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NORTH AMERICAN BATRACHIA AND REPTILIA,

FOUND EAST OF MISSISSIPPI RIVER,

BY

N. S. DAVIS, JR., AND FRANK L. RICE.

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DESCRIPTIVE CATALOGUE

OF

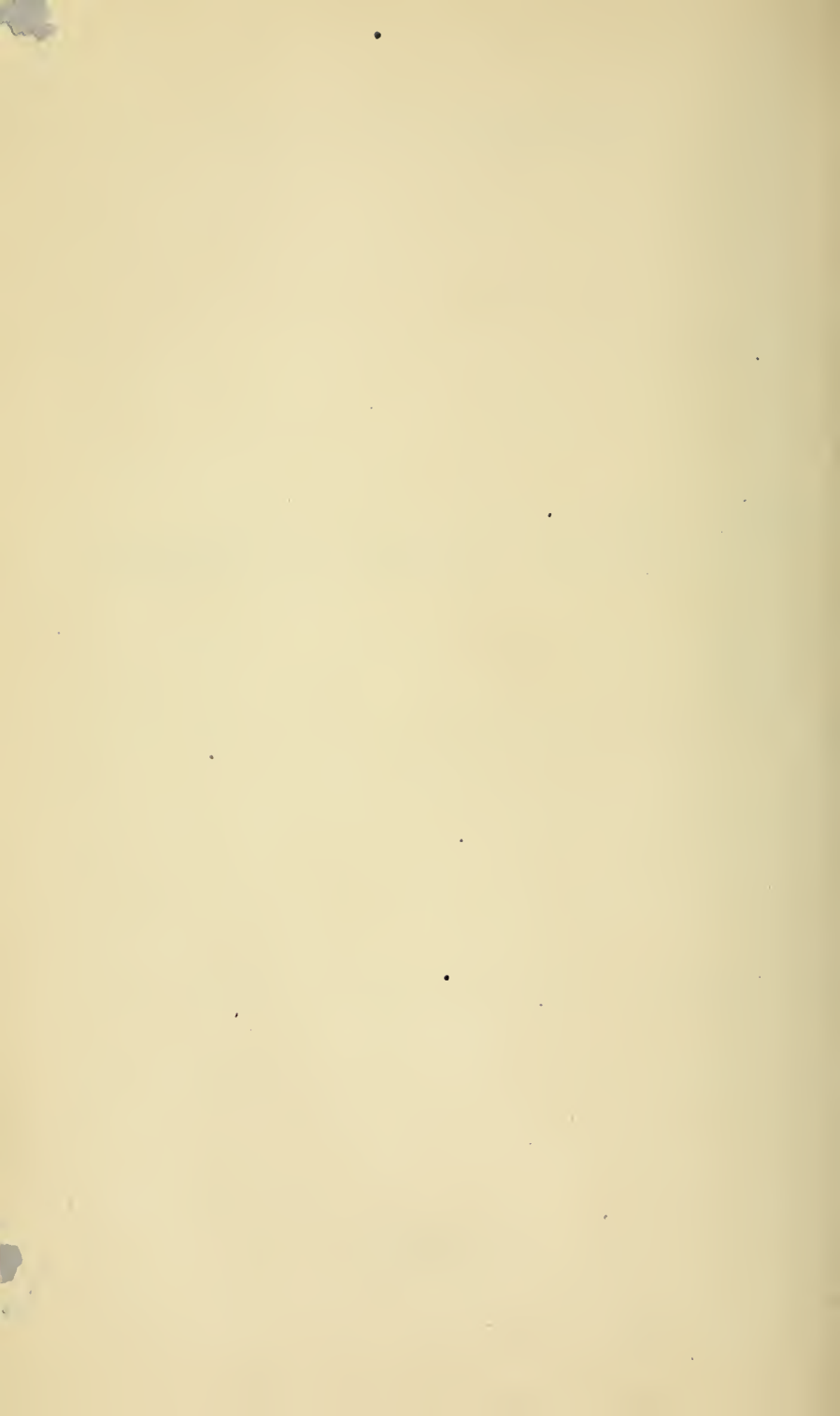
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The students of general herpetology in this country have labored under great disadvantage, as the descriptions of American Batrachia and Reptilia are scattered through many works, which are rarely found except in large scientific libraries. In the following pages an attempt is made to describe, in convenient form, the species found in Eastern North America, and the higher groups to which they belong. The nomenclature and classification used are the same as that adopted by Prof. E. D. Cope in his *Check List of North American Batrachia and Reptilia*. (Bull. of U. S. Nat. Mus., No. 1.) In order to facilitate the identification of specimens, and in order that the catalogue may be available to the greatest number, when easily recognizable characters did not exist in the natural synopses, they were added in artificial ones.

The works of the following authors have been especially useful in preparing the present paper: E. D. Cope, Baird, Girard, Agassiz, Holbrook, Huxley, Dumeril, Bibron, Gray's and Gunther's British Museum Catalogues, also the reports of the government exploring expeditions, the volumes of the Proceedings of the Philadelphia Academy of Sciences, etc.

Many of the synopses have been compiled from the numerous exhaustive articles by Prof. Cope, several of which have been copied in part almost verbatim. The compilers are much

indebted to the Northwestern University, and to the Chicago Academy of Sciences, for free access to their museums and libraries. They also feel under especial obligation for assistance of various kinds to Professors S. A. Forbes, Oliver Marcy, S. F. Baird, Mr. R. E. Earll, D. S. Jordan, and Doctors J. W. Velie and P. R. Hoy. In those instances in which the distribution of species has been extended beyond that given in Prof. Cope's check list, the new locality is noted in italics. Preceding the glossary which is appended to the catalogue, will be found a description of the faunal regions of the United States, as limited by Prof. Cope.

### SYNOPSIS OF CLASSES.

Mammary glands absent; blood cold; not less than two aortic arches; no fin rays.

*a.* Respiration through whole or part of life effected by means of branchiæ; lungs present in adult; two occipital condyles; no thoracic diaphragm; usually no scales or scutes, when present they are imbedded in skin; limbs, when present, well developed, with two or more digits; heart trilocular; no sternal ribs; undergo metamorphosis after leaving egg. . . . . *Batrachia.*

*b.* Respiration never effected by means of branchiæ, but after birth performed by lungs; no separate parasphenoid; a single convex occipital condyle; sometimes an incomplete thoracic diaphragm; body usually covered with scales or bony plates; metatarsal bones not anchylosed together or with distal tarsal bones; venous and arterial currents of blood mingled either in the heart itself, or at the origin of the aortic arches; undergo no metamorphosis after leaving egg. . . . . *Reptilia.*

# BATRACHIA.

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## SYNOPSIS OF ORDERS.

*A.* Tail present; inferior pelvic elements not consolidated into a single vertical mass; proximal elements of tarsus not elongated; frontals not confluent with parietals.

*a.* Dentaries and premaxillæ without teeth, covered with horny plates; two ethmoids, forming part of palate laterally; maxillaries, prefrontals, palatines, and pterygoids wanting; nasals present; posterior extremities absent; branchiæ persistent. . . . . *Trachystomata.*

*b.* Dentaries and premaxillæ toothed; two vertical ethmoids, one on each side of cerebral lobes; posterior extremities present.

*x.* Maxillaries, prefrontals, and nasals wanting; pterygoids and palatines present; branchiæ persistent. . . . . *Proteida.*

*y.* Usual cranial bones present; pterygoids and prefrontals sometimes absent; branchiæ wanting when completely developed. . . *Cuducibranchiata.*

*B.* Tail absent in adult; coccyx represented by a single long cylindrical bone; inferior pelvic elements consolidated into a single vertical mass; proximal elements of tarsus much elongated; frontals confluent with parietals; ethmoid, a ring usually ossified above, surrounding cerebral lobes; limbs four; body short, depressed. . . . . *Anura.*

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### Order TRACHYSTOMATA.

#### Family SIRENIDÆ.

Premaxillæ not anchylosed; two groups of vomerine teeth; parasphenoid edentulous; occipital condyles sessile; four persistent branchial arches; tongue free in front and on sides; eyes small; eye-lids not well developed; vertebræ amphicoelian; ear-

pus cartilaginous; metacarpals five. Head elongate; tail compressed.

Toes four; color uniform. . . . . *Siren*.  
Toes three; with longitudinal bands or stripes.

*Pseudobranchius*.

Genus SIREN, Linn.

1. *S. lacertina*, Linn. Great Siren. Color dusky, approaching to black, with numerous white or yellowish spots; abdomen purplish; eleven inches. Austroriparian region, North Carolina, Mexico, and *Northeastern Illinois*.

Genus PSEUDOBRANCHIUS, Gray.

2. *P. striatus*, LeConte. Striped Siren. Color dusky, with a broad yellow or brown stripe on each side; abdomen speckled with brownish white, and with two longitudinal stripes paler than those above; nine inches. Georgia.

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**Order PROTEIDA.**

Family PROTEIDÆ.

Premaxillæ not anchylosed; vomero-palatine teeth; parasphenoid edentulous; occipital condyles sessile; three persistent branchial arches; tongue large and fleshy, free in front and on sides; eyes small, distinct; eyelids none; vertebræ amphicælian; carpus and tarsus cartilaginous; metacarpals three; head elongate; trunk short and thick; toes four on each foot.

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**Order CADUCIBRANCHIATA.**

SYNOPSIS OF FAMILIES.

A. Teeth on anterior or outer margin of palatines. Prefrontals and pterygoids present; carpus and tarsus cartilaginous; vertebræ amphicælian.

a. An axial cranial bone in front of ethmoid, and one forming palatal surface in front of parasphenoid; parietals prolonged laterally, not reaching prefrontals; premaxillæ anchylosed; occipital condyles pedicellate; a single gill-cleft on each side. . . . . *Amphiumidæ*.

b. No anterior axial cranial bone; parietals and prefrontals prolonged, meeting and embracing frontals; premaxillaries separated; occipital condyles sessile; gill-clefts

- present or absent . . . . . *Menopomida*.
- B.* Teeth on posterior or inner margin of palatines; no anterior axial bope; gill-clefts closed in completely developed specimens.
- a.* Vertebrae amphicoelian; parietals embracing frontals; palatines with teeth on their posterior portion, not prolonged over parasphenoid; occipital condyles sessile.
- x.* Carpus and tarsus osseous; parasphenoid without dentigerous plates; pterygoids present; prefrontals prolonged and embracing frontals. *Amblystomida*.
- y.* Carpus and tarsus cartilaginous; parasphenoid with dentigerous plates; pterygoids wanting; prefrontals not prolonged or embracing frontals. *Plethodontida*.
- b.* Vertebrae opisthocelian; parietals not embracing frontals.
- x.* Carpus and tarsus cartilaginous; palatines with teeth on their posterior portion, not prolonged over the dentigerous parasphenoid; pterygoids and prefrontals wanting; occipital condyles pedicellate. . . . . *Desmognathida*.
- y.* Carpus and tarsus osseous; palatines with teeth on the inner margin of the separate processes which extend backward over the non-dentigerous parasphenoid; pterygoids and prefrontals present; occipital condyles sessile. . . . . *Pleurodelida*.

## ARTIFICIAL SYNOPSIS OF FAMILIES.

- A.* An opening on side of neck.
- a.* Limbs small; toes 2-2 or 3-3. . . . . *Amphiumida*.
- b.* Limbs well developed; toes 4-5. . . . . *Menopomida*.
- B.* No opening on side of neck when completely developed.
- a.* No patches of teeth (parasphenoid) on middle of roof of mouth behind; one or more series (palatine), usually transversely arranged, in front. . . . . *Amblystomida*.
- b.* Patches of teeth (parasphenoid) on middle of mouth behind. Without a row of large red spots on the sides.
- x.* Characters not combined as in the following. *Plethodontida*.
- y.* Anterior margin of tongue attached; toes 4-5; costal folds not over 15; tail compressed and finned above and no dorsal band, or parasphenoid patches of teeth well separated and a yellowish dorsal band. . . . . *Desmognathida*.

- c. Teeth on roof of mouth consisting of two longitudinal rows (palatine), which approach in front and diverge at back of mouth; usually with a row of large red spots on the sides. . . . . *Pleurodelidae*.

### Family AMPHIUMIDÆ.

- Toes two on each foot. . . . . *Amphiuma*.  
Toes three on each foot. . . . . *Muraenopsis*.

#### Genus AMPHIUMA, Linn.

5. *A. means*, Linn. Congo Snake. Color above brownish to slate color; beneath paler; one and one-half feet long. From Mississippi to North Carolina.

#### Genus MURÆNOPSIS, Fitz.

6. *M. tridactylus*, Cuvier. Color above brown to dark gray; beneath paler. Mississippi to Louisiana.

### Family MENOPOMIDÆ.

#### Genus MENOPOMA, Harl.

Palatine and maxillary teeth almost parallel; tongue transversely oval; limbs short and thick; toes 4-5, the two outer with membranous fringes; gill-clefts present.

7. *M. allegheniense*, Harl. Hell-bender. Body cinerous, with dusky blotches; length, one and one-half to two feet. Tributaries of Mississippi, and streams of Louisianian district to North Carolina.

8. *M. fuscum*, Holbrook. Body uniform umber; pale beneath. Headwaters of Tennessee river.

### Family AMBLYSTOMIDÆ.

#### Genus AMBLYSTOMA, Tschudi.

Palatine series of teeth in the same line, though often interrupted; quadrato-jugal bone wanting; tongue large and thick, with a narrow free margin, except posteriorly. A series of mucous pores around and anterior to orbit. Digits 4-5, not webbed.

- A. Palatine series of teeth extending laterally behind internal nares; plicæ of tongue radiating from its posterior portion. Par-

otoid glands not forming an ovoid distinct mass. Four phalanges in fourth toe.

a. Costal grooves 10; palatine series in three patches.

9. *A. talpoideum*, (Holbr.) Gray. Mole Salamander. Head broad, width contained about three and five-tenths times in distance from snout to groin; external nares much closer together than internal; palatine series of teeth convex backwards; tail short, compressed; patches of large pores on head; color brown or blackish above, paler beneath, irregularly marked with gray of a lichen-like character; dusky spots on back and tail; L. three and one-half inches. Austroriparian region; mountains of South Carolina.

b. Costal grooves 11; palatine series of teeth three.

x. No or one indistinct plantar tubercle.

10. *A. opacum*, (Graven) Bd. Opaque Salamander. Middle series of teeth transverse or concave, behind posterior margin of nares; width of head in specimens three inches long, less than four times in distance from snout to groin; in adults, four and seven-tenths times; no regular patches of conspicuous pores on head and parotoids. Black, with a dorsal series of transverse grayish bands about fourteen in number, which are sometimes more or less confluent and sometimes interrupted medially; L. three and one-half inches. From Pennsylvania to Florida; Wisconsin and Texas.

11. *A. punctatum*, (Linn) Bd. Large Spotted Salamander. Teeth as in the last; width of head in small specimens, three and five-tenths times to groin; in adults, four and five-tenths times; patches of conspicuous pores on head and parotoids; a deep dorsal groove; black, with a series of round bright yellow spots on each side of back; in alcoholic specimens, brown above with white spots; L. six inches. United States east of the plains; Nova Scotia.

12. *A. conspersum*, Cope. Smaller Spotted Salamander. Middle series of teeth convex, advancing beyond posterior margin of nares; width of head about four and five-tenths times in distance to groin; skin smooth; body quite free from visible pores; no distinct dorsal groove; color above, leaden beneath paler; sides with one or two series of small whitish spots; L. two and two-thirds inches. Pennsylvania to Georgia.

y. Plantar tubercles two, distinct.

