

THE UNIVERSITY OF CALGARY

Reconciliation Among Semi-Free Ranging Japanese Monkeys

(*Macaca fuscata*)

by

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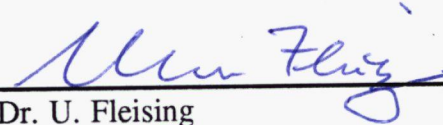
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THE UNIVERSITY OF CALGARY
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Reconciliation Among Semi-Free Ranging Japanese Monkeys (*Macaca fuscata*)," submitted by Pamela May Karen Cunneyworth in partial fulfillment of the requirements of the degree of Master of Arts.



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ABSTRACT

Observations were made on a natural troop of semi-free ranging Japanese macaques to confirm whether this primate species exhibited reconciliation tendencies. Until the present study, this research area had not yet been investigated on this species or on a species not in captivity.

Recordings of behaviours were made following naturally occurring agonistic interactions. It was established that after conflicts the monkeys displayed selective attraction toward their opponent and these interactions were consistent with the concept of reconciliation. Reconciliation was found to occur after almost one-fifth of the conflicts studied. Behaviours that were associated with the post-conflict period between opponents were grooming, warbling, lip smacking and feeding near.

Reconciliations generally occurred more often among opponents who were regularly a part of each other's social network such as among kin and "friends". These are opponents whose relationships required reconciliation after a conflict to re-establish the benefits associated with their relationships.

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CHAPTER ONE

THEMES IN AGGRESSION RESEARCH: AN INTRODUCTION

INTRODUCTION

Sociability and aggressiveness of primates may seem incompatible because aggression is traditionally viewed as a dispersal mechanism (*e.g.* Scott, 1972; Southwick, 1972). Yet, recent studies show that in post-conflict situations, former adversaries are in closer proximity than otherwise would be predicted (de Waal and van Roosmalen, 1979; de Waal and Yoshihara, 1983; Judge, 1983; de Waal, 1987; York and Rowell, 1988; de Waal and Ren, 1988; Cords, 1988; Aureli *et al.*, 1989). The mechanism for this affiliative behaviour after an agonistic encounter appears to be a factor that keeps social primates social. In the primate literature, this mechanism is known as reconciliation (de Waal and van Roosmalen, 1979). Generally, reconciliation consists of specific reconciliatory behaviours shortly after an agonistic interaction. The way in which reconciliation occurs is species-specific.

Reconciliation research provides an insight to "social cohesion, conflict resolution and tension reduction" (de Waal and Yoshihara, 1983:224). In this manner, reconciliation is a powerful coping mechanism for dealing with conflict (de Waal, 1986b).

Prior to the identification of reconciliation among social primates, the existence of social bonding, in spite of potentially high levels of agonism, was not fully understood (de Waal, 1986b). Studies in the area of reconciliation are therefore important because the absence of research on coping mechanisms for conflict interactions has resulted in an exaggeration of the antisocial consequences of agonism.

THE CONCEPT OF AGGRESSION

The meaning of the term aggression has varied between researchers and has varied through time. Freud (1959) and Lorenz (1966) considered aggression to be an instinctive behaviour that must, at one time or another, be acted out. Lorenz (1966), Dollard *et al.* (1967), Miller, (1959) and Rozenzweig (1944) describe it as internally motivated but externally stimulated by frustration.

More recently, aggression has been defined as "behavior directed towards causing physical injury to another individual" (Hinde, 1974:250). It has also been defined as the attempt of one individual to deliver noxious stimuli to another (Buss, 1971). These definitions imply a wilful attempt to harm another such that an "intent" is part of the action (Fedigan, 1982). Implicit to these ideas is that the winner gains a benefit and the loser suffers a cost. As well the term aggression is used anthropomorphically in that aggression is considered "bad" (de Waal, 1989). From the connotations of the term aggression, it is clear that a certain emotional state of the animal is implied.

In addition, the definitions of aggression frequently place an emphasis on the behaviours of actors (aggressors) thereby ignoring the behaviours of reactors (aggressees). For example, in response to aggression, typical behaviours of reactors include escape, avoidance and submission - behaviours of conflict interactions not encompassed in the definition of aggression. Aggression is thus not merely a single category of behaviour but rather it is a complex phenomena.

The definition of aggression often groups two types of behaviours: inter and intra-specific aggressive interactions. These two categories however are qualitatively distinct,

that is, "there is no necessary relationship between predatory behavior and [intraspecific] agonistic behavior in terms of the causes, expressions and functions of the behaviors" (Fedigan, 1982:75). Research on interspecific aggression, such as predator-prey relationships, found no correlation between predatory behaviour and aggressive intent. The motivation behind the action of stalking and attacking for food is of a different kind than the motivation behind the attack of conspecifics (Hutchinson and Renfrew, 1966; Scott, 1974). The research also suggests that inter and intraspecific aggressive interactions involve different neural patterns "... since in any one species predatory behavior and intraspecific fighting are usually elicited by different external stimuli ..." (Hinde, 1974:250). Therefore, from these interpretations, the term aggression encompasses two fundamentally different actions.

Because of the broad range of meanings and connotations associated with the term aggression, its conceptualization as used in nonhuman primate literature is limited. In response to such modes of reasoning, Scott and Frederickson (1951) coined the term agonism as an alternative to the term aggression. They define agonism as "behavior which is adaptive in situations involving conflict between members of the same species" (Scott, 1974:417). The change in terminology represented a major turn in aggression research by limiting the methodological and theoretical concept of conflict interactions. The term agonism changed the focus to only intraspecific conflicts and acknowledged behaviours by actors and reactors by implying that both act in ways that reduce the probability of prolonged and intense conflicts. Further, the definition lacks the connotations of an emotional aspect, especially "an intent to do harm." Agonistic

behaviours are considered to be adaptive and this aspect of the definition is the keystone to understanding conflict and conflict resolution in social primates as the emphasis is placed on interindividual cohesion rather than interindividual competition. In essence, the term agonism is a more precise definition for explaining conflict interactions: it reduces the ambiguity of the term aggression.

THE CONCEPT OF RECONCILIATION

Agonism is now considered by some to be the necessary complement to peace in social primates (de Waal, 1989). The research on peacemaking in primates stems from early primate studies where it had been noted that an increase in conflict levels corresponded to an increase in grooming sessions (e.g., Blurton-Jones and Trollope, 1968; Lindburg, 1973; Ehrlich and Musicant, 1977; van Lawick-Goodall, 1968; Nishida, 1970). This led to the conclusion that physical contact was involved in the regulation of tension (de Waal, 1986b:461). At this time, the emphasis was placed on "internal states rather than on interindividual relationships" (de Waal, 1986a:341) for example, grooming and body contact were described as having "reassurance," "appeasement," and "arousal reduction" functions (de Waal, 1986a:341).

The concept of post-conflict proximity and affiliative behaviour was taken one step further by Seyfarth (1976) and McKenna (1978). Both researchers identified a *qualitative change* in the interactions between individuals after a conflict (de Waal, 1986a). As well, Hinde and Stevenson-Hinde (1976), and Rowell (1972), interpreted presenting behaviours as a type of "social approval" behaviour or "politeness" gesture thus indicating a social

function rather than as an internal regulator of tension.

These reports recognized differences of interactions between opponents after a conflict and those interactions in other contexts. They were finally identified and termed reconciliations by de Waal and van Roosmalen in 1979. The concept of reconciliation subsequently directed attention to the positive constructive role that conflict plays in social bonds.

Reconciliation is defined as "a friendly reunion between former adversaries not long after an agonistic confrontation" (de Waal and Ren, 1988:129). Reconciliation is not a single behaviour but an interaction complex between actors and reactors.

De Waal (1986a;b) discusses several assumptions that are implicit in the term reconciliation. One, interactions in the post-conflict period are different than contacts in other contexts. Two, there is an attraction phase between opponents shortly after a conflict. Three, post-conflict contacts must be directed toward the former opponent. Reconciliation, by decreasing individual distances between former adversaries, has a social homeostatic function. In other words, reconciliation creates an "equilibrium between cohesive and disruptive social forces" among individuals of a group (de Waal, 1986a:341).

In the primate literature, little emphasis has been placed on the resulting reproductive success from reconciliatory behaviours, that is, from an ultimate causation perspective. Rather, studies of reconciliation are viewed from the perspective that social primates attempt to reduce the costs of competition while maintaining a "cohesive network of social bonds and mutual dependencies" (de Waal, 1986b:475). Reconciliation

studies and especially the work done by de Waal in *Chimpanzee Politics* (1982) describes reconciliation in terms of individual decisions regarding current social situations.

The resulting state of harmony, however, is probably not the reason - neither proximately nor ultimately - why group members buffer their aggression. Individuals decide on a day-to-day basis into which relationships they will or will not put efforts to resolve tensions. These decisions are undoubtedly guided by self-interest. Peace at the group level is, in this view, a product of selfish compromises at the individual level (de Waal, 1986a:341).

This approach emphasizes the dynamics of social relationships and thereby interpreting the supra-individual system in terms of alliances, coalitions, privilege and tolerance, and short and long-term goals of individuals.

Reconciliation by definition suggests that by the nature of the post-conflict interactions, these behaviours serve to maintain social bonds that might otherwise suffer from agonism. Reconciliation thus explains the so called paradox between sociability and aggressiveness of social primates.

PREVIOUS RECONCILIATION STUDIES

Eight studies have been conducted investigating reconciliation patterns in nonhuman primates. These studies suggest that agonism and reconciliation cannot occur, one without the other, and that peacemaking strategies are as much a part of the biological makeup of social primates as is conflict (de Waal, 1989).

Studies of reconciliation have been conducted on chimpanzees, *Pan troglodytes*

(de Waal and van Roosmalen, 1979); bonobos, *Pan paniscus* (de Waal, 1987); rhesus macaques, *Macaca mulatta*, (de Waal and Yoshihara, 1983); stumptail macaques, *Macaca arctoides* (de Waal and Ren, 1988); pigtail macaques, *Macaca nemestrina* (Judge, 1983); long-tailed macaques, *Macaca fascicularis* (Cords, 1988; Aureli *et al.*, 1989); and patas monkeys, *Erythrocebus patas* (York and Rowell, 1988). Each will be discussed in turn.

In 1979, de Waal and van Roosmalen established that among semi-free living chimpanzees, contact occurred between two opponents shortly after an agonistic interaction. These contacts were made up of specific behaviour patterns which occur rarely in other contexts. The researchers made a distinction between reconciliation and consolation behaviours. Consolation behaviours are defined as behaviours occurring between a former opponent and a third party individual shortly after a conflict. In chimpanzees, a "kiss" is characteristic of a reconciliation, whereas an embrace is characteristic of a consolation.

In chimpanzees, sex differences are apparent in respect to reconciliatory tendencies: males are more reconciliatory than females. This difference corresponds to the social organization of each sex. Male chimpanzees are more gregarious and more strongly bonded than females. The higher reconciliatory tendency of males in this type of social organization is advantageous for maintaining lasting relationships between potential allies. For example, if a relationship between two individuals is beneficial, then an unreconciled conflict may result in the disintegration of the alliance. Reconciliation would be the mechanism to reestablish the previous bond and the benefits associated with the alliance. As well, male chimpanzees formalize their respective hierarchical position

during almost every reconciliation (de Waal and Ren, 1988). In this respect, reconciliation can be viewed as a status ritual resulting in social unity (de Waal, 1982). Female chimpanzees, on the other hand, live in smaller more dispersed groups and so rely less heavily on other individuals. For this reason, females, more than males, are selective with whom they reconcile (de Waal, 1986a).

De Waal (1987) studied reconciliation in captive bonobos. Sociosexual behaviours were found to function in the regulation of tension in the group. The increase in frequency of these behaviours occurred during times of social tension or after agonistic interactions and may in part be a strategy for obtaining food resources. De Waal suggests that because grooming did not occur during times of intense agonism, grooming may instead "have a long term stabilizing effect on relationships rather than being the immediate coping mechanism that some of the other behaviours seem to be" (de Waal, 1987: 332).

In bonobos, the use of sexual behaviours in the context of reconciliation is in marked contrast to chimpanzees which rarely use sociosexual behaviours for tension reduction. As well, the most common behaviour of reconciling chimpanzees, kissing, was rarely seen in reconciling bonobos. De Waal (1987) suggests that these differences are due to the size and composition of foraging groups in the wild. Specifically, where chimpanzees travel in dispersed groups, bonobos travel in large, mixed gender parties. Thus in bonobos,

Coexistence of plural males and females
without agonistic competition in mating
could be guaranteed by changing the character of sexual behaviour into affective

behavior in which all individuals can participate, and by decreasing the reproductive meaning" (Mori, 1984:277).

De Waal and Yoshihara (1983) investigated reconciliation in rhesus macaques. In this species, reconciliation generally takes the form of embracing and lipsmacking. Redirected threats are also common at the time of reconciliation. The researchers found that rhesus macaques reconcile in relation to the general strength of the social bond of the two individuals prior to the agonistic interaction and regardless of relatedness. Because the probability of reconciliation is determined by prior social bonds, the researchers concluded that these post-conflict contacts serve to repair the relationship between the opponents.

Through research on social tolerance in rhesus monkeys, de Waal (1986a) revealed a division in the groups hierarchy. The division separated the individuals into two classes: the upper and the lower. The individuals of the upper class reconciled more often regardless of sex, whereas reconciliation occurred less frequently among individuals of the lower class. Conflicts between females of different classes reconciled significantly less often than any other category that was analyzed. De Waal attributes the difference of reconciliation tendencies to repairing relationships within social classes which leads to an increase in the likelihood of support and tolerance within that class. This repair is especially necessary among the higher ranking individuals to maintain the privileges that accompany their social class (de Waal, 1986a).

Another factor affecting reconciliatory tendencies in rhesus macaques is the intensity of the conflict. After a high intensity agonistic interaction, actors tend to groom

individuals who were not involved in the interaction, more often than base level grooming rates. This is termed re-directed affection. As the strength of the social bonds between actors and reactors increases, so does the probability of the occurrence of re-directed affection.

De Waal and Ren (1988) compared the results of the above research of rhesus monkeys to patterns of reconciliation in stump-tail macaques. Unlike rhesus macaques, stump-tails do not reconcile in relation to the strength of the social bond between individuals, rather, reconciliations were found to occur among all relationship classes. There are a number of different behaviours that may occur in the reconciliation process of stump-tail macaques. In many cases, actors showed "hold-bottom" and "genital inspection" behaviours whereas reactors showed "genital present" and grooming behaviours. The "hold-bottom" behaviour followed a pattern: the presentation is done by reactors and the "clasping of hindquarters" by actors. Because actors are generally the more dominant animal, the predictability of the direction of this behaviour appears to formalize the dominance relationship (de Waal and Ren, 1988). It is also interesting to note that first contacts are generally initiated by reactors whereas it is actors in rhesus macaques. In rhesus macaques, this is understood in terms of the subordinate being unwilling to approach the dominant individual due to "fear" (de Waal, 1986a).

York and Rowell (1988) examined reconciliation among female patas monkeys. They found that the female patas monkeys do not have explicit behavioural gestures for reconciliation, instead, reconciliation occurs in an implicit manner. Patas monkeys lack specific reconciliatory behaviours, however, "almost one-third of post-conflict

observations included affiliative behaviour between former opponents" (York and Rowell, 1988:502).

In addition, this study showed that matrilineally related individuals reconcile more often than unrelated individuals regardless of dominance rank. Interestingly, when an opponent contacted a third individual after a conflict, that individual was almost twice as likely to be a relative of the opponent. York and Rowell (1988:507) conclude that in patas monkeys "reconciliation may be not so much what you do, as whom you do it with."

It was hypothesized by de Waal (1986b) that a stable dominance hierarchy was important in the occurrence of reconciliation. However, the research of patas monkeys demonstrates reconciliation in a species which is considered to have a weak hierarchical basis as reversals in the dominance structure were common (York and Rowell, 1988).

Cords (1988) studied reconciliation tendencies in young male long-tailed macaques. This study, unlike the others, experimentally induced agonism. Cords found that the monkeys interacted sooner and more often in post-conflict situations than after neutral or affiliative interactions. This clearly illustrates that agonism does not necessarily have antisocial consequences. The data collected showed that non-kin pairs had more contact during periods of increased agonism whereas related individuals did not. This lead to the conclusion that "kin may be better able to tolerate conflict than non-kin, and so may resort to reconciliatory behaviour less readily than non-kin" (Cords, 1988:1134). The researcher also found that initiators of the reconciliation tended to be the actor of the conflict.

