Lab objectives
The objectives of today’s lab are to:
1. Gain an appreciation for the extant diversity of lizards, as represented by higher clades.
2. Learn what a crocodilian is and how to distinguish the major crocodilian clades.
3. Use a taxonomic key to help you distinguish lizard clades.

Today’s lab is the first reptile diversity lab. Lizards are a very diverse group, although no species currently live in Massachusetts. In other parts of the United States, including Arizona and Utah, lizards are the dominant component of the herpetofauna, and can be a prominent component of all of the animals you see in these places.

Tips for learning the material
Continue what you have been doing in previous weeks. Examine all of the specimens on display, taking notes, drawings and photos of what you see. In this lab you do not need to identify any of the animals to species, but don’t underestimate the difficulty of identifying lizards to their higher taxa. Quiz each other to see which taxa are easy for you and which ones give you troubles, and then revisit the difficult ones. Use a key for more difficult taxa. This will enhance the skill with which you use a key. There will also be a keying exercise, where several unknowns will be displayed and you will be expected to identify them to species.
Exercise 1: Lizard diversity

General information

About 95% of all extant reptiles are squamates. Squamata is a monophyletic group that includes the lizards, snakes, and amphisbaenians. There are numerous squamate synapomorphies, including hemipenes, caudal autotomy, scaly skin, highly kinetic diapsid skulls, and several other anatomical characters. See pages 116-121 in your textbook (Pough et al., 2004) for more information.

Lizards are a paraphyletic group within the Squamata. The other two groups, snakes and amphisbaenians, are really just two monophyletic groups of lizards. Traditionally, snakes and amphisbaenians are treated separately from other lizards. We will do the same in lab because it is a convenient way of breaking up the diversity that we will be studying. However, be aware that in reality, snakes are to lizards as humans are to primates. “Lacertilia” is used to refer to lizards in the traditional, paraphyletic sense (note the quotation marks, which denote a group that is not monophyletic). The phylogeny to the left is a recent, relatively comprehensive phylogeny (Townsend et al. 2004) that has superseded the one presented in the course textbook. Please use this one – it differs considerably from that in the textbook. Note that you are not responsible for knowing all of the taxa appearing as OTUs on this phylogeny.

Why might snakes and amphisbaenians be often recognized as distinct from lizards, when they are evolutionarily nested within lizards?

Lizards have been around since at least the mid-Jurassic (~150 mya). Currently, we recognize about 420 genera, and about 4,800 species of lizards in 18 major clades. Lizards are found throughout the world except at the highest latitudes. They range in elevation from sea level to over 5,000 m. Generally, lizards are most diverse at low latitudes and low altitudes. Eleven major clades of lizards are found in North America. Although the Five-Lined Skink (Eumeces...
fasciatus) is reported to have lived in Massachusetts, it is extirpated, and so, no lizards currently live in the state.

**Generalized morphology**
Typically, lizards have dry, scaly skin; claws; external ear openings; and moveable eyelids (although the Gekkonidae lack eyelids). Most, but not all, lizards have four legs. Legless lizards differ from snakes in that they retain a pectoral girdle and sternum and have fewer than 120 presacral vertebrae. Many legless lizards also have eyelids and external ear openings, whereas snakes lack both. Many lizards have caudal autotomy, which means that the tail easily breaks off along fracture planes. In live specimens, the broken tail will writhe to distract a predator long enough for the lizard to get away. Tails can be re-grown, but the regenerated tail is usually smaller, less colorful, and with a different scalation than the original tail. While an original tail has a vertebral skeleton, the regenerate lacks vertebrae, having a tapering, hollow cartilaginous rod instead. Many lizards have femoral pores along the inner thighs. A large number of lizards can change their skin color. This change often seems to be temperature-related.

Examine a number of specimens of several species of lizards and look at the tails. Can you tell which ones have regenerated tails? What differences do you see between original and regenerated tails?

