

UNITED STATES
DEPARTMENT OF THE INTERIOR

GRAND CANYON

Nature Notes

JULY 1931



VOLUME 5-9 6-NUMBER 9

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
GRAND CANYON NATIONAL PARK
GRAND CANYON, ARIZ.

OFFICE OF THE SUPERINTENDENT

Vol. 5
Grand Canyon Nature Notes

No. 9
July, 1931

This Bulletin is issued monthly for the purpose of giving information to those interested in the natural history and scientific features of the Grand Canyon National Park. Additional copies of these bulletins may be obtained free of charge by those who can make use of them, by addressing the Superintendent, Grand Canyon National Park, Grand Canyon, Arizona.

M. R. Tillotson, Superintendent

Edwin D. McKee, Park Naturalist

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B A T S

By Carol F. Tyler, Clerk-Stenographer.

From Grand Canyon we have previously had reported nine species of bats of which there are two represented in the Park collection. These are The Little Pallid Bat (*Myotis californicus pallidus*) and The Silver-haired Bat (*Lasionycteris noctivagans*). Those recorded in addition are the following:

Yuma Bat - *Myotis yumanensis yumanensis*, common in Supai Canyon and probably the whole Grand Canyon.

Golden Bat - *Myotis evotis chrysonotus*, recorded on the South Rim of the Grand Canyon.

Hollister Bat - *Myotis occultus*, South Rim of the Grand Canyon.

Fringed Bat - *Myotis thysanodes*, a specimen was collected on the South Rim of the Grand Canyon in August, 1928.

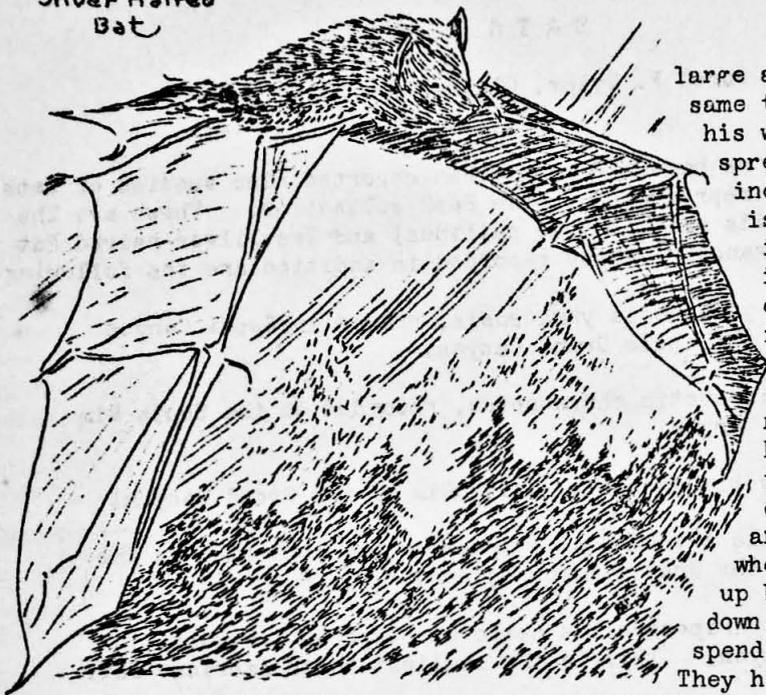
Little Canyon Bat - *Pipistrellus hesperus hesperus*, abundant in the Grand Canyon. This is the smallest North American Bat.

Pale Brown Bat - *Eptesicus fuscus pallidus*, found on the South Rim.

Mexican Free-tailed Bat - *Tadarida mexicana*, inhabiting the lower parts (Inner Gorge) of Grand Canyon.

The collection of a third specimen and the recording of a tenth species from Grand Canyon was purely an accident. The evening of June 15 was the first warm evening of the summer and though the screen door had not yet been hung on the Women's Dormitory, the front door was open. It had been open but a few minutes when in flew a bat. The lights were dim but a number of moths and other night-flying insects were circling the table lamps and that possibly explains the intrusion of the bat. The array of insects attracted by the lamps would make a nice meal without excess effort. Our first thought, of course, was to get him out and so with pillows and magazines we fanned the air, but he only went deeper into the house, finally coming to rest just over the bed in the bedroom. We finally succeeded in chasing him out of the bedroom into the living room again and then out the door. He did not stay out long but when he re-entered we were more prepared to cope with the situation. Armed with pillows and magazines we gave chase. Dan had the small Navajo Rug and with this and due to his previous practice, he was able to knock the bat against the stove after only ten attempts. The bat was stunned, and looked up at us from the top of the stove with little beady eyes. I was not too sure that bats would not "play possum" but was very sure that they were considered dirty, so I gave him a bath in the depths of water more than warm. Now that Mr. McKee has measured, compared, checked and stuffed him we find that he is a Big-eared or Desert Pallid Bat, (*Antrozous pallidus pallidus*). His ears are twice as

Silver Haired
Bat



large as his head and of the same thin hairless skin as his wings. He has a wingspread of nearly 13-1/3 inches. His total length is 4.4 inches, tail 1.9 inches, hind feet .4 inches, forearm 2.1 inches and his ear from meatus is 1.2 inches.

