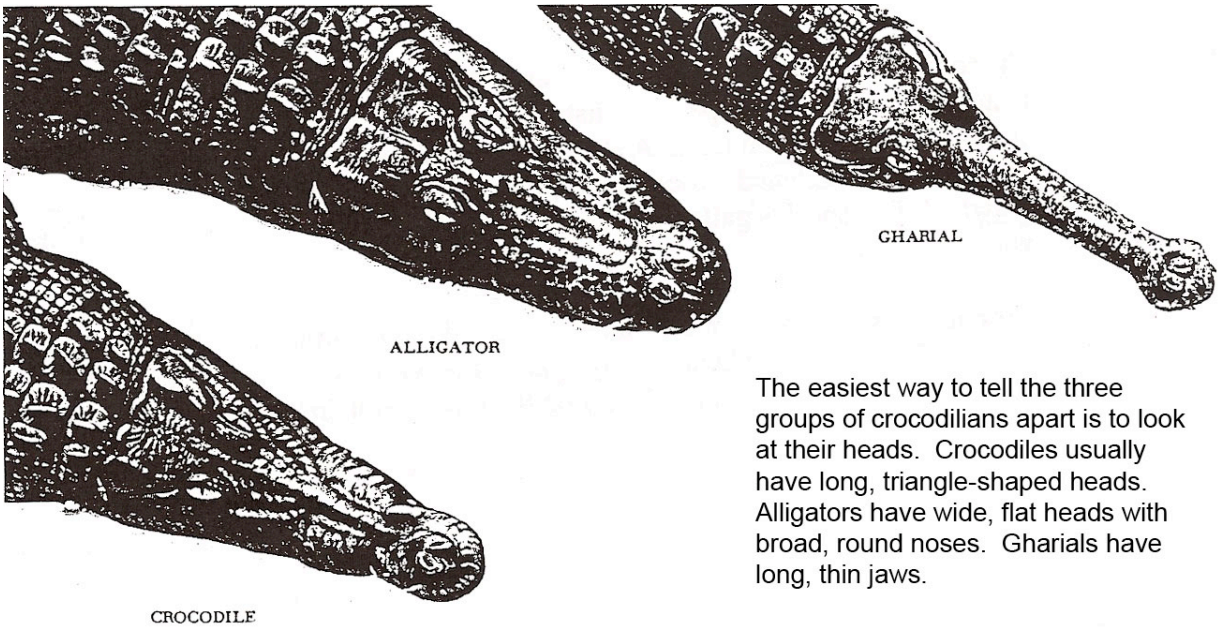
CROCODILIANS

I WHAT IS A CROCODILIAN?

Crocodilians are the only living representatives of the Archosauria group (dinosaurs, pterosaurs, and thecodontians), which first appeared in the Mesozoic era. At present, crocodiliams are the most advanced of all reptiles because they have a four-chambered heart, diaphragm, and cerebral cortex. The extent morphology reflects their aquatic habits. Crocodilians are elongated and armored with a muscular, laterally shaped tail used in swimming. The snout is elongated, with the nostrils set at the end to allow breathing while most of the body remains submerged. Crocodilians have two pairs of short legs with five toes on the front and four tows on the hind feet; the toes on all feet are partially webbed. The success of this body design is evidenced by the relatively few changes that have occurred since crocodilians first appeared in the late Triassic period, about 200 million years ago.

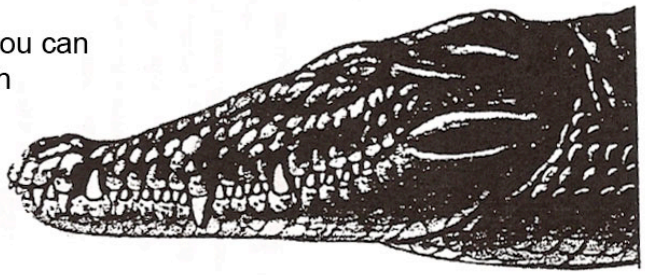
Crocodilians are divided into three subfamilies. Alligatorinae includes two species of alligators and five caiman. Crocodylinae is divided into thirteen species of crocodiles and on species of false gharial. Gavialinae contains one species of gharial.