13. *A. bicolor*, Hallowell. Middle series of teeth straight, nearly divided; external nares much closer together than internal; width of head more than one-quarter distance to groin; tail short, much compressed; dorsal furrow slight; color above, olive brown;

beneath, yellowish, which rises on the sides as short blotches, above these several ill-defined yellowish spots; parotid region yellow; tail yellow with dark spots; limbs cross-banded; L. six inches. New Jersey.

c. Costal grooves 12; mucous pores each side of muzzle.

x. Two distinct plantar tubercles; size large.

14. *A. tigrinum*, (Green) Bd. Tiger Salamander. No canthus rostralis; head long; external nares closer together than internal; tooth series continuous or slightly interrupted, generally convex forwards; parotid region much swollen; color usually blackish-brown, with irregular scattered spots or blotches of yellow; those on lower part of sides largest, subquadrate, and more or less confluent; sometimes uniform brown above and yellow below; sometimes entirely yellow, with brown linear patches; L. eight inches. United States east of the plains.

15. *A. xiphias*, Cope. Long-tailed Salamander. Canthus rostralis distinct; tail longer than head and body; external nares closer together than internal; muzzle obtuse; head small and short, width five times in distance to groin; palatine teeth in one series, slightly convex forwards; mandible projecting beyond muzzle; color above yellowish-olive; beneath brighter yellow; back and sides with reticulating bands of brown; a few rounded spots of the same on the belly; L. eleven and one-quarter inches; tail six. Ohio.

y. No or one indistinct plantar tubercle; size small; palatine series of teeth interrupted.

16. *A. jeffersonianum*, subsp. *jeffersonianum*, (Green) Cope. External and internal nares equidistant; width of head four and five-tenths to five times in distance to groin; dorsal groove indistinct; eyes situated far back; tooth series transverse, in four patches; distance between anterior corners of eyes more than twice the length of orbital fissure; head colored to black; with or without pale bluish spots on sides; L. five and five-tenths inches. Pennsylvania and Ohio northward.

17. *A. jeffersonianum*, subsp. *laterale*, (Hall) Cope. Middle patches of teeth convex forward; distance between anterior corners of eyes only twice length of orbital fissure; color black, with large white spots on sides and tail; smaller ones below; L. about one-half the preceding. In other respects like the last. Canada and Wisconsin northward; *Northern Illinois*.

18. *A. jeffersonianum*, subsp. *fuscum*, (Hall) Cope. Color dark brown, with a darker shade or band along sides; L. three and eight-tenths. Indiana and Virginia.

19. *A. jeffersonianum*, subsp. *platineum*, Cope. Width of head five and five-tenths to six times in length to groin; tooth series slightly convex; lead-colored above; paler below, with or without indistinct whitish blotches. Ohio; *Southwest Illinois*.

*B.* Palatine series of teeth not extending laterally behind inner nares; plicæ of tongue radiating from a median longitudinal furrow; no distinct parotoid mass; four phalanges in fourth toe; no canthus rostralis; species small; costal grooves 14.

20. *A. cingulatum*, Cope. Mandible shorter than muzzle; head elongate; width between eyes behind equal to distance from same to nares; width of head six and a half times in distance to groin; a strongly marked dorsal groove; palatine teeth entirely between inner nares; color black; beneath thickly speckled with gray; a vertical gray line between each pair of costal folds, which either meet the opposite one on the median line, or bifurcate to meet a similar bifurcation on the back; the annuli thus formed extend from head to end of tail; L. three and one-half inches. South Carolina.

21. *A. microstomum*, Cope. Mandible longer than muzzle; head short; width between eyes behind equal to distance from same to end of muzzle; body stouter than preceding; width of head six and a half to seven times in distance to groin; dorsal groove slight; color brownish-black, paler beneath; usually with thickly and irregularly sprinkled spots or patches of plumbeous on sides, and less numerous spots above and below; L. four inches. Eastern region, west of Alleghanies.

## Family PLETHODONTIDÆ.

### SYNOPSIS OF GENERA.

*A.* Tongue attached from the central or posterior pedicel to anterior margin in a narrower or wider band; maxillary normal, with small teeth; parietals fully ossified.

*a.* Two premaxillary bones, with fontanelle.

*x.* Digits 4-4. . . . . *Hemidactylium*.

*y.* Digits 4-5. . . . . *Plethodon*.

*b.* One premaxillary, without fontanelle. Digits 4-5.

*Stereochilus*.

*B.* Tongue free all around, attached only by the central pedicel; parietals well ossified; digits free.

*a.* One premaxillary, with fontanelle.

*x.* Digits 4-4. . . . . *Manculus*.

*y.* Digits 4-5. . . . . *Spelerpes*.

*b.* Two premaxillaries, with fontanelle. Digits 4-5.

*Gyrinophilus*.

## ARTIFICIAL SYNOPSIS OF GENERA.

## A. Anterior margin of tongue attached.

a. Toes 4-4. . . . . *Hemidactylum*.

b. Toes 4-5.

x. Tail rounded and not finned, or with costal folds not over 14. . . . . *Plethodon*.y. Tail compressed and finned above; costal folds 17; pale-yellow, brown-lined. . . . . *Stereochilus*.

## B. Tongue free on all sides.

a. Toes 4-4. . . . . *Manculus*.

b. Toes 4-5.

x. Yellow or red above, spotted or lined with black or brown; or with not more than 12 costal folds.

*Spelerpes*.

y. Uniform purple-gray above; costal folds 14.

*Gyrinophilus*.

## GENUS HEMIDACTYLIUM, Tsch.

22. *H. scutatatum*, (Schl.) Tsch. Four-toed Salamander. Costal furrows well marked; skin of back cut so as to resemble scutæ; body short; limbs slender; tail rounded at base, compressed distally, one to two times length of body; color above brown, with irregular scattered black spots on sides; below whitish, with pitchy black spots; snout yellow; limbs and tail orange-brown; L. two and five-tenths inches. Rhode Island and Illinois to Gulf of Mexico.

## GENUS PLETHODON, Tsch.

23. *P. cinereus*, subsp. *cinereus*, (Green) Cope. Palatine series of teeth well separated medially, not extending beyond inner nares externally; costal plicæ 16-19; form slender; tail cylindrical; limbs weak; inner toes rudimentary; above cinereous; no red dorsal band; below paler, sometimes spotted with darker; L. three and one-half inches. Eastern region.

24. *P. cinereus*, subsp. *erythronotus*, (Green) Cope. A red dorsal stripe from head to tip of tail; in other respects like preceding. Eastern region.

25. *P. cinereus*, subsp. *dorsalis*, Bd. M S S. Louisville, Kentucky; Salem, Massachusetts.

26. *P. glutinosus*, (Green) Bd. Viscid Salamander. Palatine series well separated medially, extending outside of inner nares; costal plicæ 14; form stout; tail rounded; limbs short, stout; inner digits distinct; black, usually with gray lateral blotches and smaller dorsal spots; L. four and one-half inches. Eastern and Austroriparian regions.

## GENUS STEREOCHILUS, Cope.

27. *S. marginatum*, Hall. Costal folds 17; body elongate; width of head contained more than seven times in length to groin; tail compressed from base; finned; size small; pale-yellow with brown lines. Georgia.

## GENUS MANCULUS, Cope.

28. *M. remifer*, Cope. Tail stout, compressed; body shorter by length of femur; black, sides speckled with lighter. Florida.

29. *M. quadridigitatus*, (Holbrook) Cope. Tail slender, cylindrical; body longer, and muzzle broader than in preceding; color above, dirty yellow, with minute dark brown spots, sometimes forming lines on vertebral region; L. three and one-half inches. North Carolina to Florida.

## GENUS SPELERPES, Raf.

A. Palatine teeth not contiguous with sphenoidal patches, nor extending outward beyond nares; tail compressed; costal grooves 13-14.

30. *S. bilineatus*, Green. Two-striped Salamander. Costal plicæ 14, generally indistinct; tail not keeled proximally above, about length of body; median digits long; color yellow, with two longitudinal black lines, and sometimes a third, on vertebral region; abdomen unmarked; L. two and three-quarters inches. Eastern and Austroriparian regions, except Texas.

31. *S. longicaudus*, Green. Cave Salamander. Costal grooves 13; tail keeled above, about twice length of body; digits widely separated, moderate; yellow, with numerous irregular black spots scattered over sides and back; belly immaculate; L. five inches. Eastern and Austroriparian regions.

32. *S. guttolineatus*, Holb. Costal grooves 13; tail keeled above, longer than body, sometimes twice its length; inner digits longest; yellow with a dorsal and lateral black band; tail black, bared with yellow; belly mottled. North Carolina to *Mississippi*.

B. Palatine teeth contiguous posteriorly with sphenoidal patches; not extended outside of nares; tail rounded at base, not keeled; costal grooves 15-17.

33. *S. ruber*, subsp. *ruber*, (Daud.) Cope. Red Triton. Costal plicæ 15-16; tail not so long as body; color above, red with numerous, crowded, somewhat indistinct, black spots; abdomen paler, unspotted; iris with a dark longitudinal bar; L. six inches. Eastern and Austroriparian regions.

34. *S. ruber*, subsp. *montanus*, (Bd.) Cope. Costal plicæ 17; tail as long as body; above reddish-brown, with few, but well-defined, black or brown spots; beneath deep salmon-color; iris without dark bar; L. five inches. Alleghany Mountains, from Pennsylvania to South Carolina.

35. *S. ruber*, subsp. *sticticeps*, (Bd.) Cope. In M S S. South Carolina.

#### Genus GYRINOPHILUS, Cope.

36. *G. porphyriticus*, (Green) Cope. Purple Salamander. Costal plicæ 14; width of head less than seven times to groin; canthus rostralis prominent; tail rounded at base, without fin; above yellowish-brown or salmon color, irregularly marked with gray; beneath whitish; L. six inches. Mountains, from Vermont to Alabama.

#### Family DESMOGNATHIDÆ.

##### Genus DESMOGNATHUS, Bd.

Premaxillaries united, embracing a fontanelle; parietals ossified; tongue free on sides and posteriorly; digits distinct, 4-5.

A. Costal plicæ 13-15.

37. *D. ochrophæa*, Cope. Generally a single, imperfect, lateral series of pores; no tubercle in canthus of eye; tail rounded, not finned; posterior half of mandible in males non-dentate; costal plicæ 13; brown, with a yellowish dorsal band; back dotted; belly dirty white, immaculate; males darker; L. three inches. Mountains, from New York to Georgia.

38. *D. fuscus*, subsp. *fuscus*, (Raf.) Cope. Generally two lateral series of pores, inferior, well developed, superior, irregular, or wanting; a tubercle in canthus of eye; tail compressed and keeled; mandible in males completely toothed; above brown, marked with gray and pink; belly marbled, the pale color predominating; no red spots on sides; L. three inches. Massachusetts to Mississippi; *Illinois*.

39. *D. fusca*, subsp. *auriculata*, (Holb.) Cope. Above black, with a series of small red spots on sides; belly marbled, the darker color predominating; otherwise as in preceding. South Carolina to Louisiana.

B. Costal plicæ 12.

40. *D. nigra*, (Green) Bd. Two well developed lateral series of pores; a tubercle in canthus of eye; tail flattened, attenuated, finned above; mandible in males completely toothed;

black above and below; L. six inches. Mountains, southward from Pennsylvania; *N. Illinois*.

### Family PLEURODELIDÆ.

#### Genus DIEMYCTYLUS, Rafin.

Palatine teeth in two longitudinal series, diverging behind; tongue attached, lateral margin alone slightly free; ribs rudimentary; tail small, compressed from base; toes four in front, five behind, the inner and outer rudimentary.

41. *D. miniatus*, subsp. *miniatus*, (Raf.) Cope. Red Eft. Above red; sides with a row of large vermilion spots; beneath paler or yellowish, with numerous black dots; skin rougher than the following; terrestrial; L. three and one-half inches. Eastern and Austroriparian regions.

42. *D. miniatus*, subsp. *viridescens*, (Raf.) Cope. Spotted Triton. Above olive-green, varying in shade, with a pale dorsal streak; beneath lemon-yellow; other markings as in the preceding; dorsal crest more developed; aquatic. Eastern and Austroriparian regions.

## Order ANURA.

### SYNOPSIS OF SUB-ORDERS AND FAMILIES.

#### A. Toothless.

- a. Epicoracoid\* divergent from coracoid, and connected with it by a longitudinal cartilaginous arch which is free from, but overlaps corresponding arch on opposite side.

##### Sub-order *Bufoniformia*.

Superior plate of ethmoid ossified; sacral diapophyses dilated; coccyx attached to two condyles; tongue free posteriorly . . . . . *Bufonide*.

- b. Epicoracoids, when present, in contact with coracoids; the distal ends of the former separated from those of the latter by articular cartilage only.

##### Sub-order *Firmisternia*.

Epicoracoids wanting; sacrum and coccyx not confluent; sacral diapophyses dilated . . . *Engystomide*.

#### B. Teeth on upper jaw.

- a. Epicoracoids directed forward, divergent from coracoids, and connected with them by overlapping cartilages.

##### Sub-order *Arcifera*.

\*The precoracoid and acromial of some authors.

- x.* Coccyx and sacrum articulated by two condyles. Sacral diapophyses dilated; vertebræ proœelian; terminal phalanges articulated inferiorly to penultimate, swollen at base, distal portion slender, nail-like; abdomen areolate. . . . . *Hylidæ*.  
 Sacral diapophyses cylindrical; vertebræ proœelian; mandible toothless; terminal phalanges not as in preceding. . . . . *Cystignathidæ*.
- y.* Coccyx and sacrum confluent; sacral diapophyses dilated; vertebræ proœelian; terminal phalanges continuous, conical. . . . . *Scaphiopidæ*.
- b.* Epicoracoids in contact with coracoids, not connected with them by overlapping cartilages.

Sub-order *Raniformia*.

Sacral diapophyses cylindrical; xiphisternum and manubrium osseous; ear well developed; frontoparietals never embracing fontanelle. . . *Ranidæ*.

ARTIFICIAL SYNOPSIS OF FAMILIES.

*A.* Toothless.

- a.* Parotoid glands present; tympanic membrane visible; skin more or less warty. . . . . *Bufonidæ*.  
*b.* No parotoid glands; tympanic membrane concealed; skin smooth. . . . . *Engystomidæ*.

*B.* Teeth on upper jaw.

- a.* Parotoid present; a large, flat-edged spur on heel. *Scaphiopidæ*  
*b.* No parotoids or large spur on heel.  
*x.* Terminal phalanges dilated; external metatarsi bound together.  
 abdomen granulated; terminal phalanges swollen at base and with slender, nail-like ends. . . *Hylidæ*.  
 2. Abdomen smooth; terminal phalanges swollen at end and terminating in a viscous disk. *Cystignathidæ*  
*y.* Terminal phalanges continuous; external metatarsi separated by a web. . . . . *Ranidæ*.

**Sub-order BUFONIFORMIA.**

Family BUFONIDÆ.

Genus *BUFO*, Laurenti.

Ear perfectly developed; prefrontals in contact with each other and with the frontoparietals, the latter entirely osseous;

parotoids not confluent, rounded; two metatarsal tubercles; tongue oval, elongated; toes more or less palmated; skin tuberculous; no dorsal ossification on head; subgular vocal vesicle in males.

43. *B. lentiginosus*, subsp. *americanus*, LeConte. Common Toad. Superciliary ridges well marked, though but moderately elevated and not terminating in a knob posteriorly; skin on head thick, adhering to skull; tympanum well developed; parotoids large, sub-reniform; internal metatarsal tubercle large and spade-shaped; toes semipalmated; large tubercles on back; beneath granulated; color above, greenish or yellowish-brown, with scattered black spots or patches; two black patches under eyes, and occasionally spots about nostrils and jaws; beneath dirty yellowish, sometimes spotted and blotched; L. two and one-half inches. Eastern United States; west to the plains.

