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THE SNAKES OF GHANA: MYTH, SCIENCE AND REALITY

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Abstract

Snakes have been symbols of fear and hostility to most human societies throughout the ages, largely due to their perceived deceit of Adam and Eve to eat the forbidden fruit in the biblical Garden of Eden, as well as to the general lack of knowledge and appreciation of snake biology and behaviour. This has resulted in the attribution of supernatural powers to snakes, leading to generation of several myths about them, which largely portray them in a negative light. Humans have thus relentlessly persecuted snakes over the years, with negative implications for ecosystem balance and biodiversity conservation. Using interviews, personal experiences, and available reports, this paper attempts to explain away 18 common Ghanaian snake myths as mere misconceptions, while also portraying snakes as quite important and indeed, useful components of the global ecosystem. Some precautions for preventing contact with snakes, thereby decreasing the likelihood of snakebites, have been provided.

Résumé

ATTUQUAYEFIO, D. K.: *Les serpents du Ghana: Mythe, science et réalité.* Les serpents ont été des symboles de peur et de hostilité à la plupart de sociétés humaines tout au long d'une éternité, largement à cause de la tromperie remarquée d'Adam et Ève de manger le fruit défendu dans le jardin d'Eden biblique, ainsi que le manque de connaissance et d'appréciation générale du comportement et de la biologie du serpent. Ceci a mené à une attribution aux serpents des pouvoirs surnaturels, menant à une création des mythes d'eux qui les présentent dans une lumière négative. Les êtres humains ont donc persécuté les serpents durant les années, avec des implications négatives pour l'équilibre d'écosystème et de conservation de biodiversité. Utilisant les entretiens, les expériences personnelles, la litérature disponible, ce document essaie de trouver une explication convaincante des mythes comme simplement des idées fausses, et présentant aussi les serpents comme tout à fait importants et en effet des éléments utiles de l'écosystème planétaire. Quelques précautions pour éviter le contact avec les serpents afin de diminuer la chance de morsure de serpent, ont été fournies.

Introduction

Snakes (*Reptilia; Squamata; Serpentes*) are reptiles, a highly specialised group of vertebrates (animals with backbones), comprising also the lizards, amphisbaenians, chelonians (tortoises, turtles and terrapins), rhynchocephalians (lizard-like tuataras), and crocodilians (crocodiles, alligators, caimans, and gavials). Modern snakes and lizards make up 95 per cent of living reptiles (Mader, 1998). The term "reptile" (Latin: *repere* = to creep or crawl) describes the crawling movement of the group on the ground, trees and walls, among others (Mitchell, Mutchmor & Dolphin, 1988). Snakes differ markedly from lizards, their closest reptilian relatives, with their most commonly recognised characteristic being a lack of limbs, which are present (with few exceptions) in the latter. Other differences include the lack of eyelids and external ear membranes (tympanum) in snakes, but their presence in lizards, and their possession of enlarged singly arranged transverse ventral scales (lizards have several rows of such scales) (Cansdale, 1955; Mattison, 1999). About 2,700 species of snakes

exist worldwide (McCarthy, 1991), with over 90 species occurring in Ghana alone (Hughes, 1988).

Humans have been fascinated and terrified by snakes throughout the ages. Snakes have featured prominently in the customs, religions and folklore of human societies worldwide, being held in high esteem by some societies as untouchable gods or spirits, and in others as evil, deadly, and despicable creatures with magical, almost supernatural attributes. Seen in a positive light, snakes have been considered religious symbols and repositories of fertility, wisdom, and good luck. Ancient Mexican Aztecs worshipped a mythical feathered serpent, *Quetzalcoatl*, as a fertility god and "master of life". Most Indian societies regard cobras as untouchable, because they are considered as reincarnations of important people *(Nagas)* (Carr, 1963; Jackson & Mirick, 1996). Ancient Greek mythology regards the *caduceus* (modern medical symbol of two snakes wrapped around a staff) as having originated from the mythical figure *Aesculapius,* who discovered medicine as he watched one snake resuscitate another with herbs (Jackson & Mirick, 1996). African (rock) pythons *(Python sebae)* and royal pythons *(P. regius)* are tabooed and worshipped in some African societies, including Ghana (Cansdale, 1961; Gorzula, 1998). Almost all the regions of Ghana have one traditional area or other having a snake, usually the royal python, African python, or black cobra *(Naja melanoleuca)* as a positive tabooed or totemic symbol (CI-G, 2004). In some parts of Africa, snakes are associated with the rainbow, and the power to control rain and rivers (Cansdale, 1955).

Negative perceptions of snakes are widespread in the largely ophiophobic Judeo-Christian societies, which condemn snakes for their perceived treachery against humans as represented by Adam and Eve in biblical times (Carr, 1963; McCarthy, 1991). The general hostility of humans toward snakes is, therefore, thought to be biblically sanctioned (Sweeney, 1971; Jackson & Mirick, 1996). The lack of snakes in Ireland has been credited to Saint Patrick, who is revered as an Irish hero for ridding the island from these sworn enemies of humankind (Carr, 1963; Jackson & Mirick, 1996). In parts of central Ghana, snakes are believed to be re-incarnations of people who are out to exact revenge on perceived enemies (Cansdale, 1961).

