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THE CULTURE HISTORY OF LOVELOCK CAVE, NEVADA

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PREFACE

Almost thirty years have passed since L. L. Loud and M. R. Harrington's report on their excavations in Lovelock Cave was published. In the intervening period, nearby sites such as Humboldt Cave, Leonard Rockshelter, and Hidden Cave have been excavated, as well as a series of caves in the Winnemucca Lake area and several caves and open sites around Honey Lake. All of these sites have produced artifacts of types similar to, or identical with, those from Lovelock Cave; however, none has produced the great quantity of well-preserved material that Lovelock Cave has, nor have they covered the long time span of the Lovelock Cave deposits, and, finally, they have not shown, with such clarity, the changes in material culture that are apparent in Lovelock Cave.

In Loud and Harrington's report of 1929, the cultural changes demonstrated for the Lovelock Culture were demarcated by a few key cultural items into three temporal periods, i.e., Early, Transitional, and Late. Much of the cultural content, though well described, could not be characterized as deriving from any particular time segment within the Lovelock Culture period. Difficulties arose in attempts to tie other Lovelock components into the Lovelock sequence. Unfortunately, the Lovelock Cave material with the best associational data, that excavated by Harrington, is stored in the Heye Foundation, Museum of the American Indian, in New York City, and hence has been relatively inaccessible for study purposes to western students.

Through the generosity of the American Philosophical Society, Penrose Fund, and assistance from the Department of Anthropology, University of California at Berkeley, the author was enabled to spend two and a half months in New York City studying the Harrington collection from Lovelock Cave.

The following paper attempts to derive as much chronological information as possible from the Lovelock Cave material in the collections of the Heye Foundation and from Loud's material which was excavated earlier and is now stored in the University of California Lowie Museum of Anthropology at Berkeley, from the Nevada State Historical Society in Reno, and from the Nevada State Museum in Carson City.

Catalog numbers bearing the prefixes '1' and '2' refer to specimens in the University of California Lowie Museum of Anthropology. Prefix number '12', when pertaining to a burial, refers to specimens in the same institution. As a prefix to an item of material culture, number '12' refers to

specimens in the Museum of the American Indian, Heye Foundation, as do prefix numbers '13', '15', and '16'. Elaborate prefixes, such as '20.2', refer to specimens in the American Museum of Natural History.

I wish to express my appreciation to Mr. E. Burnett, and Dr. F. Dockstadter of the Museum of the American Indian, Dr. James Ford of the American Museum of Natural History, Mrs. Clara Beatty of the Nevada State Historical Society, Mr. James Calhoun of the Nevada State Museum, and to the late Professor Edward Gifford of the University of California Lowie Museum of Anthropology, for their help and interest in this project.

INTRODUCTION

Lovelock Cave is situated on the north slope of the Humboldt Range, at an elevation of about 4240 ± 20 feet above sea level. It was about 350 feet above the shoreline of Humboldt Lake, which was approximately two miles to the west and north of the cave at the time of the 1912 excavations. The cave, which was carved out by wave action during a high stage of Lake Lahontan, was formed in a dome of limestone, which appears to protrude through the lake sediments. The erosional forces, which removed approximately half of the dome on the side facing the valley floor, excavated a hollow (Lovelock Cave) in the remaining limestone, approximately 40 feet deep, 160 feet wide, and up to 20 feet high. The slope leading to the cave and the floor of the mouth of the cave itself consists of talus from the eroded and collapsed dome.

Humboldt Lake varies markedly in size between the period of the fall drought and the spring runoff, and from year to year with climatic fluctuations. Its major source is the Humboldt River, which drains the greater portion of north central Nevada. The lake was described frequently, but disparagingly, in journals of explorers and emigrants, as a marshy area choked with tule, rush, and cattail, with small areas of stagnant water (see Heizer and Krieger, 1956, pp. 3-5, for a reproduction of several of these 1840-1850 accounts). Despite its noxious character to the early western migrants, Humboldt Lake was of tremendous importance to the native inhabitants. Besides its use as a major source of tule and rush for basketry and mats, the lake supported a large fish population, seasonally served as the abode of a wide variety of migrant water fowl, and provided tubers, shoots, and seeds.

One of the main aboriginal plant food resources was the nut of the piñon pine (Pinus monophylla). Stands of these trees are to be found on the higher slopes of the Stillwater Range, about twenty miles to the east.

HISTORY OF INTEREST IN LOVELOCK CAVE

Lovelock Cave was apparently called Horseshoe Cave by the early migrants (W.P.A., 1940, p. 138), and the collapsed limestone dome does suggest a horseshoe in general appearance. Sarah Hopkin's account of her people (Hopkins, 1883) relates a myth about a former people who were killed by the Northern Paiute in a cave near Humboldt Lake, presumed by

Loud and Harrington to be Lovelock Cave. She states (ibid., pp. 73-75) that her people did not know of the cave until the enemy, the Saydocarah, took refuge there.

Loud and Harrington (op. cit., p. 167) have published an account of a visit to the cave, about 1887, by John T. Reid, who relates how he was told a similar tale by Captain Natches, Mrs. Hopkin's brother, while at the cave.

According to an account obtained by Mr. Reid from James H. Hart, and published by Loud and Harrington (op. cit., pp. 168-169), Hart and David Pugh filed a mining claim on the cave in 1911 (presumably under the name "Sunset Guano Cave," which is the name Loud used for the cave in 1912), and from the fall of that year through the spring of 1912 removed and shipped to San Francisco about five carloads of bat guano. After Hart and Pugh stopped work in the cave, a Mr. George Stautts removed about a carload of guano from the cave, according to Hart's account.

Between April 1 and August 1, 1912, L. L. Loud excavated in the cave for Indian artifacts for the University of California and the Nevada State Historical Society. Between 1912 and 1924, private collectors burrowed in the cave searching for artifacts.

From July, 1924, to October of the same year, M. R. Harrington, working for the Heye Foundation, Museum of the American Indian, conducted further excavations in the cave, assisted by L. L. Loud.

About 1936, Nels Nelson, of the American Museum of Natural History, visited the cave and made a very small collection, presumably from the surface.

In 1936, a University of California field party, led by R. F. Heizer, visited the cave and collected specimens from the surface, from crevices, and from under rockfalls.

In 1949, Heizer and John A. Mills collected a number of samples for radiocarbon dating from beneath a rockfall in the southwestern part of the cave (see Heizer, 1956, pp. 55-57, for the location of these samples).

In 1950, a University of California field party visited the cave and collected specimens from the surface and from underneath rockfalls.

Private collectors still visit the cave, and it has been reported that a large net and a child's mummy were found there within the last decade.

PHYSICAL DESCRIPTION OF THE CAVE AND ITS DEPOSITS

As mentioned above, the cave is approximately 160 feet wide, 40 feet deep, and up to 20 feet high, according to Loud. Harrington says about 150 feet wide and 35 feet deep (Loud and Harrington, op. cit., pp. 3, 31). Loud published two front-to-rear (north-south) cross-sections of the cave (ibid., Fig. 6, p. 30, Pl. 3b), one side-to-side (east-west) cross-section at the back of the cave (ibid., Pl. 3a, reproduced herein as Fig. 1), and a ground plan (ibid., Pl. 2) showing the location of the cross-sections and the lots which he dug (reproduced herein as Fig. 2). The lots which Harrington excavated were also plotted on the same ground plan (reproduced separately herein as Fig. 3).

Harrington recorded several profiles which are an aid in reconstructing the nature of the cave deposits (ibid., Figs. 1, 2, 3, 4, 5). At the base of the deposits is a soft, white material, identified by Loud as "lime," and referred to by Harrington (ibid., p. 9) as "lacustrine deposits left by the waters of Lake Lahontan." Evidence from Grave 20 (ibid., p. 15) suggests that the "lime" deposit may attain up to 22 inches in thickness. The material effervesces in muriatic acid, hence, is probably calcium carbonate (lime).

If these "lime" deposits are "lacustrine," they are unlike other Lahontan deposits in caves in this area. Clean beach gravels and sands are reported from the bottom of Leonard Rockshelter, Fishbone Cave, and Hidden Cave. Limestone diaphragms or floors from the latter two caves are the closest parallel to the Lovelock deposit, but these diaphragms are layered or laminate in character, and while soft, are not powdery as are the samples collected by Loud from Lovelock Cave. The latter may represent a decomposed diaphragm or the decomposed product of the cave roof. Some stone is present in this deposit, to judge by the profile in Fig. 5 (ibid., reproduced herein as Fig. 4). Harrington (ibid., p. 4) also states that, "the bottom was composed of . . . limestone from the roof, cemented together with a rather soft, white mineral substance which crumbles into fine granules when dug."

These deposits are important to an understanding of the cave history. If they are lacustrine, they are datable (referable) to the last rise of Lake Lahontan to the level of the cave, and thus give a maximum antiquity for all of the stratigraphically superior deposits in the cave. If they are not lacustrine, but were formed by the decomposition of the cave roof, they are no longer such a time marker and might even cover earlier evidences of occupation of the cave by man. Unless some trace of aquatic life can be found in the lime sample collected by Loud, further excavation

will be needed to solve the problem of the origin of this deposit. Fish bones and ostracod shells were found in the limestone diaphragm in Hidden Cave.

A further complication arises from the fact that the layer immediately above the lime is reported to be ash. The occurrence of ash suggests that there was once an extensive fire above the lime layer, and this fire could have caused a chemical reaction in the lime and helped reduce it to its powdery condition.

For the purposes of this paper, the lime deposits will be assumed to be of lacustrine origin.

In the deepest part of the cave (the southwest end) and at the bottom of lot 4 (towards the front of the cave), Harrington reports a layer of ashes of varying thickness lying directly on the white "lacustrine" deposit as noted above (ibid., pp. 22-23, Figs. 3, 5). Presumably this ash layer extends over much of the cave floor. The nature and origin of this ash are not discussed by Harrington, but it may be the layer of burned guano reported by Heizer (1956, pp. 55-57) and dated by radiocarbon analysis as 2498 B.C. $\pm$ 250 years. An unburned sample was dated at 4054 B.C. $\pm$ 250 years. It is also possible, however, that both samples pertain to the guano layer which Harrington reports above the ash.

Above the ash, Harrington encountered a layer of bat guano with a "slight admixture of grass and rushes" (Loud and Harrington, op. cit., p. 22). This layer is apparent in the profiles from the southwestern end of the cave (ibid., Figs. 2, 5), and towards the front of the cave in lot 4 (ibid., Fig. 3). Artifacts were found in the guano layer, but since most of these were associated with fragmentary burials, they are probably intrusive into the guano from above and hence postdate it. Harrington (ibid., p. 120) states that this guano layer was not more than 20 inches deep. The guano deposit noted by Heizer (1956, p. 55) is described as being 8 inches thick where he obtained samples for radiocarbon analysis at the rear of the cave.

The subsequent deposits are composed of guano, grass, rush, dust, stone, and artifacts of various sorts. Harrington (op. cit., Fig. 5, p. 19) reports a hard-packed floor in the stratipit at a depth of 48 inches. The deposit above the floor is characterized as containing "many stones, large and small, fallen from the roof," and not many artifacts. Both Figures 2 and 3 (ibid.) show two distinct floors. Those in Figure 2 occur at approximately 48 inches and 18 inches. Floor "B" in Figure 3 occurs at about 40 inches, and Floor "A" at 22 inches. The floors in Figure 2 show heavy accumulations of rock, presumably fallen from the roof.

Since the profile in Figure 2 is from the southwestern part of the cave, and that in Figure 3 is from the front (northern) part of the cave, there is a suggestion that these "floors" are fairly wide-spread features in the deposits. The "floors" may not represent floors in the sense of having been formed by intensive packing due to people walking on them, but may rather represent periods of temporary abandonment of the cave and/or extensive and intensive spalling of the cave roof. Harrington shows the "floors" extending under the low overhang in the southwestern part of the cave, well beyond where humans could walk or sit comfortably. The 48 inch floor marks the boundary between Harrington's Transitional and Late Lovelock periods.

The upper layer of deposits in Lovelock Cave, as recorded by Harrington, reveals increased amounts of ash overlying rock in Figure 2; increased amounts of guano, ash, and large stones in Figure 3; increased amounts of ash and charred rush in Figure 4; and increased amounts of stone and ash in Figure 5. In his description of Level I of the stratipit (see Fig. 5, reproduced herein as Fig. 4), Harrington describes the upper 18 inches of deposit as consisting "mostly of ashes and of rocks from the roof, with very few artifacts, except near the surface where relic hunters had thrown some rich 'back dirt.'" Again, such deposits suggest a less frequent utilization of the cave by man.

According to Harrington, before it was disturbed, the cave floor was covered with a deposit of bat guano 3 to 6 feet deep (ibid., p. 1). This statement is apparently based on J. H. Hart's account (ibid., p. 2). Hart states (ibid., p. 168) that David Pugh had dug 4 feet deep in the guano in 1911, and that "All the Indian objects began to appear about four feet below the surface of the guano."

The impression thus created is that the cave floor was covered with pure guano to an average depth of about 4 feet, but guano miners removed this deposit prior to Loud's excavations in 1912, and removed such evidence of human occupation as might have existed from the topmost 4 feet of deposit.

Describing the mining activity in more detail, Loud and Harrington (op. cit., p. 170) relate that:

"Messrs. Hart and Pugh excavated in 1911 that portion of the cave south of a line running through the following points, leaving a vertical wall of straw and guano four to five feet high, beginning in the northernmost part of lot 3 (1912 excavations), running easterly through lot 9 and its extension, passing through boulder north of the 70 foot mark, curving thence

through lot 10, then swinging in a semicircle southerly nearly to the 60 foot mark, then turning abruptly northward and crossing the line H-G just south of the 10 foot mark, and after one slight dip southward terminating near the big boulder east of the line G-H."

Harrington (ibid, p. 115) also states, "in the rare cases where a part of the latest cave floor was found intact, the rushes and grass had been burned to the depth of a foot or so."

These various accounts suggest that part of the surface of the Lovelock Cave deposits was not covered with guano, that the guano was concentrated in the central part of the cave, and that the last human occupation ceased a considerable time before the historic period. As will be noted later, the lack of artifacts of types known to be late in time also supports the idea that the cave had been abandoned for many years.

Rockfall has been noted for several periods of the cave's history. At least one fall or one period of fall occurred between the recession of the lake waters and the Early phase of occupation of the cave. Figures 2, 3, and 5 (ibid.) show large rocks in the lower parts of the deposits. The large stone shown in Figure 5 was apparently deposited at the same time as the lime. The rocks in Figure 3 apparently postdate the lime and predate the guano layer, but their relation to the ash layer is unclear. They may possibly predate the ash. The stones in Figure 2 appear to be post-lime, but may or may not be later than the guano.

Layers of smaller rocks occurred at approximate depths of 48 inches and 18 inches. Harrington believed that the major rockfalls which converted a large, open rockshelter into a cave occurred during the period of human occupation. He does not equate this occurrence with any particular period or "floor." The large rocks shown in Figure 3 (ibid.), which bound parts of lot 4 and lie towards the front of the cave, clearly antedate all deposits except the base lime. Moderately large stones also postdate Floor A.

Sufficient detail is not presented in the profiles to date the major rockfalls at the entrance to the cave. It is clear that midden deposits extend under part of many of the rocks shown on the ground plan, but nowhere is there any indication that such deposits completely underlie these rocks. Interstices under fallen rocks could have been filled by means of natural depositional processes and pack rats could have furthered the process by building their nests there.

The accounts relate that artifacts were not encountered in the top 4 feet of deposits, but the guano miners did expose numerous artifacts.

Furthermore, despite their apparent willingness to dig slightly disturbed deposits, neither Loud nor Harrington dug in the center of the cave, the area where the guano miners worked. This evidence suggests that the guano miners dug clear to base in this area. It should also be noted that the center of the cave had the shallowest deposits.

DISTURBANCES AND EXCAVATIONS

Harrington encountered forty-eight pits dug in aboriginal times. These are plotted on the ground plan (ibid., Pl. 2). Eight of these pits contained burials, the remainder were cache pits. In many cases, Harrington was able to determine the level from which the pits were dug. These pits would indicate a considerable amount of disturbance in the deposits, and while the later material found in the pits could be easily distinguished from other material found at the same depth, older material brought up during the excavation of the pit and scattered around the contemporary floor would be inextricably mixed with the later materials.

The disturbance created by the mining activity of Hart and Pugh has already been described. There is no record of where George Stautts dug.

The areas in which Loud dug are plotted on the ground plan (ibid., Pl. 2, reproduced herein as Fig. 2). The depth to which he dug is not recorded. Harrington states that Loud dug to base in the northeastern part of the cave, and the "lime" sample saved by Loud came from lot 26, which was from that sector of the cave. Loud apparently dug around the pit formed by the guano miners' excavations in the northern part of the cave, uncovered part of the large rock in lots 11 and 9, and uncovered the rock in lot 30. He skirted around the rock in lots 11 and 9 (lots 3, 6, and 8) and extended the pit dug by the guano miners in the deep area in the southwestern corner of the cave. He obviously did not dig to base in the western half of the cave, since Harrington was able to dig later in this area and uncover apparently undisturbed cache pits.

There is no indication as to where disturbances occurred in the cave in the period between Loud's excavations of 1912 and those of Harrington in 1924.

Harrington excavated in the northern (entrance) portion of the cave and in the western sector. Little is known of the associations recovered by Harrington from lots other than number 15, since the provenience of artifacts recovered from other lots is not stated in the museum catalogs. Depth from surface was noted only for those artifacts which Harrington thought unusual. Lot 15 was located in the only area which Harrington

could locate that was relatively undisturbed. Depth by level is recorded from this lot. The levels vary in thickness as follows: Level I, 18 inches; Level II, 30 inches; Levels III, IV, and V, each 24 inches; Level VI, 0 to 28 inches.

The northeastern corner of lot 15 was disturbed by Loud's lots 6 and 8, and paralleled to the south by Loud's lots 17, 18, and 19. While the depth of these three lots was not recorded by Loud, his profile of the back of the cave shows the lots were situated so that lot 17 was higher and further east than lot 18, and that the latter was above and overlying lot 19. Roughly speaking, Loud dug this area in three levels immediately adjacent to Harrington's stratipit with its six levels, and it will serve to check and amplify Harrington's sample and interpretations.

PHYSICAL STRATIGRAPHY OF LOT 15

The physical stratigraphy of lot 15 has been mentioned briefly in a preceding section devoted to the reconstruction of the nature of the deposits in Lovelock Cave. Since the cultural debris from this pit will be the main interest of this paper, it is necessary that the physical stratigraphy be described in as great detail as possible.

Harrington's description of the stratipit, by layers, is presented below (ibid., pp. 18-24):

"Level I [surface to 18" deep] consisted mostly of ashes and of rocks from the roof, with very few artifacts, except near the surface where relic hunters had thrown some rich 'back dirt.' On account of this back dirt, the origin of which was unknown and the limits of which were hard to trace, this cut was made only 18 inches deep with the idea of ignoring its contents altogether, and starting afresh at 18 inches, in deposits we knew to be undisturbed. Only two articles in its contents, however, were obviously out of place. . . .

"The second level extended from 18 inches to about 48 inches, where there was a distinct hardpacked floor, which formed the bottom of the cut. The depth was a little less than 48 inches on the northeast side, and a little more on the southwest side. This level contained many stones, large and small, fallen from the roof, and was not very rich in artifacts. The deposit showed no trace of disturbance. . . . [The profile (Fig. 5) shows the 48" floor as a gently undulating line on a relatively horizontal plane.]

"The third level was made only 2 feet deep--that is from 48 to 72 inches,

not because we encountered a natural dividing layer as at the bottom of the second level, but because we encountered material of a somewhat different character. The material composing this level was mostly dust, grass, and rushes, with comparatively few stones, and with many more artifacts in proportion to the total bulk than in the second level. . . .

"The fourth level had no natural bottom, no dividing layer, to show us where to stop, so the 2-foot cut was made arbitrarily [72 to 96"]. The composition of the deposit was about the same as in the preceding level.

"After digging a little way into this level [fifth level--96 to 120"] the grassy refuse gave place to guano with a slight admixture of grass and rushes. This continued throughout except on the very bottom, where lay a stratum of ashes of varying thickness, resting on the white lacustrine deposit forming the bottom of the cave. This bottom was found at about 120 inches deep, in some places a little more, in others a little less, over the northeast end of the 'lot.' Toward the southwest the whole deposit grew gradually deeper, until at the far western corner, it measured 148 inches in depth. Everything below 120 inches belonged to our sixth level.

"Our fifth level contained few artifacts, except toward the southwest end, where it struck the upper part of a deposit of basketry and other articles, most of which lay in the level below. . . .

"The disadvantage of running arbitrary levels is well exemplified by the fact that the bottom of the 120-inch cut runs directly through a deposit of basketry, in the southwest end of the 'lot,' leaving part of the deposit in the fifth level and part in the sixth [120 to ca. 148"]. The thickness of the sixth level, which lay directly upon the original bottom of the cave varied from nothing at the northeast end of the 'lot' to 2 feet 4 inches at the southwest end. The composition was mostly guano with some admixture of stones, grass, rushes, and on the very bottom, ashes."

Lot 15 was 6 feet wide (south to north) and 8 feet long (east to west) when started, with the western edge abutting the cave wall. The wall of the cave at this point was undercut, and, as the pit was excavated, it was extended into the fill of this recessed area. By the time the pit was excavated to base, it was almost 16 feet long (ibid., p. 18).

Known aboriginal disturbance consisted of two cache pits (numbers 38 and 39). Pit 38 was dug by the Indians from about the 72 inch level about 3 1/2 feet from the cave wall (ibid., Fig. 5). Its contents included pinewood fragments, shell beads, a bundle of snares, cordage and

grass. It measured 4 feet 6 inches by 4 feet 2 inches, and reached a depth of nearly 6 feet below its level of origin.

Pit 39 was dug slightly to the northeast of pit 38, and was 3 feet 4 inches in diameter. Its base lay 10 feet 11 inches from the surface, and it was dug originally from level IV (72 to 96 in.). It contained a number of small fish.

Two disturbed burials were recovered from under the overhang at a depth of about 10 feet. Harrington does not mention any pits in connection with these burials. Presumably they were interred in shallow graves or merely shoved back under the overhang.

More recent disturbance is indicated on Plate 2 (ibid.), where it is noted that Loud's lots 6 and 8 included a large portion of the northeastern corner of Harrington's lot 15. The depth to which Loud dug is not known. Likewise, Plate 3a in the 1929 report shows that both the guano miners and Loud dug in the southwestern part of the cave, paralleling lot 15 to the south, but extending into it only a very short distance.

The profile of lot 15 (ibid., Fig. 5, reproduced herein as Fig. 4) was apparently drawn to represent a cut, lengthwise, through the center of the excavation (note that it bisects pit 38). Since the lot was not dug in such a manner as to expose such a profile, it is presumed that the published drawing is somewhat idealized--i.e., is a composite from both exposed side walls of the pit. Figure 2 (ibid.) presents a profile of lot 12, immediately south of lot 15. Harrington states that it is from about 6 feet west of the south wall. Unfortunately, he does not say in which direction it runs. It does run through two pits and undercuts the cave wall. Its importance here is that it is substantially the same in gross features as is the profile from nearby lot 15.

THE AGE OF THE LOVELOCK CAVE DEPOSITS

Harrington (ibid., p. 120) makes the following statement about the antiquity of the Lovelock Cave deposits:

"Kidder estimates the Basket-Maker period along about 1500 to 2000 B.C. Now the Early Period of our cave belongs to the Basket-Maker horizon, and therefore if Kidder is right an estimate of 1000 B.C. would be a conservative guess as the date of first occupation of Lovelock Cave."

