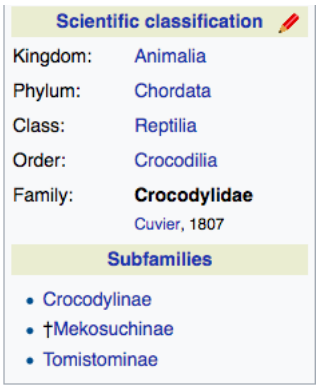
Contents

1 Crocodylia

1.1 Crocodylidae — Crocodiles

Taxonomy/Ancestry	• subfamilies – crocodylinae, mekosuchinae (ex.), tomistominae • **tomistominae** – false gharial; genetic evidence suggests they are closer to the gharials so they may be reclassified into the Gavialidae family • 3 extant genera; 16-17 species • Ancient Greek = "lizard of the Nile" • separated from other crocodilians during Eocene epoch 55 million years ago • closest living relatives are birds 
Size	5-20 ft (1.5-6.1 m) weigh up to 2000 lb (900 kg) juveniles 20 cm (7.9 in)
Color	
Anatomy	• diapsid skull • dorsal scales backed by osteoderms from heavy armor plating on neck and back • tail strongly muscled and flattened for swimming • aquatic adaptations – nostril/ear valves – nictitating membrane to cover eye – glottal valve in throat – able to concentrate and excrete salt; salt glands on tongue filter salt to allow for survival in saltwater environments • webbing on toes of the hind feet speeds swimming + gives advantage on dry land • cerebral cortex w/ 4-chambered heart • slit pupils w/ tapetum lucidum • teeth are replaced throughout lifespan • poikilothermic + ectothermic • live 70-80 yrs • distinguishing from alligators – narrower + longer heads – v-shaped snouts – lower teeth protrude when mouth closed – large 4th tooth visible – salt glands = saltwater habitat – sensory pits all over body – jagged fringe on hind legs + feet – more aggressive + dangerous
Dimorphism	males grow larger + faster

Behavior	• nocturnal hunter-scavengers • often bask on shoreline • aestivate during drought or arid conditions • adult males bellow, growl, or hiss for dominance • hatchlings grunt, squawk, communicate thru ultrasound
Habitat	Hill streams, large rivers, marshes, ponds, lakes, canals, reservoirs, saline habitats (i.e. mangrove creeks/saltpans) Deep water = safety + drought resistance but some species live in places where water regularly dries (Crocodylus suchus) by living in deep tunnels or caves; drought can also force species to move inland
Distribution	tropical + subtropical regions in Africa, Asia, Americas, Australia
Feeding Ecology	• opportunistic apex of the food chain • young are agile + can jump to eat dragonflies, termites, spiders, other insects • adolescents begin to feed on crabs, fish, frogs, reptiles, birds, + mammals • scavenge for carrion • teeth/jaws designed for seizing, tearing, + crushing rather than chewing • some species have narrow jaws + sharp teeth to hunt fish • Sensory pores in or around mouth to help detect prey • Some species herd fish to shore w/ their bodies, often communally • Control predators of commercially important fish + help maintain cleanliness as scavengers

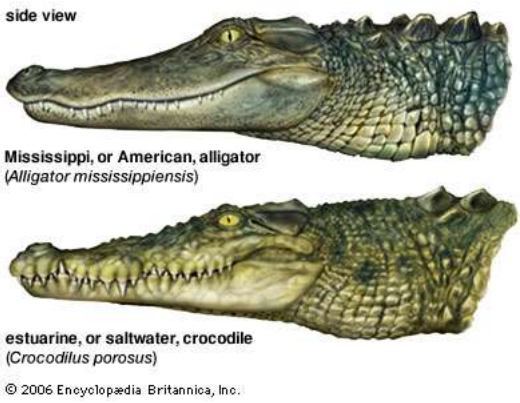
Reproductive Biology	• males defend territories + compete for mates
	• fixed breeding seasons where males mate w/ multiple females
	• females lay eggs 40-70 days after mating; incubation period depends on nest temp (avg. 60-90 days)
	  – higher temperatures = male, lower temperatures = female
	  – **hole-diggers** – 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
	  – **mound-nesters** – 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
	• females, sometimes males, guard nest during incubation
	• young call w/ quacking grunts when ready to emerge so parents release young and carry to water
	• young are cared for in creche formation w/ parents guarding young for 90 days
	• adults are conditioned to respond to young distress calls
	• mortality rate = 90% due to predators

