SNAKE COLLECTING, VENOMOUS SNAKES, AND TREATMENT OF SNAKE BITE

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As Bill Bevan, an experienced collector, said, "The general rule in finding snakes is to keep in mind their two major requirements for life, food and shelter." Seek the snake where its food is plentiful or where it lies up for rest or for assimilation of food. One need only know something of the snake's general form and habits to make a good guess as to the proper hunting grounds in any locality.

For example, the Rough Green Snake (*Opheodrys aestivus*) is insectivorous in feeding habits and its attenuated form adapts it for an arboreal existence. The author has found it most often in shrubs between forest and meadow; in one it finds shelter and from the other food. Many of the small snakes are secretive and habitually stay in concealment a large part of the time. If one wants them, he must ordinarily tear up rotten logs, lift big stones, and rake through leaf and debris piles. Thus, the diminutive, brownish ground snakes of the genera *Carphophis, Virginia,* etc., are seldom found on the surface except occasionally at night or on dark, rainy days. The Hog-nose Snakes or "Spreading Adders" (*Heterodon* spp.) are short and stout-bodied, with a shovel-like upturned snout. They are not long enough nor active enough for tree life, nor swift-moving like the open-dwelling Blacksnake. The body is not suitable for log burrowing either, which requires a smooth, cylindrical and strong body such as the King and Milk Snakes (*Lampropeltis* spp.) possess. The shovel snout and rough scales, however, indicate that these hog-nosed snakes might be able to burrow in loose sand. They eat toads almost exclusively and only occasional specimens accept frogs with any regularity. The Hog-nose Snakes may then be expected in sandy fields, not too far from woods or other concealment from which toads might come nightly.

The best time of the year to collect snakes is undoubtedly in the spring, just as soon as there is a maintained rise in temperature. At that time they are least wary and not as likely to bite when picked up, which may be due either to loss of caution engendered by the breeding season or to the isolation of the hibernation period. For these same reasons these snakes are usually concentrated in restricted localities which may be easily located.

In the northern and western states particularly, where dens must be deeper and better protected to enable the snakes to survive the winter, catching them as they come out of hibernation is by far the best method. In the southeastern states one may not find large numbers of snakes in any one denning area and the time of emergence may not be so

sharply defined, but it is still worth the effort of locating the places. Residents of any district will notice the large numbers of snakes at certain places during each spring, and the reputation of the localities—usually exaggerated in transmission—will spread far and wide as good places to avoid. By following down these reports the snake collector finds the place he wants, sooner or later.

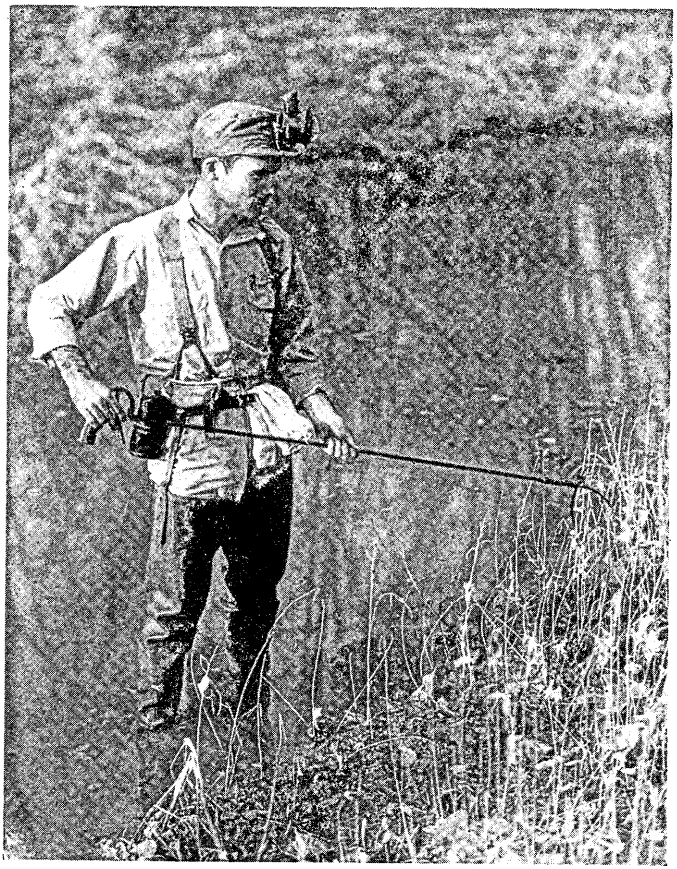

Fig. 1. The correct equipment for collecting snakes at night. The acetylene torch strapped to the body allows freedom of both hands. Specimens are carried in cloth sacks hung over the belt. The snake catcher held in the hands grips the snake securely without injury.

