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Amphibians and Reptiles

Of the Navajo Country

By Theodore H. Eaton, Jr.

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National Youth Administration
(Project 6677-Y)

Berkeley, California

1937

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Foreword

This is one of a series of bulletins on the northern Navajo country, produced under Project 6677-Y of the National Youth Administration, Berkeley, California. In its inception the project had for its main objective the publication of scientific data made available by the Rainbow Bridge - Monument Valley Expedition, resulting from four years of field work in the northern Navajo country.

Dr. Theodore H. Eaton, Jr., who has served as a member of the Expedition's biological staff in the field, was chosen N. Y. A. project director to supervise the assembling, editing and publishing of this fund of knowledge in some form in which it might be useful to the layman or student. As the work progressed it was decided to widen the scope of the project to include information from all reliable sources with a view to producing a usable scientific manual of the Navajo country. This necessitated a research program pursued mainly among publications in the library of the University of California and that of the Expedition.

Acknowledgment is due to a number of agencies and individuals without whose cooperation the production of these bulletins would not have been possible; to the Alameda County Free Library for the earlier sponsorship of the project; to the National Park Service for space necessary for the work; to the University of California for furnishing published material, collections, and space for investigators; to the trustees of the American Exploration Society (under which the Rainbow Bridge - Monument Valley Expedition operates) for unpublished scientific data collected in the field and for contributions in cash toward publication expenses; and - most of all - to Arthur M. Yale, Frederick S. Clough and other administrative officers of the National Youth Administration, who have recognized the importance of this work and have assisted in many ways toward its completion. To all these, and to all the other individuals who have assisted without recognition here, the undersigned, sponsor of the project, expresses his sincere thanks.



Ansel F. Hall

Berkeley, California
April 10, 1937

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AMPHIBIANS AND REPTILES OF THE NAVAJO COUNTRY

By

Theodore H. Eaton, Jr.

Introduction

I

Halfway between the fishes and the warm-blooded mammals there is a group of strange creatures which, for variety of habits and appearance among relatively few species, cannot be equalled elsewhere in the animal kingdom. They seem to be full of contradictions and queer combinations of traits that should not be together. We even find it impossible to give them an inclusive common name, although we know they are related to one another. Instead, we must use a series of words when referring to them: salamanders or newts, frogs and toads, lizards, snakes and turtles. The last three of these have scales or plates covering the body; the others have a naked skin, which usually must be kept moist so that the animal will not die from dessication. We call the former reptiles and the latter, with the naked skin, amphibians. We say they are cold-blooded, but we mean that they have no way of regulating the body temperature, and are therefore always of the same degree of heat or cold as their surroundings. Naturally they are most active when warm, and that is why lizards sun themselves continually when sunshine is available, and why frogs and toads hide in the mud and remain inactive during cold weather.

Even in the more thickly settled parts of the United States the amphibians and reptiles are none too well known, beyond the names of the species and a certain amount concerning their habits and the localities preferred by the commoner ones. But in an almost unexplored region like the Navajo country even these elementary facts need to be discovered. We know, from the few observations and the small collections that have been made there, most of the species to be expected, but have not yet found them all. We know, from investigations made elsewhere, something about the life-histories of the frogs and toads, although we do not know much about the dates and places for breeding, or the time taken to develop to maturity or the special conditions met with by each species in the Navajo country. Of the local life-histories and habits of the reptiles it cannot honestly be said that we know anything--even the names are questionable in certain cases. Nor are the studies of other workers elsewhere of much value to us.

The main thing needed is simply careful observation of each species, with detailed records of its life, its food, its mating, its egg-laying, its younger stages, what it does at all times of the year, what situations it prefers, how it behaves towards its own and other species.

The present account is therefore a brief summary of our present understanding of amphibians and reptiles in this area, with indications of future problems and a few hints on ways of approaching them; it is a starting point for anyone who is interested in finding out something new about these animals.

II

The desert or semi-desert conditions in the Navajo country determine the kinds of animals which live there. This is shown more strikingly among the amphibians and reptiles than in almost any other group of animals. Among the salamanders there is only one species represented, and that is rare, and among frogs, one or perhaps two. These animals depend upon water and require a regular supply of it for at least a few months of the year. On the other hand, the toads, the Spadefoot, and the Canyon Tree-toad furnish the bulk of the amphibian population, because they can go for long periods without water, and need it only for a few weeks during rainy seasons. The toads, as everyone knows, are animals of dry land wherever they occur, and at most will prefer the cool shadows and the dampness of evening in order to keep from drying out. The Spadefoot, related to toads, is a much less familiar animal, because, although it also occurs in more thickly settled parts of the country, it is subterranean most of the year, and when it does come out, it appears only at night. The Canyon Tree-toad is an especially adapted, desert-living member of the Tree-toad family, most species of which live in wet, forested parts of the world.

Among the reptiles, we see the same influence of an arid climate in the absence of any turtles. The only groups of reptiles therefore are lizards and snakes. Among these, the principle influence determining the kinds which are present is the temperature, and this depends on altitude. Since most of the Navajo territory is from 6000 to 8000 feet above sea level, the number of species is limited, especially among the snakes, and we miss some familiar southwestern desert reptiles like the Gila Monster and the Coral Snake. The prevailing family of lizards is the Iguanidae. One commonly thinks of an Iguana as a very large tropical lizard which eats leaves or fruit, but the species found in the United States are more the smaller relatives of those tropical kinds. Some

of them, like the Chuckwalla, are vegetarians, but the majority feed on insects or on smaller lizards. The only other lizard family of any importance here is the Teiidae or the Race-runners. These are so slender and short-legged that at first glance they might be mistaken for snakes, and the resemblance is increased by their habit of sticking out a long, forked tongue, which the Iguanidae cannot do. The Race-runners live on insects.

Another primarily tropical family of lizards may possibly reach this far north along the hot valley of the Colorado River. This is the family of Geckos, which every traveler to the jungle has seen climbing on the walls and ceilings of houses. Our Arizona species, however, is a little, secretive, nocturnal animal, which may have been overlooked in many places because of its habits.

The snakes are poorly represented in the Navajo country, there being only a Racer, a Gopher Snake, two scarce species of Garter Snake along the streams, and the familiar, though not abundant Rattlesnake.

The following Key will enable one to identify any amphibians or reptiles which he finds in northeastern Arizona, at least so far as known at present. The use of a key for identification depends on the simple principle of choosing between a series of alternatives. These alternatives are marked with the letters A and AA, B and BB, and so on. You read the statement given in A and see whether it applies to the animal you have. If it does, go to B and ask the same question there; if it does not, go to AA and you will find that the statement there will fit your specimen. For instance, if you have an unknown, flat-bodied, spiny lizard, look at the first choice, and you will find, "A. Without scales". Since this obviously is not true, go to AA, which says "With scales". Under this, B says, "With legs", and again you agree. The next three choices will give you, "Pupil of eye round", "Scales beneath no larger than those above", "Spines on back of head; body almost round", and in this way the animal has been identified as *Phrynosoma douglassii*, the Horned Toad. Thus, with a little practice, one can look up any unfamiliar animal, without having to read the descriptions and eliminate them one by one.

Key to Amphibians and Reptiles

Known or Likely to Occur in the

Navajo Region

A. Without scales. (Amphibia)

B. With a long tail. Ambystoma tigrinum

BB. Without a tail; hind legs for leaping.

C. Waist broad; body broad and thick; hind limbs fairly short.

D. No parotid glands (glandular lump on each side of neck, behind eye). Scaphiopus hammondi

DD. Parotid glands present.

E. Distinct crests or ridges between eyes; parotid glands oval or elongate.

F. Parotid glands bean-shape; light line down middle of back either weak or absent. . . . Bufo cognatus

FF. Parotid glands at least twice as long as wide; distinct light line down middle of back.

. B. woodhousiiEE. No crests or ridges between eyes; parotid glands small and round. B. punctatus

CC. Waist narrow; body moderate or slender; hind limbs long.

D. Disks on tips of fingers and toes; slight webs between toes; many small round spots on back; less than 2 1/6 inches long. Hyla arenicolor

DD. No disks on fingers or toes; large webs between toes; few large oval or round blotches on back; usually over 2 1/6 inches long.

E. With white line on side of upper jaw. . Rana pipiensEE. No white line on side of upper jaw. . . R. onca

AA. With scales. (Reptiles)

B. With legs. (Lizards)

C. Pupil of eye elliptical; contrasting dark bands across back and tail. Colonyx variegatus

CC. Pupil of eye round; no contrasting bands across back and tail (if any cross-bands are present, they are only on neck, or obscure or broken if on body and tail).

