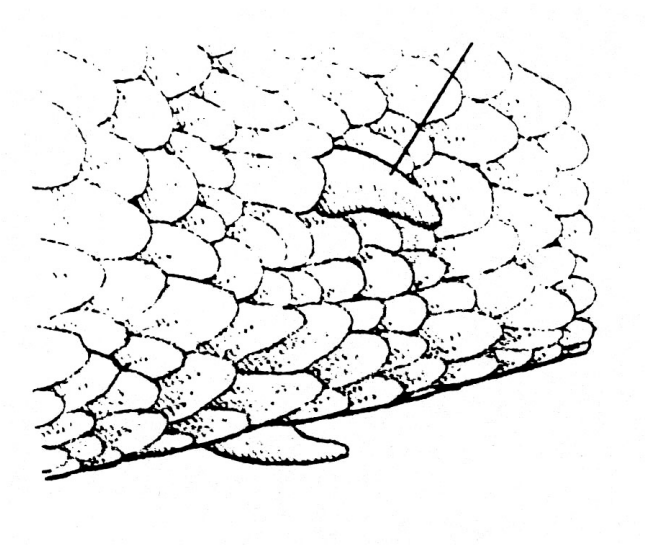
SNAKES

I WHAT IS A SNAKE?

Like all animals, snakes have gradually changed, or evolved, over millions of years. Most evidence indicates that they arose from lizards through an evolutionary stage that involved burrowing, which affected their senses. Their eyesight and hearing became weaker, and their sense of smell became acute. Their legs became vestigial limbs in the more primitive snakes, pythons and boas, and disappeared altogether in more modern species. Transparent scales took the place of eyelids, and the external ear openings closed for the purpose of burrowing. Today, there are approximately 2,700 different species of snakes. Over 800 of these are poisonous, but only 250 of these are considered dangerous to humans.



In most snakes, all traces of limbs have vanished. However, some of the more primitive groups, such as boas and pythons, have tiny remnants of the hipbones and hind limbs. The only external signs of these are small “claws” at the base of the tail, on either side of the vent, or anal opening.

Their slim bodies allow them to move easily through dense vegetation or leaf litter. Specialized arboreal snakes are able to hunt on smaller branches; their extremely elongated bodies and tails spread their weight over a large area and allow them to crawl across leaves and twigs.

Not all snakes are long and thin. A stout body allows snakes to swallow large prey. Stout bodies are characteristics of the vipers.

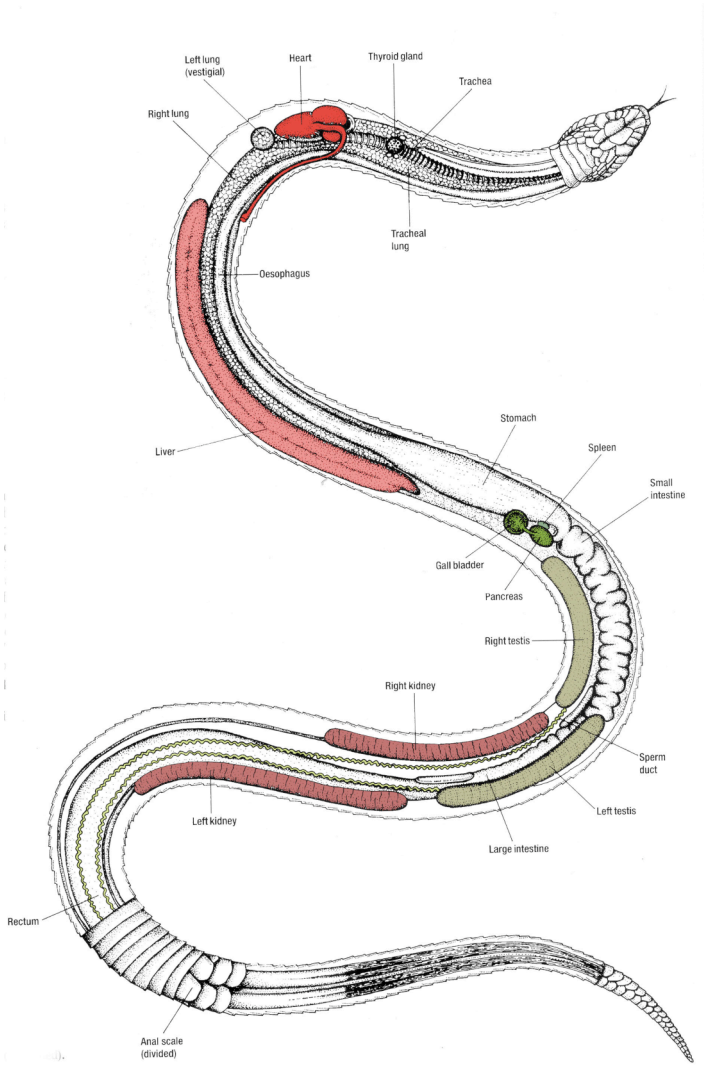
Specialized aquatic snakes have nostrils with valves that exclude water.

