

= Crocodilia =

The Crocodilia (or Crocodylia) are an order of mostly large , predatory , semiaquatic reptiles . They appeared 83 @.@ 5 million years ago in the Late Cretaceous period (Campanian stage) and are the closest living relatives of birds , as the two groups are the only known survivors of the Archosauria . Members of the order 's total group , the clade Pseudosuchia , appeared about 250 million years ago in the Early Triassic period , and diversified during the Mesozoic era . The order Crocodilia includes the true crocodiles (family Crocodylidae) , the alligators and caimans (family Alligatoridae) , and the gharial and false gharial (family Gavialidae) . Although the term ' crocodiles ' is sometimes used to refer to all of these , a less ambiguous vernacular term for this group is crocodilians .

Large , solidly built , lizard @-@ like reptiles , crocodilians have long flattened snouts , laterally compressed tails , and eyes , ears , and nostrils at the top of the head . They swim well and can move on land in a " high walk " and a " low walk " , while smaller species are even capable of galloping . Their skin is thick and covered in non @-@ overlapping scales . They have conical , peg @-@ like teeth and a powerful bite . They have a four @-@ chambered heart and , somewhat like birds , a unidirectional looping system of airflow within the lungs , but like other non @-@ avian reptiles they are ectotherms .

Crocodilians are found mainly in lowlands in the tropics , but alligators also live in the southeastern United States and the Yangtze River in China . They are largely carnivorous , the various species feeding on animals such as fish , crustaceans , molluscs , birds , and mammals ; some species like the Indian gharial are specialised feeders , while others like the saltwater crocodile have generalised diets . Crocodilians are typically solitary and territorial , though cooperative feeding does occur . During breeding , dominant males try to monopolise available females . Females lay eggs in holes or in mounds and , unlike most other reptiles , care for their hatched young .

Eight species of crocodilians are known to have attacked humans . The largest number of attacks comes from the Nile crocodile . Humans are the greatest threat to crocodilian populations through activities that include hunting and habitat destruction , but farming of crocodilians has greatly reduced unlawful trading in wild skins . Artistic and literary representations of crocodilians have appeared in human cultures around the world since at least Ancient Egypt . The earliest known mention of the story that crocodiles weep for their victims was in the 9th century ; it was later spread by Sir John Mandeville in 1400 and then by William Shakespeare in the late 16th century and early 17th century .

= = Spelling and etymology = =

Crocodilia and Crocodylia have been used interchangeably for decades starting with Schmidt 's redescription of the group from the formerly defunct term Loricata . Schmidt used the older term Crocodilia , based on Owen 's original name for the group . Shortly after , Wermuth opted for Crocodylia as the proper name for this redescribed group , basing it on the type genus *Crocodylus* (Laurenti , 1768) . Dundee ? in a revision of many reptilian and amphibian names ? argued strongly for Crocodylia to be the spelling for the group . However , it was not until the advent of cladistics and phylogenetic nomenclature that a more solid justification for assuming one spelling over the other was proposed .

Prior to 2003 , Crocodilia / Crocodylia was a group that encompassed the modern @-@ day animals (the crown group) as well as their more distant relatives now in the larger groups called Crocodylomorpha and Pseudosuchia . Under its current definition Crocodylia is restricted to only the most recent ancestor of today 's modern @-@ day crocodilians (alligators , crocodiles , and gharials) . This distinction is more important for paleontologists studying crocodilian evolution . As such , the alternate spellings Crocodilia and Crocodylia are still used interchangeably in the neontological literature .

Crocodilia appears to be a Latinizing of the Greek ???????????? (*crocodeilos*) , which means both lizard and Nile crocodile . Crocodylia , as coined by Wermuth , in regards to the genus *Crocodylus*

appears to be derived from the ancient Greek ????? (kroke) ? meaning shingle or pebble ? and ????? or ????? (dr (e) ilos) for " worm " . The name may refer to the animal 's habit of basking on the pebbled shores of the Nile .

= = Morphology and physiology = =

Crocodylians range in size from the Paleosuchus and Osteolaemus species , which reach 1 ? 1 @. @ 5 m (3 ft 3 in ? 4 ft 11 in) , to the saltwater crocodile , which reaches 7 m (23 ft) and weighs up to 2 @, @ 000 kg (4 @, @ 400 lb) , though some prehistoric species such as the late Cretaceous Deinosuchus were even larger at up to about 11 m (36 ft) and 3 @, @ 450 kg (7 @, @ 610 lb) . They tend to be sexually dimorphic , with males much larger than females . Though there is diversity in snout and tooth shape , crocodylian species have essentially the same body morphology . They have solidly built , lizard @-@ like bodies with elongated , flattened snouts and laterally compressed tails . Their limbs are reduced in size ; the front feet have five digits with little or no webbing , and the hind feet have four webbed digits and a rudimentary fifth . The skeleton is somewhat typical of tetrapods , although the skull , pelvis and ribs are specialised ; in particular , the cartilaginous processes of the ribs allow the thorax to collapse during diving and the structure of the pelvis can accommodate large masses of food , or more air in the lungs . Both sexes have a cloaca , a single chamber and outlet at the base of the tail into which the intestinal , urinary and genital tracts open . It houses the penis in males and the clitoris in females . The testes or ovaries are located near the kidneys .

The eyes , ears and nostrils of crocodylians are at the top of the head . This allows them to stalk their prey with most of their bodies underwater . When in bright light , the pupils of a crocodylian contract into narrow slits , whereas in darkness they become fully circular . This is typical for animals that hunt at night . Crocodylians also possess a tapetum lucidum which enhances vision in low light . While eyesight is fairly good in air , it is significantly weakened underwater . The eardrums are protected by flaps that can be opened or closed by muscles .

The ears are adapted for hearing both in air and underwater . Crocodylians have a wide hearing range , with sensitivity comparable to most birds and many mammals . They appear to have a well @-@ developed olfactory system , while the well @-@ developed trigeminal nerve allows them to detect vibrations in the water (such as those made by potential prey) . When the animal completely submerges , the nictitating membranes cover its eyes . In addition , glands on the nictitating membrane secrete a salty lubricant that keeps the eye clean . When a crocodylian leaves the water and dries off , this substance is visible as " tears " . The tongue cannot move freely but is held in place by a folded membrane . While the brain of a crocodylian is fairly small , it is capable of greater learning than most reptiles . Though they lack the vocal folds of mammals and the syrinx of birds , crocodylians can produce vocalisations by vibrating three flaps in the larynx .

