

Factors Affecting the Visibility of Chimpanzees (*Pan troglodytes*)
at the Detroit Zoo

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Introduction

Zoos today strive to provide enriched environments that allow captive animals to adapt to their surroundings and maintain psychological and physical well-being (Hosey, 2005). Because the public provides financial support, zoos must not only be concerned about animal welfare, but also satisfying visitors. By making animal habitats as natural and large as possible, zoos increase the activity of animals and thus their “attractiveness” to visitors (Robinson, 1998). Doing so, however, may result in visitor complaints, as the creation of such habitats often decrease the visibility of animals. Visitors themselves can also impact the behavior of animals, which in turn, may influence their visibility to the public (Hosey, 2000). For example, the activity of chimpanzees at the Los Angeles Zoo decreased during weekends and other times there were large crowds of people (Wood, 1998). The reduction in activity is likely to have affected chimpanzee visibility.

Animal welfare is a top priority at the Detroit Zoo (R. Kagan, S. Carter, S. Allard, personal communication). The commitment to this is exemplified in their treatment of their chimpanzees. The zoo has two large enclosures for ten chimpanzees. The enclosures contain trees, rocks, artificial termite mounds, and bushes designed to simulate the habitat of wild chimpanzees. While visitors can see the chimpanzees from several observation sites, the animals are sometimes out of view when they move into a moat that runs around the perimeter of the enclosures.

A previous study suggested that the chimpanzees spent considerable time hidden from visitors in the moat at the Detroit Zoo (Brown, 2011). While there was no relationship between the number of zoo visitors and chimpanzee visibility, temperature affected whether they could be seen, as the animals sought refuge in the moat on hot days (*ibid.*). While these findings are instructive, this study was conducted while the chimpanzees were housed in the larger of the two enclosures at the zoo. It remains unclear how easily the animals can be seen in the second, smaller yard. In addition, the claim that the chimpanzees were hidden from view most of the time was made based on opportunistic observations rather than quantitative data collected via samples across the day (*ibid.*).

Other factors are likely to affect the visibility of chimpanzees at the Detroit Zoo. For example, chimpanzees who are active while moving should be more easily seen than those who are stationary and resting. In addition, zookeepers feed the chimpanzees daily at mid-day by providing food in the middle of each yard (S. Allard and E. Arbaugh, personal communication). This undoubtedly draws the animals into open areas making them more visible to the public. How long they remain visible, what they do while feeding, and where they go after these mid-day feeding episodes remain to be determined.

In this research, I set out to determine the degree to which chimpanzees at the Detroit Zoo could be seen in one of their large, outdoor enclosures. In contrast to the previous study investigating this issue (Brown 2011), I collected systematic data on this issue over several days, but did so while the chimpanzees were housed in the smaller outdoor enclosure. Second, I investigate several biotic and abiotic factors hypothesized to affect chimpanzee visibility, including the number of visitors, chimpanzee behavior, and weather. Specifically, I test the hypotheses that chimpanzee visibility decreases as the number of visitors increases and during periods of high temperature and low cloud cover. I also examine whether the behavior of chimpanzees had an effect on their visibility and if some locations in the yard made them more

visible than others. Answers to these questions have important implications for zoo management interested in satisfying their paying customers who come to see the chimpanzees.

Methods

Study Site

I conducted observations of chimpanzees at the Detroit Zoo. During this study, they were housed in the north yard of the great ape exhibit. The north yard contains several trees and four large rocks. These provide shade for the chimpanzees during hot, sunny days. While the chimpanzees are visible to the public in most areas in the yard, they can descend into parts of a deep, dry moat surrounding the yard and remain hidden to visitors.

The north yard can be viewed from 7 spots by visitors, 6 from outdoors and 1 from inside a public building. I labeled these viewing areas numerically 1 to 7 starting with the public building and moving clockwise (Figure 1). I divided the yard into 4 quadrats to record the locations of the chimpanzees. Quadrats were defined based on areas visitors could see from each viewing area (Figure 1).



Figure 1. Aerial view of the north yard of the chimpanzee exhibit at the Detroit Zoo. Viewing areas (V.A.) and quadrats (n=4) are shown.

Figures 2 and 3 show the yard from two of the seven viewing areas.



Figure 2. Viewing area 4 looking into the north yard.



