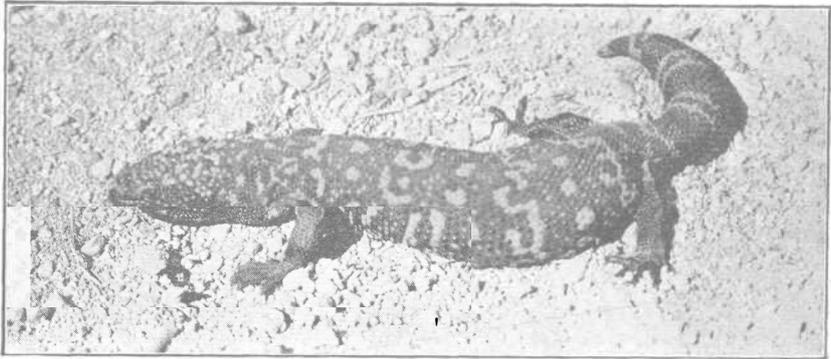


University of Arizona
College of Agriculture

Agricultural Experiment Station

Bulletin No. 83



Gila Monster. Photograph from life. About one-fifth natural size.

Poisonous Animals of the Desert

By Charles T. Vorhies

Tucson, Arizona, December 20, 1917

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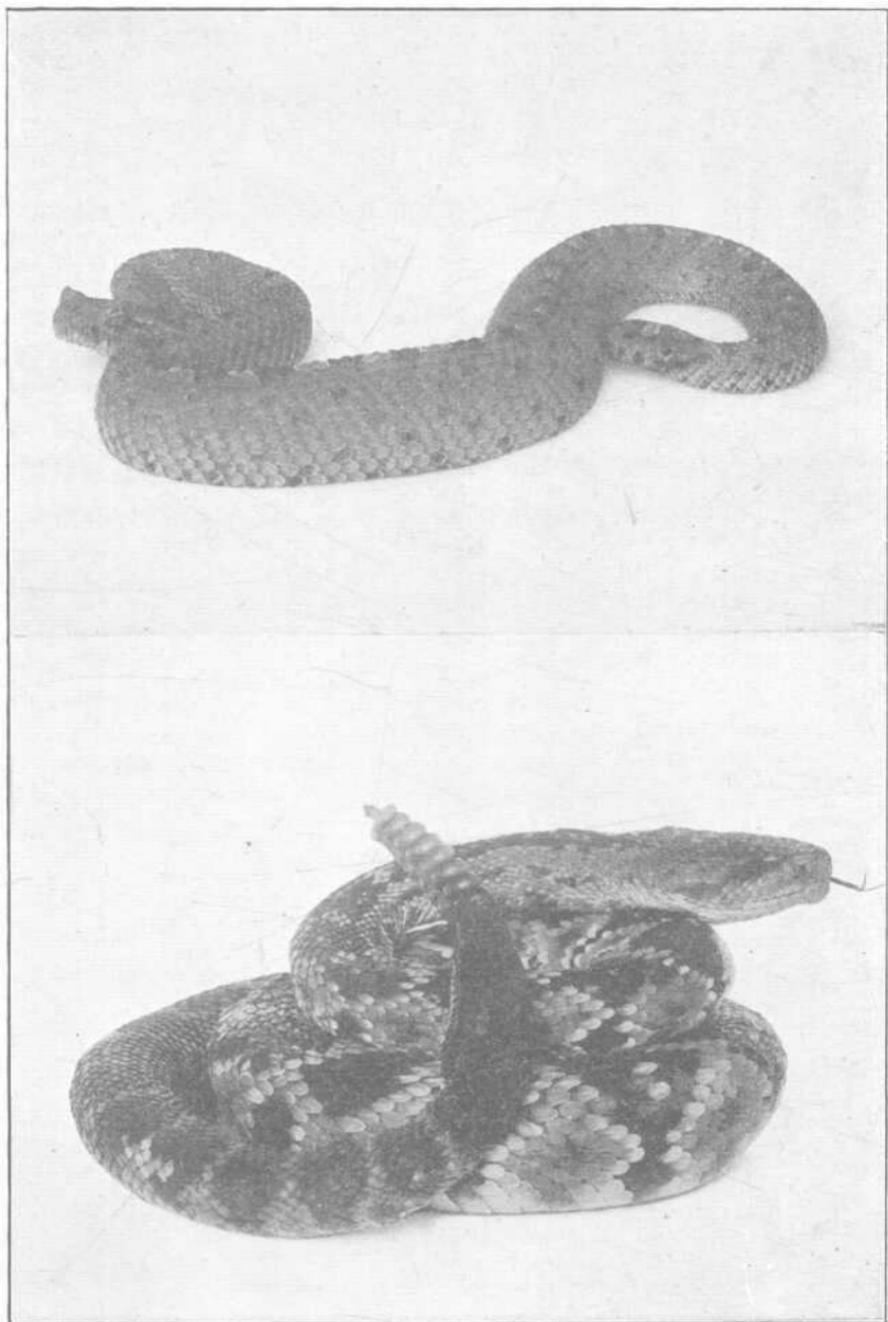


Plate 1.—Upper, Horned Rattlesnake, or "sidewinder." (*Crotalus cerastes*). Lower, Black-tailed Rattlesnake. (*Crotalus molossus*). Photographs by Dr. J. Van Denburgh, California Academy of Sciences, San Francisco, Cal.

Poisonous Animals of the Desert

By Charles T. Vorhies

INTRODUCTION

The arid and semi-arid southwestern area of the United States, with its warm climate, is the habitat of a considerable number of animal species which are more or less objects of dread for the average person. Some of these are justly feared, but many are not nearly so dangerous as popular story and belief would have them, while still others are quite harmless. A considerable part of Arizona's fauna is native to more tropical Mexico, but it also has many species of a somewhat wider distribution from north and east, and this commingling of faunas gives it perhaps as large a variety of these undesirables as any state in the Union. In addition, there seems to be an unusual amount of baseless prejudice and superstition concerning many totally harmless forms, due possibly to the large element of Mexican population. Certain superstitions, for example, concerning the "campamocha" are traceable to this source.

The purpose of this bulletin is to offer authentic information regarding a number of these more or less poisonous species and their relative degrees of "frightfulness," and to make it possible for the reader to distinguish between fact and fable; to enable him to keep cool when in no real danger; and even to enable him to distinguish the "business end" of some of these, for there exists great confusion as to whether a given form bites or stings. More than one intelligent person does not distinguish between the head and the tail ends of a common centipede.

While it would serve no useful purpose to give a full list of original papers on the animals with which this bulletin is concerned, we wish to give credit and reference to a few recent authoritative texts which have been freely consulted and used.* These works will hereinafter be referred to simply by use of the names of the authors.

-
- * 1 The Spider Book, by J. H. Comstock. Doubleday, Page & Co.
2 Medical and Veterinary Entomology, by W. B. Herms. The MacMillan Company.
3 Handbook of Medical Entomology, by Riley and Johannsen. Comstock Publishing Company.
4 The Reptile Book, by R. L. Ditmars. Doubleday, Page & Co.

VERTEBRATES

First in importance of the animals to be considered herein are the poisonous reptiles,—the snakes and the Gila Monster. When poisonous snakes are mentioned, the average person in the Southwest will think at once of rattlesnakes, and probably only of rattlesnakes, and we shall see that there is considerable justification in fact for this. Rattlesnakes or “rattlers” are distinguished from all other snakes on the globe by the possession of a peculiar appendage, the rattle. This rattle, by the way, does *not* at all accurately indicate the age of its bearer. Careful observation shows that each shedding of the skin results in the formation of a new section of the rattle, and that as many as three or four sheddings may occur in a year. Division of the number of segments of a complete, unbroken rattle by three will give more nearly the true age of the reptile.

SNAKES

Rattlesnakes are found only in the New World, mainly in North America above Panama, and more in the southwestern United States than elsewhere. Hence Arizona is practically the center of the chief rattlesnake inhabited area of the world. To put this in another way, nineteen species of rattlers are known. Only one of these is found south of Central America. Of the other nineteen kinds, fourteen occur in the United States, and of these Arizona has within its borders, according to the available data, eleven. It is hardly within the main purpose of this bulletin to discuss the different kinds in detail, yet doubtless the reader will be interested in a brief resume of the kinds, sizes, and relative abundance of these species, as well as suggestions as to their probable distribution in the State.

All rattlesnakes are divided into two principal groups: the Pygmy rattlesnakes (*Sistrurus*), and the larger rattlesnakes (*Crotalus*). As the name indicates the Pygmy rattlesnakes are of small size, seldom as much as a yard in length, and the rattles are small. There are more kinds of the larger rattlesnakes than of the Pygmy rattlesnakes, and since they are usually larger they are better known. (Certain details of structure enable the specialist to distinguish between them regardless of size.) Only one variety of the Pygmy rattlesnakes is known to occur in Arizona, Edward's Massasauga, (*Sistrurus catenatus edwardsii*.) This is one of the largest of its group, attaining occasionally to a yard or even more

in length, and its range extends into southern Arizona from the eastward to about the central part of the State.

Our larger rattlesnake species are as follows.

The Western Diamond Rattlesnake (*Crotalus atrox*), next to the largest of all, attains to a length of seven feet, and is common in at least the southern half of Arizona. Distinguished by *the white tail, banded with jet black*. A variety of this, known as the Mountain Diamond Rattlesnake, is found at higher elevations, the typical form being found in the desert valleys. For the first of these the common name of Desert Diamond Rattlesnake has also been proposed, and the latter seems slightly more appropriate, since it is the common form in the desert valleys.

The Black-Tailed Rattlesnake (*Crotalus molossus*), may attain to as much as four or five feet in length. It is reported common in northern Mexico and extreme southern Arizona, though two were once taken on San Francisco Mountain, near Flagstaff. It is found in the mountains rather than in the desert, the largest examined by Ditmars having come from "the mountains near Tucson, Arizona," and was reported by the late Mr. Herbert Brown to be "fairly common in the Santa Catalina and Rincon Mountains."

