

ARTICLE XIII.—*A Synopsis of the Reptiles and Amphibians of Illinois.* BY H. GARMAN.

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PREFATORY NOTE.

This synopsis is presented largely as it was written several years ago. Before a final report on our reptiles and amphibians is prepared, it is sincerely to be desired that examples of every Illinois species may be in the Illinois Laboratory collection for description, and that the local features of the fauna may be brought out by a critical comparison of Illinois specimens with collections from other parts of the United States. Specimens of the following species, and observations upon them, are especially desirable: *Cistudo ornata*, *Chrysemys picta*, *Pseudemys hieroglyphica*, *P. concinna*, *Heterodon simus*, *Ophibolus rhombomaculatus*, *Nerodia sipedon* var. *fasciata*, *Rana areolata*, *R. sylvatica*, *Hyla cinerea*, *Desmognathus fusca*, *Spelerpes ruber*, *Amblystoma jeffersonianum* and *A. punctatum*.

A few additional species known to occur in adjacent states may be looked for in Illinois.

*Chelopus guttatus* may occur in northeastern Illinois. It has been found in northern Indiana and in Michigan.

*Aspidonectes ferox* has been found in the Ohio River, and is likely to occur in this stream and in the Mississippi, along our borders.

*Hyla squirella* has been taken at Brookville, Indiana, by Mr. A. W. Butler. It is a southern species, most likely to occur in the south part of the State.

*Amblystoma copianum* was described in 1885 by Prof. O. P. Hay from a single specimen taken at Irvington, Indiana. It seems to bear a general resemblance to the young *A. tigrinum* just from the water. It may be distinguished from all recorded Illinois members of the genus by the presence of eleven costal grooves and two plantar tubercles.

H. GARMAN.

May 6, 1891.

## CLASS REPTILIA.

Exoskeleton in the form of horny scales or bony plates. One occipital condyle. Mandible present, each ramus of several bones. Vertebrae without terminal epiphyses. No mammary glands. Generally no diaphragm (an incomplete diaphragm is present in crocodiles). Respiration always by means of lungs, sometimes aided by the walls of the pharynx. Heart generally with three, sometimes with four, chambers. Two aortic arches. Blood not warm; red corpuscles nucleated. Alimentary canal terminating in a cloaca. Oviparous or ovoviparous.

Body enclosed in a bony shell, wide, and more or less depressed. Legs four. Turtles.....Order CHELONIA.

Body more or less cylindrical, never greatly depressed, covered with small scales, generally imbricated. Eyelids and external ears present. Legs commonly four; if wanting, with rudimentary sternal arch. Lizards.....Order SAURIA.

Body very long and slender, cylindrical, back covered with small imbricated scales, belly commonly with larger scales. No legs, or at most with rudiments of the hind pair. Sternal arch, eyelids, and external ears wanting. Snakes.  
Order OPHIDIA.

## ORDER CHELONIA.

Body enclosed between two shields (carapace, upper, and plastron, lower) consisting of bony plates. Dorsal vertebrae and ribs immovably united with the carapace. Bones of head firmly united. Jaws covered with bony plates. No teeth. No external auditory organs. Eyes with a nictitating membrane. Four well-developed limbs. Oviparous.

This well-defined group is represented in Illinois by a rather small number of species. Our streams and lakes, more especially the Illinois and Mississippi Rivers, with their extensive sloughs, their numerous sandy shores suited to the process of oviposition, and their abundance of animal and vegetable life, would seem to form an ideal chelonian habitat. About

seven species are very abundant in these streams within our limits; beyond this number the more exclusively aquatic species are rather scarce, or else only locally abundant.

The turtles are timid, inoffensive animals, avoiding man whenever possible, and only when cornered exhibiting the strength and quickness which might render them formidable antagonists if they were so disposed. The snapping turtles with their strength and vigor are quite able to hold their own against most enemies. Our species vary in length from about four inches to as many feet, and from one to a hundred pounds in weight. Their food consists ordinarily of fishes, frogs, mollusks, crayfishes, aquatic insects, and vegetation, some being exclusively carnivorous, others taking both animal and vegetable food. None of our species depend entirely upon vegetable food. Several species trouble fishermen at times by devouring fishes which have been caught on trot lines or in set nets. Excepting the *Trionychidæ*, they are not rapid swimmers, and the predaceous species probably get most of their prey by lying in wait for it. An animal once within reach of their jaws must be very quick to escape capture. I have occasionally seen an individual making off with a partly devoured water snake. They emit no sounds except by snapping the jaws when angered, and a low hiss produced by the sudden compression of the lungs and consequent rush of air through the glottis, when the head and limbs are withdrawn into the shell. The eggs are white, spherical or elongate oval (in the latter case the two ends alike in diameter), and are provided with a rather tough shell. As far as known our species all bury their eggs in sand or earth and leave them to hatch by the sun's heat.

#### SYNOPSIS OF THE FAMILIES REPRESENTED IN ILLINOIS.

Plastron with twelve plates, with no, or but one, transverse hinge. Bridge between plastron and carapace, when present, formed by wings of the pectoral and abdominal plates. No gular barbels. . . . . EMYDIDÆ.

Plastron with eleven plates, with two transverse hinges.

Bridge formed by wings of the abdominal and the contiguous axillary and inguinal. Gular barbels present.

CINOSTERNIDÆ.

Plastron small, cruciform, with ten, nine, eight, or fewer, plates.

Bridge narrow. Head very large, with gular barbels.

CHELYDRIDÆ.

Entire shell covered with a continuous skin, cartilaginous at the margins. Head slender; nostrils borne at the end of a fleshy proboscis; horny coverings of jaws concealed at the sides by fleshy lips.....TRIONYCHIDÆ.

### FAMILY EMYDIDÆ.

Shell bony, moderately depressed or strongly convex, covered with horny plates, of which there are five dorsal, eight costal, one nuchal, twenty-two marginal, two caudals, twelve sternals, and generally two axillaries and two inguinals. Head of moderate size, covered with a smooth, soft skin, retractile within the cavity of the shell. Jaws naked. Digits 5-4, generally fully webbed, rarely imperfectly webbed.

The family includes the greater part of our species. The majority are aquatic, and, though not by their structure unfitted for life on land, are rarely found far away from the water. A few are terrestrial, and in such species the webs of the feet are greatly reduced in size.

#### SYNOPSIS OF THE GENERA REPRESENTED IN ILLINOIS.

- 1 (2). Plastron immovably united with the carapace; with no transverse hinge.....5.
- 2 (1). Articulation between the plastron and carapace cartilaginous; with a transverse hinge between the pectoral and abdominal plates.....3.
- 3 (4). Carapace hemispherical. Plastron rounded before and behind. Digits with rudimentary webs.....CISTUDO.
- 4 (3). Carapace elongate, convex. Plastron emarginate behind. Digits with evident webs .....EMYD.
- 5 (6). Alveolar surfaces of the jaws with no median carina...9.
- 6 (5). Alveolar surfaces with a median carina parallel with the margins.....7.

7 (8). Plastron truncate before and behind. Alveolar surfaces of jaws moderately narrow. Digits short.

CHRYSEMYS.

8 (7). Plastron distinctly emarginate behind. Alveolar surfaces of jaws wider. Digits longer than in Chrysemys.

PSEUDEMYIS.

9 (5). Plastron deeply emarginate behind, slightly before. Digits long and fully webbed . . . . .MALACOCLEMMYS.

### CISTUDO, FLEMING.

Fleming, Philosophy of Zoölogy, 1822, p. 270.

Hoffmann, Bronn's Thier Reich, Reptilien, p. 378.

Carapace strongly convex or hemispherical. Plastron large, rounded before and behind, capable of completely closing the carapace, and affixed to the latter by a ligamentous articulation; a transverse movable hinge between the pectoral and abdominal plates, these plates with no wings in adults. Axillary and inguinal plates small or wanting. Digits 5-4 or 5-3, only the terminal phalanges free, with small interdigital webs.

*Cistudo carolina*, Linn. BOX TURTLE.

Var. *carolina*.

*Testudo carolina*, Linn., Syst. Nat., ed. 10, 1758, I., p. 198.—LeC., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 97.

*Cistudo carolina*, Dum. et Bibr., Erp. Gén., II., 1835, p. 210.—Holbr., N. A. Herp., 1842, I., p. 31, pl. 2.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 24, pl. 1, fig. 1.—Gray, Cat. Tortoises, etc., in Coll. Brit. Mus., 1844, p. 30.

*Cistudo clausa*, subsp. *clausa*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 57.

*Cistudo clausa*, Davis and Rice, Bull. Chicago Acad. Sci., 1883.

Var. *triunguis*.

*Cistudo triunguis*, Ag., L., Contr. Nat. Hist. U. S., 1857, I., p. 445.

*Cistudo clausa*, subsp. *triunguis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 57.

Length of shell about six inches; carapace strongly convex, highest before the middle. Nuchal plate very small, slightly projecting; anterior and posterior marginals slightly flared outwards. Caudals directed downwards. Two gular

plates of plastron elongate, and narrowed posteriorly. Pectorals transversely elongate, quadrangular, with no lateral projecting portion. Abdominals produced backwards laterally. No inguinal plate. Preanals and anals large, the latter truncate behind. Head convex above. Anterior legs widest, with numerous oval scales. Claws well developed. Digits 5-4, or 5-3.

Colors extremely variable; generally dark brown above, with numerous yellow markings of irregular form and disposition. Prevailing color sometimes golden yellow. Often with the yellow in the form of short stripes and spots, with a more or less continuous vertebral stripe. Head and fore legs often with round spots of orange. Iris varying from hazel to light magenta. Plastron yellow, with a few dark blotches, or with the yellow and black or brown in about equal proportions and in the form of stripes; sometimes mostly ebony black. Young are yellowish brown, and have a vertebral ridge on the carapace.

Length of shell, 4.37; depth, 1.75; width, 3.50.

Throughout the State, rare northward, not uncommon in dry woods of the south part of the State. Du Quoin, Eldorado, Cobden, Anna, Fairfield, and Mt. Carmel (Nat. Mus.).

The box turtle is the most strictly terrestrial of all our turtles, frequenting the driest hills and woods during the hottest summer months. It is said to avoid the water and to conceal itself at the approach of a storm. This is not in accord with my limited experience with the species, for but a few seasons ago I took four examples, two males and two females, from a small shallow pool, and have seen a few specimens wandering about during rain storms. It lives to a great age according to Mr. J. A. Allen. A marked specimen was known to him to have lived sixty years at least. The food consists of both animal and vegetable substances; insects, fruits, and mushrooms are known to be eaten by it. Both of the varieties occur in Illinois.

### *Cistudo ornata*, Ag.

*Cistudo ornata*, Ag., L., Contr. Nat. Hist. U. S., 1857, I., p. 445.

This species has been described as broad and flat, with no vertebral keel even in the young. It is said to be common in

some of the states between the Mississippi River and the Rocky Mountains. A few specimens have been taken in Illinois, one of which is in the museum of the Northwestern University, at Evanston.

Fairfield, Wayne Co. (Nat. Mus.).

### EMYS, BRONGNIART.

Brongniart, Mém. des savants étrangers, 1805.

Carapace moderately convex. Plastron large, separated into two parts by a transverse, movable articulation between the pectoral and abdominal plates; articulation with the carapace cartilaginous. Wings of pectoral and abdominal plates small or wanting in adults. Axillary and inguinal plates present or the latter wanting. Digits 5-4, with interdigital webs.

The single American species belonging to this genus differs from the other members of the genus as described by European authors in lacking the inguinal plate. Our species agrees in some of its generic features with members of the genus *Cistudo*, but it may be known from any species of that genus by its elongate shell, notched upper jaw, and emarginate posterior end of the plastron.

### *Emys meleagris*, Shaw. BLANDING'S TORTOISE.

*Testudo meleagris*, Shaw and Nodder, Viv. Nat., 1793, pl. 144.

*Cistudo blandingii*, Holbrook, N. A. Herp., 1842, I., p. 39, pl. 3.—Storer, Bost. Jour. Nat. Hist., 1840, III., p. 14.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 25, pl. 1, fig. 2.—Kennicott, Trans. Ill. State Agr. Soc., 1853-54, I., p. 591.

*Emys meleagris*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 442; II., pl. 4, fig. 20-22.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 57; Bull. Chicago Acad. Sci., 1883.

Length of carapace about seven inches, highest at about the middle, with a slight notch behind, margins flared anteriorly and at the sides posteriorly. Nuchal plate small, elongate in adults, wider in young examples. Caudal plates directed obliquely downward and backward. Plastron large, elongate sub-elliptical, its posterior margin broadly cut out. Gular

plates large, triangular. Pectorals and abdominals large, about equal in size, the former not narrowed, quadrangular. A very small axillary. No inguinal. Head of moderate size, convex above, nostrils anterior and near together. Anterior legs, with transverse scutes on the anterior surface, digits five. Posterior legs larger than anterior, with small oval scales, digits four, with a large projecting scale in the place of a fifth digit. Claws strong and curved.

Color above black or brown, with numerous small round or oval spots of yellow. Color beneath brownish yellow, with large black blotches on the outside of the plates. Head black or brown above, with numerous small round yellow spots, beneath yellow. Legs dark above, pale beneath. Young with a vertebral ridge on the carapace and with a roughened area on the plates surrounded by concentric lines; plates beneath smooth, but with the concentric lines. Spots often obscure.

Length of carapace, 7; width, 4.75; depth, 2.75.

Throughout the State, commoner north; formerly abundant on the prairies, but rare at present. Normal, Urbana.

This species is closely related to the box turtle in both structure and habits. It is oftener found in water than the latter, but is essentially a terrestrial species. Its home is on the prairies where it formerly occurred in numbers, but in the better agricultural regions it has been exterminated.

### CHRYSEMYS, GRAY.

Gray, Cat. Tortoises, etc., in Coll. Brit. Mus., 1844, p. 27.

Carapace depressed. Plastron large, truncate before and behind, immovably fixed to the carapace, with no transverse hinge. Wings of pectoral and abdominal plates well developed. Axillary and inguinal plates present and of about equal size. Digits 5-4, several terminal phalanges free, fully webbed, short. Alveolar surfaces of jaws moderately narrow, with a median carina parallel with the margins.

This genus and *Pseudemys* are scarcely distinct. The slight differences in the width of the horny covering of the jaws and in the length of the digits are not of sufficient importance to separate them. To these may be added a differ-

ence in the margins of the carapace and in the form and width of the plastron, but the latter are characters which vary in the same species with age.

Plastron black centrally, with rays of this color extending out along sutures, front edge deeply denticulate. . . . . *C. belli*.

Plastron reddish orange or yellow. Dorsal and costal plates alternating . . . . . *C. marginata*.

Plastron reddish orange or yellow. Dorsal and costal plates in transverse rows of three. . . . . *C. picta*.

### *Chrysemys belli*, Gray.

*Emys belli*, Gray, Synopsis Reptilium, 1831, p. 12.—Dum. et Bibr., Erp. Gén., 1835, II., p. 502.

*Chrysemys belli*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 439.—True, Yarrow's Check List N. A. Rept. and Batr., 1882.—Garman, S., List N. A. Rept. and Batr., 1884.

Shell depressed; no keel; uniformly convex above; margins nearly continuous; a very slight notch behind; nuchal plate elongated, narrowed forwards, notched in front. Plastron truncate behind, with no decided angles; outer angles of gulars protuberant. Head below medium in size; jaws weak; tympanum evident. Feet medium, fingers and toes fully webbed; nails strong and sharp.

Length of carapace, 4.25; width, 3.38; depth of shell, about 1.50.

Dull black above, with a greenish cast, with obscure yellowish lines following sutures below the dorsal and costal plates. Marginals above with about three transverse lines, the median of which reaches the inner margin of the plate, and sometimes joins a yellow band along the outer margin; marginals beneath with a broad median band which may, within, join the stripes of adjacent plates. Plastron red, with the central region occupied by a large blackish lyriiform blotch which is marbled with pale yellow and sends rays out along the sutures. Sometimes also with a pair of isolated blackish spots, one near the outer edge of each pectoral plate. Head and legs striped with red as in *C. marginata*. Noticeable lines on the head are as follows: a slender median stripe extending from the snout to a point nearly opposite the anterior edge of the tympanum.

num; a stripe extending backward from the upper border of the eye and expanding on the posterior part of the head, finally extending along the dorsal side of the neck; a short stripe extending from the posterior edge of the eye to the dorsal edge of the tympanum; a broad stripe on the neck, which bifurcates in front, sending its dorsal branch across the angle of the mouth to the posterior edge of the eye and its ventral branch across the jaws to terminate beneath the nostril; and a stripe on the symphysis of the mandible, which bifurcates and sends diverging branches along ventral side of neck. Fore feet with two conspicuous stripes in front, and with narrower marginal stripes; webs largely pale yellow. Tail with two stripes above, which converge and finally join in a single median stripe; and two similar stripes beneath converge from each side of the vent and also join in a single median stripe.

Described largely from a single young example taken on Long Island in the Mississippi River at Quincy. The characteristic marking of the plastron becomes obscure with age. The following is Gray's very unsatisfactory description:

"Shell oblong, solid, rather depressed in the center, convex on the sides, olive waved with irregular black-edged pale-dotted greenish lines placed on the edge and across the middle of each shield; vertebrals nearly square, first urceolate, the rest 6-sided; beneath black, yellow-dotted; sternum flat, surrounded with an irregular yellow edge, front edge deeply denticulate." (*Cat. Tortoise, etc., in Coll. Brit. Mus.*)

The species is very common in bottom-land lakes and ponds at Quincy, but has not been taken elsewhere in the State. It is closely related to *C. marginata*, with which it agrees in the arrangement of the dorsal and costal plates. The elder Agassiz states that the ground color is copper-red or bronze. He records it as occurring in the Osage River, Missouri, and at St. Louis.

### ***Chrysemys marginata*, Agassiz. WESTERN PAINTED TURTLE.**

*Chrysemys marginata*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 439; II, pl. 1, fig. 6. — Smith, Geol. Surv. Ohio, Zool. and Bot., IV., p. 664.—True, Yarrow's Check List N. A. Rept. and Batr., 1882.

*Chrysemys picta* [in part], Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 56.

*Chrysemys picta*, Garman, S., List N. A. Rept. and Batr., 1884.

Carapace about six inches long, depressed, convex, highest at about the middle, posterior lateral margins slightly flared. Nuchal plate long, narrow, notched in front. Three median dorsals about equal in size, hexagonal. Dorsals and costals alternating, never in transverse series of three. A slight notch in the margin, between the caudals. Plastron rounded before, truncate or cut out, leaving a very wide angle between the margins of the anals, the latter sometimes denticulate. Anterior lateral angles of the gulars with a blunt tooth, the margins more or less denticulate. Pectorals transverse, about half the size of the abdominals. Axillary and inguinal well developed. Head flattened; eyes prominent, nostrils anterior and near together. Upper jaw with a sharp tooth on each side of a median notch; lower jaw with a median tooth. Anterior feet with transverse imbricated scales; digits five, claws long and curved. Posterior legs larger, expanded distally, with four digits, claws shorter than those of the anterior digits; a corneous marginal projection in place of fifth toe.

Color above greenish olive, or brown, with a narrow black-edged vertebral line; margins of plates yellow, edged with black. Marginal plates with lines and spots of yellow or red above, with a wide transverse band, or a triangular marginal spot of red and a few lines and spots of the same below. Plastron orange or yellow, with a large black or dusky oblong central area, this often marbled with pale, sometimes obsolete. Head brown above, with narrow red or yellow lines and dots, with numerous alternating black and red or yellow lines below. Iris yellowish brown, black before and behind pupil. The most conspicuous stripes of head and neck as follows: a stripe extending from the upper posterior part of the head downwards and backwards upon the neck; a short wide dash behind the eye; a stripe extending from the posterior inferior margin of the eye beneath the tympanum and backwards on the lower part of the neck; a short wide line near the corner of the mouth on the lower jaw; and a median narrow stripe extending from the tooth of the lower jaw backwards a short

distance and then bifurcating, its branches continuing backwards on the under side of the neck. Legs and tail striped with red or yellow.

Length of carapace, 5.50; width, 3.81; depth of shell, 1.50.

Throughout the State; common. Cedar Lake, Lake Co.; Nippersink Lake; Oregon; Normal; Peoria (Brendel); Little Fox River at Phillipstown; Mt. Carmel (Nat. Mus.).

This is one of the commonest turtles of ponds and small lakes, where scores of them may be seen on bright days in summer sunning themselves on partially submerged logs. It is especially abundant in the small lakes of the northern part of the State. Young of this species with a carapace about an inch and a quarter long are very different from the adults. The most noticeable difference is in the form of the head and carapace. The head is more convex above, with shorter snout and proportionately more prominent eyes. The carapace is flatter, less elongate, in some almost circular in outline. The nuchal plate is almost square and is without the anterior notch. With age there is a gradual change in these particulars, the head becoming flatter, the snout more prominent, the carapace elongate, and the nuchal plate narrower. Some large specimens have the anterior edge of the first marginal plates sharply toothed, the teeth being large next the nuchal plate and growing smaller outwardly.

### *Chrysemys picta*, Herrm. PAINTED TURTLE.

*Testudo picta*, Herrmann, Schneider's Schildkr., 1783, p. 348.

*Emys picta*, Say, Jour. Acad. Nat. Sci. Phila., 1825, IV., p. 211.

*Testudo picta*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 115.

*Emys picta*, Dum. et Bibr., Erp. Gén., 1835, II., p. 297.—Holbrook, N. A. Herp., 1842, I., p. 75, pl. 10.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 12, pl. 5, fig. 10.

*Chrysemys picta*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 438; II., pl. 1., fig. 1-5.—Smith, Geol. Surv. Ohio, Zoöl. and Bot., IV., 1882, p. 663.

*Chrysemys picta* [in part], Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 56.

Carapace about six inches long, depressed, convex, smooth. Nuchal plate about two thirds as wide as long, notched. Dorsals

and costals arranged in transverse series of threes, never alternating as in *C. marginata*. Anterior lateral angles of the gulars, with a blunt tooth. Margins of the first marginals, the gulars, and the anals sometimes serrate. Pectorals transverse, very narrow, scarcely half the size of the abdominals. Upper jaw notched, with a sharp tooth on each side of the excision. Anterior feet smallest, with five digits. Posterior feet expanded distally, with four digits.

Color above olive-brown, or dull black, with a narrow vertebral line; median plates with yellow margins. Marginal plates with parallel or concentric yellow lines; all the yellow lines edged with black. Under side of marginal plates with large marginal spots, or almost entirely, red or yellow. Plastron yellow or orange, with an obsolete central dark area, the latter sometimes made up of approximated gray and yellow stripes. Neck, feet, and tail striped with red and yellow.

Size and proportions nearly the same as in *C. marginata*.

Mt. Carmel (Nat. Mus.).

Under the name *C. picta* this and the closely allied *C. marginata* are included by good authorities as varieties of one species, and as the former name has the right of priority it has come to be commonly applied by students to the individuals of the genus taken in Illinois. It is very probable, however, that *C. picta* will be found to be very rare in this State, if it occurs at all. *C. marginata* is at any rate the common species. Previous to the publication of Kennicott's list of the animals of Cook county the two species were not discriminated by naturalists, and his statement as to the abundance of *C. picta* in the State doubtless applies to the other species. The two species may always be known by the difference in the relative positions of the dorsal and costal plates. Otherwise the differences between them are not marked. In habits they are alike, both frequenting lakes and ponds. They are occasionally found in small streams, but their preference seems to be for quiet water in which there are partly submerged rocks or logs upon which they may climb to bask in the sun. They are harmless and timid, slipping hurriedly into the water when approached. They are said to eat both animal and vegetable food. The eggs are elongate and are deposited by the mother

in a small hole dug in the sand, and are then covered up and left to hatch in the heat of the sun.

### PSEUDEMYIS, GRAY.

Gray, Cat. Shield Rept., 1855, p. 33.

Carapace moderately depressed. Plastron rather large, immovably fixed to the carapace, with no transverse hinge, emarginate before and behind. Wings of pectoral and abdominal plates well developed. Axillary and inguinal plates rather large and about equal in size. Alveolar surfaces of jaws rather wide and with a median ridge parallel to their margins. Digits 5-4, moderately long, fully webbed.

Ridges on alveolar surfaces of jaws smooth. Both jaws with smooth edges.

With a broad orange stripe on each side of head. Carapace with yellow stripes.....*P. elegans*.

Without orange stripe on head. Markings of head and neck obscure. Carapace without yellow stripes..*P. troosti*.

Ridges on alveolar surfaces of jaws tuberculate.

Both jaws with smooth edges. Shell greatly depressed.....*P. hieroglyphica*.

Lower jaw with serrated edge. Not greatly depressed.....*P. concinna*.

### *Pseudemys elegans*, Max.

*Emys elegans*, Max., Reise Nord-Amer., I., 1839, pp. 176, 213.

*Trachemys elegans*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 435.

*Pseudemys elegans*, Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 165.--Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 56; Bull. Chicago Acad. Sci., 1883.

Carapace moderately depressed, convex, with very slight indications of a keel in small examples only, emarginate between the posterior marginal plates, making the edge obtusely serrate. Plastron emarginate before and behind. Anterior lateral angles of the gulars slightly produced. Head of medium size; upper jaw with a median emargination, lower jaw with a corresponding median tooth. Digits 5-4.

Color above light olive-gray, varying sometimes to brownish red, with yellow stripes and obscure black lines. Beneath yellow, with a large central spot of black, and sometimes a blotch of blood-red on each plate. Head striped with orange and yellow, finely above, more coarsely on the sides and beneath. Iris greenish yellow, black before and behind the pupil. A wide orange-red stripe extends from the posterior margin of the eye backwards upon the neck, where it becomes narrower. A yellow stripe extends from the lower margin of the eye downward and backward between the angle of the mouth and the tympanum and thence along the neck. On the middle line, extending from the tooth of the mandible, is a stripe which soon bifurcates and sends backward on the inferior surface of the neck two large divergent stripes. A stripe about midway between the tooth of the lower jaw and the angle of the mouth unites with one starting at the lower border of the eye, or may terminate short of it. The legs and tail are striped with yellow.

Carapace of small examples about 4 inches long is 3.12 inches wide and 1.62 inch deep. Adults reach a length of 8 inches or more.

Occurs in the larger streams of the southern two thirds of the State. Moderately common. Quincy, Henry, Peoria, Pekin, Havana, Mt. Carmel.

A handsome species, approaching the painted turtles in the beauty of its colors. When the epidermal scales are removed from the shell the pattern is very different; on the carapace the brown is entirely removed and the sub-epidermal plates are concentrically lined with black and yellow. The plates of the plastron when desquamated show a central blackish spot with a pale center, and are yellow elsewhere.

### *Pseudemys troostii*, Holbr.

*Emys troostii*, Holbr., N. A. Herp., 1842, I., p. 123, pl. 20.

*Trachemys troostii*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 435.

*Pseudemys troostii*, Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 165.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 55; Bull. Chicago Acad. Sci., 1883.

Shell moderately convex above, the slope uniform in front, somewhat explanate above the insertion of the posterior legs, a trifle depressed centrally. Third, fourth, and fifth dorsal plates with an obscure rounded median ridge. Costal plates and the first and fifth dorsals strongly longitudinally rugose; the three central dorsals only faintly so. Nuchal plate slender, tapering forward; the two adjacent marginals with outer angles projecting. Posterior five marginal plates of each side without outer angles, each with a marginal notch. Plastron a little rounded in front, nearly truncate; outer angles of the gulars bluntly tuberculate, the anterior edges roughened. Plastron broadly excised behind; anal plates with no angles. Head of medium size; jaws rather strong, the upper with a very slight median notch. Tympanum evident. Feet strong, the posterior pair greatly expanded and strongly webbed.

Length of carapace, 9.25; width of same, 6.75; depth of shell, 3.50.

Carapace greenish olive and black above, the former slightly predominating, the black confined chiefly to the margins excepting on the two median costals, where it forms a transverse median band, the olive forming on most of the dorsal and marginal plates large quadrate central spots; marginals beneath more extensively black, and with the greenish olive replaced with pale yellow. Plastron pale yellow and black, the latter extending along the sutures on the anterior two thirds of the plastron, but occupying most of the plates of the posterior lobe, leaving only central spots and part of the margins yellow. Head dusky, obscurely and finely mottled and spotted above with olive-brown, beneath narrowly and obscurely striped with greenish. Jaws horn-color with dots and dashes of black. Feet and tail dusky, with indefinite markings.

Described from a single example taken on Long Island, in the Mississippi River at Quincy. The proportions of the black and yellow of the plastron are subject to considerable variation, sometimes one, sometimes the other predominating.

This is one of our rarest species. The only examples in the State Laboratory collection were collected at Quincy. Mr. R. Ridgway of the United States National Museum has ob-

served the species at Mt. Carmel, and it has been taken also at Wheatland, some miles above Mt. Carmel.

### *Pseudemys hieroglyphica*, Holbr.

*Emys hieroglyphica*, Holbr., N. A. Herp., 1842, I., p. 111, pl. 17.  
*Ptychemys hieroglyphica*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 434.

*Pseudemys hieroglyphica*, Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 165.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 55; Bull. Chicago Acad. Sci., 1883.

Shell oval, depressed, keelless, smooth, entire in front, elongated and imperfectly serrated behind; sternum oblong, nicked behind, dingy yellow, sides olive varied; head very small, upper jaw slightly emarginate, lower jaw with a tooth; first vertebral urceolate; each costal shield with four or five, and each marginal with dark spots with concentric yellow lines.—Gray.

Length about twelve inches.

The species has been observed only in the Wabash River. It resembles in some respects *P. concinna*, but is more depressed, and the mandible is not serrated.

### *Pseudemys concinna*, LeC. FLORIDA COOTER.

*Testudo concinna*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 106.

*Emys concinna*, Dum. et Bibr., Erp. Gén., 1835, II., p. 289.—Holbr., N. A. Herp., 1842, I., 119, pl. 19.—Gray, Cat. Tortoises, etc., in Coll. Brit. Mus., 1844, p. 25.

*Ptychemys concinna*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 432; II., pl. 1, fig. 13; pl. 2, fig. 4-6.

*Pseudemys concinna*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 55.

Large. Moderately depressed. Carapace oval in outline as seen from above, very slightly wider posteriorly and maintaining its width well towards the front; slope at the sides uniform; margins slightly flared anteriorly and posteriorly at the sides; without vertebral carina. Anterior margin with a wide, rounded, median emargination. Posterior margin with several slight teeth, consisting of the produced posterior parts of marginal plates. An acute median notch behind. Costal

plates with slight longitudinal rugæ. First and last dorsal plates with obsolete rugæ. The remaining dorsal plates and the marginals smooth. Nuchal plate nearly twice as long as wide, its anterior edge straight. First dorsal plate vase-shaped in outline. The second and third dorsal plates are equal in size, are elongate, quadrangular, and about equally wide at both ends. The fourth dorsal plate is about equal in size to the two preceding plates and is elongate, but is hexagonal and narrowed behind. The fifth is the widest plate of the series, being about a third wider than long, and is sub-heptagonal. First costal-plate triangular in general form, with its outer margin rounded. The remaining costal plates are quadrangular, and decrease in relative size from before backwards. Anterior lateral angles of gular plates bluntly rounded. Posterior lobe of plastron with a median notch behind; on each side of the notch slightly sinuate. Inguinal plate produced forwards so as to exclude the greater part of the abdominal from the marginal plates. Head of medium size. Superior jaw with a perfectly smooth edge and a very slight median notch. Edge of lower jaw distinctly serrated and with a prominent median tooth; its outer surface roughened. Alveolar surfaces of jaws wide, with strongly toothed ridges. Feet completely webbed, with rather strong, slightly curved claws.

Blackish above, obsoletely reticulate with yellow lines, the areas between these lines being occupied in most cases by narrow, concentric lines of the same color. The lines on the dorsal plates are mostly longitudinal; those on the sides are mostly transverse. On the marginal plates are sets of concentric yellow lines, each set with two more or less evident central dots, one on each side of the line of union of two marginal plates. Wider orange-red lines lie one across the middle of each marginal plate; they expand at the margin of the shell and bifurcate near the inner edges of the marginal plates, their branches uniting with each other or with the netted lines of the upper part of the surface. Plastron pale straw-yellow, without blotches; wings of the pectoral and abdominal plates each with two parallel dusky lines. Inguinal plate with a dusky ring. Marginal plates beneath orange-red, with large round dusky spots at the union of two plates, including in

some cases concentrically disposed lines of red corresponding to the yellow lines on the superior surfaces of these plates. Head and neck striped with yellow and orange. A narrow yellow line extends along the middle of the head from the snout to a point just behind the orbit, where it abruptly expands and terminates. Lines on each side extend from the orbit backward upon the sides of the neck, where they become wider and more brightly colored. Of these lines two are more conspicuous than the others; one of them extends from the upper edge of the orbit, where it is very narrow, backward and downward, expanding on the posterior part of the head and becoming again somewhat narrower upon the neck; the other extends from the middle of the posterior edge of the orbit backward through the upper part of the tympanum. From the inferior edge of the orbit a stripe extends downward and backward across the angle of the jaws and soon joins another stripe which arises on the middle of the lower jaw; from their point of union a conspicuous stripe continues backward upon the lower part of the neck. A wide stripe extends from the symphysis of the lower jaw backward along the middle line for a short distance, and from it diverge, upon the inferior surface of the neck, two rather wide stripes. A narrow yellow stripe arises at each side of the median tooth of the lower jaw. A line of about the same width extends from the nostril directly downward, for a short distance, and thence obliquely backward to the middle of the side of the upper jaw. Legs and tail striped with orange. Skin anteriorly mottled with black and yellowish lines. Skin of the inguinal region white and immaculate.

Length of shell, 12.75; depth, 4.75; width, 8.75.

Apparently not common in the State. Taken only at Mt. Carmel.

This is a southern species. A fine large example, from which the above description is drawn, was sent me some years ago by Dr. J. Schneck, to whom the credit of the discovery of the species within our limits belongs. The extralimital distribution of the species includes all the South Atlantic and Gulf States from North Carolina to Texas. It occurs also, according to Prof. Louis Agassiz, in Arkansas and Missouri. The Illinois

specimen, though a finely developed one, is abnormal in the possession of a pair of small symmetrical supernumerary marginals, one on each side of the nuchal plate, making thirteen for each side and twenty-six in all.

### MALACOCLEMMYS, GRAY.

Gray, Cat. Tortoises, etc., in Coll. Brit. Mus., 1844, p. 28.

Carapace depressed, keeled. Plastron moderately large, immovably fixed to the carapace, with no transverse hinge, emarginate before and behind. Wings of pectoral and abdominal plates large. Axillary and inguinal plates present. Alveolar surfaces of the jaws smooth. Digits 5-4, long, fully webbed.

A comma-shaped yellow mark behind each eye. Keels of second and third dorsal plates concave before the tubercles. . . . . *M. lesueurii*.

Spot behind eye not comma-shaped. Keels of second and third dorsal plates uniformly convex before the tubercles.

*M. geographicus*.

### Malacoclemmys lesueurii, Gray. GEOGRAPHIC TORTOISE, MAP TURTLE.

*Emys lesueurii*, Gray, Syn. Rep., 1831, p. 12.

*Emys geographica* [in part], Dum. et Bibr. Erp. Gén., 1835, II., p. 256.

*Emys pseudo-geographica* Holbrook, N. A. Herp., 1842, I., p. 103, pl. 15.—DeKay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 19, pl. 2, fig. 3.

*Graptemys lesueurii*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 436; II., pl. 2, fig. 10-12.

*Malacoclemmys pseudogeographicus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 56; Bull. Chicago Acad. Sci., 1883.

Carapace six to eight inches long. Depressed, with a vertebral ridge, from which the sides slope like the roof of a house in young, but are more convex in large examples. Keels of second and third dorsal plates concave before the tubercles. Plastron distinctly emarginate behind, angulate on each side of the emargination. Very slightly emarginate in front.

Anterior lateral angles of gular plates slightly produced. Axillaries and inguinals equal. Head medium, its width contained about 6.4 times in length of carapace. Alveolar surface of jaws of moderate width, smooth, inner edges not elevated.

Carapace greenish olive above, obscurely reticulated with yellow lines. A black spot on each tubercle of the vertebral ridge, and large imperfectly-defined black blotches at the posterior edges of costal and marginal plates. Plastron wholly or largely yellow in large examples, in young with a large central area black, lined with pale, and with short rays extending out along sutures. Head, neck, feet, and tail, striped with yellow. Characteristic marks are as follows: a bright yellow comma-shaped spot behind each eye; a median stripe extending from the snout backward beyond the anterior edges of the spots behind the eyes. A spot on the symphysis of the mandible.

Carapace of small example, 4.50 inches long, 3.75 wide, 1.62 high.

Throughout the State, but less common north. Quincy, Jersey Co., Wabash Valley (Ridgway), Ohio River, Cairo.

This species resembles *M. geographicus* in a general way, but is very different in the size of its head and the width and character of the grinding surface of the jaws. The comma-shaped spots are sometimes isolated, forming large transverse spots. The line which begins on the tympanum in *M. geographicus* seems to have no counterpart in this species.

The young appear to take animal food chiefly. Stomachs of some of those examined contained only small gastropod mollusks. One had eaten a worm belonging to the order of Oligochaeta, and a small percentage of vegetable matter. Most of the adults examined (from Quincy) had eaten nothing but the bulbs of a sedge (*Cyperus phymatodes?*).

### **Malacoclemmys geographicus, LeS. GEOGRAPHIC TORTOISE, MAP TURTLE.**

*Testudo geographica*, LeS., Jour. Acad. Nat. Sci. Phila., 1817, I., p. 86.

*Emys geographica*, Say, Jour. Acad. Nat. Sci. Phila., 1825, IV., p. 204.

*Testudo geographica*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 108.

*Emys geographica* [in part], Dum. et. Bibr., Erp. Gén., 1835, II., p. 256.—Holbr., N. A. Herp., 1842, I., p. 99, pl. 14.—DeKay, Nat. Hist. N. Y., I., Zoöl., III., Rept. and Amph., 1842, p. 18, pl. 4, fig. 7.

*Graptemys geographica*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 436; II., pl. 2, fig. 7-9.

*Malacoclemmys geographicus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 56; Bull. Chicago Acad. Sci., 1883.

Carapace eight to ten inches long. Depressed, bluntly keeled. Keels of the dorsal plates regularly convex, posterior tubercles not very prominent. Sides a trifle less convex than in *M. lesueuri*. Outer margins of posterior marginal plates sinuate, and bluntly toothed. A wide notch between the two caudals. Plastron distinctly emarginate behind, slightly or not at all in front. Anterior angles of the gulars slightly produced, outer lateral margins of these plates sinuated. Axillary and inguinal plates equal. Posterior margins of anal plates angulate. Head very large, its width contained about 4.6 times in length of carapace. Alveolar surfaces of jaws very wide, the inner edges almost meeting at the middle line.

Carapace above olive brown, obscurely reticulate with narrow yellow lines. An undefined black spot on the posterior end of the vertebral keel of each dorsal plate. Black blotches at sutures between costal and marginal plates, sometimes also a pair of black dots on the dorsals. Marginal plates beneath with reniform blotches, including one or more yellow lines. Axillaries, inguinals, and outer extremities of pectorals and abdominals marked with similar lines of dark and yellow. Plastron in adults largely yellow. Lines of union between plates gray or black; in young often with dark spots with pale centers in the anterior inner angles of abdominal plates. Head, neck, legs, and tail striped. Characteristic marks are as follows: a longitudinally-placed spot behind each eye; a narrow dorsal line extending from the snout backward to about opposite the anterior margin of the spots behind the eyes, where it terminates abruptly; a stripe originating on each tympanum and thence extending downward and backward on the neck; and a stripe on the symphysis of the mandible.

Carapace of small example 3.50 long, 2.87 wide, and 1.37 high with plastron.

Throughout Illinois in the larger streams and lakes; abundant. Nippersink Lake, Green River in Henry county, Ogle county, Quincy, Peoria, Pekin, Little Wabash River, St. Francisville, Little Fox River at Phillipstown, Cairo.

This is a characteristic species of our waters and occurs in countless numbers in lakes, rivers, and flood-ground pools. Half the individuals which one may see perched upon logs during a day's boating in August would, if examined, prove to be of this species. It is exceedingly common in the Illinois and Mississippi rivers, where it is known (with *M. lesueuri*, from which it is not discriminated) as the mud turtle. It is timid and inoffensive in disposition, always sliding from bank or log when approached, and even when made captive shows none of the ferocity of "leather backs" and snapping turtles. The great strength of its jaws (unsurpassed in massiveness among our Chelonia) would enable it to inflict serious wounds if it were so disposed, and it is a little surprising to find such efficient weapons of offense unaccompanied by special ruggedness of temper. The unusual width of the masticatory surfaces of the jaws suggests Mollusca at once as the proper food of this turtle, and an examination of the contents of stomachs from numerous examples, young and adult, shows that it depends entirely on these for sustenance. Small examples taken at Quincy, Illinois, had eaten nothing but the gastropod *Valvata tricarinata*.

