An analysis of the impacts extractive industries have on African ape conservation and community development - trends towards community involvement in conservation

by
Ruby Vise

A THESIS

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Abstract approved:_____

Larry Becker

Primate populations are declining in number, with an estimated "60% of primate species threatened with extinction from hunting and trapping" (Estrada et al., 2017). The largest threat to mammals in West and Central Africa is commercial hunting (Jost Robinson, Daspit, & Remis, 2011). Hunting these large mammals was once practiced sustainably by local communities. However, demand from outside sources leads to hunting levels higher than the forest can support. To understand the effect of bushmeat hunting on African apes, the complex interactions of humans with the environment must be considered. The manner in which the environment, including animals and the physical geography, interacts with human inhabitants and their social institutions is often left out of conservation and development discussions. Once understood, these interactions provide insight into why some conservation initiatives are successful in working with communities and others are not.

Key Words: Bushmeat trade, Gorillas, Primate conservation, Community development, Central African ape conservation, Extractive industries

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

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Ruby Vise, Author

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Introduction

Conservation in Africa is faced with several challenges. Among these, one of the the largest and hardest to address is how to balance conservation initiatives with cultural practices and development goals. It has become increasingly important to understand the interactions of these ideals and to forge new pathways for cooperation. In recent years, conservation organizations have realized that community and government support are critical for the success of conservation programs. However, many modern conservation initiatives still view local people as potential threats to wildlife, failing to recognize the socioeconomic drivers of behavior change (Oishi, 2014). The standard protectionist model of conservation focuses on the preservation of wildlife in national parks and fighting poachers who are threats to wildlife (Marks, 1984). This model often fails to account for the historical cultural relationships people have with wildlife (Marks, 1984). In order for conservation to overcome this monumental challenge, policies must adapt to incorporate new ideas.

Extractive industries result in unsustainable use of natural resources, including wildlife. While arguments are made that sustainable harvesting of wildlife could fuel development and provide communities with an incentive for conservation, the idea is often far from the reality of these industries. Practices such as trophy hunting, bushmeat trade, and the wildlife pet trade often fail to increase the income of community members. The bushmeat crisis threatens wildlife populations and food/livelihood security for local people (Bennett et al., 2017). These extractive industries funnel wealth into an elite class, leading to exploitation of the poor reminiscent of colonialism.

The impact of extractive industries on endangered species is devastating. Endangered great apes are facing serious consequences from extractive industries. The four

types of gorillas that inhabit Afrotropical regions are mountain gorillas, eastern lowland gorillas, western lowland gorillas, and Cross River gorillas (Oishi, 2014). Hunting these large mammals was once practiced sustainably by local communities. However, demand from outside sources leads to higher hunting levels than the forest can support. The effect of increased hunting is even larger in great apes due to their slow breeding cycles and small populations (Bennett et al., 2017). Commercial hunting is the largest threat to mammals in West and Central Africa (Jost Robinson et al., 2011). Bushmeat is sold rurally in markets, through informal transactions, as well as in larger urban markets (Jost Robinson et al., 2011).

Effective conservation programs that utilize community participation are crucial to combating the population declines of great apes from extractive industries. Several alternative approaches for using conservation to benefit community development and vice versa exist. Some organizations argue that communities should take charge of their resources and manage them through community-based conservation programs. Many nongovernmental organizations focused on conservation in developing countries have added community development to their goals. While many of these organizations agree that the community must be involved in order for conservation programs to be successful, there are several different ways that NGOs approach community involvement. One approach to benefiting conservation through community development is the implementation of education programs that include information regarding endangered animals and their importance. Others argue that communities need to be directly involved in decision making and should benefit from tourism revenue generated by national parks. Financial gain from conservation has the potential to be reinvested in community development. In a world with so many conservation initiatives, it becomes increasingly

important to determine the effectiveness of these programs.

Approaches

Importance of including different views in the approach

The consideration of several viewpoints when looking at how resources are used by humans is very important. The manner in which the environment, including animals and the physical geography, interacts with human inhabitants and their social institutions is often left out of conservation and development discussions. Once understood, these complex interactions provide insight into why some conservation initiatives are successful in working with communities and others are not. In many cases, programs must be culturally relevant and have government approval. A theoretical framework that describes the interactions of the environment, human culture, and social institutions was created by Stuart Marks in his book The Imperial Lion: Human Dimensions of Wildlife Management in Central Africa. Marks argues that these interactions can be conceptualized as three components of nature. The biological/ecosystem part of nature is concerned with the scientific evidence and the organismal/chemical interactions that make up an ecosystem. Separate from this is the concept of nature as a place of spirits, contributing to cultural identity. This concept includes the belief that ancestral spirits are reincarnated as forms of nature. The third form is the imperial lion. This lion places the resource in terms of market value and its relationship with the state. It symbolizes power, particularly power imposed on locals from an outside entity. The interactions of these "three lions" are crucial to understanding conservation motives for different actors because they show the complexity of nature in the context of human society. In this text, the concept of the three lions has been adapted to the context of great apes and the actors within their ecosystems.

The ecological ape

From a conservation standpoint, understanding the ecological system of an area is extremely important. Ecological relationships existed before spheres of human influence came into being, and they are now being altered by human processes (Marks, 1984). The ecological ape represents apes as a species and the scientific/conservation agendas associated with them. Researchers tend to focus on a species rather than the social dimensions and institutions placing the species within a societal context (Marks, 1984). Wildlife biologists depend on survival of the economic importance of certain animals, in order for research opportunities associated with those animals to be available. More often than not, this limits their scope to exclude human dimensions (Marks, 1984). Furthermore, the classifications of endangered species status support the ecological arguments for conservation, based on the principle of preserving species with chances of extinction based on genetic information. The IUCN defines an endangered species as a species at risk of becoming extinct in the wild in the near future (IUCN, 2019). Gorillas have been classified as endangered since 1996, and as critically endangered since 2007 (Clough & May, 2018). Habitat requirements and impacts on populations also are considered when using an ecological approach.

The colonial ape

Adapted from the imperial lion, the colonial ape is the forced conservation of African wildlife without consideration for people already living in the area (Marks, 1984). It relies on implementation by the state and regulation through policies. Governments are largely responsible for controlling these policies and regulations, giving them control over conservation agendas. The government also has a large amount of power over resource distribution, controlling how

and when local communities can use certain natural resources (Marks, 1984). Decentralization is when a state cedes powers to lower political-administrative actors and institutions, which ideally, and ostensibly, are more accountable and representative of local populations (Ribot, 2004). States are heavily invested in furthering their development. For this paper, development can be defined as a "Process of change that affects the economic, political, and cultural fabric of society"(Marks, 1984). The political landscape is inherently linked with the market, both locally and internationally. The market drives economic incentive for activities like poaching, while law enforcement and regulation by the state allow these activities to persist.