= = = Locomotion = = =

Crocodylians are excellent swimmers . During aquatic locomotion , the muscular tail undulates from side to side to drive the animal through the water while the limbs are held close to the body to reduce drag . When the animal needs to stop , steer , or manoeuvre in a different direction , the limbs are splayed out . Crocodylians generally cruise slowly on the surface or underwater with gentle sinuous movements of the tail , but when pursued or when chasing prey they can move rapidly . Crocodylians are less well @-@ adapted for moving on land , and are unusual among vertebrates in having two different means of terrestrial locomotion : the " high walk " and the " low walk " . Their ankle joints flex in a different way from those of other reptiles , a feature they share with some early archosaurs . One of the upper row of ankle bones , the astragalus , moves with the tibia and fibula . The other , the calcaneum , is functionally part of the foot , and has a socket into which a peg from the astragalus fits . The result is that the legs can be held almost vertically beneath the body when on land , and the foot can swivel during locomotion with a twisting movement at the ankle .

The high walk of crocodylians , with the belly and most of the tail being held off the ground , is

unique among living reptiles . It somewhat resembles the walk of a mammal , with the same sequence of limb movements : left fore , right hind , right fore , left hind . The low walk is similar to the high walk , but without the body being raised , and is quite different from the sprawling walk of salamanders and lizards . The animal can change from one walk to the other instantaneously , but the high walk is the usual means of locomotion on land . The animal may push its body up and use this form immediately , or may take one or two strides of low walk before raising the body higher . Unlike most other land vertebrates , when crocodilians increase their pace of travel they increase the speed at which the lower half of each limb (rather than the whole leg) swings forward ; by this means , stride length increases while stride duration decreases .

Though typically slow on land , crocodilians can produce brief bursts of speed , and some can run at 12 to 14 km / h (7 @. @ 5 to 8 @. @ 7 mph) for short distances . A fast entry into water from a muddy bank can be effected by plunging to the ground , twisting the body from side to side and splaying out the limbs . In some small species such as the freshwater crocodile , a running gait can progress to a bounding gallop . This involves the hind limbs launching the body forward and the fore limbs subsequently taking the weight . Next , the hind limbs swing forward as the spine flexes dorso @-@ ventrally , and this sequence of movements is repeated . During terrestrial locomotion , a crocodilian can keep its back and tail straight , since the scales are attached to the vertebrae by muscles . Whether on land or in water , crocodilians can jump or leap by pressing their tails and hind limbs against the substrate and then launching themselves into the air .

= = = Jaws and teeth = = =

The snout shape of crocodilians varies between species . Crocodiles may have either broad or slender snouts , while alligators and caimans have mostly broad ones . Gharials have snouts that are extremely elongated . The muscles that close the jaws are much more massive and powerful than the ones that open them , and a crocodilian 's jaws can be held shut by a person fairly easily . Conversely , the jaws are extremely difficult to pry open . The powerful closing muscles attach at the bottom of the skull , allowing the top of the head to retain a flat profile . The jaw hinge attaches to the atlanto @-@ occipital joint , allowing the animal to open its mouth fairly wide .

Crocodilians have some of the strongest bite forces in the animal kingdom . In a study published in 2003 , an American alligator 's bite force was measured at up to 2 @, @ 125 lbf (9 @, @ 450 N) . In a 2012 study , a saltwater crocodile 's bite force was measured even higher , at 3 @, @ 700 lbf (16 @, @ 000 N) . This study also found no correlation between bite force and snout shape . Nevertheless , the gharial 's extremely slender jaws are relatively weak and built more for quick jaw closure . The bite force of *Deinosuchus* may have measured 23 @, @ 000 lbf (100 @, @ 000 N) , even greater than that of theropod dinosaurs like *Tyrannosaurus* .

Crocodilian teeth vary from blunt and dull to sharp and needle @-@ like . Broad @-@ snouted species have teeth that vary in size , while those of slender @-@ snouted species are more uniform . The teeth of crocodiles and gharials tend to be more visible than those of alligators and caimans when the jaws are closed . The easiest way to distinguish crocodiles from alligators is by looking at their jaw line . The teeth on the lower jaw of an alligator fit into sockets in the upper jaw , so only the upper teeth are visible when the mouth is closed . The teeth on the lower jaw of a crocodile fit into grooves on the outside of the top jaw making both the upper and lower teeth visible when the mouth is closed .

Crocodilians are polyphyodonts and able to replace each of their approximately 80 teeth up to 50 times in their 35 to 75 @-@ year lifespan . They are the only non @-@ mammalian vertebrates with tooth sockets . Next to each full @-@ grown tooth there is a small replacement tooth and an odontogenic stem cell in the dental lamina in standby , which can be activated when required . Tooth replacement slows significantly and eventually stops as the animal grows old .

= = = Skin and scales = = =

The skin of crocodilians is thick and cornified , and is clad in non @-@ overlapping scales known as

scutes , arranged in regular rows and patterns . These scales are continually being produced by cell division in the underlying layer of the epidermis , the stratum germinativum , and the surface of individual scutes sloughs off periodically . The outer surface of the scutes consists of the relatively rigid beta @-@ keratin while the hinge region between the scutes contains only the more pliable alpha @-@ keratin .

Many of the scutes are strengthened by bony plates known as osteoderms , which are the same size and shape as the superficial scales but grow beneath them . They are most numerous on the back and neck of the animal and may form a protective armour . They often have prominent , lumpy ridges and are covered in hard @-@ wearing beta @-@ keratin . Most of the skin on the head is fused to the skull . The skin on the neck and flanks is loose , while that on the abdomen and underside of the tail is sheathed in large , flat square scutes arranged in neat rows . The scutes contain blood vessels and may act to absorb or radiate heat during thermoregulation . Research also suggests that alkaline ions released into the blood from the calcium and magnesium in these dermal bones act as a buffer during prolonged submersion when increasing levels of carbon dioxide would otherwise cause acidosis .

Some scutes contain a single pore known as an integumentary sense organ . Crocodiles and gharials have these on large parts of their bodies , while alligators and caimans only have them on the head . Their exact function is not fully understood , but it has been suggested that they may be mechanosensory organs . Another possibility is that they may produce an oily secretion that prevents mud from adhering to the skin . There are prominent paired integumentary glands in skin folds on the throat , and others in the side walls of the cloaca . Various functions for these have been suggested . They may play a part in communication , as indirect evidence suggest that they secrete pheromones used in courtship or nesting . The skin of crocodilians is tough and can withstand damage from conspecifics , and the immune system is effective enough to heal wounds within a few days .

= = = Circulation = = =

The crocodilian has perhaps the most complex vertebrate circulatory system . It has a four @-@ chambered heart and two ventricles , an unusual trait among extant reptiles , and both a left and right aorta which are connected by a hole called the Foramen of Panizza . Like birds and mammals , crocodilians have heart valves that direct blood flow in a single direction through the heart chambers . They also have unique cog @-@ teeth @-@ like valves that , when interlocked , direct blood to the left aorta and away from the lungs , and then back around the body . This system may allow the animals to remain submerged for a longer period , but this explanation has been questioned . Other possible reasons for the peculiar circulatory system include assistance with thermoregulatory needs , prevention of pulmonary oedema , or faster recovery from metabolic acidosis . Retaining carbon dioxide within the body permits an increase in the rate of gastric acid secretion and thus the efficiency of digestion , and other gastrointestinal organs such as the pancreas , spleen , small intestine , and liver also function more efficiently .