#### FAMILY CINOSTERNIDÆ.

Shell bony, covered with horny plates. Carapace convex, with five dorsal, eight costal, one nuchal, twenty marginal, and two caudal plates. Plastron small or moderately large, rounded before, truncate or emarginate behind, consisting of three portions, the median of which is covered only by the abdominal plates and is immovably united to the carapace, while the anterior and posterior lobes are attached to the median fixed portion by transverse hinges. A single gular plate. Pectorals not forming part of the bridge. Axillary and inguinal of each

side nearly or quite in contact between the abdominals and marginals. Head large, with gular barbels. Digits 5-4, fully webbed.

Plastron moderately wide. Wings of the abdominal plates wide, with a deep groove behind. Head large, with a rhomboidal plate above.....CINOSTERNUM.

Plastron narrower. Wings of abdominal plates narrow, not grooved behind. Head of moderate size, with no plate above .....AROMOCHELYS.

### CINOSTERNUM, SPIX.

Spix [Kinosternon] *Ranæ et Testudinis brasiliensis species novæ*, 1825, p. 17.

Wagler, *Nat. Syst. Amph.*, 1830, p. 137.

Carapace elongate, convex, smooth. Plastron moderately large, rounded before, truncate or slightly emarginate behind. Wings of abdominal plates wide, with a groove behind. Inguinal and axillary plates with the wings of the abdominals forming the bridge between plastron and carapace. Digits 5-4, fully webbed. Head large, with a large rhomboidal plate above. Tail with a terminal nail.

### *Cinosternum pennsylvanicum*, Gmel. MUD TORTOISE.

*Testudo pennsylvanica*, Gmel., *Syst. Nat.* 1788, I., p. 1042.

*Cistudo pennsylvanica*, Say, *Jour. Acad. Nat. Sci. Phila.*, 1825, IV., pp. 206, 216.

*Testudo pennsylvanica*, LeC., *Ann. Lyc. Nat. Hist. N.Y.*, 1829, III., p. 120.

*Kinosternon pennsylvanicum*, Dum. et. Bibr., *Erp. Gén.*, 1835, II., p. 367.

*Kinosternon pennsylvanicum*, Holbr. *N. A. Herp.*, 1842, I., p. 127, pl. 21.—De Kay, *Nat. Hist. N. Y.*, I., *Zoöl. III.*, Rept. and Amph., 1842, p. 21, pl. II., fig. 4.—LeC., *Proc. Acad. Nat. Sci. Phila.*, 1854, VII., p. 183.

*Cinosternum pennsylvanicum*, Davis and Rice, *Bull. Ill. State Lab. Nat. Hist.* I., No. 5, 1883, p. 54; *Bull. Chicago Acad. Sci.*, 1883.

Carapace about four inches long, smooth, elongate, strongly convex, abruptly rounded behind, margins entire or slightly sinuate. Nuchal plate small, widest behind. Dorsals widest in front. Costals very large, transverse; marginals small and elongate. Plastron rounded before, truncate behind. Pectorals very much narrowed towards the middle line, forming no part of the bridge between plastron and carapace. Abdominals very large, wings with a deep groove behind. Axillary small and elongate; inguinal large, the two almost meeting between the wings of the pectorals and the marginals of the carapace. Preanals with strongly rounded outer margins. Head large, contracted towards the snout; jaws strong, the upper toothed. Chin with two tentacles; two other tentacles situated farther back on the throat. Legs short and strong, the anterior with a few transverse scales above and a few small ones on the palm, posterior with scales on the soles but with no transverse ones above; digits 5-4, with imbricated scales above, claws sharp and curved. Skin of the posterior part of the body and of the tail tuberculate, the latter with a terminal nail.

Olive-brown above, uniform or with a few small blackish spots; yellowish beneath, with the sutures and margins of the plates dark. Head brown above with paler spots and lines. Iris brown.

Length of shell, 3.62; width, 2.62; depth, 1.50

Southern Illinois, not rare. Peoria (Brendel), Mt. Carmel, common (Ridgway).

A small, obscurely-colored species, readily recognized by its single gular plate, convex shell, large head, with plate above, and gular tentacles. In the form of its head it resembles the snapping turtle and, like that reptile, bites viciously, though from its small size it is less to be feared. It preys largely on fishes, and will occasionally take the bait of the angler. The species is southern in its distribution and is probably not common in this State away from the southern counties. It frequents muddy ditches by roadsides and the stagnant waters of swamps. The eggs are elongate.

AROMOCHELYS, GRAY.

Gray, Cat. Shield Rept., 1855, p. 46.

Carapace convex, smooth or keeled. Plastron small, narrow, rounded before, emarginate behind; bridges formed of the narrow wings of the abdominal and the contiguous axillary and inguinal of each side. Digits 5-4, fully webbed. Head of moderate size.

No stripes on sides of head. Plates of carapace with black margins and radiating pale stripes. . . . . *A. carinatus*.

Sides of head striped. Plates of carapace uniform in color.  
*A. odoratus*.

*Aromochelys carinatus*, Gray. LITTLE MUD TURTLE.

*Aromochelys carinatus*, Gray, Cat. Shield Rept. Brit. Mus., 1855, p. 47.

*Ozotheca tristycha*, Agassiz, Contr. Nat. Hist. U. S., 1857, p. 425; II., pl. 5, fig. 20-22.

*Aromochelys carinatus*, Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 166.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 53; Bull. Chicago Acad. Sci., 1883.

Plates of the carapace imbricated, with black margins and radiating pale stripes. No stripes on the sides of the head. Otherwise similar to the following species.

Lake county (Davis and Rice).

This is a southern species which I have not taken in the State. It is included here on the authority of Messrs. Davis and Rice, who report it from Lake county.

*Aromochelys odoratus*, Latreille. MUSK TURTLE.

*Testudo odorata*, Latr., Hist. Nat. Rept., 1801, I., p. 122.—Le C., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 122.

*Cistudo odorata*, Say, Jour. Acad. Nat. Sci. Phila., 1824, pp. 206, 216.

*Staurotypus odoratus*, Dum. et Bibr., Erp. Gén., 1835, II., p. 358.

*Sternotherus odoratus*, Holbr., N. A. Herp., 1842, I., p. 133, pl. 22.

—De Kay, Nat. Hist. N. Y., I., Zool. III., Reptiles and Amph., 1842, p. 22, pl. 7, fig. 13.

*Ozotheca odorata*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 425; II., pl. 4, fig. 1-6.

*Aromochelys odoratus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 53; Bull. Chicago Acad. Sci., 1883.

Shell elongate, convex, widest posteriorly, smooth or with an indistinct vertebral ridge in adults, distinctly keeled in young. Nuchal plate small, elongate, and widest behind in adults. First dorsal about half as wide behind as in front; the three following dorsals hexagonal; last dorsal about half as wide before as behind. Costals very large, covering the greater portion of the carapace. Marginals, excepting one on each side of the two caudals, narrow and elongate; the two marginals next the caudals equal to the caudals in size and about twice the width of the other marginals. Plastron small, rounded anteriorly, emarginate posteriorly. A single small gular; postgulars small; pectorals large, and not specially narrowed towards the middle line. Axillaries and inguinals meeting and with the wings of the large abdominal plates forming the bridge between the plastron and carapace. Head large; snout conical; jaws very strong. Two to four gular tentacles; two more widely separated ones on the throat and with numerous small tuberculiform tentacles in series on the skin of the neck. Anterior feet with about three transverse scales on their anterior surface and with a few small ones on the palms; posterior feet with transverse scutes on the heel. Digits 5-4, claws sharp and curved. Skin of legs and tail with numerous papillæ.

Color of shell brownish black above and below in adults, more or less yellowish beneath in young. Head greenish olive or black with several stripes of yellow. A narrow stripe extends from the tip of the snout to the upper part of the eye and is continued behind the eye by a stripe which terminates abruptly in a spot on the side of the head. Another stripe of the same color extends from beneath the nostril, where it meets its fellow of the opposite side, backward beneath the eye, and continues along the neck. There is a short stripe on each side of the lower jaw which may continue posteriorly on the skin of the neck. Other stripes are formed by the approximation of the light-colored tentacles. Very young examples have a distinct pale spot on the under side of each marginal plate,

showing above as a very narrow marginal spot. Posterior margins of legs and edges of webs of the feet yellow.

Length of shell, 4.50, width, 3.19; depth, 2.

Occurs in streams and lakes throughout the State. Deep Lake, Lake Co.; Chicago: Peoria (Brendel); Pekin; Little Fox River at Phillipstown; Running Lake, in Union Co.; Southern Ill., common (Butler).

Few of our turtles change more with age than this. The carapace in young examples is sharply keeled and the posterior margins of the plates are elevated, giving an appearance of imbrication; the nuchal plate is square or transverse, while the marginals are nearly or quite as wide as they are long. In old examples there is no trace of a dorsal keel or appearance of imbrication. This is a small but strong and irritable species which occurs in considerable numbers in muddy lakes and rivers.

#### FAMILY CHELYDRIDÆ.

Shell bony, covered with horny plates. Plastron small, cross-shaped, with ten, nine, eight, or fewer, plates. Inguinals present or wanting. Head large, jaws naked. Digits 5-4, the two median longest; fully webbed.

With two rows of marginal plates on each side. Head with symmetrical plates. Tail without dorsal crest.

#### MACROCLEMYS.

With one row of marginal plates for each side. Plates of head small and indistinct. Tail with a dorsal series of elevated plates forming a crest. . . . . CHELYDRA.

#### MACROCLEMYS, GRAY.

Gray, Cat. Shield Rept., 1885, p. 48.

Cope [Macrochelys] Proc. Acad. Nat. Sci. Phila., 1872, p. 23.

Carapace with a wide channel on each side of the middle line, with two rows of marginal plates. Plastron small; bridges narrow, each covered by an elongate plate within, and without by the contiguous axillary and inguinal. Head very large, with symmetrically disposed plates above.

**Macroclemys lacertina**, Schw. ALLIGATOR SNAPPER.

*Chelydra lacertina*, Schweigger, Prod. Mon. Chel., 1814, p. 23.

*Chelonura temminckii*, Holbr., N. A. Herp., 1842, I., p. 147, pl. 24.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 9.

*Gypochelys lacertina*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 414; II., pl. 5, fig. 23-27.

*Macrochelys lacertina*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 53; Bull. Chicago Acad. Sci., 1883.

Length of adults two feet or more. Head very large, with small imbedded plates above; jaws strong, the upper hooked. Shell with a deep channel on each side of the middle line, leaving three longitudinal convex ridges; emarginate and toothed behind. Tail long, without the elevated dorsal plates of *Chelydra serpentina*. Skin with numerous short tentacles.

Quincy, Cairo, Grayville (Ridgway), Union county (C. W. Butler).

This large species is similar to the common snapping turtle. It inhabits the larger streams of the south part of the State, though as Dr. Hoy has observed it in Wisconsin, it probably occurs occasionally in northern Illinois. It attains an unusual size, even exceeding in this respect the commoner species. Mr. R. Ridgway saw a specimen at Grayville, Ill., which was "large enough to walk with a man standing on his back." A large example in the Illinois State Laboratory collection weighed when alive over eighty pounds. The width of the shell at the bridge of the plastron was 17.50 inches; the length of carapace 22.50 inches; and its depth 7.50 inches. The head measured 6.50 inches in width. Orbit one inch in diameter; eye small; iris black, with brown bars radiating from the pupil.

**CHELYDRA**, SCHWEIGGER.

Schweigger, Prod. Mon. Chel., 1814, p. 23.

Cope, Proc. Acad. Nat. Sci., Phila., 1872, p. 23.

Carapace uniformly convex in adults, obscurely channeled on each side of the middle line in young, with a single row of marginal plates. Plastron small, with nine or ten plates; bridges narrow, each covered by an elongate plate (not repre-

sented in higher turtles) within, and without by the contiguous axillary and inguinal. Head very large, with small plates above.

### *Chelydra serpentina*, Linn. SNAPPING TURTLE.

*Testudo serpentina*, Linn. Syst. Nat., 1758, p. 199.

*Chelonura serpentina*, Say, Jour. Acad. Nat. Sci., Phila., 1825, IV., pp. 206, 217.

*Testudo serpentina*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1829, III., p. 127.

*Emysaura serpentina*, [in part], Dum. et Bibr., Erp. Gén., 1835, II., p. 350.

*Chelonura serpentina*, Holbr., N. A. Herp., 1842, I., p. 139, pl. 23.—De Kay, Nat. Hist. N.Y., I., Zool. III., Rept. and Amph., 1842, p. 8, pl. 3, fig. 6, young.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 591.

*Chelydra serpentina*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 417; II., pl. 4, fig. 13-16, and pl. 5, fig. 18, 19.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 53; Bull. Chicago Acad. Sci., 1883.

Length from two to four feet. Carapace oval in outline seen from above, depressed, rounded in front, toothed behind. Dorsal plates nearly equal in size; costals but little longer; marginals very small. Plastron very small, leaving the greater part of the ventral surface of the animal exposed. Gular plates wanting; post-gulars small. Abdominals large, not forming part of the bridge between the carapace and plastron. Bridge narrow, covered by the axillary, inguinal, and, in great part, by an elongate extra plate. Head large; snout pointed; both jaws with a median tooth. Several gular tentacles. Anterior legs with transverse scales in front. Soles with small round scales. Posterior legs with transverse scales before and with both transversely elongate and round scales on the soles. Digits 4-5. Tail long, tapering, with a series of compressed and elevated plates above, and beneath with a series of flat paired scales.

Blackish brown above, pale yellow beneath. Superior surface of the head, eyelids, and the jaws more or less speckled and lined with brown.

Length of shell, 4.50; width, 3.50; depth, 2.50. Measurements from small example.

Nippersink Lake, Cook Co. (Kennicott); Green River, at Geneseo; Quincy; Peoria; Havana; Normal; Champaign; Union Co.; Mt. Carmel (Nat. Mus.).

This is one of our largest reptiles. It is extremely pugnacious and is to be handled carefully on account of the readiness with which it uses its sharp and powerful jaws. A bite from one of the larger examples would probably amputate a finger, at any rate do serious harm. Their food consists of all manner of small animals, such as fishes, frogs, reptiles, and young water birds. They are reported to have an especial fondness for young ducks. The eggs are deposited in holes dug in the sand along the banks of creeks, in June and July. The flesh is esteemed by many as a luxury, and the fishermen along the Illinois River find ready sale for those captured in their nets. The carapace in young turtles is much rougher than in adults, in consequence of the greater prominence of the radiating carinæ of the plates.

Young just from the egg are about 3.50 inches long, with very rough shell. The snout is provided with a small, horny, pointed cap, with which the shell of the egg is broken. Young kept in an aquarium had an amusing way of burying themselves in the sand, leaving only the tip of their snout exposed; when fall came on they buried themselves completely for hibernation. The writer has seen a pair of young scarcely less remarkable in their way than the noted Siamese twins. They were attached side by side for the most of their lengths. Both, as far as could be seen, were perfectly developed, and both were alive. The larger turtle was quite as strong as other turtles of the same age; the other was less strong, but its hold on life was not apparently feeble.

#### FAMILY TRIONYCHIDÆ.

Body flattened; shell covered with a continuous skin, generally cartilaginous at the margins. Head slender, covered with soft skin; nostrils opening at the end of a fleshy proboscis; horny coverings of jaws concealed at the sides by fleshy lips. Digits 5-5, with large webs, first three with claws, the fourth and fifth clawless and concealed in the webs. Aquatic.

Nasal septum with a ridge on each side. Edge of upper jaw serrulate..... ASPIDONECTES.

Nasal septum with no ridges. Edge of upper jaw serrate.

AMYDA.

### ASPIDONECTES, WAGLER.

Wagler, Nat. Syst. Amph., 1830, p. 134.

With a ridge on each side of the nasal septum. Nostrils terminal. Edge of upper jaw serrulate. Head a trifle wider than in Amyda.

### Aspidonectes spinifer, LeS. SOFT-SHELLED TURTLE, LEATHER-BACK.

*Trionyx spiniferus*, LeS., Mem. Mus., 1827, XV., p. 258.

*Aspidonectes spinifer*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 403.—Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 168.—Smith. Geol. Surv. Ohio, Zool. and Bot., IV., 1882, p. 668.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 52; Bull. Chicago Acad. Sci., 1883.

Length about eight inches. Carapace greatly depressed, with a slight, convex, longitudinal ridge anteriorly, with small tubercles on its anterior margin, and in some specimens with the entire surface roughened with small grain-like elevated points. Plastron large, anterior, leaving the posterior legs exposed. Head small, pointed, with a fleshy proboscis bearing the nostrils. Horny covering of the jaws concealed at the sides by fleshy lips. Legs strong, anterior pair with several transverse scales above, posterior with a single large scale. Feet with marginal and interdigital webs. Digits 5-5, the first three on each foot with claws, the remaining two of each foot with no claws and concealed in the webs.

Color olive-brown above. Carapace with round, brown, pale-margined spots, those nearest the middle being the largest; the margin at the sides and behind pale, bounded within by a blackish line. A pale stripe, edged with black, extends from the snout to the eye, and behind the latter continues backward and downward to the side of the neck. A similar stripe extends backward from each angle of the mouth. Superior surface of the neck with small blackish spots; inferior surface of

the same spotted and reticulate with black. Legs above and feet above and below marked with black. Young examples sometimes show a line of blackish specks on the under side of the plastron extending from the anterior legs to the outside of the posterior pair.

Length of carapace, 6.00; width, 5.50; depth, with plastron, 1.37.

Throughout the State. Rock Creek, Plano; Oregon; Quincy; Peoria (Brendel); Bluff Lake, Union Co.; Wabash River, Mt. Carmel (Ridgway).

Very similar to *Amyda mutica* in form and habits, and perhaps the two should be placed in one genus. They may be distinguished by the presence or absence of the septa of the nostrils, as described. The round ocellate spots of the carapace and the black-marked feet of this species are characteristic. The habits of the two, so far as known, are the same. Both species appear in the fish markets at Peoria, but are not discriminated, all passing under the name of soft-shells or leather-backs.

#### AMYDA, FITZINGER.

Fitzinger, Syn. Rept., 1843, p. 30.

Margin of upper jaw distinctly serrate. Nostrils slightly inferior. No ridges on the nasal septum. Head more slender than in *Aspidonectes*.

#### *Amyda mutica*, LeS. SOFT-SHELLED TURTLE, LEATHER-BACK.

*Trionyx muticus*, LeS., Mem. Mus., 1827, XV., p. 263.—Holbr., N.

A. Herp., 1842, II., p. 19, pl. 2.

*Amyda mutica*, Agassiz, L., Contr. Nat. Hist. U. S., 1857, I., p. 399; II., pl. 6, fig. 6. 7. — Jordan, Man. Vert. N. U. S., 3d ed., 1880, p. 168. — Smith, Geol. Surv. Ohio, Zool. and Bot., IV., 1882, p. 668. — Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 52; Bull. Chicago Acad. Sci., 1883.

Length about eight inches. Carapace and plastron cartilaginous in great part, greatly depressed, smooth. Plastron anterior, leaving the posterior legs exposed. Head small, slender, pointed; nostrils opening in the extremity of a short, fleshy proboscis. Jaws contracted, the horny covering con-

cealed at the sides by fleshy lips. Legs strong, with marginal and interdigital webs, anterior with a few transverse scales above, posterior with a single large scale. Digits 5-5, the first three of all the feet with claws, the two outer without claws and concealed in the webs.

Dorsal surfaces of head, legs, and carapace olive-brown, the carapace with small obscure blackish spots and short lines, and with a pale margin preceded by a blackish line. Plastron and the head and legs beneath white and unmarked. A pale, black-edged stripe extends from the snout to the eye, and is continued behind the latter backward and downward to the side of the neck.

Length of carapace, 6.50; width, 5.00; depth, with the plastron, 1.

In running water throughout the State. Mackinaw Creek, Woodford Co.; Quincy; Illinois River, Peoria; Wabash R., Mt. Carmel (Ridgway); Ohio River, Cairo.

The leather-back is never found at any great distance from water. The time for oviposition is in the fore part of July, and at this season the female searches out a sloping bank up which she creeps a short distance and deposits her eggs in a hole dug in the sand. At other seasons these turtles remain in the water, though they may often be seen at its edge basking in the sun. They are expert swimmers and can move with considerable speed against a strong current. Hundreds of them may be seen at the foot of dams across the Illinois River in July, where they apparently collect in attempting to get further up the stream. They take the hook occasionally, and their flesh is highly esteemed as food.

## ORDER SAURIA.

Body elongated and covered with numerous small imbricated scales. Four limbs (rarely wanting). Shoulder girdle always present. Eyelids and external organs of hearing present. Jaws with teeth set in a continuous groove; jaws not dilatable. Heart with three chambers. Urinary bladder present. Oviparous, with a few exceptions.

Our lizards are almost confined to the southern third of the State, where two species are very common. The joint

snake occurs in the central part of the State, but grows more common southwards. The six-lined lizard appears to be very local in its distribution in the State, and has only been observed in the central and northern parts. All our species are insectivorous. They are perfectly harmless to man, although large examples of the blue-tailed lizard have received the name "red-headed scorpion" under the impression that they are poisonous. This cannot, however, be said of all lizards; a large western species (*Heloderma suspectum*) introduces a poison into wounds produced with its teeth, which may affect the system very injuriously. Recent lizards are nearly all terrestrial in habit, and none of the Illinois species are aquatic.

#### SYNOPSIS OF THE FAMILIES REPRESENTED IN ILLINOIS.

Tongue not bifid. Legs four. Scales imbricated, carinated above. A fold of the skin on each side of the neck. Proximal end of clavicle simple.....IGUANIDÆ.

Tongue deeply bifid, with an ensheathing base. Legs wanting, or with a pair of rudimentary hind legs. Body serpentine. A lateral longitudinal groove. Proximal end of clavicle simple.....ANGUIDÆ.

Tongue bifid, but with no ensheathing base. Legs four. Two transverse subgular folds of the skin. Scales granular above, large below. Premaxillary single. Clavical dilated at proximal end.....TEIIDÆ.

Tongue notched at the tip. Legs four. No transverse subgular folds. Scales smooth and about uniform in size above and below. Premaxillary double. Proximal end of clavicle simple.....SCINCIDÆ.

#### FAMILY IGUANIDÆ.

Tongue short, thick, fleshy, but slightly free in front, scarcely bifid. Teeth attached to the inner face of the jaws, pleurodent. Femoral pores present or absent. Premaxillary single. Clavicle with simple proximal ends. Mesosternum anchor-shaped. A xiphisternal fontanel present. Abdominal ribs generally wanting.

## SCELOPORUS, WIEG.

Wiegmann, Isis, 1828, p. 369.

Holbrook, N. A. Herp., 1842, II., p. 73.

Hoffmann, Bronn's Thier-Reich, 1883, VI., Reptilien, p. 1238.

Body somewhat depressed. Head short, convex above; plates mostly small. Interparietal largest. Nostril near the margin of the snout, opening in a single plate. Several series of supraciliaries. No subgular fold. A short fold on each side of the neck. Scales imbricated, those of the back and tail carinated, those of the belly smooth. Tail rather short, depressed and thickened at the base. Femoral pores well developed. No anal pores.

*Sceloporus undulatus*, Bosc. BROWN SWIFT, PINE-TREE  
LIZARD.

*Stellio undulatus*, Bosc., Latreille's Nat. Hist. Rept., 1801, II., p. 40.

*Lacerta hyacinthina* (♂) and *L. fasciata* (♀), Green, Jour. Acad. Nat. Sci. Phila., 1818, p. 349.

*Agama undulata*, Harlan, Med. and Phys. Res., 1853, p. 140.

*Tropidolepis undulata*, Dum. et Bibr. Erp. Gén., IV., 1837, p. 298.

—Holbrook, N. A. Herp., 1842, II., p. 73, pl. 9.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 31, pl. 8, fig. 16.—Gray, Cat. Spec. Lizards in Coll. Brit. Mus., 1845, p. 208.

*Sceloporus undulatus*, subsp. *undulatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 48; Bull. Chicago Acad. Sci., 1883.

Total length about six and a half inches. Scales large above, sharply carinate and mucronate, many of them with notches on each side of the apex, about forty-five in a row from the parietals to a point opposite the vent. Scales below not carinate nor mucronate but with an apical notch. Scales in a transverse row midway between the fore and hind legs, about forty-five. Femoral pores from twelve to sixteen. Two frontal plates. Five series of supraciliaries, one of large plates, and an inner one and three outer series of small obtusely carinate ones. From two to four small frontoparietals. Four small parietals and a single very large interparietal. From

six to eight prefrontals. Internasals about ten, varying greatly in number, most of them obtusely carinate. A single nasal plate with the nostril opening in its posterior part. Auricular aperture large, bordered anteriorly with five acutely-pointed scales. Three rows of small supralabials. On the side of the neck behind the ear is a fold of the skin overlying a vertical impression which is lined with minute scales. Scales on the superior surface of the legs carinate; those on the posterior surfaces of the humeri and femora very small. All the scales on the tail are carinate and verticillated. A curved linear impression behind the vent.

Color above grayish brown, with a series of transverse curved black bars on each side of the back. Tail and legs above barred with black. All the bars bordered posteriorly with pale. A narrow black line extends from the eye posteriorly over the ear and fore leg, and may terminate behind the latter or pass into a brown band which continues along the side of the abdomen. This last is often obscure or wanting. A narrow black line crosses the head from one supraciliary ridge to the other. Color beneath grayish white or bluish; in females and young with no, or few, green or blue scales on the throat, and with the throat, sides, and ventral surfaces of the femora speckled with black, generally with a short, dark median band before the vent; in males with most of the throat and a large elongate patch on each side of the abdomen of a metallic blue or green color.

Length from tip of snout to vent, 3.00; from vent to tip of tail, 3.62.

Southern Illinois, abundant. Grafton, Belleville (Nat. Mus.), Cobden, Anna, Johnson Co., Cave in Rock, Villa Ridge, Cairo.

This is by far the most abundant lizard in Illinois. It seems to be confined chiefly to the southern third of the State; as far as I know no specimens have been collected north of Grafton, in Jersey county. Dr. Hoy, however, took a specimen in Wisconsin in 1850, and we shall not therefore be surprised if after more careful collecting the species is found to occur farther north in Illinois. But it is always to be remembered that the great change in the character of this State wrought

in the last forty years by the felling of timber, cultivation of the soil, and draining of ponds and swamp lands, has had its effect upon our fauna, and the capture of a species in central or northern Illinois forty years ago is not necessarily evidence as to the present distribution of the species. Southern birds and serpents which were in early days not rare in the latitude of Bloomington and Peoria are now not found away from southern Illinois, some of them not in the State at all. The food of the brown swift consists of insects. The stomach of an example from southern Illinois, dissected Jan. 12, 1885, was nearly filled with small ants (*Crematogaster*), and contained besides, two beetles (one a carabid, the other a chrysomelid) and a cricket. It is commonly seen on old rail fences or in the woods on logs. It runs with great rapidity, and often eludes the collector by scampering up the trunks of trees.

#### FAMILY ANGUIDÆ.

Legs wanting or two rudimentary posterior legs present. Body long and serpentiform, with lateral longitudinal grooves. Head pyramidal. Tongue bifid, extensile, with squamiform papillæ. Teeth placed on the inside of the jaws and projecting inwards.

#### OPHISAURUS, DAUDIN.

Daudin, *Hist. Nat. Rept.*, 1803, VII., p. 346.

Dum. et Bibr., *Erp. Gén.*, 1839, V., p. 421.

Holbrook, *N. A. Herp.*, 1842, II., p. 139.

Legs wanting. Ear-opening present, small. Eyelids well developed. A deep groove along each side of the abdomen. Two longitudinal series of teeth on the roof of the mouth borne on the pterygoids and palatines. Several supranasals. Nostril lateral, opening through a single plate. Sternal bones represented by rudimentary cartilages; clavicles not meeting at the middle line. Pelvis rudimentary and cartilaginous, the cartilages of opposite sides not meeting at the middle line, each bearing a minute cartilage representing femora.

The species described is the only one in the genus.

**Ophisaurus ventralis**, Linn. JOINT-SNAKE, GLASS-SNAKE.

*Anguis ventralis*, Linn., Syst. Nat., 1766, p. 391.

*Ophisaurus ventralis*, Dum. et Bibr., Erp. Gén., V., 1839, p. 423.

— De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph. 1842, p. 34; Holbr. N. A. Herp., 1842, II., p. 139, pl. 20.—Gray, Cat. Spec. Lizards in Coll. Brit. Mus., 1845, p. 56.

*Ophiosaurus lineatus*, Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 591.

*Opheosaurus ventralis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 48; Bull. Chicago Acad. Sci., 1883.

Total length about twenty-eight inches. Body long and slender. Scales equal in size above and below, those on the posterior part of the body and on the tail with a slight median ridge forming obtuse longitudinal carinæ. Aperture of the ear small. A deep groove extending from a short distance behind the ear along the sides of the abdomen to the vent. Scales in a longitudinal row from the parietals to a point opposite the vent, about one hundred and twenty-five. Scales in a transverse row about midway between the head and vent, twenty-four. Head continuous with the body, compressed forwards and pointed. Two series of supraciliary plates. Frontal large, widest behind. Two small frontoparietals. Two large parietals and a pentagonal interparietal. Two prefrontals. Internasal large, as broad as long. Seven supranasals. Nasal plate small. Rostral slightly wider than high. Eleven supralabials, the ninth and tenth largest. Marginal series of infralabials elongate and narrow.

Color above clay yellow, or brown or greenish olive, with a median longitudinal stripe of brown, and on each side above the lateral grooves a wide black or brown stripe including three narrow whitish lines. On the sides of the abdomen beneath the lateral grooves are two narrow dark stripes. Beneath whitish, unspotted.

Length of body to the vent 28.25; tail beyond vent, 19.

Throughout the State; rare in the north; formerly common in central and southern Illinois, but now fast disappearing. Cook Co. (Kennicott), Stark Co. (Boardman), Peoria (Bren-  
del), Normal, Wabash Valley (Ridgway).

The colors of Illinois specimens of the joint snake are generally disposed in distinct longitudinal dark and pale stripes,

as described. Occasional specimens occur in which the dark of the sides is intimately mingled with pale, and the pale stripes of the back may be thickly speckled with black or brown. This form seems to be more common farther south. In young examples the dark and pale stripes of the side are of about equal width. Formerly this was a very common species in dry prairie regions, but its haunts have been destroyed by the cultivation of the soil, and few can now be found. Many of those now captured have stubbed tails, these organs having been previously broken and partially reproduced. The small boy devoutly believes this species to possess the power of "coming together" again after being broken into fragments. It should be unnecessary to state here more than that it is only the long tail which breaks, and that this appendage is scarcely more brittle than are the tails of other lizards. An example dissected had eaten crickets.

The rudimentary sternal bones are imbedded in the muscles a short distance behind the head. The sternum is a thin, transversely elongate plate of cartilage, and lies behind the other bones of the arch. The scapula is largely, perhaps wholly, bone. The supra-scapula is well developed and is cartilaginous. The coracoid is large, transversely placed, and meets its fellow of the opposite side; it is also cartilaginous. The clavicle is a slender, curved bone, which is attached at its outer extremity to the ventral surface of the supra-scapula.

The pelvic bones consist of a rather long ilium, attached to the transverse process of the fifty-seventh vertebra, and a flattened bone, supposed to represent ischium and pubis combined, at its free extremity. In a small acetabulum in the surface of the latter fits a minute cylindrical femur. The bones are fully ossified. Those of the two sides are separated by a considerable interval. They are imbedded in muscle slightly in front of the vent. The rudiments are probably quite variable. The figures given by Dr. Shufeldt (*Proc. U. S. Nat. Mus.*, 1880, p. 399) and those in Bronn's *Thier-Reich* do not agree, and neither agree with dissections made by the writer.

## FAMILY TEIDÆ.

Tongue long, bifid, with squamiform papillæ. Teeth solid, pleurodont. Head pyramidal, with large, regularly disposed plates above. One pair of supranasal plates. Nostril opening in the midst of a plate, or between two plates. Scales of the back granulate or carinate; scales on abdomen large. To these, other characters used by Prof. Cope may be added as follows: A xiphisternal fontanel; premaxillary single; clavicles dilated proximally; mesosternum cross-shaped.

## CNEMIDOPHORUS, WAGLER.

Wagler, Syst. Amph., 1830, p. 154.

Holbrook, N. A. Herp., 1842, II., p. 109 (Ameiva).

Hoffman, Bronn's Thier-Reich, 1883, VI., Reptilien, p. 1076.

With two subgular folds. Tongue with no sheath, free behind. Maxillary teeth compressed, the posterior teeth tricuspid. Femoral pores present. Scales granulate above, transversely elongate and quadrangular on the belly. Digits 5-5.

*Cnemidophorus sexlineatus*, Linn.

*Lacerta 6-lineata*, Linn., Syst. Nat., 1766, p. 364.

*Cnemidophorus sex-lineatus*, Dum. et Bibr., Erp. Gén., 1839, V., p. 131.

*Ameiva sex-lineata*, Holbr., N. A. Herp., 1842, II., p. 109, pl. 15.

*Cnemidophorus sex-lineatus*, Gray, Cat. Spec. Lizards in Coll. Brit. Mus., 1845, p. 21.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 47; Bull. Chicago Acad. Sci., 1883.

Total length about seven inches. Body slender. Tail long, cylindrical, and tapering. Posterior legs much larger than the anterior, with long slender digits. Head small, compressed before the eyes and pointed. Scales on the back and sides, the superior and posterior surfaces of the posterior legs, the posterior surfaces of the anterior legs, and on the throat, minute and granular. Scales of the ventral surface of the abdomen large and quadrangular; about thirty in a longitudinal row and eight in a transverse row. Femora with a ridge bearing sixteen pores. Scales of the tail large, verticillated, carinate. Two well-marked gular folds. Ear-opening large,

circular, exposing the tympanum. Frontal plate wider in front and rounded. Parietals small. Inner series of superciliaries composed of four plates. Prefrontals in contact for a short distance at the middle line. Internasal large, hexagonal, wider than long. Nasals large, touching at the middle line, the nostril opening in their lower part. Rostral produced backward and acutely angled between the nasals. Two loreals. Six supralabials, the third largest. Five elongate, narrow infralabials.

Color above brownish gray, with three narrow yellow longitudinal lines on each side with black spaces between them. Head brown or blue-gray. Legs brown. Entire under parts bluish white.

Length of body to the vent, 2.25; tail beyond vent, 4.50.

Local in its distribution and not common; probably occurs in suitable localities throughout the State. Ottawa, Henry, Cave in Rock (?).

An exceedingly active lizard and consequently difficult of capture. It occurs in dry sandy regions, where it may be seen, by roadsides among shrubbery, or running along the lower rails of fences. It never resorts to trees, but trusts to its swiftness and skill in dodging from one covert to another to escape its pursuers. The only specimens the writer has collected in the State were taken at Henry, in a dry sunny field on the banks of the Illinois River. They were not rare in that particular locality, but were not seen any where else, though the country round about was scoured for miles. I think I saw an individual of the species at Cave in Rock on the Ohio River during the summer of 1883, but it disappeared so completely and suddenly, before I could get a fair glimpse of it, that I cannot be sure about it. An example has recently been sent to me from Ottawa.

#### FAMILY SCINCIDÆ.

Tongue very slightly notched at its tip, free in front, with squamiform papillæ. Teeth pleurodent. No gular or lateral folds. Nostril generally in one plate. No femoral or inguinal pores. Basal portion of scales ossified. Premaxillæ double. Xiphisternal fontanel generally wanting.

With two supranasals. Lower eyelid scaly. Anterior margin of ear-opening with several projecting scales . . . EUMECES.

No supranasals. Lower eyelid with a transparent central part. Ear-opening with no projecting scales . . . . . OLIGOSOMA.

### EUMECES, WIEGMANN.

Wiegmann, Herp. Mex., 1834, p. 36.

Body fusiform, cylindrical. Head pyramidal, four-sided. Two supranasals. Lower eyelid scaly. Ear-opening large, generally with a few projecting scales at its anterior margin. Scales smooth, large. Tail cylindrical and tapering. Toes 5-5.

### **Eumeces fasciatus**, Linn. BLUE-TAILED LIZARD, RED-HEADED LIZARD, SCORPION.

*Lacerta fasciata*, Linn., Syst. Nat., 1758, p. 209.

*Scincus erythrocephalus*, Gilliams, Jour. Acad. Nat. Sci., Phila., 1818, I., p. 461.

*Plestiodon quinquelineatum*, Dum. et Bibr., Erp. Gén., V., 1839, p. 707.

*Scincus fasciatus*, De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph. 1842, p. 29, pl. 8, fig. 17. — Holbr., N. A. Herp., 1842, II., p. 127, pl. 18.

*Scincus quinquelineatum*, Holbr., l. c., p. 121, pl. 17.

*Plestiodon erythrocephalus*, Holbr., l. c., p. 117, pl. 16.

*Plestiodon quinquelineatum* and *P. fasciatus*, Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 591.

*Eumeces fasciatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 47; Bull. Chicago Acad. Sci., 1883.

*Eumeces obsoletus*, Davis and Rice, Bull. Chicago Acad. Sci., 1883.

Total length about eight inches. Body moderately slender, tail long and tapering. Scales smooth, about equal in size above and below, median row beneath the tail largest and transversely elongate. Fifty-three scales in a longitudinal row from the occipital plates to a point opposite the vent. Thirty scales in a transverse row about midway between the fore and hind legs. Ear-opening large, somewhat elongate vertically, in young examples with a few projecting scales at its anterior margin. Frontals and parietals the largest of the head plates. Six large supraciliaries. Two prefrontals. A single internasal. Two supranasals, occasionally four. One

small postnasal. Two loreals, the anterior the smaller and separating the supranasals and prefrontals. Supralabials nine, the eighth largest, the sixth alone reaching the orbit. Six infralabials, the sixth largest.

Color above dark chestnut-brown or, in old examples, brown-olive with five longitudinal blue stripes, the median of which bifurcates at the base of the head and the outer on each side extends through the ear forward on the upper lip. Posterior half of the tail blue or bluish slate-color. Lines often obscure, sometimes wanting. Beneath white or pale bluish.

Length of body to vent, 3.19; tail beyond vent, 5.50.

Common in the southern counties of the State, rare elsewhere; probably does not now occur in northern Illinois. Cook Co. (Kennicott); Cobden; Anna; Dug Hill, Union Co.; Johnson Co.; Cairo.

In large specimens a few striæ occur on each of the dorsal scales. The submentals and anals are in some finely reticulate. The ventral scales present an appearance of striation, but with a lens this is seen to be due to fine dark lines radiating from the basal part of the scale. Very old examples of this species represent the *Scincus erythrocephalus* of Gilliams. This form is commonly known as the red-headed scorpion in southern Illinois, and has been mistaken for *Eumeces obsoletus*, a species which does not occur in Illinois. As illustrating the changes which take place in this species with age, the following examples are given:

1. Total length 4.50 inches. Stripes distinct. Head like the back in color. Width of head equal to distance from tip of snout to anterior margin of the interparietal plate.
2. 5.50 inches long. Stripes distinct. Head paler brown anteriorly than elsewhere. Width of head equal to distance from snout to middle of interparietal.
3. 6.25 inches long. Stripes less distinct. Head reddish brown. Width slightly greater than distance from snout to middle of interparietal.

4. 6 inches long. Stripes very obscure. Head of a uniform pale brown color. Width equal to distance from snout to posterior margin of interparietal.
5. 7.50 inches long. Median stripe lacking, color of back uniform brown, lateral stripes nearly wanting. Head brown, width equal to distance from snout to middle of first occipital plates.
6. 9.50 inches long. No stripes, pale grayish brown above. Head pale red, width equal to distance from snout to posterior margin of the occipital plates.

The last is evidently an aged example, and lacks the projecting scales commonly present in younger examples at the anterior margin of the ear-opening. The species is active, running with equal address on the ground or on trees, though perhaps it is less commonly seen on the latter than the brown swift. When captured with the hand it attempts to bite, but is not, as far as my experience goes, able to do serious harm.

#### OLIGOSOMA, GIRARD,

Girard, Proc. Acad. Nat. Sci. Phila., 1857, p. 196.

Body fusiform, cylindrical. Head short, pyramidal. No supranasal plates. Lower eyelid with a central transparent portion. Ear-opening large, with no projecting scales at its anterior margin. Scales smooth, of medium size. Tail cylindrical and tapering. Toes 5-5.

#### Oligosoma laterale, Say. GROUND LIZARD.

*Scincus lateralis*, Say, Long's Exped. to Rocky Mts., 1823, II., p. 324.

*Lygosoma lateralis*, Dum. et Bibr., Erp. Gén. V., 1839, p. 719.—Holbr., N. A. Herp., 1842, II., p. 133, pl. 19.

*Mocia lateralis*, Gray, Cat. Spec. Lizards in Coll. Brit. Mus., 1845, p. 83.

*Oligosoma laterale*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 46; Bull. Chicago Acad. Sci., 1883.