Of the age of the Late Lovelock deposits, Harrington states (ibid., p. 122):

"We have no way of telling even approximately unless we assume that the rate of deposit of refuse was reasonably uniform, and that there was no guano above our stratigraphic section. If we also assume that the date of the lowest level was about 1000 B.C., we are allowing 3000 years for the accumulation of 12 feet of refuse, or 4 feet per thousand years. Now the beginning of the Later Period is 4 feet deep; therefore if the above is true, it began about 1000 A.D. But of course this is mere speculation and may be far from the truth."

Later research has demonstrated that Basket Maker sites date from approximately 1 to 700 A.D. (Wheat, 1955). By applying Harrington's rate-of-accumulation technique to this date range, the whole of the Lovelock Cave deposits would necessarily date from the Christian era.

Modern dating methods have shown that Harrington's results were not correct, although they were remarkably close. There are now five samples from Lovelock Cave which have been tested by the radiocarbon method. Two of these pertain to the guano level above the sterile lacustrine deposits and below the occupation debris. Sample C278, which was unburned guano, yielded a date of 4054 B.C. $\pm$ 250 years. Sample C277, burned guano, yielded a date of 2498 B.C. $\pm$ 250 years. These samples were collected by Heizer and Mills (see Heizer, 1956, pp. 55-57, for their exact location in the cave). Another sample was collected from immediately above the guano layer, and was thought by Heizer to date from the earliest period of occupation. It yielded a date of 531 B.C. $\pm$ 260 years. Later, at the instigation of L. S. Cressman, two samples from Harrington's stratipit were tested and yielded dates of 268 A.D. $\pm$ 220 years for Level II, and 1218 B.C. $\pm$ 260 years for Level V (Cressman, 1956).

If we assume that these samples represent an average date or midpoint date for the level from which they derive, and further assume a constant rate of deposition, we may then tentatively assign dates to any depth of the stratipit deposits. These assumptions are probably not valid, but they do enable us to acquire working dates for interpretive purposes.

The calculated rate of deposition is one inch in about twenty years. The calculated dates for Harrington's six levels are: Level VI, 2010 B.C. to 1456 B.C.; Level V, 1456 B.C. to 980 B.C.; Level IV, 980 B.C. to 505 B.C.; Level III, 505 B.C. to 29 B.C.; Level II, 29 B.C. to 565 A.D.; Level I, 565 A.D. to 922 A.D.

The Early Lovelock phase would date from approximately 2000 B.C. to 1000 B.C.; the Transitional Lovelock phase from 1000 B.C. to 1 B.C.; and the Late Lovelock phase from 1 B.C. to 900 A.D.

Other Lovelock culture sites which have been dated by the radiocarbon method include Humboldt Cave, Hidden Cave, and the Humboldt Lakebed site (26-Ch-15). The date for the lowest level of Humboldt Cave is 2 B.C. $\pm$ 175 years. Heizer and Krieger (op. cit.) suggest that the deeper deposits in Humboldt Cave are Transitional and Late Lovelock in cultural affiliation. The minus one sigma range of this date (177 B.C. to 2 B.C.) falls within the postulated time range of the Transitional Lovelock phase. A sample from the Early Lovelock deposit in Hidden Cave yielded a date of 1094 B.C. $\pm$ 200 years. Three-quarters of its plus or minus one sigma range (1294 B.C. to 894 B.C.) falls within the postulated time range of the Early Lovelock phase. A sample from the Humboldt Lakebed site, without phase attribution, yielded a date of 733 B.C. $\pm$ 250 years. The plus or minus one sigma range of this date (983 B.C. to 483 B.C.) falls within the postulated date range of the Transitional phase.

These internally consistent radiocarbon dates, plus artifact type crossties with radiocarbon dated sites in California (Bennyhoff and Heizer, 1958), give some assurance that the dates for the Lovelock culture are reasonably correct.

It is estimated that bat guano was deposited above the occupation debris in the cave to an average depth of 4 feet. If the guano accumulated at the same rate as the occupation debris, estimated at one inch in twenty years, it would have taken 960 years for the guano to have been deposited. This number of years, added to the suggested terminal date of the human occupation, 922 A.D., yields a date of 1882 A.D. for the surface of the cave deposits at the time guano mining operations began. This date is only twenty-nine years short of the actual date (1911).

Needless to say, such extrapolations are relatively meaningless. We do not know that the rate of accumulation was constant, that the rate of accumulation was the same for both the occupation debris and the guano deposits, and that the bat population remained constant throughout the time interval involved. The results of this play with figures are not self-contradictory, however, and provide some slight support to the method.

MATERIAL CULTURE

The following section will consist of brief descriptions of the various material culture items recovered from Lovelock Cave with whatever temporal

data may be directly stated or inferable for each type. Only those types will be treated for which a depth has been recorded or for which some other associational data are available. While there are many items of archaeological interest from the cave that lack such data, they cannot by themselves throw light on the chronological subdivisions within the time span of the Lovelock culture, which is the theme of this paper.

Some comparisons will be made with materials from other archaeological sites in the Great Basin, especially Humboldt Cave, Thea Heye Cave, Hidden Cave, Danger Cave, and the Humboldt Lakebed site (26-Ch-15). These sites, as well as others mentioned in the text, are indicated on the accompanying map (Map 1).

No attempt will be made to make a functional reconstruction of Lovelock culture (except a very brief summary in the concluding section), and, therefore, the descriptions of the artifactual material will be arranged in the traditional manner, that is, by the material of which the artifact is made, such as stone, bone, shell, etc.

Ground stone

Stone working of any kind is relatively uncommon in Lovelock Cave. This statement is particularly true of ground stone implements.

Grinding implements. Specimen 13/4828 is catalogued as a "fragment of a large scoria mortar." Although the catalog number of this specimen is included in the series of numbers for artifacts from Level II of the strata-pit, unlike the catalog cards for the rest of the series, its card bears no associational data. The actual specimen was not located in the collections.

Four hullers (or manos) were recovered by Harrington. Two specimens (13/4666) were recovered at a depth of 64 inches somewhere in the cave. One is of rhyolite and is 25.0 by 12.7 by 4.5 cm., with a flat grinding surface and a rounded top (which shows slight traces of use). The other is 27.0 by 18.5 by 5.5 cm., with a slightly concave grinding surface. It shows traces of red ochre on the surface.

Specimen 13/4668 is a basalt (?) cobble, which has been used as a mano on one surface and is battered on one end. It measures 13.7 x 9.6 by 5.0 cm.

Specimen 13/4665 is a circular, gray, scoriaceous lava disk, 15 cm. in diameter and 3.3 cm. thick. It is probably a huller.

The 64 inch depth of the first two specimens suggests association with

the Transitional phase. The type probably was in use throughout the sequence, but apparently was not commonly used inside of the cave. Hullers were used by the historic Northern Paiute to crush seeds on a winnowing tray.

Perforated stones. A rectangular piece of slate or basalt, 8.5 cm. long, 3.96 cm. wide, and .41 cm. in thickness, was recovered from Level IV of the stratipit. It has a biconically drilled, central perforation which is .95 cm. in diameter. It undoubtedly belongs, typologically, with the perforated discoidals, known from other nearby open sites and from Loud's excavations in the cave (Loud and Harrington, op. cit., Pls. 55c-h, 65a,b,d,e). These occasionally occur in elliptical and rectangular form.

The use to which this artifact type was put is not known. Some of the specimens from other Lovelock culture sites are grooved in such a manner as to suggest that they were worn as pendants.

Scoria rings. Specimen 13/4667 is a stone ring made of a red, scoriaceous lava. It varies from 8.8 to 8.0 cm. in diameter, and from 4.3 to 5.0 cm. in thickness. Its biconically drilled, central perforation is about 2.9 cm. in diameter. Projecting from opposite ends are two knobs which resemble birds' heads. The larger of these is 4.3 cm. from side to side, and projects 3.1 cm. from the ring. The beak part of the head faces along the axis of the central perforation. The smaller knob projects 2.9 cm. from the ring and is 3.2 cm. from side to side. Its beak faces at right angles to the axis of the central perforation.

The object is of unknown function, but must relate to the carved stone art found at nearby lakebed sites (Heizer and Grosscup, ms.). It was found at a depth of 24 inches, and thus presumably dates from the Late phase. It is illustrated by Harrington (Loud and Harrington, op. cit., Pl. 57a).

Pipe. One pipe was recovered from a depth of 70 inches. The bowl of the pipe, which is made of a reddish, fine-grained stone, is 3.6 cm. long, 2.26 cm. in maximum diameter, 2.13 cm. in external diameter at the mouth, 1.39 cm. in internal mouth diameter, and 1.38 cm. in external diameter at the base. The stem, which is made of a polished bird bone, is 17.6 cm. long, and .88 cm. in maximum diameter. One side of the stem is incised in an irregular fashion with short parallel lines. The stem is held in place with pitch and sinew, and one (originally several) irregular piece of Olivella shell is stuck into the pitch. It is illustrated by Loud and Harrington (op. cit., Pl. 52a). There is still a cake of ash in the bowl.

The depth at which the specimen was recovered suggests that it may derive from the Transitional phase.

Boatstone. A fragment of a boatstone was recovered from the stratipit. It is made of white marble and is 7.66 cm. long (estimated original length, 16 cm.), 2.38 cm. in maximum width, and 1.76 cm. in maximum thickness. The base is concave to a depth of .10 cm.; .78 cm. from the complete end, there is a 'V' shaped groove .23 cm. wide and about .05 cm. deep. Near the groove, at one corner, there are five short incisions. The piece shows traces of red ochre on all but the broken surface.

The specimen was found in Level II. If, as is commonly believed, boatstones are atlatl weights, this specimen is the most recent evidence for the existence of the atlatl in the cave, and it is tempting to believe that the specimen has somehow become dislodged from its original position. The form of the piece is almost identical to the one from the nearby open Humboldt Lakebed site (Heizer and Grosscup, ms.), but in size it is closer to those of the Sierra foothills in California (Heizer and Elsasser, 1953, App. A).

The use of white marble is common in the Lovelock culture area, where it is used for animal effigies, charmstones (tabular stones), perforated discoidals, and other, perhaps more utilitarian, objects, such as manos.

Biconical and spherical stones. Three biconically shaped stone objects were recovered. Specimen 13/4786b, which is made of white marble, is 5.5 cm. long and 3.3 by 2.6 cm. in diameter, with a flattened cross-section (Loud and Harrington, op. cit., Pl. 57d, upper specimen). It was found at a depth of 139 inches, in an unrecorded part of the cave. Specimen 13/4787a, made of calcite, is 3.9 cm. long and 2.6 cm. in maximum diameter, but with a flattened cross-section.

Specimen 13/4685 is a biconical white marble object, 9.7 cm. long and 3.8 to 4.2 cm. in diameter. Around the center are two cut grooves which are .37 cm. wide and about .2 cm. deep, with a narrow ridge between them. The object was found at a depth of 130 inches, in an unrecorded part of the cave.

Under catalog entry 13/4781, there are listed twenty-four balls. Two of these are made of baked clay and are described in a separate section. Five could not be located in the Heye collection. The remaining seventeen are made of a striated black and white limestone or of a gray to white marble (ibid., Pl. 57b). They range in maximum diameter from 1.9 to 2.8 cm.

Specimen 13/4896 is a roughly spherical black and gray limestone ball with a maximum diameter of 2.8 cm. It is from Level IV of the stratipit.

A small stone ball was found associated with Grave 45. This grave was considered to date from the Early Lovelock phase by Harrington, partially on the occurrence of this particular specimen in association with it.

A discussion of these forms is presented in the section on their baked clay counterparts.

Chipped stone

Chipped stone is remarkable for its paucity in Lovelock Cave, compared with its abundance at open phase sites of the same culture.

Projectile points. Harrington recovered twenty projectile points and/or fragments thereof from his excavations. Of these, only fifteen were inspected. Two are from lot 15 (the stratipit). Specimen 13/4847 is of obsidian, is 3.93 cm. long, 2.44 cm. wide, .46 cm. thick, weighs 4.2 gm., and has convex sides and a concave base. It is from Level III. The other specimen (13/4895) is a fragment of chert and has a maximum broken length of 4.36 cm., width of 2.40 cm., and is .59 cm. thick. It is barbed, and has a bifurcate stem or tang. It is from Level IV.

A similar point of chert (13/4552), still bound to a foreshaft, was found at a depth of 101 inches in an unidentified part of the cave (ibid., Pl. 45c). In all probability the depth indicates that the point was associated with the Early phase. It is 4.38 cm. long (lacking the tip end), 2.48 cm. wide, and .64 cm. thick. It is shouldered rather than barbed.

Another hafted specimen (13/4960) was found in Grave 45, lot 19, which was 4 feet deep (10 inches into sterile lacustrine deposits). Since the binding covers the base, the base form is unknown (ibid., Pl. 45d). The point is 3.80 cm. long, plus the length covered by the binding, 1.75 cm. wide, and .53 cm. thick. The burial was that of an infant, and was wrapped in netting and cordage. A stone ball was found in the pit. The depth of origin of the pit was not determined.

A chert blade bound with rush in the split end of a burned cane was found at a depth of 14 inches. It is 5.75 cm. long, about 1.9 cm. wide, and about .40 cm. thick. Its form was not recorded. Its catalog number is 13/4554.

The first specimen described above (13/4847) will be considered as Type I. The next two (13/4895, 4552) will be considered as Type II.

The data on those points recovered by Harrington from the cave, but lacking associational data, are summarized in the chart below.

Twenty-four points or blades, purportedly from Lovelock Cave, are contained in the Heye collections. About as many more were present but were not noted. They are without association, and there are a few suggestions that they might not be from the cave. They were donated to the Museum by Mr. I. P. Richardson. Most, however, are of types found in other Lovelock culture sites. The chart below presents the pertinent data.

Three classifiable points with data obviously constitute a very poor sample. Loud's excavations are of no help. Heizer and Krieger's excavations (op. cit., p. 29) in Humboldt Cave throw a little light on the subject, as do those by Roust and Grosscup (Grosscup, 1956) in Hidden Cave. Specimen 1/44452, from Humboldt Cave, was found in the 0-6 inch level in Section 6, and is similar to the specimens from Lovelock Cave from Level IV and from 101 inches in depth (Type II). This type, while rather variable, was the commonest point type in Hidden Cave and was found throughout the Lovelock deposits there.

No specimen closely comparable to that from Level III (Type I) is known from Humboldt or Hidden Caves.

Heizer and Krieger's type SCb2 (especially specimens 1/42798, 42799, 42800, 42805, and 44356) is comparable to many of the specimens in the Richardson collection at the Heye Museum (Type VII). One point of this type was recovered from the upper midden in Hidden Cave. The type presumably is attributable to Late and/or Transitional Lovelock.

Crude slate knives. One fragment of a crude slate knife was recovered from Level III of the stratipit. It is roughly chipped on one edge. One end is broken. The remaining portion is 8.0 cm. long, 5.5 cm. wide, and .62 cm. thick. The type occurs in Humboldt Cave (Heizer and Krieger, op. cit., pp. 30-31, Pl. 16f, i-k) and on the nearby lakebed sites (Heizer and Grosscup, ms.).

Baked clay

Balls. Specimen 13/4781a is a gray, baked clay ball, roughly oval in form, varying from 4.0 to 3.5 cm. in diameter. Another similar specimen (13/4781b) varies from 3.5 to 3.0 cm. in diameter.

Biconical forms. Specimen 13/4786a is a reddish, biconical baked clay object, 5.2 cm. long and 2.7 cm. in diameter (Loud and Harrington, op. cit., Pl. 57d, lower specimen). It was found at a depth of 139 inches in an unrecorded part of the cave.

Points from Lovelock Cave with Depth Data

Catalog Number	Material	Length (cm.)	Width (cm.)	Thickness (cm.)	Weight (gms.)	Type
13/4847	Obsidian	3.93	2.44	.46	4.2	I
13/4895	Chert	4.36+	2.40	.59	-	II
13/4552	Chert	4.38+	2.48	.64	-	II
13/4960	Obsidian	3.80+	1.75	.53	-	-
13/4554	Chert	5.75	1.90	.40	-	-

Points from Lovelock Cave, No Location or Depth Data

13/4662	Obsidian	2.64	2.04	.58	-	II
13/4777a	Obsidian	3.50+	2.22	.63	3.56+	-
13/4777b	Obsidian	3.50	2.04+	.42	2.14+	III
13/4777c	Blk. Chert	4.00	2.18	.48	3.76	II
13/4777d	Obsidian	3.32	1.73	.47	1.62	III
13/4777e	Obsidian	4.32	1.53	.55	2.66	IV
13/4777f	Blk. Chert	5.40	1.54	.61	3.95	V
13/4780a	Chert	7.17	2.34	.58	9.49	II
13/4780b	Chert	6.99	2.35	.65	8.55	VI
13/4780c	Jasper	5.25	1.85	.62	4.80	II

Points Presumably from Lovelock Cave

12/4171a	Chert	6.04	2.48	.53	5.64	II
12/4171b	Chert	6.38+	2.39	.55	8.43	-
12/4171c	Agate	5.42	2.27	.38	3.43	VII
12/4171d	Agate	4.80	1.87+	.34	2.24	VII
12/4171e	Chert	4.46	2.06	.30	1.68	VII
12/4171f	Obsidian	4.46	1.55	.35	1.68	VII
12/4171g	Chert	4.11	2.12	.31	1.88	VII
12/4171h	Obsidian	3.39	2.31	.32	1.72	VII
12/4171i	Chert	3.93	2.18	.35	1.56	VII
12/4171j	Chert	3.75	2.02	.36	2.07	VII
12/4171k	Chert	3.85	2.16	.36	2.26	VII
12/4171l	Chert	3.84	2.03	.35	1.81	VII
12/4171m	Chert	4.43	1.78	.32	1.72	VII
12/4171n	Chert	4.06	1.86	.34	1.81	VII
12/4171o	Chert	4.64	1.27	.53	3.18	VIII
12/4171p	Obsidian	3.51	1.24	.48	1.62	IX
12/4171q	Obsidian	3.22	2.10	.40	1.36	VII
12/4171r	Chert	3.62	2.34	.35	1.81	VII
12/4171s	Chert	2.24	2.29	.33	1.36	VII
12/4171t	Chert	2.39	2.24	.36	1.49	VII
12/4171u	Obsidian	3.50	1.79	.33	1.49	X
12/4171v	Chert	2.53	1.74+	.33	.71	XI
12/4172a	Agate	6.12	1.88	1.18	13.38	XII
12/4172b	Basalt	8.92	2.21	1.09	19.18	XII

Specimen 13/4787b is a biconical to egg-shaped, light gray, baked clay object, 4.0 cm. long and 2.6 cm. in maximum diameter. It is slightly battered at the more pointed end, and is cracked, perhaps from heat. Specimen 13/4787c is of similar form, degree of battering, and material. It is 4.0 cm. long and 2.8 cm. in maximum diameter. Specimen 13/4787d is also of the same form and material and is 3.7 cm. long and 2.6 cm. in maximum diameter. It is reddish in color and is battered on the side of the narrow end.

All specimens with depth data in these two categories, balls and biconical forms (stone as well as baked clay), are from the deeper Early Lovelock and Early Transitional Lovelock deposits, and clearly are a trait to be associated with these phases. However, it cannot be definitely stated that they are lacking in the Late phase.

Similar objects are known from Washoe Lake, Nevada; from Early, Middle, and Late Horizon sites in the Sacramento Valley (Heizer, 1949); and from northeastern California, probably associated with the Indian Bank phase at Lower Klamath Lake (Squier, 1956, pp. 34-38). Ethnographically, it may have been a trait for the Klamath Indians (Culin, 1907, p. 293). Loud (Loud and Harrington, op. cit., p. 109) gives the Northern Paiute word widun'o for two of the baked clay balls (one of which is a biconical object) and mentions a game described by Gilbert Natches, a Northern Paiute, in which pebbles are hidden in the sand. He also refers to archaeological specimens found in shellmounds around Humboldt Bay, and ethnographic specimens from Smith River, California, and Rogue River, Oregon (Loud, 1918, pp. 377-380).

Cressman apparently did not find any of these objects in his many excavations in Oregon.

The specimens from the Early Horizon of Central California, which is dated as pre-2000 B.C., appear to be the oldest known occurrences in Western North America, and may be the source from which the trait was introduced into the Lovelock culture.

Bone and horn objects

Bone cones. Short, conical bone tubes have a wide, but spotty, distribution in the Great Basin. One specimen (13/4754) was recovered by Harrington from Lovelock Cave, but there are no associational data with it. Seven specimens have been recovered from the Humboldt Lakebed (Heizer and Grosscup, ms.). One was found by J. C. Merriam in a woodrat's nest at the mouth of Thousand Creek Canyon, Humboldt County, Nevada, in 1909 (1/19666), and Jennings found two finished and one unfinished specimens in Level V of Danger Cave (Jennings, 1957, p. 200). Jennings suggests that this artifact type

may have served such uses as sucking tubes, tinklers, or possibly pipes. The Humboldt Lakebed specimens have been suggested to be parts of a ring and pin game. Culin (op. cit., pp. 533-57) illustrates identical pieces so used by the Chippewa, Cree, Missisauga, Montagnis, Nascapee, Saux and Fox, several Athapascan groups in the Mackenzie area, the Assiniboin, Dakota, and Winnebago. He does not record this form of the game for any group closer to the Great Basin than the Assiniboin in Montana.

The only possibly datable archaeological occurrence is that from Danger Cave. Level V, from which they derive, has been dated by radiocarbon tests of three samples. These dates (2050 B.C., 2950 B.C., and 20 A.D.) are inconclusive, but they at least indicate the possibility that Level V and possibly Level IV (1869 B.C.) are contemporaneous with the total time span of the Lovelock culture as far as is now known. They cannot help us suggest in which Lovelock phase use was made of this artifact.

A secure date on this artifact would be most useful in view of its northern ethnographic distribution and would perhaps help date Basin contacts with its northeastern neighbors. There seems little likelihood that the trait was introduced by the southern Athapascans during their migrations to their historic environment, since there is no evidence that Lovelock Cave was still occupied at the apparently late date of this migration.

Bone awls. Four bone awls were found in the stratipit and thirty-seven were found in the rest of Harrington's excavations. Three of the four from the stratipit and twenty-two of the others were 'L' shaped scapula awls. Two of the 'L' shaped awls are from Level III and one is from Level VI. The latter may have been associated with Grave B, but this is not certain. The 'L' shaped awl type is clearly associated with the Early and Transitional phases. In Humboldt Cave, Heizer and Krieger (op. cit., Table 9) report this type in both Early and Late deposits; however, the only example not found below a depth of 36 inches was from a rat nest.

This unique awl form has attracted much attention because of its widespread distribution. Cressman (1942, pp. 63-65) has listed the locations of specimens known to him. Heizer and Krieger (op. cit., pp. 83-84) have a number of additional examples listed in their Humboldt Cave report. To their lists may be added nine from Danger Cave (three from Level III and six from Level IV), six or seven from Juke Box Cave (Jennings, op. cit., pp. 193-205), a number from Karlo, Lassen County, California (personal communication with F. A. Riddell), one specimen with poorly developed wing from Deep Springs, Inyo County, California (1/40025), and two from Wakemap Mound, Washington (2/12392, 2/12382), from Strong's excavations. Others have been found there in more recent excavations (personal communication

with Robert Greengo), and one is listed from Medicine Creek, Glacier County, Montana (20.2/2312). The examples from Humboldt Cave suggest the type lasted into the Late Lovelock phase, despite its absence from the top two levels of Harrington's stratipit. The type is not chronologically sensitive.

