REPORTS

Eggshell Cave: A Ceremonial Site in the Western Mojave Desert, California

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Excavations at a small cave in the western Mojave Desert revealed a small ceremonial location dating from late prehistoric times where, we believe, a person or persons ingested Amsinckia *seeds for their hallucinogenic effect, likely for ritual purposes.*

IN late 1969, a small cave site was reported to one of the authors (RWR) by a high school teacher. The cave was reported to contain portions of mats and other perishables, and there was concern that the site would be vandalized unless the materials were recovered in the immediate future. After initial examination of the site, the decision was made to excavate the site as soon as possible; accordingly, the work was conducted on November 2, 1969, by a volunteer crew from Antelope Valley College under the direction of R. W. Robinson.

Eggshell Cave (AVC-5, CA-KER-341) is a small exogene cave located on the north-facing slope of the western Rosamond Hills, approximately eight miles northwest of Rosamond, in the western Mojave Desert (Fig. 1). The cave is located at an elevation of 954 m. (3,140 ft.), some 60 m. (200 ft.) below the summit of the hills and overlooking the floor of the southern Fremont Valley, which is about 90 m. (300 ft.) below. The site is within the territory claimed ethnographically by the Kitanemuk (Kroeber 1925; Blackburn and Bean 1978) but lies just south of Kawaiisu territory.

The cave (Figs. 2 through 4) is 5.1 m. wide at its mouth, 3.3 m. deep, and 2.4 m. high at the entrance. The dimensions of the cave rapidly contract as it extends back into the hill (see Fig. 4). A large packrat midden was present in the rear of the cave, where a small fragment of eggshell was found (hence the name of the site). The site lies within a Creosote Scrub vegetative zone.

FIELD METHODS

The entire surface inside the cave was carefully examined for cultural materials. Matting fragments were exposed on the surface of the site, concentrated approximately in the center of the opening (see Fig. 2). The shallow soil in that area was brushed back to expose the matting. All soil thus loosened was passed through 1/8-in. mesh screen, and all cultural material from the screens was retained. No grid or formal excavation units or levels were used and the cave was, in essence, excavated as a single feature.

RESULTS OF THE EXCAVATION

The primary materials recovered from Eggshell Cave included fragments of matting lying inside the cave in the vicinity of a small, grass-lined feature containing seeds (see below). With the exception of a single rhyolite flake, all of the artifacts found were perishables.

The feature was a small, purposefully constructed depression in the soil measuring ca. 10 cm. in diameter by 3 cm. deep and lined with many small, fragmented pieces of an unidentified grass. Within the depression was a store of several hundred seeds of *Amsinckia tessellata* (fiddleneck, also sometimes called tarweed or

