SOCIAL BEHAVIOR IN JAPANESE MONKEYS, *MACACA FUSCATA*

KINJI IMANISHI

Kyoto University

INTRODUCTION

Among many species of monkeys and apes, there are only six whose social behavior have hitherto been accurately investigated in field studies. Reports on chimpanzees (24) by Nissen and on baboons (27) by Zuckerman are now rather classical. It may be rightly said that primate sociology was advanced markedly by the work of Carpenter. He reported on the behavior and social relations of howlers (2), spider monkeys (3) and gibbons (4). All of these investigations were carried out in natural habitat of the animals. Afterwards Carpenter reported on the sexual behavior of rhesus monkeys (5) which were released in Santiago Island, Puerto Rico, for the purpose of allowing them to establish experimental colonies.

Chance recently reported also on the social structure of a colony of rhesus monkeys (6) on the Monkey Hill at the "Zoological Gardens", Regents Park, London. Collins and Southwick reported on that of howlers (7). So this report will add to already accumulated data those of the seventh species, the Japanese monkey, *Macaca fuscata*.

Japanese monkeys are endemic to Japan. Shimokita Peninsula at the north end of Honshū is the northern limit of their distribution as well as that of all the monkeys and apes in the world. Yakushima, an island south of Kagoshima, is the southern limit. No other wild species of monkeys lives in Japan.

They are found usually in the thick forest of the mountain, where they gather in aggregations and live a social life. Animal sociology has not yet prepared a system of terminology denoting the difference of levels of animal aggregations. Imanishi (8) proposed two terms, "specia" and "oikia," for this purpose. Specia denotes the aggregation of all individuals belonging to the same species which occupies a definite area on the globe. Every species of plants and animals has its own specia. For instance, the specia of Japanese monkeys is confined to Japan excluding Hokkaido. The basic unit of specia, the individual, is called "specion".

In the course of evolution, specia was organized into many part aggregations in the higher vertebrates. This part aggregation is oikia. It is not a chance aggregation, but the aggregation of particular individuals. It is a sociological unit as fundamental and perpetuating as specia is, though the life of each oikia may be shorter than that of specia. Varieties of descriptive terms such as "band," "troop," "group" and even "family" which appeared in the studies of the social life of monkeys and apes, all fall into the same level of aggregation as oikia. The aggregation of Japanese monkeys which forms a concrete unit of their social life is another example of an oikia. The particular individual which is the component of oikia is called "oikion." Then, every individual monkey has double roles. He should be a specion on the one hand and an oikion on the other hand.

In the former days when the population of Japanese monkeys was much greater, oikiae would be also abundant in number and connected with each other through territories or some kind of communication. But as their population gradually decreased under the pressure of exploitation, cultivation and other human interferences, now every remaining oikia is more or less isolated on their last stronghold in the mountains. Only a few places are known where more than two oikiae are closely situated.

It happened in the summer of 1952 that the oikia of Kōshima, an isle on the east coast of Kyūshū, accommodated itself to take provided sweet-potatoes in the presence of man. This phenomenon may be a step towards the domestication, but by no means completes the process. Because provisioning put no restraint upon monkeys, they were free and wild as before, but they were accustomed to appear at the provisioning place and take the provisions. A word "provisionization" will be proposed to denote this incipient stage of domestication. In the winter of 1952-1953 the oikia of Takasakiyama, which had been intensively investigated by J. Itani since 1950, was also "provisionized."

As Takasakiyama was situated in the vicinity of Beppu, the famous recreation center with many hot-springs, provisionized monkeys at once began to attract visitors. To provisionize wild monkeys has three merits. 1) It furnishes a new scientific, educational and recreational resource to the public. 2) It saves farmers of near villages from the crop damage due to the plunder by monkeys. And, finally, 3) it means a profitable business, if the income from entrance-fees will be sufficient. The success of provisionization at Takasakiyama stimulated other localities where wild monkeys were found near at hand. From 1953 onwards at least thirteen oikiae were already provisionized by the same method.

It was pertinent to the occasion that the Japan Monkey Center was established in the autumn of 1956 at Inuyama, near Nagoya. In addition to promoting various investigations about monkeys, it aims also to guide provisionization and to keep the well-being of provisionized oikiae. If an oikia suffers from over-population as an effect of provisionization, it will be ready to remove surplus monkeys and supply them for medical uses.