As the spring of the year passes, snakes become more timid, move around less, and the summer weed growth helps to conceal them. During latter summer, the only generally good collecting is to be found around drying water holes, where the watersnakes assemble to get the stranded fish. At this time snakes lie up during the heat

of the day, so they are best sought at night with flashlight or acetylene headlight (Fig 1). Snakes may usually be blinded by the light, like bullfrogs. They may then be approached and picked up by hand when a hunter could not get within twenty feet of them during the day except by an exceedingly slow approach. In autumn the snakes become more or less accessible again when they head for their winter hibernating quarters.

A variety of implements have been used for collecting snakes. The surest method is to shoot them with a light shotgun or a rifle bored out for shot, but this usually mutilates the specimens to some extent and is useless when they are desired alive. The simplest device is a stick to pin down the snake's head until it can be secured by neck and tail and dropped into a receptacle for transportation. For greater

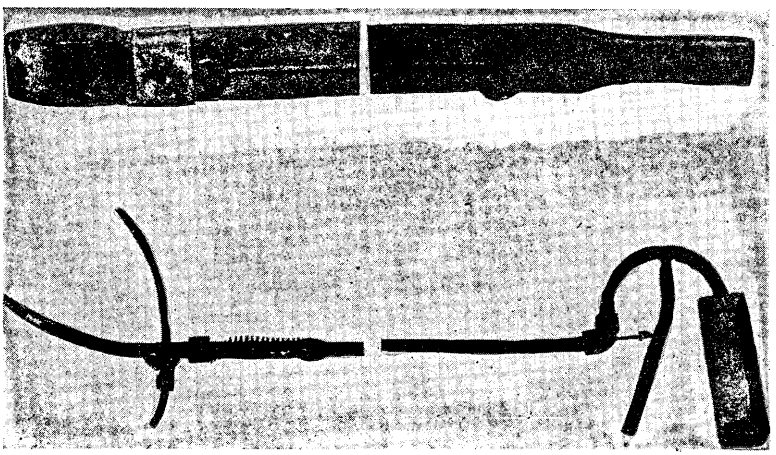

Fig. 2. Snakecatching implements.

convenience in holding the snake down, there may be a fork at the end or a prong at right angles, depending on whether the snake is expected to be found on soft or hard ground. A piece of heavy, stiff wire mounted on the end of a pole and bent into a hook is sometimes used to drag snakes out of small crevices. With the end of the wire bent at right angles, it is very useful to lift specimens out of cages.

A flexible copper wire or waxed cord noose on the end of a bamboo pole is sometimes used, but a device made of a leather strap and flattened wooden pole is not nearly as liable to injure the snake. An end of the leather strap is fastened on one side of the stick near the end, and the strap is passed up the other side, over the end, through a metal keeper screwed on the stick near the same end. When part of the strap is pushed back through the keeper, a loop is formed which may be tightened or loosened at will by manipulation of the loose end, yet holds the snake securely by the neck. A snake-catcher devised by Mr. J. E. Jolly of the Memphis (Tennessee) Zoological Garden

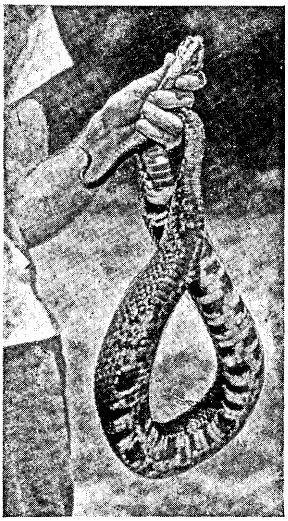

Fig. 3. The proper way to hold a snake. In this manner the head remains in a firm grip.