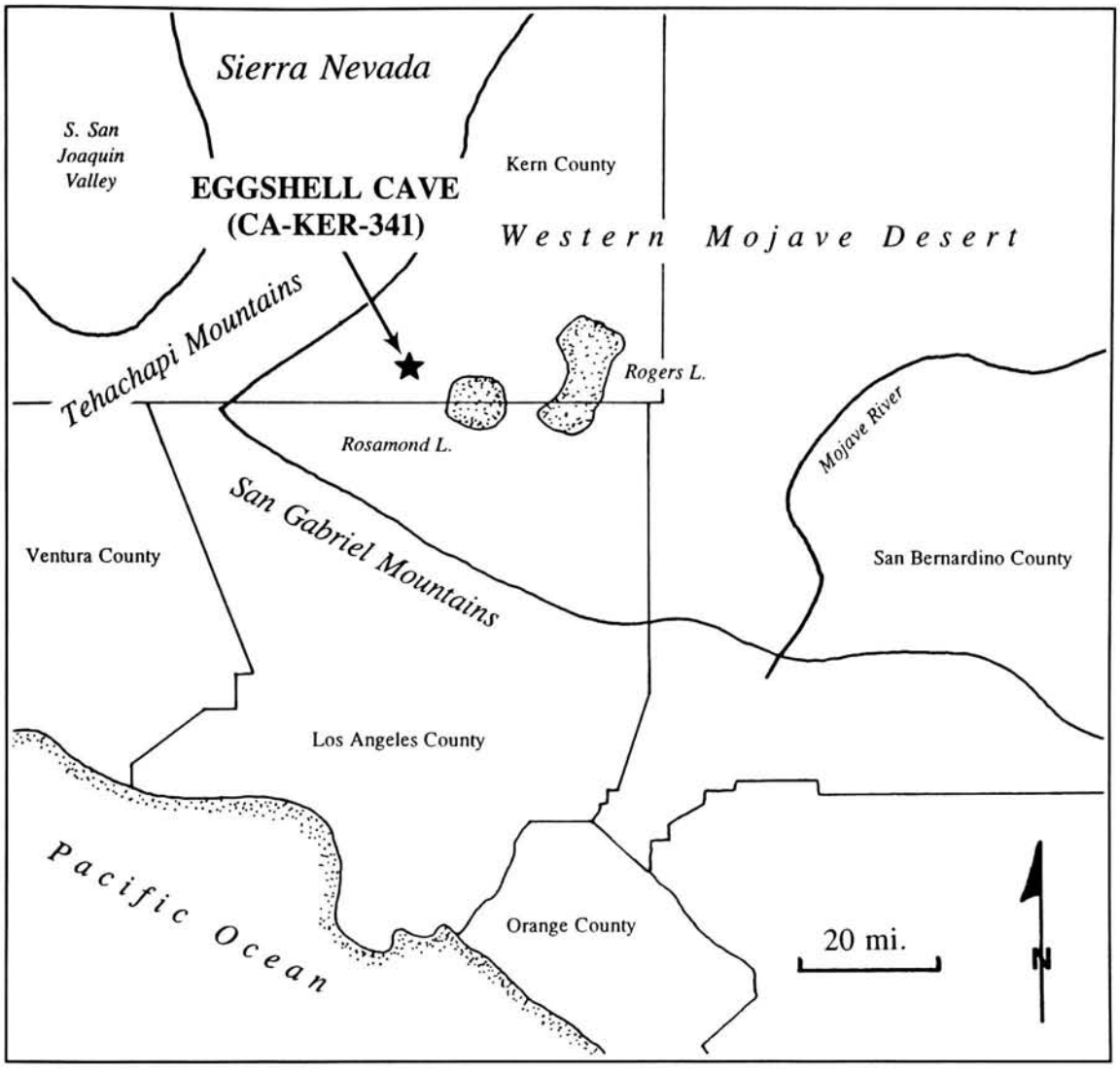

Fig. 1. General location of Eggshell Cave in the western Mojave Desert.

fireweed). The homogeneity of the seed species, the obvious construction of the pit, and the clear association of most of the matting from the site with the feature indicate that the seeds had been purposefully placed within the pit.

Material Culture

A total of 40 artifacts, as well as some unmodified materials, were discovered in the cave. Most of the artifacts are perishables, the exception being a single rhyolite flake (Cat. No. 017-B, 2.1 g.).

Matting. Twenty fragments of matting, representing at least three separate mats, were found (see Table 1). Most of the matting was made from an unidentified reed of the sedge family (Cyperaceae; including *Scirpus*, *Carex*, and *Cyperus*, Fig. 5), with one fragment (Fig. 6) specifically identified as bulrush (tule, *Scirpus* sp.).[1] Sedges were likely available in quantity at springs in the Rosamond area and along the shore of nearby Rosamond Lake. The tule mat appears to have been much more finely made than any of the other specimens. In addition, a

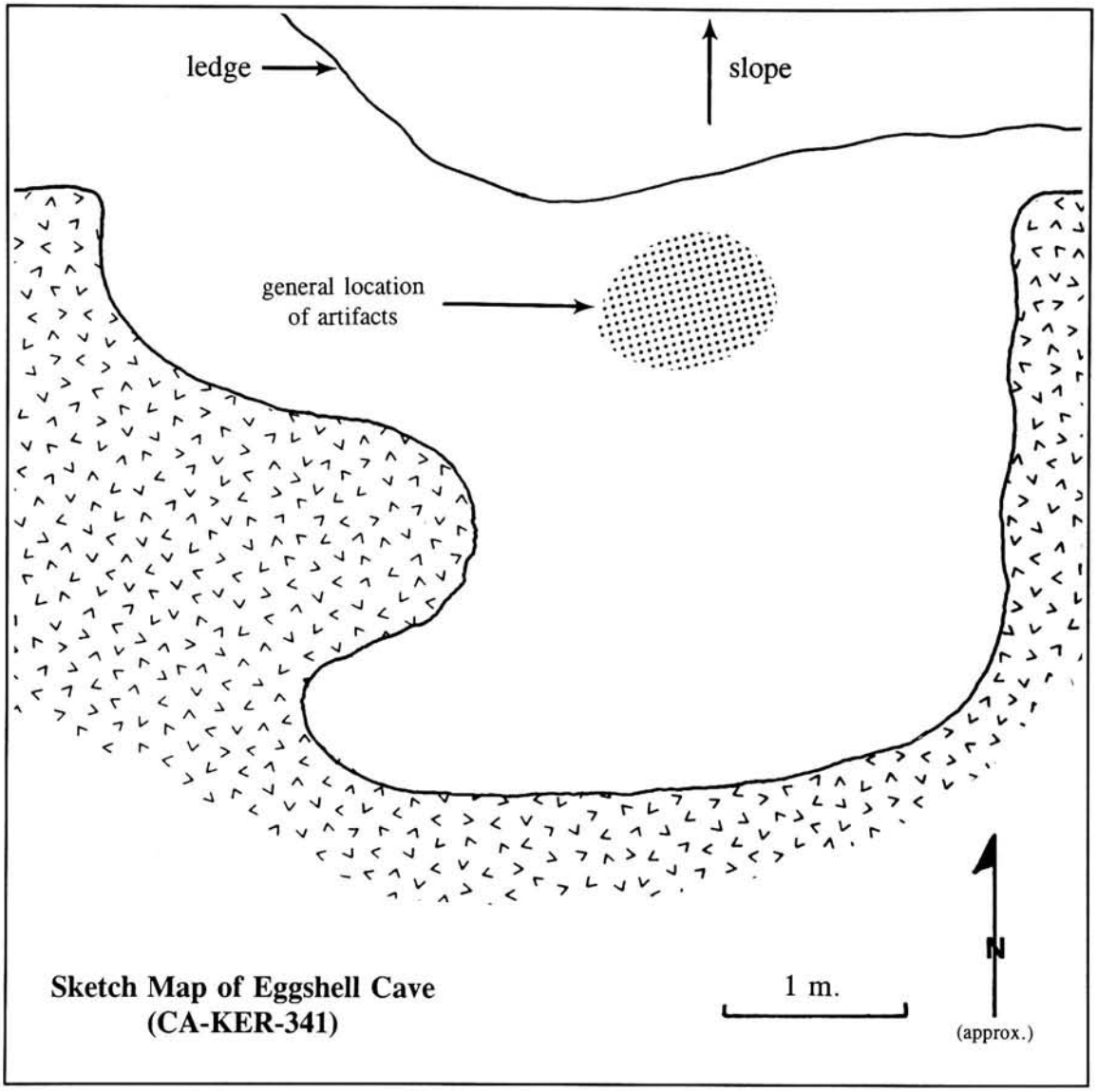

Fig. 2. Plan view map of Eggshell Cave (CA-KER-341).

fairly large number of individual sedge fragments (611.7 g.; n ≈ 550) was found, many (ca. 430) exhibiting tie impressions, indicating that they are matting (warp) fragments. These fragments range in length from 61 to 107 cm.