44. *B. lentiginosus*, subsp. *lentiginosus*, Latr. Superciliary ridges much elevated posteriorly and terminating in a rounded knob; mouth very large; tympanum and parotoid well developed, the latter uniform; toes semipalmate; back warty; abdomen granulated; above dusky brown, tinged with yellowish, and more or less blotched; beneath dirty yellowish-white; L. two inches. Austroriparian region.

45. *B. lentiginosus*, subsp. *fowleri*, Putnam, MSS. Massachusetts to Lake Winnipeg.

46. *B. quercicus*, Holb. Superciliary ridges slightly elevated, terminating posteriorly in a small knob; snout pointed; tympanum small; parotoids large, oblong; metatarsal tubercles small; toes slightly webbed; back with a few small warts; beneath granulated; body greatly depressed; back dusky, with a pale yellow vertebral line, on each side of which are black blotches, with here and there a tinge of reddish-brown; beneath silver-gray, with a yellowish tinge around vent; L. three-quarters of an inch. Florida to North Carolina and Louisiana.

47. *B. valliceps*, Wieg. Upper surface of head deeply concave; skin thin, firmly adhering to skull; superciliary ridges prominent; tympanum large; parotoids small; toes semipalmate; above yellowish-brown, with a broad dorsal streak of same tint, on each side of which is generally a black bar, extending the whole length of body; sides maculated; beneath unicolor in adults, spotted in young. Texas district and Louisiana.

**Order FIRMISTERIA.**

## Family ENGYSTOMIDÆ.

## Genus ENGYSTOMA, Fitzinger.

Ethmoid arch ossified; prefrontals in contact with each other, and with the completely ossified fronto-parietals; terminal phalanges simple; ear fully developed; head small, not distinct from body; tympanic membrane concealed; toes free or slightly palmate; metatarsi with small tubercles.

48. *E. carolinense*, Holb. Head short, pointed; body thick, nearly oval; skin smooth; toes unwebbed; above chestnut, darker along vertebral line; below grayish, thickly sprinkled with black specks; L. one inch. Austroriparian region.

**Order ARCIFERA.**

## Family HYLIDÆ.

No postorbital process to fronto-parietals, which embrace a large fontanelle; xiphisternum deeply emarginate; pupil horizontal; vomerine teeth present; true pollex a simple metacarpal, without phalanges.

## A. Digital dilations small.

a. Toes broadly webbed; tongue extensively free, deeply notched behind.....*Acris*.

b. Toes free; superior plate of ethmoid osseous; prefrontals separate.....*Chorophitus*.

B. Digital dilations well developed; tongue completely attached or one-third free; posterior digits webbed; vomerine teeth in transverse or posteriorly convergent fasciculi.....*Hyla*.

## Genus ACRIS, D. et B.

49. *A. gryllus*, subsp. *gryllus*, LeConte. Head elongated; snout pointed; tympanum rather indistinct; hind legs very long; inner and hind part of thighs reticulated; body above, brownish or cinereous; middle of head and back green or reddish-brown; a triangular dark patch between eyes; a white line from orbit to arm; two or three large oblique dark patches, usually margined with white on sides; these markings sometimes wanting; beneath white, often varied with dusky; chin and throat tinged with yellowish; L. one and one-half inches. Austroriparian region.

50. *A. gryllus*, subsp. *crepitans*, Bd. Head rather obtuse; inferior surface of thigh plain; general appearance of the pre-

ceding; L. one and one-half inches. Eastern and central regions.

### Genus CHOROPHILUS, Bd.

51. *C. triseriatus*, Wied. Above light-bluish ash; a dark dorsal stripe, commencing at snout and bifurcating about middle of body; a stripe on each side of this, and one on the side of head and body, the latter edged with white below; abdomen whitish; L. one inch. Eastern and central regions.

52. *C. triseriatus*, subsp. *corporalis*, Cope, MSS. New Jersey.

53. *C. nigritus*, LeConte. Above olive-brown, tinged with yellow and speckled with small, white granulations; an interrupted vertebral line from snout to rump; upper lip white, above which is an irregular dark patch, extending from near snout to shoulder; head and extremities ash color, the latter with dusky bars; abdomen yellowish-white; L. one and one-half inches. South Carolina and Georgia.

54. *C. angulatus*, Cope. Above chestnut-brown or bronzed; upper lip white, above which is a black patch that passes near and terminates beyond shoulder; abdomen yellowish-white; L. one inch. South Carolina.

55. *C. ocellatus*, Daud. Above uniform olive; a black streak from snout to shoulder; an oval blotch on sides; two or three small spots on loin. South Carolina to Georgia.

56. *C. ornatus*, Holb. Above dove-color with several oblong, dark brown blotches, margined with yellow, on each side of vertebral line; a black vitta from snout to near shoulder, and one from shoulder towards lower jaw; most of upper jaw yellowish; limbs with dark bands; anterior and posterior surface of thigh with yellow spots; beneath white; throat with a few black spots; under surface of legs flesh-color; L. one and one-fourth inches. South Carolina and Georgia.

### Genus HYLIA, Laurenti.

57. *H. andersoni*, Bd. Above rather deep pea-green; paler on sides and on margin of upper jaw; a narrow band of purplish-brown from eye to a little beyond insertion of arm; sides margined below by large, irregular spots of saffron; similar spots on a ground of paler shade before and behind humerus and femur, and beneath tibia; a band of mulberry tint on tibia anteriorly; beneath whitish flesh color; an oval spot of green on each side of throat; L. one inch, eight lines; femur eight

lines; tibia nine lines; foot twelve and one-half lines. New Jersey to South Carolina.

58. *H. squirella*, Daud. Above olive-green, with irregular dark blotches; a dusky bar between orbits; an indistinct band from nostril to eye; a white line along upper jaw to shoulder; beneath greenish-white in front, darker behind; throat with a few dark spots; extremities obscurely marked with darker above, flesh-colored beneath; L. one and one-quarter inches; thigh eight-tenths of an inch; leg eight-tenths of an inch; tarsus and toes nine-tenths of an inch. Austroriparian region.

59. *H. carolinensis*, Penn. Above bright green with occasional golden spots; a pale yellow line on sides of body; also one on posterior border of arm, and before and behind leg; limbs not barred; beneath yellowish-white; thigh yellow; leg flesh color; L. one and three-quarters inches; thigh eight lines; leg eight and one-half lines; tarsus and toes one inch, two lines. Austroriparian region.

60. *H. pickeringi*, Holb. Above yellowish-brown or fawn-color, with dusky spots and lines, the latter usually forming an oblique-angled cross on back; a line on top of head, extending back at an angle; another from nose to arm; limbs transversely barred, the dusky markings frequently very indistinct; beneath whitish; L. eleven and one-half lines; femur five and one-half lines; tarsus and toes nine and one-half; tibia five and one-half. Eastern region.

61. *H. femoralis*, Daud. Above cinereous, with large dark blotches; a triangular patch between eyes; six or eight sub-triangular spots of bright yellow on posterior surface of thighs, arranged nearly in a line; beneath white; chin sometimes marked with dusky; limbs with dusky spots or bars; color above somewhat variable, the darker markings not always present; L. one and one-half inches. Eastern part of Austroriparian region.

62. *H. versicolor*, LeConte. Common Tree Toad. Above gray, greenish, or brown, with large, irregular dark blotches; below white; posterior part of abdomen yellow; skin above with minute warts and granulations; exceedingly variable; L. two inches; femur one inch; tibia nine-tenths; foot one and four-tenths. Eastern and Austroriparian regions.

63. *H. gratiosa*, LeConte. Above varying from bright green to cinereous or greenish-dusky, with roundish spots or irregular blotches of darker, or speckled with variously shaped spots of the same; a few small yellow spots on back and sides;

upper lip white, sometimes varied with green or dusky; in some specimens a line extends from jaw along sides, in others, the sides are variegated with rounded spots of darker, and the line is absent; beneath whitish, more or less inclining to yellow or orange; chin marked with dusky or green; limbs barred; yellowish or reddish beneath; skin coarsely granulate above; L. two and five-tenths inches; femur one and two-tenths inches; tibia one and fifteen-hundredths; foot one and six-tenths. Florida; lower Georgia.

### Family CYSTIGNATHIDÆ.

#### Genus LITHODYTES, Cope.

Prefrontals in contact, and usually with the fully ossified fronto-parietals; ear fully developed; xiphisternum broad, without style; external metatarsi bound together; digits nearly or quite free; terminal phalanges with a distal transverse limb, supporting a viscous disk; abdomen smooth.

64. *L. ricordi*, D. et B. Southern Florida.

### Family SCAPHIOPIDÆ.

#### Genus SCAPHIOPUS, Holb.

Tympanum, cavity of tympani, parotid glands, and vomerine teeth present; derm involved in cephalic ossification, which is complete; cuneiform bone furnished with a spade-like process which is covered with a corneous sheath; xiphisternum cartilaginous; toes more or less webbed.

65. *S. holbrookii*, Harl. Above brownish; a yellowish or pale ashy band on each side, sometimes indistinct; a vertical light line on end of muzzle, and two longitudinal streaks sometimes present; occasionally a pale interorbital crossband and light markings on sides; head large; maxillary rounded; eyes prominent; tympanum distinct; tongue large, emarginate; vomerine teeth opposite posterior border of internal nares; parotids small, prominent; a gland on each side of thorax, near axillæ; skin of back minutely tuberculous; of sides, more coarsely; below nearly smooth; cuneiform process very long; size moderate. Eastern United States.

## Order RANIFORMIA.

## Family RANIDÆ.

## Genus RANA, Linn.

Vomerine teeth present; external metatarsi webbed to the base; terminal phalanges elongated, acute, or slightly dilated at tip; dorso-lateral dermal folds present or absent; abdomen smooth.

66. *R. areolata*, subsp. *capito*, LeConte. Above dark slate color, speckled with black; six rows of roundish spots on back, speckled and irregularly marked with spots of same form and color on sides; beneath yellowish-white, spotted and varied with dusky; arms and legs above gray, speckled and barred with black; beneath yellowish, especially at axillæ and groins; spotted and varied with dusky; head very large, broad, and blunt; coarsely punctured above; a deep concavity between nostril and eye; a broad, cutaneous fold from orbits to beyond middle of body; a second from corner of mouth to shoulder; body above very rough; posterior surface of thighs granulate; fingers slightly palmate at base; L. four and two-tenths inches; width of head at corners of mouth, one and five-tenths; arm one and nine-tenths; leg four and seventy-five hundredths; femur one and one-tenth; tibia one and forty-five hundredths; foot two and two-tenths inches. Florida.

Prof. Cope recognizes a second subspecies, *R. areolata areolata*, whose habitat is the Texan district, the following description of which is taken from the Mexican Boundary Survey: "Head very large, subelliptical; snout prominent, nostril situated half way between its tips and the anterior rim of eyes, which are proportionally large; tympanum spherical and of medium size; its central portion yellowish-white, whilst its periphery is black; body short and stout; limbs well developed; fingers and toes very long, without being slender; ground color of body, and head yellowish-green, marked with brown; besides there are thirty or forty brown areolæ." In our manuscript notes we had described a Rana from Benton Co., Indiana, as a new species. It differed so much from the description of *R. areolata areolata* and *R. areolata capito*, that we felt justified in giving it a new name provisionally until other specimens could be obtained so as to decide more definitely its relationship, if there was any specific, with *R. areolata*. An abstract of the following description was published in the second edition of Jordan's Manual of Vertebrata, under the name of *R. circulosa*.

Since then, other specimens have been examined and carefully compared with some from Florida and Texas. These have convinced us that specific differences do not exist between them. By comparing the description with those above, it will be seen, however, to differ as widely from them as they do from each other; therefore, if they can be retained as subspecies, the specimens falling under the following description will naturally form a third subspecies for which we propose to retain the name formerly used specifically, that is, *circulosa*.

67. *R. areolata*, subsp. *circulosa*. Above brownish-black, divided by very narrow lines of clay-color into circular and irregular blotches, which are largest posteriorly; arms with dark blotches; legs with transverse bars; posterior face of thighs mottled; beneath white; a few black spots along jaws; head broad, depressed; snout very obtuse, not produced; skin coarsely punctate above; a deep concavity between nostril and eye; diameter of tympanum and length of eye the same; internal nares oblique; the vomerine patches of teeth arranged obliquely between them; region above and behind tympanum much swollen; a broad, cutaneous fold on sides of back, narrower behind; a similar one from eye to arms; a third between these posteriorly; large oval tubercles on sides; hind surface and posterior half of under surface of thighs coarsely granulate; fingers distinctly webbed at base; toes palmated only between first phalanges, the webs narrow and incised; L. three and forty-six hundredths inches; femur one and forty-two hundredths; tibia one and sixty-three hundredths; foot two and forty-five hundredths; arms one and eighty-five hundredths; width of head one and thirty-two hundredths; length of leg five and five-tenths inches. Description taken from an alcoholic specimen collected in Benton Co., Indiana, by Mr. E. F. Shipman.

In the collection of the Smithsonian Institution, there are specimens bearing the specific name of *R. areolata* from Illinois (2), Texas (1), Florida (1), and Georgia (1). Those from Illinois, Florida, and Georgia have been labeled *R. areolata capito*, the other *R. areolata areolata*. The specimens from Illinois (northern portion) are in coloration like the one we have described above from Indiana, under the name of *R. areolata circulosa*. The Texas specimen is white below, above light brown with dark brown blotches, rounded on front portion of body and encircled by a narrow whitish line, more angular posteriorly; otherwise as in *R. areolata circulosa*. The Florida specimen is white below and yellowish or greenish above, and covered with rounded and more or less irregular brown spots;

otherwise as in *R. areolata capito*. The Georgia specimen is plain brown above; below thickly and finely mottled with brown and white; otherwise as in the last. The measurements of these are as follows:

	Length.	Width Head.	Arm.	Femur.	Tibia.	Foot.
N. Illinois.....	2.00 in.	.75 in.	.98 in.	.68 in.	.87 in.	1.31 in.
N. Illinois.....	1.87 "	.68 "	.93 "	.87 "	.97 "	1.25 "
Florida.....	2.12 "	.90 "	1.24 "	1.00 "	1.06 "	1.50 "
Georgia.....	2.55 "	1.05 "	1.20 "	1.25 "	1.37 "	1.87 "
Texas .....	3.12 "	1.06 "	1.60 "	1.50 "	1.55 "	2.25 "

68. *R. hulecina*, Kalm. Common Frog. Above greenish, often bright, with distinct pale-edged dark blotches; a whitish line on sides of head; legs barred; beneath white or yellowish, occasionally dusky markings on throat; head rather elongated; tympanum moderate; a glandular fold along upper jaw and a well marked one on each side of back; generally a pair of ridges on coccyx; femur less than tibia; the latter more than one-half length of head and body; toes moderately webbed; L. two and three-quarters inches. North America.

69. *R. palustris*, LeConte. Pickerel Frog. Above pale brown, with two rows of large oblong square blotches of dark brown on back, one or two on sides; spots in the same row sometimes confluent; a brown spot above orbits; one near snout; a dark line from nostril to eye; upper jaw white, spotted with black; arms with dark blotches; legs with transverse bars above; posterior surface of thighs mottled; beneath yellowish-white; head short, rather obtuse; body slender; tympanum moderate; glandular folds depressed, inconspicuous; toes well palmated; L. two and three-quarters inches; femur about equal to tibia, and one-half total length. Eastern region.

