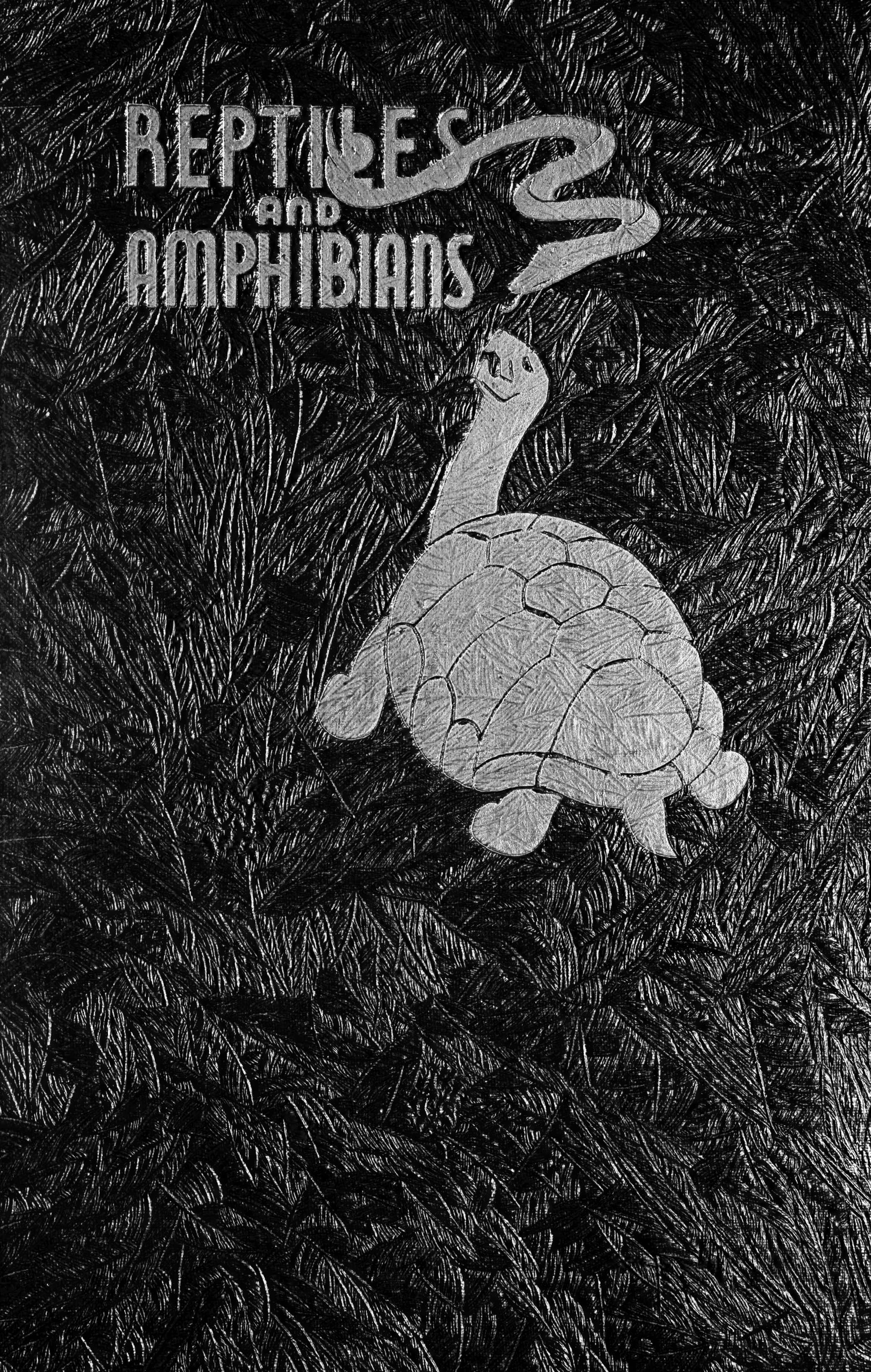
REPTILES AND AMPHIBIANS



AMERICAN MUSEUM OF NATURAL HISTORY

REPTILES AND AMPHIBIANS

(NYZP)

Ralph De Sola, Federal Writers' Project.

GIGANTIC GALAPAGOS TORTOISE

REPTILES AND AMPHIBIANS

AN ILLUSTRATED NATURAL HISTORY

Prepared by

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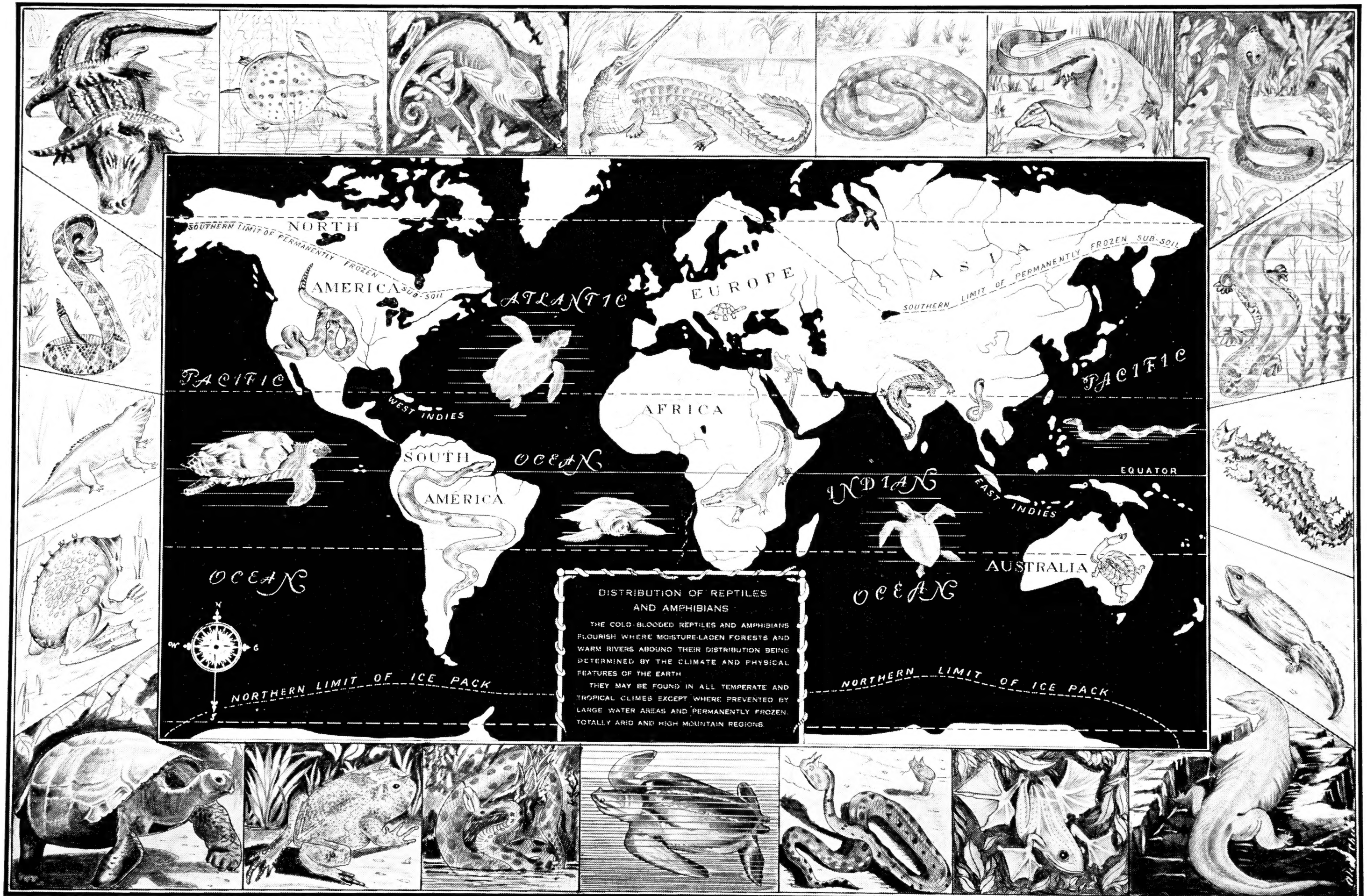
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DISTRIBUTION OF REPTILES AND AMPHIBIANS
THE COLD-BLOODED REPTILES AND AMPHIBIANS FLOURISH WHERE MOISTURE-LADEN FORESTS AND WARM RIVERS ABOUND THEIR DISTRIBUTION BEING DETERMINED BY THE CLIMATE AND PHYSICAL FEATURES OF THE EARTH
THEY MAY BE FOUND IN ALL TEMPERATE AND TROPICAL CLIMES EXCEPT WHERE PREVENTED BY LARGE WATER AREAS AND PERMANENTLY FROZEN, TOTALLY ARID AND HIGH MOUNTAIN REGIONS.

FOREWORD

Reptiles and amphibians are perhaps the most engaging of all animals, and the least appreciated. Man has made friends with most of his other fellow animals. Dogs, cats and birds have long been his household companions; he rides on the backs of horses, camels and elephants; cows eat his hay in exchange for their milk; he admires the sleek beauty of the lions and polar bears in the zoo; and in the evening he even chuckles at movies which have as actors animated and likable representations of mice, ducks, pigs and hens.

Yet, to date, very few people have had many kind words to say for the snakes and other reptiles or even for their distant cousins, the toads, frogs and kindred amphibians. Ever since the Garden of Eden most of us have gone on the assumption that creatures gliding on their bellies (which some of them do, of course, merely because they have no feet) must be inherently evil and frightening.

Actually, there is almost no ground for such an attitude on our part. Some snakes and a few crocodiles will attack man when provoked or frightened, but so will almost all the larger animals; even, under certain conditions, such timid creatures as deer and mice.

As a matter of fact, "snake stories," no matter how entertaining they may seem, usually should be classed with "fish stories" as far as their veracity is concerned. And this is a pity, for the true stories of the serpents are frequently even more fascinating than the fictional.

There is no truth, for instance, in the story of the "hoop snake" which puts its own tail in its mouth and rolls briskly downhill; but it is true that there is a boa so timid that it frequently rolls itself into a ball, which can be rolled along the ground or even tossed in the air.

It isn't true, either, that some snakes are able to milk cows; but there actually is an even more astonishing reptile, the tuatara, which has three eyes, the third set neatly in the top of its head.

Of course, there are snakes and crocodiles which cannot by any stretch of the imagination be regarded as house pets. Some of them are dangerous — almost as dangerous when frightened or annoyed as a mountain lion, for instance, or a grizzly bear.

But for every venomous snake which is likely to attack a man there are hundreds of reptiles which befriend human beings by eating mice and insects. Some, such as the king snake and the black snake go even further by devouring poisonous reptiles. Some of these gentler snakes can even be trained to have confidence in friendly human beings, and to regard a garden or a lawn as their protected home, much as do pet toads.

It has been the aim of this book to sift the facts from the fanciful stories of the reptiles and amphibians. The scientific story of these cold-blooded creatures is seldom as fantastic as the one based on superstition; but it is frequently even more readable and exciting.

All of the living representative reptiles and amphibians — crocodilians, tuataras, lizards, snakes, turtles, coecilians, salamanders, newts, frogs and toads — have been included in this account. Brief introductions to these two classes and their orders precede each chapter of the book and serve to epitomize and classify the species. Unless otherwise stated, the dimensions given in the text are average — not maximum.

It is sincerely hoped that our readers, after studying this book with its many photographs, drawings, maps and charts, will be in a position to assure others that the majority of reptiles and amphibians are peaceful, quiet, useful and inoffensive creatures, ill deserving the evil reputation which ignorance of their true nature has given them and certainly meriting man's protection and conservation.

ACKNOWLEDGMENTS

The following persons and their institutions cooperated to a considerable extent in the production of the book. They are in nowise responsible, of course, for editorial opinions, or possible errors that may have crept into the text. We extend to them our thanks and appreciation for their institutional services which went far to provide this work with its wealth of illustrations.

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Some photographs were made in a few of the foregoing institutions by members of the Federal Writers' Project. In such instances the institution's initials appear under the illustration: (CPM)—Central Park Menagerie, (NYA)—New York Aquarium, (NYZP)—New York Zoological Park, (NZP)—National Zoological Park, (SIZ)—Staten Island Zoo.

We are especially grateful to those well-known naturalists and herpetologists, Dr. Raymond L. Ditmars, Curator of Mammals and Reptiles of the New York Zoological Park, and Clifford H. Pope, one-time Assistant Curator of Herpetology of the American Museum of Natural History, who undertook to read and check our manuscript. Their many authoritative suggestions and comments have been incorporated in the printed text.

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REPTILES AND AMPHIBIANS

REPTILES

(Crocodilians, The Tuatara, Lizards, Snakes and Turtles)

"Reptile" is still a horrid word to many despite the fact that comparatively few species are deadly, and that most of these do not attack man unless provoked. Long popular association of the word with such adjectives as "slimy," "deadly" and "poisonous" has endowed reptiles with a largely undeserved notoriety.

It may be less dramatic, but much more truthful, to divest them in part of their sinister reputation, for few of the five thousand living species are cause for human worry. For example, if one were to meet all twenty-five living species of crocodilians, most of them would sidle out of the way; the encounter with the remaining few might, of course, prove embarrassing. Only two of the twenty-five hundred species of lizards are known to be poisonous, and these "Gila monsters," less than two feet long, have great difficulty in inflicting fatal injury upon a human. Snakes, of which there are approximately twenty-three hundred species, are mostly harmless; poison-injecting serpents dangerous to man comprise less than ten per cent of the total, and there are probably less than six species of constrictors capable of constricting man with their muscular coils. Turtles, including the greatly feared snappers, rarely inflict wounds and are about the most innocuous members of the reptile class. The single rhynchocephalian, the tuatara of New Zealand, molests no one and is amiable enough to share its burrow with nesting sea birds.

It is generally uninformed persons who circulate the fanciful yarns about snakes milking cows or rolling downhill in hoop fashion with the ends of their tails clutched in their mouths and, finally, swallowing themselves whole by working their jaws up from the tail.

From the viewpoint of man, reptiles play a useful role in maintaining

the balance of nature. The harmless and unoffending snake which feeds on troublesome insects and rodents is frequently a victim of ignorance and unreasoning fear.

Reptiles provide excellent leathers for fancy luggage and shoes. Turtle soup and terrapin stew have long been acknowledged delicacies, and in recent years rattlesnake meat has been making a bid for popular approval.

Jewelers and furniture inlayers use the shell of the hawksbill turtle for its decorative quality.

Primitive tribes still use reptiles in preparing charms, love potions, medicines and musical instruments, as well as for food. Salted crocodile tails, turtle eggs, fried lizard bones, and snake hearts are alleged to stimulate the love instinct.

Reptiles occupy an evolutionary position between the original inhabitants of the sea and those of the land and air. They might be said to be the children of the fishes and amphibians and the parents of the birds and mammals.

The genealogy of the modern reptiles goes back for more than one hundred and fifty million years to Carboniferous times, when they appear to have evolved from certain amphibians. In the Permian period the reptile class branched out into nearly twenty orders. One of these included the forerunners of mammals and another the forerunners of birds. Except for the four living orders of reptiles which are treated in this volume, the rest are extinct and are known only from fossilized remains.

Reptiles probably originated in the waters of the Paleozoic era when strange armored fishes were the dominant form of vertebrate life. Probably a group of fishlike amphibians, faced with extermination by drying pools and streams, crawled overland to reach other waters and so for the first time established life on land. When, through long evolutionary processes, some of these ancient amphibians completely freed themselves from the water, permanent land dwellers appeared.

In the long course of time the primitive reptiles, descendants of the amphibians, gave rise to a great number of creatures which dominated land, sea and sky for about one hundred million years. This period, the Mesozoic, is also known as the Age of Reptiles.

Some reptiles, such as the birdlike *Ornithosuchus,* became swift-running, bipedal animals. Others, the *Geosaurus,* ancestor of our modern

crocodilians, slid back to the less competitive and sluggish life of the sea. The pterosaurs were unique even among the odd specimens which the early ages developed from the initial reptiles, for they were winged animals with wing spans as great as twenty feet. Gigantic flesh-eating monsters such as the tyrannosaurs (tyrant reptiles) developed, some of which were almost fifty feet long, twenty feet high and weighed thirty tons. The *Tyrannosaurus* would stand on his massive hind legs and use his clawed forearms and great teeth to tear his prey to pieces. It was the heyday of such dinosaurs as the *Brontosaurus* or thunder lizard, the largest monster ever discovered, which weighed as much as thirty-five tons. They were strict vegetarians and consumed about five thousand pounds of green fodder daily. Despite their great bulk these peanut-brained goliaths were easy victims for the more ferocious, though smaller, flesh-eating animals.

Then, perhaps due to climatic changes and their lack of adaptability, most of these gigantic reptiles disappeared. A few, however, evolved into different forms, and to them can be traced the ancestry of virtually all living reptiles, birds and mammals.

In size, if in nothing else, the reptilian descendants of those gargantuans, are quite inferior. The longest reptiles today, such as the crocodiles and the pythons, do well to attain a length of thirty feet; even these are diminutive alongside the extinct dinosaurs, some of which grew to more than three times that length. The trunkback or leathery turtle, largest of living reptiles, seldom exceeds half a ton in weight and only averages an overall length of six feet.

Modern reptiles are described and classified as follows:

CLASS:

REPTILIA — the reptiles comprise about five thousand living species of crocodilians, tuataras, lizards, snakes and turtles. All are backboned animals breathing air by means of lungs. They have four-chambered hearts and a variable body temperature that generally corresponds with the temperature of the surrounding air or water. Protection is afforded by a covering of scales or plates. All have ribs and teeth, except the tortoises, whose jaws are armed with sharp, horny sheaths. Most of them have long tails. Reptiles reproduce by means of internal fertilization and lay

shell-covered eggs; in some cases their young are brought forth alive.

ORDERS:

CROCODILIA — the crocodilians (alligators, caymans, crocodiles and gavials). These are four-limbed reptiles of medium or large size, four to thirty feet in length, with elongated jaws. There are now twenty-five species.

RHYNCHOCEPHALIA — the tuatara. A four-footed, lizard-like reptile. Only one species, found in New Zealand, is now extant.

SQUAMATA — the lizards and snakes divided into two sub-orders:

LACERTILIA — the lizards. Reptiles with the two halves of the lower jaw fused in an immovable bony suture. Most of the twenty-five hundred species have functional eyelids.

OPHIDIA — the snakes. In snakes the two halves of the jaw are connected by an elastic ligament. They lack movable eyelids. About twenty-three hundred species are known.

CHELONIA — the terrapins (found in fresh water), turtles (salt water) and tortoises (land). The limb girdles are enclosed in the ribs, which form a boxlike covering. There are about two hundred and fifty species.

The following modern characteristics of the reptiles demonstrate the progress from aquatic to terrestrial life. The reptile skin is dry and covered with horny scales or scale-like folds of skin, unlike that of the amphibians which breathe principally through the skin and secrete a slimy substance to keep it moist. Breathing is performed almost entirely by the lungs. The mode of reproduction, too, is that of land rather than sea dwellers.

Strictly speaking, reptiles are not "cold-blooded." Their temperature is determined by the heat of their surroundings and the extent of their muscular activity. However, as they lack sufficient heat to hatch out their young, incubation, except in a few live-bearing species, is performed by

the sun's heat or the heat resulting from the fermentation of decaying plant matter.

In the amphibians a three-chambered heart propels the blood, but in reptiles there has emerged a four-chambered organ. This type is carried forward by the birds and mammals, which are still higher forms of evolutionary development.

The theory that the more individual variations a group possesses, the greater is its chance for survival, is exemplified by the reptiles. And each species, with its different environment, has developed along individual lines. For instance, there is a considerable range of locomotor adaptations. Snakes, lacking functional limbs, travel by lateral, undulating waves of the body muscles; most lizards and all turtles are four-limbed; crocodiles swim chiefly by strokes of the flattened tail; and the "flying dragon" lizard of the Indo-Malayan region, while it does not actually "fly," soars glider-like from tree to tree by means of its distensible winglike skin membranes.

Thus, while reptiles have retained such common features as the dry, scaly skin, their dissimilarities are even more striking. Tree snakes tend to have long slender bodies which enable them to "swim" over the leaves and branches. Often cave dwelling reptiles are without skin pigment and sight. Desert dwellers generally have the pallid coloration of their surroundings.

Suited to their environment, many reptiles, like other animals, have a protective coloring which blends with the background and makes them virtually invisible. Some reptiles are able to assume various colorings; for example, when some lizards want to attract mates during the breeding season, their skins assume the bright and glaring colors of the dandy, thereby probably aiding members of the same species to locate each other.

Other means of protection include bony shells, poison and musk dispensing glands, and organs of smell to catch the scent of an approaching enemy. The flattening of the cobra's hood, the rattle of the rattlesnake, and the hisses of other species might be considered as means of protection for they possibly notify the enemy to stay away — or suffer the consequences. It is also possible that these reactions are mere manifestations of fear.

Such illustrations, chosen at random, reveal the intrinsic appeal of one of the most important divisions of the earth's inhabitants, neighbors of man with which man should become acquainted.

CROCODILIANS

(ALLIGATORS, CAYMANS, CROCODILES AND GAVIALS)

THE RIVERS, swamps and marshes of the tropical world are the homes of the crocodilians, longest of living reptiles, except possibly certain specimens of the regal python. In the tropical and subtropical regions their life begins and ends — sometimes at the hands of enterprising big game hunters or commercially minded men who see the beasts as a source of material for sport shoes, bill-folds, belts, luggage and ladies' handbags. Some, however, are spared only to spend their days in idle display for the edification and amusement of urban zoo-goers.

Crocodilians may be divided into twenty-five species, ranging from the thirty-foot Indian gavial to the comparatively diminutive Central American cayman, four feet long at best. Travelers' tales of seventy-foot specimens should be ignored. There are two species of alligators, seven of caymans, fourteen of crocodiles and two of gavials.

All have been credited with many fictitious attributes, including that of being fearsome and dangerous enemies of man. On the whole the crocodilians, if unmolested, would rather run away than fight a man. Still, for safety's sake, it must be borne in mind that there are some man-eating crocodilians which need little more provocation than a pang of hunger to make a meal of a human being.

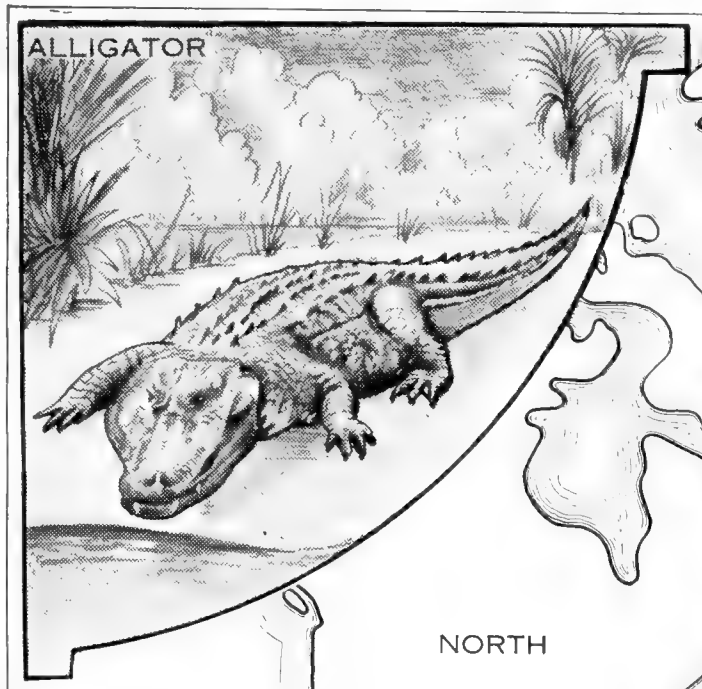
Their food is sought both on land and in water, but it is in the latter that the crocodilians are most efficient. They are able to float with only their eyes and nostrils protruding; a valve shuts off their mouths from their throats so that the jaws may be kept open under water. After sighting a victim, the crocodilian dives down and noiselessly reappears under its prey. If small, the victim is swallowed whole; if the prey is too large for that procedure, the crocodilian may clamp the victim with its jaws, lashing about until the prey is torn to small bits. In the water the saurians revolve rapidly on the long axis of their bodies.

CROCODILIAN DISTRIBUTION

GAVIALS

ALLIGATORS & CAYMANS
Note Caymans are restricted to Central and South America

CROCODILES



NORTH AMERICA

ATLANTIC OCEAN

EUROPE

ASIA

PACIFIC OCEAN

CHINA

PACIFIC OCEAN

CUBA

WEST INDIES

CENTRAL AMERICA

SOUTH AMERICA

AFRICA

INDIA

MADAGASCAR

INDIAN OCEAN

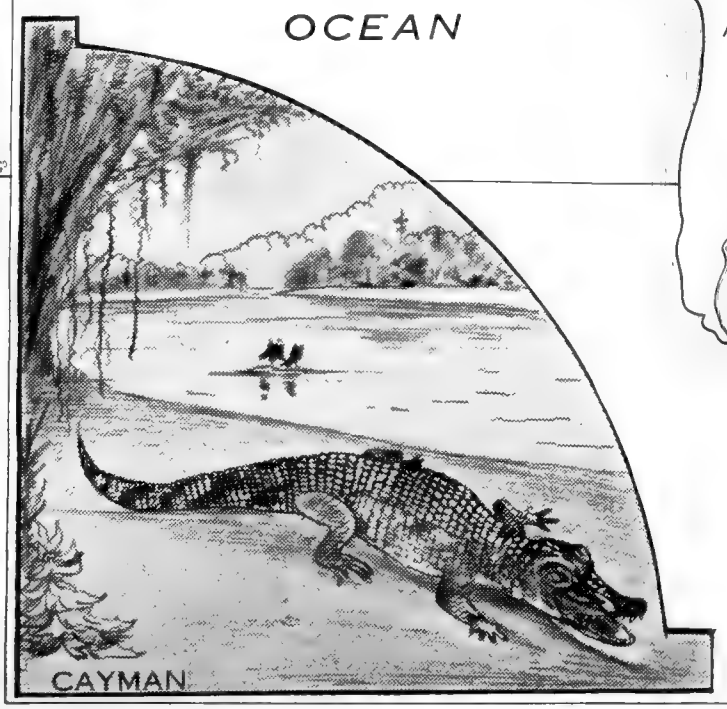
EAST INDIES

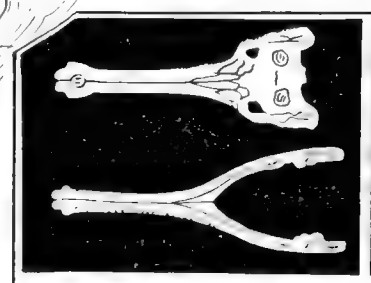
NEW GUINEA

AUSTRALIA

40°

0° EQUATOR

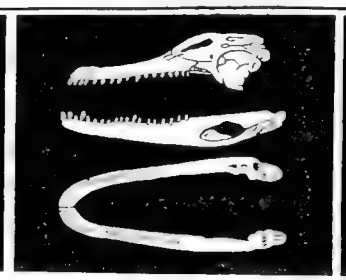




SKULL AND JAW OF THE INDIAN GAVIAL

1. SKULL SHOWING THE TYPICAL CONFORMATION OF THE GAVIAL GROUP

2. JAW SHOWING THE FUSION OF THE TWO HALVES OF THE LOWER JAW EXTENDING BEYOND THE FIFTEENTH TOOTH. THIS IS A DIAGNOSTIC CHARACTERISTIC OF THE GAVIAL GROUP.

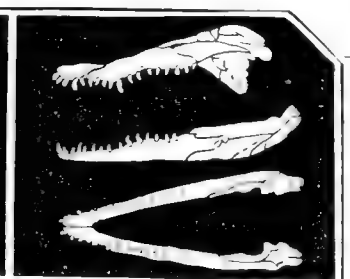


SKULL AND JAW OF THE AMERICAN ALLIGATOR

1 SKULL SHOWING SPACE BETWEEN THE FIFTH AND SIXTH TOOTH. THIS PIT IS CHARACTERISTIC OF THE ALLIGATORS AND CAYMANS

2. LATERAL VIEW OF THE JAW SHOWING THE ELONGATED FOURTH TOOTH WHICH FITS INTO THE PIT MENTIONED ABOVE

3. LOWER JAW SHOWING THE BROAD SPADE-LIKE SHAPE, CHARACTERISTIC OF MOST MEMBERS OF THIS GROUP COMPRISING THE ALLIGATORS AND CAYMANS.



SKULL AND JAW OF THE AMERICAN CROCODILE

1. SKULL SHOWING THE EXPOSED NOTCH FOR THE FOURTH TOOTH OF THE LOWER JAW. THIS IS A DIAGNOSTIC CHARACTERISTIC OF THE CROCO DILE GROUP.

2. LATERAL VIEW OF THE JAW SHOWING THE MUCH ENLARGED FOURTH TOOTH TYPICAL OF THE CROCODILE.

3 LOWER JAW SHOWING FUSION OF THE TWO HALVES EXTENDING TO THE FIFTH TOOTH.

Prepared by A Chern Cartographer

The most remarkable feature in their physiology is related to their aquatic life. One look at the skull of a crocodilian will show that the posterior nostrils are set so far back in the head and are so well separated from the cavity of the mouth by a bony palate that it is impossible for water to enter the breathing passages.

A study of the circulatory system reveals the highest state of development found among reptiles. The heart is four-chambered and supplies blood to the head, trunk and tail through an aorta, in much the manner of higher vertebrates.

The most hostile to man of the crocodilians are the crocodiles, but even some of these appear good-natured. A traveler in the Congo, for example, reported that he found two African tribes, one which ate crocodile meat and was eaten (whenever possible) by the crocodiles, and another tribe which did not use the flesh of these reptiles and was never molested by them. However, the authenticity of such "reciprocity pacts" is open to question and indicates the need for further scientific investigation.

On occasion, when the pools and lakes which most crocodilians frequent in the hot months dry up, they may undertake overland migrations to new and wetter fields. It has been reported that in bygone days some towns in India were invaded by marching armies of water-seeking crocodiles.

At mating time the sexes locate each other by bellowing and emitting a strong musky fluid from glands opening on the underside of the jaw near the throat. The females lay from twenty to ninety oval white eggs at a time on land where the heat of the sun or decaying vegetation hatches them. In some dry and sandy localities the eggs are laid in holes during the wet season.

Almost all tropical countries can claim one or more species of crocodilians. The map of crocodilian distribution shows that, although they sometimes are encountered outside of the tropical zone, they are never found in latitudes beyond the fortieth parallel. Only the range of the alligators and caymans extends out of the torrid zone.

The map is based upon researches made and published by the editor of this book in the *Bulletin of the New York Zoological Society*.

ALLIGATORS

AMERICAN ALLIGATOR

With its short legs hugging its thick, scaly body, the American alligator can propel itself through the water by means of its powerful tail and body more rapidly than a man can paddle a canoe.

But it usually avoids such extreme physical exertion, preferring to loll about in inaccessible swamps. When in the water, it frequently lies quietly with only its eyes and the tip of its nose protruding. Disturbed, it will sink to the bottom. With the characteristic sluggishness of reptiles, it spends much of its time on an exposed bank, basking in the sun.

The desire for food can spur the alligator to greater activity than is its wont. Its meal may consist of muskrats, snakes, insects, fishes, shrimp, pigs, or a number of other delicacies. If the prey is too large to be swallowed whole, the alligator holds the victim in its tooth-studded mouth and shakes it about or revolves with it in the water until it is torn to bits. Sometimes the reptile will drag the prey under water to drown it. And occasionally the victim is kept in the alligator's den until it decomposes and becomes soft enough to be readily swallowed.

On land, the alligator can run rapidly, its body well elevated, and in the dry season it may undertake long cross-country treks in search of water.

At the approach of cold weather, it takes refuge in a den, dug in a mud bank and constructed with an underwater entrance. Here it lies dormant until spring. Should a cold spell surprise it away from home, it will lie in a torpid condition until warm weather returns.

Alligators are in the main wary of man and will attack him only when cornered. Therefore, in approaching an alligator, one should strive to avoid giving it the impression that it is being cornered.

E. A. McIlhenny.

AMERICAN ALLIGATOR GUARDING NEST (*Alligator mississippiensis*). Length: 12 feet. Range: Southern United States.

Its tail is a formidable weapon. A nine-foot specimen, previously thought to be dead, once snapped its tail against the legs of a two-hundred pound man. The blow broke his leg and threw him several feet from the starting point. Since the creature's thick neck prevents the head from turning, the whole body is bent like a bow and then snapped in the reverse direction with tremendous and devastating force.

The tough hide of alligators is traversed by furrows which divide it into diamond-shaped figures. The animal is further protected by rows of bony scutes or scales, which are extraordinarily tough but are not, as popularly believed, bullet-proof.

It has no lips, and its more than eighty, long, conical teeth are naked and prominent even when the mouth is closed. Each eye, equipped with eyelids, is augmented by a third transparent lid. These transparent lids enable alligators to keep their eyes open when submerged in muddy water.

Today eight feet is the average length of alligators, but in past times

when there were fewer hunters and civilization had not overrun almost every available habitat, specimens were taken averaging more than twenty feet. As recently as 1889, sixteen feet was given as the average length.

Longevity of the species is unknown except for records of captive specimens. The title for age seems to go to one old American 'gator kept in the zoological gardens of Dresden for fifty-six years.

Ditmars, Reese and McIlhenny have observed the growth of alligators, and under favorable conditions the rate is about one foot a year for the first six years. Tagged alligators observed in the wild state show that both males and females average a little more than one foot per year until the ninth year, but the males slightly exceed the females in growth; after the fifth year the females increase in size more slowly.

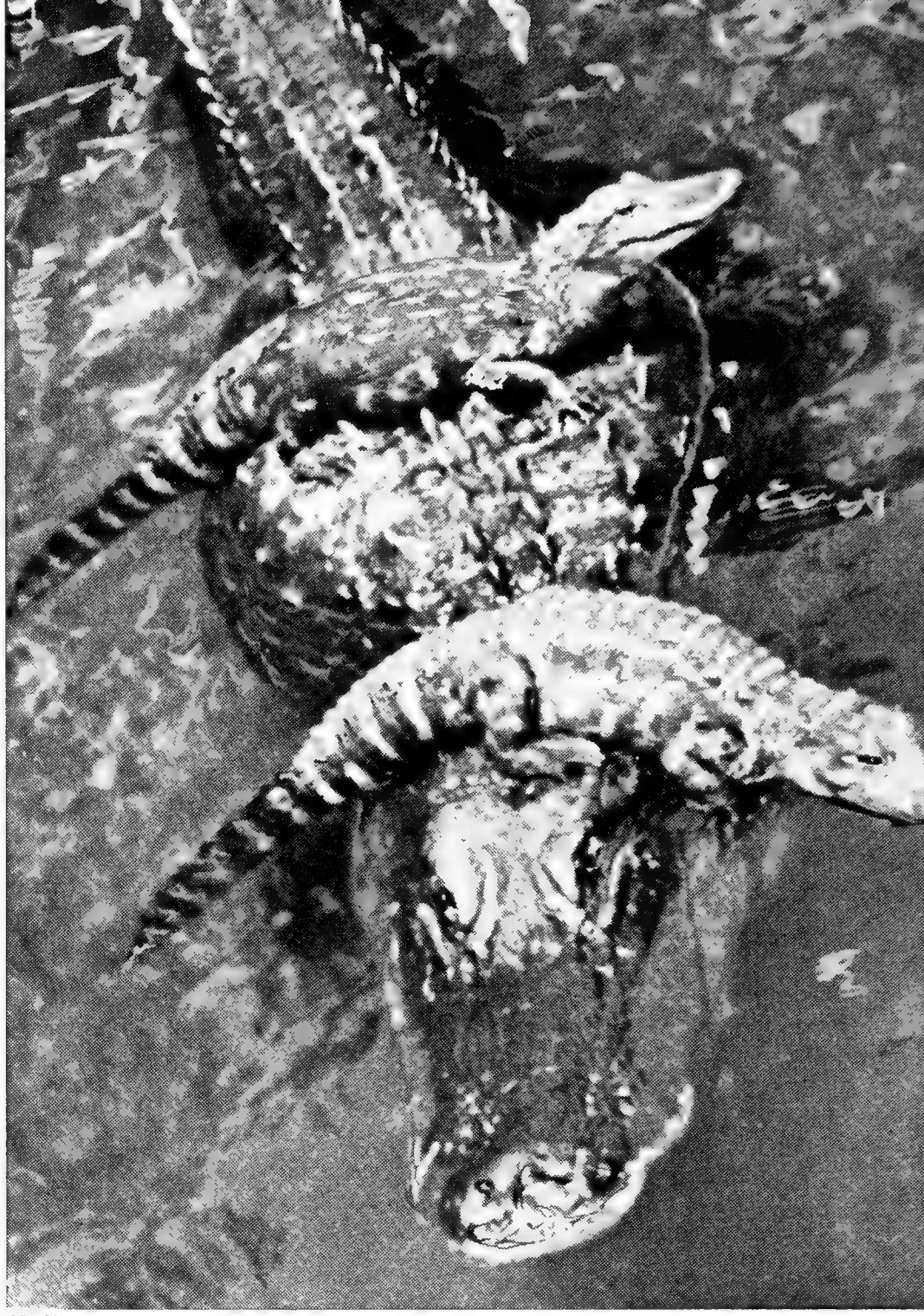
Nine years seem to mark adulthood for females, who begin to lay eggs at that age. Some captive specimens show that they are capable of breeding when nearly forty years old.

During the breeding season, which occurs in early spring, the broad-bodied, heavy-headed males bellow so that they can be heard a mile away. At this time they engage in furious fights, often losing toes, limbs and portions of their tails. They inflate themselves and hiss as they exhale, lashing about violently with their tails and churning the water.

A jet of fine musky liquid issuing from a gland in the male's chin is believed to have the function of attracting the females. In April or May the female seeks a sheltered spot on a bank, and builds a mound of mud and vegetation. There she lays her elliptical eggs, numbering about thirty, and covers them with a heap of vegetable matter. The nests may be as much as three feet high and eight feet in diameter at the base. Regardless of the dryness of the surrounding air, the interior of the nest is always damp, since the females return to wet it during dry periods. Otherwise the eggs would dry out, for they are extremely porous.

The temperature in the mound is fairly constant, ranging from ninety-five to one hundred and five degrees Fahrenheit, even when there is a variation of fifty degrees in the outside temperature. The eggs require about sixty-five days for incubation. During this time the male is utterly unconcerned with domestic affairs, but the mother remains near the nest and will defend it against humans and other animals. Several hours before hatching, the young begin to squeak, whereupon the mother opens the nest

FREE RIDE



(SIZ) *Ralph De Sola, Federal Writers' Project.*

and permits them to escape. Baby alligators are only eight inches long when hatched.

One of the earliest and most colorful accounts of American alligators was written by Sir William Bartram who, alone, paddled an Indian canoe along the St. Johns River in Florida, in 1773.

He described the region as alive with the reptiles. On one occasion they issued from the marshes in such numbers as to completely surround his canoe, "rushing up with their heads and part of their bodies above water, roaring terribly and belching floods of water over me." When a school of fish came down the river, "the alligators were in such incredible numbers, and so close together from shore to shore, that it would have been easy to have walked across on their heads, had the animals been harmless." Adept fishermen, the alligators devoured the fish "by the hundreds of thousands. The floods of water and blood rushing out of their mouths, and the clouds of water and vapor issuing from their wide nostrils were truly frightening." Bartram probably would have been more at ease

had he known that the fierce-looking "dragons" were rather harmless to man.

Since Bartram's time, American alligators have been wantonly hunted and exterminated. From 1880 to 1894, more than two million were killed in Florida alone for their hides. Today they are protected by law, because they eat harmful insects and muskrats which undermine the Mississippi levees.

The use of alligator hide became fashionable in 1855, and during the Civil War it was used extensively for shoes. By 1890 hides were still numerous enough to be bought at ten dollars a hundred. But the result of "fashion" was the destruction of millions of alligators during the nineteenth century.

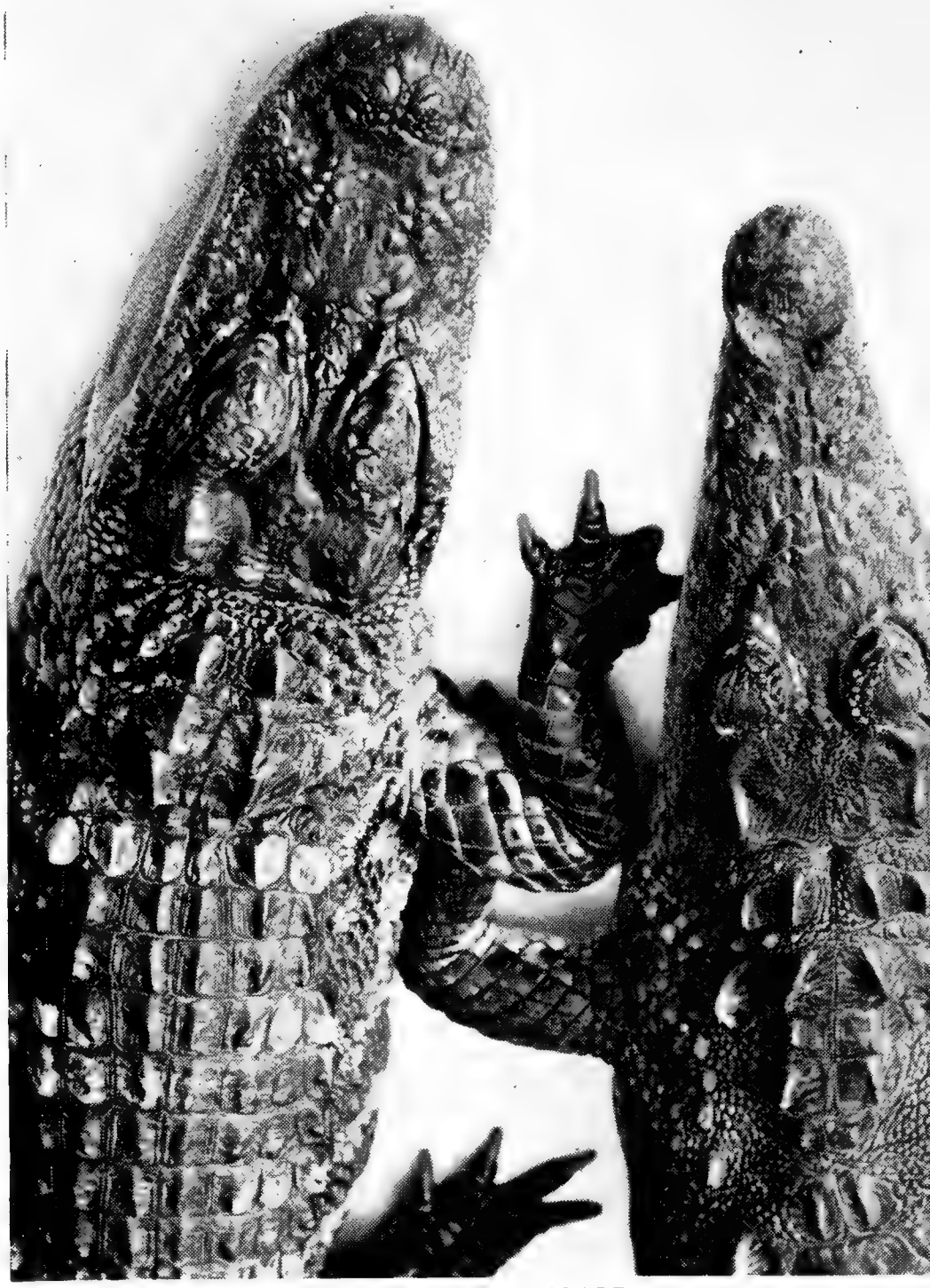
Alligators are hunted by digging down into their underground refuges and prodding their stodgy bulk with a hooked pole. The creature seizes the hook, whereupon it is dragged to the surface and dispatched with a rifle shot. Bull's-eye lanterns are used for hunting after dark.

Contrary to common belief, "alligator farms" do not breed and rear alligators. The "farmers" merely collect many wild-bred young, and exhibit these along with crusty old-timers, Indian curios and other features of interest to tourists.

They have such sideshow features as the alligator "born with only two legs" or "half a tail," and appear blissfully ignorant that generally the loss of an alligator's limbs results from the fights which take place between the males. The farms sometimes sponsor "wrestling matches" between an alligator and a man in which the poor, unoffending beast is mauled and pushed around by the zealous wrestler, who invariably emerges victorious. The farms sell baby 'gators to zoos and to tourists who want unique souvenirs of a southern trip.

Early Spanish explorers in Florida believed alligators to be giant lizards. The name alligator is probably derived from *el lagarto*, the Spanish for lizard.

ALLIGATOR AND CROCODILE COMPARED



From Ditmars' REPTILES OF THE WORLD.

The superficial characteristics of the crocodilians are very much alike. However, some have long flat snouts, while other species have short heavy ones. Crocodilians are generally classified and differentiated by the number of teeth and the structure of head bones. Young specimens are very hard to identify.

CHINESE ALLIGATOR

SMALLER than its American cousin, the Chinese alligator spends its days quietly, but at night moves about a good deal and bellows lustily. The bellowing is accomplished by a rapid exhalation which also seems to remove dust from the creature's nasal passages.

It makes a home by digging a hole, one foot in diameter, sunk obliquely to a depth of about five feet in the grassy river bank. As the cold, dry weather approaches, the alligator begins to enter the hibernation period; it issues less and less frequently from its hole, and finally settles down to await the warm season.

During the warm weather they charge with open mouths. At such times it is conceivable that they may bite, although they usually have to be teased before they seek to inflict injury.

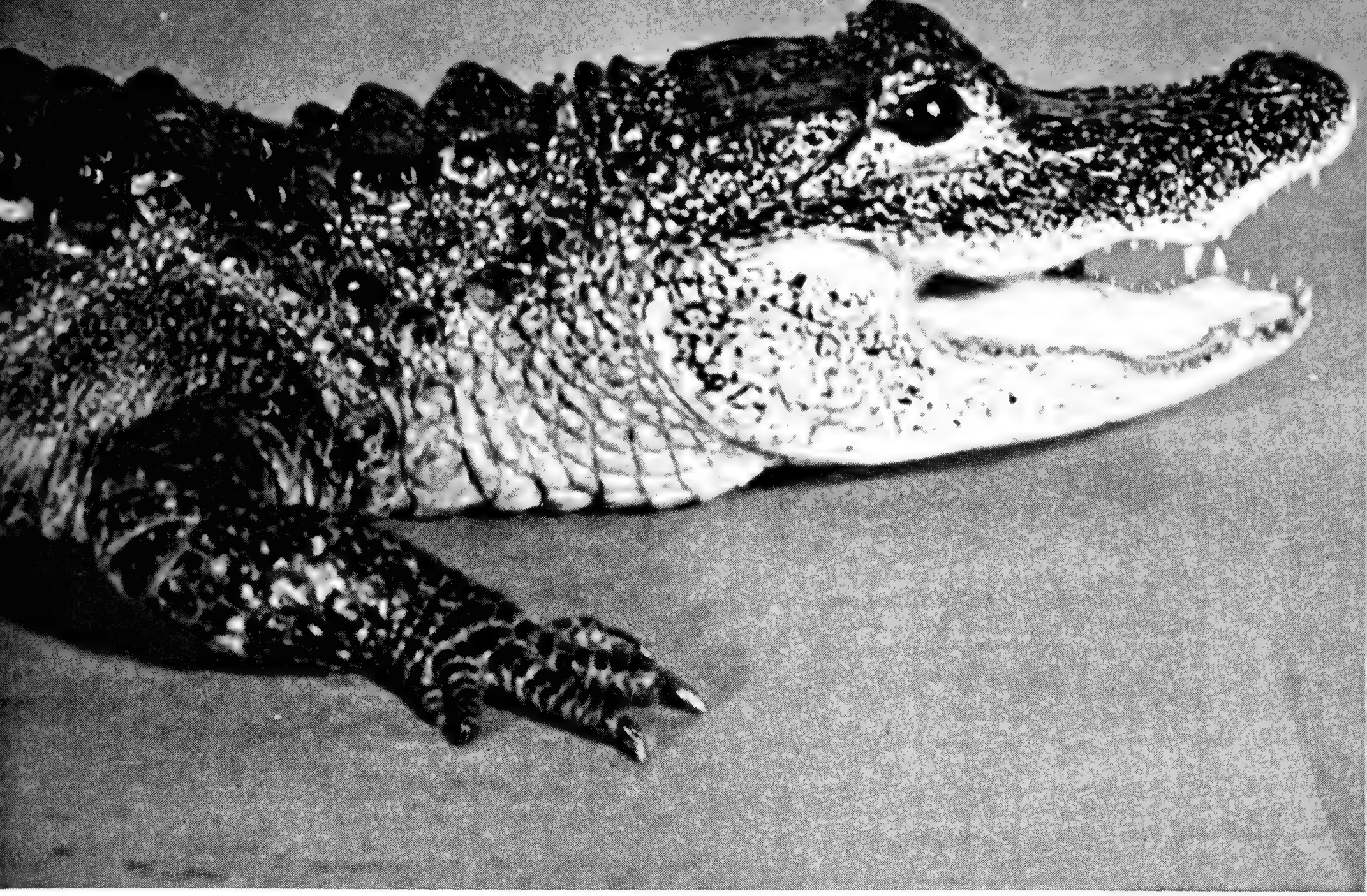
Their food consists in the main of rats, fishes and insects.

In midsummer the Chinese alligator lays ellipsoidal eggs, about as large as ducks' eggs. It builds no nest, carelessly leaving its eggs amid weeds to be hatched by the heat of the sun. At birth the baby 'gators are tan in color, with yellow markings that disappear as they grow. Full grown, they measure a maximum of six feet and are a dull blackish color with irregular, dull yellow cross bands. In captivity one specimen lived for fifty years.

The Chinese alligator first became known to western science in 1879 when A. A. Fauvel wrote an account of it, but specimens were rare outside of China until 1922 when Clifford H. Pope secured twenty in the lower Yangtze valley.

Pope found that alligators lived only in a small area, though fossil remains show that they were once common throughout eastern China. He secured his specimens by digging them out of their holes during the hibernating period. One hole was shared by a wildcat, which Pope's collector, barehanded, also captured.

It required only a week for Pope to secure twenty specimens, and he reported an almost unlimited number of alligator dens in the region. This is highly remarkable in view of the density of human population there. However, one explanation may be that the Buddhist priests consider



S. C. Dunton, New York Aquarium.

CHINESE ALLIGATOR (*Alligator sinensis*). Length: 6 feet. Range: Lower Yangtze River Valley of China.

it a virtuous act to buy alligators from their captors and set them free. Many tourists seeking alligator trophies at the local markets have been disappointed for this reason alone.

The natives use its scales for a medicine which is supposed to cure diseases of the heart and intestines, fevers, nosebleeds and toothaches. At one time the skin was used for drum heads, and the thick tails are still sometimes used for food. Popular belief among the Cantonese was that the head of the alligator could be cut off and dried, the muzzle broken, and the teeth pulled, all before the animal died.

The Chinese used to exhibit alligators at fairs, representing them as "dragons."

CAYMANS

BLACK CAYMAN

In the dry season, the voracious black cayman (*jacare-assu*), largest and fiercest of the seven species of caymans, slips down into the jungle-lined rivers of northern South America. There it feasts on fishes, river turtles and mammals which come down to the river to drink.

When these sources of supply are closed, and not even such a delicacy as an unwary human being is at hand, male caymans will not hesitate to devour their young. But the females, perhaps inspired by motherly love, encircle their offspring to protect them from the cannibalistic fathers. It is said that the females will fight desperately against the attackers and sometimes will carry off the baby caymans in cat fashion, hiding them in secluded pools until they are old enough to shift for themselves.

The females lay from thirty to forty eggs in a reed-lined hole on the riverbank. Full grown, the average black cayman measures thirteen feet. Record specimens have attained a length of twenty feet. They are evenly scaled, black above and yellow beneath. They have a broad, short skull similar to that of alligators.

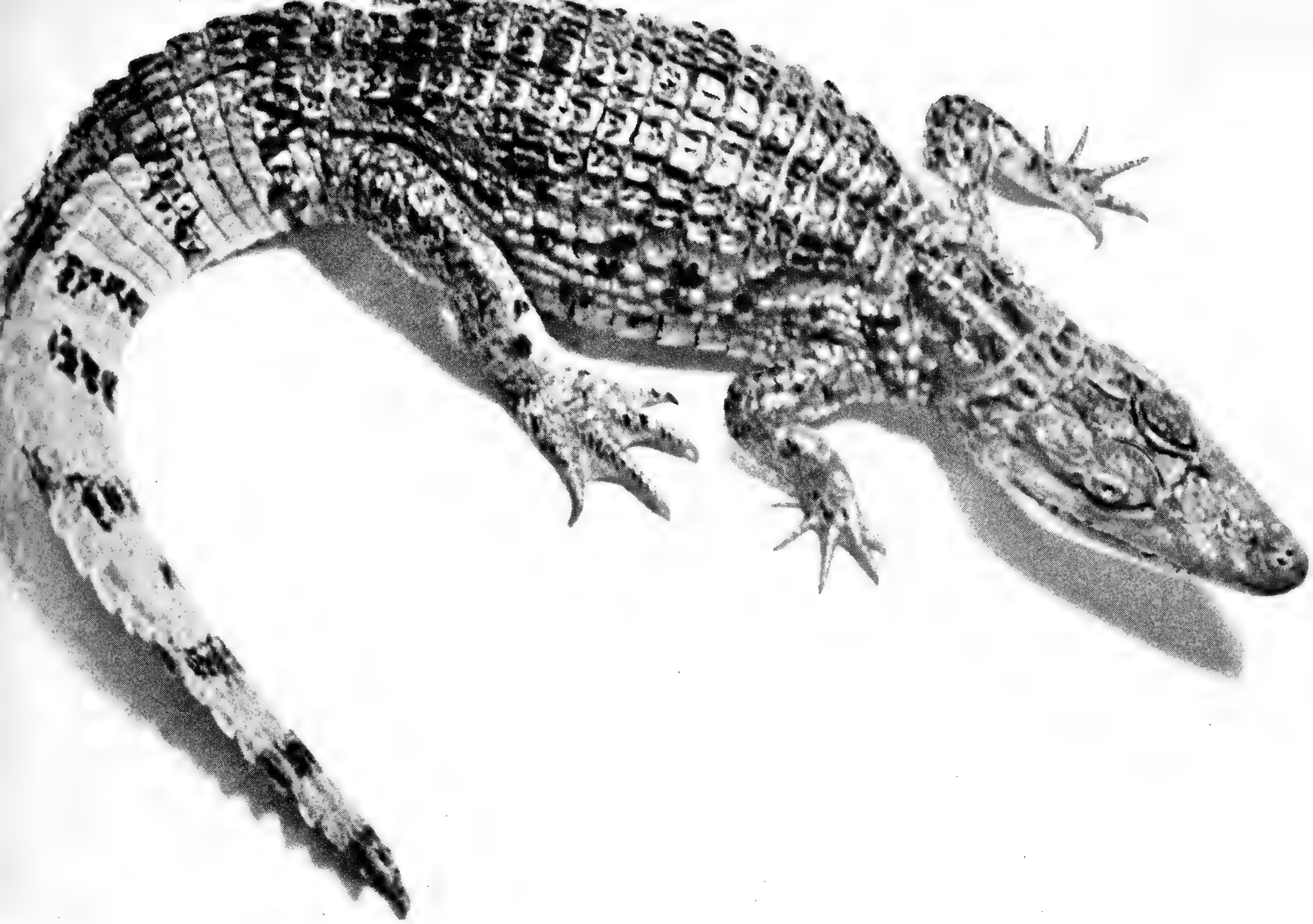
When the rainy season returns, the black caymans desert the river and migrate to the flooded forests. They can be found from the Amazon basin to eastern Ecuador and Peru.

South American natives fear these reptilian neighbors, but they seize every opportunity to capture them. The cayman's skin is exported for the manufacture of leather goods, and the flesh is greatly relished by local gourmets. The eggs, too, are considered a tasty dish.

In many Brazilian river villages, the cautious natives build a stockade in the water to protect swimmers.

