CONTRIBUTIONS TO THE ZOOLOGY OF TENNESSEE.
No. 1, REPTILES AND AMPHIBIANS.

BY SAMUEL N. RHOADS.

The following is the first of a series of papers treating of the collections of Mammals, Birds, Reptiles and Mollusks made for the Academy of Natural Sciences of Philadelphia by the writer during a trip through Tennessee, in the months of May and June, 1895.

Entering the northwestern corner of the State April 29th, collecting was carried on at the following stations in order of sequence.

1. Samburg (Wheeling), Obion County; April 30th to May 6th, a small village on the eastern shore of Reelfoot Lake, at the mouth of Indian Creek. This region lies at the foot of the Mississippi Bluff, which makes its nearest approach to the lake at this point, the strip of intervening land on which the village is built being about a quarter of a mile wide. The bluff is precipitous, rising more than 100 feet above the lake in this vicinity, and clothed with fine forests of beech, oak and chestnut, the first largely predominating.

The bottom lands surrounding the lake increase in extent both north and south of the Indian Creek confluence, and their whole extent, to within a few rods of the bluff, is annually flooded during high water in the Mississippi River. The flora of these bottoms is of the most luxuriant description, immense growths of of cypress, cottonwood, gum and maple fringing the shores and extending in unbroken areas back to the deforested crests of the escarpment. Beneath these is an undergrowth of vines and cane which is almost impenetrable except where the annual brush firing by the farmers and woodsmen has opened a passage way, or the grazing of sheep and cattle and the rooting of swine have destroyed the underbrush. The lake itself is eighteen miles long, its width varying from one-half to three miles, the greatest breadth being directly along a line passing a little north of west through Samburg.

It covers a region which, prior to the earthquakes of 1811–12, was a heavily timbered swamp traversed by Reelfoot Creek which flowed south into the Mississippi, and was interspersed with numerous ponds and bayous. Owing to the convulsions at that period this tract was submerged, partly by the subsidence of the swamp, partly by the filling up of the outlet of the creek, and thousands of acres of forested land were permanently flooded from one to ten feet in depth. The original vigor of this splendid growth is still evidenced by the innumerable stumps and blasted tree trunks which stand in and out of the water in every direction and which render the navigation and fishing of these waters so vexatious to a novice, and combine to make the most weird and impressive bit of scenery to be found along the Mississippi Valley. In such an environment we are not surprised to find animal life abounding in a remarkable degree.

Collecting at Samburg was confined to the immediate vicinity, but observations and records were made on the route between the lake and Obion and Union City.

2. Raleigh, Shelby County; April 8th to 14th. A post village located on the banks of Wolf River, nine miles east of Memphis. The hilly uplands which surround the village rise above the alluvial bottoms and bayous of the river much as the same formation (Bluff Loam or Loess) does at Samburg, and the faunal and floral peculiarities of the two regions are very nearly identical, with perhaps a more obvious austral commingling than is presented at Reelfoot Lake. Short bicycle expeditions of five to ten miles were made into the surrounding country east and west of Raleigh.

3. Bellevue, Davidson County; May 17th to 24th. A post village on Big Harpeth River, twelve miles south of Nashville. The vicinity of Bellevue lies within the western edge of the fertile central basin of middle Tennessee, the country between it and Nashville closely resembling in soil, topography and faunal and floral features the blue-grass region of Kentucky. The soil is a disintegrated limestone with abundant rocky outcrop of the same and supports fine growths of poplar, walnut, ash, oak, hickory and chestnut. A range of high hills runs east and west between Bellevue and Nashville separating the two branches of the Harpeth. The mean elevation of this region is from 600 to 700 feet above sea level, its mean depression below the Highland Rim lands lying westward

between the central basin and the Tennessee River is from 300 to 400 feet.

Trips were made from Bellevue to Nashville and southward into adjoining parts of Williamson county.

4. Chattanooga and Sawyer's Springs, Hamilton County; May 24th to June 2nd.

Owing to their proximity, and the fact that my visit to Sawyer's Springs lay within the above dates (May 28th, 29th and 30th), I include both localities under one division.

Chattanooga lies between the southern base of Walden's Ridge, belonging to the Cumberland Mountain system, and the northern base of the Lookout Mountain range, on the eastern bank of the Tennessee River. Its elevation above the sea is about 800 feet; the elevation of Lookout Mountain being 1,600 feet higher, and that of Walden's Ridge about 1,800 feet above the sea. The Tennessee Valley at Chattanooga is much narrowed and circumscribed by the mountains. The bottom lands are very fertile, supporting formerly a heavy growth of poplar, oak, gum, ash and walnut; among the foothills pines and chestnut oaks are abundant.

The valley formation is limestone; that of the mountains limestone overlaid by horizontal strata of the coal measures, and topped by the sandstone table-lands which form the Cumberland plateau.

Sawyer's Springs is a health resort on Walden's ridge, about twelve miles north of Chattanooga.

Its elevation and sandy soil present us with a marked change in climatic conditions as contrasted with the Tennessee Valley immediately below it. Laurels, rhododendrons and hemlocks fringe the streams; oak, chestnut, holly, juniper and short-leafed pines give the mountains much the aspect of such elevations in northeastern Pennsylvania, and the fauna is of a similar character.

Walden's Ridge bounds the Tennessee Valley from Chattanooga northwest to and beyond Harriman, its precipitous walls forming the eastern escarpment of the Cumberland plateau, its width ranging from five to fifteen miles. Collecting around Chattanooga was greatly facilitated by the use of a bicycle, trips being made to the Georgia line, up the Tennessee, and up the valley on the western side of the river.

5. Harriman, Roane County; June 2nd to 5th.

A town on the east bank of Emory River, near its junction with

Clinch River, situate among the foothills of the northern extension of Walden's Ridge at an elevation of 1,200 feet. The climate and natural productions of this region are much the same as those of the higher hills around Chattanooga. The country around Harriman is well wooded and some of the highest elevations of the Cumberland range in Tennessee are found to the north and west in Scott and Cumberland counties, Cross Mountain being 3,300 feet above the sea. A day's trip was made to Clinch River, near Kingston, at the junction of the Clinch and Tennessee rivers.

6. Allardt, Fentress County; June 5th to 8th.

A village on the Cumberland plateau, five miles east of Jamestown, the county seat. The table land for many miles around Allardt is remarkably level, and divides at this point the drainage north and south into the Cumberland and Tennessee rivers. The soil is rather poor, supporting a growth of oak, chestnut and pine, the latter often monopolizing large tracts. The elevation may be estimated at an average of 1,800 feet. Records were made and some specimens taken on the bicycle trip from Sunbright, Morgan County, to Allardt, and on the return journey from Allardt to Rugby Road, in Scott County.

7. Knoxville, Knox County; June 9th to 14th.

On the north bank of the Tennessee River, three miles below the junction of the French Broad and Holston Rivers. Owing to its elevation above the sea the mean temperature at Knoxville is about the same as that of Philadelphia, but the summers are cooler and winters milder.

The region is very similar to that of parts of the valley of East Tennessee already described, the fauna and flora partaking more decidedly of the Alleghenian elements found in the outlying spurs of the Chilhowee and Bay Mountain ranges on the southwest. Most of the region about Knoxville is fertile, rolling, limestone farm land, with occasional barren outcrops and ridges covered with wood. Several trips to the Holston River, and one up the east bank of that river, in the direction of Swampond Creek, were made.

8. Johnson City, Washington County; June 15th to 17th.

A picturesque town among the outlying ridges and foothills of the Great Smoky Mountains, at the junction of the E. T. & W. N. C. Narrow Gauge Railway, leading up into the Smoky Range, with the Southern Railway System. Animal and plant life show a decided

admixture of species which abound on the distant mountain sides 1,000 feet higher, and some common eastern species not hitherto met with in the State, are recorded. Deciduous forests are the rule, but lowland clearings are often covered with a dense growth of pines. The elevation of Johnson City is not given in any work accessible to me, but approximates 1,400 feet.

