

Killer Conservation: the implications of disease on gorilla conservation

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Abstract

Human intrigue with the natural world has led to a boom in nature-oriented ecotourism and research endeavors. Some of these projects and programs focus on viewing or studying endangered wildlife, but can have negative implications on wild animal health. Human contact with sensitive habitat and wildlife presents a unique opportunity for the transmission of interspecies disease, which can have traumatic effects on the conservation of endangered species. Nonhuman primates have a relatively high risk of contracting disease from visiting tourists and researchers due to their genetic similarity to humans. Local people living in and around sensitive habitats also pose a potential threat of disease transmission. There are some protocols in place to help alleviate interspecies disease transmission, but many of these protocols are centered on protecting humans rather than nonhuman primates. Using Mountain gorillas as an example, this paper examines the literature and research regarding Mountain gorilla health and welfare in the wild. Drawing on the possible shortcomings of current protocols and the potential health risks of these issues, this paper suggests some avenues for further research and pushes for the development of stronger methods for preventing interspecies disease transmission.

Keywords

Mountain gorilla, gorillas, great apes, disease transmission, zoonotic disease, primate conservation

Introduction

Humans seem to be infatuated with the extraordinary, especially when it pertains to wildlife. This intrigue drives us to want to get a closer look, to study nature intently, and to strive to understand the natural world on a new level. This drive to be closer has led to an emerging conservation concern that poses a threat to the safety and well-being of wild animals. With the dramatic decrease in wild animal population numbers, especially those populations that are already endangered, the desire to observe these animals in person before they are gone has led to a boom of research endeavors and the growth of the ecotourism industry (Woodford et al. 2002). The exposure to humans via research projects, ecotourism, and even accidental exposure to local peoples might seem harmless at first glance, but evidence has shown how truly threatening these situations can be. Certain species, particularly those most closely related to humans, are especially susceptible to the transmission of human diseases. Due to their higher degree of genetic similarity to humans, primates, particularly apes, have the highest risk of disease transmission from humans (Cranfield 2008). Although there are obvious positive aspects to both field research and ecotourism when it pertains to the conservation efforts of apes, the negative implications of disease transmission through increased exposure to humans might be enough to offset these benefits.

According to the IUCN Redlist (2008) the order Primates claims the highest proportion of endangered species within the entire class of Mammalia. Gorillas are one of the most endangered primates, with one of the species, *Gorilla beringei*, being classified as Endangered, and the other species, *Gorilla gorilla*, being classified as Critically Endangered (IUCN 2004). The endangered *Gorilla beringei*, or Eastern gorilla, can be divided into two subspecies: *Gorilla beringei graueri*, the Eastern lowland gorilla, or Grauer's gorilla, and *Gorilla beringei beringei*, the Mountain gorilla (Robbins and Williamson 2008). The Mountain gorilla (*Gorilla beringei beringei*) is a prime illustration of how exposure to humans can increase interspecies disease transmission and ultimately threaten the safety of wild populations (Cranfield 2008). Using Mountain gorillas as an example, this paper discusses research regarding the various facets of disease transmission from humans to wildlife, as well as offers some solutions to alleviate the potential for disease transmission.

The Mountain Gorilla

The Mountain gorilla is found in the montane forests of the Democratic Republic of Congo, Uganda and Rwanda, and until relatively recently lived a secluded life with minimal direct human contact (IUCN 2008). Habitat loss, poaching, surrounding human population growth, human encroachment on habitat, and local civil unrest pose the main threats to Mountain gorilla survival, ultimately making the species' health and safety an immediate concern (IUCN 2008). Mountain gorillas are an endangered species of ape whose conservation plan heavily relies on the continuous management

of wild populations, as well as the revenue generated by ecotourism. This coupled with the extremely small population size and thus, the importance of the genetic contribution of each individual, make the threat of disease a very serious issue in Mountain gorilla conservation.

Susceptibility and transmission

Mountain gorillas, as well as other apes, are especially susceptible to human disease due to their genetic similarity to humans (Cranfield 2008). Typical diseases that can be transmitted from humans to Mountain gorillas are the common cold, pneumonia, influenza, hepatitis, smallpox, chicken pox, bacterial meningitis, bovine tuberculosis, human tuberculosis, mycobacterium tuberculosis, measles, rubella, mumps, yellow fever, Polio virus, Encephalomyocarditis, Ebola fever (Woodford et al. 2002) and a variety of parasites including sarcoptic mange or scabies (Wallis 1999). These diseases have various modes of transmission which makes prevention particularly challenging. There are two basic modes of disease transmission from humans to nonhuman primates. The first type of transmission, known as aerosol transmission, involves particulate transference through the respiratory tract. Aerosol transmitted illnesses include influenza, the common cold, meningitis, and tuberculosis (Woodford et al. 2002). Approximately 24% of Mountain gorilla mortality can be attributed to respiratory disease (Cranfield 2008). Simply breathing the same air as an infected human could prove severely damaging to a Mountain gorilla.