Obviously, an animal regarded with such ambivalence as a snake is bound to generate a slew of myths, half-truths and tall tales, and these abound in Ghana. The negative perceptions of snakes, which invariably lead to their relentless persecution by humans, are particularly of great concern, because of their adverse impacts on the environment and biodiversity. In a developing country like Ghana, where most people are superstitious and poorly educated, the need to dispel such misconceptions as having no scientific bases whatsoever, is quite pressing.

The snake myths discussed in this paper have been compiled largely through information collected from the author's personal contacts with people with interesting snake stories to tell, and the popular or scientific reports, as well as the author's personal experiences as a lecturer and researcher in snake biology.

This paper documents and scientifically explains away 18 common and widely believed snake myths in Ghana, and also creates awareness of the need to conserve snakes, whose importance to the ecosystem and human survival cannot be over emphasised.

Ghanaian snake myths: Probable origins

The myths about snakes are probably more than those of any other animal group. This is largely attributable to their perceived possession of supernatural powers, in turn due to lack of knowledge and appreciation of snake biology and behaviour, particularly their ability to (i) move seemingly effortlessly in any terrain, and to locate, capture and consume very large prey, despite their lack of limbs, and (ii) cause sickness or death with a single strike or bite (Fitzsimmons, 1970). The generally superstitious nature of typical African societies has also led to the perpetuation of myths and misconceptions, as well as the anthropomorphic tendency to ascribe

human motives and emotions to certain snake behaviour. Finally, the general tendency is to regard a single anecdotal behaviour of a particular snake as being characteristic of all snakes.

All snakes are venomous and dangerous

This is one of the most widespread of the Ghanaian snake myths that may have originated from the perceived biblical treachery of snakes, and the general belief that snakes are out to carry out their "diabolical" plans to wipe out the human race from the face of the earth. From this premise, there is every justification for the belief that all snakes are equipped with weapons (fangs and venom) with which to attack and kill any human being on sight.

All snakebites are fatal

With the general belief in the inevitable fatality of snakebites, the relentless persecution of snakes by humans has some perceived justification. This general "kill or be killed" attitude of humans toward snakes, has often been extended to any other snake-like (legless) animals, whether harmless or not! This attitude may be related to situations where people become hysterical or collapse on merely meeting a snake or stepping on one without being bitten.

Snake venom is exclusively for attacking and killing humans

Many think that fangs and venom are the snakes' weapons of choice in their declared war with humans. Other animals possess venom (sometimes even more potent than snake venom), but are not regarded with the same hostility and animosity as snakes! If such animals use venom for purposes other than to kill humans, is it not reasonable to expect that snakes also might just have evolved venom for such purposes also? Clearly, there is a bias against snakes in the area of venom possession by animals, and this may once again be traced to the biblical indictment of snakes as evil creatures.

Snakes monitor the movement of potential human victims before finally biting

This myth may have originated from the erroneous belief that snakes are always on the prowl for human victims to bite. It may also have arisen from a particular snake being often met in the same general area over and over again. Also well known is the belief that snakes could be "sent" as agents of the devil to bite enemies of people who might have been offended by actions of such people. Based on the above premise, it is reasonable to expect that a snake will trail a potential victim until it is opportune to bite, whether "provoked" or not.

Snakes take revenge for the killing of a mate

It has occasionally been observed that when a snake is killed in an area, another snake of the same species, and usually of the opposite sex, is also killed in the vicinity around the same period. The general belief is that the second snake went looking for revenge for the earlier killing of its mate. The question is whether snakes, or animals for that matter, are vengeful creatures, or whether revenge is an exclusively human emotion or characteristic.

Snakes extract venom from amphibians (frogs and toads)

Snakes are often observed with posterior part of the body of a frog or toad sticking out of their mouths, or such an animal just released with slimy liquid all over its body. The conclusion has invariably been that the snake was in the process of drawing venom from the amphibian, or had just drawn venom from it. The myth is, however, silent on how the venom is drawn, and what happens to the frog or toad after it had been "sucked dry" of venom.

All black snakes are cobras

Generally, most cobras are black or dark-brown, so why not extend this to include all cobras; or conversely, why can't all black snakes be cobras? Indeed, a more extreme version of this myth

suggests that all snakes are cobras.

All snakes "spit"

This myth arose from observing a particular behaviour of a specific group of snakes (spitting cobras here), and considering it as generally characteristic of all snakes, due to lack of knowledge of snake biology. Even the word "spit" as applied to cobras, is a misnomer, as would be explained later.

