

# The Many Facets of Human Disturbances at the Tonkolili Chimpanzee Site

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## Introduction

As deforestation continues unabated across Africa (Hansen et al. 2013), animals such as chimpanzees find themselves facing an increasing reality of living in extreme anthropogenic habitats—frequently incorporating cultivated fields and villages into their core area. Such effects have led to an increasing number of interactions between chimpanzees and humans, the consequences of which have historically been negative for both species. It has, therefore, become crucial to the long-term survival of chimpanzees to understand their ecology in anthropogenic landscapes, and to look for ways to mitigate human–chimpanzee conflicts in order to protect chimpanzees living in such circumstances.

At this point, it can become tempting to search for universal variables that define human impacts, and explore solutions to anthropogenic conservation issues with chimpanzees based on these variables. However, factors within anthropogenic chimpanzee habitats, as well as human–chimpanzee interactions, can be unique and specific to the ecological, historical, social, and economic attributes of an area. Conversely, conservation initiatives targeting chimpanzees in these habitats, including mitigating the conflicts between humans and chimpanzees, require site-specific approaches to conservation that incorporate an exhaustive knowledge of all factors present within an area.

The effects of deforestation have been shown to push chimpanzees into isolated forest fragments, oftentimes sequestering a population within (Beck and Chapman 2008). Thus, the specific features of these fragments are the inescapable ecology of the chimpanzees within. Distinct fragment features have been shown to affect critical aspects of chimpanzee ecology specific to these ecosystems. These include

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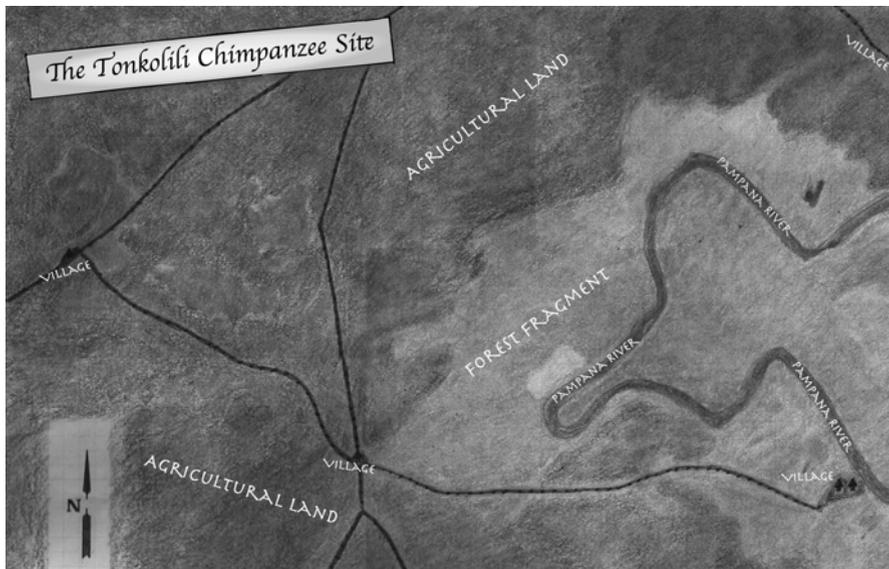
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forest attributes (Reynolds et al. 2003), parasitology (Gillespie and Chapman 2006), and interactions with local human communities (McLennan 2008). Any conservation initiatives for chimpanzees in fragmented areas must take into account the fact that the variables within can be unique. Failure to explore these factors, especially those related to the human component, can render a strategy unsuccessful (Webber et al. 2007).

A small group of chimpanzees in Sierra Leone live in a forest fragment surrounded by six human villages. This population shows how specific an anthropogenic ecology can be. This site, known as the Tonkolili Chimpanzee Site, carries with it particular dynamics endemic to it. These qualities illustrate that the variables defining human impacts are multifaceted and highly complex, and that any conservation initiative must incorporate a methodology tailored to the situation. In 2012, an initiative, “The Tonkolili Chimpanzee Project,” was founded to address the conservation issues in the area (Halloran et al. 2014). The successes and challenges that the project has faced exemplify the intricacies of anthropogenic chimpanzee ecology.

