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# 1 Crocodylia — Crocodiles and Alligators

## 1.1 Crocodylidae — Crocodiles

Taxonomy/Ancestry	<ul style="list-style-type: none"><li>subfamilies – crocodylinae, mekosuchinae (ex.), tomistominae</li><li><b>tomistominae</b> – false gharial; genetic evidence suggests they are closer to the gharials so they may be reclassified into the Gavialidae family</li><li>3 extant genera; 16-17 species</li><li>Ancient Greek = “lizard of the Nile”</li><li>separated from other crocodilians during Eocene epoch 55 million years ago</li><li>closest living relatives are birds</li></ul> <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"><p style="text-align: center;"><b>Scientific classification</b> </p><p>Kingdom: Animalia</p><p>Phylum: Chordata</p><p>Class: Reptilia</p><p>Order: Crocodilia</p><p>Family: <b>Crocodylidae</b> Cuvier, 1807</p><p style="text-align: center;"><b>Subfamilies</b></p><ul style="list-style-type: none"><li>• Crocodylinae</li><li>• †Mekosuchinae</li><li>• Tomistominae</li></ul></div>
Size	5-20 ft (1.5-6.1 m) weigh up to 2000 lb (900 kg) juveniles 20 cm (7.9 in)
Color	
Anatomy	<ul style="list-style-type: none"><li>diapsid skull</li><li>dorsal scales backed by osteoderms from heavy armor plating on neck and back</li><li>tail strongly muscled and flattened for swimming</li><li>aquatic adaptations<ul style="list-style-type: none"><li>– nostril/ear valves</li><li>– nictitating membrane to cover eye</li><li>– glottal valve in throat</li><li>– able to concentrate and excrete salt; salt glands on tongue filter salt to allow for survival in saltwater environments</li></ul></li><li>webbing on toes of the hind feet speeds swimming + gives advantage on dry land</li><li>cerebral cortex w/ 4-chambered heart</li><li>slit pupils w/ tapetum lucidum</li><li>teeth are replaced throughout lifespan</li><li>poikilothermic + ectothermic</li><li>live 70-80 yrs</li><li>distinguishing from alligators<ul style="list-style-type: none"><li>– narrower + longer heads</li><li>– v-shaped snouts</li><li>– lower teeth protrude when mouth closed</li><li>– large 4th tooth visible</li><li>– salt glands = saltwater habitat</li><li>– sensory pits all over body</li><li>– jagged fringe on hind legs + feet</li><li>– more aggressive + dangerous</li></ul></li></ul>
Dimorphism	males grow larger + faster

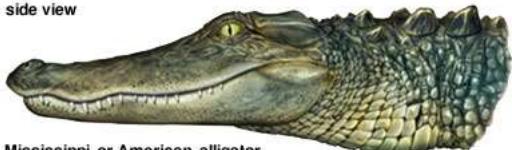
Behavior	<ul style="list-style-type: none"> <li>• nocturnal hunter-scavengers</li> <li>• often bask on shoreline</li> <li>• aestivate during drought or arid conditions</li> <li>• adult males bellow, growl, or hiss for dominance</li> <li>• hatchlings grunt, squawk, communicate thru ultrasound</li> </ul>
Habitat	<p>Hill streams, large rivers, marshes, ponds, lakes, canals, reservoirs, saline habitats (i.e. mangrove creeks/saltpans)</p> <p>Deep water = safety + drought resistance but some species live in places where water regularly dries (<i>Crocodylus suchus</i>) by living in deep tunnels or caves; drought can also force species to move inland</p>
Distribution	tropical + subtropical regions in Africa, Asia, Americas, Australia
Feeding Ecology	<ul style="list-style-type: none"> <li>• opportunistic apex of the food chain</li> <li>• young are agile + can jump to eat dragonflies, termites, spiders, other insects</li> <li>• adolescents begin to feed on crabs, fish, frogs, reptiles, birds, + mammals</li> <li>• scavenge for carrion</li> <li>• teeth/jaws designed for seizing, tearing, + crushing rather than chewing</li> <li>• some species have narrow jaws + sharp teeth to hunt fish</li> <li>• Sensory pores in or around mouth to help detect prey</li> <li>• Some species herd fish to shore w/ their bodies, often communally</li> <li>• Control predators of commercially important fish + help maintain cleanliness as scavengers</li> </ul>
Reproductive Biology	<ul style="list-style-type: none"> <li>• males defend territories + compete for mates</li> <li>• fixed breeding seasons where males mate w/ multiple females</li> <li>• females lay eggs 40-70 days after mating; incubation period depends on nest temp (avg. 60-90 days) <ul style="list-style-type: none"> <li>– higher temperatures = male, lower temperatures = female</li> <li>– <b>hole-diggers</b> – females dig in sand, earth, or gravel embankments above the hind-water line w/ clawed hind-limbs; eggs emerge lubricated + hatch with the wet season</li> <li>– <b>mound-nesters</b> – females gather vegetation, soil, or compost and digs a hole on top to lay eggs; eggs are laid at the start of the wet season and hatch when the water is highest</li> </ul> </li> <li>• females, sometimes males, guard nest during incubation</li> <li>• young call w/ quacking grunts when ready to emerge so parents release young and carry to water</li> <li>• young are cared for in creche formation w/ parents guarding young for 90 days</li> <li>• adults are conditioned to respond to young distress calls</li> <li>• mortality rate = 90% due to predators</li> </ul>
Conservation Status	<p>populations are reduced due to overhunting (for skin) and habitat loss due to human industrialization. sustainable-use programs responsible for recovery and continued survival of species like Nile, saltwater, and New Guinea crocodiles. 3 CR; 2 EN; 3 VU; 1 CD; 1 DD.</p> <p>In Ancient Egypt (Sobek and Taweret), Hinduism (Varuna, Ganga, Yamuna, Goa), Aztec (Cipactli)</p>

## 1.2 Alligatoridae — Alligators

Taxonomy/Ancestry	<p>subfamilies:</p> <ul style="list-style-type: none"> <li>• <b>alligatorinae</b> – true alligators; only 1 of 10 genera currently extant; represented today by <i>A. mississippiensis</i> in US and <i>A. Sinesis</i> in China</li> <li>• <b>caimaninae</b> – caimans in C. and S. America</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><a href="#">Animalia</a></td></tr> <tr> <td>Phylum:</td><td><a href="#">Chordata</a></td></tr> <tr> <td>Class:</td><td><a href="#">Reptilia</a></td></tr> <tr> <td>Order:</td><td><a href="#">Crocodylia</a></td></tr> <tr> <td>Clade:</td><td><a href="#">Globidonta</a></td></tr> <tr> <td>Family:</td><td><b>Alligatoridae</b></td></tr> <tr> <td></td><td><a href="#">Gray, 1844</a></td></tr> <tr> <th colspan="2">Subfamilies</th></tr> <tr> <td></td><td> <ul style="list-style-type: none"> <li>• <a href="#">Alligatorinae</a></li> <li>• <a href="#">Caimaninae</a></li> </ul> </td></tr> </tbody> </table>	Scientific classification		Kingdom:	<a href="#">Animalia</a>	Phylum:	<a href="#">Chordata</a>	Class:	<a href="#">Reptilia</a>	Order:	<a href="#">Crocodylia</a>	Clade:	<a href="#">Globidonta</a>	Family:	<b>Alligatoridae</b>		<a href="#">Gray, 1844</a>	Subfamilies			<ul style="list-style-type: none"> <li>• <a href="#">Alligatorinae</a></li> <li>• <a href="#">Caimaninae</a></li> </ul>
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Size	<p>alligator: 5-20 ft (1.5-6.1 m)</p> <p>caiman: average maximum weight of 6 to 40 kg (13 to 88 lb) depending on species, with the exception of the black caiman (<i>Melanosuchus niger</i>), which can grow more than 5 m (16 ft) in length and weigh up to 1,100 kg (2,400 lb). The average length for most of the other caiman species is about 2 to 2.5 m (6.6 to 8.2 ft) long. largest species = black caiman, smallest = Cuvier's dwarf.</p>																				
Color																					
Anatomy	<ul style="list-style-type: none"> <li>• diapsid skull</li> <li>• armored w/ osteoderms and large scales that do not overlap</li> <li>• forelimbs are smaller and weaker with 5 partially-webbed toes</li> <li>• distinguishing from crocodiles: <ul style="list-style-type: none"> <li>– wider, shorter heads w/ more obtuse snouts</li> <li>– 4th enlarged underjaw tooth fits into pit in upper jaw – no teeth visible when mouth closed</li> <li>– no jagged fringe on hind legs + feet</li> <li>– sensory pits appear only on snout and face, not neck and body</li> <li>– toes of hind feet webbed not more than halfway to tips</li> <li>– intolerant to salinity</li> <li>– generally less aggressive and dangerous</li> <li>– partake in foliage and fruit in addition to fish and meat</li> </ul> </li> <li>• caiman characteristics: <ul style="list-style-type: none"> <li>– no bony septum b/w nostrils</li> <li>– ventral armour composed of overlapping bony scutes formed from two parts united by a suture</li> <li>– longer, more slender, teeth than those possessed by alligators. The calcium rivets on its scales make their hides stiffer, and thus less valuable, than those of alligators and crocodiles.</li> </ul> </li> </ul>																				
Dimorphism	males larger and grow faster.																				

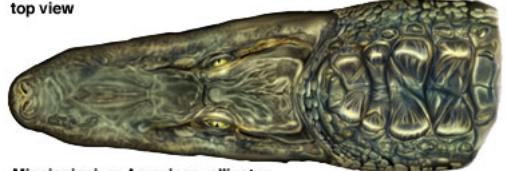
Behavior	<ul style="list-style-type: none"> <li>• ectotherms basking on shoreline</li> <li>• float on surface of water</li> <li>• become more subdued as temperatures drop but do not hibernate, making use of burrows in the winter months</li> <li>• live in groups w/ dominance hierarchies. the highest-ranking individuals assert dominance through ritualized behaviors such as vocalizations and slapping the water with their heads.</li> <li>• <b>high walk:</b> 4-limbed forward motion used for overland travel w/ belly up from the ground</li> <li>• alligator holes in the wetlands increase plant diversity and provide habitats for other animals during droughts</li> </ul>
Habitat	lakes, slow-moving streams/rivers, rivers, swamps, marshes, occasionally roadside ditches. freshwater sites w/ slow or still waters. often inhabit heavily-vegetated areas w/ muddy or murky water.
Distribution	a New World group w/ habitats in Central-Northern S. America; parts of southern and western Central America and Mexico; SE United States; eastern China.
Feeding Ecology	<ul style="list-style-type: none"> <li>• opportunistic scavenger-hunters</li> <li>• juveniles mainly eat snails and other invertebrates</li> <li>• Typical adult diet = fish, small mammals, other reptiles (including smaller alligatorids), and birds, occasionally continuing to eat snails/invertebrates</li> <li>• Predation typically occurs among eggs and hatchlings</li> <li>• Racoons, coati, foxes, skunks, and other mammals, snakes, and various raptors, can raid nests or take hatchlings</li> <li>• occasional cannibalism, but rare</li> <li>• larger alligators help control coypu population</li> </ul>
Reproductive Biology	<ul style="list-style-type: none"> <li>• spring reproductive season</li> <li>• courtship rituals thru loud bellowing choruses, vibrations of the male trunk</li> <li>• use vegetables to construct nest mounds</li> <li>• 12-60 eggs depending on species</li> <li>• egg-laying once a year in midsummer, w/ eclosion 1-2 months afterward</li> <li>• females respond to noises from eggs and assist offspring. offspring also use egg teeth for eclosion.</li> <li>• females remain w/ offspring for up to 1 year.</li> <li>• TSD is associated w/ several species, such as American alligator and common caimans. <math>\geq 88\text{degF}/31\text{degC}</math> = female; <math>\geq 90\text{degF}/32\text{degC}</math> = male. natural sex ratio of 5:1 female:male.</li> <li>• Muja = oldest known in Serbia</li> </ul>
Conservation Status	<ul style="list-style-type: none"> <li>• raised commercially for their meat and skin</li> <li>• ecotourism industry</li> <li>• in Louisiana, heavy grazing by coypu and muskrat are damaging coastal wetlands</li> <li>• Chinese alligator critically endangered; Louisiana and Florida zoos have some in captivity they are trying to preserve</li> </ul>

side view



Mississippi, or American, alligator  
(*Alligator mississippiensis*)

top view



Mississippi, or American, alligator  
(*Alligator mississippiensis*)



estuarine, or saltwater, crocodile  
(*Crocodylus porosus*)



estuarine, or saltwater, crocodile  
(*Crocodylus porosus*)

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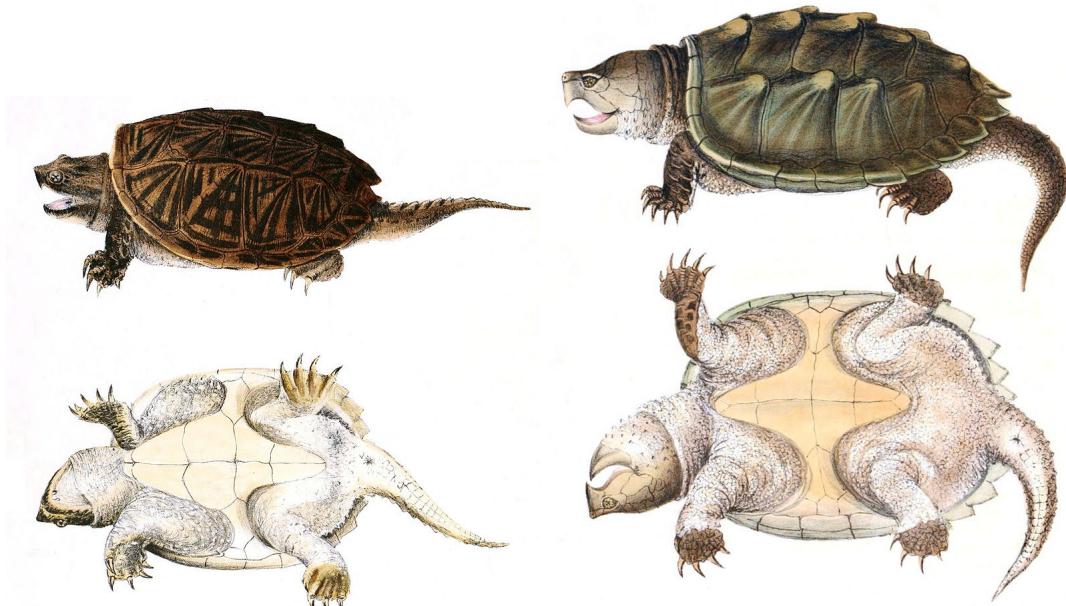
## 2 Testudines — Turtles and Tortoises

### 2.1 Chelydridae — Snapping Turtle

Taxonomy/Ancestry	<p>7 extinct, 2 extant genera.</p> <p><b>chelydra</b> – 3 species native to the Americas</p> <p><b>macrochelys</b> – much larger alligator snapping turtle, 2 species exclusively N. American forming the largest freshwater turtles in N. America. A 3rd species has been proposed, the Apalachicola.</p> <ul style="list-style-type: none"><li>• Most closely related to Platysternidae (big-headed turtles)</li><li>• Sometimes considered as subfamilies within the same family, but genetic evidence supports recognition as separate families</li><li>• Fossil record dating from Paleocene of N. America and Oligocene of Eurasia</li><li>• <i>Chelydra</i> is known from as far back as the Pliocene in N. America</li><li>• <i>Macrochelys</i> is known from as far as early Miocene</li></ul> <div style="background-color: #e0f2e0; padding: 10px;"><p><b>Scientific classification</b> </p><table><tr><td>Kingdom:</td><td>Animalia</td></tr><tr><td>Phylum:</td><td>Chordata</td></tr><tr><td>Class:</td><td>Reptilia</td></tr><tr><td>Order:</td><td>Testudines</td></tr><tr><td>Suborder:</td><td>Cryptodira</td></tr><tr><td>Clade:</td><td>Americhelydia</td></tr><tr><td>Family:</td><td><b>Chelydridae</b></td></tr><tr><td colspan="2">Gray, 1831<sup>[2]</sup></td></tr></table><p><b>Genera</b></p><ul style="list-style-type: none"><li>• <i>Chelydra</i></li><li>• <i>Macrochelys</i></li><li>• †<i>Acherontemys</i></li><li>• †<i>Chelydrops</i></li><li>• †<i>Chelydropsis</i></li><li>• †<i>Emarginachelys</i></li><li>• †<i>Macrocephalochelys</i></li><li>• †<i>Planiplastron</i></li><li>• †<i>Protochelydra</i></li></ul></div>	Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Clade:	Americhelydia	Family:	<b>Chelydridae</b>	Gray, 1831 <sup>[2]</sup>	
Kingdom:	Animalia																
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Family:	<b>Chelydridae</b>																
Gray, 1831 <sup>[2]</sup>																	
Size	7.1-31.5 in (18-80 cm); up to 249 lb (113 kg)																
Color																	
Anatomy	<ul style="list-style-type: none"><li>• long tail</li><li>• 3 rows of tubercles*</li><li>• hooked beak</li><li>• kelled*, posteriorly separated carapace</li><li>• reduced, cruciform*, hingeless plastron</li><li>• heavy claws</li><li>• 11 marginal scutes on each side of the carapace</li><li>• abdominal scutes on plastron reduced; not in contact medially</li><li>• carapace and plastron connected by narrow bony bridge</li><li>• posterior skull roof deeply emancipated</li></ul> <p>The alligator snapping turtle is characterized by a large, heavy head, and a long, thick shell with three dorsal ridges of large scales (osteoderms), giving it a primitive appearance reminiscent of some of the plated dinosaurs, most notably the ankylosaurs. They can be immediately distinguished from the common snapping turtle by the three distinct rows of spikes and raised plates on the carapace, whereas the common snapping turtle has a smoother carapace. They are a solid gray, brown, black, or olive-green in color, and often covered with algae. They have radiating yellow patterns around their eyes, serving to break up the outline of the eyes to keep the turtle camouflaged. Their eyes are also surrounded by a star-shaped arrangement of fleshy, filamentous "eyelashes".</p>																