The second type of disease transmission is called fecal-oral transmission (Woodford et al. 2002). This pathway involves exposure to pathogens from oral or fecal matter either from direct contact, contaminated water, or exposure to trash and/or discarded waste (Woodford et al. 2002).. Diseases that can be transmitted to Mountain gorillas via fecal-oral transmission include a variety of intestinal parasites, hepatitis, tuberculosis, Typhoid fever, Cholera, and possibly Ebola fever (Woodford et al. 2002). Fecal-oral transmission is especially ominous in that it can be difficult to trace the source; disease could be transmitted from a tourist leaving used tissue paper in the forest, by a local villager discarding a banana peel on his walk home, or even by feces-contaminated run-off when it reaches the drinking water after a rain. The ease of transmission via the fecal-oral conduit and the variety of ways in which exposure to disease can present itself makes this mode of disease transmission particularly difficult to manage.

Some diseases and parasites can even infect a Mountain gorilla long after the human carrier has gone (Wallis and Lee 1999). For example, sarcoptic mange, also known as scabies, can live on a surface for 2–3 days without a host (Wallis and Lee 1999). In fact, in 1996, a scabies outbreak in the Bwindi Impenetrable National Park caused severe wasting and open skin lesions that ultimately were responsible for the mortality of several Mountain gorillas (Wallis and Lee 1999). The remaining individuals had to be darted and treated with Ivermectin in order to rid the population of the mange (Wallis and Lee 1999).

It is also believed that disease transmission can occur indirectly by habitat alteration (Cranfield 2008). This occurs when habitat alteration eliminates the natural contours and corridors that would have once allowed for the natural quarantine of sick individuals, in turn preventing the separation of diseased populations from healthy populations. In agreement with Cranfield (2008), the study conducted by Goldberg et al. (2008) found a strong correlation between the level of local primate habitat fragmentation and the amount of shared bacteria amongst humans, livestock, and wild primates. This correlation suggests that the more degraded a habitat has become, and the closer humans are to wild gorilla habitat, the more likely an interspecies disease transmission will occur (Goldberg et al. 2008).

In addition, when different populations within a species run out of room to remain separate, their territories will begin to overlap. This territory overlap only further proliferates the spread and transmission of disease and has been seen before in the form of massive Ebola fever outbreaks (Cranfield 2008). Driven by habitat destruction and alteration, these outbreaks spread through primate populations rapidly and can cause irreparable damage to the genetic diversity of endangered species like the Mountain gorilla (Cranfield 2008).

Exposure

Research and management

Due to their dwindling numbers, the necessity for research and field studies examining the Mountain gorilla remains pertinent (Woodford et al. 2002). It is the hope of many that the research being conducted on the species will hold the key to saving them from extinction, or at least provide the tools that are necessary to replenish their numbers. Unfortunately, in order to study a species that makes its home in dense mountainous forests, researchers and scientists often have to trek deep into the Mountain gorillas' habitat and get fairly close to them in order to observe their behavior. With this closeness comes the threat of disease transmission from the researchers to the gorillas. Typically, research and park management personnel understand the risks that disease transmission can mean for Mountain gorillas and make attempts to minimize this threat by keeping a specific distance, sometimes wearing protective masks and gloves, and being careful not to discard any waste inside the Mountain gorillas' habitat (Cranfield 2008). Although some research groups have adopted these rules in regards to studies involving wild primates, there are some that are more diligent than others at reliably practicing these responsible research techniques.

Another issue with research regarding Mountain gorillas is the need to habituate troops for observation. Habituating gorillas can take 3–24 months and requires daily exposure to humans (Woodford et al. 2002). Daily exposure to humans not only raises the chance of disease transmission, but it also can cause stress levels amongst the gorillas to rise. Higher stress levels can inhibit the body's ability to fight infection, which

can in turn further the progression of disease (Woodford et al. 2002). Habituation is not only necessary for research but also allows for the close encounters that make ecotourism so successful.

Ecotourism

Ecotourism has grown to be one of the foremost revenue sources for conservation work regarding the Mountain gorilla (Sandbrook and Semple 2006). Gorilla trekking, or hiking into the Mountain gorilla habitat to view the troops up close provides enough income to support the Ugandan Wildlife Authority, and contributes significantly to the national budget (Sandbrook and Semple 2006). Although ecotourism provides significant income for the conservation work regarding Mountain gorillas, the constant exposure to new people from all over the world could create a potentially devastating opportunity for disease transmission (Osburn et al. 2009). There are rules and policies in place to help alleviate this problem, but safety precautions are usually directed toward the safety of the tourists not the gorillas (Sandbrook and Semple 2006).

Another issue with the rules and policies in place for tourists is enforcement. Often time tourists have paid large sums of money in order to see the gorillas. Because of this, tourists might hide symptoms of illness, break proximity rules in order to get closer to the gorillas, or exhibit other behaviors that might put themselves or gorillas at risk. One study conducted by Sandbrook and Semple (2006) found that although tourists are required to remain a minimum of 7 meters from gorillas this rule is seldom enforced. Even if all tourists and personnel remain the required distance away from the gorillas, proximity rules cannot be relied upon as the sole disease prevention method. Gorillas are not reliably stationary beings and even with the utmost effort for humans to keep their distance, the chance of a gorilla breaking the proximity still leaves a window for disease transfer.

