

THE OPHIDIA OF NEBRASKA.

BY W. EDGAR TAYLOR, PROFESSOR OF NATURAL HISTORY AND GEOLOGY IN
NEBRASKA STATE NORMAL SCHOOL, PERU, NEBRASKA.

INTRODUCTORY REMARKS.

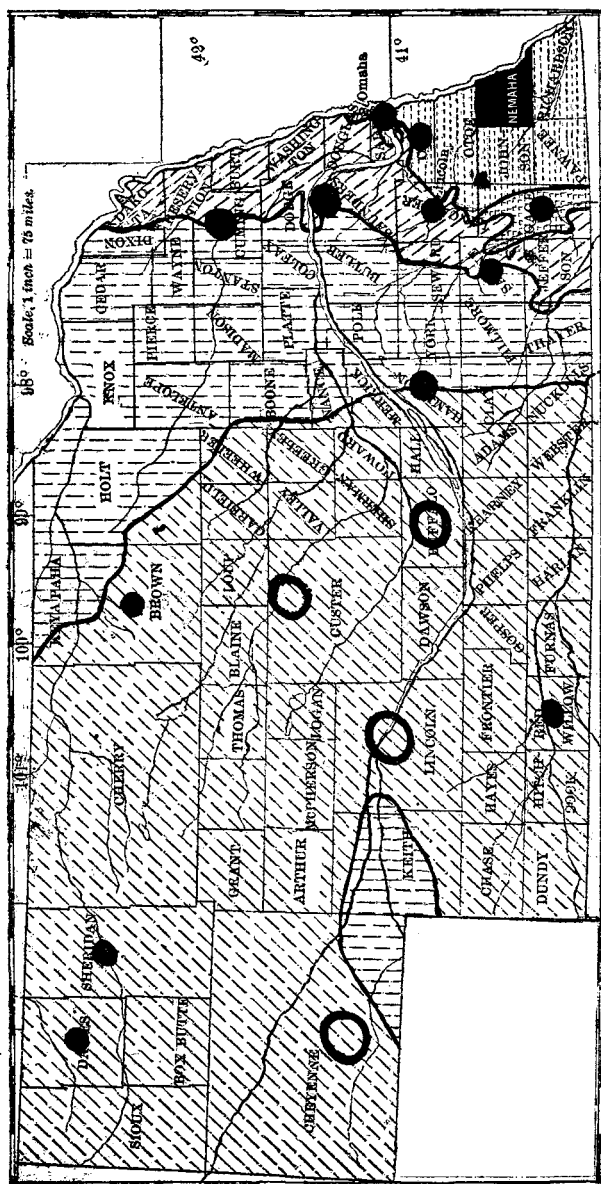
The notes and descriptions given in this catalogue are confined to the Ophidia, or serpents, of Nebraska. The range of the collections made included representative localities in different parts of the state, and only specimens actually examined by the author are included in the catalogue. The localities by counties are represented on the accompanying map.

Localities represented by the specimens examined by the author at the time of making out this catalogue are indicated by the solid circular blotches. The rings indicate the localities represented in the collections of the National Museum as published in Yarrow's Check List. In addition, many specimens, in the check list and elsewhere, are reported as from "Nebraska," and, of course, cannot be located.

The writer has been collecting, when occasion would allow, for the past four years, adding to the small collection previously made by the students of the State Normal School, until he now has a home collection of several hundred specimens. This collection includes specimens taken in Nemaha, Sarpy, and other counties in eastern and southeastern Nebraska; Dawes and Sheridan counties in northwest Nebraska and intermediate points, and Gage and Red Willow counties in southern Nebraska. In addition to this he has had free access to and has carefully examined the collection of about one hundred specimens collected from time to time in Lancaster, Cuming, Saunders, Cass, Saline, and other counties, and now at the University of Nebraska. For the privilege of examining these specimens, as well as the use of the library of the University of Nebraska, the author is greatly indebted to Instructor F. C. Kenyon and Prof. E. H. Barbour, both of the department of zoology in the University of Nebraska. In addition to the above we have received valuable collections from Prof. G. D. Swezey, Doane College, Crete; Mr. D. D. Ashley, Beatrice high school; Principal Julius Conklin, Long Pine schools; Mr. H. B. Duncanson, assistant agriculturist in the University of Nebraska, and others. This gave us an extra large number of specimens for examination, though southwest Nebraska was not as fully represented as we desired. However, it was from the last named section that most of the Nebraska specimens mentioned in Yarrow's check list were taken.

Typical specimens are preserved at the following points: State Normal School, Peru (complete); University of Nebraska, Lincoln (complete); Doane College, Crete (partial); Beatrice high school (six specimens).

There has never been a complete publication on the Ophidia of Nebraska. The paper of Dr. Edward Hallowell, "Notice of a Collection of Reptiles from Kansas and Nebraska presented to the Academy of Natural Sciences by Dr. Hammond, U. S. A.," published in the proceedings of the Philadelphia Academy of Natural Sciences for 1856, does not distinguish Nebraska from Kansas specimens, and is otherwise unreliable at the present day. This scarcity of published works on



Nebraska snakes, together with the fact that works on herpetology describing our species are so scattered and conflicting, has caused the author to append descriptions. The extra large number of specimens at command has enabled him to do this in a reasonably satisfactory manner. In order to make the catalogue of use to the masses the language is less technical; the general anatomy of the snake is briefly reviewed, and a short key is appended.

The author also hopes that the results of his studies on food habits, while not complete, will be of some value. Only foods actually found in the stomachs of these snakes are given.

The large collection we have had at our command has enabled us to make out, where necessary, somewhat extended descriptions of the young—a feature generally omitted, yet very essential in a catalogue of this nature.

The author has had access to a reasonably complete set of works on herpetology. The following have been relied on principally, the first named being followed in our classification:

The Reptiles and Batrachia of North America. Samuel Garman, Kentucky Geological Survey, 1882.

Check List of North American Reptilia and Batrachia, with Catalogue of Specimens in the United States National Museum. H. C. Yarrow, M. D. Bulletin No. 24 U. S. National Museum, 1882.

Catalogue of North American Reptiles in the Museum of the Smithsonian Institution. Part I—Serpents. S. F. Baird and C. Girard. Smithsonian Institution, 1853.

Reptiles. Spencer F. Baird. Explorations and Surveys for a Railroad Route from the Mississippi River to the Pacific Ocean. War Department, 1859. (This contains the plates for Baird and Girard's catalogue of 1853.)

North American Herpetology. J. E. Holbrook. Second edition. Philadelphia, 1842.

Check List of North American Batrachia and Reptilia. Edward D. Cope. Bulletin No. 1 of the National Museum, 1875.

Report upon the Reptiles Collected on the Survey. J. G. Cooper, M. D. U. S. P. R. R. Explorations and Surveys, 47th parallel, (date?)

Notes on the Herpetology of Dakota and Montana. Drs. Elliott Coues, and H. C. Yarrow. Bulletin No. 1, Vol. IV, U. S. Geological and Geographical Survey of the Territories, (1877?)

A Preliminary Catalogue of Kansas Reptiles and Batrachians. F. W. Cragin. Transactions of the Kansas Academy of Science, Vol. VIII, 1879–80.

Second Contribution to the Herpetology of Kansas, with Observations on the Kansas Fauna. F. W. Cragin. Transactions of the Kansas Academy of Science Vol. IX, 1883–84.

Notice of a Collection of Reptiles from Kansas and Nebraska presented to the Academy of Natural Sciences by Dr. Hammond, U. S. A. Edward Hallowell, M. D. Philadelphia Academy of Natural Sciences, 1856.

If this catalogue shall lead to the better protection of our most useful snakes, together with a more careful study of the department of herpetology so little known—development and life-history—the author shall feel amply repaid for his labors.

EXPLANATIONS.

In this catalogue the following terms are used as explained:

- VERTICAL PLATE—In the center of the crown of the head, or the central plate between the plates over the orbits of the eye.
- OCCIPITALS—The two plates immediately behind the vertical and supraoculars.
- SUPRAOCULARS—The plates immediately over the orbits of the eye, and, in some instances, projecting.
- FRONTALS—The plates immediately in front of and touching the verticals.
- PREFRONTALS—When present, immediately in front of and touching the frontals. Often absent.
- INTERNASALS—Immediately in front of the prefrontals, or, when the latter are absent, the frontals.
- ROSTRAL—Anterior to the internasals and terminating the snout.
- PREOCULARS—The plates immediately in front of the orbit of the eye.
- POSTOCULARS—The plates immediately behind the orbits of the eye.
- LOREAL—The plates below the frontals and just in front of the preoculars.
- NASALS—The plates between the rostral and the loreal. When two, known as the *anterior* and *posterior*.
- UPPER LABIALS—The plates covering the margins of the upper jaw, excepting the rostral.
- LOWER LABIALS—The plates covering the margins of the lower jaw, excepting the mental.
- TEMPORALS—The plates or scales situated between the upper labials and the occipitals, and varying in numbers.
- MENTAL—The single plate on the anterior of the lower jaw and separating the right and left lower labials.
- SUBMENTALS—The elongated and paired plates immediately posterior to the mental, and usually in anterior and posterior pairs.
- GULARS—The small scales between the submentals and the first ventral plate.
- INFRAMAXILLARIES—The small scales between the lower labials and the submentals.
- NORMAL-HEAD-SHIELDS—The arrangement on the top of the head of two frontals, two internasals, one vertical, with one supraocular on each side, and one pair of occipitals.
- VENTRAL PLATES—The long transverse plates on the ventral surface from the gulars to the vent.
- SUBCAUDAL PLATES—The plates on the under side of the tail; counted from the first complete and connected pair posterior to the vent.
- DORSAL ROWS OF SCALES—The number of rows of scales on the dorsal surface; numbered from the sides; counted at the largest portion of the body.
- LENGTH—The length of the body is from the tip of the snout to the vent; the tail from the vent to the tip of the tail. In measuring, the specimen should be stretched.

The following notations may aid some who may wish to study Nebraska serpents:

SPECIMENS COLLECTED IN NEBRASKA AND PUBLISHED UNDER OTHER NAMES.
Eutzenia sirtalis dorsalis (L.) Cope. "Platte river, Mo." (Nebr.). No. 292 Yar-
row's Check List. Reduced to *E. sirtalis*.

E. sirtalis obscura (Linn.) Cope. "Fort Kearney," "Platte river," "Missouri river," and "Nebraska." No. 295 Yarrow's Check List. Reduced to *E. sirtalis*.
Tropidonotus fasciatus Linn. "Fort Kearney, Nebr." No. 318 Yarrow's Check List. Reduced to *Nerodia sipedon*.

Bascanion constrictor Linn. "Platte river, Mo." (Nebr.), and "Fort Kearney, Nebr." No. 265 Yarrow's Check List. Reduced to *B. constrictor*, var. *flavi-ventris*.

Caudisona tergemina Say. No. 175 Yarrow's Check List. Changed to *Sistrurus catenatus*.

PROBABLY ERRONEOUSLY REPORTED.

Eutænia haydeni Kenn. "Fort Pierre, Nebraska." Cooper, U. P. R. R. Rep., p. 298. Now Pierre, S. D., and the species reduced to *E. sirtalis*, var. *radix*.

Cyclophis æstivus Linn. "Western Missouri" (Nebraska?). No. 249 Yarrow's Check List. As this species is found in Kansas the above may have been correct.

Bascanion tæniatum tæniatum (Hallowell) Cope. "From the plains to the Pacific." Garman's Reptiles and Batrachia of N. A., 1882, p. 148. We have not found the species within the state and have found no definite locations reported further east than Colorado.

Lampropeltis multistrata (Kenn.). Proc. Phil. Acad., 1860, p. 328. Credited to "Fort Lookout, Nebraska," but should have been Fort Benton, Montana. However, this species is found in Nebraska but reduced to *Ophibolus triangulus*, var. *doliatus*.

SUBEXTRALIMITAL, AND POSSIBLY MAY BE FOUND IN NEBRASKA.

Storeria occipitomaculata B. & G. Found in Kansas and reported from Wisconsin and Montana by Dr. Yarrow.

S. lineata Hallowell. This species when first described was based on a specimen taken in Kansas. Prof. Cragin says "It proves to be one of the commonest serpents of Kansas."

SUMMARY.

Genera.	Species.	Varieties.
<i>Eutænia</i>	2	6
<i>Nerodia</i>	1	1
<i>Regina</i>	1	1
<i>Storeria</i>	1	1
<i>Cyclophis</i>	1	1
<i>Bascanion</i>	1	1
<i>Masticophis</i>	1	1
<i>Pityophis</i>	1	2
<i>Scotophis</i>	2	2
<i>Ophibolus</i>	2	3
<i>Diadophis</i>	1	1
<i>Heterodon</i>	2	2
<i>Carphophis</i>	1	1
<i>Crotalus</i>	1	1
<i>Sistrurus</i>	1	1
Total.....	19	25

Of the nineteen species eleven are represented by varieties only. This is probably due to the fact that eastern and southern forms were first collected and hence are the types. Furthermore, the great change in climate, soil, etc., has very materially modified the colors. It is evident that the classification of our North American serpents needs to be rearranged and determined by a careful study of their development from the egg to the adult stage. The great task of rearing the young makes this work doubly difficult.

STRUCTURE OF THE SNAKE.

The snake is an animal known in a general way by every one. They are among our most beautiful and useful animals, yet a terror to both young and old. If our serpents were properly understood the common dread and fear possessed by so many people would pass away. The great dread and terror created on the part of the uninitiated at the mere sight of a harmless snake is more than foolishness. With the exception of the rattlesnakes our species are entirely harmless and practically defenseless. Even when they bite, the only result is a slight wound not as painful as an ordinary pin scratch. Most of our snakes should be protected, since they are such excellent friends of the agriculturist, destroying large numbers of insects, mice and other rodents.

The body of the snake is long, slender, graceful and beautiful, of course varying in different species. It is protected on the dorsal surface by more or less subquadrate or ovoidal scales, which are somewhat scattered and loosely attached, thus allowing the free extension of the skin. The ventral surface is clearly separated from the dorsal by long transverse plates extending clear across the abdominal surface. These plates in all Nebraska species, excepting the Rattlesnakes, are paired on the tail.

The length of the snake is divided into three regions; namely, the head, the body proper, and the tail. These regions are often more or less indistinct when viewed from the dorsal surface, the Worm Snake (*C. amœna*, var. *vermis*) being, perhaps, the most notable example of this indistinctness; but are usually readily separated, the most distinct being the rattlesnakes. However, these three divisions show quite distinctly on the ventral surface. Here the head is separated from the ventral plates of the body by from one to eight rows of small scales or gulars. The tail is separated from the body by the vent, and usually by its rapidly decreasing size, and, further distinguished in all except the rattlers, by the division of each subcaudal plate. The head in shape is either conical, as in the Blue Racer; triangular, as in the Blowing Adder; or fusiform, as in the Bull Snake. However, all gradations and modifications of these types exist, and furthermore, the head is always more or less covered with peculiar plates, differing from the scales of the body, and usually modified in some of its outlines peculiar to each individual species. As a rule, in all our Nebraska species, the head is separated from the body by the constriction of the neck, especially in the case of the Rattlesnakes and Blowing Adders, though in some species, the neck is quite full and large, comparatively. The pupil of the eye in all of our species, excepting the rattlers, is round; in the latter it is elliptical and a pit exists between the eye and the nostril.

The body is always more or less cylindrical, often widest on the ventral surface and tapering towards the median dorsal and usually largest in the middle, or in

the case of the rattlers, just posterior to the middle. Furthermore, it is capable of lateral expansion, most notably so in the case of the Blowing Adders.

The tail varies in proportional length, as well as in distinctiveness, in different species, being very short and distinct in the Rattlesnakes and Blowing Vipers, and slender in most Garters. It is always rounded and tapering and usually differently marked from the body, and terminated either by rattles or a horny tip, the latter often very slight.

The skeleton of the snake is loosely put together, and usually the bones are simply connected by ligaments, thus allowing the free extension of the body in swallowing objects exceeding the diameter of the snake. The teeth are small and sharp for the most part located on the jaws and the palate.

The most characteristic feature of the internal anatomy of the snake is the want of symmetry in the paired organs. In the Rattlers both lungs are developed, but in all other Nebraska species the right lung is moderately well developed but the left lung is not functional and is either wanting or rudimentary if present. The functional lung is long, rather large, and has a thin-walled extension called the air-sac. The ovaries and testes are paired, the right almost invariably larger and placed a little in advance of the left. The male copulative organs are two in number and placed on each side of the vent. They are tube-like, everted when in use like the finger of a glove, and in some species, for instance the Garters, are covered with numerous curved spines varying in size. The trachea, or windpipe, in general, is similar to the trachea of other vertebrates. The œsophagus is a small tube leading into the stomach, which is simply an enlargement of the alimentary canal, consists of a number of longitudinal plications or folds, and, as in the case of the body and œsophagus, seems to be capable of great expansion. The intestines are divided by constriction into small intestines and large intestines. The circulation is double and somewhat incomplete, there being two auricles, but the septum between the two ventricles is usually wanting or imperfect. The other organs need not be mentioned here.