It should be noted that the spatial distribution of the type is roughly congruent with that of the historic Shoshonean tribes, the major exceptions being the Columbia River area and the Four-Corners region, and even these locations are adjacent to this linguistic area. However, the distribution of the language group and the artifact type centers on an environmental area, the Great Basin, and therefore the congruent distribution may be accidental.

This awl type occurs with the greatest frequency at Lovelock Cave, where a total of at least thirty-one specimens are known. When those from Humboldt Cave and the Humboldt Lakebed are included, there is a total of at least thirty-eight known specimens from the area. This number is almost half of all known specimens (excluding Karlo and the newer recoveries from Wakemap). Temporally the Danger Cave specimens are perhaps the oldest specimens, but Lovelock Cave lacks older, comparable deposits, and we cannot give the maximum age of the type in this area.

The other awl from the stratipit is made from the split radius of a medium sized mammal. It derives from Level II of the stratipit. Of the other awls from the cave in general, one is made of an ulna, and two of split cannon bones. The others are made of various mammal limb bone, except for one made from the humerus of a moderate-sized bird. Four are made of splints of limb bone from a large mammal. None of these types appear particularly useful for chronological purposes.

Horn sickles. Sickle-shaped implements made of mountain sheep horn have been described in some detail by Heizer (1951a, pp. 247-52), and he has discussed their use and distribution. Harrington discusses them briefly (Loud and Harrington, op. cit., p. 27), and attributes them to the Early Lovelock phase. He recovered nine examples, six (13/4927) apparently in a cache in the deepest level of the stratipit. Another specimen (13/4523) was found at a depth of 72 inches, which would suggest either a Transitional or Early date, depending on its horizontal location. A somewhat aberrant example (13/4524) was associated with Grave 35 (lot 14), which is thought by Harrington to date from the Transitional phase. There are no data with the last specimen (13/4522).

Clearly the type is Early and probably Transitional Lovelock as well. Heizer and Krieger (op. cit., pp. 88-89) report the type from the Early

and Late deposits in Humboldt Cave. They consider these deposits to cover the span of time from Transitional Lovelock to prehistoric Northern Paiute times. They also refer to similar specimens in Basket Maker sites in the Southwest. Such occurrences suggest a late survival of the trait.

Horn pendants, spoons, and arrow wrenches. There are eight horn objects from the Heye collections which fit into this general heading. At least two are probably arrow wrenches or straighteners. One (12/4189) has four perforations ranging in diameter from .80 to .88 cm., and averaging .84 cm. The second (13/4566) is a fragment, but has two and a half holes in it. These range from .75 to .82 cm. in diameter, and average .78 cm. It shows traces of green paint on both sides. Another specimen (13/4565) has three perforations ranging in diameter from .88 to .98 cm. and averaging .92 cm., but the object is fairly well finished, and hence may have served as a pendant as well.

Specimen 13/4542 has two small perforations at one end. The piece is thinned and somewhat bent to a shallow spoon or shoe-horn shape.

Specimen 13/4563 is perforated at one end and shows traces of red and green paint. It is undoubtedly a pendant. None of the above mentioned specimens have any associational data.

Specimen 13/4541 is a thin, triangular horn object to which a cord has been tied at the pointed end. It is not perforated, and it has traces of red paint. It is presumed that the object, which was found at a depth of 72 inches, was a pendant.

Specimen 13/4562 is a thin, arrow-shaped piece of horn with serrated edges and a small perforation in the base. Undoubtedly a pendant, it was found at a depth of 82 inches.

The final horn specimen (13/4539) is a thin rectangle, 11.1 cm. long, 2.46 cm. to 2.56 cm. wide, and .79 cm. thick. The edges of the object are highly polished, but its surface is not. It is not perforated. It is described in the catalog as a mesh gauge, and would undoubtedly serve such a function. There are no associational data.

Heizer and Krieger (op. cit., p. 16) report a horn arrow wrench from Humboldt Cave. It has only one perforation and was found with a rope through this hole, suggesting that it may also have been used as a pendant or as a part of a rattle. They also give (ibid., p. 78) a brief summary of the distribution of this common western North American trait. These authors further report (ibid., p. 67) a drilled horn pendant, but the specimen is unlike those from Lovelock Cave.

Ten horn pendants were recovered from Hidden Cave. Of these, six came from a packrat nest. Those from the midden were less than 12 inches deep. This portion of the midden deposits is probably Late or Transitional Lovelock.

Loud (Loud and Harrington, op cit., pp. 42-46, Pl. 15) recovered a number of horn objects, including four or more pendants. One of these came from lot 31 and one from lot 6; both of these lots appear to have been dug to only a shallow depth and presumably are late in time. The dating of any object from its occurrence in one of Loud's lots is a very doubtful process, however. The rattle from lot 26, associated with a child burial, includes several specimens which, if found separately, would be typed as pendants. This burial is believed to date from the earlier half of the deposits on the basis of the shell beads and the plain, flexible twined tray which are associated with it. It seems probable, therefore, that pendants or pendant-like objects made of horn are general Lovelock traits and are not chronologically significant within the time span of the Lovelock culture.

Loud also recovered three arrow wrenches. One of these was recovered from the dump in front of the cave, one is from lot 3, and one is from lot 25. Neither of these lots can be dated.

Hoof pendants. Ten specimens of artiodactyl hoof sheaths were recovered. Of these, five have been modified to the extent of grinding off the tip to form a perforation. Three specimens have short lengths of leather thongs passing through the perforation; the thong is prevented from slipping through the hole by tying an overhand knot in it. Two of these specimens also have a series of Olivella beads (type 1a) strung on the thong. One of the perforated specimens came from Level III of the stratipit, and an unmodified example came from Level IV. Loud recovered twenty-four perforated hoofs, twenty-two of which were from the rattle in association with the burial in lot 26. As mentioned above, the burial and its associated objects probably date from the lower half of the deposits. Five specimens were recovered from Humboldt Cave (Heizer and Krieger, op. cit., p. 68). The only one with depth data is from the 24-30 inch level. Since the type is widely known ethnographically, it would be surprising if it were not a part of the Late Lovelock phase. It is attested to for the Transitional phase from the stratipit in Lovelock Cave and for the Early phase from the burial in lot 26. In summation, the type is probably a general Lovelock culture trait.

Objects made of leather and intestines

Moccasins. Moccasins are rare in Lovelock Cave; whole and fragmentary pieces number only seven or eight from five or six pair. A private

collector, I. P. Richardson, recovered a beaded child's moccasin with a fragment of its mate. Its provenience and associations with the cave are not known. Loud recovered a child's moccasin of a quite different style from lot 22, but the depth is not known. Other material from this lot, if associated, would suggest Transitional or Late Lovelock. Two human bones were found in lots 22 and 23. Harrington recovered an infant's moccasin of a third style, but it was without provenience.

Fragments of a pair of moccasins, adult size, were found with the burial in pit 36. The body, that of a child, was wrapped in a net and lay on a coiled basket tray. The whole burial was burned. The grave was dug from a depth from surface of 21 inches. Harrington believed that the burial dated from slightly later than that in pit 35, which he dates from associated artifacts as Transitional. Presumably this would date the burial in pit 36 as late Transitional or early Late Lovelock.

There is a fragment of hide which is triangular in shape, and to which is sewn, with Apocynum cordage, another piece of hide. The larger fragment is worn, but still shows traces of hair. The specimen may possibly be a fragment from a moccasin, but the identification must remain doubtful. The fragment is from Level IV of lot 15.

The data are inconclusive but suggest that moccasins may have been present as early as the beginning of the Christian era, and perhaps 500 to 1000 years earlier (i.e., from Transitional Lovelock).

The adult moccasins appear to have been made in three parts. The sole turns up around the foot and puckers around the toes. There is a heel seam at the back. The instep or gosset is a separate piece which is long enough to fold back in a flap, but the example is fragmentary. The top is also fragmentary, but covered at least 8 cm. of the ankle. There appears to have been a fringe on the top. The top piece is perforated 4 cm. from the heel on both sides with a row of diagonal cuts, perhaps for laces.

The infant's moccasin is made of two pieces of soft leather. The sole forms the sides and top and is sewn front and back. The instep is formed of a separate piece of leather which is cut into a fringe at one side.

The beaded specimens have a sole which turns up around the foot and is puckered at both heel and toe. It is sewn to an upper, made of a single piece of leather, which forms both the instep and the top. The upper is sewn up the front of one side. It would be high enough to cover the ankles.

The specimen from lot 22 is composed of several pieces of deer hide with the hair on the outside, and has been repaired with dehaired hide. It has been compared to Fremont moccasins, but is not the same. It consists of a separate sole to which is sewn two, now fragmentary, pieces of hide to form the instep. It is possible that the instep fragments were once part of a single piece of hide which also formed the top of the moccasin (i.e., like the beaded specimens described above). There are no dewclaws on the specimen such as are characteristic of Fremont moccasins.

Intestine containers. Harrington recovered at least three intestine objects. One (13/4703) is a flat segment wrapped around a piece of pitch. Another (13/4729) is a segment tied at one end with a feather quill and a piece of Apocynum cordage. The untied end is evenly cut and the piece has been slit up one side to the end. The third piece (13/4728) is tied at one end with a feather quill and a piece of cordage. The free end of the cord is 16 cm. long. The opposite end of the intestine is puckered, as if it had been tied at one time, but no trace of the tie remains. The whole piece is about 31 cm. long, and has a flattened width of 10 cm. At the center of one side a thin cord has been attached by tying it around a pebble pressed out from the inside of the intestine wall. The piece gives the impression of having been a float. It was found at a depth of 30 inches in an unknown part of the cave.

There are three specimens from Humboldt Cave (Heizer and Krieger, op. cit., p. 32, Pl. 29a). These were found together, wrapped in a skin. They are tied at one end like the Lovelock specimens. One contained fishhooks, the others were empty. Loud (Loud and Harrington, op. cit., p. 47) mentions two bladders, but does not describe them.

A depth of 30 inches in the cave may mean that the artifact was Late or Transitional Lovelock (probably not Early). The Humboldt Cave specimens came from a cache which Heizer and Krieger apparently believe is Late (i.e., prehistoric Northern Paiute). A long time span is therefore suggested for this artifact type, possibly from Transitional Lovelock into prehistoric Northern Paiute times.

Wooden objects

Loops. Specimen 13/4583 is a piece of carefully shaped wood (willow?) which has been bent back on itself to form a loop. The wood was apparently evened on both flattened surfaces and on one edge. The piece split in half at one time, leaving the other edge rough. Assuming that the piece was symmetrical, the original width would have ranged from 2.38 to 2.66 cm. The piece in its present condition has a maximum width of 1.34

cm. The thickness ranges from .41 to 1.32 cm. The total length of the stick is about 74 cm., and the length of the specimen from the bend to the opposite end is about 35 cm.

The specimen would have been about the right size and shape (before it was bent) for use as an atlatl or rabbit stick; however, there is no trace of a hook or finger grips or roughening of the handle area as is usually found on such objects.

No use for the object in its present form is suggested. The specimen was found at a depth of 136 inches, and is attributable to the Early Lovelock deposits.

Specimen 13/4821 is a thin willow limb bent to form a loop about 15 cm. long by 9 cm. wide, with a handle about 36 cm. long (overall length is 51 cm.). The outer base of the loop is worn, and the outer sides are charred and pitted in spots. The inside of the loop is neither worn nor burned. There are tie marks at the top of the loop and about the middle of the handle, but the tie itself is gone.

Small branches were trimmed off even with the limb. This varies from .96 to 2.03 cm. in diameter.

The specimen is believed to be a stirring stick, and presumably was not used to pick up hot rocks, as indicated by the lack of charring on the loop. It was found in Level I of the stratipit, and is attributable to the Late Lovelock phase.

Net stick. Specimen 13/4938 is cataloged as a "net stick." It is a piece of wood, probably cottonwood, 49.6 cm. long, 2.85 cm. in diameter at its largest end, and 1.93 cm. in diameter at the opposite end. The large end is blunt; the small end is tapered for the last 1.5 cm. of its length, but the tip is blunt.

A net fragment is tied to the stick, at one place, about 1 cm. below the taper. A thick cord which ran through the net selvage as well as one mesh side is caught by about twelve turns of another cord and tied to the stick. The net has an average mesh of about 5 cm.

The function of the stick is not known, but it may have been used to spread the net when the latter was in use or when it was drying or being repaired. The specimen was found in lot 15 in the deepest level, and thus belongs to the Early Lovelock phase.

Cradles. A number of long sticks with broad, shallow grooves cut

into them at intervals were found in the deposits. Loud found eight of these sticks tied together and covering an infant burial, hence their identification as cradle parts.

Specimen 13/4614 is 56.6 cm. long and 2.88 cm. in maximum diameter. It has seven grooves which average 1.1 cm. in width (.86 to 1.33 cm.) and range from .8 to 1.5 cm. in depth. The grooves range from 7.3 to 8.8 cm. apart (average 7.8 cm.). The depth of this specimen is not known.

Specimen 13/4934 is a fragment 26.8 cm. long and 1.72 cm. in maximum diameter. Two grooves are present and average 9.4 cm. apart (including the distance from the first groove to the complete end). The grooves are about 1 mm. deep toward the complete end, but are shallower towards the other end. The grooves are about .7 cm. wide. The stick was found in the deepest level (Level VI) of lot 15.

Specimen 13/4918 is cataloged as a "net stick" but is similar to the above specimens. Both ends are broken. The remaining portion is 38.7 cm. long and 1.60 cm. in maximum diameter. There are traces of five grooves which vary in depth from 2.7 mm. to a mere scratching of the surface, and average about 1.5 cm. in width. The grooves range from 6.8 to 9.0 cm. apart (average, 8.1 cm.). It is from Level V of lot 15.

Specimen 13/4617a is 21.5 cm. long, and 1.62 cm. in maximum diameter. One end is crudely rounded off, the other end is broken. It is not grooved, as are the previous specimens, but has three notches cut along one edge. The notches range in depth from .35 to .44 cm. (average, .38 cm.), and are .9 cm. wide. The notches range from 6.3 to 8.1 cm. apart (average, 7.2 cm.).

Specimens 13/4617b and 13/4611a fit together to form a fragmentary stick 29.1 cm. long and 1.46 cm. in maximum diameter. There are portions of four notches present which vary in depth from .32 to .51 cm. (average, 41 cm.). The notches vary in width from .8 to 1.1 cm. (average, .96 cm.) and range from 5.2 to 10.4 cm. apart (average, 7.7 cm.). There are no depth data for these two catalog entries.

Heizer and Krieger (op. cit., pp. 61-62) recovered nine sticks from Humboldt Cave which they suggest may have been parts of cradles. There are only two grooves on each stick, and they are much thinner sticks than the Lovelock Cave specimens.

Clearly the type of cradle which is constructed of a series of grooved or notched sticks bound together with cordage is an Early Lovelock trait. The thinner specimens from Humboldt Cave may represent a Transitional

and/or Late Lovelock refinement of the type. These cradles are much heavier in construction than those made by the modern Northern Paiute, and show no evidence of the bent willow border so characteristic of the modern type.

Fishhook(?). At a depth of 12 inches in the cave deposits, two sticks (13/4533) were found which were loosely bound together with a piece of tule. One of the sticks is 12.1 cm. long and has a maximum diameter of .79 cm. (near one end). The larger end is blunt but well smoothed, and slightly tapered. The opposite end tapers to a sharp point. The other stick is smooth and blunt on both ends, 11.1 cm. long and .78 cm. in maximum diameter (near one end). The thicker end is hollowed out on one surface to form a concavity .35 cm. deep, and .40 cm. wide at the end which shallows out toward the opposite end within 1 or 2 cm.

The blunt end of the first stick is bound so as to be adjacent to the concave surface of the second stick, and presumably the two pieces were made to fit together, although when found the two were not engaged. When the first stick is placed within the concavity of the second, the two form a fishhook-shaped artifact.

The object showed no indication of having been tied to a fishline. The tule binding was too loose to have been effective and probably would not have held well if tied tightly. The piece may not have been finished. It would have been too large to be effective in catching all but the largest fish in Pyramid Lake, and would have been large for even a pelican to swallow.

This specimen is probably to be associated with the Late Lovelock phase, but its uniqueness makes it untrustworthy as a time marker.

Stick with projecting branch. There are two carefully worked sticks with small projecting branches from the deeper cave deposits. One (13/4527) is 18.7 cm. long, and varies in diameter from 1.36 to 1.06 cm. Nine centimeters from one end is a projecting branch 3 cm. in length, and .51 cm. in diameter. The ends are cut off smoothly and all other branches are carefully cut off and smoothed down. The end of the projecting branch has scoring marks which suggest that there was once a binding around it at this place. The specimen was found at a depth of 94 inches.

The second specimen (13/4528) is 17.8 cm. long, 1.69 cm. in maximum width, and 1.1 cm. in maximum thickness. The sides have been carefully smoothed. The branch sticks out 9.5 cm. from one end for a distance of 5.8 cm. It is .67 cm. in diameter and is cut off at a slight bevel. The ends of the stick are shaped to a point (as viewed from the side). There are five shallow notches on the edge from which the branch projects (four

on one side and one on the other side). One end is slightly broken. This specimen was found at a depth of 106 inches. Presumably these objects are an Early Lovelock trait, but their function is unknown.

Fire hearths. Most of the fire hearths appear to be made of cottonwood; however, the specimens were not examined by a trained botanist and comparative material was not available when the study was made. The one definite exception is a bundle of split arrow canes (13/4602). Examples of cane hearths, as well as cattail stalk hearths, are also known from Loud's excavations (Loud and Harrington, op. cit., pp. 96-97). Fire drills were not preserved nor recognized in the New York collection, but some evidence may be obtained by examining the pits in the hearths. Three types of pits were recognized: (1) concave, (2) concave with a small pile in the center, and (3) flat at the bottom with a depressed ring around the bottom at the sides. The first type, presumably, forms when the fire drill is made of a homogeneous wood. The second type forms when the wood has a soft (i.e., pith) center, and the third type when a reed or cane is used. Examples of all types of drills are found either from the cave or in nearby cave deposits.

The range in diameter of holes, and hence of drills, is from .77 to 1.24 cm. The average is 1.01 cm.

Both type (1) and (3) are known from the same specimen, one example of which occurred in the 0-18 inch level (Level I) of lot 15. The earlier history of fire hearths and drills cannot be demonstrated.

Actual fire drills were recovered by Loud (ibid., pp. 96-97). These appear to have been made of willow and greasewood.

Pin or needle. Specimen 13/4536 is a wooden object (probably made of greasewood) 4.71 cm. long. It is broken at one end; the complete end is expanded to form a head or knob 1.18 cm. in diameter and .74 cm. high. The body of the object varies in diameter from .67 cm. at the head to .55 cm. at the broken end. The broken end is also burned. Its use is not known. It was found at a depth of 6 inches and should, therefore, be attributed to the Late Lovelock phase.

Specimen 13/4599 is a stick of greasewood 12.1 cm. long and .63 cm. in diameter at the center. The head of the stick is .92 cm. wide by .67 cm. thick. The head is perforated biconically, the hole is .37 cm. in diameter. The stick tapers to a point at the opposite end. Presumably the piece is a needle, awl, hair pin, or pendant. There is no sign of rotary wear such as is commonly noted on bone basketry awls. No depth record is preserved.

Knife handles or spear foreshafts. There are five objects in this category in the Heye collections. All have been cataloged as knife handles; however, three of these specimens (13/4557, 13/4603, and 12/4193) are made with wedge-shaped bases, strongly suggesting that they were inserted into another piece of wood. They had stone blades which apparently were held in place with pitch. The wood was prevented from splitting by binding around the cleft at the base of the blade. One specimen (12/4193) still has the blade intact (Loud and Harrington, ibid., Pl. 45b). The blade is triangular in shape, 9.4 cm. long, 3.8 cm. wide, .88 cm. thick, and made of mottled chert. Specimens of this sort would not appear sturdy enough for use as cutting implements, but would be better as piercing or stabbing implements. They are probably spear heads and foreshafts rather than knives, or possibly they may be daggers. This observation would hold for those specimens called knives from Humboldt Cave (Heizer and Krieger, op. cit., pp. 26-27, 30), as well as specimens 1/19219 and 1/21504 from Loud's Lovelock Cave excavations (Loud and Harrington, op. cit., pp. 100-101).

Specimen 13/4537, from Lovelock Cave, has a rectangular cross-section not amenable to hafting such as the above specimens. It is comparable to two specimens (15/8786 and 15/8906) from Thea Heye Cave (see Map 1), which have a similar shape and hold stone blades so deeply buried in the wood that the edges are hidden and only the triangular points protrude at the end.

The knife from Lovelock Cave (13/4537) was found at a depth of 103 inches, and is believed to derive from the Early Lovelock deposits. The Thea Heye specimens are without depth provenience. The total deposit in Thea Heye Cave appears to be Transitional and Late Lovelock. It may be assumed that this type of knife has been used for a long time and has no intra-Lovelock chronological significance.

The spear heads or daggers are without depth data, and therefore cannot be assigned to any particular Lovelock phase. The Loud specimen (1/19219) was associated with burial 12/2652 in lot 32. The other associated specimens suggest an Early Lovelock date for the grave lot. There is thus some evidence that the type is associated with the Early Lovelock phase.

Atlatls. One complete and three fragmentary atlatls have been recovered from Lovelock Cave. The complete specimen is known from a model made by Loud from drawings of the original, now lost (see Loud and Harrington, op. cit., p. 100, Fig. 16). It is grooved and may have had a detachable hook. The handle is carved to provide finger grips and is more like Eskimo atlatls than those of the Basket Makers.

Specimen 13/4549 is 18.4 cm. long, 2.05 cm. in maximum width, 1.69 cm.

in minimum width, and ranges from .68 to .74 cm. in thickness. A groove, 2 mm. deep, runs the entire length of the fragmentary specimen and varies from .92 to 1.34 cm. in width. The narrow end has been chewed by a small carnivore, and the tip is missing. There is no trace of a spur or hook, but one must have been present at one time. There is no depth datum for this specimen.

Specimen 13/4550 has been carbonized, and it is entirely possible that its resemblance to the hook end of an atlatl is entirely fortuitous. It is 6 cm. long, and varies from 2 cm. in width at the complete end to 1.5 cm. in width at the broken end. The groove runs for a length of 3.8 cm. from the broken end. It is .8 cm. wide and about .1 cm. deep. The maximum thickness of the piece is 1.32 cm. The spur end is a knot which runs from one surface to the other. There is no depth datum for this specimen.

Specimen 13/4548a (Loud and Harrington, op. cit., Fig. 18a) is a fragment from the hook end of an atlatl. It is 28.2 cm. long, has a maximum width of 1.47 cm., and is 1.33 cm. in maximum thickness. The wood has a small pith center. At the hook end the wood has been cut down (to make the hook) and penetrates into the pith, which has been hollowed out for a length of about 7.43 cm. The tip of the hook is located 2.48 cm. from the end. There is a slight curvature to the specimen.

Specimen 13/4548b (Loud and Harrington, op. cit., Fig. 18b) is a fragment of the hook end of an atlatl, and is 20.7 cm. long. It has a maximum width of 1.93 cm., and a maximum thickness (at the hook) of .89 cm. The minimum width is 1.54 cm. and the minimum thickness is .52 cm. The groove, which runs from the broken end to the spur, ranges from .98 to .67 cm. in width, and is about 2 mm. deep. The spur rises .40 cm.

