<ARTICLE>
Playing with His Leg: A Case of Imaginary Social Play by an Adolescent Male Chimpanzee at Bossou?

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INTRODUCTION
Human children sometimes create imaginary playmates. Together with other forms of pretense, imaginary social play is considered to be an essential part of human cognitive development. For example, it is argued that imaginary playmate fantasy occurs frequently among human children and it facilitates social development by making possible the practice of play frame negotiation. Some authors restrict imaginary social play to Homo sapiens, emphasizing that the complex interactions that characterize the play with an imaginary companion constitute...
a form of pretense that is beyond nonhuman animals. Besides “playmates,” imagination itself or pretense is an important aspect of the human mind. However, this concept is rarely the main topic of the studies on nonhuman primates (but see refs 3, 4). There are scattered reports of language-trained or encultured apes showing imaginary play or some form of pretense. These observations were often accompanied with the use of ASL or lexigrams that could represent abstract concepts in the minds of the apes. In addition, when the imaginary play was “social” (i.e. oriented toward an imaginary companion), the direct targets of the behaviors were always human artifacts (such as dolls) whose shapes often resemble, at least to observers, something animate.

There are also some anecdotal reports of imaginary plays by the wild apes such that a juvenile chimpanzee treated a log as if it were a baby. As some authors have pointed out, such examples have to be treated with caution. Great apes often handle objects for no particular purpose, and some of the cases are not necessarily evidence of imaginary play. However, two Mahale cases are more convincing because the players exhibited play panting although they were engaging in solitary play. This vocalization is usually emitted when playing with a “social companion” rather than during solitary play. In addition, some behavioral elements in these two cases (hitting, biting, mounting, aeroplane, etc.) are usually oriented to conspecifics. These two characteristics (play panting and socially oriented behaviors) may be more reliable indicators for imaginary social play. Thus far, such examples have been reported only from Mahale. In this paper, I report the first case of possible imaginary social play from Bossou, Republic of Guinea that included these two characteristics.

**OBSERVATION**

On February 18, 2003, Tua (an old male) and Poni (a male born in 1993) were found together with other chimpanzees at the Gban hill in the morning. At approximately 8:20 am, the two started to move separately away from others to Gein hill across the road. At 10:55 am, Poni walked backwards with his mouth open (showing play face) to Tua. It is possible that Poni was soliciting Tua to play; however, Tua did not respond, and Poni then galloped in front of Tua. After feeding and moving for a while, at 11:14 am, Tua began to sleep in the bush. Poni continued to feed nearby. At 11:41 am, Poni’s play panting was audible from the bush where he had been feeding. I moved to a spot from where Poni was visible and started to videotape his actions. After biting the pith of the undergrowth vegetation a little, he moved a few meters away and resumed to play by himself by lying upward in the bush, holding his legs to his chest, and play panting repeatedly. At 11:45:46 am, he sat up, and with a play face, he pushed his own legs against the ground. Then after putting his face close to the legs, he began to bite his left leg (Figure 1a). He paused for a while and then resumed biting his left leg for approximately 1 min. During this, his body was vibrating due to hard play panting.

At 11:47:14 am, he paused playing and did not display a play face. After 10 s, he started observing his left leg, and after extending the left hand to hold the leg and pull it toward himself (Figure 1b), he again bit the leg for 15 s. He sat straight and began to hit the left leg with the right hand (Figure 1c) and then he pressed the leg down against the ground with both hands (Figure 1d). He then pirouetted and again pressed down the leg. He then hit the left leg with the right knuckle repeatedly (3–12 times).

**DISCUSSION**

It is notoriously difficult to define animal play because anything peculiar or anything different from the normal behavioral categories could be described as play. The above case is considered play due to the presence of the play face and play panting, which are only seen in
the context of play. In addition, socially oriented behavioral elements such as biting, hitting, and pressing down against the ground occurred frequently. Thus, this case appears highly similar to what has been described as “imaginary social play” in Mahale chimpanzees. However, since imagination cannot be directly observed, any proposed example of imaginary play can be criticized. For example, Call and Tomasello were not convinced the case of imaginary anti-dipping at Gombe, because many other interpretations are also possible. Similarly, what may look like pretense can always be interpreted as something other than pretense. Thus, alternative explanations may be possible for Poni’s behavior. One possibility is that Poni’s behavior was abnormal. However, Poni had never shown any evidence of mental or physical illness. Another possibility is that Poni’s play was just an extension of the usual solitary play (i.e. locomotor or object play). But then we need to explain why he delivered physical stimulation to his own leg when there were many external objects that could be played with. It is unlikely that he did this only to play pant. Another difficulty with this interpretation is that play panting does not occur reflexively in response to physical stimuli. Self-tickling usually does not cause humans to laugh spontaneously even when the stimulation is similar to that arising by being tickled by others. A final possible interpretation is that this was truly a case of imaginary social play, in which Poni treated his left leg as if it were a social playmate, and directed socially oriented behaviors toward it. Since we can never obtain direct knowledge about others’ mental states, the imagination of others (whether apes or humans) cannot be proved. We cannot completely rule out alternative interpretations, but nor can imagination be ruled out completely. This case may be a rare case of imaginary play in wild great apes, and the first one to be accompanied by play panting and socially oriented behaviors in West African chimpanzees. The unique aspect of this example is that the direct target was the individual’s own body (the left leg, in particular) instead of any external object. This indicates that Poni played two different roles simultaneously—one was to bite and the other was to be bitten.