is one of the best mechanical devices for the night collection of water snakes that the author has used. The apparatus is about four and a half feet long. It is a metal tube with opposed tongs at one end and a handle and trigger at the other. A wire through the tube connects the movable tong with the trigger (Fig. 2). Catchers of any sort are somewhat unwieldy, particularly in brush. The author often discards all of them when the going is hard and relies entirely upon his own quickness of hand. Then snake-catching becomes sporting. Venomous ones may be held by the tail until a stick can be broken off to pin down the head, or they may be dropped into a receptacle without securing the head.[1] However, to avoid injury or possible escape of the snake, it should be held by both neck and tail whenever possible (Fig. 3). Strong cotton bags have proven by far the best means of carrying reptiles. There is very little danger of a venomous snake's biting through a sack unless the cloth is thin enough to be seen through.

Snakes preserved for scientific purposes should be arranged in a simple coil (Fig. 4). Males should have the hemipenes everted by injection of preservative into the tail near its base. About eight per cent formaldehyde or eighty per cent grain alcohol are the usual preservatives. A solution of one part formaldehyde, three parts alcohol, and six parts water is now being used to some extent, but the color loss in specimens seems more noticeable. The fluid should be injected hypodermically into the body cavity until the scales separate slightly and then worked all through the snake by manual manipulation. If no injecting outfit is at hand, the snake should be opened by a series of slits along the belly. This is best done with a sharp pair of scissors. The preserving solution should be changed at least once. Remove large food masses before preservation.

It is quite important that as many records as possible be kept of the natural inhabitants of an area, in view of the fact that the surface

[1]It is feared that a too matter-of-fact account will tempt amateurs into free handling of venomous snakes. This is certainly true of lecturers who show dangerous snakes alive during their talks. A person who wishes to keep snakes should first learn to differentiate instantly between any venomous snakes he is likely to meet and the harmless ones and to confine his attentions to the latter until skill in handling them is attained. Lastly, if he handles his five hundredth poisonous snake with as much care as his first one, there is not much danger in his being bitten.

conditions of the land are continually changing because of the advance of civilization. Such information may some day be valuable in zoogeographical or other scientific studies. Consequently, collectors should keep as accurate and complete a record of their work as they can. Both environmental and geographic data, as well as dates and collectors, should be recorded and each specimen tagged individually. The more complete and accurate the data, the more valuable will be the specimens.

There are in the United States several genera of snakes, mostly small and secretive, with grooved fangs in the rear of the mouth and a comparatively small amount of venom which quickly paralyzes the animals they prey upon. However, these snakes are generally

Fig. 4. A collection of snakes preserved for future use. The two flat front jars above have snakes prepared for museum exhibition.

timid and unwilling to bite, and if they did strike in self-defense, the venom fangs would normally not be used. Consequently, they are generally not included in detailed treatments of the venomous snakes. A bite from one of them would usually be no worse than a bee-sting.

The Coral or Harlequin Snake of the Southeastern United States, which averages two and a half feet in length, is a slender, cylindrical, smooth snake, evincing burrowing habits. It is ringed in black, yellow, and deep red, *with the narrow yellow rings between the broad red and black ones.* Also the snout is black and across the middle of the head is a broad yellow band and behind it a black ring. None of the harmless North American snakes have this arrangement. The eastern Milk Snakes (*Lampropeltis triangulum* subspp.) resemble Coral Snakes

superficially. They have a ground color of gray or yellow and a series of broad, black-bordered red or brown saddles which in southern subspecies nearly encircle the body. The Scarlet King Snake (*L. elapsoides* subspp.) of the southeastern states and the western Coral King Snakes (*L. zonata* and *L. pyromelana*) have a completely ringed pattern of red, yellow and black, but with the same arrangement. The black rings enclose the red and the yellow separates the black. The little southeastern Scarlet Snake (*Cemophora coccinea*), when viewed from above, seems to have rings like the Scarlet King Snake, but the belly is plain white or yellow.