Figure 3. Viewing area 3 looking in north yard.

Subjects

Subjects were 10 chimpanzees, 2 males and 8 females ranging in age from 3 to 46 years (Table 1). They included 1 adult male, 6 adult females, and 3 subadults. Individuals were easily recognized by their facial features and other anatomical characteristics.

Name	Age	Sex
Imara	21	M
Ajua	8	M
Trixi	46	F
Bubbles	45	F
Abby	33	F
Tanya	26	F
Nyani	26	F
Chiana	23	F
Akira	5	F
Zuhura	3	F

Table 1. Chimpanzee study subjects, with their ages and sex.

Behavioral Observations

I conducted observations over 15 days between June – August 2017. Because I was interested in how chimpanzees reacted to the presence of human visitors, I collected data toward the end of the week and weekend, Thursday through Sunday during normal visiting hours 9 a.m. to 4 p.m. I collected approximately 5.1 hours of observation each day totaling 76.5 hours. I recorded data during three blocks of time to ensure that observations were spread evenly across the day: 9:00-10:40 a.m.; 11:45 a.m.-1:25 p.m.; 2:30-4:10 p.m.

I recorded observations during 10-minute scan samples conducted at the 7 viewing areas. I started each day from viewing area 1 or 7 and moved clockwise or counterclockwise to the next viewing area for the next scan until I arrived at the opposite side of the enclosure. I rotated my starting point and ending point between viewing areas 1 and 7 to avoid repeats.

During each scan sample, I recorded whether chimpanzees were visible, their identities (Table 1), behavior (Table 2), and quadrat location (Figure 1) within the yard. Individual chimpanzee behavior was recorded as resting, grooming, self-grooming, feeding, playing, traveling, or aggression. Definitions of each behavior are given in Table 2. I also recorded the number of visitors at each viewing area and the temperature and cloud cover during each scan. The number of visitors was recorded using a clicker each time an individual entered the viewing area during each 10-minute scan sample. Temperature was recorded in degrees Fahrenheit using the *Underground Weather app* for Huntington Woods, MI. Cloud cover was recorded using a three-point scale: (0) No clouds, (1) Partially Cloudy, (2) Mostly Cloudy.

1. Resting	Remaining immobile without movement
2. Grooming	Picking at the exposed skin of another chimpanzee using one's hand or lips.
3. Self-grooming	Grooming (2) oneself.
4. Feeding	Picking up and ingesting food.
5. Playing	Either self or social play. Determined by context of movement. Some behaviors associated with play, include but are not limited to: dangling, leaping, tumbling, chasing, and wrestling.
6. Traveling	Moving in the enclosure.
7. Aggression	Exhibiting aggressive behaviors towards another chimpanzee including, but not limited to: biting, slapping, chasing, screaming, and shoving.
8. Displaying	Male dominance display. Associated behaviors include pant hoots, piloerection, swaying body while in bipedal stance, and chasing another individual to a submissive stance.

Table 2. Chimpanzee behaviors recorded in this study.

Results

Visibility

Over 15 days of observations, I recorded whether the chimpanzees were visible during 315 scan samples. At least one chimpanzee could be seen in 244 of these scans or 77.5% of the time. Chimpanzees could be seen at some times during the day more than others. This varied from a low of 53% of the time at 1145, 1315, and 1545 to a high of 100% of the time at 0930, 1215, and 1500 (Figure 4).

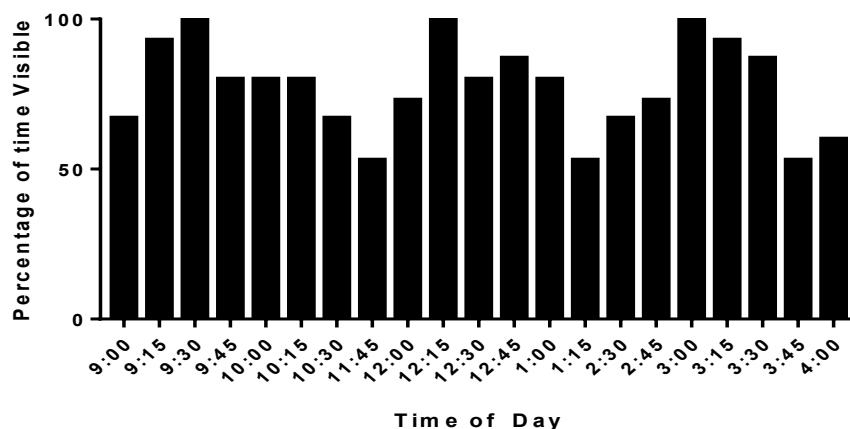


Figure 4. Chimpanzee visibility across the day. The percentage of time chimpanzees were observed during each 15-minute scan are shown.

