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Entomological Appraisal of
Wetherill Mesa Archeological Excavations

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In compliance with a request from ~~Mr.~~ Chester A. Thomas, Superintendent of Mesa Verde National Park, Dr. Paul W. Oman asked the writer enroute from California, to make a brief visit to Mesa Verde National Park for the purpose of appraising the possibilities of entomological study of the ruins of the cliff dwelling Indians currently being excavated at Wetherill Mesa.

In an interview with ~~Mr.~~ Thomas and Dr. Douglas Osborne, Archaeologist in Charge, it became evident that the principal motivation for this request stemmed from the possible light such a study might shed on the causes of the decline of the culture over 600 years ago as established by tree ring dating. ~~Mr.~~ Thomas mentioned such possibilities as plagues of locusts and of Mexican bean beetles.

Two effective working days, June 17 and June 18, ^{1960,} were devoted to this study. On Friday, June 17, I examined the collections assembled in the laboratory. These consisted of vegetable matter, one each mummified human and turkey carcasses and turkey dung. On Saturday I was conducted by Dr. Osborne and Mr. Art Rohn through the ruins currently under excavation at Long House and Mug House. On Saturday afternoon I visited the Museum and Spruce Tree House which are open to the public. On Sunday I walked the rim Rocks along the crest of Spruce Tree Canyon to Pictograph Point and then to the Headquarters Mesa by way of the canyon trail. In the afternoon I explored the Spruce Tree Canyon trail observing generally the biota and geological formations.

The caves of the cliff dwelling Indians are situated in the slopes of the deep and precipitous canyons dissecting Mesa Verde. These canyons are dry except for trickles of seepage water. The semi-desert vegetation formation is piñon-juniper with an admixture of a single species of oak and of Rhus.

The caves are of sandstone and are of various sizes. But in all cases they are shallow with the larger ones having a depth of not more than 100 feet from the innermost wall to the edge of the area protected by the overhanging rim rock. Except for localized areas of very limited seepage at their innermost bases, these caves are dry, being protected from all precipitation except possibly drifting snow. Mr. Alden Hayes, Field Supervisor, informed me that much of the time the soil in the caves may actually be drier than the atmosphere and that drifting snow undoubtedly evaporates before soaking into the soil. Presumably it is this condition which enables preservation of so much organic material in the ruins in the form of vegetable matter (cornstalks, beans, etc.) and carcasses of turkeys and human corpses that happened to be buried in soil protected by the cliff ceiling. It is of entomological interest that this situation may be sufficiently dry to exclude the activities of most stored product insects.

Both Long House and Mug House caves have been extensively excavated, but there remain some portions which contain organic materials.

Messers Osborne and Rohn showed me sections of adobe roofing and/or flooring 3 1/2 ft. x 2 1/2 ft. perfectly intact and over-laying supporting layers of closely laid stout juniper and piñon poles and sticks. This adobe contained large portions of corn stalks in an excellent state of preservation. In Mug House Mr. Rohn showed me a large area, yet to be excavated, of a stratum of plant parts principally of corn plants. These were covered by six inches or more of aeolian dust. In this deposit the corn husks, leaf blades, etc. were loosely strewn and none appeared to represent large portions of plant parts intact such as stalks, root crown, etc. It is interesting to note that in a limited area of seepage all traces of vegetable remains, including even cactus spines, had completely disappeared through deterioration.

Numerous sizeable stems (4" - 7" diameter) of juniper and piñon were noted to be intact both in Long House and Mug House. These contained the vermiculations of many borers representing several species. Most of them I consider to be of Chrysobothris (Buprestidae). A single unemerged adult, head missing, was noted in one of the timbers in Mug House. I am confident that these insect workings were contemporaneous with the Indian habitation of these cliffs.

Also examined in Mug House and Long House were deposits of turkey guano that were several inches thick. Evidently the birds were kept in close confinement and, as a result, the guano is badly trampled and discrete skats were lacking.

Messers Osborne and Rohn showed me the sites from which a mummified carcass of a human infant and of a turkey had been uncovered and excavated. Both had been covered with debris and an overburden of aeolian borne dust. Just several feet away was soil moistened by seepage.

Widespread through the ruins as well as in sandstone caves generally were extensive deposits of skats of wood rats (Neotoma). Many of these accumulations were cemented together by glossy vitreous deposits presumed to be urine from the rats. Apparently these skats range in age from pre-Indian times to recent. I perused some for evidence of ptinid beetles in both Long House and Mug House but without finding any.

I noticed no accumulations of bat guano. But Messers Osborne and Rohn pointed out that several bird nests were encountered in their work. Apparently these were of birds of prey, buzzards and of ravens. These various animal nests must be expected to support a rather rich insect fauna. Since such insects are living at the present time as well as in the past, it will be necessary to attain a knowledge of them in existing nests before an understanding of many of the insect fragments of the ruins can be realized.

In the laboratory, I examined the collections of dry vegetation materials which had been removed from the ruins in the course of excavations of Long House. These were composed of about two bushels of dried parts of corn plants and a small collection of beans and pods. These had been set aside for study by Dr. Hugh Cutler of the Missouri Botanical Gardens.

I examined each piece of the remains of corn plants which had been removed from room No. 32 (Cutler box No. 9). The material amounted to about one bushel and was composed of sections of stalks, numerous root crowns, tassels, and many cobs (lacking grain) with the bulk being composed of husks and portions of leaf blades. All these materials had been sorted into individual paper bags by plant part. Unfortunately the fine debris which sifted out in the course of this sorting had been discarded. Undoubtedly many insect remains have been lost in this way.

