



Reptiles & Amphibians:

A Resource for Teachers

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REPTILES

Reptiles are vertebrate animals that are either terrestrial or aquatic. Most have the following features:

- cold-blooded (poikilothermic)
- breathe air with lungs
- dry skin with scales
- internal fertilization
- paired, short limbs, usually with five clawed fingers/toes (when present)
- three- or four-chambered heart
- amniote eggs (each with an amnion and allantois in a fluid-filled sac)
(The amnion is the inner wall of the fluid-filled sack in which the embryo is suspended. The allantois is another sac that projects from the embryo's digestive tract. It serves as a bladder to receive and store waste and allows oxygen and carbon dioxide in and out of the slightly porous shell.)
- A complete or incomplete partition (secondary palate) along the roof of the mouth that separates the food and air so that breathing can continue while eating



There are four orders of reptiles:

- TESTUDINATA (turtles)
- SQUAMATA (lizards and snakes)
- RHYNCHOCEPHALIA (tuataras)
- CROCODILIA (alligators, crocodiles, caimans, and gavials)

TESTUDINATA (Turtles)



Testudinata was the first order of reptiles to evolve more than 200 million years ago. There are about 245 species in this order, each varying greatly in size. Even though all living shelled reptiles are known as turtles, the terms tortoise and terrapin are applied in different parts of the world.

The term, tortoise, usually refers to terrestrial or land turtles, and the term, terrapin, to aquatic, hard-shelled turtles. The tiny spectacled tortoise (*Homopus signatus*) is the smallest member of this order, measuring only 3.75 inches (9.5 cm) in

length and weighing only 5 ounces (142 gr). The Leatherback turtle (*Dermochelys coriacea*) is the largest member of this order with a shell length up to 95 inches (241 cm) and a weight of up to 1,890 pounds (857 kg). Turtles are found on every continent except Antarctica and have adapted to many types of habitats — mountains, plains, deserts, savannas, grasslands, and woodlands.

Turtles are the only reptiles that have a shell built into their skeleton. The turtle's shell consists of two parts: the carapace (upper) and the plastron (lower). The upper and lower parts are joined on each side by a bridge. The protective shell is made up of bony segments covered by large horny plates called scutes. Openings for the head, legs and tail are where the carapace and plastron meet.

The arrangement and number of scutes differ and are helpful for identification of species. Three families of turtles lack the protective horny plates: the softshell turtles, the leathery turtles, and the Papuan softshell turtles. All modern turtles lack teeth on their jaws, although small teeth are evident on the palate of the oldest known fossils. The horny ridges which occur on the upper and lower jaws of modern turtles are razor sharp in carnivores and serrated in herbivores.

Two main suborders can be found today: the hidden-necked and the side-necked turtles. The hidden-necked turtle can partially draw its head directly into the shell by bending the vertebral column of the neck. The side-necked turtle folds its head under the front edge of the shell by moving the head left or right.

All turtles have strong limbs, but toes and fingers differ depending on the habitat of the individual species. The digits of land turtles are fused together, while aquatic turtles have webbing between each digit.

Sea turtles are the only turtles which must drag their body across the ground when they come ashore to lay eggs. Turtles lay their eggs in a nest chamber and the young develop at the temperature of their surrounding environment. Parents display no further interest in their offspring after the eggs are laid or covered. All babies fend for themselves from the moment they hatch.

There are twelve families in the Order Testudines. These include the Carettochelyidae, Chelidae, Cheloniidae, Chelydridae, Dermochelyidae, Dermatemydidae, Emydidae, Kinosternidae, Pelomedusidae, Testudinidae, and Trionychidae families.

Chelidae

Matamata (*Chelus fimbriatus*)

The matamata (*Chelus fimbriatus*) is the only member of its genus. It has a brown-black carapace which is oblong and usually covered with algae. Males have a concave area on the plastron and longer, thicker tails than females. The large, flat head has a narrow snout. Loose flaps of skin around the head and neck sway in the water like aquatic vegetation.



The matamata can hold its breath for long periods of time, allowing it to wait underwater for its prey, which is sucked into the mouth as the head is thrust forward. Another hunting technique used by the matamata is herding small fish into shallow pools where they are devoured. Chewing is difficult as the jaws of the matamata are not attached.

The matamata rarely swims but walks along the river bottom, rarely basking in the sun. The mating ritual includes the male thrusting his head towards the female and opening and closing his gaping mouth. Nesting occurs from October to December when 12-28 eggs are deposited in each clutch. Hatchlings are more colorful than adults and are poor swimmers.

The matamata is found in rivers in parts of Bolivia, Peru, Colombia, Ecuador, Venezuela, and Brazil. They are most often observed in muddy rivers and shallow swamps.

Cheloniidae (sea turtles)

Hawksbill sea turtle (*Eretmochelys imbricata*)



Sea turtles occur worldwide in all tropical oceans and are truly marine, with females coming ashore only when nesting. There are seven species of sea turtles: six in the Cheloniidae family, and one in the Dermochelyidae family (the leatherback sea turtle). All sea turtles are threatened or endangered.

The hawksbill sea turtle is brown in color, with numerous splashes of yellow, orange, and brown on the carapace. The plastron is yellow with black spots. It is the only sea turtle with a combination of two pairs of prefrontal scales on the head and four pairs of costal scutes on the carapace. Juveniles are black or very dark brown with light brown or yellow coloration on the edge of the shell, limbs and raised ridges of the carapace. While young, the carapace is heart-shaped, and as they mature, it elongates. Males have longer claws, thicker tails, and brighter coloring than females. The hawksbill sea turtle has a tapered head that ends in a sharp point resembling the beak of a hawk.

The hawksbill is small to medium-sized, with the carapace of adults being 2.5-3 feet (0.76-0.9 m) in length and weights of between 100-150 pounds (45-68 kg). Hatchlings weigh about 0.5 ounce (14 gr).

Typically diurnal (except during mating season), solitary hawksbill turtles comb the reefs and continental shelves searching for food. Like other sea turtles, the hawksbill sea turtle makes incredible migrations between their feeding and nesting grounds. When hawksbill sea turtles are young, they cannot dive into deep water. Because of this, they are forced to live in floating sea plants (such as sargassum). Hawksbill sea turtles, like other sea turtles, hear well and have a strong sense of smell. They feed primarily on sponges but will also eat mollusks, marine algae, crustaceans, sea urchins, fish, and jellyfish.

The nesting season varies, but in most places, nesting occurs at night between April and November once every two to three years. Nesting begins when the turtles leave the sea to locate an area to lay their eggs. They typically choose areas far back on the beach, either under or in vegetation. They dig a pit in the sand, fill it with approximately 140 eggs, and then cover it. Afterwards, the adult turtles return to the sea, leaving the eggs (which hatch in approximately 60 days). When the eggs hatch, the newborn turtles immediately move toward the water where they will grow and mature.

The most significant nesting within the U.S. occurs in Puerto Rico and the U.S. Virgin Islands (specifically on Mona Island and Buck Island). They are found in tropical and subtropical regions of the Atlantic, Pacific and Indian Oceans and are widely distributed in the Caribbean Sea and western Atlantic Ocean. Hawksbill sea turtles frequent rocky areas, coral reefs, shallow coastal areas, lagoons, and narrow creeks. They are rarely seen in water deeper than 65 feet (20 m).

Emydidae

Red-eared slider (*Trachemys scripta*)



Red-eared sliders are easily identified by a prominent red patch behind each eye. The oval carapace is olive to brown with yellow markings. The skin is green to olive brown with yellow stripes. There are many stripes on the neck, and a central chin stripe runs backward and splits to form a Y-shaped design.

Males are usually smaller than females, growing to approximately eight inches (20.3 cm) with a maximum size of 11½ inches (29 cm). Red-eared sliders dig nests along the banks of lakes and rivers. The nests are an average of 4 to 4½ feet (1.2-1.4 m) deep with a clutch size of 7 to 13 eggs. The eggs hatch in approximately 68-70 days, and up to three clutches may be laid per season.

Trachemys scripta is the most variable of all turtles, with 14 or more identified subspecies. They are found in the U.S., through Mexico, and Central America to Brazil. They prefer a quiet body of water with a soft bottom, plenty of aquatic vegetation, and suitable basking sites. Juveniles are highly carnivorous, but adults are omnivorous and will eat almost any food item available (algae, assorted plants, tadpoles, small fish, insects, crayfish, shrimp, amphipods, and various mollusks).