One of these last two specimens came from a depth of 102 inches, and the other from 48 inches; it is not known which specimen came from which depth. The second specimen is very similar to 13/4549.

All known specimens show or suggest a groove and a projecting spur or hook. A specimen, very similar to 13/4548b, is known from Hidden Cave. Specimen 13/4548a is more aberrant, but shows the same features. The form of the handle end of the Lovelock Cave atlatls is less definitely known. The one complete specimen from Lovelock Cave, known only from a model, is the only example showing the handle end. As noted above, it looks more like an Eskimo atlatl than a Basket Maker atlatl. The atlatl from the Winnemucca Lake area, illustrated by Harrington (1959), is complete. It is probably attributable to the Lovelock culture, but its associations remain in doubt. Harrington's illustrations of it show a handle like those

of the Basket Maker atlatls, and those from southern Oregon (Cressman, Williams and Krieger, 1940). There are two atlatls from a non-Lovelock culture site, Council Hall Cave, White Pine County, Nevada (Museum of the American Indian, 16/4507 and 16/4508). They have short grooves with flush spurs and the handle end is grooved for the finger loops. They are almost identical to those illustrated by Kidder and Guernsey (1919, pp. 178-181, Figs. 87, 88, Pl. 82), which presumably are Basket Maker II. The Winnemucca Lake specimen was found approximately halfway between the Council Hall Cave finds and those of southern Oregon. It is also intermediate in form between these two occurrences. The one complete example from Lovelock Cave appears to be aberrant.

The depths noted for the atlatl fragments (13/4548a, b) appear to be equivalent to Early and Transitional levels in the stratipit. Irrespective of which specimen came from which depth, it is highly likely that the use of atlatls is a trait of these two phases. It would be interesting to know which specimen is the earlier, but these data are now lost.

Calculated ages suggest that the Transitional phase lasted from 1000 to 1 B.C., and it may be assumed that the atlatl was used during this time span. As is shown below, during the same period the bow and arrow were introduced, and by the end of this period had replaced the atlatl. The suggestion may be made, therefore, that in the Lovelock area the use of the atlatl died out, and the bow and arrow became the major hunting implement at least several centuries before a similar shift occurred in the Anasazi area.

In the Anasazi area, the introduction of the bow and arrow is thought to have occurred during Basket Maker III times. Wheat (op. cit., p. 185) dates Basket Maker III as beginning about 400 A.D.

Bows. Four bow fragments are known from the cave; however, no provenience for association data are preserved with the specimens. No two of the three end fragments are of the same type. One (13/4604) has a horizontally placed side notch on each side (Fig. 7b). Another (13/4532) has a diagonal groove on each side (Loud and Harrington, op. cit., Pl. 45a, Fig. 7a). The third (1/21418) has no notches, but a small amount of the tip is broken away (Loud and Harrington, op. cit., Pl. 47m). All four specimens have curved surfaces, but the degree of curvature varies. Specimen 13/4604 has flat sides and slightly convex surfaces. Specimen 13/4618 is elliptical in cross-section, with equal curvature on both sides (Fig. 7c). The edges are relatively sharp. Specimen 13/4532 is roughly elliptical with rounded edges. One surface is approximately twice as curved as the other. Specimen 1/21418 is almost flat on one surface, and

has a highly arched opposite surface. The arched surface shows traces of sinew backing.

Arrowshafts (with nock ends) indicate the use of the bow in Levels I through III (i.e., from 500 B.C. to 900 A.D.), although we cannot assign a particular type or specimen to a particular spot or period within this 1400 year span of time.

Foreshafts. Foreshafts are among the more numerous artifact types found in Lovelock Cave. At least two were found in every level of the stratipit, except Level V (none were found in this level): Level I, 2; Level II, 12; Level III, 7; Level IV, 3; Level V, 0; Level VI, 2. Relatively few of these specimens are complete. In addition, a number of specimens (Level II, 8; Level III, 2) were found inserted into fragments of cane shafts.

Harrington has suggested (ibid., pp. 24-25) that atlatl foreshafts can be distinguished from arrow foreshafts by their diameters. Thus atlatl foreshafts were stated to range from 6/16 to 7/16 inch (.95 to 1.11 cm.), and arrow foreshafts from 3/16 to 5/16 inch (.48 to .79 cm.).

If the diameters of the sample of foreshafts (144) in the collections in New York from Lovelock Cave are plotted on a graph, it is noted that they range from .35 to 1.60 cm. in diameter, and form a slightly bimodal curve with a break falling between .87 and .98 cm. Five specimens fall within the break area, that is, have diameters between .87 and .98 cm. Twenty specimens fall in the large range; 119 fall in the small range. Even when plotted at .05 cm. intervals, the bimodality still exists and the break falls between .90 and 1.00 cm. Statistically, then, it might be expected that those foreshafts with diameters less than .90 cm. would be arrow foreshafts, and those above 1.00 cm. would be atlatl dart foreshafts. However, two facts complicate this simplistic picture. Of the 41 specimens from the stratipit, only four would fall into the atlatl range (Level IV, 1; Level III, 3), three would fall in the indeterminate range (Level IV, 2; Level II, 1), and the remaining thirty-four fall in the arrow range (Level I, 2; Level II, 18; Level III, 12; Levels IV and V, 0; Level VI, 2). In other words, if the dichotomy postulated above were true, the oldest foreshafts in the cave would be arrow foreshafts. These would be followed in time by atlatl foreshafts, and these in turn would be replaced by arrow foreshafts. Secondly, if the foreshaft diameters of the two specimens of known atlatl darts from Leonard Rockshelter (see Map 1) are included on the chart, one would fall within the indeterminate range and the other would fall in the arrow range. It would appear that it is not possible to distinguish an arrow foreshaft from an atlatl foreshaft on the basis of diameter alone. A similar situation prevails with regard

to main shafts (see below). Lacking any evidence of thick arrow foreshafts, it may still be presumed that the thicker specimens are atlatl foreshafts, but one still could not draw a line separating the thicker arrows from the thinner darts.

Nine complete foreshaft specimens are included in the collection. Of these, seven are short (under 20 cm. in length), and two are long (over 35 cm. in length). The short specimens tend to greater diameters than the long ones, but there is an overlap in range and the sample is so small that no weight can be given to the dichotomy. Further evidence is given by fragmentary specimens, some of which are as long as the longest complete specimens, but even thicker than the short specimens.

It may be that there are at least three types of foreshafts and that each type has a different function. Suggested types are: (1) long, thin, and pointed, or with a small inserted stone point; (2) long and thick, point type unknown but probably pointed and/or with a large inserted stone point; (3) short and thick with inserted stone point, or with a knob of wood or bone for use as a bunt. The types probably intergrade. The long, thin foreshafts might be used for small game or fish, whereas the thicker foreshafts might be used for large game.

Shafts. These are made of long, straight sections of arrow cane. No complete specimens were found (with one possible exception), but fragments from both ends of the shaft were recovered. None of Harrington's shaft fragments are butt ends of atlatl darts. A few have nocks and therefore must be arrows. One atlatl dart shaft butt end (1/21479) exists in the University of California Lowie Museum of Anthropology collection (see Loud and Harrington, op. cit., Pl. 47k). It has a smooth butt end which is hollowed out to engage the hook of the atlatl. It is feathered tangentially, unlike arrows, which are feathered radially. The complete atlatl dart from Leonard Rockshelter (Heizer, 1938) is also feathered tangentially.

As mentioned above, Harrington has suggested (Loud and Harrington, op. cit., pp. 24-25) that atlatl dart shafts may be distinguished from arrow shafts on the basis of their diameters. He suggests an arrow range from .63 to .95 cm. (4/16 to 6/16 in.), and the one dart occurrence as 1.43 cm. (9/16 in). The diameters of the Lovelock specimens measured in New York range from .67 to 1.55 cm., and when plotted exhibit a unimodal curve. Known atlatl darts from Leonard Rockshelter have diameters of .85 and 1.17 cm., and the one from Lovelock Cave, collected by Loud, has a diameter of .99 cm.

If the lengths of the fragments under .85 cm. in diameter are plotted separately from those between .85 cm. and .97 cm. in diameter and from

those over .97 cm. in diameter, only slight differences are to be noted in average length of fragment. The thinner fragments are about 2 cm. longer on the average than the thicker fragments, and the thicker fragments, in turn, are about 2.6 cm. longer on the average than the middle group. These figures appear to reflect more on the mechanics of cane breakage than on the original length of the cane shafts.

Reconstruction of arrow-dart length. Since only one possibly complete arrow shaft and no complete dart shafts were recovered, an attempt was made to reconstruct the average original length of shaft. This attempt depends on the postulate that shafts tend to break into two pieces, either at random along the length or approximating a normal distribution curve about the center (when the fragmentary lengths are plotted on a graph). The original average length should be twice the average length of fragments in both of the two postulated cases. The lengths were so plotted and a fairly normal curve resulted. The average length was approximately 17 cm. (6.7 in.); thus the reconstructed average shaft length would be 34 cm. (13.4 in.). It was noted that proximal fragments tend to be shorter than distal fragments, suggesting that a weak point existed towards the proximal end, probably at the end of the inserted foreshaft. Theoretically this fact does not change the resulting average length of fragments, and when the average length of proximal fragments is added to the average length of distal fragments the sum is not appreciably different from twice the overall average.

The reconstructed average length (34 cm., or 13.4 in.) appears to be very short. This figure would also mark the average maximum pull of the bow (see Pope, 1923), and again the figure would appear too low.

It seems probable that the shafts do not always break into two pieces. Median fragments are not readily discernible as shafts, but some possible specimens are known from the collection. Multiple breakage would presumably reduce the average length of fragments, and hence reduce the reconstructed average shaft length. The calculated figure must be considered a minimum estimate of the average length of shaft. The one possibly complete arrow shaft measured 47.0 cm. (18.5 in.) in length.

The average complete foreshaft is 22.5 cm.; the range is from about 10 cm. to almost 39 cm. The portion of foreshaft inserted in the shaft ranges from 2.7 to 12.1 cm. in length, and averages 6.7 cm. Subtracting the average figure for inserted portion from the average foreshaft length leaves an average effective foreshaft length of 15.8 cm. (6.2 in.), which would give a total average arrow or dart length of about 50 cm. (19.7 in.) or, if the range of foreshaft lengths is used, a range from 37.3 to 66.3 cm. in length (14.7 to 26.2 in.). The possibly complete arrow shaft plus

the average length of effective foreshaft would give a total arrow length of 24.7 inches, or a range from 19.7 to 31.2 inches.

Kelley (1932, p. 143) mentions three kinds of arrows used by the Surprise Valley Paiute: bear and elk, over 3 feet long, perhaps nearer 4 feet; deer and antelope, about 3 feet; and bird, much smaller (duck arrows ca. 15 in.). Steward (1933, pp. 261-262) mentions arrows about 34 inches long for the Owens Valley Paiute, and for Death Valley Shoshoni arrows, short flight, about 40 inches with 4 inch wooden foreshaft, and long flight, up to 43.5 inches with foreshafts 5.5 inches long. Six arrows made by a Northern Paiute, and now in the Lowie Museum of Anthropology at the University of California, range in length from 24 7/8 to 28 1/6 inches.

In the light of this ethnographic evidence, the reconstructed arrow length appears to be short, but within reason.

Throwing clubs. A cache of four wooden throwing clubs was found at a depth of 95 inches under the large rockfall northwest of lot 15 (probably lot 16). They must be from the Early Lovelock deposits. They vary in length from 38 to 55 cm. (from one end to the other in a straight line, not along the curve), in width they vary from 2.7 to 6.0 cm. One end is enlarged, the other is slender. The slender end is broken on all specimens (Loud and Harrington, op. cit., Pl. 16a, b). Two specimens show a series of cut notches along one edge. On one (13/4805) there are twelve notches along the outside edge of the wide end; on the other (13/4803) there are six notches on the inner edge of the narrow end.

Three of the specimens have 'S' curves, the fourth has a single arc. Apparently they follow the natural curvature of the limb from which they were made. The thickened end may mark where the branch joined the trunk of the tree or joined another larger branch. No other examples have been reported from the cave. A single cache of a number of similar specimens was found in Fish Cave in Lovelock culture deposits. These examples (at the Nevada State Museum) were different in that one end is covered with incised cross-hatching.

None of the specimens from central Nevada show the longitudinal grooving characteristic of Anasazi throwing clubs.

Pendants. A number of wooden objects which are presumed to have been used as pendants have been recovered from the deposits. There are three spatulate objects with knobs at the narrow ends. Two of these are from the deepest level of the stratipit (one illustrated, 13/4930, Fig. 8d herein; Loud and Harrington, op. cit., Pl. 48d). The third (13/4561), which retains a fragment of a leather thong at the neck of the piece, was found 93 inches deep in an unrecorded part of the deposit. One of these specimens shows traces of red ochre.

Another specimen, 13/4929 (Loud and Harrington, op. cit., Pl. 48f), also from the lowest level of the stratipit, is more elongated than the previous specimens. The narrow end is rectangular and is perforated for suspension, rather than knobbed. This specimen shows faint traces of painted bands, alternating red and black, which run across the short axis of the specimen on one surface (Fig. 8c). The opposite surface shows traces of black near the narrow, perforated end, but no traces of paint could be discerned on the remainder.

Specimen 13/4545 (Fig. 8a,b herein; Loud and Harrington, op. cit., Pl. 48e) is a thin, flat oblong piece of wood, perforated at the corners (now largely missing) of the wider end. One surface is flat; the other is slightly convex. The whole piece shows traces of an overall red stain. On the convex surface there are traces of four black zigzag lines running from one side to the other, across the wider two-thirds of the piece. The flat side shows traces of approximately ten zigzag lines, possibly five pairs originally, running from the wide end to within one-third of the narrow end. There is a faint trace of a line running across the width of the piece at the narrow end of the zigzags. The designs were probably faintly scratched into the wood before they were painted, since slight traces of these incisions are still discernible.

There are no data associated with this specimen. The previous specimens show, however, that wooden pendants, some of which are painted, are a trait associated with the Early Lovelock phase.

Shell objects

Beads. Bennyhoff and Heizer have published (op. cit.) a summary of shell bead and ornament types from western Nevada which includes the specimens from Lovelock Cave. Their report includes the Heye Museum specimens as recorded by me. According to their typology, Lovelock Cave had Olivella bead types 1a, 1b, oval, grooved rectangle, flat disk, cap (G1b) and thick rectangle (2b); Macoma disk (V1aIV); and Haliotis square (1). Ornament types include Haliotis C(1)a, C(1)1, C(2), and C(2)1.

There are 187 specimens of Olivella type 1a (ibid., Fig. 1, 1 and 2). Five of these are from Level IV, four are from Level V, ninety-six from Level VI, six from 72 to 74 inches in depth, and one was possibly associated with Grave 18, which is believed to date from the Early phase. The remainder are without provenience. All of the specimens with data are from early Transitional and Early deposits.

There are eight specimens of Olivella type 1b (ibid., Fig. 1, 3). None have associational data.

There are twenty-seven specimens of Olivella oval type (ibid., Fig. 1, 47; 1, 48; 1, 49). Specimen 13/4650 consists of eight of these beads on a short string. There are no data with them. Specimen 13/4850 consists of a string holding nineteen beads from Level III of the stratipit. The type is therefore to be associated with the Transitional phase. Bennyhoff and Heizer (op. cit., p. 70) argue for a dating for the type corresponding to the Middle Horizon of California on the basis of its similarity to a Middle Horizon type in California and its occurrence in the older deposits at Karlo. The Middle Horizon is dated at 2000 B.C. to 300 A.D. in California. Transitional Lovelock is dated at about 1000 B.C. to 1 B.C. in Lovelock Cave.

The Olivella grooved rectangle type is unique to Lovelock Cave (ibid., Fig. 1, 42; 1, 43). There are two strings, one with five beads (13/4648) and one with eleven (13/4660). There are no associational data with these specimens, except that specimen 13/4660 has a black abalone (Haliotis cracherodeii) pendant at the end of the string. This species of abalone was most commonly used in Central California during the Middle Horizon which would suggest an Early or Transitional date in Lovelock Cave.

There are approximately 188 specimens of Olivella flat disk beads from Lovelock Cave (ibid., Fig. 1, 41). These occur on eight separate short strings and are cataloged under a single entry (13/4647). They were found at a depth of 84 inches (horizontal location not known), and are probably associated with the Early Lovelock deposit. According to Bennyhoff and Heizer (op. cit., p. 69), this type resembles type 3c Olivella saucers of the Middle Horizon in California.

There are twelve specimens of Olivella cap (G1b) (ibid., Fig. 1, 11). Eleven of these are cataloged as 13/4658, and one is cataloged as 13/4644. No data are with the specimens. Bennyhoff and Heizer (op. cit., End Note 29) suggest that the type was traded from Southern California and that the type is not quite as early as the complex which is considered to be Early Lovelock (Haliotis pendants C(1), C(1)1, C(2), C(2)1; and bead types Haliotis square (1), Macoma disk, and Olivella thick rectangle (2b)).

There are at least four specimens of Olivella thick rectangle from the Heye collection, and probably more (ibid., Figs. 1, 16; 1, 17). There are two each from catalog entry 13/4746 and 13/4796. There are no data with 13/4746, but 13/4796 is considered to be associated with Grave 18, which Harrington believes to date from the Early Lovelock phase. The type occurs in the Windmiller and Berkeley facies in Central California and in the Early Island period in Southern California.

There are two Macoma clam disk beads (13/4796) associated with Grave

18 and they would therefore date from the same period as the other bead types associated with that grave (ibid., Fig. 1, 51; 1, 52). Bennyhoff and Heizer (op. cit., p. 65) note them from "five interior sites of the lower Middle Horizon" in California and postulate a northern coast source for the type.

There are twenty-five or more specimens of Haliotis square bead (1) (ibid., Fig. 1, 65; 1, 66). All but five of these are from Grave 18 (13/4796). The five (13/4747) are without data, but Grave 18, as mentioned above, is probably Early Lovelock in age. The type is considered to be virtually indistinguishable from those found in Early Horizon sites in Central California.

Orchard (1929) analyses and illustrates the stringing patterns of some of the beads described above.

Other ornaments. Ornament type Haliotis C(1)a is represented by one specimen (13/4742b) from a depth of 74 inches (Bennyhoff and Heizer, Fig. 1, 72). It probably was associated with another specimen (13/4742a) which is made of mussel shell. In California this type occurs in both the Early and Middle Horizons, but is more common in the latter. Loud recovered one specimen of this type (1/19347) from lots 6 and 8.

Ornament type Haliotis C(1)1 is known from one specimen (1/19346) recovered by Loud (ibid., Fig. 1, 73). It presumably has a temporal distribution in California similar to that of type C(1)a.

Ornament type Haliotis C(2) is represented by one specimen (13/4743) found at a depth of 74 inches (the depth and catalog position suggest that this specimen may have been associated with 13/4742a, b [ibid., Fig. 1, 74]). Its temporal position is the same as the two preceding types.

Ornament type Haliotis C(a)1 is represented by a single specimen (13/4636) from a depth of 126 inches (ibid., Fig. 1, 76). It must belong with the Early Lovelock deposits. Like the previous types, this type occurs in both the Early and Middle Horizon in Central California. Since this specimen is made from H. rufescens rather than H. cracherodii, it suggests a connection with the Early, rather than the Middle, Horizon of Central California.

There are two specimens of Haliotis type Q1a1 (or U4), both made from H. cracherodii shells, such as were used during the Middle Horizon in Central California (ibid., Fig. 1, 77). Specimen 13/4660 is associated with Olivella grooved (cut) rectangle beads, but has no locational data. Specimen 13/4649 is associated with Olivella type 1a, but has no locational

data. The other examples of this bead type (Olivella 1a), with data, are all from the lower half of the deposit. According to Bennyhoff and Heizer (op. cit., p. 86, End Note 46), the form has little temporal significance in California. These specimens probably are to be associated with Early or Transitional Lovelock deposits.

Cordage and woven objects

Matting. Although mat fragments are common items of Lovelock culture, only one type appears to be chronologically useful. This type is also the most distinctive mat variety, and is made with tule or cattail warps and Apocynum cordage wefts. The last warp on each side is generally three ply braid. The second to last warp may be rope. The selvage at the warp end is not treated in a special manner; the wefts run close to the cut off warp end, and only the tightness of the twining prevents the wefts from slipping off.

There are three specimens from the stratipit. One (13/4813) is from Level I. The other two are from a bundle containing a miscellaneous lot of artifacts found at the base of a large rock in the western part of the stratipit at a depth of about 48 inches. Although Harrington did not record this bundle as an intrusive cache, it seems highly likely that it was such a cache and may, therefore, have originated anywhere in the deposits above this depth. A fourth specimen was found at a depth of 16 inches in an unrecorded part of the cave. Clearly the type is Late Lovelock in time, although it is not possible to state whether it was used throughout the Late Lovelock phase or only in the last part of that phase.

The type is widely distributed, occurring in Humboldt Cave (Heizer and Krieger, op. cit., p. 59), Hidden Cave, Ocala Cave (Loud and Harrington, op. cit., pp. 150-151), Danger Cave (Levels III and IV; Jennings, op. cit., pp. 242-244), Promontory Cave #1 (Steward, 1937, pp. 29-33), Segi Cave I [Pueblo I] (Guernsey, 1931, p. 96, Pl. 58), in the Fremont area (Morss, 1931, p. 71, Pl. 41), and possibly Basket Maker II in Dupont Cave (Nusbaum, 1922, pp. 100-101, Pl. LII, a somewhat aberrant example). Ethnographically it has been reported for the Klamath (Barrett, 1910, p. 255, Pl. 23).

One-rod coiling. One-rod coiling may be divided into two types--coarse and fine. Coarse coiling has 3 to 5 stitches per 2 cm., and 3½ to 4½ coils per 2 cm. In thickness it varies from .51 to .88 cm. Where observed, it was coiled clockwise and had stitches with a down to the left pitch. The fine coiling has 6 to 14 stitches per 2 cm., and 6 to 9 coils per 2 cm. In thickness it varies from .30 to .50 cm. Of the four observations made, two were clockwide and two were counter-clockwise in coiling, pitch was down to the left, and the selvage was a simple coil. The coarse

ware tends to be coated with an organic substance, probably pitch and/or charred mush.

Two of the fine specimens have decorations of alternating black and light colored stitches. A third specimen has a black decoration of rows of alternating black and natural stitches, as well as short, solid rows several coils high in blocks alternating with natural coils. The specimen (13/4530) is a complete piece, a shallow tray 4.3 cm. in diameter and about 2.5 cm. high. Of the other two, one (13/4588) is a small bowl about 14 cm. in diameter and 6 cm. high. The other (13/4698) is probably a lid from a small bowl. It is 3.3 cm. in diameter and .85 cm. high. There is a hole in the center through which a cord is passed and knotted on the concave side in an overhand knot.

Of the five specimens, two are small bowls, one is a bowl lid, one is a jug, and one is a tray. Only two have depth data. Specimen 13/4812 is from Level I, and specimen 13/4698 is from a depth of 69 inches. What little evidence there is suggests that the type is Late Lovelock and possibly Transitional. The specimen from 69 inches depth is, however, the coarsest of the fine specimens and is a lid.

Multiple-rod coiling. One of the specimens of single-rod coiling discussed above has a few coils with a second, smaller rod added. Of the other specimens with two rods, probably six show a predominance of three-rod triangular coiling with two rods only near the rim, and fifteen appear to have only two-rod foundations. Three of the latter are fragments of rims and the body type is not known. The type is felt to be only a variant of three-rod coiling since it occurs with this type on the same specimen, and does not appear to be distributionally distinct from the strictly three-rod pieces.

