VARIATIONS IN THE WATER-SNAKE.

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The following is the result of a study of the variations in the members of a litter of 33 young of the water-snake—*Natrix fasciata fasciata* (L.) The mother was captured at the Lake Shore Railroad bridge No. 13, Sandusky, Ohio, in August, 1901. The head of the mother was so mutilated on being killed that it was thrown away, and hence no comparative study of parent and offspring could be made. The young were very nearly ready to hatch and probably would have been born in a few days. With the exception of some of the gastrosteges, all external characters were as in the adult condition.

Owing to the want of time, only the external characters are considered in this paper. All measurements were made on the fresh specimens, *i. e.*, before the snakes were placed in formalin. Care was taken not to stretch the specimens more than was necessary to straighten them. The counting of scales, etc., was done under a lens and each count was verified twice.

The results of the study are given in the table on page 186. The following have been considered :

1. The variation in length from snout to tip of tail.
2. The variation in length from snout to the tip of the anal plate.
3. The variation in length from anal plate to the tip of the tail.
4. The variation in the number of gastrosteges, *i. e.*, the ventral plates.
5. The variation in the number of gastrosteges from their beginning in the gular region to the umbilicus.
6. The variation in the number of postoculars.

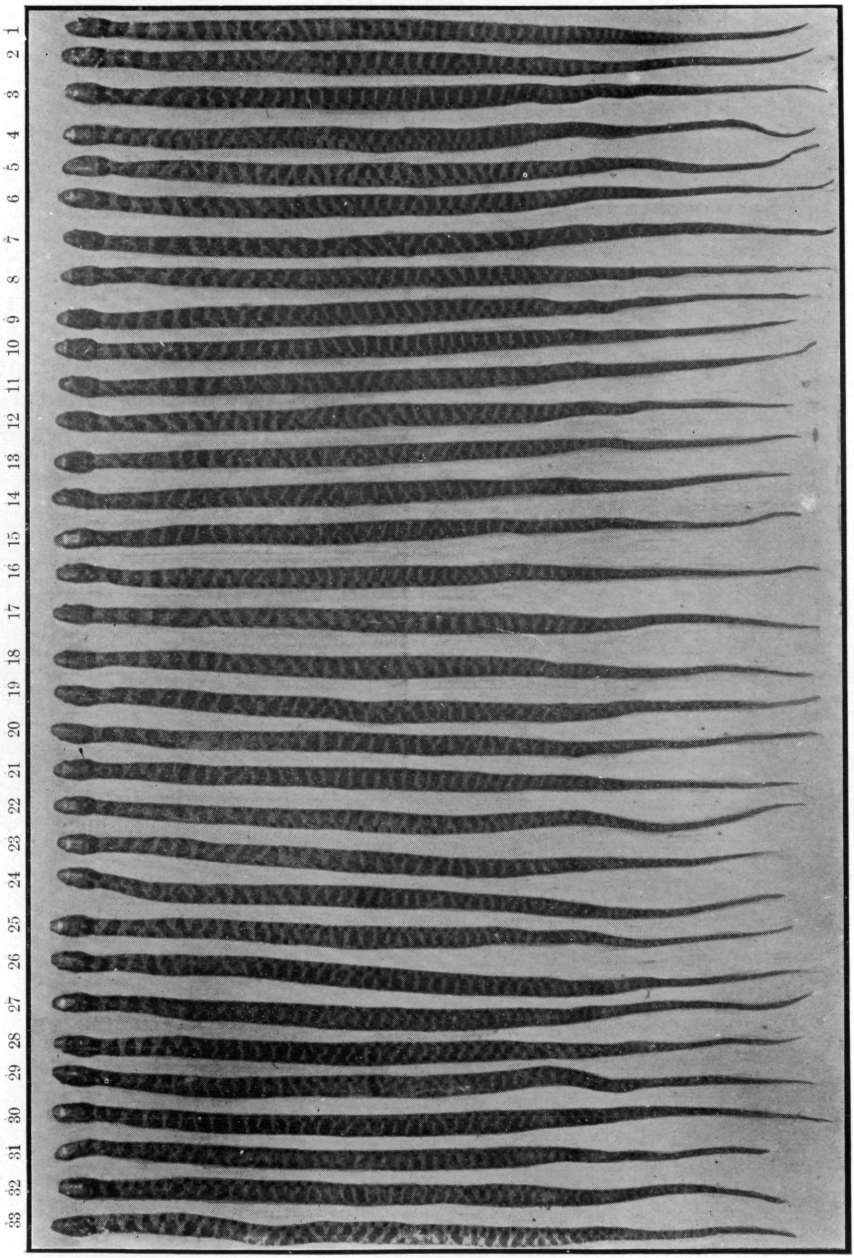
The maximum and minimum number, the difference between them, the mode and the mean are given in each case. Obviously, as the variates in columns 4, 5 and 6 are integral, the mean in these cases would sometimes be only approximate, *i. e.*, fractional. Under these conditions the probable error of the mean was not calculated, but only approximated, by adding an integer to the mean in case the fraction was greater than one-half.*

Comparing columns 2 and 3, it will be seen that there is greater variation in the body region than in the tail. This is contrary to what may have been expected, as in certain organs, such as the vertebrae, greater variation occurs in the tail than in the body.

