IV.

Fish Remains from Human Coprolites and Midden Deposits Obtained During 1968 and 1969 at Lovelock Cave, Churchill County, Nevada

W. I. Follett

INTRODUCTION

This is a report on fish remains obtained from human coprolites and midden deposits collected during 1968 and 1969 at Lovelock Cave, Churchill County, Nevada. These were collected since the publication of an analysis of fish remains from the human coprolites and midden deposits collected during June 1965 in other parts of the cave (see Follett 1967:93-116).

Lovelock Cave (site NV-Ch-18), situated in a limestone outcrop of the West Humboldt Range (see Heizer and Napton 1969, figs. 3, 4) at about 4,240 feet (1,292 m.) above sea level, is some two miles east of the bed of Humboldt Lake (the terminus of the Humboldt River) and 15 miles south-southwest of the town of Lovelock.

The present collections of coprolites comprise two series of 15 each: the "AN" series, collected during September 1968 and May 1969 in Lovelock Cave, at grid locations S10/W50 and S10/W55 (see Heizer and Napton, fig. 9, this volume), and the "LX" coprolite series collected during 1968-1969 by members of a University of California archaeological field party (see Heizer and Napton, fig. 9, this volume), at grid location NS0/W30. Identification numbers are those assigned by the Lovelock Coprolite Analysis Project, Department of Anthropology, University of California, Berkeley. (The collections are deposited in the Lowie Museum of Anthropology on the Berkeley campus.)

Each coprolite of these two series was divided approximately into halves: one half was retained intact for possible future pollen analyses, radiocarbon determinations, or for other studies; the other half was rehydrated (see Heizer and Napton 1969:566), and the fish remains and other constituents were segregated for study and analysis.

Radiocarbon dates obtained by the University of California at Los Angeles and by Isotopes, Inc., Westwood, New Jersey, are approximately A.D. 1800 to 2740 B.C. for the "AN" series of coprolites and approximately A.D. 700 to A.D. 50 for the "LX" series.

The "AN" coprolites were found in three separate stratigraphic horizons, the characteristics of which are described in the article by Heizer and Napton (this volume). Coprolites AN 1-5 came from the surficial debris in the AN test unit. According to Napton (personal communication, March 1970), all of these specimens are approximately equivalent in age and composition to the "Entrance" coprolite series analyzed by Ambro (1967:37-47) and Cowan (1967:21-35). Fish bones found in these coprolites were studied by Follett (1967:93-116). A sample entrance coprolite gave a radiocarbon age of A.D. 1805±80 (UCLA-1071-E; Tubbs and Berger 1967:89-98). Coprolite AN-6, found in a level 48 to 56 inches below the surface, is of unknown age. Coprolites AN 7-10, from a depth of 72 inches, probably were deposited in the midden circa 1000 B.C. (Napton personal communication, March 1970; see Heizer and Napton, this volume). Radiocarbon analysis of

a sample of vegetal material (AN-16), consisting of fragments of Scirpus sp. and Typha sp., from the same depth, produced a date of 2740 B.C. ±110 (I-3962; Buckley, personal communication to Napton, January 1969). Coprolites AN 11-15 came from a layer of guano and midden trash, at a depth of 84 inches. Napton (personal communication 1970) suggests that these coprolites might have been deposited prior to 1500-2000 B.C.

The "LX" coprolites range in age from about A.D. 700 to A.D. 50. Coprolites LX 1-3, which were found in the disturbed surface debris, may be approximately equivalent to the "Interior" coprolites analyzed in 1967 (see Cowan, Ambro, Follett, and Tubbs and Berger, cited supra). Coprolites found at a depth of 24 to 36 inches in the LX test unit may date from about A.D. 600, while coprolites LX 7-9, from 36 to 48 inches deep, may have been deposited in the midden circa A.D. 500. Coprolites LX 10-12, found 48 to 60 inches below the surface, are bracketed by two radiocarbon determinations: coprolite LX-10 has a date of A.D. 480±90 (I-3963; Buckley, personal communication to Napton, March 1969); and coprolite LX-16 has a date of A.D. 350±50 (UCLA-1418; Berger, personal communication to Napton, 1968). Coprolites numbered LX 13-15, found at a depth of 58 to 72 inches below the surface of the test unit, may date from about the first century A.D. Vegetal material (LX-56), consisting of saltgrass (Distichlis cf. spicata) and cattail (Typha cf. angustifolia) found in association with the coprolites, yielded a date of A.D. 50±60 (UCLA-1417; Berger, personal communication to Napton, 1968). This sample of vegetal material was found at a depth of 56 inches below the surface. According to Napton, who provided the information discussed in the preceding paragraphs, an empty cache pit was found at this depth in the north profile of the LX test unit, and its presence suggests that some mixing of the deposits probably occurred in prehistoric times, even though there had been no disturbance of this small segment of the original cave deposit during the modern era (see Heizer and Napton, this volume).