CENTRAL AMERICAN CAYMAN

Farther north from Panama to Colombia, is the range of the Central American cayman, known locally as the *babilla.* About four feet long, it



(NYA) *Ralph De Sola, Federal Writers' Project.*

SPECTACLED CAYMAN (*Caiman sclerops*). Length: 8 feet. Range: Northern South America.

is the smallest of crocodilians. When passing ships disturb the water in the Panama Canal, the row of inert "logs" along the bank begins to swim, and only then can it be recognized as very-much-alive *babillas.*

A subtle tactic is used by the natives to capture the *babilla.* They lash two, pointed sticks crosswise, attach a rope and tie the free end of the rope around their waists. Then they walk through the reeds into the river until they are half submerged, and gently slap the water in imitation of an animal drinking. When they are lucky, a hungry *babilla* comes rushing up for a meal, jaws agape to seize the native's enticingly extended arm. At that instant, the native jams the stakes between its jaws and makes for the bank, drawing the *babilla* in at the end of his rope. One machete blow, and the *babilla* is on its way to the leather goods manufacturer and the native's dinner table.

The five other species of cayman, which range from Central America to northern Argentina, are also used as a source for leather goods.

CROCODILES

NILE CROCODILE

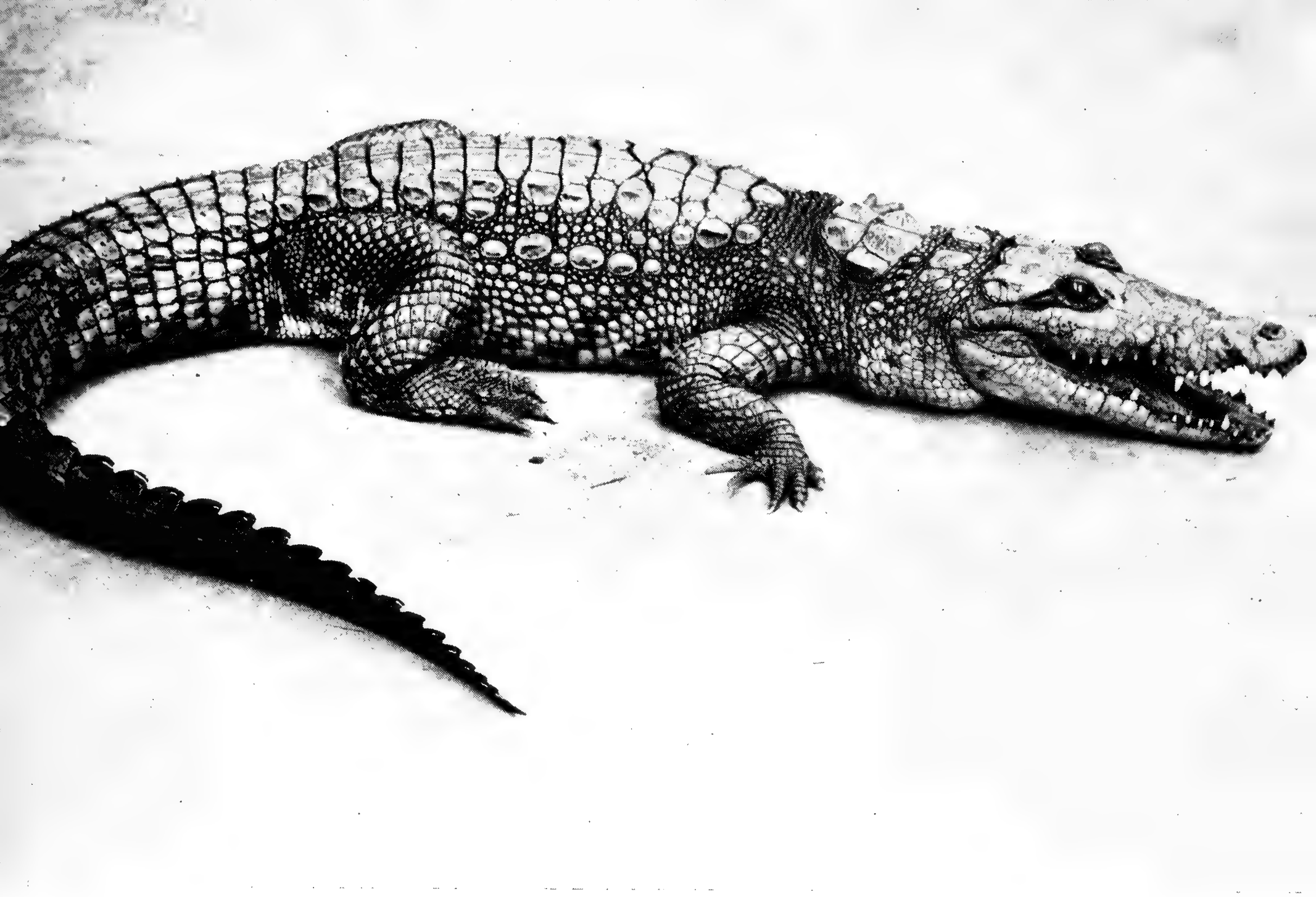
THE MAN-EATING Nile crocodile, ranging through Palestine, Madagascar and nearly all of Africa has the most venerable recorded history of all crocodilians. Well known to the ancient Egyptians, who built their civilization about the River Nile, the crocodile was worshiped as a god and embalmed along with the bodies of prominent men. The dangerous reptile was referred to in the Bible as Leviathan, and a mode of capturing it, strikingly similar to that employed by primitive peoples today, was described in the Book of Job.

In the European Middle Ages, when people knew the crocodile only from wild descriptions and crude pictures, it became a symbol of hypocrisy since, while devouring a man, it shed "crocodile tears." In more recent times, however, it was discovered that crocodiles cry when their mouths are so full that the bulk of their prey presses against their lachrymal glands.

The Nile crocodile spends its time floating in African streams and lakes, submerged except for its eyes and the tip of its broad snout, on the lookout for fishes or aquatic birds. When it sights a victim, it can submerge and unerringly reappear directly under its prey's nose.

When not in the water, the crocodile suns itself on sand-bars or dry banks. The natives in many regions fear to cross a stream without first offering prayers to the crocodiles; these prayers may be accompanied by sacrifices, frequently human. Many tribes consider themselves descended from the crocodiles and therefore do not hunt them; others worship them as gods. Some hunt the crocodile only for revenge when a crocodile has killed a man, and often permission must first be obtained from the local witch doctor before embarking on the hunt. Apart from the prayers and incantations, the usual devices employed in the hunt are either a baited noose or two, crossed pointed sticks, such as are used in South America for hunting caymans.

In color, the adult Nile crocodile is a dark olive-green. Its usual length



New York Zoological Society.

MAN-EATING NILE CROCODILE (*Crocodylus niloticus*). Length: 20 feet. Range: Africa, Syria and Madagascar.

is from fourteen to sixteen feet, although record specimens have been known to attain twenty-five feet. It is fierce and powerful, dashing rapidly out of the water to seize a man or other victim on the riverbank. Throwing its victim down with a stunning snap of its powerful tail, it will drag it under water to drown. The body is then pulled to the crocodile's den, and when the meat is somewhat softened by decomposition, the reptile sits down to dinner. The den is a thirty-five-foot passage, dug in the river-bank, with an underwater entrance leading to a dry compartment. The natives sometimes hunt the crocodile by blocking up the water hole and digging out the reptile from above.

The Egyptian plover, a bird inhabitant of the tributaries and mud-flats of the Nile, has been surnamed the crocodile bird because of its idyllic association with the crocodile. As the reptile wallows in the river slime, its gums grow full of leeches. These the crocodile birds are said to pick from between its teeth, even entering the cavernous mouth on occasion. At

the approach of danger, the plover warns its cold-blooded friend by taking flight. An instant later the crocodile slithers off into the murky water.

The crocodiles possess two musk glands, which serve for sexual attraction. The reptiles require a perfectly dry nesting site, where their twenty to thirty eggs can be hatched by the heat of the sun. After twelve weeks, the young begin to utter a hiccup-like sound inside the eggs and to butt against the shell with their single egg-teeth. The mother scrapes away the shell and leads her young to water. The young, a pale olive color with large black spots, are born with a true crocodile's disposition, for they will at once snap at a man's fingers if available. They are about eleven inches long and grow one foot each year for the first few years. They attain sexual maturity in their eighth year. Nile crocodiles enjoy an amazing fertility. Arthur Loveridge writes that in the first six months of 1922, 120,502 eggs were brought to the authorities of Tanganyika in response to a reward offered by them. This figure, of course, does not include those which were hatched.

The natives in many parts of Africa use plaited crocodile hide for armor.

(SIZ)

Ralph De Sola, Federal Writers' Project.

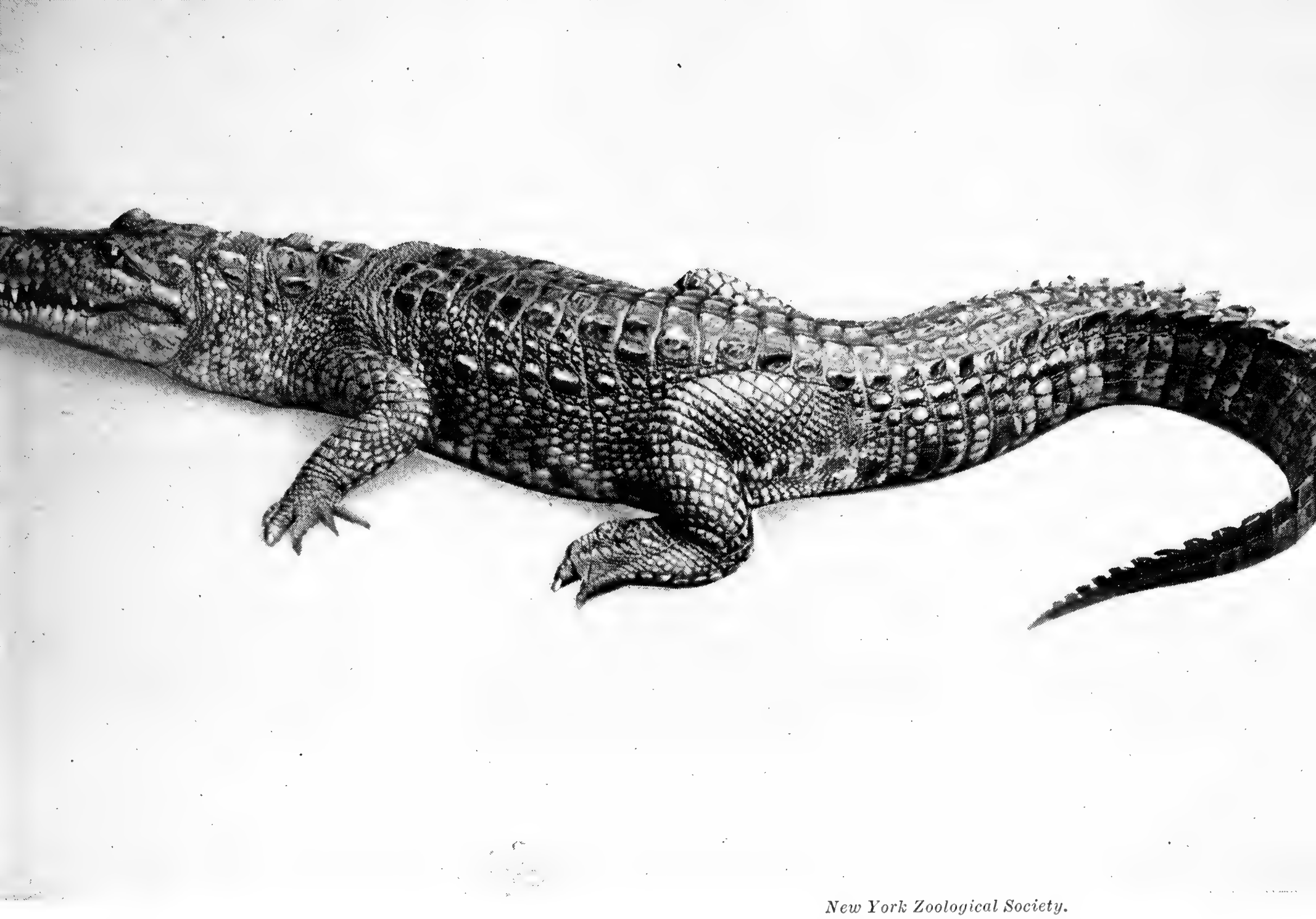
NILE CROCODILE PROFILE

SALT-WATER CROCODILE

THE RECORD for man-eating, however, is held not by the Nile, but by the salt-water crocodile, a species attaining a length of twenty feet. It inhabits the estuaries of East Indian rivers and extends its range from Ceylon to the Solomon and Fiji islands, South China and the Philippines. This crocodile has often been seen swimming in the ocean, hundreds of miles from shore. This swimming ability, no doubt, accounts for its wide distribution.

The man-eating prowess of this crocodile has given rise to a host of legends and strange customs among the natives of various islands. Frazer in his *Golden Bough* writes that in Koepang, on the island of Timor, a pig with red bristles and a young girl perfumed and bedecked with flowers were sacrificed to the crocodiles before a coronation or military campaign. The girl was set on a sacred stone in a cave, whence a crocodile eventually dragged her into the water. There, the natives believed, the reptile married her. If she were not a virgin, it was thought, her crocodile bridegroom would return her.

On many islands in the Malay Archipelago the belief is common that women sometimes bear twins, of which one is human, the other a crocodile. On these occasions the midwife carries the crocodile to the river and releases it. The family brings food for the crocodile at regular intervals, and the human child must go to the river to honor his twin, on pain of terrible misfortune. Often groups of these "crocodile people" go out in boats to visit their twins. They sing and weep until a crocodile is sighted and then offer it food and tobacco.



New York Zoological Society.

MAN-EATING SALT-WATER CROCODILE (*Crocodylus porosus*). Length: 20 feet.
Range: Indo-Australian region.

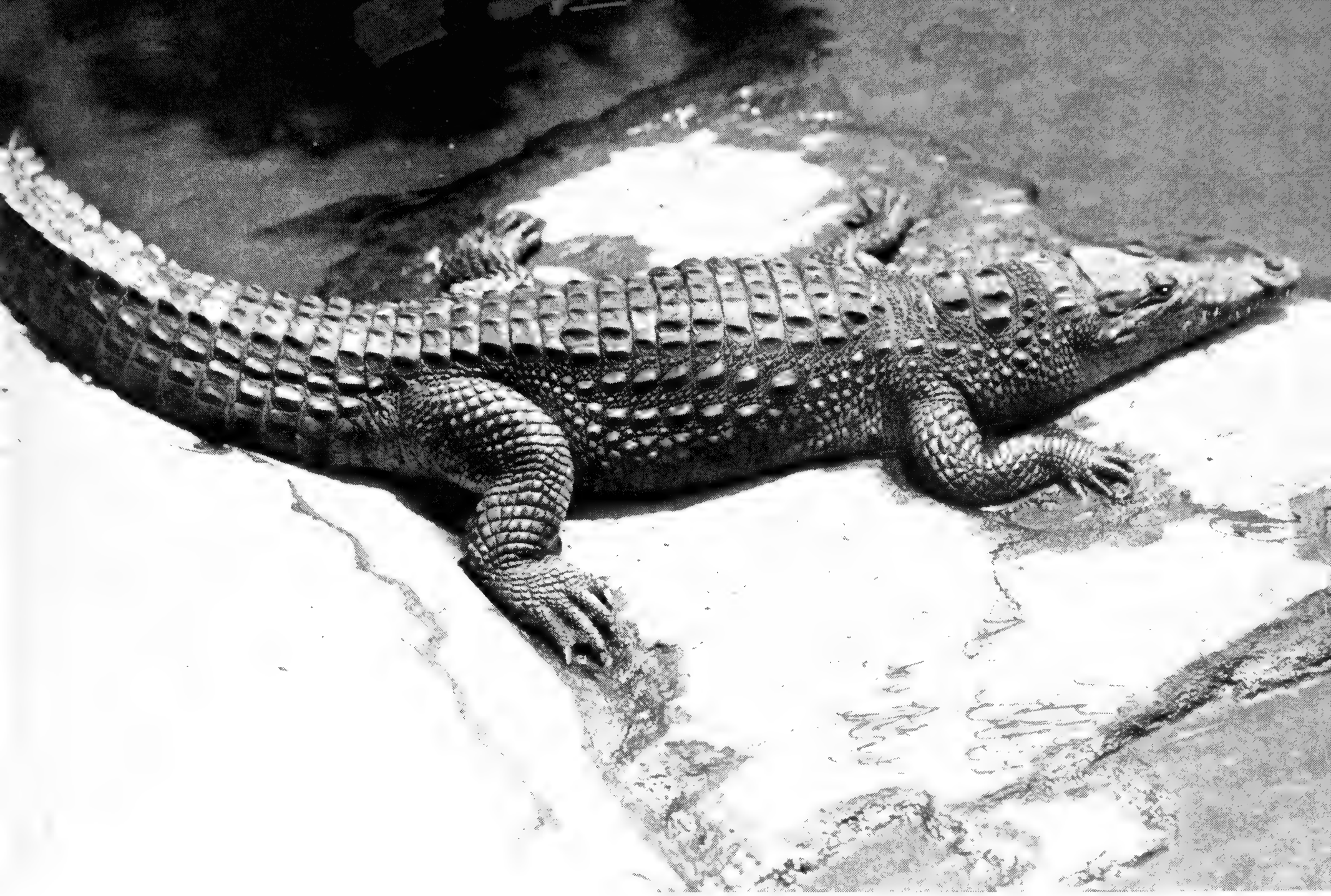
ORINOCO CROCODILE

ANOTHER CROCODILE of great ferocity is the Orinoco crocodile of South America. Baron Alexander von Humboldt reported seeing specimens twenty-five feet long, but more recent explorers describe ten feet as a fair length. In 1930 over 200,000 skins of this species and of the caymans inhabiting the same region were exported. However, the Orinoco crocodiles are still abundant enough to do much harm to natives who, in retaliation, destroy their nests. The presence of these creatures in the Guianas is one of the numerous factors that make escape from the French (Guiana) penal colony difficult. Many escaping convicts have met a swift and terrible death in the reptiles' powerful jaws.

SWAMP CROCODILE

ALL CROCODILES are not man-eating. Among the comparatively harmless varieties is the twelve-foot Indian mugger, inhabiting the swamps of India, Ceylon and Java, which, though cannibalistic, does not molest man. Noted for its timidity, the mugger spends its time well hidden in its native bogs, except during periods of drought, when it moves about for considerable distances in search of water. During the long dry season, the muggers estivate in the mud, emerging from their sleep in time to greet the torrential rains.

The mugger is held sacred by the Hindus. At Mugger-Pir, near Karachi, about one hundred and fifty of the reptiles have long been fed and cared for. For a fee the *fakir* in charge will amuse sightseers by throwing the crocodiles a goat or the carcass of some other animal, and the entire reptilian population of the swamp will come forth and struggle for the prey. A British army lieutenant is alleged to have crossed the swamp by stepping over the backs of the crowded reptiles. One large crocodile, known as "the chief," is described as living in a solitary state, permitting none other to share its abode.



New York Zoological Society.

AMERICAN CROCODILE (*Crocodylus americanus*). Length: 14 feet. Range: Tropical America, southern Florida and Greater Antilles.

GAVIALS

INDIAN GAVIAL

THE GREENISH-BROWN Indian gavial or *gharial* is the giant among present-day crocodilians. A specimen in the British Museum measures thirty feet, while live individuals of twenty feet are common. Yet despite its size and strength the gavial is harmless to man, as its long, slender snout, especially suited to fish-catching, is not adapted for attacking the larger mammals. According to reliable authorities, the human ornaments found in the stomachs of dead gavials prove nothing. These ornaments, it is said, were eaten along with Hindu corpses which the gavials had unearthed. The *gharial* has, however, been known to eat birds and small mammals such as young goats and small dogs.

This immense reptile inhabits the rivers of British India. Here, sharing the habitat of other crocodilians, it lies for hours under water, with only its eyes and the nostril tips protruding. It catches fishes by a rapid sidewise snap of its snout and then passes them head first down the mouth, in a series of jerks. In winter months it spends most of its time basking in the sun on sandbanks, but takes to the water as the sun goes down. During the rains it leaves the flooded main rivers and migrates to smaller streams. Indian washerwomen pray to the gavials to keep away evil spirits.

This species is the sole survivor of a large family of reptiles residing in India in prehistoric times. Pliocene fossils show a related species fifty to sixty feet long.

The gavial is equipped with twenty-one or twenty-two rows of sharp transverse scutes or scales. Its long cylindrical jaws contain twenty-seven to twenty-nine upper teeth and twenty-five or twenty-six lower teeth on each side. The teeth are conical and hollow, considered better suited to snatching fishes than to crushing big game.

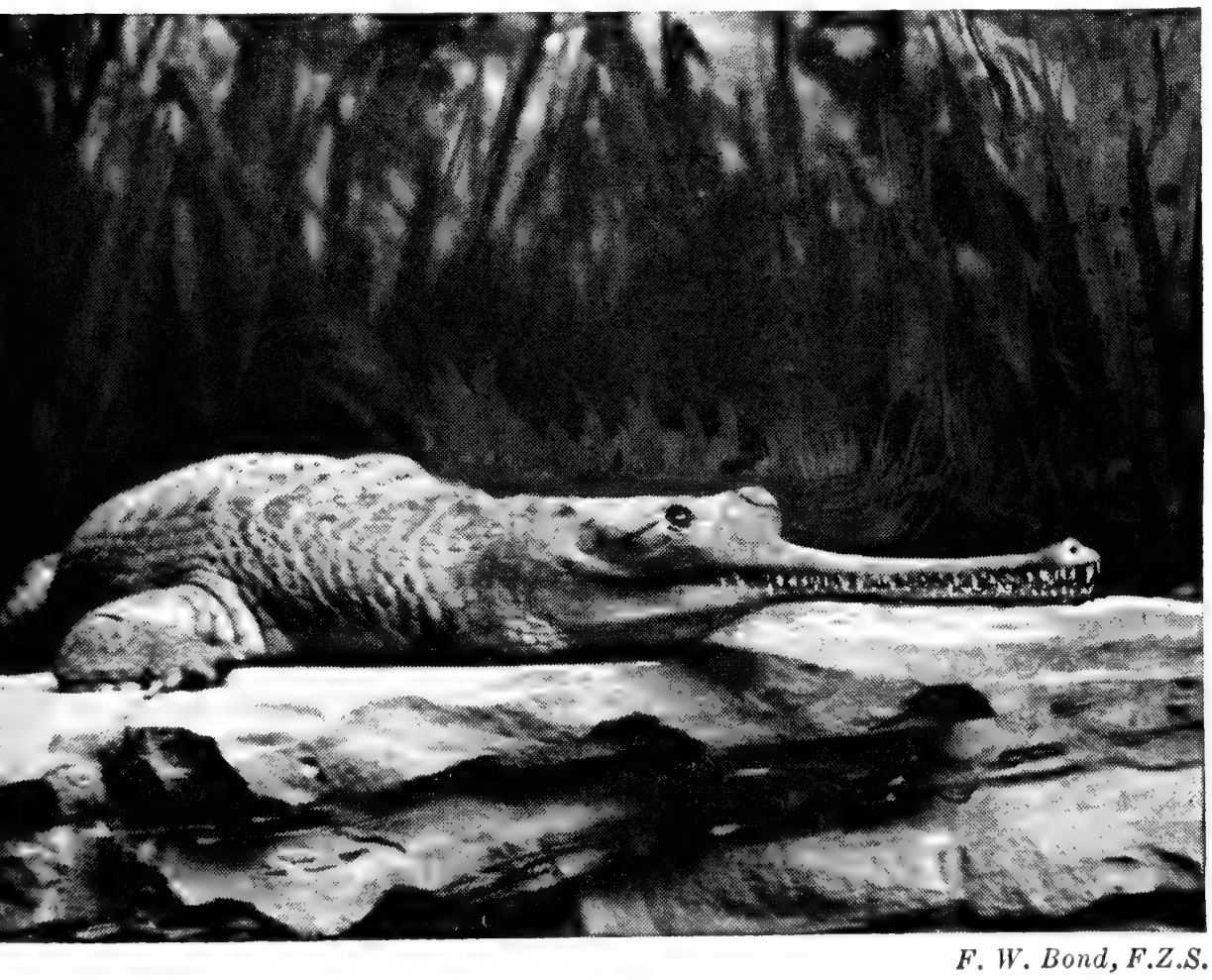
Gavials lay their eggs in sandbanks to be hatched by the sun. Two rows of twenty eggs are laid, separated by one foot of sand. The young appear in March. Paler in color than their elders, they are about sixteen inches in length, nine inches of which consists of emaciated tail.

New York Zoological Society.

MALAYAN GAVIAL (*Tomistoma schlegeli*). Length: 15 feet. Range: Malay Peninsula, Sumatra and Borneo.

MALAYAN GAVIAL

THE SMALLER Malayan gavial, also called false *gharial* and *bediai,* has a somewhat shorter snout than the Indian gavial and is thought to be the link between the gavial and the crocodile. Its average length is fifteen feet.



F. W. Bond, F.Z.S.

INDIAN GAVIAL (*Gavialis gangeticus*). Length: 24 feet. Range: Rivers of India.

THE TUATARA

(SOLE LIVING MEMBER OF THE ORDER RHYNCHOCEPHALIA)

THE TUATARA is a "ghost out of the past," as out of place among living reptiles as a Neanderthal man would be on Times Square.

These lizard-like creatures are the sole survivors of the large order of rhynchocephalians which died out in the Triassic age. They still linger on only in a few small New Zealand islets which are the protruding peaks of submerged mountains. Tuataras are sometimes described as "living fossils," since all other species of their order are known only by fossilized remains many thousands of years old.

The tuatara burrows its home in the sandy and pebbly soil. Entered by a passageway of several feet, the apartment has two rooms lined with leaves and grass. But the tuatara tenants only one; the other is invariably occupied by a family of petrels, a species of sea bird — and the animal neighbors seem to live together much more amicably than do neighbors in a city tenement.

Resting during the day in the dark shelter of this retreat, the tuatara ventures forth at night in search of food. The belly and tail of its slow-moving form scrape the ground as it drags along on four feet, the front two of which strikingly resemble a fat baby's hands. When it sights a beetle, grasshopper, spider or worm, it raises its scaly belly and tail from the ground, darts forward and makes short shrift of its prey.

The tuatara has a difficult time escaping from trouble. Sluggish, it runs very slowly and habitually pauses to crane its neck backward to peer at the pursuing enemy. Perhaps this characteristic accounts in part for the systematic depletion which has made it a rare reptile.

Before scientists discovered that it was a unique relic of earlier epochs, the tuatara was well on the road to extinction. Some were killed off by man-made bush fires. Pigs and other animals put ashore by such early explorers as Captain Cook dined upon the peace-loving creature, as did some of the reptile-eating Maoris. Another factor which helped to eliminate the species from New Zealand is that the sheep ate the grass that sustained the insects which provided the tuatara's food. Despite the government's

Length: 2 feet. A.N. BRECKON, TIME, INC.

TUATARA.

SPHENODON PUNCTATUS.

Range: Islets off New Zealand.

The tuatara, probably the world's oldest prehistoric reptile and one time inhabitant of all New Zealand, is today confined to less than a score of islets. Surviving specimens are protected by an Act of the New Zealand Parliament.

PACIFIC OCEAN

NEW ZEALAND

NORTH ISLAND

SOUTH ISLAND

NORTH CAPE

AUCKLAND

BAY OF PLENTY

EAST CAPE

WELLINGTON

NELSON

COOK STRAIT

CHRISTCHURCH

DUNEDIN

STEWART ISLAND

1 2 3 4 5 6 7 8 9 10 11 12 13

DISTRIBUTION OF THE TUATARA TODAY

1 · ISLETS OFF CAPE KAREKARE
2 · POOR KNIGHTS ISLANDS
3 · HEN AND CHICKENS ISLANDS
4 · MOKOHINAU GROUP
5 · LITTLE BARRIER ISLAND
6 · CUVIER ISLAND
7 · MERCURY ISLANDS
8 · ALDERMAN ISLANDS, SLIPPER AND SHOE ISLANDS
9 · KAREWA AND MOTOKI ISLANDS
10 · PLATE ISLAND, WHALE ISLAND AND RURIMA ROCKS
11 · EAST CAPE ISLAND
12 · BROTHERS ISLETS
13 · STEPHEN ISLAND
( ) APPROXIMATE POSITION OF LOCALITIES

Prepared by A. Chern, Cartographer

decree of immunity for tuataras, the decimation seems to be continuing on the few islands which they still inhabit.

Probably the day is not far off when the only observable tuatara will be a mounted specimen displayed behind museum glass. For although some have lived more than twenty-five years in captivity, they usually do not reproduce in confinement. Often they will go without eating for months; then suddenly they will begin to eat heartily every day. However, they will accept only living food. As a result, zoo-keepers sometimes place a chunk of meat on a stick and wave it about until the animal snaps at it with its sharp teeth.

Although it resembles the lizard, the tuatara is as nearly related to the turtle. Among its outstanding characteristics are a row of yellow erectile spines (in the language of the Maoris, *tuatara* means "having spines") which form a crest on its back, and a third eye set on the top of its head. Equipped with a lens, retina and an opening in the skull for the optic nerve, the pineal eye, which is no longer used, at least indicates that the tuatara's ancestors had a third functional eye.

This harmless creature is said to bite and scratch humans, but only in self-defense and then not badly. Its color is a dark olive-green. Burrowing in the sand dulls it, however, and it is only after a good washing that the skin colors assume their intrinsic brightness and distinctiveness.

The vanishing tuatara has no external sex organs, and hence it is difficult to distinguish male from female.

In November and December, New Zealand summertime, the female lays about ten elongated, hard-shelled eggs, which she buries in the sand. Thirteen months later the baby tuatara emerges from the shell and within six months has doubled in size.

Alfred Sherwood Romer, in *Man and the Vertebrates*, states: "It was long ago pointed out that the tuatara is a reptilian 'missing link' which may be a survivor of an archaic group from which the ruling reptiles, lizards and perhaps other types may have evolved.

"Why has this 'living fossil' survived in this one locality when its relatives have otherwise perished? This is an extreme case of survival due to isolation. New Zealand has probably been completely separated from other bodies of land since some time in the Age of Reptiles. The development of mammals in other continents has probably been a factor in the

destruction of the tuatara's relatives over most of the world. But not a single mammal (except the bats) appears to have reached New Zealand until man arrived, and the lack of mammalian competition has presumably been the reason for the preservation of this archaic reptile."

The chart showing the distribution of the tuatara was plotted on the basis of data supplied by Dr. Frieda Cobb Blanchard.

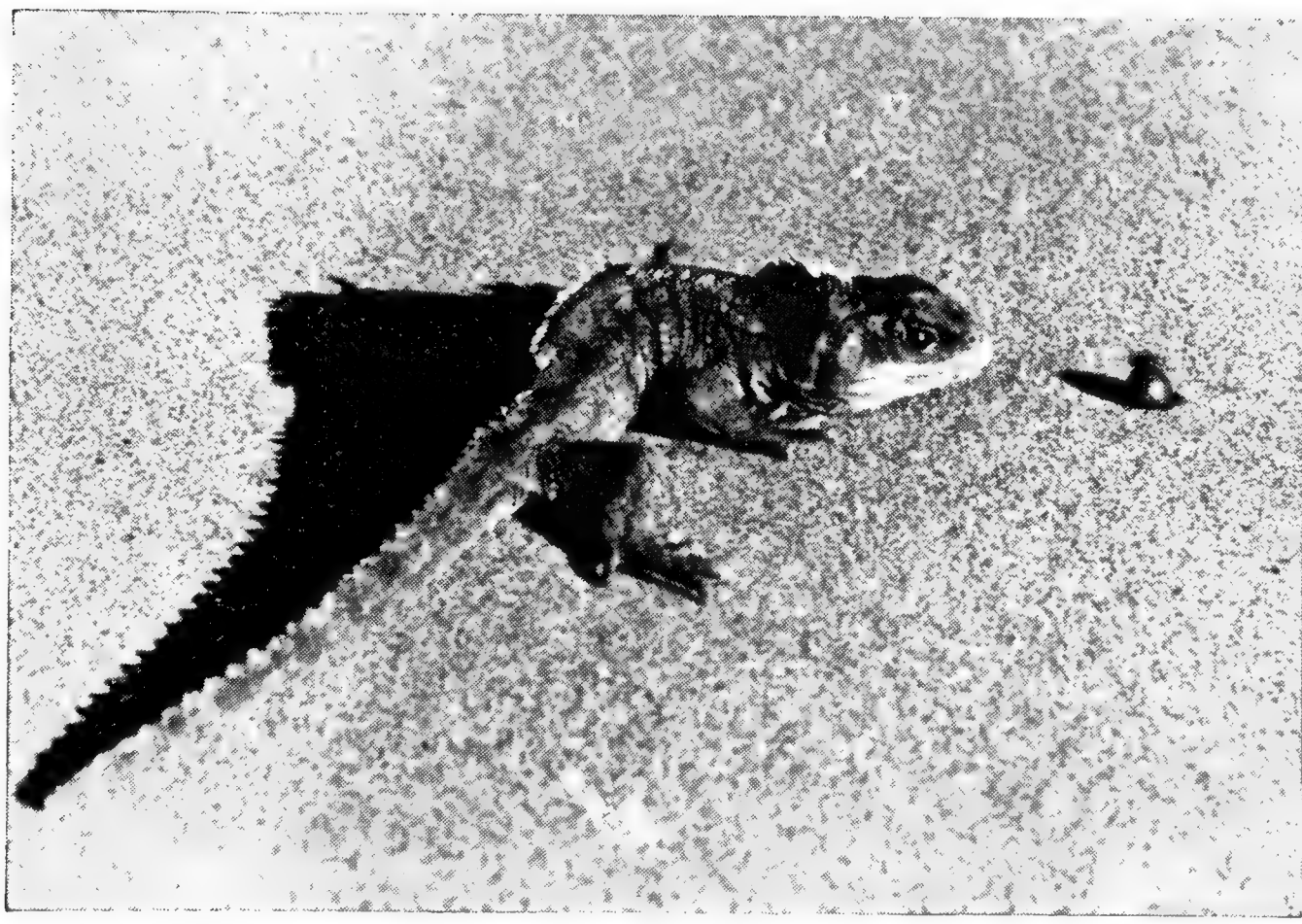
A. N. Breckon, Time, Inc.

ANGER

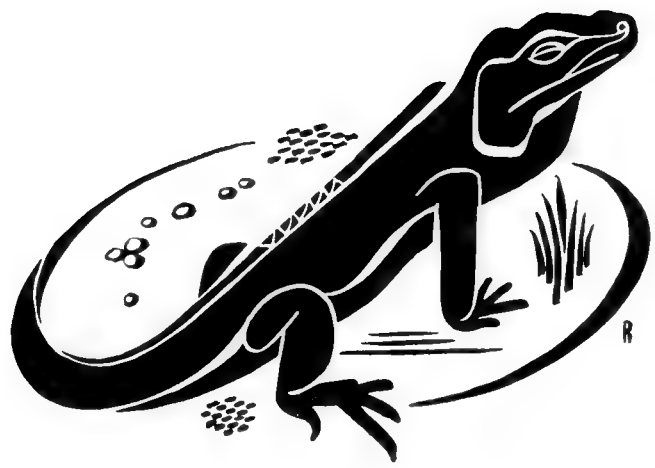
THIRD EYE

A. N. Breckon, Time, Inc.

SNAIL EATER



A. N. Breckon, Time, Inc.



LIZARDS

LIZARDS ARE the most abundant of the living reptiles, comprising twenty-one families, divided into more than twenty-five hundred species. As a rule, they are coated with scale-like folds of the skin, have four legs and a tapering tail. Some, however, are legless and resemble snakes, but even these can be distinguished by their ear openings and movable eyelids.

Lizards vary considerably in size, ranging from the ten-foot-long dragon of Komodo Island to the tiny tropical American gecko, less than two inches in length and weighing all of one-fifth of an ounce.

Simplified, the chief groups of lizards may be arranged as follows:

Geckos, of which there are more than two hundred and seventy-five species, are egg-laying, soft-skinned small lizards found in almost all temperate and tropical countries. Included with them are four species of large-eyed uroplatids from Madagascar whose lichen-like skins resemble the tree trunks to which they cling; five species of xantusids, inhabiting the western deserts of North America and the arid regions of Central America and Cuba; three species of serpent-like Malayan dibambids, in which the hind limbs of the females are lacking and those of the males are so degenerated that they probably are used only as claspers; five species of limbless burrowing feylinids of Madagascar and Africa, whose eyes are completely covered by skin; and the single anelytropsid, resembling a feylinid, which is found only in the humus of certain Mexican forests.

Skinks are medium-sized lizards of cosmopolitan distribution covered with overlapping scales, beneath each of which is a bony plate embedded in the skin. Studies by Taylor, Burt and others indicate that the family is on the ascendant. In this grouping of approximately four hundred species are included the gerrhosaurids, a small family of about fifteen species confined in range to Africa and Madagascar.

Old and New World Lizards include the lacertids and teiids. The ninety-odd species of lacertids inhabit all parts of the Eastern Hemisphere with the exception of Madagascar and the Australian region, while the one hundred and twenty-five species of teiids, which superficially resemble them, are generally confined to the American tropics.

LIZARD EVOLUTION

MILLIONS OF YEARS

200 MILLION YEARS OF LIZARD LIFE

MODERN TIMES

1,000,000 AGE OF MAN

60,000,000 AGE OF MAMMALS

120,000,000 AGE OF REPTILES

35,000,000 PERMIAN PERIOD

GECKOS

SKINKS

OLD and NEW WORLD LIZARDS

WORM-LIKE LIZARDS

MONITORS

POISONOUS LIZARDS

IGUANAS

AGAMAS

CHAMELEONS

★ MARKS APPEARANCE OF FOSSIL ANCESTOR

INDICATES PROBABLE FAMILY RELATIONSHIP

GEOLOGICAL PERIODS: PERMIAN | TRIASSIC | JURASSIC | CRETACEOUS | EOCENE | OLIGOCENE | MIOCENE | PLIOCENE | PLEISTOCENE and RECENT

Worm-like Lizards are usually covered with mere vestiges of scales, lack visible eyes and ears, and have pinkish bodies and bluntly rounded tails which explain their name. The group is divided into three families: about forty species of amphisbaenids in America, the Mediterranean countries and Africa; two species of aniellids found only in California; and about forty species of anguidids, which are chiefly American but have a few European and Indian representatives. Resembling them are the snake-like lizards or pygopods which are degenerate species confined to Australia, Tasmania and New Guinea. In superficial appearance and actions there is little to distinguish the eight little-known members of this lizard family from true snakes.

Monitors are large lizards inhabiting parts of Africa, Arabia, southern Asia and Australia. The largest one of the twenty-seven species, and the largest of all living lizards, is the Komodo dragon of the East Indies.

Poisonous Lizards, of which there are but three species, include the famed Gila monster, the only one whose venomous nature has been investigated; the Mexican beaded lizard, and a third species, confined to the East Indies; the latter never having been investigated sufficiently to establish whether or not it employs venom.

Iguanas, with about three hundred species, are probably the best known lizards. All iguanas, including the related horned "toads," chuckawallas and basilisks, are almost entirely confined to the Western Hemisphere. Included in this group are the granular scaled xenosaur of Mexico and the fourteen species of African and Malagasy zonurids.

Agamas include more than one hundred and fifty diverse and curious species. Some have the ability to glide, others display wonderful bearded and cape-like appendages, and one — the *Moloch horridus* — wins the prize for sheer hideousness.

Chameleons, numbering less than fifty species, are queer-looking, casque-headed monsters in miniature. They have prehensile tails, fast changing colors and rolling eyes. They wander about trees and bushes in Africa, Madagascar, the Mediterranean countries, southern India and Ceylon.

The relationships of these families are in part indicated in the chart of lizard evolution adapted from an article by Dr. William K. Gregory, published in the *Bulletin of the New York Zoological Society.*

GECKOS

In the Malayan region dwells the strangest of geckos. Known as the "flying" gecko, this lizard, according to Ditmars, is able to glide from tree to tree in search of insects. While it does not actually fly, its leap resembles the flight of a man-made aerial glider. The gecko has webbed feet which, together with membranes appended to its body, tail and limbs, serve it as a parachute.

Most geckos, however, run about on four feet. They are small thick-set creatures with flat heads and stumpy tails, rarely attaining a length of fifteen inches and often measuring less than two inches.

With few exceptions, they have expanded toes, sometimes connected by a web and equipped with round, adhesive pads. The traction mechanism of their toe pads enables them to run casually around on the most slippery surfaces and even scamper blithely across ceilings. A tame gecko running over a man's hand produces a clammy sensation and is extremely difficult to shake off. One species, inhabiting the forests of eastern Madagascar, is believed by natives to dart up on the chest of a man and hold on so firmly that it can be removed only by cutting off the skin to which its toes adhere. Although the suction power of this uroplatid lizard is exaggerated, it is greatly feared by the local populace.

The skin of geckos is usually of a dull color, smooth, and covered with crowded granular scales. Some species have larger scales among the small ones, some are covered with "warts," and still others have round, fishlike scales. Among the latter is the wonder gecko of the Central Asiatic deserts, which, writes Gadow, can produce a chirping sound by rubbing together the big scales on its tail. The Madagascar scaly gecko has an outer skin so tender that it can escape a captor by abandoning it in the captor's hand.

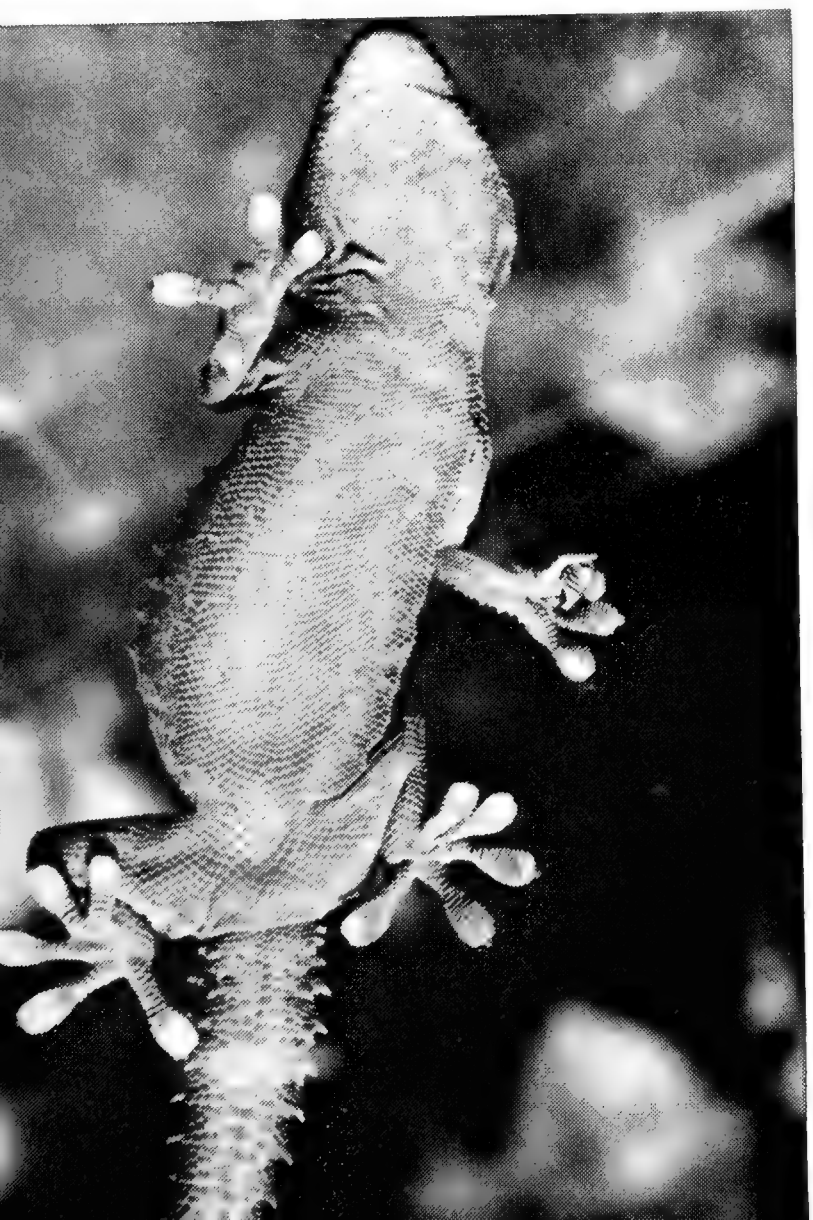
On the whole, geckos prefer night life. Their eyes, which are usually without movable lids, contract in daylight to a fine vertical line. A few species, however, have true eyelids; some resemble snakes in that the transparent lids cover the eye; and the diurnal species, living in open sand, possess a round pupil.

In their broad mouth is a short, flat, sticky tongue, which is extended

AUSTRALIAN GECKO (*Gymnodactylus platurus*). Length: 1 foot. Range: Australia.

American Museum of Natural History.

Dr. H. Hediger.



MAURITANIAN OR MOORISH GECKO (*Tarentola mauritanica*). Length: 8 inches. Range: Mediterranean countries.

not only for tasting, eating and drinking, but also for cleaning their eyes. Its stickiness is an asset in taking beetles and other insects from narrow crevices. The mouth contains a great number of teeth, quite similar in shape, each having one cusp on a cylindrical base. The gecko's neck is short and thick-set. The medium-sized tail is exceedingly fragile. If it breaks off, it will grow again, but without the diagonal rows of scales which adorned the original.

Many of the geckos shed their fine outer skin periodically and usually eat it.

The geckos vary widely in their habits and appearance, depending upon their environment. Some live in trees growing on jagged cliffs, and pursue their prey at night, often while running upside down. Others, living in sandy regions, have slender toes trimmed with scales, adapted to the sandy terrain of Turkestan, Persia, Arabia and the African deserts.

Most of the desert geckos are under seven inches in length. Some geckos in the Malayan region attain lengths of fifteen inches and are quite stocky. They eat other lizards as well as their staple diet of insects, and are not averse to gobbling up a small bird or rodent.

Geckos are often attracted to tropical homes by insects hovering about the light of a lamp. They can enter houses through the smallest crevices. They scurry over the walls and ceilings so swiftly that it is almost impossible to catch them. One writer tells of a gecko in Colombo, Ceylon, who was trained to appear at a colonist's dinner table each day at dessert time. The family once left the house for some months, yet when they returned and sat down to dinner, the gecko reappeared.

Geckos have received their name from a cry which they utter "by a convulsive movement of their tongue." The usual cry resembles "yecko" or "gecko" although some emit a sound like a cat's "meow."

They have, almost throughout the world, achieved a sensational reputation for being poisonous, but in actual fact they are quite harmless, unable even to bite severely. It is not odd, therefore, that a species inhabiting the American southwest should mistakenly be known as the "poison lizard."

L. M. Klauber.

ARIZONA NIGHT LIZARD (*Xantusia arizonae*). Length: 4½ inches. Range: Arizona.

SKINKS

ALTHOUGH these lizards are not usually eaten by man, it is said that Genghis Khan, marching through Central Asia, fed his warriors on skink meat to make them fiercer. Yet the skink itself is a most unwarlike animal.

Some burrow in the sand and have little or no use for their rudimentary legs. Most skinks dwell in the desert although a number of species spend their lives in the vicinity of grass and trees.

A few snake-like skinks, although they have small legs, do not bother to use them when in a hurry, but fold them up and glide away on their bodies. In some species, one pair of limbs is so degenerated as to be useless; in others, neither pair is of practical aid. Some species are completely limbless. So great is the variation, that even among a single species there exist differences in the number of toes. Except for the snake-like species, most skinks have short legs on which they can travel swiftly when need be.

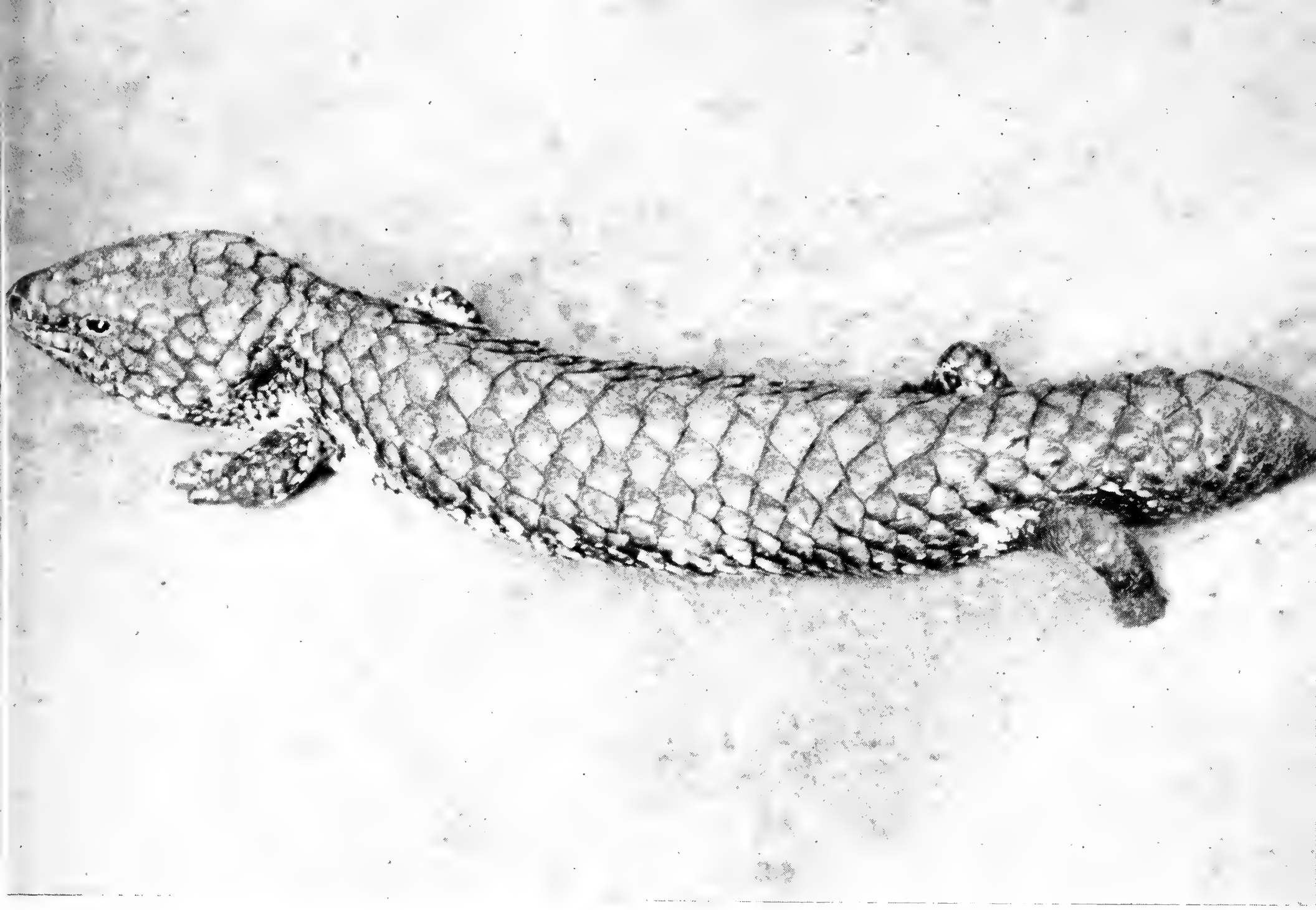
Most of them are alike in appearance and, especially in the limbless skinks, the head, body and tail are not clearly marked off as in other lizards. They have large, rounded, rather smooth scales which overlap. Unlike most other lizards, they have bony plates under the scales. The eyes are well developed and have round pupils, while the movable eyelids are augmented by a third, transparent, windowlike lid. This feature of the skink's eyelids, together with its round, tubelike body and smooth skin, adapts it to a subterranean life.

There are wide divergences in the size of these creatures. The largest one, the giant skink, grows to a length of two feet. This comparatively huge member of the family, living in New Guinea, Java and the Moluccas, according to de Rooij not only eats insects but also small birds and mice.

FIVE-LINED SKINK

THE FIVE-LINED SKINK indiscriminately feeds on insects of all sorts, including wasps and yellow-jackets. Its smooth, glistening, hard skin is a protective armor against the stings of its victims.

The skink has been observed by McIlhenny to deliberately approach a wasp's nest, seize it in its jaws, and shake it by thrashing about with



New York Zoological Society.

STUMP-TAILED SKINK (*Trachysaurus rugosus*). Length: 1 foot. Range: Australia.

its body. As the young wasps drop out they are devoured. Adult wasps, having learned from experience that discretion is the better part of valor in dealing with skinks, flee without a fight. Their only defense is to build their nests in localities not inhabited by their enemy. A five-lined skink has been known to raid as many as twenty wasps' and twelve yellow-jackets' nests within two weeks.

This species is found in the eastern United States and is especially prolific in the southeast. It makes its home in hollow pine trees and beneath the loosened bark of fallen trees. It is a hard creature to capture, for it always has a prepared hiding place to which it flees when in danger.

It acquires its name from the five yellow stripes which adorn its black body in youth. Added brightness is lent to the young skink by the rich blue of its tail, which has won the reptile the additional name of blue-tailed skink. As the lizard advances in age, however, the stripes become obscure and vanish, the body becomes brownish in color, the head a glowing red. At this stage, it is popularly called red-headed lizard or "scorpion" and is mistakenly considered poisonous.

Males grow to a length of ten inches, females to seven. The females never completely lose the five characteristic stripes and their heads are never as red as the males'. The head of the male, swollen at the temples, gives it a terrifying appearance.

The difference in coloration between the young five-lined skink and the adult is so great, that for a time they were thought to be two different species.

AUSTRALIAN STUMP-TAILED SKINK

THIS SKINK, inhabiting Australia, has a tail so blunt that it seems to have a head at both ends of its body.

About a foot long, it is brown in color, spotted or banded with yellow. Its rough, overlapping scales and heavy, shapeless body make it resemble the dry cone of a pine tree.

Raymond L. Ditmars, New York Zoological Society.

DESERT SKINKS (*Scincus officinalis*). Length: 9 inches. Range: North Africa.

W. Lincoln Highton, Works Progress Administration.

BROWN SKINK (*Eumeces obsoletus*). Length: 11 inches. Range: Central western United States and northern Mexico.

It is thought by some authorities to be the only lizard which gives birth to one offspring at a time, bringing it forth alive after a three-month period of gestation. Other specialists insist that two or even three young are produced. At birth, the young lizard is half the size of the adult.

The stump-tailed skink spends its time tunneling in the sand, or basking in the sun on a bed of sand or stones. About six times a year it sheds its skin, after having soaked itself in water. The lizard feeds on worms, small snakes and other lizards, but in captivity it will eat any sort of meat as well as raw greens. Stump-tails thrive in captivity and, perhaps because of the easy life, become sluggish and slow-moving.

EGYPTIAN SKINK

THIS NINE-INCH SKINK, inhabiting the Sahara Desert and parts of Egypt, has a snout built like a shovel — and used like one. When it wants to dig down in the sand, it scoops out a burrow with its snout. Its feet too are adapted to desert life, with wide, thin toes permitting it to saunter over the sand.

The body of the Egyptian skink is cream-colored with black or dark red bands, which appear as the creature becomes older. Its flat abdomen is reminiscent of the constricting snakes, and the body looks still more serpentlike when gliding along the mounds and hollows of the sandy terrain. This skink is uncomfortable unless kept in a temperature of more than ninety degrees Fahrenheit; much below that it becomes torpid with cold.

The Arabs believe that the flesh of the Egyptian or desert skink will cure almost any disease, and it is widely used for food and medicine. When broiled, it is said to have an excellent flavor.

A relative of the Egyptian skink, the seps, of the Sahara Desert and Arabia, has a seven-inch, snakelike body. Its small legs are of little use to it and are frequently folded against the body as the lizard glides along like a serpent. Flower writes that its wedge-shaped snout aids it in virtually swimming into the sand to escape trouble.

MONKEY-TAILED SKINK (*Corucia zebrata*). Length: 10 inches. Range: Solomon Islands.

Dr. H. Hediger.

OLD AND NEW WORLD LIZARDS

OLD WORLD LIZARDS

THE TRUE LIZARDS of the Old World are most numerous in Africa. They are also found in Europe and Asia as far northward as the region of permanently frozen sub-soil. Members of this family live chiefly on the ground. For the most part they subsist on insects and grubs, but some species are cannibalistic. Their well-developed limbs are equipped with five toes each; their tongues are cleft, and they all possess efficient eyes and ears. Some of these small-scaled lizards bring forth their young alive, but most lay soft, oval eggs which they bury in the ground for the sun to hatch.

SAND LIZARD

A DENIZEN of England and northern Europe, the eight-inch sand lizard darts so rapidly over the broken ground that the eye has difficulty in following it. The male of this species is a bright emerald green, while the female is brown with black and white spots. Male and female are said to pair for life and to share in tending the six or twelve thin-skinned eggs brought forth each year.