Aureli, Van Schaik and Van Hooff (1989) also studied reconciliation in long-tailed macaques. They found that there was a tendency to establish affiliative behaviours between opponents within the first three minutes after a conflict however these contacts did not consist of specific behavioural acts. Further, they found that reconciliation was more likely between opponents who were kin and between opponents who had strong social bonds regardless of relatedness. These conclusions are counter to those reported by Cords (1988) and possibly reflects the differences in the methodological approach between the two studies: Cords isolated juvenile males from the rest of the group and induced agonism. Aureli *et al.* on the other hand used all members of a captive group (except infants) and recorded reconciliation behaviours after naturally occurring conflicts.

Judge (1983) studied reconciliation in a group of pigtail macaques. Unlike other species, the actor reconciled with relatives of the reactor, and the reactor reconciled with relatives of the actor. This, the researcher suggested, is due to the prevalence of kin aiding in agonistic interactions, thus reconciling with kin reduced the likelihood of continued agonism by the opponent's kin.

In summary, researchers have found that reconciliation occurs in all social primates studied thus far, and that this behavioural pattern functions in group cohesion, conflict resolution and tension reduction. The differences that occur in specific opponent dyads in the post-conflict period generally depend on the relationship between the opponents prior to the conflict. Reconciliation is an important new line of research as it elucidates the presumed dichotomy between sociability and conflict in primate social groups.

Table 1.1
SUMMARY OF THE FACTORS AFFECTING RECONCILIATION
OF PREVIOUSLY STUDIED SPECIES

SPECIES	Degree of Relatedness	Social Bond Strength	Sex of the Opponents	Age of the Opponents	Initiator of Reconciliation
Chimpanzees (<i>Pan troglodytes</i>)	N.I.	N.I.	Dif.	N.I.	No
Bonobos (<i>Pan paniscus</i>)	N.I.	N.I.	No	No	A.
Rhesus Macaques (<i>Macaca mulatta</i>)	Dif.	Dif.	No	No	A.
Stumptail Macaques (<i>Macaca arctoides</i>)	Dif.	No	No	No	No
Pigtail Macaques (<i>Macaca nemestrina</i>)	Dif.	N.I.	N.I.	N.I.	NI
Long-tailed Macaques (<i>Macaca fascicularis</i>)	Dif.	Dif.	Dif.	N.I.	R.
Immature Long-tailed Macaques (<i>Macaca fascicularis</i>)	Dif.	N.I.	N/A	N/A	A.
Patas Monkeys (<i>Erythrocebus patas</i>)	Dif.	N.I.	N/A	N.I.	No

Dif. A difference was observed in the reconciliatory patterns
 No No difference was observed in the reconciliatory patterns
 N.I. No information was provided
 N/A Not applicable
 A. Actor of the Conflict
 R. Reactor of the Conflict

Reconciliation has been studied in seven species of primates thus far. All studies have been conducted in captive situations. Reconciliation now needs to be investigated in more species to determine the variability of the post-conflict behaviours and to determine the role of the environment on these behaviours. Specifically, studying the differences in reconciliation behaviours in varying living conditions, (e.g. captive versus feral groups) and varying sizes of social groups should provide a fuller understanding concerning the interaction between conflict and reconciliation, reconciliation and the social environment, and reconciliation and the physical environment.

OBJECTIVES

This study will supplement the primate literature by identifying patterns of reconciliation in Japanese macaques (*Macaca fuscata*), a previously unstudied species for this research area. This project is also the first reconciliation study on a large, naturally occurring troop of semi-free ranging primates.

This study was conducted in an attempt to answer the following questions: 1) Do Japanese macaques reconcile after a conflict? If yes, then 2) What are the diagnostic behavioural patterns of reconciliation? 3) Does kinship, social bond strength, sex of the opponents, age of the opponents and the intensity of the conflict affect the pattern of reconciliation? 4) If differences occur in the frequency of reconciliation behaviours between different categories of individuals, can this be attributed to specific inter-individual processes between the opponents? In other words, do the behaviours in the post-conflict period follow patterns that reflect aspects of the relationship between the

opponents involved (*e.g.* dominant or subordinate; kin or nonkin)?

OVERVIEW OF THESIS

This thesis explores the pattern of reconciliation among the Arashiyama West Troop of Japanese monkeys at the South Texas Primate Observatory by discussing the field data qualitatively and quantitatively. Chapter two begins the discussion by presenting a qualitative description of the conflict and post-conflict periods. This chapter is included to provide a foundation for the main body of the text through accounts of specific field experiences.

Chapter three presents the methods of the research. A brief description of Japanese monkeys is given as well as a description of the study troop, the research area and the data collection methods.

Chapter four contains a quantitative analysis of the data. This analysis addresses two questions. Firstly, it addresses the question of whether reconciliation occurs in Japanese monkeys. To answer this, a comparison is done between interactions in post-conflict contexts and non-conflict contexts. The differences are discussed in terms of the conditions that must be met for interactions to be considered reconciliation.

Secondly, chapter four addresses the question of whether diagnostic patterns of behaviour occur in the post-conflict period. The patterns of behaviour that are discussed are broken down into four sections: first obvious behaviours directed toward the opponent, less obvious interactions between opponents, post-conflict third party agonism and third party consolation.

Chapter five also deals with quantitative data. This chapter addresses the question of whether relatedness, social bond strength, sex and age of the opponents, and conflict intensity, determine the likelihood of a reconciliation interaction. This was accomplished by statistically testing for significance each of the variables (kinship, social bond strength, sex and age of the opponents, and conflict intensity) against the post-conflict behaviours isolated in chapter four.

Chapter six discusses the reconciliation patterns revealed in chapters four and five in terms of inter-individual processes between the opponents. De Waal's reconciled hierarchy model is used as a possible explanatory framework, and in addition, the influence of kinship and social bond strength on reconciliation patterns are discussed in greater detail.

Chapter seven concludes the thesis with an overview of the key changes in the primate literature concerning conflict interactions. Then, a summary of the results and the ideas in the thesis are presented.

CHAPTER TWO

FIELD MOMENTS: A QUALITATIVE DESCRIPTION

INTRODUCTION

This chapter presents qualitative descriptions of conflict and post-conflict periods. These descriptions are included to provide a backdrop for the main body of the text through accounts of specific field experiences. An attempt is made to illustrate the variability of the situations and of the personalities of the monkeys.

THE CONFLICT PERIOD

At Arashiyama West, conflicts occurred often among the members of the troop. Fighting was more frequent during the cooler parts of the day, the morning and the evening, and during the cooler months of the year.

The conflicts varied in intensity and in the situations leading up to them. The intensities ranged from fear grimaces to serious woundings. During many of the conflicts, the loud vocalizations by the opponents drew my attention and the attention of other monkeys. During the first part of the study, most conflicts appeared to be "all show", that is, little physical contact was made and few injuries resulted. However, during the mating season, woundings were relatively frequent. These woundings included lost canines, canine punctures, torn ischial callosities and scratches. Small amounts of blood on the hair, and limping, were common.

Situations leading up to the conflict were varied. For many conflicts the immediate cause can only be described as "unprovoked." A classic example involved the alpha male Rocky and a low ranking adult female, Patty. Patty and her sister were

sleeping about two meters apart. Rocky passed the sisters and sat about four meters away. After a short time, Rocky walked toward Patty, bent down and tried to see the face of the sleeping monkey. A few seconds later, Rocky grabbed Patty, pinned her down with his teeth, and pinched her forcefully. Patty's screams were accompanied by the screams of her sister who ran around them for the duration of the conflict.

More commonly, unprovoked incidents were initiated as one monkey walked by another. These generally consisted of threats and chases. Frequently during the mating season males would initiate conflicts with a series of females, one after another. Many times the lower ranking females took the brunt of these actions.

In other situations, reasons for the initiation of the conflicts were obvious. Infants were often the centre of the cause. On one occasion, an old adult female, number 58 approached too close to Lady Di's young infant, the infant at the time had wandered away from his resting mother and twin brother. Lady Di lunged and grabbed 58, then retrieved her offspring. The conflict was brief, however, it left 58 with a small wound on her right arm.

Adult males were observed pushing infants away apparently to avoid confrontations with the mother although the attempt was not always successful. In these cases, mothers would hesitantly threaten the male, grab the infant and leave immediately.

On a number of occasions, individuals would initiate a conflict much to the 'surprise' of the opponent. In these situations, a mistake or an accident lead up to the conflict. For example, a mother, Fatsu Matsu and her daughter Patty were sitting and resting within a meter of each other when the daughter's two year old offspring ran up,

bumped her grandmother and ran off. Fatsu Matsu turned and slapped Patty to the daughter's apparent surprise since she appeared to be unaware of what her offspring had done.

Another situation involved a young adult female, Julie and her two offspring. Julie's four year old daughter carried away her infant brother and began playing with him on the climbing structures. The problem arose when the infant got his head caught between two pieces of wood. The screaming infant brought Julie over immediately, threatening and grabbing the older sibling, and pulling at the infant. The daughter began screaming and jumping around, however, she did not move far away. In the end, the mother carried off the infant, who finally freed himself from the wood slats, leaving the daughter behind.

These brief descriptions attempt to illustrate the diversity of conflict situations that can arise and the variability of factors involved.

THE POST-CONFLICT PERIOD

The post-conflict period is complex due to the interactions between opponents, responses by other monkeys to the conflict, and the idiosyncrasies of each monkey involved. Presented here are several field situations that attempt to show this complexity.

On several occasions, it appeared that a third monkey acted to buffer the tension between the two opponents. One incident went as follows. A mother, number 58, was being groomed by her adult daughter, Nubbin. After some time, 58 kicked Nubbin who immediately jumped back. Nubbin attempted to approach her mother a few seconds later

but was chased away. After the short chase Nubbin fear grimaced to 58, and both mother and daughter sat down. Nubbin got up and walked over to her older sister Julie who was sitting about ten meters away from them. 58 who had been sitting with her back to her daughters turned, and then walked toward them and sat down beside Nubbin. The three of them were now sitting very close together. About 15 seconds later, Nubbin moved to the other side of Julie thereby placing Julie between herself and her mother. At this time the opponents sat with their backs to one another. Nubbin then moved to about four meters away but reapproached about one and a half minutes later to sit beside her mother. 58 presented herself for grooming and Nubbin responded by grooming her mother, however she appeared hesitant. The opponents in this incident spent most of the post-conflict period in the vicinity of Julie and thus Julie may have acted as a buffer between them.

A second possible example of a buffering of tension occurred after a conflict between a high ranking female, Adrienne and a two year old female, in the presence of the alpha male, Rocky. After the conflict the young female sat directly behind Adrienne who was sitting beside Rocky. After about 20 seconds, Adrienne got up and moved to the other side of Rocky, thereby putting Rocky between the two opponents. This seating arrangement lasted for just over four minutes. At that time, Adrienne moved off leaving Rocky and the young female behind.

Another interesting example of an interaction in the post-conflict period occurred after a low intensity conflict between a mother, number 92, and her young adult daughter, number 623. 92 and 623 settled down to rest immediately after the conflict, when at this

time, Fang, the son of 92 and the brother of 623, also the second ranking male of the troop, walked over and climbed on to a wooden structure that overlooked 92 and 623. Fang stayed on the wood structure apparently watching his mother and sister for four and a half minutes before leaving. Interestingly, shortly after Fang left, 92 moved away from her shaded sleeping area to sit and watch her son attacking the alpha male's sister.

The personality of each monkey appears to influence the rate of conflict and the behaviours directed toward the opponent. One example of an idiosyncrasy is by the old adult male, Groucho. Groucho was observed on two occasions to manipulate objects in the presence of his opponent shortly after the conflict. In one case he appeared to 'pretend' to feed as he was picking up and moving around kernels of corn. After another conflict, he sat with his hand close to his face looking intently at it, turning it over and looking at it again.

Another example of an idiosyncrasy comes from a monkey named Scooter. Scooter, a six year old peripheral male, would occasionally move in closer to the main troop. At these times many of the other monkeys would back away from him, leaving what looked like a corridor for him to walk through. I did not see this type of behaviour for any of the other monkeys. This may be explained by his temperament as indicated to me in the initial stages of the project. Scooter regularly went out of his way to visually and vocally threaten me and his attempts to slap me were not uncommon.

Presented here are several brief anecdotes of field situations of the Japanese monkeys in Texas. During the first part of the field study, little was observed to indicate that reconciliation was involved in the behavioural patterns of the post-conflict period.

However, as more and more post-conflicts were observed certain patterns became evident in spite of the complexity and variability present.

CHAPTER THREE METHODS

INTRODUCTION

This study is an investigation of the reconciliation patterns of Japanese macaques (*Macaca fuscata*). The study group was located at the South Texas Primate Observatory, in Dilley, Texas. Unlike the previous studies which focused on reconciliation in captive situations, the present research was conducted on a semi-free ranging troop.

This chapter outlines the research project with a description of Japanese monkeys, the study troop, and the research area. Then, the chapter presents the data collection methods and the ethogram.

THE STUDY SPECIES: JAPANESE MONKEYS (*Macaca fuscata*)

Japanese macaques are medium sized, omnivorous monkeys indigenous to Japan. They live in multifemale, multimale groups with a definite mating and birthing season. The species displays a moderate degree of sexual dimorphism and females exhibit minimal sexual swelling.

Social Organization

Theoretically, Japanese monkey troops are arranged in concentric circles (Bramblett, 1976). The innermost circle consists of dominant males and dominant females with their adult female kin and their juvenile offspring and infants. The next circle out consists of the peripheral animals, usually younger males and males with low status. The furthest circle out consists of solitary or semi-solitary males.

Female lineages are important in the social organization of Japanese monkeys.

Females stay in their natal troop for life and are bonded with their maternal relatives. Males on the other hand, become peripheral to the group at about the time of sexual maturity. They may live a solitary or semi-solitary life for a number of years before entering a non-natal troop at some later date. In this species, offspring acquire their rank in the social group from their mother. Within the family, the youngest offspring is more dominant than older siblings in conflicts when the mother is present. When the mother is not present, the older sibling may be dominant.

The Study Troop

In 1954, research by Japanese primatologists began on the study troop which, at this time, still resided on the Arashiyama mountains in Japan. As a result of provisioning, the troop grew from 47 animals in 1954 to 163 animals in 1966. In 1966 the troop fissioned. After the split, one of the daughter troops, troop A, moved down the slopes of the mountains and subsequently became a problem to the residents of the area. Because the monkeys became a public nuisance, a search began to find a suitable site for them to live. In February 1972, troop A was captured and transported to Texas in its entirety (Bramblett, 1976).

Troop A now exists as a natural, semi-free ranging group on a private ranch near the town of Dilley, Texas. Dilley is situated about halfway between San Antonio and Laredo and lies within the lower Sonoran life zone (Lapedes, 1974). This life zone consists largely of thorn and scrub-brush.

The site is 58 acres in size and is enclosed by a 8 foot fence. The monkeys,

numbering over 500, have access to two large fields, two ponds, several water spigots, and a ravine extending the length of the enclosure. Numerous artificial wood structures are on the site which the monkeys use for climbing and for protection from the elements.

The monkeys are fed once a day. Their diet consists of corn, milo, cattle cubes and monkey chow. On occasion, fresh produce is brought in from San Antonio. Natural forage such as mesquite, cactus and wildflowers is also available on the site.

The animals are identified by a facial and leg tattoo. These tattoo numbers access genealogical, birth, death, and injury information. These records continue to be updated on a daily basis. Human intervention is kept at a minimum, however the monkeys are habituated to the presence of researchers.

DATA COLLECTION METHODS

I now turn to a description of the data collection methods used for the study of reconciliation in Japanese macaques. In this section the subject animals used are identified, the four types of data that were collected are discussed and the ethogram is presented.

The Subject Animals

The monkeys used in this study as focal animals consisted of a sample of 18 individuals ranging in age from 5 to 26. Animals were included in the sample representatively across age, sex, and rank categories. One animal was selected for each cell specified in table 3.1. The number within each cell corresponds to the tattoo number

of the subject animal used in the study. In many of the cases, these monkeys were chosen because their tattoos were clear and/or they were individuals with distinguishable characteristics. This allowed for easy identification by the researcher especially at the beginning of the research period. In addition, an attempt was made to include as many of the central troop monkeys in the focal sample as this would increase the likelihood of sighting as many of the focals at any one time however, this was not always possible. In several cases the focal monkeys were peripheral individuals of the main troop.

Table 3.1
SUBJECT MONKEYS

Females:				Males:			
<i>AGE</i>	<i>Rank</i>			<i>AGE</i>	<i>Rank</i>		
	high	medium	low		high	medium	low
old	#26	#58	#60	old	#129	#143	#134
middle	#3	#477	#227	middle	#239	#260	#12
young	#623	#305	#361	young	#624	#472	#402

The subjects were grouped into three categories according to age. The age categories take into account the differences in life expectancy between males and females. These categories are as follows: young adult (males and females: 5-10 years), middle adult (males: 11-17; females: 11-19 years), and old adult (males: 18 + years; females: 20 + years) (McDonald, 1988; McDonald Pavelka, per.com., 1990). Individuals were also

classified into rank categories: low, medium, and high, as identified from the long-term observations by the director of the facility.

