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A NEW SUBSPECIES OF WATER SNAKE FROM
ISLANDS IN LAKE ERIEBY ROGER CONANT AND WILLIAM M. CLAY¹

FOR a number of years it has been known that water snakes inhabiting the islands in the western part of Lake Erie differ considerably in coloration and color pattern from those of the adjacent mainlands. Morse (1904, 131) recognized their aberrant appearance by identifying them as *Natrix fasciata erythrogaster* Shaw, and Conant (1934, 22) mentioned them in conjunction with his study of Ohio water snakes.

Recently we have made collections on several of the islands and on the Ohio mainland. Additional material from this region and a considerable series from Ontario were borrowed from museums, making it possible for us to examine a total of 669 specimens, most of which were alive. Of these we recorded the pattern of 329 individuals and made scale counts upon 261. A careful study of the material indicates that the water snakes of the islands constitute a definite geographic race for which we propose the name:

Natrix sipedon insularum, n. subsp.

DIAGNOSIS.—This snake is similar in scutellation and size to *Natrix sipedon sipedon* (Linné) but differs in the complete, or

¹ Contribution from the Zoological Society of Philadelphia and from the Department of Zoology of the University of Michigan.

almost complete, absence of a dorsal and ventral color pattern. The coloration tends to be uniformly gray above and cream white below. This pattern is present from the time of birth and is not lost during ontogenesis as in *Natrix erythrogaster erythrogaster* (Forster).

RANGE.—*N. s. insularum* inhabits the islands in Lake Erie lying between Point Pelee (south of Leamington), Essex County South, Ontario, and Catawba and Marblehead peninsulas (east of Port Clinton), Ottawa County, Ohio (see Map 1). Specimens showing intergradation with *Natrix sipedon sipedon* have been examined from the Catawba and Marblehead peninsulas and from certain of the islands.

TYPE.—Univ. Mich. Mus. Zool., No. 80457. Sex ♂. Type locality, Pelee Island, Lake Erie. Collected June 9, 1935, by Roger Conant, William M. Clay, *et al.*

DESCRIPTION.—Dorsal scales keeled (those of first row less strongly than the others), emarginate, and in 23 rows for a short distance upon the neck, then 21, changing shortly to 23 again, then diminishing until there are but 16 rows in the region in front of the anus, the full formula being therefore 23-21-23-21-19-17-16. Ventrals 143; anal divided; subcaudals 73, all divided.

Supralabials 8 on each side, sixth and seventh largest, fourth and fifth in contact with the eye; infralabials 10 on each side. One pre- and 3 postoculars adjoining each eye. One temporal in first row and 2 in second row on each side. Anterior chin shields parallel and in contact; posterior chin shields slightly longer than the anterior, diverging posteriorly, and made separate throughout their length by 5 small scales.

The entire dorsal surface is practically of a uniform medium gray but with occasional very faint traces of the lowermost portion of lateral spots (such as are present in *sipedon*) on the posterior part of the body. A lens reveals the dorsal scales to be of a light, uniform, gray ground color with more or less flecking of black and with margins and keel of a lighter shade.

The ground color of the ventrals is cream white, but their anterolateral ends are encroached upon by the dorsal color.

This encroachment begins in the neck region and increases in extent posteriorly so that the tip of the tail is heavily pigmented with flecks of gray. The chin shields, gulars, infra-labials, and lower portion of the supralabials are cream or nearly so.