D. Scales beneath not larger than those above, and arranged in many rows.

E. Spines on back of head; body almost round, flattened.

. Phrynosoma douglassii

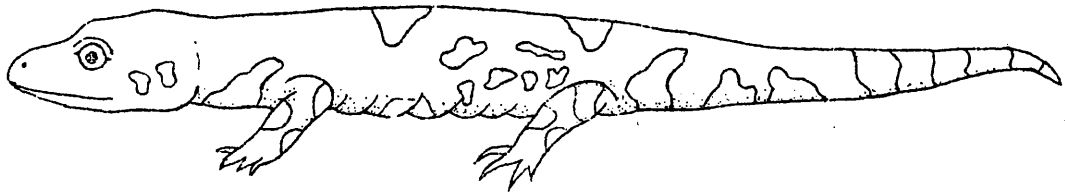
EE. No spines on back of head; body more slender.

F. No fold of skin across throat nor along sides of body.

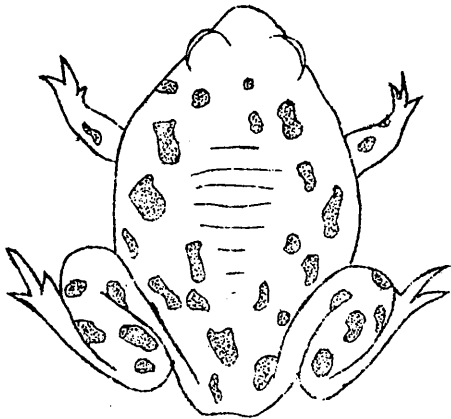
G. Prevailing color pattern of lengthwise stripes, often broken into blotches. Sceloporus graciosus
graciosus

- GG. Prevailing color pattern of dark cross-bands, often broken or indistinct.
- H. No black collar on neck; scales small, close-set. S. elongatus
- HH. Black collar on neck; scales rather large, bristling. . . . S. magister
- FF. Fold of skin across throat or along sides of body.
- G. No ear opening. . . . Holbrookia maculata approximans
- GG. Ear opening present.
- H. More than 6 inches total length.
- I. Large flattish lizard; distinct fold behind ear and along side of body; no green or yellow spots. Sauromalus obesus
- II. Large or medium lizard with distinct pattern of green or yellow spots or leopard-like blotches.
- J. A double black collar on neck. . . . Crotaphytus collaris baileyi
- JJ. No collar on neck. C. wislizenii
- HH. Less than 6 inches total length.
- I. Scales on middle of back not decidedly larger than those on sides. . . . Uta stansburiana stansburiana
- II. A strip of about 6 rows of scales down middle of back, larger than those at sides. U. ornata symmetrica
(or U. levis)
- DD. Scales below in eight rows, distinctly larger than those above.
- E. A patch of enlarged scales on back of forearm. Cnemidophorus sexlineatus sackii
- EE. No such enlarged scales. . . . C. tessellatus tessellatus
- BB. Without legs. (Snakes)
- C. Body slender or moderate; head approximately same width as neck; no "rattle" on tail.
- D. Distinct lengthwise stripes.
- E. Stripes on sides only; tail pink or red beneath. Masticophis taeniatus taeniatus
- EE. One stripe along middle of back and one on each side.
- F. Stripes very clear and strong; no dark spotting. Thamnophis eques
- FF. Stripes faint or dull; dark spots also on back. (some individuals) T. ordinoides vagrans

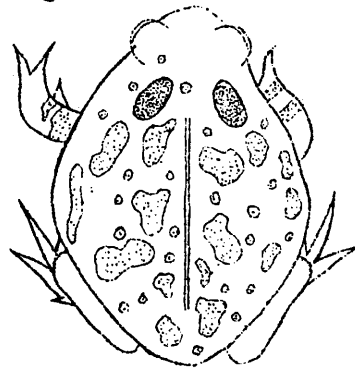
AMPHIBIANS OF THE NAVAJO COUNTRY



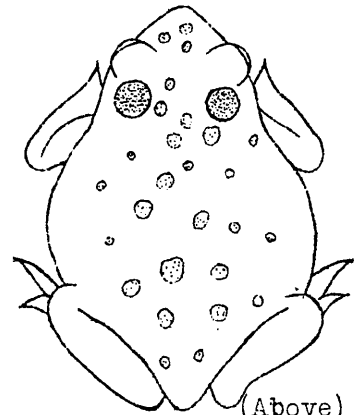
Tiger Salamander



Western Spadefoot



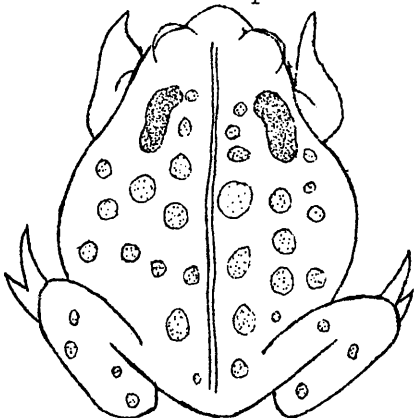
Great Plains Toad



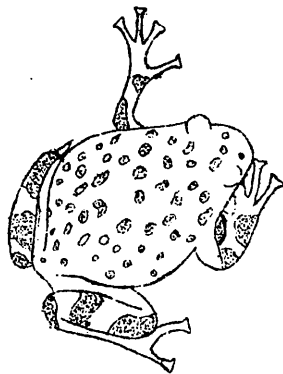
(Above)

Red-spotted Toad

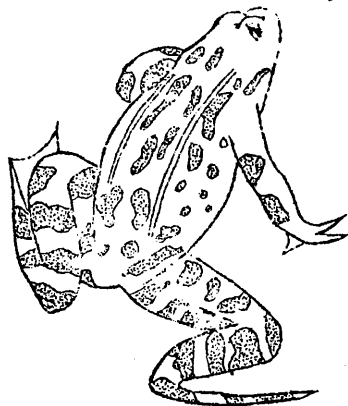
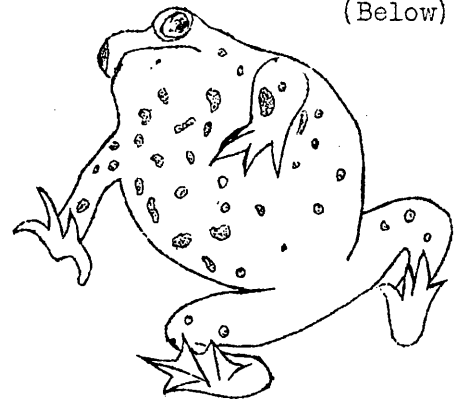
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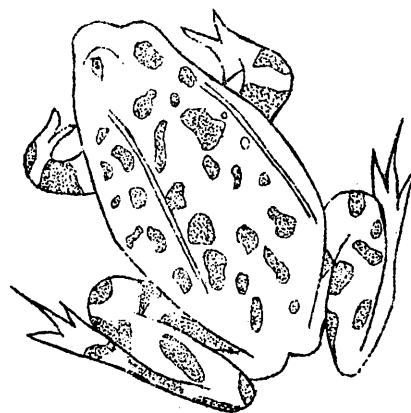
Rocky Mountain Toad



Canyon Tree-toad



Leopard Frog



Nevada Frog

- DD. No distinct lengthwise stripes; pattern of spots or blotches or none at all.
- E. Pattern of obscure black spots on dark ground; occasionally without pattern; small snake, under $2\frac{1}{2}$ feet. (most individuals).
 T. ordinoides vagrans
- EE. A row of large dark blotches down middle of back, other smaller ones on sides; large or medium snake, usually over $2\frac{1}{2}$ feet.
 Pituophis catenifer deserticola
- CC. Body thick and heavy; head much wider than neck; "rattle" on tail.
- D. General color gray or brown; larger.
 Crotalus confluentus confluentus
- DD. General color reddish; smaller. C. c. nuntius

TIGER SALAMANDER

Ambystoma tigrinum Green

Here and there, in reservoirs or standing pools, even in the most barren desert, one is likely to encounter this so-called Water-dog or Mud-puppy, or its larva, called the Axolotl. This animal, in whatever stage of development it may be, is a smooth-skinned, four-legged, lizard-shaped creature which may reach nearly a foot in length. Its skin is slaty in color, covered with yellowish or cream-colored blotches, sometimes conspicuous, and sometimes almost lacking. The Salamander is absolutely harmless, and it does not have the legendary habit of "sporting in the flames."

The Salamanders lay their eggs in the water, which means that in the rainy season one may see the adults on the bottom of a clear pool, or even in a well. In the Navajo Country this is in the early summer. At other times one practically never sees them because they are far down in the ground in deep crevices or in burrows made by rodents, where they may find enough moisture to keep their skins from getting dry. Only at night, and preferably a rainy night; does the Tiger Salamander venture abroad.

Mating and egg-laying take place in the water, each female laying three or four hundred eggs, enclosed in a large transparent mass of jelly. This ordinarily lies just beneath the surface and

is attached to sticks or weeds in the water.

One of the most interesting and easy studies in natural history is to watch the early development of young Salamanders, for it can easily be followed through every stage without disturbing the jelly surrounding the eggs. In a week or so, depending upon the temperature, the young larvae break out of the disintegrating mass and swim about in rather jerky fashion, spending most of the time on the bottom. They soon adopt the same color as the mud and leaves around them and so become almost impossible to find. Besides this, they are lively little fellows, with big eyes and a long tail, so that if you did find one, you would have considerable difficulty in catching it.