For Taylor and Carlson, imaginary companions (IC) are unique to humans because IC of human children are often sustained for several months and usually have their own personality. Thus far, we have no evidence that the imaginary playmates of chimpanzees are sustained or have personalities; it may well be impossible to prove the personality of an imaginary playmate through observation. Thus, according to their criteria, chimpanzees would not have IC even if they were capable of imagination. However, Poni’s behavior can plausibly be interpreted as imaginary social play, in that behavioral elements that are usually directed to live social playmates were repeatedly directed to objects (including his own body and empty space). It appears premature to exclude nonhuman animals from the realm of imaginary social play.

ACKNOWLEDGEMENTS

I thank DNRST of Guinea for permission to conduct the field research at Bossou; G. Ohashi, G. Yamakoshi, and the staff of IREB for their cooperation at the field; Y. Sugiyama and T. Matsuzawa for giving me the opportunity to visit Bossou; and T. Nishida for continuous support and guidance. The study was financially supported by grants from Japanese MEXT (#122375003, #16253007 to T. Nishida, and #16770186 to M. Nakamura) and by a grant for the biodiversity research of the 21st century COE (A14).

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<NOTE>
A Wild Chimpanzee Birth at Mahale

Koichiro Zamma1,3, Tetsuya Sakamaki2,3 & Rashidi Shabani
INTRODUCTION

Wild chimpanzee births are difficult to observe because females tend to hide during the birthing process to avoid others. On 26 May 2000, Juno, a female chimpanzee at Mahale Mountains National Park, Tanzania, gave birth. Although we did not see the exact moment of birth, we report our observations of her behavior immediately before and after the birth.

OBSERVATIONS

Before birth

At 08:14 on 26 May 2000, we began to observe the chimpanzees of M group in Mahale. At 08:21, one researcher (KZ) started to follow an adult male called Kalunde. Around 08:30, Juno appeared uttering pant-grunts to Kalunde. She then climbed a tree and lay on a day bed made of one branch. The chimpanzees moved north and ate the fruit of *Psydrax parviflora* or *Uvaria angolensis*.

At 11:46, Juno reappeared. She crouched on the ground in front of Kalunde, and he began to groom her. After a few seconds, Alofu, an adult male, approached and peered at Juno’s genitals. Kalunde also tried to peer at them, but she turned around once to prevent this. Her genital skin was not swollen, seemed dry, and showed no sign that her water had broken. She had not given birth at that time. When Juno lay on her left side, Alofu and Kalunde examined her genitals for 13 seconds. Subsequently, she lay on her back, and the males started grooming her. She did not reciprocate the grooming. At 11:47, Juno rolled over and lay on her left side, and then again lay on her back at 11:48. Alofu changed his position to follow her genitals. At 11:49, Juno lay on her left side again, and at 11:51 she turned around and crouched. Alofu changed his position again, following her genitals, and he and Kalunde continued to groom her. At 11:57, Kalunde stopped grooming and lay in the same location, but Alofu continued to groom Juno. At 12:01, Kalunde groomed Alofu for a short time and then left. When KZ left, following Kalunde, Juno was still being groomed by Alofu.

After birth

When a researcher (RK) observed Juno in the tree at 14:44, she was already nestling her newborn in her arms. RK had followed his focal animal, Masudi (an adult male), to the location and he also found Alofu on the ground. Juno climbed down from the tree, uttered pant-grunts to Alofu, and climbed another tree. Then, Fanana (the alpha male) came to the tree, displayed, and charged Juno. She screamed and climbed higher. After Fanana left, Juno made a bed and started to rest.

At 15:03, researchers KZ and TS arrived at the tree while following their focal animals. TS had been following an adult male chimpanzee named Bonobo since that morning. Juno appeared from the bed with her newborn and touched her genitals five times while sat on a branch 20 m above the ground. KZ took video on it using SONY DCR-PC7. Four adult females (Caliope, Totzy, Nkombo, and Zola), an adult male (Carter), and four immature chimpanzees (Primus, Ivana, Jidda, and Christmas) watched Juno in the tree. Caliope was a multiparous female with a 2-year-old offspring, and Totzy, Nkombo, and Zola were nonparous females with swollen genitals. Jidda was the 5-year-old offspring of Juno. At 15:05, Juno put the end of the umbilical cord in her mouth and pulled on it as if she was trying to suck fluid inside it (Figure 1, Video 1: available online at mahale.main.jp/PAN/19_1/19(1)_02.html). The umbilical cord was about 40 cm long and the other end was connected to her newborn. The placenta was not observed. Then, Juno moved on woody vines while holding the umbilical cord in her mouth (Figure 2). The newborn was clinging to her abdomen, held there with Juno’s thigh and hand. Primus stared at Juno from a distance of 3 m. At 15:07, Juno defecated and urinated, then lay on her back on a woody vine. When Caliope approached Juno while fleeing from Primus, Juno uttered soft barks and moved on the tree while holding the umbilical cord in her mouth. At 15:09, Primus and Carter started to display in the tree, but they hastily climbed down and uttered pant-grunts to Fanana, who had ap-
peared beneath the tree. Carter also uttered pant-screams to Fanana, and then Juno and another chimpanzee uttered pant-hoots. At 15:12, Fanana left the location and some of the other chimpanzees also started to leave the tree. At 15:21, Caliope also left. Juno uttered “hu, hu” and the newborn uttered “fi, ha-ha.” The newborn was female.