Fineness of specimens varies greatly. Stitches per 10 cm. vary from 15 to 100, and coils per 10 cm. vary from 15 to 47½. Thickness of basket wall varies from .35 to .98 cm.

Like one-rod coiling, multiple-rod coiling may be divided into fine and coarse varieties. The fine variety has more than 35 stitches per 10 cm. and/or more than 35 coils per 10 cm. Wall thickness varies from .35 to .70 cm. Approximately half of the collection is thicker than .70 cm., but the thinnest basketry is not necessarily the finest. On the contrary, the two thinnest fragments are typed as coarse. It should also be noted that three of the six fine pieces have 25 or less coils per 10 cm.

Of the six fine specimens, two lack data, one is from Level II, two are from Level III, and one is from 92 inches in depth (i.e., probably

from the Early Lovelock deposits). In other words, the type occurs throughout the Lovelock sequence. Two of the specimens have feathered decorations. One of the feathered specimens also has a black, woven decoration in a quatrefoil pattern. This specimen lacks associational data. The other feathered specimen is from a depth of 92 inches. Two of the fine specimens are coated with pitch or similar material. One of these is without data; the other is from Level II. The remaining two are decorated with pendant triangle designs in black or brown. Both specimens are from Level III.

Baumhoff and Heizer (1958), in their study of the fine coiled basketry from Humboldt and Lovelock Caves, suggest that the fine coiled specimens are trade pieces from the Washo or Maidu. While the suggestion is not proven, and possibly is not provable, it appears to be highly probable.

There are twenty coarse specimens with feathered decorations. Of these, seven are without data; three are from burial 20. There are two specimens from Level V and the same number from Level VI. There are none from the upper four levels. Clearly coarse coiled basketry with feathered decoration is an Early Lovelock trait.

Coarse, multiple-rod foundation coiled basketry is found in every level of the stratipit. A number of different forms were made. Coiled trays were recovered from every level except Level IV. A coiled burden basket was found with burial 20 (an Early Lovelock burial). Coiled jugs, coated with pitch, are indicated by fragments from Level II and Level III and presumably for the Early Lovelock deposits, on the basis of the specimen illustrated by Loud and Harrington (op. cit., Pl. 67), which they report as having been found at a depth of 15 feet.

Wicker basketry. Lovelock wicker is the most diagnostic artifact type of the Lovelock culture. Its techniques of manufacture are unique to a small geographic area, and are limited to a relatively short span of time, as far as is now known. It is not known ethnographically. It is not easily related to the few other examples of wicker, such as those of the ethnographic Southwest, or the Pomo, or to the archaeological specimens from southeastern Oregon, or the so-called wicker specimen from Danger Cave.

The warp is not distinguishable from that of most stiff twined baskets. The wefts are virtually identical to those commonly used in the Basin area for diagonal and plain stiff close twining. The differences lie in using two wefts, one on top of the other or side by side, and weaving them under one warp and over the next, the same rod being under the weft in one row and above the weft in the adjacent weft row.

Virtually all wicker baskets (where appropriate portions are preserved) are started at the apex with plain twining (over 2 or 3, under 2 or 3) with rounded wefts, followed by a number of rows of over 1 under 1 plain twining with ribbon wefts. The bulk of the basket is then in wicker (ribbon wefts), although occasionally one or more rows of plain twining may be inserted. At the broad end of the basket the ribbon wicker is ended off with one or more rows of plain twining (over 2 under 2) before the selvage starts. The selvage is formed by bending the warps diagonally, usually in pairs, and intertwining them, usually in a wicker weave. A few are twined as Heizer and Krieger (op. cit., p. 39) point out.

As Harrington (Loud and Harrington, op. cit., p. 26) has indicated, wicker was recovered from Levels II, III, and IV of lot 15. Its greatest frequency (11 out of 20 specimens) is in Level III. The evidence from Humboldt Cave (Heizer and Krieger, op. cit., pp. 37-44) suggests that wicker continued to be made throughout the Late Lovelock phase, and, therefore, should also have occurred in Level I in Lovelock Cave.

We lack evidence for the initial development of the wicker technique. Presumably, it derives from a plain twining antecedent and may have begun as a textural decoration. The decorated area may have gradually enlarged until it formed the bulk of the basket. We should eventually find, if the theory is correct, a few specimens with only a few rows of wicker on them.

Most wicker baskets are decorated. The occasional rows of twining have already been mentioned. The commonest decorative technique is accomplished by using one weft with a bark coating (or perhaps dyed), which is alternated with the other plain weft element by twisting. Light areas on the outside of the basket tend to be dark on the inside and vice versa. Absolute image alternation does not take place, since the warps are alternately exposed and reverse images are thus offset one warp row. On the archaeological specimens the color is often worn off, but the design may sometimes be reconstructed by plotting the distribution of the twists in the wefts. A few fragments have traces of red paint on them, but no clear design can be discerned. Not enough specimens are available with stratigraphic data to show differences in design preference through time.

There are no complete wicker baskets, but all the evidence suggests a conical form. Fragments occur which measure up to 68 cm. in length and 120 cm. in width. If it is assumed that the width approximates one half of the original circumference (on the largest fragments only), and the length approximates the original length of the side of the basket, an estimate of the original size of the basket may be obtained.

A fragment 59 cm. long and 120 cm. wide would suggest a basket with a height of 45 cm. (18 in.) and a diameter of 38.2 cm. (15.1 in.). This particular specimen preserves 13 plain twined rows at the apex and includes at least part of the selvage. It can only be a few centimeters less than the original size of the basket. The suggested basket size is small for ethnographic burden baskets, but within the known range of such baskets. It perhaps should be pointed out that the larger Northern Paiute burden baskets are made of openwork diagonal twining; they were largely used for gathering pine nuts, and were often cached in the pine nut groves rather than being brought back to the winter settlement. A similar trait for the Lovelock peoples may account for the smaller sized burden basket being preserved in the cave and the rarity of diagonal twined basket fragments in the cave. It should also be noted that wicker baskets, if desired, can be made as tight as twined baskets, such as would be needed for carrying small seeds.

Catlow twined basketry. Flexible twined basketry occurs in the lower half of the deposits. Two types are easily distinguishable, although Loud and Harrington treated them as a single type. One type is woven on warp elements composed of single rods of a flexible material, probably tule. The other type is woven on warps composed of two elements twisted together to form two-ply cordage. The latter type is known in the literature as Catlow Twine or Catlow Twined. The former type will be referred to herein as Plain Flexible Twined.

Eight specimens of Catlow Twined were observed in the New York collections. Seven were excavated by Harrington. The other specimen was originally in Loud's collection. The larger specimens are probably from flat trays. Six of the specimens are decorated with a yellowish overlay (grass?) in horizontal bands, horizontal zigzags, or over the entire surface. The overlay lies on top of one weft element and is treated as an integral part of the weft, except when it was desired to have adjacent, rather than alternate, stitches in the yellowish color, or when a gap of more than one stitch is desired. In the first instance, the overlay is wrapped vertically around the entire weft between two adjacent warps and is brought to the outer surface on the other weft element. In the second instance, the overlay jumps the required distance on the inside of the basket before being brought to the outer surface.

Occasionally the wefts in a particular area of the basket are browner in color and give a banded or speckled appearance to the surface, depending on whether one or both weft elements are of this color. Such decoration appears to be accidental, rather than purposeful, since it does not coincide with the overlay decorations. The warps of all specimens are two-ply 'Z' twist cordage, and the wefts are pitched down to the right.

Two of the specimens were recovered from the 72 to 96 inch level of the stratipit (Level IV), and a third is recorded as having a depth of 83 inches. Fragments of Catlow Twined baskets used as patches have been noted on wicker baskets from Ocala Cave (1/21600) and Thea Heye Cave (15/8700, 15/8824). Heizer and Krieger (op. cit., pp. 55-57) believe that Catlow Twined is associated with the Late level in Humboldt Cave (prehistoric Northern Paiute level). Baumhoff (1957, pp. 1-5) has demonstrated that the few examples from Central California are Late Horizon, Phase II.

Plain Flexible Twined. There are thirty-seven specimens of Plain Flexible Twined basketry, of which two are in the American Museum of Natural History and the remainder in the Heye collections. All have wefts which are pitched down to the left. Designs are in black and/or yellow overlay like the Catlow Twined. There are two examples in which one weft element is human hair cordage and a band of alternate black stitches is produced. Forms tend to square bags and flat circular trays. There is one specimen from the 72 to 96 inch level and nine from the 120 to 148 inch level in the stratipit. In addition, there is one from 83 inches in depth (possibly associated with a piece of Catlow Twined found at the same depth and cataloged under the same number, but horizontal location not given).

Another piece was associated with Grave 45 in lot 19 (48 in. deep, 10 in. into sterile lacustrine deposits). Other items with this burial include a stone ball, a foreshaft with a stone point which is probably for an atlatl, cordage, and netting. Harrington considers the burial to be Early Lovelock in age because of the stone ball and the atlatl foreshaft and point. The position of the burial well into sterile lacustrine deposits (although the depth of origin of the grave is not known) would also suggest that the burial dates from the earlier part of the cave's occupation.

There is only a slight indication of temporal overlap of the two types of flexible twining. The Plain Flexible type is clearly Early Lovelock in age and is rare in Transitional Lovelock. The type is absent from Humboldt Cave (Heizer and Krieger, op. cit., p. 56). Catlow Twined occurs only in Transitional Lovelock in Lovelock Cave, and in Humboldt Cave only in the Late, prehistoric Northern Paiute, level (ibid., pp. 55-57, 88). Both types share the traits of flexibility and the use of yellow overlay, but differ in kind of warp, in pitch of weft, and in the use of black overlay and human hair cordage weft in the earlier form. Catlow Twined is rare enough to suggest that it is a trade item, perhaps deriving from the Klamath-Modoc area where the technique occurs ethnographically. Plain Flexible Twined may well be a local manufacture. Stiff twining has not been recovered from Early Lovelock deposits. Flexible twining could be

the antecedent from which the stiff twining developed. Arguing against this idea is the fact that known examples of stiff twining have a different weft pitch and the fact that stiff twining occurs in the Humboldt Culture which precedes the Lovelock occupation in Leonard Rockshelter.

Loud recovered forty-two specimens which he considered to be examples of flexible twining. At least six of these specimens are thick sandal fragments. This leaves approximately ten fragments of Catlow Twined and twenty-three fragments of Plain Flexible Twined in the Loud collection. With Harrington's collection, there is a total of seventeen fragments of Catlow Twined, and fifty-eight fragments of Plain Flexible Twined. Combining fragments which are probably from the same basket, it is highly likely that no more than twelve Catlow Twined and no more than forty-four Plain Twined baskets are represented in the entire collection.

Unfortunately, similar estimates for coiled and wicker baskets cannot be made. Fragments of these two types are much more common; however, the original baskets were often quite large and could break into many more pieces than the flexible baskets. Clearly, however, the two flexible types, and especially the Catlow Twined, are relatively rare.

Plain Flexible Twined may have developed into Catlow Twined. Chronologically, on the basis of the Lovelock data, such a developmental sequence is possible; however, the change in pitch of weft argues against this possibility.

The antiquity of Catlow Twined in southeastern Oregon remains obscure. Cressman (1942, p. 39; 1951, pp. 307-309) states that basketry, possibly of Catlow Twined type, was associated with the radiocarbon dated sandal (9053 $\pm$ 350 B.P.) from Fort Rock Cave. If, as Cressman intimates, the Fort Rock specimen or specimens (accounts vary) are not typical Catlow Twined, then we must look to the other caves for the earliest evidence of this basketry type, that is, either Roaring Springs or Catlow Caves.

Roaring Springs Cave deposits have not been dated by the radiocarbon method. A radiocarbon sample from Catlow Cave was dated at 959 $\pm$ 150 B.P. This sample came from a depth of 2.88 feet, presumably from stratum II in the northern section of the cave. Heizer (1951b, Pl. 23) has mentioned that the sample came from "slightly higher than the midpoint of the deposit," and he gives a total deposit depth of 7 feet. Probably 6½ feet would be a closer estimate, to judge from Cressman's published accounts (1940, 1942). In his evaluation of western radiocarbon dates, Cressman (1951, p. 304) states that the sample, a digging stick used as a poker, dates from "near the end of occupation" of the cave. A certain contradiction is apparent.

If 2.88 feet of deposit accumulated in 959 years, 7 feet of deposit laid down at the same rate would take about 2325 years to accumulate. Such an extrapolation would suggest initial occupation of the cave at about 375 B.C. If the oldest Catlow Cave Catlow Twined basketry dates from later than 375 B.C., then the Lovelock Cave Catlow Twined basketry is older than the southeastern Oregon occurrence. Actually, no definite conclusion can be reached on the relative antiquity of the two occurrences on the basis of the data now available.

Twined tule bags. Loosely woven, rather cylindrical, twined tule bags are common artifacts in Lovelock sites. Harrington recovered at least three specimens from the stratipit, two from Level III and one from Level IV.

Loud (Loud and Harrington, op. cit., p. 71, Pl. 26c, e) found twenty-seven tule "carrying cases," most of which are of the type discussed above. Heizer and Krieger (op. cit., pp. 59-60, Pl. 27) report six specimens of this type, three from caches, one from a rat nest, and two from below 30 inches in the deposit. Hidden Cave produced several such bags from the upper levels. At least one living Northern Paiute remembers how to make such bags.

The chronological evidence suggests that tule bags have been made since the beginning of the Transitional Lovelock times, and continued to be made until historic times.

Aprons. A characteristic garment of the people of the Lovelock culture, as of many western aboriginal groups, is a small pubic covering made of shredded vegetable fibers. It is usually worn by females.

Harrington recovered five specimens, four of which were inspected. Of these four, one was made of grass, one of sage bark with Apocynum cordage wefts, one of old netting with cordage wefts, and the last of the skin or bark of an unidentified type of root. All specimens are held together with one or two rows of two strand down to the right twining. They range in width from 8.5 to 30 cm., in length from 20 to 41 cm., and in thickness from .47 to 1.25 cm.

Loud recovered three specimens (Loud and Harrington, op. cit., pp. 53-54, Pl. 19a-c). Two of these used old nets for part of the warp.

Heizer and Krieger recovered a similar specimen, made of sage bark, from a rat nest near the entrance to Humboldt Cave (op. cit., pp. 65, 84). They also recovered several specimens of the skin or bark from which one of the Lovelock Cave specimens was made.

Data are difficult to obtain for all of these specimens. Harrington records that an apron was found around the waist of the burial (female) in Grave 18, and that it was made out of worn-out netting which was dyed red. This description fits specimen 13/5005. The burial probably dates from the Early Lovelock phase. Harrington also mentions a small fiber (shredded bark) apron from the cache in pit 4, lot 7, which he considers to be Late Lovelock. Presumably this specimen is 13/5006a or c.

These limited data are enough to suggest that this type of garment is a trait of the Lovelock culture throughout its existence.

Cloth. One specimen (13/4626), while undoubtedly not manufactured on a loom, approaches true cloth in texture and weave. This small fragment of finger weaving is made with Apocynum cordage warps and wefts. It is 11 cm. long (warp), 7 cm. wide (weft), and .22 cm. thick. Warps and wefts are composed of two-ply 'S' twist cordage with a 60 degree twist, and a diameter which varies from .08 to .12 cm. All but two weft rows are twined diagonally down to the right (two strand twining), each stitch enclosing two warps. There are eight weft stitches enclosing sixteen warp strands per centimeter, and five weft rows per two centimeters. The third row from both ends is plain weave, under two, over two. The specimen was found at a depth of 53 inches; the location is not recorded. At this depth, the fragment may be presumed to belong to the Transitional deposits.

Fabric with quillwork. There are three fragments of a soft fabric made of Apocynum cordage and porcupine(?) quills. These have been described and illustrated by Orchard (1925, pp. 187-190, Figs. 82-84). To his description a few additional observations should be added. Specimen 13/4800 is 6.0 cm. long and 3.4 cm. wide. The warps are composed of two-ply 'S' twist Apocynum cordage, .19 cm. in diameter and with a 30 degree twist. The wefts are composed of two-ply 'S' twist Apocynum cordage, .04 cm. in diameter and with a 45 degree twist. The quills average about .15 cm. in width. There are traces of red paint on the quills. Specimens 13/4801a, b are probably part of the same original specimen since the techniques of manufacture are identical. Specimen 13/4801a is 5 cm. long and 3.5 cm. wide, while 13/4801b is 3.5 cm. long and 3.0 wide. The quills are white. Specimen 13/4800 is from a depth of 154 inches, and 13/4801 is from 158 inches. These specimens undoubtedly date from the Early Lovelock phase. With the possible exception of the water jug (reported from a depth of 15 feet), they represent the deepest finds recorded from the cave.

Another plain, twined, textile-like object is specimen 1/21083, which was recovered by Loud (Loud and Harrington, op. cit., pp. 48-49, Pl. 43o).

The warps are two-ply 'Z' twist cords made of feather quills, and the wefts are two strand, plain down to the right twining of Apocynum cordage. It is from Loud's lot 37, which appears to be stratigraphically lower than lots 35 and 36 (ibid., Pls. 2, 3a). Lot 35 contains five (?) pieces of wicker basketry; lot 36 contains one piece; lot 37 contains none. The latter lot produced four projectile points or fragments. They are of various sizes and could be either atlatl or arrow points. They are not of the commonest Late type, nor are they of the commonest Early type. A guess date for lot 37, and hence for the textile, would be Transitional or Early. The technique of manufacture suggests Catlow Twined, which has already been suggested as a Transitional trait.

Twined bag and knotless netting. Specimen 13/4795 is a small twined bag with a covering of knotless netting. The bag is 4.9 cm. wide at the base, 3.9 cm. wide at the mouth, and 5.3 cm. high. The piece is badly charred and too delicate for a detailed examination. The material, number of elements, and degree and direction of twist of the warps could not be determined. The wefts are two-ply 'S' twist cordage, about 1 mm. in diameter. The twining is of the two strand variety with the pitch down to the right. There are five weft stitches per 2 cm., and about twelve weft rows per 2 cm. The starting pattern and top selvage could not be determined. The wefts are woven continuously around the bag, so that there are no selvages at the sides. The netting cover appears to have been started at the top and worked down and continuously around the piece and brought together at the bottom with the last row. No terminal knot was observed. The netting was rather tightly woven with ten rows vertically and horizontally per 2 cm. There are no associational data with the piece. Grave lot 18 includes a burned deposit directly west of the burials, and contained a fragment of a flexible twined bag with shell beads attached. These specimens have the catalog number 13/4746, and appear in the catalog immediately following the above specimen. The charred nature of both lots may have led the cataloger to record them in sequence, or an original association may have been the deciding factor. There are other charred sections in the deposit, however.

One other piece of knotless netting is known from the cave; it was collected by Loud for the University of California (ibid., p. 82, see "crochet work"). The specimen (1/20732) is very small, containing only a few meshes. Loud recovered it from the guano miner's dump in front of the cave. The second piece mentioned by Loud is knotted netting.

A larger piece of knotless netting, a bag, was recovered from Thea Heye Cave, and since the material from this cave is Transitional and Late Lovelock, it may be suggested that knotless netting is a trait to be associated with one or the other or both of these periods. Since it cannot be said

that knotless netting is definitely lacking in Early Lovelock, it is not definite that the Lovelock specimens are Transitional or Late and not Early. The similarity of the twining in the bag described above to Catlow Twined would also suggest a Transitional or Late date for both the bag and the netting.

Netting. Netting, generally in small fragments but occasionally in virtually complete nets, is one of the most common artifact types in Lovelock Cave. A few examples occurred in every level of lot 15 except Level II. Sixty-eight specimens were studied in the Heye Foundation collections, and six in the American Museum of Natural History collection. These seventy-four specimens were cataloged in twenty lots, and are believed to represent thirty-two or thirty-three individual nets.

All specimens are made with sheetbend knots. This particular knot has two faces, i.e., it appears different on one surface than it does on the other. Every other row of knots shows the same face, whereas the alternate rows show the opposite face. Presumably this knot pattern indicates a change in motor habits during the tying of the alternate rows, or, more probably, turning the net over or working from the opposite side of the net for alternate rows. The knot pattern, together with the orientation of the knot and individual variations in the cordage from which the net was made, enables the investigator to determine the direction in which the net was manufactured, that is, whether the work proceeded along the length or the width of the net.

As might be expected, most of the Lovelock nets which retain selvage edges show that the net weavers worked across the width (the short dimension) of the net. However, in at least two cases the evidence suggests that each course of these particular nets was woven to its entire length before another row of meshes was added. In one case the length of the net involved is 15.2 meters (approximately 50 ft.) long.

An alternate explanation to the apparent weaving of a net along its longest dimension would be a different motor habit; possibly the bundle of cord was manipulated at right angles to that used by the majority of net weavers. The important point, of course, is that two different techniques were used during the time Lovelock Cave was occupied. Of the two unusual specimens, one is from a depth equivalent to the lowest level of the stratipit; the other is without data. Perhaps this possible change or variation in motor habits has some chronological significance, but the sample is too small and the data are too uncertain to be sure.

Mesh size (average per specimen) was plotted on a graph to determine relative frequency of the various sizes. Since nets were presumably used

for several different purposes, it was thought that several functional net subtypes might be discernible.

Mesh sizes range from .61 to 16.2 cm. There are two major peaks on the frequency curve. One falls between .6 and about 2.5 cm., the second falls between 2.5 and 8.5 cm. Beyond this range there are a few nets which have much larger meshes. The difference between average cord diameter of the first two classes is of the order of .01 cm., a figure which does not appear to be significant; however, the second class has the finer cordage of the two. The larger meshed nets are made of cord averaging 1.8 mm. in diameter, or about three times the average of the other two classes.

Ethnographic evidence indicates that nets were used for carrying, or for the hair; for fishing, fowling, rabbit drives, and perhaps deer and antelope drives. None of the elaborate double nets or nets with two sizes of mesh, such as Loud reported (ibid., pp. 87-91), were observed in the Heye collection.

The evidence of frequency of net mesh suggests no more than three possible functional net types. If the nets were more complete, a form variation might be discerned. The more complete nets tend to be long and narrow, like historic rabbit nets. Several nearly complete, small mesh nets from Hidden Cave are nearly square.

In addition, some nets may have been used for more than one purpose. For instance, rabbit nets may have been strung over water to catch ducks and other water fowl. Both the fish and rabbit nets of the Owens Valley Paiute are described by Steward (1933, pp. 252-254) as being 3 feet wide and about 50 feet in length. Stewart (1941, pp. 369-370) reports rabbit nets used also for birds and for fishing among various Northern Paiute bands.

Slings. One sling was analyzed in the Museum of the American Indian; another is listed in their catalog but was not located for study. The analyzed specimen (13/5047) is unfinished, but there is little doubt that it was intended to become a sling pocket. It is 13.7 cm. long, 3.4 cm. wide (maximum), and .4 cm. thick. The finished end loop is 2.0 cm. long, 1.5 cm. wide, and .5 cm. thick. The foundation of the pocket was apparently started by wrapping a length of Apocynum cordage seven times around a form, possibly the hand. At one end the same cord was then used to bind together the loops into two sections with eight figure eight loops. The free end is then run around the outermost free string, along behind the next adjacent string, back over that string, behind the next string, and so forth. The next row reverses the pitch of the weft. Only two weft rows are preserved. The single cord of which the pocket is made is two-ply, 45 degree 'Z' twist, and varies in diameter from .13 to .15 cm.