Baumhoff and Heizer (1965:702) noted that "the earliest radiocarbon date for human occupation of Lovelock Cave is 1218 B.C." Vegetal material from the "AN" unit taken at a depth of 78 inches has yielded a date of 2740 B.C. ±110 years (I-3962; discussed supra). This represents the oldest date yet obtained at Lovelock Cave from probably cultural material. Cultural dates older than 1218 B.C. are provided by radiocarbon dates of human remains, which date 1420 B.C. ±100 (I-4758) and 1450 B.C. ± (UCLA-1459-C; Berger, personal communication to Napton, 1969).

FISH REMAINS

More than 5,800 remains, representing at least 98 fish, were recovered from 14 coprolites (eight coprolites of the AN series; six of the LX series).

Forty-seven remains, representing at least seven fish, were obtained directly from midden refuse in an auxiliary part of the Lovelock rockshelter.

These remains were from two stations, one of which is the "WA" (West Alcove), grid location S15/W100, depth 10 to 11 feet, sample 46:1029. The approximate age of this stratigraphic level is indicated by radiocarbon dates of sample coprolites. Coprolite WA-20-A produced a date of A.D. 300±60 (UCLA-1459-B; Berger, personal communication to Napton, 1968), and coprolite WA-21 gave a date of A.D. 120±60 (UCLA-1459-A; Berger, personal communication, 1970).

The other locus from which fish-bone samples were obtained is WA grid location S10/W95, surface to 12 inches deep, sample 46:1044. The approximate age of the deposit containing these bones is probably not much later than A.D. 1805, and not earlier than A.D. 1430, according to Napton (person communication, 1970). These dates are based on the radiocarbon date of the entrance coprolites and on a radiocarbon determination of a layer of seeds (Scirpus cf. robustus) found at a depth of seven inches in the West Alcove test unit, grid location S10/W95. The radiocarbon age of this seed sample (82:1577) is A.D. 1430±95 (I-4672; Buckley, personal communication to Napton, 1970).

I wish to express my appreciation to Mrs. Lillian J. Dempster, of the California Academy of Sciences, for assistance with the manuscript; to Mr. Maurice C. Giles, of the California Academy of Sciences, for enlargements of the photographs; to Dr. Robert F. Heizer, of the University of California, for permission to report on these fish remains; to Dr. Robert R. Miller, of the University of Michigan, for literature references; and to Mr. Lewis K. Napton, of the University of California, for archaeological data.

FISHES REPRESENTED

Fishes of two families, three genera, and three species are represented in the present collections of coprolite and midden materials: tui chub, Tahoe sucker, and cui-ui. The size attained by these species, and archaeological sites at which their remains have been collected, were noted by Follett (1967: 95).

The fish remains from the coprolites are those of the tui chub (see p. with the exception of a quadrate of the Tahoe sucker (pl. 3; see p.). A few remains of the cui-ui (see p.) were found in the midden material, but none in the coprolite material.

Many of the numerous skeletal elements recovered from the coprolites are identifiable to species with reasonable certainty, but since the lower pharyngeals are the most distinctive, they have been selected as the basis for identification and measurement of the coprolite material. However, since no pharyngeal of a Tahoe sucker was found, a quadrate of that species was used (pl. 3); for comparison, a quadrate of a tui chub is illustrated (pl. 4).