Terrestrial movement

At 15:23, Juno descended the tree and walked on the ground with her newborn, which she held with her right hand. A researcher (TS) followed her. At 15:25, Juno shifted to holding her newborn with her left hand and walked tripodally while trailing the umbilical cord. She passed in front of Masudi uttering pant-grunts, and sat on the ground. Masudi approached Juno from behind. She showed a grin face while uttering soft pant-grunts. She looked frightened. Masudi stood quadrupedally and peered at her from a distance of 10 cm. At this time, Pimu (an adolescent male) approached and sat in front of Juno. When Juno left, Pimu attacked her back. Juno ran away uttering screams and barks. Pimu left, while displaying. Caliope came to Juno’s side, like a guard, uttering vocalizations. Juno and Caliope walked together in a different direction from the others.

At 15:30, Caliope had left and Juno walked alone. She ate *U. angolensis* fruit. She pulled the umbilical cord with her right hand. At 15:42, she lay on her back. The newborn sucked Juno’s left nipple. When the newborn almost slid off, Juno held her up. The newborn uttered “hu, hu.” At 15:44, Juno sat up. TS heard the vocalizations of other chimpanzees some distance away. At 15:52, Juno picked up the umbilical cord and the newborn uttered “hu, hu.” At 15:53, Juno put the umbilical cord in her mouth and chewed on it. At 15:57, Juno started to walk with the newborn, trailing the end of the umbilical cord. At 15:58, she entered a thick bush and TS stopped following her.

We observed 50/51 individuals in M group that day.

Examination of the bed

At 15:56, researcher KZ climbed up to observed the empty bed. It was 80 cm in diameter and the placenta was not found on it.

DISCUSSION

Juno gave birth between 12:01 and 14:44 on 26 May 2000 while moving with almost all members of her unit group. Wild chimpanzee births are observed extremely rarely\(^1\). Juno immigrated in 1987 and had given birth to four offspring (MMCRP unpublished data). She had spent a long time in M group and had given birth many times, so she might have had the confidence to give birth the fifth time in broad daylight.

The umbilical cord was observed, but the placenta was not found. Previous reports of chimpanzee births have described the delivery of the placenta 13–18 minutes after birth, and the mother’s consumption of it beginning 0–4 minutes later\(^2,3\). Juno must have eaten the placenta shortly after she delivered.

Based on a 229-day gestation period\(^4\), Alofu was the likely father of Juno’s offspring because only Juno and Alofu were not observed from 26 September to 11 October 2000 and were thought to have formed a consort-ship. However, Juno was observed to copulate at least 27 times with 10 males subsequently (Table 1. TS unpublished data), so the paternity was confused among these males. Because the males had the idea that they were the father of her newborn, they may not have delivered terrible attack on Juno and her newborn though some of them displayed near Juno and charged her.

It is interesting that Alofu, the probable father, spent time peering at Juno’s genitals before the birth, although they were not swollen and lacked any visible sign of parturition. The urinary estrone conjugate (EIC) of female chimpanzees peaks during genital swelling and just before birth, whereas urinary pregnandiol glucuronide (PdG) remains at low levels during swelling and increases just before parturition\(^5\). Alofu may have smelt an odor indicating swollen genitals or imminent parturition.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


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Table 1. The partners and number of copulations with Juno observed from November to December 2000 (TS unpublished data).

<table>
<thead>
<tr>
<th>Partner</th>
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<td>Alofu</td>
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<tr>
<td>Hambi</td>
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</tr>
<tr>
<td>Masudi</td>
<td>2</td>
</tr>
<tr>
<td>Pimu</td>
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<tr>
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</tbody>
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Ecological Aspects of Chimpanzee Insectivory in the Budongo Forest, Uganda

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INTRODUCTION

All long-term studies of chimpanzees (Pan troglodytes) show that they habitually eat insects, most often social insects obtained by extractive foraging with simple tools. This generalisation holds across Africa from Senegal to Tanzania, but Ugandan populations are exceptional: Except for Kalinzu with ant dipping for Dorylus5, no other Ugandan long-term study site (Budongo, Kanyawara, Ngogo, Semliki) shows regular insectivory, technically-aided or otherwise5. At Budongo, only occasional cases of eating Cubitermes have been recorded4. This dearth is puzzling, especially when these sites are compared with those (Gombe, Mahale) of neighbouring Tanzania, which have well-documented and varied elementary technology5,6.

Lack of insectivory could reflect basic environmental constraints: Absence or scarcity of prey species, or absence or scarcity of raw materials for tools5. Less likely alternative explanations are differences between Ugandan and non-Ugandan populations in terms of genome, diet, manual dexterity, intelligence, or appetite. The presence of ant dipping at Kalinzu casts doubt on all these alternatives. Finally, such inter-population differences could result from differences in cultural knowledge, as has been found elsewhere6. That is, some populations of chimpanzees may not have discovered that some insects are edible or can be got with technical assistance.

Our study sought to explore the role of environmental constraints in the absence of regular insectivory in the Budongo Forest Reserve, Uganda.