Small; total length about four and a quarter inches. Body cylindrical. Head small; snout short; superciliary region convex. Ear-opening large, exposing the tympanum. Scales

about equal on dorsal and ventral surfaces; much smaller on the sides; largest on the ventral surface of the tail. Seventy scales in a row from the occipital plates to a point opposite the vent. Twenty-six scales in a tranverse row midway behind the fore and hind legs. Frontal plate contracted to a point behind where the supraciliaries of opposite sides are but slightly separated. Supraciliaries in two series, the inner of four large plates, the outer of many very small ones. The two transverse prefrontals separated by the frontal or touching at their inner angles. Internasal large. No supranasals. A single nasal; no postnasals. Two loreals. Supralabials seven, the sixth largest. Six infralabials.

Color above light chestnut-brown, with a lateral dark brown or black stripe extending from the snout nearly to the tip of the tail, or terminating in older examples immediately behind the posterior legs. The brown of the middle of the back with a few serially disposed dark spots. Legs brown, marked with dark brown or black above. Beneath yellowish on the body; bluish on the tail.

Length of body to vent, 1.75; tail beyond vent, 2.50.

Southern Illinois; not common. Cave in Rock.

This is our rarest lizard. It frequents wooded regions and is found under rocks and among leaves. It is not known to ascend trees.

## ORDER OPHIDIA.

Body greatly elongated and covered with horny imbricated (in a few cases granular and not imbricated) scales. Limbs wanting (rudiments of hind limbs present in the boa-constrictor, pythons, and a few others). Shoulder girdle never present. Eyelids and external organs of hearing wanting. Mouth very dilatable, the bones of the jaws being loosely articulated. No urinary bladder. Oviparous or ovoviparous.

Because of the superstitions associated with them serpents possess a peculiar interest for most people. The almost universal dread in which they are held has probably been acquired in the majority of cases, having been instilled into the childish mind by fancied encounters of imaginative and ignorant travelers in the tropics. Certain children, at any raté, who

have not had such fictions recounted to them by nurse; or parent, or playmate, show no fear when serpents are first brought into their presence. The truth is that the number of poisonous species of a given region is not often large. In Illinois we have but four poisonous serpents in a total of about forty species; and the proportion of noxious to innoxious species is probably not much greater anywhere in the country. At the same time it must be acknowledged that the prevalent fear of snakes serves a very useful purpose in keeping children from being bitten by species really poisonous. The harmless kinds take advantage of the feelings they inspire, and simulate the behavior of their formidable relatives by coiling, striking, and even producing a semblance of the noise of the rattlers by causing the tail to vibrate rapidly in contact with dead vegetation. All, or nearly all, will use the teeth when pressed, but the bite is not followed by serious consequences.

We have no very large species. Certain of the boas and pythons of tropical countries reach a great length—as much as fifty feet or more, it is asserted. The smallest, among which are our species of *Carphophis*, are not above a foot long.

The food consists of living animals, generally swallowed alive, but sometimes picked up after having been killed by other agencies. The teeth serve merely as organs of prehension, and the fangs, when present, are used only in striking.

The young hatch from eggs, which are commonly deserted after being placed among decaying vegetable matter; but some species are known to guard them until the young come forth. Some are, it is believed, habitually ovoviparous; and from observations made on our common species it is evident that many, at least occasionally, produce living young.

Without fangs. Pupil of eye round. No pit between eye and nostril. Two series of subcaudal plates. . . . .*COLUBRIDÆ*.

With fangs. Pupil of eye vertical. A pit between eye and nostril. Some or all of subcaudals united. . . .*CROTALIDÆ*.

### FAMILY COLUBRIDÆ.

Teeth numerous, used only for prehension, the posterior ones sometimes larger than the others and grooved. With-

out fangs or poison glands. Head generally slender, always lacking the lateral pits which characterize our poisonous species. Pupil of eye round. Cephalic plates covering most of the head. Dorsal scales carinated or smooth. Subcaudal plates in two series. Tail ranging from long to short, always without a rattle.

This family contains most of our serpents. All are perfectly harmless to man, but when cornered they often show considerable spirit in defending themselves. The slight wounds which they are able to inflict with their teeth heal almost as readily as scratches from a needle. The spreading adder, a dark form of which is known as the king snake, approaches the moccasin and rattle snakes in shape of head and body, and is very generally believed to be poisonous,—a belief which it encourages by extravagant behavior when disturbed. The food consists of fishes, frogs, mice, birds, and insects. Our species spend most of their time on the ground among vegetation. A few are expert climbers, while many of the common terrestrial species swim and dive readily when compelled to enter the water. The species of *Nerodia* and *Regina* are constantly found about water, where they depend upon fishes for sustenance. The eggs are often placed in loose decaying vegetable matter, where their development is accelerated by the warmth due to the process of decomposition. Many of our species, perhaps most, or even all, may produce young alive.

#### A SYNOPSIS OF ILLINOIS GENERA OF COLUBRIDÆ.

- 1 (15). Dorsal scales carinated.
- 2 ( 6). Anal plate entire.
- 3 (22). Rostral not wedged between internasals.
- 4 ( 5). Two nasals. . . . . EUTAINIA.
- 5 ( 4). A single nasal, grooved below nostril.  
TROPIDOCOLONIUM.
- 6 ( 2). Anal divided.
- 7 (14). Loreal present.
- 8 (12). Two nasals.
- 9 (26). Rostral normal in shape.
- 10 (27). Anteorbitals present, loreal not reaching orbit.
- 11 (23). Scales strongly carinated. . . . . NERODIA.

- 12 ( 8). One nasal.
- 13 (18). Nasal grooved below nostril. . . . . REGINA.
- 14 ( 7). Loreal absent . . . . . STORERIA.
- 15 ( 1). Dorsal scales smooth.
- 16 (28). Anteorbitals present. Loreal not reaching orbit.
- 17 (19). One nasal, not grooved below nostril. Color  
green . . . . . CYCLOPHIS.
- 18 (13). One nasal plate, not grooved below nostril. Color  
green . . . . . PHYLLOPHILOPHIS.
- 19 (17). Two nasal plates.
- 20 (24). Anal divided.
- 21 (25). Upper anteorbital large, lower small. No pale  
ring on neck. . . . . COLUBER.
- 22 ( 3). Rostral wedged between internasals. Two pre-  
frontals . . . . . PITYOPHIS.
- 23 (11). Dorsal scales feebly carinated. Size large.  
ELAPHIS.
- 24 (20). Anal entire . . . . . OPHIBOLUS.
- 25 (21). Anteorbitals about equal in size. A pale ring at  
base of head. . . . . DIADOPHIS.
- 26 ( 9). Rostral plow-shaped. With an azygos plate.  
HETERODON.
- 27 (10). No anteorbitals. Loreal reaching the orbit.  
HALDEA.
- 28 (16). No anteorbitals. Loreal reaching the orbit.
- 29 (31). One nasal.
- 30 (32). Nasal grooved below nostril. Dorsal rows 19-21.  
HYDROPS.
- 31 (29). Two nasals. Dorsal rows 15 or 17. . . . VIRGINIA.
- 32 (30). Nasal not grooved below nostril. Dorsal rows 13.  
CARPHOPHIS.

EUTAINIA, BD. AND GIR.

Bd. and Gir., Cat. N. A. Rept. Pt. I., 1853, p. 24.

Dorsal scales carinated, in from nineteen to twenty-one rows. Rostral normal. Two internasals. Two prefrontals. Two nasals, the nostril between. Loreal present. One anteorbital. Three postorbitals. Anal entire. Body moderately

slender, with more or less evident yellow or greenish longitudinal stripes. Often ovoviparous.

Lateral stripes on the third and fourth rows of dorsal scales.

Dorsal scales in 19 rows. The dark color of the back uniform. Body slender.....*E. SAURITA.*

Dorsal scales in 21 rows, with more or less distinct black spots between the stripes: Stouter than *E. saurita.*

*E. RADIX.*

Lateral stripes on the second and third rows of scales.

Dorsal scales in 19 rows.....*E. SIRTALIS.*

Dorsal scales in 21 rows.....*E. VAGRANS.*

***Eutainia saurita*, Linn. GARTER SNAKE, RIBAND SNAKE.**

**Var. *saurita*.**

*Coluber saurita*, Linn., Syst. Nat., ed. 12, 1766, I., p. 385.

*Eutainia saurita*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 24.

*Eutainia saurita*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 38; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus saurita*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 23, 137, pl. 3, fig. 2.

**Var. *faireyi*.**

*Eutainia faireyi*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 25.

*Eutainia faireyi*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 39; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus saurita*, var. *faireyi*, S. Garman, Mem. Mus. Comp. Zool., 1883, p. 137.

**Var. *proximus*.**

*Coluber proximus*, Say, Long's Exped. to Rocky Mts., 1823, I., p. 187.

*Eutainia proxima*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 25.

*Eutainia proxima*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 39.

*Tropidonotus saurita*, var. *proximus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 24, 137.

Body slender. Head distinctly marked off by the more slender neck. Tail long, tapering. All the dorsal scales carinated. Frontal elongate, hexagonal, sides generally incurved. One anteorbital. Three postorbitals. Seven or eight supralabials; sixth and seventh largest. Ten infralabials; fifth and

sixth largest. Dorsal rows of scales nineteen. Ventrals about 160-175. Subcaudals about 100-115. Anal entire.

Color above from light brown to black, uniform or with short whitish lines between the stripes. All three stripes green or yellow, or the dorsal stripe yellow and the two lateral green. Lateral stripes on the third and fourth rows of scales of each side. Beneath green or whitish, uniform. Black or brown below the lateral stripes. Head brown above with two white or yellow spots at the inner margins of the parietals. Anteorbital with a wide pale stripe next the eye. Generally with one or more of the postorbitals pale. Supralabials pale, all, or only the anterior, narrowly margined with black above.

Total length of example of var. *faireyi*, 27.50; tail, 8.25.

Throughout the State. Not common. Chicago (Nat. Mus.), Cook county (Kennicott), Peoria (Brendel), Normal, Jersey county, Mt. Carmel (Ridgway), Union county.

The three varieties occur in the State. *Saurita* is not represented by Laboratory collections, and is probably rare. It is included on the authority of Messrs. Davis and Rice and the National Museum list.

#### Variety *saurita*.

Color above light chocolate-brown. Stripes yellow. Tail more than a third of the total length. Ventrals about 157. Subcaudals 115-118.

#### Variety *faireyi*.

Color above black. Stripes greenish. Tail less than a third the total length. Ventrals about 174. Subcaudals about 105-115.

#### Variety *proxima*.

Color above black. Dorsal stripe brownish yellow. Lateral stripes whitish green or yellowish. Tail much less than a third of the total length. Ventrals about 170-180. Subcaudals 100-108.

**Eutainia, radix.** Bd. and Gir.

*Eutainia radix*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 34.

— Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Eutainia radix*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 39; Bull. Chicago Acad. Sci., 1883.

Head rather small, wider than the neck. Tail moderately long, tapering. Dorsal scales all carinate. Frontal hexagonal or pentagonal. Two nasals. One large anteorbital. Three postorbitals. Seven supralabials; fifth and sixth largest. Nine or ten infralabials: fifth and sixth largest. Dorsal rows twenty-one; sometimes twenty or nineteen. Ventrals 150-160. Anal entire. Subcaudals about 65-75.

Color above brown, with three longitudinal yellow stripes and six longitudinal series of black spots; the black color often predominating. Dorsal stripe on one and two half rows of scales, becoming decidedly orange towards the head. Lateral stripes on the third and fourth rows of each side. There are two series of the black spots on each side between the dorsal and lateral stripes, and a single row of spots below the lateral stripe. Beneath greenish, with two series of black spots, one on each side near the edges of the ventral scutes. Head plain brown above, with a pair of small yellow spots at the inner margins of the parietals. Iris brassy immediately about pupil, but extensively black before and behind. Posterior margin of all the supralabials marked with black. Infralabials and under side of the head yellowish.

Length, 12; tail, 6.

Occurs in all parts of the State, but is more common north. Cook county (Kennicott), Freeport, Milan, Colona, Galesburg, Normal, Mt. Carmel (Ridgway).

**Eutainia sirtalis**, Linn. GARTER SNAKE.**Var. sirtalis.**

*Coluber sirtalis*, Linn., Syst. Nat., ed. 10, 1758, p. 222.

*Tropidonotus sirtalis*, Holbr., N. A. Herp., 1842, IV., p. 41, pl. 11.

*Eutainia sirtalis*, Bd. and Gir., Cat. N. A. Rept., Pt. I. 1853, p. 30.—

Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Tropidonotus sirtalis*, subsp. *sirtalis*, *obscura*, and *dorsalis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I, No. 5, 1883, pp. 39, 40; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sirtalis*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 24, 138, pl. 3, fig. 3.

Var. *parietalis*.

*Coluber parietalis*, Say, Long's Exped. to Rocky Mts., 1823, I., p. 186.

*Eutania parietalis*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 28.

*Eutania sirtalis*, subsp. *parietalis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, p. 40; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sirtalis*, var. *parietalis*, S. Garman, Mem. Mus. Zool., pp. 25, 139.

Body moderately slender. Head distinctly wider than neck. Tail slender, tapering. Dorsal scales all carinated. Frontal hexagonal. Two nasals. A single large anteorbital. Three postorbitals. Supralabials seven; fifth and sixth largest. Ten infralabials; fifth and sixth largest. Dorsal rows nineteen. Ventrals about 140-170. Anal entire. Subcaudals about 60-80.

Colors extremely variable. From light olive-brown to blackish brown above, with three longitudinal green or yellow stripes. Head olive-brown above, white below. Pupil with a narrow brassy ring about it. Iris blackish with some copper-color above and below. Tongue red, black-tipped. The dorsal stripe occupies one and two half rows of scales. The lateral stripes occupy the second and third rows of each side. The ground color may be nearly uniform, or with two series of black spots on each side. Black spots are generally present on the side, beneath the lateral stripes. Green beneath, with a series of black spots on the scutes at each side. Head brown above, with a pair of small yellow spots at the inner edges of the parietals. Supralabials greenish, uniform, or with black posterior margins.

Total length, 40.25; tail, 8.

Throughout the State. Abundant. Freeport, Oregon, Peoria, Normal, Bloomington, Champaign, Anna.

Variety *parietalis*.

In addition to the typical form of the species this variation is quite frequently met in the eastern part of the State. It is

marked along the lateral stripes, between head and tail, with obscure red spots; and the skin, when the dorsal scales are drawn apart, shows short whitish marks in about three series on each side, the two lower in pairs, and the upper composed of single spots at the margin of the dorsal stripe.

The species is extremely common everywhere, and with the other striped species is known as the garter snake. It is not so strictly terrestrial as is supposed, being most commonly found near water in the dry part of summer; and in spring, when just awakened from hibernation, it may occasionally be seen lying in the water as if trying to moisten the dried-out skin. It feeds on fishes and insects, and, when it can get them, gorges itself with tadpoles.

**Eutainia vagrans**, Bd. and Gir. LARGE-HEADED STRIPED SNAKE.

*Eutainia vagrans*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 35.

*Eutania vagrans*, Baird., U. S. Pac. R. R. Expl., 1859, X., Reptiles, p. 19, pl. 17.—Cooper, U. S. Pac. R. R. Expl., 1860, XII., Reptiles, p. 297.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 39; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sirtalis*, var. *vagrans*, S. Garman, Mem. Mus. Comp. Zool., 1883, p. 139.

Body long and slender. Head short and broad. Dorsal scales all carinated. Supralabials eight; sixth and seventh largest. Twenty or twenty-one rows of dorsal scales. Ventrals 161–179. Anal entire. Subcaudals in 70–90 pairs.

Color above light olive-brown, with two series of blackish brown spots on each side, the spots of the upper series encroaching on the dorsal stripe. Lateral stripes on the second and third rows of dorsal scales of each side. Beneath slate color.

A single specimen of this species collected near Chicago by Mr. E. W. Nelson is the only one known to have been found in the State.

**NERODIA**, BD. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 38.

Dorsal scales carinated, in from twenty-three to thirty-three rows. Rostral normal. Two internasals. Two prefrontals. Loreal present. Two nasals. One or two anteor-

bitals. Two or three postorbitals. Anal divided. Aquatic serpents of medium size, spotted with black or dark brown.

Dorsal scales in 23–25 rows. No suborbital plates present.

N. SIPEDON.

Dorsal scales in 29–33 rows. Suborbital plates present.

N. CYCLOPIUM.

**Nerodia sipedon**, Linn. SPOTTED WATER SNAKE.

**Var. sipedon.**

*Coluber sipedon*, Linn., Syst. Nat., ed. 10, 1758, I., p. 219.

*Tropidonotus sipedon*, Holbr., N. A. Herp., 1842, IV., p. 29, pl. 6.—

De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 42, pl. 14, fig. 31.

*Nerodia sipedon*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 386.

—Kenn., Trans. Ill. State Agr. Soc., 1853–54, I., p. 592.

*Tropidonotus sipedon*, Dum. et Bibr., Erp. Gén., 1854, VII., p. 568.

*Tropidonotus sipedon*, subsp. *sipedon*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 42; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sipedon*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 25, 140, pl. 2, fig. 3.

**Var. fasciatus.**

*Coluber fasciatus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 378.

*Nerodia fasciata*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 39.

*Tropidonotus fasciatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 42; Bull. Chicago Acad. Sci., 1883.

**Var. erythrogaster.**

*Coluber erythrogaster*, Shaw, Gen. Zoöl., III., 1804, p. 458.

*Nerodia erythrogaster*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 40.

*Tropidonotus sipedon*, subsp. *erythrogaster*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 42; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sipedon*, var. *erythrogaster*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 26, 141.

**Var. rhombifer.**

*Tropidonotus rhombifer*, Hallowell, Proc. Acad. Nat. Sci. Phila., VI., 1852, p. 177.

*Nerodia rhombifer*, Bd. and Gir., Cat. N. A. Rept., 1853, p. 147.

*Tropidonotus rhombifer*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 43; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus sipedon*, var. *rhombifer*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 26, 141.

Body moderately slender. Head distinctly marked off by the more slender neck. Tail cylindrical, tapering, of moderate length. Rostral wider than high, excavated below. Frontal much larger than wide, pentagonal. Parietals very large. A single nasal, with a groove below the nostril, sometimes apparently two plates with the nostril between. Loreal rhomboidal. A large vertically elongate anteorbital. Two or three postorbitals. Supralabials eight, sixth and seventh largest. Ten infralabials, the fifth and sixth largest. From twenty-three to twenty-five rows of dorsal scales, the carinae on the outer scales a trifle less prominent. Ventrals one 130-150. Anal divided. Subcaudals in 40-80 pairs.

Color extremely variable; from yellowish brown through various shades of brown and red to blackish brown, sometimes uniform, but generally with a dorsal series of dark spots and on each side a series of smaller squarish spots which alternate with those of the dorsal series. Generally some of the spots of the three series, on the anterior part of the body and on the tail, fuse, forming transverse bands; sometimes all are thus fused. The number of the spots varies with age. Beneath yellowish, with subtriangular blackish or brown spots on the scutes, becoming larger posteriorly and giving the prevailing color; sometimes uniformly reddish. Posterior margins of labial plates generally dark. Young, and some adults, with a pair of small pale spots on the parietals, as in the *Eutæniæ*.

This water snake is one of the commonest species within our limits. It feeds largely on small fishes.

Throughout the State. Cook county, Ogle county, Galesburg, Peoria (Brendel), Pekin, Normal, Anna.

#### Variety *sipedon*.

Grayish brown, with three series of squarish dark spots, those of the lateral series alternating with the dorsal spots. Beneath thickly blotched with black posteriorly, becoming paler towards the head. Dorsal rows twenty-three. Common everywhere.

Variety *fasciatus*.

Dark brown, with transverse lozenge-shaped spots on the back, and from thirty to thirty-eight red spots on each side. Reddish white beneath. Dorsal scales in from twenty-three to twenty-five rows. Anna, Union county.

Variety *erythrogaster*.

Uniform reddish brown or blackish above, bright reddish or yellow beneath. Dorsal rows from twenty-three to twenty-five. Peoria, southern Illinois, Anna (C. W. Butler).

Variety *rhombifer*.

Brown above, with a series of rhomboid dark spots on the back, which touch by their apices. More or less blotched with black beneath. Dorsal rows twenty-five (Hallowell gives this number in his original description; later writers have given twenty-seven as the proper number). Two specimens are in the collection of the Northwestern University at Evanston, one from Cook county, and the other from Union county.

*Nerodia cyclopium*, Dum. et Bibr.

*Tropidonotus cyclopium*, Dum. et Bibr., Erp. Gén. 1854, VII., p. 576.

*Tropidonotus cyclopium*, Davis and Rice, Bull. Ill. State Lab.

Nat. Hist., I., No. 5, 1883, p. 43.— S. Garman, Mem. Mus.

Comp. Zoöl., 1883, pp. 26, 142, pl. 2, fig. 4.

Body moderately stout. Head swollen at the cheeks, narrowed forward. Tail tapering, rather short. All the dorsal scales carinate, those of the outer row less strongly, those of the back very strongly, becoming sharp longitudinal keels on the tail. Rostral about twice as broad as high. Nasal large, nostril near the upper margin, but not quite dividing it into two plates. Loreal large, widest below. One large anteorbital, widest above. Two postorbitals and from two to three suborbitals. Supralabials greatly developed, eight in number; the sixth and seventh much the largest. Infralabials from ten to twelve; fifth and sixth largest. Dorsal rows from twenty-seven to thirty-three. Ventrals about 144. Anal divided. Subcaudals about 65 pairs.

Color brown above, obscurely marked with black, this color being mostly confined to the bases of the scales and indicating vertical lateral bands and dorsal spots as in *T. sipedon*. Brownish beneath posteriorly, paler anteriorly; in an Illinois example yellowish below, with a small black spot on each side of most of the abdominal scutes, and with a few similar irregularly placed spots on the under side of the tail.

Total length, 41.25; tail, 9.50.

Southern Illinois. Bluff Lake, Union county.

The only example of this species in the Laboratory collection from Illinois differs in some respects from the typical forms of the species as described. On one side there are two suborbitals, on the other but one; on neither side is the anteorbital in contact with the suborbitals; the latter crowd the labials away from the eye, leaving an unoccupied space above the fourth labial. The dorsal scales are in twenty-nine rows. The ventrals number one hundred and forty; the subcaudals, sixty.

#### REGINA, BD. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 45.

Dorsal scales carinated, in from nineteen to twenty-one rows. Rostral normal. Two internasals. Two prefrontals. A single nasal, grooved beneath the nostril. Loreal present. One or two anteorbitals. Two or three postorbitals. Anal plate divided.

Dorsal scales in 19 rows. Colors in longitudinal bands. With two approximated blackish bands on the abdomen.

R. LEBERIS.

Dorsal scales in 20 rows. Colors in longitudinal bands. No longitudinal bands on ventral surface. . . . . R. GRAHAM.

Dorsal scales in 19 rows. Brown above, spotted with black. Red below, with a series of round black spots on each side. . . . . R. KIRTLAND.

#### *Regina leberis*, Linn.

*Coluber leberis*, Linn., Syst. Nat., ed. 10, 1758, I., p. 216.

*Tropidonotus leberis*, Holbr., N. A. Herp., 1842, IV., p. 49, pl. 13.

—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 45., pl. 11, fig. 23.

*Regina leberis*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 45.—

Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Tropidonotus leberis*, Dum. et Bibr., Erp. Gén., 1854, VII., p. 579.

— Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 41; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem.

Mus. Comp. Zool., 1883, pp. 27, 142, pl. 2, fig. 1.

Body moderately slender. Head small. Tail rather short. Dorsal scales all carinate, the outer very faintly, in nineteen rows. Rostral wide and low, excavated beneath. One (!) nasal, grooved below the nostril, sometimes also above. Two anteorbitals. Two postorbitals. Supralabials seven or eight; fifth and sixth largest. Infralabials nine or ten; fourth and fifth largest. Dorsal rows nineteen; scales of outer row widest. Ventrals 140-149. Anal divided. Subcaudals 64-81. Tail about three tenths the length of the body.

Color above brown, with a blackish line occupying the median row of dorsal scales, and on each side similar lines occupying the fifth row. On the sides a straw-colored band occupies the upper half of the outer row and the whole of the second dorsal rows. Lower half of outer dorsal row and outer margins of the abdominal scutes occupied by a brown band. Beneath yellowish, with two longitudinal bands of brown. Labials and lower part of rostral yellowish. A small brown spot beneath the angle of the mouth.

Throughout the State. Cook county, Geneva, Galesburg.

Similar to *R. grahami* in the number of dorsal scales and number and form of the head plates, but differing in color, the average number of ventral and subcaudal scutes, and the proportional length of the tail.

Ventrals, 147. Subcaudals, 72. Total length, 12.50; tail, 3.

Ventrals, 149. Subcaudals, 79. Total length, 8.50; tail, 2.62.

*Regina grahami*, Bd. and Gir.

*Regina grahamii*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 47.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Tropidonotus grahami*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 41; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus leberis*, var. *grahamii*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 28, 142.

Body moderately slender, tapering towards the extremities. Head small, not much wider than the neck. Tail rather short. All the dorsal scales carinate, Rostral low and broad, distinctly excavated below. Parietals very large. Frontal elongate, pentagonal. A single (!) nasal plate on each side, obliquely grooved below the nostril. Two anteorbitals. Two postorbitals. Seven or eight supralabials; the fifth and sixth largest. Ten infralabials; fourth and fifth largest. Dorsal rows nineteen; the scales of the outer row of each side less strongly carinate than the others, and about as wide as long. Ventrals 156-173. Subcaudals 54-65 pairs. Anal divided. Tail about two tenths the length of the body.

Color above brown, with a pale brown dorsal stripe about three scales wide; on each side of this stripe a wide brown or gray band edged with blackish, and about five scales wide; and outside these on each side a straw-colored band occupying the three outer rows of scales. Edges of the outer dorsal rows and sides of the abdominal scutes black, producing on each side of the abdomen a zigzag line. Beneath straw-color, uniform, or with a median dusky band beneath the tail, and before the vent a series of blackish spots.

Total length, 31.75; tail, 5.50.

Throughout the State. Cook county (Kennicott), Normal, Pekin, Champaign.

In the original description of this species the number of dorsal rows of scales is given as twenty. Illinois examples have nineteen without exception, as far as I know. Besides the differences of color, this species differs from *R. leberis* in the number of ventral and subcaudal scutes, and in the length of the tail as compared with that of the body.

Ventrals, 173. Subcaudals, 65. Total length, 27.25; tail, 4.75.

Ventrals, 158. Subcaudals, 54. Total length, 31.75; tail, 5.50.

Ventrals, 156. Subcaudals, 58. Total length, 26.75; tail, 5.25.

Ventrals, 160. Subcaudals, 61. Total length, 14; tail, 2.50.

**Regina kirtlandi\***, Kenn.

*Regina kirtlandii*. Kenn., Proc. Acad. Nat. Sci. Phila., 1856, p. 95.

*Tropidoclonium kirtlandi*. Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 41; Bull. Chicago Acad. Sci., 1883.

*Tropidonotus kirtlandii*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 28, 143, pl. 1, fig. 3.

Body tapering towards the extremities. Head small, scarcely wider than the neck. Tail short, tapering, in adults abruptly more slender than the body. Dorsal rows of scales nineteen, all carinated. Rostral low and wide. Frontal hexagonal. Supraciliaries small. One nasal, grooved below the eye. One anteorbital. Eye small. Two postorbitals. Six supralabials, fifth and sixth largest. Seven infralabials, fifth largest. Dorsal rows of scales nineteen. Ventrals 131-133. Anal divided. Subcaudals in 52-56 pairs.

Color above brown, with two dorsal series of black spots, and on each side a series of larger round black spots, sometimes with a series of small spots beneath the last. Flanks gray. Ventral surface, between two submarginal series of round black spots, bright red, almost carmine beneath the tail, gradually fading to a dull yellowish white on throat and under side of head. Labials yellowish. Young are almost uniform brown above, and frequently are speckled with black between the round spots of the ventral scutes.

Total length of an adult, 17; tail, 3.25.

Formerly common in the north half of the State; rare at present. West Northfield (Kennicott), Normal, Champaign.

A handsome snake, which ten years ago was not uncommon along prairie brooks, in the central part of the State. Tiling, ditching, and cultivation of the soil have destroyed its haunts and nearly exterminated it. Mr. Kennicott found it in northern Illinois under logs. I have never seen it elsewhere than on the open prairie. It has a peculiar habit of flattening its body and remaining motionless to escape detection.

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\* Prof. E. D. Cope has recently established the genus *Clonophis* for this species.

## TROPIDOCOLONIUM, COPE.

Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 76.

Microps (preoccupied in Coleoptera), Hallowell, Proc. Acad. Nat. Sci. Phila., VIII., 1856, p. 240.

Dorsal scales carinated. Rostral plate normal. Two internasals. Two prefrontals. One nasal, grooved below the nostril. Loreal present. One anteorbital. Two postorbitals. Head small, not distinct. Teeth small, isodont. Anal not divided. Tail short.

The genus is here restricted to the species for which it was originally proposed.

**Tropidoclonium lineatum**, Hallowell.

*Microps lineatus*. Hallowell, Proc. Acad. Nat. Sci. Phila., VIII., 1856, p. 241.

*Tropidoclonium lineatum*. Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 76.

*Storeria lineata*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 32, 143.

Head small, not distinct. Tail short, tapering abruptly. Dorsal scales in nineteen rows; the two outer rows on each side larger than the others, smooth and shining; first row without carinae, second row with a faint carina at the base of each scale; third row with the outer halves of scales polished but with distinct carinae. Frontal plate longer than wide, the sides parallel. One anteorbital. Two postorbitals. Eye small, above the third labial. Supralabials six or seven, third and fourth largest, fifth crowded away from the margin. Ventrals 150. Subcaudals 26.

Color above brown, with a yellow-gray median stripe one and two half scales wide extending from the occiput to the tip of the tail, and with three outer rows of dorsal scales of the same color on each side. A distinct black spot at the base of each scale of the outer row. Head above olive-brown; supralabials yellow-gray. Ash-gray beneath, becoming yellowish on the head and tail. Each ventral plate with a transverse black spot on the middle of its base. The spots behind the first ten each with a median posterior notch, the notches becoming gradually deeper posteriorly and for a short distance before

the vent dividing the spots into two. Subcaudals each with a basal black spot.

Total length, 15.12; tail 1.37.

Described from a single example\* from Urbana, Ill., collected April 4, 1889, the only representative of the species which has thus far been found within our limits. The species is said to occur from Kansas to Texas, and is not included in any of the accounts of species of this region. In Dr. Yarrow's catalogue of North American reptiles in the National Museum, I find record of an example taken at Hughes, Ohio, April, 1879, a record which seems to have escaped the attention of recent writers. The Illinois example differs from Hallowell's description of the type in several respects, and does not agree exactly with other descriptions with which it has been compared. Thus the abdominal plates are said to vary from 138 to 145, the subcaudals from 32 to 35 pairs, while the eye is said to rest on the third and fourth supralabials. In none of these characters does our example agree exactly, as may be seen by the above description. The colors also of the Illinois specimen seem to be darker than usual.

#### STORERIA, BD. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 135.

Dum. et Bibr., Ischnognathus, Erp. Gén., VII., 1854, p. 506.

Dorsal scales carinated, in fifteen to seventeen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. Two nasals, or one with a groove beneath the nostril. One or two anteorbitals. One or two postorbitals. Oviparous. Small, obscurely-colored species.

The nostril is commonly said to open between two nasal plates in species of this genus. This is not always so, occasional specimens showing a single plate on one side of the head with a groove beneath the nostril, while there are two plates on the opposite side, or the plates of both sides may be united. In a perfect example of *S. occipitomaculata* in the Laboratory collection there is but one large postorbital plate.

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\*Other examples of the species from the same locality were examined after this was written. See Bull. Ill. State Lab. Nat. Hist., III., p. 187.

Dorsal scales in 15 rows. . . . . *S. OCCIPITOMACULATA*.

Dorsal scales in 17 rows . . . . . *S. DEKAYI*.

***Storeria occipitomaculata*, Storer.**

*Tropidonotus occipito-maculatus*, Storer, Rep. Rept. Mass., 1839, p. 230.

*Coluber occipito-maculatus*, Storer, Bost. Jour. Nat. Hist., 1840, III., p. 33.

*Coluber renustus*, Hallowell, Proc. Acad. Nat. Sci. Phila., 1846-47, III., p. 278.

*Storeria occipito-maculata*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 137.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Storeria occipitomaculata*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 40; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 30, 143, pl. 1, fig. 2.

Small. Body tapering to the extremities. Head small. Tail short. All the dorsal scales carinated. Rostral plate excavated below; its anterior face convex. Frontal hexagonal, sides converging posteriorly. Two anteorbitals. Two postorbitals. Six or seven supralabials. Seven infralabials; the fourth and fifth largest. Dorsal rows fifteen. Ventrals 117-128. Anal divided. Subcaudals 43-52.

Olive or chestnut-brown above, uniform, or with a dorsal ash-gray stripe, and a similar stripe on the outer rows of dorsal scales, the latter more obscure than the dorsal stripe, or wanting altogether. Beneath salmon-red, fading anteriorly into light gray. External margins of the ventral scutes gray; the anterior scutes with distinct blackish submarginal spots, forming a longitudinal series for each side. Head above reddish brown, faintly iridescent, with three occipital pale spots, the median much the largest. Fifth supralabial pale.

Total length of an adult female, 11.31; tail, 2.44.

Occurs everywhere within our limits. Not common. Cook county (Kennicott), Peoria (Brendel), Normal, Belleville (Nat. Mus.), Anna.

***Storeria dekayi*, Holbr.**

*Tropidonotus dekayi*, Holbr., N. A. Herp., 1842, IV., p. 53, pl. 14.—

De Kay, Nat. Hist., N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 46, pl. 14, fig. 30.

- Storeria dekayi*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1858, p. 135.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, p. 592.  
*Ischnognathus dekayi*, Dum et Bibr., Erp. Gén., VII., 1854, p. 507.  
*Storeria dekayi*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 40; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 31, 143, pl. 1, fig. 1.

Small. Body tapering to both extremities. Head small, but clearly marked off by the slender neck. Tail short. Rostral excavated below, its anterior face convex. Frontal hexagonal, wide. Two nasals. One large anteorbital. Two post-orbitals, sometimes one. Seven small infralabials, the fourth and fifth much the largest. Seventeen dorsal rows of scales, the outer row of each side widest. Ventrals about 120-128. Anal divided. Subcaudals about 48-60.

From ash-gray to chestnut-brown above, with a pale dorsal stripe, on each side of which is a series of brown spots; the latter may encroach upon the median stripe, and occasionally unite across the middle line; sometimes they are wanting. Beneath pale gray, with one or two small black specks near the outer margins of each ventral scute. Head brown above, with a faint iridescence. On each side of the neck, at the base of the head, is an obliquely-placed black or brown bar, the two occasionally meeting above. Smaller black bars across the temporals and superior labials of each side extend to or slightly beyond the angle of the mouth. Posterior margins of the third and fourth supralabials black. Infralabials pale, or touched with black at the margins.

Total length, 12.75; tail, 2.50.

Occurs in all parts of the State, but is not very common. Englewood, Chicago, Plano, Peoria (Brendel), Kappa, Normal, Belleville and Mt. Carmel (Nat. Mus.).

#### HYDROPS, WAGLER.

Wagler, Syst. Amph., 1830, p. 170.

S. Garman, Mem. Mus. Comp. Zoöl., 1883, p. 31.

Scales smooth and shining, in from fifteen to twenty-one rows. Anal plate divided. Rostral normal. One or two internasals. Two prefrontals. One or two nasals. A large elongate loreal, with the prefrontal forming the anterior rim of the orbit.

No anteorbitals. Two postorbitals. Body moderately stout. Head scarcely distinct from the body.

Two internasal plates. With several longitudinal red stripes above.....H. ERYTHROGRAMMUS.

One internasal plate. Uniform blue black above.

H. ABACURUS.

**Hydrops erythrogrammus, Daudin. RED-LINED HORNED SNAKE, HOOP SNAKE.**

*Coluber erythrogrammus*, Daudin, Hist. Nat. Rept., 1799, VII., p. 93, pl. 83, fig. 2.

*Helicops erythrogrammus*, Holbr., N. A. Herp., 1842, III., p. 107, pl. 25.

*Abastor erythrogrammus*, Bd. and Gir., Cat. N. A. Rept., Pt. 1., 1853, p. 125.

*Calopisma erythrogrammus*, Dum. et Bibr., Erp. Gén., 1854, VII., p. 336.

*Abastor erythrogrammus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 32; Bull. Chicago Acad. Sci., 1883.

*Hydrops erythrogrammus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 35, 144.

Body moderately stout. Head scarcely wider than the neck, slightly depressed. Tail short. Dorsal scales smooth. Rostral plate very wide. Two small internasals. Prefrontals large, forming part of the anterior rim of the orbit. Frontal plate hexagonal, its lateral margins nearly parallel, except between the parietals. Supraciliaries large. One nasal plate, grooved below the nostril. Loreal elongate, forming part of the anterior rim of the orbit. No anteorbital. Two postorbitals, the lower small. Supralabials seven, sixth largest. Infralabials seven or eight, the fourth or fifth largest. Dorsal scales in nineteen rows, all smooth and polished. Ventrals 167-185. Subcaudals in 38-50 pairs.

Color above bluish black, with five longitudinal red stripes. Of these, one on each side occupies the two outer rows of scales, excepting the bases of the scales of the inner row: three scales above these stripes, on each side, is another, occupying but one scale in width; while the fifth stripe occupies the median dorsal row of scales. Beneath carneous, with round black

spots near the outer margins of each ventral scute, forming two longitudinal series. Sometimes with a broken median series of spots. Cephalic plates faintly margined with yellow. Labials and scales of the under side of the head, each with a black central spot.

Attains a length of more than 36 inches.

Southern Illinois. "Found north to Mt. Carmel at least." (Ridgway.)

### **Hydrops abacurus**, Holbr. RED-BELLIED HORN SNAKE.

*Coluber abacurus*, Holbr., N. A. Herp., 1836, I., p. 119, pl. 23.

*Helicops abacurus*, Holbr., N. A. Herp., 1842, III., p. 111, pl. 26.

*Farancia abacurus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 123.

*Calopisma abacurum*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 342.

*Hydrops abacurus*, Dum. et Bibr., Erp. Gén., Atlas, pl. 65.

*Farancia abacura*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 32; Bull. Chicago Acad. Sci., 1883.

*Hydrops abacurus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 36, 144, pl. 1, fig. 5.

Body tapering very slightly toward the extremities. Neck thick, as wide as the head. Head small. Tail of moderate length, maintaining its diameter well toward the tip and tapering suddenly, the tip covered by a conical nail. All the scales smooth and shining. Rostral plate wide. But one internasal. Two large prefrontals, each forming a part of the boundary of the orbit of its side. Frontal large, elongate. Supraciliaries small. One nasal, grooved below the nostril. A single elongate loreal which forms part of the anterior boundary of the orbit (some authors consider this an anteorbital and describe the species as without a loreal). No anteorbitals. Two postorbitals, the lower much the smaller. Parietals large, bounded exteriorly by two elongate temporals. Six or seven supralabials, the eye above the third and fourth, fifth and sixth largest. Infralabials eight or nine, the fifth largest, those following it becoming rapidly smaller, the last smallest of all. Dorsal scales in nineteen rows, large, the outer scales wider than long. Ventrals 168-203, the one preceding the anals divided. Subcaudals in 35-49 pairs, a few of those behind the vent sometimes united.

Color above uniform bluish black. Beneath bright brick-red, with broken or complete transverse bluish black bands which are continuous at the sides with downward extensions of the black of the dorsal surface. The red of the ventral surface extends upward on the sides between the black bars to the third or fourth row of dorsal scales. Head olive-brown above, uniform or marked with red. Posterior supralabials reddish brown with black central spots. Inferior surface of the head brownish anteriorly, becoming pale salmon-red behind, many of the plates with black central spots. The transverse black bars alternate on the posterior part of the tail, and are wanting toward the tip.

Total length of an example from Union Co., 38.50; tail, 6.25.

Southern Illinois. Frequent. Wabash Valley (Ridgway), Bluff Lake, Union Co.

This is a beautiful serpent with the scales of the dorsal surface like polished ebony. "Not uncommon as far north as Vincennes. A living female with eggs was sent to the National Museum from Wheatland, Ind." (Ridgway). "Common around the Bluff Lakes [Union Co.] during August and September." (C. W. Butler.)

### CYCLOPHIS, GÜNTHER.

Günther, Cat. Coll. Serp. in Brit. Mus., Pt. I., 1858, p. 119.

Bd. and Gir., *Chlorosoma*, Cat. N. A. Rept., Pt. I., 1853, p. 108.

Dorsal scales perfectly smooth, in fifteen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. One nasal, nostril opening in its middle. Loreal present. One anteorbital. Two postorbitals. Small, slender; head distinct from body; tail moderately long.

### *Cyclophis vernalis*, Harlan. GREEN SNAKE.

*Coluber vernalis*, Harlan, Jour. Acad. Nat. Sci. Phila., V., 1827, p. 361.—Holbr., N. A. Herp., 1842, III., p. 79, pl. 17.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 40, pl. 11, fig. 22.