Dimorphism	males larger than females
Behavior	<ul style="list-style-type: none"> <li>• vicious temperament; since they are on top of the food chain, they have little fear</li> <li>• snapping jaws used against prey and predators</li> <li>• highly aquatic but leave water to nest or travel over land to reach new habitats or lay eggs</li> <li>• diurnal, but nocturnal activity rare in northern populations</li> <li>• most hibernate, but many individuals are capable of going w/o hibernation and remaining active beneath ice. Hibernating snapping turtles do not breathe for, in the northern part of their range, more than six months since ice covers their hibernating site. These turtles can get oxygen by pushing their head out of the mud and allowing gas exchange to take place through the membranes of their mouth and throat. This is known as extrapulmonary respiration. If they cannot get enough oxygen through this method they start to utilize anaerobic pathways, burning sugars and fats without the use of oxygen. The metabolic by-products from this process are acidic and create very undesirable side effects by spring, which are known as oxygen debt.</li> <li>• In shallow waters, common snapping turtles may lie beneath a muddy bottom with only their heads exposed, stretching their long necks to the surface for an occasional breath (their nostrils are positioned on the very tip of the snout, effectively functioning as snorkels).</li> <li>• Common snapping turtles sometimes bask—though rarely observed—by floating on the surface with only their carapaces exposed, though in the northern parts of their range, they also readily bask on fallen logs in early spring.</li> </ul>
Habitat	Common habitats are shallow ponds or streams. Some may inhabit brackish environments, such as estuaries.
Distribution	<p><b>common snapping turtle:</b> southeastern Canada, southwest to the edge of the Rocky Mountains, as far east as Nova Scotia and Florida.</p> <p><b>alligator snapping turtle:</b> southeastern United States waters. They are found from the Florida Panhandle west to East Texas, north to southeastern Kansas, Missouri, southeastern Iowa, western Illinois, southern Wisconsin, southern Indiana, western Kentucky, and western Tennessee. They are found on the Missouri River at least as far north as the Gavins Point Dam, the southernmost dam on the Missouri River at Yankton, South Dakota, and are featured in the Gavins Point Dam Aquarium.</p> <p><u>Located from sea level to 2000 m elevation.</u></p>
Feeding Ecology	<p>Snapping turtles consume both plant and animal matter, and are important aquatic scavengers, but they are also active hunters that prey on anything they can swallow, including many invertebrates, fish, frogs, reptiles (including snakes and smaller turtles), unwary birds, and small mammals. In some areas, adult snapping turtles can be incidentally detrimental to breeding waterfowl, as they will occasionally take ducklings and goslings but their effect on such prey is frequently exaggerated.</p> <p>Common snapping turtles have few predators when older, but eggs are subject to predation by crows, mink, skunks, foxes, and raccoons. As hatchlings and juveniles, most of the same predators will attack them as well as herons (mostly great blue herons), bitterns, hawks, owls, fishers, bullfrogs, large fish, and snakes. There are records during winter in Canada of hibernating adult common snapping turtles being ambushed and preyed on by northern river otters. Other natural predators which have reportedly preyed on adults include coyotes, black bears, alligators and their larger cousins, alligator snapping turtles. Large, old male snapping turtles have very few natural threats due to their formidable size and defenses, and tend to have a very low annual mortality rate</p>

Reproductive Biology	<p>Courtship is variable and poorly developed and may include direct mounting, following of the female, face-offs/head-swaying, etc.</p> <p>This species mates from April through November, with their peak laying season in June and July. The female can hold sperm for several seasons, using it as necessary. Females travel over land to find sandy soil in which to lay their eggs, often some distance from the water. After digging a hole, the female typically deposits 25 to 80 hard-shelled, but not brittle eggs each year, guiding them into the nest with her hind feet and covering them with sand for incubation and protection. Incubation time is temperature-dependent, ranging from 9 to 18 weeks. In cooler climates, hatchlings overwinter in the nest.</p> <p>TSD: intermediate temperatures produce male offspring, while high and low extremes produce females. Clutches are so large that different areas of the nest may produce different sex ratios. Though their potential lifespans in the wild are unknown, alligator snapping turtles are believed to be capable of living to 200 years of age, but 80 to 120 is more likely. In captivity, they typically live between 20 and 70 years.</p>
Ecological Role	have been seen as invasive species in Italy and Japan, as well as the Czech Republic and Germany for the alligator snapping turtle.
Conservation Status	<p><b>common snapping turtle:</b> used as food w/ turtle soup. The species is currently classified as Least Concern by the IUCN, but has declined sufficiently due to pressure from collection for the pet trade and habitat degradation that Canada and several U.S. states have enacted or are proposing stricter conservation measures. In Canada, it is listed as 'Special Concern' in the Species at Risk Act in 2011 and is a target species for projects that include surveys, identification of major habitats, investigation and mitigation of threats, and education of the public including landowners. Involved bodies include governmental departments, universities, museums, and citizen science projects.</p> <p><b>alligator snapping turtle:</b> Because of collection for the exotic pet trade, overharvesting for their meat, and habitat destruction, some states have imposed bans on collecting alligator snapping turtles from the wild. The IUCN lists it as a threatened species, and as of June 14, 2006, it was afforded some international protection by being listed as a CITES III species (which will put limits on exportation from the United States and all international trade in this species). The alligator snapping turtle is now endangered in several states, including Kentucky, Indiana, Illinois, and Missouri, where they are protected by state law. They are designated as "in need of conservation" in Kansas.</p>



## 2.2 Kinosternidae — Musk and Mud Turtles

Taxonomy/Ancestry	<ul style="list-style-type: none"> <li>• 24 species within 4 genera, but taxonomic reclassification ongoing</li> <li>• <i>kinosternon</i> — “mud turtles,” small aquatic turtles from the Americas</li> <li>• <i>sternotherus</i> — “musk turtles,” endemic to N. America, closely related to <i>kinosternon</i></li> <li>• <i>claudius</i> — only extant species is narrow-bridged musk turtle found in Mexico, Guatemala, and Belize</li> <li>• <i>staurotypus</i> — Mexican musk turtles; giant musk turtles; three-kelled musk turtles; 2 recognized species found in Mexico and Central America</li> </ul> <div style="background-color: #f0f0d0; padding: 10px;"> <p><b>Scientific classification</b> </p> <table border="0"> <tr><td>Kingdom:</td><td>Animalia</td></tr> <tr><td>Phylum:</td><td>Chordata</td></tr> <tr><td>Class:</td><td>Reptilia</td></tr> <tr><td>Order:</td><td>Testudines</td></tr> <tr><td>Suborder:</td><td>Cryptodira</td></tr> <tr><td>Superfamily:</td><td>Kinosternoidea</td></tr> <tr><td>Family:</td><td><b>Kinosternidae</b></td></tr> <tr><td></td><td>Agassiz, 1857<sup>[1]</sup></td></tr> </table> <p><b>Genera</b></p> <p><i>Kinosternon</i>  <i>Sternotherus</i>  <i>Claudius</i>  <i>Staurotypus</i></p> </div>	Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Superfamily:	Kinosternoidea	Family:	<b>Kinosternidae</b>		Agassiz, 1857 <sup>[1]</sup>
Kingdom:	Animalia																
Phylum:	Chordata																
Class:	Reptilia																
Order:	Testudines																
Suborder:	Cryptodira																
Superfamily:	Kinosternoidea																
Family:	<b>Kinosternidae</b>																
	Agassiz, 1857 <sup>[1]</sup>																
Size	typically small, 10-15 cm (3.9-5.9 in) in length, but <i>staurotypus</i> can get much larger, up to 30 cm (12 in).																
Color	may be black, green, or yellowish in color. most species don't have shell markings, but some have radiating black markings on each carapace scute. some species have distinctive yellow striping along head and neck.																
Anatomy	<ul style="list-style-type: none"> <li>• tall, highly domed upper carapace w/ distinct keel down center</li> <li>• plastron differs by species <ul style="list-style-type: none"> <li>— some species have 1 or 2 hinges reaching from left to right side of shell; other species have none. the hinges allow plastron and carapace to pull tight against each other after the turtle pulls itself into the shell.</li> <li>— some species have plastron covering only part of lower body; others have large plastron almost entirely concealing undersides</li> </ul> </li> <li>• barbels* hanging from chin</li> <li>• glands/sacs along side produce characteristic musky substance (smells like skunk spray)</li> </ul>																
Dimorphism	Males usually have thicker and longer tails tipped w/ a spine; also have 2 rough, scaly patches on each leg. females are typically larger than males.																
Behavior	<ul style="list-style-type: none"> <li>• aquatic for majority of lifespan</li> <li>• slow swimmers</li> <li>• travel to land for nesting or to feed during rainy season</li> <li>• some diurnal, others nocturnal</li> <li>• hibernation/estivation: <ul style="list-style-type: none"> <li>— yellow mud turtle holds record for amt of time spent hibernating/estivating: inactive from winter to spring, summer to fall, only awakening when spring rains flood ground</li> <li>— warm, wet climates → active all year</li> <li>— cold winters and deserts w/ long stretches of dry weather → active only a few months a year and spend the rest underground waiting for better conditions</li> </ul> </li> </ul>																

Habitat	freshwater species living in still or slow-moving waters. prefer year-round bodies such as lakes or ponds. a few reside in shallow, seasonal ponds which have water only during a few months of the year, typically spring.
Distribution	native to Americas
Feeding Ecology	carnivorous turtles eating snails, clams, insects, worms, leeches, and sometimes freshly killed fishes they find. those w/ large heads typically prefer snails and clams which they can easily open w/ their jaws. in seasonal ponds, they may eat a large amount of seeds.
Reproductive Biology	<ul style="list-style-type: none"> <li>• no courtship rituals; mating takes place in water</li> <li>• females go onto land to nest. they may either bury eggs in a hole they dig or simply lay eggs on surface leaves.</li> <li>• lay 3-6 hard-shelled eggs during late spring and early summer</li> <li>• up to 6 clutches per year</li> <li>• oblong eggs range from 0.9-1.7 in (2.3-4.3 cm) long and from 0.6-1.0 in (1.5-2.5 cm) wide</li> <li>• hatch 75 days to a year after being laid</li> <li>• TSD: medium temperatures produce male offspring; females are produced by extremes</li> <li>• post-eclosion, some species winter in subterranean nest and truly emerge in spring</li> <li>• the yellow musk turtle is the only turtle species known to exhibit parental care. suggested to sometimes stay w/ nest and urinate on eggs long after laying to keep them moist or protect them from predators.</li> </ul>
Ecological Role	
Conservation Status	4 VU; US Fish and Wildlife lists flattened musk turtle as Threatened. However, most species are quite common in their own habitats.



## 2.3 Emydidae — Box, Pond, and Marsh Turtles

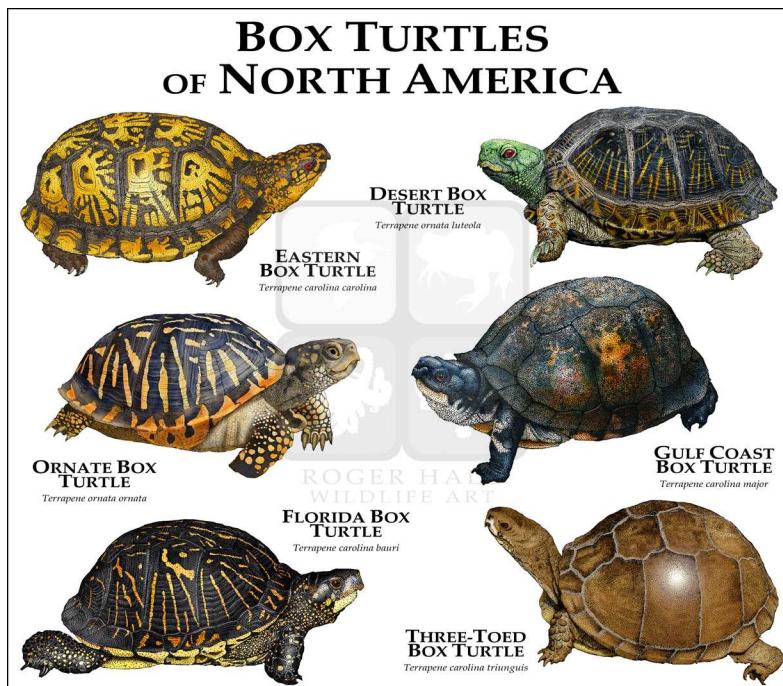
Taxonomy/Ancestry	<p>the largest and most diverse turtle family, w/ about 50 species in 10 genera. previously, several species of Asian box turtles were classified as Emydidae but now they have been moved to another family. it contains 2 subfamilies: Emydinae and Deirochelyinae.</p> <p>the oldest fossils are known from Upper Cretaceous and Paleocene of N. America. in modern times, closest relatives = Geoemydidae and Testudinidae (tortoises). as recognized today, Emydidae family includes primarily New World species.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>Scientific classification</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Kingdom:</td><td>Animalia</td></tr> <tr><td>Phylum:</td><td>Chordata</td></tr> <tr><td>Class:</td><td>Reptilia</td></tr> <tr><td>Order:</td><td>Testudines</td></tr> <tr><td>Suborder:</td><td>Cryptodira</td></tr> <tr><td>Superfamily:</td><td>Testudinoidea</td></tr> <tr><td>Family:</td><td><b>Emydidae</b></td></tr> <tr><td colspan="2" style="text-align: center;">(Rafinesque, 1815)<sup>[2]</sup></td></tr> </table> </div>	Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Superfamily:	Testudinoidea	Family:	<b>Emydidae</b>	(Rafinesque, 1815) <sup>[2]</sup>	
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Superfamily:	Testudinoidea																
Family:	<b>Emydidae</b>																
(Rafinesque, 1815) <sup>[2]</sup>																	
Size	10-24 in (25-60 cm)																
Color																	
Anatomy	<ul style="list-style-type: none"> <li>• most diverse turtles in appearance</li> <li>• the carapace typically takes the form of a low arch, but is domed in some</li> <li>• some have keels* in the form of 1-2 ridges running from the front to the back</li> <li>• a prominent bridge often connects the carapace to the plastron</li> <li>• typically 8 pleurals, 5 vertebrals, and 24 marginals on carapace</li> <li>• 12 scutes on the plastron</li> <li>• seam b/w posterior marginal scutes and last vertebral overlap pygal bone</li> <li>• some members have moveable hinge separating pectoral and abdominal segments</li> <li>• small skulls</li> <li>• toe webbing</li> <li>• karyotype most commonly has 50 chromosomes</li> </ul>																
Dimorphism	Males generally smaller than females in aquatic emydids, but this may be reversed among semiaquatic and terrestrial species.																
Behavior	<ul style="list-style-type: none"> <li>• well-developed basking habit</li> <li>• some active year-round; others seasonally inactive <ul style="list-style-type: none"> <li>– in temperate northern species, hibernacula are generally located in well-oxygenated areas of water, but painted and Blanding's turtles are tolerant of hypoxic conditions</li> <li>– at least 2 aquatic species, chicken turtle (<i>Deirochelys reticularia</i>) and western pond turtle known to hibernate terrestrially</li> <li>– eastern box turtle (<i>Terrapene carolina</i>) burrows beneath leaf litter and hibernates in shallow soil to survive subfreezing temps</li> </ul> </li> <li>• elaborate courtship</li> </ul>																
Habitat	<ul style="list-style-type: none"> <li>• Found in diverse range of habitats</li> <li>• Occur abundantly in most permanent freshwater rivers, streams, lakes, and ponds</li> <li>• One species found only in estuaries/coastal waters</li> <li>• May be semi-aquatic to fully terrestrial</li> </ul>																