Serpents are rather defective as to their organs of special sense. The sense of taste is probably lacking or very defective; the tongue being used as a feeler or organ of touch. The serpent feels its way by constantly thrusting forward its tongue. According to Dr. Yarrow the sense of sight is more or less imperfect, the sense of smell and touch being of chief value in securing food. The sense of hearing is dull and it is probable that the snake detects the approach of an animal more by the jar than by hearing. The sense of smell is better developed and is probably employed by the snake both in finding food and its mates. Many of our species exude an odor, most notably in the case of the Water Adder (*N. sipedon*).

All of our snakes are carnivorous, and seldom, if at all, eat food which they have not killed or captured themselves. All are more or less insectivorous. The special foods are given under the appropriate species. Serpents are usually better climbers than is accredited them, especially the Pilot Snake and the Blue Racer.

KEY.

(Prepared largely from Jordan's Manual.)

	PAGE
I. Upper jaws in front with large, erectile, perforated fangs; a deep pit on each side behind the nostrils; anal plate and generally subcaudal plates undivided. (Rattlesnakes) <i>Crotalidæ</i>	352
<i>a</i> —Top of the head with eight or nine plates symmetrically arranged; rattles small. <i>Sistrurus</i>	355
<i>aa</i> —Top of the head mostly covered with small scales; rattles large. <i>Crotalus</i>	354
I. Poison fangs wanting; no deep pit between the eyes and nostrils; subcaudal plates arranged in pairs. (Colubrine Snakes) <i>Colubridæ</i>	319
<i>a</i> —Dorsal scales not keeled; anal plate bifid.	
<i>b</i> —Scales, 13; ventral plates, about 137; color brownish. (Worm Snake) <i>Carpophis</i>	351
<i>bb</i> —Scales, 25 to 29 (median dorsal faintly keeled). <i>Scotophis</i>	337
<i>c</i> —Black (the young gray with chestnut-brown blotches). (Pilot Snake) <i>Obsoletus</i>	337
<i>cc</i> —Reddish-brown with chestnut blotches. (Fox Racer) var. <i>Vulpinus</i>	339
<i>bbb</i> —Scales, 15 to 17.	
<i>c</i> —Ventral plates, from 175 to 200.	
<i>d</i> —Bluish or greenish black, slightly tinged with red; young, blotched. (Blue Racer) <i>Bascanion</i>	331
<i>dd</i> —Dingy-white, mixed with brown, varying to black on the anterior half of the body. (Coach-Whip Snake) <i>Masticophis</i>	334
<i>cc</i> —Ventral plates, about 165.	
<i>d</i> —Blackish, with yellow collar. (Ring-necked Snake) <i>Diadophis</i> ...	345
<i>dd</i> —Green (blue in alcohol); no collar. (Green Snake) <i>Cyclophis</i> ...	330
<i>aa</i> —Dorsal scales not at all keeled; anal plate, entire. <i>Ophibolous</i>	341
<i>bb</i> —Dorsal scales in 25 rows; color brownish. (Chain Snake) var. <i>Calligaster</i>	341
<i>bb</i> —Dorsal scales in 21 rows.	
<i>c</i> —Color chiefly black. (King Snake) var. <i>Sayi</i>	344
<i>cc</i> —Color red or grayish, with dark markings. (House Snake) var. <i>Doliatus</i>	342
<i>aaa</i> —Dorsal scales more or less keeled; anal plate, entire.	
<i>b</i> —Scales, 25 to 30; ventral plates, about 230; blotched. (Bull Snakes) <i>Pityophis</i>	334
<i>c</i> —Rows of dorsal scales from 31 to 35. Var. <i>Bellona</i>	337
<i>cc</i> —Rows of dorsal scales from 27 to 29. Var. <i>Sayi</i>	335
<i>bb</i> —Scales, 19 to 21; ventral plates, about 155; striped. (Garters) <i>Eutænia</i>	318
<i>c</i> —Lateral stripes on the third and fourth rows of scales.	
<i>d</i> —Scales above and below the lateral stripes with subquadrate black spots. (Racine Garter Snake) var. <i>Radix</i>	325

<i>dd</i> —Scales not spotted, or, at least, but little, in 19 rows; body slender. (Fairey's Ribbon Snake) var. <i>Faireyi</i>	321
<i>cc</i> —Lateral stripes on the second and third rows of dorsal scales.	
<i>d</i> —Dorsal rows, commonly 21; normally eight superior labials; no brick-red. (Wandering Garter Snake) var. <i>Vagrans</i>	325
<i>dd</i> —Dorsal rows, commonly 19, but often 21; normally seven upper labials; vivid brick-red present (Common Garter Snake).	1
<i>c</i> —Uniform brown; spots obscure; stripes distinct; red not conspicuous. <i>Sirtalis</i>	322
<i>ee</i> —Stripes dull green; marked by rather large confluent spots or blotches with interspaces vivid brick-red. (Parietal Garter) var. <i>Parietalis</i>	325
<i>aaaa</i> —Dorsal scales keeled; anal plate bifid.	
<i>b</i> —Scales, 15 to 17. (DeKay's Brown Snake) <i>Storeria</i>	329
<i>bb</i> —Scales, 19 to 21. (Queen Snake) <i>Regina</i>	328
<i>bbb</i> —Scales, 23 to 29.	
<i>c</i> —Snout recurved and keeled. <i>Heterodons</i>	346
<i>d</i> —Azygos plate encircled by ten to fifteen small plates. (Hog-nosed Snake) var. <i>Nasicus</i>	349
<i>dd</i> —Vertical plate in direct contact with the frontals. (Spreading Adder) <i>Platyrrhinus</i>	347
<i>cc</i> —Snout without recurved keel at its tip.	
<i>d</i> —Ventral plates, from 200 to 240; brown or black. <i>Scotophis</i>	337
<i>e</i> —Black (young gray with chestnut-brown blotches. (Pilot Snake) <i>Obsoletus</i>	337
<i>ee</i> —Reddish brown with chestnut blotches. (Fox Racer) var. <i>Vulpinus</i>	339
<i>dd</i> —Ventral plates, 130 to 160; brownish, usually with cross blotches. (Water Adder) <i>Nerodia</i>	326

THE OPHIDIA OF NEBRASKA.

SUBORDER—ACACOPHIDIA (Non-venomous snakes).

FAMILY—COLUBRIDÆ (Colubrine snakes).

GENUS EUTÆNIA, Baird & Girard.

Body moderately stout in some species, slender in others. Scales carinated. Skin very extensible. Cephalic plates normal. Preoculars, one; postoculars, three. Ventral plates all entire; subcaudals divided. Dorsal rows of scales, 19–21. Ventral plates, 147–170. Subcaudals, 50–120. General color, three light stripes on a darker ground, intervals with alternating or tessellated spots. Abdomen without square blotches. Mostly terrestrial. Many of the species ovi-viparous.

The following representatives of this genus have been reported from Nebraska by various excellent authorities:

Eutænia faireyi.

E. proxima.

E. radix.

E. radix, var. *twiningi*.

E. vagrans.

E. sirtalis.

E. sirtalis, var. *dorsalis*.

E. sirtalis, var. *parietalis*.

E. sirtalis, var. *obscura*.

We have succeeded in collecting representative Nebraska types of all these species and varieties, and feel sure that collectors have not made sufficient allowances for existing climatic conditions of the state. It is well known that specimens collected in the western part of the state materially differ in colors from other specimens universally recognized as being identically the same species. Now most of our Garters possess bright colors, and hence are subject to greater variations. The decrease and change in vegetation on passing from eastern to western Nebraska is apparent to any one exploring the state, our western plains being comparatively bare and thus, as is well known, affecting the colors of all animals. Furthermore the Garters in eastern Nebraska, corresponding and similar to the same species in the Mississippi valley, as we pass to the western part of the state, gradually intergrade with the more typical western specimens. Most of the previous descriptions are too specific, being adapted to individual specimens or special localities. The statement of Dr. Yarrow in reference to Dakota and Montana specimens applies equally well to Nebraska, namely: "A certain proportion of the specimens cannot be referred without hesitation to the described species they are supposed to represent, or, rather, may be referred, with about equal propriety, to more than one such species. This indicates either that the descriptions drawn from particular type

specimens are too exclusive to fairly afford specific diagnosis, or that the supposed species that they represent are not valid, but blend with each other through intermediate specimens. There is unquestionably a gentle and complete intergradation between several of the accredited species.

"Too much stress altogether has been laid, in the preparation of specific diagnoses, upon points which should properly be only adduced in illustration of the normal inherent range of variation of the individual, and have no value whatever as functions of the actual specific equation. For instance, 'superior labials, seven' and 'superior labials, eight' are expressions found in the diagnosis of certain species as distinguishing marks. Whereas the fact is, as any one may satisfy himself by examination of the first dozen specimens of *Eutænia* that come to hand, that the superior labials may be either seven or eight in different specimens of indubitably the same species, or that there may be eight of them on one side of the mouth, and seven on the other in the same specimen. Subdivisions of the genus have been based upon the number of dorsal rows, whether 17, 19, or 21. Whereas it is a fact that different specimens vary a pair or two of scales in this respect, and that different parts of the body of the same specimen show a different number of rows and scales. Other matters, such as the width and sharpness of definition of the characteristic stripes, and the special tinge of coloration of these and other parts of the body, might be mentioned in similar terms."

It may be doubted that the position of the lateral stripe may be made a means of grouping the species as proposed by Dr. Yarrow. This point, while to a certain extent fixed, seems to vary occasionally. In view of these facts, we consider the reduction of the number of species and varieties as made by Mr. Garman a step in the right direction, though for Nebraska, at least, hardly satisfactory.

After studying somewhat carefully a large collection of both young and adults, including fresh and alcoholic specimens, and made in various parts of the state, the following classification would seem more reasonable:

Eutænia saurita, var. *faireyi*.

This variety should include *E. faireyi* and *E. proxima*. Beyond question, so far as Nebraska is concerned, these two species intergrade, and furthermore, the usual differences as given are so trifling and slight that it is very difficult to make definite distinctions were it necessary.

Eutænia radix.

This species should include *E. vagrans*, *E. radix*, and *E. radix*, var. *twiningi*. We see no good reason for separating *E. radix* and *E. vagrans*. The usual separation made on the 19 and 21 dorsal rows of scales, respectively, is not well founded, since in our specimens the first named species often, perhaps in a majority of the specimens, have 21 rows. Dr. Yarrow states that this is also true of Dakota and Montana specimens. The two species agree in colors, size, distribution, and, as already stated, seemingly intergrade with reference to the position of the lateral stripes.

Eutænia sirtalis, var. *parietalis*.

This variety should include vars. *dorsalis*, *parietalis*, and *obscura*. Western varieties of *obscura* and *dorsalis* are hardly the typical *sirtalis*, as defined by Garman, though made such by the latter. The types seem more like extreme forms of var. *parietalis*. Besides, these three varieties, as they exist in Nebraska, certainly inter-

grade and definite characteristics for separating them can hardly be determined. This classification is given as a result of our studies simply, as the range of our work outside of the state has not been sufficiently thorough to warrant any changes. The classification followed below is that of Mr. Garman.

1. *Eutænia saurita*, var. *faireyi* Baird & Girard. Fairey's Ribbon Snake.

Body above black or blackish-brown, more or less glossy, with three greenish, bluish, yellowish, or whitish stripes. This beautiful ribbon-like snake seldom exceeds two and one-half feet in length. The tail is about one-third the total length of the body, pointed. The ground color of the dorsal surface is black or dark brown. A median dorsal stripe begins one scale in width at the occipitals, gradually widens to one and almost two half scales till the vent is reached, where two half scales are covered to the tip of the tail. The lateral stripes are greenish-yellow; cover the upper two-thirds of the third and the lower half of the fourth rows of scales and extend from the head to the vent, where they become narrower and cover the middle portion of the first row, becoming faint before reaching the tip of the tail.

The space below the lateral stripe is the same color as above, sometimes faded or shaded into the olive beneath.

The carinæ of the dorsal region, often, but not always, are of a whitish hue, giving the species a streaked appearance. Often the upper anterior border of the last row of scales, sometimes the fourth and fifth also, is irregularly bordered with white. Number of dorsal rows of scales, 19; all distinctly carinated. Sometimes the dorsal stripe is more greenish or brownish than the lateral stripes, but more frequently of the same color or yellow on the neck only.

Upper surface of the head brownish black, and the neck and occipitals about the same color as the body. There are two light yellow occipital spots touching on the inner borders of the occipitals. Upper labials, yellowish white, touched with green. Under surface of the under jaw yellowish white. One row of gulars preceded by several small scales exists between the ventral plates and the submentals. Eyes large, over the fourth and fifth labials. Nine head-shields. Vertical, sub-hexagonal, rather acute posteriorly, and concave on the sides, and nearly twice as long as wide. Rostral broader than high, rounded above and arched below. Nasals, two, anterior larger, opening of the nostril on the commissure. Loral, one, small and horizontal. Postoculars, three, the middle largest. Preocular, one, clavate, and posterior border yellowish white. Temporals, from one to three. Mouth cleft deep and curved near the sixth upper labial. Upper labials, usually eight; sixth, seventh, and fifth largest; all yellow more or less touched with green. Submentals, two pairs, oblong, posterior, larger and pointed.

Ventral surface decidedly greenish-white, becoming whiter on the tail, without specks or blotches, but the outer ends of the ventral plates are touched with the black of the dorsal surface. Ventral plates, from 170 to 180, last united; subcaudal, plates, 95-106.

Young.—Precisely as in adults, except indications of spots.

Remarks.—This species may be determined from the other Garters by the number of rows of scales and the absence, comparatively speaking, of any spots on either the dorsal or ventral surface; also by their slender and graceful bodies. The latter

point, however, is by no means fixed, as in other species slender specimens are often found.

The food of this snake consists mostly of insects and their larvæ, but also includes fish, frogs, etc.

This species is common, but nowhere abundant. We have examined specimens collected in Nemaha, Saline, and Saunders counties.

2. *Eutænia sirtalis* (Linnaeus) Baird & Girard. Common Garter Snake.

This species is the most abundant serpent within the state. They represent a large number of varieties, about two-thirds of the described varieties having been reported as found in Nebraska. However, it would seem that these forms intergrade so closely that the varieties are separated with great difficulty. We have selected a type corresponding to the following general characteristics, but the collector will find many intermediate forms.

The body is usually stout, and rather heavy and somewhat rigid. The average length of adults is about three feet, of which the tail constitutes about eight inches. The ground color of the dorsal surface above the lateral stripes varies from light ashy to olive or very dark and even black. Quite often its lighter markings and scales are decidedly tinged with yellow, but more frequently with a bluish-green color. A broad median dorsal stripe of greenish-white, sometimes yellow, well defined and covering one and two half rows of scales, may be seen running from the occipitals to near the tip of the tail. In very light specimens, most notably those from the western part of the state, this stripe is margined on each side, for one-third of a scale, continuously with black. One lateral stripe is found on each side and on the second and third rows of scales, falling to the first on the tail, and from one and one-half to two scales in width; color light yellow, often greenish. The space between the stripes varies from light or olivaceous to black. Just above and touching each lateral stripe is a series of black spots, each covering one-half scale, rather obscure and numbering from 70 to 80. The space below the lateral stripe is the same color as the abdomen but slightly darker or more olive. All of the dorsal scales are notched posteriorly and carinated. The scales of the first row are subquadrate, the lower posterior border concave, scales in the second row are oval, the rest becoming narrower towards the median dorsal. Number of dorsal rows, 19.

The head is quite distinct from the body, broad behind, narrowing towards the front, and flat on the crown, thus giving a triangular outline when viewed from above. A small yellowish spot may be seen near the inner margin of each occipital plate. Head shields, nine. Vertical, subhexagonal, broadest anteriorly, posterior pointed, sides concave, not more than half the size of the occipitals. Rostral broader than high, yellowish below and brownish on the upper border. Nasals, two, subquadrate and the opening of the nostril on the commissure. Loral, one, subquadrate and rather acute, angular on the lower posterior. Preocular, one, broadest at the top, and lower two-thirds yellowish. Postoculars usually three, rarely four; second from the upper largest. Eyes large, over the third and fourth or fourth and fifth labials. Mouth cleft deep and curved. Upper labials, seven, rarely eight; fifth and sixth largest. Lower labials, ten, rarely eleven; sixth, fifth, and seventh largest. Submentals, two pairs, the hinder narrower and larger. One row of gulars between the ventral plates and posterior submentals, passing between the latter and to the anterior pair.