Thirty-nine fragments of one-ply sedge tie (weft) also were found. In addition, a small "pile" of shredded sedge stems was discovered. Some of the one-ply ties were made from an unidentified plant material, several of which look like bark. Nine knots, all of sedge, were recovered (Table 2). Most of these were likely attached to the various mats at some point in time.

Cordage. Eleven fragments of loose cordage were recovered (Table 2), not including the cordage still attached to the matting fragments. Six of the pieces are a fine two-ply, S-twist variety made from *Apocynum* (Indian hemp), but one of the six (also *Apocynum*) is more complex, consisting of a two-ply, Z-twist, with each pri-

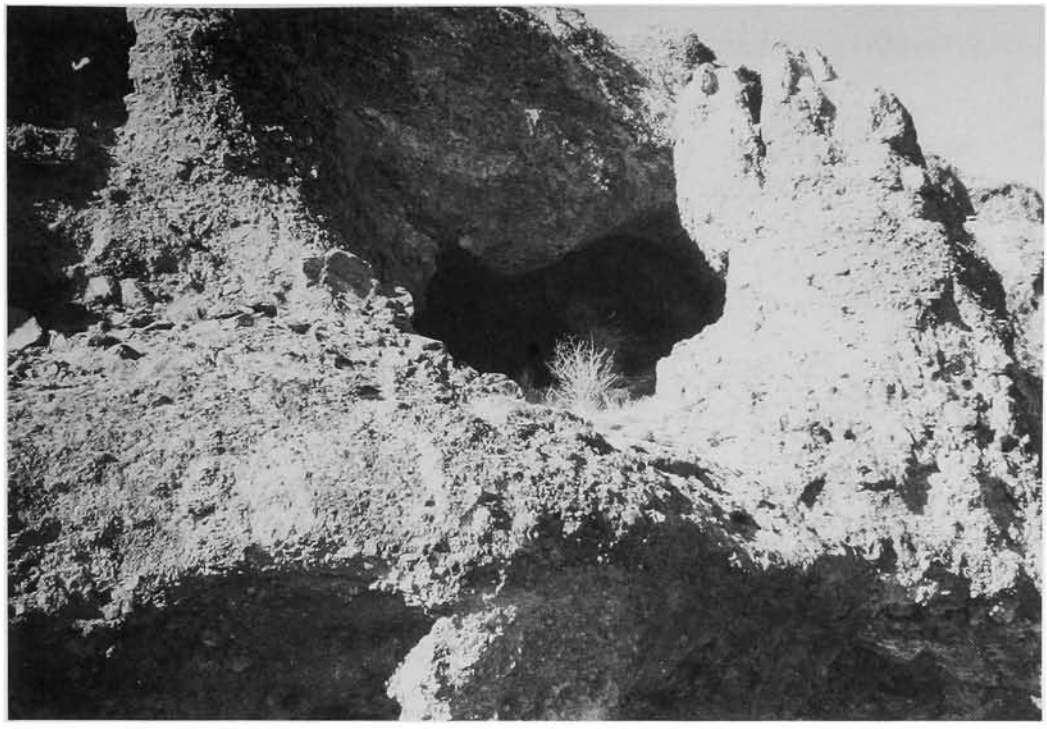

Fig. 3. The mouth of Eggshell Cave (CA-KER-341), view south.

Fig. 4. The interior of Eggshell Cave (CA-KER-341), view south.

Table 1
ATTRIBUTES OF MATTING FRAGMENTS FROM EGGSHELL CAVE (CA-KER-341)

Cat. No.	Material	Length x Width (mm.)	No. of Bundles	Reeds per Bundle	Cordage (Ties)	No. of Ties Present and Spacing (cm.)	Fig.
010-A	sedge	610 x 100	6	7	one-ply, sedge	3; 15, 18	
010-B	sedge	813 x 50	5	8	one-ply, sedge	5; 15, 14, 14, 18	
010-C	sedge	635 x 76	5	13, 10, 9, 9, 9	one-ply, sedge	3; 15	
010-D	sedge	660 x 102	13[a]	8	one-ply, sedge	4; 17, 12, 19	
012-B	sedge	490 x 25	1	8	one-ply, sedge	3; 10	
012-C	sedge	270 x 40	3	3	one-ply, sedge	2; 7	
014-D	sedge	760 x 25	2	4	one-ply, sedge	2; 9	
014-E	sedge	508 x 130	10	4	one-ply, sedge	2; 10	
015-F	sedge	407 x 70	5	6	one-ply, sedge	4; 6, 7, 10	
015-G	sedge	483 X 70	5	4, 6, 6, 6, 4	one-ply, sedge	5; 8, 8, 10, 10	
018	tule	342 x 103	23	3	two-ply, S-twist, cf. *Apocynum*	6; 4, 5, 4, 5, 5	6
019	sedge	150 x 80	3	7	one-ply, sedge	2; 7	5
024	sedge	230 x 50	2	4, 3	one-ply, unidentified	1	
028	sedge	60 x 40	2	3	one-ply, sedge	1	
030	sedge	190 x 39	3	2	two-ply, S-twist, cf. *Apocynum*	2; 4	
035	sedge?	31 x 57	7	1?	one-ply, unidentified	1	
049	sedge?	37 x 41	3	2	one-ply, unidentified	1	
050	sedge	160 x 30	3	2	one-ply, sedge	2; 5.3	
067	sedge	150 x 13	2	3	one-ply, sedge	2; 6	
072	sedge	330 x 80	7	3	one-ply, sedge	4; 6, 9, 7	

[a] Five bundles are present, but extra cordage with reed impressions indicate at least eight other bundles.

mary ply consisting of two-ply, S-twist cordage. Five fragments of sedge "cordage" were found, one fragment of one-ply with a knot on one end and four pieces of braided, three-ply material (Table 2, Fig. 7). The latter fragments are quite different from the weft material used to tie the sedge matting and could be considered part of the mats (rather than separate cordage).