In the course of a year, the larva may grow to a length of four or five inches, feeding on small water insects, worms, and other creatures that it can swallow. It still has a dull gray or brown color without the yellow blotches of the adult, and it still carries on each side of its neck three bushy gills for breathing in the water. At the end of the year it may do one of two things, either lose its gills, develop spots and come out of the water a full-fledged adult Salamander, or continue life permanently as a larva. This strange situation has caused much confusion on the part of naturalists, for the big, permanent larva seemed, to those who first discovered it, to have no relation to the Tiger Salamander. The larva, called the Axolotl, was found to be mature, to lay eggs, and to reach a length of ten or twelve inches. The Tiger Salamander, on the other hand, which is well known in the east and in other parts of the country, normally transforms to a complete adulthood at the end of one or two years, and later returns to the water to lay its eggs. Finally some biologists, rearing the Axolotl from the eggs, were able to obtain both mature Axolotls and transformed Tiger Salamanders from the same batch of eggs, and thus the connection between two apparently different animals was established. In the desert of the southwest and northern Mexico it seems to be more common for the mature stage to be the Axolotl, with gills and other external features of a larva, instead of the transformed adult.

Local records: Kayenta, 5800 ft., June 10, 1933; Branch of Long Canyon near Ladder House, 1935.

Range: Most of North America from southern Canada to northern Mexico.

WESTERN SPADEFOOT

Scaphiopus hammondi Baird

Most people can tell a toad from a frog by its warty skin and its short legs, but the Spadefoot is not a true toad. It has the same kind of skin and the same proportions, but it lacks the large oval parotid gland on each side of the neck which distinguishes a true toad. It has on the back of each hind foot a sharp, black, horny projection with which to dig itself into the ground. The Great Plains Toad, which occurs in the southwest, also has a spade on its hind foot, but the presence of the parotid glands in back of the head distinguishes it from the Spadefoot.

The latter is from $1\frac{1}{2}$ inches to $2\frac{2}{5}$ inches in length, not counting the hind legs, and its back is covered with small dark brown spots. The ear drum is just behind the eye, and is only about half as large as the eye. The males average slightly larger than the females, and have broader fingers.

The Spadefoot has some of the most interesting habits of any amphibian in this country. The adults are almost never seen except in or near the water just after a heavy rain in summer. The rest of the time they are underground. When a heavy storm comes, in which two or three inches of rain fall in a few hours, the Spadefoots may come out and go into the water to lay their eggs. Occasionally at such times they congregate in great numbers and make a loud chorus, sounding like "onk, onk!" or "wonk, wonk!" This voice is totally different from the shrill trilling of the true toads and can also be distinguished from the more drawn out croak of a frog or the sheep-like baaing of the Canyon Tree Toad. The Spadefoot does not linger in the water day after day like other amphibians, but may come by the hundreds, mate and lay its eggs, and vanish completely in one night. The Spadefoots usually lay their eggs in small clusters of jelly attached to twigs in the water, and they ordinarily come to temporary pools such as could be found after a cloudburst.

The tadpole stage of development goes very rapidly and the young Spadefoots leave the water in about thirty days. The tadpoles are carnivorous, unlike the other frogs and toads. I have seen them eating Fairy Shrimps and other small animals in a muddy pool in Tsegi-at-sosi Canyon. They are greenish black above and silvery gray beneath. The tail is strong and muscular, and the spiracle or breathing pore is on the left side below the center of the body. The legs begin to sprout before the tadpole loses its tail. Around the muddy edge of a drying pool in midsummer one may find young Spadefoots, not over half an inch long and with stumps of tails still showing, hopping away from the water.

Local Records: Laguna Wash, Kayenta, 5800 ft., June 10; Tsegi Canyon, 6500 ft., June 15; head of Long Canyon, 8000 ft., June 29; Rainbow Lodge, 6500 ft., July 5. (Eaton) Water Lily Canyon, mouth of Long Canyon, top of Skeleton Mesa, Navajo County, Arizona. (Cole, 1935). Tadpoles found in following places: Betatakin Canyon, 6850 ft., June 17; Rainbow Lodge, 6500 ft., July 8; Rainbow Bridge Canyon, 3500-4000 ft., July 7; Tsegi-ot-sosi Canyon, 6000 ft., July 20. (Eaton)

Range: The United States west of the Mississippi, from British Columbia to Mexico.

GREAT PLAINS TOAD

Bufo cognatus (Say)

The true toads are much more familiar to everyone than the Spadefoots. This is the least common of three species which have been found in the Navajo Country. The only record so far is of a large female caught by the writer at midnight in the sandy desert between Tuba and Kayenta, Arizona. When picked up and put down again this one took a most absurd position, with its hind legs pushed out backward and its nose down against the ground in front, the body being humped up in the middle. Probably this was an attitude used instinctively for defense.

To recognize the Great Plains Toad, first notice its size and color. The body and head together measure between two and four inches in adults. The color is variably brownish gray, often with a trace of greenish, and there are several dark spots on the back and sides. These are small and numerous in males (about $\frac{1}{8}$ inch in average diameter) and much larger in females ($\frac{1}{4}$ to $\frac{1}{2}$ inch); in both sexes the spots usually are bordered with white. The throat of the male is blackish, that of the female white. Behind the eyes, on each side of the neck, you will see a large oval brown swelling, the parotid gland. This has about the shape of an egg, and is not more than $1\frac{1}{2}$ times as long as it is wide. The shape of these glands helps to tell the Great Plains Toad from the Rocky Mountain Toad, in which they are at least twice as long as wide. Another feature to look for is the hard knobby lump on the snout, extending back between the eyes, where it divides into two strong ridges. This will tell the Great Plains Toad from the Spotted Toad, a commoner species, without the knob and ridges.

Like other toads of the genus Bufo, this one seeks water-holes in the rainy season, sings at night with a high-pitched trill (males only) and lays its eggs in long narrow strings of transparent jelly, fastened to objects in the water. Sometimes there are many hundreds of eggs laid by one female. They hatch in a few days and produce tiny black tadpoles. The time taken to pass through the egg and tadpole stages, and the differences between this and other kinds in the immature period are not yet known.

Local record: Between Tuba and Kayenta, about 5500 ft., midnight, June 9, 1933.

Range: Montana and North Dakota to Texas, Mexico, and southeastern California.

RED-SPOTTED TOAD

Bufo punctatus Baird and Girard

This is the commonest and smallest toad in the Navajo Country, but apparently it is not found in all parts. The adults are from $1 \frac{3}{5}$ to 3 inches long. They are dotted both above and below with black. The warts on the back and head are very small, but each one is usually reddish or orange, surrounded by a small black ring. Apart from its small size and the numerous dots, you can recognize this interesting toad by its comparatively sharp nose, the round parotid glands which are smaller than the eyes, and the absence of a white line on the middle of the back.

On the evenings of July 5 and July 8, 1933, the writer and some friends went out with flashlights at Rainbow Lodge hunting frogs and toads. We had heard a loud chorus of croaking and trilling from some rocky pools near by, for this was just the height of the breeding season. On approaching the water we cautiously shone our lights here and there, along the shore and in the middle of the pool, and every few feet we would see a Red-Spotted Toad or a pair of them, along with Rocky Mountain Toads, Spadefoots, and Canyon Tree Toads. The commonest of all was the small Red-Spotted Toad. Sometimes we would see a male sitting in the water, or floating with his head out, and his throat swelled into a round ball almost half the size of his body. This is the vocal organ of these creatures, and they sing without opening their mouths, simply by passing the air rapidly back and forth from the lungs to the throat pouch, across the vocal chords. This causes a rapid vibration of the pouch, and indeed of the whole animal, so that little ripples continually spread in circles from the singing male.

In mating, the male clasps the female around the waist and they remain together for several hours while the eggs are laid in long strings. Occasionally you will see a second male riding piggy-back on the first, but usually this does not last long because the males resent being seized as if they were females. The eggs are attached to sticks and stones in the water and one toad will sometimes lay several thousand. They look like tiny black dots arranged in a glass filament, but of course the jelly is very soft and may fall apart if you try to lift it from the water. It takes only two or three days for the eggs to hatch, and then the small black tadpoles, with whitish tails, swim around in the shallow water; those that survive the attacks of water insects, suffocation in the stagnant pools, or getting caught on dry land when the water goes down, will transform into toads in from forty to sixty days, still being less than half an inch long.

Local records: Top of Skeleton Mesa, mouth of Long Canyon, Navajo County, Arizona; Rainbow Lodge, San Juan County, Utah. (Cole, 1935). Bright Angel Creek, Grand Canyon, 2300 ft., June 7; Rainbow Lodge, Coconino County, Arizona, 6500 ft., July 5; Rainbow Lodge, 6500 ft., July 8; Rainbow Bridge Trail, 4000-6000 ft., July 6. (Eaton, 1935).