Distribution	<ul style="list-style-type: none"> <li>Found in lowland temperate regions of N. America, S. Africa, southern Turkey, Middle East, and throughout Europe to southern Russia</li> <li>Formerly more widespread in Europe but Scandinavian populations extirpated during Pleistocene</li> </ul>
Feeding Ecology	<ul style="list-style-type: none"> <li>Includes diets from strictly herbivorous to strictly carnivorous</li> <li>Hatchlings of many species highly carnivorous, but become omnivorous as they mature</li> <li>Some have diverse, generalized diets; others have highly specialized diets</li> <li>Map turtle (genus <i>Graptemys</i>) females may develop huge heads w/ broad palates to crush large mollusks</li> <li>Chicken turtles and Blanding's turtles independently evolved long neck w/ well-developed hyoid apparatus (elaborate bony structure that rapidly expands throat to suck in prey items)</li> <li>Hyoid apparatus commonly found in piscivorous turtle species</li> </ul>
Reproductive Biology	<ul style="list-style-type: none"> <li>mating generally occurs in the spring, but some species may store sperm from earlier matings for many years</li> <li>many species display elaborate courtship utilizing thin forelimb claws which are vigorously waved at females; a unique pattern of head bobs may be exchanged</li> <li>the female allows the male to mate, suggesting the females choose whom to mate with</li> <li>elongated eggs may be flexible or brittle-shelled</li> <li>most exhibit TSD</li> </ul>
Ecological Role	
Conservation Status	<ul style="list-style-type: none"> <li>7 VU; 6 EN; 14 NT</li> <li>Human activities (eg pollution, habitat destruction, road mortality, and collection for pet trade) responsible for most species' decline</li> <li>Ex — Diamondback terrapin (<i>Malaclemys terrapin</i>) once faced extinction due to overcollection for human consumption, but recovered as it fell out of favor w/ wealthy ppl</li> </ul>

### 2.3.1 Terrapene — Box Turtles

Taxonomy/Ancestry	<p>a member of the subfamily emydinae. 12 taxa over 4 species. Terrapene originally coined as genus separate from Emys for species w/ sternum separated into 2-3 divisions which can move independently.</p> <p>they appear abruptly in the fossil record in modern form, implying they are a generalist species able to survive under a wide variety of conditions. older fossils have been found in Nebraska dating back to the Miocene (15 Mya). only recognized extinct subspecies dates from Pliocene and was much larger than other species.</p>
Size	10-22cm (4-9 in)
Color	females usually have yellowish-brown eyes, while males typically have red or orange eyes.
Anatomy	<ul style="list-style-type: none"> <li>• distinguished by domed shell which is hinged at the bottom <ul style="list-style-type: none"> <li>– allows animal to close shell tightly to escape predators</li> </ul> </li> <li>• item avg. lifespan of 50 yrs, but many can live past 100. once maturity is reached, the chances of death do not seem to increase w/ age.</li> <li>• age can be roughly estimated by counting growth rings on scutes, but estimates may be inaccurate b/c the plastron is worn smooth over time.</li> </ul>
Dimorphism	Males have concave area on plastron centered beneath hinge.
Behavior	<ul style="list-style-type: none"> <li>• defend selves from predation by hiding, closing shell, and biting, but are vulnerable to surprise attacks and persistent gnawing/pecking</li> <li>• tend to move further into woods prior to hibernation</li> </ul>
Habitat	<ul style="list-style-type: none"> <li>• no standard habitat, but generally found in mesic woodlands</li> <li>• <i>T. ornata</i> can be found in grasslands</li> <li>• desert box turtle can also be found in semidesert w/ rainfall predominantly in summer</li> <li>• Coahuilan box turtles found only in region characterized by marshes, permanent presence of water, and cacti</li> </ul>
Distribution	native to N. America, where the species w/ the widest range, the common box turtle, is found in the US and Mexico. the ornate box turtle is endemic to south-central and southwestern US/adjacent Mexico, the spotted box turtle is endemic to northwestern Mexico, and the Coahuilan box turtle found only in Cuatro Cienegas Basin in Coahuila, Mexico.
Feeding Ecology	an omnivore w/ a varied diet, it eats anything it can catch. invertebrates/insects = principal component but diet also consists of vegetation. the diet can be amended w/ fruits. at times, it eats poisonous mushrooms, making its meat dangerous for humans.

Reproductive Biology	relatively slow reproducers, they reach sexual maturity only after 4-5 yrs. females can store viable sperm in the oviducts for up to 4 yrs. they mate from may-october and lay elliptical, leathery eggs in flask-shaped holes 3-4 in deep in warm, sunny soil. they may have more than 1 clutch a yr, w/ avg. clutch size being larger in northern populations and ranging from 1-7 eggs. incubation takes 2-3 months. infant mortality is high, since the shell is weaker. infants may overwinter in the nest.
Ecological Role	
Conservation Status	<ul style="list-style-type: none"> <li>• 1 EN; 1 V; 1 NT; 1 DD</li> <li>• Often taken as or bred as pets <ul style="list-style-type: none"> <li>– Easily stressed and require more care than is generally thought</li> <li>– Require outdoor enclosure and constant exposure to sun</li> <li>– Recommended to buy captive bred to reduce pressure on wild populations</li> </ul> </li> <li>• Some states prohibit collecting wild turtles or require permits to keep them</li> <li>• State reptile of N. Carolina, Tennessee, Missouri, and Kansas</li> </ul>



### 2.3.2 Actinemys — Western Pond Turtles

Taxonomy/Ancestry	<p>emydinae subfamily. originally, its single species was considered to be part of <i>Clemmys</i>.</p> <table border="1"> <tr> <td colspan="2" style="text-align: center; background-color: #c8e6c9;"><b>Scientific classification</b></td> </tr> <tr> <td>Kingdom:</td><td>Animalia</td></tr> <tr> <td>Phylum:</td><td>Chordata</td></tr> <tr> <td>Class:</td><td>Reptilia</td></tr> <tr> <td>Order:</td><td>Testudines</td></tr> <tr> <td>Family:</td><td>Emydidae</td></tr> <tr> <td>Genus:</td><td><i>Actinemys</i> or <i>Emys</i><sup>[1]</sup></td></tr> <tr> <td>Species:</td><td><i>A. marmorata</i></td></tr> <tr> <td colspan="2" style="text-align: center; background-color: #c8e6c9;"><b>Binomial name</b></td></tr> <tr> <td colspan="2" style="text-align: center;"><i>Actinemys marmorata</i> or <i>Emys marmorata</i><sup>[1]</sup></td></tr> <tr> <td colspan="2" style="text-align: center;">(Baird and Girard, 1852)</td></tr> <tr> <td colspan="2" style="text-align: center; background-color: #c8e6c9;"><b>Subspecies</b></td></tr> <tr> <td colspan="2" style="text-align: center;"><i>Actinemys marmorata marmorata</i></td></tr> <tr> <td colspan="2" style="text-align: center;"><i>Actinemys marmorata pallida</i></td></tr> </table>	<b>Scientific classification</b>		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Family:	Emydidae	Genus:	<i>Actinemys</i> or <i>Emys</i> <sup>[1]</sup>	Species:	<i>A. marmorata</i>	<b>Binomial name</b>		<i>Actinemys marmorata</i> or <i>Emys marmorata</i> <sup>[1]</sup>		(Baird and Girard, 1852)		<b>Subspecies</b>		<i>Actinemys marmorata marmorata</i>		<i>Actinemys marmorata pallida</i>	
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<i>Actinemys marmorata marmorata</i>																													
<i>Actinemys marmorata pallida</i>																													
Size	up to 20 cm (8 in) in carapace length.																												
Color	dorsal color — dark brown, dull olive. yellow plastron w/ dark blotches in acute center.																												
Anatomy	<ul style="list-style-type: none"> <li>low, broad carapace which is widest behind the middle. in adults, it is smooth, containing no keels* or serrations.</li> <li>grow slowly in wild — age at 1st reproduction may be 10-12 yrs</li> <li>may survive &gt;50 yrs in wild</li> </ul>																												
Dimorphism	males have light/pale-yellow throat.																												
Behavior	frequently bask, and can be encouraged to bask on artificial surfaces for easier study.																												
Habitat	<ul style="list-style-type: none"> <li>occur in both permanent and intermittent waters — marshes, streams, rivers, ponds, lakes</li> <li>favor habitats w/ many emergent logs/boulders to bask</li> <li>bask on top of aquatic vegetation, and are consequently often overlooked in the environment</li> <li>terrestrial habitat also important b/c they can spend up to 200 days outside of water when aquatic habitat dries (intermittent ponds), and many overwinter outside the water</li> </ul>																												
Distribution	<p>originally, the western pond turtle ranged from northern Baja California, Mexico, north to Puget Sound, Washington. however, as of 2007, they are rare/absent in Puget Sound. they have a disjunct distribution in most of Northwest, isolated populations in southern Washington, and may be locally common in some streams, rivers, and ponds in southern Oregon. they also occur in Uvas Canyon area, Santa Cruz Mts, California, in Northbay, lakes such as Fountaingrove lake. they range up to 305 m (1,001 ft) in Washington, up to 915 m (3,002 ft) in Oregon.</p>  <p>The range of the Western pond turtle.</p>																												

Feeding Ecology	<p>omnivorous, they often eat:</p> <ul style="list-style-type: none"> <li>• insects, crayfish, aquatic vertebrates</li> <li>• fish, tadpoles, frogs, carrion rarely</li> <li>• filamentous algae, lily pads, tule, cattail roots</li> </ul> <p>generally, they are well protected due to their shells, but are threatened by predators such as raccoons, otters, ospreys, coyotes. hatchlings may be preyed on by weasels, bullfrogs, large fish.</p>
Reproductive Biology	<ul style="list-style-type: none"> <li>• 5-13 eggs per clutch in annual or biannual egg-layings</li> <li>• may travel some distance from water for egg-laying, as much as 0.8 km (1/2 mi) away from and up to 90 m (300 ft) above nearest source of water. however, most nests are within 90 m (300 ft) of water</li> <li>• the female leaves water in evening, selects nest site in open area of sand or hardpan facing southwards</li> <li>• flask-shaped nest w/ abt 5 cm (2 in) opening; the female covers nest w/ soil/adjacent low vegetation</li> <li>• the vast majority of hatchlings overwinter in the nest</li> <li>• winter rains may be necessary to loosen hardpan soil where nest is</li> <li>• young first appear in spring following egg deposition</li> </ul>
Ecological Role	
Conservation Status	listed as VU due to human threat, they face extinction due to the removal of ponds, wetlands, and the contamination of water sources.



### 2.3.3 Malaclemys — Diamondback Terrapins

Taxonomy/Ancestry	a member of the Deirochelyinae subfamily. a monotypic genus containing only the <i>M. terrapin</i> species, w/ 7 subspecies recognized.																				
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	Gray, 1844 <small>[2]</small>																				
Species:	<b><i>M. terrapin</i></b>																				
Size	males — 13 cm (5.1) in; 300 g (11 oz). sexually mature at 2-3 yrs and 4-5 in of length females — 19 cm (7.5 in); 300 g (11 oz). sexually mature at 6-7 yrs and 6.75 in of length																				
Color	named for the diamond patterned growth rings on carapace. unique patterns of wiggly black markings/spots on the body and head.																				
Anatomy	<ul style="list-style-type: none"> <li>wedge-shaped shell wider from back than front</li> <li>large webbed feet</li> <li>species from warmer regions are larger</li> <li>adapted to marine environment near the shore <ul style="list-style-type: none"> <li>impermeable skin can stay in salt water for extended periods of time</li> <li>lachrymal salt glands</li> <li>can distinguish b/w drinking water of different salinities</li> <li>behavior to obtain freshwater — drink freshwater surface layer on top of salt water during rainfall; raising head to catch rain drops</li> </ul> </li> </ul>																				
Dimorphism	females larger than males.																				
Behavior	the behavior of <i>Malaclemys</i> is mostly unknown due to their aquatic nature. it is suggested that nesting is the only activity that they perform on land. they most likely hibernate during colder months.																				
Habitat	<ul style="list-style-type: none"> <li>coastal habitats — estuaries, tidal creeks, salt marshes</li> <li>typically cordgrass marshes that flood at high tide, but also live in mangrove swamps in Florida</li> <li>survive in both freshwater and ocean water but prefer intermediate salinities</li> <li>no long-distance migrations</li> </ul>																				
Distribution	narrow strip of coastal habitats on Atlantic and Gulf coasts of US — Cape Cod to southern tip of Florida and around Gulf Coast to Texas																				
Feeding Ecology	shrimps, clams, mussels, and other marine invertebrates, especially periwinkle snails.																				
Reproductive Biology	<p>see Emydidae entry for courtship and mating.</p> <ul style="list-style-type: none"> <li>females wander considerable distances before nesting</li> <li>nest in sand dunes or scrub vegetation near ocean in June or July</li> <li>clutch sizes vary latitudinally ? 5.8 in S. Florida to 10.9 in NY</li> <li>after covering nest, female returns to ocean and does not come back to nest</li> <li>usually hatch in 60-85 days in August/September. the hatchlings, which are freeze-tolerant but have a lower salt tolerance, may overwinter in the nest.</li> <li>exhibit TSD — warmer temperatures produce females, cooler temperatures produce males</li> </ul>																				
Ecological Role	at high densities, may eat enough invertebrates to significantly impact ecosystem, especially b/c periwinkles can overgraze important marsh plants																				

Conservation Status	<ul style="list-style-type: none"><li>• Classified NT due to decreasing pop. #s within range</li><li>• Limited protection on state-by-state level</li><li>• 1900s — considered delicacy to eat, almost hunted to extinction</li><li>• Severely depleted by land development along Atlantic coast</li><li>• Receive wounds from propellers on motorboats</li><li>• Get trapped in crabbing/lobster nets</li></ul>
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### 2.3.4 Graptemys — Map Turtles

Taxonomy/Ancestry	<p>13 species. also known as “sawback turtles.” Member of subfamily Deirochelyinae.</p> <table border="1"> <thead> <tr> <th colspan="2">Scientific classification</th></tr> </thead> <tbody> <tr> <td>Kingdom:</td><td>Animalia</td></tr> <tr> <td>Phylum:</td><td>Chordata</td></tr> <tr> <td>Class:</td><td>Reptilia</td></tr> <tr> <td>Order:</td><td>Testudines</td></tr> <tr> <td>Suborder:</td><td>Cryptodira</td></tr> <tr> <td>Family:</td><td>Emydidae</td></tr> <tr> <td>Subfamily:</td><td>Deirochelyinae</td></tr> <tr> <td>Genus:</td><td><b>Graptemys</b></td></tr> <tr> <td></td><td>Agassiz, 1857<sup>[1]</sup></td></tr> <tr> <th colspan="2">Species</th></tr> <tr> <td colspan="2">13, see text</td></tr> </tbody> </table>	Scientific classification		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Family:	Emydidae	Subfamily:	Deirochelyinae	Genus:	<b>Graptemys</b>		Agassiz, 1857 <sup>[1]</sup>	Species		13, see text	
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Kingdom:	Animalia																								
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Genus:	<b>Graptemys</b>																								
	Agassiz, 1857 <sup>[1]</sup>																								
Species																									
13, see text																									
Size	Males: 3-7 in Females: 7-10 in																								
Color	the lines on the shell resemble waterways on maps. it has thicker, yellow lines on the limbs and face.																								
Anatomy	resemble many other aquatic turtles, but distinguished by keel running length of center of carapace. some have spike-like juts along the keel. live 15-100 years.																								
Dimorphism	females larger than males. males have much longer claws on the front legs. Females can be partitioned into 3 groups based on head width/amt of mollusks eaten — Microcephalic (narrow, consume few mollusks); Mesocephalic (wider, mostly mollusks w/ softer-bodied prey); Megacephalic (widest, almost entirely mollusks)																								
Behavior	spend many hours basking. they are communal w/ other turtles — share space and use each other for predator-watching.																								
Habitat	<ul style="list-style-type: none"> <li>mostly aquatic, but spend some time on land</li> <li>live only in freshwater, like ponds/rivers, and prefer flowing water</li> <li>ideal environment = underwater plant matter to eat; rocks and logs to bask on</li> </ul>																								
Distribution	found throughout eastern half of US and northwards into southern Canada																								
Feeding Ecology	<ul style="list-style-type: none"> <li>more carnivorous than most Emydids</li> <li>females have wider heads — eat mollusks, insects, crayfish</li> <li>males w/ smaller heads — smaller mollusks and insects</li> <li>feeding is always in the water</li> </ul>																								
Reproductive Biology	<ul style="list-style-type: none"> <li>breed in spring/fall</li> <li>mating takes place in deep waters</li> <li>nesting period in May-July</li> <li>prefer unshaded sites of sandy soil</li> <li>usually lay 2 or more clutches of 6-20 eggs</li> <li>hatch after 50-70 days in August-September</li> <li>may overwinter in nest</li> <li>TSD <ul style="list-style-type: none"> <li>— 25°C = male</li> <li>— 30-35°C = female</li> </ul> </li> </ul>																								
Ecological Role	control invasive mollusks like zebra mussels and Asian clams																								
Conservation Status	5 LC; 3 EN; 2 VU; 2 NT 3 species bred heavily for pet trade in 1970s but slowly decreased in popularity																								