When submerged , a crocodilian 's heart rate slows down to one or two beats a minute , and blood flow to the muscles is reduced . When it rises and takes a breath , its heart rate speeds up in seconds , and the muscles receive newly oxygenated blood . Unlike many marine mammals , crocodilians have little myoglobin to store oxygen in their muscles . During diving , muscles are supplied with oxygen when an increasing concentration of bicarbonate ions causes haemoglobin in the blood to release oxygen .

= = = Respiration = = =

Crocodilians were traditionally thought to breathe like mammals , with airflow moving in and out tidally , but studies published in 2010 and 2013 conclude that crocodilians breathe more like birds , with airflow moving in a unidirectional loop within the lungs . When a crocodilian inhales , air flows through the trachea and into two primary bronchi , or airways , which branch off into narrower

secondary passageways . The air continues to move through these , then into even narrower tertiary airways , and then into other secondary airways which were bypassed the first time . The air then flows back into the primary airways and is exhaled back out . These aerodynamic valves within the bronchial tree have been hypothesised to explain how crocodilians can have unidirectional airflow without the aid of avian @-@ like air sacs .

The lungs of crocodilians are attached to the liver and the pelvis by the diaphragmaticus muscle (analogous of the diaphragm in mammals) . During inhalation , the external intercostal muscles expand the ribs , allowing the animal to take in more air , while the ischiopubis muscle causes the hips to swing downwards and push the belly outward , and the diaphragmaticus pulls the liver back . When exhaling , the internal intercostal muscles push the ribs inward , while the rectus abdominis pulls the hips and liver forwards and the belly inward . Because the lungs expand into the space formerly occupied by the liver and are compressed when it moves back into position , this motion is sometimes referred to as a " hepatic piston " . Crocodilians can also use these muscles to adjust the position of their lungs ; thereby controlling their buoyancy in the water . An animal sinks when the lungs are pulled towards the tail and floats when they move back towards the head . This allows them to move through the water without creating disturbances that could alert potential prey . In addition , they can also spin and twist by moving their lungs laterally .

Swimming and diving crocodilians appear to rely on lung volume more for buoyancy than oxygen storage . Just before diving , the animal exhales to reduce its lung volume and achieve negative buoyancy . When submerging , the nostrils of a crocodilian shut tight . All species have a palatal valve , a membranous flap of skin at the back of the oral cavity that prevents water from flowing into the throat , oesophagus , and trachea . This enables them to open their mouths underwater without drowning . Crocodilians typically remain underwater for fifteen minutes or less at a time , but some can hold their breath for up to two hours under ideal conditions . The maximum diving depth is unknown , but crocodiles can dive to at least 20 m (66 ft) .

= = = Digestion = = =

Crocodilian teeth are adapted for seizing and holding prey , and food is swallowed unchewed . The digestive tract is relatively short , as meat is a fairly simple substance to digest . The stomach is divided into two parts : a muscular gizzard that grinds food , and a digestive chamber where enzymes work on it . The stomach is more acidic than that of any other vertebrate and contains ridges for gastroliths , which play a role in the mechanical breakdown of food . Digestion takes place more quickly at higher temperatures . Crocodilians have a very low metabolic rate and consequently , low energy requirements . This allows them to survive for many months on a single large meal , digesting the food slowly . They can withstand extended fasting , living on stored fat between meals . Even recently hatched crocodiles are able to survive 58 days without food , losing 23 % of their bodyweight during this time . An adult crocodile needs between a tenth and a fifth of the amount of food necessary for a lion of the same weight , and can live for half a year without eating .

= = = Thermoregulation = = =

Crocodilians are ectotherms , producing relatively little heat internally and relying on external sources to raise their body temperatures . The sun 's heat is the main means of warming for any crocodilian , while immersion in water may either raise its temperature by conduction , or cool the animal in hot weather . The main method for regulating its temperature is behavioural . For example , an alligator in temperate regions may start the day by basking in the sun on land . A bulky animal , it warms up slowly , but at some time later in the day it moves into the water , still exposing its dorsal surface to the sun . At night it remains submerged , and its temperature slowly falls . The basking period is extended in winter and reduced in summer . For crocodiles in the tropics , avoiding overheating is generally the main problem . They may bask briefly in the morning but then move into the shade , remaining there for the rest of the day , or submerge themselves in water to keep cool . Gaping with the mouth can provide cooling by evaporation from the mouth lining . By these means ,

the temperature range of crocodilians is usually maintained between 25 and 35 ° C (77 and 95 ° F) , and mainly stays in the range 30 to 33 ° C (86 to 91 ° F) .

The ranges of the American and Chinese alligator extend into regions that sometimes experience periods of frost in winter . Being ectothermic , the internal body temperature of crocodilians falls as the temperature drops , and they become sluggish . They may become more active on warm days , but do not usually feed at all during the winter . In cold weather , they remain submerged with their tails in deeper , less cold water and their nostrils just projecting through the surface . If ice forms on the water , they maintain ice @-@ free breathing holes , and there have been occasions when their snouts have become frozen into the ice . Temperature sensing probes implanted in wild American alligators have found that their core body temperatures can descend to around 5 ° C (41 ° F) , but as long as they remain able to breathe they show no ill effects when the weather warms up .

= = = Osmoregulation = = =

No living species of crocodilian can be considered truly marine ; although the saltwater crocodile and the American crocodile are able to swim out to sea , their normal habitats are river mouths , estuaries , mangrove swamps , and hypersaline lakes , though several extinct species have had marine habits , including the recently gone " *Gavialis* " *papuensis* , which occurred in a fully marine habitat in the Solomon Islands coastlines . All crocodilians need to maintain the concentration of salt in body fluids at suitable levels . Osmoregulation is related to the quantity of salts and water exchanged with the environment . Intake of water and salts takes place across the lining of the mouth , when water is drunk , incidentally while feeding , and when present in foods . Water is lost from the body during breathing , and both salts and water are lost in the urine and faeces , through the skin , and via salt @-@ excreting glands on the tongue , though these are only present in crocodiles and gharials . The skin is a largely effective barrier to both water and ions . Gaping causes water loss by evaporation from the lining of the mouth , and on land , water is also lost through the skin . Large animals are better able to maintain homeostasis at times of osmotic stress than smaller ones . Newly hatched crocodilians are much less tolerant of exposure to salt water than are older juveniles , presumably because they have a higher surface @-@ area @-@ to @-@ volume ratio .

