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RATTLESNAKES (*Crotalus viridis viridis*)

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RATTLESNAKES

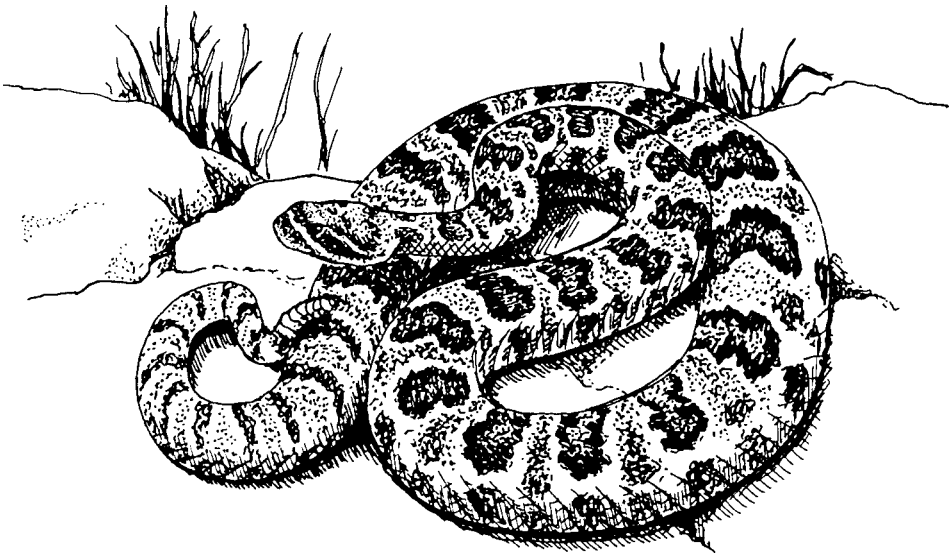


Fig. 1. Prairie rattlesnake, *Crotalus viridis viridis*

Damage Prevention and Control Methods*

Exclusion

Construct a snake-proof fence around areas of human activity.

Seal entrances to buildings and structures.

Habitat Modification

Eliminate shelter for snakes.

Control rodents; they attract snakes.

Repellents

None are available.

Toxicants

None are available.

Fumigants

Generally not effective in dens.

Trapping

Effective in some situations when properly placed.

Glue boards are useful in removing rattlesnakes from buildings.

Shooting

Effective where safe.

Other Methods

Organized snake hunts may be successful in spring or early summer.

Snake Bite

Wear protective clothing and be careful when climbing and walking.

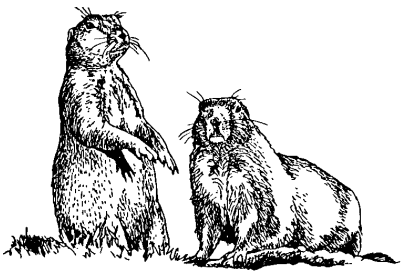
If a bite occurs, keep the victim calm, warm, and reassured. Seek medical attention immediately.

*Information pertains to other poisonous snakes.

Introduction

Rattlesnakes are distinctly American serpents. They all have a jointed rattle at the tip of the tail, except for one rare species on an island off the Mexican coast. This chapter concerns the genus *Crotalus,* of the pit viper family Crotalidae, suborder Serpentes. Since snakes evolved from lizards, both groups make up the order Squamata.

This article describes the characteristics of the common species of rattlesnakes that belong to the genus *Crotalus.* These include the eastern diamondback, (*C. adamanteus*); the western diamond (back) rattlesnake, (*C. atrox*); the red diamond rattlesnake, (*C. ruber*); the Mohave rattlesnake, (*C. scutulatus*); the sidewinder, (*C. cerastes*); timber rattlesnake, (*C. horridus*); three subspecies of the western rattlesnake, (*C. viridis*): the prairie rattlesnake (*C. v. viridis*); the Great Basin rattlesnake (*C. v. lutosus*); and the Pacific rattlesnake (*C. v. oreganus*).