### 2.3.5 Trachemys — Sliders

Taxonomy/Ancestry	<p>subfamily Deirochelyinae. 16 species w/ 19 subspecies b/w them. named for how they “slide” into the water if they sense danger while basking. also known as red-eared terrapins*.</p> <div style="border: 1px solid black; padding: 10px;"> <p><b>Scientific classification</b> </p> <table border="0"> <tr><td>Kingdom:</td><td>Animalia</td></tr> <tr><td>Phylum:</td><td>Chordata</td></tr> <tr><td>Class:</td><td>Reptilia</td></tr> <tr><td>Order:</td><td>Testudines</td></tr> <tr><td>Suborder:</td><td>Cryptodira</td></tr> <tr><td>Family:</td><td>Emydidae</td></tr> <tr><td>Subfamily:</td><td>Deirochelyinae</td></tr> <tr><td>Genus:</td><td><b>Trachemys</b></td></tr> <tr><td></td><td>Agassiz, 1857 <a href="#">[1]</a> <a href="#">[2]</a> <a href="#">[3]</a></td></tr> </table> <p><b>Synonyms</b></p> <p><i>Calliclemys</i> <a href="#">[1]</a> <a href="#">[2]</a>  <i>Redemys</i> <a href="#">[1]</a> <a href="#">[2]</a></p> </div>	Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Family:	Emydidae	Subfamily:	Deirochelyinae	Genus:	<b>Trachemys</b>		Agassiz, 1857 <a href="#">[1]</a> <a href="#">[2]</a> <a href="#">[3]</a>
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Subfamily:	Deirochelyinae																		
Genus:	<b>Trachemys</b>																		
	Agassiz, 1857 <a href="#">[1]</a> <a href="#">[2]</a> <a href="#">[3]</a>																		
Size	carapace typically 15-20 cm (6-8 in).																		
Color	distinct broad stripe extending from right behind eye, slightly curving. the carapace is leaf green in the young, turning dark w/ age. light yellow plastron w/ dark irregular markings in the center of the scutes.																		
Anatomy	<ul style="list-style-type: none"> <li>the carapace is oval and flattened, w/ a weak keel that is more pronounced in the young</li> <li>upper carapace contains vertebral scutes forming central elevated portion</li> <li>relies on middle ear covered by cartilaginous disc; no visible outer ear or external auditory canal</li> <li>live 20-30 years; shorter in captivity</li> </ul>																		
Dimorphism	<p>females larger.  males have longer claws on front feet to hold female during mating. thicker and longer tail holding dark colored, retractable penis.  in the male, the cloaca is beyond the edge of the carapace, while in the female, it is at or under the rear edge of the carapace.  the male's plastron is slightly concave, while the female's is completely flat.</p>																		
Behavior	<ul style="list-style-type: none"> <li>often seen basking in groups</li> <li>almost entirely aquatic but bask to maintain body temp.</li> <li>do not hibernate, but brumate* <ul style="list-style-type: none"> <li>occasionally rise to surface for food, drink, or air</li> <li>inactive in October when temp &lt; 10°C (50°F) — enter state of torpor and do not eat or defecate, remain motionless, less breathing, may become active during warmer times in winter but return when temp drops</li> <li>survive anaerobically producing ATP from glycolysis w/ dropped metabolic rate</li> <li>do not brumate* if captive</li> </ul> </li> </ul>																		
Habitat	exclusively freshwater, they live in habitats w/ rocks or logs to bask on.																		
Distribution	native to the Americas, they range from the US to northern Argentina.																		

Feeding Ecology	<p>Young pond sliders tend to be more carnivorous than adults, eating about 70% animal matter and 30% plant matter. Adults eat 90% plant matter and 10% animal matter. Foods include aquatic insects, snails, tadpoles, crawfish and other crustaceans, and fish. They also eat plants like arrowhead, water lilies, hyacinths, and duck weed. Feeding occurs under water, usually in the early morning or late afternoon.</p> <p>Pond slider eggs and hatchlings are preyed on by raccoons, skunks, opossums, foxes, and other predators. They are relatively safe from most predators once they reach adult size and while they are in the water. Large predatory fish seem to find the hatchlings difficult to handle and do not tend to eat them. Red-eared sliders may attempt to bite and scratch when harassed, but most pull their head and legs into their shells for protection.</p>
Reproductive Biology	<ul style="list-style-type: none"> <li>• mating takes place from March-July</li> <li>• courtship — male swims around female and flutters claws around her head; if receptive, female swims toward male and sinks to bottom for mating</li> <li>• courtship = 45 min, mating = 10 min</li> <li>• on occasion male appears to be courting another male; may be sign of dominance or preclude fight</li> <li>• post-mating, female spends extra time basking to keep eggs warm. she may change her diet.</li> <li>• can lay 2-30 eggs, up to 5 clutches a year</li> <li>• actual egg fertilization takes place during egg-laying — female can lay fertile eggs in following season w/o mating</li> <li>• during last weeks of gestation female spends time scratching at ground to find suitable place</li> <li>• Incubation = 59-112 days</li> <li>• hatchling breaks egg w/ egg tooth</li> <li>• may overwinter in nest</li> <li>• new hatchling has yolk sac attached to stomach which will be absorbed; damaging yolk sac = death → when relocating eggs, always mark top so they don't get flipped over and let sac strangle baby</li> </ul>
Ecological Role	<p>Pond sliders help to control populations of the animals that they consume and affect aquatic vegetation as they graze. Young pond sliders are an important food source for large, aquatic predators.</p>
Conservation Status	<ul style="list-style-type: none"> <li>• most commonly traded reptile</li> <li>• when mature, they can bite, which results in them being dumped into the wild</li> <li>• asymptomatic carriers of salmonella; FDA banned selling turtle eggs and turtles w/ carapace length under 4 in (10 cm)</li> <li>• considered significant threat to native turtle species in Australia; high social/economic costs predicted</li> </ul>



### 2.3.6 Chrysemys — Painted Turtles

Taxonomy/Ancestry	<p>1 species, <i>C. picta</i>, w/ 3 subspecies. Member of subfamily Deirochelyinae. It is commonly found in the fossil record. The oldest samples are from Nebraska 15 mya. Most recent fossils are widely distributed; fossils &lt; 300,000 years old are found throughout the US and southern Canada.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td>Animalia</td></tr> <tr> <td>Phylum:</td><td>Chordata</td></tr> <tr> <td>Class:</td><td>Reptilia</td></tr> <tr> <td>Order:</td><td>Testudines</td></tr> <tr> <td>Suborder:</td><td>Cryptodira</td></tr> <tr> <td>Family:</td><td>Emydidae</td></tr> <tr> <td>Subfamily:</td><td>Deirochelyinae</td></tr> <tr> <td>Genus:</td><td><b><i>Chrysemys</i></b></td></tr> <tr> <td></td><td>Gray, 1844</td></tr> <tr> <td>Species:</td><td><b><i>C. picta</i></b></td></tr> </tbody> </table>	Scientific classification		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Family:	Emydidae	Subfamily:	Deirochelyinae	Genus:	<b><i>Chrysemys</i></b>		Gray, 1844	Species:	<b><i>C. picta</i></b>
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Family:	Emydidae																						
Subfamily:	Deirochelyinae																						
Genus:	<b><i>Chrysemys</i></b>																						
	Gray, 1844																						
Species:	<b><i>C. picta</i></b>																						
Size	Female: 10-25 cm (4-10 in); 500 g (18 oz) Male: 7-15 cm (3-6 in); 300 g (11 oz)																						
Color	Red/yellow stripes on neck, legs, and tail.																						
Anatomy	Upper jaw = philtrum (shaped like inverted V) w/ downward, tooth-like projection on either side. Distinguish from red-eared slider: <i>Chrysemys</i> is flatter; slider has red "ear" marking and spotted bottom shell.																						
Dimorphism	Females larger than males. The female has a higher, more rounded carapace, and the male has longer foreclaws; longer, thicker tail; cloaca located farther out on tail																						
Behavior	<ul style="list-style-type: none"> <li>• Emerges at sunrise to bask, then goes to water to forage; repeats cycle until night when it sinks to the bottom to sleep</li> <li>• Must maintain 17 – 25°C internal body temperature to be active</li> <li>• Spring — forages at water temp 15 – 18°C but not if temp exceeds 30°C</li> <li>• Fall — stops foraging when temperature is below 15 – 18°C</li> <li>• Winter — hibernation <ul style="list-style-type: none"> <li>– In the north, they can hibernate as long as October-March</li> <li>– In the south, they may not hibernate at all</li> <li>– Body temperature falls to 6°C</li> <li>– Periods of warm weather bring them out of hibernation temporarily</li> <li>– Buries self on bottom of water body, near water in shore-bank or muskrat burrow, or in woods or pastures</li> <li>– Does not breathe — adaptations of blood chemistry, brain, heart, and shell allow it to survive extreme lactic acid build-up</li> </ul> </li> <li>• May migrate several km searching for water, food, mates w/ group of 100s of turtles <ul style="list-style-type: none"> <li>– May vacate shallow water during summer to look for more permanent bodies</li> <li>– Frequently cross lakes or travel down creeks</li> <li>– Have homing capabilities thru visual recognition; can return to collection points if released elsewhere</li> </ul> </li> </ul>																						
Habitat	Need fresh waters w/ soft bottoms, basking sites, and aquatic vegetation. It therefore favors shallow waters w/ slow currents such as creeks, marshes, ponds, and lakeshores. Eastern painted turtle — Very aquatic, only leaves water body when forced by drought, have appeared in brackish waters Midland/southern painted turtles — Seek very quiet waters: shores and coves; tolerate pollution Western painted turtle — Streams and lakes, but also pasture ponds and roadside pools; found as high as 1,800 m (5,900 ft)																						

Distribution	the most widespread N. American turtle, its range extends from the Atlantic to the Pacific. on the E. Coast, it ranges from the Canadian Maritimes to Georgia. on the W. Coast, it ranges from British Columbia to Washington to Oregon to Vancouver Island. in the north, it extends into much of southern Canada; to the south, it reaches the US Gulf Coast in Louisiana/Alabama. it also has dispersed populations in the southwestern US and is found in 1 river in northern Mexico.
Feeding Ecology	omnivorous, it hunts along water bottoms, chasing victims from vegetation to open water. it consumes plants and skims the surface of the water to catch small particles. they commonly eat crayfish, dragonfly larvae, water lilies, and duckweed. they are vulnerable to predators when young: red fox, garter snake, crows, snapping turtle, water bugs, raccoon.
Reproductive Biology	<ul style="list-style-type: none"> <li>• mate in the spring and fall if the water temp is 10 – 25°C.</li> <li>• courtship — male follows female and strokes face w/ elongated claws until female swims to bottom to copulate</li> <li>• female stores sperm for up to 3 years in oviduct — may have 3 clutches, w/ multiple fathers</li> <li>• nesting in late May to mid-July <ul style="list-style-type: none"> <li>– Dug in sandy soil, often near water; older females nest further inland</li> <li>– Dig nests w/ body temp 29 – 30°C; may delay if not</li> <li>– Presses throat against ground of diff potential sites to sense moisture, warmth, etc.</li> <li>– Takes 4 hrs to build nest using hind legs, lubricating w/ bladder water</li> <li>– Eggs = white, elliptical, porous, flexible</li> <li>– Bigger female = bigger eggs and clutch</li> </ul> </li> <li>• 72-80 day incubation</li> <li>• young hatch w/ egg tooth</li> <li>• may overwinter. since they can survive winter in the nest, they range further north than most US turtles. they survive subfreezing temperatures w/ blood that can be supercooled and skin resisting penetration from ice crystals.</li> <li>• Dependent on egg yolk at first, begin feeding to support growth after 1-1.5 weeks of leaving nest</li> </ul>
Ecological Role	
Conservation Status	LC. widespread, but human settlement still has noticeable effects on population density. able to maintain range better than some other turtles b/c it can tolerate polluted environments. range eroding heavily in Pacific Northwest; considered S2 (imperiled) in Oregon and British Columbia. habitat loss by drying of wetlands; even if water remains, basking logs/rocks often cleared away; urbanization takes away soil for nesting. often killed on road. threatened by introduction of invasive non-native species (eg red-eared slider).



### 2.3.7 Pseudemys — Cooters and Redbellies

Taxonomy/Ancestry	<p>subfamily Deirochelyinae. 7 species, validity of some taxa in question. referred to as cooters from kuta, word for turtle in Bambara and Malinke languages.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td>Animalia</td></tr> <tr> <td>Phylum:</td><td>Chordata</td></tr> <tr> <td>Class:</td><td>Reptilia</td></tr> <tr> <td>Order:</td><td>Testudines</td></tr> <tr> <td>Suborder:</td><td>Cryptodira</td></tr> <tr> <td>Family:</td><td>Emydidae</td></tr> <tr> <td>Subfamily:</td><td>Deirochelyinae</td></tr> <tr> <td>Genus:</td><td><b>Pseudemys</b></td></tr> <tr> <td></td><td>Gray, 1856<sup>[1]</sup></td></tr> </tbody> </table>	Scientific classification		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Family:	Emydidae	Subfamily:	Deirochelyinae	Genus:	<b>Pseudemys</b>		Gray, 1856 <sup>[1]</sup>
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Kingdom:	Animalia																				
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Genus:	<b>Pseudemys</b>																				
	Gray, 1856 <sup>[1]</sup>																				
Size	among the largest of the Emydids, they have carapace lengths reaching 17.3 in (44 cm) and weigh up to 22 lb (10 kg).																				
Color	black head w/ light lines running toward snout.																				
Anatomy	they have a dark, highly domed carapace w/ large webbed feet to navigate strong currents. the hatchling has a round carapace, 1.5 in (4 cm) in diameter, green w/ bright yellow markings.																				
Dimorphism	females larger than males.																				
Behavior	<ul style="list-style-type: none"> <li>• bask on logs/sun-warmed rocks, often w/ other aquatic basking turtles (e.g. sliders, painteds)</li> <li>• diurnal, wake w/ morning sun to bask/forage</li> <li>• wander b/w bodies of freshwater → develop relatively large home range</li> <li>• sleep under water vegetation</li> <li>• cooler climate cooters = dormant during winter up to 2 months in underwater mud. do not breathe but take in oxygen from water thru cloaca</li> </ul>																				
Habitat	usually found found in rivers w/ moderate current, lakes, or tidal marshes w/ heavy vegetation. they collect on the peninsular floodplains. they care capable of tolerating freshwater and brackish water.																				
Distribution	native to central/eastern US, from Virgina south to mid-Georgia, west to eastern Texas, Oklahoma, north to southern Indiana. some populations in Rio Grande, Mexico.																				
Feeding Ecology	<ul style="list-style-type: none"> <li>• highly omnivorous, they will eat plants or animals, dead or alive</li> <li>• they cannot swallow out of water, so they will leave to chase a prey item and then return to swallow it</li> <li>• they chase, kill, and eat small fish</li> <li>• they find carrion along the river edge</li> <li>• tooth-like cusps in upper jaw function as an adaptation to aid in eating leaves/fibrous vegetation</li> <li>• primarily, they consume a wide variety of aquatic plants, some terrestrial near water edge</li> <li>• can take calcium thru separate source (e.g. cuttlebone) to self-regulate intake</li> <li>• young tend to seek more protein-enriched (meat) diet</li> <li>• hatchlings predated upon by avian/mammal predators: skunks/raccoons, bull frogs, herons, snapping turtles, predatory fish, alligators, muskrats</li> </ul>																				

Reproductive Biology	<p>similar to the red-eared slider, they mate in early spring. as part of courtship, the male uses claws to flutter at the female's face and sniffs the female's tail for a pheromone signal. he swims above the female, stroking her face. if she is receptive, she will sink to the bottom of the river and allow the male to mount.</p> <p>after several weeks, the female crawls to land seeking a nesting site in May-June. she typically chooses sandy/loamy soil in an open area, within 100 ft (300 m) of the water's edge. she lays 10-25 eggs in 1 or more clutches, yielding ellipsoidal, 1.5 in (4 cm) long eggs. incubation time is determined by the temperature and ranges from 90-100 days.</p> <p>eggs hatch within 45-56 days in August-September. they usually remain in the nest through the 1st winter. nearly 100% of offspring will die the 1st year.</p>
Ecological Role	
Conservation Status	Threatened by loss of habitat, predation, highway death, use as food source, pet industry, but hardy as a whole, continues to thrive. LC.