Range: Southwestern states from Texas to southern and Lower California.

ROCKY MOUNTAIN TOAD

Bufo woodhousii Girard

This species you may recognize among the others in the southwest by the thin white line extending all the way down the middle of the back, the large and long parotid glands at the back of the head--each gland being at least twice as long as wide--and by the blunt round nose and the L-shaped ridges between the eyes. This toad attains a larger size than the other two we have described, reaching from $2\frac{1}{2}$ to nearly 5 inches in length. The color above is grayish brown, with several large warts and with black spots, especially on the sides.

Although not very abundant, the Rocky Mountain Toad occurs widely over the Navajo region. We found it in 1933 at Kayenta, Betatakin Canyon, Dogoszhi Canyon and Rainbow Lodge. At Kayenta, June 10, and at Rainbow Lodge, July 5, they were in the water in chorus at night.

Local records: Water Lily canyon, mouth of Long Canyon, Long Canyon near Ladder House, Navajo County, Arizona. (Cole, 1935). Bright Angel Creek, Grand Canyon, 2300 ft., June 7; Kayenta, 5800 ft., June 10, June 13; Betatakin Canyon 6750 ft., June 17; Dogoszhi Biko, 7000 ft., June 23; Rainbow Lodge, 6500 ft., July 5-8. (Eaton, 1935).

Range: Montana south to Texas, west to southeastern California.

CANYON TREE-TOAD

Hyla arenicolor Cope

In the late afternoon of June 7, 1933, the writer was looking for lizards, frogs and toads in the canyon of Bright Angel Creek, which is one of many short branches of the Grand Canyon of the Colorado. As I walked up the canyon among some cottonwoods, with little irrigation ditches here and there, and green grass growing in this welcome oasis, I thought I heard sheep baaing just ahead of me. I kept on, surprised that there should be any in such a place, and presently the sound was all around me, yet there were definitely no sheep in the canyon. So I began to realize that this was something strange, and looked closely on the ground and in the ditches. Here at last I found the source of the sound,--not lambs, although they bleated in exactly the same way, but Canyon Tree-toads.

At Rainbow Lodge in early July they occurred in a very different situation. Here, at about 6500 feet, the south-facing rocky slope is cut by rough stream-beds in which, at the time, only a trickle of water flowed. At dusk I found the Canyon Tree-toads, not only in the water but on the bare boulders and ledges along the streambed. They were alert and very active, making great leaps when approached, and hiding in crevices. The noise was a "baa-a!", as before, but when they croaked from beneath a flat rock the resonance made a veritable roar. I caught some by waiting quietly where I could grab them as they hopped out from their hiding places.

By this time it will be clear that the Canyon Tree-toad has little to do with trees. Its name comes from its close relationship to the other species of *Hyla*, most of which do climb trees. This one is large for a *Hyla*, from $1\frac{1}{6}$ to $2\frac{1}{6}$ inches long, and superficially it might be mistaken for the Red Spotted Toad, because the back is covered with small dark dots and the skin is not perfectly smooth. But look at the long slender hind legs, at the absence of parotid glands, and especially at the little disks on the enlarged tips of all the toes, and you will recognize it for a Tree-toad.

The eggs, unlike those of any other amphibian in the Navajo country, are separate instead of in clusters, and each one has its own capsule of jelly surrounding it. They are laid on leaves in the water as a rule, but may float free. The tadpoles take from 40 to 75 days to develop; but very little is known about the life-history of this species because it is limited to the barren deserts of the southwest.

Local records: Bright Angel Creek, Grand Canyon, 2300 ft., June 7; Rainbow Lodge, Coconino County, Arizona, 6500 ft., July 5 (Eaton, 1935).

Range: Southwestern states from Texas to southern California, Utah and Mexico.

LEOPARD FROG

Rana pipiens Schreber

The Leopard or Meadow Frog, *Rana pipiens*, seems to be rare in the Navajo country. The only localities for it to my knowledge are on the San Juan River at Goodridge, Utah, and at Rainbow Bridge canyon. It probably occurs in small numbers most of the way along the San Juan and Colorado rivers. The center of its population is in the eastern states.

The size is medium, for a frog, up to $4\frac{1}{2}$ inches in length, and the upper parts and legs are smooth greenish brown with large dark spots ringed narrowly with white. There are two light raised lines down the back, about as far apart as the eyes. Beneath, the body and legs are shiny white. Another species, the Nevada Frog, *Rana onca*, may occur in the same places, but it is so much like the Leopard Frog that it may be no more than a race or variation of it, adapted to life in the desert. This kind has smaller spots, and sometimes they are practically lost from the forward part of the body. It is a browner and smaller form, not over 3 inches

long. A good collection of specimens, including tadpoles, from different localities in Arizona, Utah and Nevada would settle the question of relationships by showing whether *Rana oncea* is really distinct or merges into *R. pipiens*.

One may expect to find the Leopard Frogs croaking in still pools along the larger streams. The eggs are laid in big floating masses up to 6 inches in diameter. The tadpoles take two to three months to become full-grown. Anyone who has raised tadpoles from the eggs in the east has probably used this species, for it is the most familiar of all.

Local records: Rainbow Bridge Canyon, below the bridge, 3500 ft., July 7; Goodridge, San Juan County, Utah, 4000 ft., July 27.

Range: Widespread and common over North America, westward to the eastern edge of the Pacific Coast states, and from the extreme north into Mexico.

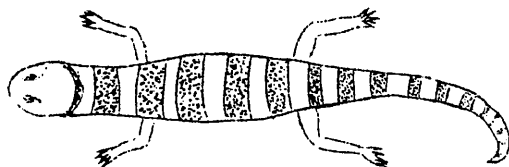
BANDED GECKO

Coleonyx variegatus Baird

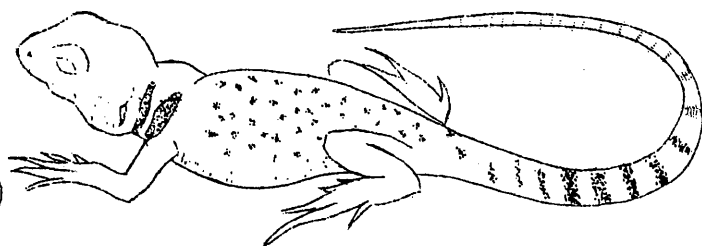
The first lizard in this account of Navajo reptiles is the one that you are least likely to see. If you want to contribute to our knowledge of a queer and secretive animal, go down into the Colorado Canyon or possibly the San Juan Canyon, and start looking for lizards at night with a lantern. Your chances of success are slight and you will find no one who can help you by any first-hand information. But you may come across a little slender lizard walking around on the sand hunting for insects. Its contrasting pattern of black and whitish bands will startle you, and may suggest that it is poisonous. But if you have ventured as far out of your way as this, don't hesitate now. The Gecko is completely harmless. By all means catch the specimen dead or alive, and report it to the custodian of Navajo National Monument or to some naturalist of your acquaintance.

The Banded Gecko belongs to a large family of tropical lizards, and its most northern recorded locality is southwestern Utah. But since the Colorado Canyon makes a pathway from the hot southwestern desert up into northeastern Arizona, and since the animals and plants found there are typical of the Lower Sonoran Zone, we need not be surprised if this species occurs among them.