Conservation Status	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. In Ancient Egypt (Sobek and Taweret), Hinduism (Varuna, Ganga, Yamuna, Goa), Aztec (Cipactli)

1.2 Alligatoridae — Alligators

Taxonomy/Ancestry	subfamilies: • **alligatorinae** – true alligators; only 1 of 10 genera currently extant; represented today by *A. mississippiensis* in US and *A. Sinesis* in China • **caimaninae** – caimans in C. and S. America  **Scientific classification** Kingdom: Animalia Phylum: Chordata Class: Reptilia Order: Crocodilia *Clade*: Globidonta Family: **Alligatoridae** Gray, 1844 **Subfamilies** • Alligatorinae • Caimaninae
Size	alligator: 5-20 ft (1.5-6.1 m) caiman: average maximum weight of 6 to 40 kg (13 to 88 lb) depending on species, with the exception of the black caiman (Melanosuchus niger), 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.
Color	
Anatomy	• diapsid skull • armored w/ osteoderms and large scales that do not overlap • forelimbs are smaller and weaker with 5 partially-webbed toes • distinguishing from crocodiles: – wider, shorter heads w/ more obtuse snouts – 4th enlarged underjaw tooth fits into pit in upper jaw –¿ no teeth visible when mouth closed – no jagged fringe on hind legs + feet – sensory pits appear only on snout and face, not neck and body – toes of hind feet webbed not more than halfway to tips – intolerant to salinity – generally less aggressive and dangerous – partake in foliage and fruit in addition to fish and meat • caiman characteristics: – no bony septum b/w nostrils – ventral armour composed of overlapping bony scutes formed from two parts united by a suture – 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.
Dimorphism	males larger and grow faster.

Behavior	• ectotherms basking on shoreline • float on surface of water • become more subdued as temperatures drop but do not hibernate, making use of burrows in the winter months • 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. • **high walk**: 4-limbed forward motion used for overland travel w/ belly up from the ground • alligator holes in the wetlands increase plant diversity and provide habitats for other animals during droughts
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	• opportunistic scavenger-hunters • juveniles mainly eat snails and other invertebrates • Typical adult diet = fish, small mammals, other reptiles (including smaller alligatorids), and birds, occasionally continuing to eat snails/invertebrates • Predation typically occurs among eggs and hatchlings • Racoons, coati, foxes, skunks, and other mammals, snakes, and various raptors, can raid nests or take hatchlings • occasional cannibalism, but rare • larger alligators help control coypu population
Reproductive Biology	• spring reproductive season • courtship rituals thru loud bellowing choruses, vibrations of the male trunk • use vegetables to construct nest mounds • 12-60 eggs depending on species • egg-laying once a year in midsummer, w/ eclosion 1-2 months afterward • females respond to noises from eggs and assist offspring. offspring also use egg teeth for eclosion. • females remain w/ offspring for up to 1 year. • TSD is associated w/ several species, such as American alligator and common caimans. ¡88degF/31degC = female; ¿90degF/32degC = male. natural sex ratio of 5:1 female:male. • Muja = oldest known in Serbia
Conservation Status	• raised commercially for their meat and skin • ecotourism industry • in Louisiana, heavy grazing by coypu and muskrat are damaging coastal wetlands • Chinese alligator critically endangered; Louisiana and Florida zoos have some in captivity they are trying to preserve


