

From the foregoing it is evident that degeneration has not proceeded in the reverse order of development; rather the older normal stages of ontogenic development have been modified into the more recent phyletic stages through which the eye has passed. The adult degenerate eye is not an arrested ontogenic stage of development but a new adaptation, and there is an attempt in ontogeny to reach the degenerate adult condition in the most direct way possible.

THE FLORIDA GOPHER.

BY WM. B. FLETCHER.

If there is any one animal peculiar to the United States and limited in its habits to a very small section, it is the Florida Gopher (*Testudo Polyphemus* (Daudin) *Zerobates Carolinus* Ag.), which is found in all the pine barrens and sandy uplands of Florida, and, but rarely, in parts of Alabama and Georgia; never north of the Savannah River.

The word gopher comes from the old French, and means to honeycomb, make numerous holes or burrow, and by the early French settlers was indiscriminately employed to designate all burrowing animals. To nearly all persons living outside of the three States mentioned, the word gopher indicates one of the pouched rodents, rats or squirrels which burrow in the ground and are found from Illinois west to the Pacific coast, and all over the southwestern States. What we call gophers in the North are called salamanders in the South.

Had nature intended to put into any one animal the characteristics of all that is harmless, patient, kind and non-resistant, it is found in the gopher. Possessing greater strength in proportion to its size than any of the vertebrata, yet it never attacks other animals or defends itself from them except by withdrawing its head and legs within the protection of its shell; the horny fore-arms and hands, as it were, placed over the head and face, making a complete armor against the foe, no matter how sharp the teeth or claw may be, or how powerful the jaw of the attacking animal.

The habits of the gopher are those of peace and quietude, except in the rare instances of personal contests with its kind. While it is true

that they are frequently seen in numbers of ten to twenty grazing in the same locality like so many cattle, it is rare to see them close together, and there is seemingly no bond of communication between them, for the gopher is an animal of almost perfect silence and the only approach to vocal sounds is a slight hiss as the head is suddenly drawn in, compressing the lungs and forcing the air quickly through the chink of the glottis; and I have sometimes thought I recognized a faint "mew" like that of a kitten.

The gopher is a most strict vegetarian in his native State, but, under domestication, will learn to drink milk, to eat salads of various kinds, prepared with dressing of eggs, condiments, etc. He heartily abjures all kinds of flesh or insects, and would starve before eating either. He does not seem inclined to social life with his own kind, and invariably lives alone, save for the companionship—either by accident or from choice—of the white and mottled frog, or cricket, that is almost always found in his home, and which is known to the native Floridian as his "familiar." The gopher is thus an example of absolute independence, each dwelling alone in his or her own home; never have I found two in one house, and I know of none having calling acquaintances. The female deposits her eggs, from one to two dozen in number, in the sand at the entrance to her burrow, covers them up to the depth of four inches, and then her domestic duties to her family are ended; she may sit at the doorway and chew her cud when the weather is agreeable, that is, not raining, or too hot from the direct rays of the sun. She may at times cover her deposit with her impenetrable shell to keep them from the opossum or meandering coon; but one thing is certain, when the eggs are hatched by the heat of the May sun, each little gopher—an inch in diameter—goes for itself, finds its own food, makes its own house and is recognized as an independent citizen from the very shell.

When driving through the pine barrens one will sometimes pass a dozen or more of these animals grazing within a few hundred feet of one another. They swing along with heads thrust forward much as if the neck were a cable and the head the motive power, drawing a heavy inverted basin behind. Coming to a tuft of wire grass or other crisp or tender herbage they draw it in by the tongue, cut it off sharply by the triple row of sharp, serrate teeth-like edges of this horny layer of the jaws and swallow it down without mastication. The animal will give little heed to your presence or that of your dog, unless quite near his hole, but will

draw himself within his shell and remain perfectly quiet for from one to five minutes, and then proceed with his journey or browsing, provided you keep still, even though you are within three feet. After feeding he returns to his abode and proceeds to masticate the coarse herbage ingested. It is almost comical to see him sitting beside his doorway, his black skinny head thrust out, chewing with great satisfaction the morning's repast. It looks like a caricature of a Florida cracker sitting at the open window of his cabin chewing tobacco; but the gopher doesn't expectorate.

