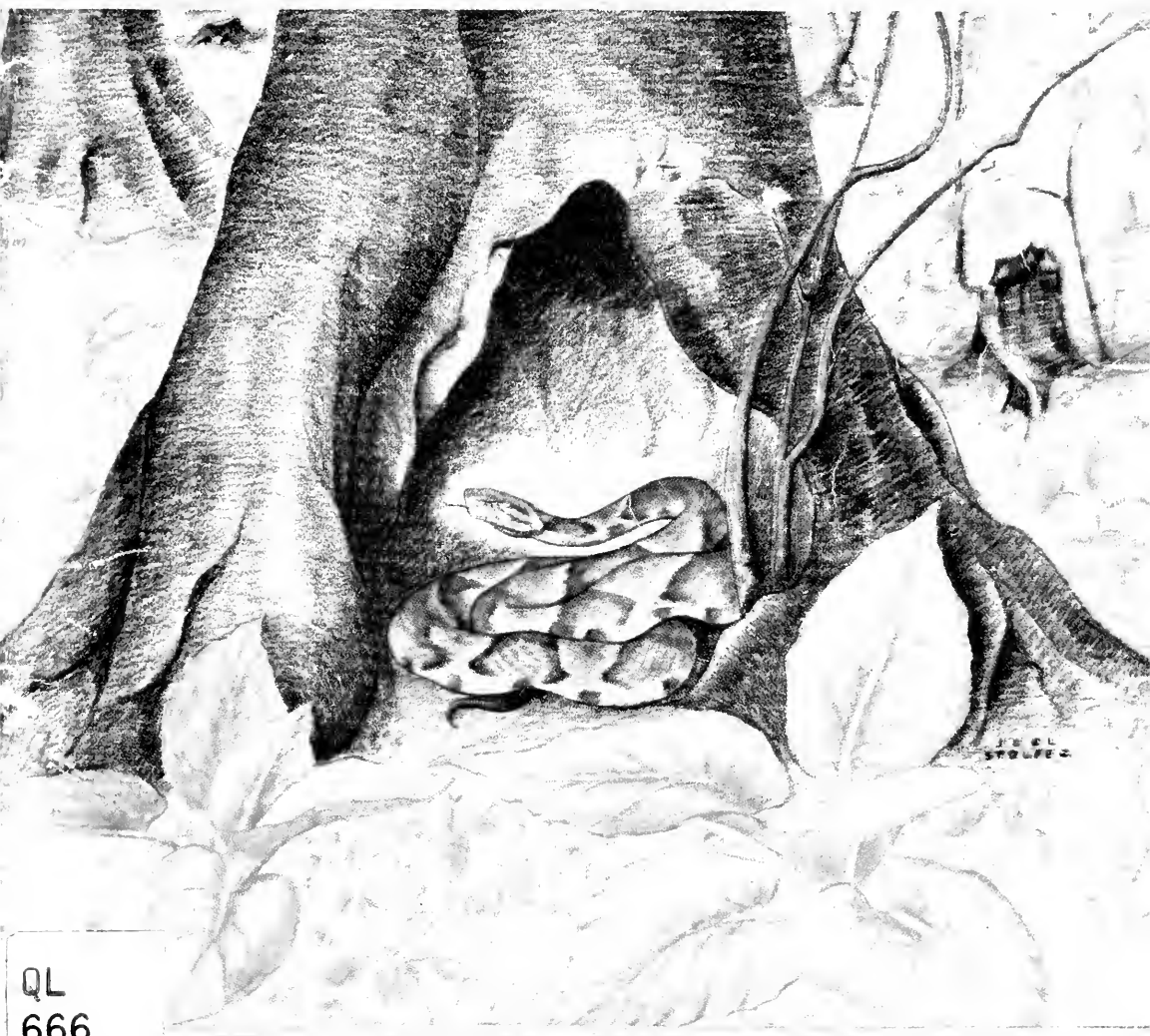




SERPENTS ⁵⁻¹¹⁻¹² *of the*
NORTHEASTERN STATES

Raymond L. Ditmars



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SERPENTS *of the*
NORTHEASTERN STATES

A Guide to the Venomous and Non-
venomous Species of the North At-
lantic and New England Areas.

By

RAYMOND L. DITMARS

Curator of Mammals and Reptiles
New York Zoological Park

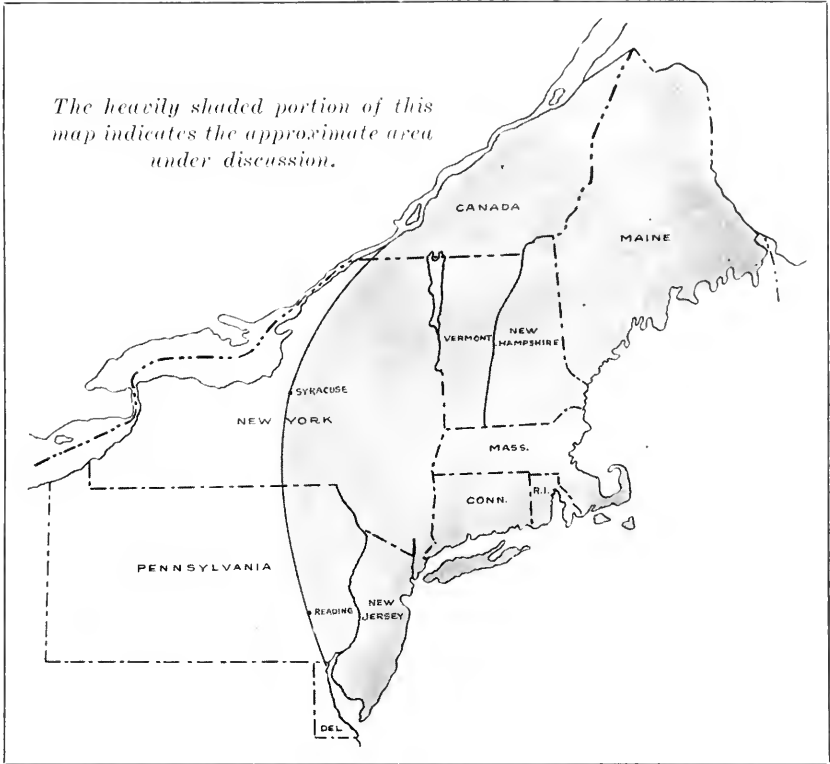
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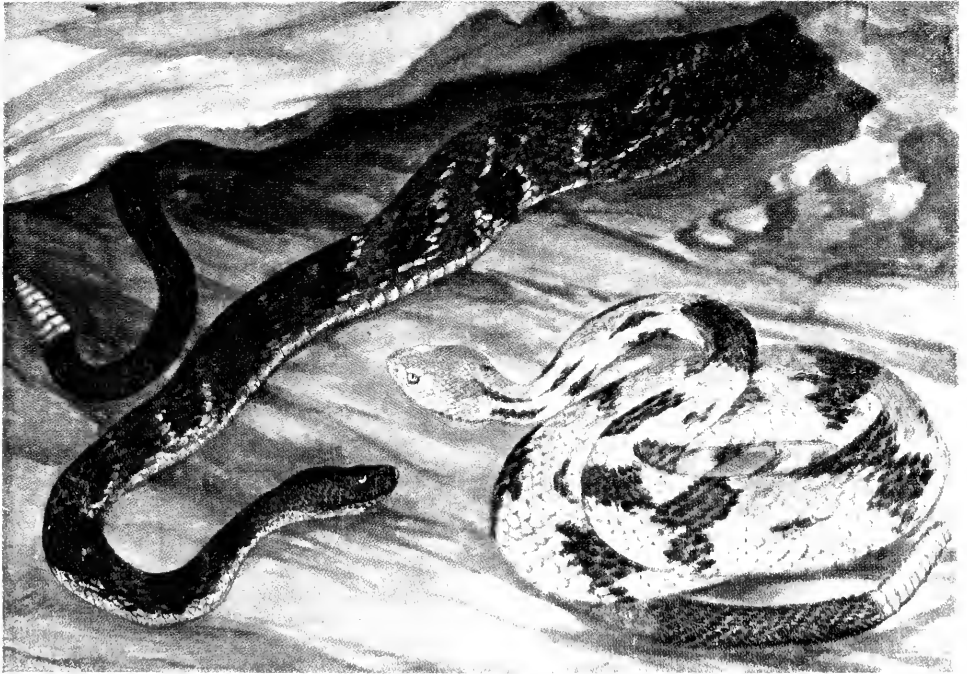
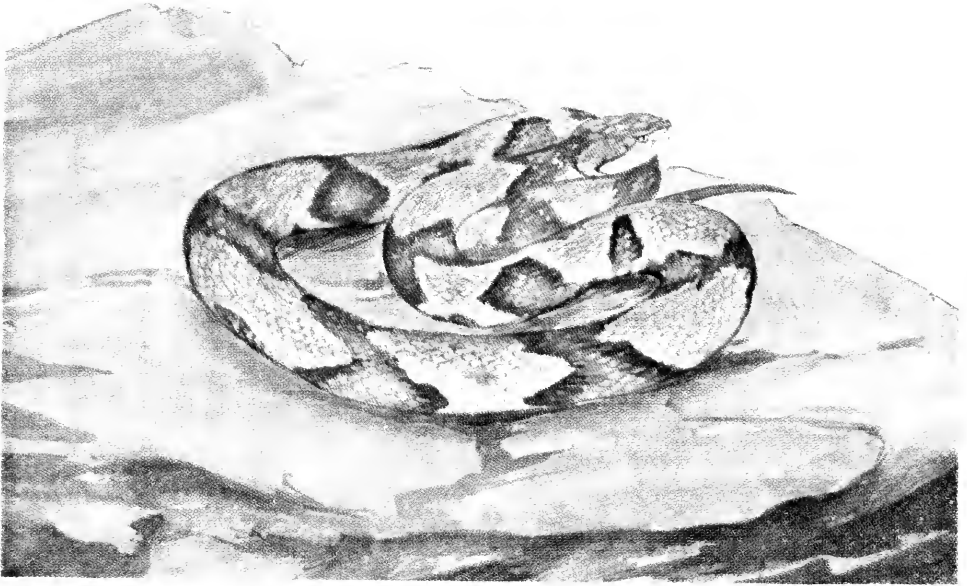
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Upper: Copperhead snake, *Agkistrodon mokasen mokasen*.
Lower: Timber rattlesnake, *Crotalus horridus*.

These species and the massasauga (a small rattlesnake) are the only poisonous serpents of the northeastern States. (Drawings by Helen Tee-Van)

Identification of Snakes

There are twenty-one distinct species of serpents in the northeastern part of the United States from the Canadian border to Delaware, of which only three are poisonous.

That a certain amount of confusion exists in the public mind not only about the identification of venomous and non-venomous reptiles but about the economic value of snakes, their habits and their habitats, has long been apparent to the author. Nearly three million persons visit the New York Zoological Park each year and from the questions they ask, as well as the evidence of a very heavy correspondence about snakes, he has been made aware of the need for a simple but complete guide to the serpents found in the northeastern part of the United States.

The variety of serpent life in this area is imposing, but the species are not so numerous that an understanding of the general facts about them cannot easily be grasped by anyone. The essential point with which most persons are concerned is the differentiation of poisonous and non-poisonous snakes, and after that the identification of any species that may be encountered. The former is not difficult; the three poisonous serpents are the timber rattlesnake, the massasauga and the copperhead, but as both the timber rattlesnake and the massasauga are true rattlers and possess the warning appendage on the tail it will simplify a definition to say that there are only two *kinds* of poisonous snakes in our northeastern States, the rattlesnake and the copperhead.

In extensive scientific works for the precise identification of serpents, there are many species which on superficial examination appear similar. In such works, definition is by technical differences of head scalation, number of rows of scales around the body, the number of abdominal shields, and relative size and arrangement of the teeth. Coloration and pattern have a part in such descriptions, but as unrelated species may be similarly marked, extremely detailed descriptions are necessary to separate them.

This is not the case with our local serpents. The number of species is so moderate and differences so marked, that simple outlines will plainly define each species. No scientific study is necessary in making immediate identification of these local snakes.

The terrain inhabited by the twenty-one species is varied. Some are more commonly found in wild meadows, others persistently fre-

quent the immediate course of brooks, small rivers or the margins of ponds and lakes. Some wander widely over varying ranges and may be seen almost anywhere on low or high ground. One species shows a marked preference for the arid, sandy stretches immediately back of ocean beaches, another for the pine areas of New Jersey and to the southward. The prevailing type of rattlesnake is far more commonly associated with the vicinity or the actual slopes of the mountainous areas, and this condition, though to a lesser degree, is indicated for the more generally distributed copperhead snake.

A Key to the Species

A key to the identification of the northeastern serpents may be based upon four simple points. These are: (1) the kind of scales—whether smooth or keeled; (2) the pattern and coloration; (3) size; (4) shape of the pupil of the eye. This latter characteristic alone immediately separates the poisonous species on gross examination. The scales of serpents are either quite smooth, or have a ridge or keel running lengthwise along the center. With some, the keel is faint; with others, like the harmless water snake, garter snake and flat-headed “adder,” the keel is very distinct. The local poisonous serpents have strongly keeled scales.

Following is a key to the species, arranged without regard to technical classification, except that the venomous species are in sequence and conclude the list.

Part I: *Non-venomous*

1. PUPIL OF EYE ROUND

A—Scales Smooth

Size—Small

- Brown above; pinkish beneath WORM SNAKE
 Brown above with minute black dots;
 yellowish-white beneath SMOOTH BROWN SNAKE
 Pale green above; white beneath GREEN SNAKE
 Dark gray above; a yellow ring around
 neck; yellow beneath RING-NECKED SNAKE

Size—Moderate

- Gray, with chestnut or olive blotches
 above; square patches of black and
 white beneath MILK SNAKE

Size—Large

Black, with narrow yellow or white chain-like, or narrow cross-ring, markings on back; black and white beneath KING SNAKE

Satiny black above; black or dark gray beneath; chin and throat white BLACKSNAKE

B—Scales of Back Feebly Keeled

Size—Moderate to Large

Grayish or yellow, with vivid, deep crimson blotches along back; black and white beneath. (Distinguished from the similarly marked Milk Snake by its feebly keeled scales.) CORN SNAKE

Size—Large

Polished black above; white beneath, blotched with gray. Some scales of the sides show narrow white edges. (Distinguished from the Blacksnake by its feebly keeled scales.) PILOT BLACKSNAKE

C—Scales Strongly Keeled

Size—Small

Brown above; pink beneath DEKAY'S SNAKE

Brown or gray above; bright red beneath STORER'S SNAKE

Size—Small to Moderate

Uniform pale green above; yellow beneath KEELED GREEN SNAKE

Brown or black above, with vivid yellow stripe on back and a similar stripe on each side on third and fourth rows of scales from underside RIBBON SNAKE

Size—Moderate

Brown or black above, with a more or less distinct yellowish stripe on back and a light stripe on each side on second and third rows of scales from underside. GARTER SNAKE

Brown, with three narrow black stripes on back and a bright yellow stripe on each side. Three dark stripes on abdomen QUEEN SNAKE

Size—Moderate to Large

Dark brown or blackish above, with more or less distinct reddish transverse bands; white or yellow beneath, spotted with red..... WATER SNAKE

Brownish, olive or grayish, with rather bold darker transverse markings; broad head, snout upturned and sharp FLAT-HEADED "ADDER;" HOG-NOSED SNAKE

Size—Large

White, with strong blackish or brown blotches; abdomen marbled white; head conical or pointed PINE SNAKE

Part II: *Venomous*

2. PUPIL OF EYE ELLIPTICAL. SCALES KEELED.

Size—Moderate to Large

Light chestnut brown or pinkish-gray, with a series of dark-brown transverse bands, narrow on the back and becoming much wider on the sides COPPERHEAD SNAKE

Tail ending in a rattle

Grayish, with a series of dark blotches on the back. Top of head with large, symmetrical shields MASSASAUGA

Size—Large

Yellowish or grayish, with dark transverse bands; sometimes dark tan or uniform black. Top of head with small scales TIMBER RATTLESNAKE

The preceding key, coupled with an examination of the illustrations, should suffice in most instances for identification, but the detailed descriptions on following pages will clarify points of doubt and show the arrangement of the species as they appear in systematic lists, although this is of little import in the present instance because of the

elimination of large numbers of related species occurring outside of the area under consideration.

