

XVII. FIELD OBSERVATIONS ON SOME AMPHIBIANS AND REPTILES OF PIMA COUNTY, ARIZONA.*

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The following notes were secured in the field during July and August, 1923, when A. I. Ortenburger was sent to Pima County, Arizona, by The American Museum of Natural History to secure specimens, data, and accessories for a Gila monster habitat group. R. D. Ortenburger was able to go through the interest and generosity of Dr. Howard A. Kelly of Baltimore, Md.

Our permanent camp was near the historic Steam Pump Ranch, 13 miles north of Tucson, just at the foot of the Santa Catalina Mountains. We had easy access to four distinct types of habitat: (1) the greasewood plains just north of Tucson; (2) the willow-poplar association along the banks of the Canada del Oro; (3) the desert floor where mesquite (*Prosopis* sp.) is the dominant form; and (4) the foothills and canyons of the mountains where the dominant forms are the giant sahuara (*Carnegiea gigantea*) and ocotillo (*Fouquieria splendens*). Common to the two last mentioned habitats are cholla (*Opuntia* sp.), cat-claw (*Acacia greggii*), squawwood (*Celtis pallida*), and palo verde (*Parkinsonia* sp.).

While most of our time was spent in the study of the Gila monster, a representative collection of amphibians and reptiles was also made, and many notes were recorded concerning their habits. In many cases, accurate color descriptions were made before the animals were preserved; the color names capitalized are those of Ridgway's *Color Standards and Nomenclature*. The specimens are all in the collection of The American Museum of Natural History at New York City.

Scaphiopus couchii Baird.

On the few occasions when it was possible to collect these spadefoot toads, 132 specimens were taken. These were obtained at four different times. Most of them were taken on two or three successive nights when the animals were breeding in a large muddy roadside puddle of rain water. The breeding habits of this species have been briefly outlined in a previous paper (Ortenburger, A. I., 1925, 19). On every occasion when there was a heavy rain these toads were found in daytime as well as at night. The first date on which

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eggs were found was the night of July 7; this was after the first hard rain. Development from the egg is very rapid; eggs laid about midnight were so far developed by nine o'clock the next morning as to be called small tadpoles. Such rapidity of development is necessary because of the rapid drying up of these temporary mud puddles, as Ruthven (1907,504) has already noted.

Scaphiopus hammondii Baird.

This species of spadefoot toad is by far the commonest amphibian of this region. In all, 633 specimens were taken; this number is no indication of their relative abundance, for during the nights when they were breeding, several times this number could have been taken. This species is about five times as numerous as *S. couchii*, its larger relative. Data secured concerned with the habits of *S. hammondii* have been given in another paper (Ortenburger, A. I., 1925, 19).

Bufo alvarius Girard.

Bufo alvarius is much commoner near the Steam Pump than other species of the genus. With a few exceptions it is found only in the wet places around the cattle watering troughs of the ranches in the mesquite association. The only other place where we found it was in a temporary roadside pond formed by a heavy rain where *Scaphiopus couchii* and *S. hammondii* were breeding. These, however, had very probably come from the watering troughs of the ranch only a few hundred yards distant. While *Bufo alvarius* was found in the pond with the breeding *Scaphiopus*, none of the former were breeding. One specimen was found at dusk at the mouth of a canyon on the dry sandy stream bed, and a few were found at night by the roadside. Practically all were found after dark, but we discovered that their day time hiding place was in hollows under the watering troughs.

This toad is surprisingly active for its size, and its movements when attempting to escape are quite rapid, sometimes necessitating a chase of several yards before capture. The habit of puffing out the body and thus reaching a startlingly large size is interesting. These toads can produce enough pressure so that it requires considerable strength of the fingers to hold them. On several occasions when a few were put into a collecting bag they would swell up so as to render later extraction from the bag quite difficult.

The food of this species consists chiefly of large beetles. Practically all of the stomachs examined were found to be quite full.

Bufo cognatus cognatus (Say).

This form is one of the rarer amphibians of the region. With *Bufo alvarius* it was found almost always in the vicinity of watering troughs. Several were caught during the night of July 7 singing on the bank of a pond where the large series of *Scaphiopus* were taken. None of the *Bufo cognatus* were breeding, however. All were sitting on the muddy bank a few inches from the edge of the pool; none were actually in the water. The song or trill is exceedingly loud and very harsh and tinny, reminding one very much of a Klaxon auto horn. The interval between songs is rather long, nearly a minute, and as in *Bufo americanus* and *Bufo fowleri* the trill is sustained for a considerable length of time. When singing, the pouch is very pointed and arises under the throat and projects forward and upward when fully distended to a point about level with the anterior part of the lower jaw. The call is a chirp somewhat like that of a sleepy little chicken.

Bufo punctatus Baird and Girard.

Only three specimens of this rare little toad were found. All of them were some distance from water, one a half mile away, the other over a mile. The first was found in the open mesquite association, while the others were on the sand among boulders in the dry stream bed about a half mile up a canyon. All were taken at night. The dorsal coloration in life is very striking: the bases of the small sharply pointed warts are bright pink and the body color is olive green.

Coleonyx variegatus (Baird).