At the approach of winter the sand lizards burrow into the earth, where they hibernate until spring.

COMMON OR VIVIPAROUS LIZARD

THE FAWN-COLORED common lizard is also known as the viviparous lizard because it brings forth its young alive, either free or wrapped in a membranous covering. The newborn, less than an inch in length, arrive in

American Museum of Natural History.

GREEN LIZARD (*Lacerta viridis*). Length: 1 foot. Range: Central and southern Europe and Asia Minor.

litters of from eight to twelve and are immediately left by the mother to shift for themselves. Hiding in the underbrush for the first few days, they subsist upon a portion of the egg yolk that has been absorbed through the abdominal opening. Later they feed on tiny insects which they find in cracks in the soil. The adult lizard attains a length of eight inches.

GREEN LIZARD

THE GREEN LIZARD of France and Central Europe is an active, friendly creature, which can be taught to eat out of a man's hand provided the hand contains grubs, worms or larvae. Most members of this species attain a length of twelve inches and are colored a uniform green, but some are spotted or streaked with yellow. Their brittle tails often snap off when they are caught, and in the course of time are replaced by new and shorter ones. Green lizards excavate burrows and spend their nights in them.

On the evening of Easter Sunday, the gypsies of southern Europe take a wooden vessel resembling a band-box which rests cradlewise on two cross-pieces of wood. In this they place herbs and the dried carcass of a lizard, which every person present must first have touched with his fingers. The vessel is then wrapped in white and red wool and carried by the oldest man from tent to tent. It is finally thrown into running water after every tribe member has spat into it once and the sorceress has uttered some spells over it. Frazer states that the gypsies believe that this ceremony dispels all illnesses that would otherwise afflict them during the coming year. Anyone finding the vessel and opening it is believed to be visited with all the maladies which the others have escaped.

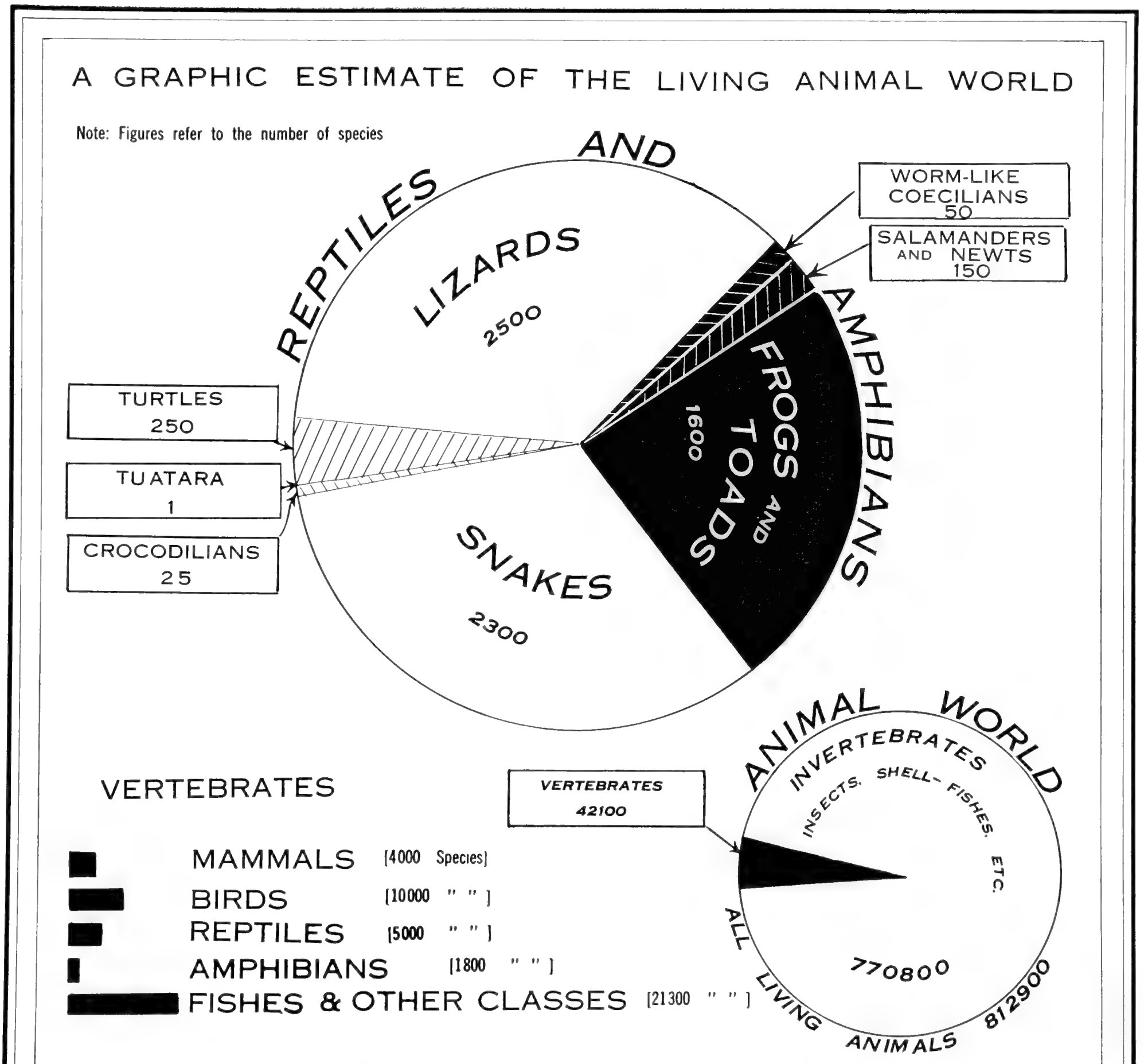
WALL LIZARD

THE WALL LIZARD is so called because of its habit of scampering up and down walls. Many different varieties of this species are found throughout southern Europe and on the various Mediterranean islands.

(SIZ)

Ralph De Sola, Federal Writers' Project.

SOUTH AMERICAN OR GREAT TEGU (*Tupinambis teguixin*). Length: 4 feet.
Range: Northern South America.



EYED LIZARD

THIS GREEN, eighteen-inch lizard, named for its blue, eye-shaped markings, is remarkable chiefly for the varied diet it will consume in captivity. Its menu includes minced beef, eggs, mice, young birds and the young of its own kind.

NEW WORLD LIZARDS

CLOSELY resembling the family of Old World lizards are the New World lizards. A few species, however, attain a much larger size than any of the Old World varieties. Some live in trees, while others remain on the ground.

TEGU

THE GREATER PART of the tegu's four-foot length is taken up by its stout whiplike tail. These swift, powerful lizards do great damage to farms, raiding poultry yards and carrying off large numbers of fowl. In addition they break many eggs with their muscular jaws, which are capable of crushing a man's hand. Tegus are marked with handsome, lacey patterns, which may be brown, black, yellow or cream-colored. In some regions of South America these reptiles are known as safeguard lizards, as they are supposed to warn of the approach of alligators.

Old tegus develop heavy, crocodile-like pouches on the side of their jaws. These vicious reptiles may be tamed in confinement, though the young frequently fly into a rage and chase their keepers. They often kill other lizards, holding them between their jaws and shaking them to death. Tegus live on insects, small reptiles and birds.

Other New World lizards are the various race-runners, noted for the lightninglike rapidity with which they dash about the sandy regions of the warmer parts of America; and the degraded, worm-like scolecosaurs, which live largely on ants.

New York Zoological Society.

ALLIGATOR TEGU (*Dracaena guianensis*). Length: 2½ feet. Range: Northern South America: the Guianas.

Close observation of lizards, which seem to renew their youthful complexions by casting off their old skin, may have led to an interesting custom of ancient Mexico. Sufferers from diseases of the skin or eyes masqueraded in the flayed skins of men and women who had impersonated local gods in religious ceremonies. They evidently hoped to slough off their own dirt, diseases and parasites as their reptilian neighbors were seen to do.

The Tamanachiers of the Orinoco and the Arawaks of British Guiana used to say that their god once visited the earth and was set upon by human beings, who did not recognize him. He took away their gift of immortality to punish them, and bestowed it upon lizards, snakes and the other skin-changers.

WORM-LIKE LIZARDS

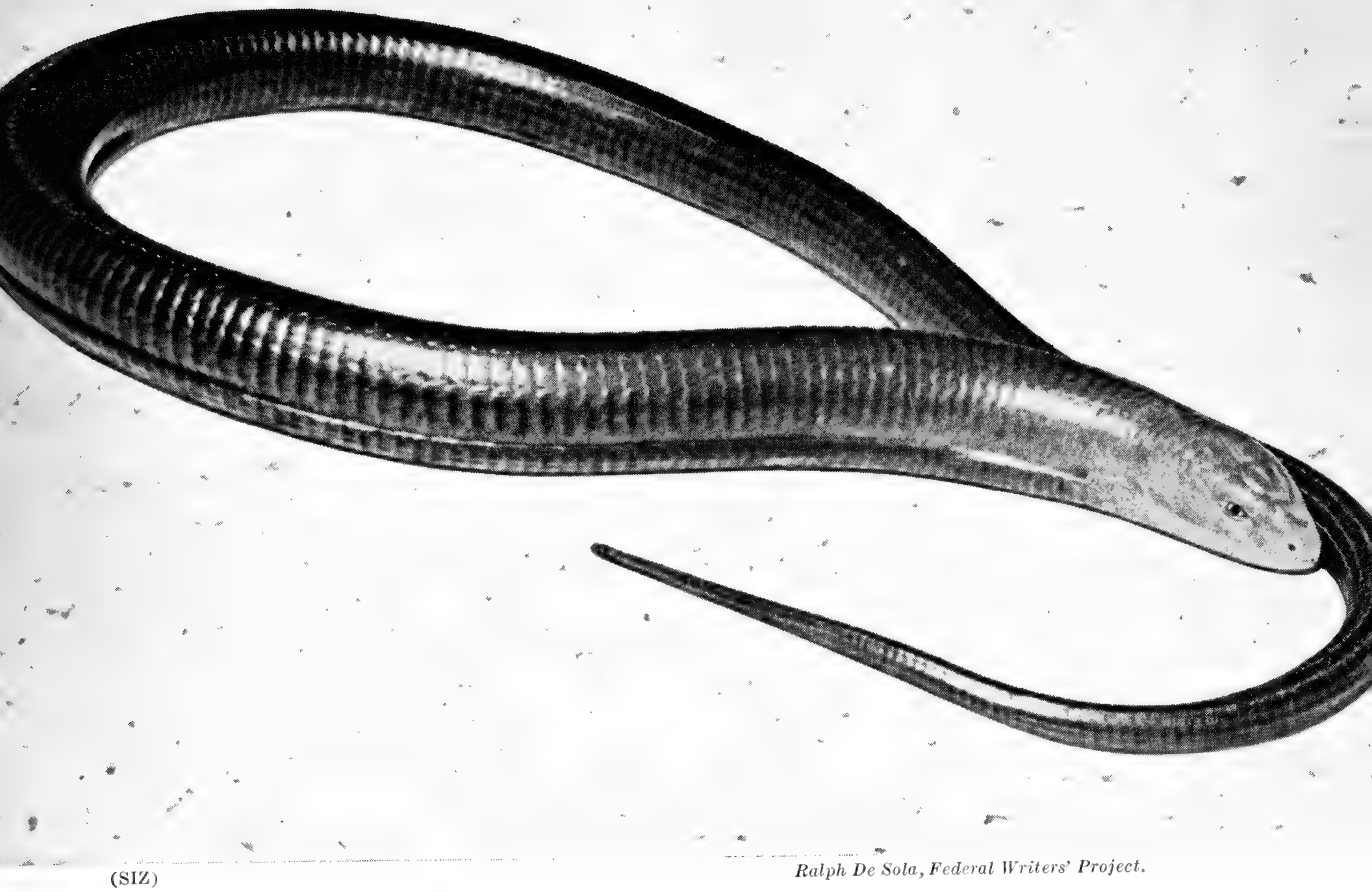
AMPHISBAENAS

THE AMPHISBAENAS are burrowing, worm-like lizards, specially adapted for raiding anthills in such diverse areas as western Mexico, Lower California, the Mediterranean region and Africa. Their name is taken from that of a mythical monster which possessed a second head in place of a tail and, as the Greek word indicates, could move forward or backward with equal ease. Although this legless lizard actually has but one head, it is hard for the untrained eye to distinguish the head from the short, rounded tail, for the creature's eyes and ears, adapted to subterranean life, are concealed. Like the mythical monster, the amphisbaena is able by means of its wormlike rings, to move forward or backward in a series of vertical undulations. The rings are divided into tiny squares, which help the reptile to grip smooth surfaces.

Among primitive peoples the belief is still common that amphisbaenas possess two heads, and that one is awake while the other sleeps. The reptile seems aware of the resemblance between its extremities, for when attacked, it will hold its tail erect, simulating the head. According to Van Denburgh, as the enemy attacks the supposed head the lizard will swing its true head around and inflict a powerful bite.

The scalation, usual in most lizards, has disappeared from the amphisbaena, except for vestiges on the head. In most species legs are totally lacking. The teeth are not set in sockets, but are consolidated with the jaw itself.

The white amphisbaena of South America is the largest member of the family, attaining a length of two feet, with a girth of only one inch. Amphisbaenas are often found in manure piles, where they burrow in search of grubs.



(SIZ) *Ralph De Sola, Federal Writers' Project.*

"GLASS SNAKE" (*Ophisaurus ventralis*). Length: 2½ feet. Range: Southern United States.

ANIELLIDS

THE APPROACH of an insect or grub attracts the aniellid's attention, but the limbless lizard makes no attempt to move toward it. If, however, the insect comes into the immediate vicinity, the aniellid will raise its head and crawl out of its burrow. When its head is directly above the victim, it will plunge its jaws down into the sand, thus imprisoning the insect. The insect's struggles only force it deeper into the lizard's mouth, where it remains for some time before being swallowed. A considerable amount of sand is swallowed at the same time.

Slevin says that these small, dark-bodied reptiles of California and Lower California spend most of their time lying in the sand with only their head exposed. On cloudy days they seem to be more deeply buried than on clear days, while in warm weather they grow somewhat more active.

Aniellids have been observed in a laboratory to lie motionless in the sand for days at a time, except when distracted by some noise or moving object. When the temperature fell below sixty degrees Fahrenheit a group of the lizards would submerge as deeply as possible and crowd together for warmth. When the room grew warmer, the individuals would again separate and bring their heads to the surface.

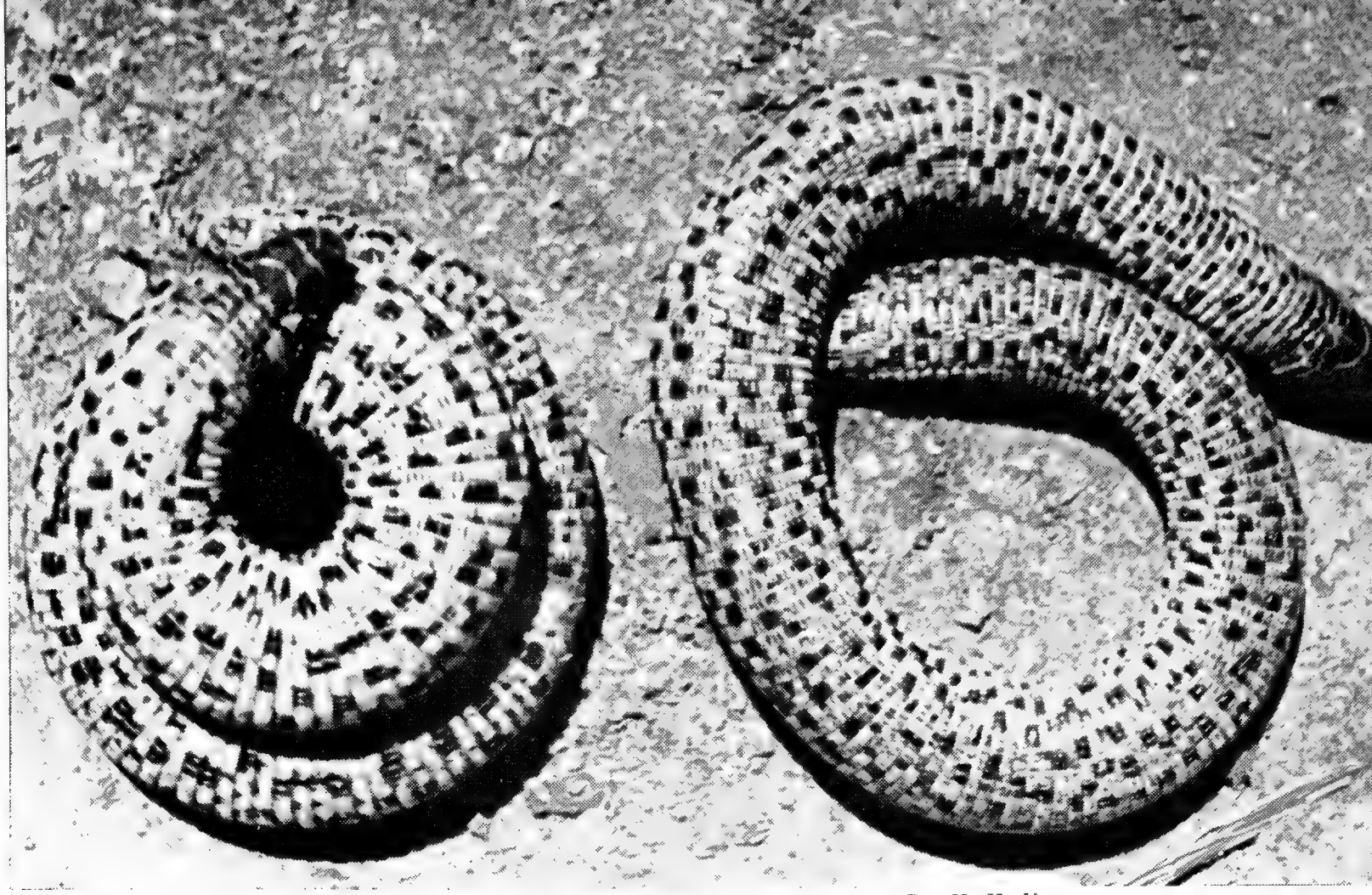
"GLASS SNAKE"

ANOTHER type of worm-like lizard is represented by the anguids, found chiefly in the warmer regions of the New World, but also having a few Asiatic and several European species. A typical member of this family is the "glass snake," which attains a length of three to four feet.

The "glass snake" burrows in sand and among fallen leaves, subsisting largely on insects. After catching its prey, the reptile stuns it by a powerful shaking and then crunches it in its jaws.

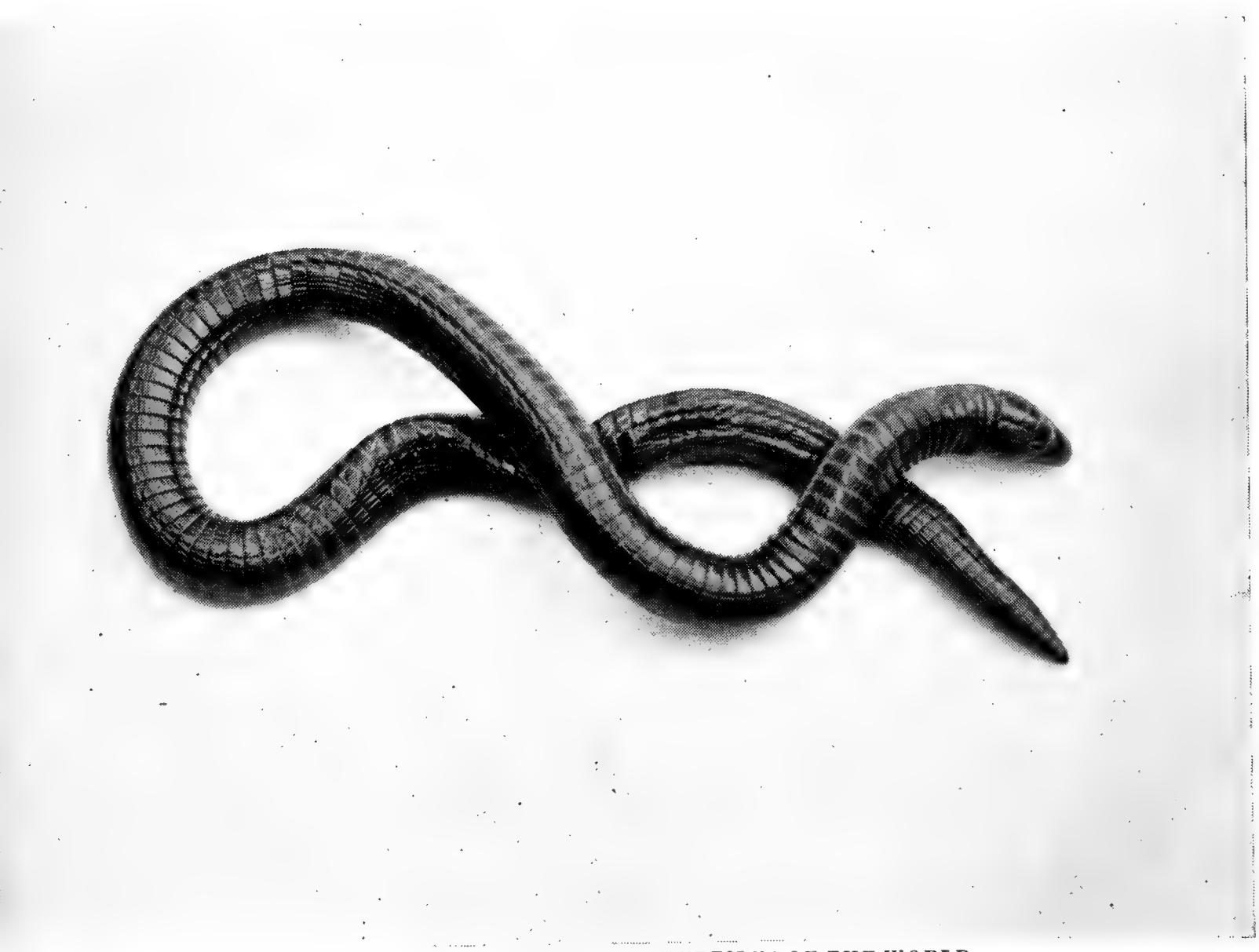
Prof. Franz Werner reports that peasants of southern Europe believe that the "glass snake" can snap itself to pieces and put itself together at will. This superstition is based on the creature's ability, when seized by the exceedingly long tail, to lose that appendage, which goes on wriggling — the lizard escaping in the excitement. The "glass snake" periodically sheds its entire epidermis.

It lays its eggs under moss and leaves. Six to twenty young emerge alive. These reptiles grow quite tame in the presence of man. When caught, they do not bite but sometimes soil their captor's hands with a saliva resembling tobacco juice. One captive specimen lived more than thirty years.



Dr. H. Hediger.

MOROCCAN AMPHISBAENIDS (*Trogonophis maroccana*).
Length: 1 foot. Range: Morocco.



From Ditmars' REPTILES OF THE WORLD.

IBERIAN WORM LIZARD (*Blanus cinereus*). Length: 10 inches. Range: Spain, Portugal and northwest Africa.

MONITORS

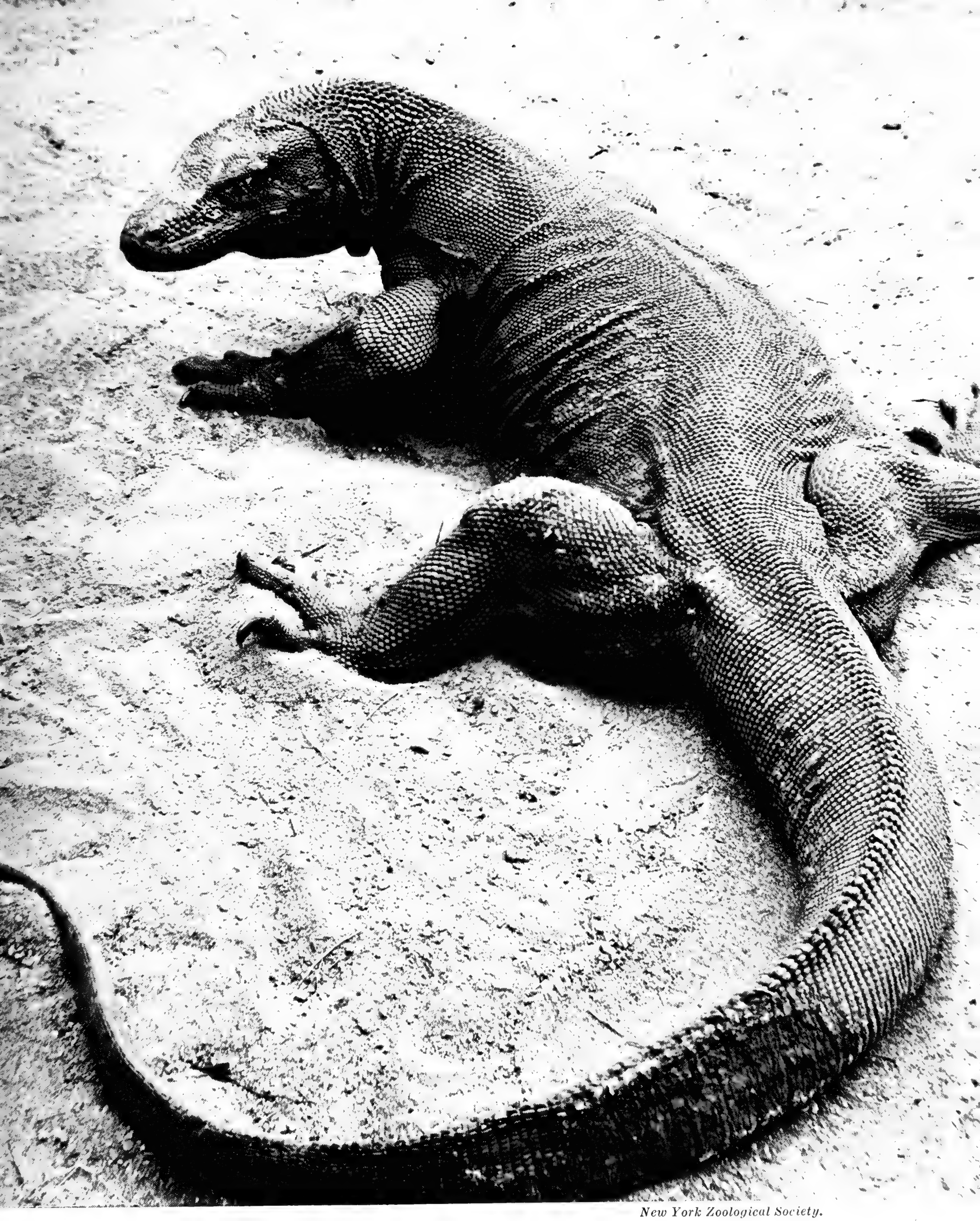
MONITORS are large, water-loving lizards, of great strength and fierceness. The monitors are distinguished from other lizards by their long, smooth tongue, deeply cleft like that of a serpent, and by their long neck, which greatly enhances their biting power. The skin of the monitors is smooth, covered above with round granular scales and beneath with smooth square shields.

They derive their name from the fact that the Nile monitor is believed to give warning of the presence of crocodiles.

Powerful swimmers, they are aided by a relatively long tail, which in many species is laterally compressed. The teeth of this hunting lizard are large and pointed. Monitors may be gray, brown or black and ornamented, especially when young, with dull yellow markings in the form of spots or transverse bars. Some species are found in desert or water regions, and may be good tree climbers.

WATER MONITOR

THE SLENDER, nine-foot *kabara goya,* or water monitor, pursues its prey by land and by water. In search of fishes it glides rapidly through rivers and streams with the help of its flattened tail, and is capable of submerging for long periods of time. With equal agility the yellow-spotted reptile climbs trees for birds' eggs and, on occasion, makes a meal of the corpses which the natives of Siam sometimes "bury" on a bough. Amid the jungle marshes the intrepid lizard will attack other reptiles and mammals. Rushing furiously upon its prey, it grasps it in its jaws and shakes it to death. If the animal struggles, the *kabara goya* holds it down with its claws, while its jaws seek a better hold. A small victim will be tossed about till its head points down the reptile's throat and then swallowed in a series of rapid gulps. Larger prey may be dropped after the struggle. The monitor rests from its exertion, licks its jaws, feels about the dead beast with its tongue,



New York Zoological Society.

KOMODO DRAGON (*Varanus komodoensis*). Length: 9 feet. Range: Komodo, Rinja, Flores, Padar and Mboera islands in the Dutch East Indies.

and finally begins the slow, difficult process of swallowing. Water monitors have been known to swallow half-grown rabbits whole.

During the mating season these lizards fight wildly among themselves, rearing up on their hind legs and grappling with their jaws.

Some twenty-four, soft, white-shelled eggs are laid usually in a hollow tree trunk near the water.

Despite their great size and agility, the water monitors have stronger enemies. The larger snakes of India find them good eating, and man, too, hunts them for food, sometimes with the help of dogs. The Singhalese believe its fat, applied externally, is a cure for skin diseases. The rural population also make a poison called *kabara tel* of this substance, which, taken internally, is extremely toxic, having figured in many local murders. If a *kabara goya* enters a native house or walks across the roof, it is considered an evil omen, and a priest's services are required to set things right. Heretics allege that the priests keep pet *kabaras* which they train to walk over other people's roofs.

Water monitors become very tame in captivity and are fairly docile when kept indoors. In the open, their wild moods are said to get the better of them.

Another denizen of India is the *bis cobra,* or land monitor, measuring some six feet in length and frequenting the drier regions. Low-caste Hindus in search of food dig these creatures out of their burrows. The monitor is in the habit of sitting in its burrow with its tail toward the opening; if the tail is caught, the clumsy beast finds it hard to turn around. Snake charmers are said to dive into their burrows and grasp them by the tail. Sometimes in this pursuit, the charmers are bitten, and the reptile's jaws have to be cut from their hands with a knife or shears, so tightly are they clamped.

Bis cobras are destructive to poultry and crops, but benefit man by eating great numbers of rodents. When chased, they may climb up a tree and disappear in a hole at the top. Cornered, they rear up on their hind legs and inflate themselves with air, which they then expel with a harsh noise to terrify an assailant.

KOMODO DRAGON

GREATEST of lizards, the heavy-set, twelve-foot Komodo dragon can kill a deer or a small pig. After dismembering its victim by a violent shaking, the brown, two-hundred-and-fifty-pound monster bolts it in great chunks, licking its saw-toothed jaws with its long, yellowish tongue. Often several monitors will fight furiously among themselves for division of their prey, and if one of their number is wounded, the others may finish it off and devour it.

In their more peaceful moments the dragons lie sprawled on a sand-bank, sunning themselves and staring vacantly into the void. At night they repair to a burrow dug under a rock or amid the tree roots in the side of a gulley. They are powerful, though clumsy, swimmers and sometimes take to the water in search of turtles. The young dragons are able to climb trees, this gift helping them to feed on birds' eggs and occasional chicks.

Though their thick, scaly skin is of no commercial use, these lizards were, until recently, extensively hunted and are wary in the presence of man. If possible, they run away, but when cornered they try to club their enemy with their thick tail. They are captured in specially built traps, baited with dead pigs, but are so powerful that they have been known to break through the bars and escape.

Despite their ferocity in the wild state, they become quite docile in captivity. Captive Komodo dragons are fed once every five days, alternating one dozen eggs and either two pigeons or a medium-sized chicken.

The Komodo monitor was discovered in 1912 on the East Indian island of Komodo. Recently this island and two adjacent ones inhabited by dragons have been made game preserves by the Dutch government, and today the dragons once in danger of extinction are fairly numerous.

NILE MONITOR

NUMBERS of greenish-gray Nile monitors lie on an African riverbank, basking in the tropic sun. These eight-foot lizards are, with the exception

of the crocodile, the largest quadruped reptiles in Africa. At the approach of man they will run swiftly into the bush or clamber into a tree, for years of persecution have made them extremely wary. It is, indeed, the monitor's misfortune to be hunted for an uncommon number of reasons. Its tough hide is used not only for leather, but also for the manufacture of native musical instruments; it preys on poultry; the natives erroneously believe its bite to be poisonous; some Africans roast it for food; and, to make matters worse for it, the melted fat of its reproductive organs is considered an unfailing cure for earache. The fishermen on Lake Victoria Nyanza flay monitors alive, as the skin, in this manner, comes off more easily.

Only when cornered will the great reptile turn and fight, brandishing its long, razor-edged tail like a whip. As a last resort, it may eject an evil-smelling mess from its cloaca.

Actually the monitor is most beneficial to humans, for it feeds largely on crocodile eggs and young man-eating crocodiles. Other items on its diet are rats, mice, toads, insects, and birds surprised on its arboreal excursions. The monitor is a fierce fighter, breaking its victim's spine with its teeth and claws.

This lizard's eggs are invariably laid in termites' nests, in sets of approximately twenty-four. Of a dull white color, they are two and one-half inches long and one and one-half inches wide. The mother tunnels into the center of the nest and there deposits her eggs. Many of the eggs are destroyed by temperature conditions, by ants who like to share a part of their own nest, and by burrowing aardvarks which live on the ants. The incubation period is apparently ten months long, and the young are born in November. At this time, the escaping egg-liquid softens the surrounding clay, permitting the young lizards to dig a vertical passage to the surface. In thirteen days the young assume a yellow and black color which serves to camouflage them among the reeds by the riverbank. They are exceedingly active and pugnacious if disturbed. At the end of one month they begin to take on their adult coloring.

In the cool season of the year, monitors are seldom seen.

Varanus exanthematicus, another African monitor, is remarkable for its habit of rolling on its back when frightened, putting one hind foot in its mouth and lying motionless until the danger has passed.

American Museum of Natural History.

KOMODO STEPPING OUT

POISONOUS LIZARDS

CLOSELY related to the worm-like lizards are the poisonous lizards, which like the former possess a beadlike scalation. They are stout creatures covered with close beady tubercles, which in their garish coloring resemble Indian beadwork. The rear teeth are curved and fanglike. Those of the lower jaw are grooved while near their base a row of glands secretes (in at least one species) a poison closely resembling snake venom. These creatures live in the deserts of the southern United States, Mexico and Central America. *Heloderma suspectum*, the Gila monster of Texas, Arizona and New Mexico, and *Heloderma horridum*, the beaded lizard of southern Mexico and Central America, are separated by a large stretch of territory in which no heloderm at all is found. This curious fact has thus far not been adequately explained. Another, though less known relative, is found in the East Indies.

GILA MONSTER

ONE OF the "terrors" of the Texas badlands is the pink and black Gila monster, a venomous lizard attaining a length of twenty inches. It also inhabits parts of Utah, Arizona and New Mexico. Ordinarily sluggish and slow-moving, the Gila, when annoyed, can maneuver with great speed and agility. Rearing up the forward part of its body, the reptile will hiss fiercely, while its forked, purple tongue darts menacingly in and out. Some Gilas are so agile that they can reverse their position completely in a single leap. If the lizard's jaws connect, their bite is as powerful and tenacious as a bull dog's. The teeth are ground from side to side with a view to imbedding the fangs as deeply as possible. The venom is rapidly fatal to small animals, particularly attacking the heart. Scientists believe it to be highly dangerous to man and recommend treatment of its bites with suction bulb and snake-bite serum. At one popular sideshow act in the American Southwest a snake-oil "doctor" used to permit himself to be bitten by the lizard and then stubbornly refused to die. However, he did die in Los Angeles in 1915, but some persons insisted that he had a weak heart or had died from some other cause. The fact remains that he turned blue all over and died in

(SIZ) *Ralph De Sola, Federal Writers' Project.*

GILA MONSTER (*Heloderma suspectum*). Length: 1½ feet. Range: Arizona, New Mexico, southern Utah, Nevada, and Sonora in northern Mexico.

about fifty minutes after being bitten. It is therefore best to give the Gila the benefit of the doubt. Ornamented in glaring mottles like an impressionistic bathroom, the Gila can be said even to look venomous.

It is believed to feed on the eggs of snakes and lizards, which it digs out of the sand as they are incubating. It is also supposed to eat ants, but it refuses them in captivity. The stubby tail of the lizard serves as a reservoir for the storage of fat. When much food is available, the tail fills out, and in the lean periods, when the Gila is obliged to go without food, it subsists by absorbing the fat in its tail.

In July and August the Gila lays from six to thirteen smooth, tough-shelled eggs, two and three-quarters by one and one-half inches in size. The eggs are buried in the sand at a depth of from three to five inches, usually near a stream, because incubation which lasts twenty-eight to thirty days requires both warmth and moisture. A fresh-laid egg contains a small but well-formed embryo. The young are about four inches long and even more vividly colored than their elders.

IGUANAS

GALAPAGOS MARINE IGUANA

On the shores of the volcanic Galapagos Islands, marine iguanas are sometimes found in groups of several hundred, sunning themselves or diving after seaweed. These dull black and brown creatures are not merely the only marine lizards but also probably the most gregarious of lizards. With their short, stout heads and the crests of curved spines surmounting their necks and backs, they look fierce and sullen. But in reality, these powerful, five-foot lizards are among the tamest of animals. Though they have strong teeth, and claws powerful enough to hold fast to a rock amid a pounding surf, they have never been known to attack a man, even when teased or molested.

Marine iguanas are singularly fortunate in possessing no enemies on land, while in the sea they fear only an occasional shark. With the sea lions they live on the best of terms, the two species stumbling over one another's bodies without hostility.

Giant crabs sometimes crawl over the iguanas, picking ticks off their backs. When the crabs crawl over their faces, the iguanas exhibit no anger, but merely close their eyes in self-protection. The great hawks, which prey on smaller lizards of the region, leave the twenty-pound iguanas strictly alone. It is this absence of enemies, no doubt, which has made the lizards so tame. Charles Darwin in his *Voyage of the Beagle*, tells how, when he seized marine iguanas by the tail and threw them into the water, they would simply turn and swim back to where he had found them. Beebe lassoed the same iguana six times, hurled it about and flung it to the ground. Each time the lizard grew apparently tamer. These creatures like to be petted and are not averse to posing for photographers. Only on rare occasions, when pursued, will they take refuge under a rock or in their burrow, and then, such is the strength of their claws, it is very difficult to pull them to the surface.

Marine iguanas live near the shore, never straying very far out to sea or inland. The young play together like kittens, rearing up on their hind legs, sparring with their forepaws, and threatening to bite. At night the

American Museum of Natural History.

GALAPAGOS MARINE IGUANAS (*Amblyrhynchus cristatus*). Length: 5 feet. Range: Galapagos Islands.

creatures repair to burrows dug in the soft lava above the shoreline. In the morning they move down to the water to dive for seaweed. Their long, flattened tails make them powerful swimmers. They are also able to walk on the ocean bottom, digging their claws into the rock to resist the backwash.

GALAPAGOS LAND IGUANA

THE LAND IGUANA of the Galapagos closely resembles its seaside relative, except for a shorter tail and somewhat angry moods. Though it inhabits the same small islands, it has never been known to mingle with the marine iguana, or, indeed, to venture near enough to water to make its acquaintance. It obtains its drinking water from cactus plants.

The land iguana's food consists of berries, hard-spined cactus leaves,

and the limbs of acacia trees. Sometimes the iguana climbs trees to feed. The seeds in the droppings of these lizards help in spreading plant life. Like the marine iguanas, they live in peace with their neighbors, often sharing their vegetable food with a bird or tortoise. Only in captivity do they grow savage and fight among themselves.

Land iguanas dig burrows in old lava or eroded limestone, scraping lackadaisically with one paw while the other rests.

RHINOCEROS IGUANA

THE DARK BROWN rhinoceros iguana of Haiti and Puerto Rico is so-called because of the three blunt protuberances on its snout, the largest attaining a length of only three-eighths of one inch. With its massive head, its hanging throat pouch, its bulging jaws and the loose folds of skin covering its shoulders and neck, it looks like a fantastic reconstruction of some prehistoric reptile. These creatures will often squat perfectly motionless on their hind quarters, remaining for hours in an attitude of timeless impassivity. They attain a length of four and one-half feet.

The iguana is a great fighter, swishing its powerful spiny tail, gnashing its teeth and snatching with its claws. If approached by an inexperienced human it can inflict as much damage as a wildcat, but if grasped by the hind legs and the back of its neck, it is powerless. The rhinoceros iguana is a favored item among lizard-lovers in the United States, bringing as much as fifty dollars a head. It is hunted with the aid of dogs specially trained for the purpose.

In captivity the rhinoceros iguana gradually grows tame until it eats quietly out of its keeper's hand. It is especially fond of young chickens, which it kills by shaking them about with its jaws. If the chicken is too large to swallow whole, it will be shaken into chunks. Rats, bits of beef, bananas, berries, lettuce and celery are also appreciated.

American Museum of Natural History.

RHINOCEROS IGUANAS FIGHTING (*Metopocerus cornutus*). Length: 4½ feet. Range: Haiti and Puerto Rico.

American Museum of Natural History.

GALAPAGOS LAND IGUANA (*Conolophus subcristatus*). Length: 4½ feet. Range: Galapagos Islands.

COMMON IGUANA

THE COMMON IGUANA is well known throughout tropical South America for its white, chickenlike meat, which is an important source of native food. This lizard is a pale, greenish-gray color, marked with black bars on the sides. The females display a somewhat darker hue, while the young show patches of light green. A striking characteristic is the row of soft, leathery, lancelike spines covering its neck and back. These creatures may weigh as much as thirty pounds, yet despite this weight, they spend most of their time in trees where they balance themselves on slender branches with their forelegs dangling down on the side in a slovenly, nonchalant manner. A peculiarity of this species is a large, circular shield beneath the eardrum.

Though largely herbivorous, they also like to eat young birds, rats, mice and worms. The young scurry about in search of insects and grubs and are even capable of catching flies on the wing.

Common iguanas often mistake telegraph poles for trees, clustering on them in great numbers and nodding gravely as a train passes.

They doze in the trees above a river bank. If startled, they dive into the water, sometimes from a great height. They swim swiftly — the only water animals in their habitat capable of out-distancing them are the crocodilians.

The common iguana makes its home in a burrow, dug horizontally in the riverbank. Twenty-four eggs are laid each spring and hatch in May. The contents are mainly yolk and therefore useless for coating meringue pies, but they are widely used by the natives of South America who cook them and eat them fried, or pickled and dried.

These creatures are prepared for market by tying their hind legs together with their own tendons. Occasionally iguanas arrive in New York in this manner. Despite their weeks of discomfort, they behave in a perfectly normal manner when released.

The habits of iguanas have been studied in some detail by Barbour, Ramsden, Noble, Grant and other workers who have concerned themselves with neotropical reptiles.

From Ditmars' REPTILES OF THE WORLD.

TURKS ISLANDS IGUANAS (*Cyclura carinata*). Length: 3 feet. Range: Turks Islands, West Indies.

New York Zoological Society.

SPINY LIZARDS (*Zonurus giganteus*). Length: 15 inches. Range: South Africa.

HORNED "TOADS"

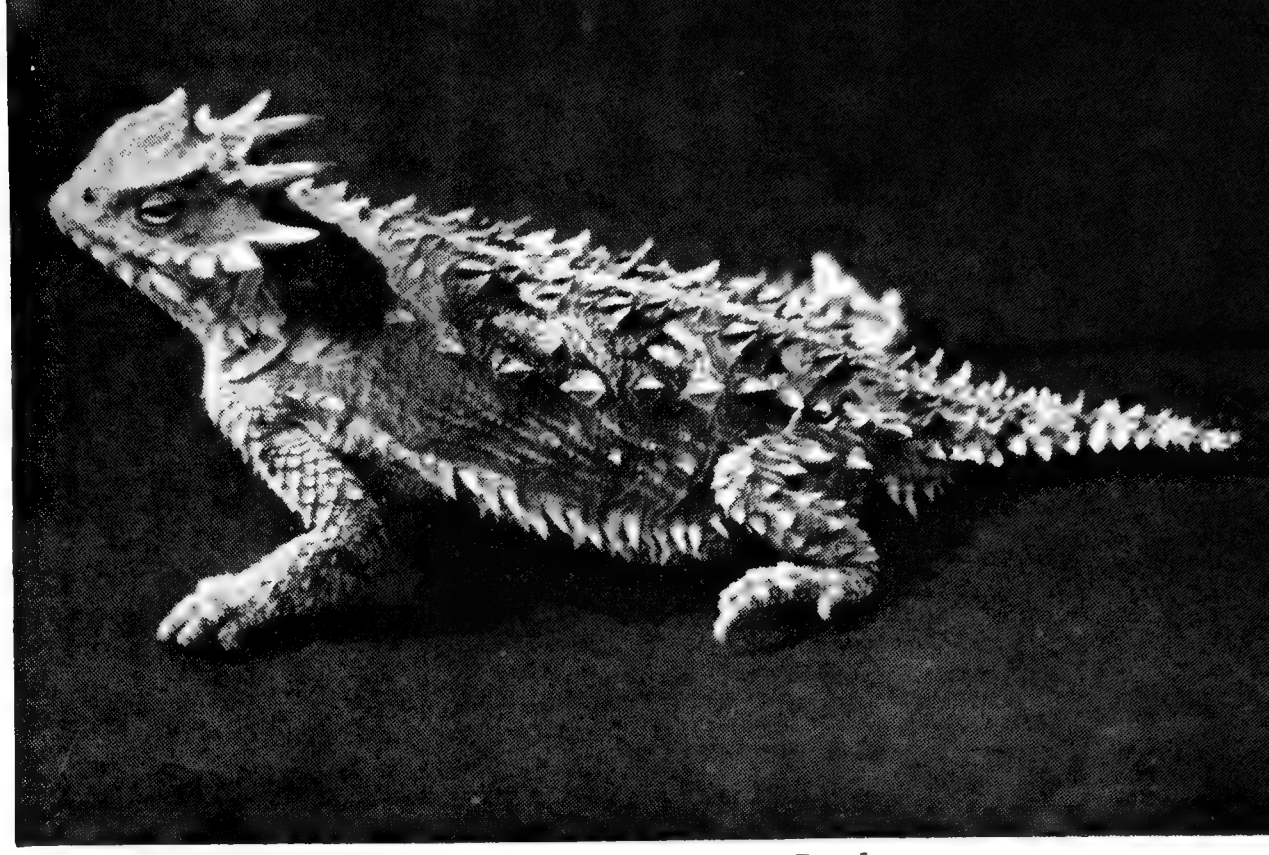
THE HORNED "TOADS" common in the deserts of the central and southern United States hunt beetles and other insects during the hottest part of the day. Before nightfall they burrow into the sand by a series of odd contortions and remain buried for the night. These lizards have flat, broad bodies, resembling a toad's, and are covered with spiny scales of varying size. Their colors — a sprinkled yellow, gray, black and brown — constitute an excellent desert camouflage.

The horns, which give this reptile a rather menacing appearance, are bony spines protruding from the head and back, the longest being those on the head. Usually slow-moving, horned lizards run swiftly if they have to. They are harmless to man.

Texas horned lizards are often caught by tourists as souvenirs of their trip. They usually die of improper food, cold, dampness or lack of sun. This species has two large spines on the center of the head and three on each temple. The Pacific horned lizard has a narrower body than the Texan variety, though its tail is thicker and longer. When angry it puffs up, its eyes bulge and squirt tiny jets of blood. The reddish color of this lizard is relieved by a brownish spot on each shoulder and three stripes of the same color on its back.

When the crowned lizard of Lower California burrows into the sand for the night, its tallest spines often remain above the surface like periscopes. When it first emerges in the morning, the reptile is lethargic, but in the noonday heat it becomes very active in pursuing flies, ants, worms, caterpillars and moths. When chased, these creatures run swiftly for a few yards and then stop to nod their heads. In the winter they like to hibernate. If prevented from so doing, they will go on living through the cold weather, but when spring comes, they usually die.

PACIFIC HORNED "TOAD" (*Phrynosoma blainvillii*). Length: 6 inches. Range: Southern and Lower California.



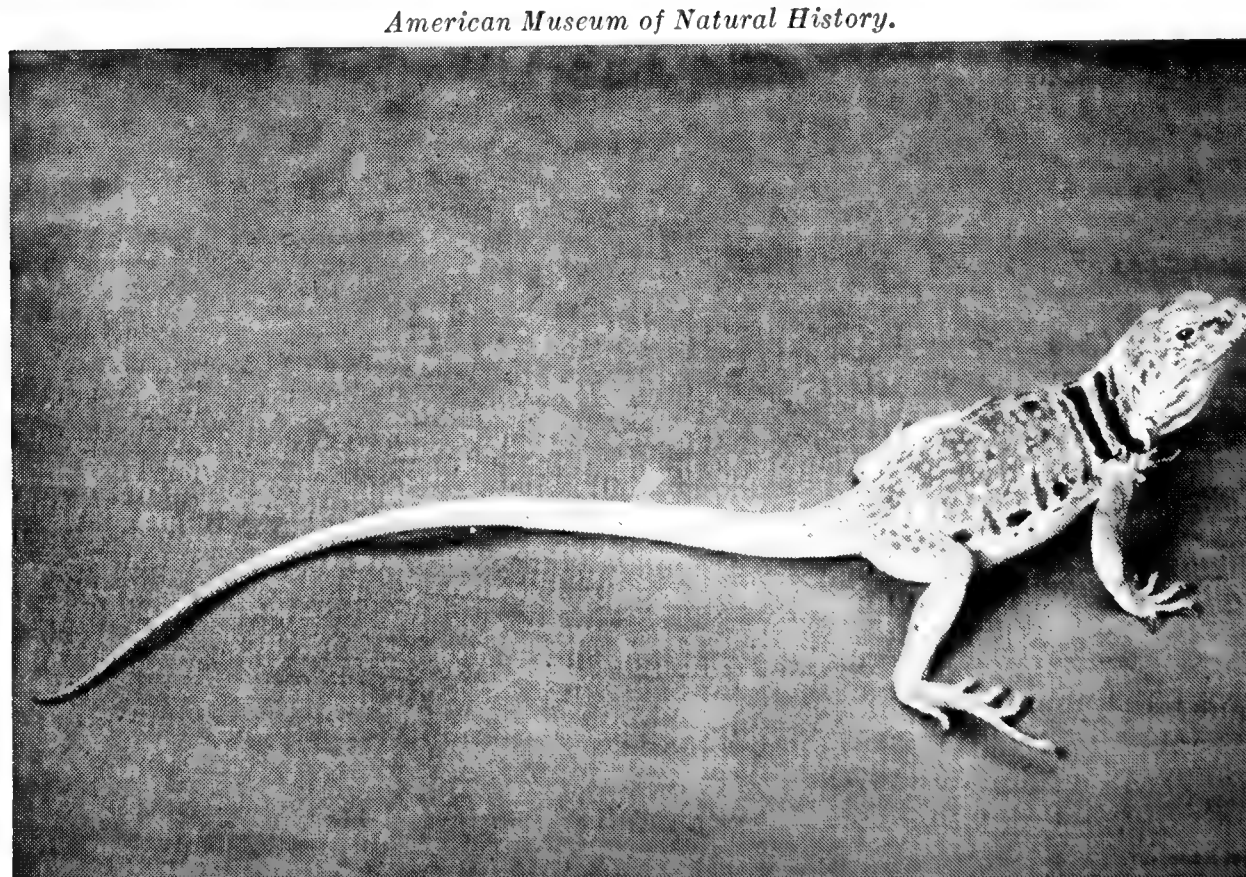
George L. Dowden.

BANDED BASILISK (*Basiliscus vittatus*). Length: 2 feet. Range: Mexico to Ecuador.

From Ditmars' REPTILES OF THE WORLD.

COLLARED LIZARD (*Crotaphytus collaris*). Length: 1 foot. Range: Central and western United States.

American Museum of Natural History.



AGAMAS

"FLYING DRAGON"

"FLYING DRAGONS" make their home high up in trees or tall grasses, descending to earth so rarely that they are seldom seen by man. But when danger threatens, these tree lizards glide gracefully to the ground with the help of winglike membranes which can be opened or closed at will. They do not actually fly. A Celeban species uses its "wings" in courtship display.

These reptiles show great agility in hunting insects, leaping through the air like a dart; when not hunting, they lie motionless with their flat bodies pressed close to the bark of a tree limb. The tail of this reptile, though long and slender, does not easily break off. A skin sac or dewlap hangs from the "dragon's" throat. This lizard lays oval white eggs in batches of three or four.

There are about twenty species of "flying dragons," varying as to size and color. It is a curious fact that these reptiles have the same range, the Indo-Malayan region, as those strange mammals, the "flying" lemurs, whose aerial habits they approximate.

"BLOODSUCKER"

THE "BLOODSUCKER" LIZARD is not a vampire; it owes its misleading name to its faculty of changing color when angry or eating: the head and neck turn a bright red, while the body changes from brown to yellow. Of its total length of fourteen inches, its tail occupies eleven.

The female deposits about one dozen oval, soft-shelled eggs in leaf mold or in the cracks in a rotting log. The young require approximately two months to hatch. This lizard's range is India, Afghanistan and southern China.

From Ditmars' REPTILES OF THE WORLD.

"FLYING DRAGON" (*Draco volans*). Length: 9 inches. Range: Malaysia.

A larger species from Ceylon and southern India is also called "blood-sucker," because its head and neck turn red when it is excited. This reptile, Deraniyagala reports, attains a length of two feet.

Another colorful species is known from Turkestan and is remarkable for the extreme variations of its colors. The usual color scheme is brown above with dark markings, and white or light brownish below. The whole body may turn a dirty white, black or grayish-brown. Red may appear in patches and lines on the males, and in larger patches on the females. The male can show blue stripes, and sometimes can become blue altogether. These color changes are not protective, for the brighter the sun shines, the more conspicuous does the lizard become.

Agama stellio, found in southwestern Europe, Asia Minor and Egypt, is killed by pious Mohammedans because they believe it to be mocking their prayers as it nods its head, runs, stops, and nods again when pursued. It is also exhibited by snake-charmers. The *hardim,* as it is called locally, reaches a length of fifteen inches; it has large neck folds, and its back is covered with spines. The ancient Greeks called it *korkodilos.*

SPINY-TAILED LIZARDS

RANGING throughout the deserts of North Africa, Arabia, Persia, Syria and northwest India, the spiny-tailed lizards, or mastigures, have a heavy tail, covered with strong spines. They have small, smooth scales on their body and head. These lizards spend their nights and cool days in burrows, which are sometimes as long as four feet. When danger approaches, they dart inside their burrows. When once their forefeet and heads are inside, they will allow themselves to be pulled apart rather than emerge. The Arabs esteem their flesh as food, alleging that it tastes like chicken.

When first made captive these lizards were observed not to drink water, and consequently they did not long survive. Then it was accidentally discovered that the mastigures absorbed their moisture from the air through the skin. After that an artificial spray was devised to give the same effect as desert dew and when so treated they thrived. These lizards usually measure not more than a foot and a half in length.

New York Zoological Society.

SPINY-TAILED MASTIGURE (*Uromastix spinipes*). Length: 1½ feet. Range: Sahara, Africa.

(NZP) *W. Lincoln Highton, Works Progress Administration.*

ARMED SAIL-TAILED LIZARD (*Acanthosaura armata*). Length: 2 feet. Range: Southeastern Asia.

CHAMELEONS

CHAMELEONS are the apes of the reptile world. With the help of their forked feet and long, prehensile tails, they move among the treetops in a slow and nonchalant, but highly acrobatic fashion.

Prominent features of these lizards are their helmet-shaped heads and bulging uncoordinated eyes. One eye may be staring at an insect which the reptile contemplates devouring, while the other rolls around, taking in a wider view of the arboreal landscape. After deliberately studying its prey — preferably a grasshopper, cricket or spider — for some minutes, the chameleon darts out its sticky tongue, sometimes to a length of six or seven inches, and snaps the victim back into its jaws. The lizard chews the food before swallowing.

Male chameleons fight furiously among themselves, most often for food or mates. On one occasion a moth was seized by two of these creatures and pulled back and forth in a veritable tug of war. A single branch, it appears, contains room for no more than two chameleons. If a third appears, the other two attack him, swaying from side to side like Bowery toughs. Sometimes the intruder is intimidated, but often a savage battle ensues. The reptiles tussle with their claws, bite, mount on each other's backs, and butt with their heads. On the ground they are clumsy and almost helpless.

Like many other lizards, chameleons are remarkable for their color changes. Their most common shades are yellow and yellowish-brown, but they may turn green, black or gray, or else they may become mottled or blotched with these colors. Experiments show that these changes are not protective. They occur as reactions to sunlight, temperature changes, anger, sickness and death. One specimen placed in a position to receive sunlight through a wire grating showed the design of the grating for half a minute after its removal from the sun.