9. Roan Mountain, Carter County; June 18th to 23rd.

The Tennessee and North Carolina State line forms an acute angle on the summit of Roan Mountain, the northwestern third of the peak belonging to Tennessee. The elevation of the peak above Roan Mountain Station at is base is 3,000 feet—the total elevation being 6,394 feet. Roan Mountain Station is twelve miles from the top of the mountain, and the country lying between these points along the valley and cañon of the Doe River formed the field of investigation in this region. On the return journey a walk of thirty miles was taken, down the headwaters of Rock Creek twelve miles, and thence across to the Doe River Valley and Roan Mountain Station. This ended the Tennessee trip so far as it related to field work in natural history.

On the summit of Roan Mountain we have a reproduction, with local variations, of the fauna and flora of the Canadian zone.

This gives place, at a lower elevation of 4,500 feet to 5,000 feet above the sea, to the deciduous flora of the Alleghenian region with a corresponding change in animal life, and this gradation from the biological conditions of the north to those of the Carolinian fauna is illustrated in a wonderful manner as one descends the mountain and proceeds along the Doe River and valley to Johnson City. The climatic conditions found on the summits of the Appalachian system in this region differ markedly from those found in New England and the Middle States in their greater humidity, due to the frequent precipitation and presence of clouds and fog. To a person who has visited both mountain systems there is a marked resemblance in this respect between the climatic conditions of the southern Alleghenies and those of the Cascade Range in Washington and British Columbia, and the fauna and flora of the two show a like differentiation. Another factor which probably has much to do with the peculiar biological features of this region is the equability of temperature. Roan Mountain, for example, being always cool, often cold, but never hot in the sense of the extreme heat to be found in summer

among the White Mountains, neither are its plants and animals subjected to those frigid winter temperatures which their New England congeners must suffer. In consequence there is a correlation in the animal and plant life of these distant localities without identity. In some cases this variation amounts to specific values, in others only subspecific, but in all, owing to their isolation, the habitat is clearly definable.

Tennessee comprises within its limits an unusually varied topography, and owing to its proximity in the west to the influence of the Gulf of Mexico by way of the Mississippi, and in the east to the lofty mountain ranges, the State presents a fauna and flora of great diversity and unusual interest to the biologist. The greater part of what is popularly known as West Tennessee is in the Louisianian* fauna, including all the country lying west of a line running north from Lawrenceburg, Lawrence County, to the intersection of the Kentucky state line by the Tennessee River. Animals characteristic of this fauna, which rarely, if ever, are found in Middle Tennessee are the two Marsh Hares, *Lepus aquaticus* and *L. palustris;* a Cotton Rat? *Sigmodon;* a small Mole Shrew, *Blarina;* a large Deer Mouse, *Peromyscus*; the Swallow-tailed Kite, *Eleanoides forficatus;* Mississippi Kite, *Ictinia mississippiensis;* Snake Bird, *Anhinga anhinga;* Prothonotary Warbler, *Protonotaria citrea;* Louisiana Tree-frog, *Hyla cinerea semifasciata;* Say's Chain Snake, *Ophibolus getulus sayi;* Louisiana Triton, *Diemyctylus viridescens meridionalis;* Cyclops Water Snake, *Natrix cyclopion* and the Alligator Snapper, *Macroclemys lacertina.*

From the western boundary of the Louisianian fauna, as above defined, the whole of Middle and East Tennessee, below an altitude of 3,000 feet, is included in the Carolinian fauna. Characteristic animals of this fauna in Tennessee are the Opossum, *Didelphys marsupialis;* Pine Mouse, *Microtus pinetorum;* Least Mole Shrew, *Blarina——?* and typical forms of the eastern Deer Mouse, Gray Squirrel, Wood Rabbit, and the Gray Fox; also the Acadian Flycatcher, *Empidonax acadicus;* Yellow-breasted Chat, *Icteria virens;* Kentucky Warbler, *Geothlypis formosa;* Blue-winged Warbler, *Helminthophila pinus,* and Bewick's Wren, *Thryothorus*

*Zoogeographic nomenclature used is that of Dr. J. A. Allen. Bull. Amer. Mus. N. Hist., IV, Art. XIV, 1892.

bewickii. Among reptiles may be mentioned the Pine-tree Lizard, *Sceloporus undulatus;* Nebulous Toad, *Engystoma carolinense;* Pilot Snake, *Coluber obsoletus,* and Box Tortoise, *Terrapene carolina.* Many of these are found in the Louisianian fauna, but attain their maximum development and numbers in the Carolinian.

Elevations between 3,000 and 5,000 feet in the Cumberland Plateau and the Unaka and Great Smoky Mountain systems of East Tennessee, are in the Alleghenian fauna. Some of the representative animals of this area are the Red Squirrel, *Sciurus hudsonius*; Mole Shrew, *Blarina talpoides;* Brown Shrew, *Sorex personatus;* Canadian Warbler, *Sylvania canadensis;* Least Fly-catcher, *Empidonax minimus;* Wilson's Thrush, *Turdus fuscescens;* Dusky Salamander, *Amblystoma jeffersonianum*; Black Salamander, *Desmognathus nigra,* and northern Spring Frog, *Rana clamitans melanota.*

On the highest mountain tops, in the evergreen timber belt, above 5,000 feet elevation, are found a few animals whose position belongs more strictly to the Canadian than the Alleghenian fauna. These are the Mountain Deer Mouse, *Peromyscus* ——*?* Great Red-backed Vole, *Evotomys carolinensis*; Bog Vole, *Synaptomys* ——*?*; Winter Wren, *Troglodytes hiemalis;* Golden-crowned Kinglet, *Regulus satrapa,* and Common Crossbill, *Loxia c. minor.* A few of the Alleghenian reptiles extend into the Canadian fauna to the very summit of Roan Mountain.

The following annotated list of the reptiles and amphibians of Tennessee includes only those species collected by me during the recent trip.

To this is added a list of twenty-five species, not observed by me, of which there exist authentic records as having been observed or taken in the State. I have also appended a list of twenty-nine species of which we have no Tennessee record, but which are likely to be found there.

There is no area of similar extent in the eastern United States, whose zoölogy is so little known as that of Tennessee. State geological surveys, with the exception of those of Gerard Troost, published between the years 1835 and 1838, have made no attempt to treat of the fauna and flora of Tennessee, nor can we find in zoological literature anything which can be said to have reference to the State in a faunal sense. I have been aided in making out the list of additional recorded species of reptiles and amphibians by

reference to Dr. Holbrook's Herpetology, and to the check-lists of Yarrow and Cope of the collections in the National Museum.

I have largely adopted the nomenclature and sequence of orders and genera used by Professor Garman in his valuable Synopsis of the Reptiles and Amphibians of Illinois. The code of nomenclature of the American Ornithologist's Union is responsible for any apparent idiosyncracies of names or spelling that may appear.

The collection numbers 270 specimens, classed as follows : Chelonia, 45; Sauria, 27; Ophidia, 46; Anura, 63; Urodela, 89.

So far as I have been able to discover, the whole number of species and subspecies of Reptilia and Amphibia recorded from Tennessee is 77, of which 52 are represented in the collection; besides these there are about 30 species which are likely to be found in the State limits, making the approximate number of Tennessee species and subspecies 107.

REPTILIA.

Order CHELONIA.

Family EMYIDÆ.

Genus TERRAPENE Merrem.

1. **Terrapene carolina** (L.). Box Tortoise.

Not observed in west Tennessee but found in the middle and eastern districts and abounding among the foothills of the Cumberland and Great Smoky mountain ranges.

Mr. W. E. Taylor has recently[1] suggested that Kentucky and Tennessee specimens of this animal may possibly be entitled to rank as a variety of *T. carolina*.

If by "variety" a geographic race or subspecies is meant, the five specimens recorded below show that such a conclusion would be untenable, the individual variations of Tennessee Box Tortoises being as numerous and undefinable as those of a like series from the Middle States.