Make sure you review how to identify the scales that are labeled in your field guide and in lab 1. Also learn the gular fold, femoral pores and post anal scales. These are all useful for identification.

**Generalized life history**
Most lizards are diurnal and terrestrial. There are a handful of semi-aquatic lizards and only one marine lizard, the Galapagos Marine Iguana. Most lizards are insectivorous, but some of the larger lizards are herbivorous or carnivorous. There are at least two venomous lizard species, both of which can be found in SW United States and northern Mexico region – the Gila Monster (Heloderma suspectum) and the Beaded Lizard (Heloderma horridum). However, recent research shows that some monitor lizards, especially the Komodo dragon (Varanus komodoensis) also have potent venoms. Territoriality is common among lizards, especially during the breeding season. Most lizards are oviparous, but ovoviviparity has evolved independently at least 45 times; about 20% of extant lizard species are viviparous. Most lizards probably have genetic sex determination, but at least some have temperature-dependent sex determination. Parental care of any kind is uncommon. Juveniles sometimes have different proportions or color patterns than adults and fill different niches. There are several parthenogenetic lizard species. The most notable are several species of whiptail lizard (Aspidoscelis, formerly Cnemidophorus), some of which also live in the SW United States.
What is parthenogenesis, and what is characteristic of parthenogenetic populations?

Conservation
The primary human threat to lizards is probably habitat destruction, including the construction of roads. The use of roads results in considerable roadkill of lizards and snakes. Many lizards have a market value in the pet trade, which also takes a toll. Gila Monsters are particularly valued by collectors, as are several species of iguana, gecko, and chameleon. Some South American tegu lizard and iguana populations are threatened due to overexploitation for skins or food, respectively.

Lizards by Clade

Gekkota: Geckos and Allies
*Content and distribution:* ~97 genera, about 1,050 species. Nearly global distribution. Four major clades are recognized: Eublepharidae, Gekkonidae (appears on the phylogeny), Diplodactylidae, and Pygopodidae. The pygopodids are flap-footed lizards, endemic to Australia, and look nothing like other gekkotans externally. The pygopodids are not mentioned further in the lab, but we have representatives of the other three subclades.

*Morphology:* All geckos have relatively thin skin and most have granular dorsal scales, vertical pupils, and adhesive pads with subdigital setae. These setae are thought to be a key innovation that has allowed geckos to diversify as much as they have. The Gekkonidae and Diplodactylidae have a *spectacle* instead of eyelids (an immovable, transparent scale) over each eye like a snake. Eublepharids differ from other gekkotans in that they lack subdigital setae, which are highly-modified scales on the toes used for climbing (see pages 129-130, and 377-381 in Pough et al. 2004). They also have eyelids. Tail autotomy is highly developed in all of these groups.

*What is meant by the setae being a key innovation that has allowed geckos to diversify? Why would this structure allow diversification?*

*Life history:* Most are nocturnal climbers. Most are oviparous, but a few are viviparous. Unlike most other squamates, gekkonid egg shells are hard rather than leathery. A few gekkonid species are parthenogenetic. Eublepharids live in arid and semiarid habitats. Most wander around on the ground instead of climbing like traditional geckos. All are oviparous, depositing just 1-2 eggs per clutch.
Miscellaneous facts: About 25% of all lizard species are gekkotans. Unlike most other squamates, many geckos use vocalizations to communicate. *Hemidactylus turcicus* has been inadvertently transported by people all over the world and the species has established itself in many cities, thriving on insects attracted to lights.

**Species in lab:**
- *Rhacodactylus ciliatus* – Crested Gecko (Diplodactylidae)
- *Eublepharis macularius* – Leopard Gecko (Eublepharidae)
- *Hemitheconyx caudicinctus* – African Fat Tailed Gecko
- *Gekko sp.* – Gecko (Gekkonidae)
- *Hemidactylus turcicus* – House Gecko (Gekkonidae)
- *Phelsuma sp.* – Day Gecko (Gekkonidae)

Examine the specimen of *Hemitheconyx caudicinctus* and compare it to the other gekkotans on display. To which gekkotan subclade do you think it belongs to?