Types of Data Collected

The study was conducted between July and November 1990. The majority of the data were collected in the morning and early afternoon (0700 - 1400 hr) and included feeding and nonfeeding times. 180 conflicts were used in the analysis of this study. Four types of data were collected: Conflict data, post-conflict data, matched-control data, and scan samples. The collection methods of each will be described.

Conflict Data

The first type of data is the conflict data. On a day-to-day basis, the researcher would locate the troop and situate herself in a manner that allowed her to observe as many focal monkeys as possible. At this point the monkeys were observed until a conflict occurred. No particular order of focal monkeys was maintained in the collection of the data. The collection of conflict data began when one of the subject animals was seen to be involved in a conflict, and the opponent could be identified by the researcher. As often conflicts were triadic or polyadic interactions, I had to be sure of the identification of the main opponent. Only two monkeys were listed as opponents in the conflict for the purposes of this study. The monkeys involved were identified and their tattoo numbers recorded. One monkey was designated as the actor, and the other monkey as the reactor. The designations of actor and reactor were used instead of aggressor and

aggressee because of the connotations associated with the word aggression. The actor was regarded as that opponent who took the offensive role in the conflict. This monkey was often, but not always, the initiator of the conflict. For instance, one monkey may direct a facial threat at another but then in response to this threat the second monkey will initiate a chase and grab sequence. The reactor was regarded as the opponent who took the defensive or submissive role in the conflict.

In order to reduce the potential sources of variation in this initial study of reconciliation, conflicts involving infants and conflicts involving consortships were not included.

Conflict data are a list of ad lib entries made just prior to the collection of the focal animal data (discussed below). The list describes the conflict using ethogram units (*e.g.* vocal threat, lunge, fear grimace) and identifies which opponent displayed which behaviour.

The conflict data were used in the analysis to identify how variations of the conflict interaction affect the pattern of reconciliation. The variables of the conflict interaction used in the analysis were selected prior to the field work and were derived from the literature. These variables are conflict intensity, relatedness, social bond strength, sex of the focal monkey, and sex and age of the opponents.

Conflict intensity: During the initial stages of the analysis the conflicts were categorized into three intensity levels following the groupings of agonistic confrontations by Kurland (1977). Kurland created a set of six agonistic behavioural complexes of Japanese macaques. These complexes are based on "the tendency of any animal to give

a particular agonistic display if another one is displayed" (Kurland,1977:73). The results of the analysis showed that there are three offensive behaviour complexes -threat, attack and punish, and three defensive behaviour complexes - submit, appease, and fear. Although Kurland stated that the terms he used indicated the relative intensities of the agonism, he did not pursue the subject further.

I followed Kurland's agonistic behavioural complexes to group the conflicts into three levels of intensity, low, medium and high. Kurland's threat and submit complexes define the category of low intensity conflicts. These complexes include visual and vocal threats, lunges, fear grimaces and cowering.

Kurland's punish, attack and fear complexes define the categories medium and high intensity conflicts. The agonistic behaviours of these complexes include pulls, pushes, grabs, cuffs, bites, chases and screams. These behaviours generally occur in combination with low intensity behaviours. Medium and high intensity categories are distinguished by the number of behaviours involved and the severity of the attack. For the most part medium intensity conflicts include the above behaviours when they occurred up to two times, and screaming in response to a threat. Prolonged conflicts, especially those involving strike and counter-strike sequences, and all pin-and-bite interactions were considered high intensity conflicts.

Kurland's "appease" category of lip-smacks and quacks was not included in the conflict analysis as these behaviours were considered as part of the reconciliatory not the agonistic complex.

Relatedness: From the records of the research facility the degree of relatedness

between actors and reactors was ascertained. The data were broken down into four categories depending on the percent related - based on maternal relatedness only: 0% (unrelated); 12.5% (aunt-niece/nephew); 25% (sibling; grandmother-granddaughter/son); and 50% (mother/offspring). For the purpose of this study, relatedness of less than 12.5% is considered to be non-kin.

Social bond strength: The social bond strength between the focal monkey and the opponent monkey describes the strength of their social ties as compared to other monkeys of the troop. Social bond strength is discussed in greater detail in the scan sample section below.

Sex of the focal animal: The sex of the focal animal is classified as either female or male.

Sex of the opponents: The sex of the opponents identifies the sex of the focal animal and the sex of the opponent animal (in no particular order). The conflicts are classified as either female-female, female-male, or male-male conflicts.

Age of the opponents: From the records of the facility, age was calculated for each subject animal and each opponent. Age for each individual was grouped into one of three categories: juvenile (1-4 years), young adult (5-10 years), and old adult (11 years and older). Age was not broken down into smaller categories so as to maintain an adequate sample size for each group. The age categories of the opponents were then grouped as per the conflicts: juvenile versus young adult, juvenile versus old adult, young adult versus young adult, young adult versus old adult, and old adult versus old adult. Because only adults were used as subject animals there is no juvenile versus juvenile

conflict category.

Summary: From the variables just described, two summaries of the conflicts were created. First, the total number of conflicts for each factor (conflict intensity, relatedness, etc.) are presented. Second, in table form, the number of conflicts for each variable is listed for each subject animal.

65 of the conflicts were low intensity, 74 were medium intensity conflicts and 41 were high intensity conflicts.

161 of the conflicts observed were between unrelated individuals, individuals that were 12.5% related constitute 1 of the conflicts, individuals that were 25% related made up 5 of the conflicts, and 13 of the conflicts were between 50% related individuals.

Social bond strength is broadly represented ranging from opponents that were never seen together to opponents that were observed engaging in social activities often.

90 of the conflicts had a female focal monkey and 90 had a male focal monkey.

109 of the conflicts were between a male and a female, 51 were between two females, and 20 conflicts were observed between two males.

4 conflicts were between a juvenile and a young adult, 17 were between a juvenile and an old adult, 20 were between two young adults, 67 were between a young adult and an old adult, and 72 were between two old adults.

A summary of the conflicts is now presented based on the categories of the conflicts just described for each of the subject monkeys.

Table 3.2
SUMMARY OF CONFLICTS

Subject Monkey	Conflict Intensity			Kinship (%)				Sex of the Opponents			Age of the Opponents				
#	L	M	H	0	12	25	50	F-F	F-M	M-M	J/Y	J/O	Y/Y	Y/O	O/O
Females															
26	2	6	2	10	0	0	0	7	3	0	0	2	0	4	4
58	4	4	2	6	0	0	4	5	5	0	0	2	0	1	7
60	6	3	1	7	0	0	3	5	5	0	0	2	0	1	7
3	1	7	2	10	0	0	0	6	4	0	0	1	0	3	6
477	2	5	3	8	0	2	0	5	5	0	1	0	4	5	0
227	6	2	2	9	0	0	1	8	2	0	0	1	0	3	6
623	5	2	3	9	0	0	1	7	3	0	2	0	4	4	0
305	6	3	1	6	0	1	3	7	3	0	0	4	0	3	3
361	5	3	2	9	0	0	1	1	9	0	1	0	1	8	0
Totals:	37	35	18	74	0	3	13	51	39	0	4	11	9	34	32

Continued....

Continued... Table 3.2 Summary of Conflicts

Subject Monkey	Conflict Intensity			Kinship (%)				Sex of the Opponents				Age of the Opponents			
#	L	M	H	0	12	25	50	F-F	F-M	M-M	J/Y	J/O	Y/Y	Y/O	O/O
Males															
129	4	3	3	9	0	1	0	0	10	0	0	2	0	1	7
143	2	3	5	10	0	0	0	0	9	1	0	1	0	5	4
134	4	2	4	10	0	0	0	0	9	1	0	0	0	4	6
239	5	3	2	9	0	1	0	0	6	4	0	0	0	4	6
260	1	6	3	10	0	0	0	0	7	3	0	2	0	3	5
12	4	5	1	10	0	0	0	0	7	3	0	0	0	3	7
624	1	6	3	9	1	0	0	0	7	3	0	0	5	5	0
472	3	6	1	10	0	0	0	0	9	1	0	0	5	5	0
402	4	5	1	10	0	0	0	0	6	4	0	1	1	3	5
Totals:	28	39	23	87	1	2	0	0	70	20	0	6	11	33	40

L - low; M - medium; H - high

F-F - female, female; F-M - female, male; M-M - male, male

J/Y - juvenile/young adult; J/O - juvenile/old adult;

Y/Y - young/young; Y/O - young/old adult; O/O - old/old adult

Post-Conflict Focal Animal Data

The second type of data is the post-conflict focal animal data. The focal sessions were one hour in duration and commenced at the end of a conflict - a conflict which met the conditions described earlier. This focal session is termed the post-conflict data (de Waal and Yoshihara, 1983). Post-conflict focal animal data (Altman, 1974) were collected for 10 conflicts per subject monkey for a total of 180 conflicts. All behaviour was recorded including the time of onset and completion, other individuals involved, and whether the behaviour was done by, or done to, the subject animal. States and events were recorded. A state is defined as behaviours whose duration is longer than a few seconds, such as grooming or sleeping. Events are behaviours that are more or less instantaneous, such as a facial threat or a vocalization. Special attention was given to those behaviours directed toward the opponent. The ethogram units used in this study are presented in table 3.3.

Matched-Control Focal Animal Data

The third type of data is the matched-control focal animal data (de Waal and Yoshihara, 1983). One hour matched-control samples were collected using the same procedures as that of the post-conflict focal animal sessions. The data were collected in pairs: one matched-control focal session was conducted for each post-conflict focal session. Both sessions were conducted on the same focal monkey. The matched-control data represent nonpost-conflict behaviours of the focal monkey thus they provide the base-line interaction pattern between the two opponents.

The matched-control focal animal sessions were conducted on the next possible day after the post-conflict focal animal session. A total of 180 matched-control focal animal sessions were conducted, one for each of the post-conflict focal animal sessions. In several of the previous studies, the matched-control data were conducted at the same time on the day following the post-conflict session. Under the semi-free ranging conditions of this study it was not always possible for the matched-control data to be collected precisely 24 hours later, however the matched-control sample was taken at the next available and appropriate time.

Scan Samples

The fourth type of data are the scan samples. Scan samples were conducted to determine the social network of the subject animals. Specifically, the data identifies the individuals with whom the focal animal interacts and the proportionate amount of time the focal animal spends with each. Scan samples consist of state behaviours of the subject animal as well as the individuals with whom the subject animal was in proximity and with whom it interacted.

186 scan samples were conducted. Each sample was 30 minutes in duration. An attempt was made to locate all subjects, however, those subjects not found within the 30 minute scan were given a "NO" (not observed) entry.

During the analysis, a list was compiled for each of the subject animals. Each list contained all the animals recorded on the scan samples that were seen with the focal monkey. The frequencies with which they were seen was also recorded. To examine the social network of the focal animal, each frequency was then changed to a percentage of

the total number of times the focal monkey was observed. Because the focal animals were not found during every scan sample, the total number of observations for each is different. Thus the number of observations of social contact with each interactant is expressed as a proportion of the total number of scan sample observations for that subject animal.

Presented here is an example of the social network scores as identified by the scan samples. The subject #623 was observed in social contact with #92 24 out of 161 total observations. This represents 14.9% of the total time #623 was observed. #623 and #396 were observed 8 out of 161 scan samples or 5.0% of #623's total observation time; for #623 and #449, 3 out of 161 scan samples or 1.9%; and #623 and #705, 1 out of 161 scan samples or .6%. The percentages thus represent a measure of the strength of the social bond between the two individuals. These scores thus indicate that #623 spent more time with #92 than with the others therefore #623 has a stronger social bond strength with #92 than with #396, #449 or #705. Similarly, #623 has a stronger social bond strength with #396, than with #449 and #705, but #623 and #396 has a weaker social bond strength than between #623 and #92.

All data for this study were collected using pencil and paper, by the observer. A stopwatch was used to measure durations of focal and scan sessions, and state behaviours.

Table 3.3
THE ETHOGRAM
 (adapted from Fedigan, 1976)

Term	Definition
Sit:	to be in a sitting posture and not performing any other of the behaviours in this ethogram.
Sit Near:	two monkeys sit within one meter of each other.
Sit Far:	two monkeys sit between one and two meters of each other.
Huddle:	to sit in bodily contact with another monkey or monkeys.
Lie:	differing from Sit only in the posture of the monkey.
Lie Near:	two monkeys lie within one meter of each other.
Lie Far:	two monkeys lie between one and two meters of each other.
Stand:	four-legged stance, usually a transitional behaviour between sitting and travelling or other movement patterns. Occasionally a monkey may simply remain in this pose for some time, giving the impression of indecisiveness.
Bipedal:	to stand up on the two hind limbs and look around attentively. This is an attentive, locating behaviour, performed predominantly during foraging trips.
Climb:	simple act of ascension by using the hands and feet. Climbing is used to obtain food from trees and bushes; to obtain a better view; and it is also the behaviour which follows a troop alarm.
Sun:	on clear mornings after cold or wet winter nights, the monkeys sit in exposed locations in a characteristic posture with the head and shoulders thrown back and chest exposed to the sun.
Swim:	occurs in the two artificial ponds in the enclosure. It may involve play behaviours, or may simple resemble a sedate stroll across the pond, apparently as a cooling device in the summer.
Sleep:	in a sitting or lying posture a monkey closes its eyes and is assumed to be asleep.
Jump startle:	a sudden explosive movement of the body in place, occurring when a monkey is caught unaware, for example when another monkey is not heard to approach but is suddenly seen at close range.
Run startle:	a sudden explosive movement across space, caused by sighting a fearful stimulus.
Run with troop:	after an alarm, the majority of the troops runs in fright, usually all in the same direction toward trees or shelter.
Approach:	a direct advance by one monkey towards another, almost always preliminary to a social interaction such as groom solicitation. An

Continued...

Continued... Table 3.3 The Ethogram

Term	Definition
Follow Near:	approaching monkey is usually dominant over the approached, or else signals friendly intentions as it approaches.
Follow Far:	to travel up to one meter behind and in the path of another monkey. to travel between one and two meters behind and in the path of another monkey.
Contact calling:	vocalizations commonly used as the troop moves through the brush, possibly to locate specific troop members such as mother, offspring, etc. Occasionally a monkey simply sits and calls, apparently trying to locate or make contact with some unknown individual.
Travel:	to move across the ground, at a walking speed.
Lope:	locomotor pattern of moving quickly in a swinging stride.
Forage:	to eat native vegetation.
Drink:	usually at the two artificial ponds or spigots, occasionally from puddles.
Mouth-to-mouth:	one monkey places its mouth directly on another's mouth and sniffs intently, apparently in an effort to determine what the latter is eating. Mouth-to-mouth is frequently seen when an individual tries a new food and when infants are learning which plants to eat by observation of their mother's foraging patterns. Mouth-to-mouth seems a very 'familiar' gesture and individuals may react with screams or threats if muzzled by a nonrelated monkey. It is even sometimes used as a form of harassment when young monkeys repeatedly muzzle sick or old monkeys.
Look:	monkeys in general do not watch one another directly or obviously. However, on certain occasions they may be seen to do so: a monkey may watch intently what another eats, or the progress of a quarrel or courtship between two other monkeys. Occasionally also deliberate visual attention is apparent when environmental stimuli are monitored, e.g., watching a snake cross a path.
Smell:	a monkey places its nose close to an object (plant, other monkey, dead animal, etc.) and sniffs.
Groom solicitation:	a monkey presents a portion of its body (chest, back, etc.) to another monkey at very close range.
Groom:	one monkey inspects and cleans the fur of another. This is done with a gently rhythmical pattern of fur separation, scratching at the

Continued...

