

NOTES ON THE REPRODUCTION OF CERTAIN
REPTILES.¹

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For several years I have handled a number of reptilian eggs in order to secure the embryos, and the following observations are based mainly on those collected during the past three summers (1900, 1901 and 1902). The eggs of several species of snake and lizard are found in summer (from about the middle of May to the middle of August) by farm hands who plough them up, when breaking up land that has been in clover or wheat or some other early crop; from this it can be understood that the eggs are deposited at no great depth in the ground. Eggs of the Painted and Mud Turtles (*Chrysemys picta* and *Kinosternon pensylvanicum*) are often ploughed up in the low grounds.

The eggs of the Black Snake (*Bascanion constrictor*) are more frequently found than those of any other species of snake, these are a short oblong in shape, often lumpy and one sided or irregular, and covered with a thick skin with a rough surface to which dirt readily adheres so that the color is usually a dirty white. The eggs are free, not adherent to one another in clusters as is the case with some other species; in size they vary from about 26 to 40 mm. in length, by 21 to 28 in width, and are found in lots of from 5 to 22 in number, the larger lots usually consisting of larger eggs than the smaller lots, from which one would naturally infer that the smaller lots of smaller eggs were probably laid by smaller and younger individuals, and the larger lots of larger eggs by larger and older specimens.

The eggs must take at least a month to hatch, possibly much longer. A lot of 13 eggs were brought in June 28, 1900, and four of them were kept until they hatched on July 25, twenty-seven days later, the young snakes emerging through a

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longitudinal slit in the egg, sometimes there are several of these slits; in this lot the markings of the young snakes began to show on those preserved on July 6, nineteen days before hatching. Another lot of 21 eggs of this species brought in July 11, 1902, in which the spotted color pattern had begun to appear on the embryos were kept till some of them hatched on July 28, seventeen days later, three young snakes which hatched, measuring respectively 285, 300 and 303 mm. in length. Another lot, obtained in 1900, contained among others, one egg which, though entirely normal in external appearance, was very abnormal internally, inasmuch as it contained two embryos, and one of these was a two-headed monster.

Occasionally an egg of this species is pyriform in shape, much like a killdeer's egg, as was the case with one egg of the lot of thirteen mentioned previously, and with one of a lot of five brought in June 28, 1901.

Another species whose eggs are sometimes brought in is the Spreading Adder (*Heterodon platyrhinus*). The eggs of this species are about the same size and shape as those of the Black Snake, but the skin of the egg is smooth and very thin, much thinner than in any other species of snake whose eggs I have handled. Like those of the Black Snake, the eggs of this species are free, not adherent to one another in clusters.

A lot of 13 eggs was brought in June 23, 1900, from which embryos were put up from time to time, till a young *Heterodon* was hatched from the last egg on Aug. 14, fifty-two days later, the young snake 200 mm. in length, emerging from a longitudinal slit in the egg; the only egg in this lot measured was 39 mm. long by 29 in breadth and oblong in shape.

Another lot of 26 eggs was brought in June 27, 1902 (ten other eggs were said to have been broken when the lot was ploughed up) and were about 33 mm. long, a short oblong in shape, and were kept till a young snake 185 mm. long was hatched from the last egg on Aug. 5, thirty-nine days later.

On Aug. 1, 2 and 3, 1901, a Spreading Adder in captivity laid sixteen eggs, similar to the two lots previously mentioned but whiter in color, owing to their not having been in contact with the soil. These eggs although only just laid, contained

small embryos and in this connection I may state that I never yet opened a snake's egg which did not contain an embryo large enough to be recognized as a snake. Lizard's eggs, however, not infrequently have the embryo small enough to escape notice, and a large majority of all turtle eggs brought in are quite fresh. The yolk of a snake's egg too is whitish in color and thicker in consistency than the yellowish yolk of a lizard's egg, while the white and yolk of turtle's eggs resemble those of bird's eggs very closely in general appearance. These remarks, however, are only meant to apply to the different species I have myself examined.

The eggs of the King Snake (*Ophibolus getulus*) are long, oblong in shape, with a smooth tough skin and are more or less adherent to one another in clusters. A lot was brought in July 11, 1900, some of which were put up from time to time till three young snakes, 275 mm. long, were hatched from the last eggs on Aug. 14, thirty-four days later. These eggs were about 40 to 43 mm. long by 24 to 26 wide.

In July, 1900, a King Snake in my possession laid 17 eggs in confinement; these eggs were like the foregoing lot, but smaller, and were also adherent in clusters. One egg of this lot contained an embryo with two heads, and two bodies, the bodies separate for the anterior one third of their length.

Another lot of 10 eggs laid in confinement in July, 1901, were stuck together in two clusters, four in one lot and six in the other, and measured 31 to 35 mm. in length.

On Aug. 17, 1901, a Striped Chicken Snake (*Coluber quadrivittatus*) from Georgia, laid 9 eggs in confinement, two lots of two each were adherent, the rest free. The eggs were long and narrow with a tough white skin and measured 37 to 43 mm. long by 17 to 20 wide.

On July 25, 1901, I found 17 eggs in a box in which I was keeping two species of *Coluber* (*guttatus* and *quadrivittatus*); these eggs were much like those of the King Snake but longer in proportion and contained very small embryos. Nine eggs were stuck together in a cluster, six in another and there were two free eggs.