The ground color of the ventral surface is a greenish or bluish white, darker than the lateral stripes of the dorsal surface. A small orbicular black spot is distinctly visible near the extremities and on the anterior edge of each ventral plate. The ventral plates are broad and number from 155 to 165, last entire; subcaudals, from 65 to 85.

Young.—The young are similar to the adults; the markings usually more distinct.

Remarks.—Specimens of this species are subject to great variations. However, all are marked with more or less brick-red, in this respect intergrading with var. *parietalis*. The most typical specimens are collected in the western part of the state, but it may be well doubted whether we have within the state the typical *sirtalis*, notwithstanding it has often been reported. Certainly very good types are found, but by far the larger number of our specimens belong to var. *parietalis*, intergrading with the first named.

The food habits are identical with var. *parietalis*.

We have collected specimens from Brown, Dawes, and Nemaha counties. Dr. Yarrow reports the following varieties which Mr. Garman has made identical with the typical *sirtalis*:

E. sirtalis, var. *sirtalis*. One specimen from "Nebraska" and one from "Western Missouri" (Nebr.).

E. sirtalis, var. *dorsalis*. One specimen from "Platte river, Mo." (Nebr.).

E. sirtalis, var. *obscura*. Four specimens from "Fort Kearney, Nebr."; five from "Platte river, Nebr."; two from "Nebraska"; two from "Missouri river" (Nebr.); one from "Southern Platte" (Nebr.); four from "Platte river" (Nebr.); three from "Republican river" (Kansas or Nebraska?).

2a. *Eutænia sirtalis*, var. *radix* Baird & Girard. Racine Garter Snake.

The head is broad and somewhat depressed and ovate in outline as seen from above. Form, stout, compact, and rather cylindrical; average length of the adults about two feet and one-half; tail, about six inches.

Ground color from light to dark olive, brownish, with three longitudinal yellow stripes and three series of distinct jet black spots on each side. However, the dorsal color varies from a very light brown, most notably in western specimens, to almost black. The dorsal stripe extends from the occipitals to the tip of the tail; is of a bright yellow color anteriorly, becoming greenish and much lighter posteriorly. For the length of three or four scales back of the occipitals it is one scale in width, then widening to one and two half scales, narrowing on the tail. The lateral stripes are on the third and fourth rows of scales, decidedly greener than the anterior dorsal, begin about seven scales from the cleft of the mouth, cover two half scales in width till reaching the vent, where they descend and cover the first row to the tip of the tail. The inner dorsal spots are often confluent and touch the dorsal stripe; alternating with the next lower series and, also, usually the corresponding row on the opposite side of the median dorsal; number often indeterminate. The second series is in contact with the upper sides of the lateral stripes, beginning near the head and gradually disappearing on the tail. These spots are more or less orbicular and alternate with the first dorsal row, as well as the corresponding lateral row on the opposite side; number from 75 to 80 on the body, and in size two and three scales in diameter, becoming smaller on the tail. The third

dorsal series is below the lateral stripe, subquadrate, touching the ventral plates and the lateral stripes, thus forming bars, and are very distinct. They equal in number and size, and alternate with the second dorsal row, with which they sometimes form bars across the lateral stripe and near the head. The first row of dorsal scales is very broad ovate, much broader than the rest, which become narrower till the median dorsal row is reached. Posterior angle of the dorsal scales truncated, with the corners rounded off, the first row often notched, a character seen to a less extent on the second row. The carination of all the scales is greater than usual, and the whole specimen has a rougher appearance. Number of dorsal rows, usually 19, but often 20 or 21.

The upper surface of the head is light olivaceous; under surface yellowish with an occasional bluish or greenish blotch. The face is yellowish, much mottled with dark brown. The upper labials are decidedly greenish-bluish and heavily bordered posteriorly with black or dark brown. A small yellow spot is seen near the inner margin of each occipital plate, the two placed in the center of a black orbicular blotch.

The ground color of the ventral surface is bluish or greenish white, very frequently mottled with dull yellowish. Near the ends and on the posterior edges the ventral plates are marked by irregular black blotches or lines. In addition, in some specimens, the whole posterior ventral surface is promiscuously blotched with black. Number of ventral plates, from 150 to 170, last usually entire, rarely divided; subcaudals, from 65 to 80 pairs.

The above description corresponds with the more typical specimens of eastern Nebraska and found to a certain extent all over the state. In Dawes, Sheridan, and other western counties specimens are found that correspond precisely with Dr. Yarrow's description of *E. radix*, var. *twiningia* form since dropped. The description is as follows:

"The difference (between *E. radix*, and *E. radix*, var. *twiningia*) is easily recognized in life by an observer familiar with both kinds. The principal character is seen in the increased breadth and intensity of coloration of the dorsal band, especially on the anterior portion. This band is of a rich chrome yellow or reddish golden, contrasting strongly with the clear pale yellow of the lateral stripe. This richly colored cadmium-yellow band commences as a minute linear trace on the middle borders of the two scales just posterior to the two occipitals; it then covers a single scale in rear of these, gradually increasing until three or even four scales are covered, finally settling down to thin scales which continue down two-thirds of the body, then covers one whole and two halves; opposite the anus, and to its termination, it is confined to two half scales. At its broadest part, near the head, it is full three scales broad, and sometimes three and two half scales in width. There are slight or no indications of darker mottling, even in the lighter colored specimens. Below the lateral band the dark color is usually much broken up with mottling of the color of the belly. With much the same general form as *E. in radix*, the head appears decidedly narrower and less obtuse."

Young.—The young agree with the adults in every essential particular.

Remarks.—This pretty snake is found all over the state and in food habits agrees with specimens of *E. sirtalis*, var. *parietalis* of the same size. Earth worms and insect larvæ seem to constitute the bulk of their food.

We have examined specimens from Cuming, Dawes, Lancaster, Nemaha, and

Sheridan counties. Dr. Yarrow reports one specimen from "Nebraska" and another from "Platte river, Mo." (Neb.).

2b. *Eutænia sirtalis*, var. *parietalis* Say. Parietal Garter Snake.

This variety differs from *sirtalis* principally in color. Mr. Garman gives as distinguishing characteristics 21 rows of dorsal scales, and a greater number of dorsal spots and ventral and subcaudal plates than is possessed by *sirtalis*. But these characteristics are rather the exceptions, since many are found having but 19 rows of scales and corresponding ventral and subcaudal plates. Typical specimens are as in *E. sirtalis*, excepting the following points:

The space between the stripes varies from bright olivaceous to black, in which and on each side of the median dorsal stripe may be seen from one to two series of rather large spots, sometimes one or both series rather obscure. Each series numbers from seventy to eighty to the vent. Usually when the two rows are distinguishable the upper row is confluent next to the median dorsal stripe; the two alternating with each other and more or less united anteriorly and posteriorly. The intervals between these blotches, more especially on the anterior of the body, are of a vivid brick-red, which color, as well as the black, is often seen bordering and on the bases of adjoining scales, and also on the skin. The amount and the vividness of this red varies considerably in different specimens. The stripes also vary considerably in shades of colors; usually are a greenish blue, but frequently deep yellow. This yellow is sometimes so abundant as to give a yellowish tint to the whole specimen. The space below the lateral stripes varies from light olivaceous or brown to very dark brown, almost black.

Young.—The young are similar to the adults and determined without difficulty. However, the spots and other markings are usually more distinct.

Remarks.—This variety is very common in eastern Nebraska, but largely displaced in the western part of the state by the more typical *sirtalis*.

The full-grown specimens of this species feed largely on frogs, their stomachs often containing two and even three specimens of the full-grown Leopard Frog (*R. virescens*). On one occasion we observed a member of our excursion party immediately after capturing and engaging a large specimen of these Garters make a test of its appetite. It voraciously swallowed in succession three large specimens of the common Leopard Frog. The snake still seemed anxious for more frogs, but the cries of the latter and the pleading of the young ladies, who were members of the class, caused the said young man to cease his experiments. A very peculiar feature of their food habits consists in the fact that specimens of this Garter, not exceeding two and one-half feet in length almost always contain within their stomachs specimens of the common earth worm. This fact is not, however, peculiar to this species, but nevertheless the manner of capturing these worms would certainly be interesting.

We have examined specimens from Cuming, Nemaha, and Saunders counties. Dr. Yarrow mentions one specimen from "Republican river, Mo." (Nebr.?).

2c. *Eutænia sirtalis*, var. *vagrans* Baird & Girard. Wandering Garter Snake.

This variety agrees with var. *radix* in size and color and in markings, except as mentioned below. There are usually 21 rows of dorsal scales. The dorsal stripe does not contain so much yellow, being rather light and greenish. This stripe is

narrower, the median dorsal covering but one row of scales, the tint usually bordering the adjoining scales. The lateral stripes are usually on the second and third rows, but sometimes touching the fourth. These stripes are narrow, but owing to the encroachment of the black spots on both sides, and the fact that the lower edge of each scale of the two rows covered by the stripe is black, the stripe is zigzag. Often in this zigzag course this stripe is made to touch three rows. In most specimens the scales covering the interspaces of the blotches between the median dorsal lateral rows are bordered with white.

Young.—Similar to the adults.

Remarks.—The food habits are similar to other Garters of this species. This variety is generally distributed, but nowhere common. We have collected specimens from Gage, Nemaha, and Sheridan counties. Dr. Yarrow reports one specimen from "North Platte" (Nebr.); one from "Platte river" (Nebr.), and two from "Nebraska."

GENUS NERODIA, Baird & Girard.

Body generally stout, and almost all the species attaining a large size. Tail one-fourth or one-fifth of the total length. Scales carinated. Cephalic plates normal. Preoculars, generally one, occasionally two; postoculars, three, occasionally two. Last and sometimes penultimate ventral plate bifid; subcaudal, all bifid or divided. Dorsal rows of scales, 23–29. Ventral plates, 133–154. Subcaudal, 66–80. General color, three series of dark blotches on a lighter ground, sometimes almost uniform, brown or blackish. Abdomen unicolor or maculated. Habits aquatic.

3. *Nerodia sipedon* Linnæus. Water Adder.

The body is short, spindle-shaped, and broad ventrally; often three feet in length, of which the tail is probably eight inches. Head rather narrow, relatively long, flat, and blunt, though distinct from the body. Mouth deeply cleft and abruptly curved near the seventh or eighth labial, and a faded dark bar runs from the angle of the mouth to the eye. Postoculars, three, sometimes two; small, the middle or the lower usually largest; preocular, one, curved and oblong vertically. Length of the vertical plate slightly less than the commissural line of the occipitals, but longer than the supraoculars; shape elongated subpentagonal.

In fresh and typical specimens the ground color is a whitish-yellow, with a very decided but light coppery tinge, and the markings distinct. However, ashy-gray or brownish-red specimens are often found. A few specimens have been found which were decidedly yellowish over other colors, both dorsally and ventrally, and readily separated from typical specimens by this characteristic, though agreeing in others. There are three rows of dorsal blotches, varying in color from light brown to black, the adjoining blotches often being more or less connected. In the median dorsal row the blotches, on the body, number 32 or 33, sometimes more, are usually subquadrate or oblong, sometimes becoming oval or ovate posteriorly; size of the larger near the central portion of the body from five to ten scales in length and fourteen scales in width, gradually disappearing on the tail. The lateral blotches, excepting anteriorly and on the tail, alternate with the dorsal series, are oblong, extend to the tip of the tail, are five scales long and six wide, and extend onto the ventral scales for the width of one or two scales. The dorsal and the lateral blotches unite anteriorly and form seven or more broad transverse bands or bars.

In the same way about twenty-five transverse bars are formed on the tail. All the dorsal blotches are bordered with black, and separated by a light grayish color. which is bordered by the light coppery ground color. The space between the median dorsal blotches is about one scale in length; between the lateral dorsal three scales in length. Posteriorly, the blotches or bars are at right angles to the axis of the body; anteriorly, the blotches are more or less oblique and the bars are widest in the middle, each becoming narrower towards the ends. Number of rows of dorsal scales, 23, rarely 25; broadest on the sides and all strongly keeled; notched at the apex.

Ground color of the ventral surface similar to the dorsal but lighter, more coppery, and decidedly yellowish. The markings consist of a double median row of irregular and somewhat confluent blotches which become thicker and darker posteriorly. In addition to the extension of the lateral dorsal blotches onto the ventral plates each intermediate ventral scale is marked by a brownish-black blotch. These blotches vary considerably in color, being black, reddish coppery, brown, or yellowish. Ventral plates, from 140-150, at least the last bifid; subcaudal plates, 60-80.

Young.—The young are marked as in the adults, being, however, much more distinct and the scales without specks or very small blotches. The ground color is much lighter, often almost white. The two dorsal series of blotches, one median and two lateral, are always distinct, but subject to as many variations in size, shape, and color as in the adults. For example, in specimens before us the blotches vary from jet black on a ground color of reddish-yellowish white to rufous on a clean white background. In the same specimens the blotches vary in shape, the usual type being quadrate or subquadrate for the median, and oblong or suboblong for lateral blotches. These blotches are arranged as in adults, the variations being very great.

Remarks.—This snake is extremely sluggish, very ill-tempered and unpleasant to handle. Often when brought into our laboratory, after being agitated, they emitted a very offensive, strong odor, which could be detected anywhere within the room.

They are very abundant in streams and stagnant waters and are usually found in brush or drifts.

Our specimens are not the typical *sipedon* but partake partly of the characteristics of both var. *rhombifer* and var. *erythrogaster*; in fact good types of either variety are found, but as each grades into the other and also into the typical *sipedon* we hardly consider it advisable to divide the species. We suspect that the same conditions are true of Kansas specimens, as Professr Snow reports var. *rhombifer* and Professor Cope var. *erythrogaster*, while the species *sipedon* is also reported by various persons.

The reputation of this species for variability is fully sustained in Nebraska, our collection showing specimens of all known shades and distinctness of markings. As in other sections of the United States, these serpents are commonly regarded as venomous, though harmless, and are popular known as the Water Moccasin, Water Snake, Water Adder, etc.

The food of this snake consists almost wholly of water insects and their larvæ, fish and craw-fish, being the most fish-loving of all our species. Very often the stomach is completely filled with parasitic worms belonging to the "round-worm" type (*Nematelminthes*).

We have examined specimens collected in Cuming and Nemaha counties. Dr. Yarrow reports one specimen from "Nebraska."

GENUS REGINA, Baird & Girard.

Body slender; tail subconical, very tapering, forming one-third or one-fourth of the total length. Head conical, continuous with the body, and proportionately small. Eyes large. Mouth deeply cleft. Labials small. Loral and nasals large. Scales carinated. Cephalic plates normal. Preoculars, two, occasionally one; postoculars, two, occasionally three. Last, and sometimes last but one, ventral plate bifid or divided. Subcaudal plates all divided. Dorsal rows of scales, 19-21. Ventral plates, 132-162. Subcaudal, 52-82. General color, five or more longitudinal dark bands on a lighter ground. Abdomen unicolor, or likewise provided with similar bands. Aquatic.

4. *Regina leberis*, var. *grahami* Baird & Girard. Graham's Queen Snake.

Body rather slender and spindle-shaped, but stout; tail decidedly distinct from the body. Average length of adults, two and one-half feet; tail five inches.

Dorsal surface dull dark brown, or slightly olive, with a dorsal light brown line, margined on each side by a narrow indistinct black line. This light brown line covers one and two half rows of scales; usually, but not always, may be seen the full length of the snake, and, when very distinct, sometimes contains two small whitish stripes, one on each edge of the scales of the median dorsal row. These lines seem to be formed largely by the exposure of the skin. On each side of the dorsal stripe is a very indistinct black line covering one and a half scales. This color exists both on the skin and scales. Next succeeds a very indistinct, uniform light brown stripe covering one and two half rows of scales. This stripe is often imperceptible, and rarely a row of whitish spots is found on the skin touching each side of the sixth row of scales. Then again, a black line covering the fourth and one-half of the fifth row of scales and touching the third is found. The first, second, and third rows of scales are reddish-straw color. This yellowish band extends forward, passing under the head to the extremity of the snout. Another black line is seen running from behind the neck to the vent, affecting the extreme ends of the ventral plates and the lower third of the first row of scales, forming a somewhat zigzag blackish line. All of the scales are notched posteriorly and carinated excepting the first row, and sometimes the second and third also, in which the carina is represented by a whitish line. Carinae very rough and whitish, appearing like lines or stripes. Dorsal rows of scales, 19; very broad ovate in the first row, gradually narrowing to narrow ovate in the median dorsal.