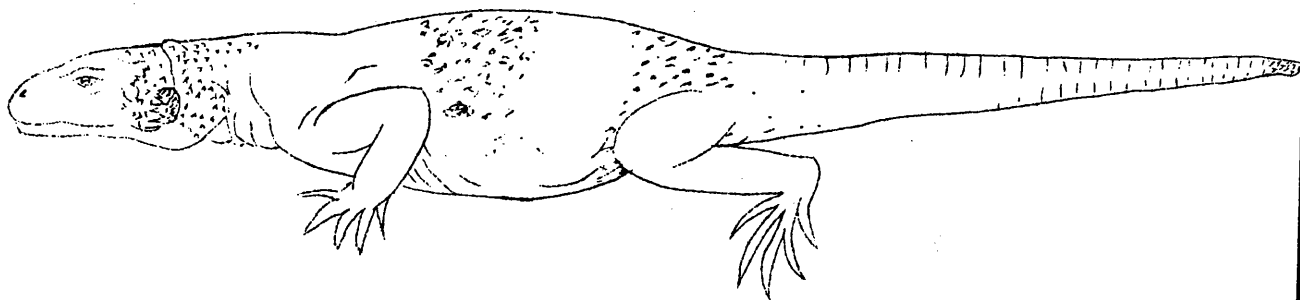
LIZARDS OF THE NAVAJO COUNTRY



Banded Gecko



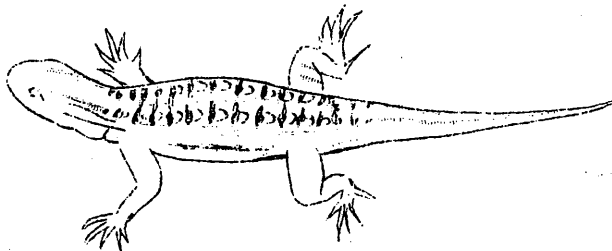
Collared Lizard



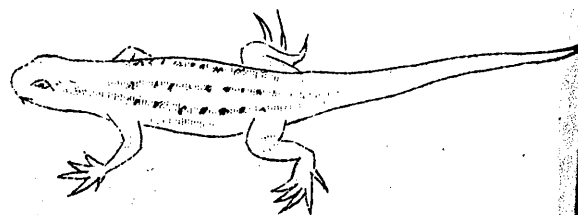
Chuckwalla



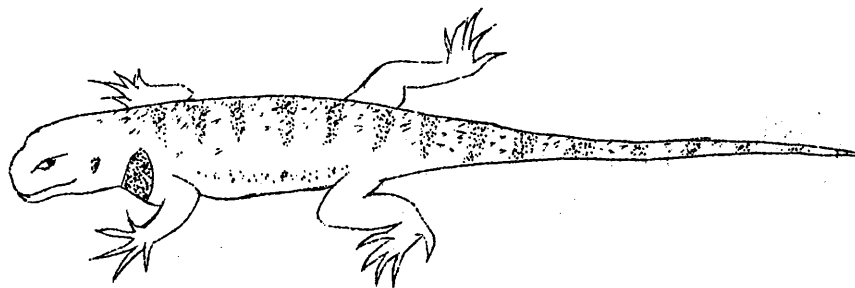
Northern Brown-shouldered Uta



Stejneger's Blue-bellied Lizard

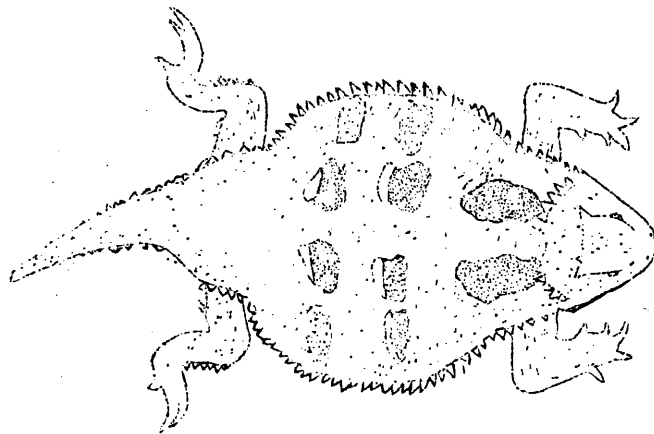


Sagebrush Swift

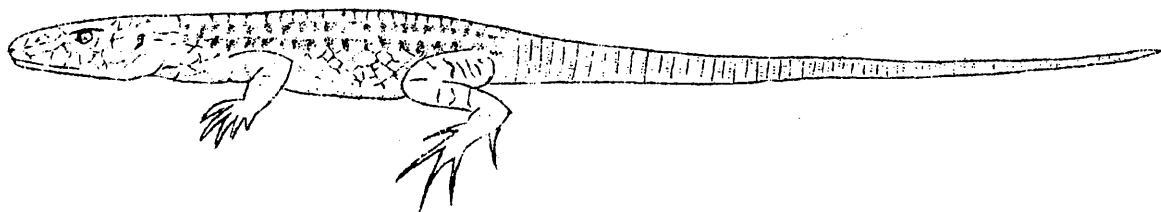


Desert Scaly Lizard

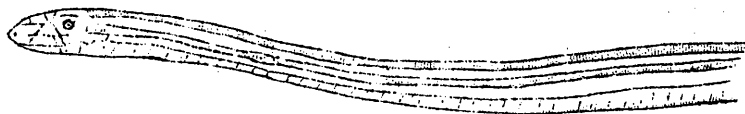
LIZARDS AND SNAKES OF THE NAVAJO COUNTRY



Short-horned Horned Toad



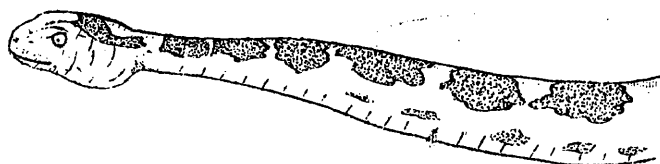
Striped Race-runner



Western Striped Racer



Desert Gopher Snake



Prairie Rattlesnake

The young ones have a far more conspicuous pattern of contrasting bands than the adults, in which the bands tend to break up into blotches. The animal is so seldom found that we can give no more information than this about its habits. Anyone who is interested and lucky enough to find it may add considerably to our knowledge, as well as enjoy the experience of meeting a rare and peculiar species.

Local records: It has not been reported in the Navajo country, but may be there, in the lower part of the Colorado Canyon or San Juan Canyon.

Range: From Texas and southern California south into Mexico.

WESTERN COLLARED LIZARD

Crotaphytus collaris baileyi Stejneger

In contrast to the Gecko, the Collared Lizard is so common and so conspicuous that you can hardly avoid seeing it if you visit the Navajo Country during the summer. If you do not see it yourself, some one will bring it for you to admire. Its bright green, spotted coat, double black collar with reddish or orange spots, and bright, alert looking eyes make it the most beautiful lizard in the southwest. The underparts are white or whitish with a tinge of blue. The collar does not usually come completely around the back of the neck; the two parallel black bands are separated by whitish bands. It is larger than most species, usually ten to fifteen inches in length, with the tail much longer than the body. The legs are long and strong and the head is usually held higher than the body, the neck being narrow and flexible. On account of its green pattern and its ability to change to lighter or darker shades, many people call it a chameleon. This name is also applied to one or two other American lizards, but incorrectly. The true chameleons are a separate family of Old World Lizards which live in trees and have a prehensile tail.

The Western Collared Lizard usually lives in rocky places where it can easily find shelter. It is exceedingly active in hot weather, running and climbing on rocks or even jumping from one perch to another.

When caught, it struggles vigorously and will bite a finger if it is in reach, but the teeth are very small and will not puncture the skin, and the lizard is not poisonous.

The Collared Lizard eats a considerable variety of insects, and may occasionally eat other lizards, small snakes and leaves or flowers. The tongue is short, a characteristic of the Iguana family to which this belongs. It has been observed to lay twenty-one eggs in early August, but both the number and the season probably vary considerably.

Local records: Tuba City, Coconino County, about 5000 ft., June 9; Kayenta, Navajo County, 5800 ft., July 14; Paiute Canyon, 5500-6000 ft., July 2; trail to Rainbow Bridge, San Juan County, Utah, 4000-6000 ft., July 6; Rainbow Lodge, Coconino County, Arizona, 6500 ft., July 8. (Eaton). Monument Valley (Cole).

Range: Southwestern states from Texas to California, southern Idaho and northern Mexico.

LEOPARD LIZARD

Crotaphytus wislizenii Baird and Girard

This is a close relative of the Collared Lizard, but it lacks the collar and is brown with distinct leopard-like spots. Narrow yellowish or whitish lines cross the back and sides. The tail is twice as long as the body, and the total length is a foot or more. This lizard is whitish or yellowish beneath with brown streaks on the throat.

It is not as common as the Collared Lizard, and lives in open valleys and level desert land rather than on rocky, irregular ground. Like the Collared Lizard, it feeds on a variety of insects and frequently on other lizards including some almost as large as itself.

The female is said to develop special coloration during the breeding season, becoming pink or red on the under parts of the body; this is an exception to the general rule that males acquire a decorative color in the breeding season. The eggs are supposedly laid in early summer and hatch in August and September.

Local records: Poncho House, Chinle Canyon, San Juan County, Utah, 4000 ft., July 20 (Eaton); Sagebrush flats below Rainbow Lodge, Coconino County, Arizona, 5800 ft., (Cole).

CHUCKWALLA

Sauromalus obesus Baird

The Chuckwalla or Chuckawalla is a big, homely, dull-colored reptile which lives in the hottest and driest parts of the Navajo Country, namely the San Juan and Colorado Canyons. It reaches the length of a foot and a half and a weight of three or four pounds.

In the summer of 1933 the writer spent a grueling half hour near the bottom of the Grand Canyon trying to entice a Chuckwalla out from under a rock. It was a large male, slaty gray with irregular blackish zones around its body and tail, and with rough knobs on its head. The body appeared swollen between the front and hind legs--hence the scientific name "obesus." This individual ran into a crack under a large boulder and stayed there, just out of reach of a stick. Thinking that strategy might work, I went away and then quietly climbed up on the boulder from behind. I lay looking over the edge, waiting for it to come out so that I could capture it with a loop on the end of a stick, as the reptile collector ordinarily does when he has no other weapon. Repeatedly during the next thirty minutes the Chuckwalla put its nose out and looked around, but refused to come out far enough for me to slip the loop over its neck. It had plenty of patience or else nothing to do, and could afford to stay there indefinitely. But presently the broiling sun became too much for an ardent collector, and I had to retire to a shady place. Within a minute the Chuckwalla was out, running over the rocks and chasing another one of its own kind which I had not seen before. Such are the trials of a big game hunter!