*Chlorosoma vernalis*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 108.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Liopeltis vernalis*, Smith, Geol. Surv. Ohio, Zoöl. and Bot., IV., 1882, p. 695.

*Cyclophis vernalis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 36; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 39, 146, pl. 3, fig. 4.

Small. Body slender. All the dorsal scales smooth. Rostral plate angulate between the internasals. Frontal elongate, narrowed behind, pentagonal. One or two anteorbitals. Two postorbitals. Seven supralabials; middle of the eye above the third and fourth. Eight infralabials, the fifth largest. Dorsal scales in fifteen rows. Ventrals about 148 in adults (125 or more in younger examples). Subcaudals about 80 (69–95).

Color above uniform pale green; whitish below. Head olive above. Iris pale yellow about pupil, more extensively so above; elsewhere dark. Supralabials pale. Young examples are more brownish.

Total length of an adult female, 10.25; tail, 5.25.

Occurs in all parts of Illinois. Common. Cook county, Galesburg, Peoria (Brendel), Normal, Monroe county (Nat. Mus.)

A handsome small species occurring everywhere in meadows and pastures. It feeds upon insects. A female before me which was captured at Normal, July 6, contains fully developed eggs.

#### PHYLLOPHILOPHIS, S. GARMAN.

S. Garman, Mem. Mus. Comp. Zoöl., 1883, p. 40.

Dorsal scales carinated, in seventeen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. One nasal plate, with the nostril opening in its middle. Loreal present. One anteorbital. Two postorbitals. Small, slender; head distinct; tail long.

#### *Phyllophilophis æstivus*, Linn. GREEN SNAKE.

*Coluber æstivus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 387.

*Leptophis æstivus*, Holbr., N. A. Herp., 1842, IV., p. 17, pl. 3.—

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 106.

*Leptophis majalis*, Bd. and Gir., l. c., p. 107.

*Herpetodryas astirus*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 209.

*Cyclophis astirus*, Davis and Rice, Bull. Ill. State Lab. Nat.

Hist., 1., No. 5, 1883, p. 36; Bull. Chicago Acad., 1883.—S.

Garman, Mem. Mus. Comp. Zool., 1883, pp. 40, 146, pl. 3, fig. 1.

*Phyllophilopis astirus*, S. Garman, List N. A. Rept. and Batr.

Essex Inst., 1884.

Small. Body long and slender. Head long, wide behind, narrowing forward. Neck slender. Tail long, slender and tapering. Dorsal scales, excepting the two outer rows of each side, distinctly carinated. Rostral plate large, convex, with a lunate impression below, obtusely angulate between the internasals. Frontal plate elongate, pentagonal, narrowed behind. Loreal quadrangular. One anteorbital (three on each side in an example from southern Ill.). Two postorbitals. Seven or eight supralabials; center of the eye behind the line of junction of the third and fourth, sixth largest. Eight infralabials, fourth and fifth largest. Ventrals 150–165. Subcaudals 111–135.

Color above pale green. Supralabials and entire under surface greenish white.

Total length, 27.25; tail, 9.75.

Southern Illinois, common. Mt. Carmel (Ridgway), Anna (Butler), Pine Hills, Union county.

Easily distinguished from *Cyclophis vernalis*. From the strong resemblance of this small serpent to some of the tree-inhabiting species of the tropics one would infer that its habits were similar, but instead, as observed by Prof. Cope in an example kept by him in confinement, it remains under-ground most of the time with the head and neck exposed and motionless, a habit which may serve it in eluding its enemies or bringing the insects on which it feeds within its reach. Those we have collected were found among herbage, in situations similar to those in which *Cyclophis vernalis* occurs.

#### COLUBER, LINN.

Linn., Syst. Nat., 1748, p. 34.

Bd. and Gir., Bascanion, Cat. N. A. Rept., Pt. I., 1853, p. 93.

S. Garman, (in part) Mem. Mus. Comp. Zool., 1883, p. 40.

Dorsal scales smooth, in seventeen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals.

Two nasals. Loreal present. One large superior and a very small inferior anteorbital. Two postorbitals. Eye large. Body long, slender; head distinct; tail long.

Large active species.

**Coluber constrictor**, Linn. BLACK SNAKE, BLUE RACER.

*Coluber constrictor*, Linn., Syst. Nat., 1758, ed. 10, I., p. 216. —Storer, Bost. Jour. Nat. Hist., 1840, III., p. 27.—Holbr. N. A. Herp., 1842, III., p. 55, pl. 11.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 35, pl. 10, fig. 20.

*Bascanium constrictor*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 93.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Coryphodon constrictor*, Dum., et Bibr., Erp. Gén., VII., 1854, p. 183.

*Bascanium constrictor*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 38; Bull. Chicago Acad. Sci., 1883.

*Coluber constrictor*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 41, 146, pl. 4, fig. 3.

Large. Body long and slender. Head elongate, clearly marked off from the body, front convex, sides channeled. Eye large. Tail long and tapering. Rostral plate strongly convex, angulate between the internasals. Frontal large, elongate, its lateral margins incurved. Supraciliaries jutting over the eyes. Nostril large. Two nasals of about equal size. One or two loreals. Two anteorbitals, sometimes but one, the superior very large, vertically elongate and expanded above; inferior plate small. Two postorbitals. Seven supralabials, the fourth, sixth and seventh largest. Nine infralabials, the fifth much the largest, the eighth and ninth very small. Dorsal scales in seventeen rows: large, all perfectly smooth. Ventrals, 172-190. Anal divided. Subcaudals in 89-110 pairs.

Color above uniform deep blue-black or olive-brown, slate-gray or greenish white beneath. Inferior portions of all the supralabials pale. Head olive-brown above. Pupil with a narrow coppery ring. Iris nearly all black. The colors of the young are entirely different. In specimens of a foot long there is a dorsal series of dark brown blotches, and below these on each side numerous small brown spots. Beneath gray, with numerous round or lunate black spots toward the sides. Head olive-brown above, the plates edged and marked with black. Tail uniform brown above, paler below.

Total length of an example from southern Illinois, 45.50; tail, 11.50.

Throughout the State. Common south. Cook Co. (Kennicott), Galesburg, Peoria (Brendel), Normal, Urbana, Cobden, Anna.

Formerly a common species, but it has been exterminated in the better agricultural regions, and is not common at present except in localities where there are extended tracts of uncultivated land to afford it retreats. The pilot snakes and this species are not commonly discriminated, and accounts of the habits of the black snake as frequently refer to one as to the other. This is one of the largest species of our fauna, reaching a length of seven feet or more. It is perfectly harmless, but will occasionally pursue one whom it recognizes as more cowardly than itself. It is a great coward, however, and ordinarily takes to flight at the first sound of one's approach. It is an inveterate robber of birds' nests, climbing trees for this purpose with great facility. Besides young birds, its food consists of frogs and field mice. The form known as the Blue Racer seems to be the more common in central Illinois.

#### PITYOPHIS, HOLBR.

Holbr., N. A. Herp., 1842, IV., p. 7.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 64.

Median rows of dorsal scales slightly carinated, outer rows smooth, in from twenty-five to thirty-five rows. Anal plate entire. Rostral plate produced upward and backward between the internasals. Two internasals. Two pairs of prefrontals or one pair; sometimes with a small intermediate extra plate—the anterior frontal. Two nasals. Loreal present. One or two anteorbitals. Two to five postorbitals. Includes large, spotted species.

*Pityophis catenifer*, Blainville. BULL SNAKE.

Var. *catenifer*.

*Coluber catenifer*, Blainville, Nouv. Ann. Mus. Hist. Nat., III., 1834, pl. 26, fig. 2, 2a, 2b.

*Pituophis catenifer*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 69.

Var. *sayi*.

*Coluber sayi*, Schlegel, Essai Phys. Serp., 1837, p. 157. — Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 151.

*Pityophis sayi*, subsp. *sayi*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 38.

*Pityophis catenifer*, var. *sayi*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 52, 150.

Var. *bellona*.

*Churchillia bellona*, Bd. and Gir., Stansbury's Explor. and Surv. Great Salt Lake, 1853, p. 350.

*Pituophis bellona*, Bd. and Gir. Cat. N. A. Rept., Pt. I., 1853, p. 66.

*Pityophis catenifer*, var. *bellona*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 53, 151.

Large. Head large, wide behind, snout somewhat pointed. Outer dorsal scales smooth, the median rows carinate. Rostral plate wedged between the internasals, sometimes reaching the prefrontals. Prefrontals in a transverse series of one or two pairs. Sometimes with a small extra plate in advance of the frontal. Frontal large, its lateral margins parallel or convergent posteriorly. Parietals large, with a linear impression, as if mutilated. One or two loreals, one or two anteorbitals; if two, the inferior is much the smaller. From two to four post-orbitals. Supralabials eight, the fourth or fifth reaching the orbit, seventh largest. Eleven to thirteen infralabials, gradually increasing in size to the seventh, thence diminishing. Rows of dorsal scales from twenty-five to thirty-five. Ventrals 209-243. Subcaudals 52-71.

Color above from yellowish white to reddish brown, with a dorsal series of large black or brown spots, and with two or three series of smaller spots on each side. Beneath yellow, more or less blotched with black. A black bar, arched forwards, generally extends from orbit to orbit across the head. Another black bar extends from the supraciliary plate to the angle of the mouth, crossing the seventh and eighth upper labials. Labials more or less widely edged with black.

Total length, 61.75; tail 8.

Prairies in all parts of the State. Rockland (Nat. Mus.), Normal, southern Illinois (Nat. Mus.).

Variety *sayi* (?)

Illinois examples of the species are referred to this variety with a good deal of doubt. If the published descriptions of the variety are complete, our snakes certainly do not belong to it. In many respects the central Illinois examples are intermediate between var. *sayi* and var. *bellona*, and, judging from descriptions alone, are as properly referable to the latter as to the former. The description following is based upon six examples from the prairie region of central Illinois.

Rostral plate wedged between the internasals above, in one example reaching the prefrontals. Two pairs of prefrontals. A small anterior frontal present in four examples. Frontal large, wide in front, emarginate for the accommodation of the anterior frontal when the latter is present, sides slightly incurved and approaching posteriorly. Parietals large, impressed as if from an injury. Loreals one or two. Anteorbitals one in five examples, two in the remaining one, the inferior plate in the latter very small. Postorbitals two, three, or four; in one example three on one side and four on the other. Supralabials eight, the fourth alone reaching the orbit; fourth, sixth, and seventh largest. Eleven infralabials. Dorsal scales in from thirty-one to thirty-three rows, from seven to nine outer smooth. Ventrals 209-228. Subcaudals 51-60 pairs.

Color above straw-yellow, faintly brownish in some examples, with a dorsal series of large black or brown spots numbering from forty-two to fifty-five to the vent, and from nine to thirteen on the tail. On the dorsal scales of each side, are one or two additional series of black or brown spots which, anteriorly, are elongate longitudinally, and on the tail fuse with the dorsal spots, forming transverse bars. Beneath pale yellow, with brown or black blotches confined to the sides of the ventral scutes or uniformly distributed. Head with a black bar extending from orbit to orbit on the supraciliaries, frontal and prefrontals. An oblique black bar extends from the orbit to the angle of the mouth, crossing the seventh and eighth supralabials. Most of the labials are edged with black. The black spots, in some examples, encroach upon the yellow ground color to such an extent that only narrow lines of yellow appear between them.

In an attempt to find where the Illinois examples of the species belonged, the published descriptions of American species of the genus have been tabulated, and those characters of each in which any one of the six examples described agreed were checked. It was found that most of them agreed most closely with var. *bellona*. The descriptions of var. *sayi* are, however, not complete, and the result is consequently unsatisfactory.

The bull snake is not an uncommon species in Illinois, occasionally even occurring in door yards. When offended it will strike, as do most other harmless snakes, and utter a hissing sound accompanied by a humming noise bearing a very remote resemblance to the bellow of a bull, hence the common name. While holding one of these snakes over a table a short time since, the rapid vibration of the tail on the smooth surface of the table gave forth a hissing sound bearing resemblance to the noise made by the rattle of members of the genus *Crotalus*. The resemblance would doubtless be increased where the tail struck against grasses and leaves, and may serve these snakes as a protection against enemies. The humming noise which accompanies the hissing is due to a vibration of a peculiar flattened and freely movable epiglottis.

#### ELAPHIS, ALDROVANDI.

Aldrovandi, *Serpentum et Draconum*, 1640, p. 267.

Bd. and Gir., *Scotophilus*, *Cat. N. A. Rept.*, Pt. I., 1853, p. 73.

S. Garman, *Mem. Mus. Comp. Zool.*, 1883, p. 53.

A few median dorsal rows with faintly carinated scales: dorsal rows twenty-three to twenty-nine. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. Two nasals. Loreal present. Anteorbitals one. Postorbitals two or three. Body long, slender; head distinct; tail long. Includes the largest and most active of our Ophidia.

General color black, uniform, or with obscure blotches.

E. OBSOLETUS.

General color brown, with chestnut blotches. . . . E. GUTTATUS

**Elaphis obsoletus**, Say. PILOT SNAKE, BLACK SNAKE.**Var. obsoletus.**

*Coluber obsoletus*, Say, Long's Exped. to Rocky Mts., 1823, I., p. 140.

*Georgia obsoleta*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 158.

*Scotophis obsoletus*, Kenn., Proc. Acad. Nat. Sci. Phila., 1860, p. 330.

*Coluber obsoletus*, subsp. *obsoletus* and *confinis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, pp. 36, 37; Bull. Chicago Acad. Sci., 1883.

*Elaphis obsoletus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 54, 151, pl. 4, fig. 2.

**Var. lindheimeri.**

*Scotophis lindheimerii*, Bd. and Gir. Cat. N. A. Rept. Pt. I., 1853, p. 74.

*Scotophis emorgi*, Bd. and Gir., l. c., p. 157.

*Coluber emorgi* and *C. lindheimeri*, Davis and Rice, Bull. State Lab. Nat. Hist., I., No. 5, 1883, p. 36; Bull. Chicago Acad. Sci., 1883.

*Elaphis obsoletus*, var. *lindheimerii*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 54, 152.

Body elongate, slender, slightly compressed, ventral surface flattened. Head large, elongate, clearly separated by the narrower neck. Only the median dorsal scales carinate. Rostral plate wide, excavated below. Prefrontals very large. Frontal pentagonal, nearly or quite as wide in front as long. One large anteorbital. Two or three postorbitals. Eight supralabials, the middle of the eye above the line of juncture of the fourth and fifth. Thirteen infralabials, the sixth and seventh or fifth and sixth largest. Dorsal scales in from twenty-five to twenty-nine rows, the two or three outer rows of each side smooth, the carinae of remaining rows becoming more prominent above. Ventrals 217-239. Subcaudals 72-85.

Color above brown or black with a silken gloss, or a gray ground color, and black or brown dorsal and lateral blotches. Beneath, straw-yellow in the young, with squarish or elongate blackish blotches, mostly confined to the sides in front, but gradually fusing toward the tail and giving a uniform dark slate-color on the under side of the latter. In adults most of the ventral surface is dark slate or black; in all stages on the

under side of the head the color is uniform yellow, and this color occupies the middle of the scutellæ for some distance behind the head. Labials mostly yellow, some of them with faint dusky margins.

Total length, 64.50; tail, 10.

Throughout the State. Most abundant in southern Illinois. Rushville, Galesburg, McLean county, Mt. Carmel (J. Schneck), Union county.

#### Variety *obsoletus*.

Dorsal scales in twenty-five to twenty-nine rows. Ventrals 231-239. Subcaudals 76-85. Color above black or brown, sometimes with a gray ground color and black or brown dorsal and lateral spots. Beneath dark slate-gray posteriorly, becoming paler forward.

#### Variety *lindheimeri*.

Dorsal scales in twenty-nine rows. Ventrals 217-234. Subcaudals 72-85. Ground color gray, narrowly separating dorsal and lateral black or brown blotches.

Southern Illinois.

With material representing this species from various localities in the State, I find it impossible to separate the variety *confinis* from *obsoletus*. A complete series may be selected connecting the darkest with the palest individuals of the species. The rows of dorsal scales vary from twenty-five to twenty-seven in both black and light-colored examples. This is a fine large species which bears a superficial resemblance to the common black snake (*Coluber constrictor*) and this latter species is occasionally credited with traits which belong to the pilot snake. The pilot snake is said to climb trees in search of birds' nests as does the true black snake. Dr. J. Schneck, of Mt. Carmel, in a note to the American Naturalist for 1880, states that one of the forms of this species has the habit of moving the tail rapidly when excited, and thus producing a buzzing sound. Mr. Chas. Aldrich makes a similar statement concerning another form which he collected in Iowa.

**Elaphis guttatus**, Linn. FOX SNAKE, CORN SNAKE.**Var. guttatus.**

*Coluber guttatus*, Linn., Syst. Nat., ed. 12, 1766, p. 385.—Holbrook, N. A. Herp., 1842, III., p. 65, pl. 14.

*Scotophis guttatus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 78.

*Elaphis guttatus*, Dum. et Bibr. Erp. Gén., VII., 1854, p. 273.

*Coluber guttatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 37; Bull. Chicago Acad. Sci., 1883.

*Elaphis guttatus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 55, 152, pl. 4, fig. 1.

**Var. vulpinus.**

*Scotophis vulpinus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 75.—Kenn., U. S. Pac. R. R. Expl., 1853-55, XII., Book II., p. 299.

*Coluber vulpinus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 36; Bull. Chicago Acad. Sci., 1883.

*Elaphis guttatus*, var. *vulpinus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 56, 153.

Body moderately slender. Head large. Carinae of dorsal scales faint, several outer rows smooth. Rostral plate wider than high, emarginate beneath and with a lunate impression above the emargination. Frontal plate about as wide as long. One large anteorbital. Two postorbitals. Supralabials eight, eye over the fourth and fifth, seventh largest. About eleven infralabials, fifth and sixth much the largest. Dorsal scales in from twenty-five to twenty-seven rows, seven or more outer smooth on the neck, farther back only two perfectly smooth. Ventrals 200-235. Subcaudals 65-79.

Ground color above grayish yellow or brownish, with a dorsal series of large hazel blotches and on each side two or three series of smaller blotches, the blotches of the lowest series extending upon the abdominal scutellæ; all the spots obscurely margined with black. Beneath yellowish, checkered with black. Head brown above, uniform or with a dark bar reaching from orbit to orbit across the prefrontals and with others from the eye to the mouth. Two elongate brown spots on the neck, behind the head, may unite anteriorly upon the parietals.

Total length 25.50; tail, 8.25.

Throughout the State. Cook Co. (Mus. N. W. Univ.), Peoria (Brendel), Normal, Wabash Valley (Ridgway).

### OPHIBOLUS, Bd. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 82.

Dorsal scales smooth, in from seventeen to twenty-five rows. Anal plate entire. Rostral normal. Two internasals. Two prefrontals. Two nasals, occasionally but one. Loreal present or, rarely, wanting. One anteorbital. Two or three postorbitals. Body moderately stout. Head not well separated from the body.

Dorsal scales in 25 rows. Spotted with olive-brown above.

Obsoletely blotched below ..... O. CALLIGASTER.

Dorsal scales in 21 rows. Spotted with chestnut-brown or with red above. Blotched with black below.... O. TRIANGULUS.

Dorsal scales in 21 rows. Light chestnut-brown above, with obscure blotches. Uniform reddish yellow beneath or obsoletely blotched..... O. RHOMBOMACULATUS

Dorsal scales in 21 rows. Chiefly black above, with narrow transverse yellow lines which bifurcate on the flanks or not. Most of the dorsal scales with a yellow spot in some examples ..... O. GETULUS.

Dorsal scales in 19 rows. Loreal plate present. Red, with black rings..... O. DOLIATUS.

Dorsal scales in 19 rows. Loreal plate wanting. Red, with black rings..... O. ELAPSOIDEA.

### *Ophibolus calligaster*, Harlan.

*Coluber calligaster*, Harlan, Jour. Acad. Nat. Sci. Phila., 1827, V., Pt. 11., p. 359.

*Ophibolus caustii*, Kenn., Proc. Acad. Nat. Sci. Phila., 1859, p. 99.

*Lampropeltis calligaster*, Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

*Ophibolus calligaster*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci. 1883.

*Ophibolus triangulus*, var. *calligaster*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 66, 185.

Rather large. Body tapering gradually to the extremities. Head of moderate size, not noticeably wider than the

neck. Tail cylindrical, tapering, short. All the dorsal scales smooth. Rostral plate wider than high, strongly convex, distinctly but obtusely angulate on each side at the line of union of the anterior nasal and first labial plates, faintly angulate on each side between the anterior nasal and the internasal, and with an evident obtuse angle between the internasals. Frontal rather short and wide, its anterior margin nearly straight, lateral margin converging posteriorly, acutely angulate behind. Loreal plate quadrangular. One large anteorbital. Eye small. Two postorbitals (three on one side in one example studied). Two elongate temporals wedged between the parietals and the fifth and sixth supralabials. Seven supralabials, the eye above the third and fourth, fifth and sixth largest. Nine infralabials, fifth largest, fourth next. Dorsal scales in twenty-five rows. Ventrals 199-207. Subcaudals 43-47.

Color above olive-brown, with a dorsal series of from fifty-three to fifty-nine transverse dorsal brown blotches, each margined with three, or, where the spots fuse, two, series of small brown spots. Beneath yellowish white (in alcohol), with obsolete dusky blotches. A brown band, edged with blackish brown extends backwards on the neck from the outer margin of the parietal of each side. A brown spot on the frontal and parietals includes a small pale spot which lies partly upon the tip of the frontal. An obscure dark brown bar extends from orbit to orbit on the posterior portions of the prefrontals. Another bar extends from the eye to the angle of the mouth. The spots of the median dorsal row are about two and a half scales long and eleven wide. Posteriorly some of them are emarginate before and behind. Described from two examples in the Laboratory collection.

Total length of example from Pekin 40.75; tail 5.25.

Occurs on prairies throughout the State. Not very common. Pekin, southern Illinois (Mus. N. W. Univ.), Mt. Carmel (Nat. Mus.).

This species bears a very strong resemblance in the character of the plates of the head and the character and disposition of the spots to *Elaphis guttatus*. It has the same small eye, the same transverse band between the orbits, the oblique band

from the eye to the corner of the mouth and the elongate bands on the neck and back part of the head.

**Ophibolus triangulus**, Boie. MILK SNAKE, CHICKEN SNAKE, HOUSE SNAKE, THUNDER AND LIGHTNING SNAKE, KING SNAKE, CHEQUERED ADDER.

**Var. triangulum.**

*Coluber triangulum*, Boie, Isis, 1827, p. 537.

*Coluber eximius*, Holbr., N. A. Herp., 1842, III., p. 69. pl. 15. — De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 38, pl. 12, fig. 25.

*Ophibolus eximius*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 87.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Ablabes triangulum*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 315.

*Ophibolus doliatus*, subsp. *triangulus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist. I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci., 1883.

*Ophibolus triangulus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 65, 155, pl. 5, fig. 1.

**Var. doliatus.**

*Ophibolus doliatus*, Bd. and Gir., Cat. N. A. Rept. Pt. I., 1853, p. 89.

*Ophibolus doliatus*, subsp. *doliatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci., 1883.

*Ophibolus triangulus*, var. *doliatus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 66, 155.

Body cylindrical, maintaining its diameter well toward both extremities. Head of medium size. Neck rather thick in adults. Eye small. Tail short. All the dorsal scales perfectly smooth. Rostral plate wider than high. Loreal quadrangular. One anteorbital. Two postorbitals. Seven supralabials, eye above the third and fourth, lower postorbital resting in a notch between the fourth and fifth. Nine infralabials, the fifth much larger than the others. Dorsal scales in twenty-one rows, the scales of the median rows differing less in size from those of the lateral rows than usual. Ventrals about 211. Subcaudals about 52 pairs (a few occasionally united).

Color above pale brown or gray, with large dark brown or reddish brown dorsal blotches edged with black, and low down

on the flanks a series of small black spots with pale centers: some of the latter spots alternate with the brown dorsal blotches, while others are opposite them and may fuse with their black margins. Sometimes there are two series of spots on the flanks. Iris red. Tongue red, black-tipped. Yellowish beneath, checkered with black, paler anteriorly, often mostly black posteriorly from fusion of the black marks, spots sometimes confined to the sides. Head brown above posteriorly, sometimes with a cordiform or triangular pale spot behind the parietals; generally with a more or less distinct dark bar on prefrontals, reaching from one orbit to the other. A black dash extends from the eye to the corner of the mouth. Labials edged with black. The anterior dorsal brown spot generally includes the pale spot behind the parietals and extends upon the head; it frequently also fuses with the spot following.

Total length of example from Galesburg, 36; tail, 5.12.

Throughout the State. Moderately common. Freeport, Galesburg, Peoria (Brendel), Pekin, Hudson, Normal, Urbana, Mt. Carmel (Nat. Mus.), Cobden, Anna.

#### Variety *triangulus*.

With large chestnut-brown, black-margined dorsal spots separated by a gray or yellowish brown ground color. Checkered with black beneath. Everywhere common.

#### Variety *doliatus*.

With large red black-margined dorsal blotches and white or gray interspaces. The approximation of the black margins of adjacent blotches gives the effect of pairs of transverse black lines embracing pale bands. Beneath yellowish, with most of the black at the sides, or the surface mostly black.

Southern Illinois.

Farmers frequently find this species in their cellars, where it is supposed to be attracted by the milk. Its food, according to De Kay, consists of frogs and toads.

#### *Ophibolus rhombomaculatus*, Holbr.

*Coronella rhombomaculata*, Holbr., N. A. Herp., 1842, III., p. 103, pl. 23.

*Ophibolus rhombomaculatus*, Bd. and Gir., Cat. N. A. Rept. Pt. I., 1853, p. 86.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci., 1883.

*Ophibolus triangulus*, var. *rhombomaculatus*, S. Garman, Mem. Mus. Comp. Zool., 1883, p. 156.

Dorsal scales in twenty-one rows.

Light brown above with a large dorsal and two small lateral series of dark-margined reddish brown blotches. Salmon-red beneath, with very obscure dark blotches. A dark stripe extends from the eye to the corner of the mouth. Dorsal blotches about fifty-two (ten of which are on the tail), each about seven scales wide and from one and a half to two and a half scales long. Ventrals about 211. Subcaudals about 45. Southern Illinois (Davis and Rice).

## *Ophibolus getulus*, Linn. CHAIN SNAKE, KING SNAKE.

### Var. *getulus*.

*Coluber getulus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 382.

*Coronella getula*, Holbr., N. A. Herp., 1842, III., p. 95, pl. 21.

*Coluber getulus*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 37, pl. 10, fig. 21.

*Ophibolus getulus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 85.

*Coronella getula*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 616.

*Ophibolus getulus*, subsp. *getulus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 33.

*Ophibolus getulus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 68, 156, pl. 5, fig. 3.

### Var. *sayi*.

*Coronella sayi*, Holbr., N. A. Herp., 1842, III., p. 99, pl. 22.

*Coluber sayi*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 41.

*Ophibolus sayi*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 84.

*Coronella sayi*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 619.

*Ophibolus getulus*, var. *sayi*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 68, 156.

Body moderately stout. Width of the head but little greater than the diameter of the neck. Tail rather short, tapering. All the dorsal scales smooth. Rostral plate but little wider than high, convex, angulate between the interna-

sals. Frontal pentagonal or subhexagonal. Loreal present. One large anteorbital. Two postorbitals. Eye moderate in size. Seven supralabials, eye over the third and fourth, sixth largest, the succeeding plates rapidly decreasing in size. Dorsal scales in twenty-one rows. Ventrals 200-224. Subcaudals 41-52.

Color above black, with transverse yellow lines, which may be very narrow and not extend downwards on the flanks, or may be so wide as to give the prevailing color and bifurcate on the flanks, thus producing a dorsal series of large black or brown areas and another smaller lateral one for each side. Sometimes with a yellow dot on most of the dorsal scales. Beneath yellow, with squarish blotches of black. Mostly devoid of black beneath the head and neck; sometimes nearly black posteriorly from union of the blotches. Head black above, dotted with yellow. Supralabials and infralabials black-edged.

Throughout the State. Rare north, moderately common in the south part. Peoria (Brendel), Wabash and Richland counties (Ridgway), Anna and Dug Hill in Union county.

#### Variety *getulus*.

With from twenty-five to thirty-five transverse yellow lines which bifurcate on the flanks and divide the black of the dorsal surface into several series of large blotches. Most of the scales of the blotches uniformly black. This variety has not, to my knowledge, been found in Illinois.

#### Variety *sayi*.

Black, with more than sixty transverse yellow lines, sometimes mostly lacking, which, as a rule, do not bifurcate on the flanks. Sometimes most of the dorsal scales have a central yellow dot. This variety represents the species in the State. The young may be taken occasionally under logs in southern Illinois. I have not collected it north of Union county, but Dr. Brendel reports it from Peoria, and Dr. Hoy has taken it in Wisconsin, so that it may be looked for anywhere within our borders.

Variety *niger*, Linn.

Mr. Ridgway reports this variety from Mt. Carmel. It is unknown to me.

*Ophibolus doliatus*, Linn.

*Coluber doliatus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 379.—Harlan, Jour. Acad. Nat. Sci. Phila., 1827, V., p. 362.

*Coronella doliata*, Holbr. (not of Dum. et Bibr.), N. A. Herp., 1842, p. 105, pl. 24.

*Ophibolus doliatus*, subsp. *coccineus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 34; Bull. Chicago Acad. Sci., 1883.

*Ophibolus doliatus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 64, 154, pl. 5, fig. 2.

Body slender, cylindrical. Tail short. Dorsal scales smooth. Rostral plate wide. Frontal wide and short. One anteorbital. Two postorbitals. Loreal present. Supralabials seven. Infra-labials eight. Dorsal scales in nineteen rows. Ventrals 169–176. Subcaudals 31–43 pairs.

Color above light red, with from twenty to twenty-five pairs of transverse black bands which are continuous about the body, or are interrupted on the abdomen. Between each pair is a yellowish band.

Occurs in southern Illinois according to Davis and Rice. It is probably rare. I have not seen it.

This species may be known from the variety *doliatus* of *O. triangulus* by the fewer rows of dorsal scales and the character of the transverse black lines.

*Ophibolus elapsoideus*, Holbr.

*Calamaria elapsoidea*, Holbr., N. A. Herp., 1842, III., p. 119, pl. 28.

*Osceola elapsoidea*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 133.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 33; Bull. Chicago Acad. Sci., 1883.

*Ophibolus doliatus*, var. *elapsoideus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 65, 155.

*Ophibolus elapsoideus*, S. Garman, List. N. A. Rept. and Batr., Bull. Essex Inst., 1884.

Small. Body slender. Tail short. Rostral plate wide. Frontal wide and short, subhexagonal. Loreal absent, its place

occupied by a downward extension of the prefrontals. One anteorbital. Two postorbitals. Supralabials seven, sixth largest, eye above the third and fourth. Infralabials seven, fifth largest. Dorsal scales in nineteen rows, the outer scales of each side a trifle the largest. Ventrals 175-180. Subcaudals 44-54.

Bright red above, with eighteen to twenty-five pairs of transverse black bands, each pair enclosing a white band. Head red in front, marked with black posteriorly, and with a yellow band bounded by black bars on the occipital region. The black bands may be continuous around the body, or be interrupted on the ventral surface.

Anna; not uncommon (C. W. Butler).

#### DIADOPHIS, Bd. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 112.

Dorsal scales smooth, in fifteen to seventeen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. Two nasals. Loreal present. Two anteorbitals. Two postorbitals. Moderately slender. Head distinct from the body. Small species.

#### *Diadophis punctatus*, Linn. RING SNAKE.

##### Var. *punctatus*.

*Coluber punctatus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 376. — Holbr., N. A. Herp., 1842, III., p. 81, pl. 18. — De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 39, pl. 14, fig. 29.

*Diadophis punctatus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 112.

*Ablabes punctatus*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 310.

*Diadophis punctatus*, subsp. *punctatus*, Davis and Rice, Bull. Ill. State Lab Nat. Hist., I., No. 5, 1883, p. 35; Bull. Chicago Acad. Sci., 1883.

*Diadophis punctatus*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 72, 138, pl. 2, fig. 2.

##### Var. *amabilis*.

*Diadophis amabilis*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 113.

*Diadophis punctatus*, subsp. *amabilis*. Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 35; Bull. Chicago Acad. Sci., 1883.

*Diadophis punctatus*, var. *amabilis*. S. Garman, Mem. Mus. Comp. Zool., 1883, p. 159.

### Var. *arnyi*.

*Diadophis arnyi*. Kenn., Proc. Acad. Nat. Sci. Phila., 1859, p. 99.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 35; Bull. Chicago Acad. Sci., 1883.

*Diadophis punctatus*, var. *arnyi*. S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 72, 158.

Small. Head depressed. Tail short. Dorsal scales smooth. Rostral plate much wider than high. Frontal wide, the width well maintained posteriorly. One nasal, the nostril opening in its middle, or two nasals, with the nostril opening mainly in the anterior plate. Two anteorbitals and two postorbitals. Supralabials seven or eight, the third and fourth or the fourth and fifth beneath the eye. Supralabials eight or nine, the fifth large. Dorsal scales in from fifteen to seventeen rows. Ventrals about 141–193. Subcaudals 36–59 pairs.

Color above black or blackish brown, with a yellow band across the base of the head. Beneath yellowish, with a single median series or with numerous irregularly distributed spots of brown or black. Supralabials dark or yellow. Infralabials and other plates on the under side of the head uniform yellowish or each with a small brown spot. The yellow band of the base of the head varies in width from a single scale to three or even four scales, and may be interrupted in the middle; it is in most examples bordered before and behind with black.

Throughout the State. Not common. Rock Island (Nat. Mus.), Warsaw, Union county (Mus. N. W. Univ.).

### Variety *punctatus*.

Fifteen rows of dorsal scales. Uniform yellow below or without a median longitudinal series of dark spots on the abdominal scutellæ. Ventrals 148–160. Subcaudals 36–56.

### Variety *amabilis*.

Fifteen rows of dorsal scales. Yellow beneath, with numerous small black spots. Ventrals 182. Subcaudals 59.

Variety *arnyi*.

Seventeen rows of dorsal scales. Yellow beneath, thickly spotted with black. Occipital band from one to one and a half scales wide. Ventrals 160. Subcaudals 50 pairs.

A specimen of this species in the Laboratory collection from Warsaw, Hancock county, has the lower part of the rostral and, excepting a narrow superior border, all the supralabial plates but the last yellow. In some respects it resembles the form described by Prof. E. D. Cope as var. *stictogenys*.

## HETERODON, BEAUV.

Beauv., Latreille, Hist. Nat. Rept., 1799.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 51.

Dorsal scales carinated, in twenty-three to twenty-seven rows. Anal plate divided. Rostral plate plow-shaped, with a keel above. Two internasals, with a small azygos plate between them or separated by numerous small plates. Two prefrontals, in contact or separated by small plates. One or two loreals. Short and stout, with large, wide head and short tail. The species possess the power of expanding the body.

Internasals and prefrontals in contact with the azygos.

H. PLATYRHINUS.

Internasals and prefrontals separated from the azygos by small plates..... H. SIMUS.

*Heterodon platyrhinus*, Latreille. SPREADING ADDER, HOG-NOSE SNAKE, BLOWING VIPER.

Var. *platyrhinus*.

*Heterodon platyrhinus*, Latr., Hist. Nat. Rept., 1802, p. 32, pl. 28, fig. 1-3.—Holbr., N. A. Herp., 1842, IV., p. 67, pl. 17.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 51, pl. 13, fig. 28.—Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 51.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.—Dum. et Bibr., Erp. Gén., VII., 1854, p. 766.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 43; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 75, 159, pl. 6, fig. 5.

**Var. niger.**

*Heterodon niger*, Troost, Ann. Lyc. Nat. Hist. N. Y., III., 1833, p. 186.

Body stout. Head large. Snout recurved. Tail short and tapering. Dorsal scales, with the exception of the outer row of each side, carinate. Rostral plate produced forward, slightly recurved, anterior margins sharp, keeled above. Azygos plate elongate, bounded anteriorly by the rostral, at the sides by the internasals and prefrontals, and posteriorly by the prefrontals. Vertical longer than wide, hexagonal. Nine or ten anteorbitals, postorbitals, and suborbitals, with the supraciliary completely encircling the eye. Nostril valvular, situated in the posterior part of the nasal. A single loreal. Supralabials eight, increasing in size from first to seventh, eighth equal to fifth. Nine or ten infralabials. Dorsal rows of scales twenty-five. Ventrals about 140. Subcaudals 37-60.

Color above from grayish brown to black, in the lighter-colored examples with about thirty brown or black dorsal spots, with one or more series of smaller spots on each side, or with a series of squarish pale dorsal spots, margined before and behind with black and with a round black spot at each side. Often uniform brown above, sometimes blue-black. Beneath uniform whitish in adults, in young blackish or nearly uniform black. A dark bar, including the anterior margins of the supraorbitals and frontal and the posterior half of the prefrontals, extends from orbit to orbit. A bar on the head, behind the orbit, is continuous with a black bar which extends backward upon the neck. A short black vitta extends from the eye to the angle of the mouth.

Total length, 27.37; tail, 3.62.

Throughout the State; common south. Cook Co. (Kennicott), Peoria (Brendel), Tazewell Co., Belleville, Mt. Carmel, Union Co.

**Variety platyrhinus.**

Color above grayish to reddish brown, with dark bands.

Variety *niger*.

Nearly uniform brown, or bluish black, large.

Southern Illinois. Belleville, Mt. Carmel (Nat. Mus.), Saratoga.

A singular species known everywhere as the spreading adder from its habit of expanding the head and neck when disturbed. From its threatening behavior it is thought to be poisonous, but it has no fangs and is consequently perfectly harmless. I have seen the variety *niger* when suddenly exposed by turning over a log under which it was concealed, lash the body about violently and cast a yellowish material from its mouth, at the same time hissing and expanding to its greatest capacity. This variety when struck a sharp blow, will sometimes pretend to be mortally wounded, casting itself upon its back and persistently returning to that position when placed belly downward.

**Heterodon simus**, Linn. HOG-NOSE SNAKE.Var. *simus*.

*Coluber simus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 375.

*Heterodon simus*, Holbr., N. A. Herp., 1842, IV., p. 57, pl. 15.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 59.

*Heterodon simus*, subsp. *simus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 44; Bull. Chicago Acad. Sci., 1883.

*Heterodon simus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 16, 160, pl. 6, fig. 4.

Var. *nasicus*.

*Heterodon nasicus*, Bd. and Gir., Stansbury's Expl. and Surv., Val. Great Salt Lake, 1853; Cat. N. A. Rept., Pt. I., 1853, pp. 61, 157.

*Heterodon simus* var. *nasicus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 77, 160, pl. 6, fig. 6.

Small. Body stout. Head large, convex above. Tail very short, cylindrical, tapering. Dorsal scales all carinate excepting the outer row of each side; scales of the row next the outer with very faint carinæ on their basal portions. Rostral plate produced forward and upward, its anterior face flat,

keeled above, with sharp anterior margin. Azygos plate minute, surrounded by small plates which separate the internals from the nostril. Prefrontals small, separated by small intervening plates. Nostril large, valvular, in posterior part of nasal. Two or three loreals. From ten to thirteen small oculars, with the supraocular encircling the eye. Supralabials eight, sixth largest. Infralabials ten to thirteen. Submentals short. Dorsal rows twenty-three to twenty-seven. About 146 ventrals. Subcaudals about 40.

Color above yellowish brown, with a dorsal and two or three smaller lateral series of brown spots. Beneath yellowish, more or less blotched with squarish black marks, these sometimes giving the prevailing color. Throat and neck uniformly pale beneath. A brown band extends from orbit to orbit, arching slightly forward. Behind this a pair of bars, one on each side, extend from the upper posterior rim of the orbit toward the middle line. A wide brown band extends from the eye to the angle of the mouth. Wide bands extend from the parietals downward and backward on each side of the neck; a short band on the middle line meets them at the posterior margin of the parietals.

Total length of small Illinois example, 7.62; tail, 1.

Rare in Illinois. Pekin.

#### Variety *simus*.

About thirty-five spots in the dorsal series. Dorsal scales in twenty-five rows. From five to eight small plates about the azygos. Frontal plate as broad as long.

Credited to Illinois by Davis and Rice.

#### Variety *nasicus*.

About fifty spots in the dorsal series. Dorsal scales in twenty-three rows. Azygos encircled by many small plates. Vertical plate slightly broader than long.

The only example of the species in the collection of the State Laboratory represents this variety.

**HALDEA, Bd. AND GIR.**

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 122.

Dorsal scales in seventeen rows. Anal plate divided. Rostral normal. One internasal. Two prefrontals. Two nasals. Loreal elongate, with the prefrontal forming the anterior rim of the orbit. No anteorbitals. One postorbital. Small.

**Haldea striatula, Linn.**

*Coluber striatulus*, Linn., Syst. Nat., ed. 12, 1766, I., p. 375.—

Harlan, Jour. Acad. Nat. Sci. Phila., 1827, V., p. 354.