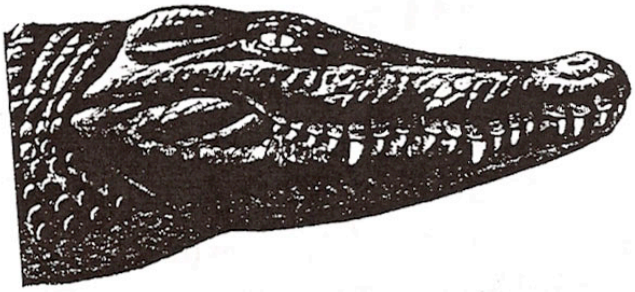


The easiest way to tell the three groups of crocodilians apart is to look at their heads. Crocodiles usually have long, triangle-shaped heads. Alligators have wide, flat heads with broad, round noses. Gharials have long, thin jaws.

Another way to tell the three groups of crocodilians apart is to look at their teeth.

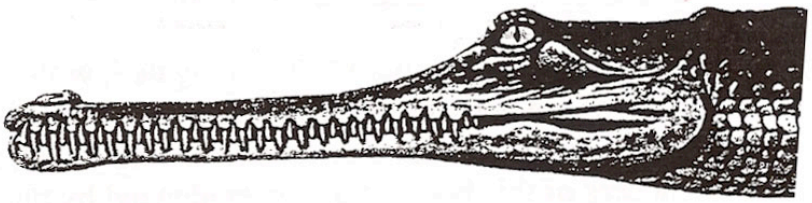
When a crocodile's mouth is closed, you can see both the upper and the lower teeth





An alligator's lower teeth fit inside the upper ones. When it closes its mouth only the upper teeth can be seen.

A gharial has room for over 100 teeth in its long mouth. Unlike the teeth of alligators and crocodiles, a gharial's teeth are all about the same size.



II PHYSICAL CHARACTERISTICS

A Locomotion

Crocodilians spend time on land primarily to bask in the sun, to move from one body of water to another, to escape from disturbances, or to reproduce. They use three distinct styles of movement on land. A stately high walk is used when moving unhurried on land. When frightened, crocodilians plunge down an embankment in an inelegant belly crawl. A few species gallop across land to escape danger or to reach the next watering hole.

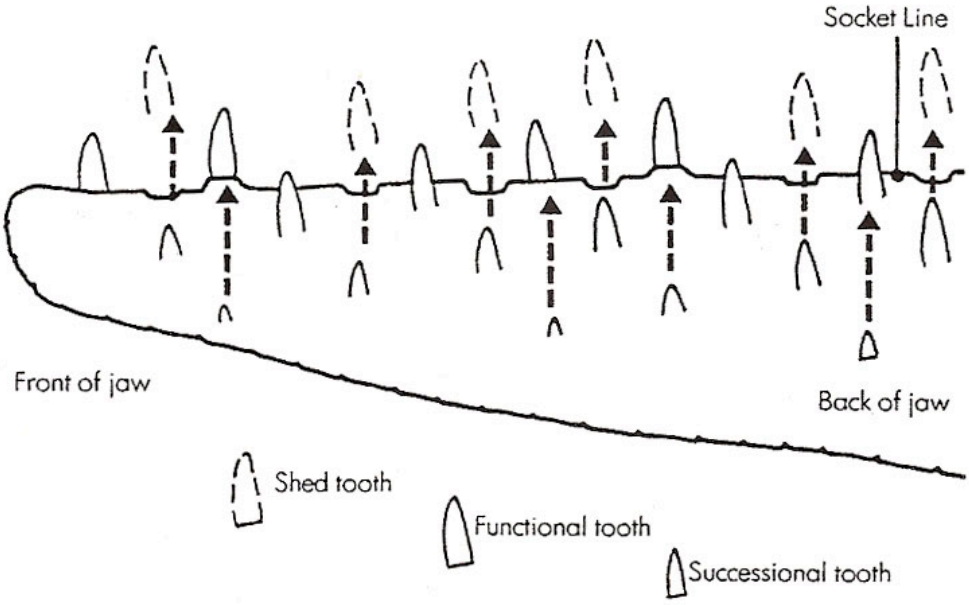
Crocodilians are excellent swimmers. The tail moves from side to side in a sweeping motion. The limbs are held closely against the body, streamlining the profile and reducing drag. The partial webbing on the hind feet helps them to balance and maneuver in the water.