Faunal Remains. Five faunal elements were recovered, including a long bone shaft fragment from an unidentified small- to medium-sized mammal, a mandible fragment from an unidentified small (rodent-sized) mammal, and three bone fragments of unidentified small mammal(s). None of the bones was burned and all are considered natural in origin, likely associated with the packrat nest in the rear of the cave.

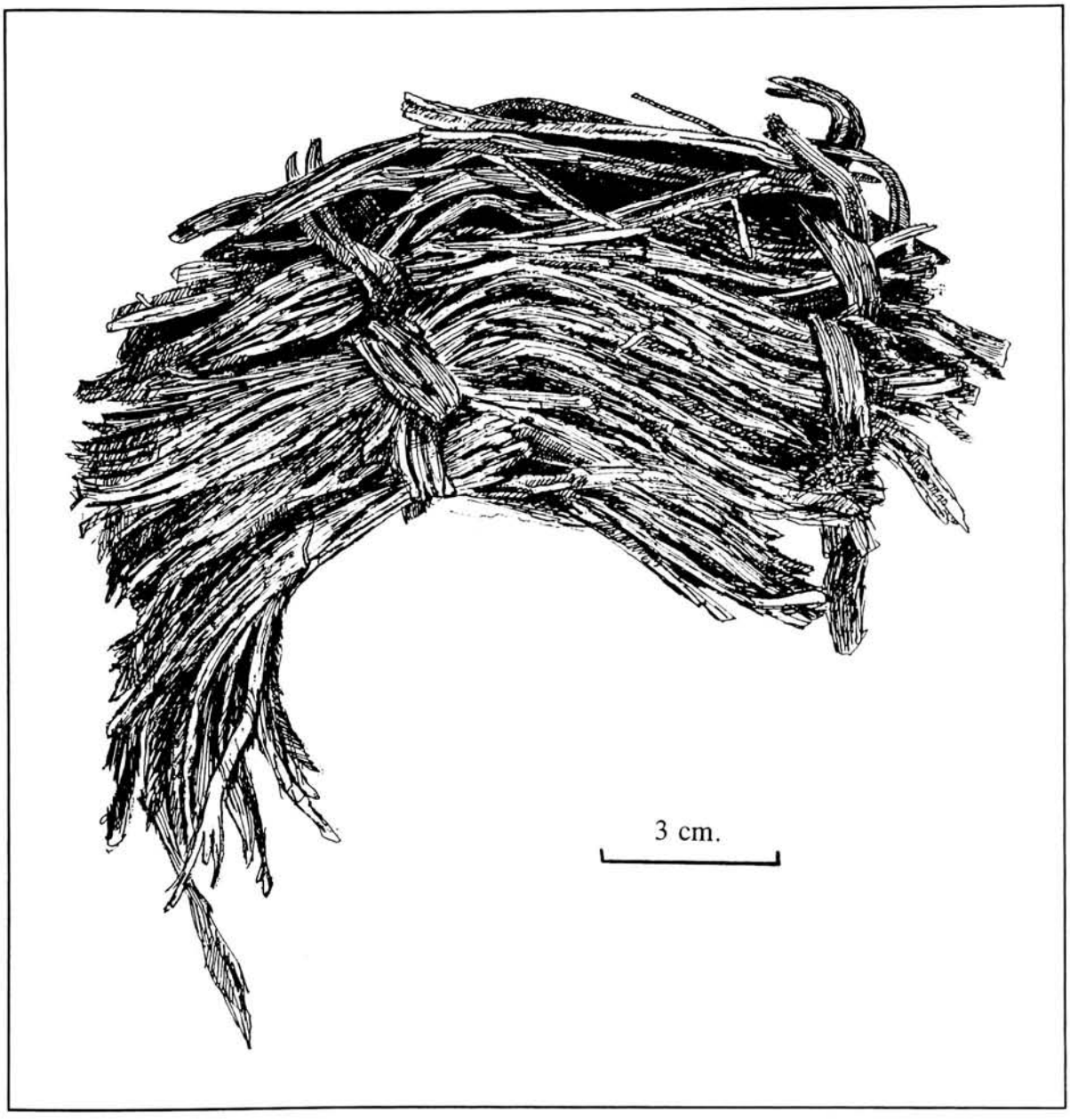

Fig. 5. Sedge matting (Cat. No. 019) from Eggshell Cave (CA-KER-341).

Seeds. Loose fiddleneck seeds (≈ 10.2 g.) were found in the small, grass-lined depression. Additional fiddleneck seeds were found adhering to the grass lining, and others were discovered adhering to several fragments of matting. Most of the seeds were intact and easy to identify; however, some were darkened, suggestive of burning or parching. The fiddleneck seeds originally were thought to represent food (see Sutton 1988:73).

