

Niomi and Bryce Nature Notes

Sept. 1935
Vol. 7
No. 3



DEPARTMENT OF THE INTERIOR
National Park Service
Zion and Bryce Canyon National Parks, Utah

Vol. 7
Zion-Bryce Nature Notes

No. 3
September, 1935

This bulletin is issued monthly for the purpose of giving information to those interested in the natural history and scientific features of Zion and Bryce Canyon National Parks. Additional copies of these bulletins may be obtained free of charge by those who can make use of them by addressing the Superintendent, Zion National Park, Utah. PUBLICATIONS USING THESE NOTES SHOULD GIVE CREDIT TO ZION-BRYCE NATURE NOTES.

P. P. Patraw, Superintendent

C. C. Presnall, Park Naturalist

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THE DATURA

By C. C. Presnall

More by accident than otherwise this issue of Nature Notes has become chiefly a Datura issue, to which the following resume of the subject may be a fitting introduction.

Ever since Zion National Park has been open to visitors, the auto bus drivers have pointed out the large, trumpet-shaped flowers in Zion Canyon, calling them Zion Lilies, probably not realizing that they were neither lilies nor confined to Zion. They are properly called Datura meteloides, and are found throughout the southwestern states and much of Mexico; and there are other kinds of Daturas in the eastern and southern states, South America, and Asia.

The genus is notable principally because of its narcotic properties, due to certain alkaloids contained in the leaves, roots, and seeds; chief of these drugs are hyoscyamine and scopolamine. The narcotic effects of Datura have been known for many centuries among many peoples. In India the natives have long used the metel-nut or Dhatura (from which is derived the present latin name); a knowledge of the medicinal value of Datura metel was known to the Arabs in the eleventh century; and the Chinese wrote of its properties in the sixteenth century. When white men first settled in the Americas they found New World forms of the plant in common use among many Indian tribes of both North and South America. The Indians of Virginia used Datura stramonium (which has come to be commonly known as Jimson or Jamestown Weed) in the boys adolescence ceremony. The Indians of Mexico used several different species of Datura, principally Datura meteloides, the magic plant of the Aztecs, known as "coatlxoxouhqui" or "green snake weed"; and Datura innoxia, known as "toloatzin" (from the way in which the seed pods droop). This name became corrupted to "toloache" by which the Datura is known today among Indians of southern California.

The various "toloache cults" among California Indians, from the Mariposa and Yokut tribes in the north to the Cocopa in the south, have attracted much attention among ethnologists, who find that the religious use of Datura spread throughout these tribes in comparatively recent times, and was an entirely separate thing from the customary and previous medicinal use. A possible outgrowth of the "toloache cult" is seen among the

Zuni doctors probably attained greater knowledge of the uses of the plant than those of any other tribe north of the Rio Grande, as is narrated in the article by Ranger-Naturalist Reid.

Many visitors to Zion, interested in the prehistoric peoples inhabiting this canyon, ask whether they used the *Datura*. It seems likely that they did, since Miss Alice Eastwood, of the California Academy of Science, found *Datura* seeds and seed pods in the Pueblo ruins in southwestern Utah.

In conclusion it might be well to summarize the principle kinds of *Datura* found throughout the world.

Datura metel L. is the form occurring in southern Asia and parts of Africa.

In the United States there are three common forms, *Datura stramonium* L., or Jimson Weed, in the eastern states; *Datura meteloides* DC. or Sacred *Datura*, throughout the southwest; and *Datura discolor* Bernh., in the warmer parts of the southwest.

Mexico has at least eight forms of *Datura*, including the three in the United States. One of the Mexican forms (*Datura ceratocaula*) is aquatic.

In South America, particularly in Columbia, Ecuador, Peru, and Chile, there are at least a dozen kinds of tree *Daturas*, some of which are also found in the West Indies. *Datura arborea* L., and *Datura suaveolens* H. & P., are two of the better known forms. The latter is often cultivated in hot-houses, and is known as Angel's Trumpet. It is a native of Brazil. Some of these arboreal forms have beautiful red or yellow flowers.