Bats do not build nests or make any sort of home for themselves and their young. They find dark caves, attic rooms and deep crevices in rocks where they hang themselves up by their hind feet, head down. In this position they spend much of their lives.

They hibernate for practically five or six months of the year and are entirely dormant with no action whatever throughout their bodies. During the six or seven months of activity a bat spends from five to six hours on the wing out of each twenty-four. At twilight as soon as the weather is warm enough in the spring they begin to appear and start their search for moths and other night-flying insects, but usually by midnight they have found sufficient food and have returned to their own particular roost. The sharp teeth of the bat so thoroughly disintegrate the insects he consumes that it is practically impossible by stomach analysis to determine his diet or menu. He is conveniently equipped with over-sensitive antennæ in his ears with which he is able to hear the flutter or rustle of these insects' wings. There is no doubt but that the bats in their forage by night assist in protecting the trees and shrubs from pests as do the birds by day.

The bat's voice, seldom heard, is a mere squeak quite similar to that of a mouse. It is said that many of the sounds made by bats are too highly pitched to be audible to the human ear.

The mating of bats is presumed to take place in July or August and the young, but one a year, are born in May or June, the reproductive process being retarded during hibernation. The young at birth weigh nearly a fourth as much as the mother which would compare with a human parent giving birth to a thirty-five-pound child. The nipples of the mother bat are conveniently located under her wings and the young bat is easily carried about while the mother is on the wing.

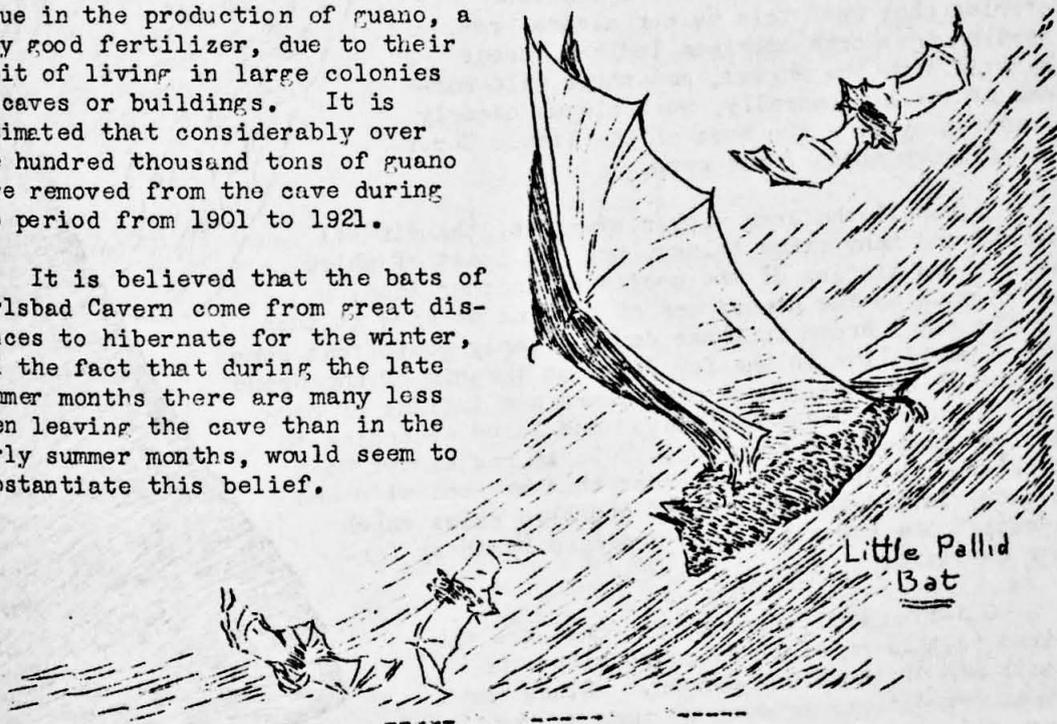
Practically the only enemies of bats are the owls. However, cats are sometimes known to catch and eat them.

Bats with their nocturnal habits and due to their selection of hiding places are often referred to as "emissaries of the Devil". Wild and weird stories are told of bats and the name has been used colloquially for things and actions of devilry - when, as a matter of fact, the bat is a quite harmless, law-abiding, independent and very highly specialized mammal of which there are many families, species and genera.

