



EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT REPTILES

The first reptiles evolved in the Upper Carboniferous period, at least 300 million years ago. The Class Reptilia consists of three orders:

- Order Crocodylia*, consisting of roughly 30 species and subspecies of crocodile, alligator and caiman
- Order Chelonia* (tortoises and turtles), at least 244 species
- Order Squamata*, includes lizards (over 3,150 species)
- Snakes* (about 3,000 species)
- Amphisbaenians* or “worm lizard” (lesser known)

There are about 160 species of Amphisbaenians, and they are found in Africa, Europe, Asia, North and South America. They are burrowing animals, up to two feet long, whose ring like scales gives them an earthworm like appearance. The fourth Order, Rhynchocephalia, flourished in pre-historic times but is now almost extinct. The number of species making up the single living genus, represented by the *Tuatara*, is still being argued. There are either one or two: *Sphenodon punctatus* and *S. guntheri*. The Tuatara is extremely rare, found on just a few islands near New Zealand. Superficially lizard like, the Tuatara has unique eye and jaw anatomy, which among other factors separate it taxonomically (the factors which determine its place in our classification of order, family, genus and species). Unusually for reptiles, Tuataras are adapted to life at temperatures as low as 6° Celsius.

Reptiles, like birds, have voluntary control over the muscles in their eyes, which determine their pupil size. This means that they are able to constrict and dilate their pupils at will, not just in response to light.

The brain of a reptile is not more than 1% of his body mass. This means that the brain of a 70 lb python is no larger than a lima bean. Unlike amphibians, however, the reptilian brain has two hemispheres. Since man appears to use very little of his brain mass, the reptilian brain appears to be highly and efficiently adapted. The nervous systems of reptiles are sufficiently complex and similar to those of mammals, in that their senses and pain perception are highly refined. We are only beginning to understand just how highly specialized these animals are.

Reptiles were the first vertebrates to evolve with 12 cranial nerves. “Lower” vertebrates have 10 pairs of these important nerves, which govern activities of the senses, such as sight, hearing and taste.

The jaw structure of a reptile does not permit chewing; they can only tear their food.

Some reptile species are known to store sperm and produce young, three and perhaps six or more years after a single, successful mating. In some cases, it is possible to have an infertile clutch followed by a fertile clutch without further matings.



The temperature at which the egg is incubated determines the sex of a turtle. Warmer temperatures produce females; cooler temperatures produce males and temperatures in the middle result in a mixed clutch. The situation is reversed for crocodiles, with males predominating at higher temperatures. Chromosomes determine the gender of a snake, as it is in the case of mammals and birds.

Reptiles do not have sweat or sebaceous glands, therefore; they are not slimy. They are, however, waterproof: and this, in addition to lacking a metamorphic stage is one of the distinctions between amphibians and reptiles (eg. tadpoles metamorphose, or change into frogs).

The reptilian egg, with calcium in its shell is not dependant on development in water, as is the amphibian egg.

Reptiles are not “cold blooded”, rather they are ectothermic animals, which rely on heat to be provided by the environment, as they produce none of their own. Behavior, such as seeking shade, gaping and shunting blood toward or away from the body surface allows impressively fine control of body temperature several degrees above or below the ambient temperature. When housed in suitable environments, most reptiles when active, maintain a body temperature similar to that of mammals.

SNAKES

Snakes are more closely related to lizards than to other reptiles, and probably evolved from, a single group of lizards, but curiously, probably not from the group of legless lizards.

In ancient Greece, the sick and injured sought the aid of the god of healing and medicine, Asklepios. They took an offering to the temple and slept there, waiting for the god to come to them in their dreams, or to send his sacred servants, the snakes. Ancient writings tell of the snakes, the drakons, healing with a touch of the tongue. The snake in question was *Elaphe longissima longissima* (Aesculapian snake). The Romans chose to import this snake to their own temples, rather than to bring in Greek healers, until 293 BC, the time of a plague. The god Asklepios was brought to Rome in the form of the snake, and the plague subsided. The snake today forms part of the symbol of physicians and veterinarians, linking snakes to millennia of healing and medical practice.