The effect of human visitors on chimpanzee visibility

The Zoo opened at 0900 and I made observations starting then until late in the afternoon before closing time. Visitation rates to the chimpanzee exhibit varied across the day ($M = 3.69$ visitors / scan; $SD = 1.86$; Figure 5). I recorded no visitors at the 0900 opening time. The average number of visitors rose steadily thereafter until mid-day at 1145. Visitation then leveled off and was more or less consistent for the rest of the day until I stopped observations at 1600. There was a negative relationship between chimpanzee visibility and the average number of visitors per scan, suggesting that the presence of people may have led the chimpanzees to hide. There was no correlation between these variables, however ($r_s = -0.13$, $p > 0.50$, $N = 21$; Figure 6).

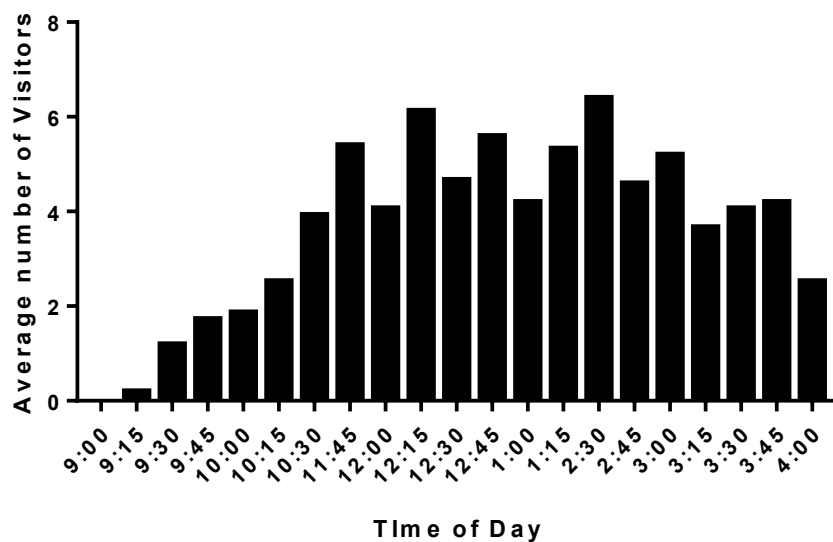


Figure 5. Human visitors at the chimpanzee exhibit. The mean number of visitors recorded during each 15-minute scan sample are shown.

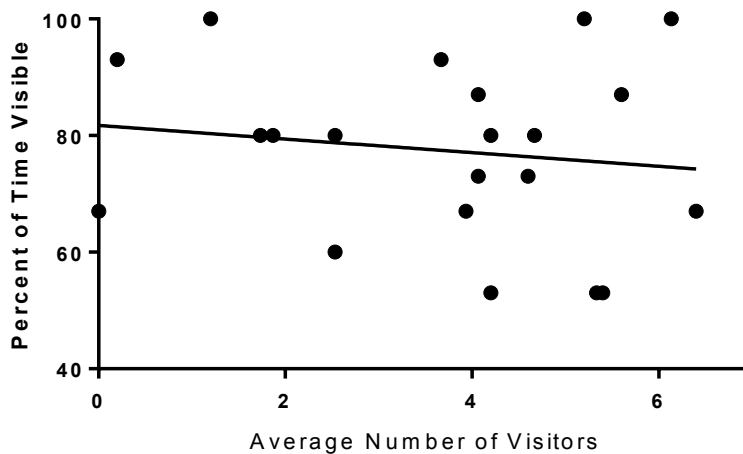


Figure 6. The relationship between chimpanzee visibility and the average number of visitors to the exhibit.