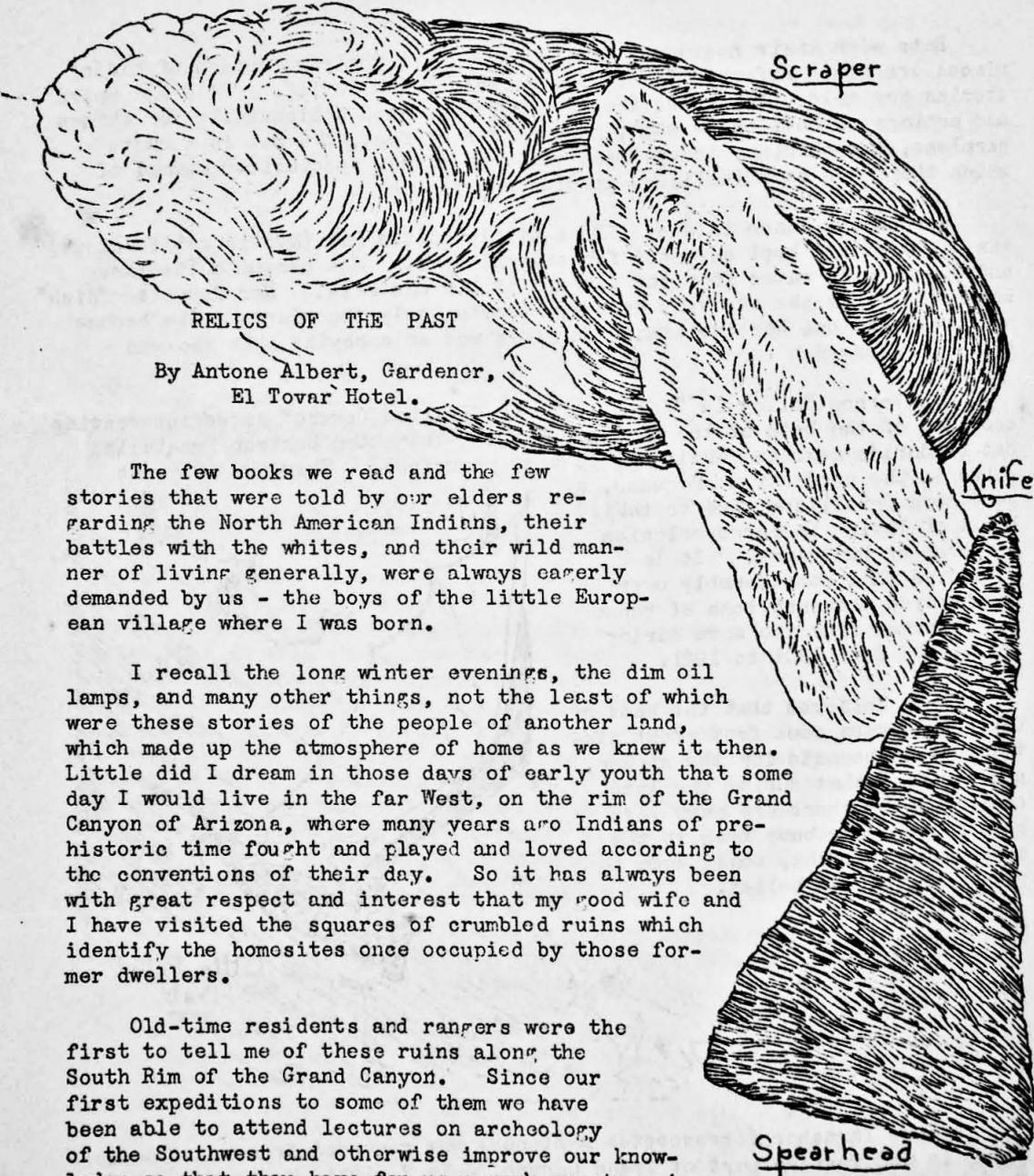
At Phantom Ranch in June 1929 a Little Pallid Bat (*Myotis californicus*) was captured and kept as a pet for several days. She became quite tame and would drink water from the fingers of her mistress. Her favorite "dish" was moths which she ate very daintily, leaving only the wings. She became very trusting but her insistence for food was so annoying that she was finally released.

Mr. Vernon Bailey in "Animal Life of Carlsbad Cavern" gives interesting accounts of the bats of the Carlsbad Cave. There the Mexican Free-tailed Bat (*Tadarida mexicana mexicana*) is most prevalent. They are of great value in the production of guano, a very good fertilizer, due to their habit of living in large colonies in caves or buildings. It is estimated that considerably over one hundred thousand tons of guano were removed from the cave during the period from 1901 to 1921.

It is believed that the bats of Carlsbad Cavern come from great distances to hibernate for the winter, and the fact that during the late summer months there are many less seen leaving the cave than in the early summer months, would seem to substantiate this belief.



A Sage Thrasher (*Oreoscoptes montanus*) was recorded from near Thunder River in the western part of Grand Canyon, July 7, 1931, by Messrs. Clifton M. Greenhalgh and Randolph Jenks. This is the first record of this bird from the Grand Canyon National Park.



RELICS OF THE PAST

By Antone Albert, Gardener,
El Tovar Hotel.

The few books we read and the few stories that were told by our elders regarding the North American Indians, their battles with the whites, and their wild manner of living generally, were always eagerly demanded by us - the boys of the little European village where I was born.