Stepping on the skeleton of a venomous snake could result in poisoning or death

It is generally believed that snakes possess poisonous bodies, and any form of contact with any part of a snake's body could result in poisoning, with potentially fatal consequences. As the skeleton is in the snake's body, it is reasonable to expect that stepping on it exposes one to poisoning, which could result in death. The myth is, however, silent on the mode of transfer of the poison into the body of the victim, unless it is assumed that the bones of a snake skeleton are sharp enough to puncture the skin of the victim.

Snakes love, and are attracted by music

This is probably the most widespread of all the snake myths, usually bandied around by some people with conviction and some degree of confidence. The origin of this myth may be traced to the tendency of some snakes to venture into human habitations and hide behind musical and other household electrical appliances. The all-too-familiar spectacle of dancing cobras in front of flute-playing Asian or Arabic snake-charmers often portrayed in films and books has also contributed to perpetuating this myth. Generally, the belief is that if music is pleasing to the human ear, why not a snake's ear? The pertinent questions, however, are whether snakes have "ears" at all; and if they do, whether they perceive or "hear" sound the same way as humans do.

Snakes bite or sting with their tongues and tails

It is widely believed that a snake's poison fang is its forked tongue, which flicks in and out of its mouth rather menacingly. The locomotory slashing of a snake's tail from side-to-side, has also been perceived as a behaviour geared toward "attacking" or biting or stinging prey. It is a fact that some animals (e.g., scorpions) do sting with their sharp-pointed, venom-containing tails, but can the same be said of snakes, with their blunt and fleshy tails and tongues?

Snakes move very fast, and can easily outrun humans

The "flowing" side-to-side movements of snakes give an illusion of very fast movement that cannot be matched by even the fastest human being. This could be one reason why people tend to "freeze" as if hypnotised, on meeting a snake, probably because of the feeling that humans are no match for snakes in speed, and that the better strategy under the circumstances would be to remain absolutely still, and hope that the snake moves away!

Snakes break the spines of their human victims before swallowing them

This myth is probably the closest to reality. Snakes, limbless, often have to capture and swallow live prey, which must be subdued using any means possible to make swallowing easier. One way is to weaken the victim's body, or to immobilize it by injecting venom. If the snake is non-venomous, it must physically attack the victim and attempt to break its bones as a way of weakening it, which is what most people believe snakes do. The question, however, is whether the snake has no better way of subduing a prey than attempting to break its bones, which comes with certain risks (including death) to the snake itself. A better way is probable, with much less risk to the snake, as will be explained later.

Snakes "hypnotise" their human victims into immobility

The fear or panic on meeting a snake often renders most people temporarily immobile ("frozen"), as they are confronted with the snake's unblinking stare. This phenomenon has often been described as *hypnotism* by the snake as a prelude to biting. Once again, the question is whether hypnotism is an exclusive human characteristic or invention.

Snakes are vocal

Many think snakes produce sounds through vocalization, much like humans or some other animals (e.g., birds). The origin of this myth may be the variety of animal sounds often heard in the wild, some of which are attributed to snakes. The question here is: Do snakes have the requisite apparatus and mechanisms to enable vocalization as occurs in some other animals?

Normal two-headed snakes exist

Occasionally, snakes hatch, or are born with two heads. Some Ghanaian snakes are commonly referred to as "two-headed" or "double-ended" snakes (Cansdale, 1961) (e.g., blind snakes– *Typhlops* spp. and Calabar ground pythons– *Calabaria reinhardtii)*. Of course, such snakes do not actually possess two heads, but the more pertinent question is whether snakes, or any other animal for that matter, born with two heads, can survive and live normally.

The "black" or "snake"stone is an antidote to snakebites

The so-called "black" or "snake" stones have been used in many areas of Africa, including Ghana, to treat snake-bite victims. They are known to have been imported from Asia. Their effectiveness or otherwise, in treating snakebites is controversial.

Flying snakes exist

To most people, any airborne animal is considered a flier. Some snakes and a few other animals have achieved such feats, but whether they fly is another matter. To the biologist, or zoologist for that matter, a flying animal must possess certain basic equipment, and any animal without such equipment simply does not fly. The question is whether snakes actually possess these flying apparatus, in which case they must be described as such; otherwise, they must be doing something else.

Ghanaian snake myths: The science and the reality

Most human societies are generally ophiophobic, because of the perception that snakes are vicious and cunning creatures with a deep hatred for humans. Such perceptions are largely misplaced, as in reality, most snakes, even venomous ones, are timid and retiring, and lack the brain capacity for cunning. Admittedly, some snakebites are serious, and a few may prove fatal, especially for children, but snakebites' greatest danger is probably hysteria, which has most people nearly dying of fright even if bitten by harmless snakes. Such deep and irrational fear of snakes is borne out of ignorance and superstition, which only a knowledge of snake biology and behaviour can assuage. Below are simple scientific or biological explanations of the perceived strange behaviours of snakes which have been viewed by humans through a smokescreen of folklore, myth, legend and half-truths over the years.

