The Predator's Pursuit - Part 1 - Weaponry

by
Francois Cronje
of
Green Monkey Safari

Introduction

Within the entire system of natural law, few features inspire awe as much as the predator's mercilessness and precision. Whether procuring prey involves active pursuit or perfect motionlessness, the tension can be felt through the spine. Whether death is delivered in gruesome displays of power or a flashing strike of venom, the excitement possesses any onlooker. This inspired awe is of a primal nature, one that has been integrated into our psyche over millennia of evolutionary hardship and successful survival. For an extended period of our own mammalian existence, we were the hunted, and even now as human super predators dominating the land, seas, and skies, the concept of "the hunt" and "the predator" still resounds loudly in the depths of our psyche.

The exact definition of predation may be elusive as it manifests in a spectrum of ways, however, in its basic form, a predator is that which hunts, kills and consumes its prey. This requires weaponry, strategy, and means of execution which the prey may also possess for its defence. The natural flow of evolution has provided an array of weaponry by which predators flourish. The continual interaction between predator, prey, and environment has seen to the manufacture of truly brilliant natural weapons, with specific purpose and design.

Piercing teeth, hooking claws, shearing bills, crushing bodies and venomous injections are only a few of the many impressive adaptations in the predator's arsenal. This presentation will take a look at some of the masterful ways in which terrestrial predators hunt, kill and consume. Part 1 focuses on weaponry, part 2 will discuss hunting strategy and means of execution.

Teeth

Teeth are perhaps the primary weapon of most predators, whether they are a mammal, serpent or of other phyla. The design of a predator's teeth depends on its purpose along with the type of prey consumed. Some teeth are strong and designed to pierce and hold onto prey, while others are needle sharp and designed to envenomate. Other teeth are designed for shearing flesh off of the bone while, some teeth are simply designed to hold and crush exoskeletons. The predator's tooth structure is therefore directly correlated to its primary food source, and the best way to catch and consume it.

A typical indication of a predatorial mammal is the possession of long canine teeth, also known as cuspids or simply as fangs. There are four in total, two on the upper maxillary and two on the lower mandibular arch next to the lateral incisors. In general, the canine teeth of terrestrial mammalian predators are enlarged and elongated with long firm roots. These sharp teeth, along with a strong jaw allows for piercing the thick skin of larger herbivores and holding onto it while the prey is brought down, or to tear away at its skin and flesh.

This tearing may accelerate blood loss and cause extreme shock in the prey which speeds up its demise.

Most mammalian predators have specially adapted molars and premolars that are sharpened to form a rigid blade-like structure. The teeth are fused and enable a predator to shear or cut meat from the bone. This is known as the carnassial shear or sectoral teeth, which sharpens itself as the teeth from the top jaw abrades against the lower. This adaptation dates back 60 million years in the fossil record and is the trait which places an animal in the taxonomic order of Carnivora.

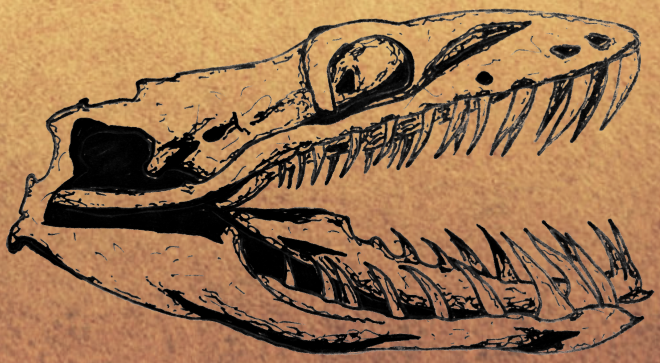
This order does not define an animal as being a carnivore, as a diet of pure or mostly meat is required, which is to be found in many other orders of life. Though this anatomical feature dates back so far, it is believed to have evolved separately in several carnivorous creatures in various locations and times. This structure varies slightly according to species, while a handful of predators lack them completely.

The tooth structure of reptilian carnivores differs from those of mammals. It also differs between reptiles depending on their method of hunting and the prey they most commonly consume. A carnivorous lizard, for example, has relatively unspecialized teeth compared to mammals.

