Observations on Sphenodon punctatum in Captivity

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OBSERVATIONS ON *SPHENODON PUNCTATUM* IN CAPTIVITY

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*Sphenodon punctatum*, known as the tuatara lizard by the natives of New Zealand, is the only living species of reptile included in the order Rhynchocephalia and is considered by scientists to be the most ancient representative of reptile-like animals now living. All the other representatives of the order are known only as fossils. The rhynchocephalians possess so called "abdominal ribs" which foreshadow the plastron of the chelonians.

In early times *Sphenodon* was very generally distributed over the Dominion of New Zealand, but at present it is confined to only a few rocky islands on the east coast of the North Auckland Peninsula, on Karewa and other islets in the Bay of Plenty, on East Cape Island, and on Stephen Island in Cook Strait. The great reduction in numbers has been due largely to the fact that the natives used it as food. Certain indigenous birds, and exotic cats and hogs, introduced by man also played an important part in the destruction of these reptiles. It is now protected by law and Stephen Island in Cook Strait has been made a government preserve.

*Sphenodon* is somewhat lizard-like in appearance, combining, to some degree, the characters of the crocodile, the turtle, and the lizard, with features of its own, the most distinctive one being the possession of a vestigial structure known as the pineal eye. The body of the animal is about nine inches long, very stoutly built and slightly depressed. The tail is as long as the body and somewhat compressed. The reptile possesses a median dorsal spiny crest which, after being interrupted in the shoulder region, continues on the back as a row of compressed spinelike scales, whitish in color. On the mid-dorsal part of the tail is a longitudinal row of deep-seated, posteriorly directed, clawlike spines. Interrupted rows of smaller spines of the same character are found on the lateral portions of the body and tail. The four well developed limbs each bear five digits which are united at the base by a web more pronounced between the first four digits. Small granular scales cover the upper part of the body and tail; the
scales on the ventral surface are large, squarish and arranged in transverse rows. The coloration above is yellowish green, the yellow being due to small, scattered yellowish spots. The color below is whitish.

The reptiles have been brought into America several times in the past, but the ones which I discuss here were brought into the United States by Professor C. C. Nutting, Head of the Department of Zoology, State University of Iowa, and leader of the recent Fiji-New Zealand Expedition.

Professor Nutting says they were the most distinguished and popular passengers aboard ship. They were kept on one of the lower decks and were cared for by the ship's butcher. On the way from the coast they were attended by the baggage men. Their car became detached from the train and went adrift in the desert, delaying their arrival in Iowa City twenty-four hours, the date of arrival being September 9, 1922. The amount of interest in them and proof of good care was evidenced when word was received from every baggage man who had handled them asking in regard to their welfare. Some difficulty arose in checking these animals as baggage from San Francisco. This was soon settled by a higher baggage official who considered the sphenodons as mud puppies and mud puppies as dogs. Dogs, of course, are domestic pets and can be checked very readily.

The sphenodons are four in number and have been kept captives in their home on the ground floor of the Natural Science Building at Iowa City. The room is steam heated, electric lighted and has been unusually warm during the winter months. The temperature fluctuates a good deal during the course of the day, being warmest in the early morning and late afternoon.

This home consists of a heavy wooden box approximately three feet long, two feet wide, and a foot high. The lid of the box is a wooden frame, supporting a wire netting of one-half inch mesh through which sunshine may enter each afternoon. The inner furnishings of the home consist of a sprinkle of wet sand and several rugged rocks at one end and at the other end a shallow pan of water which seems to be a favorite resting place for the reptiles. Sometimes an individual remains in the water an hour or more. From the amount of time spent therein, the tank seems to be very necessary. The entire body, except the head, is always submerged and sometimes the head also may be immersed for several seconds. This act is occasionally repeated three or four times in succession.
Each captive tuatara has its individuality and idiosyncrasies. One has succeeded in retaining its original tail, the others have, for some reason, had to regenerate the distal portions, making them somewhat stubby in appearance. Another is gifted with the power of climbing and generally partakes of its acrobatic stunts as soon as the box is opened. Still another is somewhat pugnacious and dislikes very much to be touched or handled. The first and last ones mentioned are the most energetic and the most lively. The largest one is very lazy, seldom moving and apparently has to use all available energy in lifting its extremely large head. I was very much surprised one day after teasing this reptile for a while to find that it could move by leaps and bounds, for it was able to spring its length and height at a single leap. The amount of time spent by the reptiles in moving around, unless disturbed, is not great. They stand like wax models the greater part of the time, and occasionally remain motionless for hours. One might think that they were slow moving creatures, but the contrary is true. Movements are very characteristic and instantaneous. Their very expressive eyes and well executed acts make them appear to have a purpose in view. They possess well developed decurved claws, which aid them in digging and climbing and facilitate their passage through the narrow crevices between the rocks. In moving, the motion of the appendages is about as much lateral as it is ventral. They walk over one another when necessary and sometimes pile up four deep. Several times I have noticed a claw of one caught in the lower eyelid of another and no attempt made to free the eyelid from the claw.