Because investigations hitherto done on the social life of monkeys and apes were restricted to one or two oikiae as their objects, there is scarcely any comparative study of oikiae belonging to the same species. But so many oikiae of Japanese monkeys have been provisionized that investigators are now able to compare these oikiae with one another. It is enough to mention here that each oikia is different not only in the population, in the socionomic sex ratio, but also in various aspects of social behaviors of its oikions. If every oikion is nothing else but a species, these behavioral differences which seem to be differences of characteristics of each oikia might not occur. Then how does every oikion acquire these characteristics of an oikia to which it belongs? Here are problems concerning culture and personality, the existence of which in monkeys and apes was already suggested by Imanishi (9).

IN THE FOREST

Before provisionization it was all the investigator could do to trace the swift movement of nomadic oikia in the dense forest covering the steep mountain sides. In this situation discrimination of individual oikions was not yet possible except for the sex and age difference among them. But problems such as patterns of nomadism, vocal communication in the oikia, behavior against the common enemy, etc., were cleared up after extended observation.

Itani and Tokuda (18) reported on the nomadic life in the oikia of Takasakiyama. This oikia has several centers where it rests at night. These centers are usually chosen on ridges commanding a comparatively wide view. Places where it frequents for eating change according as items of available food change from season to season, though a pattern of nomadism is regularly seen so long as the quantity of a certain kind of food is enough to support the total population of the oikia.

Itani (14) reported on items of vegetable food such as buds, shoots, leaves, fruits, barks, etc., which were taken by oikions of Takasakiyama. It covers 119 species of plants. Animal food, for example, spiders, beetles, butterflies, ants, etc., are also eaten. Eggs are eaten by those of Minoo, near Osaka. Food preference peculiar to some oikia are not rare. Kawamura (20) suggests that each oikia develops its own food culture.

The area in which an oikia live a nomadic life may be called its "territory." The extent of territory varies from about 1 square kilo-meter to 8 square kilo-meters according to the size of the population of the oikia and the quantity of available food. Territories of adjacent oikiae sometimes overlap, as in the case of two oikiae of Minoo. But conflict is seldom observed because a dominance-subordination relationship is already fixed between them and the subordinate keeps away from the dominant. It is said that when two adjacent oikiae come close, leaders of each oikia shake trees and utter threatening cries. This seems to be a demonstration to avoid serious conflict. Kawamura and Tokuda (23) did not find any conflict among oikiae which they observed in Takagoyama, near Tokyo.

Vocalization plays an important role in the nomadic life of oikia because there remains only vocal communication in order to bring together individual oikions which in the thick forest scatter in the extent from 100 to 200 square meters. Itani (11) (12) recorded more than 30 kinds of vocalization in the oikia of Takasakiyama, and classified them into six types as follows :

1) calls to one another in calm mood,	4) warning calls,
2) defensive cries,	5) voices peculiar to babies and infants,
3) aggressive cries,	6) voices peculiar to estrous females.

In these six types the important vocalization which is used for ordinary communication in the forest is the first type.

Recently Itani (15) classified between calls and cries more definitely. Cries which are always accompanied by highly emotional expression and directed to a particular individual are useful for short distance communication, while calls which are accompanied by less emotional expression and directed to no particular individual are useful for long distance communication. Two-third of more than 30 kinds of vocalization are calls which are utilized as various signals and orders in the nomadic life of oikia. He says calls which are so conspicuous in the vocalization of Japanese monkeys are rather remotely connected with human language because the latter is utilized only for short distance communication as cries are.

Warning calls "kwan" are usually uttered by one of males that happen to be there and discover an approaching enemy. These calls have an effect to silence the other oikions and retire them to a safer place. Itani (13) reports that when calls are uttered by a young male, his place is sooner or later taken by a more competent adult male.

Oikia in its nomadic life forms a line when it moves from one place to another. At the head of the procession goes a party of young males. In the middle goes a cluster composed of females, infants, babies and one or several dominant males. The rear part is occupied again by young males. Itani (13) counted the population of oikia of Takasakiyama by observing such a procession from some corners.

AFTER PROVISIONIZATION

As a result of successful provisionization, an oikia comes out of the forest into the open feeding place where unobstructed observation becomes possible for the first time. At the same time it becomes at last to be possible for the investigator to discriminate every individual oikion of the oikia. As Itani (13) and Kawamura (21) reported oikiae form in concentric circles at the feeding place. The middle part of the procession is now the central part which occupies the feeding place proper. It is composed of dominant males together with females, infants and babies. The peripheral part which surrounds the central part is composed of younger males. They can enter the feeding place proper only before the central part comes there in the morning or after it has gone away from there in the evening.