*Calamaria striatula*, Holbr., N. A. Herp., 1842, III., p. 123, pl. 29.

*Haldea striatula*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 122.

*Conocephalus striatulus*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 140.

*Haldea striatula*, Baird, U. S. Pac. R. R. Expl., 1859, X., Rept., pl. 32, fig. 91.— Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 32; Bull. Chicago Acad. Sci., 1883.

*Virginia striatula*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 97, 166, pl. VII., fig. 2.

Small. Moderately slender. Head scarcely wider than the neck. Tail short. Dorsal scales carinated. Rostral plate narrowed above. But one internasal, subtriangular. Prefrontals reaching the orbit. Nostril opening in the posterior margin of the anterior nasal plate. Loreal elongate, reaching the orbit. No anteorbitals. A single postorbital. Supralabials six, fifth largest. Dorsal scales in seventeen rows, the outer row of each side obsoletely, the rest distinctly carinate. Ventrals 119–130. Subcaudals 25–46 pairs.

Color above grayish or reddish brown. Beneath yellowish or reddish. A light chestnut band across the parietals; sometimes wanting.

Length about 10 inches.

Southern Illinois.

This species is reported from Wisconsin and other points to the north of us, and we may therefore look for it anywhere in the State.

## VIRGINIA, BD. AND GIR.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 127.

Dorsal scales smooth, in fifteen or seventeen rows. Anal plate divided. Rostral normal. Two internasals. Two prefrontals. Two nasals, nostril in the posterior edge of the anterior plate. Loreal large, with the prefrontal bounding the orbit in front. No anteorbitals. Two postorbitals. Small.

Dorsal scales in 17 rows.....V. ELEGANS.

Dorsal scales in 15 rows.....V. VALERIÆ.

## Virginia elegans, Kenn.

*Virginia elegans*, Kenn., Proc. Acad. Nat. Sci. Phila., 1859, p. 99.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 31; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 98, 166.

“Resembles *V. valeriæ*; vertical and occipital plates narrower. Dorsal scales very narrow and elongated, much more so than *V. valeriæ*, disposed in seventeen rows. Color uniform light olivaceous brown above; dull yellowish white beneath.”

“Readily distinguished from the nearly allied *V. valeriæ* by the narrower dorsal scales in seventeen rows instead of fifteen as in that species.”

“Heavily timbered regions of southern Illinois” (Kennicott), Mt. Carmel (Ridgway).

## Virginia valeriæ, Bd. and Gir.

*Virginia valeriæ*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 127.—Bd., U. S. Pac. R. R. Expl., 1859, X., Rept., pl. 33, fig. 94.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 31; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 98, 166, pl. 7, fig. 3.

Small. Head scarcely wider than neck. Tail short, tapering. Rostral about as high as wide. Internasals present. Prefrontals reaching the orbit. Frontal hexagonal. Nostril opening in posterior edge of anterior nasal plate. Loreal elongate, reaching the orbit. No anteorbitals. Two postorbitals. Supralabials six, fifth largest. Infralabials six, fourth largest.

Dorsal scales in fifteen rows, all smooth. Ventrals 117-128. Subcaudals, 24-37 pairs.

Grayish or yellowish brown, uniform, or with from two to four longitudinal series of black spots. Uniform yellow beneath. Spots of the back sometimes irregularly distributed.

Not common. Cook Co. (Nat. Mus.), Union Co. (Mus. N. W. Univ.).

### CARPHOPHIS, GERV.

Gerv., D'Orb. Dict. Nat. Hist., 1843, III., p. 191.

S. Garman, Mem. Mus. Comp. Zool., 1883, p. 99.

Dorsal scales smooth, in thirteen rows. Anal plate divided. Rostral normal. Internasals present or absent. One nasal. Loreal large, reaching the orbit. No anteorbitals. One postorbital. Very small. Head not distinct from the body, depressed. Tail short, terminating in a single acute nail.

No internasals ..... C. HELENÆ.

Internasals present ..... C. AMENÆ.

*Carphophis helenæ*, Kenn. WORM SNAKE.

*Celuta helenæ*, Kenn., Proc. Acad. Nat. Sci. Phila., 1869, p. 100.

*Carphophiops helenæ*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 31; Bull. Chicago Acad. Sci., 1883.

*Carphophis helenæ*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 100, 166.

Small. Body cylindrical, maintaining its diameter well toward the extremities. Head small, depressed, no wider than the neck. Tail moderately long, its tip covered by a sharp conical nail. A single pair of prefrontals, each of which forms part of the anterior boundary of the eye of its side. No internasals. One nasal, the nostril opening in its middle. An elongate loreal, forming part of the anterior rim of the orbit. No anteorbitals. One postorbital. Supraciliary unusually small. Frontal large, wide. Supralabials five, the fifth largest and elongated. Six infralabials, fourth largest. Dorsal scales in thirteen rows, all smooth and polished. Ventrals 120-125. Subcaudals 30-36.

Color above from pale to dark olive-brown. Supralabials, outer row of dorsal scales of each side, and entire ventral surface, flesh-color.

Total length of an example from Cobden, 9.62; tail, 1.68.  
Southern Illinois. Not uncommon. Mt. Carmel (Ridgway), Cobden, Dug Hill, Union county.  
Occurs under logs in the woods.

**Carphophis amœnus**, Say. GROUND SNAKE.

**Var. amœnus.**

*Coluber amœnus*, Say, Jour. Acad. Nat. Sci. Phila., 1825, IV., p. 237.—Storer, Bost. Jour. Nat. Hist., 1840, III., p. 28.

*Brachyorrhos amœnus*, Holbr., N. A. Herp., 1842, III., p. 115, pl. 27.

*Celuta amœna*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 129.

*Carphophis amœna*, Dum. et Bibr., Erp. Gén., VII., 1854, p. 131.—Allen, Proc. Bost. Soc. Nat. Hist., 1869, p. 182.

*Carphophiops amœnus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 31; Bull. Chicago Acad. Sci., 1883.

*Carphophis amœna*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 100, 167, pl. 7, fig. 1.

**Var. vermis.**

*Celuta vermis*, Kenn., Proc. Acad. Nat. Sci. Phila., 1859, p. 99.

*Carphophiops vermis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 31; Bull. Chicago Acad. Sci., 1883.

*Carphophis amœna*, var. *vermis*, S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 101, 167.

Small, cylindrical. Head small, not wider than the neck. Tail of moderate length, terminating in a point. Rostral wide. Internasals present. Prefrontals forming part of the anterior rim of the orbits. One nasal. Loreal large, elongate, reaching the eye. No anteorbitals. One postorbital. Supraciliaries very small. Supralabials five, the fifth largest. Infralabials six, third largest. Dorsal scales in thirteen rows, all smooth and shining. Ventrals 112–131. Subcaudals 24–36 pairs.

Lustrous brown or black above. Flesh-color beneath.

Reaches a length of about 12 inches, with the tail 1.50.

Occurs throughout the State. Not common. Cook Co. (Kennicott), Mt. Carmel (Ridgway).

**Variety amœnus.**

Brown above. Outer row of dorsal scales and ventral surface, flesh-color.

Variety *vermis*.

Black above. Two outer rows of dorsal scales and the ventral surface flesh-color. Larger than var. *amœnus*.

## FAMILY CROTALIDÆ.

With poison glands and erectile fangs, ordinary teeth few. Head wide and deep, with a deep pit between the eye and nostril. Cephalic plates crowded forward, or the frontal and two parietals wanting. One or two nasals. Loreal present or absent. Pupils of the eye vertically elongate. Most of the dorsal scales strongly carinated. Some or all of the subcaudal scutellæ united. Tail short, with or without rattle.

This family includes the rattlesnake, water moccasin, and copperhead. All are venomous, but not so dangerously so as is commonly supposed. They may be known from most of the non-venomous species from their stouter bodies, wider heads, and the pit between the eye and nostril. No harmless snake of this country has this pit. In regard to these depressions Owen writes: "Secreting follicles of the skin in serpents are chiefly confined to certain depressions or inverted folds of the derm. These in *Crotalus* and *Trigonocephalus* constitute a pit between the nostril and the eye on each side of the head." A few harmless species, such as the spreading adder, resemble the members of this family in stoutness of body. With the exception of members of the genus *Elaps*, the family contains the only venomous serpents in the United States. The four described below are the only poisonous species which occur in Illinois.

With a rattle. Frontal and parietals lacking. Supralabials separated from the eye by more than two series of small plates. Most of the subcaudal scutellæ entire. . . CROTALUS.

With a rattle. Frontal and parietals present. Supralabials separated from the eye by two series of small plates. The posterior subcaudal scutellæ divided. . . . . SISTRURUS.

Without a rattle. Frontal and parietals present. . . ANCISTRODON.

## CROTALUS, LINN.

Linnaeus, Acc. Mus. Adolph. Frid., 1754, p. 39.

Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 1.

Head deficient in cephalic plates, the frontal and parietals being absent and their place being occupied by small scales like those on the body. Pit between the eye and nostril large. Fangs and poison glands well developed. Supralabials separated from the orbit by three or more series of small plates. Dorsal scales in from twenty-one to thirty-one rows, carinated. Subcaudals entire or with one or two posterior divided. Rattle present. Body moderately stout. Tail short.

*Crotalus horridus*, Linn. TIMBER RATTLESNAKE.

*Crotalus horridus*, Linn., Syst. Nat., ed. 10, 1758, I., p. 214.

*Crotalus durissus*, Holbr. N. A. Herp., 1842, III., p. 9, pl. 1.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph. 1842, p. 55, pl. 9, fig. 19.—Kenn. Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.—Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 1.

*Caudisoma horrida*, Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 309.

*Crotalus horridus*, Davis & Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 27; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 115, 174, pl. 9, fig. 1.

Large, reaching a length of six feet. Body moderately short. Neck contracted abruptly behind the head. Tail short, compressed, not tapering. Rostral plate small, narrowed above. Two nasals, the anterior larger. Two or more loreals. Two anteorbitals, the superior larger, the inferior smaller and forming the superior margin of the pit. About five postorbitals and suborbitals, the latter separated from the supralabials by two rows of scales. Supralabials fourteen, first and fifth (fourth in some examples) largest. Fifteen infralabials. A pair of large elongate submentals. Dorsal scales carinate, excepting the outer rows, which are smooth or obsoletely carinate in front, in from twenty-three to twenty-five rows. Ventrals 165. Subcaudals 23, the first and last paired.

Color above brownish yellow to almost black, posteriorly with transverse zigzag bands of chestnut-brown, edged with black and bordered outside the black with yellow, anteriorly with three series of brown spots bordered in the same manner.

Beneath yellow, more or less blotched and speckled with black at the sides. Head uniform brown above, with a wide brown band extending from the eye obliquely downward and backward over the angle of the mouth. Tail black in adults, banded in young.

Total length of specimen from Mt. Vernon, 46; tail, with nine rattles, 4.50.

Throughout the State in hilly forest regions, but being rapidly exterminated. Cook Co. (Kennicott), Peoria (Brendel), Wabash Valley (Ridgway), Mt. Vernon, Union Co.

### SISTRURUS, S. GARMAN.

S. Garman, Mem. Mus. Comp. Zoöl., 1883, pp. 110, 176.

Wagler, Caudisoma, Syst. Amph. 1830, p. 176.

Bd. and Gir., Crotalophorus, Cat. N. A. Rept., Pt. I., 1853, p. 11.

With large symmetrical cephalic plates. Loreal present. Pit between eye and nostril large. Fangs and poison gland well developed. Supralabials separated from the orbit by two series of small scales. Dorsal scales in twenty-three to twenty-five rows, from one to three outer rows smooth. Subcaudals entire or but few divided. Rattle present. Body stout. Tail short.

### *Sistrurus catenatus*, Raf. MASSASAUGA, PRAIRIE RATTLE-SNAKE.

*Crotalinus catenatus*, Raf., Am. Month. Mag., 1818, IV., p. 41.

*Crotalophorus tergeminus*, Holbr. N. A. Herp., 1842, III., p. 29, pl.

5.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., 1842, Rept. and Amph. p. 57.—Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 14.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.

*Crotalophorus kirtlandii*, Kenn., l. c.—Dum. et Bibr., Erp. Gén., VII., Pt. II., 1854, p. 1482.

*Crotalus tergeminus*, Dum. et Bibr., Erp. Gén., VII., Pt. II., 1854, p. 1479.

*Caudisoma tergema*, Davis & Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 28; Bull. Chicago Acad. Sci., 1883.

*Crotalus catenatus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, p. 118, pl. 9, fig. 2.

*Sistrurus catenatus*, idem, l. c., p. 176.

Small. Body fusiform. Head moderately wide. Neck slender. Tail short, scarcely tapering. Dorsal scales carinate

except the two outer rows of each side. Rostral plates excavated below. Anterior nostril much the larger, reaching the posterior nasal and in contact above with prefrontal and supraciliary. Inferior anteorbital about half as wide. About four postorbitals and suborbitals. Supralabials small, about thirteen. Infralabials thirteen. Dorsal rows twenty-five. Ventrals 140. Subcaudals 28, generally a few posterior plates divided.

Color above gray to blackish brown, with a dorsal series of about forty chestnut-brown spots edged with black, and outside the latter color narrowly margined with white. On each side two or three series of smaller brown spots similarly margined. First dorsal spots with two arms which extend forward to the parietal plates. A wide brown band extends from the eye over the angle of the mouth and terminates on the side of the neck; it is margined above with pale yellow and below by a yellow bar which extends from the inferior anteorbital across the angle of the mouth. Superior labials mostly brown. Beneath thickly blotched with black, paler anteriorly.

Total length, 25.50; tail, with four rattles, 3 inches.

Prairies throughout the State. Cook Co. (Kennicott), Galesburg, Peoria (Brendel), Pekin, Normal, Farmer City.

### ANCISTRODON, BEAUV.

Beauvais, *Agkistrodon*, Trans. Am. Phil. Soc., 1799, p. 381.

Dum. et Bibr., *Trigonocephalus*, Erp. Gén., 1854, VII., p. 1488.

S. Garman, *Ancistrodon*, Mem. Mus. Comp. Zool., 1883, p. 120.

With symmetrical plates on the head. Loreal present or absent. Pit between the eye and nostril large. Fangs and poison glands well developed. Dorsal scales in from twenty-three to twenty-five rows, all strongly carinated. Posterior subcaudal plates divided. No rattle. Body short. Tail short, terminating in three elongate plates. Terrestrial or aquatic.

Includes the poisonous copperhead and the water moccasin.

Scales in 23 rows. Loreal present. Terrestrial. . . A. CONTORTRIX.

Scales in 25 rows. Loreal wanting. Aquatic. . . A. PISCIVORUS.

**Ancistrodon contortrix**, Linn. **COPPERHEAD.**

*Coluber contortrix*, Linn., Syst. Nat. ed. 10, 1758, p. 216.

*Trigonocephalus contortrix*, Holbr. N. A. Herp., 1842, III., p. 39, pl. 8.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 53, pl. 9, fig. 18.

*Aγκistrodon contortrix*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 17.

*Trigonocephalus contortrix*, Dum. et Bibr., Erp. Gén., 1854, VII., Pt. II., p. 1494.

*Ancistrodon contortrix*, Cope, Proc. Acad. Nat. Sci. Phila., 1859, p. 336.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 28; Bull. Chicago Acad. Sci., 1883.—S. Garman, Mem. Mus. Comp. Zool., 1883, pp. 120, 178, pl. 8, fig. 1.

Body moderately stout. Head wide. Neck slender. Tail short and tapering. All the dorsal scales carinate. Rostral large. Frontal pentagonal. Generally three prefrontals, the median very small. Loreal present, separating the posterior nasal from the superior anteorbital. Anteorbitals three, inferior minute. Postorbitals from four to six. Supralabials eight, the third not reaching the orbit. Infralabials ten. Dorsal rows of scales twenty-three. Ventrals about 150. Subcaudals about 45, the posterior in pairs.

Color above light chestnut-brown, with a series of inverted Y-shaped brown marks on each side. Color beneath yellowish, with a series of black blotches on each side. Head uniform brown above, each parietal with a small brown spot with a pale margin; sides with a yellowish white band which posteriorly rounds the angle of the mouth and extends forward on the infralabials.

Length from two to three feet.

Throughout the State; rare north, frequent south. Peoria (Brendel), Anna (C. W. Butler).

This species is very rare in northern Illinois, if it occurs there at all. Dr. Brendel reports having seen but two specimens at Peoria, and these more than twenty years ago. It is not uncommon in the southern part of the State, and Messrs. Boyer and Strode report it as not rare in Fulton county.

**Ancistrodon piscivorus, Lac. WATER MOCCASIN.**

*Crotalus piscivorus*, Lac., Buffon's Hist. Nat., Quad. Ovip. et Serpens, 1789, II., pp. 130, 424.

*Trigonocephalus piscivorus*, Holbr., N. A. Herp., 1842, III., p. 33, pl. 7.

*Toxicophis piscivorus*, Bd. and Gir., Cat. N. A. Rept., Pt. I., 1853, p. 19.

*Trigonocephalus piscivorus*, Dum. et Bibr., Erp. Gén., VII., Pt. 2, 1854, p. 1491.

*Ancistrodon piscivorus*, Cope, Proc. Acad. Nat. Sci. Phila., 1859, p. 336.

*Ancistrodon piscivorus*, subsp. *piscivorus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 28; Bull. Chicago Acad. Sci., 1883.

*Ancistrodon piscivorus*, S. Garman, Mem. Mus. Comp. Zoöl., 1883, p. 121, pl. 8, fig. 2.

Body short and stout, tapering toward both extremities. Head large, deep, wide. Neck slender. Tail short, compressed, tapering, abruptly more slender than the body. All the dorsal scales carinate. Rostral plate large, truncate above. Internasals triangular, the outer margin arcuate. Frontal large, longer than wide, hexagonal. Parietals large, their posterior extremities nearly or quite separated by transverse sutures. Nasals two. No loreal. Three anteorbitals, the superior large, elongate, and reaching the posterior nasal. Three small post-orbitals. Seven or eight supralabials, the third reaching the orbit. Ten infralabials. Dorsals in twenty-five rows. Ventrals 136. Subcaudals about 45, often the first, and generally from fifteen to twenty-five posterior, paired.

Color above brown or blackish, with about eleven transverse black bands alternating with as many brown bands, the latter widening on the back and with a dusky center, the black bands widening at the sides and often with a brown area in the expanded lateral portions. Sometimes nearly uniform blackish brown, often mostly brown with narrow transverse lines of black. With numerous black blotches beneath, black posteriorly. Head uniform brown or black above, with a wide black band, edged above with brown and below with yellow, extending from the eye over the angle of the mouth and terminating on the neck. Tail uniform black, or with a few pale spots beneath posteriorly, sometimes banded.

Total length of a very large specimen from Bluff Lake, 46 ; tail, 6.25.

Shallow lakes and bayous of southern Illinois, abundant. Bluff Lake, Union Co., Mt. Carmel (Ridgway).

The water moccasin is very abundant in the lakes of the southern part of the State. Mr. Ridgway of the National Museum states that it occurs as far north as Mt. Carmel, and thinks possibly even to Vincennes. During July it may be seen in great numbers coiled up on partly submerged logs, where it lies for hours basking in the sun. If disturbed it hisses and vibrates its tail after the manner of its relatives, the rattlesnakes, but always retreats into the water when approached too closely. Sometimes it makes its way up an inclined tree to a distance of six or eight feet above the water, but tumbles headlong into the water when alarmed. Mr. Peery, who lives at the edge of Bluff Lake, in Union Co., tells me that in the fall of the year this serpent leaves the water and resorts to the bluffs for hibernation. A female kept in confinement by Mr. C. W. Butler, of Anna, gave birth to young in the fall of the year. Dogs are occasionally bitten by this species, but generally recover after a spell of severe sickness.

All the Illinois examples of the species belong to the variety *piscivorus*. The variety *pugnax* may be known from the position of its second labial, this plate being crowded upward from the margin of the jaw. It has not been observed within our limits.

## CLASS AMPHIBIA.

Exoskeleton generally wanting. Two occipital condyles. Mandible of several pieces. No true diaphragm. Respiration during a part or whole of life by means of branchiæ. Heart in the adult with three chambers. Two aortic arches. Blood not warm, red corpuscles nucleated. Alimentary canal terminating in a cloaca. Oviparous.

Illinois members of the group belong to the two orders characterized below. Our species all have naked skins. A group (order Gymnophiona) represented by a few genera occur-

ing in Africa, South America, and Ceylon has small embedded scales, and is further characterized by absence of limbs and tail.

Body of adult stout, short. Hind legs suited to leaping and swimming. No tail. Frogs and toads. . . . . Order ANURA.

Body long and slender. Hind legs not enlarged for leaping and swimming, sometimes wanting. Tail and sometimes branchiæ persistent. Salamanders. . . . . Order URODELA.

## ORDER ANURA.

(Amphibia Ecaudata, Theriomorpha, Batrachia.)

Body stout, short, more or less depressed. With two pairs of legs, the anterior of which bear four, and the larger posterior pair five, digits. Mandible generally toothless. Adults tailless. Vertebral column composed of but few vertebræ and terminating in a long solid coccyx—the urostyle. Sternal arch complete. Radius and ulna fused. Tibia and fibula also fused. The two proximal tarsal bones very long and often fused at their extremities.

The adults are known as frogs and toads. They move on land by leaps, the structure of the posterior legs being specially suited to this mode of locomotion. In water they use the same legs for swimming. The food consists chiefly of small invertebrates, insects constituting the greater part of it. The young are known as pollywogs and tadpoles. They are fish-like, living in water, in which they swim with the aid of a tail, and breathing by means of branchiæ. Instead of teeth they possess horny jaws. At this stage of their lives they subsist chiefly on vegetable substances, such as filamentous Algae, diatoms, desmids, etc.

### SYNOPSIS OF THE FAMILIES REPRESENTED IN ILLINOIS.

- 1 (2). Fingers and toes with no evident discs at their tips. 3.
- 2 (1). Fingers and toes with evident discs. . . . . 7.
- 3 (4). Upper jaw with teeth. No overlapping sternal cartilages; omosternum and sternum present. Transverse processes of sacrum subcylindrical.

RANIDÆ.

- 4 (3). No teeth .....5.  
 5 (6). No parotid. Omosternum wanting, clavicle and precoracoid sometimes wanting. Transverse processes of sacrum expanded .....ENGYSTOMIDÆ.  
 6 (5). Parotid present. Sternal arch with clavicles, precoracoids and overlapping cartilages; omosternum wanting .....BUFONIDÆ.  
 7. With teeth. Sternal arch with overlapping cartilages; omosternum and sternum present. Transverse processes of sacrum expanded.....HYLIDÆ.

### FAMILY RANIDÆ.

No parotids. Fingers and toes generally without discs; the former without webs, the latter webbed; basal portions of fourth and fifth toes not bound together. Teeth on the upper jaw, and generally on vomers also. No fontanel between parieto-frontals. Omosternum and sternum present. Coracoids expanded, in contact with each other and narrowly separated from the precoracoids by cartilage. No epicoracoids. Transverse processes of sacrum subcylindrical. Urostyle articulated to two sacral concavities. Liver with three lobes.

A large and widely distributed family, including many large species. It is represented in Illinois by the single genus *Rana*.

### RANA, LINN.

Linnaeus, *Systema Naturæ*, ed. 10, 1758, I., p. 210 (S. Garman).

Hoffmann, Bronn's *Thier-Reich*, VI., Amphibien, p. 618.

Holbrook, *N. A. Herp.*, IV., p. 77.

Fingers and toes very slightly or not at all expanded at their tips, the former without webs, the latter more or less webbed. Tongue wide, free and deeply excised behind. Tympanum distinct. Skin smooth or slightly tuberculate. Glandular folds present or absent. Vomerine and maxillary teeth present. No fontanel between the parieto-frontals. Males with two lateral vocal sacs.

This genus includes all the large active frogs of swamps and meadows. Seven species occur in the State.

## SYNOPSIS OF THE ILLINOIS SPECIES.

1 ( 2). With distinct dark spots above, arranged in more or less perfect longitudinal rows.....3.

2 ( 1). Spots, when present, obscure and not arranged in longitudinal rows.....9.

3 ( 4). With more than two complete rows of spots between the glandular folds of the back.

## R. AREOLATA.

4 ( 3). With but two complete rows of spots between the glandular folds.....5.

5 ( 8). Spots oval or nearly round; glandular folds narrow and elevated.....6.

6 ( 7). Spots isolated, anterior of the three on the head small or wanting; males with saccular dilations behind the angles of the mouth.

## R. UTRICULARIA.

7 ( 6). Spots not isolated, anterior of the three on the head about equal to the others; males without saccular dilations.....R. PIPIENS.

8 ( 5). Spots squarish; glandular folds wide and depressed.

## R. PALUSTRIS.

9 (11). With distinct glandular folds on the sides of the back; size small or medium.....10.

10 (12). Tympanum large. No distinct dark spot extending from the nostril through the eye and including the tympanum.....R. CLAMITANS.

11 ( 9). No, or very indistinct, glandular folds. Size very large.....R. CATESBIANA.

12 (10). Tympanum very small; a distinct dark spot extending from the nostril through the eye and including the tympanum.....R. SILVATICA.

**Rana areolata**, Bd. and Gir.

*Rana areolata*, Bd. and Gir., Proc. Acad. Nat. Sci. Phila., 1852, VI., p. 173.

*Rana capito*, LeC. Proc., Acad. Nat. Sci. Phila., 1855, VIII., p. 425.

*Rana areolata*, Baird, Mex. Bound. Surv., 1859, III., Reptiles, p. 28, pl. 36, fig. 11 and 12.

*Rana areolata*, subsp. *capito*, Cope, Check List N. A. Batr. and Rept., 1875, p. 415.

*Rana circulosu*, Rice and Davis, Jordan's Man. Vert., 2d ed., 1878, p. 355.

*Rana areolata*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 41.

*Rana areolata*, subsp. *capito*, Rice and Davis, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, pp. 22, 23.

*Rana areolata*, subsp. *circulosu*, Rice and Davis, Bull. Chicago Acad. Sci., 1883.

Body about two and a half inches long, rather stout. Glandular folds conspicuous. A saccular dilation at the corner of the mouth in males. Skin tuberculate and punctate above, smooth below; femora granulate posteriorly. Head large, obtuse, with a marked concavity between the nostril and the eye. Fingers with slight web. Web of toes small and with deeply incurved margins.

Color above dark gray or slate-color, with about six longitudinal rows of round dark spots margined with yellowish. Sides marked with numerous spots and specks of black. Yellowish white beneath, with dark markings of irregular size and shape on the throat. Irides golden mingled with black. Anterior and posterior legs gray, the former with spots and the latter with alternating wide and narrow bands of black. Interspaces between larger markings speckled with dusky.

Length of body, 2.33; width of head, .89; femur, 1.06; tibia, 1.06; tarsus and fourth toe together, 1.64.

Rare. Northern Illinois.

The only specimen known to have been taken in Illinois was collected years ago by Robert Kennicott, and is now in the collection of the National Museum at Washington. In 1878 Messrs. Rice and Davis secured a specimen from northern Indiana and described it as a new species (*R. circulosu*), which, at a later date, they reduced to the rank of a variety. Kennicott's specimen was examined by them and pronounced identical with the Indiana specimen. The specimen at Washington is labeled *R. areolata capito*, and a study of more material from this region will probably show this name to be the right one for Illinois examples of the species.

**Rana utricularia**, Harlan.

*Rana utricularius*, Amer. Jour. Sci. and Arts, 1825, X., p. 60;  
Jour. Acad. Nat. Sci. Phila., 1826, V., p. 337.

*Rana halerina* (in part), Dum. et Bibr., Exp. Gén., 1841, VIII.,  
p. 352.

*Rana berlandieri*, Baird, Mex. Bound. Surv., 1859, III., Reptiles,  
p. 27, pl. 36, fig. 7.

*Rana halerina*, subsp. *berlandieri*, Cope, Check List N. A. Batr.  
and Rept., 1875.

*Rana utricularia*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus.,  
2d ed., Sal. Ecaudata, p. 40.

Size large; body about three inches long. Olive-green above, with isolated subcircular black spots. Legs spotted and banded with black. Pale below. Males with saccular dilations of the skin behind the angles of the mouth for the accommodation of the vocal sacs.

Length of body, 2.50; from tip of snout to axilla, 1.25; femur, 1.25; tibia, 1.37; tarsus and fourth toe together, 1.94. The above measurements are from a male taken near Philadelphia, Pa. A male from Macomb, Miss., is smaller.

Dunleith (Ridgway), Union Co.

The major part of the description of *R. pipiens* will apply to this species. The size, proportions, and the plan of markings are about the same in both species. The saccular dilations of the skin in the males of this species will readily distinguish them. Both sexes can probably, in most cases, be distinguished from those of *R. pipiens* by the character of the spots and by the general color. In this species the spots are fewer in number, are smaller, rounder, and more widely separated. The anterior of the three spots of the head is smaller than the other two, or may be wanting. The general color is more brown than green, and gives specimens a slight general resemblance to *R. palustris*. A few immature specimens of *Ranae* from Villa Ridge and Anna are referred with some hesitation to this species. One of the largest of these is a male of the year, and shows the distended skin at the corners of the mouth. The ground color of these specimens in life was slate-gray with a slight coppery tinge. The head, above, in males was pale green with a brassy tinge over the eyes and along the sides of the snout. Pupil of eye black; iris coppery above and

below, black anteriorly and posteriorly. Tympanum brown, with a pale center. Glandular folds yellow. Femora gamboge-yellow ventrally, and, in a female, with a wash of the same color along the flanks. The largest of these specimens measures 2.37 inches in length.

***Rana pipiens*, Schreber. LEOPARD FROG, SHAD FROG.**

*Rana pipiens*, Schreber, Der Naturforscher, 1782, p. 182 (S. Garman).

*Rana pipiens*, Gmel., Syst. Nat., ed. 13, 1788, III., p. 1052.

*Rana halcina*, Dum. et Bibr., Erp. Gén., 1841, VIII., p. 352.—Holbr., N. A. Herp., 1842, IV., p. 91, pl. 22.—De Kay, Nat. Hist. N.Y., I., Zool. III., 1842, Rept. and Amph., p. 63, pl. 20, fig. 49.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 593.

*Rana pipiens*, LeC., Proc. Acad. Nat. Sci. Phila., 1855, VIII., p. 424.

*Rana halcina*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 41.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 24; Bull. Chicago Acad. Sci., 1883.

*Rana pipiens*, S. Garman, Bull. Essex Inst., XX., 1888, p. 95.

Body about three inches long; slender. Males with no saccular dilations of the skin at the corners of the mouth. Skin smooth above and below, excepting that of the ventral posterior surfaces of the femora, which is granulate. Head obtusely pointed, sides scarcely arcuate. Margin of lower lip notched on each side of the symphysis, leaving a median knob. Tongue obcordate, with two small posterior lobes; free for half its length behind, and also extensively free at the sides. Nostril about midway between the tip of the snout and the anterior border of the eye. Eye large. Tympanum circular in outline; about two thirds the longitudinal diameter of the eye. A well-developed glandular fold extends along each side from the posterior upper margin of the eye nearly to the posterior extremity of the body, terminating above the femora. Two other folds, one for each side, extend along the upper lip obliquely downward and backward between the tympanum and the angle of the mouth, and terminate above the axilla. Margins of the webs deeply incurved between the toes, not extending beyond the base of the penultimate phalanx of the fourth

toe. Palms with two obscure tubercles; soles, each with a large and a small tubercle.

Green above, with more or less perfect series of pale margined oval black spots on the back, and with the legs spotted and banded with black. White or yellowish white beneath. Margin of the upper lip pale or green, with a dark band above the pale margin, often including spots of pale, extending posteriorly to the angle of the mouth. Above the dark stripe is a pale one which extends from near the tip of the snout posteriorly and passes upon the glandular fold, which is pale to its posterior extremity. An obscure dark band extends from the nostril to the eye, but is often interrupted, or may be represented by a black spot over the nostril only. Pupil of the eye black, iris golden. Tympanum brown, with a pale spot in its center. The head above is marked with three large spots of about equal size; one of these lies on the middle line just in advance of the eyes, the other two lie one above each eye. Between the glandular folds of the back are two longitudinal series of oblong and oval black spots, with about four or five spots in each series. Generally there are several extra spots between the series. The glandular folds of the back are yellow. Immediately below the folds is a series of large black spots, and beneath these are several large spots and a number of smaller round black spots of irregular size. Anterior legs spotted with black above, and constantly with a black dash on the base of the humerus. Posterior legs with black transverse bars above and with a few spots between the bands at the margins; sometimes only spotted. Posterior surface of femora vermiculate or spotted with black. Posterior surface of the tarsi with a more or less perfect black longitudinal band. Body beneath pale yellow or white, with a few small spots near the angle of the mouth, and sometimes with the lower lip and sides of the throat dusky.

Length of body, 2.69-3.56; from tip of snout to axilla, 1.25-1.68; femur, 1.37-1.87; tibia, 1.56-2.06; tarsus and fourth toe, 2.06-2.81. The measurements first in order were made in all cases from a male; the higher measurements were from females.

The species occurs in abundance throughout Illinois. Dunleith (Ridgway), Freeport, Cook Co. (Kennicott), Green R., Henry Co., Normal, Peoria (Brendel), Cairo, Grand Detour (Yarrow).

This frog can generally be distinguished from its near ally, *R. palustris*, by the shape of the spots on the back, by the equal size of the three spots on the head, by the narrower and more elevated glandular folds, and by the ground color above, which is green, brassy, or greenish gray, instead of brown. As a rule, this species has less black about the tympanum. Specimens are occasionally found which are nearly intermediate between the two species, and the young especially are often very similar. There still exists a difference of opinion as to whether or not the males of *R. pipiens* have external vocal sacs. The fact is that the *vocal sacs* are as truly external in *R. palustris* and *R. pipiens* as they are in *R. utricularia* (*R. berlandieri*, etc. of authors), and the difference between the two former and the two latter, in respect to the sacs, is that the *skin* behind the angle of the mouth is conspicuously distended to accommodate the sacs in *R. utricularia*, and is not thus expanded in the other two species. Of the many males of *R. pipiens* which have been examined from central Illinois none have the skin distended, but all have sacs just beneath the angle of the mouth between the skin and adjacent muscles. The species has been described as having internal vocal sacs, but the latter occupy the same position as in *R. utricularia*, and differ only in being smaller. Next to the bull frog, this is our most familiar species. It occurs everywhere along brooks and about ponds, and in damp weather may be found in fields at a considerable distance from water. During the dry weather in August it collects in great numbers about pools of water on the prairies. Its food consists of insects and, at least occasionally, of mollusks. In the few stomachs examined by the writer, Coleoptera constituted the principal part of the former. The mollusks were taken from the stomach of a single specimen and belonged to the genus *Limnæa*.

**Rana palustris, LeC. PICKEREL FROG, MARSH FROG.**

*Rana palustris*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1825, I., p. 282.—Dum. et Bibr., Erp. Gén., 1841, VIII., p. 356.—Holbr., N. A. Herp., 1842, IV., p. 95, pl. 23.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 62, pl. 22, fig. 60.—Cope, Check List N. A. Batr. and Rept., 1875.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 42.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 24; Bull. Chicago Acad. Sci., 1883.

Body about two and a half inches long. Males with no saccular dilations of the skin at the corners of the mouth. Skin smooth above and below, excepting granulated areas on the ventral posterior surfaces of the femora. Head obtuse, distinctly arcuate at the sides when viewed from above or below. Margin of lower lip notched on each side of the symphysis, leaving a median knot. Tongue obcordate, with two posterior lobes; free for half its length posteriorly, and also extensively free at the sides. Eye large. Tympanum circular in outline, about two thirds the longitudinal diameter of the eye. Nostril about midway between the eye and the tip of the snout. Palms with a pair of inconspicuous tubercles; soles with a large and a small tubercle each. Margins of webs incurved between the toes, not reaching beyond the penultimate phalanx of the fourth toe. A wide depressed glandular fold extends from the posterior margin of the eye along the sides of the back nearly to the posterior extremity of the body. Another glandular fold extends along the side of the head passing over the angle of the mouth posteriorly and terminating above the axilla.

Color above pale brown, with four series of large, quadrangular brown or black spots with pale margins. Under part of the body yellowish white; of the thighs bright yellow. Upper lips with dark irregular spots, forming in some examples an almost continuous stripe. Above this stripe is the yellow glandular fold, and above the anterior portion of the fold is a dark band which includes the nostril and extends to the anterior border of the eye. Pupil of the eye black; iris golden. Tympanum pale brown with some black at its center. Between the tympanum and the eye is a small triangular black spot. A black or brown bar extends from the posterior border

of the eye over the tympanum and downward behind the latter to the glandular fold of the side of the head. Head above with three dark spots, of which the anterior is smallest and is commonly minute. Between the bright yellow glandular folds of the sides of the back are two longitudinal series of squarish black or brown spots, sometimes united so as to form two wide longitudinal bands. Below the glandular fold of each side is another series of large dark spots, and still lower down on the sides are a few large spots and several smaller round spots. Anterior legs like the back above, with a dark dash at the base of the humeri and with a few other dark spots elsewhere; sometimes with a dark band along the posterior surface. Posterior legs banded and spotted with brown or black above, with the posterior surface of the femora marbled with black or with numerous small round spots. A black band extends along the posterior surface of the tibia. Lower lip more or less speckled with dark spots.

Length of body, 2-2.62; from tip of snout to axilla, .97-1.25; femur, .94-1.37; tibia, 1.03-1.50; tarsus and fourth toe, 1.37-2.06.

Wabash Valley (Ridgway), Bluff Lake in Union Co.

This species has been reported common throughout the State, but it is far from being so. It does not occur at all on the prairies of central Illinois, and it is doubtful if it is common anywhere within our limits. Two fine examples were taken in southern Illinois in the summer of 1883, and are the only ones taken during many years' collecting. These specimens differ from typical forms of the species from the East in several particulars. The spots are black and most of those of the two median series of the back are united so as to form two wide longitudinal bands. The entire throat back to the anterior limbs is obscurely marbled with dusky. The species bears a general resemblance to *R. pipiens*, but it is to be readily separated from the latter by the arcuate outline of the sides of the head, by the form of the spots, and by the wide depressed glandular folds. It will average smaller than *R. pipiens*. The males *do* possess vocal sacs, and in precisely the same situation as in males of the other species. The habits are much the same as those of the leopard frog. This species breeds a little earlier,

and in life is peculiar for its strong odor. It is said to utter a "prolonged grating note while floating at the surface of the water."

**Rana clamitans, Latr. SPRING FROG, GREEN FROG.**

*Rana clamitans*, Latr., 1801, Rept., II., p. 157 (S. Garman).

*Rana clamata*, Dam. et Bibr., Erp. Gén., 1842, VIII., p. 373.

*Rana clamitans*, Holbr., N. A. Herp., 1842, IV., p. 85, pl. 20.

*Rana fontinalis*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 62, pl. 21, fig. 54.

*Rana clamata*, Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 593.

*Rana clamitans*, Cope, Check List N. A. Ba'r. and Rept., 1875.

*Rana clamata*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 36.

*Rana clamitans*, Davis and Rice, Bull. Ill State Lab. Nat. Hist., I., No. 5, 1883, p. 24; Bull. Chicago Acad. Sci., 1883.

Body about three inches long; stout. Glandular folds on the side of the body evident. Males with no saccular dilations behind the angles of the mouth. Skin minutely roughened; granulate about the vent. Head of moderate size, obtusely pointed. Margin of lower jaw notched on each side of the symphysis, leaving a median projection. Tongue obcordate, with two posterior lobes, extensively free posteriorly and laterally. Nostrils about midway between the tip of the snout and the eye. Tympanum large, circular in outline, more than two thirds the longitudinal diameter of the eye. First finger extending beyond the second when the two are opposed. Palms with two indistinct tubercles, soles with but one tubercle. Margins of webs markedly incurved between the toes; reaching slightly beyond the base of the antepenultimate phalanx of the fourth toe. A well-defined glandular fold extends along the sides of the back from the posterior border of the eye nearly to the posterior extremity of the body. An indistinct fold also extends along the side of the head, lying between the tympanum and the corner of the mouth and terminating above the axilla.

Color above green or brown, darker posteriorly, with obscure black spots of irregular size. White beneath, throat yellowish. Tympanum brown. Pupil of eyes black; irides

golden. Anterior legs with a dark dash at their bases, and with a few dark spots elsewhere on the limbs, sometimes almost entirely black posteriorly. Posterior legs obscurely banded and spotted with black; posterior surface of thighs mottled; webs dusky. White below, with the lower lip dark-spotted, and in young specimens with the throat, flanks, and ventral surface of the femora mottled with dusky.

Length of body, 2.87; from tip of snout to axilla, 1.37; femur, 1.19; tibia, 1.25; tarsus and fourth toe together, 2. These measurements are from a small example.

The species occurs in all parts of the State. Ottawa, Champaign, Union Co.

This is a large species more closely resembling the bull frog than any other. The glandular folds of the sides, the length of the first finger as compared with the second, and the incurved margins of the webs between the toes will always enable one to separate the two species. The spring frog is very rarely found at any great distance from water. In the latter part of summer it may often be found on the banks of small woodland streams, but owing to its habit of diving headlong into the water when approached it is not easy to secure. Its flesh is frequently eaten.