The White Rattlesnake (*Crotalus mitchelli*), as its name indicates, is very light in color, even so white as to have suggested to one collector when coiled the appearance of bunches of cotton. About three and one-half feet seems to be the maximum length. This is probably restricted in Arizona to the southwestern portion and records do not indicate that it is very common anywhere. The tail being white with black rings might lead to the assumption of its being a very light variant of the Diamond Rattlesnake. Two bright red specimens have been reported from Cave Creek, Maricopa County.

Price's Rattlesnake (*Crotalus pricei*), is next to the smallest of the *Crotalus* kinds, an adult measuring a little less than two feet in length. It is rare, at least in the United States, Ditmars reporting that "barely a dozen specimens have been taken" in this country. It was discovered in the Huachuca Mountains in 1895. It ranges probably only in the most southern portion of Arizona, at considerable elevations in the mountains.

The Green Rattlesnake (*Crotalus lepidus*), is the smallest of the *Crotalus* species, less than two feet in length, slender, with broad head. Color "greenish-gray, or rich dark green above, crossed at intervals with narrow, jet-black bands. The bands are

usually bordered with pale greenish-yellow. The abdomen is pinkish, or yellowish-white." (Ditmars). This is a rare rattlesnake, found thus far only along the Mexican boundary in Mexico, Texas, New Mexico and Arizona.

Our chief purpose in giving these details, particularly with regard to the last two species, is in the hope that specimens may be sent to our museum from loyal Arizonians. We, for that matter, would be pleased to receive good specimens of any of the rattlesnakes found in Arizona, of which we have at present only a meager collection.

The Tiger Rattlesnake (*Crotalus tigris*), is upward of four feet in length, strongly banded on the posterior two-thirds of the body with yellowish-gray and very dark bands. It is found chiefly in barren mountains of the extreme Southwest, i. e., southwestern Arizona and southern California, and was reported common near Yuma in the flood season of 1905.

The Horned Rattlesnake (*Crotalus cerastes*), is a small but distinctive species with a small horn-like protuberance over each eye. It is well-known by reputation in Arizona, and best known as the "side-winder." The latter name is given to it because of the fact that when hurried it moves by a peculiar looping movement which carries it obliquely sidewise as well as forward, an adaptation to progression over yielding sand. The side-winder is small, two to two and a half feet in length, and is probably found in all desert areas of Arizona, since it is known also in Utah, California and Nevada. It has the reputation of being a very dangerous reptile, due perhaps to agility and a vicious temperament. It is not likely that its poison is different in quality or quantity from that of other rattlers.

The Pacific Rattlesnake (*Crotalus oregonus*), is called the Black Rattlesnake where known in Arizona. Ditmars does not include Arizona in its range, but Dr. J. Van Denburgh of the California Academy of Sciences has secured three specimens; one from Oak Creek, Coconino County; one from Cave Creek, Maricopa County, and one from the Santa Catalina range. Dr. R. H. Forbes, of the Experiment Station, also assures me that he has seen the Black Rattlesnake in the latter mountains. In coloration the Santa Catalina specimens appear much darker than the one figured by Ditmars. This kind reaches a length of about three feet.

The Prairie Rattlesnake (*Crotalus confluentus*), is not included with Arizona's rattlers by Ditmars, and again we are indebted to

Dr. Van Denburgh for a single specific record, he having photographed a specimen from Cave Creek. While usually only of moderate size, specimens up to six feet in length are on record. This is the common rattler in the great plains region between the Rocky Mountain divide and the Mississippi River, but is probably not common anywhere in Arizona, unless it be in the northeastern portion of the State.

Another species, more recently described, (*Crotalus willardi*) is represented in the University collections by a single specimen. This was taken in the Santa Rita Mountains, May 28, 1912, at about 7500 feet altitude. It is hardly more than 16 inches in length, with small rattles. The back is marked with two rows of small, irregular, somewhat star-like dark spots. No further data are at hand concerning this kind.

Now, *all* rattlesnakes are venomous and *dangerous, deadly*,—let there be no mistake about that. Familiarity occasionally breeds contempt, even here, and some foolhardy individuals with better luck than sense, handle rattlers. Such, too, have been known to pay the penalty eventually for their foolishness. The white man had best leave the barehanded manipulation of live rattlers to the Hopi snake priests, who are seemingly much wiser than we in the matter of remedies.

The rattlesnake strikes,—literally stabs,—with fangs pointing toward the victim, and it momentarily compresses the jaws (bites) at the instant of penetration of the fangs, voluntarily injecting the venom through the hypodermic needle-like fangs by definite muscular action. There is thus no matter of chance about the placing of the poison in the wound. Removal of the fangs renders a rattler comparatively harmless for only a few days at most, since a series of new fangs is constantly moving forward from behind to replace the old as they are lost. Even immediately after removal there is danger, for the poison is ejected from the glands as well without as with the fangs and may enter the wounds made by the smaller teeth. Though there is necessity for proper precaution in the vicinity of a rattlesnake, there is no need to be panic-stricken at the mere sight of one. The snake cannot strike accurately for much more than half its length,—not its whole length in any case, and absolutely cannot *leap* at an intended victim.

The writer has been assured by a prominent physician, long resident in Tucson, that he has never seen a serious case of rattlesnake bite at the time he would like to see it, *viz*, immediately after

the injury, and he further explained that this was because the serious cases seldom reach the physician. Cases in which the fangs have not struck fairly or but glancingly, or through clothing, come in for treatment. From all that the writer can glean from authoritative sources he believes the above to be correct, since it is doubtless true that not only is the great majority of the Mexican population ignorant of the proper treatment for rattlesnake bite, but also that much of the white population is equally so. The principal object of offering information on poisonous snakes in this publication is then to emphasize the proper method of dealing with this emergency, and no less to combat the common, but wrong, method of treatment.

First of all, notwithstanding a firm rooted popular conviction to the contrary, *whiskey is not a remedy*. It is not only useless, but absolutely harmful, especially if given in large quantities, as is the usual tendency. If you want to finish the job begun by the rattler, take plenty of strong alcoholic stimulant. Small doses at the proper time *may* be of service. The facts as to whiskey treatment may be reassuring only to some persons who find themselves in a rattlesnake country where bottled "snake-bite" is taboo.

If one would be prepared to deal properly with snake bite let him carry when in the open at least the following" equipment, which should be on the person to be effective, not half a dozen miles away in camp, cabin or auto.

1. A very sharp knife or razor. Best, because it is least bulky and can be kept clean, is a good safety razor blade. This could easily be carried sterilized in a waxed paper wrapping.
2. A small vial of crystals of potassium permanganate.
3. A rubber band, of sufficient size and strength to be used as a ligature without the delay of tearing strips of cloth, tying knots, twisting, etc.

These are the most important—the essential—things. Absorbent cotton, sterilized gauze, and some one of several antiseptic solutions are next in usefulness. A hypodermic syringe and strychnine tablets may be valuable for those who understand their use, but if the other things are near at hand at the moment needed, these are not so likely to be wanted.

Now for the procedure to be followed in the event of being bitten:

1. KEEP COOL, life depends on it
2. Place a ligature above the wound *at once*. If bitten on a finger, ligature only the finger. If on hand or arm,

or on foot or shank, place the ligature above the elbow or knee, where there is but one bone in the limb. If the rubber band is on hand much time will be saved for the next step. If not, apply a ligature (tourniquet) of cloth and twist it sufficiently to cut off circulation in the limb. Do not leave a ligature in place for more than twenty minutes, or thirty at the very outside, lest mortification of the limb begin.

3. As quickly as possible after being struck, but only after applying the ligature, cut across the fang punctures for about one inch, both ways, *deeper* than the fangs penetrated. If bitten on the finger, cut to the bone at least lengthwise. Look out for tendons in a cross-cut on the finger.
4. Bleed the wound as thoroughly and rapidly as possible. If sucking the wound aids bleeding, *suck if*
5. After some good bleeding wash the wound *thoroughly* with potassium permanganate,—enough in water to produce a deep wine color. If without water, as might well be the case in the desert country, rub some crystals into the wound, aiding their solution with saliva. This chemical specifically destroys all the venom with which it comes in contact. There are other substances which will do this, but their action on the flesh is more injurious. If you have water, use it, as the use of crystals is rather more likely to injure the flesh than the use of solution.
6. Remove ligature.
7. At this point *small doses* of whiskey as a stimulant may be useful. Hypodermic doses of strychnine act as a powerful stimulant and may be used by those properly equipped if fainting spells indicate a need of such.

While the above procedure is being carried out send for a physician or start to one at the earliest possible moment. The wounds made in the drainage process should be dressed as carefully as circumstances permit, using for this purpose the surgical dressings and antiseptic solution for a wet dressing, if at hand. If these are not available keep the wound as clean as possible until a physician can be had to apply proper dressings. In any case have a physician care for the wounds, for the deadening effect of the poison on the natural defenses of the blood makes the part extremely liable to germ infection, such as blood poisoning. Since the permanganate can only act against the poison with which it comes in direct contact, *it is useless after the venom has become disseminated in the blood.* Hence the importance of immediate action for beneficial results,

Besides the rattlesnakes there are not more than two other poisonous species of snakes in Arizona. One of these is known as the

Annulated Snake (*Sibon septentrionalis*) and has been reported from the southern part of the State. It is probably not at all common. It is rather slender, about two and a half feet long, and its poison fangs are in the back of the mouth, hence they do not injure by striking. If provoked into seizing a finger so as to imbed the fangs the results would be severe, though perhaps not fatal. Ditmars calls it "dangerous, but not deadly."

