INTRODUCTION

In 1965 several graduate students in the Department of Anthropology, University of California, Berkeley, instituted what promises to become a long-term archaeological research project concerned with analysis of coprolites, or desiccated human excrement, a type of paleobiological material that is seldom preserved in most of the world's archaeological sites. This report summarizes recent findings made in the course of the continuing research project, and presents three new studies of the palynological, paleo-ornithological, and faunal remains found in the Lovelock coprolites. Lastly, there is offered an interpretation of some of the information that is now available concerning Lovelock Cave and culturally related Great Basin sites.

Lovelock Cave, located at an elevation of 4240 feet a.s.l. on the north flank of the Humboldt Range in Churchill County, Nevada, is a dome-shaped chamber about 160 feet long and 40 feet wide formed in a limestone outcrop (cf. Plate 3). The cave is about 2.5 miles south and some 300 feet above the southeast shore of the now-extinct Humboldt Lake, which was a remnant of ancient Lake Lahontan (Morrison 1961; 1964). The first occupation of the cave by man probably occurred about 2000-3000 B.C. (Heizer 1967). Cultural material, rockfall, aeolian dust, bat guano, rat-nest debris and assorted trash gradually accumulated inside the cave, eventually forming a deposit that was more than fifteen feet thick in the southwest end of the cavern (Loud and Harrington 1929; Grosscup 1960, 1963). Occupation of the interior of the cave apparently came to an end a few hundred years before Caucasian settlement of the Humboldt Valley in the mid-nineteenth century, although the outer rockshelter appears to have been resorted to, perhaps in times of valley flooding or during periods of intense winter cold, until as recently as A.D. 1800. Following the time when man apparently no longer occupied the main cave chamber, a deposit of bat guano varying from three to six feet thick accumulated over parts of the archaeological midden. Removal of the guano for commercial purposes in 1911 led to discovery of the well-preserved archaeological material contained in the underlying powder-dry cultural strata. During 1912, L. L. Loud of the University of California, Berkeley, working unassisted, recovered from the archaeological midden some 10,000 artifacts

made of wood, vegetal fiber, stone, skin, bone, feathers and other materials. The physical remains of the Lovelock population found by Loud included skeletal material, partially mummified bodies preserved by desiccation, human hair, and an incredible amount of desiccated human excrement.[1] Almost all of the perishable material in the cave has survived the passage of time in a quite remarkable state of preservation.[2]

In the period between 1912 and 1924, no provision was made to protect the archaeological material remaining in the cave, and relic collectors dug at random in the deposit. Loud returned to the site in 1924 with M. R. Harrington (then attached to the Heye Foundation), in order to make additional collections and to examine the stratigraphy of the western end of the cave, which Loud had been denied permission to dig in 1912 (Loud and Harrington 1929). At the conclusion of the 1924 field season the site was again abandoned, and destructive digging by relic collectors has continued from that date up to the present time.

In 1950 R. F. Heizer and a field party of Anthropology students from the University of California, Berkeley, collected from the disturbed midden a number of coprolites, most of which were of human origin but of unknown stratigraphic provenience. Fifty-one of these coprolites were analyzed by N. L. Roust, using a dry-dissection technique developed by him (Roust 1967:49-88). In 1958 G. L. Grosscup examined the Lovelock Cave artifact collection made by Harrington in 1924 and now housed in the Museum of the American Indian, Heye Foundation, New York. Grosscup's comprehensive analysis (1960) is the only published modern assessment of Lovelock Cave archaeology.

In 1965 Heizer and another generation of graduate students returned to Lovelock Cave in order to collect coprolites of known stratigraphic provenience. Several score specimens were found in a crevice along the edge of the ancient cave entrance; another accumulation was found in a small undisturbed remnant of refuse located well inside the cave (for these locations see Heizer 1967, Fig. 1). One of the crevice or entrance coprolites (UCLA sample number 1071-E) produced a radiocarbon date of 145 $\pm$ 80 years (Tubbs and Berger 1967:89-92), while a radiocarbon date of 1210 $\pm$ 60 (*circa* A.D. 740) was obtained from a cache or interior specimen (UCLA 1071-F).[3] Twenty entrance and thirty interior specimens were analyzed in 1966 and reported upon by R. Cowan (1967) and R. Ambro (1967).

