

Use of Leaves As Cushions to Sit on Wet Ground by Wild Chimpanzees

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A new type of tool use, leaf cushion, by wild chimpanzees (*Pan troglodytes verus*) at Bossou, Guinea, was found. We report two cases: one is indirect evidence; the other is direct observation of a chimpanzee who used the tool. Both cases indicate that chimpanzees used a set of leaves as a cushion while sitting on wet ground. Chimpanzees at Bossou show various kinds of tool use, some of which are unique to the community. Most of these behavioral patterns are subsistence tool use for obtaining food, as at other study sites. The use of leaves as a cushion adds to the few instances of nonsubsistence, elementary technology seen used by wild chimpanzees. *Am. J. Primatol.* 44:215–220, 1998. © 1998 Wiley-Liss, Inc.

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INTRODUCTION

Various kinds of tool use by chimpanzees have been reported from several research sites throughout Africa. Most of these are subsistence related [McGrew, 1992], and only a few are examples of nonsubsistence tool use, such as the leaf napkin [Goodall, 1986], stepping stick and seat stick [Alp, 1997], and weapon use [Goodall, 1986].

A group of wild chimpanzees has been studied at Bossou since 1976, and many types of tool use have been observed [Sugiyama, 1993]. Most of these are subsistence tool use such as nut-cracking [Sugiyama & Koman, 1979; Matsuzawa, 1994; Inoue-Nakamura & Matsuzawa, 1997], ant-dipping [Sugiyama et al., 1988], use of leaves for drinking water [Sugiyama & Koman, 1979], pestle-pounding [Sugiyama, 1994; Yamakoshi & Sugiyama, 1995], and algae-scooping [Matsuzawa et al., 1996].

In January of 1997, we observed a new type of nonsubsistence tool use by the wild chimpanzees at Bossou. The newly observed tool might be called a leaf cushion, as the chimpanzees used a set of leaves to sit on wet ground. In this paper, we describe two cases of the use of leaves as cushions in detail.

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METHODS

We studied a group of wild chimpanzees (*Pan troglodytes verus*) at Bossou, in the southeastern corner of the Republic of Guinea, West Africa, 7°39' N and 8°30' W. Their home range, which is about 15 km² including its periphery, is covered with dense primary and open secondary forests surrounded by cultivated and abandoned fields. All individuals have been identified and habituated to human observers since 1976 by Sugiyama and colleagues [Sugiyama & Koman, 1979] and were observed from within 10 m. The group comprised 18 chimpanzees during the present study.

Our study had two aims. One was to conduct field experiments on nut-cracking at a special site in the group's home range [Matsuzawa, 1994]. The other was to collect behavioral data by following chimpanzees in the forest using ad-lib sampling [Altmann, 1974]. According to our behavioral definition, tool use is the adaptive behavior in which one object is related to another (or others) to obtain a goal [Matsuzawa, in press]. Oil palm nuts and fewer than five bananas were given to the chimpanzees each day at the outdoor laboratory, but no food was given at other areas in the forest. We observed the group for 30 consecutive days, from December 1996 to January 1997.

RESULTS

We recorded two cases of a new type of tool use, here named leaf cushion, while following chimpanzees in the forest. Case 1 comprised indirect evidence for the use of a leaf cushion by chimpanzees, while case 2 entailed direct observation of an adult chimpanzee using one.

Case 1

On the morning of January 14, 1997, while following the track of the chimpanzees, T.M. found leaves of the parasol tree (*Musanga cecropioides*) lying on the ground. It had rained in the evening of the previous day, leaving the ground wet at the time of the observation. According to ranging records, the chimpanzees had spent the previous night in the vicinity. Three sets of leaves were found on the wet ground, located in the undergrowth about 1 m from a chimpanzee trail. We did not directly see how chimpanzees used these leaves, but we inferred from the traces that they had indeed been used. The following is a description of the three sets of leaves and the signs that led us to believe that they had been handled by chimpanzees:

The first set is the clearest example of the three (Fig. 1). This set consisted of four leaves of a parasol tree. Each leaf forms a compound consisting of 14–18 leaflets attached radially to a central stem. The set lay on the ground about 50 cm from the base of a parasol tree approximately 3 m high. It was clear that the four leaves had been broken off from the tree, and several leafstalks projecting from branches of the tree showed signs of recent injury. The four leaves lay face down one upon another on the ground. Their diameters were approximately 30 cm, 30 cm, 40 cm, and 45 cm. The four leaves completely overlapped each other, and the diameter of the whole set was about 45 cm.

The second set was found next to the first and consisted of two compound leaves lying one on top of the other (Fig. 1). The bottom leaf was lying face up, while the top leaf was lying face down. These leaves, too, showed signs of having been broken off from the same tree. The diameters of the two leaves were about 60 cm, and they were folded in two. Combined, the two leaves covered an area about 60 by 35 cm in size.

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The third set was found at a distance of about 2.5 m from the parasol tree. A single leaf, about 40 cm in diameter, lay face down on the ground. Similarly to leaves in the other two sets, it showed signs of having been broken off.