Kinosternidae

Mexican musk turtle (*Staurotypus triporcatus*)

All members of this family produce a pungent musk from glands located both in front of and behind the bridge area between the plastron and the carapace. Mexican musk turtles develop three longitudinal “keels” on its carapace. The carapace is brown and green with yellow seams, and dark spots. The large head is yellow to olive with dark reticulations that extend on the jaws. Two sensory barbels are found on the chin. The limbs and tail are grayish brown. The toes are webbed.



The Mexican giant musk turtle is the largest species of the Kinosternidae, reaching a shell length of 15 inches (38 cm). Nesting occurs in September with a normal clutch consisting of three to six eggs. They are found in Belize, Guatemala, Honduras, and Mexico and prefer slow-moving waterways, such as lakes, marshes, and lagoons. They eat small invertebrates (aquatic insects, worms, snails, clams, and crustaceans), fish, and amphibians, as well as other smaller mud turtles.

Pelomedusidae

Arrau side-necked turtles (*Podocnemis expansa*)

Arrau side-necked turtles are easily identified due to their large size. They are the largest living members of the genus *Podocnemis* (side-necked turtles). The carapace of the female may reach an approximate length of three feet (0.9 m) and weigh close to 200 pounds (91 kg). The adult carapace is somewhat flat and broad and is olive, dark gray, and brown in color. The carapace of the juvenile has dark spots with a light border. The plastron is large but does not completely cover the carapacial opening. The plastron, bridge, and outer edge of the underside are yellow. The head is gray/brown with yellow markings, and it has a broad protruding snout and square upper jaw. The jaws are tan, chin is yellow, and the neck is yellow and gray. Males have longer, thicker tails and rounder heads than females. The neck does not pull straight back into the shell like most turtles, instead, it is folded to the side.



Arrau turtles live in the rivers and drainage areas of many rivers in South America. They are sometimes found on the island of Trinidad after floods of the mainland Orinoco river. Arrau turtles live in the main rivers of the Orinoco and Amazon basins during the dry season and move into the flood plains during the rainy season where they find fruits, flowers, roots, and aquatic plants for food. They tend to fast during the dry season.

Mating occurs in the water, then the female basks in the sun for six hours or more a day, possibly to speed up the development of the eggs. After several weeks of basking, the female turtles begin to explore the nesting areas after sunset. Egg laying takes place a few nights later.

The nesting beaches often become so crowded that several females use the same nest. Nesting takes place during the dry season between February and April in Venezuela on exposed sandy riverbanks and sand bars. The nest is approximately 30 inches (76 cm) deep. Females bury up to 130 eggs in each nest. Hatching occurs in 45-50 days after which the brightly marked hatchlings (carapace length of 1½ to 2 inches or 3.8 - 5.1 cm) head to the water.

Pelomedusidae

Savannah side-necked turtle (*Podocnemis vogli*)



The savannah side-necked turtle is one of the smaller species of *Podocnemis*, with an average carapace length of 14 inches (36 cm). In adults, the carapace is olive to brown. The head is broad with a protruding snout and is grey to brown in color. The jaws are yellow, and the neck and limbs are gray.

This species is endemic to small streams, swamps, and rivers of Venezuela and Colombia. They inhabit smaller bodies of water than their larger relatives. When the small ponds in which they live evaporate in the dry season, the turtles are forced to aestivate in the mud. They are omnivorous,

mainly feeding on vegetation, fruits, insects, worms, and amphibians. The savannah side-necked turtle is predominantly diurnal and basks on sunny days. Egg clutches usually consist of 12-15 eggs and are laid far from water in dry savannah clay soils three times per year.

Yellow-spotted Amazon river turtle (*Podocnemis unifilis*)

Yellow-spotted Amazon river turtle female shells reach 27 inches (68 cm) in length, with males reaching 14 inches (35 cm). The carapace is brown to green/gray with a narrow yellow border that darkens to olive-gray with age. The head is large, and the upper jaw has a distinct notch. One barbel is present on the chin in the Orinoco population and two in the Amazon population. The gray-brown head has yellow spots on the sides of the snout and on either side of the head. Males maintain the juvenile head markings and have longer and thicker tails than females.



The yellow-spotted Amazon river turtle is found in lakes, ponds, floodplains, and lagoons along the Orinoco and Amazon rivers. This turtle primarily eats vegetation.

Nesting season varies depending on geographical location but is generally in June-July or September-October. Females dig their solitary nests away from the water and lay at least two clutches of 15-25 eggs each breeding season. The shell length of a hatchling is about 1.7 inches (4.3 cm).

Testudinidae

Yellow-footed tortoise (*Chelonoidis denticulata*)



The yellow-footed tortoise has a thick, heavy shell that is dark brown with patches of yellow and/or orange. The limbs and head are brown with orange scales and markings. The skin is black, and some scales on the tail and forelegs are bright yellow.

They usually reach a length of 16-20 inches (41 - 51 cm), This species is a true “rainforest” species and is found in tropical evergreen and deciduous rainforests where it feeds on grasses, succulent plants, fallen fruit, and carrion.

Breeding and nesting occur throughout the year, with a clutch size of between four to eight eggs. Incubation takes four to five months.

Worldwide turtle populations have been declining at an alarming rate. Here are some of the factors contributing to this decline:

- the adults are used for food and turtle oil
- there is a decrease in numbers due to herbicides and insecticides
- a lot of destruction of their natural habitats
- the eggs are used as a major source of protein
- they are sold in the pet industry

SQUAMATA (snakes & lizards)

The largest order of reptiles is Squamata (meaning “scale reptiles”). This order includes snakes and lizards, which are found on every continent except Antarctica.

Lizards

There are over 4,500 species of lizards. The smallest lizard is the monitor gecko (*Sphaerodactylus parthenopion*), measuring around 1.3 inches (3.4 cm) in length and weighing only 0.004 ounces (0.12 gr). The largest lizard is the Komodo monitor which can reach lengths of 5.5 to 10 feet (1.7 to 3.0 m). Few lizards exceed 12 inches (0.3 m) in length, and this relatively small size enables a large, diverse population to exist in small areas. The small size of the animals also limits their geographical range. Mountain ranges and bodies of water create substantial boundaries for small species but promote the evolution of new species.

Most lizards cannot regulate their body temperature. The average body temperature for lizards is 107° F (42° C). Temperatures above or below this can affect mobility.

Most lizard species exhibit external fertilization. Oviparous reproduction (egg-laying) is most though some species are viviparous (live-bearing). Except when mating, most lizards keep a solitary existence.

Some lizards include chameleons (family Chamaeleonidae), iguanas (family Iguanidae), geckos (family Gekkonidae), Gila monsters (family Helodermatidae), casque-headed lizards (family Corytophanidae), horned lizards (family Phrynosomatidae), monitors (families Varanidae and Lanthanotidae), skinks (family Scincidae) and racerunners, whiptails, and tegus (family Teiidae).

Corytophanidae

Helmeted basilisk (*Corytophanes cristatus*)

The casque (or helmet) of the helmeted basilisk is triangular and continues as a vertical crest onto the shoulders. They have a gular sac, which is an inflatable skin pouch present in the throat region. The limbs and tail are long and slender. A canthus (corner at either side of the eye) raises into a ridge, arching over the eyes and back. Coloration varies from tan, brown, or green with irregular spots and bands. Adult helmeted basilisks reach a total length of 14-15 inches (35.6-38.1 cm). There is little or no sexual dimorphism in size, though the crest is somewhat larger in males.

Helmeted basilisks use their cryptic coloration as a defense, usually remaining motionless on a vertical limb. When threatened, they increase their apparent size by stiffening the legs to raise the body, moving the head to raise the crest, and expanding the throat fan. Head-bobbing, lunging, and biting are also used if necessary. Helmeted basilisks sit and wait for their prey, feeding mostly on large insects. They are not very agile but can move quickly for short distances by using a bipedal “hop”.



Helmeted basilisks inhabit dry, moist, and wet forests. They are common in the Yucatan and range from Veracruz to Panama. Five to eight eggs are laid in a shallow nest on the forest floor. The leathery eggs are 0.8 - 1 inch (2-2.5 cm) in length and weigh 0.07 - 0.1 ounce (2-2.8 gr).