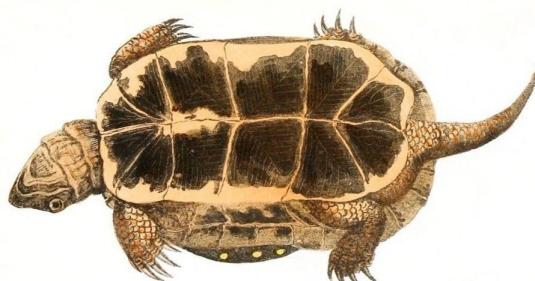


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### 2.3.8 Clemmys — Spotted Turtle

Taxonomy/Ancestry	<ul style="list-style-type: none"> <li>• 1 N. American species, <i>C. guttata</i></li> <li>• until recently, consisted of 4 species — bog turtle, spotted turtle, western pond turtle, and wood turtle — but recent genetic analysis revealed spotted turtle was distinct</li> <li>• bog/wood turtles moved to <i>Glyptemys</i></li> <li>• western pond turtle renamed <i>Actinemys</i></li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><b>Animalia</b></td></tr> <tr> <td>Phylum:</td><td><b>Chordata</b></td></tr> <tr> <td>Class:</td><td><b>Reptilia</b></td></tr> <tr> <td>Order:</td><td><b>Testudines</b></td></tr> <tr> <td>Suborder:</td><td><b>Cryptodira</b></td></tr> <tr> <td>Family:</td><td><b>Emydidae</b></td></tr> <tr> <td>Genus:</td><td><b><i>Clemmys</i></b></td></tr> <tr> <td></td><td>Ritgen, 1828</td></tr> <tr> <td>Species:</td><td><b><i>C. guttata</i></b></td></tr> </tbody> </table>	Scientific classification		Kingdom:	<b>Animalia</b>	Phylum:	<b>Chordata</b>	Class:	<b>Reptilia</b>	Order:	<b>Testudines</b>	Suborder:	<b>Cryptodira</b>	Family:	<b>Emydidae</b>	Genus:	<b><i>Clemmys</i></b>		Ritgen, 1828	Species:	<b><i>C. guttata</i></b>
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	Ritgen, 1828																				
Species:	<b><i>C. guttata</i></b>																				
Size	8-12 cm (3.1-4.7 in)																				
Color	the carapace can be black, bluish-black. up to 100 small yellow round spots w/ the amount depending on range. the spotting pattern extends out to the neck and limbs from the head. the left side typically has more spots than the right. southern individuals tend to have smaller spots than northern. the plastron is yellow or orange-yellow w/ black spot present on each scute; w/ age, melanin of plastron increases until completely black.																				
Anatomy	<ul style="list-style-type: none"> <li>• lacks a keel</li> <li>• small, semi-aquatic turtle</li> </ul>																				
Dimorphism	can be told apart from birth. males have a tan chin, brown eyes, and a long thick tail w/ a concave plastron. females have a yellow chin, orange eyes, a shorter tail, and a convex or flat plastron. they grow larger and have more spots.																				
Behavior	<ul style="list-style-type: none"> <li>• very intelligent; proven to have the intelligence of a mouse</li> <li>• spends a lot of time on land; often basks on patches of grass near water</li> <li>• only active in the cooler spring months; activity peaks during April-May</li> <li>• in the warmest parts of summer (water temp. &gt; 30°C, they may aestivate terrestrially or aquatically for long periods of time, but they are relatively tolerant of drought conditions. burrow into leaf litter, marsh edges, open fields, or muskrat burrows</li> <li>• winter dormant period may commence in later summer or fall</li> <li>• distinct seasonal movement patterns <ul style="list-style-type: none"> <li>— spring — positive association in wetlands hosting abundant wood frog egg masses</li> <li>— late summer — negative association in forested wetlands</li> </ul> </li> </ul>																				
Habitat	variety of habitats including swamps, bogs, fens, marshes, and wet pastures. can live in brackish environments including streams influenced by tides and vernal pools. avoids artificial reservoirs and deep open-water areas. habitats must have areas of soft substrate and at least some aquatic vegetation for survival.																				

Distribution	<p>ranges from southern Maine, Quebec, and Ontario, south along eastern US to Florida in east and central Ohio in west. disjunct populations in Canadian portion of range and in central Illinois, central Georgia, N./S. Carolina, and Indiana. despite large numbers of populations in Canada, many are not self-sustaining b/c they are small and isolated from each other. range overlaps that of many other turtles including wood, bog, snapping, painted, Blanding?s, eastern box, common musk, and eastern mud turtles.</p> 
Feeding Ecology	<ul style="list-style-type: none"> <li>• omnivorous active hunter — seeks out prey by pointing head into aquatic plants and may venture onto land to hunt</li> <li>• feeds at temps above 14.2°C (57.6°F) = roughly mid-March to September</li> <li>• can only feed in water</li> <li>• consumes plant material like aquatic vegetation, green algae, and wild cranberries</li> <li>• meat includes aquatic insect larvae, worms, slugs, millipedes, spiders, crustaceans, tadpoles, salamanders, and some small fish species</li> <li>• captivity = fruits such as cantaloupe/watermelon and fresh/canned fish</li> <li>• highly vulnerable to predation due to size and frequent migration</li> </ul>
Reproductive Biology	TSD — researchers claim global warming may impact population sex ratios. females travel onto land and lay eggs in sunny soil. nesting may also take place in other terrestrial locations such as man-made dykes or muskrat nests.
Ecological Role	
Conservation Status	considered EN. frequent movements expose them to threats such as predators, roadkill, and illegal collection. high risk of extinction in several areas ranging from South Carolina up to Maine in the USA and even further north into Ontario, Canada, mitigation requires spatial and temporal shifts in habitat use. human impact = habitat destruction/alteration, collection for pet trade, and vehicle mortality.



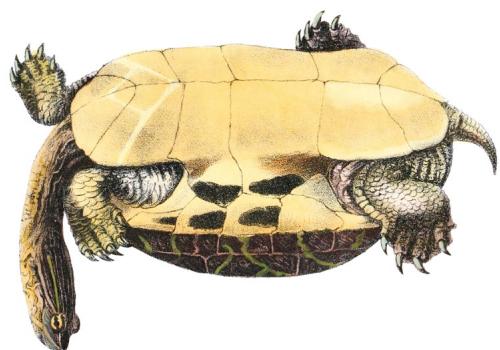
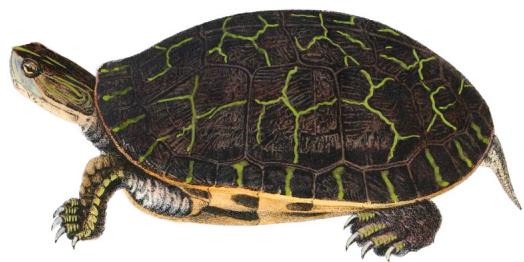
### 2.3.9 Glyptemys — Sculptured Turtles (Wood and Bog Turtle)

Taxonomy/Ancestry	<p>subfamily Emydinae. 2 N. American species, bog and wood turtles. formerly considered members of <i>Clemmys</i>. 50 chromosome karyotypes.</p> <p>During the last post-Pleistocene ice age, Glyptemys turtles were forced south by encroaching glaciers from the north. After glaciation, some turtle colonies relocated to their original northern range, while others continued to live in the new, southern range. Some fossil remains from the Rancholabrean period (300,000 to 11,000 years BP) have been found in Georgia and Tennessee, areas farther south than the turtles' current range.</p>																								
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Size	Glyptemys turtles are small to medium in size: the bog turtle males grow to be 9.4 cm (3.7 in) and females 8.9 cm (3.5 in) while wood turtles of either gender reach 14 to 20 cm (5.5 to 7.9 in) in length. Bog turtles weigh 110 g (3.9 oz) and wood turtles average 1 kg (2.2 lb) at maturity.																								
Color	bog has small, bright blotches on each side of the neck. wood has dark grey to black head w/ bright orange coloration on ventral surfaces.																								
Anatomy																									
Dimorphism																									
Behavior	These turtles are diurnal and become active in the early morning. During extremely cold days, they each may spend time under water, while the bog has been known to also seek dense underbrush or mud in which to bury itself. Excessively hot days sometimes causes these turtles to estivate.																								
Habitat	These turtles are semiaquatic and are commonly found in bogs, fens, and small streams which have soft yet compacted, sandy bottoms.																								
Distribution	Glyptemys turtles are endemic to eastern North America. Their collective range extends from Nova Scotia south to Georgia and from Nova Scotia west to Minnesota.																								
Feeding Ecology	feed on insects, plant matter, small invertebrates, and carrion.																								
Reproductive Biology																									
Ecological Role																									
Conservation Status	Both species are protected throughout their ranges. The bog turtle is considered endangered, while the wood turtle is labeled as vulnerable, a less dire rating.																								



### 2.3.10 Deirochelys — Chicken Turtle

Taxonomy/Ancestry	<p>subfamily Deirochelyinae. monotypic genus — <i>D. reticularia</i>. known as “chicken turtles” b/c they taste like chicken.</p> <table border="1"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><i>Animalia</i></td></tr> <tr> <td>Phylum:</td><td><i>Chordata</i></td></tr> <tr> <td>Class:</td><td><i>Reptilia</i></td></tr> <tr> <td>Order:</td><td><i>Testudines</i></td></tr> <tr> <td>Suborder:</td><td><i>Cryptodira</i></td></tr> <tr> <td>Family:</td><td><i>Emydidae</i></td></tr> <tr> <td>Subfamily:</td><td><i>Deirochelyinae</i></td></tr> <tr> <td>Genus:</td><td><i>Deirochelys</i></td></tr> <tr> <td>Species:</td><td><i>D. reticularia</i></td></tr> </tbody> </table>	Scientific classification		Kingdom:	<i>Animalia</i>	Phylum:	<i>Chordata</i>	Class:	<i>Reptilia</i>	Order:	<i>Testudines</i>	Suborder:	<i>Cryptodira</i>	Family:	<i>Emydidae</i>	Subfamily:	<i>Deirochelyinae</i>	Genus:	<i>Deirochelys</i>	Species:	<i>D. reticularia</i>
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Genus:	<i>Deirochelys</i>																				
Species:	<i>D. reticularia</i>																				
Size	10.5-25.4 cm long																				
Color	yellow stripe on forelegs and rear legs. net-like pattern on carapace.																				
Anatomy	it can be distinguished from the painting turtle by the unusually long, striped neck. pear-shaped carapace. it can live for 15 years.																				
Dimorphism	females are larger than males. males have a longer, thicker tail and longer front claws.																				
Behavior	<ul style="list-style-type: none"> <li>• occasionally bask</li> <li>• spend most time in water</li> <li>• nearly all males, some females leave wetland each fall to spend winter buried in forest, making it one of the most terrestrial turtle species</li> <li>• aestivates* in uplands during droughts, rather than migrating</li> </ul>																				
Habitat	semiaquatic, it prefers quiet, still bodies of water such as shallow ponds/lakes, ditches, marshes, cypress swamps, and Carolina bays. it favors dense vegetation, and soft substrate. it is tolerant of ephemeral bodies, and can travel on land to burrow and escape dry conditions.																				
Distribution	coastal plain of southeastern US but absent from Piedmont and Mountains.																				
Feeding Ecology	it is almost completely carnivorous during its 1st year of life, but after that it becomes omnivorous. it hunts amidst aquatic vegetation for insects, amphibian larvae, small fish, and crayfish. it uses its well-developed hyoid apparatus* to create suction pulling food items into throat																				
Reproductive Biology	<ul style="list-style-type: none"> <li>• courtship — male vibrates front claws on female's face</li> <li>• unusual among turtles — fall/winter egg-laying period beginning in later summer-early fall and resuming again in Feb/Mar</li> <li>• females create cylindrical nest in variety of soil types</li> <li>• 2-19 clutches</li> <li>• embryos go thru period of diapause in late gastrula stage — must experience per. of cool temps before development proceeds</li> <li>• some eggs may overwinter in nest before eclosion and emerge a year or more after laying</li> <li>• hatch in 152 days at 29°C</li> <li>• temp-related sex determination (TSD) — 25°C incubation = all males; warmer temp = females</li> </ul>																				
Ecological Role																					
Conservation Status	LC, they are considered stable throughout their range, except for Virginia, where they are endangered. habitat destruction reduces suitable habitats for foraging, migration, and hibernation. they are sometimes killed on roads, as well. they may be hunted for food.																				



### 2.3.11 Emydoidea — Blanding's Turtle

Taxonomy/Ancestry	<p>subfamily Emydinae. monotypic genus — <i>Emydoidea blandingii</i> named after Dr. William Blanding, an American naturalist.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><a href="#">Animalia</a></td></tr> <tr> <td>Phylum:</td><td><a href="#">Chordata</a></td></tr> <tr> <td>Subphylum:</td><td><a href="#">Vertebrata</a></td></tr> <tr> <td>Class:</td><td><a href="#">Reptilia</a></td></tr> <tr> <td>Order:</td><td><a href="#">Testudines</a></td></tr> <tr> <td>Family:</td><td><a href="#">Emydidae</a></td></tr> <tr> <td>Subfamily:</td><td><a href="#">Emydinae</a></td></tr> <tr> <td>Genus:</td><td><a href="#">Emys or</a> <a href="#">Emydoidea<sup>[1][2]</sup></a></td></tr> <tr> <td>Species:</td><td><b><a href="#">E. blandingii</a></b></td></tr> </tbody> </table>	Scientific classification		Kingdom:	<a href="#">Animalia</a>	Phylum:	<a href="#">Chordata</a>	Subphylum:	<a href="#">Vertebrata</a>	Class:	<a href="#">Reptilia</a>	Order:	<a href="#">Testudines</a>	Family:	<a href="#">Emydidae</a>	Subfamily:	<a href="#">Emydinae</a>	Genus:	<a href="#">Emys or</a> <a href="#">Emydoidea<sup>[1][2]</sup></a>	Species:	<b><a href="#">E. blandingii</a></b>
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Species:	<b><a href="#">E. blandingii</a></b>																				
Size	18-23 cm shell.																				
Color	bright yellow chin and throat. carapace specked w/ yellow/light-colored flecks/streaks on dark background. plastron yellow w/ symmetric dark blotches. dark head w/ yellow speckled legs.																				
Anatomy	the carapace is domed but slightly flattened along the midline, and oblong when viewed from above. it is also known as the “semi-box” turtle b/c it has a hinged plastron, but the lobes do not shut as tightly as the box turtle. it may live to 80 years. since it does not demonstrate notable symptoms of aging until the end of its lifespan, it is considered senescent*.																				
Dimorphism																					
Behavior	very timid, it may plunge into the water and remain at the bottom for hours, or withdraw into the shell, when alarmed. very gentle, it rarely bites, and is an agile, good swimmer. it overwinters under or near water, in mud, or under vegetation or debris.																				
Habitat	it inhabits wetlands w/ clean, shallow water. it can wander far from the water, especially for nesting or in search of a mating site or new food source.																				
Distribution	range center = Great Lakes, extends from central Nebraska and Minnesota eastward through southern Ontario as far as northern NY. isolated populations in SE NY, New England, Nova Scotia.																				
																					
Feeding Ecology	omnivorous, it consumes crustaceans and other invertebrates, fish, frogs, crayfish, carrion, berries, and vegetable debris. it is also capable of catching live fish.																				
Reproductive Biology	it requires 14-20 years to reach sexual maturity. nesting takes place in early April-May, and nesting happens in early June. clutch size varies regionally; in New York, it is 5-12 eggs. females may be found more than a kilometer from where they hibernated during the mating season.																				
Ecological Role																					
Conservation Status	EN. primary threat = habitat fragmentation and nest predation by unnaturally large predator population. endangered in Indiana, Illinois, Missouri, Maine, New Hampshire, Massachusetts, and South Dakota.																				

## 2.4 Testudinidae — Tortoises

Taxonomy/Ancestry	<ul style="list-style-type: none"> <li>• in America:           <ul style="list-style-type: none"> <li>– turtle is used as a general term for Testudines, including tortoises as a specific term for terrestrial turtles or specific members of Testudinidae</li> <li>– terrapins are turtles that are small and live in fresh and brackish water</li> </ul> </li> <li>• in Britain:           <ul style="list-style-type: none"> <li>– turtle not generic term for members of order Testudines, also applies “tortoise” broadly to land-dwelling members</li> <li>– “terrapin” = larger group of semi-aquatic turtles</li> </ul> </li> </ul>																		
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Family:	<b>Testudinidae</b>																		
	Batsch, 1788																		
Size																			
Color																			
Anatomy	<ul style="list-style-type: none"> <li>• the number of concentric rings on the carapace can be used to tell age           <ul style="list-style-type: none"> <li>– growth depends highly on accessibility of food and water; well-fed tortoise w/o seasonal variation = no rings</li> <li>– some tortoises grow <math>\leq</math>1 ring per season</li> <li>– some have no rings visible due to wear</li> </ul> </li> <li>• 1 of the longest animal lifespans; notable old tortoises: Tu'i Malila, Adwaita (oldest known, 255 if verified), Harriet, Timothy; typically 185 at max</li> <li>• extremely small brains           <ul style="list-style-type: none"> <li>– Central/S. American tortoises have no hippocampus (emotion, learning, memory, spatial navigation)</li> <li>– red-footed tortoises may rely on medial cortex</li> <li>– Francisco Redi removed brain of land tortoise which then lived for 6 months; freshwater tortoises could but didn't live as long. cut off head of tortoise which lived for 23 days.</li> </ul> </li> </ul>																		
Dimorphism	<ul style="list-style-type: none"> <li>• Sometimes, males have longer, more protruding neck plate</li> <li>• Sometimes, females have longer claws</li> <li>• Female typically larger than male</li> <li>• Male plastron curved concave to aid reproduction</li> <li>• Females have smaller tails, dropped down; males have much longer tails which are normally pulled up and to the side of rear shell</li> </ul>																		

Behavior	<ul style="list-style-type: none"> <li>move slowly on dry land at 0.17 mph (0.27 km/h). record speed = 5 mph (8.0 km/h)</li> <li>starts digging ground to create hibernaculum* at 1st signs of autumn <ul style="list-style-type: none"> <li>prefers swampy grounds where it can bury itself in mud</li> <li>loses appetite as temp drops</li> <li>may stop digging if temp increases but resumes immediately if it becomes cold</li> <li>stops breathing during hibernation</li> <li>wakes up in spring but only gradually regains appetite/energy as temp warms up</li> </ul> </li> <li>spend many hours sleeping in summer from late afternoon until the next morning</li> <li>love warm weather but avoid hot sun under green leaves/vegetation</li> <li>often engage in male-to-male combat</li> </ul>
Habitat	terrestrial, from deserts and grasslands to shrublands and forest floors.
Distribution	mainly tropical/subtropical in N./S. America, Europe, Asia, and Africa, as well as numerous oceanic islands.
Feeding Ecology	mostly herbivorous, with some being omnivorous, they consume grasses, weeds, leafy greens, flowers, and some fruits. certain species consume worms, insects, and carrion. too much protein is detrimental in herbivores, causes shell deformities and medical problems. juveniles may have slightly different nutritional requirements (e.g. youth of herbivorous species will eat worms for protein). eat more in summer.
Reproductive Biology	<ul style="list-style-type: none"> <li>courtship often involves male chasing female and ramming/biting her</li> <li>females dig nesting burrows for 1-30 eggs</li> <li>egg-laying occurs @ night</li> <li>female covers clutch w/ sand, soil, organic material</li> <li>size of egg depends on mother, estimate by measuring width of cloaca b/w carapace and plastron</li> <li>after incubation, fully formed hatchling breaks shell w/ egg tooth</li> <li>hatch w/ embryonic egg sac for nutrition for 1st 3-7 days</li> </ul>
Ecological Role	
Conservation Status	a notable VU species is the Galapagos giant tortoise, which is the largest living species whose lifespan can exceed 100 years. it was hunted almost to extinction for food but conservation/breeding efforts brought them back to VU. Kurma, a half-tortoise deity, is the 2nd avatar of Vishnu in Hindu culture. they also serve as a symbol of longevity in Chinese culture.