Very little is known regarding the aboriginal use of fiddleneck. Zigmond (1981:11) reported that the Kawaiisu used fiddleneck leaves for "greens in the spring." No mention was made

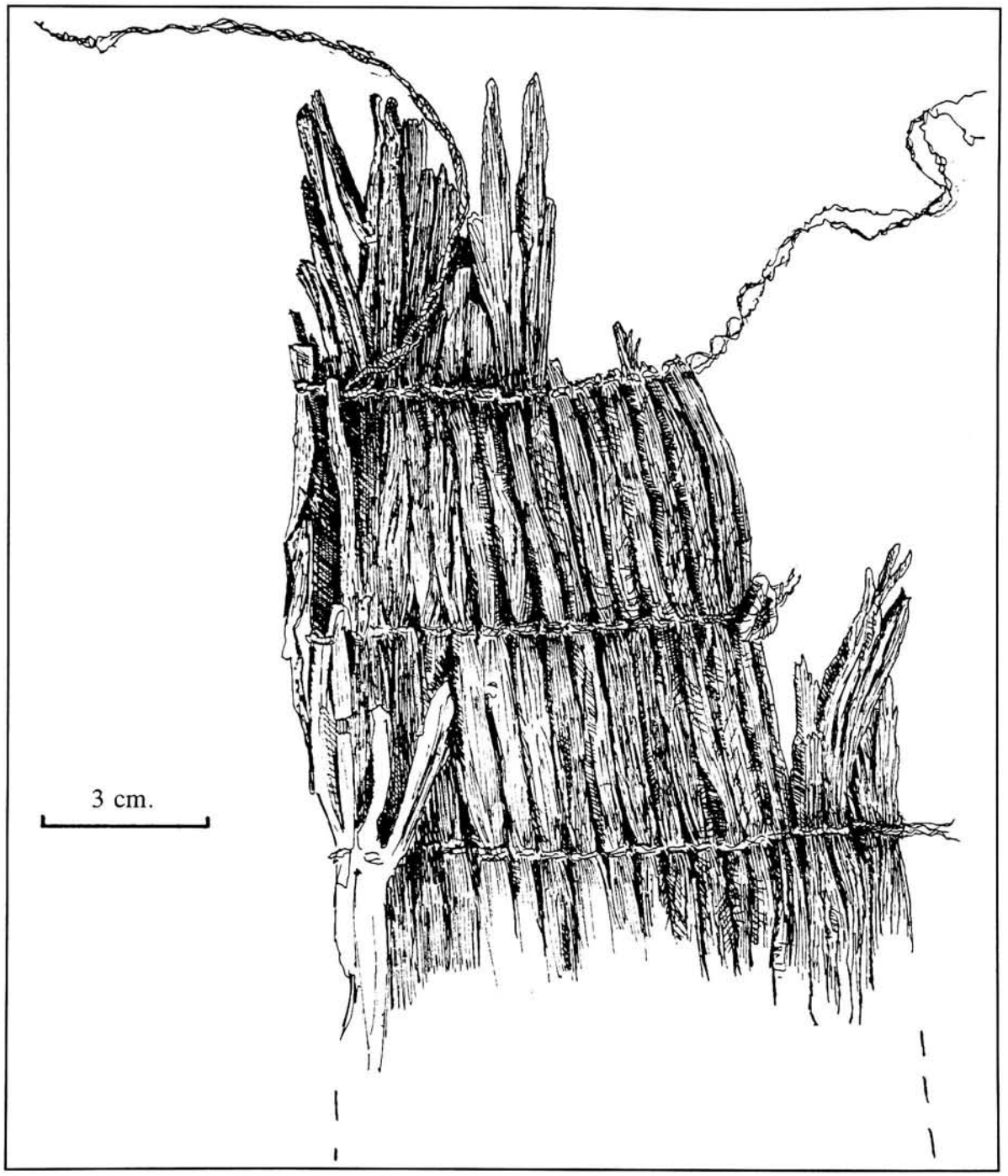

Fig. 6. Tule matting fragment (Cat. No. 018) from Eggshell Cave (CA-KER-341).

by Zigmond of any use of the seeds. Gayton (1948:16) reported that fiddleneck was eaten by the Yokuts "with salt grass while in the tender stage." Bocek (1984:252) noted that the Costanoans used *Amsinckia* for "unspecified medicinal purposes." No information is currently

Table 2
ATTRIBUTES OF ISOLATED KNOTS AND CORDAGE FROM EGGSHELL CAVE (CA-KER-341)

Cat. No.	Material	Length x Width (mm.)	Ply	Twist	Comments	Fig.
		Isolated Knots				
032	sedge?	31 x 15	--	--	simple	
033	sedge?	22 x 16	--	--	simple	
034	sedge?	32 x 17	--	--	simple	
047	sedge	15 x 7	--	--	simple	
051	sedge	37 x 21	--	--	simple	
052	sedge	21 x 16	--	--	simple	
053	sedge	17 x 15	--	--	simple	
054	sedge	46 x 33	--	--	simple	
055	sedge	19 x 18	--	--	simple	
		Isolated Cordage				
020	sedge	217 x 11, 3 braids in 6.7 cm.	3	braided	wrapped in two places by one-ply cordage	7a
021	sedge	176 x 9, 3 braids in 3 cm.	3	braided	--	7b
021-A	sedge	210 x 6, 3 braids in 1.5 cm.	3	braided	simple knot on one end	7c
022	sedge	125 x 4, 5 braids in 3 cm.	3	braided	--	7d
023	cf. *Apocynum*	56 x 2	2	S	very fine cordage	
025-A	sedge	65 x 6	1	--	knot on end	
029	cf. *Apocynum*	24 x 2	2	S	very fine cordage	
036	cf. *Apocynum*	42 x 5	2	S	--	
037	cf. *Apocynum*	38 x 7	2	S	--	
038	cf. *Apocynum*	44 x 6	2	S	--	
039	cf. *Apocynum*	75 x 10	2	Z	each primary ply is two-ply, S-twist	

available on Kitanemuk use of fiddleneck.

