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Netting in the Northern and Western Great Basin

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Differences between the northern and western Great Basin have long been recognized, based on technological attributes such as lithic procurement networks and distinctive basketry traditions. A detailed look at knotted-net manufacture in the northern and western Great Basin is presented using archaeological samples from Nevada and Oregon museum collections, and drawing upon the ethnographic record to inform our analysis of net types and their uses. Metrics were recorded for 89 nets and net fragments to identify any apparent differences in construction and to investigate whether distinctive patterns in net-making might also distinguish these areas. Recorded metrics do indeed show a statistically significant difference in net construction between the northern and western Great Basin. Direct AMS dates are reported for sixteen of the sampled nets.

Economic diversification in the Upper Paleolithic of Eurasia was facilitated by technological innovations that included fiber-based hunting techniques involving traps, snares, and nets (Adovasio et al. 1996; Lupo and Schmitt 2002; Soffer 2004). Nets proved to be highly efficient tools for taking fish, mammals, and waterfowl, and accompanied the earliest peoples into the Americas. Netting of terminal Pleistocene or early Holocene age has been reported for the northern Plains and the eastern Great Basin (Adovasio et al. 2009; Aikens 1970; Aikens and Madsen 1986; Frison et al. 1986). The earliest AMS dating evidence of netting in the Great Basin comes from a kinked cordage fragment, possibly from a knotless net, found in the Paisley Caves, Oregon, that dates between ~10,278 and 10,212 cal B.P. (Connolly et al. 2016).

Despite this long history, and common reports of archaeological netting (Andrews et al. 1986; Heizer and Krieger 1956; Kallenbach 2013; Loud and Harrington 1929) there have been few attempts to present a comprehensive account of knotted-net manufacture and use in the archaeological record. The most notable exceptions are Burgett-Jolie (2005) and Adovasio et al. (2009). Here we present a detailed account of knotted-net manufacture in the northern and western Great Basin, Elephant Mountain being the southernmost northern Great Basin site. We use archaeological samples from Nevada and Oregon museum collections, and draw upon the ethnographic record to inform our analysis of net types and their uses (Fig. 1).

Many researchers have recognized differences between the northern and western Great Basin, based

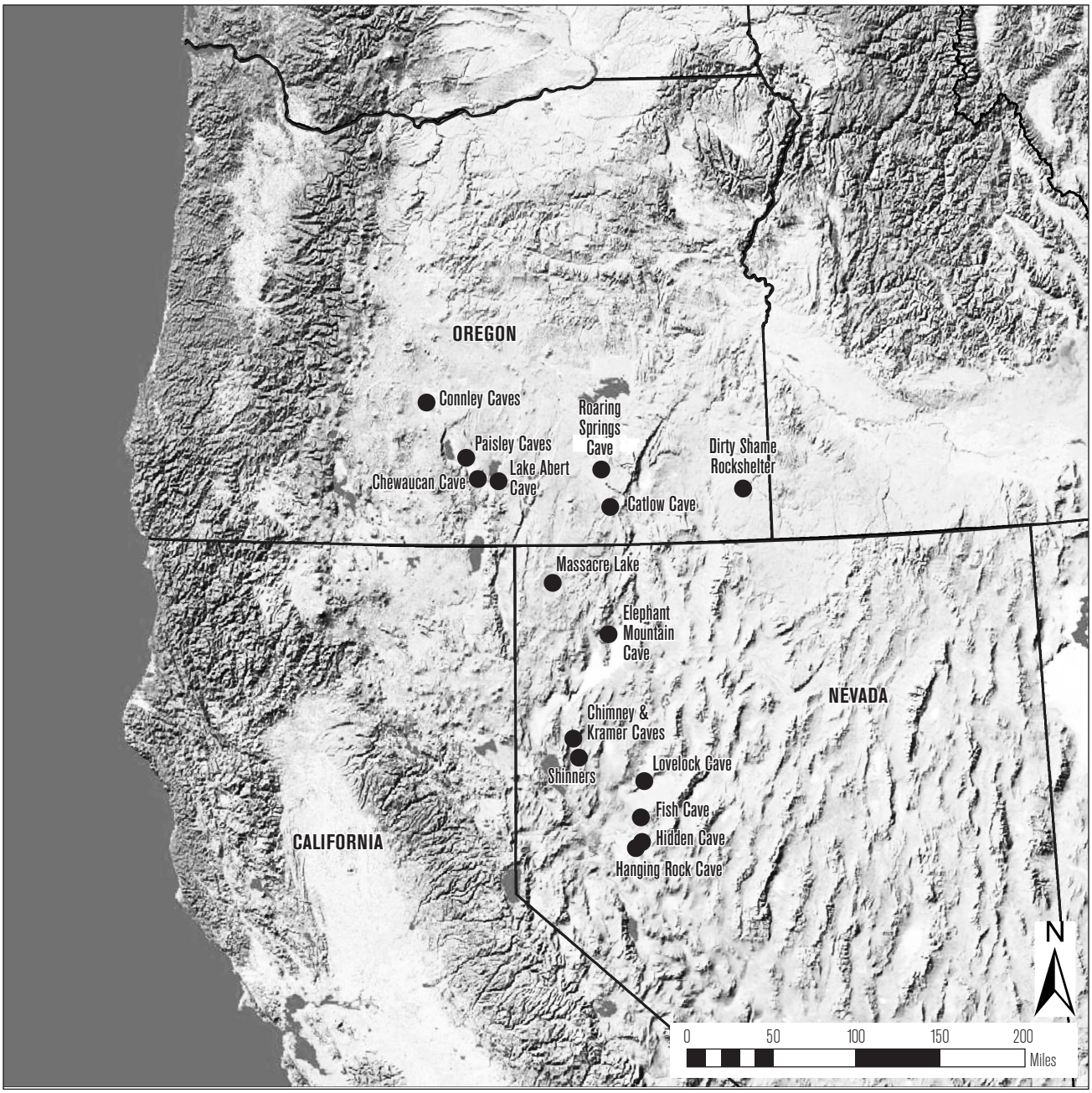

Figure 1. Overview map showing site locations.

on technological attributes such as lithic procurement networks (Jones et al. 2003) and distinctive basketry traditions (Adovasio 1970, 1986). We examine netting from these regions to determine whether patterns in net-making might also distinguish these areas. The metrics recorded for each sampled net do indeed show a statistically significant difference in net construction between these two regions.

STUDY SAMPLE AND METHODS

The sample of archaeological nets and net fragments considered here are from collections located at the Nevada State Museum (NSM) and the Museum of Natural and Cultural History (MNCH) at the University of Oregon. Eighty-nine specimens from sixteen archaeological sites in the northern and western Great Basin are included in the archaeological analysis. We examined more than

Table 1

RADIOCARBON DATES FROM SAMPLE KNOTTED NETS FROM THE NORTHERN AND WESTERN GREAT BASIN

Region	Site	Museum	Catalog Number	Laboratory	Sample	$^{14}C \pm \sigma$ B.P.	Cal B.P. $\pm 2\sigma$
N	Chewaucan Cave	MNCH	263-1-31284	Beta-249775	fiber	340 ± 40	489–308
N	Chewaucan Cave[1]	MNCH	96-12-21	AA-30375	fiber	325 ± 50	495–300
N	Roaring Springs Cave	MNCH	1-89212	Beta-448983	fiber	4,090 ± 30	4,809–4,448
N	Dirty Shame Rockshelter	MNCH	404-B3-6/1-C1	Beta-448984	fiber	5,820 ± 30	6,728–6,536
N	Connley Caves	MNCH	15-C-11-5	Beta-164959	fiber	4,520 ± 40	5,310–5,046
N	Lake Abert Cave #1	MNCH	100II-1-12364	AA-98330	fiber	1,602 ± 36	1,563–1,405
N	Roaring Springs Cave 35Ha-433	MNCH	60-1-8830	AA-106455	fiber	1,047 ± 25	1,049–923
N	Catlow Cave	MNCH	56-1-2916	AA-106450	fiber	1,270 ± 25	1,281–1,176
W	Elephant Mt Cave 26Hu3557	NSM	261-264	Beta-83484	fiber	2,050 ± 60	2,290–1,876
W	Lovelock Cave 26Ch5	NSM	PB-1	Beta-257745	fiber	1,690 ± 40	1,701–1,529
W	Lovelock Cave 26Ch5	NSM	F-2	Beta-257744	fiber	3,480 ± 40	3,849–3,640
W	Shinners Site C 26Wa200	NSM	FH-3	Beta-257747	fiber	3,470 ± 40	3,843–3,636
W	Shinners Site C 26Wa200	NSM	FH-2	Beta-257746	fiber	3,760 ± 40	4,242–3,895
W	Lovelock Cave 26Ch5	NSM	NHS 308-1	AA-104828	fiber	3,041 ± 41	3,363–3,082
W	Lovelock Cave 26Ch5	NSM	NHS 308-2	AA-104829	fiber	4,630 ± 37	5,467–5,298
W	Lovelock Cave 26Ch5	NSM	NHS 188	AA-104827	fiber	4,443 ± 44	5,285–4,847
W	Chimney Cave 26Pe3b	NSM	201	AA-104830	fiber	2,526 ± 41	2,749–2,474

Notes: All dates were calibrated using OxCal 4.2 (Bronk Ramsey 2009) and the IntCal13 curve (Reimer et al. 2013). MNCH = Museum of Natural and Cultural History; NSM = Nevada State Museum.

[1]Chewaucan Cave (Cat. No. 96-12-2) lab specimen AA-30375 is not included in the analysis. This net fragment, though not from the bagged cache, was recovered from Tucker Hill Cave (also known as Chewaucan Cave), and is housed at the Lake County Museum, Nevada.

this number, but excluded specimens that were too fragmentary to give us reliable measurements; in a few cases, we counted as one specimen multiple fragments from a single site believed to be from the same net. Of the 89 analyzed specimens, 45 are from northern Great Basin sites, and 44 are from western Great Basin sites. Sixteen of the nets sampled have direct AMS dates (Table 1), ranging from 5,820 ± 30 B.P. (Dirty Shame Rockshelter, Beta-448984) to 340 ± 40 B.P. (Chewaucan Cave, Beta-249775).

Netting was analyzed using standardized recording. Net cordage was described according to Hurley (1979), with measurements taken from several locations on each net. Measurements, including mesh size, cord diameter, and number of twists per centimeter, were taken at different points (up to a dozen) for the same net when possible, then an average calculated. Other documented information includes the number of plies per cord, spin (s or z) for each ply, and twist (S or Z) for the final cord. For example, Szz cordage is made up of two z-spun plies, joined together by a counter S-twist (Figs. 2 and 3).

Nets were measured by extending the cord, or splaying out the mesh without pulling it taut, and then pinning the cordage/netting in place. The mesh size was determined by measuring the distance between two adjacent knots (from the center of each knot). For a square mesh, a knot-to-knot measurement of 5 cm. would be referred to as a 5-cm.-square mesh; this differs from a diagonal measure used by some analysts (e.g., Andrews and Adovasio 1980). The overall width of the net was determined by counting the number of mesh units and multiplying that by the average mesh size, as well as by direct measurement where possible. Nets were defined as complete if they had three selvages: one top, one bottom, and one side edge, as determined by the length of the net being examined. Internal fragments that lacked selvage were not measured for overall width or length. Netting fragments included in the sample had

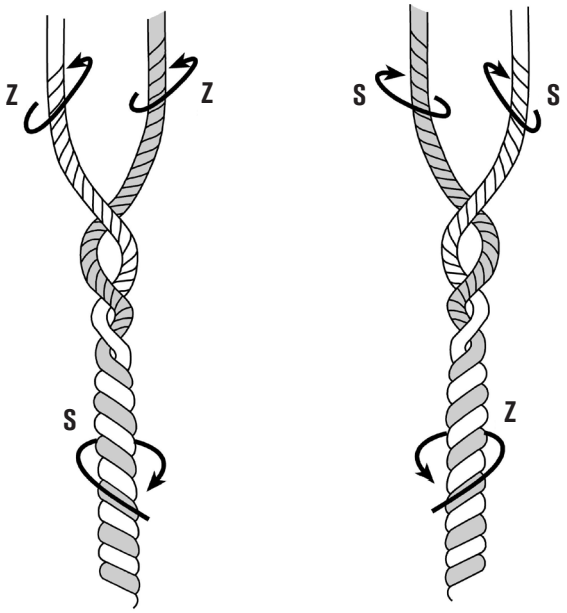

Figure 2. Illustration of z- and s-spun cords used to make 2-ply S- and Z-twist cordage.

a minimum of two intact knots in order to take a knot to knot measurement. The knot types are described according to Shaw (1972) and Emery (1966); however, knots from this archaeological sample are exclusively reversing weaver's/sheet-bend knots (Fig. 3). Repairs, selvage type, condition, material, and noticeable staining and adhesions were also noted.

HISTORIC ACCOUNTS OF NET-MAKING AND USE

Emery (1966) defined netting as a flexible open-mesh fabric woven by repeatedly linking, looping, or knotting a single continuous element (cord) with itself. When making a knotless net, the weaver constructs the fabric by linking, looping, or interlooping the cord. Knotted nets are made by tying knots at mesh intersections. Knotted nets, usually tied with reversing weaver's/sheet-bend knots, dominate the Great Basin ethnographic and archaeological records.