All snakes are venomous and dangerous

Contrary to popular belief, only about 800 (30 %) of the world's estimated 2,700 snake species are venomous, and only about 250 (9.3 per cent) are considered dangerous to humans (McCarthy, 1991). Less than half (44 %) of Ghana's estimated 90 species of snakes are venomous (Hughes, 1988), out of which only a few (cobras, mambas, and vipers) are considered dangerous. A venomous snake may not necessarily be dangerous, either because (i) its

venom may not be potent enough to cause fatalities, (ii) it may not be disposed to biting, or (iii) its venom injection apparatus is inefficient. Conversely, some non-venomous snakes may be dangerous for their large size and, therefore, their ability to swallow humans. A typical example is the non-venomous African python *(P. sebae),* Ghana's only large python which can grow to lengths of between 8 and 10 m or more.

Ghana has three types of non-venomous snakes (Hughes, 1988): (i) small harmless burrowing snakes, comprising the families Leptotyphlopidae (worm/thread snakes) and Typhlopidae (blind/glass snakes), (ii) large constricting snakes, comprising the pythons and boas (Boidae), and (iii) small constricting snakes belonging to the third sub-family Boiginae of the family Colubridae, (ii) cobras and mambas (Elapidae) with short fixed front fangs, and (iii) vipers and adders (Viperidae) with long, movable hinged fangs.

All snakebites are fatal

All snakes can bite with their normal teeth, but only venomous snakes can inject *potentially* fatal venom through biting or striking with specialised teeth *(fangs),* connected to *venom glands* via a *venom duct.* Any bite by a venomous snake is potentially fatal, but most are not because *all* bites by venomous snakes are potentially treatable with the requisite medical attention, and most snakebite victims recover without treatment (Cansdale, 1955). Even with the undeserved

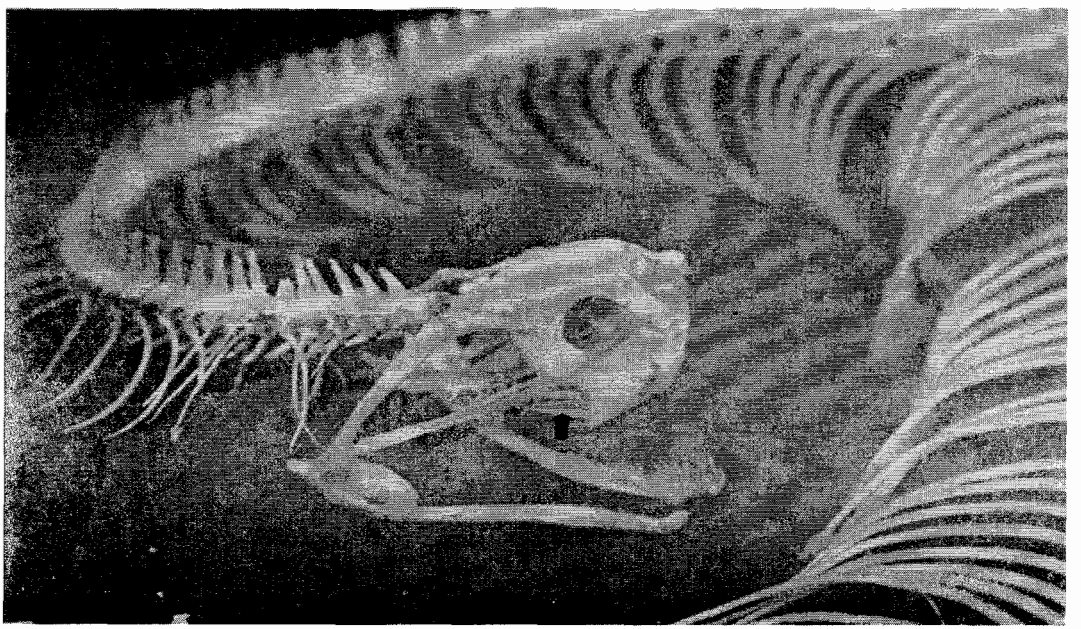

Fig. 1. Skull of puff adder (*Bitis arietans*) showing the long, curved and hinged front fangs (arrowed).

comprising the sub-families Colubrinae (fangless colubrids) and Dasypeltinae (toothless egg-eating snakes) of the family Colubridae. Venomous snakes in Ghana also belong to three families (Hughes, 1988): (i) back-fanged colubrids,

reputation of snakes as deadly killers of humans, not more than 1,000 snakebite fatalities are recorded annually in Africa (Ewer & Hall, 1988), where far more people die from road accidents and deadly diseases like malaria and AIDS.