The effect of temperature on chimpanzee visibility

I made observations during the summer and average temperatures across the day ranged from about 70 – 82⁰ F ($M = 77.82$, $SD = 4.10$; Figure 7). The chimpanzees did not appear to seek shade and hide when it got hot, and there was no relationship between whether they could be seen and temperature ($r_s = -0.05$, $p > 0.80$, $N = 21$; Figure 8).

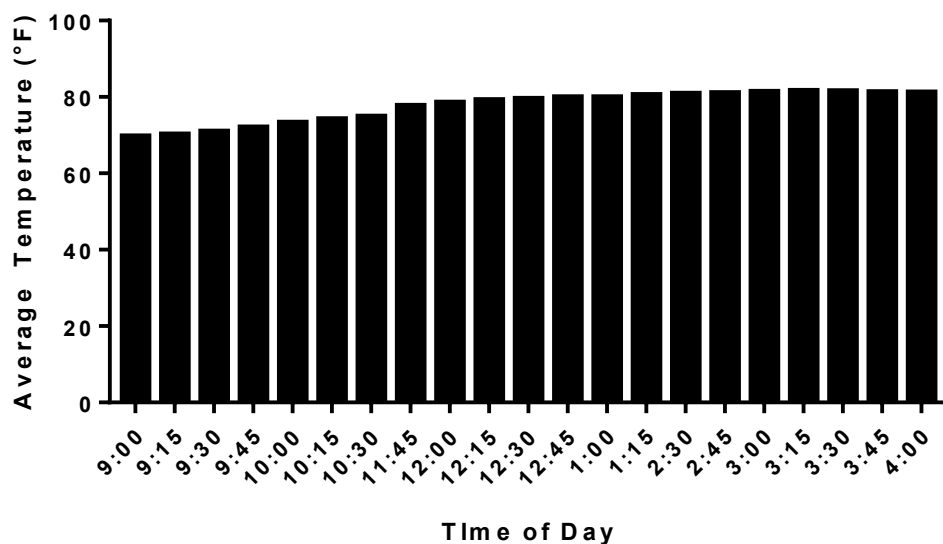


Figure 7. Temperature across the day at the Detroit Zoo.

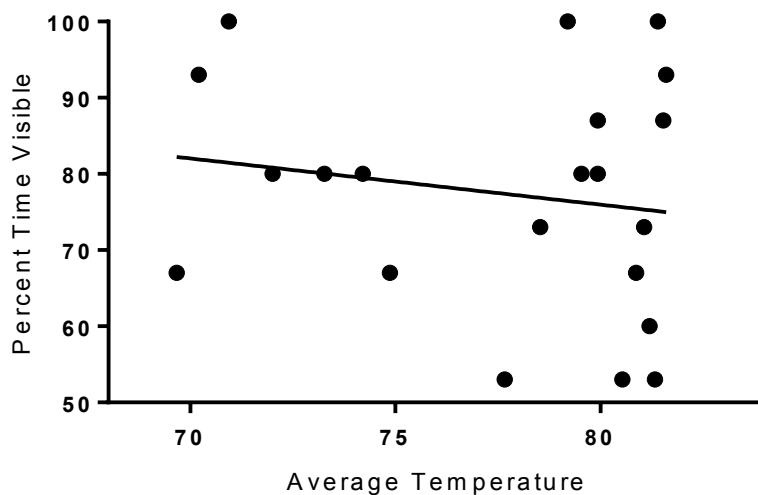


Figure 8. The relationship between chimpanzee visibility and temperature.

The effect of cloud cover on chimpanzee visibility

There were no clouds during 146 of the 315 scans made over 15 days. Alternatively, I recorded partial and full cloud cover during 105 and 64 scans, respectively. The visibility of chimpanzees did not appear to be influenced by cloud cover, as I recorded their presence a similar number of times in each of the three cloud cover categories (Figure 9).