Head slightly larger than the neck, flat, especially just behind the orbit, and triangular above. Mouth deeply cleft and curved near the sixth upper labial. Rostral broad and low. Nasal seemingly one divided vertically, with the nostril on this cleft. Loral, one, subquadrate. Preoculars, two, rarely three; both small and subequal. Postoculars, two, rarely one or three, and subequal. Temporals rather oblong and from one to three. Upper labials, usually seven, and the fifth and sixth largest. Lower labials, nine, rarely eight or ten; fourth and fifth largest. Submentals, two pairs, the posterior much longer. Usually two rows of gulars between the ventral plates and submentals, and frequently a single, sometimes

double, row extending to the first lower labials and between the submentals. Head shields, nine, and normal.

The abdomen is uniform reddish light straw color, with a single central row of small nebulous or subtriangular black spots posteriorly, which disappear on the anterior third or two-thirds of the body, and are sometimes obsolete. Ventral plates, 132-162, last bifid; subcaudals, 52-86.

Young.—The young, notwithstanding the fact that they are often mistaken for ground snakes, are very much like the adults. The abdomen is light straw yellow, and the lateral dorsal stripe the same color but decidedly more reddish. The median dorsal stripe is a very light brown, while the lateral brown stripes between the median and first lateral is a shade darker. All of the dark stripes are either black or very dark brown and distinct. In very young specimens there is a median double row of black spots on the ventral surface. These rows extend the full length, excepting a short space anteriorly, and are formed by two black blotches on the posterior edge of each ventral plate.

Remarks.—This beautiful snake is one of our commonest serpents and very abundant around sloughs and stagnant waters. We have more frequently found this species in muddy, wet grounds than in water. This fact, together with the shape of its body and head, and the fact that craw-fish seem to constitute its principal food, has led the writer to think that, perhaps, this snake is an expert in fishing the craw-fish out of its hole. We have found as high as five and six craw-fish in one stomach and have never found other substances excepting insect larvæ and masses indistinguishable.

We have examined specimens from Gage, Lancaster, and Nemaha counties.

GENUS STORERIA, Baird & Girard.

Head subelliptical, distinct from the body. Cephalic plates normal. Loral plate absent. Oculars, two posterior; one or two anterior. Nasals, two, rather large. Body small, scarcely exceeding a foot in length, subcylindrical; tail comparatively short, tapering. Dorsal scales, 15-17 rows, all carinated. Ventral plates, 120-140; posterior, one bifid. Subcaudal, all divided, from 41 to 51 in number. Color, brown, with two dorsal dotted lines.

5. *Storeria dekayi* Baird & Girard. De Kay's Brown Snake.

Body rather heavy and spindle-shaped, its average length in adults being about fifteen inches; the tail is slender, distinct, and pointed, and in adults about three inches in length. Ground color above, dull, dirty yellow, gray, or chestnut-brown, often slightly reddish, with a rather obscure clay-colored dorsal band, three scales wide, extending from the occipitals nearly to the tip of the tail, and margined by dotted lines. These dots, of which there are about 82 on the body, are arranged in pairs and united anteriorly, forming bars, each generally covering from one to three scales. The color of the dots seems to exist on the skin and bases of the scales. Hence, on separating the scales, the skin on each side of the fourth lateral row exhibits a second series similar to and alternating with the first. Also a third series, opposite to the first and alternating with the second, is seen along the second row, and there are even traces of a fourth between the abdominal and first dorsal series. All of these dots, except the first series, are more or less indistinct. First dorsal row of scales, broad, ovate, and largest; the rest gradually narrowing to

linear on the median dorsal. Dorsal rows of scales 17, all distinctly keeled but the first row, which is marked by a whitish line representing the obsolete carinae. Head small, rounded posteriorly, and distinct from the body. Eyes medium sized. There is a dark blotch on each side of the head about three rows of scales posterior to the occipitals; a dark bar or orbicular blotch on each angle of the mouth, and two, often confluent, below the orbit of the eye. A second very small, narrow, horizontal patch of black on the sides of the head is found between the angle of the mouth and the eye. The posterior margins of the third and fourth labials are bordered with black. The crown of the head is of a dull color and very finely and obscurely mottled with a darker color. Nasal cleft from the nostril downward and the nostril mostly in the anterior portion. Vertical, suboblong, pointed posteriorly, and half the size of the occipitals. Occipitals, two, subbrightangular triangular. Usually one large, pointed, rather oblong temporal. One preocular, elongated vertically, and two postoculars, the upper the largest. Frontals, two, rather short and broad. Internasals subquadrate. Lorals absent. Upper labials, seven on each side; seventh and sixth largest. Lower labials, seven; fifth and fourth largest, extending quite to the submentals. A second plate parallel with the sixth labial, but rather longer. Submentals, two pairs, subequal, and no gulars between the last pair and the ventral plates.

Color beneath, grayish-yellowish-white, each side somewhat indistinctly marked by a row of small blackish specks. The brown of the sides usually increases gradually in depth to the dorsal stripe.

Young.—The young vary in color from a very light yellowish-brown to a dark bluish-chestnut. In some the markings are all more or less indistinct while in others they are plainer and more definite than the adults. All the other characteristics similar to the full-grown specimens.

Remarks.—The contents of their stomachs indicate that these little snakes, which are often called "Grass Snakes," are almost wholly insectivorous. That their color is a great protection, is indicated by the comparatively small numbers collected by amateurs, notwithstanding the fact that they are common.

It will be noticed that our species possess some of the characteristics of *S. lineata*; yet it is quite distinct.

We have examined some twelve or more specimens collected in Nemaha and adjoining counties, and feel sure in saying that the species is at least common in eastern Nebraska.

GENUS CYCLOPHIS, Gunther.

Body slender, belly rounded; head ovoid, distinct from the neck; tail long, tapering regularly. Eye somewhat large, pupil round. Teeth equal, smooth. Head-shields, nine. Loral present or lacking. Nasal entire. Oculars, 1-2. Scales smooth in 15 rows, or keeled in 17. Anals and subcaudals bifid.—(Garman.)

6. *Cyclophis vernalis* Gunther. Northern Green Snake.

This little green snake is one of our most beautiful serpents, its color often aiding it in eluding the eye of the observer. The body is graceful and elongated, subcylindrical, a little deeper than broad, spindle-shaped, covered with smooth scales, subquadrate on the sides, becoming ovate on the median dorsal; number of rows,

15. The tail is very much tapering, pointed, forming about one-third of the total length. The adults are from fifteen to twenty inches in length. The body is dark green above (blue in spirits), lighter on the sides. Whole under surface plain light yellow. Ventral plates, 130-140, last bifid; subcaudal plates, 85-90.

The head is elongated, ovoidal, slightly swollen on the temporal regions, and separated from the body by a slender neck. Snout rounded and projecting considerably over the lower jaw. Cephalic plates normal. In the specimens we have examined there was usually one nasal plate on one side, and two on the other, though the normal condition would be one plate with the nostril in the center. Loral one, small or medium, and suboblong or subquadrate. Normal number of preoculars, one; club-shaped, angular above and rounded below, with the posterior margin concave. Postoculars, two; upper larger, both small and subquadrangular. Eyes relatively large. Cleft of the mouth deep and curved. Temporal scales, three or more, well developed, oblong, the anterior one elongated and largest. Upper labials, seven; the seventh, sixth, and fifth largest. Lower labials, seven or eight; fifth and fourth largest, the three anterior and the three posterior quite small. Two pairs of submentals, the posterior longer and slenderer than the anterior pair, extending much beyond the fifth lower labial. From two to three rows of gulars between the posterior submental and the first anterior ventral plate.

Young.—Similar to the adults.

Remarks.—We have examined some eight or ten of these serpents, all collected in Cuming county by Mr. Lawrence Bruner, and now in the collection of the State University. Dr. Yarrow mentions one specimen taken at "Sand Hill, Nebraska." They are probably not rare, but are greatly protected by their color.

We can say nothing as to their food habits further than that they are probably insectivorous and vermivorous.

GENUS BASCANION, Baird & Girard.

Body slender, elongated. Tail very long. Head narrow, deep, long. Eyes very large. Postoculars, two; anterior, two; upper very large, lower very small, in a notch between the second and third labials. Fourth labial produced up behind the eye to meet the lower postocular. Loral, one; nasals, two. Vertical much elongated and narrow, concave externally. Dorsal rows of scales, 17, all perfectly smooth, and subhexagonal. Ventral plates, 170-200; posterior, one, divided; subcaudal, 90-110, all bifid. Colors black or olive. Uniform above, lighter below; skin between the scales black. Young blotched.

7. *Bascanion constrictor*, var. *flaviventris* Baird & Girard. Blue Racer.

Body slender, much elongated, and scales decidedly smooth and lustrous. Tail long and slender. Average length of adults about three feet and one-half, though sometimes reaching four feet, of which length the tail constitutes about eight inches.

Dorsal surface varying from light to dark olive green, or blue, sometimes pale green, lighter on the sides, and often considerably tinged with reddish or brownish posteriorly. The full grown adults are perceptibly darker than the young, and the numerous blotches of the latter completely disappear. However blotches are sometimes found on specimens three feet in length, and increase in distinctness with the decrease of the size of the specimen till the typical young are reached. In the

medium sized specimens the blotches become confluent and finally unicolor. Dorsal rows of scales, 17; all smooth, widest on the sides, where they are obscurely margined with greenish-yellow, the skin between the scales being black.

The head is rather distinct from the neck, long, narrow, angled in front, concave on the sides, crown flat and curving downward near the snout. Eyes large and normally over the third and fourth labials. Mouth cleft deep and slightly curved. Crown-shields, nine. Frontals wide and bent down on the sides of the head. Internasals elongated and bent down on the face. Vertical much longer than broad, anterior convex, sides much concave, and posterior pointed. Occipitals elongated, broadest anteriorly. Rostral broad and very convex. Nasals, two; the nostril on the commissure. Loral, one; usually subquadrate. Preoculars, two; upper large, lower small, and normally in a notch between the second and third labials. Postoculars, two; rather small. Temporals, six; arranged in two rows of three pairs. Upper labials, seven; fourth, sixth, and seventh largest. Lower labials, nine; fifth very large. Posterior, two; very small. Submentals, two pairs, oblong; about two rows of gulars between the posterior pair and first anterior ventral plate. Beneath bright greenish-yellow, rather lighter on the tail, this color involving the lower half of the labials. In medium sized specimens the ventral surface is irregularly and somewhat obscurely blotched with bluish-greenish, the same color marking the ends of the ventral scales. Ventral plates from 170-195, last usually bifid; subcaudal plates, from 70-85 pairs.

Young.—The young agree with the adults in everything except coloration, but this feature is so different that the young, by those not acquainted, are often mistaken for other species. In specimens from ten to fifteen inches in length the ground color of the dorsal surface is light brown, gray, or olive, and marked by four series of blotches, the lateral sometimes confluent, and all gradually disappearing on the tail. The median dorsal series number from 65 to 85 on the body, often becoming indistinct posteriorly; extend to the occipitals and are confluent and zigzag anteriorly; next becoming suboblong, often oblique or confluent, three and four scales long and ten or twelve wide; dark chestnut, brown-bordered with black, and separated by light interspaces of from one to two scales and usually becoming indistinct posteriorly except when the epidermis is removed. The next—the adjoining series—are on the second and third rows, rather oblong, alternate with the dorsal series and are darker, often irregular, becoming indistinct posteriorly. The third series are on the first and second rows, dark and irregular and disappearing anteriorly and posteriorly. The fourth series extends from the head to or near the vent, are black, double the number in the median dorsal series; are located mostly on the ends of the ventral plates but touching the first row of dorsal scales, and are from one to two scales in length. The sides of the head are whitish, especially labials and oculars; tinged with bluish behind the eye and spotted with dark brown, and the posterior edge of each upper labial is heavily bordered with black. The head above is olive; the posterior margins of both frontals and internasals dark chestnut, as are the adjoining edges of the vertical and supraoculars, and posterior edges of the supraoculars and occipitals, as well as a small blotch on the outer edge of the supraoculars; and a broad patch in the center of the occipitals running up onto the vertical.

The ventral surface is pale greenish-yellow, sometimes deep yellow, marked by two irregular series of black blotches, from two to four on each scale, which disappear before reaching the vent.

Remarks.—Our Blue Racer is certainly a variety of the eastern Black Racer though perhaps not a different species. Notwithstanding it varies considerably in colors, no black specimens are found within the state. The statement of Dr. Yarrow, that "The position of certain of the upper labials and their relation to the eye and that of the lower postorbital afford the most reliable means of distinguishing the species," is found of not much value. For example, in the case of the nine specimens before us, in making this description, we find the following variations: In each instance there are two preoculars, but in two of these examples the upper is semi-cleft. In all specimens the lower preocular is in a notch between the labials, but in eight instances between the second and third, and in one case between the third and fourth labials. In every specimen, labials, or a labial, were produced up behind the eye to meet the lower postocular, but in five instances this was found to be the fourth; in three instances the fourth and fifth, and in one instance fifth and sixth labials. In seven specimens but one loral was present; in two instances there were two lorals, seemingly one cleft horizontally. In eight specimens the pupil of the eye was slightly back of the commissure between the third and fourth labials, these labials in other cases being substituted by the fourth and fifth labials. Seven upper labials in eight specimens, third and fourth largest; and eight in one, fourth and fifth largest. In eight specimens there were eight lower labials; in one, nine. These variations do not seem to take place in any definite order, but, on the contrary, seem to be the results of the divisions of the normal scales.

The Blue Racer is our most active and agile serpent; said to destroy Rattlesnakes and is very abundant. It has the same habit of climbing in bushes, both seemingly for the purpose of basking and for hunting prey, common to the Black Snake of the eastern states. We have never noticed it in trees of any size, but have often seen it in bushes and underbrush. It seems to climb by extending its slender body in a skillful manner over a number of small branches in such a way that its weight is distributed, enabling it to crawl over the smallest bushes, such as the hazel-nuts.

This serpent is our most daring species, and is commonly believed by some to chase persons. This it probably does through mere curiosity, or owing to the temerity of the individual, as it invariably flees when given an opportunity. If forced to fight, it often indicates its displeasure by rapidly vibrating its tail, raised as in the case of the Rattlesnakes. When in the leaves a perceptible noise may be made in this way. As is well-known, this snake is a great enemy of numerous small birds, robbing their nests.

A somewhat careful examination of the stomach contents of numerous specimens shows this snake to be a great insect destroyer, the most common insect found being the grasshopper, dragon-fly, etc. Other snakes are, also, devoured in great quantities, the Garters being most frequently captured. On the point of eating other snakes, their desires seem to be limited by ability to swallow only, we having found in some large specimens Garters not less than two feet in length.

This species is common all over the state and well known. We have examined specimens from Brown, Cuming, Gage, Lancaster, Nemaha, and other counties. Dr. Yarrow mentions specimens as follows: Two specimens from "Platte river," one from "Nebraska," one from "Fort Kearney, Nebr.," and another from "West-

ern Missouri" (Nebraska?). Dr. Cooper also mentions specimens collected in Nebraska, but gives neither numbers nor localities.

GENUS MASTICOPHIS, Baird & Girard.

Similar in general features to *Bascanion*, but still more slender and elongated. Tail very long. The head is almost as deep as broad, and the vertical plate very narrow and long. The most striking feature of difference is seen in the prolongation upwards of the fifth posterior labial, instead of the fourth, to meet the lower postocular. Supraoculars very broad and projecting, more so in proportion to the vertical than in *Bascanion*. Rostral quite small. Eyes very large. Postoculars, two; lower resting on the upward extension of the fifth labial, not touched by the sixth. Preoculars, two; upper very large, lower very small, in a notch between the third and fourth labials. One loral and two nasals, with the nostril intermediate. Scales all very smooth. Dorsal rows, 17 or 15. Ventral plates, 200-210; posterior divided. Subcaudal, 95-150, all divided. Abdomen blotched, seldom unicolor. Marking, anteriorly and posteriorly, apt to be different.

(—) *Masticophis flagelliformis*, var. *testaceus* Say. Coach-whip Snake.

Mr. Garman gives the range of this snake as "Dakota to Texas and the Pacific coast," and Dr. Yarrow mentions one specimen taken on "Platte river, Mo." (Nebraska). The extremely large collection we have had at our command would have enabled us to find this species if it were common, but as it is reported on excellent authority we append Mr. Garman's description and include the species in our catalogue without numbering it.