II PHYSICAL CHARACTERISTICS

A How Snakes are Built

Underneath their scaly skin, snakes have bones and muscles, heart and intestines, liver and lungs, much like those of other vertebrates. Most of these organs have been modified for the purpose of swallowing prey whole and rapid locomotion.

The backbone of the snake is very flexible. Some of the smaller snakes have 180 vertebrae along their backbone; longer species have as many as 400 vertebrae. The gullet (throat) of a snake makes up one-third of the total length of the body. The gullet leads to a very long stomach, both of which stretch when large food items are swallowed. The other organs are also long, and fit one behind the other. The primitive boas and pythons are the only snakes that retain a pair of lungs. In most other snakes the left lung is either greatly reduced or absent.



- The Green anaconda (*Eunectes murinus*) of northern South America is the longest snake, reaching lengths of 11.5 m (38 ft). They are ambush predators and await prey while submerged in water.

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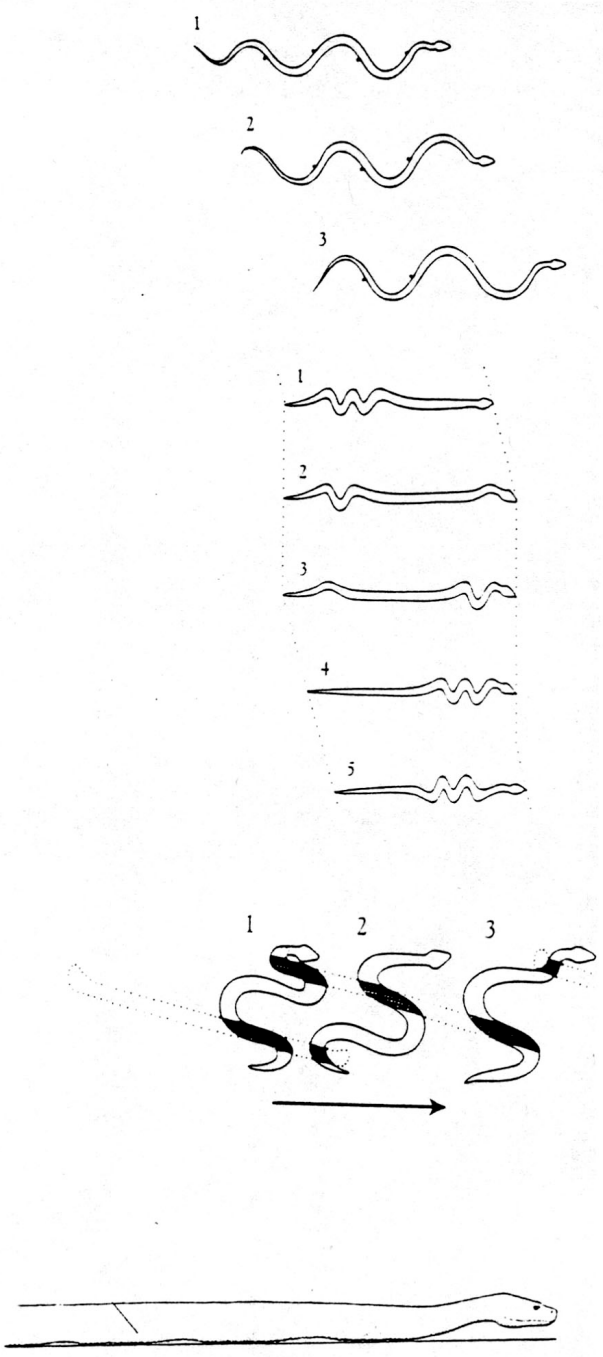
By Chris Mattison ~ pg. 46

