

THE RED-BELLIED WATER SNAKE, *NATRIX*
SIPEDON ERYTHROGASTER (FORSTER),
IN OHIO.

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During a study of the reptiles indigenous to Ohio four water snakes of the genus *Natrix* have been collected. Three of these, *Natrix sipedon sipedon* (Linné), *Natrix septemvittata* (Say) and *Natrix kirilandii* (Kennicott) are widely recognized and are known from numerous localities in the state. The fourth, a rarer, large, red-bellied form, has been identified as *Natrix sipedon erythrogaster* (Forster). There seems to be no general agreement among herpetologists as to the validity of the latter which has long been confused with *Natrix sipedon sipedon*. Stejneger and Barbour (1923, p. 108) do not admit it to their "Check List of North American Amphibians and Reptiles," but refer to it in a footnote which reads, "Apparent forms which are more or less uniformly rufescent are found in the ranges of both the subspecies (*Natrix sipedon*) *fasciata* and (*Natrix sipedon*) *sipedon*. To these the names of *Natrix sipedon erythrogaster* and *Natrix sipedon fulviventris* have been given."¹ Blanchard in his key to North American snakes (1925a, pp. 9-10) includes *Natrix sipedon erythrogaster*, but mentions no locality as far north as Ohio. In "The Herpetology of Michigan," by Ruthven, Thompson and Thompson (1912, p. 95) and Ruthven, Thompson and Gaige (1928, pp. 105, 108) *erythrogaster* is not recognized as distinct, although Clark (1903, pp. 1-23) discussed in detail the differences between this form and *sipedon* as seen in a series of specimens from southern Michigan and concluded that it should be considered as a distinct species. Taylor (1929, p. 57-58), writing on the snakes of Kansas, favors a similar interpretation as does also Blanchard in papers (1922, p. 12, and 1924, pp. 537-538) published before the appearance of his key (1925a).

With a view to shedding some additional light on the systematic status, natural history and range of this reptile, in

¹This foot note is repeated in the third (1933) edition of "A Check List of North American Amphibians and Reptiles," by Stejneger and Barbour.

so far as its occurrence in Ohio is concerned, the red-bellied water snake is here discussed in some detail. Young specimens obtained from captive females are briefly described and compared with the young of *Natrix sipedon sipedon*. A small series of *sipedon* from the same localities in which *erythrogaster* has been collected is considered for comparison as are also certain statistics gleaned from a study of 100 specimens of *sipedon* selected at random from various parts of the state.

While reported from other localities, *erythrogaster* has so far been taken in Ohio in only two places, these, with attendant data, being as follows:

1. Near Blakeslee, Williams County, (60 miles west of Toledo), 11 adult specimens of *erythrogaster*, one adult and one juvenile specimen of *sipedon*.

2. Near Mt. Victory, Hardin County (80 miles south of Toledo), five adult specimens of *erythrogaster*, one of which (No. 1690),² collected July 23, 1932, gave birth to eight young September 30, 1932, and one (No. 1662), collected May 29, 1932, had 18 well formed embryos removed from her upon her death October 23, 1932. Two specimens of *sipedon*, one of which (TZS No. 1518) collected July 23, 1932, gave birth to 13 young September 14, 1932.

The only Ohio record in the literature is by Morse (1904, p. 131), who mentions collecting *Natrix fasciata erythrogaster* Shaw at Put-in-Bay, but the only specimen (No. 41) in the collection of the Ohio State Museum identified as *erythrogaster* and bearing Morse's name as collector is definitely *sipedon*. The writer has examined 202 specimens of water snakes from the Ohio Lake Erie islands and the adjacent mainland without finding a single one which approaches *erythrogaster*, although several have a pinkish or light orange mid-ventral surface as do others from various parts of the state and particularly from southern Ohio. A large percentage of the specimens from the islands exhibit peculiar abnormalities of pattern which it is planned to discuss in a longer paper now in preparation.

