BioResource Now !

Issue Number 11 May 2015

Focus

Introduction to the Great Ape Information Network (GAIN)

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At present, there are 319 chimpanzees, 25 gorillas, and 49 orangutans in Japan. Please note that this method of counting great apes is the same as that used for counting humans. Since great apes belong to the Hominidae, this method of counting may be feasible. Note that this is the general idea of primatologists, and not my personal opinion.

photo: Chimpanzees

photo: Gorillas

photo: Orangutans

Humans are identified as the species *Homo sapiens* in the genus *Homo* in the family Hominoidae. We sometimes assume that there is a special organism belonging to one species in one genus in one family, which is wrong. The family Hominoidae consists of four genera: *Homo, Pan, Gorilla*, and *Pongo*.

The genus *Pan* consists of chimpanzees (*Pan troglodytes)* and bonobos (*Pan paniscus*). Around 30,000 years ago in Europe, there were Neanderthals (*Homo neanderthalensis*) that belonged to the same genus as modern humans (*Homo sapiens*), but different species. The relationship between modern humans and Neanderthals is the same as that between chimpanzees and bonobos. At present, there are six bonobos in the Kumanoto Sanctuary, Wildlife Research Center of Kyoto University in Japan.

photo: Bonobos

We have been working on a project named the Great Ape Information Network (GAIN). Great apes consist of animals belonging to three genera (the genera *Pan, Gorilla,* and *Pongo*) in the family Hominoidae, except the genus *Homo*. There are various organisms on Earth, which are said to belong to tens of millions of spe- cies. Among these organisms, great apes are the closest to humans. Whole-genome sequencing has been completed for humans and chimpanzees.The difference between human and chimpanzee DNA sequences was revealed to be as low as 1.2%.

photo: Orangutans

Great apes, which are our evolutionary neighbors, are imminently threatened with extinction in the wild. The International Union for Conservation of Nature and Natural Resources has designated great apes as endangered species. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, generally known as Washington Convention) banned the international trade of great apes. Therefore, Japan has not imported great apes living in the wild since 1980, the year in which Japan ratified the CITES. Great apes in Japan are considered important natural resources of the country.

The GAIN project was launched in 2002 when the National BioResource Project (NBRP) started. The differences between the GAIN and the NBRP are that (1) the GAIN handles species that are extremely close to *Homo sapience* and (2) the GAIN handles endangered species. We have been developing a database for great apes in Japan focusing on "information." Please feel free to visit the following website for GAIN:

http://www.shigen.nig.ac.jp/gain/

In Japan, all the individuals of great apes have been registered. A system equivalent to Japan's family registration system has been prepared for great apes. We know the identity of the parents as well as the date of birth of each individual. In other words, information about the current location (facility, zoo, etc.) and the birth and death of each individual can be obtained in real time. Due to the efforts of persons concerned for more than these 10 years, a world-exclusive database has been constructed.

↳ To the next page

First, in addition to family tree information, information about the behavior, character, morphology, and genome of each individual has been analyzed and disclosed. Great apes are the closest animals to humans; however, private information of a great ape is open to public, though that of a human cannot be disclosed. Therefore, biologically valuable information has been extracted from material derived from these individuals collected using noninvasive methods, such as hair, urine, and blood sampled during medical examinations. This information has contributed to the advancement of genetic research. In fact, the whole chimpanzee genome was sequenced using blood collected from a chimpanzee living in Japan, and induced pluripotent stem cells were then produced. The genomes of a chimpanzee trio (parents and offspring) have been analyzed.

Second, data on individuals that already died have been reconstructed using records in the past. Namely, the origins of existing individuals have been restored by tracing their histories. In future biological research, in which additional aspects such as family tree information are important, the GAIN will be an extremely valuable database.

Third, the GAIN has been internationally transmitting information in English. Information in Japanese is simultaneously translated into English. The GAIN is the world's most advanced database for great apes. Recently, the United States has launched a similar database (ChimpCare). At present, we know that 1741 chimpanzees live in the United States. However, a system to register each individual, similar to that in Japan, has not been prepared.

photo: Chimpanzees

Among the member nations of the Group of Seven, only Japan has wild monkeys, a fact that that is relatively unknown. American, German, and French monkeys do not exist, but Japanese monkeys (*Macaca fuscata*) do exist.

Primates include "monkeys and apes including humans" and consist of approximately 300 species. Primates other than humans are distributed only in the tropical zone and the surrounding areas; i.e., South America, Central America, Africa, India, and Southeast Asia. Therefore, Japanese monkeys represent the northernmost population of Primates except humans. Based on such blessings of nature, Japan has transmitted the results of primate research, prior to other countries in the world.