B Locomotion

All snakes are legless. Snakes use four main methods of getting around without legs: serpentine/undulatory motion, concertina motion, sidewinding and caterpillar/rectilinear motion. They are elongate because they must form curves along the length of the body to push against the substrate during locomotion.



- **Serpentine/undulatory** locomotion is used both in the water and on land. In the water the body laid out in a series of S-shaped curves, moves forward while the head lays out additional curves. On the ground, the sides of the snake's body thrusts against any ground irregularities.

- The **concertina** locomotion is especially helpful in climbing trees. Most of the snakes using this motion have a prehensile tail, like the tropical American tree boas.

- **Sidewinding** is used mainly by desert dwelling species, like the African horned viper and the American sidewinder. The snake makes an arc with the front part of its body and throws its head some distance before it touches the sand. It then transfers the rest of its body across the arc, meanwhile laying out another arc with its head. This decreases the body contact with the hot sand and keep the snake from slipping on sand dunes.

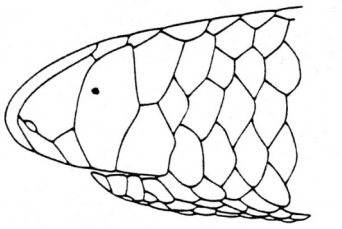
- The caterpillar/rectilinear locomotion is a slow, creeping movement making use of enlarged belly scales that act ads anchoring points and provides traction.

Mambas hold the record for the fastest snake. Green mambas have been clocked at 11.5 km (7 mph) an African black mamba was clocked at this same speed while chasing a man who had been harassing it.

C Senses

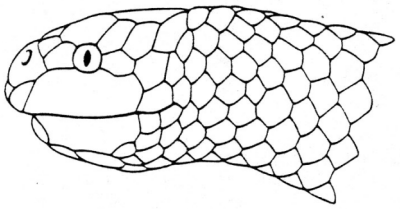
1 Sight

A snake seems to have a “glassy stare” because it lacks eyelids. A transparent scale covers the eyelids. This is not a moveable membrane like a nictitating membrane. The eyes vary a great deal in their sensitivity. Snakes appear to recognize movement more readily than shape and form. Eyesight is fairly good at close range and is particularly responsive to moving objects. The eye is more perceptive in faint than strong illumination. The eye probably gets a general impression of the surroundings rather than a sharp image of an object.



Burrowing snakes have small eyes and can distinguish only between light and dark.

Blind Snakes: 1 genus - Leptotyphlops has 95 species, 2 are found in the SW

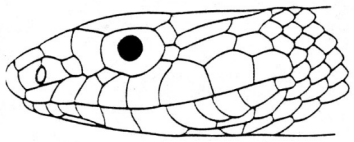


Aquatic snakes and nocturnal hunters have vertical elliptical pupils that open up very wide in dim light.

Boidae has 20 genera with 59 species

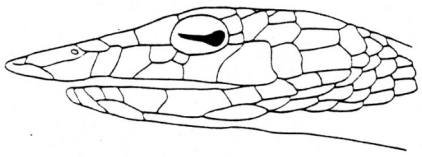
Viperidae has 3 genera with about 290 species & 17 in US

Colubrids



Diurnal snakes have round pupils that can close tightly to make a tiny opening permitting a minimum of light to enter the eye in very bright sunlight.