70. *R. septentrionalis*, Bd. Above brown or olive, with vermiculations of lighter; sometimes a few dark blotches posteriorly; beneath white or yellowish, unblotched; a cutaneous fold on each side of back; femur and tibia about equal, and about one-half length of body; L. two and one-half inches. Canada to Montana.

71. *R. clamitans*, Merrem. Green Frog. Above green or brownish, darker posteriorly; generally with irregularly disposed small blackish spots; arms with dark blotches; legs with narrow transverse bars; beneath white, sometimes tinged with yellow, and frequently marked with dusky in front; posterior surface of thighs mottled with black; tympanum large; an elevated cutaneous fold on each side of back; toes well palmated; femur

and tibia about equal, and one-half length of body; L. three inches. Eastern United States.

72. *R. catesbiana*, Schaw. Bull Frog. Above greenish of varying shades, marked with numerous small dark spots; head usually bright, pale green; extremities blotched; posterior surface of thighs mottled with blackish; below yellowish-white, often clouded with dusky; cutaneous folds none or inconspicuous; head very large, as broad as long; tympanum large; interval between patches of palatine teeth comparatively large; toes broadly webbed to the base of last joint; femur about equal to tibia, and less than one-half total length; L. five inches. Eastern United States.

73. *R. temporaria*, subsp. *sylvatica*, LeConte. Wood Frog. Above pale reddish-brown; a dark brown vitta, narrow before and broad behind, from snout to near shoulder, bordered below by a yellowish white line; a black spot usually at base of arms; flanks mottled in front; extremities with transverse dark bars above; below white, sometimes mottled on anterior surface; head small, pointed; tympanum small; a narrow cutaneous fold on each side of back; femur and tibia about equal, the latter considerably more than one-half total length; L. one and three-eighths inches. Eastern region.

74. *R. temporaria*, subsp. *cantabrigensis*, Bd. General appearance and size of preceding; light colored lateral folds and a dorsal line from snout to arms; sometimes dark spots above; a narrow light line along posterior face of thighs; tibia about one-half length of body. Canada to Rocky Mountains.

# REPTILIA.

## SYNOPSIS OF ORDERS.

A. Cloacal aperture transverse; penis double; dorsal vertebræ movable upon one another and ribs upon them; teeth present; lungs free; limbs when fully developed, with free digits; heart trilocular.

a. Rami of lower jaw loosely united in front by ligament and muscle, attached behind to a movable quadrate bone, which in turn is connected with a movable squamosal; palatine united to pterygoid only; no pectoral arch or urinary bladder; no eyelids or tympanic cavity. . . . . *Ophidia.*

b. Rami of jaw more firmly united; no movable squamosal; anterior ends of palatines united to maxillæ and vomers; pectoral arch and urinary bladder present; usually with movable eyelids and a tympanic cavity.

*Lacertilia.*

B. Cloacal aperture round or longitudinal; penis simple.

a. A dorsal shield or carapace present, composed of the much-flattened spinous processes of the dorsal vertebræ, and the greatly expanded ribs, which are united to superficial bony plates; ribs and dorsal vertebræ immovable; all vertebræ without transverse processes; an abdominal plate or plastron; pectoral and pelvic arches within shield; scapula and precoracoid ankylosed; quadrate firmly united to skull; heart trilocular; lungs fixed against inner periosteum of carapace; no true teeth; urinary bladder present. . . . . *Testudinata.*

b. No carapace or plastron; anterior dorsal vertebræ with elongated and divided transverse processes; teeth in sockets; lungs free; four well-developed limbs; heart quadrilocular; rami of lower jaw united by suture; quadrate immovably fixed to skull; no urinary bladder; movable eyelids, and rudimentary external ear.

*Crocodylia.*

## Order OPHIDIA.

## SYNOPSIS OF FAMILIES.

A. Maxillary bone vertical; fangs erectile, perforated, and not grooved externally; a deep fossa on each side of head behind nostril, partly occupying the excavated maxillary. . . . *Crotalidæ*.

B. Maxillary bone horizontal, not excavated; rudimentary extremities none.

x. Maxillary with a permanently erect, perforated, and usually grooved tooth; neural spines and pleuropophyses short; caudal hypopophyses bifid.

*Elapidæ*.

y. Maxillary produced to premaxillary, bearing solid teeth; coronoid bone wanting. . . . . *Colubridæ*.

## ARTIFICIAL SYNOPSIS OF FAMILIES.

A. Sub-caudal scutellæ entire; head very distinct from body. *Crotalidæ*.

B. Sub-caudal scutellæ bifid.

x. Postorbitals wanting; head continuous with body. *Elapidæ*.

y. Postorbitals present; head variable. . . . *Colubridæ*.

## Family CROTALIDÆ.

A. Top of head scaled; tail terminated in a rattle. *Crotalus*.

B. Top of head covered with symmetrical plates.

a. Tail terminated in rattles. . . . . *Caudisona*.

b. Tail terminated in a horny point. . . . . *Ancistrodon*.

## Genus CROTALUS, Linn.

1. *C. horridus*, Linn. Northern Rattlesnake. Muzzle covered above with small plates or numerous scales; two marginal shields between superciliary and rostral; rostral high, narrow, cuneiform; scales 23-25 rows, all carinate; 12-14 labials; two rows of scales between them and the orbit; a light line from superciliary plate to angle of mouth; on body two series of brown dorsal rhombs, which are confluent, except on the anterior part, forming transverse zigzag blotches; tail black; general color sulphur-brown of various shades; G. 165-170. Eastern and Austroriparian regions.

2. *C. adamanteus*, subsp. *adamanteus*, (Beauv.) Cope. Diamond Rattlesnake. Muzzle, marginal shields, and rostral,

the same as in the preceding species; dorsal rows 27; 14-16 labials; three rows of scales between suborbitals and labials; general color brown; three series of complete brown rhombs with yellow edges, the median row largest and separated only by their yellow margins; a yellow line from superciliary to angle of mouth; G. 165-170, North Carolina to Florida; Mississippi.

Genus CAUDISONA, Laur.

3. *C. miliaria*, Linn. Ground Rattlesnake. Color above dark grayish ash; a series of 38 or 45 dark brown dorsal blotches, with a narrow yellowish border; a broad dorsal band of brownish-red passing through these from head to tail; three series of blotches on each side; a white line from lowest part of orbit extending back obliquely to angle of mouth; below reddish-yellow, marmorated with blackish blotches and minute dots; dorsal rows 22-25, all carinated; G. 130-140. Austroriparian and Sonoran regions.

4. *C. tergemina*, (Say) Cope. Massassauga. Color above brown; about thirty-four deep chestnut-brown dorsal blotches; blackish externally, and with yellowish-white margins; three lateral series of blotches; a narrow band of yellowish-white from the pit to neck; below blackish-brown and yellowish; color above sometimes uniform black; dorsal rows 25, all carinated except the outer one; G. 135-150. Eastern region west of Alleghany Mountains; Georgia.

Genus ANCISTRODON, Beauv.

5. *A. piscivorus*, subsp. *piscivorus*, Lac. Water Moccasin. No loral plate; two pairs of occipitals; upper wall of pit formed by anti-orbital; third labial large, constituting the inferior wall of orbit; general color brown, with 20 or 30 indistinct dark vertical bars, one or two scales wide; beneath black with yellowish-white blotches; an obsolete brown streak behind eye; dorsal rows 21-25; G. 138-145. Austroriparian region, except Texas.

6. *A. atrofuscus*, Troost. Black Moccasin. Above dusky with rhomboidal smoky-gray dorsal blotches, disappearing near the black tail; beneath white, blotched with black and minutely punctate; upper lip white; dorsal rows 25; G. 130-140. Mountains of Tennessee and North Carolina.

7. *A. contortrix*, Linn. Copper Head; Cotton Mouth. Loral present; suborbital plates present; one pair of occipital

plates; posterior wall of pit formed by anteorbital; general color hazel-brown, brightest on top of head; on sides 15-26 dark blotches, somewhat resembling an inverted Y; sides of head yellowish-white; chin and throat unspotted; beneath dull yellowish, with a series of 35-45 large dark blotches on each side; dorsal rows 22-23; G. 150-155. Eastern and Austroriparian regions.

### Family ELAPIDÆ.

#### Genus ELAPS, Schu.

Body slender; tail short; head somewhat depressed, generally continuous with body; scales smooth; anal entire; subcaudal bifid; nasals two; loreal none; anteorbital one; post-orbitals two. See p. 27

8. *E. fulvius*, subsp. *fulvius*, Linn. Harlequin Snake. Head black anteriorly with a yellow ring across the occipital region; body annulated with alternating red and black rings, 14-19 of each, which are separated from one another by a narrow band of yellow; the black rings covering about eight scales, the red six, and the yellow one or two; tail with alternate rings of black and yellow; colors beneath the same, but duller; the red spaces spotted with black; dorsal rows 15; G. 205-210. Austroriparian region.

9. *E. distans*, Kenn. Body slender; annulated with alternating black and reddish rings, which are not separated by lighter ones; the black rings are narrow on the body, four or five scales wide, and are broad upon the tail, about eight scales wide; the plain, unspotted, reddish rings of the back, three or four times as wide as the black ones; on the tail, only a third or fourth as wide; dorsal scales small. Florida.

### Family COLUBRIDÆ.

#### ARTIFICIAL SYNOPSIS OF GENERA.

- A. Dorsal scales smooth; anal divided.
- a. Nasals one.
1. Prefrontal one.....6. *Farancia*.
  2. Prefrontals two or none.
- æ. Anteorbital absent.
- †Postorbital one; unicolor.....1. *Carphophiops*.
  - ‡Postorbitals two; striped.....5. *Abastor*.

- y.* Anteorbitals present.  
 †Superciliaries small, narrow, width nearly uniform; eye small.....7. *Contia*.  
 ‡Superciliaries quite large, broadest posteriorly; eye large.....13. *Cyclophis*.
- b.* Nasals two.  
 1. Loral absent.....4. *Tantilla*.  
 2. Loral present.  
*α.* Anteorbitals present.  
 †One anteorbital.  
 \*Dorsal rows 17.....12. *Dromicus*.  
 \*\*Dorsal rows 25 to 29.....14. *Coluber*.  
 ‡Two anteorbitals.  
 \*Head depressed; anteorbitals nearly equal in size.....11. *Diadophis*.  
 \*\*Head deep; upper anteorbital much the largest.  
 17. *Bascanium*.  
*y.* Anteorbitals absent.....2. *Virginia*.
- B.* Dorsal scales smooth; anal entire.  
*a.* Loral absent.....9. *Osceola*.  
*b.* Loral present.  
 1. Rostral acute, produced forwards, causing a sharply pointed snout.....8. *Cemophora*.  
 2. Rostral not produced.  
*α.* Superciliaries moderate; scales scarcely overlapping; head depressed.....10. *Ophibolus*.  
*y.* Superciliaries broad; scales imbricate; head deep.  
 15. *Spilotes*.
- C.* All or part of dorsal scales carinate; anal entire.  
*a.* Postfrontals two pairs.....16. *Pityophis*.  
*b.* Postfrontals one pair.....18. *Eutenia*.
- D.* All or part of dorsal scales carinate; anal divided.  
*a.* Nasals two.  
 1. Rostral produced, recurved and keeled.....23. *Heterodon*.  
 2. Rostral not produced.  
*α.* One prefrontal.....3. *Haldea*.  
*y.* Two prefrontals.  
 †Loral present.  
 \*Scales on back slightly carinate; sides smooth; G. 200-235.....14. *Coluber*.  
 \*\*All dorsal scales carinate; G. 130-170.  
 21. *Tropidonotus*.  
 ‡Loral absent.....19. *Storeria*.

## b. Nasal one.

1. Two prefrontals; two postorbitals.

x. Nasal not grooved below nostril; tail very long.

13. *Cyclophis*.y. Nasal grooved; tail short. . . . 20. *Tropidoclonium*.2. One prefrontal; three postorbitals. . . . 22. *Helicops*.

## 1. GENUS CARPHIOPS, GERV.

Prefrontals present or absent; nasal one; orbit formed anteriorly by loreal and postfrontal; postfrontal one; superciliaries very small; vertical broad; dorsal scales smooth; anal divided. head continuous with body; unicolor.

a. One pair of frontal plates.

10. *C. helenæ*, Kenn. Snout shorter and narrower than in the following species. Color above lustrous chestnut brown; beneath flesh color, which extends to second row of lateral scales; dorsal rows 13. Southern Illinois and Mississippi.

b. Two pair of frontal plates.

11. *C. amœnus*, Say. Ground Snake. Color above chestnut brown; yellowish or salmon color beneath; dorsal rows 13; G. 120-130. Massachusetts to Louisiana and Illinois.

12. *C. vermis*, Kenn. Worm Snake. Color above lustrous, purplish black; beneath flesh color, extending to third row of lateral scales; dorsal rows 13. Larger than the preceding species. Missouri, Kansas, and Southern Illinois.

## 2. GENUS VIRGINIA, B. and G.

Nasals two, nostril in the anterior one; loreal and postorbital forming anterior border of orbit; postorbitals two; vertical broad; dorsal scales smooth; anal divided; eye moderate; head distinct from body.

13. *V. valerie*, B. and G. Color above yellowish or grayish brown, with minute black dots irregularly scattered or constituting rows; beneath yellowish; subrhomboidal dorsal scales in 15 rows; G. 120-130. Maryland to Illinois, and North Carolina.

14. *V. elegans*, Kenn. Color above uniform light olive-brown; beneath dull yellowish-white; dorsal scales very narrow and elongated, in 17 rows. Southern Illinois and Arkansas.

## 3. GENUS HALDEA, B. and G.

Prefrontal one; nasals two; loreal and postfrontal forming anterior part of orbit; postorbital one; superciliaries large; verti-

cal hexagonal, elongate; dorsal scales carinate, in 17 rows; anal divided; G. 120-130; eye large; head distinct from slender body; unicolor above.

15. *H. striatula*, (Linn) B. and G. Above reddish-gray; below salmon color; G. 125-130. Virginia to Texas; *Illinois* (Ridgway).

#### 4. GENUS TANTILLA, B. and G.

Nasals two; loral absent; anteorbital one; posterior one or two; dorsal scales smooth; anal divided; eyes small; head continuous with body; unicolor.

16. *T. coronata*, B. and G. One anteorbital; two postorbitals; color above reddish-brown; head a deep chestnut-brown; a black band across neck above, in front of which is a narrow lighter space; dorsal rows 15; G. 140-145. Georgia and Mississippi.

#### 5. GENUS ABASTOR, Gray.

Nasal one, grooved beneath nostril; loral and postorbital forming anterior part of orbit; postorbitals two; vertical elongated; dorsal scales smooth; anal divided; eyes moderate; head continuous with body.

17. *A. erythrogrammus*, (Daud.) Gray. Red-lined Snake. Color above bluish-black, with three longitudinal lines of red (yellow in alcoholic specimens); median line narrowest; beneath flesh color, with two series of bluish-black blotches; dorsal rows 19; G. 175-185. North Carolina to Alabama; *Illinois*.

#### 6. GENUS FARANCIA, Gray.

Prefrontal one; nasal one; loral and postfrontal form anterior part of orbit; postorbitals two; dorsal scales smooth; anal divided; eye small; head slightly distinct from body.

18. *F. abacura*, (Holb.) B. and G. Red-billed Horn Snake. Color above bluish-black, with sub-quadrate red spots on the flanks; beneath red, barred and blotched with black; dorsal rows 19; G. 170-175. Austroriparian region.