These fifty coprolites were assigned reference numbers in the order in which they were analyzed. The twenty coprolites from the entrance and the thirty coprolites from the interior were studied at the same time, so that one cannot tell readily by the reference number whether a particular coprolite came from the older interior lot or the younger entrance group. Since it would be confusing to renumber the fifty coprolites, the original number system has been retained and reference to entrance coprolites are prefixed with E- and interior ones with I-. For more ready cross-reference to Ambro (1967) and Cowan (1967) we provide the following list of the coprolite numbers of each lot. Numbers omitted (1-4, 53-54) were incompletely analyzed and were therefore not tabulated by Cowan and Ambro: Interior coprolites (I-) Nos. 5, 6, 7, 8, 9, 13, 14, 15, 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 34, 36, 37, 39, 40, 41, 42, 43, 49, 50, 51, 55. Entrance coprolites (E-) Nos. 10, 11, 12, 16, 17, 18, 19, 23, 29, 31, 33, 35, 38, 44, 45, 46, 47, 48, 52, 56.

The coprolites were processed by the trisodium phosphate (NA_3PO_4) rehydration method developed by Callen and Cameron (1960). Preliminary analysis of the major food items contained in the ancient excrement revealed the broad outlines of the Lovelock subsistence economy as it was manifested during the time when the coprolites were deposited. The homogeneous dietary pattern exhibited by the constituents of these two groups of coprolites is of no small interest in view of the fact that the radiocarbon dates obtained from sample specimens indicate that the entrance coprolites date circa A.D. 1800, while the interior specimens evidently were deposited about 1000 years earlier - - approximately A.D. 740.

Ambro and Cowan, who were chiefly responsible for the analysis of the fifty coprolites, worked with the help of volunteer undergraduate laboratory assistants and prepared over 600 microscope slides of individual food items. Most of the coprolite constituents were identified as to general class (that is, as seeds, plant remains, feathers, etc.). Generic and specific identifications were to be completed during future phases of the Lovelock project, and because of this a relatively high percentage of the gross coprolite constituents remained unidentified. Dietary reconstruction through coprolite analysis ultimately depends, of course, on accurate identification and reliable quantification of as many food items as possible. To date about 80% of the items mounted in 600 microscope slides have been identified by various specialists in the biological

sciences. Earlier, fish bones, mostly those of Tui Chub (Siphateles bicolor), were examined and described by Follett (1967), two coprolites were checked for viable pathogens (Tubbs and Berger 1967), and occlusion-impressions in masticated vegetal "quids" were studied by Turner (1967). During 1968 the Lovelock Research project was continued by Napton with minimal funds secured by Heizer, and this phase of the project resulted in identification of samples of mammal hair, pollen grains, and feathers contained in the coprolites. Studies of plant remains, seeds, shells, insects, human hair, osseous material, and many other items found in these coprolites have been completed and reports of the findings are now in preparation. Preliminary interpretation of the lacustrine subsistence adaptation manifested in Lovelock Cave is set forth in the concluding section of this publication. We wish to thank the Wenner-Gren Foundation for Anthropological Research for their generous support of this project, and express once more to Dr. Sanford Elberg, Dean of the Graduate Division at Berkeley, appreciation for his interest and support in providing the means of instituting this program in 1965.

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NOTES

[1] The Lovelock collections housed at Berkeley include some 2000 human coprolites. Coprolites were found in abundance in the cave during the excavations of 1912 by L. L. Loud, who remarked (1929:35);

> The human excrement in the cave reveals, on the part of the ancient inhabitants, an incredibly coarse diet of seeds, hulls, and tough plant fibers. Some of the excrement was over 2 inches in diameter.

Loud's brief observation of the contents of this ancient excrement marks the beginning of Lovelock Cave coprolite investigations.

[2] The basic reports on Lovelock Cave are by Loud and Harrington (1929) and Grosscup (1960). Additional studies of materials from the cave include an examination of a sling pocket (Heizer and Johnson 1952:139-147), and description of projectile points recovered in 1965 from the guano miner's dump (Clewlow 1968a:89-101). Orchard (1925:187-190) has described porcupine quillwork displayed in some of the Lovelock minor crafts. Baumhoff and Heizer (1958:49-59) studied the relationship between prehistoric Lovelock Cave and recent California Indian basketry. Jones et. al. (1967:123-128) have analyzed a wooden effigy found in Lovelock Cave. Skeletal remains were studied by Kennedy (1959), Gifford (1926) and Wyman and Boyd (1937).

[3] Tubbs and Berger (1967) note that the interior coprolite UCLA 1071-F produced a radiocarbon age of 1210 $\pm$ 60, which gives a historical age of either A.D. 880, A.D. 800, or A.D. 680. An approximate historical date of A.D. 740 may be obtained by subtracting the radiocarbon age from the present date, where "present" is assumed to be A.D. 1950 (Deevey, Flint and Rouse 1967). By the same means the entrance coprolite UCLA 1071-E can be assigned an approximate historical date of A.D. 1800.