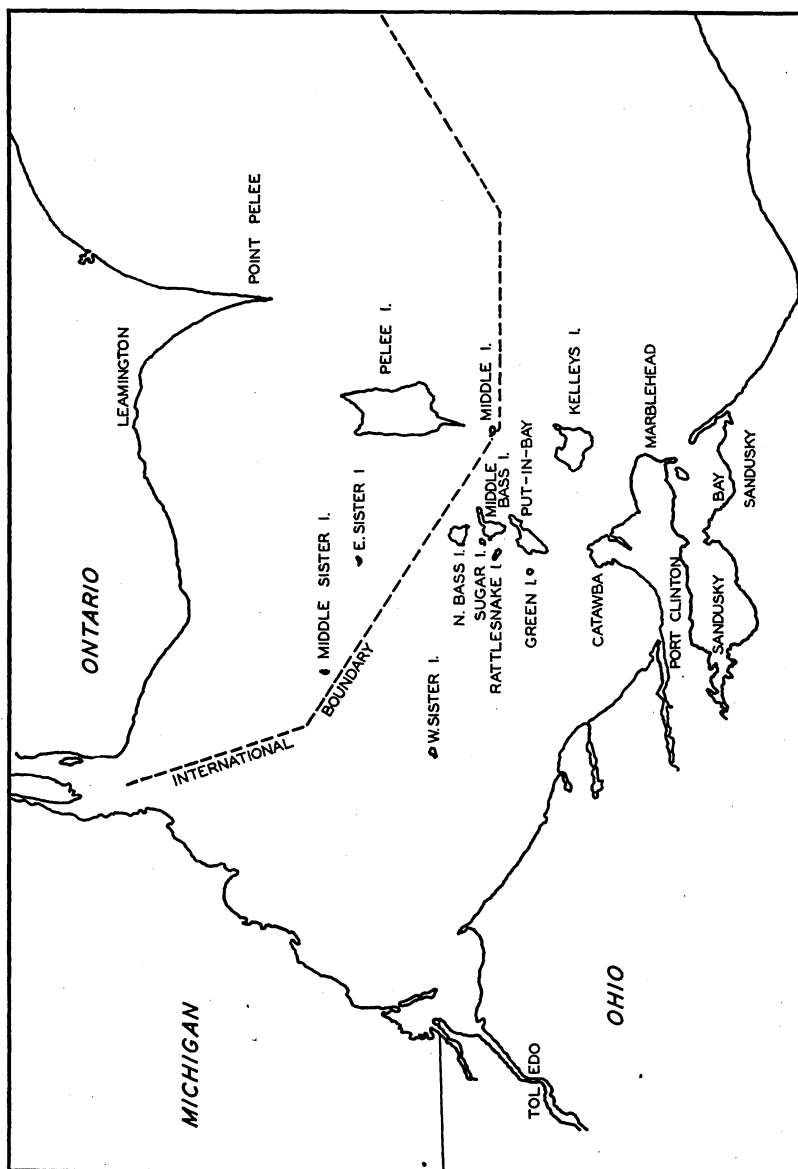
The total length is 720 mm., that of the tail is 176 mm. The tail is therefore about 24.4 per cent of the total length.

INTERGRADATION.—Since the distances between the various islands and the mainland are not great it is to be expected that random crossings by the snakes must take place occasionally. That this occurs is indicated by the fact that specimens showing intergradation with *sipedon* have been found on nearly all of the islands we have visited. It is of significance, however, that the farther the island is from the mainland the less contamination by *sipedon* is in evidence. Thus on Kelleys Island, Put-in-Bay, and Middle Bass Island which lie near the Ohio shore (see Map 1), intergrades are common, and a small number of specimens is even indistinguishable from *sipedon*. On Pelee Island, which is more remote, the influence of *sipedon* is much less apparent.

Intergrades are uncommon on the Catawba and Marblehead peninsulas and are unknown from other mainland localities. Specimens of *insularum* crossing from the islands to the shore appear to be unable to establish themselves, and the *insularum* characters soon disappear in the presence of the more widespread *sipedon*. The water barrier, narrow though it is, appears to be sufficiently effective to prevent the absorption of *insularum* by *sipedon*.

In order to indicate the relative proportions of typical *insularum*, typical *sipedon*, and the intergrades, four pattern types were defined into which were assorted the specimens whose patterns we studied. These pattern types may be described as follows:

A. Typical *insularum*. Dorsal pattern entirely absent or represented by a slight indication of dorsal blotches along the middorsal surface, or a slight indication of lateral blotches on the first one to three rows of scales. Belly uniformly light.