PREVENTION AND CONTROL OF WILDLIFE DAMAGE — 1994

Cooperative Extension Division
Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln

United States Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

Great Plains Agricultural Council
Wildlife Committee

There are 15 species of rattlesnakes in the United States and 25 in Mexico. Other front-fanged poisonous snakes of the Crotalidae family, which are not included in this discussion, are the massasauga and pigmy rattlesnakes, both of the genus *Sistrurus.* Also not included are two snakes that do not have rattles, hence are not called rattlesnakes: the water moccasin or cottonmouth, and the copperhead, both of the genus *Agkistrodon*. Two other genera of poisonous snakes in North America are coral snakes (*Micrurus* and *Micruroides*) of the family Elapidae.

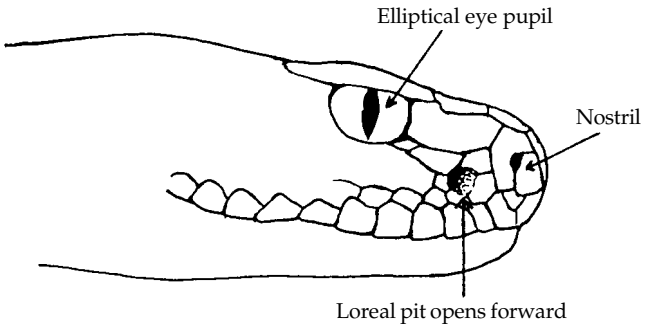


Fig. 2. Rattlesnake head showing "cat-eye" elliptical pupil and location of the large loreal pit, characteristic of pit vipers.

Identification

Rattlesnakes are usually identified by their warning rattle — a hiss or buzz — made by the rattles at the tip of their tails. A rattlesnake is born with a button, or rattler, and acquires a new rattle section each time it molts. Rattlesnakes also are distinguished by having rather flattened, triangular heads. The heads of all *Crotalus* rattlesnakes are about twice as wide as their necks. Only pit vipers possess this head configuration; coral snakes do not.

Rattlesnakes belong to the pit viper family Crotalidae, so named because all possess visible loreal pits, or lateral heat sensory organs, between eye and nostril on each side of the head (Fig. 2). These heat sensory pits are not present in true vipers, which do not occur in the Western Hemisphere. The facial pits enable rattlesnakes to seek out and strike, even in darkness, warm objects such as small animal prey, as well as larger animals that could be a threat. The vertically elliptical eye pupils, or "cat eyes," are also a characteristic of rattlesnakes (Fig. 2). Identifying a dead rattler whose rattles are missing can be done by looking at the snake's scales on the underside in the short region between the vent and the tip of the tail. If the scales are divided down the center, the snake is harmless. The scales on rattlesnakes are not divided.

Rattlesnakes come in a great variety of colors, depending on the species and stage of molt. Most rattlers are various shades of brown, tan, yellow, gray, black, chalky white, dull red, and olive green. Many have diamond, chevron, or blotched markings on their backs and sides.

Range and Habitat

Rattlesnakes occur only in North and South America and range from sea level to perhaps 11,000 feet (over 3,000 m) in California and 14,000 feet (4,000 m) in Mexico, although they are not abundant at the higher elevations. They are found throughout the Great Plains region and most of the United States, from deserts to dense forests and from sea level to fairly high mountains. They need good cover so they can retreat from the sun. Rattlers are common in rough terrain and wherever rodents are abundant.

Food Habits

Young or small species of rodents comprise the bulk of the food supply for most rattlesnakes. Larger rattlers may capture and consume squirrels, prairie dogs, wood rats, cottontails, and young jackrabbits. Occasionally, even small carnivores like weasels and skunks are taken. Ground-nesting birds and bird eggs can also make up an appreciable amount of the diet of some rattlers. Lizards are frequently taken by rattlers, especially in the Southwest. The smaller species of rattlesnakes and young rattlesnakes regularly feed on lizards and amphibians.