From the above it will be seen that there is available a total of 42 specimens of *erythrogaster* and 17 of *sipedon* from the Williams County and Hardin County localities. A careful

²All of the known specimens of *erythrogaster* from Ohio are in the collection of the Toledo Zoological Society except No. 443 in the Ohio State Museum and two individuals in the private collection of Dr. Frank N. Blanchard, of the University of Michigan.

study of this material shows that it agrees in practically every detail with Clark's (1903) specimens from near Olivet, Michigan.

The most conspicuous difference between adult Ohio specimens of *sipedon* and *erythrogaster* is in color. In the latter the dorsal surface is uniform black or brownish black with the belly uniform bright red or scarlet, except for the antero-lateral portions of the ventral scutes which are black or blackish. In *sipedon* the upper surface is usually patterned with a mid-dorsal and lateral series of dark blotches, these being sub-quadrate in form and superimposed upon a paler ground color. In many of the darker specimens, however, the blotches may be more or less confluent. The belly pattern normally consists of dark semicircles on a lighter ground, but these markings are often reduced or are represented by dotted or clouded areas, while in some individuals the belly may tend towards uniform black, never uniform red as in *erythrogaster*. A light midventral area which varies from white to yellow, orange or pink extends from the chin nearly, or quite, to the anal plate in many specimens. This condition has not been seen in *erythrogaster*.

Young specimens of both *sipedon* and *erythrogaster* have a well marked pattern of blotches on a paler ground, but the arrangement of these is different in the two forms. In *erythrogaster* the lateral blotches alternate with those of the dorsal series farther forward than in *sipedon*; in both forms the tendency is for the most anterior dorsal and lateral blotches to unite, forming dark crossbands, but this tendency is much more marked in *sipedon* than in *erythrogaster*. In *erythrogaster*, of the total of 31 to 42 blotches from the head to a point directly above the anal plate, the fusion occurs in from 1 to 9 of the most anterior blotches with an average of 3.7. In the series of 17 *sipedon*, of the 30 to 37 blotches, the anterior 8 to 14, average 10.6, do not alternate. The average for the series of 100 *sipedon* is also 10.6. In several of these latter specimens the blotches are united to form the above mentioned crossbands almost throughout the length of the body, but in one (TZS No. 540), from Geauga Lake, Geauga County, they are alternated forward to the head although otherwise the specimen exhibits typical *sipedon* characters.

The belly in juveniles of both forms is similar to, but paler than, that of the adults.

TABLE I.
 VARIATIONS IN OHIO SPECIMENS OF *Natrix sipedon erythrogaster* AND *Natrix sipedon sipedon*.*

