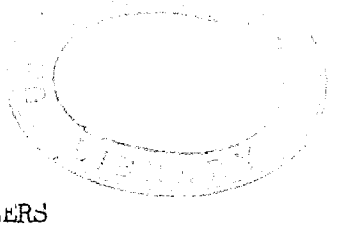

THE BIOLOGICAL RESOURCES OF THE CLIFF DWELLERS

by

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In June 1934, twenty of us arrived at Water Lily Canyon in Arizona. A pack train of mules had brought us food and baggage, and left us on a small alluvial terrace, once probably the cornfield of a cliff dwelling farmer. The ancient dwellings we could see under a high overhanging cliff, about a mile upstream. The pack train had gone back for more provisions.

Here we were, men in a wilderness, but our pack train still kept us tied to Main Street with its butcher, its baker and its candlestick maker! Suppose the pack train failed to return. Would we starve after our month's provisions were exhausted? We agreed we might, and yet our archaeologists informed us that in this very area, a few centuries ago, at least 150 people had lived and had their being. How did they secure all their necessities from an environment which at first sight seems almost barren?

These cliff dwellings abandoned during the 12th century and certain artifacts indicate a civilization far from primitive, comparing favorably with that of European peasants of the same period.

Proteins, starches, fats, sugars, vitamins, clothing and shelter are the fundamental necessities of life. These cliff dwellers not only possessed them all, but they secured them all from their immediate biological environment. They had become adept in utilizing what was at hand.

They were not a carnivorous people. Lack of bone remnants in the ruins, scarcity of game in the region, their dentition, their relatively small stature, their comparatively small bones, the scarcity of hunting implements, snares etc., all indicate that animal protein at least was not the prevalent part of their diet.

The abundant remnants of plants indicate that necessity had made them vegetarians. The grass family was, as to-day, a most important provider. To this must be added the oak and especially the pinon pine which to them was the manna of the wilderness.

A survey of the adjoining territory by Bolton of our expedition showed an average acre to contain 22 pinon pines. Each pine averaged 19 cones with 8.5 seeds per cone--a total of 13243 seeds per acre. Assume that one third are worm eaten before they can be gathered we still have 8828 seeds per acre. If a man consumes 300 seeds per day, with other foods, an acre would support one man for a month. On the basis of these figures 900 acres would be needed for 150 people for 6 months. If however the pinon pines of the entire region seem to bear only in two years cycle, as indicated by casual field observations, this figure would have to be doubled, harvest coming only every two years. It is the pinon pine, lowly, hardy and simple as he may seem at first sight, which becomes the salvation of these people.

Fats were derived mainly from the oils of plants. Not a very available form, it is true, but the climatic factors which surrounded them did not demand a diet rich in fat for at least eight months of the year.

Sugars were indeed a luxury: outside of the sweet juice of certain plants, the exudation of the yucca pods, and the sprouts and roots of grasses and thistles, it is a question if they ever had much sweet. Surely no pure sugar was known.

From the berries and especially from the fruits and edible parts of the cactus they obtained certain necessary vitamins.

For clothing they had learned to weave the bast fibers from grasses and from the bark of trees. The art of spinning fibres from such plants as the yucca, the thistle and even cotton, had also progressed to a marked skill.

More than that, not having been satisfied to depend solely upon the native flora, they had already learned, and practiced, with no small degree of skill, the art of agriculture.

Maize, cotton, potatoes, squash, beans and tomatoes they produced, as proven by either plant remains in their store houses, or by the escapes still growing wild in the region. It would, indeed, be an interesting history, which would tell us of the importation an acclimatization of these plants in a climatic environment which at first must have seemed forbidding.

Turkey raising was the chief animal husbandry. How extensive it was we do not know, but from turkeys it seems they derived everything but milk. Turkeys probably furnished the customary poultry products also much of their clothing was made from stripped turkey feathers interwoven in warps of plant fibers.

Shelter, like shelter to-day, was made of clay, stone or parts of plants. Much has been said about clay and stone. It is the plants, however, which furnished roofing material; interwoven reeds of the grass Phalaris were used skillfully to produce dust proof ceilings and efficient partitions, which to-day remain intact after several centuries of exposure. Indeed, these reed structures bid fair to outlive the disintegrating sandstone.

Climatic conditions were such that there were months of plenty and months of famine, which might have been disastrous had it not been for store houses skillfully built and protected. In other words, Northern Arizona was not a tropical isle nor a land of milk and honey. Survival here meant a real struggle. June must have been a welcome month; gooseberries dangling like rubies please not only the eye but more so the palate; tender grasses like Panicum and various Muhlenbergia furnish sweet rhizomes. By the end of June, Oryzopsis must have festooned many a rafter with its sweet seeds; and in the way of meat, maybe grasshoppers entered the menu.

July brought in the sprouting roots of the thistle and the sago lily. They were like asparagus to them. Juniper berries were also ripe, but children hoping for the black gooseberry must have awaited anxiously the return of parents. Cactus fruit was the dessert which even to our modern sophisticated taste is a delicacy. Menzanita berries and buckthorn although more coracious and acrid to us, to their unspoiled palates, must have been sweet. Then the service berries in rich purple coats and glutinous flesh must have been on the bill of fare. Indeed, July must have been a month of pleasant harvest. True an eastern Indian used to blue berries, raspberries, black berries, strawberries and others, might have scorned their pleasures; but these were people of the desert.

August, refreshed with showers, brought to culmination the acorn crop. Fresh acorn meal must have been a luxury, not to say anything of the many fresh grass seeds. It was a busy time.

Storehouses were cleaned, acorns gathered and stored. Corn-fields were constantly watched and cultivated. Beans were weeded, squashes and potatoes were watered or tilled; and probably by the end of August, corn on the cob, beans and squashes were not unknown on the tables of the industrious ones. Fields could not be extensive because of the topography of the land and the lack of fences, implements etc. It is a question if these luxuries of the table were abundant. Surely their table did not compare with the modern Thanksgiving offering.

September must have been a continuation of August with decreasing returns near the end of the month. Short days, cooler nights must have begun to be felt by the fields and the harvest time must have progressed well on towards the end of the month.

October must have been marked with a pinon pine nut on their calendar if they had one. Their very existence for the next six months depended upon that important crop. Failure of crop or lack of industry in gathering it might have spelled ruin for the community. Although they had some corn, squashes, beans etc., to them pinon nuts were what wheat is to us. The grass seeds supplemented, but never could have sustained the large community.

Nor has the aesthetic been forgotten all this time. Squaws have gathered heads of the rabbit brush flowers out of which a yellow stain will be extracted, maybe cercocarpe roots out of which red dye will be taken, bee plant roots for black dye. Cowarnia (cliff rose) bark was used for lining the cribs of babes.

Meanwhile we have forgotten the medicine man. Quietly, unobstrusively, he has gone over the hills, into canyons, across dells, and there he has plucked or uprooted such plants as will be needed to assuage the ailments of the tribe. Nay more, he has gathered such plants as are necessary for various ceremonies, that the children of men may be pleasing in the sight of the Gods.

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