Fiddleneck Chemistry. Fiddleneck contains an alkaloid (pyrrolizidine, concentrated in the flowers and seeds) that is hallucinogenic[2] and can cause subtle personality changes (Fuller and McClintock 1986:332-333). The effects of fiddleneck poisoning are cumulative, and may not manifest themselves for many months. The alkaloid acts on the liver, preventing the conversion of ammonia to urea. This results in an accumulation of ammonia that is toxic to the central nervous system by inhibiting the ability of the brain to utilize oxygen, often culminating in coma and death (Fuller and McClintock 1986: 333). Other plants containing pyrrolizidine have been intentionally used for medication in Jamaica (Fuller and McClintlock 1986:333).

The effects of fiddleneck on animals have been known by ranchers for many years. Fiddleneck collects nitrates which are found to be capable of causing distress or even death in cattle (Fuller and McClintlock 1986:307, 385). In ruminants, the nitrates are absorbed by the bloodstream, converting the hemoglobin of the red blood cells into a chocolate-colored methemoglobin that cannot carry oxygen. In mammals (including humans), the nitrates may also be converted into nitrosamines, a strong liver toxin, by the warm acid conditions of the stomach (Fuller and McClintlock 1986:307). Small

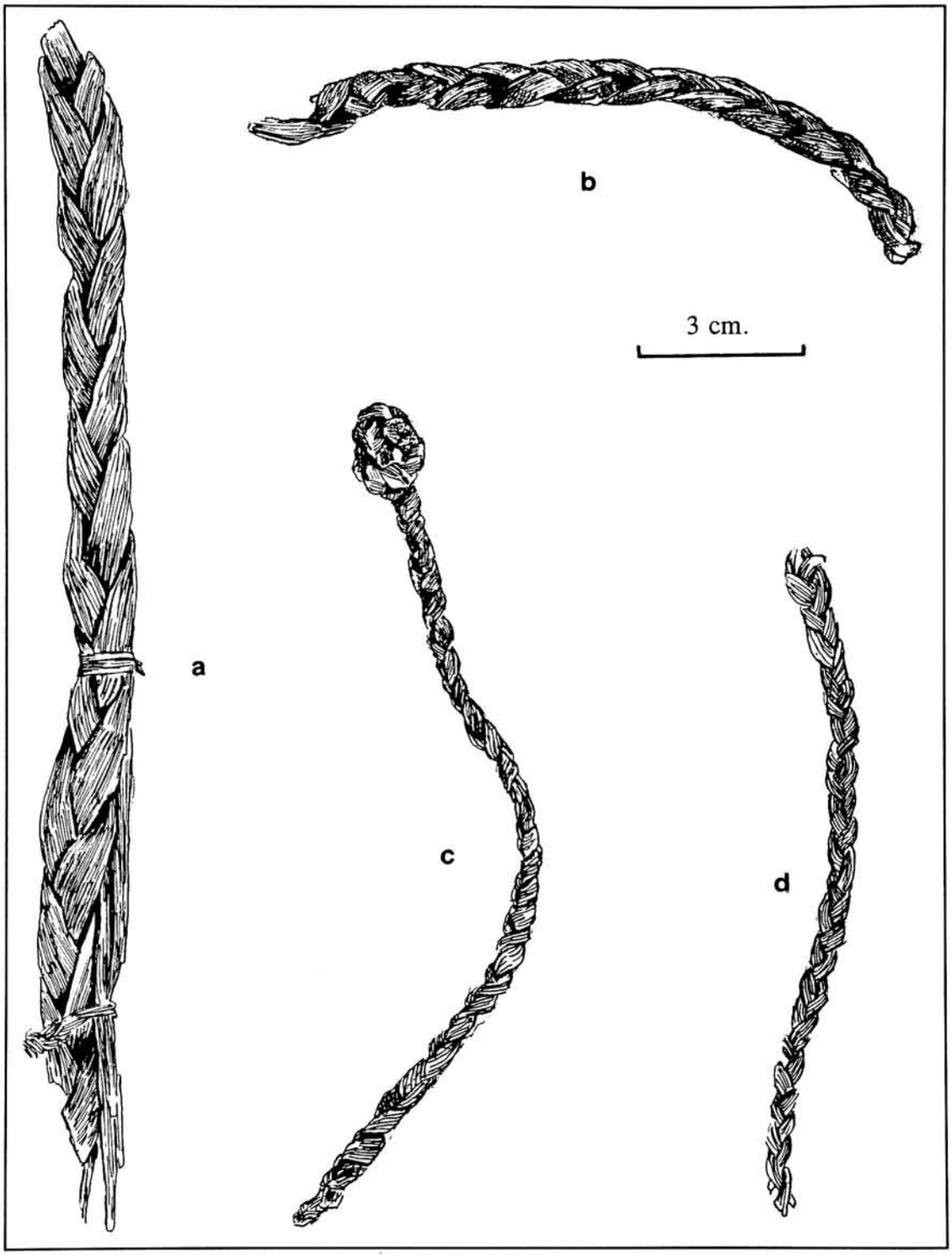

Fig. 7. Examples of braided sedge cordage from Eggshell Cave (CA-KER-341): (a) Cat. No. 020; (b) Cat. No. 021; (c) Cat. No. 021-A; (d) Cat. No. 022.

children are known to have been seriously affected by nitrosamines in pre-prepared foods. Further, nitrosamines are known carcinogens (Fuller and McClintlock 1986:307).

