(4 × 4 × 10m^2) of transected area, yielding an overall density of 0.1 hammers and 0.04 anvils per metre squared. Moreover, all 16 hammer stones were found in one 5-m stretch of eroding stream-bed. No other hammers or stones bigger than gravel, and no rocky outcrops were found anywhere else in the river valley, except in eroded gullies. The seven wooden anvils were either tree roots (5) or fallen logs (2). However, each grove had several hammer and anvil stones within 25–50 m of the palms, eroding out of gully sides and bottoms.

The 16 potential hammer stones found on transects averaged 317 g (range: 200–530) in weight, and had a mean length of 8 cm (range: 6–11), width of 6 cm (range: 4–7), and height of 4 cm (range: 3–6). A selection of eight stones found nearby in streambeds was bigger: mean weight: 822 g, length: 11 cm, width: 8.5 cm, height: 6 cm. Too few anvils were measured to yield findings on dimensions. Most stones in both sets were quartz, with which we easily cracked nuts. The most common shape of stone was rectangular solid.

DISCUSSION

We found no evidence that the chimpanzees of Semliki eat oil palms, in any form. So, why do they apparently ignore this valuable, potential food source? The presence of edible, productive and accessible oil palms, growing conveniently close to well-travelled chimpanzee trails provides strong evidence against hypothesis 1. Moreover, the Semliki chimpanzees *do* eat the fruits of *Phoenix reclinata* throughout their range, showing that they are not averse to Palmae fruits.

Although potential hammers and anvils were patchy in distribution, all groves had nearby sources of stones, at least, so that raw material scarcity cannot account for the absence of nut-cracking, at least by lithic elementary technology. Carriage of stones over distances of tens of metres, in order to crack oil palm nuts, is well known in West Africa[9] and would have sufficed at Semliki. Thus, hypothesis 2 cannot account for the absence of nut-cracking.

Absence of oil palm exploitation seems unlikely to be environmentally precluded, thus leaving by exclusion support for hypothesis 3, that absence reflects cultural ignorance on the part of the apes[2,10]. However, conclusions based on absence of evidence are always problematic, so more intensive and extensive study is needed.

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<NOTE>
A Case Report of Meat and Fruit Sharing in a Pair of Wild Bonobos

Satoshi Hirata[1], *Shinya Yamamoto*[2], *Hiroyuki Takemoto*[2] *& Tetsuro Matsuzawa*[2]

1. *Great Ape Research Institute, Hayashibara Biochemical Laboratories, Inc., Japan*
2. *Primate Research Institute, Kyoto University, Japan (E-mail: hirata@gari.be.to)*

INTRODUCTION

A number of observations of hunting and meat sharing in chimpanzees across different populations in Africa have been reported[1,2]. In contrast, hunting is generally rare in bonobos (bilias). In Wamba, the Democratic Republic of the Congo, bonobos have been studied since 1973; however, only five cases of successful hunting have been reported, all of which involved a scaly-tailed squirrel as prey[3,4,5]. Among these, two involved meat sharing. On the other hand, fruit sharing is fairly common among Wamba bonobos, and Kuroda argued that the sharing of highly preferred fruits among bonobos appears to resemble the meat sharing among chimpanzees[6].

Fruit and meat sharing have also been documented in bonobos in Lomako[7] (see refs. 8, 9, 10 for meat eating in other populations). When a case of sharing two species of fruit and a case of sharing a duiker were compared, the success rate of food transfer relative to the frequency of begging behavior was significantly lower in meat sharing.

This suggests that meat and fruit sharing have different characteristics in bonobos.

It is difficult, however, to draw conclusions about the similarities and differences between fruit and meat sharing in bonobos. Because hunting is rare in bonobos, it is difficult to obtain sufficient data for analysis, as we must take into account the differences in individual tendencies and social relationships of individuals involved. Yet, one possible way to obtain insight is to compare fruit and meat sharing that occurred between two individuals within a short time period.

Here we report two cases of food sharing within a pair of unrelated adult female bonobos in Wamba. One case involved sharing a highly preferred large fruit, and the other case involved sharing the meat of a scaly-tailed squirrel.

OBSERVATIONS

We made *ad libitum* observations of the bonobos of the E1 group in Wamba in the northern sector of the Luo Scientific Reserve. Whenever possible, their behaviors were videotaped. Data presented here are based on video recordings of two cases of food sharing between two unrelated adult females Yuki and Hoshi. In both cases, the possessor of the food was Yuki.

Case 1: sharing a junglesop fruit

The video recording started when Yuki was holding a junglesop fruit (*Anonidium mannii*) on July 23, 2010. This fruit is typically approximately 40 to 50 cm long and 4 to 6 kg in weight and can be classified as a rare and highly preferred food for bonobos[6]. The size of the agglomerate of the fruit Yuki was holding was estimated to be 25 × 20 × 15 cm and 1 to 2 kg at the beginning of our observation. Hoshi then approached to within a short distance of Yuki and stayed within reach for 2 min 19 s. Hoshi then moved away from Yuki, while Yuki was still holding and eating the agglomerate of the fruit, estimated at this time to be 10 × 10 × 5 cm.

While Hoshi stayed within reach of Yuki, Hoshi showed begging behaviors 14 times. All of these resulted in the transfer of a part of the junglesop from Yuki.

Fig. 1. Yuki (lower right) holding a scaly-tailed squirrel and Hoshi (upper left). Both of them had dependent offspring.

