V. TWO FISH NETS FROM HIDDEN CAVE, CHURCHILL COUNTY, NEVADA
A TECHNICAL ANALYSIS

Richard D. Ambro

INTRODUCTION 103

DESCRIPTION OF NETS 103
Dimensions 104
Yarns Employed 104
Basic Construction 105
Knots Employed 106

Net No. 1 109
Net No. 2 111

Net Selvages 113
Mounting 114
Repairs to Nets 117

NATURE AND USE OF THE TWO NETS 122

ILLUSTRATIONS
Diagram 1. Hidden Cave Net No. 1 . . . 128
Diagram 2. Hidden Cave Net No. 2 . . . 129
Plate 1 130
Plate 2 132

BIBLIOGRAPHY 134

INTRODUCTION

In 1939 the University of California Museum of Anthropology acquired a collection of archaeological specimens as a donation from Mrs. E. W. Blair of Fallon, Nevada. Included in the collection were two large and surprisingly well preserved fish nets which, because of their nature and condition, are unique for the area. Very little information is available concerning the provenience and circumstances of the discovery of the nets. All that is known is that they were reported to have been found in Hidden Cave (site Ch-16) near Stillwater, Nevada. This site has been briefly described by Grosscup (1956). The collector supposedly entered the cave and, finding the nets on or near the surface of the cave floor, carried them off. This presumption, as well as the excellent state of preservation of the nets, suggests their dating to the not too distant past, while the presence of small quantities of cotton places their use, and perhaps their manufacture, within the historic period.

I am indebted to Dr. Robert F. Heizer of the University of California Archaeological Research Facility for bringing these specimens to my attention and encouraging me to analyze them.

DESCRIPTION OF NETS

Diagrams 1 and 2 schematically illustrate the two nets, which are catalogued in the Lowie Museum of Anthropology as numbers 1-39988 and 1-39989 respectively. The better preserved of the two, UCMA 1-39988 (hereafter referred to as No. 1), exhibits only one major tear and has practically complete selvages. Specimen UCMA 1-39989 (hereafter referred to as No. 2) is less well preserved—numerous rents are present and almost the entire length of selvage CD is missing, along with a considerable portion of selvage BD adjacent to it.

Both nets have scattered areas where the adhering urine and excrement of wood rats (Neotoma) renders the elements stiff and brittle and has stained the fabric deep yellowish-gold in color. The remaining areas, being unsoiled, have retained their natural color, full flexibility, and considerable strength, although the latter is probably somewhat less than when the nets were first used.

Dimensions of Nets

Diagram 1 shows that net No. 1 approximates a trapezoid with one deviation in the form of the short projection at AE. The top or "head" selvage (AB) is 315 cm. in length and the bottom or "foot" selvage (CD) is 360 cm. The distance between AB and CD averages 250 cm. The lateral selvage of the projection (AE) is 60 cm. long, and selvage EF is 50 cm. in length. From point F the selvage extends diagonally to point C, a vertical distance of 190 cm.

Net No. 2 is almost square in shape although selvage CD is somewhat longer than AB as reconstructed in Diagram 2. The head selvage AB measures 220 cm., including 30 cm. missing at point B. The foot selvage CD has only three short lengths intact. However, using the measurements of "join" 5 (see next paragraph), a projected length of about 290 cm. can be calculated for CD. The distance between the intact selvages is 270 cm., while most of the lower edge terminates at about 250 cm. from AB. All measurements refer to the areas of meshes, excluding any attached structures.

Diagrams 1 and 2 include various subdivisions or segments of the nets which are indicated by Roman numerals. These are defined by what may be called "joins"—junctions of what, after analysis, can only be considered separate and distinct elements, suggesting the joining of parts or fragments of other nets to produce the larger complete form. The technique employed is discussed and illustrated below, and the basis for these subdivisions is presented as various aspects of the analysis are considered.

Briefly, as preliminary data, the vertical dimensions or widths of the subdivisions are as follows:

Net No. 1	Net No. 2
Ia - 15 cm.	Ia - 10 cm.
Ib - 55 cm.	Ib - 20 cm.
II - 80 cm.	II - 70 cm.
III - 55 cm.	III - 20 cm.
IVa,b - 45 cm.	IV - 120 cm.
	V - 20 cm.

Yarns Employed

Almost all the yarns used in the basic construction of the various

sections of the nets are of Apocynum fiber and are 2-ply S, the single exception being an instance of cotton yarn in join 5 of net No. 2. The cordage from both Lovelock and Humboldt caves includes both S and Z yarns, but 2-ply S predominates so that, in this respect, the specimens under consideration do not markedly differ from the archaeological material for the area (Loud and Harrington 1929:78; Heizer and Krieger 1956:62). The majority of yarns are gray in color; joins 2, 3, 4, and 5 as well as area III of net No. 1, and areas IVa, IVb, and join 5 of net No. 2 are composed of yarn gray-red to red in color. These fall in the color range for Apocynum (Gregoire 1956). The single instance of cotton yarn observed for join 5 of net No. 2 is 4-ply S, 1.4 mm. and spun at 45 degrees. Similar cotton yarns, however, are present in other contexts and will be discussed accordingly.

The diameter and degree of twist of the various Apocynum yarns is variable due to their having been hand or thigh spun. Different amounts of fiber and twisting result in the varying yarns. Rarely, however, do the yarns exhibit any great change in diameter along a short length, and their strength and appearance suggest considerable competence in manufacture.

The total range in diameter of yarns in net No. 1 is 0.7-1.8 mm., and for No. 2, 0.6-1.9 mm. Thus they are roughly comparable. The range within each segment amounts to 0.1-0.8 mm. variation at the maximum, with the most frequent variation amounting to 0.2-0.5 mm. The degree of twist falls between 30 and 45 degrees with varying tendencies. Precise data are presented in Tables 1 and 2 and are utilized in detailed discussion of the various subdivisions. The range of diameters for yarns employed in nets recovered from Lovelock Cave are comparable to those observed in the two nets from Hidden Cave which are analyzed here, although the corresponding meshes are not similar (cf. Loud and Harrington 1929:83f.).

Basic Construction

Netting involves the hanging of rows of loops or "half meshes" on preceding rows with the aid of knots. Yarn, mesh, and color variation all indicate that the rows of both nets from Hidden Cave proceeded along the long axis of any given section rather than across, as might be expected. The same situation is noted in a much longer net (49 ft.) from Lovelock Cave (Loud and Harrington 1929:90).

Mesh sizes show a great deal of variation, measurements being taken on a side. For net No. 1 the range is 0.7-1.6 cm., with the amount of difference in a given section varying from 0.1-0.4 cm., and 0.2 being most

frequently observed. Net No. 2 has meshes that vary from 0.5-1.6 cm., with variations within a given area amounting to 0.2-0.5 cm., the most frequent being 0.2-0.3 cm. Both nets have a similar range of mesh sizes, although slightly less variation within a given section is observed in net No. 2. In general, the mesh sizes are smaller than those observed for the Lovelock Cave examples; however there is a slight overlap as one Lovelock Cave net had 1.5 cm. meshes and several had meshes measuring 2.0 cm. (Loud and Harrington 1929:87). Obviously either the selection of the segments was not random—in an attempt to fit them together by careful joining—or the total needs of the Hidden Cave people producing them were slightly different from those of the Lovelock Cave group. In any event, a good deal of the variation in detail may be due to the lack of a mesh gauge, the size of each loop—being controlled by the eye as it was looped over a finger—reflecting variations in judgment.

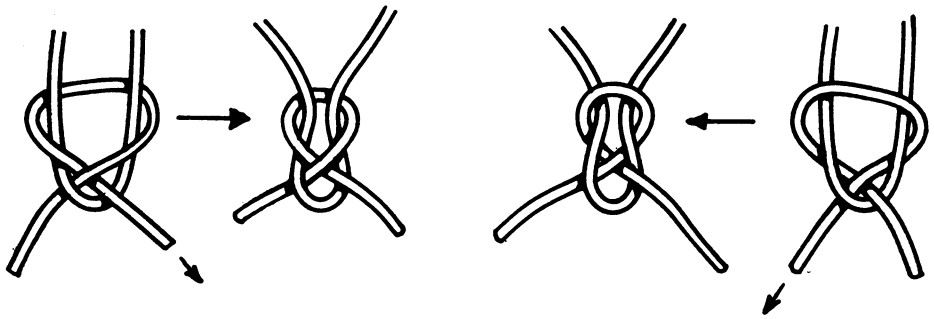


Figure 1

a. Obverse b. Reverse

Knots Employed

It is not surprising that the basic knot for both nets is the "sheet bend" or "net knot," more often simply called the "mesh knot." This knot has a world wide distribution in both archaeological and ethnographic material, and the Great Basin is no exception. Its nature and structure are of interest not only as a technological feature but also as a valuable aid to analysis of other related factors. The knot is composed of two elements: one "passive"; the other "active." As mentioned previously, the making or "braiding" of a net involves the use of a continuous yarn in rows of loops, a given row being hung upon and thus supported by the preceding row. The addition of a row involves the engaging of the preceding loop series so that the manipulated yarn is the active element and the support is the passive element. A needle or bodkin of some sort was probably employed to facilitate the passage of the element manipulated. Figure 1 illustrates the process and the result from both sides. The

obverse face has a characteristic three-lobed structure and indicates progression of the loops from left to right, the usual method. The reverse face indicates that work progressed in a right-to-left direction for that row, suggesting not so much a change of motor habits but that the net was turned over to allow work to continue in the normal direction. The resulting structure of the net has alternating rows of obverse and reverse faces. Of additional importance are clues indicating the direction of the succession of rows (cf. Grosscup 1950:109). Figure 1b clearly shows the active and engaged elements and illustrates how the vertical passive element is held by the more horizontal active element in a structure suggesting the letter "T." The stem is the passive element and points in the direction of succeeding rows. Examination of these features resulted in the observation that the direction was by no means consistent—some sections converging, others diverging, and still others being consistent when adjacent. Upon close examination of the region where two such segments touched, an odd and significant structure was observed; invariably a single row of yarn alternately engaged the loops of the edges of the two segments. That is, a single active element, often quite distinctive from the adjoining yarns, engaged loops in both directions alternately so that two opposed knots resulted.