Helodermatidae

Chiapan beaded lizard (*Heloderma alvarezii*)



Chiapan beaded lizards grow up to 35 inches (90 cm) in length, with the tail making up most of the length. The chiapan beaded lizard is completely black with a pink tongue. The skin is composed of beaded scales containing bits of bone called osteoderms (many dinosaurs had this kind of skin). The scales protect the lizards from the sharp teeth and claws of their predators. Chiapan beaded lizards are related to monitor lizards and Gila monsters and are descended from mosasaurs, huge, seagoing lizards that lived in the Cretaceous period (Mesozoic era). Mexican beaded lizards are found in woodland areas, in the western coastal areas of Mexico and in Guatemala.

The Gila monster and chiapan beaded lizard are the only two poisonous lizards. Chiapan beaded lizards release their poison along grooves located outside of their teeth. The poison glands are under the lower teeth. Because the poison moves slowly, these lizards must keep biting and not let go. With their strong jaws, they chew the venom into the prey. Although the poison of the Mexican beaded lizard is extremely painful, it is not lethal. The Mexican beaded lizard is immune to the venom of other poisonous lizards and rattlesnakes, which is deadly to most other desert creatures.

Their long claws are used for digging. In the winter, Mexican beaded lizards find spaces in which to rest. They enter a quiet state similar to hibernation. Their burrows, called hibernacula, often attract other reptiles. They spend more than half of their lives in these hibernacula. Chiapan beaded lizards can eat up to half their weight at one time and store extra fat in their tail for a long winter.

After leaving the hibernacula for the season, male chiapan beaded lizards compete for the chance to mate. These fights are brutal and can last for hours, with the larger lizard usually winning. Chiapan beaded lizards mate in the spring and lay a clutch of an average of 10 eggs 45 days later. After an incubation period of about 10 months, the young hatch. The babies have sharp teeth and poisonous venom from the time they hatch.

Phrynosomatidae

Crevice spiny lizard (*Sceloporus poinsettii*)

The dorsal color of the crevice spiny lizard is gray green to red. The dorsal scales are large and spiny. A dark band across the neck may be lined with white on either side. The long tail has black and white bands. Males have blue patches on the throat and sides of the belly. The upper side of females and juveniles have dark crossbands. Including the tail, adult lizards reach lengths of 5 -11.5 inches (12.7 – 29 cm).

They are diurnal and usually found in rocky terrains in barren, arid and semi-arid areas ranging from southern New Mexico, central Texas, and into northern Mexico.



Crevice spiny lizards are active and quick, but shy, and will retreat to rocky crevices when threatened. They mainly feed on insects and arthropods but will also consume tender vegetation. This species is an ambush predator and forager, with vision being their primary sense.

Males often display to females and advertise territories by displaying their colorful throats and undersides. Head bobbing and tail raising may also be observed. Females give birth annually to live young in early to mid-summer.

Teiidae

Caiman lizard (*Dracaena guianensis*)



Caiman lizards have enlarged dorsal scales on their backs that resemble crocodile scutes. They have a green body, a red-orange head, and short powerful limbs. Their heavily muscled jaw has strong, modified molar teeth, necessary for cracking snail shells and removing the soft parts. Their tail is powerful, long, and flattened, and is used for swimming and self-defense. Caiman lizards also have third eyelids that are transparent and protect the eyes while underwater. Both sexes look similar, except the male's head is more red and broader. They are aquatic, spending most of their time in or near water. They are also excellent climbers, basking on branches overhanging the waterways. At night, they hide in trees and bushes.

Caiman lizards are large, reaching lengths of two to four feet (0.6-1.2 m) and weighing up to 10 pounds (4.5 kg). They are carnivorous predators. Large freshwater snails are their primary food source; though they also eat insects, crabs, fish, rodents, and amphibians.

After mating, female Caiman lizards lay their eggs in a hole in the riverbank and cover them for protection. The clutch size is 8 to 10 eggs, which stay underground for five or six months. When the baby lizards hatch, they are completely independent and there is no parental care given.

Caiman lizards inhabit the rainforest and swampland areas of South America in Brazil, Colombia, Ecuador, Guyana, and Peru.

Snakes

There are around 2,700 species of snakes in the order Squamata. Snakes range in size from the tiny thread snakes and worm snakes, which grow to about six inches (15 cm) in length, to anacondas that reach 33 feet (10 m) in length. Snakes have been successful in evolving lengthened bodies and limbs that are reduced in size (or absent). All snakes are carnivores, lack external eardrums, and have a fixed, transparent scale over each eye instead of an eyelid. They generally have short tails. Snakes possess more vertebrae (some have up to 400 vertebrae, humans have only 33) which give their backbone more flexibility and facilitates their movements.

Snakes use different strategies to move, including lateral undulation, rectilinear locomotion (caterpillar crawl), concertina locomotion, slide-pushing, and sidewinding. The snake pushes against irregular features in the surface to move by means of lateral undulation. Rectilinear locomotion is a sneaky way of getting around allowing snakes to move close to prey without being noticed. The snake “walks” on its own skin by moving the broad scales on the belly forward and pulling the rest of the body along. Concertina locomotion is the pushing of the head forward and allowing the rest of the body to coil up and so on. Slide-pushing results when the snake pushes its body forcefully in vigorous undulations in a sideways sliding motion over a smooth surface (usually when the snake is startled and tries to escape quickly). Sidewinding is used to move across smooth or soft surfaces. The snake skips across the surface, only touching the ground in two spots, moving sideways in an “s” like shape.



The mouth of a snake is small relative to the size of its body, which can pose a problem when feeding. However, several strategies have been developed to combat this problem. Some eat large numbers of small prey, others kill large prey and eat them in small bites, and others radically adjust the shape of their skull to enable them to eat prey much larger than their own size.

The skull of the snake has several points where adjacent bones can move relative to one another. The two halves of the lower jaw are not fused but are joined by an elastic ligament which allows it to stretch apart. Their skin can also stretch to accommodate large meals. Snakes consume large amounts of food so it may not be necessary for them to eat on a daily or even weekly basis; some only eat several times a year.

Snakes rely on their sense organs to hunt for prey. The forked tongue of the snake is a great source of information for the snake. The tongue is used to gather chemicals from the environment, which are deposited in the Jacobson's organ in the mouth. Here the samples are analyzed through the senses of taste and smell to give the snake information about its surroundings.

Vision is another tool used by snakes. Snakes do not have eyelids but have a fixed transparent scale over each eye for protection. Snakes have no external ear openings, though scientists believe snakes can hear or detect vibrations in the ground or the water. Some snakes (pythons and boas) have pit organs which allow them to sense a temperature increase when warm-blooded prey is nearby.

Boidae

Green anaconda (*Eunectes murinus*)



The non-venomous green anaconda, a type of boa constrictor, is easy to distinguish from other large constrictors by their dorsal colors and patterns. They are typically olive green but may vary from grey/brown to nearly black. They have large black or dark brown spots that are round, oval, or in the shape of a crossbar.

Anacondas are very large, growing 15 feet (4.5 m) or longer, with girths of up to 3.5 feet (1.1 m). The head of an anaconda is disproportionately small when compared to the size of the body. The eyes and nose are positioned on the top of the head, which is an adaptation to the aquatic environment. In the water, the anaconda is extremely agile

and flicks its tongue constantly, using its sense of taste to find information about its environment. Longevity in the wild is unknown, but Anacondas have lived up to 32 years in captivity.

They are found in every South American country except Argentina, Chile, and Uruguay. Anacondas are often found resting among vegetation or tree roots at the edge of the water or lying submerged in the water. They can also be found basking on a log or branch, especially in the morning hours. After they get warm, they find relief from the heat by resting in the shade, hiding under a large object, or entering the water. During the hot, dry season, anacondas will bury themselves in mud and become inactive. Young anacondas fall prey to various carnivores in their range.

Anacondas are known to feed upon a variety of animals including fish, amphibians, mammals, and other reptiles. They use a “sit and wait” ambush strategy. An anaconda will lie partially or totally submerged at the water’s edge and wait for an animal to come and drink. The unsuspecting animal is bitten, constricted, and dragged into the water, where it is submerged and ingested. Anacondas unhinge their jaws to swallow animals bigger than themselves.