Rattlesnakes consume about 40% of their own body weight each year. Many prey are killed but not eaten by rattlesnakes because they are too large or cannot be tracked after being struck. One male rattler captured in the field had consumed 123% of its weight, but young rattlers frequently die due to lack of food. Domestically raised rattlesnakes will survive when fed only once a year, but in the field, snakes usually feed more than once, depending on the size of prey consumed. A snake may kill several prey, one after another, and of different species. When rodents and rabbits are struck, the prey is immediately released. The snake then uses its tongue to track the prey to where it has died.

Digestion is quite slow and usually no bones remain in the feces, called "scats." Hair, feathers, and sometimes teeth, however, can usually be identified in scats. Rattlesnakes use very little energy except when active, and they probably are active for less than 10% of their lives. They are not very active unless food is scarce. They store much fat in their bodies, which can last them for long periods.

General Biology, Reproduction, and Behavior

When a rattlesnake strikes its prey or enemy, the paired fangs unfold from the roof of its mouth. Prior to the completion of the forward strike motion, the fangs become fully erect at the outer tip of the upper jaw. The erectile fangs are hollow and work like hypodermic needles to inject a modified saliva, the venom, into the prey. Rattlesnakes can regulate the amount of venom they inject when they strike.

Mature fangs generally are shed several times a season. They may become embedded in the prey and may even be swallowed with the prey. When one mature fang in a pair is lost, it will soon be replaced by another functional mature fang. A series of developing fangs are located directly behind one another in the same sheath at the roof and outer tip of the mouth (Fig. 3). If a newly replaced fang is artificially removed, it may require weeks or longer before another replacement will be fully effective. One fang can function, however, while the other in the pair is being replaced. Fangs that get stuck in a person's boot are not very dangerous; they cannot contain much venom since they serve only as a hollow needle. The external opening of the hollow fang is a groove on the outside of the fang, set slightly back from the tip to prevent it from becoming plugged by tissue from the prey (Fig. 3).

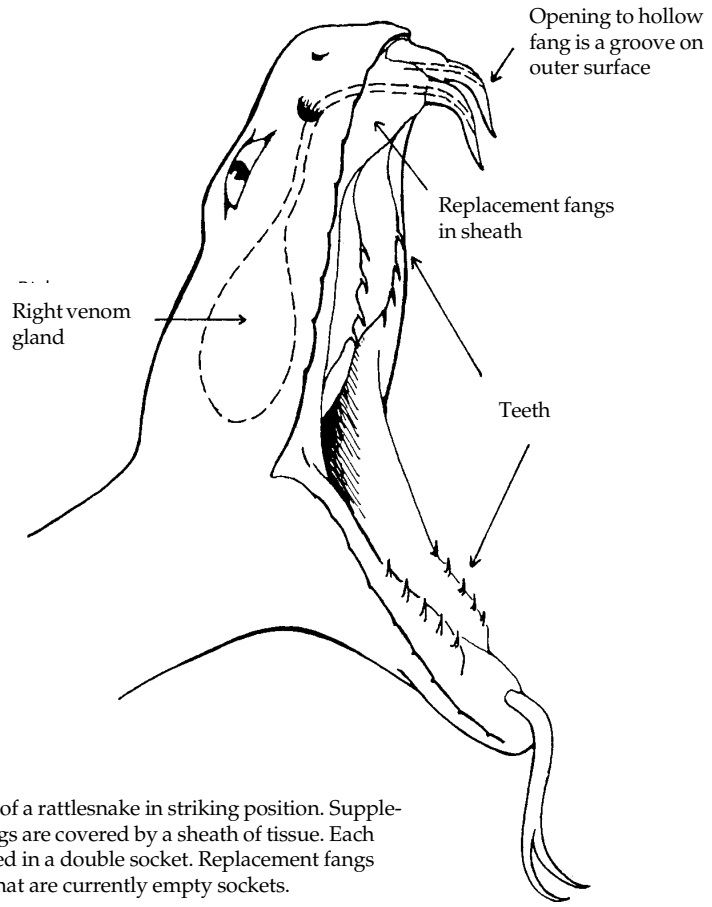


Fig. 3. Head of a rattlesnake in striking position. Supplementary fangs are covered by a sheath of tissue. Each fang is located in a double socket. Replacement fangs appear in what are currently empty sockets.