Local people

The local people living in and around the Mountain gorilla habitat are often overlooked vectors for disease transmission. Local people might stumble across troops in the forest, discard waste where gorillas congregate, or keep domestic animals in propinquity to gorilla habitat (Cranfield 2008). They also often share the same water sources and other forest resources with the gorillas, which is proving to be a tremendous threat to both human and gorilla health (Stoinski 2015). These issues are worsened by the ecological imbalance between the growing size of the human population and their livestock, and the loss of available surrounding habitat (Cranfield 2008). Additionally, there can be a severe lack in the quality of health services available to local people (Stoinski 2015). As research has shown in the past, if local people are suffering from illnesses and disease then local wildlife will most likely follow suit (Osburn et al. 2009).

Disease management

With the many facets of interspecies disease transmission, how can we possibly protect the Mountain gorillas without destroying them in the process? One advantage that the Mountain gorilla subspecies has over most other wild primate populations is a very successful and active veterinary monitoring and intervention program. Commonly known as the Gorilla Doctors, the veterinarians working with the Mountain Gorilla Veterinary Project spend countless hours monitoring and treating the gorillas for injury and illness in the wild (Stoinski 2015). Robbins et al. (2011) reported that the Mountain gorilla population is currently growing. Based on the records for successful veterinary interventions for respiratory disease, injury, and other illnesses, veterinary treatment could have at least a 40% positive effect on the population growth rate (Robbins et al. 2011). In other words, without any veterinary intervention, the growth rate of the subspecies could be 40% lower than it is now (Robbins et al. 2011). Although veterinary programs have shown to be both effective and important to gorilla conservation, these types of programs can be expensive, and are seldom available to other ape species. Even if present, these veterinary programs should be coupled with other proactive methods in order to increase their success as conservation strategies.

Mountain gorilla trekking and research is also very important to both the species' survival and the economies of the countries where they reside. Due to their economic and cultural importance, there are already extensive policies and regulations in place to protect gorillas. As discussed earlier, these policies can be difficult to enforce, but that does not mean we should stop trying. Researchers and scientists are the optimal place to start the journey to better conservation practices. Requiring researchers to undergo periodic health screenings, wear protective masks and gloves, and follow strict proximity rules while making observations could help alleviate the risk of disease transmission from researcher to subject. It might also be beneficial to implement a vaccine requirement for incoming researchers, as well as a quarantine period upon their arrival at a new field site (Cranfield 2008). Researchers and scientists have a special investment in the health and wellbeing of endangered species and should be held to a higher standard. Future studies should also be conducted to establish how well researchers and scientists are following disease prevention protocols, and to determine if changes should be made to protocols to further alleviate disease transmission.

The tourists that come to see the gorillas are pivotal to their survival, but it is important to regulate their visits. Currently most gorilla trekking companies have strict rules including maintaining a specific distance from the gorillas, burying any feces and/or waste while in the forest, not using flash photography to reduce the stress of visits, and not attending the trek if they are not feeling well (Sandbrook and Semple 2006). As we have examined, enforcing these rules can prove to be difficult and will not always protect the gorillas during unpredictable circumstances.

Tourists can carry novel diseases, have lowered immune responses from the stress of travel, and might have incomplete vaccine histories and/or health records (Sandbrook and Semple 2006). Respiratory disease is quite possibly the most threatening

type of disease to endangered apes, so requiring that tourists wear a mask while visiting the gorillas might be an easy way to avoid some of these aerosol-transmitted diseases by filtering particulates from human breath (Cranfield 2008). Also, an education session for tourists about the risks of disease transmission can help people understand the measures that should be taken in order to protect themselves and the animals that they are observing.

Encouraging forest guides to enforce the rules of gorilla trekking by implementing some kind of incentive program for local guides and their families should be investigated as a powerful means of improving cooperation with rule enforcement. Also, providing health screenings and care to forest guides could help eliminate them as a possible vector for disease transmission. Although the initial cost of health checks and screenings might be substantial, this proactive strategy might prevent an even more expensive veterinary reactive strategy to an outbreak of disease. Coupled with a veterinary disease prevention and treatment approach, the improvement of healthcare and regulations of the humans in contact with and surrounding the gorilla habitat may be pivotal to preventing disease and disease transmission in wild gorilla populations.

Conclusion

It may be difficult to ask tourists to wear masks while visiting animals in the wild, and it may be expensive to maintain a veterinary program for wild populations and to improve healthcare systems for local people, but making these improvements could be the key to preventing disease transmission to not only Mountain gorillas but also to other apes. Understanding the risk of interspecies disease transmission as a conservation threat is the first step in forming a strategy for preventing catastrophic disease outbreaks. Taking steps toward changing current protocols and ensuring protocols and regulations are followed should be pursued as an active conservation strategy for wild primate populations. These proactive changes and improvements coupled with the reactive strategy of veterinary care in the wild might make all the difference to primate conservation as a whole.

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