The ape of culture

Cultural systems include language, beliefs, and how people categorize or evaluate objects (Marks, 1984). Among other things, culture affects people's perception of resources and their value (Marks, 1984). The value of a national park is significantly different for a local farmer who deals with crop raiding animals than it is to a tourist or government official. The value of an animal is partially determined by the cultural associations it carries (Marks, 1984). The ape of culture represents cultural ties to nature. An example of a strong cultural tie to chimpanzees is the Beka ceremony of the Bakwele people, which is a coming of age circumcision ceremony (Quammen, 2015). Little is known about this tradition outside of the Bakwele community - so little that it has only been documented in an unpublished report based on local interviews. This report details that traditionally a boy must kill a male and female chimpanzee and give its arms to the elders to be eaten. In recent years, the ceremony has adapted to reuse the same chimpanzee arms for several ceremonies (Quammen, 2015). This is an example of the ability of culture to shift over time, changing the inherent value of a resource based on new information or ecosystem

changes. Any alternative resources must fit into the values and needs of a society to be accepted and used (Marks, 1984). Norms of a society also play a role in determining cultural ties to wildlife, dictating the appropriate human-wildlife interactions in the culture (Marks, 1984).

Research question

Primate populations are declining in number, with an estimated "60% of primate species threatened with extinction from hunting and trapping" (Estrada et al., 2017). A main driver of this decline is the presence of extractive industries, particularly those which are illegal. Research in this area is ongoing, but there have been few instances where data concerning the relationship between primate conservation and extraction has been investigated using the three concepts of nature approach. The next section of this paper will investigate how extractive industries in Africa affect conservation of endangered apes and community development. Then, the focus will be shifted to question the effectiveness of alternative conservation methods which involve the community at furthering conservation and development. It is important to understand the role extraction has on conservation and development from the perspective of the state in order for policies regarding these interactions to be created. Existing conservation methods will also benefit from an increased understanding of the role they play in community development.

Methods

My motivation for this study stemmed from my study abroad experience in Tanzania and my internship with the Pan African Sanctuary Alliance (PASA). In Tanzania, I learned about African ecology and wildlife management through the School for Field Studies. This experience drove my interest in African conservation issues and led me to become an intern for PASA. PASA is an association of 23 primate wildlife centers across 13 African countries.

During this internship, I gained knowledge of conservation issues facing primates and the complex role culture, market demand, and corruption play in determining the outcomes of conservation programs.

For this thesis, I worked with Dr. Larry Becker and my associates at PASA to review a variety of studies concerning the relationships of the three concepts of nature. This study is limited to the Afrotropical regions of Africa, primarily because this is the habitat of African great apes. Many of the studies used focused predominantly on gorilla species, but in some cases, chimpanzees and gorillas were grouped together under the term great apes. For the research, I familiarized myself with the arguments conservationists use to argue for/against the use of extractive industries as a means to improve community development. Secondary data was used to gain a wide understanding of the issues over a large geographic area. To determine the success of the conservation community in improving community development, I reviewed case-studies to provide a critique of place-specific programs following different methods of community involvement. The locations of these case-studies can be seen below in Figure 1. I looked into the challenges, successes, and shortcomings of alternative conservation methods that aim to include the community.

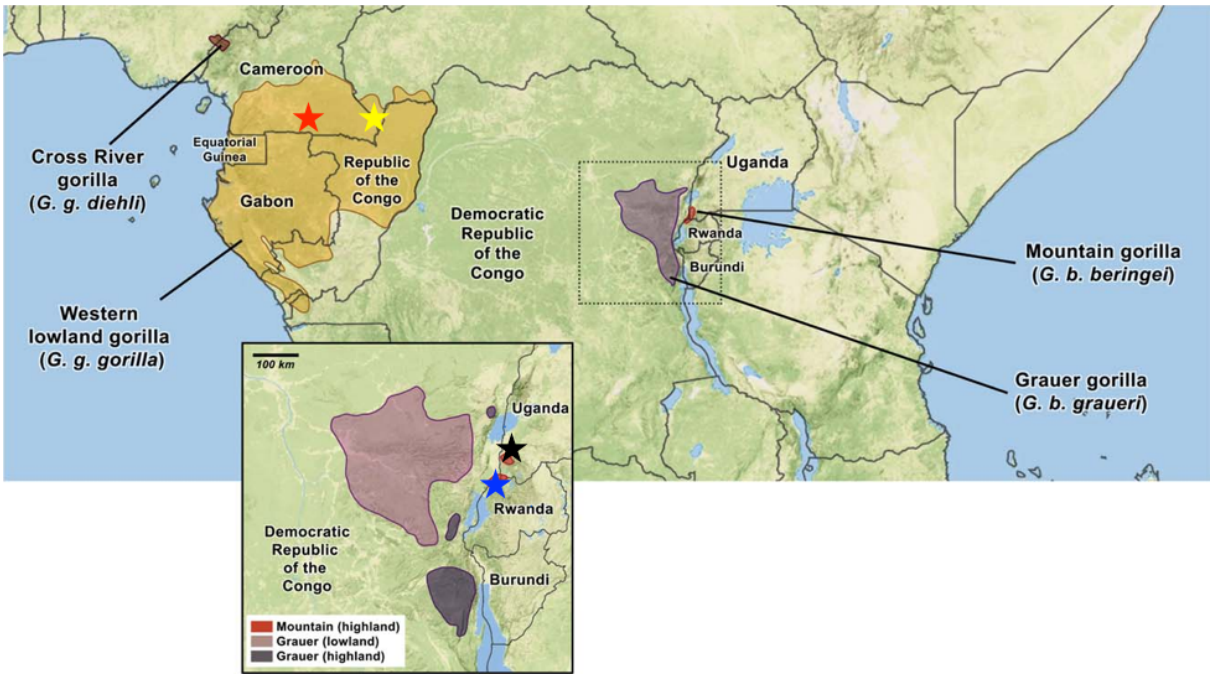

Figure 1: Map showing gorilla ranges and several study locations referenced in the following sections: Dja Biosphere Reserve (red), Dzanga-Sangha Reserve (yellow), Volcanoes National Park (blue), Kalinzu Forest Reserve (black). Map obtained from Knigge, Tocheri, & Mcnulty (2015).