In many cases the gastrosteges were found to be bifid, as in the normal anal-plate. The number of these that were found, together with their distribution, are given in column 7, where the numbers represent the number of the gastrostege, counting

*Davenport, C. B., "Statistical Methods." John Wiley & Sons, N. Y., 1899.

OHIO NATURALIST. *Plate 13.*



from the neck. The pre-anal scale was found to be bifid in several of the snakes. Since the gastrosteges represent modified scales—scales such as occur on the dorsal and lateral surfaces of the body—these bifid scales may represent a primitive condition, where the ventral scales were similar to the dorsal scales. This bifidity of gastrosteges is not at all common in the adults of this species. Hence it seems probable that during succeeding moults the normal gastrostege is finally obtained. A fact that points to this conclusion, indirectly however, is that on examining the labials, the fourth lower labial in specimen number 4 was found normal, but the epidermis, which had been loosened by the formalin, was seen to have a bifid labial corresponding to, and lying immediately above, the fourth labial. This shows that in this case at least the labial was changed from a bifid to a single plate.

The point of exit of the umbilical cord (*i. e.*, the yolk-sac and the allantois), the so-called dermal umbilicus, being an old structure, would be definite in position to a certain degree. The number of gastrosteges anterior to this was found to vary to the amount of ten scales in different individuals.

In respect to the scutæ of the head, it may be said that little variation was found. The shape of the rostral, vertical, nasals, etc., presented little perceptible differences in the several individuals. However, the number of post-oculars was found to be different in difierent snakes and on opposite sides of the same snake. In column 6 of the table these variations are shown. The first number represents the scales on the left side, the second number those on the right side of the snake. Where the figures are the same, as *e. g.*, 3–3, there is no variation in the number of postoculars on the two sides of the head.

The number of longitudinal rows of scales was found to vary in each specimen and in different parts of the same specimen. Thus, in tracing a row of scales from head to tail, the row would often end in a V-shaped plan, formed by the approximation of the rows lying on either side of the row in question. The same was true of the mother. Therefore no attempt was made to tabulate them.

The plate on page 184 shows the 33 young from a dorsal view. They should be counted from right to left to correspond with the table. It will be seen that the color pattern varies in the different snakes. All gradations, from regularly arranged saddle-shaped markings to chain-like figures are found. The greatest irregularity in the markings occurs in the region over the heart. The post-occipital collar is entire in some, as in specimen No. 1; in others, such as No. 12, this collar is cut into lateral moieties, all gradations existing between the two.

If Cope's conclusions are correct that, in reptiles at least, color variations arise posteriorly and advance anteriorly, the regular

arrangement of markings is later and the irregular the more primitive.

This brief study has shown how variable some of the characters really are. Some of these characters are used in classification, and varieties and even species have been proposed which were founded on no more fundamental characters than these. The

Number of specimen.	(1) Length from snout to tip of tail.	(2) Length from snout to anal plate.	(3) Length from anal plate to tail.	(4) Number of gastrosteges.	(5) Number of gas. to umbilicus.	(6) Number of postoculars.	(7) Bifid gastrosteges.
1	265 mm.	195 mm.	70 mm.	146	129	3-3	
2	261	203	58	146	129	3-3	30 + 33
3	265	197	68	147	130	3-3	
4	243	189	54	143	124	3-3	116, 135
5	244	191	53	147	132	3-3	147
6	252	195	57	144	126	3 3	143
7	274	207	67	150	133	3-2	
8	261	197	64	142	127	2-2	
9	260	193	67	143	128	2 2	
10	253	199	54	146	129	3-3	28, 29, 30
11	265	198	67	145	128	2-2	
12	253	197	56	143	127	2-2	
13	261	194	67	146	130	3-3	
14	259	194	65	144	125	2-3	33
15	245	190	55	143	127	3-3	142
16	254	189	65	142	126	3-3	
17	270	200	70	146	131	2-2	
18	257	194	63	144	128	2-2	
19	267	201	66	142	126	3-3	30,31,32,141
20	263	197	66	145	127	3 2	
21	247	194	53	147	129	3-3	1, 2, 3
22	256	195	61	147	132	3-2	
23	249	190	59	144	128	2-2	
24	248	195	53	148	132	2-2	
25	250	185	65	145	130	3-3	
26	261	203	58	146	128	3-3	
27	259	194	65	143	128	2-2	
28	255	199	56	145	128	3-3	
29	264	197	67	144	128	3-3	
30	268	198	70	143	123	2-2	
31	247	190	57	144	125	2-2	
32	250	192	58	144	128	3-3	143
33	257	198	59	147	127	3-3	146
Maximum.	274 mm.	207 mm.	70 mm.	150	133	3-3	
Minimum.	243	185	53	142	123	2-2	
Difference.	31	22	17	8	10	1-1	
Mode.....	261	194-197	67	144	128	3-3	
Mean.....	257	195	63	144	128		

two species, *amoenus* and *helenæ* of the genus Carphophiops are examples ; they were separated by the former having two pairs of frontals and the latter one pair.

A study of the young of the forms of *Eutainia* would be interesting and profitable as a means of arriving at some conclusion as to the status of the several species and varieties.

The writer is indebted to Prof. Herbert Osborn for the photograph reproduced herewith.