# PLANT REMAINS IN SOME COPROLITES FROM UTAH

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ABSTRACT

The plant content of coprolites from the Glen Canyon region of southern Utah, as determined by phosphate analysis, is compared with the pollen analysis of other pieces of the same coprolites. The authors conclude that the pollen analysis definitely supplements the information obtained from the other source, and the material studied revealed the unsuspected presence of *Cleome*.

THE RESULTS of the pollen analysis of coprolites (human feces) from the Glen Canyon region of southern Utah (Martin and Sharrock 1964) and the trisodium phosphate analysis for plant content of coprolites from Peru and Mexico (Callen 1963) prompted the suggestion that an exchange of materials might furnish complementary pictures of prehistoric diet. Samples of eight coprolite collections from Utah, whose pollen analysis had already been published (Martin and Sharrock 1964), were sent to the coprolite laboratory at Macdonald College of McGill University for analysis by the trisodium phosphate method. Similarly, samples of Tamaulipas material, which still had to be subjected to phosphate analysis, were sent to the Geochronology Laboratories of the University of Arizona for pollen analysis. It is the former material from Utah upon which we wish to report at this time. Perhaps we should also make it quite clear that by "coprolite" we mean dry, unreduced, and nonmineralized excrement. The present samples appear to be of human origin, with one exception, and were associated with Pueblo III artifacts.

## LAKE CANYON

(See Martin and Sharrock 1964: 171, Table II)

Sample No. : 42Sa693
Field Specimen No.: 13-160 } Axe Groove Alcove

Three coprolites of this material were analyzed.

*Coprolite 1* — principal materials: grass tissue and a few glumes; bean-pod tissue and bean seed coat; meat remains.
— also present: cactus remains; composite seed fragments; possible squash tissue; pollen grains; a down feather; charred material.
— probably not eaten: insect remains; grains of sand.

*Coprolite 2* — principal materials: a few seeds; part of a fruit; meat remains; animal hairs.
— also present: bean-pod tissue and trichomes; grass (6) tissue; dicotyledon tissue; vascular bundles and fibers; grass-pollen grains; down-feather barb; hairs (either human, or animal whiskers); animal hairs.
— probably not eaten: insect head.

*Coprolite 3* — principal materials: fruit tissue; maize pericarp; caterpillar (head and body).
— also present: plant (dicotyledon) tissue, some roasted; monocotyledon (grass?) tissue, epidermis and trichomes; grass glumes; seed coat and base of a seed.

Because of their difference in content, these three coprolites must represent three different meals. Food present in the stomach at one time is thoroughly mixed before being discharged into the duodenum and small intestine. Under normal conditions this material remains more or less together until discharged in the normal way some 24 to 36 hours later.

*Pollen analysis*, Table II, No. 1 (Martin and Sharrock 1964): the single coprolite examined under this field number shows mainly grass and *Cleome* pollen.

Sample No. : 42Sa373
Field Specimen No.: 29-1 } Wasp House

*Coprolite 4* — principal materials: *Opuntia* tissue and epidermis; *Opuntia* pollen grains.
— also present: dicotyledon tissue; monocotyledon epidermis; grass leaf; *Agave* epidermis; cactus spine; maize pericarp; fruit tissue; plant fibers; meat remains; coyote hairs.
— probably not eaten: insect remains.

*Pollen analysis*, Table II, No. 2 (Martin and Sharrock 1964), shows almost exclusively *Opuntia* pollen.

Sample No. : 42Sa619
Field Specimen No.: 19-108 } Gourd House

*Coprolite 10* — principal materials: grass seeds and glumes; grass fibers and vascular bundles; meat remains.
— also present: plant embryo; fine fragment of pine wood.
— probably not eaten: insect pupa.

*Pollen analysis*, Table II, No. 4 (Martin and Sharrock 1964), shows mainly grass pollen. Much less numerous were pollen grains of the chenopodamaranthus (cheno-ams) type and of pine.

Sample No. : 42Sa662
Field Specimen No.: 9-1 } Grid Alcove

*Coprolite 7* — principal materials: *Cucurbita* seed and fruit fragments; other seeds of two kinds (cheno-ams); some *Agave* tissue.
— also present: plant fibers; seed embryos; *Amaranthus* seeds; roasted seeds; immature anthers; fragment of wood; meat remains; cartilage.
— probably not eaten: larval skins.