Continued... Table 3.3 The Ethogram

Term	Definition
Warble:	<p>skin and stroking pulls of the fur. A groomed monkey assumes a languorous posture which indicates the sensual aspects of this interaction. Monkeys groom in the absence of objects to remove from the fur, and for far longer periods than necessary for simple cleaning. Grooming is an affiliative behaviour.</p> <p>vocalizations of a tremulous quality, given when two monkeys encounter one another and some tension exists in the situation. Warbles serve to assure the other monkey of friendly intentions and a certain amount of 'flattery' (Itani, 1963) is involved as it is usually the subordinate or more nervous monkey who gives the sounds. Examples are when young males approach peripheral males, and when young females entice infants of dominant females to interact under the watchful eye of the mother.</p>
Lunge:	a plunge forwards toward an opponent in an agonistic encounter, followed by quick retreat.
Slap:	the first monkey hits the second with the flat of its hand. An aggressive gesture occurring during agonistic encounters.
Visual/vocal threat:	consists of the following agonistic signals: stare, lid, gape, and growl. The components are rapid and flexible in combination and sequence, thus they are combined into this 'threat' unit.
Pinch or grab:	to take hold of another's body by the hand and squeeze to the point of causing pain.
Pull or push:	to attempt to move another monkey by applying pressure.
Bite:	to seize another with the teeth.
Chase:	to pursue another monkey with accompanying agonistic signals, indicating the intent is to do harm or drive away the chased individual.
Displace:	<p>one monkey moves toward another who immediately moves out of the former's way. Frequently the displacer will sit down or stand in the exact location the displaced has just vacated. Although not as physically aggressive as some other agonistic gestures, 'displace' is usually a very clear indication of relative dominance status.</p>
Scream:	<p>a loud, shrill vocalization indicating distress. A scream may be directed into the face of an opponent monkey, it seems to also function to inform the surrounding animals that an agonistic encounter is taking place and the screamer desires help. Thus it is</p>

Continued...

Continued... Table 3.3 The Ethogram

Term	Definition
	not clearly either an aggressive or a submissive signal.
Fear grimace:	a submissive visual signal in which the lips are retracted from the teeth, with the teeth clenched.
Seek aid or aid:	an individual in a dispute screams and looks repeatedly toward an uninvolved monkey for support, or else seeks to put this other animal between himself/herself and the opponent.
Support:	an animal A enters an ongoing dispute in which a relative (A) is involved and directs aggressive signals at the opponent monkey (B). Usually both A and A continue to direct aggression together at B. They may be counterattacked by B or B's relatives.
Present:	a gesture of orienting the hindquarters toward another while sitting with the posterior raised slightly off the ground.
Mount:	A stands up against the back of B, braces his feet on B's calves and his hands on B's back. Mounts can occur between a male and female, two females or two males.
Lip smack:	a rapid up and down movement of the lips over the teeth with the lips slightly pouted. It appears to be a reassurance signal used in social situations in which there might be some tension. Its most frequent use is by males in courtship interactions.
Reach:	a mounted monkey reaches a hand back and grasps the leg or other body part of the mounter.
Look back:	a mounted monkey twists its head and body around in order to make visual contact with the mounter.
Estrus hack:	vocalization given by females in estrus. Some elements of sexual frustration or dissatisfaction are involved (Itani, 1963). This vocalization strongly resembles 'wean sounds'
Masturbate:	self-manipulation of the genitals.
Play:	a group of fairly stereotyped behaviours: cuffing, pulling, mouthing or jumping on with accompanying play face expression.
Object manipulation:	sustained handling of a small mobile object which is not a food item.
Infant on:	to assist the infant in keeping up with the troop during movement, mothers and/or other animals often carry infants clinging to their bellies or riding 'jockey style' on their backs.
Suckle:	to suck milk from the breast.
Wean tantrum:	melodramatic outbursts of rage given by young monkeys when

Continued...

Continued... Table 3.3 The Ethogram

Term	Definition
Retrieve:	repeatedly denied access to the nipple, they consist of screaming and aggressive signals directed at the mother and nearby individuals, as well as flinging oneself disconsolately on the ground. an individual hurries over to an infant in a stressful situation and carries it away.
Hold:	a gesture of holding an infant by the foot, hand or tail, while the infant struggles to continue some exploration upon which it had been intent.
Display:	a vigorous locomotor pattern which calls attention to the actor, a display usually involves hearty shaking of some large flexible item in the environment, such as branches, poles, etc. Display is sometimes accompanied by grunting vocalizations.
Move:	the act of shifting in location but maintaining the same general position. This shifting is of limited distance, usually about .5 meters.
Pass Near:	to walk in front of another monkey up to one meter away. The other monkey is generally in a sitting position.
Pass Far:	as above but the pass is between one and two meters away from the other monkey.
Feed Near:	two monkeys feed within one meter of each other.
Feed Far:	two monkeys feed between one and two meters of each other.

CHAPTER FOUR

IDENTIFICATION OF RECONCILIATION PATTERNS

INTRODUCTION

This chapter contains a quantitative analysis of the reconciliation data recorded in the field. This analysis addresses two questions. Firstly, it addresses the question of whether reconciliation occurs in Japanese monkeys. Secondly, this chapter addresses the question of whether diagnostic patterns of behaviours occur in the post-conflict period. In many cases, these are discussed in terms of actor and reactor patterns.

DO JAPANESE MONKEYS RECONCILE?

The following is an analysis to determine whether Japanese monkeys reconcile after a conflict. Statistical tests were conducted to see if the post-conflict interactions meet the conditions of the concept of reconciliation put forth by de Waal (1986a). The first condition tested was whether an attraction phase occurred between opponents in the post-conflict period. The second condition tested was if behaviours in post-conflict interactions were different than those in non-conflict interactions. Lastly, the data were examined to determine if the occurrence of reconciliation behaviours affects the likelihood of continued agonism in the post-conflict period.

Attraction

The first condition of the concept of reconciliation is that there is an attraction phase between opponents in the post-conflict period (de Waal, 1986a). To test whether this occurred among Japanese monkeys, interaction levels were compared to base line

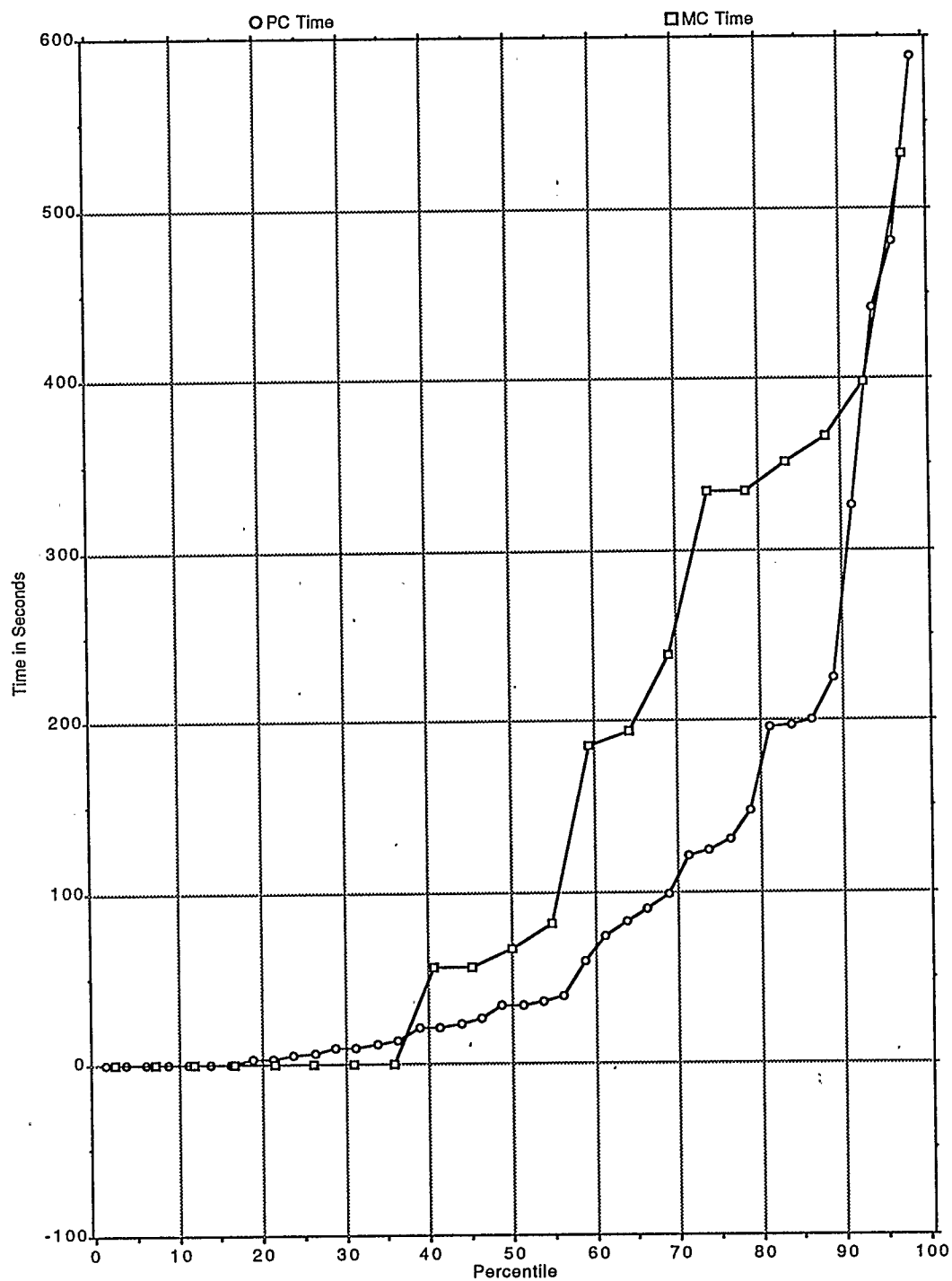
activity patterns between the same opponents. This base line activity pattern was established from the matched-control focal animal sessions.

The test was conducted to determine if the null hypothesis holds true. The null hypothesis is that agonistic interactions do not increase the probability that the opponents will contact each other in a non-agonistic manner. If the null hypothesis does not hold true then an attraction between opponents can be demonstrated. At this point, it will be possible to state that these interactions have met the first condition of the concept of reconciliation.

The hypothesis was tested by statistically comparing the time between the post-conflict and the matched-control focal animal sessions, that at least one opponent directed a behaviour toward the other or when a proximity behaviour was displayed. Interactions were considered for the first ten minutes of the post-conflict and the first ten minutes of the matched-control focal animal sessions. The results were plotted in figure 4.1. Two tests were conducted to test the hypothesis. First, a one-tailed paired t-test was performed comparing the mean time of interactions between the post-conflict and the matched-control interactions to determine if the two means are defined by samples from the same population.

The results of the t-test conducted produced a test statistic of 3.486 which is significant at the .05 level. These two samples thus have a difference of mean scores beyond the expected sampling error. Therefore, the test rejects the null hypothesis and accepts the hypothesis that an attraction occurs between opponents because the opponents interact sooner in post-conflict than in non-conflict contexts.

Figure 4.1
COMPARISON OF POST-CONFLICT (PC) AND
MATCHED-CONTROL (MC) INTERACTION TIMES FOR FIRST
BEHAVIOURS DIRECTED TOWARD THE OPPONENT



Second, a test was then done to compare the number of interactions that occurred in the post-conflict period to the number in the matched-control period. The data was tested for goodness-of-fit of a 1:1 expectation. 39 interactions were recorded in the post-conflict period, as compared to 17 in the matched-control. The chi-square test statistic was 13.34. At the .05 level, the null hypothesis that post-conflict and matched-control interactions occurred at random intervals was rejected. Thus, this indicates that the monkeys tend to seek out and establish interactions with their opponents in the post-conflict period.

Attraction between opponents in the post-conflict period is clearly demonstrated from these tests therefore the null hypothesis is discarded. Thus, the data satisfies the premise of the concept of reconciliation that there is an attraction phase between opponents shortly after a conflict.

Behaviours Directed Toward the Opponent

The second premise of the concept of reconciliation is that behaviours directed toward the opponent in the post-conflict period are different than behaviours in non-conflict contexts.

The first behaviours directed toward the opponent in the post-conflict period were compared to first behaviours directed toward the opponent in the matched-control period. These behaviours are summarized in table 4.1. The two types of interactions, those in conflict and those in non-conflict contexts, were tested for significance in a chi-square test. The frequencies were changed to percentages to take into account the differences

Table 4.1
 BEHAVIOURS DIRECTED TOWARD OPPONENT:
 A COMPARISON BETWEEN POST-CONFLICT (PC) AND MATCHED-
 CONTROL (MC) INTERACTIONS

	PC (percentages)	MC	χ^2	p=	Signif.
APPEASEMENT BEHAVIOURS:					
Lip smack	5.7	0	5.7	<.05	sig.
Lip smack/warble	3.4	0	3.4	>.05	n.s.
Warble	12.5	0	12.5	<.05	sig.
Warble/groom	3.4	0	3.4	>.05	n.s.
Contact call	1.1	0	1.1	>.05	n.s.
Genital present	1.1	0	1.1	>.05	n.s.
Mount	2.7	1.1	3.2	>.05	n.s.
AFFILIATIVE BEHAVIOURS:					
Groom solicitation	9.1	1.1	8.0	<.05	sig.
Groom	13.6	3.4	10.2	<.05	sig.
PROXIMITY BEHAVIOURS:					
Sit-near	5.7	3.4	2.3	>.05	n.s.
Sit-far	5.7	5.7	0.0	>.05	n.s.
Feed-near	6.8	0	6.8	<.05	sig.
Pass-near	0	1.1	1.1	>.05	n.s.
Pass-far	3.4	3.4	0.0	>.05	n.s.
Follow-far	3.4	0	3.4	>.05	n.s.
OTHER BEHAVIOUR:					
Agonism to opponent	22.7	0	22.7	<.05	sig.

n.s. not statistically significant

sig. statistically significant

χ^2 (chi-square) values based on 1:1 expectation for occurrences in the post-conflict and matched-control focal animal sessions.

in sample size. Each behaviour was tested separately and the assumption of randomness, that is a 1:1 expectation of occurrence between the two interactions, was the basis for determining the expected values in the formula. The matched-control column only lists those behaviours that were also found in the post-conflict focal animal data. Because of this, the matched-control column is not a complete list of behaviours observed thus the percentages do not add up to 100.

The marked differences were that no appeasement behaviours were seen in the matched-control interactions between opponents. Of the appeasement behaviours, lip smacking and warbles were the most common interaction types in the post-conflict period. These behaviours could be deemed the diagnostic reconciliatory behaviours. Grooming also occurred more often in the post-conflict than the matched-control period. Interestingly, it was feed-near that proved to be the diagnostic proximity behaviour. Lastly, no agonism was directed toward the opponent in the matched-control sessions. Agonism occurred more frequently than any of the other behaviours in the post-conflict period. To clarify this point, the agonism displayed after the orientation is the frequency shown in the table. The conflict was considered to be finished at the time of orientation because generally at the time of orientation the monkeys sat down and appeared to be "evaluating" the situation.

The differences in the behaviours directed toward the opponent in the post-conflict and the matched-control sessions clearly indicate that interactions between monkeys differ between agonistic and nonagonistic situations.

Continuation of Agonism

The data were examined to determine if the occurrence of post-conflict behaviours decreased the likelihood of continued agonism between the opponents. The null hypothesis that was tested was that agonism after a post-conflict behaviour had an equal probability of occurring as not. This was tested for a one to one expectation in a chi-square test. The following is a summary of the data for this test:

	agonism	no agonism
with post-conflict behaviours	7	32

The test statistic is 16.026, thus at the .05 level of significance, the null hypothesis is rejected. The conclusion drawn from this states that the likelihood of continued agonism is low when post-conflict behaviours are displayed.

Summary

The preceding tests clearly illustrate that in post-conflict contexts there is an attraction phase between opponents and that the interactions are different than those observed in non-conflict contexts. In addition, when behaviours were directed toward the opponent the likelihood of a continued conflict decreased. These differences satisfy the conditions of the concept of reconciliation as put forth by de Waal (1986a). It was found that in 39 of the 180 or 21.7% of the conflicts studied, the former opponents were observed to interact with appeasement, affiliative or proximity behaviours. These conflicts are considered to be reconciled.

HOW DO JAPANESE MONKEYS RECONCILE?

It has now been established that reconciliation occurs in Japanese macaques as the data satisfies the conditions of the concept of reconciliation. Next is the question of *how* they reconcile. The following is an analysis of the post-conflict interactions to identify the diagnostic patterns of reconciliation. In many cases, they are discussed in terms of the differences between actor's and reactor's behaviour. These interactions are broken down into four sections: first obvious behaviours directed toward the opponent, less obvious behaviours directed toward the opponent, third party agonism, and third party consolation. Each will be discussed in turn.

First Obvious Behaviours Directed Toward the Opponent

The first obvious behaviours directed toward the opponent in the post-conflict period are listed in table 4.2. This list was compiled from the focal animal data and presents the frequency of each behaviours' occurrence as displayed by actors toward reactors and by reactors toward actors.

From this list no one behaviour appears to be diagnostic of reconciliation in Japanese macaques. There are however, interesting differences between behaviours exhibited by actors and reactors.

Appeasement Behaviours

There was a higher frequency of appeasement behaviours, such as lip smacks, warbles, genital presents, and contact calls in the reactor's repertoire of behaviours than

in the actor's repertoire of behaviours. Twenty of reactor post-conflict behaviours consist of "appeasement" behaviours as opposed to three by actors. Of the appeasement behaviours, the vocalization called the warble occurred more often than the other behaviours. Warbles were used in combination with lip smacking and grooming. These behaviours were displayed usually within a few seconds of one another. Contact calls and genital presents rarely occurred in the post-conflict period.