How do extractive industries in tropical Africa affect conservation of endangered apes and community development?

Section overview

Extractive industries involve removing resources from the environment in an unsustainable manner. A classic example of an extractive industry is mining because it involves extracting minerals from the ground, without any way to make the system renewable by creating more of the mineral. Extractive industries offer quick money, but what happens when the resource is depleted? Resource depletion leaves communities with less economic opportunity, not to mention the unintended consequences of livelihood devastation that can occur from improper extraction practices. Extraction affects to African apes through the growing bushmeat trade. Natural resources, which include animals in this context, are social concepts and biological entities (Marks, 1984). African apes exist without the presence of humans, making them a

biological entity, but they can also be valued by humans and thus affected by social constructs. The concept of a resource system, which is the accumulation of processes altering a resource towards a useful objective, will be applied to the bushmeat trade to provide insights into how the trade occurs (Marks, 1984). The illicit trade of great apes involves hunting adults and forcibly removing infants from the forest. This is detrimental to the population of endangered species, representing the ecological ape. The bushmeat trade interacts with the ape of culture because it alters preexisting cultural practices involving apes. The colonial ape is brought into the discussion because of power relations within illicit trading networks that involve government corruption, as well as by market drivers for continued demand. In the case of the bushmeat trade, extraction remains ineffective in its contribution to community development since most of the money is made by elites and middlemen, leaving a small sum for local participants. These arguments will be expanded on in the following sections to show the complexity of the bushmeat commodity chain and its impact on local people near the Dzanga-Sangha Reserve.

The bushmeat trade as a resource system

The increased demand and extraction levels have led to the bushmeat trade become unsustainable, far from the subsistence hunting with which it once was associated. Great apes are primarily hunted for food, but also for trophies, and for juvenile pets. There are several cultural uses that contribute to ape hunting. An example is the placement of chimpanzee skulls near rivers to summon rain by people living near the Dja Biosphere Reserve in Cameroon (Tagg et al., 2018). Demand for bushmeat has increased in recent years due to the rapid urbanization of tropical forest regions, which increases demand from cities (Estrada et al., 2017). The trend of increased demand for ape meat in African cities has been found across a wide geographic range

(Estrada et al., 2017; Tagg et al., 2018). Demand from wealthy people in urban areas for ape meat, which is considered a delicacy and a symbol of wealth, increases demand as incomes rise (Estrada et al., 2017). Availability of guns in Africa has also contributed to the increase of bushmeat hunting (Estrada et al., 2017).

The killing and trading of great apes is illegal, but it is still widely carried out in illegal networks. Ape body parts (hands and heads) are said to be an even more profitable trade (Nforngwa, 2015). In late 2014, 34 chimp heads, 24 gorilla heads, and 16 limbs were seized from 22 poachers by game rangers in Cameroon (Nforngwa, 2015). Seizures like these are considerably different than the small-scale subsistence hunting often associated with ape bushmeat. However, it has become clear in recent years that the trade in great apes for meat and parts has become integrated into organized trafficking systems (Nforngwa, 2015). Interactions between law enforcement and people operating in illegal networks inhibit development at the community level due to prosecutions of low-level poachers and injuries during enforcement, all while the money moves through illegal channels. The bushmeat trade has been a multimillion-dollar industry for over two decades (Davies, 2002; Clough & May, 2018). The informal nature of the bushmeat trade means countries are missing out on the economic gains in the form of taxes and they are losing valuable natural resources (Davies, 2002). This also means money cannot be redistributed through the government towards development goals.

The commodity chain of the bushmeat trade is comprised of hunters, carriers, traders, middlemen, and consumers. Hunters rely on carriers to aid in preservation (often smoking) of meat in the forest and transportation of meat out of the forest to its destination (Tagg et al., 2018). Traders will often purchase meat to be sold in markets or to restaurants (Tagg et al., 2018). Organization of the bushmeat trade increases the efficiency of illegal activities by

providing protection from rangers, access to a market, and support during prosecutions. Middlemen who have substantial power within society carry the ability to protect poachers from prosecution and heavy sentences (Tagg et al., 2018). Middlemen respond to market demand generated by urban restaurants or elite members of society (Tagg et al., 2018). They also work with government officials, usually from the forest administration and enforcement sectors (Tagg et al., 2018). The powerful nature of middlemen and their elite relationships connects them to actor's representative of the state, and of the colonial ape. Power is used to facilitate the bushmeat trade, even though the trade is not in the best interest of the citizens of the state. Many wildlife crime court cases end with lenient sentences for traffickers due to corruption and complicity (Nforngwa, 2015). Prosecutors estimated that corruption interfered with 80% of their cases against ape traffickers (Nforngwa, 2015). The low risk of prosecution, coupled with the high profits associated with ape trafficking, contribute to its continuation.

The illegal system used in the bushmeat trade is also associated with the trade of body parts and live juveniles. Trading in live apes for pets or entertainment is one of the most lucrative aspects of the illegal great ape market, with an estimated annual value of $1 million to $8.5 million generated in the trade of young gorillas and chimpanzees (Clough & May, 2018). Gorillas are traded as live animals less often than chimps because they have higher rates of death when separated from their mothers; they make up about 13% of the trade (Clough & May, 2018). The trade in live infants goes hand in hand with the bushmeat trade because obtaining an infant involves the killing of any adult apes in the family (Clough & May, 2018). Because of this, trading in live apes has a large ecological impact on the species, especially when considering their slow life history strategies. Furthermore, great apes are relatively easy targets for hunting because of the large, loud groups they live in (Estrada et al., 2017). This evidence makes it clear

that hunting great apes negatively affects the species, contributing to their decline and increasing obstacles for conservation. This struggle is representative of the ecological ape.

Despite the ecological impacts, participation in the bushmeat trade continues and can be quite profitable for hunters. Hunters who only kill great apes on occasion are opportunistic hunters. Opportunistic hunters earn considerably low profits (30 Euros per gorilla carcass) compared to specialized hunters because they sell meat at cheap prices to avoid detection by law enforcement (Tagg et al., 2018). The financial risk is high for opportunistic hunters and small-scale sellers because they face larger expenses for transportation of illegal meat (Tagg et al., 2018). These actors do not benefit very much from being part of the commodity chain. The consolidation of power in the illegal networks excludes those who only occasionally participate in poaching, meaning that most participants see few financial gains. Because of this exclusion, it is difficult to make arguments that the bushmeat trade significantly benefits the finances of local communities. In reality, an interview study found that over half of the opportunistic hunters said they would be willing to stop hunting if there was a financial alternative, including profitable agriculture (Tagg et al., 2018).