*Pollen analysis*, Table II, No. 5 (Martin and Sharrock 1964), shows almost exclusively grass pollen.

MOQUI CANYON

(See Martin and Sharrock 1964: 170, Table I)

Sample No. : 42Sa736
Field Specimen No.: 65-6 } Bernheimer Alcove

*Coprolite 6* — principal materials: bean leaflets and pod (but not seed coat); roasted plant tissue; mesquite (6); meat remains.

— also present: plant tissue; monocotyledon epidermis; grass leaf fragments, fibers and vascular bundles.

— probably not eaten: *Drosophila* larvae; sand grains.

*Pollen analysis*, Table I, No. 4 (Martin and Sharrock 1964), shows mainly cheno-ams and some *Cleome* pollen.

Sample No. : 42Sa736
Field Specimen No.: 69-20 } Bernheimer

*Coprolite 9* — principal materials: bean-pod tissue and seed coat; maize pericarp; composite seed coat.

— also present: dicotyledon tissue and fibers; monocotyledon tissue and vascular bundles; meat remains.

*Pollen analysis*, Table I, No. 7 (Martin and Sharrock 1964), shows mainly grass and *Cleome* pollen, with a small amount of *Cucurbita* pollen.

GLEN CANYON

(See Martin and Sharrock 1964: 172, Table III)

Sample No. : 42Ka433
Field Specimen No.: 154-7 } Benchmark Cave

*Coprolite 8* — principal materials: *Opuntia* tissue roasted; *Agave* tissue roasted; small black seeds.

— also present: roasted plant tissue; roasted cactus tissue (*Opuntia?*); monocotyledon epidermis, tissue and fibers; bone; meat remains.

— probably not eaten: insect chitin.

*Pollen analysis*, Table III, No. 5 (Martin and Sharrock 1964), shows mainly pine and composite pollen, as well as some grass and *Artemisia* (a composite) pollen.

GLEN CANYON, NONHUMAN MATERIAL

(See Martin and Sharrock 1964: 173, Table IV)

Sample No. : 42Sa373
Field Specimen No.: 5-70 } Wasp House

*Coprolite 5* — principal materials: bone, bone marrow, and meat remains.

— also present: *Opuntia* epidermis and tissue; composite seed; bean-pod tissue; fruit tissue; plant tissue.

— probably not eaten: insect chitin.

*Pollen analysis*, Table IV, No. 2 (Martin and Sharrock 1964), shows mainly cheno-ams pollen, along with pine and composite pollen.

Under normal circumstanes, most plants have finished flowering long before the seeds or fruits mature. In the comparative study being reported here, it was surprising, therefore, to find a positive correlation between pollen and phosphate analyses in two cases. These two are coprolites 4 and 10 of the phosphate analysis. Coprolite 4 contained *Opuntia* (prickly pear) cactus as the dominant plant of the meal, and pollen analysis revealed *Opuntia* pollen almost exclusively. No flower parts or stamens were found in this coprolite, although stamens have been found in another coprolite (No. 7). In coprolite 10, grass seeds and tissue had formed the principal material of the meal, and grass was predominant in the pollen analysis.

In the majority of cases, however, the pollen analyses do not appear to reflect closely the nonpalynological content of the coprolite and, hence, of the actual plants eaten. For example, in phosphate analysis of coprolite 7, *Cucurbita*, cheno-ams (see Martin and Sharrock 1964), and *Agave* were the principal plants, whereas the pollen analysis revealed grass pollen almost exclusively. Again, in coprolite 9 (phosphate analysis), bean, maize, and composite seeds were the principal materials, whereas the pollen analysis showed grass and *Cleome* pollen almost exclusively.

The absence of *Cleome* from amongst the plants identified in the phosphate analysis was disappointing since it had figured very prominently in the pollen analysis. We must conclude, therefore, that, if eaten at all, *Cleome* pollen was probably ingested without accompanying plant tissues. Coprolites containing the *Cleome* pollen did not contain the remains of anthers, so eating of the actual flowers does not come into question. Anthers found in another Utah coprolite (No. 7) are almost certainly those of a grass, and in any case, no *Cleome* pollen was recorded from that coprolite.