Description of the Species

All scientific names in this review follow the latest procedure in indicating whether or not varietal forms have been recognized among the various species. When the designation is binomial, there are no known subspecies or varieties. If trinomial designation is followed, one or more subspecies have been recognized. For example, the scientific name of our local ring-necked snake is given as *Diadophis punctatus edwardsii*, indicating that it is a variety of the typical form, *Diadophis punctatus punctatus*, which occurs in the southeastern United States, whereas with the hog-nosed snake, *Heterodon contortrix*, the binomial designation indicates that no forms or varieties have been described.

Part I: *Non-venomous Snakes*

WORM SNAKE

Carphophis amoena amoena (Say)

(Fig. 1)

The worm snake is a very small snake and while fairly abundant in some areas is not often observed, because of its secretive habits. Occurrence is "spotty," the species being common in some districts, yet never found in similar terrain but twenty miles or so distant. Thus it is abundant in northern New Jersey, particularly so in the area immediately back of the Palisades along the Hudson, where it hides under stones and decaying logs or burrows into the ground. Its occurrence along the eastern portion of the Hudson River valley is problematical, however. Records indicate that it occurs in a number of areas of New Jersey, but is rare north of Connecticut, probably not going into the northern New England States.

The worm snake has a smooth, shining and cylindrical body and sharp snout. Above, it is light brown or brownish gray; the underside is a delicate shade of pink. It seldom exceeds a length of eleven inches and is usually smaller.

This little serpent might be confused with Storer's snake and DeKay's snake, both of which are of similar size and inclined to hide under stones. It may be immediately recognized, however, by its smooth and glossy scales. The other two similarly-colored species have keeled scales, imparting a dull, lusterless surface to the back.

The food of the worm snake consists largely of earthworms and soft-bodied insect larvae. It is an oviparous, or egg-laying, species.

General range: Southern New England to Florida; westward to Illinois.

RING-NECKED SNAKE

Diadophis punctatus edwardsii (Merrem)

(Fig. 2)

The ring-necked snake is so unusual in coloration and pattern that it may be distinguished at a glance. It is small, seldom thicker than a quarter of an inch or five-sixteenths of an inch, its smooth scales are lustrous gray or bluish-black, with a brilliant yellow ring around the neck immediately behind the head, in vivid contrast to the body coloration. Beneath, the color is orange-yellow and there is usually a single row of black spots along the center of the abdomen. The length of adult specimens is from ten to fifteen inches.

Ring-necked snakes frequent damp woods and may be found under flat stones or burrowing beneath the bark of decaying trees. Numbers of them are sometimes to be found under the top stones of old, broken dams which no longer act as spillways. Distribution is quite general, although the species is more abundant in hilly areas.

The food consists of small salamanders and earthworms. The species is oviparous.

General range: Southern Canada to the mountains of the Carolinas; westward to Wisconsin. The typical form inhabits the southeastern States. One subspecies extends westward to Texas.

HOG-NOSED SNAKE

(Spreading Adder, Hissing Adder)

Heterodon contortrix (Linné)

(Figs. 3, 4, 5)

This is a very interesting snake. No other species among the local harmless serpents exhibits such marked, characteristic habits. When frightened, it will flatten a considerable portion of the neck by means of elongated ribs which are spread laterally. The head also becomes broad and flat, is tilted to one side, or slowly waved in threatening fashion, while the reptile exhales its breath in long, sharp, hisses. During these manifestations it presents a sinister appearance. It is quite natural that this harmless species has an evil reputation.

Most of these snakes are slain during their harmless bluffing and have no opportunity to exhibit their final resort to escape the intruder. This is in feigning death. The hissing ceases, the body writhes as though in pain, the neck is arched and the jaw drops open. The rep-

tile then rolls on its back, with the appearance of being dead. However, there is one inconsistent phase in the manoeuver. If turned with a stick upon its crawling surface, it returns with agility to its former position. Apparently it is convinced that the only position for a dead serpent is on its back.

With proportionately the thickest body of any of the local non-venomous serpents, and a wide, distinct head, this snake is often mistaken for the copperhead, from which it differs in its irregular pattern, sharp, shovel-shaped snout, round pupils, and double row of plates under the tail. Moreover, the copperhead never assumes any air of bravado.

The scales of this species are keeled. A large specimen is three feet long, but most adults are two to two and one-half feet long. Coloration and markings are extremely variable, but the usual hue is yellowish or brown, with dark brown or black irregular cross-bands. Some specimens have bright shades of yellow or red, the latter color being particularly evident anteriorly. Occasional specimens are entirely black.

This snake is most abundant in sandy areas and is found in considerable numbers in some portions of Long Island, immediately back of the sea beach. It is also common in sandy areas in New Jersey. It is by no means confined to sandy regions, however, as it is also found in the mountains, although sparingly. The greater number of uniformly black specimens are observed in elevated areas.

Quite recently its specific name was changed to that by which the copperhead was known—*contortrix*. Its name was formerly *Heterodon platyrhinus*, but Dr. Thomas Barbour, after a careful examination of the later editions of Linné, finds that as the result of an error in early nomenclature, confusing two species, the hog-nosed snake was renamed *contortrix* in the 12th edition of the "Systema Natura," thus rendering that specific name untenable for the copperhead, the specific name of which is now noted in the systematic lists as *mokasen*.

The hog-nosed snake appears to feed largely upon toads and frogs. It is oviparous.

General range: Very extensive. From Massachusetts to Florida; westward in the south to Texas and in the north to Minnesota.

GREEN SNAKE

Liopeltis vernalis (Harlan)

(Fig. 6)

An easily identified species of small size, with smooth scales and uniform pale green hue above, whitish beneath. It is a dainty creature, eighteen to twenty-four inches long, and seldom of greater diameter than three-eighths of an inch. Just before shedding the

skin, most specimens are of a greenish-gray hue. Its smooth scalation and whitish underside immediately distinguish it from the next described species, which also is uniformly green above.

The green snake is most frequently found in wild meadows. Its occurrence is erratic. It is common in some portions of the Kittatinny Mountains and the Catskills. There are equally favorable areas, from the viewpoint of topographic conditions, where it is seldom seen. Its occurrence is thus "spotty" in the whole northeastern area.

This is one of the few insectivorous serpents. It feeds largely upon soft-bodied insect larvae, crickets, grasshoppers and spiders. It is oviparous, depositing elongate, soft eggs under flat stones.

General range: Southern Canada to Florida; westward to the central States and in the south to New Mexico.

KEELED GREEN SNAKE

Opheodrys aestivus (Linné)

(Fig. 7)

Except in New Jersey, this species is rare in the area under consideration. It has been recorded in Connecticut and Pennsylvania, but does not appear to occur in the northerly New England area. It is pale green above and bright yellow beneath, the under hue making it distinct from the other local green snake. A point for instant identification, however, is its keeled scales, imparting a rough appearance in place of the satiny surface of the common species.

This is essentially a southern species. New Jersey and southern Pennsylvania might be considered as the northerly limit of the normal range. Daniel Carter Beard, council officer of the Boy Scouts of America, has written that he has found the species at Hawley, Pennsylvania, which is north of the latitude of Port Jervis, and a number of years ago I found several specimens of this snake near Waterbury, Connecticut. They were in a grapevine attached to the side of an old farmhouse. It is a larger species than the smooth green snake, attains a length of about three feet, and is more arboreal in habits.

Feeding is similar to the former species, and it is also oviparous.

General range: Pine barrens of New Jersey to Florida; westward to southern Illinois and south to New Mexico.

BLACKSNAKE

(Black Racer)

Coluber constrictor constrictor (Linné)

(Figs. 8, 9)

This is the largest of the broadly distributed local serpents, with the exception of the somewhat similar mountain or pilot blacksnake.

The two species are often confused on gross examination. The black racer is of satiny luster, with smooth scales. It is of uniform black above, both scales and skin. The only break in its monotone is a white patch on the chin or the lower labial plates.

The blacksnake is of interest in being alert, extremely swift, and savage if cornered. Occasional specimens, in the breeding season, which is May, will actually attack. It will glide toward an intruder on the ledgy hibernating quarters, striking madly at one's feet or legs. If among dried leaves, it will vibrate the tail, producing a buzzing sound. This is also the habit of the mountain blacksnake, corn snake, pine snake, king snake, milk snake and the poisonous copperhead.

This serpent is not an enemy of the rattlesnake, nor is it a constrictor, as the scientific name implies. Both species have been noted in close proximity, basking in the sunshine, apparently in entirely normal, fraternal association.

The food consists of frogs, small rodents and small birds—rodents forming the greater portion of the food. It is of economic value and should be preserved. The eggs are laid under flat stones during June or July and hatch in six to eight weeks' time. They are unique among the eggs of the local, oviparous serpents in appearing as if sparsely sprinkled with grains of coarse salt. The young are grayish and strongly blotched when hatched and retain this pattern up to the following summer, somewhat resembling young milk snakes, but distinguished by the proportionately larger eyes and by the tendency of the blotches on the back to become very narrow as they approach the tail, practically disappearing posteriorly. Adult specimens attain a length of six feet.

General range: The typical black racer inhabits the entire eastern United States, extending westward to the plains, where it gives way to a paler variety or subspecies, grayish or bluish, with yellow undersurface. This is the blue racer of the plains, which extends westward to the Pacific Coast.

CORN SNAKE

Elaphe guttata (Linné)

(Fig. 10)

The corn snake is a southern species and seldom is found north of Maryland, but as it has been recorded several times from the State of New Jersey, it comes within the scope of the present listing. Dr. Henry W. Fowler of the Academy of Natural Sciences of Philadelphia writes: "Specimens were taken at Chatsworth, New Jersey . . . and this is the only locality I know it from in the State limits." We received a small adult specimen which had been picked up by an auto-

mobile party in what was described as the central part of the pine barrens, probably not far from where Dr. Fowler recorded it.

Coloration and pattern are very striking. The ground hue is gray, tan or reddish. On the back is a series of large, crimson saddles, narrowly bordered with black. There is a series of similar blotches, though smaller, on the sides. The abdomen is white, with large black squares. The pattern is rather similar to that of the milk snake, but the corn snake has faintly keeled scales. In its southerly range it attains a length of six feet. The name of corn snake is derived from its habit of frequenting fields of ripening grain, where rodents may be plentiful.

Food consists of small rodents and birds. The species is oviparous.

General range: Southern New Jersey to Florida; westward to the Mississippi.

MOUNTAIN BLACKSNAKE

(Pilot Blacksnake)

Elaphe obsoleta obsoleta (Say)

(Fig. 11)

The largest local species, attaining a length of eight feet and a diameter of two inches. A specimen captured near Forestine, Sullivan County, New York, was eight feet four inches long, and during its struggles to escape it disgorged a full-grown red squirrel. It is a powerful constrictor.

As previously explained, this species is quite similar to the black racer on gross examination. However, it may be distinguished by the faintly keeled scales, wide head, stouter body, and tendency of the scales to show narrow white edges, also by a considerable portion of the abdomen being white.

Distribution of this species points to its preference for higher ground. It often climbs into trees, lying on heavy horizontal branches which terminate near a sheltering crevice formed by the disintegration of a rotted knot. Specimens were found living in a great tree and sheltering in a hollow area immediately beneath a colony of wild bees. They have been noted in the Kittatinnies, the Hudson Highlands, the Ramapo Mountains and elevated portions of Connecticut. A six-foot specimen was taken on a hill near the reservoir immediately outside the city limits of White Plains, in Westchester County, New York.

The food consists of rodents and birds, apparently never cold-blooded prey. While alleged to commit depredations among small birds, its rodent-destroying habits should be noted. Also, the fact

should be remembered that this reptile existed as a part of the natural fauna long before human ideas resulted in lists of so-called "vermin" and "predatory animals" to be destroyed, with the view of improving Nature's original plans. The species is oviparous.

General range: Central Massachusetts to Michigan; southward to Florida and Texas.

PINE SNAKE

Pituophis melanoleucus (Daudin)

(Fig. 12)

The pine snake occurs only in the southerly pine barren regions of New Jersey, and southward. It is fairly common in the New Jersey area.

This is one of the largest and heaviest species of serpents in the northeastern States. Specimens six feet in length are not rare. The coloration is intense and rather characteristic. The usual marking is dull white on the back, becoming intensely white on the sides. Down the back is a series of large black blotches, closer together and not sharply defined on the forward portion, but posteriorly wider apart and in vivid contrast. The greater portion of the abdomen is marble white. The head resembles that of a turtle, being proportionately small, and the sharply pointed snout protrudes over the lower jaw.

When annoyed, the pine snake takes a deep breath, opens its mouth slightly, and by means of a small, voluntarily erectile appendage in front of the breathing passage or glottis, is able to eject the air with a loud, hissing sound. It is a constrictor.

Food consists of rodents and birds. It is oviparous.

General range: The pine barrens of southern New Jersey to Florida.

MILK SNAKE

(Checkered Adder)

Lampropeltis triangulum triangulum (Lacépède)

(Fig. 13)

Consideration of this species brings us to a reptile inhabiting the greater part of the northeastern area. It is brightly marked, of fair size, and the numerous specimens sent to us for identification indicate that it is often mistaken for the copperhead, from which it may be immediately distinguished by the smooth scales. Although generally distributed, it is not usually common.