Specialty hunters specifically target apes for profit and claim be part of a larger trading network. Many of the specialty hunters thought the income was too good to leave or said hunting was too much of an important tradition to give up (Tagg et al., 2018). “Our study found that a specialized hunter, on the other hand, may derive an income of c. 80 000–100 000 XAF (c. 122–152 Euros) for a gorilla and between 30,000 and 35,000 XAF (c. 46–53 Euros) for a chimpanzee” (Tagg et al., 2018). Several studies have found that middlemen profit the most out of all actors in regional bushmeat trade (Tagg et al., 2018). Middlemen received 196 Euros per gorilla carcass, compared to the 122 Euros of the specialist hunter (Tagg et al., 2018). The same

trend of economic gain is seen in the trade of live infants. The profit margins for selling an infant on the international market are significantly more than profits seen by poachers or domestic dealers (Clough & May, 2018). The percent markup from a domestic dealer to an international dealer is a 1500% price increase, illustrating that profits made from the illegal trade are disconnected from communities (Figure 2) (Clough & May, 2018).

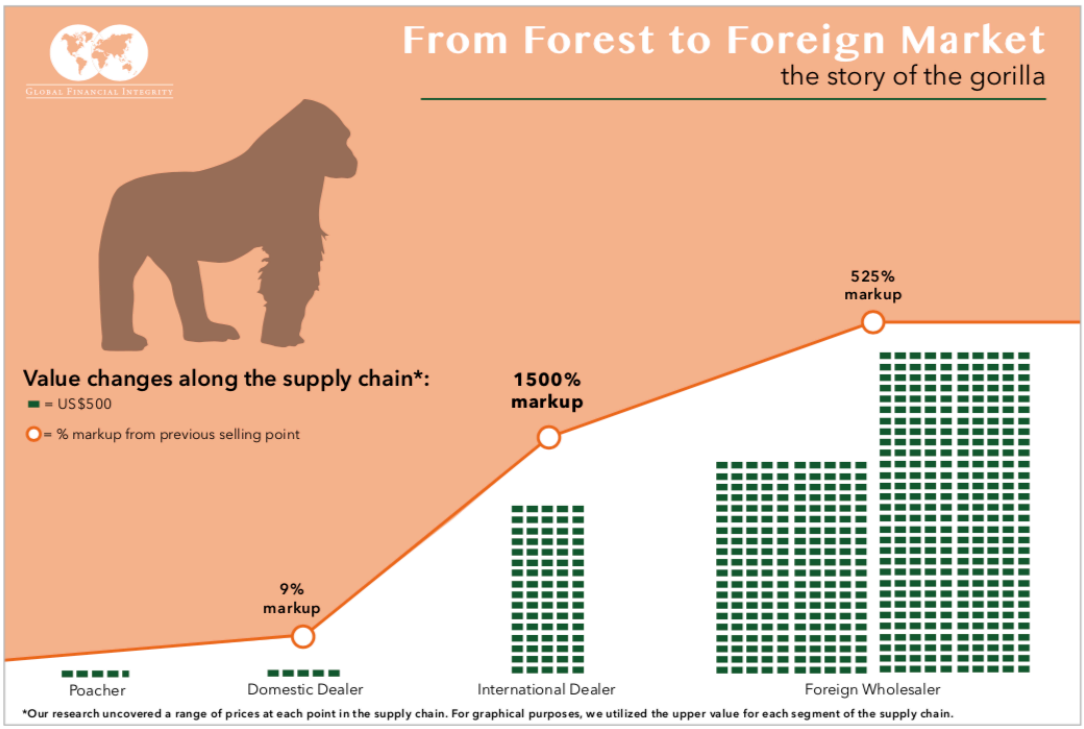

Figure 2: This figure shows the financial increases of live gorillas as they are passed through different actors in the commodity chain. Created by Clough & May (2018).

The role of economics and the colonial ape goes much farther than mentioned above. It has been argued that unsustainable growth in the bushmeat trade has been influenced by a lack of development policies targeting rural economy growth (Bennett et al., 2017). The lack of income opportunities from development programs makes participation in the bushmeat commodity trade a worthwhile endeavor for people looking to get by. Alternatives to joining the illegal activity

could be created by more jobs in the formal sector, which would be a byproduct of development. While the implementation of these programs largely falls on the government of each country, the voices of NGOs and international governments often support certain initiatives. International development and conservation agencies must come to a consensus on how to approach the bushmeat crisis to allow their support to be useful to governments and policy makers (Bennett et al., 2017). If the different actors involved in rural development and conservation programs fail to coordinate their activities, the colonial ape may destroy populations of endangered apes and the livelihoods of many people.

Effect of commercial hunting on livelihoods

A study by Hardin and Remis aimed to improve understanding of human and nonhuman primate interactions within the Dzanga-Ndoki Park and Dzanga-Sangha Dense Forest Reserve (RDS) in the Central African Republic (Hardin & Remis, 2006). Within the Dzanga-Sangha Reserve (multi-use zone outside the national park), subsistence hunting, logging, and agriculture are allowed (Jost Robinson et al., 2011). However, there is a problem of illegal commercial hunting within the park that has impacted the ecological ape and culture of local people (Jost Robinson et al., 2011).

The BaAka are a group of hunter-gatherers in the region, while the Bakwele are often farmers. Due to their livelihood strategies, they have intimate knowledge of the surrounding forest and are heavily impacted by the availability of resources within it (Hardin & Remis, 2006). Both the BaAka and Bakwele have traditionally hunted gorillas (Oishi, 2014). BaAka hunters have extensive knowledge of the family dynamics of gorillas and their habitats (Oishi, 2014). The skin of gorillas and chimpanzees are used by the BaAka as daily-use objects and raise

the hunters' prestige. The BaAka and Bakwele peoples have coexisted with great apes for centuries, and both cultures place significant value on these species (Oishi, 2014). Many BaAka refrain from consuming apes because of the similarities they share with humans (Oishi, 2014). Gorillas are not only viewed as a source of food by these communities. Rather, they are valued for the strong cultural and spiritual beliefs associated with them. This amounts to strong cultural ties between the existence, and survival, of great apes. The ape of culture presents itself in this context through the involvement of apes in human cultural practices, an example of which is the important role chimpanzees play in BaAka cultural songs (Hardin & Remis, 2006; Oishi, 2014).