Both of our specimens of this little gekko were found in the mesquite association of the desert floor. The first was caught at 11 P. M. slowly walking on the gravel at the side of the road. It made no effort to escape; when a light was flashed into its eyes, it simply stopped and was thus easily picked up. The only other specimen was accidentally unearthed at noon while digging for a large snake (*Masticophis piceus*) which had disappeared down a gopher hole. The *Coleonyx* was dug up about 1½ feet below the surface and about 8 feet from the opening of the mammal burrow. Due probably to the intense heat of the sun it made frantic efforts to dig into the freshly dug earth and was caught only by quick action. It proved to be a female with two eggs which could be plainly seen through the nearly transparent wall of the belly. This specimen was kept alive in a box containing about two inches of sand. There she buried herself about half of the day; the rest of the time she lay on top of the sand, pressed close against the side of

the box. At some time during the night of August 26 one egg was laid on top of the bare sand; no effort was subsequently made by the lizard to cover it. The egg was cream white with fine longitudinal striations. It measured 16 mm. in length and 7 mm. in diameter. The second egg was not laid before the animal was killed and preserved on August 30.

On several occasions when photographs and moving pictures were made, opportunity was presented to note further the reactions of this lizard. It was very evident when the animal was put in the sun that the hot sand really burned the tender feet which were very delicate and almost transparent. Its negative heliotropic reactions were very pronounced. The movements were very quick and nervous; it would run a few inches and then stop and look around. When running the body was held high off of the ground, and the tail curved decidedly upwards. When handled roughly or suddenly picked up, it gave a short weak squeak.

It is interesting to note that this little gekko is commonly mistaken for a young *Gila monster* by the inhabitants of the region.

Crotaphytus collaris baileyi (Stejneger).

Only two specimens of this agile lizard were found, both two or three miles up a canyon. One was taken on a cool rainy morning in a crack about an inch wide between the two halves of a large split boulder, in the sahuara-ocotillo association on top of a ridge. The other specimen was first seen running across a huge boulder near the top of a similar ridge. Both animals showed an unusually bright lemon yellow coloration of the fingers and supraoculars.

Crotaphytus wislizenii Baird and Girard.

Crotaphytus wislizenii in this region is much the commoner of the two species of the genus. In contrast to *C. collaris baileyi*, it was never found in the canyons but always in the mesquite or cholla association. Three of the five specimens were found among the *Acacia*, *Celtis*, and mesquite on the level desert floor, while the other two were collected in quite a different habitat—the low cholla-covered ridges just west of the Canada del Oro. All were shot after they had taken refuge under bushes. These lizards are then quite difficult to see, for to escape detection they usually flatten themselves on the ground where their brown spotted coloration blends with that of the ground surface.

As has been noted by others this species is probably the most vicious lizard of the region, as shown by its actions when handled and also by its food. Two of our specimens had large individuals

of *Callisaurus ventralis ventralis* in their stomachs; a third had eaten a large *Cnemidophorus melanostethus*; the fourth, several Orthoptera; the stomach of the fifth was empty.

Callisaurus ventralis ventralis (Hallowell).

This is one of the common lizards of the region and a fine series of 72 specimens was obtained. Of this number, 38 were found on the sandy washes at the mouths of the canyons; 11 in the cholla association west of the Canada del Oro; 11 in the mesquite association of the plains; 6 in the willow-poplar association along the banks of the Canada del Oro; and 6 a short distance (in no case more than a mile) up the canyons on the sand among the boulders.

Callisaurus is more difficult to collect than the other lizards of the family because of its habit of running 50 feet or more when disturbed. It stops at length with marvelous abruptness, placing its front legs stiffly before it and slides a few inches amid a scattering of stones and pebbles. It is so colored that even the dust and slight shadows thus caused are scarcely sufficient to make it discernible. This species is so difficult to locate after it has run and started that one can approach within two or three feet before seeing it.

Holbrookia elegans Boucourt.

Only two specimens of *H. elegans* were taken and these were collected under a bush in Pima Canyon. Both were females and each contained 6 fairly well developed eggs. Neither stomach contained food.

Holbrookia maculata approximans (Baird).

Holbrookia maculata approximans, like *H. elegans*, is much less common than *H. texana*. Only two specimens of this form were taken. Both were found on the tops of huge boulders, some little distance up a canyon. The general behavior seems to be very much like that of *H. texana*.

Holbrookia texana (Troschel).

This rock-loving form is the dominant one of its genus in the Santa Catalina Mountains. It was found only in the canyons, usually some distance from the mouth. Of the 21 specimens collected, 16 were found resting on boulders and all the others were on the sand among the stones. When resting they stand with the front legs stiffly before them and slightly spread. They have the familiar habit of quickly and jerkily raising and lowering their bodies. When pursued this beautifully colored lizard never seeks cover but relies

on speed entirely. Like *Callisaurus v. ventralis*, so closely does the coloration of these lizards resemble their surroundings that they will run a considerable distance at great speed, stop suddenly, and disappear from view although the watcher may know within a few feet where they have stopped.

Uta ornata symmetrica (Baird).

This is one of the common lizards of the region, found almost everywhere except on the ground. More than 70 specimens were caught; of these, 35 were on the large boulders in the canyons; 21 were on the corral fences which are made of logs and branches; 10 were on the main trunks of mesquite trees; 2 were on the wooden parts of buildings; and one each on palo verde and dead cholla. When these lizards are on trunks of trees they are usually 8 to 12 feet or more from the ground. Only one was found on the ground, and when pursued it immediately ran up a mesquite tree and was finally caught far out on a limb.