This species is said to blow itself up with air when hiding in a crevice so that no amount of pulling and prying will dislodge it. Another method of defense is to swing its tail violently, striking the person or animal that has picked it up.

The Chuckwalla, like many of the tropical Iguanas, is a vegetarian, and eats the leaves, buds or flowers of desert plants. Some of the southwestern Indians in turn cook and eat Chuckwallas, and there is no reason why an animal of clean habits, living on plants, should not be good food.

The size and abundance of the Chuckwalla make it rather well known, but we have practically no information about its breeding habits; here is another opportunity for someone with plenty of time and no objection to the heat of the desert.

Local records: Rainbow Bridge trail, San Juan County, Utah; Canyons of San Juan and Colorado rivers (Cole, 1935).

Range: From northern Lower California northward through southeastern California and Arizona to southern Nevada and southern Utah.

WESTERN EARLESS LIZARD

Holbrookia maculata approximans Baird

The commonest lizard at Kayenta is this little Holbrookia, which runs about on the sand of the open desert. It is a smooth, clean, and neat looking little reptile, only about four inches in length. The body is grayish and brownish above with a touch of yellow and numerous light spots, while below it is clear white or pale yellow. This species may be recognized in case of doubt by the two or three black bars just behind the front legs on each side; sometimes these bars are bordered with blue.

While most lizards have an ear opening that is easily seen on each side of the head, this species has none; its ears are internal and are probably used more for equilibrium than for hearing.

The throat is usually darker than the rest of the under parts. On the sides of the belly, there is a fold in the skin which makes the body wall more flexible when the lizard breathes.

One can tell the male from the female by its large postanal plates. The females reach a greater size, and in the breeding season their bodies are swollen with eggs. A single female contains usually from four to eight rather large eggs which probably is the number that are laid in a season. But we know nothing more of the habits of Holbrookia than this.

Local records: Kayenta, 5800 ft., June 10, 13 (Eaton).

Range: From southeastern Utah through Arizona and New Mexico to Sonora.

SAGEBRUSH SWIFT

Sceloporus graciosus graciosus Baird and Girard

In almost every part of the Navajo Region, especially the open desert, the Sagebrush Swift is the most abundant reptile. It has been found in elevations from 5800 feet to about 8600. In general the Sagebrush Swift is light or dark wood-brown, with two or four lengthwise stripes of pale gray, bordered with dark brown or black. The pale stripes may be broken up partly or completely into spots. The body and sides are yellowish beneath with a blue speckling under the throat and a blue area on each side of the belly; these are more conspicuous in the males than in the females. The specimens from Kayenta, in open desert country, are smallest and palest, with the most distinct pattern and the smallest dorsal scales. Those from higher elevations, from 6500 to 8000 feet, are usually so nearly uniform dark brown that the stripes show very faintly. The scales on the back are somewhat larger and the lizards themselves are larger. Those that come from the south rim of Grand Canyon, I found to be the darkest of all. They have larger and stronger scales, and barely a trace of stripes. I saw one very dark individual at about 8600 feet on Navajo Mountain, but was unable to collect it.

These Swifts feed on insects, and one may obtain quite a collection of beetles, ants and flies by cutting open the stomachs of a few specimens. The females usually contain seven or eight eggs. Ordinarily this species seems to be limited to level ground, and is not found on the walls of canyons or on logs and boulders, thereby differing from the next one.

Local records: Kaibab Trail, Grand Canyon, Coconino County, Arizona, 6500 ft., June 7; Kayenta, 5800 ft., June 10, June 13; Marsh Pass, 6000 ft., June 14; Tsegi Canyon, 6000-6500 ft., June 17; Betatakin Canyon, 6600-6850 ft., June 17; Tsegi Canyon, 6500 ft., June 18; Dogoszhi, 6500-6800 ft., June 23; Skeleton Mesa, 8000 ft., June 21; Bat Woman Canyon, 7000 ft., June 23; head of Long Canyon, 8000 ft., June 29; Dunn's Trading Post, 6500 ft., July 4; Tsegi-et-sosi Canyon, 6000 ft., 3rd week of July. (Eaton). Water Lily Canyon, Dogoszhi Biko Canyon, Keet Seel Canyon, Long Canyon near mouth, Long Canyon near Ladder House, Bubbling Springs Canyon, mesa top west of Bubbling Springs Canyon, top of Skeleton Mesa, Marsh Pass, Navajo County, Arizona; Navajo Mountain, San Juan County, Utah. Altitude range 6000-10,000 feet. (Cole)

STEJNEGER'S BLUE-BELLIED LIZARD

Sceloporus elongatus Stejneger

This dark brown, medium-sized lizard is one of the three or four commonest species in the Navajo country, but its whole range is limited to northern Arizona, southern Utah, and probably a corner of Colorado. In general this lizard is much like the Sagebrush Swift, but larger and more uniform in color, tending towards the complete loss of a pattern of markings. Ordinarily the pattern consists of four or five lengthwise black streaks on the head and about fifteen irregular or broken black cross bars on the body. The legs are also banded with black. The ground color varies from gray or buff to a dark burnt brown, almost black. The lighter individuals show a much more distinct pattern of markings than the dark ones. Probably a collection from many localities would show a correlation between the altitude or type of environment and the darkness of the lizard, as appears in the Sagebrush Swift. The underparts of the body are white or yellowish with a blue spot on each side of the throat and a larger blue area on each side of the belly. This color is more intense in the males, and in a series of specimens you may easily separate the two sexes by this characteristic.

Stejneger's Blue-bellied Lizard is common among trees, large rocks and on hillsides, unlike its near relative the Sagebrush Swift, which is prevalent in level, treeless and rockless areas. Both species may occur together in the heads of some of the canyons, where the two situations are combined. Females of this species collected in June contained seven or eight large eggs, apparently about to be laid. Like the other Swifts, this one feeds on a great variety of insects.

Local records: Two miles north of Agathla Peak, near Kayenta, 6000 ft., June 12; Marsh Pass, 6000 ft., June 14; Tsegi Canyon, 6000-6500 ft., June 15; Tsegi Canyon, 6500 ft., June 16; Betatakin Canyon, 6800 ft., June 16; Dogoszhi Biko, 6500-6800 ft., June 19; Bat Woman Canyon, 6900 ft., June 23; Dogoszhi Biko, 7000 ft. and head of Dogoszhi Biko, 7500 ft., June 24; Dunn's Trading Post, San Juan County, Utah, 6500 ft., July 4. (Eaton) Water Lily Canyon, Dogoszhi Biko Canyon, Betatakin Canyon, Keet Seel Canyon, Long Canyon near mouth, Long Canyon near Ladder House, mesa top west of Bubbling Springs Canyon, top of Skeleton Mesa, Marsh Pass, Navajo County, Arizona; Rainbow Lodge, Coconino County, Arizona. Altitude range 4200-7500 feet. (Cole)

Range: From Texas to southern California, southward into Lower California and northward into Nevada, western Utah and southern Idaho.

DESERT SCALY LIZARD

Sceloporus magister Hallowell

This is the largest species of Swift to be seen in northeastern Arizona, and it can be found only by going to particular preferred localities. It likes the hotter, drier zone, but is not strictly a desert animal. The specimens collected by the writer near Kayenta, Arizona, were in a scrubby pine forest, where the pines grow among hot ledges and boulders, and the lizards found many places to hide. The three species of *Sceloporus* in the Navajo country show a most interesting variety of habits. The Sagebrush Swift is seldom found either among trees or rocks. Stejneger's Lizard prefers boulders and fallen logs. The Desert Scaly Lizard is a tree climber. Two or three times on one hot June day I climbed pine trees in pursuit of these lizards, but usually they proved more agile than I and had almost the ability of a squirrel to keep the tree trunk between themselves and me. Sometimes by a quick grab around the back of a limb I was able to get my hand on one, but even the trick of snapping off the tail saved one or two. This amputation of the tail, which looks like a horrible accident, is really a special device for self-defense, so that while an animal is distracted by the wriggling tail the lizard makes its escape, and promptly grows a new one. All of the Swifts and a few others, like the Whip-tailed lizards, share this characteristic.

The Desert Scaly Lizard is larger than its two near relatives, reaching eight or ten inches in length, with a thick strong body and scales that seem to bristle up. There is a black band looking like a collar on the lower part of the neck, and the back is crossed by several indistinct dark bands. The usual blue spots on the sides of the abdomen and on the throat will help you to recognize this as a *Sceloporus*.

This species is reported to feed on smaller lizards, especially the common *Uta*.

Local records: Mouth of Bright Angel Creek, Grand Canyon, Arizona, 2300 ft., June 7; Cameron, about 4000 ft., June 8; Agathla Peak, near Kayenta, 6000 ft., June 12. (Eaton) Rainbow Bridge, Rainbow Lodge, and Rainbow Bridge trail (Cole).