The kidneys and excretory system are much the same as in other reptiles , but crocodilians do not have a bladder . In fresh water , the osmolality (the concentration of solutes that contribute to a solution 's osmotic pressure) in the plasma is much higher than it is in the surrounding water . The animals are well @-@ hydrated , and the urine in the cloaca is abundant and dilute , nitrogen being excreted as ammonium bicarbonate . Sodium loss is low and mainly takes place through the skin in freshwater conditions . In seawater , the opposite is true . The osmolality in the plasma is lower than the surrounding water , which is dehydrating for the animal . The cloacal urine is much more concentrated , white , and opaque , with the nitrogenous waste being mostly excreted as insoluble uric acid .

= = Ecology and life history = =

= = = Distribution and habitat = = =

Crocodilians are amphibious reptiles , spending part of their time in water and part on land . The last surviving fully terrestrial genus , *Mekosuchus* , became extinct about 3000 years ago after humans had arrived on its Pacific islands , making the extinction possibly anthropogenic . Typically they are creatures of the tropics ; the main exceptions are the American and Chinese alligators , whose ranges extend as far north as the south @-@ eastern United States and the Yangtze River , respectively . Florida , in the United States , is the only place that crocodiles and alligators live side by side . Most crocodilians live in the lowlands , and few are found above 1 @,@ 000 metres (3 @,@ 300 ft) , where the temperatures are typically about 5 ° C (9 ° F) lower than at the coast .

None of them permanently reside in the sea , though some can venture into it , and several species can tolerate the brackish water of estuaries , mangrove swamps , and the extreme salinity of hypersaline lakes . The saltwater crocodile has the widest distribution of any crocodilian , with a range extending from eastern India to New Guinea and northern Australia . Much of its success is due to its ability to swim out to sea and colonise new locations , but it is not restricted to the marine environment and spends much time in estuaries , rivers , and large lakes .

Various types of aquatic habitats are used by different crocodilians . Some species are relatively more terrestrial and prefer swamps , ponds , and the edges of lakes , where they can bask in the sun and there is plenty of plant life supporting a diverse fauna . Others spend more time in the water and inhabit the lower stretches of rivers , mangrove swamps , and estuaries . These habitats also have a rich flora and provide plenty of food . The Asian gharials find the fish on which they feed in the pools and backwaters of swift rivers . South American dwarf caimans inhabit cool , fast @-@ flowing streams , often near waterfalls , and other caimans live in warmer , turbid lakes and slow @-@ moving rivers . The crocodiles are mainly river dwellers , and the Chinese alligator is found in slow @-@ moving , turbid rivers flowing across China 's floodplains . The American alligator is an adaptable species and inhabits swamps , rivers , or lakes with clear or turbid water . Climatic factors also affect crocodilians ' distribution locally . During the dry season , caimans can be restricted to deep pools in rivers for several months ; in the rainy season , much of the savannah in the Venezuelan llanos is flooded , and they disperse widely across the plain . Desert crocodiles in Mauritania have adapted to their arid environment by staying in caves or burrows in a state of aestivation during the driest periods . When it rains , the reptiles gather at gueltas .

Dry land is also important as it provides opportunities for basking , nesting , and escaping from temperature extremes . Gaping allows evaporation of moisture from the mouth lining and has a cooling effect , and several species make use of shallow burrows on land to keep cool . Wallowing in mud can also help prevent them from overheating . Four species of crocodilians climb trees to bask in areas lacking a shoreline . The type of vegetation bordering the rivers and lakes inhabited by crocodilians is mostly humid tropical forest , with mangrove swamps in estuarine areas . These forests are of great importance to the crocodilians , creating suitable microhabitats where they can flourish . The roots of the trees absorb water when it rains , releasing it back slowly into the environment . When the forests are cleared to make way for agriculture , rivers tend to silt up , the water runs off rapidly , the water courses can dry up in the dry season and flooding can occur in the wet season . Destruction of forest habitat is probably a greater threat to crocodilians than is hunting .

== Spacing ==

Adult crocodilians are typically territorial and solitary . Individuals may defend basking spots , nesting sites , feeding areas , nurseries , and overwintering sites . Male saltwater crocodiles establish year @-@ round territories that encompass several female nesting sites . Some species are occasionally gregarious , particularly during droughts , when several individuals gather at remaining water sites . Individuals of some species may share basking sites at certain times of the day .

== Feeding ==

Crocodilians are largely carnivorous , and the diets of different species can vary with snout shape and tooth sharpness . Species with sharp teeth and long slender snouts , like the Indian gharial and Australian freshwater crocodile , are specialised for feeding on fish , insects , and crustaceans , while extremely broad @-@ snouted species with blunt teeth , like the Chinese alligator and broad @-@ snouted caiman , specialise in eating hard @-@ shelled molluscs . Species whose snouts and teeth are intermediate between these two forms , such as the saltwater crocodile and American alligator , have generalised diets and opportunistically feed on invertebrates , fish , amphibians , other reptiles , birds , and mammals . Though mostly carnivorous , several species of crocodilian

have been observed to consume fruit , and this may play a role in seed dispersal .

In general , crocodilians are stalk @-@ and @-@ ambush predators , though hunting strategies vary depending on the individual species and the prey being hunted . Terrestrial prey is stalked from the water 's edge and then grabbed and drowned . Gharials and other fish @-@ eating species sweep their jaws sideways to snap up prey , and these animals can leap out of the water to catch birds , bats , and leaping fish . Small animals can be killed by whiplash as the predator shakes its head . Caimans use their tails and bodies to herd fish into shallow water . They may also dig for bottom @-@ dwelling invertebrates , and the smooth @-@ fronted caiman will even hunt on land . Some crocodilian species have been observed to use sticks and branches to lure nest @-@ building birds . Nile crocodiles are known to hunt cooperatively , and several individuals may feed on the same carcass . Most species will eat anything suitable that comes within reach and are also opportunistic scavengers .

Crocodilians are unable to chew and need to swallow food whole , so prey that is too large to swallow is torn into pieces . They may be unable to deal with a large animal with a thick hide , and may wait until it becomes putrid and comes apart more easily . To tear a chunk of tissue from a large carcass , a crocodilian spins its body continuously while holding on with its jaws , a manoeuvre known as the " death roll " . During cooperative feeding , some individuals may hold on to the prey , while others perform the roll . The animals do not fight , and each retires with a piece of flesh and awaits its next feeding turn . Food is typically consumed by crocodilians with their heads above water . The food is held with the tips of the jaws , tossed towards the back of the mouth by an upward jerk of the head and then gulped down . Nile crocodiles may store carcasses underwater for later consumption .