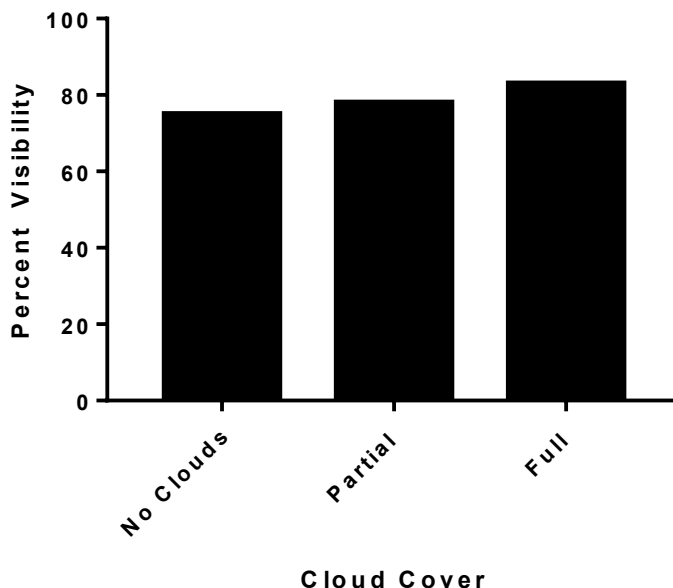


Figure 9. Chimpanzee visibility as a function of cloud cover. The percentage of time chimpanzees were visible during different periods of cloud cover are shown.

Chimpanzee behavior and visibility

Chimpanzees were visible in 244 of the 315 scan samples recorded in this study. Increased activity involving feeding, playing, and traveling did not appear to make the chimpanzees more visible, as they were seen engaging in these behaviors less than 30% of the time they were seen ($n = 174$, 28.7%; Figure 10). In contrast, the chimpanzees were stationary and in one place, either resting, grooming, or self-grooming, most of the time ($n = 70$, 71.3%; Figure 10).

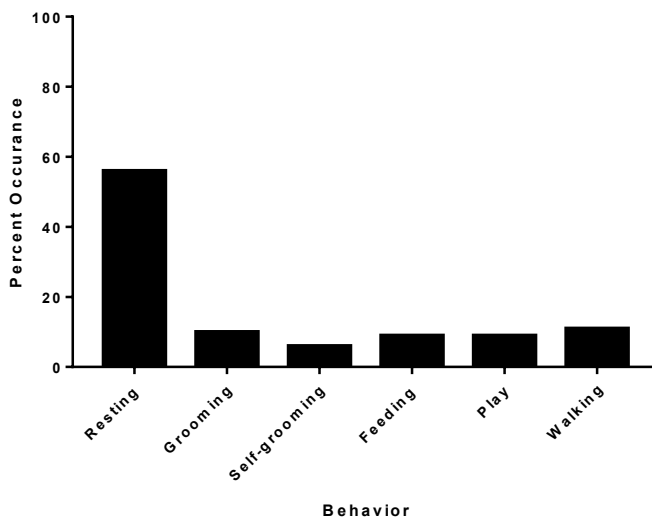


Figure 10. The effect of behavior on chimpanzee visibility. The percentage of times chimpanzees were engaged in different behaviors when visible is shown.

Chimpanzee location and visibility

The chimpanzees showed a distinct preference for one part of the exhibit, as well over half of the time they were recorded in one of the four quadrats, quadrat 1L ($n = 157$, 64.3%; Figure 11). They spent far less time in each of the three remaining quadrats. I recorded them in quadrats 3L and 4L a similar number of times (3L: $n = 40$, 16.4%; 4L: $n = 37$, 15.2%). They spent the least amount of time in one part of the exhibit, quadrat 2L ($n = 10$, 4.0%).

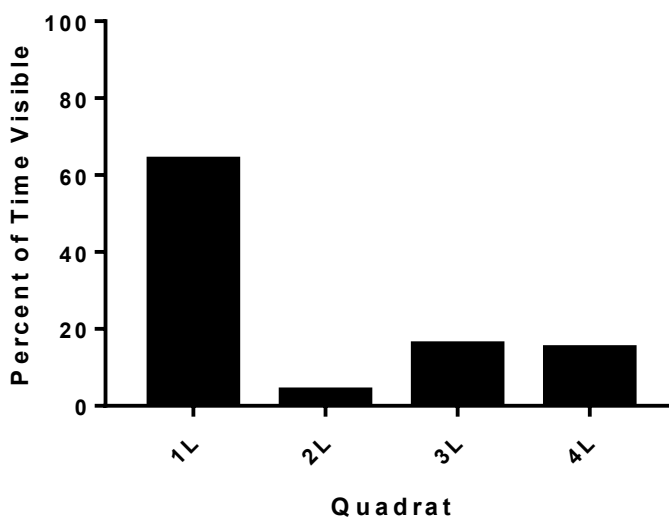


Figure 11. Percentage of time chimpanzees were in each quadrat of the yard when visible is shown.