The Hognosed snake (*Heterodon sp.*), Grass snake and the Spitting Cobra can feign death, by flipping on to their backs when threatened. They open their mouths, allow their tongues to loll and can empty their anal glands of a foul smelling substance, making them highly unappetizing to any potential predator.

Although they have no ears, snakes can hear. Their hearing is developed best for very low frequencies of 150-600 Hz, but they are known to hear as well as humans do, except for the higher frequencies.

Many snakes, such as vipers, boas and pythons have temperature-sensing organs on their heads, primarily along the lips. These heat pits are sensitive to changes in temperatures as low as 0.002° C, and effectively allow the snake to navigate and hunt in the dark.



Snakes can have over 300 pairs of ribs.

Snakes turn “blue” before a shed. This opaque change to the skin is actually due to the presence of a lymph-like layer of fluid between the old and new skins, prior to the shed of the old skin.

Reports of the longest, heaviest and oldest reptiles abound. Many cannot be verified. A reticulated python, shot in Indonesia in 1912, was said to be 10m or 32 feet 9 1/2 inches in length. One Burmese Python weighed in at over 400 lbs.

Sir Percy Fawcett is said to have killed an anaconda measuring 18.9m, that is 62 feet, in 1901, in Brazil.

The King Cobra, which can reach 5.6m, is the largest poisonous snake.

The female Cobra, many viper species and the Burmese Python are known to build nests and guard their eggs until they hatch.

The oldest recorded snake was a Ball Python (*Python regius*), who lived for 47.5 years or perhaps a Boa (*Boa constrictor*) who died in 1971, at the age of 40 years, 3 months and 14 days.

Since the early part of the last century, the New York Zoological Society has offered a reward of \$50,000 for the capture of a live snake greater than 30 feet in length.

The smallest snake may be the Martinique Thread Snake (*Leptotyphlops bilineatus*), which does not exceed 10.8 cm or 4 1/4 inches.

A snake's internal organs, although superficially different have typically the same functions as those of a mammal. The difference lays in their arrangement, one after the other, to accommodate the tube like body. All snakes have a right lung, which extends most of the way to the vent. In most species, the left lung is considerably shorter, or even missing.

The glottis, which is the entry to the trachea, (breathing tube) can move to either side, to allow the snake to swallow prey. This is the tube you see when you look at the floor of a snake's mouth. Cartilage around the opening of the tube closes to prevent food from entering the respiratory tract, and is modified in many snakes to produce the classic “his”.

A snake's heart can slide one to one and a halftimes its length from its normal position, to allow the passage of swallowed prey. This is because of the relative mobility of the pericardial sac, which surrounds the heart.

Venom glands have evolved independently in several species. Venoms are very complex substances, which may consist of a dozen or more toxic components. These can include substances poisonous to the heart, nerves and DNA as well as enzymes that break down natural tissue barriers, allowing the spread of venom within the body.



Spitting Cobras can inject venom in their bites, but can also force venom out, under pressure, through tiny channels in their fangs. Raising the front half of its body, the snake can aim venom at the eyes and mucous membranes of its target, over a meter (three feet) away.

Snakes have two rows of teeth on the top jaw, one row on the bottom jaw and the teeth, including fangs, in most cases are replaced throughout life.

When the tongue is in the mouth, it lies in a sheath beneath the glottis with its tip touching the vomeronasal or Jacobson's organ. This is an organ of smell, so when your snake flicks out his tongue, he is, in fact, "tasting" or smelling the air. The forked design allows the snake to detect on which side the smell is strongest, and so to locate his prey, even in the dark.

The Brahminy Blind snake is parthenogenetic. They are all females, which when mature, lay fertile eggs. The young are clones of the mother. Although native to Asia, this snake is now found in warm countries all over the world. At 4 1/4 inches, it is also one of the shortest snakes.

The Emerald Tree Boa is born red or yellow, and changes to green after about a year.

The Rattlesnake's rattle consists of six to ten layers of scales, which fail to shed and make that distinctive sound when the tail is shaken as a warning. Eventually the older segments will slough as the rattle lengthens.

The tail of the Calabar Ground Boa is blunt, cylindrical and has white scales on the underside, and altogether appears very much like a head. When threatened, the snake coils into a ball, hides its head, leaving the less vulnerable tail exposed to confuse predators.

