ACTIVITY BUDGET AND FOOD HABITS OF JAPANESE MACAQUES (*Macaca fuscata yakui*)

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Introduction

It has been reported that some primate species change their diet in response to environmental changes (Hladik, 1981). Furthermore, in order to understand an animal's dietary niche or adaptability, the contents of their diet and its determinants should be clarified.

In this study, we examine in Yakushima macaques (*Macaca fuscata yakui*), which are one of two subspecies of Japanese macaques. They live only on Yakushima island, and inhabit forest dominated by evergreen broad-leaved trees. The monkeys feed mainly on fruit, seeds, leaves, and insects (Maruhashi, 1980).

To clarify the ecology of the monkey, we attempt to assess the activity budget and the diet composition of Yakushima macaques.

Methods

Study Site

The study was conducted at Yakushima Island (31°N, 131°E) in the southwest part of Japan (Fig. 1). This region has an area of 503 km^2, with the highest peak being 1,935m above sea level (a.s.l.).

We established our study site in a part of the area designated as National Park and World Natural Heritage. This region is covered by primary and secondary warm temperature evergreen broad-leaved forest on the western coast of Yakushima (0–300m a.s.l.).

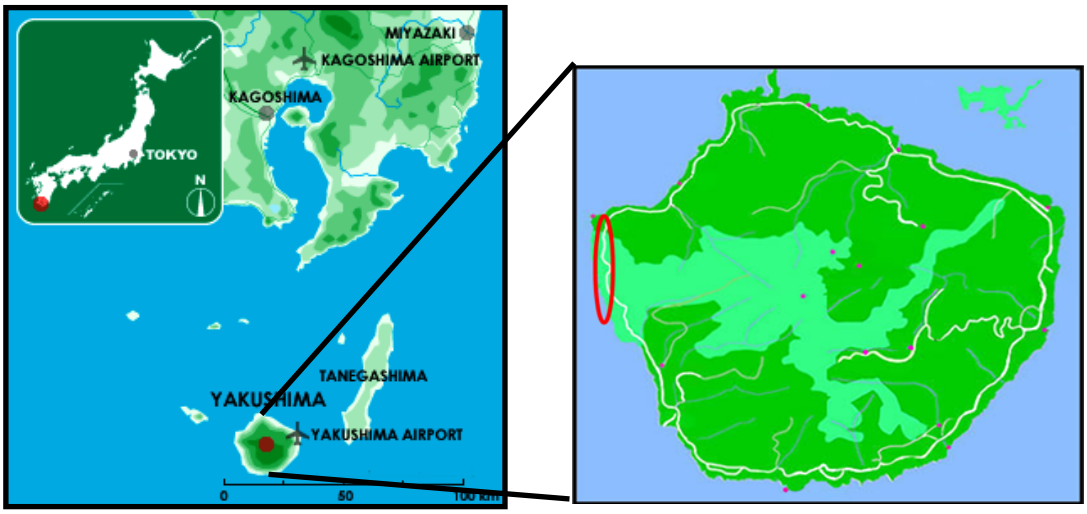

Figure 1. Study site (red circle), located on the western coast of the Yakushima Island.

The mean annual temperature is approximately 21°C, and precipitation ranges from 2,500mm to 4,700mm along the coast, and it exceeds 8,600 mm in the upper area (Tagawa 1980; Eguchi, 1984).

The vegetation consists of species belonging mainly to the Fagaceae, Lauraceae and Myrsinaceae (Agetsuma, 1995). Subtropical plants, such as *Ficus superba*, *F. microcarpa*, and *Cyathea boninsimensis* are also present. The plant species diversity of the forest is very high (Tagawa, 1980) (Fig. 2)

Figure 2. Vegetation type: primary and secondary evergreen broad-leaved forest.

Behavioral observation of the macaques

The activity budget of the 12 adults of Yakushima macaques (eight females and four males) that belong to three different target groups were observed from September 9th to 12th, 2012. Group size varied from 15 to 32 individuals. These groups are wild but well-habituated to researchers observation using the focal animal sampling method (Altmann, 1974).

We followed the focal animals and recorded their behaviors during the day at a distance of 2-10m with time sampling of the three interval minutes as long as possible, totalizing 1500 minutes observations efforts (Fig. 3).