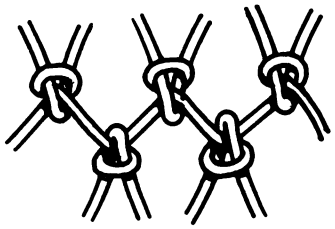


Figure 2

Figure 2 illustrates the reverse faces of the knots in opposition. Whenever both selvages are intact, such a structure or join is knotted at both selvages, marking the beginning and end of a single passage. This feature, as well as varying work directions, led to further observations and to the conclusion that separate and distinct parts were involved, and that these were pieced together to form the larger whole.

A description of each net and its components follows. Specific data and discussion of the observations illustrated in Diagrams 1 and 2 are used and tabulated in Tables 1 and 2. Numeration and treatment start from the top of each net (AB) as seen in the diagrams.

TABLE 1

Diameter and Degree of Twist of Yarn in Net No. 1

Feature	Color	Diameter of Yarn (mm.)	Degree of Twist	Mesh Diameter (cm.)
Segment Ia	Gray	0.7-1.1	30-45	0.8-0.7
Join 1	Gray	1.0-1.1	45	1.0
Segment Ib	Gray	0.7-1.2	30-45	0.8-1.0
Join 2	Tan	0.7	45	0.8
Segment II	Gray	1.2-1.6	30-45	1.3-1.5
Join 3	Tan	0.9-1.1	30-45	1.0-1.3
Segment III	Tan	0.9-1.5	30-45	1.3-1.5
Join 4	Tan	1.0-1.2	30-45	1.2-1.3
Segment IVa	Gray	1.1-1.5	30-45	1.4-1.6
Segment IVb	Gray	1.0-1.5	30-45	0.9-1.3

TABLE 2

Diameter and Degree of Twist of Yarn in Net No. 2

Segment Ia	Gray	0.8-1.5	30-45	0.5-0.7
Join 1	Gray	1.0-1.9	30-45	0.5-0.7
Segment Ib	Gray	0.7-1.5	30-45	0.5-0.7
Join 2	Gray	1.0-1.1	30-45	0.8-1.0
Segment II	Gray	0.5-1.5	30-45	0.8-1.3
Join 3	Gray	0.7-1.0	30-45	0.8-0.9
Segment III	Gray	1.0-1.4	30-45	0.8-1.0
Join 4		(no actual join)		
Segment IV	Gray tan	0.6-1.3	30-45	1.3-1.6
Join 5	Gray	0.7-1.0	30	1.0-1.3
Segment V	Gray	1.0-1.5	30-45	1.0-1.3

Net No. 1 (Diagram 1)

Segment Ia has 0.7-0.8 cm. mesh of gray yarn, 0.7-1.1 mm. in diameter, and with the majority of degrees of twist observations at 30 degrees. Segment Ib has similar but slightly more variant mesh size (0.9-1.0 cm.), of gray yarn of similar diameter but more tightly spun (30-35 degrees) than Ia. Of special interest is the presence of broken or meshless knots along AB on Ia, indicating the use of a fragment or trimming of the segment. However, the knots of segment Ia indicate that work proceeded in a downward direction while those of Ib are in the opposite direction. The converging segments meet at join 1 which is composed of a row of 1.0 cm. meshes in gray yarn, 1.0-1.1 mm. in diameter, and spun at 45 degrees. Knots at either end mark the row and were apparently mesh knots, although somewhat felted.

Detached Arabic numerals shown on the diagrams indicate "features" which merit comment; these are points distinctive from the general structure.

Feature 5 involves the "bating" or pairing of loops when engaged, resulting in two meshes being held or engaged by a single knot below. Figure 3 illustrates the technique employed, and Plate 1a shows the paired loops. The active element involved is the join yarn, indicating an attempt to compensate for ten extra meshes in segment Ia, the total number of loop pairs present. That is to say, segment Ia was ten meshes wider than segment Ib, and in order to create a neat, straight selvage these extra loops were taken up.

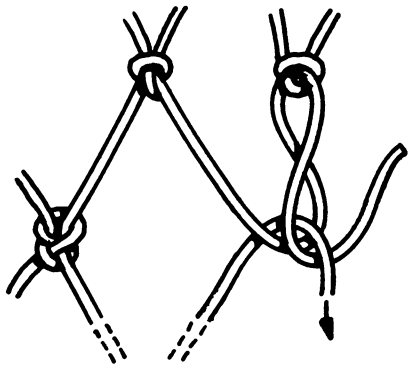


Figure 3

Segment II is quite distinct from segment Ib by virtue of larger mesh size (1.3-1.5 cm.) and yarn diameter (1.2-1.6 mm.), while its gray color, 30-45 degree of twist, and direction of work are comparable to those of segment Ib. However, segments Ia and Ib project some 50 cm.

beyond the left lateral margin of section II. Again a join marks the boundary, suggesting that segment II was joined with segment Ib despite the considerable difference in size. The number of extra meshes in segment Ib was far too large to take up so that the necessary addition was allowed to extend beyond the selvage of segment II. No other anomalies were observed here. Plate 1b illustrates the projecting segment, the angle created, and the differences in mesh sizes. It is possible that the entire segment composed of Ia and Ib was originally a small net although none of the complete long, narrow nets from Lovelock Cave have such a short length. A second possibility is that the projection was intentional and associated with a specific function—a point to be dealt with later.

Segment III is distinctive in that reddish yarns were used in its construction and the diameters of the yarns (0.9-1.5 mm.) are slightly smaller than those of segment II. The mesh size, however, is the same as that of the upper segment (1.3-1.5 cm.) and the work progresses in the same direction as that in segment II. Join 3, attaching segment II to segment III, is of reddish yarn, 0.9-1.1 mm. in diameter and spun at 30-45 degrees, and exhibits meshes (1.0-1.3 cm.) somewhat smaller than those of the two segments described above.

Two anomalies present along the join merit discussion. Feature 6 is composed of 17 loops along the edge of segment III, alternating with engaged loops of the same segment. The single yarn utilized in the join knots around one loop, passes through the next, and continues along to the opposite segment to engage a single loop there, returning to repeat the process. Evidently this technique was employed as an alternative method in taking up extra meshes in joining. The area in question is 35 cm. long, falling along join 3 between 110 and 75 cm. from the BD selvage. The same manipulation is observed in an area 20 cm. long at the selvage and the end of the join. This is referred to as feature 7 and consists of such unengaged loops accompanying alternating knotted loops. The last manipulation of the join takes in an additional 9 loops and knots itself to segment II at the selvage. Plate 1c shows the join in feature 7 with the knotted and loose loops. Although the mesh sizes are comparable, segment III is 42 meshes wider than segment II, the latter's inadequacy being compensated for by two sets of paired loops manipulated in the described manner.

Segments IVa and b are attached to the preceding segment by a single passage of yarn which serves to effect join 4. Its meshes (1.2-1.3 cm.) are smaller than those of either of the joined sections, and employ the same reddish fiber as that of join 3 and segment III. The typical

opposition of knots is present along the join, as well as another set of extra loops treated in the same way as those of features 6 and 7. Eight extra loops are involved, beginning with 5 single loops with alternating knots and 3 loops at the termination of the join at the FC selvage. The extra loops composed part of segment III, providing another example of attempts to match various segments of net, segment IV being 8 meshes shorter than segment III.

Segment IV is divided into two areas which have been labeled IVa and IVb on diagram 1. Segment IVa is characterized by gray yarns 1.1-1.5 mm. in diameter, spun at 30-45 degrees, and employed in meshes 1.4-1.6 cm. in range. Segment IVb also has meshes of gray yarn, with a diameter and twist range (1.0-1.5 mm. at 30-45 degrees) almost exactly that of segment IVa. The mesh size, however, is somewhat smaller, ranging from 0.9-1.3 cm. Also of interest is the direction of work as indicated by the knots. Those of segment IVa indicate progression towards the top of the net; that is, in the same direction as segments Ib, II, and III. Segment IVb exhibits work in the opposite direction. This extraordinary combination was accomplished by placing two short portions of nets together to complete the desired width. Join 5 is of a type differing from those already mentioned. It is oriented in a vertical direction as it unites the edges of segments IVa and IVb. The familiar zigzag alternation in knotting was employed in this instance, but the knot involved is not the mesh knot; half-hitches have been substituted, possibly to save time.

Summary: Net No. 1 is composed of five separate segments and one fragment pieced together, with single rows of joining in which various mesh sizes, color, and work directions occur. Inadequate matching resulted in one large projection and numerous extra loops being taken in. One result of joining different mesh sizes was to produce the trapezoidal shape seen in the specimen, the smaller loops at join 1 allowing less extension of the larger loops attached, thus causing the sides to slope inward.

Net No. 2 (Diagram 2)

Segments Ia and Ib of net No. 2 are comparable in that both employ gray yarn 0.8-1.5 mm. in diameter, spun at 30-45 degrees, with meshes 0.5-0.7 cm. in size. However, the direction of work of segment Ia is opposite to and converges toward that of segment Ib. Join 1, of gray yarn 1.0-1.9 mm. in diameter, spun at 30-45 degrees in meshes 0.5-0.7 cm. in size, unites the two. At feature 6 two meshes of segment Ib are not joined to segment Ia as the latter is two meshes shorter than the former. The upper selvage of

segment Ia carries the remains of dead knots along the top row, precisely like those of segment Ia in net No. 1 (p. 109), good evidence of the use of a fragment. It is possible that some of the segments of both nets Nos. 1 and 2 may have been fragments of other nets with the dead knots removed, a frequent practice to prevent rot at the knots. This is conjectural, and the various components may have been small or incomplete nets.