In this paper, "length" of fish indicates total length (straight-line measurement from tip to snout to end of longest caudal ray). Weight of fish

is computed from length of fish, as determined from length of pharyngeal (or quadrate). The weights are necessarily estimates, since fish (of the same species) of identical length may differ considerably in weight.

Minnows -- Cyprinidae

Tui chub, Gila (Siphateles) bicolor (Girard)

This chub (see Follett, 1967, pl. 5), known to the Northern Paiute as "tui-pagwI" (Loud and Harrington 1929:156), is a palatable food fish although it is bony (Kimsey 1954:406).

Coprolite Material: 144 pharyngeals (32 complete, 112 incomplete; pls. 1, 2), ranging from 3.1 to 9.1 mm. in length (measured as by Uyeno 1961:332, fig. 1A), representing at least 97 fish about 45 to 130 mm. in length and perhaps 0.7 to 20.8 g. in weight (total weight of fish, perhaps 471 g.). One hundred twenty-five pharyngeals were taken from seven coprolites of the AN series and 19 from six coprolites of the LX series (table 1).

Characteristic remains of this species (basioccipital, cleithrum, pharyngeals, preopercle, ribs, vertebrae) from Lovelock Cave coprolites were illustrated by Heizer and Napton (1969, fig. 6, middle row, middle group).

Midden Material: Three pharyngeals (two complete, one incomplete), 16, 18, and 24 mm. in length, representing three fish about 22, 25, and 32 cm. in length and perhaps 140, 190, and 350 g. in weight; WA Sample 46:1029. Four vertebrae (incomplete, two of the Weberian series articulated); WA Sample 46: 1044.

Suckers -- Catostomidae

Tahoe sucker, Catostomus tahoensis Gill and Jordan

This sucker (see Snyder 1917, fig. 1, as Catostomus arenarius) was known to the Northern Paiute as "awago" (Loud and Harrington 1929:156).[1]

Coprolite Material: One quadrate (incomplete, pl. 3), 8.4 mm. in length, representing a fish about 21 cm. in length and perhaps 120 g. in weight, from coprolite AN-11.

Midden Material: None.

Cui-ui, Chasmistes cujus Cope

This sucker (see Snyder 1917, fig. 2) was known to the Northern Paiute as "kuyui."[2] It formerly constituted the principal food-supply of the Northern Paiute of the Pyramid Lake region (Powers 1877:449), the most widely known band

among all the Northern Paiute (Stewart 1939:138); they were known as the Kuyui-dika (Kroeber 1925:584).[3]

Coprolite Material: None.

Midden Material: Two cleithra[4] (one incomplete, representing a fish about 55 cm. in length and perhaps 1.8 kg. in weight; one fragment, articulated with scapula, coracoid, and mesocoracoid); one pelvic fin (incomplete, identification to species doubtful); WA Sample 46:1029. Thirty vertebrae (seven precaudal, incomplete; 23 caudal, one complete, 22 incomplete), representing fish to about 61 cm. in length and perhaps 2.5 kg. in weight; three hypural fans (incomplete); one pelvic fin (incomplete; identification to species doubtful); WA Sample 46:1044.

DISCUSSION

All three species recognized in the present collections, tui chub, Tahoe sucker, and cui-ui, were represented in the fish remains obtained from coprolites and midden deposits collected at Lovelock Cave during 1965. The Lahontan speckled dace, Rhinichthys osculus robustus Rutter, of which five pharyngeals were found in the 1965 collections (Follett 1967:96), was not recognized in the present material.

Remains of the Lahontan cutthroat trout, Salmo clarkii henshawi Gill and Jordan, were not found in the present collections, nor in those of 1965, nor in the yet earlier collections recorded by Loud and Harrington (1929) from Lovelock Cave. The absence of this trout from the two earlier collections was discussed by Follett (1967:101), who concluded that possible explanations of this absence would be conjectural. The same conclusion applies as well to the absence of this fine trout from the present collections.