A black Chicken Snake (*Coluber obsoletus*) laid a number of

eggs in confinement in the summer of 1899 from which young snakes were finally hatched, but I am sorry to say I did not take any notes. A large specimen of the western Bull Snake (*Ptyophis sayi*) also laid eggs in captivity the same summer, but I kept no record of these and can only say the eggs were considerably larger than those of the *Coluber obsoletus* and that young snakes finally hatched out from ten or twelve of them. I have no record and cannot remember certainly whether these eggs or those of the Chicken Snake were free or adherent, but I think both lots were in the latter condition.

On July 5, 1902, a Milk Snake (*Ophibolus doliiatus triangulus*) from Michigan, in my possession, laid 15 eggs all adherent in one cluster; there were about 30 mm. long, with smooth, tough, white skin and short oblong in shape. On the same day a dead Green Snake (*Cyclophis æstivus*) was brought to me, which contained in its oviducts four elongate, thin skinned eggs (20 to 22 mm. long) which contained small embryos.

On July 12, 1902, two lots of snake's eggs were brought to me, different from any I had previously obtained. One lot consisted of two elongate, smooth, whitish eggs, 23 and 25 mm. long. One was put up and the other kept until Aug. 14 (thirty-three days later) when a young *Carphophiops amannus* within a day or two of hatching was taken from the egg. The other lot consisted of eight eggs, short, oblong in shape, just about the size and shape of the eggs of the lizard, *Sceloporus undulatus*, but smooth skinned and one-sided and about 16 to 17 mm. long. These were kept until Aug. 8, when two young snakes 185 mm. long, also *Carphophiops amannus* were hatched from the last eggs. Practically all the lizards' eggs brought in belong to two species, *Sceloporus undulatus* (the Fence Lizard) and *Cnemidophorus scxlineatus* (the Sand Lizard locally known as Sand Trotter, Sand Skeeter and Sand Sister), more than an hundred eggs of each of these species are brought in every year, those of *Sceloporus* predominating in the early part of the season and *Cnemidophorus* in the latter part.

The eggs of *Sceloporus undulatus* are short, oblong in shape, measuring from 14 to 18 mm. long and about 10 to 13 mm. wide, and the skin is roughened causing dirt to readily adhere to

it. The embryos show the characteristic dark cross bars across the back, when only about half hatched. The number of eggs laid in one lot is from ten to fifteen. One rather curious fact in connection with this species and the next is that the eggs increase in size after obtrusion; when first laid the eggs are relatively long and slender, but as the embryo develops the eggs increase in thickness if not in length. On June 28, 1902, four very slim and narrow eggs of this species were brought to me; I preserved one and kept the other three in dry earth in a corked bottle; on July 23, the eggs had materially increased in size and a second egg was preserved, on Aug. 11 a third egg was put up; on Aug. 23, the remaining egg was still unhatched, but the skin had become loose and flabby, on Sept. 3, the next time I looked, a young lizard had hatched out, 67 days after the eggs were brought to me (the egg, however, probably hatched a day or two after Aug. 23).

The eggs of *Cnemidophorus sexlineatus* are similar in general appearance to those of *S. undulatus*, but somewhat larger (about 17 to 22 mm. long by 11 to 14 mm. broad) with a smooth skin, to which dirt does not adhere so readily as to the rough skin of the *Sceloporus* eggs, and hence they usually look much whiter. The markings on the embryo do not show until a week or so before hatching. On July 8, 1901, three small white eggs which from their size ($9\frac{1}{2}$ mm. long) could only belong to the Ground Lizard (*Leiopisma laterale*) and which contained lacertilian embryos were brought to me, and another lot of three similar eggs on July 2, 1902, which were said to have been found in a rotten stump.

Of the Testudinata, the eggs most frequently brought in are those of the little Mud Turtle (*Kinosternon pennsylvanicum*); these are hard shelled usually rather blunt at the ends and varying from a rather short to a rather long oblong in shape, varying from 23 to 29 mm. in length; the eggs are sometimes ploughed up, but are often said to have been found in "holes in the bank" of Walnut Creek. Some of the larger eggs attributed to this species may be those of *Aromochelys odoratus* the Musk Turtle.

In preparing the shell of an adult *Aromochelys tristycha* (a smaller species than *A. odoratus* or *K. pennsylvanicum*) from

Texas, two hard shelled eggs were taken from the oviducts, Aug. 20, 1902. These eggs were about 26 mm. long and resemble the smaller eggs of *Kinosternon*.

The eggs of the Painted Turtle (*Chrysemys picta*) which are not infrequently brought in, are larger (32 to 34 mm. long) and more elongate than those of the Mud Turtle, and are covered with a smooth, thin, crisp skin instead of a hard shell.

The eggs of the Chicken Turtle (*Deirochelys reticulata*), a number of which were taken from the oviducts of two or three dead females from Georgia, in Nov., 1900, are very similar to those of *Chrysemys*, but larger, measuring from 37 to 40 mm. long.

On June 9, 1901, 26 spherical white eggs about 26 or 27 mm. in diameter and said to have been found buried in the sand near a pond, were brought to me; these were said to be "turtle eggs" i. e., those of *Chelydra serpentina* and I have no reason to suppose the identification was incorrect. The eggs are covered with a thin, crisp skin as those of the Emydoid turtles are.

Of the viviparous snakes of the Natricine group a few of my observations deserve to go on record. On Aug. 2 and 3, 1894, a *Natrix leberis* gave birth in captivity to thirteen living young. On July 28, 1900, a *Virginia elegans* from Mississippi gave birth to five young, and in August, 1899, a *Liodytes alleni* from Florida to six.

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