Figure 3. Behavioral observation of the macaques.

Behaviors were classified into feeding, moving, resting, social grooming and self grooming, as well as note the location (on tree/on ground).

We recorded the diet of Japanese macaques by direct observation, using a binocular for identified the plant species consumed by macaques. Food items eaten by macaques were categorized into (1) fruits/seeds, including fruit, pulp, seeds and nuts; (2) leaves, including shoots; (3) insects and other animal matter and (4) mushrooms.

We calculated the relative frequency of each behavior per individual to determine the general trend of their activity budget.

Results

Yakushima macaques spend 41% of the daytime feeding, 28.2% grooming, 15.5% resting, 15.1% moving and 1.2% self-grooming (Fig. 4).

From our observation of the macaques feeding, we found that the main food in September is fruits and Seeds (41%) and also they ate leaves (22%). We observed very few times they ate insects (9%) and mushrooms (3%) (Fig. 5).

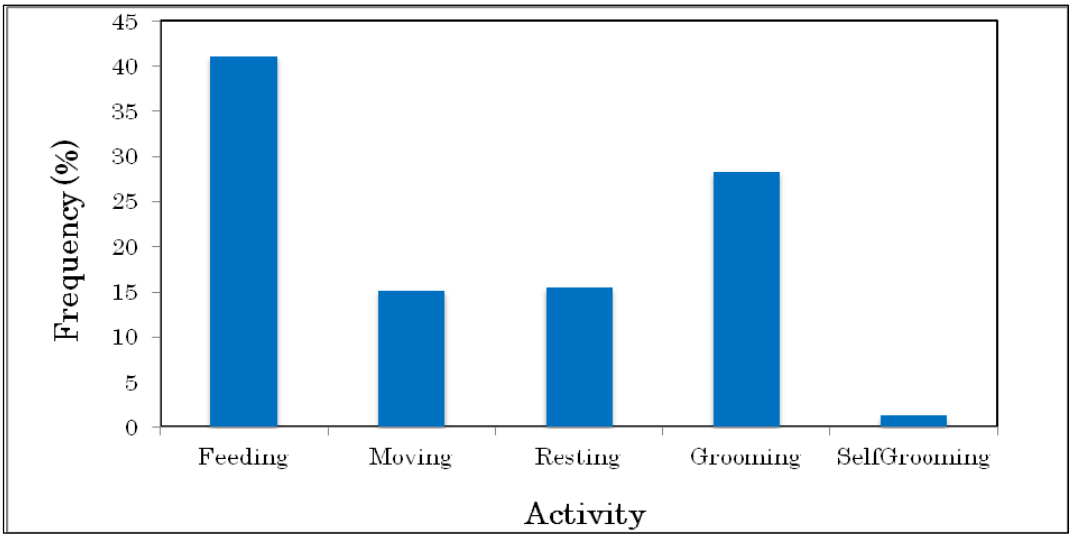

Figure 4. The frequency of activity budget of Yakushima macaques.

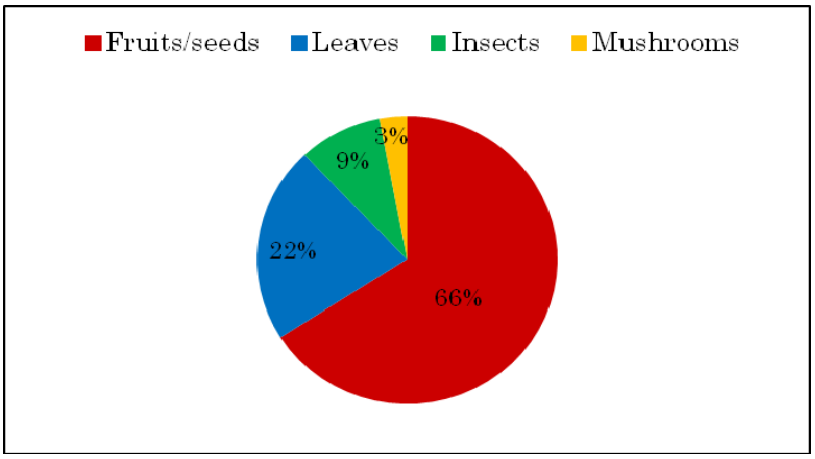

Figure 5. Diet composition of Yakushima macaques.

