

Everything Crocodilian

Everything you need to know about crocodilians.

Text and photos by Stephen Cooper

It's one of the most dramatic events in the natural world. Thousands of migrating herbivores, mostly wildebeest and zebra, mass at a river crossing that's standing between them and fresh grazing land. The first to reach the riverbank are nervous and hesitate until the ever-swelling wall of horns and hooves pressing from behind forces them into the river. They leap into the muddied water followed by wave after wave of their kind. Some - the boldest and luckiest - reach the opposite bank, others are taken by the river's current, and many others end their lives in the jaws of Nile crocodiles (*Crocodylus niloticus*). The crocs have assembled in great numbers to meet the migration, their annual feast. Year after year, throughout the millennia, this gauntlet from hell has culled the herds of the weak and unfit.

Perfect Predators

Eighty million years ago, during the late Cretaceous Period, the largest crocodile yet discovered - *Deinosuchus*, the "terror crocodile" - plied the waters of what is now Texas. Hunting duck-billed hadrosaurs in much the same way as modern Nile crocs hunt wildebeests, *Deinosuchus* took a greater toll on their numbers than its better-known compatriot predator *Tyrannosaurus rex*. The fossil remains of *Deinosuchus* are often found in association with croc-tooth-damaged hadrosaur bones. At about 50 feet and 8 tons, the terror crocodile dwarfed all modern croc species, but with the exception of its dimensions, it so closely resembled modern crocodiles that if it survived today it would be classified taxonomically within their ranks.

If evolutionary pressure ceases once a given species has reached "perfection," then the descendants of *Deinosuchus* have long been and are today perfect predators. The crocodile lineage goes back to the archosaur, which lived during the Triassic Period some 230 million years ago. Crocs predate dinosaurs, competed with them, fed upon them and survived them. Today, 23 species of crocodilians - alligators, caimans, crocodiles and gavials - inhabit the seas, rivers, lakes and swamps of the warmer regions of five continents.

The classification of the various genera, species and subspecies of crocodilians are grouped within three subfamilies: Alligatorinae, Crocodylinae and Gavialinae. These are grouped within the Family Crocodylidae and Order Crocodylia.

Alligators

Alligators and caiman belong to the subfamily Alligatorinae and all members but one (the Chinese alligator) are native to the New World.

They are distinguished from crocodiles and gavials by the presence of a socket in the upper jaw, which completely sheaths the large corresponding fourth tooth in the lower jaw so that it is invisible when the jaws are closed (this tooth in the lower jaw extends up and over the bottom of the upper jaw in crocs and gavials).

Following are some key points regarding each species.

Chinese alligator (*Alligator sinensis*)

Chinese alligators range solely within mainland China and are critically endangered. Adults are small, usually less than 6 feet in length, with large heads and broad snouts. They are dark gray to black, and the brightly colored hatchlings closely resemble young American alligators with yellow banding on a black background.

Captive breeding of *A. sinensis* has been hugely successful - so successful, in fact, that there is a shortage of suitable habitat remaining in China to accommodate the numbers of captive-bred animals that could, theoretically, be reintroduced into the historic range. Construction of dams might well doom this species in the wild.

American alligator (*A. mississippiensis*)

This species is found exclusively within the United States. It ranges from southern Virginia to the Florida Keys, west to southern Arkansas, Oklahoma and eastern Texas. In the past, large bull alligators may have reached 20 feet in length; today, however, a 13-footer is considered large.

The American alligator is one of the most impressive examples of species recovery in the annals of conservation. This is especially amazing considering that many people still regard it as a dangerous swamp monster bent on devouring human beings.

By the 1970s, mostly due to hide hunting, American alligator numbers were reduced to a point where recovery was doubtful. Later, now protected under the Endangered Species Act, state laws and a gradual change in public opinion, gators began their recovery. The advent of commercial alligator farms, which supply the demand for hides, all but eliminated the profit in poaching, which removed pressure from wild populations.

Florida could be considered the American alligator capital. They are so common that they are sometimes found in residential swimming pools and on golf courses. Nowadays, the old joke is that gators give a whole new meaning to the term "water hazard."

Caiman
There are three caiman genera: Caiman (common caiman, broad-snouted caiman and Yacaré caiman), Paleosuchus (dwarf and smooth-fronted caiman) and Melanosuchus (the black caiman).

Common or spectacled caiman (Caiman crocodilus)
Its subspecies range throughout most of Central and South America from southern Mexico to Argentina. A feral population resides in southern Florida, the Everglades and in introduced populations in several locales (most notably Cuba). All *C. crocodilus* subspecies are relatively small, usually less than 8 feet in length. They not only have the greatest range of any New World crocodylian, but also occur in the greatest numbers (although some subspecies are locally uncommon and threatened where not protected).