side view
Mississippi, or American, alligator
(Alligator mississippiensis)
estuarine, or saltwater, crocodile
(Crocodilus porosus)
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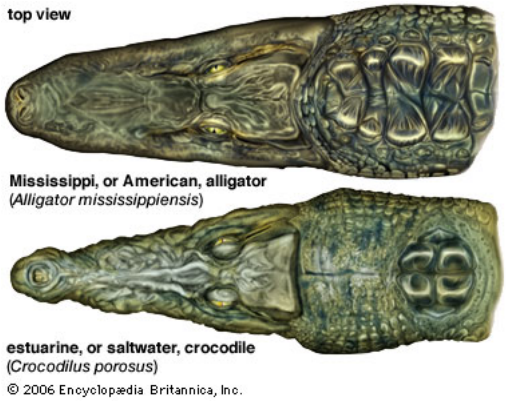
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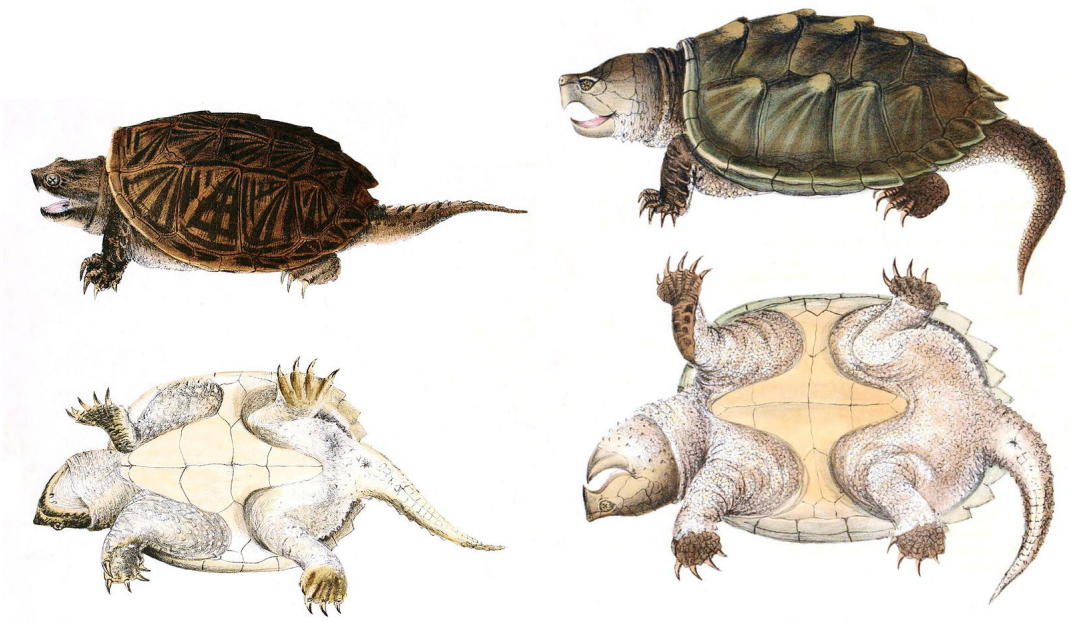
2 Testudines