MAP 1. The western end of Lake Erie. Pelee Island is the type locality for *Natrix sipedon insularum*.

colored, the ventrals often with dark bases. (Pl. I, Figs. 1 and 2.)

B. Pattern of *sipedon* somewhat in evidence, but with the blotches imperfect, contorted, narrow, or obscure. Along each side a gray, patternless area covering approximately the fourth to tenth scale rows and imparting to the specimen a light gray lateral stripe. Belly uniformly white anteriorly, darker and sometimes well marked posteriorly. (Pl. II, Fig. 2.)

C. Rather similar to that of *sipedon*, but with the blotches not sharply defined and often narrow. A slight indication of a light lateral stripe usually present. Belly fairly well marked with half-circles as in *sipedon*. (Pl. III, Figs. 1 and 2.)

D. Typical *sipedon*. Well patterned above and below. (Pl. II, Fig. 1.)

The number of specimens falling into each of these categories is shown in Table I.

TABLE I
 PERCENTAGE OF TYPES OF COLOR PATTERN IN POPULATIONS OF *insularum*
 AND *sipedon* FROM VARIOUS LAKE ERIE ISLANDS AND THE
 ADJACENT MAINLANDS
 (The subscript numerals indicate the number of specimens)

LOCALITY	PATTERN			
	"A"	"B"	"C"	"D"
Ontario				100.0 ₆₈
Port Clinton, Ohio				100.0 ₂₀
Lakeside and Marblehead, Ohio	16.7 ₁			83.3 ₅
Catawba Peninsula, Ohio	5.3 ₂	2.6 ₁	18.4 ₇	73.7 ₂₈
Kelleys Island	12.5 ₂	31.2 ₅	43.8 ₇	12.5 ₂
Put-in-Bay	39.5 ₆₂	40.1 ₆₈	15.9 ₂₅	4.5 ₇
Middle Bass Island	27.5 ₁₄	37.3 ₁₉	25.5 ₁₃	9.7 ₅
Pelee Island	61.1 ₂₂	33.3 ₁₂	5.6 ₂	
Green Island	100.0 ₁			
Rattlesnake Island	100.0 ₄			

VARIATION.—Specimens of *insularum* show comparatively little variation in color and but slightly more in color pattern.

Normally they are uniformly gray, greenish gray, or brownish gray above. If a dorsal pattern is at all evident it is of a shade but little darker than the ground color. The belly normally is white or yellowish white, but the bases of the ventrals, especially toward the tail, often are of the same shade as the ground color above. There is apparently no color variation correlated with sex or age; males and females are alike and juveniles of all sizes, including newly born individuals, are similar to the adults.

Comparison of specimens of *insularum* with intergrades and with typical *sipedon* from both Ontario and Ohio localities reveals that there is little difference in scutellation. The maximum number of scale rows in the island specimens as a whole is 25 and the minimum is 16; the most frequent formulae are 23-23-18, 23-23-17, 23-23-16, and 21-23-17. In Ontario the numbers of ventrals and subcaudals in *sipedon* average somewhat higher than in Ohio; the averages for the island specimens closely approximate those for *sipedon* from Ontario (see Table II).

In the island snakes the ventrals in males vary from 141 to 153, average 146.3; in females from 137 to 152, average 145.9. Subcaudals in males vary from 70 to 81, average 75.6; in females from 58 to 68, average 63.3. Upper labials are 8, occasionally 7, rarely 9; lower labials are 10, occasionally 11 or 9. There is 1 preocular and usually 3 (or less often 2) postoculars; 1 temporal in the first row and usually 3 (or less often 2) in the second row.

The length of the tail in males varies from 23.1 per cent to 27.9 per cent, average 25.5 per cent of the total length; in females from 20.3 per cent to 24.5 per cent, average 22.4 per cent.