Rattlesnakes cannot spit venom, but the impact of a strike against an object can squeeze the venom gland, located in the roof of the mouth, and venom may be squirted. This can happen when a rattler strikes the end of a stick pointed at it, or the wire mesh of a snake trap. The venom is released involuntarily if sufficient pressure is exerted, as occurs when venom is artificially "milked" from live snakes. Such venom is dangerous only if it gets into an open wound. Always wear protective clothing when handling rattlesnakes.

Female rattlesnakes are ovoviviparous. That is, they produce eggs that are retained, grow, and hatch internally. The young of most species of rattlesnakes are 6 to 8 inches (15 to 20 cm) when born. They are born with a single rattle or button, fangs, and venom. They can strike within minutes, but being so small, they are not very dangerous. Average broods consist of 5 to 12 young, but sometimes twice as many may be produced.

The breeding season lasts about 2 months in the spring when the snakes emerge from hibernation. Sperm is thought to survive in the female as long as a year. During summer, pregnant females usually do not feed, so few are ever captured that contain eggs about to hatch. The young are born in the fall. Most rattlesnakes are mature in 3 years, but may require more time in northerly areas. Rattlesnakes may not produce young every year.

The sex of a rattlesnake is not easy to determine. Even though the tail of the rattlesnake (the distance between the vent and the rattles) is quite short, it is much longer in males than in females of the same size. The paired hemipenises of male snakes are not visible except during mating, when one of these paired hollow organs is turned inside out and extruded from the cloaca. If both are extruded artificially, they appear like two forked, stumpy legs.

Snakes never close their eyes, since they have no eyelids. They are deaf, but can detect vibrations. They have a good sense of smell and vision, and their forked tongues transport microscopic particles from the environment to sensory cells in pits at the roof of the mouth. A rattlesnake uses these pits to track prey it has struck and to gather information about its environment.

Snakes have a large number of ribs and vertebrae with ball-and-socket joints. Each rib is joined to one of the scales on the snake's underside. The snake accomplishes its smooth flowing glide by hooking the ground with its scales, which are then given a backward push from the ribs. Rattlesnakes often look much larger when seen live than after they have been killed. This happens because their right lung extends almost the full length of the tubular body, and when the snakes inhale they can appear much fatter and more threatening. The expulsion of the air can produce a hiss.

Rattlesnakes, like other snakes, periodically shed their skin. When the new skin underneath is formed, the snake rubs its snout against a stone, twig, or rough surface until a hole is worn through. After it works its head free,

the snake contracts its muscles rhythmically, pushing, pulling, and rubbing, until it can crawl out of the old skin, which peels off like an inverted stocking. Each molt produces a new rattle. Some rattles usually break off from older snakes. Even if no rattles have been lost, they do not indicate exact age because several rattles may be produced in one season.

Even though the optimum temperature for rattlesnakes is around 77° to 89° F (25° to 32° C), the greatest period of activity is spring, when they come out of hibernation and are seeking food. If lizards are active, be alert for rattlesnakes. The activity period for rattlers can vary from about 10 months or so in warm southern regions to perhaps less than 5 months in the north and at high elevations. Depending upon availability of good, dry denning sites below the frost line, rattlesnakes may hibernate alone or in small numbers. However, sometimes they den in large groups of several hundred in abandoned prairie dog burrows or rock caverns, where they lie torpid in groups or "balls." All dens must be deep enough so the temperature is not affected by occasional warm days. If not, the snakes might emerge too early in spring only to become sluggish and vulnerable should the weather again turn cold. Since snakes are cold-blooded animals and their body temperature is altered by air temperature, refrigeration makes them sluggish and easy to handle for displaying.

Rattlesnakes usually see humans before humans see them, or they detect soil vibrations made by walking. They coil for protection, but they can strike only from a third to a half of their body length. Rattlers rely on surprise to strike prey. Once a prey has been struck, but not killed, it is unlikely that it will be struck again. Experienced rodents and dogs can evade rattlesnake strikes.