Grass. Apart from those in the grass-lined pit, a fairly large number of grass plants with roots was found (Table 3). Such grasses often are called "bunch grass" and include a variety of taxa. None of the specimens from Eggshell Cave could be identified, even to genus.

Miscellaneous Materials. Miscellaneous materials were found in association with the matting and seed specimens, including a variety of unmodified floral materials, some stones, insect remains, portions of a packrat nest, and other items (Table 4). Of some interest is the presence of a fairly large strip of apparently unmodified juniper (*Juniperus* sp.) bark (Cat. No. 015-C, Table 4). This species is not indigenous to the local area and must have been brought to the site by people. Although the function of the bark is unknown, it is possible that it was used either as matting or for medicinal purposes (e.g., Bean and Saubel 1972:82).

Table 3
UNMODIFIED "BUNCH GRASS" FROM EGGSHELL CAVE (CA-KER-341)

Cat. No.	Description
010-H	many fragments with roots, 2.8 g.
010-J	fragments with roots and soil, 6.4 g.
011-B	fragments, 28.6 g.
012-D	fragments, 3.0 g.
013-D	21 segments, 5 to 15 cm. long, 22.5 g.
013-E	10 segments, 5 to 20 cm. long, 18.7 g.
014-F	three segments, 18.9 g.
014-G	three segments, 6.0 g.
015-H	29 segments, 34.8 g.
015-I	25 segments, 32.0 g.
015-J	many fragments, 20.6 g.
016-A	23 segments, 163.3 g.
016-B	12 segments, 72.0 g.
017-K	many fragments, 44.4 g.
017-L	33 segments with roots, 125.3 g.
025	fragments, 6.7 g.

Dating

The presence of perishable remains at a site is usually suggestive of a rather late date. However, in the absence of any temporally diagnostic materials (e.g., glass beads, late period projectile point types), it was decided to obtain a radiocarbon date of some of the loose sedge matting fragments (taken from Cat. No. 013-A). The assay returned a radiocarbon date of "modern" (90 ± 40 RCYBP; UCR-2663).

CONCLUSIONS

The site lies within Kitanemuk territory (Kroeber 1925; Blackburn and Bean 1978:Fig. 1), and may be associated with one or more of the few known late ethnohistoric sites in the vicinity (e.g., Willow Springs [CA-KER-129], located about six miles west). The construction of the cordage may be a clue to the ethnic identity of the users of the cave. For the Kawaiisu, Zigmond (1986:402) noted the usual use of three-ply cordage, none of which was identified at Eggshell Cave (notwithstanding the braided sedge material). However, for the Kitanemuk, Harrington (1942:24-25) reported the use of two-ply string, as well as the use of several strands of two-ply string for "heavier" cordage. This supports an assignment of the assemblage to the Kitanemuk.

The Kitanemuk practiced the administration of drugs (e.g., *Datura*) to boys in the winter months so that they might acquire supernatural power (Blackburn and Bean 1978:565-566):

> The drug, taken one evening after fasting, induced a coma for a day or two. Upon awakening the boy was given a lump of tobacco to hold in his mouth; this rendered him briefly unconscious. When he awakened the *pinihpa* [the one in charge of the ceremony] asked him what he had seen, for example, whether he had seen or spoken to some animal or bird, or had seen nothing (in which case the process was still regarded as beneficial).

Table 4
MISCELLANEOUS MATERIALS FROM EGGSHELL CAVE (CA-KER-341)

Cat. No.	Description	Association
004	four very small stones, 0.2 g.	grass-lined pit
005	one insect fragment, 0.1 g.	grass-lined pit
006	one insect carapace, 0.1 g.	grass-lined pit
007	rodent feces, 0.2 g.	grass-lined pit
008, 009	sand, 83.8 g.	grass-lined pit
010-E	sand and unidentified fiber, 0.5 g.	matting
010-F	unidentified plant material, 1.2 g.	matting
010-I	unidentified charred plant material, 0.1 g.	matting
010-K	93 unmodified sedge fragments, 6.4 g.	matting
010-L	unidentified plant material, 0.1 g.	matting
010-M	two unidentified seeds, 0.25 g.	matting
010-N	one owl pellet, 1.0 g.	matting
010-R	thin, hollow reed fragment, 14.6 cm. long	matting
011-C	unidentified plant roots, 20.2 g.	matting
011-E	rodent feces, 0.4 g.	matting
011-F	unidentified plant material and bark, 2.0 g.	matting
011-G	sand, 1.0 g.	matting
011-H	plant (cf. saltbush, *Atriplex*) roots and stems, 92.8 g.	matting
011-I	21 roots (cf. sagebrush, *Artemisia*), 89.3 g.	matting
013-C	thin, hollow reed fragment, 11.3 cm. long	matting
014-C	rat nest material, 0.1 g.	matting
015-C	strip of unmodified bark (cf. *Juniperus*), 450 x 22 mm., 7.9 g.	matting
015-D	rat nest material, 0.1 g.	matting
015-E	15 unidentified bunch grass fragments, 1.5 g.	matting
016-D	one small, unmodified stone, 2.0 g.	matting
016-E	rat nest material, 0.5 g.	matting
016-F	seven unmodified and unidentified sticks, 3.4 g.	matting
017-A	two roots (cf. saltbush, *Atriplex*), 11.5 g.	matting
017-C	20 small, unmodified stones, 13.5 g.	matting
017-D	five small, unmodified sticks (cf. creosote, *Larrea*), 3.8 g.	matting
017-H	many small, unmodified, unidentified sticks, 23.1 g.	matting
066	bunch grass stems, 3.6 g.	unknown

Before dawn on the following day the *pinihpa* took the boy to an isolated place in the hills or to a shrine to pray, taking seeds [not identified], tobacco, feather down, and beads as offerings. These were placed in five piles on the ground in the form of a cross.