Coloration is yellowish brown or gray, with a series of irregular, chestnut-brown or reddish blotches edged with black. On some specimens these blotches are dark olive. On the sides are smaller blotches in alternation with those on the back. It is white beneath, with small oblong spots of black.

It has acquired the name of "milk snake" from its habit of prowling into stables, where it is alleged to steal milk from the cows. This is rather a ridiculous theory and proof of the deed from careful observers is wanting. Captive specimens are quite indifferent to milk. As the species feeds largely upon small rodents, its presence in stables and barns may be accounted for as a search for mice and young rats. It is a constrictor, and oviparous, laying twenty or more eggs with soft, leathery shells. Young specimens are marked like the parent but are of more vivid coloration.

General range: Southern Canada to North Carolina; westward to Illinois and Wisconsin. Varieties or subspecies, with brighter red markings, extend southward to the Gulf of Mexico and southwestward nearly to the Pacific Coast.

KING SNAKE

Lampropeltis getulus getulus (Linné)

(Fig. 14)

Like the pine snake, corn snake and the keeled green snake, this is a southern reptile, barely extending its range into the area of this list. Its status is rather like that of the corn snake, though possibly more king snakes have been noted in New Jersey. Dr. Fowler, who prepared a list of amphibians and reptiles of New Jersey, explains: "The king snake is known to me only from the region of the coastal plain of New Jersey."

Northern specimens are seldom longer than four feet. The scales are smooth and lustrous and the average specimen is black with narrow yellow or white cross-bands, which fork on the sides and connect in chain-like fashion. The abdomen is black with large patches of white or yellow.

A decided tendency toward cannibalism renders this species unique. It attacks and kills other snakes of dimensions closely approaching its own, and kills and devours copperhead snakes and rattlesnakes. It is immune to the bites of poisonous species. Rodents form a considerable part of its food and the species may be regarded as of definite economic value. It is particularly docile and quickly tamed. Like all of the preceding species, it is oviparous.

General range: New Jersey to Florida; westward to the Mississippi Valley.

STRIPED WATER SNAKE

(Queen Snake)

Natrix septemvittata (Say)

(Fig. 15)

When young, this species looks somewhat like a dark garter snake without a dorsal stripe, but retaining yellow stripes on each side. It is readily separated from that species by three pronounced dark stripes extending along the abdomen. It is a small and rather slender snake, usually two feet in length, or slightly longer. Adults are dark brown, with three narrow black stripes on the back, which may be indistinct. The bright yellow stripe on the lower portion of the side covers one-half of the first and second rows of scales.

This is a persistently aquatic reptile, sometimes hanging on the bushes above brooks or small streams of rather rapid motion. In the area outlined in this work, the striped water snake appears to avoid sluggish streams and ponds.

Food consists of frogs and toads. The species is viviparous, bringing forth the young alive.

General range: Western Pennsylvania to Wisconsin; southward to the Gulf.

WATER SNAKE

Natrix sipedon sipedon (Linné)

(Figs. 16, 17)

This persistently aquatic serpent, seen along ponds and streams, should not be called a "moccasin." That term properly designates a poisonous water snake of the south and is also applied in some southern areas to the copperhead, where the latter is referred to as the high-land moccasin.

Our local water snake, member of a genus represented by about a dozen semi-aquatic species in south-central and southern areas, is an ugly looking reptile and savage when restrained. However, it is in no way related to the poisonous moccasin or "cotton mouth" snake. The northerly limit of the latter is southern Virginia.

The body of the water snake is rather stout, with strongly keeled scales; the color is brown, with broad, irregular cross-bands of reddish brown which show more plainly on the sides. The abdomen is yellowish white, usually brightly marked with red spots and blotches. Large or old specimens may appear a uniform dull brown or almost black. The young are quite different from the adult, being gray with the cross-bands blackish and very distinct. Large adults are four feet



long and fully two inches in diameter. The average length is two and one-half to three feet.

While there are allegations that the water snake is harmful in destroying game fish, this is not at all likely. Game fish, as a rule, are too active for the snake to catch them. It pursues slower-moving fish, as well as frogs and toads. Frequenting the margins of ponds and lakes, large and small streams, old dams or the stone bases of roughly-constructed bridges, the water snake may often be seen basking on a rock, stretched on the bank or even on branches overhanging the water, into which it plunges when alarmed. This is the second species so far considered which is viviparous. The young are produced alive, and there are as many as three dozen or more in a litter. They are born during late August or early September.

General range: Maine to Colorado and southward to Alabama and Oklahoma.

DEKAY'S SNAKE

(Brown Snake)

Storeria dekayi (Holbrook)

(Fig. 18)

There should be little difficulty in identifying this and the closely allied Storer's or red-bellied snake of the same genus.

The coloration is brown or brownish gray above, with a series of minute black spots in pairs usually present on the back. The central area between these spots is sometimes of a lighter tint than the ground color, imparting to some specimens the effect of an indistinct stripe. Beneath, the color is pinkish white. The scales are strongly keeled. The average length of full grown specimens is about one foot.

This snake still occurs in several areas in Central Park, hemmed in on all sides by the congestion and bustle of New York City. There is an old cemetery, less than a city block square, in the Borough of the Bronx, New York City, where these little serpents are fairly abundant. Occurrence in the northeastern States is general except in elevated areas where this species appears to be replaced by the allied Storer's snake.

The brown snake is frequently found hiding under flat stones. In such places it can find its food which consists largely of earthworms, and it is unique in surviving in localities where other serpents, even the common garter snake, have long disappeared. Its secretive habits, diminutive size and dull coloration aid in its protection. It is a viviparous species. The young are very dark, with a whitish ring around the neck, and resemble the young of the ring-necked snake, but may be distinguished by their keeled scales.

General range: Southern Canada and eastern United States; southward to Mexico.

STORER'S SNAKE

(Red-bellied Snake)

Storeria occipito-maculata (Storer)

(Figs. 19, 20)

Similar in form and upper coloration to the preceding, although many specimens are a bit smaller. It may be distinguished by the vivid vermilion undersurface. There is a tendency to have a paler band on the back. Some specimens are a rich brown and others slaty gray. The gray specimens usually have the more strongly-defined dorsal band, which is intensified by being bordered with rows of minute black spots. The average length is eight to ten inches.

This is a species preferring the more elevated and wild areas and does not occur in the immediate vicinity of New York City. Together with the ring-necked snake, it occurs in portions of New England where the winters are very severe and other serpents (except the striped snake) are rare or entirely absent.

Food consists mainly of earthworms. The species is viviparous and the young are black, with whitish ring around the neck.

General range: Similar to the allied preceding species, but extends farther north into Canada.

SMOOTH BROWN SNAKE

Virginia valeriae valeriae Baird and Girard

(Fig. 21)

Because of its smooth scales and small size, there is a possibility of confusing this species with the worm snake (*Carphophis*), but it ranges only into the extreme southerly area of this list—southern New Jersey.

Its snout is not so sharp as that of the worm snake, and the scales are of rather satiny luster. The color is dark chestnut or grayish-brown, usually with two rows of minute black dots on the back. The abdomen is yellowish-white. Average length is between six and eight inches.

The smooth brown snake feeds on worms and soft-bodied insect larvae and is viviparous.

General range: Southern New Jersey to Georgia; westward to Tennessee. A subspecies extends the range to Illinois and Texas.

RIBBON SNAKE

Thamnophis sauritus sauritus (Linné)

(Fig. 22)

Two striped snakes occurring in the local area may be separated by difference of form, intensity of pattern and location of the lateral stripe.

The ribbon snake is the more slender, and its pattern is considerably more intense than that of the related garter snake. Coloration is dark brown or black, with a bright yellow stripe down the back and a similar stripe on each side, situated on the *third and fourth rows of scales* from the plates of the abdomen.

Distribution is quite general in more or less undisturbed areas, though it is not nearly as abundant as the garter snake. It frequents damp meadows and the grassy borders of brooks and might almost be noted as semi-aquatic. It is a member of a genus with several species as fully aquatic as the water snake. It seldom exceeds a yard in length.

Food consists of small fishes, tadpoles and frogs. It is viviparous and the litters are small, there seldom being as many as a dozen young.

General range: Southeastern Canada and eastern United States to the Mississippi Valley; southward to Georgia and Alabama. Subspecies extend westward to Nebraska, southward into Florida and southwesterly into Mexico.

GARTER SNAKE

(Striped Snake)

Thamnophis sirtalis sirtalis (Linné)

(Figs. 23, 24, 25)

The most commonly seen of the local serpents. Distribution is general and it is fairly abundant near reclaimed or improved areas, where other snakes have long since disappeared. It is common along the salt meadows immediately west of the lower Palisades of the Hudson, and in many of the suburban areas of New Jersey and New York. Large numbers inhabit the old reservoir site along Jerome Avenue in the northerly part of New York City, and even occur on the northerly portion of Manhattan Island. It is found about everywhere in the rural districts where snakes occur.

The general color is dark brown or black, with three yellowish stripes extending lengthwise. The color beneath is greenish-yellow. The skin along the sides, when distended, shows numerous white or pale greenish spots, which are often so arranged that a checkerboard or tessellated appearance is produced when the scales are widely sepa-

rated after eating, or if the reptile is angry and greatly flattens the body. Coloration and pattern are quite variable. The stripes may be more or less distinct. When the side stripes are present, they are always on the *second and third rows of scales*, counting upward from the abdominal plates. With some specimens the central stripe may be ragged or broken, and with others from the mountainous areas of New England, the stripe is usually very faint or absent. With these, the tessellated pattern of the skin invades the scale coloration, producing a checkered effect. The side stripes remain to assist in identification.

The garter snake feeds only upon cold-blooded prey such as frogs, toads, tadpoles, salamanders and earthworms. The length of a large female adult is about a yard, while the males are seldom more than two to two and one-half feet in length. This is a viviparous species, bringing forth as many as thirty young in a litter. The markings of the young are similar to those of the parent, although the tendency toward tessellated pattern may be more pronounced.

General range: Probably extending further north in easterly Canada than any other species of serpent. According to Dr. Thomas Barbour, it ranges up to the 50th degree of latitude. It is found southward to Florida and westward to Minnesota and Missouri. Sub-species carry the range to the Pacific Coast.

Part II: *Venomous Snakes*

The three poisonous snakes coming within the scope of this article are members of the Family *Crotalidae*. In non-technical terms they are called pit vipers, owing to the presence on both sides of the head, between the eye and the nostril, of a deep pit, appearing more prominent than the nostril itself. Another external characteristic renders them unique among the local species. This is the form of the pupil of the eye, which is elliptical. In the non-venomous species the pupil is round. The arrangement of the plates or scales under the tail is a third means of differentiation. They occur in a double row from the vent to the tip of the tail in the non-venomous species, while among the poisonous snakes the plates from the vent to the tip of the tail are in a single row, except with the copperhead, where the scales separate into two rows near the tip.

The crotaline serpents are provided with a pair of long, hollow teeth in the forward portion of the upper jaw. These are the fangs, which have an orifice at the tip, like a hypodermic needle, for the injection of poison when they are driven into an offending object by a combination strike and bite, or by a deliberate bite alone. A tubular connection from the base or top of each fang extends backward to a poison gland on each side of the head. When the serpent bites, a con-

traction of the masseter muscle against each gland vigorously squeezes it, forcing poison forward and out of the connected fang. The fangs are on movable bones and fold back against the roof of the mouth when the jaws are closed. They are covered with a sheath of delicate flesh which is forced back when the fangs are imbedded in any object.

These pit vipers do not spring or jump at an intruder. They strike from one-third to one-half their length, and almost invariably coil with the neck in an S-shaped, lateral loop, ready to strike from that position. They can as readily strike when crawling, for when disturbed, the neck is usually kept laterally looped for defence. They can also quickly turn and deliberately bite, without darting the head from a loop. These local species never wantonly attack a human.

All are viviparous, giving birth to living young to the number of about twelve.

COPPERHEAD SNAKE

Agkistrodon mokasen mokasen Beauvois

(Figs. 26, 27)

Coloration is vivid and rather characteristic, because of the separation and fair symmetry of the blotches. The body hue is pale brown, pinkish, or light reddish-brown, with a series of large blotches on the sides, somewhat like inverted Ys. These blotches are usually of a rich, chestnut-brown. When examined from above, a number of the markings will be seen to unite across the back, producing a continuous pattern across the body, the central portion being narrow and broadening on each side, giving the outline of an hour-glass. The top of the head is without marking, and often slightly paler than the body hue. The undersurface is usually pale, pinkish-brown, with a row of dark spots on each side. There is some pattern variation in intensity of the blotches, which may be paler in the central area and outwardly margined (very narrowly) with quite a pale tint, which accentuates their intensity.

Large specimens are about three feet long, but occasional four foot specimens are noted. Curiously enough, the largest specimens which ever came to the writer's attention were captured in the immediate vicinity of White Plains, Westchester County, New York, where an example measuring four feet and five inches, and approximately two inches in diameter, appears to be a record for the species.

The water snake and hog-nosed snake are sometimes mistaken for the copperhead, because of their proportionately thick bodies and gross similarity of markings. The poisonous species, however, carries its points of marked differentiation in its elliptical pupils, prominent cavity or pit between the eye and nostril, and greater number of plates under the tail in a single row. The milk snake is also confused with

the copperhead, but is more slender and the blotches are irregularly rounded and narrowing as they approach the sides, instead of spreading widely as with the copperhead.

While the bite of the copperhead is very dangerous and there are records—although they are rare—of deaths from such injuries, it is not nearly so poisonous as the timber rattlesnake. Its fangs are proportionately shorter, its venom not so virulent, and the amount of poison injected into a bite of lesser quantity, because of the serpent's smaller size. In habits it is very quiet, preferring to lie perfectly still when an intruder enters its lair and to depend on its pattern and colors closely resembling the fallen leaves around it to avoid detection. Seldom will it make any attempt to strike, unless very definitely annoyed or attacked, or if it is stepped on. Most of the cases of copperhead bites which have come to our attention have resulted from the latter condition, and have been inflicted on persons wearing low shoes, many of the bites being on or near the ankles. If a copperhead fears it is about to be attacked, it will set up a rapid, vibrating movement of the tail, and among dried leaves this produces a distinct buzzing sound, readily heard for about fifteen feet. It will coil and fight bravely if cornered, but at the first opportunity it will turn quickly and glide to safety in some crevice.

Distribution is more extensive than with the rattlesnake, since its protective coloration and more secretive habits have preserved it from extinction in many places. Copperheads are still found along the top and at the base of the Palisades of the Hudson, while the rattlesnake appears to have been extinct in that area for close to fifty years. Throughout Pennsylvania and New Jersey the copperhead is rather generally distributed except in regions of intensive cultivation. There are various areas of New York State where the species has not been recorded. It is common from the latitude of northern Westchester County well up the Hudson and past the easterly border of the Catskill area, also in counties to the west. While showing a decided preference for mountain areas, as illustrated by its abundance in elevated regions of New Jersey, Pennsylvania and Connecticut, it does not occur in the Catskill Mountains proper, although in the vicinity of Phoenicia and on Tremper Mountain it is common enough, and in but few portions of the Berkshires, nor is it found in the general area of the Schwan-gunk Mountains in Sullivan County, except on the easterly side of the Neversink River. However, it is quite evident and increasing in abundance along the Delaware River. It is common in Connecticut, both along the shore and in elevated regions, also in the coastal area of Rhode Island. The species does not extend north of central Massachusetts; hence it may be eliminated from consideration in the States of Vermont, New Hampshire and Maine.