METHODS

The study was done in the Sonso region Budongo from 14 July–8 September, 2011. Subjects were 80+ well-habituated chimpanzees (Pan troglodytes schweinfurthii) of the Sonso community7. SH did 12 line-transects of 6 m width, each of 500 m length, along the existing grid system of trails; six ran north-south and six ran east-west. Sites of transects were balanced for the two main forest systems of trails; six ran north-south and six ran east-west. Data-collection entailed marking a circle of 5 m radius around the resource and counting all plants presenting potential raw materials, in three categories: woody tree or shrub, vine, or monocotyledon (e.g. grass, sedge)8.

To measure the chimpanzees’ consumption of insects, both direct and indirect data were collected. SH logged 80 hr of direct observation of opportunistically encountered parties of chimpanzees, using continuous recording of feeding or interacting with insects9. For indirect data, SH collected all fresh faecal samples (n = 26) from chimpanzees encountered; these were sealed in ziplock bags and later sluiced in running water to detect undigested food fragments.

To estimate productivity, that is, amount of termites available to harvest, SH randomly sampled 10 Cubitermes and two Pseudacanthotermes mounds, removing about 150 cm³ from their tops. Once sealed in a ziplock bag, the soil was broken into chunks of less than 1 cm³; all termites, by caste, were counted in the contents7. Also, SH made and used flexible probes modelled on chimpanzee fishing probes, to fish termites from these mounds. To measure the payoff from termite fishing, efficiency, success rate, and error rate were calculated10.

Because sample sizes were small and data non-normally distributed, all statistical tests were non-parametric. Alpha was set at 0.05, and all tests were two-tailed.

For specific details of methods, see Hedges11.

RESULTS

Cubitermes ugandensis mounds were found at a mean density of 34.4 mounds/ha (SEM = 8.17). Neither Macrotermes bellicosus nor Pseudacanthotermes spiniger mounds were found on transects, but two mounds of each genus were found and monitored elsewhere. Two chimpanzees were seen to eat soil from mounds, one of Pseudacanthotermes and one of Cubitermes. Two mounds (one of each genus) showed damage from chimpanzee predation, but the two Macrotermes mounds showed no signs of chimpanzee use.

Volume of termite mounds varied greatly but did not differ across forest types. Mean volume of Macrotermes mounds was almost 300 times that of the average Cubitermes mound, and mean volume of Pseudacanthotermes mounds was almost seven times as big.

Encounter rate over 6 days of Dorylus (wilwerthi or kohli) columns on trails was 0.20 columns per km and 0.42 columns per hr. Neither Apis mellifera nor Dorylus nests were found on transects, but one of each was found and monitored elsewhere.
Raw materials for fishing probes were super-abundant. Cubitermes mounds afforded a mean of 580 tool sources per mound, while the numbers of sources for other insect prey species were: Macrotermes (155), Pseudocanthotermes (460), Dorylus (440), and Apis (684). Availability of raw materials did not differ across prey species, but overall, woody plants predominated over monocots or vines in abundance.

None of the 26 faecal specimens yielded insect remains.

The 12 mounds assessed for termite availability yielded an average of 104.8 termites per sample, but the range of values was huge (0–361).

SH’s fishing from Cubitermes mounds was minimally productive, as the passageways were narrow and the soldiers passive. Fishing was a far less useful harvesting technique than detaching portions of the mound, with mean yields of 2.4 versus 123.5 termites. Pseudocanthotermes showed the reverse: Fishing was far more productive than detaching soil, with mean yields of 139 versus 11.5 termites. Fishing the two Macrotermes mound yielded almost nothing (mean of 2.5 termites).

DISCUSSION

Availability of prey or of raw materials seems not to be an obstacle to Budongo chimpanzees using tools to obtain insects. The low abundance of mounds of Macrotermes and Pseudocanthotermes is within the range of densities at other sites where these genera are fished: Bilenge (0.35/ha, Macrotermes; 1.03, Pseudocanthotermes); Campo (0.68/ha); Gombe (0.40/2.04), etc. Similarly, the density of Cubitermes mounds at Budongo, at 34.4 mounds/ha, where the termites are eaten without tools, is intermediate in a wide range of values: 0.8/ha at Gombe at one extreme, to 233.8/ha at Lui Kotal at the other.

Similarly, encounter rates for Dorylus at Budongo, measured by either distance or time, are comparable to those from other sites. For distance, Budongo’s encounter rate of 0.2/km is close to Gashaka’s dry season rate of 0.21, where the highest rate of consumption of Dorylus by chimpanzees has been recorded. For time, Budongo’s rate of 0.42/hr also resembles Gashaka’s at 0.43/hr.

Too few data are available to compare abundance of Apis nests between Budongo and other sites. Similarly, too few data have been published or were obtained here to allow confident comparison of termite mound volumes.

Consumption of termite soil (and termites) by chimpanzees varies hugely. Budongo’s rate of 0.79/100 hr of such geophagy is higher than that at Kibale (0.52) but much lower than that at Kasoje (4.07)\(^3\). This report of Sonso chimpanzees eating the soil of Pseudocanthotermes appears to be a first for this genus in Uganda.

Raw materials of all types for extractive probes are readily available. To take the most pertinent case, Budongo’s Macrotermes mounds afforded 155 raw material sources on average, compared with a range from 37 at Assirik to 228 at Semiliki.

Absence of termites in chimpanzee faecal samples replicates the results of an earlier study\(^4\), confirming that insectivory is rare.

Technical (i.e. fishing) versus non-technical (i.e. detachment) acquisition of termites seems not to have been compared systematically before this study. The closest result to ours seems to be that tools and techniques used to obtain Dorylus differ according to species of ant\(^5\). But until the chimpanzees of Budongo learn to eat Pseudocanthotermes and Macrotermes, these differences remain hypothetical.