As their name would suggest, the day geckos (*Phelsuma*) are diurnal. Examine the specimens on display. What clue do they possess that tells you they are diurnal? (Hint: Look into their eyes!)

**Scincidae: Skinks**

*Content and distribution:* About 115 genera, about 1,345 species. Worldwide except Antarctica, northern Eurasia, and most of Canada.

*Morphology:* Scincids have shiny, smooth, cycloid scales. Some have osteoderms under the scales. Body size ranges from 5-32 cm SVL. Limb reduction (and sometimes absence) has evolved repeatedly within this clade. As a result, body form varies from lizard-like to snake-like. They generally have fairly conical heads and cylindrical bodies. Tail autotomy is well developed.

*Life history:* Most are diurnal. One species of skink is semi-aquatic, but most are terrestrial or fossorial. Some forms are very specialized, with one large species having a prehensile tail and being fully arboreal, and another species having evolved adhesive pads, convergent with those of gekkonids and anoles. About 45% are viviparous. Females guard eggs in some species. Many change their color or pattern significantly as they age. Most are insectivorous.

*Miscellaneous facts:* Scincidae is by far the most diverse group of lizards, rivaled only by gekkonids. However, most of these species are barely studied and of all squamate taxa, scincid phylogeny is most poorly understood.
Species in lab:
   *Eumeces laticeps* – Broad-Headed Skink
   *Eumeces schneideri* – Schneider’s Skink
   *Scincella lateralis* – Little Brown Skink
   *Scincus scincus* - Sandfish
   *Mabuya sp.* – Unidentified Skink

What are some features that you can use to distinguish the Scincidae from other lizard clades on display?

Teiidae: Whiptails, tegus and their allies
*Content and distribution:* 9 genera, 125 species. North, Central, and South America.

*Morphology:* One species can reach 1.3 m in length, but most species of *Aspidoscelis*, which lives in the United States are generally ~10 cm SVL. They have granular dorsal scales, and larger shields on the head, limbs, and ventral side. They also have forked tongues.

*Life history:* Teiids are diurnal, active foragers. Habitat ranges from desert to mountaintop to rainforest. Some species are semi-aquatic and specialized on a snail diet. All are oviparous. There are several all-female parthenogenetic species of *Aspidoscelis*. These parthenogenetic species are the result of hybrid crosses between two sexual *Aspidoscelis* species.

Species in lab:
   *Aspidoscelis sonorae* – Sonoran Whiptail (parthenogenetic)
   *Aspidoscelis tigris* – Tiger Whiptail (sexual)

Describe the scales on the ventral side of *Aspidoscelis*.

What key traits can you use to distinguish teiids from the other lizard clades on display?
Anguidae: Glass Lizards and Alligator Lizards

Content and distribution: 13 genera, about 110 species. The Americas, Europe, western and SE Asia, and NW Africa.

Morphology: One species can reach up to 1.3 m in length, but most species are typically about 10 cm SVL. Limb reduction has evolved repeatedly in this family, so these lizards tend to have a relatively elongate body and short (or absent) limbs. These well-armored lizards have osteoderms (bony plates) underneath their scales. They commonly have a ventrolateral fold on each side that allows the body to expand somewhat despite their rigid armor. Tail autotomy is well-developed.

Under what conditions might body elongation and limb reduction be adaptive in Anguids?

Life history: Most are diurnal and found in relatively cool, humid areas. All are carnivorous, mostly insectivores. Most are oviparous, but some of the higher-elevation anguids are ovoviviparous. Some of the oviparous species attend their eggs until hatching.

Species in lab:
Elgaria sp. – Alligator Lizard
Ophisaurus ventralis – Glass Lizard

How would you distinguish the Anguidae from the Scincidae and Teiidae?

Helodermatidae: Gila Monsters and Beaded Lizards

Content and distribution: 1 genus, 2 species. SW U.S., Mexico, and Guatemala.