Reproduction can take place in or out of the water. Litter sizes range from 4 to 77 young. The gestation period lasts between five and eight months. At birth, the neonates are rather aggressive, but become more docile after a few months. The Anaconda is the world’s largest or heaviest snake. The most significant threat to anacondas is habitat destruction.



Boa constrictor (*Boa constrictor imperator*)



The Mexican or Central American boa constrictor is the northernmost subspecies. It is found from Mexico to northwestern South America. Boa constrictors are usually about ten feet (3 m) in length but can grow to be much longer. Their coloration is often sandy brown with a pink tint and dark brown marks on the back. They may forage in trees but are mainly terrestrial.

Their diet consists mainly of birds, iguanas, and small mammals. Their keen sense of smell helps detect the presence of other animals. Like other constrictors, they coil around and suffocate their prey, rather than crushing it. The

loosely hinged jaws can be stretched, enabling it to swallow animals with bodies much larger than the boa's head. The female boa constrictor bears her young alive (ovoviviparous). There can be several dozen offspring at each birth. The offspring are 12-24 inches (30-60 cm) in length.

Viperidae

Eyelash palm viper (*Bothriechis schlegelii*)

The eyelash palm viper has a patch of bristly scales that looks somewhat like eyelashes above each eye. The head of this slender snake is distinct from the neck. They have very long fangs and heat sensitive pits between the eyes and nostrils. Colors and patterns vary greatly, depending on the geographical origin of the snake. Its venom is somewhat mild and is not considered lethal. They are arboreal snakes, equipped with a prehensile tail that allows them to climb up tree trunks, over small branches, and over palm leaves. The eyelash palm viper is aggressive and primarily inhabits mid to low elevations.



Eyelash palm vipers use chemical substances called pheromones to communicate. They have been observed as high as 59.5 feet (18 m) in trees but may also be found just above the leaf litter, perched on a root. The eyelash palm viper ranges from southern Mexico to Venezuela and Ecuador. These "sit and wait" predators are thought to be primarily nocturnal but are sometimes found sunning on leaves or branches. They specialize in taking a variety of prey, including small mammals, birds, bats, lizards, and frogs. Eyelash palm vipers reach

lengths of 22 - 36 inches (56-91cm).

One litter may contain 12-20 snakes of several different color ranges. A gestation period of 166 days was reported in Honduras. They are born aggressive, and ready to defend themselves. Young snakes mainly prey on tree frogs. *Bothriechis schlegelii* are threatened by large mammals, other snakes, and humans.

Middle American rattlesnake (*Crotalus simus*)

The middle American rattlesnake is the second longest venomous snake in Mexico. They can reach lengths of 72 inches (183 cm) with females being slightly smaller. The head of this species is stout and broad. The brown-black diamonds on the back contrast with the lighter colored sides. The back quarter of the snake turns to a solid black or brown. The underside is a solid cream brown color. Stripes on the head and neck distinguish neotropical rattlesnakes from other rattlesnakes.



Their venom attacks not only the circulatory system, but also the nervous system, causing paralysis. The venom contains both hemotoxic and neurotoxic components, making it the most potent in this genus and highly dangerous.

They are crepuscular and feed on rodents, lizards, and small birds. Two small pits located between their eyes sense the heat of their prey. Neotropical rattlesnakes are not extremely aggressive. The neotropical rattlesnake is found from central Mexico to Costa Rica in open, grassy areas and areas with low thorn bushes. They can climb trees and swim to catch prey.

The young develop in an egg capsule but break free of it at birth. Twenty to fifty babies are born (usually in August) and leave their mother in less than a day. Within seven to ten days, they shed their skin for the first time, displaying their full rattle.

Central American fer-de-lance (*Bothrops asper*)

The Central American fer-de-lance is the largest and most dangerous venomous snake in the Yucatán Peninsula. The head is triangular and distinct from the neck. The eyes are moderately large, pupils are vertically elliptical, and a deep pit can be seen between each eye and nostril. Their colors and patterns vary, with the back being tan, tan, brown, or grey with pale pink undertones. The top of the head is dark gray or brown above the chin, with lighter, yellow-tinted cheeks. The fer-de-lance grows to an average of 4-6 feet (1.2-1.8 m) in length.



Central American fer-de-lances are found in low and moderate elevations on the Atlantic slope from Tamaulipas southward through Central America to Ecuador, Colombia, and Venezuela. Scattered populations are found on the Pacific slope of Chiapas and Guatemala. They are widespread in the Yucatán Peninsula but apparently are absent in the arid northwest corner. They are terrestrial, except for younger snakes that are sometimes found in vegetation. Adults feed predominantly on birds, small mammals, whereas juveniles consume small frogs, lizards, and centipedes. Mating takes place from October to November. The brood size ranges from 5-86 young, with newborns appearing in the summer rainy season.

CROCODILIA (Crocodiles, Alligators, Caimans, Gavials)

Crocodylians are large, aquatic reptiles that range in length from four feet (1.2 m) to 30 feet (9 m). Few data are available on the life span of crocodiles in the wild. Signs of aging, such as lack of teeth, are evident in animals more than 50 years of age. One crocodylian in Australia lived 66 years in captivity. It has been speculated that some of the largest crocodylians could be close to 100 years old.

The order Crocodylia includes the family Crocodylidae (true crocodiles), the family Gavialidae (gharials), and the family Alligatoridae, which includes the both the subfamily Caimaninae (caimans) and the subfamily Alligatorinae (alligators). Crocodylians date back to the dinosaur age, ranking them among the oldest surviving vertebrate life forms. They have been of major importance to the ancient cultures of Africa, Asia, Australia, China, Egypt, North America, and South America. Due to their longevity, predatory nature, appearance and large size, crocodylians have always played an integral part in the folklore of many countries.



The feature that most distinguishes crocodiles from alligators, caimans, and gharials is the arrangement of the fourth tooth in their narrow lower jaw. All the other teeth fit into pits, however, this long exposed tooth fits into a groove on the upper jaw, giving the crocodile a distinct look. In alligators, the teeth of the lower jaw are overlapped by the upper teeth, hiding them from view.

Crocodylians have no lips, therefore cannot push water from their mouth. They do have a secondary palate in the roof of their mouth that separates the food and air so that crocodylians can breathe while eating. When the animal submerges, muscles seal the external nostrils in the nasal plate.

Crocodylians can snap their jaws together with tremendous force, crunching turtle shells and other hard prey items. However, the muscles that open the jaws are quite weak, making it easy to keep the mouth of large crocodiles closed. The pointed, conical-shaped teeth are kept in their sockets by means of connective tissue. Their teeth are continuously replaced through life, which happens slower with age. New teeth develop in a separate pocket on the inner side of the existing teeth. Each tooth moves into place as the old tooth breaks down or is lost. Some crocodylians may have as many as fifty sets of teeth.

The tongue is wide and attached to the bottom of the mouth and does not aid in capturing its prey. The interlocking teeth at the end of the snout are better suited for grabbing and inflicting injury on prey than for chewing. Small prey, such as fish, are carefully passed from the front of the mouth to the back and then swallowed into the cheek cavities by a quick upward movement of the head. Crocodylians tend to roll their larger prey in the water in such a way that chunks of meat are torn off and swallowed whole.

Crocodylians rely on their environment for body warmth. Body size influences the rate of heat loss, with larger animals having more control over thermoregulation than juveniles. Water temperatures have less extreme variation than air temperatures, therefore, crocodylians remain close to water. They bask on land in the sunshine during the mornings and afternoons to raise their body temperature, but usually return to the water at midday when the sun becomes stronger. Gaping of the mouth is often seen while they are basking. This may allow the

crocodilian to cool its head while the remainder of its body stays heated. During the dry season, crocodilians may burrow into mud to avoid the extreme heat. In areas where the temperature falls below freezing, crocodilians dig dens with overhead air holes that allow for extra warmth. Other crocodilians burrow to survive droughts. These burrows may house as many as 10 - 15 animals. Salt glands are present in all crocodiles, but not in alligators and caimans. It is thought these glands may have been carried over from marine ancestors. Their primary function is to counter salt buildup following extended periods of dehydration.

