



TITLE:

Chimpanzee Kanako

AUTHOR(S):

Hirata, Satoshi

CITATION:

Hirata, Satoshi. Chimpanzee Kanako. *Primates* 2020, 61(5): 635-638

ISSUE DATE:

2020-09

URL:

<http://hdl.handle.net/2433/265280>

RIGHT:

This is a post-peer-review, pre-copyedit version of an article published in *Primates*. The final authenticated version is available online at: <https://doi.org/10.1007/s10329-020-00856-9>.; The full-text file will be made open to the public on 25 August 2021 in accordance with publisher's 'Terms and Conditions for Self-Archiving'; This is not the published version. Please cite only the published version. この論文は出版社版ではありません。引用の際には出版社版をご確認ご利用ください

Title: Chimpanzee Kanako

Author: Satoshi Hirata¹

Affiliation:

¹Wildlife Research Center, Kyoto University, 2-24 TanakaSekiden-cho, Sakyo, Kyoto 606-3201, Japan

Chimpanzee Down Syndrome

Kanako was a female chimpanzee who was born on 2 June 1992 at a facility in Kumamoto, Japan, which was then owned by a pharmaceutical company. She passed away peacefully in the morning of 12 February 2020 at 27 years of age.

As reported in this journal (Hirata et al. 2017), Kanako was a blind chimpanzee with a chromosomal abnormality: chimpanzee trisomy 22. The total number of chromosomes in a normal chimpanzee is 48 (24 pairs), compared to 46 (23 pairs) in humans (Jauch et al. 1992). To put it simply, chimpanzee chromosomes 12 and 13 are merged in human chromosome 2. The remaining chromosomes in chimpanzees and humans have a one-to-one correspondence. Chimpanzee chromosome 22 corresponds to human chromosome 21 (Richard and Dutrillaux 1998). Kanako had an extra copy of chromosome 22, i.e., she had three copies, whereas normal chimpanzees have only two. In humans, having an extra copy of chromosome 21 causes Down syndrome, or trisomy 21. Kanako had chimpanzee trisomy 22, which is equivalent to human trisomy 21.

After Kanako was born she at first appeared to be developing like a normal baby chimpanzee, although a caregiver noted that she was somewhat inactive and seemingly had less power in her hands and feet than normal; she was also unusually quiet. Her weight at birth was 1940 g, which is above average for newborn chimpanzees. Kanako's mother stopped taking care of her when she was about 5 months old, so she was reared by humans from then on. Shortly before 1 year of age, Kanako began to develop cataracts, leading to increasing loss of eyesight. At around 1 year of age she began to search for food with her mouth, a sign of loss of vision. One year later she underwent cataract surgery. However, Kanako repeatedly rubbed her eyes after surgery, resulting in postoperative inflammation. The inflammation caused pupillary block, which led to

glaucoma. Kanako's eyesight got progressively worse, and when she was 7 years old she began exploring her surroundings exclusively by touch, at which point she was declared blind.

No-one knew that Kanako had a chromosomal abnormality until she was 22 years old. Although a genetic disorder had been suspected, no formal test had been conducted because genetic diseases are not curable. Thus there appeared no real advantage to finding out the genetic cause of Kanako's condition. Kanako was taken care of by the same personnel who looked after the other chimpanzees at the facility.

In 2011, ownership of the facility was transferred from the pharmaceutical company to Kyoto University; I will return to this later. A new diagnostic ultrasound imaging device was acquired, which allowed the chimpanzees to be given advanced physical check-ups. Kanako's echocardiogram showed abnormal blood flow, which indicated a hole in the wall of her heart.

Although genetic diseases are not curable, diagnosis can be helpful for better management and care. Because of Kanako's physical appearance, which was somewhat different from that of normal chimpanzees, the personnel already suspected that she might have a chromosomal abnormality. A medical investigation confirmed that she had chimpanzee trisomy 22.

As mentioned above, Kanako developed cataracts in infancy, which eventually caused blindness. She also had other eye problems such as nystagmus, strabismus, and keratoconus. Another major health issue was the hole in her heart. Furthermore, she had abnormal tooth eruptions, and her joints were more flexible than normal. Her physical growth was retarded, and she remained small as an adult. All of these symptoms are known to be associated with Down syndrome in humans. Kanako's was the second reported case of chimpanzee Down syndrome. The first was reported in the 1960s, and concerned a chimpanzee who also had heart disease, and died before reaching 2 years of age (McClure et al. 1969). A third case was recently reported in this journal on a female chimpanzee who showed retarded growth along with abnormal behavioral and physiological traits (Frandsen et al. 2020).

Kanako's social life

When she was little, before she lost her eyesight, Kanako was paired with an infant male chimpanzee, who was also reared by humans. So she had some experience of interacting with conspecifics before she became blind. Kanako was dominant over the male and would take food before he did. But when Kanako was around 6 years of age, the decision was taken that she should live alone. Living with conspecifics is extremely difficult for blind chimpanzees, as they cannot take preventive action to avoid becoming the target of aggression by group mates.