The average size of the full-grown gopher is twelve and one-half inches in longitudinal, and fourteen in transverse measure of the shell, the latter measurement being greater because the enameled shell bends underneath to join the plastron, or breast bone, as we might call it. When the head and legs are drawn in (the animal has no tail) from every aspect there is an arch, compressed, it is true, at the base, and, in the very old, slightly so on the top. It is from this peculiar structure that a gopher in good condition, weighing eight and one-half pounds, can lift two hundred pounds when balanced centrally. I have seen two small gophers, weighing four pounds each, attached to a cart as oxen, draw two lads weighing together one hundred and twenty pounds.

On December the third, last, I took Henry Jordan, a very intelligent native colored man, with me, and went out to get some gophers for dissection. About a mile from Palm Springs, Florida, there is a tract of country, which, eight years ago, contained most valuable orange groves, as the long rows of big dead stumps of orange trees testify. It has been abandoned and the tenantless, decaying villas, with pine and palm trees shooting up through their rotting porches and roofs, and mats of climbing roses and jasmine creeping through the open doors and windows plainly show. In these abandoned fields the gopher has taken up his habitation. On a space of ten acres I counted some fifty gopher holes. The soil is typical of Florida uplands—yellowish brown, or like white salt, is the sand through which some coarse weeds and grasses emerge in tufts. Wherever you see a pile of sand, apparently as much as two flour barrels would hold, slightly spread out in front of an arched doorway, and in that sand see the prints of the dragging shell and toe points going inward to the door, you can safely say that Mr. or Mrs. Gopher will receive callers at home.

The character of the soil or sand in which the gopher loves to delve

much resembles a very light brown sugar, containing so much moisture that you may thrust your cane into it, and withdrawing, leave a hole. We find an entrance to the burrow, which has a hallway perhaps three feet wide and tapering in eighteen inches, with a downward slant to the opening proper; here we come to an arch, one-third of a circle, over a horizontal base which measures fourteen inches; we take a long rod and thrust down the incline and find it goes eight feet at an angle of forty-five degrees and then turns; we lay the rod on top of the ground in the same direction, and dig a foot or two beyond our measure, then down, and strike the hole; from this point the burrow changes direction twice, but always an easy incline downward, the sand gradually becoming more damp as we proceed. After we had made a trench some twelve feet from the entrance large enough to stand and work in, and six feet deep, I asked Henry how far he thought we must go before we got the gopher. "Well, we must jist go on dis road till we git him, if it takes a hundred yards." After digging four feet more and still down, Henry handed up a bleached cockroach, remarking, "We's most' got um; here's one of his 'familiar,' and when we come to de white frog we's got um shore." Sure enough it was so, for the spade went four feet more and we could hear it grate on the shell; at the same time a white frog jumped out. It was a bright-eyed little fellow, with transparent legs and toes. A few black specks about his head made a pretty contrast to his sparkling gold-ringed iris. "Hold on, Henry," I said, "let me pull out that gopher; I fear you will scratch him with the spade." "You can't pull him out wid an ox team," was the reply. "Well, get out of my way and I will show you; he can have no purchase in this wet sand." So in I went, "belly flat," as the boys say when coasting, squeezing myself into the hole until I got my hand on the shell. There were no hind legs to be found, and the wet oval shell was so slippery I had to give it up and be drawn out myself by the legs. "I'll show you how to get 'im widout scratchin' de shell," said Henry, and he proceeded to make a cave under the gopher. Into this he dropped, was scouped out and handed over. We had dug twenty feet, making the gopher's hole twenty-eight feet long and eight deep. In Indiana soil we would have had a half day's job to make this excavation, which, in this soft moist soil, required one hour and a quarter. The pointed, scouped spade used can be pushed into the soft sand without using the foot to propel it.

We dug out four other gophers and found there is no particular rule in the builder's mind as to how far he will tunnel or in what direction. They go into the ground for protection, for comfort and for water. A popular error exists among the natives here that the gopher does not require water because he goes only in dry places and hides from the heavy dews, or even the lightest rains; but I find that he invariably stops his digging when he has reached a sand so moist that he can suck particles of moisture through the sieve-like serrations of his jaws, which, when closed make openings of one fiftieth of an inch. If particles of sand should enter they settle in the deep groove between the serrations of the lower jaw. If you dig a little hollow six inches beyond the lower end of a gopher run you find it soon filled with water oozing up from below.

The gopher makes burrows for the purpose of regulating the temperature to a degree most fitted to his comfort and well being. When he has browsed to his satisfaction and the sun is too hot, he retires to the shade of his cave. If his shell is uncomfortably dry he retires deeper, and if he is thirsty he drinks in the filtered water from his own well. I have taken a gopher out of the ground, stopped up the entrance to his burrow, except the first foot or two, and then watched his puzzled look as he endeavored to enter. He looked curiously about as if taking in certain land marks, then, having got his bearings in mind, would make another dash at the place where his entrance had formerly been. After a half-dozen trials he threw up his head in disgust and marched off. I have put one gopher in another's hole, but it will back out and go away.