Datura ceratocaula

A Mexican species

ETHNOBOTANICAL NOTES

By K. E. Weight

According to legends and studies made by students interested in the early people of the Zion region, plants played a very important role in their lives. Before white man came into this section of southern Utah the Paiutes and the Pueblos or Cliff Dwellers were absolutely dependent upon the biological environment for their food. Game animals were killed for their meat diet, but from all indications, plant foods played the most important part in their diets.

Indians who inhabited the southwest lived with the plants. According to M. C. Stevenson * they were very sacred to each tribe. Some species were dropped to the earth by the Star People; some were human beings before they became plants; others were the property of the Gods, and all, even those from the heavens, are the offspring of the Earth Mother, for it was she who gave the plants to the Star People before they left this world and became celestial beings.

Plants were used in many ways by these aborigine people. In addition to those that were edible, they selected many for their medicinal value, for weaving, dyeing, basketry, pottery decorations, toilet, clan names, and for their ceremonials. A full discussion of each of the above listed uses of plants cannot be made in this article, but some of the plants common to Zion that were used in a medicinal way will be described.

It is often said that medical treatment is older than intelligence in man. To substantiate this statement, the dog is cited who goes to the field and hunts his special grass medicine; the bear dresses the wound of her cubs with almost human intelligence. Primitive man certainly did not know why his plant medicine cured, but from the result he no doubt could see some advantages in the effort made.

Probably the outstanding herbaceous plant, at least from the tourist point of view, in Zion National Park is the Sacred Datura (Datura meteloides). From a medicinal point of view this species was no doubt the most important plant of the early Indians. This plant according to Indian legend was once a boy and a girl. In the olden times A'neglakya (name of mythical boy) and A'neglakyatsi'tsa (name of mythical girl), brother and sister, lived in the interior of the earth, but they often came to the outer world and walked about a great deal, observing closely everything they saw and heard, and repeating all to their mother. This constant talking did not please the Divine Ones (twin sons of the Sun Father). One day the boy and girl met the Divine Ones and a conversation soon started. They told how they could

(* Ethnobotany of the Zuni Indians, 13th Annual Report of the Bureau of American Ethnology.)

make one sleep and see ghosts, and how they could make one walk about and detect the person who had committed theft. After this meeting the Divine Ones concluded that the people from the interior of the earth knew too much and that they should be banished for all time from the world. From that time on they never did appear on the earth again. A beautiful flower sprang up at the spot where the two last stood on the earth. This original plant in time had many offspring that scattered over the earth. From this beginning came the beautiful Sacred Datura.

Datura yields a powerful alkaloid drug (narcotic) known to the medical profession as Hyoscine. It has been in constant use by modern medical men since 1762. Long before that time it was employed by the Indian priests. It was prescribed for many ills and disorders. Each doctor collected his own medicine and prepared it for use. The powerful root was given as a narcotic. At the time of operating, a small dose was given internally. Soon the patient became unconscious and the operating was done without pain. Ground roots and flowers of the same plant were used as an antiseptic, producing rapid healing effects. According to reports there was very little evidence of any ill effects from the use of this drug.

Ephedra nevadensis S. Wats. (Joint-fir) is another common plant of the park. It was utilized in the making of a tea. The stems and leaves were ground and boiled for some time in water. The tea was used for nearly all ailments. It no doubt helped in some cases, because a recent study reveals the fact that it is a good tonic, aiding in the restoration of the appetite, and also that it contains small amounts of Vitamin D. *

The common sunflower (Helianthus annuus L.) was employed in conjunction with other plants to cure rattlesnake bites. After sucking the blood from the snake wound, the ground roots of the sunflowers (combined with Psilostrophe tagetina and Ansonia brevifolia, not in the park) was applied to the wound with a bandage. Should the patient be troubled with throbbing in the part affected, the priest would unbind the wound and puff smoke from a corn-cob pipe filled with native tobacco (Nicotiana attenuata Torr.). Death due to rattlesnake bite was seldom known to the early Indians.

Puccoon (Lithospermum linerifolium Goldie) an early spring flower of Zion, was used to relieve sore throat and the swelling of any part of the body. The root was ground to a powder in the morning on a ceremonial grinding stone in the room of the patient, and gathered into a deer-skin sack. The remainder of the plant was made into a tea by boiling in water, which was given warm to the patient as soon as made. The powdered roots were applied direct to the swollen parts. Goldenrod (Solidago canadensis Gray) one of the fall blooming plants of Zion, was also given as a medicine for the same troubles.

