

---

CEPHALIC DEFORMITIES IN EMBRYOS OF THE  
MASSASAUGA RATTLESNAKE (*SISTRURUS*  
*C. CATENATUS*, *RAF.*)\*

BERTRAND A. WRIGHT, *University of Illinois, Urbana, Illinois*

Although the massasauga was at one time widely distributed over the prairies of Illinois (cf. Garman, 1892; Hay, 1893) at the present time there are only a few isolated spots where this snake can still be found. For a number of years the author has been interested in a colony of massaugas which is located on the floodplain of the east bank of the Des Plaines River just north of the county line between Lake and Cook Counties (Wright, 1939). The area in which the snakes of this colony breed is confined to a forest edge community which is flooded during spring and fall.

During the summers of 1937 and 1938 the writer had the opportunity to study the colony in some detail. A number of gravid females were collected at various times during the spring months and were

brought into the laboratory where they were kept under observation up through the time they gave birth to their young.

Five gravid females gave birth to young on the following dates: August 20, August 30, August 31, and in two cases on September 1. In recording the measurements of these litters it was noticed that three of the females had discharged undeveloped embryos. (See table I.)

A superficial examination of these eggs revealed that the embryos had attained various stages of development. Some had barely started growth and appeared as a small black spot on the surface of the egg. Others had reached a stage very close to that of newly born snakes with the yolk sac completely withdrawn into the body cavity.

TABLE I

| Date             | Number of young born alive | Undeveloped embryos discharged |
|------------------|----------------------------|--------------------------------|
| August 20.....   | 8                          | none                           |
| August 30.....   | 12                         | 1                              |
| Aug. 31.....     | 8                          | 11                             |
| September 1..... | 14                         | none                           |
| September 1..... | 5                          | 3                              |

In all the more advanced embryos it was noticed that there was some deformity in the cephalic region. Several of the embryos showed a complete lack of the frontal and parietal bones on the dorsal surface of the head. In these cases the skin was deeply invaginated into the brain cavity indicating that this organ was completely or partially lacking (fig. 1). Gross dissection of the embryos revealed that in many cases the cerebellum and cerebrum were almost entirely lacking. At first the writer assumed that some factor or factors of handling either during capture or while the snakes were in the laboratory might have accounted for these deformities. However, several important factors indicate that this first assumption could not be true and that a hereditary rather than an environmental influence may have caused the malformations.

As has been previously stated, the gravid females were collected at various times during the gestation period and since no unnecessary handling was done, the possibility of an environmental factor as the cause of such deformities is slight. The mechanical injury factor is ruled out by the facts that: (1) undeveloped embryos at all stages of development were discharged by the same female; (2) inasmuch as the head is in the center of a sphere formed by the body of the snake as it develops, it is not very likely that the head, which is the most protected part of the embryo, would be the only part to exhibit injuries. Furthermore, all the embryos displayed the same general type of deformity. Recently the writer had the opportunity of examining a number of still-born young extruded from a female massauga collected in the same area in the spring of 1939. Without exception, each still-born snake showed cephalic deformities similar to those found in the 1937 litters.

Several other investigators have noticed

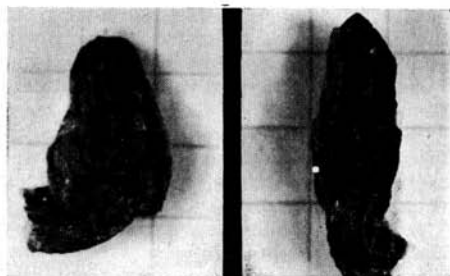


Fig. 1. Still-born snakes from the collections of 1937. Note the lack of skull bones and the deep invagination of the skin into the resulting pocket. In both of these snakes the cerebrum and cerebellum were only partially developed. (Each square represents one-sixteenth square inch.)

the extrusion of infertile or still-born young in snakes. Klauber (1936) states that broods in captivity often include infertile eggs or deformed embryos which die soon after birth. He further states that while the loss of young is greater in captive specimens, snakes in nature are also subject to the same deformities. Swanson (1933) records still-born young extruded from massasaugas collected in western Pennsylvania. Unfortunately, neither of these investigators give any indication as to the nature of the deformities or the proportion of still-born to normal young.

On the basis of the material presented here it seems quite possible that a hereditary lethal factor might account for these embryonic mortalities. This belief is further substantiated by the fact that all the females collected in northeastern Illinois were taken from an area of less than a half acre. In such a restricted location, inbreeding would surely occur. This inbreeding after a period of years would be most favorable for the expression of any lethal factor or factors which might be present in the stock.

## REFERENCES

- Garman, H. A synopsis of the reptiles and amphibians of Illinois. Bull. Ill. State Lab. Nat. Hist., 3:215-385. 1892.
- Hay, O. P. The batrachians and reptiles of the state of Indiana. Ann. Rept. Dept. Geol. Nat. Res. of Indiana, 17 (1891) 534-536. 1893.
- Klauber, L. M., A statistical study of the rattlesnakes. Occ. Papers San Diego Soc. Nat. Hist., 1:1-24. 1936.
- Swanson, P. L. The size of *Sistrurus c. catenatus* at birth. Copeia, 1933:37. 1933.
- Wright, B. A. Habit and habitat studies of the Massasauga Rattlesnake (*Sistrurus c. catenatus*, Raf.) in northeastern Illinois. 1939.

\*Contribution from the Zoological Laboratory of the University of Illinois, No. 564.