I recall the long winter evenings, the dim oil lamps, and many other things, not the least of which were these stories of the people of another land, which made up the atmosphere of home as we knew it then. Little did I dream in those days of early youth that some day I would live in the far West, on the rim of the Grand Canyon of Arizona, where many years ago Indians of prehistoric time fought and played and loved according to the conventions of their day. So it has always been with great respect and interest that my good wife and I have visited the squares of crumbled ruins which identify the homesites once occupied by those former dwellers.

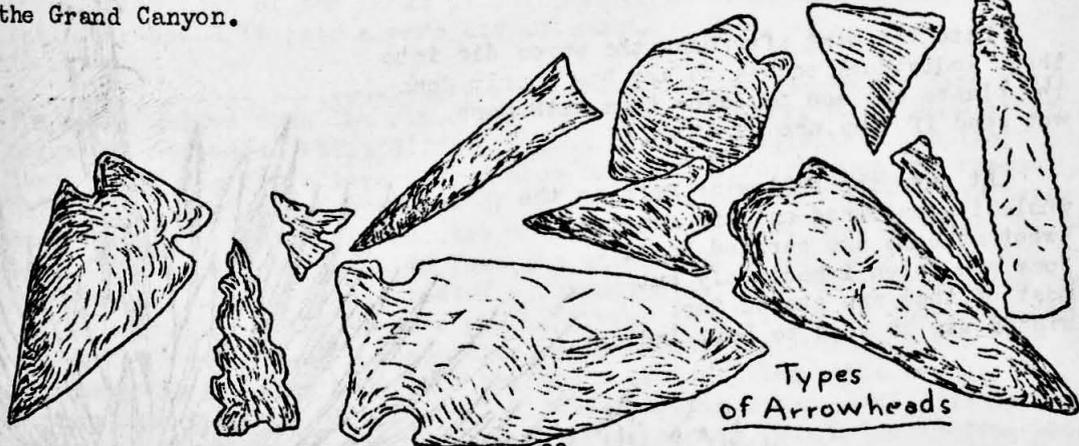
Old-time residents and rangers were the first to tell me of these ruins along the South Rim of the Grand Canyon. Since our first expeditions to some of them we have been able to attend lectures on archeology of the Southwest and otherwise improve our knowledge so that they have for us a much greater significance.

For our greater pleasure we obtained permission several years ago to make surface collections as we roamed along the rim and back thru the Tusayan National Forest. I believe that we have traversed on foot more than eleven hundred miles back and forth between Grand Canyon and the Coconino Basin, 40 miles east, and the Bass Camp region, 40 miles to the west. Of course we have made a number of trips into the Canyon in addition to the journeys along the rim.

After locating the ruins, which are usually found along the southeast sides of knolls or ridges, we begin a systematic search of the immediate area. We always find pieces of broken pottery, some of them large or interesting enough to be worth collecting, scattered in abundance. But the arrowheads and other artifacts of special interest are harder to see -- they must be searched for diligently. Sometimes we return again and again to the same spot before beginning to find much that is of importance to us. One must train his eyes to see the particular things he is searching for.

Altogether we have collected thus far some 1,500 fine specimens of scrapers, knives, spearheads and arrow-points. Also, several stone axes and one interesting old pipe. We have them mounted in cases and identified according to possible age and use.

To some our hobby may seem wasteful of time. But to us it is one of the bright spots in our life here at the Grand Canyon.