The entire row of teeth is conical or blade-like bicuspid or tricuspid, with little size variation throughout the mouth. In larger reptilian predators such as crocodiles, there is especially little variation in design and size of the teeth. Instead, the multitudes of teeth are designed to hold and tear meat from a carcass and is consumed without chewing. While insectivorous lizards have relatively smaller teeth that are simply designed to crack the exoskeletons of an insect to kill it and swallow it whole.

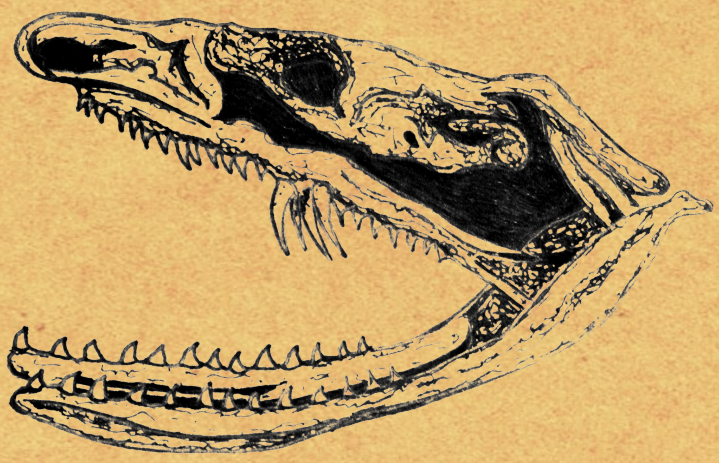
Some reptiles are far more specialized and therefore have unique teeth, such as snakes. This is especially true for venomous snakes who inject toxins via hollow or more primitive grooved teeth. Four primary groups of snakes are identified based on their dentition, which for the most part, correlates with their evolutionary lineage and venom type. These are Aglyph, Opisthoglyph, Proteroglyph, and Solenoglyph.

Aglyph refers to snakes with teeth ”lacking grooves”.



Most aglyphs are non-venomous and therefore lack grooves and venom-injecting fangs. This is the least specialized dentition of all snakes. The teeth are generally similar in size, though may vary depending on the primary diet of the snake, such as bird eating specialists. Though the size may vary slightly, the general shape and structure of the teeth do not change. This structure is commonly found in constrictors, who rely on holding onto prey with their sharp teeth while the body wraps around the prey.

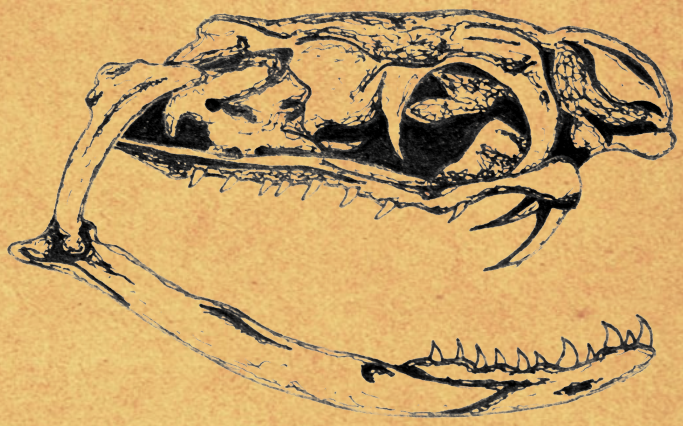
Opisthoglyphs are known as "rearward grooved" snakes.



These snakes possess enlarged teeth capable of injecting venom, however, these are situated further back on the maxillae and face backward. Therefore, the prey needs to be moved further back into the mouth for envenomation to occur.

This poses no problems with smaller prey or human fingers, as the snake is capable of quickly moving it toward the back of the mouth with its flexible jaw and other sharp teeth. This is not a blanket rule, as some of these snakes are capable of opening the mouth wide enough to bite larger animals with relative ease. Most of these snakes are not venomous enough to harm humans, though a few exceptions exist that are severely venomous, such as the boomslang and twig snake.

Proteroglyph snakes are known as "forward grooved" snakes.



These snakes have far fewer teeth than the previous types, though possess relatively larger fangs at the front of the mouth which are hollow for the injection of venom. These fangs point more downward than backward and fold around the venom channel. Some of the snakes in this group, such as spitting cobras and the rinkhals, have modified fang tips that enable them to project venom over a distance.