Primatology is one of Japan's unique international contributions, and the GAIN is a valuable information database in the field of biological science. We will continuously make every effort to utilize such advantages further.

photo: Orangutans

Introducing our Seismic Server Racks

Ongoing Column [No 95] 10min.

The Genetic Resource Center moved its office to the new wing in November 2014. Our server racks were replaced with "seismic" racks at the time of the move, which I would like to introduce in this article.

There are several different approaches for containing damages caused by vibrations from earthquakes including seismic isolation, earthquake-resistant construction, and damping systems. Seismic isolation tries to avoid vibration; earthquake-resistant constructions endure vibration; and damping systems try to control vibration. Each of these approaches has strengths and weaknesses in terms of cost and ease of implementation. Similar to information security, there is no upper limit to how much can be invested in countermeasures. Therefore, the best strategy is to choose the appropriate countermeasure by estimating the intensity of future earthquakes based on J-SHIS (Japan Seismic Hazard Information Station) and the National Seismic Hazard Map. According to these resources, the probability of an earthquake stronger than intensity 6 occurring in Mishima City, Shizuoka Prefecture, in the next 30 years is between 26 and 100% (Fig. 1). It is generally said that hard disk drives can withstand vibrations from earthquakes of up to around intensity 5. Therefore, we agreed on the objective of limiting the vibration within our information center to that equivalent to an earthquake of intensity 5, even when an earthquake of intensity 6 or greater hits the area.

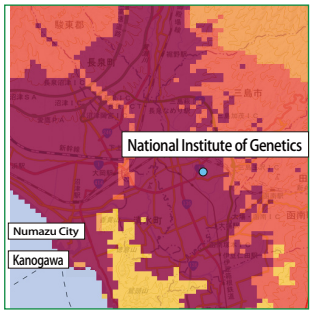

Fig.1. Prediction of an earthquake greater than intensity 6 striking Mishima City region within the next 30 years (data taken from J-SHIS)

1. Seismic Server Racks

Seismic server racks reduce vibrations inside the racks by synchronizing with the vibrations caused by an earthquake. We selected a product that can reduce seismic vibration to around intensity 5 when an earthquake of around intensity 7 strikes.

There are certain disadvantages of seismic racks. They require a larger footprint in order to allow room for the swaying of the racks. They cannot be installed on a level higher than the tenth floor because the swaying of the building adds to the vibration from the earthquake with a resulting total vibration that can exceed the capacity of the seismic isolation device(s). Furthermore, some products have complex mechanisms that require regular maintenance as well as a plan to respond to device failures.

The server room used by the information center satisfied the above-mentioned limitations, and we decided to implement the seismic server racks that have a built-in seismic isolation unit (Fig.2). As an alternative, there are seismic isolation units that are sold separately from server racks. This allows for the reuse of existing racks. There are also seismic isolation floor plates; these are two thin plates layered together. These types have a simple construction compared with other types, and have the advantage of being easier to install.

Fig. 2.
Seismic Server Racks

2. Intensity and Gal

Seismic isolation, resistance, and damping mechanisms use Gal, a unit for measuring acceleration and for representing the vibration that those mechanisms can withstand. The use of Gal enables performance to be measured quantitatively. For example, an intensity 5 earthquake equates to between 80 and 250 gal, intensity 6 is about 250–400 gal, and intensity 7 is greater than 400 gal. The Hanshin Awaji Earthquake is often used as a benchmark in product evaluation tests, during which the maximum observed acceleration was 1,818 gal. The seismic server racks implemented at the information center guarantee protection up to this value. As a reference, the Great Eastern Japan earthquake measured 2,933 gal. Intensity 8 equates to 6,000 gal, but it is said that this intensity cannot occur naturally.

The seismic rack we implemented as a part of our office move can reduce the vibration from an intensity 7 (920 gal) to an intensity 5 (200 gal) earthquake. Because hard disk drives can withstand vibrations up to intensity 5, we believe that our hard disks are safe even if a major earthquake strikes our region.

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Editor's Note

This month, the GAIN project was introduced by Professor Matsuzawa, who is a famous animal psychologist and primatologist and who is well-known in the "EYE PROJECT." The members of the GAIN project and the people working in rearing facilities have made every possible effort to construct the GAIN. Please visit this precious information database.
Photographs of great ape parents and offspring are charming indeed (Y. Y.).

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