Colubrids



Diurnal snakes that use sight to hunt their prey often have pointed snouts and eyes positioned or aimed forward.

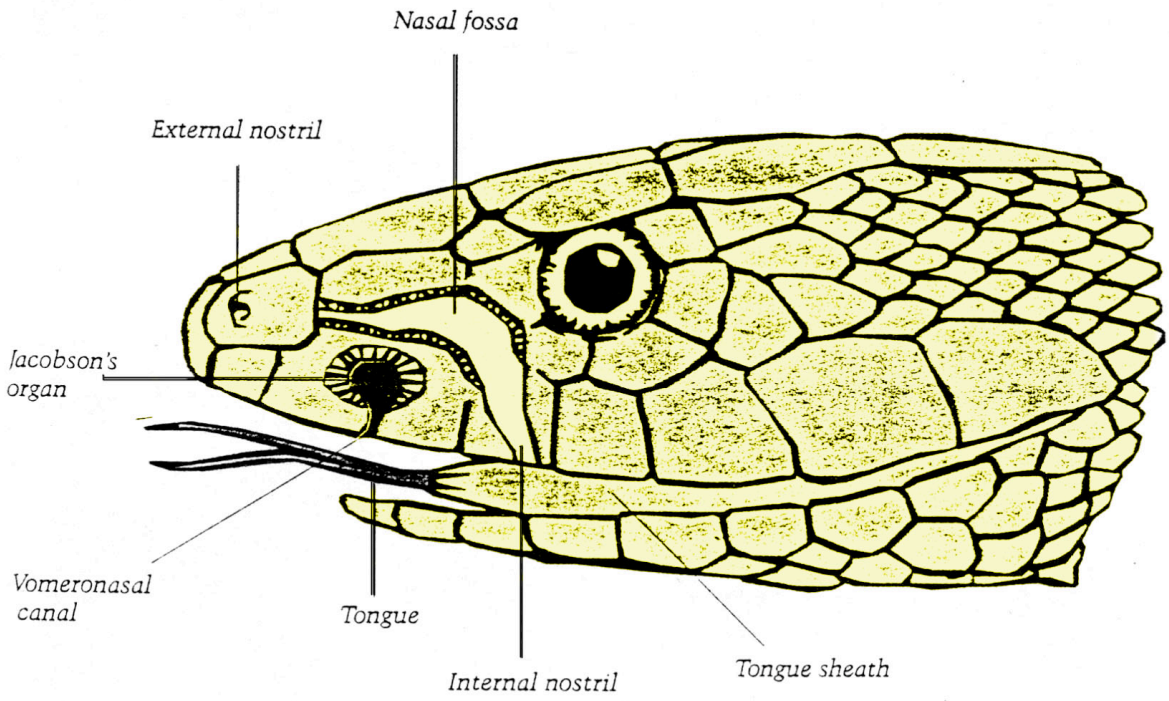
Colubrids

2 Sound

There are no external ears in snakes. The single ear bone is attached to the jaw rather than to a tympanis membrane. Although snakes can hear low frequency sound very well, they cannot hear sound in the higher ranges. Thus, a rattlesnake cannot hear its own rattle. Instead of sound, snakes feel vibrations in the ground and sense when either prey or danger is close by.

3 Smell

Snakes are often secretive and rely on scent rather than vision. As a result, snakes are usually less conspicuous part of the fauna. The snake's tongue plays a very important role in the sense of smell. When a snake investigates its surroundings, it flicks its tongue out. The tongue picks up scents in the form of airborne molecules and is then withdrawn into the mouth. Here the tips of the forked tongue are inserted into the opening ducts of the Jacobson's organ, the molecules are identified, and the information passed along to the brain. Active snakes use their tongues constantly and rely on their Jacobson's organ to interpret the world.



Phermones are probably important in snake reproductive ecology and are produced in the skin and possibly the scent glands in the tail.