HOW THE SUPAI INDIANS PREPARE MESCAL AS TOLD
ME BY SUPAI LILLY BURRO

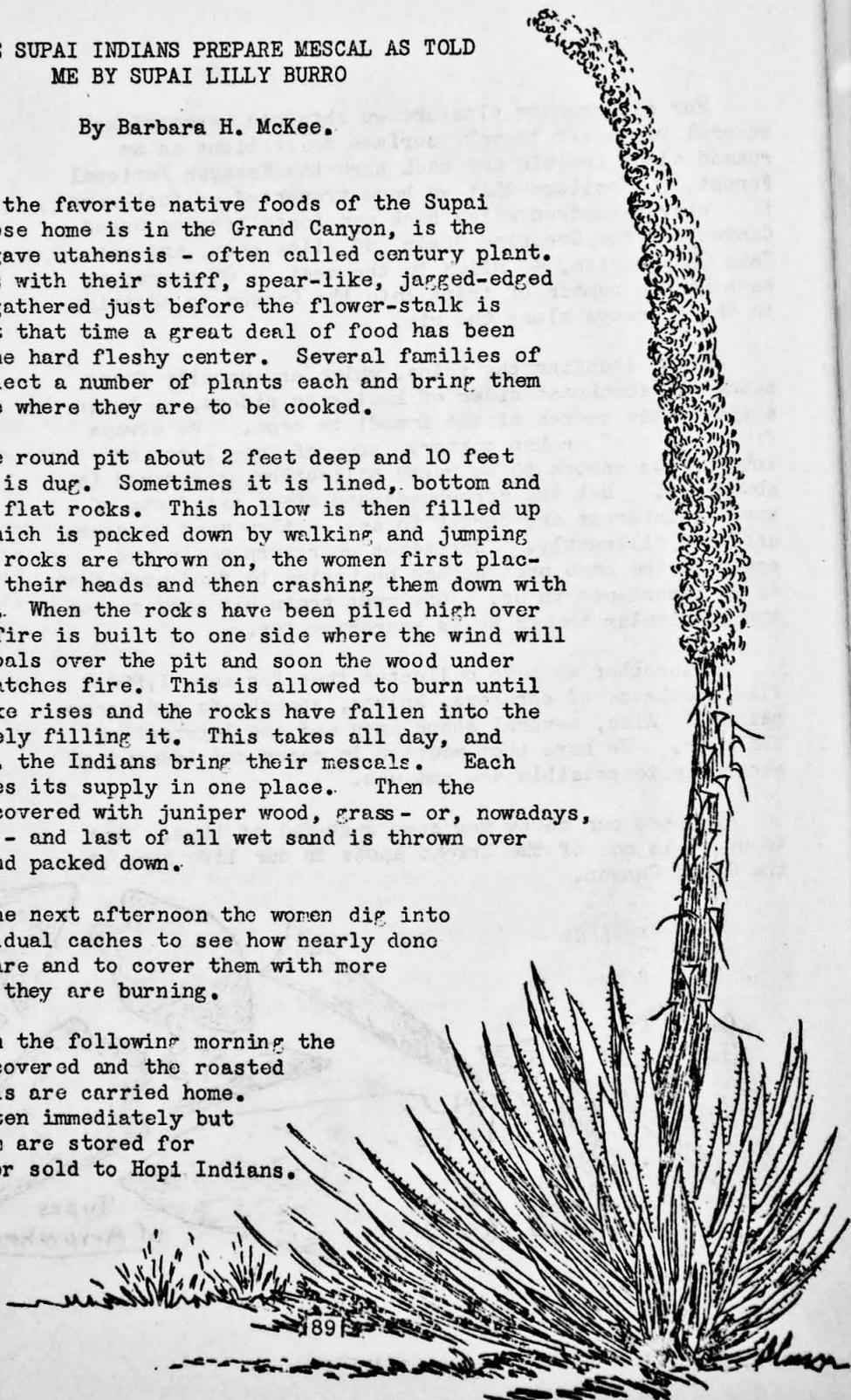
By Barbara H. McKee.

One of the favorite native foods of the Supai Indians, whose home is in the Grand Canyon, is the mescal or *Agave utahensis* - often called century plant. These plants with their stiff, spear-like, jagged-edged leaves are gathered just before the flower-stalk is sent up. At that time a great deal of food has been stored in the hard fleshy center. Several families of Indians collect a number of plants each and bring them to the place where they are to be cooked.

A large round pit about 2 feet deep and 10 feet in diameter is dug. Sometimes it is lined, bottom and sides, with flat rocks. This hollow is then filled up with wood which is packed down by walking and jumping on it. Big rocks are thrown on, the women first placing them on their heads and then crashing them down with great force. When the rocks have been piled high over the wood a fire is built to one side where the wind will blow live coals over the pit and soon the wood under the rocks catches fire. This is allowed to burn until no more smoke rises and the rocks have fallen into the pit completely filling it. This takes all day, and about 5 p.m. the Indians bring their mescals. Each family places its supply in one place. Then the plants are covered with juniper wood, grass- or, nowadays, gunny sacks - and last of all wet sand is thrown over the mound and packed down.

Late the next afternoon the women dig into their individual caches to see how nearly done the plants are and to cover them with more wet sand if they are burning.

At dawn the following morning the whole is uncovered and the roasted sweet mescals are carried home. Some are eaten immediately but most of them are stored for winter use or sold to Hopi Indians.



Mescal which has been cooked and stored is later prepared for food by pounding on a flat board or rock. Chunks of it are sometimes put in water and allowed to soak. The resulting beverage is quite sweet and greatly liked by the Supais.

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A GOPHER-SNAKE LUNCHES

By Ranger Naturalist Earl Count.

As I was lecturing to a large group of people at the Yavapai Station recently, a series of squeaks and something of a commotion nearly caused me to lose part of my audience. When finally I had come to a close, most of us gathered in a corner of the porch to watch a 44-1/2 inch gopher-snake "reap the benefits of the chase".