## 2.5 Cheloniidae — Sea Turtles

Taxonomy/Ancestry	<p>7 species — Green Sea Turtle, Loggerhead Sea Turtle, Olive Ridley Sea Turtle, Hawksbill Sea Turtle, Flatback Sea Turtle, Green Sea Turtle, and the Kemp's Ridley Sea Turtle.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><b>Animalia</b></td></tr> <tr> <td>Phylum:</td><td><b>Chordata</b></td></tr> <tr> <td>Class:</td><td><b>Reptilia</b></td></tr> <tr> <td>Order:</td><td><b>Testudines</b></td></tr> <tr> <td>Suborder:</td><td><b>Cryptodira</b></td></tr> <tr> <td>Clade:</td><td><b>Pancheloniidae</b></td></tr> <tr> <td>Family:</td><td><b>Cheloniidae</b></td></tr> <tr> <td colspan="2"><a href="#">Oppel, 1811<sup>[1]</sup></a></td></tr> </tbody> </table>	Scientific classification		Kingdom:	<b>Animalia</b>	Phylum:	<b>Chordata</b>	Class:	<b>Reptilia</b>	Order:	<b>Testudines</b>	Suborder:	<b>Cryptodira</b>	Clade:	<b>Pancheloniidae</b>	Family:	<b>Cheloniidae</b>	<a href="#">Oppel, 1811<sup>[1]</sup></a>	
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Family:	<b>Cheloniidae</b>																		
<a href="#">Oppel, 1811<sup>[1]</sup></a>																			
Size	71-213 cm in carapace length. around 350 lb.																		
Color																			
Anatomy	unlike tortoises and other turtles, they lack the ability to retract their heads into the shell. their plastron is considerably reduced from other turtle species, and connected to the top part of the shell by ligaments w/o a hinge separating the pectoral/abdominal plates of the plastron. they are the only turtles who front limbs are stronger than their back limbs. the carapace is oval/heart-shaped, and the limbs have been modified into flippers for swimming, so they cannot support the turtle's weight on land.																		
Dimorphism																			
Behavior																			
Habitat	living in tropical oceans, they spend most of their lives swimming out in the waters over the continental shelf, the neritic zone. they tend to frequent bays and estuaries.																		
Distribution	far reaching into warmer temperatures and tropical/subtropical areas of Pacific and Atlantic ocean. also found in warmer seas such as Mediterranean seas.																		
Feeding Ecology	omnivorous, but they mainly eat meat, such as sponges, jellyfish, mollusks, barnacles, sea urchins, even fish. they also eat algae and sea plants. adults are predated upon by sharks, saltwater crocodiles, and coyotes or other canids may eat nesting females. eggs and hatchlings face predation from insects, crustaceans, mollusks, small mammals, birds, other reptiles, and various fish.																		
Reproductive Biology	<ul style="list-style-type: none"> <li>• courtship/mating takes place in shallow offshore waters</li> <li>• male/female pairs float near the surface, w/ the male carapace protruding from the water</li> <li>• females reproduce on multi-year cycles, but produce multiple clutches within single season (spring to late fall)</li> <li>• 100 eggs/clutch</li> <li>• incubation 50-60 days, warmer temp = faster development</li> <li>• eggs tend to hatch at same time at night, possibly to aid in digging</li> <li>• TSD: warm = female, cold = male</li> </ul>																		
Ecological Role	important role in marine ecosystems by maintaining health balance of sea grasses/reefs.																		
Conservation Status	mostly endangered or threatened. 2 EN, 1 VU, 2 CE, 1 DD. they are mainly endangered due to their slow growth rate, such that many do not survive to adulthood. they are often caught by fisheries or fishermen or hunted for their eggs or shells. they may also develop tumors or deformities due to human pollution.																		



## 2.6 Trionychidae — Soft-Shelled Turtles

Taxonomy/Ancestry	<p>sometimes called “pancake turtles.” N. American members of genus <i>Trionyx</i> assigned incorrect resurrected name <i>Apalone</i> until 1987. 3 subfamilies: Plastomeninae (extinct); Cyلانorbinae; Trionychinae.</p> <p>most closely related to Carettochelydidae (pig-nosed turtles). fossils suggest much broader distribution than currently known. oldest member dates from late Jurassic.</p>																						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #c0e0a0;"> <th style="text-align: center; padding: 2px;">Scientific classification</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">Kingdom:</td> <td style="padding: 2px;">Animalia</td> </tr> <tr> <td style="padding: 2px;">Phylum:</td> <td style="padding: 2px;">Chordata</td> </tr> <tr> <td style="padding: 2px;">Class:</td> <td style="padding: 2px;">Reptilia</td> </tr> <tr> <td style="padding: 2px;">Order:</td> <td style="padding: 2px;">Testudines</td> </tr> <tr> <td style="padding: 2px;">Suborder:</td> <td style="padding: 2px;">Cryptodira</td> </tr> <tr> <td style="padding: 2px;">Superfamily:</td> <td style="padding: 2px;">Trionychia</td> </tr> <tr> <td style="padding: 2px;">Family:</td> <td style="padding: 2px;"><b>Trionychidae</b></td> </tr> <tr> <td></td> <td style="padding: 2px;">Fitzinger, 1826</td> </tr> <tr style="background-color: #c0e0a0;"> <th style="text-align: center; padding: 2px;">Subfamilies</th> </tr> <tr> <td></td> <td style="padding: 2px;">Cyلانorbinae</td> </tr> <tr> <td></td> <td style="padding: 2px;">Trionychinae<sup>[1]</sup></td> </tr> </tbody> </table>	Scientific classification	Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Testudines	Suborder:	Cryptodira	Superfamily:	Trionychia	Family:	<b>Trionychidae</b>		Fitzinger, 1826	Subfamilies		Cyلانorbinae		Trionychinae <sup>[1]</sup>
Scientific classification																							
Kingdom:	Animalia																						
Phylum:	Chordata																						
Class:	Reptilia																						
Order:	Testudines																						
Suborder:	Cryptodira																						
Superfamily:	Trionychia																						
Family:	<b>Trionychidae</b>																						
	Fitzinger, 1826																						
Subfamilies																							
	Cyلانorbinae																						
	Trionychinae <sup>[1]</sup>																						
Size																							
Color																							
Anatomy	<ul style="list-style-type: none"> <li>• shell lacks horny scutes* (spiny softshell does have some protrusions) — carapace = leathery and pliable</li> <li>• central part of carapace has layer of solid bone, outer edges don't</li> <li>• soft shell helps them move easily in open water or lake bottoms; faster on land</li> <li>• feet = webbed, 3-clawed</li> <li>• carapace color of each species tends to match sand/mud color of their region = camouflage for feeding</li> <li>• sexual dimorphism — females much larger than males</li> <li>• many characteristics of aquatic lifestyle <ul style="list-style-type: none"> <li>— must be submerged to swallow food</li> <li>— necks disproportionately long to breathe surface air from water</li> <li>— “breathe” underwater w/ rhythmic movements of mouth containing numerous processes copiously supplied w/ blood like gill filaments in fish</li> <li>— Chinese softshell shown to excrete urea while “breathing” underwater — efficient solution in brackish environments</li> </ul> </li> </ul>																						
Dimorphism	Females can grow up to several feet in carapace diameter, while males stay much smaller.																						
Behavior	spend much time lying in mud. basking is not common. use a “lie and wait” feeding methodology. much faster than other turtles due to light shell.																						
Habitat	soft bottom bodies of freshwater, although they can also adapt to highly brackish waters. favor slow moving streams, swift rivers, lakes, ponds.																						
Distribution	eastern N. America, Africa, Asia, and Indo-Australian archipelago.																						
Feeding Ecology	most species are carnivorous, but some can be omnivorous. they eat crustaceans, insects, mollusks, fish, amphibians.																						
Reproductive Biology	courtship observed in a few species, involves head bobbing and male rubbing female's carapace. our knowledge of their reproduction is poor. clutch size = 20 eggs; multiple clutches per year.																						
Ecological Role																							
Conservation Status	some species critically endangered in Asia due to harvesting for food. most commonly consumed = Chinese softshell <i>Pelodiscus sinesis</i> . turtle farms exist. in the US “harvesting” softshells was legal in Florida until recently. as of 2009, only 1 turtle per person per day can be collected.																						



### 3 Lacertila/Sauria — Lizards

#### 3.1 Gekkonidae — Gecko Lizards

Taxonomy/Ancestry	part of the infraorder Gekkota. gekkonidae is the largest family of geckos, with over 950 described species in 51  <table border="1"><thead><tr><th colspan="2">Scientific classification</th></tr></thead><tbody><tr><td>Kingdom:</td><td>Animalia</td></tr><tr><td>Phylum:</td><td>Chordata</td></tr><tr><td>Class:</td><td>Reptilia</td></tr><tr><td>Order:</td><td>Squamata</td></tr><tr><td>Infraorder:</td><td>Gekkota</td></tr><tr><td>Family:</td><td><b>Gekkonidae</b></td></tr><tr><td></td><td>Gray, 1825</td></tr><tr><th colspan="2">Genera</th></tr><tr><td colspan="2">See text</td></tr></tbody></table>	Scientific classification		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Squamata	Infraorder:	Gekkota	Family:	<b>Gekkonidae</b>		Gray, 1825	Genera		See text	
Scientific classification																					
Kingdom:	Animalia																				
Phylum:	Chordata																				
Class:	Reptilia																				
Order:	Squamata																				
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Family:	<b>Gekkonidae</b>																				
	Gray, 1825																				
Genera																					
See text																					
Size																					
Color																					
Anatomy	<ul style="list-style-type: none"><li>• ectothermic*</li><li>• shed skin regularly; detach loose skin from body and eat it</li><li>• 60% of gecko species have adhesive toe pads that have been gained and lost repeatedly thru evolution<ul style="list-style-type: none"><li>— spatula-shaped setae (bristles found on the toe pads) arranged in lamellae (thin plate-shaped structures) enable attractive Van der Waals' forces b/w beta-keratin lamellae/setae/spatulae structures and surface</li><li>— self-cleaning; can remove dirt just by stepping</li><li>— does not adhere to teflon (polytetrafluoroethylene) b/c it has low surface energy</li><li>— humidity fortifies gecko tension even on hydrophobic surfaces, but tension is reduced if completely immersed in water</li><li>— molecular water layers carry large dipole moment; when present on setae and surface, surface energy of both is increased, therefore energy gain of contacting surfaces is increased, resulting in higher gecko adhesion force</li><li>— elastic properties of beta-keratin change w/ water uptake</li><li>— phospholipids lubricate setae and allow gecko to detach foot for next step</li><li>— every square mm of footpad = 14,000 setae</li></ul></li><li>• not double-jointed, but display digital hyperextension — toes can hyperextend in opposite directions from human fingers and toes</li><li>• skin is a papillose surface made from hair-like protuberances developed across entire body (no scales), conferring superhydrophobicity; antimicrobial action</li><li>• polyphodonts* — replace each of 100 teeth every 3-4 months<ul style="list-style-type: none"><li>— next to each full grown tooth there is a small replacement tooth developing</li><li>— formation of teeth = pleurodont: fused/ankylosed by sides to inner surface of jaw bones</li></ul></li><li>• instead of eyelids, geckos have a transparent membrane which they lick to clean</li><li>• nocturnal species = excellent night vision 350x more sensitive than humans; 3 different photopigments sensitive to UV, blue, and green</li></ul>																				
Dimorphism																					

Behavior	<ul style="list-style-type: none"> <li>• unique among lizards for their vocalizations: they use chirping sounds in social interaction           <ul style="list-style-type: none"> <li>— use to defend important resources (e.g. feeding areas)</li> </ul> </li> <li>• mostly nocturnal — emerge from hiding places in early evening to forage/seek mates, but their body temperature drops as the night progresses, limiting activity</li> <li>• in diurnal species, there are 1 or 2 peaks of activity during day, often in late morning and mid-to-late afternoon</li> <li>• tropical species are active year-round</li> <li>• northern and southern species remain inactive within burrows during cold periods, though they may emerge during warmer nights</li> <li>• solitary, but some species can reach high densities and share retreat sites. such species demonstrate reduced aggression towards each other but no complex social structure</li> <li>• deter predators using vocalizations, bites, defecation           <ul style="list-style-type: none"> <li>— cryptic coloration or concealing skin folds/flaps to avoid detection</li> <li>— some outrun predators</li> <li>— some species can shed skin if grabbed</li> <li>— demonstrate autotomy*, but can only use as last resort b/c tail stores nutrients               <ul style="list-style-type: none"> <li>* decreased activity following autotomy to recover</li> <li>* often return to area where they lost it; if still there, they eat it</li> <li>* some species attack rivals and eat their tail</li> </ul> </li> </ul> </li> </ul>
Habitat	require egg-laying sites, adequate supplies of arthropod prey, and retreats protecting against temp extremes and predators. often substrate-limited and need certain kinds of rocks. arid zones = narrow rock crevices or burrow. humid tropical forest habitats also common — trunks, branches, tree canopies, rotting logs, rocks. savannas/grasslands = less numerous, patchy distributions — trees, rocks, nests. several species live inside human habitations in warm parts of the world — often welcomed b/c they feed on insects and artificial lighting attracts prey.
Distribution	<ul style="list-style-type: none"> <li>• Migrated over the world from Pacific Rim 1000s of yrs ago</li> <li>• Spread across islands and continents</li> <li>• Chiefly tropical and subtropical but range as far north as southwestern US, southern Europe, southern Siberia</li> <li>• Reach New Zealand and approach southern tip of S. America to south</li> <li>• Most species restricted to small geographic ranges</li> </ul>
Feeding Ecology	<ul style="list-style-type: none"> <li>• often eat eat insects (eg moths, mosquitoes, crickets, grasshoppers, mealworms)</li> <li>• larger species take small vertebrate prey (eg small snakes, lizards, mammals, birds)</li> <li>• some island lizards supplement diet w/ fruits, nectar, or pollen; these lizards play roles as pollinators/seed dispensers</li> <li>• hunt using combo of visual/chemical clues</li> <li>• other species = ambush predators</li> </ul>

Reproductive Biology	<ul style="list-style-type: none"> <li>• some species parthenogenetic — female can reproduce w/o copulating w/ male           <ul style="list-style-type: none"> <li>– improves ability to spread to new islands</li> <li>– islands populated by single female gecko = lack of genetic diversity</li> <li>– sometimes there are no males at all due to hybridization of 2 bisexual parent species</li> </ul> </li> <li>• less vocal geckos can identify members of opposite sex thru chemical cues or vision</li> <li>• males rub/lick females before mating; restrain during copulation by biting nape of neck or back</li> <li>• most lay eggs           <ul style="list-style-type: none"> <li>– lay eggs in protected sites providing high-humidity microclimate such as under bark, in shallow nests, or burrows/rock crevices</li> <li>– fixed clutch sizes — mostly 2, sometimes 1</li> <li>– tropical species may produce several clutches, species in colder areas usually have only 1</li> <li>– typically abandon eggs</li> </ul> </li> <li>• development = 1-6 months depending on temp</li> <li>• some have TSD: high temp = male, low temp = female</li> <li>• hatchlings slit shells w/ paired egg teeth shed shortly after eclosion</li> <li>• geckos of New Zealand and 1 species in New Caledonia = viviparous, possess simple placenta. always produce twins which gestate for 4-14 months</li> </ul>
Ecological Role	
Conservation Status	<p>population estimates exist for only a few ? conservation status of most species unknown. island-dwelling geckos w/ limited distributions threatened by habitat destruction (ie deforestation), introduction of rats, cats, predatory mammals. only extinct known geckos = largest geckos, giant gecko of Round Island and Delcourt's giant gecko from New Zealand. large geckos once hunted for food. most modern consumption = medicinal. sold dried or pickled to increase vitality and cure ailments in China and SE Asia.</p>



