

Gorilla Foodways

Overview

Next to the chimp and his cousin, the bonobo, the gorillas are the most similar to humans genetically, containing about ninety to ninety five percent of our genes. Paradoxically, they are not as similar to humans as many other primates, like the capuchin, spider and baboon, in their particular evolutionary path and expression of traits--thus making them especially interesting--and thus showing that genetic similarity does not necessarily equate to overall similarity, and thus showing, too, that small changes in genetics can result in large changes in the expression of traits.

The closest relatives of gorillas are the other two Homininae genera, chimpanzees and humans, all of them having diverged from a common ancestor about 7 million years ago. Since they are one of the more fascinating species and perhaps the most human in the way they look, they have been studied extensively--so we know more about them than most other primates.

Gorillas come in three types: the mountain gorilla and the eastern lowland gorilla and western lowland. Although similar to each other, they nonetheless inhabit different ecosystems which in turn change their foodways. Overall, I will address their foodways--as one one species, while also addressing the differences that suggest so much about the relationship between evolution and ecosystems. They are three times as large as the next largest primate: the chimpanzee: males weight about three hundred pounds at about five feet tall and some even reach five hundred pounds and females about half of that, at around one hundred and fifty pounds--so the sexual dimorphism is pronounced. Overall, gorillas do not use their enormous mass and muscles to gather their food, outside of climbing trees--but evolved that way, perhaps only to protect them from predators since they feed on the ground, subject to various predators--as is especially the case with the alpha of the group, the silverback.

Even more so than baboons, gorillas spend about all of their time on the ground, about all of their feeding time, while only retreating into the trees to sleep at night, building nests out of leaves. The mountain gorillas live in forests as high as ten thousand feet while other gorillas live much closer to sea level, also in forests and swamps: in all cases, they live in forests dense in greenery year round. They live in groups of about twenty, usually headed by one silver back, and otherwise females and offspring which are usually from the alpha male--and sometimes some other beta males. Their life expectancy is 35 to 40 years, sixty in captivity

DIET

Gorillas rarely drink water "because they consume succulent vegetation that consists of almost half water as well as morning dew",[24] although both mountain and lowland gorillas have been observed drinking.

It's not that he hasn't tried. Berry himself tastes everything he sees gorillas eat. Or almost everything. He can report that gorilla preferences cover a diverse range of tastes, from "sweet,"

"astringent" and "tasteless" to mouth-numbingly "bitter." But with caution that comes from an extensive knowledge of phytochemistry, Berry doesn't graze willy-nilly through the gorilla salad bar. Some of the alkaloid-laden plants that gorillas crave, he notes, are poisonous to humans.

Eastern lowland gorillas will also eat insects, preferably ants

SENSING

--cannot find any research

LOCOMOTION

When gorillas, such as the mountain gorilla, live in regions with less fruit and thus are more folivorous, they tend to need less territory--because, as we know, fruit is more scattered and leaves are less. Thus, while mountain gorillas have larger terrains--one to six square miles--they nonetheless only move about one third mile per day--similar, I would say, to we humans and of course the howlers. As usual, these homeranges vary according to other factors, such as the size of the group as well as the size of the individuals in the group: obviously, the bigger the group, the more food they need and thus obviously the more terrain. Also since their food is more easily accessible, due to it being more rough and plentiful, they typically exist more peacefully with other groups of Gorillas.

However, lowland gorillas eat more fruit--and at the same time, travel further distances to acquire that fruit--thus their territories and daily ranges are larger. Lowland gorillas must travel farther each day, and their home ranges vary from one to two and one half milers per day while ranging around one and half miles per day--much more than the mountain gorillas. Western lowland gorillas depend on fruits more than the others and they are more dispersed across their range.[23] They have home ranges from three to five miles and travel about three fourths of miles per day. (Wiki, 2020)

Like other apes, gorillas mostly knuckle walk and occasionally stand upright, and frequently in postures that allow them to protect their food from other gorillas. They move extremely slowly--due, most of all, to their slower metabolisms.

When gathering more fruit, gorillas of course leave the ground for the trees--and thus climb, climb, almost always quadrupedally, engaging both their fore and hind legs, to support their greater weight: even silverbacks that weigh over three hundred pounds can easily climb vertical trunks. However, due to their weight, they must stay only on trunks and strong limbs--and cannot swing like other monkeys.

CAPTURE

Since gorillas eat mostly leaves and fruits, and little to no animals, they are not particularly sophisticated in their capture, mostly using their hands to pluck leaves and fruits--and accordingly have opposable thumbs.

They break into termite nests to eat the larvae.