Morphology: These are wide-bodied lizards with thick, short tails used for fat storage. Unlike other lizards, they have bead-like scales that do not overlap. Underlying these scales are osteoderms that serve as a bony armor. These lizards are venomous, with the venom flowing passively from ducts in the mouth along grooves in the teeth of the lower jaw. Careful when handling these specimens to avoid the teeth!

Life history: Helodermatids mostly eat vertebrates, especially mammal and bird nestlings. They are active during cooler, wetter conditions than many other lizards. They spend most of their lives in ground burrows, but can climb trees to seek out bird nests. Both species are oviparous. Their eggs take nearly a year to hatch.

Species in lab:
Heloderma suspectum – Gila Monster

Varanidae: Monitor Lizards, Goannas.
Content and distribution: 1 genus, 40 species. Africa, southern and southeast Asia, Australia.

Morphology: Varanids have a quite characteristic appearance, reminiscent of a velociraptor. They have long snouts with posteriorly positioned nostrils and boxy heads. They have well developed limbs with powerful claws. They often use their tails to whip potential attackers. They cannot autotomize their tails.

Life history: Monitor lizards are carnivores, eating primarily small vertebrates, although some of the large species will even eat deer. At least one species, living in mangroves, eats crabs and other crustaceans. Most are terrestrial, but some are arboreal. They are also good swimmers.

Miscellaneous facts: The Komodo dragon is the largest and heaviest extant lizard. It has a potent venom, which it relies on to hunt large prey. Even a scratch from a Komodo dragon’s teeth on a deer or water buffalo can kill the animal in a few days.

Species in lab:
Varanus rudicollis – Rough-neck Monitor
Varanus exanthematicus – Savannah Monitor

Many herpetologists think that helodermatids and varanids are quite closely related. What is one morphological feature that might unite these two groups? What is one piece of information that could cast doubt on this close relationship?

Acrodonta
The Acrodonta contains two groups: the Agamidae and the Chamaeleonidae. Although the Chamaeleonidae are highly distinct, it is now thought that they have evolved from within the Agamidae, instead of being their sister group.

“Agamidae”: Dragons and their allies

Morphology: Small to large (some ~1m) with no trends toward limb reduction. Often have scales modified into crests, spines, and frills. They have acrodont dentition, meaning that their teeth are fused to the jaws at their base.

Life history: Most are diurnal and terrestrial, although they are quite diverse. Often sexually dimorphic and use their crests, spines, and frills during intraspecific interactions.
Miscellaneous facts: Agamids are Iguanian lizards, but it seems that they are paraphyletic because the Chamaeleonidae evolved from them. The Acrodonta are the sister group to the Iguanidae. Agamids and Iguanids are parallel radiations in many ways; many species between the two groups are convergent in morphology and habits.

Species in lab:
- Physidgnathus coccincinus – Water Dragon
- Pogona vitticeps – Bearded Dragon
- Uromastyx sp. – Spiny Tailed Lizard

Chamaeleonidae: Chameleons
Content and distribution: 6 genera, ~130 species. Africa, Madagascar, Middle East, India, Sri Lanka, and southern Spain.

Morphology: Zygodactylous feet, independently moving eyes, prehensile tails (in arboreal species), modified elongate tongues…. Many striking autapomorphies!

What is meant by zygodactylus feet?

Life history: Chamaeleons are able to change color. This can be done for camouflage as well as inter and intraspecific communication. Most notably, females of some species will assume a specific color pattern to signal to males that they are gravid and, therefore, “unavailable”. Most are oviparous, but a few are viviparous. Many have very large clutches, with well over 100 young. They are predominantly insectivorous, although some of the larger species will eat small vertebrates.

