

# Methodological Problems in Fieldwork: Understanding the mind of nonhuman primates

Hideshi Ogawa

## Abstract

The possible methodological problems in fieldwork are discussed with comparison through field observation of humans, great apes, and other primates. In field primatology today, remote sensing technologies using GPS (Global Positioning System), GIS (Geographical Information System), and biotelemetry are powerful tools. Collaborative research involving field primatologists and remote sensing scientists is needed to obtain information which can not be obtained by traditional methods in primatology. In addition, habituation and direct observation of wild primates may result in infections and disturbance of activities of the animals. Fieldworkers must consider the necessity of the fieldwork and should confirm that there is no alternative method prior to the practice of their fieldwork. In the study of animal behaviour today, reproducibility of observations and experiments is strictly examined. When inter-observer reliability is examined, observers can be regarded as an instrument for measuring behaviour in the same way that a thermometer is used to measure temperature. On the other hand, however, variations between observers were considered to be important in traditional social anthropology and primatology, because observers were regarded as a kind of lens which reflect the function and meaning of the behaviour of the study subjects. Only when observers understand more about the study subjects, they find something new which has not been found by other observers. Therefore, some fieldworkers have tried to assimilate to their study subjects. As well as social anthropologists, field primatologists sometimes feel sympathy with their study subjects, and feel as if they understand the mind of the subjects and how the subjects think about the mind of other individuals. However, we can not know which cognitive mechanisms were actually used, even when the observed behaviour appears to be similar to the behaviour of the fieldworkers themselves. Previous studies indicate that most nonhuman primates like macaques do not have the ability of mind-reading. While chimpanzees understand at least perceptions and some mental states in others, macaques do not envision the mind of others when they predict the behaviour of others. Fieldworkers should be more aware of the difference between cognitive mechanisms of themselves and those of their study subjects: local people in a different culture and society, great apes, and other nonhuman primates.

Key words: fieldwork, observation, mind-reading, cognitive mechanism, remote sensing technology, reproducibility.

## INTRODUCTION

Since Malinowski's long-term intensive fieldwork, participant observation has been an important research method in social anthropology and sociology (Malinowski, 1922). There, observers were regarded as a kind of lens which reflect various aspects of their study subjects. When observers understood more of the language, culture, and society of the local people, and when the observers had a viewpoint which was closer to that of the local people and which was different from other fieldworkers, the observers would have more chance to find something which had not been found by other fieldworkers. Therefore, some social anthropologists tried to assimilate to the local people, while some social anthropologists kept some social and psychological distance from the local people in order to compare the society of the people and the society of themselves.

In primatology, a lot of long-term observations of nonhuman primates have been conducted in their natural habitats (eg. Goodall, 1971). I have been studying ecology and social behaviour of nonhuman primates too. I stayed 646 days in Tanzania and studied wild chimpanzees (*Pan troglodytes*) in the savanna woodland area (Ogawa et al., 2007). I stayed 382 days in China and studied Tibetan macaques (*Macaca thibetana*) in a free-ranging social group at Mt. Huangshan (Ogawa, 2006), as well as Japanese macaques (*Macaca fuscata*) in a free-ranging social group at Arashiyama Monkey Park, Kyoto in my home country, Japan. During the fieldworks, I tried to understand not only ecology and behaviours of the primates but also the mind of them. Besides, I was sometimes impressed with the life of wild animals. The fieldworks were not only just a study of animals but also the process of discovering myself.

However, because (1) various alternative methods other than fieldwork have been developed and (2) fieldwork causes ethical and conservational problems in primatology, we should consider whether or not fieldwork is needed for that study. In addition, because (3) reproducibility is essential to the study of animal behaviour like other natural sciences and (4) fieldworkers can not directly know the cognitive mechanisms of animals even when the observed behaviour appears to be similar to the behaviour of the fieldworkers themselves, we should be careful when we interpret the behaviour of animals.

In this article, I discuss some methodological problems in fieldwork and the practice of fieldwork below.

## DISCUSSION

### (1) The use of remote sensing technologies in primatology

In the study of wild animals today, more and more remote sensing technologies are used (Honest & Macdonald, 2003; Hughes, 2003; Philips et al., 1988). Remote sensing technologies provide information which is not obtained by traditional methods.