## Location

The Tonkolili Chimpanzee Site (Fig. 1) incorporates a forest fragment located on the banks of the Pampana River in Central Sierra Leone (Halloran et al. 2013). The fragment extends 7 km<sup>2</sup> from the river’s riparian growth. The riparian forest connects this area to other fragments in Central Sierra Leone. Thus, there are forested



**Fig. 1** A map of the Tonkolili Site showing four of the six villages

corridors in and out of the site. The site is also surrounded by agricultural fields that are cultivated and shared by the six local villages that surround the site. The crops in these fields vary; however, most of the land is used for oil palm (*Elaeis guineensis*). The edges of the fragment are fallow areas, cut down and cultivated at random times, then allowed to regrow once the harvest season has ended.

The six villages that surround the site belong to two different chiefdoms. The land and forest are shared unequally, with property rights shifting based on the political climate between the communities, which may favor some villages over others. In some cases, a village may be completely excluded from using the land by the others. The agricultural fields and villages are interspersed with several smaller forested patches. The chimpanzees, showing an ability and propensity to cross through domestic areas, frequently use these patches. The patches, and the cultivated areas between them, occupy 18 km<sup>2</sup>. This, plus the 7-km<sup>2</sup> fragment, equals a 25-km<sup>2</sup> core area for the Tonkolili chimpanzees.

## Background

The forest fragment contains a relatively high density of chimpanzees. A standing crop nest count (SCNC) census of chimpanzees reveals a density of two chimpanzees per km<sup>2</sup> (unpublished raw data). A survey of the wild food resources being consumed by the chimpanzees—primarily black velvet tamarind (*Dialium indum*), rubber tree fruit (*Funtumia* sp.), and tamarind (*Tamarindus indica*)—reveals an abundance that may not support such a high density (unpublished raw data). However, the chimpanzees make up for these deficiencies by raiding and consuming cultivated crops—primarily the oil palm (both fruits and petiole), as well as the non-native mango (*Mangifera indica*) and pineapple (*Ananas comosus*). Crop raids are the most frequently reported interactions between the chimpanzees and humans.

A surprising by-product of crop raiding is that the seeds of the non-native cultivars are now being dispersed throughout the primary forest fragment. Mango saplings appear along chimpanzee created trails. In some places, deep in the forest, fully grown fruiting mango trees exist as part of the forest canopy. In addition, groundnut, guava, and pineapple can be found along the chimpanzee trails. These non-native food resources, imported by humans and introduced into the fragment presumably by chimpanzees, have altered the forest. Because of this, the chimpanzees have food preferences within the forests based on the presence of the human communities. This has modified their feeding ecology and, potentially (based on the presence of a uniquely introduced food availability), their social strategies, reproductive strategies, and territoriality; thus, giving a new facet of how humans can impact a landscape and the organisms within.

Interviews with the villages show a long history of human–chimpanzee interactions in the area. However, these interactions have changed over the course of several decades. The community also reports that encounters with chimpanzees have continually increased. Reports of interactions that occurred prior to the

Sierra Leone civil war consist mostly of chimpanzee attacks on livestock, pets, and humans. Reports since the civil war consist mostly of crop raiding by the chimpanzees. The community also reports that the killing of chimpanzees by humans has “always occurred”, but has increased since the war as a method of crop defense and also due to the increasing number of encounters. The villagers claim to not eat the chimpanzees.

The primary reason for the present high density of chimpanzees in the fragment, as well as the increasing number of encounter with humans, stems from an exponential deforestation rate that has continually increased across Sierra Leone (Jallow 2014). This has resulted in high-density fragments such as the one occupied by the Tonkolili chimpanzees. The increasing density of chimpanzees within the fragment has necessitated their need for cultivated crops, resulting in the increased frequency of chimpanzees entering the agricultural fields.