Elongate, tapering to head and tail; head a little larger than the neck, long, quadrangular in transverse section at the eye, with concave sides, arched from the snout backward; tail near one-fourth of the total, tapering, slender. Eye large, pupil round, brows overhanging. A couple of the posterior maxillary teeth a little longer. Crown shields normal. Frontals broad anteriorly, bent downward at the sides. Vertical, broad in front, narrow in the posterior half. Supraoculars broadening backward. Nasal divided. Loral, small, lozenge-shaped. Preoculars, two; lower small, in a notch between the third and fourth labials; upper large, reaching the vertical. Postoculars, two. Labials, eight; fourth and fifth entering the orbit, last two larger. Lower labials, ten; fifth large. Submentals, two pairs; subequal. Scales, moderate; smooth; in 17 rows, outer broader. Ventrals, broad, 191-198. Anal bifid, occasionally entire. Subcaudals, 80-108 pairs.

Reddish-brown, more red below, lateral edges of scales lighter, each scale with a brown line through its middle, darkening toward the tip. On the hinder portion of the body each scale has a light spot at its base, and the margin is brown. Head brown, more or less yellow, or mottled with yellow. Labials, chin, and throat yellow, more or less blotched with brown. Usually there are two rows of brown spots on the shields of the throat, sometimes extending under the body. In a specimen stripped of the epiderm there are indistinct, narrow, transverse lines of darker on the back. Total length, forty-seven inches; tail, twelve and one-half inches.

GENUS PITYOPHIS, Holbrook.

Long, moderately stout, compressed; head distinct from the neck, subconical, broad posteriorly, pointed at the muzzle; tail rather short. Eye moderate, pupil

round. Teeth equal, smooth. Crown shields, nine to eleven. Prefrontals one to two pairs. Nasals divided. A loreal, rarely suppressed. One or two preoculars. Postoculars, two to five. Scales, keeled, in 27 to 35 rows. The individual variation is very great in specimens belonging to species of this genus, particularly so in those of the Rocky mountains.—(Garman.)

8. *Pityophis catenifer*, var. *sayi* Schlegel. Western Bull Snake.

Head elliptical, rather pointed and crown rounded throughout, and broad behind, and well separated from the body by a contracted neck, very much tapering to the end of the snout, but subquadrangular from the eyes forward. Rostral plate, one, rarely two; very narrow, projecting; the apex elevated and pointed, extending far back between the nasals. Vertical, short, broad, nearly as broad anteriorly as long, and very much tapering posteriorly; its sides concave, rarely almost straight; general outline subpentagonal. Nasals subquadrangular, anterior one somewhat larger and extending upon the sides of the rostral considerably; nostril situated in the upper portion of the commissure, but more in the posterior plate. Loreal, one, rarely two, rather large; or when two, the lower one very small; upper one regular and slightly convex on its anterior margin. Normal number of postoculars, four, though in some instances only two and in others five, varying in the order of relative sizes. Numerous small temporal shields. Upper labials, usually eight, but almost as often nine; seventh and sixth, or eighth and seventh, depending on the number of labials, somewhat largest. Lower labials thirteen, often twelve; seventh, sixth, and fifth, or sixth, fifth, and fourth, depending on the number of labials, largest, the six posterior ones the smallest. Dorsal scales elliptically elongated, constituting 31–35 rows; all carinated excepting the six or seven outer rows; dorsal scales much smaller than the lateral.

The ground color of the dorsal surface whitish or reddish yellow, marked as follows: A median series of 45–55 blotches on the body; on the tail about twelve; subquadrangular, from twelve to twenty-five scales in width, and embracing longitudinally from nine to ten scales. These blotches are brown, bordered with black on the middle of the body, black towards the head and tail; quadrate and concave before and behind, seldom subcircular or elliptical anteriorly, narrowing posteriorly till on the tail they assume the shape of narrow transverse bars, tapering downwards. Anteriorly the space between these blotches embraces two or three scales, but posteriorly this intermediate space increases so as to become much greater towards the vent, sometimes becoming as wide as the blotches themselves. The adjoining blotches on each side of the median dorsal series are much smaller and somewhat irregular; brown, bordered with black, when bordered at all; usually alternating, opposite to the light spaces, and covering about three rows of scales; often distinctly confluent and elongated, thus forming a continuous chain on the back and enclosing entirely the light spaces between the median blotches, disappearing before the vent is reached. A series of subcircular or oblong blotches run conspicuously along the middle of the flanks on the third, fourth, fifth, sixth, and seventh rows of scales; numbering on the body about sixty, on the tail combining with the medial blotches. Alternating with the last, sometimes doubling, usually on the second and third rows of scales, may be found a third very indistinct row, rather elongated anteriorly, becoming subcircular near the middle of the body and disappearing posteriorly. Also, extending from the head to the vent, bordering the

flanks and ventral scales on each side, is a series of conspicuous triangular blotches, sometimes alternating, but frequently uniting with the subcircular blotches on the median flanks so as to form bands or bars. The tendency of the subcircular series and the triangular series to become obsolete vertical bars, more apparent posteriorly, gives the flanks a nebulous appearance. However, by examining the stretched and dried skin of one of these specimens the true markings may be easily determined. In many specimens, owing to the fact that on the anterior, third, and upper part of the body the bases, and sometimes the two anterior thirds, of the scales are jet black, the ground color appears darker, or, in rare cases, black. Usually all of the dorsal blotches on the anterior of the body are jet black.

Ground color of the ventral surface yellowish-white, with an external series of rather large black spots on each side united with the lowest series of the dorsal blotches as before mentioned, inside of which are two irregular series of wavy black blotches. Ventral plates, 220-235; subcaudal plates, 50-65.

Head above much spotted and specked with black, with which the labials are heavily margined. Under surface of the head light straw color, sometimes rather minutely specked. A very conspicuous frontal black bar begins at or near the angle of the mouth on the twelfth or thirteenth lower labial and extends across the upper half of the ninth and eighth upper labials, thence across the orbit of the eye bordering the commissure between the frontals and supraoculars and verticals. Average length of adult specimens about five feet, including the tail, which is about seven inches. However, specimens much larger are found. Dr. Cooper, in his report upon the "Reptiles Collected on the Survey" of the Union Pacific railroad, quotes Dr. Suckley as saying, "A very large *Pityophis* was collected by me in Nebraska. The length of the skin, stretched somewhat in taking off, was eighty-seven inches."

Young.—Similar to the adults, except not so many small black specks on the scales, and hence the four alternating series of spots on each flank, the lower on the outer edge of the abdomen, are more distinct.

Remarks.—This snake, the common Western Bull Snake, is one of our commonest serpents and the largest species found within the state. They are found throughout the state, are comparatively docile unless attacked, when, although non-venomous, their great strength and weight enables them to make a strong defense. We have often kept them for several days in our laboratory. In several instances, when allowed to run at large in the room, after having disappeared for several days, they were found snugly coiled away in some cupboard or drawer thought to have been out of their reach. When very much agitated and excited they rapidly vibrate the tail similar to Rattlesnakes. When in a zinc tank about 2x2 feet these vibrations could be distinctly heard.

When forced to fight these snakes prefer to get against some object or coil the body around some bush or stake, when they can strike a blow sufficient to defend themselves against the attacks of an ordinary sized dog. However, they never fight as long as there is any show for escape, as may be seen by tracing them on an open and almost grassless prairie.

The results of the examinations of the stomachs of these snakes show that their food is almost wholly made up of rodents, most notably ground mice, but, also including rats, gophers, squirrels, moles, and simlar animals.

What meager notes we have on their breeding habits show them to be very pro-

life, accounting for the fact that they are still numerous notwithstanding their wanton destruction in great numbers.

This species is very abundant all over the state and intergrades with var. *bellona*. We have examined specimens from Brown, Dawes, Gage, Lancaster, Nemaha, Sarpy, Sheridan, and other counties. Dr. Yarrow mentions one specimen of this variety as taken in "Nebraska."

8a. *Pityophis catenifer*, var. *bellona* Baird & Girard.

This and the preceding variety is found in Nebraska, but as will be seen in the description for var. *sayi*, they intergrade. Thus, while good types of each variety are found, it hardly seems advisable or necessary to separate them.

Mr. Garman gives the following distinctions: Spots more numerous in var. *bellona*, the dorsal series being from 70 to 80. Rows of dorsal scales in var. *sayi*, from 27 to 29; var. *bellona*, 31 to 35. According to some herpetologists, var. *sayi* has considerable more black on the dorsal scales, thus giving the variety a much darker color.

The localities for the state for the two varieties are about the same; var. *bellona* possibly is more abundant in the western part of the state.

Dr. Yarrow mentions three specimens of this variety as taken at "Fort Kearney, Nebr."

We are of the opinion that the two varieties should be reduced to one, but will not attempt to say whether it should be *sayi* or *bellona*, both applying equally well to Nebraska species.

Young.—Similar to the young of var. *sayi*.

Remarks.—Food and other habits similar to var. *sayi*.

GENUS SCOTOPHIS, Baird & Girard.

Form colubrine. Body cylindrical, very long—many individuals attaining a very large size—perhaps the largest of all North American serpents. Head elongated, rather narrow. Vertical plate very broad, sometimes wider than long. Prefrontals very large. Postoculars, two; preoculars, one; generally very large; the longitudinal extension of this and of the frontals producing a much elongated muzzle. Mouth deeply cleft, outline nearly straight. Dorsal rows of scales, 23–29; those along the back slightly carinated (9–15), on the sides smooth. Ventral plates, from 200 to 233; posterior bifid. Subcaudals all bifid.

Color brown or black, in quadrate blotches on the back and on the sides, separated by lighter intervals. Abdomen usually coarsely blotched with darker. In one species dark stripes on a light ground. Although very large and powerful, many species of the genus are characterized by their extreme gentleness, rarely becoming enraged, even when provoked.

9. *Scotophis obsoletus* Say. Pilot Snake.

This is one of our largest snakes, the average length of adults being about five feet, of which length the tail constitutes about eleven inches. In color it is a deep black on the dorsal surface; some of the scales and sometimes the skin, also, having dashes of reddish white at their bases, scarcely indicating blotches. Number of dorsal scales, 25, sometimes 27; marginal scales larger; two outer rows smooth, sometimes outer only, the others becoming more distinctly keeled till the median row is reached.

In full grown specimens the upper surface is as above described, but younger specimens tend more to the markings given for the young. Even in full grown specimens, on separating the scales, those at certain successive intervals on both sides and back will be found to have their bases narrowly margined with white, as if the fundamental color consisted of dark blotches on a dark ground. A specimen not exceeding three feet in length will show these points more distinctly, and specimens decreasing in age and increasing in distinctness of blotches may be found till reaching the young.

The head is large, broad behind, narrow in front of the eyes, depressed, with flat crown, and rather distinct from the body. Eyes moderately large, and over the fourth and fifth labials. Mouth cleft deep and curved at the sixth upper labial. Head shields, nine, broad. Vertical, broad anteriorly, concave laterally and pointed posteriorly. Frontals rather large and bent down on the sides of the face. Snout prominent. Rostral large, broadest at the base, convex and broader than high. Nasals, two, and the nostril on the commissure between. Loral rather small, sub-oblong or subquadrate. Preocular, one, sometimes semi-cleft, large, and concave posteriorly. Postoculars, two, subequal. Occipitals large and the exterior-anterior corners turned down in front of the upper temporals. Temporals, usually two, oblong. Upper labials, eight; seventh largest. Lower labials, twelve, rarely thirteen; sixth largest, rarely the seventh. Submentals, two pairs, the posterior smaller and separated by small scales. From two to four rows of gulars between the ventral plates and the posterior submental.

The color of the ventral surface is whitish or straw yellow anteriorly, becoming slate-black posteriorly, and is marked by two rows of blotches beginning about a foot or less from the head and uniting near the vent, or sooner, form a solid slate-black. Each blotch is from one to three or four ventral plates in length and near the outer margin. The ends of the ventral plates are slate colored, with the anterior edge down to the angle or keel bordered with the black of the dorsal surface. Many intermediate and smaller blotches are irregularly distributed. Ventral plates, 220-235, the last bifid; subcaudal plates, about 80. The upper surface of the head and face, touching the upper labials, is black, the rest of the head being the color of the anterior ventral surface.

Young.—One not acquainted with this snake would hardly recognize the young as belonging to the same species as the adults. They agree with the description given for the adults except as mentioned below. In a specimen ten or fifteen inches in length, the ground color of the dorsal surface is a very light gray, very slightly reddish or yellowish. The neck is relatively smaller than in adults and hence the head more distinct. The dorsal surface is marked by a median and two lateral series of conspicuous blotches. The median dorsal are light brown or steel gray, the edges bordered with a dark brown, which gradually fades out on the blotches, often leaving light areolæ. These blotches number on the body from twenty-five to thirty-five, on the tail about ten or fifteen; anteriorly, longer than broad, about fourteen scales long and ten wide; posteriorly, broader than long, about ten long and fourteen wide; on an average separated by interspaces of from three to five scales; very irregular in shape and in their outlines, but generally subquadrate and concave both posteriorly and anteriorly; on the tail forming mere bands.

The adjoining lateral series are found on the second, third, fourth, fifth, sixth,

and seventh rows of scales, of the same color, and alternate with the median dorsal, are elongated but very irregular in shape and disappear near the vent. The next or second series are more grayish, subquadrate, two or three scales in length, extending to the keel of the edge of the abdomen, and are twice as numerous as the first series, and extend to near the tip of the tail. The series intermediate between the first and second lateral series is either obsolete or seldom seen, and then only near the middle of the body. The dorsal scales are more or less sprinkled with gray and not so distinctly carinated as in adults.

Head grayish, with a dark brown band across the hinder portion of the frontals, through the eye to the angle of the mouth, but seldom crossing. A similar but wider diverging band runs from each side of the anterior median blotch to the occipitals, thus enclosing a light colored space on the top of the neck and back of the head. Margins of the lower labials more or less bordered with gray or dark brown. Ventral surface light yellow and on each side of the median line a series of quadrangular blotches similar to the adults.

Remarks.—This snake is, perhaps, our most skillful climber, often being found on the limbs of the larger trees with head raised, as if viewing the surrounding country. It is said that it is due to this fact that the serpent is called the Pilot Snake. It is one of our most docile serpents, and students have, by tying a string around its neck and thus retaining their captive for further observation, watched it climb the trees on the normal school campus. This it accomplishes not by winding around the tree wholly, but by curving its body in various directions in order to support its graceful form on the rough projections of the bark. The cause of this wonderful success in climbing may be surmised when we are told that birds constitute its choice food. One large specimen contained in its stomach two fledglings of the Downy Woodpecker (*D. pubescens*) large enough to fly, which the peculiar nesting habits of the mother bird had enabled the serpent to capture. However, mice and other rodents are frequently captured.

Mr. S. Garman, in his descriptions referring to this species, says: "Through its varieties this species is so closely related to the following (*E. guttatus*), that the separation is a matter of considerable difficulty. It is quite likely that a larger series of specimens may render the degradation of *E. obsoletus* to the rank of a variety of *E. guttatus* unavoidable." Our studies have included a large number of species, both adult and young, and, as will be seen from our descriptions, the two species intergrade. We feel sure that Mr. Garman's prediction will prove the correct one.

We have examined adult specimens from Nemaha county, where they are by no means rare, and the young from Lancaster and Nemaha counties. Dr. Yarrow mentions one specimen from "Western Missouri," which term at the time of making the collection, 1853 (?), probably was applied to what is now the state of Nebraska.

10. *Scotophis guttatus*, var. *vulpinus* Baird & Girard. Fox Racer.

Body elongated, ventral surface flat and angled at the sides; head elongated and decidedly distinct from the neck, tapering regularly to the moderately broad snout; crown flat; tail short and tapering. Average length, about twenty-four inches, of which the tail constitutes about four inches.

Ground color above, light reddish brown, lighter on the sides, marked anteriorly and posteriorly by three series, and near the middle of the body four series of blotches. The median series are more or less irregular in outline and shape but usually subquadrate or suboblong, concave anteriorly and posteriorly; deep reddish-chestnut brown, bordered by a darker brown; about two inches from the head about six scales long and twelve wide, and separated by interspaces of four scales; near the middle of the body three scales long and eleven wide, and interspaces of three scales, and posteriorly three scales long and ten wide, interspaces two scales; not forming bands on the tail. These blotches are variously arranged, but usually oblique; number on the body forty-three, and on the tail fifteen. The first blotch anteriorly is divided into two, and each division elongated on the nape, extending to the occipitals. The first lateral series are on the third, fourth, fifth, sixth, and seventh rows of scales, and alternate and agree in color and markings with the median dorsal. Anteriorly these blotches are black, suboblong, about two scales wide and about five long; near the middle orbicular and about three scales in diameter, and posteriorly elongated vertically, being about three scales wide and two long; disappearing on the tail. The second lateral series, when present, alternates with the first, are on the second and third, or when seemingly crowded down by the first, on the first and second rows of scales, and are about one scale wide and two long, and black. The third lateral series is on the first and second dorsal rows and extends on the ventral plates to the keel, double in numbers the first lateral dorsal rows, black, covering about two ventral plates in length and wider than long, and extending to the tip of the tail. Dorsal scales widest on the sides, all more or less sprinkled with gray and chestnut-brown; number of rows, twenty-five, from the first to the sixth or eighth smooth, the median dorsal decidedly keeled.