The present study indicates that the warble is used in post-conflict situations, this however, is not the only context in which the warble is used. Warbles were heard in several different contexts: (1) at the beginning of groom sessions between adults when no apparent conflict occurred prior to their interaction; (2) when females attempted to groom unrelated infants and the infant's mother was nearby; (3) when adult females were in proximity to a female who had twin infants; and (4) when juveniles passed adults - these adults were sometimes involved in groom sessions with other adults, or the adult had previously been in an agonistic interaction.

Affiliative Behaviours

There is a striking difference in the frequency of grooming and groom solicitations between actors and reactors. In total, actors were found to groom their opponents three times and solicit for grooming on eight occasions. Reactors were never seen to solicit for grooming but groomed their actors on nine occasions.

Interestingly, several instances of "refusals of reconciliation" were observed in the field. In three instances that groom solicitations were displayed by actors toward reactors,

Table 4.2
FIRST OBVIOUS BEHAVIOURS DIRECTED TOWARD OPPONENT

Behaviour	Actor	Reactor
APPEASEMENT BEHAVIOUR:		
Lip smack	2	3
Lip smack/warble	0	2
Warble	1	10
Warble/groom	0	3
Contact call	0	1
Genital present	0	1
Mount	2	0
AFFILIATIVE BEHAVIOUR:		
Groom solicitation	8	0
Groom	3	9
PROXIMITY BEHAVIOUR:		
Sit-near	5	5
Sit-far	5	5
Feed-near	6	6
Pass-far	1	2
Follow-far	2	1
OTHER BEHAVIOUR:		
Recontact	4	5
Agonism to opponent	18	2

reactors did not respond to grooming.

Proximity Behaviour

In addition to appeasement and affiliative behaviours, a compilation was made of more subtle behaviours such as those behaviours exhibited in proximity to the opponent. Such behaviours include sit, feed, follow and pass. Proximity behaviours are divided into near and far categories. Behaviours that occur within one meter of the opponent are

considered near and those occurring between one and two meters are considered far. Of the proximity behaviours sitting within two meters and feeding near were common in the post-conflict period.

Other Behaviour

Recontact refers to situations when two opponents separate then come together again shortly thereafter. Separating was defined as moving out of sight or moving away to the point that distinguishing the opponent amongst the other monkeys was difficult (at least for the observer). Recontact is not a term on the ethogram but was identified during the initial analysis of the focal animal data. Recontact occurred in low frequencies but was initiated by both actors and reactors: four by actors and five by reactors, out of a total of 180 conflicts (5.0%).

Agonism toward the opponent occurred often in the post-conflict period. Agonism toward the opponent was counted only if an orientation had been made prior to the continuation of the conflict. Actors displayed more agonism toward reactors than any other behaviour directed toward reactors.

Less Obvious Interactions Between Opponents

Less obvious interactions between opponents also occurred in the post-conflict period. These are more subtle interactions between opponents who are still in view of one another than the behaviours discussed earlier. Examined here are orientations, distance between opponents, decrease in distance after orientation, time of separation, and

initiator of separation. Each will be discussed in turn.

Orientation

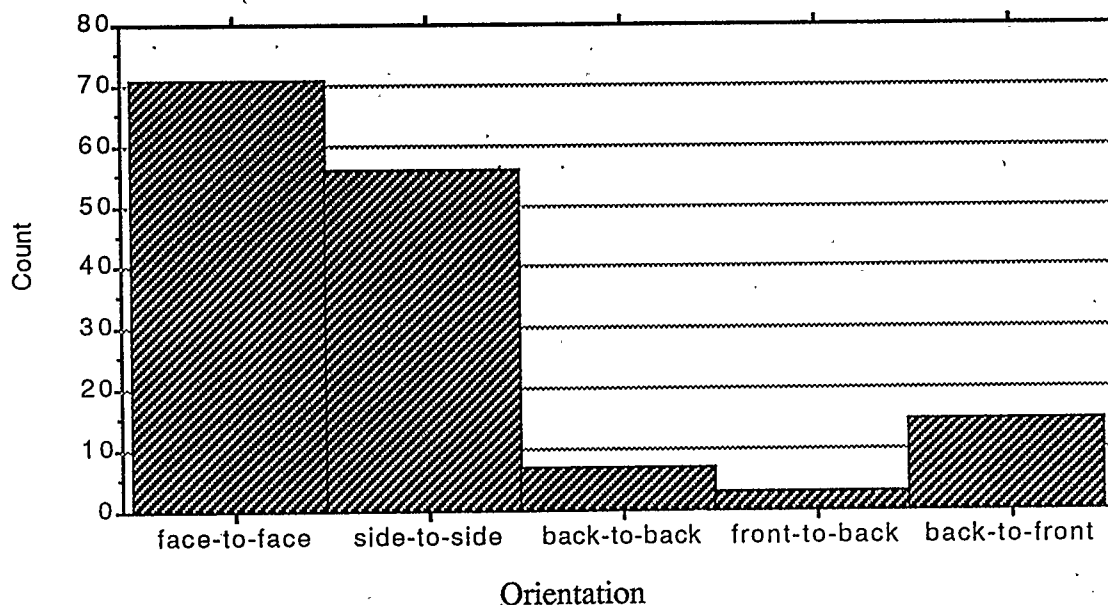
Orientation is defined as the position each opponent takes in relation to the other once the animals cease moving after a conflict. Usually but not always the animals are in a sitting position. The orientations were broken down into five categories: face-to-face, side-to-side, back-to-back, front-to-back, and back-to-front. The last two categories are distinguished by identifying actors orientation first and reactors orientation second.

From the focal animal data, the frequency of each orientation category was counted: one orientation was counted for each conflict ending in an orientation. This data is summarized in figure 4.2. Orientations occurred in 152 of the 180 conflicts (84.4%). Conflicts resulting in opponents sitting face-to-face or side-to-side, made up 83.6% (N=127) of post-conflict orientations. Instances when opponents sat with their backs to each other, or when actors sat facing the back of reactors or when reactors sat facing the back of actors make up only 16.4% (N=25) of all orientations.

There is an indication that it is more important that reactors stay vigilant to actors than actors to reactors as illustrated by the very low percentage (2.0%, N=3) of conflicts where actors face reactors but reactors are turned away. Whereas, 9.9% (N=15) of the conflicts ending with an orientation, actors are turned away and reactors are facing actors.

It is clear from the graph that there is a strong tendency for the monkeys to sit face-to-face or side-to-side rather than back-to-back, front-to-back or back-to-front. To confirm this, a chi-square test was conducted to determine if the null hypothesis, that each

Figure 4.2
ORIENTATIONS OF FOCAL MONKEYS



orientation has equal probability, was acceptable at the .05 level of significance. Orientations were grouped in three categories: face-to-face, side-to-side, and other. The other category included back-to-back, front-to-back and back-to-front because of the low sample sizes of each. In the test for goodness-of-fit the difference was highly significant. The chi-square test statistic was 21.72, therefore at the .05 level, the null hypothesis that orientations occurred randomly was rejected.

Characteristically, face-to-face or side-to-side sitting positions involved glances at the opponent during scans of the monkeys' whole field of vision. Direct looking at the opponent occurred often but these were not prolonged stares. Unfortunately, accurate frequency data for "looking at the opponent" was not obtained. In the literature, this

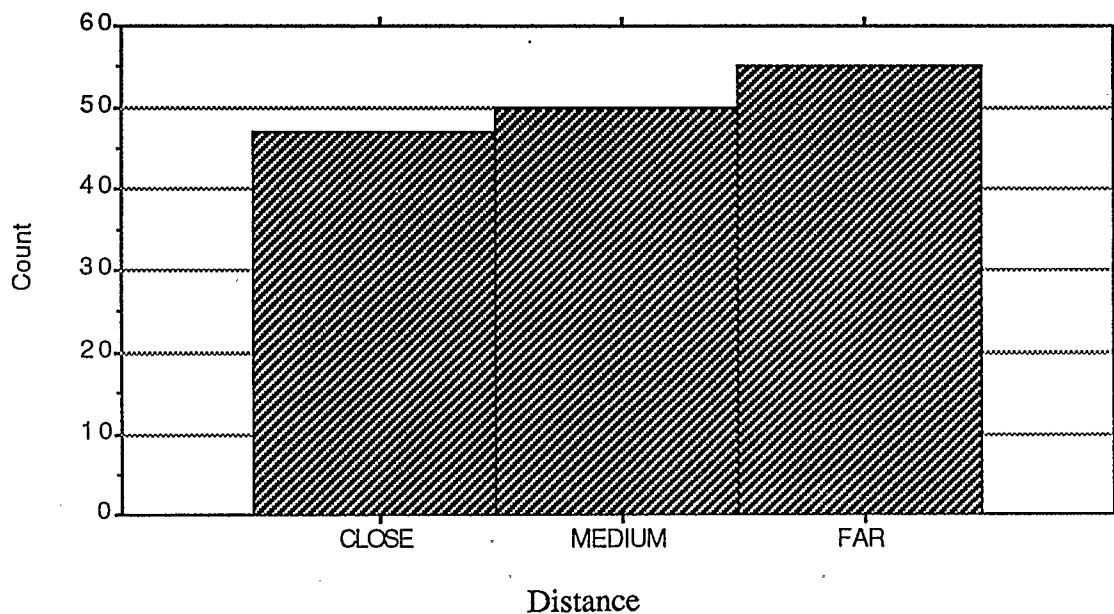
behaviour pattern data has been considered "unreliable because it is easily missed, and often it is difficult to determine whether an animal did in fact look at another" (Kurland, 1977:33).

Distance

The distance between opponents was recorded at the time that the orientation was recorded in the focal animal data. The distance recorded on the data sheets was estimations in meters. However, because the chance of error in these estimations increased as the distance between the opponents increased, the data were categorized. From the raw data, measures from one to three meters were classified as close, from four to seven meters as medium, and eight and more meters as far. Figure 4.3 summarizes the frequency of occurrence of distances by category.

The histogram shows that all three distance categories were fairly evenly utilized. There are, however, several interesting points associated with this pattern. Firstly, the histogram clearly illustrates that agonism does not cause a subsequent and immediate dispersal of the opponents as 97 of the 152 conflicts (63.8%) that end in orientation resulted in the opponents sitting within seven meters of each other. Secondly, 47 of the 55 conflicts (85.5%) in the far category were classified as face-to-face or side-to-side orientations, suggesting that even though the opponents are eight meters or further from each other they continued to be vigilant toward their opponent. Thirdly, the tendency for back-to-back, front-to-back or back-to-front orientations was not significantly different between the three distance categories (close N=9; medium N=8; far N=8).

Figure 4.3
DISTANCE BETWEEN OPPONENTS



Decrease In Distance After Orientation

After an orientation, one monkey may decrease its distance in relation to the opponent. From the focal animal data, the frequencies of decreases were counted. Of the 180 conflicts, 66 (39.7%) resulted in a decrease in distance in the post-conflict period. Although the immediate effect of the conflict was an increase in distance between opponents, these decreases in distances showed that this affect was short-lived.

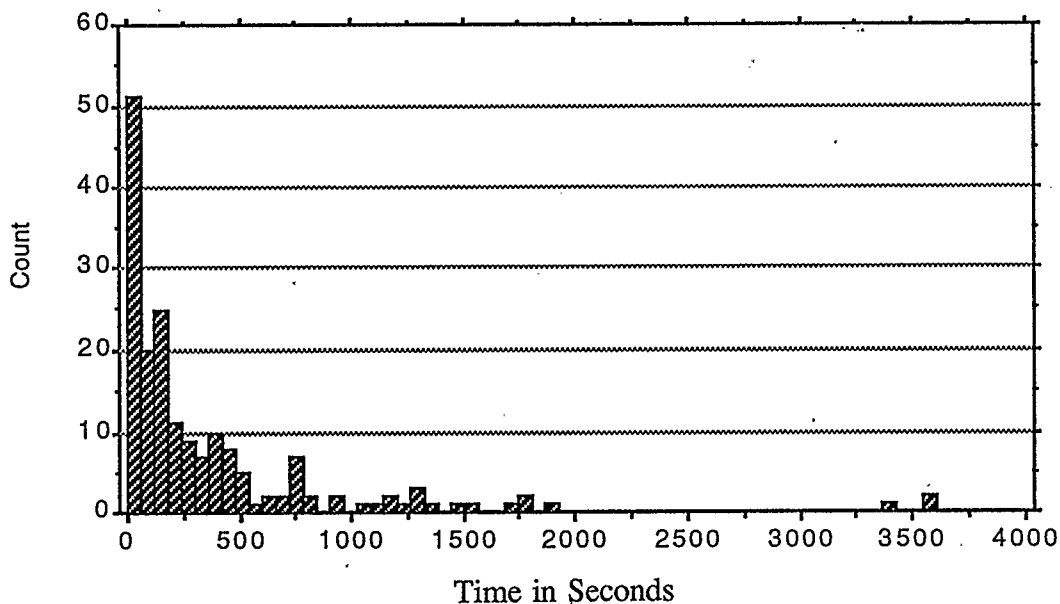
Time of Separation

From the post-conflict focal animal sessions the time that one of the monkeys involved in the conflict left the area was noted as the time of separation. In figure 4.4 the

separation time (in seconds) is summarized for each conflict. If opponents did not separate during the focal session, they were recorded in the histogram at 3600 seconds. This represents the end of the focal animal session thus including all conflicts in the analysis.

This histogram shows that there is a high rate of opponent separation during the first ten minutes after the termination of the conflict. Of the 180 conflicts, 51 (28.3%) of the opponents separated during the first post-conflict minute. After the first two minutes a total of 71 (39.4%) of the opponents had separated. By the end of the first ten post-conflict minutes, 147 (81.7%) of the 180 conflict opponents had separated. In the two cases when opponents stayed together for the entire post-conflict focal sessions, the conflicts were of low intensity, and the opponents were females and 50% related.

Figure 4.4
TIME OF SEPARATION



Time of separation can be turned around to show the time spent together for the opponents. The same graph can be interpreted as showing that by the end of the first ten post-conflict minutes, 18.3% of the opponents remained together.

Initiator of Separation

The initiator of the separation was recorded during the focal animal sessions when one of the monkeys left his/her opponent to the point that the monkey went out of sight or distinguishing it from other monkeys was difficult. For the analysis, the data was separated into two categories: actors and reactors. The results show that of the 180 conflicts, actors initiated the separation 101 times and reactors, 77 times. (Two of the conflicts did not result in a separation during the focal animal session and therefore are not included in these counts). A chi-square was conducted to test the null hypothesis of whether the initiator of the separation has an equal probability of being either the actor or the reactor. The chi-square test statistic 3.24 shows that the null hypothesis could not be rejected at the .05 level of significance. In other words, no pattern exists as to whom, the actor or the reactor, initiates the separation.

Post-Conflict Third Party Agonism

The preceding analysis discussed behaviours directed toward the opponent in post-conflict interactions. The next two sections deal with an analysis of interactions of the focal animal to a third individual. Post-conflict third party agonism, then third party consolation will be discussed.

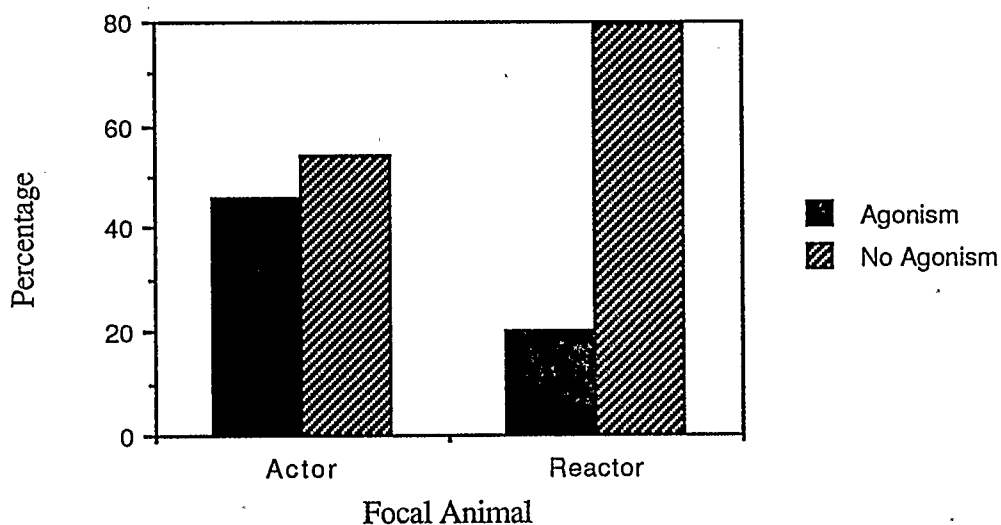
Post-conflict agonism to a third individual was identified in the focal animal data as agonistic encounters directed toward any individual except the former opponent. This data is summarized in figure 4.5. The data were separated by actor and reactor behaviour. (The term redirected aggression generally refers to third party agonism by the reactor, but due to the connotations of the word aggression, this term will not be used). The graph presents the frequencies of occurrence that the actors and the reactors initiated agonistic interactions. This examination was limited to the first ten minutes post-conflict because it was felt that if the time was extended the effects of the conflict would not necessarily be reflected in the data.