In general, these proteroglyphs need to hold onto prey for a brief moment as to ensure a decent dose of envenomation. This group is known for having some of the most toxic venoms of terrestrial snakes.

Solenoglyphs also termed "pipe grooved" snakes are known for the sheer size of hollow envenomating fangs that they possess, which easily pierce deep into its prey.

These fangs are folded backwards in the mouth to accommodate its large size and are held firm by enlarged maxilla reduced to the front of the mouth. A specially designed jaw and skull allow for the mouth to open near 180 degrees, which also rotates the fangs forward when biting. The venom of solenoglyphs are generally less toxic than other groups, however, the efficiency and speed of the bite, along with the amount of venom injected makes them just as dangerous.

Claws

Claws differ depending on the species of animal and its primary use. Some claws are designed to grab and hold onto its quarry, while others may be used for improved grip while chasing down prey. Other animals use it simply for climbing or digging, instead of hunting, such as certain spider, lizard and anteater species. Since the focus here is on hunting, only the claws of those in the mammalian Carnivora order, such as felines and canines will be discussed in terms of their hunting use.

Claws in four-limbed vertebrates or Tetrapods are designed in two layers. Both layers are constructed from keratin, the substance of which hair, nails, horn sheaths of bovines and rhino horn is made of. The two layers are known as the unguis, or outer layer, and subunguis, or inner core. These differ in construction and hardness. The subunguis grows in a parallel grain to the direction of the claw's growth, but is softer and easily damaged.

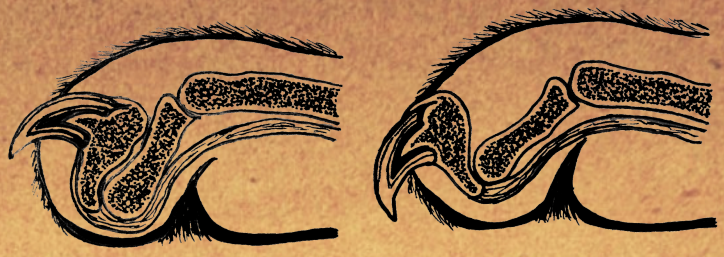
The outer layer or unguis creates a hard shell around the subunguis and grows in oblique angles perpendicular to the claws growth direction. It grows at a faster rate than the inner claw in order to ensure durability and increases the claw's curve and sharpness as it grows. As the claws grow from the nail matrix of the third phalanges, the base continually thickens while the rest of the claw becomes longer.

Claws and their use differ depending on the type of animal.

A good example of this distinction is between felines and canines, as the design and function of the claw are markedly unlike. In canine species, the claws are somewhat rough and worn, as they are continually being used for grip on the ground when they run and also at times to dig.

This creates more wear and tear on the claw, however, it has increased size and durability compared to that of feline species. This provides increased grip and consequently speed as the canine runs and the claws dig into the ground. The claw is therefore not sharp and cannot be used to grasp and hold prey, instead, canine species rely on their powerful bite to hold onto prey.

In contrast, feline claws are well protected, better maintained, less durable and consequently much sharper. The claws when at rest are sheathed in special sockets of skin on the paw, which reduces wear and tear when not being used. When claws are needed for climbing, hunting or the marking of territory, the feline simply protracts them at will. The claws can be protracted individually or collectively as needed.



These sharp claws are used to hold onto prey as they easily pierce the skin, which reduces the chance of the prey escaping. Also, the dew claws of felines are sharper as they receive less wear than other claws and is used to help hold prey. While the dew claws of canines are of little significance.

Conclusion

Clearly, the arsenal of terrestrial predators are diverse and specifically designed for particular purposes. A myriad more examples of unique and interesting natural weapons are still available to explore and be discussed. Such as the armaments that prey animals use to defend themselves, and the spectrum of aquatic and arboreal creatures with fascinating weaponry of their own. This interaction between predator and prey certainly inspires awe to humanity to this day. It is written in our genetic memory to respect and venerate these amazing natural creations. And, to remember our role in this natural playground.

Written & Illustrated
by
Francois Cronje

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www.greenmonkeysafari.com
travel@greenmonkeysafari.com
(+27) 78 662 1766