These small lizards are extremely active and are often difficult to capture even when shot. They display uncanny ability when pursued to keep just on the other side of some object, for example a boulder or the logs of a corral fence. They are active until just after dark. As Camp (1916,525) has noted (for another species of *Uta*) they are fond of lying flat on top of a boulder or dead wood and basking in the sun. However, at mid-day even these lizards seek the shade. *Uta ornata symmetrica* is often seen to raise its body with the well known quick jerky motion so common with such forms as *Callisaurus* and *Holbrookia*, but the interval between these jerks is greater than in *Holbrookia texana* for example.

The variation in color in this species is remarkable, ranging from very light gray to very dark brown gray. They were almost always colored so as to be quite inconspicuous in their immediate surroundings. For example, those found on the light colored granite boulders in the canyons were almost invariably a correspondingly light gray, while those on the dark weathered logs of the corral fences were dark gray or dull black. Only a very few exceptions to this relation were observed.

The *Utas* living in the corral fences undoubtedly feed almost entirely on the house flies attracted by the cattle. In a few instances the lizards were observed to catch the flies. When shipped alive to New York the *Utas* were kept alive for months on house flies and meal worms.

Several females contained eggs; the number in each averaged about nine.

Uta stansburiana stejnegeri Schmidt.

This form is not nearly so common as the preceding one, *Uta ornata symmetrica*; actually less than half as many specimens were taken. If we may trust a generalization drawn from so few specimens it would seem that this is a saxicolous form, for of the 32 specimens collected, all but 2 were found on rocks. One was on the trunk of a mesquite tree growing on a boulder strewn hillside, and the other on a corral fence. As Ruthven (1915, 951) has observed, the mere fact that a form is saxicolous does not mean that it may not cross the soil between rock-covered areas. Such wanderings from rocky habitats must be very uncommon in this species, as no specimens were seen on the sand-gravel floor of the desert, and no others were seen on the corral fences except the one caught. In practically all cases the two species of *Uta* were on rocks in the same general habitat, but in no case were both species taken on the same boulder at the same time.

Sceloporus clarkii Baird and Girard.

Several of these large lizards were taken. In no case were they found on the desert floor; all of them were at least a mile up one of the several canyons of the mountains. All except one were seen on the sides of large boulders. In some cases especially in the cool early morning they were found in the cracks formed by exfoliation of the huge boulders, the stone evidently retaining some of the heat of the sunshine of the day before. In only one case was a specimen seen on vegetation, and then it was on the trunk of a dead palo verde tree, head down and about one foot from the ground.

Sceloporus magister Hallowell.

Sceloporus magister is much the commoner of the two forms of *Sceloporus* which occur in this region. Its distribution is apparently as distinct from that of *S. clarkii* as is the distribution of *C. melanostethus* from that of *C. g. gularis*. *S. clarkii* was found only in the canyons at least a mile from the mouth, while *S. magister* was found only on the desert floor or on the tops of the small ridges just to the west of the Canada del Oro. Moreover it does not seem to be found at all commonly on boulders as is *S. clarkii*. With a single exception all the specimens of *S. magister* were found on vegetation. Most of them were on the trunks of large standing dead chollas; several, among and beneath the piles of dead cholla branches; many, on trunks of large cat-claw bushes; and one, on the corral fence made of logs. They commonly take refuge in the mammal nests which are in the piles of dead cholla branches.

Phrynosoma solare Gray.

Twenty-six specimens of this lizard were collected. Twenty-one of these were obtained on sandy washes in the greasewood plains about 5 miles north of Tucson. Four were in the mesquite association near the Steam Pump. One, however, was taken near the highest point on the road between Oracle and Mammoth. While the coloration and general appearance of this latter specimen were quite noticeably different from that of the other specimens it also must be referred to *P. solare*. In the mesquite association these lizards are most frequently found lying quietly on the ground under a clump of nopal (*Opuntia* sp.); if disturbed upon the open sand they run to the nopal clumps if at all possible.

Heloderma suspectum Cope.

We are very fortunate in being able to secure 16 specimens of the Gila monster. We did not find it confined to any one habitat or association. Most of them were in the sahuara-ocotillo association, either in the canyons or on the ridges between them; several were found on the level desert floor in the mesquite association; and one was in the irrigated region northwest of Tucson at the edge of an alfalfa field.