In conclusion, the most likely explanation for the lack of extractive foraging for insects by Budongo chimpanzees is lack of cultural knowledge.

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Update on the Assirik Chimpanzee (Pan troglodytes verus) Population in Niokolo Koba National Park, Senegal

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INTRODUCTION

The Assirik, Senegal chimpanzee population was studied extensively by McGrew and colleagues in the Stirling African Primate Project (SAPP) in the late 1970s1 and surveyed by the Miami Assirik Pan Project (MAPP) in 20002. These chimpanzees (thought to represent a single community3), within the Niokolo Koba National Park (or Parc National du Niokolo Koba, PNNK), remain the only protected population in the country, with most of Senegal’s chimpanzees living in unprotected areas4. In 2012, the Iowa State Assirik Primate Project (ISAPP) surveyed Assirik and outlying areas in the PNNK to assess chimpanzee density and to explore the possibility of establishing a research program there in collaboration with the National Parks Department of Senegal and University of Cheikh Anta Diop in Dakar. One objective in this study was to re-survey the Assirik area in order to compare our results to data collected in 2000.

METHODS

Niokolo Koba National Park is in southeastern Senegal (12°53’ N, 12°44’ W) (Figure 1). The habitat is Sudano-Guinean mixed woodland and savanna, characterized by an extensive 7-month dry season and less than 1,000 mm of rainfall per year. The park has four diurnal non-human primate species (see Table 2) and two nocturnal species (Galago senegalensis, Potto perodicticus). Several potential mammalian predators on chimpanzees exist in the PNNK, including lion (Panthera leo), leopard (Panthera pardus), spotted hyena (Crocuta crocuta) and wild dog (Lycaon pictus).5

We combined systematic line transect and reconnaissance sampling of chimpanzee nests in an effort to replicate methods from the MAPP study6. However, with less than half of the time available to conduct the survey, we did only two rather than four 2-km transects that radiated from the summit of Assirik and did not repeatedly sample areas. On 12 different days, from January 26–February 2, 2012, we surveyed 115.7 km (78.7 km on foot, 37 km by vehicle) during daylight hours for chimpanzee nests. We sampled the Mt. Assirik area as well as areas to the north and north of this summit (Table 1, Figure 2). This included two 2-km transects at the Assirik summit and 6.7 km in two forested valleys (Stella’s and Lion Valleys), in addition to searching wooded areas. In order to provide a measure of potential chimpanzee predators, prey and competitors, we calculated encounter rates (number of sightings or individuals per km) with mammals (excluding rodents and bats), on foot (102.4 km) and from the vehicle (448.6 km) between the Ranger Post to the southeastern section of PNNK. Vehicle surveys could cover the same area more than once and included encounters with animals seen on the Tambacounda-Kedougou highway running through the PNNK.

We made several assumptions in our analyses of nest densities. We assumed all nests were less than 120 days old and that each weaned chimpanzee built a new nest each night. We used a formula revised from Marchesi and co-workers6: Density = (# nests/area surveyed) (1/mean nest duration [120 days]) to calculate the density of nest-building chimpanzees. We weighted our values according to habitat type since the Assirik summit transects bisected only woodland and grassland habitats, and most nests were found in gallery forests. Therefore, we calculated nest density in woodland (including bamboo woodland = 42% of area) and gallery forest (3% of area) separately in order to produce a more accurate measure of chimpanzee density in this savanna mosaic. Percentage habitat values are from Baldwin and co-workers7. No nests were found in gallery forests during the transect surveys, which accounts for 55% of the area used by Assirik chimpanzees7. We used data from the 2.77 km transect through Lion Valley to represent chimpanzee nest density in gallery forests and used the two 2-km transects from the summit of Assirik to represent woodland habitats, multiplying these values by 3% and 42%, respectively. This procedure replicates MAPP methods5.
RESULTS
We recorded 840 nests built by chimpanzees in the PNNK (Table 1, Figure 2). Additionally, we heard at least one chimpanzee pant-hooting during a transect survey on the eastern slope of Assirik. Chimpanzee nest density in the PNNK was estimated at 1.28 individuals per km².

We recorded 16 mammal species during 106 sightings (0.19 per km) with 476 individuals (0.86 per km) (Table 2). We also found recent traces of poachers (e.g. shotgun shells, footprints, sounds of gunfire). During one foot survey, we encountered a group of poachers and then immediately left the area for safety reasons.

DISCUSSION
Although our results from this brief survey indicate that the chimpanzee population in the PNNK increased since the MAPP survey, from 0.13 nest-building chimpanzees per km² calculated in 2000² to 1.28 in this study, such an interpretation should be made with caution. The results reported here accounted for less than 7 km of line transects, compared to the 13.7 km surveyed in the 2000 study². Plumptre & anomaly recommend surveying at least 200 km for forest-dwelling primates. However, effective sampling distances in a savanna environment are likely to be shorter because detection distances (i.e. strip width) are larger. In the MAPP survey², a detection distance of 36 m was calculated based on nest sighting distances, suggesting a strip width of

Table 1. Surveys of chimpanzee nests and mammals in Niokolo Koba National Park. Nest survey distances are in parentheses.