Species in lab:
- Chamaeleo calyptratus – Veiled Chameleon
- Chamaeleo jacksonii – Jackson’s Chameleon

Iguanidae: Iguanids
NOTE: The systematics of the Iguanidae are a controversial topic. In 1989 the monophyly of the group was challenged and it was spit into several “families”. Since then, Iguanid monophyly has been reaffirmed primarily with molecular data and the new “families” were subsumed as subclades. However, the monophyly of some of these groups is currently uncertain. We will recognize the same subclades as Pough et al. 2004 (Herpetology 3rd Ed.). Please learn these subclades because a number of them are very diverse in North America. Many of these subclades are also very distinct from the others.
Why would the monophyly of a group be an important consideration for taxonomy?

Crotaphytinae: Collared and Leopard Lizards
Content and distribution: 2 genera, 12 species. South and SW U.S. and northern Mexico.

Morphology: Crotaphytines are fairly large lizards, averaging about 100-150 mm SVL. They have large heads; small, granular scales; well-developed legs; and long tails. They lack caudal autotomy.

Life history: Crotaphytines inhabit mesic to arid habitats. They are mainly insectivorous, but also consume small vertebrates, particularly other lizards. All crotaphytines are oviparous. Females often develop bright red or orange spots when gravid.

Species in lab:
- *Crotaphytus collaris* – Eastern Collared Lizard

How would you distinguish *Crotaphytus* from other lizards on display today?

Corytophanidae: Basilisks and Their Allies
Content and distribution: 3 genera, 9 species. Central Mexico to northwestern South America.

Morphology: Corytophanines are generally light-bodied, mid-sized lizards. All species have head crests, but in *Basiliscus* they are sexually dimorphic. The head crests are used in defensive displays to make the lizard look larger than it actually is.

Life history: Corytophanines inhabit mesic, rain forest habitats and are arboreal. Some species are semi-aquatic. All are oviparous. *Basiliscus* species have enlarged scales on the toes of their hind limbs that facilitate running bipedally across water. They are also called “Jesus Christ lizards” because of their ability to run on water.

Species in lab:
- *Basiliscus vittatus* – Brown Basilisk

What is a trait that you can use to distinguish members of this clade from the others on display today?
Iguaninae: Iguanas

**Content and distribution:** 8 genera, about 34 species. SW U.S., Mexico, Central and South America, Galapagos, Fiji, and West Indies.

**Morphology:** Iguanines are large lizards, ranging in average SVL from 14-70 cm. The colon has partitions that probably assist in the digestion of plant matter. Another adaptation for herbivory is a short jaw line and tall skull. These features facilitate large force production by the jaws for breaking down plant matter. Many have enlarged dorsal crests.

**Life history:** Iguanines are mostly herbivorous as adults. Some are terrestrial, some are rock dwelling, and some are arboreal. One species enters the ocean to feed on algae. Many species use striking visual displays to proclaim territories and attract mates. Most are oviparous.

**Miscellaneous facts:** Herbivorous iguanines have a rich gut microbe fauna that aids in the breakdown of cellulose. It is speculated that young may need to ingest the feces of adults to establish these organisms in their own system.

**Species in lab:**
- *Dipsosaurus dorsalis* – Desert Iguana
- *Sauromalus sp.* – Chuckwalla

**Why would partitions in the colon of iguanas help in the digestion of plant material? (Hint, consider how cows digest their food.)**

**One of the agamids on display is convergent with *Dipsosaurus* in eating seeds and leaves. Which one do you think it is? Why?**

**Looking at the specimens of iguanas on display, what is one synapomorphy you might use to distinguish this group from other lizards?**
**Polychrotinae: Anoles and their allies**

*Content and distribution:* 8 genera, >450 species. About half of these species occur in the Caribbean. The others occur on SE United States, Mexico, Central and South America.

*Morphology:* Often with smooth scales and pointed snout. Most species have adhesive pads on their toes, convergent with geckos, which have allowed them to exploit a variety of niches. Most species also have a throat fan, called a *dewlap*, which is often brightly colored and used in interspecific and intraspecific communication.

**What are some differences between the toe pads of the anoles and geckos on display in the lab? How might they differ functionally?**

*Life history:* Oviparous, laying eggs singly or in pairs. They are insectivores and most species are small. In the Caribbean, they occur in very high densities and serve as food for many other animals.