Segment II contains gray yarns 0.5-1.5 mm. in diameter, spun at 30-45 degrees, with meshes of 0.8-1.3 cm. Mesh size distinguishes segment II from segment I, but the direction of work does not differ. Join 2 is of gray yarn, 1.0-1.1 mm. in diameter, spun at 30-45 degrees of twist, in 0.8-1.0 cm. meshes which unite the segments. We note an anomaly at the right hand (BD) selvage—a group of 8 meshes (feature 7) are bated or gathered together by a single knot, as described for feature 5 of net No. 1 (p. 109). Next to the cluster are two single examples of bated loops, indicating that segment II was 10 meshes wider than the preceding component, the join yarn being employed to engage the extra loops.

Segment III is characterized by gray yarns 1.0-1.4 mm. in diameter, of predominantly 45 degree twist, with meshes 0.8-1.0 cm. in size. The direction of work is toward the top. Join 3, coming between segment II and III, is of gray yarn, 0.7-1.0 mm. in diameter, at 30-45 degrees, with 0.8-0.9 cm. meshes. Feature 8 consists of a series of 8 scattered bated loops ending with the taking in of three additional loops at the BD selvage. The extra meshes are part of segment III, indicating that again only a rough estimation of width was attempted, with any extra loops—in this case, ten—being knotted by the join element.

Segment IV is distinguished from segment III by yarn of a reddish-tan color, more variable diameter (0.6-1.0 mm.), and larger mesh size (1.3-1.6 cm.). No true join is present. As the direction of work is the same in both cases and no anomalies are present along the boundary numbered join 4, it would seem likely that when segment III was added to segment IV work was merely resumed, using new string. This is the only instance of an obvious addition through renewed or altered construction that came to my attention, although numerous insignificant yarn changes and minor mesh variations probably reflect the frequent interruptions that any such time consuming handiwork repeatedly encounters.

Segment V is composed of gray 1.0-1.5 mm. yarns, spun at 30-45 degrees, in meshes ranging from 1.0-1.3 cm. The direction of work is toward the lower portion of the net in contrast to that of segment IV. Join 5, the means of attaching this last fragment to the net, consists of simple, knotless zigzagging between the two edges. Segment V is truly a fragment as

indicated by numerous dead knots along the join. The yarn used for the greater part of the join's length, where preserved, is Apocynum, 0.8-0.9 mm. wide, 30 degree twist, while that in the areas designated as feature 9 is 4-ply S cotton cordage, 1.4 mm. in diameter and spun at 45 degrees. This cordage is obviously of European manufacture, attested both by the material and its machine-made regularity. Plate 2d shows the irregular manner in which the join was accomplished; it was obviously a hasty and careless addition, more closely resembling a repair.

Summary: Net No. 2 resembles No. 1 in its composite nature, varying components, and attempts to accomodate varying mesh counts by bating. It differs in the use of coarse sewing and the addition of new rows of netting on older ones as a means of composing the larger object. The use of probable fragments occurs in both specimens and, as suggested above, some of the other segments may have been fragments with the broken knots undone.

Net Selvages

The finished or "self edges" of the various components of the two nets are, with the exception of the knotted edges of segments Ia of both nets and segment V of net No. 2, composed of the unengaged loops of meshes. The beginning or "head" of any given net consists of a row of loops or hangers cast over a stick or, more probably in the case of the extreme length of the specimens examined, a large loop holding the first row with successive rows being added, and the entire fabric being easily turned to allow for continuous manipulation in a left to right direction. When the work was completed, the supporting cord would be removed. The bottom or "foot" of the net—marking the last passage—consists of a row of half-meshes or loops. The lateral selvages also exhibit unengaged loops, but these represent the first and last meshes of the rows and the lack of lateral tensions allows the meshes to contract for an area several centimeters wide along the edge. The result is a series of vertically extended meshes whose unexpanded elements form a straight edge along the lateral selvage. Occasionally, as an aid in obtaining a straight edge, European net makers add a single passage of taut yarn, knotted along the lateral selvages to keep the meshes stretched vertically. In the case of net No. 1, a length of similar structure is present for a distance of 20 cm., beginning at point F and extending downward (feature 10). Fine cotton yarn was employed, composed of three 2-ply Z elements re-plied S. Its uniform diameter (0.9 mm.) and twist (45 degrees), as well as its fiber, indicate this yarn was of machine manufacture.

The differences in yarn diameter of the 8 additional meshes and those of the actual body of net No. 1 are apparent in Plate 1b, to the right of the scale (feature 10). Half-hitches were employed, recalling join 5 of the same net. A granny knot at either end fixes the "bridle" in place and suggests that this was probably its intended length. Its function, therefore, cannot be definitely ascertained and the term bridle is applied on structural grounds alone.

In general the lateral selvages of both nets appear quite straight and regular, with the exception of the various anomalies associated with joining.

Mounting

Frequently additional structures were provided along the selvage of a net to strengthen it or aid in manipulation. Such structures are present on the two nets analyzed. Along the bottom selvage (CD) of each net is a row of 10 cm. loops knotted to the regular meshes above. These loops pass around a heavy cord and are held in place by a third, regular diameter (0.8-1.2 mm.) yarn that engages the loop in a half-hitch without involving the heavy cord. Plate 1d and figure 4 illustrate this construction.

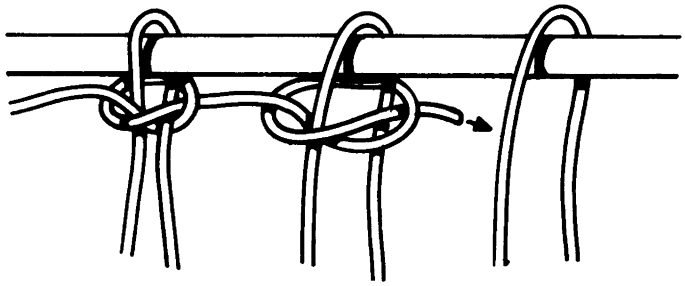


Figure 4

The lower selvage of net No. 2 is poorly preserved while that of No. 1 (feature 9) is intact. Both exhibit knots indicating work on this structure progressed downward toward the heavy supporting cord. In the case of net No. 1, three normal rows were added first, while net No. 2 had only one regular row added before the construction of the long loops. The supporting cord could easily have been used as a guide or gauge to regulate the length of the loops between the net and the cord, providing the latter was kept taut. The half-hitches were applied tightly against the support, rendering the engaged loops immovable. For the most part, the spacing of the loops was even (0.5-1.0 cm. apart) although some irregularities do occur, especially at the corners of net No. 1 where noticeable congestion is present.

The data for the yarns of the structure in nets Nos. 1 and 2 are given below. Very little difference is exhibited between the two specimens.

	Element	Fiber	Color	Diameter (mm.)	Degree of Twist
Net No. 1	Loops	Apocynum	Gray, gray tan	0.8-1.2	30-45
	Support	do.	Gray	1.3-2.3	45
	Knotty	do.	Gray, gray tan	0.9-1.2	30-45
Net No. 2	Loops	do.	Gray, gray tan	0.8-1.0	30-45
	Support	do.	Gray	1.3-2.0	45
	Knotty	do.	Gray, gray tan	0.8-1.2	30-45

An example of the attachment of a string of shell beads to another cord through the use of half-hitches and a third element is described by Loud and Harrington (1929:105) from Lovelock Cave, and offers a distant parallel to the structure described from Hidden Cave. However, in the Lovelock Cave specimen the half-hitch engages both the supporting cord and the cord with the beads; thus no examples of the precise technique used at Hidden Cave have been encountered elsewhere.

Features 13, 14, and 15 on net No. 1 involve the gathering of small coils of the supporting cord with its loops affixed and secured. Feature 13 is reproduced in Figure 5; it has two coils tied in a granny knot of reddish Apocynum yarn. Features 14 and 15 each involve several turns of gray yarn before knotting, with the former composed of three and the latter of two coils. The nature of the tying yarns is in no way distinct from those used in the construction of the nets. The function of these gathered coils may have been as a means of taking in slack or providing a point of attachment in manipulation of the net.

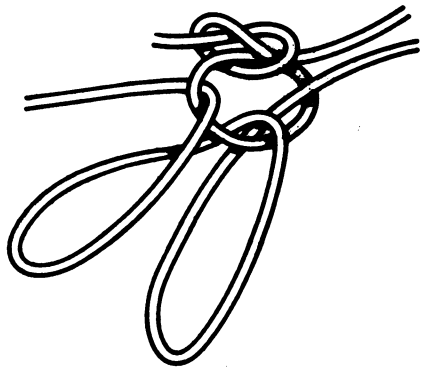


Figure 5

At either end of selvage CD of net No. 1 a loop of the supporting cord is present. Feature 11 at corner C has its loop formed by the doubling back of the free end which was then tied in a half-hitch. The loop at corner D, feature 12, is too badly felted to be analyzed but could parallel feature 11. No such elements are present on the few centimeters of selvage CD remaining of net No. 2 although they may have been present originally. The function of the end loops, like that of the gathered coils between them, could relate to manipulation and use of the net, possibly as points of attachment.

On the remaining three selvages of both nets there is evidence of a second form of mounting where large loops are knotted with mesh knots along the selvage; these were probably in turn threaded or "reeved" by a second cord (pl. 2b). The loops are not attached in any way to the second element, but are free to slide as motion and force require. These loops extend 15 cm. or more beyond the selvage, with varied spacing. The reeving element is preserved only along selvage BD in net No. 1, and along parts of selvages AC and AB of net No. 2. The large loops are preserved to one degree or another on all selvages of both nets. In the case of net No. 1, selvage AC shows evidence for 15 loops spaced 16-26 cm. apart; selvage AB retains 17 loops with similar spacing; and selvage BD shows 12 loops with a range of 1.6-3.0 cm. spacing. The diameters of the looping yarns range from 1.6-2.0 mm., spun at 30-45 degrees; those of the reeving yarns range from 2.0-2.3 mm., spun at 45 degrees. Both yarns are of gray Apocynum, spun 2-ply S twist.