The only other poisonous snake to be found here is the brilliantly colored Sonoran Coral Snake (*Elaps euryxanthus*). This slender little snake, seldom above two feet in length and often shorter, is found in central and southern Arizona. It is marked with black, yellow, and red bands *encircling* the body, the *black always bordered on both sides by the yellow*. This snake is dangerous if given a good opportunity, though on account of its small size it is hardly dangerous save when stepped on barefoot or handled, the latter being sometimes done under the impression that it is a harmless snake. Relatively to its size its fangs are as long as those of some other exceedingly dangerous snakes, but actually they are not large enough to penetrate a fair covering of clothing. It seizes without warning and *chews* to imbed the fangs, but does not strike as does the rattlesnake and is said never to bite save when actually touched. Its poison, however, is more virulent, drop for drop, than that of the rattlesnake. Deaths from the bites of larger species of the same genus (*Elaps*) often occur in South America, and it is related to some of the most deadly snakes known. Its small size and resemblance to certain harmless snakes has led to an under-rating of its true character.

Note the following distinctions:

Black-yellow-red-yellow-black, Coral Snake.

Yellow always *between* black and red.

Red-black-yellow-black-red, harmless King and Milk Snakes.

Black always *between* red and yellow.

Since potassium permanganate is a specific destroyer of all snake venoms, treatment for a bite of the Coral Snake or other poisonous species would be the same as for rattlesnake bites. It may be stated *most emphatically* in this connection that the popular impressions regarding easy distinctions between poisonous and non-poisonous snakes, such as the large, angular head like that of a rattlesnake for poisonous species, and the small rounded head for harmless species; or brilliant colors as in the king and milk snakes for harmless species, *do not hold*. The Coral Snake alone violates

both these rules, and there are harmless snakes with enlarged heads, and several poisonous snakes with heads like those supposed to belong to harmless kinds. The best rule we can suggest is that *you* learn to know the poisonous snakes of your region, for they are few to learn; then regard all others not merely as harmless, but as *actually useful*, and treat them accordingly. Of all American species of snakes, only 17 are poisonous. While it is true that the venomous snakes are very useful also, we shall not plead for them, but certainly there is not the slightest basis in fact for doing aught else than protect the non-poisonous. This is so important at any time, and particularly now, when every agency affecting our crops is being carefully reckoned with, that we will take time and space to quote from an article by Mr. G. K. Norton, in *American Forestry*, who puts the case convincingly. He says, after recounting the facts concerning the millions of dollars of damage done by rodent pests:

"Reptiles are a very important factor in the natural work of restraining the too rapid increase of rodents. Practically all our snakes feed largely upon rodents. One in particular which has a wide range is the *Lampropeltis doliaetus triangulus* (milk snake, house snake, spotted adder, checkered adder), which finds 90 per cent. of its diet in small mammals. This reptile, together with dozens of others, is absolutely harmless, defenseless, and in no way destructive, though many ridiculous tales are told of it.

"The gross ignorance regarding our snakes causes slaughter of all things that wear scales and crawl. Farmers should protect and breed the harmless snakes rather than kill them. Many European countries have protective legislation. Another fact: all the king snakes—and the family is large—are natural enemies of other snakes and eat many of them. In numbers they probably overbalance the poisonous species and by general distribution usually occupy the same habitat as the dangerous snakes. In this way they materially help to lessen danger of poisonous snake-bite. Until a person is able to distinguish and name a snake immediately, and know whether it is dangerous or not, that person has no right to kill any snake. Every time a snake is killed more damage is being done than good."

LIZARDS

Just one other poisonous reptile belongs to our fauna,— the Gila Monster (*Heloderma suspectum*, cover cut.) This and a closely related species, *Heloderma horridum*, found only in Mexico, are the *only poisonous lizards in the world*. Absolutely no other lizards (these including the so-called "horned toads") are poison-

ous. The Gila Monster has poison glands, but in the lower instead of the upper jaw, the secretion oozing out between the teeth and the lower lips. It has no poison fangs, however, and therefore no definite mechanism for forcibly injecting poison with a stroke as does the rattlesnake. It will snap and bite if irritated, and will cling like a bulldog when it gets hold, and poison may enter the wounds made by its numerous small sharp teeth as a result of the tenacious grip of the animal. The effects of its bite are variable, owing doubtless to the imperfect application of the venomous saliva. Though some reports have it that human deaths have resulted from the bite of this animal, these reports are but hearsay and fade away to nothing upon investigation. The writer is indebted to a reputable physician of Tucson who has made considerable effort to authenticate a single case of death caused by the Gila Monster, and has failed to do so. An exhaustive report on "The Venom of *Heloderma*," by Leo Loeb, published by the Carnegie Institution, as well as the researches of other investigators, shows that the venom produces fatal results in various small animals, such as rats, mice, frogs, guinea pigs, etc. As to effects on man, we find no local data to discountenance the following statement from Loeb's report:

"No death of a human being has come to our knowledge that can be attributed to the bite of a Gila Monster. A bite from this animal is in man either followed by no symptoms at all or by a local swelling, perhaps extending to the shoulder, if the bite affected the upper extremity. * * * * * In all the reports concerning the local effect of the bite of the *Heloderma* in man, mention is made of the rapid appearance of swelling and hemorrhagic discoloration of the skin at the site of injury. We found that when fresh venom was injected subcutaneously into an animal, no swelling or hemorrhage appeared at the site of injection; and when venom was injected intramuscularly, no hemorrhage was noted. * * * * * It is impossible, however, to absolutely rule out mechanical injury as a factor in causing the appearance of these local symptoms when an individual is bitten by a *Heloderma*. The animal has very powerful jaws and its bite would easily bruise a large area of flesh and skin. When the animal bites it clings tenaciously, and in endeavoring to extricate a wounded part the injury might easily be increased."

Whether potassium permanganate is destructive to *Heloderma* venom is not determined. Therefore we cannot recommend it as of value in case of a bite by this animal. We would only suggest releasing the bitten part as rapidly and yet as coolly and carefully as possible and then seeking a physician, perhaps first inducing

some bleeding and then washing the wound with an antiseptic. The venom is not to be regarded as deadly to man, hence there is no need for hysterical fear.

In closing on *Heloderma* we would suggest that there is no good reason for remorselessly slaying every Gila Monster encountered. Rather should we class it with the road runner and the peccary as unique features of our fauna, a part of the characteristic landscape of Arizona, like the giant cactus among the flora of the State.

We have already said that all other lizards are non-poisonous, yet the majority are more or less feared by many people. Of these,

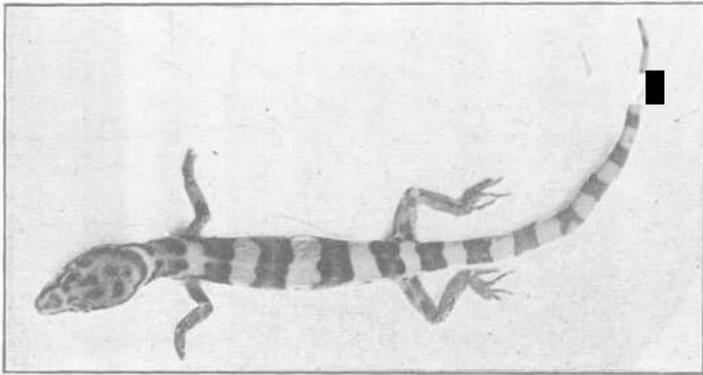


Fig. 1.—Banded Gecko (*Eublepharis variegatus*). Harmless.

if there be any one kind deserving mention here as perhaps more often feared by those who meet with it than are the general run of lizards, that one is the delicate, retiring, absolutely harmless, little lizard known as the Banded Gecko (Fig. 1). It is feared because it is mistaken for a "young Gila Monster," this being in part due, possibly, to the light-yellow and dark bands, which, however, are much more regular than on the Gila Monster; and to the fact that its small soft scales have somewhat the rounded, bead-like shape of those of the larger animal. (This is assuming that the frightened person looks closely enough to see the scales, which is doubtful.) The Gecko does not hiss, but produces an audible squeak. It is probably mainly nocturnal in habit. Ditmars gives the length as three inches, but the specimen from which our figure was taken is four and three-quarters inches long.

SKUNKS

Keeping strictly within the limits of our subject, we would not deal with any mammals, for we have none which are poisonous in the proper sense of the term, as used elsewhere in this publication. But inquiries having come regarding the so-called "hydrophobia skunk," it should be treated in this connection.

Probably none of the many animals suspected of being dangerous in Arizona has created so wide a diversity of opinion as has this one. In one sense perhaps, a myth, this animal is nevertheless much feared in a considerable portion of the Southwest; yet the "tenderfoot" is moved to much mirth at the suggestion that the skunk will boldly bite a person sleeping out unprotected. The writer has laughed at many detailed stories of the hydrophobia skunk, and notwithstanding the circumstantial tales has often slept unprotected on the ground.

It is most unwise, however, to dismiss such a universally feared animal without investigating carefully all available data on the matter. Though we shall find that there is no basis for the widespread fear of some animals discussed herein, we desire to stand on facts in any case. I should be the last to deny that a skunk bite might produce hydrophobia, for we know that a wide variety of animals are subject to the disease and can pass it on through the saliva, probably all of the cat and dog tribe, as well as others in this category. The feature of this instance is that there is popularly supposed to be a particular species or kind of skunk whose bite *always* gives hydrophobia. If this be true, then the skunk assuredly differs from any of the other animals which are subject to rabies; for in other cases, as the dog, an individual animal gets the infection from some other infected animal (never spontaneously from heat or thirst), suffers from the disease, and while so suffering is capable of conveying the infection to other animals. Rabies (hydrophobia) is a germ disease and can no more be contracted spontaneously than can typhoid fever, or tuberculosis. It is the idea carried with the term "the hydrophobic skunk," rather than the idea that some skunks might be suffering from the disease and therefore dangerous that throws the proposition into disrepute with so many people; and in addition to that, perhaps, the very details as usually given, instead of carrying conviction, seem merely to be the embellishments of the joker trying to "stuff" the newcomer.