## 3.2 Polychridae — Anoles

### 3.2.1 Anolis — Anoles

Taxonomy/Ancestry	<p>generally considered to be monotypic containing only <i>Anolis</i>, but recent genetic research identified several clades within <i>Anolis</i> which may sometimes be elevated to generic status: <i>Dactyloa</i>, <i>Deiroptyx</i>, <i>Ctenonotus</i>, <i>Xiphosurus</i>, <i>Norops</i>, <i>Chamaelinorops</i>, <i>Anolis</i>, <i>Audantia</i>. genus <i>Polychirus</i> was previously placed in the family under family name <i>Polychrotidae</i>, but recent genetic studies confirm it is not closely related and is now invalidated and classified as <i>Polychirus</i> in family <i>Iguanidae</i></p> <p>391 species in <i>Anolis</i>. displays considerable paraphyly but phylogenetic analysis suggests some subgroups/clades. several species of <i>Anolis</i> occasionally prescribed to proposed genus <i>Norops</i> but validity of <i>Norops</i> is sketchy.</p> <p>known for being remarkably adaptable — rapidly adapt behavior/morphology over ecological timescales. Presence of ground predator = selective gradient in favor of longer hindlimbs within a generation, followed by shorter hindlimbs as they tended to perch higher up. Cuban anole living in Florida rapidly adapted, as did native anoles. green anole moved to higher perches and adapted large toepads better suited for those — observed in just 20 generation.</p>																
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Kingdom:	Animalia																
Phylum:	Chordata																
Class:	Reptilia																
Order:	Squamata																
Suborder:	Iguania																
Family:	Dactyloidae																
Genus:	<b><i>Anolis</i></b>																
	Daudin, 1802																
Size	8-18 cm (3-7 in); some larger species can surpass 12 in or even reach 20 in																
Color	large majority sport green coloration (only species native to US = green anole). many can change color to a limited extent (only changing to 1 color), but the extent of the ability varies widely between species. they are often referred to as “American chameleons.”																
Anatomy	<ul style="list-style-type: none"> <li>• live b/w 4-8 yrs but may live beyond w/ proper care</li> <li>• males have <b>dewlaps</b> made of erectile cartilage extending from neck and throat areas (see behavior)</li> <li>• pads w/ several flaps of skin horizontally covered in microscopic hair-like protrusions (setae) which allow them to cling to surfaces like a gecko</li> </ul>																
Dimorphism	<p>green anole = female has pale dorsal stripe extending from neck to tail, smaller body, smaller head w/ shorter snout.</p> <p>brown anoles = share above characteristics w/ wider dorsal stripe, often diamond-shaped or w/ squiggly edges.</p> <p>stripes may be present in males, but always smaller and fainter. some females have pale, v small dewlaps.</p>																
Behavior	<ul style="list-style-type: none"> <li>• change color based on stress level, sun/light exposure, surroundings</li> <li>• use dewlaps as signal for attracting mates, winning contests, communicating condition</li> <li>• diurnal</li> <li>• utilize autotomy to escape predators at times</li> <li>• usually have small territories w/ basking area, shady area, high lookout, and place to hide <ul style="list-style-type: none"> <li>– do not tolerate other anoles within territory</li> <li>– raises spine, fans dewlap, does “push-ups” accompanied by hisses</li> <li>– males will fight by biting each others’ tails</li> </ul> </li> </ul>																
Habitat	semiarboreal, they usually inhabit regions 3-6 m (9.8-19.7 ft) high such as shrubs, walls, fences, bushes, short trees.																

Distribution	found throughout southeastern US, @ least as far west as San Antonio, Caribbean, Mexico, and other warm regions of western world. knight, green (only native), bark, Jamaican giant, and Cuban brown anoles can all be found in US, primarily Florida. most prevalent = Cuban brown, pushed native green/Carolina anole pop. further north. when green and brown inhabit same area, brown = primarily terrestrial/lower branches, green anoles = higher.
Feeding Ecology	live insects and other invertebrates, such as crickets, spiders, moths. opportunistic feeders — eat any attractive meal that is small enough.
Reproductive Biology	breeding takes place for several months beginning in the late spring. males employ head-bobbing and dewlap extension. they lay 1-2 small, soft-shelled eggs in leaf litter. multiple clutches can be laid at a time.
Ecological Role	<p>predators include skinks, cats, snakes, birds, sometimes other larger lizards. less susceptible to predation if they have a dewlap where both scales and skin in between match expected pale grey or white color of ventral surface.</p> <p>known for demonstrating ecomorphs — species w/ same structural habitat/niche, similar in morphology in behavior, not necessarily close phyletically. they show both adaptive radiation and convergent evolution, repeatedly evolving into similar forms on different islands.</p> <ul style="list-style-type: none"> <li>• Crown-giant - large body, large head, large sub-digital lamallae, inhabit uppermost canopy</li> <li>• Grass-bush - upper most reaches of trunks of tall trees and lower canopy, predominantly green, large sub-digital toe pads and short stout legs to aid in arboreal locomotion, have most drastic color-changing</li> <li>• Trunk - trunks of tall trees, mid-sized, short limbs/tails, all, short, triangular heads</li> <li>• Trunk-crown</li> <li>• Trunk-ground - perch on lower trunk of trees or rocks immediately under tree trunk, stocky w/ relatively large heads and long legs for jumping (jump onto prey on ground and retreat back into tree)</li> <li>• Twig</li> <li>• Primarily related to substrate diameter</li> </ul>
Conservation Status	green anole <i>A. carolinensis</i> became 1st reptile to have complete genome published. some species in Caribbean threatened due to small range. many non-native anoles introduced to new areas by humans; may outcompete indigenous species. function well as native pest control. may bite humans but rarely draw blood.



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### 3.3 Iguanidae — Iguanids

#### 3.3.1 Iguana — Green Iguana

Taxonomy/Ancestry	<p>subfamily Iguaninae. 2 species, widespread green iguana and endangered Lesser Antillean iguana.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Scientific classification</th> </tr> </thead> <tbody> <tr> <td>Kingdom:</td><td><b>Animalia</b></td></tr> <tr> <td>Phylum:</td><td><b>Chordata</b></td></tr> <tr> <td>Class:</td><td><b>Reptilia</b></td></tr> <tr> <td>Order:</td><td><b>Squamata</b></td></tr> <tr> <td>Suborder:</td><td><b>Iguania</b></td></tr> <tr> <td>Family:</td><td><b>Iguanidae</b></td></tr> <tr> <td>Genus:</td><td><b><i>Iguana</i></b></td></tr> <tr> <td colspan="2"><small>Laurenti, in 1768</small></td></tr> </tbody> </table>	Scientific classification		Kingdom:	<b>Animalia</b>	Phylum:	<b>Chordata</b>	Class:	<b>Reptilia</b>	Order:	<b>Squamata</b>	Suborder:	<b>Iguania</b>	Family:	<b>Iguanidae</b>	Genus:	<b><i>Iguana</i></b>	<small>Laurenti, in 1768</small>	
Scientific classification																			
Kingdom:	<b>Animalia</b>																		
Phylum:	<b>Chordata</b>																		
Class:	<b>Reptilia</b>																		
Order:	<b>Squamata</b>																		
Suborder:	<b>Iguania</b>																		
Family:	<b>Iguanidae</b>																		
Genus:	<b><i>Iguana</i></b>																		
<small>Laurenti, in 1768</small>																			
Size	1.5-1.8 m (5-6 ft) in length including tail. avg. male = 4 kg (8.8 lb); avg. female = 1.2-3 kg (2.6-6.6 lb).																		
Color	dewlap typically orange. yellow eyes. despite the name, green iguanas come in a variety of colors, <u>including green to lavender, blue, black, pink</u> .																		
Anatomy	<ul style="list-style-type: none"> <li>• row of spines running from back to tail</li> <li>• <b>parietal eye*</b> — tiny 3rd eye on head resembling a pale scale. functions as a light-sensing organ to help detect predators stalking from above.</li> <li>• <b>tuberculate scales*</b> — small scales resembling spokes behind necks</li> <li>• <b>sub-tympanic scale*</b> — large round scale on cheeks located below tympanum (eardrum) behind each eye</li> <li>• 3-chambered heart w/ 2 atria, 1 ventricle, 2 aortae w/ systemic circulation like most reptiles</li> <li>• skull and body show adaptations to herbivorous lifestyle (strong bite, efficient processing) <ul style="list-style-type: none"> <li>— taller/wider skulls</li> <li>— shorter snouts</li> <li>— larger bodies</li> <li>— <b>acrodontal teeth*</b> — sit on top of surface of jawbone, project upwards. small and serrated to hold food</li> </ul> </li> <li>• adults found on St. Lucia have many differences compared to other green iguanas <ul style="list-style-type: none"> <li>— light green w/ predominant black stripes</li> <li>— black dewlap</li> <li>— eyes white or cream</li> <li>— smaller scales to back of head near jawbone</li> <li>— typically lay 25 eggs instead of usual 50</li> </ul> </li> <li>• lateral nasal gland to supplement renal salt excretion by expelling excess potassium and sodium chloride. not capable of creating liquid urine more concentrated than bodily fluids, so they excrete nitrogenous wastes as urate salts thru salt gland.</li> </ul>																		
Dimorphism	males have 2 hemepenes. male has more developed femoral pores; longer and thicker spines																		

Behavior	<ul style="list-style-type: none"> <li>• navigate thru crowded forests using visual acuity to locate food</li> <li>• employ visual signals to communicate w/ others of same species</li> <li>• whip-like tails can be used to attack or for autotomy</li> <li>• dewlap helps regulate body temp, used in courtship and territorial displays</li> <li>• attempt to flee when frightened           <ul style="list-style-type: none"> <li>– may dive into nearby body of water and swim away</li> <li>– if cornered, will extend dewlap, stiffen/puff up body, hiss, and bob head @ predator</li> <li>– can lash w/ tail, teeth, claws; wounded more inclined to fight</li> </ul> </li> <li>• use head bobs and dewlaps in social situations — greeting/courting; frequency and # of head bobs = special meaning</li> <li>• males often use bodies to shield females from predators — only species of reptile that does this</li> </ul>
Habitat	arboreal, but often found near water. climb up trees but stay near ground during colder weather.
Distribution	native to tropical areas of Mexical, Central America, S. America, and Caribbean.
Feeding Ecology	<ul style="list-style-type: none"> <li>• primarily herbivores</li> <li>• require precise ratio of minerals — 2:1 calcium to phosphorus</li> <li>• forage exclusively on vegetation and foliage — turnip greens, mustard greens, dandelion greens, wild flowers, fruit, growing shoots of &gt;100 species of plant, wild plums, collards, butternut squash, acorn squash, mango, parsnip</li> <li>• juveniles often eat feces from adults to acquire microflora to process low-quality herbivorous foraging diet</li> <li>• some debate as to whether captive animals should be fed animal protein — can result in renal failure and other health problems</li> <li>• hunted by predatory birds</li> </ul>
Reproductive Biology	<ul style="list-style-type: none"> <li>• femoral pores secrete scent</li> <li>• males display dominant behaviors</li> <li>• oviparous</li> <li>• clutches of 20-71 eggs once per year during synchronized nesting</li> <li>• no parental protection after laying</li> <li>• in Panama, green iguana has been observed sharing nesting sites w/ American crocodiles and in Honduras w/ spectacled caimans</li> <li>• hatchlings emerge after 10-15 wks incubation</li> <li>• juveniles stay in familial groups for 1st year</li> </ul>
Ecological Role	
Conservation Status	lesser antillean endangered. enforcement of hunting regulations difficult, suffer from habitat loss to agriculture, predation by introduced animals, and competition from the invasive green iguana. iguanas sometimes used as food source.



### 3.3.2 Dipsosaurus — Desert Iguana

Taxonomy/Ancestry	monotypic genus — <i>D. dorsalis</i> . originates from “dipsa” — thirsty — and “saurus” — lizard. “dorsalis” = Latin “dorsum” = spike.																		
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Kingdom:	Animalia																		
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Suborder:	Iguania																		
Family:	Iguanidae																		
Genus:	<i>Dipsosaurus</i>																		
	Hallowell, 1854																		
Species:	<b><i>D. dorsalis</i></b>																		
Size	blunt, medium-sized — 61 in (24 cm) long																		
Color	Pale grey-tan to cream w/ light brown reticulated (net) pattern on backs and sides. reticulated pattern becomes brown spots near back legs, then tail stripes. sides become pinkish during breeding season.																		
Anatomy	row of keeled dorsal scales going down back (become slightly larger over back).																		
Dimorphism																			
Behavior	scamper into shrub and go down burrow when threatened.																		
Habitat	<ul style="list-style-type: none"> <li>• habitat confined within range of the creosote bush</li> <li>• dry, sandy desert scrubland below 1,000 m (3,000 ft)</li> <li>• can also be in rocky streambeds up to 1,000 m</li> <li>• southern portion = areas of arid subtropical scrub and tropical deciduous forest</li> <li>• can withstand high temp, often out after other lizards shelter</li> <li>• use burrows <ul style="list-style-type: none"> <li>– dug in sand under bushes</li> <li>– often borrow burrows of kit foxes and desert tortoises</li> </ul> </li> </ul>																		
Distribution	Sonoran and Mojave deserts of southwestern US and northwestern Mexico. occur on several <u>Gulf of California islands</u> .																		
Feeding Ecology	herbivorous. buds, fruits, leaves of annual and perennial plants, especially yellow creosote bush flowers.																		
Reproductive Biology	mate in early spring, producing 1 clutch of eggs per year of 3-8 eggs. hatchlings emerge around September.																		
Ecological Role	consumed by birds of prey, foxes, rats, long-tailed weasels, some snakes, humans.																		
Conservation Status	LC. sometimes used as a meat source by humans.																		



### 3.3.3 Sauromalus — Chuckwalla

Taxonomy/Ancestry	6 species. comes from Greek “sauros” — lizard — and “omalus” — flat. “chuckwalla” comes from Shoshone “tcaxxwal” or Cahuilla “caxwal” transcribed by Spaniards as “chacahuala”																
	<div style="background-color: #e0f2e0; padding: 10px;"> <p style="text-align: center;"><b>Scientific classification</b> </p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Kingdom:</td> <td><b>Animalia</b></td> </tr> <tr> <td>Phylum:</td> <td><b>Chordata</b></td> </tr> <tr> <td>Class:</td> <td><b>Reptilia</b></td> </tr> <tr> <td>Order:</td> <td><b>Squamata</b></td> </tr> <tr> <td>Suborder:</td> <td><b>Iguania</b></td> </tr> <tr> <td>Family:</td> <td><b>Iguanidae</b></td> </tr> <tr> <td>Genus:</td> <td><b><i>Sauromalus</i></b></td> </tr> <tr> <td></td> <td>Dumeril, 1856</td> </tr> </table> </div>	Kingdom:	<b>Animalia</b>	Phylum:	<b>Chordata</b>	Class:	<b>Reptilia</b>	Order:	<b>Squamata</b>	Suborder:	<b>Iguania</b>	Family:	<b>Iguanidae</b>	Genus:	<b><i>Sauromalus</i></b>		Dumeril, 1856
Kingdom:	<b>Animalia</b>																
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Family:	<b>Iguanidae</b>																
Genus:	<b><i>Sauromalus</i></b>																
	Dumeril, 1856																
Size	common chuckwalla measures $15\frac{3}{4}$ in. long																
Color	see sexual dimorphism.																
Anatomy	<ul style="list-style-type: none"> <li>• stocky, wide-bodied w/ flattened midsections, prominent bellies</li> <li>• may live for 25 yrs or more</li> <li>• thick tails tapering to blunt tip</li> <li>• loose folds of skin along neck and body</li> <li>• small, coarsely granular scales</li> </ul>																
Dimorphism	males — reddish-pink to orange, yellow, or light grey bodies + black heads, shoulders, and limbs; larger and possess well-developed femoral pores on inner sides of thighs. females/juveniles — bodies w/ scattered spots or contrasting bands of light/dark in shades of grey or yellow.																
Behavior	<ul style="list-style-type: none"> <li>• run from potential threats and wedge into tight rock crevice and inflate self</li> <li>• males seasonally + conditionally territorial <ul style="list-style-type: none"> <li>– abundant resources = hierarchy based on size</li> <li>– combo of color + physical displays (e.g. push-ups, head-bobbing, gaping of mouth) communicate/defend territory</li> </ul> </li> <li>• diurnal</li> <li>• ectothermic* — spend most of mornings/winter days basking</li> <li>• hibernate during cooler months, emerge in February</li> </ul>																
Habitat	prefer lava flows + rocky areas vegetated by creosote bush and other drought-tolerant scrub. may be found at elevations up to 4,500 ft (1,370 m)																
Distribution	wide distribution in biomes of Sonoran + Mojave deserts. common chuckwalla ( <i>S. ater</i> ) = greatest range from SoCal east to southern Nevada and Utah and Western Arizona, and south to Baja California + northwestern Mexico. peninsular chuckwalla ( <i>S. australis</i> ) found on eastern portion of southern half of Baja California Peninsula. other species island-dwelling found off coast of Baja California or in Gulf of California, believed to have been translocated to some islands by Comcaac (Seri) ppl as food source.																
Feeding Ecology	primarily herbivorous, feed on leaves, fruit, flowers of annuals + perennial plants. they are said to prefer yellow flowers. insects = supplementary prey.																
Reproductive Biology	mating takes place from April-July. 5-16 eggs are laid b/w June and August, which hatch in late September.																
Ecological Role	fed on by coyotes/other mammals, larger avian predators, snakes.																
Conservation Status	2 LC; 1 NT; 2 EN; 1 NE. Angel Island species eaten by Comcaac (Seri) ppl.																