HABITAT AND HABITS.—The islands are all of limestone, which is often of a porous nature, and ponds and bogs are rare upon them. The water snakes, for the most part, appear to be restricted to the edges of the islands. They are not numerous on sand and gravel beaches but where rocks are strewn upon the shores, where low cliffs are close to the water's edge, or

TABLE II
 AVERAGE NUMBER OF VENTRAL AND SUBCAUDAL SCALES AND PROPORTIONATE TAIL LENGTH IN WATER SNAKES
 FROM THE LAKE ERIE ISLANDS AND ADJACENT MAINLANDS
 (The subscript numerals indicate the number of specimens)

LOCALITY	VENTRALS		SUBCAUDALS		RELATIVE TAIL-LENGTH	
	Males	Females	Males	Females	Males	Females
Ontario (mainland)	145.9 ₂₃	145.6 ₃₇	75.2 ₂₃	63.5 ₃₄	0.2516 ₂₀	0.2171 ₂₉
Pelee Island	146.3 ₂₃	146.1 ₁₃	76.1 ₁₄	63.8 ₁₂	0.2536 ₁₄	0.2223 ₁₁
All islands	146.3 ₇₁	145.9 ₄₁	75.6 ₃₉	63.3 ₃₅	0.2550 ₃₉	0.2240 ₃₅
Ohio	140.6 ₃₂	141.7 ₄₈	73.3 ₄₅	62.0 ₄₂	0.2568 ₃₇	0.2260 ₃₄

where docks extend into the water they are abundant. On June 1, 1935, three collectors on Put-in-Bay Island caught 234 specimens in exactly four hours, or an average of almost a snake a minute! In some instances as many as 12 and 14 large individuals were found hiding under a single rock!

AFFINITIES.—That *insularum* and *sipedon* are closely related, despite striking differences in their appearance, is indicated by similarities in their scutellation and by their ability to intergrade.

Attention should be called, however, to the occurrence in mountains of Pennsylvania, Virginia, and West Virginia, of water snakes which, judging from the few specimens we have seen, are almost indistinguishable from *insularum*. Their distribution appears to be discontinuous, and is in a region generally populated by *sipedon*. It is possible that these *insularum*-like snakes may eventually be referred to *insularum*, but at the present time we prefer to assign them to *sipedon* and to withhold a final decision until further investigation is carried out.

Various explanations may be advanced to account for the origin of *insularum*. It may have arisen from *sipedon* by mutation, either on one of the islands (or the peninsula which preceded the present islands) or on the Ohio mainland whence it may have spread to the islands, or *insularum* and the mountain specimens of similar appearance may represent relics of an ancient, wide-ranging form whose origin may or may not have been in *sipedon*. In any event, the evidence afforded by structural similarities and intergradation indicates that, with the possible exception of the unicolorated mountain form of uncertain identity, *sipedon* is more closely allied to *insularum* than is any other existing snake.

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PLATE I

FIG. 1. *Natrix sipedon insularum*. Type "A" color pattern. Pelee Island.

FIG. 2. Same specimen, ventral view.

