.) alluded to by Pope (1962) as the distance at which the California Indian was most effective as a marksman. These blinds are usually found at the highest point on the respective knoll or hill and generally provide the widest panorama.

If, however, animals were *driven* rather than allowed to approach on their own, their movements could probably be more easily controlled through the use of "beaters" and "drivers." The advantage of this method is that it requires fewer total individuals even if the beaters and drivers are used. With this technique, though, the blinds on the highest respective knoll or hill may have been ambush locations rather than observational/signaling

posts. They may have been placed there because of the habit mountain sheep have of running to the highest point when alarmed. Egan (1917: 238-241) cites a similar habit for antelope: "An antelope, when started up, will always run directly for one of these (knolls) that lay opposite from where he gets his scare from, and they run from hill to hill . . ."

The ethnographic accounts for the Panamint Shoshone are generally lacking in detail and sometimes contradictory concerning specifics of large game hunting. Steward (1938:33) indicates that deer and mountain sheep were taken by a single hunter or small groups of men, while antelope were hunted communally. However, Driver (1937:61) states that mountain sheep were hunted communally. He says they were driven to hunters concealed behind blinds.

Since the ethnographic accounts are contradictory other evidence needs to be examined. It has been suggested (Heizer and Baumhoff 1962:240) that the association between rock art and hunting blinds may be one such avenue of exploration. The association is not strongly supported by the evidence of a single petroglyph at Upper Warm Springs. However, in the Saline Valley, hunting blinds and rock art are associated at the Hunter Canyon site, where there are numerous mountain sheep petroglyphs. That today, the transient range of bighorn sheep encompasses the Saline Range (Fig. 1) lends further supporting evidence.

CONCLUSION

The field data taken in conjunction with the early historic accounts and the comparative data, provide overwhelming support for use of the rock features at the Upper Warm Springs as large game hunting blinds. The empirical data, including the location of the features with respect to terrain, their distribution with respect to one another and with respect to other archaeological sites, their artifactual associa-

tions and their orientation with respect to existing game trails, are the best evidence for such use. Unfortunately, the ethnographic data are woefully inadequate in terms of descriptive data on hunting techniques employed for animals other than antelope. In other instances the ethnographic accounts are clearly contradictory. On this basis, it is difficult to adequately evaluate which of the hunting techniques are signified by the large number of rock features present at the Upper Warm Springs.

Based on the fact that such a large number of rock features are present one may hypothesize that hunting at Upper Warm Springs was in fact a communal undertaking, although in years when no communal hunts were scheduled, the springs could have been used by individual hunters or even several bowmen working together.

Final consideration is whether bighorn sheep or antelope or both were hunted at the Upper Warm Springs. The historic description of bighorn sheep, their frequent depictions in rock art in Saline Valley, and the fact that they are cited as having been driven along trails and ambushed from blinds suggests that bighorn were the primary focus of hunting at Upper Warm Springs.

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NOTES

1. This translates as "stomach to the ground."

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