Rattlesnakes may appear quite aggressive if exposed to warm sunshine. Since they have no effective cooling mechanism, they may die from heat stroke if kept in the sun on a hot day much longer than 15 or 20 minutes.

If a rattlesnake has just been killed by cutting off its head, it can still bare its fangs and bite. The heat sensory pits will still be functioning, and the warmth of a hand will activate the striking reflex. The head cannot strike, but it can bite and inflict venom. The reflex no longer exists after a few minutes, or as long as an hour or more if it is cool, as rigor mortis sets in.

Damage and Damage Identification

The greatest danger to humans from rattlesnakes is that small children may be struck while rolling and tumbling in the grass. Only about 1,000 people are bitten and less than a dozen people die from rattlesnake venom each year in the United States. Nevertheless, it is a most unpleasant experience to be struck. The venom, a toxic enzyme synthesized in the snake's venom glands, causes tissue damage, as it tends to quickly tenderize its prey. When known to be abundant, rattlesnakes detract from the enjoyment of outdoor activities. The human fear of rattlesnakes is much greater than the hazard, however, and many harmless snakes inadvertently get killed as a result. Death from a rattlesnake bite is rare and the chance of being bitten in the field is extremely small.

Experienced livestock operators and farmers usually can identify rattlesnake bites on people or on livestock without much difficulty, even if they did not witness the strike. A rattlesnake bite results in almost immediate swelling, darkening of tissue to a dark blue-black color, a tingling sensation, and nausea. Bites will also reveal two fang marks in addition to other teeth marks (all snakes have teeth; only pit vipers have fangs too). Rattlesnakes often bite livestock on the nose or head as the animals attempt to investigate them. Sheep, in particular, may crowd together in shaded areas near water during midday. As a consequence, they also frequently are bitten on the legs or lower body when pushed close to snakes. Fang marks and tissue discoloration that follows in the major blood vessels from the bite area are usually apparent on livestock that are bitten (see Wade and Bowns 1982, pages 32 and 34 in the **Damage Identification** section of this book).

Legal Status

Most species of rattlesnakes are not considered threatened or endangered. Since they are potentially dangerous, there has not been much support for protecting them except in national parks and preserves. However, since there are state and local restrictions, contact local wildlife agencies for more information.

Damage Prevention and Control Methods

An occasional single poisonous snake can be destroyed if one has enough determination. In areas where the habitat is favorable for rattlesnakes, copperheads, or water moccasins, a significant reduction in their population density may be difficult. In snake country, most people learn to "keep their eyes open" and be cautious.

Exclusion

When feasible, the most effective way for a homeowner to protect a child's play area from rattlesnakes is to construct a rattlesnake-proof fence around it. The fencing must be tight. If wire mesh is used, it should be 1/4-inch (0.6-cm) mesh and about 3 feet (1 m) high. Bury the bottom 3 or 4 inches (8 or 10 cm) or bend outward 3 or more inches of the base of the wire to discourage other animals from digging under the fence. Put the stakes on the inside and install a gate that is tight-fitting at the sides and bottom, equipped with a self-closing spring. The benefit of the fence will be lost if wood, junk, or thick vegetation accumulates against the outside of the fence. Vegetation that has ground-level foliage also provides attractive hiding places for rattlesnakes, so it should be removed or properly pruned. Tight-fitting doors will prevent snakes from entering outbuildings. The foundations of all buildings should be sealed or tightly screened with 1/4-inch (0.6-cm) wire mesh to keep out snakes.

Habitat Modification

It is always desirable to use nonlethal biological means of control when feasible. Although good quantified data are not available to evaluate the effectiveness of removing the prey of snakes, effective, sustained rodent control will reduce the attractiveness of a rural residence or other facility to rattlesnakes. Snakes will not remain in habitat made less favorable for them. Hiding places under buildings, piles of debris, or dense vegetation should be removed. Hay barns and feed storage areas that encourage rodents will attract rattlers.