The Coral Snakes (*Micrurus* and *Micruroides*) are members of the group to which belong the deadly cobras and sea snakes, and like them have two short, immovable fangs in the forward roof of the mouth. The amount of venom is not large, and the snake must deliberately bite or chew before the fangs can penetrate, but the neurotoxic venom is so powerful that it is estimated that over seventy per cent of the victims die. Fortunately, there are few injuries from the Coral Snake, due to its secretive nature and sometimes passive behavior. Some specimens can be handled freely for weeks without a display of temper, but at any time a little too much pressure in handling or a resistance to the snake's movements will cause it to swing suddenly and grasp the offending hand or instrument. The Coral Snake does not strike like the vipers, it twists from side to side like a steel spring, and when the fangs are brought into play it chews.

The other North American venomous snakes, the rattlesnakes, water moccasins, and copperheads, are pit vipers. The name of pit viper arises from the presence of a deep, highly innervated pit on each side of the head between eye and nostril. There are recognized at the present time about twenty-six species and subspecies of rattlesnakes in the United States, but the only dangerous one found in the eastern states north of the Carolinas, Louisiana, and Arkansas is the Banded or Timber Rattlesnake, *Crotalus horridus,* of which the lower Mississippi Valley form has recently been recognized as a subspecies, *C. h. atricaudatus.* The Florida Diamondback Rattlesnake (*C. adamanteus*), which probably attains the greatest weight of any venomous snake, is found as far north and west as southern North Carolina and Louisiana. With the exception of the Pigmy Rattlesnakes (*Sistrurus*), which are usually too small to be at all dangerous, all the other rattlesnakes are primarily western forms, with the greatest number of species being found in the deserts of the Southwest. The Copperhead may be distinguished from all the other snakes by its unmarked copper-colored head. It is found in all of the eastern states from Massachusetts and Illinois southward—except peninsular Florida—and in western Texas as a subspecies (*Agkistrodon mokasen laticinctus*). The Cottonmouth or Water Moccasin (*A. piscivorus*) is one of the larger snakes. It ranges from Virginia to Florida and

up the Mississippi Valley to Illinois, being the only venomous snake commonly found about Reelfoot Lake in northwestern Tennessee.

The pit vipers have elongated hollow fangs which are rigidly fastened to short, movable bones, so that the fangs fold against the roof of the mouth when not in use. The venom, formed and stored in modified salivary glands in the snakes' temples, is haemotoxic and somewhat haemolytic, rather than neurotoxic. (A notable exception to the pit viper rule is the Tropical Rattlesnake of Mexico, Central America, and South America. It has a predominantly neurotoxic venom.) The bite of a dangerous snake may usually be recognized by the round, wide-spaced punctures left by the two fangs. The bite of a harmless snake is a horseshoe-shaped mark of many small teeth, or a few long scratches if the snake did not hit solidly. The snake may, at any rate, be considered harmless if the bite does not begin to swell and pain in five or ten minutes. The fangs of the Coral Snake usually leave several sets of punctures, but accidents due to these snakes are so rare that little attention has been paid to their treatment. For the same reason, no antivenin has been developed in the United States to combat the Coral Snake bite.

The suction method of treating poisonous snake bite seems to be the most reliable surgical procedure as well as the handiest and best first aid treatment. This should always be supplemented by antivenin injections, but the general tendency among physicians has been to place too much reliance on the use of antivenin without the supportive incision and thorough suction. The various home remedies such as herbs, coal oil, large doses of whiskey, freshly-killed fowls, etc., as well as application of silver nitrate or injection of potassium permanganate, have proven entirely useless and often detrimental. Anyone who expects to handle very many venomous snakes while not close to a general hospital or other reliable source, should keep a supply of antivenin handy. However, it should be remembered in getting this that as many as five doses of antivenin at about ten dollars per tube may be needed for the bite of a very large snake. For the sportsman and others whose contact with snakes is only incidental, one of the suction kits is sufficient protection. Economy and portability are in favor of the suction kit. It should contain a strong rubber suction bulb with a detachable large and a smaller narrow aperture, a tourniquet (preferably a rubber tube), a vial of some dependable antiseptic (tincture of iodine or metaphen is recommended), and a sterile lancet. Complete directions accompany the various suction kits and tubes of antivenin.