While Kanako was living alone, the facility and its organization underwent a major change, as scientists who research chimpanzees and other concerned individuals succeeded in ending biomedical research on chimpanzees in Japan. The facility where Kanako lived, which had been owned by a pharmaceutical company that had also performed medical experiments on its chimpanzees, was transformed into a sanctuary for chimpanzees who had been retired from medical use (Morimura et al. 2011; Matsuzawa 2020). In 2007 the facility was renamed “Chimpanzee Sanctuary Uto,” and a new management team, a collaboration between the pharmaceutical company and Kyoto University, was established. Four years later, in 2011, the entire organization was transferred from the pharmaceutical company to Kyoto University, and it is now called the Kumamoto Sanctuary of the Wildlife Research Center, Kyoto University. (Fig. 1).

A new member of staff, Ms. Etsuko Nogami, who came to the facility from Kyoto University in 2007, attempted to improve Kanako’s situation. Etsuko Nogami imagined creating a situation where Kanako could interact with other chimpanzees (Fig. 2). However, as already mentioned, it is difficult for a blind chimpanzee to live with conspecifics due to the risk of injury from aggression. Indeed, when other chimpanzees at the facility saw Kanako in the adjacent enclosure, they became aggressive, and threatened her through the separating wire mesh and bars. Some chimpanzees tried to poked her with a stick, spat at her, or rattled the fence violently. They appeared to be aware that Kanako was not normal, and rejected her.

Roman, an adult female chimpanzee, was different. She showed only gentleness toward Kanako. Roman was generally very quiet, and not prone to aggressive or excitable outbursts. Whenever there was a fight among her group members, Roman played a key role in intervening in the conflict, thus Etsuko Nogami wondered whether Roman might be able to spend some peaceful time together with Kanako.

The encounters between Kanako and Roman, which first took place in adjacent rooms, then in the same room, went well. Kanako was 18 years old and Roman 37 years old when they first met (Fig. 3). In the first encounter, Roman approached Kanako and gently patted her on her back, during which time Kanako seemed to be relaxed. Roman tried to initiate play with Kanako, or tried to groom her, but Kanako showed no response, which was not surprising as she could not see what Roman was doing.

After repeated encounters, the two new friends just began to have a quiet time together, staying close to each other and sitting side by side. Occasionally Roman tried to initiate interaction with Kanako by extending her arm or moving her body to solicit play. When Kanako showed no response, Roman just watched her quietly. Although Kanako did not actively engage with Roman, she appeared to enjoy her company, and emitted positive vocalizations such as soft grunts when she heard sounds indicating that Roman was coming to join her. These peaceful and quiet meetings between Kanako and Roman in the same room took place about once a month. Because Roman played an important social role in her group, it was thought that she should not leave it more frequently.

Unfortunately, the two chimpanzees' time together came to an end when Roman passed away from a sudden stroke in 2018, when she was 45 years old. Roman was a gentle, socially skilled, wild-born chimpanzee, who had been used in medical studies on hepatitis. She was the mother of three offspring, and she took adequate care of all of them.

Etsuko Nogami looked for another chimpanzee who could stay with Kanako, and decided that Yoshie, a 29-year-old female, was a candidate for this. However, Yoshie's character was in stark contrast to Roman's, and her behavior often idiosyncratic and unpredictable. She was a sort of outlier in her group. Etsuko Nogami was not sure if the outcome of Yoshie and Kanako's first meeting would be good or bad, but fortunately it went well (Fig. 4).

In their first meeting, Yoshie approached Kanako, put her hand firmly on Kanako's back, and touched and grabbed her hands and feet to bring her closer. Yoshie continued to initiate interaction with Kanako, and head-butted her while making a play face. After several such encounters, Kanako began to respond more actively and positively toward Yoshie. Whereas Roman's gentle and quite passive demeanor meant that she and Kanako did not interact much, Yoshie's livelier behavior elicited a different response

from Kanako, and the two began to engage in much more physical contact. Fortunately, or unfortunately, depending on one's viewpoint, as Yoshie was an outlier in her group, her absence was unlikely to have a negative effect on its social balance. Yoshie and Kanako were therefore allowed to be together almost every day, and Yoshie was always willing to go to Kanako's enclosure.

Kanako's final months

The story of Kanako, Roman and Yoshie reminds me of another case reported in this journal. Matsumoto et al. (2016) observed a disabled infant chimpanzee in the wild, at Mahale, Tanzania (Nakamura et al. 2015). The infant was retarded in its physical development, and when the mother carried it she gave it extra support with one hand. The infant's older sister also engaged in caregiving. Until the disabled infant disappeared at around 2 years of age, both the mother and the sister took good care of it. Thus, at least some chimpanzees, both in the wild and in captivity, show gentleness—compassion—toward disabled individuals.