The skin of crocodilians is made up of scales that vary in shape and strength. Crocodilians do not shed like snakes. Instead, they lose and replace individual scutes. These scutes provide both increased protection for the body and enable the transference of heat when basking. Located along the back are osteoderms (bony deposits within each scale). The osteoderms are rough in texture and are often different in color. The tail has no osteoderms, but it does have a double row of thick scutes that aid in swimming.

Crocodilians mainly swim using their powerful tails. The webbed feet help somewhat but are normally kept close to the body when in the water. The legs are used when moving quickly on land to catch prey. Some crocodilians can move at speeds of more than ten miles (16 km) per hour, but only for very short distances.

Crocodilians are normally quite sluggish, except when feeding, when they switch to an anaerobic (absence of oxygen) metabolism. The concentration of lactic acid in the blood rises during an attack and falls after the catch is complete. Oxygen lowers the lactic acid level; however, an extended struggle may result in over-exertion and death from acidosis (an abnormal acidity of the blood).

Crocodilians with smaller snouts have more mobility in water, but less variety in prey. Crocodilians are excellent opportunistic hunters. With only the eyes (and sometimes the tip of the snout showing), they can look for unsuspecting prey while staying hidden from view. The eyes are close together, allowing for binocular vision. When hunting at night, their eyes have a slit-like pupil that allows more light to enter than would be possible if the pupil was round. A layer of cells at the back of the retina directs light going through the eye.



This improves the images that are seen and explains the glow of their eyes at night when light shines on them. Crocodilians have both rods and cones, giving them color vision. The protective membrane over their eyes allows crocodiles to see underwater. A large portion of their small brain is allotted to olfactory stimuli, resulting in a keen sense of smell. Their hearing is also good. Flaps of tissue cover the ear opening when submerged.

Crocodilians are sensitive to a wide frequency range. The use of communication by vocalization is unique among crocodilians. “Bellowing” is somewhat like the roar of a lion, with males having a lower pitch than females. Hatchlings grunt or bark, a sound that is often mimicked by hunters to lure adult crocodiles. Head slapping is also used for communication, where the lower jaw rests on top of the water and the upper jaw slaps closed, causing a loud pop followed by a splash. Head slapping is also used as a sign of dominance. Some species communicate by head slapping underwater and blowing bubbles. Tail thrashing is another means of communicating.

All crocodilians reproduce by means of eggs. Sexual maturity is indicated by size, around six feet (1.8 m) in length, a length attained at about 10-12 years of age.

Family Alligatoridae, subfamily Caimaninae

Dwarf caimans (*Paleosuchus palpebrosus*)



Dwarf caimans (*Paleosuchus palpebrosus*) are dark reddish-brown. They are heavily armored, providing protection from predators. The head is short and smooth with a high skull and an upturned, long snout. The head is void of bony ridges between the eyes. The dorsal surface is mostly plain, while the upper and bottom jaws are covered with several dark and light spots. The tail is marked with dark bands to the tip. The eyes are brown. The fourth tooth on each side of the bottom jaw fits into a socket within the upper jaw and is not visible when the jaws are closed.

They are nocturnal hunters, preferring to spend the daylight hours basking in the sun. They migrate long distances due to competition. This species is the smallest living crocodylian. Males grow to a length of 4.3 - 4.9 feet (1.3-1.5 m) and the females grow to a length of 4 feet (1.2 m). Young dwarf caimans feed on insects, crabs, frogs, tadpoles, shrimp, snails, and small fish. Adults feed on fish, frogs, tadpoles, snails, small mammals, and a wide variety of insects. Their prey is usually swallowed whole or in large pieces.

They communicate through sounds, postures, movements, smells, and touch. Non-verbal communication is done by slapping the head on the surface of the water or clapping the jaws. During courtship, males emit a "chumph" sound.

Female caimans build nests using soil mixed with leaves, grasses, and twigs. The nest contains an egg chamber at the center, where around 10 to 25 eggs are laid. The eggs are incubated for 2.5 - 3 months. During this time the mother guards the nest. The female opens the nest in response to the vocalizations of the hatchlings. Once hatched, the babies stay beneath the debris of the nest for several days before venturing out on their own.



Dwarf caimans prefer clean, fast-moving streams or rivers in forested areas containing waterfalls and rapids. They are widespread throughout the Orinoco and Amazon basins, inhabiting areas extending from Colombia, Venezuela, and the Guianas, south to Sao Paulo and the upper Rio Paraguay in southern Brazil and west to the Rio Pastaza in Ecuador.

Family Crocodylidae

Morelet's crocodile (*Crocodylus moreletii*)



The Morelet's crocodile is a small Central American crocodile, reaching lengths of 10-14 feet (3-4.3 m). The main distinction is the unusually broad snout. The iris is silvery brown in color. Morelet's crocodiles have between 66-68 teeth. The teeth in the upper and lower jaws are in perfect alignment (which distinguishes crocodiles from alligators). The fourth tooth, on either side of the bottom jaw, is slightly larger than the other teeth and is visible when the mouth is closed.

Morelet's crocodiles are similar in color to but darker than American crocodiles. They are a dark gray/brown in color, with darker bands and spots on the body and tail. The neck scales are heavy. The legs are powerful and end in clawed, webbed feet. The tail is also very powerful, allowing Morelet's crocodiles to swim well. Juveniles are bright yellow in color with black bands.

The nostrils are situated at the end of the snout. The eyes are further back, with the ears behind the eyes. These three sensory receptors are all located on the same plane on the top of the head, allowing it to stay almost completely underwater, while still being able to see, hear and smell. The eyes have a special eyelid called a nictitating membrane, which is a clear eyelid that covers and protects the eye while underwater.

Appetites of Morelet's crocodiles vary according to age and size. Juvenile Morelet's crocodiles eat small invertebrates and fish. Adolescents feed on aquatic snails, fish, small birds, and mammals. Older and larger crocodiles feed on larger prey, including domestic animals such as dogs, birds, fish, lizards, and mud turtles. They can also be cannibalistic, eating young juveniles. Morelet's crocodiles are generally shy around humans.

Morelet's crocodiles are found in northern and central coastal Belize, as well as areas in Mexico and Guatemala. They seem to prefer freshwater and are found mainly in swamps, marshes, rivers, and lakes in forested areas. They will also live in brackish waters (areas where salt and freshwater meet) and in lowland rivers and ponds. Their range overlaps that of the American crocodile.



The breeding season starts before the rainy season. Approximately 20-45 eggs are laid in a nest near the water or on floating vegetation. Nests may contain eggs from more than one female. Females guard the nest for 80 days, after which the eggs hatch. Both parents protect the juveniles from enemies.

Orinoco crocodile (*Crocodylus intermedius*)



The Orinoco crocodile is a relatively large species with a long, slightly upward-curving snout. They have symmetrical dorsal armor with six prominent scutes on the back of the neck. There are three color phases which occur in the Orinoco crocodile. The mariposa (Spanish for butterfly), which is a gray/green body and dark dorsal patches, the amarillo (Spanish for yellow), which is the most common coloration with a light, tan body and scattered dark areas, and negro (Spanish for black), which is a uniformly dark gray).

Orinoco crocodiles have a total of 68 teeth. If they lose a tooth, it is replaced, although this process slows with age. They have up to 50 sets of teeth. The largest males rarely exceed 16 feet (5 m) in length.

The Orinoco crocodile is found in the waters and lagoons of the Orinoco River basin in eastern Colombia and Venezuela. The juveniles eat small fish and invertebrates. The adults eat aquatic vertebrates and terrestrial mammals or birds.

A hole nest is excavated from exposed sandbars during the annual dry season (January to February). Clutch size is between 15 to 70 eggs. The eggs hatch two months later with the onset of the wet season and a rise in the water level. Females protect the young for one to three years. The Orinoco crocodile aestivates in holes dug in the riverbanks during the annual dry season when water levels become very low.