However strong ties between the ecological ape and culture are in this region, management of the RDS is controlled by the Central African Republic government along with NGOs such as the WWF (Hardin & Remis, 2006). This set-up places power in entities with little direct accountability to the local people. Institutions with colonial roots often force those ideas onto different environments. In this case, the management of the RDS is a manifestation of the colonial ape, watching over the ecological ape and the local people of the area. Not only does the colonial ape overlook the system, but it also has direct control over the policies in place regarding zone uses and subsistence hunting.

Within RDS, recent logging has created access points for hunters, marked by higher amounts of snare hunting. The logging industry provides income to residents and is not dependent on the availability of prey (Hardin & Remis, 2006). Long term effects of logging on forest habitat led to fewer gorilla nests sited in the area several years later (Hardin & Remis, 2006). Logging and mining operations also facilitated the commoditization of bushmeat trade, altering the small scale hunting previously seen in the area (Oishi, 2014). Recent overhunting has caused a shift in prey species from the preferred duiker meat to that of arboreal monkeys and

apes (Jost Robinson et al., 2011). As duiker populations decline from overhunting, primates are used to fill the gap in available prey (Jost Robinson et al., 2011). This leads to a greater effect of human predation on gorilla populations within RDS. This can be measured by significant decreases in gorilla prevalence within the Kongana sector, falling from 56 nests in 1997 to 9 nests in 2002 (Hardin & Remis, 2006). One reason for this sharp decline is the integration of commercial hunting into the traditional forest camps of the BaAka (Hardin & Remis, 2006). Market evaluation found an increase in the abundance of primates sold from 2006 to 2008 (Jost Robinson et al., 2011).

Interviews conducted with Bakwele and BaAka peoples of the area revealed a shift in hunting techniques from snares to mostly gun hunting (Jost Robinson et al., 2011). Interestingly, gun hunting was associated with a higher number of primate kills compared to those killed by snares (Jost Robinson et al., 2011). The use of guns has made gorilla hunting much easier due to the large size of gorillas and the behavior males display towards potential threats (standing upright) (Oishi, 2014). Hunters also reported having to travel farther for each hunting trip, and many attributed the decrease in animals to the increase of guns (Jost Robinson et al., 2011). Firearm availability has increased in the area due to an increase in legal sales and the prevalence of armed conflict, which fuels illegal gun use (Jost Robinson et al., 2011). In this case, increased hunting of apes directly relates to conflicts with the state and to changes in traditional hunting methods brought by gun use.

Currently, hunters and market women report feeling left out of the future of RDS. Many reported that they were willing to find other means of income that could be more profitable and sustainable (Jost Robinson et al., 2011). This awareness of the ecological ape and sustainability issues provides hope for change. There are several ways in which the BaAka have already

applied their intimate knowledge of the forest in conservation research and monitoring jobs (Hardin & Remis, 2006). Involvement of local people in conservation ground work is an important step to integrating the ecological ape and ape of culture. As these workers become involved in resource management, they will increase the accountability of policies and enforcement to the local people, because they are aware of the stakes people have in the environment. However, their exclusion from formal education makes it hard for them to progress in the field (Hardin & Remis, 2006).

How effective are alternative conservation methods which involve the communities in furthering conservation and development?

Section overview

While the first half of this thesis focused on understanding the bushmeat trade as an extractive system with harmful effects to the ecological ape and the ape of culture, this next section will explore mitigation methods. The need for change is evident from the decline in great ape populations attributed to increased commercial hunting. Mitigation strategies for combating the bushmeat trade must involve human dimensions and recognize the livelihood needs of those living near protected wildlife. One of the elements of their effectiveness is the degree to which they benefit the development of communities and conservation programs. Education regarding the environment contributes to the overall education of locals, and it may serve to inspire a new generation of environmentally aware workers. Development projects created using revenue from ecotourism allows for greater opportunity in the regions. The rest of this paper will evaluate the wide variety of community education programs tackling conservation and environmental education, as well as the effectiveness of community involvement surrounding the Volcanoes National Park in Rwanda.

Education programs

The concept of conservation education is that it will positively affect knowledge and attitudes surrounding conservation, which will lead to an individual behavior change in interactions with the environment. Environmental concern has been shown to be influenced by contact with the environment (Bogner, 1998). Environmental education aims to give people the information necessary to make informed decisions about the environment and ultimately take action to protect it (Bogner, 1998). Collectively, changes made by children in communities will decrease the environmental impact of the community as a whole on the environment (Kuhar, Bettinger, Lehnhardt, Tracy, & Cox, 2010). The effects of increased knowledge on attitudes and action towards the environment have long been studied and argued over (Bogner, 1998). Increased knowledge is an important building block for future individual conservation action (Leeds et al., 2017). While students living near protected areas likely have pre-existing knowledge of the forest, many have not been exposed to nature from a conservation standpoint (Kuhar et al., 2010). Students will be aware of the ape of culture but may not have much knowledge regarding the ecological ape. Few evaluations of the effectiveness of conservation education programs have been completed (Kuhar et al., 2010). The lasting effect of a short program given once during a child's education on shifting the behaviors of a population remains to be seen (Bogner, 1998).

Conservation education can involve many actors including governments and NGOs. Often, the public school system of a country, which is supported by the government, is used to integrate conservation topics into existing curriculum. NGOs may be involved in this process by supplying school districts with the material, or they may be responsible for running their own education program outside of the school system. An example of this could be a field trip to a

national park or local animal rescue center, where educational activities are run by the staff. Aside from the different types of educational programs, varying teaching strategies are used. These techniques are very different from the traditional public education systems in African primary and secondary schools rely on. The education program curriculum is often centered around an educational film, picture book, or outdoor activity.

Integrating national park field trips into schools

One way to incorporate conservation education into the public-school system is to offer field trip opportunities to nearby national parks and other protected areas. This provides students with formal access to the park, including tourism activities such as viewing the wildlife and guided activities led by environmental educators. An example of a program utilizing this teaching method is the forest experiences program developed by the Jane Goodall Institute, Ugandan Ministry of Education and Sports and the National Forestry Authority of Uganda (Kuhar et al., 2010). This program has been in place since 2004 and provides primary school children living near the Kalinzu Forest Reserve (KFR) with access to environmental education (Kuhar et al., 2010). This education program aimed to promote pro-environmental behavior changes that increase the success of CBC programs (Kuhar et al., 2010).