Eggshell Cave is interpreted as such a ceremonial site; an "isolated place in the hills," where a person or persons would go, perhaps repeatedly, to seek a vision or visitation with the aid of the hallucinogenic properties of, or at

least including, fiddleneck seeds.[3] The artifact assemblage corresponds quite well to this interpretation. One could go to the cave, place the seeds in a small depression, sit on some matting, eat some seeds, and wait for the desired result while looking out over the western Fremont Valley. Few other materials would have been needed.

NOTES

1. All of the material was originally identified as tule (see Sutton 1988:73) but was later identified more generally as a sedge (Cyperaceae, which includes tule). This identification was based primarily on gross morphology, particularly the triangular cross section of the stems (having three-ranked leaves) evident in many of the pieces. The stems of cattail (*Typha*) are not triangular, but many of the sedges, including *Scirpus* (but not *S. actus*, common tule, which is round), *Carex*, and *Cyperus*, are triangular.

2. A completely unauthorized, and very dangerous, experiment on the effects of the ingestion of fiddleneck seeds was conducted by an imprudent student in April 1994. Approximately 40 fiddleneck seeds were eaten by that person (who weighed ca. 130 pounds), causing immediate dizziness and a feeling of euphoria. This euphoric feeling lasted from afternoon into the evening. There was still a feeling of well-being the next morning.

This same person had previously experimented with *Datura*. Upon being asked to compare the effects of both substances, the response was that the "high" caused by *Datura* was more intense than fiddleneck, but that "hangover" from *Datura* was similar to that of alcohol, while the fiddleneck caused no such effect.

3. Fiddleneck is but one of the hallucinogenic substances that may have been used for vision purposes. *Datura*, and even some ants (Blackburn 1976), also were used. Fiddleneck seeds are most commonly available in the spring. It is so ubiquitous in southern California that its seeds would have been readily available to anyone. It is our feeling that, unlike *Datura*, fiddleneck required no special knowledge to use and may have served as a "poor man's" hallucinogen.

ACKNOWLEDGEMENTS

The field crew consisted of Sue Holmes, Diane Humphrey, Jeannie Lee, Shirley Redman, R. W. Robinson, Sylva Robinson, Dave Stillwell, and Mark Q. Sutton (we hope no one was forgotten). The laboratory work was accomplished by the senior author, with the assistance of Dorothy Fleagle, during a laboratory analysis class at CSU Bakersfield. The radiocarbon date was provided by the Radiocarbon Laboratory at the University of California, Riverside, and we thank R. E. Taylor and Chris Prior for their efforts. The comments of Jill Gardner, Mike Glassow, Meg McDonald, and the reviewers for the *Journal* are appreciated. Mike Kaberline contributed the excellent artifact drawings and Maynard Moe of the CSUB Biology Department assisted in plant identification. The materials collected from the site are stored at Antelope Valley College.

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Microwear Analysis of the Lithic Assemblage at the Rosenberger Site

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For several decades, microwear analysis has been applied to a variety of flaked stone artifacts. These studies have attempted to ascertain the function of specific flaked stone tools. This study applies microwear analysis to flaked stone artifacts recovered from a burial site in western Idaho. The purpose of this study is to determine if the artifacts recovered from the Rosenberger site (10-PE-29) were burial specific; that is, produced and used for ceremonial purposes only.

OVER the past three decades, microwear analysis of prehistoric flaked stone tools has become a standard procedure in lithic research (Yerkes and Kardulius 1993). One common approach is the determination of use-wear patterns exhibited on flaked stone margins. The current study applies this approach to the Rosenberger site (10-PE-29) assemblage from western Idaho. The Rosenberger and related sites are located in the central portion of western Idaho (Fig. 1) and constitute what is formally identified as the "Western Idaho Burial Complex" (Pavesic 1985). Pavesic's (1985, 1992) definition was based on shared burial patterns, ritual interment practices, and distinctive associated artifacts.

The Rosenberger collection provides a unique opportunity to study edgewear. The flaked stone tools are part of a single archaeological assemblage (Clarke 1985), although the site likely experienced multiple interment episodes. Furthermore, the artifacts were enclosed in glass frames soon after recovery, minimizing long-term curation damage. The overall objective of this study is to test Pavesic's (1992:290) assertion that the interred turkey-tail points, stemmed points, and cache bifaces were burial specific and appear "as fresh as if made yesterday."

SITE DESCRIPTION

The Rosenberger site is located on a sandy knoll 1.3 km. east of New Plymouth, Idaho, along the southern terrace of the Payette River. In 1962, Fred Rosenberger discovered the site during land modification. Firsthand reports relevant to the site have come from residents in the area who witnessed the excavation of the pit, which was approximately three meters in diameter. Arment (1968:2) noted that

> The human skeletal remains were not articulated. In fact, within the whole interment scarcely a bone fragment was found over six inches in length. It appeared that here were parts of three, maybe more, human skeletons.

No osteological analysis was performed at that time, and the human remains were either lost or reburied at an undisclosed location. Obsidian hydration data suggest that the site dates between about 4,100 and 4,450 B.P. (Pavesic 1985:77). Based on comparable sites and tool morphology, Pavesic (1985:78) suggested that the site may be considerably older. A subsequent limited test