When we look for information on skunks in systematic works,

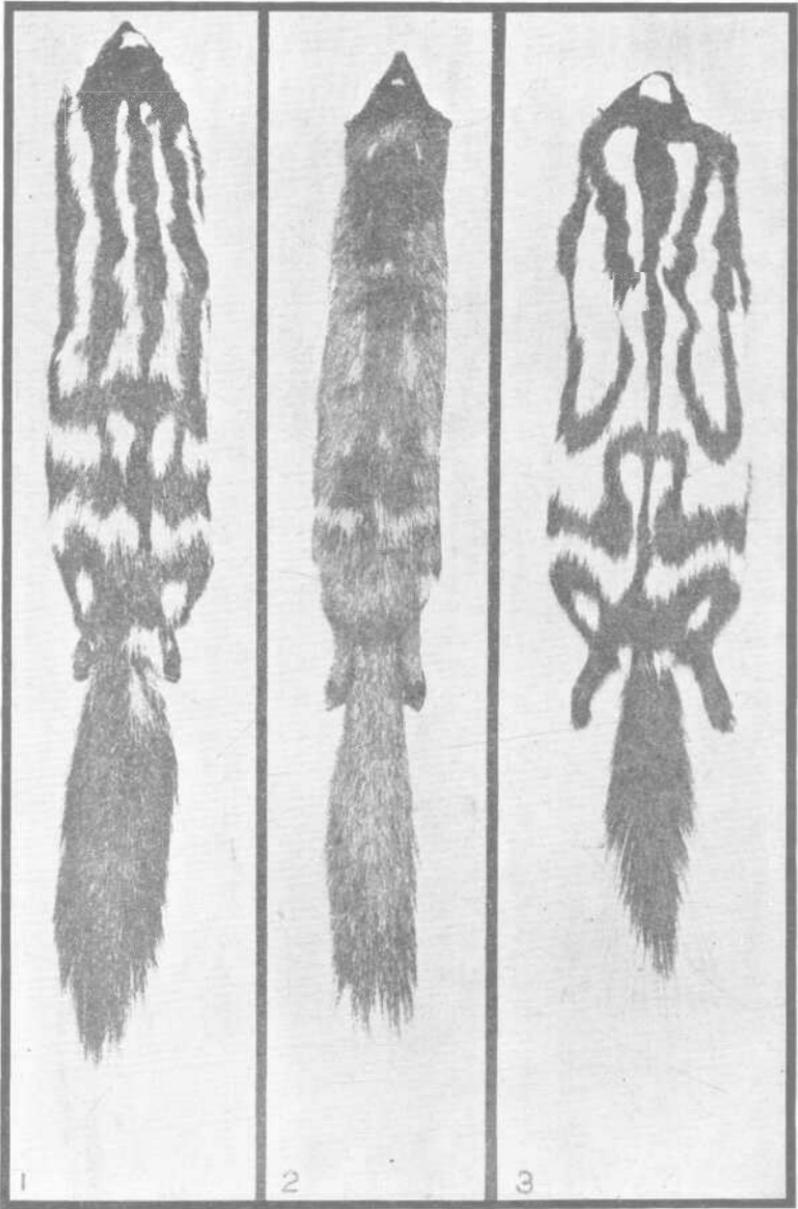


Plate II.—Skins of spotted skunks, (*Spilogale*). No. 3 is a species found in Arizona. (From N. American Fauna, No. 26.)

we find first that all of the species fall into two commonly known groups (genera). The larger skunks (*Chincha* or *Mephitis*) are marked with a stripe or stripes down the back, except a few individuals which are wholly black. They are never spotted. The smaller skunks (*Spilogale*) are spotted in addition to whatever stripes they may have, or striped and cross-banded so as to appear more or less spotted, and are often known as spotted skunks or "civet cats." (These, by the way, are properly called civet, though in Arizona the Ring Tail is miscalled by this name.) Plates II and III indicate clearly the differences between striped and spotted skunks (North American Fauna No. 26), we are told that "while there are a few authentic cases of skunk bite having resulted fatally, there are also many instances in which it has produced no ill effect whatever. The recorded cases of skunk rabies are nearly all from the plains region of the west * * * * and relate more to *Mephitis* than to *Spilogale*. The most plausible explanation of these facts seems to be that at certain periods rabies may become locally epidemic among dogs and wolves, and by them be communicated to skunks." Thus the blame is thrown mainly upon the striped skunks, the reverse of the usual opinion in Arizona. We are referred in this work to *Fur-Bearing Animals*, by Elliott Coues (1877) and in this work several authentic cases of death from rabies following skunk bite (kinds of skunk not specified) are reported, four of them by a United States Army surgeon. One case of recovery from such a bite without rabies resulting is also specifically reported. Another portion of the same work deals with the report of another United States Army surgeon (John G. Janeway, M. D., Assistant Surgeon U. S. A.) who personally observed fifteen fatal cases of hydrophobia. Ten of these resulted from skunk bite (kind of skunk not stated.) Details of three of these ten cases are given, from which we learn that these three individuals were bitten in the night, one in the nose, one in the little finger, and the other in the hand.

Dr. Antonio Lagorio, of the Chicago Pasteur Institute, makes the following statement in the *Tempe Normal Student*, (May 15, 1908):

"I have found skunk bites to be very dangerous, and I am convinced that all persons bitten by skunks should take at once the Pasteur treatment. I have known of several deaths from hydrophobia, due to skunk bites. Last year a skunk was brought alive

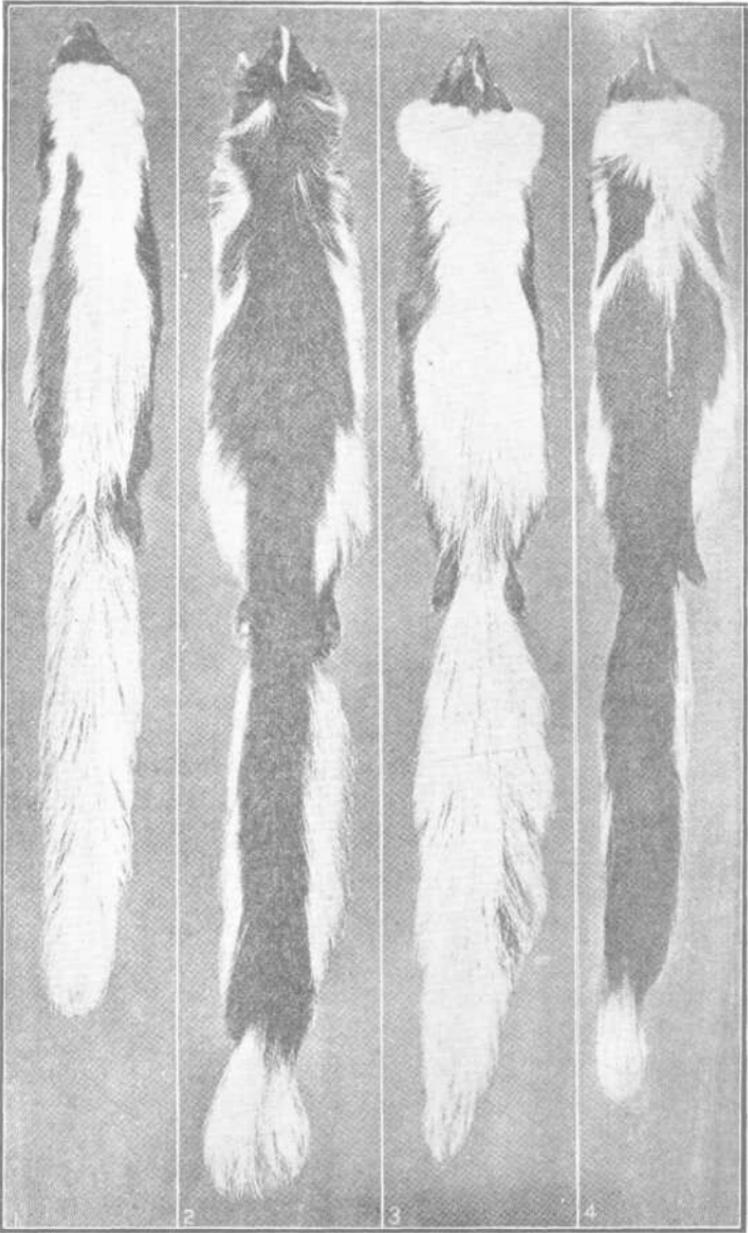


Plate III.—Skins of striped skunks (*Mephitis*). All are varieties of a single species. Nos. 2, 3, and 4 are all of a variety (*milleri*) which has been taken in Arizona. (From N. American Fauna, No. 20.)

to me from Arizona, which had bitten two persons. Three days after the animal died with all the symptoms of hydrophobia. I have treated several persons bitten by skunks and all have about the same history of skunks creeping up during the night, and biting either the nose, ears, hands, or exposed feet, some sticking so fiercely as to have to be choked off."

Inquiry from the Rockefeller Institute for Medical Research develops that they have made no special study of rabies with reference to the skunk

From the available information we must conclude that there is no particular species of skunk which can be designated as "*the hydrophobia skunk*"; nor should we speak of "a hydrophobia skunk" in any other sense than we might say a hydrophobia coyote. However, we are forced to conclude also that, rabid or not rabid, skunks are rather more apt to bite sleepers, than are coyotes, wolves, and dogs. A possible explanation of this would seem to be the undoubted fact that skunks as a rule are comparatively fearless prowlers on account of their excellent natural protection. A skunk displays no haste to get out of the way when encountered, feeling perfect confidence that the other fellow is the one to be careful.

It appears, too, that perhaps a rather larger proportion of bites from skunks produces rabies than of the bites from any other animal. Yet statistics on over 3000 cases of rabies show ninety per cent infected from dogs, and only one per cent from skunks, so that the total showing is not great. Most of us, from states farther east, never heard of a "hydrophobia skunk" until we came west, yet 41 cases reported in Coues' work "occurred in Virginia, Michigan, Illinois, Kansas, Missouri, Colorado, and Texas." It would seem that the greater fear of skunks met with here may be due, in part at least, to two causes: first, that many more people sleep in exposed situations in the open western climate; and, second, that there may have been local epidemics of skunk rabies in various western localities.