Selvage AC of net No. 2 retains 18 loops spaced 15-23 cm. apart. Selvage AB preserves fragments and examples of only 15 meshes, spaced as in AC. Selvage BD is poorly preserved and now shows evidence of 9 loops. Most yarns are gray to gray tan, 2-ply S twist. The diameter of the looping yarn ranges from 1.0-1.2 mm., spun at 30 degrees. Yarns used in the process of reeving range from 2.0-2.5 mm., spun at 45 degrees, and are gray in color.

Wherever the loops attach themselves to the net, the tension and strain cause the mesh to extend, creating a peak. These are especially obvious in Plates 1a, c and 2a, b.

Groups of loops appear to have been tied at points A and B of both nets. Net No. 1 has 3 loops so engaged at point A (feature 16), the tie being accomplished with a fragment of reeve yarn with a granny knot (pl. 1a). At point B another such cluster occurs; this consists of 4 loops and the end of the reeve yarn from BD, also held with a granny knot (feature 17). The reeve end doubles back and knots once at feature 18

(this knot is too felted to identify) and again at a point 30 cm. from the corner, with a granny knot.

		Loops		Reeves	
	Selvage	Diameter (mm.)	Degree of Twist	Diameter (mm.)	Degree of Twist
Net No. 1	AC	1.6-2.0	30-45	-	-
	AB	1.6-2.0	30-45	-	-
	BD	1.6-2.0	30-45	2.0-2.3	45
Net No. 2	AC	1.0-1.2	30	2.0-2.5	30-45
	AB	1.0-1.2	30	2.0-2.5	45
	BD	1.0-1.2	30	-	-

Corner A of net No. 2 preserves 6 mounting loops which are gathered and held by a small fragment of looping cord, the latter passing through the loops and securing them with a granny. This has been designated feature 22; the loops with their peaked selvage sections are illustrated in Plate 2a. Corner B of net No. 2 is poorly preserved, but one may surmise that a similar corner treatment was once present at that point.

Feature 21 of net No. 2 is a similar structure which occurs between corners A and B along the top selvage. Six loops, with accompanying selvage peaks, are gathered and held by a square knot of yarn similar to that of the gathered loops (pl. 2c). Net No. 1 may have had such a feature but no trace of it is present on the relatively intact upper selvage; hence feature 21 of net No. 2 may be unique.

These groups of mounting loops tied in clusters at the corners (and in one case the center) of the upper selvage must have served some function related to the use and manipulation of the nets as they control the selvage at significant positions, as well as the areas adjacent to the selvage. In fact, all selvages retain features suggesting the need and intention of controlling the nets in specific and patterned ways. These features are similar in both specimens.

Repairs

As might be expected, use of the nets resulted in the need for occasional mending. Numerous instances of repairs are present in the two

specimens.[1] The most common and basic repair involved the replacement of one or both sides of a mesh. Several methods were employed to meet this problem. The most common and durable is the reconstruction of the side or sides in question by knotting in a short length of yarn to fill the gap. The method of attaching the yarn is the same as that used in the original construction of the fabric as the mesh knot is used. The original knots are engaged anew, contrary to the common European practice which involves the untying of the useless knots first to avoid retention of moisture which could contribute to the deterioration of the elements at these points. By far the most frequent repair involves only one or two sides of a single mesh, with the appropriate repair resembling a "/" or "V" respectively. Longer repairs were carried out in a given row, and in those cases where several rows were involved the repair yarn hung successive rows of new structure until the hole was filled. It seems useless to list and classify all the repairs of this sort, as only the manner and not the size of the repair is of interest.

The yarns employed in reconstruction of the nets are as varied as

---

[1]As an aside, it may be noted that patching and repairing of nets and baskets were abundantly present in the materials recovered from both Lovelock and Humboldt caves. This use of a piece to the limit was no doubt directed toward the economy of labor, and so long as a damaged piece—especially a complicated and composite one like a basket or net—could be patched, it represented a postponement in the making of a new one. In general this activity would seem to fit the culture and activity pattern otherwise known in at least two aspects: (1) something that could be utilized was valued exclusive of its esoteric nature and appearance; and (2) free time for industrial pursuits was limited.

Broken wooden implements such as digging sticks or bows were ultimately employed as firewood when they had reached a point where no other use for the fragments was conceivable. The linings of the numerous cache pits in Humboldt Cave consisted for the most part of fragments of wicker twined and coiled baskets. Nothing indicates that all these baskets (representing no fewer than 359 specimens, cf. Heizer and Krieger 1956: 34-37) were reduced to fragments in the cave, and it seems more likely that they represent an accumulation of basketry pieces used in open air sites which were brought to the cave for the specific purpose of lining and covering cache pits. Little lengths of string rolled around a stick, bits of nets, scraps of leather, and other little hoards of what can only be called scrap are frequently found in the dry Nevada cave deposits. These are to be interpreted as otherwise useless remnants saved for some future service in a moment of need.

those used in the basic fabric, but do not exceed the range of the latter. Gray and gray tan yarns are present as well as numerous instances of deep reddish yarns. The reddish cordage possibly reflects the rare use of this segment of the color range, but differential weathering and bleaching may also be involved. Thus the red yarns may be newer than the gray ones.

The occurrence of cotton yarn in features 20-23 of Net 1 is a significant exception. These repairs are composed of six single ply strands plied S at 45 degrees, with a diameter of 2.5 mm. Note that all occur on or near join 3, possibly indicating its weakness.

A second alternative in repairs is more hasty in nature, requiring only that the adjacent intact mesh sides be tied together with a loop held by a knot. When the tear involved several meshes, the resulting repair "pursed" the edges together. Feature 24 of net No. 1 purses four meshes together with an Apocynum yarn 0.8 mm. in diameter, and employs a granny knot.

Cotton yarn occurs in features 14 and 15 of net No. 2, involving two and six meshes respectively. The yarn appears to have been similar to that employed in features 20-23 of net No. 1, although somewhat altered. Feature 14 of net No. 2 has yarn that is only 2-ply, spun at 15 degrees; however, feature 15 is held together with yarn that is primarily 3-ply, also loosely spun at 15 degrees, but it retains at one end the remains of two additional elements. Thus this section is composed of five strands spun at 45 degrees. This observation and the proximity of feature 14 suggest that part of a single piece of yarn was untwisted and removed to be used in feature 14 while the remaining elements were used in feature 15. The knot employed in both cases is the granny.

Feature 25 of net No. 1 is unique in that it employs a strip of white cotton cloth to purse the edges of a hole together. It has single ply yarns, 0.15 mm. wide and spun at 30 degrees in the Z direction. The cloth is square count with a projected 75 x 75 threads per square inch. The texture resembles that of an ordinary bed sheet and its source was probably a trade item of similar nature. The strip is 4.5 cm. long and 1.0 cm. wide, folded lengthwise and engaging two meshes in a half-hitch.

Several instances of the use of stiff, tough, vegetable "fiber" appear to be hasty, on-the-spot repairs of minor tears. Features 26 and 27 of net No. 1 involve three and two meshes respectively, and employ a stiff, woody stem (possibly Apocynum) tied in a half-hitch.

Features 16 and 17 on net No. 2 employ a strip of what is possibly

arrowcane (Phragmites) or tule (Scirpus), and involve seven and two meshes respectively, with the half-hitch again being used. Apparently these reflect hasty emergency repairs, the half-hitches suggesting that the stiff material made more elaborate knots impossible and unnecessary.

The third alternative in repairing the nets is as hasty as the second but involves much larger or longer tears. This takes the form of simple lacing of the edges of a rent with a cord which was pulled tight, much in the way of the join at 5, although this is much looser than the lacing on the repairs. This method was apparently used on net No. 1 only at features 28-30. Feature 28 is roughly in the shape of an inverted "V" and has a total seam length of 28 cm.; features 29 and 30 are 8.0 cm each. All three employ gray Apocynum yarn 1.0-1.3 mm. wide, spun at 33-35 degrees. Grannies are used to secure the ends of the laces.

Several repairs are present in the various additional structures attached to the nets. Feature 31 on net No. 1 involves two broken loops of the long variety that edge the selvage along CD. A red Apocynum yarn engaged the doubled over ends in a square knot, engaged the supporting cord in a half-hitch, and completed the repair by knotting itself in another half-hitch just under the square knot (fig. 6). Extending from feature 31 to the corner at C, a distance of 20 cm., feature 32 represents the repair of an area in which that portion of the long loops passing over the support cord has broken or abraded away. Still being engaged by the

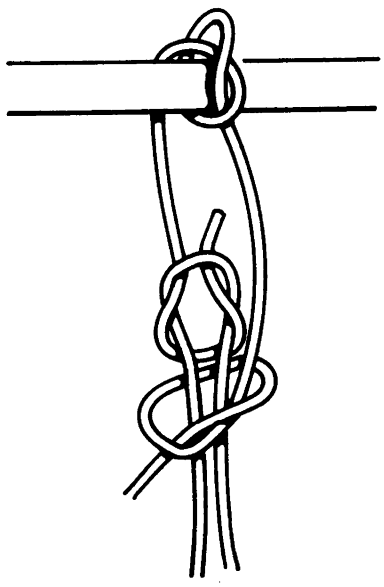


Figure 6

third element, an auxiliary element—again of red Apocynum—engages both the supporting cord and the engaging element with a series of half-hitches spaced about one centimeter apart (fig. 7). In structure the repair duplicates the method previously discussed for Lovelock Cave in a string of beads (Loud and Harrington 1929:105). However, in view of the numerous and varied applications of this knot in series elsewhere on the two specimens, the parallel is surely a chance application of a familiar motor habit.