INGESTION

Analysis of gorilla teeth:
32 teeth like humans
mostly larger and flat
canines not used for eat eating

What about the gorilla's long, sharp canines? They're used for display, in particular "to defend against external threats, as well as fend off other male gorillas competing for dominance," Kathy Garrigan, of the African Wildlife Foundation, said via email.

DIGESTION

As you might expect of folivores, gorillas have larger digestive tracts, relative to their overall size, with the usual larger acidic stomach, shorter small intestine and enormous colon to ferment all the plant fibers in their diet--thus following the same patterns as howlers and other, large folivores--and thus, too, explaining their more protrusive midsections.

METABOLISM

Gorillas eat as much as forty pounds of plants every day. As noted gorillas prefer fruits, just like the howlers, but are limited in their access to them by limitations placed on their own locomotion and abundance of the fruit. Generally, gorillas do not eat animals, except that some of them consume minuscule amounts of ants and other insects that happen to be crawling on their food. Eastern lowland gorillas will also eat insects, preferably ants.

Generally about one to two percent of their diet consists of animal foods, mostly in the form of the various bugs, such as termites and ants, that are on the plants they are eating.

One group of gorillas ate two hundred species of various plants, as well as one hundred different kinds of fruits--or three hundred plants altogether; and another group consumed around one hundred and eighty plants, showing the importance of their intelligence in knowing these plants. Sometimes these plants are abundant and common; sometimes they are rare, but nonetheless known and eaten.

When primatologist gathered many of the most common plants that gorillas consumed and analyzed its macronutrient content, they concluded that gorillas may eat around: twenty four percent protein mostly from leaves; sixteen percent glucose/fructose; three percent as dietary long chain fatty acids; and about fifty seven percent short chain fatty acids from the fermentation of fiber. In other words, gorillas receive enormous amounts of their energy from these

"ferments" which, however, provide limited amounts of ATP, less both glucose and dietary fatty acids.

Another study confirms something similar: that gorillas eat foods that contain two to thirty percent protein and anywhere from two to eighty percent fiber--with thirty five of the plants containing condensed tannin and two foods that contain cyanide. Another confirmed that at least fifteen percent of the protein eaten by gorillas is not uptaken, due to being bound to various fibers and other molecules.

Most gorillas show preference, as you might expect, for leaves higher in protein and sugars and lower in fiber--and presumably toxins as well. And most gorillas vary their diet according to the season--with rainy seasons creating more sugary fruit; and the gorillas then eat so much fruit that they actually reduce the amounts of other nutrients in their diet.

From this we can draw some conclusions about their various metabolisms--even though we do not have any actual studies. For brain catabolism, they use glucose from fruits, with some gorillas receiving more of those dietary sugars than others. They also synthesize propionic acid into glucose in the liver--and perhaps some other forms of gluconeogenesis, from some amino acids. For muscle catabolism, they likely use mostly short chain fatty acids, comparatively low in ATP--thus perhaps explaining their limited mobility. They appear to not receive enough fatty acids in their diet for anything other than anabolism.

For anabolism of proteins, they presumably receive enough amino acids, in good enough ratios to each other, from their over one hundred plants to anabolize complete and collagenous proteins. For anabolism of cell membranes, they receive enough of all the fatty acids they need from plant cell membranes, while needing to synthesize the polyunsaturates into their longer chain forms.

Given this, they need to perform considerable amounts of nutrient synthesis, most likely everyday: gluconeogenesis and lipogenesis in particular; and perhaps the synthesis of amino acids into other amino acids, specifically the ones found in collagenous proteins. They also convert beta carotene in vitamin a: and vitamin k1 into k2.

Like all other primates, gorillas also practice geophagy: eating clay, dirt, sand, silt, muddy waters and the like--but only about six times per year, that is both alkaline, possessing negative charges, as well as containing both macro and trace minerals, including sodium. They practice geophagia for all of the reasons already mentioned--and perhaps also to supplement their diet with certain macro and trace minerals, especially ones not abundant in their diet, including sodium, chloride, iron and others.

Source:

Ganas, Jessica, et al. "Food Preferences of Wild Mountain Gorillas." *American Journal of Primatology*, vol. 70, no. 10, Wiley, Oct. 2008, pp. 927–938. Crossref, doi:10.1002/ajp.20584.

Mahaney, W.C., Watts, D.P. & Hancock, R.G.V. Geophagia by mountain gorillas (*Gorilla gorilla beringei*) in the Virunga Mountains, Rwanda. *Primates* 31, 113–120 (1990).
<https://doi.org/10.1007/BF02381034>

Popovich, David G., et al. "The Western Lowland Gorilla Diet Has Implications for the Health of Humans and Other Hominoids." *The Journal of Nutrition*, vol. 127, no. 10, Oxford University Press (OUP), Oct. 1997, pp. 2000–2005. Crossref, doi:10.1093/jn/127.10.2000.