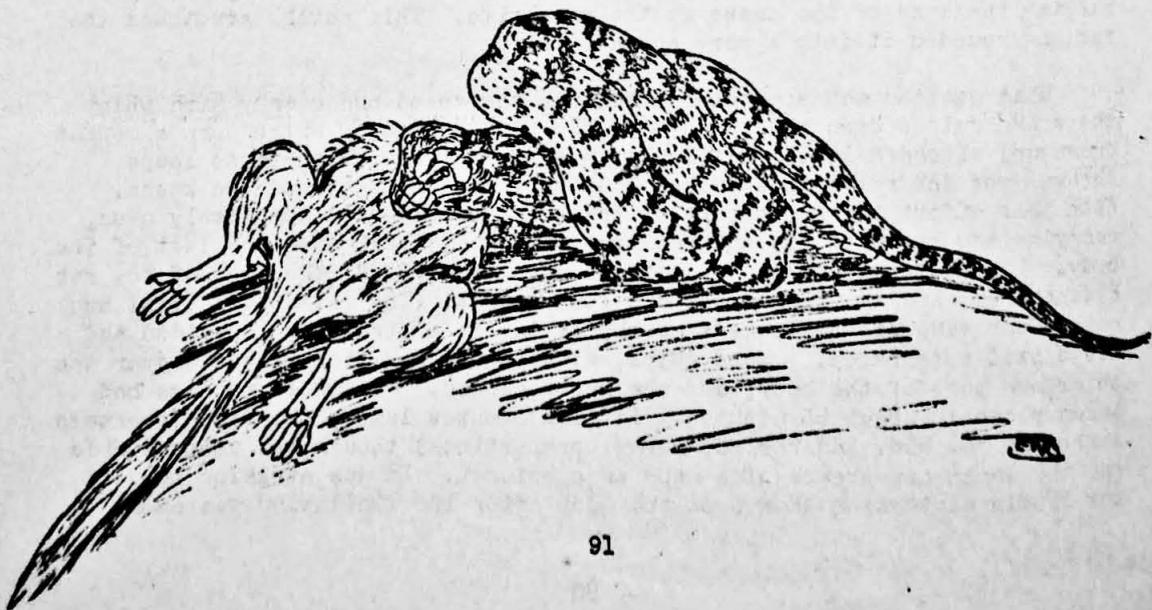
A good-sized packrat was on its way down the throat of the snake, head first, flattened, with hind feet spread. It was, of course, quite dead by now. Occasionally the snake would writhe, bring two or three loops up over that part of its body which was enlarged by the addition of the rat. Possibly the squeezing helped force the prey down. Over the enlarged part of the snake's body passed waves of contraction from the rear forward; these being seen when the loops were not covering the body. The food thus moved to the rear on the principle of pulling a draw-string into the hemmed neck of a sack. Then loops would be flung forward over the rat, repeatedly burying the head of the snake at the same time. This action stretched the rat and rounded it into a more compact form.

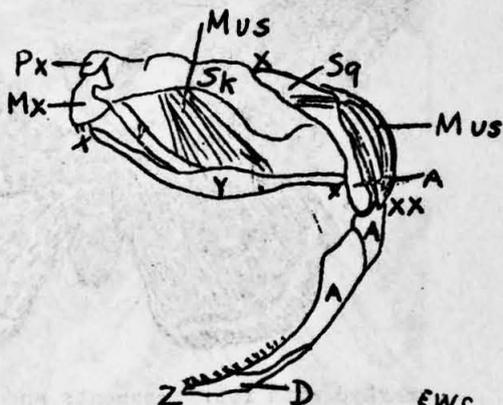
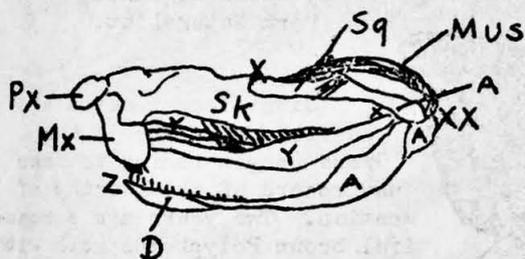
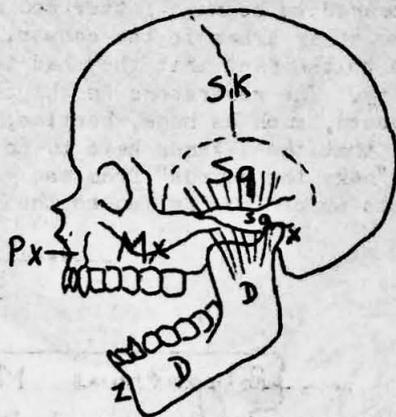
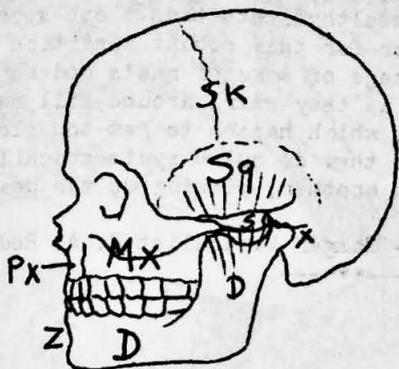
What excited the spectators most was the speed and energy with which the snake gulped down the rat. Even the hind quarters, which were somewhat drawn up, afforded little difficulty. A few writhes, with three loops thrown over the rat's legs pushed them back and straightened the knees. With this effort the front part of the snake even turned completely over, carrying the rat with it; and the mouth hitched itself over the last of the body. The mouth now began to lose its uncanny stretch, the feet of the rat disappeared, and the snake rested a few moments. The rat's tail still hung out at one side of the snake's mouth, giving it a strangely lop-sided and disjointed appearance. More gulps, with sinewy peristaltic waves over the thickened part of the body, and the mouth closed. The whole process had taken place in about 55 minutes. Fifteen minutes later, the first fourteen inches of the body had resumed normal proportions; though the ventral side had the loose appearance of a nape or a brisket. It was striking to note how little distention showed on the body after the swallowing was over.