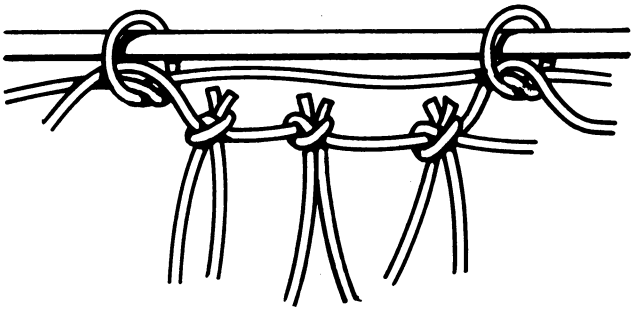


Figure 7

Three examples of mended mounting loops occur in net No. 1 along selvage BD. Feature 33 is the joining of two elements of adjacent broken loops with a granny to replace the loop, while feature 34 employs a square knot, and feature 35 a slip half-hitch. Feature 36 involves the tying of the loose end of a broken mounting loop directly with an indeterminate knot. Many examples of knots in simple repairs of mounting loops are present on both specimens and a breakdown of these follows.

	Type of Knot	No. of Examples	Feature No.
Net No. 1	Granny	5	33, 35, 40, 41, 45
	Square	1	34
	Half-hitch	2	43, 44
	Unidentifiable	2	36, 42
Net No. 2	Granny	1	10
	Square	3	13, 20, 23
	Half-hitch	2	10, 22
	Unidentifiable	1	18

Adding to these the total number of knots already described for various features, the total number of instances of knots—aside from those

associated with the construction—is 65, broken down for each net as follows:

Type of Knot	Net No. 1	Net No. 2
Granny	15	4
Square	2	5
Half-hitch	8	8
Mesh	9	10
Unidentifiable	4	2
	38	27

Although the figures vary between the two nets, the total number of examples of each knot type indicates that the granny and mesh knots shared equal popularity (19 examples), with the half-hitch occurring 16 times, the square knot not as common as the others (7 examples), and 6 unidentifiable knots rounding out the figure to a total of 65 knots. It is interesting to note that no occurrence of the clove hitch was observed. Perhaps its use was not required by the needs of the two specimens. Such specialized items as fish nets could not be expected to reflect an entire technical inventory, as did the Lovelock Cave material.

NATURE AND USE OF THE TWO NETS

It is obvious that both nets exhibit marked similarity to one another. Both are roughly trapezoidal, although net No. 2 is less so than No. 1, and both exhibit this tendency toward the AB selvage. Both nets are composed in aggregate of smaller segments and fragments; the segments of both specimens designated Ia being fragments showing in each case opposition to the direction of work on segment Ib. The yarns employed—with the exception of the few cotton yarn occurrences—as well as the mesh widths are comparable. Both nets exhibit the same specialized mounting structure along selvage CD in contrast to that of the remaining three selvages, the latter being treated with large mounting loops and a reeving cord. Both specimens preserve clusters of these loops at corners A and B, while net No. 2 preserves a similar structure between these two points. These are assumed to relate to the handling of the nets, and to judge from the similarity of structure the function must also have been comparable.

Archaeological material concerning the nets of the area is scant, often constituting barely more than a passing reference. The material

from Lovelock and Humboldt caves suggests that the common hunting and fishing nets tended to be extremely long and very narrow. The ethnographic material is scarcely more helpful, with the use of rabbit nets in fishing being reported for the Shoshone (Steward 1941:276), the Utes (Stewart 1942:249), and the Owens Valley Paiute (Steward 1933:251). Evidently the general Great Basin pattern suggests something different from the two specimens under discussion. Large nets (10 ft. x 30 yds. or more) were noted for the Humboldt Lake Paiute by R. F. Heizer (unpublished notes), the nets being used to capture ducks. Two poles, each 15 feet high, were set upright with the net between them, tangling the ducks as they flew or paddled by, and being pulled over them. It is possible that the two nets analyzed here were employed in a similar manner, although the lack of great length would have rendered them somewhat inadequate for this purpose.

Kroeber and Barrett (1957:45, 171, fig. 17, pl. 11) illustrate and describe a mounting structure quite similar to that described for selvage CD of nets Nos. 1 and 2, the structure with the long loops tied to a supporting cord by a third element. The Yurok example illustrated by Kroeber and Barrett does not have the third element, the long loops being attached directly to the support with larks head knots. However, the general appearance and relationship to the selvage is present in both. The Yurok specimen is a scoop net and the edge in question is one that is stretched between two poles of a "V" frame. The supporting cord is attached to the tips of the poles by means of loops at either end, resulting in a tightly stretched edge. It must be noted that two loops occur in a similar position in net No. 1 and presumably occurred on net No. 2 at one time.

The illustration of the Yurok net (ibid., 45) shows that the side selvages are edged with a series of large loops associated with a second cord. Unlike the loose, sliding association of loops and cord observed in the Nevada specimens, the Yurok mounting has the loops attached to the cord with larks head knots. Again the precise structure may differ, but a significant similarity of placement and general structure is to be seen between the two patterns. The Yurok specimen is attached along its lateral selvages by attaching the mounting by means of ties or loops that pass around the pole and mount at once. One loop alongside BD of net No. 1 (feature 45), as well as a loop from net No. 2 (feature 11, fig. 8) could have been part of a series serving a similar function. One significant difference is present in the Yurok net in that it has a tapered, conical base corresponding to selvage AB of nets Nos. 1 and 2. It is conceivable that the gathered loops at the corners and in the center of AB may have served to create a partial pouch, all being attached at a

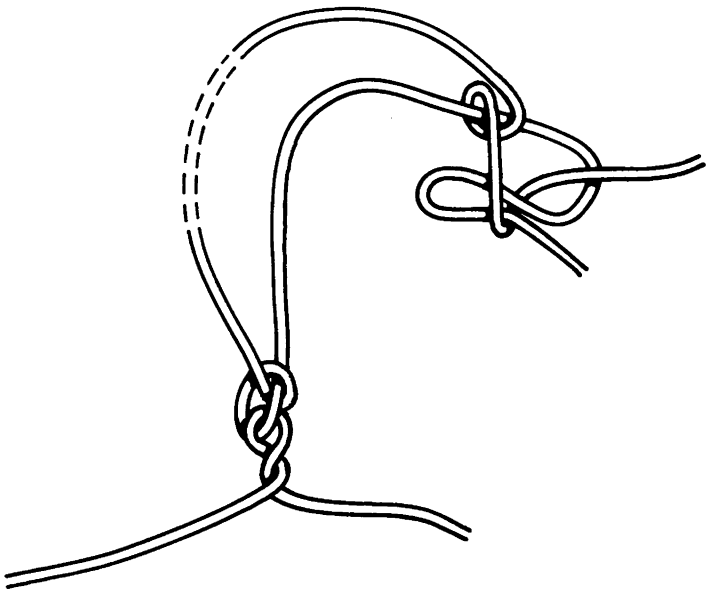


Figure 8

given point near the apex of a "V" frame. The mesh size of the Yurok specimen in the cone area is considerably smaller than that of the rest of the net, presumably to give that area additional strength to support the weight of the fish collected. The mesh diameter of segments Ia and Ib of both nets tends to be significantly smaller than that of the rest of the net. Also, the projection AE-F in net No. 1 may have been intentional rather than accidental, perhaps being employed to better approximate a cone or pocket.

If the similarities between the Yurok and Hidden Cave nets are significant, then the convergence of the sides toward selvage AB observed in both Nevada specimens could be intentional; that is, to facilitate the collection of fish toward the back pouch of the nets, just as the fish were collected in the cone in the Yurok scoop net. If this inference is correct, then the apparent careless matching and gathering of extra loops could be explained as part of a careful construction of a tapered net. Even the dimensions are suggestively similar, with the CE edge of the Yurok net measuring 240 cm. in comparison to 315 cm. for net No. 1 and 290 cm. for net No. 2. The lateral measurements of the Yurok net exceed 330 cm., in comparison to 250 cm. for net No. 1 and 270 cm. for net No. 2.

A tentative reconstruction of the Nevada nets as scoop nets is provided in Figure 10, based upon and adapted from an illustration in Kroeber and Barrett (1957;45; fig. 9 herein). Although scant, the literature for

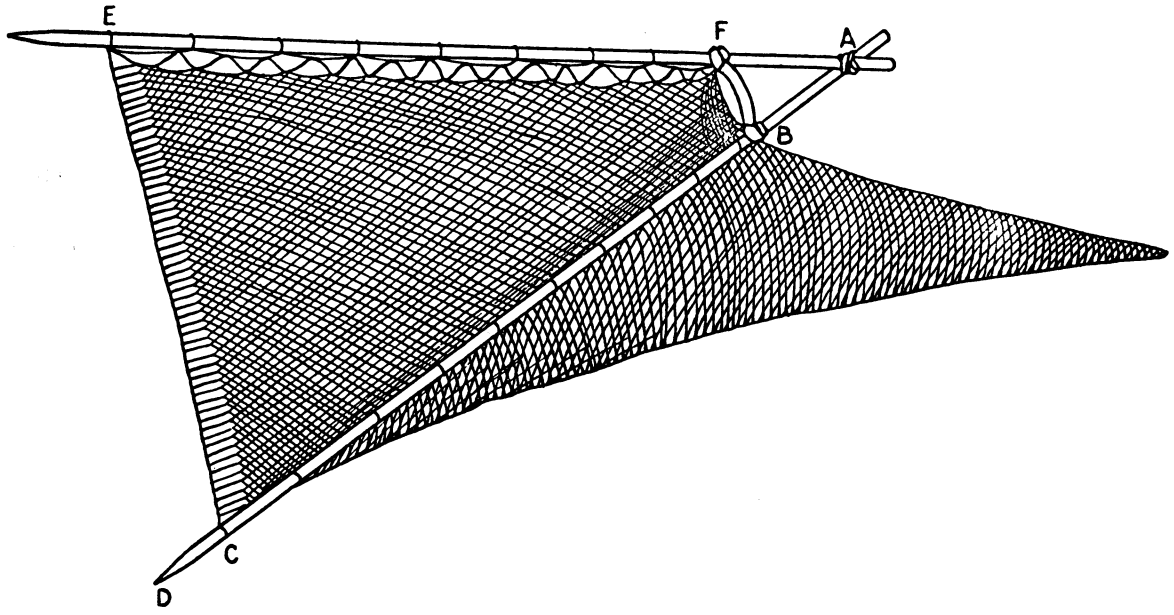


Figure 9. Scoop net or surf net. Dimensions: A-B, 90 cm.; A-D, 333 cm.; A-F, 87 cm.; B-C, 225 cm.; B-F, 67 cm.; C-D, 18 cm.; C-E, 240 cm. (After Kroeber and Barrett 1957:45.)