2.1 Chelydridae — Snapping Turtle

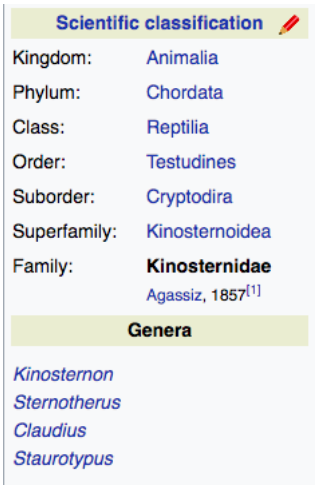
Taxonomy/Ancestry	7 extinct, 2 extant genera. **chelydra** – 3 species native to the Americas **macrochelys** – much larger alligator snapping turtle, 2 species exclusively N. American forming the largest freshwater turtles in N. America. A 3rd species has been proposed, the Apalachicola. • Most closely related to Platysternidae (big-headed turtles) • Sometimes considered as subfamilies within the same family, but genetic evidence supports recognition as separate families • Fossil record dating from Paleocene of N. America and Oligocene of Eurasia • *Chelydra* is known from as far back as the Pliocene in N. America • *Macrochelys* is known from as far as early Miocene **Scientific classification** Kingdom: Animalia Phylum: Chordata Class: Reptilia Order: Testudines Suborder: Cryptodira *Clade*: Americhelydia Family: **Chelydridae** Gray, 1831[2] **Genera** • *Chelydra* • *Macrochelys* • †*Acherontemys* • †*Chelydrops* • †*Chelydropsis* • †*Emarginachelys* • †*Macrocephalochelys* • †*Planiplastron* • †*Protochelydra*
Size	7.1-31.5 in (18-80 cm); up to 249 lb (113 kg)
Color	
Anatomy	• long tail • 3 rows of tubercles* • hooked beak • kelled*, posteriorly separated carapace • reduced, cruciform*, hingeless plastron • heavy claws • 11 marginal scutes on each side of the carapace • abdominal scutes on plastron reduced; not in contact medially • carapace and plastron connected by narrow bony bridge • posterior skull roof deeply emancipated 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".

Dimorphism	males larger than females
Behavior	• vicious temperament; since they are on top of the food chain, they have little fear • snapping jaws used against prey and predators • highly aquatic but leave water to nest or travel over land to reach new habitats or lay eggs • diurnal, but nocturnal activity rare in northern populations • 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. • 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). • 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.
Habitat	Common habitats are shallow ponds or streams. Some may inhabit brackish environments, such as estuaries.
Distribution	**common snapping turtle**: southeastern Canada, southwest to the edge of the Rocky Mountains, as far east as Nova Scotia and Florida. **alligator snapping turtle**: 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. Located from sea level to 2000 m elevation.
Feeding Ecology	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. 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

Reproductive Biology	Courtship is variable and poorly developed and may include direct mounting, following of the female, face-offs/head-swaying, etc. 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. 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.
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	**common snapping turtle**: 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. **alligator snapping turtle**: 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.



2.2 Kinosternidae — Musk and Mud Turtles

Taxonomy/Ancestry	• 24 species within 4 genera, but taxonomic reclassification ongoing • *kinosternon* — "mud turtles," small aquatic turtles from the Americas • *sternotherus* — "musk turtles," endemic to N. America, closely related to *kinosternon* • *claudius* — only extant species is narrow-bridged musk turtle found in Mexico, Guatemala, and Belize • *staurotypus* — Mexican musk turtles; giant musk turtles; three-kelled musk turtles; 2 recognized species found in Mexico and Central America 
Size	typically small, 10-15 cm (3.9-5.9 in) in length, but *staurotypus* 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	• tall, highly domed upper carapace w/ distinct keel down center • plastron differs by species – 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. – some species have plastron covering only part of lower body; others have large plastron almost entirely concealing undersides • barbles* hanging from chin • glands/sacs along side produce characteristic musky substance (smells like skunk spray)
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	• aquatic for majority of lifespan • slow swimmers • travel to land for nesting or to feed during rainy season • some diurnal, others nocturnal • hibernation/estivation: – 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 – warm, wet climates –¿ active all year – 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

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	• no courtship rituals; mating takes place in water • females go onto land to nest. they may either bury eggs in a hole they dig or simply lay eggs on surface leaves. • lay 3-6 hard-shelled eggs during late spring and early summer • up to 6 clutches per year • 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 • hatch 75 days to a year after being laid • TSD: medium temperatures produce male offspring; females are produced by extremes • post-eclosion, some species winter in subterranean nest and truly emerge in spring • 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.
Ecological Role	
Conservation Status	4 VU; US Fish and Wildlife lists flatted musk turtle as Threatened. However, most species are quite common in their own habitats.