Southern California Wildlife - Native Reptiles & Rattlesnakes

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By show of hands, how many of you have encountered some type of reptile (snake or lizard) while working? Or during your off hours while gardening, hiking, mountain biking, etc.? Reptiles, while plentiful here in San Diego County, are typically very shy creatures due to the fact that they see humans as predators. (The "law of the land" is that bigger animals typically eat smaller animals.) Reptiles inhabit just about every environment that we do! (Be sure to take a look at the reptiles we brought in today at the break or at the end of the class!)

They say that a person who can caress a snake can do anything. It is not our aim today to get you to like reptiles – but it is our goal to give you a clearer understanding of reptiles and their behaviors. First, we are going to talk about some of the lizards that inhabit our county.

As we have stated, reptiles are in just about all the habitats that we have in San Diego. Lizards are fascinating creatures which have a lot to teach us if we only pay attention to them. They could be the next indicator species of environmental troubles after amphibians. We have brought in four species of lizard today that span some broad habitat choices ranging from coastal sage scrub and chaparral on the coast and foothills to the forests of higher elevations as well as riparian areas and oak woodlands.

Lizards

1. Side Blotched *Uta stansburiana*
   It is estimated that a single lizard can devour up to 9,000 insects each year.

2. Western Fence *Sceloporus occidentalis*
   Western Fence lizards may reduce the incidence of Lyme disease in their range! It has recently been discovered that when infected ticks feed on the blood of these lizards, the Lyme disease spirochetes they carry are destroyed. In areas with Western Fence, about 5 percent of ticks carry the disease, while in other areas 50 percent of ticks harbor the disease. (Reported by the NY Times News Service, April 19, 1998)

3. Southern Alligator Lizard *Elgaria multicarinata*
   Alligator Lizards have prehensile tails. By using the tail as a support, or to hang onto branches, they can maneuver through vegetation quite effectively. Their diet includes various insects, small animals such as young mice and birds, tree frogs, and even other lizards. Alligator Lizards aren't easily intimidated by humans and, while not venomous, can inflict a painful bite. They have an ornery disposition and if you decide to catch one, expect to pay the price.

4. Western Skink *Eumeces skiltonianus*
   The cobalt blue tail is thought by most to attract the attention of predators.

Non-venomous Snakes

The next topic for discussion is the snakes that inhabit our wonderful county. First, we will cover the non-venomous species, then we will discuss rattlesnakes.

When we talk about boas most people would think of the large tropical boas that are seen on the television. However, San Diego itself has the distinct honor of being home to two different species of boa.

1. Rubber Boa *Charina bottae*
   Rubber Boas are typically found in the upland habitats of San Diego such as scrub pine oak woodlands, chaparral and coniferous forests.

2. Rosy Boa *Lichanura trivirgatta*
   This species usually has a pattern of three, poorly defined, lengthwise stripes: one central and two lateral on a lighter ground. These Boas live in dry scrubland, desert fringes, or talus slopes on south facing hillsides.

Other non-venomous species native to San Diego County include the following:

3. San Diego Gopher Snake *Pituophis cantenifer annectens*
   This species is found at the coast to the foothills and mountains. This snake is most active during the day and may be seen in a variety of habitats, especially in the open areas of fields, meadows, and coastal sage scrub. When Gopher Snakes become agitated, they often vibrate their tail. When this occurs in loose, dry vegetation the resulting sound resembles that of a rattlesnake. This behavior plus the dorsal blotches that might be mistaken for a rattlesnake's diamond pattern, often result in the gopher snake being killed by a frightened person!

4. California Kingsnake *Lampropeltis getula californiae*
   The habitat varies for this subspecies of which there are quite a few. In our state and county they are found in deserts, chaparral, piñon-juniper woodlands and river bottoms. Kingsnakes are immune to rattlesnake venom. Their first line of defense is to defecate and smear it on themselves. This behavior is thought to be due to the fact that predators don't like the smell.