From my superficial examination of these materials I found little evidence of primary insect attack. There was no stripping that could have been attributed to grasshoppers. There was no obvious damage from stem borers or defoliators generally. But it should be noted that I did not feel sufficiently qualified to cut open root crowns and stalks for evidence of borers. I found no further evidence in spot checking corn material in Cutler boxes Nos. 3 through 8 and 10 through 12. Of special interest is a single ear of corn

complete with grain and husk (No. 12780 ey/700). From the outside there was no conspicuous insect damage such as that of the corn ear worm. Three additional well preserved ears of corn remarkably free of insect injury are on display in the Museum.

Most of the positive results on insect damage of the corn appear to be the work of stored product insects, as indicated in the following list:

Numerous dermestid exuviae

Lepidopterous cocoons including Tineids

Cocoons of parasitic hymenoptera

Some stem borer and/or anobiid work

Many corn cobs containing much insect fecula

Jug of remarkably well preserved corn grains (about 3 quarts in volume) included a limited amount of insect injured grain

In cases where good examples of damage were involved, I set aside the material as examples to be observed by people sorting over the plant materials.

All of the limited amounts of beans and pods recovered from the ruins of Long House were found to be free of evident insect injury except those for Nos. $\frac{12123}{700}$ and $\frac{14800}{700}$ ^a which showed evidence of borings. There was, however, nothing pointing definitely to the bean weevil, Acanthoscelides obtectus. In the Museum there is on exhibit a complete bean vine but there are no leaves or beans remaining, only the stems and pods. I have seen no evidence that might be used for judging the presence or absence of Mexican bean beetle.

I also spot checked the skats, mostly turkey guano and droppings in boxes 1 and 2 from Long House. I saw no evidence of insect attack.

Of special interest are the mummy of an infant and the carcass of a turkey both of which had been excavated during the past year from Long House. The carcass of the turkey had lost all of its larger feathers. Unless the bird had been plucked by the Indians, it is reasonable to assume that dermestids had devoured the feathers down to the follicles of the dried and shriveled skin which was largely intact. Some of the carcass had undergone deterioration and these portions bore numerous expired dipterous puparia believed to be of syrphid and/or muscoid flies. These insects could only have developed under conditions of putrefaction and must be contemporaneous with the Indian culture.

The mummy of the child excavated in close proximity to the turkey carcass was considerably more disintegrated with only small areas of the dried skin being intact. I found about a dozen puparia of blow flies clinging to the underside of the mummy. Obviously there must have been many more puparia, as well as other insect remains, associated with this mummy. But they had been lost in the course of handling the specimen as well as in leaving behind the fine debris surrounding the mummy in its burial site. There is little doubt that the blow fly puparia developed contemporaneously with the cliff dwelling Indians.

Of particular interest were two living larvae of a dermestid beetle, Atlagenus sp. found infesting the mummy. One of these was collected and is now being reared by Dr. Paul Spangler of the Insect Identification and Parasite Introduction Division of the U. S. D. A. It is hardly likely that these dermestid larvae were infesting this mummy in situ. It is rather more likely that this infestation developed while these specimens were deposited in the laboratory. In this connection it is possible that the cliff site affords enough protection to render the burial site too dry even for dermestid attack.

CONCLUSIONS AND RECOMMENDATIONS

The vegetable remains, especially of corn and of piñon and juniper logs and poles, that are being excavated from the ruins of the cliff dwelling Indians are sufficiently extensive and well enough preserved, I believe, to be of considerable value in determining the insect fauna affecting these materials as living plants 600 years ago. But in the case of the agricultural plants, I was impressed by the paucity of insect damage. But in the eyes of a specialist much more may be evident than there was to the cursory examination I was able to give it.

The mummy and the turkey carcass that have been unearthed include a wealth of blow fly and syrphid fly exuviae that must have been contemporaneous with the cliff dwellers 600 years ago.

Generally among the plant and animal materials there is evidence of injury of stored product insects. And there are numerous tineid cocoons and exuviae of dermestids, usually Altagenus, distributed through the materials. A closer search will certainly reveal a rather rich fauna of such insects. In order to interpret such findings, it will be necessary to gain a knowledge of the current active infestations of insects associated with nests of wood rats, various birds, etc. which inhabit the same caves that the cliff dwelling Indians occupied.

If a careful entomological appraisal is to be made of the organic remains of these excavations, a great deal of effort must be exercised to sort out and save the insect fragments and fine workings which heretofore have largely been lost in handling and sorting the materials macroscopically.

Two alternate suggestions seem feasible.

First: If continued excavations are planned, a resident entomologist should be employed, one who could participate in the work. By being present while various organic materials are exposed, evidence of presence and/or attack of insects would be noted. Since a fairly limited fauna is indicated, associations of damage and fragments are probable. Identifications of a few samples of fragments associated with each type of feeding evidence should give a reasonably complete picture of the fauna contemporaneous, in the caves, with the Indians.

Second: If the excavations have been completed some positive results may come from examination of the organic matter already collected. A specialist in corn insects could, in a short period, make reasonably accurate analyses of evidence of attack. A specialist in stored product insects could, in a similar period, arrive at satisfactory conclusions regarding the kinds of stored products insects that were present. If the evidence of wood-attacking insects is of interest, one well-versed in identifying feeding by them should recognize most of them.