Wishing to measure the snake, I started to draw it toward me. Immediately, and with much alacrity, it proceeded to scale the stone wall in the corner of the station, wriggling into the wide joints between the stones. On seizing the snake by the neck, I was further impressed with the firmness of its grip on the wall. There seemed to be no more sluggishness to it in that cool corner than there would have been to any snake that had not just accomplished the ever spectacular task of swallowing a creature larger in diameter than itself.

It is a perpetual source of stupefaction to witnesses of this feat to see that mouth stretch so enormously; an explanation therefore may not be amiss. The bones in the jaws of the snake are not knit into a firm structure as in the human. Man is a mammal; and while he and his like have a solid chin, the two halves of the lower jaw in the snake are bound by elastic ligaments. (The mammalian lower jaw has a somewhat similarly loose knitting at the chin-line only during early embryonic life.) While the whole question is really somewhat complicated, it may further be noted that, in the mammalian head, the upper jaw is firmly fixed to the rest of the skull, and in the lower jaw many of those bones found in the reptile are lacking or are not involved. One bone in particular, the squamosal, is fused into the mammalian skull, while in the snake it forms part of a movable, jointed lever-arm. Thus the snake jaw can drop farther, and can expand sidewise at both ends to form a truly yawning cavity. At the chin it can stretch, because of elastic ligaments that hold the two halves together; at the angle of the jaw because of the extra hinge. (See diagrams)

A meat-eating animal possessed of legs may use them for holding and manipulating its prey while tearing it to pieces. The flexible head of the snake may be part of Nature's ingenious way for compensating an animal which she has bereft of those important appendages. It is indeed a versatile creature that can run, climb, swim, hunt, fight and eat efficiently without their aid.





Snake diagrams adapted from
Hegner: *Collage Zoology*.

A. Bones lacking in the human jaw system. D. Dentary bone.
Sq. Squamosal bone. Mx Maxillary bone - the main part of the upper jaw.
Px. Premaxillary bone - the front part of the upper jaw. Mus. Muscles,
Sk. Skull proper - brain case. X. Hinge-joints. Y. In man, these bones
form a solid part of the skull, and are therefore immovable. Z. "Chin".

Note the play of the two muscles in the snake head, and contrast with the small play in the human jaw. In the skull of man, the lower jaw consists of the dentary bone which works against the squamosal on the ball-and-socket principle; the squamosal forming a solid part of the skull. Compare this single hinge with the many in the snake. The human maxilla, furthermore, is also fused into the skull; in the snake it is movable. In the snake the hinge-joint XX can be pushed out sidewise, while the ligaments at Z allow the "chin" to stretch sidewise.

EWC

A few days ago my attention was attracted by a number of brightly-colored lizards which had taken up their abode at the Union Pacific Power Plant near Roaring Springs. These lizards, some six or seven in number, appeared to be much fatter and in a more healthy state than those seen in some other areas in the canyon. One reason for this robust condition was due to the fact that they had taken advantage of some of man's modern machinery. The generators in the power plant as they whirl around kill many insects, such as bugs, beetles, and flies, which happen to get too close. All that the lizards have to do (and which they do quite systematically) is "make the rounds" from one generator to another, picking up the dead insects which have fallen to the floor.

-- Ranger Naturalist R. A. Redburn --

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Polyphemus Moth
2/3 natural size