#### 7. GENUS CONTIA, B. and G.

Nasal one; loral present; anteorbital one; postorbitals two or one; superciliaries small, narrow; width nearly uniform; vertical broad; dorsal scales smooth; anal divided; eye small; head short, depressed.

19. *C. pygmaea*, Cope. Postorbitals two; color above black, with faint pale lines along the center of each scale on several lateral rows; beneath yellowish; tail reddish; dorsal rows 17; G. 118-122. Florida.

#### 8. GENUS CEMOPHORA, Cope.

Dentition isodont; rostral acute, produced forward, causing a sharply pointed snout; nasals one or two; loreal one; anteorbital one; postorbitals two; superciliaries small; dorsal scales smooth; anal entire; eye small; head subconical, continuous with body.

20. *C. coccinea*, Blumenbach. Superciliaries very narrow; upper labials six; body yellowish-red (crimson in life), crossed by from 20 to 26 black rings, enclosing yellow ones; beneath uniform yellowish-white; dorsal rows 19; G. 160-170. Austro-riparian region.

#### 9. GENUS OSCEOLA, B. and G.

Nasals two; loreal absent; postfrontals very large, touching upper labials; anteorbital one; postorbitals two; dorsal scales smooth; anal entire; eye large; head distinct from slender body.

21. *O. elapsoidea*, (Holb.) B. and G. Scarlet Snake. Post-orbital large, and extending to second upper labial; rostral very broad; ground color bright red, fading beneath, annulated by about 18 pairs of jet black rings, each enclosing a white one; the black rings tapering on the sides, the white ones widening; head red, maculated with black; a yellow collar on upper part of neck, bordered by black lines; dorsal rows 19; G. 175-180. Virginia to Florida; *Illinois*.

#### 10. GENUS OPHIBOLUS, B. and G.

Nasals two; loreal present; anteorbital one; postorbitals two; superciliaries moderate; dorsal scales smooth, scarcely overlapping; anal entire; head depressed; body rather thick; tail short; eyes small.

A. Dorsal rows 21.

a. Predominating color black.

22. *O. getulus*, subsp. *getulus*, (Linn.) Cope. Chain Snake. A series of large black blotches along middle of back, and another on each side; these are separated from one another by narrow, continuous, yellow lines; abdomen with central black blotches, which are usually confluent with those on sides; G. 210-225. East of Alleghanies, from Maryland to Florida and Louisiana,

23. *O. getulus*, var. *sayi*, (Holb.) Cope. King Snake. Above black, with a yellow spot in the center of each scale; these spots sometimes form interrupted transverse lines across the back; the scales between with indistinct or obsolete spots; abdomen yellowish white with black blotches; G. 210-225. From Alleghany to Rocky Mountains, north to Illinois; *Wisconsin* (Hoy.)

b. Predominating color not black.

24. *O. doliatus*, subsp. *doliatus*, (Linn.) Cope. Corn Snake. Color red (in alcohol, yellowish); back crossed by pairs of narrow black lines, between which are yellow ones; the lines of each pair separate on sides and become confluent with the nearest one of the adjacent pair; abdomen varied irregularly with black; G. 190-215. Maryland to Kansas; Illinois, Arkansas, Louisiana, and Texas.

25. *O. doliatus*, subsp. *coccineus*, (Schl.) Cope. Red Snake. The same as last, except that the black lines are not confluent with those adjacent, but form black rings extending around the body, the ends of which sometimes meet on the abdomen and sometimes not; G. 180-210. Florida to New Mexico; Kansas; *Illinois*.

26. *O. doliatus*, subsp. *triangulus*, (Boie.) Cope. Milk Snake. Color above grayish ash, with a dorsal series of about fifty chocolate blotches and two other series on each side. The dorsal ones about four scales long and 12-15 wide, separated by intervals of one and one-half to two scales; beneath yellowish-white, with square black blotches; G. 200-215. Virginia to Canada; Iowa and Wisconsin.

27. *O. rhombomaculatus*, Holb. Color above light chestnut, with a dorsal and two lateral series of darker rhomboidal blotches; the dorsal ones, about fifty in number, one and one-half to two and one-half scales long, six or seven wide, and separated by intervals of about three scales; beneath reddish-yellow, obscurely blotched with light brown; G. 200-205. North Carolina, Georgia, *Illinois*.

B. Dorsal rows 25.

28. *O. calligaster*, Say. Above light olivaceous brown or gray, with a dorsal series of about 60 subquadrangular, emarginate, dark chestnut-brown blotches from head to tip of tail; two smaller lateral series on each side. Illinois to Kansas and Arkansas.

## 11. Genus DIADOPHIS, B and G.

Nasals two; loral present; postorbitals two; anteorbitals two, rarely equal in size; dorsal scales smooth, anal divided; eye large; head depressed; unicolor, with generally a light ring on the occipital region.

A. Dorsal rows 15.

29. *D. punctatus*, subsp. *punctatus*, (Linn.) Cope. Ring-necked Snake. Eye over fourth and fifth upper labials; body above bluish-black; beneath yellowish-orange, with a series of sub-triangular spots along sides of scutellæ, and sometimes a similar medial series; tail beneath unicolor; eight upper labials and chin yellowish; a yellowish-white occipital ring, about two scales wide; G. 140-160. United States and Canada, east of the plains, and Texas.

30. *D. punctatus*, subsp. *amabilis*, (B. and G.) Cope. Eye over third and fourth upper labials; above blackish-brown; beneath yellowish-white, with crowded small black spots from head to end of tail; the seven upper labials and chin blackish-brown; occipital ring narrow; scales on sides considerably larger than those on back; G. 180-185. Western United States, east to Ohio.

B. Dorsal rows 17.

31. *D. arnyi*, Kenn. Color above uniform leaden-black; beneath yellow, spotted thickly and irregularly with black; the spots on under part of neck smaller; occipital ring light yellow, narrow, one and two half scales wide. Illinois and Kansas.

## 12. Genus DROMICUS, Bibron.

Posterior maxillary tooth largest, not grooved, separated by an interspace from the rest; nasals two; loral rarely wanting; postorbitals two; dorsal scales rather short, rarely slightly carinate; generally in 17 or 19, exceptionally in 15 or 23 rows; anal divided; eye moderate.

32. *D. flavilatus*, Cope. Nostril in the prenasal; color above golden brown; the two lower rows of scales gold-edged; color of back commencing on the third row of scales; vertebral row sometimes darker tipped; below whitish; dorsal rows 17; G. 126. Coast of North Carolina.

## 13. Genus CYCLOPHIS, Günther.

Teeth equal, smooth; snout protruding; loral one, occasionally wanting; postorbitals two; dorsal scales smooth or carinate; anal divided; eye large.

33. *C. vernalis*, DeKay. Summer Snake. Color above green; below yellowish; tail between one-third and one-fourth total length; dorsal rows 15, all smooth; G. 130-140. Eastern and Austroriparian regions.

34. *C. estivus*, (Linn.) Günther. Grass Snake. Color above bright green; below yellowish-white; tail more than one-third of total length; dorsal rows 17, the vertebral ones strongly keeled; G. 150-160. Austroriparian region, north to New Jersey and Southern Illinois.

#### 14. GENUS COLUBER, Linn.

Nasals two; loral present; anteorbitals one; postorbitals two; dorsal scales slightly carinate along back, smooth on sides (the carinations sometimes obsolete); anal divided.

A. Without longitudinal brown bands.

a. Scales in 29 rows.

35. *C. emoryi*, (B. and G.) Cope. Vertical longer than head; color above ashy-gray, with a dorsal series of transverse brown blotches, and two smaller lateral rows (sometimes traces of a third); dorsal blotches narrowly margined with black; beneath yellowish-white, with indistinct brownish blotches; ten or twelve outer rows of dorsal scales smooth, the rest slightly carinated; G. 210-220. Mississippi Valley to Kansas and Illinois.

36. *C. lindheimeri*, B. and G. Vertical as broad as long; a series of black dorsal and lateral blotches; intermediate spaces lighter; scales edged with white; beneath greenish-white; bluish slate color on centers of scutellæ, especially posteriorly; dorsal scales obsoletely carinated; outer ten rows smooth; G. 225-235. Texas, Arkansas, and Southern Illinois.

b. Scales in 25 rows; vertical broader than long.

37. *C. vulpinus*, B. and G. Fox Snake. Color above light brown, with about 60 transverse, quadrate, chocolate dorsal blotches, margined with black; one or two lateral rows of same color; dorsal blotches three or four scales long; beneath yellowish-white, with alternating quadrate black blotches; the four lateral rows of scales smooth; G. 200-210. Massachusetts to Kansas, and northward.

c. Scales in 25-27 rows; vertical longer than broad.

38. *C. obsoletus*, subsp. *obsoletus*, (Say.) Cope. Pilot Snake. Color above uniform black; a few scales narrowly edged with white; beneath slaty-black, except on the chin and

throat, which are yellowish; dorsal rows 27, the seven outer smooth; G. 230-235. Eastern United States from Texas to Massachusetts.

39. *C. obsoletus*, subsp. *confinis*, B. and G. Color above ashy-gray, with a series of about 45 dark chocolate-brown dorsal blotches, with indistinct black margins; blotches six or seven scales long and eleven wide; two smaller lateral series; beneath yellowish, blotched with black; dorsal rows 25, outer six smooth, the rest obsoletely carinated; G. 235-240. Austroriparian region to Missouri; *S. Illinois*.

40. *C. guttatus*, Linn. Color above light red, paler on sides, with a series of about 45 dark brick-red quadrate dorsal blotches, deeply margined with black; two more or less distinct series of similar lateral blotches. In some alcoholic specimens the blotches are hazel, with lighter intervals; beneath yellowish-white, with sub-quadrate black blotches; dorsal rows 27, very obsoletely carinated; G. 215-235. Austroriparian region to Virginia; *S. Illinois*.

*B.* With four longitudinal brown bands.

41. *C. quadrivittatus*, Holb. Chicken Snake. Color above greenish-yellow, with a brown lateral and dorsal band on each side; beneath light straw color; dorsal rows 27, only five or eight median ones carinated; G. 230-240. North Carolina to Florida.

#### 15. Genus SPILOTES, Wagler.

Nasals two; loral one, sometimes two; anteorbitals one or two; postorbitals two; superciliaries very broad; dorsal scales smooth, slightly carinate along the back in some foreign species; anal entire; head deep.

42. *S. couperi*, Holb. Postorbitals over the fourth labial; color above black; beneath dark slate; no red markings on abdomen; G. 185-187. Georgia.

43. *S. erebennus*, Cope. Postorbitals over the fifth labial; color above black, with scattered spots of reddish-white at base of the scales; beneath slate color, anteriorly with bases of scutellæ red; G. about 195. Texas to Alabama.

#### 16. Genus PITYOPHIS, Holb.

Vertical elongated, sometimes absent; posterior frontals two pairs; loral one; anteorbitals one or two; postorbitals three or four; dorsal scales carinate along back, smooth on sides; anal entire.

44. *P. melanoleucus*, Daud. Pine Snake. Bull Snake. Anteorbital one; postorbitals three; color above whitish, with a dorsal series of brown blotches, margined with black, 24 to the anus; three series of lateral blotches which are more or less confluent; dorsal scales in 29 rows, the four outer ones smooth, the next three obscurely carinate; G. 220-230. New Jersey to South Carolina, Ohio, *Michigan* (Gibbs).

45. *P. sayi*, subsp. *sayi*, Schl. Western Pine Snake. Anteorbital one; postorbitals three; color above chestnut-brown, with numerous transverse reddish-orange blotches, which form bands posteriorly; sides mottled with black and orange; dorsal scales in 25 rows; G. 220-225. Illinois to Kansas and northward.

#### 17. Genus *BASCANIUM*, B. and G.

Nasals two; loral present; anteorbitals two, upper much the larger; postorbitals two; dorsal scales smooth; anal divided; eye very large; head narrow, deep; body slender.

46. *B. constrictor*, Linn. Center of eye over fourth labial, which alone is in contact with postorbital; color above in adult, pitch-black; beneath with greenish tinge; young with dorsal blotches; dorsal rows 17; G. 175-190. Austroriparian and Eastern regions.

47. *B. anthicum*, Cope. Eye over third and fourth or fourth and fifth labials; color above black, varied with many yellow scales which are either single or grouped in irregular spots; beneath yellow; dorsal rows 17. Louisiana.

48. *B. flagelliforme*, Catesb. Center of eye over junction of fourth and fifth labials, the last in contact with the postorbital; color above black anteriorly and brownish posteriorly, lightest on tail; beneath yellowish-white, blotched with brown anteriorly; dorsal rows 17; G. 200-210. South Carolina to Florida.

#### 18. Genus *EUTÆNIA*, B. and G.

Nasals two; loral present; anteorbitals one or two; post-orbitals three or four; dorsal scales carinate; anal entire; general color three light stripes on a dark ground.

A. Lateral stripe on third and fourth rows of scales.

a. Scales little or not spotted, in 19 rows.

α. Dorsal band complete.

\*Stripes uniform in color.

49. *E. saurita*, (Linn.) B. and G. Riband Snake. Color above bright chocolate; light brown below, lateral stripes;

beneath greenish-white; tail more than three and less than three and one-quarter times in total length; G. 150-160. Austroriparian and Eastern regions.

50. *E. faireyi*, B. and G. Garter Snake. Color above blackish-brown; beneath greenish-white; color above and below lateral lines the same; tail less than one-third total length; G. 165-180. Mississippi Valley from Louisiana to Wisconsin.

\*\*Stripes not uniform in color.

51. *E. proxima*, (Say.) B. and G. Color above black; dorsal stripe ochraceous yellow or brown; lateral ones greenish-white or yellow; light below lateral lines; beneath greenish-white and yellowish; tail three and one-half or more times in total length; G. 165-180. Mississippi Valley north to Wisconsin; Texas and Northern Mexico.

y. Dorsal band incomplete or wanting; all scales keeled.

52. *E. sackeni*, Kenn. Color above olive-black; not lighter below the very narrow greenish-yellow lateral stripes; beneath uniform greenish; tail one-third total length. Floridan district.

b. Scales above and below lateral line with sub-quadrate black spots.

53. *E. radix*, B and G. Hoy's Garter Snake. Color above varying from deep brownish-black to olive-green; with three narrow gamboge-yellow stripes; six series of black spots, sometimes obscure; below greenish with black markings predominating on sides; tail about five times in total length; superior labials seven; dorsal scales rough, in 19-31 rows; G. 150-160. Central region to Lake Michigan; Oregon.

2-

B. Lateral stripe on second and third rows of scales.

a. Scales in 21 rows.

54. *E. vagrans*, B. and G. Color above ashy or brown, with dorsal stripe on a single row of scales, sometimes wanting; on each side about 100 small black spots in two series; beneath plumbeous or slate color; superior labials eight; G. 160-180. Central, Pacific, and Northern regions; *Illinois* (Nelson).

b. Scales in 19 rows.

x. A dorsal band.

55. *E. sirtalis*, subsp. *sirtalis*, (Linn.) Cope. Common Garter Snake. Color above olivaceous-brown, three series of small spots on each side, about 70 from head to anus; the upper series encroaching on the narrow and rather indistinct dorsal stripe; greenish-white below the lateral lines and on abdomen;

G. 135-160. Entire North America, except Sonoran region and along Pacific coast.

56. *E. sirtalis*, subsp. *parietalis*, (Say.) Cope. Color above olive-brown; two series of quadrate black blotches on sides, between which are blotches of brick-red; beneath bluish-green; G. 155-160. Central and Pacific regions; Indiana and Illinois.

