

sogar die in Länge und Befiederung des Schnabels, wie in der Befiederung der Füße liegenden Hauptunterschiede in manchen speciesreichen Gruppen der Vögel vielleicht dem einen oder anderen Ornithologen für die Aufstellung einer neuen Gattung wichtig genug erscheinen. Eine eingehendere Darstellung werde ich in nächster Zeit an anderer Stelle geben, wobei ich zugleich den Nachweis zu führen gedenke, daß Selater in der oben erwähnten Arbeit die Abbildung Forster's auf Tafel II in seiner »Historia Aptenoditae«² mit Unrecht auf unsere Art bezieht; Forster's Zeichnung stellt entschieden die andere Pinguin-Art (*A. Pennanti* Gray) dar, was auch mit dem angegebenen Fundort Südgeorgien übereinstimmt.

Stuttgart, 24. December 1895.

4. Notes on the Biology of *Phrynosoma cornutum* Harlan¹.

By Charles L. Edwards, Professor of Biology, University of Cincinnati.

eingeg. 10. Januar 1896.

While living in Austin, Texas, from May, 1892 to July, 1894, I had abundant opportunity of verifying previous observations upon the life of *Phrynosoma*, and of adding some notes that so far as I can find, have not been given before this paper.

(*Phrynosoma cornutum* Harlan, in Texan parlance the »horny frog« is easily approached under the natural conditions of its habitat, and with a plentiful supply of live flies I have had no difficulty in keeping from fifty to one hundred of them confined in vivaria for many weeks at a time. Six months of the hot, dry, Texas summer, with long days under the glaring sun, and the ground covered with a layer of fine, lime-stone dust, gives this species of *Phrynosoma* an ideal environment.)

Historical and General.

A review of the principal points concerning the biology of this familiar genus as brought out in the literature appended, and confirmed by myself, may be first presented. Not to go back to the original systematic descriptions of Wiegmann, Girard, Harlan, Hallowell, Bell, Gray, and Blainville; or to mention the synonymy from the various catalogs of reptiles, the taxonomic needs of this paper may be served by reference to Gentry's (10) review of the genus *Phrynosoma*.

(This cunning little Iguanid is harmless, never biting its captor,

² Commentationes Societatis Regiae Scientiorum Gottingensis. Vol. III. 1781.

¹ Read Dec. 26th, 1895, at the 5th Annual Meeting of the Ohio Academy of Science, Cincinnati O.

and soon becoming so tame that it may be trained to work in harness pulling a toy wagon, or to eat insects from one's hand. When gently rubbed it puffs itself out, but when in fear it becomes flattened to the ground. *Phrynosoma* chiefly enjoys a dust heap, where with tail and feet flinging the warm calcareous powder over its body, or with alternate sawing motions of its sides, it quickly buries all of itself save the head, and sometimes even this part, in the dirt. While built after an awkward pattern for a lizard, and generally moving slowly, yet it can, when alarmed, run rapidly. It is very clever at »playing possum«, and aided by its protective coloring, often escapes from an enemy.

The food of *Phrynosoma* always consists of live animals: spiders, flies, and especially ants. In Texas the agricultural ant (*Pogonomyrmex barbatus*) furnishes almost exclusively the diet of the horned frog. If however a quantity of ants are placed with the latter in a vivarium, they soon find thin places on the apparently tough, horney armor of their enemies and by stinging they drive the horned frogs crazy, and frequently to death. While having an abundant supply of water in the vivarium, I have never seen these lizards drink, although they are said to lap up drops of dew when in natural environment. The molting(3), and the curious habit of ejecting blood from the eyes(11, 12) are phenomena often observed. The statement of Böttger that a voice is absent in *Phrynosoma* must be modified, for under certain conditions of excitement it utters a sharp squeak.

Coition.

A male and female kept in confinement were seen in the act of coition on the 5th, and again on the 7th, of July, 1895. The act lasts for several hours. The male clasps the female over the shoulders by his fore feet, and around the body just in front of the thighs by the hind feed and legs which are there held fast by the series of clasping glands on the inner face of his thighs. The female, half raised on her fore legs, her hind legs being spread wide apart and flat on the ground, remains passive. The male is greatly excited, quivering in every part of his body. At the beginning he moves his tail slowly from side to side in the same way that characterizes an individual when intently watching a fly which it is about to catch. During the injection of sperm the male holds his tail half erect, with slow forward and backward movements of the body, the female remaining unmoved. After coition, the back of the pelvic region of the female is covered with seminal fluid and as she moves slowly away she throws sand over herself.

Nest Building and Ovulation.

This lizard has always been given as viviparous. On the contrary it builds a nest and lays eggs therein. The only time I observed the nest building was on June 25th, 1894. The location was on a stony clay bank at the side of an Austin street. When first seen, 6 p. m., the female was excavating a tunnel at an angle of about 75° to the surface of the ground, and wide and high enough to comfortably work in. She dug with her front feet, pushing back the loose earth and bits of stone with her hind feet until this debris was quite clear of the entrance. So absorbed was she in her work that my presence did not cause any alarm. The next morning I found the tunnel neatly filled again and the lizard gone.