Evaluations of the forest experiences program were done with pre- and post- surveys of groups of students that went to the forest reserve for the program. Another survey was given after a 30 day period to measure long term effects, followed by another information session. The program adapted to include a 1 year and 2 year evaluation of the program in 2006. The data was used to analyze changes in the proportion of students who answered each question correctly at different points in the program. Results found a general trend for more correct answers in the

post-program evaluations (Kuhar et al., 2010). Environmental issues and solutions presented in the program were the most common correct answers in the post-program surveys (Kuhar et al., 2010). There were few correct answers for environmental issues and solutions in pre-surveys, making the improvement for these categories useful in determining program effectiveness (Kuhar et al., 2010). The proportion of correct answers increased over each new survey time.

Performance on the pre-surveys was also found to increase each year after program implementation, suggesting children who had participated in past year programs had shared information they had learned with younger children (Kuhar et al., 2010). This would not be unlikely due to the exciting nature of the trip to the national park for children without regular access (Kuhar et al., 2010). There is also the potential that teachers gained conservation knowledge while bringing students to the park and began to incorporate activities into their own teaching.

Another example of a program implemented at a national park is the outdoor ecology program at the Bavarian Forest National Park, where students around the age of 12 participate in 1-day and 5-day programs. Effectiveness of the program, specifically in shifting attitudes towards conservation and exploitation was measured by post-test surveys given one month after the program. As with the forest experiences program in Kalinzu National Park, students who attended the program in the Bavarian Forest National Park had higher scores for the survey than the control group of students given the survey. The program positively impacted the environmental knowledge of the participants and their attitudes toward human-nature relationships (Bogner, 1998). Students were able to acknowledge the ways people manipulate nature and were able to reflect on them, which is a key step the ecological literacy needed to manage natural resources effectively in a contemporary setting (Bogner, 1998). An important

difference between the program in Kalinzu National Park and Bavarian Forest National Park is whether behavioral changes were measured by the surveys. The 5-day program at Bavarian National Park was also able to positively influence verbal commitment to environmental action and resulted in more positive reported behaviors (Bogner, 1998). This is compared to the survey for the Kalinzu Program that only provided evidence for an increase in conservation related knowledge (Kuhar et al., 2010).

Education by wildlife sanctuaries

There are also education programs run by wildlife sanctuaries and rehabilitation centers fir primates affected by extractive industries. Aside from the conservation benefits of providing care to injured animals and working with law enforcement, many sanctuaries have distinguished conservation education programs. In 2012, a study revealed low environmental knowledge regarding primates in students neighboring national parks, which demonstrates a need for conservation programs to include this type of education (Kuhar, Bettinger, Lehnhardt, Cartwright, & Cress, 2012). The locations of PASA sanctuaries make them uniquely positioned to deliver conservation education over long time periods (Kuhar et al., 2012). Each year, they educate more than 500,000 people in Africa on wildlife conservation issues, specifically those concerning primates (PASA, 2018). Evidence suggests that conservation education programs can affect human behavior regarding the environment, such as reducing firewood use in some areas (Kuhar et al., 2012). PASA wildlife sanctuaries have several education initiatives. Some allow classes to visit the center for lessons, while other programs travel to schools, using rubrics, films, and books to bring the material to life (Kuhar et al., 2012).

The Kids for Compassionate Conservation program was started in 2015 by three member organizations in Cameroon- Ape Action Africa, Limbe Wildlife Center, and Sanaga-Yong Chimpanzee Rescue (PASA, 2019). Due to the success of this program, it was expanded to an additional three PASA members- HELP Congo, Fernan-Vaz, Ngamba Island, and Chimpanzee Conservation Center. Now, the program has expanded to five countries. This program uses an innovative children's book titled "Je Protège les Chimpanzés" ("I Protect Chimpanzees") paired with interactive group projects to teach children empathy towards chimpanzees (Figure 3). The book follows a young Cameroonian boy named Daniel who is fascinated by chimps he finds in the forest. Daniel finds an orphaned chimp whose mother was killed by poachers and he takes it on a long journey to the Sanaga-Yong rescue facility. Results from student pre- and post-surveys indicated an increase in students who understood (a) understood chimpanzees should not be eaten as bushmeat, (b) to contact the police if they saw a chimpanzee in a neighbor's house, and (c) that chimpanzees should not live in houses (PASA, 2019).

Figure 3: A young girl fills out a worksheet while reading the book "Je Protège les Chimpanzés" ("I Protect Chimpanzees") during an education workshop by Sanaga-Yong Chimpanzee Rescue, a PASA member in Cameroon.

Another education program run by PASA sanctuaries is the Edutainment Films Program, which was started in 2016 (PASA, 2019). This program uses 20 engaging films produced by Nature for Kids. Several of these films feature an African boy named Ajani and his experiences with the gorillas and chimpanzees living near his village. The films focus on the effects of habitat loss, snaring, and the bushmeat trade on primate populations (Leeds et al., 2017). The films have been shown by nine PASA members across nine countries to hundreds of thousands of people (PASA, 2019). They have also been aired on national television in Cameroon and shown at schools. The use of films in conservation education is not new; they have been used since the 1960s (Leeds et al., 2017). However, there is little published evidence about the effect that viewing conservation films has on influencing conservation action (Leeds et al., 2017). One aspect of films that make them a promising tool is the fact that films are a rarity in many rural areas that surround primate ranges. This increases anticipation and makes the experience memorable for the students (Leeds et al., 2017). Films also provide the opportunity to showcase primate behavior that may not be possible to view up close in the wild.

The films featuring Ajani and his adventures have been used by other conservation organizations in their own education programs. Evaluations from these other programs have found knowledge of primate anatomy and behavior to increase after the program (Leeds et al., 2017). Results also indicated that students were more knowledgeable on the threats facing primates covered by the films and were able to provide more responses to questions of what they could do to help conservation (Leeds et al., 2017). Providing the next generation with adequate environmental knowledge, particularly from the scientific perspective, provides opportunities for local people to be involved in conservation initiatives at higher levels. Since education has been identified as a constraint for involvement in government and policy making, these programs have

the potential to increase the accessibility of working in the government for rural people.