57. *E. sirtalis*, subsp. *obscura*, Cope. Color above uniform brown; spots obscure; dorsal and lateral bands distinct. Eastern sub-region north of Washington; northern part of Pacific region.

58. *E. sirtalis*, subsp. *dorsalis*, (B. and G.) Cope. Color above olivaceous, with three broad greenish-white stripes; below lateral ones and on abdomen greenish-white; two rows of small spots on each side, the superior row connected by a narrow line; upper labials seven or eight; G. 160-170. Entire North America.

*y.* No dorsal band.

59. *E. sirtalis*, subsp. *ordinata*, (Linn.) Cope. Color above olive, with three distinct rows of dark square spots, about 85 from head to anus; lateral and dorsal stripes very indistinct or wanting; beneath greenish-white, with black spots on sides of scutellæ; G. 135-155. Northern part of Eastern region and North Alabama.

#### 19. Genus STORERIA, B. and G.

Nasals two; loral absent; anteorbitals one or two; postorbitals two; dorsal scales carinate; anal divided; head distinct from small body; general color brown, with two dotted dorsal lines.

60. *S. dekayi*, (Holb.) B. and G. DeKay's Brown Snake. Color above gray or chestnut-brown, with a clay-colored dorsal band; a series of dots along its margin, two scales apart; two other dotted lines and traces of a third on sides; a dark patch on each side of the occipital; beneath grayish-white; one ante and two postorbitals; dorsal rows 17; G. 120-140. Central, Austroriparian and Eastern regions.

61. *S. occipitomaculata*, (Storer.) B. and G. Red-bellied Snake. Color above gray or chestnut-brown, with sometimes a paler vertebral line, margined by a series of black dots; three light blotches on base of head; beneath red or salmon-color; two anterior and posterior orbitals; dorsal rows 15; G. 115-130. Eastern region; South Carolina and Georgia.

20. Genus *TROPIDOCLONIUM*, Cope.

Nasal one; grooved below nostril; loral present; anteorbital one; postorbitals two; dorsal scales carinate; anal divided.

62. *T. kirtlandi*, (Kenn.) Cope. Kirtland's Snake. Body stout; head small, continuous with neck; tail short and small; ground color light reddish-brown, with four dorsal series of circular black spots, the two central series smallest; beneath uniform reddish, with a row of small black spots on each side; dorsal rows 19; G. 130-140. Illinois to Ohio.

21. Genus *TROPIDONOTUS*, Kuhl.

Nasals two; loral present; anteorbitals one or two; postorbitals two or three; all dorsal scales carinate, except occasionally one or two outer rows; anal divided.

A. Five or more longitudinal bands on a light ground.

63. *T. grahami*, B and G. Anteorbitals two; postorbitals three, lower very small; a light brown dorsal band, on each side of which is a narrow black band, three scales below is a second black line, and between the abdomen and sides a third; above the second line the scales are brown, below it straw color; beneath yellowish, with a blackish band under tail; dorsal rows 20, all carinate; G. 160-165. Mississippi Valley to Wisconsin; Michigan.

64. *T. leberis*, Linn. Anteorbitals two, upper larger; post two, upper smaller; color above chestnut or chocolate-brown; a black band on median row of scales, another on the fifth, and a broader yellow band on the first and second; beneath yellowish, with two brown bands; dorsal rows 19, all carinated. Austroriparian and Eastern regions.

65. *T. rigidus*, Say. Anteorbitals two, upper larger; post two, nearly equal in size; color above greenish-brown, with a deeper brown spot at base of each scale on the flanks; two brown bands on back; beneath dull yellowish, with two series of brown blotches; dorsal rows 19, two outer obsoletely or not at all carinated. Pennsylvania to Georgia, east of the Alleghanies.

B. Unicolor or transversely barred or blotched.

a. No suborbital plates.

Dorsal rows 19, all carinated.

66. *T. compsolvemus*, Cope. Postorbitals three, lower very small; color above blackish-brown, with indistinct pale transverse bands, two or three scales apart; beneath a stone-brown, generally

darkest in the center; a yellow spot near anterior border of each of the anterior gastrosteges; G. 125-130. Florida.

Dorsal rows 21, all carinated.

67. *T. compressicaudus*, Kenn. Body much compressed near tail; postorbitals three, upper and lower small, middle one with lower border produced to labials; color above yellowish-olive; four black stripes on neck; body anteriorly crossed by zigzag black bars, posteriorly with three series of spots, not alternating. Florida.

68. *T. ustus*, Cope. Nostril in the prenasal plate; postorbitals two; color above yellowish ferruginous, palest on the head and darkest on the tail; anteriorly are indistinct half bands; posteriorly the bands cross the back completely; beneath salmon colored; G. 125-130. Florida.

Dorsal rows 23-25.

69. *T. fasciatus*, Linn. Postorbitals two or three; color above blackish-brown, with transverse black dorsal blotches, and about 35 sub-triangular or oblong red spots on the flanks; sometimes broken rings of yellow dots across back; beneath reddish-white, sometimes blotched with black; G. 128-135. Austroriparian regions.

70. *T. sipedon*, subsp. *sipedon*, Linn. Postorbitals three; color above brownish, with three series of alternating dark blotches bordered with black, more or less confluent, especially anteriorly, about 30 from head to tail; the light intervals sometimes obsolete; beneath yellowish blotched with brown; G. 135-145. Eastern and Austroriparian regions, except Texas.

71. *T. sipedon*, subsp. *woodhousei*, B. and G. Color above dusky, with three series of black blotches, about 40 in number; a narrow whitish line between the dorsal blotches; beneath yellowish, sometimes spotted with black; G. 140-150. Texas to Missouri; *Illinois*.

72. *T. sipedon*, subsp. *erythrogaster*, Shaw. Postorbitals three; dorsal scales very strongly keeled on posterior part of body; color above uniform reddish (black in alcohol), and beneath copper color; G. 148-155. Austroriparian region, except Texas; Michigan, *Illinois*, Kansas.

Dorsal rows 29, all carinated.

73. *T. taxispilotus*, Holb. Postorbitals two; color above reddish-brown, with three series of subquadrangular blackish blotches, about 46 in number; the dorsal series seven to ten rows wide, and two to three scales long; the lateral series nine to ten

rows wide, and three to five scales long; beneath yellowish-white, with brown blotches; G. 140-145. North Carolina to Georgia.

Dorsal rows 27, all carinated.

74. *T. rhombifer*, Hallowell. Postorbitals two or three; color above light brown; about 50 dorsal blotches of same color, surrounded by black lines; beneath yellowish-white, blotched with darker; G. 140-145. Louisiana to Illinois and Michigan.

*y.* A suborbital series of plates; dorsal rows 29-31.

75. *T. cyclopium*, Dum. et Bib. Ante and postorbitals two; (in Cuban specimens, one anteorbital and only 23 dorsal rows); color above dark plumbeous brown, with blackish alternating vertical bars, one or one and one-half scales wide, and three and one-half or four scales apart; beneath brownish-white; G. 140-145. Florida; *S. Illinois*.

## 22. GENUS HELICOPS, Wagler.

Teeth smooth, the posterior two in upper jaw longer than and separated from the others; prefrontals one or two; nostril not higher than wide; nasal grooved; loral sometimes absent; anteorbitals one or two; postorbitals two or three; temporals four to twelve; upper labials eight or nine; lower nine or eleven; dorsal scales carinate in 10 to 25 rows.

76. *H. alleni*, Garman. Head continuous with neck; one prefrontal; nasal plates meeting behind rostral; loral present; one ante and three postorbitals; color in longitudinal bands; the vertebral dark brown, five and two half scales wide; the next yellowish-brown, two half scales wide; the next dark brown, two and two half scales wide; the next brownish-yellow, two and one-half scales wide; beneath and on upper labials dull yellow or straw color; dorsal scales smooth, in 19 rows, exterior very wide; two vertebral rows of tail strongly keeled; G. 128. Florida.

## 23. GENUS HETERODON, Beauv.

Posterior palatine teeth largest; rostral produced, recurved and keeled; behind rostral and between frontals one or more small plates; nasals two; loral one or two; orbit bordered below and on sides by a continuous chain of small plates; dorsal scales more or less carinate, smooth in some foreign species; anal divided; head broad and short; body stout; tail short; head, neck and body capable of great dilation.

*A.* Azygos in direct contact with frontals.

77. *H. platyrhinus*, (Latr.) Cope. Blowing Adder. Rostral prominent; scales on back of head carinate; center of eye

over fifth labial; color above yellowish or brownish, with darker dorsal blotches, 20 to 30 from head to anus; sides more or less mottled with dark blotches; occasionally uniform black above; dorsal rows 23-25; all, or all but two or three outer rows strongly keeled; G. 125-150. Austroriparian or Eastern regions.

78. *H. platyrhinus*, subsp. *atmodes*, (B. and G.) Cope. Rostral obtuse, but little prominent; scales on back of head obsoletely carinate; center of eye over fourth labial; color above pitch-black, with 25 light yellow transverse dorsal bands (sometimes nearly obsolete); sides mottled with black and yellowish; beneath yellowish, blotched with black; young specimens somewhat lighter; dorsal rows 23; the scales with short keels, the outer rows obsoletely carinate; G. 130-145. North Carolina to Georgia.

*B.* Azygos encircled by from five to ten small plates.

79. *H. simus*, subsp. *simus*, (Linn.) Cope. Hog-nosed Snake. Vertical as broad as long; upper labials high, seven to eight; ground color above light brownish-yellow, with a dorsal series of about 35 transverse black blotches; on sides from one to three smaller series; beneath yellowish, obscurely maculate; dorsal rows 25, outer ones smooth; G. 115-135. Austroriparian region, except Texas; *Illinois and Wisconsin.*

## Order LACERTILIA.

### SYNOPSIS OF FAMILIES.

A. Vertebrae procelian; parietal bone single.

a. Pterygoid in close contact with sphenoid.

Teeth simple, conical, and pointed, attached to the inner side of the jaws; tongue scaly; body covered by square equal shields; limbs usually absent; tail very short. . . . . *Amphisbænida.*

b. Pterygoid not touching sphenoid.

α. Supranasal plates not more than one pair; clavicle with a dilated proximal end.

Premaxillary single; temporal fossæ not roofed; xiphisternal fontanelle present; tongue squamose or squamose-papillose; nostril either in a plate or suture. . . . . *Teiida.*

Premaxillary double; temporal fossæ roofed;

- xiphisternal fontanelle rarely present; tongue squamose; nostril in a plate. . . . . *Scincidae*.
- y. Supranasal plates numerous; internasal plate large, transverse; head shielded behind; tongue papillose, sheathed at the tip; clavicle with a simple proximal end; mesosternum cruciform . . . . . *Anguidæ*.
- z. Tongue simple, papillose; clavicle with a simple, proximal end.  
 Articular bone and xiphisternal fontanelle wanting; abdominal ribs present . . . . . *Anolidæ*.  
 Articular bone and, generally, xiphisternal fontanelle present; abdominal ribs rarely present. . . . . *Iguanidæ*.
- B. Vertebrae usually amphicealian; parietals double.  
 Pterygoid not touching sphenoid; tongue papillose. . . . . *Gecconidæ*.

## ARTIFICIAL SYNOPSIS OF FAMILIES.

- A. Limbs none.  
 Tongue scaly; eyes invisible. . . . . *Amphisbænidæ*.  
 Tongue not scaly; eyes visible. . . . . *Anguidæ*.
- B. Limbs present.
- x. Toes simple.
1. Tongue deeply bifid at end; scales of back small, granular. . . . . *Teidæ*.
  2. Tongue not deeply bifid.  
 Scales of back large, smooth. . . . . *Scincidæ*.  
 Scales of back large, carinate. . . . . *Iguanidæ*.
- y. Toes expanded into disks near the end.  
 Toes clawless; scales of back large, keeled. *Gecconidæ*.  
 Toes with claws; scales of back granular. . . . . *Anolidæ*.

## Family AMPHISBÆNIDÆ.

## Genus RHINEURA, Cope.

Nasal shields present; ten or twelve plates on head; no preanal pores; tail depressed, and tuberculous above; eyes invisible.

80. *R. floridana*, Baird. Floridan Blind Snake. Vertical plate large and irregularly pentagonal; occipitals small; three small plates on each side of vertical; nasal single; superior labials four; inferior three or four; sternal plates small, about 12; three pair of preanal plates in a longitudinal series; superior maxillary teeth 5-5, anterior pair longest; 14 to 16 rings on tail, all but

basal ones tuberculous; color dirty white; head yellowish above. Florida.

### Family SCINCIDÆ.

Nasal plate single, ungrooved, nostril in the center; rostral erect, triangular; scales smooth; limbs present; toes compressed, five on each foot.

Palate toothless; supranasal plate none; lower eyelid with a transparent disk; ear large, circular, entirely exposed . . . . . *Oligosoma*.

Palate toothed; supranasal plates two; lower eyelid scaly; limbs strong; ear dentate in front. . . . . *Eumeces*.

#### GENUS OLIGOSOMA, Grd.

81. *O. laterale*, (Say.) Grd. Ground Lizard. Head short; body and tail long; color above chestnut, with a black lateral line from snout to near tip of tail; beneath neck silvery-white; abdomen yellowish; tail blue; limbs weak. Austroriparian region; South Carolina.

#### GENUS EUMECES, Wieg.

82. *E. septentrionalis*, (Bd.) Cope. Northern Skink. One postnasal plate, not separating the internasals and postfrontals; color above olive; with four equidistant and equal dark stripes, covering two half rows of scales; two narrow white lateral lines traversing the centers of a single row of scales, margined by black; upper lateral stripes separated by six rows of scales; beneath greenish. Minnesota, Nebraska, and Wisconsin. (Hoy.)

83. *E. egregius*, (Bd.) Cope. Floridan Skink. One postnasal plate, separating postfrontal and internasals; four upper labials; two central dorsal rows of scales largest; ear very small; color above reddish-ash, with two white lines on each side, margined with dusky; sometimes a third; each on the center of a single row of scales; upper lateral lines separated by two plain rows of scales. Florida.

84. *E. onocrepis*, Cope. Frontal in contact with vertical; postfrontals not in contact medially; superciliaries three, anterior longest; superior labials eight; dorsal scales equal; color above dark brown, darkest on sides and lightest on tail; two narrow light lines on each side of head and neck, none on body or tail; below white or straw color. Florida.

85. *E. anthracinus*, (Bd.) Cope. Coal Skink. Color above dark bronze, with four yellow lateral stripes, between and above

and below which are lines of anthracite black; the upper yellow line on the center of a single row of scales; the lower on parts of two rows; tail dark blue above; below yellowish-white. Pennsylvania to Texas, in mountains.

86. *E. obsoletus*, (B. and G.) Western Skink. Parieto-occipital and vertical the largest cephalic plates; color above greenish-white; the scales narrowly margined with black; beneath uniform. Sonoran region, borders of Central and Austroriparian, *Illinois* (Forbes).

87. *E. fasciatus*, (Linn.) Cope. Common Skink. Postnasals one or two, separating internasals and postfrontals; superciliaries five; superior labials eight; dorsal scales equal; color above bluish-black, or olive-brown, with five yellow lines, the median one forming two on the head; the superior lateral ones bordering the superciliaries; inferior lateral extending forward on superior labials; the median and superior lateral line on parts of two rows of scales; the inferior lateral on one and one-half or two rows before and just behind arms, but covering a single row on sides; the lines are two rows apart, and frequently partially or wholly absent. Head sometimes reddish. Below yellowish-white. Central, Austroriparian, and Eastern regions.