The above plants are but a few of those used by the Indians in their medical practices.

(* Dr. L. L. Cullimore, Provo, Utah)

THE SACRED DATURA AMONG THE ZUNI

By H. L. Reid

Without doubt the most spectacular plant within Zion National Park, so far as the traveler is concerned, is the Sacred Datura (Datura meteloides), with its large white trumpet-like blossoms. Many popular names, such as Jimson Weed, Moon Flower, Zion Lily, and Angel's Trumpet, have been given to the plant.

The Datura is a genus of the solanaecous plants and is closely related to the tomato, the potato, and the night shades. Within Zion Canyon the first blossoms appear in early June and continue with increasing productivity throughout the summer, ceasing only with the approach of the frosty nights of autumn. During the height of the blooming season it is not uncommon to find from sixty to seventy blooms on one plant, while as many as one hundred twenty-three have been counted on one of the larger specimens.

This plant is not only attractive to the eye, but it has a long and interesting history. Years before white men first visited the West, the Datura was used by the Indians in their medical practice and in their ceremonials. The Zuni ascribed to it a sacred origin as is revealed by the following legend. *

In olden times a boy and his sister, named respectively A-neglakya and A-neglakya-tsi-tsa, lived in the interior of the earth. They often came to the outer world where they would walk about observing with care everything they saw and heard, and upon their return repeated all to their mother. This constant talking was displeasing to the Divine Ones, twin sons of the Sun Father.

One day the Divine Ones chanced to meet the brother and sister, and they made inquiry as to how they were enjoying themselves. The couple replied to the effect that they were happy, and then continuing the conversation they explained to the Divine Ones how they could make a person go to sleep and see ghosts, and how they could also make one walk about and while walking see one who had committed a theft. After this meeting the Divine Ones concluded that this boy and his sister knew too much, and in consequence should, for all time, be banished from this world. Following their banishment beautiful flowers, exactly like those worn on each side of the head of the boy and girl while on their earthly visits, sprang up at the spot where the two had descended. The Divine Ones called the plant Aneglakya, after the boy's name.

(*Ethnobotany of the Zuni Indians by Matilda Coxé Stevenson, Thirteenth Annual Report of the Bureau of American Ethnology.)

The original plant, so the legend avers, has many children scattered over the earth, the colors of which belong to the four cardinal points. Some of the flowers are tinged with yellow, some with blue, some with red, while some are all white.

The use of the Datura by the Indians has been known for many years. While our own medical science was still in its dark ages, the Royal Society of London gravely inquired of Sir Philberto Vernatti "whether the Indians can so prepare the stupefying herb Datura, that they make it lie several days, months, or years, according as they will have it, in a man's body, and at the end kill him without missing half an hour's time."

The Datura was widely and variously used by most of the tribes of the southwest, especially those in south and central California, the Paiutes, and the Zuni. The last-named tribe was the most advanced in its use, as shown by the following facts gleaned from the Stevenson reference already mentioned.

Among the Zuni the rain priests administer Datura that one may become a "seer", while the Zuni "doctor" gives the powdered root of the plant to render his patient unconscious while he performs minor operations such as setting fractured bones, treating dislocations, and making incisions for the removing of pus.

Matilda Coxe Stevenson reports that she "observed the late Nai-uchi, the most renowned medicine-man of his time among the Zuni, give his medicine before operating on a woman's breast. As soon as the patient became unconscious he cut deep into the breast with an agate lance, and inserting his finger, removed the pus; an antiseptic was then sprinkled over the wound, which was bandaged with soiled cloth. When the woman regained consciousness she declared that she had had a peaceful sleep and beautiful dreams. There was no evidence of any ill effects from the use of the drug."

Among the Zuni the medicine of the Datura is the property of the rain priests and the directors of the Little Fire and Cimex fraternities, who are the only ones to administer it medically and then with the greatest of care. Each director must collect the medicine which he uses, and he must also prepare and deposit prayer-plumes to the sacred plant in order that his treatment may be successful.

The powdered root of the Datura is given as a narcotic, while the root and flowers ground together into meal are applied to wounds of every description by the directors of the Indian medical fraternities. Wounds are said to heal very rapidly under this treatment. The plant also figures very prominently in the Indian ceremonials. A minute quantity of the powdered root was put into the eyes, ears, and mouth of the rain priests when they went at night to ask the birds to sing for rain. It was said that the birds were never afraid to tell the rain priests that they would sing for rain when the priests had the powder in their eyes, ears, and mouth.