Broad-snouted caiman (C. latirostris)
This caiman, as its name implies, has a very broad snout and head. It is also distinguishable by the bony ridges running down either side of the snout and can reach 10 feet in length (although most rarely exceed 6 1/2 feet). Because of the lack of osteoderms (bony formations within scutes) in their belly scales and lack of protection, broad-snouted caiman are threatened or endangered in all the countries they occur: Brazil, Argentina, Bolivia and Paraguay.

Yacaré caiman (C. yacare)
The Yacaré caiman has the bony ridge about its eyes that's common to all members of the genus Caiman. It differs from *C. crocodilus* in that it has larger teeth in its lower jaw that sometimes protrude through holes in the snout. Yacaré caiman are threatened because of hide hunting and lack of adequate protection where it occurs in South America.

Dwarf or Culvier's dwarf caiman (Paleosuchus palpebrosus)
Smooth-fronted or Schneider's dwarf caiman (P. trigonatus)
The literal translation of Paleosuchus is "ancient crocodile," referring to a prehistoric lineage 65 to 80 million years old. These two species are the true dwarves of the crocodylians; *P. trigonatus* males reach only 4 1/2 feet in length and *P. palpebrosus* 5 feet.

These are also the most heavily armored modern crocodylians (particularly *P. trigonatus*). The profusion of osteoderms in the scutes has served them well, both as protection from the environment and predators, including hide hunters (the ossification renders their skins useless for leather goods).

Paleosuchus are readily distinguished from other caiman genera by their lack of "spectacles," hence the common name, smooth-front. Paleosuchus palpebrosus have short snouts and a high skull, giving them a somewhat "puppylike" appearance. They also have reddish-brown eyes that often match their overall coloration. Paleosuchus trigonatus has large pyramidal scutes on the back of the neck. Hatchlings' heads are bright gold to copper colored from just behind the eyes to the base of the skull. Neither species appears to be endangered at this time.

Black caiman (Melanosuchus niger)
This is the true giant of caimans. Reaching a length of 20 feet, it is the largest predator in South America. Adults superficially resemble American alligators but differ anatomically by having uniquely shaped skulls and large eye sockets. Specimens are basically black, though some have brown heads. The young, unlike other caiman species, are brightly colored.

Because of its size, which poses a danger to people and cattle, and the relatively osteoderm-free belly scales, Melanosuchus niger has been hunted to near extinction (its overall population has been reduced by 99 percent). It ranges throughout the Amazon drainage in north-central South America and is critically endangered wherever it occurs.

Crocodyles
The subfamily Crocodylinae contains three genera: Crocodylus (true crocodyles), Osteolaemus (dwarf crocodyles) and

Tomistoma (false gavials).

American crocodile (*Crocodylus acutus*)

Four species of *Crocodylus* reside in the New World. The most widespread and largest is the American crocodile, which can reach 16 feet in length. It ranges from south Florida and the Caribbean islands, including Jamaica and Cuba, through coastal Mexico to Ecuador and Peru. In the United States, it is rare and considered shy, but in other areas *C. acutus* occasionally kills and devours humans.

Hunted to near extinction, its numbers have not rebounded like alligators, even after being afforded legal protection. Conflict with humans who have invaded its historic habitat to build homes and marinas has usurped much of the coastal habitat this croc requires.

The American crocodile is most often found in brackish water or saltwater and has well-developed salt glands (present in all crocs but absent in alligators and caiman) to deal with the saline habitat by excreting excess salt. It is endangered throughout its range, with only several hundred surviving in the United States.

Orinoco crocodile (*C. intermedius*)

The Orinoco croc rivals *C. acutus* in size. Its jaws are somewhat more narrow than the American croc's, and they exhibit a slight upward curve.

More likely to be found in freshwater habitat, it ranges throughout the Orinoco River drainage of Venezuela and Colombia, where it, also, is critically endangered. The species' large size and lack of osteoderms has led to its wholesale slaughter; perhaps 1,500 remain in the wild.

Morelet's crocodile (*C. moreletii*)

This is the smallest of the New World crocs, growing to only about 12 feet. It mostly inhabits quiet bodies of freshwater in areas of Mexico, Belize and Guatemala. Exploited for its hide, numbers of Morelet's have been greatly reduced everywhere it occurs. It is a broad-snouted species, colored brown with faded banding and silver irises.

Several years ago, I visited Cox Lagoon in Belize, where herpetologists R. Howard Hunt and James Tamarack, along with Mike Miller of the Monkey Bay ecological facility, are working to establish a reserve for *C. moreletii*. The crocs are relatively common there, and can be seen not only in the lagoon itself, but also in the surrounding ditches and pools. Cox Lagoon also supports jaguars, tapirs, howler monkeys and over 200 other wildlife species. Captive breeding of *C. moreletii* is being undertaken at several facilities, with an eye toward reintroduction.