The Surprise Valley Paiute used their fingers to gauge mesh size; two fingers for suckers; three for trout or duck; and four for rabbits (Fowler 1989:89, 1992:117; Kelly 1932:136). Northern Paiute people from the Stillwater Marsh constructed nets as follows: "Cordage in a ball or on a carved shuttle was passed around the fingers and the knot was tied at the top of the index finger. A second loop

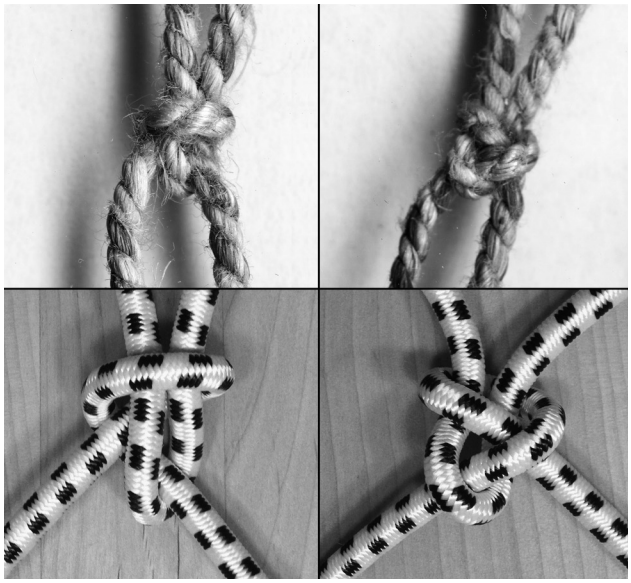

Figure 3. Two sides of a sheet bend or weaver's knot; top images are from the Chewaucan Cave net 1-3128a.

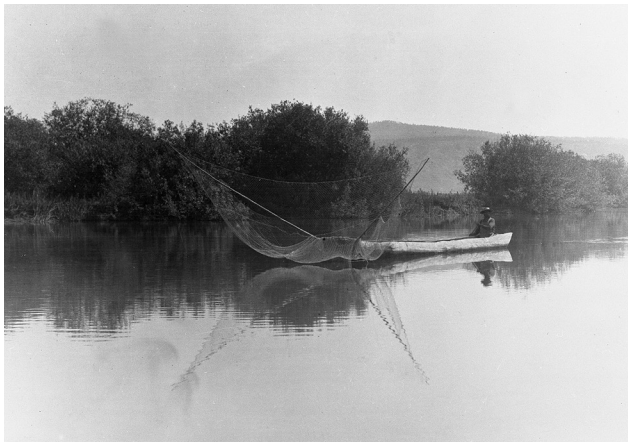

Figure 4. Klamath net fisherman. Copyright © Phoebe A. Hearst Museum of Anthropology and the Regents of the University of California, Photography by Samuel A. Barrett (Catalog No. 15-4093).

and knot followed, and the process continued. When the finger or fingers were full, the knots were slipped off and a new set started" (Fowler and Bath 1981:178). The rows were made along the short net dimension until the desired net length was reached (Fowler 1992:116–117; Fowler and Bath 1981:178).

People made cord for netting from the inner bark (bast) of several plants. Dogbane (*Apocynum* sp.) was most frequently used throughout much of the Great Basin, but nettle fiber (*Urtica* spp.), was most commonly used by the Klamath. Milkweed (*Asclepias* sp.) and Rocky

Mountain flax (*Linium lewisii*) were also used by the Klamath and some Northern Paiute bands (Anderson 2005:230; Barrett 1910:250–251; Downs 1966:27; Eiselt 1997:60; Fowler 1989:86, 1992:114; Fowler and Fowler 1970:126, 140; Jenkins 1994:349; Kelly 1932:135; Spier 1930; Stewart 1941:388; Wheat 1967:55). The Surprise Valley Paiute did use sagebrush for cordage, but nets were always made of dogbane (Kelly 1932:136); similarly, Spier (1930:175) reports a variety of materials (including tule and grasses) used for coarse cords by the Klamath, but "finer cords, such as those for fish lines and nets, are made of nettle bark fibers" (Fig. 4).

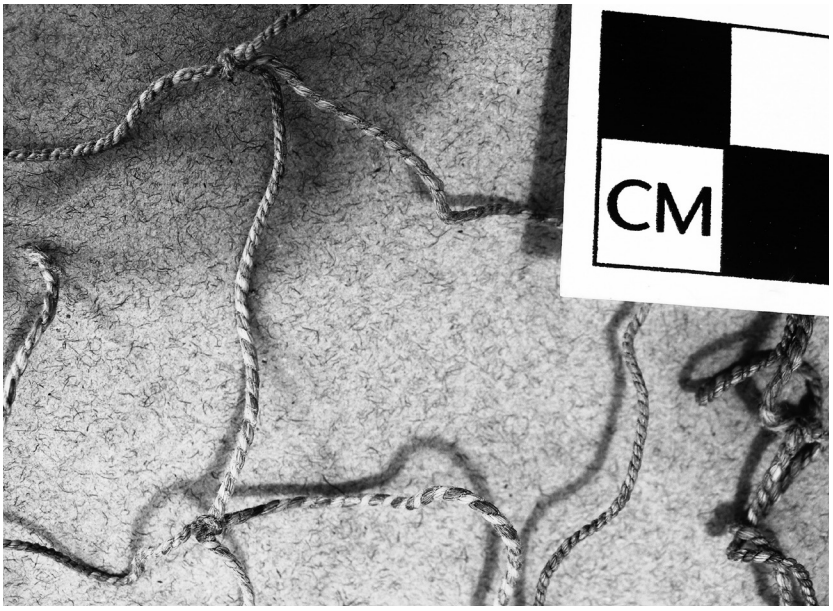

Figure 5. Lovelock Cave net, 26CH5/PB-1.

Figure 6. Chewaucan Cave net, 1-21283a.

The analyzed netting includes both retted and unretted (or partially retted) fibers. Retting separates inner fiber from outer bark and produces a finer and whiter cord. Fibers are retted by soaking the plant under water, or by leaving cut plants in the field to be soaked by precipitation (Norton 1990). The result of the uneven retting is the appearance of variegated cordage. For example, netting from Lovelock and Chewaucan caves exhibits alternating colors in the cordage (Figs. 5 and 6).

Net cord, like most spun cordage in the Great Basin, is presumably made by spinning two damp fiber strands along the thigh, either toward or away from the body to form two strands. The paired strands are then twisted together in the opposite direction to make a single 2-ply cord. Pushing first away from the body produces two-ply s-spun Z-twist cord and pulling first toward the body results in a two-ply z-spun S-twist cord (Eiselt 1997:63; Fowler 1989:87, 1992:115; Kelly 1932:135; Wheat 1967:59). Lindstrom (1992:303) calculated the cost of making a net 100 feet long and 4.5 feet wide, with a cordage diameter of 1/16 of an inch; a 4-inch-mesh net would require 3,343 feet of cord (0.63 miles), requiring approximately 213 hours to produce. Anderson (2005:230–31, Table 10) adopted these values to estimate that five plants of either dogbane or milkweed yielded one foot of cord. As an example, a gill net with the same dimensions as described above would require 16,715 stalks to manufacture the necessary 3,343 feet of cord.

DESCRIPTIVE ANALYSIS OF ARCHAEOLGICAL NETTING

The archaeological netting sample includes examples of various net construction techniques that can be found in the ethnographic record, including long nets, dip

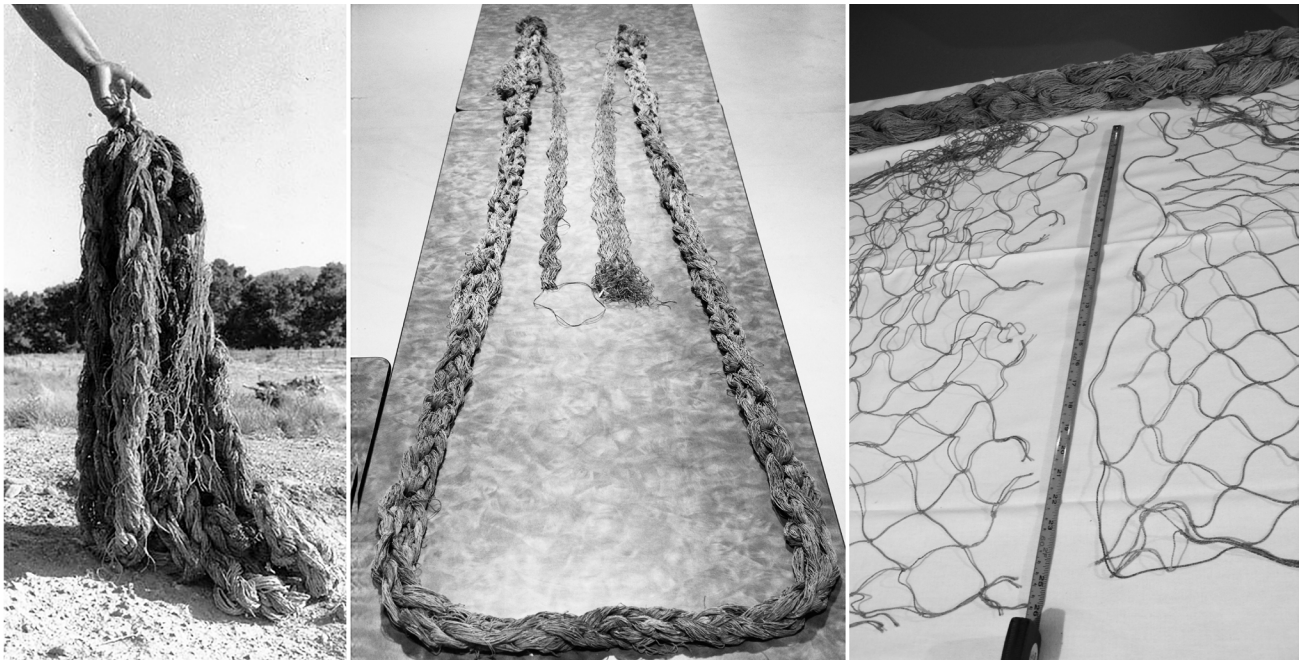

Figure 7. Captain Wasson net. Image on right showing end selvages.

nets or traps, possible mist nets, and bags or hair nets. Examples of selvage techniques, variegated cordage, and very fine cordage used for large gauge nets are also discussed. A representative sample of the 89 net and net fragments analyzed at the two museums is described below, illustrating these various types and construction techniques.

Archaeological Long Nets

Long or linear nets were rectangular fabrics commonly associated with rabbit drives, but they were also used to take larger fish and birds. Ethnographic accounts of net hunting with long nets described rabbit drives as communal, though the number of people or families involved, the length of netting (nets could be tied together), and the time of year vary across cultural regions (Adovasio et al. 2009: Kelly 1932). Rabbit nets varied from 1.5 to 6 feet (45 cm. to 1.8 m.) high and from 20 to 400 feet (6–12 m.) long with a 2 to 3-inch (5–7.6 cm.) gauge, approximately the size of a rabbit's head (Adovasio et al. 2009:88; Fowler 1986:82, 1989:26–28; Kelly 1932:88; Nevers 1976:15, 42; Price 1980:62; Wheat 1967:14). The Klamath set long nets for hunting waterfowl underwater in marshy lake margins, "to catch the birds as they dive" (Spier 1930:159). Another method was to stretch a net near the surface of the water: "As a flock of birds swims or flies into this net it is let down by men on the shore" who paddle out in a canoe to remove the entangled birds (Barrett 1910:247).

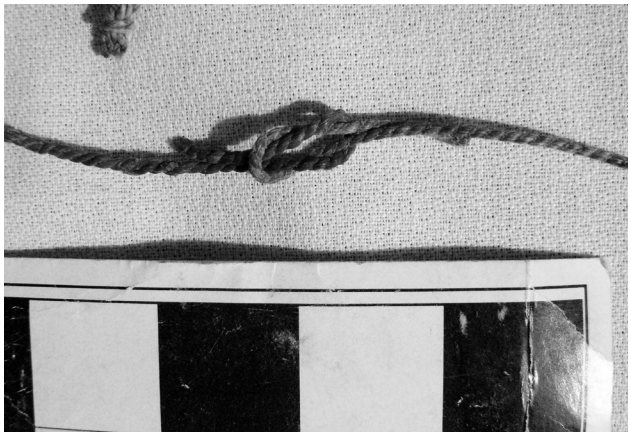

Figure 8. Captain Wasson net lark's head knot repair.

Two ethnographic long nets provide historical comparisons for the long nets in the archaeological sample. One Northern Paiute net was donated to the Nevada State Museum in 1942 by Ada Ducker (CM-91-g), and the other is part of a Northern Paiute net made by Captain Wasson and donated to the Churchill County Museum by his grandchildren in 1970 (Fig. 7). Wheat (1967:59, 116) describes the historic Wasson net as over

300 feet long, made with dogbane cordage "so uniform that it is hard to believe that it was made by hand," with a mesh "just large enough to catch a rabbit behind the ears when it tried to force its way through." Both nets are tied with reversing weaver's/sheet-bend knots and have been repaired with what appears to be the same cordage used to make the net, but using square and lark's head/reef knots to integrate the repair (Fig. 8). Metrics for these two nets are included in this analysis.