*Miscellaneous facts:* Caribbean species have repeatedly diversified on different islands and specialized to six different *ecomorphs*, which differ in body proportions and inhabit different habitats. Only one species is endemic to the US (*Anolis carolinensis*). It is abundant but being displaced in southern localities by other species that have been introduced to Florida and Louisiana.

*Species in lab:*
- *Anolis carolinensis* – Green Anole
- *Anolis sagrei* – Brown Anole

*Anolis sagrei* is classified as a trunk-ground ecomorph, inhabiting mainly tree trunks, while *Anolis carolinensis* is closely aligned to the trunk-crown ecomorphs, living higher in the tree. Examining these two species, what are some differences in their body proportions that might lead to their belonging to different ecomorphs?

**Phrynosomatinae: Horned, Sand and Fence lizards**

*Content and distribution:* 9 genera, about 125 species. North and Central America.

*Morphology:* Generally fairly small lizards, ranging from 4-18 cm SVL. Three subclades exist and are quite distinct. Horned lizards have short and stout bodies and have horns on the
posterior margin of the head. Sand lizards are often gracile and fast runners with small scales. Most fence lizards have keeled, overlapping scales covering much of their bodies.

**Life history:** Species range from deserts to mountaintops to rain forests. Most are diurnal and terrestrial. Many are desert dwellers. Many have ritualized display movements for proclaiming territories and attracting mates. Most are oviparous. Phrynosomatines are predominantly insectivores and many horned lizard species have specialized to eat ants.

**Species in lab:**
- *Callisaurus draconoides* – Zebra-tailed Lizard
- *Phrynosoma hernandesi* – Greater Short-horned Lizard
- *Phrynosoma modestum* – Round-tailed Horned Lizard
- *Phrynosoma solare* – Regal Horned Lizard
- *Sceloporus clarkii* – Clark’s Spiny Lizard
- *Sceloporus jarrovi* – Yarrow’s Spiny Lizard
- *Sceloporus magister* – Desert Spiny Lizard
- *Sceloporus sp.* – Western Fence Lizard
- *Urosaurus ornatus* – Ornate Tree Lizard
- *Uta stansburiana* – Common Side-blotched Lizard

Examine the specimens of *Phrynosoma*. What is one synapomorphy of the genus?

**Exercise 2: Crocodylia**

**General information**
The Crocodylia is a monophyletic group. They are the sister group to dinosaurs + birds, making up the Archosauria with those taxa. Crocs have been around since the mid-Triassic (~215 mya). There are three main clades, with 7 genera and 23 species currently recognized. The phylogenetic position of the members of the Gavialidae is controversial because molecular and morphological data conflict. Pictured to the left (Pough et al. Fig. 4-39) is the most widely accepted phylogeny. Crocs are found in tropical and subtropical areas throughout the world.

**Generalized morphology**
Crocodilians have elongate, powerful, heavily-armored bodies with four short, powerful limbs; a long snout with thecodont teeth; and a long, muscular tail. They have several adaptations for
their aquatic habitat, including webbed feet, nostrils that can be closed by valves, and a **secondary palate** that enables the crocs to breathe air through their nostrils while their mouths are open underwater. Some other derived crocodilian respiratory features include a four-chambered heart (other reptiles have three-chambered hearts), a diaphragm-like membrane between the pectoral and abdominal cavities, and lungs with well-developed alveoli. Their cloacal slit is longitudinal (compared to the transverse cloacal slit of the Squamata).

**Examine a crocodilian skulls on display.**

**What is meant by thecodont teeth?**

**What is a secondary palate and how does it allow crocs to breathe with their mouths full (hint: do we have a secondary palate?)**

**Generalized life history**

Crocodilians are closely tied to water, but can also get around quite well on land. They are strictly carnivorous and eat a wide variety of animals, including about 2,000 humans per year. The three main clades have a close association between diet and cranial morphology.