B Growth

Growth can be rapid in environments that contain abundant food and are warm all year round. Many individuals grow more than 30 cm (12 in) in a year. The young of some of the larger species, such as the mugger in India, can grow from about 25 cm (10 in) at hatchling to more than 1 m (3.3 ft) by the end of the first year. The record length for a gharial is 6.6 m (21.5 ft) and for an American crocodile is 6.9 (22.6 ft).

C Feeding Habits

Most crocodilians are “sit-and-wait” predators. Rather than actively seeking food, they wait for the food to come to them, thus conserving energy. When something appetizing presents itself at the waters edge, a crocodilian may lunge. Many of the differences between crocodilian species reflect variations in diet. In the gharial, an extremely elongated snout is associated with a fish-eating habit. Alligators and the mugger have short, broad snouts and powerful jaws for tackling a much wider range of prey, including turtles, egrets, and small to large mammals. The snout of the Nile crocodile is long and narrow for eating fish, birds, and hoofed mammals. The teeth of crocodilians are adapted for tearing and holding prey. To dismember very large prey which cannot be swallowed whole, crocodilians perform twisting movements that aid their tearing teeth in detaching large chunks of flesh. Crocodilians often lose teeth in encounters with prey, but they are quickly replaced.



The presence of stones in the stomachs of crocodilians has been observed since very early times and is often a part of the folklore surrounding these reptiles. According to one Malay legend, the crocodile swallows a stone whenever it enters a new bay or river. In another legend, it keeps tally of its human victims in this manner. Some scientists believe that the stones aid the crocodile in diving and in holding its prey underwater. A more popular idea amongst zoologists is that the hard material helps to grind food, which, as with nearly all reptiles, is swallowed with very little chewing. Other suggestions are that the stones help to ease hunger pains during periods of shortage of food or supplies minerals not in the normal diet.

D Senses

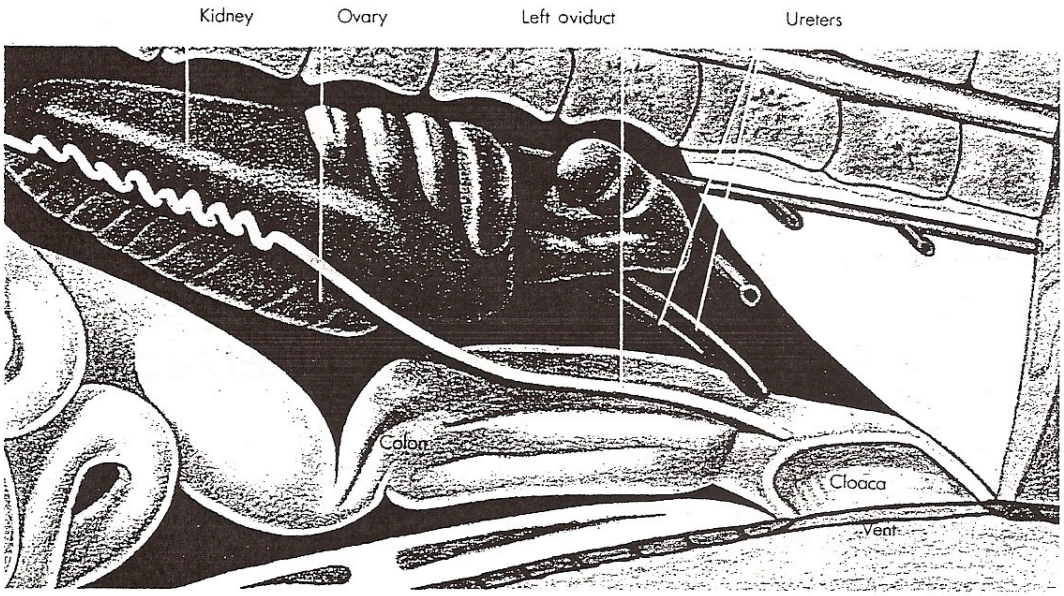
The sense of smell in crocodilians is well developed. Smell is useful both in the detection of prey and in reproduction.