The Common Egg Eater (*Dasypeltis scabra*) is a highly specialized snake. Although it is not venomous, the markings are sufficiently similar to those of the deadly cobra or viper, which a potential predator will think twice before attacking. The Egg Eater can also expand its jaws to mimic the larger head of the venomous snakes and coil to rub together its scales to mimic the rasping warning sound of the viper. To consume an egg, *Dasypeltis*' jaws can expand to four or five times the size of the egg. Once engulfed, two specialized vertebrae pierce the egg. Other modified bones in the vertebral column stabilize it, prevent its slipping out of the mouth or further into the snake. Yet another set of unique vertebrae crush the egg. Once emptied of its contents, the shell is regurgitated.

The Black Mamba (*Dendroaspis polynepsis*) is brown, grey or olive, but never black. It is a particularly dangerous snake, with a bite, which kills 95-100% of victims. The Black Mamba may also be the fastest snake, reaching speeds of 10-12 mph. Other particularly dangerous snakes include the Common Krait, Russell's Viper (both Asian snakes) and the Taipan (Australian). Seven of the ten most deadly snakes live in Australia

The Adder (*Vipera berus*), is found as far north as the 69th latitude, inside the Arctic Circle.



Snakes move by relaxing and contracting muscles lengthwise along the body. Side winding is a specialized form of motion that allows a snake to travel with speed and relatively little expenditure of energy along loose desert sand. The snake lifts a loop of its body from the surface, using its head and tail. The loop is moved sideways and then back to the ground. This creates the typical series of unconnected parallel tracks.

The paired claw-like structures seen on either side of the vent of a snake such as a Ball or Royal python are in fact, remnants of the legs present in the animals from which the modern species has evolved.

LIZARDS

Many lizards, but not monitors or chameleons, can undergo tail autonomy, which is lose the tail to distract or to escape from a predator. The tail breaks through a predetermined fracture plane in a vertebra. It will grow back, but without bone (just a rod of cartilage), and will be slimmer, shorter and a different color, with small scales.

Some snakes and geckos, such as the Tokay, do have eyelids, but like snakes, the two lids have fused, to form a clear "spectacle", which sheds along with the rest of the skin. The Leopard gecko has more traditional eyelids.

Why is the Legless lizard not a snake? He has eyelids.

Like snakes, lizards have a Jacobsen's organ, and they smell by "tasting" the air. When lizards flutter the underside of their throats they are moving air past the Jacobsen's organ.

The Gila Monster (*Heloderma suspectum*) and the Mexican Bearded Lizard (*Heloderma horridum*) are the only two venomous lizards.

The Kamodo Dragon is the largest lizard, reaching 10 feet. These clever hunters, once they know their preys travel routes, will wait to ambush them. Having bitten a large animal on the leg, instead of killing it immediately, the Kamodo will allow the toxins produced by bacteria in the wound to weaken the animal over several days. The Dragons track their prey, waiting until the animal is too weak to escape.

Most lizards replace their teeth throughout life, with the exception of the chameleon and the Agamid lizards.

Some Horned Lizards (*Phrynosoma sp.*) can squirt blood from their eyes. By constricting muscles, which prevents the flow of blood out of the head, blood pressure builds in the head until vessels in the inner caner of the eyes rupture, squirting blood for up to four feet.



The “third” or parietal eye seen on the top of the head of lizards such as the Green Iguana contains a lens and retina-like structure, which connects via nerves to the pineal gland in the brain. Although it does not form images, this structure is important in governing hormone production related to time spent basking.

Herbivorous lizards such as the Green Iguana can conserve water by excreting excess salt from the blood stream, through a nasal “salt gland”. This is what produce the crusty white substance often sneezed out by iguanas.

Unlike other lizards, Geckos have vocal cords, which allow them to vocalize.

The Basilisk and the Collared Lizard (*Crotaphytus collaris*) are capable of bipedal locomotion, that is, they can run on their hind legs. When young, they can even run on water.

Flying or Draco lizards, found in India, soar between trees using wing-like membranes linking their front and rear legs. They come to the ground only to mate and to lay their eggs.

The oldest known lizards may be a Mexican Beaded Lizard (33 years, 11 months) and a Cayman Island Ground Iguana (33 years 5 months).