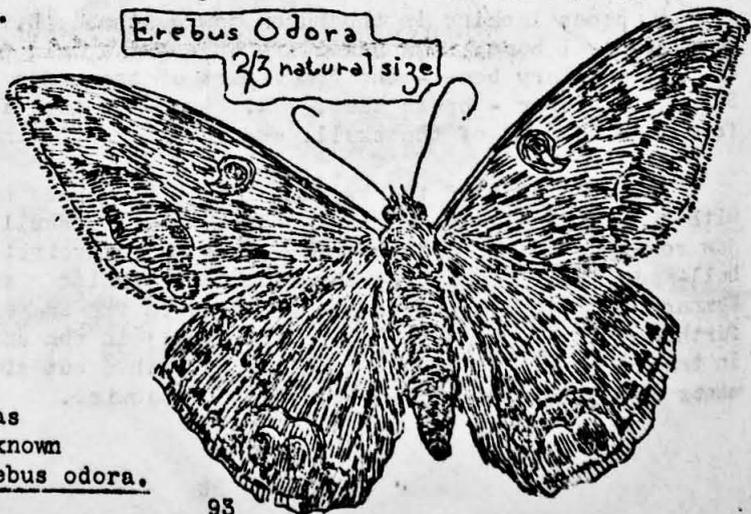
GIANT MOTHS

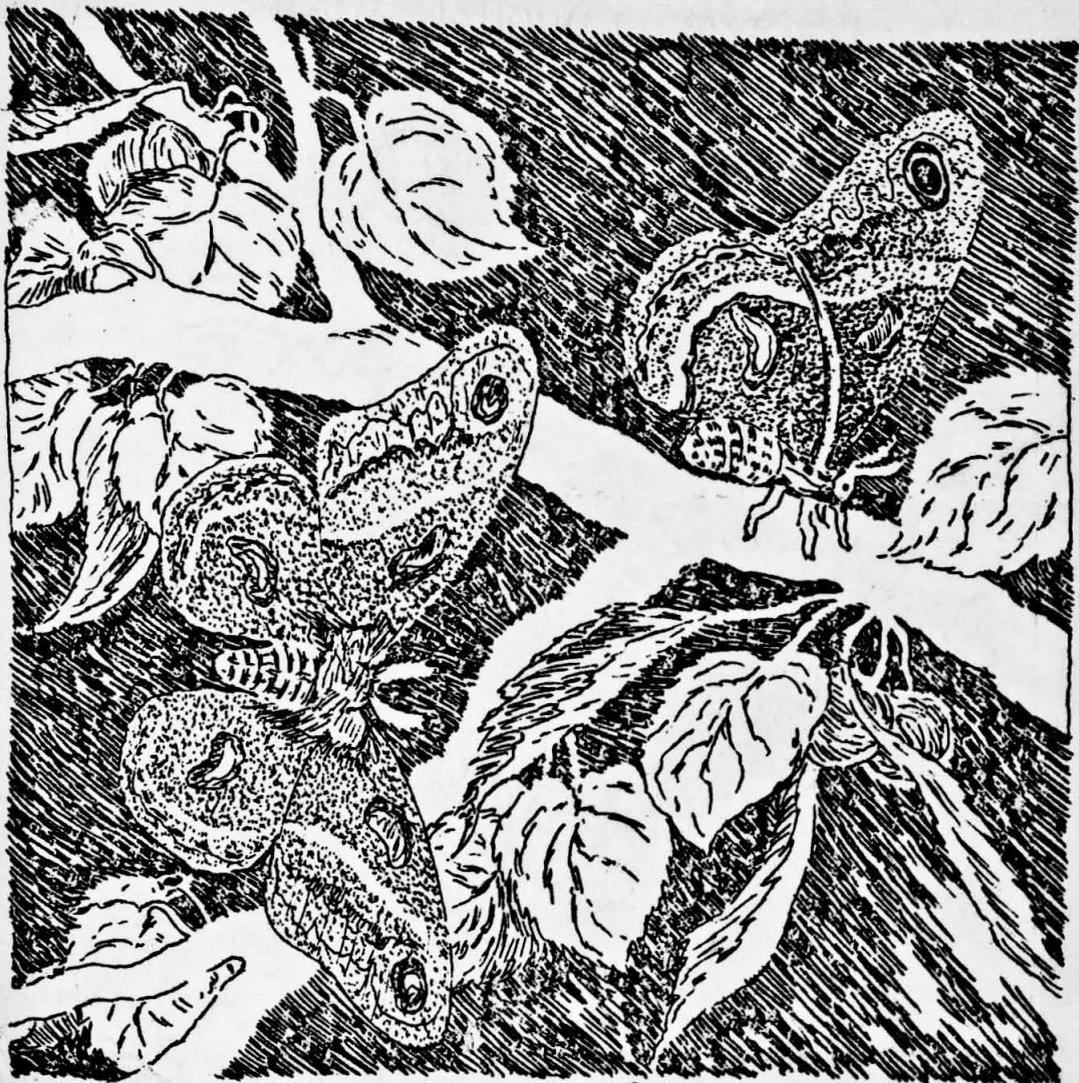
By Edwin D. McKee,
Park Naturalist.

Giant forest moths are sufficiently rare in the Grand Canyon region to make any record of them worthy of mention. Two years ago a beautiful brown Polyphemus moth with a wing spread of 5-1/2 inches was found at Grand Canyon (Nature Notes Vol. 3, No. 2). The following year another large moth - the Cecropia - was discovered in about the same locality. Its deep reddish brown color and its deep reddish brown color marked with four crescents and a marginal band of white makes it one of the

most beautiful insects. Curiously enough, in the month of June, 1931 four specimens of the giant moths were found at Grand Canyon. Of these, three were the Polyphemus but the fourth was of a variety which because of its exceptional size and foreign range deserves special mention. It has no common name but is known to the scientist as Erebus odora.

Erebus Odora
2/3 natural size





Cecropia Moth

The *Erebus odora* is one of the largest moths found in the United States having a wingspread of slightly more than seven inches. It is a tropical species and although it is not known to breed within the United States, it has not infrequently been found there as a straggler, especially in the southern part. Its general dull grey color is not striking but the design upon it is very attractive, and its great size alone is enough to make it very conspicuous. The specimen from Grand Canyon was found near Phantom Ranch on June 26. Five days earlier another of the same species had been recorded from the Hopi Indian village of Chimopovi.