#### Family TEIIDÆ.

##### Genus CNEMIDOPHORUS, Wieg.

Body slender; above covered with small, granular scales; below large ones; tail long, ringed with large, carinated scales; head long, narrow, pyramidal, covered with large regular shields; ear large; tongue long and slender, bifid at end; generally two gular folds; outer part of arms and legs covered with large shields.

88. *C. sexlineatus*, (L.) D. and B. Six-lined Lizard. Internasal none; superciliaries three, two large; color on head and along back dusky brown; on each side three yellow longitudinal lines, the upper one short, and somewhat indistinct; between these longitudinal lines jet black; throat silvery-white; abdomen bluish-white. Sonoran, Austroriparian regions to S. E. Virginia; *Illinois and Wisconsin*.

#### Family ANGUIDÆ.

##### Genus OPHIOSAURUS, Daud.

Tongue arrow-headed in shape, with a triangular notch in front; anterior free part with granular papillæ; teeth in several

rows on the palate; nostrils lateral in a single plate; supra-nasal shields narrow and numerous; ear small; body serpentiform, with two deep lateral furrows; limbs none.

89. *O. ventralis*, Daud. Glass Snake. Markings somewhat variable, but generally yellowish on back, frequently with spots of brown or greenish; two narrow brown or black dorsal lines; sides brown, with two narrow longitudinal greenish lines, often spots of the same; below yellowish white. Austroriparian region; Kansas; *Illinois and Southern Wisconsin*.

### Family IGUANIDÆ.

#### Genus SCELOPORUS, Wiegman.

Body depressed, covered with large, keeled scales; caudal and dorsal the same, except that those of the back are arranged in transversely diagonal series and those of tail in simple transverse; back not crested; sides not serrate; head without spines, the plates smooth, slightly convex; throat with a fold on each side; nostril superior, subapical; ear with a dentate fringe of scales in front; femoral pores distinct; toes simple.

90. *S. undulatus*, subsp. *undulatus*, Harl. Superciliaries in four rows, the two outer and the inner small; scales of back large, strongly carinate, about 35 oblique rows from head to base of tail; scales on inside of tibia not carinate; color variable; above greenish or bluish with transverse undulating dark bands; below yellowish, mottled with darker and usually a large blue or greenish blotch on throat and sides; length about seven inches. North America, except Sonoran and Lower Californian regions.

91. *S. floridanus*, Baird. Superciliaries in three rows, the inner and outer small, the middle large; scales of back large, rough, about 33 oblique rows from head to base of tail; scales on sides of tibia carinate; color above greenish-yellow, with two broad yellow stripes, five scales apart, and with distinct blackish transverse bars; larger than *S. undulatus*. Florida.

### Family ANOLIDÆ.

#### Genus ANOLIS, Merrem.

Teeth on palatines; toes 5-5, long and slender; the penultimate joint in all except the inner ones, which are rudimentary, much expanded; hind limbs longer than the fore; scales of body small and rounded; skin on throat loose and more or less inflata-

ble; back with or without a crest; upper jaw rounded at end, even with the lower; rostral erect.

92. *A. principalis*, Linn. Green Lizard; Floridan Chameleon. Head pyramidal, broad and flattened; tail rounded and tapering, covered with imbricate scales, which are larger than those of the body; length more than one and one-half times that of head and body; color of head brown; of body above, varying through all shades from bright pea-green to bronze-brown; a lighter dorsal stripe; back and sides with fine brown zigzag lines; body below ashy, greenish, or soft white; loose skin on throat with longitudinal brown lines; sometimes scarlet; no crest. Austroriparian region.

### Family GECCONIDÆ.

#### GENUS SPHERODACTYLUS, Cuv.

Scales of back equal, granular or rhombic; tail with a central series of shields; neither femoral nor preanal pores; eyelids circular. Toes with a single series of transverse plates beneath; clawless, with a terminal compressed point; free, slender, subcylindrical at base, with a small, entire, circular terminal disk, convex beneath.

93. *S. notatus*, Baird. Scales on back and sides large, strongly carinated, on belly smaller, smooth, hexagonal; above light brownish-yellow; dotted all over with reddish-brown, most distinctly on head and least on belly. Key West, Fla. (Cuba).

## Order TESTUDINATA.

### SYNOPSIS OF FAMILIES.

A. Forearm and hand, and leg and foot, in the form of wings or paddles; not capable of distinct movements at wrist and ankle joints; digits flattened, elongated, and bound immovably together by the integument.

a. Feet scaleless; the anterior pair very large; the posterior smaller but broad. . . . . *Sphargididae*.

b. Feet covered with scales. . . . . *Chelonidae*.

B. Limbs not in the form of paddles, capable of distinct movements at wrist and ankle joints.

a. Shield leathery, incompletely ossified; feet with few scales; head long and pointed; body very flat.

*Trionychidae*.

b. Shield completely ossified.

æ. Fingers and toes not bound closely together; more than the distal phalanges free.

\*Tail crested, very long and strong; plastron narrow and small; bony vertebral plates 12, continuous the whole length of carapace; plates of plastron nine; head large; neck long and stout; body highest in front.. *Chelydridæ*.

\*\*Tail short; plastron usually broad and large.

1. Lower jaw with a long, strong, sharp point at symphysis; bony vertebral plates from 5-7, not continuous; plates of plastron eight in adult; iliac bones arched outwards; coracoids reaching back of middle transverse suture of plastron; coracoid and pubis closely approximated; skin loose on knees and elbows; tail tipped with a horny spur in males.

*Cinosternidæ*.

2. Lower jaw without long point at symphysis; bony vertebral plates 10, continuous; plates of plastron nine; iliac bones nearly parallel; coracoid not reaching middle transverse suture; skin clinging more or less to knees and elbows.

*Emydidæ*.

γ. Fingers and toes bound closely together; only the last joint free; bony vertebral plates about 10; plates of plastron nine; iliac bones wider apart at hip joints than at sacrum..... *Testudinidæ*.

#### Family SPHARGIDIDÆ.

Body highest in front and widest at the anterior edge of the bridge; posterior limbs much exposed; head high, short and very broad at the back; two pits and two teeth-like projections on the upper jaw; a single, median projection on the lower. There is but one genus in the family.

#### Genus SPHARGIS, Merrem.

Body covered by a smooth coriaceous skin; feet without nails; several longitudinal ridges along carapace.

94. *S. coriacea*, Rondelet. Leathery Turtle. Color above dark brown; below whitish; nodules along the longitudinal ridges of carapace. On the Atlantic coast to Massachusetts,

## Family CHELONIDÆ.

Body highest in front, and widest about the middle; no tooth-like projections on the jaws; carapace heart-shaped.

A. Costal scales five on each side; scales around the large median plate on top of head 13 to 20; scales on cheeks 15 to 20; cutting edge of lower jaw not serrated. . . . . *Thalassochelys*.

B. Costal scales four on each side; scales around large median plate on top of head seven.

a. Scales on cheeks from 7 to 10; cutting edge of lower jaw not serrated. . . . . *Eretmochelys*.

b. Large scales on cheeks 15 to 20; cutting edge of lower jaw deeply serrate. . . . . *Chelonia*.

## Genus THALASSOCHELYS, Fitz.

95. *T. caouana*, Linn. Loggerhead Turtle. Head low, broad and flat; jaw with strong, pointed beaks; shell smooth, subcordiform; vertebral scales 5, costal 10, and marginal 25 to 27; scales not imbricate; two nails to each paddle. Entire Atlantic coast.

## Genus ERETMOCHELYS, Fitz.

96. *E. imbricata*, Linn. Tortoise-shell Turtle. Head low and broad; anterior part of jaws produced forward into a projecting bill; scales on shield imbricated, forming thick, hard plates; four pairs of costals; no horny plates on neck; two nails to each paddle. Southern Atlantic coast.

## Genus CHELONIA, Brong.

97. *C. mydas*, Schw. Green Turtle. Head high and narrow; upper jaw slightly notched in front; lower jaw with a small projection; the sides deeply serrated; body oblong; scales of shield thin, not imbricated; a single nail to each paddle. Atlantic coast, south of Long Island.

## Family TRIONYCHIDÆ.

Head long and narrow; nostrils not subdivided by an internal ridge; edge of upper jaw sharp, and serrated behind.

*Amyda*.

Head broad; nostrils subdivided by a ridge which projects from the median wall; edge of upper jaw not serrated.

*Aspidonectes*.

## Genus AMYDA, Ag.

98. *A. mutica*, (Les.) Ag. Fresh-water Leather Turtle. Back depressed; no spines on anterior margin of carapace, and no tubercles on back. Color above, in adult, nearly plain olive; in young, more or less spotted with black; below whitish, without spots. North of the Ohio river, in tributaries to the Mississippi and St. Lawrence.

## Genus ASPIDONECTES, Wag.

*a.* Lower surface of body and under part of feet white.

99. *A. ferox*, Schw. Soft-shelled Turtle. Tubercles on shield in male larger than in female; in the young, two or three concentric black lines, separating the pale margin from the light brown colored back, which is studded with black dots and ocellated spots, becoming blotched in the adult. Georgia to Western Louisiana.

*b.* Lower surface and under parts of feet spotted with black.

100. *A. spinifer*, Les. Common Soft-shelled Turtle. A blunt median keel, sloping uniformly on the sides; in the young, a single black line about the edge of the carapace; shield olive-brown, with dark spots; spines less prominent in males than in females. North of the Ohio river, in tributaries of the Mississippi and St. Lawrence.

101. *A. nuchalis*, Ag. Agassiz's Soft-shelled Turtle. Marked depressions on either side of the blunt median keel, which has a triangular dilation in front; spines and tubercles prominent in the male. Cumberland and Upper Tennessee rivers.

102. *A. asper*, Ag. Tubercles large and coarse, behind supported by prominent bony warts on the osseous plates; in the young, two or three black lines around the posterior part of the carapace. Tributaries of the Lower Mississippi.

## Family CHELYDRIDÆ.

Head narrow about the nose and eyes, broad behind; feet strong, and toes with long, strong claws; web small.

*a.* Eyes lateral and distant; alveolar plate very broad; strong pointed projection at the symphysis of the jaws; three scales on each side between costal and marginal rows. . . . . *Macrochelys*.

- b. Eyes superior, rather close together; alveolar plate narrow; a small pointed projection at symphysis of jaws; no scales between the costal and marginal rows ..... *Chelydra*.

GENUS CHELYDRA, Schw.

103. *C. serpentina*, Linn. Common Snapping Turtle. Head rough, covered with soft skin; tail with two rows of large scales beneath; ridges of carapace disappearing with age; jaws moderately hooked. Throughout the United States, except Pacific sub-region.

GENUS MACROCHELYS, Gray.

104. *M. lacertina*, Schw. Alligator Snapper. Head very large, covered with smooth, symmetrical plates; tail with many small, imbricate scales beneath; carapace strongly tri-carinate; the keels not disappearing with age; jaws strongly hooked. South of Missouri river, in tributaries to the Mississippi and Gulf of Mexico; north to Wisconsin.\* Rare.

FAMILY CINOSTERNIDÆ.

Head pointed in front; eyes situated far forward; lower jaw terminating in a sharp point; limbs slender; feet short.

- a. Plastron small, narrow behind, with eleven scales; front and hind portions very little, if at all, movable on middle ..... *Aromochelys*.
- b. Plastron larger; front and hind portions broad and rounded, freely movable on middle part (except often in old specimens); scales 8 to 11. Alveolar plate flat and rather broad ..... *Cinosternum*.

GENUS AROMOCHELYS, Gray.

105. *A. odoratus*, Latr. Musk Turtle. No point at symphysis of upper jaw; the end of lower curved somewhat upward and outward; scales of carapace not imbricated in adult; shell dusky, clouded, sometimes spotted; two yellow stripes, one above, the other below the eye, extending along the neck. Austroriparian and Eastern sub-regions.

106. *A. carinatus*, Gray. Little Musk Turtle. A point or chisel edge at symphysis of upper jaw; scales of keel somewhat

\*Fide Dr. P. R. Hoy.

imbricated; edged with black, and with black lines or dots radiating from their posterior portion to their front and lower margins; no stripes along neck. Louisianian district; *Northern Illinois*.

Genus CINOSTERNUM, Wagl.

107. *C. pennsylvanicum*, Bosc. Mud Turtle. Jaws strong, and hooked in front; scales smooth; color above dusky-brown; below variable, yellowish to chestnut; head dark, with light dots; throat yellowish. Austroriparian and Eastern sub-regions.

Family EMYDIDÆ.

A. Plastron and carapace immovably united by a bony symphysis; no hinge across middle of plastron.

a. Alveolar surface of jaws broad.

1. Alveolar surface of upper jaw with a submedian ridge, parallel to margin; toes short and strongly webbed; head with thin, hard skin; upper jaw notched in front. . . . . *Pseudemys*.

2. Alveolar surface of jaws smooth; in front part of upper a deep groove; toes short; head covered with soft skin; upper jaw not notched in front . . . . . *Malacoclemys*.

b. Alveolar surface narrow.

1. Alveolar groove well marked, except in front; toes strong, broadly webbed and spreading; hind feet largest; carapace rather flat.

*Chrysemys*.

2. Carapace considerably arched; toes with a small web; feet nearly equal in size; species small.

*Chelopus*.

B. Plastron and carapace united by a cartilaginous lateral suture; plastron hinged across the middle.

a. Carapace somewhat depressed; plastron more or less emarginate behind; feet strongly webbed. . . *Emys*.

b. Body short and high; plastron rounded or truncate in front and behind; feet nearly free of webs.

*Cistudo*.

Genus PSEUDEMYIS, Gray.

A. No scales upon loose skin between legs; ridge on alveolar surface of upper jaw tuberculate; shield in young covered

with more or less confluent ocellated or lozenge-shaped figures, which become more transverse in adult, and may wholly disappear in old age.

*a.* Strong, coarse serratures on both jaws; prominent hooks at symphysis of upper.

108. *P. rugosa*, Shaw. Red-bellied Turtle. Above dusky with variable markings; generally with irregular bands or blotches of red; below dusky or reddish; head and neck brown, with obscure reddish lines. New Jersey to Virginia.

109. *P. mobilensis*, Holb. Above brown, reticulated with yellow lines; below yellow, more or less blotched with black; head and neck brown, with yellow, longitudinal lines; serratures of lower jaw coarser than in upper. Florida to Texas.

*b.* Lower jaw alone distinctly serrated; upper comparatively smooth; notch at its symphysis small.

110. *P. concinna*, LeC. Above brown, with yellowish lines, which are mostly longitudinal on vertebral row of scales, transverse or bifurcating on the costal, and concentric or transverse on marginal; below yellow; neck with yellow or reddish lines. Austroriparian region.

*c.* Both jaws smooth.

111. *P. hieroglyphica*, Holb. Hieroglyphic Turtle. Above olive-brown, subdivided into spaces of various shapes, by more or less concentric yellow lines; below dusky yellow; head and neck dark brown with yellow lines. Middle, Western, and Gulf States.

*B.* Scales upon loose skin between legs and on neck; low ridge on alveolar surface of upper jaw not tuberculate; vertebral scales, with numerous longitudinal bands; costal scales with transverse ones; marginal scales with concentric figures; in old age the bands disappear; edge of marginal plates notched.

112. *P. scabra*, Linn. Rough Terrapin. Above dark brown, with irregular and broken bands of yellow; head and neck black, with yellow lines; throat with broader lines; carapace broad, high, keeled, and covered with coarse rugosities; deeply serrated behind. North Carolina to Georgia.

113. *P. troosti*, Holb. Yellow-bellied Terrapin. Above dusky, with a greenish tinge, and slightly mottled; below brownish-yellow, more or less blotched with black; head and neck obscurely banded with yellowish lines; carapace not keeled, and with but slight rugosities. Valley of Mississippi to Illinois.