USEFUL VOCABULARY

acidosis	abnormal acidity in the blood
adaptation	adjustment to environmental conditions
aestivate	to spend a hot or dry period in a prolonged state of dormancy
agile	an organism that makes quick and easy movements
allantois	an embryonic sac from the digestive tract that stores waste and allows oxygen and carbon dioxide in and out of an egg
amarillo	yellow (Spanish)
ambush	a surprise attack by a predator from a hidden position
amnion	the sac in which the embryo is suspended
anaerobic	involving an absence of oxygen
analyze	to separate into parts to determine the nature, proportion or function
ancestors	an animal from which later generations have evolved
aperture	an opening, hole, or gap
aquatic	relating to water
arboreal	adapted for living in trees
armor	a protective coat
barbel	a long sensory organ found on the lips or jaws of certain animals
bask	to lay in the sun to gain warmth
bellow	to utter loudly or powerfully
binocular	involving two eyes
bipedal	an organism moving on two feet
bladder	a sac in the abdomen which receives and stores urine from the kidneys for excretion
brackish	a mixture of seawater and fresh water
burrow	tunnels or holes, or the act of digging tunnels or holes
calcareous	containing calcium carbonate, calcium, or lime
camouflage	an organism that has an adaptation to blend in with its surroundings
canopy	the largest and most active layer of the rainforest (ranging from 60-100 feet (18 - 31 m)
canthus	corner at either side of the eye
carapace	the hard, protective covering over all or part of the back
carbon dioxide	a heavy, colorless gas; absorbed from the air by plants in photosynthesis (CO ₂)
carnivore	flesh-eating
casque	helmetlike structure
chamber	an enclosed space or compartment
clutch	the number of eggs laid at one time

cold-blooded	body temperature varies with environment
cone	cells found in the retina of most vertebrates, sensitive to bright light and color
congregation	a gathering of multiple organisms
conical-shaped	cone shaped with a narrow, pointed top
coniferous	trees bearing cones and evergreen needle-like leaves
conservation	preserving and/or protecting something
constriction	making smaller or narrower by binding, squeezing, or shrinking
continent	one of the seven divisions of land on Earth
crepuscular	becoming active at twilight or before sunrise
deciduous	a tree or shrub that sheds its leaves annually
dehydration	the act of losing water
destruction	the action or process of destroying something
dewlap	a loose fold of skin hanging from the throat of an animal
digit	a finger or toe
dimorphism	existence among animals of the same species of two distinct forms that differ in one or more characteristics, such as coloration, size, or shape
display	a demonstration to a conspecific or mate to gain attention
diverse	differing from one another
docile	easy to manage or discipline
dorsal	relating to the back of something
drought	dry weather, lack of rain
egg	a reproductive cell produced by the female
egg-tooth	a sharp projection of skin at the tip of the upper jaw used to break the eggshell
elastic	able to quickly move back to the original shape after being squeezed or stretched
elongate	to make longer
embryo	an animal in the earliest stages of development in the uterus or egg
environment	surroundings or external conditions
evolution	process of gradual, progressive development from a simple to an advanced form
excavate	to create a hole or cavity
external	outside of something
extinct	a species that is no longer in existence
exuvia	what remains when an organism sheds its skin
fertilization	to make a female's egg fertile by pollinating or impregnating with the male gamete
floodplain	a flat region or valley surrounding a stream into which the stream overflows during flooding
forage	search for food
fuse	to unite by melting or blending together

gait	way or rate of walking or running
gaping	holding the mouth open
gelatinous	viscous, having a high resistance to flow
gestation	pregnancy
gill	the organ for breathing for most aquatic animals
gland	any organ or specialized group of cells that produces secretions
gular	relating to the throat
habitat	a place where an organism naturally lives or grows
hatchling	an organism that is recently hatched from an egg
head slapping	the sudden closing of the mouth that makes a loud noise and splash
helmeted	equipped with or wearing a helmet; helmet-like appendage
hemotoxin	a substance that causes blood poisoning
herbicide	a chemical substance used to destroy plants
herbivore	a plant-eating organism
hibernacule	the winter quarters for a hibernating animal
hibernation	spend the winter in a dormant state
immune	resistant to infection
incubation	to keep eggs in a favorable environment for hatching or developing
infrared	invisible rays just beyond the red end of the visible spectrum
insecticide	a chemical used to kill insects
insectivore	any animal or plant that feeds mainly on insects
internal	inside the body
interval	the amount of time between two events
invertebrate	having no backbone or spinal column
irrigation	to refresh by watering
juvenile	a young plant or animal
keel	a longitudinal ridge that serves a purpose (like the keel on a boat that keeps the boat from rolling)
larva	the early, immature form of an animal which becomes an adult through metamorphosis
ligament	a band of tough tissue connecting bones or holding organs in place
limb	an arm, leg, or wing
longevity	the length or duration of life
longitudinal	running lengthwise
lung	respiratory organs in vertebrates that oxygenate blood and remove carbon dioxide
malnourished	improperly nourished
mangrove	a group of tropical woody plants that are highly tolerant of saltwater
marine	of or relating to the sea

membrane	a thin layer of tissue
metabolism	the process and rate of changing food into energy
metamorphosis	to change form, shape, or structure
mosasaurs	huge, seagoing lizards that lived in the age of dinosaurs
murky	dirty or cloudy, difficult or impossible to see through
musk	a strong-smelling substance secreted by animals
neonate	a newly born organism
neurotoxic	poisonous to nerves or nerve tissues
nictating membrane	a transparent inner eyelid in some animals that closes to protect and moisten the eye
nocturnal	active at night
odor	a smell or fragrance
offspring	the immediate decendent of an organism
olfactory	the sense of smell
omnivore	an organism that eats both plants and animals
organ	specialized tissues adapted for a specific function in the body of an organism
osteoderm	bony deposits in the scutes
oviparous	eggs that mature and hatch after being expelled from the body
ovoviviparous	eggs develop within the female (unlike oviparous), and the embryo gains no nutritional substances from the female (unlike viviparous); also known as oviviparous
oxygen	colorless, tasteless gas found in our atmosphere (O ₂)
palate	roof of the mouth
partition	divider, separator
permeable	open to passage or penetration, usually by fluids
pharynx	tube that connects the mouth and nasal passages with the esophagus
pheromones	chemical substances released by an organism
pigment	matter in the cells and tissues of plants and animals that contribute to color
placenta	the lining of the uterus which bears the eggs
plastron	the lower part of the shell of a turtle or tortoise
poikilothermic	having a body temperature that varies with the environment
pollution	a substance which contaminates an area
population	the number of inhabitants in a specific location
porous	contains small openings
predator	hunts and feeds on other animals
prey	an organism hunted or killed for food by another animal
pungent	having a particularly strong odor
pupil	the circular (usually black) opening in the iris of an eye
range	the area in which an organism lives

regenerate	grow a replacement body part
resistant	to be immune or impervious to something
retina	the innermost lining of the eyeball
rod	cells in the retina of a vertebrate that are sensitive to dim light
sargassum	a brown seaweed with berry-like air bladders, usually floating in large masses
scute	a strong scale on the body of an animal
secrete	to release
shell	the hard outer covering of an organisms
side-winding	a form of locomotion (used by snakes) involving looping the body sideways in an S shape
skeleton	rigid support or protective framework of an organism
snout	the pronounced nose and jaws (or muzzle) of an animal
solitary	living or being alone
speciation	the process of developing new species through evolution
species	a group of organisms having common attributes
submerge	to place under or cover with water
subtropical	the regions bordering the tropical zone
symmetrical	regular in form
temperature	degree of heat
terrestrial	relating to land
territory	area in which an organism lives and defends from competitors
trachea	tube that moves air to and from the lungs
transparent	a clear surface where objects on the other side are visible
tropical	located in the tropics
vegetation	plant life
vertebrate	an organism with a backbone or spinal column
vulnerable	an organism that can be wounded or physically injured
warm-blooded	having a body temperature that remains relatively constant
webbing	a membrane joining the digits

AMPHIBIANS

Amphibians are terrestrial and/or aquatic vertebrate animals with some or all of the following features:

- cold-blooded (poikilothermic)
- some breathe air with lungs, others with gills
- development involves metamorphosis
- skin is smooth, moist, and permeable
- possess many glands (some of which may be poison glands)
- pigment cells common
- no scales on the body
- mostly internal fertilization in salamanders and caecilians; mostly external in frogs and toads
- usually have four limbs although some are legless
- have a three-chambered heart
- are predominantly oviparous
- feed on insects or other small invertebrates
- skeleton is mostly bony with varying numbers of vertebrae



There are three orders of amphibians:

- ANURA - Frogs and Toads
- CAUDATA - Salamanders and Newts
- GYMNOPTIONA – Caecilians

ANURANS (Frogs & Toads)

The order Anura (frogs and toads) has more than 4,500 species. There are some basic, general differences between frogs and toads. Frogs are aquatic and mostly smooth and slimy, while toads are often dry and bumpy. Frog legs are long, strong, and built for jumping. The bones and muscles in their legs are elongated to improve their ability to leap. Toads have shorter legs and typically walk instead of hop.