Village economics has been a huge determinant on the nature of human–chimpanzee interactions at the site. Prior to the civil war, the communities relied on rearing livestock and cultivating honey (through bee keeping) as their primary sources of economy. In addition, they maintained crop fields of cassava and rice. During the war, rebel soldiers occupied the villages and many villagers fled into the forest. By the end of the occupation, the rebels had killed their livestock, destroyed their bee keeping boxes, and burnt their crop fields. When the villagers returned, they found they were left with no economic means. Since then, they have relied on obtaining loans for oil palm seeds. The oil palms can be harvested for kernels (which are used to make soap) and palm oil. However, because the chimpanzees frequently raid the palms and use the trees as nesting sites, the crops are often destroyed. The palms, therefore, do not produce a viable yield, leaving the villages in debt.

These factors have created a perception of chimpanzees as dangerous pests. Because of this, chimpanzees have been killed in the forest fragment out of both fear and as a method of resource defense. In addition, a dead chimpanzee can yield a relatively high price when sold to various societies for ritual practices. Combined, these variables point to a highly unsustainable coexistence between humans and chimpanzees at the site.

## **The Project**

The Tonkolili Chimpanzee project began in 2012. While in Sierra Leone, we drove beside an agricultural field where several chimpanzee nests were visible from the road. We ventured on to the nearest village where the chief met us. When we asked him if there were chimpanzees in the area, he replied that, yes, they had “many” chimpanzees in the forest. In fact, he exclaimed, they had just killed two very recently. At this point, we were introduced to the hunter who had been killing the chimpanzees. He agreed to show us around the forest.

When we explored the forest, we were excited to find signs of chimpanzees throughout the fragment. Therefore, we made the decision to stay in the area for the

next several weeks. Over the course of our first trip, we were able to explore the forest extensively. Of note was the fact that, though we were able to visually spot the chimpanzees and were in very close proximity to them, we never heard them vocalize. It is possible that this was because they were being regularly hunted.

Also during this initial trip, we were able to discuss the chimpanzees with members of the different villages. From this we learned that the chimpanzees were viewed as pests due to the economic problems caused by crop raiding. Based on this understanding, we began to design a conservation initiative that would reduce the villages' reliance on the crops that were being raided, while protecting the chimpanzees from being killed.

At the end of the summer, with the Conservation Society of Sierra Leone (our partner NGO), we proposed an agreement with the villages. It stated that we would seek out funds to rebuild prewar economic activities. In return, the villages would not hunt the chimpanzees in the fragment. The Conservation Society would monitor the agreement. The villages, and the governing chiefdoms, agreed and the project was commenced.

Upon returning to the USA, we began to look for funds. We approached a company that operated primate field schools and proposed a course whereby students learned about chimpanzee ecology in anthropogenic areas. We could then use a portion of the tuition to fund the project. They agreed. In addition, we approached Lynn University with an idea to construct bee keeping boxes as a student project. The university agreed to fund the materials and the shipment of the boxes, which we could set up the following summer.

The following summer, we returned to the site with funds to build livestock pens, purchase livestock, and plant a community garden with crops that we believed the chimpanzees were less likely to raid (okra, green beans, cassava, etc.). We also brought 10 bee keeping boxes. Together, the boxes would yield approximately 130 kg of honey per harvest—enough to be shared between the villages.

To monitor the chimpanzees, we set up camera traps (Fig. 2) throughout the forest. They revealed new chimpanzee births and a population that was larger than originally suspected. These photos, combined with the fact that the chimpanzees were now highly vocal, provided evidence that the villages had been true to their word and no chimpanzees had been killed. We began working on other community initiatives: building more livestock pens, purchasing more livestock, and having wells dug for two of the villages that had no access to adequate drinking water. We returned home that season feeling surprised at how well the project was doing. However, this feeling was not to last much longer.

The following winter, a fire swept through one of the villages (this was the village we had initially approached, stayed with, and had the closest ties to). The fire had spread from the agricultural fields into the village. The thatched roof huts were quickly consumed. In the end, all but three huts were destroyed. Luckily, no one had been hurt, but almost everything within the village was destroyed. We were able to raise enough funds to rebuild the huts. In an attempt to prevent future fires of this sort, we rebuilt the thatched roofs with metal roofs.