Rattlesnakes

1. Sidewinder *Crotalus cerastes*
   The habitat of the Sidewinder is typically desert with loose sand dunes. However, the Sidewinder has been documented in hardpan, rocky, or gravelly sites as well. The types of vegetation associated with this snake are creosote, mesquite, and paloverde.

2. Speckled Rattlesnake *Crotalus mitchelli*
   The Southwestern subspecies that we have is known to inhabit primary desert areas, usually occupying the hottest driest part of that desert. It seems to prefer the rocky microhabitats such as canyons, foothills, and erosion gullies.

3. Western Diamondback Rattlesnake *Crotalus atrox*
   The Western Diamondback lives in a variety of dry or seasonally dry habitats. These include deserts, scrublands, grasslands, and open coniferous woods. This snake looks at first glance like a Southern Pacific Rattlesnake *Crotalus viridis helleri*. However, it is a different species and can be identified from its cousin by the black and white coon-tail or banding just before the rattle.

4. Red Diamond Rattlesnake *Crotalus rubber*
   This rattlesnake occurs in rocky habitats with thick vegetation sometimes moving into cultivated areas and grasslands. It is most common in the western foothills of coast ranges but also in the dry rocky woodlands.

5. Mojave Green Rattlesnake Crotalus *scutulatus*
   This is one of the most aggressive of the rattlesnakes as well as one of the most potent as far as venom is concerned. This snake is found in semiarid grasslands, open brush areas, or deserts where the soil is not particularly rocky. While there have been reports of these snakes being found in San Diego County, there are no documented cases.

6. Southern Pacific Rattlesnake *Crotalus viridis helleri*
   This is the most common rattlesnake in San Diego County. It is also the most aggressive snake in the County. Any area that supports a population of rodents will support these snakes.

Venom

No discussion about venomous snakes is complete without a discussion of venom. First of all, there is a difference between venom and poison. Poison is that which you must ingest, inhale, or obtain through topical contact. Venom is something that is injected into you by another animal such as bee, wasp, spider, or rattlesnake.

The injection mechanism of a rattlesnake is under the skin and just behind the eye. Enclosed in a specialized musculature is a bulbous salivary type of gland which is known as the venom gland. In its most basic terms, "venom" is nothing more than modified saliva. It is injected into prey via two hollow fangs which are erected when the snake strikes. At other times the fangs are folded back into the mouth and covered by fleshy sheaths.

Venom Properties

The properties of venom in rattlesnakes vary somewhat within species. Generally speaking there are two types of venom most commonly associated with venomous snakes of all kinds. They are known as hemotoxic or neurotoxic. The hemotoxic type will affect blood and circulatory systems within the body of its prey; the neurotoxic type found in some rattlesnakes affect the central nervous system.

Lethal dose measurements are provided for snake venom but these results can be misleading. For example, in a scientific study, if one hundred mice are injected with the venom in a sterile environment, the number of mice that die from the injection is used to determine the lethal dose rating. However, this may not be a legitimate point of reference for humans. This is due to the fact that humans are not only larger than mice and their circulatory systems are different, but too many variables are taking place in the wild to accurately measure the impact of the venom.

So where do we look for an accurate measurement of lethality in humans? The answer is somewhat disturbing when we take into account what we are talking about. *Yield* is the term used to measure how much venom is injected into an object. From various studies we can discover what the lethal human dose of venom **might** be. As mentioned earlier, there are simply too many factors to consider.

Samples of Specific Venom Properties

1. Sidewinder *Crotalus cerastes*
   This snake injects approximately 0.06 ml per bite. Total yield is usually 20-45mg of dried venom per adult with a maximum yield of 63mg. (Ernst and Zug 1996; Klauber 1972). Only 0.10mg/kg will kill a mouse (Ernst & Zug 1996); human lethal dose is 40mg (Dowling 1975). Sidewinder venom is hemorrhagic as well as anticoagulant. Typically the symptoms for humans are mild but there have been fatalities recorded.