Among such technologies, GPS (Global Positioning System) and GIS (Geographical Information System) are powerful tools in primatology. For example, I always carried a portable GPS during my fieldwork for the study of distribution of wild chimpanzees in Tanzania. When I found a bed of chimpanzees, I recorded the location (latitude and longitude) by the GPS. Now, a GIS expert is collecting data recorded by many fieldworkers, plotting all the points of bed sites on a GIS map, and analyzing the location of those bed sites. Once the location of a bed site was recorded by GPS, GIS data shows altitude, angle, and direction of slope at that place. Once a vegetation type at a certain place is recorded and correspondence between the vegetation type and colour on a satellite photo is established, vegetation types of any bed sites were shown from the satellite photos. Furthermore, for example, GIS data shows the distance between a bed site to its nearest evergreen forest where water is available. A GIS expert can analyze various factors affecting chimpanzee preference for bed sites. As I do not know about detail technical methods for GIS analyses, collaborative research is needed.

Radio-tracking and telemetry are used in many studies of wild animals. VHF or UHF radio-tracking transmitters and receivers have been traditionally used to locate wild animals. Nowadays satellite tracking systems are developed. Like studies of other wild animals, GPS telemeters are used in primatology. GPS collar telemeters were put on the neck of Japanese macaques in a free-ranging group at Kyoto, Japan, and the GPS telemeters automatically recorded the location of the monkeys every 5 minutes (Takenoshita et al., 2005). In addition, biotelemetry is used as a remote measurement of biological data such as body temperature, heart rate, blood pressure, and brain wave activity. From fecal and urine samples, information on DNA, hormone, pathogenic bacteria, parasites can be obtained by non-invasive ways (Goossens et al., 2003). When fieldworkers talk about the future study methods, we sometimes say "We may not have to go the field far away from our office, because future technology makes it possible to get any information through telemeters in the future."

Thus, more and more collaborative researches involving primatologists and remote sensing scientists like GIS experts are important to use current and emerging technologies.

(2) Ethical and conservational problems in fieldwork: Can observers become air?

While remote sensing technologies are developed, fieldwork causes ethical and conservational problems in primatology.

I remember that, when I was a graduate student observing wild Japanese macaques, I was advised "You should be just like the air around these monkeys." This means that an observer should not have any influence on the study subjects. Many scientists may think that this is ideal condition in field observation of animal behaviour. However, it may be impossible in most cases, especially in social anthropology where fieldworkers are not merely an observer but a participant of the society of the local people. Even when wild animals are well habituated to observers and they do not appear to mind the observers, however, habituation and close direct observations may result in infections of the animals and disturbance of the activity of the animals (Deem et al., 2001). There was a case that the group size of habituated wild Japanese macaques decreased at Yakushima Island, Japan (Takahata et al., 1994). Although competition for food resources between social groups of Japanese macaques had a more direct influence on the population change of the habituated group, close and long-term direct observations by fieldworkers might also disturb feeding, reproductive, and other activities of the wild animals. In many national parks, the staff made rules which restrict observational time and distance between wild animals and observers including fieldworkers and tourists (eg. Collins, 2003).

If we will continue fieldwork, fieldworkers should confirm whether there are any alternative methods and re-consider the necessity of the fieldwork. Prior to the practice of their fieldwork, we have to identify the answers which data can not obtain without the fieldwork and why fieldwork is essential to that study.

(3) Reproducibility and inter-observer reliability: Should observers become an instrument?

In the study of animal behaviour now, observational methods are very systematic (Martin & Bateson, 1986). There are several common sampling methods: focal animal sampling, scan sampling, and behaviour sampling. There are several common recording methods: continuous recording and time sampling (instantaneous sampling). During my observation of social behaviour of Japanese macaques and Tibetan macaques, I usually used one of the most popular sampling and recording methods in primatology. Prior to observation, I made a list of definition of behaviours I should record. According to focal animal sampling and continuous recording method, I continued recording all events and states involving the focal animal during one session, 15 minutes observation. According to scan sampling and time sampling method, I also recorded individuals within 1m and 5m (or 2.5m) distance from the focal animal in every 5 minutes. Once observers choose an observational method, there is a little room

to change the method by personal preferences of observers.

In addition, reproducibility is essential to the study of animal behaviour like experiments in physics and other natural sciences. This means that, if observers are well trained and the observers use the same observational method for the same study subjects, the same results should be found. For example, when co-authors and I submitted our manuscript to a scientific journal, we had to show the result of inter-observer reliability (Berman et al., 2007). That is, we showed that two observers simultaneously recorded the behaviour of the same focal animal and that the frequency of behaviours recorded by the two observers was not different from each other over a statistically significant level.

Should observers become like an instrument? According to a guide of measuring behaviour, "Observers can be regarded as instruments for measuring behaviour in the same way that a thermometer is used to measure temperature (p.116, 2nd edition, 1993)" (Martin & Bateson, 1986).

(4) The ability of mind-reading: Should observers become a monkey?