Their food habits and method of taking food are worthy of mention. In their native haunts their food consists mainly of insects, earthworms, and food they are able to take from their commensal companions, the petrels. During the time they have been in the United States, except the last two weeks, their food has consisted of fresh, juicy round steak of which they partake freely at each meal. They have been fed about every three or four days; occasionally, a longer time intervened. For several months they would not eat in my presence, but one day the temptation became too great for the little fellow, it appeared from under the rock and showed me just how this feat was accomplished. In the approach, the limbs were moved, alternately, with a distinct pause between successive movements. When near the flesh, the neck was arched, the anterior part of the body raised, and the head turned down. In the meantime, there seemed to be an in-
crease in amount of blood in the sinuses around the eyeballs, making the eyes very prominent and partaking of the nature of a stare. The reptile took the food by snapping at it several times and finally succeeded in catching it between its powerful jaws. The juicy morsel proceeded on its way by four successive motions of the head, one the opening of the mouth, another the arching of the large fleshy tongue at its anterior end, then the thrusting of the head forward very quickly after which the jaws were tightly closed by the contraction of the great muscles in the temporal vacuities of the head. In the latter operation, the food snapped and cracked as if it were going through a sausage grinder. The motions were repeated several times when the reptile was ready for the next morsel. Swallowing did not seem to be evident, and has not been noticed at any time. Since this time the remaining sphenodons have been seen eating and the process is about the same. It matters not how much food is present on the floor of the box, the last piece dropped in front of the animal is generally the one taken. They seem to like the idea of motion because at present they are receiving live earthworms for food and pick them up much more readily than they did the steak. Judging from their actions, they seem to get a good deal of satisfaction in setting their teeth into the worms, whose extremities vigorously squirm on either side of the sphenodon's mouth.

Production of sound is not well developed in these reptiles and some observers have never heard them utter a noise. Nevertheless, they are able to make sounds of two kinds; one, a low hiss when eating, the other a low, deep croak much the same as the croak uttered by a frog when picked up by the abdomen. Sometimes this croak is given when the animal is frightened. It has also been heard at night, during the earlier part of the year, when there was a great deal of activity among the reptiles in trying to get out of the box. When I was handling the little fellow one day it became very indignant and was put back on a large rock in the box where it proudly remained and uttered a series of six successive croaks. The performance has been repeated since, but the number of croaks was reduced to five.

Careful watch has been kept for expressions indicating something of the degree of mentality of these animals. During the Christmas holidays Professor Nutting took one of them to the Boston Meeting of the American Association for the Advancement of Science and after its return to its fellows there was no evidence of recognition. Expressions of fear have been noticed
since February 20, 1923, and have been quite pronounced when the box is closed quickly, being indicated by a desire to hide. One day while I was feeding them, there was a general scurry and as quick as a flash three were under rocks and the little fellow was in the tank of water, motionless, with its head submerged and eyes closed. After a few moments, they resumed their normal attitudes as if nothing had happened. Acts of a similar nature have occurred since, but I am still unable to account for the cause. Recently, when I approach the box they seem to show apparent recognition by a certain movement of the head.

During the night of March 25, 1923, the little fellow went through a period of ecdysis and during the night of April 6, one of the others did the same thing. Water seems to be very necessary for a proper ecdysis, considering the results in these two individuals. In the case of the first the tank of water was not deep enough and the skin remained very tightly applied to the dorsal parts of the body and was removed with forceps about ten days later. For the other specimen there was sufficient water and ecdysis was complete, except for a small portion on the top of the head. In both cases, the cast skins were found around and in the tank. The only external portions of the body which did not seem to shed were the claws. The two reptiles that have shed their skins are much brighter than those that have not, but the coloration is not the same in the two individuals.

A good many changes have taken place in the animals since my observations began and some of the results obtained differ from those of other writers. It is hoped that the sphenodons will live for a considerable length of time and that our knowledge concerning them may be increased.

Acknowledgment is here given to Professor Nutting for permission to record the above notes.

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