A large specimen from Chattanooga has an ebony black plastron; the unkeeled carapace is of the same ground, with numerous spots and small irregular figures of gold scattered over each plate; marginal plates each with a large orange spot; top of head and anterior surfaces of fore legs yellow spotted. Two younger specimens from

[1] Proc. U. S. Nat. Mus., XVII. 1895, p. 578–9.

Bellevue are of the orange and black type with yellow and black plastron and strongly marked keel, typical of eastern examples of same age, and the same color pattern is exhibited by the adult specimens from Johnson City, in which the keel has almost disappeared. Specimens—Bellevue, 2; Chattanooga, 1; Johnson City, 2.

Genus **PSEUDEMYS** Gray.

2. **Pseudemys elegans** (Maxim. Wied). Wied's Turtle.

Very abundant at Reelfoot Lake as attested by numerous shells lying about the marshes. The young, from one to two inches in diameter, were swarming in the tributaries of the lake. In all of these the red neck-stripe was strongly marked. Of numerous large turtles seen in the Wolf River bottoms near Raleigh some were probably of this species. Specimens—Samburg, 2 ad.; 15 juv.

3. **Pseudemys concinna** (Le C.). Le Conte's Turtle.

A specimen from the Wolf River has remarkably long, slender nails on the three inner toes of the fore feet, the fourth being quite short.

Specimens—Raleigh, 1 ad.; Samburg, 1 juv.

Family KINOSTERNIDÆ.

Genus **KINOSTERNON** Spix.

4. **Kinosternon pensylvanicum** (Gmel.). Mud Turtle.

One adult specimen from Reelfoot Lake is not distinguishable from the typical eastern examples of this species.

Specimen—Samburg, 1.

Genus **AROMOCHELYS** Gray.

5. **Aromochelys odoratus** (Latr.). Musk Turtle.

Specimens—Samburg, 1; Chattanooga, 1.

6.? **Aromochelys carinatus** (Gray). Carinated Musk Turtle.

A Musk Turtle collected in Emory River, at Harriman, Roane County, is very doubtfully referred to this species.

Description—Carapace strongly keeled, convex, rounded and serrate posteriorly, and covered throughout with imbricated plates. Posterior borders of marginal and dorsal plates acute, strongly produced, forming a serrate dorsal and posterior outline. Plastron subtriangular, widely truncate anteriorly, narrowed and emarginate ventrally. Minute gular plate scarcely projecting beyond anterior margins of postgulars, the latter squarely cut in front,

their lateral apices each forming the apex of an obtuse angle whose anterior side is formed by the transverse anterior face of the postgular and the oblique lateral face of the pectoral plate. Pectoral plates rhomboidal, their median suture longer than the anterior (pecto-gular) suture and their posterior (pecto-abdominal) suture equalling the length of the lateral margin of the plate. Abdominal plates rhomboidal, transversely elongate, their lateral margins slightly convex, posterior margins truncate. Upper mandible emarginate with a well defined hook. A triangular emarginate rostral shield reaches median line of orbits. A pair of barbels at symphysis of lower jaw; the cervical folds and tubercles nearly obsolete. Crown and rostrum olive; black-spotted; rest of dermal surface bluish-white; the upper head and neck streaked and spotted with irregular black lines. Two black bands pass back from the eye across and above tympanum and join on foreneck, reaching thence to forearm; continuous black stripes above and below this reach from the temples and base of mandibles to base of neck. Superior surface of legs and feet and tail irregularly marbled with black. Plastron, mandibles and claws olive yellow. Plates of carapace olive, with black margins. The skull, viewed laterally, shows a depressed interorbital, convex frontal and depressed occipital profile.

Measurements: Length of plastron (median) 41 mm.; greatest width of bridge (interaxillar width), 35.5; width of carapace between anterior margins of seventh pair of marginal plates, 53. Greatest length of skull, 23; greatest width of skull, 14.5.

The specimen above described was found dead in the Emory river, and had evidently just been thrown there by one of the numerous urchins who were fishing near the place. The anterior half of the carapace was missing. The animal was apparently two-thirds grown.

A comparison with several alcoholic specimens of *A. odoratus* of the same age, taken near Philadelphia by Dr. Jos. Leidy, shows so many decided peculiarities in the Tennessee example that I have been almost induced to give it a new name.

The most prominent of these is the truncated shape of the plastron and the rhombic outlines of the abdominal and pectoral plates, the former wholly lacking the deeply cleft emargination of the axillary border. The shape of the skull is quite different, and the

carinated and serrate carapace and peculiar coloration very marked.

From *A. carinatus* it is distinguished by its dermal coloration, though it resembles it in the imbrication of the carapace.

Not having specimens of *carinatus* I am unable to make the necessary comparisons, but I find Professor Boulenger's diagnosis of that species, taken from Gray's types, to correspond too closely to the Harriman specimen to warrant naming it anything else. Professor Garman states that *carinatus* has no stripes on sides of head, which my specimen has. The southwestern habitat of *carinatus* is another reason for suspicion that the Harriman turtle is distinct.

Family CHELYDRIDÆ.

Genus CHELYDRA Schweigger.

7. **Chelydra serpentina** (L.). Snapping Turtle.

This species abounds at low altitudes throughout the State.

Specimens—Samburg, 6 juv.; Johnson City, 1 ad.

Family TRIONYCHIDÆ.

Genus ASPIDONECTES Wagler.

8. **Aspidonectes spiniferus** (Le S.). Soft Shelled Turtle.

Very abundant in West Tennessee.

Specimens—Samburg, 1 half-grown; 10 juv.

Order SAURIA.

Family IGUANIDÆ.

Genus SCELOPORUS Wiegmann.

9. **Sceloporus undulatus** (Bosc. Daud.). Brown Swift, Tree Lizard.

Represented all over the State below an elevation of 3,000 feet.

Specimens—Samburg, 3 ad; Raleigh, 3 ad; Sawyer's Springs, 4 ad; Harriman, 1 ad; Allardt, 1 ad; Knoxville, 1 ad.

Family TEIDÆ.

Genus CNEMIDOPHORUS Wagler.

10. **Cnemidophorus sexlineatus** (L.). Six-lined Lizard.

This active lizard was numerous in the suburbs of Chattanooga along railroad embankments.