Head reddish, with a darker, black-edged band across the posterior portion of the frontals, through the eye, across to the angle of the mouth. Eye medium sized and over the fourth and fifth labials. Mouth cleft deep and the curve gradual and slight. Head shields, nine, broad. Occipitals subtriangular, longer than the vertical, and anterior-exterior corner turned down between the temporal and upper postocular. Vertical, broad anteriorly and narrowing and pointed posteriorly. Frontals broader than long and bent down on the sides of the face. Internasals rather small and pointed. Rostral convex, and wider than high. Nasals, two, and the nostril on the commissure. Loral small. Preocular, one, larger above. Postoculars, two, subequal. Temporals, two, elongated and subequal. Upper labials, eight; seventh largest. Lower labials, ten; sixth largest. Submentals, two pairs, the posterior smaller and separated by two rows of small scales. Three rows of gulars between the posterior submentals and first ventral plate.

The ventral surface is a light straw-yellow color and marked by black quadrangular or subquadrangular blotches, covering in length from one to three ventral plates and alternating on each side of the median line, or confluent. Ventral plates, 200, the last bifid; subcaudal plates, 68.

Young.—We are not sure that we have collected specimens of the young. Specimens which seemed, at first, to be the young of this species, on closer examination proved to be more closely related to *Ophibolus triangulus*, var. *calligaster*. We are inclined to believe that the young of this and the last named species are similar, if not identical. Many of the young of *O. triangulus*, var. *calligaster*, are precisely like the adult *S. guttatus*, var. *vulpinus*, in color.

Remarks.—This snake, at least for Nebraska specimens, is rather hard to separate from the younger specimens of *O. triangulus*, var. *calligaster*, with which it seems in some instances to intergrade. However, it may generally be distinguished from the latter by the smaller number and longer dorsal blotches; the number of labials and consequent position of the eye over the fourth and fifth, instead of the third and fourth upper labials; the carination of at least the median dorsal scales; the division of the anal plate, and the absence of the dark chestnut occipital spot enclosing a lighter space on the occipitals.

The small number we have examined has not enabled us to determine its food.

The few specimens we have collected are all from Nemaha county, but judging from its distribution in adjoining states it may be found all over the state, but in small numbers. Mr. Garman gives the locality of the species as from "Massachusetts to Nebraska."

GENUS OPHIBOLUS, Baird & Girard.

Body rather thick, tail short. Dorsal rows, 21 (in one group, 23), the scales hexagonal, arranged in longitudinal series, broad, short, scarcely overlapping, nearly as high as long, all perfectly smooth and lustrous. Ventral plates, 180–220; posterior, entire. Subcaudal all bifid. Head short, depressed, but little wider than the body. Eyes very small. Vertical plate very broad. Postoculars two, the lower in notch between the fourth and fifth labials. One preocular, like the loreal, small. Nasals, two, with the nostril between them. Upper labials, seven.

Ground color, black, brown, or red, crossed by lighter intervals, generally bordered by black.

11. *Ophibolus triangulus*, var. *calligaster* Say. Kennicott's Chain Snake.

The average length of the adults of this species is about three and one-half feet, the tail being about six inches; the body is tapering each way from the middle and deeper than wide, narrowing upward.

Dorsal surface varying from light to dusky chestnut-brown, often a reddish-brown, darker along the back, lighter on the sides, and marked by three series, sometimes four near the middle of the body, of very dark chestnut-brown blotches. The median series are irregularly and transversely rhomboidal, wider than long, anteriorly about twelve scales in width and four, rarely as many as eight, in length, becoming shorter posteriorly until on the tail not over one or two scales in length. These blotches are very irregular, often oblique, and usually more or less concave, anteriorly and posteriorly. They number from 40 to 55 on the body; from 14 to 22 on the tail, and each is bordered with black and separated by intervals of three to six scales. On each side and alternating with the last named series is a second dorsal series on the second to the sixth outer rows. Each of these blotches is sub-circular, or oblong, irregular, and in colors and markings similar to the median and dorsal series, and in size two and one-half scales in diameter, though varying considerably; number on the body, from 40 to 56, on the tail uniting with the next lower series on the flanks. A third series alternating with the second series and often uniting with the outer row on the ventral surface may be found on the first, second, and third rows of scales, and are irregular, but similar to the median dorsal, though much smaller. They are often confluent with each other, and rarely with the second series of the dorsal blotches. Often a row of blotches is seen at

intervals between the second and third series, indicating that the latter is really composed of two rows. Number of dorsal rows of scales, 25; smooth, and larger and broader on the sides; the dusky-brown scales often very faintly bordered with chestnut. Each scale is minutely mottled and speckled with chestnut-brown.

The head is cone-shaped, flattened on top and rather small and indistinct from the body. The most notable marking on the head is the chestnut-brown frontal bar, in some specimens somewhat indistinct. This bar begins on the last upper labial, usually the seventh, extends across the upper portion of the sixth labial, covering the lower half of the lower temporal, thence covering the lower postocular, thence across the anterior angle of the supraocular, proceeding across the posterior border of the frontals. This band is often extended and united with a lateral dorsal blotch. Another chestnut-brown blotch varying considerably in different specimens, begins about eight scales posterior to the occipitals, and forks about midway the commissure between the occipitals. Also a pair of irregular chestnut bands are found covering three rows of scales on the sides of the neck and touching the exterior border of the occipitals.

Eyes relatively small and over the third and fourth labials. Mouth cleft deep but almost straight. Crown shields, nine, and broad. Frontals broadest, anteriorly, much broader than long, and bent down on the sides of the head. Internals small, ovate, and pointed in the direction of the third upper labial. Rostral convex and broader than high. Loral, one, small, and oblong. Preoculars, usually two, sometimes one. Postoculars, two; upper larger. Temporals, usually two. Upper labials, seven; posterior three larger. Lower labials, nine or ten; fifth largest. Submentals, two pairs; oblong; anterior larger. Four rows of gulars between the posterior submental and ventral plates.

The ventral surface is whitish-yellow in color, and marked by two double rows of speckled, bluish-black or dark blotches arranged in irregular alternate pairs. The outer row covers the ends of the ventral scales and about half of the scale in the first dorsal row, sometimes uniting with the subcircular spots on the flanks. The subcaudal scales are not distinctly marked or l'anded excepting small specks. The number of ventral plates is about 204, last united; subcaudal plates, 55, approximately.

Young.—The young are variable; either decidedly rufous or gray; all the markings more distinct than in adults. Often the median dorsal blotches are divided into two orbicular blotches. Otherwise as in adults.

Remarks.—These snakes are quite abundant, and similar in habits to the Western Bull Snake (*P. catenifer*). They are very quiet, often found around lumber, side-walks, buildings, etc., where they go in search of their favorite food, such as mice and other rodents. While we have found bird eggs, usually the eggs of the Towhee (*P. erythrophthalmus*), Cowbird (*M. ater*), Wood Thrush (*T. mustelinus*), indicating that they were found on the ground, and other food in their stomachs, yet this snake feeds largely on destructive rodents.

We have examined specimens from Lancaster and Nemaha counties.

11 a. *Ophibolus triangulus*, var. *doliatus* Baird & Girard. House Snake.

Body extremely slender, round, and pretty, and tapering. Average length of the adults two and one-half feet, of which length the tail constitutes about four and one-half inches.

Color above, bright red; in alcohol, reddish or yellowish white, depending on the length of time kept in the spirits. The dorsal surface is crossed by from twenty-one to twenty-eight scarlet rings or blotches; and six or seven scarlet bars on the tail, the number of the latter often indeterminate. The bright scarlet dorsal bands are deepest in color on the dorsal surface, gradually becoming lighter on the sides. These scarlet bands are usually from seven to fifteen scales longitudinally; narrowing and rounding on the sides; generally ceasing on or near the first dorsal row but sometimes extending onto the ventral plates. However, there is much variety in size and shape. Each scarlet band has a jet-black border about two or three scales in width, connecting, extending onto, and marking three or four ventral scales in succession; and in some instances bifurcating and with the opposite band surrounds a medium sized light centered blotch on the ventral surface. Between the black borders of the contiguous scarlet bands is a whitish-yellow transverse band three or four scales in width on the median dorsal, the narrowest point, becoming wider on the sides, the widest point covering seven or eight scales. The ends of this band are often decidedly mottled with gray, which faintly but distinctly extends clear across the dorsal surface. In some instances this color is sufficient to give a decidedly grayish tinge to the dorsal surface, and in some specimens this grayish band contains in the center of the wide space on each flank a black blotch with a light areola. This blotch is extended from the ventral surface and is very seldom wholly on the dorsal surface. All the scales are smooth, and in shape varying from ovate in the dorsal to subquadrate on the tail and sides. Dorsal rows, 21, sometimes 23.

Head very small and indistinct from the body; rather pointed, tapering from the temporals; crown rather flat. The anterior portion of the first pair of dorsal rings crosses the posterior part of the occipitals, sometimes not touching, extending across to the angle of the mouth. The head in front of this, excepting just front of the eyes and forward, light chestnut-brown, black, or scarlet, minutely and numerously specked with black; sometimes a small black ring on the posterior half of the vertical. All, or nearly, of the labial commissures, upper and lower, more or less distinctly bordered with black. Pupil over the fourth commissure. There is a light yellow collar covering three or four scales, just posterior to the occipital black band, sometimes interrupted by the median dorsal, by the extension of the black border of the first scarlet to meet the occipitals, thus forming a T. The lower postocular, which is smaller than the upper, rests in a notch between the fourth and fifth upper labials, lying longitudinally against the latter. Eyes small and over the third and fourth labials. Mouth cleft deep and almost straight. Crown shields, nine, broad. Vertical, broadest anteriorly, pointed posteriorly, and convex on the sides. Frontals bent down on the side of the head. Internasals small and wider than long. Rostral convex and broader than high. Nasals, two, and the nostril on the commissure. Loral, small, and low. Postoculars, two; subequal. Preoculars, one; suboblong. Temporals, usually two. Upper labials, seven; posterior three larger. Lower labials, nine; fifth largest. Submentals, two pairs; anterior larger. About four rows of gulars between the first ventral plate and posterior submentals.

The ground color of the ventral surface is a yellowish-white marked by irregular, large, subquadrate, black blotches. These large blotches, which on an average are the width of four ventral plates, are opposite the transverse yellow dorsal bars

and alternate with the scarlet bands, and mostly disappear on the tail or unite with the dorsal bars to form bands. These irregular blotches are usually absent in specimens where the black borders connect on the ventral surface. The number of ventral scales is usually 215, last entire; subcaudal plates, 56.

Young.—Similar to the adults, except in very young specimens the black is displaced by a lavender or bluish-brown color, and the gray sprinkling the yellow bands of the dorsal surface of the adults is absent.

Remarks.—This is one of our prettiest snakes, very docile, not often even making an attempt at defense. It seems to feed largely upon insect larvæ and worms, though the fact that a young specimen thirteen inches in length contained in its stomach a young of De Kay's Brown Snake (*S. dekayi*) six inches long, is sufficient evidence of its disposition to devour other snakes. They are generally distributed, very variable and somewhat common, though not abundant. We have examined specimens from Cuming, Nemaha, and Red Willow counties.

12. *Ophibolus getulus*, var. *sayi* Holbrook. King Snake.

Body round, slender, long and graceful, and, as in most other species of this genus, very stout; deeper than wide. The average length of adults is about three feet, of which length the tail constitutes about five inches. Head not very distinct; crown flat, narrow in front and curving downward towards the rostral. Eyes medium, and over the third and fourth upper labials. Mouth, cleft deep, outline slightly curved. Vertical plate, triangular; widest anteriorly, lateral edges very convex, much pointed posteriorly, and shorter than the occipitals. Occipitals subangular and truncate posteriorly. Supraoculars, suboblong; widest posteriorly. Nasals, two; subquadrate, and the nostril on the commissure. Temporals, nine; arranged in three rows respectively, of two, three, and four scales, beginning anteriorly. Frontals rather large, broad, and turned down on the sides; prefrontals smaller. Rostral small, not projecting. Loral, convex, and broader than high. Loral, subquadrate. Preocular, vertical and large. Postoculars, subequal. Upper labials seven, increasing in size to the sixth. Lower labials, nine; fifth, fourth, and sixth largest. Submentals, two pairs; anterior larger; a row of small scales between the posterior pair, and also two rows of gulars between the latter and first ventral plate. Scales on the body nearly as wide as long, somewhat truncated at each end, those in the tail being wider than long. Dorsal rows, twenty-one; exterior, quadrate and rather larger; diminishing almost imperceptibly to the back, although all the scales in a single oblique row are very nearly the same shape and size. The scales on the back are lustrous, jet-black, each one, usually, with an oblong subcircular irregular yellow spot, all peculiarly arranged with reference to each other. It is easy to see that these spots are arranged in some definite order, yet the order is often obscure and hard to describe. The spots, which on the sides occupy nearly the whole of the scale, are smaller towards the back and become either irregularly distributed specks or regularly arranged small oblong bars, formed by the aggregation of these spots, and grouped in such a way as to form transverse, very narrow, longer bars or stripes. In this way somewhat irregular, oblique, transverse stripes are formed, dividing the median dorsal surface into eighty-five or ninety checks or suboblong black blotches, each three or four scales long and about five scales wide. The yellow lines thus separating these spots are very irregular, narrow, and somewhat disconnected, and in this way making the

exact number of spots hard to determine. The transverse lines bifurcate at about the eighth or ninth outer row, the branches connecting with those contiguous, so as to form subhexagons or squares. Every scale from the first row, and including the eighth, is marked by a yellow spot, these decreasing in size towards the median dorsal. These are so arranged on adjoining scales that there are four in a group, except sometimes three in first row, about five of these groups forming a double line from the juncture of the transverse stripes to the abdomen, running at an angle of forty-five degrees, either posteriorly or anteriorly. The latter markings are, however, not very distinct, owing to the confusion produced by the greater number of yellow spots.

Beneath, light yellow, with broad distinct subquadrate or angular blotches of black, on the edges of the abdomen, becoming more numerous posteriorly. One of these blotches is found opposite each dorsal dark space, and anteriorly on each fourth ventral scale, becoming closer posteriorly, till one is found or covers each alternate ventral plate. A median row of very irregular and rather large black spots, usually alternating with the lateral row, exist on the centers of the ventral plates. Number of ventral plates, 213, last entire; subcaudal plates, 50.

Under parts of the head rich cream yellow, with the posterior border of each labial bordered with black. Upper labials still more heavily bordered on both edges. Rostral yellow, bordered around the upper and outer edges with black. Whole upper portion of head black, variously marked by yellow dots and lines. Yellow spots on each scale differently arranged, but always on the same plan.

Young.—We have examined but one specimen of the young. Similar to the adult.

Remarks. We have seen but two specimens of this snake in Nebraska, one collected in Nemaha county and the other from Lancaster county. Mr. Lawrence Bruner reports that he collected a specimen from near Kearney. This indicates a general distribution over the state, though probably the King Snake is at no point common.

GENUS DIADOPHIS, Baird & Girard.

Head subelliptical, elongated, depressed, distinct from the body. Cephalic plates normal. Two postoculars, and two preoculars. A well developed loreal. Two nasals; nostril between. Eyes large. Mouth deeply cleft. Body slender, subcylindrical; tail tapering. Scales smooth, disposed in fifteen or seventeen rows. Last ventral plate bifid. Subcaudals all divided. Unicolor above, and generally with a light ring on the occipital region. Abdomen lighter, unicolor, or punctate.

13. *Diadophis punctatus*, var. *docilis* Baird & Girard. Ring-necked Snake.

Body above ash-gray to reddish-brown, lighter on the sides; subcylindrical, slender and largest in the middle. The length of adult specimens is usually about eleven inches, the tail being about two inches. The dorsal scales, when examined closely, appear very thickly punctured with minute black dots; are narrowly bordered with a lighter color and their bases are black, the latter point best seen by stretching the scales apart. These scales are smooth, glossy, and in shape vary from subquadrangular on the sides to ovate in the median dorsal. Dorsal scales uniformly in seventeen rows.

A deep reddish-orange (yellow in alcohol) collar-like ring, having a diagonal width of three scales, and about three scales from the occipitals, is very prominent.

This ring widens on the sides and is broadly bordered anteriorly and posteriorly with black.

