

ON THE EJECTION OF BLOOD FROM THE EYES OF HORNED TOADS.

BY
O. P. HAY.

Some years ago there moved into my neighborhood, from Texas, a family which included among its members two boys. These boys had brought along with them a few lizards belonging to the genus *Phrynosoma*, and popularly called Horned Toads. The boys told me that these little animals would sometimes, when teased, squirt blood out of their eyes. I did not handle them much and saw no evidences of such a sanguinary disposition as was imputed to them. I did not believe that the lizards could really squirt blood, nor did I wholly disbelieve the boys' story. I thought it possible that some gland about the head might secrete a red fluid, which might be ejected by the animal when there was occasion for its use.

During a part of the past summer I was, through the kindness of Mr. Leonhard Stejneger, curator, permitted to work in the Department of Reptiles of the National Museum. Near my desk there was a specimen of *Phrynosoma coronatum* which had been sent from California by a member of Dr. Merriam's exploring party. About the 1st of August it was shedding its outer skin, and the process appeared to be a difficult one, since the skin was dried and adhered closely. One day it occurred to me that it might facilitate matters if I should give the animal a wetting; so, taking it up, I carried it to a wash-basin of water near by and suddenly tossed the lizard into the water. The first surprise was probably experienced by the *Phrynosoma*, but the next surprise was my own, for on one side of the basin there suddenly appeared a number of spots of red fluid, which resembled blood. I immediately recalled what the boys had told me of the ability of Horned Toads to squirt blood, and I concluded that this was a good time to settle the question whether this fluid was blood or not. A microscope was soon procured and an examination was made, which immediately showed that the matter ejected was really blood.

The affair now became very interesting. Just where the blood came from I could not determine with certainty, the whole thing having happened so suddenly and unexpectedly; yet the appearance seemed to indicate that the blood came from the region about one of the eyes. There appeared to be a considerable quantity of the blood, since on the sides of the vessel and on the wall near it I counted ninety of the little splotches. A consultation was had with Mr. Stejneger the next

day with regard to the propriety of dashing the animal into the water again to discover, if possible, where the blood came from. It was thought, however, that such blood-lettings must be somewhat exhausting, and that it would be better to allow the animal a day to recuperate. While talking I picked up the lizard and was holding it between my thumb and middle finger, and stroking its horns with my fore-finger. All at once a quantity of blood was thrown out against my fingers, and a portion of it ran down on the animal's neck; and this blood came directly out of the right eye. It was shot backward and appeared to issue from the outer canthus. It was impossible to determine just how much there was of the blood, but it seemed that there must have been a quarter of a teaspoonful. I went so far as to taste a small quantity of it, but all that I could detect was a slight musky flavor.

All that I was able at that time to find in print concerning this strange habit of these animals is contained in Prof. S. F. Baird's "Annual Record of Science and Industry" for 1872, p. 256. It appears to be merely a clipping from a newspaper, and reads as follows:

We published not long ago a notice of a peculiarity of the Horned Toad of California in the expulsion of a blood-like fluid from the eye, and a reader of the *Weekly* writes to give his own testimony to the fact. He states that he has caught numbers of these in Texas, and frequently noticed the ejection of the bloody fluid from the inner canthus of the eye, once receiving the discharge in his own eye, while holding the animal at a distance of at least a foot. The sensation experienced was quite painful for a few minutes.

Some very interesting questions arise regarding this strange habit. What is the purpose of the Horned Toad in thus besprinkling an enemy with its own blood? What is the source of the blood, and how is it expelled with such force? Is the habit practiced at all times of the year or only during certain conditions of the animal? I may state here that I was able to get the lizard to discharge blood only twice. Afterwards no amount of teasing sufficed to provoke it to a repetition of the act. This makes it appear probable that, as suggested by Mr. Stejneger, the habit is practiced only during the time of shedding the skin.

As to the purpose of the habit, it appears to me quite likely that it is done in order to defend itself from the attacks of its enemies, although it would not seem likely that blood would hurt the eyes much, notwithstanding the statement of the newspaper correspondent referred to above. Nevertheless, a discharge of blood into the eyes of some pursuing bird or snake might so seriously interfere with its clearness of vision that the lizard might make its escape while the enemy was wiping its eyes.