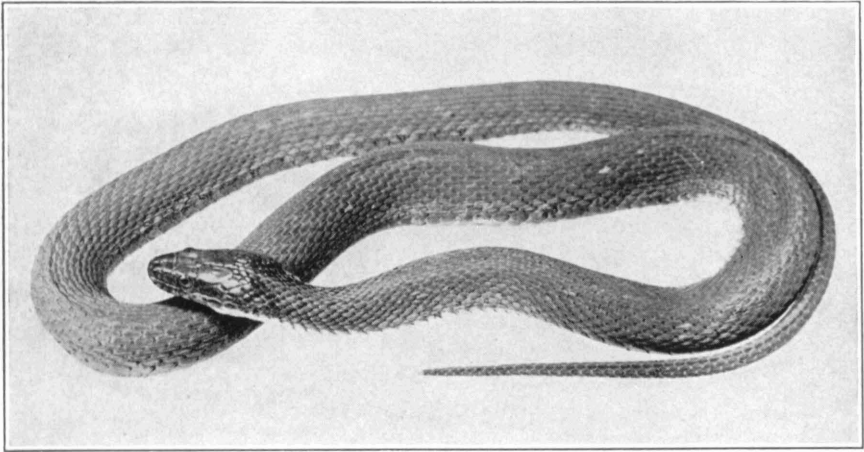


FIG. 1

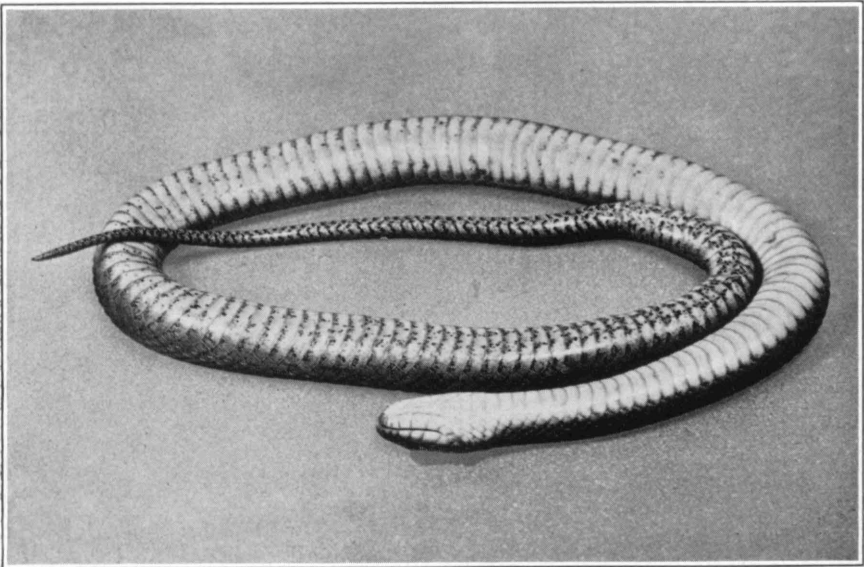


FIG. 2

PLATE II

- FIG. 1. *Natrix sipedon sipedon*. From Washtenaw County, Michigan.
FIG. 2. *Natrix sipedon insularum*. Type "B" color pattern. Pelee Island.