After carefully removing the replaced debris, the tunnel was found to be seven inches deep. At the bottom, forming an L with this tunnel was a narrow entrance leading into a chamber three and one-half inches in diameter and two inches high, which was quite round except for two projecting stones. Here perfectly packed in with loose earth were twentyfive eggs, while again in a hole one and one-half inches deep at the bottom of the tunnel, were fifteen more. Since the embryos of one of these sets were at a considerably more advanced stage, this female must have taken advantage of the excavation of another. At the time of ovulation the embryo, while at an advanced stage, is still not ready to hatch by probably some days or even weeks. This stage will be considered in detail in a later paper on the embryology of *Phrynosoma*.

Authors (7, 8), give the period of gestation as high as one hundred days in females kept in confinement, but while I have not complete data from coition to ovulation, I believe that under natural conditions the time of carrying the eggs is much shorter.

A female which had laid eggs in captivity in August, 1894, became very restless after the eggs were taken away. She tried constantly for two or three days to get out of the vivarium at the place where the wire screen had been raised to remove the eggs. Lockwood (4) gives an instance of this maternal anxiety where a female attempts to distract the attention of an observer from her young.

1) Girard, Stansbury's Rept. Salt Lake, p. 360. Texas.

2) Boettger, O., Über das Gefangenleben der gehörnten Kröteneidechse (*Phrynosoma cornutum* Harl.) aus Mexico. Zool. Garten, p. 289—293. 1879.

3) Hoffmann, W. J., Molting of the Horned Toad (*Phrynosoma Douglassi* Gray). Am. Nat. Vol. 13. p. 326—327. May, 1879.

4) Lockwood, S., Maternal Anxiety in a Horned Toad. Am. Nat. Vol. 17. p. 682—683. 1883.

- 5) Nehrling, H., Texas und seine Thierwelt. Zool. Garten, 25. Jhg. p. 230—234, and 259—262. 1884.
- 6) Simons, R., Zur Pflege von *Phrynosoma cornutum*. Jahresber. Nat. Ver. Elberfeld, 6. Hft. p. 148—154.
- 7) Lockwood, S., The Chameleon viviparous. Am. Nat. Vol. 19. p. 407. 1885.
- 8) Shufeldt, R. W., Probable period of gestation in Horned Toad. Science, Vol. 6. p. 185—186. 1885.
- 9) Zipperlen, A., Eidechsen im Terrarium. Zool. Garten, 26. Jhg. p. 366—368. 1885.
- 10) Gentry, A. F., A review of the genus *Phrynosoma*. Proc. Acad. N. Sci. Phil. p. 138—148. 1885.
- 11) Wallace, J., Proc. Zool. Soc. London. 1871. p. 1—2.
- 12) Hay, O. P., On the Ejection of Blood from the Eyes of Horned Toads. Proc. Nat. Mus. Vol. XV. p. 375—378. 1892.
- 13) Brehm, Thierleben, Vol. 7. 3rd Ed. 1892.
- 14) Standard Nat. Hist. Vol. III. p. 424—426. Boston, 1885.

5. *Heteropenaeus longimanus* nov. gen. n. sp., eine neue Penaeide aus der Java-See.

Von Dr. J. G. de Man in Jerseke, Zeeland, Niederlande.

eingeg. 17. Januar 1896.

Unter den mir von der Direction des Naturhistorischen Museums in Lübeck zur Bearbeitung anvertrauten Decapoden findet sich auch eine merkwürdige Penaeidenform, die ich mir erlaube schon an dieser Stelle bekannt zu machen, weil der die Macruren behandelnde letzte Theil meiner Arbeit wahrscheinlich erst im Sommer dieses Jahres erscheinen wird.

Heteropenaeus longimanus ist in der Sammlung durch zwei schöne und vollständig conservierte Exemplare, ein Männchen und ein Weibchen, aus der Java-See vertreten. Von allen andern Penaeiden unterscheidet sich diese Art durch die merkwürdigen Verhältnisse des ersten Pereiopodenpaares beim Männchen. Bei allen bis jetzt bekannten Formen dieser an Gattungen und Arten so reichen Familie sind die drei ersten, eine Schere tragenden Füße nach demselben Typus gebaut; sie nehmen nach hinten allmählich an Länge zu und das Handglied der Scheren erscheint stets sehr kurz im Verhältnis zum verlängerten Carpus. Beim Männchen des *Heteropenaeus* aber ist das erste Pereiopodenpaar stark verlängert und nicht das kürzeste, sondern das längste sämmtlicher Füße. Diese beiden Füße sind aber, wie es auch sonst bei den Penaeiden der Fall ist, von gleicher Größe, Länge und Gestalt; sie sind cylindrisch, wenig dicker als die folgenden Füße und zeigen beinahe ihrer ganzen Länge entlang dieselbe Dicke. Einen weiteren wichtigen Unterschied bieten die Scheren, welche fast zweimal so lang sind wie der Carpus, während die Finger außerordentlich kurz erscheinen im Verhältnisse zum cylindrischen Handgliede. Die Füße

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