There are no provenience data for the specimen described above. It was cataloged as a "cord pendant." The catalog entry for the specimen not examined (13/4701) says: "Medicine bundle consisting of a bunch of sage grass containing a piece of gum and a root. Around the grass is wrapped a skin cover. An animal skin medicine bag containing pine nuts and a sling is on the outside, and a net is wrapped around the entire bundle. Found 105 inches deep."

It is presumptive evidence that the sling in 13/4701 is not the same as 13/5047, since one is called a pendant and the other a sling. The entry is important since it indicates that slings are an Early Lovelock trait. The slings recovered from Humboldt Cave show that the trait also occurs in Transitional-Late times as well (O'Neale, 1947; Gregoire, 1956). The one previously described sling from Lovelock Cave (Heizer and Johnson, 1952, pp. 139-147) was associated with a child's burial (12/2670), age about five years, which was also accompanied by a large quantity of netting, a composite bone and horn rattle, a fragment of a birdskin blanket, an Olivella bead necklace, a cord of human hair, a bundle of feathers, a hair net, and a large Plain Flexible Twined tray. The grave lot exhibits predominantly Early Lovelock traits and hence strengthens the idea that slings are an Early Lovelock trait. It further suggests that slings were used as toys since this specimen was found with a child; however, since most of the other associated items are objects normally used by adults, this interpretation must not be accepted unqualifiedly.

Fur and feather cordage and blankets. Fragments of fur cordage were recovered from Levels I, III, and IV, and a whole blanket from Level VI (Grave A). Grave 20, which is believed on stratigraphic grounds to be a part of the Early Lovelock deposits, also contained a rabbit skin blanket. If we may assume that fur cordage indicates the manufacture of rabbit skin blankets, then there is evidence that such blankets were made throughout the occupancy of Lovelock Cave.

Fragments of feathered coot(?) skin cordage were found in Levels III and IV. Fragments of a blanket were found in Grave 46. This burial cannot be dated, although Harrington suggests that it may be Late because of its association with the bird skin blanket. The burial cannot really throw any light on the dating of the artifact type. Burial 12/2670 (lot 26) is dated by a number of associated artifacts as Early Lovelock. Fragments of a birdskin blanket are also associated. If it may be assumed that birdskin cordage indicates the manufacture of birdskin blankets, then there is evidence that such blankets were made during the Transitional phase in Lovelock Cave, and the burial in lot 26 suggests that they were also made in the Early Lovelock phase.

Cordage fragments composed of both fur and feathers were recovered only from Level I in lot 15, and presumably indicate the manufacture of blankets of mixed composition in the Late Lovelock phase.

Harrington (Loud and Harrington, op. cit., p. 27) mentions a piece of feather cloth woven of cordage wound with downy feathers, rather than bird skin, from Level III. No such specimen was noted in the collection.

Snares. Seventy-two snares were recovered by Harrington from the cave. Loud had recovered eight earlier. Each snare was made of a thin willow twig, which was bent into a tall triangle. The free ends of the twig form the acute angle of the triangle. Two minor variants occur. The commonest type (67 specimens) has a loop formed by tying an overhand knot in one end. The loop in the other type (5 specimens) is formed by folding the end of the stick back on itself and tying it in place with cordage. A string is tied to the free end of the stick, passed through the loop at the opposite side, and is then tied to the end of a short stick. It is not known how these snares were used, or what they were intended to catch.

Two specimens of the knotted variety were recovered from Level III of lot 15 (13/4845). Catalog entry 13/4515 consists of a bundle of about thirty snares of the knotted variety. Entry 13/4516 consists of two bundles, one containing the five specimens of the unknotted variety, and the other containing about thirteen of the knotted variety. Entry 13/4517 consists of twenty-eight specimens, twenty-seven of which were examined. These were of the knotted variety. None of these last three entries has associational data; however, Harrington mentions (ibid., pp. 12-13) two bundles of snares in a cache of duck decoys in Pit 12, and illustrates one bundle (ibid., Pl. 48a) without giving the catalog number, as well as two individual specimens which he implies are from the bundle in question, and to which he gives the number 13/4517. The illustrated bundle does not have twenty-eight snares in it, as 13/4517 originally had, and hence cannot refer to that catalog item. By the same reasoning, the illustrated bundle cannot be 13/4515. The bundle of five snares under 13/4516 is too small and of a different variety, but the bundle of thirteen is of the right type and number. This, then, must be one of the two bundles associated with the cache and it is reasonable to assume that the other bundle with the same catalog number is the other bundle from the cache. If the two bundles are thus correctly identified, then the two types are shown to be contemporaneous. Harrington (ibid., p. 115) mentions that snares also came from an unidentified pit which originated in lower Transitional deposits (i.e., Level IV). The cache in pit 12 is believed to date from the late Transitional or Late phase, and the two snares from Level III have been mentioned above. In summation, there is evidence for snares in Transitional Lovelock and perhaps Late Lovelock as well.

A bundle of short lengths of cordage which are tied to six short sticks, like those attached to the snares described above, was found in Hidden Cave (17 in. deep in pit M4). They are from a deposit that probably dates from Transitional Lovelock times, but may also be Late.

A similar, but much larger, snare has been reported by Heizer (1942, p. 122, Fig. 100c-5) from Massacre Lake in northwestern Nevada. A bundle of similar snares has recently been recovered from Eastgate Cave (26-Ch-36), about sixty miles to the southeast of Lovelock Cave.

Sandals. Sandals have been discussed in detail by Loud (Loud and Harrington, op. cit., pp. 54-56). He is perhaps too refined in his typing of this artifact type. For instance, he separates sandals with a covering over the toes from those without. In all probability this difference depends on the preservation of the specimen, since there is little evidence that the toe portion was ever finished off without the covering, which is only an extension of the sole warps.

Harrington (ibid., p. 27) reports sandals from only the top level of the stratipit, and in the upper portion of the deposits elsewhere in the cave. The specimen from Level I (13/4813) lacks the toe portion of the sole and upper covering. Another fragment from the stratipit, overlooked by Harrington, consists of a portion of the toe area, including sole and upper and several ties (13/4878o). It is from Level IV and hence extends this artifact category back to the Transitional Lovelock phase.

Decoys. Decoys and decoy parts are relatively common in Lovelock Cave. Several different kinds were made by the inhabitants of the cave, and one type was made by the historic Northern Paiute, who lived in the same area. Harringtondistinguished two types--painted and stuffed. The latter type may be further subdivided.

Type I (painted). Harrington (ibid., p. 114) describes the technique of manufacture of this type, and his illustrations (ibid., Pls. 33, 34) show the details of construction better than any written description could. All examples of this type came from a single cache in Pit 12, lot 4, and include eight finished specimens (13/4512) and three unfinished specimens (13/4513). The same bundle contained a rush bag full of feathers, feathers wrapped in a piece of mat, a bunch of feathers tied with string, and two bundles of snares. All items were wrapped in a rush mat and had been covered over with other mat fragments, pieces of "twined pack basket," and a large coiled basket. The pit was 61 inches deep from the surface, but had been dug when the floor was 32 inches lower.

The catalog does not list any associational data for the contents of

this cache; however, the catalog entries 13/4510 through 13/4517 fit the description of the cache, and Harrington specifically identifies 13/4512, 13/4513, and 13/4517 with the cache. There appear to be too many bundles of snares, however. The attribution of all these entries to this cache is of some importance, since item 13/4511 is cataloged as "rush bag (with piece of rush matting inside for cover) containing a bundle of feathers tied with rush binder; and a mass of loose feathers." This group of items was not located for description, but the catalog entry seems to describe the small bunches of feathers used on a different type of decoy and thus would suggest the contemporaneity of the two types. The associated items and the depth of the pit suggests that this type of decoy is not from the earliest part of the site. Harrington believes the cache to date from the Transitional or Late phases. The lack of wicker work and the presence of "twined pack basket" fragments suggest Late Lovelock.

Type II (mounted), subtype A. Head mounted on tule neck, attached to a body like Type I, but without breast binding. Feathers are stuck in the back, and small bundles of small feathers are stuck in the sides. This type of construction was probably used for the manufacture of goose decoys, as well as duck decoys. Neck bundles were recovered from Level II, and a stuffed duck head was recovered from Level III. Bundles of small feathers were recovered from Level II, from pit 4 (lot 7), and, as mentioned above, probably from the same cache as the Type I decoys (pit 12, lot 4). Loud recovered neck bundles from a cache in his lot 34. Lot 34 appears to underlie his lots 13 and 14, which contain both Transitional and Late materials. Since the specimens are from a cache, and the depth of origin of the cache is not known, the association does not help date the type. Clearly, however, from the other evidence, this type of decoy occurs in late Transitional and early Late Lovelock deposits.

Type II (mounted), subtype B. Head, neck, and part of the body of the bird is mounted on the tule foundation, and supplemental bunches of feathers may be stuck around the edges. Harrington found many fragments of head with skin and feathers complete along the breast and forepart of the back, occasionally including the wings. The temporal distribution of this subtype is presumably the same as the previous subtype.

A fragmentary example (1/44175) of a Type II decoy was recovered by Heizer and Krieger (op. cit., p. 14) at a depth of 24-30 inches in Humboldt Cave. This occurrence, plus the distribution of small bundles of small feathers which are definitely used on decoys in the Lovelock Cave collection, suggests that the decoy is not restricted to the Late deposits in the cave.

No examples like the modern Northern Paiute decoy, in which the entire back of the decoy is covered with skin, are known from Lovelock Cave,

although one was recovered from Humboldt Cave (Heizer and Krieger, op. cit.,p. 13, Pl. 28a). They are presumably variants of the Type II decoy.

Decoys of ducks and/or geese have a wide ethnographic distribution in the West. Archaeological specimens are known only from the Humboldt Sink area (Lovelock, Ocala, and Humboldt Caves). Heizer and Krieger (op. cit., p. 76) present the ethnographic distribution.

Quills with cords attached. At least forty-one specimens of large feathers, probably pelican feathers, to which short lengths of tule or reed rope have been attached, were recovered from the stratipit. Twenty-six were found in Level IV and thirteen were from Level V. The remaining two were from Level I, and were thought by Harrington to be from relic hunter's backdirt. Whether or not these last two specimens are taken into consideration, the overwhelming majority of specimens are from the lower half of the deposits and hence derive from the Early and Transitional phases of the Lovelock culture.

The quills occur in bunches or concentrations, suggesting that large numbers were used for whatever purpose they may have been intended. Harrington believes they were hung on ropes strung between bushes to frighten animals, such as deer, during drives, and this explanation seems entirely plausible.

Loud recovered no quills of this sort in lot 17, but did find one specimen in lot 18 and one in lot 19, which distribution tends to confirm Harrington's sequence. He also notes (Loud and Harrington, op. cit., pp. 74-76) that objects of this type are confined to the southwestern portion of the cave.

Similar feathers without attached ropes were recovered from Levels III, IV, and V (7, 7, and 20, respectively). Presumably these feathers are the raw material for making the artifacts described above. If they are, they extend this artifact type into Level III, which however, is still part of the Transitional Lovelock phase.

CONCLUSIONS

The chart (Fig. 10) summarizes the chronological results of the foregoing study; however, some discussion is necessary to evaluate these results. The following traits appear to be restricted to the Early Lovelock phase: net sticks; biconical baked clay and stone objects; a wooden loop; cradles made of notched or grooved sticks; sticks with a projecting

branch; hafted stone knives; throwing clubs; wooden pendants; Olivella flat disk beads; Olivella thick rectangular beads; Macoma disk beads; Haliotis square beads; Haliotis ornament type C(2)1; coarse coiled, multiple-rod burden baskets; and coarse, multiple-rod feather decorated coiled baskets. Of these fifteen traits, only four are placed as Early Lovelock with assurance because of their occurrence in lot 15. The other eleven traits are considered Early because of their depth (horizontal location not known) or by association with a burial which appears to be datable by other associated objects. The wooden loop is probably unique, an accident of manufacture. Many of the other traits undoubtedly continued into succeeding phases of the Lovelock culture, but their presence was not recorded in that restricted section of the cave deposits with which we must deal.

Objects which appear to serve a useful purpose and meet a continuing need, such as hafted knives, net sticks, throwing clubs, and cradles, may be expected to continue in use unless replaced by a modified form of the same trait or by a different but similarly functioning trait. The lighter, thinner sticks of the Humboldt Cave cradles may be such a modification. The replacements for the other three traits mentioned above have not been found, and hence it is to be expected that future excavation will reveal their continuance in the Lovelock culture.

More confidence may be placed in the chronological sensitivity of the shell beads and pendants, the wooden pendants, and the style of decorating coarse, coiled baskets with feathers. The coiled burden baskets were apparently replaced by wicker burden baskets.

Ten traits appear in both Early and Transitional deposits, but not in later deposits. They are: projectile points of type II; plain flexible twined basketry; Haliotis ornament type C(1)a; Haliotis ornament type C(2); horn sickles; horn pendants; atlatls and darts; Olivella bead type 1a; and 'L' shaped scapula awls. As mentioned above, the evidence from Humboldt Cave suggests that horn sickles and the 'L' shaped scapula awl continued into Late Lovelock times.

Six traits appear to be limited to the Transitional phase. These include: perforated stones; stone and clay balls; Catlow twined basketry; projectile point type I; crude slate knives; and Olivella oval beads. Again, evidence from Humboldt Cave suggests that Catlow twined basketry was present in the Late Lovelock phase too.

There are six traits which are shared by only the Transitional and Late Lovelock phases. These are: wicker basketry; snares; fine one-rod coiled basketry; intestine containers; sandals; and possibly projectile point type III.

The six traits restricted to the Late Lovelock phase are: boatstones; carved stone art; the wooden fishhook(?); a wooden pin; mats with cordage wefts; and blankets made with both feather and fur cordage in the same piece. The wooden fishhook(?) may be a unique object. The boatstone fragment may be an heirloom.

Two traits are shared by only the Late Lovelock phase and the historic Northern Paiute: the looped stirring stick and the wooden fire hearth.

Traits found throughout the Lovelock sequence but which appear to be lacking (i.e., not reported) among the historic Northern Paiute, include: large quills with attached cords; coiled water jugs; fine multiple-rod coiled basketry; and flat, round, coiled trays.

Traits found throughout the Lovelock sequence (with the exceptions noted below) and among the historic Northern Paiute include: shredded fiber aprons; mats; hoof pendants or rattles; nets; fur blankets; feather blankets; pointed wooden foreshafts; and slings. Aprons are not reported for the Transitional phase, hoof pendants or rattles and bird skin blankets are not recorded for the Late Lovelock phase, and slings are not reported for either the Transitional or Late phases. These absences are believed to be due to depositional lacunae rather than to their intermittent occurrence in the Lovelock culture continuum.

Traits restricted to just the Transitional Lovelock phase and the historic Northern Paiute or to both the Transitional and Late Lovelock phases as well as the historic Northern Paiute include: moccasins; stone huller; stone pipes; twined tule bags; bows and arrows; and duck decoys.

While grinding tools other than hullers have not been included because of their apparent absence from the cave deposits, it may be assumed that mortars and pestles and metates and manos are attributable to the Lovelock culture. Besides the few examples found by Loud outside of the cave, many specimens have been found in open sites such as the nearby Humboldt Lakebed site (26-Ch-15). It is highly probable that these implements were used throughout all three Lovelock phases. They were also used by the historic Northern Paiute.

It is clear that more work is needed to clarify the temporal subdivisions within the 2000 to 3000 year span now attributed to the Lovelock culture. Unfortunately, the excavated material from Lovelock Cave cannot be counted upon to help clarify the finer and more exact subdivisions that might be hoped for. Humboldt Cave has helped, but is of limited usefulness because of its brief occupation span and the unstratified nature of its deposits. The major function was apparently as a storehouse, and the

occupational debris deposited there was greatly disturbed by the digging of numerous cache pits. Heizer and Krieger (op. cit.) have probably extracted as many chronological inferences from the deposits as may safely be inferred.

Unpublished data from Hidden Cave and the Winnemucca Lake caves will undoubtedly help clarify the situation once they are published. Reports on the excavation of a number of small nearby sites have recently been published (Baumhoff, 1958; Elsasser, 1958), but they have not been utilized in the present paper. Their deposits were unstratified, and hence do not help solve our chronological problems.

The Lovelock Cave stratigraphic profiles and the artifacts from lot 15 suggest a gap, or at least a period of less intense occupation, between the lowest (Early Lovelock) occupation and the Transitional Lovelock deposits. As will be noted in the profile of lot 15 (Fig. 4), a change occurs in the physical content of the natural strata in Level V. The fourth level was made up of dust, grass, rushes, a few stones, and many artifacts. The sixth level was mostly guano, with a small amount of stone, grass, and rushes. The change occurs in Level V. Harrington (Loud and Harrington, op. cit., p. 23) reports that, "Our fifth level contained few artifacts, except toward the southwest end, where it struck the upper part of a deposit of basketry and other articles, most of which lay in the level below." There are fewer catalog entries for Level V than for any other level of lot 15.

There are fifteen artifact types which are restricted to the Early Lovelock deposits; twenty-eight artifact types are known only from the post-Early Lovelock deposits. Seventeen artifact types occur in both the Early Lovelock deposits and the later deposits. Such a trait distribution does not of itself suggest a gap in occupation. On the contrary, it strongly suggests a cultural continuity. However, in the Great Basin, where cultural change was apparently very slow, a depositional gap could well exist and not be reflected in the cultural inventory of the preceding and following deposits.

A similar depositional gap is noted in Hidden Cave, where the Early Lovelock deposit is separated from later deposits by a sterile layer of silts. The Early Lovelock deposits are probably to be correlated in time with the reformation of the Basin lakes at the beginning of the Medithermal temperature age, which starts about 2500 to 2000 B.C. (Antevs, 1952). The sterile silts in Hidden Cave are probably to be correlated in time with a subsequent dry period, which eventually gave way to a moister period. At this time the lakes probably reformed. This second Medithermal lake presumably correlates in time with the Transitional Lovelock occupation. The

Early Lovelock deposits in Hidden Cave have a radiocarbon date of 1094 B.C. ± 200 years.

The foregoing observations apply to the Carson Sink area in which Hidden Cave is situated. It is not known whether or not the Humboldt Sink was completely dry during any part of the Medithermal; however, if it did dry completely, it may be expected that the Lovelock population moved closer to water supplies during the drier periods and in so doing more or less abandoned the cave.

Many questions about the various phases of the Lovelock culture still are unanswered. Very little is known of the Late Lovelock phase and of the succeeding prehistoric Northern Paiute (Dune Springs phase, see Grosscup, op. cit., p. 62). The evidence now at hand suggests a decline in the occupation of caves in Late Lovelock times, and a relatively slight use of caves for occupation in prehistoric Northern Paiute times. Most of the upper deposits in Lovelock and Hidden Caves were removed by guano miners, and with these deposits went the evidence of late occupation, if such evidence was present originally. There well could be an abrupt break in the local sequence between Late Lovelock and prehistoric Northern Paiute, but decisive evidence for a break or for a continuum is still lacking. Traits known to be shared by the peoples of the Late Lovelock phase and the historic Northern Paiute tend to be those traits which were widely used throughout the West in historic times. These traits are shown on the accompanying chart (Fig. 10).

Linguistic evidence suggests that the extension of the Northern Paiute, Shoshone, and Ute languages into the areas occupied by speakers of these languages in historic times did not begin to take place until approximately 1000 years ago (Lamb, 1958, pp. 95-100). There is sufficient archaeological evidence available now to indicate that something drastic happened in much of the Great Basin about that time. This statement is particularly true of the southeastern portion of the area, where the evidence for Fremont-Puebloan occupation disappears or is submerged by what is presumably prehistoric Ute occupation (Harrington, 1930, pp. 23-24, 106-126; Wormington, 1955, pp. 186-190). Pendergast and Meighan (1959), in an account of Southern Paiute-Puebloid historical relationships, do not contradict this view. Evidence of Northern Paiute occupation in southeastern Oregon appears as a thin veneer above older and different deposits (Cressman, 1942, pp. 136, 140).

The distribution of the Lovelock culture is still poorly known. Lovelock material occurs in the Honey Lake area at Karlo and perhaps in Tommy Tucker Cave (Riddell, 1956, pp. 44-49). It is clearly present on the eastern shore of Pyramid Lake and around Winnemucca Lake (Orr, 1952,

1956; Roust, 1958). It is well demonstrated by excavations in the Carson Sink area in Hidden Cave and other sites, and, of course, in the Humboldt Sink. The Massacre Lake area cannot be excluded, but the one brief report of excavation records materials which could be quite recent, and hence postdate the Lovelock culture (Heizer, 1942). The southeastern Oregon cave materials are not the same as those of the Lovelock culture, although they are probably related. The Tule Lake-Klamath Lake area has yielded some similar material, but again, on the whole, is different (Cressman, 1942; Heizer, 1942; Squier, op. cit.). Investigations on the Lake Tahoe-Reno area have established the Martis complex (Heizer and Elsasser, op. cit.), which is not Lovelock but probably is contemporaneous with Lovelock, at least in part. The material from Raven Cave in eastern Nevada and Danger Cave in western Utah cannot be classified as Lovelock, although there are many similarities present (Jennings, op. cit.). Sites in southern Nevada also lack evidence of Lovelock occupation.

The southwestern boundary of the Lovelock culture apparently falls somewhere between Pyramid Lake and the Truckee River Canyon. The Washoe-Northern Paiute boundary may well be very close to the Lovelock-Martis boundary. The western boundary is probably near Honey Lake. To the east and southeast, it is expectable that the Late Lovelock boundary is to the west of the "Puebloan" pottery line as plotted by Harrington (1928). The southern boundary may be similarly described, but the relationship of the Lovelock culture to the Pinto complex still needs to be investigated. Shutler has recently found evidence of Pinto occupation in Stuart Rockshelter in southern Nevada, and has obtained radiocarbon dates of 1915 B.C. $\pm$ 250 years and 2095 B.C. $\pm$ 300 years on this material (Harrington, 1957, p. 72). These dates overlap slightly with the postulated time span of the Early Lovelock phase. The northern boundary would presumably be south of the southeastern Oregon caves.

Walker Lake, in central Nevada, lacks known evidence of Lovelock occupation, but no excavations have been made there. Only prehistoric Northern Paiute remains have been recorded from this area. The territory of the Lovelock culture may well extend only a short distance away from the relatively luxuriant environment of the remnant Lahontan lakes.

The beginnings of the prehistory of Lovelock Cave are shrouded in the darkness of geologic time; however, the geological formation in which Lovelock Cave was later formed need not concern us other than to point out that it is a limestone dome and was in existence before the Pleistocene lake, now known as Lake Lahontan, came into being. One or more of this lake's several high water stages eroded away almost half of the above mentioned limestone dome, leaving in the remaining portion a large cave or rockshelter. The receding waters of the last high stage of Lake Lahontan apparently

deposited a layer of lime on the floor of the cave. This deposit probably was laid down about 14,000 years ago, if we assume that it is contemporaneous with the lime layers in Hidden Cave in the Carson Sink area and Fishbone Cave in the Winnemucca Lake area, and that these layers are correctly dated by radiocarbon analysis.

Eventually the waters of the lake sank below the elevation of the cave, and what is now known as Lovelock Cave was exposed to the light of day. This event must have occurred about 11,000 years ago, to judge by radiocarbon dates for dry organic material from the caves in the Winnemucca Lake area and from Leonard Rockshelter. Shortly thereafter the cave would have been available for occupation by terrestrial life.