In the face of the facts and conclusions above offered, there seems to the author just one more unavoidable conclusion, and that is,—in case of skunk bite take the Pasteur treatment. This treatment is successful in more than ninety-nine per cent of cases treated before symptoms of the disease appear, and will do no harm whatever even if infection has not occurred. On the other hand, one may not wait to see whether symptoms appear, for treatment is entirely useless after that. As to whether we shall continue to

sleep out unprotected, that is a question for each individual to settle for himself.

INVERTEBRATES

The remaining animals to be treated here all belong to a quite different group, the Arthropoda, or "jointed-foot" animals, having a characteristic horny outer shell or exoskeleton, rather than a bony skeleton within the body: and those of this immense group which interest us here are the insects and their relatives the spiders, scorpions, centipedes, etc.

It is a peculiar fact that while fear of certain forms of insects is much exaggerated or entirely unfounded, yet certain other insects which actually cause thousands of cases of illness and death not only do not cause general alarm, but it is well-nigh impossible to arouse some classes of the population to their importance. These are the insects definitely proven to carry diseases of man. Such common insects as house-flies, carrying typhoid fever and other diseases; body-lice carrying the dread typhus fever; malarial mosquitoes, and the yellow fever mosquito, are examples of these. Yet the less educated people can hardly be forced to give attention or thought to these deadly, but non-poisonous, insects; while the harmless "campamocha" and "Child-of-the-Desert" are greatly feared. This bulletin is not to deal with the disease carriers, however, important as they are, for much more of both general and particular information is available concerning them than concerning other, actually less important, but poisonous or feared kinds of this region.

INSECTS

First to be mentioned among poisonous insects are bees, wasps, and ants, and they are discussed in part for purposes of illustration and comparison, since they are familiar to every one. All bees and wasps, and many ants of the Southwest, have stings with which a definite poison is injected into the wound made. All ants, whether stinging or not, attack by biting. The bite is only a pinch with the jaws and is in itself non-poisonous; but even the stingless ones possess the usual poison glands, and these are said to bring the tip of the abdomen forward and spray poison into the wound made by biting. The sting, in so far as we humans are concerned, is only a weapon of defense, never of offense, and we need not fear the bee or wasp visitor so long as we attend quietly to our own affairs and

commit no aggression. Probably no person approaching near to maturity has been so fortunate as to escape a painful experience with one of these, and it is perhaps because of their commonness and wide distribution that we do not greatly and unreasoningly fear them. As a matter of fact, they are quite as much to be dreaded as some supposedly more dangerous animals which are less common or of more restricted distribution. More than one case of serious illness and even of death is on record from the stings of ordinary honey-bees, and to some individuals a single sting is a very serious matter. We commonly recognize the fact of wide individual variation in respect to the effects of the poison of bee or wasp stings, and this principle applies equally to the poisons of spiders, centipedes, scorpions and the like. When the average person suffers comparatively little from a single sting or even from several stings at one time, a particular individual may have some peculiar characteristic of constitution or temperament which makes for serious illness with but one or a few stings. The local pain and inflammation varies somewhat, but not so much, perhaps, as the constitutional effects of the poison. It may be well to state in passing that the great majority of bees and wasps are useful insects, the former for pollination of flowers, and the latter for destruction of many injurious insects. Therefore, they should not be molested save in particular instances when they are so located as to be nuisances. This must be qualified somewhat for the ants. Many of them doubtless do great good in destroying injurious insects, but some denude an appreciable percentage of tilled ground, and some have been reported injurious to livestock. Herms reports as follows on one of the "harvester ants":

"One of the most formidable stinging ants in California is *Pogonomyrmex californicus*. This ant will not only attack humans but also small domesticated animals. Thus hog raisers in the Imperial Valley, California, report many pigs killed by ants, one farmer reporting a loss of 400 small pigs during one year and another 100 to 150 during a period of three years,—all killed by ants."

This report, Herms says, is not fully verified, yet it cannot at present be safely denied. We have this species and others of *Pogonomyrmex* in Arizona. Professor Wheeler, a distinguished authority on ants, reports on the stings of *Pogonomyrmex* kinds as follows:

"The sting of these ants is remarkably severe, and the fiery, numbing pain which it produces may last for hours. On several occasions when my hands and legs had been stung by several of

these insects while I was excavating their nests, I grew faint and almost unable to stand. The pain appears to extend along the limbs for some distance and to settle in the lymphatics of the groin and axillae."

There will be mentioned specifically here but one group of wasps, peculiar, hairy, wingless forms, called "Velvet-ants" and "Cow-killers." They are ant-like in appearance chiefly because of their lack of wings, being larger than ants (up to an inch in length) and covered with a thick pile of hairs, whence the term *velvet*. They are generally conspicuously banded with contrasting colors, oftenest black and some shade of red, sometimes black and yellow, and in a few cases black and white. They are much more abundant in the and southwest than elsewhere. Their stings are very long and capable of inflicting a painful wound, though not more dangerous than other wasps or hornets. It is said the term Cow-killers is given them in parts of Texas, where their sting is popularly believed to be dangerous to livestock. This superstition has not yet been met with in Arizona by the writer, but may exist in some parts. Even these are generally useful in destroying undesirable insects.

The sting of the honey-bee, which usually remains in the wound, should be removed by scraping with a knife blade or fingernail, not by grasping, the latter method resulting in forcing more poison into the wound. For stings of bees, wasps, and ants, alkalines such as ammonia or soda are generally recommended, but are of little value and should not be rubbed in if applied. Wet cloths as hot as can be borne will afford relief and "The application of wet clay, or of the end of a freshly cut potato is sometimes helpful." (Riley and Johannsen.) In extreme cases of great susceptibility or many stings, call a physician.

Several rather large (about an inch long is an average), and conspicuous insects known to entomologists as "assassin-bugs" or "cone-noses" are poisonous, and are known on occasion to attack man. "Assassin-bug" sounds vicious enough surely, but the majority, if not all of these assassinate chiefly other insects. Certain kinds, however, may attack human beings to get a meal of blood, while others attack only when carelessly or roughly handled. Even those most likely to attack us are perhaps in houses primarily to catch other insects, one such being descriptively called the "bed-bug-hunter." Some may be attracted to lights, and coming in contact with the person on face or hands, will stab quickly and vi-

ciously with the beak, especially if an incautious attempt be made to pick the intruder off with the fingers. A sudden snap of the finger is the safest means of getting rid of one of these unwelcome bugs. While there are doubtless several kinds of this group native to the Southwest, of which probably Arizona has its full share, the writer of this bulletin has had no personal reports of injury, and only a single unlabelled specimen is at present in the University collections. At this juncture we will depend for local information upon Dr. A. W. Morrill, State Entomologist. In a paper published in the Arizona Medical Journal, January, 1914, he says:

"In many parts of the Southwest there is a large relative of the bedbug, known as the blood-sucking *conenose*, belonging to the genus *Conorhinus*, which is quite troublesome as a household pest. Other common names for this insect are "Arizona bedbug," "bellows bug," and "Arizona tiger." This is one of the species which contributed to the kissing bug scare of 1899, which 'encouraged by the newspapers,' says one entomological writer, 'resulted in one of the most interesting cases of widespread popular alarm arising from a comparatively insignificant cause, which has occurred in the present scientific and matter-of-fact century.' It is a fact, nevertheless, that there is considerable evidence that the Arizona blood-sucking insect above named transmits pathogenic (disease producing) organisms. The sting of this bug frequently produces red blotches on the body, as reported by one of my correspondents, and in one case reported from Arizona several years ago the effect of a single sting is said to have produced 'red blotches and welts all over the body and limbs.'"

Dr. Morrill further informs me by letter that the localities from which he has had such reports of injury are Fort Apache, Cottonwood, and a ranger station about twenty-five miles north of Clifton.

A figure (Fig. 2) of any one of these showing the general characteristics of elongated body, and slender, cone-shaped head (cone-nose) with strong beak beneath, and protruding, rather fierce looking eyes, will enable one to be on guard. These insects really neither bite nor sting, but *pierce*. That is, the wound is made with beak-like mouth parts which cannot bite by pinching, but which penetrate the skin in the manner of a sting, like the "bite" (piercing) of a mosquito. A poisonous Saliva is injected into the



Fig. 2.—"Cone-nose blood sucker" or Arizona bed-bug (*Conorhinus sanguisugus*) enlarged about twice. (From *Insect Life*.)

wound through the beak. The wounds are said to be very painful for a time, even leading to nausea and dizziness, but are hardly to be regarded as dangerous, save possibly in the case of a child or a person of very weak constitution, or in the event of a germ infection following. Herms thus describes his own experience in accidentally grasping a cone-nose on a leaf:

"The bite was instant and the pain most intense, and though the wound was on the finger the pain seemed to extend to the head and was followed by a feeling of faintness. The recovery, however, was a matter of less than half an hour with no after effects except for a slight local cellulitis."

There are two innocent, non-poisonous insects which attract much attention in the Southwest, and are feared without cause.

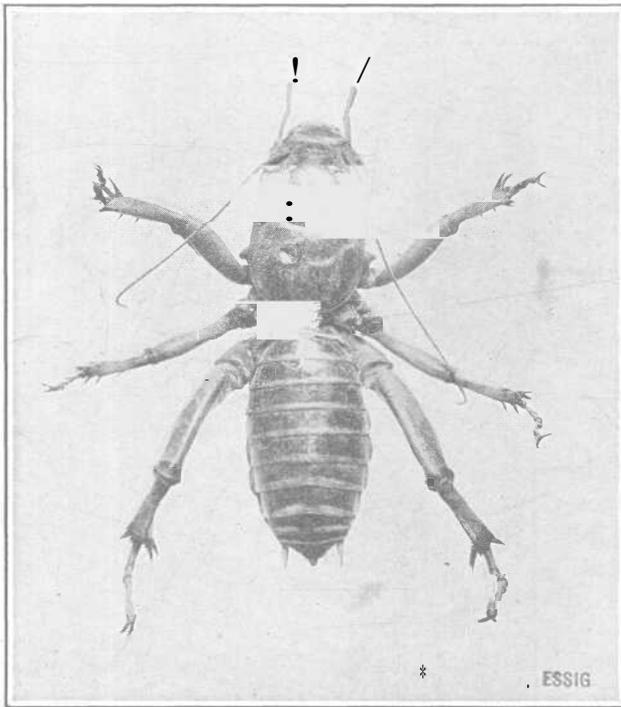


Fig. 3.—The Sand or Jerusalem cricket (*Stenopelmatus irregularis*). Somewhat enlarged. (From the Monthly Bulletin of the California State Commission of Horticulture.)