1. Is it an honor to be advised "You became a monkey"?

Contrary to the guide of measuring behaviour of animals, some social anthropologists tried to assimilate to the local people. Even in primatology, some friends of mine tried to assimilate to their study subjects, nonhuman primates. I recall that, during my observation of Japanese macaques, I was advised not only "Become the air around these monkeys so as not to disturb the monkeys" but also "Become a monkey to understand these monkeys, especially to understand their mind". You may agree that observers should be like the air, but you may wonder if it is popular attitude to be like a monkey in primatology. I remember that it was not so peculiar advice among Japanese primatologists at that time. For example, there is a Japanese book entitled "The man who became a monkey" (Hazama, 1972). This is a story that the author became so familiar to monkeys through the process of observation and management of Japanese macaques at Arashiyama Monkey Park, Kyoto, Japan that he could understand more about monkeys. It was great honor to be said "You have become a monkey", at least, among Japanese field primatologists around me.

However, there is a serious problem if we use sympathy in the study of nonhuman primates. This is because recent experiments and observations showed that most nonhuman primates do not understand mental states of other individuals (Byrne & Whiten, 1988; Cheney & Seyfarth, 1990; Povinelli et al., 1990; Premack & Woodruff, 1978; Tomasello & Call, 1997). This means that, if you had entirely the same mind as a monkey, you could not understand the mind of yourself and the mind of other individuals, because you would lost the ability of mind-reading. There is a famous Morgan's canon "in no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as

the outcome of the exercise of one which stands lower in the psychological scale (p. 53)" (Morgan, 1894). We can not know which cognitive process was actually used, even when the observed behaviour appears to be very similar to the behaviour of ourselves.

## 2. Difference between cognitive process in humans and those in nonhuman primates

The ability of mind-reading of animals was started from the article entitled "Does the chimpanzee have a theory of mind?" (Premack & Woodruff, 1978). Having a theory of mind means having the ability of mind-reading. Povinelli et al. (1990) conducted the following experiment. (1) Captive chimpanzees were shown that a piece of food was put in one of boxes. Because there was a blind between the boxes and the chimpanzee, however, the chimpanzee were not able to see which box the food was put in. (2) Two persons stood behind the blind. One person saw which box the food was put in, while the other person was blindfolded and unable to do so. (3) Each person pointed a different box. (4) The chimpanzee opens any one of the boxes according to the directions of either of the two persons. In the first experiment, 3 of 4 chimpanzees opened the box indicated by the person who saw which box the food was placed in. This suggests that these chimpanzees understood the relationship between "seeing" and "knowing." They understood that the person who could see it was the one who knows it. The chimpanzees may have a theory of mind or, at least, a theory of perception. Wimmer & Perner (1983) made an effective experiment to test understanding of the knowledge of other individuals and examined this ability in infants of human (*Homo sapiens*). This is known as a false belief task. In this experiment, the following story was presented to the subjects, human infants, by means of a puppet show or a videotape: (1) A boy named Maxi helped his mother to make a chocolate cake and they put the chocolate on a green shelf. Later, Maxi went outside to play. (2) While he was outside, his mother removed the chocolate from the green shelf and used some of it. She then put it on a blue shelf instead of the green shelf and left the kitchen. (3) Maxi returned and wanted to eat the chocolate. After presented this story, the subjects, human infants, were asked "Where does Maxi look for the chocolate?" Normal human infants are able to give the correct answer "Maxi looks for the chocolate on the green shelf" when they are approximately 4-year-old. Further, when they are approximately 8-year-old, they are able to understand a secondary belief like "The 3-year-old infant thinks that Maxi knows the chocolate is on the blue shelf" (Perner & Wimmer, 1985).

Contrary to humans and chimpanzees, however, there has been no experiment which demonstrated the ability of mind-reading in macaques, though even the ability of mind-reading in chimpanzees is still in controversy after revised experiments and other trials (eg. Call et al., 2004; Povinelli & Vonk, 2004; Tomasello & Call, 1997). Macaques often "teach" their group members that they are in a dangerous situation by an alarm call when they have found a predator nearby. In order to judge whether the individual who made an alarm call

understood the mind of other individuals, however, it is necessary to examine if the individual alarmed others because the others were not aware of the dangerous situation. Mothers of Japanese and rhesus macaques (*Macaca mulatta*) did not change the frequency of their alarm calls depending on whether or not their infants could recognize a dangerous object (Cheney & Seyfarth, 1990).