The shape and size of the cave or shelter opening at this time is not known; therefore it cannot be stated that the cave was immediately available for human, packrat, or bat occupation. The first occupants noted in the cave were bats. Their presence is attested to by the deposits of bat guano. Their occupancy of the cave does not tell us the nature of the cave opening. Sites as dissimilar as Leonard Rockshelter, which is basically a canted dike of rock with small fissures and concavities within it, and Midden Cave, which is a large, multi-chambered cave with a very small opening, supported bat colonies. The radiocarbon dates of the guano layers indicate that this occupation first took place about 6000 years ago.

There appears to be a lapse of time between the exposure of Lovelock Cave by falling water levels and the occupancy of the cave by bats. Presumably the cave was closed during this period, since there are no deep deposits of dust or organic material (guano). Such an interpretation favors the idea that Lovelock Cave, at that time, was really a cave and not a rockshelter, as Harrington (Loud and Harrington, op. cit., p. 120) has suggested. A small opening or a wide but low entrance could easily be closed by a rockslide, brush (especially tumbleweed), a packrat nest, or sand. Later rock falls or fire or decay in the case of brush or rat nests could have reopened the cave. A rockshelter would have been much more difficult to close.

It is estimated that about 4000 years ago (2000 B.C.) man first made use of the cave. Evidence from other sites, such as Leonard Rockshelter, clearly indicate that man was in the area previously.

The cave's first human tenants had few material possessions, to judge by what they lost, discarded, and stored in the cave and which was preserved until this late date. The people of the Early Lovelock culture phase, who may have lived during the period from 2000 to 1000 B.C., had for weapons the atlatl and dart, throwing clubs, and slings. Projectile points of type II were in use, as were hafted stone knives. Pointed wooden foreshafts appear

to have been used commonly on the darts. Nets were used, probably both for hunting and fishing. Large feathers tied with cords may have been used in the construction of drives for rabbits or other animals. Clothing consisted of shredded fiber aprons, birdskin blankets, and fur blankets. Babies were kept in cradles made of hefty notched or grooved sticks. A variety of basketry techniques and forms were present. Plain flexible twined basketry and multi-rod coiled baskets were made. The latter type occurs in both fine and coarse varieties. The forms in which the coarse multi-rod coiled baskets were made include flat trays, water jugs, burden baskets, and a variety of bowls. Many of the latter form were decorated with feathers. 'L' shaped awls made of artiodactyl scapulae were used. Artiodactyl hooves were used for rattles and pendants. Pendants were also made of horn and wood. A wide variety of beads and pendants, made of shells of Olivella, Macoma, and Haliotis, were imported from the Pacific coast or made locally from imported shells. Horn sickles were used, presumably to gather and cut grasses. Other objects reported include a "net stick," a wooden loop, biconical stone and baked clay objects, and shaped sticks with a projecting branch.

During the later part of this period, the cave may have been abandoned or at least occupied less intensively.

In the following Transitional Lovelock culture phase, which is tentatively dated from 1000 to 1 B.C., the cave was occupied extensively to judge by the greater number of specimens deposited at this time. The atlatl and dart were still used, but the bow and arrow were introduced and ultimately completely replaced them. Hafted knives, throwing clubs, and slings are unrecorded for this period, but may well have continued to be used. Projectile points of type II were still in use, but points of type I were also used. Points of type III may also have appeared by this time. The pointed wooden foreshaft appears to be more common than stone points. Nets continued to be used for hunting and fishing. Large quills with attached cords were still in use, presumably in animal drives. Crude knives of slate were used, perhaps to cut grass or rushes like the horn sickles noted for the Early Lovelock phase. The latter are still present in the cultural inventory. Snares were also used to obtain small animals and decoys were used to lure ducks, geese, and other water birds.

Plain flexible twined basketry is rare at this time, and Catlow twined basketry occurs in such limited quantities as to suggest that it was traded from some other group. Coarse multi-rod coiled basketry continues to be made into bowls, water jugs, and flat trays, but burden baskets appear to be made solely with the new technique of wickerwork. Feather decorations are no longer used. Fine multi-rod coiled basketry continued to be made, and fine one-rod coiled basketry appears for the

first time. Twined tule bags make their initial appearance, as do containers made of segments of intestine from some large animal. 'L' shaped scapula awls continued to be used. Definite evidence of grinding tools appears for the first time in the form of hullers, but undoubtedly mortars and pestles and manos and metates were also present.

Cradles are not recorded for this period, but examples from Humboldt Cave suggest cradles similar to the Early Lovelock form but of a lighter construction.

Many of the shell bead and pendant types used in the Early Lovelock phase have apparently gone out of style and only three of the original eight types continue to be used. A new type, the oval Olivella bead, appears for the first time. Horn pendants are still in use, but wooden ones are no longer made. Hoof rattles and pendants continue to be used.

Shredded fiber aprons are not recorded for this phase, but undoubtedly were used. Blankets made of birdskins and of fur continued to be worn. Moccasins and sandals appear for the first time.

Perforated stone objects of unknown utility were present, as were tubular stone pipes and balls made of baked clay and of stone.

During the Late Lovelock phase (1 B.C. to 1000 A.D.), the bow and arrow continued as the major weapon. Knives are not recorded, but may be assumed to have been present. Nets continued to be used, as were snares. Slings are not recorded, but may have been present to judge from the Humboldt Cave occurrence. Decoys were still used to lure waterfowl. Projectile points of type III probably were in use. Pointed wooden foreshafts continued to be used. The boatstone fragment found in the deposits of this phase appears anachronistic if it is interpreted as being an atlatl weight, and if the atlatl ceased to be used during the preceding phase. If these interpretations are correct, and the boatstone was indeed in situ, it may be interpreted, perhaps, as an heirloom used as a charmstone. The large quills with attached cords presumably used for animal drives are reported, but may be from a relic hunter's back dirt.

Coarse, multiple-rod coiled basketry continued to be made into flat trays, bowls, and water jugs. Fine multi-rod and fine one-rod coiling were still practiced. Wicker burden baskets continued to be made, but possibly were declining in frequency. 'L' shaped scapula awls were absent, but may still be a Late Lovelock trait on the basis of the Humboldt Cave occurrences.

Intestine containers were still being used. Twined tule mats were still

being made, and a new variety, made with cordage wefts, was introduced. The looped stirring stick and the wooden fire hearth were present.

No ornaments of shell, wood, horn, or hoof are recorded, but it seems unlikely that some of them were not used by the Late Lovelock people.

Shredded fiber aprons, sandals, moccasins, and fur blankets were still worn. A variety of blanket, made using both fur and feathered skin elements, occurred at this time. Blankets made solely of feathered skin elements are not recorded for this phase, but probably were present, since they were present in the preceding phase as well as in the later historic Northern Paiute culture. A similar argument may be made for stone hullers, stone pipes, and twined tule bags.

Additional traits present are the unique wooden fishhook-like object, the wooden pin, and carved stone art in the form of a ring with two protruding heads.

Here the cultural history of Lovelock Cave ends, except for the recent activities of guano miners, relic hunters, and archaeologists. The evidence at hand suggests that the cave was abandoned by the people of the Lovelock culture. Obviously the bats remained as tenants. Their droppings over a thousand year period created a deposit of guano worthy of recovery by mining operations, and led indirectly to the destruction of much of the information contained in the archaeological deposits.

Knowledge of the prehistory of this area during the next 800 or more years is very meagre. We must turn to historic records to discover what the terminal products of the area were in those artifact categories for which some record was preserved in Lovelock Cave.

The historic Northern Paiute used hunting implements similar to those of the Late Lovelock people. These included the bow and arrow (with pointed wooden foreshafts and with "Desert Side-notched" stone points), nets, and duck decoys. Slings are reported as toys. Matting and twined tule bags were made, but coiled basketry may not have been present. Ethnographic accounts are conflicting on this point. Wicker basketry is not reported. Flat trays, water jugs, burden baskets, and bowls are made with a stiff, diagonal twined technique.

Clothing was much the same, including shredded fiber aprons, moccasins, fur blankets, and birdskin blankets. Some question exists as to the use of tule sandals by the historic Northern Paiute. Stewart (op. cit.) reports the trait for some bands, but not for the band which occupied the area around Lovelock Cave.

Wooden firehearths, looped stirring sticks, and hoof rattles are reported ethnographically. Hullers, mortars and pestles, and manos and metates were all used. A question exists as to whether these were made by the Northern Paiute or were picked up from Lovelock culture sites and reused.

Traits recorded for the historic Northern Paiute but not for the peoples of the Lovelock culture have not been included on the chart. The data are derived from Stewart (op. cit.).

From this summary, it would seem that the historic Northern Paiute differ from the Late Lovelock peoples only slightly more than the latter differ from the Transitional Lovelock peoples. The evidence for the abandonment of Lovelock Cave and other caves formerly occupied by Lovelock peoples, the absence of excavated archaeological sites for the period following this abandonment, the linguistic evidence for a comparatively recent migration of the Northern Paiute into the area, and the marked differences (although limited numerically) between the Late Lovelock culture and that of the historic Northern Paiute, support the theory that the Lovelock people abandoned not only the cave but also the area, and that the Northern Paiute moved into uninhabited land. Of course the latter people may have had something to do with removing the Lovelock people from the area as well.

A similar problem of cultural continuity is apparent when the earlier end of the Lovelock continuum is examined. Little is known of the antecedents of the Lovelock culture. The Humboldt culture, discovered in Leonard Rockshelter, is known to have contained atlatls and darts, netting, stone knives, and Olivella beads. The atlatls are inferred from the occurrence of darts. The darts are composite and are made with a pointed wooden foreshaft and a cane mainshaft. The one specimen with a mainshaft is actually made of two cane sections. This technique is not reported for Lovelock Cave. The dart is feathered tangentially, as was the Lovelock dart. The netting appears indistinguishable from Lovelock netting. The one blade recovered is unique. The Olivella beads are of a very simple type still in use in the historic period.

The Leonard culture, known also to precede the Lovelock culture in Leonard Rockshelter, is known solely from an infant burial in association with fragments of a charred stiff twined basket.

Had any of these finds been made in Lovelock Cave, they would not have appeared out of place. Because of geological association, radiocarbon dating and superposition, it is known that the Humboldt and Leonard materials are much older than the Lovelock materials. While the people who made

these older artifacts may not have been the direct cultural and biological ancestors of the Lovelock people, certainly the cultural antecedents of the Lovelock culture could not have been much different.

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BAE	Bureau of American Ethnology
-B	Bulletins
-R	(Annual) Reports
MAIHF	Museum of the American Indian, Heye Foundation
-C	Contributions
-IN	Indian Notes
-INM	Indian Notes and Monographs
PM	Peabody Museum (of Harvard University)
-P	Papers
SWM	Southwest Museum
-M	Masterkey
-P	Papers
UC	University of California
-AR	Anthropological Records
-PAAE	Publications in American Archaeology and Ethnology
UCAS	University of California Archaeological Survey
-R	Report

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EXPLANATION OF ILLUSTRATIONS

Map 1. Sites with Lovelock Culture Components.

Figure 1. Cross-Section of Cave in Line A-B of Figure 3.

Figure 2. Plan of Lovelock Cave (Loud's Excavations, 1912).

Figure 3. Plan of Lovelock Cave (Harrington's Excavations, 1924).

Figure 4. Diagrammatic Section of Stratigraphic Area, Lot 15.

Figure 5. Typable Points Excavated by Harrington.

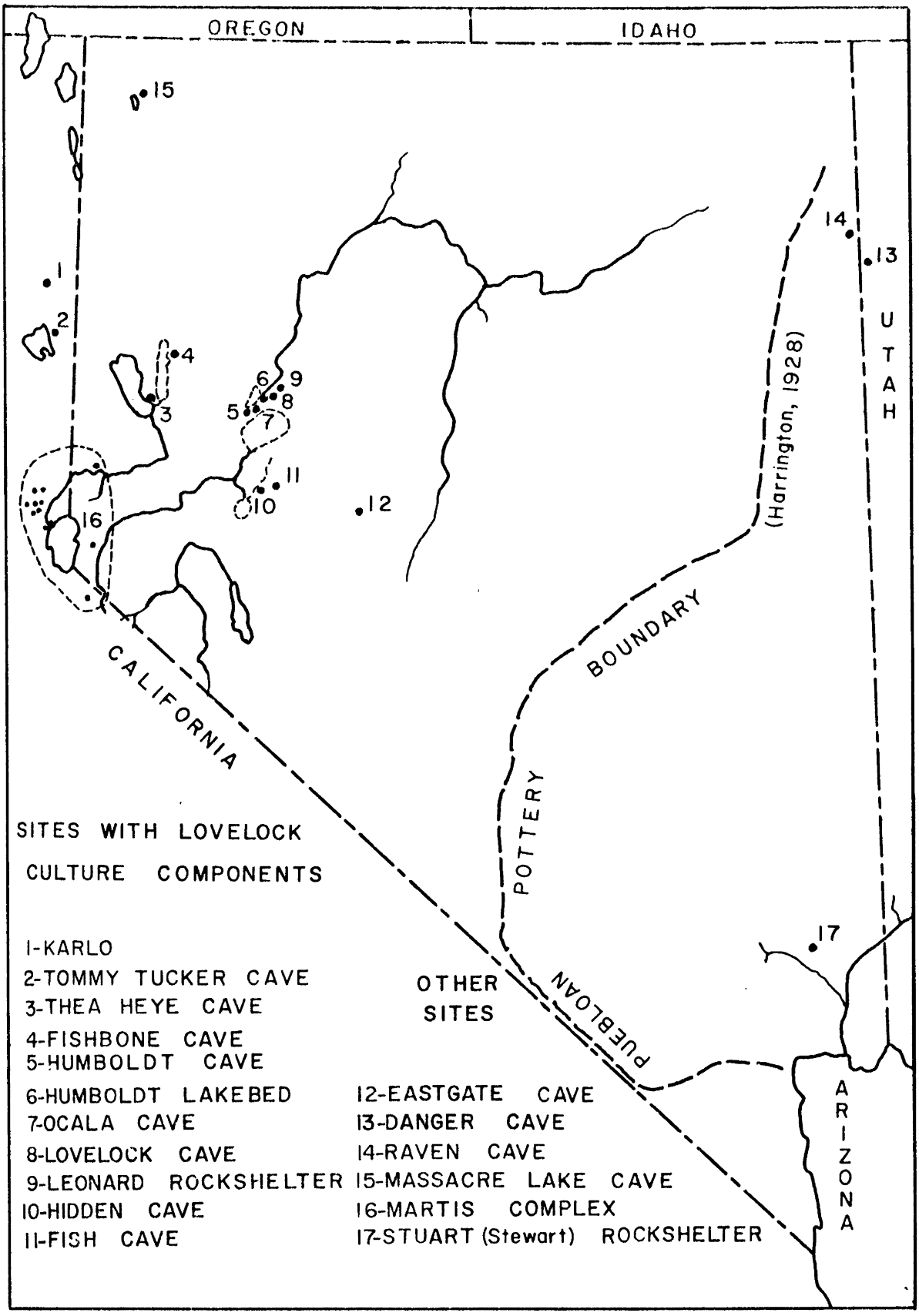
Figure 6. Ideal Point Types.

Figure 7. Bow Fragments.

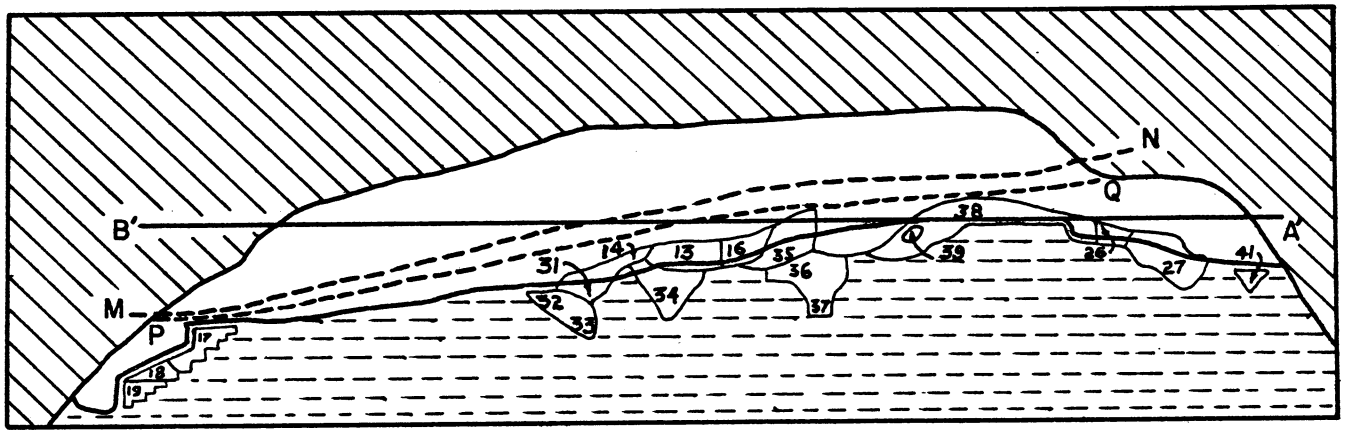
Figure 8. Wooden Pendants.

Figure 9. Detail of Sling.

Figure 10. Chronological Chart.
Squares filled in black represent firm estimates of temporal position of artifacts. Squares with vertical and horizontal lines indicate less and lesser degrees, respectively, of certainty of placement.


OREGON
IDAHO
UTAH
ARIZONA
CALIFORNIA
(Harrington, 1928)
BOUNDARY
POTTERY
PUEBLOAN
SITES WITH LOVELOCK CULTURE COMPONENTS
1-KARLO
2-TOMMY TUCKER CAVE
3-THEA HEYE CAVE
4-FISHBONE CAVE
5-HUMBOLDT CAVE
6-HUMBOLDT LAKEBED
7-OCALA CAVE
8-LOVELOCK CAVE
9-LEONARD ROCKSHELTER
10-HIDDEN CAVE
11-FISH CAVE
OTHER SITES
12-EASTGATE CAVE
13-DANGER CAVE
14-RAVEN CAVE
15-MASSACRE LAKE CAVE
16-MARTIS COMPLEX
17-STUART (Stewart) ROCKSHELTER

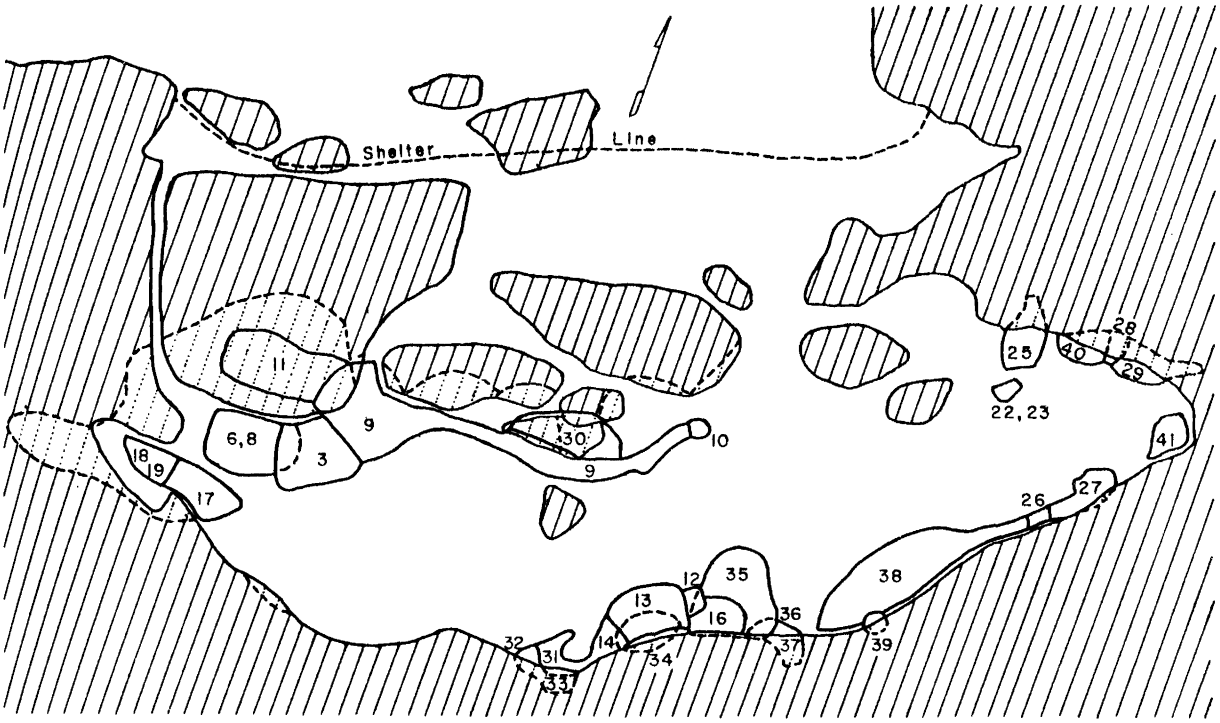
MAP I



CROSS-SECTION OF CAVE IN LINE A-B OF FIGURE 3

Line M-N, probable original level of guano before excavated by Hart and Pugh. Line P-Q, probable original level of guano along the back wall of the cave. From Loud and Harrington, 1929, Plate 3a.