### ***Rana catesbiana*, Shaw. BULL FROG.**

*Rana catesbiana*, Shaw, Gén. Zoöl. 1800-19, III., p. 106, pl. 33.

*Rana mugiens*, Dum. et Bibr., Erp. Gén., 1842, VIII., p. 370.

*Rana pipiens*, Holbr., N. A. Herp., 1842, IV., p. 77, pl. 18.—

De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 60, pl. 19, fig. 48.

*Rana catesbiana*, Cope, Check List N. A. Batr. and Rept., 1875.

—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882,

Sal. Ecaudata, p. 36.—Davis and Rice, Bull. Ill. State Lab.

Nat. Hist., I., No. 5, 1883, p. 25; Bull. Chicago Acad. Sci., 1883.

Body six inches, or more, long; stout. No glandular folds. Males without saccular dilations of the skin behind the corners of the mouth. Skin faintly tuberculate above, distinctly tuberculate on the sides; granulate in the region of the vent and on the posterior surface of the femora. Head very large and wide, obtusely pointed. Margin of lower jaw notched on each side of the symphysis. Tongue obcordate, with two

small posterior lobes; extensively free posteriorly and laterally. Nostril about midway between the tip of the snout and the anterior border of the eye. Tympanum very large, its diameter equal to or exceeding the longitudinal diameter of the eye. First finger extending but little or not at all beyond the second when the two are opposed. Palms with two tubercles each; soles with but one. Webs between the toes very large, reaching a little beyond the base of the distal phalanx of the fourth toe and quite to the tips of the other toes. Margins of webs not so strongly incurved as in *R. clamitans*.

Color above uniform olive-green or with obscure dusky spots, darker posteriorly. Head often bright green. Yellowish beneath. Pupil of the eyes black; irides golden. Tympanum brown or green, with a pale center. Anterior legs with a few dusky spots. Posterior legs obscurely banded and spotted with dusky; posterior surface of thigh mottled with black. Under parts more or less speckled and mottled with blackish.

Length of body, 6; from tip of snout to axilla, 2.06; femur, 2.25; tibia, 2.37; tarsus and fourth toe together, 3.94.

Common in all parts of the State in permanent waters. Lake Co., Peoria, Anna, Mt. Carmel (Yarrow).

This frog is one of the largest of its kind. It is widely known from its peculiar bass notes, which have a fancied resemblance to the expression "blood 'n' 'oun's." It rarely occurs away from the water and is most commonly seen at the margins of lakes or bayous, with only the head exposed. At such times it may be approached to within a short distance, and is often caught by throwing towards it a hook baited with a bit of red flannel. Frogs thus captured are often seen in the markets and command a good price. Its food consists of insects, mollusks, young frogs, young turtles, snakes, young ducks, and field mice; in fact almost anything that will pass between its capacious jaws. It passes more than one season in the tadpole state. It is extremely abundant in the shallow lakes in the northern and southern parts of the State.

***Rana silvatica*, LeC. WOOD FROG.**

*Rana sylvatica*, LeC., Ann. Lyc. Nat. Hist. N. Y., 1825, I., p. 282.

—Dum. et Bibr., Erp. Gén. 1841, VIII., p. 362 — Holbr., N. A. Herp., 1842, IV., p. 99, pl. 24.

*Rana temporaria*, subsp. *sylvatica*, Cope, Check List N. A. Batr. and Rept., 1875.

*Rana silvatica*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata.

*Rana temporaria*, subsp. *sylvatica*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 25; Bull. Chicago Acad. Sci., 1883.

Body about two inches long; slender. Males with no saccular dilations of the skin at the angles of the mouth. Glandular folds present. Femora granulate beneath. Head small, obtusely pointed. Nostrils slightly nearer the tip of the snout than to the anterior border of the eye. Tympanum very small. Margins of webs between the toes incurved.

Color above reddish brown, uniform in adults, more or less mottled with obscure dusky marks in young examples. A dark brown or black spot, which rapidly widens posteriorly, extends from the nostril through the eye, includes the tympanum, and is obliquely truncate above the anterior legs. Below this spot is a yellow band which in adults is lost in the ground color on the side of the snout, but in the young continues to the tip of the snout. Anterior legs with obscure dusky marks, with a distinct black dash at the bases of the humeri. Posterior legs with transverse dusky bands. Body white beneath, yellowish posteriorly, sometimes with faint dusky marks anteriorly.

Length of body, 1.52; from tip of snout to axilla, .60; femur, .72; tibia, .74; tarsus and fourth toe together, 1.00.

Northern Illinois, Peoria (Brendel).

This is the most nearly terrestrial of all our *Ranæ*. It is generally found in oak woods among the fallen leaves. It is one of the first species to awake from hibernation in the spring and resorts at once to the water to breed. This accomplished, it leaves the water and is not again found in it during the remainder of the season. The eggs were found by Prof. Putnam in Massachusetts, as early as the 18th of April, attached in a mass to a spear of grass. It feeds upon insects.

## FAMILY ENGYSTOMIDÆ.

No parotids. Tympanum concealed. Fingers and toes not expanded at their tips, the former without, the latter with or without, webs. No teeth. Hearing apparatus fully developed. Prefrontals fully developed, in contact with each other, and with the parieto-frontals. No overlapping sternal cartilages. Clavicles and precoracoids sometimes wanting. Transverse processes of sacrum dilated.

This is a small but widely distributed family containing eight genera and about twenty-one species. It is represented in North America by the single genus *Engystoma*.

## ENGYSTOMA, FITZINGER.

Fitzinger, Neue Klassifikation der Reptilien, 1826.

Dum. et Bibr., Erp. Gén. 1841, IX., p. 738.

De Kay, Nat. Hist. N. Y., I., Zoöl. III., 1842, Rept. and Amph., p. 65.

Head small, pointed, continuous with the body; mouth-cleft small; tongue free behind, elliptical, entire. Limbs stout and rather short. Eustachian ossicle very small. Males with an internal, sub-gular vocal sac.

The genus contains twelve species, most of which occur in tropical America.

*Engystoma carolinense*, Holbr. NEBULOUS TOAD.

*Engystoma carolinense*, Holbr., N. A. Herp., 1842, Vol. I., p. 83.—

Dum. et Bibr., Erp. Gén., 1841, VIII., p. 743.—LeC., Proc.

Acad. Nat. Sci. Phila., 1855, VIII., p. 430.—Gunther, Cat.

Batr. Sal. in Coll. Brit. Mus., 1858, p. 51.—Cope, Check List

N. A. Batr. and Rept., 1875.—Boulenger, Cat. Batr. Sal. in

Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 162.—Yarrow,

Check List N. A. Rept. and Batr., 1882.—Davis and Rice,

Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 18; Bull.

Chicago Acad. Sci., 1883.

Body stout, oval. Skin smooth, with a distinct fold just behind the head. Head depressed, flat above, triangular in contour. Eye small. Lower jaw incised at the symphysis, with a rounded eminence occupying the bottom of the incision. Legs rather short, but stout, the femora of the hind legs being

especially strong. Fingers and toes slender, cylindrical, with small round tubercles at the articulations below. One palmar and three plantar tubercles. The first or inner toe is shortest, the fourth very much the longest, while the two intermediate toes, the second and third, with the others, form a series the members of which regularly increase in length outward; the fifth toe is about as long as the second.

Color above olive-brown or gray, marked and spotted with dusky; below pale yellowish, closely marbled with purplish, but more yellowish posteriorly on the abdomen and under side of the femora. Two wide, poorly defined pale bands begin at the fold of the skin behind the eyes and pass backward and slightly downward to the insertion of the femora; they are bordered above by a sinuous band of interrupted elongate dark spots, and below by a wider continuous dark band, which in front passes immediately over the fore legs, through the eye and around the snout, where it unites with its fellow of the opposite side. Two dark bands cross the tibia. The throat of adult males is bluish black. The colors vary with age and, to some extent also, at the will of the animal. Older examples are darker, and the markings are in them more obscure. The characteristic markings are consequently more apparent on medium-sized specimens because of the paler color and consequent greater contrast between it and the dark marks. Examined with a lens, the skin of the body is seen to be sprinkled with minute dark specks, the closer aggregations of which form the dark spots, while their absence in numerous small irregular areas on the abdomens of the younger examples produces a fine mottling of the under side. Occasionally the pale bands on the sides of the back are so nearly the shade of the ground color as not to be apparent; and they may be rendered still more obscure by the absence of the dark band which generally bounds them above. A very young specimen before me has a series of small dark spots along the middle of the back. The feet are more or less spotted with dark above. A black spot over the vent seems to be constant.

Length of body of an adult male, 1; length of head from tip of snout to the cervical fold, .19; vertical diameter of head, .12; from tip of snout to axilla, .50.

Extreme southern part of the State.

This is a small, clumsy toad, with a very small head and disproportionately stout hind limbs. It has been reported from the most southern part of the State only, and is probably very rare even there. It is one of the species which, like the siren, water-moccasin, and red-bellied horn snake, mark southern Illinois as a part of a southern zoölogical sub-region. Outside Illinois the species is almost confined to the Southern States; though Dr. Holbrook thought he recognized its peculiar note in the State of New York. Of its habits but little can be written at present. LeConte found it abundant under logs in Georgia, and others have collected it among weeds. The peculiar form, small immersed head, small withdrawn eyes, and strong hind legs, suggest subterranean habits.

### FAMILY BUFONIDÆ.

Parotids present. Tympanum present or absent. Fingers and toes not expanded at their tips; the former perfectly free; the latter with small or large webs. Skin generally more or less warty. No teeth. Hearing apparatus fully developed. Superior plate of the ethmoid bone ossified, usually covered by the completely ossified parieto-frontals, or by these and the prefrontals together. Precoracoids present, divergent from the coracoids, the latter dilated, nearly or quite in contact, each connected with the former on the same side by a cartilaginous arch. Diapophyses of sacral vertebra dilated. Urostyle attached to two sacral condyles.

The family contains four genera, and ninety-nine species. Species belonging to the family are found in all the great zoölogical regions.

### BUFO, LAURENTI.

Laurenti, Synopsis Reptilium, 1768.

Hoffmann, Bronn's Thier-Reich, VI., Amphibien, p. 643.

Smith, Geol. Surv. Ohio, IV., Zoöl. and Bot. Pt. I., Zoöl., 1882, p. 702.

Head moderate in size, broadly rounded. Mouth rather large. Parotids well developed, with evident pores. Tympanum more or less distinct. Short and stout; fingers and toes

cylindrical or depressed; toes palmate or semipalmate. Skin warty or smooth (subgenus *Calophrynus*). Two metatarsal tubercles, one of which is very large and is situated at the base of the first toe. Tongue elongate, oval, free for a part of its length behind and at the lateral margins. Males generally with an internal subgular vocal sac. Pupil of eye elliptical and dilatable. Eustachian tube large.

Of the ninety-six species belonging to this genus, fifty-seven occur in the zoölogical region of which South America forms the greater part; seven occur in the North American region; and the remainder are distributed, some to each of the remaining regions of the globe.

### **Bufo lentiginosus, Shaw. THE AMERICAN TOAD.**

#### **Var. *lentiginosus*.**

*Rana lentiginosa*, Shaw, General Zoöl., III., Amph., 1802, p. 173, pl. 53.

*Bufo musicus*, Dum. et Bibr., Erp. Gén. VIII., 1841, p. 689.

*Telmatobius lentiginosus*, LeC., Proc. Acad. Nat. Sci. Phila., 1854, VII., p. 426.

*Bufo lentiginosus*, subsp. *lentiginosus*, Cope, Check List N. A. Batr. and Rept., 1875.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 17; Bull. Chicago Acad. Sci., 1883.

#### **Var. *americanus*.**

*Bufo americanus*, LeC., MS. (LeConte never printed a description of this variety).—Holbr., N. A. Herp., 1st ed., 1834, I., p. 75, pl. 9.—Baird, U. S. Mex. Bound. Surv., 1859, Reptiles, p. 25, pl. 39, fig. 1-4.

*Bufo lentiginosus*, subsp. *americanus*, Cope, Check List N. A. Batr. and Rept., 1875.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 17; Bull. Chicago Acad. Sci., 1883.

#### **Var. *lentiginosus* and *americanus*.**

*Bufo lentiginosus*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 308.

Body very stout, depressed. Skin tuberculate above, granulate below. Head not tuberculate except about the eyes, widely channeled longitudinally, with two ridges bounding the channel at the sides. Upper jaw incised at the symphysis; lower jaw incised on each side of the symphysis, leaving a symphy-

seal knob. Eyes large. Parotids large, elongate, imperfectly elliptical. Tympanum circular or slightly elongate vertically, its diameter a trifle greater than half the longitudinal diameter of the eye. Vocal sac of male opening by two large slits in the floor of the mouth, one on each side, just within the mandible. Legs short and very stout. Fingers a little depressed, with a few small tubercles beneath. First finger projecting nearly at a right angle to the others, and more enlarged at the base than they; the third finger longest. Palm with a large round callosity. Toes depressed, partly webbed, the first the shortest, the fourth much the longest. A large flattened process arises on the under side of the foot at the base of the first toe; on the outer side of the foot is a callosity about half the size of that on the palm.

The color varies with age and locality. The general color of adults is olive, or reddish or grayish brown above, with a narrow vertebral pale line and with spots of dark brown or black, margined with pale; pale below, immaculate or spotted with black. The color of the upper surface in old specimens is often so dark that the markings cannot readily be discerned. On well-colored specimens of medium size the following marks may be seen: Two small vertically elongate spots, one on each side of the middle line below and inside the nostrils; a quadrangular spot below the eye; a small spot between the latter and the elongate spots; an elongate spot between the anterior angle of the eye and the nostril; a large elongate spot extending from the inferior posterior rim of the eye to the angle of the mouth; two spots on the head, sometimes united and forming a band between the anterior angles of the eyes; two elongate spots, one on each side, lying on the lid of the eye and extending obliquely backward across the cranial ridges nearly to the median pale stripe; two small spots, one for each side, at the upper anterior margins of the parotids; two small spots near the median line, about opposite the middle of the parotids; two large spots, one for each side, near the upper posterior margins of the parotids; then follow several spots of different sizes on each side of the median line, and outside these are still others. All these spots on the back have a narrow pale margin. Under surface pale yellowish or whitish; immaculate or spotted with

black. Well-defined bands are frequently apparent on the legs of the younger examples, but in adults are generally obscured by the ground color. Tubercle at the base of first toe black-tipped. Tips of fingers and toes also sometimes black-tipped. The males are much smaller than the females, adults of the former not being more than one third the weight of a female with ripe ova. Length of head not much more than half the width of the same. Depth of the head, measuring from the under side of the closed mandible to the highest point of the cranial ridges, about one half the width of the head. Length of head contained about four times in the length of the body from tip of snout to tip of urostyle.

Length of body of an adult female, 3.62; width of abdomen, 2.75; depth of abdomen, 1.37. Length of body of an adult male, 3; width of abdomen, 1.31; depth of abdomen, 1.

#### Variety *americanus*

Cranial ridges not much elevated, not specially enlarged on the back of the head, slightly diverging posteriorly, and, at the back of the head, turning at right angles to the original course and reaching tympanum. Body very stout. Limbs short and strong. Skin very coarsely tuberculate above. Color above olive-brown, spotted as described above; below yellowish white, more or less spotted with black. In this variety the ridges on the head are never as prominent as in the adults of the variety *lentiginosus*. Occasional examples approach the other variety in the prominence of the ridges, but the latter are never so much enlarged behind. Generally the channel of the head is open behind, but in a large male before me it is completely closed by a transverse ridge passing from the posterior end of one longitudinal ridge to that of the other. The colors are, as a rule, darker in this variety. All the Illinois examples which have been studied, excepting very young ones, are spotted on the skin of the ventral side. These spots are most abundant in the region between the fore legs, and are sometimes so aggregated there as to form a large blotch. Some young examples have no other marks on the skin of the ventral side than this blotch. The throat is generally plain whitish, but

exceptions occur in which it is slightly spotted, and on a female before me are two black bands just within and parallel to the rami of the mandible. The posterior part of the abdomen and the ventral side of the thighs are generally pale.

Abundant throughout the State. Specimens have been studied from Freeport, Normal, Galesburg, and Centralia.

### Variety *lentiginosus*

Cranial ridges elevated and with a bulbous enlargement behind. Body less stout, limbs more slender, fingers and toes longer and more slender, mouth larger, eye larger, and skin very much less coarsely tuberculate, than in the variety *americanus*.

Two toads, now before me, from southern Illinois, differ from others collected in the central part of the State in so many particulars, and agree in many points so closely with the variety *lentiginosus*, as to warrant our including this variety in the fauna of the State. Attention was called to these toads by the peculiar note they uttered,—a note quite unlike the trill of toads which collect in ponds in central Illinois in the spring of the year. The note consists of a prolonged and rather shrill scream, repeated at short intervals at dusk in summer evenings. The toads themselves were more active than their more northern cousins, hopping with such celerity as to lead one quite a chase before they could be captured. In markings they agree well with the northern variety, but the ground color is more predominant, the spots being proportionately reduced in size. The entire ventral side of the body is yellowish white. The ridges of the head are not so much enlarged posteriorly as they are on large examples of this variety from the Southern States, but are markedly elevated behind. The most noticeable difference between these specimens and those of the variety *americanus*, from central Illinois, is in the smooth skin and slender legs and digits of the former. The foot and toes are especially slender and the webs are much reduced in size. The entire build of these two specimens is suggestive of the appropriateness of the name "land frog," given this variety by the early writers on American Herpetology.

Length of the two specimens 2.37 and 2.12 respectively.

Southern Illinois ; collected only at Anna and Villa Ridge.

Though at other seasons of a mild and timid disposition, the toad throws off its mildness and timidity with the first warm days of April and hies to some pool or wayside ditch in recklessly amorous humor. Here the sexes meet and, not without some animated discussion, partners are chosen. Soon afterwards the spawn is to be seen suspended among dead water plants, or lying on the bottom as strands of translucent gelatinous matter, in which at pretty regular intervals, the dark-colored eggs are imbedded. From these eggs small tadpoles or pollywogs are, a little later, excluded, and often in such numbers as to blacken the bottoms of pools. The tadpoles feed upon Algæ and other vegetable matter for several weeks, then acquire limbs, lose their tails by resorbtion, and appear on land as very small toads. Henceforth they live on land, excepting during the breeding season, and feed on animal food, chiefly insects. During the summer, toads lead the lives of hermits in shallow holes or under boards or stones, and are widely scattered. They are inactive during bright days and remain in their retreats, but at dusk and on cloudy days they may be seen in gardens and fields hopping about in search of insects. Of these nothing comes amiss. Stink-bugs, tumble bugs, and even stinging Hymenoptera may be taken from their stomachs. Predaceous beetles (*Carabidæ*) form a conspicuous element of the food of adult toads, the common genera *Harpalus*, *Evarthrus*, *Pterostichus*, and *Amara* being most largely represented. In the food of young toads, ants take the place of beetles to some extent. Injurious insects are frequently eaten, among them *Aphididæ*; but the greater part of the food of toads taken at random consists of insects which do not attract the attention of economic entomologists. Beneficial insects are perhaps as frequently eaten as injurious ones. The variety of species eaten at one time is astonishing. Sixteen genera, representing two classes of arthropods and five of the seven orders of one of them, have been determined from the contents of one stomach. The following list gives in the order of their importance the elements of the food of twelve stomachs of toads from .37 inch to 3 inches in length:

Carabidæ, Formicidæ, Coleoptera (miscellaneous), Chrysomelidæ, Hymenoptera (miscellaneous), Hemiptera (Pentatomidæ, Lygæidæ, Aphididæ), Orthoptera, Lepidoptera (larvæ), Diptera, Myriapoda, and Arachnida.

### FAMILY HYLIDÆ.

Parotids generally wanting. Tympanum present. Fingers and toes more or less expanded at their tips; the former with or without webs, the latter always more or less webbed; basal portions of the fourth and fifth toes bound together by the integument. Teeth always on the upper jaw; generally on vomers, and in one genus (*Pharyngodon*) on the parasphenoid. With or without a fontanel between the parieto-frontals. Omosternum and sternum present; sternum with overlapping cartilages. Transverse processes of sacrum more or less expanded. Urostyle attached to two sacral condyles. Vertebrae procœlian.

The three genera of this family which belong to the fauna of Illinois, agree in lacking parotids, in having maxillary and vomerine teeth, and in having a fontanel between the parieto-frontals. The family is represented in all the zoölogical regions except the Ethiopian.

#### SYNOPSIS OF THE GENERA REPRESENTED IN ILLINOIS.

- 1 (4). Digital discs small; fingers without webs.
- 2 (3). Webs reaching nearly to the tips of the toes. Tympanum not distinct. Transverse processes of sacral vertebra not much expanded.....*ACRIS*.
- 3 (2). Webs small, not reaching nearly to the tips of the toes. Tympanum distinct. Transverse processes of sacral vertebra widely expanded.....*CHOROPHILUS*.
- 4 (1). Digital discs large; fingers and toes with webs. Tympanum distinct. Transverse processes of sacral vertebra widely expanded.....*HYLA*.

## ACRIS, DUM. ET BIBR.

Dum. et Bibr., *Erp. Gén.*, 1841, VIII., p. 506.

Hoffmann, *Bronn's Thier-Reich*, VI., Amphibien, 1873-78, p. 647.

Smith, *Geol. Surv. Ohio*, IV., Zoöl. and Bot., Pt. I., Zoöl., 1882, p. 705.

Digits but slightly expanded at their tips. Toes with large webs; basal part of fourth and fifth toes bound together by the integument; fingers free. No parotid. Tympanum small and not distinct. Tongue short, cordiform, excised, and partly free behind. Teeth present on upper jaw and on vomer. Skin smooth or slightly roughened. Sacral diapophyses not widely expanded. Parieto-frontals embracing a fontanel. Males with a subgular vocal sac. The genus is peculiar to America.

*Acris gryllus*, LeC. CRICKET-FROG, PEEPER, SAVANNAH  
CRICKET.

Var. *gryllus*.

*Rana gryllus*, LeC., *Ann. Lyc. Nat. Hist.*, N. Y., 1824, I., p. 282.—

Harlan, *Jour. Acad. Nat. Sci. Phila.*, 1827, V., p. 340.

*Acris gryllus*, LeC., *Proc. Acad. Nat. Sci. Phila.*, 1854, VII., p. 426.

*Acris gryllus*, subsp. *gryllus*, Cope, *Check List N. A. Batr. and Rept.*, 1875.

*Acris gryllus gryllus*, Yarrow, *Check List N. A. Rept. and Batr.*, 1882.

*Acris gryllus*, subsp. *gryllus*, Davis and Rice, *Bull. Ill. State Lab. Nat. Hist.*, I., No. 5, 1883, p. 18; *Bull. Chicago Acad. Sci.*, 1883.

Var. *crepitans*.

*Acris crepitans*, Baird, *Proc. Acad. Nat. Sci. Phila.*, 1854, VII., p. 59; LeC., l. c., p. 426.—Baird, *Mex. Bound. Surv.*, 1859, *Reptiles*, III., p. 28, pl. 37, fig. 14-17.

*Acris gryllus*, subsp. *crepitans*, Cope, *Check List*, 1875.

*Acris gryllus crepitans*, Yarrow, *Check List*, 1882.

*Acris gryllus*, subsp. *crepitans*, Davis and Rice, *Bull. Ill. State Lab. Nat. Hist.*, I., No. 5, 1883, p. 18; *Bull. Chicago Acad. Sci.*, 1883.

*Acris gryllus*, Dum. et Bibr., *Erp. Gén.*, 1841, VIII., p. 507.—Boulenger, *Cat. Batr. Sal. in Coll. Brit. Mus.*, 2d ed., 1882, *Sal. Ecaudata*, p. 336.

Small. Upper surface of body and limbs with small scattered elongate or rounded warts of irregular size. Posterior part of skin of belly and the inferior posterior part of that covering the posterior femora distinctly granulate. Two large granules beneath the vent. Throat, chest, and the greater part of the limbs, smooth. A distinct fold of the skin across the chest between the fore legs. Tongue broad, slightly excised behind, and free for about one fourth of its length behind. Nostrils situated in slight eminences. Eyes prominent. A single large palmar callosity. The first finger of the male but slightly swollen. Two small conical plantar tubercles.

Color above, some shade of gray, brown, or olive-green, often with a median longitudinal diffuse band of red or green, and with several black spots, of which a triangular one between the eyes is constant and characteristic. Beneath pale. Upper jaw black or dark brown, with four vertical pale lines on each side. A narrow pale line extends from the lower posterior part of the eye to the base of the fore leg. Above this line lies an elongate black spot which extends from the eye towards, but does not quite reach, the fore leg. Behind the insertion of the fore leg, on the side, is a large oblique black spot margined with white. Another similar but smaller spot lies in advance of, and above, the insertion of the hind leg. The triangular spot between the eyes is narrowly margined with white, its apex pointing backward. The middle of the back is often occupied by a longitudinal red or green band, and immediately on each side of the latter are several obscure black spots. Color beneath pale, sometimes tinged with yellow on the throat. Throat more or less speckled with dusky or brown. Lower jaw pale, or with a few dark specks at the symphysis, becoming darker towards the angle of the mouth, from which point a dark dash passes to and upon the base of the fore leg. Legs and digits dark above, with round dark spots; pale and unmarked below. A black spot may often be visible over the vent, and generally a dark bar passes from this region along the posterior surface of the thigh.

Length of body, .87-1.25; from tip of snout to axilla, .28-.50; femur, 44-62; tibia, .62-.69; tarsus and fourth toe together, .69-.94 inch.

The species is one of the most abundant members of the family in all parts of Illinois. Specimens are in the collection of this Laboratory from Geneva, Cedar Lake, Colona, Geneseo, Peoria, Pekin, Normal, Urbana, Warsaw, Union county, and Cairo.

Size and color are extremely variable. In most specimens from central and northern Illinois the markings are all very obscure, and often the triangular spot between the eyes is so indistinct as to require close looking to detect it. Others of the marks described above may even be wanting, and in but few specimens are all the marks plainly visible. The greenish and reddish forms seem to be more abundant in southern Illinois. The skin of the more northern individuals is rougher, the warts often being elongate and ranged so as to form short ridges.

This is a rather coarsely built frog, bearing a close resemblance in build to the *Ranidæ*. It is more strictly terrestrial than our other *Hylidæ*, and probably never resorts to shrubs and trees. It is usually found at the margins of streams or pools, into which it leaps when disturbed, but only to return to the shore a short distance from the observer. It is a good swimmer, as its webbed hind feet indicate. Its note is a rapidly repeated grating noise, thought to resemble the trilling of a cricket, whence the name cricket-frog. Its food consists of insects, and if the habits of the frogs led them more frequently into cultivated grounds they would doubtless do good service to agriculture in destroying aphides. Among other insects, *Chlorops*, crane flies, *Thyreocoris*, *Calocoris rapidus*, numerous pupæ and wingless female *Aphididæ* and *Orthoptera*, have been determined from the contents of their stomachs. Examples nearly grown were taken November 17, 1888, under logs in the vicinity of a creek in Champaign county, where they were hibernating.

The variety *gryllus* of this species has been credited to Illinois and probably occurs about the shallow lakes of the south part of the State. LeConte's characterization of the two forms in the Proceedings of the Philadelphia Academy is the best extant, but the only difference he presents which in so variable a species is of varietal importance, is the size (1.4

inches for variety *gryllus* and 1.2 for variety *crepitans*). None of the Illinois specimens examined are more than 1.25 inches in length of body.

### CHOROPHILUS, BAIRD.

Baird, Proc. Acad. Nat. Sci. Phila., 1854, Vol. VII., p. 60. (*Chorophilus* and *Helocætus* of this reference are included in the genus as now used.)

Cope, Proc. Acad. Nat. Sci. Phila., 1865, p. 194.

Smith, Geol. Surv. Ohio, Vol. IV., Zoöl. and Bot., Pt. I., Zoöl., 1882, p. 704.

Digits but slightly expanded at the tips. Toes with very small webs; fingers free. Tympanum small but distinct. Tongue cordiform, excised, and partly free behind. Teeth present on upper jaw and on vomer. Skin more or less granulate. Sacral diapophyses widely expanded. Prefrontals separate from each other. Fronto-parietals embracing a fontanel, without a postorbital process. Males with a subgular vocal sac. The species are all American.

### *Chorophilus triseriatus*, Wiedman.

*Hyla triseriata*, Wiedman, Reise 1, 1839, p. 249.

*Helocætus triseriatus*, Baird, Proc. Acad. Nat. Sci. Phila., 1854, VII., p. 60.

*Chorophilus triseriatus*, subsp. *triseriatus*, Cope, Check List N. A. Batr. and Rept., 1875.

*Chorophilus triseriatus*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 335.

*Chorophilus triseriatus triseriatus*, Yarrow, Check List N. A. Rept. and Batr., 1882.

*Chorophilus triseriatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 19.

*Chorophilus triseriatus*, subsp. *triseriatus*, Davis and Rice, Bull. Chicago Acad. Sci., 1883.

Small. Small webs between all the toes. Vomerine teeth between, not behind, the internal nares. Dorsal surface finely, ventral surface coarsely, granulate. Upper surface of head, limbs, excepting the femora, and in males the throat, smooth. Tympanum circular in outline, about half the longitudinal diameter of the eye. Tongue elongate, slightly excised, and free behind for about a third of its length. Upper jaw very slightly

excised, lower rounded. Palm with numerous rounded tubercles. First finger of males greatly swollen at base. Two small plantar tubercles. Basal part of outer toes bound together by the integument. Skin of the throat greatly distended in males and thrown into longitudinal folds when the vocal sac is at rest.

Color above ash-gray or dull black, marked with spots and longitudinal stripes of brown or black. Below whitish, with a few brown specks on the side, and on the belly, behind the fore limbs. The upper jaw is margined by a dark stripe, which is widest in front and becomes gradually narrower on each side to the angle of the mouth. Above this stripe is another pale one which passes just beneath the eye and extends backward, between the angle of the mouth and the tympanum, to the base of the fore leg of each side. Both these bands are continuous around the snout. Above the pale stripe are dark bands, one for each side, which include the nostrils, rapidly widen to the eyes, and are continued behind them to or beyond the middle of the sides. Two other bands begin behind the eye, extend along the sides of the back, and terminate a short distance above and in front of the femora. A median dorsal band begins on the snout, expands abruptly between the eyes, and terminates at about two thirds the distance from the snout to the posterior end of the body. At its posterior termination lie two short stripes, one on each side of the middle line, reaching back toward the end of the body. Legs colored like the back above, with dark spots; pale below.

Length of body about 1.14; length from tip of snout to axilla, .5; femur of hind leg, .37; tibia of hind leg, .41; tarsus and fourth toe together, .69.

Occurs throughout the State. Specimens have been examined from Oregon, Plano, Normal, and Johnson county. Kennicott reports the species from Cook county.

The above description will apply to most normally colored adults; but it is to be remembered in using it that the species is subject to a good deal of variation in markings, with locality, age, and sex. The males are, as a rule, darker colored than females and young, and the latter may lack the dorsal stripes altogether, and may be speckled with brown. The median dorsal stripe generally expands between the eyes, but some-

times sends distinct branches to the latter, and in some examples these seem to have become isolated and form dark spots above the eyes. The stripe is often interrupted, and may be continuous with one or other of the short stripes which begin at its posterior end. The two latter may be united for a part of their length across the middle line.

With the first mild spring days, often before all the snow and ice of winter have disappeared, the loud trill of this small species may be heard from pools and ditches. The note is so resonant that on quiet evenings it may be heard a half mile or more and is commonly attributed to the larger frogs of the genus *Rana*. When the note is uttered the vocal sac is extended to its utmost and is larger than the head. Later in the season the note is not heard and the species is not often seen. It feeds upon insects. Hemiptera, Coleoptera, and insects of other orders may be found in its stomach.

#### HYLA, LAURENTI.

Laurenti, *Synopsis Reptilium*, 1768.

Hoffmann, *Bronn's Thier-Reich*, VI., Amphibien, p. 653; Cope, *ibid*, p. 612 (quotation).

De Kay, *Nat. Hist. N. Y.*, I., Zoöl. III., Rept. and Amph., 1842, p. 71.

Digits expanded into evident discs at their tips. Toes webbed, fingers more or less webbed, or free. Tympanum distinct. Eustachian tube well developed. No parotid. Tongue broad, entire or slightly excised, adherent, or more or less free behind. Teeth present on upper jaw and on vomers. Skin smooth or a little roughened. Sacral diapophysis widely expanded. A fontanel between the fronto-parietals. Inferior eyelid transparent. Males with one or two vocal sacs.

This is a genus of arboreal frogs, the members of it spending much of the time on trees and shrubs, to which they cling by means of the large digital discs. They are very active, leaping incredible distances when alarmed, but depending for protection mainly on a ready power of suiting their color to the surroundings. The species are most numerous in the neotropic region. Twelve species occur in North America of which but three have thus far been found in Illinois.

Green or gray, with a yellow stripe on each side. No dark markings. Body about 1.75 inch long. . . . . *H. CINEREA*.

With an X-shaped dusky mark on the back. Snout produced in front of the nostrils. Palms and soles not granulate. Body about .87 inch long. . . . . *H. PICKERINGI*.

With numerous irregular dark markings. Palms and soles granulate. Snout bluntly rounded; nostrils almost terminal. Body about 1.6 inch long. . . . . *H. VERSICOLOR*.

*Hyla cinerea*, Pennant. BULL FROG, GREEN TREE-FROG, CINEREOUS FROG.

**Var. *cinerea*.**

*Calamita cinerea*, Schneider, Amph., 1, 174, 1799 (as cited by S. Garman).

*Hyla lateralis*, Daudin, Hist. Nat. des. Rain., Gren. et Crap., 1802, p. 16, pl. II., fig. 1.—LeC., Ann. Lyc. Nat. Hist. N. Y., 1825, I., p. 279.—Harlan, Jour. Acad. Nat. Sci. Phila. 1826, V., p. 341.—Dum. et Bibr., Erp. Gén., 1841, VIII., p. 587.

*H. carolinensis*, Günther, Cat. Batr. Sal. in Coll. Brit. Mus., 1858, p. 105.—Cope, Check List N. A. Batr. and Rept., 1875.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 377.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 20; Bull. Chicago Acad. Sci., 1883.

**Var. *semifasciata*.**

*Hyla semifasciata*, Hallowell, Proc. Acad. Nat. Sci. Phila., 1857, p. 307.

Of medium size; about 1.75 inches long. Skin smooth above, largely granulate below. A single plantar tubercle; surface of palm with none. Body moderately slender; head large. Eye large and prominent. Tympanum circular in outline, about two thirds the longitudinal diameter of the eye. Mandible seen from below almost angulate in front, with a symphyseal knob. Tongue short, obcordate, free at the sides and for about one third its length behind; notched behind. Vomerine teeth in two short transverse rows between the internal nares. Skin of the belly and that of the inferior posterior part of the femora distinctly and closely granulate. Middle of throat also with a few small granulations. Skin elsewhere smooth. Webs

of fingers very small; discs large, that of the first digit smallest. Hind legs long and slender. Webs of toes extending to the base of the distal phalanx in all but the fourth toe, where they reach the base of the penultimate phalanx; discs not as large as those of the fingers.

Color above from bright pea-green through various shades of gray to almost black, with specks of orange on the back, and a wide buff or silvery stripe beginning at the tip of the snout and extending along the upper jaw, under the tympanum and along the side, to the posterior end of the body, or terminating on the side of the abdomen. Iris golden, pupil elongate in life. Color beneath yellowish or flesh-color, unspotted; throat at the angle of the mouth greenish. Legs green or gray above, pale beneath; discs and webs pale. A pale stripe extends along the posterior face and upon the base of the fourth finger of the anterior leg. A similar pale stripe extends along the posterior face of the tarsus and is continued upon the fifth toe of the posterior leg.

Length of body, 2.06; from tip of snout to axilla, .75; femur, 1; tibia, 1.06; tarsus and fourth toe together, 1.44. The foregoing measurements are taken from a single Illinois example, and are above the average for the species. Typical examples of the species are said to average less than 1.5 inches in length.

Southern Illinois. Abundant about lakes.

An example of this species from Bluff Lake, Union county, conforms more closely with Hallowell's variety *semifusciata* than with type forms of the species. It differs from the latter in its greater size and in that the lateral pale stripe terminates on the middle of the side. This stripe was, in life, bordered below on the snout, and both below and above on the side, with dusky. The pale stripe on the posterior face of the anterior leg was also bordered below by a dusky line.

This is the most beautiful tree-frog of our fauna. It lives on the leaves of plants, frequenting especially lily pads and other aquatic vegetation at the edges of lakes. It occurs also, at times, in fields of corn. Its food consists of insects, the common fly being, it is said, preferred. Its note resembles the tone of a cow bell heard at a distance. Where abundant

about water, the frogs are very noisy just before dusk, the chorus being broken, however, by longer or shorter intervals of silence. A single note is first heard, and, as if that were a signal, it is taken up and repeated by a dozen noisy throats till the air is resonant with the sound. After a time it ceases as suddenly as it began, to be again resumed after a period of quiet.

**Hyla pickeringi**, Holbr. CASTANET TREE-FROG, PIPING TREE-FROG.

*Hylodes pickeringii*, Holbr., N. A. Herp., 1842, IV, p. 135, pl. 34.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 69, pl. 20, fig. 51.

*Hyla pickeringii*, LeC., Proc. Acad. Nat. Sci. Phila., 1854, VII., p. 429.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 593.—Cope, Check List N. A. Batr. and Rept., 1875.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 399.—Yarrow, Check List N. A. Rept. and Batr., 1882.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 20; Bull. Chicago Acad. Sci., 1883.

A small delicate species, about .87 inch long. Skin mostly smooth above, granulate beneath and on sides. Palms with a few small tubercles and one large one; base of first finger with a tubercle. Soles smooth, with a well-developed tubercle at the base of the first toe, and a minute one at the bases of the fourth and fifth toes, the latter sometimes wanting. Body very slender; head large and long, flat above; limbs slender and weak. Snout produced, distinctly projecting beyond the nostrils, somewhat angulate. Mandible seen from below rounded in front, the sides less divergent posteriorly than usual; not swollen in front so as to form a knob. Tongue large, obcordate, notched, and in part free behind. Tympanum slightly elongate vertically, its vertical diameter about two thirds the longitudinal diameter of the eye. Dorsum mostly smooth, with a few granules above each eye. Belly and ventral surface of femora coarsely, throat and ventral portion of the sides finely, granulate. Surface elsewhere smooth. Fingers longer and more slender than usual, the third especially long; web wanting between the first and second fingers, almost imperceptible between the others. Toes also long and slender; webs very

small, minute between the first and second toes and only reaching the base of the antepenultimate phalanx of the fourth toe. Discs at tips of digits only moderately large.

Color above some shade of gray or brown, with narrow lines of dark brown or black, the principal of which are disposed on the back in the form of a large letter X; pale beneath. The ground color is usually pale brown. The anterior arms of the X-shaped mark converge from just behind the eyes to the middle of the back, where they meet; and from this point the two posterior arms diverge posteriorly and ventrally. Another mark behind this sometimes resembles an inverted letter V. A dark band, well defined above but fading into the ground color below, extends along the side of the snout to the anterior border of the eye. A wider band, which includes the tympanum, extends from the posterior border of the eye toward the base of the anterior leg. Two lines, one above each eye, sometimes unite across the median line and form a triangular spot. Iris golden, pupil black. The legs above are like the back in color and are banded with brown, two or three wide bands occurring on the femora and on the tibiae. A dark line is generally present on the posterior surface of all the legs. A dark spot overlies the vent. Body and legs uniformly pale beneath, or with the throat yellowish, speckled with dusky.

Length of body, .87; from tip of snout to axilla, .44; femur, .44; tibia, .5; tarsus and fourth toe, .69. These measurements are from a single specimen.

The species is sparingly distributed throughout the State. Cook county (Kennicott), Aux Plains River (Ridgway), Running Lake in Union county.

Though so delicate in appearance this tree-frog is really one of the most hardy of our frogs. In Massachusetts Mr. J. A. Allen found it the first to become active in the spring, and often when the weather was severely cold. The eggs were found by Prof. F. A. Putnam on the 17th of April, placed singly upon plants at some distance apart. The note is a clicking or piping noise.

**Hyla versicolor, LeC. COMMON TREE-TOAD.**

*Hyla versicolor*, Ann. Lyc. Nat. Hist. N. Y., 1825, I., p. 281.—Harlan, Jour. Acad. Nat. Sci. Phila., 1826, V., p. 343.—Dum. et Bibr., Erp. Gén. 1841, VIII., p. 566.—De Kay, Nat. Hist. N. Y., I., Zool. III., 1842, Rept. and Amph., p. 71, pl. XXI., fig. 53.—Holbr., N. A. Herp., 1842, IV., p. 115, pl. XXVIII.—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 592.—Cope, Check List N. A. Batr. and Rept., 1875.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Ecaudata, p. 372.—Yarrow, Check List, 1882.—Davis and Rice, Bull. Ill State Lab. Nat. Hist., I., No. 5, 1883, p. 20; Bull. Chicago Acad. Nat. Sci., 1883.