Crocodilians also have a good sense of hearing. They have external ear openings covered with a moveable flap to reduce water intrusion during diving. Hearing is useful since crocodilians vocalize in a variety of contexts. Adults of some species bellow during courtship season, larger animals hiss or snarl warnings at intruders, and smaller ones bark distress calls to adults.

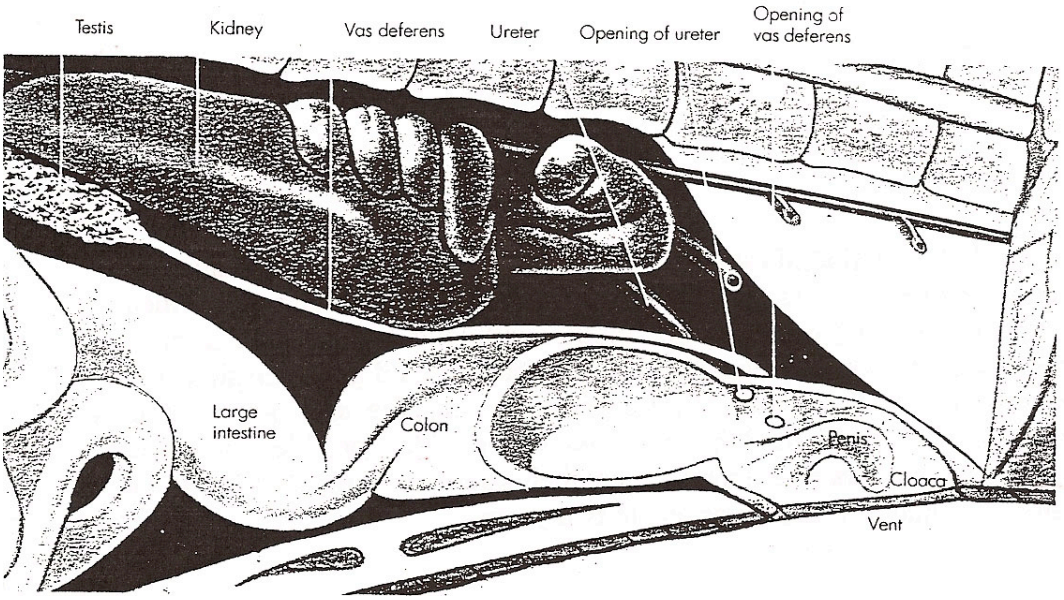
Crocodilian eyes are set laterally on the top of the head and are more prominent in alligators and caimans than in crocodiles. The eyes have a vertical pupil that can open wider at night to allow more light to enter than would be possible in a round pupil. Crocodilians have well-developed moveable eyelids and a transparent third eyelid called a nictitating membrane. Although covering the eye while the crocodilian is submerged, the nictitating membrane does not allow the eye to focus underwater. Crocodilians apparently use vision to capture prey above the surface of the water, but must rely on other senses underwater.

III REPRODUCTION

Male crocodilians have a single, grooved penis that protrudes from the cloaca through a longitudinal slit during copulation. Except for the gharial, crocodilians have no external characteristics to identify them as male or female. A mature male gharial develops a bulbous pot-like structure at the ends of its elongated snout. In al species, the male courts the female, swimming parallel to her and placing his fore and hind limbs over her body. During copulation the pair usually sinks to the bottom. About two months after copulation, the female is ready to lay her eggs. The temperature at which American alligator eggs are incubated determines if the embryo will be male or female. Research is still being done to determine whether or not this is true of all crocodilian species.