Vision and hearing are important to both frogs and toads. Their eyes are large and set high on their head to provide a large field of vision. The eyeballs retract into sockets to help with swallowing by pushing against the roof of the mouth.

Some of the families in the Order Anura include the Bufonidae, Centrolenidae, Dendrobatidae, Discoglossidae, Hylidae, Hyperolidae, Leipelmatidae, Leptodactylidae, Microhylidae, Myobatrachidae, Pelobatidae, Pipidae, Pseudidae, Ranidae and Rhinophrynidae.

ANURANS

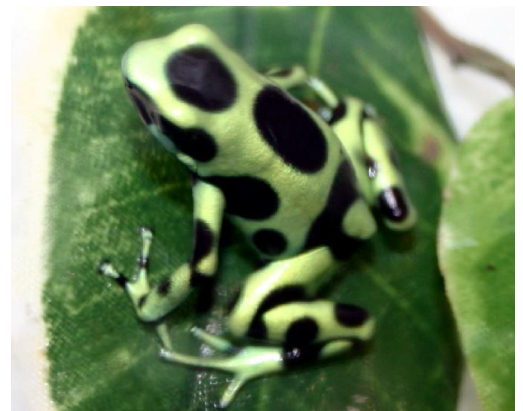
Dendrobatidae

Yellow and black poison dart frog (*Dendrobates leucomelas*)



Blue poison dart frog (*Dendrobates azureus*)

Green and black poison dart frog (*Dendrobates auratus*)



The genus *Dendrobates* includes brilliantly colored frogs that grow to about one inch (2.5 cm) in length. Bright-colored frogs are often the most poisonous and the least shy, and the *Dendrobates* are no exception. A gland in their skin secretes a poison. They have adhesive pads on their toes that help them climb trees in search of insects. Males are slightly smaller than females but stockier. *Dendrobates* are found on the forest floor and among the trees in rainforests in Central and South America.

Dendrobates eat small insects such as ants and spiders. Their skin secretions become poisonous when they eat a specific combination of ants and plants. Without this certain mixture, the frogs are not poisonous. Breeding occurs during the rainy season. Females lay small batches of eggs about every three weeks during this time. The female carries her tadpoles from the floor of the forest up into the canopy and puts them in a small pool of water inside a bromeliad. The tadpoles emerge as frogs. This method is safer than placing the tadpoles in the river where they would likely be eaten.

Their bright colors send messages to potential predators that they are deadly. The call of the poison dart frog varies from species to species but can be difficult to distinguish. The males are territorial, staying in one place for days or weeks, using their calls to designate it as their territory. Males of the same species will space themselves 10 - 13 ft (3-4 m) apart. Their lack of predators allows these frogs to be diurnal.

Indigenous South American groups use the powerful poison to coat the tips of their arrows and blow darts. One frog can produce enough poison for 40-50 darts. The strength of the poison varies with the species.

Pipidae

Surinam toad (*Pipa pipa*)

The average length of the Surinam toad is four to five inches (10-13 cm). Females are normally larger. The forelimbs are short with star-shaped fingers and no webs. These fingertips have tiny “feelers” on the end, used when searching for food. These aquatic omnivores eat worms, insects, crustaceans, and small fish.

Native to northern South America, Surinam toads are found in murky ponds and swamps and spend most of their time resting underwater. They can stay submerged for more than one hour, but usually come to the surface every thirty minutes.

Mating begins when males make a series of clicking sounds while underwater. The female releases eggs which are received by the male who fertilizes them and allows them to roll onto the back of the female. The eggs sink into the skin and form pockets over a period of several days, eventually taking on the structure of a honeycomb. The female carries the eggs until they are fully developed and emerge as miniature adults. Surinam toads lay and fertilize approximately 100 eggs.



Leptodactylidae

Ornate horned frog (*Ceratophrys ornata*)



Ornate horned frogs grow to six inches (15 cm) in length. Females are slightly larger than males. Ornate horned frogs are green with dark red to black markings along their back. When lunging at prey, their mouths look enormous. They are passive hunters, waiting for food to come to them before attacking. Insects, lizards, mice, and other frogs make up their diet. The common name, horned frog, comes from the folds of skin located over their eyes.

Native to South America, ornate horned frogs burrow in leafy, muddy vegetation of tropical forest floors. Females lay 1,000-2,000 eggs in non-moving (still) water. It takes only two weeks for the eggs to hatch and for the young to develop into small frogs. The average life span is six years.

Bufoidea

Marine or cane toad (*Bufo marinus*)

Marine toads are distinguished by deeply pitted parotoid glands extending far down the sides of their bodies. They are typically brown or gray with cream-colored spots across the back, sides, and legs. The underside is creamy yellow, sometimes spotted with black. The back and legs are covered with spiny warts. They have an average length of six to nine inches (15 to 23 cm).

The marine toad sits in an upright position. When it moves, it makes short, fast hops. During cold or dry seasons, it remains inactive in a shallow burrow. Marine toads are omnivorous, eating insects, vegetation, small birds, and snakes. Their skin secretions are highly toxic to dogs, cats, and other animals (including humans).



Breeding occurs from early spring to autumn, during or after rain. They are found from the Amazon basin in South America, through Central America, into southern Texas. *Bufo marinus* were also successfully introduced in Hawaii, Mauritius, Fiji, Philippines, Taiwan, the Ryukyu Islands, New Guinea, Australia, and many other Pacific islands as control agents for insects.

Panamanian golden frog (*Atelopus zeteki*)



Atelopus zeteki inhabits areas along streams in western-central Panama. Panamanian golden frog coloration ranges from pale to golden yellow on the back with a bright yellow belly. Adults also have black markings, which are absent on younger frogs. Males and females have the same coloration. Females are larger than males, measuring 1.75 – 2.5 inches (4.4 - 6.4 cm) in length and weighing 0.14-0.53 ounces (4 - 15 gr). Panamanian golden frogs in dry forest stream areas are two-thirds larger than those found in wet forest stream areas.

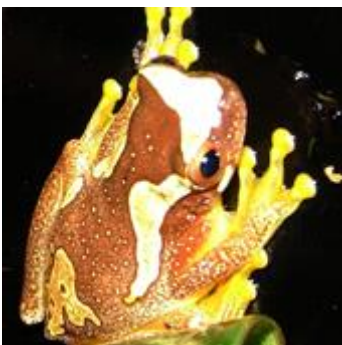
Panamanian golden frogs are active mainly in the morning and early evening. Males make vocal calls (chirps) to attract mates and claim territories. Males also wave their hands to let other frogs know the territory is taken. This behavior, known as semaphoring, probably resulted from environments where vocal calls were drowned out by noisy, fast-flowing streams. Their keen eyesight is helpful in locating a variety of small invertebrates (beetles, flies, wasps, ants, spiders, caterpillars, etc.) which are included in their diet.

Males are known to be very persistent, clinging to a female for days, waiting on her back until the moment she is finally fertile. Eggs are laid at the onset of the dry season when the streams are slower and lower. An average clutch size is 370 and metamorphosis takes from four to eight months, depending on water conditions.

Hylidae

Hourglass tree frog (*Dendropsophus ebraccatus*)

Hourglass tree frogs are highly variable in shape, but usually take the form of an hourglass. The back is yellow or light brown and is covered with brown markings. The side of the head is mostly brown, with a distinct cream-colored stripe that runs from the lip to the eye, expanding to a pale spot below the eye. The legs are pale orange or yellow; the sides, arms, hands, and feet are pale yellow. The underside is cream-colored, and the iris is reddish bronze.



Males are 0.94 -1.06 inches (2.4 - 2.7 cm) long and females are 1.18 - 1.34 inches (3.0 - 3.4 cm). Hourglass tree frogs are nocturnal, arboreal frogs. They spend most of their non-breeding time in forest trees and in bromeliads. During the rainy season, they descend from the trees to swamps and ponds in the rainforest for breeding.