In South Africa, 10,000 deaths from road accidents, 2,000 from lung cancer and other smoking-related diseases, 220 from lightning, and less than 20 snakebite deaths were recorded in 1 year (1986) alone (Branch & Spawls, 1995). During a 5-year period, no snakebite fatalities were recorded in 34 (68 %) of 50 health units visited in Kenya (Coombs *et al.,* 1997). Swiecicki (1965) reported no fatalities from 540 snakebite cases admitted to 13 hospitals in 6 years in Ghana (1958-1964). A recent study in the United States estimated that only 0.2 per cent of snakebite victims died annually, and that most of such fatalities resulted from lack of medical treatment or first aid (Grenard, 2000).

Snake venom is exclusively for attacking and killing humans

As snakes are limbless, venom injection provides a very efficient mechanism for feeding and defence against potential predators. It has been suggested that snake venom evolved as a way of obtaining food, and is only used secondarily as a means of defence (Mader, 1998). In the absence of arms, legs, or claws, venomous snakes use venom to kill quickly, prey that might otherwise escape or hurt them (Orenstein, 1994).

Snakes may bite humans as a result of some irresponsible or careless behaviour of the latter (e.g., touching, catching, attempting to kill, or playing with a snake) (Branch, 1993). Of 227 cases of venomous snakebites analysed in 1988 over a 10-year period in the United States, 44 per cent occurred during accidental contact (e.g., stepping on snakes), while 55 per cent resulted from grabbing or handling snakes. In 28 per cent of the latter, the victims were intoxicated (Grenard, 2000). Indeed, research has indicated that snakes bite people only as a last resort, once they have determined that (i) an easy escape is impossible, or (ii) the intruder cannot be held off by a threat display. Indeed, the popular saying goes that "snakes are first cowards, then bluffers, and last of all, warriors", stressing their largely defensive nature (Gibbons & Dorcas, 1998).

From a zoological standpoint, *optimal foraging theory* suggests that animals optimise the energy gained from food by expending minimum energy for maximum gain (Smith, 1986). Venom production is an energy "investment" by the snake, so it would be energetically unwise for it to be used for purposes other than obtaining prey, or for self-defence. Snake venom contains complex proteins which require time and energy to produce (Gibbons & Dorcas, 1998). Research has shown that snakes often inject less venom than they have available when biting defensively, than when biting a potential meal. Indeed, snakes have been known to control the venom they inject, with "dry bites" (no venom injected with the bite) often occurring when the victim is not a potential meal (e.g., human being) (Gibbons & Dorcas, 1998). Venomous snakes are small-sized and, therefore, cannot swallow humans if they bite, and the larger snakes which can consume humans (pythons and boas) are non-venomous. That is something to ponder over!

Snakes monitor the movement of potential human victims before finally biting

Snake venom is primarily for feeding and defensive purposes, and it is unlikely that snakes would monitor the movements of potential human victims simply to inflict a bite. Like most other animals, snakes have home ranges to which they are confined for most of their lives, subject to the continued availability of the basic necessities for their existence (food, shelter, mates). A snake is often seen in a particular area because that is its home range (like humans, animals have homes too!). Snakes have special adaptations for locating potential prey, and this includes stalking, but not necessarily monitoring the movement any animal over a long period. For energetic reasons, a snake would not stalk a human victim to simply inflict a bite without consuming the victim.

Snakes take revenge for the killing of a mate

Some snakes often move in pairs, especially during the breeding season, in which case the

killing of one is likely to be followed by the killing of its mate, which may be present in the vicinity, and would have been attracted by scent trails (pheromones) left by its dead partner. Evidence suggests that scent trails play a major role in mate location by male snakes (Fitzsimmons, 1970), which may sometimes follow such trails for miles! As snakes normally do not show aggressive tendencies, as one would expect in a revenge situation, attributing a revenge motive to a snake is indicative of the common fallacy of *anthropomorphism* (tendency to ascribe human attributes, motives and behaviours to animals).

Snakes extract venom from amphibians (frogs and toads)

Snakes possess recurved (backwardly curved) teeth unsuitable for chewing, but are very efficient for swallowing struggling live or dying prey (e.g., amphibians) whole. Snakes become vulnerable when swallowing prey, and will quickly disgorge the prey at the slightest threat or disturbance to enable easy escape from danger. This leaves the disgorged animal smeared with a slimy enzyme-containing saliva, which has been mistaken for venom which the snake was in the process of taking from the prey (amphibian). Snakes are particularly partial to a diet of frogs or toads, with some feeding exclusively on them (e.g., night adders); they would usually be seen swallowing them, lending some credence to the myth.

Venomous snakes synthesise venom for feeding and protection from potential predators, and most are so dependent on venom that they do not survive if they are devenomed (May & Marten, 1982). Obviously, venomous snakes would be "living dangerously" if they had to depend on amphibians for their supply of this essential requirement for their survival. Amphibians could also not do without venom (some are even more potent than snake venom), which is also needed to ward off potential predators. Toads secrete ***bufotalin*** and ***bufogin***, which disrupt the heart and central nervous system of potential predators or enemies, and the very powerful frog *batrachotoxin* causes paralysis, convulsions and even death in humans and other animals (Wager, 1965; May & Marten, 1982). Non-venomous snakes also swallow frogs and toads, and their intention is obviously not to obtain venom from them, but simply to eat them.