Similar long nets from three cave sites (Chimney Cave, Chewaucan Cave, and Elephant Mountain Cave) have dimensions and mesh sizes that are consistent with these ethnographic nets. Excellent preservation of these complete or nearly complete nets from dry cave sites provides an opportunity to document selvage techniques, overall net size, condition, and residue from use. Metrics for these and all other netting described below are included in Table 2.

Table 2

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
56	Catlow Cave	1-3166	Szz	4.5, 5.0, 5.5, 5.0, 5.1	5.0	2.06, 2.20, 1.86, 2.20, 1.80	2.00	4.0, 6.0, 4.5, 5.0	4.9	Three fragments, probably from same net; some fibers have very reddish tone.
56	Catlow Cave	1-4813	Szz	4.5, 4.5, 4.9, 4.8, 4.8, 4.9	4.7	1.31, 1.39, 1.50, 1.23	1.36	3, 4, 6, 6, 6, 7	5.3	Net fragment, charred at some knot nodes and cord ends.
56	Catlow Cave	1-3254a	Szz	1.3, 1.4, 1.7, 1.7	1.5	1.30, 1.59, 1.23, 1.44	1.39	8, 9, 9, 9	8.8	
56	Catlow Cave	1-4815a	Szz	4.3	4.3	1.2, 1.3, 1.4	1.30	5, 6, 7, 7	6.3	Four fragments, two probably from same net; just two knots; 1-4815b is a small piece with several unevenly spaced knots, nature of structure not clear (not clearly netting).
56	Catlow Cave	1-2916	Szz	6.4, 6.4, 6.5, 6.6, 6.5, 6.5	6.5	1.40, 1.30, 1.30, 1.34, 1.27, 1.60	1.37	6.0, 5.0, 6.0, 6.5, 7.0, 7.0, 5.0	6.1	Triangular net, fourteen squares at base and gathered into knot at apex; ca. 55 cm. wide x 80 cm. long.
263	Chewaucan Cave	1-31283A	Szz	5.8, 6.5, 6.5, 6.3, 6.0, 6.4, 6.2, 6.5, 6.0, 6.0, 6.2, 6.7, 6.0, 6.4, 6.4, 6.0, 6.3, 6.3, 6.3, 6.1, 5.8, 6.3, 6.7, 6.7, 6.0, 5.8	6.2	1.9, 1.8, 1.5, 1.7, 2.0, 1.7, 1.4, 1.4, 1.7, 1.8, 1.7, 1.8	1.70	7, 7, 6, 7, 7, 6.5, 5, 6, 5	6.5	Long net, 1.2 m. wide x 11.5 m. long.
263	Chewaucan Cave	1-31283B	Szz	5.5, 6.0, 5.9, 6.0, 6.2, 5.9, 6.3, 5.7, 5.8, 6.4, 5.6	5.9	2.1, 1.6, 1.4, 1.3, 1.6, 1.7, 1.9, 1.5, 1.8, 1.6	1.27	6, 6, 7, 6, 5, 7, 6	6.1	Long net fragment.
263	Chewaucan Cave	1-31284	Szz	5.5, 5.3, 5.0, 5.4, 5.5, 5.6, 6.0, 5.6, 5.5, 6.0, 5.8, 5.7, 5.5, 5.5, 5.5, 5.3, 5.4, 5.5, 4.5, 5.2	5.5	1.32 to 1.80	1.56	7, 8, 3, 4	5.5	Long net, 18 m. long compressed, ca. 12.7 m. long open x 1.1 m. wide.
26Pe3b	Chimney Cave	206	Szz	0.5, 0.6, 0.5, 0.6	0.6	0.56, 0.61, 0.61, 0.43, 0.53	0.55	14, 14, 14, 14	14.0	Fine large mesh fragment, *Apocynum*(?; retted), reversing weavers knots, light use, small patches of black stains (blood?), small fragment with square mesh.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
26Pe3b	Chimney Cave	201-1	Szz	4.0, 4.0, 4.0, 4.0	4.0	0.86, 0.64, 0.76, 0.61, 0.56, 0.81	0.71	14, 11, 14	13.0	*Apocynum*(?; retted), reversing weavers knots, light use, stiff, dirty, black crusty stains (blood?), post deposition damage.
26Pe3b	Chimney Cave	201	Zss	4.8	4.8	1.61	1.61	6	6.0	Large net fragment 20.66 ft. (629.92 cm.) long x 5.04 ft. (153.63 cm.) wide.
1265	Connley Caves	CC-15C-11-5	Szz	2.6, 2.6, 2.3	2.5	.6, .5, .55	0.55	10, 14, 18	14.0	Very fine cordage, possible netted bag; cords very in twist tightness; cord ends bundled and twisted into Szz bundle, ca. 4.2 cm. thick.
26Hu3557	Elephant Mountain Cave	761	Szz	6.35, 4.44	5.4	0.42	0.42	15	15.0	Long net, 23 mesh units wide, 1,143 cm. long x 3.24 cm. wide.
26Hu3557	Elephant Mountain Cave	762	Szz	6.35, 7.62	7.0	0.68	0.68	8	8.0	Netting tied around bundle, 129.54 cm. wide.
26Hu3557	Elephant Mountain Cave	763	Szz	6.35, 4.44	5.4	0.42	0.42	15	15.0	Long net, 21 mesh units wide, 523.72 cm. long x 133.35 cm. wide.
26Hu3557	Elephant Mountain Cave	764	Szz	5.08, 5.08	5.1	0.77	0.77	9	9.0	Netting tied around bundle, short edge is 19 mesh units wide, 91.44 cm., no cord edge.
26Ch1e	Fish Cave	1-1e-124-1	Szz	0.6, 0.6	0.6	0.88, 0.91, 0.79. 0.76, 0.71	0.81	11	11.0	Small net fragment, reversing weavers knots, no stain, light use, post-deposition fragmentation, worn knots.
26Ch1e	Fish Cave	1-1e-16	Szz	1.0, 1.0	1.0	0.37, 0.33, 0.63, 0.33, 0.63	0.45	10	10.0	Net fragment (small fragment), *Apocynum*(?), reversing weavers knots, very light use wear, sediments noted.
26Ch1e	Fish Cave	1-1e-149	Szz	0.6, 0.7 ,0.6, 0.7	0.7	0.62, 0.69, 1.00, 0.75, 0.60	0.73	9, 10, 8	9.0	Bag or hair net fragment.
26Ch162	Hanging Rock Cave	213	Szz	1.2, 1.0	1.1	0.50, 0.38, 0.65, 0.50	0.51	8, 8,	8.0	*Apocynum*(?), three-knot fragment, reversing weavers knots, white stain, dirty, black stain at knots.
26Ch162	Hanging Rock Cave	230	Szz	2.5, 2.0	2.3	0.21, 0.24, 0.22	0.22	24, 24	24.0	*Apocynum*(?), three-knot fragment, reversing weavers knots, dark stain (blood?), slight fraying, unraveling, shiny knots.
26Ch162	Hanging Rock Cave	261	Szz	1.0, 1.2, 1.0, 1.2	1.5	0.51, 0.49, 0.53, 0.48	0.50	6, 8, 11, 9	8.5	Small fragment of sqaure mesh, *Apocynum*(?), reversing weavers knots, moderate wear, dirty, frayed.
26Ch162	Hanging Rock Cave	273	Szz	5.7, 4.7	5.2	0.65, 0.75. 0.65, 0.70	0.69	12, 12,	12.0	*Apocynum*(?; retted), rectangular, three-knot fragment, reversing weavers knots, dark stain (blood?), cords between knots. sharply kinked, light use, slight fraying
26Ch162	Hanging Rock Cave	275	Szz	4.0, 3.5, 4.0, 4.0, 4.0	3.9	0.53, 0.49, 0.57, 0.56	0.54	10, 13, 13, 10	12.0	*Apocynum*(?; retted), irregular square mesh, reversing weavers knots, frayed, light use, very dirty, dark red and black stain, attached to 2nd compressed net fragment(s), crusty, substance–could not separate.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
26Ch1b	Hidden Cave	1-1b-13-G-12	Szz	3.5, 3.5	3.5	0.88, 0.80, 0.68, 0.45	0.70	9, 14, 8, 24	13.5	*Apocynum*(?; retted), reversing weavers knots, frayed, dark stain, single mesh cell enclosed in glass slide. Approx. diameter measured through glass.
26Ch1b	Hidden Cave	1-1b-13-G-15	Szz	0.5, 0.5, 0.4, 0.5, 0.4, 0.5, 0.4, 0.5	0.3	0.63, 0.50, 0.64, 0.66	0.61	11,11 14	12.0	Net fragment, weavers knots, very small net mesh, possibly hair net or bag, 1 ply larger, retted *Apocynum*(?),staining noted, wear on knots.
26Ch1b	Hidden Cave	1-1b-193	Szz	1.7, 1.7	1.7	0.68	0.68	14	14.0	Fragmented net, reversing weavers knots, *Apocynum*(?), red stain, frayed cords and knots, square mesh.
26Ch1b	Hidden Cave	1-1b-338	Szz	1.3, 1.3, 1.3, 1.3	1.3	0.53, 0.51, 0.69, 0.91, 0.66	0.66	16, 20	18.0	Net fragment, small fragment, *Apocynum*(?), reversing weavers knots, use wear, frayed cordage, rectangular mesh, stained.
26Ch1b	Hidden Cave	1-1b-496	Szz	2.3, 2.3, 2.3, 2.3	2.3	0.67, 0.83, 0.69, 0.94, 0.56	0.63	20	20.0	*Apocynum*(?), reversing weavers knots, heavy use wear frayed cordage, stained.
26Ch1b	Hidden Cave	1-1b-803	Szz	3.0, 2.9, 3.0	3.0	0.32, 0.33, 0.46, 0.51, 0.35	0.39	17	17.0	Net fragment, very fine cordage, bird feather, *Apocynum*(?), flattened reversing weavers knots, very fragile, impressed dirt, mud, very fragmented stained.
26Ch1b	Hidden Cave	1-1b-13-G-7	Szz	2.0, 5.0, 3.0, 5.0	3.3	1.07, 1.50, 1.59, 1.10, 0.78, 0.95, 0.61, 1.32	1.12	13	13.0	Bag net fragment.
26Wa196	Kramer Cave	315	Szz	2.4, 2.4	2.4	0.16, 0.16, 0.14, 0.15, 0.16	0.15	16, 18, 16, 22, 22	14.0	Small net fragment, *Apocynum*(?), retted, reversing weavers knots, unraveling, dirty, discolored, frayed, shiny knots.
26Wa196	Kramer Cave	343	Szz	1.3, 1.3	1.3	0.86, 0.74, 0.79, 0.81	0.80	10, 10, 13	11.0	Small net fragment, *Apocynum*(?; retted), reversing weavers knots, dirty, discolored, frayed, shiny knots, light use.
26Wa196	Kramer Cave	1959	Szz	3.5, 3.0	3.3	0.12, 0.13, 0.10, 0.11	0.12	26, 24	25.0	Net fragment with rectangular mesh, *Apocynum*(?; retted), reversing weavers knots, small fragment, three knots, very fine, light use, fragile, brittle, stiff, no knot wear, unraveling, red stained.
26Wa196	Kramer Cave	2748	Szz	3.0, 3.0	3.0	0.74, 0.81, 0.69, 0.64	0.72	8. 10	9.0	Apocynum(?; retted), reversing weavers knots, small fragment, one mesh cell, light use, red stained.
26Wa196	Kramer Cave	2749	Szz	2.5, 2.5	2.5	0.97, 0.74, 0.81, 0.74	0.82	9, 12	11.0	Net fragment (single intact mesh unit), *Apocynum*(?), reversing weavers knots.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
26Wa196	Kramer Cave	No Number	Szz	0.70, 0.70	0.7	0.48, 0.48, 0.48, 0.46, 0.46	0.47	14, 7, 8, 24	13.0	*Apocynum*(?; retted), reversing weavers knots, large fragment, fine, light use, dirty, discolored, frayed, shiny knots, red stained.
10OII	Lake Abert Caves	1-12364w	Szz	5.8	5.8	1.80, 1.48, 1.42	1.57	6, 7, 6	6.3	Two knotted elements cf. *Apocynum* cordage, S-twist, z-spin.
10OII	Lake Abert Caves	1-12365h	Szz	5.5, 6.5	6.0	1.80, 1.52, 1.20, 0.80	1.33	5, 5, 10, 10, and one strand measured 7 twists for 0.5 cm.	8.8	Three knotted elements cf. *Apocynum* cordage, net frag., S-twist, z-spin. One strand is very fine (0.8 diam., 7 twists per 0.5 cm.), tied to the thicker cordage.
26Ch5	Lovelock Cave	188	Szz	3.5, 3.5, 3.5, 3.5	3.5	0.31, 0.34, 0.32, 0.39	0.34	12, 10, 12, 12	11.5	Large net fragment of very fine cordage, self-selvage, edge cord kinks, retted *Apocynum*(?) with reversing weavers knots, numerous repairs, staining noted (black).
26Ch5	Lovelock Cave	LLC-1	Szz	3.81	3.8	0.53	0.53	11	11.0	Small net fragment with large mesh. Knotted cord selvage, reversing weavers knots, edge cord (1.05 maximum/6 turns) knotted and looped through mesh, *Apocynum*(?).
26Ch5	Lovelock Cave	NHS 308-1	Szz	6.5, 6.5, 6.5, 6.5	6.5	0.93, 0.92, 0.96, 1.01, 0.94, 0.96, 0.97, 0.94	0.95	9, 8, 9,10	9.8	Net fragment (1 of 10+ fragments of a larger net) constructed with paired cordage, four elements in a knot, reversing weavers knots, *Apocynum*(?),frayed, stained.
26Ch5	Lovelock Cave	NHS 308-2	Szz	2.9, 2.9	2.9	0.30, 0.28. 0.32, 0.28	0.29	7	7.0	Net fragment, fine to very fine cordage used for construction, *Apocynum*(?), reversing weavers knots, stained at breaks and along edges, frayed, unidentified plant residue noted.
26Ch5	Lovelock Cave	NHS 308-3	Szz	5.0, 5.0	5.0	0.74, 0.88, 0.84, 0.85	0.83	9, 14, 17	13.3	Net fragment, 85 cm. wide on bias, reversing weavers knots, edge cord kinks, varigated red/white (retted?) cordage, *Apocynum*(?), dark red/ black stains, unidentified plant residue noted, cobwebs, impressed sand.
26Ch5	Lovelock Cave	NHS 308-4	Szz	4.3, 4.3	4.3	min. 1.08, 0.86, 0.91, 0.96, max. 1.03, 1.05, 1.03, 1.08	min. 0.95 max. 1.06	min. 8, max. 11	min. 8, max. 11,	Net fragment, 73.1 cm. wide on bias, reversing weavers knots, no edge cord kinks, *Apocynum*(?), frayed knots, holes, red stain, cordage is maximum on one side of the mesh and minimum on the other.
26Ch5	Lovelock Cave	NHS 308-5	Szz	3.1, 3.5	3.3	0.82, 1.14, 0.93, 0.89	0.95	13, 8	10.5	Net fragment, slightly irregular square mesh, reversing weavers knots, *Apocynum*(?), net stained red, light use wear, white staining.
26Ch5	Lovelock Cave	No#465	Szz	0.07, 0.06, 0.07, 0.06	0.1	0.67, 0.67, 0.71, 0.62	0.66	16, 18, 16, 16	16.5	Net fragment constructed of very fine *Apocynum*(?) cordage, stained and frayed, reversing weavers knots.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
26Ch5	Lovelock Cave	F-2	Zss	1.27, 1.27	1.3	0.52	0.52	11	11.0	Net fragment.
26Ch5	Lovelock Cave	PB-1	Zss	5.13, 4.56	4.8	0.49, 0.71	0.60	13	13.0	Large gauge possible mist net fragment.
26Wa9	Massacre Lake Cave	C-31	Szz	5.7, 7.7	6.7	1.35, 1.82, 1.35, 1.43, 1.45	1.48	8, 8, 8,	8.0	*Apocynum*(?), rectangular mesh, three-knot fragment, reversing weavers knots, black stain (blood), frayed knots.
26Wa9	Massacre Lake Cave	C-38	Szz	4.7. 4.5	4.6	1.35, 1.34, 1.73, 1.34, 1.45	1.44	6, 6, 6,	6.0	*Apocynum*(?; retted), 3-knot fragment, irregular square mesh, reversing weavers knots, frayed, light use.
	Northern Paiute Ethnographic Net	CM-91-g	Szz	5.08	5.1	0.46	0.46	6	6.0	Long net, 5,141 cm. (163' 8") long x 162.56 cm. (64") wide.
1704	Paisley Cave #1	PC-1/7A-9-6	Szz	1.8, 2.0, 2.4	2.1	0.77, 0.82, 0.73, 0.72	0.76	9, 6, 8, 6	7.3	Fragment of fine netting, five knots, with small fragment of even finer netting attached.
1704	Paisley Cave #1	PC-1/7A-9-6 same as above?	Szz	1.6	1.6	0.52, 0.48, 0.63	0.54	11, 12	11.5	Fragment of fine netting, five knots, with small fragment of even finer netting attached.
Probably Acc 60	Paisley Cave #1,	n/a	Szz	6.2	6.2	1.68, 1.70	1.69	5.0, 5.5	5.3	Two knots, s-twist cordage.
1704	Paisley Cave #2	PC-2/4A-WF-1	Szz	0.9, 1.0, 0.9, 0.8, 0.9, 1.0	0.9	0.68, 0.72, 0.70	0.70	7.5, 9.0, 9.0	8.5	Eleven knots, very small mesh, cords have relatively loose twist.
1374	Paisley Cave #5	P5-U5-QB-7-2	Szz	2.2	2.2	0.76, 0.76, 0.89	0.80	13, 16	14.5	Two sheetbend knots, very fine, tightly twisted cords. Likely part of P5-U5-QB-7-3.
1374	Paisley Cave #5	P5-U5-QB-7-3	Szz	–	–	0.73, 0.66, 0.74, 0.92, 0.85	0.78	10, 11, 12, 13	11.5	Multiple fragments; five knots but no two on a single piece. Likley part of P5-U5-QB-7-2.
1704	Paisley Cave #5	PC-5/12C-11-2	Szz	2.2	2.2	–	–	11, 14, 14	13.0	Several very fine fragments, probably from same structure, only one with two knots.
1704	Paisley Cave #5	PC-5/13A-10-1	Szz	2.3	2.3	–	–	10, 12, 12	11.3	Fine cordage with two knots.
1704	Paisley Cave #5	PC-5/13A-5-2	Szz	2.1	2.1	0.86, 0.83, 0.85	0.85	12, 14, 12	12.7	Fine cordage with two knots.
1895	Paisley Cave #5	PC-5/15A-4-1a	Szz	2.2	2.2	0.75, 0.88, 0.82	0.80	11, 12	11.5	Fine netting, two knots. Likely part of PC-5/15A-5-1.
1895	Paisley Cave #5	PC-5/15A-4-1b	Szz	–	–	0.78, 0.98, 0.86	0.90	10, 11	10.5	Single knot.
1895	Paisley Cave #5	PC-5/15A-5-1	Szz	2.1, 2.2, 2.4	2.2	0.94, 0.77, 0.84	0.85	10, 11, 13	11.3	Small net fragment with sheetbend knots, one end slightly charred; very fine, tightly twisted cords. Likley part of PC-5/15A-4-1a.
1374	Paisley Cave #5	PC-5/5A-6-1	Szz	2.3, 2.3	2.3	0.83, 0.74, 0.75, 0.79, 0.79, 0.89	0.80	12, 13, 12, 12	12.3	Fine netting fragments, two with two knots each.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn.–kn. avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
1374	Paisley Cave #5	PC-5/5B-7-3a	Szz	2.2, 2.3, 2.1, 2.3, 2.1, 2.2	2.2	0.83, 0.88, 0.86	0.86	11, 12, 13, 13	12.3	Fragment with seven knots.
1374	Paisley Cave #5	PC-5/5-B-9-1a	Szz	–	–	0.77, 0.89, 0.88	0.85	10, 13	11.5	Single knot
1895	Paisley Cave#5	PC-5/14A-2-1	Szz	1.9	1.9	0.75, 0.81, 0.92	0.83	14, 10, 12	12.0	Fine knotted cord, probably netting, two knots.
60	Roaring Springs Cave	1-7403	–	5.2	5.2	1.27, 1.30	1.30	6	6.0	Three knots.
60	Roaring Springs Cave	1-7576	Szz	4	4.0	1	1.00	7	7.0	Very fine cordage with sheetbend knots.
60	Roaring Springs Cave	1-7731	Szz	6.1, 6.0, 5.8	6.0	2.0, 1.8, 1.7	1.83	5.5, 5.0, 6.0	5.5	Salvaged bundle of cordage, appears to be a net that has been untied, cordage has knot kinks.
60	Roaring Springs Cave	1-7818	Szz	6.3, 6.4, 6.4	6.4	1.56, 1.18, 1.17, 1.50	1.35	5.0, 5.0, 5.6	5.2	Net frag., overall size ca. 8x14 cm.
60	Roaring Springs Cave	1-8059	Szz	5, 6	5.5	1.0, 1.5	1.25	5	5.0	Fragment with seven sheet bend knots, broken cordage, only one complete square.
60	Roaring Springs Cave	1-8309	Szz	6.2	6.2	1.6	1.60	6	6.0	Fragment with two sheet bend knots.
60	Roaring Springs Cave	1-8332	Szz	6	6.0	1.6	1.60	6	6.0	Small net fragment.
60	Roaring Springs Cave	1-8402	Szz	5.2, 5.1, 5.6	5.3	1.7, 1.6, 1.9	1.73	5, 4	4.5	Trace of ocher on sheet bend knot.
60	Roaring Springs Cave	1-8921	Szz	2.0, 2.1, 2.2	2.1	1.27, 1.30	1.30	7, 9	8.0	
56	Roaring Springs Cave	1-4949a	Szz	15	15.0	1.46, 1.30, 1.29, 1.50	1.39	7.5, 6.0, 7.5, 5.0	6.5	Two knots, may not be a net (snare part?); one knot has loop made by wrapping looped cord with second cord; 2nd know is complex, double or triple overhand?
56	Roaring Springs Cave	1-4949b	Szz	–	–	1.2, 1.4, 1.6	1.40	5.5, 6.0	5.8	One sheet bend knot.
56	Roaring Springs Cave	1-4949c	Szz	5.4	5.4	1.40, 1.54, 1.55	1.50	6.0, 4.5, 5.0	5.2	Two sheetbend knots, possible dogbane.
56	Roaring Springs Cave	1-4958a	Szz	6.35, 6.40	6.4	1.4, 1.6	1.50	5, 6, 5	5.3	Three sheetbend knots, possible nettle, small reddish stain.
56	Roaring Springs Cave	1-4958b	Szz	6.4, 6.4	6.4	1.4, 1.5, 1.7	1.53	5.5	5.5	Possible nettle.
56	Roaring Springs Cave	1-4958c	Szz	–	–	1.50, 1.60, 1.65	1.58	6.5, 7.0, 7.0	6.8	Single knot.
60	Roaring Springs Cave	1-8835A	Szz	6.1, 5.5	5.8	1.4, 1.5	1.45	5.5, 6.0	5.8	
60	Roaring Springs Cave	1-8835B	Szz	2.5, 2.5, 2.6	2.5	1.0, 1.1, 1.4	1.75	6, 8, 5	6.3	
60	Roaring Springs Cave	1-8830	Szz	2.6, 4.8, 2.6, 3.3, 3.4	3.3	0.80, 1.20, 1.01, 1.10	1.03	8, 11, 9, 10	9.5	Complete small fine net, ca. 66 cm. x 70 cm. Knot to knot varies from 2.6 to 4.8 cm.