Rogers, M. Elizabeth, et al. "Western Gorilla Diet: A Synthesis from Six Sites." *American Journal of Primatology*, vol. 64, no. 2, Wiley, 2004, pp. 173–192. Crossref, doi:10.1002/ajp.20071.

ENCHEPHELIZATION

As larger animals, gorillas have both the constraints and benefits to their encephalization: the constraints are the rougher diets, larger guts, slower metabolism that overall do not create enough additional nutrients, especially glucose, to both evolve and maintain brain metabolism. The benefits are they live longer lives--and thus have more time to both grow and program larger brains: also as larger animals, they can use more of their total brain mass for functions like intelligence and culture. Accordingly, as you might expect, gorillas are somewhat encephalized.

They have larger brains than all other primates, just because they are so enormous; however, in brain to mass, and brain to mass then adjusted for other factors, they are not too encephalized; they are half as encephalized as chimps for example (Katherine Milton, *American Physiological Society*, Volume 1, April 1986.) However, they show considerable signs of observed intelligence, perhaps due to their longer lifespans and greater programming. Generally, gorillas use their intelligence the same as other primates, to find, identify and know the behavior of their food and to understand the dynamics of their larger, complicated groups.

In the most extreme case, the domesticated, Koko, understands one thousand bit of "gorilla sign language," as well as two thousand english words while nearly all texts used by humans contain around three thousand words. In other words, she can understand about as many english words in common usage. At one point, Koko asked for one cat as her pet: and at first researchers gave her stuffed, fake kittens but she was not interested. Later they allowed her to select one real cat from one litter which Koko named all balls and then treated her with the same gentleness and love as she would her own gorilla child. However, the cat was later killed in an accident, causing Koko to both communicate and display signs of mourning. Later she picked two more cats from one litter, naming them "Lipstick and smokey."

CHILD REARING

Female gorillas raise their own young for about three years; during the five months, their babies are entirely dependent upon them; and then ride on their mother's back for about five months; at

one year, they are more dependent but still stay close to their mother at all times and sleep in the same nest with her and continue to nurse; and even after three years, build their nests close to their mother. Mothers will defend their babies to the death, as is the case with poachers on several occasions.

And one female can raise about four children in her lifetime. One female can raise about four children in her lifetime and about forty percent of them die before reaching adulthood.

Both males and females tend to leave their group of origin--but females more so, usually to become the mate of another silverback to prevent inbreeding. The males on the other hand are more inclined to stay--but if so, remain submissive to the silverback--the alpha of the group. But some males also stray, not to other groups to become submissive to yet another silverback, but on their own in hopes of attracting stray females to form their own "harem" or to join other groups of males that form stronger and more egalitarian bonds with each other. (wisc.edu) Perhaps from sheer desperation, tend to experiment with homosexuality, sometimes to relieve stress and show dominance through mounting and other times to express actual sexuality. (Yamagiwa 1987)

SOCIAL STRUCTURE

While gorillas are neither matrilocal or patrilocal, they do nonetheless express enormous amounts of sexual dimorphism--what the males being two to three times as large as the females. Accordingly, the normal group of gorillas is male dominated, by one, enormous and ferocious silverback, and twenty or so other gorillas, most of them his mates and children. Occasionally, the group consists of more than one male, usually related to the silverback, like his son--in which case the other males are submissive; unrelated males rarely exist in the same group.(wisc.edu) (Typically, if there is more than one male, the non-silverback males are often related to the silverback. It is less common to have non-related males in the same group-Yamagiwa 1987). And if more than one beta males exist in the same group, they are typically ranked according to their age. Within the groups headed by silverbacks, it appears that, unlike other groups of primates, neither the males nor females form bonds amongst member of the same sex; the females are competing against each other for the attention of the silverback and, as such, form closer bonds only between mothers and daughters. For the males, if more than one exists, they are typically competing for the females and furthermore their societies are based not on cooperation between males but on strict competition and dominance. So, the core of Gorilla society is bonds between the male, usually the silverback, and essentially his harem of women and children. Through this arrangement, the female, especially given the enormous size of the silverback, is protected from predators most of all, like jaguars, and other male gorillas who kill their children to wipe out the genes of the silverback. Accordingly, the silverback stays close to his females and, though not attending to their babies, nonetheless grooms the mothers and provides usually minimal amounts of care for the children. The silverback also makes all decisions, determining the movement and feeding of the groups, as well mediating conflicts between the various members (wisc.edu)

As for mating the females tend to come into estrus throughout the year, from three to thirty times and females will usually initiate copulation by pursing their lips, making steady eye-contact and slowly approaching the male and, if he still seems disinterested, she will take other measures to get his attention, such as reaching towards him and even touch him. If the group consists of more than one male, the female will sometimes choose a male other than the Silverback and sometimes she will mate with multiple males. In some cases the male approaches the female and vocalizes in one form or another.