Chameleons may lay as many as forty eggs. The young are ludicrous in appearance, having heads out of all proportion to their bodies. In captivity this lizard lays no eggs and shows little enthusiasm for food, though it does drink much water. Its body may become thin and translucent, and

New York Zoological Society.

COMMON CHAMELEON (*Chameleon vulgaris*). Length: 6 inches. Range: Mediterranean countries.

New York Zoological Society.

COMMON CHAMELEON DESCENDING

it is a rare chameleon that lives for more than five months in "protective custody."

The three-horned chameleon, an East African species, is feared and hated by the natives, who erroneously believe it to be poisonous. The horns are coveted as ornaments by the women, who string them on necklaces. A young man who seizes one of the lizards and cuts off its horns is considered exceedingly brave.

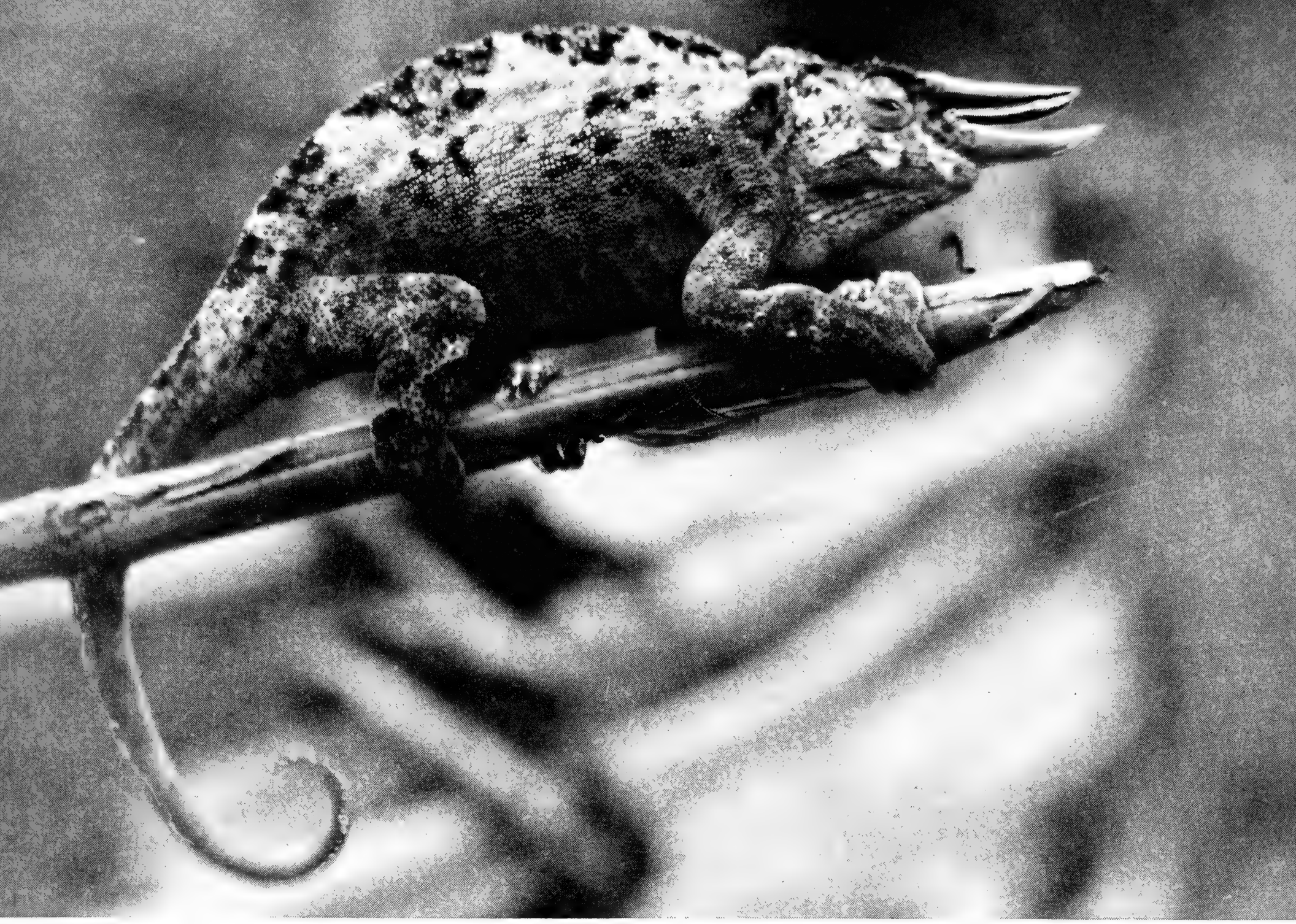
AMERICAN "CHAMELEON"

THE AMERICAN "CHAMELEON," which is technically no chameleon at all, but an anole, changes its color according to light and temperature conditions and according to its emotional state. In the trees, these creatures, all of five inches long including their three-inch tail, are hard to detect because they assume the dull brown color of tree bark. It is their bright eyes that sometimes give them away to collectors who sell them at fairs and circuses.

When two males meet, they nod their heads as if to acknowledge one another's presence. Then the skin of the throat is distended into a dewlap, and turns a bright pink, while the body turns gray. A moment later they are dashing back and forth, locked in battle. After the fight the loser turns a dull yellow and usually departs without his tail. The victor, however, turns a vivid green for some minutes, before gradually resuming his native brown.

These anoles are catlike in seeking their food. They move slowly until within a few inches of their victim — a gnat, butterfly, beetle, spider, wasp or scorpion — then they extend their tongue and spring.

A larger relative, the Cuban anole, attaining a length of sixteen inches, lives among mangoes, palms and other tropical trees. The body of this creature is green, its neck pouch yellow. It feeds on fruits and berries, and lays its eggs in the hollows of trees. The adults rarely descend to the ground, while the young hide among the dense leaves of the treetops. The males are exceedingly pugnacious. When they fight, a ridge temporarily forms on their back.



James P. Chapin, American Museum of Natural History.

THREE-HORNED CHAMELEON (*Chameleon johnstoni*). Length: 1 foot. Range: Belgian Congo, Africa.

Dr. H. Hediger.

COMMON CHAMELEON SWIMMING


R

SNAKES

ACCORDING to legend, the entire serpentine population of Ireland fell victim to the doughty shillelah of St. Patrick. Be that as it may, there really are no snakes in Ireland. New Zealand, and a few isolated oceanic islands of recent formation such as the Azores, must have had their St. Patricks, too, for these regions are also snakeless. However, with these exceptions, all parts of the temperate and tropical world have representatives of the twenty-three hundred existing species of snakes.

As a rule the snakes that come most often to the attention of people are those noted for some spectacular habit or feat—real or fictitious. Consequently snakes, for the average reader, are things that drop out of trees to strangle men in their coils, and creep into tents and houses in India to kill people with their poisonous fangs. There are snakes that can do these things, in tropical America as well as India. But the great majority are not only harmless in their dealings with man but even help him to control rodent and insect pests.

The large snakes, such as pythons and boas, are not the only ones capable of swallowing prey many times their own girth. All snakes can perform this feat because their jaws readily spread both at the hinges and at the front where the two halves of the lower jaw are held together with an elastic ligament, unlike the fixed jaws of lizards. Legless lizards should not be confused with snakes.

Contrary to popular opinion snakes have good vision. Tests made by Warkentin show that sight is temporarily disturbed just before they shed their skins, because the cornea becomes opaque until the skin is sloughed off. Just after shedding, the sight is keenest.

For convenience the ten families of snakes have been grouped in the following popular classification:

Worm-like Snakes are small, harmless creatures, seldom seen because of their burrowing habits. They include about one hundred species of blind, blunt-tailed and shiny-scaled typhlopids found in almost all tropical countries; the twenty-five closely related leptotyphlopids (sometimes called glauconids) of the warmer regions of the Americas, southwestern Asia and

Africa; the beautifully colored ilysiids, found only in tropical South America and the Indo-Malayan region; the worm-eating, forest-living uropeltids of Ceylon and southern India, forty in number; and the three-foot-long xenopeltid of southeastern Asia. Only a single species of the last family is known.

Constrictors range in size from the sand boas measuring less than a yard in length to the monster anacondas which have been known to attain thirty feet. Pythons and boas are subdivisions of the family Boidae. The pythons differ from the boas chiefly in that they possess an extra skull bone, the supraorbital, and that they are confined with but one exception to the Old World while for the most part the boas are situated in tropical America. One very rare python is found in Mexico. In all about seventy species are known.

Harmless Snakes include the great majority of typical colubrid snakes. They inhabit almost all parts of the globe and may be found in terrains as diverse as arid deserts, dense jungles and high mountains. Some of these snakes burrow beneath the humus of forests and are small-headed and shorttailed; others that dwell in deserts are rough-scaled and colored in the pallid tones of their habitat; typical ground-dwellers are cylindrical, having in addition distinct heads and fairly long tails; aquatic species are provided with nostril valves which can be closed during periods of submergence; tree snakes tend to be greatly elongated and whiplike.

Many of the species included in this grouping are beneficial to farmers as destroyers of rodents and insects. A bull snake has been known to eat as many as thirty-five field mice in one day. Some farmers catch bull snakes, place them at the entrance of gopher rat holes, and applaud the usefully destructive work of the snakes.

Sea Snakes are elapids adapted to aquatic life. Like some other water snakes their nostrils are provided with valves. The tails of these front-fanged snakes are flattened vertically and serve as sculling or sweep oars. About fifty species have been described from the Indian and Pacific Oceans. Sea snakes range in size from four to twelve feet. All are poisonous although the majority of individuals are rather good-natured and seem not to mind being handled.

Rear-fanged Poisonous Snakes include aquatic species which inhabit the fresh waters and estuaries of the Indo-Australian region. They include

an egg-eater known only from Bengal, some poisonous tree snakes, gliding snakes and sand snakes. Because of the situation of their fangs, they find it difficult to bring them into play. However, a few of the larger species such as the *boomslang* of South Africa are dangerous to man. The venom injected by this arboreal serpent affects the blood stream of victims, destroying numbers of red corpuscles and increasing the white cells. This type of toxic action is called haemolytic in contradistinction to the neurotoxic, or nerve-paralyzing effects characteristic of cobras, coral snakes and kraits. Vipers and rattlers also dispense a haemolytic type of poison.

Front-fanged Poisonous Snakes or elapids are to be found in all tropical countries. Some of the deadliest of all snakes are included in this classification. Typical examples are the banded coral snakes of tropical America, the southern United States, and Australia, the six-foot hooded black snake, the tiger snake, the viperlike death "adder," the death-dealing kraits which are responsible in part for the high snake-bite mortality in Malaya, the South African tree-living mamba, and the well-known cobras of Africa and southern Asia.

Movable-fanged Poisonous Snakes (vipers and rattlesnakes) differ from other poisonous snakes in that their fangs are situated on the front of their upper jaws and, as indicated, are movable. This permits the snake to fold its fangs back into a position parallel to the roof of the mouth when they are not in use. Vipers and rattlers are cosmopolitan except for the Australian region and Madagascar. Most members of this order are large, stout snakes with fairly prominent flattened heads.

SNAKE-BITE

To DATE there is no accurate means of even estimating the number of deaths from snake-bite each year throughout the world. This is due largely to the difficulty of keeping a faithful check on some of the more congested regions of the East, where most of these fatalities occur. In India alone, for instance, it is believed that as many as 20,000 natives fall victim each year to the different varieties of deadly snakes which infest the peninsula. But there is still no way of establishing the accuracy of this figure.

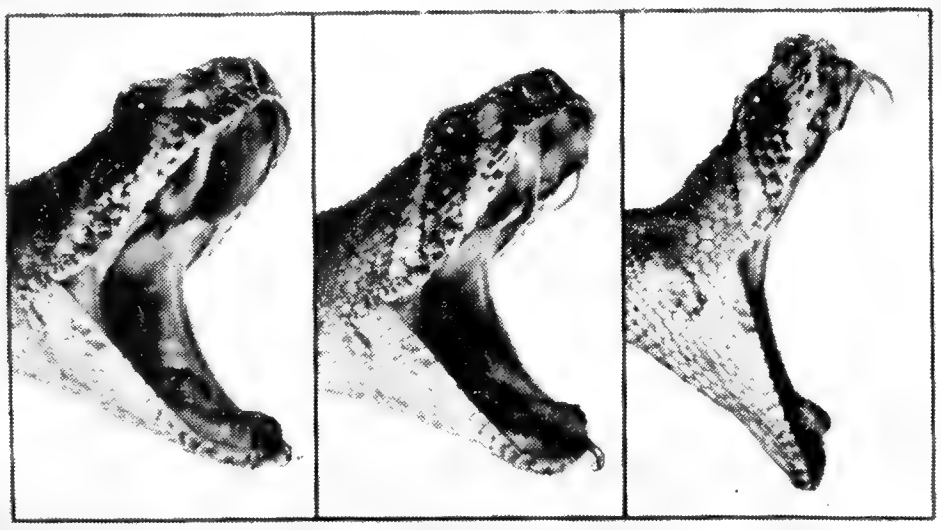
SNAKE-BITE

RESTING COIL

CRAWLING POSITION

STRIKING COIL

HOW A RATTLESNAKE BITES



FANGS FOLDED

ADVANCED FOR ACTION

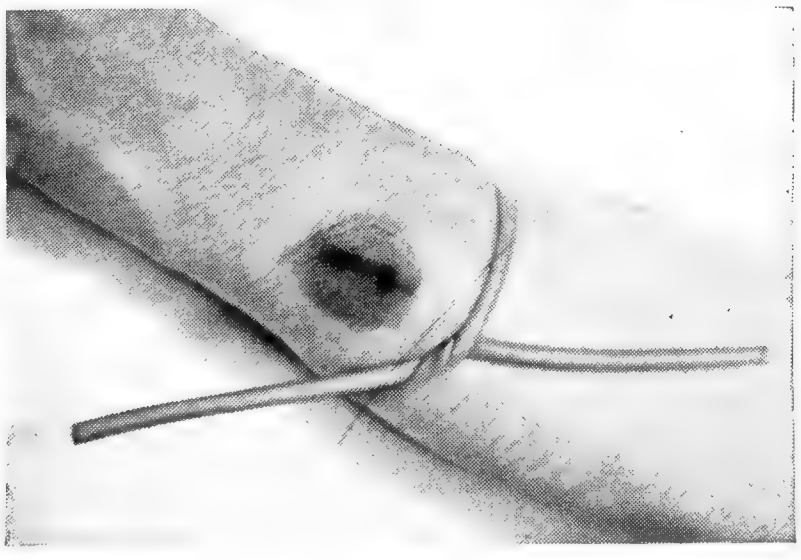
STRIKING

MODEL HEAD, WITH SKIN REMOVED, SHOWING RIGHT POISON GLAND AND DUCT LEADING TO ONE OF THE TWO HYPODERMIC NEEDLE-LIKE FANGS.

SNAKE-BITE TREATMENT

SNAKE-BITE SUCTION OUTFIT

1. TOURNIQUET 3. RAZOR BLADE 5. LARGE APPLICATOR
2. ANTISEPTIC 4. SMALL APPLICATOR AND SUCTION BULB



PREPARATION OF WOUND FOR TREATMENT

REMOVING POISON WITH SUCTION BULB PRIOR TO ANTIVENIN INJECTION

PHOTOS BY L.M KLAUBER: AMERICAN MUSEUM OF NATURAL HISTORY: SHARP AND DOHME: RALPH DE SOLA. FEDERAL WRITERS' PROJECT

In the United States, however, we know definitely that snake-bites account for the death of only slightly more than one hundred and fifty persons each year, while estimates based on careful research have placed the yearly number of snake-bites as somewhere between fifteen hundred and two thousand. This is far less than the 30,000 persons killed each year by automobiles in the United States. Yet, strangely enough, most people are still much more afraid of snakes than they are of motor vehicles. From the figures it may be seen that only some ten per cent of all snake bites in this country prove fatal. This is not a very high figure, when one considers the toxic powers which characterize some of our more poisonous serpents. These figures could be lowered appreciably if persons frequenting snake-infested areas would only exercise a minimum of caution.

To Avoid Being Bitten

There are many who enjoy camping, hiking, and other outdoor activities which may lead them through wooded or brush areas where poisonous snakes are apt to be found. It is wise for such persons to take a few precautions, in order that the hazards of outdoor life may be minimized.

A pair of thick canvas or leather leggings is an excellent protection against the poisonous reptiles found in the northern United States. High shoes should be worn with the leggings, for otherwise a portion of the ankle is left exposed and so becomes an excellent target for the snake. One should also be wary while climbing or pushing one's way through thick underbrush to see that the hands are not thoughtlessly thrust into the neighborhood of a snake crevice or den. Eyes should be on the alert continually, as their use is the best guarantee of safety. Foremost, however, one can save time, trouble and worry by finding out about the snakes of the region in some reliable book. Frequently poisonous snakes are found in but restricted parts of their range and consequently many local areas are free of them. For example, Long Island, New York, is free of venomous snakes although at one time rattlers were known.

Unfortunately no hard and fast rule of thumb can be given to differentiate poisonous from harmless species. In general, however, the pupils of poisonous serpents are elliptical while those of all but one or two harmless species are round. The relatively thick heads and tapering necks of

rattlers and copperheads also helps to distinguish them but is a misleading character because it is also found in boas and pythons.

In southerly areas of the United States, and in the tropics, where weather conditions tend to reduce the resistance-value of leggings, the best possible protection is a pair of leather puttees thick enough to be impregnable against the fangs of any snake. In the southern United States, it is wise also to be wary of hollow tree trunks. They serve in many cases as the hiding places of venomous reptiles.

First Aid Kits for persons travelling in snake infested regions should contain a suction-bulb snake-bite outfit, as illustrated, and two tubes of the anti-venin for combatting the venoms of the snakes of the region.

If Bitten

Don't give whisky or alcoholic drinks of any kind. Alcoholic stimulants will only step up the circulation of the blood, hastening the action of the venom.

Don't burn or cauterize the wound.

Don't use any of the so-called "folklore" remedies. They are useless, and in many cases downright harmful.

Don't apply any whole grains of potassium permanganate to the wound. However, a weak solution may be made with water and washed into the incisions. This will neutralize any venom the solution reaches.

(1) The victim should be encouraged to remain as calm as possible. Excitement will only send the blood racing to the heart, and speed the absorption of the venom. He should be reminded that the bites of American snakes are rarely fatal, especially with any kind of treatment. Get the patient to a hospital or to a doctor as soon as possible. In the meantime —

(2) A tourniquet should be applied just above the bite, between it and the heart. Cord, rubber tubing, or even a necktie will do. Pressure should not be so great as to stop blood circulation entirely. The idea is to halt the flow of lymph. Loosen the tourniquet for a minute at fifteen minute intervals.

(3) Connect the two fang punctures with a single incision of a clean, sharp-bladed instrument, preferably a single-edged safety razor blade.

The cut should be approximately one-quarter of an inch deep, or in cases where an unusually large snake has been responsible for the bite, three-eighths of an inch deep. The blade should be sterilized before the operation with iodine, alcohol, or even the flame of a match.

(4) Apply suction by means of the suction-bulb included in the snake-bite kit, or with the lips if necessary. The latter method should not be undertaken by anyone with sores in his mouth. Suction should be continued for at least a half hour.

(5) If anti-venin serum is available, use according to the instructions on the package. But in any case the suction operation should also be performed, as either of these techniques alone does not constitute a complete treatment.

(6) If the swelling progresses up the limb, make additional incisions at the point of swelling, and repeat the suction treatment. The tourniquet, however, should always be kept above the swollen area. It is best to apply a second tourniquet in such cases, before removing the original one.

(7) If the victim is faint, he should be given some strong coffee or tea.

A great many people are bitten each year by harmless snakes; much undue excitement is caused. However, the bite of a venomous snake is unmistakable since it causes a burning pain in the region of the bite within one to five minutes. After such an attack, a swelling develops within ten minutes. Without these symptoms there is nothing to fear, and the bite may be treated as any other wound or ignored if the snake is small.

It is interesting to note that snake venom has positive as well as negative values. Persons afflicted with epilepsy, arthritis, asthma and cancer have responded to treatments employing snake venom in excessively minute doses.

WORM-LIKE SNAKES

BLIND SNAKES

ONE MORNING some burghers of Calcutta turned on the water for their baths and were amazed to see dark brown, wormlike creatures some six inches in length issuing from the faucets. When identified, the intruders proved to be blind snakes, a subterranean species with eyes covered over by scales and a short, sharp spine at their rear extremity. These reptiles, which come to the surface of the ground only in wet weather, are good swimmers. They are believed not to be totally blind, but to be capable of distinguishing between light and darkness. Sometimes they invade houses in throngs of one hundred or more.

Blind snakes are timid, inoffensive creatures, whose only defenses against aggressors are their subterranean life and their armorlike scales, which protect them from the soldier ants sharing their abode. They are valuable to man as destroyers of snake and insect eggs and of termites, which in many countries destroy the wooden underpinning of rural dwellings. Another item on their menu is caterpillar droppings.

Above ground, these creatures progress smoothly and actively. When angry they dart out their tongues like other snakes. Their smooth, shiny scales prevent the earth from sticking to them as they burrow. Because of a similarity of appearance between head and tail some Indian natives believe them to be two-headed. Wall observes that as a defense these reptiles emit a foul-smelling anal discharge, which may also serve to help the sexes find one another in the mating season.

A blind snake placed on a table by one investigator, tied itself into a knot. The knot was not untied by reverse action, but by moving forward, so that the knot passed down the body and off the tail.

It is believed that only the younger and smaller specimens are seen at the surface, while the adults burrow deeper and do not emerge. These creatures are believed to slough their skins underground, but the candid camera has not yet surprised them in the act. The blind snake's eggs, two to seven in number, resemble cooked rice grains.

From Ditmars' REPTILES OF THE WORLD.

YELLOW-HEADED WORM SNAKE (*Leptotyphlops albifrons*). Length: 8 inches. Range: Tropical America.

ROUGH-TAILED EARTHSNAKES

THE ROUGH-TAILED EARTHSNAKES, of which there are some forty species, differing from one another only as to scalation, burrow through the soil of damp mountain forests or of gardens. These eighteen-inch, blackish creatures are timid and slow-moving, repelling other subterranean animals with their shieldlike tail. They are valuable to farmers as eaters of insects. They bring forth their young alive.

Leptotyphlops decima is the smallest known snake, attaining a length of no more than four inches. The leptotyphlopids, of whose thirty species this is one, have teeth only in the lower jaw; they approach the lizards in bone structure, in that they have pronounced pelvic girdles. They are known to lay eggs. Leptotyphlopids inhabit the tropical regions of America, Africa and southwestern Asia.

CONSTRICTORS

REGAL PYTHON

THE REGAL or reticulated python is the largest known snake, one specimen having attained a length of thirty-two feet. The average adult length is about twenty-two feet, while two hundred and twenty-five pounds is considered a good weight. The glistening skin of these giant constrictors is covered with an intricate yellow-brown and black design. The head is brown with a narrow black line extending backward from the snout, and the eyes are red with vertical pupils.

Goats, leopards, sheep, swans, and other mammals and birds are among the constrictor's victims. Although a fourteen-year-old boy was once found in the stomach of a dead python, the snake's man-eating propensities have been exaggerated by legend and in the *Swiss Family Robinson*. Because pythons insist on swallowing their victims head first, it is doubtful whether the largest of them could swallow a full-grown man; measurements show that the shoulders would be too large for the serpent's gullet.

The python attacks its victim by tossing its body around it; in less than a few seconds two or three coils surround the prey. Then the reptile begins to squeeze. It does not, as popularly supposed, kill by crushing the bones, but merely by halting breathing and circulation. Reptiles are more difficult to kill by constriction, as the circulatory system of cold-blooded animals is less sensitive. In a battle with a lizard, the python comes out victor, but half kills itself in the process.

After swallowing its food, the python becomes sluggish and helpless until digestion is nearly completed, and this may take weeks. In this condition the snake is an easy victim for hunters. Natives kill it for food and for its beautiful skin, which is made into leather.

When the python's meal is digested, the snake — if it has escaped the hunter — becomes restless until its appetite is again appeased.

In captivity a sixteen-pound python swallows an eight-pound rooster whole in ten minutes. A twenty-foot python dines on two chickens every ten days, while another specimen of the same length devours a twenty-five-

Raymond L. Ditmars, New York Zoological Society.

REGAL PYTHON (*Python reticulatus*). Length: 25 feet. Range: Malaysia.

NZP) *W. Lincoln Highton, Works Progress Administration.*

BALL OR ROYAL PYTHON (*Python regius*). Length: 6 feet. Range: Tropical West Africa.

pound pig. After a meal the python coils up in its shallow bathing pool and remains there for about one week.

When first captured, most regal pythons refuse to eat and must be subjected to forced feeding. In one case twelve keepers were required to hold the monster while four skinned rabbits were being rammed down its throat with a pole. Actually the snake is no stronger than a powerful man, and it is only because of its length that so many men are needed to hold it still.

It has been calculated by Benedict that a seventy-pound python needs one hundred and eight calories per day to keep it in good condition. A human being of twice the weight requires from fifteen to sixty times as much. A python may at one meal eat four hundred times as much food as it needs for a single day. This enables the reptile to fast for months without ill effects. One python fasted for seventeen months, during which time it lost half its weight but remained otherwise healthy. A few pythons have survived captivity for periods in excess of twenty years.

INDIAN PYTHON

THOUGH somewhat shorter than the regal, the Indian or black-tailed python looks larger when coiled, because of its greater thickness. This species has two distinct types of coloration, one dark olive with black markings, the other tan, marked with olive-brown and usually showing a pinkish line on either side of its head. Both types have a dark, spear-shaped figure on the top of their heads. All are also known as rock pythons and are found in Ceylon as well as India.

Though Indian pythons when captured also refuse food at first, they are easier to keep in captivity than their regal cousins. They can travel without losing their appetite and easily adapt themselves to circus life. They grow sluggish and docile, so that gullible sideshow audiences believe that they have been charmed. An Indian python may become so attached to its master that it will take food from no one else. These snakes have lived in captivity for twenty years.

Other well-known pythons are the thickset African rock python, averaging about eighteen feet in length; and the carpet and diamond snakes of

New York Zoological Society.

SOUTH AMERICAN BOA OR BOA CONSTRICTOR (*Constrictor constrictor*).
Length: 10 feet. Range: Tropical Central and South America.

Australia, which attain respective lengths of eleven and nine feet and are known to swallow the kangaroo-like wallabies of the region. Another constrictor is the beautifully colored green python of New Guinea.

COMMON BOA

NOT THE least of the virtues of the common boa of South America is the fact that it preys upon the mongoose. The mongoose was brought to South America to prey upon poisonous snakes but tricked its sponsors by also developing an appetite for chicken.

When the boa stretches its body to cross from tree to tree there may be all of ten feet of snake suspended between the boughs. The related water boa, or anaconda, sometimes attains the length of twenty-five feet.

These snakes are remarkably prolific, a captive specimen having

borne sixty-four living young. Some boas have endured the enforced security of zoo life for more than twenty years.

In climbing, the snake encircles the trunk with the hind part of its body, raising the fore part which entwines itself higher up. When the fore part has secured its hold, the hind part is drawn up and again coiled round the trunk. Crossings from tree to tree are made by stretching the body across the intervening space while the hind part still holds fast to the first tree. When the fore part has a good grip on the second tree, the rest of the body is swung across.

CUBAN BOA

THE CUBAN BOA or *maja* is ten feet long. Its large bright eyes give it a most wicked appearance, which is not belied by its temper. This species seldom becomes resigned to captivity and usually strikes its head against the glass of its cage until pain and fatigue force it to stop. As it strikes, it emits a short, broken hiss.

In the wild state it serves sugar cane planters by eating rats and preying upon the destructive mongoose.

SAND BOA

THE SAND BOA of India obtains its food by crawling into the burrows of rodents, crushing the inhabitants against the walls. Most of its life is spent in subterranean passageways. This species, about a yard long, has earned the name of two-headed, because of a stumpy tail sometimes mistaken for a head. Some Hindus, intent upon deceiving tourists, paint mouth and eyes on the reptile's tail and assure gullible foreigners that one head sleeps while the other watches.

When first captured, sand boas strike swiftly in a series of wounding blows. One specimen lived for more than twenty years in Regent's Park, London.

New York Zoological Society.

EMERALD TREE BOAS (*Boa canina*). Length: 4 feet. Range: Brazil and the Guianas.

RUBBER BOA

THE PYGMY rubber boa, inhabiting the Pacific coast of the United States, has received its name because, with its cylindrical, stubby form, it looks like a two-foot length of grayish rubber hose. This snake is very gentle. When frightened, it twists itself into a ball-shaped mass, so round that it can be rolled about or even tossed about, like a ball.

In devouring mice and other rodents, it kills them by constriction before swallowing. Feeding takes place in the early hours of the day when the boa is most active. The rubber boa frequently climbs rough-barked trees and reposes for hours stretched out on a limb.

HARMLESS SNAKES

TREE SNAKES

As TREE SNAKES weave in and out of the boughs, they resemble beautifully colored vines or twigs. Swaying their heads and bronze, golden-green necks from side to side, they seem to undulate gently with the breeze.

The adult tree snake may be from two to five feet in length. Its head is distinct, and it has large bright eyes.

Feeding on lizards and tree frogs, the tree snake will dart away into the underbrush if disturbed. Cornered, it turns and attempts to bluff the pursuer with menacing gestures. Jaws wide agape and head weaving from side to side, these delicate serpents vainly strive to appear sinister.

As a rule the lustrous body of the tree snake is not distinctly marked. Most species, however, have a black line extending from the eye to the corner of the mouth.

GARTER SNAKES

GARTER SNAKES are probably the last of the snakes of the eastern United States to go into hibernation and the first to emerge. In March, when the snow has not yet completely melted, they can be seen basking in the sunlight. Specimens have been found at altitudes exceeding five thousand feet.

Hardy and stubbornly resisting extinction, the garter snake is one of the commonest snakes east of the Mississippi, often found in parks and gardens within the confines of large cities.

Usually in August the female garter snake gives birth to her litter, which numbers from seventeen to about thirty. As soon as they are born, they make their own way in the world, feeding upon small earthworms until the hibernation period. In spring, when the ground is moist and their diet abundant, they grow rapidly until they are able to partake of larger morsels like young toads and frogs. The young garter snake is

From Ditmars' REPTILES OF THE WORLD.

GARTER SNAKE AND YOUNG (*Thamnophis sirtalis*). Length: 3 feet. Range: Eastern North America.

This unusual photograph was made to illustrate the fact that snakes do not eat their young although placed in proximity with them. It is also true that snakes do not care for their offspring, although garter snakes bring them forth alive.

mature at the age of one year and can breed during the following spring. The fully developed adult is about thirty inches long.

Garter snakes live for a long time in captivity and grow quite tame and affectionate. Some have lived for more than ten years in cages. When first caught, however, they give off a strongly offensive odor from glands situated near the base of the tail as well as feces discharged from the anus.

An almost universal belief among country people is that garter snakes swallow their young at the approach of danger. When Ditmars published an article, exposing this superstition, it was greeted by a storm of protest. Many wrote that they had actually seen the phenomenon. A possible explanation of this belief is that some snakes, such as the king snake, often swallow the young of other snakes, while if a dead female garter snake is cut open at the proper season, the unborn, but fully developed young may be found inside.

RIBBON SNAKES

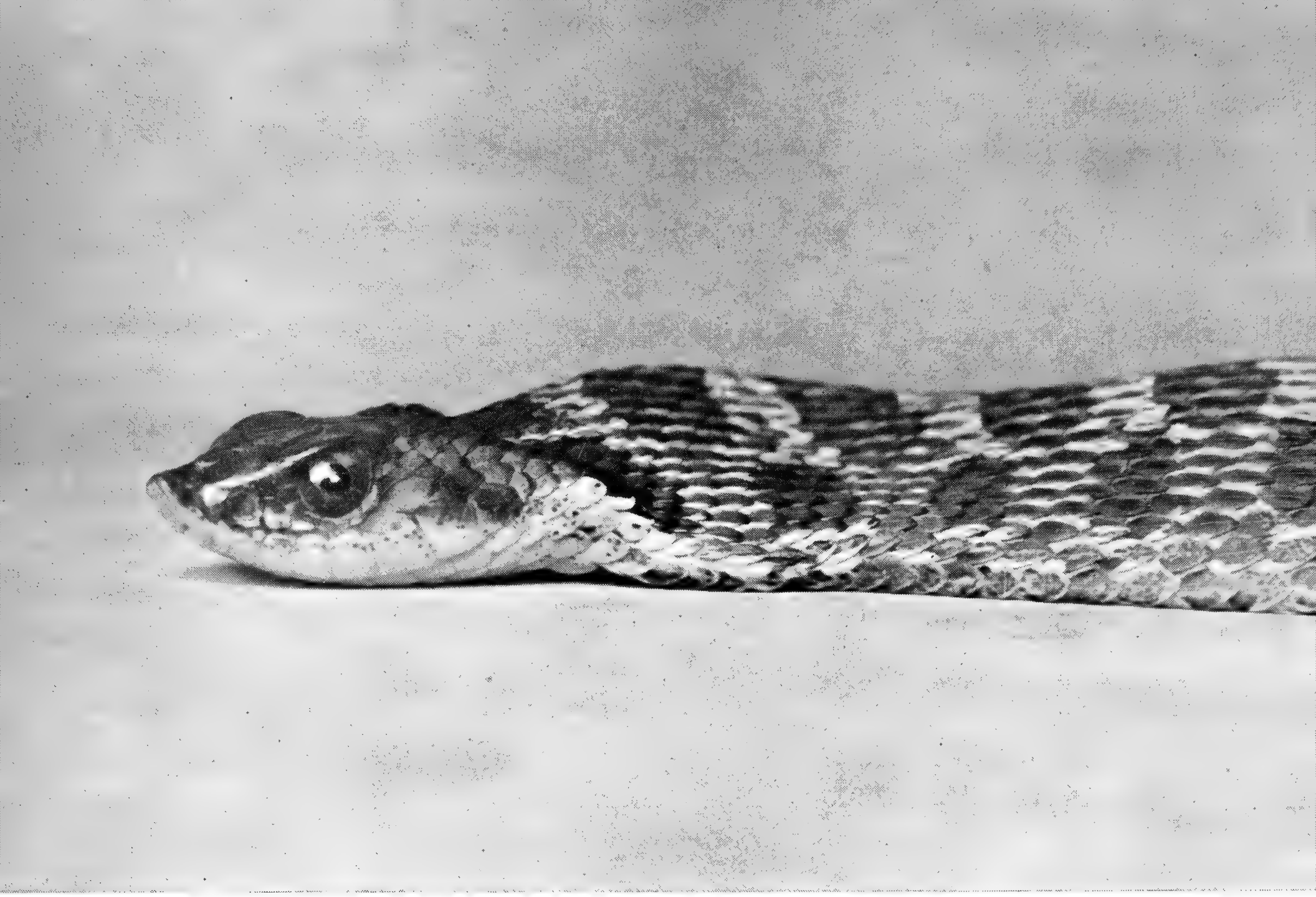
THE RIBBON SNAKE is found throughout southeastern Canada and the United States east of the Mississippi River.

Subsisting entirely on small fishes and amphibians, the ribbon snake dares not leave the immediate vicinity of water. This slender, dainty snake makes its home in meadows and swampy lowlands or along the edges of streams and ponds where fishes, frogs and tadpoles are plentiful.

Should danger threaten, it plunges into the water if any is handy and takes refuge in the aquatic growths at the bottom until it believes it is safe. The ribbon snake swims and dives with all the agility of a water snake.

The ribbon snake seems to have difficulty in spotting stationary prey. As soon as there is a slight motion, however, the snake lunges forward and seizes its victim before it can make another move.

This sensitivity to movement is said to be used by ribbon snakes in captivity as a means of deceiving each other. When food is dumped into their cage, they seize the morsels with their mouths and begin to eat.



New York Zoological Society.

HOG-NOSED SNAKE (*Heterodon contortrix*). Length: 3 feet. Range: Eastern and southern United States.

At the same time they set up a commotion with their tails, perhaps in the hope of distracting the attention of the other snakes from the food.

An average ribbon snake measures somewhat more than two feet in length. It is dark brown or black on top and yellowish-white underneath. A yellow stripe extending down the back and sides is the reason for the snake's name. Ribbon snakes bring forth about fourteen live young.

HOG-NOSED SNAKE

WHEN surprised or threatened, the harmless hog-nosed snake displays the most menacing and terrifying attitudes. It swells and puffs to unbelievable proportions, flattens its neck in the manner of a cobra and hisses in sinister fashion.

Despite its comparatively small size, about one yard, the hog-nosed snake is much feared among the uninitiated. It is mistakenly believed to be poisonous, and therefore in various localities is called spreading adder, blow snake, and blowing viper.

This reptile owes its name to its turned-up nose, protected with a hard shield. The armored nose is used for burrowing in soft soil. The hog-nosed snake eats fishes and frogs and will frequently root out a toad buried near the surface. The large, fang-like teeth in the rear of the jaw puncture the bodies of amphibian victims, which resist being swallowed by inhaling deeply and puffing up.

The hog-nosed snake is a great bluffer. If molested, it will go into a highly convincing series of actions intended to convey the idea that it is dying. Finally it will actually roll over on its back and seem to die. The only flaw in this performance is that if the snake is rolled over to its normal position again, it will roll right back with its belly upward.

This serpent is usually encountered in dry sandy areas near the seashore. Occasionally, however, it is found in hilly and mountainous regions.

The color of the hog-nosed snake is yellow-brown crossed by brown or black bands. The snake lays about two dozen eggs during the latter part of July.

Raymond L. Ditmars, New York Zoological Society.

KING SNAKE (*Lampropeltis getulus getulus*). Length: 5 feet. Range: New Jersey to northern Florida and Alabama.

Raymond L. Ditmars, New York Zoological Society.

CALIFORNIA KING SNAKE (*Lampropeltis getulus boylii*). Length: 5 feet. Range: California.

KING SNAKE

NOT EVEN the rattler is safe from the king snake. The king snake will eat other food such as eggs, but seems to prefer snakes. It is relatively immune to the venom of poisonous snakes and shows no hesitation in attacking any of them. It is, however, untrue that it likes poisonous snakes better than others.

It kills mammals, usually small rodents, by constriction, squeezing them until death comes. With small snakes, however, it employs a different method, seizing them at any point and working upward with its jaws toward the head. The victim will continue to struggle until it has been completely swallowed, and sometimes even afterward. Reliable observers state that they saw a Florida king snake swallow a whip snake longer than itself down to the last inch of tail. Upon being startled, the king snake regurgitated with the suddenness of a released spring. Its victim lived for months after this experience and did not seem to be at all injured.

Despite its pugnacious habits toward other snakes, the king snake is not hostile to man. It can be handled easily within a few moments after being captured. When first seized, however, it will hiss with a sneeze-like sound and emit an unpleasant scent from glands in the tail. A few individuals, however, exhibit snappish ill-temper.

Few species are more favorable for study and observation. They become very tame and are quite hardy, living for years. In captivity they eat mice and sparrows, smaller snakes, either dead or alive, and strips of raw beef. A large specimen of the king snake measures five feet. Their ten to twenty-four eggs hatch in five or six weeks.

BLACK SNAKE

THE BLACK SNAKE, attaining a length of six feet, is believed to be the sworn enemy of the rattlesnake, to invite encounters with human beings, and to have the strength to crush an arm or leg into numbness. It is said to hypnotize birds and squirrels within reach of its jaws.

These beliefs are totally unfounded. The black racer will attack and

Raymond L. Ditmars, New York Zoological Society.

BLACK SNAKE (*Coluber constrictor*). Length: 6 feet. Range: Eastern United States.

eat other snakes, but only when these are smaller than itself. When it meets a human being, it will use its astonishing speed to leave the neighborhood as quickly as possible.

The black snake does not constrict but kills its prey in the manner of the gopher snake by holding it to the ground and then swallowing it. The racer haunts stone walls or bushes at the edges of dry meadows where it preys on the nests of birds and wild mice. It climbs trees with agility in its hunt for eggs and young birds.

When captured, the racer will often turn and strike repeatedly at any nearby object including the hand that holds it, but after a short while in captivity it loses its nervousness and has been known to climb up on its master's hands to feed. If kept near certain tropical varieties of snakes, it will succumb to mites harbored by the other snakes.

The slaughter of the black racer in rural regions deprives the farmer of a natural ally in his fight against harmful rodents.

The racer is smooth and satiny without being shiny. Black racers are black above and milky blue beneath, with white chin and throat.

WATER SNAKE

THE STOUT, dark brown water snake is sometimes confused with the venomous water moccasin. In many regions it is even called "moccasin" and is unreasonably feared.

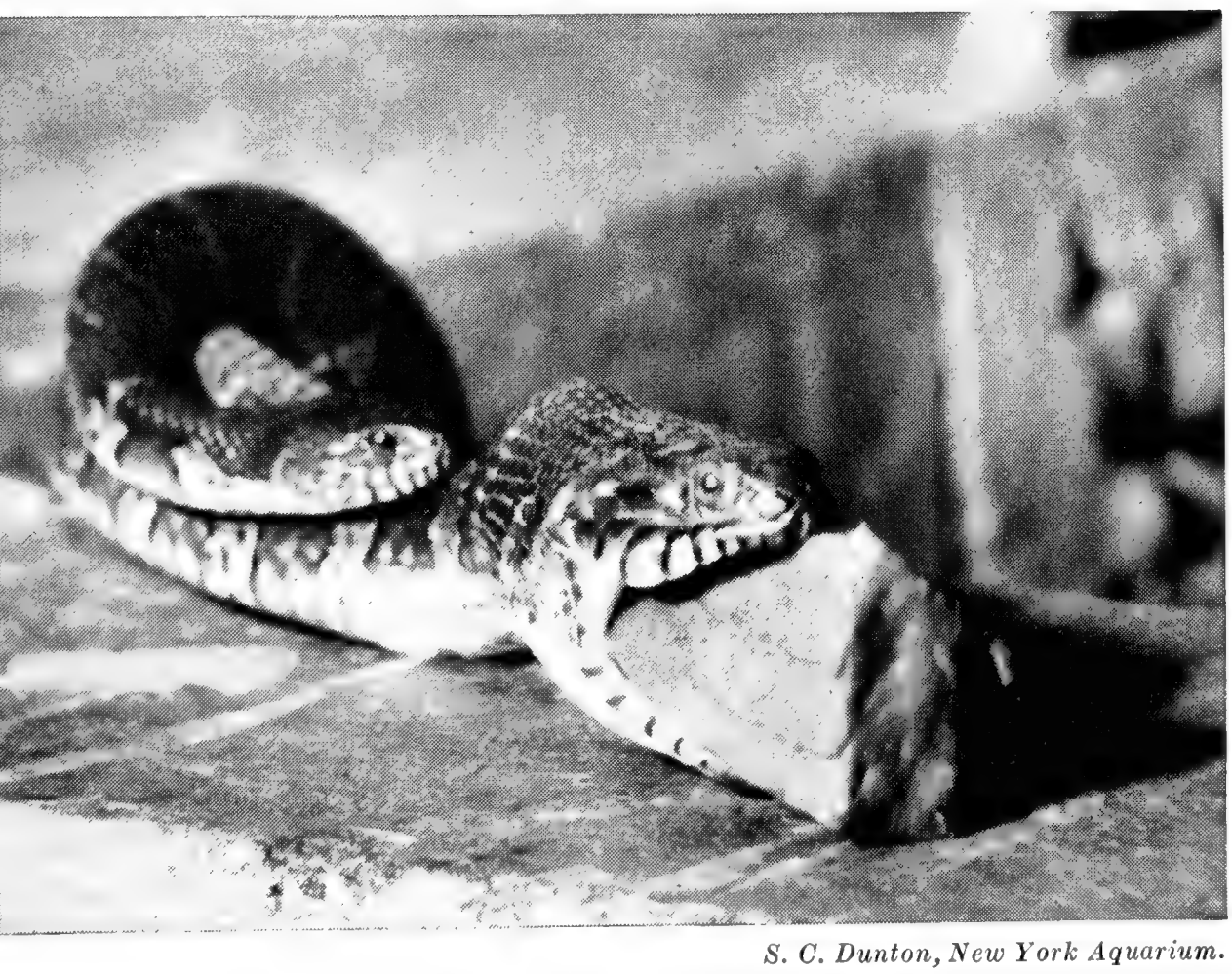
When angry or cornered, the water snake flattens its head and body and strikes out viciously. Though not poisonous, it can draw blood or even inflict a tearing bite. Yet it is extremely timid and will always go in peace, provided an avenue of escape is left open. Diving into the water, it can remain submerged for many minutes.

Sportsmen are always quick to blame some outside agency for the bad fishing. The water snake, coming in for its share of the blame, is accused of devouring the game fish. Herpetologists consider this unlikely, as the snake does not swim quickly enough to overtake the swifter fish. It is thought to restrict itself to frogs, tadpoles and the more slow-moving fishes.

When not pursuing their prey, water snakes like to sun themselves

From Ditmars' REPTILES OF THE WORLD.

WATER SNAKE (*Natrix sipedon*). Length: 4 feet. Range: Eastern United States to Nebraska and Texas.



S. C. Dunton, New York Aquarium.

WATER SNAKES EATING BEEF

in a bush or on a tree limb overhanging the water. From this vantage point they can survey the stream to see if anything edible chances by.

Water snakes can be caught by suspending a small fish on a line. The snake swallows the fish, and when the line is hauled in, the snake must be seized before the bait is disgorged. These reptiles have a highly developed sense of smell. If a fish is rubbed along the floor of a cage containing water snakes, they become frenzied in their efforts to locate the food and may even bite one another in their excitement. In the wilds, they are preyed upon by herons and other snake-eating birds.

In August or September the female brings forth a brood of living young, which may number more than forty.

GOPHER SNAKE

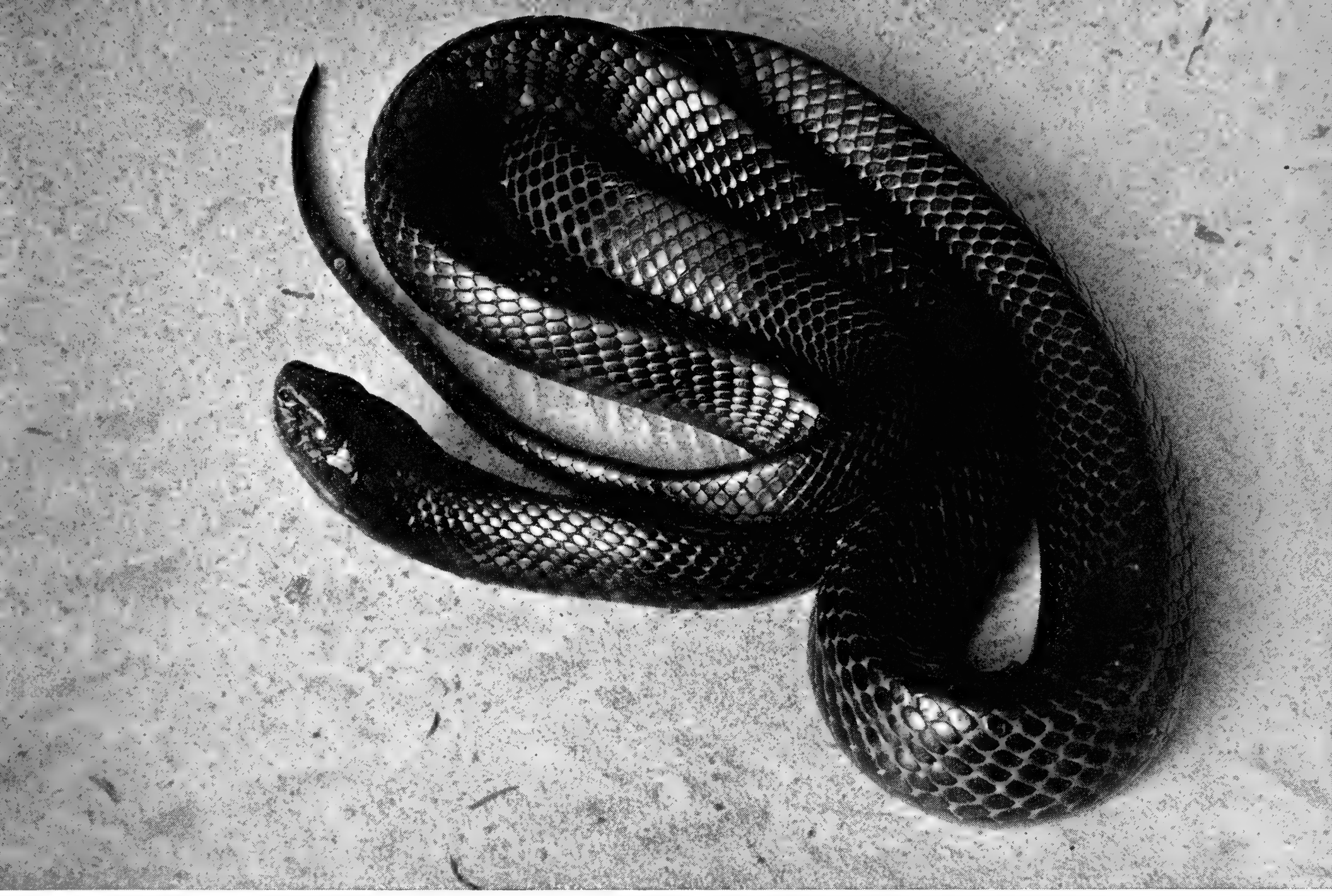
IN THE SOUTHERN United States, the eight-foot gopher or indigo snake is often found near houses, spending its whole life in a restricted area. The sharecroppers appreciate its value as a rat-killer and do not molest it. In addition to rodents, the snake eats frogs, birds and other snakes. It does not kill by constricting, but holds its victims to the ground by superior weight, swallowing them when they are sufficiently weakened.

The indigo snake has different colors in different localities. In South America it is black on the forward portion and yellow behind; in Central America it is a light olive color; in the eastern United States it is blue-black.

This snake becomes exceedingly docile in captivity after the first difficult days. It is very hardy, seems to enjoy being handled, and is clean in its cage habits. One specimen, caught full grown, lived for eleven years after its capture.

EGG-EATING SNAKE

THE EIER-VRETER'S claim to distinction is not that it eats eggs; many snakes include eggs in their diet. Egg-eating snakes of South Africa, however, eat eggs exclusively when adult. It swallows them whole, saws them open within



Raymond L. Ditmars, New York Zoological Society.

FLORIDA GOPHER OR INDIGO SNAKE (*Drymarchon corais couperi*). Length: 8 feet. Range: Southeastern United States.

its gullet by means of a special set of bony cutters extending from the vertebrae into the throat, and then ejects the shell. This is remarkable when we consider that the snake is less than two feet in length and that the eggs may be three to four times the diameter of its neck. The *eier-vreter* is perhaps the only snake in the world using this technique. As a rule it robs tree nests, but it has no objection to the eggs of terrestrial birds and barnyard fowl.

A timid and practically toothless reptile, the egg-eating snake may rely for defense on mimicry. In pattern it closely resembles the venomous night adder. In southwest Africa and Egypt, where the night adder is not known, the egg-eater is said to mimic other poisonous vipers.

The typical marking of the egg-eating snake is a series of three rows of dark spots on an olive or light brown background. Its sound is alleged to be a rasping noise produced by rubbing the rough scales of its hide together.

Fitzsimons claims that in captivity, egg-eaters become tame enough to feed from a man's hands. It is said they will never eat an egg containing a partly developed young bird or one that is not fresh.

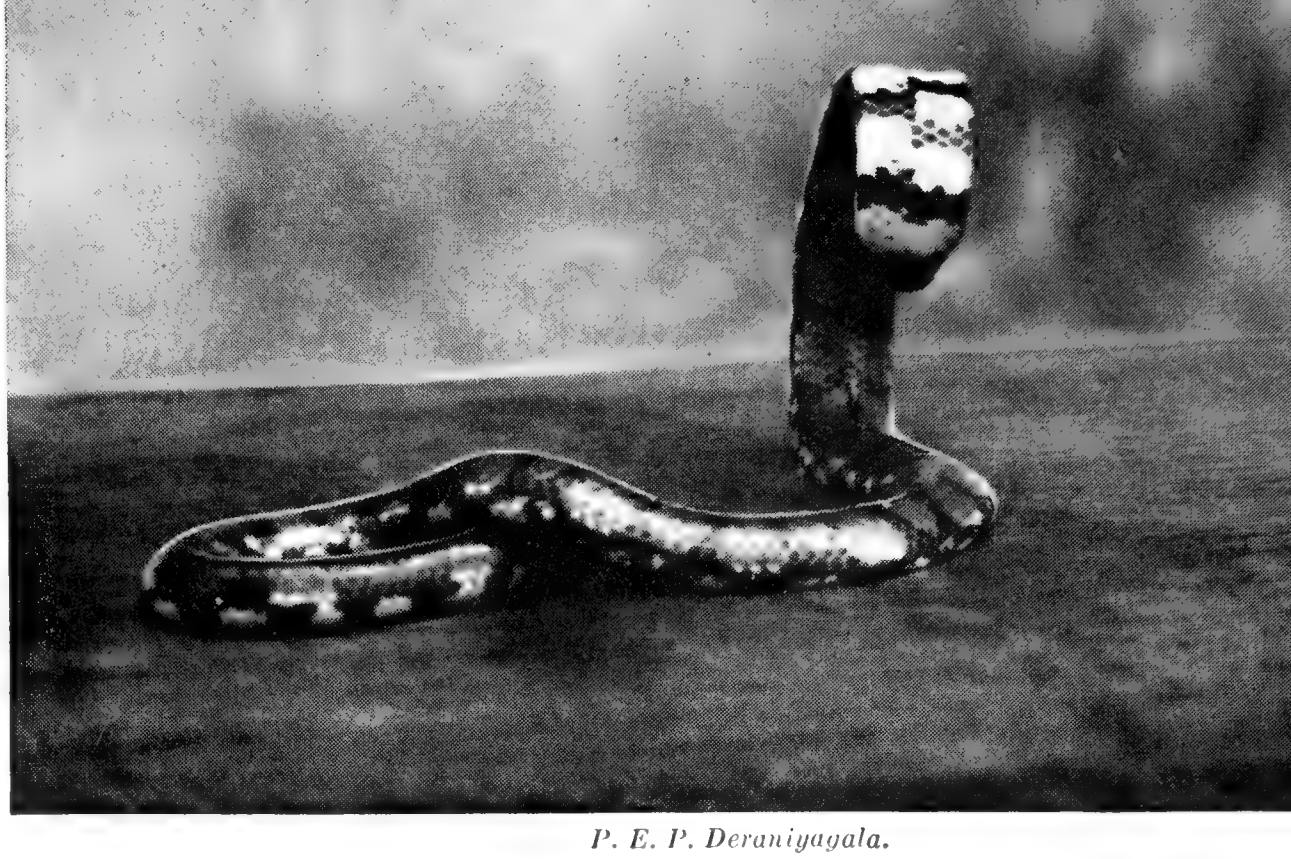
As if in retribution for its depredations among unborn birds, the egg-eating snake is stalked by the fierce secretary bird, which transfers the serpent to its gullet in one swoop.

COACHWHIP SNAKE

THE LONG, slender coachwhip snake inhabits open country, where it can move along with almost the speed of a walking man. Like the gopher snake, it often takes refuge in the burrow of the gopher tortoise. The coachwhip eats small rodents, birds and eggs. Unlike most harmless snakes, it has a vicious temper and does not thrive in captivity. With its nervous disposition it requires more food than most snakes.