Table 2 (*Continued*)

METRICS FOR NETTING AND NET FRAGMENTS FROM NEVADA AND OREGON MUSEUM COLLECTIONS

Acc. No.	Site	Cat. No	Cord type	Knot-knot	Kn-kn avg.	Cord diam.	Cord diam. Avg.	Twists/cm.	Avg. tw./cm.	Description
26Wa200	Shinners C Falcon Hill	FH-2	Zss	4.16	4.2	0.2	0.20	11	11.0	Large gauge size and fine net cordage, possible mist net fragment.
26Wa200	Shinners C Falcon Hill	FH-3	Zss	6.35	6.4	0.17	0.17	14	14.0	Large gauge size and fine net cordage, possible mist net fragment.
	Wasson Net	CCM 133L7	Szz	4.7, 5.1	4.9	1.0, 1.1, 1.2, 1.0	1.08	4, 5, 6, 7	5.5	Long net fragment, 82.5 cm. wide x at least 110 ft. in length.

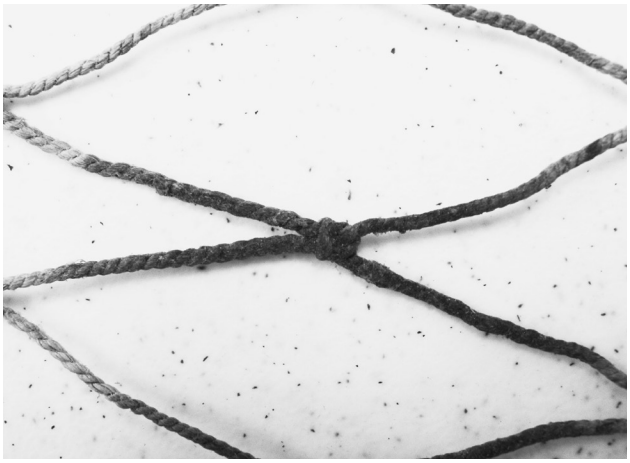

Figure 9. Chimney Cave net (26Pe3b/201) stain detail.

Chimney Cave Net. A large, long net fragment from Chimney Cave (26Pe3b/201) is 6.29 meters long (20.66 feet) and 1.53 meters wide (5.04 feet), and has returned an AMS date of 2,526 ± 41 B.P. (AA-104830). The net has been cut along its width at one end and the mesh units have been gathered and tied with an overhand knot. The other end and both long edges appear to be intact, with kinking suggesting that the net was bound by a cord loop threaded through the selvage. The net fragment was stained with a thick organic residue (Fig. 9) with inclusions that appear to be associated with knots in a random spotting pattern that could not be easily explained by post-depositional contamination (packrat urine, etc.). This may be blood and tissue residue from the net's last use.