Frightening

No methods are known that will frighten rattlesnakes. Sounds certainly will not work because snakes are deaf.

Repellents

Many potential snake repellents have been researched, only to be found ineffective. All species of snakes are likely to cross a strip of repellent substance if they want to get to the other side.

Dr. T's™ Snake-A-Way®, a mixture of sulphur-naphthalene, has been registered by EPA; however, its registration in California was denied as of July 1991, because required data was not submitted. A Y-shaped laboratory enclosure that provided rattlers with a choice of crawling into a tunnel with odor or one free of odor showed they usually chose the passage free of odor. No field test data is available. To be of practical use, the odor of a snake repellent must not be too objectionable to people.

Toxicants

No effective toxicant is registered for the control of rattlesnakes. When rodents were poisoned with various rodenticides and then fed to rattlesnakes, the snakes were not affected. Apparently, digestion is too slow for the toxicants to have an effect on snakes.

Fumigants

It may be possible to kill rattlesnakes in burrows and rock dens with toxic gas, although this is not a very practical method. Calcium cyanide is a chemical frequently recommended, but no lethal gas has had good success because snakes have such a slow rate of metabolism, especially when in hibernation. In addition, susceptible nontarget species in the burrows or dens may become victims.

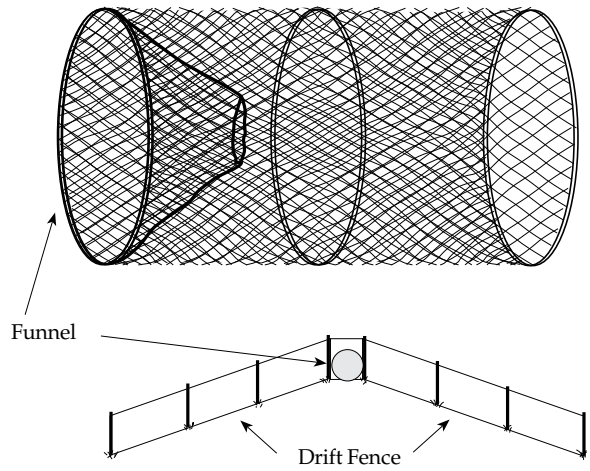


Fig. 4. A fish-type funnel trap of 1/4-inch hardware cloth attached to an inward-sloping drift fence of the same wire mesh can be useful in trapping snakes as they emerge from a multi-opening den. Escape will be reduced if a wooden nest box is attached to the funnel trap.

In the spring and early summer, when hibernating snakes are about to emerge, gasoline poured down a burrow or into a den will drive the snakes out. As the snakes exit they can be clubbed, shot, or captured alive with snake tongs that secure a snake at its neck. If transported in a bag, tie the top securely. Many snake hunters push a hose down a burrow and after listening to confirm that rattlesnakes are present, pour 1 to 2 ounces (30 to 60 ml) of gasoline into a funnel on the hose and then blow on the hose. This technique seems quite effective for seasonally reducing rattlesnake numbers, but it may be lethal to nontarget animals including nonpoisonous and beneficial snakes. To be effective, community-wide campaigns should extend over several days, since many snakes may escape into holes or crevices. Snake hunters should wear protective clothing such as pants, heavy gloves, and boots.

Trapping

Various combinations of fencing and traps at known rattlesnake dens can be very successful if one is trying to collect rattlesnakes, because in some localities several hundred rattlesnakes may occupy the same den. If all but one opening can be blocked, it is then quite simple to pipe or otherwise channel the emerging rattlesnakes into a large oil drum or other receptacle. If it is not possible to find all den openings, inward-sloping drift fences of 1/4-inch (0.6-cm) hardware cloth mesh, 1 or 2 feet (0.5 m) high, with fish-type funnel traps (Fig. 4) will suffice. The inward sloping funnel makes it difficult for the snakes to escape. If a wooden nestbox is attached to one side of these traps, the snakes will usually hide in the box and not spend as much time trying to escape. Drift-fence funnel traps also catch many other animals. Therefore, this control method requires daily inspection and usually is not very practical except at dens.