In order to determine, if possible, the source of the blood, an alcoholic specimen of the same species was dissected, but the investigation was fruitless. It appears to me useless to expect to find anything of the nature of a gland. Glands secrete materials from the blood, not blood itself. The most probable theory regarding the matter seems to be that there is lodged in the head, on each side, a blood sinus, a portion

of whose wall lies in the inner surface of the eyelid. This sinus is probably surrounded with muscular tissue of sufficient force to cause the thin wall in the lid to be ruptured and the blood to be ejected to a considerable distance. If this is the actual structure of the apparatus the rupture would soon heal and all things be ready for the next time of peril. Now, on turning up the upper lid of the eye of the living specimen the inner lining is seen to be very dark, not with pigment, apparently, but as if there were a quantity of blood there contained in a thin-walled vessel. However, if such an explanation is the correct one, the sinus, in order to contain sufficient blood, must be continued back into the head some distance. I hope ere long to secure materials sufficient to enable me to settle this interesting question.

Conversation with friends has elicited the fact that others have noted the remarkable habit referred to above. Prof. L. M. Underwood, of De Pauw University, has kindly sent me the following:

In answer to a request from Prof. O. P. Hay I give herewith my experience with a *Phrynosoma*.

In 1885 a student of mine received a specimen of Horned Toad from California. In examining the animal I took occasion to turn him on his back, using a lead pencil for the purpose. The animal resented this treatment and showed considerable anger, opening his mouth and puffing up his body. Irritating the animal still more, he grew more and more enraged, until finally blood spurted from just above his eye, which was fired at least a foot from the animal, as several spots struck my arm considerably above my wrist. After spurting the blood the animal became limp and collapsed, and remained in a stupor for some time, and, when handled, behaved as if dead. After a time, possibly not over five or six minutes, certainly not over ten, the animal revived and commenced to run about the table. Wishing to know if he would repeat the operation, I commenced to irritate him again in the same manner. After becoming enraged again the animal soon went through the same process, ejecting blood from the same eye as before. He then fell into a similar stupor and remained about the same length of time, after which he revived. No amount of irritation could produce a third discharge, although the animal showed some anger.

Mr. S. F. Denton, of Washington, D. C., has communicated to me his experience with the Horned Toad. About seventeen years ago he was at Sonora, Cal. He caught one day a very large Horned Toad. He had been told by the proprietor of the hotel that these animals were called by the Mexicans "sacred toads" "because they wept tears of blood." Mr. Denton scouted the idea, but it was not long before he had reason to confess his mistake. He was gently stroking the animal on the back, when it appeared to look at him as if taking aim, and then, all at once, a stream of blood was shot into his eye. There was so much of it that it ran down on his shirt bosom. He thought there was between a tablespoonful and a teaspoonful. The blood was shot out with so much force that some pain was produced, and there was pain felt for some little time, though this ceased as soon as the blood was wiped out. The next morning the eye was somewhat inflamed, but this condition soon passed away. Not long afterwards, perhaps the next morning, the animal squirted blood out of the other eye. Mr. Denton

states that he did not see that the lizard showed any signs of exhaustion or collapse after the operation. Neither did I observe anything of the kind in the case of the animal experimented with at Washington. Nevertheless, a brief period of stupor might have escaped the notice of both Mr. Denton and myself.*

* While preparing this paper, Mr. Leonhard Stejneger has kindly called my attention to the fact that a notice of this remarkable habit of the *Phrynosomas* was published in 1871, in the Proceedings of the Zoological Society of London, pp. 1-2. At one of the meetings Mr. A. R. Wallace read extracts from letters of Mr. John Wallace, of Stockton, Cal. After describing the animal, which he says is there called the "Horned Toad," he proceeds as follows:

"Under certain circumstances, apparently as a means of defense, this creature squirts out from one of its eyes a jet of bright red liquid very much like blood. This I have observed three times from three different individuals, although I have caught many that did not do it. They do not generally use this defense when first captured, although I caught one a few days ago which squirted the liquid a distance of 6 inches over the back of my hand, and another ejected it when I flourished a bright knife before its eyes."

Dr. Günther (*Biologia Centrali Americana*, Zool., pt. LXXXIII, Feb., 1890, Reptiles, p. 77, footnote) refers to this notice and states that he had not been able by dissections of fresh specimens to find the source of what he calls "the secretion."