Chewaucan Cave Nets. The Chewaucan Cave long nets are part of a cache discovered in 1967 by relic collectors digging in eastern Oregon (Kallenbach 2013). One of the nets (1-31284) returned an AMS date of 340 ± 40 B.P. (Beta-249775). Museum records also indicate that a

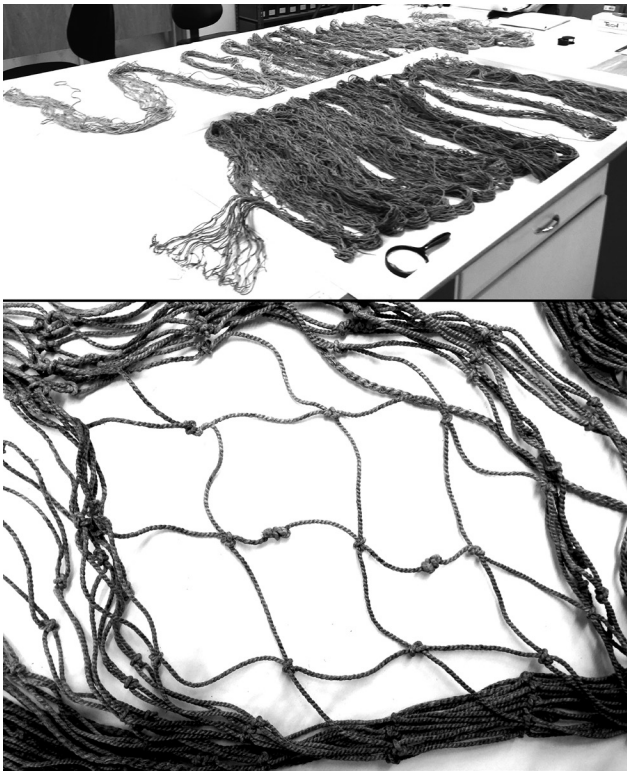

Figure 10. Chewaucan Cave nets (1-31284 and 1-31283A and B).

sample from the large grass bag containing the cached nets and other items returned a radiocarbon date of 340 ± 80 B.P. (GaK-1755). The nets (1-31284 and 1-31283A and B) are similar in that both are knotted nets constructed with a reversing weaver's knot, and 2-ply s-spun Z-twist cordage made from nettle or dogbane (Fig. 10), However, the nets differ in end selvage construction; the start for 1-31283 is hanging loops (Fig. 11), as opposed to the chain loop start employed in net 1-31284 (Fig. 12). Net 1-31283 is in two fragments (A and B)—a larger section of the net (1-31283A) and a smaller section which has been cut off

Figure 11. Chewaucan Cave net 1-31283 hanging loop selvage.

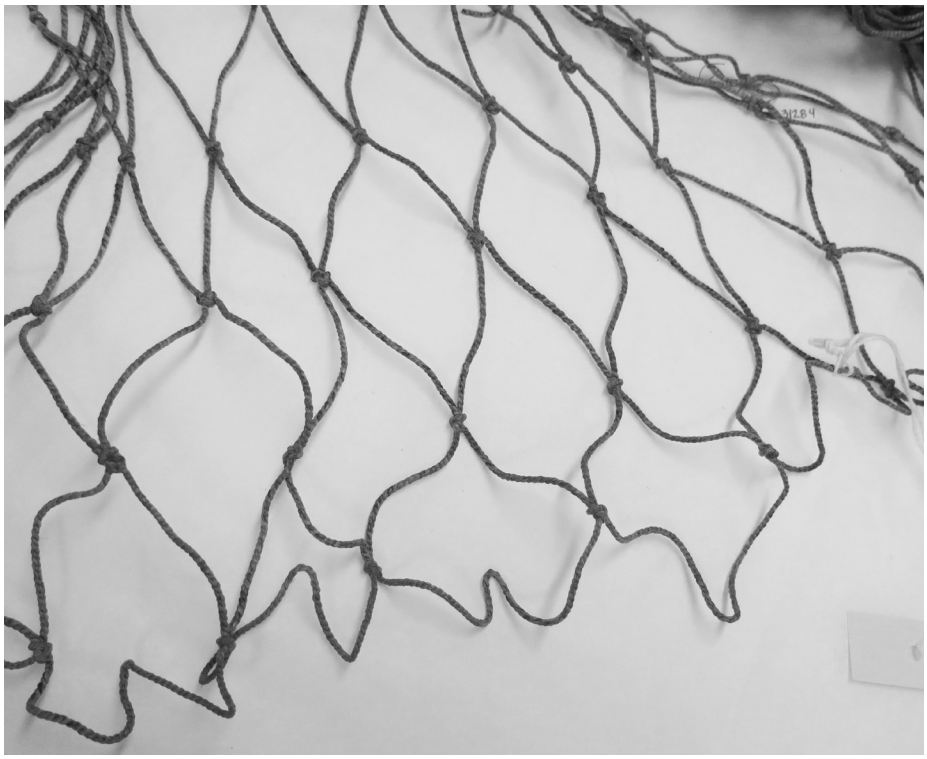

Figure 12. Chewaucan Cave net 1-31284 chain loop selvage.

(1-31283B) from it. Net A appears to have been made in three sections, with two similar variegated cordage net fragments joined by an unfinished (probably nettle) cordage middle section; slightly more robust cords are looped through side selvage loops (though not present in the newer section of the net), and end selvages are secured with overhand knots. Net A shows very little use wear, with no knot repairs. There is white residue in the crevices of some knots, possibly crystallization of mineral residue. Some downy waterfowl feathers also remain embedded in the netting, and there are very occasional ochre spots (possibly from proximity to ochre found on other perishables in the storage cache).

Net 1-31284 has the same structure as the other net, but with a slightly smaller mesh size (ca. 5.5 cm.). This net exhibits more wear than 1-31283, as many repairs and breaks were noted throughout the net. Repairs were usually made either with new cordage being knotted in, or by tying existing cordage together. The mesh size and dimensions suggest that the nets may have been used as either waterfowl or rabbit nets. The fact that the cache is in such close proximity to the Chewaucan marshes and river, and the presence of feathers, further supports their use as waterfowl nets.

Elephant Mountain Cave. Elephant Mountain Cave (26Hu3557), a deep cave on the western edge of the Black Rock Desert (Barker et al. 2011), contained two Native American bundle burials tied with netting (NSM Nos. 762 and 764). One bundle was enclosed in a large conical Catlow twined basket and the other in a large cylindrical Catlow twined basket. Since the collector, Jack Harrelson, cut rather than untied the binding nets, their length could not be determined. Three AMS dates on the baskets and one of the nets indicate both individuals were interred sometime between 2,129 and 1,970

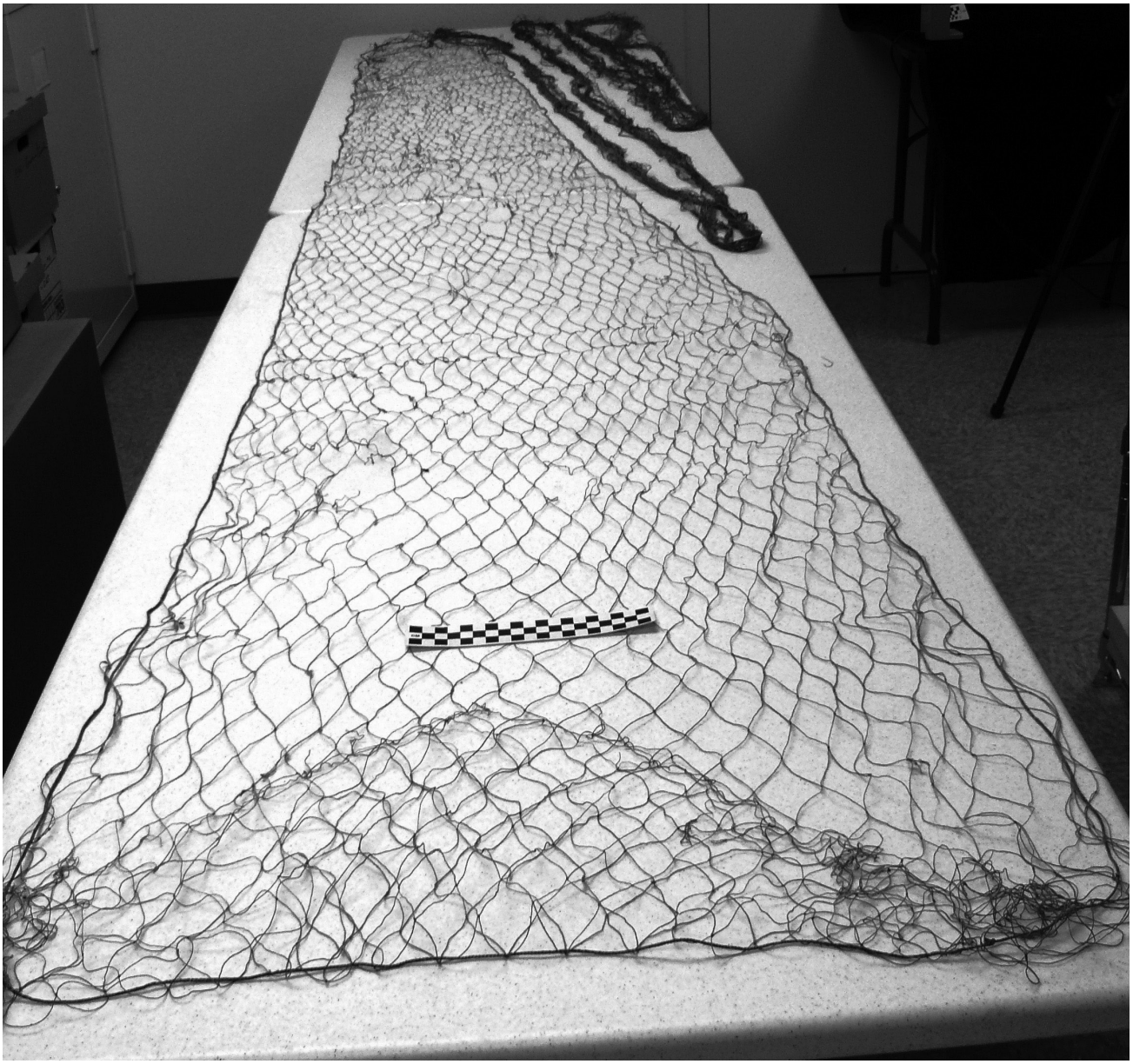

Figure 13. Elephant Mountain Cave long net, 25Wa3557-761.

cal B.P. (Barker et al. 2011). In addition, there were two folded nets (Fig. 13) inside the cylindrical bundle (NSM Nos. 761 and 763). These nets have been repatriated along with the burials and the Catlow twined baskets.

The nets used to bind both the cylindrical bundle (No. 762) and the conical bundle (No. 764), have similar edge construction. The chain-loop end selvages were woven by hooking the middle of a mesh unit and looping it through an adjacent unit that was in turn looped through the next unit (also called crocheted). The weaver repeated this until all mesh units were connected and the edge could be secured by a single knot (Fig. 14). There was no heavy cordage threaded along the sides.

Overall, the binding nets are made with very fine, well-finished cordage. They show some knot wear and frayed splices, as well as repairs and mottled staining. The looped end selvage on the short binding net is not typical of other western Nevada nets.

The two folded nets are made with very fine cordage. The shorter folded net (No. 763) has some worn knots and frayed areas and numerous repairs using cordage

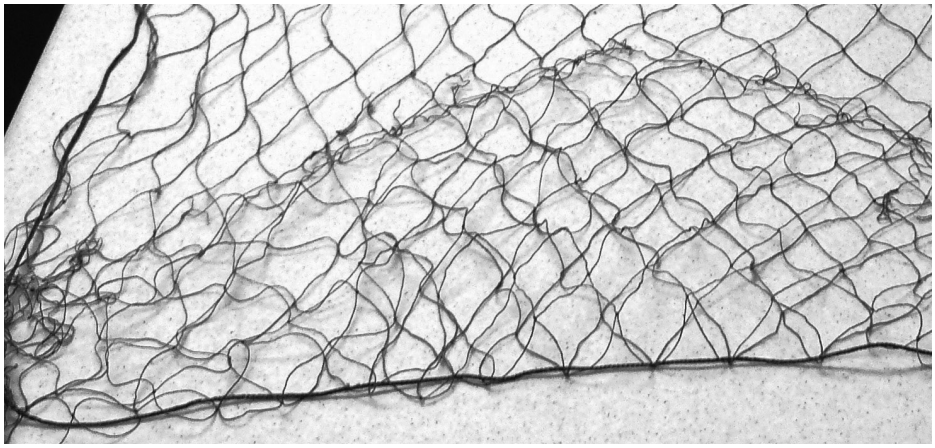

Figure 14. Elephant Mountain Cave net chain loop selvage.