Figure 1: Male chuckwalla



Figure 2: Female chuckwalla

### 3.4 Crotaphytidae — Collared Lizard

Taxonomy/Ancestry	now considered a subfamily of iguanidae.  <table border="1"><thead><tr><th colspan="2">Scientific classification</th></tr></thead><tbody><tr><td>Kingdom:</td><td>Animalia</td></tr><tr><td>Phylum:</td><td>Chordata</td></tr><tr><td>Class:</td><td>Reptilia</td></tr><tr><td>Order:</td><td>Squamata</td></tr><tr><td>Suborder:</td><td>Iguania</td></tr><tr><td>Clade:</td><td>Pleurodonta</td></tr><tr><td>Family:</td><td><b>Crotaphytidae</b></td></tr><tr><td colspan="2">H.M. Smith &amp; Brodie, 1982</td></tr><tr><th colspan="2">Genera</th></tr><tr><td colspan="2"><i>Crotaphytus</i></td></tr><tr><td colspan="2"><i>Gambelia</i></td></tr></tbody></table>	Scientific classification		Kingdom:	Animalia	Phylum:	Chordata	Class:	Reptilia	Order:	Squamata	Suborder:	Iguania	Clade:	Pleurodonta	Family:	<b>Crotaphytidae</b>	H.M. Smith & Brodie, 1982		Genera		<i>Crotaphytus</i>		<i>Gambelia</i>	
Scientific classification																									
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H.M. Smith & Brodie, 1982																									
Genera																									
<i>Crotaphytus</i>																									
<i>Gambelia</i>																									
Size	8-15(20-38 cm) in length.																								
Color	collared — bands of black around neck and shoulders.																								

Anatomy	<ul style="list-style-type: none"> <li>• femoral pores</li> <li>• small interparietal scale</li> <li>• NO bony lines or projecting ridges</li> <li>• long limbs and tails</li> <li>• large head and powerful jaws</li> <li>• live 5-8 years</li> <li>• pleurodont teeth</li> </ul>
Dimorphism	males have a blue-green body and light brown head. female's have a light brown head and body.
Behavior	<ul style="list-style-type: none"> <li>• quick runners; record = 16 mph (26 km/h)</li> <li>• known for standing on hind legs and exhibit unusual form of saltatory bipedalism* to jump b/w boulders</li> <li>• if 2 males are placed in the same cage, they will fight to the death</li> <li>• undergo brumation</li> <li>• emit squealing vocalizations when stressed, which is unknown among other iguanians</li> </ul>
Habitat	desert-dwelling in arid, open regions.
Distribution	native to Southwestern US and northern Mexico — Missouri, Texas, Arizona, Kansas. full extent = Ozark Mountains to SoCal.
Feeding Ecology	Crotaphytids are carnivores. Crotaphytus (collared lizard) species feed primarily on insect and small vertebrates. Species of Gambelia (the leopard lizards) are particularly noted for feeding on other reptiles, especially smaller iguanian lizards.
Reproductive Biology	In a few species (e.g. <i>Gambelia wislizeni</i> , <i>Crotaphytus collaris</i> ), the females' orange spots brighten during shortly before oviposition, and fade between clutches. In at least one <i>Crotaphytus</i> species, males have been observed licking females during courtship.
Ecological Role	predators: other lizards, birds (eg roadrunners), coyotes, cats, carnivorous mammals.
Conservation Status	not threatened or endangered. common collared lizard = Oklahoma state reptile. known as "mountain boomer," possibly b/c settlers mistook sound of wind for lizard calls.



### 3.5 Phrynosomatidae — Earless, spiny, tree, side-blotched, horned lizards

#### 3.5.1 *Sceloporus* — Spiny Lizards

Taxonomy/Ancestry	<p><b>Scientific classification</b> </p> <p>Kingdom: Animalia      Phylum: Chordata      Class: Reptilia      Order: Squamata      Suborder: Iguania      Family: Phrynosomatidae      Genus: <b><i>Sceloporus</i></b>      Wiegmann, 1828</p> <p><b>Synonyms</b></p> <ul style="list-style-type: none"> <li>• <i>Sator</i> Dickerson, 1919</li> </ul>
Size	up to 5.6 in
Color	<p>base coloration = grey, tan, brown.</p> <ol style="list-style-type: none"> <li>adult male — blue/violet patches on belly + throat, green/blue color on tail + sides</li> <li>female/juvenile — large combined dark spots on black/belly areas</li> <li>brownish/yellow triangular spots on shoulders</li> <li>winter = darker colors to absorb heat</li> <li>summer = lighter to reflect radiation</li> </ol>
Anatomy	large, pointed, keeled*, overlapping scales w/ sharp spines
Dimorphism	see color.
Behavior	<ul style="list-style-type: none"> <li>adjust internal temp by changing color</li> <li>camouflage</li> <li>basks on rocks/hard surfaces</li> <li>shelters underground in burrows or under cover during hottest part of day in summertime</li> <li>hibernates in late fall and during cold months of winter, re-emerges in spring</li> <li>good climber</li> <li>males territorial, stand tall, expose blue throat, and do push-up display</li> <li>autotomy</li> </ul>
Habitat	<ul style="list-style-type: none"> <li>biotic communities like Sonoran desertscrub, Great Basin desertscrub, semidesert grassland, interior chaparral, and woodlands</li> <li>usually encountered on lower slopes</li> <li>in tree branches or vicinity of ground cover (eg wood piles, rock piles, packrat nests)</li> </ul>
Distribution	ranges across deserts of southwestern Arizona and northeastern plateaus. elevations from near sea level around Colorado River to 5000.
Feeding Ecology	<ul style="list-style-type: none"> <li>feeds on insects</li> <li>ants, beetles, caterpillars, spiders, centipedes, small lizards</li> <li>occasionally small lizards, nesting birds, leaves, flowers, berries</li> </ul>

Reproductive Biology	<ul style="list-style-type: none"> <li>• sexually mature at 2-3 years</li> <li>• breed in spring, early summer — generally May/June, sometimes until August</li> <li>• clutch of 3-19 eggs laid May-August</li> <li>• hatch August-September, sometimes October</li> <li>• females lay more than 1 clutch</li> </ul>
Ecological Role	
Conservation Status	no issues.



### 3.5.2 Cophosaurus and Holbrookia — Earless Lizards

Taxonomy/Ancestry	cophosaurus = greater earless lizards. 1 species: <i>C. texanus</i> holbrookia = lesser eared lizards, named for zoologist John Edwards Holbrook. 3 recognized species.
Size	greater: $2\frac{3}{4}$ to $7\frac{1}{4}$ in lesser: up to 70 mm (2.75 in)
Color	skin coloration typically matches habitat soil, sprinkled w/ light brown dots. the greater's tail is mostly black underneath, and the lesser's tail is plain white underneath. in the lesser, 2 black bars mark the lower side of the body around the forelimb.
Anatomy	
Dimorphism	in the greater, the male has 2 distinct black lines anterior to the hind legs that wrap onto the ventral side and stop abruptly. females/juveniles have a distinct dark stripe on the back side of each thigh. pregnant females have lighter coloration on the flanks. in the lesser, 2 black bars mark the lower side of the body around the forelimb. females often have a peach/pink tint w/ an orange throat patch.
Behavior	<ul style="list-style-type: none"> <li>• both are diurnal</li> <li>• the greater is extremely active at all times of day, even the hottest hours <ul style="list-style-type: none"> <li>– only hides during cloudy days</li> <li>– fast; raises tail as it runs and waves tail when it slows or halts</li> <li>– rarely stops on flat, open ground; prefers rocks/boulders</li> <li>– coloration blends into rocks and soil</li> <li>– not very wary; can stop for long time before running from approacher</li> </ul> </li> <li>• the lesser is most active in the mid-morning and late afternoon during the hottest summer months <ul style="list-style-type: none"> <li>– hibernates during cold months of winter, late fall</li> </ul> </li> </ul>
Habitat	<ul style="list-style-type: none"> <li>• the greater is terrestrial, inhabiting deserts/dunes and rocky areas such as desert flats, streambeds, limestone cliffs</li> <li>• the lesser has communities ranging from semidesert grassland, interior chaparral, into woodlands <ul style="list-style-type: none"> <li>– enters Arizona upland Sonoran desertscrub in some localities</li> <li>– usually encountered on level terrain in open, sunlit areas w/ sparse vegetation, sandy/gravelly soil</li> </ul> </li> </ul>
Distribution	<ol style="list-style-type: none"> <li>1. greater: found west of Fort Worth/Austin to eastern Trans-Pecos area in Texas, into Arizona and N. Mexico. absent from eastern Texas, Lower Rio Grande Valley, Panhandle</li> <li>2. lesser: Distributed across northeastern plateau region, portion of Arizona strip, sub-Mogollon rim central Arizona, and northernmost sky islands in SE portion. found at elevation ranging from 2,200' to 7,000'.</li> </ol>
Feeding Ecology	insectivores. consume grasshoppers, beetles, bees, wasps, ants, butterflies, moths, spiders, small lizards.
Reproductive Biology	<ol style="list-style-type: none"> <li>1. greater: lay eggs Mar-Aug, take 50 days to hatch; 3 clutches/season. rarely reaches 2 years of age.</li> <li>2. lesser: spring mating, 1-2 clutches laid in spring/summer. 1-10 eggs/clutch.</li> </ol>
Ecological Role	
Conservation Status	considered LC or NT.



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### 3.5.3 Uma — Fringe-Toed Lizards

Taxonomy/Ancestry	
Size	
Color	brown/tan/grayish coloration w/ contrasting pattern of black splotches/eyespots on dorsal. pale underside w/ black bars on underside of tail, black mark on lower sides.
Anatomy	<ul style="list-style-type: none"> <li>• fringe on toes helps them run quickly over sand, stop from sinking</li> <li>• dorsal surface = velvety, intricate markings w/ granular scales to help bury in sand</li> <li>• upper jaws overlap w/ lower and nostrils can be closed at will to prevent intrusion of sand particles <ul style="list-style-type: none"> <li>– flaps close against ear openings</li> <li>– lower eyelids have interlocking scales</li> </ul> </li> </ul> 
Dimorphism	males have 2 enlarged postanal scales, distinct femoral pores, hemipenal bulge. females have more pronounced pinkish coloration on sides during mating season
Behavior	<ul style="list-style-type: none"> <li>• run quickly across dunes</li> <li>• parietal eye thought to help self-monitor level of solar radiation</li> <li>• often basks w/ only head above sand until body temp warms enough to unbury body and start activity</li> <li>• typically burrow into sand or under bush in defense</li> <li>• not communal, but a hierarchy will develop among individuals forced to coexist within a confined space; dominance is established through aggression displays and fighting, and results in a hierarchy in which a single dominant male has several equal subordinates, with additional tiers of less dominant individuals below the subordinates</li> <li>• both male and female <i>Uma inornata</i> maintain home territories; the territory of an average adult male is about 1070 square meters, while that of an average adult female is about 437 square meters. Territory size has been found to be proportional to snout vent length, with younger lizards maintaining proportionally smaller territories than their adult counterparts</li> <li>• frightened lizard may either retreat into a nearby rodent burrow or dive beneath the sand. In addition, lizards in the genus <i>Uma</i> have been observed running bipedally over the sand when fleeing predators at high speeds.</li> </ul>
Habitat	low desert areas w/ fine, loose sand, including dunes, flats with sandy hummocks formed around the bases of vegetation, washes, and the banks of rivers. needs fine, loose sand for burrowing.
Distribution	range thru SE California, SW Arizona, extend into NW Sonora and NE Baja California.
Feeding Ecology	primarily insectivores: ants, beetles, grasshoppers, caterpillars. also eat flower buds, stems, leaves, plant seeds. varies on an annual cycle, with a primary diet of flowers and plant-dwelling arthropods during the spring and a primary diet of ground-dwelling arthropods and leaves during the summer. During the month of May (the peak of the breeding season) male and female diets differ significantly, with females specializing in energy maximizing foods (anything with high nutritional value) and males specializing in time minimizing foods (usually easily located flowers and plant matter). individuals will also consume their own or others' shed skins if encountered.
Reproductive Biology	lays 1-5 eggs from May-July. Male reproductive success has been found to be influenced heavily by precipitation and food supply; in years of low winter precipitation and inadequate nutrition, testes of <i>Uma inornata</i> do not become reproductively active. sexually mature at 2 years of age. no parental care.
Ecological Role	eaten by the American Kestrel and Loggerhead Shrike.

Conservation Status	The Coachella Valley fringe-toed lizard is listed on the U.S. Endangered Species Act List as threatened, and on the IUCN Red List as endangered ( <i>Uma inornata</i> is not listed on the CITES appendices). Causes of the fringe-toed lizard's status are numerous, and include habitat fragmentation, drought, and scouring. Both the 3,709 acre Coachella Valley National Wildlife Refuge and the adjacent 16,405 acre Coachella Valley Preserve have been established to protect the remaining areas in which <i>Uma inornata</i> still occurs. In addition, concerns about movement of sand off from protected habitat areas are being addressed through the Coachella Valley Multispecies Habitat Conservation Plan and the Conceptual Area Protection Plan.
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### 3.5.4 Urosaurus and Uta — Tree and Side-Blotched Lizards

Taxonomy/Ancestry	
Size	<ul style="list-style-type: none"> <li>uta: males up to 60 mm (2.4 in), females a little smaller</li> <li>urosaurus: 4.7-6.6 cm (1 7/8-2 3/5 in)</li> </ul>
Color	<ul style="list-style-type: none"> <li>in uta, the degree of pigmentation varies w/ sex and population <ul style="list-style-type: none"> <li>some males have blue flecks spread over backs and tails, sides may be yellow or orange, others may be unpatterned</li> <li>females may have stripes along dorsal/sides or be plain</li> <li>prominent blotch on sides just behind front limbs</li> <li>blue-black mark present on sides of chest behind front limbs</li> </ul> </li> <li>urosaurus is greyish, light brown, or beige, and is able to quickly change from light to dark</li> </ul>
Anatomy	small scales, larger keeled scales down the back. gular fold* across throat. long thin tales. live for about a year.
Dimorphism	see color.
Behavior	<ul style="list-style-type: none"> <li>diurnal, tolerant of heat</li> <li>active from: <ul style="list-style-type: none"> <li>uta: active whenever temp is warm (all yr in southern deserts, semi-arid regions), inactive when cold</li> <li>urosaurus: active from Mar-fall</li> </ul> </li> <li>basking <ul style="list-style-type: none"> <li>uta: often found basking on rocks</li> <li>urosaurus: often found basking on lower branches</li> </ul> </li> <li>defense <ul style="list-style-type: none"> <li>uta: relies on coloring, so isn't very wary; also autotomy</li> <li>urosaurus: relies on camouflage to disguise, runs away or to other side of branch when spotted</li> </ul> </li> <li>uta is known for its <b>morphs</b> <ul style="list-style-type: none"> <li><b>orange-throated male</b> — ultradominant, establish territory w/ multiple females, largest/most aggressive</li> <li><b>blue-throated male</b> — dominant, intermediate size, guard smaller territory w/ 1 female; better at catching yellow-throated but vulnerable to having female stolen by orange-throated</li> <li><b>yellow-throated male</b> — sneakers, mimic females to steal mates from orange-throated, smaller size; may under specific circumstances transform into blue-throated</li> <li>because 1 male morph does particularly well against another, but poorly against the 3rd (rock-paper-scissors), a cycle is created where the least common morph of 1 breeding season has the most offspring for the next</li> <li><b>orange-throated female</b> — r-strategists producing large clutches w/ many small eggs; more successful at lower population densities w/ less competition, less predators</li> <li><b>yellow-throated female</b> — k-strategists producing small clutches w/ larger eggs; more successful at higher population densities w/ high predation</li> </ul> </li> </ul>
Habitat	prefer open rocky areas w/ scattered vegetation. utilizes a wide variety of habitats, including hardpan, sandy, rocky, and loamy areas grown with chaparral, scattered trees, grass, shrubs, and cactus. urosaurus: favor creosote bushes w/ large exposed roots and spends night in burrows under shrub or in sand or at tips of branches, occasionally foraging on the ground.

Distribution	ranges through most of California south of the Bay Area, all of Nevada, eastern Oregon, south-western Idaho, central Washington, most of Utah, the western edge of Colorado, much of New Mexico the west part of Texas, north-central Mexico, along the west coast of Sonora, all of Baja California and many of its islands
Feeding Ecology	insectivorous beetles, ants, spiders, scorpions, ticks. may eat plants for water or by accident.
Reproductive Biology	mate in spring, producing 1-7 clutches of 1-8 eggs laid March-August. females can store sperm to fertilize eggs later. juveniles hatch June-September, breeding the following spring.
Ecological Role	
Conservation Status	

**Urosaurus:**



**Uta:**