Cuban crocodile (*C. rhombifer*)

This species has the most restricted range of any crocodilian. As its name suggests, it is native to Cuba and its outlying islands. One population survives within the mainland's Zapata Swamp and another on the offshore island of Isla de la Juventud.

Cuban crocs can reach 16 feet in length, but most attain only about 12 feet. The main threats to native populations are hybridization with American crocs and predation of the young by introduced brown caiman (*Caiman crocodilus fuscus*).

Cubans are the most colorful and distinctive in appearance of all the New World crocs. Coloration is vivid black with profuse bright yellow spotting, although this fades somewhat as they age. The skull is extremely short and broad with elevated bony ridges behind the eyes that give the appearance of horns. Cuban crocs have well-muscled legs, short feet and little webbing between their toes, adaptations for hunting on land.

Ex-crocodile farmer Tommy Krutchfield once described these crocs as "velociraptors" to me. They will attack in packs with little or no provocation and are incredibly agile and fast. Their jumping ability is almost beyond belief. Several years ago, a 6-foot female Cuban croc leapt the height of her chain-link fence and latched onto a friend's arm, eventually tearing it off.

Many of those who work with crocs consider *C. rhombifer* the most dangerous of all, but Flavio Morrissiey of Orlando, Florida's Gatorland is doing something I would have thought impossible, if not suicidal: He's training Cuban crocs to come when called and to jump to be fed with a clamp stick. You've got to see it to believe it. More than just an exciting show for tourists, it is an exercise that may one day lead to a formula for testing crocodilian intelligence.

Cuban crocs are being bred in captivity at a number of facilities so that there will be a reservoir of genetically pure Cuban crocs for future ventures in reintroduction.

Nile crocodile (*C. niloticus*)

Three very different crocodile species of two genera reside in and around the continent of Africa. The largest, most widespread and best known is the Nile crocodile. Second only to the saltwater croc in size, Nile crocs often reach 16 feet in length and are heavily built. They can be found throughout tropical Africa and Madagascar in various freshwater and coastal habitats. Coloration, maximum size and the presence of osteoderms varies from population to population. Adult Niles feed on large mammals - including humans - and are responsible for 300 or more deaths a year. Yet this species is farmed extensively and hatchlings are sometimes sold as pets!

Slender-snouted crocodile (*C. cataphractus*)

Crocodylus cataphractus is a secretive species that reaches a maximum length of 13 feet. Its narrow snout is indicative of a species that feeds primarily on fish. It inhabits freshwater environments within Africa's tropical forests and does not occur in high concentrations. Conservation status is not known but the slender-snouted croc is considered vulnerable and protected legally throughout its range. Legislative protection, however, only goes as far as restrictive budgets and lack of enforcement personnel allow.

Dwarf crocodile (*Osteolaemus tetraspis*)

The dwarf crocodile reaches only 6 1/2 feet at maturity. With a short, broad snout and heavy ossification (including its eyelids), it resembles a caiman more than a crocodile. Dwarf crocs occur in freshwater in the tropical forests of west and central Africa. Because of its small size and armor plating, this species has never been a target of hide hunters, but it is vulnerable as a food source for an ever-growing human population.

Saltwater crocodile (*Crocodylus porosus*)

The saltwater crocodile is the largest croc, attaining a length of more than 20 feet and weighing more than a ton. It is, in fact, the largest living reptile, and in its home range it is feared more than sharks.

"Salties" are also the widest ranging of all crocodylians. They can be found from Fiji throughout the southwest Pacific to Australia, New Guinea, the Philippines, Indonesia, Southeast Asia, coastal India and Sri Lanka. It inhabits various habitats, including freshwater lakes, rivers and billabongs, as well as coastal areas and estuaries. It is a man-eater and is responsible for the majority of crocodile attacks on humans.

During World War II, a group of about 1,000 retreating Japanese soldiers entered a mangrove swamp near Burma where, because of a British naval blockade, they were forced to spend the night. Hundreds of saltwater crocs attacked in the dark. Throughout the night the assault went on, and witnesses aboard nearby British ships told of the screams and the sounds of the crocs feeding. In the morning the Brits went ashore and found only 20 survivors. This mass croc attack surpasses the casualties inflicted by sharks on the survivors of the U.S.S. Indianapolis, but is less well known.

For years, *C. porosus* was hunted relentlessly. Now protected and farmed in captivity, it has rebounded, particularly in Australia.