Toad-like; of medium size, about 1.6 inches long. With small warts above; closely granulate over most of the ventral surface. Palms granulate, with a large grooved tubercle; a second tubercle on the basal part of the first finger. Soles granulate, with an elongate tubercle at the base of the first toe, and a very small one at the base of the fourth and fifth toes. Body stout; head only moderately large; limbs strong. Snout bluntly rounded. Mandible seen from below rounded or truncate in front, produced upwards at symphysis, but not swollen in front, as in *H. cinerea*, so as to form a knot. Tongue very short and broad, free for about one third its length behind, and with a small notch. Vomerine teeth in two short rows, slightly separated, between the internal nares. Eye large. Tympanum about two thirds the longitudinal diameter of the eye, beneath a rounded fold of the skin. Warts of the dorsal surface small and isolated; entire under surface granulate, that of the abdomen sharply and closely; that of the throat more finely and less closely; while that of a wide strip between the anterior legs is minutely granulate or nearly smooth. Legs obscurely granulate excepting the posterior surface of the humeri and the upper surface (proper) of the posterior feet, which are smooth, and the ventral surface of the femora, which are sharply and closely granulate. Webs of fingers small; of toes rather large, reaching the distal phalanx in all but the fourth toe, where they reach the penultimate.

Color above ash-gray, brown, or green, variously marked with dark bands and spots. A pale spot beneath each eye with a dark one behind it, and an oblique dark band on the head

above each eye are constant. Beneath pale, throat dusky, or with a few dark specks; yellow on posterior part of belly and ventral side of femora. Upper lip more or less dusky. A dark band extends from the nostril to the anterior upper angle of the eye. A quadrate pale spot lies between the eye and the angle of the mouth, and is bounded posteriorly by a dark spot, which extends from the posterior rim of the eye upward and backward, including the tympanum, toward the base of the anterior leg. Markings of the back brown or blackish, with narrow black margins. Two bands start, one on each side, from the dorsal margins of the eyes and extend toward the middle line and posteriorly; they are sometimes united across the line. The spots of the back are large, of very irregular form, and are not just alike in any two specimens. Sometimes the greater part of the surface is occupied by a brown patch, with processes of the same color passing out from it; often four smaller spots lie two on each side of the middle line; and various other degrees of fusion or isolation of the spots occur. Flanks with small brown spots. Legs and feet dark above, banded with brown or black; pale below. Femur with two dorsal transverse bands, marbled posteriorly with purple or brown, yellow below; tibia also with two dorsal bands; tarsus with one band.

Length of body, 1.44-2; from tip of snout to axilla, .62-.87; femur, .69-.92; tibia, .71-.94; tarsus and fourth toe together, .94-1.21.

Common throughout the State. Cook county (Kennicott), Aux Plains River (Ridgway), Yorkville, Rock Island, Galesburg, Peoria (Brendel), Normal, Anna.

Besides the variation in the markings of adults, noted above, there is great variation in the ground color, dependent on a number of circumstances. Young specimens taken on the leaves of plants are green, with few or no dark marks. Adults also vary in general color from greenish through shades of gray to almost white, but the color most common is ash-gray. This frog is commonly found on fences, the walls of buildings, the trunks of trees, or on leaves of plants. Its note is often heard in midsummer in the evening and just before rains. The voice is ventriloquous, and this, with the power which the frogs

possess of suiting their color to the surface they rest upon, makes their capture difficult. They pass the winter in hollow trees and logs. The food consists of insects; ants, moths, and Coleoptera (click beetles, etc.) being found in their stomachs. A small specimen from southern Illinois, taken on blackberry leaves, had stuffed its stomach with numbers of a small ant, *Cremastogaster lineolata*.

The "mummified frog" referred to by Dr. R. W. Shufeldt in "Science," Vol. VIII., p. 279, obtained from a lump of coal in Bloomington, McLean county, Illinois (Shufeldt writes it McLean Co., Penn., and later corrects to Burlington, Ill.), was examined at the Illinois Laboratory soon after it was found. It was beyond doubt a dried up example of this species which, by some accident, had got among the coal.

## ORDER URODELA.

(Amphibia Caudata, Icthyomorpha, etc.)

Body elongated and more or less cylindrical. Anterior and posterior legs of nearly equal size (posterior pair wanting in the family Sirenidae). Digits varying as follows: 2-2, 3-2, 3-3, 4-4, or 4-5, the last combination being the commonest. Mandible generally with teeth (wanting in the Sirenidae). Adults with tails. Vertebral column composed of many vertebrae, with no terminal solid coccyx. Sternal arch not complete, the clavicles and coracoids not meeting at the ventral median line. Radius and ulna not fused. Tibia and fibula separate. Proximal tarsal bones not elongate nor fused at their extremities.

The adults are known as tritons, salamanders, and mud-puppies. They move on the land by walking or running, and swim in the water by an undulating movement of the tail and body. The food consists of insects, Crustacea, and mollusks. The young are generally tadpoles, living in the water and respiring by means of branchiae (a few never enter the water at any age). They possess teeth like those of the adults and feed mainly upon animal food, Entomostraca, Branchiopoda, and Cladocera often constituting the greater part of it. They may be known from the tadpoles of the order Anura, by their more elongate bodies and the absence of horny plates on the jaws.

SYNOPSIS OF THE FAMILIES REPRESENTED IN ILLINOIS.

- 1 ( 2). Branchial tufts persistent.   Vertebræ amphicœli-  
an .....11.
- 2 ( 1). Branchial tufts lacking in adults .....3.
- 3 ( 4). Vertebræ amphicœlian .....7.
- 4 ( 3). Vertebræ opisthocœlian .....5.
- 5 ( 6). Tongue small, and free only at the sides.   Palatine  
teeth in two longitudinal series.   No parasphe-  
noid teeth.   Occipital condyles sessile.

PLEURODELIDÆ.

- 6 ( 5.) Tongue rather large, free laterally and posteriorly.  
Palatine teeth in transverse series.   Two para-  
sphenoid patches of teeth.   Occipital condyles  
with pedicels.....DESMOGNATHIDÆ.

- 7 ( 8). Tongue attached by a pedicel and all its margin  
free, or by a narrow median strip, and free later-  
ally and posteriorly.   Palatine teeth transverse.  
Parasphenoid teeth present.   Carpus and tarsus  
cartilaginous.   Pterygoids wanting.

PLETHODONTIDÆ.

- 8 ( 7). Tongue largely attached, free in front and at the  
sides .....9.

- 9 (10). Branchial apertures closed in adults.   Palatine  
series of teeth nearly or quite transverse, on the  
posterior margin of the palatine bones.   No  
parasphenoid teeth.   Carpus and tarsus ossified.  
Pterygoids present.....AMBLYSTOMIDÆ.

- 10 ( 9). Branchial apertures open (in our species) or closed.  
Palatine series of teeth not transverse, on the  
anterior margin of the palatine bones.   Carpus  
and tarsus cartilaginous.....MENOPOMIDÆ.

- 11 (12). With two pairs of legs.   Jaws provided with teeth.  
Teeth on the roof of the mouth in an arched  
series .....PROTEIDÆ.

- 12 (11). Posterior legs and the pelvic bones lacking. Jaws with horny plates instead of teeth. Teeth on the roof of the mouth in two large patches.

SIRENIDÆ.

### FAMILY PLEURODELIDÆ.

Branchial openings closed in adults, no tufts. Fingers four; toes five. Palatine teeth in two longitudinal series borne posteriorly on processes of the palatine bones, which project backward beneath the parasphenoid. Eyelids present. Teeth on maxillaries and premaxillaries. No parasphenoid teeth. Tongue free at the sides. Parietals not embracing frontals. Pterygoids and prefrontals present. Occipital condyles sessile. Carpal and tarsal bones ossified. Ribs small. Vertebrae opisthocœlian.

### DIEMYCTYLUS, RAFINESQUE.

Rafinesque, Ann. Nat., 1820.

Cope, Proc. Acad. Nat. Sci. Phila., 1859, XI., p. 126.

Smith (Notophthalmus), Tailed Amphibians, 1877, p. 103.

Tongue small, free at the sides. Palatine teeth in two longitudinal series which diverge slightly posteriorly. Processes from the frontals and tympanic bones forming an arch behind the orbit. The first and fifth toes rudimentary. Tail strongly compressed. Skin above the eyes and on the jaws with large mucous pores.

Two species referable to this genus occur in the United States. The following is the only one which occurs in the Eastern and Middle States. It is the closest ally of the European tritons which our fauna furnishes us.

*Diemyctylus miniatus*, Raf. NEWT, EFT, EVET, RED EFT, SPOTTED TRITON.

Form *miniatus*.

*Triturus miniatus*, Raf. Ann. Nat., 1820.

*Notophthalmus miniatus*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 284.

*Salamandra symmetrica*, De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 73, pl. 15, fig. 33.

*Salamandra coccinea*, De Kay, l. c., p. 81, pl. 21, fig. 54

*Notophthalmus miniatus*, Kenn., Trans. Ill. State Agr. Soc. 1853-54, I., p. 593.

*Diemyctylus miniatus*, subsp. *miniatus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 15; Bull. Chicago Acad. Sci., 1883.

### Form *viridescens*.

*Triturus viridescens*, Raf., Ann. Nat., 1820.

*Notophthalmus viridescens*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 284.

*Triton millepunctatus*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 84, pl. 15, fig. 134.

*Notophthalmus viridescens*, Kenn., Trans. Ill. State Agr. Soc. 1853-54, I., p. 593.

*Diemyctylus miniatus*, subsp. *viridescens*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 15; Bull. Chicago Acad. Sci. 1883.

*Malpe viridescens*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 21.

Length, including the tail, about three inches. Body somewhat fusiform. Skin smooth or scabrous. Head small, bluntly rounded. Tongue small. Eye small. Anterior legs slender, with four digits, the first of which is shortest, the fourth next in length, and the third longest. Posterior legs much larger than the anterior legs, with five digits, the first and fifth of which are rudimentary. Vent situated in a prominence. Tail strongly compressed.

Color above olive-brown or brownish red, with numerous black specks, and on each side a longitudinal series of red spots enclosed in black rings.

Beneath pale yellow or salmon-red uniformly sprinkled with round black spots. Upper lip pale, with a few dark specks. A dark band extends from the nostril through the eye and terminates above the base of the anterior leg. Pupil of the eye black; iris golden or reddish. Dorsal surfaces of the legs colored like the back; ventral surfaces, like the belly. Tail dark above, pale below, speckled with black.

Length, including tail, 3.50; tail, 1.75.

The species occurs throughout the State and is not uncommon in northern and southern Illinois. Cook Co. (Kennicott), Geneva, Delavan, Peoria (Brendel), Mt. Carmel (Ridgway), Cave in Rock, Grand Tower.

Form *miniatus*.

Skin scabrous. Tail with no, or with a very slight, fin-like expansion above and below. Color brownish red above, salmon-red below. Terrestrial.

Form *viridescens*.

Skin smooth. Tail with a fin-like membranous expansion above and below. Color olive-brown above, pale yellow below. Aquatic.

The colors vary a good deal in both forms. The number of red spots of the longitudinal series varies from one to seven, and the number may not be the same on the two sides of the same animal. In nearly grown young they are, at least occasionally, wanting. In addition to the red spots of the longitudinal series there are often a few others farther down on the sides. The limits of the two colors of the dorsal and ventral surfaces are clearly defined, and they may be separated along the sides by an obscure dark line. A pale vertebral stripe is not uncommon. The males may be known by the enlarged posterior legs. These limbs are used for clasping the females during sexual union, and on the ventral surface of each is a series of transversely elongate corneous black tubercles, which are doubtless of service in maintaining the embrace. The digits are furnished with similar corneous tips. The posterior legs of the female are smaller than those of the other sex and lack the tubercles. The form *miniatus* occurs under stones, logs, etc., and appears to be strictly terrestrial. The form *viridescens*, on the other hand, is always found in the water, either in small streams or quiet pools. The movements, whether on land or in water, are not rapid, and specimens may be captured quite easily with the hands. The food consists of insects, small mollusks, and crustaceans, the latter constituting an important element of the food of the aquatic form. The species eaten

belong in the main to the groups Branchiopoda and Ostracoda. I have observed the sexes engaged in the reproductive act in July, but this was probably preparatory to a second brood, for I have now before me a nearly grown larva which was taken in southern Illinois April 20, and is probably the offspring of adults which met early in spring.

#### FAMILY DESMOGNATHIDÆ.

No branchial tufts; opening closed in adults. Fingers four; toes five. Palatine teeth borne on transverse processes of the palatine bones. Parasphenoid with two thin plates bearing elongate patches of teeth. Parietals not embracing frontals. Prefrontals and pterygoids wanting. Occipital condyles with pedicels. Carpus and tarsus cartilaginous. Vertebrae opisthocœlian.

Peculiar to America.

#### DESMOGNATHUS, BAIRD.

Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., 282.

Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 112.

Tongue large, free laterally and posteriorly. Palatine teeth in two short series on transverse processes of the palatine bones. Premaxillaries united, embracing a narrow fontanel. Parietals ossified. Tail subcylindrical at base, compressed distally. With lateral series of mucous pores.

An examination of the cranial bones and vertebrae is necessary to separate members of this genus from those of *Plethodon*. There are no essential external differences between the two genera. Three species are known from the eastern United States, and two of them occur in Illinois.

#### *Desmognathus nigra*, Green. BLACK SALAMANDER.

*Salamandra nigra*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 352.

*Triton niger*, De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 85, pl. 15, fig. 35.—Holbr., N. A. Herp., 1842, V., p. 81, pl. 27.

*Desmognathus niger*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 285.

*Desmognathus nigra*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 117.

*Desmognathus niger*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 19.

*Desmognathus nigra*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 14; Bull. Chicago Acad. Sci., 1883.

Length, including tail, from four to six inches. With twelve costal folds. Body rather stout. Head of moderate size; snout rounded. Eyes prominent, with a tubercle in the anterior angle. Tongue nearly circular in outline. With two series of pores on the side, the superior of which extends from the eye nearly to the tip of the tail. Tail almost cylindrical at its base, compressed, and with a dorsal membranous expansion distally.

Color above and below brown or black, slightly paler beneath. Lips, palms, and soles paler.

Length of body, 6; tail, 2.8.

Cook county.

A specimen of this species is in the National Museum at Washington, labeled as having been collected in Cook county by Robert Kennicott. Outside Illinois the species is chiefly confined to the coast states, and is especially abundant in the mountains of Pennsylvania and farther south. It is to be looked for under stones in running water. Hallowell found the females distended with eggs in April, and counted as many as seventy yellowish ova in the ovaries of one individual. When about one and a half inches long they lose the gills. The young are exceedingly active.

***Desmognathus fusca*, Raf. DUSKY OR PAINTED SALAMANDER.**

*Triturus fuscus*, Raf., Ann. Nat., 1820.

*Salamandra picta*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 75.

*Salamandra quadrimaculata*, Holbr., N. A. Herp., 1842, V., p. 49, pl. 13.

*Desmognathus fuscus*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 285.—Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 115.

*Plethodon fuscus*, Smith, Tailed Amphibians, 1877, p. 69.

*Desmognathus fuscus*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 77.

*Desmognathus fuscus*, subsp. *fuscus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 14; Bull. Chicago Acad. Sci., 1883.

Length, including the tail, about three and a half inches. With fourteen costal folds. Body moderately stout. Head of moderate size, snout prolonged. Eyes prominent, with a tubercle in the anterior angle. Tongue oblong oval in outline. Two series of lateral pores, the superior of which is imperfect, or may be lacking. Tail subcylindrical at the base, compressed and carinate above, with a dorsal membranous expansion distally.

Color above brown, marbled with pink and gray, paler and marbled beneath and on the sides. Young with two dorsal longitudinal series of pink spots; old individuals uniform blackish.

Length of body, 2.3; tail, 1.76.

Mt. Carmel (Ridgway).

This species is reported by Messrs. Davis and Rice as occurring throughout the State. It lives in swift flowing brooks, under stones. The eggs are laid embedded in strings of gelatinous material and are carried wrapped about the body of one of the adults. There are two varieties of the species, but only the variety *fusca* has been observed in Illinois. The variety *auriculata* may be looked for in southern Illinois. Prof. Cope characterizes the two forms as follows:

Above brown, with gray or pink shades; sides and belly marbled, the pale predominating; no red spots on sides.

var. FUSCA.

Above and sides black; the latter with a series of small red spots; a red spot from eye to canthus of mouth present or absent; belly marbled, the dark predominating.

var. AURICULATA.

## FAMILY PLETHODONTIDÆ.

No branchial tufts; openings closed in adults. With four legs, fingers four, toes four or five. Palatine series of teeth more or less transverse. Eyelids present. Teeth on the maxillaries and premaxillaries. Parasphenoid teeth present. The tongue attached by a slender median pedicel and free all round, or attached by a median strip which extends from the anterior margin to about the middle, the tongue being thus free at the sides and behind. Palatines not prolonged over the parasphenoid. Pterygoids wanting. Prefrontals present, not prolonged and embracing frontals. Premaxillaries generally embracing a fontanel. Occipital condyles sessile. Carpus and tarsus cartilaginous. Vertebrae amphicœlian.

### SYNOPSIS OF ILLINOIS GENERA.

- 1 (2). Tongue attached by a pedicel and free all round. One premaxillary bone, with a fontanel. Fingers four; toes five, free. Cranial bones ossified.....*SPELERPES*
- 2 (1). Tongue attached by a median strip and free at the sides and behind. Two premaxillary bones .....3.
- 3 (4). Fingers four; toes five. Parietals ossified. *PLETHODON*.
- 4 (3). Fingers four; toes four. Parietals ossified.

*HEMIDACTYLUM*.

### *SPELERPES*, *RAF.*

Rafinesque, *Atlantic Jour.* 1832, I., p. 22.

Hoffmann, *Bronn's Thier-Reich*, VI., Amphibien, p. 670.

Cope, *Proc. Acad. Nat. Sci. Phila.*, 1869, p. 104.

Tongue small, circular in outline, attached by a pedicel, free at its margins. Vomerine teeth more or less transverse, interrupted medially or continuing to the parasphenoid patches; the latter in two large posteriorly divergent patches. Costal grooves well marked. Tail long, with no membranes. Species mostly small.

## ILLINOIS SPECIES.

- 1 (2). Vomerine teeth continuous with the parasphenoid patches. Costal grooves fifteen or sixteen. General color red or brown with numerous dark spots and specks.....S. RUBER.
- 2 (1). Vomerine teeth not continuous with the parasphenoid groups.....3.
- 3 (4). Costal grooves thirteen. Tail very long, with black vertical bars. General color yellow, the sides thickly marked with black.....S. LONGICAUDUS.
- 4 (3). Costal grooves thirteen. Tail of moderate length, with no vertical bars. General color yellow, with a black stripe on each side of the back .....S. BILINEATUS.

**Spelerpes ruber, Latr. RED SALAMANDER.**

*Salamandra rubra*, Latr., Hist. Nat. des Reptiles, 1802. IV., p. 305.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 80, pl. 17, fig. 43.—Holbr. N. A. Herp., 1842, V., p. 35, pl. 9.

*Pseudotriton ruber*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 286.

*Bolitoglossa rubra*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 89.

*Spelerpes ruber*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, pp. 105, 107.—Smith, Tailed Amphibians, 1877, p. 86.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 62.

*Spelerpes ruber*, subsp. *ruber*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 13; Bull. Chicago Acad. Sci., 1883.

Length, including tail, about five and a half inches. With fifteen or sixteen costal folds. Body moderately slender. Head not clearly marked off from the body. Gape rather small. Jaws strong. Snout short. Eyes rather small and not very prominent. Tongue circular in outline, attached by a slender pedicel only. Palatine series of teeth extending outside the inner nares and within continuous with the sphenoidal patches. Tail short and strong, cylindrical at its base, compressed and ensiform distally; no membranous expansion.

Color above red or reddish brown, with numerous dusky specks or spots, the latter often distinct and round, or obscure and of irregular size and shape, sometimes even fusing so as to form an irregular mottling of the surface. Below pale orange or flesh-color, unspotted. Legs spotted above, pale below. Lower jaw generally more or less spotted.

Length from tip of the snout to the posterior margin of the vent, 3.25; tail from the posterior margin of vent to the tip, 2.25.

Aux Plaines River.

A specimen of the species in the collection of the National Museum at Washington is the only one known from the State. It was collected by Robert Kennicott. This is a fine strong species of great activity, which occurs under stones both on the land and in running streams of spring water. The female has been observed with the body distended with ova in the latter part of April. Several varieties are indicated in the lists, but it is doubtful if they are entitled to that rank.

### **Spelerpes longicaudus**, Green. LONG-TAILED SALAMANDER.

*Salamandra longicauda*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 351.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 78, pl. 17, fig. 41.—Holbr., N. A. Herp., 1842, V., p. 61, pl. 19.—Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, p. 287.

*Cylindrosoma longicaudatum*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 78.

*Spelerpes longicaudus*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, pp. 105, 107.—Smith, Tailed Amphibians, 1877, p. 84.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1883, Sal. Caudata, p. 64.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 13; Bull. Chicago Nat. Sci., 1883.

Length, including the tail, about five inches. With thirteen costal folds. Body very slender. Head of moderate size, slightly wider than the neck, depressed. Eyes prominent. Gape large; jaws weak; margin of upper lip angulate on each side and slightly excavate between the angulations. Tongue attached by a distinct pedicel. Palatine series of teeth not extending outside the inner nares, and not continuous with the sphenoidal patches. Tail extremely long and slender, subquad-

angular in section at its base, gradually tapering and compressed toward the tip.

Color above and below yellowish brown, or brownish yellow, or pale yellowish, with small spots or specks of black on the back, often consisting of a more or less perfect vertebral series and, generally, with the sides thickly marked with black, which on the body forms a closely mottled area with scalloped upper margin, and on the sides of the tail, vertical bars which may be angulate posteriorly. Immaculate below. Legs spotted with black above, uniformly pale or with a few spots below.

Length of the body from tip of snout to the posterior margin of the vent, 2; tail, from posterior margin of the vent to the tip, 3.31.

Southern Illinois, abundant. Makanda, Cobden, Saratoga, Johnson Co.

A considerable range of variation is presented by the species. The plan of coloration is that described above, *i. e.*, plain belly, closely marked sides, and slightly speckled back; but young examples and occasional well-grown ones may have the back uniformly marked with rather large black spots or with numerous fine specks. In some young the spots are not aggregated on the sides, but these specimens generally show a tendency to such aggregation in a broken row of elongate spots on the superior part of the side and in an obsolete mottling of the surface below it. The throat may be obsolete mottled with brownish. This little animal has been called the cave salamander, and is said to frequent the waters of deep caverns. It is one of the most abundant of its kind in the extreme southern part of the State, where it is commonly found under logs and stones, occasionally associated with *Plethodon glutinosus*. I have never seen it in water, and have taken but one example from a cave, though caves in various parts of the region in which the species occurs have been carefully searched. It is an active little fellow, resembling the lizards in the quickness of its movements when attempting to escape capture.

*Spelerpes bilineatus*, Green.

*Salamandra bislineata*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 352.

*Salamandra bilineata*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 79, pl. 23, fig. 67.—Holbr., N. A. Herp., 1842, IX., p. 55, pl. 16.

*Spelerpes bilineata*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 287.

*Bolitoglossa bilineata*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 91.

*Spelerpes bilineatus*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, pp. 105, 107.—Smith, Tailed Amphibians, 1877, p. 83.—Bou'enger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 66.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 13; Bull. Chicago Acad. Sci., 1883.

Total length about four inches. With fourteen costal folds. Small, body slender. Head small, slightly wider than the neck, snout rounded. Eye prominent. Palatine teeth not extending outside the inner nares and not continuous with the sphenoidal patches. Tail long and slender, subcylindrical at base, slightly compressed distally.

Color above brownish yellow, with a distinct narrow black stripe extending from the posterior margin of the eye to near the tip of the tail. Beneath yellow, immaculate.

Length of body to the vent, 1.42; tail, from the vent to the tip, 3.83.

This small species is included on the authority of Messrs. Davis and Rice. Dr. Hoy has collected it at Racine, Wis. A form of the species originally described as *Salamandra cirrigera* possesses two barbels on the snout. The habits, as far as known, are like those of *S. longicaudus*.

## PLETHODON, TSCHUDI.

Tschudi, Batr., 1883, p. 92.

Hoffmann, Bronn's Thier-Reich, VI, Amphibien, p. 668.

Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 99.

Tongue moderately large, attached by a median strip, free laterally and posteriorly. Palatine teeth interrupted medially. Parasphenoid patches of teeth in contact at the middle line. Costal grooves well marked. Tail rather long, with no membranous expansion. Species mostly of small size.

The following will separate the two species known to occur in Illinois:

With fourteen costal grooves. Palatine series of teeth extending outside the inner nares. Color black, with gray spots, most numerous on the sides. Moderately stout.

P. GLUTINOSUS.

With from sixteen to nineteen costal grooves. Palatine teeth not extending outside the inner nares. Color dark gray, with or without a red longitudinal dorsal band. Rather slender ..... P. ERYTHRONOTUS.

### *Plethodon glutinosus*, Green. GRAY-SPOTTED SALAMANDER.

*Salamandra glutinosa*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 357.—De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 81, pl. 17, fig. 42.—Holbr., N. A. Herp., 1842, p. 39, pl. 10.

*Plethodon glutinosus*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, p. 285.

*Cylindrosoma glutinosum*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 80.

*Plethodon glutinosus*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, pp. 99, 100.—Smith, Tailed Amphibians, 1877, p. 66.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed, 1883, Sal. Caudata, p. 56.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 12; Bull. Chicago Acad. Sci., 1883.

Length, including the tail, about five and a half inches. With fourteen costal folds. Body slender. Head depressed. Eye prominent, no tubercle in its anterior angle. Palatine teeth in two series which extend outside the inner nares. Tongue large, nearly circular in outline, attached for about three fourths its length by a narrow strip along its middle, beginning near the anterior margin. Tail cylindrical at its base, gradually tapering to the tip, very slightly compressed distally, no membranous expansion.

Color above and below bluish black in adults, brownish black above and pale brownish below in young, with numerous small grayish white spots, which are often aggregated on the sides or form larger white blotches there. Throat, gular fold, palms, soles, digits, and under side of the tail more or less brownish.

Length of body. 2.62; tail, 2.31.

Southern Illinois, abundant. Makanda, Cobden, Anna, Saratoga, W. Northfield (Yarrow).

The head and ventral side of the tail are as a rule almost or quite devoid of spots. Young examples generally have the spots as numerous on the top of the head as elsewhere. The margins of the vent are pale in the darkest examples. Under stones and logs in southern Illinois this salamander is very abundant. It sometimes occurs in caves. I have never seen it in the water. Once disclosed, it is easily captured, as its movements are not rapid. It has been reported common throughout the State, but occurs in laboratory collections made in Union county only, though doubtless it is common in other counties adjacent.

### **Plethodon erythronotus, Green. RED-BACKED SALAMANDER.**

#### **Var. erythronota.**

*Salamandra erythronota*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 356.—Harlan, Jour. Acad. Nat. Sci. Phila., 1876, V., p. 329.—Storer, Bost. Jour. Nat. Hist., 1840, III., p. 53.

*Plethodon erythronota*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 285.

*Plethodon erythronotus*, var. *erythronotus*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, pp. 99, 100.

*Plethodon cinereus*, subsp. *erythronotus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 12; Bull. Chicago Acad. Sci., 1883.

#### **Var. cinerea.**

*Salamandra cinerea*, Green, Jour. Acad. Nat. Sci. Phila., 1818, I., p. 326.—Harlan, Jour. Acad. Nat. Sci., Phila., 1826, V., p. 330.

*Plethodon cinereus*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 295.

*Plethodon erythronotus*, var. *cinereus*, Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 100.

*Plethodon cinereus*, subsp. *cinereus*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 12; Bull. Chicago Acad. Sci., 1883.

*Salamandra erythronota*, De Kay, Nat. Hist. N. Y., I., Zool. III., Rept. and Amph., 1842, p. 75, pl. 16, fig. 38.

*Plethodon erythronotum*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 86 — Smith, Tailed Amphibians, 1877, p. 64. — Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 37.

Total length from three to three and a half inches. With from sixteen to nineteen costal folds. Body cylindrical, very slender. Head small, flat above, depressed. Eye prominent. Lower jaw weak. Tongue large, attached by a strip along its middle. Palatine teeth not extending outside the inner nares. Tail rather short, cylindrical and tapering. Legs weak; first toe of both anterior and posterior feet rudimentary; fifth toe of latter small.

Color above uniform brownish black with minute scattered white points or with a wide longitudinal band varying from yellow to bright red, extending from the tip of the snout nearly to the tip of the tail. Color below whitish mixed with dusky, the latter color predominating posteriorly, becoming paler anteriorly until on the throat the color is whitish with an obscure dusky mottling.

Length from snout to vent, 1.25; tail, beyond vent, 1.16.

Credited to Illinois on the authority of Davis and Rice. It should be looked for in southern Illinois.

### Variety *erythronota*

may be known by its wide yellow or red dorsal band.

### Variety *cinerea*

lacks the dorsal band, but otherwise presents no essential points of difference. It has been supposed to be represented merely by the old examples of the species, but it is not positively known just what the relations of the two forms is. It is not a relation of sex, for Hallowell found by dissection both males and females of the red-backed form.

This little salamander is one of the earliest to appear in spring, and, in localities frequented by it, is common under stones and the bark of decaying logs. It is strictly terrestrial, the eggs being deposited in small masses under bark. The young accompany the parent for some time after hatching.

## HEMIDACTYLIUM, TSCHUDI.

Tschudi, Klass. Batr., 1838, pp. 59, 94.

Hoffmann, Bronn's Thier-Reich. VI., Amphibien, p. 669.

Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 99.

Fingers four, toes four. Tongue attached by a median strip, free laterally and posteriorly. Palatine teeth interrupted medially. Parasphenoid patches not in contact. Parietals ossified, without fontanel. Two premaxillaries, embracing a fontanel.

But one species occurs within our limits.

**Hemidactylum scutatum**, Schlegel. FOUR-TOED SALAMANDER.

*Salamandra scutata*, Schlegel, Mus. Leyd. Abbildungen, 1837, pl. 40, fig. 4-6 (From Cope).

*Hemidactylum scutatum*, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, p. 286.

*Salamandra melanosticta*, Gibbes, Bost. Jour. Nat. Hist., 1845, V, p. 89, pl. 10.

*Desmodactylus scutatus* and *D. melanostictus*, Dum. et Bibr., Erp. Gén., 1854, IX., pp. 118, 119.

*Hemidactylum scutatum*, Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 593.—Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 99.—Smith, Tailed Amphibians, 1877, p. 59.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 12; Bull. Chicago Acad. Sci., 1883.

Total length about two and six tenths inches. Body cylindrical. Head large; snout obtuse; neck contracted. Tail cylindrical, a little more than twice the length of the body. Legs weak, all with four digits.

Color above ashy brown, with scattered black spots. Snout yellow. Legs and tail brownish orange. Entire under surface silvery white, marked with jet black spots.

Northern Illinois (Kennicott).

Mr. Kennicott reports this species common in some localities in northern Illinois. It is found under logs and is said to be very alert in its movements.

FAMILY AMBLYSTOMIDÆ.

No branchial tufts ; openings closed in adults. With four legs ; fingers four, toes five. Palatine teeth in a more or less transverse series. Eye'lids present. Teeth on the maxillaries and premaxillaries. No parasphenoid teeth. Tongue free in front. Palatine bones not prolonged over the parasphenoid. Pterygoids and prefrontals present, the latter with the parietals prolonged and embracing the frontals. Premaxillaries not embracing a fontanel. Occipital condyles sessile. Carpus and tarsus ossified. Vertebræ amphicœlian.

Represented by the single American genus, *Amblystoma*.

AMBLYSTOMA, TSCHUDI.

Tschudi, *Batr.*, 1838, p. 57.

Hoffmann, *Bronn's Thier-Reich*, VI., *Amphibien*, p. 666.

Smith, *Tailed Amphibians*, 1877, p. 29.

Body stout or rather slender. Mouth large, subterminal. Tongue large and fleshy, its anterior portion finely plicate. Palatine teeth extending to or passing behind the internal nares. Gular fold present. Costal grooves well marked. Palms and soles generally with one or more tubercles. Tail rather long, compressed distally, with no membranous expansion.

SYNOPSIS OF ILLINOIS SPECIES.

- 1 ( 2) Palatine series of teeth not extending outside the inner nares. Plicæ of tongue radiating from a median longitudinal groove. Mandible projecting. Color black or brownish, with gray spots on the sides. Rather small and slender.....A. MICROSTOMUM.
- 2 ( 1) Palatine series of teeth extending outside the inner nares. Tongue with no longitudinal grooves, plicæ radiating from behind.....3
- 3 (6,9) Costal grooves twelve.....4
- 4 ( 5) No or one indistinct plantar tubercle. Color uniform gray or with pale spots on the sides. Size small .....A. JEFFERSONIANUM.

- 5 ( 4) Two distinct plantar tubercles. Color brown or black, with numerous yellow spots; these generally aggregated on the sides of the belly.....A. TIGRINUM.
- 6 (3,9) Costal grooves eleven.....7
- 7 ( 8) With a series of round yellow spots on each side, Immaculate below. Large.....A. PUNCTATUM.
- 8 ( 7) With transverse gray bands on the back. Rather small and stout.....A. OPACUM.
- 9 (3,6) Costal grooves ten. Palatine series of teeth convex backwards. Color blackish brown, uniform or with a few gray specks on the sides.....A. TALPOIDEUM.

### *Amblystoma microstomum*, Cope.

*Amblystoma microstomum*, Cope, Proc. Acad. Nat. Sci. Phila., 1861, p. 123; Proc. Acad. Nat. Sci. Phila., 1867, p. 206.

*Amblystoma porphyriticum*, Hallowell, Proc. Acad. Nat. Sci. Phila., 1856, p. 8.

*Amblystoma microstomum*, Smith, Tailed Amphibians, 1877, p. 44 — Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 50.— Davis and Rice, Bull. Ill. State Lab. Nat. Hist., 1, No. 5, 1883, p. 11

Total length from four to six inches. With thirteen costal folds. Body slender for a member of this genus. Head very small, strongly convex above and sloping uniformly from the occiput to the margin of the snout. Eye small and well forward. Gape small, lower jaw distinctly projecting beyond the upper when the mouth is open. Tongue but slightly free at its lateral margins, with a median longitudinal groove from which the plicæ radiate. Palatine series of teeth contiguous at the middle line and forming an obtuse angle, the apex being directed anteriorly; not extending beyond the inner margin of the nares. Legs rather weak, digits depressed, the fourth toe especially long. Tail subcylindrical at its base, compressed and gradually decreasing in depth distally. Superior surface of head smooth; inferior surface and sides of tail granulate; skin elsewhere minutely pitted.

Color above and below dull black or fuscous, with numerous grayish white patches on the sides, often contiguous and

giving the prevailing hue. Under surface with a few scattered patches of the same color.

Length from tip of snout to posterior end of anal slit, 2.50; tail beyond the latter point, 1.75.

Occurs in the south half of the State. Galesburg, Normal, Champaign, Decatur, Mt. Carmel (Ridgway).

A rather slight *Amblystoma*, readily to be separated from any other by its short series of palatine teeth, its small head, and projecting mandible. It is not uncommon on the prairies of central Illinois in spring, resorting at that season, with *A. tigrinum*, to the temporary pools for reproduction. It sometimes awakes from hibernation before the snow has all disappeared, and in one instance was taken in water on the 18th of February. During the summer occasional specimens find their way into cellars. The largest specimen examined is from Decatur, and measures 2.94 inches from tip of snout to posterior end of the anal slit, and 2.25 inches from the latter point to the tip of the tail, giving a total length of a fraction more than five inches. Prof. Cope gives six inches as the maximum of length. A single example from Normal, taken in spring, presents differences from the ordinary form which possibly indicate a variety. The short snout and the color separate it at once from *A. cingulata*. In this example the jaws are nearly equal, so that the upper one is slightly visible when the head is viewed from beneath. There is a line of five large mucous pores over the eye, a patch of about the same number beneath the anterior portion of the eye, and a line from the posterior margin of the same to the corner of the mouth. The tail decreases but slightly in depth towards its tip, and is so strongly compressed distally that the terminal fourth is very thin. The tail is distinctly grooved beneath for more than its basal half; but this may be due to the action of the alcohol. Black above and below, marked as in the ordinary form.

**Amblystoma jeffersonianum**, Green.**Var. platineum.**

*Amblystoma platineum*, Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 198.

*Amblystoma jeffersonianum*, subsp. *platineum*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 11; Bull. Chicago Acad. Sci., 1883.

**Var. fuscum.**

*Amblystoma fuscum*, Hallowell, Proc. Acad. Nat. Sci. Phila., 1857, p. 216.

*Amblystoma jeffersonianum*, var. *fuscum*, Cope, Proc. Acad. Nat. Sci. Phila., 1867.

*Amblystoma jeffersonianum*, subsp. *fuscum*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 10.

**Var. laterale.**

*Amblystoma laterale*, Hallowell, Proc. Acad. Nat. Sci. Phila., 1856, VIII., p. 6.

*Amblystoma jeffersonianum*, var. *laterale*, Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 197; Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 10; Bull. Chicago Acad. Sci., 1883.

*Salamandra jeffersoniana*, Green, Contr. Maccl. Lyc. to Arts and Sciences, 1827, I., p. 4.

*Amblystoma jeffersonianum*, Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 195.

*Amblystoma jeffersonianum*, subsp. *jeffersonianum*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 10.

Extreme length from about four to six inches. With twelve costal grooves. No or one indistinct plantar tubercle. Body rather slender. Head elongate, snout obtuse. Tongue large. Palatine teeth in four series, the median two nearly straight or arched forwards. Eyes large and well forwards. Mucous pores present on sides of head. Tail shorter than body, oval in section at its base, gradually compressed toward the tip. Legs rather strong; toes long and but slightly depressed.

Color gray, dark brown or black, with pale blue spots on the sides, or with numerous small or large pale spots on the sides and a few small ones on the belly, or with no spots and with a dark shade along the sides.

Four varieties have been described and are indicated below. Three of them have been recorded from the State, and we may look for the remaining one.

#### Variety *platineum*.

Lead-colored, with many indistinct whitish spots or with none. Eyelids with pale margins. More slender than the variety *jeffersonianum*.

Belleville (spec. in Nat. Mus.).

#### Variety *fuscum*.

Dark brown, with a dark band along the sides. Length from tip of snout to posterior end of anal slit, 2.25; from latter point to end of tail, 1.55.

Not yet observed from Illinois.

#### Variety *laterale*.

Black, with large pale spots on the sides and small ones beneath. Median series of palatine teeth convex forwards. About half the size of variety *jeffersonianum*.

Northern Illinois (Davis and Rice).

#### Variety *jeffersonianum*.

Gray or black, with or without small pale spots on the sides. In fresh examples, with light blue spots on the sides. Length about 5.50

Southern Illinois (Ridgway).

### *Amblystoma tigrinum*, Green. TIGER SALAMANDER.

*Salamandra tigrina*, Green, Jour. Acad. Nat. Sci. Phila., 1825, V., p. 116.

*Triton tigrinus*, De Kay, Nat. Hist. N. Y., Rept. and Amph., 1842, p. 83, pl. 15, fig. 32.—Holbr., N. A. Herp., I., Zool. III., 1842, V., p. 79, pl. 26.

*Amblystoma tigrina*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 284.

*Amblystoma tigrinum*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 108. Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 179.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 43.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 10; Bull. Chicago Acad. Sci., 1883.

Very large, total length from six to eleven inches. With twelve costal grooves. Body rather stout. Head large, wide, convex above. Eye small but prominent. Mouth large. Tongue large, obovate, wider than long, plicæ radiating from its posterior portion, no longitudinal groove. Palatine teeth extending outside the inner nares. Mucous pores of head mostly between the eye and nostril and in an elongate patch above them. Cervical fold conspicuous. Limbs strong; digits depressed. Tail varying in length, shorter or longer than the body, strongly compressed distally and regularly decreasing in depth towards the tip.

Color above brown or brownish black, with numerous irregularly disposed round yellow spots. Brown or dusky below, with scattered yellow spots or with most of the spots aggregated on the sides and more or less coalescent. Throat with a few spots or almost entirely yellow. Legs and tail spotted with yellow.

Length of an average specimen, from snout to the posterior end of the anal slit, 4.19; from the latter point to tip of tail, 3.44.

Throughout the State. Cook Co., Peoria (Brendel), Normal, S. Illinois.