Ledgy, wooded hills, with a base of wild, damp meadows, are the favorite prowling grounds of this snake, as it searches for small

rodents, birds and frogs. During the summer it is often seen along old stone walls which might offer shelter and a congregating place for rodents. With the autumn it returns to specific crevices among the rocks to hibernate, and it is close to such locations that the young are born during August or early September. From six to nine young are produced in a litter. The tails of the infant snakes are bright, sulphur yellow.

General range: Central Massachusetts to northern Florida; westward to Texas.

MASSASAUGA

Sistrurus catenatus catenatus (Rafinesque)

(Fig. 28)

The massasauga might be regarded as somewhat of an intruder among the local serpents, as it is essentially a western species and is found only in a limited area in western New York. It is a small rattlesnake which may be easily distinguished from the widely distributed timber rattlesnake by the large and symmetrically arranged plates on the top of its head—quite similar to the head plates of a harmless serpent. Its rattle, of course, provides a point for immediate identification. The ground color is brown or grayish, with a series of chestnut-brown, symmetrical, oval blotches on the back, becoming darker toward the edge and narrowly outlined with a paler hue. There is a smaller row of rounded blotches on each side. The usual length of the massasauga is from two to three feet.

Mr. Edward T. Whiffen, who has been much interested in the occurrence of this reptile in New York State, has written about it in the New York Zoological Society BULLETIN¹ as follows:

“The massasauga, a species of dwarf rattlesnake, is still to be found in New York State, in and around Cicero Swamp, which, with some interruptions, stretches across the northern parts of Onondaga and Madison Counties, between Oneida and Onondaga Lakes. The main swamp is said to be fourteen miles long and seven miles wide in its greatest extent. It consists of the swamp proper, in which are numerous ‘islands,’ or higher areas of land. Next to the dry land is the ‘shore,’ a wet, marshy strip, from seventy-five to one hundred yards wide. Beyond the ‘shore’ is the swampy land proper, fairly dry in summer and covered by a dense growth of trees, bushes, ferns and moss. In some places this moss is knee-deep. Many of the bushes are of the huckleberry variety, and it is among these that the massasauga is frequently seen in August and September, when berry-pickers go out into the swamp.

¹ Vol. XVI, No. 55.

"The massasauga seems to like the neighborhood of swamps, though it shuns the actually wet places. In the harvest season it is usually found either in the hay-fields or oat-lots, or it may be seen out on the moss among the bushes, or under the evergreen trees. However, it may occur almost anywhere. A gentleman told me that two years ago he found a large massasauga in his wood-pile, about six feet from the house. Others reported having found the snake in their cellars, or under the steps. There is an abundance of frogs and mice in the meadows, and frogs and birds in the swamp, and such conditions account for the presence of the reptile in those places. In the hay-field the massasauga seems to select the damper spots, where the growth of vegetation is heaviest. There it is frequently cut in two by the knives of the mowing-machines. Newly cleared fields, where there are plenty of stumps and berry bushes, are also favorite lurking places of this reptile, which is sometimes seen sunning itself on a stump, or lying coiled among the bushes.

"Older residents assured me that the snake is much less common than formerly, when its range extended over the entire northern part of the county. Its disappearance is due probably to ceaseless slaughter and to the draining of the swamps. That it is still fairly common may be judged from the fact that the killing of a dozen snakes in an area of perhaps a hundred acres was reported within the space of two weeks' time. One of these snakes had sixteen rattles and two had ten. Six or eight was a common number. The whole region is abundantly supplied with reptile life, milk snakes, ribbon snakes, garter snakes, water snakes, etc., being of frequent occurrence. As much of the swamp has little value for tillage purposes, and as the timber is small and comparatively worthless, the massasauga, though in diminishing numbers, will probably continue to be found in the region for some time."

General range: Western New York to Nebraska; northward into Michigan and Ontario; southward to Kansas. A subspecies, *S. catenatus edwardsii*, ranges from Oklahoma into Mexico.

TIMBER RATTLESNAKE

(Banded Rattlesnake)

Crotalus horridus (Linné)

(Figs. 29, 30)

In pattern and colors, this species presents great variation. The most familiar phase is that of sulphur yellow or pale tan ground-color, with wide, dark brown or black cross bands, usually wavy or pointed to the rear, and sometimes broken into three series of blotches, the central or larger ones being rather rhomb-like. The tail is black.

The blotches on some specimens are narrowly margined with a paler hue. The ground-color varies from yellow to brown and olive. Some specimens are so suffused with black that the bands are indicated only by their pale margins. Specimens of a uniform, velvety black, are not rare. Blackish and pale yellow specimens are usually associated in the same den. The greater number of the black specimens are males, although there are some melanistic females. We have never noted any pale yellow male examples. These large yellow or tan specimens thus appear to be invariably females.

The average length of the adult timber rattlesnake in the northeastern States is slightly under four feet. As with a number of species of serpents, however, a specimen may well exceed the usual run. The largest specimen I ever examined was two inches over six feet in length and nearly three inches in diameter. It was taken near Sheffield, in the Berkshires. A specimen nearly as large (slightly under six feet) was taken near the top of the great rock slide near Hartsville, Massachusetts, the same shattered ledge that is alleged to have inspired Oliver Wendell Holmes' description of "the mountain" in his classic novel, "Elsie Venner." Large specimens have been recorded from New Jersey and Pennsylvania.

Distribution of the rattlesnake in the northeastern States is associated with hills and mountains of moderate height, on which there are broken ledges with large, loose fragments on the slopes and top. These flat fragments may be a foot or more in thickness and from a yard to six or eight feet in length, sloping back into a fissure the bottom of which may be covered with soil or leaves, and which provides a position of security during storms. It is the common habit of rattlesnakes to coil under the edge of these rock masses, protected from the too-hot summer sun, and ready to retreat quickly if disturbed. If the intruder goes on his way, the snake may lie in its motionless coil without sounding the rattle, thus seeking to escape notice.

Near these natural homes are specific crevices or "dens," where rattlers that have roamed over a considerable area during the summer congregate each fall preparatory to deep penetration and hibernation beyond the frost line. During the late summer the females return to such places and here the young are born, with a natural instinct to return to this specific spot each year for winter shelter. From the areas of the ledges, many rattlesnakes prowl through the forest areas for food, and often into the farmlands. Variations in weather conditions produce marked difference in numbers observed. During particularly dry summers they may come into the low grounds for water in considerable numbers. Their natural prey, small rodents and birds, sometimes shift their feeding grounds and this also affects the summer distribution of the rattlesnake. If a farm is infested with rats and mice and a rattlesnake den is not far distant, it will not take the reptiles long to discover the favorable feeding ground. They may also

be commonly noted during the haying season, attracted by the presence of large numbers of field mice.

While a very dangerous snake from the standpoint of its large fangs and the amount of venom it is able to inject at a bite, the northern rattlesnake is a rather inoffensive reptile as compared with its larger allies in the southern States. It almost invariably gives warning of its presence by sounding the rattle, if disturbed when out of immediate contact with a sheltering crevice. If closely approached, it will strike, but the full striking distance of the average specimen is barely eighteen inches—and usually shorter. There are records of fatalities from the bite of this species, but generally considered, in the northeastern portion of its range, there is a surprisingly small number reported, less than with the copperhead, which gives no warning of its presence. In an area of the southern Berkshires, where rattlesnakes are particularly frequent, the writer has records of but three bites during a period of about twenty years. One of these was fatal.

Distribution is general in the wilder, hilly country, with the exception of the Catskill and Adirondack Mountains. As far as we are aware, no rattlesnake has ever been recorded from the Adirondack Mountains proper, although the species is quite common on Tongue and Black Mountains, in the vicinity of Lake George. Likewise, the only recent Catskill records come from Tremper Mountain, at the edge of the Catskills, near Phoenicia, New York. The species is abundant in the Ramapos, the Kittatinnies of New Jersey and Pennsylvania, and the Swangunk range in New York. Curiously enough, while rattlesnakes are common on the high ridge of the mountains west of the Housatonic River and across from Kent, Connecticut, they are seldom recorded on the easterly side of the river in this area. They are abundant in the southerly Berkshires and on the hills a few miles south of Hartford, Connecticut.

In central New Jersey the snake occurs under conditions rather curious for a mountain type. There is considerable flat, forested country back of the central coast, quite damp in spots and with large sections covered with heavy sphagnum moss. In these locations, the species attains a larger average size than the mountain type and may exhibit a slightly different coloration: grayish, with strongly contrasted black bands and a faint, rusty, dorsal stripe, several scales wide. There is a resemblance to the southern race known as the cane-brake rattlesnake, which in the costal area of the southeast and the lower Mississippi Valley frequently attains a length of close to eight feet and has a distinct reddish band along the back.

Rattlesnakes are extremely rare in the State of Maine, and that area is thus unique among all the States in the virtual absence of poisonous serpents. The Boston Society of Natural History has been unable to obtain a record specimen from Maine for its collection.

There appears to be a few records from New Hampshire, and specimens are reported on an island in Lake Winnepesaukee. Vermont seems to have few specimens, except along the westerly slopes of the Green Mountains and in the southern portion of the State. Both the copperhead and rattlesnake appear to be extinct on Long Island, although evidence that the latter was formerly found there exists in skins and rattles among the trophies of old farm houses. We have been unable to verify the occurrence of either species during the past thirty years.

General range: The central portion of the New England area, southward to northern Florida; westward to the Plains.

Summary

Part I: *The Local Non-venomous Serpents*

The largest of the local species, and approximately ranking in size in the order named, are the mountain blacksnake, pine snake, common blacksnake or racer, king snake, corn snake, water snake and milk snake.

The most diminutive species are the worm snake, DeKay's snake, Storer's snake and smooth brown snake. Differences of coloration may be defined as follows:²

Worm Snake	}	No pattern
Ring-necked Snake (Has a yellow collar)		
Smooth Green Snake		
Keeled Green Snake.....		
Blacksnake		
DeKay's Snake (Occasionally a faint band on back and minute black dots)		
Storer's Snake (Same as DeKay's).....	}	Strongly blotched pattern
Smooth Brown Snake (Minute black dots on back)		
Hog-nosed Snake (Occasional specimens are black)		
Corn Snake		
Pine Snake	}	Numerous scales narrowly edged with white
Milk Snake		
Water Snake		Transverse bands extending to sides
King Snake		Pale chain pattern
Mountain Blacksnake		

² See also descriptive key at beginning of article.

Ribbon Snake)
 Garter Snake) Striped lengthwise
 Striped Water Snake; Queen Snake)

Seven species have perfectly smooth scales, two have the scales faintly keeled, and with nine the scales are strongly keeled.

Eleven of the species are oviparous and seven are viviparous.

Two species, the banded water snake and the queen snake, are persistently aquatic. The ribbon snake also takes much to the water, or frequents margins of streams and damp meadows.

The hog-nosed snake prefers very dry, sandy areas. This species is the most dramatic in endeavoring to frighten an intruder. While most snakes will glide to safety when disturbed, this species widely flattens the neck and hisses. It will also feign death.

The preceding species and the pine snake are the only local species that hiss loudly when disturbed.

Several of the local non-venomous species will flatten the body and strike, if cornered. Their bites are entirely innocuous beyond the possibility of infection which may result from any small abrasion.

The two species of blacksnakes, the corn snake, pine snake, king snake and milk snake, vibrate the tail when angry, and produce a buzzing sound when the appendage is among dry leaves.

Twelve of the local species feed only upon cold-blooded prey, three upon both cold and warm-blooded prey, and three entirely upon warm-blooded prey. The common green snake appears to be the only species which is altogether insectivorous. While its near ally, the keeled green snake, feeds largely on insects, it also devours small lizards.

The garter snake, DeKay's snake and water snake are the most abundant species.

Part II: *The Local Venomous Serpents*

Since there are only three species of poisonous serpents in the northeastern States and these may be separated into only two kinds—rattlesnakes and the copperhead—the pertinent information concerning them may be summarized briefly:

- | | | |
|--|---|----------------------|
| <p>A. No rattle:
 COPPERHEAD</p> | } | Transversally banded |
| <p>B. Tail ending in a rattle:
 TIMBER RATTLESNAKE
 MASSASAUGA</p> | | |

The distribution of the copperhead is general except in areas of intensive cultivation, and it prefers ledgy, wooded hills with a base of uncultivated, damp meadows.

The distribution of the timber rattlesnake is general throughout the area with the exception of the major portion of the Catskills and the whole of the Adirondacks. It is commonly associated with wilder, hillier areas and the neighborhood of broken ledges of rock.

The massasauga is essentially a western species of rattlesnake and is found only in a limited area in western New York. It likes the neighborhood, although not the actual location, of swamps.

Precautions Against Accidents

A pair of stout, canvas leggings or leather puttees is positive protection to the legs against northern poisonous serpents. The leggings, however, should be worn with high shoes. If low-cut shoes are worn, there is usually several inches of the ankle left exposed—and this is the part of the limb most frequently bitten.

With the legs protected, it is well to bear in mind that the use of the hands in climbing rocky places or getting over a stone fence is dangerous, unless each hand-hold is investigated with due thought of crevices or hollows that may secrete a coiled serpent. Any thick, brushy place or pile of leaves in the wilder country should be considered a hazard, unless the eye is keen in noting where the hand is directed.

In establishing a summer camp, it is well to ascertain from local residents whether or not there is a particular prevalence of poisonous snakes. We have several times been consulted about camps which have unconsciously been located in the immediate vicinity of a den of rattlesnakes or copperheads, with the consequence that a number of city children, unfamiliar with woodcraft, have been turned loose in an area over-run with poisonous reptiles. There are many ideal locations for camps where poisonous serpents are seldom reported, and the finding of such areas is not difficult. There are also fine camping areas in most of the States under consideration in which no poisonous snakes are ever to be found.

While the education of young people in camps about the wild types of life found in the nearby country is highly desirable, instructional measures relating to poisonous snakes have been a bit overdone. By this I mean the exhibition of numerous living specimens and the handling of them in what is considered to be a safe way, to show the poison fangs, etc., the carrying of such specimens to lectures, and the like. Too much familiarity reduces respect for danger and it has been noted that a good many boy students have been inclined to transport poisonous reptiles in anything but a competent and cautious manner.