Fewer fish remains were recovered from the present collections (both of coprolites and of midden materials) than from the 1965 collections. In the present collections, about 97 tui chubs and one Tahoe sucker are represented in 14 half-coprolites, and about three tui chubs and three cui-ui in midden materials; in the 1965 collections, about 298 tui chubs, five Lahontan speckled dace, and three Tahoe suckers are represented in 29 whole coprolites, and about 22 tui chubs, seven Tahoe suckers, and eight cui-ui in midden materials. The fishes represented in the present collections are intermediate in size between the largest and the smallest represented in the 1965 collections.

More than six times as many pharyngeals were recovered from the AN series of the present collections as from the LX series (125 from the AN series, 19 from the LX series). Similarly, in the 1965 collections 458 pharyngeals were recovered from the entrance lot (situated near the AN unit and of comparable age to AN coprolites 1-5) and only 24 from the interior lot, which was located in the vicinity of the LX unit. (The interior coprolites are of about the same age as the latest of the LX coprolites.)

Possibly this difference in number of pharyngeals reflects a seasonal difference in the occupation of the sites (see Napton 1969:28-97). The AN location, and the entrance location, may have been occupied at a season, perhaps late summer or early fall, when small tui chubs were readily obtainable in the receding pools of the Humboldt Sink. In contrast, the LX location, and the interior location, may have been occupied during a season, perhaps winter, when tui chubs were difficult to obtain, or when the Lovelock Cave people resorted to scanty supplies of fish that they had dried and stored in the interior of the cave.

Remarkable numbers of pharyngeals of the tui chub were recovered from two coprolites of the 1965 collections: 123 from one, 101 from another (Follett 1967:95, table 2, pl. 1). The 45 pharyngeals recovered from half-coprolite AN-2 of the present collections (table 1) may represent an abundance approaching that of the 101 pharyngeals from a whole coprolite of the 1965 collections.

The presence of a considerable number of pharyngeals (32 of 144) bearing a complete series of teeth (which are readily dislodged from the arch) is convincing evidence that at least the heads of these fish had been swallowed whole. The 1965 coprolite material supported the same conclusion (Follett 1967:100).

The fishes represented in the present collections, like those of the 1965 collections (see Follett 1967:99-101), were probably taken in Humboldt Lake or in the lower Humboldt River (tui chubs, especially the smaller ones, and Tahoe sucker) and in Pyramid Lake, Winnemucca Lake, or the lower Truckee River (tui chubs, especially the larger ones, and cui-ui).

The conclusion expressed by Follett (1967:100), rejecting the possibility that the cui-ui represented at Lovelock Cave could have been taken at a time when a high stage of Lake Lahontan had extended the range of the species to the vicinity of Lovelock Cave, is further supported by Morrison (1965, table 1 and fig. 4-D), who indicated that the last stage of Lake Lahontan occurred more than 10,000 years before the present. As noted on page , <u>supra</u>, this was long before the earliest known human occupation of Lovelock Cave.

Table 1

Weight of Remains and Size of Pharyngeals and of Fish Represented in Coprolite Material of Tui Chub, Gila (Siphateles) bicolor

Coprolite	Total remains	Pharyngeals		Fish represented by pharyngeals			
						Weight (g.)	
No.	Weight (g.)	Number	Length (mm.)	Number	Length (mm.)	Range	Total
AN Series (A.D. 1800 to 2740 B.C.)							
AN-1	0.90	23	3.1-6.0	15	45-86	0.7-6.3	33.1
AN-2	0.54	45	3.2-7.3	29	46-105	0.8-11.6	86.2
AN-6	0.01	1	4.2	1	61	1.8	1.8
AN-7	0.14	9	4.2-6.3	7	61-91	1.8-7.6	32.0
AN-8	0.52	4	4.1-8.7	4	59-124	1.7-18.4	36.9
AN-9	0.58	11	5.4-7.7	9	78-110	4.3-13.1	69.0
AN-10	1.64	32	4.7-9.1	18	68-130	2.7-20.8	124.6
Total	4.33	125		83			383.6
LX Series (A.D. 700 to A.D. 50)							
LX-3	0.23	1	4.7	1	68	2.7	2.7
LX-6	0.02	1	5.3	1	77	4.2	4.2
LX-7	0.66	5	5.1-8.1	3	74-116	3.7-15.2	34.1
LX-9	0.02	4	4.5-6.5	4	65-94	2.3-8.4	19.7
LX-11	0.21	4	3.6-4.3	2	52-62	1.2-1.9	3.1
LX-14	0.12	4	5.5-7.6	3	80-109	4.8-12.8	23.9
Total	1.26	19		14			87.7