Head very much elongated, above blackish-brown, distinct from the neck, crown flat and curved from the anterior of the occipitals forward; most of the upper labials yellow. A gray or black projecting angle of the color from the crown of the head extends from the temporals across the angle of the mouth. Lower labials and adjoining scales, as well as the submentals, regularly specked with blue or black. Vertical plate, elongated and subpentagonal, and rounded on the posterior lateral angles. Frontals subquadrate, extending down onto the face. Postoculars, two; upper larger. Preoculars, two; lower oblong, upper quadrate. Internasals small. Rostral broad and low, not reaching back on the head. Nasal divided, and the nostril mainly in the anterior portion. Loral, one; subquadrate. Temporals, two or three. Upper labials, seven; sixth largest; third and fourth in the orbit of the eye. Lower labials, eight; fifth very large. Two pairs of submentals, posterior half as large as the anterior pair. Mouth cleft deep, more than half behind the eye. Rows of gulars between the posterior submentals, and first ventral plate from one to four.

Whole ventral surface brown (reddish white in alcoholic specimens); usually each ventral scale is specked or barred on the posterior margin with from one to four blue or black blotches, forming a median series of blotches from the head to the vent. Sometimes these small spots are irregularly scattered all over the abdomen and extend to the tip of the tail. Also the exterior-posterior edge of each ventral scale from the head to the tip of the tail is marked by a blue or black bar or blotch, giving the appearance of a zigzag line on each border of the ventral surface. Number of ventral plates, from 160 to 175, last bifid; subcaudal plates, from 45 to 55.

Young.—The young are very similar to the adults, except the ground color of the dorsal surface is more of a slaty-blue.

Remarks.—These little snakes are popularly known as "Young Blue Racers," and since they resemble the adult Racers more than the young of the latter do, this belief is not strange. The Ring-necked Snake is rather common and usually found under rocks and in and around old logs and stumps.

We have not often been able to determine the contents of their stomachs, but their food seems to be principally small larvæ, insect eggs, etc.

Professor Cragin states that Kansas specimens of this species possess seventeen dorsal rows of scales. It would seem that Kansas and Nebraska specimens of this species are peculiar in this respect.

We have examined specimens from Cass and Nemaha counties.

GENUS HETERODON, Beauvais.

Body short, stout; tail short. Head, neck, and body capable of excessive dilatation. Posterior palatine teeth longer. Head broad, short; outline of mouth very convex, on a single curve. Orbit closed by a continuous chain of small plates, the circle completed above by the supraoculars. Rostral prominent, its anterior face very broad and turned up; its ridge above sharp. Behind it a median plate, either in contact with the frontals or separated by small plates. Frontals in two pairs. Nasals, two. Loral, one or two. Dorsal rows of scales, 23-27, carinated. Ventral plates, 125-150, posterior bifid; subcaudal plates all bifid.

Colors light, with dorsal and lateral dark blotches, or else brown, with dorsal transverse light bars. Sometimes entirely black. (Baird & Girard.)

The serpents of the genus *Heterodon* are of medium sized, thick, heavy form, and sluggish; of repulsive aspect, and, generally speaking, of an earthy color, so much so that the intruder may get over them before being warned by the well-known hissing noise. So successfully does their color protect them that the writer has, when looking for these serpents, often failed to see them till his attention was directed by their motion, notwithstanding the fact that the snake was coiled on the bare sand.

The two species are not often distinguished by those who have not studied them, notwithstanding great differences, and they are commonly called "Blow Snakes," "Puffing Vipers." "Blowing Adders," "Spreading Adders," "Sand Vipers," "Hognosed Snakes," etc. They are quite generally supposed to be venomous, but, of course, are entirely harmless. This supposition is probably created by certain mistaken similarities to the venomous snakes; namely, the flat, broad, triangular shape of the head, the shape and general color of the body, and the habit of hissing when irritated. However, these snakes may readily be distinguished from other serpents in the elevated and prolonged rostral plate, forming a sort of muzzle.

The following statement of Dr. Yarrow is true of Nebraska species, though the fang-like teeth are rather small to be mistaken for fangs: "The belief in the poisonous qualities is further heightened by the presence of two tolerably large teeth on each upper jaw, resembling fangs, these teeth being the ninth (?) of the series in some individuals, their bases being below the fifth upper labial. There is no groove present, nor is the tooth movable. We do not know that this fact has ever been before mentioned, although the post-palatine teeth are spoken of as being larger than others. These large teeth have, however, a sort of sheath over them, similar to the fang sheath of the Rattlesnake (*Crotalus*). There is an interval between the small interior teeth, and these are not contained in the same sheath as the fang-like teeth, which in some cases is found to have in its sheath one or more smaller fang-like teeth." *

14. *Heterodon platyrhinus* Latreille. Spreading Adder.

Body stout, usually flattened and short, the average length of adults being about twenty-five inches. Tail distinct, rapidly tapering, and very short—in adults being about five and one-half inches.

Ground color of the dorsal surface reddish or grayish brown above, lighter on the sides, marked by about twenty to twenty-five median dorsal blotches on the body, and nine to twelve on the tail. These blotches are quadrate on the body, becoming bands on the tail; very dark chestnut-brown, distinctly margined with black, the margin generally being obsolete on the outside. These blotches are usually nine scales wide and eight long; and separated anteriorly by interspaces of light reddish-brown three scales in length, which become shorter posteriorly. Another series is usually found on the third, fourth, fifth, sixth, seventh, and eighth rows of scales, alternating with and often touching the median dorsal row, and extending from the neck to the vent. This series consists of about twenty to twenty-

* Notes on the Herpetology of Dakota and Montana, by Dr. Elliott Coues and Dr. H. C. Yarrow: Bulletin of the United States Geological and Geographical Survey of the Territories, Vol. IV, No. 1, p. 270.

five orbicular and elliptical blotches; the diameter of the orbicular ones anteriorly five scales, posteriorly less; and the elliptical blotches four scales long and seven wide; darker and more distinctly bordered than the median series, and separated from each other by broad intervals and from the corresponding median blotches by not exceeding one-half scale. The next series is always very faint and indistinct in adult specimens when seen at all. (See remarks on the series under *Young*). Dorsal rows of scales, 25, rarely more; outer row, and often the second and third also, smooth, the remainder more or less distinctly carinated, the carinae extending to the ends of the scales; those just behind the occipital plates truncated, with obsolete carinae. Scales on the posterior of the body shorter and broader than anteriorly, widest on the sides, first two rows grayish; all minutely punctate with black.

Vertical plate, unequal sided hexagonal, narrower and more acute behind; much longer than broad; angles all distinct, lateral outlines straight, and the vertical and the occipitals longer than broad, the latter rounded from the inner posterior to the anterior outer angle. Frontals, two; large and elongated transversely; the lateral angle extending down to the face to meet the loreal; usually but not always partially separated anteriorly by the azygos plate. Prefrontals, two; small, triangular, and entirely separated by the azygos. Rostral with the outline spherical angled, rather acute at the apex, its upper surface compressed into a sharp ridge, which is prolonged backwards between the nasals and prefrontals and connected with the azygos. This plate varies in outline from oblong with rounded angles to linear, subpentagonal, acute-angled behind, where it wedges between the prefrontals and sometimes the frontals. Supraoculars each nearly as large as the vertical, subquadrate and angular. Temporals, and the scales immediately posterior to the occipitals, smooth. Eyes large. Lorals, one; angular. Nasals, two; subangular; the posterior one joined by its apex to the exterior angle of the frontals. Nostril valvular, situated almost wholly in the posterior nasal, the anterior edge being formed by the anterior nasal into which it extends very slightly. Upper labials, usually eight but sometimes nine; seventh, sixth, or sixth, seventh, and fifth, largest; third, fourth, and fifth, sometimes fourth, fifth, and sixth, in contact with the suboculars. Lower labials, eleven; first, third, and fourth usually largest, the remainder subequal. Two large temporal shields above the three posterior labials and the outline of the upper jaw convex. The postoculars and preoculars are replaced by a crescent of twelve small subquadrate scales extending clear around under the eye from the posterior to the anterior of each supraocular. Submentals, two suboblong pairs, the anterior much larger and the posterior pushed apart by a pair of small scales, and separated from the first ventral plate by four rows of gulars.

The ground color of the head is similar to that of the body, the crown, however, being slightly more red. There is a transverse black or dark bar, often somewhat indistinct and bordered with black, on the forehead crossing the posterior half of the frontals, involving only the anterior edge of the vertical and the anterior portion of the supraoculars. Below the eye this bar becomes jet-black, crossing the postoculars, covers the large temporal, the upper third of the next to the last upper labial, and disappears on the last upper labial. Behind the frontal is a dark patch, often in adults somewhat indistinct and margined with black, with its anterior margin a little back of the middle of the vertical, and involving the adjoin-

ing margin of the supraoculars and occipitals, together with the greater portion of the occipitals; sometimes with a light spot in the middle, which appears to extend continuously backwards to the neck. The dark frontal and occipital patch extends diagonally on the neck, where it is three scales in width, jet-black and continuous with the jet-black, elliptical, first pair of spots on the neck—the latter spots seemingly formed by the complete union of the anterior two pairs of lateral dorsal blotches. An elongated and somewhat indistinct narrow vertebral spot, about four scales wide and fifteen long, is found just behind the junction of the occipitals and generally isolated from them. The head is distinctly specked and blotched with chestnut-brown.

Beneath greenish-yellow, sometimes with more or less obsolete brownish blotches, indistinctly visible through the epidermis. Ventral plates, 130–145, last bifid; subcaudal plates, 45–55.

Young.—The ground color of the dorsal surface of the young is decidedly more grayish and all the markings more distinct and clean-cut than in the adults. In the young specimens, besides the median dorsal and lateral dorsal series, another series of still smaller blotches is distinctly visible just below the lateral dorsal series. This second series seemingly is made up of two rows, there being two or more opposite each one of the first lateral, and placed on the second, third, and fourth exterior rows. In older specimens these blotches are more or less confluent and so arranged as to form a semi-zigzag line from the head towards the vent.

The ventral surface of very young specimens is almost a solid slate-color excepting anteriorly; subcaudal plates more or less mottled with various shades of brown but no slate. In older specimens the slate color gradually disappears until they become more like the adults.

Remarks.—This species is subject to great variations in both colors and markings. Sometimes the sides of the dorsal blotches pass gradually into the ground color forming indistinct transverse bands. More frequently these blotches are light internally and narrowly margined with black. One very large specimen possessed no blotches whatever, either on the dorsal or the ventral surface, excepting two very indistinct and faint jet-black blotches on the neck; the ground color was of a decidedly reddish tinge, lighter on the sides.

The ground color is usually grayish, reddish, or yellowish, but varies considerably in different specimens. Usually when the dorsal ground color is a reddish dark-brown the spots are surrounded by a somewhat light yellow margin outside of the black border. These snakes are quite common, seemingly more frequent in eastern Nebraska, and feed almost wholly on insects, insect larvæ, and worms. They are always found in a good condition—generally fat—and are worthy of protection, being entirely harmless.

We have examined specimens from Cuming, Gage, Lancaster, and Nemaha counties. Dr. Yarrow reports one specimen from "Nebraska." Seemingly displaced in western Nebraska by *H. simus*, var. *nasicus*.

15. *Heterodon simus*, var. *nasicus* Baird & Girard. Spoon-bill Snake.

Body short and heavy, usually flattened; average length of the adults being about two feet; the short, very distinct and pointed tail constituting between two and three inches of this length.

Ground color of the dorsal surface an earthy light brown or yellowish-gray, often very light yellow when kept in alcohol, marked by about forty median dorsal blotches on the body and thirteen bands on the tail. These blotches are irregular in shape, rather longer transversely, subquadrate, or subcircular; light, chestnut-brown, indistinctly margined with black, this margin generally being obsolete on the outside. The median blotches are seemingly made up by the merging of two rows, this appearance being more decided posteriorly; the largest not being over nine scales wide and five long, and separated by interspaces of one and one-half scales in length, which are rather constant, though narrowing on the tail. Another series covering the sixth, seventh, eighth, and the adjoining sides of the fifth and ninth rows of scales, alternating with the median dorsal row, extends from the neck to the vent. This series consists of about forty orbicular blotches; diameters anteriorly four scales, posteriorly two scales, each of the same color as the median series but darker and more distinctly bordered and separated by intervals of about three scales from each other, and not exceeding one scale from the corresponding median blotches. Another very faint grayish series, without borders, alternating with the last and smaller, may be seen on the fourth, fifth, and sixth rows of scales. This series is usually very obscure and often difficult to determine. Dorsal rows of scales, 25; decreasing in numbers posteriorly; outer row smooth, rest all distinctly carinated, the carinae extending to the ends of the scales; those just behind the occipital plates truncated, with obsolete carinae. Scales posteriorly shorter and broader than anteriorly; shape, broad oblique ovate on the sides to linear on the dorsum. The first row is mostly yellowish-white, the rest grayish, with a yellowish border decreasing in width to the median dorsal row; all minutely but distinctly punctate with chestnut-brown.

The ground color of the head is similar to that of the body. A broad chestnut-brown colored bar beginning just below the angle of the mouth, covers the last upper labial, also the upper half of the succeeding labial borders the upper side of the third from the last, covers the anterior two rows of temporals, then passes across the upper postoculars, thence the posterior portion of the supraoculars onto the posterior portion of the vertical, where it is separated from the corresponding opposite bar by a yellow line yet to be mentioned. Another bar of similar color begins on the commissure between the fifth and sixth upper labials, where it is often rather indistinct, widens on the suboculars, then passes across the forehead covering all of the frontal scales and the anterior borders of the vertical and supraoculars. On the neck is a pair of club-shaped chestnut-brown spots, thirteen scales long and eight scales wide, extending diagonally to the occipitals. Between these and immediately posterior to the occipitals, but touching, is a much smaller club-shaped chestnut-brown spot. All of these spots are bordered by a darker color, of more or less distinctness in different specimens. The various cephalic bars are separated by the ground color, thus forming a yellowish line which crosses in front of the center of the vertical, and through the middle of the supraoculars; a second similar but more indistinct line runs parallel to this, just behind the rostral, and extending down in front of the eye. A third very distinct and similar line crosses the posterior angle of the vertical, and runs back on the sides of the neck, behind the labials and temporal shields. This line is connected with the first yellow vertical line by another line covering the middle of the vertical. The throat and chin are yellow and unspotted.

The head of the *H. simus*, var. *nasicus*, and *H. platyrhinus* are otherwise quite distinct. In the first named species the head is relatively shorter, rounded on top (the last species being flat), jaws much more curved, labials shorter, becoming so more rapidly towards the anterior, and excessively high. Furthermore, in *H. simus*, var. *nasicus*, the vertical plate is broader than long; rostral, much higher, broader, and more nearly erect; more strongly keeled; and the single plate (azygos) posterior to the keel of the rostral in the case of *H. platyrhinus*, is in this species surrounded behind and on the sides by from twelve to fifteen small plates, sometimes fewer, and arranged without any symmetry. In the case of a specimen collected near Rushville, Sheridan county, the azygos plate and the adjoining scales were completely covered by a single scale, and the number of scales thus concealed was not revealed until this scale was removed.

The ventral surface is earthy yellowish-white, peculiarly marked by two rows of slaty-black, oblong, irregular, alternate, and confluent zigzag blotches. These blotches begin near the head, become thicker posteriorly; on the tail forming a solid color; each covering three ventral plates in length.

Young.—In the young the ground color is a very light yellow, almost white. The dorsal markings are all distinct, including the indistinct blotches of adults, and the blotches are all deep chestnut-brown; the median, first, and third series margined with black. The median row, which in the adults was mentioned as appearing as if formed by the merging of two rows, for a short space both on the anterior and posterior of the body consists of two entirely distinct rows of orbicular blotches. The carinæ do not extend to the tips of the scales, which are almost wholly margined with white, excepting blotches, the margins being wider on the lateral rows. The scales are not punctate.

Ventral plates, similar to the adults, but blotches thicker and the surface is darker.

Remarks.—This snake is commonly called the Sand Viper, Blowing Viper, or Spoon-bill Snake. The latter name is derived from its peculiar habit of disappearing quickly under the loose sand or plowed ground. These snakes are common in the middle and western part of the state, especially in the "sand hills." We have examined specimens from Cuming, Dawes, Hamilton, and Sheridan counties; and Dr. Yarrow mentions two specimens from "Nebraska," four from the "Platte river," and one each from the "South Platte" and "sand hills."

Food habits similar to *H. platyrhinus*.

GENUS CARPHOPHIS, Gervais.

Body comparatively stout, subcylindrical; head small, not distinct from the neck, depressed; tail stout, conical. Crown-shields normal, short, broad, often fused or subdivided. Snout prominent, rostral bent back on the top. Nasal entire. Preocular, united with the loreal, or very small. Scales broad, smooth, glossy, in thirteen to fifteen rows. Anal bifid. Subcaudals in two rows.—(Garman.)