Snake venom composition is different from that of amphibians, being modified saliva for immobilizing and preparing prey for digestion (Branch & Spawls, 1995). It comprises a mixture of over 20 different components made up of biologically active enzymes, water, mucus, and salts. Different snake species produce different combinations of toxins such as phospholipase, hyaluronidase, fibrinolysins, neurotoxins, haemorrhagins and cardiotoxins, producing three major types of snake venom classified according to the parts of the body they affect. *Cytotoxins* affect the blood vessels and tissues, and are characteristic of spitting cobras, burrowing vipers and most adders, while *neurotoxins* affect the nervous system, causing paralysis, and are characteristic of elapid snakes (cobras and mambas). *Haemotoxins,* which prevent or delay blood clotting, are possessed by venomous colubrids and some vipers (Branch & Spawls, 1995). So unique and complex is snake venom that to date, it has been impossible to use biotechnology or genetic engineering to artificially synthesize it.

All black snakes are cobras

Most cobras are black or dark-brown , but several black snakes are not cobras, and a few cobras are not black. The non-poisonous house snake *(Lamprophis* sp.*),* black or dark-brown, has often been mistaken for a cobra, as it frequents houses like cobras do. It is, however, distinguished from cobras by its thinner, longer body and smaller head. Cobras do not have body patterning like the pythons or vipers, so they are often mistaken for other black snakes, most of

which are colubrids.

All snakes "spit" venom

The specialised ability to "spit" venom is a defensive strategy used only by spitting cobras *(Naja nigricollis)*. Even the closely related species like the black/forest cobra *(Naja melanoleuca)* (Fig. 2) is a non-spitter (Cansdale, 1955). The specialised "spitting" ability of so-called spitting cobras is due to their being the only venomous snakes with the opening of the fang perforation directed forward, not terminal to the fang, so that venom can be sprayed or squirted out straight in front. Such cobras, therefore, have to simply open their mouths for two jets of venom to be discharged through the perforation toward the eyes of a potential victim. The primary function of "spitting" is to ward off large mammals which may step on the snake, or humans which may approach too close (Cansdale, 1955). The cobra threat posture of spreading out its flexible neck ribs and loose skin to form a wide "hood", is not always followed by spitting, and what is "spat" is not saliva, as often misconstrued, but the same venom injected through a bite.

Stepping on the skeleton of a venomous snake could result in poisoning or death

It is pertinent to differentiate a *poison* from *venom*, words which are often used interchangeably. A *poison* is any substance that causes illness or death when taken into the body; *venom* is a specific substance produced by specialised tissues in an animal, which can only be introduced into a victim by a special biting apparatus (e.g., fangs in snakes). Some animals are *poisonous* by virtue of their *whole* bodies being harmful to eat or touch; others (e.g., venomous snakes) possess venom glands from which venom can only be injected through biting or striking. These definitions indicate clearly that neither the snake's body nor skeleton is poisonous, and stepping on either (provided there are sharp points to puncture the skin) has about the same consequences (e.g., infection) as

Fig. 2. African forest cobra *(Naja melanoleuca)*, a non-spitting cobra.

stepping on the skeleton of any other animal, or any other sharp object.

Snakes love, and are attracted by music

Music must be *heard* to be appreciated, but the structure of a snake's auditory apparatus (lack of a middle and external ear) makes it inefficient at perceiving airborne sounds. While snakes may not be completely deaf, their level of hearing does not enable the appreciation of music in the human sense. Some snakes are habitual visitors to houses (e.g., house snakes, spitting cobras, and egg-eaters), but generally most snakes are attracted to houses which provide easy sources of food (e.g., mice, rats, chicken, and frogs), good hiding places (e.g., behind furniture), or warmth (e.g., musical and other heat-generating appliances). It is really not about music.

The "dancing cobras" often portrayed in films, television, and books, are simply the snake-charmer's mastery of the art of illusion and some knowledge of snake behaviour. The cobra's swaying movement to the snake-charmer's flute or other musical instrument is actually a reaction to the movement of the flute rather than the music being played. Cobras assume a peculiar defensive or threat posture by raising their upper bodies and spreading their flexible neck ribs and loose skin around the neck to form a wide "hood", and swaying in rhythm with any movement in front of them. Snake-charmers simply exploit this peculiar behaviour to create an illusion of "dancing" to the swaying flute, with the music serving to further enhance the illusion (McCarthy, 1991). Indeed, waving anything rhythmically in front of a cobra will induce it to "dance".