The first of these is known as the "sand cricket," or sometimes as the "Jerusalem cricket" and also as "Child-of-the-Desert," the last appellation being the most used of the three in Arizona. This insect is merely a peculiarly shaped wingless grasshopper, whose habits and life history are not fully known. (Fig. 3).

It is entirely harmless, save that its biting jaws are somewhat larger and more powerful than those of the ordinary grasshopper,

so that it is able to nip one somewhat severely in self-defense. It is quite without poison. I have myself been bitten by one, with no more effect than from a similar nip with a pair of forceps. It is heavy or plump-bodied, without wings at any stage, cream colored, with large creamy or light brown head. This large head is smoothly rounded, bald, without the angles common to most grasshopper heads, and has often been described to the writer as resembling "a baby's head." From this common conception of its appearance doubtless arose the name "Child-of-the-Desert." It is a burrower in sandy soils and probably seldom appears on the surface except at night, which perhaps accounts for its being sometimes confused with the "vinegarone." Indeed, Miss Anita Post, of the Department of Romance Languages, assures me that the Mexican population regularly call it by the same term (*mata venado*) as the other animal, which will be discussed later in this paper. "Sand-cricket" is the simplest and best term to use for this insect.

The second of these insects is the praying mantis, called commonly by the Mexicans the "campamochoa." This insect (Fig. 4), we will grant is eerie in appearance as it rolls about its very mobile head, with the protruding, staring eyes, in odd fashion. The popular superstition with regard to this is that if accidentally eaten by

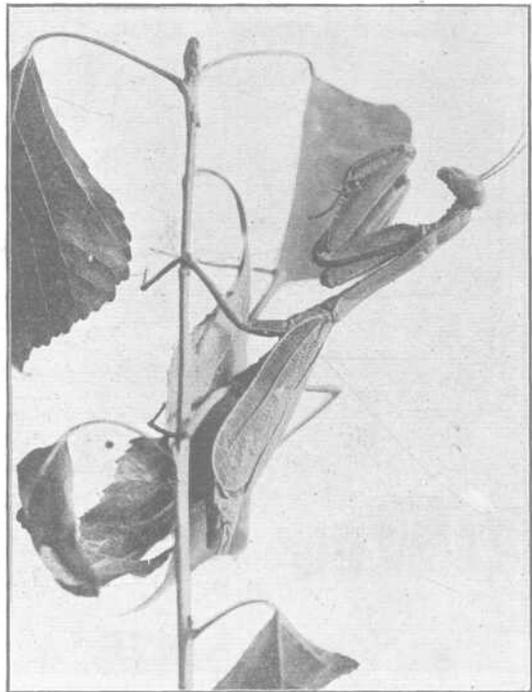


Fig. 4.—The praying mantis. Photograph from life, natural size.

a horse or cow the result will be fatal. This seems to be a local variation of the belief referred to by Comstock in his work on insects, in which he says:

"They are also called mule-killers, from the absurd superstition that the dark-colored saliva they eject from their mouths is fatal to the mule."

There is also about as much reason in this prejudice as there would be basis for saying that the "tobacco juice" of the grasshopper is a deadly poison. The praying mantis is really a *preying* mantis. Lying in wait for the insects upon which it preys, it uses the long grasping forelegs, borne on the up-reared front part of the body (whence the name "rear-horse") for seizing the hapless victim. It is distinctly a useful insect and innocent of harm. Indeed,

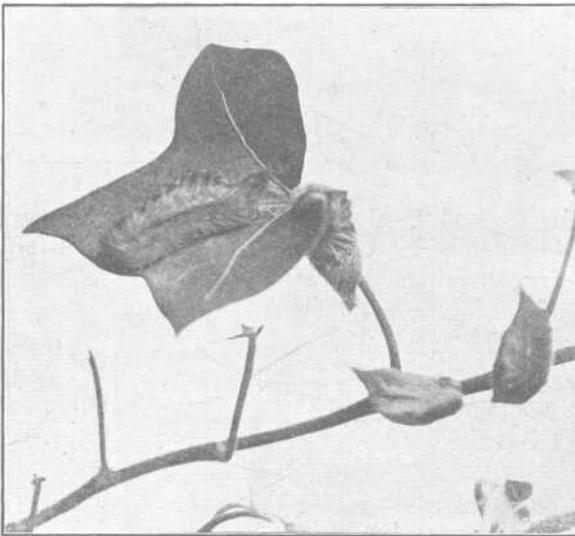


Fig. 5.—Flannel moth larvae on English ivy. Three-fifths life size. Photograph from life.

one of these makes a most interesting pet if kept in a small cage and supplied with flies or other small insects.

Last of the insects to be mentioned will be certain moth larvae known as flannel moths. These are "woolly caterpillars" whose hairs are so

give great resemblance to a bit of flannel. (Fig. 5).

Hidden beneath the thick covering of long, soft, harmless hairs, however, are groups of stiff bristles or spine-like hairs. These will penetrate and break off in the skin, producing a rash much like that caused by a nettle, hence called nettling hairs. Two species of these flannel moths are known further east, but have not been reported from Arizona. In September, 1917, however, specimens of flannel moths, which may or may not prove to be one of the kinds already known, were sent to the University from Tombstone, by Mrs. Julia R. Axtell, with the report that they had destroyed a fine wall of English ivy, and that "In some way it seems to poison

everyone who happens to touch it." Observing some care, I have been able to handle with my fingers, several of the live specimens in rearing cages without injury to the thick skin within the hand. Having accidentally brought the back of my thumb in rough contact with one, however, I almost immediately began to feel the effects of the nettling hairs. Using no treatment, I found that the effects became rather more severe than a like amount of contact with nettles. The pain, while not intense, was sufficient to enforce itself on my notice and was rather more of an aching pain and less of an itching or burning sensation than nettles. For three hours this was allowed to continue, then a wet paste of baking soda was applied, and this soon relieved the pain. Soda seemed much more efficacious for this purpose than for a bee sting. The following day all pain was gone, only a few slightly raised red points, somewhat sensitive to touch, remaining.

SPIDERS

Of the invertebrates with which this bulletin deals, spiders are perhaps the most universally feared. This being true, and since Arizona lies in that region of the country in which are found several of the most dreaded kinds, we shall deal with this subject in considerable detail, taking care to be as definite and explicit as possible. In the first place, it may be said that while there appear in the public press frequent accounts in convincing detail, of persons having suffered more or less severely from spider bites, investigation of these reports shows little foundation in fact. Scientific men attempting to follow up and authenticate these accounts, either fail utterly to find the supposed victim, the case being imaginative or fictitious, or, on finding the victim or the physician in the case, learn that the injury is only *supposed* to have been inflicted by a spider; and often, too, that whatever the original cause, the effects noted are due to germ infection of the wound and not to a venom. Probably many reported cases of spider bite, are in reality made by cone-noses. Spiders do have definite poison glands in the head or bases of the claw-like biting jaws, and these discharge their poison through ducts leading through the jaws; and this poison is regularly used in paralyzing prey. But as has been pointed out by authorities, venom that will kill a fly is not necessarily harmful to man.

Now, do spiders use their jaws and poison freely in self-defense against man? The very common belief is that they do. The,

writer's own experience in occasionally catching spiders is that they do not. Professor Comstock reports that in years of study of spiders, involving the handling of very many live specimens, he has never been bitten. Others bear out this evidence with personal experience, and emphasize also the lack of power to do damage by reason both of the small size of the jaws and the inconsiderable effect of the poison itself. Dr. Riley says, "Some years ago the senior author (himself) personally experimented with a number of the largest of our northern species, and with unexpected results. The first surprise was that the spiders were very unwilling to bite and that it required a considerable effort to get them to attempt to do so. In the second place, most of those experimented with were unable to pierce the skin of the palm of the hand, but had to be applied to the thin skin between the fingers before they were able to draw blood * * * In no case was the bite more severe than a pin prick and though in some cases the sensation seemed to last longer, it was probably due to the fact that the mind was intent upon the experiment." Other men have experimented with similar results. Certainly we must conclude that the ordinary spider is anything but dangerous.

Certain exceptions to the above general rule cannot be disposed of quite so readily, particularly in the southwestern area of which



Fig. 6.—Crab-spider. Photograph from life, natural size.

Arizona is the center. These exceptions are the many and various large hairy spiders dubbed tarantulas at sight, and a certain small black species found 'in the South' and hence doubtless within our borders.

Tarantulas are among the most dreaded of all spiders by the average person. Let us emphasize just here the spelling and pro-

nunciation of the word, *ta-ran-tu-la*. The word is often senselessly corrupted to "triantler." The term tarantula was originally given to a European spider, the bite of which was supposed to produce tarantism, a form of hysteria. This hysteria, once started, often became contagious, but was purely a nervous disease. There is no evidence that the bite of a spider was responsible for even the first case of a given outbreak. The tarantulas of the Southwest belong to a family of spiders entirely different from this European form, and the name, moreover, applies to trap-door spiders as well, which belong to this family. Several kinds of rather large, long-legged, somewhat hairy spiders which run swiftly are also often called tarantulas, and are supposed by many to be the young. This is likewise true of the crab-spiders (Fig. 6) which are represented in our fauna.