= = = Reproduction and parenting = = =

Crocodilians are generally polygynous , and individual males try to mate with as many females as they can . Monogamous pairings have been recorded in American alligators . Dominant male crocodilians patrol and defend territories which contain several females . Males of some species , like the American alligator , try to attract females with elaborate courtship displays . During courtship , crocodilian males and females may rub against each other , circle around , and perform swimming displays . Copulation typically occurs in the water . When a female is ready to mate , she arches her back while her head and tail submerge . The male rubs across the female 's neck and then grasps her with his hindlimbs , placing his tail underneath hers so their cloacas align and his penis can be inserted . Mating can last up to 15 minutes , during which time the pair continuously submerge and surface . While dominant males usually monopolise reproductive females , multiple paternity is known to exist in American alligators , where as many as three different males may sire offspring in a single clutch . Within a month of mating , the female crocodilian begins to make a nest .

Depending on the species , female crocodilians may construct either holes or mounds as nests , the latter made from vegetation , litter , sand , or soil . Nests are typically found near dens or caves . Those made by different females are sometimes close to each other , particularly in hole @-@ nesting species . The number of eggs laid in a single clutch ranges from ten to fifty . As in all egg @-@ laying amniotes , crocodilian eggs are protected by hard shells made of calcium carbonate . The incubation period is two to three months . The temperature at which the eggs incubate determines the sex of the hatchlings . Constant nest temperatures above 32 ° C (90 ° F) produce more males , while those below 31 ° C (88 ° F) produce more females . However , sex in crocodilians may be determined in a short interval , and nests are subject to changes in temperature . Most natural nests produce hatchlings of both sexes , though single @-@ sex clutches do occur .

The young may all hatch in a single night . Crocodilians are unusual among reptiles in the amount of parental care provided after the young hatch . The mother helps excavate hatchlings from the nest and carries them to water in her mouth . Newly hatched crocodilians gather together and stay close to their mother . For spectacled caimans in the Venezuelan llanos , individual mothers are known to leave their young in the same nurseries , or crèches , and one of the mothers guards them . Hatchlings of many species tend to bask in a group during the day and disperse at nightfall to feed

. The time it takes young crocodilians to reach independence can vary . For American alligators , groups of young associate with adults for one to two years , while juvenile saltwater and Nile crocodiles become independent in a few months .

= = = Communication = = =

The social life of a crocodilian begins while it is still in the egg , because the young start communicating with each other before they are hatched . It has been shown that a light tapping noise near the nest will be repeated by the young , one after another . Such early communication may help them to hatch simultaneously . Once it has broken out of the egg , a juvenile produces yelps and grunts , either spontaneously or as a result of external stimuli and even unrelated adults respond quickly to juvenile distress calls .

Vocalisations are frequent as the juveniles disperse , and again as they congregate in the morning . Nearby adults , presumably the parents , also give signals warning of predators or alerting the youngsters to the presence of food . The range and quantity of vocalisations vary between species . Alligators are the noisiest , while some crocodile species are almost completely silent . Adult female New Guinea crocodiles and Siamese crocodiles roar when approached by another adult , while Nile crocodiles grunt or bellow in a similar situation . The American alligator is exceptionally noisy ; it emits a series of about seven throaty bellows , each a couple of seconds long , at ten second intervals . It also makes various grunts and hisses . Males create vibrations in the water to send out infrasonic signals that serve to attract females and intimidate rivals . The enlarged boss of the male gharial may serve as a sound resonator .

Another form of acoustic communication is the headslap . This typically starts with an animal in the water elevating its snout and remaining stationary . After some time , the jaws are opened sharply then clamped shut with a biting motion that makes a loud slapping sound , and this is immediately followed by a loud splash , after which the head may be submerged and copious bubbles produced . Some species then roar , while others slap the water with their tails . Episodes of headslapping spread through the group . The purpose varies , but it seems to be associated with maintaining social relationships , and is also used in courtship . Dominant individuals may also display their body size while swimming at the water surface , and a subordinate will submit by holding its head at an acute angle with the jaws open before retreating underwater .

= = = Growth and mortality = = =

Mortality is high for eggs and hatchlings , and nests face threats from floods , overheating , and predators . Flooding is a major cause of failure of crocodilians to breed successfully , as nests are submerged , developing embryos are deprived of oxygen , and juveniles get washed away . One of the chief predators of alligators ' eggs in Florida is the raccoon , which is attracted by olfactory cues after the nest has been disturbed by turtles . The Florida black bear also raids alligator eggs . In Africa , mongooses , honey badgers , baboons , otters , warthogs , bushpigs , and spotted hyenas are all fond of crocodile eggs , but the monitor lizard is thought to be the most important nest raider . This lizard is also a major hazard in Asia , where other egg predators include civets , mongooses , rats , sloth bears , jackals , and dogs .

Despite the maternal care they receive , hatchlings commonly fall to predation . While the female is transporting some to the nursery area , others are picked off by predators that lurk near the nest . The hatchlings are a source of food for most of the creatures that feed on eggs , and are also subject to aquatic attacks by turtles , fish , and snakes . Birds of prey take their toll , and in any clutch there may be malformed individuals that are unlikely to survive . In northern Australia , the survival rate for saltwater crocodile hatchlings is only twenty @-@ five percent , but with each succeeding year of life this improves , reaching sixty percent by year five . Mortality rates are fairly low among subadult and adults of small species , though they are occasionally preyed on by large cats and snakes . The jaguar and the giant otter may prey on caimans in South America . In other parts of the world , elephants and hippopotamuses may kill crocodiles defensively . Authorities differ

as to whether much cannibalism takes place among crocodilians . Adults do not normally eat their own offspring , but there is some evidence of subadults feeding on juveniles and of adults attacking subadults . In Nile crocodiles , rival males sometimes kill each other during the breeding season .

Growth in hatchlings and young crocodilians depends on the food supply , and sexual maturity is linked with length rather than age . Female saltwater crocodiles reach maturity at 2 @. @ 2 ? 2 @. @ 5 m (7 ft 3 in ? 8 ft 2 in) , while males mature at 3 m (9 @. @ 8 ft) . Australian freshwater crocodiles take ten years to reach maturity at 1 @. @ 4 m (4 ft 7 in) . The spectacled caiman matures earlier , reaching its mature length of 1 @. @ 2 m (3 ft 11 in) in four to seven years . Crocodilians continue to grow throughout their lives . Males in particular continue to gain in weight as they get older , but this is mostly in the form of extra girth rather than length . Crocodilians can live 35 ? 75 years , and their age can be determined by growth rings in their bones .

= = = Ecological roles = = =

Being highly efficient predators , crocodilians tend to be top of the food chain in their watery environments . The nest mounds built by some species of crocodilian are used by other animals for their own purposes . American alligator mounds are used by turtles and snakes , both for basking and for laying their own eggs . The Florida red @-@ bellied turtle specialises in this , and alligator mounds may have several clutches of turtle eggs developing alongside the owner 's eggs . Alligators modify some wetland habitats in flat areas such as the Everglades by constructing small ponds known as " alligator holes " . These create wetter or drier habitats for other organisms , such as plants , fish , invertebrates , amphibians , reptiles , and mammals . In the limestone depressions of cypress swamps , alligator holes tend to be large and deep . Those in marl prairies and rocky glades are usually small and shallow , while those in peat depressions of ridge and slough wetlands are more variable . Man @-@ made holes do not appear to have as large an effect .