As has been briefly mentioned in another paper (Ortenburger, R. D., 1925, 22) we found them at all times of the day although they were most often taken at night. This thick bodied clumsy lizard is usually very slow in its movements, its usual gait being about that of a very small child. This of course is because of its very short thick legs. It does display surprising speed and dexterity in lateral movements of the head and the bending of the body in the same direction. The bite is as quick and unexpected as the movements of the anterior part of the body. In one case when an attempt was made to hold a Gila monster down with the barrel of a pistol, the animal snapped and bit the barrel with such force as to break several of its teeth. Even this did not cause the animal to relinquish its bulldog hold. These lizards are powerful diggers. Several individuals which we kept in captivity for many weeks spent entire nights digging with slow persistence in the gravel which formed the bottom of their cage. Several times when individuals were turned loose for the purpose of taking moving pictures, they immediately turned toward boulders in the vicinity and attempted to burrow under them, digging with the same slow but powerful strokes that were used when digging in their cages. It is probable that most of them do not dig their own holes as in three or four instances individuals were seen which could not be captured because they ran with their

lumbering gait toward mammal holes located under the large boulders. One of the copulating pair escaped in this way and three others would have escaped in a similar manner but for quick work with a 22 caliber rifle. The copulating pair was seen just after dark July 14, about a mile and a half up one of the canyons, and they were out in a hard shower. This would indicate that they do not mind the rain. That they like water was further borne out by the actions of individuals kept in captivity. The cage in which they were kept was of good size with a flat water pan in one corner in the wet sand; under this pan were invariably found as many of the animals as could find a place, and most of the others were then in the water pan.

No difficulty was experienced in feeding the captive individuals. They eagerly ate hens' eggs, but it was found that they apparently liked them unbroken better than broken. They were at first fed eggs which had been broken into a shallow pan. These they would lap up slowly with their thick tongues, usually spilling most of it over the edge of the pan. When an unbroken egg was placed in the cage in the evening, it would always be broken by morning and the inside left perfectly clean. In all cases the side of the egg was the part broken and not the end and in eating the contents none was wasted.

These animals were relatively good natured among themselves and with other animals in the same cage. In no case did they bite or attempt to bite the other animals (*Uta* and *Scaphiopus*) which were kept in with them and which would climb over the heads of the Gilas a great many times a day. They did occasionally bite each other, but only in a half-hearted fashion, usually merely snapping a leg of the offending individual and then releasing the hold after a few minutes. When teased they became very aggressive and vicious, hissing and blowing and snapping very suddenly.

Unfortunately most of the stomachs examined were entirely empty. Of those which did have some food remnants, one stomach contained a foot and part of the leg of a large *Cnemidophorus gularis*; another contained unidentified ants; and still another, small Diptera and bits of the common grass of their habitat (*Bouteloua aristidoides*). This grass was probably eaten accidentally along with the other food. Mr. E. H. George, an entirely trustworthy observer, reported the following fact concerning the food habits of this lizard. A Gila monster found along the road was thrown into the body of a steel road truck where, probably because of the unnatural heat and motion, the contents of the stomach were

regurgitated. He identified fragments and whole eggs of Gambel's partridge, a bird which nests on the ground.

Cnemidophorus gularis gularis (Baird and Girard).

This is the form which occurs well up in the canyons and on the foothills of the Catalinas. It was found by us as high as the vertical cliff on the west side of Pusch Ridge directly opposite the Steam Pump. It is reported (Van Denburgh 1922, 503) from Mt. Lemmon, in the Catalina Mountains, altitude 8500 feet. We found it to be almost as common on the tops of the foothills as down in the canyon. In very few cases was this species found as far down as the wide sandy washes at the mouths of the canyons where it is replaced by *C. melanostethus*. In general the local ranges of these two forms do not overlap. *C. gularis* is not nearly so common a form even in its typical habitat as is *C. melanostethus*, although 118 specimens of the former were taken and easily several times this number could have been taken if an effort had been made.

C. gularis is in general much slower in all of its movements than is *C. melanostethus*. When it runs it is only for a few feet at a time and at each halt it turns to look around thus rendering it very easy to capture. Sometimes even when closely pursued its gait is only a slow walk. It never darts away swiftly as does *C. melanostethus*.

Although this species is quite at home upon the stones and boulders, it probably feeds exclusively upon the ground. More than once this whip-tail was seen on the sand among the boulders, eating. Its actions reminded us very much of a chicken, except that the fore feet were used for scratching rather than the hind feet. It usually made two or three scratches with one foot, backwards and laterally, and then two or three with the other foot. They were in no case observed to make alternate single strokes. After every few scratches they would stop and pick up some food by making very rapid neck movements, again reminding one of a chicken. They showed very little fear, for as this process was observed for some minutes in several instances, they would occasionally turn the head or the whole body and look at us, and then continue eating.

No eggs were found although a special search was made for them. One evening (July 15) at 6 P. M. a female containing well developed eggs was dug out of a freshly made hole about $1\frac{1}{2}$ inches in diameter and one foot deep. This hole had been dug in the clean sand in a dry stream bed about a half mile up a canyon. There was little doubt that the female caught had dug the hole herself and possibly intended to deposit her eggs there.

Cnemidophorus melanostethus Cope.

This is by far the commonest lizard of the region, for although we secured 206 specimens in all, one could easily have collected 50 or more any day. It is the dominant lizard of the mesquite association of the desert floor and also on the low cholla-covered ridges west of the Canada del Oro. This form never occurred up in the canyons more than half a mile.

In contrast to *C. g. gularis* this lizard runs very swiftly. When disturbed it seldom runs less than 15 or 20 feet and often several times this distance, particularly when vegetation is scanty. Almost always they run to the clumps of weeds for protection hiding on the opposite side from the pursuer.

It forms at least part of the food of several other reptiles of the region—for example *Masticophis flagellum frenatus*, *Crotalus tigris* and *Crotaphytus wislizenii*.

Cnemidophorus tessellatus tessellatus (Say).