Glue boards are useful for trapping rattlesnakes that are in or under buildings (Knight 1986). To trap rattlesnakes, use a plywood board approximately 24 x 16 inches (61 x 41 cm). Securely tack a 6 x 12-inch (15 x 30-cm) rodent glue trap (or use bulk glue to make a similar-sized glue patch) to the plywood (Fig. 5). Place the board against a wall, as this is where snakes are likely to travel. The rattlesnake will become stuck while attempting to cross the board. Do not place the board near any objects (pipes, beams) that the snake can use for leverage in attempting to free itself.

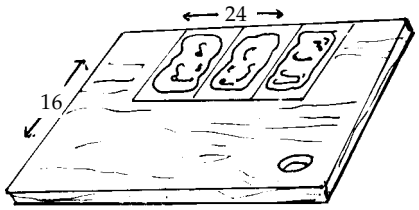


Fig. 5. A glue trap to catch rattlesnakes can be made by attaching three to six rodent glue traps to a wooden board.

The glue trap can be removed easily using a long stick or pole with a hook or by an attached rope if a hole is drilled through the plywood board. Animals trapped in the glue can be removed with the aid of vegetable oil, which counteracts the adhesive.

Do not use glue boards outdoors or in any location where they are likely to catch pets or desirable nontarget wildlife. The glue can be quite messy and is difficult to remove from animals.

Shooting

A shotgun has often been used to eliminate individual rattlesnakes around a rural homestead. Similarly, a pistol loaded with birdshot is very effective at close range. Shooting is not considered effective for reducing large populations.

Other Methods

Dynamite blasting of known dens is dangerous and has questionable advantages. There is no way to know what kinds and how many snakes have been killed, and the blast may create an even better den for future rattlesnakes.

Rattlesnakes have natural predators, but the predators are not likely to help much in controlling rattlesnake populations. Some dogs, especially if they have experienced a snake bite, become excellent guards for children. They will bark when a snake is discovered, and many can kill rattlesnakes as well. Domestic geese and turkeys may also help, by acting as an alarm and by frightening snakes. Hogs do not provide practical protection around a homestead.

Snake Bite

The best protection for humans when traveling in snake country is common sense in choosing protective foot and leg wear. When climbing, one should beware of putting a hand up over rocks. Rattlesnakes might be waiting there for a rodent, and the warmth in a hand may cause the snake to strike reflexively. Care should be taken at night, when snakes are more active, and the chance of stepping on a snake is greater. Fortunately, rattlesnakes try to avoid people.

The best first aid for a poisonous snake bite is to seek immediate medical care and to keep the victim calm, warm, and reassured. Do not drink alcohol or use ice, cold packs, or freon spray to treat the snake bite or cut the wound, as was once recommended.

If a victim of snake bite is several hours from a car and medical aid, apply a light constricting cloth or other band on the bitten limb, 2 to 4 inches (5 to 10 cm) from the bite and between bite and heart. Make sure it is not as tight as a tourniquet. It should be easy to insert a finger under the band. Loosen it if swelling occurs. Apply suction at the wound for at least 3/4 of an hour by mouth (if no mouth sores), or with a snake bite kit, but again, only if medical assistance is several hours away.

The causes of human death from rattlesnake venom are varied, but usually occur from extended hypotension and cardiopulmonary arrest. Usually within a few minutes after being struck the victim will experience pain and swelling at the wound site.

Economics of Damage and Control

The greatest economic loss to humans from rattlesnakes comes from the number of domestic livestock and pets that are killed. Horses and cattle are most frequently struck in the head while grazing. Some have claimed that rattlesnakes benefit ranchers by the number of rodents they eat, but current predator-prey theory discounts this. It is very doubtful that snakes have much effect on the density of rodents.

The commercial value of rattlesnakes consists of the venom, rattles, skins and, to a limited degree, the meat.

Acknowledgments

Figures 1 through 3 by Emily Oseas Routman.

Figures 4 and 5 by Jill Sack Johnson.

For Additional Information

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