In the Amazon basin , when caimans became scarce as a result of overhunting in the mid @-@ 20th century , the number of local fish , such as the important arapaima (*Arapaima gigas*) , also decreased . These are nutrient @-@ poor waters , and the urine and faeces of the caimans may have increased primary production by contributing plant nutrients . Thus the presence of the reptiles could have benefited the fish stock ; the number of crocodilians in a stretch of water appears to be correlated with the fish population .

= = Evolution and classification = =

= = = Evolution = = =

The main distinguishing characteristic of diapsid tetrapods is the presence of two openings (temporal fenestrae) on either side of the skull behind the eye . Living diapsids include all crocodilians , lizards , snakes , tuataras , and birds . The feature that distinguishes archosaurs from other diapsids is an extra pair of openings in the skull (antorbital fenestrae) in front of the eye sockets . Archosauria is the crown group containing the most recent common ancestor of crocodilians and birds and all its descendants . It comprises the Pseudosuchia , the " false crocodiles " , and the Ornithosuchia , which in turn comprises the dinosaurs and their relatives , the pterosaurs , and the birds . Pseudosuchia is defined as living crocodilians and all archosaurs more closely related to crocodilians than to birds . The Pseudosuchia ? bird split is assumed to have occurred close to the Permian ? Triassic mass extinction event . Modern crocodilians have lost the antorbital fenestrae , but they were present in most of their fossil ancestors as small openings .

The crocodylomorphs are the only pseudosuchians to have survived the Triassic ? Jurassic extinction event , 201 @. @ 3 million years ago . During the early Jurassic period , the dinosaurs became dominant on land , and the crocodylomorphs underwent major adaptive diversifications to fill ecological niches vacated by recently extinguished groups . Unfolding fossil evidence shows that Mesozoic crocodylomorphs had a much greater diversity of forms than modern crocodilians . Some

became small fast moving insectivores , others specialist fish eaters , still others marine and terrestrial carnivores , and a few became herbivores . The earliest stage of crocodilian evolution was the protosuchians , which evolved in the late Triassic and early Jurassic . They were followed by the mesosuchians , which diversified widely during the Jurassic and the Tertiary . Another group , the eusuchians , appeared in the late Cretaceous 80 million years ago and includes all the crocodilians living today .

Protosuchians were small , mostly terrestrial animals with short snouts and long limbs . They had bony armor in the form of two rows of plates extending from head to tail , and this armor is retained by most modern crocodilians . Their vertebrae were convex on the two main articulating surfaces , and their bony palates were little developed . The mesosuchians saw a fusion of the palatine bones to form a secondary bony palate and a great extension of the nasal passages to near the pterygoid bones . This allowed the animal to breathe through its nostrils while its mouth was open under the water . The eusuchians continued this process with the interior nostrils now opening through an aperture in the pterygoid bones . The vertebrae of eusuchians had one convex and one concave articulating surface , allowing for a ball and socket type joint between the vertebrae , bringing greater flexibility and strength . The oldest known eusuchian is *Hylaeochampsa vectiana* from the lower Cretaceous of the Isle of Wight in the United Kingdom . It was followed by crocodilians such as the *Pristichampsidae* , the so called ' hoofed crocodiles ' , in the Palaeogene . Spanning the Cretaceous and Palaeogene periods is the genus *Borealosuchus* of North America , with six species , though its phylogenetic position is not settled .

The three primary branches of Crocodilia had diverged by the end of the Mesozoic . The earliest known members of the group are alligatoroids and gavialoids that lived in North America and Europe during the Campanian (around 83 to 67 million years ago) . Although the first known crocodyloids appeared in the Maastrichtian (around 72 to 66 million years ago) , that lineage must have been present during the Campanian , and the earliest alligatoroids and gavialoids include highly derived forms , which indicates that the time of the actual divergence between the three lineages must have been a pre Campanian event .

== Relationships ==

The phylogenetic relationships of crocodilians has been the subject of debate and conflicting results . Many studies and their resulting cladograms , or " family trees " of crocodilians , have found the " short snouted " families of *Crocodylidae* and *Alligatoridae* to be close relatives , with the long snouted *Gavialidae* as a divergent branch of the tree . The resulting group of short snouted species , name *Brevirostres* , was supported mainly by studies which analyzed skeletal features alone .

In 2012 , Erickson et al. produced a phylogeny formed from DNA sequencing to give a maximum likelihood cladogram of the relationships among living crocodilians (excluding the yacare caiman for which no DNA evidence was available) . In this , the existence of a distinct group *Brevirostres* was rejected , with the long snouted gavialids more closely related to crocodiles than to alligators .

== Taxonomy ==

Extant

Family *Gavialidae*

Genus *Gavialis*

Gharial (*Gavialis gangeticus*)

Genus *Tomistoma*

False gharial (*Tomistoma schlegelii*)

There are two extant species of *Gavialidae* : the gharial and the false gharial . Gharials can be recognised by the long narrow snout , with an enlarged boss at the tip . They are rare and found only in South Asia .

Family *Alligatoridae*

Genus Alligator

American alligator (*Alligator mississippiensis*)

Chinese alligator (*Alligator sinensis*)

Genus Paleosuchus

Cuvier 's dwarf caiman (*Paleosuchus palpebrosus*)

Smooth @-@ fronted caiman (*Paleosuchus trigonatus*)

Genus Caiman

Yacare caiman (*Caiman yacare*)

Spectacled caiman (*Caiman crocodilus*)

Broad @-@ snouted caiman (*Caiman latirostris*)

Genus Melanosuchus

Black caiman (*Melanosuchus niger*)

The extant Alligatoridae are two species in the genus Alligator , and six species of caimans grouped into three genera . They can be recognised by the broad snout , in which the fourth tooth of the lower jaw cannot be seen when the mouth is closed .

Family Crocodylidae

Genus Crocodylus

American crocodile (*Crocodylus acutus*)

Orinoco crocodile (*Crocodylus intermedius*)

Freshwater crocodile (*Crocodylus johnsoni*)

Philippine crocodile (*Crocodylus mindorensis*)

Morelet 's crocodile (*Crocodylus moreletii*)

Nile crocodile (*Crocodylus niloticus*)

Desert crocodile (*Crocodylus suchus*)

New Guinea crocodile (*Crocodylus novaeguineae*)

Mugger crocodile (*Crocodylus palustris*)

Saltwater crocodile (*Crocodylus porosus*)

Cuban crocodile (*Crocodylus rhombifer*)

Siamese crocodile (*Crocodylus siamensis*)

Genus Mecistops

Slender @-@ snouted crocodile (*Mecistops* [*Crocodylus*] *cataphractus*)

Genus Osteolaemus

Dwarf crocodile (*Osteolaemus tetraspis*)

The extant Crocodylidae are twelve species in the genus Crocodylus , and two species in other genera . They have a variety of snout shapes , but can be recognised because the fourth tooth of the lower jaw is visible when the mouth is closed .