Of the three species of *Cnemidophorus* found this was the least common. Only three specimens were taken and all of these were found some distance up the canyons in the foothills of the Santa Catalinas, that is, from 2 to 3 miles from the desert floor. One was found under a dense cat-claw bush near the dry stream bed, another running across the sand of the stream bed, and the third in a similar place in Pima Canyon.

Masticophis flagellum frenatus (Stejneger).

Four individuals of this species were collected. All of these were taken in the vicinity of the Steam Pump which is located about 13½ miles north of Tucson. All of these were found in the mesquite association on the level desert floor and none in the canyons of the nearby Santa Catalina Mountains. As Camp (1916, 509) has said, they are the swiftest of all the desert snakes. One of the specimens caught was found under a large clump of *Celtis pallida* (squaw-wood); another was seen under a small bush eating a lizard (*Cnemidophorus melanostethus*) and this individual was later found to have in its stomach three other lizards of the same species; the third specimen caught had one *Uta ornata symmetrica* in its stomach; and the fourth, surprised while under a mesquite, very quickly raised the anterior half of its body into the air and climbed very rapidly into the upper part of the bush. These rather brightly colored snakes are very difficult to see when in the bushes, as, once they reach a desired position they remain perfectly quiet and are then difficult to distinguish from the numerous

branches. It is interesting to note that all of the specimens seen took to the bushes when disturbed, as they are excellent and extremely rapid climbers. None of the several individuals of *M. piceus* which we saw did this.

The following is an accurate description of a typical living specimen (A. M. N. H. Field No. A. I. O. 0291) of the so-called "red-phase" collected near the base of the Santa Catalina Mountains: Top of head a light Rood's Brown, mottled especially on the superciliaries and anterior head plates with black; dorsal scales above scutes 1-15 black with a few brown scales scattered through them; posterior to the black neck, dorsal scales in the dark crossbands Cameo Brown with lateral edges of each scale Pinkish Vinaceous; scales in the lighter crossbands entirely Pinkish Vinaceous, with a darker longitudinal stripe through the median portion of each scale which is Sepia. There are no crossbands on the posterior two-thirds of the body; in this region the scales are colored as follows: Anterior fifth and lateral margin of each side of the anterior half of the scale, Eugenia Red, central portion Sepia, posterior fourth Bone Brown. The anterior half of the belly is cream, the posterior half Deep Vinaceous, this latter changing gradually on the tail to Jasper Red. There is present on the anterior part of the belly a parallel series of blotches which are black anteriorly but change to a red-brown and gradually become less and less distinct until at about scute 40 they disappear. The remainder of the belly and the ventral surface of the tail is immaculate.

Masticophis piceus (Cope).

Seven individuals of this interesting snake were collected during the summer. This form, of which formerly only four specimens were known in collections from this general region, was found to be much more common than *M. frenatus*. As has been mentioned above only four specimens of this last mentioned species were collected and no others were even seen. In the case of *piceus*, however, seven were caught and at least twelve more were seen, which escaped in spite of the fact that we always carried loaded collecting pistols and were on the look out for them. It is without doubt much more common than the red whipsnake. While it occupies the same general habitat, namely, the mesquite association, its habits are very different in several respects. As was pointed out in the discussion of *M. frenatus*, it is typically at home in the bushes, primarily *Celtis pallida* and *Acacia greggii*, while only two of the several individuals of *piceus* seen were in bushes, and in no case did one take to a bush when disturbed. *Piceus* will, invariably

and with no hesitation, when pursued, make for a hole or small burrow which it seems to know the location of with great exactness. Moreover (as was the case with a lizard of the same general habitat—(*Cnemidophorus melanostethus*), each individual seems to have its own hole which it will rapidly go toward when disturbed, even though it must come toward the pursuer and almost to his feet to enter it. The speed with which these black whipsnakes travel is remarkable. Forms which I had formerly considered as fast, such as the blue racer, I have found to be slow in comparison. In one case, for example, on a poor surface, the bare gravel desert floor, an individual that I was pursuing easily gained distance between us while I was running as fast as I could on level ground. The sound made by these snakes in speeding across the desert floor also gives an idea of their speed, as when traveling across such a surface the sound produced reminds one of that made by scratching a small sharp stick of wood across a window screen. It is further interesting to point out that there is no slackening of speed when the hole sought is approached, the snake plunging into it at full speed, disappearing with astonishing rapidity. Unlike some snakes of the Arizona desert region the black whipsnake does not seem to like the rain, as only one was ever seen while it was raining and this one was closely bunched together in a small dry spot under a mesquite tree. Most of the specimens seen were out in the morning between 7 and 11. During the hot part of the day they seek the shelter of their holes, which are those made by the small mammals of the desert. They come out again in the evening as late as 7:30 P. M. They, like some other of the desert animals are troubled by the cacti. Spines were found on the bellies of several specimens and in one, four long cholla spines (*Opuntia* sp.) were noticed within a space of two inches on its belly.

All of the specimens seen were either in the mesquite or the cholla association. None was found in the canyons, but they are common on the sandy washes at the canyon mouths.

A specimen of this species was the longest snake taken during the entire summer, measuring 5 feet 8 inches. This is also the record for the species as far as data are available.