**Fig. 2** A photo from one of the camera traps showing a female chimpanzee with an infant on her chest

With the village rebuilt, and no injuries from the fire, the project seemed poised to resume. However, when we returned the next summer, we found the chimpanzees silent again. After repeated inquiry, it was revealed that one of the villages had hosted a visiting hunter in the spring. The hunter had killed two adult male chimpanzees and sold them to secret societies. This village had apparently taken offense to the fact that the burnt village now had metal roofs instead of thatching (a more significant mark of status than we had realized). They hosted the hunter because, according to conversations with members of the village, they no longer felt the project had any value for them and wanted to end it.

The hunter, himself, was arrested—not for killing the chimpanzees, but for using an illegal rifle (both are illegal; killing a chimpanzee carries a fine of roughly \$4, while using an illegal firearm can be punishable by years in prison). He had been turned in by the old hunter, who had initially taken us through the forest on our initial village and was now solidly behind the project.

The events of that year were symptomatic of a general short sightedness and oversimplification that was hindering the project. We were concentrating entirely on the fact that the chimpanzees were being perceived as an economic threat, while ignoring other factors at the site. Intervillage politics, land disputes, historical encounters with chimpanzees, and even mythic perceptions of the chimpanzees were having as much of an impact of the sustainability of the chimpanzee population as the perceived

economic threat. Before that summer, we had begun to address some of the project's shortcomings. Most significantly, a cultural anthropologist joined the project as a collaborator. Through her expertise, we were able to collect more extensive ethnographic data on the local community. Most of this has centered on community perceptions of chimpanzees, chimpanzee conservation, and human survival. Through this, we will be better able to address community needs while simultaneously working to conserve the chimpanzee population.

We also initiated the process of training and hiring local community members from each village to act as both researchers and patrols. The researchers are trained to collect ecological data via GPS, as well as check, monitor, and maintain the camera traps. The goal of this initiative is to create a conservation enterprise. At the end of the summer, we held a meeting with members of all six villages together. The aim of the meeting was to clarify the project to all of the villages and to begin a more open dialogue with the community. At the end of the meeting, one of the elders from the largest village stood up and told a story that had occurred before the war. A woman, he recounted, was walking out to one of the fields with her infant strapped to her back. On the road, she encountered three large chimpanzees. The chimpanzees attacked the woman, took the baby from her back, and killed the baby in front of her. When he finished his story, he asked us a question. Why, he asked, would they want to keep these animals in the forest? The story and the question highlighted the extremely complex nature of the situation, not just at the Tonkolili site, but in all anthropogenic chimpanzee habitats. As human impacts have depleted chimpanzee habitats and increased the densities in small fragments, encounters with humans have increased. Each specific encounter adds an element to an ever-growing collective perception of chimpanzees held by a local human community. The negative consequences of these encounters, whether they are economic consequences or violent consequences, increase the collective community animosity and fear towards chimpanzees. It is the burden of the conservation strategy to find an optimality, a value, of living wild chimpanzees for the humans that live among them. The value must exceed the heavy detriments incurred by human–chimpanzee interactions. If not, the strategy will fail.

## **Towards a Sustainable Anthropogenic Landscape**

The dynamics at the Tonkolili Site were forged element by element. Alter, or take away, any one element, and the dynamics can change drastically. Each ecological variable, each encounter between a human and a chimpanzee, each economic circumstance faced by the local human community, each aspect of the political and social landscape within the local human community, and each facet of history occurring at (or around) the site have all created these dynamics. The Tonkolili Site is shaped as much by the types of crops that the community has grown, as it is by chimpanzees dispersing cultivated seeds throughout the forest. The dynamics of the site are determined as much by the economic realities of the community, as they are by the brutal civil war that created these realities. The dynamics specifically identify



**Fig. 3** The Pampana River cuts through the forest fragment

the Tonkolili Site, dictating the health of the ecosystem and the sustainability of the chimpanzees. Humans haven't just influenced the chimpanzee habitat, they have defined it (Fig. 3).