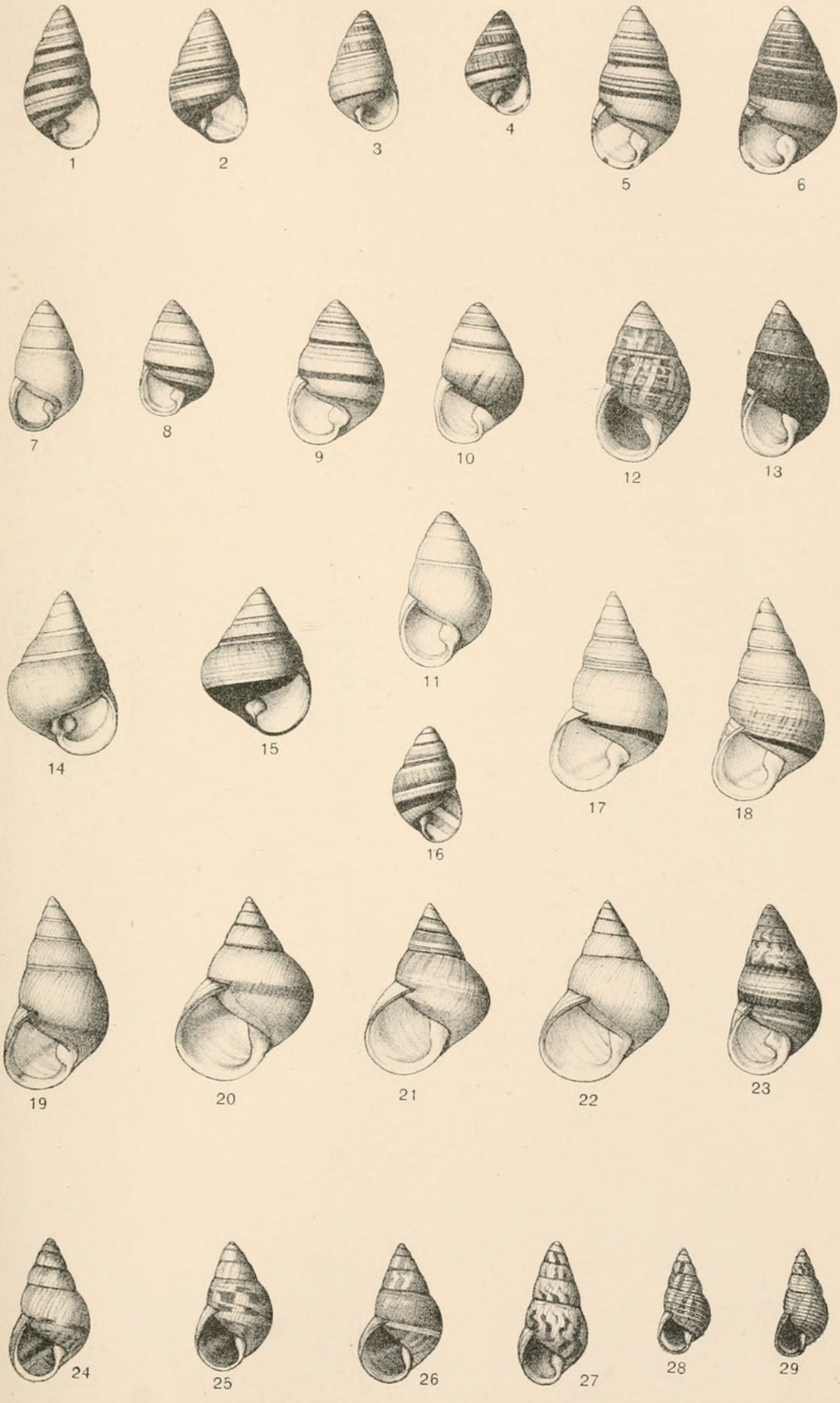
I saw none elsewhere and was unable to capture any.

Family SCINCIDÆ.

Genus EUMECES Wiegmann.

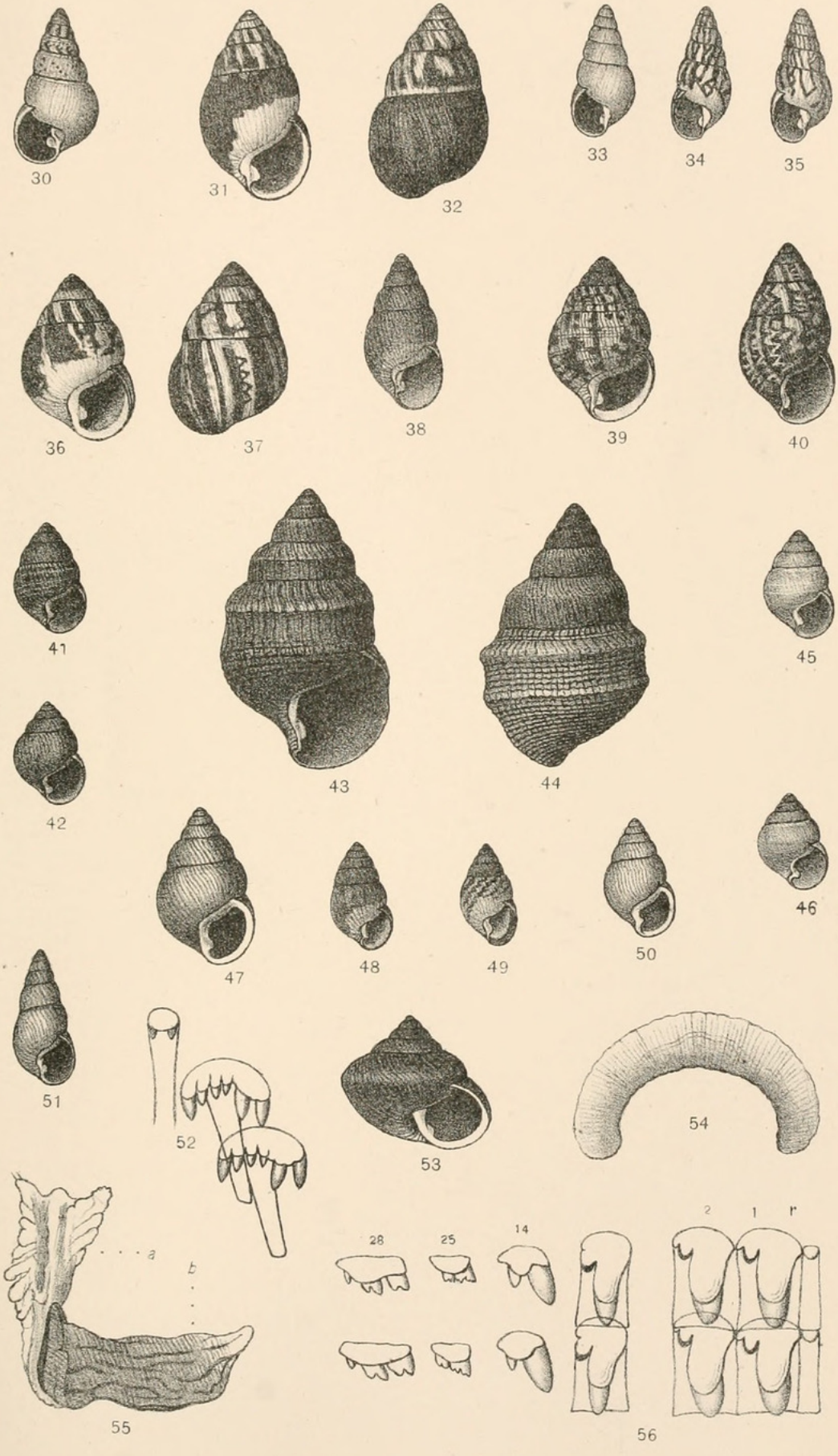
11. **Eumeces fasciatus** (L.). Blue-tailed Lizard, Scorpion.

I found this species in the western lowlands only.