CHARACTERISTIC	<i>Natrix sipedon erythrogaster</i>		<i>Natrix sipedon sipedon</i>			
	1. From Hardin and Williams Counties	No.†	1. From <i>erythrogaster</i> Localities	No.†	2. From Various Ohio Localities	No.†
		40		17		100
Ventrals ♂	149 to 156, average 151.8	18	138 to 143, average 140.9	8	135 to 149, average 140.6	52
Ventrals ♀	149 to 157, average 153.5	22	141 to 145, average 142.1	9	135 to 149, average 141.7	48
Ventrals ♂ and ♀	149 to 157, average 152.7	40	138 to 145, average 141.5	17	135 to 149, average 141.1	100
Subcaudals ♂	71 to 84, average 76.8	17	70 to 76, average 73.1	8	68 to 78, average 73.3	45
Subcaudals ♀	64 to 74, average 67.4	17	60 to 64, average 62.3	9	57 to 70, average 62.0	42
Subcaudals ♂ and ♀	64 to 84, average 72.1	34	60 to 76, average 67.4	17	57 to 78, average 67.9	87
Ventrals + Subcaudals ♂	223 to 236, average 228.6	17	208 to 218, average 214.0	8	206 to 224, average 213.8	45
Ventrals + Subcaudals ♀	216 to 228, average 221.5	17	203 to 208, average 204.4	9	194 to 217, average 203.7	42
Ventrals + Subcaudals ♂ and ♀	216 to 236, average 225.1	34	203 to 218, average 208.9	17	194 to 224, average 208.9	87
Eye/Head, Adult ♂	20.4% to 23.0%, average 21.9%	6	21.2%	1	19 % to 22.2%, average 20.4%	18
Eye/Head, Adult ♀	21.1% to 25.1%, average 22.5%	8	19.3% to 19.4%, average 19.35%	2	18.1% to 21.0%, average 19.5%	14
Eye/Head, Adult ♂ and ♀	20.4% to 25.1%, average 22.2%	14	19.3% to 21.2%, average 20.0%	3	18.1% to 22.2%, average 20.0%	32
Eye/Head, Juvenile ♂ and ♀	23.8% to 27.2%, average 25.1%	8	19.2% to 22.6%, average 21.6%	14	19.8% to 22.4%, average 21.3%	39
Blotches from Head to Anus	31 to 42, average 35.7	26	30 to 37, average 34.3	17	26 to 43, average 32.7	89
Blotches not Alternated ♂	1 to 9, average 4.4	12	8 to 13, average 10.1	8	1 to 32, average 11.3	38
Blotches not Alternated ♀	1 to 8, average 3.1	14	8 to 14, average 11.0	9	1 to 27, average 9.8	39
Blotches not Alternated ♂ and ♀	1 to 9, average 3.7	26	8 to 14, average 10.6	17	1 to 32, average 19.6	77

*Imperfections in many specimens prevent complete counts of all characters as:

Only specimens with perfect tails are included in the counts involving the number of subcaudals.

Embryonic specimens are not included in the measurements involving the eye.

Specimens having obscure or very irregular markings are not included in the figures concerning the number of blotches.

All juvenile specimens of *sipedon* included in the computations are under 300 mm. in length.

All adult specimens of *sipedon* are 568 mm. or more in length, this being the size of the smallest large *sipedon* from the *erythrogaster* localities.

†The figures in these columns refer to the number of specimens involved in each series of extremes and averages.

In a series of eight newly born young of *erythrogaster* (from specimen No. 1690) the coloration in life of the dorsal and lateral blotches is black on a ground color of orange brown shading from Mars Orange³ to Sanford's Brown, although this color is paler in the narrow lines separating the adjacent dorsal blotches. Median blotches are three or four scales long and from nine to eleven scales wide. Lateral blotches are two or three scales wide and extend from the edges of the ventrals to the eighth or ninth row of scales. The belly is uniform orange, ranging from Bittersweet Orange to Orange Rufous, except for the anterolateral edges of the ventrals, which are blackish. The labials are the same color as the belly but the sutures between them are darker and are almost black in some cases. There is a patch of white on the chin shields and gulars.

Both forms tend to darken with age. In *sipedon* the blotched pattern usually persists throughout life although occasional large specimens may approach uniform blackness. In *erythrogaster* the juvenile pattern is replaced by the uniform colors of the adult. A freshly shed specimen of the latter 855 mm. in length shows a faint indication of the blotches which can be counted when held in the proper light. The number of blotches, 33, the anterior four of which do not alternate, falls well within the range of variation as shown above in the series of juveniles.

Correlated with the differences of color and pattern are differences in scutellation. The ventral scutes, including the divided anal plate, average 11.2 higher for *erythrogaster* than for *sipedon* from the same localities and 11.6 higher than for the 100 specimens of *sipedon* from various parts of the state (see Table). The extremes for each form are from 149 to 157 and from 135 to 149, respectively; only at 149 do they overlap, which number is seen in two *sipedon* and only one *erythrogaster*.

The number of subcaudals averages somewhat higher in *erythrogaster*. In males there are 71 to 84, average 76.8, while in males of *sipedon* the limits are found to be 68 to 78, average 73.3. The females of *erythrogaster* vary from 64 to 74, average 67.4; of *sipedon* from 57 to 70, average 62. Both sexes considered together range from 64 to 84 in *erythrogaster* with an

³Capitalized color names are those of Ridgway's "Color Standards and Color Nomenclature" (1912).

average of 72.1 and from 57 to 78 in *sipedon* with an average of 67.9.