In interpreting the results of this comparative study, it should be borne in mind that the pollen counts are relative, and not absolute, since only 200 grains were counted for each sample. Pollen could be ingested from extraneous dirt and general background contamination, not to mention from the withered calyx on a fruit or from some other source. We feel it would be fair to conclude that the phosphate analysis is a more reliable indicator of diet, but we also believe that the pollen counts can and do add supplementary data that may reveal additional unsuspected information about the diet. In the examples analyzed in this study, the *Cleome* pollen is just such a case.

A surprising discovery in coprolite 10 was a tiny fragment of coniferous wood. Pine pollen had actually been identified in the pollen analysis, which might suggest the collecting of pinewood for torches or other uses, or hunting close to pine woods at flowering time (May/June), which would result in the inhalation of greater quantities of pine pollen than is normal.

Several other interesting materials have also been identified from this Utah material; these include animal hairs, some actually identified as coyote, and others identified as either animal whiskers or human hair. This is an aspect of the coprolite work which is being developed and which was first reported in the Tehuacán reports (Callen 1968a). Similarly, the presence of *Drosophila* and other insect remains are recorded in the same reports.

To the best of our knowledge at present, the plant part of the cave diet in the Great Basin region (which includes the Glen Canyon) consisted of seeds, nuts, and a few roots. Cowan (1967) lists seeds as the codominant or even dominant item of the diet in 47 out of 50 coprolites from Lovelock Cave, Nevada. Ambro (1967) lists fiber, representing the stems and roots of the plants *Typha* and *Scirpus* (which grow in shallow water), as being as abundant as seeds in Lovelock Cave coprolites. Roust (1967) found that *Scirpus* and grass seeds, plus *Scirpus* fiber, constituted the major plant content of coprolites from four other western Nevada caves. Yarnell, in Watson and Yarnell (1966), identified the remains of 17 plants in coprolites from Salt's Cave, Kentucky, as seeds, fruits, or nuts. Yarnell (1966) also reported 13 plants in coprolites from several sites in Wisconsin, all (with the exception of one root) being seeds, fruits, or nuts. However, when we look farther south into the state of Tamaulipas in northern Mexico and into the state of Puebla in southern Mexico (Callen 1968b), we find that plant tissues other than seeds and fruits formed the bulk of the cave diet for the greater part of the year.


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# FURTHER COMMENTS ON EMERY AND EDWARDS' "ARCHAEOLOGICAL POTENTIAL OF THE ATLANTIC SHELF"

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Abstract

Salwen (1967) in commenting on Emery and Edwards' stimulating article supplied several important data for northeastern United States. The author, who has for a long time been in agreement with Emery and Edwards' general conclusions, offers additional supportive data from both coasts of Florida.


IN A RECENT issue of *American Antiquity*, Emery and Edwards (1966) appraised the archaeological potential of the Atlantic continental shelf and predicted that evidence of occupation by man should be found a considerable distance out from the present shoreline. They suggested the distance out might correlate with the age of occupancy. Subsequently, Salwen (1967) commented on this interesting possibility and listed some important inundated sites in the northeast not mentioned by Emery and Edwards. The author wishes to mention data from the Gulf coast of Florida and to record a new site situated below the present mean tide level on the Atlantic coast of Florida.

Emery and Edwards carefully avoided discussing the Gulf of Mexico coast of Florida except to mention Dalton points from Tampa Bay and the fact that the bases of many shell middens tested in the Everglades region were below present sea level. For the record it should be stated that Archaic and some Suwannee points, the Florida variant of Paleo-Indian points, have also been dredged from Tampa Bay. One Paleo-Indian point, resembling an unfluted Cumberland, was dredged from the southern edge of Charlotte Harbor in southwestern Florida. By far the greatest concentration of these Paleo-Indian-like points in Florida is in the Santa Fe and Suwannee River channels. This may suggest a period of river cutting.

There is abundant evidence of the advance of Gulf waters on the western side of peninsular Florida. This applies not only to the Paleo-Indian and Archaic epochs but also to post-fiber-tempered (post-Orange) ceramic periods (Bullen and Bullen 1950). Perhaps the most striking examplel is at Battery Point, Bayport, in Hernando County. There, to form a roadside park, debris was pumped up from a short distance off shore. This work