

THE ANATOMY OF THE  
DIGESTIVE AND UROGENITAL SYSTEMS  
OF THE HORNED TOAD

Virgil O. Johnson, University of South Dakota.

The horned toads belong to the genus *Phrynosoma* of the family Iguanidae. They are commonly called horned toads which would lead one to believe that they are amphibians. They are not amphibians but are reptiles and it would be more correct to call them horned lizards.

The habitat of the horned lizards is a dry, hot, sandy region such as is found in the south western part of the United States. However they may be found in other parts of the country where the conditions are suitable for them. They have been found in the western part of South Dakota, but not abundantly. I was unable to secure any South Dakota specimens so the material for this work was secured from a supply house in Texas.

The digestive system.—There is a large buccal cavity. The tongue is attached at the posterior part. The opening to the esophagus is large and capable of great expansion although these animals live on small insects. The stomach is long and of uniform width throughout its length. Histological sections show the stomach to be very similar to the general vertebrate type. There are both longitudinal and circular muscles, submucosa and mucosa. The glands and gastric pits are well defined.

It is very interesting to note that there are two caeca on the alimentary canal of the horned lizards. One of them is found at the point where the small intestine fuses with the stomach. At this point the two-lobed pancreas is located and is very much like the pancreas of other vertebrates. The second caecum occurs on the colon near the point of attachment of the small intestine. This caecum is more pointed and corresponds to the appendix in man.

The small intestine averages eleven centimeters in length. It is composed of the usual layers of tissue, showing fairly deep pits in histological sections.

The large intestine is comparatively short and extends under the pelvic girdle to unite with the cloaca. Its cell struc-

ture is very similar to that of other vertebrates, and no unusual differences were noticed.

The liver as an attached gland of the digestive system is interesting in many ways. It is very large and is divided into two lobes. Its ventral lobe covers most of the abdominal cavity. On this lobe is found the gall bladder partially embedded in the right margin. The common bile duct emerges from the liver posterior to the gall bladder. The dorsal lobe of the liver is slender and also very long. It extends down the dorsal wall of the coelom to the right gonad, the latter being attached to it. No differences from the general structure of the liver of other vertebrates were found in histological examinations.

The urogenital system.— There are two outstanding points of interest in this system. They are the total absence of a urinary bladder and the location of the adrenal bodies next to the gonads instead of near the kidneys as is the case in other forms.

In the male specimens the testes are located on the dorsal wall of the coelom about one-half inch anterior to the cloaca. They are attached to the dorsal wall in different ways. The left testis is attached to the mid-dorsal line by a broad mesorchium. The right testis has a very unusual attachment. It is attached to the dorsal lobe of the liver. The vasa deferentia leave the testes at a point slightly anterior to the middle. They have many convolutions inside thin-walled sacs which form the epididymis. It is at this point that the adrenal bodies are found. They lie between the epididymis and the testis on each side. They are small oblong bodies of brownish color. In other vertebrates they are closely associated with the kidneys.

The vasa deferentia continue back toward the cloaca. They lie on the mid-ventral surfaces of the kidneys and receive the ureters from the kidneys which are dorsal to the cloaca. The apertures of the vasa deferentia are marked by small papillae on the inner surface of the cloaca.

There are two copulatory organs in the male, called hemipenes. These are also found in some other lizard forms. They are protruded from the cloaca during copulation, by a muscle which is attached to each hemipenis. This muscle also re-

tracts them.

The female urogenital organs are located in the same positions as the testes of the male. The ovaries are oval bodies approximately the same size as the testes. The left ovary is attached to the dorsal wall by the mesovarium, while the right ovary is attached to the dorsal lobe of the liver as is the testis in the male. The mesovarium extends posteriorly from each ovary along the mid-ventral line of the kidney. The ureter extends through the mesentery to the dorsal wall of the cloaca.

The oviducts, which are thin-walled and many-pleated, lie laterally along the abdominal cavity. They expand at the anterior ends into wide thin-walled ostia. Their posterior openings are noticeable as small slits on the inside of the cloaca. Back of these slits are the apertures of the ureters.

The adrenal bodies are located in the mesovarium, close to the ovaries.

In concluding this paper, I think it worth while to enlarge somewhat on the urinary system. The kidneys are located in the extreme posterior part of the abdominal cavity, dorsal to the cloaca. In other vertebrate forms they are anterior to this position. The location of the adrenal bodies near the gonads instead of near the kidneys, is not because they have moved up to that position during the development of the lizard, but because the gonads have remained where they arose. As a result the gonads and adrenal bodies seem to be closely associated. As I have stated before, the ureters come from the kidneys near their posterior ends and enter into the dorsal side of the cloaca.

The urinary bladder in other lizard forms is located ventral to the cloaca. In the horned lizards it is entirely lacking. Even with very careful dissection on several specimens and the use of the blow pipe, no bladder was revealed. The absence of the bladder may be correlated with the dry habitat of the horned lizards, where no great amount of water is passed through the body.