Table 2

Fish Remains in Midden Materials (WA = West Alcove)

Species	No. of fish represented	Skeletal element	No. of elements
WA Sample 46:1029 (depth 10-11 feet, approximate age A.D. 300)			
Tui chub (Gila bicolor)	3	Pharyngeal	3
Cui-ui (Chasmistes cujus)	1	Cleithrum	2
		Pelvic fin	1
WA Sample 46:1044 (depth 0-12 inches, approximate age A.D. 1805 to A.D. 1430)			
Tui chub (Gila bicolor)	1	Vertebra	4
Cui-ui (Chasmistes cujus)	3	Pelvic fin	1
		Hypural fan	3
		Vertebra	30

End Notes

1. This name was spelled "awagu" by Stewart (1941:425).

2. Anthropologists usually spell this name "kuyui" (see Kroeber 1925: 584); ichthyologists now follow Snyder (1917:50) in spelling the name "cui-ui" (see American Fisheries Society 1960:17). Cope (1883:149), who published the original description of this species, spelled the name "couia".

3. The name of the "cui-ui eaters" was spelled "kuyui-tekade" by Loud and Harrington (1929:153) and "kuyui-dökädö" by Stewart (1941:363).

4. A cleithrum of the cui-ui was illustrated by Follett (1967,pl. 2).

Explanation of Plates

Plate 1 Right lower pharyngeal, dorsal (occlusal) aspect, length 5.5 mm., of tui chub (Gila bicolor); representing a fish about 80 mm. in length and perhaps 4.8 g. in weight; from coprolite AN-2.

Plate 2 Ventromesial aspect of right lower pharyngeal shown in Plate 1.

Plate 3 Right quadrate, lateral aspect, length 8.4 mm., of Tahoe sucker (Catostomus tahoensis); representing a fish about 21 cm. in length and perhaps 120 g. in weight; from coprolite AN-11.

Plate 4 Right quadrate, lateral aspect, length 4.0 mm., of tui chub (Gila bicolor); representing a fish about 85 mm. in length and perhaps 6 g. in weight; from coprolite AN-10.