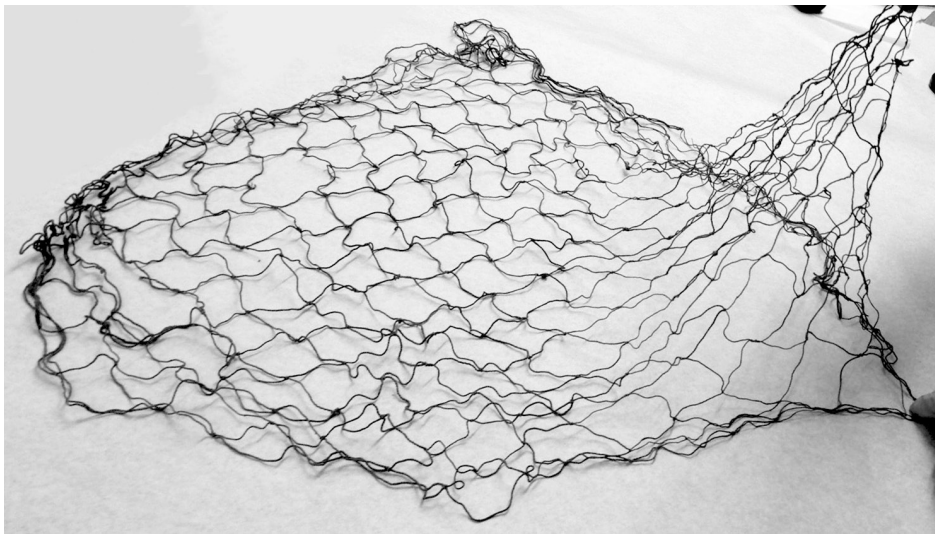

Figure 15. Fishbone Cave net, 1-1e-149.

Figure 16. Hidden Cave net, 1-16-13-G-7.

similar to that used in its manufacture. The long folded net (No. 761) also has some worn knots and frayed areas. It has numerous repairs using cordage that is uniformly finer, with a shiny surface.

Fish or Hair Nets

In the ethnographic period, nets with small-mesh gauge and relatively thick cordage were used as either small fish or men's hair nets (women primarily wore twined hats (Fowler 1992). Archaeological examples of possible small fish or hair nets include fragments from Fishbone Cave, Hidden Cave, and Lovelock Cave.

Fishbone Cave. A small, square mesh net with thick cordage, tied with reversing weaver's knots from Fishbone Cave (1-1e-149), shows light to moderate use wear and staining. One end of the net was drawn together with a separate cord, suggesting use as a carrying bag or hair net (Fig. 15).

Hidden Cave. A rectangular mesh bag net from Hidden Cave (1-1b-13-G-7) was tied with reversing weaver's knots, using cordage made from unretted dogbane. The net is shiny with well-worn knots and reddish/black staining (Fig. 16).

Lovelock Cave. A large fragment of netting from Lovelock Cave (26Ch5/F-2), with an AMS date of 3,480 ± 40 B.P. (3,820–3,710 cal B.P., Beta-257744), has relatively fine tightly-twisted cordage, and a very small mesh size. In addition to being an example of a relatively small mesh gauge, this net was expediently repaired by looping a thicker diameter cord through the edge mesh units of a large hole and cinching the hole closed (Fig. 17). This net also exhibits a knotted selvage (Fig. 18).

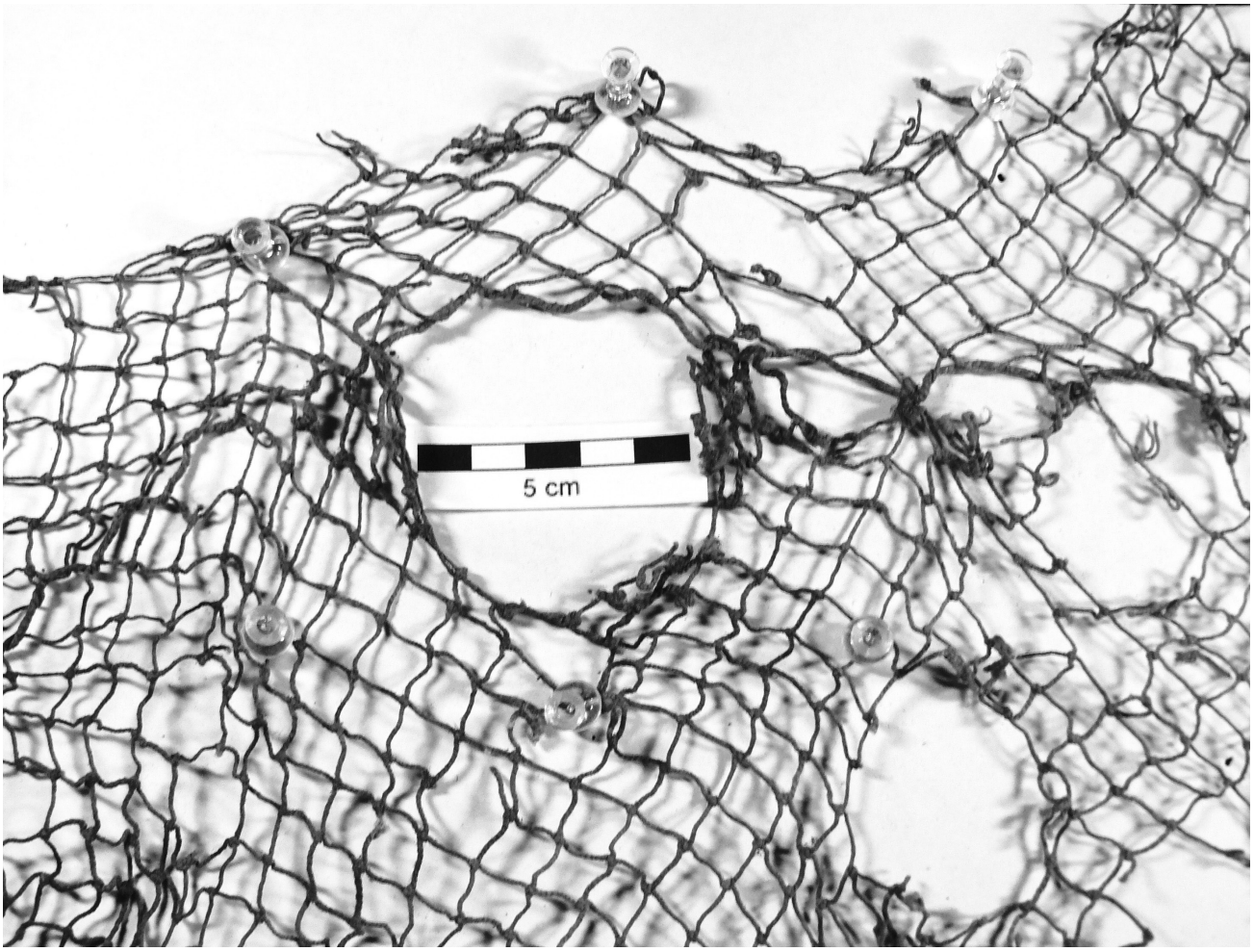

Figure 17. Lovelock Cave net, 26Ch5-F2.

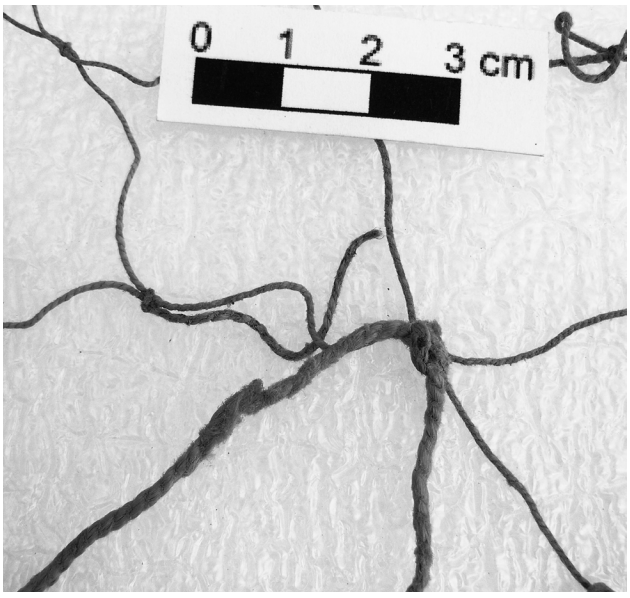

Figure 18. Lovelock Cave net, 26Ch5-F2 selvage knot.

Nets Constructed with Large Gauge Size and Fine Cordage

Mist nets, suitable for ensnaring birds or bats, can be characterized by their comparatively large net gauge and very fine cordage; two net fragments from Shinners Site C may have been used as such. Both nets were made with unretted dogbane cordage. The first net fragment (26Wa200/FH-3) has been AMS dated to 3,470±40 B.P. (3,815–3,700 cal B.P., Beta-257747). The cordage is very fine and very tightly twisted. The fragment has a square mesh with a mesh size of 6.35 cm. This net was repaired with cordage that appears to be even finer than that used in the initial construction. The second net fragment from Shinners Site C (26Wa200/FH-2) was AMS dated to 3,760±40 B.P. (4,205–4,045 cal B.P., Beta-257746). The cordage is also very fine and very tightly twisted. The fragment has a large square mesh; a feather adhering to

Figure 19. Shinners Site C net, 26Wa200/FH2.

the netting may indicate the type of prey taken during its last use (Fig. 19).

Dip Nets

Ethnographic dip nets were rectangular, circular, or triangular. Larger dip nets were manipulated with two poles, each generally two inches in diameter by six to ten feet in length, creating a 'V' frame to support a net that measured ten to thirteen by ten to twenty-three feet (Barrett 1910:249; Fowler 1989:32–33; Raymond and Sobel 1990:5; see Fig. 4). Dip nets could also be supported with three poles in an 'A' or 'H' frame configuration (Riddell 1978:54; Wheat 1967:9). Larger diameter cord was attached to the net, and a bobber-like floatation device was attached to the cord (Barrett 1910:189; Fowler 1989:32). Ambro (1966) describes an archaeological net from Hidden Cave that is similar to recorded ethnographic dip nets.

Roaring Springs Cave. A small, complete net from Roaring Springs Cave (1-8830), appears to be a small dip net; Burns Paiute tribal elders who were shown photographs of the net favored its use as a dip net. The net is made with a highly irregular mesh size. The drawstring running along the edge, and its asymmetric shape, may indicate its use as a dip net or bird trap, in which the bait is placed toward the back of the net (M. Mathewson, personal communication 2014).

The net has a looped end-selvage of ten loops at one end, which may have been cinched together, as well as three knotted loops placed together toward the center of the netting, creating a bunching effect which gives the net a three-dimensional form that is slightly rounded or cone-shaped. The non-standard gauge size used contributes to the rounded shape.

The overall shape of the net, when laid flat, is somewhat diamond-shaped. At each loop in the selvage,

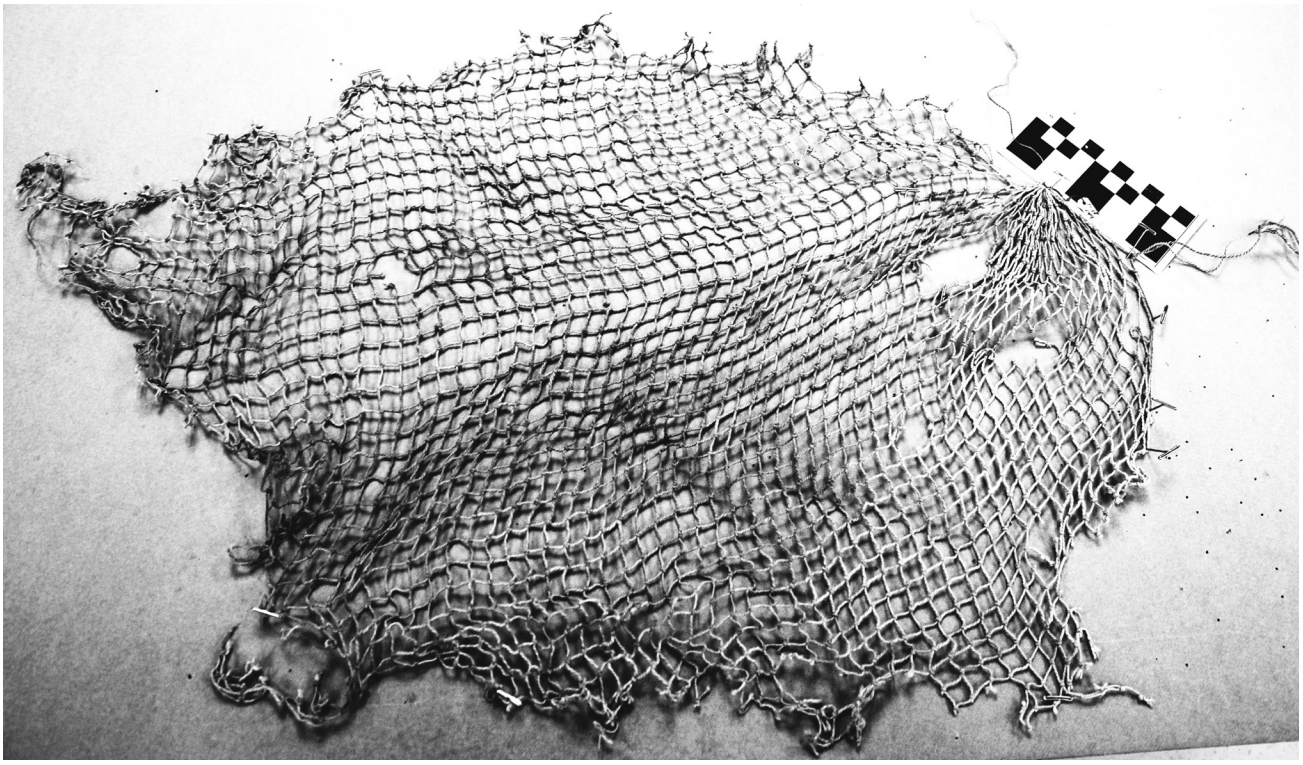

Figure 20. Roaring Springs Cave net, 1-8830.

the length of the net increases by one or two squares. There are about ten tears in the netting, and about four knotted repairs noted (Fig. 20).