Several accidents have resulted from this undue familiarity. Camp instructors should be cautioned not to go too far in this direction, to instruct boys not to collect poisonous serpents, and not to harbor such creatures for observation. A captive poisonous snake, except in the care of a competent person, is a source of danger to the possessor and those around him.

Treatment of Snake Bite

Through the formation of the Antivenin Institute of America and the guidance of Dr. Afranio do Amaral, Chief of the Brazilian government's Instituto Butantan, specific serum for the bites of poisonous snakes is being regularly produced in the United States. This product should be located at all points of particular hazard.

It is made by injecting horses with small doses of snake venom, the process continuing through a number of months until the animals have developed a high degree of immunity. Blood is then obtained from them, in small quantities, and is subjected to a number of processes. The red is separated from the serous portion, and the latter is filtrated. Simply explained, the action of this serum, injected into the human victim who has been bitten by a dangerous snake, is to neutralize the poison of the reptile. Its effect is rapid and quite astonishing in relieving the dramatically alarming effects of snake bite.

Serum may be injected immediately after a bite, or up to the time the victim has approached a condition of collapse. After collapse it is usually too late to be properly taken up by the circulation and thus neutralize the poison.

The bite of a copperhead or massasauga is not ordinarily fatal, although it may be very serious. Serum may be injected as late as a day or even two days after the symptoms of great swelling have developed. It is far better, however, to inject it as soon as possible after the bite, in order to neutralize the poison before it proceeds far in destruction of tissue and the red cells of the blood stream. This prevents an extensive necrosis of the bitten area.

A large specimen of the timber rattlesnake may inject enough poison to cause death within ten to twelve hours, and in a much shorter time if a vein is actually struck, which is a rare but possible condition.

As the bite of a poisonous snake is actually a simultaneous double injection by two hypodermic teeth (the fangs), the measures to meet the emergency should be quick and positive. A ligature of some type should be bound a moderate distance above the bitten part, to prevent the poison being absorbed into the upper limb. The ligature may consist of a strip of cloth, a large handkerchief, or even a piece of heavy cord. A rubber ligature is much the best. The ligature should be

made sufficiently tight to indicate a stoppage of circulation. Even moderate pressure tends to localize the area of poisoning.

With the absorption of the poison retarded, the fang wounds should be opened by an incision across them to an estimated depth of three-eighths of an inch for a large rattlesnake, or a quarter of an inch for a copperhead. The incision should be made with care not to injure the delicate tissue covering a bone, or to cut into a blood vessel. If no cupping device is at hand, drainage should be induced by sucking the wound, there being practically no danger from this if the lips and mouth are free from sores.

After these immediate emergency measures for eliminating as much poison as possible from the vicinity of the wound, the serum should be administered. It is provided in tubes which are actually small hypodermic syringes, and it is only necessary to attach the needle and the handle. A portion of the serum may be injected in the vicinity of the bite, and the balance under the skin between the shoulder blades or on the abdomen, by what is known as subcutaneous injection. In this way it is quickly taken up by the general circulation. The entire contents of a tube should be injected for a bite. If symptoms are particularly grave, two tubes may be necessary. Intravenous injection might be advisable if the poison fangs have punctured a blood vessel, but this should be done only under the direction of a doctor who has actually diagnosed the condition. Tubes of serum are accompanied by full directions for use.

The ligature should be slacked off every ten minutes or so, to induce bleeding at the wound. If no serum is available, the treatment of suction and the frequent slackening of the ligature should be continued, and additional drainage incisions, upward from the injury, are necessary if the swelling greatly increases. If a good cupping device is at hand, the incisions should be rather short and X-shaped so as not to extend beyond the suction surface of the device and thus admit air. It is well to wash the incision with a *mild* solution of permanganate of potassium crystals in pure water (enough to produce a pale amethyst hue), as this fluid will neutralize by oxidation what venom it may reach. The use of strong solutions of permanganate of potassium, however, is not only unwise, but dangerous, as much tissue destruction accompanies the use of this chemical at a high strength. This caution also includes the utter rashness of rubbing pure crystals of permanganate into a wound. Moreover, such a wound should never be cauterized. Nothing should be more foreign to the treatment of snake bite than such practice, which actually seals the destructive poison within the tissue.

As not only the immediate area of the wound, but a considerable portion of the neighboring tissue, is much weakened and subject to bacterial invasion, and the bite itself is sometimes attended by specific

infection with germs from the snake's mouth, the wounds should be covered with a heavy layer of wet dressing and kept saturated with a mild antiseptic solution. This not only retards or prevents infection, but induces copious drainage through a discharge of quantities of serous fluids which always appear to be rushed to such a poisoned area.

There are but few spots in the whole northeastern area where poisonous snakes occur which are not accessible, within a reasonable time, to the aid of a physician, and the snakebite victim should, if possible, place himself in skilled hands to carry through all but the preliminary stages of treatment.

A first-aid kit for the treatment of snake bite should contain the following articles: Several one-edged safety razor blades; a small bulb and cupping glass for flat surfaces, with additional attachment for "round" surfaces, like a finger; a roll of rubber ligature; a small roll of bandage; and two tubes of antivenomous serum. The serum will remain efficacious for several years. A few permanganate crystals may also be carried. Whiskey is useless as a cure, although a moderate dose of medicinal brandy does no harm and may greatly relieve the mind during a situation which may not be nearly as dangerous as it seems.

We have noted bites of copperheads that produced great swelling which cleared up within a few days with no other treatment than a drainage incision across the fang wounds and the covering of the area with a wet dressing. There are also cases of both copperhead and rattlesnake bites being treated with the serum and the patient going about his regular business the following day. Again, there are records of grave manifestations. Consequently, poisonous serpents warrant great respect, caution in investigating their lairs, and personal protection in going through the areas which they inhabit.

As many people are bitten by harmless snakes which may quickly glide away, leaving apprehension behind them, it is well to understand that the bite of a poisonous serpent is unmistakable. A harmless serpent may produce distinct wounds from its recurved teeth, and as only a few of the teeth may cause lacerations which bleed, the imagination of a nervous person may quickly picture them as two "fang" punctures. If nothing happens within ten minutes following a bite, the snake was harmless. A bite from a poisonous serpent rapidly develops unmistakable symptoms. A burning pain is apparent within three to five minutes and within ten minutes there is a distinct swelling. This rapidly increases, and is usually followed, within half an hour or less, by profuse perspiration and possibly reflex vomiting. By this time, of course, emergency treatment should have been given, and if serum is at hand, its injection may prevent the more alarming symptoms.



Books of Reference on Serpents

The following publications may be consulted for a more extensive study of serpents and other reptiles:

- REPTILES AND AMPHIBIANS: THEIR HABITS AND ADAPTATIONS
Thomas Barbour
 Houghton Mifflin Company, New York City.
- CHECK LIST OF NORTH AMERICAN AMPHIBIANS AND REPTILES
 (Technical) *Leonhard Stejneger and Thomas Barbour*
 Harvard University Press, Cambridge, Massachusetts.
- REPTILES AND BATRACHIANS..... *E. G. Boulenger*
 E. P. Dutton & Company, New York City.
- THE CROCODILIANS, LIZARDS, AND SNAKES OF NORTH AMERICA
 (Technical) *Edward Drinker Cope*
 Annual Report of the United States National Museum, 1898 (1900)
- THE REPTILE BOOK (Reptiles of North America) *Raymond L. Ditmars*
 Doubleday, Doran & Company, Garden City, Long Island, New York.
 (On file in the larger libraries. New edition known as
 REPTILES OF NORTH AMERICA.)
- REPTILES OF THE WORLD *Raymond L. Ditmars*
 The Macmillan Company, New York City.
- AMPHIBIA AND REPTILES *Hans Gadow*
 The Macmillan Company, New York City.
- THE POISONOUS SNAKES OF NORTH AMERICA *Leonhard Stejneger*
 United States National Museum, Washington, D. C.

ILLUSTRATIONS



Fig. 1. Worm Snake, *Carphophis amoenus amoenus*. A burrowing species which is rather common but seldom observed. It is brown, with smooth, polished, almost opalescent scales. The food consists of earthworms and insect larvae.

Fig. 2. (Lower) Ring-necked Snake, *Diadophis punctatus edwardsii*. This species is unique in coloration. The smooth and satiny scales are lustrous gray and in contrast to this tone there is a brilliant yellow ring around the neck. It is secretive and lurks under flat stones or old fallen tree trunks.

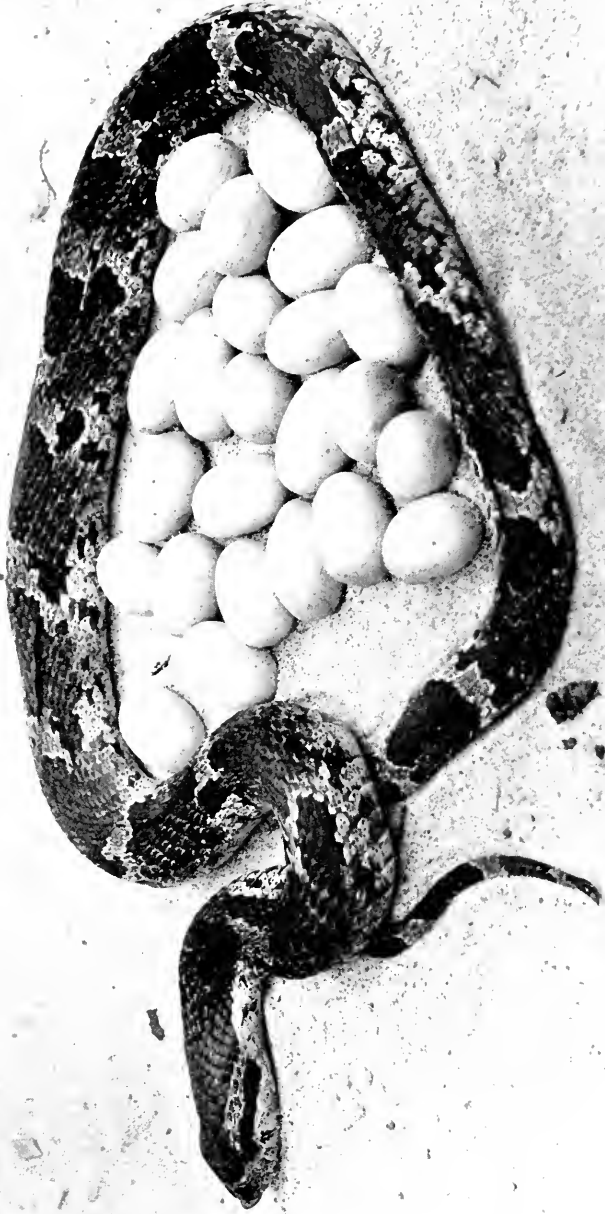


Fig. 3. Hog-nosed Snake (Spreading Adder, Hissing Ather), *Heterodon contortrix*. Some snakes lay eggs and others produce living young. The former are designated as oviparous and the latter as viviparous; or to be technically exact, ovoviviparous, meaning that the eggs are retained within the oviduct until the young are fully developed. The oviparous species bury their eggs in soil or under flat stones, where they hatch, without parental care, in about six weeks' time.

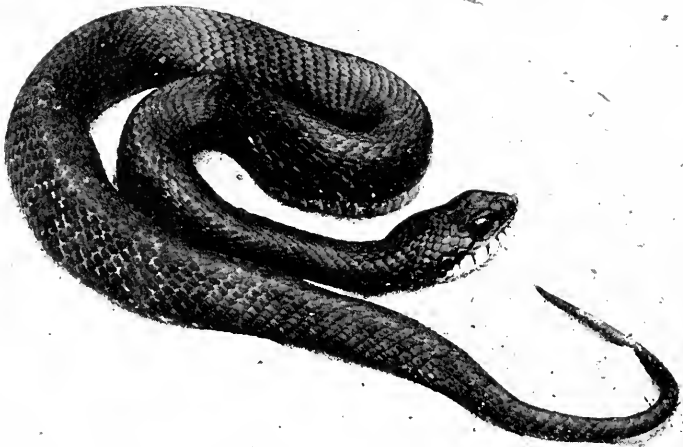
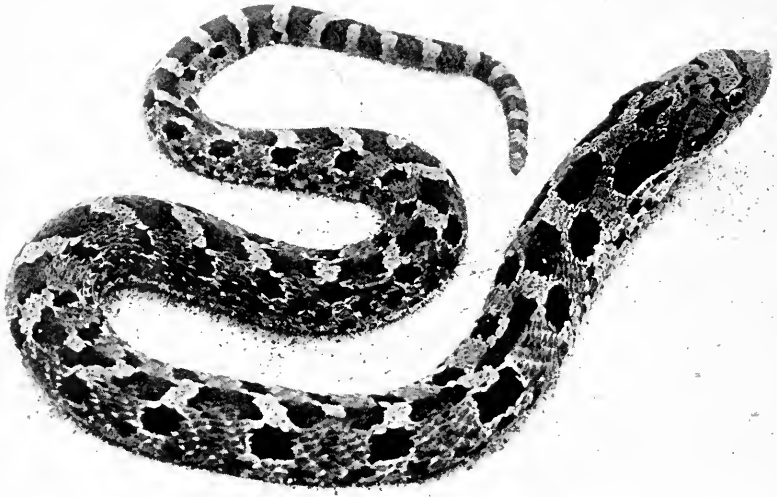


Fig. 4. Hog-nosed Snake (Spreading Adder, Hissing Adder), *Heterodon contortrix*. Characteristic among the local serpents in its ability to flatten the head and neck to wide extent and emit sharp hisses. If further alarmed, it rolls upon its back and feigns death. It seldom attempts to bite.

Fig. 5. (Lower) Black Hog-nosed Snake. A dark variation of the species figured above. The typical form is more frequent in sandy places, while black specimens frequent elevated areas.



Fig. 6. Green Snake, *Liopeltis vernalis*. Occurs in wild meadows, but is not frequently seen, because of its protective coloration. The scales are of satiny luster and leaf green in color.