Plate 1

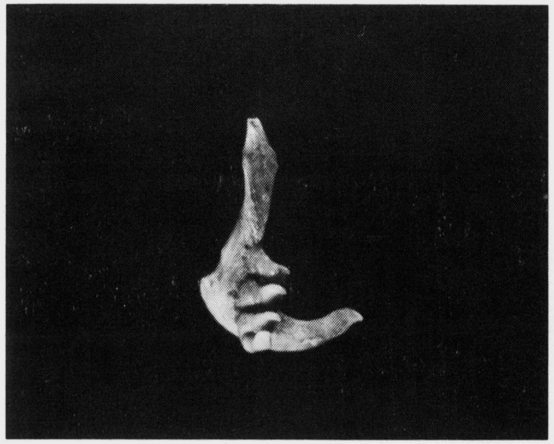

Plate 2

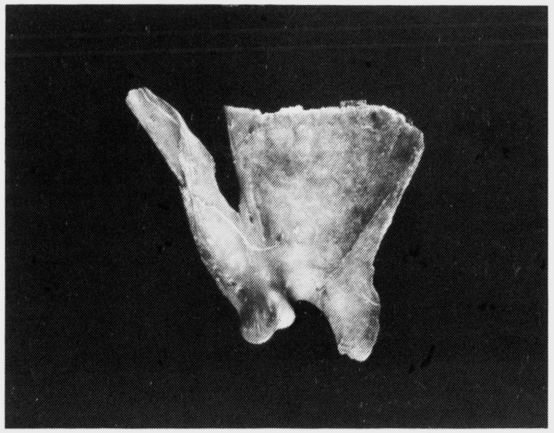

Plate 3

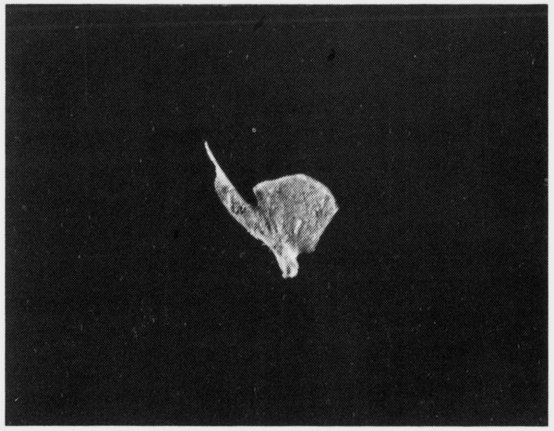

Plate 4

Bibliography

Ambro, Richard D.
1967 Dietary - Technological - Ecological Aspects of Lovelock Cave Coprolites. Univ. Calif. Archaeological Survey, Report 70: 37-47. Berkeley.

American Fisheries Society, Committee on Names of Fishes
1960 A List of Common and Scientific Names of Fishes from the United States and Canada. 2nd ed. Amer. Fisheries Soc., Spec. Publ. 2.

Baumhoff, Martin A. and Robert F. Heizer
1965 Postglacial Climate and Archaeology in the Desert West. In The Quaternary of the United States; a Review Volume for the VII Congress of the International Association for Quaternary Research. Princeton Univ. Press. Pp. 697-707.

Cope, E.D.
1883 On the Fishes of the Recent and Pliocene Lakes of the Western Part of the Great Basin, and of the Idaho Pliocene Lake. Proc. Acad. Nat. Sci. Philadelphia 1883:134-166.

Cowan, Richard A.
1967 Lake-margin Ecologic Exploitation in the Great Basin as Demonstrated by an Analysis of Coprolites from Lovelock Cave, Nevada. Univ. Calif. Archaeological Survey, Report 70:21-35. Berkeley.

Follett, W. I.
1967 Fish Remains from Coprolites and Midden Deposits at Lovelock Cave, Churchill County, Nevada. Univ. Calif. Archaeological Survey, Report 70:93-116. Berkeley.

Heizer, Robert F. and Lewis K. Napton
1969 Biological and Cultural Evidence from Prehistoric Human Coprolites. Science 165:563-568.

Kimsey, J. B.
1954 The Life History of the Tui Chub, Siphateles bicolor (Girard), from Eagle Lake, California. Calif. Fish and Game 40:395-410.

Kroeber, Alfred L.
1925 Handbook of the Indians of California. Bur. Amer. Ethnol., Bull. 78.

Loud, Llewellyn L. and M. R. Harrington
1929 Lovelock Cave. Univ. Calif. Publs. Amer. Archaeol. and Ethnol. 25:1-183.

Morrison, Roger B.
1965 Quaternary Geology of the Great Basin. In The Quaternary of the United States; a Review Volume for the VII Congress of the International Association for Quaternary Research. Princeton Univ. Press. Pp. 265-285.

Napton, L. K.
1969 The Lacustrine Subsistence Pattern in The Desert West. Kroeber Anthro. Soc., Spec. Papers 2:28-97.

Powers, Stephen
1877 Centennial Mission to the Indians of Western Nevada and California. Smithsonian Inst. Ann. Report (1876):449-460.

Snyder, John Otterbein
1917 The Fishes of the Lahontan System of Nevada and Northeastern California. Bull. U.S. Bur. Fisheries 35 (1915-1916):31-86.

Stewart, Omer C.
1939 The Northern Paiute Bands. Univ. Calif. Anthro. Records 2:127-149.

1951 Culture Element Distributions: XIV. Northern Paiute. Univ. Calif. Anthro. Records 4:361-446.

Tubbs, Deborah Y. and Rainer Berger
1967 The Viability of Pathogens in Ancient Human Coprolites. Univ. Calif. Archaeol. Survey, Report 70:89-92. Berkeley.

Uyeno, Teruya
1961 Late Cenozoic Cyprinid Fishes from Idaho with Notes on Other Fossil Minnows in North America. Papers Michigan Acad. Sci., Arts, and Letters 46 (1960):329-344.