Kawamura and Kawai (22) reported that there was once an independent group of six young males in Minoo, a rare case in Japanese monkeys, although Carpenter (3) found a male subgroup in spider monkeys. Judging from the fact that this group is now following one of two oikiae there, it might be the detached form of the peripheral part here mentioned.

Outside of the peripheral part there appears frequently big, solitary males. They enter the feeding place after the oikia has left, otherwise they will be driven off by young males of the peripheral part. The aim of their approach seems to be females and/or provisions. They are either oikions of the oikia or those of different oikiae. Why and how they prefer the solitary life is not certain but it will be not easy for them to be accepted by their approaching oikia. One adult male which was released experimentally at Kôshima in 1952 even now lives a solitary life in this lonely islet.

In the oikia of Takasakiyama there are six dominant males in the central part. They are bigger and older than any other males of the peripheral part. They are leaders of the oikia and make up a class by themselves. In the peripheral part there are also ten dominant males, a little smaller and younger than the leaders, which make up a class next to the leader class. They may be called subleaders. When leaders go up to the mountain while females, infants and babies still stay at the feeding place, these subleaders enter into the central part from the peripheral part and take leader's roles. The number

Fig. 1. Schematic representation of distribution of oikions in an oikia at the feeding place.

of leaders and subleaders seems to be in proportion to the population of the oikia. But, notwithstanding the increase in population of oikia of Takasakiyama from about 250 in 1953 to about 440 in 1956, the number of leaders and subleaders remains at six and ten respectively. That is contrary to common expectations.

Leaders of the oikia never quarrel in the feeding place but always cooperate with each other to control followers. They look after females and infants, mediate quarrels among them, and guard against the entry of young males into the central part of the oikia. Leaders never quarrel because of the dominance-subordination relationship which

is settled among them.

Itani (13) tried a simple test to detect this relation between two individuals. When food, a mandarin orange for instance, is thrown between two individuals, the dominant one behaves as if the food is properly his own, and takes it, while the subordinate averts his eyes from the food and does not try to get it. The test revealed a linear order of dominance rank among six leaders as well as among ten subleaders. But among females and young males it is less definite. Using the similar test, Tokuda (26) clarified the dominance-subordination relationship among eighteen oikions of the oikia of Kôshima.

It is often observed in the feeding place that the dominant male mounts the subordinate one. This means the confirmation of dominance rank between them as Chance (6) remarks about rhesus monkeys. Itani (13) reported that sometimes the dominant one allows the subordinate to mount him in order to let the subordinate groom him. The change of dominance rank, if it occurs, is also recognized through a corresponding change in these behaviors.

ACCULTURATION

Provisionization is initiated by offering food to which wild monkeys are accustomed. But monkeys gradually come to accept new foods. Oikions of Takasakiyama did not take the peanut at the beginning of provisionization, because they did not know it due to the lack of its cultivation near Takasakiyama. They took it, however, after four months during which it was left everyday at the feeding place.

A new habit is acquired by one oikion through trial and error, and then imitated by other oikions. The habit of eating candies, whose sweetness delighted monkeys once they tried them, is still spreading among oikions of Takasakiyama. Itani (16) tested every oikion six times since July 1954 to determine whether it would eat candies. His conclusion is that adults are very slow in acquiring this new eating habit as compared to infants and babies who acquire the habit rather quickly and easily from their peers. It is also observed that the mother learns to eat candies from her own baby, instead of that the baby learns it from the mother. Regardless of the direction of transmission, a habit is transmitted only through a close relationship between two particular oikions.

The following instance may not be properly called acculturation but be worth while mentioning here. Kawamura (19) (20) reported that there is spreading among oikions of Kôshima a habit to wash sweet-potatoes with water before eating them. This habit was started in 1953 by a young female of three years old. It was then transmitted to her playmates as well as to her mother and during three years it was acquired by eleven oikions including its inventor. To follow its trace consecutively will be desirable for the debated problem of subhuman culture.

CONSERVATION OF OIKIA

The sexual behavior of Japanese monkeys is another side of their social life that becomes clear after provisionization. The rutting season begins, in most oikiae, at the end of December and lasts till the end of March, though some females are estrous earlier or later than this period. During the period not only the color of faces and sexual skins of both sexes turns bright scarlet, but the sexual skin of young estrous female swells markedly.