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<thead>
<tr>
<th>Date</th>
<th>Km surveyed by vehicle</th>
<th>Km surveyed on foot</th>
<th>Nest count</th>
<th>Area surveyed</th>
<th>GPS point</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Jan</td>
<td>79(26)</td>
<td>4(4)</td>
<td>0</td>
<td>Southeast of Assirik</td>
<td>12°49.373 N, 12°39.782 W</td>
</tr>
<tr>
<td>17 Jan</td>
<td>0(0)</td>
<td>23(23)</td>
<td>49</td>
<td>Southeast of Assirik</td>
<td>12°51.171 N, 12°42.945 W</td>
</tr>
<tr>
<td>18 Jan</td>
<td>35(0)</td>
<td>10(5.3)</td>
<td>0</td>
<td>Southeast of Assirik</td>
<td>12°49.400 N, 12°39.818 W</td>
</tr>
<tr>
<td>19 Jan</td>
<td>44(0)</td>
<td>0(0)</td>
<td>0</td>
<td>Highway</td>
<td>13°04.511 N, 12°43.384 W</td>
</tr>
<tr>
<td>23 Jan</td>
<td>69(5)</td>
<td>3.8(3.8)</td>
<td>78</td>
<td>Assirik woodlands</td>
<td>12°53.738 N, 12°42.360 W</td>
</tr>
<tr>
<td>24 Jan</td>
<td>0(0)</td>
<td>9.5(9.5)</td>
<td>75</td>
<td>Assirik area, Stella's Valley</td>
<td>12°53.012 N, 12°43.670 W</td>
</tr>
<tr>
<td>25 Jan</td>
<td>0(0)</td>
<td>11.4(11.4)</td>
<td>213</td>
<td>Mount Assirik area</td>
<td>12°52.682 N, 12°45.130 W</td>
</tr>
<tr>
<td>26 Jan</td>
<td>69(0)</td>
<td>1.7(1.7)</td>
<td>121</td>
<td>Assirik gallery forest and woodland</td>
<td>12°53.532 N, 12°42.589 W</td>
</tr>
<tr>
<td>30 Jan</td>
<td>69(0)</td>
<td>8.3(4.2)</td>
<td>30</td>
<td>Assirik gallery forest and woodland</td>
<td>12°57.469 N, 12°43.562 W</td>
</tr>
<tr>
<td>31 Jan</td>
<td>6(6)</td>
<td>12.4(7.6)</td>
<td>126</td>
<td>Mount Assirik area</td>
<td>12°52.401 N, 12°46.156 W</td>
</tr>
<tr>
<td>1 Feb</td>
<td>8.6(0)</td>
<td>14(5.7)</td>
<td>68</td>
<td>Assirik area, Lion Valley</td>
<td>12°51.395 N, 12°46.864 W</td>
</tr>
<tr>
<td>2 Feb</td>
<td>69(0)</td>
<td>4.3(2.5)</td>
<td>80</td>
<td>Tower highway gallery forest and woodland</td>
<td>13°02.407 N, 12°40.278 W</td>
</tr>
<tr>
<td>Total</td>
<td>448.6(37)</td>
<td>102.4(78.7)</td>
<td>840</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
72 m provided a reliable estimate of chimpanzee nest density in this environment. Nonetheless, given the brief nature of our study, our comparative analysis should be used primarily as a relative measure of the presence and location of chimpanzees in the PNNK over the years. However, we found a large number of chimpanzee nests during a relatively brief survey, which is encouraging.

We recorded more nests in 2012 relative to the 2000 survey, although nest encounter rates (nests per km) were higher in 2000. A total of 29 km (on foot) and 54 km (via vehicle) were surveyed during the MAPP study compared to the current effort of 78.7 km and 37 km surveyed by foot and vehicle, respectively. We recorded 840 nests along 115.7 km (7.3 nests per km surveyed), while MAPP recorded 736 nests along 83 total km (8.9 nests per km surveyed). We attribute the lower encounter rate in 2012 to reconnaissance sampling more than 10 km southeast of the Assirik summit, where no nests were observed (Figure 2).

Based on our 2012 records of nests in new areas surveyed relative to the 2000 study, we suggest that at least two chimpanzee communities use the PNNK, in contrast to the findings of Tutin and co-workers. We recorded nests more than 20 km north of Mount Assirik (Figure 2). At the Fongoli site, less than 60 km from Assirik (Figure 1), the chimpanzees’ home range is over 86 km², and the nests more than 20 km north of Mount Assirik (Figure 2). At the Fongoli site, less than 60 km from Assirik (Figure 1), the chimpanzees’ home range is over 86 km², and the

<table>
<thead>
<tr>
<th>Species</th>
<th># times encountered</th>
<th># individuals encountered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baboon (Papio hamadryas papio)</td>
<td>27</td>
<td>248</td>
</tr>
<tr>
<td>Vervet monkey (Chlorocebus aethiops)</td>
<td>26</td>
<td>108</td>
</tr>
<tr>
<td>Patas monkey (Erythrocebus patas)</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Warthog (Phacochoerus africanus)</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Oribi (Oribi oribi)</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Derby Eland (Taurotragus derbianus)</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Duiker species (Cephalophus spp.)</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Banded mongoose (Mungos mungo)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Bushbuck (Tragelaphus scriptus)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hartebeest (Alcelaphus buselaphus)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Grimm’s duiker (Sylvicapra grimmia)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Roan antelope (Hippotragus equinus)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Slender mongoose (Galerella sanguinea)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Egyptian mongoose (Herpestes ichneumon)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mongoose (sp. indet.)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Civet? (Viverra civetta?)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Golden cat? (Caracal aurata?)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Species heard but not seen were leopard (Panthera pardus), spotted hyena (Crocuta crocuta) and chimpanzee (Pan troglodytes verus)

Table 2. Mammal species recorded in Niokolo Koba National Park*.