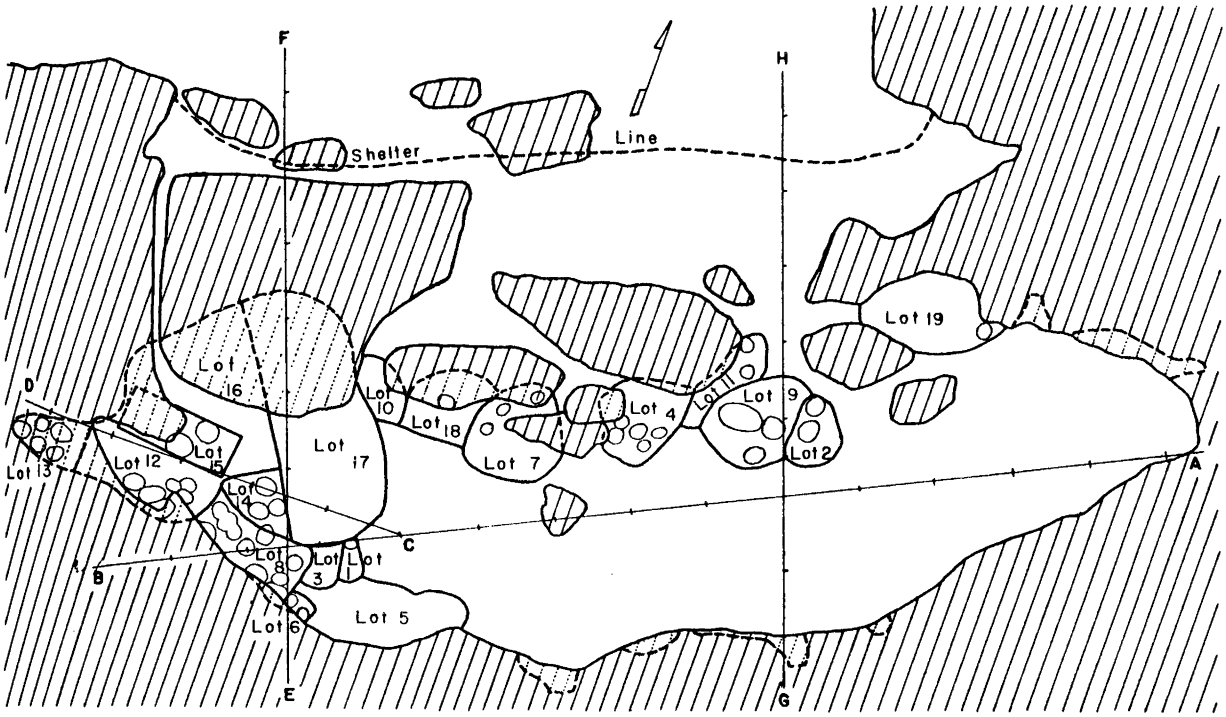
FIGURE I



PLAN OF LOVELOCK CAVE

(Loud's excavations — 1912)

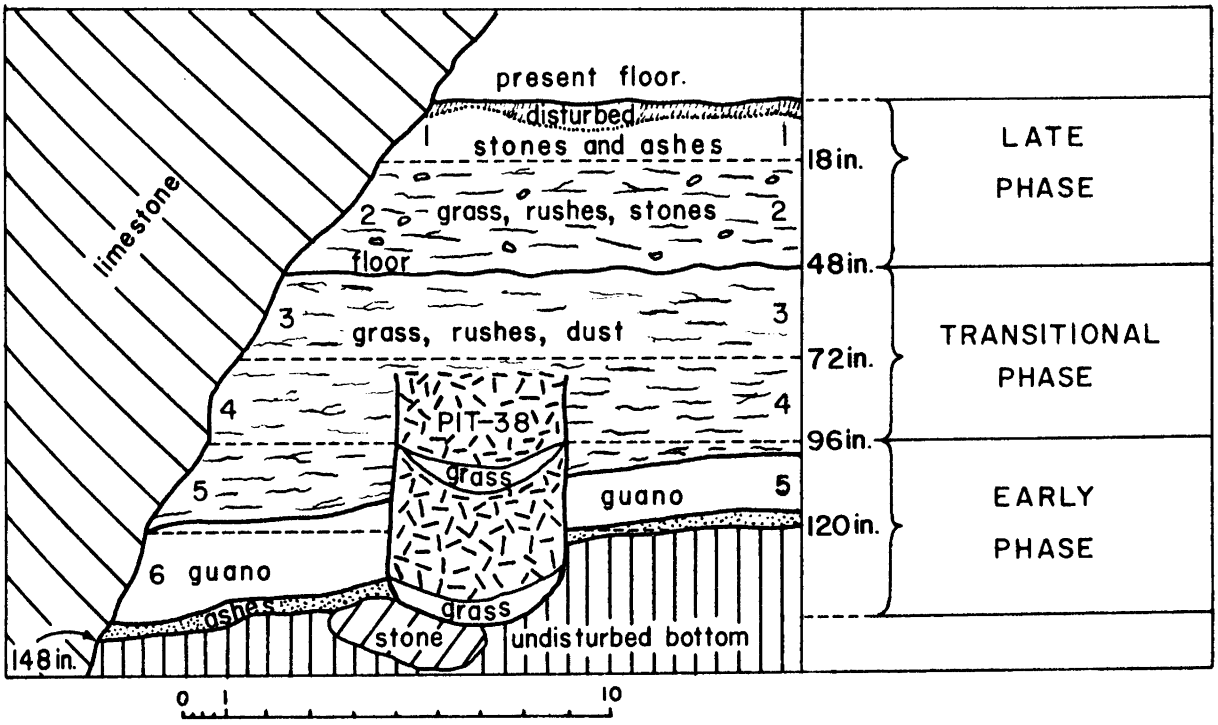
FIGURE 2



PLAN OF LOVELOCK CAVE

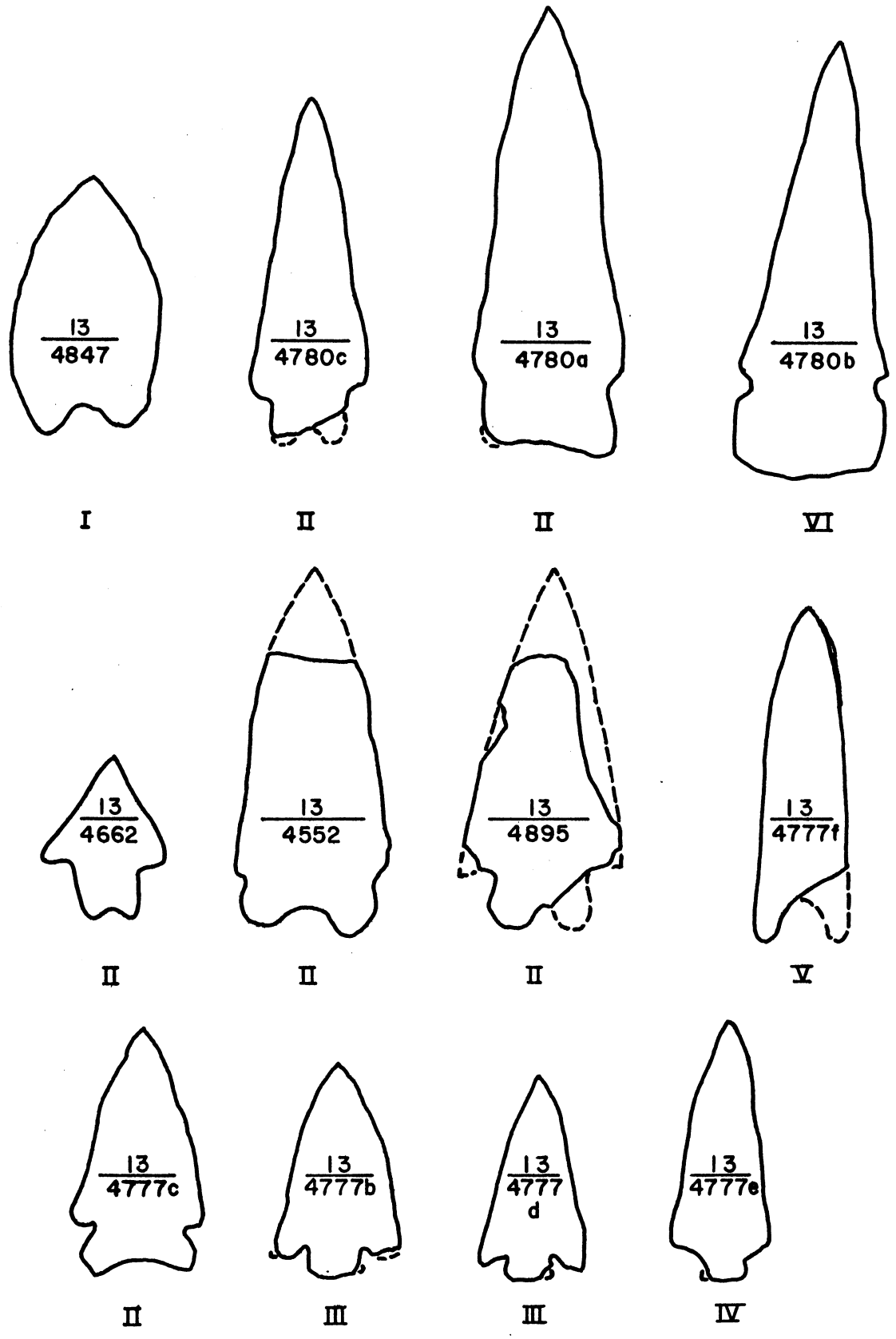
(Harrington's excavations — 1924)

FIGURE 3



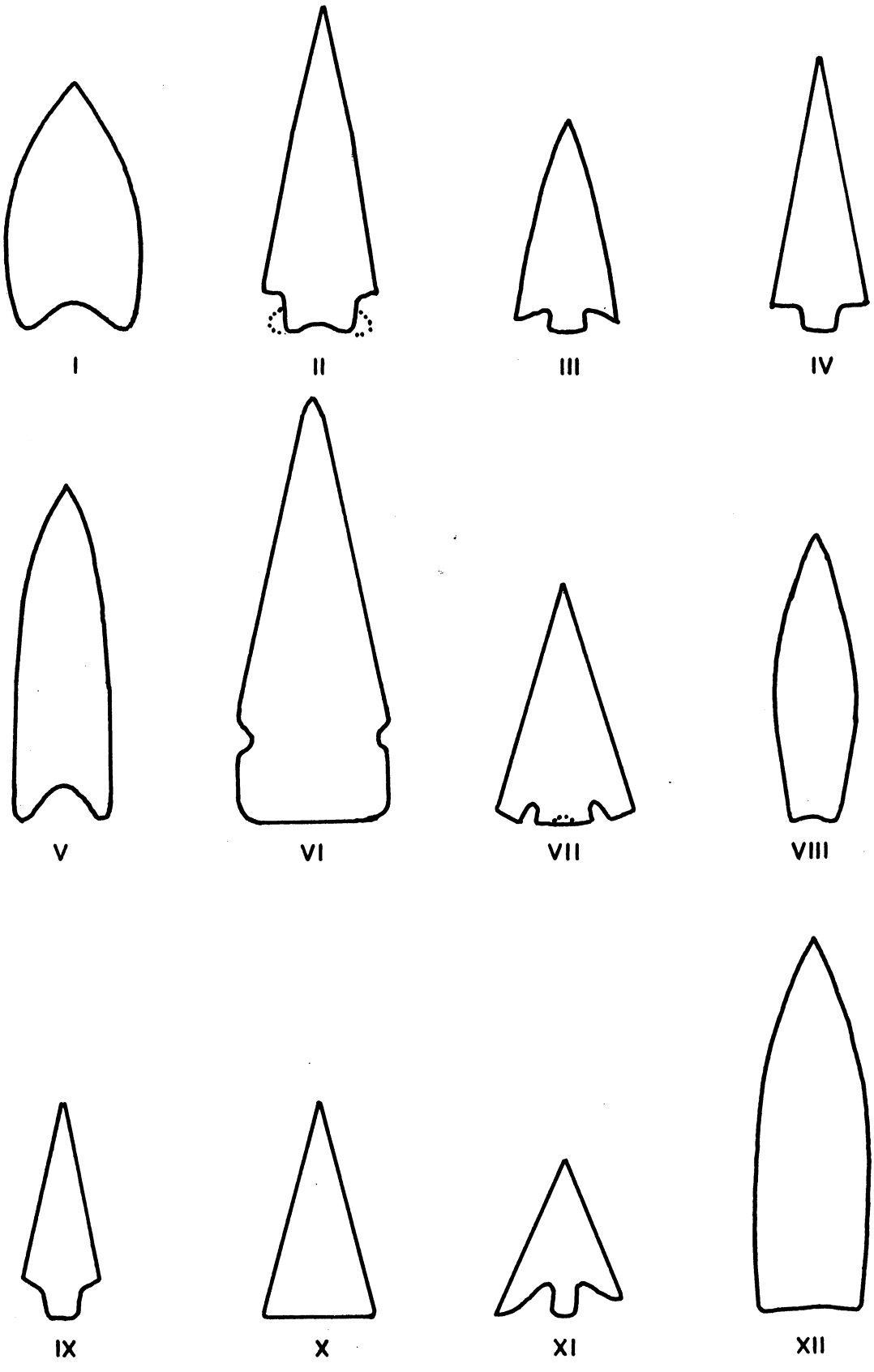
Diagrammatic section of stratigraphic area, lot 15 (after Loud and Harrington, 1929, fig. 5).

FIGURE 4



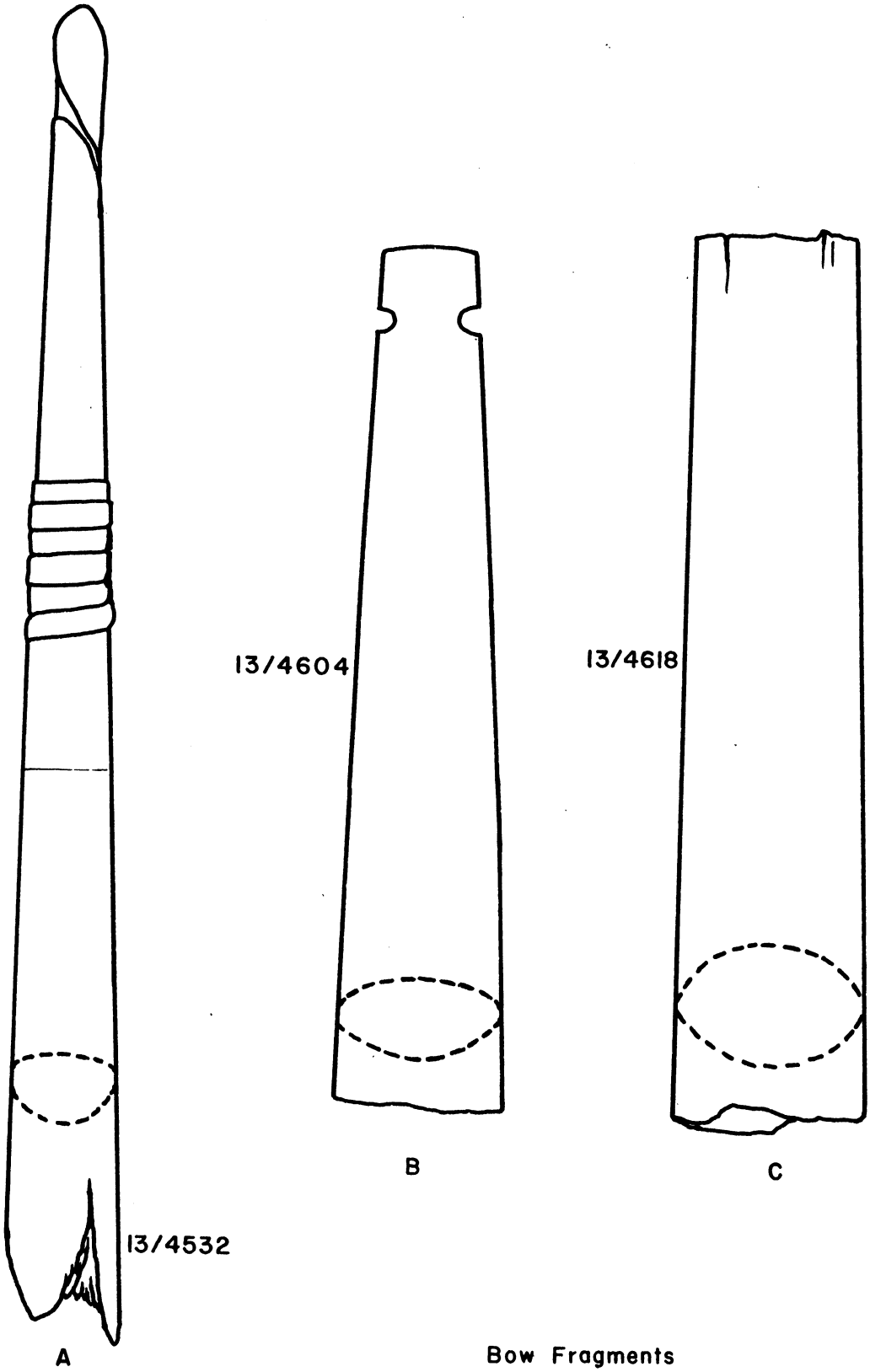
Typable points excavated by Harrington

FIGURE 5



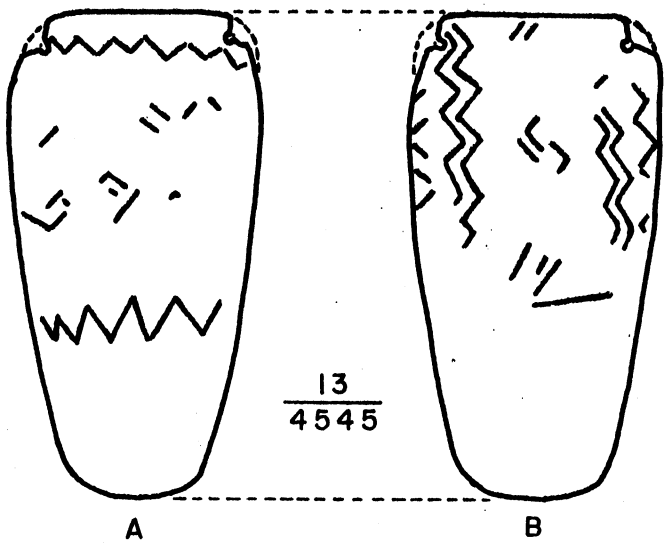
Ideal point types

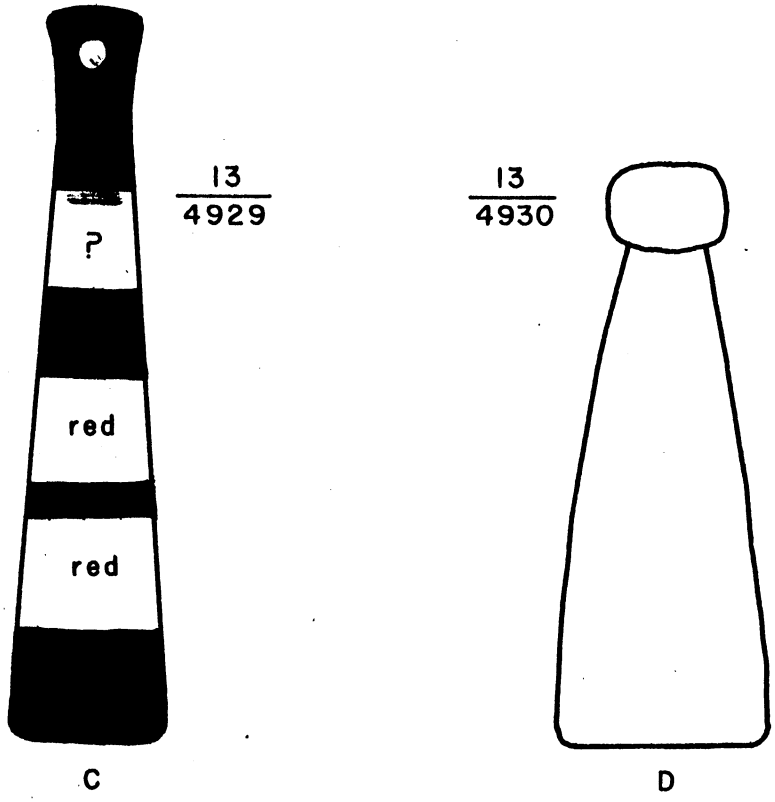
FIGURE 6



Bow Fragments

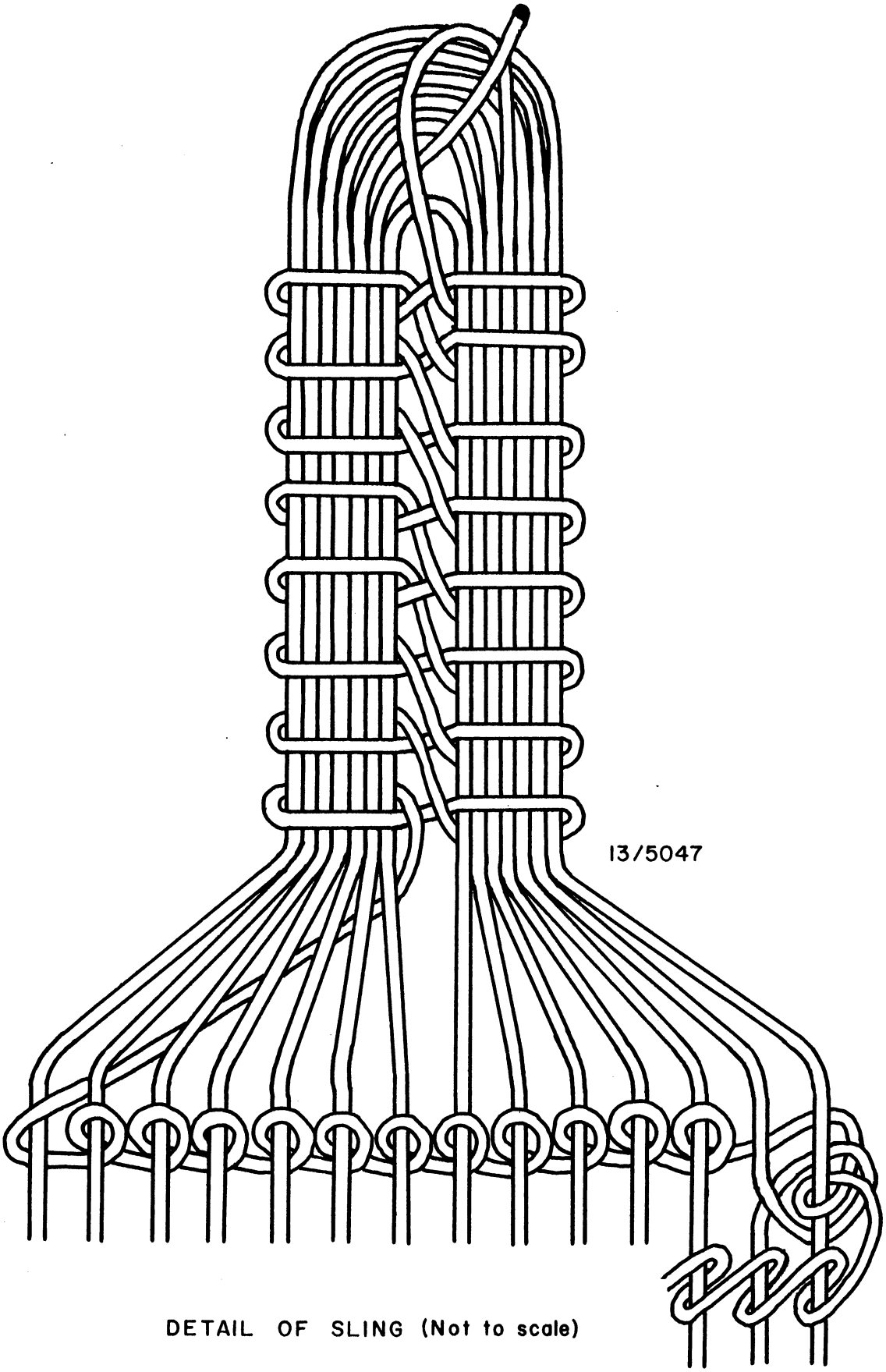
FIGURE 7





Wooden pendants

FIGURE 8



DETAIL OF SLING (Not to scale)

FIGURE 9

Hist. N. Paiute
Late Lovelock
Trans. Lovelock
Early Lovelock
I
II
III
IV
V
VI
Net stick
Cradles
Biconical objects
Wooden loop
Stick with projecting branch
Hafted knife
Throwing clubs
Wooden pendants
Olivella flat disk beads
Olivella thick rectangular beads
Macoma disk beads
Haliotis square beads
Haliotis ornament C(2)1
Coarse feathered coiled basketry
Coarse coiled burden baskets
Projectile point type II
Plain flexible twined basketry
Haliotis ornament C(1)a
Haliotis ornament C(2)
Horn sickles
Horn pendants
Atlatls
Darts
Olivella bead type 1a
'L'-shaped scapula awl
Perforated stones
Stone and clay balls
Catlow twined basketry
Projectile point type I
Slate knife
Olivella oval beads
Wicker basketry
Snares
Projectile point type III
Fine one-rod coiled basketry
Sandals
Intestine objects
Boatstone
Carved stone art
Wooden fishhook(?)
Wooden pin
Mats with cordage wefts
Fur & feather cordage blankets
Stirring stick
Fire hearths
Quills with cords
Coarse coiled water jugs
Fine multiple-rod coiled basketry
Coarse multiple-rod coiled trays
Shredded fiber aprons
Hoof rattles or pendants
Birdskin blankets
Fur blankets
Slings
Moccasins
Hullers
Stone pipes
Twined tule bags
Bows
Arrows
Decoys
2000 A.D.
1500 A.D.
1000 A.D.
500 A.D.
1 B.C.
500 B.C.
1000 B.C.
1500 B.C.
2000 B.C.

FIGURE 10