A large individual was found one morning with only his head and neck out of a hole and with a good sized rattler (*C. atrox*) half swallowed. The rattler was quickly pulled out of the black whipsnake's mouth and preserved, but the whipsnake escaped. Thus we know that this species eats rattlers and probably other snakes of this region; an examination of the stomachs showed that they like-

wise commonly eat lizards, among them *Crotaphytus wislizenii* and *Uta ornata symmetrica*.

Ruthven has published (1907, 574) a very good detailed color description from life so our data need not be repeated here. We noted though that *M. piceus* is a much stouter and larger snake than *M. frenatus*, which occurs in the same general region.

With one exception, the snakes which we saw and collected there were coral or Old Rose below anteriorly and deep rose posteriorly and under the tail. The single exception was black beneath on the anterior third of the body. The usual coloration of the belly and ventral surface of the tail differs from that of California specimens, which are cream or yellowish in color on these parts. Our observations for the Arizona specimens collected in the same region agree with Ruthven's (1907, 574) description except that our specimens showed Old Rose coloration below rather than the orange he mentions. The posterior ventral Old Rose coloration is of frequent occurrence throughout the genus.

Masticophis semilineatus (Cope).

If we may base a conclusion on the literature and data derived from the three specimens which were collected it seems quite evident that *M. semilineatus* is a mountain form, and to a considerable extent an arboreal one.

The three specimens referred to this species which were taken near Tucson were all found in the same general habitat, the sahuara-ocotillo association. We found them in bushes, either *Celtis pallida* or *Acacia greggii* and they were some little distance up the canyons. In no case did we see an individual until after our attention had been called to it by the sound it made when moving through the bush. In one case even after we had located the snake in a small *Celtis* bush only 6 feet high, 4 feet long, and about 3 feet wide, we lost sight of it twice while it was still in the bush before we captured it. Two of the specimens, after being disturbed in the bushes, took refuge in loose piles of rock and remained at the very bottom of the piles until pulled out after removing the rocks. When handled they were extremely vicious and struck repeatedly, much like *M. ruthveni*. Having obtained a hold with their teeth, they would form a loop with their neck and then give a vigorous jerk.

Other reptiles which are found associated with these specimens of *semilineatus* are: *C. gularis gularis*, *C. tessellatus*, *Callisaurus v. ventralis*, *Heloderma suspectum*, *Sceloporus clarkii*, *Holbrookia texana*, *Crotalus molossus*, *Thamnophis eques*, *Crotaphytus c. baileyi*.

The following is a color description based on notes taken in the field from the three specimens while they were alive. Anterior third of dorsal surface of body a slaty blue (Dark Green Blue Gray), changing to yellow gray green (Grayish Olive) on middle third, and then to pearl gray (Olive Gray) which extends to the end of the tail, becoming progressively lighter; skin of same color as dorsal scales, becoming a very little lighter laterally; belly faintly yellow on first fifteen scutes changing to a distinct light yellow (Baryta Yellow) posteriorly which is retained to within 25 or 30 scutes of the anal plate; posterior part of belly and ventral surface of tail blue-white; scutes, particularly the lateral portions, and scales, especially rows 1 and 2, sparsely dotted with small brown or very dark blue gray dotlets, which become progressively fewer dorsally and disappear on the posterior portion of the tail.

The black upper edge of the last supralabial is continued posteriorly, forming on the neck a single lateral black line which above scute 5 divides to form another stripe on row 4; above scute 10 the original stripe divides again, forming the stripes on rows 2 and 3. There are dark stripes, then, on rows 2, 3, and 4 on the anterior third of the body proper. This portion of the body may be described in detail as follows, progressing from the scutes to the mid-dorsal scale row: Each scute marked with an indefinite brown-gray blotch just posterior to the lateral angle; a brown-black blotch present on the lower fourth or fifth of each scale in row 1, remainder of scale white or faint yellow; lower half of scale row 2 white or cream, third quarter black, dorsal quarter dark gray; lower quarter of scale row 3 dark gray, second quarter black, upper half white or cream; lower half of scale row 4 white or yellowish, upper half black; row 5 and those dorsal to it gray-blue.

On the middle third of the body there is a light brown-green stripe on each of the scale rows 1, 2, 3, and 4. The stripe on the first scale row is indicated, at about the middle of the anterior third of the body by the laying down of a brownish-green pigment in the anterior end of the scales of the first row. At that portion of the body where there is a change in dorsal color from the anterior dark blue color to the yellow-green of the middle third, this pigmentation of the first row extends throughout the length of the scale and occupies the median quarter of it. The black pigment on rows 1, 2, and 3 which is present anteriorly, gradually is lost on the median third of the body, and the stripes become a light gray-brown. The very noticeable white stripe which occupies adjacent halves of rows 3 and 4 anteriorly, becomes a green-yellow

and thus, due to a lack of contrast in colors, is not nearly so distinct as it is on the anterior third of the body.

The coloration of the posterior third of the body is as follows: Only the first, second, and fourth stripes are at all obvious. The third stripe is lost because of the loss of a scale row at a point approximately at the color change from the middle to the posterior third of the body. The scales on the posterior third of the body are in general merely different shades of the same color of gray, but the lateral *light* stripe on rows 3 and 4 is still apparent.