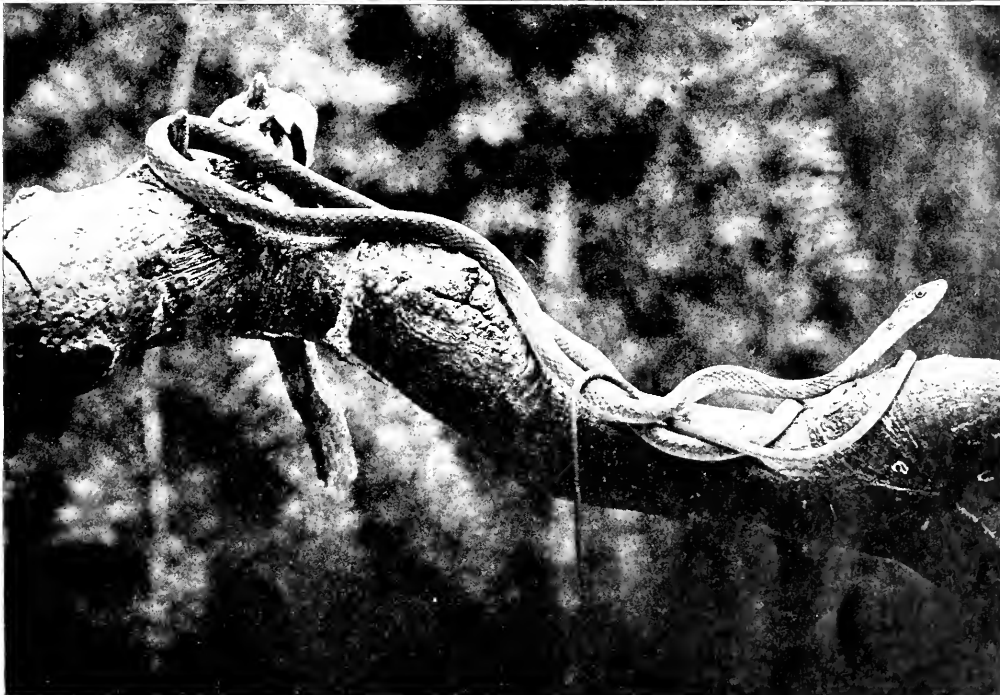


Fig. 7. (*Lower*) Keeled Green Snake, *Ophiodrys astivus*. While similar in coloration to the species figured above, there is a marked difference in the texture of the scales. With this species they are keeled, each showing a raised line or ridge running lengthwise along the center. Both of the green snakes feed upon insects.

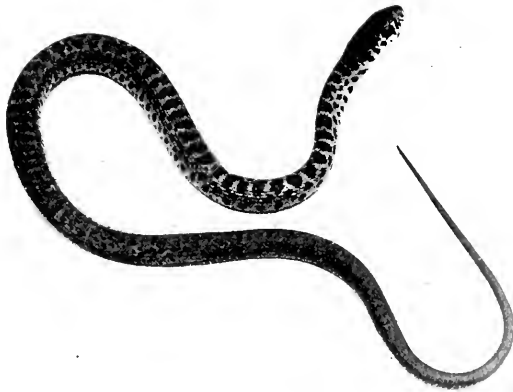
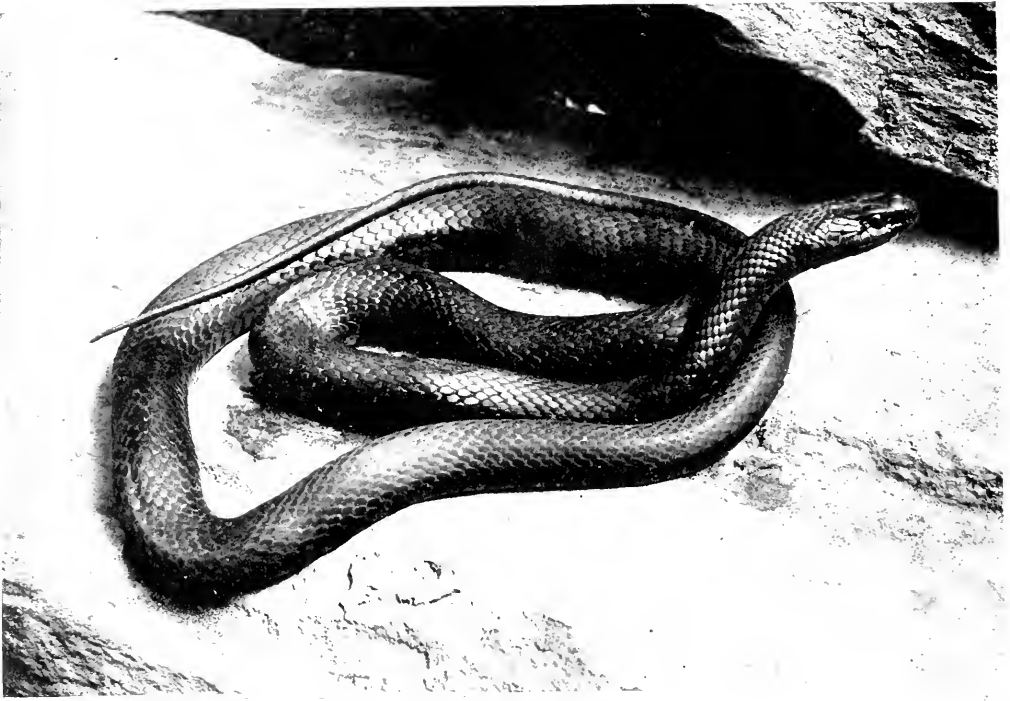


Fig. 8. Blacksnake (Black Racer), *Coluber constrictor constrictor*. This and the pilot blacksnake are the largest of the broadly distributed local serpents. The scales are smooth and satiny, distinguishing the species from the other blacksnake, with which it is often confused. The racer is a useful reptile as it feeds largely upon rodents.

Fig. 9. (*Lower*) Young of the common Blacksnake. The egg are laid early in July and may take nearly two months to develop. The young are spotted until late the following year.

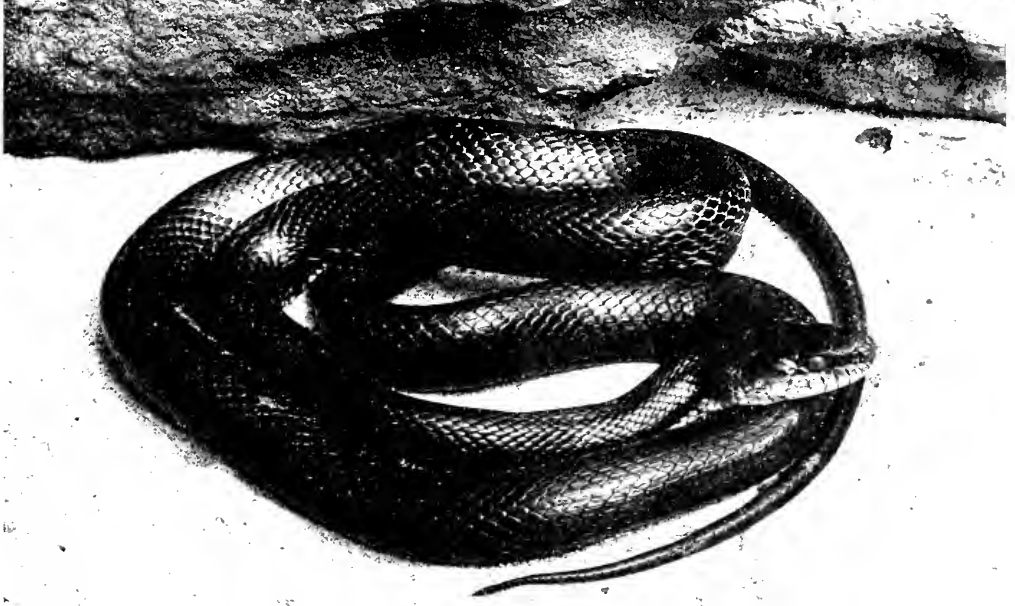


Fig. 10. Corn Snake, *Elaphe guttata*. A southern species, extending northward only into southerly New Jersey. Coloration and pattern are striking, the back being grayish or tan, with large crimson blotches.

Fig. 11. (Lower) Mountain Blacksnake (Pilot Blacksnake), *Elaphe obsoleta obsoleta*. Largest of the local species. It attains a length of eight feet. Occurrence is largely confined to the more elevated areas. This serpent is frequently confused with the common blacksnake, but may be distinguished by its faintly keeled scales, many of them narrowly edged with white.



Fig. 12. Pine Snake, *Pituophis melanoleucus*. In the local area, the distribution extends only into the pine barren regions of New Jersey, where this large species is fairly common. The habitat extends southward to Florida. This powerful species is one of the largest serpents of the east, and is characteristic in taking deep breaths when annoyed, opening the mouth slightly, and producing a loud, hissing sound by expelling the air against an erectile appendage in the lower jaw.

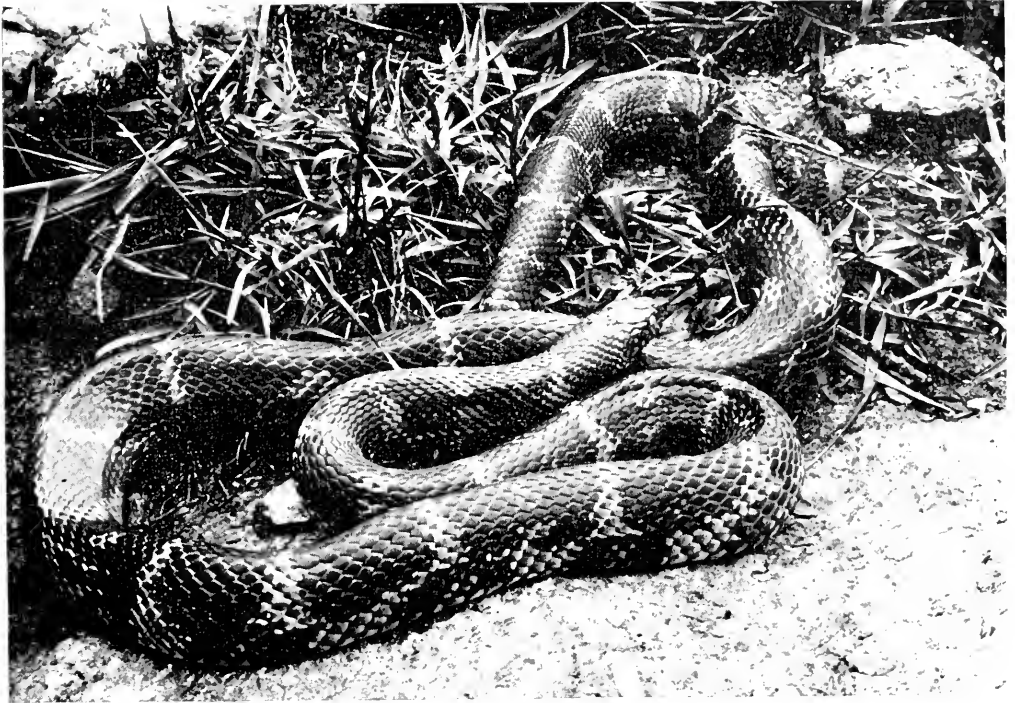
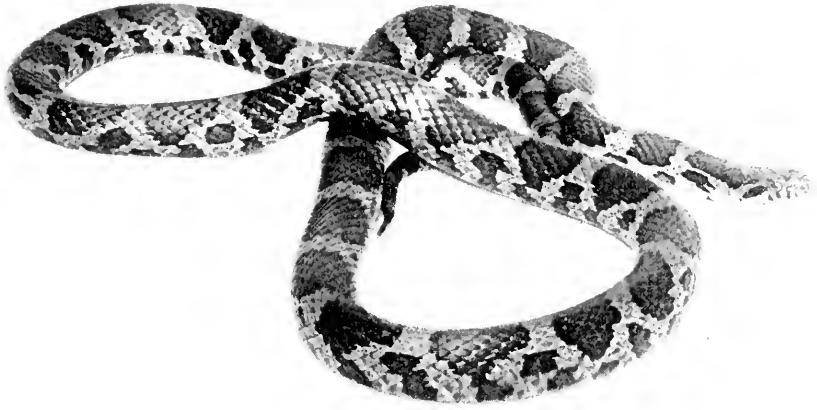


Fig. 13. Milk Snake, *Lampropeltis triangulum triangulum*. Of economic value, yet branded by a common myth alleging that it lurks around barns to steal milk from the cows. It frequents old buildings in search of small rodents, upon which it feeds. The brown blotches also cause the snake to be mistaken for the copperhead.

Fig. 14. (Lower) King Snake, *Lampropeltis getulus getulus*. A southern species, ranging into central New Jersey. It is immune to the poison of venomous snakes and will constrict and eat well-grown copperheads and rattlesnakes.

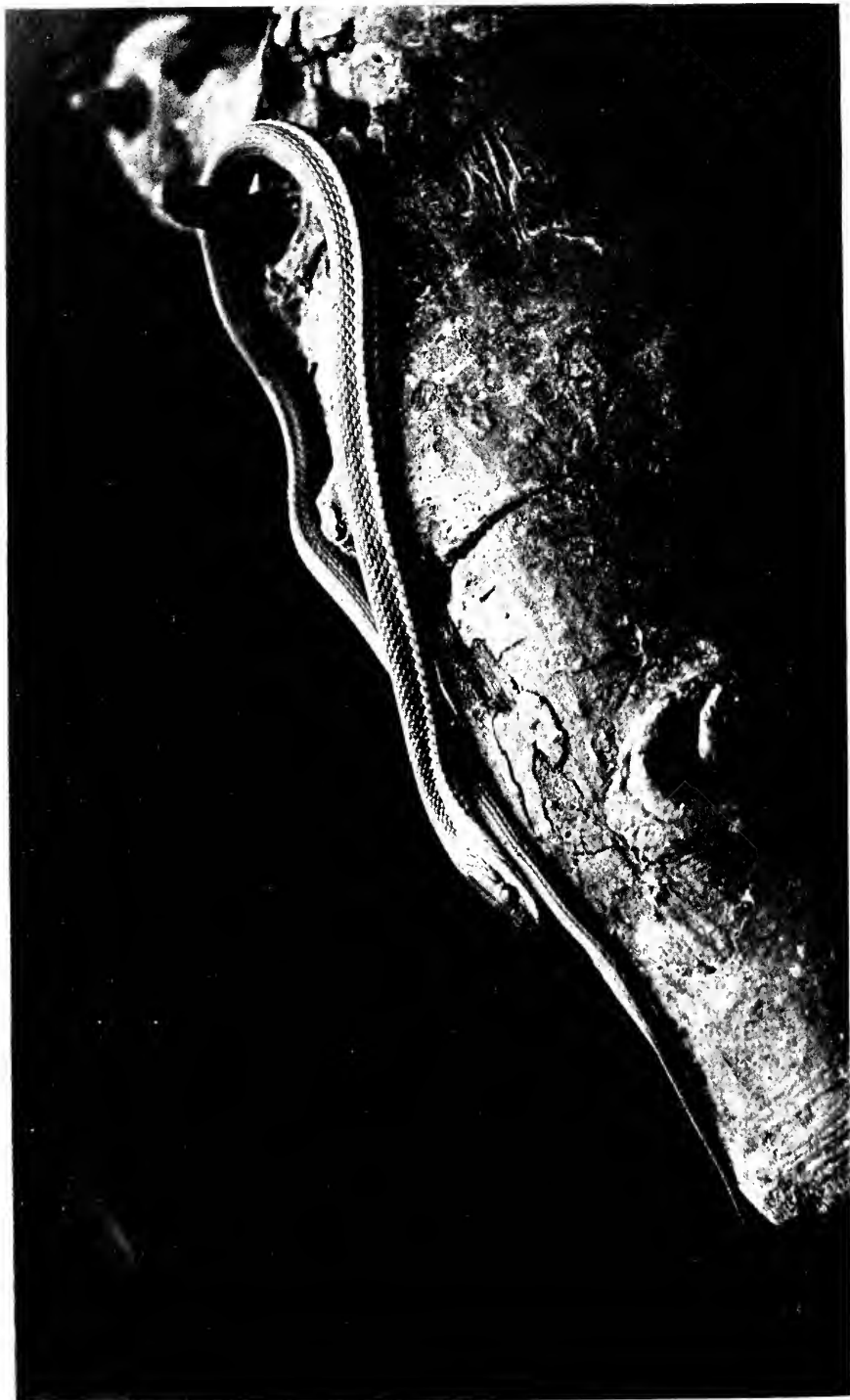


Fig. 15. Striped Water Snake, *Natrix septemvittata*. The range of this species extends but slightly into the westerly portion of the local area covered in this article. When young, this species looks somewhat like a dark garter snake without a dorsal stripe. Adults are dark brown with three rather obscure dark stripes on the back. Brooks and rather swift streams are the usual lurking places, where specimens sometimes may be seen in bushes overhanging the water.