ACKNOWLEDGMENTS

We thank the Republic of Senegal, Direction des Parcs Nationaux, especially Docteur Djibril Dioucou, Commandant Mamadou Sidibe, and the rangers at Niokolo Koba Post for assistance. We thank Gray Tapan for information on the location of chimpanzees in the PNNK, Erik Otarola-Castillo for technical advice, and WCM McGrew for helpful comments on this manuscript.

REFERENCES

that the eastern limit for the distribution of chimpanzees in Tanzania was at long. 31°'1’ E on the left bank of the Ugalia River, and the southern limit was at lat. 6°38’ S of the Wansisi Hill. The left bank of the Ugalia River is also the eastern limit of the distribution of the chimpanzee in Africa. Unfortunately, research in Ugalia was not continued after that because efforts were concentrated on work at Mahale.

In 1994, however, Dr. Hideshi Ogawa (Chukyo University) and I resumed the survey in Ugalia and studies there continue to the present day. Dr. Ogawa revised the southern limit of the distribution of chimpanzees in Tanzania to lat. 8°12’ S. We have also revealed unique ecological characteristics of the miombo arid woodland of Ugalia, and interesting studies of various mammals and raptors have been initiated there.

The program of the symposium held on 16th May, 2012 is shown below. It began with a keynote presentation by Dr. Keyyu, who introduced activities and research in TAWIRI, and then the latest studies were described in three presentations for each of Mahale and Ugalia. These presentations dealt not only with chimpanzees, but also referred to various other fauna, including raptors, and to the vegetation and climate. The symposium stimulated active discussion among many researchers and students. We would like to express our sincere thanks to all of the participants in this symposium.

On the following day (the 17th May), a closed workshop was held among Dr. Keyyu and researchers of Mahale and Ugalia. We discussed future collaboration between TAWIRI and WRC in scientific research, conservation and education. Studies in most of the 16 national parks and 10 reserves for wild animals in Tanzania have been carried out by European and American researchers. Japanese researchers have mainly promoted studies in Mahale and Ugalia in western Tanzania. Although there is the Katavi National Park in the south of Mahale, foreign researchers seldom work there. So we also discussed a plan for Japanese researchers to develop studies in the whole of western Tanzania, from Katavi N.P. to Mahale and Ugalia. This workshop was a valuable event. One excellent outcome was an agreement to form a MOU between TAWIRI and WRC in the near future.

Dr. Keyyu had friendly discussions with researchers and students at WRC, and he also visited Kyoto City Zoo and Kyoto Aquarium. He was deeply touched to see a
newborn gorilla in the zoo and wondered at the exhibits of
great salamanders and dolphins in the aquarium. Though
his stay in Kyoto was only 4 days, it was a fruitful time,
and he left for home on 19th May. We hope that TAWIRI
and WRC will develop more on each research and activity
in Tanzania.

<Symposium For Wildlife Studies In Tanzania>
Venue: Wildlife Research Center, Kyoto University
Schedule:
09:50– Greeting, Prof. Gen’ichi Idani (WRC)
10:00– Keynote address, Dr. Julius Keyyu (TAWIRI),
“Activities of TAWIRI and Research Topics”
11:15– Dr. Michio Nakamura (WRC), “Long-Term
Research and Conservation of Chimpanzees at
Mahale”
12:15– Lunch time
Research in Mahale: Climate, Vegetation, and Plant
Phenology”
14:10– Dr. Koichiro Zamma (Great Ape Research
Institute, Hayashibara), “Populations of Mammals
and Chimpanzees in Mahale”
15:00– Coffee break
15:10 – Ms. Midori Yoshikawa (WRC & Tokyo
University of Agriculture and Technology), “The
Present States of Chimpanzees in Ugalla and
Other Non-Protected Areas, Tanzania”
15:50– Ms. Eriko Iida (WRC), “Wild Mammals in
Ugalla Area”
16:30– Dr. Hiroshi Kaneda (WRC), “Ugalla, from
Eagle’s View”
17:10– Discussion
18:00– Close
19:00– Social gathering

<Workshop for Prospect and Cooperation
for Wildlife Research in Tanzania (Closed)>  
We discussed for future collaboration between
TAWIRI and WRC in scientific research, wildlife conser-
vation and education.

<NEWS>
Book Launch

Prof. Toshisada Nishida’s last book, Chimpanzees of
the Lakeshore: Natural History and Culture at Mahale
(Cambridge University Press, 320 pp., 2012) got a launch
party at the annual meeting of the American Association
of Physical Anthropologists. The AAPA met in Portland,
Oregon, USA, from 11–14 April, 2012. The event was ar-
ranged by Martin Griffiths, commissioning editor for the
book, at Cambridge University Press. Conviviality was
guaranteed by CUP’s provisioning with a keg of crafted
ale from the hometown Rogue Brewery. Prof. William
McGrew proposed the toast to Prof. Nishida at the outset,
but later so many more persons arrived that another keg
too be tapped and another toast was made. At least
200 persons, including many prominent primatologists,
attended, and the proceedings ended only with the drink-
ing of the last drop of beer. It is hoped that Toshi (as he
is affectionately known by his Western friends and col-
leagues) would have appreciated this celebration of his
life and achievements.