*Gavialis* and *Tomistoma* have long and very thin snouts with which they slash laterally into schools of small fish. *Alligator* and *Paleosuchus* have relatively broad, short and heavy snouts and often specialize in eating turtles. Members of the genera *Crocodylus* and *Caiman* have snouts of moderate length and intermediate breadth and are generalized predators. Drowning is often used as a method of killing large prey. They become quite territorial during the breeding season. All crocodilians have internal fertilization, are oviparous, and have temperature-dependent sex determination. Eggs are laid in nests near water and are guarded by the parents.
In several species, the female assists with digging up the nests, hatching, and transports the young to water in her mouth. Hatchlings may remain with the female for a few weeks. Crocs are generally inactive during the winter, spending those months in burrows or quiet water.

**How might a broad snout be adaptive for subduing turtles?**

**How would internal fertilization be adaptive for animals like crocodylians?**

**Conservation**
Hunting (for leather and meat) and habitat destruction are the main threats faced by crocodilians today. Many species have declined significantly over the last 200 years as a result of these pressures, and at least 17 of the world’s 23 croc species receive some kind of governmental protection. Experimental efforts to control hunting by creating croc farms and using incentives to encourage sustainable harvest of wild populations are underway, but according to some, these efforts are failing the species most in need (see Thorbjarnarson 1999). Several species will probably become extinct in the near future.

**North American Clades**
**Alligatoridae: Alligators and caimans**
*Content and distribution:* 3 genera, 8 species. SE U.S., Central & South America, east China.

*Morphology:* Alligatorids have broad snouts that hide the lower teeth when the jaw is closed. Some species can reach at least 6 meters in length.

*Life history:* Most inhabit fresh water, although they are sometimes found in brackish water.

*Miscellaneous facts:* *Alligator mississippiensis* is the only native U.S. alligatorid, but *Caiman crocodilus* has been introduced into southern Florida. *Alligator mississippiensis* was extensively hunted in the U.S. from around 1800 to 1962 for the leather trade, resulting in widespread population declines and local extirpations. Following protection in the 1960’s, the species rebounded well in the U.S. and is currently probably more abundant than any other crocodilian. Today, South American caimans are the main source of crocodilian leather, endangering several species.
Species in lab:
- *Alligator mississippiensis* – American Alligator
- *Alligator sinensis* – Chinese Alligator

**Crocodylidae: Crocodiles**

*Content and distribution:* 2 genera, 13 species. Distributed worldwide in tropical and subtropical areas.

*Morphology:* Crocodylids usually have narrower snouts than alligatorids and the 4th tooth of the lower jaw is visible when the mouth is closed. One species can reach 7 meters in length.

*Life history:* Some species inhabit brackish and salt water, others inhabit fresh water.

*Miscellaneous facts:* The Australasian *Crocodylus porosus* and African *Crocodylus niloticus* are the crocodilian species that tend to eat people relatively often. The only crocodylid in the U.S. is *Crocodylus acutus*, where it is restricted to a few protected areas in southern Florida.

Species in lab:
- *Osteolaemus tetraspis* – Dwarf Crocodile

What feature can you use to classify the crocodilian specimens on display to their clade?

Which clade does the unidentified species of crocodilian belong to? Why?

**Exercise 3: Keying lizards**

During the Urodela diversity lab, you learned to use a taxonomic key. It is useful to key out specimens of different groups to get accustomed to looking at the different suites of useful characteristics of each group. During today's lab, there are four unidentified specimens. Use the taxonomic keys in lab to identify them. Don't forget to write down the steps you went through to arrive at your answer.

A. Steps: _________________________   B. Steps: __________________________
   Species: ___________________________   Species: ___________________________

C. Steps: _________________________   D. Steps: __________________________
   Species: ___________________________   Species: ___________________________
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Some aspects of this lab are derived from labs by Bonine & Foldi (2008); Bonine, Smith & Stitt
(2003); Edwards (2002).