16. *Carphophis amœna*, var. *vermis* Kennicott. Worm Snake.

Body round and worm-like, scarcely exceeding one foot in length; tail two inches, not decidedly distinct from the body and gradually tapering. Head very small and tapering from the neck; from the pupil of the eye upward and extend-

ing to the posterior of the occipitals, light gray, being distinct from the graphite gray of the dorsal surface; no markings; the rest of the head light orange-yellow. Vertical plate, large, subequilateral triangular, and each side convex. Occipitals subovate, and at least a third larger than the verticals. Temporals, in one row; two, the anterior linear and the posterior orbicular. Supraoculars, two, extremely small and subquadrate. Frontals, one pair; suboblong, and extending down on the sides to meet the loral. Internasals, two; linear transversely. Rostral subquadrate. Postocular, one; very small, about half the size of the supraoculars. Preoculars absent. Loral, one; oblong and extending to the orbit of the eye. Nasal, one; suboblong, and the nostril opening anteriorly. Upper labials, five; increasing in size posteriorly. Lower labials, six; fourth, fifth, and third largest. Mental, broad and triangular. Submentals, two pairs; each oblong, the smaller posterior. Two rows of gulars between the submentals and ventral plates.

Dorsal surface, graphite colored; sides, covering two and one-half scales, light orange-yellow, being an extension of the color of the abdomen. Scales smooth, subquadrate on the sides, becoming narrower towards the median dorsal row. No markings; dorsal rows, 13.

The whole ventral surface light orange in alcoholic specimens, bright salmon color in life. Ventral plates, about 137, last bifid; subcaudal plates, 35 approximately.

Remarks.—Of the habits of this little snake, or of the young, we can say nothing, as but one specimen has been collected within the state. This one was taken at Peru, Nemaha county, by students of the State Normal. This seems to be the most northerly specimen of this species recorded. Dr. Cooper mentions one specimen collected in "Western Missouri," which term was probably applied to what is now the state of Nebraska.

SUBORDER—SOLMOGLYPHA.

FAMILY—CROTALIDÆ (Rattlesnakes).

The mechanism of the poison apparatus of the Rattlesnakes has been carefully worked out by Drs. Mitchell, Yarrow, and others; Dr. Yarrow studying more particularly *C. confluentus*. We have been able to verify the following notes as applied to *S. catenatus*. The tongue and smaller teeth, as is well understood, have nothing to do with the poison apparatus and are practically the same as in other Nebraska serpents. The upper and lower jaws are not articulated, being in this respect similar to other snakes. The regular teeth are on the jaw-bone proper, or what is sometimes called the inner jaw; are small, pointed, and sharp, being used simply for feeding and in no case for inflicting a punishment upon the enemies of the snake. By simply opening the mouth the fangs may be seen just inside the upper labials and below and slightly forward of the eye.

Each fang is scythe-shaped, usually about one-fourth of an inch long, extremely pointed and sharp and skillfully enclosed in a membrane called the *vagina dentis*. When the fang is at rest it is turned backward against the roof of the mouth so as to be out of the way in feeding, and completely enveloped in the membrane which fits onto it somewhat after the style of a glove finger. In a fresh specimen it will be seen that this membrane may be made to slip off by the erection of the fang. In the *S. catenatus* the fang is double, each division cylindrical and separate ex-

cept basally, and connected by a very thin membrane in such a way as to form a tube at the base of the fang and a trough-like cavity near the apex. Between the bases of the divisions of the fangs this tube connects with the duct of the poison gland. This double fang is firmly fixed in the maxillary bone, and of itself is immovable. The maxillary bone is comparatively small, and irregularly triangular, contains the pit seen from the outside and is articulated above by means of a rotary joint with a smaller bone, the lachrymal. This lachrymal is fixed to the frontal by means of a hinge joint which, as will be seen later, allows the lachrymal and maxillary, and with them the fangs, a forward and outward motion. This motion is very essential, as it permits the erection of the fangs in a position suitable for inflicting a wound on the enemy; and may spread the fangs so as to fall outside the lower jaw in case the jaws snap, as is often the case, when missing the object. Posteriorly and exteriorly and by means of a hinge-joint, the maxillary is articulated to a rod-like bone, the pterygoid, which attaches to the bone containing the teeth proper, the palatal bone, about midway of the latter. These bones are acted upon by several of the numerous muscles on the side of the head, giving the pterygoid bone a motion forward and outward, and thus in conjunction with the joints of the maxillary and lachrymal, already mentioned, causes the fangs to assume a defensive attitude, at the same time spreading. Dr. Yarrow's statement just here seems probable: "This protrusion of the fang is not an automatic motion, consequent upon mere opening of the mouth, as formerly supposed, but a volitional act, as the reverse motion, namely, the folding back of the tooth, also is; so that in simply feeding, the fangs are not erected. The folding back is accomplished by the ectopterygoid and spheno-palatine muscles, which, arising from the skull behind as a fixed point of action, in contracting draw upon the jaw-bones in such a way that the maxillary, and with it of course the fang, are retracted, when the tooth is folded back with an action comparable to the shutting of the blade of a pocket-knife. All the motions of the fangs are controlled by these two sets of antagonistic muscles, one of which prepares the fangs for action, while the other stows them away when not wanted."

The poison fluid has nothing to do with the ordinary saliva, and is secreted in a separate and oval-shaped gland which rests against the skull, below and behind the eye, and tapers to a duct which leads to the base of the fang.

The rattle, as any one may see by simple examination, is epidermal, but its origin is yet a subject of speculation. The popular belief that the age of the serpent may be determined by the number of rattles, there being, as commonly supposed, one for each year, is erroneous for at least two reasons: Firstly, the number has been found to depend more upon the vigor of the individual snake than upon seasons. Secondly, as any one may see who will but take the pains to examine, these rattles are often lost, the older ones being easily pulled off by the fingers.

As to the uses of the rattles many theories have been given. Some claim that the sound is to allure insectivorous birds; or to terrify smaller animals on which the snakes feed; while others maintain that the rattles are special organs for bringing the sexes together. These rattles, however, whether subserving any of these purposes or not, are undoubtedly used for protection. Though ordinarily able to defend itself, the snake is when its poison has been used left comparatively helpless. Specimens which we have experimented with in our laboratory show great caution in the use of their poison fluid, never striking, unless excited, except the

object be within reach and placed in an intrusive or bantering attitude. They invariably rattle when agitated and before striking, and give every indication that they value highly their much-feared venom. These facts indicate quite clearly that the rattles are used as a warning in order to preserve the poison fluid.

GENUS CROTALUS, Linnæus.

Tail terminating in a rattle. A deep pit in front of the eye. Top of the head covered with scales, with several larger plates in front. Anal entire. Subcaudals simple, a few of the posterior sometimes divided.

17. *Crotalus confluentus* Say. Common Rattlesnake.

Head subtriangular and rounded anteriorly. Plates on top of the head scale-like (squamiform), irregular, angulated, and imbricated; scales between the supraoculars small, numerous, and usually uniform. Four rows of scales between the subocular series and the labials, three extending to the pit. Labials, fifteen, sometimes eighteen; small and nearly uniform. Dorsal rows of scales, twenty-five, often more. Dorsal blotches quadrate anteriorly, becoming oblong near the middle of the body, then almost linear posteriorly; concave before and behind on the anterior of the body; the edges becoming straight on the median portion, then irregular; intervals between the blotches widening towards the posterior of the body. The stripe from the supraoculars to the angle of the jaws crosses on the second row of scales above the angle of the mouth. Margins of the rostral light.

The general color of the dorsal surface is yellowish-brown with a series of subquadrate dark chestnut blotches, margined with black and edged with white, with the corners rounded and the anterior and posterior sides frequently concave, the exterior convex. These blotches are ten or eleven scales wide and four or five long, lighter in the center, and margined for one-third of a scale with light yellowish. The intervals along the back are light brown, darker than the margins of the blotches. Anteriorly the intervals between the dark spots are each but a single scale; posteriorly more, becoming sometimes two scales, where, also, the spots are more rhomboidal or lozenge-shaped; nearer the tail, however, they become transversely quadrate. Along the third, fourth, and fifth lateral rows of scales is a series of indistinct brown blotches covering a space of about four scales, and opposite to the dorsal blotches; between these blotches, and opposite to the intervals of the dorsal blotches, are others less distinct. Along the fifth, sixth, seventh, and eighth rows is a second series of more or less obsolete blotches, each covering a space of about four scales, and just opposite the intervals between the dorsal spots. The dorsal and lower series are separated by an interval of three scales, light brown in color. Tail above marked by nine or ten chestnut bands formed by the median lateral blotches.

Beneath, the color is dull yellowish, somewhat obscurely blotched with two rows of light brown subquadrate blotches. Ten or twelve darker half rings are visible on the tail.

Young.—The young are precisely as in adults, except the markings are much more distinct and the ground color less earthy and more of a whitish-yellow.

Remarks.—The common Rattlesnake, in habits and food proclivities, is similar to *S. catenatus*, being possibly more venomous. Our location in the state has enabled us to study the latter species more carefully. While at one time abundant all over

the state it is now seldom found in eastern Nebraska, seemingly displaced by *S. catenatus*. We have collected specimens in Brown, Dawes, Hamilton, and Sheridan counties. The species is still common in the middle and western part of the state, though no doubt soon to become less common. Dr. Yarrow in his check list reports specimens as collected at Sidney, Fort Kearney, and Pole Creek, all in Nebraska. Dr. Cooper, in his report on "Reptiles Collected on the Survey" of the Union Pacific railroad quotes Dr. Suckley as saying: "This species is very numerous on the Missouri river and its tributaries between Fort Union, Nebraska, and the Rocky mountains. In July and August they are found very common in the dry canyons, and among the willow brush and cottonwood forests along the banks of the rivers. They are then sluggish and stupid, being, according to popular belief, 'blind,' and are said to be at that season exceedingly venomous. This stupid condition during the drouth of summer is not uncommon to many species of snakes, the torpidity being analogous to that of hibernation, and may therefore be called *æstivation*. Hunters have told me that the serpents are 'blind,' because they are at that time about shedding the cuticle, and that as evidence of loss of vision the snake when provoked will 'strike wildly.'"

GENUS *SISTRURUS*, Garman.

Tail terminating in a rattle. A deep pit in front of the eye. Top of the head having parietals and frontals, as in the *Colubridæ*. Anal entire. Subcaudals simple, a few of the posterior sometimes divided.

18. *Sistrurus catenatus* Rafinesque. Massasauga.

The body is short, heavy, and spindle-shaped, the largest part being posterior to the middle; rapidly tapering towards the head. The average length of the body of adults is about two and one-half feet, and the tail four inches, including rattles.

The ground color is usually dull brown on the dorsal surface, becoming somewhat lighter on the sides. The blotches are deep chestnut-brown bordered with black and edged with a yellowish-white. The median dorsal blotches are from thirty-four to forty-five in number on the body; more or less cordate anteriorly and ovate or rounded oblong posteriorly; often irregular and crossing obliquely; anteriorly about six scales long and ten wide; posteriorly five scales long and eight wide. The first lateral series adjoining the median dorsal is found on the fourth, fifth, sixth, seventh, and eighth rows of scales, and is extremely faint, and consists of dull chestnut subcircular blotches, about five scales in diameter, and alternate with the median dorsal series, sometimes touching. These blotches are rather irregular in outline and position, but by placing the specimen under water it will be seen that the outlines gradually fade into the ground color, often prolonging downward between the next lower lateral blotches. The second lateral row is composed of the largest lateral blotches. They extend the full length of the body, are suborbicular, and from two to three scales in diameter anteriorly, becoming oval or oblong and slightly larger near the middle of the body, and again smaller posteriorly. They are opposite and correspond in color and markings to the median dorsal blotches, and are on the second, third, fourth, fifth, and sixth rows of scales. The third lateral series, first from the ventral surface, is composed of blotches in size about equal to those of the second series, occupying the first and second rows

of scales, and extending somewhat onto the ventral plates, alternating with the adjoining series, and all more or less chestnut-brown bordered similarly to the median dorsal row, though the yellow edging in some specimens is wanting. The tail is decidedly distinct from the body and marked by seven or five transverse dark chestnut bands, formed by the union of the blotches of the median and second lateral series. The dorsal scales are broad ovate on the sides, narrowing towards the median dorsal row, and all carinated except the first row; dorsal rows usually twenty-five, sometimes twenty-three or twenty-seven. All of these scales are distinctly mottled and specked with chestnut-brown, the first and second rows somewhat irregularly edged with yellowish-white.

The head is distinct, large, and deep. Vertical plate, subpentagonal, narrowing and pointed posteriorly, sometimes by a small scale; anterior usually straight and sides convex. Occipitals, two, each semi-orbicular, and somewhat mucronate in front. Temporals, small and numerous. Supraoculars, two, each slightly larger than the vertical and somewhat ovate in outline, extending out over the orbit of the eye. Frontals, two; subquadrate, about two-thirds the size of the vertical and turned upwards on the exterior border. Internasals, two, subtriangular, turned upwards as in the case of the frontals, about half the size of the latter. Rostral, oblong and high, sometimes narrowing upwards. Postoculars, four, extending around beneath the orbit. Preoculars, two, the upper larger but both irregular in outline. Lorals, two; small above the pit. Nasals, two, the posterior irregular, anterior oblong. Upper labials, twelve, but often irregular; middle one largest. One row of small scales extending to the nasals, passing between the labials and suboculars—the second scale from the anterior containing the pit. Usually thirteen lower labials, though often irregular; fourth, fifth, and sixth largest. Submentals, one pair, each ovate and edged with white. From six to eight rows of gulars between the submentals and first ventral plate.

The color of the head is a brownish-gray variously marked by chestnut-brown. The occipitals are gray with an orbicular brown spot marking the center of the two plates. A very dark chestnut-brown stripe two and one-half scales in width and bordered below with white begins from five to fifteen scales back of the angle of the mouth, runs just above the upper labials and across the orbit and covering the frontals and internasals. The white bordering the lower edge of the stripe divides at the angle of the mouth, the lower division bordering the upper edges of the lower labials, while the upper division at the nostril takes a downward course and thus borders posteriorly the vertical nasal bar, which is also similarly bordered anteriorly. Another vertical bar of the same color and markings extends from the pit downwards. With the exception of the white borders already mentioned the whole face is chestnut-brown. On the under jaw two orbicular slate-colored cheek patches about four scales in diameter exist near the ventral plates, being the last blotch of the exterior ventral row. A mushroom shaped blotch of the same color and on the anterior of the jaw is very noticeable.

The ground color of the ventral surface is yellowish-white, very irregularly marked with heavy irregular black blotches and sprinkled with very small black specks. The commingling of these colors gives the ventral surface a greenish-blackish brown color, becoming darker posteriorly. Sometimes, in addition to the third lateral series mentioned as extending onto the ventral surface, two median

rows of large, irregular, slate-colored blotches may be distinguished. Ventral plates, 145 to 160, last united; subcaudal plates, 25 to 35, the last one or two bifid.

Young.—Less brown and decidedly more gray than the adults. All of the markings more distinct. Ventral surface decidedly more whitish and distinctly marked by numerous large, slate-colored, transverse bars, which appear to be arranged in two irregular rows, each of which distinctly terminates at a median point.

Remarks.—The Massasauga or Prairie Rattlesnake is common in eastern and middle Nebraska, though we have not found it in the extreme western part of the state. It may be readily distinguished from the Common Rattlesnake (*C. confluentus*), since in the latter the top of the head is covered with a large number of small scales like those of the body, while in the *S. catenatus* the same region is shielded by eight or nine symmetrical plates, like serpents generally.

We have often kept this snake engaged in our laboratory, but have never succeeded in getting them to eat. They seem to prefer to remain coiled in some dark corner of the cage, seemingly awaiting an attack. We have in numerous instances studied the mechanism of the poison fangs and glands as well as the somewhat complicated act of striking, as mentioned under the subfamily.

The contents of the stomachs of this species shows that its food is almost wholly made up of mice and animals of that class. Aside from well known venomous qualities this snake has no bad habits and is decidedly useful. It is said that rats and mice will very soon disappear when the presence of this reptile is known. In at least one instance we have known this statement to be true. It was noticed that rats which a few days previous had been extremely numerous in a certain cellar had wholly disappeared. Within a few days more the mystery was solved by finding a huge rattler in the doorway. These facts fully account for the frequent finding of the rattler around old cellars, buildings, etc., where they go to hunt for their choice food.

We have examined specimens from Gage, Lancaster, and Nemaha counties, and Dr. Yarrow mentions one specimen as from "Nebraska."