Two other important pieces of evidence suggested that the leaves had been used by chimpanzees. First, we found fresh, half-eaten clusters of young leaves of the parasol tree scattered around the three sets and underneath the first set. Only chimpanzees feed on leaves of the parasol tree at Bossou, as no other large-sized animals inhabit the area. Thus, it was certain from this evidence that chimpanzees had been present recently at the site. The second piece of evidence was provided by the observation that the three sets of leaves were flattened, appearing as though they had been sat upon. The site was surrounded by dense thicket, which the observers had to cut through in order to make the observations. There were no tracks left by humans in the vicinity; therefore, we concluded that the leaf cushions were not made or used by humans. Furthermore, because the leaves were in three sets, it may be that more than one chimpanzee used the cushions, either simultaneously or successively. After the investigation of the leaves, we resumed following the chimpanzees' track and found at least two individuals in a thicket at a distance of approximately 500 m from the location of the three cushions.

Case 2

On January 18, 1997, at 08.08, M.M., S.H., and P.G. (a local assistant) encountered a 16-year-old male named Foaf around the top of Mt. Gban, in the core area of the chimpanzees' home range. The humidity at about 08.00 in those days was nearly 100% according to a hygrometer placed on a tree in the forest. Mt. Gban was covered in mist, especially near the top, leaving the ground evidently wet.

Foaf was in the sitting position at the time of the encounter, resting on a path about 15 m ahead of the three observers. The presence of three other chimpanzees was noted on nearby trees, where they normally stay when the ground is wet from the early morning mist. The path ran straight between Foaf and the observers, so visibility was very good. However, he was sitting behind the buttress root of a *Triplochiton scleroxylon* tree, which hid his waist and legs from view. After he left, we proceeded to investigate the site more closely, and found five leaves of the carapa tree (*Carapa procera*) at the exact location where Foaf had been sitting (Fig. 2).

The five leaves were arranged side by side on the ground. Four of the five lay face up, and the remaining leaf was folded in two. The tips of all the leaves were oriented in the same direction. Chimpanzee hair was found on the ground about 2 cm from the end of the leaves. The leaves had wrinkles, dents, and folds, indicating that they had been pressed down. They showed no signs of having been broken off.

We thus saw Foaf sitting on the spot but did not see him handle the leaves or arrange them side by side. However, it would appear unlikely that he had just happened to sit on leaves that had naturally fallen in such a configuration. We can say with certainty that the leaf arrangement was not a human construction, as Mt. Gban is considered sacred, and no one except for researchers and only two local assistants strolls its forests. We therefore suspect that Foaf had collected the fallen leaves and arranged them on the ground by himself. Carapa trees were abundant nearby, and there were several other fallen carapa leaves lying in close range, but none of those were arranged in a pattern similar to the surmised leaf cushion. The carapa tree is a predominant species at Bossou.



Fig. 1. Two sets of compound leaves (*Musanga cecropioides*) used as cushions. The set in the lower half of the photograph (the first set in the text) consisted of four leaves. The set in the upper half (the second set in the text) consisted of two compound leaves.



Fig. 2. Five leaves (*Carapa procera*) arranged side by side on the ground. Sizes were 14.0 by 6.5 cm, 14.0 by 7.0 cm, 15.5 by 8.5 cm, 11.0 by 7.0 cm, and 16.0 by 6.0 cm. The five leaves could be regarded as one 19 by 26 cm rectangle.

DISCUSSION

The present paper describes two instances where chimpanzees appeared to use sets of leaves as cushions to sit on wet ground. We do not know whether the leaf cushion is a recent invention or a habitual tool. In the latter case, it is not known why use of this tool remained undetected until the present study, even though the chimpanzees have been studied since 1976 at Bossou. One possibility is that it was difficult in the past to observe in detail the behavior of the chimpanzees on the ground at Bossou, due to dense foliage. However, the extent of habituation to human observers has progressed rapidly due to intensive continuous study in recent years, especially since 1994. Now it is possible to observe the chimpanzees at close range. An alternative possibility is that it is likely to be difficult to distinguish the remains of leaf cushions from naturally fallen leaves until one's attention is drawn to them. One of us has in the past observed one or two leaves of the parasol tree lying face down on the ground at Bossou in a way similar to those in case 1 of the present study. Although these leaves may have been leaf cushions as well, no further attention was paid to them at the time. We would like to alert researchers at Bossou and at other study sites to the possibility that chimpanzees collect and arrange leaves as cushions.

The leaf cushion is probably used to avoid sitting directly on wet ground. Chimpanzees generally shun water. At Mahale and Gombe, for example, they are reluctant to sit or rest on wet ground on rainy days [Nishida, 1980; Goodall, 1968]. The present study demonstrates that chimpanzees may in such cases use leaf cushions to avoid direct contact with the accumulated moisture. In case 1, the leaves were arranged face down, possibly because the upper surfaces were wet while the lower were not. In case 2, five leaves were used, probably because one leaf of the carapa tree is not large enough for an adult male to sit on.

All the leaves used for leaf cushions were detached and rearranged on the ground, with the possible function of keeping a chimpanzee from getting wet. Therefore, the leaf cushion may be considered a tool according to our definition and can further be classified as a nonsubsistence tool. It is, however, similar in some ways to ground nests or daybeds. Ground nests have been observed at several study sites in Africa [Izawa & Itani, 1966; Reynolds & Reynolds, 1965; Goodall, 1962; Boesh, 1995; Matsuzawa & Yamakoshi, 1996], although they have never been seen at Bossou. Nest-building is usually excluded from tool use, but Fruth and Hohmann [1996] hypothesized that it is not only properly placed within the realm of tool use but that it is also the original tool that led to the mental and physical ability to use the tools we see today. The leaf cushion is thus noteworthy in considering the link between nest building and tool use.

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