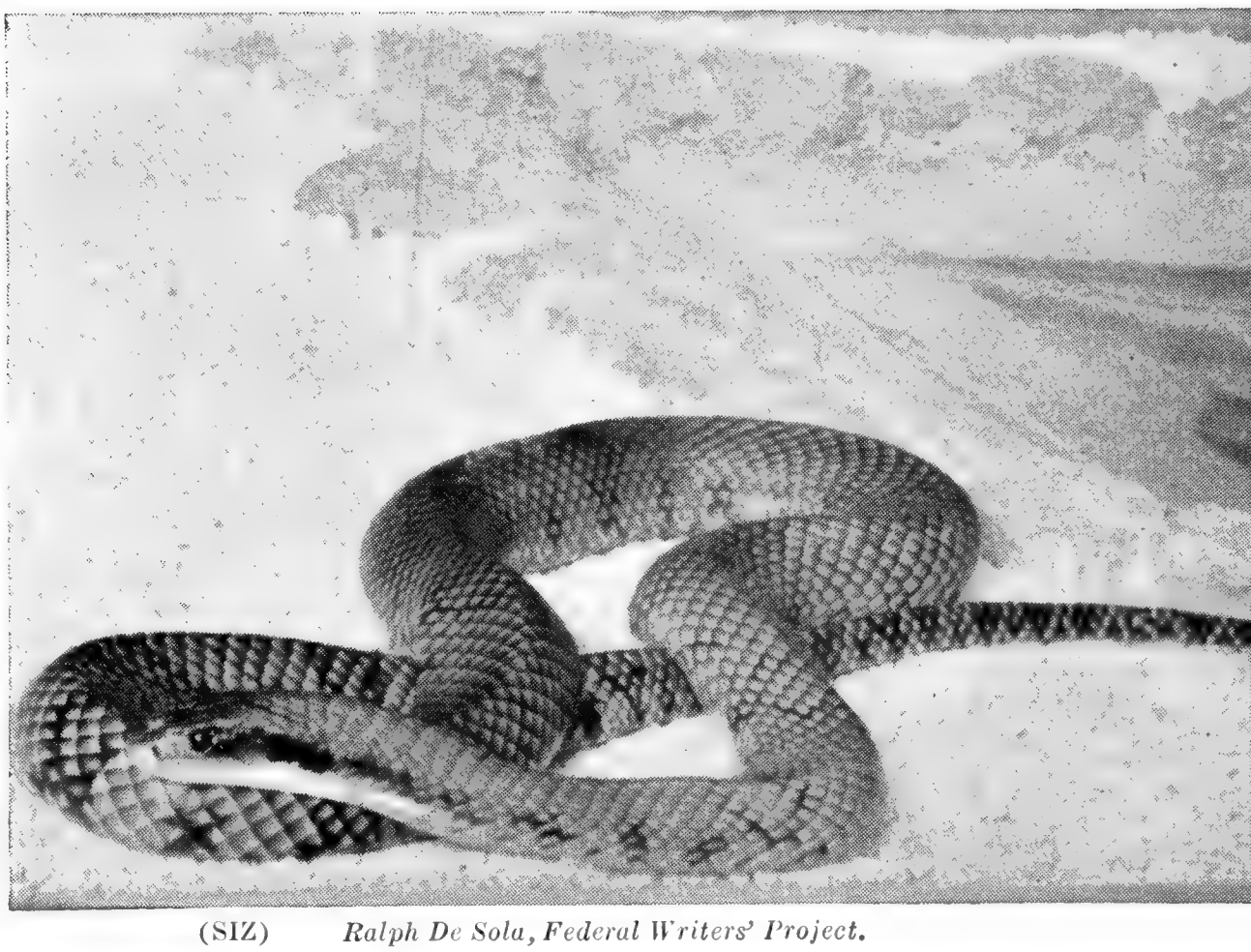
This reptile lays from one to two dozen eggs.

EAST INDIAN RED SNAKE (*Cylindrophis rufus*), a harmless two foot long species common in Malaysia, defends itself by mimicking the cobra. However, the tail is erected and flattened like a hood — not the neck as would be expected.



P. E. P. Deraniyagala.

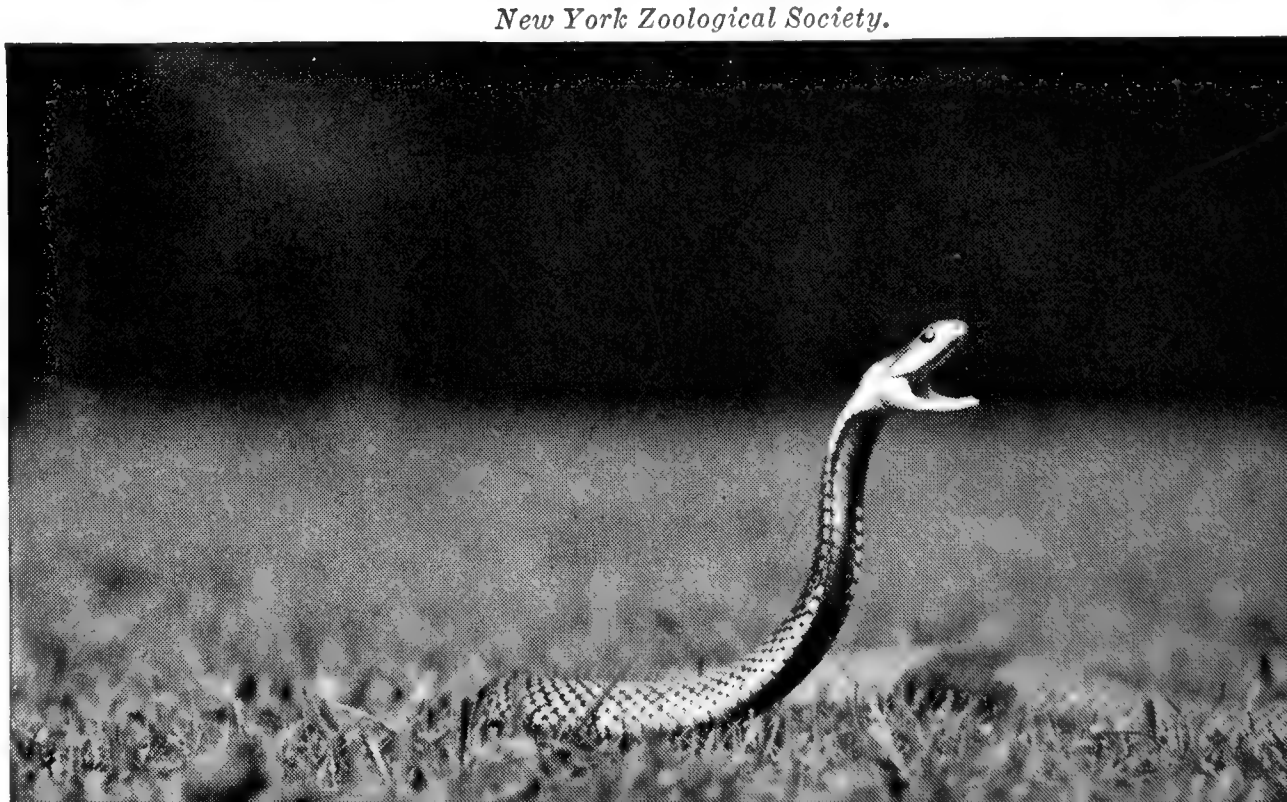
SOUTH AMERICAN RIVER SNAKE (*Cyclagras gigas*). Length: 6 feet. Range: Rivers of tropical South America.



(SIZ) *Ralph De Sola, Federal Writers' Project.*

CUBAN RACER (*Alsophis anguliferi*). Length: 4 feet. Range: Cuba.

New York Zoological Society.



SEA SNAKES

WHILE DRAWING in their nets Malayan fishermen are occasionally bitten and killed by sea snakes, caught among the fish. Related to the cobras and kraits, these marine serpents are confined in range to the Indian and western Pacific oceans. Only one species, the yellow-bellied sea snake, is found in New World Pacific waters.

These reptiles vary from four to twelve feet in length; their body is heavy, their head and neck strikingly slender by comparison. The diameter of the body may be four to six times that of the head. The flattened tail serves as an oar to propel them through the water. Fishes and eels on which they feed are paralyzed by strong venom. Malcolm Smith who has studied the clan observes that though sea snakes crowd around oriental harbors, they are docile by nature and will not attack swimmers or small craft; it is only when cornered and confused, as in the meshes of a fish net, that they are dangerous.

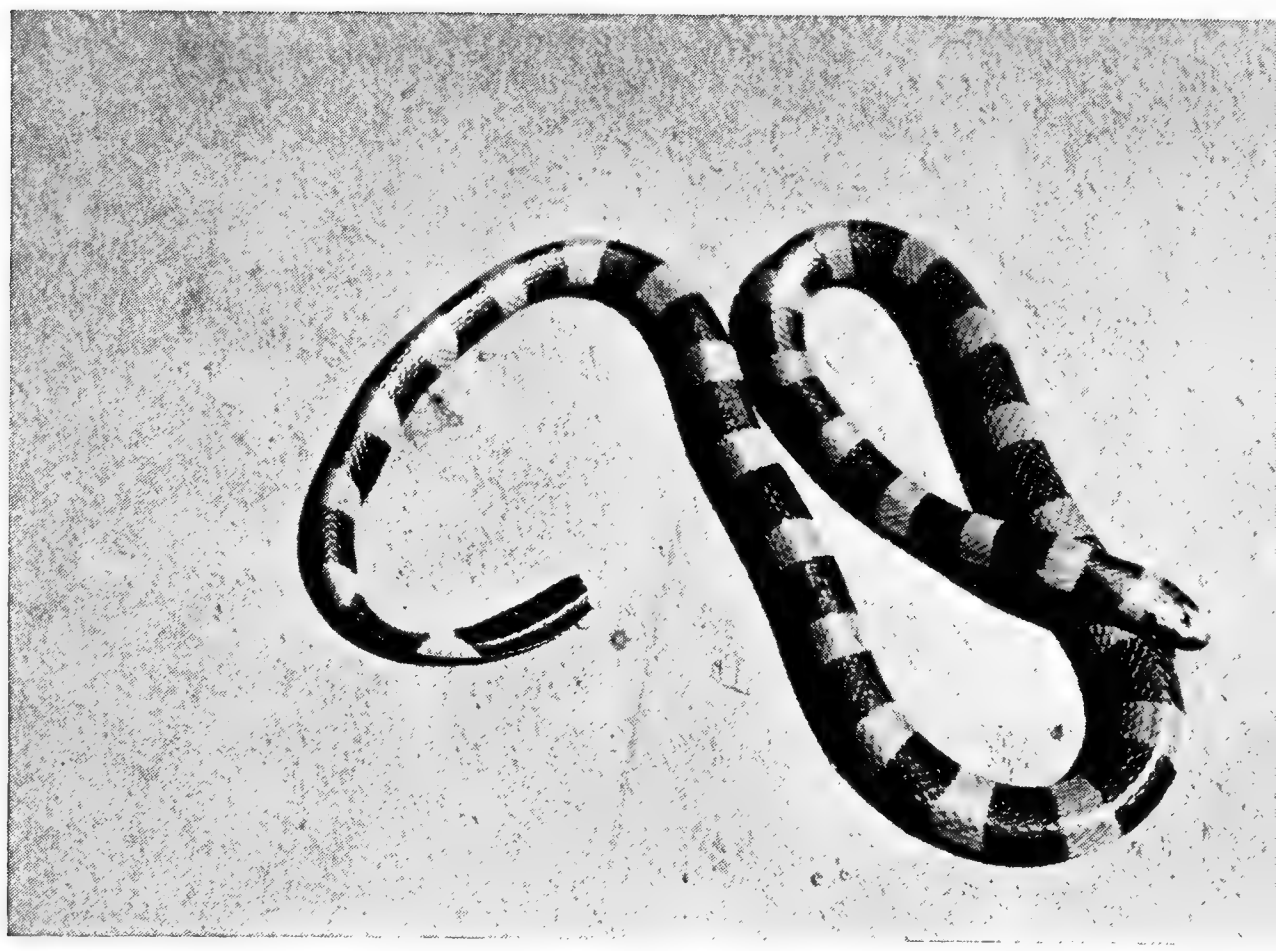
Sea snakes are thoroughly adapted to marine life and may be seen as far as a thousand miles from shore, though as a rule they prefer regions close to the land. Their bodies are often covered with green algae. As a rule these reptiles come to the surface for air at frequent intervals, but when necessary, they can remain submerged for a long while, drawing air from the water which they "swallow" and eject in a regular flow.

Some species have brilliant rings and may easily be seen from passing boats. It is these creatures, no doubt, that formed the basis for many of the tall stories told by medieval mariners about sea monsters that bored holes in the sides of ships or strangled seamen who had fallen overboard into their sinewy folds. Most sea snakes are exclusively marine, though they survive a long time when removed from the water. One genus, however, is known to prowl about tropical marshes and can slide gracefully in and out of the water. Unlike other sea snakes these have broad abdominal plates adapted to locomotion on land.

YELLOW-BELLIED SEA SNAKE (*Pelamydrus platurus*). Length: 2½ feet. Range: Indian Ocean and tropical Pacific.

Raymond L. Ditmars, New York Zoological Society.

RINGED SEA SNAKE (*Laticauda colubrina*). Length: 5 feet. Range: Tropical western Pacific.



New York Zoological Society.

Some sea snakes bring forth living young in tidal pools and shallow flats while others lay eggs. The young are able at birth to shift for themselves. The young of John's sea snake are fourteen inches at birth — their mother is twice as long. Adults give evidence of early maturity, mating at the age of six to eight months.

REAR-FANGED POISONOUS SNAKES

BOOMSLANG

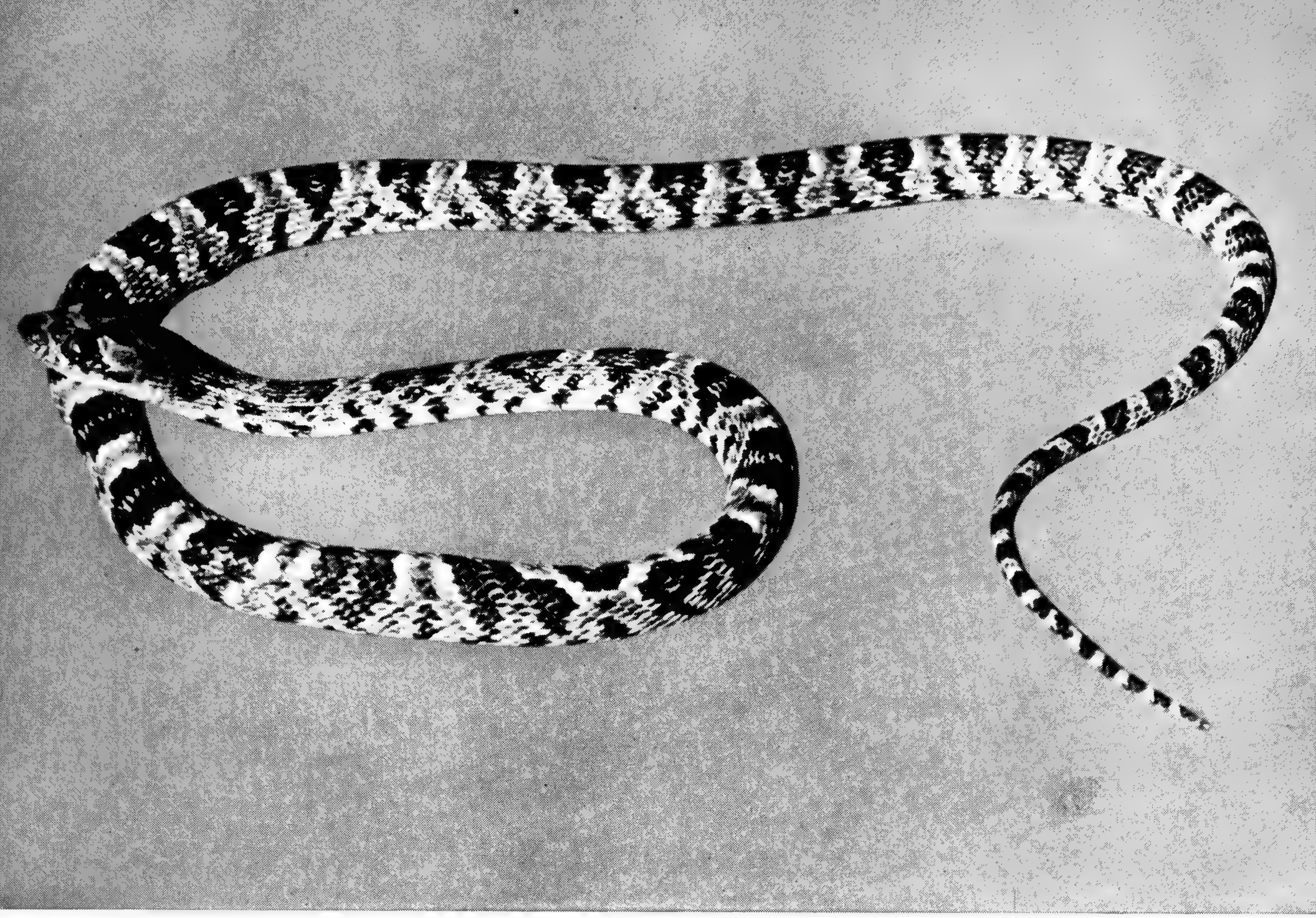
THE BOOMSLANG is a South African cannibal and may swallow a member of its own species almost as long as itself. A boomslang, four and one-half feet long, has been observed to swallow a four-footer. These cannibals also eat frogs, though they refuse toads. Of an intensely jealous disposition, one boomslang, seeing another eating a frog, will attack and devour both snake and frog.

The boomslang was named for its arboreal habits (*boomslang* being the Dutch for tree snake), but when birds' eggs are scarce it crawls about the ground in search of lizards and frogs. Though its venom glands are comparatively small, its bite is highly dangerous. Humans bitten by the boomslang suffer hemorrhages from the nose, mouth and bowels; black blotches appear all over the body, and the victims frequently die. A rooster is killed in approximately three minutes, a rabbit in fifteen, an ox in forty-five. One reptile can kill several fowl, each taking progressively longer to die. Venom injected in a jackal's veins killed the creature instantly.

The boomslang lays one to two dozen eggs in October, November and December, the South African spring. They are usually laid under rotting leaves.

SHAAPSTEKER

SHAAPSTEKERS (Dutch for sheepstickers) have received their name unjustly. The ringhals, or spitting, cobra kills a sheep and scurries away across the South African veldt, while the shaapstekers continue to crawl about the grass nearby, confident in their innocence. Ranchers seeing the dead sheep and the snake put two and two together and kill the reptile on sight. The shaapsteker makes its home near cattle and sheep ranges, because its food —



L. M. Klauber.

LYRE SNAKE (*Trimorphodon vandenburghi*). Length: 2½ feet. Range: Southern California. This rear-fanged snake although it kills small lizards is harmless to man. It is representative of a number of related species found in the American Southwest.

beetles, grubs, insects and small lizards — abounds amid the dung of those creatures.

Like other rear-fanged snakes the shaapsteker must imbed its fangs for many seconds before the poison can take effect. Its venom is stronger than a cobra's but less in quantity. It can kill a rat in two hours, a chicken in seven to ten. For the first two hours the fowl shows no symptoms, then it grows sleepy, and a gradual paralysis ensues. Humans can be poisoned from bites only on the bare flesh, as the curved fangs cannot penetrate clothing. But if the reptile does succeed in getting the proper grip, a man, unattended, may die in from six to twelve hours.

MUSSURANA

THE BLACKISH-BLUE mussurana, or false boa, constricts and also injects poison. This eight-foot snake appears to deliberately hunt the highly poisonous Brazilian fer-de-lance, against whose venom it is immune. In fighting the fer-de-lance, its fangs are of little use; it kills its victim by constriction, and while the poisonous reptile is still writhing, swallows it whole. The process of swallowing takes about fifteen minutes. The mussurana also hunts rodents, which it corners and paralyzes with its poison.

FLYING SNAKES

THE FLYING SNAKES, a group less than a yard in length, are largely arboreal, chasing lizards up and down tree limbs. When frightened or startled, they flatten out their elongate bodies by shifting their movable ribs, and glide to the ground or to a lower limb. On landing they resume their normal shape and crawl away. Members of this genus vary in color from green to olive to black. *Chrysopelea ornata* has rich red or yellow splotches. The flying snakes are found in South China, Malaysia, Burma and India.

From Ditmars' REPTILES OF THE WORLD.

LONG-NOSED TREE SNAKE EATING A LIZARD (*Oxybelis acuminatus*). Length: 4 feet. Range: Mexico to tropical South America.

New York Zoological Society.

MANGROVE SNAKE (*Boiga dendrophilus*). Length: 6 feet. Range: Malaya to Philippines.

FRONT-FANGED POISONOUS SNAKES

KING COBRA

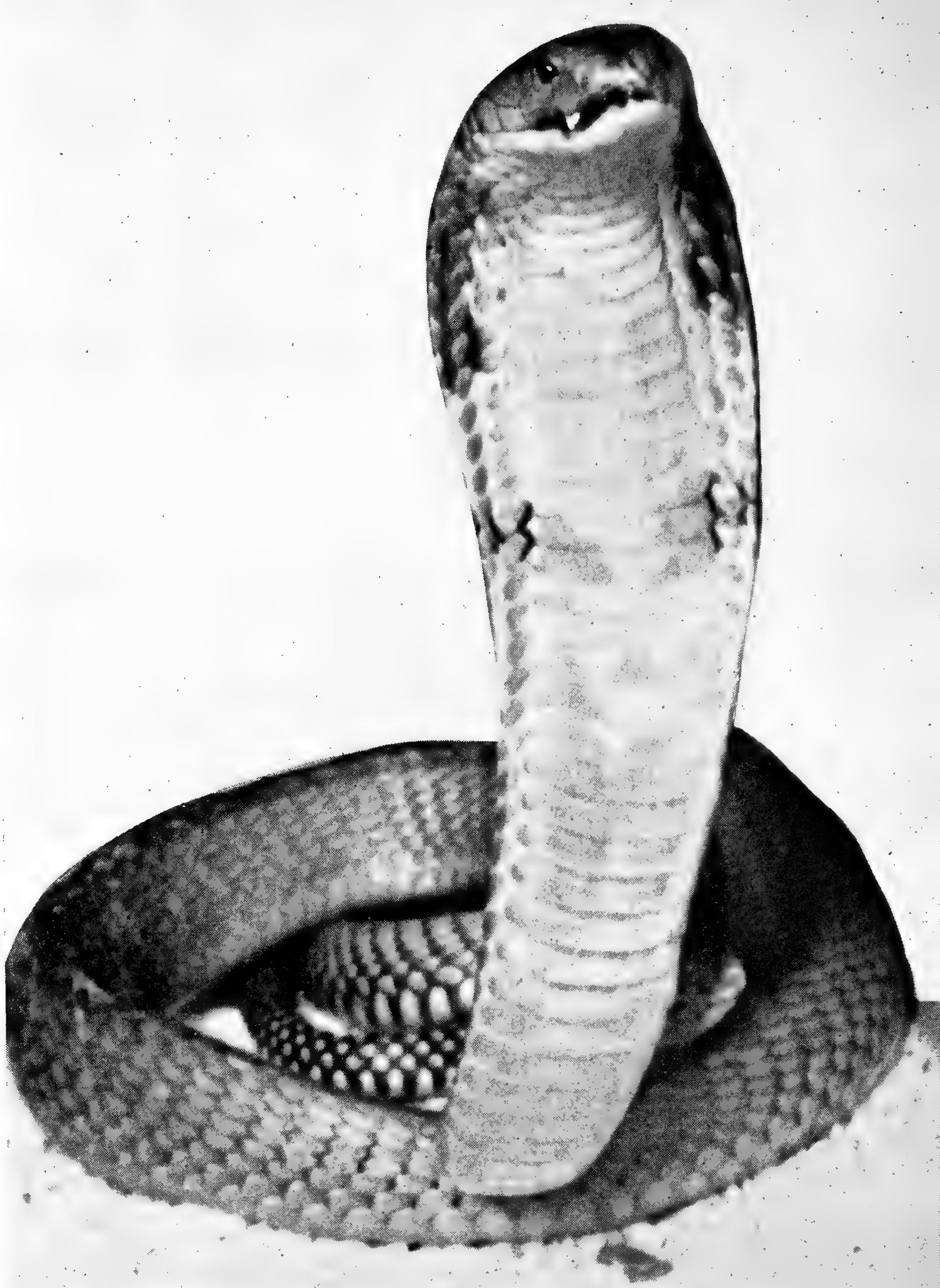
THE KING COBRA is the largest and probably the most dangerous of poisonous snakes. Its fierceness and ample venom make it one of man's most dreaded animal foes. In addition to killing men it frequently slays elephants by biting them in the tip of the trunk or just above the toenail. Inasmuch as a work elephant, trained for transporting teakwood, is valued at four thousand dollars, jungle trails are frequently closed when cobras are engaged in guarding their nests.

Adult king cobras average about twelve feet in length, though a specimen measuring eighteen feet, four inches has been recorded. These snakes, however, are so slender that, according to Boulenger, a fifteen-footer may weigh as little as sixteen pounds. Their color is yellow-brown or olive-green; there may be black bands around the body or a patch of reddish-orange at the throat. The young are so brilliantly banded that they are often mistaken for kraits and other species.

When aroused, they rear to a height of four feet and remain perfectly still as they stare at their enemy out of their bright, bronze-colored eyes. They do not sway back and forth like the common cobras or distend their hoods as wide.

The king cobra habitually eats non-poisonous snakes. In captivity it will devour a four- or five-foot snake every week, consuming some hundred and fifty feet of snakes in an eight-month period. Only in the mating season do they go out of their way to attack man. Otherwise they attack only when disturbed. If, however, a man accidentally collides with a cobra, the serpent will fight rather than glide away.

Burmese natives catch cobras by working in teams of two. One man waves his hand in order to attract the snake's attention while the other sneaks up behind, grabs the serpent by the tail. He lifts it and deftly deposits it in a basket.



(SIZ) *Ralph De Sola, Federal Writers' Project.*

KING COBRA (*Naia hannah*). Length: 12 feet. Range: Southern Asia.

In captivity king cobras exhibit an intelligence unusual in snakes. They learn not to attack people through the glass of the cage. They recognize their keepers and notice which way a door opens; when they grow hungry, they linger near their feeding door and watch for their keeper.

King cobras when caught can stand a six-weeks journey without food or other care. The only ill effect is a skin cap left over their eyes after shedding. To remove this cap without being bitten takes considerable ingenuity and dexterity.

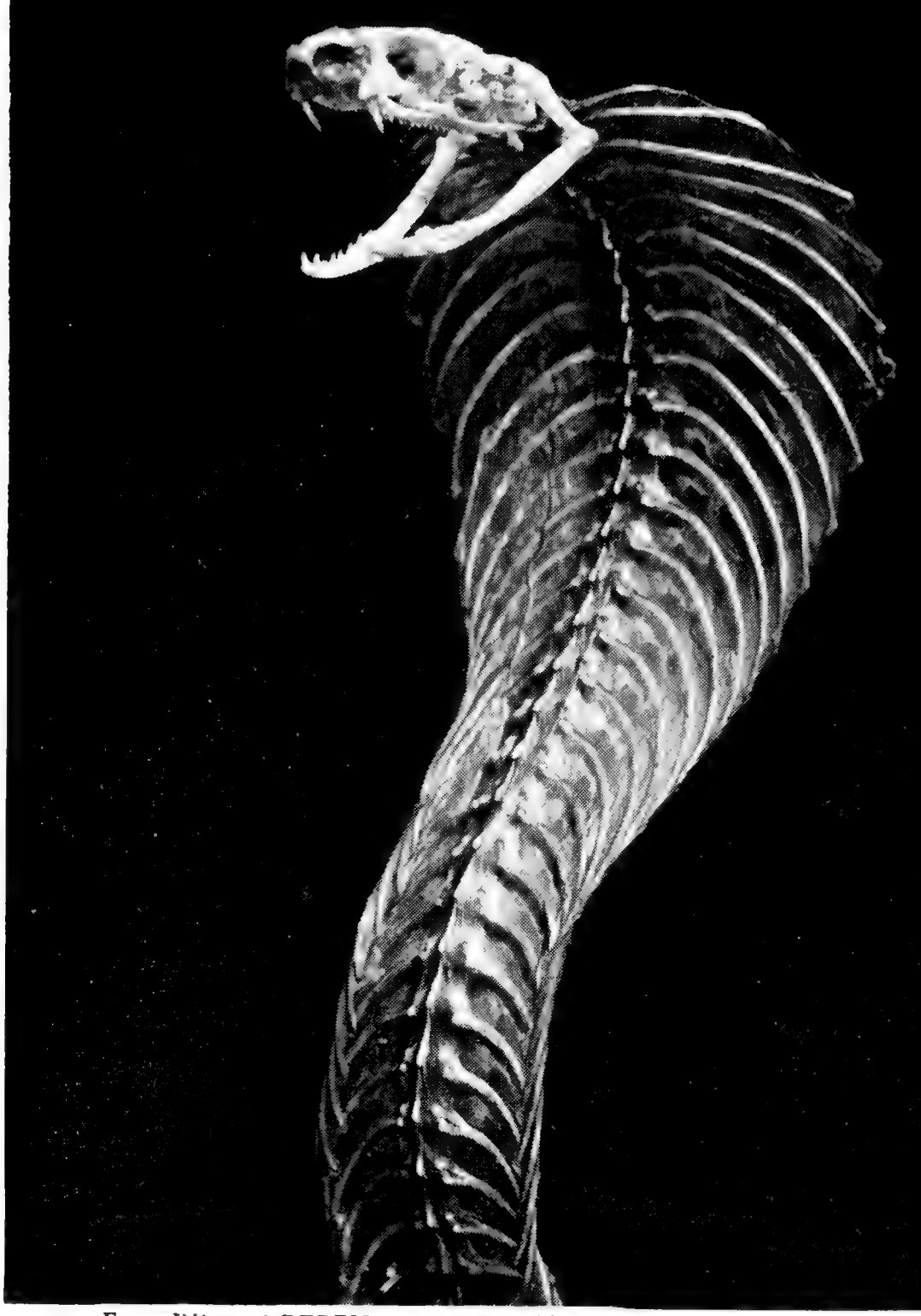
INDIAN COBRA

COBRAS ARE accorded a respect amounting to reverence in the superstition and folklore of India. It is believed by some orientals that if a man is wronged during his lifetime he will be reincarnated as a cobra and will avenge himself upon the wrongdoer. When an animal is attacked by a cobra, the snake is really settling old scores with a human being in animal form who once harmed him. Sometimes the snake dies with his vendetta uncompleted and is reborn as human, the better to find his enemy. On the other hand, the cobra is supposed to be loyal to the memory of a dead human who has once befriended him. In Madras the killing of a cobra is regarded as a sin. Its body is cremated and milk poured over the ashes. For three days, the "murderer" is considered polluted.

The six-foot Indian or common cobra ranges throughout southern Asia and is found up to an altitude of three thousand feet in the Himalayas. Its usual coloring is yellowish to dark brown with a black-and-white, spectacled-shaped marking on the hood. Unlike the king cobra, it does not feed on snakes, but on frogs and rodents. In killing these it shows great agility, darting at them with unerring precision. Once it secures a hold, it bites tenaciously, the muscles of its jaws bulging as it exudes its venom. When angry, it raises its body, distends its hood and sways rhythmically from side to side. As it strikes, it emits a sharp, sneeze-like hiss.

Indian cobras often live in empty termites' nests, piles of wood or stone. Sometimes they enter houses in search of rats. They commonly travel in pairs, a male and a female together, hunting in the late afternoon and evening to avoid the sun's greatest heat.

ASIATIC COBRA'S SKELETON



From Ditmars' REPTILES OF THE WORLD.

Cobras like milk but do not milk cows.

In fighting mongooses, the cobra does not use the darting technique it employs against rodents. Instead it strikes from its reared position until it becomes exhausted. Then the mongoose feints with a bite to the snake's tail. When the cobra lashes out in that direction, the mongoose leaps to its throat, securing a death grip. The mongoose is not immune to the cobra's venom, but depends on its agility and thick fur to escape harm. Often, however, the mongoose will undramatically stand on the snake and, holding it down with its feet, bite through its back and neck.

The cobra lays about twelve eggs, the size of a pigeon's. Peafowl and jungle-cocks prey on the young cobras.

In India many deaths result each year from the bite of cobras, though it is not known what percentage of the 20,000 annual fatalities from snake-bite can be attributed to this snake. The reasons for the high mortality are insufficient leg covering among the peasantry and ignorance as to the correct treatment of snake bites. A good serum for cobra bite is produced by the Haffkine Institute in Bombay, but generally the natives prefer to use "snake stones," a light, porous application that sucks blood from the wounds and falls off when saturated. This treatment removes very little of the venom.

The fangs of the cobra are not poison-coated, nor does it inject venom in the manner of the rattlesnake. When the cobra secures a bite, it twists its head to the right and then to the left, releasing muscles above each fang and permitting the poison to flow into the wounds.

SPITTING COBRAS

THE SPITTING COBRA, or black-necked cobra, is an African species, ranging from Upper Egypt through West Africa to the Transvaal. Seven feet in length and endowed with a large quantity of venom, it is one of Africa's most dangerous snakes. When angered, it rises and with deadly marksmanship ejects a spray of poison at its enemy's eyes. It can spit as far as twelve feet, and as high as a man's eye. If the spray is not washed off, blindness may ensue. The serpent can eject half a dozen jets of poison in quick succession, and in twenty-four hours the store of venom is replenished.

(SIZ) *Ralph De Sola, Federal Writers' Project.*

ASIATIC COBRA (Spectacled Variety) (*Naja naja*) (Indian Form). Also called Indian Cobra. Length: 6 feet. Range: Southern India and Ceylon.

(SIZ) *C. V. M. Sutcliffe.*

ASIATIC COBRA (Monocellate Variety) (*Naja naja*) (Eastern Form). Range: Extreme southeastern Asia.

There are various color types of spitting cobra. One is blue-black with scarlet patches on the hood. Another is olive with yellow spots, while still another is salmon pink. In captivity the snakes become docile and soon learn not to spit at the glass cage fronts. They can survive many years of captivity.

The ringhals cobra, like most snakes with Dutch names, is a South African variety. It is the smallest of cobras, reaching a length of only four feet. Like the black-necked cobra, it uses the water-pistol technique in attacking, but owing to its smaller size cannot spit as far. The name was given it by the Boers, because its neck is ringed by one or two white collars. It differs from most cobras by bringing forth living young, from twenty to sixty in a litter.

MAMBAS

DESPITE THEIR large friendly eyes and generally gentle appearance, the mambas have the reputation of being the most dangerous of African snakes. Their average length is about seven feet, but the black mamba sometimes can be as much as twelve feet long. They are exceedingly light in build, being only about half as thick as a king cobra of the same length.

Mambas lurk in small trees and bushes on the lookout for birds. They also stalk rodents on the ground, moving with remarkable speed and agility. As a rule they slither away at the sight of man, but in the breeding season they may attack anyone approaching too closely to their haunts.

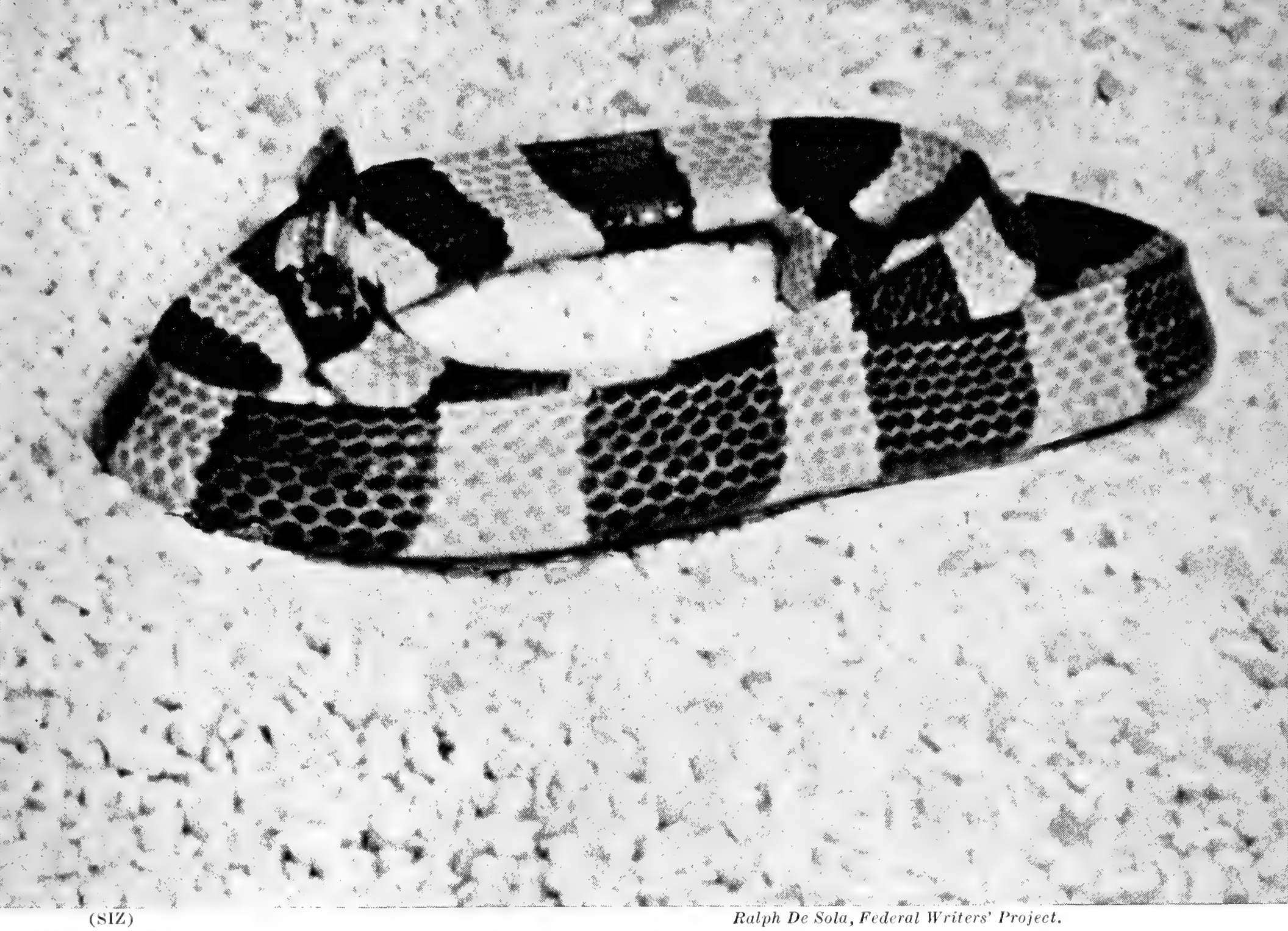
Mambas become quite docile in captivity, but never live much more than a year in confinement.

KRAITS

KRAITS ARE exceedingly abundant in southeast Asia and are almost as poisonous as cobras. A goodly percentage of the snake-bite mortality in these regions can be traced to these snakes. They are four to five feet long, black or dark brown in color, with tan or yellow bands across the back. A ridge extends down the back, topped by a row of large scales. The head is small. The surface is smooth and glistening.

The kraits are nocturnal in habits, hunting for smaller snakes, frogs, lizards and rodents. They are a great menace to human beings as they often enter houses in search of rodents. They like to cover themselves with warm dust in roadways. The krait's attack is a sideswish which may be accomplished without coiling.

They are sluggish in captivity and do not live long.



(SIZ) *Ralph De Sola, Federal Writers' Project.*

BANDED KRAIT (*Bungarus fasciatus*). Length: 4 feet. Range: India and Malaysia.

CORAL SNAKES

CORAL SNAKES are slender, brightly colored snakes, reaching a length of four feet. Their bite can be fatal to man, but they cause few deaths since their brilliant color warns of their presence, their eyesight is poor, and they are generally timid. The greater part of their careers is spent underground where they feed on coecilians, or beneath the bark of trees, searching for lizards, small snakes and insects. There are various non-poisonous snakes that resemble coral snakes. It is thought by some that nature may have given them this appearance as a means of protection.

In Central America the coral snakes are called *gargantillas*, meaning necklace and referring to their red, yellow and black rings. North American varieties are the harlequin snake and the Sonoran coral snake, which differ from the others chiefly as to color scheme. They are rarely seen above ground

except during the spring plowing. Asiatic coral snakes are eaten by cobras but seem to be immune from attack by the mongoose.

AUSTRALIAN BLACK SNAKE

THE FIVE-FOOT Australian black snake is a slender species, with neck ribs that form a hood about half as broad as that of the cobra. Its smooth scales are blue-black in back, while the underside is a bright red. Black snakes live in marshes, where they hunt frogs, rodents, birds and lizards. They are excellent swimmers. They bring forth living young, two dozen or so to the litter.

Black snakes have survived for as long as seventeen years in captivity. However, they cannot tolerate the mites they sometimes catch from other snakes. Their poison is not very dangerous to man. Specimens caught by the head try to strike their captors with their tail, and often escape in the panic thus created.

TIGER SNAKE

THE TIGER SNAKE of Australia and Tasmania is the most deadly snake of that region. Its name, however, arises not from its fierceness, but from its banded color design. Its venom is considered by some toxicologists to be the most virulent of all snake venoms but the tiger snake has a smaller supply than larger snakes.

Tiger snakes are irritable and strike swiftly. Since some fifty of them are born in a litter, they are unpleasantly common.

New York Zoological Society.

CORAL OR HARLEQUIN SNAKE (*Micrurus fulvius*).
Length: 3 feet. Range: Southern and midwestern United States.

MOVABLE-FANGED POISONOUS SNAKES

COPPERHEADS

COPPERHEADS ARE the most common poisonous snakes to be found near the great thickly settled regions of the eastern United States, and consequently most cases of snake-bite in these regions can be attributed to them.

Fortunately the bite of these snakes, though dangerous, is fatal to man in less than one per cent of cases; they cannot, as a general rule, kill a healthy adult, but too much reliance should not be placed in this fact.

A record specimen, four and one-half feet long, was found near White Plains, New York, only a few miles from New York City. The usual adult length is three feet.

The copperhead's body is rather thick for its length; the color may be tan, pinkish, or reddish-brown. The sides are adorned with blotches of a darker brown, which seem to unite and form a continuous saddle-like pattern.

A quiet snake, the copperhead will show fight only when stepped on or otherwise disturbed. Generally it will lie perfectly still in the presence of an intruder, relying on its protective coloring, which blends with the dead leaves. When afraid, it vibrates its tail in such a way as to produce a buzzing among the leaves. It will fight if necessary, but it prefers to take refuge in a crevice among the rocks. Wooded hills and marshes are its usual habitat, and here it spends its time searching for rodents, frogs and birds. In winter it goes into a crevice to hibernate.

Soon after emerging from their winter torpor, the snakes mate. Then the females congregate in protected hiding places until August or September when the young are born. The period of gestation is about twenty weeks. In birth the young are expelled at almost hourly intervals. For about forty-five minutes the newborn snakelet remains quietly within its embryonic membrane, which it then pierces. The little snakes possess an egg-tooth on the forehead, but make no use of it for this purpose. One hour after birth

(SIZ) *Ralph De Sola, Federal Writers' Project.*

COPPERHEAD SNAKE (*Agkistrodon mokasen*). Length: 2½ feet. Range: Eastern United States.

the young copperhead possesses enough venom to kill a mouse if it is so inclined. The young have brilliant yellow tails which fade to brown before the third year, except in the Texas variety, which retains a greenish-yellow tail throughout life.

When food is brought to a cage full of young copperheads, they wriggle their tails. It is thought that this is a means of attracting their prey; the remainder of the body is camouflaged, and the prey, attracted by the mysterious yellow object, moves to within striking distance. Within ten days after birth the young snakes shed their skin for the first time.

The copperhead's chief enemies, aside from man, are other snakes, especially king snakes.

WATER MOCCASIN

THE WATER MOCCASIN or cottonmouth ranging over the wet lowlands of the southern United States, is irritable and pugnacious. It reaches a maximum length of six feet, and its usual length is four feet. The young will snap at a moving object even before they have completely escaped from the embryonic membranes and at birth can inject a fairly strong dose of poison. A captive moccasin which escaped into the cage of a large South American anaconda, bit the constrictor several times and killed it. One specimen survived captivity for twenty-one years.

When surprised or angry, the moccasin opens its mouth wide, disclosing a white, cottonlike fleshy interior. This is why many persons call it cottonmouth.

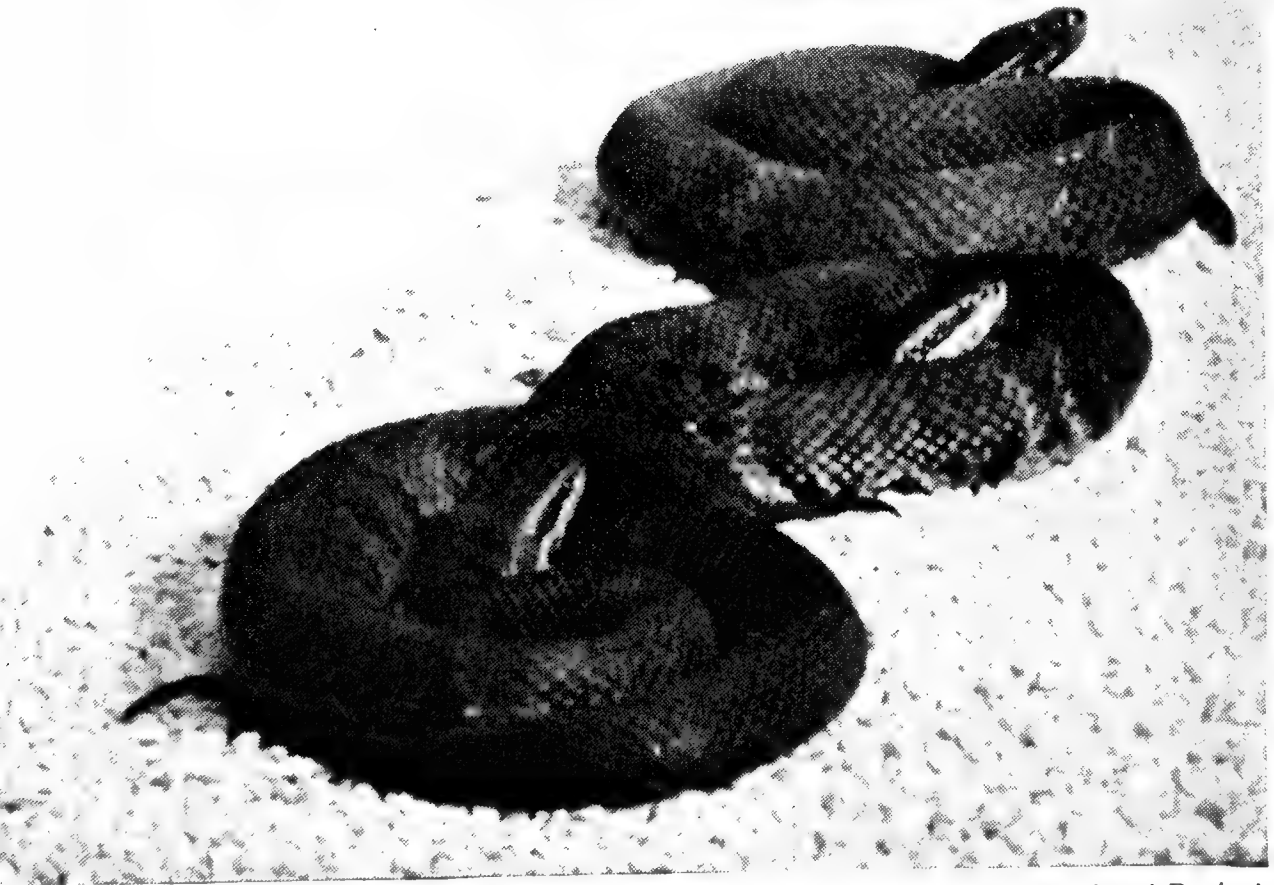
This snake is often found on low branches overhanging a stream. When frightened, it slides into the water, swims under the surface for a distance, and later emerges in a hidden spot among the reeds. In the water it hunts for fishes and frogs, while on land it partakes of birds and small mammals.

The water moccasin is an olive or brownish color with indistinct blackish bands on the sides. A dark band runs from each eye to the corner of the mouth. The mating of moccasins first occurs during the third year of their lives.

In captivity these snakes grow gentle and sluggish and often survive for many years.

From Ditmars' REPTILE BOOK.

COTTONMOUTH MOCCASIN (*Agkistrodon piscivorus*). Length: 5 feet. Range: Southeastern United States.



YOUNG COTTONMOUTH MOCCASINS

Ralph De Sola, Federal Writers' Project.

(SIZ)

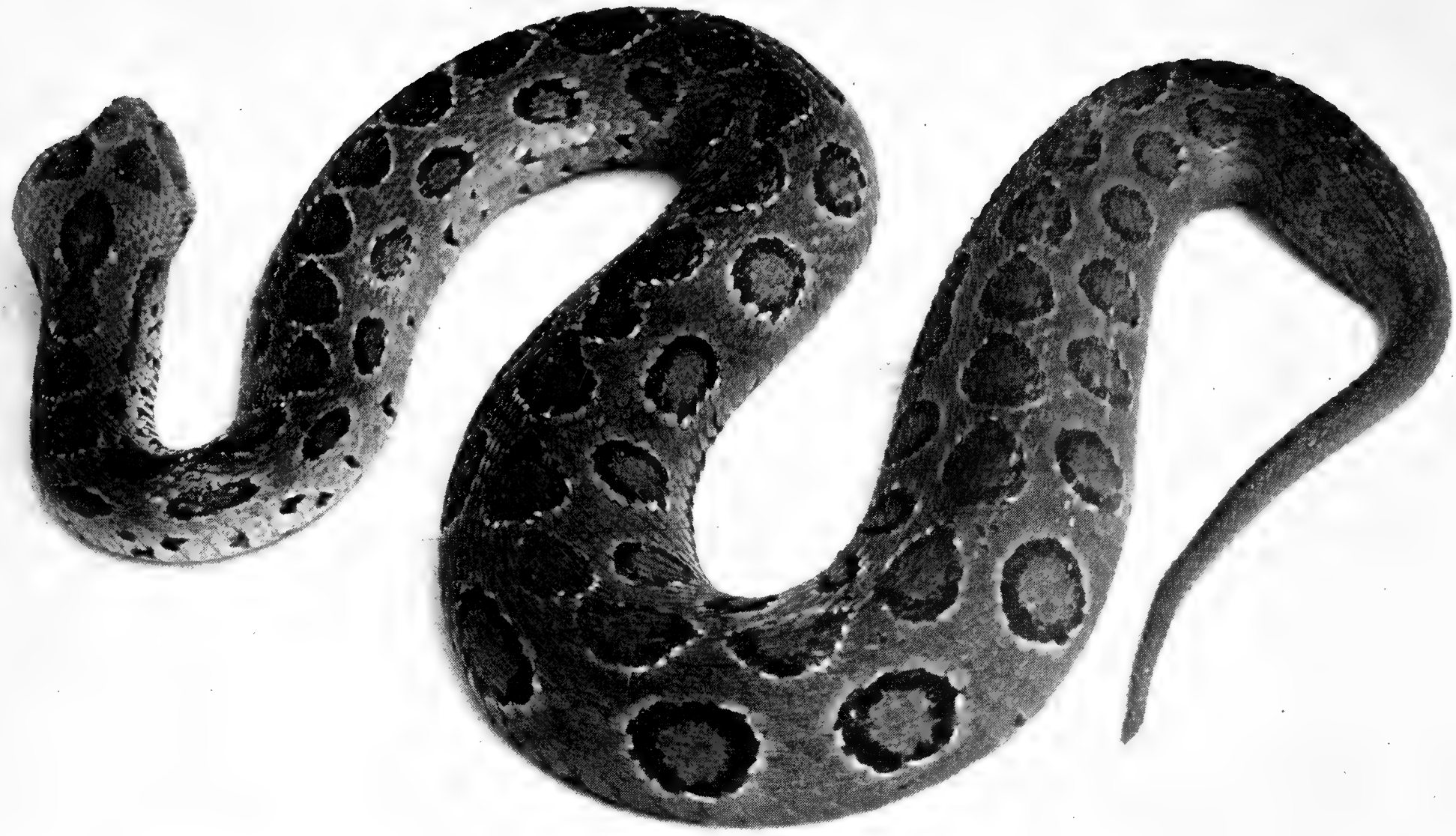
FER-DE-LANCE

BECAUSE of its deadliness and abundance, the fer-de-lance, also called *barba amarilla,* is known as the terror of the Central American lowlands. It also frequents tropical South America and the West Indian islands of Martinique and St. Lucia. The effects of this snake's poison are rapid and terrible. It destroys the red blood cells and breaks down the walls of the blood vessels. Visible early symptoms are reddening of the eyes and vomiting of blood. Hemorrhages ensue in the stomach, throat, mouth and kidneys. The tissue around the wound is completely destroyed by the poison. So strong is the venom that a Honduran woman whose fingers were lacerated from grating cocoanut died from tending the wound of her bitten husband. One reason for the uncommon abundance of the fer-de-lance is that the young are brought forth in litters of sixty or more.

This viper attains a length of eight feet. Its color is gray, olive or reddish with dark cross bands. Its brightly colored tail is said to attract its prey and its lance-shaped head is the reason for its French name of fer-de-lance. *Tomigoff* is British West Indian Negro dialect for a snake of any sort, and Jamaican workers on the Panama Canal applied the term to the fer-de-lance, which was abundant in that region. The name of *barba amarilla,* or yellow beard, arises from its yellow chin. Mongooses introduced into Martinique and St. Lucia to combat it have had some success, chiefly in killing the young. A full-grown snake is just as likely to kill the mongoose. The fer-de-lance is common in regions inhabited by man, because it commonly feeds on rodents. A legend long current in the West Indian islands has it that they were purposely introduced by the French planters to make it difficult for slaves to escape.

RUSSELL'S VIPER

THOUGH SLUGGISH and slow-moving, the five-foot Russell's viper, or *tic polonga,* rivals the cobra as the greatest killer among oriental snakes. The poison of this viper tends to coagulate the blood and destroy the red blood cells. It can kill a chicken in the record time of thirty-eight seconds and a



Raymond L. Ditmars, New York Zoological Society.

RUSSELL'S VIPER (*Vipera russellii*). Length: 4 feet. Range: Southeastern Asia.

dog in twenty-six minutes. A man if not treated will succumb to exhaustion from hemorrhages, tetanus or gastric disturbances, in from one to fourteen days.

The *tic polonga* is a rich tan color. Three rows of black rings bordered with white or yellow run the entire length of its body. Though it usually inhabits the plains, it is also found in the mountains of India up to seven thousand feet. It avoids the thick jungle. Nocturnal in habits, it lives largely on rats, and is consequently numerous in the neighborhood of human settlements. When disturbed, the *tic polonga* emits a rapidly intermittent hiss, producing as loud a tone in the intake as in expiration. The sound is much like that produced by a leaking football. In striking, the viper slides forward almost imperceptibly for a foot or more and then springs.

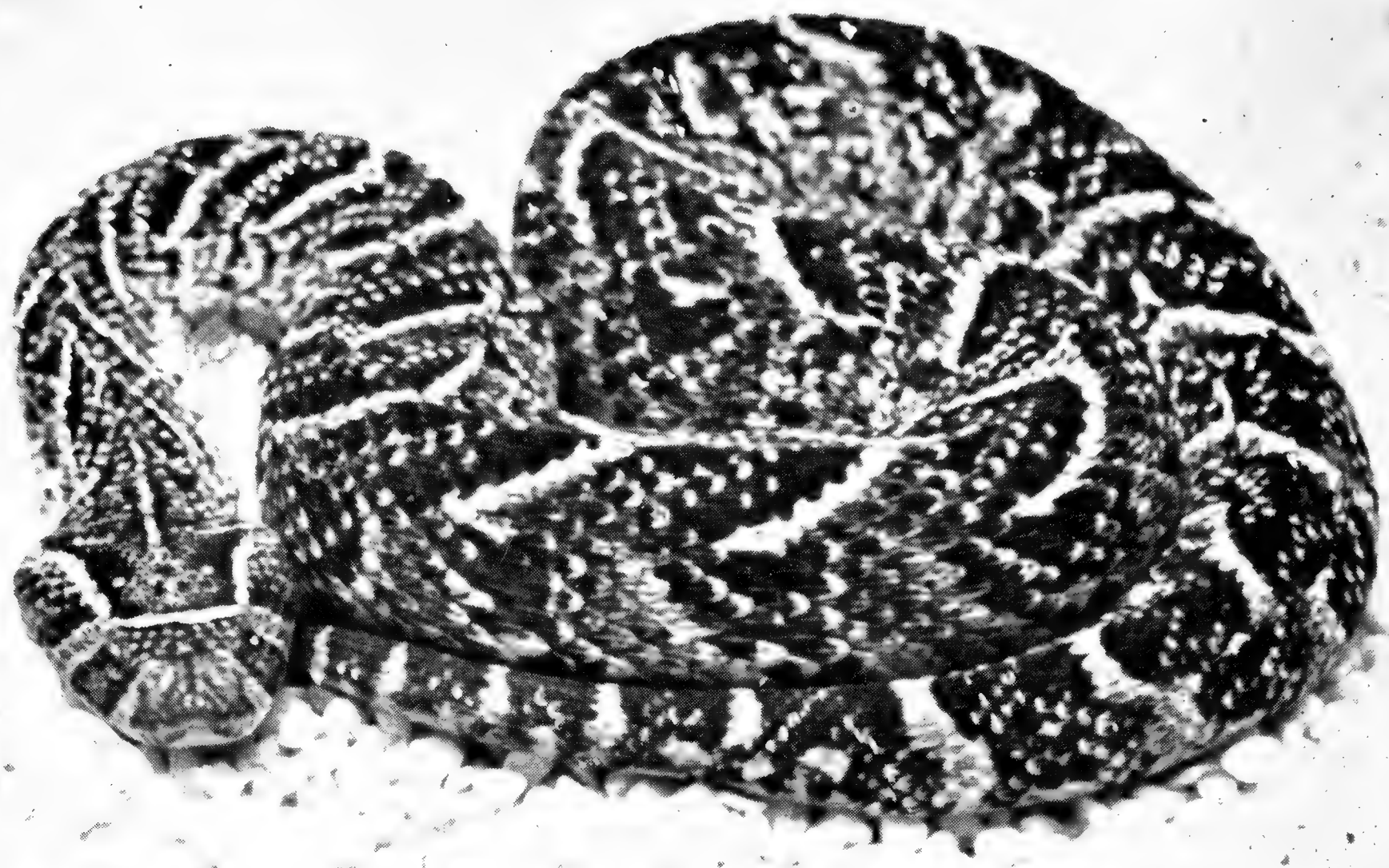
Because of their large litters which are born six months after mating, these snakes are exceedingly abundant in some regions. In the last century a British judge had to abandon his house in Ceylon because it was infested with *tic polongas*. The young are more belligerent than their parents and, unlike their elders, are said to be cannibalistic.