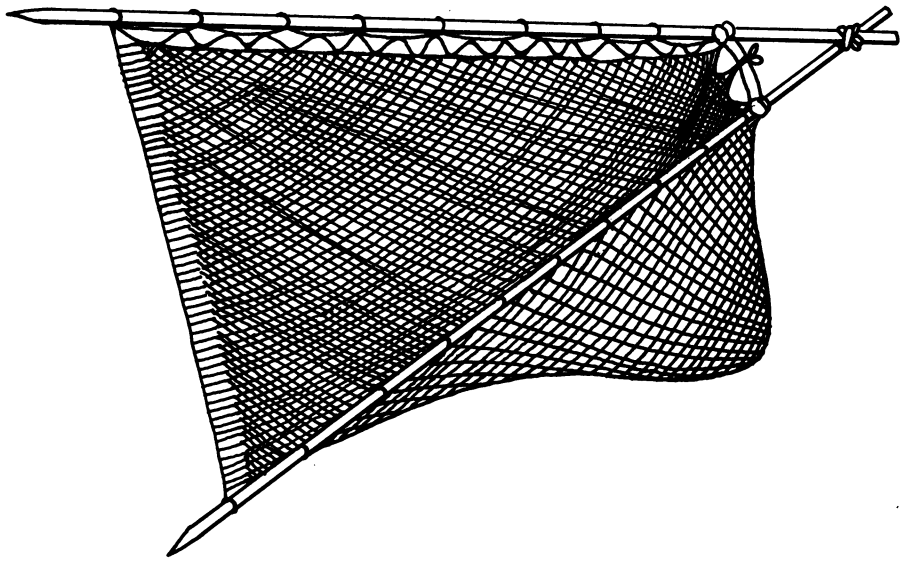


Figure 10. Tentative reconstruction of Hidden Cave nets.

the Great Basin does contain a few references to similar devices but lacks details. A large fragment of net was recovered from Lovelock Cave by Loud and Harrington (1929:89), who described it as being 6 by 10 feet and "gathered to a point at the bottom.... The dimensions given...are not strictly length and breadth, but rather what would correspond to length and breadth in the ordinary flat rectangular net." Apparently the basic fabric may have been square in shape and altered. The Southern Paiute of Ash Meadow are reported by Steward (1941:330) to have employed dip nets of some type for catching small fishes. The use of an "A" frame dip net for fishing from tule balsas is reported by Riddell (1960:37) for the Honey Lake Paiute. R. F. Heizer has recorded (unpublished notes) the use among the Humboldt Lake Paiute of a "big, wide net with a pole on each side, the pole being tied to the net. It was laid in the water and pulled out, to capture fish." However, the poles in this instance are parallel to one another. In any event, these reports indicate that the idea of dip or scoop nets was indeed present in the Great Basin.

Although conjectural, since no association with poles is present, the size, shape, and technical details discussed above suggest that mounting on a "V" or "A" type frame is quite probable and would have been employed in fishing some nearby body of water, perhaps the Carson or Humboldt sinks. On the other hand, it is also possible that the net was used unmounted and free to be pulled out of the water by lines. However, the apparent specialization of the CD selvage and its parallel in the scoop net suggest a somewhat more elaborate and particularized device. If so, the nets would represent a possible survival of an earlier form or adaptation of an idea, both deriving ultimately from the Pacific Coast where such fishing apparatus is common and elaborated.

The basic construction of the nets, as far as materials and technique are concerned, is purely aboriginal in character and might date to any period, while the presence of cotton yarn and cloth indicate that their manufacture dates to shortly before or sometime after the early contact with Europeans. Such mixed finds occur elsewhere, as in the cache from Humboldt Cave (Heizer and Krieger 1956:91) which contained

- 3 burlap sacks
- 2 pairs trousers
- 1 canvas ore sack
- 5 strips of cloth
- 1 Apocynum cord
- 1 fishline with bone hooks
- 1 chert blade
- 1 steel arrowpoint
- 1 bundle of eagle feathers

This cache was found 4 inches below the surface of the cave and represents a late deposit combining elements of both aboriginal and European origin, an association also present in the two nets from Hidden Cave.

The nets reflect the general character of Great Basin economic activity, where available material and resources were exploited to their fullest and with great ingenuity, being employed in the struggle for existence. It comes as no surprise that large nets such as these were pieced together from various scraps and remnants to increase and restore their economic productivity.

With all the known facts taken into consideration, it would seem that the two nets from Hidden Cave could have been constructed any time before or during the late 1840's when the first significant numbers of Europeans passed through the area, until about 1900. The nets may be protohistoric with repairs having been made in the early historic period when aboriginal methods still prevailed, or they could be quite late, with only small amounts of cotton being available. Even at a late date the yarn employed would have been handmade for the Indians of the area would have been too poor to buy a machine-made net or even cotton yarn to use in homemade construction.

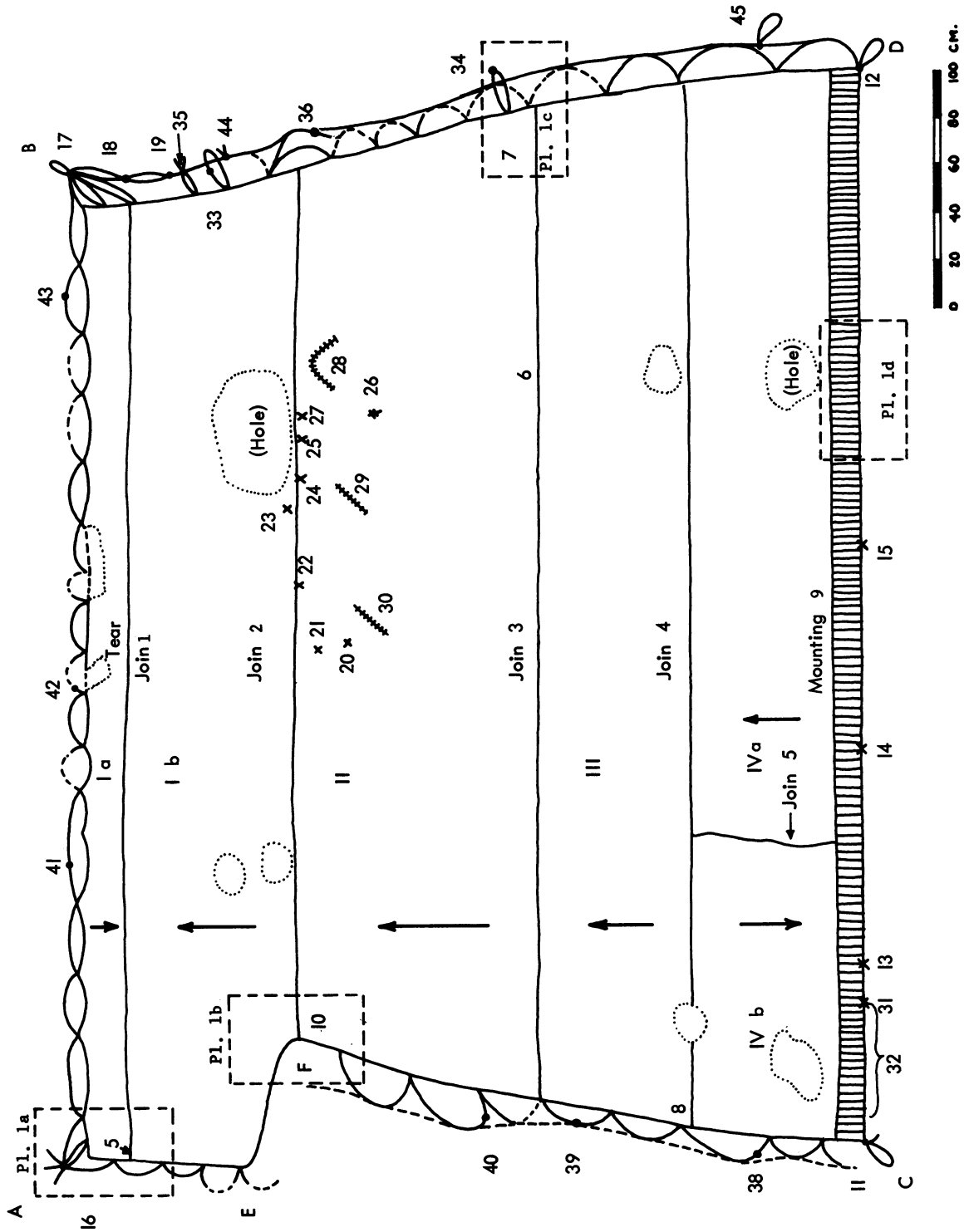


Diagram 1. Hidden Cave net No. 1 (UCMA 1-39988).