Community Development near Volcanoes National Park

Background

Another method of connecting conservation and community development is through tourism. The Volcanoes National Park (VNP) in Rwanda was created in 1925 and is the oldest National Park in Africa and provides a case-study to determine the effectiveness of tourism in furthering conservation and development (Hitimana, Namara, & Sengalama, 2006). This 16,000 km^2 park borders Virunga National Park in DR Congo and the Mgahinga Gorilla National Park in Uganda, creating a vast protected area for Mountain Gorillas (Ndabamenye, 2008). The total protected area created by the bordering national parks is 450 km^2 (Hitimana et al., 2006). Within the transnational protected area of DR Congo, Rwanda, and Uganda, is one of the two mountain gorilla populations on Earth. This system places high regard on the ecological ape because of the status associated with mountain gorillas. This protected area had 250 mountain gorillas in the 1980s, but this population has increased to 480 gorillas in 2010 (Grueter et al., 2013). This increase is attributed to more conservation programs running in the area, including tourism, anti-poaching patrols, and education (Grueter et al., 2013). The emphasis of programs run with support from the colonial ape is to benefit community development, and thus the ape of culture.

Distribution of gorillas within the parks is influenced by the availability of food resources. Gorillas feed primarily on herbaceous leaves and stems. As effects of global warming increase, plant species important to gorilla diet may shift to higher altitudes, which may lead to changes in gorilla distribution (Grueter et al., 2013). The specialization in diet for mountain gorillas is due to the specificity of their habitat; the habitat ranges of eastern lowland gorillas

allows for greater diet diversity (Grueter et al., 2013). However, mountain gorillas have incorporated many new plant species to their diet in recent years, showing an ability for diet plasticity (Grueter et al., 2013). Our understanding of ecological constraints for mountain gorillas is largely due to the high prevalence of researchers interested in them. This expression of the ecological ape has been influenced by the creation of research centers and impacts our general understanding of the species itself. Gorillas in this area were found to have a 3-4% annual population growth rate in 2004 (Grueter et al., 2013). Despite recent growth, the mountain gorilla population has declined by 40% since the 1960s, and it will decline again if habitat loss from human activity continues (Munanura, Backman, C. Hallo, & Powell, 2016). Changes in anthropogenic factors have a large impact on the ecological ape.

Illegal forest activity affects mountain gorillas. They are oftentimes accidentally caught by snares targeting ungulates for bushmeat consumption (Munanura et al., 2016; Munanura, Backman, Hallo, Powell, & Sabuhoro, 2018). Less frequently, they are trafficked by locals. A survey found that people participating in illegal hunting were also likely to be cutting bamboo and harvesting medicinal plants, meaning mitigation of illegal hunting would have a large impact (Munanura et al., 2018). It would also be important for mitigation to include health strategies, because of the cultural medicinal value of bushmeat within the population. Access to bushmeat is a safety net for local people when faced with abrupt condition changes to their livelihoods (Bennett et al., 2017).

The VNP is surrounded by four districts with high population densities (Ndabamenye, 2008). Population density is higher in the surrounding area of the VNP due to human migration towards more fertile volcanic soil (Hitimana et al., 2006). Within the surrounding area, demand for agricultural labor is seasonal, and migration of men follows this trend (Hitimana et al., 2006).

Community members living near the VNP must travel farther for health and school services due to low availability of social services nearby (Hitimana et al., 2006). This demonstrates a need for community development programs, particularly in regard to access to social services and food security.

The high population density magnifies the pressure of humans on the VNP, especially considering that the population is increasing (Hitimana et al., 2006). The high human population levels in the area increase the interactions between humans and wildlife and the need for community involvement in conservation. High population density also adds to the urgency for value intensive farming and the creation of off-farm economic activities. Community tourism and beekeeping could be possibilities.

Past community projects implemented in this area focused on improving the socio-economic development of communities bordering the VNP (Ndabamenye, 2008). These sustainable projects included incorporating orchards and animal husbandry into farming systems to improve yields, decreasing grazing to preserve land quality, using agroforestry to fight soil erosion, promotion of activities such as rainwater collecting and use of energy efficient stoves, and beginning beekeeping and cultural tourism industries in the region (Ndabamenye, 2008). There are several attractions in the area that could support the development of community tourism. Outside of the park are opportunities for ecotourism in caves and hot springs (Hitimana et al., 2006). There is also an opportunity for cultural tourism to showcase the Rwandan way of life. The development of community tourism industries generates income on natural resources without exploitation.

Ecotourism and communities

The VNP provides important employment opportunities for locals in the tourism industry, which has increased as the demand to see mountain gorillas has increased (Hitimana et al., 2006). Tourism in Rwanda is largely supported by the presence of mountain gorillas, making VNP a large tourism hub. The link between protecting the ecological ape and improving life for the ape of culture can be argued for because of increased infrastructure and services that follow tourism, which benefits neighboring communities (Hitimana et al., 2006). Overseeing this connection is the colonial ape, taking form in the policies surrounding tourism conducted at the national park, which is run by the state. The colonial ape decides how money from tourism is allocated to communities, and it influences development projects implemented in the area.

Community-based tourism revenue sharing (TRS) programs aim to connect the fight against poverty with the preservation of wildlife (Munanura et al., 2016). These funds go towards community projects in areas near national parks. Rwanda allocates 5% of their total tourism revenue to TRS programs (Munanura et al., 2016). In 2017, over $600,000 was given through the TRS program to community-based projects (Wairima Ndungu, 2018). This is compared to the $16.4 million the park generated from park entry fees in 2016 (Wairima Ndungu, 2018). The TRS supported programs surrounding the VNP include social infrastructure development in the form of schools, water tanks, and bridges, as well as investment for off-farm industries like cattle raising and beekeeping (Munanura et al., 2016). Projects are selected by the Revenue Sharing Committee from project proposals submitted by community associations and organizations (Munanura et al., 2016).

Despite the praise these programs receive, there are several policy constraints and conceptual limitations. A limitation of this program is that the system requires community associations to pay a membership fee to buy into the TRS program (Munanura et al., 2016).

While the TRS benefits arguably outweigh the cost, membership fees exclude the poorest community members from participation. In this aspect, policies created by the colonial ape improve the economic situation and access to infrastructure for communities with enough money to afford participation and do nothing for the people living next to VNP in poverty, who are most likely to turn to the forest for subsistence (Munanura et al., 2016).