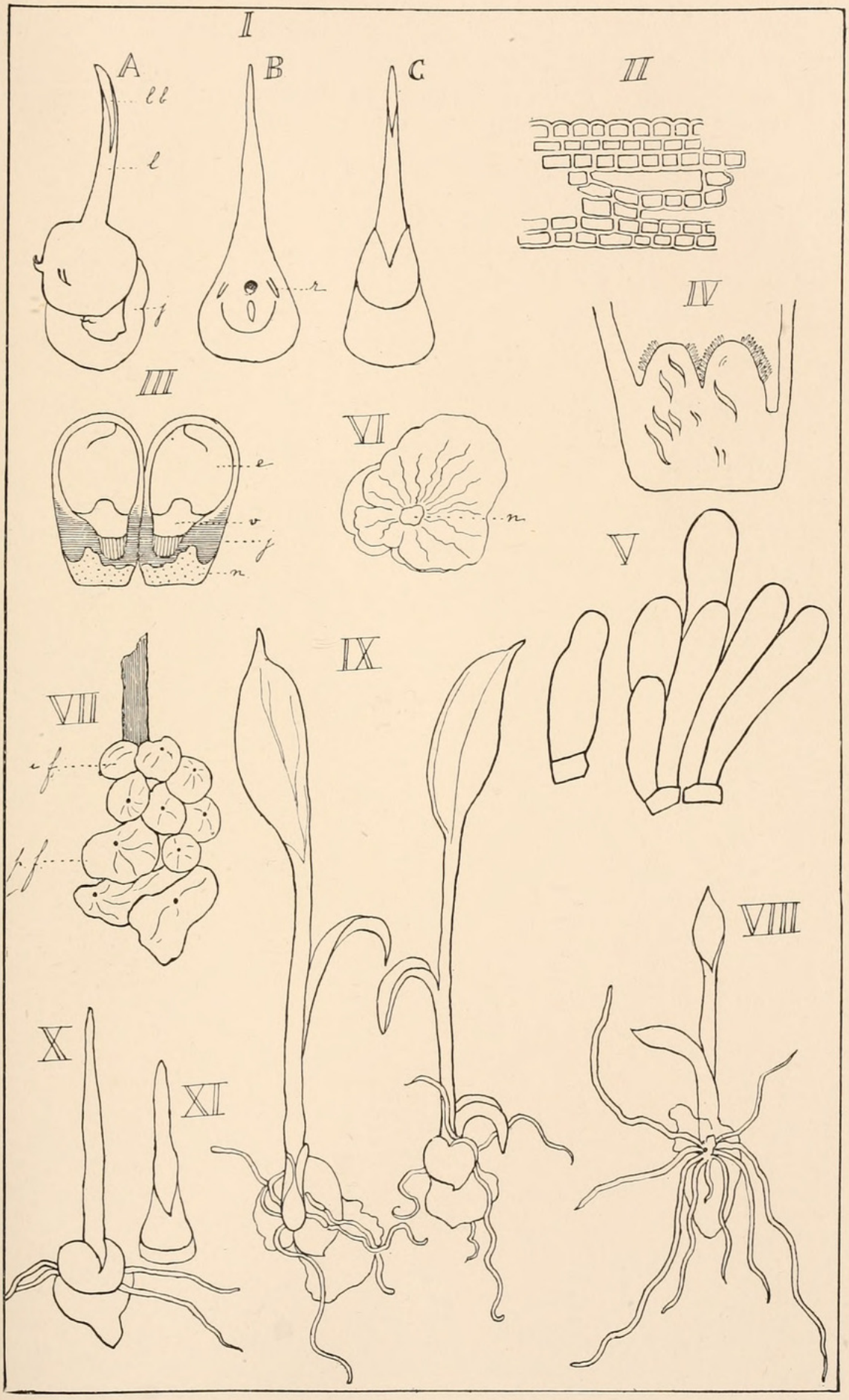
W.H.C. Sheppard, del. et. Lith.

BALDWIN ON ACHATINELLA.

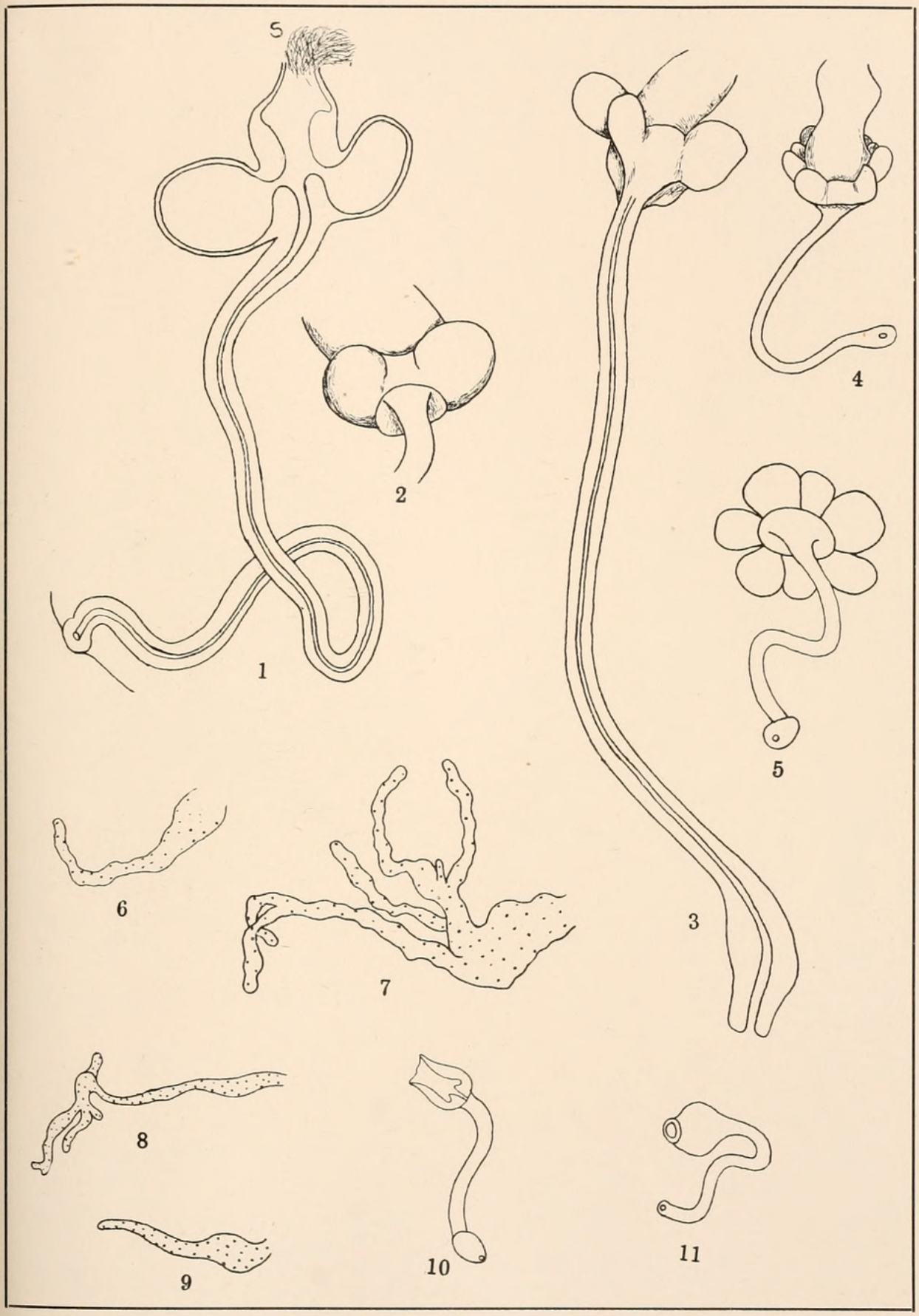


Edwin Sheppard, del. et Lith.