The higher number of scales in *erythrogaster* is best shown by adding the number of subcaudals to the number of ventrals in each form and comparing the results. Thus it will be seen that *erythrogaster* averages 16.2 more than *sipedon* as is shown in the table.

The eye is somewhat larger in *erythrogaster*, this being particularly noticeable in the young. If the diameter of the eye be divided by the length of the head, measured from the tip of the rostral to the posterior tip of one of the parietals, a figure suitable for making comparisons is obtained. In eight juvenile *erythrogaster* the eye ranges from 23.8% to 27.2%, average 25.1%, of the length of the head; in 13 juvenile *sipedon* from 19.2% to 22.6%, average 21.6%. Juveniles in the series of 100 specimens show nearly the same range and average. In adults the eye of *erythrogaster* is found to average 2.2% larger than in *sipedon*.

Aside from the differences evident in pattern, color and scutellation, certain facts concerning habits and habitats indicate further dissimilarity. *Sipedon* occupies a variety of situations and appears to thrive wherever there is a sufficient quantity of water to assure it a food supply and a haven of retreat. *Erythrogaster*, on the other hand, in both Ohio localities, inhabits the environs of small woodland ponds which frequently become dry in midsummer, and in these localities it is much more abundant than *sipedon*; only two of the latter have been taken in each place, while on May 7, 1932, over 30 specimens of the former were seen in Williams County. *Erythrogaster* has been found much farther from water than any of the several hundred *sipedon* which the writer has collected in the state, and one of the Hardin County individuals was encountered fully 200 yards from the nearest pool. It is the writer's impression that *erythrogaster* is more vicious than *sipedon* and that it is more wary and consequently more difficult to capture.

Of the large number seen on May 7th in the Williams County locality several pairs were breeding and the entire colony appeared to be alert and active; one male specimen swam close enough to the writer to be easily seized. The behavior of this individual was unusual but possible explanations might be found in the mating activities or in the fact that the writer

reeked with the musk-like secretion of the caudal glands which had been liberally sprayed on his person by previous captives.

The present Ohio records, with Clark's (1903) record from Olivet, Eaton County, Michigan, extend the known range of *erythrogaster* a considerable distance to the north. According to Blanchard (1925a, p. 10) this form occurs from the "Lowlands of Virginia and the Carolinas, west to Louisiana and north in the Mississippi Valley into southern Illinois." Additional locality records are available from southwestern Indiana and adjacent Kentucky (Blanchard, 1925b, pp. 384-385), but specimens are apparently lacking between this area and northwestern Ohio. This absence might be a result of the intensive cultivation which, with the attendant draining of the land, has doubtless destroyed many habitats suitable for *erythrogaster*. Careful search, however, will probably reveal it in additional localities in Ohio, Indiana and Michigan.

CONCLUSIONS.

1. The data presented show that *Natrix sipedon erythrogaster* (Forster) is entitled to recognition as maintained by Clark, Blanchard and Taylor.

2. A study of Ohio material shows that *erythrogaster* may be readily distinguished by differences in color, pattern, scutellation, size of eye and habitat from *Natrix sipedon sipedon* (Linné), with which it has been confused.

3. The range of *Natrix sipedon erythrogaster* should be extended to include northwestern Ohio and, in view of Clark's (1903), record southern Michigan.

AUTHOR'S NOTE.

Since the above paper was read before the Ohio Academy of Science on April 4, 1933, certain pertinent data have come to hand which it seems advisable to sum up briefly. The Blakeslee locality was revisited April 22, 1933, and twelve specimens of *erythrogaster* were secured, among them the first juvenile to be encountered in the field. This specimen, 388 mm. in length, agrees in detail with the juveniles born to a Hardin County female as described in the paper except that while the blotched pattern is still discernible along the sides, the dorsal surface is nearly uniform blackish brown above and the belly is somewhat paler and more yellowish.