In India, the venom of this creature is prescribed in the form of pills by native doctors as a treatment for many kinds of diseases. South African scientists have done much experimenting with viper venom as a treatment for epilepsy.

PUFF ADDER

One of the most common African snakes, the puff adder, often lies motionless and well camouflaged by its orange-brown color athwart the jungle trails. Unlike other snakes, it makes no attempt to get out of the way when people approach, but if stepped on, it will respond viciously. Consequently many barefoot natives are bitten. Some have been known to die, but as a rule the puff adder's bite is not fatal to man. The hiss of this viper is a vigorous puff; hence the name.

Puff adders are also found in large numbers about human habitations. Englishmen and natives have been terrified frequently at finding puff adders in their beds. In addition to rats, the serpents eat birds, toads, chickens, lizards. About a day after feeding, the body color of the snake has been



(SIZ) *Ralph De Sola, Federal Writers' Project.*

PUFF ADDER (*Bitis arietens*). Length: 4 feet. Range: Africa and Arabia.

observed to deepen to a reddish brown. The bite of one puff adder will kill another. Young puff adders fed to a carp by scientists bit the fish internally and killed it.

GABOON VIPER

ANOTHER African viper is the awe-inspiring Gaboon, which is the heaviest, though not the longest, of African poisonous snakes. It is dark brown, marked with yellowish diamonds running lengthwise. Its head is impressively broad, and its fangs may be one and one-quarter inches long. Yet despite its ferocious aspect, it is placid and slow to attack. Its venom, however, is extremely potent.

The vipers also have European representatives, and these have occupied an important place both in folklore and primitive medicine. Among them are the asp said to have bitten Cleopatra; the nose-horned viper, known in Austria as the *sandnatter;* Orsini's viper, found in the Italian Abruzzi; and the common viper, found throughout Europe and England.

In eighteenth-century England viper flesh was the chief ingredient in a popular remedy for scurvy, known as viper bread. The recipe was: one ounce powder of viper's flesh, three ounces of the mealy part of the sassafras root finely powdered, one pound fine wheat flour, yolk of one egg, a little yeast and sufficient milk to knead. Form into cakes and bake. "Tincture of vipers" was used in a prescription to induce sweating.

BUSHMASTER

LARGEST of all the vipers is the bushmaster, known in Central America as *cascabela muda,* or silent rattler. Examples twelve feet long have been found, and nine feet is a common length. It is the only American viper that lays eggs. Like the rattler, it warns of its presence by vibrating its tail, but the sound produced is no more than a low buzz.

A slender snake, the bushmaster is pale brown or pinkish, with large

Raymond L. Ditmars, New York Zoological Society.

BUSHMASTER (*Lachesis muta*). Length: 10 feet. Range: Tropical America.

black and brown blotches. Though nowhere very abundant, it is aggressive and dangerous. It will not shy away from an intruder, but tends to attack, striking from an S-shaped, sidewise loop. Its fangs are long, and it secretes a large amount of venom.

RATTLESNAKES

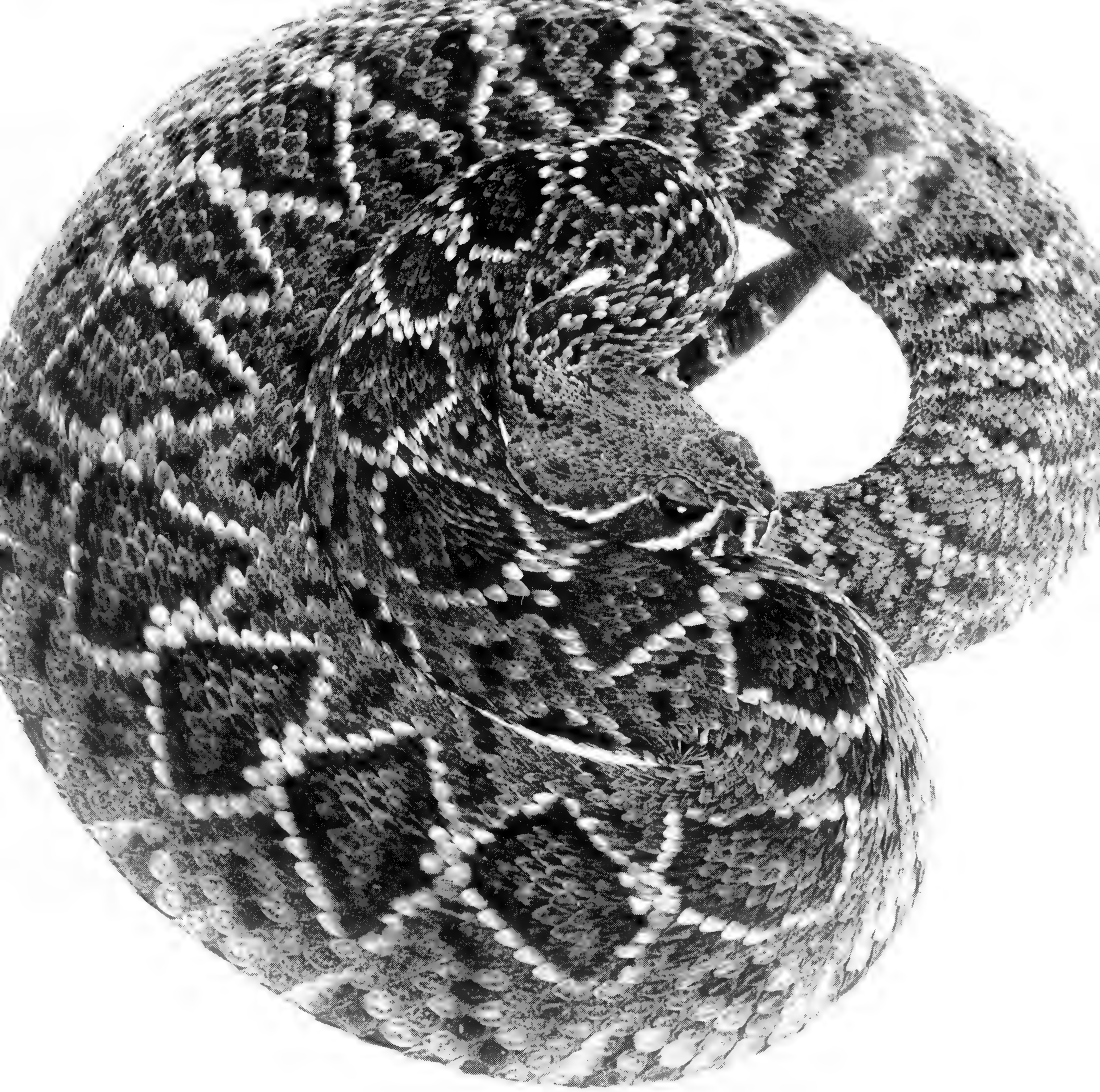
An encounter with a rattlesnake is usually an unexpected event. It may occur — and often does — during a hike, picnic, or camping expedition in many parts of the United States and as far south as Argentina.

The snake may be gliding across a forest pathway, or sunning itself on a ledge. It senses the approach of footsteps. The rattler cannot hear, but it feels the vibrations of the earth against its belly and becomes tense. It sees the intruder before being seen itself.

Frightened or annoyed, it assumes its characteristic S-shaped striking coil and usually gives warning by vibrating the "rattle" at the end of its tail. The intruder draws up suddenly. If he is close enough, the rattlesnake uses his moment of indecision to lunge forward and sink its hypodermic-like fangs into an unprotected leg. Then, if content with its work, the creature slithers away. The bite of rattlesnakes, as recorded in the United States, has only been fatal in fifteen per cent of all cases not properly treated. And the smaller rattlers do not secrete enough venom to kill a man.

Snake charmers have found through painful experience that pulling fangs is no insurance against snake-bite, as reserve teeth grow in very quickly. Removal of the poison glands has also proved impractical in the past because of the high mortality among snakes operated upon and the danger to the operator. Recently, however, a technique has been developed by Tait and extended by Babcock for anesthetizing rattlers and successfully removing the poison glands. Curiously enough, Tait found that fangs continued to grow after the sacs had been removed.

Pope, who has made some interesting researches on the relative toxicity of snakes, writes that if a fifteen-pound diamond-back, noted for the great amount of venom carried at one time, were loaded with the poison of the Australian tiger snake, one load could kill four hundred men.



L. M. Klauber.

EASTERN DIAMOND-BACK RATTLESNAKE (*Crotalus adamanteus*). Length: 8 feet. Range: Southeastern United States.

According to Klauber there are about forty species and sub-species of rattlesnakes. The largest of these, the eastern diamond-back rattler, grows to seven and one-half feet in length; Willard's pigmy, a half-pint pest local to Arizona and New Mexico, achieves all of fifteen inches. Of the whole fearsome tribe, the western diamond-back rattlesnake has been awarded the palm as killer-in-chief.

No type of terrain has proved inhospitable to rattlers. While the greater number live in arid or semi-arid bushland, rattlers climb mountains as high as 14,500 feet, and pick their way through forests and swamps, and individuals have been found swimming in rivers and lakes — even in the ocean. Often a single species will adapt itself to different habitats.

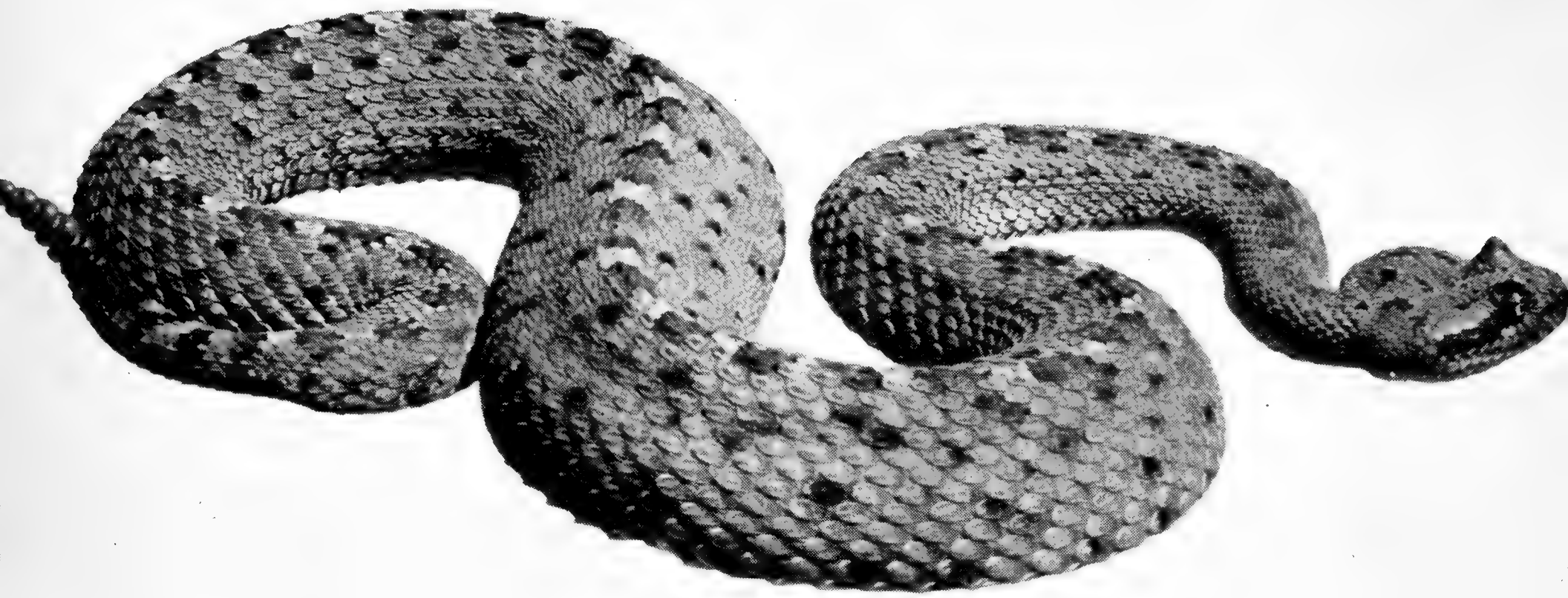
With the coming of the first frost rattlesnakes go into hibernation. In cold regions they seek out the shelter of caves or "snake dens," deep fissures in the rocks frequently extending thirty feet beneath the surface. There, intertwined in large numbers, they spend the cold months in a state of torpor. Some species expropriate the holes dug by other animals. In the warmer climes they hibernate separately, frequently emerging during hot spells in quest of food and sunlight.

During the spring and autumn, rattlers forage for their food by day, but during the hot season appear only after sunset. The direct heat of the southern sun will kill a rattlesnake in less than a quarter of an hour. The presence of rattlesnakes in any neighborhood is conditioned by the availability of its fare — rodents and birds. They render a service to farmers by eating the rats and field mice which multiply in the vicinity of harvest operations.

These snakes also serve economic functions by yielding their skins for the manufacture of fancy leather goods and their flesh is canned in Florida for the delectation of certain epicures. A rattlesnake oil sold in the Orient and at American sideshows is alleged to relieve the twinges of rheumatism, cure the gout and grow hair.

In addition, rattlers create an economic "demand" which they "supply" themselves. Their venom is extracted and manufactured into antivenin used in the treatment of rattlesnake bite. Experimentation is proceeding in the use of venom to cure epilepsy and other disorders.

The poisoning apparatus is a frightfully efficient device. Venom glands in the sides of the serpent's head connect through ducts with long, hollow



L. M. Klauber.

HORNED RATTLESNAKE OR SIDEWINDER (*Crotalus cerastes*). Length: 2½ feet. Range: Southwestern United States.

fangs, folded, when not in use, against the roof of the mouth. In striking, the snake rears upward for about six to twelve inches, so that the force of the blow is downward. The mouth is kept closed until just before the fangs make contact, then they spring erect and inject the poison.

Rattlers have two types of toxins in their venom. The one toxin breaks down the walls of small blood vessels, dissolves cells, and paralyzes nerve centers, making breathing difficult and causing congestion, while the other prevents the clotting of blood sometimes causing a hemorrhage. Calmette, Crimmins, Ditmars, do Amaral and a host of other investigators have studied the toxin of the rattlesnake.

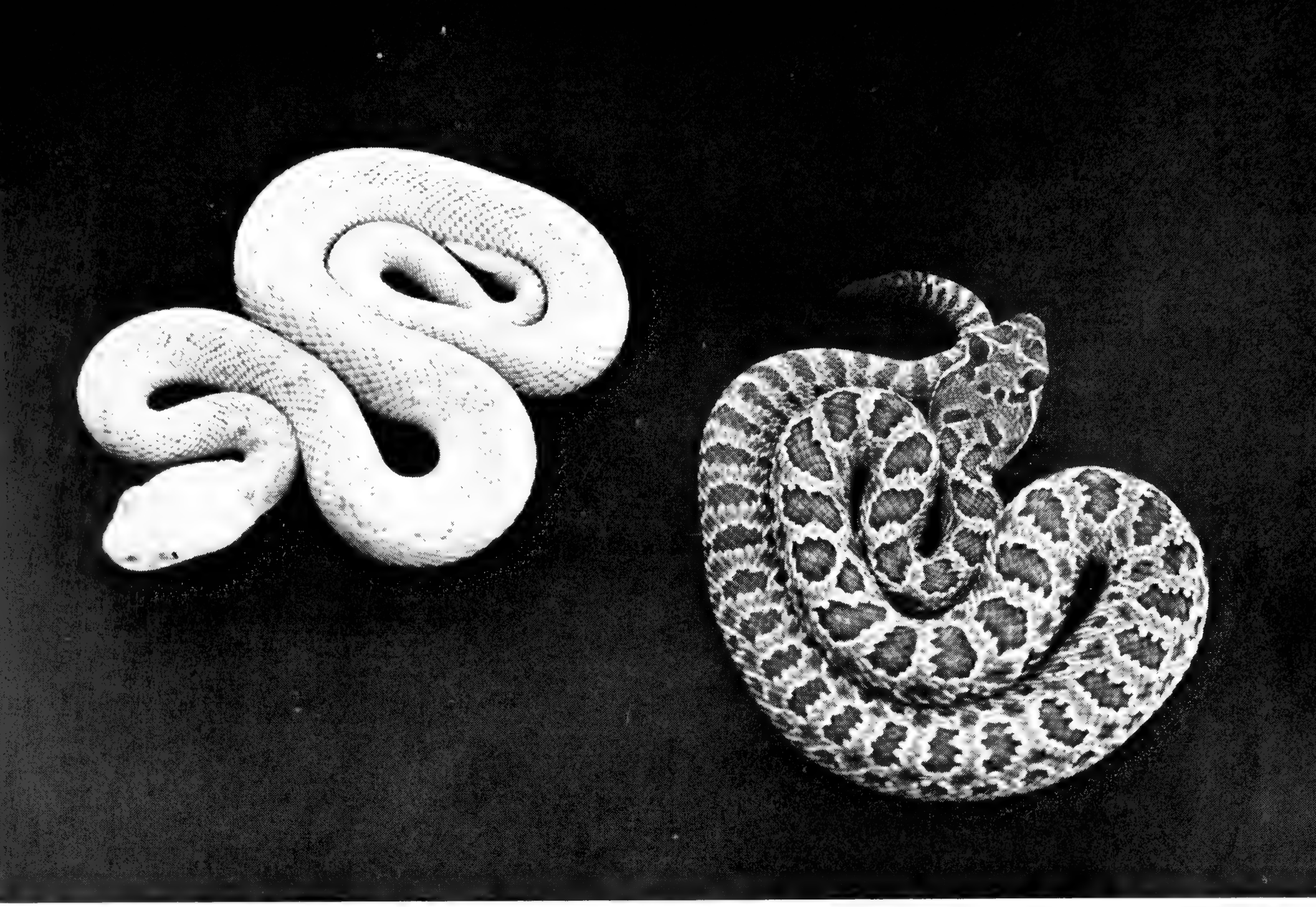
The snake's "word to the wise," its rattle, begins as a single button appearing after the first skin has been shed. With each shedding an additional segment appears. Most specimens have rattles composed of from five to fifteen segments, the larger number being unusual as they frequently break off. The number of rattles or segments is therefore not a reliable way to tell the age of the snake.

Record skins of rattlers exhibited in circuses and sideshows are frequently something less than meets the eye. To be sure, record specimens of the large eastern diamond-back rattlesnake really do reach a length of nine feet. But in their search for the "colossal" and the "stupendous," exhibitors sometimes stretch the hides to twice their size and add an extra set of rattles.

When first caught, this snake can be kept alive only through forced feeding with eggs and viosterol. Nervous and intolerant of handling, it flies into defensive tantrums. Later it will eat live rodents but if annoyed during the kill it will regurgitate them.

In August and September the eastern diamond-back gives birth to a litter of from eight to twelve young. In this connection Ditmars mentions a phenomenon quite unusual with snakes of any type. A mother eastern diamond-back, kept at the reptile house of the New York Zoological Park, tried to attack its keeper whenever he approached the cage in which she lay with her brood. Snakes as a rule forget completely about their young from the moment of birth.

Rattlers play an important part in the religious life of the Hopi Indians. During the ceremonial snake dance, live rattlers are handled by young boys and tribal priests without apparent harm. Large numbers of the snakes



L. M. Klauber.

ALBINO AND NORMAL PRAIRIE RATTLESNAKES COMPARED

are caught before the great festival in summer, and stored in earthenware jars. Attendants wash and dry them, passing them easily through their hands in the process. During the dance, the priests even put the snakes in their mouths. The fangs are not withdrawn, yet for some unknown reason, the dangerous creatures seem to fall in with the spirit of the festival and inflict no injuries on their handlers.

The rattlesnake was so familiar in early American settlements that it was used as a revolutionary emblem on a colonial flag with the warning: "Don't tread on me."

TURTLES

(TORTOISES, TERRAPINS AND TURTLES)

THE TERM "TURTLE," has been broadly applied to the four-limbed animal dressed by nature in an armor sometimes as invulnerable as the metal suit of warrior knights. To most people a turtle is a turtle whether it swims in the sea, lurches cross-country like a miniature army tank, or wallows in the mud. It may be a mild, inoffensive vegetarian, or it may hunt and fish for its food and snap your finger off if you give it half a chance — and still be a "turtle."

Scientists, however, speak of the whole family as chelonians, and some like Hornaday and Surface further divide them into turtles, tortoises and terrapins. Tortoises have dome-shaped top shells and clublike legs and spend all their time on land. Turtles dwell in the water and have flippers instead of legs. And the terrapins, whose feet are webbed between the toes, have the amphibian characteristic of dividing their time between land and water.

Nevertheless, in conformity with custom, we shall call all these creatures "turtles" except in those few cases where usage dictates otherwise. Like most other reptiles, turtles are equally distributed over most of the temperate and tropical continental regions. Sea turtles inhabit the warmest waters of most of the seas and oceans, as they have done throughout much of geological history.

Their shells, the upper called the carapace and the lower called the plastron, fit around them like a barrel with the ends knocked out for the head, tail and legs. These shell parts are formed by flat, bony ribs, fused together and completely covered with a horny exterior. The upper and lower shells are connected at the sides by means of bony "bridges." The protruding head, neck and limbs are protected by scales or just skin.

Most backboned animals draw breath by means of movable ribs and muscular diaphragms; their chest cavity acts as a bellows to pump air in and out. The turtle, however, has ribs fused to the underside of the carapace. It is able to force some air into and out of the lungs by raising and lowering

TORTOISES

Domed shells and elephantine feet are typical features of terrestrial species.

TERRAPINS

Depressed shells, rudder-like tails and webbed feet are typical features of semi-aquatic species.

TURTLES

Streamlined shells and paddle-like flippers are typical features of marine species.

SURVIVAL OF TURTLES

Turtles, more than any other order of reptiles, have managed to survive unchanged through the centuries of geological progress. The land-living tortoises, the semi-aquatic terrapins of fresh water, and the turtles of the sea have filled all the available habitats of temperate and tropical countries. Their remarkable adaptation to environment is the factor of natural selection which has made for survival; gradual extinction has been the fate of less conservative animals.

the floor of its mouth as it distends and compresses its neck. Other methods of respiration are anal and pharangeal.

Turtles are toothless, but their horny beaks with sharp cutting edges can inflict a nasty wound. It is just as well that the great majority are peaceful by nature. Land turtles generally eat vegetable foods, whereas many aquatic forms eat animal and vegetable foods with equal relish.

Female land turtles can do no more than hiss but the unmusical utterances of the males run the gamut from the pipings of the smaller species to the hoarse bellowings of the giant tortoises.

Adult turtles vary greatly in size. The fresh-water mud turtle seldom reaches a size much larger than three inches in length. The trunk-back marine turtle is frequently over six feet long.

The age achieved by some turtles is truly remarkable and Major Flower, who is an authority on the longevity of animals, writes: "Tortoises live to ages exceeding those of all other vertebrate animals."

Turtles reproduce by means of eggs laid in sand or loose earth. Even the sea turtles make for shore to lay their eggs. The eggs are round or elliptical and may be covered with a hard shell, stiffened by its content of calcium, or by a softer parchment-like covering.

Alfred Sherwood Romer in *Man and the Vertebrates* pays a merited tribute to the turtle family.

"The turtles are the most bizarre of reptilian groups. Because they are still living, turtles are commonplace objects to us; were they extinct their shells, the most remarkable armor ever assumed by a land animal, would be a cause for wonder.

"The turtles, once within the shelter of their armor, became the conservatives of the reptilian world. The oldest forms were contemporaries of the earliest dinosaurs. The ruling reptiles grew to dominate the reptilian scene but the turtles persisted unchanged. The dinosaurs passed away and the mammals took their place, but the turtles went calmly on their placid way. Now man dominates the scene, but the turtles are still with us. And if, in the far distant future, man in turn disappears from the earth, very likely there will still be found the turtle plodding stolidly on down the corridor of time."

Popularly classified, the following groups of turtles will be represented in this chapter:

Snapping Turtles dwell in fresh-water streams, lakes and ponds. There are four species of these fresh-water turtles in North and Central America and one species found only in New Guinea. Their relatively large heads, long, alligator-like tails, rough shells, and above all their use of powerful, notched jaws, have given all of these turtles a well-deserved reputation for viciousness.

The *Musk and Mud Turtles* are also found in North, Central and northern South America, except for the giant-headed turtle, native to bodies of fresh water in Siam, Burma and China. The American species number more than fifteen. Disturbed in their muddy haunts, these reptiles give off a musky stench by secreting substances from small skin glands. Many species are able to withdraw head and limbs into the shell, the under part of which is provided with front- and rear-hinged lobes.

The twenty-four generic types of *Water Turtles* are distributed all over the earth with the exception of the Australian region. Their physical characteristics as a group encompass every degree of evolutionary adaptation from aquatic to terrestrial life. One of these, the *Batagur* turtle has a shell almost two feet long. Found in Bengal, Burma and Malaya, it is enabled by its webbed toes to lead a completely aquatic existence. The better-known painted turtles, sliders, diamond-back terrapins, as well as the pond and box turtles, will be treated more extensively later in the chapter.

Land Tortoises bring to mind the gigantic long-lived inhabitants of the Galapagos Islands and a few remote archipelagos of the Indian Ocean. Closely related are more than seventy-five smaller species found throughout the tropical world. Perhaps the most curious land tortoise is the East African soft-shelled tortoise whose flexible shell permits it to hide in the crevices of its rocky homeland.

Sea Turtles range throughout the principal seas and oceans. The giant trunk-back, about which very little was known until recently, attains a weight of more than fifteen hundred pounds and is the largest of all living reptiles. Until a few years ago no one had ever observed this turtle depositing its eggs, although adult specimens had been captured from time to time in various parts of the ocean. In general the sea turtles have the same habits.

Snake-necked Turtles are able to withdraw their long necks and heads into the shell in time of danger. This group is known from examples found in South America, Australia and New Guinea. All its members are quite

similar except for the fringe-headed South American matamata and a New Guinea species provided with paddle-shaped limbs like a sea turtle. Snake-necks from tropical Africa, South America and Madagascar can only partially retract their necks. These also inhabit fresh water.

Soft-shelled Turtles comprise a single family with twenty-five or more species scattered throughout Africa, Asia and North America. Their leathery skins cover pancake-shaped bodies.

SNAPPING TURTLES

SNAPPING TURTLE

A MAN ONCE cut off the head of a snapping turtle. Although it was several hundred feet from its pond, the turtle, headless, clambered back into the water before dying. This fearsome creature, which sometimes attains a length of two feet and a weight of sixty pounds, is drawn to an aquatic life from the day of its birth.

The snapper usually rests on the muddy bottom of ponds, lakes and streams. Its brown top shell, imbedded in the mud, looks like a rock. This impression is heightened by the slimy, green algae which grows on the shell. The snapper's coloration is an excellent disguise, permitting it to gobble up unsuspecting fishes which think they are swimming over just another stone — and are captured before realizing their mistake.

When the snapper sights the leg of a waterfowl on the surface of the water, its ferocity is brought into play. Extending its long neck, it shoots its head upward and, in the twinkling of an eye, has seized its prey's limb in a cruel beak strong enough to bite off a man's finger. Down comes the helpless swan or small goose, whose life is speedily ended by a few more sharp hungry snaps. When dead, the victim is torn to pieces and devoured.

The snapper is not a bit fussy about its food. Sometimes it adds a vegetable side dish — marsh grass — to its meat dinner. When food is scarce in the water, it plods ashore to capture a chicken or small reptile in its sharp-beaked jaws. It drags its captive, sometimes still living, back into the water where it leisurely sups in its aquatic dining room. It is believed that the snapping turtle can swallow only under water; at any rate, it seems to prefer to do so. Yet, despite its voracious character, the snapper can live for months without food.

It lays its round eggs, about two dozen at a time, during the late spring or early summer — the date depending on the locality. It goes ashore for this task, sometimes traveling for a mile to establish a nest.

When it reaches what it deems a satisfactory spot, it industriously scoops out a hole with its hind legs. There it deposits the thin, but hard-

New York Zoological Society.

SNAPPING TURTLE (*Chelydra serpentina*). Length: 1½ feet. Range: Southern Canada to Ecuador.

shelled eggs and permits the dirt to slide back into the hole as a protective covering. When this task is completed, the turtle trudges back to its watery home.

The young turtles, when hatched, are only about one inch in diameter. But from the moment that they break from the shell these infant turtles are on their own. They must support themselves because, like most cold-blooded creatures, they receive neither food nor training from their mother. Instinctively the young snapper sets out for the nearest body of water as soon as it emerges from the egg. Experiments have shown that even if obstacles are placed in its way, or it is turned in the opposite direction, it will head stubbornly for the water in which it thrives.

As the snapper grows past maturity, its easygoing life begins to show. It becomes so overburdened with the fat of good living that it can move its broad, webbed feet only with difficulty, at a lumbering crawl.

In this period of its life, the snapping turtle is greatly relished by

gourmets, notably the Chinese-Americans, for its tasy meat. In its younger days it is said to give off an offensive, musky odor. In rural districts it was once common practice for farmers to catch snappers and place them in the swill barrel. There, feeding on the food of hogs, they grew deliciously fat and lost their muskiness. When the farmer considered the time ripe, the bloated snapper was killed and eaten.

This turtle is also widely used for Philadelphia snapper soup. A few hostelries in that city still observe the early American custom of raising a flag, depicting a turtle on a white background, when that tasty dish is being served. In some sections even the eggs are considered good eating, and the oil derived from the turtles is thought to be good for bruises. Sometimes a fisherman — to his disgust — pulls up his hook which seemed to have been seized by a prize fish and finds a snapper hanging on. Men kill it because of its depredations among fish and fowl, and some seek to "bring it back alive." It thrives in captivity though retaining its sullen disposition.

Extreme caution must be exercised by those handling these creatures. A snapper must be grasped by its horny tail and held at arm's length until sacked or penned; otherwise, when it makes a thrust with its long, snake-like neck, it may clamp its dangerous beak on the body or clothing of its captor, according to Conant.

Raccoons and skunks do not even give snapping turtles a chance to live, for they prey upon the eggs. Its nemesis in a fair, animal fight is the otter, which usually emerges victorious from such brawls. Both the otter, which is a mammal, and the snapper seize the same animals for food. The viciousness of the otter is demonstrated by its work in the water, where it kills ten times as many fishes as it can eat. When the two come to blows in some pond or stream, the slow-moving turtle gives rapid vent to its full fury. The waters are churned as mammal and reptile bite and snap in death combat. Ultimately the turtle succumbs to its superior and the sharp teeth of the otter sink conclusively into the vanquished snapper's neck, severing its head from its clawing body.

A number of American Indian tribes had a strange use for the snapping turtle. They would disembowel the creature, cut off its legs and tail, and make a handle by inserting a piece of wood through the head and flabby neck. Then some stones were placed within the hollow shells which were closed by sewing up the skin at both ends. The result was a rattle which,

SNAPPING TURTLES HATCHING

American Museum of Natural History.

when swung by the handle, made the stones clatter loudly against the hard shells. Such instruments were used to accompany the ceremonial dances of the Indians, and may be seen in several museum collections devoted to the American Indian.

ALLIGATOR SNAPPING TURTLE

IF TURTLES were given to sneering, the alligator snapper, largest North American turtle, could rightfully sneer at its close relative, the common snapper. In virtually every respect does it outshine its feared, but comparatively puny, neighbor. For example, while the common snapper can bite off a man's finger, the alligator snapper puts it to shame by easily being able to bite off a man's arm.

This denizen of the lower Mississippi, the Gulf States and the southeastern United States attains a length of more than four feet and a weight of well over one hundred pounds. Down its dull yellow carapace run three rows of keels which look like miniature strings of mountain peaks and add little, if anything, to its beauty. The alligator snapper is generally considered, and rightfully, to be the largest, ugliest and fiercest turtle in North America.

Early backwoodsmen are responsible for its name. Pioneers thought that this creature was the result of a mating between the common snapping turtle and the alligator because it looks like the former but has a long, knobby alligator-like tail. However, the legend is untrue; science has yet to discover a romance between a crocodilian and a chelonian.

Equipped with a pair of jaws capable of snapping a broom handle in two and then crunching it to bits, the voracious brute does not dally with its prey. Once its head, which is as large as a bull terrier's, comes within striking distance of a fish, duck, frog or snake, the victim's doom is sealed.

In procuring food it uses the decoy with which nature generously provided both the alligator snappers and common snappers. This consists of a pink filament lying on the turtle's tongue. The turtle waves it about in a slow, circular motion so that it appears to be a worm. The body of the alligator snapper is not visible because the dull-yellow top shell blends with the coffee-colored water. As a fish pauses to investigate the worms floating over the "rock," the jaws of the turtle open wide and finish the poor fish with a few sharp bites.

When the alligator snapper walks on land, its body is held high on erect limbs, giving it a somewhat stilted, haughty appearance. The massive

Raymond L. Ditmars, New York Zoological Society.

ALLIGATOR SNAPPING TURTLE (*Macrochelys temminckii*). Length: 3 feet. Range: Mississippi River region and southeastern United States.

tail is used to help support its great bulk. Because of its ponderous weight, the alligator snapper moves about slowly.

During the summer months, the female digs a hole in a sloping sand bank near the water. Here it deposits from twenty to forty eggs, each the size of a golf ball.

The alligator snapper is hunted by the inhabitants of the Mississippi region, who relish its flesh. When it is captured alive, it seems to be extremely moody and will eat only if provided with a hiding place where it can dine in solitude.

One member of this species lived in captivity for forty-three years.

MUSK AND MUD TURTLES

MUSK TURTLE

THIS IS THE skunk of the turtle world.

It has been derisively dubbed with such local nicknames as "stinkpot" and "Stinkin' Jenny," which, truth to tell, it heartily deserves.

It is a small creature, measuring about six inches from extended head to tip of tail, but it can keep off far stronger adversaries by emitting its horrible, musky-smelling secretion. In addition this odor, released from skin openings, probably serves to attract prospective mates in much the manner of crocodilians.

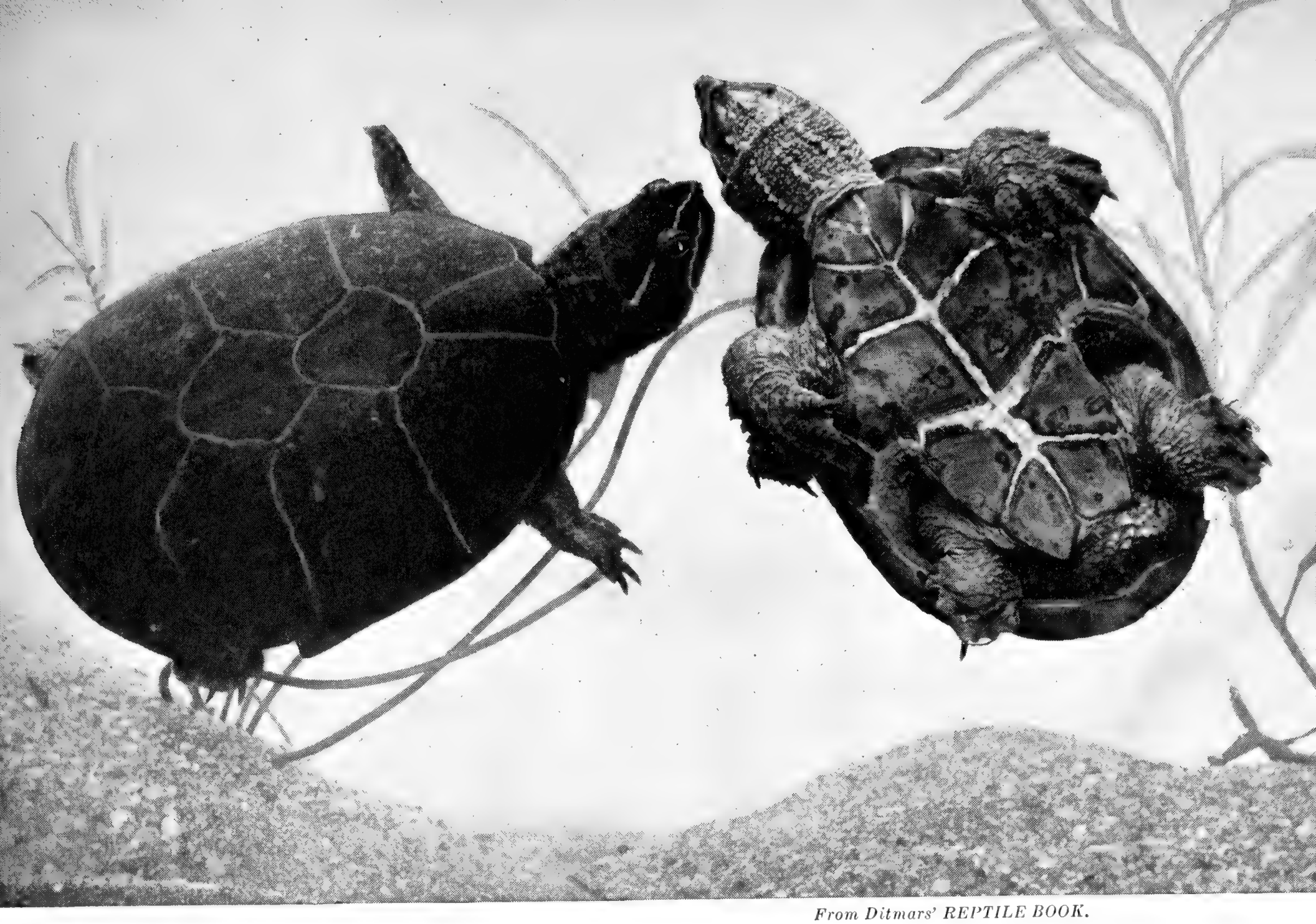
The musk turtle lives in ponds and sluggish streams. Its food is secured on the mud bottom where it voraciously preys upon tiny fish, insects, tadpoles, fish eggs and snails, for it has a keen appetite. Much activity is also expended in scavenging bits of dead fish and water fowl. This turtle unconsciously mimics the common snapper when it snaps its beak on a victim. If the opportunity presents itself, the musk turtle will attempt to chew a man's finger. It is quite a ferocious creature for its size, and its ill-temper rivals the snapper's.

The carapace, more than three inches long and two inches wide, is dark brown, and often striped. But the coating of green slime that covers it makes the colors inconspicuous. It has a large head and sharp-edged jaws.

This creature leaves the water only on rare occasions, usually to lay its eggs. In winter it hibernates in the muddy bottoms of ponds and swamps.

In June the female lays from three to seven thick-shelled eggs. The eggs are deposited in a depression in the mud bank, among piles of reeds or in the rotting wood of tree stumps. At birth, the young are soft-shelled and about one-half inch long. They reach maturity in about a year.

Unlike most pond turtles the musk turtle can live in deep water. Several placed in deep water by Dr. Ditmars seemed to experience no difficulty



From Ditmars' REPTILE BOOK.

MUSK TURTLES (*Sternotherus odoratus*). Length: 3½ inches. Range: Eastern United States.

although kept there for weeks. They simply swam to the surface for air, a feat, however, which would exhaust most pond turtles and lead them to drown.

Not only does the musk turtle annoy fishermen by eating young fish, but it also tenaciously grabs the hook as though the hook really contained a delicious meal for a turtle. It is a great swimmer and yanks the line so vigorously that the angler believes he has caught a whopper. Usually the fisherman is moderately angry when his eyes show him his catch, but when his nose picks up the musk turtle's scent, he cuts the line quicker than if he were fishing in prohibited waters and saw the game warden coming.

MUD TURTLE

CLOSELY RELATED to the musk turtle, and also emitting an evil-smelling scent, the mud turtle dwells in muddy streams and ponds. It is also called the mud box terrapin, because its lower shell is hinged, enabling it to pull in its limbs, head and tail, and bring the two shells together like a box. Sometimes very old turtles are unable to use this defense because the two hinges become stiff and bony.

The male is equipped with a sound-producing mechanism, which is used to attract the female during the mating season. Horny scales on the calf and thigh are rubbed together to produce a noise like the chirp of a cricket.

During the winter the mud turtle leaves the water. According to Cahn it hibernates in higher ground, burrowing a cozy nook about ten inches below the surface.

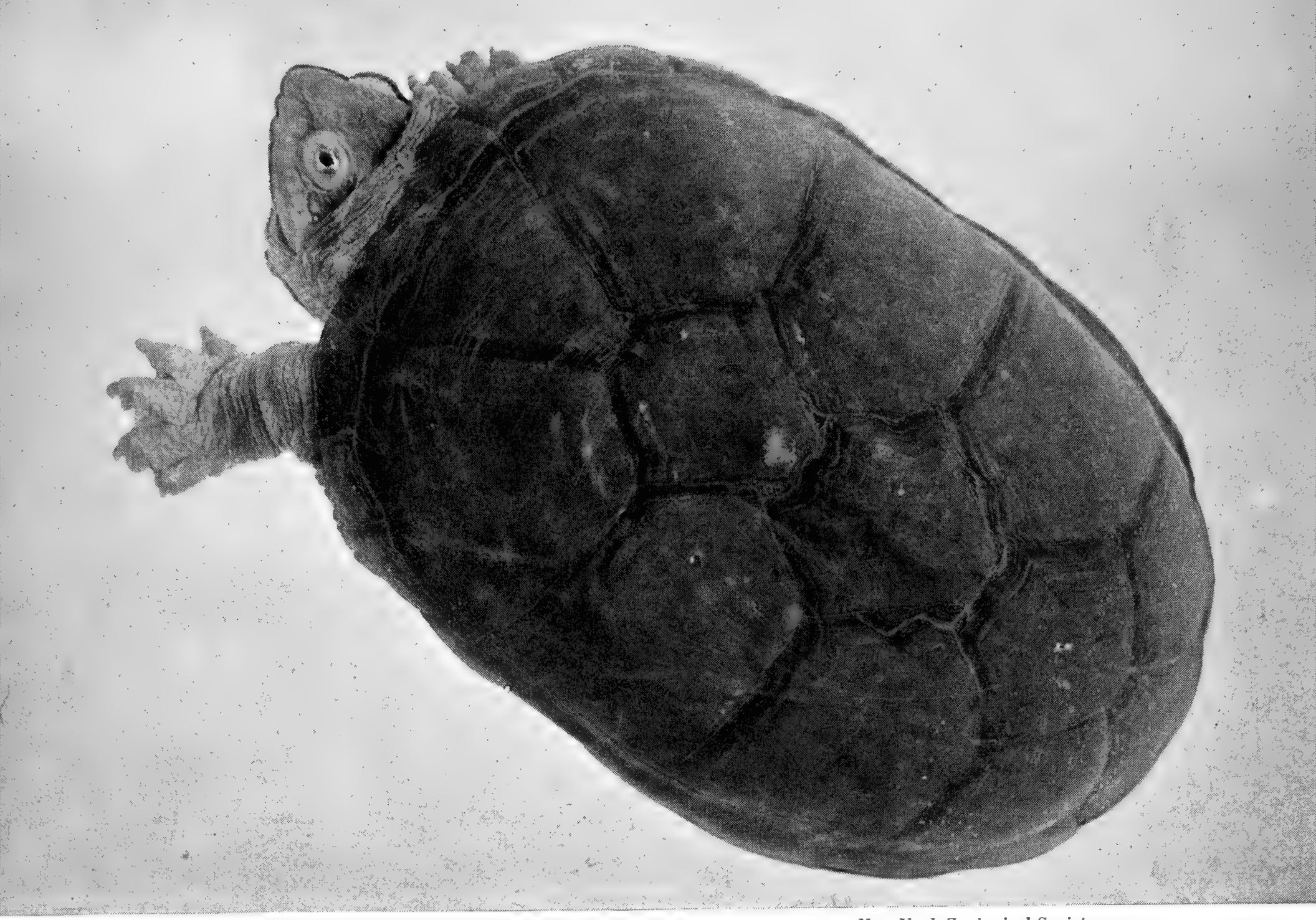
It feeds on small fishes and insects, and in captivity is quite willing to lunch on earthworms and chopped fish or beef. Although it eats other creatures, it is seldom attacked. However, snakes, weasels and skunks relish its eggs, which are found in mud or rotting logs. Three to five eggs, quite long and smooth, are laid by the mud turtle.

The mud turtle is a trifle larger than the musk turtle. Its top shell is a drab brown, sometimes with black edges on the shields. One has lived in a washbowl for twenty-five years. It has been cared for by William T. Davis, President-Emeritus of the Staten Island Museum.

Like their cousins, mud turtles have been kept in deep water without any ill effects. In rising to the surface for air, they exhibit no haste, but tread the water with an even movement of their webbed feet.

As in all mud and musk turtles, the female is smaller than the male and has a smaller tail.

The Arizona mud turtle, which swims in the swift currents of the muddy Colorado River, is the largest species in the United States. Its shell is six inches long.



New York Zoological Society.

MUD TURTLE (*Kinosternon subrubrum*). Length: 5 inches. Range: Eastern and southern United States.

WATER TURTLES

PAINTED TURTLE

DAUBED BY NATURE with gaudy yet pleasing colors this small pond turtle is acclaimed as the prettiest of all. It has a six-inch top shell of black or deep olive, often trimmed with a yellow border on the front margin of each plate, and yellow stripes along its throat. The lower shell is also of rich yellow hue; the limbs, tail and marginal plates connecting the two shells are splotched a brilliant red.

Despite its flashy clothes, the painted turtle is a shy little creature. One of its favorite pleasures is to sun itself on a fallen trunk in the pond, and sometimes groups of them, lined up like a row of soldiers, will take possession of a floating log.

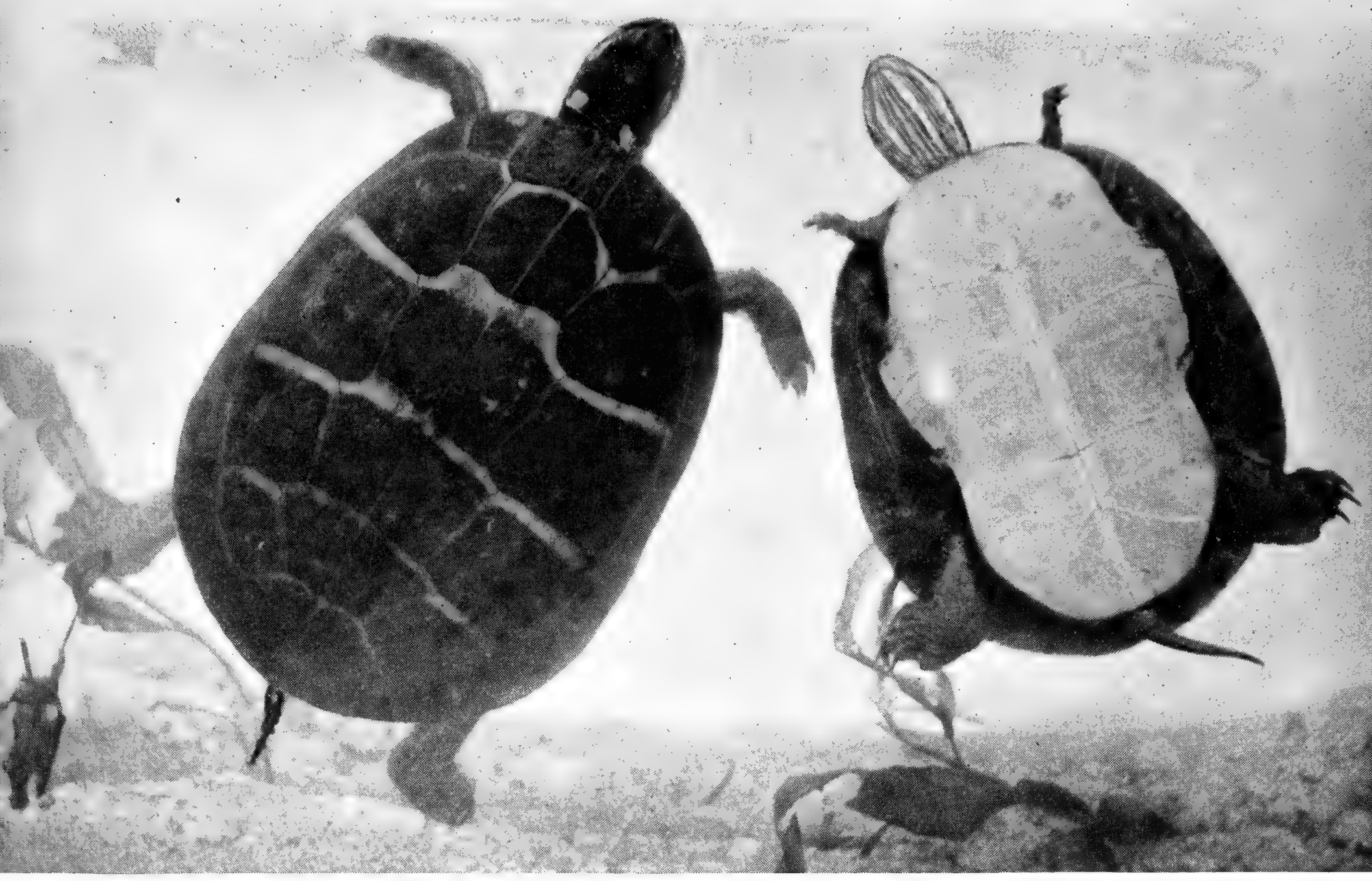
But if someone approaches, they drop back into the water and swim down to the bottom. They will return to their sun bath only after reconnoitering assures them that the coast is clear.

The painted turtle crawls through the thick grass on the banks, and therefore its lustre may be somewhat dimmed by a coating of mud. Along the shore and in the water, it picks up such food as moss, insects, small fishes and tadpoles.

The flesh of the painted turtle may be eaten, but because of its small size the turtle has no commercial value. This removes one source of danger, but it still has such enemies as skunks, weasels, crows and birds of prey. Against them it will put up a frantic yet ineffectual struggle.

In June it lays from five to eight soft, elliptical eggs. The painted turtle begins to lay eggs at the age of eleven. Thoreau wrote an interesting account of his first-hand observations of a female going through this process. He stooped so that his face was little more than a foot from Mrs. Turtle, who, unconcerned about Thoreau, proceeded with her task.

She stopped by a pitch pine and began to dig a hole with her hind feet, resting her body on the forelegs. In a few minutes a small hole about two inches deep was excavated. Then the eggs were dropped in and, without turning to look at them, she separated them one from the other with her



Raymond L. Ditmars, New York Zoological Society.

PAINTED TURTLES (*Chrysemys picta*). Length: 6 inches. Range: Northeastern United States.

hind legs. Following this, the eggs were padded with soft earth which the turtle pressed down compactly. She hid the hole with more earth, leaves and grass. Forty-five minutes after mother turtle had come to the spot, she left without once having deigned to glance at her handiwork.

SLIDER TURTLES

CLOSELY RELATED to the painted turtles are the American sliders. Typical species such as the red-bellied terrapin, which like other sliders employs its legs in scooping out the earth to deposit its eggs; Troost's terrapin, the males of which, like other fresh-water species, have exceedingly long mandarin-like nails; the long-necked chicken terrapin; the Florida cooter ("cooter" being an American corruption of the original African name for

a terrapin — *Kouta*) and other species such as the map and yellow-belly, are all of commercial value and are to be seen in the fish markets of the eastern seaboard, the Gulf and Central States.

SPOTTED TURTLE

BRIGHT YELLOW-ORANGE spots in each of the top shell's black shields is responsible for the spotted turtle's name.

These turtles may be seen in fresh-water ponds in the eastern United States, and sometimes according to J. T. Nichols they even venture into brackish areas. They enjoy sunning themselves, and will clamber on a log in groups, sometimes so numerous that they are perched one atop the other. These attractive creatures are intelligent enough to quickly learn the way through a maze — if there is food at the end.

Their shell is about four inches long, although smaller in the females, whose tail is also shorter than that of the males. When born, the young have an egg-tooth on their nose to help them crack through the eggshell; it disappears a week later.

Like many of its chelonian brethren, the spotted turtle hibernates in the mud beneath the water. Sometimes, when a premature thaw breaks the frost, the turtle will ascend to the surface with the speed of molasses. It will enjoy its first bit of sun in a long while, strolling along the bank. But as the sun goes down and frost once again sets in, the impetuous creature will learn that it made a mistake in believing spring had come. It will be unable to move its sluggish body through the frozen mudbank and several months later only scattered bits of its shell will be left to greet the spring.

LEPROUS TURTLE

A RELATED SPECIES is the leprous turtle of Spain, Morocco and Algeria, so named because in stagnant and impure water it acquires a skin disease superficially akin to man's leprosy. The shell of the leprous turtle is cracked by the hot sun and it becomes infected from the foul waters.

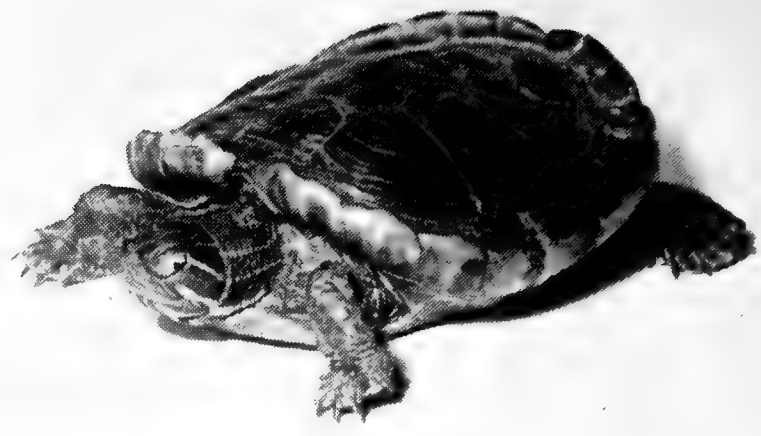


Photo by S. C. Dunton, New York Aquarium.

"PAINTED" TURTLES, like this specimen, sold as souvenirs, seldom live to achieve maturity, because— the binding agent in the paint causes the shell to curl, preventing proper growth and causing suffocation.

Some members of this species which live in clean, fresh water are not affected and retain a healthy appearance. The top shell of a leprous turtle is about eight inches long and is a dull olive gray, while the bottom shell and legs are yellow. Their bright colors tend to fade as they grow older. The young ones are quite different from the adults, having an orange dot on each olive brown shield.

Leprous turtles can be kept in captivity for many years, eating under water. At first they produce a strong, distasteful stench, which becomes less and less offensive as they become acclimated. They can live out-of-doors as far north as England, but then they hibernate in the winter. If kept in tanks of warm water, they do not hibernate and they mate throughout the year rather than at a specific season.

Related species of pond turtles include the semi-aquatic, brown-shelled wood turtle of the eastern United States; the Caspian turtle; the European pond turtle; and the numerous Asiatic and East Indian varieties that serve the native populations as sources of food, destroyers of insects and scavengers of stagnant pools and sewage-clogged streams.

DIAMOND-BACK TERRAPIN

THE DIAMOND-BACK is undoubtedly the most popular North American terrapin. To its many admirers, however, it has little charm when in its native salt marshes or muddy tide flats. But put it in a kettle with the other ingredients necessary for making a savory diamond-back terrapin stew — and its popularity is well-nigh limitless.

So great has been the demand for these creatures from epicures, that at one time the species was threatened with extinction. The price for a large terrapin has been as high as ten dollars, and a normal price may be from sixty to seventy-five dollars a dozen. When it is considered that the average specimen has a shell of about eight inches and weighs only three pounds, the price it brings stamps it as a luxury food.