The top of the head is the same color as the anterior dorsal region of the body, with yellowish blotches on the prefrontals and internasals; chin shields and infralabials blue-white; post-oculars with blue-white centers edged with black; iris orange-gold, pupils slightly longitudinally elliptic, the curve of smaller radius being anterior; upper preoculars mostly cream-white, but upper third or quarter of scale a light gray and anterior edge black; lower preocular white, dotted very minutely with gray; loreal white, with posterior and lower edges and posterior half of upper edge black; anterior nasal white, with narrow black edges above and below; rostral mostly white, with upper posterior angles yellowish-gray; internasals also yellow-gray; supralabials white, at least the posterior with black upper edge.

Phyllorhynchus browni Stejneger.

One specimen of this rare little snake was taken about nine o'clock one evening in the mesquite association near the mouth of one of the canyons. It had just crawled out from under a small clump of low weeds and was proceeding in a leisurely manner. It was kept in captivity for some time and remained buried under the sand practically all the time except at night. In pattern and in structural characters it agreed quite closely with descriptions.

Arizona elegans Kennicott.

A single specimen was found at 10:00 P. M. It was first seen at the edge of a temporary mud puddle at the side of the Florence road $4\frac{1}{2}$ miles north of Tucson. When approached it took to the water and swam very well, seeming entirely at home in the water. It was kept alive for some time and on several occasions when temporarily liberated near water always went to the water and swam out in it in an attempt to escape. It did not seem to resent frequent handling and never offered to bite. The color of this specimen, about one foot in length, may be described as follows: General ground color of the two or three mid-dorsal scale rows Tilleul Buff, that of rows 4 to 11 Sorghum Brown (with edges of scales

white); rows 1 to 3 and scutes blue-white; dorsal blotches on anterior three-quarters of body Mummy Brown narrowly edged with Fuscous Black, this Mummy Brown changing on posterior blotches to Clay Color; sides of body on scale rows 3, 4, and 5 sparsely speckled with Bone Brown; small lateral blotches of Mummy Brown also present which lack the black outline present in the dorsal blotches; skin between dorsal scales Mauve; general color of top of head and temporals Drab; markings on top of head Bone Brown as are also a stripe from eye to angle of mouth and line between fourth and fifth supralabials; an indefinite ventral light stripe of Pale Wistaria Blue occupying middle quarter of scutes.

Pituophis catenifer rutilus Van Denburgh.

Eight specimens of this bull snake were collected. They were found only in the lower flats in the mesquite association. In almost every case they were taken in the evening, one as late as 10:30 P. M. These specimens were found in the same habitat and at the same time of day as *Crotalus a. atrox*. They show little fear when approached. One large male advanced with head held high hissing loudly at the collector.

Thamnophis eques (Reuss).

This garter snake is of very general distribution in the country near Tucson. We found it on the low flats in the mesquite association, in the canyons, and once among the rocks at the top of the talus slope at the base of the sheer wall of the Pusch Ridge of the Santa Catalina Mountains. The snakes were found at all times of the day and did not seem to retire until well after dark. In the canyons when alarmed they seek protection under boulders and show unusual speed for a snake of this genus.

Thamnophis marcianus (Baird and Girard).

Only two specimens of this species were found, one near the road 5 miles north of Tucson and the other in the mesquite association near the Steam Pump. The last had a young specimen of *Scaphiopus hammondi* in its stomach.

Micrurus euryxanthus (Kennicott).

A single specimen, given to us by Professor C. T. Vorhies of the University of Arizona, was added to the collection. This came from the greasewood plains just north of the city limits of Tucson.

Crotalus atrox atrox (Baird and Girard).

The desert diamond rattlesnake is by far the commonest snake of the region. While only thirty specimens were actually taken, if systematic collecting for these snakes had been done at the proper

time of day, five or six a day could easily have been found and these within a radius of two miles of camp.

C. a. atrox is confined to the plains and flat washes in the mesquite association; it is replaced by *C. molossus* in the canyons and on the foothills. *C. a. atrox* frequents the holes of small mammals which are so numerous on the desert floor. In these cool refuges they spend the greater part of the day coming out just at dusk or occasionally in the early morning. Most of our specimens were collected between 6:30 and 7:30 in the evening. A great deal of night collecting was done and yet none of this species was found out after dark. The few found in the morning were observed in each case retiring to their holes while those collected in the evening were seen either coming out from their holes or stretched at full length near them.

The progress of leaving the hole was observed in one instance. When first seen the snake was already about half way out of the burrow, and it took fully fifteen minutes before it had emerged entirely. Its actions were very slow and deliberate. It felt repeatedly with its tongue all objects which were near enough to reach. After doing this each time it would lie perfectly motionless for several seconds or a minute or two before it proceeded. It yawned several times, and finally slowly crawled under the overhanging bush and lay quiet.

The rattlers are surprisingly good-natured and even-tempered. In general they do not resent movements within a foot or two of them, merely following the moving object with their eyes. Of the thirty specimens only four were found coiled and only one rattled before being shot or otherwise disturbed. In all cases except one the snakes attempted to retreat after being shot. These rattlers do not seem to mind the rain as on two different occasions we found them fully exposed to a hard beating rain. One of them was lying stretched at full length, all but the end of its tail out of a hole, the other coiled out on the open sand several feet from even such protection as a bush might afford. When the ground is wet *C. a. atrox* is very easily seen due to the contrasting colors but in dry weather it is usually very difficult to detect because of similarity of coloration to the sand.