Do geckos have suction cups on their toes? No. Thousands of fine, densely packed hair-like structures on the underside of the toes of most gecko species allow them to defy gravity by gripping the microscopic irregularities in apparently smooth vertical surfaces, such as aquarium walls. Ground dwelling Leopard geckos lack these little hairs, and have claws, instead.

Pigment filled cells; called chromatophores are located in the skin of the chameleon. These cells expand and contract, in response to the color of the environment and the need for concealment, as well as to the animal's psychological or physical state (eg. pain or aggression).

CHELONIA-TORTOISES, TURTLES AND TERRAPINS

Testudo, the Latin word for tortoise, shell, arch or vault, was also the name given to a technique used by Roman soldiers in warfare. Standing close together, in the shape of a rectangle, they held their shields flat over their heads, to form a protective dome, allowing them to approach the enemy en masse, unharmed by spears, stones and arrows.

The black soft shelled turtle figures importantly in Hindu mythology, and the 300 remaining animals, believed to represent the souls of long ago sinners, transformed into reptiles by a 13th century saint, are in a tank attached to a temple in Bangladesh. Each animal is considered sacred, and so none can be removed.

The oldest known tortoise may have been a Radiated Tortoise from Madagascar (*Astrochelys radiata*), who died in 1965. She was at least 188 years old, having been given to the Tonga royal family, by Captain Cook in 1773 or 1777.



The Galapagos Tortoise is the largest living species, weighing in some cases, over 260 kg.

The carapace or upper shell of the tortoise or turtle is composed of about 50 bones, which include modified ribs, vertebrae and boney skin plates. The lower shell or plastron has evolved from the clavicles or collarbones and the ribs. The boney structure joining the two is called the bridge. The shell is very much alive, not dead tissue, like nails or hair.

The growth rings on the scutes or scales on a tortoise cannot be used to determine the animals age with any degree of accuracy, as in most instances, growth spurts and interruptions in growth are determined largely by environmental conditions.

In leatherback and soft-shelled turtles, the honey scutes have been replaced with tough, leathery skin.

Some species have hinges on either the carapace or the plastron, which allow closure of the shell.

The Snapping Turtle (*Macrolemys sp.*) has a worm-like, fleshy structure on its tongue, which it wiggles to attract fish.

Turtles cannot protrude their tongues from their mouths, but they can smell. Flapping the loose skin under the chin or throat moves air over the Jacobsen's organ.

Tortoises and turtles do not have teeth.

Tortoises store sperm and have been known to produce fertile eggs three years after the last mating. *Stupendemys geographicus* was a prehistoric turtle, which was 10 feet long and probably weighed 4,000-5,000 lbs, or about 2,000 kg.

ALLIGATORS AND CROCODILES

Crocodilian mothers often guard their nests, and when the young are ready to hatch, they vocalize, through the eggshell. The female then digs away the covering sand and even carries them delicately in her mouth toward the water. After this, the young will stay in groups for protection.

The oldest known alligator (*Alligator mississippiensis*) was 66 years old when she died in Australia in 1978.

The Saltwater Crocodile (*Crocodylus porosus*), lives in the coastal waters of the Pacific, in Asia, can reach 23 feet and weigh in at over 1,000 kg or 2,200 Lbs.

A flap at the back of the throat, and valves in the nasal passages allow a crocodile or alligator to feed under water, without inhaling water and to breathe while only his nostrils protrude above the water's surface.



Sidney
ANIMAL HOSPITAL

9842 Second Street; Sidney, BC Canada V8L 3C6
T: 250-656-3333 W: www.sidneyanimalhospital.com
E: sidneyanimalhospital@shaw.ca

Crocodylian reptiles, like birds and mammals, have four chambered hearts, whereas the other reptiles have just three chambers that are two atria and one ventricle.

The crocodile's brain mass is less than 0.5% of his body mass. They can smell, hear, see well at night and have a strong homing instinct, which may cause them to travel many miles to the location where they were trapped or hatched.

Teeth are replaced on average once every two years.

“Paleface”, the well-known white alligator, who lived at New Orleans’ Aquarium of the Americas, died recently, having ingested a coin thrown into his tank by a visitor. Paleface was one of a clutch of white alligators, which were not albinos, but had an extremely rare genetic condition called leucism.