2. Speckled Rattlesnake *Crotalus mitchelli*
   The minimum lethal dose for a 350g pigeon injected with venom is only 0.002-0.04mg dried venom, and for mice the lethal dose is 0.05-0.12 (Klauber 1972). Lethality of dried venom is not diminished with time; Russell et al. (1960) found it had not weakened after 26-27 years in storage. A typical adult may possess up to 227mg of dried venom (Klauber 1972); however, on the average individual yield is only about 0.06mg (0.18ml) of venom per bite for young snakes. Adults may inject 0.1mg (0.3ml), and old snakes 0.16 (0.48ml) (Amaral 1928).

3. Western Diamondback Rattlesnake *Crotalus atrox*
   This snake venom possesses hemorrhagic properties as well as neurotoxic properties. Yields in this snake are often high with a total yield being 175-600mg of dry venom (Ernst and Zug 1996). The human lethal dose is approximately 60-100mg. Envenomation by this snake is very serious and is probably the one snake responsible for the most human deaths in the United States.

4. Red Diamond Rattlesnake *Crotalus rubber*
   This snake typically has a high venom yield of 120-668 (mean 364) mg, with the lethal dose for humans being about 100mg. While being a hemorrhagic venom it, has properties within it that actually break down the clotting mechanisms.

5. Mojave Green Rattlesnake Crotalus *scutulatus*
   Of all venomous snakes in California, this is the most dangerous to humans. It has highly neurotoxic venom which affects the heart, skeletal muscles, and neuromuscular junctions. The average yield of dry venom is 77 (50-150) mg per fresh adult. The estimated lethal dose for humans is very small probably only 10-15mg (Minton and Minton 1969). This snake accounts for the most envenomation deaths in Middle California.

6. Southern Pacific Rattlesnake *Crotalus viridis helleri*
   This is the most irritable of all the rattlesnakes that the Southern California Wildlife team has encountered. It would seem that it is ready and willing to strike without hesitation at a seconds notice. Please do not be fooled by the snakes specimens. These are also the most common rattlesnakes that you will encounter in San Diego County. Venom properties of this snake signify quite a bit of interest for all herpetologists due to the fact that it appears to be evolving. Typical yield of dried venom in an adult is 35-250mg with an average venom yield in a bite being 65-90mg (Amaral 1928); lethal dose for humans is about 70-160mg (Minton & Minton 1969). Typically, this snake is known to have hemorrhagic venom properties. However, certain populations are being documented that have shown an increase in neurotoxic properties as well.

First Aid for Human Envenomation

Depending on who you talk to, there have been several differing theories and methods for rattlesnake envenomation treatment. Let's take an historical look and discover why these different techniques do not work.

Historical First Aid Options - DO NOT USE!

1. Tourniquet: Early in American history most wounds were treated with a tourniquet. While intentions were good, this is one of the worst things to do because the blood flow is now restricted. This means that the venom while prevented from getting to the heart is also compartmentalized in the limb therefore no good blood can flow to the limb and dilute the venom.

2. Cut and Suck: Another early technique, people would cut an "X" over the fang marks and attempt to suck out the venom. This strategy resulted in other possible problems: secondary infection, shock via trauma due to the cutting not being accurate, plus the possibility of the person doing the sucking also being poisoned.

3. Electroshock: In the late nineties, someone applied electroshock to a rattlesnake bite and claimed that it destroyed the venom. There is no proof that this technique works.

4. Venom Extractors: Most recently, venom extractors have been used but this causes the venom to compartmentalize to a small area leading to disastrous results.

5. Pressure Immobilization Bandage: Until recently, this was thought to be the best treatment - however, by reading the following reference, we can now see that this may no longer hold true. "*The longer survival suggests that PI might prolong life, a desirable goal if survival is in question because of (1) a serious bite and (2) a lengthy delay in gaining access to the most appropriate medical treatment–antivenom. However, PI treatment following bites by rattlesnakes may be accompanied by extensive and undesirable tissue destruction, as suggested by the higher intracompartmental pressures. Thus, any potential benefit of PI must be weighed against risks resulting from local tissue damage. Clearly, further study of the trade-offs between survival and tissue damage associated with PI treatment seems warranted."*

In summary, first aid you should <u>not</u> use for snakebites includes:

- Constricting bands/tourniquets
- Cutting the skin/suction by mouth
- Electroshock
- Venom Extractors
- Pressure dressings (or applying ice packs)
- Alcohol (external or internal!)