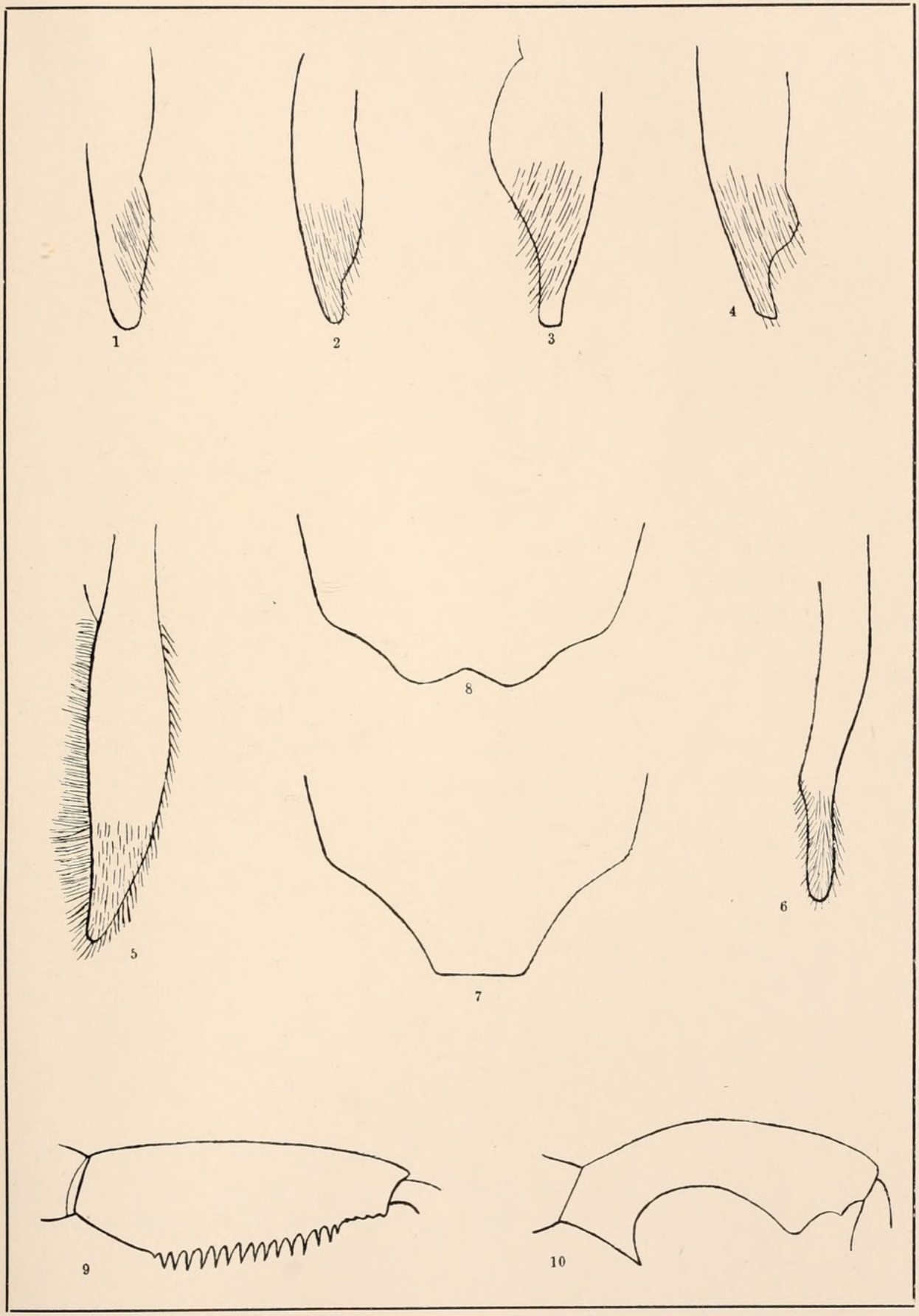
BALDWIN ON ACHATINELLA.



KELLER ON PELTANDRA.



MOORE ON FRIDERICIA.



FOX ON BEMBICINI.

All the color variations defined by Professor Garman[1] are found in the series collected. The "Scorpion" is well known and much dreaded by the people of Tennessee.

Specimens—Samburg, 4 juv., 1 ad; Raleigh, 3 juv., 2 ad.

Genus **OLIGOSOMA** Girard.

12. Oligosoma laterale (Say). Ground Swift.

Distribution identical with that of *Sceleporus undulatus*. Abundant.

Specimens—Raleigh, 3 ad; Sawyer's Springs, 1 juv. ad.

Order OPHIDIA.

Family COLUBRIDÆ.

Genus **THAMNOPHIS** Fitzinger.

13. Thamnophis ordinatus (L.). Common Garter Snake.

Very few specimens of this genus were met with. A specimen of typical (?) *ordinatus* was taken on the Cumberland plateau near Clear Fork Creek in the northern corner of Morgan County, but it escaped from my pocket. A small individual in bad state of preservation was examined at Samburg and thrown away.

Specimens—Samburg, 1 juv. ad.

14. Thamnophis ordinatus obscurus (Cope). Plain Garter Snake.

A large garter snake which I found in a mutilated condition on the road from Cloudland to Roan Mountain Station is doubtfully referred to this variety. It has nineteen rows of scales and seven labials, and was originally about 30 inches long and an inch in diameter at the thickest part. The color of the back is a uniform greenish bronze without spots or lines saving a yellowish vertebral stripe covering the median row and half of each of the two adjoining rows of dorsal scales. The gastrostegal scales are of a uniform deep greenish azure hue. The head is dark bronze without markings.

Specimen: Base of Roan Mt. (3,500 ft.), Carter Co., 1 ad.

Genus **NATRIX** Laurenti.

15. Natrix sipedon (L.). Spotted Water Snake.

The series of smaller water snakes from Reelfoot Lake plainly demonstrates that the so-called "varieties" *fasciatus* and *rhombifer*

[1] Rept. & Amphib. of Ills. p. 258-9.

have no correlation with faunal or geographic conditions, but are the result of individual variation, of age, and, in some instances, of sex and season. No specimens of "variety" *erythrogaster* were taken but the same remarks are undoubtedly applicable to that phase also. Strictly speaking, these names have no place in nomenclature save as pure synonyms of *sipedon*, the first name applied by Linnaeus to this species. As trinomials they are inapplicable, for the same reason, and the sooner herpetologists are willing to confine the use of trinomials to geographic races of constant and definable characters the better it will be for that branch of science. In the case of *N. sipedon* the use of these varietal names even in the liberal sense of a color phase is objectionable, as there are innumerable intermediate variations between the forms so designated which defy classification and which are as fully entitled to varietal rank as those already proposed. An instance of this is exhibited by one of the Samburg specimens which so closely resembled a blacksnake that I had originally put it in the same jar with a *Bascanion* from that locality. This specimen, apart from its color, is a typical *N. sipedon*. In life it was dull black over the whole upper surface, below clear white with fine mottling and shading of steel blue across the bases of the gastrosteges. There are no traces of spots or bands above, either on the outer dermal covering or on the portions of the underlying skin which have been exposed by handling. Prof. Garman mentions that sometimes the upper colors are uniform, from which I infer he means without spots, but Prof. Cope[1] makes no mention of such a phase. The whiteness of the lower parts in the Samburg specimen seems inconsistent with the idea suggested to me by Mr. A. E. Brown, that it is an example of melanism. It may be stated in this connection that Mr. Brown, who has perhaps seen and handled more of these snakes than any one in America, had never seen a black one before. See, however, *Tropidonotus niger* of Holbrook.

Of the specimens from middle and east Tennessee all belong to the *sipedon-fasciatus* types, some with the dorsal bands continuous on the sides. In one from Walden's Ridge some of the dorsal bands are continuous, interspersed by large quadrate lateral blotches alternately distributed on either side with their upper corners meeting along the vertebral line.

[1] Chars. & Vars. Snakes N. A., Proc. N. Mus., XIV, 1892.

Two specimens from the Nolachucky and Tennessee Rivers are alike in their rusty olive upper shades and orange-yellow bellies finely spotted with sparse black dots. In one of these the dark dorsal blotches are rhombiform and confluent; in the other they are square, separated by light, transverse bands and alternated along the sides by smaller squares of the same color. In another specimen from the Nolachucky the general appearance is similar to these but the belly is white, nearly spotless anteriorly but darkly blotched and tesselated with black, distally. The dorsal pattern is a curious mixture of those exhibited by the two specimens described in the preceding paragraph. Young specimens from Bellevue and Roan Mountain show similar inconsistencies with any popular or scientific classification.

Specimens: Samburg, 6 ad.; Bellevue, 2 juv.; Sawyer's Springs, 2 ad.; Harriman, 1 juv.; Knoxville, 1 ad.; near Greeneville, (Nolachucky Riv.), 2 ad.; Doe River (4,000 ft.), 1 juv.

16. Natrix cyclopion (Dum. Bibr.). Cyclops Water Snake.

Four specimens of this huge water snake from Samburg are remarkably uniform in coloration. The upper ground is dark olive. Beginning at the base of the skull irregular squarish blotches of black alternating with patches of the ground color extend almost to the end of the tail and occupy the middle eight rows of dorsal scutes. On the sides, opposite the olive dorsal squares and touching the corner of the black dorsal squares are squares of the same size and color reaching to and invading the abdominal scutes. The whole effect is a regular checker-board pattern. The lower head and neck are yellow, unspotted. Remainder of lower parts becoming paler yellow distally and increasingly blotched with alternating double and treble rows of rounded spots on the bases of the gastrosteges until at the ventral region they assume a checker-work pattern similar to that of the back. The three largest specimens have twenty-seven dorsal scale rows, the smallest, twenty-five. The largest specimen was nearly five feet long and contained two cat-fish, one of which would weigh a pound and a half and whose pectoral spines protruded through the skin of the snake nearly an inch on either side of the abdomen.