Each of the dominant males in the central part follows an estrous female for two or three days and comes into a consort relationship with her. In some oikia the consort relationship is initiated by the male attacking the female, in other oikia this pattern is not found. In the oikia of Takasakiyama where there are so many adult females that many of them are simultaneously in estrus, it is observed that some estrous females escape from the central part and make a secret consort relationship with one of the males of the peripheral part.

The length of pregnancy is about five months and births have been found to occur from the middle of May to the middle of August. Babies become capable of walking in a week or so after their birth, and begin to take solid food in forty days. The close mother-baby relationship which begins with birth lasts for at least ten months. During this period babies seem to learn from their mothers food habits and other fundamental attitudes peculiar to the social life of the oikia.

Itani (13) reported that when the next birth season comes near, most leaders and subleaders of the oikia of Takasakiyama voluntarily take over from the mothers the care of babies. This interesting behavior has not been observed in any oikia except that of Takasakiyama and in no subhuman society except that of Japanese monkeys.

There are two kinds of relationship among oikions. The one is the relationship formed between two oikions heterogeneous with regard to age and sex. The consort relationship between the adult male and the adult female, and the mother-baby or leader-baby relationship here mentioned are examples of heterogeneous relationships. The other is the relationship formed between two oikions homogeneous with regard to age and sex. The first appearance of this homogeneous relationship in the life-history of individual oikion is noticed after eight months from the birth, when babies seek babies and come together to play with each other.

Babies after twelve months old are called infants. They prefer more and more similar sexed playmates to opposite sexed ones, although no preference seems to exist during babyhood. In Takasakiyama, Itani (13) observed that male infants under two years old are still in the central part with their mothers, but they often go out to the peripheral part to associate with young males, and at least leave the central part in order that they themselves become young males.

Female infants, on the contrary, never go out from the central part. They become young females there, mature sexually at three years and a half, and conceive from four years and a half. Males mature sexually at five years.

In due course of time young males of the peripheral part will be raised to the status of subleaders and at last of leaders, then they will return to the central part where they were born. In a large oikia such as that of Takasakiyama, however, there are so many young males that the full careers of only a small part of them can be followed. The life-histories of every oikion which was born after provisionization has been recorded for the last five years. This procedure will ultimately reveal which young males in each oikia become the leaders of the next generation.

Unlike other studies, attention was given to dominance-subordination relationships among females as well as among males. It was observed that in Takasakiyama dominant females are situated near the center of the central part, while subordinate ones near the margin of the central part. Tokuda (26), reporting on a mixed colony of rhesus monkeys and crab-eating monkeys in the Kyoto Zoo, observed that children of the female of

higher status show a tendency to be dominant over others. Asakura (1) reported the same phenomenon in a colony of Japanese monkeys in the Ueno Zoo, Tokyo

Recent field reports mention instances of a young male in the central part of an oikia which is tolerated by leaders and females, or is already appointed to the higher status worthy of staying there. It is probable that he is the son of some dominant female of the oikia. As dominant females are usually on intimate terms with leaders, their babies are the ones most likely to be taken care of by leaders. At any rate it is necessary for males to be accepted by females, especially by dominant females, in order to enter into the central part from outside.

Itani (17) reported that in Takasakiyama since 1955 young males have been leaving the oikia in increasing numbers. He considered the phenomenon as socially pathological if it is caused by the fact that their path to higher status is blocked. However, it may be only a natural remedy for the hypertrophied oikia, containing over 400 oikions, to discharge some excessive oikions in so far as it does not divide itself into two oikiae.

Imanishi (10) considered in introducing the concept of "identification" from psychoanalysis that males which have mothers of higher status are able to identify successfully not only with their mothers but also with their leaders, while those which have mothers of lower status are not able to identify successfully with their leaders in their childhood. If other things are equal, males growing up with successful identification will cooperate with leaders more willingly, be accepted by them as well as by females more easily and finally succeed their leaders, while those with unsuccessful identification will not go on smoothly with the tradition or the culture of the oikia and leave the oikia more unhesitatingly. If the population of the oikia increases under the fixed number of leaders as in the case of the oikia of Takasakiyama, those males with unsuccessful identification will increase and those which desert the oikia will also increase. Thus the oikia itself is conserved.

The author acknowledges the Primates Research Group of Kyoto University for referring freely to its mimeographed pamphlet "Field Notes on the Social Behavior of Japanese Monkeys (*Macaca fuscata*)" (1955) in preparing this paper.

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* Articles written in Japanese.

** Articles written in Japanese with English summary.

MS. received V 7, 57