Among these episodes, detailed interaction during the fruit transfer was documented in 12 episodes, which could be divided into two categories. The first category involved three episodes in which Hoshi extended her hand to the agglomerate of the fruit Yuki was holding in her hand. In all three episodes, Yuki showed mild rejection by moving the fruit away from Hoshi. Despite this, Hoshi grasped the fruit and tore off a tiny portion (approximately 5 × 3 × 2 cm or less) of the fruit and then ate it. The second category involved nine episodes in which Hoshi extended her hand toward Yuki's mouth while Yuki was chewing the fruit. Yuki never showed overt rejection to this type of begging behavior; instead, she removed a seed with a small amount of flesh attached from her mouth. Hoshi received it in her hand, chewed it, and after a while, discarded the seed.

Case 2: sharing a scaly-tailed squirrel

The video recording started immediately after a local assistant noticed that Yuki had captured a scaly-tailed squirrel (*Anomalurus* sp.), which also appears to be a preferred food for bonobos[3], on August 23, 2010. The squirrel was estimated to be approximately 30 cm long from head to rump and about 1 kg in weight. Yuki spent 45 min eating it. During this period, Hoshi intermittently approached to within a short distance of Yuki (Figure 1). The following description is based on 39 min 4 s of video recordings in which their behaviors were clearly identified.

While Yuki was holding and eating the prey, Hoshi stayed within reach of Yuki for nine separate bouts, for a total of 17 min 48 s. During this period, Hoshi showed begging behaviors 20 times. Of these, four resulted in the transfer of a part of the prey from Yuki. With the exception of one bony portion, the transferred part could not be identified. The 20 episodes were divided into four categories based on the begging behavior of Hoshi. The first category involved six episodes in which Hoshi extended her hand to the squirrel in Yuki's hand. None of these episodes resulted in transfer of meat. Of these episodes, Yuki showed mild rejection by moving the prey away from Hoshi in three episodes so that Hoshi could not touch the prey. In another episode, Yuki herself moved away, and Hoshi could not touch the prey. In the remaining two episodes, Yuki did not show overt rejection, but Hoshi could not touch the prey and ceased begging. The second category involved eight episodes in which Hoshi extended her hand to Yuki's mouth as Yuki was chewing a part of prey. Yuki never showed overt rejection in these episodes. In one episode, Yuki removed a tiny portion of the prey (less than 3 × 1 × 1 cm) from her mouth, and Hoshi received it. In the remaining seven episodes of this category, Hoshi ceased begging without receiving anything. The third category involved four episodes in which Hoshi brought her own mouth within 10 cm of Yuki's mouth. In one of these episodes, Yuki removed a tiny portion of the prey (longest aspect less than 1 cm) from her mouth, and Hoshi received it. The remaining three episodes did not result in food transfer, although Yuki did not show overt rejection. The last category involved two episodes in which Hoshi grabbed Yuki's hand, which was holding a tiny portion, but not the main part, of the prey, and pulled it toward her. Yuki did not show overt rejection in either

episode, and Hoshi took a tiny portion. In one episode, the portion could be identified as a bone approximately 3 cm long.

DISCUSSION

The success rate of food transfer relative to the frequency of begging behavior was 14/14 in *Case 1* and 4/20 in *Case 2*. Lower transfer rate of meat is consistent with the observations at Lomako[7]. However, some features were common to both meat and fruit sharing. First, the possessor showed rejecting behavior when being begged for the main part of the food. Second, it appeared that the transferred parts were less valuable for the possessor. Therefore, the possessor was reluctant to share the most valuable parts of the food, but tolerated the transfer of non-valuable parts.

Several hypotheses have been postulated to explain food sharing in nonhuman primates, including the sharing-under-pressure hypothesis and the reciprocal exchange hypothesis[11]. The former proposes that an individual shares to avoid conflict with the beggar. The latter proposes that a possessor shares food in exchange for a past or future benefit (e.g., receiving the same food or items of a different currency, such as grooming, alliances, or copulations). Neither of these appears to fully explain our observations. The former hypothesis cannot explain the differential rate of food transfer if we assume that the degree of pressure given by the same type of behavior by the same individual toward the same target individual remains more or less constant. The latter cannot explain why the possessor only tolerated the transfer of non-valuable parts because it would be more reasonable to assume that the possessor would share the valuable part if he/she expected a future return benefit.

In a study of mother–infant chimpanzee pairs in captivity, a sharing pattern similar to our observations was documented[12]. The mothers were reluctant to share edible parts of their food with their infants, but tolerated the transfer of non-edible parts. Therefore, bonobos and chimpanzees might have a similar psychological propensity underlying food sharing, although our anecdotal observations do not allow for a systematic conclusion. Such psychological propensity should be taken into account when we attempt to understand the functional aspect of food sharing.

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<BOOK INFO>

Edited by Elizabeth V. Lonsdorf, Stephen R. Ross, and Tetsuro Matsuzawa
With a Foreword by Jane Goodall

The Mind of the Chimpanzee: Ecological and Experimental Perspectives

Understanding the chimpanzee mind is akin to opening a window onto human consciousness. Many of our complex cognitive processes have origins that can be seen in the way that chimpanzees think, learn, and behave. The Mind of the Chimpanzee brings together scores of prominent scientists from around the world to share the most recent research into what goes on inside the mind of our closest living relative.

Intertwining a range of topics—including imitation, tool use, face recognition, culture, cooperation, and reconciliation—with critical commentaries on conservation and welfare, the collection aims to understand how chimpanzees learn, think, and feel, so that researchers can not only gain insight into the origins of human cognition, but also crystallize collective efforts to protect wild