<BOOK INFO>
Long-Term Field Studies of
Primates

Edited by Peter M. Kappeler and David P. Watts

Some primate field studies have been on-going for
decades, covering significant portions of individual life
cycles or even multiple generations. In this volume, lead-
ning field workers report on the history and infrastructure
of their projects in Madagascar, Africa, Asia and South
America. More importantly, they provide summaries of
their long-term research efforts on primate behaviour,
ecology and life history, highlighting insights that were
only possible because of the long-term nature of the study.
The chapters of this volume collectively outline the many
scientific reasons for studying primate behaviour, ecology
and demography over multiple generations. This kind of
research is typically necessitated by the relatively slow
life histories of primates. Moreover, a complete under-
standing of social organization and behaviour, factors
often influenced by rare but important events, requires
long-term data collection. Finally, long-term field projects
are also becoming increasingly important foci of local
conservation activities.

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1. The Values and Challenges of Long-Term Field Studies / 
   Peter M. Kappeler, Carel P. van Schaik & David P. Watts

Part II Madagascar
2. Berenty Reserve, Madagascar: A Long Time in a Small
   Space / Alison Jolly


5. A 15-Year Perspective on the Social Organization and Life History of Sifaka in Kirindy Forest / Peter M. Kappeler & Claudia Fichtel

Part III America

6. The Northern Muriqui (Brachyteles hypoxanthus): Lessons on Behavioral Plasticity and Population Dynamics from a Critically Endangered Species / Karen B. Strier & Sergio L. Mendes

7. The Lomas Barbudal Monkey Project: Two Decades of Research on Cebus capucinus / Susan Perry, Irene Godoy & Wiebke Lammers

8. Tracking Neotropical Monkeys in Santa Rosa: Lessons from a Regenerating Costa Rican Dry Forest / Linda M. Fedigan & Katharine M. Jack

9. The Group Life Cycle and Demography of Brown Capuchin Monkeys (Cebus apella nigrirus) in Iguazu National Park, Argentina / Charles Janson, Maria Celia Baldovino & Mario Di Bitetti

Part IV Asia

10. Social Organization and Male Residence Pattern in Phayre's Leaf Monkeys / Andreas Koenig & Carola Borries


Part V Africa

12. The Amboseli Baboon Research Project: 40 Years of Continuity and Change / Susan C. Alberts & Jeannne Altmann

13. The 30-Year Blues: What We Know and Don’t Know About Life History, Group Size, and Group Fission of Blue Monkeys in the Kakamega Forest, Kenya / Marina Cords


15. Long-Term Field Studies of Chimpanzees at Mahale Mountains National Park, Tanzania / Michio Nakamura & Toshisada Nishida

16. Long-Term Studies of the Chimpanzees of Gombe National Park, Tanzania / Michael L. Wilson


18. Long-Term Studies on Wild Bonobos at Wamba, Luo Scientific Reserve, D. R. Congo: Towards the Understanding of Female Life History in a Male-Philopatric Species / Takeshi Furuichi, Gen’ichi Idani, Hiroshi Ihobe, Chie Hashimoto, Yasuko Tashiro, Tetsuya Sakamaki, Mbangi N. Mulavwa, Kumugo Yangozene & Suchisa Kuroda

Part VI Summary

19. Long-Term, Individual-Based Field Studies / Tim Clutton-Brock

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<BOOK INFO>

The Ecological Impact of Long-Term Changes in Africa's Rift Valley (Environmental Science, Engineering and Technology)

Edited by Andrew J. Plumptre

Despite Africa’s rich biodiversity and the importance of its ecosystem services, it has relatively few collaborative, network-based studies that examine the ecological impacts of climate change. This book marks the begin-
ning of such a collaboration. It covers ecological information that spans across five countries in the Albertine Rift region, reflects over 50 years of research, and includes contributions from 65 researchers who represent 44 organizations at work in 11 sites. It provides invaluable information about past and current trends in the status of species, ecosystems and associated threats, as well as recommendations for interventions.

6. The Effects of Environmental and Anthropogenic Changes on the Savannas of the Queen Elizabeth and Virunga National Parks / Andrew J. Plumptre, Derek Pomeroy, Jared Stabach, Nadine Laporte, Margaret Dririce, Grace Nangendo, Frederick Wanyama & Aggrey Rwetsiba

7. Long-Term Ecological and Socio-Economic Changes in and around Bwindi Impenetrable National Park, South-Western Uganda / Aventino Kasangaki, Robert Bitariho, Phil Shaw, Martha Robbins & Alastair McNeillage


11. Long-Term Changes in the Ecological Factors Surrounding the Chimpanzees of the Gombe National Park / Lilian Pintea, Anne Pusey, Mike Wilson, Ian Gilby, Anthony Collins, Shadrack Kamunya & Jane Goodall

12. Long-Term Changes in the Social and Natural Environments Surrounding the Chimpanzees of the Mahale Mountains National Park / Noriko Itoh, Michio Nakamura, Hiroshi Ihobe, Shigeo Uehara, Koichiro Zamma, Lilian Pintea, Anton Seimon & Toshisada Nishida

13. Long Term Changes in Africa’s Western Rift Valley: Synthesis of Main Findings / Andrew J. Plumptre