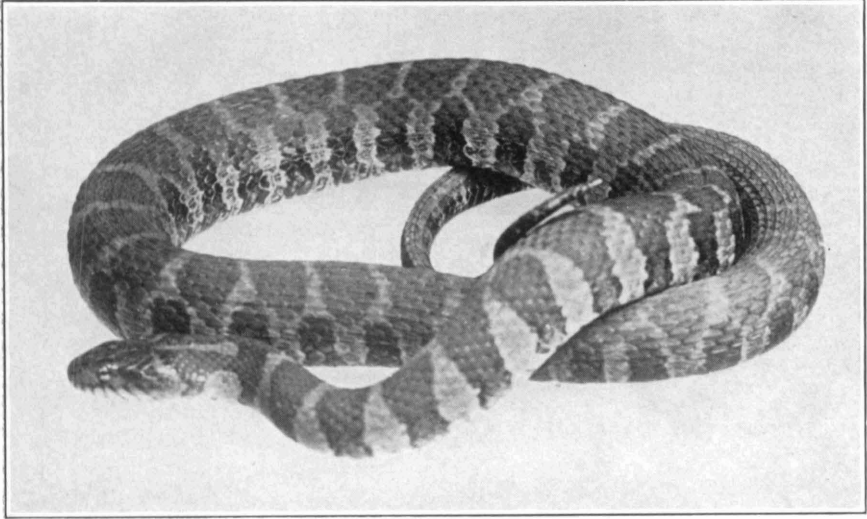


FIG. 1

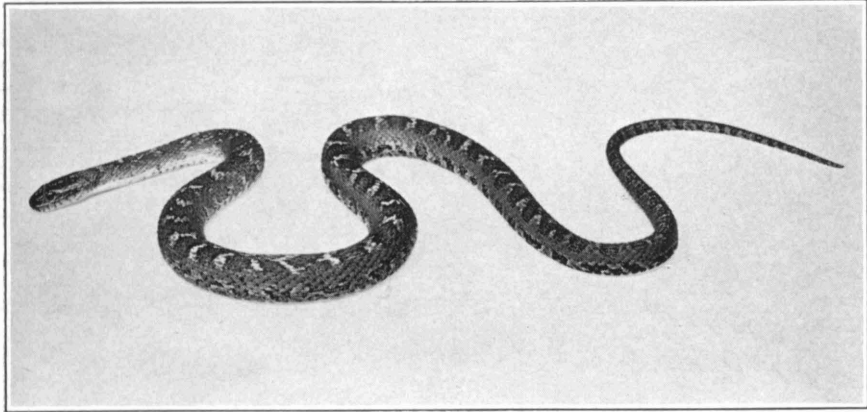


FIG. 2

PLATE III

FIG. 1. *Natrix sipedon insularum*. Type "C" color pattern. Pelee Island.

FIG. 2. Same specimen, ventral view.

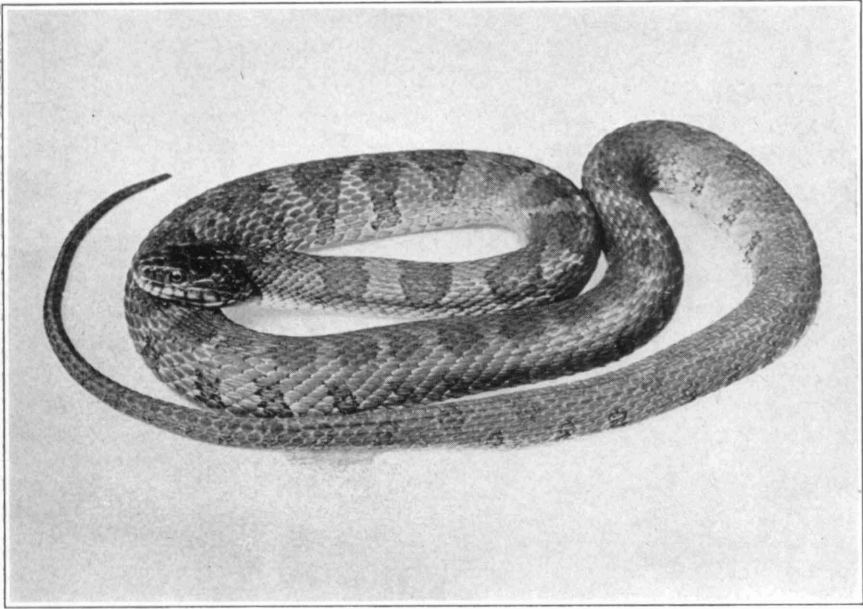


FIG. 1

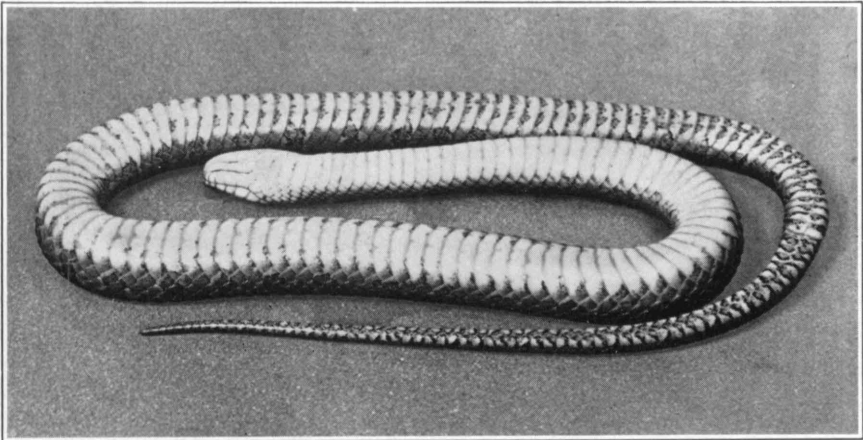


FIG. 2