Catlow Cave. Another possible dip net came from Catlow Cave (1-2916). The net is triangular in shape, as one end has been gathered into a knot; the cordage in the knotted bundle has a darker tone than the rest of the cordage, possibly from handling (Fig. 21).

ANALYSIS OF ARCHAEOLOGICAL NET METRICS

Net gauge values for both the northern and western Great Basin are bimodal, but modal values differ by region. For the northern Great Basin, distinct modes are seen for small mesh nets between 2 and 3 cm., and for larger mesh nets between 4.5 and 6.5 cm. (Fig. 22). In the western Great Basin, small (0.5–1.5 cm.) and large (3–5 cm.) mesh gauge modes are offset from the peaks in the north. Cord diameter was next examined. As with mesh size, the data indicate two primary modes, generally corresponding to the large and small mesh-size modes. However, when broken down by geography, it is evident that this bimodal pattern holds in the northern Basin but not clearly in the western Basin (Fig. 23).

In the western Great Basin, cord diameter is more uniformly small, regardless of mesh gauge. Computing a correlation coefficient for cord diameter and net mesh size for these two populations reveals a weak but positive relationship between cord diameter and mesh size in the north ($r^2=0.2914$), and little relationship between these variables in the west ($r^2=0.0203$).

Another attribute of net cordage is the tightness of twist, which was measured as twists per centimeter (Fig. 24). Again, different modal values are apparent for northern and western Great Basin nets, with western Great Basin net cordage twisted about twice as tightly as northern Basin net cordage. More twists for western Basin net cordage means greater fiber density, a way to add strength to cordage that, on average, is finer than that used for northern Basin nets. To express this relationship visually, the ratio of cord twists/cm. to cord diameter was calculated, which produced a single value to express this relationship for each specimen in the database. Ratio values were then ordered from small to large. These ordered values did a remarkably good job of organizing

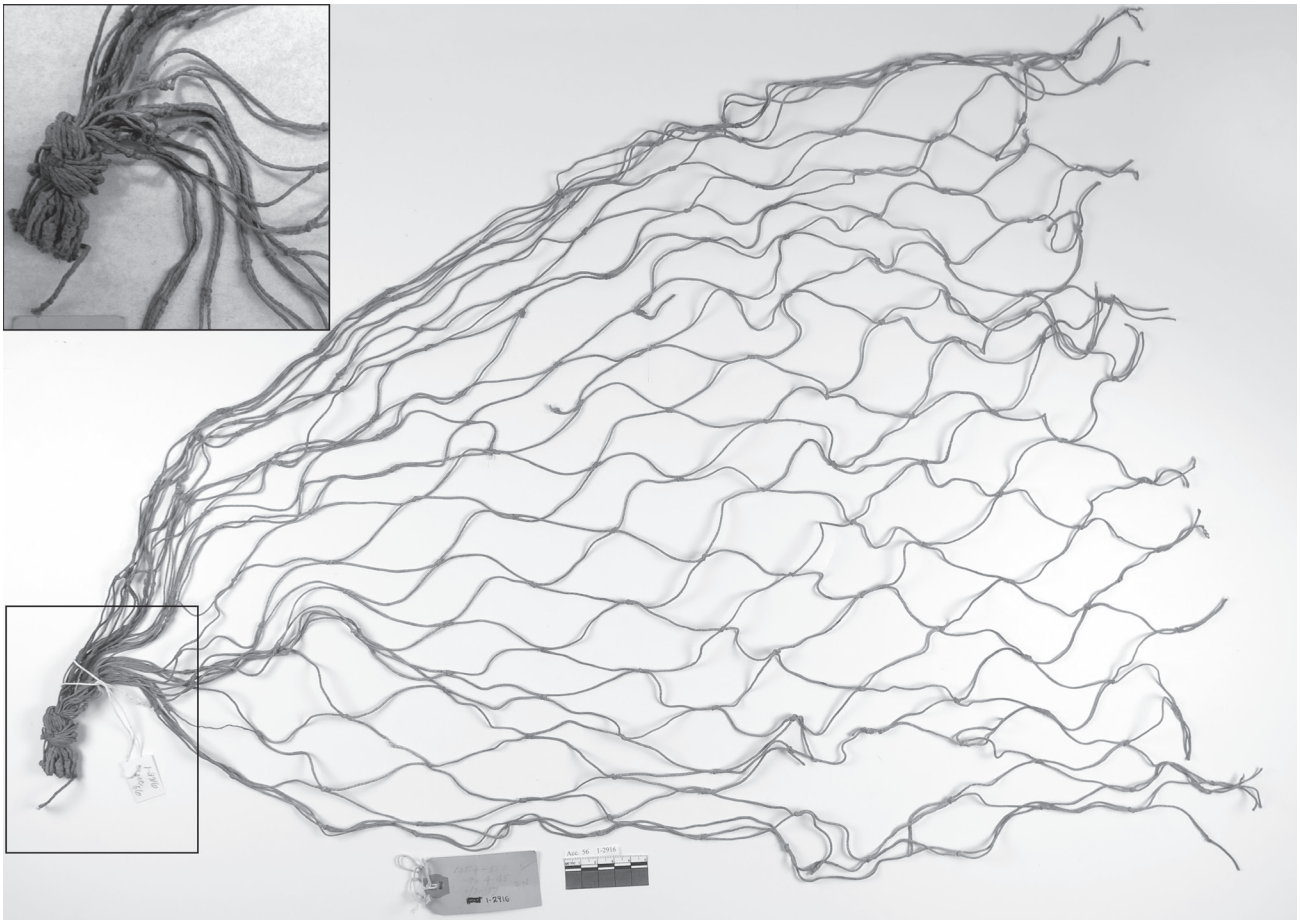

Figure 21. Catlow Cave net, 1-2916.

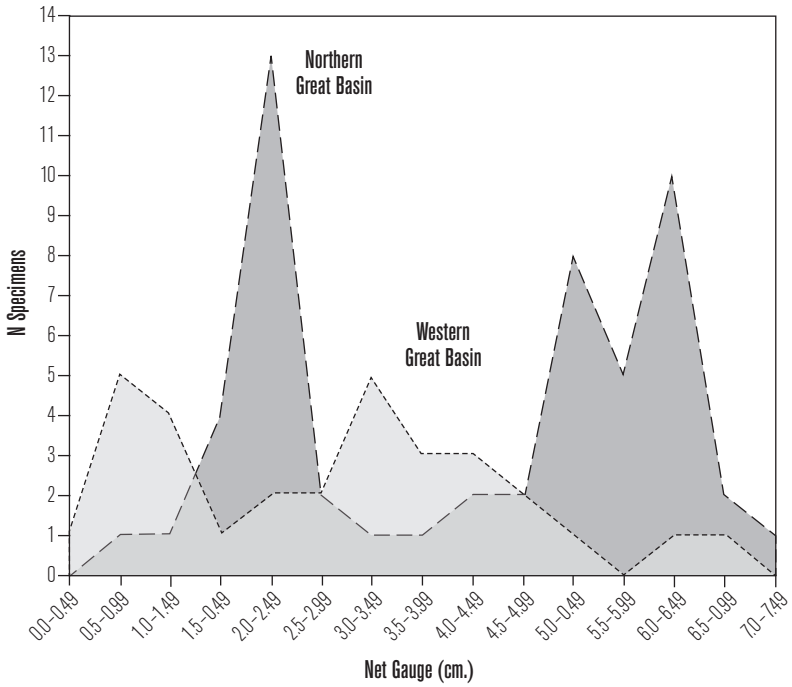

Figure 22. Northern and Western Great Basin net gauge modes.

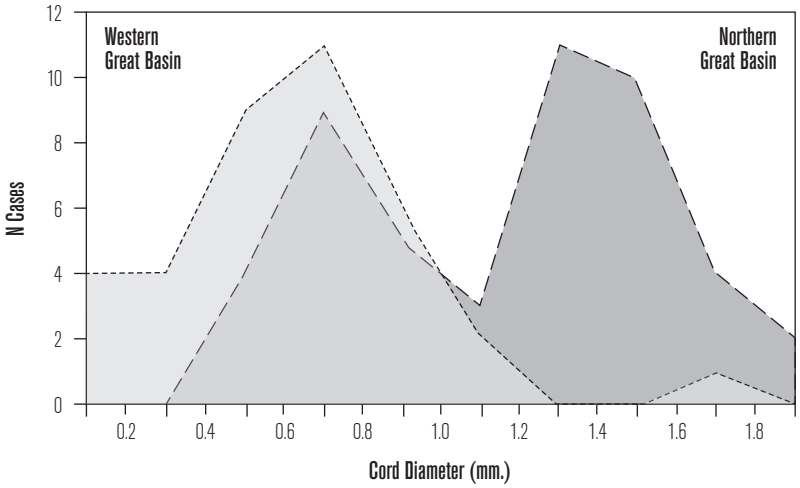

Figure 23. Northern and Western Great Basin cord diameter modes.

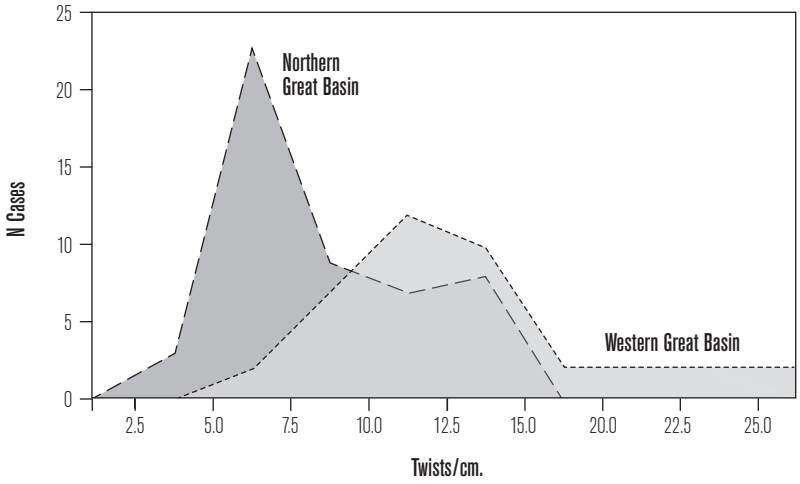

Figure 24. Northern and Western Great Basin twists/cm.

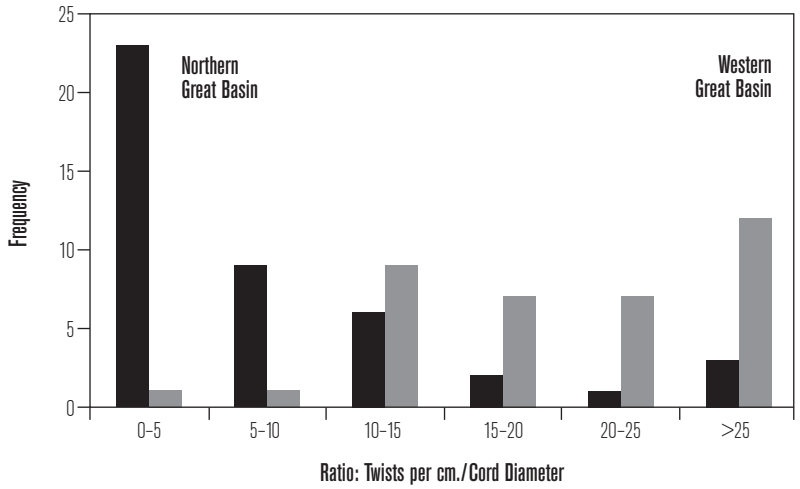

Figure 25. Ratio of cord twists/cm. to cord diameter for the northern and western Great Basin.

specimens by site geography, as Figure 25 shows, setting off these geographic sets as reasonably distinct populations.

SUMMARY

With only sixteen dated nets in the sample, seven from the north and nine from the west, it is difficult to develop a reliable temporal context for net making in the region. It does appear that net types and construction techniques were relatively stable over at least the last 5,500 years.

Different selvage construction types are represented in the sampled net. Complete nets or nets with selvages intact are uncommon in the archaeological record and are therefore important to document. Selvage types represented in the sample include knotted (Lovelock Cave net [Figs. 17 and 18]), unknotted hanging loops (Chewaucan Cave net 1-31283 [Fig. 12]), and chain loop (Chewaucan Cave net 1-31284 [Fig. 11] and Elephant Mountain Cave net [Figs. 13 and 14]). Heavy cordage looped or knotted and looped through the side selvage (edge) units appears to be a common selvage treatment.

Net types examined in this sample appear to be used in the capture of prey, but "netting" is used to manufacture other types of artifacts, including hairnets, bags, and slings. It is especially important to identify net use when possible, especially those with small net mesh gauges (around 1/2-inch), as the gauge size/fineness of cordage correlation may relate to usage. Further analysis of net fragments will provide additional information about the variety of manufacture and types of mesh artifacts beyond the type used for hunting. While most people attribute long nets with large net gauge to rabbit drives, it is important

to note that the same net could be used to capture fish and birds as well.

During this analysis, stains and residues were examined both macroscopically and microscopically. The blood and tissue residue may be the result of the net's past use. Further microscopic examination, and possibly DNA analysis, could confirm the prey taken with the net. It is most likely that feathers in the netting from Shinners Site C (26Wa200/FH-2) and Chewaucan Cave (1-31283A) are evidence of the capture of birds. However, Fowler (1989:32–33) describes how a feather bobber was attached to the hand line on a dip and bag fishing net. Future netting projects will pursue both botanical and ornithological analysis in concert with current archaeological methods (including further radiocarbon dating of specific nets) in an attempt to understand the use of nets in the past.