Considerable preparation was necessary before a complete rain ceremony could be carried out. Each rain priest must prepare four plume-offerings, one to Aneglakya and one to Aneglakyatsitaa, and two to his deceased predecessors. Each plume-offering must contain an underwing plume of the turkey,

one white fluffy plume of the top of the eagle's tail, and one tail plume from the teal duck. It must also contain one tail or wing feather from the long-tailed chat, bird of the North, one from the long-crested jay, bird of the West, one from the macaw, bird of the South, one from the purple martin, bird of the Zenith, and one from the painted bunting, bird of the Nadir. The plume-offerings being prepared, the rain priest deposited each of the four offerings in separate excavations which he had previously made with an ancient bean planter, and then addressing Aneglakya and Aneglakyatsitsa and his ancestors he would say:

"I place my prayer-plumes and I take your medicine that I may talk to the birds of the six regions, that the rains may come and fructify Earth Mother and make her beautiful".

A small quantity of the powdered root of the Datura was at times given to an individual in the hope of securing rain, and "it was believed that rain will surely come the day following the taking of the medicine unless the man to whom it is given has a bad heart." It was also administered by the rain priests to put one in a condition to sleep and see ghosts.

The Zuni say that when one touches a Datura blossom with moist hands, the impression will be imprinted on the hand and also on the body at whatever place the hand touches the body. The blossom, they say, will appear on the hair if the hand is placed on the head.

If one of the Indians has been robbed and wishes to discover the thief, he summons to his aid the rain priest, who prepares plume-offerings similar to those previously described, and then on the day that the man who has lost his property is to be treated by the rain priest, at sunrise he plants the plume-offerings with the following prayer to Aneglakya and Aneglakyatsitsa and his ancestors:

"I give you plume-offerings and collect your medicine which I will give to my child at night that he may see the one who has robbed him."

As night approaches the rain priest goes to the home of the plaintiff, where he finds him seated in the darkness of an inner room, dressed in a white cotton shirt and trousers, and blue leggings, but no shoes or headkerchief. There must be no fire in the room. The rain priest takes a seat by the side of the man and taking a bit of the Datura root from the palm of his hand places it in the man's mouth, telling him to chew the medicine that he may sleep soundly and be possessed of the power to see the one who has robbed him.

facing eastward. The rain priest here repeats to the man what he heard him say during the night and gives to him the name of the person he mentioned while under the influence of the Datura. The patient declares that he has no recollection whatever of anything that happened during the night. The rain priest now directs the man to go to the house of the one whose name he called during the night, but before he is permitted to go the rain priest makes a fire, heats water and gives the man about a quart of it to drink, which induces vomiting. This drinking of the water followed by copious vomiting is repeated four times. After this procedure the root of the Datura is supposed to be entirely ejected from the body. Should this ejection not take place, the flowers of the Datura, they believe, would appear over the body.

The robbed man remains within his room while the rain priest goes to his own home and notifies his wife and the other women of his family to prepare and carry a bowl containing yucca root to the house of his patient, where yucca suds (yucca is sometimes called soap plant because of the soapy nature of the roots) are to be made and the patient's head washed. During the hair washing ceremony the man kneels on a blanket and the rain priest sits back of him with a hand on each of his shoulders.

The rain priest now presents the robbed man with four ears of corn tied together, which are to be planted, apart from the other corn, during the coming season. In return the patient presents the rain priest with a few yards of calico, or perhaps a shirt and trousers, after which the priest's family brings food that has been cooking during the night and prepares a meal. After the repast the patient visits the person whom he saw while under the influence of the Datura, and tells him that he saw him in his dreams and knows that he stole his property. According to the Zuni "the accused always returns the property for he is ashamed of having been discovered."

Among some of the Indian tribes of the southwest the use of the Datura never attained the position of high importance that it did among the Zuni. The Mohaves gathered the leaves and roots and after bruising them, mixed them with water. This mixture they permitted to stand for several hours, after which a highly narcotic liquid was drawn off. This drink produced a stupefying effect which it is said was not easy to remove. Among the Paiutes the plant was called Main-oph-weep. They prepared a drink of the watery infusion of the bruised seeds which they fermented in the sun and drank for the purpose of producing intoxication.