Snakes bite or sting with their tongues and tails

Both the tongue and tail of snakes have no connection whatsoever with biting, stinging, or venom for that matter. Snake tongues are olfactory (smell) and tactile (touch) organs, while the tails are locomotory and prehensile in function. The flicking tongue "smells" the environment for potential prey, enemies or mates (Fitzsimmons, 1970; Sweeney, 1971; McCarthy, 1991), and the leglessness of snakes makes the tail a very important organ for propelling the snake forward during locomotion. *Biting* and *stinging* are different processes, the former involving teeth only, and the latter any other sharp-pointed body parts (including the tail). *Snakes bite, scorpions sting!* . The use of the word "bite" for front-fanged venomous snakes is itself a misnomer, as such snakes actually "strike" with their mouths open (Cansdale, 1955).

Snakes move very fast, and can easily outrun humans

A record of a snake being able to outrun a normal human being is lacking; snakes simply do not move as rapidly as often thought. The world's fastest snakes (e.g., green mambas and racers) can only handle estimated maximum speeds of between 6 and10 km/h, while the slower snakes (e.g., giant vipers) can only manage 1.6 km/h. Humans are much faster, recording speeds of up to 45 km/h over short distances. Snake speeds are often much overestimated probably because of the strange and unfamiliar way in which they move, and the panic on meeting them (May & Marten, 1982). Snakes actually undergo a lot of sideways bending and contortions during movement, with little forward progression. It has also been suggested that the camouflaged nature of snakes makes them "disappear" from view rather quickly, creating the illusion of fast movement, although the snake itself may be hidden close by.

Snakes break the spines of their human victims before swallowing them

The larger non-venomous snakes (e.g., pythons and some colubrids) kill or immobilise prey by *constriction*, a process of suffocating the prey by squeezing it, forcing air out of its lungs, and crushing the heart. Prey immobilization or death does not, therefore, involve paralysis through breaking the spinal bones (McCarthy, 1991). Non-venomous snakes must kill quickly and efficiently

to avoid possible risks of injury to themselves while overpowering prey (Mattison, 1999). Suffocating the prey is probably preferable to physically breaking its bones, which could involve a longer struggle and possible danger to the snake's life.

Snakes "hypnotise" their human victims into immobility

Hypnosis is essentially a two-way affair, with the subject being willing, cooperative and relaxed, while the hypnotist uses his powers of suggestibility and persuasion to achieve his/her aim (Leokum, 1994). A person confronting a snake is definitely neither relaxed, nor in a cooperative mood. It is a matter of life and death! It has been suggested that a person's inherent fear of snakes would make him/her feel "hypnotised" (self-hypnosis), if ever that was possible. Also, hood-spreading in cobras has been misconstrued as a form of hypnotizing stance by the snake!

Snakes are vocal

Like most reptiles, snakes are generally silent, non-vocal creatures, but they can produce sounds through "hissing" (expelling air forcefully from the lungs, or coiling and rubbing their body scales together to produce characteristic sounds). These behaviours are, however, only manifested when the snake is under threat, or irritated in some way. The variety of animal sounds regularly heard in the wild could be attributed to animals like frogs, insects, birds, and some mammals.

Normal two-headed snakes exist

Many kinds of animals are born or hatch with two well-developed heads arising out of one body (Manchester, 1990). Double-headedness may result from occasional genetic abnormalities and embryological disorders in animals (including humans). The story is told of a freak two-headed king snake, *Lampropeltis* sp. (nicknamed "Dudly-Duplex") at the San Diego Zoo (USA), which survived fairly well until either head tried to swallow the other, resulting in the death of both (May & Marten, 1982). This provides further evidence that double-headedness in snakes, and other animals for that matter, is abnormal. In Ghana, some snakes are described as "two-headed" (e.g., *Calabaria reinhardtii*–Calabar python), because they possess blunt, "head-like" tails, and not because they possess two heads. For the same reason, the worm snakes *(Leptotyphlops* sp.*)* and blind snakes *(Typhlops* sp.*)* of Ghana are also described as "two-headed".

The "black" or "snake" stone is an antidote to snakebite

"Black" or "snake" stones have been claimed to contain several absorbent substances which extract venom when the stone is administered at the site of the bite. The use of ground rhinoceros horns to treat snakebite victims in some African societies is also probably related to absorbent properties (Sweeney, 1971). The question is whether absorbency alone is enough to determine the efficacy of such stones, having regard to the complexity and variety of snake venom. A snakebite victim may appear to have been cured after applying the stone, when it was possible that the victim would have survived anyway without treatment, as do most snakebite victims (Cansdale, 1955). Obviously, more research is needed to assess the efficacy or otherwise, of black stones in treating snakebites.

Flying snakes exist

As a group, snakes are not particularly suited for aerial exploits, although myths about flying snakes have been around throughout history (Summers, 2003). Indeed, no modern reptile is capable of sustained aerial locomotion (flight) (Carr, 1963). "Flying" refers to a long-distance movement of an animal through air with *power* provided by special flying apparatus called *wings*. Some animals can, however, "glide" by floating on air currents over short distances without the use of power from wings. To biologists, an animal is properly called a flier, if it

can generate enough force to gain altitude in still air. Thus, if an animal can manage at least 30 cm of horizontal travel for at least every 30 cm it falls, such an animal is properly called a glider (Summers, 2003).