In order to create sustainability at the Tonkolili Site, the unique dynamics must be explored, understood, and addressed. Together, these dynamics can be viewed as a causal nexus where each variable creates a ripple effect. The ripples influence other variables, culminating in the present state of the site. The most obvious variable is the ecology of the chimpanzees in the forest fragment. As we have seen, they live with an unusually high population density. This was brought on by large-scale deforestation across the region. The deforestation represents human impacts that are not necessarily immediate. In fact, through deforestation, the chimpanzees are being impacted not just by the humans in their immediate vicinity, but by the actions of humans across the region and, in the sense that the forces of deforestation exist in the global demand for resources in West Africa, across the globe.

The high density has several consequences. Most significantly is the fact that the increased density equals more frequent encounters with humans. Because these encounters have been violent in the past, where livestock, pets, and even humans are injured or killed, each encounter builds a highly negative perception of chimpanzees among the community. This negative perception creates a massive barrier to any perception of value that the community could have of living chimpanzees. The high density also carries the consequence that the forest fragment alone cannot sustain the population of chimpanzees. The chimpanzees have adapted to this by feeding off the crops cultivated by the community. This creates a severe economic adversity for the villages because of what occurred during a war, they are economically reliant on cultivating crops that chimpanzees frequently raid. This, in turn, adds to the already negative perception of chimpanzees. Not only are chimpanzees potentially lethal, they also destroy the economic viability of an already highly impoverished community.

The result is the focal conservation issue: chimpanzees being shot in the forest. However, as this causal nexus shows, the killing of chimpanzees is merely a symptom of a much larger operation. When we initiated the Tonkolili Chimpanzee Project, we were only treating this symptom and its most obvious causes. However, as we worked to rectify the problem, the other ripples in the causal nexus were supplanting what we attempting to fix. As we treated the economic situation, we failed to address the perceptions. Had this understanding been the initial foundation of the Tonkolili Chimpanzee Project, we may have avoided some of the challenges we experienced. It is from this understanding that the project has proceeded ever since.

The final consequence of this causal nexus is the inadvertent seed dispersal by the chimpanzees. Through this phenomenon, we see a grand ecological adaptation to human impacts. The forest is becoming sustainable for the chimpanzees, while at the same time, reducing the chimpanzees' need to go into the crop fields. The forest has been altered in a way that benefits both species. It serves as a reminder that coexistence between the two species is possible, and perhaps there are ecological mechanisms that allow chimpanzees to survive in an anthropogenic landscape.

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## References

- Beck, J., & Chapman, H. (2008). A population estimate of the endangered chimpanzee *Pan troglodytes vellerosus* in a Nigerian montane forest: Implications for conservation. *Oryx*, *42*(03), 448–451.
- Gillespie, T. R., & Chapman, C. A. (2006). Prediction of parasite infection dynamics in primate meta-populations based on attributes of forest fragmentation. *Conservation Biology*, *20*(2), 441–448.
- Halloran, A. R., Cloutier, C. T., Monde, S., & Sesay, P. B. (2014). The Tonkolili chimpanzee project in Sierra Leone: Implications for chimpanzee conservation strategies in anthropogenic landscapes. *African Primates*, *9*, 15–22.
- Halloran, A. R., Cloutier, C. T., & Sesay, P. B. (2013). A previously undiscovered group of chimpanzees (*Pan troglodytes verus*) is observed living in the Tonkolili District of Sierra Leone. *American Journal of Primatology*, *75*(6), 519–523.
- Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-resolution global maps of 21st-century forest cover change. *Science*, *342*(6160), 850–853.
- Jallow, H. (2014). Sierra Leone's 5th National Report to CBD. *Environmental Protection Agency of Sierra Leone*.
- McLennan, M. R. (2008). Beleaguered chimpanzees in the agricultural district of Hoima, western Uganda. *Primate Conservation*, *23*(1), 45–54.
- Reynolds, V., Wallis, J., & Kyamanywa, R. (2003). Fragments, sugar, and chimpanzees in Masindi District, western Uganda. In *Primates in fragments* (pp. 309–320). New York: Springer.
- Webber, A. D., Hill, C. M., & Reynolds, V. (2007). Assessing the failure of a community-based human-wildlife conflict mitigation project in Budongo Forest Reserve, Uganda. *Oryx*, *41*(02), 177–184.