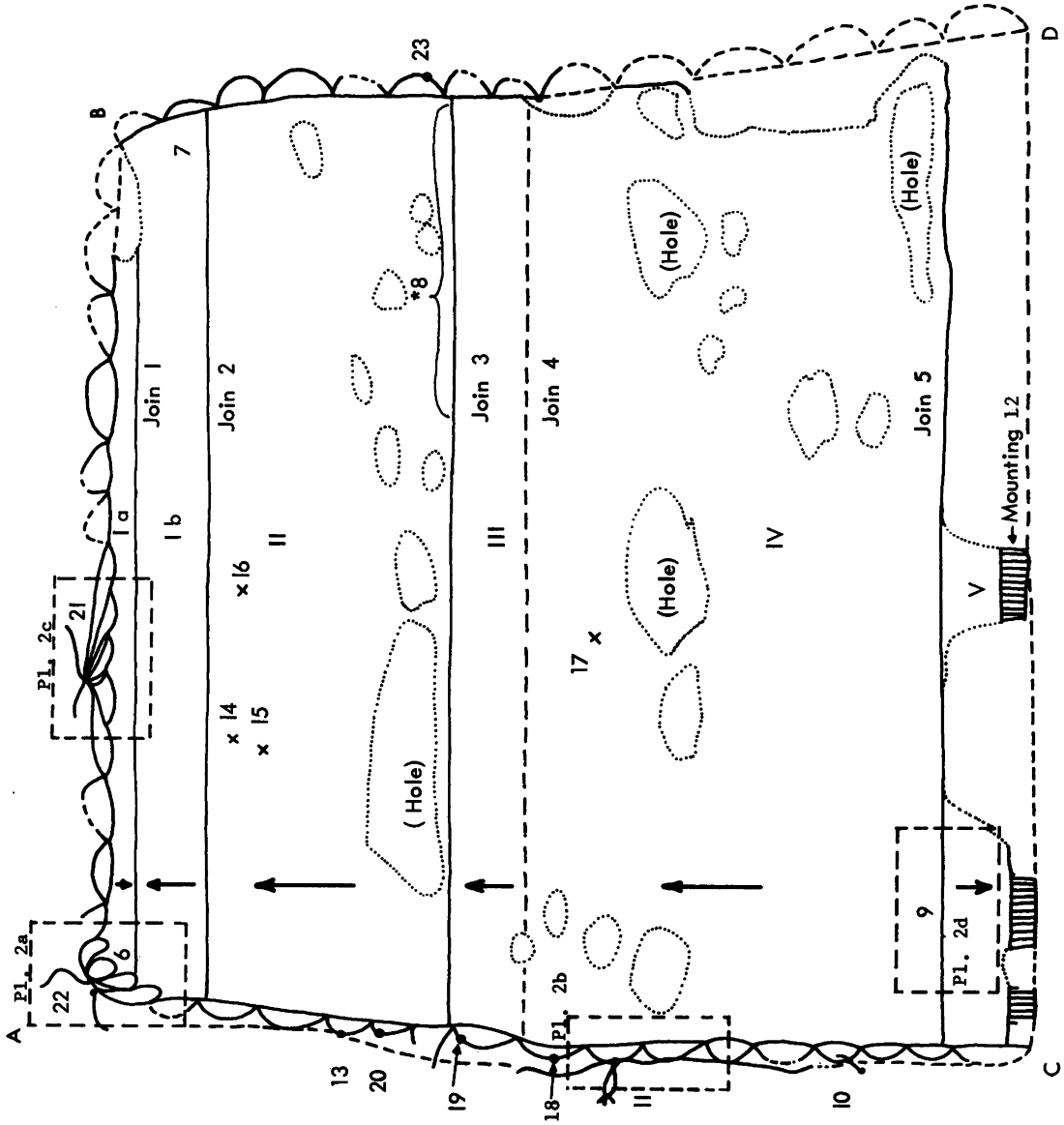


Diagram 2. Hidden Cave net No. 2 (UCMA 1-39989).

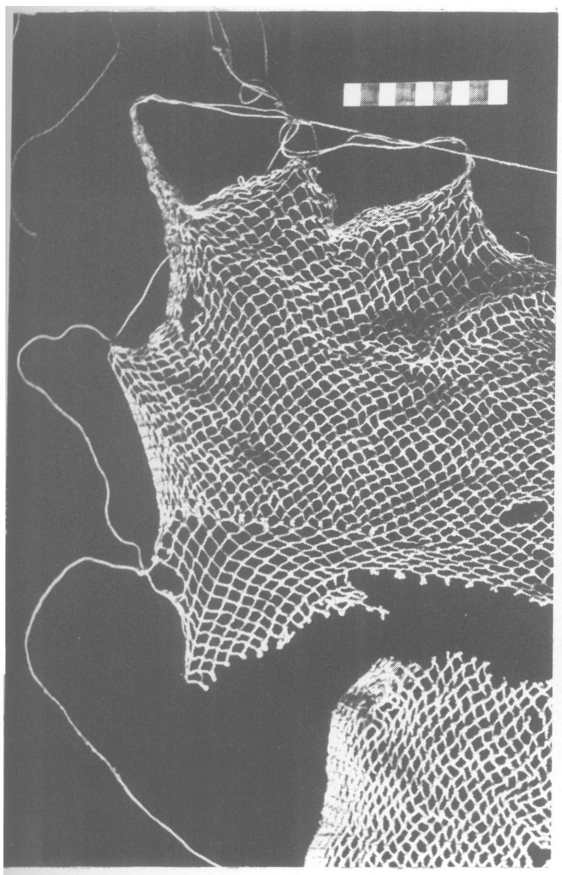
Plate 1

a. Corner A of net No. 1 showing the difference in mesh size between segments Ia and Ib as well as bated loops. Note gathered peaks at top. Slightly less than one-quarter actual size.

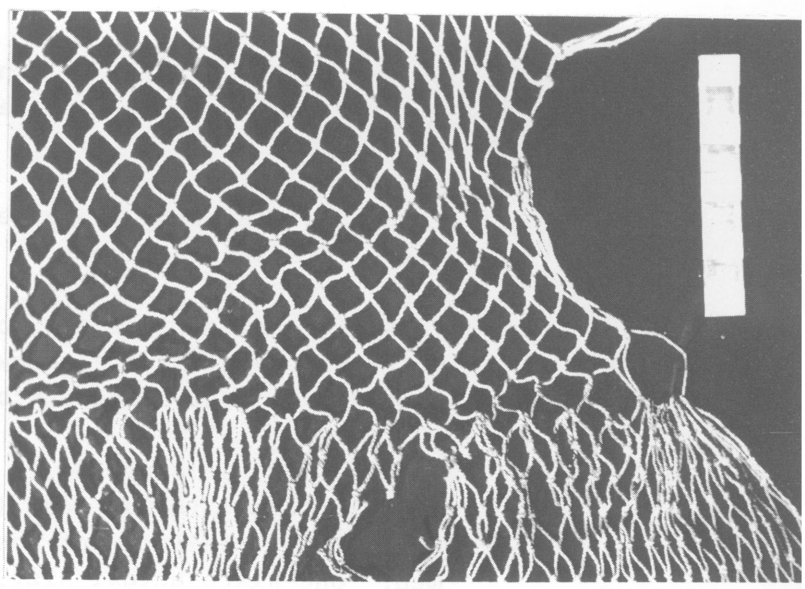
b. Angle F of net No. 1, created by join 2 of segments Ib and II, showing the point of joining and difference in mesh size. One-sixth actual size.

c. Close-up of feature 7 of net No. 1 showing the extra loops gathered in each mesh along join 2 and the congestion at the final loop. Slightly more than one-third actual size.

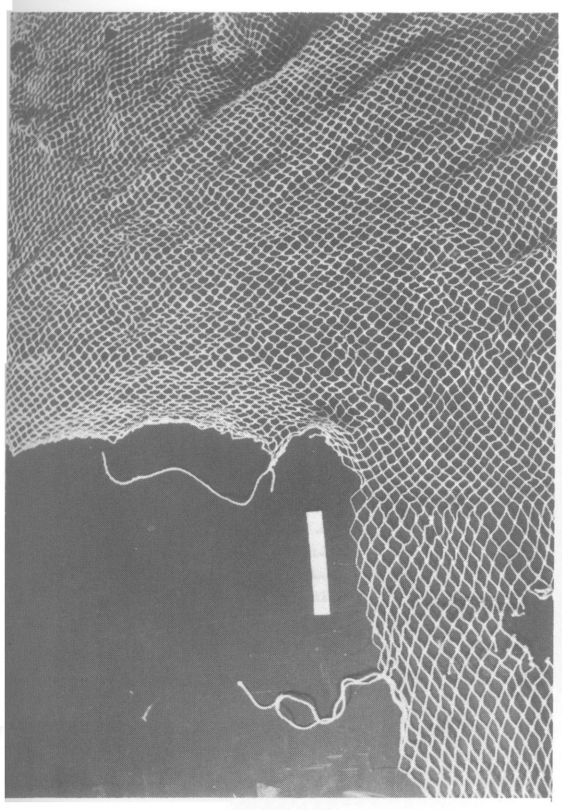
d. Portion of mounting along selvage CD of net No. 1, showing the long loops and support cord; the third element is not visible. One-third actual size.