One of the crab-spiders is often found in bunches of bananas, and is an object of fear, but true tarantulas are much less often found in this situation. This banana spider is quite harmless, as are other crab-spiders probably, a personal friend of the writer's having captured many with his bare hands without ever being bitten. One of these crab-spiders has been received from Nogales labeled "white tarantula," indicating that it may be accounted dangerous. While most tarantula species are dark or black in coloration, this "white tarantula" and many other crab-spiders are gray, or of very light color.

Tarantulas (Fig. 7), like other spiders, have poison jaws for killing or paralyzing their prey, and their formidable size would indicate that if their poison



Fig. 7.—A tarantula. From a dried specimen, slightly reduced.

be at all virulent, a bite might produce marked effects on a human being. Even on this point there is no experimental evidence whatever regarding American species, but the poison from a single individual of a species from Haiti has been found sufficient to kill ten

sparrows or twenty mice. That from a Corsican species was equally powerful, but with effects on sparrows and mice reversed.

In the course of preparation of this bulletin the writer was quite surprised on failing completely to find any record of a case of tarantula bite. Original sources were not available to any extent, but when the authors of three special works have similarly failed to find such record it may reasonably be supposed that it is non-existent. At this juncture we had recourse to inquiry from physicians of Tucson. Five were consulted with the following results: Two reported never having seen a case of tarantula bite, and one of these has had twenty-five years' experience in Tucson. Of the other three, one reported two cases; the second, with twelve years' experience, had himself been bitten on the leg, and had seen three other cases in addition to his own; while the third of these, with thirty-six years of practice in Tucson, had seen but one case. Since there seem to be no other records, these cases are worth stating specifically.

Case 1 was that of a railroad laborer bitten on the hand. The arm became much swollen to the shoulder and became discolored with suffused blood,—“black-and-blue.” The more serious results lasted two or three days, but a state of depression lasted for some time, and complete recovery took some weeks. This case was bitten in daytime on accidentally bringing the hand in contact with a tarantula, in the act of turning over a stone.

Case 2 was an old man 70 years of age, Mexican, bitten on the side of the neck in early morning. When seen by the physician several hours later the neck was badly swollen, the line of the chin continued straight down to the body. Numbness was at first experienced. Recovery was a matter of a few days. The tarantula was killed.

Case 3 was bitten on the lip. Numbness and much swelling followed, as in Case 2. The tarantula was killed and brought to the hospital with the patient.

Case 4, the physician, was bitten on the leg several years ago, and scar still remains. This physician reports his own case and the other three attended by him as swelling somewhat, though not extensively, and as becoming blue from sub-cutaneous hemorrhage, the blueness lasting for a long period. In these cases is also reported a digestive action from the venom, resulting in sloughing ulcers, which were very slow to heal.

These cases are unquestionably authentic, as to the animal re-

sponsible, and as to the severity of the results. The details concerning the effects, while not identical, are sufficiently similar to show the possible seriousness of a tarantula bite. On the basis of the facts learned, I should say that tarantulas are not nearly so prone to bite human individuals as is generally supposed, since but seven cases have been seen by five reputable physicians with an aggregate of more than a hundred years of practice in Tucson. I believe, also, that while the injury produced is quite severe, and somewhat serious, yet it is hardly to be considered actually dangerous to life for the average healthy, full-grown individual. One physician consulted suggested the possible danger in case the poison should be injected by the jaws into a good-sized blood vessel, and we can agree with that, yet recognizing that the likelihood of the animal so injecting the poison is not very great, on account of the size of the jaws. These are large for a spider, but not to be compared in length with the fangs of a rattlesnake. For a child the bite would likely be very serious and quite possibly fatal. Indeed, one unauthenticated case of death of a child in Tucson has been reported to me.

Some of the reported cases of spider injury state that the injury was inflicted by a "small black spider," and these reports are more likely to have a basis in fact as to ill effects than other stories of spider injury. There is a certain species of small black spider, about one-half inch long,—the "black widow," or "shoe-button spider," *Latrodectus mactans*, which is seemingly a somewhat formidable exception to the general rule concerning small spiders. This kind is reported from "the South," not specifically from Arizona, but doubtless exists here. Experimental evidence shows that this and other species of *Latrodectus* from various parts of the world have a much more virulent poison than ordinary spiders. This is borne out by reported cases, while in the various countries where they are native these spiders are almost universally held to be dangerously poisonous. Among them are the dreaded "Malmignatte" of southern Europe, the "Katipo" of New Zealand, the "Vancoho" of Madagascar, the "Karakurte" of southeastern Russia, and our own kind, called "Po-ko-moo" by certain California Indians. The latter, according to Merriam, as quoted by Comstock "rank it with the rattlesnake as *poison*. To poison their arrows they mash the spider and rub the points of the arrows in it." The symptoms produced experimentally agree with the symptoms of persons who have been snake bitten. There are several cases on record of severe

symptoms following the bite of this species, one of which ended fatally. This may even then have been an exceptional case due to personal condition or even in part to fear. As I read over the account of this and another severe case from the same locality (North Carolina) I cannot but wonder whether the reported dosage with alcohol may not have put the fatal touch upon the one case and the nearly fatal touch upon the other. We know now that whiskey is the worst thing to give at certain stages in rattlesnake bite, notwithstanding popular opinion to the contrary, and it may well be so in the case of the bite of this spider. A case is personally reported to me from Yuma, Arizona, of a bite from a black spider, doubtless this or a related species. In this case the victim, a lady, was bitten on the hand and serious "symptoms of blood poisoning" followed, which it required some weeks to cure.

This exceptional spider is easily recognizable, being shiny black, with red or yellow markings. An hour-glass shaped mark on the lower side of the abdomen is the most constant of these marks. Spots may in addition be found along the middle of the back. The male has in addition to these, four pairs of stripes on the sides of the abdomen. A gray species of this genus has been described from California, and may belong to our fauna, but no reports are available concerning injury from it.

MATA VENADO

Near relatives of the spiders are the peculiar creatures commonly known in this region as the "vinegarone" (Fig 8), of which five kinds are definitely reported from Arizona. This is called in local Spanish *mata venado* (kill deer). Others occur in Colorado, New Mexico, and California, and it is likely that one or more additional kinds may be found here. Twelve species are at present known in North America north of Mexico, so that probably half the kinds now known are native to this State. All are restricted in distribution to the West and to the Southwest. These creatures are accounted rather rare by writers, but we believe that their nocturnal habits (one or two kinds are said to be diurnal) makes them seem to be less plentiful than they really are. They hide by day in holes and under stones and rubbish and come forth by night for insect prey. They are very active when engaged in killing ants, and have been called wind-scorpions on account of their speed and agility in pursuit of their prey. They have been called sun-spiders also, presumably some diurnal kind receiving this name. The characteristic

shape for all is sufficiently uniform that the accompanying cut of one will serve to identify any kind of "vinegarone." Attention may be directed to the peculiar fact of possessing *four* pointed jaws, this causing the head to be of very different shape from that of the "Child-of-the-Desert" with which it is frequently confused. Its body is somewhat hairy, also, while that of the insect alluded to is smooth and shiny. Color and nocturnal habits are about the only actual resemblances between the two, this animal being creamy to light brown. The much used, and misused, term vinegarone does not rightly belong to this animal, it seems, but to a peculiar scorpion, which will be mentioned later.

These animals are accounted poisonous and are held in great dread by the Mexican population, this fear having been more or less communicated to the white residents also. In spite of having heard personally of two instances in which humans were bitten, with some resulting symptoms which would seem to indicate a poisonous bite, the writer must admit his own skepticism as to their dangerous character. This view is held, first, because examination by competent authorities has failed to disclose the presence of any poison glands in the biting apparatus, and second, because observers submitting voluntarily to being bitten have not suffered any ill effects indicating poison. The bite as such is likely rather severe, as the jaws are large and powerful. Herms reports that in the neighborhood of the Salton Sea, the belief exists that any animal drinking from a watering trough in which one of these happens to be present will die.

When living specimens can be secured and kept long enough to permit of observations and experiments worth while, the subject may be checked up for one or more of the Arizona species. In the meantime we wish to emphasize the almost certainly harmless nature of these animals so far as poison is concerned, and will conclude with the following quotation from Comstock, which is brief and to the point:

"The solpugids are commonly believed to be venomous; but those who have studied them most carefully do not think that this

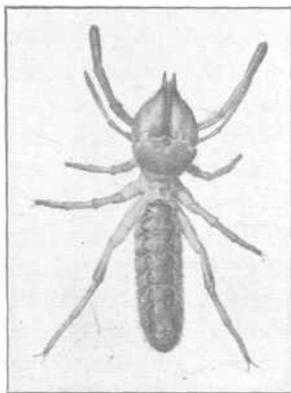
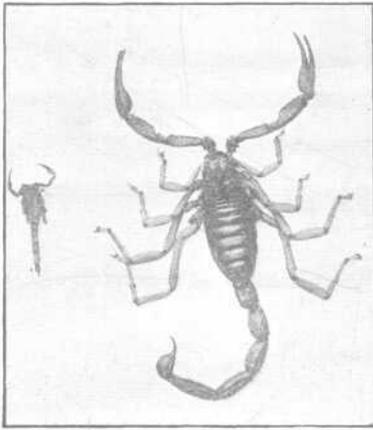


Fig 8.—Solpugid (mata venado). Also called (wrongly) the vinegarone. Photograph from life, natural size.

is so. No poison glands have been found, and observers have allowed themselves to be bitten by solpugids without suffering anything worse than a passing pain from the wound." (Zoologists know these animals as *solpugids*).