Range: From northwestern Lower California to southern Utah, southern and western Nevada, and southern California.

NORTHERN BROWN-SHOULDERED UTA

Uta stansburiana stansburiana Baird and Girard.

There are two species of *Uta* in the Navajo Region, both of them abundant and widespread, and occupying the same situations, so far as we know. This one has by far the widest range of the two, from Mexico to southern Idaho and eastern Oregon and west into the San Joaquin Valley in California. It is a small lizard, usually three to four inches long, and exceedingly variable in color. Specimens found on red sandstone are red, and those on gray or brown rocks are gray or brown accordingly. The scales are very small, giving a smooth beady appearance when you look at the lizard closely. There are two light stripes running lengthwise down the back, and a series of light spots surrounded by darker lines or blotches between them and on the sides. The legs and tail are similarly spotted with light and dark. Looking closely at the lizard you will often see a variety of colors, including blue, green, red and yellow on different scales. The general tone of color in a given individual is that which best matches the surroundings. This species is yellowish white beneath, with a blue or green tinge on the throat and on the sides of the abdomen. It is easy to confuse this with the other *Uta* which occurs in the same places, but if you have a specimen in hand, you will see that the scales on the back are all practically uniform in size, or increase only slightly in the middle. There is no distinct band of larger scales running down the center of the back.

These small lizards occur usually on rocks or ledges, sometimes on bare sand, but never on trees or logs. They eat insects, largely ants or flies and other kinds that may be on the ground where they live. One female caught June 15, 1933, contained two eggs each slightly less than half an inch long. This suggests that the last part of June is the breeding season, and that perhaps only two or three eggs are laid each year by each female. There have been no observations on the life history of these lizards. Anyone who can catch them and keep them in a cage with the proper surroundings and food may learn a good deal that is new.

Local records: Mouth of Bright Angel Creek, 2300 ft., June 7; Kayenta, 6000 ft., June 12; Agathla Peak, near Kayenta, 6000 ft., June 12; Tsegi Canyon, 6000-6500 ft., June 15; Head of Dogoszhi Biko, 7500 ft., June 24; Rainbow Lodge, 6500 ft., July 8; Trail to Rainbow Bridge, 4000-6000 ft., July 6; Tsegi-ot-sosi Canyon, 6000 ft., July 16. (Eaton) Long Canyon, Bubbling Springs Canyon, Marsh Pass, Rainbow Lodge and Rainbow Bridge trail. (Cole)

Range: From Texas to southern California, southward into Mexico and northward into southern Idaho and eastern Oregon.

ARIZONA TREE UTA

Uta ornata symmetrica (Baird)

In this species, unlike the Northern Brown-shouldered Uta, there are two lengthwise series of distinctly enlarged scales along the middle of the back, two rows in each series, and with a central series of two rows of very small scales between them. Except for this, the appearance of the lizard, and its size, habits and abundance, are very similar to the preceding.

The Arizona Tree Uta occurs very widely through Arizona, including many localities in Coconino County and one (Camp Apache) previously reported in Navajo County. We add here many new records in this area. To the north, in Utah, occurs a very closely related species, *Uta levis*, the Cliff Uta, for which the nearest records are Grand Gulch, Natural Bridges and Bluff, San Juan County. (Woodbury, 1931). To distinguish between these two species Van Denburgh (1922) gives the following characters:

"Series of enlarged dorsal scales usually beginning in front of a line connecting insertions of the fore-limbs; dorsolateral tubercles well-developed; elongate tubercles on dorsolateral line of neck. . . . Enlarged dorsals normally in more than one definite row anteriorly.

U. o. symmetrica

"Series of enlarged dorsal scales not continued anterior to insertions of fore-limbs; dorsolateral tubercles much reduced, sometimes nearly absent; no elongate tubercles on dorsolateral line of neck.

U. levis."

The specimens collected by T. H. Eaton in 1933, for which the localities are given below, are definitely symmetrica, not levis, because they agree with the first of these descriptions, and the area is closer to the previous locality records for symmetrica. On the other hand Cole, collecting in 1934 and 1935 in the same place, identified his as levis, and stated (1935) that symmetrica was not present. Aside from the fact that all previous reports of levis are from localities north of the San Juan, and that there is no similar barrier separating our area from known localities for symmetrica, there is a good chance that intermediate specimens occur and that the two are not distinct enough to warrant a complete separation as species. In other words, a northern and a southern race may intergrade along the San Juan.

A pair collected June 14, 1933, at Marsh Pass, just after mating, showed decided differences in color beneath. The male was all dark slaty on the under side except for a pinkish shade around the anal region and a pink band about two scales wide extending out along each thigh. The female was whitish or buffy under the head and in the anal region, extending part way out on the thighs, but shading gradually into dark slaty on the legs, tail and abdomen.

Local records: 2 mi. north of Kayenta, Arizona, 6000 ft., June 10, 1933; Marsh Pass, 6000-6300 ft., June 14; Tsegi Canyon, 6000-6500 ft., June 15; Tsegi Canyon, 1 mi. below Betatakin ruin, 6500 ft., June 16, 18; Skeleton Mesa, 8000 ft., June 21; head of Long Canyon, west rim, 8000 ft., June 29 (Eaton). The records given by Cole (1935) and stated to apply to U. levis, are these: Dogozhi Biko; Long Canyon near mouth; Long Canyon near Ladder House; top of Skeleton Mesa; mesa top west of Bubbling Springs Canyon; Marsh Pass; Rainbow Lodge and trail.

Range: New Mexico through Arizona to southeastern California and northern Sonora.

SHORT-HORNED HORNED TOAD

Phrynosoma douglasii Roll

The Horned Toad is not a toad but a lizard; this is a statement with which most accounts of it must begin. Most people have seen this interesting creature, and have heard queer stories about it, such as the remarkable assertion that it can squirt blood from its eyes. The strangest thing about this story is that it is true. The Horned Toads seem to have very thin capillaries in the rims of their eye sockets, and under great excitement it is possible for them to break these and squirt a few drops of blood several inches. Just why this happens we do not know, since it seems unlikely that any enemy would be frightened away, and it is certain that neither the blood nor anything else about the lizard is harmful.

Another trait unusual among lizards in this country is that the Horned Toads do not lay eggs. Actually there are eggs in the body of the parent, but they hatch before they are laid, and the young lizards are born looking just like small editions of their parents. One day a Horned Toad was found at Kayenta, put in a cigar box and left over night. The next morning the cigar box contained twelve, the young ones being only an inch or less in length.

With a few distinctive habits like this, one would think that any lizard might be satisfied with an ordinary looking body, but the appearance of the Horned Toad is as strange as anything else about it. It is a short-legged, short-tailed, broad, flat animal covered all over with short spines, especially around the edges and on the back of the head. Between the front and hind legs the body is almost circular. The head is rather high and short, with a strong ridge over each eye, and this helps to give the animal an alert, intelligent expression. The general color, as in most lizards, is like that of the surroundings; the Horned Toads prefer sandy places. There are usually six or eight dark blotches, occurring in pairs along the middle of the back. Each of these may have a light band around the edge. Other blotches occur on the sides and on the tail and legs, and with the spiny skin, the animal looks as if it were made of rough gravelly stone. Underneath the body is white or yellowish with smooth, small scales.

The Horned Toad lives on ants and other insects, and may eat great quantities of them at a time. It does not run fast like other lizards, but is protected by its color and by hiding or standing still so that it is invisible. There are two subspecies of Phrynosoma douglasii in northern Arizona; at least there have been two described, ornatissimum and hernandesii. The former is supposed to have shorter spines on the head and a tendency towards greenish on the head and back. The latter has larger head spines, and is redder, especially on the head. Ornatissimum furthermore comes from the open desert, while hernandesii is supposed to occupy higher wooded plateaus. The specimens collected in the Navajo country however, are a complete mixture of these characteristics, and can not be separated in one way without contradicting the separation which would be made on another character. Therefore, the two subspecies evidently overlap in this region, and their characteristics are so mixed that it is impossible to tell one from the other.

Another species, P. platyrhinos Girard, with much longer horns on the back of the head, is reported from the San Juan canyon (Cole).

Local records: Top of Skeleton Mesa, Black Mesa, Mesa top west of Bubbling Springs Canyon, Marsh Pass, Kayenta, Navajo County, Arizona. 6500-8000 ft. (Cole). Tuba City, 5000 ft., June 9; Kayenta, Arizona, 5800 ft., June 10, 13; Dunn's Trading Post, San Juan County, Utah, 6000 ft., July 4 (Eaton).

Range: Phrynosoma douglasii and its subspecies range from Washington, Idaho, and Wyoming south through Oregon, Nevada, Utah and Colorado to Arizona, New Mexico and western Texas.