114. *P. elegans*, Wied. Above brown, more or less marked with irregular lines of yellow or brownish-yellow; below yellow, with dark blotches; head and neck dusky, with bright red or yellowish lines on sides and beneath; carapace smooth and flat. Central region; Texan district; *Southern Illinois*.

GENUS MALACOCLEMYS, Gray.

a. A spoon-shaped dilation at extremity of lower jaw.

115. *M. geographicus*, Les. Map Turtle. Above olive-brown, with paler streaks and intersecting lines, which are especially distinct on neck, legs, and edge of carapace; plastron yellowish; carapace sometimes well keeled; the vertebral row of scales not imbricated. Mississippi Valley, Pennsylvania, and New York.

116. *M. pseudogeographicus*, Holb. Above as in last, but with the markings less distinct and of large figure; yellow stripes on head, neck, and legs; plastron yellow, with black or reddish-brown markings; carapace keeled; vertebral row of scales more or less imbricated by a black projection on their posterior border. Mississippi Valley to Wisconsin and Northern Ohio.

b. No spoon-shaped dilation on lower jaw.

117. *M. palustris*, Gmel. Diamond Back. Carapace sometimes a plain greenish-gray, sometimes almost black, and sometimes with concentric stripes; plastron varying from light yellow to yellowish-green or reddish-brown; plain or dotted, or concentrically striped; shell smooth or with concentric grooves. Coast from New York to Texas.

GENUS CHRYSSEMYS, Gray.

118. *C. picta*, Herm. Painted Turtle. Body rather flat; bridge connecting carapace and plastron wide but flat; scales of carapace greenish-black, edged with a paler tint; marginal scales with bright red markings; plastron yellowish, generally blotched. Eastern region, Louisiana and Mississippi.

119. *C. reticulata*, Bosc. Southern Painted Turtle. Body moderately high and elongated; bridge high and wide; plastron somewhat narrow; above dusky or dark brown, reticulate with yellow lines, which are frequently obscure in adult specimens; beneath yellow, sometimes with black markings. Gulf States.

GENUS CHELOPUS, Raf.

a. Edge of upper jaw straight, slightly notched in front, but not produced downward.

120. *C. guttatus*, Schw. Speckled Tortoise. Snout rounded, and its sides not compressed laterally; above black with yellow spots; rarely plain black; plastron black, or yellow spotted with black. Eastern region, east of Ohio.

b. Upper jaw more or less deeply notched in front, and projecting in the form of an arched bill.

121. *C. muhlenbergi*, Schw. Sides of head compressed, but not narrowing downward; carapace with or without a keel, and the scales either plain or concentrically grooved; a large tooth on either side of notch in upper jaw; above dark brown, obscurely blotched with lighter; neck with a dark orange blotch on each side; below dark with yellowish or reddish spots. New Jersey and Eastern Pennsylvania.

122. *C. insculptus*, LeC. Wood Turtle. Sides of head compressed, and nose narrowing downward; in the adult the scales either have radiating ridges, or are smooth; above reddish-brown, with radiating black lines; plastron yellow with black blotches; throat and extremities reddish. Eastern region, east of Ohio.

#### Genus EMYS, Brong.

123. *E. meleagris*, Shaw. Blanding's Tortoise. Black, usually with yellow spots on the carapace; head spotted; plastron yellow with black blotches; young nearly circular, and entirely black except the plastron, which is edged with white. Alleghanian district to Wisconsin.

#### Genus CISTUDO, Flem.

Vertebral scales about as wide as long; the young, and often the adult, with a distinct keel.

124. *C. clausa*, subsp. *clausa*, Gm. Box Turtle. Shell broad; colors variable; above blackish with yellow blotches, or numerous small spots and lines; sometimes the background appears yellow with black markings; beneath usually blackish, with a yellow border, occasionally all yellow; hind feet with four toes.\* Eastern part of United States.

125. *C. clausa*, subsp. *triunguis*, Ag. Three-toed Box Turtle. Three toes on hind feet; color pale yellowish, with few spots. Austroriparian region to Georgia, Eastern Pennsylvania.

\*A number of specimens from Pease River, Florida, collected by Dr. J. W. Velie, and a considerable number in the National Museum, from Lake Okeechobee, agree in the following distinguishing characters, and may represent a local Floridan variety:

Carapace more arched than in the last; costal plates flatter, and sloping abruptly downward; marginal plates flaring but little; shell narrower and higher; color above blackish; a yellow dorsal line; vertebral scales with a few lines of yellow; on the costal scales the lines are few and long, radiating from the posterior upper corner; beneath yellowish, with generally small scattered black spots and streaks; scales of carapace, in small specimens, somewhat imbricated.

## Family TESTUDINIDÆ.

## Genus TESTUDO, Linn.

126. *T. Carolina*, Linn. Gopher Turtle. Above brownish; head almost black; beneath yellow; fore limbs large and strong; hind ones short and rounded; plastron projecting beyond the carapace in front. Austroriparian region.

## Order CROCODILIA.

## Family CROCODILIDÆ.

Head depressed, elongated; nostrils approximated at end of muzzle; tongue fleshy, adherent; teeth in a single row; body depressed; with solid, carinated shields on back; tail compressed laterally; presacral vertebræ proœlian.

Nasals entering into formation of nasal aperture; teeth unequal.

a. Muzzle broad; sides of head subparallel; forehead divided longitudinally by a ridge; fourth pair of mandibular teeth received in pits in sides of upper jaw.

*Alligator.*

b. Muzzle narrow, head tapering; fourth pair of mandibular teeth received into grooves in edges of upper jaw.

*Crocodilus.*

## Genus ALLIGATOR, Cuv.

127. *A. mississippiensis*, Daud. Common Alligator. Nuchal plates four, separate from cervical; on back eight longitudinal series of quadrilateral and strongly tuberculo-carinated plates; flanks covered by nine or ten rows of smaller, smooth, rhomboidal plates; beneath, the smooth square plates are arranged in transverse and longitudinal rows; above dusky brown or black in adult; in young barred with yellow; beneath yellowish, somewhat dusky. Austroriparian region.

## Genus CROCODILUS, Cuv.

128. *C. americanus*, Seba. Floridan Crocodile. Muzzle elongated; nuchal plates four to two; cervicals six; dorsal plates in four longitudinal series; vertebral large, regular, broader than long; lateral series scattered, irregularly hexagonal; head and back of male rough, of female comparatively smooth; the former leaden black above; almost or quite destitute of yellow; the latter uniformly mottled with black and yellow; beneath pale yellow, darker on sides, with fine irregular streaks and spots of black. Floridan district.

FAUNAL REGIONS OF UNITED STATES.

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*Austroriparian Region*.—Bordered on the south and east by the Gulf of Mexico and the Atlantic; on the north and west by a line extending south through the eastern part of North and South Carolina, west through upper Georgia and Alabama, north through the western part of Tennessee and Kentucky to Southern Illinois, west and south to Indian Territory, and across the western corner of Texas to New Mexico and the Rio Grande. It includes three districts: the *Floridan*—the southern portion of Florida; the *Louisianian*—from the Floridan to Texas; the *Texan*—Texas.

*Eastern Region*.—Bordered on the south by the Austroriparian; on the east by the Atlantic; on the west by a line running north from the northeast corner of Indian Territory to the southeast corner of Dakota, thence northwest.

*Pacific Region*.—Bordered on the east by the Sierra Nevada mountains; on the west by the Pacific; on the south by Lower California.

*Lower Californian Region*.—Occupies the peninsula of that name.

*Central Region*.—Bordered on the east and north by the Eastern; on the west by the Pacific; on the south by the Austroriparian and Sonoran regions.

*Sonoran Region*.—Includes parts of Nevada, New Mexico, Arizona, and Sonora in Mexico.

## GLOSSARY.

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- Alveolar surface*—That portion of the jaws where the teeth are usually found.
- Amphicælian*—Said of those vertebræ that are concave at each end.
- Anal*—Pertaining to the anus.
- Anal plate*—The plate or scale which covers the anus in front.
- Anchylosed*—Firmly united, as when bones are grown together.
- Annulated*—Ringed or banded transversely.
- Anteorbital plate*—That situated along the anterior margin of the eye, the largest dimension of which is vertical.
- Areolate*—Divided into small spaces which are bounded by parts differing in color or structure.
- Articular bone*—The portion of the lower jaw which articulates with the quadrate.
- Azygos*—A plate directly behind the rostral.
- Branchiæ*—Gills; the respiratory organs of fishes, etc.
- Bridge*—The bony or horny plates which unite the carapace and plastron of turtles.
- Canthus*—Corner or angle.
- Canthus rostralis*—Corner or angle of snout.
- Carapace*—The dorsal shield of turtles; usually composed of bony plates covered by horny scales.
- Carinate*—Keeled or ridged longitudinally.
- Carpus*—The wrist bones connecting the forearm with the long bones of the hand.
- Clavicle*—The collar-bone or anterior inferior portion of the pectoral arch. It does not form part of socket for arm.
- Cloacal aperture*—Entrance into the cloaca, or chamber into which the rectum, and the genital and urinary organs open.

- Coccyx*—The vertebræ of the tail, or those behind the sacrum.
- Condyle*—Articulating surface of a bone.
- Connate*—United into one body.
- Coracoid*—A bone or cartilage on the ventral side of an animal, which helps to form the socket for the articulation of the arm.
- Coriaceous*—Leathery.
- Costal*—Pertaining to or in relation with the ribs.
- Costal grooves or plicæ*—Grooves or folds between the ribs.
- Cruciform*—Cross-like.
- Dentaries*—Distal ossification of the mandible or lower jaw.
- Depressed*—Flattened.
- Diaphragm*—The muscular septum separating the thoracic and abdominal cavities.
- Diapophyses*—Transverse processes of the vertebræ.
- Digits*—Fingers and toes.
- Distal*—Remote from point of attachment.
- Dorsal*—Pertaining to the back or upper surface.
- Edentulous*—Without teeth.
- Emarginate*—Slightly notched at tip.
- Epicoracoid*—Equivalent to precoracoid of Huxley. It is a portion of the coracoid bone or cartilage lying in front of and more or less separated from the rest by a fontanelle.
- Femoral pores*—Pores along the under surface of the thigh.
- Fontanelle*—A space between bones occupied by a membrane.
- Fossa*—A depression or excavation more or less cup-shaped.
- Fronto-parietal*—A bone formed by, and occupying the place of, the frontal and parietal.
- G. Gastrosteges*—Transverse band-like plates on the abdomen.
- Gular fold*—A transverse fold across the throat.
- Hypopophyses*—A process from the median line of the under surface of the bodies of the vertebræ.
- Iliac bones*—That part of the pelvic bones which articulates with the vertebræ.
- Imbricate*—Overlapping, like shingles.
- Internasals*—Plates on top of snout, between nasals.
- Isodont*—Equal toothed.
- Keel*—Ridge.

*Labials*—Plates that border the mouth, except the rostral.

*Loral*—A plate between nostril and eye, whose longest dimension is longitudinal.

*Mandible*—The lower jaw.

*Marginal plates*—Those around the margin of the carapace.

*Maxillary bones*—Those at side of upper jaw, and separated in front by premaxillaries.

*Metacarpals*—Long bones in hand separating the carpals from the phalanges.

*Metatarsals*—Bones in foot separating tarsals from phalanges.

*Nares*—Openings of nose, external and internal.

*Nasal*—Pertaining to the nose.

*Nasal plates*—Those about the external nares.

*Neural spine*—The median dorsal spine of the vertebræ.

*Nuchal*—Pertaining to nape of neck.

*Occipital plates*—Those behind the vertical.

*Ocellated*—With eye-like spots, usually round with a lighter border.

*Opisthocælian*—Said of the vertebræ when concave on the posterior end only.

*Palatine teeth*—Those on the palate bone; generally on anterior part of mouth.

*Palmate*—Webbed.

*Papillose*—Covered with papillæ or small fleshy projections.

*Parotoid*—A projecting gland behind jaw on side of neck.

*Phalanges*—The bones which form the fingers and toes.

*Pectoral arch*—The bones that support the fore limbs, as the clavicle, coracoid and scapula.

*Pedicellate*—With a stem, stalk, or foot.

*Penultimate*—Next to the last.

*Plantar tubercles*—Tubercles on the soles of the feet.

*Plastron*—The abdominal shield of turtles.

*Pleurapophyses*—The true ribs or their homologues.

*Plicæ of tongue*—Folds or grooves on the surface.

*Plicate*—Transversely folded or wrinkled.

*Pollex*—Thumb.

*Postfrontal plate*—One in front of vertical.

- Postorbital plates*—Those behind the eye.
- Preanal pores*—The pores in front of the anus.
- Prefrontal plate*—In front of postfrontal.
- Premaxillary bones*—Those which form anterior border of upper jaw, meeting in median line.
- Proœlian*—Vertebræ concave in front only.
- Proximal*—Nearest.
- Pubis*—The anterior segment of the lower portion of the pelvic bones.
- Quadrate bone*—The proximal bone in the series forming the lower jaw; the one by which the rest are joined to the cranium.
- Reniform*—Kidney-shaped.
- Rostral plate*—The one that forms the tip of the snout.
- Rugosities*—Roughnesses or wrinkles.
- Semipalmate*—Toes half webbed.
- Serrated*—With saw-tooth projections.
- Sessile*—Attached without any stalk or foot.
- Squamosal*—Like a scale.
- Sternal plates*—Those on the abdomen.
- Sternal ribs*—The ribs which are attached to the sternum.
- Subapical*—Near the apex.
- Subcaudal*—Beneath the tail.
- Subcircular*—Nearly round.
- Subcylindrical*—Almost cylindrical.
- Subgular*—On the throat or under surface of the neck.
- Suborbital plates*—Those between eye and labials.
- Superciliary*—Over the eye.
- Superciliary plate*—On top of head, over eye.
- Supranasal plate*—One above the nasal.
- Symphyses*—Junctures of bones, especially along median line.
- Tarsal bones*—Those in the ankle between the long bones of foot and leg.
- Temporal plates*—Between occipitals and labials.
- Tympanum*—The drum-head of the ear.
- Ultimate*—Last or farthest.
- Vertebra*—One of the bones of the back.

*Vertebral*—Along or in relation to the vertebræ.

*Vertical plate*—In center of top of head, between eyes.

*Vesicle*—A sack or bladder-like cavity.

*Vomerine teeth*—Those on vomer.

*Vomeropalatine*—Those on the united vomer and palate.

*Xiphisternum*—The posterior segment of the sternum.





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## ERRATA.

P. 6. After description following Family PROTEIDÆ read:

### Genus NECTURUS, Raf.

3. *N. lateralis*, (Say) Bd. Mud Puppy. Above brownish, with darker sub-circular spots; generally a dark stripe from snout back to eyes. A more or less distinct lateral band in young. Below dusky. Large, bushy, bright red gills, forming three tufts on each side of head. Head depressed; snout truncated; gular fold well developed; tail much compressed.  $1\frac{1}{2}$  feet. Eastern region, except New England and Eastern Middle States, and from a few points in Austroriparian.

4. *N. punctatus*, (Gibbes) Cope. Above nearly uniform dark olive, with numerous small orange or yellowish dots irregularly distributed over the whole surface, and large, dark, ill-defined spots at distant intervals. No lateral band. Beneath pale flesh color. Smaller and more slender than the preceding species. Eastern S. Carolina.

P. 18. Before FIRMISTERNIA and ARCIFERA, for ORDER read SUB-ORDER.

P. 22. Before RANIFORMIA, for ORDER read SUB-ORDER.