A prominent group in the region, the Batwa community, reported loss of livelihood due to restrictions on collecting products from the park. Despite the collection of these products being illegal, it persists to a degree due to the associated cultural benefits (Hitimana et al., 2006). Products collected include firewood, honey, medicinal plants, bamboo, and animal poaching (including large mammals and baby gorillas) (Hitimana et al., 2006). Batwa livelihoods are dependent on natural resources from the surrounding forest, access for which is now controlled by the government (Hitimana et al., 2006). The colonial ape's power dominated the ape of culture in this example. To avoid more conflict, government programs for poverty alleviation are necessary in low-income populations surrounding protected areas (Hitimana et al., 2006). TRS was determined to have a low impact on conservation due to the exclusion of the poorest in the community (Munanura et al., 2016). Poor residents are dependent on harvesting material from the park, even though it is illegal. For TRS to become successful, it must address the needs of the poor living on the edge of the park, especially concerning the issue of food insecurity (Munanura et al., 2016).

The largest threats to people's livelihoods and conservation were considered water access and land scarcity since they force people to encroach on the park and enter it illegally (Hitimana et al., 2006). In many areas, people are dependent on water located in the national park (Hitimana et al., 2006). Access to water in the boundaries of the national park is restricted by

policies created and enforced by the colonial ape, taking the form of policy makers and rangers. Rainfall collection, particularly on public buildings, has been identified as a good solution for the conflict. Land scarcity contributes to increased land degradation through soil erosion and lowers soil fertilely. The need for land is high due to the reliance on agricultural livelihoods. From this evidence, it is clear that livelihoods, and the ape of culture, are dependent on access to natural resources of the area.

Representation of local people is incorporated into selecting Natural Resource Management (NRM) agendas in the form of District Development Plans (DDP) (Ndabamenye, 2008). DDPs are used by the district, which is an entity of the state, to provide direction for future development goals. Participation in creating the DDPs increases community involvement with institutions of the colonial ape and ensures the DDP focuses on issues that will improve their livelihoods. However, this can easily become focused on public services, such as access to electricity, rather than NRM (Ndabamenye, 2008). The districts also monitor and partner with NGOs working in the area to ensure there are not too many organizations focused on the same issues (Ndabamenye, 2008). To allow districts more involvement in activities in the VNP, it is recommended that projects are incorporated into existing DPPs (Ndabamenye, 2008).

Within VNP are several NGOs with their own conservation initiatives and program activities. Of these, several focus on mountain gorilla conservation. One example is the Dian Fossey Gorilla Fund, which has been involved in their Research Center of Karisoke since 1967 and in lessening human encroachment on the park (Hitimana et al., 2006). Preservation of the ecological ape and scientific discovery is coupled with concern for the ape of culture. Not only have gorilla populations been monitored closely by the scientific community, but the Dian Fossey Gorilla Fund also works to improve living standards for communities living near the park

through the implementation of activities such as beekeeping to generate income (Hitimana et al., 2006).

The views of community members on NRM have been recorded during community development workshops run by the International Gorilla Conservation Program (IGCP) in the Kinigi area of Rwanda. It was found that community members recognized the important role the revenue sharing program had on social infrastructure development (Hitimana et al., 2006). Contributions to schools and other facilities led the community to highly value the VNP (Hitimana et al., 2006). The education infrastructure in the surrounding districts is in scarce supply and varying shape (Hitimana et al., 2006). Access to primary and secondary school facilities depends on the district, but overall the facilities lack supplies (Hitimana et al., 2006).

There is evidence that conservation incentive programs such as providing opportunities for alternative livelihoods fail to substantially improve conservation efforts by the community (Munanura et al., 2018). These programs can easily look over non-material hardships that contribute to illegal forest use. By only focusing on income generation or infrastructure development, programs neglect to address underlying causes such as education, healthcare, and community participation (Munanura et al., 2018). In many ways, the link between increased income and increased will to preserve wildlife fails to be made (Munanura et al., 2016).

Conclusions and Recommendations

Based on the evidence given, the importance of understanding the role of the three apes in conservation and development is clear. However, the depth of these interactions remains tangled in the many stakeholders and their interests. Together, these three concepts of nature drive the arguments of conservation and even development. Modern conservation agendas have

become politicized, often representing international and state actors as well as corporate funders (Hardin & Remis, 2006). Since they are rooted in institutions with colonial legacies, indigenous people can be left out of conservation discourse, making it more important than ever to keep the ape of culture in the discussion (Hardin & Remis, 2006).

Decentralization aims to give more power to communities over their natural resources, but management of natural resources at any level faces the challenges associated with pleasing the three apes. One challenge decentralization faces is integrating scientific knowledge into the local level. Often, local managers involved in decentralized projects rely on local environmental knowledge, which can create misunderstanding when dealing with scientists and high-level policy makers reliant on Western science. In this case, the education level is a constraint on the scientific knowledge of people working at the local level. Another challenge for states using decentralization is fitting the needs of local circumstances into the national goals. Decentralization provides a framework for the state to approve different approaches for different areas based on the circumstances and needs of each location.

The need for primate conservation in Africa is greater than ever. Addressing the growth of the trade in ape meat and body parts is critical to ensure the existence of chimpanzees and gorillas in the future. Unchecked, increased demand and high poaching levels will further increase the unsustainable harvest of endangered species. Great ape species not only are important megafauna in their habitat, but they represent our closest animal relatives. Organized hunting and trading of great apes is driving these species to extinction (Nforngwa, 2015). Each of the three apes has a valuable role in conservation. The ecological ape provides scientific evidence supporting the need for protective measures. The ape of culture is able to tackle market demands leading to illegal trafficking and can address environmental policy. The ecological and

colonial apes are reliant on cooperation from the ape of culture because without support from the local people a program cannot be successful. Innovative conservation approaches that address organized crime while equally considering the three apes are needed.

The three apes must also be considered when using conservation to promote community development. The case study of Volcanoes National Park provides a good example of the interactions between scientists, community members, and government programs in making the connection between conservation and development. Programs must involve community decision making and be place-specific in order to be effective. On the international level, discussions regarding the value of environmental preservation must be had. Environmental services are difficult to quantify and are often left out of international development discussions, which tend to focus on economic issues. The link between conservation issues and development is historically weak; many arguments fail to prove conservation's ability to stimulate economic growth (Davies, 2002). Research must look at these questions while considering all actors to develop a better understanding of development. In addition, the impact of natural resources and biodiversity on the livelihoods of the rural poor are rarely advocated for, meaning systems must be adapted to allow them greater participation (Davies, 2002). These voices must be integrated into modern conservation agendas to save species from becoming extinct.

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