Even if no suction outfit is available, considerable can be done. Most important is to keep calm, especially if alone. The first step is to slow down the absorption of venom, if the bite is on arm or leg, by means of a tourniquet tied two or three inches above the injury. A piece of string, a handkerchief, a necktie, heavy rubber band, or anything of the sort can be used. It will do no harm to put a second tourniquet halfway above the first one, but both *must* be entirely

loosened for two or three minutes every twenty minutes to avoid the possibility of gangrene. Incisions may be made with a sharp knife or a razor blade sterilized by passing through a flame. Cross incisions should be cut at each of the fang punctures, or, better if no large blood vessels are in the way, the two punctures should be connected by a long incision and shorter cross cuts made at the punctures. The longer and deeper cuts should, if possible, be with the longitudinal axis of the underlying muscles, not across them, and at the punctures they should go a little deeper than the fangs penetrated. The fangs of an average Cottonmouth are about one-fourth inch long, but a rattlesnake's would be slightly longer.

The quicker suction is started, the greater the concentration of venom removed, though the actual volume of fluid removed in the first half-hour may not be large. The patient or someone else may use his mouth with entire safety if no bad teeth or mouth abrasions are present, but a strong rubber bulb is more efficient and less tiring. A bottle can be heated, its mouth applied to the injury, and cold water poured over it. Special precautions for asepsis should be taken, as the snake venom greatly lowers the natural resistance of the body to infection from other agencies.

The patient should be in the hands of a physician as quickly as possible, and an injection of antivenin made an hour or two after the injury. Suction is then suspended for an hour in order not to withdraw the antivenin. Suction should, however, be continued vigorously at intervals for at least ten or twelve hours. If the swelling does not diminish in a few hours, or other alarming symptoms continue, another injection of antivenin should be given. If it was an unusually large snake or the person bitten was ill or young, as many as five or six shots of serum should be used. One tube of antivenin will neutralize only a limited amount of venom, while the size and health of the body has much to do with the amount it can safely absorb.

Snake-bitten persons should remain in a hospital or at least under the care of a physician for some time. Various supplementary treatments such as more extensive incisions, irrigations, heart stimulants, and sedatives are often important. Remember that most fatalities occur from twenty-four to forty-eight hours after the accident, but that death may occur five or six days afterward. Extreme cases call for blood transfusions and intravenous injections of antivenin.

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RECOVERY FROM VIRUS DISEASE CAUSES IMMUNITY IN TOBACCO

Acquired immunity to disease in man and animals has given rise to important branches of medical science—particularly preventive inoculation with a mild form of a disease to prevent dangerous infection by a severe form.

Until recently, however, it was generally believed that the only hope for immunity or resistance in plants must come through the existence of inherited characters or factors.

Now, Dr. James Johnson of the Bureau of Plant Industry, working at the Wisconsin Agricultural Experiment Station, has announced that tobacco plants recovering from tobacco streak—a virus disease fairly common in Wisconsin and to some extent elsewhere, acquire a considerable degree of immunity from further infection. Renewed infection is not likely to affect the new growth. However, these "recovered" plants are infectious to healthy plants, that is, "carriers" of the infection.

Dr. Johnson's findings confirm the results of recent research into the virus diseases of tobacco and potatoes. and may have practical results. It is not likely, he says, that protective inoculation of individual plants may prove a practical disease control method for ordinary crop plants grown annually from seed. But in the case of plants ordinarily grown by propagation—potatoes and sweetpotatoes, for example, and many trees, shrubs, bulbs, and perennial ornamentals—it is likely, he thinks, that immunization may be applied to planting stock, so that the propagated material will possess immunity. It is possible that acquired immunity may explain why commercial stocks of potatoes are not attacked by some of the virus diseases that are likely to attack seedling potato varieties with which the plant breeders experiment.

Dr. Johnson makes clear that his experiments do not suggest hope that plants may acquire immunity from fungous and bacterial diseases, but do open a field for attack on the virus diseases. His work with tobacco streak indicates the acquired immunity is specific and gives protection against this disease only. It does not render his plants immune to other virus diseases.

Other investigators in recent years have reported a few instances in which recovery from one virus seems to give some degree of protection from one or more of the other related virus diseases.