Furthermore, we analyzed the diet data separately for male and female (Fig. 6). Male ate 75.6% fruits and seeds, 13.3% leaves, 6.7% insects and 4.4% mushrooms. Female ate 61.36% fruits and seeds, 6.82% leaves, 29.6% insects and 2.3% mushrooms. Although both of male and female prefer fruits and seeds, we found the difference between male and female. That is females ate more insects than males did.

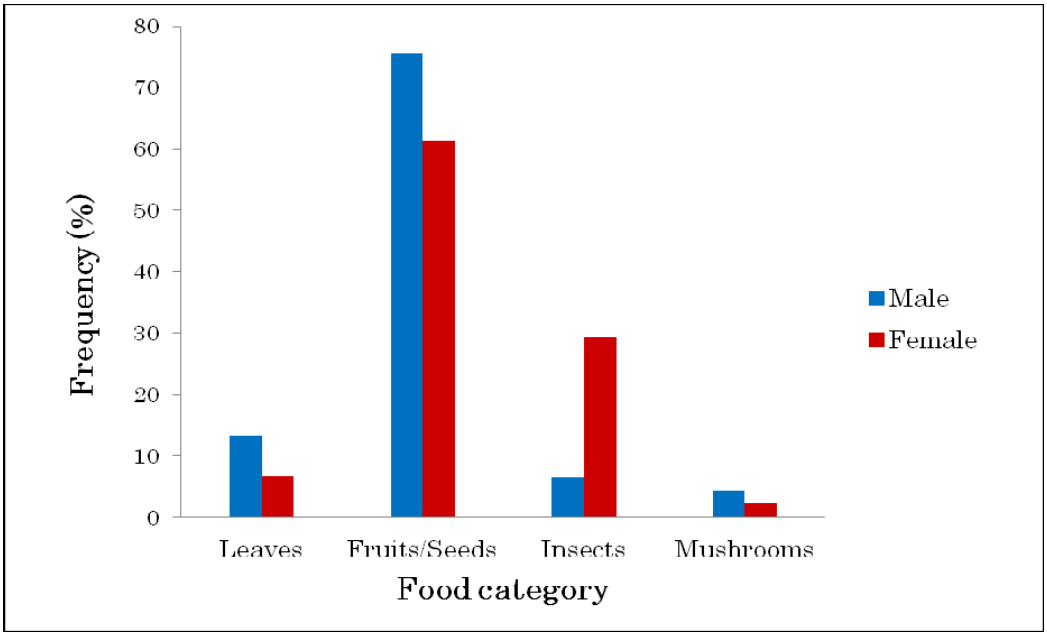

Figure 6. The comparison of diet between males and females.

Discussion

Our results show that the most frequent activity is feeding (41%). This finding is similar to those reported by Hanya (2004), who demonstrated that Japanese macaques of coniferous forest spend 38% of their daytime on feeding. However, the frequency of others activities do not agree with previous studies, probably due to seasonal variation, differences between zones, or sample size.

We found that fruits and seeds are the most important food item of their diet, supporting previous studies with Japanese macaques of Yakushima (Agestuma 1995, Hill 1997, Hanya et al. 2003). Agetsuma (1995) suggested that leaves are eaten only when preferred foods, like fruits are

not available. The study site of our research is rich in fruits, according to Hanya et al (2003), who reported higher fruit availability in the low- than in the middle- and high-zone forest. The same author also demonstrates a seasonal variation on their diet. They eat seeds and fruits the most in autumn (mass fruiting season) and the least in spring, in agreement with our findings.

The present data shows that females seems to eat more insects than males do. It has been suggested that female monkeys of some species require more protein than males (Gautier-Hion, 1980; Harrison, 1983), and that lactation may lead to an increase in metabolic rate (Portman, 1970). According to Agestuma (1995), insects and mature leaves are the main protein sources for Yakushima macaques, and the numbers of most insects at the field site increase from May to September, which support our results.

Acknowledgement

We would like to thank the Staff of WRC Kyoto University and all those who made this field science course feasible for the huge efforts. In particular, Prof. Hideki Sugiura and lecturers Dr. Akiko Sawada, Dr. Akiko Takahashi and Mr. Takahumi Suzumura for support in the field course.

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