The vertebrates include gliding snakes, lizards, frogs, mammals, and even fishes that do not truly fly, because they lack wings, the basic flying equipment. Flying ability has evolved in only three groups of animals (birds, bats and insects); all other animals (including snakes) are better described as *gliders*. This difference is quite significant if you are zoologist, or a scientist, for that matter!

Some precautions for prevention of snakebites

Generally, the age-old maxim "prevention is better than cure" should always apply when dealing with snakes. The only way to avoid snakebites is to considerably reduce contact with snakes through instituting certain basic preventive measures as outlined below:

1. Human habitations should be kept free of known snake-hiding places (e.g., piles of stones, firewood, overgrown vegetation, garbage heaps, old vehicle tyres, and pits) or potential prey (e.g., rats, mice, poultry, frogs, and toads).
2. Poultry and other livestock should be well-secured in cages away from the house, to avoid attracting bird or egg-eating snakes like spitting cobras *(Naja nigricollis)* and egg-eaters *(Dasypeltis* sp.*)*. Night adders *(Causus maculatus)* are particularly fond of toads, and may venture into households with standing water.
3. When walking in bushy areas, clear paths must always be used; there should be no blundering through tall grass or overhanging bush. A log or big rock crossing a path should be stepped on, rather than jumped over, to see the other side, where a snake could be hiding.
4. Most snakebites occur on the lower legs and feet; walking barefoot or wearing shoes with exposed parts (e.g., sandals) especially at night, therefore, poses a risk. Adequate footwear (preferably long boots or shoes, e.g., Wellingtons) and long trousers, or anything that covers the whole foot and ankle, must be worn when working in known snake-infested areas.
5. Unprotected hands or feet should not be inserted into places that cannot be seen (e.g., burrows in the ground, under logs or piles of stones).
6. Whenever possible, sleeping or sitting on bare ground near favourite hiding places of snakes (e.g., vegetation, ant-hills and piled-up stones/pebbles) should be avoided.
7. Snakes should not be picked up, teased, molested, or played with, because some snakes may feign death as a defensive mechanism, and most may bite even when fatally injured. Young snakes (even day-old ones) or their fangs, should not be touched, especially with the bare hands, as their venom is potent, and they inflict fatal bites. Snake teeth stay sharp, and fangs may contain potent venom long after a snake's death.
8. If a dangerous or poisonous snake must be removed or killed (e.g., when it poses a threat to human life, or bites someone, and its body is needed for identification purposes), this should be done with something long (e.g., stick) or anything that does not require the snake killer to be too near the snake (e.g., gun or piece of rock). If possible, this should be done by a competent snake-catcher who may not need to kill it. If a snake does not pose any threat to human life, it is best left alone or lured back into its wild habitat. This way, no one is put at risk, and biodiversity is conserved.
9. There should be no panicking or making of threatening gestures when a snake is met, as snakes normally only bite in self-defence. It is prudent to remain still and wait for the snake to retreat, which it invariably does.

10. Working alone in remote areas, especially those known to be snake-infested, should be avoided as much as possible, as immediate help and assurance will be needed if one is bitten by a snake.
11. Conscious efforts should be made to learn more about snakes, and to familiarise oneself with the common snake species in a particular area, because the chances of surviving a snakebite are increased if the offending snake could be identified.
12. Finally, it should be remembered that most snakebite victims recover even without treatment; with prompt treatment, snakebite fatalities are rare.

Conclusion

Apart from snakes being the greatest controllers of disease-carrying and crop-destroying rodents, they are also important to humans in the (i) medical use of their venom for treating diseases like stroke, epilepsy, hypertension and rheumatism, and as analgesics, (ii) use of their flesh as food (bushmeat) in some human societies, and (iii) economic use of their skins for production of leather, bags, belts, etc.). Snakes also have their part to play in the complex ecosystem interactions of animals which ensure the maintenance of the balance of nature (Pringle, 1954). The simple fact is that snakes are very much important for human survival, with as much right to existence on this earth as any other living things, including humans. The ways in which we can ensure the survival of these interesting and enigmatic creatures on earth are (i) to appreciate their importance to our own survival on earth, (ii) to stop their wanton persecution for their perceived hostility toward us, and (iii) to preserve their preferred habitats (Carr, 1963). As humans, we should learn to overcome our fear of, and hostility toward snakes, which are largely irrational and borne out of myth, superstition and ignorance. As Walter (1955) put it, "snakes have more right to be terrified of man than man of snakes; but whereas snakes do not know enough to be afraid, a man's fear is usually due to ignorance". If we learn to treat snakes with respect, they are likely to reciprocate. After all, humans throughout the ages have learnt to co-exist with even the most poisonous and dangerous snakes to the extent of keeping them as pets!

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