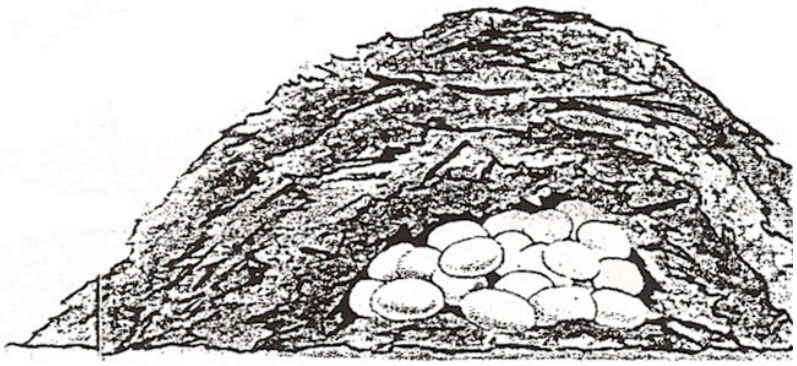
♀ reproductive system

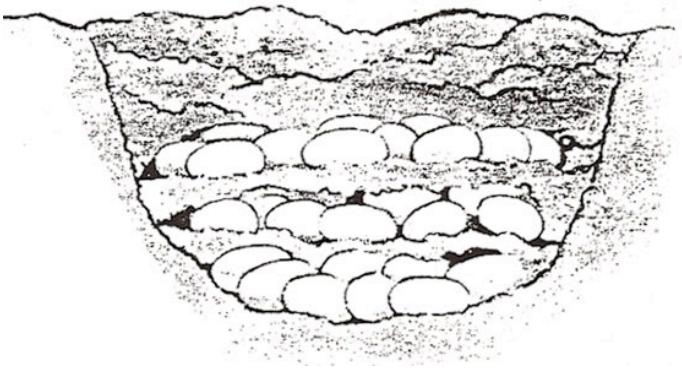


♂ reproductive system

Some species, such as the Nile and Australian crocodiles and the gharial, dig a flask shaped hole in the ground for a nest. The eggs are hard, with heavily calcified shells. Great care is taken not to break any eggs when placing them in the nest. It is thought that each egg is laid onto the mother's rear foot, which, like a hand, lowers it carefully into the hole. When laying is complete, the mother carefully covers the eggs with soil. She leaves no traces of the nest, and her own tracks will disappear in even a slight breeze.

Many other crocodilians, including the American alligator and the saltwater crocodile, build mound nests. Over a period of several nights, the female heaps large quantities of vegetation over the eggs. This vegetation helps with the incubating process by raising the temperature of the nest. The completed nest may be 2.5-3 m (8-10 ft) in diameter and 70-100 cm (26-40 in) high.



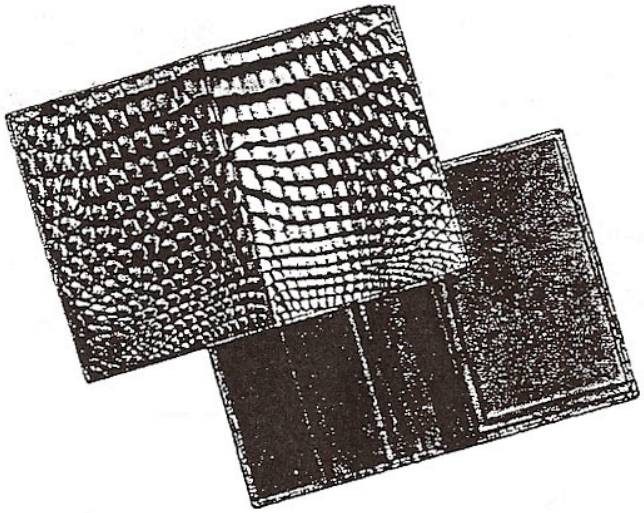


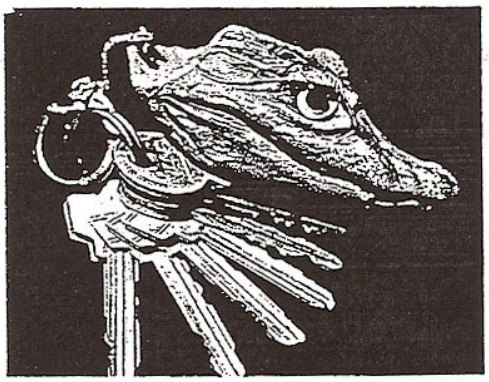
After an average incubation period of two and one-half to three months, the crocodilian hatchlings will break their shells, and with just their snouts poking out, will wait for their mother. The new hatchlings may even call their mother with loud, high-pitched grunts. In many species, the female will pick up eggs that have not hatched and gently crush them with her jaws to release the young. Females of many species, like the Nile and saltwater crocodile, will carry the young in their mouth until they reach the water. Nile crocodile mothers have nursery areas in quiet backwaters where they protect their young for three months. In the American alligator, care may last as long as one to two years.