Living and extinct groups

= = Interactions with humans = =

= = = Farming and ranching = = =

Alligators and crocodiles were first farmed in the early 20th century , but the facilities involved were zoo @-@ like and their main source of income was from tourism . By the early 1960s , the feasibility of farming these reptiles on a commercial scale was investigated in response to the decline of many crocodilian species around the world . Farming involves breeding and rearing captive stock on a self @-@ contained basis , whereas ranching means the use of eggs , juveniles , or adults taken each year from the wild . Commercial organisations must satisfy the criteria of the Convention on International Trade in Endangered Species (CITES) by demonstrating that , in the area concerned , they do not adversely impact the wild population .

Alligator and crocodile farming began because of demand for their hides , but now nearly all parts of the animal are put to use . The side and belly skin make the best leather , the meat is eaten , the

gall bladders are valued in East Asia , and the heads are sometimes made into ornaments . In traditional Chinese medicine , alligator meat is said to cure the common cold and prevent cancer , while various internal organs are believed to have medicinal properties .

= = = Attacks = = =

Crocodylians are opportunistic predators that are at their most dangerous in water and at the edge of water . Eight species are known to attack humans and may do so to defend their territories , nests , or young ; by mistake , while attacking domestic animals such as dogs ; or for food , as larger crocodylians can take prey as big as or bigger than humans . The species on which there is most data are the saltwater crocodile , the Nile crocodile , and the American alligator . Other species which have sometimes attacked humans are the black caiman , the Morelet 's crocodile , the mugger crocodile , the American crocodile , the gharial , and the freshwater crocodile .

The Nile crocodile has a reputation as the biggest killer of large animals , including humans , on the African continent . It is widely distributed , found in many habitats and cryptically coloured . From a waiting position with only its eyes and nostrils above the water , it can lunge at drinking animals , fishermen , bathers , or people collecting water or washing clothes . Once seized and dragged into the water , there is little chance for the victim to escape . Analysis of attacks show that most take place during the breeding season or when crocodiles are guarding nests or newly hatched young . Although many attacks go unreported , there are estimated to be over 300 per year , 63 % of which are fatal . Wild saltwater crocodiles in Australia carried out 62 confirmed and unprovoked attacks causing injury or death between 1971 and 2004 . These animals have also caused fatalities in Malaysia , New Guinea , and elsewhere . They are highly territorial and resent intrusion into their territories by other crocodiles , humans , or boats such as canoes . Attacks may come from animals of various sizes , but the larger males are generally responsible for fatalities . As their size increases , so does their need for larger mammalian prey ; pigs , cattle , horses , and humans are all within the size range they seek . Most of the people attacked were either swimming or wading , but in two instances they were asleep in tents .

American alligators are recorded as making 242 unprovoked attacks between 1948 and mid @-@ 2004 , causing sixteen human fatalities . Ten of these were in the water and two were on land ; the circumstances of the other four are not known . Most attacks were in the warmer months of the year , though in Florida , with its warmer climate , attacks can happen at any time of year . Alligators are considered to be less aggressive than either the Nile or saltwater crocodile , but the increase in density of the human population in the Everglades has brought people and alligators into closer proximity and increased the risk of alligator attacks . Conversely in Mauritania , crocodiles appear to be habituated to the local people , who swim with them without being attacked .

= = = As pets = = =

Several species of crocodylian are traded as exotic pets . They are appealing when young , and pet @-@ store owners can easily sell them , but crocodylians do not make good pets ; they grow large and are both dangerous and expensive to keep . As they grow older , pet crocodylians are often abandoned by their owners , and feral populations of spectacled caimans exist in the United States and Cuba . Most countries have strict regulations for keeping these reptiles .

= = = In medicine = = =

The blood of alligators and crocodiles contains peptides with antibiotic properties . These may contribute to future antibacterial drugs .

= = Conservation = =

The main threat to crocodylians around the world is human activity , including hunting and habitat

destruction . Early in the 1970s , more than 2 million wild crocodilian skins of a variety of species had been traded , driving down the majority of crocodilian populations , in some cases almost to extinction . Starting in 1973 , CITES attempted to prevent trade in body parts of endangered animals , such as the skins of crocodiles . This proved to be problematic in the 1980s , as crocodiles were abundant and dangerous to humans in some parts of Africa , and it was legal to hunt them . At the Conference of the Parties in Botswana in 1983 , it was argued on behalf of aggrieved local people that it was reasonable to sell the lawfully hunted skins . In the late 1970s , crocodiles began to be farmed in different countries , started from eggs taken from the wild . By the 1980s , farmed crocodile skins were produced in sufficient numbers to destroy the unlawful trade in wild crocodilians . By 2000 , skins from twelve crocodilian species , whether harvested lawfully in the wild or farmed , were traded by thirty countries , and the unlawful trade in the products had almost vanished .

The gharial has undergone a chronic long term decline , combined with a rapid short term decline , leading the IUCN to list the species as critically endangered . In 1946 , the gharial population had been widespread , numbering around 5 000 to 10 000 ; by 2006 , however , it had declined 96 ? 98 % , reduced to a small number of widely spaced subpopulations of fewer than 235 individuals . This long term decline had a number of causes , including egg collection and hunting , such as for indigenous medicine . The rapid decline of about 58 % between 1997 and 2006 was caused by increasing use of gill nets and the loss of riverine habitat . The gharial population continues to be threatened by environmental hazards such as heavy metals and protozoan parasites , but as of 2013 numbers are rising , due to the protection of nests against egg predators . The Chinese alligator was historically widespread throughout the eastern Yangtze River system but is currently restricted to some areas in southeastern Anhui province thanks to habitat fragmentation and degradation . The wild population is believed to exist only in small fragmented ponds . In 1972 , the species was declared a Class I endangered species by the Chinese government and received the maximum amount of legal protection . Since 1979 , captive breeding programs were established in China and North America , creating a healthy captive population . In 2008 , alligators bred in the Bronx Zoo were successfully reintroduced to Chongming Island . The Philippine crocodile is perhaps the most threatened crocodilian and is considered by the IUCN to be critically endangered . Hunting and destructive fishing habits have reduced its population to around 100 individuals by 2009 . In the same year , 50 captive bred crocodiles were released into the wild to help boost the population . Support from local people is crucial for the species survival .