Discussion

The Detroit Zoo houses their chimpanzees in a large, state-of-the-art exhibit that is designed as much for the animals as it is for the viewing public. The exhibit gives the chimpanzees several places to hide from visitors if they do not wish to be seen. Results of this study nevertheless show that the chimpanzees were visible to the viewing public most of the time. This finding is important as it indicates that animal welfare does not necessarily have to be compromised with a primary goal of the Zoo, which is to display animals to the general public.

William Brown (2011) conducted a similar study on these same chimpanzees at the Detroit Zoo investigating the effects of visitors on chimpanzee visibility. At the time of his study, however, the chimpanzees at the Detroit Zoo were kept in a much larger yard (66,000 square feet) south of the public building. His results suggest that that the chimpanzees were out of sight to visitors most of the time and that they typically rested when visible. He documented a negative relationship between temperature and visibility. The chimpanzees seemed to hide and became less visible as temperature increased. In contrast, there was no relationship between the number of visitors and the percentage of time chimpanzees could be seen (*ibid.*). Brown's findings contrast with those reported here and indicate that where chimpanzees are displayed has a significant impact on their visibility at the Zoo. The south yard (66,000 square feet) is three

times larger than the north yard (22,000 square feet) where I made my observations, and it is likely that the former furnishes more places for the chimpanzees to hide from the public.

A closer examination of my findings indicate that the chimpanzees can be seen at some times more often than others. Visibility ranged from a high of 100% at 0930, 1215, and 1500 to a low of 53% at 1145, 1315, and 1545. In additional analyses, I investigated several factors hypothesized to influence their visibility, including the number of human visitors, temperature, cloud cover, and chimpanzee behavior.

The number of visitors steadily rose through the day peaking at 1430 hours before starting to fall (Figure 5). An increase in the number of visitors, however, did not influence chimpanzee visibility. This is an important finding for zoo management purposes as it suggests that the chimpanzees are not negatively impacted by visitor presence. Average temperatures across the day ranged from 70-82° and plateaued from 1500 to 1600. There was no relationship between temperature and chimpanzee visibility, and the chimpanzees did not hide when it got hot. Nevertheless, they did seek shade along the side of a large, centrally placed rock. Some chimpanzees also seemed to enjoy spending time underneath a tree north of the rock. When there, they were still visible to zoo visitors from two of the viewing areas (4 and 5, see Figure 1).

Chimpanzee visibility was not influenced by cloud cover. During all times, irrespective of cloud cover, the chimpanzees were visible more than 75% of the time.

Predicted behaviors to increase chimpanzee visibility such as feeding, playing, and traveling did not increase their visibility. Instead, the chimpanzees could be seen most often when they were resting. One exception to this occurred at midday when they were fed. Interestingly, the chimpanzees could always be seen at 1215 just before the times they were typically fed at 12:30, 12:35, and 12:40.

The chimpanzees spent most of their time in one particular location in the enclosure, quadrat 1 (Figure 1). This quadrat contains a large tree and the cement rock that provide ample amounts of shade during most of the day. My anecdotal observations suggest that the chimpanzees enjoyed spending a lot of their time on the large cement rock, which provided considerable shade on the north side and would have been cooler than the ambient temperature.

In sum, chimpanzees housed in the north yard of the great ape exhibit at the Detroit Zoo could be easily seen by visitors during most times of the day. This result contrasts with those derived from an earlier study conducted while the chimpanzees were kept in the much larger south yard of the exhibit (Brown, 2011) and suggests that the size of the enclosure plays an important role in influencing chimpanzee visibility. This finding has important implications for Zoo management concerned with their paying customers who are likely to be unwilling to spend large amounts of time searching for chimpanzees on display. None of the biotic or abiotic factors that I investigated in this study appeared to affect whether chimpanzees could be seen. These included the number of visitors, temperature, cloud cover, and chimpanzee behavior. These results should be interpreted cautiously because I conducted observations over a small number of days. A larger sample is clearly warranted to validate these negative results. I did find that chimpanzees seemed to prefer one part of the enclosure that was particularly exposed, which made them readily viewable. Additional work will be required to investigate the factors that make this part of the exhibit especially attractive to the chimpanzees.

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