Mugger crocodile (*C. palustris*)

The mugger croc is distributed throughout the Indian subcontinent, Nepal, Pakistan and Iran. It grows to over 13 feet in length and is heavy bodied and broad snouted (it resembles the American alligator). Muggers usually are found in still, shallow bodies of freshwater, but may occasionally inhabit brackish water. They are being bred at several zoos and croc farms for reintroduction into protected habitat.

The story goes like this: During Britain's colonization period in India, drunken soldiers returning to their barracks would sometimes be attacked by robbers. They would be hit on the head and stripped of everything, including their clothes. The unconscious, naked victims were then thrown into a roadside swamp to be eaten by mugger crocs. When unlucky soldiers failed to show for roll call the next morning, they would be reported as "mugged." Hence, the possible connection to the term used today to describe a personal assault.

Siamese crocodiles (*C. siamensis*)

Until recently, Siamese crocs were believed to be extinct in the wild. But apparently, an isolated, genetically pure population has been discovered in the Cardoman Mountains of Kampuchea. They once ranged over Vietnam, Thailand and the Malay Peninsula. Croc farms have tens of thousands, but their stock is believed to be polluted genetically from hybridization with saltwater crocodiles. The newly discovered population of *C. siamensis* gives hope to future breeding and repatriation attempts.

New Guinea crocodile (*C. novaeguineae*)

This is a moderately sized species that can grow to 13 feet. It is found in freshwater habitats of New Guinea. Coloration is brown to olive with darker cross banding. There are two populations, one on the northern coast and one on the southern. Separated by a mountain range, there is no chance of interbreeding, which may lead to a reclassification, either specific or subspecific.

The skin trade has taken its toll on *C. novaeguineae*, but captive breeding (farming) has relieved much of the pressure on wild populations.

Philippines crocodile (*C. mindorensis*)

The Philippine croc is native to a number of the islands. It is critically endangered and may not recover; estimates of its total population are as low as 500. Hunting caused the initial decline, but now agricultural schemes and human encroachment are the main threats.

Philippine crocs rarely exceed 10 feet in length, are relatively broad snouted and inhabit still or slow-moving bodies of freshwater. They are problematic in captivity, and there has not been a great deal of success with captive-breeding programs.

Johnston's crocodile (*C. johnsonii*)

Australia's "other crocodile" is the Johnston's, known locally as "freshies" (as opposed to "salties"). This is a small species that grows to about 10 feet and is characterized by an extremely narrow snout. Freshies occur in freshwater habitats of tropical northern Australia. Once heavily hunted, they are now completely protected and seem to be recovering. There are films of this species galloping in the same manner as a horse, albeit for short distances.

False gavia or false gharial (*Tomistoma schleglii*)

This species - it's a croc, not a true gavia - is the last of an ancient line whose ancestors date back to the Eocene Period, more than 55 million years ago. Its historic range was from Borneo and Sumatra and the Malay Peninsula to Thailand, where it is now most likely extinct. In any case, false gavials are rare wherever they occur.

The extremely narrow snout, superficially resembling that of a true gavia, has led to the common name. *Tomistoma schleglii* is heavy bodied and can grow to over 13 feet in length. Hide hunting and human encroachment (the usual suspects), including habitat loss due to rice cultivation, have led to the false gavia's critically endangered status. They are being bred in Thailand, which offers hope for their survival.

This croc is one of the few species in which females offer no parental protection to their young.

Gavials

Gavials (*Gavialis gangeticus*)

Also known as gharials, true gavials occupy their own subfamily, the Gavialinae. They have the narrowest jaws of any crocodilian and are extremely aquatic (indicated by its weak legs and extensively webbed hind feet). Its appearance is reminiscent of ancient seagoing reptiles. The genus, *Gavialis*, is known from the Miocene.

They can attain great length and have been measured at 21 feet. Adult males develop a large knob at the end of the snout, the function of which is not understood.

Gavialis gangeticus is another critically endangered crocodilian whose range is now restricted to the northern part of the Indian subcontinent, including Nepal. There has been some success in captive breeding, which, along with enforced protection, has worked to stem their decline.

Concluding Comments

After about 30 years of protection, eight species of crocodilians are harvested under regulation, eight others are no longer in danger of extinction but are not harvested, and seven remain endangered. This is according to the Crocodile Specialist Group, comprised of dedicated zoologists who recommend quotas and oversee a 200-million-dollar-a-year trade in crocodilian products. Work continues to save the seven critically endangered species and to prevent the remainder from declining.

In 80 million years, countless species have evolved and faced extinction, and mankind has risen to dominate the planet. Throughout it all, crocodilians have remained what they have always been: perfect predators. They have changed little from their ancestors, who made velociraptors nervous and walked the Earth long before grass existed. Perhaps, if given a real chance, they will be around another 80 million years.