Humans and chimpanzees can recognise their own images in a mirror (Gallup, 1970). However, there are only a few reports showing that trained Japanese macaques were able to recognize themselves in a mirror (Itakura, 1987), although some animals able to use a mirror to look for hidden food. Through developmental process of individuals, once self-recognition was established, that animals and humans come to understand the relationship between seeing and knowing. Therefore, mind-reading and self-recognition may have been closely related both in the developmental process of each individual and the evolutionary process of the species.

### 3. Evolution of mind-reading in primates

Many group living animals can predict the behaviour of other individuals in the group. However, there are 2 methods used in the prediction of the behaviour of others.

In method 1, an individual remembers each occurrence of the behaviour of others in different situations and assumes that the individuals will perform the same behaviour when they are in the same situation. Here, that individual associates (1) the previous situations and (2) the behaviour of others. Once group members use a more complicated process of decision-making, however, it is difficult to directly associate a situation and behaviour. Other group members may think, "If I perform behaviour A, my opponent will perform behaviour P. Then, at that moment, I can perform behaviour B. Therefore, I should first perform behaviour A in order to perform behaviour B." If other group members have such a complex decision-making process, the social environment including the minds of other group members becomes more complex, and it is necessary to change the method for predicting the behaviour of others from method 1 to 2. In method 2, in the situations in which the decision-making process of other group members is complex, it becomes necessary to associate (1) the previous situation similar to now, (2) the mental states of oneself in the previous situation and the possible mental states of others in that situation, and (3) the behaviour of others in those mental states. One can predict the behaviour of others by assuming that this individual sees it, knows it, and, then, will do it. Actually, we cannot predict the behaviour of other people, unless we consider the mind of others into account. If we do not try to understand what others are thinking and why they want to do, more information, memories, and assumption are necessary. The ability of mind-reading has been evolved and developed in the lineage of humans and great apes.

On the other hand, the lineage of macaques chose another method. When they predict the behaviour of others, macaques do not anticipate the minds of others. Instead, they may memorize each individual's behaviour in various situations, classify them into categories based on social relationships of the individuals and the social contexts, and directly predict the behaviour of others based on this classification. Thus, unlike humans and great apes, macaques are not psychologists but are ethologists (behaviourists).

#### 4. Fieldworkers should be more aware of the difference in cognitive mechanisms.

Taking the results of the experiments and observations above into consideration, fieldworkers should be more aware of the difference between cognitive mechanisms of the fieldworker themselves and nonhuman primates. As well as primatologists, social anthropologists also should be careful of the differences between themselves and local people who live in a different culture and society, even though basic cognitive mechanisms of local people are much similar to fieldworkers, compared to the difference between humans and nonhuman primates. Final interpretation of behaviour of wild animals and local people should be tested by the experiment which is carefully designed to examine the mind of the study subjects.

However, this does not mean that fieldwork is not worth conducting. I believe that fieldwork is important in understanding wild animals and local people, because fieldwork gives observers valuable inspiration about the meaning of behaviour of their study subjects. While macaques cannot understand the minds of other individuals, our own unique ability of mind-reading, allows us to feel sympathy towards others and to imagine what others are thinking. In this sense, we are not a mere thermometer but a more sensitive lens which reflects various aspects of the study subjects. Although observers should keep some physical distance with the subjects to avoid infections and disturbance of activity of the wild animals, and more and more collaborative researches are important to use current and emerging technologies, I shall continue to enjoy fieldwork and to take inspiration from the observation of my study subjects. Although final interpretation of behaviour of wild animals should be tested by the experiment which is carefully designed to examine the mind of the study subjects, I will continue to attempt to understand my study subjects with through mind-reading and long-term observation of the social context of behaviour of the animals in their natural habitat.

## CONCLUSION

(1) In field primatology today, remote sensing technologies using GPS, GIS, and biotelemetry are powerful tools. (2) In addition, habituation and direct observation of wild primates may result in infections and disturbance of activities of the animals. Fieldworkers



must consider the necessity of the fieldwork and should confirm that there is no alternative method prior to the practice of their fieldwork. (3) In the study of animal behaviour, reproducibility of observations and experiments is examined. When inter-observer reliability is examined, observers can be regarded as an instrument for measuring behaviour. On the other hand, however, observers are regarded as a kind of lens which reflect the function and meaning of the behaviour of the study subjects. When observers understand more about the study subjects, they may find more about the mind of the study subjects. (4) However, even when the observed behaviour appears to be similar to the behaviour of the fieldworkers themselves, we can not know which cognitive mechanisms were actually used. Previous studies indicate that most nonhuman primates do not have the ability of mind-reading, although they can predict the behaviour of other individuals. Fieldworkers should be more aware of the difference between cognitive mechanisms of themselves and those of their study subjects.

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