From the foregoing it is evident that for many years the Datura has been extensively employed among the Indians, and especially among the Zuni. The remedial properties of the plant were undoubtedly discovered by chance and later came to be associated with the gods. They learned the value of the Datura as a narcotic perhaps centuries before the birth of Baron Stoeber of Vienna, who first brought Datura stramonium to the attention of the medical profession in 1762. Since its first introduction the Datura has played its part in the world of drugs. It contains atropine and hyoscyne which are today obtained from the Datura stramonium and used as nerve sedatives and antispasmodics.

ALONG NATURE'S HIGHWAY

Many an individual takes the opportunity of visiting the live reptile exhibit at Zion Museum. Most unusual among the recent visitors was one who came, not as one interested in education or amusement, but as a hungry individual in search of food. This unusual visitor, a Road-runner (Geococcyx californianus) when first observed was trying very industriously to get at a desert horned toad (Phrynosoma platyrhinos) which is on exhibit in one of the cages.

Previous reports confined this bird to the lower portions of the park; the south entrance, and Coalpits Wash. This is the first time the road-runner has been observed as far up the canyon as the museum. - H. Grantham.

Without making a daily observation it would be impossible to determine the number of buds and flowers produced from one large *Datura* plant during one summer. They bloom at night and the flowers fade and die in just a few hours when the sun strikes them the following morning. The following numbers of buds and flowers counted on one plant along the Canyon Road on August 29, 1935, will give some idea of the great amount of energy required by the plant in the process of reproduction. The plant examined was about ten feet in diameter. It had eight major stems from the same root. One hundred and five flowers were in full bloom at 8:00 A.M. The buds from one inch or more in length to those that would open the following night numbered between four and five hundred. This plant had nearly six hundred buds and flowers at the time of observation. The same plant had been blooming since about June 15, 1935. - K. E. Weight.

An unusually late nesting date for White-throated Swifts was recorded at Bryce on September 8, 1935, when adult birds were seen carrying food into a crevice above the Navajo Trail, in the canyon known as Wall Street. The young must have been nearly ready to leave the nest, judging by the clamor with which they greeted each offering of food. - C. C. Presnall.

At the parking space at the east end of the Mt. Carmel Tunnel, on September 27, 1935, I observed an Inyo Chipmunk (E. quadrivittatus inyoensis) apparently eating sand. With 8-power binoculars I could plainly see it pick up chunks of sand the size of a pea and chew on them. At other times it placed its mouth to the ground and chewed or dug at the sand. Examination of the spot showed that a number of small tin sausage cans had been discarded there by tourists. Perhaps a small amount of liquid had been spilled and the chipmunks were eating the salt or grease; or perhaps they were getting moisture from the sand, recently wet by rain. The latter seems hardly likely, however. Several spots on the sandy area showed evidence of such work by the chipmunks. - W. S. Long.

Fluctuations in density of animal populations are of particular interest to one who studies an area for several successive years. A few such fluctuations in the Southern Utah Parks region are here noted. At Bryce the Fremont Chickarees (Sciurus f. fremonti) or tree squirrels as they are locally known, are on the upswing of an apparently long cycle. Local residents said they were very numerous about 1923, but became almost extinct soon after. My first observations, in 1933, revealed but two in the park. In 1934 I found half a dozen, and this year they are numerous enough to attract the attention of the more observing visitors. They have by no means yet reached the maximum peak of their cycle.

In Zion National Park, Dr. Woodbury reported chipmunks very numerous when he first became ranger-naturalist in 1925, after which they declined in numbers so that when I first visited the park in 1933 the form dorsalis utahensis was very rare, and quadrivittatus inyoensis and minimus conso-
brinus were scarce. This year utahensis is fairly common, being seen dashing across the roads quite often; the other two forms, on the plateaus, are also more numerous, especially inyoensis, which is abundant in some sections.

Such cycles of abundance and scarcity are very important, since they have a direct effect on numbers, movements, and food habits of larger predatory species, as weasels and bob-cats. Much of the animal kingdom depends upon an abundant supply of the smaller animals. - C. C. Prexnall.