The males call to the females from low, exposed vegetation at the edge of a pond, from dusk throughout most of the night. Their small size puts them at great risk of predation when breeding. Cat-eyed snakes, frog-eating spiders, bulldog fishing bats,

and other winged predators are their main threats. If breeding is successful, the female lays eggs in clumps (24 - 76 eggs) in a single layer on the upper surfaces of leaves above water. The leaf eventually falls into the water and the eggs hatch into beautiful gold and black-striped tadpoles. The tadpoles quickly grow and metamorphosize into frogs. The young frogs head for the trees until the next breeding season.

Red-eyed tree frog (*Agalychnis callidryas*)

The red-eyed tree frog has bright red, bulging eyes and a bright green body. The sides are blue with pale yellow stripes, the feet are reddish orange, and the upper legs are blue. They have powerful legs and can jump long distances. The suction cups on the toes are important for mating, sleeping, and eating. Even though Red-eyed tree frogs spend a large portion of their time in trees, they are good swimmers.



The average size of *Agalychnis callidryas* is a maximum of three inches (7.6 cm). They are nocturnal and rest on the undersides of large leaves during the day. This carnivorous amphibian feeds on crickets, moths, flies, grasshoppers, and smaller frogs. Bats, snakes, and birds are their main predators.



Red-eyed tree frogs have a very musical mating ritual. When a male starts croaking, the rest of the males in the area join in as well. This "song" is sung to attract the females. The croaking continues as the males jump from leaf to leaf to establish a territory. The males inflate their vocal sacs and rise on all four legs to deter males from their territory and to attract females.

Red-eyed tree frogs spend their lives near water because they must return to the water to lay their eggs. Females lay eggs above the water on the undersides of leaves, and the male fertilizes the eggs as they are deposited.

When the eggs hatch into tiny brown tadpoles, they fall into the water below. As they mature, they lose their tail, develop lungs, and become brightly colored.

Mexican tree frog (*Smilisca baudinii*)

The Mexican tree frog is generally gray/brown in color, with darker brown irregular blotches. Their underside is light gray or white. Their legs have distinctive dark bands. A dark band runs from the snout to above the forelimbs. Females are larger and have a rounder body shape. Females grow to three inches (8 cm) in length and males reach two inches (5.5 cm). These nocturnal, arboreal amphibians find shelter under loose tree bark, in damp soil, or in fallen logs during the dry season. They are generally found in the lower levels of forest where they eat such invertebrates as grasshoppers, roaches, and spiders. Frog-eating snakes are their main predators.



A few nights after strong rains of the wet season, males can be heard making deep sounds ("bonks") that are repeated up to six times. Mexican tree frogs typically call as pairs, and the initial calls of a pair cause other pairs to respond.

Following rain, Mexican tree frogs move to and from wetlands to breed. Breeding sites are small, temporary pools where eggs are initially deposited as clusters.

CAUDATA

The order Caudata (meaning “provided with a tail”) has more than 500 recognized species of salamanders, newts, sirens, amphiuma, waterdogs, and mudpuppies. They range in size from the lungless salamander (*Thorius*), which only reaches one inch (2.5 cm) in length, to the Chinese giant salamander (*Andrias davidianus*), which grows to six feet (1.8 m).

Salamanders can be mistaken for lizards because of their many similarities; however, they lack scales. Like lizards, salamanders can regenerate their tails after they have been lost, usually to escape danger. Salamanders and newts periodically shed their skin because they continue to grow after reaching adulthood. Once they shed the top layer of skin, called the exuvia, they typically eat it. This provides a rich source of nutrients for the animal.

Salamanders have mucous, granular, and mixed glands distributed over their body. The mucous gland helps to keep the animal moist, even when out of the water, and acts as a lubricant when swimming. The granular gland may secrete toxins or odors for self-defense. The third gland produces a mixture of both substances. There are ten families in the Order Caudata.

Ambystomatidae

Axolotl (*Ambystoma mexicanum*)



Axolotls are also known as Mexican walking fish. Their name comes from an Aztec word meaning “water dog” or “water monster.” Axolotls have cylindrical bodies, short legs, a relatively long tail, and feathery, external gills. They have four toes on the front feet, five toes on the back feet, and moveable eyelids. They are known for their blunt snouts and large mouths. Adult Axolotls can reach approximately 12 inches (30 cm) in length and can weigh as much as 10.5 ounces (300 gr).

Aggressive towards one another, the Axolotl will bite off the gills, feet, and tails of other axolotls. When this happens, these body parts regenerate. Axolotls are amphibians, their body and gills must remain moist so they can breathe. The Axolotl differs from other amphibians in that it typically spends its entire life in the water in the larval stage. It is one of the amphibian species exhibiting “neoteny” (the ability to breed in a larval form).

Should the Axolotl undergo metamorphosis, it is transformed into the Mexican salamander. Some sources say Axolotls can be induced to complete metamorphosis under a variety of conditions, including environmental stress or treatment with thyroid hormone. Once they have gone through metamorphosis, regeneration is no longer possible (or greatly reduced) and the life span is shortened. Axolotls are nocturnal animals that avoid light.

The Axolotl was originally native to Xochimilco and Chalco, two freshwater lakes south of Mexico City. Chalco is now gone and Xochimilco survives only as a network of canals and lagoons. These bodies of water are muddy bottomed and rich in plant and animal life.

Axolotls become sexually mature at about 18 months while still in the larval form. After the courtship dance, the female Axolotl takes up the sperm capsule deposited by the male. Eggs are laid individually, usually on plants. There may be between one hundred and over a thousand eggs laid in one spawning, depending on the size of the female. Eggs hatch after 14 days at 75°F (24°C), and after a few hours, the larvae begin to eat anything small enough to fit in their mouths.

GYMNOPHIONA (Caecilians)

The order Gymnophiona is made up of more than 150 species of caecilians (burrowing amphibians that resemble worms). They are found in tropical and subtropical zones. Although the word caecilian means blind, they do have small eyes. These legless amphibians range in size from the small *Grandisonia brevis* at 4.3 inches (11 cm), to the large *Caecilia thomsoni* of South America, which reaches lengths up to 5 feet (1.5 m).

The shape of their head allows caecilians to burrow through the soil and build tunnels. Their small eyes are an adaptation because of the lack of light they encounter. They are equipped with tentacles on either side of their snout which are thought to be organs of taste and smell. The body of the caecilian is made up of a series of rings or folds called annuli which are thought to aid in locomotion. Some caecilians are oviparous (egg-layers), some viviparous (have live young) and a few are ovoviviparous (eggs hatch inside the mother and the young live in her until maturity).

Caecilians are carnivorous and are mainly insectivores, but occasionally eat earthworms, small frogs, and lizards. The main predators of the caecilians are snakes. There are five or six recognized families in the Order Gymnophiona.

Typhlonectidae

Aquatic Caecilian (*Typhlonectes natans*)

Typhlonectes is the genus of fully aquatic Caecilians found only in South America. Although the *Typhlonectes natans* spends its entire life in water, you can observe it coming to the surface to fill its lungs with air. It resembles a smooth, rubbery tube that is dark grey/lavender in color.

They reach lengths of between 18 and 22 inches (46-56 cm). They have poor eyesight, and they search for their food (fish and aquatic invertebrates) mainly using their sense of smell. The *Typhlonectes natans* is viviparous, giving birth to fully formed young. Due to the long gestation period (six to nine months), females breed no more than every two years and have a small number of offspring.



USEFUL VOCABULARY

adhesive	a substance that sticks to something (such as glue)
blunt	having a flat or rounded end; not sharp
bromeliad	an epiphyte plant
concave	an outline or surface that curves inward
diurnal	active during the day
introduced	bring in and establish in a new place or environment, such as plants or animals
oxygen	colorless, tasteless gas found in our atmosphere (O ₂)
retract	to pull back in
spawning	releasing or depositing eggs
spherical	shaped like a ball
suffocation	the lack of air or inability to breathe
tentacles	long, flexible growths used for grasping, moving, or feeling
toxin	a substance that is harmful to a living organism
uniformly	completely, without variation
waste	matter that is not used
webbing	a membrane joining the digits
yolk	the protein and fat stored in the ovum that serves as nourishment for the growing embryo