Kanako became less active in June 2019. She lost her appetite, and began to lie down for longer periods of time. Her heartbeat was fast even when she was resting. By this stage her heart might have been severely malfunctioning. Etsuko Nogami devoted herself to looking after Kanako, including giving her medicine for her heart condition, which was actually very difficult to do as Kanako generally refused to eat. Everyone at the facility was worried about Kanako, but a few weeks later she appeared to have largely recovered, with her appetite almost back to normal. Yet her heartbeat remained high throughout the day. After that, her condition fluctuated between good and bad. When she was not in good condition she remained lying down without eating for almost the entire day, but occasionally when she was feeling better, she laughed (Goodall 1989) while interacting with Etsuko Nogami. She could also spend time with Yoshie when the weather was nice. In autumn, she loved eating persimmons. As this fruit is unavailable in winter, the sanctuary staff dried persimmons so that Kanako could continue to eat her favorite treat. A large quantity of dried persimmon was prepared, enough to last Kanako until the following autumn.

Everybody at the sanctuary hoped that Kanako could enjoy another spring. Unfortunately, however, she breathed her last on the morning of 12 February 2020. Chimpanzees everywhere, in the wild and in captivity, show great individuality. Chimpanzees can be healthy or handicapped, aggressive or gentle, bold or cautious,

sociable or moody, etc. Kanako might just have been one of them, but in this editorial I wanted to share our memories of her, and my hope that all the chimpanzees in the world may live a happy life.

Acknowledgments

This article is mostly based on a report by Etsuko Nogami, along with a paper by Hirata et al. (2017). I would like to thank Toshifumi Usono (DVM), Migaku Teramoto, Naruki Morimura, and all the other staff of Kumamoto Sanctuary for the care of the chimpanzees there. Thanks are also due to the Great Ape Information Network (GAIN) (<https://shigen.nig.ac.jp/gain/>), which supports the activities of the sanctuary. The GAIN identifiers (ID) and the online records of the chimpanzees mentioned in this article are as follows: Kanako, GAIN ID 480, <https://shigen.nig.ac.jp/gain/ViewIndividualDetail.do?id=400>; Roman, GAIN ID 283, <https://shigen.nig.ac.jp/gain/ViewIndividualDetail.do?id=425>; Yoshie, GAIN ID 348, <https://shigen.nig.ac.jp/gain/ViewIndividualDetail.do?id=354>.

References

- Frandsen P, Johansen P, Carlsen F, Hvilsom C (2020) Genetic diagnosis of trisomy 21 in chimpanzees (*Pan troglodytes*). *Primates* 61:347–350
- Goodall J (1989) Glossary of chimpanzee behaviors. Jane Goodall Institute, Virginia
- Hirata S, Hirai H, Nogami E, Morimura N, Usono T (2017) Chimpanzee Down syndrome: a case study of trisomy 22 in a captive chimpanzee. *Primates* 58:267–273
- Jauch A, Wienberg J, Stanyon R, Arnold N, Tofanelli S, Ishida T, Cremer T (1992) Reconstruction of genomic rearrangements in great apes and gibbons by chromosome painting. *Proc Natl Acad Sci USA* 89:8611–8615
- Matsumoto T, Itoh N, Inoue S, Nakamura M (2016) An observation of a severely disabled infant chimpanzee in the wild and her interactions with her mother. *Primates* 57:3–7

Matsuzawa T (2020) WISH cages: constructing multiple habitats for captive chimpanzees. *Primates* 61:139–148

McClure HM, Belden KH, Pieper WA, Jacobson CB (1969) Autosomal trisomy in a chimpanzee: resemblance to Down's syndrome. *Science* 165:1010–1012

Morimura N, Gen'ichi I, Matsuzawa T (2011) The first chimpanzee sanctuary in Japan: an attempt to care for the “surplus” of biomedical research. *Am J Primatol* 73:226–232

Nakamura M, Hosaka K, Itoh N, Zamma K (eds) (2015) *Mahale chimpanzees: 50 years of research*. Cambridge University Press, Cambridge

Richard F, Dutrillaux B (1998) Origin of human chromosome 21 and its consequences: a 50-million-year-old story. *Chromosome Res* 6:263–268

Figures

Fig. 1 Aerial view of Kumamoto Sanctuary



Fig. 2 Etsuko Nogami and Kanako



Fig. 3a, b Roman and Kanako [reproduced from Fig. 5 in Hirata et al. (2017)]

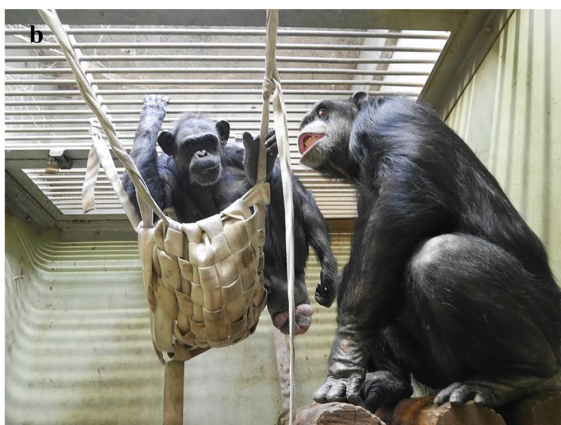


Fig. 4a, b Yoshie and Kanako