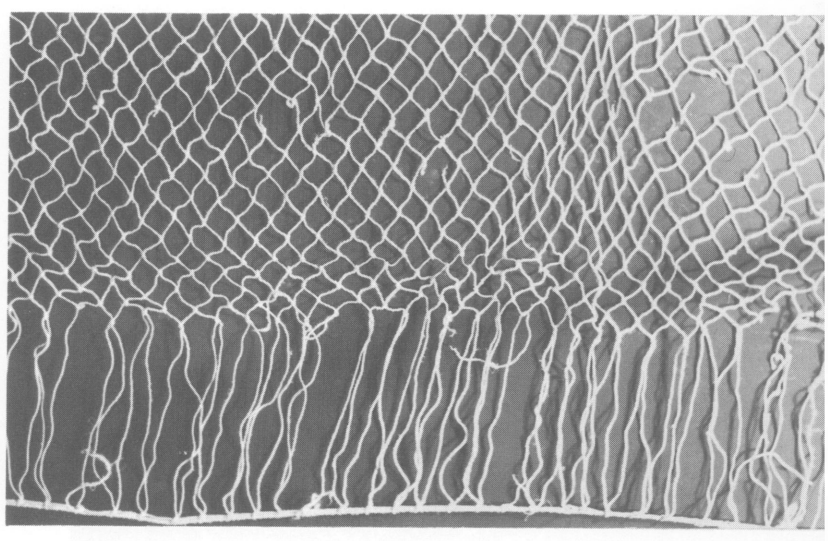
a



c



b



d

Plate 1

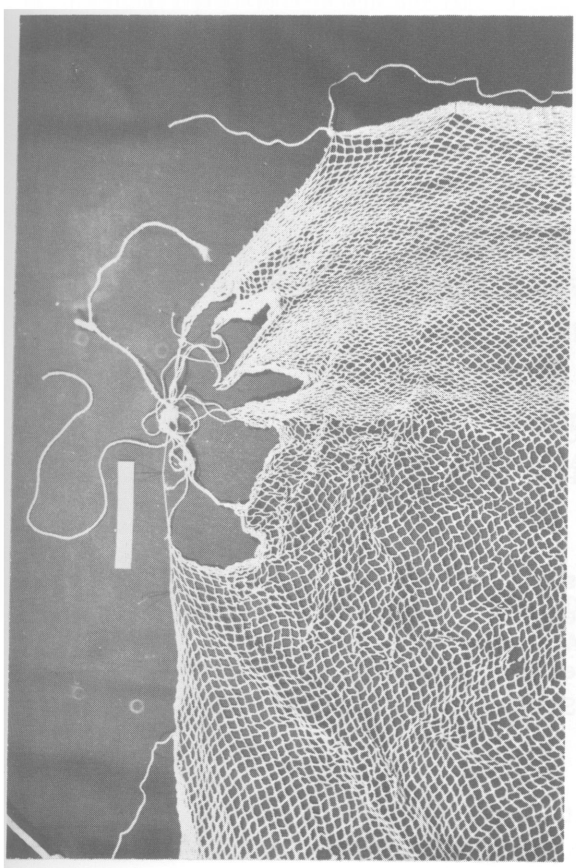
Plate 2

a. Corner A of net No. 2 showing gathered peaks and difference in mesh size between segments Ia and Ib. One-sixth actual size.

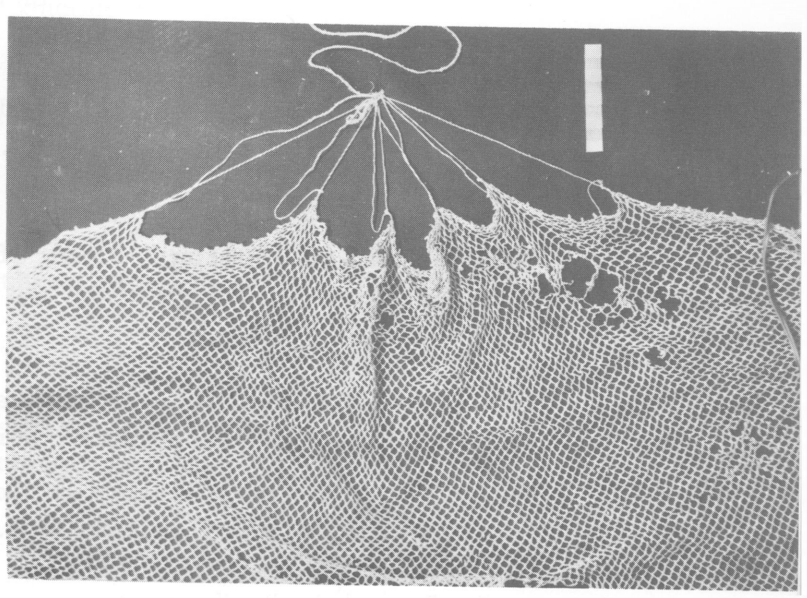
b. Portion of mounting along selvage AC of net No. 2. Note reeve cord and feature 11. One-sixth actual size.

c. View of feature 21 of net No. 2 showing the gathered mounting peaks and the somewhat pursed edge of the selvage along AB. One-sixth actual size.

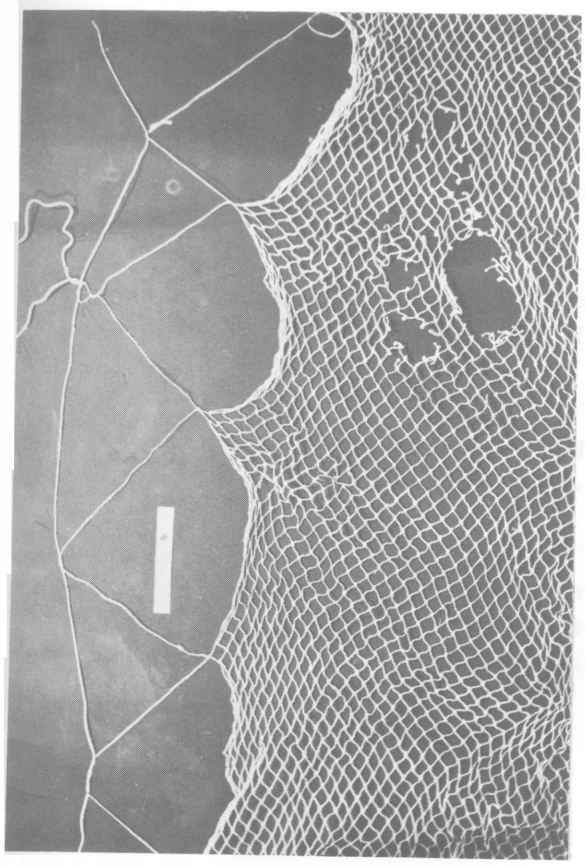
d. View of join 5 of net No. 2 showing the careless manner in which the join was made (see arrow, diagram 2) as well as the poor condition of the lower portion of the specimen. One-sixth actual size.



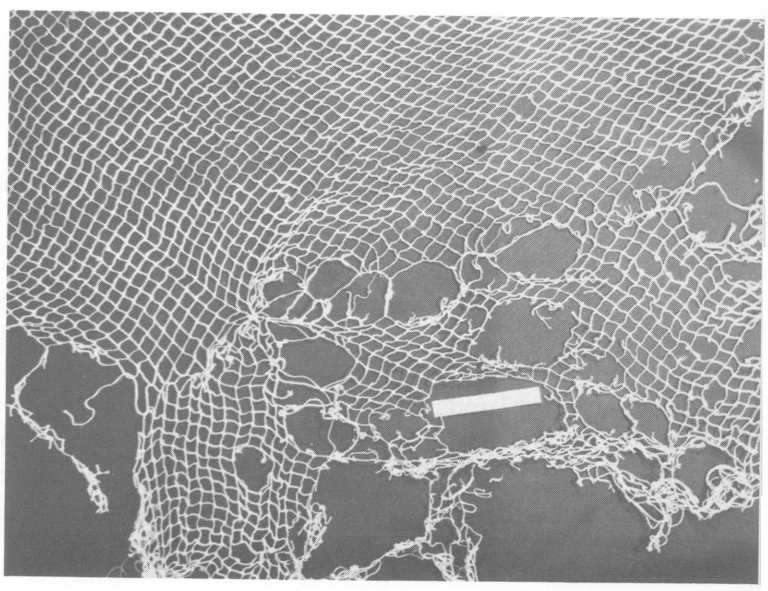
a



c



b



d

Plate 2

BIBLIOGRAPHY

Graumount, R. and J. Hensel
1939 Encyclopedia of Knots and Fancy Rope Work. Cornell Maritime Press, New York.

Grégoire, Chérie
1956 Apocynum Sling. Univ. of Calif. Publs. Amer. Arch. and Ethnol., Vol. 47, No. 1, App. II:102-105. Berkeley.

Grosscup, G. L.
1956 The Archaeology of the Carson Sink Area. Reports of the Univ. of Calif. Arch. Survey, No. 33:58-64. Berkeley.

1960 The Culture History of Lovelock Cave, Nevada. Reports of The Univ. of Calif. Arch. Survey, No. 52:1-72. Berkeley.

Heizer, R. F. and A. D. Krieger
1956 The Archaeology of Humboldt Cave, Churchill County, Nevada. Univ. of Calif. Publs. Amer. Arch. and Ethnol., Vol. 47, No. 1. Berkeley.

Kroeber, A. L. and S. A. Barrett
1957 Fishing Among the Indians of Northwestern California. Univ. of Calif. Anthrop. Records, Vol. 21, No. 1. Berkeley.

Loud, L. L. and M. R. Harrington
1929 Lovelock Cave. Univ. of Calif. Publs. Amer. Arch. and Ethnol., Vol. 25, No. 1. Berkeley.

Lowie, R. H.
1909 The Northern Shoshone. American Museum of Natural History, Anthropological Papers, Vol. II, Part II. New York.

Riddell, F. A.
1960 Honey Lake Paiute Ethnography. Nevada State Museum Anthropological Papers, No. 4. Carson City.

Rostlund, E.
n.d. A distribution study of fresh water fish and fishing in aboriginal America north of Mexico. MS in the University of California General Library, Berkeley, 1951.

Steven, G. A.
1950 Nets, How to Make, Mend and Preserve Them. Routledge & Kegan Paul, Ltd., London.

Steward, J. H.
1933 Ethnography of the Owens Valley Paiute. Univ. of Calif. Publs. Amer. Arch. and Ethnol., Vol. 33, No. 3:233-350. Berkeley.

1941 Culture Element Distributions: XIII. Nevada Shoshone. Univ. of Calif. Anthrop. Records, Vol. 4, No. 2:209-359. Berkeley.

Stewart, O. C.
1942 Culture Element Distributions: XVIII. Ute-Southern Paiute. Univ. of Calif. Anthrop. Records, Vol. 6, No. 4:231-354. Berkeley.