Our research shows that z-spun S-twist (Szz) cordage used in netting is the dominant cordage type in both regions (92%). Most ethnographic net fragments described in the literature were also made from cordage using the 2-ply z-spun S-twist technique (Fowler 1994). The pattern differs markedly from the predominantly s-spun Z-twist cordage and rope of other fibers (tule, sagebrush bark, etc.) found in the same assemblages. Although direction of cordage twist has been noted as indicative of ethnic boundaries or population changes through time (Adovasio and Pedler 1994; Petersen et al. 2001; Petersen and Wolford 2000), the consistent presence of predominantly S-twist cordage for netting and predominantly Z-twist for other cordage types in the same assemblages suggests other factors were involved, probably gender-based cord-making traditions (Fowler 1992, 1994).

Differences between the northern and western Great Basin regions have been recognized in their distinctive basketry traditions (Adovasio 1970, 1984) and participation in separate lithic procurement networks (Jones et al. 2003). We find that differences in net metrics and fine cordage further distinguish these regions.

Different modal values for net mesh size are clear in our samples; both sets exhibit bimodal values, but mode peaks are clearly offset between regions. We recognize multiple possible explanations for this, including functional differences that reflect distinct fishing, fowling, and game capture priorities in varied environmental settings; different learned norms of net-making within the social groups who occupied each region; or the possibility that our analyzed sample does not faithfully represent the populations from which they derive.

Cord diameter and tightness of twist (twists/cm.) also differ between northern and western Great Basin samples. In the western Basin, cord diameter is more uniformly small, regardless of mesh gauge, while in the north there is a positive (but weak) correlation between cord diameter and mesh size. Western Great Basin net cordage is also twisted about twice as tightly (on average) as northern Basin net cordage. More twists add density and strength to cordage, which may compensate for the generally finer net cordage in the western Great Basin.

There are multiple possible explanations for these differences in mesh size metrics between the northern and western Great Basin. Functional differences, reflecting differing fishing, fowling, and game capture priorities from one environmental setting to another, may be a factor. As a learned behavior, it is also possible that these observed geographic trends relate to different learned norms of net-making within the social groups who occupied the two study areas, particularly for netting not directly tied to procurement activities (such as hair nets or tote nets). Finally, the samples of archaeological specimens available to us for this analysis may not faithfully represent the populations from which they derive. Nonetheless, the different net metrics by region support other studies that suggest these areas were likely culturally distinct from one another.

A number of researchers have explored the relationship between material culture, including fiber artifacts, and meaningful social boundaries (Adovasio 1986; Adovasio and Pedlar 1994; Maslowski 1996; Petersen et al. 2001; Petersen and Wolford 2000). This study adds to that body of research, identifying patterns that may distinguish both geographically-anchored social communities, and possibly-gendered patterns within communities.

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REFERENCES

Adovasio, J. M.
1970 The Origin, Development and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1–40.

1986 Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Population Movements in the Prehistoric Great Basin. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, Carol J. Condie and Don D. Fowler, eds., pp. 43–88. Salt Lake City: University of Utah Press.

Adovasio, J. M., Olga Soffer, and Bohuslav Klíma
1996 Upper Palaeolithic Fibre Technology: Interlaced Woven Finds from Pavlov I, Czech Republic, c. 26,000 Years Ago. *Antiquity* 70:526–534.

Adovasio, J. M., Rhonda L. Andrews, and J. S. Illingworth
2009 Netting, Net Hunting, and Human Adaptation in the Eastern Great Basin. In *Past, Present and Future Issues in Great Basin Archaeology: Papers in Honor of Don D. Fowler*, B. Hockett, ed. [*Bureau of Land Management, Cultural Resource Series* 20.] Reno, Nev.

Adovasio, J. M., and D. R. Pedler
1994 A Tisket, a Tasket: Looking at the Numic Speakers through the "Lens" of a Basket. In *Across the West: Human Population Movement and the Expansion of the Numa*, D. B. Madsen and D. Rhode, eds., pp 114–112. Salt Lake City: University of Utah Press.

Aikens, C. Melvin
1970 Hogup Cave. *University of Utah Anthropological Papers* 93. Salt Lake City: University of Utah Press.

Aikens, C. Melvin, and David B. Madsen
1986 Prehistory of the Eastern Area. In *Handbook of North American Indians, Volume 11: Great Basin*, Warren L. D'Azevedo, ed., pp. 149–160. Washington, D.C.: Smithsonian Institution.

Ambro, Richard D.
1966 Two Fish Nets from Hidden Cave, Churchill County, Nevada: A Technical Analysis. *University of California Archaeological Survey Reports* 66:101–135.

Anderson, M. K.
2005 *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources*. Berkeley: University of California Press.

Andrews, R. L., and J. M. Adovasio
1980 Perishable Industries from Hinds Cave, Val Verde County, Texas. *Ethnology Monographs* 5. University of Pittsburgh Department of Anthropology, Pittsburgh.

Andrews, R. L., J. M. Adovasio, and R. C. Carlisle
1986 Perishable Industries from Dirty Shame Rockshelter, Malheur County, Oregon. *University of Oregon Anthropological Papers* 34. University of Oregon Department of Anthropology, Eugene.

Barker, P., C. Pinto-Ellis, and D. Valentine
2011 Looting at Elephant Mountain Cave. *Nevada Archaeologist* 24:1–10.

Barrett, S. A.
1910 The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon. *University of California Publications in American Archaeology and Ethnology* 5(4):239–92. Berkeley.

Bronk Ramsey, Christopher
2009 Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51(1)337–360.

Burgett-Jolie, R.
2005 Netted Structures in the Prehistoric Great Basin. Paper presented at Unraveling the Boundary: Perishable Technologies Across and Between the Prehistoric Great Basin and Southwest, annual meeting of the Society for American Archaeology, Salt Lake City, Utah.

Connolly, Thomas J., Catherine S. Fowler, Pat Barker, and William J. Cannon
2016 Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *American Antiquity* 81(3):490–514.

Downs, James F.
1966 *The Two Worlds of the Washo, An Indian Tribe of California and Nevada*. New York: Holt, Rinehart & Winston.

Eiselt, B. Sunday
1997 Defining Ethnicity in Warner Valley: An Analysis of House and Home. *University of Nevada, Reno, Department of Anthropology Technical Report* 97-2. Reno.

Emery, I.
1966 *The Primary Structure of Fabrics: An Illustrated Classification*. Washington, D.C.: The Textile Museum.

Fowler, Catherine S.
1986 Subsistence. In *Handbook of North American Indians, Volume 11: Great Basin*, Warren L. D'Azevedo, ed., pp. 64–99. Washington, D.C.: Smithsonian Institution.
1989 Willard Z. Park's Ethnographic Notes on the Northern Paiute of Western Nevada, 1933–1944, Volume 1. *University of Utah Anthropological Papers* 114. Salt Lake City.
1992 *In the Shadow of Fox Peak: An Ethnography of the Cattail-Eater Northern Paiute People of Stillwater Marsh*. [*U. S. Fish and Wildlife Service Cultural Resource Series* 5.] Washington D.C.: Government Printing Office.
1994 Material Culture and the Proposed Numic Expansion. In *Across the West: Human Population Movement and the Expansion of the Numa*, D. B. Madsen and D. Rhode, eds., pp. 103–113. Salt Lake City: University of Utah Press.

Fowler, Catherine S., and J. E. Bath
1981 Pyramid Lake Northern Paiute Fishing: The Ethnographic Record. *Journal of California and Great Basin Anthropology* 3(2):176–186.

Fowler, Don D., and Catherine S. Fowler
1970 Stephen Powers' "The Life and Culture of the Washo and Paiutes." *Ethnohistory* 17:117–149.

Frison, G. C., R. L. Andrews, J. M. Adovasio, R. C. Carlisle, and R. Edgar
1986 A Late Paleoindian Animal Trapping Net from Northern Wyoming. *American Antiquity* 51(2):352–361.

Heizer, Robert, and Alex Krieger
1956 The Archaeology of Humboldt Cave, Churchill County, Nevada. *University of California Publications in American Archaeology and Ethnology* 47(1 & 2):1–194.

Hurley, W. M.
1979 *Prehistoric Cordage: Identification of Impressions on Pottery*. [*Aldine Manuals on Archaeology* 3.] Washington D.C.: Taraxacum, Inc.

Jenkins, Dennis L.
1994 Archaeological Survey and Excavations in the Duncan Creek Research Area: Changing Human Use of Uplands Environments West of Silver Lake. In *Archaeological Researches in the Northern Great Basin: Fort Rock Archaeology Since Cressman*. [*University of Oregon Anthropological Papers* 50]. Department of Anthropology and State Museum of Anthropology, University of Oregon, Eugene.

Jones, George T., Charlotte Beck, Eric E. Jones, and Richard E. Hughes
2003 Lithic Source Use and Paleoarchaic Foraging Territories in the Great Basin. *American Antiquity* 68(1):5–38.

Kallenbach, Elizabeth
2013 The Chewaucan Cave Cache: A Specialized Tool Kit from Eastern Oregon. *Journal of California and Great Basin Anthropology* 33(1):72–87.

Kelly, Isabel T.
1932 Ethnography of the Surprise Valley Paiute. *University of California Publications in American Archaeology and Ethnology* 31:67–210.

Lindström, Susan
1992 *Great Basin Fisherfolk: Optimal Diet Breadth Modeling of the Truckee River Prehistoric Subsistence Fishery*. Ph. D. dissertation, University of California, Davis.

Loud, Lewellyn L., and M. R. Harrington
1929 Lovelock Cave. *University of California Publications in American Archaeology and Ethnology* 25(1):1–251. Berkeley.

Lupo, Karen D., and Dave N. Schmitt
2002 Upper Paleolithic Net-Hunting, Small Prey Exploitation, and Women's Work Effort: A View from the Ethnographic and Ethnoarchaeological Record of the Congo Basin. *Journal of Archaeological Method and Theory* 9(2):147-179.

Maslowski, Robert F.
1996 Cordage Twist and Ethnicity. In *A Most Indispensable Art: Native Fiber Industries from Eastern North America*, James B. Petersen, ed., pp. 88–99. Knoxville: University of Tennessee Press.

Nevers, Jo Ann
1976 *Wa She Shu: A Washo Tribal History*. Reno: Inter-Tribal Council of Nevada.

Norton, Ruth E.
1990 Technology Plant Materials Used in Artifacts, In *The Conservation of Artifacts Made from Plant Materials*, Mary-Lou E. Florian, Dale Paul Kronkright, and Ruth E. Norton, eds., pp. 83–138. Marina del Rey, Cal.: The Getty Conservation Institute.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford
2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, Penelope B. Dooker, ed., pp. 226–253. [*Southern Illinois University Center for Archaeological Investigations Occasional Papers* 28.] Carbondale, Ill.

Petersen, James B., and Jack A. Wolford
2000 Spin and Twist as Cultural Markers: A New England Perspective on Native Fiber Industries. In *Beyond Cloth and Cordage, Archaeological Textile Research in the Americas*, Penelope Ballard Drooker and Laurie D. Webster, eds., pp. 119–139. Salt Lake City: University of Utah Press.

Price, John A.
1980 The Washo Indians: History, Life Cycle, Religion, Technology, Economy and Modern Life. *Nevada State Museum Occasional Papers* 4. Carson City, Nev.

Raymond, Anan, and Elizabeth Sobel
1990 The Use of Tui Chub as Food by Indians of the Western Great Basin. J*ournal of California and Great Basin Anthropology* 12(1):2–18.

Reimer, P. J., E. Bard, A. Bayliss, J. W. Beck, P. G. Blackwell, C. Bronk Ramsey, C. E. Buck, H. Cheng, R. L. Edwards, M. Friedrich, P. M. Grootes, T. P. Guilderson, H. Haflidason, I. Hajdas, C. Hatté, T. J. Heaton, D. L. Hoffman, A. G. Hogg, K. A. Hughen, K. F. Kaiser, B. Kromer, S. W. Manning, M. Nui, R. W. Reimer, D. A. Richards, E. M. Scott, J. R. Southon, R. A. Staff, C. S. M. Turney, and J. van der Plicht
2013 IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years Cal BP. *Radiocarbon* 55(4):1869–1887.

Riddell, F. A.
1978 Honey Lake Paiute Ethnography. *Nevada State Museum Anthropological Papers* 4:1–87. Carson City, Nev.

Shaw, G. R.
1972 *Knots: Useful and Ornamental*. New York: Bonanza Books.

Soffer, Olga
2004 Recovering Perishable Technologies through Use Wear on Tools: Preliminary Evidence for Upper Paleolithic Weaving and Net Making. *Current Anthropology* 45(3):407–413.

Spier, Leslie
1930 Klamath Ethnography. *University of California Publications in American Archaeology and Ethnology* 30:1–338. Berkeley, Cal.: University of California Press.

Stewart, Omer C.
1941 Culture Element Distributions, XIV: Northern Paiute. *University of California Anthropological Records* 4(3):361–446. Berkeley.

Wheat, Margaret M.
1967 *Survival Arts of the Primitive Paiutes*. Reno: University of Nevada Press.