The data show that agonism toward a third individual by reactors is not common after a conflict. Of the 69 conflicts where the focal monkey was the reactor, only 14 (20.3%) initiated a conflict with a third individual, 55 (79.7%) did not. A chi-square test was performed to determine if the null hypothesis was acceptable at the .05 level of significance. The null hypothesis is that in the post-conflict period, agonism toward a third individual by reactors has an equal probability of occurring as not. The difference between the occurrence of agonism toward a third party was statistically significant. The test statistic 24.36 is larger than the critical value at .05 level of significance thus the null hypothesis is rejected indicating that reactors generally do not respond to conflicts with third party agonism.

Agonism toward a third party by actors showed different results. Of the 111 conflicts when the focal monkey was the actor, 51 (45.9%) initiated a conflict and 60 (54.1%) did not. The test statistic, .7297 is smaller than the critical value at .05 level of

significance thus the null hypothesis is accepted. Agonism to a third individual by actors in post-conflict periods has an equal probability of occurring as not.

Figure 4.5
AGONISM TOWARD A THIRD MONKEY



Third Party Consolation

Consolation is defined as "contact of the aggressed party with a third animal" (de Waal and van Roosmalen, 1979:55). Consolations have been regarded as providing reassurance to the individual involved in a conflict.

Consolations were recorded in the post-conflict focal animal sessions when

interactions occurred between the reactor and a third party individual. Of the 69 conflicts involving the focal animal as the reactor, one conflict did not result in the focal animal interacting with a third monkey during the one hour post-conflict focal animal session. And, after one other conflict, the opponents did not separate therefore no consolations were identified. Consequently, 67 conflicts were identified as having consolations occurring.

The following section identifies the patterns of consolation in Japanese monkeys. This is done by examining five aspects of these contacts: consolation behaviours, initiator of the consolation, time of consolation, degree of relatedness between the opponent and the consoling monkey, and the social bond strength between the opponent and the consoling monkey. Unless otherwise stated, the analysis deals only with the reactors of the conflicts as per the definition of consolation. Each will be discussed in turn.

Consolation Behaviours

From the focal animal sessions, the first behaviour between the opponent monkey and the consoler was identified and recorded in table 4.3. These behaviours include interaction behaviours and proximity behaviours.

The data shows that 44 of the 67 consolations resulted in proximity behaviours with their consoler. Sitting within two meters of a third animal was the most common behaviour. The remaining 23 consolations were behaviours clearly directed toward the consoler. Of these, 12 were grooming sessions: the reactor groomed the consoler more frequently than the consoler groomed the reactor. Groom solicitations to consolers

occurred three times and from consolers, groom solicitations occurred four times.

Other affiliative behaviours such as consort position, mount and huddle were behaviours that were displayed infrequently.

Table 4.3
CONSOLATION BEHAVIOURS

Proximity Behaviour:	Frequency:
Sit-near	14
Sit-far	18
Feed-near	5
Feed-far	6
Follow-far	1
Affiliative Behaviour:	
Groom to consoler	8
Groom from consoler	4
Groom solicitation to consoler	3
Groom solicitation from consoler	4
Consort Position	2
Mount	1
Huddle	1

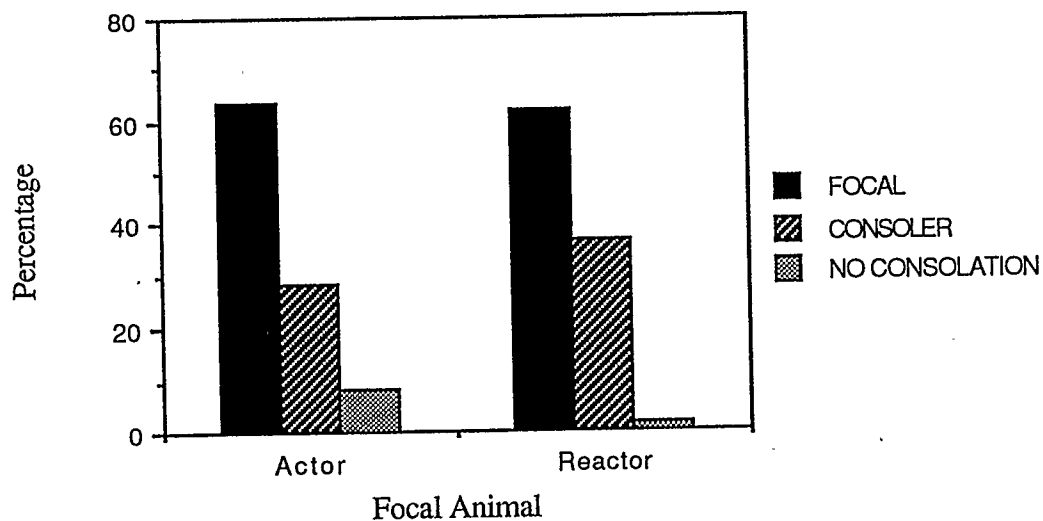
Initiator of Consolation

The initiator of the consolation was defined as the monkey, the reactor or the consoler, that began the consolation interaction. The consoler is the monkey who was *not* involved in the conflict.

Consolations were initiated by reactors 61.8% of the time (N=42), and consolers initiated the consolation 36.8% (N=25) of the time. A chi-square test was performed to determine if the null hypothesis was acceptable. The null hypothesis is that the initiator

of the consolation was equally likely to be the reactor as the consoler. The chi-square test statistic of 55.3 exceeded the critical test value thus indicating that the null hypothesis is rejected at the .05 level of significance. Therefore, this test suggests that the reactor of the conflict initiates consolations more often than the third individual with whom they are interacting in post-conflict situations.

Figure 4.6
INITIATOR OF CONSOLATION



Interactions with a third party by *actors* of the conflicts were analyzed in the same manner to see if they had a similar pattern as the consolations by reactors. The same null hypothesis was used as in the previous test. The results showed that of the conflicts when the focal monkey was the actor, 63.6% (N=70) of the time actors initiated the interaction whereas consolders initiated the interaction only 28.2% (N=31) of the time. In a chi-square test, the test statistic of 47.3 exceeded the critical test value thus indicating that

the null hypothesis is rejected. The initiator of consolations was more often actors than consolars.

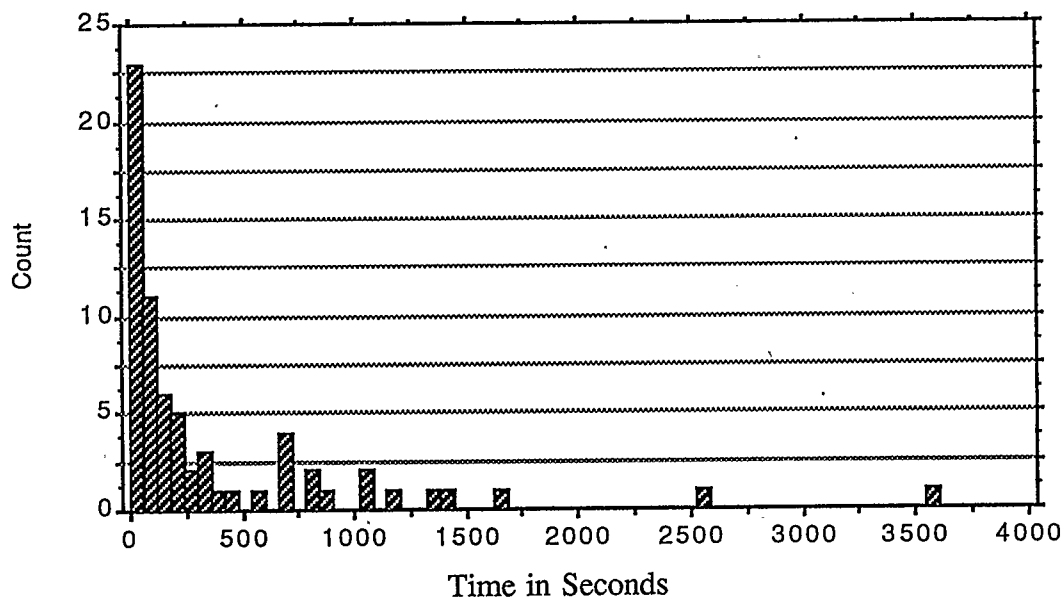
In addition, of the post-conflict periods when no consolations occurred, 8.2% were actors (N=9) and 1.4% were reactors (N=1).

A comparison of the initiator of consolations percentages is summarized in figure 4.6. The tests illustrate that the opponents, actors and reactors, are attempting to initiate a nonagonistic interaction with a consoler in the post-conflict period.

Time of Consolation

The time of consolation in post-conflict situations for reactors is summarized in figure 4.7. One conflict did not result in a consolation during the post-conflict period.

Figure 4.7
TIME OF CONSOLATION



This consolation is shown as 3600 seconds on the graph as this represents the end of the post-conflict focal animal session, therefore 68 conflicts are included in the analysis. One pair of opponents did not separate therefore this conflict was not included in the analysis.

23 of the 68 consolations (33.8%) occurred in the first minute after a conflict. After the first two minutes, 34 of the 68 consolations (50.0%) occurred and after the first ten minutes post-conflict, 53 of the 68 conflicts (77.9%) of the reactors interacted with a consoler.

Relatedness to Consoler

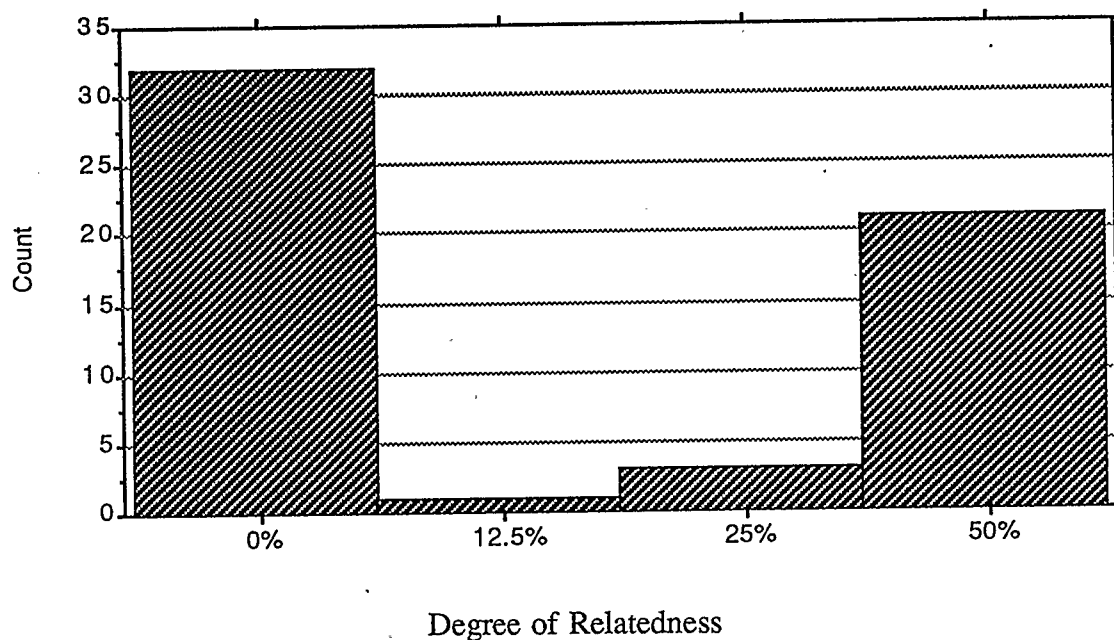
For the most part, the identification of the consoler was discernable as the monkeys encountered by the subject animals were also viewed on a day-to-day basis by the researcher. There were 10 consolders who could not be identified and therefore these consolations were eliminated from the analysis comparing relatedness and social bond strengths between reactors and consolders. In addition, two other conflicts are not included: the conflict not resulting in a consolation, and the conflict where the opponents did not separate. Consequently, in the following analyses, only the remaining 57 consolations are used.

If the focal animal joined a group at the time of consolation, one of the following criteria were chosen to determine which monkey was regarded as the consoler: 1) the monkey most closely related to the focal animal, 2) the adult in a group of juveniles or 3) an animal known to the observer. Infants were not noted as consolders and juveniles were rarely noted as the consoler unless they were related to the reactor. The data were

analyzed in this way because "interactions with the adults in the society were considered a better indicator of sociability than were interactions with juveniles" (McDonald, 1988:43).

From the records of the research facility the degree of relatedness between consolers and reactors was ascertained. The data were broken down into four categories depending on the percentage related - based on maternal relatedness only: 0% (unrelated or less than 12.5% relatedness); 12.5% (aunt-niece/nephew); 25% (sibling; grandmother-granddaughter/son); and 50% (mother/offspring). The data are graphed in figure 4.8. The results clearly show that consolations generally occurred between individuals that are unrelated (N=32; 56.1%) or are mother-offspring pairs (N=21; 36.8%). Rarely were individuals that were 12.5 or 25% related selected as console partners (N=4; 7.0%).

Figure 4.8
RELATEDNESS TO CONSOLER



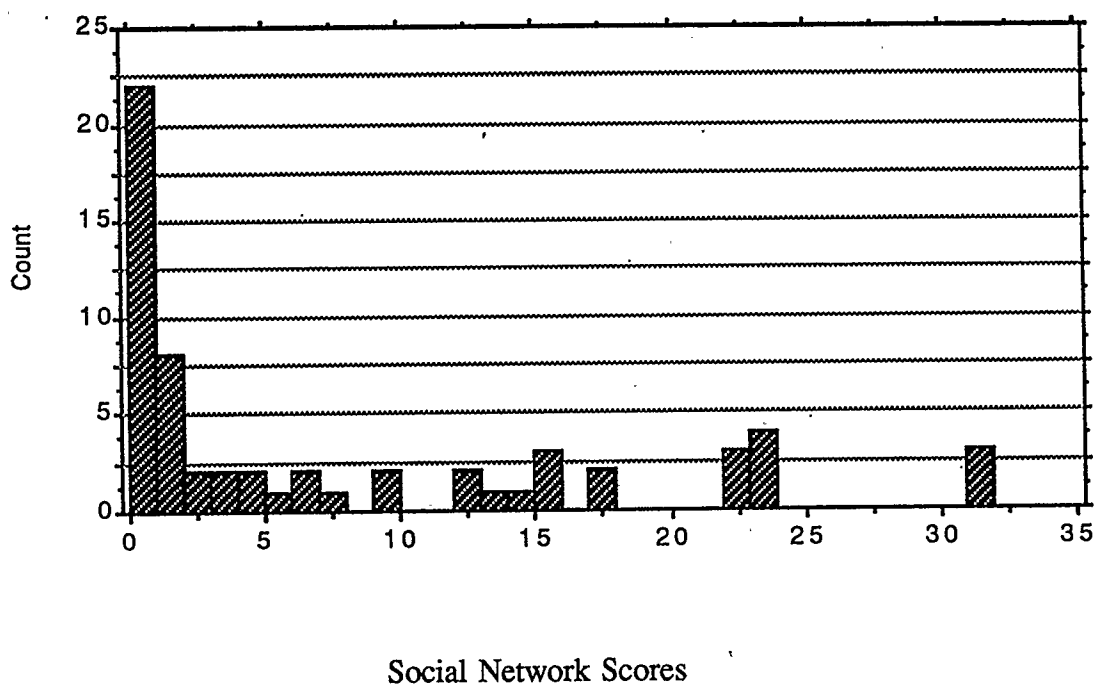
Social Bond Strength to Consoler

The social bond strength between focal animals and other monkeys was determined from the social network scores created from the scan sample data. A list was compiled for each of the subject animals. Each list contained all the animals recorded on the scan samples and the percent of the total number of scan sample observations with which they were seen with the focal monkey. It is these percentages that are used in the following analysis.

The results listing the social network scores between reactors and consolders are presented in figure 4.9. The scores range from 0 to 31.9 (N=61) with a mean of 7.7 and a standard deviation of 9.6.