SCORPIONS

Other forms closely related to the spiders are the scorpions (Spanish, *alacran*), so commonly known in Arizona as hardly to need any description or illustration. (Fig. 9). They are common



in the warm southwestern regions, though unknown in the north. A considerable number of species occur in this area of the United States, and Comstock lists seven kinds with ranges which indicate that they probably belong to our fauna. A full study of them may disclose more than seven. It may be emphasized that the scorpion does not bite, having no mouth parts capable of inflicting injury on the human body, nor does it do injury by means of

Fig. 9.—Scorpions, one-half life size. The smaller one is not the young of the larger, but is a mature specimen of its kind.

part of the abdomen (so-called tail) up and forward over the back and striking forcibly with it, the curved spine or sting being driven with sufficient force to make the wound. Having observe them paralyze insect prey with a more deliberate working in by continued pushing of the sting, we conclude that it may penetrate the human skin in the same way, under circumstances that do not permit of its striking, as when caught in a shoe by the foot. There is a well developed poison gland in the bulbous base of the sting.

In the whole literature on scorpions, which belong to all hot regions of the world, will be found many statements which are apparently conflicting regarding their dangerous or poisonous character. An analysis of these statements indicates that the sting of some of the largest species in other countries than our own may be dangerous, even to adults, and accounts of numerous deaths of children in Mexico are given. But some of these kinds are many

inches in length, much larger than any Arizona species, though size is not in itself an indicator of comparative harmfulness. Certain small dark scorpions in Arizona are commonly reputed to produce a more painful wound than the larger ones. We wish to emphasize that fatal, even serious, results from the sting of any Arizona scorpion are no more probable than such results from the sting of a honey bee. Yet many a person has such an unreasoning fear of a scorpion as to believe that it is time to make a will when stung. In such cases fear produces greater shock effects than the sting itself. Personal acquaintance with many who have been stung, and conversation with physicians, is convincing proof that we need fear them no more than, if as much as, the ordinary bee or wasp.

The Whip Scorpion probably occurs in Arizona, and is much feared where it is known. (Fig. 10). We are assured by those who have handled this

animal alive that it does not bite or pinch, and it certainly has no sting on its whip-like tail and may safely be accounted non-poisonous. It gives off an odorous substance for protection when disturbed, which resembles the odor of vinegar, and to it in Texas the name vinegarone

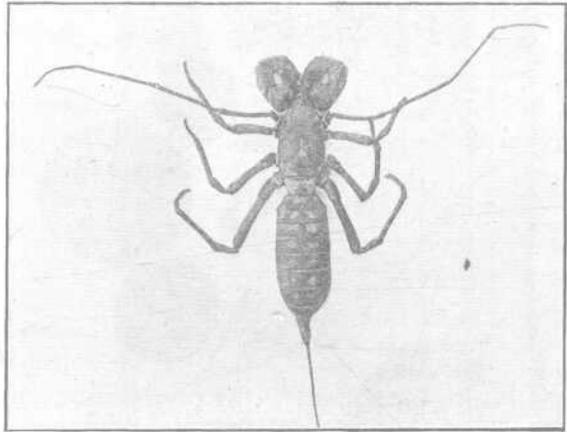


Fig. 10.—Whip scorpion. Two-thirds life size.

was applied. There seems little doubt that this is the correct and original use of this word, though it is now most commonly applied in Arizona to the solpugid, as noted above. In some parts of the South this is called a "grampus."

MYRIAPODS

Second only to the tarantula, if not, in fact, its co-equal as an inciter of fear, is the centipede (*cientopies*), another nocturnal prowler. (Fig. 11). Strangely enough the many small species of these so common under sticks and stones throughout the United

States are scarcely recognized as being in fact centipedes. These small species are entirely harmless to man, though possessed of the same poison apparatus for killing prey as the larger ones. As



Fig. 11.—Centipede. Two-fifths life size. Poisonous.

the more tropical regions are approached larger kinds are found, until, in the equatorial regions, some are said to reach a length of eighteen inches. In Arizona specimens eight inches in length are not rare, and the maximum size reported to the writer is one foot, this, however, being an estimate, and not an actual measurement. The term centipede and *cientopies* mean literally *hundred feet*, and in some parts of our country the small ones are known as "hundred-legged worms." As a matter of fact our largest local species has considerably less than one hundred feet, the number being forty-four, or twenty-two pairs. Some smaller but more slender species have as many as 173 pairs. These counts include in every case an anterior pair which act as poison claws or jaws, and a posterior pair somewhat modified and held in an elevated position, the latter being often mistaken for antennae. In this way arises an existing confusion as to which is the head end of the animal. I have even been asked whether there is a head on each end! The front pair of legs is laid forward beneath the head, where they act as a pair of jaws moving laterally, and within their bases lie the poison glands. Insects are almost instantly killed when seized with these jaws and are then eaten by means of less conspicuous true mouth parts.

Various texts and references prove to be quite indefinite in their statements so far as specific cases of effects of bites on humans inflicted by American species are concerned. All agree as to harmlessness of small kinds, as to effect of poison on prey, and as to painfulness and possible danger from the largest ones. For effects and possibilities of local kinds we must again depend on local experience, which is definite. The writer has personally known of two cases of centipede bite. In one of these instances a then member

of the University staff was bitten on the upper arm about 11 p. m., by a large specimen, about seven inches long. Hydrogen peroxide was applied. (This would prevent germ infection of the wound, but probably would not counteract the poison.) Pain at first was like pin pricks, but in about an hour became severe, preventing sleep. Two prick marks showed, which were pink, red, then whitish in center, then purple. In the morning at five a physician was sought, who advised putting on baking soda. The arm became swollen and very painful, with sharp pains. Swelling and pains extended downward into the hand and lasted all day. Some feeling of faintness and nausea occurred at times next day and slight pain across abdomen also. Pain was severe all next day (Friday) and "might not have slept Friday night, but had sleeping tablets from physician." On Saturday the pain was gone except when the hand or arm was touched. On Monday afternoon still slightly painful to touch; swelling gone. Still slightly painful to lift arm. (Some of the symptoms given, the writer believes, may have been due to undue nervousness as to effects, as the victim in this case was undoubtedly somewhat wrought up about it.) In the other instance a lady was bitten about 11 p. m. on the heel, through a reinforced portion of the stocking, the animal being seven or eight inches in length. The bite was described as feeling like a hot needle at the instant of infliction. The pain following was described as a recurrent throbbing or stabbing, and sleep was prevented, though the victim asserts she does not really know whether this was the result of the pain itself, or the excitement of the occasion. Only slight swelling appeared in this case, and it was gone within twenty-four hours. Patient was about the next day, shopping down town in the afternoon, but could still feel throbbing pains. After two days all effects had disappeared. Asked as to the comparative effects of a bee sting, this lady immediately stated that the only bee sting she had ever suffered was worse, producing the same sort of throbbing pain, and that it lasted much longer. It must be said that the centipede bite having been inflicted through the clothing was probably not as bad as it otherwise would have been, but would in any case hardly have been worse than the bee sting. While these effects were severe in both cases, it will be seen after all that honey bee stings are of at least equal severity in many cases. One should certainly avoid these injuries when possible, yet there is absolutely no reason for the unreasoning fear of the centipede, as compared with the relative calmness about bees.

One hears many statements as to the poisonous character of *all* the claws of the centipede. These vary from the supposition that a centipede merely walking undisturbed across the skin leaves an inflamed trail, to the story that one cannot be removed from the skin, however suddenly (even by shooting it away with a six-shooter!), without its sinking every claw into the flesh and leaving a line of severe wounds; even so severe that sloughing of affected flesh follows. There are certainly no poison glands in any other than the specialized front feet. Yet the claws are sharp-pointed, and a reputable physician assures me that he has seen an inflamed

path across the skin, but this in case where the animal has been grasped and irritated in contact with the skin, as when within the clothing. Even in this case the physician admitted the possibility of several bites in succession having been received. On the other hand, the writer admits the possibility that the claw points might produce irritation comparable to so many pin pricks if the animal were caused to cling tightly to the body. Local physicians agree with the writer that centipede injury is only to be classed with the sting of the scorpion in severity, and both of these with bee and wasp stings.

A non-poisonous, perfectly harmless animal which causes needless fear is the millipede or "thousand-legged worm." (Fig. 12). It is also called wireworm on account of its smooth, hard body covering, but should not be confused with the wireworm, which is

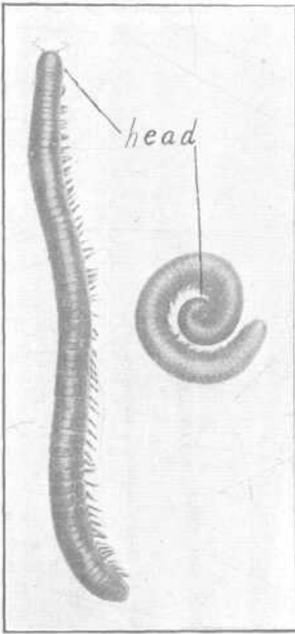


Fig. 12.—Millipedes. One-half life size. Harmless.

a type of small, smooth, hard, almost legless insect larvae, none so large as the millipedes. Millipedes are of a group related to the centipedes in structure, but differing in habits and in certain easily recognizable characters. Centipedes are flat bodied and each segment or "joint" of the body bears one pair of legs. Millipedes are cylindrical bodied, and each apparent segment bears *two pairs of legs*. They feed only on vegetable material, hence have no poison apparatus, and their mouth parts are too small and weak to inflict even

the slightest injury on the human skin. They secrete an ill-smelling fluid for protection when handled. Locally, we have some very large representatives of the group, as long and thick as a lead pencil when they are fully extended. They commonly curl up into a tight coil when disturbed. It may be said in closing that "thousand legs" is no more accurate for these than "hundred legs" for centipedes, yet the larger ones do have a number so great that the average person does not think of counting them, and one wonders what kind of a poem might have resulted had these instead of centipedes been the object of investigation in the following instance Professor E. Ray Lankester, an eminent English zoologist, some years ago attempted "to study the order in which the legs of Centipedes moved, and came to the conclusion that if the animal had to study the question itself, it would not get on at all. He finishes with the following verses :

"A Centipede was happy quite
Until a toad in fun
Said, Tray which leg moves after which?
This raised her doubts to such a pitch,
She fell exhausted in the ditch,
Not knowing how to run."