4 Taste

Snakes do not have a sense of taste.

5 Infrared receptors

Specialized infrared receptors that are receptive to heat are located in a pit organ. The pit organ provides directionality and distance of an infrared source, their potential prey. The pit organ permits rapid and sensitive detection of changes in infrared radiation. These thermal cues are integrated with visual ones giving them a image of their environment. The pit organs are effective in localizing endothermic prey under dark conditions. Those snakes lacking pit organs sense infrared radiation via nerve endings in the skin of the head but are far less sensitive and directional.

D Diet & Methods of Eating

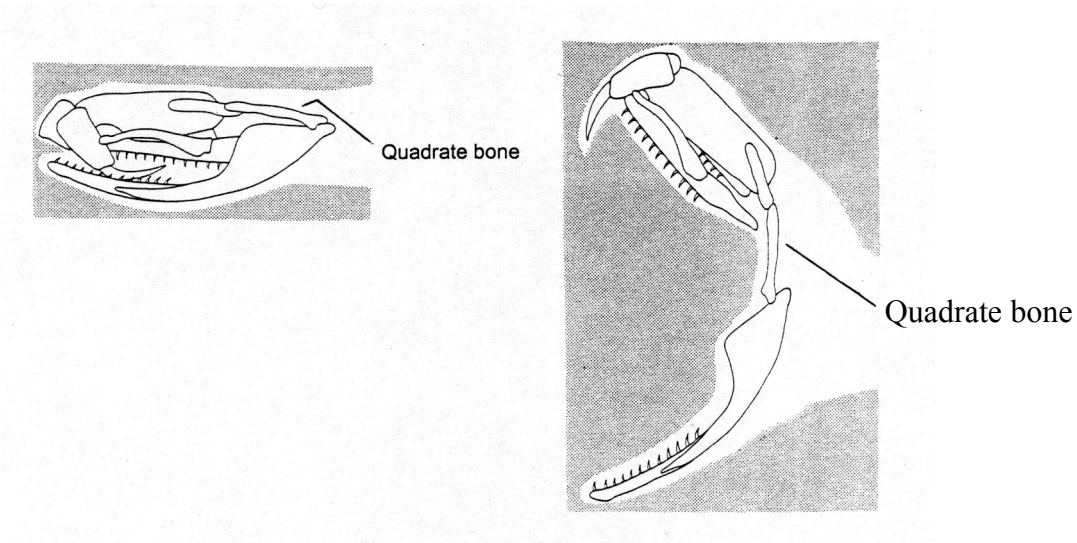
All snakes eat animals; there are no vegetarian snakes. Birds and mammals are the favored prey of snakes that kill with venom. Boas and pythons mainly feed on mammals, which they kill by constriction. America's cat-eyed snakes* and Asian snail eaters eat exclusively snails. Their lower jaws are modified as tiny hooks to pull the snail out of its shell. Other snakes, like the African egg eating snake whose diet consists only of eggs, can swallow prey twice the size of their own head.

*The Encyclopedia of Snakes © 1995 p. 99 states that *Leptodeira sp*. of C & S America eats frog's eggs.

The Encyclopedia of Snakes © 1995 p 105

Typical snake teeth are long, slender and slightly curved. The front fangs of vipers and elapids have a venom canal, which is a hollow tube distinct from the pulp cavity of the teeth. Snake venoms are specialized to attack the blood, muscles or nerves. Venoms are thought to be derived from digestive enzymes.

Snakes are able to swallow large prey because their jaws are so flexible. The quadrate bone that links the lower jaw to the skull, works like a double jointed hinge, allowing the snake to open its jaws wider to accommodate larger prey. Digestion begins immediately since the stomach is located right behind the throat. Depending on the size of the prey, digestion may take from one day to one week because the snake's stomach needs to dissolve fur and bones. The larger the prey, the longer a snake can go without eating. Skulls of snakes are rather kinetic.