This species was abundant on the shores of Reelfoot Lake and its large, triangular head, thick body and similar color pattern

prevent its being distinguished by the natives of that locality from the deadly moccasin, with which they almost invariably confound it. The original spelling of the specific name for this species, *cyclopion*, should be adhered to.

Specimens: Samburg, 3 ad.; 1 juv.

17. **Natrix leberis** (L.). Seven-striped Water Snake.

Not seen except in the central basin. In a large specimen from Bellevue there are no black dorsal stripes. The back is uniform olive brown with a pale whitish stripe along margins of outer dorsal scutes, succeeded by a blackish stripe on edges of abdominal scutes which is distinct from the next yellow stripe anteriorly, but is merged ventrally with the inner black stripe of belly. The median, yellow, inferior stripe disappears on the abdomen, and wholly fades in the black of the ventral and caudal regions. This results in the diminution of the pectoral pattern of five light and four dark stripes to an abdominal striation of two obscure light lateral lines, and an unbroken intervening dark area formed by the confluence of the seven light and dark median stripes of the pectoral region into a single band of black. Two young, taken with this specimen, show faint vertebral and costal stripes, and in all other respects are normal. The above description seems to show an approach to *grahami*, but its nineteen dorsal scale rows and color pattern are nearer *leberis*. Its peculiarities lend some color to the idea that *grahami* is not specifically separable from *leberis*, and Prof. Cope's diagnosis of the two (Proc. Nat. Mus., XIV, p. 667) shows, when compared with that of Prof. Garman (Rept. & Amphib. Ills., p. 272), that their characters are quite variable, and this, too, in the direction of each other.

Specimens—Bellevue, 1 ad., 2 juv.; Richland Creek near Nashville, 1 juv.

Genus OPHEODRYS Fitzinger.

18. **Opheodrys aestivus** (L.). Green Summer Snake.

Reported from all over the State, but only seen by me on the Cumberland plateau in Scott and Fentress counties. It is probable most of the "Green Snakes" of east Tennessee are *Liopeltis vernalis* (De Kay-Harl.), none of which were taken.

Specimens—3 m. W. Rugby Road, Scott County, 1 juv.; 8 m. E. Allardt, 1 ad.

Genus **BASCANION** Baird, Girard.

19. **Bascanion constrictor** (L.). Black Snake.

Fairly abundant in sparsely settled districts.

Specimens—Samburg, 1 ad.; Bellevue, 1 ad.

Genus **COLUBER** Linnæus.

20. **Coluber obsoletus** Say. Pilot Snake.

I found this the most abundant snake throughout the State. The large specimen from Fentress County has only twenty-three rows of dorsal scales, all the others have twenty-five, bringing the average far below the normal number for this species, which is never less than twenty-five, and often reaches twenty-nine rows. In the twenty-five-rowed specimen the prevailing color is black, with slight marbling of gray above. The supralabials and anterior lower scutes are white, becoming heavily blotched with alternating quadrate spots of black on the belly. The lower caudal region is quite black. The dorsal color pattern is rhomboidal, and there is a tendency to striation in the gray lateral markings of the fore part of the body. The specimen was nearly five feet long. It is plainly referable to the form described by Holbrook as *Coluber alleghaniensis*. A young specimen from the same locality has the same color pattern, but is much lighter.

Three specimens from Samburg exhibit very instructive characters. The smallest, a half grown specimen, has a gray-black ground with a black dorsal row of separated rhomboid blotches and a similar row of blotches on each side which are alternate to the dorsal ones, but do not touch them. The belly is white, with alternating tesseræ of black spots on either side in short longitudinal rows from three to five scutes in length, and one-eighth to one-sixteenth of an inch in width. Another large specimen is similar, but darker, the dorsal blotches less defined, and the lateral ones merged into a dark longitudinal band with a superior narrower band of gray traversing almost the entire length. The under side is white mottled with dusky anteriorly, but with a continuous median light stripe to tip of tail. It is intermediate between *alleghensis* and *quadrivittatus*. A large Chattanooga specimen is intermediate between the Allardt and Samburg examples. No specimens of the very dark form of typical *obsoletus* were seen, though I examined several other Samburg specimens which were not pre-

served. A study of Professor Boulenger's diagnosis of this species[1] corroborates my own observations and belief that individuals which may be severally classed under the varietal synonyms *allegheniensis*, *lindheimeri*, and *spiloides* may be found associated in both Carolinian and Austroriparian districts. As in the case of *Natrix sipedon* these facts defy any attempt to define geographical races of *obsoletus* or to apply names to them in the trinomial sense.

Ophidians are not subservient to the same fixed laws of geographic variation which apply to birds and mammals, and which have enabled us to define with scientific exactness the faunal areas over which they are distributed, to designate these races by trinomials, and even to predict the character of sub-specific variations in a given area upon our knowledge of the physiographic and climatic conditions there obtaining. Though recent attempts to classify the North American Reptilia and Batrachia by the code of trinomial nomenclature adopted by the American Ornithologists' Union has in many cases been a failure, it is not improbable that when reptiles are collected in large series, and at different seasons from continuous areas of country we may be able in most cases to define geographic races on *structural* characters quite as constant as the superficial ones afforded us by sub-species of birds and mammals.

Specimens—Samburg, 2 ad., 1 juv.; Chattanooga, 1 ad.; Allardt, 1 juv.; 1 ad.

Genus OPHIBOLUS Baird, Girard.

21. Ophibolus triangulus (Daud.). King Snake, Milk Snake.

The only specimen taken has twenty-one dorsal scales and, in nearly all minutiæ, corresponds to Boulenger's description of *triangulus*. It seems desirable and proper that these characters should be considered sufficient to specifically separate this snake from the *doliatus* of Linnaeus. In doing this Prof. Garman has made the curious blunder of using the name *doliatus* of Baird and Girard for a variety of *triangulus*.

Specimen: Bellevue, 1 ad.

22. Ophibolus getulus sayi (Holbr.). Chain Snake.

The only specimen is the dark phase of *sayi* with minute dots on a black ground and a heavily blotched yellowish belly. The distinctions between typical *getulus* of the east Carolinian district

[1] Cat. Snakes B. Mus., II, 1894, pp. 50, 51.

and *sayi* of the west are so constant as to deserve trinomial recognition.

Specimen: Samburg, 1 ad.

Genus **HETERODON** Beauvais, Latreille.

23. **Heterodon platyrhinus** Latr. Hog-nosed Snake.

Of the three Samburg specimens one adult is noteworthy in having the body and tail a uniform grayish olive above and ashy white below, without markings. The head and neck have the normal black markings.

Specimens: Samburg, 2 ad., 1 juv.

Genus **CARPHOPHIS** Gervais, D'Orbigny.

24. **Carphophis amoenus** (Say). Ground Snake.

In the Raleigh specimen there are no internasal scutes. In one from Sawyer's Springs the right internasal is partly developed and in the other both internasals are present.

Specimens: Raleigh, 1 ad.; Sawyer's Springs, 2 ad.

Family CROTALIDÆ.

Genus **CROTALUS** Linnæus.

25. **Crotalus horridus** L. Timber Rattlesnake.

I did not actually meet with this snake, but secured the rattle of a specimen killed near Samburg during my stay. They are numerous in West Tennesseee.

Genus **AGKISTRODON** Beauvais.

26. **Agkistrodon contortrix** (L.). Copperhead.

This snake is abundant in the western half of the State. Two specimens were caught in the runways of mice in the small "Cyclone" traps which were used for trapping mammals. This would indicate that small rodents are a favorite food of the Copperhead and are systematically pursued in their burrows.

Specimens: Samburg, 2 ad.; Raleigh, 1 ad.; Sawyer's Springs, 1 juv.

27. **Agkistrodon piscivorus** (Lacep.). Water Moccasin.