The diminishing supply led to the establishment of terrapin "farms" in such states as the Carolinas and Georgia. Here wild terrapins were placed in captivity and fattened for market. Some of these enterprises are commercial hatcheries which breed diamond-backs, nurturing the young until they are delectable enough for the connoisseur's table. As an emergency measure North Carolina in 1923 prohibited the capture of terrapins for a five-year period, and Hildebrand began experiments in cooperation with the Bureau of Fisheries to save the precious animals from complete extinction.

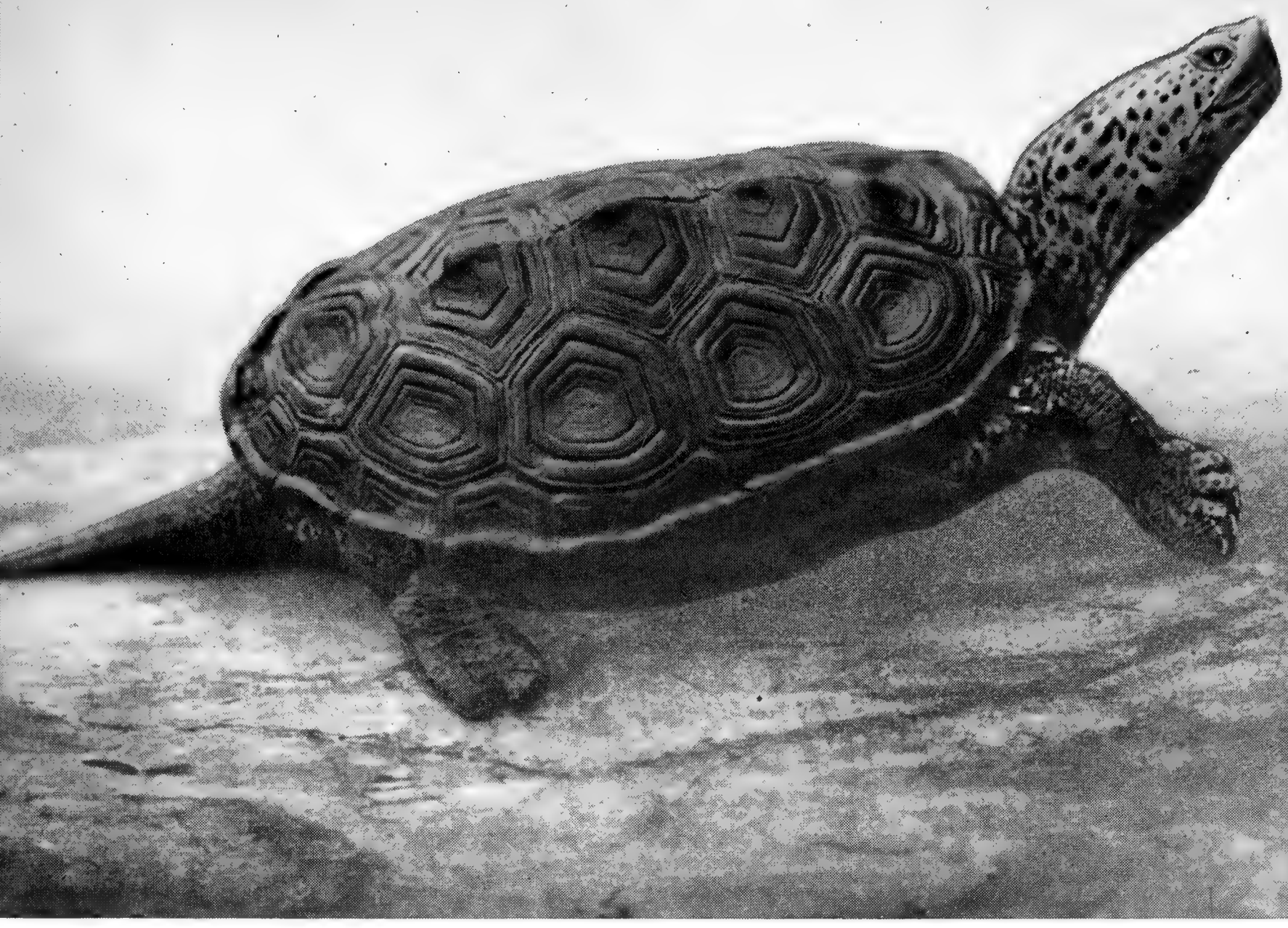
There are "farms" which imitate the Florida alligator "farms" by exhibiting terrapins with clever traits. One, at Isle of Hope, near Savannah, Georgia, features a piano-playing diamond-back which, when posed on a tiny player piano, will wiggle its claws as though really producing the music.

The diamond-back has quite a degree of intelligence. Experiments have shown that it can learn to associate certain sounds or even lights with its feeding time, and will come promptly to the feeding place.

The diamond-back acquired its popular name from the diamond-shaped pattern of the plates on its rough, dark olive top shell. Its lower shell is yellow. The mouth has a sharp cutting edge and a wide grinding plate, permitting it to eat shellfish without difficulty. Other staples in its diet include grass, snails and mollusks. In captivity it consumes chopped clams and oysters, shrimps and fish. It prefers to eat under water.

Among diamond-backs, the female is the dominating sex, attaining a shell length of from eight to twelve inches, while the runty male, stretching himself to his full length, has a shell of only four inches.

The females lay from five to twelve eggs, which are buried five inches deep in the mudbank or at the edge of a marsh. The one-inch-long young are hatched in the summer time but remain in the nest until the following spring, not feeding at all during that period. However, those born on the "farms" are not permitted to hibernate and are fed to increase their rate



New York Zoological Society.

DIAMOND-BACK TERRAPIN (*Malaclemys centrata concentrica*). Length: 8 inches. Range: Massachusetts to Maryland.

of growth. It is interesting to note that the death rate of young turtles raised on "farms" is only about five per cent.

Diamond-backs cannot live in fresh water since a fungus grows on their bodies and infects their flesh. In captivity, they will thrive if salt is mixed into their water, to give it the brackish flavor of their native habitat.

BOX TURTLE

A TIMID LITTLE creature, the common box turtle has a number of entertaining characteristics and is the subject of humorous stories.

It can completely seal its body within its two shells, thus withdrawing from the outside world whenever danger seems to threaten. The lower shell is hinged, enabling this turtle to pull in its legs, head and tail and then

close the lower shell so tightly against the upper that not even a toothpick can be inserted between the shells.

When tamed, the box turtle becomes as delightful as more common pets and will even feed out of one's hand. It consumes such edibles as earthworms, raw meat, greens and fruit. Indeed it is so polite, that it will readily accept all the food it can eat and consequently may put on a good deal of excess weight. Sometimes it grows so fat that it cannot close its shells on both ends. Its bulging body pops out on one end when the shells are closed on the other, in a manner similar to that of a toy balloon which is squeezed by a child. The box turtle may become so accustomed to the safety of captivity that it cannot even be tempted to close its shells.

Most of its time is spent on land. It will enter the water only to ford a stream, cool off, or escape an enemy. It floats like a cork but swims with the irregular, frightened strokes of the novice swimmer who suddenly finds himself in water over his head.

The common box turtle clambers slowly through the forests and fields although it can put on speed when necessary. It hunts insects, worms and, in season, blackberries. In its wanderings it maintains an excellent sense of direction. A box turtle has been carried miles from its haunts, then attached to a spool of thread which it unwinds as it journeys back to the starting point. Trailing it through the thread, C. M. and R. B. Breder observed that the turtle will pursue nearly a beeline in returning from where it was abducted.

In their journeys in search for food and mates, box turtles avail themselves of man's smooth roads. Here they often meet death under the crushing wheels of automobiles.

This animal seeks shelter under bushes. It does not burrow a hole in which to live but it manages, by burrowing, to force its legs into the ground. Then it forces the edges of the top shell down into the soil. All that remains showing is the rounded portion of the top shell which seems very much like a stone imbedded in the ground and is difficult to recognize as part of a turtle.

When born, the box turtle is about the diameter of an American half dollar and when it is fully grown its oval shell is almost six inches long. From three to six eggs are laid by the female in a small hole in open fields, the operation being similar to the egg-laying of other water turtles.

New York Zoological Society.

BOX TURTLE (*Terrapene carolina*). Length: 5 inches. Range: Eastern United States except Florida.

Miss Marion Bush, quoted by Ditmars in his excellent review of the species, wrote:

"As to the time of day at which the eggs are laid:—The female comes to select a place about six o'clock in the evening, at a time when turtles have generally retired for the night. My theory is that the hour is chosen in order that she may be free from interruption, as the male turtle is a most ardent and inconsiderate wooer, apparently ready to mate at any season of the year."

The top shell of the common box turtle is brown or black and spotted with orange, red or yellow, while the bottom shell, also brown or black, is spotted with yellow. The hind feet generally have only four toes, each being clawed and partially webbed.

A great many people have used the lower shells of turtles as a place to carve their initials, for box turtles have been known to live from thirty to sixty years. One turtle, according to Flower, attained the venerable age

of one hundred and twenty-three. Other remarkable age records have been obtained by Nichols who has marked the plastrons of Long Island specimens for many years.

However, the custom of marking box turtles is not always in the interests of science. Once a European savant was visiting at the home of a Pennsylvania Dutch farmer. In his rambles through the countryside, he picked up a box turtle on whose plastron was inscribed, "G. W. 1732." He naively rushed to his host with this "discovery"— a turtle not only two centuries old but also bearing Washington's initials and date of birth. After seeing the specimen, the farmer went into the yard for a few minutes and returned with another box turtle inscribed, "Adam, 1."

The box turtle is remarkably hardy, and can go for a long period without food or water. In captivity this pleasant creature is clever enough to be taught to come to a water faucet and beg for a drink.

These turtles are rarely used for food. There is one example, cited by Babcock, of striking Scranton coal miners, in 1902, who ate box turtles and were poisoned. It is believed that the turtles themselves had previously eaten toadstools which do not injure them but poison humans.

Miss Bush tells a story which indicates that although box turtles do not quarrel with man, they are not so pacific among themselves. "A curious instance of fighting, for sheer love of fighting, came to my attention some years ago. In walking through the fields I collected a number of box turtles, which I set free almost immediately. One was an unusually handsome male, quite unblemished except for a curious scar across his nose.

"After carrying him a little I put him down in company with a smaller but older male. Chancing to come upon them later, I found the one with the scarred nose making the most furious onslaughts on the other, who had wisely shut himself up and was impervious to attack. The attacker continued to make lunges until his nose was torn and bleeding from the contact with the other's shell. Finally he succeeded in turning his victim upon its back, whereupon he planted his feet firmly upon the closed plastron and stood with neck outstretched, lacking only the voice to crow over his victory."

The largest of the nine species of box turtles is the southern box turtle, inhabiting the pine forests and palmetto tangles of Florida, southern Geor-

UNDERSIDE OF BOX TURTLE SHOWING HINGE

New York Zoological Society.

gia and southeastern Texas, whose shell is seven inches long. The shell is high and narrow, embellished with thin green lines radiating from the center. Other species are scattered over many parts of North America from Maine to Yucatan.

Curiously enough, all of the box turtles found in North and Central America are classified and included with the water and pond turtles, although in appearance and habits they are more like tortoises than terrapins.

LAND TORTOISES

GIANT TORTOISE

ON A FEW scattered island groups in the Pacific and Indian Oceans dwell the last of the giant tortoises. These are the creatures so familiar to everyone as the mild turtles which children may straddle for a ride. And, in legend, they are known as the "rocks" which suddenly arise and begin to walk after men have sat upon them.

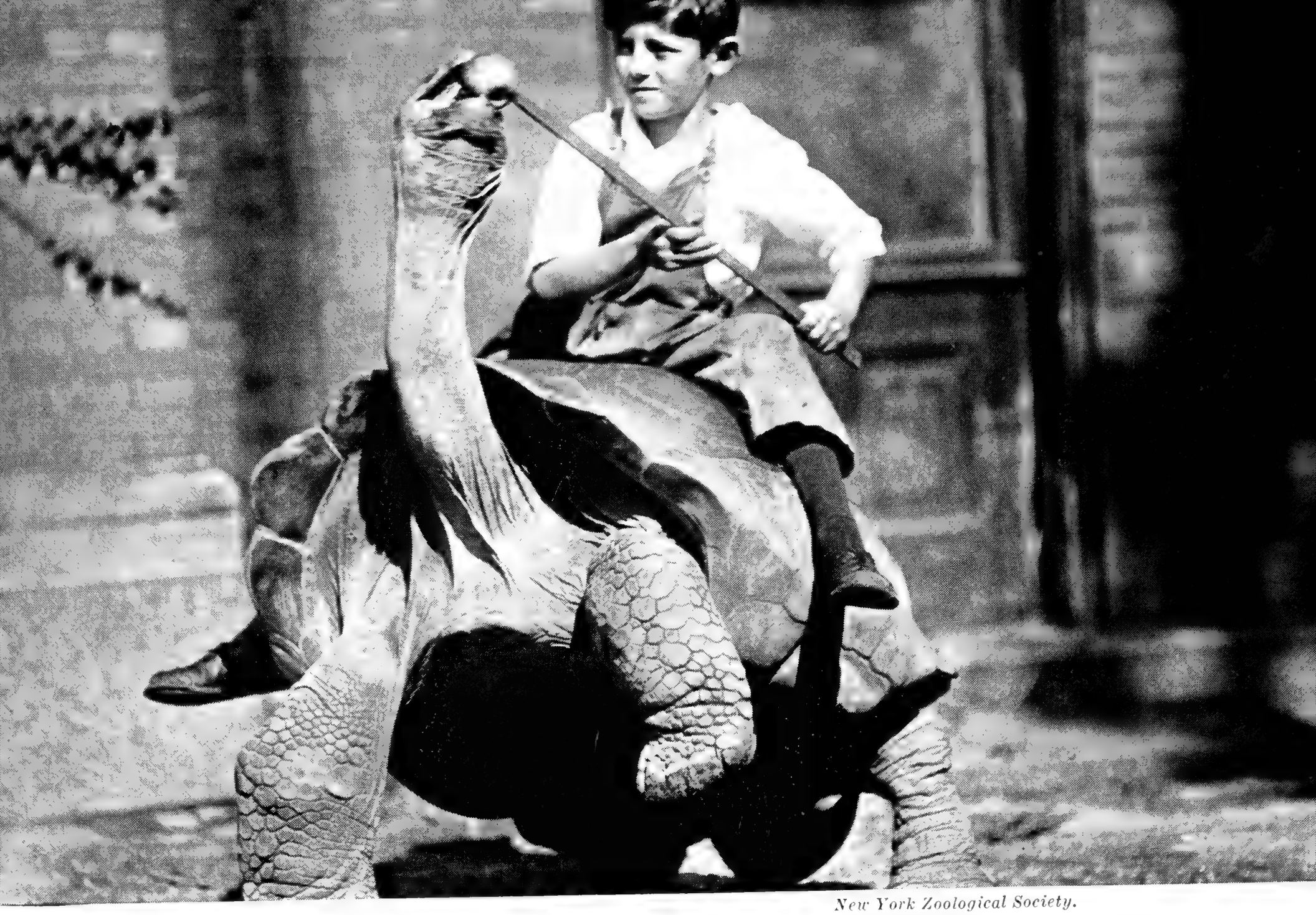
They are mighty indeed when compared to the other land tortoises. Their shells may measure more than four feet and, adding their large heads and long necks, their total length is considerably greater. They weigh as much as five hundred pounds. Yet despite these immense proportions, they are as meek as the tiny box turtles.

The ultimate fate which awaits the entire group is mutely pictured in one of their native haunts, the Galapagos Islands, about six hundred miles west of Ecuador on the equator. On these volcanic islands there are thousands upon thousands of tortoises' shells left to the harsh mercy of a glaring sun — the animals which once wore this armor have been killed by men, wild dogs and rats. Thus, a once mighty race is now on the road to complete disappearance although, if left alone, it might well be a numerous tribe since giant tortoises can possibly live for hundreds of years and reproduce from their tenth year onward.

These massive creatures are best known from the specimens obtained on the Galapagos Islands. The islands have craters which still spout forth their fiery substance at irregular intervals and make life even more hazardous for the animal inhabitants.

The surface of the Galapagos is coated with old and new lava flows, but through this fire-tempered slag heap, the turtles have worn smooth, slippery paths by their wanderings from the coast to the interior highlands. In crevices of the lava, and where the earth has been untouched by eruptions, heavy grass, cactus and foliage grow, providing food for the tortoises.

Like their kin throughout the world, the giants lead a lazy life. They move about only when necessary, to mate, eat and drink. When the sun



New York Zoological Society.

GIGANTIC GALAPAGOS TORTOISE (*Testudo vicina*). Weight: 305 pounds. Length: 3½ feet. Range: Southerly portion of Albemarle Island, Galapagos.

beats down upon them too fiercely for comfort, they seek the shady shelter of some thorny bush.

They are provided with a counterpart of the plover which picks leeches from crocodiles' teeth. Little, red fly-catchers perch upon the tortoise and pick off the tiny grass seeds which get into the folds of its skin, the corners of its mouth and its nostrils. The tortoise apparently appreciates its little servant for it never evinces the slightest displeasure at its presence. An observer reported that he had seen one of the birds enjoying a ride on the back of a tortoise. It would fly off to pick up an insect and then return to its perch to continue the free ride.

Other neighbors of the Galapagos tortoises are the wild cattle with which they live amicably. The cattle are descendants of those put ashore by sailors because they were breeding too fast in the holds of ships. The tortoises and the cattle will eat the same food and rest in the same area without getting into each other's way.

The female tortoise is larger than the male and, being broad posteriorly, presents a matronly appearance. The male makes his affection known to her by bumping her shell and nibbling her limbs. If she is at all receptive, they mate to the tune of the male's guttural bellows, which can be heard a quarter of a mile away.

The female lays her eggs in October and November but, with astonishing acumen, doesn't "put them all in one basket." Between twenty and thirty eggs are laid at one time, and about a week later an additional batch is deposited in another site. The eggs are perfectly round and about seven inches in circumference.

In making a nest, the female scoops out a hole about a foot wide and fifteen inches deep. The eggs are piled in several layers, between each of which the mother packs about an inch of manure. The sides and top of the hole are lined with soft earth. Then the mother pounds down the top until a hard crust is formed which, theoretically, should protect the eggs until they hatch.

But in spite of her pains few of the eggs ever remain safe. The wild dogs of the Galapagos, descendants of tame dogs landed by early voyagers, have developed an insatiable love for tortoise eggs. Tens of thousands of eggs are broken and eaten yearly by the dogs, and the effect upon the birth rate of the tortoises is obvious. Even those tortoises which are hatched live in constant danger from the dogs until they attain a length of at least one foot and their shells harden sufficiently to resist the canine marauders.

One might expect that, in self-defense, the giant tortoise would develop an angry ferocity. But it does not. For example, on sighting a man, it utters a sharp hiss, withdraws its head and legs into its shell, and flops heavily to the ground.

Man is perhaps a greater and more vicious enemy than the other animals. The human invaders have killed hundreds of thousands of full-grown specimens to obtain their oil for native cooks and cosmopolitan cosmeticians. And natives have no compunction about killing a three-hundred-pound tortoise just to obtain a few pounds of its meat for a meal. The tortoises are still further depleted by scientific expeditions. They do not readily reproduce in captivity.

The attack upon the giant tortoises is believed by Dr. C. H. Townsend to have begun as early as the sixteenth century when sailing vessels stopped

New York Zoological Society.

LARGEST AND SMALLEST GALAPAGOS TORTOISES — "OLD GRANDPA" AND "IKE"

at the Indian and Pacific Ocean islands on which they are found. A common practice was to seize hordes of tortoises and store them alive in the hold of the ship. They could be kept for months without food and were always on hand when fresh meat was needed. The number of portions that could be served from a single tortoise is further indicated from Darwin's observations that a large tortoise required six men to carry it.

After the heavy tropical rains the tortoise enjoys slopping about in the cool mud holes to refresh itself. This also relieves it of the wood ticks which cling to inaccessible parts of its flesh.

The tortoise marches up and down the hills, from its highland habitat to the seashore, as the weather changes. It requires almost three days to cover eight miles although it stops only for food. The Galapagos tortoise is energetic enough to ascend the slopes of the steepest hills in quest of new ranges. Occasionally such explorations result in death by a fall from a cliff. If it is not injured by a fall it will continue again and again to essay

the climb, stopping only when injured or killed. There is a purpose in these climbs, for the tortoise likes the springs and moist meadows of the higher altitudes.

This giant is a genuine landlubber. It is almost helpless when thrown into the sea. Although it will float for days wherever carried by the current, it can swim but feebly, floating too high to be a good swimmer. William Beebe has found that it is adversely affected by swallowing salt water.

During the breeding season the males seem to be in a fighting mood. They will push against one another, buckle up, rear up on their hind legs and snap at each other, but no one seems to get hurt. If a tortoise is turned over on its back, it will right itself by swinging its legs in one direction to gain momentum for the turn, and shoving its long neck against the ground to gain leverage as does a wrestler in distress.

The giant tortoise attains its great bulk from a purely vegetable diet. It nibbles grass, moss and, strangely enough, the spiny leaves of cactus. In captivity it will thrive on clover, melons, pumpkins and hay, and it loves bananas. The tortoise has the intelligence to come up to the keeper and feed out of his hand when it detects a favorite food on the menu. Once or twice a week the captive tortoise will guzzle eight quarts of water at one sitting.

These creatures are really as old as they are big. One specimen in the New York Zoological Gardens since 1901 is said to be over two hundred years old and still going strong. Many have been observed to live for more than one hundred and fifty years. A United States Navy report states that a Galapagos tortoise branded by Captain James Cook in 1773 was still alive in 1923, but quite decrepit. A tortoise, imported from the Galapagos, which kept Napoleon company during his exile is still alive on St. Helena.

So pleasant are the Galapagos tortoises that children sit on their backs and ride around. One species even has a shell conveniently shaped like a Spanish saddle. A favorite trick to make the tortoise begin to lumber is to hold an apple on a stick before its nose. To make the tortoise turn around, the rider simply turns the stick (and the apple) to one side, and the tortoise swings around in its futile effort to grab the morsel.

Children of the Galapagos Islands bore holes in the shells of baby tortoises and make them draw their toy carts around.

PORTRAIT OF "OLD GRANDPA"

(NYZP) *Ralph De Sola, Federal Writers' Project.*

The charm of this tortoise is illustrated by one which was saved from the doom that a Valparaiso restaurant owner was about to mete out, and taken to Regent's Park, London. It developed a zest for buns and would rise on its hind legs, mutely begging for this delicacy.

It is unfortunate that these survivors of so many millions of years of change should now be facing extermination. Since the seventeenth century, an estimated ten million tortoises have been taken from the Galapagos Islands. In 1691, an explorer could write, "Sometimes you see two or three thousands of them in a flock, so that it is possible to walk a hundred paces on their backs." But now one is much more likely, when frequenting their haunts, to see an equally impressive number of shells and skeletons as testimony to their unhappy fate.

GOPHER TORTOISE

MR. AND MRS. GOPHER TORTOISE stay home during the hot, sunny part of the day, for it is cool in their subterranean burrow a dozen feet deep. The secluded burrowers never have other tortoises to keep them company in their dugout, although they generally have many neighbors. This is evidenced by the tell-tale mounds of earth clustered together in a region where a colony of gophers has scooped out its dwellings.

The animal world does provide the pair with uninvited guests. The burrowing owl, raccoon, gopher frog, blacksnake and coachwhip snake dart into the underground sanctuary when trouble brews above. During the day, indefatigable spiders weave strands across the mouth of the hole only to see them broken when the tortoises come out. And a new species of "tumble bug" has been discovered in the gopher's home. This insect feeds on the excrement of the tortoise and is to be found only near a colony of gophers.

In the evening the gopher clambers out of its hole and casts about for a meal. A vegetarian, it will dine on grass, clover, lettuce and berries. Because it damages gardens and orchards, man has no scruples about killing it off. In captivity, where it must be kept perfectly dry and warm, it may deign to eat a piece of raw meat. It can be taught to come forward to feed out of the keeper's hand and put in an appearance at mealtimes when kept as a household pet.

During the breeding season the male utters a short, rasping, mating call. In June the female lays five eggs beneath the sandy mound outside her door, exposing them to the sun's heat. The eggs, as large as pigeons', are considered rather good eating in the southern part of the United States. And even if the egg hatches, the creature itself may become a morsel for some local lover of tortoise flesh.

The gopher tortoise, when born, has a dull, yellowish blotch on each of the top shell's shields. As it grows older, it loses this bit of color and remains a dull brown.

The smooth, flattened shell is about twelve inches long. From the front of the lower shell there extends a heart-shaped projection which is used as a spade when the tortoise scoops out its home. An average specimen

American Museum of Natural History.

DESERT TORTOISE (*Gopherus berlandieri*). Length: 1 foot. Range: Southern Texas and northern Mexico.

weighs about nine pounds, the female being slightly larger than the male.

When an old gopher, wandering along the sandy terrain, sees danger coming it seems to resign itself to its fate by drawing in its head and limbs and sinking down. The younger and more daring gophers, however, make a beeline for their burrows with about as much rapidity as could be optimistically expected from such slow-moving creatures. Should a man seize them, they attempt to kick their way to freedom with their clubbed feet.

If it is lucky enough to avoid the dangers besetting tortoises, the gopher may live for more than a hundred years.

Another tortoise inhabiting the New World is the red-footed tortoise of northern South America and the West Indies. In the Antilles it is almost extinct according to Grant. Ranging as far south as Argentina is a related species which, like its red-footed relative, has a shell two feet long.

SOFT-SHELLED TORTOISE

WHILE the gopher is provided with instruments for digging its home, the East African soft-shelled tortoise squeezes its way in between rocks and crevices to establish a dwelling place. Bones missing from the shells permit a flexibility which enables it to slightly inflate or deflate its frame, according to necessity.

By way of exception to the general rule, this tortoise lives in the water during the rainy season.

GREEK TORTOISE

THE GREEK TORTOISE, well-known as a household and garden pet throughout Europe, is typical of the land tortoises of the Old World. It is found in the northern half of the Balkan Peninsula, and parts of Asia Minor and Syria. It has a pale olive top shell about six inches long.

When the tortoise sights its traditional foe, the bearded vulture, it withdraws into its shell. Nevertheless, the bird swoops down upon it, carries it aloft and drops it upon stony ground to smash its protective armor. One such unfortunate tortoise, dropping to its doom, fell upon the head of Aeschylus, the Greek poet, causing his death.

Some believe this tortoise to be a music-lover. There is a report that during a concert in a small European town, a group of Greek tortoises came to the edge of the bandstand and listened intently, heads smartly erect, until the conclusion of the final number. Experiments, however, have shown that any succession of sounds arrests the attention of tortoises whether the source be a symphony orchestra or the staccato exhaust of a steamshovel.

It seems rather lazy, even for a tortoise. It goes to sleep quite early and rises late. During the mating season, from May until late summer, the males woo the females. The male utters a piping sound and caresses his belle by bumping shells. Several weeks later, the female lays from two to four oval eggs.

(CPM) *Ralph De Sola, Federal Writers' Project.*

ALBINISTIC SOUTH AMERICAN TORTOISE (*Testudo denticulata*). Length: 1 foot. Range: Tropical South America and found on a few West Indian islands. Albinism, lack of pigment, is seldom encountered in turtles. This specimen is perhaps unique.

In captivity Greek tortoises thrive on vegetables, bread and milk, and water. Peddlers sell them in England as pets, often claiming that they eat the black beetles that infest homes. However, being vegetarians, the captive tortoises refuse this diet and die.

When they receive proper care, they live quite long. The famous tortoise owned by Gilbert White was kept for fifty-four years though its total age was not known. An even more venerable specimen traced by Flower was the ancient Greek tortoise owned by Archbishop Laud of Canterbury who placed it in his garden in 1628. It lived for one hundred and two years, and then it was accidentally killed by a gardener.

Many other tortoises of similar size and habits live in the Old World. These include the Iberian tortoise of Spain and North Africa; the hinged-back tortoise of Abyssinia; the seventy-five pound leopard tortoise of East Africa; and the handsome star tortoise of India.

SEA TURTLES

TRUNKBACK TURTLE

DESPITE their immense bulk, trunkback, or leathery turtles swim swiftly and easily along the ocean bottom in search of food. Their limbs are long, flat and paddle-like, lacking the plates characteristic of other sea turtles. Little is known of this giant reptile's habits, but the construction of its jaws leads scientists to believe that it eats seaweeds, fishes, mollusks and shellfishes.

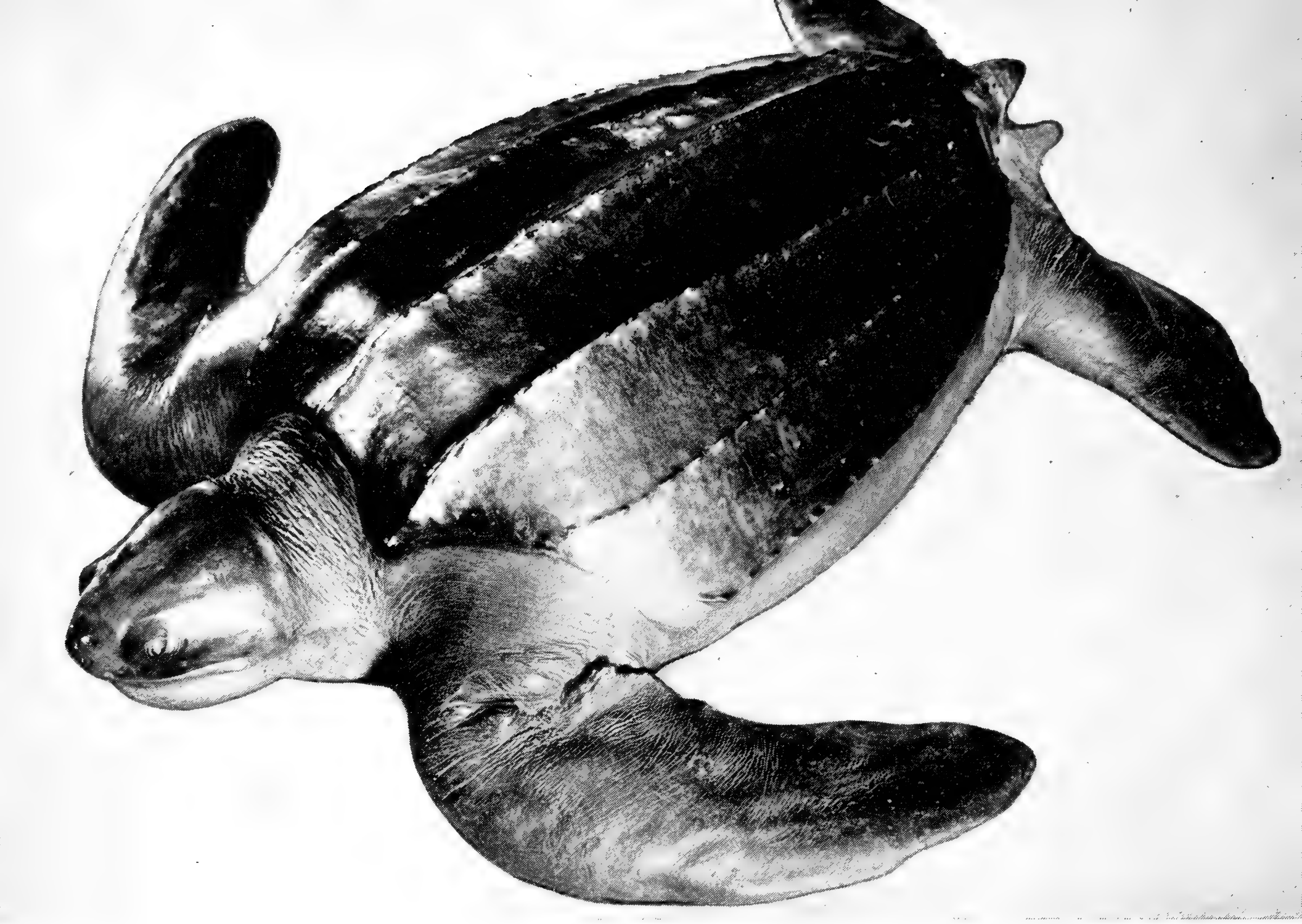
The trunkback is the largest of sea turtles, in fact the largest of all living reptiles, record specimens having weighed as much as fifteen hundred pounds. The head, which like the body is also plateless, may have a diameter of ten inches, while the flipper-spread may be as much as nine feet. The armor of this seagoing fortress consists of seven heavy keels, running lengthwise down the back and covered with a leathery skin. The color is dark brown or black, sometimes spotted with yellow. It is from this huge shell that the god Hermes was believed to have fashioned the first harp. Since in ancient times the trunkback actually did inhabit the Mediterranean, it is quite possible that the early Greeks fashioned musical instruments from its shell.

At mating time the female trunkback crawls out on the beach above the tide line and digs a hole about two feet deep, using her hind feet as scoops. She neatly arranges her ninety to one hundred and fifty eggs in the nest, smooths out the sand so as to leave no trace of her activities and departs never to return.

After the sun's heat has incubated the eggs, the young crack their shell by means of a hooked egg tooth on their beaks and make their way to the water.

In India and Ceylon where Deraniyagala has observed this giant turtle the monitor lizard eats the trunkback's eggs, and sea birds prey on the young. It is curious to note that only young and fully grown trunkbacks have been observed. Half-grown specimens are unknown.

The flesh of this chelonian is not eaten. The oil, however, is used in



American Museum of Natural History.

TRUNKBACK TURTLE (*Dermochelys coriacea*). Weight: 900 pounds. Length: 6 feet. Range: All temperate and tropical oceans.

Ceylon as a varnish for seagoing canoes. Hornaday wrote that a pint of oil can be extracted from each square foot of the trunkback's blubber-like coating.

GREEN TURTLE

IN SHALLOWS not far from the shore, green turtles graze along the bottom of the ocean on seaweeds, shrimps, lobsters and small shellfishes. Like other sea turtles they must from time to time come to the surface for air. The shell of these marine reptiles is olive or brown with yellow blotches; the breastplate or plastron is yellow. The term "green" arises from the greenish fat inside the shell. The surface of the shell is frequently covered in part with clusters of barnacles and short fronds of seaweed.

Because of their economic uses, green turtles are rarely found in the large sizes or numbers that once were common. Formerly, six-foot turtles weighing five hundred pounds were usual, while today specimens sent to American markets from South Atlantic and Caribbean waters range from seventy-five to one hundred and fifty pounds. The species is also found in the Pacific and Indian Oceans.

Green turtles are caught by means of nets, harpoons and poles. They frequently sleep on the surface of the ocean and sometimes on desolate beaches and in this condition are easily taken. When sleeping at sea their dormant backs, floating just out of water, provide resting places for small gulls and terns. When ambushed on the beach they are turned on their backs by a deft stroke of a long pole. They are shipped to market either lying on their backs or in great water tanks placed on the vessel's deck. Some are so heavy that they must be loaded and unloaded with the help of derricks.

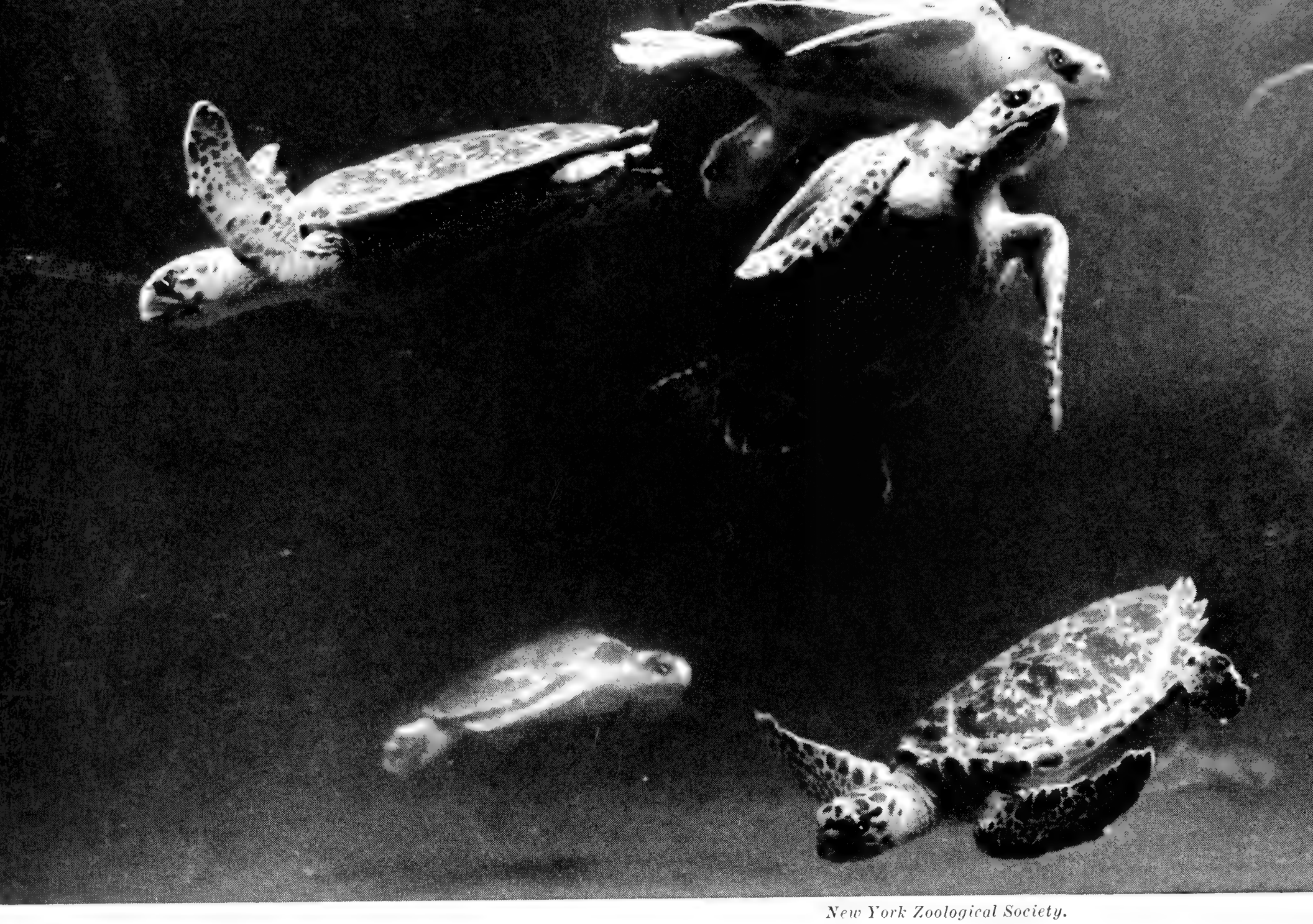
The famous soup, cherished by gourmets, is made from the shell with the dense green fat clinging to it. Turtle soup is about one-third flesh, fresh vegetables, sherry wine, a number of spices and water. Aside from being a great delicacy, the soup is said to derive medicinal value from the iodine and phosphate contained in the seaweed eaten by the turtle.

Related marine turtles, the loggerhead and Kemp's bastard, have similar habits, but are not valued for their flesh.

HAWKSBILL TURTLE

One of the smallest sea turtles, the hawksbill is also the most valuable to man because of the fine texture and strength of its beautiful shell. Like other sea turtles, this two-and-a-half-foot species grazes along the bottom of ocean shallows for seaweed and crustaceans. It, too, lays its eggs on a sandy beach just above the tide line and then promptly forgets about them.

In Cuba this turtle is sometimes caught in an unusual fashion. A remora, or sucking fish, is thrown into the sea with a line attached to its tail. When the adhesive disk on the fish's head clings to the turtle, the fisherman pulls in the line.



New York Zoological Society.

SEA TURTLES SWIMMING (KEMP'S LOGGERHEAD, HAWKSBILL AND GREEN)

In the West Indies the turtle is killed and left to rot on the beach. This loosens the plates, which then are put in boiling water to soften them and make them pliable. A large specimen yields about eight pounds of tortoise shell. In the East Indies, however, the turtle is boiled alive, as the plates are believed to lose their color if they are left on the rotting reptile. The meat is said to be poisonous because of certain marine plants the reptile feeds on. Singhalese fishermen will not eat it before they have fed the liver to the crows. If the birds discard the liver, the turtle is said to be poisonous. The Singhalese also believe a hawksbill with fourteen shields to be poisonous.

The shell of the hawksbill is a black or brown color, splotched with yellow. Articles made from it or inlaid with it are expensive and somewhat rare. It is, therefore, imitated with a man-made plastic product that is more durable and less expensive. Cigarette cases, Spanish combs, and inlaid furniture made of real tortoise shell are exceedingly costly and increasingly rare.

SNAKE-NECKED TURTLES

MATAMATA

LIKE a log covered with rough bark, the dark brown matamata lies submerged in the muddy waters of the Amazon, waiting for its prey. Fishes, frogs and tadpoles are attracted by the movements of the feeler-like threads that protrude from the skin on its neck. When they come close, they are not seized in the reptile's jaws, which are weak and covered with a soft, fleshlike skin, but are engulfed by suction. The matamata's shell, covered with thick, bony shields, may be as much as three feet long, while its head and neck may more than duplicate that length. For protection the head may be folded back under the shell. The tail is short.

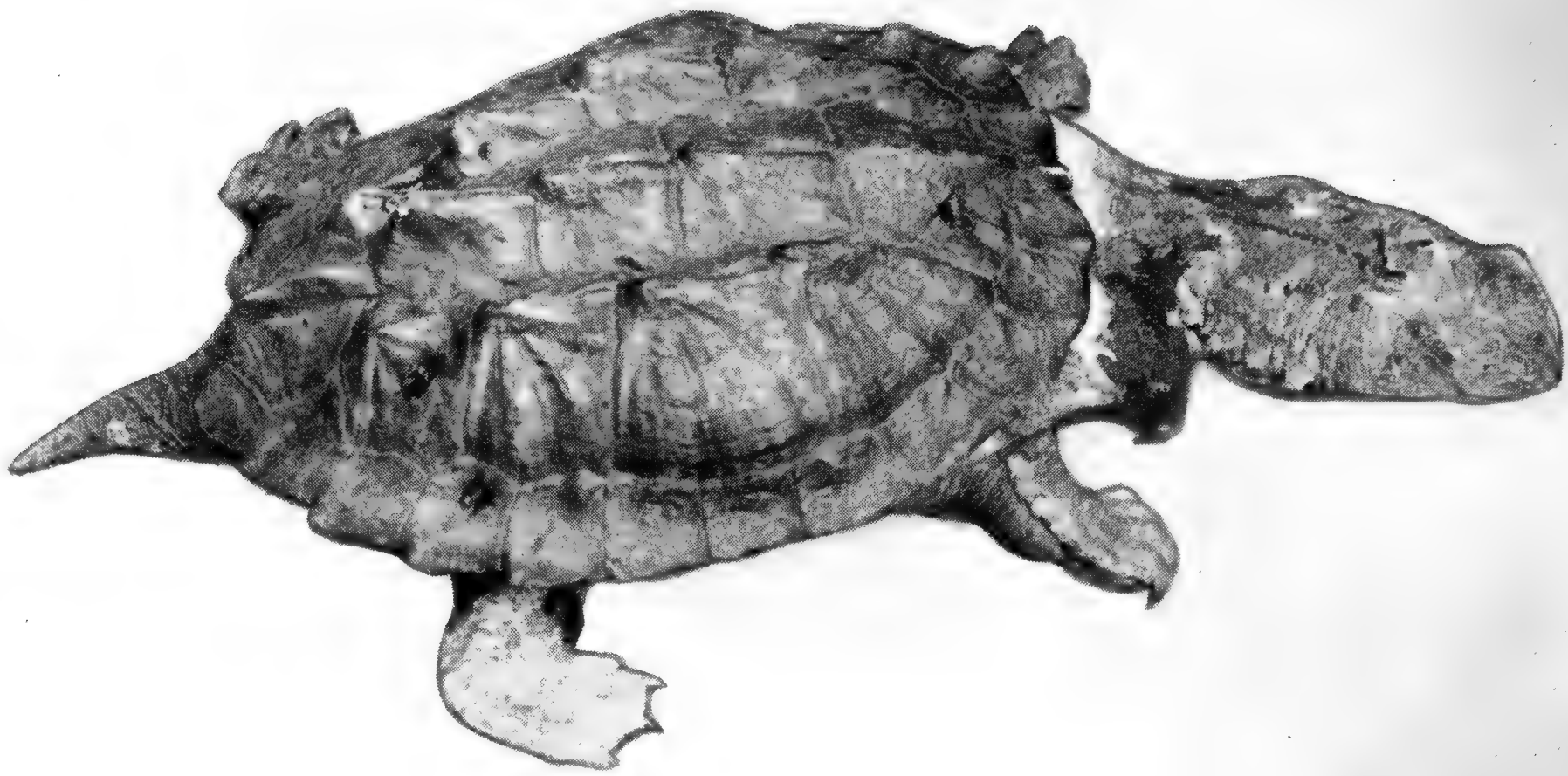
The young have black and yellow spots on their shields and are not as ungainly-looking as their parents.

Related to the matamata are the South American snake-necked turtles. Largest of these is perhaps the Amazon river turtle, attaining a length of more than three feet and esteemed for its eggs as well as for its flesh. Thousands of them are taken every year to supply Brazilians with terrapin stew, pickled eggs and a curious sort of "butter," made from mashed eggs.

AUSTRALIAN SNAKE-NECKED TURTLE

THE TEN-INCH Australian snake-necked turtle is equally at home on land and water. With its long neck either stretched out straight or bent in an S-shape, it swims about by night in search of worms, frogs and caterpillars, which it catches by a swift, sidewise jerk of the head. It feeds exclusively in the water, but likes to rest and crawl about on land. Its shell is a rich dark brown, its breast-plate and eyes are yellow.

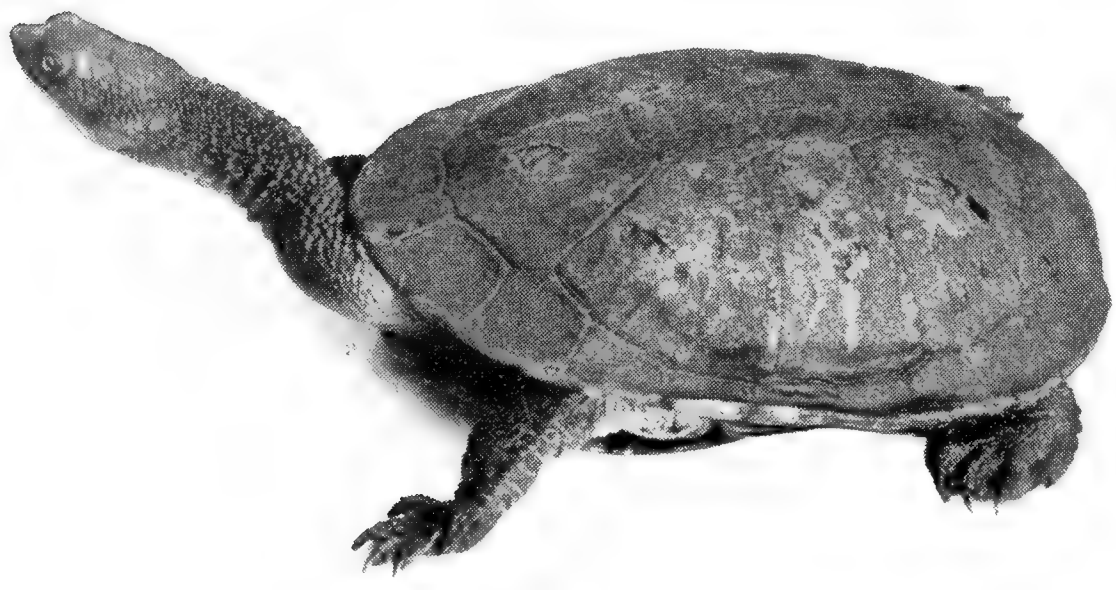
These creatures thrive in captivity, provided they may choose freely



New York Zoological Society.

MATAMATA TURTLE (*Chelus fimbriatus*). Length: 2 feet. Range: The Guianas and northern Brazil.

between land and water. Some specimens spend the major part of their time on land, under a shady ledge, lying motionless with their necks tucked sidewise beneath the shell. Though their eyes may be closed, they can see through the transparent lid. When the head is out, it looks like a snake.



AUSTRALIAN SNAKE-NECKED TURTLE (*Chelodina longicollis*). Length: 6 inches. Range: Australia.

New York Zoological Society.

SOFT-SHELLED TURTLES

SOFT-SHELLED TURTLES make their home in the muck of riverbeds, where they feed chiefly on frogs and fishes. Their weapons in hunting are the agile claws on their three inside toes and a sharp biting mechanism concealed beneath their soft lips. The snakelike neck can be darted after prey with astonishing rapidity. It also serves as a breathing tube when in shallow water; the reptile, instead of rising to the surface for air in person, merely thrusts up its tubular nose. Both the slender head and the feet can be completely withdrawn into the shell in time of danger, but though this gesture may give the reptile a sense of security, the shell is so soft that it offers little real protection.

Soft-shelled turtles rarely come out of the water, except for the females who deposit their eggs in the riverbank, just above the water level. If surprised on land, they dash rapidly for the water, and often bruise their soft under parts on the rocks. The round eggs are heavy-shelled but brittle.

These turtles are easily cared for in captivity and remain in good health if their tank is provided with a layer of sand for them to burrow in and a log on which they can occasionally climb out. A rock or concrete bottom causes sores on their soft bodies.

The southern soft-shelled turtle, found in the southeastern United States, is the largest American variety, attaining a length of eighteen inches and a weight of forty pounds. Adults are light or olive-brown above and white below, while the young are mottled with black. These turtles are caught with hook and line. Southern Negroes are known to roll the smaller ones in corn meal and cook them whole, after cutting off the heads and cleaning them through a small hole in the breastplate. Because of their shape they are popularly called flapjack or pancack terrapins.

Another American species is the spiny soft-shelled turtle of the Mississippi, St. Lawrence and Great Lakes. Adults are a foot in length; their upper shell is olive, and their breastplate white. The front edge of the shell is armed with spines. There are two light stripes down the head. The young have black circles on the shell.

New York Zoological Society.

SPINY SOFT-SHELLED TURTLE (*Amyda spinifera*). Length: 1 foot. Range: Eastern United States to Montana and Colorado.

The genus *Emyda* of India has flaps at the rear of the plastron, which close over the legs when they are pulled in, while the front of the upper shell folds down to cover the head and front legs. The shell, however, is so soft that this ingenious contrivance affords little real protection against beasts of prey.

AMPHIBIANS

(Worm-like Amphibians, Salamanders and Newts, Frogs and Toads)

Hundreds of thousands of years ago, in the steamy humidity of the swamps and jungles of the Devonian age, the development of living things took a gigantic step forward when backboned creatures first emerged from the sea to spend intervals on land. Some of them were enormously large, reptile-like, and covered with formidable armor; others were more like certain fishes known from fossils of that age. Their special characteristics, however, were vocal expression and the ability to live on land as well as in the water.

Present-day amphibians, or batrachians as they are sometimes called, retain these fundamental traits. However, the modern descendants of the most primitive of four-footed animals are much smaller, weaker and numerically inferior. Yet in the course of their evolution from the earliest land pioneers they have become more highly specialized and structurally quite unlike their Devonian ancestors.

Amphibians comprise a class of vertebrates whose place in the evolutionary scale is between the fishes and the reptiles. Like some reptiles, many amphibians are able to shed their skins. A few, when full grown, retain their tails and even look like reptiles.

The life history of modern amphibians parallels the slow evolution of their ancestors. They are born, like most fishes, from eggs generally laid in the water. In many species the eggs, surrounded by a gelatinous envelope for protection, develop into larvae or tadpoles which breathe through gills and propel themselves by means of their tails. At this stage they are limbless.

Then a miracle of nature takes place as the creatures prepare to bridge the gulf separating the denizens of the water from those on land. In certain species the external gills are greatly reduced, the tail fin is absorbed into the body, the larval skin is shed, lungs form, legs begin to "sprout," and eyelids are grown. Recent discoveries indicate that these changes are to a great extent controlled by the action of glandular secretions in which the thyroid plays a part.

Here, however, the parallel with evolution ends, for the majority of mature amphibians, unlike the mammals, are incapable of breaking completely with their aquatic mode of life. The reproduction of their kind can, as a rule, only be accomplished in a watery medium. So, back to the streams and ponds these amphibians must return to lay their eggs. Their cycle is completed.

The amphibians of today are described and classified as follows:

CLASS:

AMPHIBIA — the amphibians, represented by about eighteen hundred living species of worm-like amphibians (coecilians), salamanders and newts, frogs and toads. All are backboned animals, respiring chiefly through their skin. They have three-chambered hearts and, like reptiles, a variable body temperature that corresponds with the temperature of the surrounding air or water, hence they too are also called "cold-blooded." In winter they hibernate. They are covered with a glandular skin, in some smooth, in others rough. They usually deposit their eggs in the water, and these gelatinous bodies after hatching, with but a few exceptions, pass through an aquatic larval existence before changing into gillless adults. The eggs, unlike those laid by reptiles, are never covered with a calcareous shell.

ORDERS:

GYMNOPHIONA — the limbless, worm-like, short-tailed coecilians comprising some nineteen genera and fifty-odd species, generally distributed throughout the tropics with the exception of the island of Madagascar.

CAUDATA — the four-limbed, tailed salamanders and newts, of which there are more than one hundred and fifty kinds distributed in most temperate and tropical countries of the earth.

SALIENTIA — the long hind-limbed, tailless frogs and toads which number more than sixteen hundred species scattered throughout the temperate and tropical regions.

In various parts of the world frogs and toads not only aid man by eliminating noxious, crop-destroying insects, but also serve as food. French-

men have been nicknamed "Frogs" because of their predilection for frogs' legs. But they are not alone in this custom, as a cursory examination of the advertising matter of some American sporting journals will show. Advertisements of canned frogs' legs, the "technique of frog farming in ten easy lessons" and "mating frogs for sale" would seem to indicate that some Americans are also addicted to frog flesh. In some oriental countries dried frogs and salamanders are used for curative purposes, although their therapeutic value is questionable. Tanned frog skins also serve in the manufacture of fancy key-holders and purses, and in Japan toadskins are made into fine leather.

As we shall discover in the text to follow, some South American tribes utilize poison frogs in tipping the barbed shafts of their arrows. And not a few thirsty Australian natives have relieved their parched throats by squeezing certain flatheaded burrowing frogs, from each of which they can press enough water to fill a wine glass.

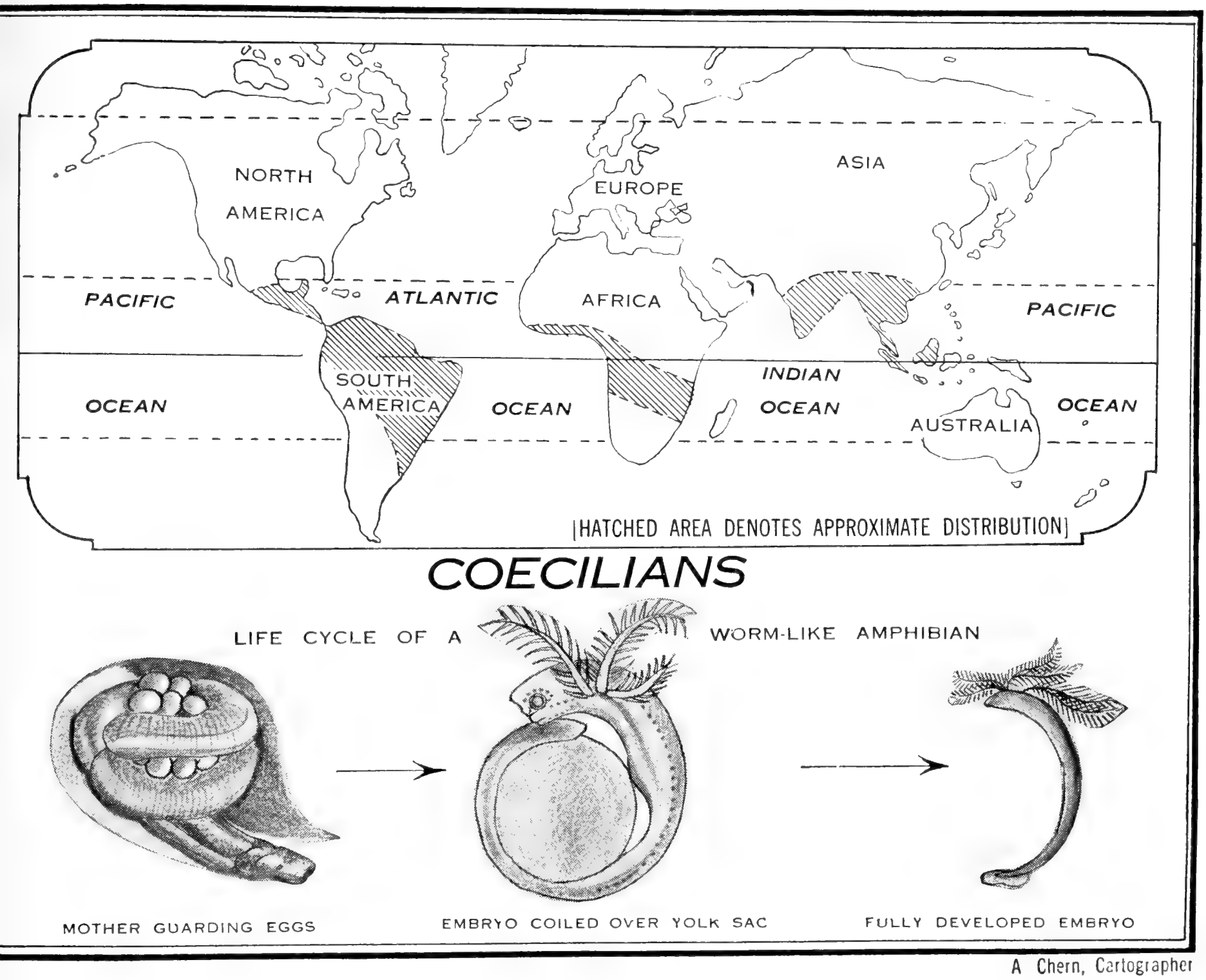
But indeed the amphibians' greatest use to man has been as the ideal laboratory animal. According to Noble some of our most fundamental discoveries in general physiology, endocrinology and embryology have been made with amphibian material.

