An Introduction to Reptile Diversity and Biology

Reptiles are a fascinating and ancient group of animals.

The objective of this teaching guide is to provide a classroom resource and introductory primer on reptile diversity and biology. To begin, a brief discussion on reptile evolution will trace the development of the modern reptile groups. These groups will then be discussed, as well as what makes those groups distinct from others.

Topics to be addressed include: early reptile evolution, basic reptile biology, reptile habitat choice and local reptile wildlife of the central New York region.
From Water to Land

Reptiles were the first vertebrates to live independently of the water, some 310-320 million years ago. What made this possible were:

- The development of a hard, dry scaly skin layer
- The production of a leathery-shelled, amniotic egg

Both adaptations prevent water loss, a key limiting factor for life.

Amphibians need access to wet ecosystems because of their moist, permeable skin and jelly-covered eggs.

The first reptiles were small, lizardlike animals that evolved from amphibians. Their skulls show evidence of a hard crushing bite believed to be better suited to crushing insects than the snapping bite of amphibian ancestors.

Changing Body

As amphibians made the transition to land, their bodies changed in a number of ways:

- Skull shape became more compact and with tightly linked bones, a change from the loosely attached bones of the amphibian skull.
- The skull also developed holes to give room for jaw muscles to move, allowing for a lighter skull and a more powerful bite.
- Limb position moved from straight out from the sides to more underneath the body, which allows for faster movement.
- As skin became thicker, cutaneous respiration (breathing through skin) gave way to pulmonary respiration (breathing through lungs). The early reptiles had completely formed rib cages to protect their new, larger lungs.
**REPTILE DIVERSITY**

**The Age of Reptiles**

Reptile species were at their most numerous and diverse during the Mesozoic Era, 248-65 million years ago. During this period, reptiles came in aquatic, land, and flying forms. Other than size, modern species have not changed much from their ancient relatives.

Reptiles evolved to fill every niche imaginable. Today, reptiles are still incredibly diverse and can be found on every continent except Antarctica.

**The Numbers**

There are more species of reptiles (9547) and amphibians (7000) together than either birds (9000) or mammals (4670). More species, especially in the tropics, are being discovered every year.

**Modern Reptiles**

Modern reptiles are divided into 5 main classifications: turtles and tortoises, lizards, snakes, crocodilians and tuataras.

**Turtles and Tortoises**

Turtles and tortoises are one of the most ancient forms of reptiles, having changed very little over their 200 million year history. Today, there are over 300 species distributed worldwide. The most recognizable aspect of a turtle is its shell, which is actually part of their skeleton. A turtle’s shell is composed of three parts:

- **Carapace** is the upper part and the spine is attached here
- **Plastron** is the lower part
- **Bridge** is where they are connected

Each part is typically made of bony plates, although leatherback turtles and softshell turtles are exceptions. While turtles are often aquatic species, tortoises are a special lineage of terrestrial turtle.

Turtles do not have teeth, but rather a bony beak that they use to clip foods such as vegetation or small animals.
**Lizards**

Lizards have evolved into many different forms compared to other reptiles. Around 5600 species exist today, living everywhere except Antarctica. Most lizards are relatively small in size, but the largest, the komodo dragon, can reach over 10 feet in length.

Although many people believe that snakes are the only reptiles without legs, there are actually lizard species with no or extremely reduced limbs. Most lizards possess eyelids and external ear openings, in contrast to snakes.

**Snakes**

There are currently around 3380 known species of snakes. Of all the reptiles, lizards and snakes are most closely related to each other. Together, they make up the reptile order Squamata, and are known as *squamates*.

What sets snakes apart from most lizards is their head shape, lack of external ears and lack of moveable eyelids. Snakes also have flexible jaws that can accommodate prey larger than their head!

**Crocodilians**

Another ancient lineage, crocodilians include alligators, crocodiles, gharials, and caimans. 25 species are found in the tropics around the world. Crocodilians are the largest living reptiles. Even the smallest, the Cuvier’s dwarf caiman, measures 5 feet long! All crocodilian species are semi-aquatic, with short legs and large body best suited for movement in water.

Crocodilian characteristics include:

- A four-chambered heart, similar to mammals, rather than the three-chambered heart possessed by other reptiles.
- A bony secondary palate, which allows them to open their mouths under water without fear of drowning.

**Tuataras**

Tuataras are a distinct group of primitive reptiles that resemble lizards. Only 2 species can be found, both in New Zealand. Tuataras are the slowest growing reptiles, and it is believed that they can live to be 200 years old.

Tuataras have a few more characteristics that set them apart from other reptiles:

- A third eye with an uncertain purpose. It is believed to be used for either Vitamin D production, thermoregulation, or circadian rhythm cycling.
- Unusual tooth pattern. Two rows of teeth on the upper jaw overlap one row of teeth on the lower jaw. This pattern is unique to tuataras out of all living animals.
**HABITAT AND LOCAL SPECIES**

New York State has a total of 38 reptile species, ranging from snakes to turtles to lizards. From this total, there are:

- 17 turtle species (including 4 sea turtles)
- 17 snake species
- 4 lizard species

In Tompkins County:

- 5 turtle species
- 10 snake species
- 1 lizard species

The largest snake in New York: Black rat snake, growing over 8 feet in length.
The largest turtle in New York (excluding sea turtles): Common snapping turtle, which can weigh up to 75 pounds.

Venomous snakes of New York:

- Timber Rattlesnake-southern part of NY, including in Tompkins County.
- Massasauga Rattlesnake-shy, swamp dwelling snake found outside Rochester.
- Northern Copperhead-orange and brown-patterned snake found in southeast NY.

Reptiles can be found in places ranging from dry deserts, to bodies of water, to tropical forests. The range of a reptile is most limited by climate. This is because:

**All reptiles are ectothermic.**

Reptiles and amphibians are often described as ‘cold-blooded.’ This term is not very accurate, however, as their blood is not cold. Ectos means outside, and -thermic refers to temperature.

Unlike birds and mammals, reptiles cannot create their body heat internally. Instead, they must rely on external sources of heat like the sun in order to regulate their body temperature.

Reptiles can be found on all continents except Antarctica, and some are better suited to colder temperatures than others.

In New York, reptiles spend the majority of their time regulating their body temperature. They are most often found either sunning themselves in open spaces such as on top of rocks or on logs, or hiding beneath leaf litter, stones, or in the water.
## Additional Resources

### Books


### Video

“Life in Cold Blood.” BBC documentary hosted by Sir David Attenborough. *(High quality five-part documentary about reptiles and amphibians)*

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**Unless otherwise stated, all photos were either personally taken by me or found on Wikipedia.**