Current First Aid Options – USE!

Get to a hospital as soon as possible is the only way to treat any type of envenomation. There is no safe field treatment of any kind for envenomation. Following is a list of the things to do if you should be envenomed by a snake:

- The snakebite victim should move or be moved beyond the snake's striking distance.
- The victim should avoid exertion and be reassured, kept warm, and transported to the nearest medical facility as quickly as possible.
- The bite location should be loosely immobilized in a functional position just below heart level, and all rings, watches, and constrictive clothing removed.
- Stimulants should not be administered.
- Tourniquets, incision and suction, cold packs, and electric shock are contraindicated.
- The pressure immobilization (crepe bandages) method is not recommended in the United States for pit viper bites because local necrosis may be increased.

Possible Long Term Effects of Envenomation

The following is an incomplete list of things which may happen even after being treated by the hospital. Possible complications include:

- Bleeding
- Compartment syndrome
- Necrosis with resulting tissue loss or loss of function
- Renal failure
- Infection
- Respiratory difficulty
- Death (rare)
- Antivenom-associated complications (hypersensitivity reactions)

Snake Encounter Prevention & Management

The Southern California Wildlife team has been actively searching for rattlesnakes for over 30 years and has encountered approximately two dozen. In order to avoid rattlesnakes, simply make a lot of noise when you are working in an area where they have been spotted or seen. Contrary to popular belief, rattlesnakes do not want to be near humans. They do not chase people at all; nor do they seek people out to bite them.

So what do you do if you should encounter a rattlesnake? First, identify the snake's "Hot Zone." Basically the "Hot Zone" is that area around the snake in which it is capable of striking and hitting its target. You can estimate the "Hot Zone" is generally 1/3 of its body length. With that in mind, let's go through the different options if you encounter a snake. These are listed in order (safest to most dangerous).

Snake Encounter - Recommended Options

1. **BACK AWAY AND LEAVE THE AREA**
   This is the safest thing to do, especially if there is no immediate threat or danger to humans.

2. **CALL SOMEONE FOR HELP TO REMOVE THE SNAKE**
   Call Southern California Wildlife (SCW) to remove the snake safely. You can also call emergency personnel (County Animal Control) but they will destroy the snake. Call SCW first if the snake MUST be removed from the area.

3. **BARRICADE THE AREA**
   If there is chance that someone else may encounter the snake that day, barricade the area with traffic cones at least ten feet away from the snake. The snake will most likely leave the area within a day.

Snake Encounter - Recommended ONLY If Absolutely Necessary

4. **Prod with a Long Stick**
   Prod the snake gently to move out of the area. This is the second to last resort if humans are already in the area and cannot be safely moved out of the area. Note: the snake will likely see this as a threatening move and react accordingly.

5. **Bucket and Broom**
   Catching the snake by using a broom and gently sweeping it into a bucket and covering it to remove it from the area (or covering it with the bucket to keep it in place) – use this as the last resort – it should never be done if it is deemed too risky (the snake is too large or it is moving too quickly, etc.)

You are not expected to handle a snake as part of your job duties! The goal of today's training is educate you about snakes and recommend that you use the most sensible option – leave the area where the snake is located and do other work until the snake has moved on. If you do see a snake, report the location to the staff near the area (including the supervisor) and only call to get help to remove the snake if it is a safety risk to staff or park patrons. We cannot stress enough that the closer you get to a snake the more dangerous it is for everyone (humans and snakes)!

Web Resources

http://www.reptileallsorts.com/bites-venom.htm

http://www.hsc.wvu.edu/som/pim/Venomous%20Snakebite.htm

http://mysite.mweb.co.za/residents/net12980/ld50tot.html

http://www.merck.com/mrkshared/mmanual/section23/chapter308/308a.jsp

http://www.llu.edu/llumc/emergency/venom-er/