Gorillas seem quite territorial, so such that, when one group encounters another, the silverback will usually engage in conflict; while this encounter can sometimes result in fights to the death, it usually just results in lots of display of powers until both parties back down--and therefore avoid damage to each other.

While the silverbacks have advantages, they nonetheless fight to the death to protect their harems, both from predators, like jaguars, as well as other silverbacks. When the silverback of any group dies due to predators or natural causes, the females usually stay together, probably for protection from predators, until another silverback comes along that hopefully will not kill their children. However, if another silverback kills the silverback protecting the group, the females usually disperse, to avoid the silverback killing their children. (Wisc.edu) Like the other great apes, gorillas can laugh, grieve, have "rich emotional lives", develop strong family bonds, make and use tools, and think about the past and future.¹ Some researchers believe gorillas have spiritual feelings or religious sentiments. They have been shown to have cultures in different areas revolving around different methods of food preparation, and will show individual colour preferences.

NESTING

At night Gorillas construct nests made from branches, either on the ground or sometimes in trees, and the mothers nest with their babies, though the whole group stays together.

COMMUNICATION

They communicate as well, mostly it seems around the two fundamental tasks of avoiding predation and finding food. When spying predators, they use various screams and roars to alarm others.

For example, when they are traveling, each member of the group has his own vocalization, which is used to determine his whereabouts in dense, jungle foliage (wisc.edu). When threatened otherwise, they cough and grunt--and hoots and chest beating to threaten other groups of gorillas. Belches signifies contentment; chuckles play; and infants whimper. During copulation they grunt and whimper (wisc.edu).

Perhaps gorilla society evolved mostly around the need for protection from predation. Since they live on the ground, and slower, they are exposed to way more possible predation than

primates living in the trees. So they evolved their larger size to serve as natural and easy deterrents to all sorts of predators--and even moreso, evolved the enormous, fearless and ferocious silverback to protect the rest of the group--so that the group could essentially direct greater nutrition to the silverback, instead of all of themselves, thus making the arrangement serve the whole group. Since his services are so important, the rest of the group thus revolved around him.

TOOLS

Gorillas construct nest for sleeping from branches and leaves, in the trees and on the ground, that are about two to feet wide. Other gorillas were observed using sticks to measure the depth of water--and another was observed using one stump as one bridge. And another gorilla was observed using rocks to smash open palm nuts, just like chimps and capuchins.

Gorillas construct nests for daytime and night use. Nests tend to be simple aggregations of branches and leaves about 2 to 5 ft (0.61 to 1.52 m) in diameter and are constructed by individuals. Gorillas, unlike chimpanzees or orangutans, tend to sleep in nests on the ground.

The following observations were made by a team led by Thomas Breuer of the Wildlife Conservation Society in September 2005. Gorillas are now known to use tools in the wild. A female gorilla in the Nouabalé-Ndoki National Park in the Republic of Congo was recorded using a stick as if to gauge the depth of water whilst crossing a swamp. A second female was seen using a tree stump as a bridge and also as a support whilst fishing in the swamp. This means all of the great apes are now known to use tools.

In September 2005, a two-and-a-half-year-old gorilla in the Republic of Congo was discovered using rocks to smash open palm nuts inside a game sanctuary. While this was the first such observation for a gorilla, over 40 years previously, chimpanzees had been seen using tools in the wild 'fishing' for termites. Great apes are endowed with semi precision grips, and have been able to use both simple tools and even weapons, by improvising a club from a convenient fallen branch, for example. (WIKI, 2020)

SUMMARY

Gorillas follow the usual pattern as most primates--except that for their large size and folivorous diet, they display greater encephalization, along with other great apes--although much less encephalization as compared to chimps, bonobos, orangutans and other, select frugivorous monkeys like capuchins and spiders.

They are huge, with slower metabolisms (but perhaps slightly higher as compared to other animals of their size), rougher diets devoid of many needed macronutrients; about the same senses (unknown); reduced locomotion and, if not smaller territories, then larger day ranges; limited capture enhanced guts; enhanced nutrient synthesis; and slightly enhanced

encephalization and observed intelligence, perhaps due most of all to their larger lifespan and overall girth.

They in turn use their encephalization to know many plants in their environment; for socialization and communication.

Overall, they are giant primates, with slow metabolisms, small territories and locomotion, enormous guts that restrict their movement; slow metabolism; lots of nutrient synthesis.