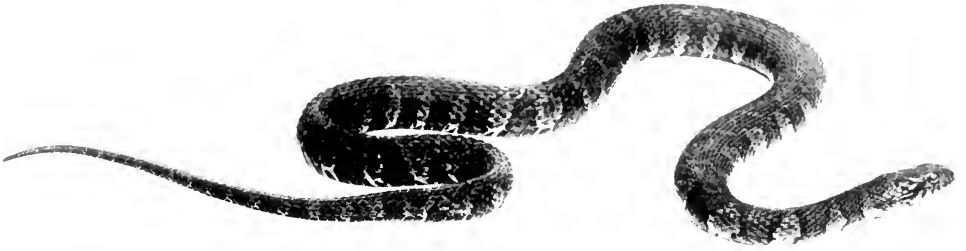


Fig. 16. Water Snake, *Natrix sipedon sipedon*. This is the common brown water snake, which is broadly distributed and so frequently seen along the margins of ponds and brooks, near the crevices of foundations of old bridges, or lurking among the flat stones of disintegrated dams. It is improperly called "water moccasin," a name confusing it with a poisonous water snake of the southern States. There is no poisonous water snake in the northeast.

Fig. 17. (Lower) Young Water Snake, showing distinct markings. Old specimens are usually dull brown above.

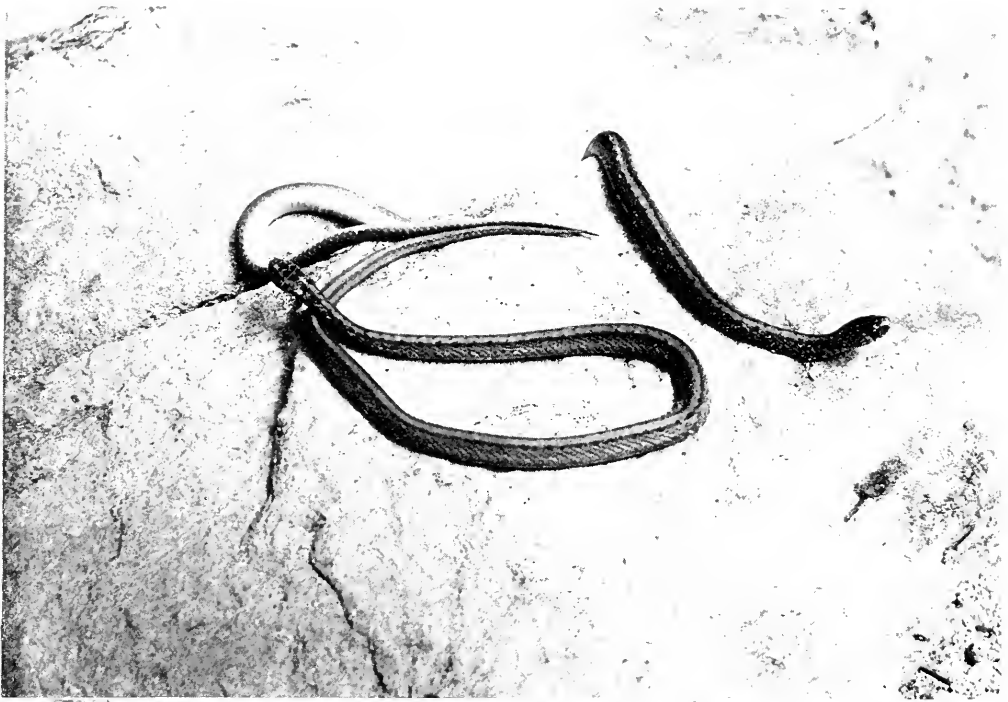


Fig. 18. DeKay's Snake (Brown Snake), *Storeria dekayi*. Seldom over one-quarter of an inch diameter, dull brown in color. Because of its habit of hiding under flat stones, this unobtrusive little serpent has survived in areas where other snakes have long since disappeared.

Fig. 19. (Lower) Storer's Snake (Red-bellied Snake), *Storeria occipito-maculata*. Similar in form and upper coloration to the species figured above, but distinguished by the brilliant red under-surface. The distribution is largely confined to the more elevated areas. Several color phases are shown. The upper central figure is a slaty gray specimen from the Catskills.

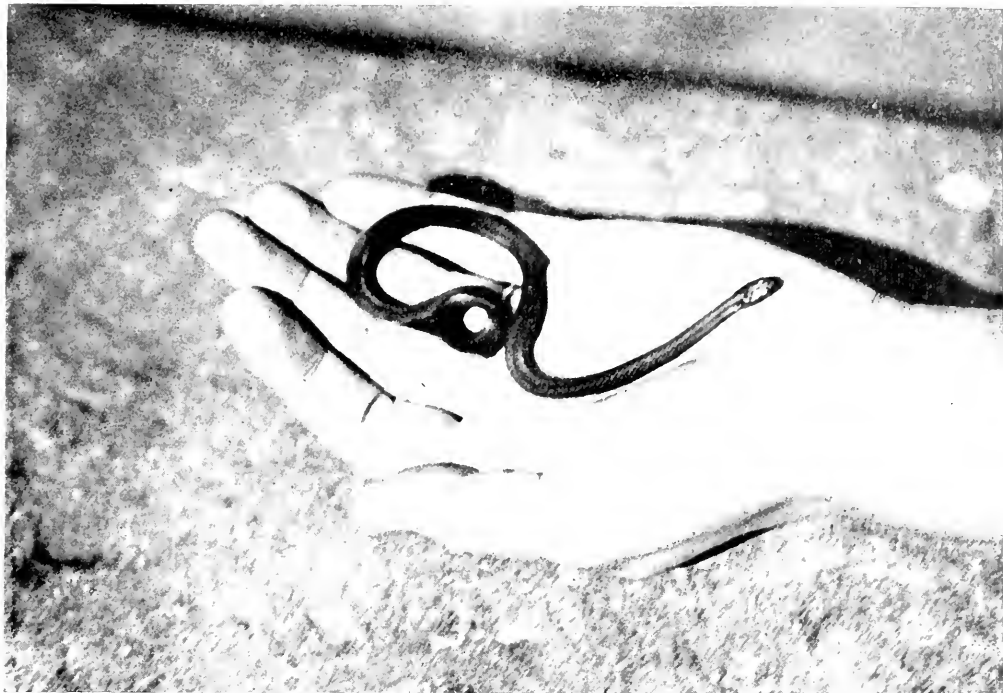


Fig. 20. Storer's Snake (Red-Bellied Snake), *Storeria occipito-maculata*. Indicating the dimensions of an adult specimen from Sullivan County, New York. The food of the three species of little brown snakes (including the species shown below) consists largely of earthworms, although the young are so diminutive that they search for the soft-bodied larvae of small insects.

Fig. 21. (Lower) Smooth Brown Snake, *Virginia valerieae valerieae*. Ranges only into the extreme southerly area of the northeastern States. Immediately distinguished from the other brown snakes by its smooth scales.



Fig. 22. Ribbon Snake, *Thamnophis sauritus sauritus*. Two closely related striped snakes occur within the local area. Their general characteristics are clearly shown in the cuts on this page. The ribbon snake is considerably more slender and its side stripes are higher up on the sides than those of the commoner garter snake.

Fig. 23. (Lower) Garter Snake, *Thamnophis sirtalis sirtalis*. Most abundant and generally distributed of any of the local species. A large specimen is about three feet in length. The central stripe is indistinct on occasional specimens.

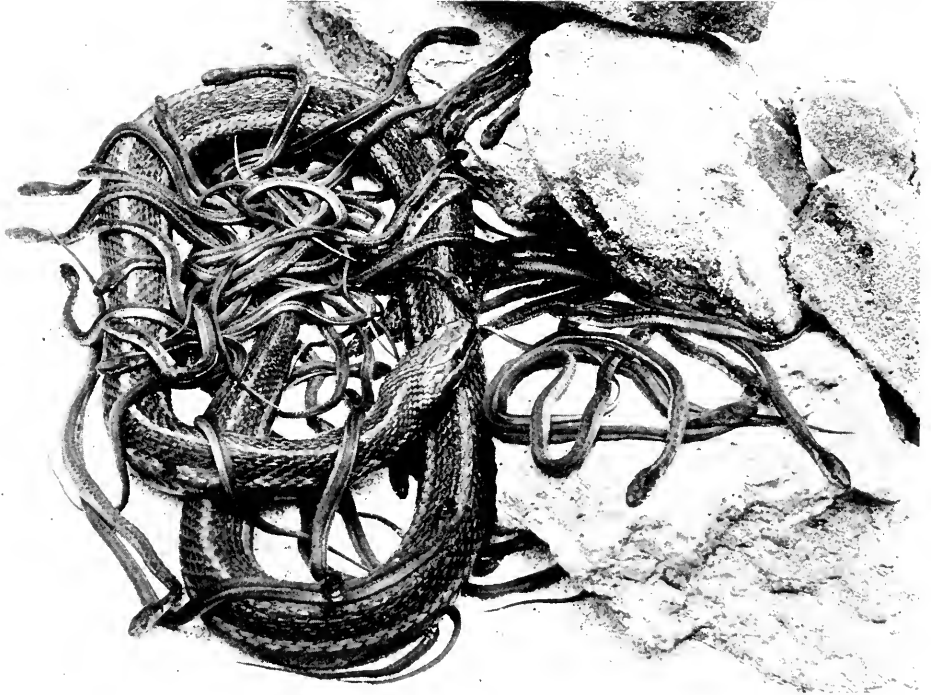
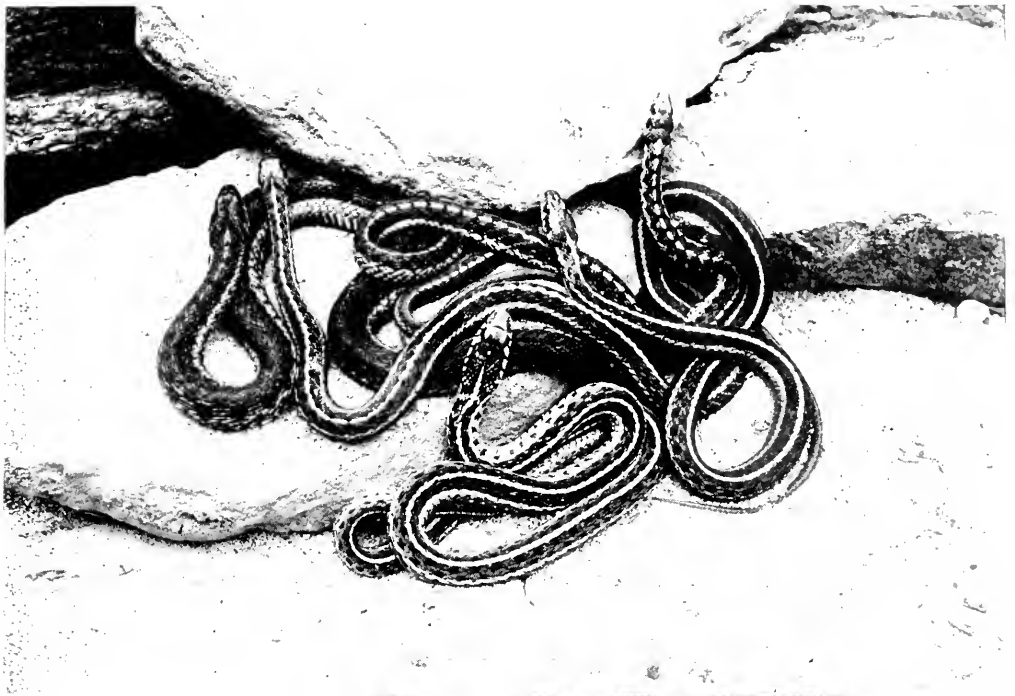


Fig. 24. Varieties of the Garter Snake, *Thamnophis sirtalis sirtalis*. The specimen at the left is from the Kittatinny Mountains, and the central or dorsal stripe is lacking.

Fig. 25. (Lower) Garter Snake and young. The presence of the young near a viviparous parent does not indicate parental care. The young reptiles are immediately ready to shift for themselves when born, although they may incidentally remain near a crevice where the mother is sunning. Litters of garter snakes and water snakes vary from a dozen to more than fifty.



Fig. 26. A Copperhead blended with the tints, tones and shadows of its lurking place. These dangerous snakes are extremely difficult to see when coiled among fallen leaves, which is a common habitat. All of this goes to show the necessity of care in placing the bands when picking flowers or climbing, or in walking through brushy places with thin stockings and low shoes.



Fig. 27. Copperhead Snake, *Agkistrodon mokasen mokasen*. Coloration is vivid and rather characteristic. The body hue is pale brown or reddish brown, with large blotches on the sides like inverted "Ys." These are of rich, chestnut brown. Examined from above, a number of the markings will be seen to unite across the back, giving the outline of an hour glass.



Fig. 28. (Lower) Massasauga, *Sistrurus catenatus catenatus*. A small rattlesnake which ranges easterly into the local area in a limited portion of western New York. Its rattle is an immediate point of identification.