IV CROCODILIANS AND PEOPLE

Historically, utilization of crocodilians for food, medicine, or religious purposes was modest. Australian Aborigines, Native Americans in the southeastern U.S., and tribal peoples in India and New Guinea ate crocodilian where they were available. In parts of China and Southeast Asia, crocodilian dorsal scales, internal organs, and musk were valued for their medicinal properties or were used in the manufacture of perfume. In the northern Philippines, Borneo, and Malaysia, the teeth and claws of the crocodilians were used as ingredients in magician's potions.

It was not until the mid 1800s, during and after the Civil War, that the utilization of crocodilians' skins became big business. Leather made from crocodilian skin was used to make footwear and traveling bags for those involved in the war. Since the mid 1800s, 15 of the 22 species of crocodilians have been commercially exploited for their skins. In recent years, over-utilization of crocodilians has brought many species to the brink of extinction and has seriously threatened the continued existence of others.





In 1973, representatives from 81 nations met in Washington D.C. and formed the Convention of International Trade in Endangered Species (CITES). The convention requires party nations to prohibit import of wildlife taken or exported illegally from its country of origin. It also requires all party nations to report annually on all imports and exports of wildlife listed on the CITES Appendices. Appendix I lists endangered species that may not be traded internationally for primarily commercial purposes (e.g., certain crocodilian skins). Appendix II lists species not at present endangered but which might become so if trade is not regulated. In recognition of the decline of many crocodilian species, <u>all crocodilians</u> were placed on one of the two CITES appendices in 1973.

CROCODILIANS LISTED ON CITES APPENDICES

Appendix I (endangered)	Appendix II (not at present endangered)
Chinese Alligator (*Alligator sinensis*)	American alligator (*Alligator mississippiensis*)
Apaporis River Caiman (*Caiman crocodilius apaporiensis)*	Brown Caiman (*Caiman crocodiles fuscus* – including *C.c.chiapasius)*
Broad-snouted Caiman (*Caiman lstirostris*)	Broad-snouted Caiman (*Caiman lstirostris*) – Argentina population
American Crocodile (*Crocodylus actus)*	American Crocodile (*Crocodylus actus)* - Cuba population
African Slender-snouted Crocodile (*Crocodylus cataphractus)*	Yacare Caiman (*Caiman yacare*)
Orinoco Crocodile (*Crododylus intermedius*)	Common Caiman *(Caiman crocodilus crocodilus*)
Philippine Crocodile (*Crocodylus mindorensis)*	Autstralian Freshwater Crocodile (*Crocodylus johnsoni)*
Morelet's Crocodile (*Crocodylus moreletti)*	Morelet's Crocodile (*Crocodylus moreletti)* – Belize and Mexico populations
Nile Crocodile (*Crocodylus niloticus)*	Nile Crocodile (*Crocodylus niloticus)* – Botswana, Egypt, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, South Africa, Uganda, Tanzania, Zambia and Zimbabwe populations
Mugger Crocodile (*Crocodylus palustris)*	New Guinea Crocodile (*Crocodylus novaeguineae)*
Saltwater Crocodile (*Crocodylus porosus)*	Saltwater Crocodile (*Crocodylus porosus)* – Australia, Indonesia, Papua New Guinea populations
Cuban Crocodile (*Crocodylus rhombifer*)	
Siamese Crocodile (*Crocodylus siamensis)*	
Black Caiman (M*elanosuchus niger)*	Black Caiman (M*elanosuchus niger)* – Brazil, Equador populations
Indian Gavial (*Gavialis gangeticus)*	Smooth-fronted Caiman (*Paleosuchus trigonatus)*
African Dwarf Crocodile (*Osteolaemus tetraspis)*	Dwarf Caiman (*Paleosuchus palpebrosus)*
Tomistoma (*Tomistoma schlegelii)*	

Updated 8/2011