A test was conducted comparing the mean of the social network scores of the consolders to the mean of the total social network scores for each subject monkey. The mean of the social network scores for consolders is 7.7 and the mean for all the social networks is 1.4. The null hypothesis tested is that these two scores are not different beyond the influence of sampling error. In a t-test of difference between two independent means with heterogeneous population variances, the test statistic was found to be 2.75. This was significant at the .05 level. Thus, the null hypothesis is rejected. The difference in the two sample means reflects the assumption that in the post-conflict period, reactors are consoling with individuals with whom they normally interact more frequently. It appears then, that selectivity of contact partners for consolation occurs. Monkeys with higher social network scores with the reactor are often chosen as console partners.

Figure 4.9
SOCIAL NETWORK SCORES BETWEEN REACTORS AND CONSOLERS



SUMMARY

This chapter analyzed quantitatively, the patterns of behaviour in the post-conflict period of Japanese monkeys. These patterns were discussed in terms of reconciliation. The analysis addressed the questions, do Japanese monkeys reconcile, and if the answer is yes, how do they do this? The results showed that reconciliation does occur and certain behavioural patterns exist.

In post-conflict periods, interactions between opponents occurred sooner and more frequently than interactions between the same monkeys in non-conflict contexts. In

addition, these interactions were different than those occurring in non-conflict contexts. It was concluded that appeasement, affiliative and proximity behaviours between opponents occurred after 21.7% of the conflicts studied. Thus, reconciliation is said to occur after approximately one-fifth of the conflicts among Japanese monkeys.

First obvious behaviours directed toward the opponent consisted of appeasement, affiliative, and proximity behaviours. Appeasement behaviours were more commonly displayed by reactors and the most common appeasement behaviour was the warble. Of the affiliative behaviours, grooming was observed most often. Both actors and reactors were observed to initiate grooming, however only actors displayed groom solicitation behaviours. Proximity behaviours such as feed near occurred frequently in the post-conflict period. Although proximity behaviours are not necessarily 'directed toward' the opponent, they are considered to be a behavioural pattern consistent with the concept of reconciliation.

Less obvious behaviours were apparent from the examination of the post-conflict period. Specifically, opponents tended to orient themselves toward their opponent in either a facing or side-to-side direction. At the time of orientation, the three distance categories, close, medium, and far, were fairly evenly utilized by the opponents. In almost 40% of the post-conflict periods, opponents were found to decrease their distances in relation to one another after an orientation was made.

By the end of the first ten minutes post-conflict period, over 80% of the opponents had separated, in other words, just under 20% of the opponent pairs remained together longer than ten minutes after a conflict. No pattern existed in regards to which monkey,

the actor or the reactor, initiated the separation of the opponents.

Two interactions were analyzed between opponents and third party individuals: agonism to a third individual and third party consolation. The analysis of agonism to a third party individual showed that reactors do not generally initiate agonistic interactions to a third party after a conflict. In contrast, an actor is equally likely to initiate an agonistic interaction with a third party as not.

Reactors were found to initiate non-agonistic interactions with a third individual shortly after a conflict. These interactions are termed consolations. Consolations generally were proximity behaviours such as sitting or feeding within two meters, however, when affiliative behaviours occurred, grooming to the consoler was most likely to be the behaviour displayed. Third party consolations were more likely to be initiated by the monkey involved in the conflict than by the consoler. Almost 80% of the reactors were involved in a consolation within the first ten minutes post-conflict. These consolations generally were with nonrelatives or with individuals that were 50% related, and with individuals with whom they had stronger social bonds.

From the data presented, agonism among Japanese monkeys is found to be not necessarily a dispersive mechanism rather, as in many cases, behaviour patterns occur that serve to maintain proximity between opponents. Thus these patterns show distinct features that reflect the concept of reconciliation.

CHAPTER FIVE

FACTORS AFFECTING PATTERNS OF RECONCILIATION

INTRODUCTION

The previous chapter analyzed the behaviours in the post-conflict period in order to identify the presence of reconciliation in Japanese monkeys. The results of the analysis showed that reconciliation occurred however not all conflicts resulted in these behavioural patterns. This chapter continues the analysis, however we now deal with how certain sociological and contextual factors affect reconciliatory patterns. Only those tests that resulted in statistically significant results are discussed. There is variability in the level of detail of the tests used to analyze these factors. This is due to the nature of the data as some data sets could not be broken down further because this would result in sample sizes too small for statistical reliability. The results of the tests are summarized in table 5.1.

DEGREE OF RELATEDNESS

Discussed here is how degree of relatedness between the opponents affected post-conflict behaviours such as distance between opponents, decreases in distance, reconciliation behaviours, time of reconciliation, time of separation and initiator of separation.

Distance Between Opponents

A Goodman Kruskal's gamma measure of association between distance and relatedness was conducted to determine if the distance between opponents at the time of

Table 5.1
SUMMARY OF TESTS: FACTORS THAT AFFECT RECONCILIATION

<i>Post-Conflict Behaviours:</i>	Sociological Factors of Opponents:				
	Degree of Relatedness	Social Bond Strength **	Sex of the Opponents	Age of the Opponents	Conflict Intensity
Orientation	n.s.	n.s.	n.s.	n.s.	n.s.
Distance	sig.	sig.*	sig.*	n.s.	n.s.
Decrease in Distance	sig.	sig.	n.s.	n.s.	n.s.
Post-conflict Behaviour	sig.	sig.	n.s.	n.s.	n.s.
Time of Reconciliation	sig.	n.s.	n.s.	n.s.	n.s.
Time of Separation	sig.	sig.	n.s.	sig.	n.s.
Initiator of Separation	marg.	n.s.	n.s.	n.s.	n.s.

n.s. Not statistically significant

sig. Statistically significant

marg. Inconclusive - marginally significant

* A third variable, conflict intensity, was controlled

** Based on social network scores

orientation was affected by the degree of relatedness between the opponents. For this test, distance was ranked into three categories: close (1-3 meters), medium (4-7 meters), and far (>8 meters), and kinship was divided into two groups: related and unrelated. The former consisting of those opponents that are 12.5, 25 and 50% related, and the later consisting of those opponents that are less than 12.5% related.

The test results are presented in table 5.2. The gamma test statistic (-0.667) shows that there is a moderate negative association between the degree of relatedness and distances between opponents. In a general way, relatedness explains 66.7% of the differences found in these distances. The negative sign of the statistic indicates that related monkeys interact differently than unrelated monkeys as the data shows that related opponents stay closer together after a conflict than unrelated opponents.

Table 5.2
Goodman Kruskal's Gamma-
Distance Between Opponents by Degree of Relatedness

<u>Distances</u>	<u>Degree of Relatedness</u>	
	Related	Unrelated
Far	2	52
Medium	4	46
Close	13	34
Gamma= -0.667 p < .05 sig.		

Decreases in Distance

A test was conducted to determine if the degree of relatedness affected whether or not a decrease in distance between opponents occurred in the post-conflict period. The test conducted, the chi-square goodness-of-fit test, assumed that there is a 1:1 occurrence for each of the two kinship categories. The null hypothesis is that relatedness does not affect the occurrence of a decrease in distance in post-conflict periods. The frequency for decreases in distance among related opponents was counted. It was found that 16 out of a possible 19 conflicts (84.2%) between related individuals resulted in a decrease in distance. Between unrelated opponents, 51 out of a possible 161 conflicts (31.7%) resulted in a decrease in distance. The difference in percentages between the two categories was found to be significant (test statistic = 24.6) at the .05 level. This test rejects the null hypothesis and thus concludes that a decrease in distance in the post-conflict period occurs more frequently between related opponents than between unrelated opponents.

Post-Conflict Behaviour

The frequency was counted for the occurrence of post-conflict reconciliation behaviours, appeasement, affiliative, and proximity behaviours, and for two categories of relatedness - related or unrelated. A chi-square goodness-of-fit test was conducted comparing these frequencies. The null hypothesis tested was that relatedness does not affect the occurrence of reconciliation behaviours as defined by appeasement, affiliative and proximity behaviours. The null hypothesis assumes a 1:1 expectation of reconciliation behaviours between the two categories of kinship. Of the 19 conflicts

between related individuals, 10 (52.6%) were observed with reconciliation behaviours. Of the 161 conflicts between unrelated individuals, only 29 (18.0%) were observed with reconciliation behaviours. The chi-square value is 16.94 and is accepted at the .05 level and thus the null hypothesis is rejected. These results illustrate that reconciliation behaviours occur more frequently among related opponents than between unrelated opponents.

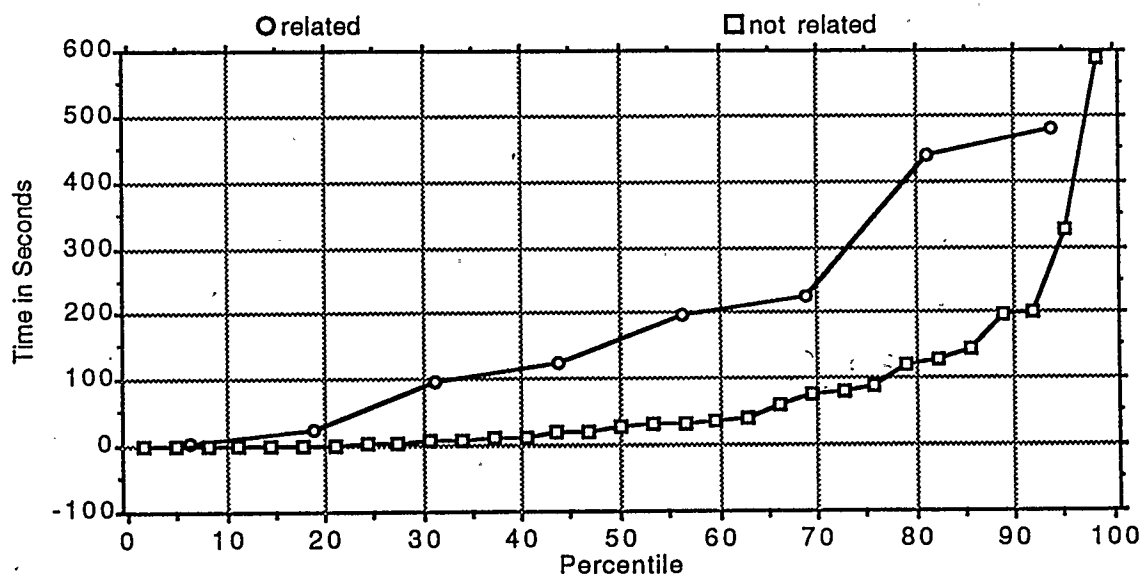
Time of Reconciliation

Figure 5.1 compares the time of reconciliation between kin and nonkin as distinguished by the time of the first behaviour directed toward the opponent in post-conflict situations. A test was conducted comparing the mean of the time of reconciliation between unrelated opponents (112.95 seconds) to the mean of the time of reconciliation between related opponents (191.77 seconds). The null hypothesis is that the difference in means is due to sampling error. The null hypothesis was tested in a t-test. The test statistic, 4.04, was found to be significant at the .05 level. This shows an unexpected pattern. Of the post-conflict periods when opponents interacted with one another, kin opponents were found to reconcile later than non-kin opponents.

Time of Separation

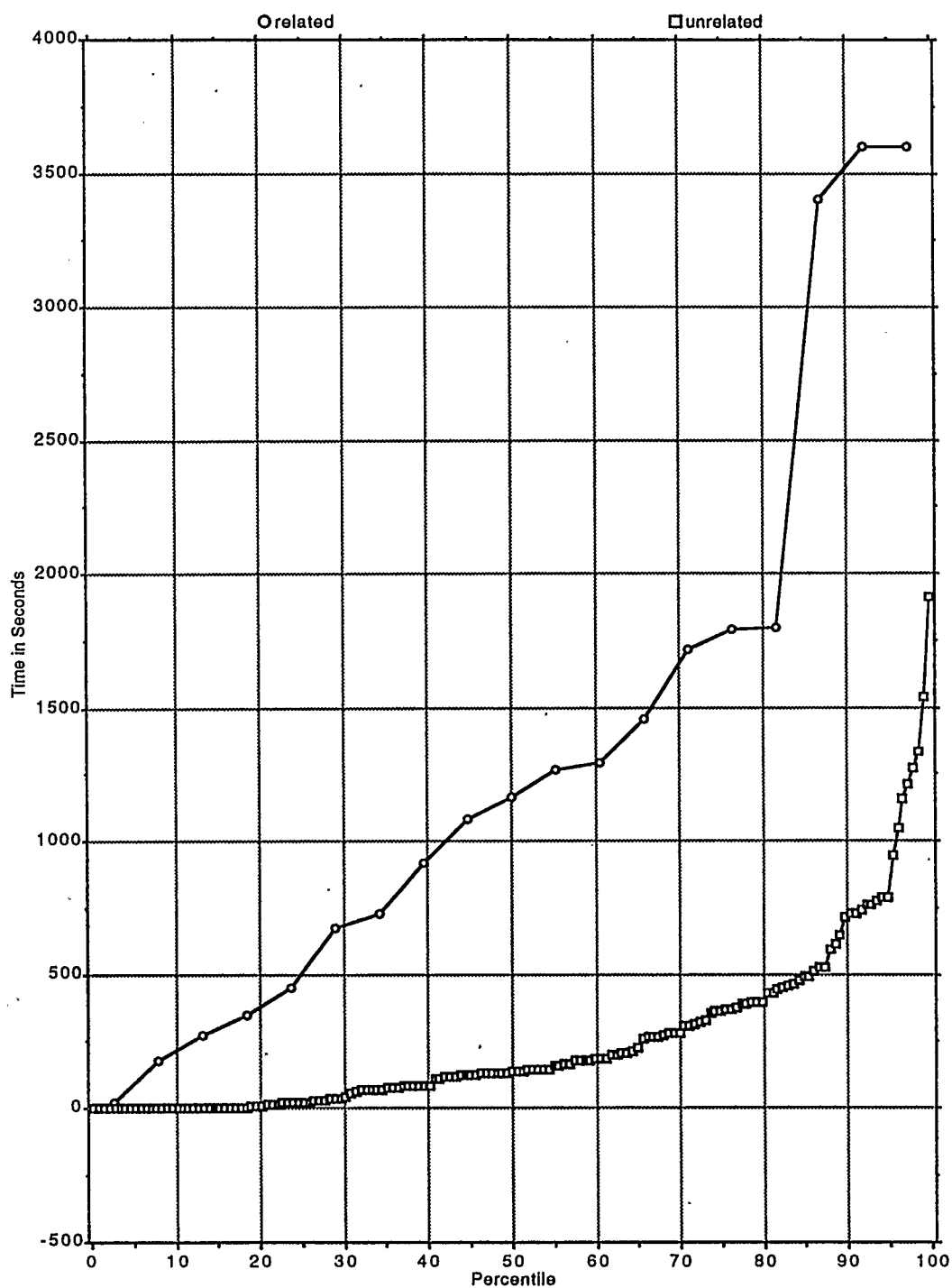
Time of separation refers to the time that the opponents spend together before one monkey leaves the area. All focal animals, actors and reactors are included. A test of variance was conducted comparing the time in seconds of the separation and two classes of kinship: related and unrelated. The null hypothesis that relatedness does not affect the

Figure 5.1
TIME OF RECONCILIATION



time of separation between opponents, was tested. Figure 5.2 plots the time of separation for both kinship categories. A one factor anova test was conducted. The Scheffe F-test (test statistic = 94.864) and the Fisher SPDF (test statistic = 223.772) computed for the anova were significant at the .05 level. The null hypothesis was rejected. The mean time of separation for unrelated opponents is 252 seconds and for related opponents is 1357 seconds. This clearly indicates that unrelated opponents separate significantly sooner than related opponents. Interestingly, this pattern appears to account for the delayed time of reconciliation behaviours displayed among related opponents as discussed in the previous

Figure 5.2
TIME OF SEPARATION COMPARING RELATED AND
UNRELATED OPPONENTS



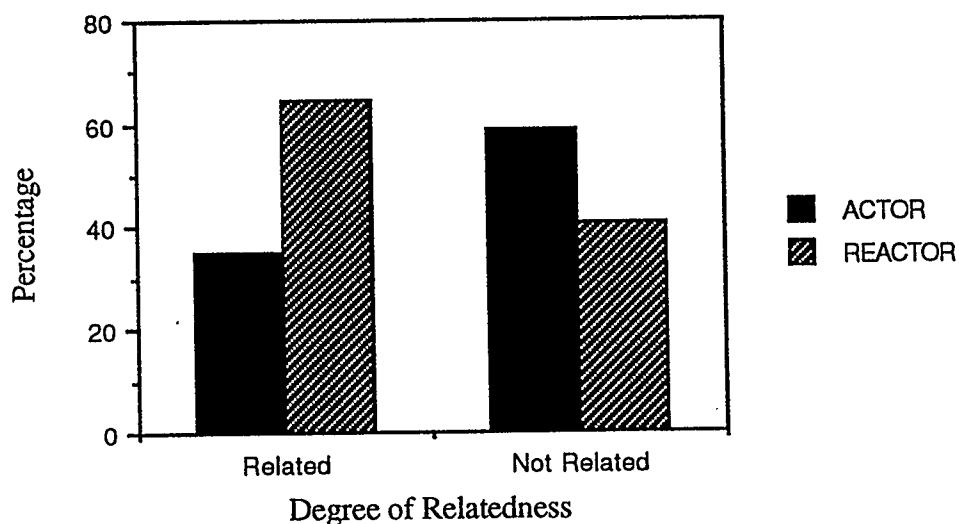
section. Because unrelated opponents separate sooner after a conflict, the reconciliation also needs to occur sooner. This is in contrast to related opponents who separate much later and therefore need not reconcile immediately.