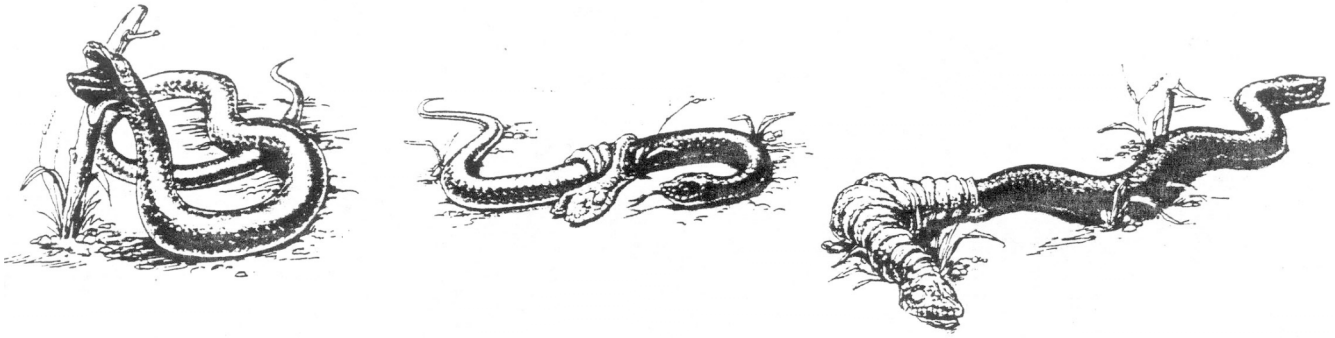


- All of the snakes in the ARC kill their prey by constriction.

E Shedding the Skin

Snake's scales consist of three layers; the outer layer is presented to the environment and the inner layer forms continually beneath the outer layer. The inner layer will replace the outer layer when it is shed. Between these two layers is a thin layer of cells that enables these two layers to separate during shedding. The snake secretes an oily substance into this space in order to facilitate shedding; this is why a snake's skin and eyes appear opaque before shedding. The skin is shed in one piece, with the snake starting the process by rubbing the snout on a rough object, then removing its old skin by crawling through vegetation or rough surfaces.

As shedding is to some extent dependent on growth, young snakes tend to shed more often than adults do because they grow more quickly. As their growth rate slows down, so does the frequency of shedding. Adult snakes still need to shed a few times per year to replace any worn or damaged scales.



III REPRODUCTION

Male snakes have two copulatory organs, called hemipenes. Only one hemipenis is used during mating. When the female is ready to mate, she leaves behind a pheromone trail in order for the male to track her. When he finds her, he begins to court her. Courtship in most snakes involves contact; the male crawls over and beside the female, often rubbing or tapping his chin against the female's back and head. This contact increases the female's receptivity to mate and in some species simulates ovulation.

Some snakes give birth to live young. There is no evidence of parental care in live-bearing species. The female apparently takes little interest in the young once they are born. Other snakes lay eggs. Snake's eggs are not pigmented to any great degree. So they must be hidden or buried. Parental care of eggs is found in several families of snakes. A female python will actually gather her eggs into a pyramid-shaped pile and stay coiled around them until they hatch. With the female python's muscle contractions, heat is produced. This heat helps to incubate the eggs.

Snakes are oviparous or viviparous and closely related species can differ in reproductive mode. **Courtship and breeding habits are located on the individual fact sheets.**

IV DEFENSE MECHANISMS

“Snakes are first cowards, next bluffers, and last of all warriors” (Pope 1958). If a snake is faced with a potential threat, it will first try to escape. If escape is not possible, it will resort to bluff or temper. For example a cobra will raise its hood, a Gopher snake will flatten its head and rattle its tail, a Ball python will roll into a ball leaving its head in the coils and exposing its tail, a rattlesnake will shake its tail, and a hognose will play dead. If bluff or temper does not work, a snake might strike. If a snake is picked up, it may emit a foul-smelling odor from its cloacal glands.