Both the pale gray and the reddish brown form were taken. The gray form is well enough known, but as the olive brown form is less familiar, the following color description of the latter recorded in the field is given: Ground color or middle part of dorsal surface Grayish Olive; dark dorsal blotches Fuscous, central scales

dark Buffy Brown, light outlines of these blotches Dark Olive Buff, these colors all becoming darker anteriorly and lighter posteriorly; belly Naphthalene Yellow.

Crotalus molossus Baird and Girard.

This species is much less common than *C. atrox atrox* as is shown by the fact that only four were collected. It is found in an entirely different habitat. All were seen in the canyons some distance from the mouth. Two of the four were lying stretched out on top of boulders sunning themselves early in the morning. The other two were found under bushes at the same time of day. Only one of the four rattled when approached.

Crotalus tigris Kennicott.

A single specimen of the tiger rattlesnake was obtained at the mouth of a canyon about 8:00 A. M. It was seen slowly crawling under a cat-claw bush with the tail of a lizard (*Cnemidophorus melanostethus*) protruding from its mouth. This fact indicates that the rattler must have had to display much more than its usual speed to catch such a swift lizard.

The difference between the coloration of this form and that of the other rattlers of the region is very striking. A field description of the coloration of *C. tigris* follows: Sides of the body salmon on first two scale rows, covered more or less with dark gray or dark brown dots; this coloration changing on rows 3 to 6 to a light blue gray which is retained on the dorsal surface; mid-dorsal three or four rows with anterior edges of scales salmon buff (in some cases keels also); dorsal and lateral surfaces of body marked with brown blotches; these blotches covering the mid-dorsal eight to nine rows, three to five scales long, narrowed laterally to a single scale on row five or six; blotch below this point covering two or three scales in length and thus continued to the scutes; near tail blotches becoming transverse bands; scales making up blotches salmon brown thickly covered with dark brown dots (15-50 on each scale) concentrated on the posterior half of each scale; throat and chin shields pearl white gradually changing on scutes to Apricot Buff at about one-third the distance to the tail.

Terrapene ornata (Agassiz).

Only one specimen of this species was seen during the entire summer. It is without much doubt a rare form in this vicinity; Ruthven (1907, 596), found none in the vicinity of Tucson. Van Denburgh, however, has published records from this region. The

single specimen taken was found about 5 miles north of Tucson near water, that is, only about 100 yards from the Rillito Creek.

Gopherus agassizii (Cooper).

Of this common land turtle, about 20 specimens were taken. They were typically found in the sahuara-ocotillo association, and nearly always in exactly the same sort of surroundings where we found the Gila monster. Their favorite haunts were the boulder-strewn shelves above the dry stream beds of the canyons, and always up the canyons some distance from their mouths. They were not easily detected unless they were moving, for they very much resembled the smaller rounded boulders. Those that were actually moving about were taken in the early morning before the sun was very hot; later, in the heat of the day they were invariably found in the shade of the rocks or actually under them. In several instances a turtle was found resting under a boulder in a hole just large enough to afford him refuge from the sun; these holes had been freshly dug. In all cases the head of the turtle was toward the outside. One big fellow was observed coming out of such a hole under a huge boulder. His exit was slow and deliberate with many stops and occupied more than five minutes. This large concavity was well worn and the amount of excreta showed that it had been in use for some time. It was not a matter of chance that we never found any of these turtles in the sun, for some which we kept in captivity demonstrated this fact. An open cage of turtles was unfortunately left in a place exposed to the sun for one day with the result that all died. Another which was "staked out" became entangled in the cord with which it was tied, and was unable to reach shade as it always had on former days. It likewise was killed by the sun before noon. These turtles of the desert are like the snakes in being unable to withstand the direct and continued action of the sun.

The food of this species consists entirely of grass (mostly *Bouteloua aristidoides*) as an examination of several stomachs showed. One turtle was seen eating this grass, his head turned sideways, but stopped the instant he heard or saw a slight movement of the observer.

BIBLIOGRAPHY

Camp, C. L.

1916. Notes on the local Distribution and Habits of the Amphibians and Reptiles of Southeastern California in the Vicinity of the Turtle Mountains. Univ. Calif. Pub. Zool., Vol. 12, No. 17, pp. 503-544, pls. 19-22.

Ortenburger, A. I.

1925. Life History Notes—Scaphiopus—the Spadefoot Toad.
Proc. Okla. Acad. Sci. Vol. IV, pp. 19-20, pls. II, III, IV.

Ortenburger, R. D.

1925. Notes on the Gila Monster.
Proc. Okla. Acad. Sci. Vol. IV, p. 22.

Ridgway, R.

1912. Color Standards and Color Nomenclature.
Pub. by Author. Pp. 1-43, pls. 1-53.

Ruthven, A. G.

1907. A Collection of Reptiles and Amphibians from Southern
New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist.
Vol. 23, Art. 23, pp. 483-604, figs. 1-22.

Van Denburgh, J.

1922. The Reptiles of Western North America.
Occ. Pap. Calif. Acad. Sci. X, Vol. I, pp. 1-611, pls. 1-57.