At this time I have a gopher in a little chicken coop, which has the sand for its floor. He has been there a week but has made no effort to free himself by digging out. He has buried himself all but about an inch of the rear of his shell, and from there he makes no attempt to go deeper. I have never seen two gopher holes very close together; sometimes one burrow will cross another, but never into it; the nearest being about eighteen inches.

The anatomical peculiarities of the gopher are the head, which, from the rear view, much resembles that of a frog, but is covered with a hard, black, adherent skin or scales; the jaw and tongue quite angular, looking into the mouth it seems a perfect triangle; the tongue has villi much like that of herbivorous animals; it has three well-defined stomachs. The intestine from the third stomach is very large, with muscular arrangement that the herbage ingested may be brought up at will, thus the animal is

able to go for weeks using up the stores of provision laid up within the large intestine. A gopher weighing six pounds had a reserve of two and one-half pounds within. I removed one and a half pounds of meat from the shell and legs, leaving the rest of his weight in the skeleton. There are forty-six laminated sections in the shell of the full-grown gopher; these laminae are about one-fortieth of an inch in thickness and readily scale off after the animal dies, leaving under each section a segment of true bone of the same shape and size. The brain of this animal (weighing six pounds) weighs but 40 grains; the spinal cord unusually large. The sympathetic and solar plexus largely developed. The heart is larger than in other testudo of like weight, having two auricles and a large, strong, half-divided ventricle. The lungs are attached to the dorsum of the thorax. The diaphragm is stronger than among the turtles. The ovaries long and broad, containing ten to twenty mature eggs, three-eighths of an inch in diameter, and perfectly spherical. When deposited they have a hard calcareous shell. In my specimen there were three hundred immature ova in the Fallopian tubes and ovaries; the tubes open into a short vaginal sheath an inch from the common outlet. The sex may be distinguished by the males having a concave form of the lower third of the sternum, while in the female it is slightly convex or flat. The upper part of the sternum (plastron) is a solid piece, projecting beyond the shell an inch and a half. The eye is covered with a nictating membrane as in birds.

The general intelligence of the gopher is quite limited. It remembers localities, but I do not think it remembers friends or enemies. I have one that has had the run of my office, house and yard for several months. It has gained in weight and is healthy. She likes a warm, snug corner by the fire when the days are cool; when outdoors she wanders about to certain places where she formerly found good pasturage. She knows where the gate is, and likes to get on the street for a promenade, where she walks on the tips of her strong fore clays; her blunt hind legs and club feet giving her the appearance of a miniature elephant.

The gopher, when turned upon the back, can not return to its natural position, and when one fights another it is to use its projecting sternum as a battering ram, striking his antagonist amidships and throwing him over on his back; then, as the vanquished foe thrusts its head and neck out to regain position, it receives various blows upon the neck from the same source. I have witnessed but one fight of this kind and that was

between two female gophers. The punishment given by the larger one caused the death of the smaller one.

In evidence that there is a necessary transpiration through the under shell or plastron a gopher will die if that part of the body is vanished.

The gopher is eaten and much esteemed as food by the colored people. It is popularly supposed to contain portions of all kinds of meat and fish under its different segments. My experience is that it is more palatable than any other testudo, and it contains but one kind of meat, and that tough.

I must be pardoned for not referring to the literature of my subject. It is because I have found almost nothing, and that brief and incomplete in "Wood's Natural History," and I write this far from libraries and reference books.

Orlando, Florida, December 23, 1899.

LIBRARIES OF MICROSCOPICAL SLIDES.

BY A. J. BIGNEY.

Since the earliest times it has been the custom of educated people to have libraries. No line of thought has received more attention in the past few years than the biological sciences. Probably the world has received more physical good from such work than from any other source. What the next generation will bring forth can hardly be imagined. Every one who owns a microscope is adding a little to the world's stock of knowledge in biology. Not only does such a worker need books, but he should make another kind of library, a collection of slides. To the teacher in biology this is almost a necessity. To make the slides of greatest use they should be classified in some systematic way. It has been my experience and observation, in small as well as large colleges and universities, that the slides are packed away without any or very little system, and the teacher must depend upon his memory in finding them. This causes very much annoyance and much loss of time. Last fall I classified my slides in a simple way and it has been of so much value to me that I feel