The colors vary in individuals and with age. The yellow spots may be distinct and bright yellow or so obscure as to be scarcely discernible; they may be abundant and pretty regularly distributed, or may be few in number and confined chiefly to the sides of the belly. Young just from the water are nearly uniform brownish black above, with no spots or a very few small ones, and are yellowish beneath, with perhaps a few indistinct spots at the sides. At this stage some of the larval characters are not yet lost. Rudiments of the branchiæ are apparent; the rami of the mandible are not so much arched, nor so widely divergent as in adults; the palatine teeth are strongly arched forwards; the tongue is small, and elongate; and the tail is shorter proportionally to the body than in adults. Examples about five inches long ordinarily resemble the adults in every respect except the proportional length of the tail, which seems to increase with age. The following measurements illustrate this change of proportions. The first are from

a young one in which rudiments of the branchiæ persist; the second from an average adult; the third from a very large individual. (1) Body, 2.50; tail, 1.75. (2) Body, 4.19; tail, 3.44. (3) Body, 5.25; tail, 5.50.

The larvæ are so remarkable as to deserve a special paragraph. They differ in no essential respect from the Siredon of Mexico and our Western States, but as far as at present known positively, they do not breed while in the larval condition. The Siredon of the West is now known to transform into an Amblystoma very similar to, and perhaps only a variety of, our species. The larva of *A. tigrinum* when about ready to transform is nearly four inches in length, and, barring its legs, bears an obvious resemblance to some of the fishes, notably, in the shape of the head, to *Pelodichthys*. The body is gradually more and more compressed from the head to the extremity of the tail. Head deep at the base, with a uniform slope from base to snout, the profile of which is nearly straight. Tongue large and fleshy, mounted on the hyoid bones, and strictly comparable with similar structures in fishes; the tongue of the adult Amblystoma develops later. Palatine teeth in four series, strongly arched forwards, approximating and parallel with the maxillaries. Gill-opening large, making free communication with the mouth. A free fold of skin continues from its anterior margin over the throat, uniting at an angle with one from the opposite side; and across the opening are three free arches, each bearing at its dorsal extremity a branchial filament, and along its inner margins a series of acute flexible processes resembling the gill-rakers of fishes, which interlock when the arches are closed. The anterior arch lacks the filaments on its anterior side. The opening is bounded posteriorly with what is evidently a fourth arch, though it is united behind with the integument; it also bears the filaments on its anterior edge. The costal folds are evident and agree in number with those of adults. Limbs weak; digits flattened and pointed. The tail is strongly compressed and bears a membranous expansion above and below, that above extending forwards nearly to the head and that below reaching the vent.

This is our largest and most abundant salamander. It resorts in great numbers to the ponds on prairies in early spring

to deposit its mass of eggs. At such times it frequently finds its way into cellars. The eggs are generally attached to sticks or dead vegetation and are surrounded by a translucent gelatine. A little later the larvæ are abundant in these pools, feeding, as I find by dissection, largely on Crustacea, which the gill-rakers on the branchial arches enable them to collect. The stomachs are sometimes packed with *Daphnia pulex*. The smallest examples examined—about an inch long—had eaten nothing but animal food. They lose their branchiæ and leave the water before the close of the summer, and many of the pools in which they breed are soon after dried up. They are not often seen afterwards until the fall rains set in, when they again appear in cellars and under porches, evidently searching for a place to pass the winter. Their movements on land are very clumsy and their migrations to and from the water seem to be performed at night. A large specimen kept in an aquarium cast its skin *twice* between the 12th and 18th of October. I am disposed to believe, from facts given below, that this species remains, where conditions are suitable, or, perhaps, unsuitable, to its complete development, longer than one season in the larva state, and may even breed in that state. As before stated, the young ordinarily leaves the water when in the neighborhood of four inches long, and specimens four and a half inches long have all the essential adult characters. There are now in the Laboratory collection, however, two specimens measuring seven and three fourths and eight and three eighths inches respectively, which retain in a remarkable degree the larval characters, and had doubtless but recently left the water when they were captured. The tongue of these examples is very small, elongate, and occupies no more than half the space between the rami of the mandible. The mandibular rami are less arched and less widely divergent than in adults; the palatine teeth are more strongly arched forwards; the rudiments of branchiæ persist; the digits are strongly depressed; and the membranous expansion is still present for a short distance on the tail above, and sharp grooves indicate its recent resorption at other points. The colors also are those of a recently transformed larva. One of these examples proves to be a male with well-developed sexual organs. Unfortu-

nately the date at which they were collected has been omitted from the labels. Both were taken at Normal in 1882. Many other young of the usual size were collected the same season.

**Amblystoma punctatum, Linn. SPOTTED SALAMANDER.**

*Lacerta punctata*, Linn. Syst. Nat., ed. 12, 1766, I., p. 370.

*Salamandra venenosa*, Holbr., N. A. Herp., 1842, V., p. 67, pl. 21.

*Salamandra subciolacea*, De Kay, Nat. Hist. N. Y., I., Zool., III., Rept. and Amph., 1842, p. 74, pl. 16, fig. 36.

*Amblystoma punctatum*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser. 1849, I., p. 283—Kenn., Trans. Ill. State Agr. Soc., 1853-54, I., p. 593.—Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 175.—Smith, Tailed Amphibians, 1877, p. 36.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 41.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 9; Bull. Chicago Acad. Sci., 1883.

Total length about six inches. With eleven costal grooves. With one indistinct plantar tubercle or with none. Body stout, cylindrical, slightly swollen at the abdomen. Head wide, depressed, large, mucous pores present. Eyes moderately large. Mouth large. Tongue large, nearly circular in outline, its plicæ radiating from its posterior portion. Palatine teeth in three series, the median being arched backwards. Tail oval in section at its base; compressed distally.

Color above bluish black with a longitudinal series of large round yellow or orange spots on each side of the back, extending from the eyes nearly to the tip of the tail. Beneath uniform bluish black, with no marks. Legs with one or two spots of yellow above.

Length of body from tip of snout to posterior end of anal slit, 3.40; tail beyond the latter point, 3.10.

Occurs throughout the State but is not common. Cook Co. (Kennicott), Union Co. (in collection Northwestern University at Evanston), Mt. Carmel and Belleville (Yarrow).

This is a large species bearing a general resemblance to *A. tigrinum*, but is to be distinguished at once by the disposition of the spots in two series and by the immaculate ventral surface. It has not, to my knowledge, been seen in the central part of the State. Mr. Kennicott tells us in his catalogue of the animals of Cook county (Trans. Ill. Agr. Soc., 1853-54) that

he has only taken it there in timber. In the Eastern States it replaces *A. tigrinum*. It is commonly found under logs and stones. In an article on the development of this animal Prof. S. F. Clarke states that the eggs are deposited in masses of from two to three hundred and are covered, as are those of *A. tigrinum*, by a gelatinous coat. The species is said to use its tail for prehension. (S. Garman, Science, VIII., 13.)

### **Amblystoma opacum**, Gravenhorst.

*Salamandra opaca*, Gravenhorst, Ueber. Zoöl. Syst., 1807, p. 431.

*Salamandra fasciata*, De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 77, pl. 17, fig. 40.

*Amblystoma opaca*, Baird, Jour. Acad. Nat. Sci. Phila., 21 Ser., 1849, p. 283.

*Salamandra opaca*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 66.

*Amblystoma opacum*, Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 173.—Smith, Tailed Amphibians, 1877, p. 37.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882. Sal. Caudata, p. 40.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 9; Bull. Chicago Acad. Sci., 1883.

Total length about three and a half inches. With eleven costal folds. Two distinct plantar tubercles [sic]. Body stout and short, fusiform. Head large, depressed, widened posteriorly. Mouth large, jaws about equal. Tongue large, obovate, completely occupying the space between the mandibular rami; plicæ radiating from the posterior part of the tongue. Vomerine teeth extending outside the inner nares; consisting of three series,—a median large one straight or arched forwards, and a short series behind each of the internal nares. A distinct postocular groove, curving downwards behind the angle of the mouth. Cervical fold distinct. No large mucous pores on the head. Limbs moderately strong. Tail short, thick at the base and subcylindrical, compressed distally and tapering to a point.

Color above fuscous, with wide grayish-white transverse bands which widen laterally and terminate abruptly on the upper part of the sides. Head often extensively gray between the eyes, with a band of the color passing from this over the eyes and sometimes uniting with the extremities of first white

band, thus enclosing a large dark area on the posterior part of the head. The bars of the back and tail may be interrupted medially, and frequently unite at their extremities with adjacent bars. Beneath dark slate-color, or, in some alcoholic examples, liver-brown, immaculate. Cervical fold, palms, and soles, pale. Digits with pale articulations, giving an annulated appearance.

Length from snout to posterior end of the anal slit, 2.19; from latter point to tip of tail, 1.28.

Occurs throughout the State. W. Northfield (Kennicott), Cobden, Mt. Carmel (Yarrow).

According to descriptions of this animal there is but a single indistinct plantar tubercle. The specimens before me from southern Illinois have two tubercles, both of which are clearly visible. The male and female remain with the eggs, which are said to be deposited in the "beds of small ponds," and to number as high as one hundred and eight.

### *Amblystoma talpoideum*, Holbr. MOLE SALAMANDER.

*Salamandra talpoidea*, Holbr., N. A. Herp., 1842, V., p. 73, pl. 24.

*Amblystoma talpoideum*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 109.—Cope, Proc. Acad. Nat. Sci. Phila., 1867, p. 172.—Smith, Tailed Amphibians, 1877, p. 41.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 40.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 9; Bull. Chicago Acad. Sci., 1883.

Total length about three inches. With ten costal grooves. Body short and stout, depressed. Head large, depressed, snout slightly angulate. Mouth large, jaws about equal. Palatine series of teeth in three sections, the median slightly arched backwards. Mucous pores present on head. Tail short, thick at its base, compressed distally.

Color above dusky or dark brown, mottled with small gray dots and a few obscure dusky spots. Beneath dusky.

Length from tip of snout to posterior end of anal slit, 2.30; from latter point to end of tail, 1.50.

Cairo (Cope).

In Prof. Cope's "Review of the Amblystomidæ" a specimen of this species from Cairo, is noted as belonging to the National Museum and as having been collected by Kennicott. The species is a near relative of *A. opacum*.

## FAMILY CRYPTOBRANCHIDÆ.

Two pairs of legs present, the anterior with four digits, the posterior with five. Jaws provided with teeth. Palatine teeth approximating and parallel with those on maxillaries and premaxillaries. No parasphenoid teeth. No eyelids. No branchial tufts. Branchial opening present (in our genus) or absent. Premaxillaries not anchylosed. Nasals, pterygoids, and prefrontals present. Occipital condyles sessile. Carpus and tarsus cartilaginous. Vertebrae amphicœlian.

## CRYPTOBRANCHUS, LEUCKART.

Leuckart, Isis, 1821, p. 257 (S. Garman).

Branchial openings persistent. Body stout. Mouth large, terminal. Tongue large, free in front. Palatine series of teeth strongly arched forward, parallel with, but not as long as, that on the jaw. Internal nares at the extremities of the palatine series. No gular fold. Outer digits with lateral membranous expansions. Tail short, compressed distally, with a dorsal membranous expansion.

*Cryptobranchus alleghaniensis*, Latr. HELLBENDER.

*Salamandra alleghaniensis*, Latr., Hist. nat. des Reptiles, 1802, p. 253.

*Abranchus alleghaniensis*, Harlan, Ann. Lyc. Nat. Hist. N. Y., 1824, I., p. 233.

*Menopoma alleghaniensis*, *id.*, *ibid.*, p. 271.—De Kay, Nat. Hist. N. Y., I., Zoöl. III., Rept. and Amph., 1842, p. 89, pl. 18, fig. 44.—Holbr., N. A. Herp., 1842, V., p. 95, pl. 32.—Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., 289.—Dum. et Bibr., Erp. Gén., 1854, IX., p. 206.—Smith, Tailed Amphibians, 1877, p. 22.

*Cryptobranchus alleghaniensis*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., Sal. Caudata, p. 81.

*Menopoma alleghaniensis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 8; Bull. Chicago Acad. Sci., 1883.

Total length from one and a half to two feet. Body stout, cylindrical. Head wide, depressed, with lines of large mucous pores above and below. Eye small and not prominent,

superior. Mouth large, jaws strong, the lower jaw bearing a membranous fold of skin on each side. Tongue large, free in front. Teeth on jaws and palatines in single series and directed backwards. Gill cleft not large; no gular fold. Legs rather stout; digits short, with very slight webs, and the outer ones with membranous expansions. Tail short, stout at base, compressed distally, and with a large dorsal expansion.

Color above and below uniform leaden, with obscure dark spots.

Length of a small specimen : from tip of snout to posterior end of anal slit, 7.25; from latter point to the end of the tail, 3.87.

Wabash River (Ridgway).

This species is said by Prof. Cope to occur in all the tributaries of the Mississippi River, and so may probably be found throughout the State. It is a large aquatic batrachian resembling in many respects the larvæ of our salamanders. It is said to feed upon crayfish, fishes, reptiles, etc. Specimens from Ecorse, Michigan, examined by Prof. S. I. Smith, had eaten *Cambarus propinquus*, together with a neuropterous larva allied to *Perla*, and a small fish.

### FAMILY PROTEIDÆ.

Two pairs of legs present, all with four digits, or the anterior with three and the posterior with two. Jaws provided with teeth. No parasphenoid teeth. No eyelids. Branchial tufts persistent, with three free arches in the branchial opening. Premaxillaries not anchylosed. Maxillaries, nasals, and prefrontals wanting. Pterygoids and palatines present. Occipital condyles sessile. Carpus and tarsus cartilaginous. Vertebrae amphiœlian.

### NECTURUS, RAFINESQUE.

Rafinesque, Jour. Phys., 1819, vol. 88, p. 417.

Wagler, Nat. Syst. Amph., 1830, p. 210.

Smith (Menobranchus) Tailed Amphibians, 1877, p. 17.

Four digits on all the feet. Body stout. Mouth of moderate size, terminal, with large fleshy lips. Tongue free in front;

slightly free at the sides. Palatine teeth approximating those on the premaxillaries, the series interrupted posteriorly. Internal nares large, outside the palatine teeth. Branchial tufts plumose. Gular fold present. Tail short, strongly compressed, with extensive membranous expansions above and below.

**Necturus maculatus**, Rafinesque. MUD PUPPY, WATER DOG.

*Necturus maculatus*, Raf., Jour. Phys., 1819, vol. 88, p. 417.

*Triton lateralis*, Say, Long's Exped. to the Rocky Mts., 1823, I., p. 5.

*Menobanchus lateralis*, Harlan, Ann. N. Y. Lyc., 1824, I., p. 233.

—De Kay, Nat. Hist. N. Y., Rept. and Amph., 1842, p. 87, pl. 18, fig. 45.—Holbr., N. A. Herp., 1842, V., p. 115, pl. 38, and also p. 111, pl. 37.

*Necturus lateralis*, Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., 1849, I., p. 290.

*Menobanchus lateralis*, Dum. et Bibr., Erp. Gén., 1854, IX., p. 183.—Smith, Tailed Amphibians, 1877, p. 17.

*Necturus maculatus*, Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d. ed., 1882, Sal. Caudata, p. 84.

*Necturus lateralis*, Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883 (inserted under errata); Bull. Chicago Acad. Sci., 1883.

Total length about one and a half feet. Bodystout. Head depressed, very wide at base, somewhat contracted before the eyes. Eyes small, embedded, lateral. Mouth not very large, with large expansions of the skin forming fleshy lips. Jaws angulate in front; palatine teeth approximating and parallel with the maxillary teeth, interrupted posteriorly. Internal nares large, opening outside the palatine series of teeth. Tongue very large, extensively free in front. Branchial tufts large; gill-opening not large, crossed by but one free arch. Gular fold distinct. Limbs moderately strong; digits without webs or lateral expansions of the skin. Vent with plicate margins. Tail spatulate; stout and cylindrical at the base, strongly compressed and increasing in height distally, with a fin-like expansion above and below.

Color above dark gray, with obscure subcircular dark spots and minute dark specks. An obscure dark band extends along the snout and through the eye, behind which it may terminate

or continue along the side of the body. Branchial tufts crimson. Beneath paler than above, with the under side of the throat and middle of the belly nearly white. Tail sometimes with an orange border and generally with large submarginal dark spots.

Length from tip of the snout to posterior margin of vent, 9.25; from latter point to end of tail, 4.37.

Occurs in running water throughout the State. Cook Co., Oregon, Peoria (Brendel), Henry, Mt. Carmel (Yarrow).

This is one of our largest batrachians, but it retains throughout life many of the characters of the tadpoles of other members of the order. It is often captured on hooks baited for fish, and so dreaded is its bite that the line is frequently cut to let it escape. It is, however, perfectly harmless. The spawning season is in April and May. The eggs, Holbrook tells us, are about as large as peas. It subsists on crustaceans, insects, and mollusks.

## FAMILY SIRENIDE.

Posterior legs and the pelvic bones wanting. Anterior legs with three or four digits. Jaws provided with horny plates instead of teeth. Vomerine teeth in two large divergent patches. No parasphenoid teeth. No eyelids. Three persistent branchial tufts, with three corresponding free arches across the branchial opening and a fourth arch bound in the integument. Premaxillaries not anchylosed. Maxillaries, palatines, pterygoids, and prefrontals wanting. Occipital condyles sessile. Carpus cartilaginous. Vertebrae amphicoelian.

The family includes but two genera, both American. They may be defined as follows:-

Digits three. Branchial tufts not fimbriate. With longitudinal bands.....PSEUDOBRANCHIUS.

Digits four. Branchial tufts fimbriate. Without longitudinal bands.....SIREN.

## SIREN, LINN.

Linnaeus, Act. Acad. Upsal. 1766.

Dum. et Bibr., Erp. Gén., 1854, IX., p. 191.

Body long and slender. Mouth small, inferior. Tongue free in front and slightly free at sides. Vomerine teeth in two patches, not in contact in front, widely divergent posteriorly. Internal nares outside the patches of teeth. Branchial tufts fimbriated. Tail short, compressed, with a slight dorsal membrane.

The genus includes but the single species described below.

### *Siren lacertina*, Linn.

*Siren lacertina*, Linn., Act. Acad. Upsal. 1766.—Harlan, Jour. Acad. Nat. Sci. Phila., 1826, V. p. 321.—Holbr., N. A. Herp., 1842, V., p. 101, pl. 34.—Baird, Jour. Acad. Nat. Sci. Phila., 2d Ser., I., 1849, p. 291.—Dum. et. Bibr., Erp. Gén., 1854, IX., p. 193.—Smith, Tailed Amphibians, 1877, p. 12.—Boulenger, Cat. Batr. Sal. in Coll. Brit. Mus., 2d ed., 1882, Sal. Caudata, p. 87.—Davis and Rice, Bull. Ill. State Lab. Nat. Hist., I., No. 5, 1883, p. 6; Bull. Chicago Acad. Sci., 1883.

Total length from two to three feet. Slender and eel-like. Head rather small, depressed. Eyes small, embedded, well forwards. Snout but slightly rounded from side to side, almost truncate. Nostrils inferior, widely separated. Mouth small, inferior, transverse; lower lip marked off by a groove. Lower jaw provided with a black, corneous, sharp-edged covering, like the jaws of tadpoles, in place of teeth. Upper jaw with a similar but smaller plate. Vomerine teeth in two large oblique patches. Three coarsely fimbriate branchial tufts. Branchial opening not large, covered by three free arches, bearing at their inner margins series of short cartilaginous tubercles. The single pair of legs is placed close behind the head. They are rather weak, and bear four small digits which have dark horny tips resembling claws. Vent, a puckered orifice. Tail compressed and tapering towards the tip, with a slight dorsal membranous expansion.

Color above dusky or black, sometimes with small whitish spots. Beneath bluish black.

Length from tip of snout to posterior margin of vent, 6.87; tail beyond the latter point, 3.37.

Not uncommon in southern Illinois. N. Ill. (Davis and Rice), Alton (Cope), Running Lake, Union Co., Mt. Carmel (Ridgway).

A small example of this species from Running Lake, Union Co., was marked when alive with a bright orange band across the end of the muzzle and another one extending from the sides of the mouth to the bases of the branchial tufts. This remarkable batrachian is not uncommon in the mud of lakes in the southern portion of Illinois. It is probably pretty strictly limited to that portion of the State, though Messrs. Davis and Rice record it from northern Illinois on the strength of a specimen in the collection of the Northwestern University at Evanston. What they feed upon is not very definitely known. LeConte found nothing but mud in the stomachs of those he examined, and we imagine this had been taken for the minute organisms it contained, just as the tadpoles of frogs fill their intestines with this material for a similar purpose. The acute black corneous tips of the digits, especially marked in young, led Linnæus to describe the Siren as possessing claws, and a granulation of the skin observable in some alcoholic specimens probably led others of the fathers to describe it as possessing small embedded scales. Linnæus is represented as writing to Dr. Gordon of South Carolina, to whom he was indebted for specimens of the Siren, that nothing had so much exercised his mind, and there was nothing he so much desired to know, as the true nature of this animal. Le Conte and others proved many years ago, by finding spawn in its, ovaries that it was an adult batrachian. So many southern species inhabit the south part of the State that it would not be surprising if *Pseudobranchius striata* should also be found to occur there.

## EXPLANATION OF THE FIGURES.

### PLATE IX.

FIG. 1.—Ventral view of the shell of *Emys meleagris*.

FIG. 2.—Dorsal view of the shell of *Chrysemys marginata*: *a*, dorsal plates; *b*, costal plates; *c*, marginal plates; *d*, nuchal plate.

FIG. 3.—Ventral view of the shell of *Chrysemys marginata*: *a*, gular plate; *b*, postgular plate; *c*, pectoral plate; *d*, abdominal plate; *e*, preanal plate; *f*, anal plate; *g*, axillar plate; *h*, inguinal plate.

FIG. 4.—Ventral view of the shell of *Aromochelys odoratus*.

### PLATE X.

FIG. 5.—Ventral view of the shell of *Chelydra serpentina*.

FIG. 6.—Right ramus of mandible of *Malacoclemmys geographicus*.

FIG. 7.—Right ramus of mandible of *M. lesueuri*.

FIG. 8.—Ventral view of the skull of *M. geographicus*: *mx*, maxilla; *v*, vomer; *pl*, palatine bone.

FIG. 9.—Ventral view of the skull of *M. lesueuri*. Same bones, outlined as in Fig. 8.

### PLATE XI.

FIG. 10.—Feet of *Cistudo carolina*: *a*, fore foot; *b*, hind foot.

FIG. 11.—Feet of *Chrysemys marginata*: *a*, fore foot; *b*, hind foot.

FIG. 12.—Feet of *Emys meleagris*: *a*, fore foot; *b*, hind foot.

### PLATE XII.

FIG. 13.—*Aspidonectes spinifer*, dorsal view.

FIG. 14.—The same, ventral view.

### PLATE XIII.

FIG. 15.—Ventral view of the head of *Elaphis obsoletus*: *l*, infralabials; *m*, submentals; *n*, ventrals.

FIG. 16.—Dorsal view of the head of *E. obsoletus*: *a*, rostral plate; *b*, internasal; *c*, prefrontal; *d*, frontal; *e*, supraorbital; *f*, parietal; *o*, dorsals.

FIG. 17.—Lateral view of the head of *E. obsoletus*: *g*, nasals; *h*, loreal; *i*, anteorbital; *j*, postorbitals; *k*, supralabials; *l*, infralabials; *o*, dorsals.

FIG. 18.—Dorsal view of the head of *Eumeces fasciatus*.

FIG. 19.—Bones of the rudimentary hind limb of *Boa scytale*.  
(After Hoffmann.)

FIG. 20.—Rudimentary hind limb of *Python*, showing muscles.  
(After Hoffmann.)

FIG. 21.—*Rana areolata*: *a*, hind foot; *b*, fore foot.

#### PLATE XIV.

FIG. 22.—*Rana clamata*: *a*, hind foot; *b*, fore foot.

FIG. 23.—*Rana catesbyana*: *a*, hind foot; *b*, fore foot.

FIG. 24.—*Acris gryllus*: *a*, hind foot; *b*, fore foot.

FIG. 25.—*Thorophilus triseriatus*: *a*, hind foot; *b*, fore foot.

FIG. 26.—*Hyla versicolor*: *a*, hind foot; *b*, fore foot.

#### PLATE XV.

FIG. 27.—Sternal bones of *Rana catesbyana*: *st*, sternum; *xs*, xiphisternum; *co*, coracoid; *cl*, clavicle; *os*, omosternum; *s*, scapula; *ss*, suprascapula.

FIG. 28.—Sternal bones of *Bufo lentiginosus*: *st*, sternum; *xs*, xiphisternum; *co*, coracoid; *ep* and *ep'*, epicoracoids; *pc*, precoracoids; *cl*, clavicle; *s*, scapula; *ss*, suprascapula.

FIG. 29.—Sternal bones of *Hyla versicolor*: *st*, sternum; *os*, omosternum.

# INDEX OF GENERA.

Aceris.....	339, 340	Haldea.....	263, 306
Aromochelys .....	238, 240	Hemidactylum.....	360, 368
Amblystoma... ..	215, 369	Heterodon.....	215, 263, 302
AMBLYSTOMIDÆ .....	353, 369	Hydrops .....	263, 279
Amphibia.....	316	Hyla.....	215, 339, 345
Amyda .....	246, 247	HYLIDÆ .....	318, 339
Ancistronon.....	310, 313	IGUANIDÆ .....	249
ANGUIDÆ .....	249, 252	Macroclemmys.....	242
ANURA.....	317	Malacoclemmys.....	219, 224
Aspidonectes .....	215, 246	MENOPOMIDÆ.....	See Errata.
Bufo .....	333	Necturus.....	381
BUFONIDÆ.....	318, 333	Nerodia .....	215, 262, 268
Carphophis .....	263, 308	Oligosoma.....	257, 259
CHELONIA.....	216	Ophibolus .....	215, 263, 293
Chelopus .....	215	OPHIDIA.....	216, 260
Chelydra .....	243	Ophisaurus .....	252
CHELLYDRIDÆ .....	218, 242	Phyllophilophis.....	263, 283
Chorophilus.....	339, 343	Pityophis .....	263, 286
Chrysemys.....	215, 219, 222	Plethodon .....	360, 364
CINOSTERNIDÆ.....	218, 237	PLETHODONTIDÆ.....	353, 360
Cinosternum .....	238	PLEURODELIDÆ .....	353, 354
Cistudo .....	215, 218, 219	PROTEIDÆ.....	353, 381
Cnemidophorus .....	255	Pseudemys.....	215, 219, 228
Coluber.....	263, 284	Rana.....	215, 318
COLUBRIDÆ .....	261	RANIDÆ .....	317, 318
CROTALIDÆ .....	261, 310	Regina.....	263, 272
Crotalus .....	310, 311	REPTILIA.....	216
CRYPTOBRANCHIDÆ, Errata, 380		SAURIA .....	216, 248
Cryptobranchus.....	380	Sceloporus.....	250
Cyclophis.....	263, 282	SCINCIDÆ.....	249, 256
DESMOGNATHIDÆ .....	353, 357	Siren.....	383
Desmognathus .....	215, 357	SIRENIDÆ .....	354, 383
Diadophis .....	263, 300	Sistrurus .....	310, 312
Diemyctylus.....	354	Spelerpes .....	215, 360
Elaphis.....	263, 289	Storeria.....	263, 277
EMYDIDÆ .....	217, 218	Teidæ.....	249, 255
Emys .....	218, 221	TRIONYCHIDÆ.....	218, 245
Engystoma.....	331	Tropidoclonium.....	262, 276
ENGYSTOMIDÆ.....	318, 331	URODELA.....	317, 352
Eumeces .....	257	Virginia.....	263, 307
Eutainia.....	262, 263		

# PLATE IX.

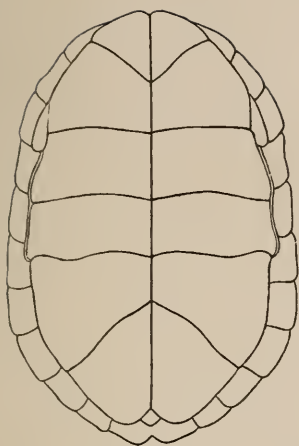


FIG. 1.

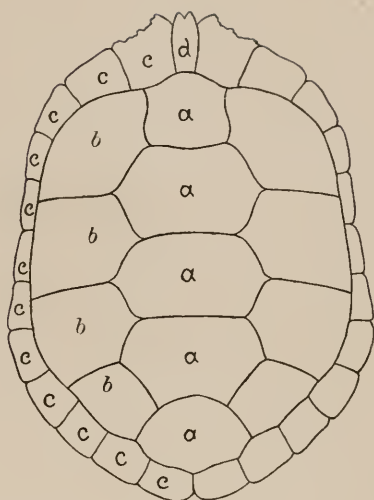


FIG. 2.

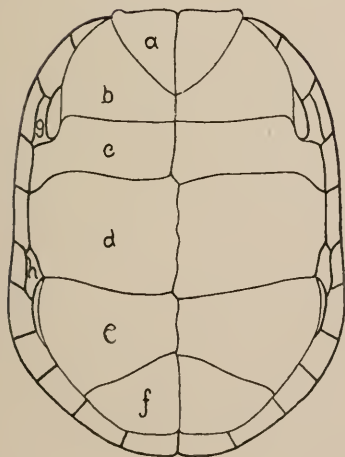


FIG. 3.

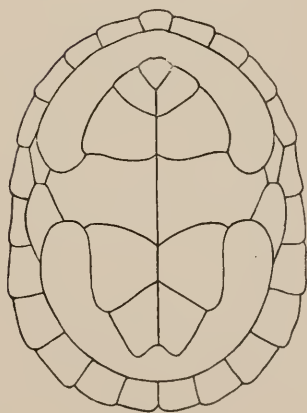


FIG. 4.

# PLATE X.

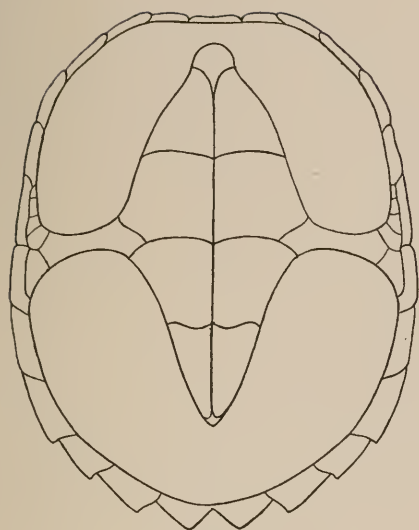


FIG. 5.



FIG. 6.



FIG. 7.

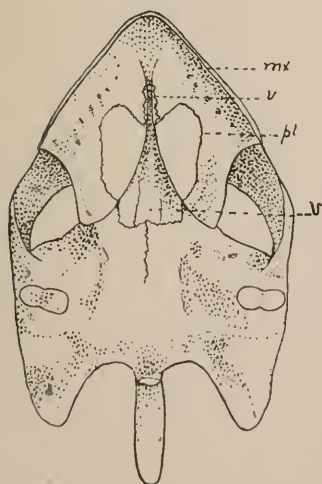


FIG. 8.

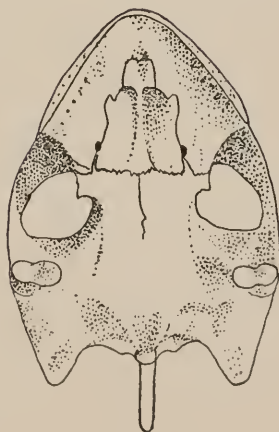


FIG. 9.

PLATE XI.

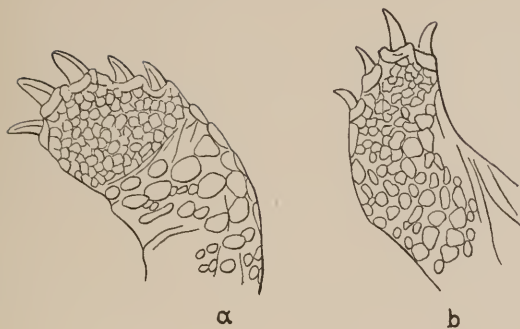


FIG. 10.

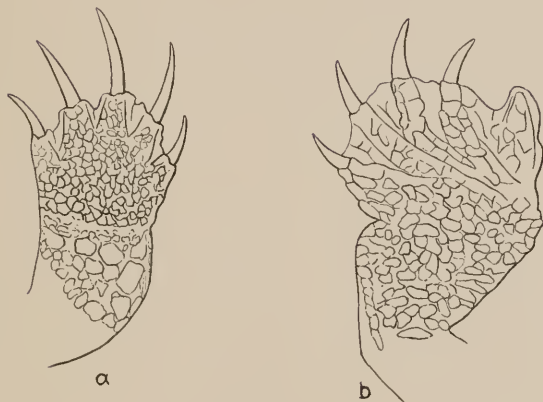


FIG. 11.

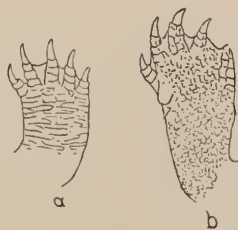


FIG. 12

PLATE XII.

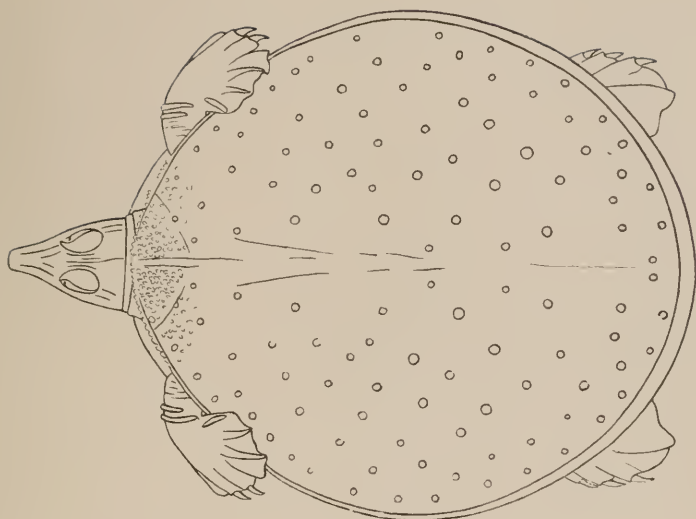


FIG. 13.

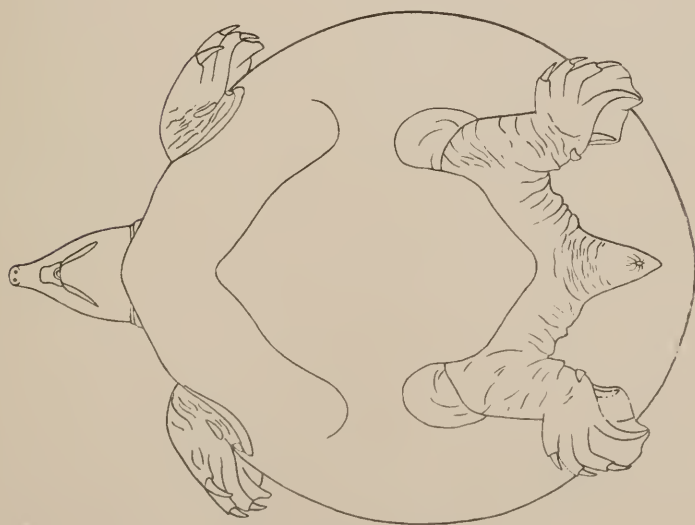


FIG. 14.

# PLATE XIII.

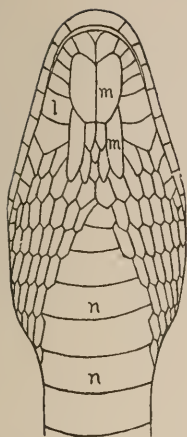


FIG. 15.

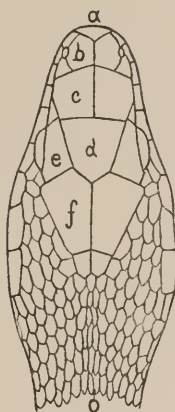


FIG. 16.



FIG. 17.

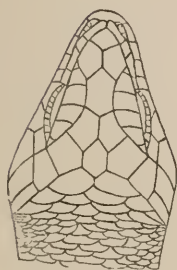


FIG. 18.



FIG. 19.



FIG. 20.



a



b

FIG. 21

# PLATE XIV.

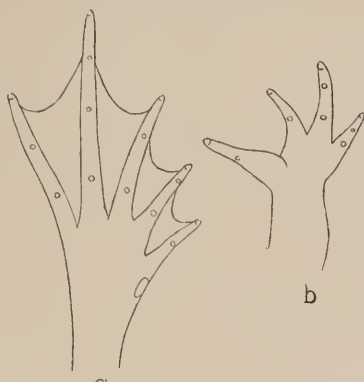


FIG. 22.

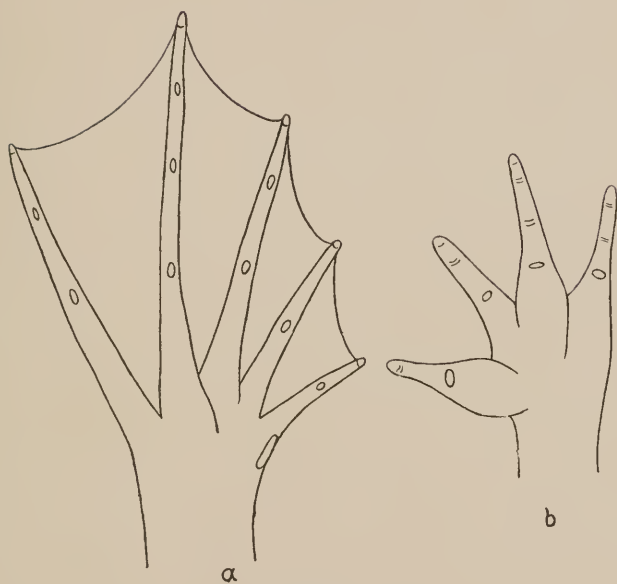


FIG. 23.

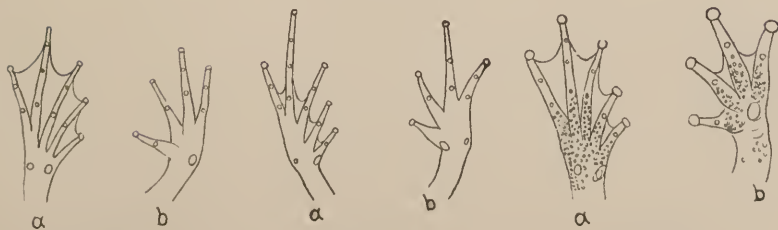


FIG. 24.

FIG. 25.

FIG. 26.

# PLATE XV.

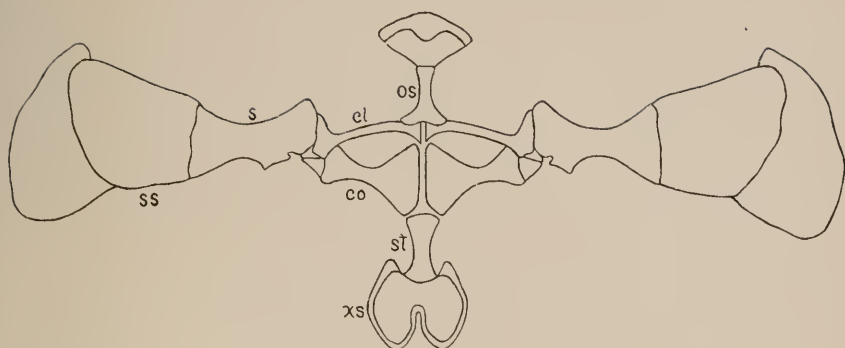


FIG. 27.

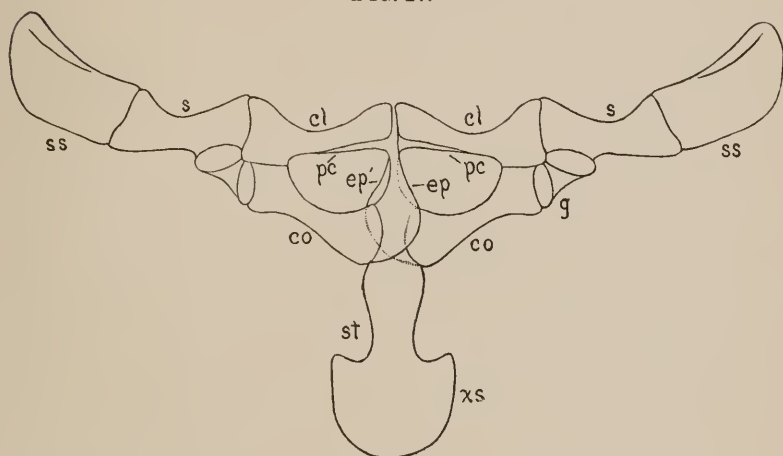


FIG. 28.

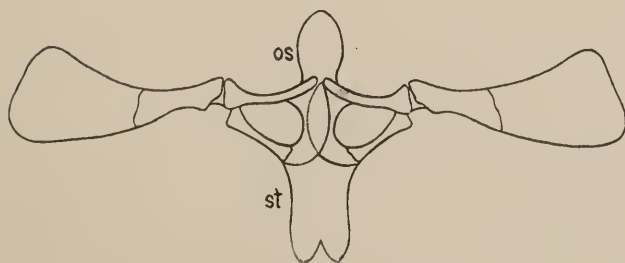


FIG. 29.