Confronted by danger, the cobra flattens the skin of the neck into a wide hood, which makes it look bigger than it is. It does this by spreading long, movable ribs

To warn away enemies, the rattlesnake shakes the hollow segments that form the rattle at the end of its tail. Each time it sheds its skin, it adds one new section

The red, yellow, and black bands of the venomous Arizona coral snake acts as a warning flag to other animals. Some harmless species imitate its stripes to bluff their enemies.

Images
The Encyclopedia of Snakes © 1995 by Chris Mattison p126
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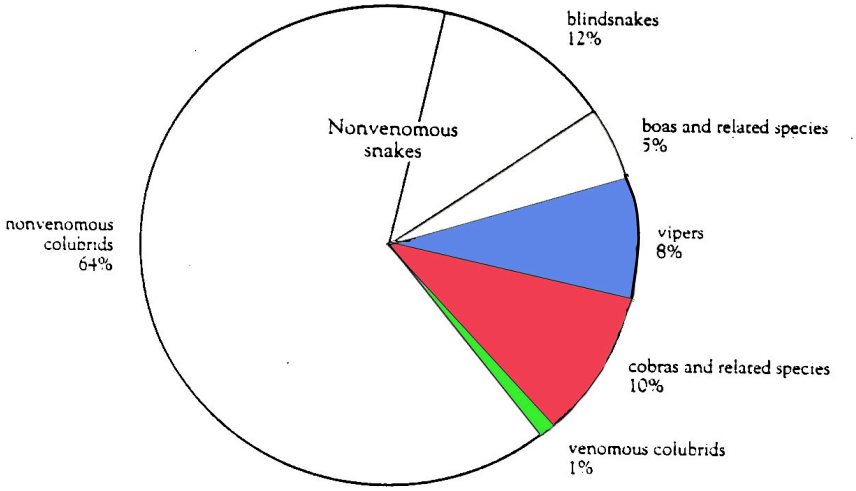
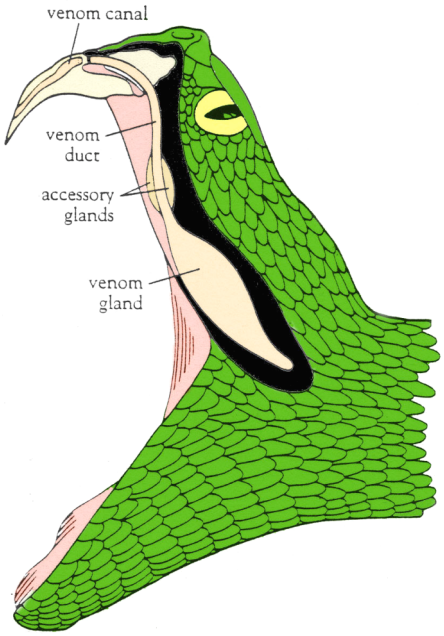
V VENOMOUS SNAKES

A snake injects venom into its prey using specially adapted teeth or fangs. In the most venomous snakes, such as vipers, cobras, and sea snakes, the fangs are found at the front of the upper jaw. In other venomous snakes the fangs are at the back of the jaw. The venom itself is a complicated “cocktail” that affects the prey’s nervous system, tissues, and /or blood. The main purpose of the venom is to subdue the prey, but it can also be used for defense. Venoms are specialized to attack the blood, muscle or nervous systems.





- The Hook-nosed sea snake has the most lethal venom. It is estimated that only 1.5 mg of its venom will kill a human. This sea snake ranges from the Persian Gulf and the waters of southern Asia ton the northern coast of Australia. Russell’s viper of southern Asia and the Inland taipan of Australia are nearly as deadly as the Hook-nosed sea snake.
- King cobras, Gabon vipers, Eastern diamondback rattlesnakes, and bushmasters have the capacity to deliver the largest volume of venom in a single bite. Approximately 1`00 mg of venom from an Eastern diamondback kills an adult man. Large diamondbacks store as much as 850 mg in their venom glands.