The American alligator has also suffered serious declines from hunting and habitat loss throughout its range , threatening it with extinction . In 1967 it was listed as an endangered species , but the United States Fish and Wildlife Service and state wildlife agencies in the Southern United States stepped in and worked towards its recovery . Protection allowed the species to recuperate , and in 1987 it was removed from the endangered species list . Much research into alligator ranching has been undertaken at the Rockefeller Wildlife Refuge , a large area of marshland in the state of Louisiana . The resulting data has increased understanding of penning , stocking rates , egg incubation , hatching , rearing , and diet , and this information has been used at other establishments around the world . Income from the alligators kept at Rockefeller Wildlife Refuge contributes to conservation of the marshland . A study examining alligator farms in the United States showed that they have generated significant conservation gains , and poaching of wild alligators has greatly diminished .

= = Cultural depictions = =

= = In mythology and folklore = =

Crocodilians have had prominent roles in the myths and legends of various cultures around the world and may even have inspired stories of dragons . In Ancient Egyptian religion , Ammit , the demoniac devourer of unworthy souls , and Sobek , the god of power , protection , and fertility , are both represented as having crocodile heads . This reflects the Egyptians ' view of the crocodile both

as a terrifying predator and an important part of the Nile ecosystem . The crocodile was one of several animals that the Egyptians mummified . Crocodiles were also associated with various water deities by tribes of West Africa . During the Benin Empire , crocodiles were considered the " policemen of the waters " and symbolised the power of the king or oba to punish wrongdoers . The Leviathan described in the Book of Job may have been based on a crocodile . In Mesoamerica , the Aztecs had a crocodilian god of fertility named Cipactli who protected crops . In Aztec mythology , the sea monster Tlaltecuhli is sometimes described as merging with a " great caiman " . The Mayans also associated crocodilians with fertility and death .

The gharial is featured in the folk tales of India . In one story , a gharial and a monkey become friends when the monkey gives the gharial fruit . The gharial 's wife demands that her husband bring home the monkey to eat , believing that the fruit made the monkey 's heart sweet . The gharial complies at first and attempts to lure the monkey to his home , but soon comes clean about the plan . Their friendship ends after that . Similar stories exist in Native American legends , and in the African American folktale of an alligator and Br 'er Rabbit .

In a Malay folk tale , the mouse deer Sang Kancil wants to cross a river to reach the fruit trees on the far side , but Sang Buaya , a crocodile , is waiting in the river to eat him . Sang Kancil asks all the crocodiles to line up across the river so he can count them for the king , and makes them promise not to eat him as he counts . He then steps on their heads one by one , calling out " One ! Two ! Three ! " as he goes . When he reaches the far side , he thanks them for helping him cross the river , and feasts on fruit . Sang Buaya does not fare as well , since the other crocodiles are angry with him for letting Sang Kancil trick them . A legend from East Timor tells how a boy rescues a gigantic crocodile that becomes stranded . In return , the crocodile protects him for the rest of its life , and when it dies , its scaly ridged back becomes the hills of Timor . One Australian Dreamtime story tells of a crocodile ancestor who had fire all to himself . One day , a " rainbow bird " stole fire @-@ sticks from the crocodile and gave it to man . Hence the crocodile lives in water .

= = = In literature = = =

Ancient historians have described crocodilians from the earliest historical records , though often their descriptions contain as much legend as fact . The Ancient Greek historian Herodotus (c . 440 BC) described the crocodile in detail , though much of his description is fanciful ; he claimed that it would lie with its mouth open to permit a " trochilus " bird (possibly an Egyptian plover) to enter and remove any leeches it found . The crocodile was one of the beasts described in the late @-@ 13th century Rochester Bestiary , based on classical sources , including Pliny 's *Historia naturalis* (c . 79 AD) and Isidore of Seville 's *Etymologies* . Isidore asserts that the crocodile is named for its saffron colour (Latin *croceus* , ' saffron ') , and that it is often twenty cubits (10 m (33 ft)) long . He further claimed that the crocodile may be killed by fish with serrated crests sawing into its soft underbelly , and that the male and female take turns guarding the eggs .

Crocodiles have been reputed to weep for their victims since the 9th century *Bibliotheca* by Photios I of Constantinople . The story was repeated in later accounts such as that of Bartholomeus Anglicus in the 13th century . It became widely known in 1400 when the English traveller Sir John Mandeville wrote his description of " cockodrills " :

" In that country [of Prester John] and by all Ind [India] be great plenty of cockodrills , that is a manner of a long serpent , as I have said before . And in the night they dwell in the water , and on the day upon the land , in rocks and in caves . And they eat no meat in all the winter , but they lie as in a dream , as do the serpents . These serpents slay men , and they eat them weeping ; and when they eat they move the over jaw , and not the nether jaw , and they have no tongue . "

William Shakespeare refers to crocodile tears in *Othello* (Act IV , Scene i) , *Henry VI* , Part 2 (Act III , Scene i) , and *Antony and Cleopatra* (Act II , Scene vii) .

Crocodilians , especially the crocodile , have been recurring characters in stories for children throughout the modern era . Lewis Carroll 's *Alice 's Adventures in Wonderland* (1865) contains the poem *How Doth the Little Crocodile* , a parody of a moralising poem by Isaac Watts , *Against Idleness and Mischief* . In J. M. Barrie 's novel *Peter and Wendy* (1911) , the character Captain

Hook has lost his arm to the crocodile . Hook fears the crocodile , but is warned of its approach by the ticking of a clock which it has swallowed . In Rudyard Kipling 's Just So Stories (1902) , the Elephant 's Child acquires his trunk by having his (short) nose pulled very hard by the Crocodile " on the banks of the great grey @-@ green , greasy Limpopo river " . The newly elongated nose allows him to pick fruit instead of waiting for it to fall , and to do many other useful things . Roald Dahl 's The Enormous Crocodile (1978) , illustrated by Quentin Blake , tells how a crocodile wanders the jungle looking for children to eat , trying one trick after another .

= = = In sports and media = = =

Crocodylians are sometimes used as mascots for sports teams . The Canton Crocodiles were a baseball team in the Frontier League , while the University of Florida sport teams are known as the Florida Gators , in reference to the American alligator , and their mascots are Albert and Alberta Gator . In film and television , crocodylians are represented as dangerous obstacles in lakes and rivers , as in the 1986 Australian comedy film " Crocodile " Dundee , or as monstrous man @-@ eaters in horror films like Eaten Alive (1977) , Alligator (1980) , Lake Placid (1999) , Primeval (2007) , and Black Water (2007) . Some media have attempted to portray these reptiles in more positive or educational light , such as Steve Irwin 's wildlife documentary series The Crocodile Hunter . Crocodylians in animation include the Hanna @-@ Barbera character Wally Gator , and Ben Ali Gator from the Dance of the Hours segment of Disney 's 1940 film Fantasia .