SPOTTED RACE-RUNNER; WHIP-TAIL

Cnemidophorus sexlineatus sackii Wiegmann

As its name implies, this is a swift, alert species of lizard, which depends on speed for escape. It belongs to a different family from the preceding kinds, having a long slender body, whip-like tail, and a forked tongue which it thrusts out frequently like a snake. The head is slender, and as the lizard glides along the ground with an uneven jerky motion, dragging its tail, the resemblance to a snake is striking. The legs, however, are fully developed, and when startled the whip-tail darts away at a terrific rate, almost too fast to follow with the eye; it goes on its hind legs, with the tail straight out behind for a balance.

The scales are small and granular except for the plates on the head and those on the belly, the latter being in eight distinct lengthwise rows. In all the younger and half-grown specimens the color is brown with four or six narrow lengthwise stripes of yellow, greenish-yellow or even bluish; there may be a faint stripe along the middle of the back. Older specimens have rows of light spots between the stripes, which may join these and make a ladder- or net-like pattern, and occasionally the spots entirely replace the stripes in very old individuals. Thus you may find individuals which look different enough to belong to entirely different species, and this has caused a good deal of confusion in classifying them.

There are two other species of Cnemidophorus for which this might be mistaken. One is C. perplexus, from New Mexico, Texas and Cochise County, Arizona, which has a clear, well-defined middle stripe, and three others on each side. The other is C. tessellatus tessellatus, which is common farther west, and which lacks the patch of enlarged scales on the back of the fore arm which occur in perplexus and sackii. Neither of these other species has been reported authentically from northeastern Arizona, although tessellatus comes as near as Bluff, Utah, and Cole (1935) has it from the vicinity of Rainbow Lodge, a doubtful record.

The Spotted Race-runner has suffered a good deal at the hands of classifiers, through no fault of theirs, however. They have done the best they could. The species is known in most of the older books as Cnemidophorus gularis, but Burt, in 1931, showed that the name which has priority is the one used here.

Local records: Tuba City, 5000 ft., June 9; 2 miles north of Agathla, near Kayenta, 6000 ft., June 12; Kayenta, 5800 ft., June 13; Tsegi Canyon, 6000 ft., June 15, 18; Beta-takin Canyon, 6850 ft., June 17; Dogozhi Biko, 6500-6800 ft. June 19; Skeleton Mesa, 8000 ft., June 21; head of Dogozhi Biko, 7500 ft., June 24; Rainbow Lodge, Coconino County, 6500 ft., July 8; trail to Rainbow Bridge, San Juan County, Utah, 4000-6000 ft., July 6.

Range: From southern Utah through Arizona and New Mexico to western Texas and northern Mexico.

WESTERN STRIPED RACER; WHIP SNAKE

Masticophis (Coluber) taeniatus taeniatus Hallowell

You will know the Racer by its extremely slender body and long tail, which give it the common name of Whip Snake, and by the narrow light yellow stripes along each side. The body is yellow beneath, but the tail is pink or rose color on the under side. The back and head are mostly a smooth brown or slaty color. The snake as a whole, while much more slender than the Gopher Snake, reaches 4 or 5 feet in length and can travel with great rapidity. Frequently it climbs bushes and trees, hunting for birds' nests. It also eats lizards occasionally, but makes up for any damage done in this way by feeding mostly on rodents. The two specimens found by the writer in 1933 were in open sagebrush country, one in Paiute Canyon and the other near Rainbow Lodge.

Local records: Paiute Canyon, 5500-6000 ft., July 2; Rainbow Lodge, 6500 ft., July 8.

Range: From Oregon and Idaho, southward through Nevada, Utah and Colorado into all of the southwestern States from western Texas to eastern California, and southward to central Mexico.

DESERT GOPHER SNAKE

Pituophis catenifer deserticola Stejneger

This is the largest and commonest snake in the high plateaus of northeastern Arizona. It usually reaches a length of 3 or 4 feet. The color pattern of the back and sides is of light brown or yellowish gray bands alternating with dark blotches. The blotches of the middle row are large and regular in shape, broader than the light areas between them, and either square or hexagonal in outline. Along each side of the body are 2 or 3 irregular rows of smaller dark brown spots, alternating with one another, and still more occur on the underside, where the ground color is whitish or yellowish. The Gopher Snake feeds on rodents of many kinds and has considerable economic value. Gopher snakes should be rigidly protected, and there is no excuse for the horror and shuddering that comes over many people when they see a snake of any kind. This, like many other species, is not only completely harmless and of great value as a control of vermin, but makes a most interesting pet.

The eggs of a Gopher snake are laid in a hole in the sand, several inches deep, and are then buried. So far as known there are only 6 or 8 eggs laid in a season.

Local records: Kayenta, 5800 ft., June 10; Marsh Pass, 6000 ft., June 14; Tsegi Canyon, 6000-6500 ft., June 15; Dogoszhi Biko, 7000 ft., June 23 (Eaton). Water Lily Canyon, Long Canyon, Dogozhi Biko, Bubbling Springs Canyon, Kayenta (Cole).

Range: From Utah (and probably Colorado) westward to the Pacific coast, as far north as British Columbia and as far south as Lower California.

WANDERING GARTER SNAKE

Thamnophis ordinoides vagrans (Baird and Girard)

Of all the 20 or more species of Garter Snakes in the United States, this and the following are the only ones which occur in the Navajo country. This is a small, obscurely marked and dull colored snake, not over $2\frac{1}{2}$ feet in length. The general tone of color is dull brown, varying toward yellow or olive, but with two rows of black spots on each side, alternating with one another. Sometimes there is a yellow line along the middle of the back and also along each side, but many specimens do not show these at all.

One immature specimen was found in 1933 at Goodridge on the shore of the San Juan River. Like other Garter snakes this species lives in and near the water, where it feeds on frogs, tadpoles, fish and sometimes on lizards. It is not, however, a true ~~water~~ snake.

Instead of laying eggs this garter snake gives birth to from 8 to 14 young, which are ready to fend for themselves as soon as they are born.

Local records: Goodridge, Utah, 4000 ft., July 28, 1933.

Range: From Washington and Oregon eastward to Idaho, south through Utah, Nevada and eastern California into Arizona.

WHITE-BELLIED GARTER SNAKE

Thamnophis eques Rouss

This beautiful species, which has been reported from Bluff in San Juan County, Utah, has three distinct stripes along the back and sides, orange, yellowish, or greenish in color, against a dark brown or black ground. The underside is white or yellowish white.

This snake is a good swimmer, even in swift current, and apparently always lives along streams. We know practically nothing about its habits, except to infer that it catches frogs, tadpoles, and fish, like its relative the Wandering Garter Snake.

Local records: Bluff, San Juan County, Utah (Woodbury, 1931).

Range: From Central America northward through Mexico, New Mexico and Arizona into western Texas and southern Utah.

PRAIRIE RATTLESNAKE

Crotalus confluentus confluentus Say

We now come to the only poisonous reptile which occurs in northern Arizona. Every one recognizes a rattlesnake by its broad short body, roughly triangular head, and the series of loose horny rattles on the end of the tail. There is no reason to fear being bitten in the Navajo country, because rattlesnakes are scarce on account of the altitude, and it is difficult even for a snake collector to find one. The true Prairie Rattlesnake occurs in the more northern part of the Navajo country, and from

there northward into Utah and east through the Prairie states. A different race, the Arizona Prairie Rattlesnake, recently described by L. M. Klauber, prevails throughout the Hopi country and southward as far as Flagstaff and Holbrook. Both of these have the usual series of large dark blotches along the middle of the back, which vary in shade and in distinctness between individuals. But the more northern race, confluentus, is generally gray in tone and is much larger than nuntius, the southern one, which is reddish.

The eggs hatch before they are laid, and the young are born alive, 4 to 6 or more in number. The normal food of a rattlesnake is gophers and mice, woodrats and other rodents, usually swallowed head first. The rattlesnake is therefore a useful species, and if one can resist a natural temptation to kill it, he is at least helping to control the population of agricultural pests.

At least half a dozen different races of the Prairie Rattlesnake have been described in northeastern Arizona and southern Utah, mostly by Klauber, who is the leading authority on this subject. It seems that the variety of climate and elevation has caused the frequent isolation of groups here and there so that small differences of color, size and number of scales have arisen, and made the classification very confusing. One should not attempt to decide the correct name of a specimen from any southwestern locality without getting the advice of Mr. Klauber at the Museum of Natural History in San Diego, California.

Local records: (c. confluentus) Marsh Pass, and sides of Black Mesa, Navajo County; 6200-7000 ft. (Cole). Marsh Pass, 6000 ft., June 14; Dunn's Trading Post, 2 mi. east of Navajo Mt., 6500 ft., July 4; Alkali Mesa, 10 mi. east of Blanding, Utah, 6000 ft., July 27. (Eaton).

Range: For the entire species, confluentus: Throughout the west, from Canada to Mexico and from Texas to the Pacific coast. For the race c. confluentus: In the northern and eastern Navajo reservation, thence northward and eastward. For the race c. nuntius: Hopi villages, and in general from Williams and the south rim of the Grand Canyon east to the New Mexico line.

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