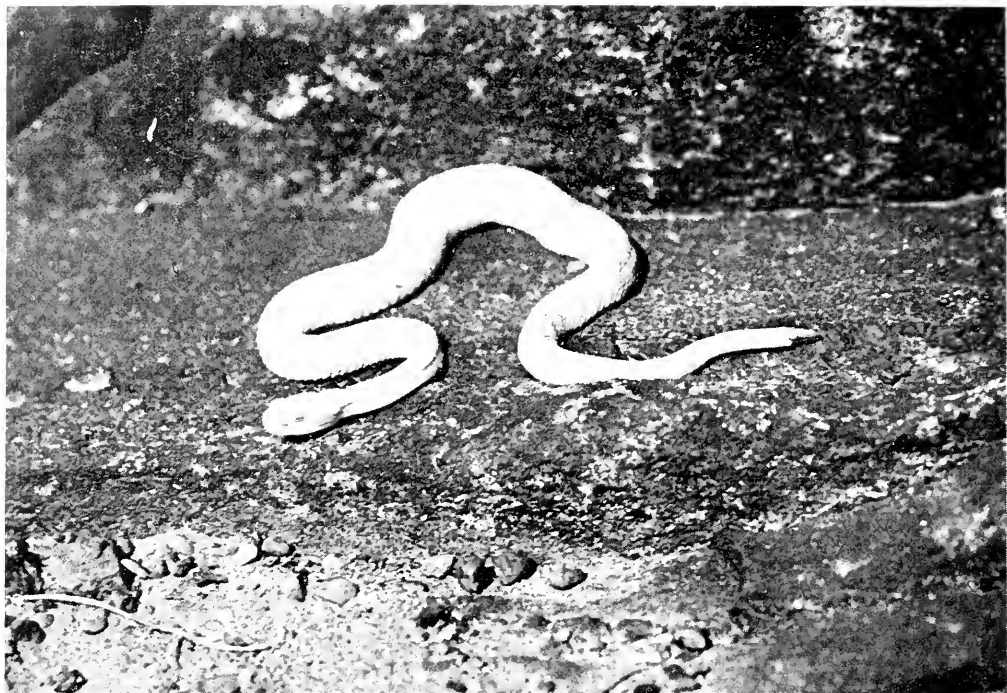


Fig. 29. Albino Timber Rattlesnake, *Crotalus horridus*. Albinism among serpents is fairly frequent. This specimen was discovered at Black Rock, near Sheffield, Massachusetts. It was twenty-five inches long. A second specimen, apparently a year older, was found at the same den the following year.

Fig. 30. (*Lower*) Timber Rattlesnake, *Crotalus horridus*. Typical example of the species of rattlesnake broadly distributed over the northeastern area in the neighborhood of mountains and ridges. Yellow and blackish examples are equally common.



Fig. 31. (Left) Eye of the Hog-nosed Snake, showing the round pupil typical of the local non-poisonous snakes.

Fig. 32. (Right) Eye of the Copperhead, showing the elliptical pupil that identifies the local poisonous snakes.

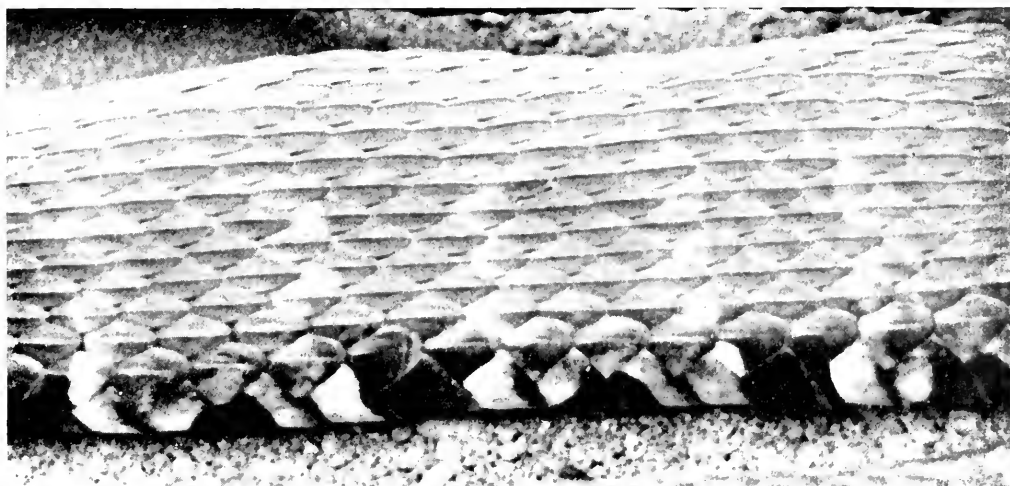
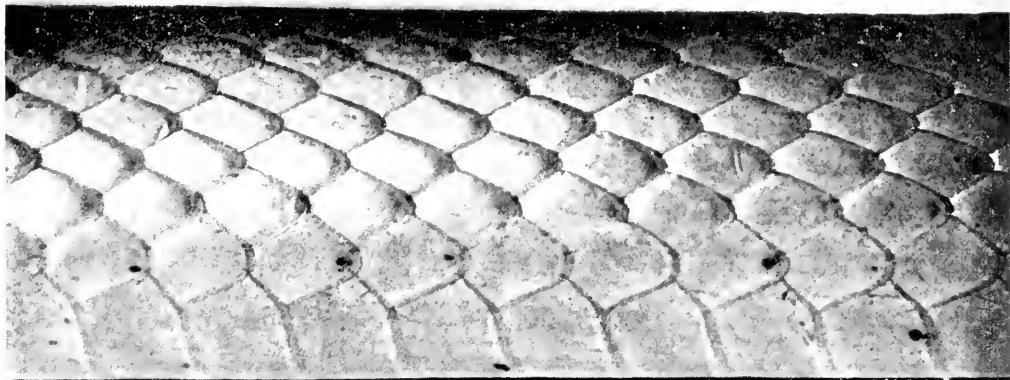


Fig. 33. Typical smooth, or unkeeled, scales. (Blacksnake).

Fig. 34. (Lower) Strongly keeled scales of the Water Snake.

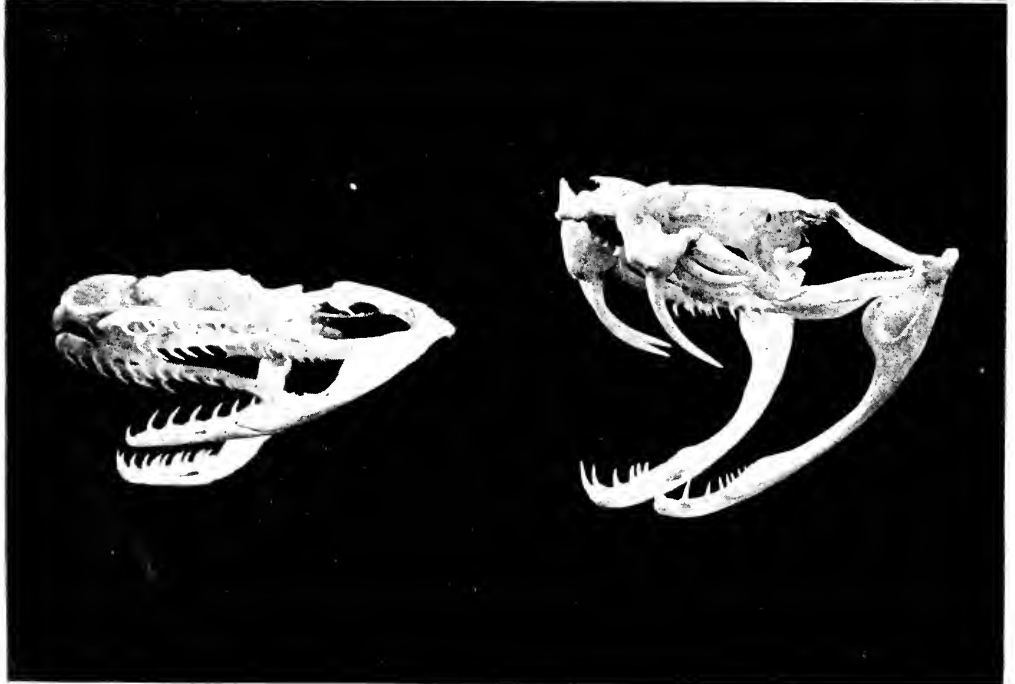
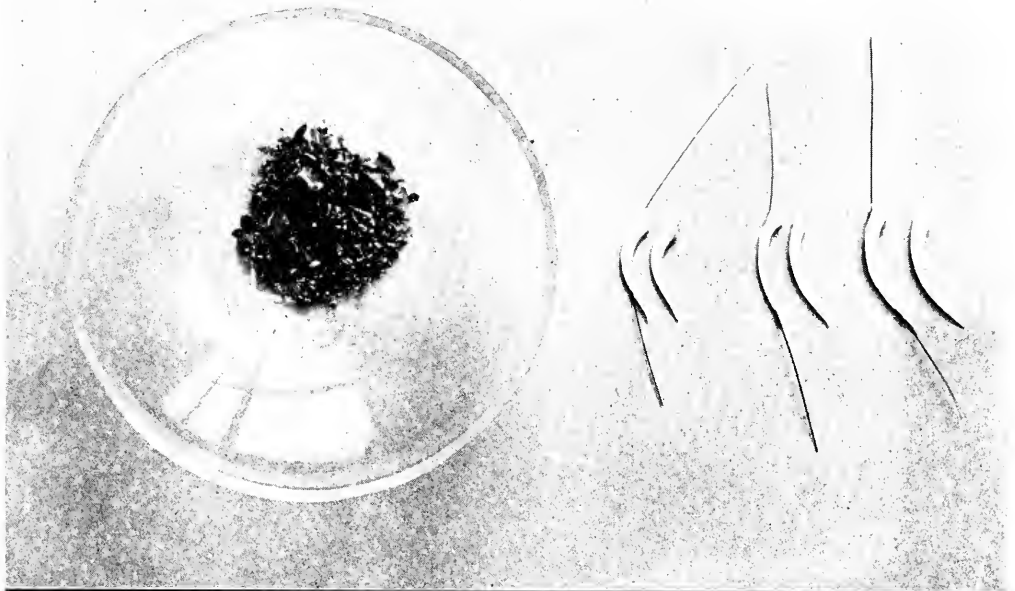


Fig. 35. Dried crystals of rattlesnake poison. It is dehydrated after extraction from the snake to prevent decomposition. When used for immunization in producing antivenomous serum, it is quickly soluble in distilled water. It retains its potency for years in a dried state. (*Right*) Fangs of Rattlesnake, Fer-de-lance and Bush-master, with horsehair passed through the orifice which extends from tip to the base, to show the resemblance to the hypodermic needle of the surgeon.

Fig. 36. (*Lower*) Skulls of harmless and poisonous serpents. The latter shows reserve fangs and a double fang on right—one of these about to be shed.



Fig. 37. A Copperhead Den. This typical formation of shelving rocks at the top of a ledge illustrates the kind of place it is well for picnic parties to avoid, and where care should be used when the hands are employed in climbing, or if a person is walking about in low shoes, with ankles and legs unprotected. The rocks cover deep, sheltering crevices, in which numbers of snakes may be lurking.

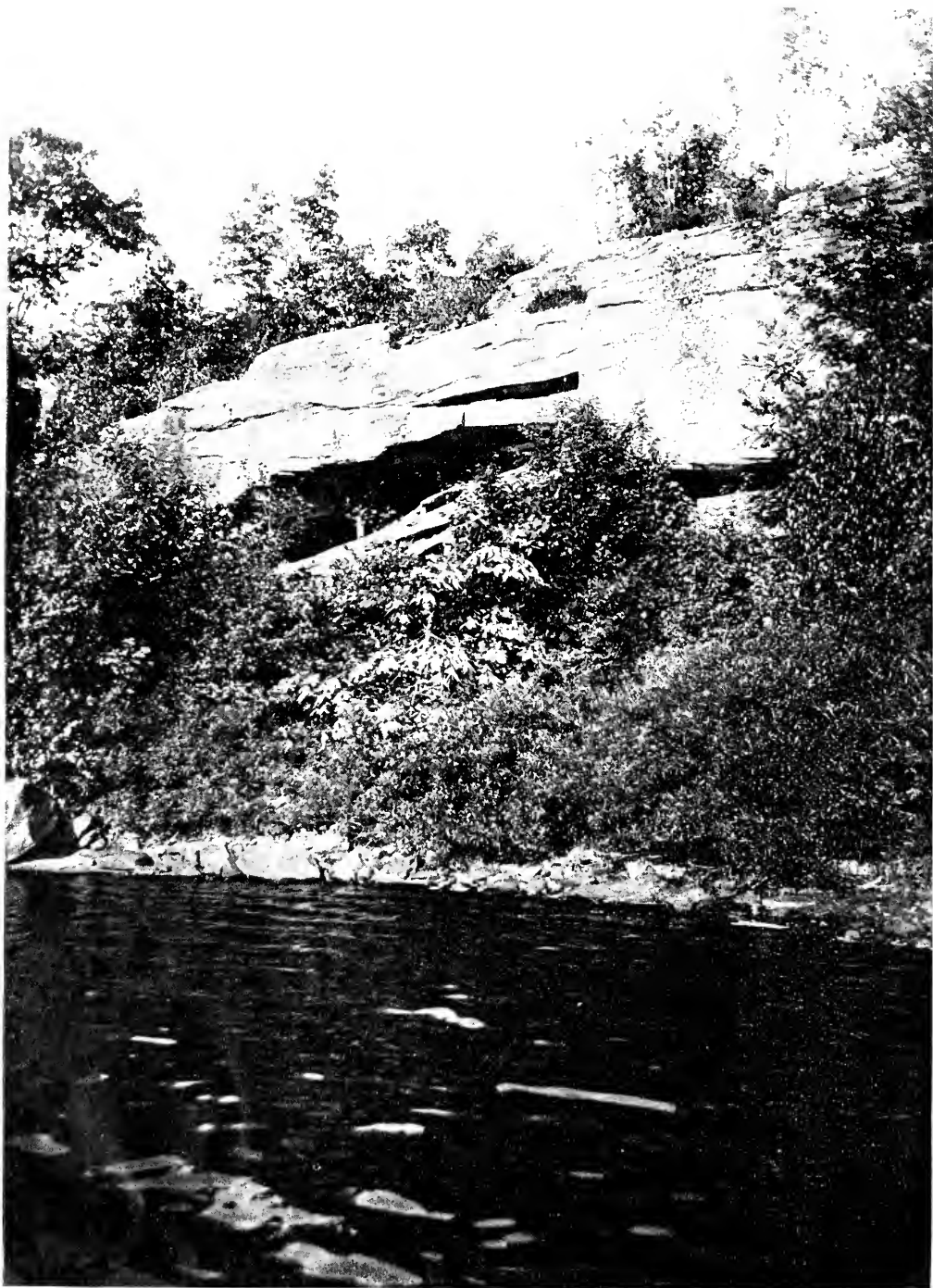


Fig. 28. A Rattlesnake Den. Portion of a ledge in Sullivan County, New York, which extends a distance of several hundred yards, with numerous lesser ledges behind it. The top is covered with loose, shelving rocks, many of them covering deep crevices. The great fissure in the center is about five feet high and extends in about twelve feet, when it narrows to a crevice of great depth. Numbers of rattlesnakes congregate at this den every autumn to hibernate.

The Poisonous Serpents of the New World

A Comparative Review

By

RAYMOND L. DITMARS

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