An adult pair was discovered in mating position on this date, while another male lay coiled nearby. Two of the twelve specimens have been preserved; the others are being kept alive.

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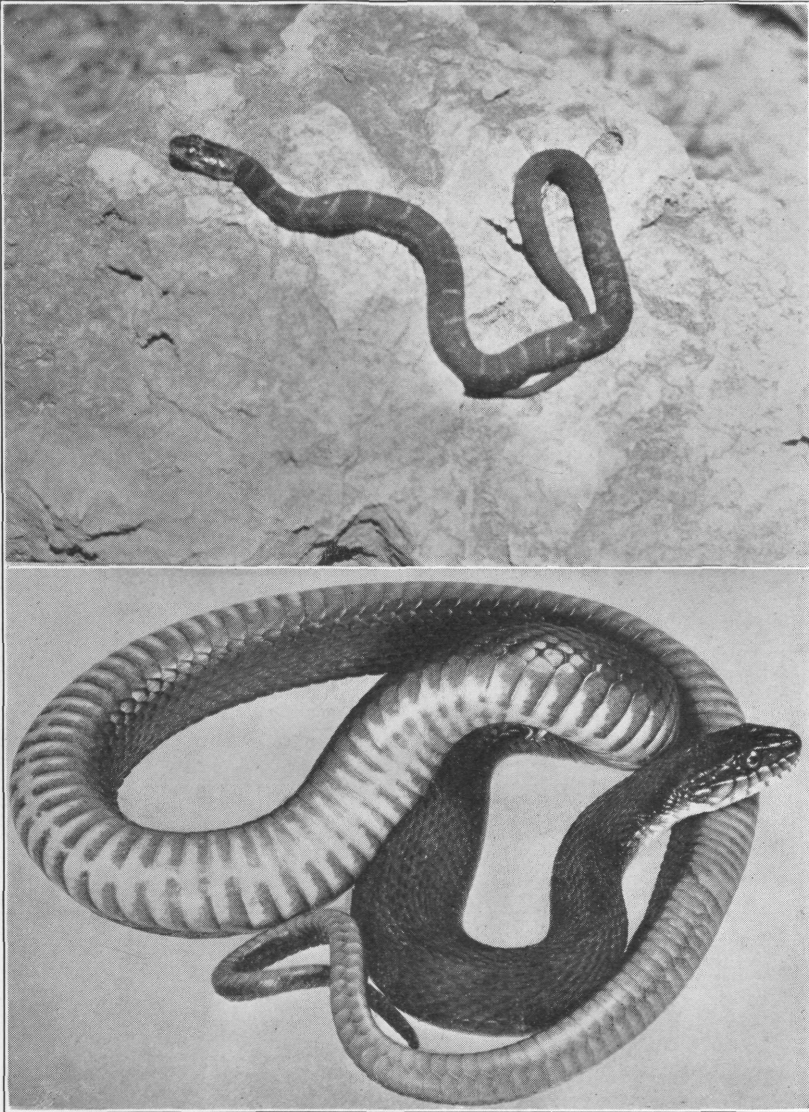


FIG. 1. (Upper.) Juvenile specimen of *Natrix sipedon erythrogaster* 9 months old and 355 mm. in length. The pattern, while still apparent, is rapidly becoming obsolete. This snake was born in captivity September 30, 1932 to a female (TZS No. 1690), collected near Mt. Victory, Hardin County, Ohio. Photo by Lawrence D. Hiett.

FIG. 2. (Lower.) Adult male *Natrix sipedon erythrogaster* 1106 mm. in length, collected April 22, 1933, near Blakeslee, Williams County, Ohio. Photo by Howard K. Gloyd.



FIG. 3. Habitat of *Natrix sipedon erythrogaster* near Blakeslee, Ohio, April 22, 1933. More than half of the known specimens of this snake from Ohio have been taken in or near this small pond. Photo by William M. Clay.