Though the Moccasin is accounted abundant by the people of Reelfoot Lake, I did not secure or positively recognize more than one specimen.

Specimen: 1, half-grown.

AMPHIBIA.

Order ANURA.

Family RANIDÆ.

Genus RANA Linnæus.

28. Rana pipiens Schreber. Leopard Frog.

The small series at my disposal prevents any discussion of the supposed characters of the subspecies recognized by Prof. Cope in his Batrachia of North America. The inconstancy of some of these characters, however, is patent enough and the multiplication of new trinomials quite unwarranted.

Specimens: Samburg, 1 ad.; Raleigh, 2 ad.; Chattanooga, 1 juv.

29. Rana palustris Le C. Pickerel Frog.

Only found in east Tennessee.

Specimens: Harriman, 1 ad.; 1 juv.; Roan Mt., (3,500 ft.) 1 ad.; 1 juv.

30. Rana clamitans Bosc Mss., Sonn., Latr. Southern Spring Frog.

The most abundant of the genus throughout the State.

Specimens: near Bellevue, 3 juv. ad.; Chattanooga, 1 ad.; Harriman, 1 ad.

31. Rana clamitans melanota (Raf.). Northern Spring Frog.

Two large frogs from a spring on the summit of Roan Mountain and within a few yards of the Tennessee State line, in Mitchell County, North Carolina, showed such striking differences from *clamitans* of western Tennessee that I was inclined to consider them a distinct species. Similar specimens were seen on the banks of Doe River during the ascent of the mountain, but none were secured. The Roan Mountain specimens are almost precisely in color and measurements like Holbrook's figure of *Rana horiconensis* from Lake George and without doubt represent the same phase of variation from the typical southern *clamitans*[1] which we find in that species in the northern States and Canada.

Dr. Holbrook compares his *horiconensis* with *fontinalis* (*clamitans*) remarking on its size and color, and then says it cannot be the *Rana melanota*, "as it wants the 'yellow streak on the sides of the head.'"

[1] The type locality is Charleston, South Carolina.

Rafinesque's description (Annals of Nature, 1820, p. 5) is as follows:

"25. *Ranaria (Rana L) melanota.* Back olivaceous black, a yellow streak on the sides of the head, chin, throat and inside of the legs whitish, with black spots; belly white, without spots. A pretty frog, living in Lake Champlain and Lake George; vulgar name Black Frog: total length two and a half inches. Eyes large, iris gilt violet. The anterior feet have four free toes, and the hind feet five palmated ones."

There is little doubt that Rafinesque had in hand the same large, dark variety of *clamitans* which Holbrook had; the yellow streak on the side of the head (which is faintly developed in the figure of *horiconensis* and which is seen in the Roan Mountain frogs as an irregular whitish yellow stripe from the nostril under the eye to the angle of the mouth) is not a valid objection to this view. The fact that Holbrook's type also came from Lake George, and that the name of "Black Frog" is applicable to it, is further proof of their identity. The same frog from Lake Superior was named *Rana nigricans* by Agassiz in 1850. Professor Cope does not think the variation of the northern form of *clamitans* constant, and he cites a a dark Louisiana example. I am inclined to believe, however, that we have in eastern North America a light colored smooth-skinned, medium-sized Spring-frog in the Carolinian fauna, and a large dark, shagreened Spring-frog peculiar to the Canadian fauna. The name and description of *fontinalis* of Le Conte is not more applicable to the northern form than the southern, and he gives no habitat. The name *clamitans* was first given to this species in Sonnini and Latreille's Natural History of Reptiles, in 1802. Daudin, who generally gets the credit of this name, spelt it *clamata* in his Natural History of Reptiles in 1803, and gives himself the credit of naming it in Latreille's work above cited. Bosc would appear to have sent this name when he sent the types and description to Latreille and Daudin from South Carolina, and so far as I can discover, he has a right to some credit for the name. To accord this to him, and at the same time indicate the publishing author, I have adopted the formula, "Bosc Mss., Sonn., Latr."

The spelling "*clamitans*" will have to be adopted, as it has priority.

It is not only bad form, but unscientific and misleading to indicate

the authorship of published manuscript names by only giving the name of the manuscript author, and it is to be hoped that a proper formula for such names will be proposed by the A. O. U.

32. **Rana catesbiana** Shaw. Bull Frog.

Abundant in all lowlands throughout the State.

A very large Samburg example is remarkably dark beneath, the entire lower parts being coarsely ocellated and vermiculated with black on a white ground ; the head quite black above, the body sooty black. A smaller specimen from the same locality is light olive above, and nearly immaculate below.

Specimens: Samburg, 2 ad.; Nolachucky River, Greene County, 1 juv.

Family ENGYSTOMIDÆ.

Genus ENGYSTOMA Fitzinger.

33. **Engystoma carolinense** Holbr. Nebulous Toad.

The specimens taken were found under logs in woodland, near running water.

Specimens: Raleigh, 1 ad.; near Chattanooga, 1 ad.

Family BUFONIDÆ.

Genus BUFO Laurenti.

34. **Bufo lentiginosus** (Shaw). Southern Toad.

Specimens from southern Tennessee approach nearly to those found in the Gulf States, but the majority are intermediates.

Specimens: Bellevue, 1 ad.; Sawyer's Springs, 2 ad.

35. **Bufo lentiginosus americanus** (Le C., Mss. Holbr.). Northern Toad.

Two typical examples were taken on Roan Mountain. They partake of the characters found in so many of the animals of this humid "Canadian" environment, viz., the large size and saturated coloration. One was found on the summit.

Specimens: Roan Mountain (6,300 ft.), 1 ad.; (5,000 ft.), 1 ad.

Family HYLIDÆ.

Genus ACRIS Dumeril, Bibron.

36. **Acris gryllus** (Le C.). Cricket Frog.

Examination of nearly forty specimens from widely separated localities in Tennessee and Kentucky fails to reveal any constant distinctions between *gryllus* and *crepitans*, if both forms are found in

the State. Prof. H. Garman considers the size of *gryllus* (1.4 in.) as given by Le Conte as the only reliable difference. This is much larger than any in my series, and as the Samburg specimens are smaller and more slender than those from the Cumberland plateau, the theory that the southwestern frogs are larger than northeastern ones is contradicted. Le Conte defines the habitat of *gryllus* in the south Atlantic States, and that of *crepitans* in the remainder of the eastern United States, but Prof. Cope's identification of the Smithsonian series allots specimens of both forms to both sides of the Allegheny Mountains in such a way that faunal definitions lose their significance. Such being the case I have lumped the entire Tennessee series under the original specific name.

Specimens: Samburg, 10 ad.; Chattanooga, 2 ad.; Sawyer's Springs, 12 ad.; Greeneville, 4 ad., 4 juv.

Genus **CHOROPHILUS** Baird.

37. Chorophilus triseriatus (Wiedm.). Chorus Frog.

A male and female were taken together in a pool on the Chickamauga battle field, eight miles from Chattanooga. I heard the voice of this species in other parts of the State but do not remember it west of the central basin.

The specimens have been mislaid.

Genus **HYLA** Laurenti.

38. Hyla cinerea semifasciata (Hallow.). Hallowell's Tree Frog.

The name of the typical eastern form of this species has a rather peculiar history. Later authors have adopted the name *carolinensis* of Günther, (Cat. Bat. Sal., B. M., 1858, p. 105). Günther in his synonymy quotes a "*Calamita carolinensis*, Penn., Zool. Arct. II, p. 331," and, contrary to good rules, our most noted writers in this branch of science have used the name binomially as "*Hyla carolinensis* Pennant."

Reference to the Arctic Zoology shows us that Pennant not only never imposed original binomials or polynomials on previously unnamed species but that the "*Calamita carolinensis*" of Günther is mythical. The entire reference to it by Pennant is as follows:

"Fr.[og] with the back gibbous, cinereous, and smooth: belly yellow and granulated; on each side from the nose to the rump is a line; the same on the outside of the thighs and legs; toes bullated