Many myths surround the amphibians, chief of which concerns the warty toad, supposed to impart its lumpy blemishes to anyone handling it, and the salamander which, because of its cold, slimy skin, is supposed to live through fire. Equally famous are the tales of "showers of frogs" still told and believed by many people. In fact there is a certain scientific authority for this belief since many terrestrial species have the habit of concealing themselves during dry periods only to issue forth in great numbers to greet the return of the rains.

While the amphibians figure but insignificantly in the human scheme, their numbers, universality and importance in animal evolution make them well worth knowing. Many distinguished American naturalists such as Holbrook, Cope, Dickerson, Fowler, Holmes, Stejneger, Barbour, the Wrights, Gaige, Dunn, Noble, Bishop — to mention but a few — have concerned themselves with the life histories of amphibians.

WORM-LIKE AMPHIBIANS

(COECILIANS)



A Chern, Cartographer

WORM-LIKE and limbless, the fifty species of coecilians comprise what is certainly the most secretive and least known of the amphibian dynasty. Indeed, not one of these fifty species has a popular name. They owe their esoteric life to their small size and burrowing habits. Coecilians are dis-

tributed throughout much of the tropical world. The largest species, a native of Ecuador, appears to be three feet long.

Though these amphibians are related to frogs and salamanders, they seem to have originated from a different source. Unlike the more typical amphibians with soft moist skins, coecilians have scales which, though small and hidden beneath the skin, can be readily detected. Besides scales and ordinary slime glands, coecilians have glands from which they squirt a semi-poisonous irritating fluid. So slippery is the slime covering their bodies that they are exceedingly difficult to hold.

The coecilian with which man is most familiar is *Ichthyophis glutinosus*. About a foot long and one-half inch in diameter, it is colored dark brown or bluish-black. Yellow bands along each side brighten its otherwise dull appearance. The body is marked with narrow transverse folds. This species inhabits southern Asia and enters its breeding season after the spring monsoon, according to the Sarasins.

The female curls about her string of two dozen or so yellow eggs after burying them in moist ground near running water. During the incubation period the eggs increase to nearly twice their original size. The evolving embryo develops three pairs of long delicately fringed gills which soon shrivel, leaving a small hole known as the gill cleft.

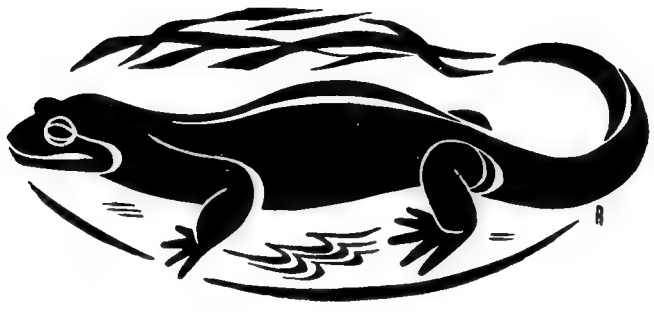
After hatching, the larva lives aquatically for a long period. Two finlike crests on the tail act as propellers and enable the youthful *Ichthyophis* to reach the surface for air. At this stage, the eyes, though small, are well developed and about fifty epidermal sense organs appear as white spots on the gray skin, from gill cleft to tail tip. With further growth the tail shortens and loses its crests; a film of skin covers the eyes; facial tentacles make their appearance and the skin undergoes a complete transformation. Finally the larva emerges from the water and begins its burrowing underground life.

The eel-like *Typhlonectes* is the only thoroughly aquatic coecilian, having the additional distinction of omitting the egg-laying stage observed by other members of the family. Only two other species of coecilians, the *Siphonops* of South America and the *Dermophis* of West Africa are known to bring forth their young alive.

The specimens of *Typhlonectes* reproduced here were secured by Prof. E. R. Dunn and are probably the only individuals ever photographed.

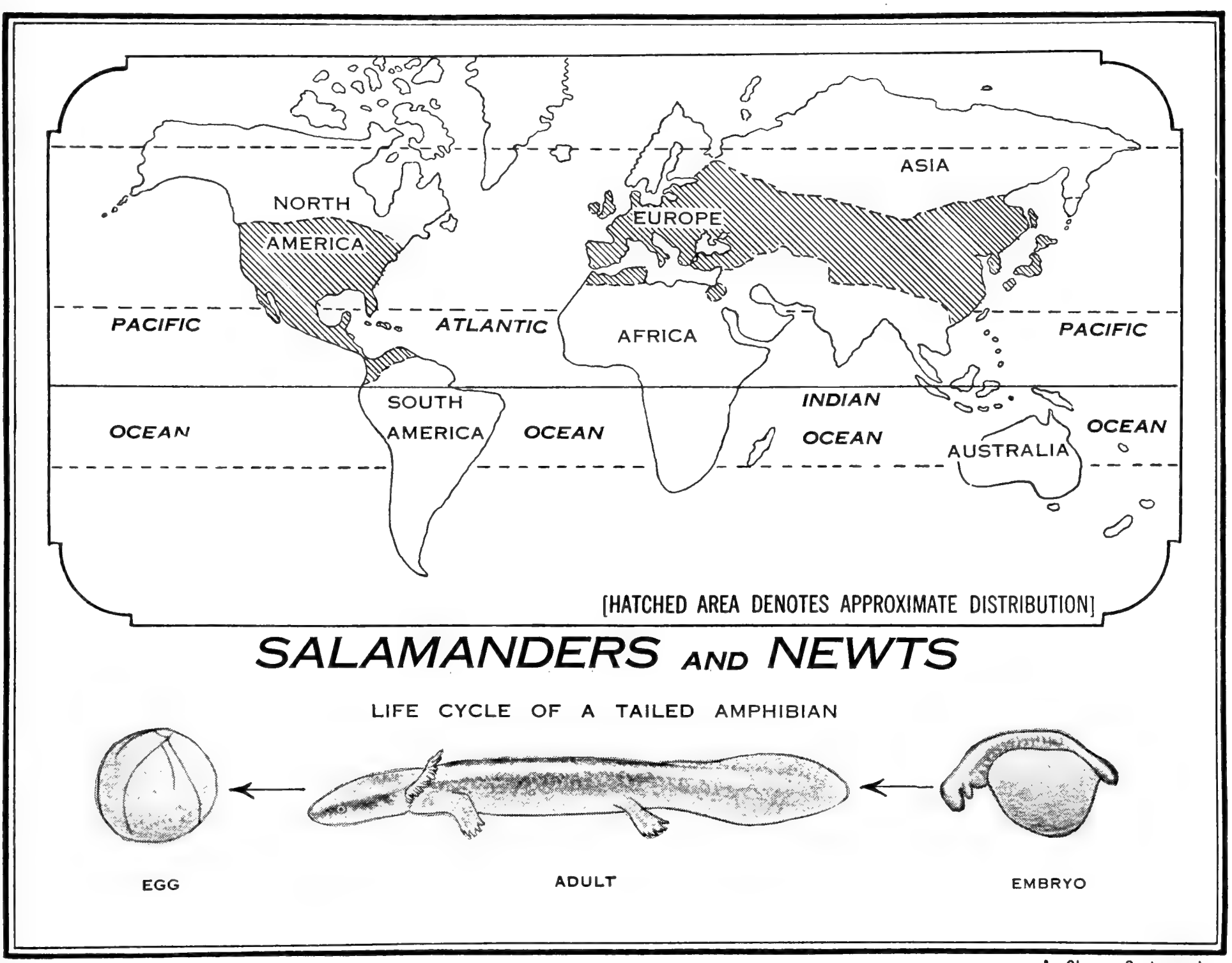
S. C. Dunton, New York Aquarium.

COECILIANS (*Typhlonectes* species). Length: 2 feet. Range: Tropical South America.



SALAMANDERS AND NEWTS

(TAILED AMPHIBIANS)



A. Chern, Cartographer

SALAMANDERS have often fallen prey to human superstition. Because of their cold, shiny skin and seeming indifference to injury, these amphibians were believed in medieval times to be immune to fire, and the belief has persisted to this day in some backward rural regions. In order to prove or

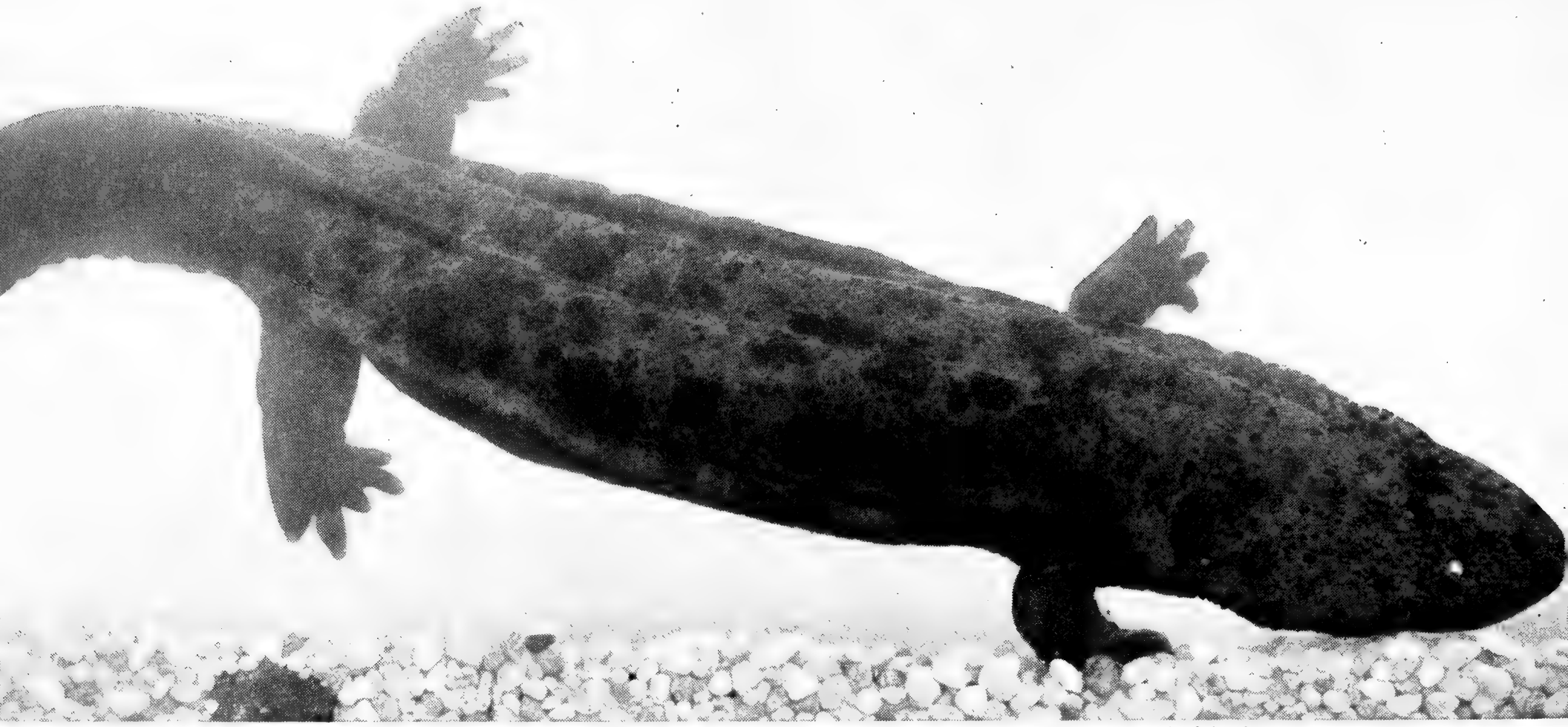
disprove this theory, countless salamanders have been flung to the flames, whence of course they never emerged. The chief victim of this practice of superstitious man was the spotted yellow-on-black European fire salamander, which in fact owes its common name to human credulity. In older times when wood was gathered from the forest and brought indoors to dry by the heat of the hearth, fire salamanders would emerge from the bark and crawl about the house. The inhabitants always thought they had emerged from the fire, however. Hence their name and the superstition surrounding them.

Salamanders and newts are frequently confused with lizards because of their similar appearance. They are, however, immediately distinguished from those reptilians by the complete absence of scales. Newts, generally considered, are the smaller members of the salamander family.

None of the salamanders can be considered dangerously venomous, but the skin of some species secretes fluids which are toxic to some degree. The fire or spotted salamander, for example, can, if sufficiently provoked, spray its milky-white poison to a distance of one foot by violent contractions of the skin. This venom produces only smarting in humans, but it is fatal to small creatures such as frogs, which sometimes attempt to dine on live fire salamanders.

GIANT SALAMANDERS

EVERY FAMILY of animals has its giant; the salamanders have one which, when compared to the average size of the group, is gargantuan indeed. The giant salamander is not only the largest member of its immediate family, but also the largest of amphibians. A five-foot specimen from Japan lived in captivity in England for fifty-two years, and some are believed to live for more than a century. Giant salamanders inhabit the rushing mountain streams of Japan, China and Tibet, but usually seek out quiet shallow pools at the stream's edge, where they reconnoiter sluggishly or lie completely motionless. They make their home beneath the rocks at the bottom of the stream and always keep the entrance to this abode scrupulously clear of débris. The giants search for their food at night.



New York Zoological Society.

GIANT SALAMANDER (*Megalobatrachus japonicus*). Length: 5 feet. Range: Japan and China.

New York Zoological Society.

AXOLOTLS (*Ambystoma tigrinum*). Length: 6 inches. Range: Eastern United States to Central Mexico.

Though ferocious-looking, they can be captured with almost ludicrous ease. A hook baited with a worm or frog serves to start them on their way to oriental cook-pots and medicine chests. Giant salamanders have large, depressed heads and squat bodies; their skins are spotted black-and-brown. Fleshy membranes border their bodies and their short limbs. The finned tails are rounded at the tip.

A much smaller counterpart of the giant salamander is the "hell-bender," of the Mississippi and its tributaries. Though it is not nearly as vicious as its name would indicate, this eighteen-inch variety is a fighter and unbelievably hardy. Dr. Stejneger states that after soaking a hell-bender in alcohol for twenty-four hours to preserve it, he was amazed to find it not only alive but rather active. In appearance and life habits it is very much like its larger Asiatic relative.

AMERICAN SALAMANDERS

VIRTUALLY ALL salamanders, regardless of their mode of life, lay their eggs in water. The larvae have three pairs of gills at each side of the neck; in some salamanders these gills disappear at later stages, and in others they remain through life. One species, in fact, may under certain conditions never leave its larval form. This is the axolotl, long considered an unclassified aquatic species, found in the deep lakes near Mexico City. They are now known to be the larvae of the tiger salamander, an American species so named because of its blotchy-yellow stripes on a brown or black body.

Perhaps because of the dryness of the surrounding country axolotls never leave their lake abode, but retain their larval form, in which they often attain a length of one foot. They reproduce, however, in much the same manner as fully developed salamanders, so that one never knows if an axolotl is the offspring of another axolotl or a tiger salamander. By experimentation, naturalists have discovered that the axolotl can be forced to breathe through its lungs by gradually reducing its water supply. The

New York Zoological Society.

SPOTTED NEWTS (*Notophthalmus viridescens*). Length: 3 inches. Range: Eastern North America.

"CONGO EEL" (*Amphiuma means*). Length: 3 feet. Range: Southeastern United States.

New York Zoological Society.

gills shrink, and the axolotl matures into the tiger salamander. But if the creature is returned to deep water before the transformation is complete, the gills enlarge and the tiger salamander resumes its earlier form. Natives like to eat the axolotl either boiled or roasted.

The marbled salamander is closely related to the "tiger."

Several members of the American salamander family have developed unique habits. The heavy-set, brownish-black *Ambystoma talpoideum* burrows rapidly into the earth like a mole, leaving ridges of turned-up soil behind it.

NEWTS

ONE OF THE most common of the American varieties is the crimson-colored spotted newt, which is known better in its larval than its adult stage. The young, known as red efts, are a brilliant coral color. For some years they are almost entirely terrestrial, returning to water only as they approach maturity. When fully grown this salamander is about three inches long. Its color is olive or yellow-green with black-bordered crimson spots lining each side. It thrives on snails and other tiny fresh-water invertebrates.

"CONGO EELS"

ANOTHER, the "blind-eel," "Congo eel" or "Congo snake," which is neither eel nor snake nor from the Congo, inhabits muddy waters from the Mississippi to South Carolina. In appearance and slipperiness it resembles the eel. Four hardly perceptible feet easily distinguish it, however, from the fish and from the two-footed siren.

New York Zoological Society.

MUD PUPPY (*Necturus maculosus*). Length: 1 foot. Range: Eastern United States.

BLIND SALAMANDERS

NOT LONG AGO several blind and colorless small salamanders were taken from the depths of an artesian well at the United States Fisheries Station, at San Marcos, Texas. Inhabiting water nearly two hundred feet below the earth's surface, these Texas blind salamanders are completely without lungs. They have bushy external gills, and their legs are exceptionally long. Though lungless, the family of the blind salamanders is perhaps the most versatile of all the salamander groups. The terrestrial salamander, a member of this family, lays its eggs on land; moreover, its embryo loses its gills before hatching and emerges a true copy of its parents. One blind salamander (*Typhlotriton spelaeus*) curiously enough has sight in its larval stage, when it resides near the mouths of caves.

PROTEANS

THE EUROPEAN blind salamander (*Proteus*) dwells in certain lightless subterranean lakes and mountain cavities east of the Adriatic. A distant relative, both in appearance and habitat, is the "mud puppy," *Necturus,* of North America, also called "water-dog." This is an aquatic variety whose flattened tail makes it an unusually efficient swimmer. Its dark-brown mottled and spotted body is covered with thick slime which makes it almost impossible for human fingers to hold. Plume-like, velvety, red gills provide the creature with oxygen. The "mud puppy" is widely used for laboratory work.

New York Zoological Society.

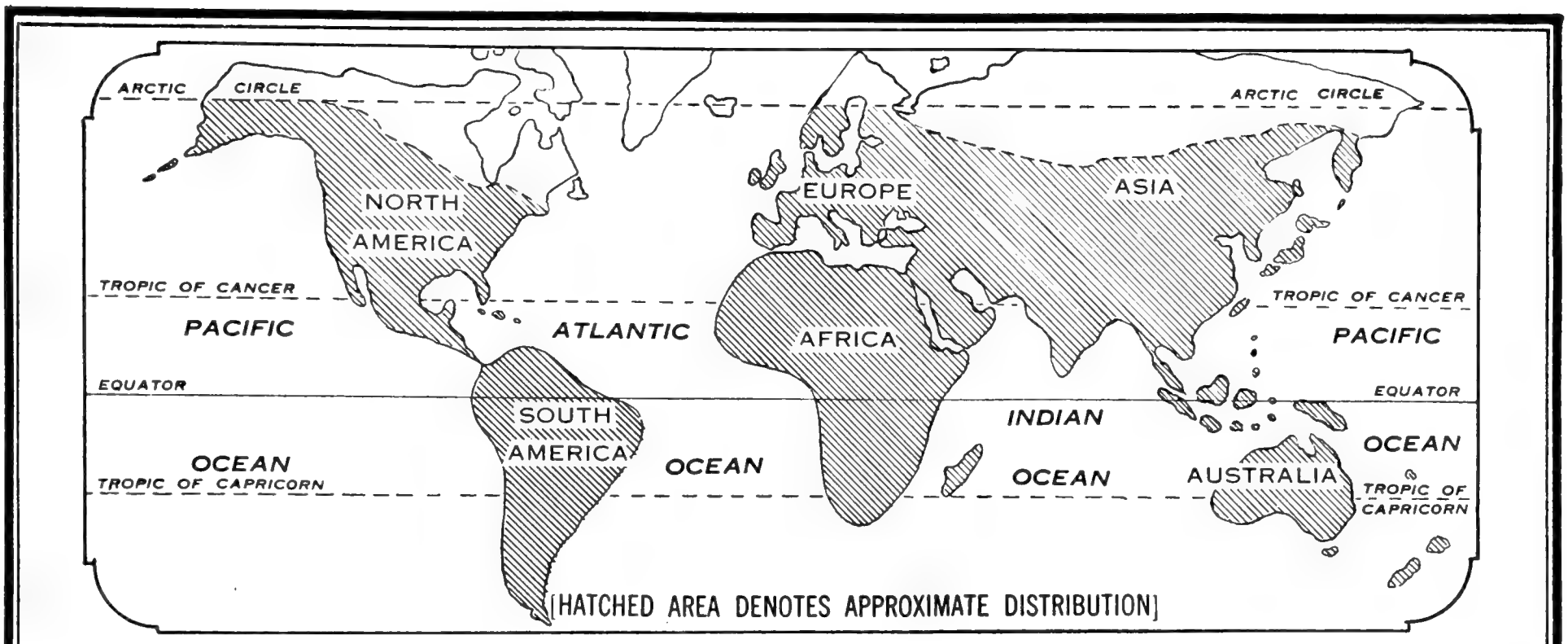
SIREN (*Siren lacertina*). Length: 2½ feet. Range: South Atlantic, Mississippi and Gulf regions of the United States.

SIRENS

THE TWO-FOOTED SIREN, despite its name, is one of the most ungainly of its order. Except for a pair of rudimentary legs at the front of its body it resembles a stout eel. The siren has large external gills and is easily identified by a multitude of tiny light spots. It is also called the mud-eel and appears by that name in Stejneger and Barbour's *Check List of North American Amphibians and Reptiles.*

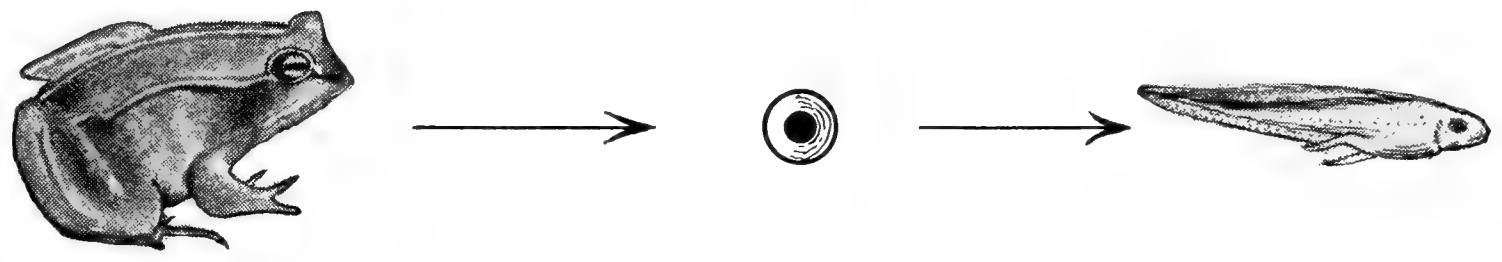
FROGS AND TOADS

(Tailless Amphibians)



FROGS AND TOADS

LIFE CYCLE OF A TAILLESS AMPHIBIAN



A. Chern, Cartographer

Toads and frogs are not readily distinguished from one another, but generally frogs are smooth and wet-skinned whereas toads are rough and dry. The intelligence quotient of the toad is conceded by Dr. Noble to be higher than that of the frog. In general the terrestrial species of amphibia

seem brighter than the aquatic. Toads usually tend more to a life on land but, as will be seen, some are almost totally aquatic. Though there are not many age records of these amphibians, some European toads are known to have lived thirty-six years in captivity.

Both toads and frogs are renowned for their leaping ability, a fact well established in Mark Twain's tale of *The Jumping Frog*. They have the exceptional advantage of being able to breathe with their lungs while above water and through their scaleless skin when below.

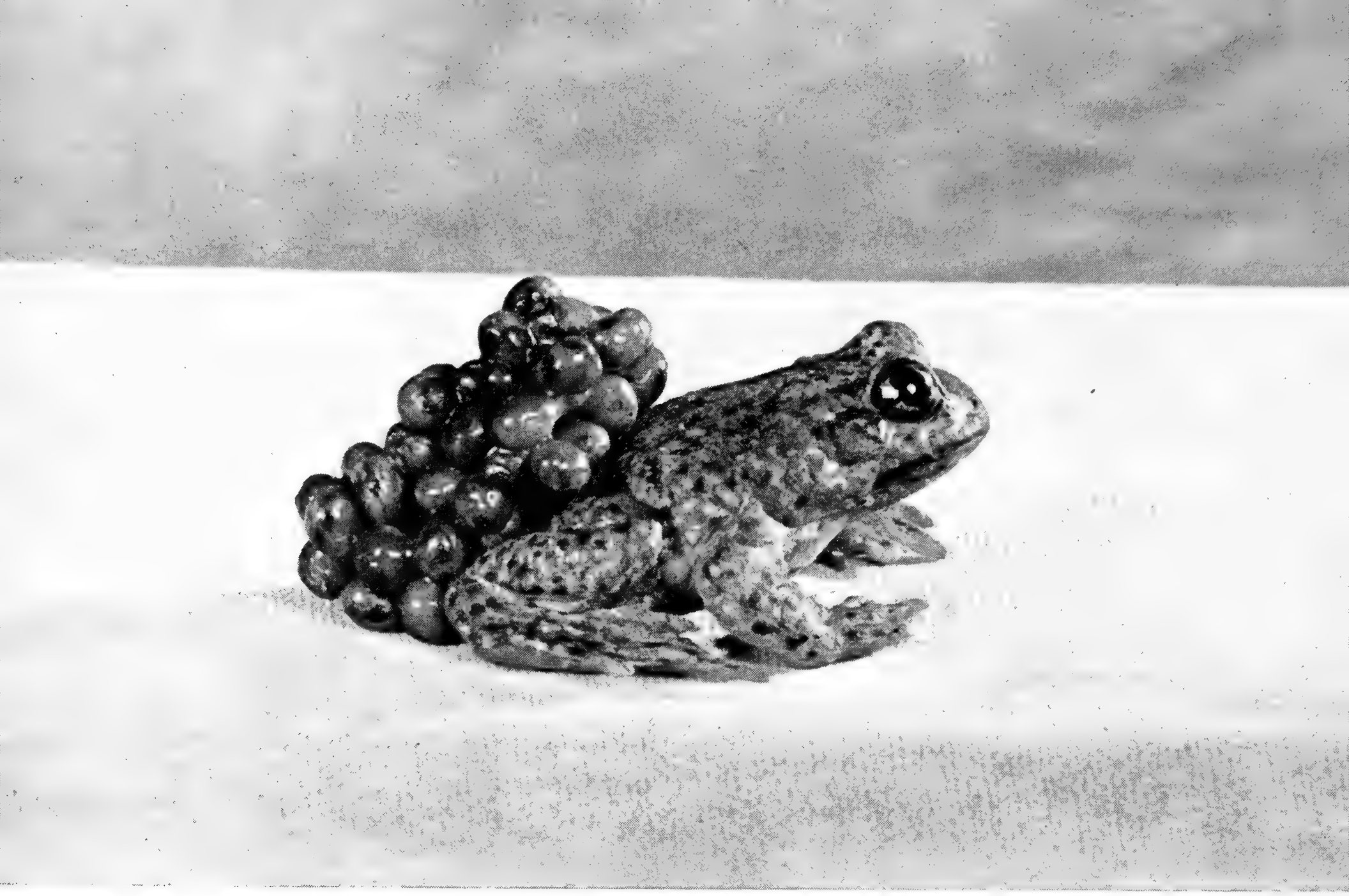
The families of this order include the primitive toads of the northwestern United States and New Zealand, and the related Old World primitive bell-toads found in Europe, Eurasia and the Philippines; the tongueless toads of tropical Africa and northern South America; the spade-foot toads known principally from North America although found in many other regions, and the related forest frogs of the East Indies, southeastern Asia and the Seychelles; the true toads of almost world-wide distribution; the tree frogs, neotropical toads and their semi-aquatic relatives all found in the American tropics except for one African hylid; the typical frogs which include *Rana* of the New World although this family is more widely represented by the tropical tree frogs of the Eastern Hemisphere; and the closely related toads of the Indo-Australian and Malagasy regions. In all, some sixteen hundred species of the foregoing families are known.

Because of the great number of families and species of toads and frogs it would be manifestly impossible to recount the life history and habits of all members of the order. Therefore only the most representative and interesting will be treated in the pages to follow. However, these have so many closely related species, with similar characteristics, that the necessary limits are not as severe as they might at first seem.

PRIMITIVE TOADS

FIRE-BELLIED TOAD

THE SMALL fire-bellied toad has little to fear although the puny creature's only "weapon" is its brightly colored undersurface. The red belly seems



American Museum of Natural History.

MIDWIFE TOAD WITH EGGS (*Alytes obstetricans*). Length: 3 inches. Range: France, Spain, Portugal, Switzerland, western Germany and southeastern Holland.

to be a reminder of the toad's poisonous secretions which cause internal disorders when swallowed.

If danger threatens, this four-inch toad hastily flaunts the lurid red of its belly by raising its head, arching its back and then posing in absolute rigidity. Most small animals become momentarily paralyzed at the sight of a larger foe, permitting the larger creature to administer a swift *coup de grace*. But the immobility of this water toad is a protective device, granting an attacker ample opportunity to see the reddish color, symbolic of its poisonous nature.

In contrast to the gaudy underparts, the toad's back is somberly colored in dark gray or greenish black. During the mating season the male, which can readily inflate its throat, is moved to sad song.

The fire-bellied toad is usually found in large lowland pools throughout northern Europe, but it has a counterpart in South China. Another close relative, the yellow-bellied toad inhabiting the highlands of southern Europe, differs only in color and the absence of the males' vocal sacs.

MIDWIFE TOAD

THE MIDWIFE TOAD takes better care of the eggs entrusted to it than most animal mothers. Not only does it guard the eggs until they are hatched, but it even uses the further precautionary measure of carrying the eggs on its body wherever it goes. And yet such solicitous motherhood is not a feminine virtue, for strange to relate the midwife toad is the male member of the family.

A string of eggs are wound around each of his hind legs as soon as Mrs. Toad finishes her part of the job. Then the male midwife toad hies himself off to some inconspicuous hole to await the birth of his babies, the end of his chore.

At night he leaves his abode in search of food and to dampen the eggs in dew or water. When the eggs are ready to hatch, he goes to a nearby pool; there the soft eggshells dissolve and the well-developed tadpoles relieve their parent of his burden by slipping into the water.

This odd creature is a native of southwestern Europe. Two inches long, he has a smooth gray or brown back, spotted with green or red. His underparts are a grayish white, and further color is lent by golden irises shot with black.

TONGUELESS TOADS

MOST TOADS are dependent upon their long darting tongues to capture insect prey, but two varieties have been denied this instrument. They are the Surinam and clawed toads, which lead almost totally aquatic lives and must catch and swallow their prey like fish.

SURINAM TOAD

THE MOTHER of a family of Surinam toads would put the proudest kangaroo to shame, for the brood which she carries in the pouches on her back

American Museum of Natural History.

MODEL OF SURINAM TOAD HATCHING YOUNG (*Pipa pipa*). Length: 5 inches. Range: Brazil, Guianas and Trinidad.

may number several dozen. This denizen of the waters of northern Brazil and the Guianas is toothless as well as tongueless; she could not, by any stretch of the imagination, be considered the least bit attractive.

During the mating season, the usually silent male utters a metallic, ticking call, probably to attract the female. When mother toad lays her eggs, father obligingly presses them from her long oviduct into pouches in her soft-skinned back. In this sanctuary, the eggs, protected from egg-eaters, develop until the fully-formed young poke out heads and hands, giving the appearance of a crowded school bus. After birth the female rubs the skin, with its shiny, hardened pouch lids, off her back.

The Surinam toad's grotesque, flat head is not at all beautified by the two round-pupilled eyes which seem tacked on like tiny pellets. Its rather graceful forelegs have fingers ending in star-shaped discs; its large, broadly webbed hind legs enable the toad to move rapidly. The skin is dark brown above, whitish on the underparts.

Slime glands cover the entire surface of its body. There are also four rows of large poison glands as well as smaller poison glands scattered throughout the skin.

CLAWED TOAD

THE CLAWED TOAD, related to the Surinam, darts about in the pools of tropical Africa. Its name was derived from the dark brown spikes extending from three toes on each foreleg. These claws enable the toad to grab the food which it shoves glutton-like into its mouth. The hind legs, broadly webbed, swiftly propel the toad as it searches for its dinner or escapes a foe.

In August, during the mating season, the male utters a scarcely audible "tick tick."

Soon after the eggs are laid they are attached to stones or water plants where they swell to double their original size. Several days after hatching, the larvae develop long tentacles, which give the toad the ludicrous appearance of a miniature sea lion with enormous tusks. However, as the toad grows, the tentacles shorten to a more proportionate size.

(NZP) *W. Lincoln Highton, Works Progress Administration.*

CLAWED TOAD (*Xenopus laevis*). Length: 3 inches. Range: Tropical Africa.

New York Zoological Society.

UNDERSIDE OF LIVE
SURINAM TOAD

The clawed toad attains a length of three inches. Its smooth skin is covered with tubelike structures, said to have sensory functions. The upper parts are colored an olive-brown; the stomach is whitish and sometimes spotted with brown.

Only such calamities as the drying up of a pool or a shortage of food will compel the clawed toad to leave the water.

In captivity the clawed toad proves its hardiness, requiring no special temperature arrangement. It eagerly pounces upon the worms and bits of meat which are fed to it.

In one South African hospital physicians use these toads in pregnancy tests.

SPADE-FOOT TOADS

WHEN first unearthed, the burrowing spade-foot, or hermit toad, looks like a small ball of brown earth. But then it expels the air from its lungs and the deflated sides collapse like a punctured balloon. Two elevations appear at the smaller end and become discernible as round, staring eyes of brilliant gold. Awkward hands are lifted, one at a time, and rubbed over the eyes.

Awake and alert after this lazy operation, the hermit toad begins to consider escape. It neither plays dead nor makes sudden leaps but, if permitted, simply begins sinking out of sight into the soft earth until it finally disappears. Its disappearing act is no miracle; it is the work of two efficient, spadelike hind legs which may dig the little creature as far down as three feet below the surface.

The recluse generally burrows a six-inch hole in which it leads a lonely life. Only during the breeding season does it venture forth, the males calling in a loud chorus and the females responding in low grunts.

Instinctively, the young toad emerging from the tadpole stage begins burrowing in the ground. In fact, if it is unable to get out of the water after reaching maturity, it drowns.

The hermit spade-foot is green, yellow or ashy brown, and may have

New York Zoological Society.

SPADE-FOOT TOADS (*Scaphiopus holbrooki*). Length: 3 inches. Range: Parts of southern and eastern United States.

CUBAN TOAD (*Bufo peltacephalus*). Length: 4½ inches. Range: Cuba.

(NZP)

W. Lincoln Highton, Works Progress Administration.

a curved yellow line extending backward from each eye. The undersides are a dingy white, turning purplish at the posterior parts. This lonely animal is found throughout all of eastern North America.

A Central European relative acts much the same, but burrows in sandy soil, leaving no trace of its work since the loose sand fills up the hole as it digs. Some specimens are adorned with red spots.

When captured, it utters a shrill, startling cry and the skin is quickly covered with a secretion smelling like garlic. Consequently, in Germany, it is known as "garlic toad." Tame individuals soon learn enough manners to stop emitting the offensive fluid.

TRUE TOADS

"Sweet are the uses of adversity,
Which like the toad, ugly and venomous,
Wears yet a precious jewel in his head."

COMMON TOAD

THE HOPTOAD, with sparkling eyes of gold and black, is the best known toad in the United States. The beauty of its jewel-like orbs, a toad characteristic immortalized by Shakespeare, is more than balanced by its dark, unattractive body, covered with warts. But it must be said in all fairness that this maligned animal keeps its warts and does not, under any circumstances, pass them on to boys who play with toads.

A discriminating eater, it will feed only upon moving things. Thus it is probably the most useful of all frogs and toads since it hops about farm lands and gardens, destroying such pests as ants, potato bugs and worms.

It is protected by a changing coloration, the ability to "play 'possum" rather convincingly, and the secretion of a milky fluid irritating to the mucous membranes of man and other animals.

Records show that at least one of these olive-green toads has lived to the ripe old age of thirty-six.

(NYA) *Ralph De Sola, Federal Writers' Project.*

MARINE TOAD (*Bufo marinus*). Length: 6 inches. Range: Tropical America to southern Texas.

H. L. Stecher.

AMERICAN TOAD (*Bufo americanus*). Length: 3 inches. Range: United States and Canada east of the Rockies.

MARINE TOAD

In tropical America the marine toad squats quietly in a puddle or among dense vegetation and calmly swallows insects at a breath-taking rate. One observer credits it with gobbling up fifty-two mosquitoes in one minute, probably a record for the entire animal kingdom.

It is sometimes called the giant toad, but its six-inch length makes it a colossus only in comparison with the related garden toads. The brown skin on its back is quite warty and splotched with black.

The marine toad, despite its misleading name, is not a seafarer but is found inland. It was accorded the label because Linnaeus happened to receive one specimen from a tropical American beach and concluded, erroneously, that it lived in the sea.

HORNED TOAD

Probably the most belligerent of all toads, the horned toad, is an excellent hunter, capturing and slowly devouring birds, rodents and frogs of comparatively large size. When two horned toads are shipped together in a box, it is not at all uncommon for the smaller one to arrive inside the larger. As might be expected, this voracious creature is very ill-tempered and will unhesitatingly nip a finger quite severely.

Also known as the horned frog and barking toad, it owes its popular name to the peculiar three-cornered projection above the eye. However, this "horn" is a flexible skin growth and not horny.

It shows a striking color combination. Its green and yellow skin is punctuated with dark green spots, large on the back and smaller on the sides and limbs. Yellow and white dots, and some red or brown lines, round out the color pattern, which seems of protective value in the tall pampas grasses of Uruguay, Paraguay and northern Argentina.

When not in hiding under grass or creepers, the horned toad partly digs itself into the ground and tosses bits of earth on its hard back.

The species should not be confused with the horned "toad," a lizard described in an earlier chapter.

New York Zoological Society.

GREEN TREE FROG (*Hyla cinerea*). Length: 2 inches. Range: Southeastern United States.

TREE FROGS

TREE FROGS are renowned for their loud but not unpleasant trillings, which keep country nights alive with sound. The grooved and sticky pads on their feet enable them to perch effectively on the branches and leaves of trees. Virtually all of the one hundred and fifty species of the tree frog family are either American or Australian, but a few varieties are distributed in other parts of the globe according to Noble's *Biology of the Amphibia.*

The misnamed European tree frog is found in Asia as well as Europe. Its smooth, shiny back is grass-green, and the granular underparts are yellowish-white, turning pinkish on the thighs. When a fly or other insect settles within sight, this frog will leap fearlessly after its prey from any height, breaking its fall by grasping at leaves. The giant of tree frogs is a Haitian variety, which often reaches five inches in length.

A unique method of egg protection has been evolved in many Old World tree frogs. The spawn are usually suspended above the water and then whipped into a foam with the hind legs. Thus air is beaten into the egg mass to supply the embryo with oxygen, since the surface of the foam develops a protective crust. When the eggs hatch, the tadpoles easily slide into the water.

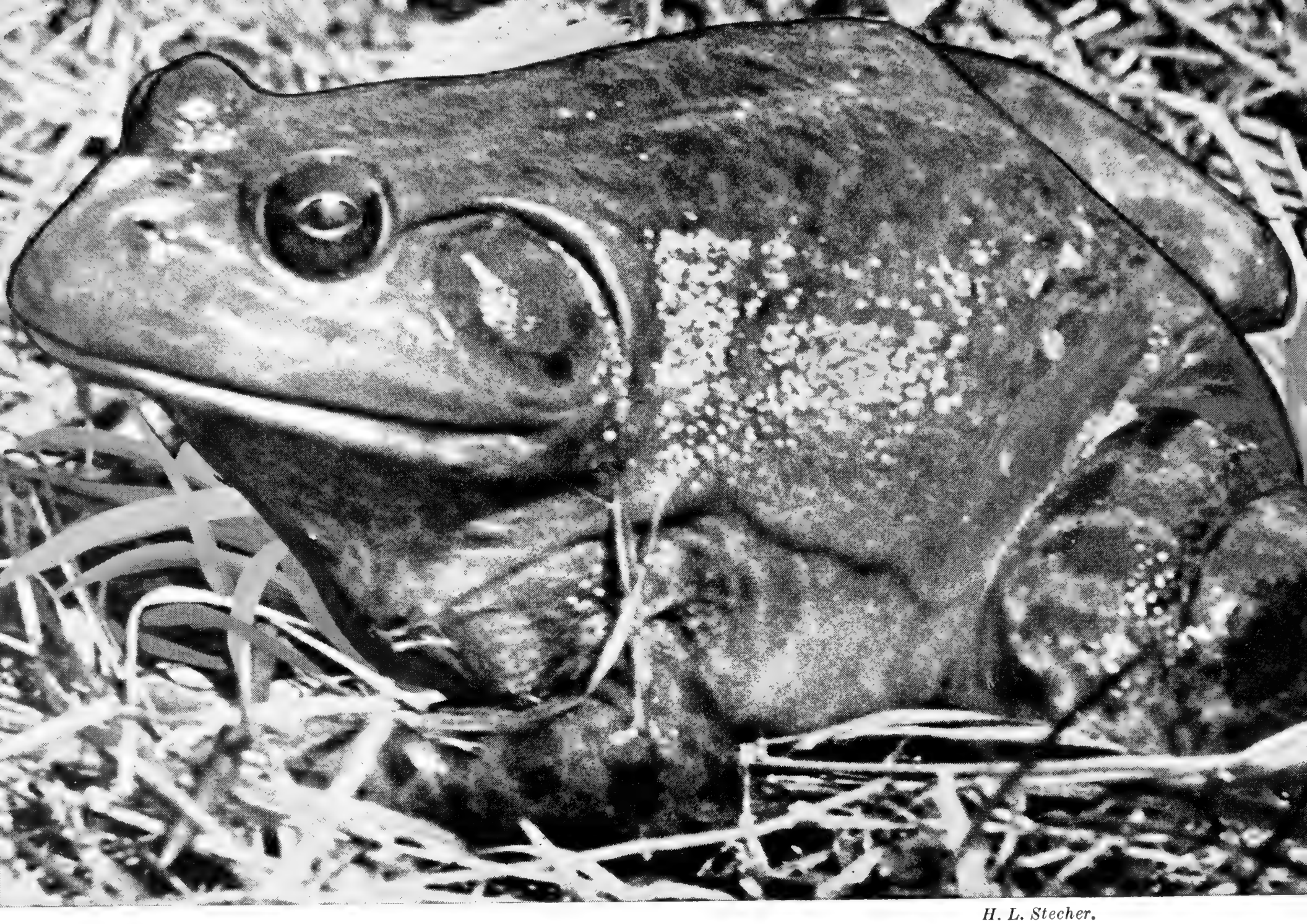
Tree frogs are not considered very intelligent members of their order. However, they are famed as weather prophets, and farmfolk are familiar with their lively chirpings which precede rainy weather.

TYPICAL FROGS

FROGS ARE versatile little creatures, a short survey of their accomplishments reveals. King of all frogs is the foot-long giant or goliath frog found in the sluggish streams of the Cameroons in West Africa. It can easily kill a large rat. Natives of the region prize the thigh bones of the giant for ceremonial purposes.

The young of the Solomon Island frog undergo complete metamorphosis within the egg and hop about as soon as they are hatched. In India the skating frog outdoes the *fakir* by jumping from the water, landing on the surface, and then taking off again. The Seychelles frog carries its dozen or so tadpoles on its back, to which they cling by means of their adhesive undersides. It is believed that they go through their entire development in this position. A skinny parachutist is the "flying" frog, which with its webbed hind and forelegs can glide safely from trees to the ground.

The poison frog secretes a toxic substance which the Indians of South America use to poison arrows and dye parrot feathers. The latter turn green and yellow when rubbed on the frog's back, which is spotted green, yellow and cherry. Despite its toxic effect on others, the poison frog is a good father to its tadpoles which it transports on "frog back" from the site where the eggs were laid to the nearest pool. Enlarged vocal sacs cover the entire undersurface of the male Darwin frogs and serve as an incubator for the larvae. The male picks up the eggs in his mouth and



H. L. Stecher.

BULL FROG (*Rana catesbeiana*). Length: 8 inches. Range: Eastern United States.

places them in the sac. The "hairy" frog is not a fiction but a very living native of Africa. The lower sides and thighs of the male are covered with tiny hairlike tubes resembling gills and serving the same function.

Frogs have leaped their way into literature via Mark Twain's story *The Celebrated Jumping Frog of Calaveras County*. Now Calaveras County, California, holds yearly jumping events for frogs in commemoration of the story. "Zip," the titleholder in 1938, soared through the air with the greatest of ease for a new record of fifteen feet, ten inches.

One of the most common of Old World frogs is not unreasonably known as the common frog. It resides in temperate regions from England to Japan, and shows as many variations in markings and color as the number of countries which it inhabits. The sexes are hardly distinguishable except in the breeding season, when the inner fingers of the males' forelegs develop swollen pads and the webs on the hind legs grow considerably larger.

BULL FROG

In May the bull frog emerges from a long winter rest to drown out the croaking of its feebler relatives with its booming note. In voice, as in size, it is the lord of North American frogdom, though its bulbous eyes also make it one of the stupidest-looking species.

The bull frog inhabits pools and other suitable bodies of water, usually those choked with water weeds. Only in rainy weather will it leave its pool for cross-country trips. Though generally green or greenish-brown, it varies in color according to localities. In some regions the male has a yellow throat, while in others the throat is the usual drab color; the underparts are sometimes white and sometimes spotted. Though a powerful swimmer, the bull frog can swim only short distances at a time, perhaps as its habit of rolling its eyes downward when in motion prevents it from seeing. On a long trip the frog stops at regular intervals to open its eyes and take bearings. The hind legs propel it through the water with a sort of back kick. When attracted by some juicy crayfish, the bull frog expels the air from its lungs and dives with closed nostrils.

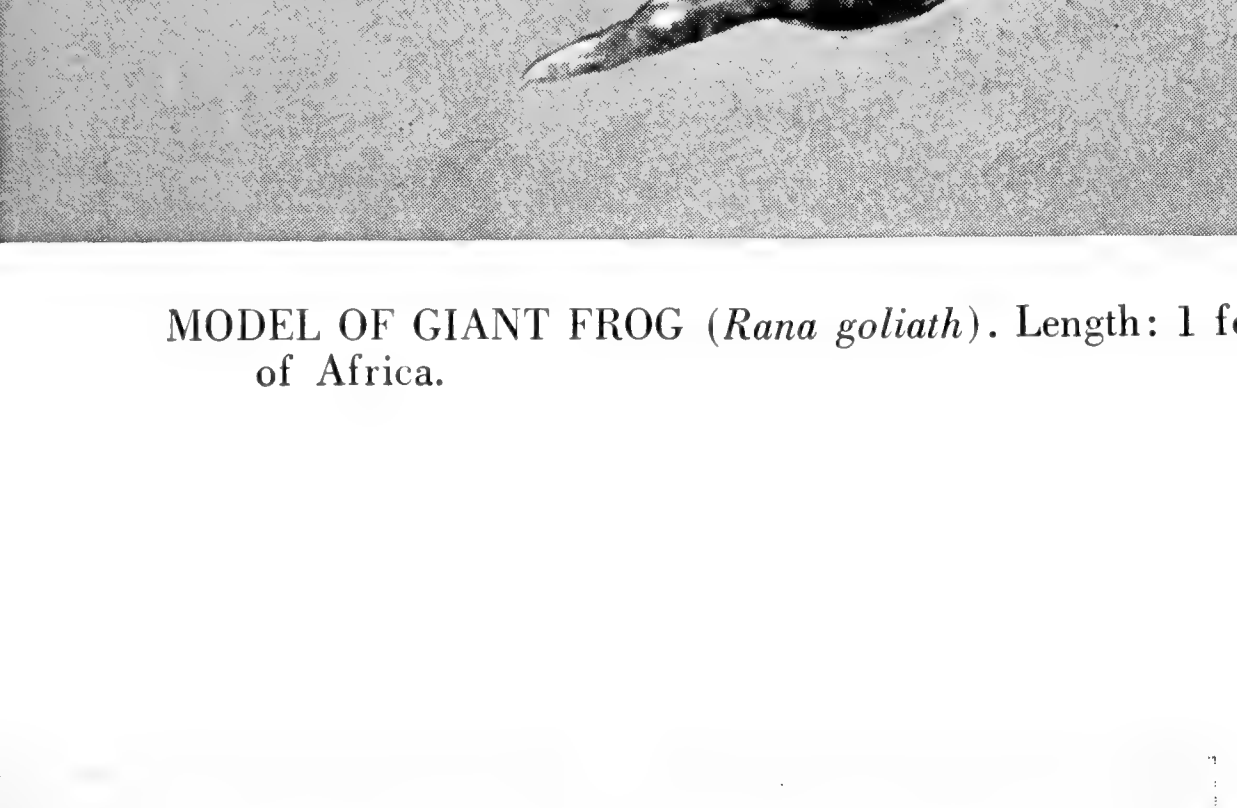
Though easily prompted to song by pleasing sounds, it is a strict individualist and declines membership in any chorus. The female is said not to croak.

This goggle-eyed amphibian spends its leisure hours floating among the pond lilies or perching on logs. On land it breathes in gulps as if swallowing a bulky object. In addition to crayfishes the frog eats snails, minnows, insects, small snakes, small birds and its own young, either in the form of tadpoles or baby frogs. The bull frog's chief enemies are snakes and large birds. When one is seized by a hawk, its scream of anguish sounds almost human.

May or June is bull frog breeding season. The eggs hatch out soon after they are laid, but in northern regions the tadpoles require two or three seasons to develop into mature frogs. The tadpoles are very large, sometimes reaching a length of seven inches. Large eyes, fleshy lips and muddy marbled markings emphasize their puffy aspect. Ranged along each side of the throat are three sets of internal gills, which are the sole breathing apparatus of young tadpoles. At a later stage the gills disappear and

American Museum of Natural History.

MODEL OF GIANT FROG (*Rana goliath*). Length: 1 foot. Range: The Cameroons of Africa.



New York Zoological Society.

THE HORNED FROG OR BARKING TOAD (*Ceratophrys ornata*), belongs to the toad family and is described in this chapter as the horned toad. It is found in Brazil and Argentina, where it attains a length of seven inches.

are replaced by lungs. Arms, with elbows showing first, push out of the breathing pore. For a while the tadpoles are entirely dependent for locomotion on their long tails which quickly grow again if an enemy, such as the diving beetle, performs an amputation. Later the tail gradually disappears to be replaced by powerful hind legs.

The southern bull frog scarcely deserves its name, for its croak most closely resembles a pig's grunt. It grows to a length of from four to five inches, and is colored lustrous yellow-greens and browns. Its eyes are set close together in its long head. It ranges from Louisiana to Florida and southern Georgia.

LEOPARD FROG

THOUGH less publicized than the bull frog, the leopard frog is the most common of North American species. It owes its name to its coloring and markings rather than to any unusual agility or ferocity. Two bronze or yellow folds of skin run almost parallel from the frog's eyes to its posterior; between them are rows of brown or olive-green spots, each encircled by a fine yellow or white line.

Now and then the leopard frog leaves its pond for a trip overland. If surprised, it squirts forth a foul-smelling liquid at its assailant, and will stage a determined fight for freedom. When captured, however, it soon grows resigned and, as a rule, songful. Its rather pleasing sound is produced by vocal pouches, which swell up behind and under the ears. When collapsed, the skin of these pouches is crinkled and baggy.

The leopard frog accomplishes its frequent skin changes with quite a ceremony. First the skin splits over the back of the head, and the front feet are used to draw it over the eyes. During this first stage the frog sits with its back buckled high. Once the skin is over the back, it must be kicked off the hind legs. This is accomplished by stretching the legs arduously back and forth until the skin is brushed off.

The southern leopard frog is considered the most beautiful frog of America; it shows its aristocratic breeding by refusing to mate with the ordinary leopard frog, which often shares its habitat. Easily distinguished from the leopard frog by its intense metallic green and brown

mixtures, the southern leopard frog can also be recognized by its long, gracefully pointed head and a circular white spot at the center of the ear. Dark green or brown spots cover the bullet-shaped body.

PICKEREL FROG

THE AGILE American pickerel frog does not resemble the pickerel, but is used as a bait to lure that tasty fish. An unpleasant skin secretion prevents the frog from being eaten by man, and it appears to be poisonous to other frogs, for when other varieties are confined with it, they usually die. This frog spends most of its time on land and is often confused with the leopard frog because of its spots, which, however, are square and without yellow margins. The young pickerel frog sheds its skin even before the stub of its tadpole's tail has entirely disappeared. In the sunlight the young are a lustrous bronze color, but when emerging from the water, they can scarcely be distinguished from the mud.

WOOD FROG

THE EASTERN wood frog is unique in its ability to turn in mid-air, so that on landing from its long leap, it faces its enemy. Sometimes each of this frog's eggs is surrounded by a green jelly, composed of microscopic plants which feed on the carbon dioxide given off by the embryo and in turn supply it with oxygen. Of all American frogs this is the most terrestrial. Its excellent protective coloration makes it hard to locate, but once detected it is easily identified by its dark brown or black cheek patches with a yellow-gold line running along the sides of the upper jaw to the shoulder.

GREEN FROG

VISITORS to American ponds are often surprised by green frogs which jump into the water, seemingly from nowhere, uttering a deep *jurg* as they land. These familiar, metallic-green frogs are almost entirely aquatic. They shed their skin four to five times a year, and if the process takes place on land, they swallow the skin.

GOPHER FROG

THE FLORIDA gopher frog looks like a toad, and likes to eat toads. Moreover it is not affected by the poisons of its fellow amphibian, which it ejects as soon as the prey is swallowed. Sitting at the edge of the gopher tortoise's hole, whence comes its name, this frog awaits its prey and at the same time keeps a lookout for its enemies. In time of danger it disappears into its ready-made refuge and can be captured only by being dug out. The gopher frog exhibits color schemes ranging from gray-brown to yellow-purple; it has bulging eyes and a large head and mouth.

WESTERN FROGS

CALIFORNIA and the far West boast some of the most lavishly colored frogs in the land. One of these studied by Dr. T. I. Storer is the red-legged frog. It is considered most delectable eating. This aquatic species, although it is said by Dickerson to take eight years to become fully grown, never manages to lose its awkward gait on land. The western frog also has red underparts which, however, are not visible unless the frog is turned over. Like many other varieties this one, when held with feet unsupported, becomes very talkative. Another Californian, the two-inch, yellow-legged frog appears more like a toad than a frog, because its skin is covered with small warts.

NORTHERN FROG

RARELY mentioned, the northern frog is considered the probable link between the genus *Rana* and some lower forms. This frog prefers rivers to ponds and is sometimes known as the mink frog because of its mink-like scent. Also called the Hoosier frog, it is found through northern New England and New York, westward to Minnesota and as far north in Canada as the southern shores of Hudson Bay.

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