Initiator of Separation

A test of significance was conducted to determine if relatedness of the opponents affected whether the actor or the reactor initiated the separation depending on the degree of relatedness between the opponents. After conflicts between kin, the actor was observed to initiate the separation six times (35.3%) and the reactor was observed to initiate the separation eleven times (64.7%). (Two of the conflicts between kin did not result in a separation and therefore are not included in this analysis). After conflicts between nonkin, the actor was observed to initiate the separation 95 times (59.0%) and the reactor was observed to initiate the separation 66 times (41.0%). These results are summarized in figure 5.3.

In a chi-square goodness-of-fit test, the null hypothesis - that relatedness between opponents did not affect whether the initiator of the separation was the actor or reactor - was tested. The test results were marginally significant (chi-square statistic= 3.522, $p=.0605$). This suggests that relatedness affects whether the initiator of the separation is the actor or the reactor. After conflicts between related individuals, there is a tendency for reactors to initiate the separation. After conflicts between unrelated individuals, there is a tendency for actors to initiate the separation.

Figure 5.3
INITIATOR OF SEPARATION



SOCIAL BOND STRENGTH

The social bond strength of the opponents as indicated by the social network score was found to affect the pattern of reconciliation. The factors that were found to be significant are discussed here. These factors are the distance between opponents, decreases in distance, post-conflict behaviour and the time of separation.

Distance Between Opponents

A test was conducted to determine if the social bond strength between opponents affected the distance between opponents after a conflict. Distance was classified into

three categories: close (1-3 meters), medium (4-7 meters), far (8 + meters). The null hypothesis, that distances between opponents in the post-conflict period were not affected by the strength of the social bonds between opponents, was tested using a Kruskal-Wallis test. This test determined whether the distributions of the social network scores for the three distance categories differed significantly. The results are reported in table 5.3.

Table 5.3
KRUSKAL-WALLIS H TEST
COMPARING SOCIAL NETWORK SCORES AND DISTANCES BETWEEN
OPPONENTS

Distance Category	# Cases	Sum of Ranks	Mean of Ranks
Close	47	4703.5	100.1
Medium	50	3774.5	75.5
Far	55	3150.0	57.3
<hr/>			
N= 152	Df=2	H=23.996	p=<.05

The test results show that the three distance categories differed significantly in regards to the social network scores. Therefore, the null hypothesis is rejected. The distance between opponents in the post-conflict period is influenced by the social bond strength between the opponents. Opponents who have higher social network scores are closer on average than opponents with lower social network scores. The results suggest that the stronger the social bonds, the closer the opponents are at the time of orientation in the post-conflict period.

Decreases in Distance

Social network scores were separated into two groups, 0 - 7.9, and 8.0 and up. These two groups represent a distinction between weak and strong social bonds. The break between the groups was chosen as this is the mean of the social network scores between the focal animals and the opponents plus one standard deviation. The decreases in distance were counted for each group. The null hypothesis, that there is no difference in the frequencies of decreases in distance between the two groups, was tested using a chi-square goodness of fit test. Of the 163 conflicts between opponents with social network scores between 0 and 7.9, 51 (31.3%) resulted in decreases in distance. Of the 17 conflicts between opponents with social network scores of 8.0 and up, 14 (82.4%) resulted in decreases in distance. The test statistic comparing these percentages is 23.0 which was significant at the .05 level and thus the null hypothesis was rejected. Opponents with stronger social bond strengths have a greater likelihood of decreasing their distances in the post-conflict period than opponents with weaker social bonds.

Post-Conflict Behaviour

The frequencies of occurrence of post-conflict reconciliation behaviours were counted for the two categories of social bond strength (identified from the social network scores), weak (0 - 7.9) and strong (8.0 and up).

A contingency table analysis was conducted comparing the percentages to determine if the occurrence of post-conflict reconciliation behaviours was within random expectation. The null hypothesis tested was that bond strength does not affect

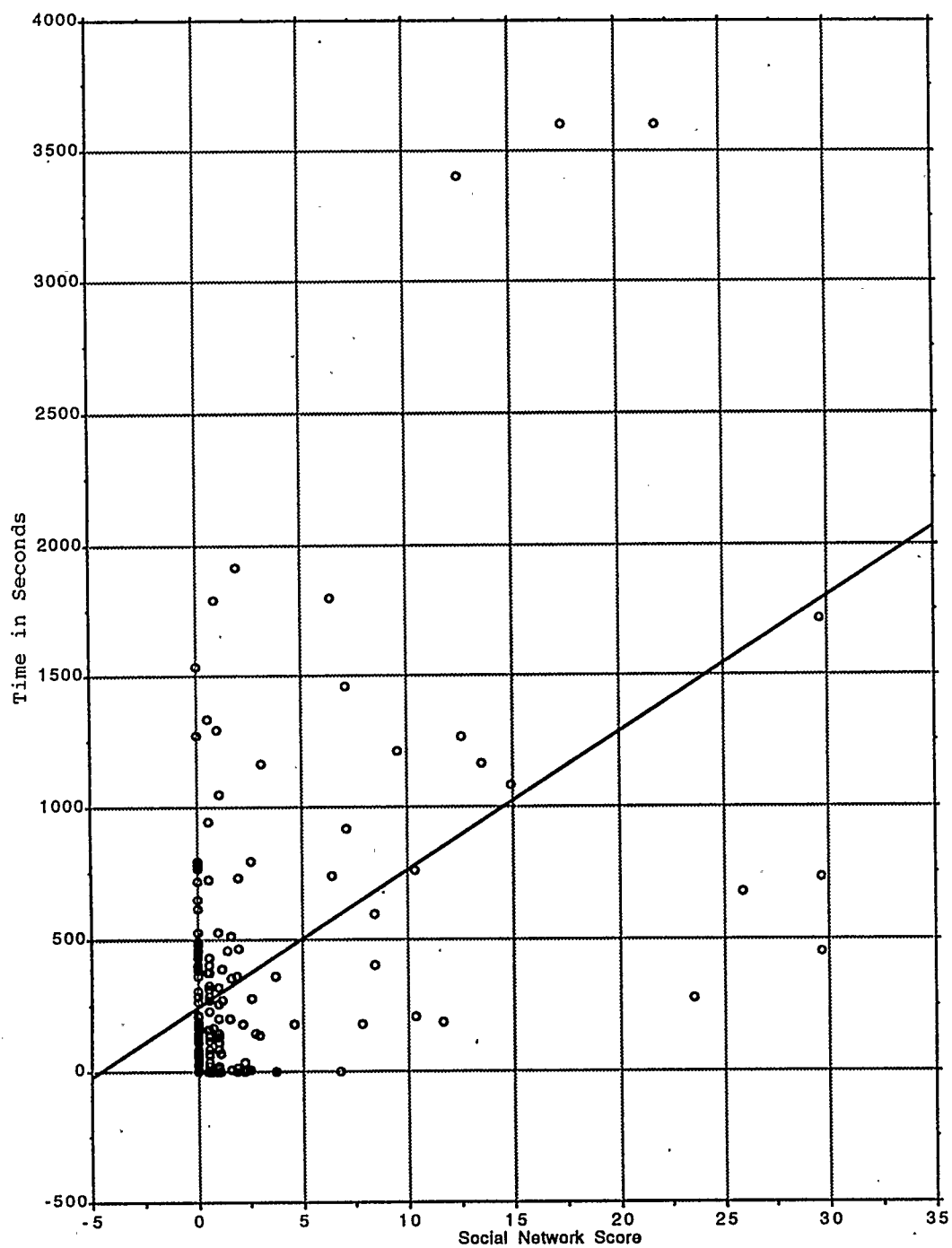
	Post-Conflict Reconciliation Behaviour	
	Yes	No
weak social bonds	31 (19.0%)	132 (81%)
strong social bonds	9 (52.9%)	8 (47.1%)

the occurrence of reconciliation behaviours. The contingency chi-square statistic is 25.087 and is accepted at the .05 level of significance and thus the null hypothesis is rejected. This test indicates that those opponents with strong social bonds are more likely to reconcile than opponents with weak social bonds. However, among those with strong social bonds reconciliation behaviours have almost an equal likelihood of occurring as not. On the other hand, among opponents with weak social bonds, there is a higher probability that no post-conflict reconciliation behaviour will be displayed.

Time of Separation

A Pearson's product-moment coefficient of correlation (r-value) comparing social network score and time of separation was found to be 0.495 (N=180). This test statistic indicates a moderate association between social network score and time of separation. This is illustrated in figure 5.4. The results suggest that as the social bonds increase so does the tendency for the opponents to separate at later times in the post-conflict period.

Figure 5.4
A COMPARISON OF SOCIAL NETWORK SCORES AND TIME OF
SEPARATION



Distance was categorized as close (1-3 meters), medium (4-7 meters), and far (> 8 meters). The chi-square test was then controlled for the three conflict intensities, low, medium, and high. The null hypothesis tested is, that there was no difference between distance categories for conflicts between the three different categories of sex of the opponents. The test results for the low and high intensity conflicts were not significant, however the test results for the medium intensity conflicts were found to be significant (chi-square= 11.9, $p=>.05$). After medium intensity conflicts between two females, opponents on average are closer together as compared to conflicts between two males or between females and males. These results are reported in table 5.4.

AGE OF THE OPPONENTS

From the records of the facility, age was calculated for each subject animal and each opponent. Age for each individual was grouped into one of three categories: juvenile (1-4 years); young adult (5-10 years) and old adult (11 years and older). Next, the age categories of the opponents were grouped as per the conflicts: juvenile versus young adult, juvenile versus old adult, young adult versus young adult, young adult versus old adult, and old adult versus old adult. Because only adults were used as focal animals, there is no juvenile versus juvenile category.

Discussed here is how age of the opponents affected the time of separation.

Time of Separation

A test was conducted to determine whether the means of the time of separation

were different for the different age categories of the opponents. Table 5.5 summarizes the results of an Anova test comparing each group. This analysis indicated that conflicts between juveniles and old adults resulted in times of separation that are significantly later than times of separation after conflicts between juveniles and young adults, two young adults, two old adults, or between young and old adults at the .05 level. But interestingly,

Table 5.5
ANOVA: RESULTS FOR TIME OF SEPARATION
AND AGE CATEGORIES OF OPPONENTS

Age Category For Both Opponents	Mean In Seconds of Time of Separation	Standard Deviation
Juvenile/Young adult	335.75	253.01
Juvenile/Old adult	1031.29**	1278.30
Young adult/Young adult	227.50	255.44
Young adult/Old adult	344.56	436.09
Old adult/Old adult	277.59	394.16
** statistically significant		

when the time of separation in the category juvenile/old adult are separated by relatedness, that is, when mother-offspring conflicts are not counted, the time of separation falls well within the range of the time of separation for the other categories (Mean=276.6; SD=277.58). The difference in the time of separation for this category as indicated on the table thus lies in the special relationship between offspring and their mothers.

SUMMARY

From the preceding analysis, several factors were found to affect the pattern of reconciliation. The influence each factor has on the pattern of post-conflict interaction however, differs. The following is a summary of these influences.

1) The analysis found that relatedness between opponents affected the pattern of reconciliation more than any of the other factors. Firstly, related opponents stayed closer together after a conflict than unrelated opponents. Secondly, related opponents were more likely to decrease their distance in regards to one another after an orientation was made, than unrelated opponents. Thirdly, related opponents displayed more reconciliatory behaviours in the post-conflict period than unrelated opponents. Fourthly, a tendency exists for reactors to initiate the separation between related opponents and for actors to initiate the separation between unrelated opponents. Fifthly, related opponents spent more time in the same general vicinity after a conflict than unrelated opponents. Sixthly, the timing of the reconciliation behaviour was found to occur earlier between unrelated opponents than between related opponents.

2) The analysis also found that the strength of the social bond between opponents affected the pattern of reconciliation. Firstly, opponents with higher social network scores generally are closer together after the conflict than opponents with lower social network scores. Secondly, there is a tendency for opponents with higher social network scores to decrease their distances after a conflict more often than opponents with lower social network scores. Thirdly, monkeys with higher social network scores display more reconciliatory behaviours in the post-conflict period than monkeys with lower social

network scores. Fourthly, opponents with higher social network scores on average spend more time in proximity to one another than opponents with lower social network scores.

3) The sex of the opponents was found to affect the reconciliation pattern in a limited way. After low and high intensity conflicts no significant difference was found comparing sex of the opponents with distance, however, after medium intensity conflicts there was a difference. Conflicts between two females resulted in distances that were closer than after conflicts between two males or a female and a male. In addition, after medium intensity conflicts between two males, opponents were further away than after medium intensity conflicts between two females or a female and a male.

4) The age on the opponents was found to affect the reconciliation pattern also in a limited way. The time of separation for all categories was similar except after conflicts between juveniles and old adults. After these conflicts, the time of separation was significantly later in the post-conflict period. This was found to be due to the special relationships between mothers and their offspring as conflicts between unrelated juveniles and old adults had the same pattern of time of separation as the other age categories.

5) Interestingly, conflict intensity was not associated with any significant differences in the pattern of behaviours in the post-conflict period.

The present study revealed that reconciliation occurs in Japanese monkeys. The pattern of reconciliation was found to be affected primarily by the degree of relatedness and secondarily by the strength of the social bonds between the opponents. Sex and age of the opponents had a limited effect on these patterns. Conflict intensity was found not to affect the pattern of reconciliation in the post-conflict period.

CHAPTER SIX DISCUSSION

INTRODUCTION

This study revealed that reconciliation occurs after about one-fifth of the conflicts among Japanese monkeys. Warbling, lip smacking, groom solicitations, grooming and feeding near are behaviours that occurred more frequently in post-conflict than matched-control periods. Because of this, these are deemed reconciliation behaviours. Reconciliation was found to occur more frequently between related opponents and opponents with stronger social bonds than between unrelated opponents and opponents with weaker social bonds.

The discussion now turns to an examination of the patterns of reconciliation described in chapters four and five. The question that is addressed is how these patterns reflect inter-individual processes between the opponents. Firstly, the results of the study are discussed in terms of de Waal's (1986b) reconciled hierarchy model. The results are integrated into this model as a possible explanatory framework for the reported patterns of reconciliation among the Japanese monkeys in Texas. Secondly, the influence of kinship and "friendship" on reconciliation behaviours as found in this study are discussed in terms of the benefits associated with relationships of these types.

THE RECONCILED HIERARCHY MODEL

De Waal (1986b) presents a model of social mechanisms that he suggests contributes to the reduction of the costs of competition between members of a primate group. By reducing the cost of competition, the resulting effect of these social

mechanisms is a maintenance of social cohesion and stability. The model provides an understanding of behaviour that is beneficial for the individual and for the group in conflict contexts. This is done without the cost-benefit dichotomy that has been pervasive in much of the literature on aggression. Interestingly, this model explains how behavioural mechanisms affects social organization without an evolutionary tone. De Waal's model is called the reconciled hierarchy.

The reconciled hierarchy model consists of three social mechanisms: conditional reassurance, formalization of status, and status striving. De Waal's model has been expanded here to include actor's and reactor's behaviour for each mechanism. This revised model is presented in table 6.1. Each mechanism will be discussed in turn.

Conditional Reassurance: At the individual level, conditional reassurance occurs when the dominant individual offers reconciliation and social tolerance to the subordinate individual in return for the subordinate individual's submission. At the group level, conditional reassurance, creates a dominance hierarchy which has the effect of reducing the number of conflicts within the group because each individual recognizes his/her position in relation to the position of other troop members. It is considered that conditional reassurance promotes social cohesion among the troop members because competition is decreased due to this recognition of position.

Formalization of Status: At the individual level, formalization of status occurs when individuals display certain behaviours according to their respective ranks to other members of the troop. This is considered to be the formal dominance layer between two individuals. The formal dominance relationship of a dyad remains stable regardless of

Table 6.1
THE RECONCILED HIERARCHY MODEL

SOCIAL MECHANISM	ACTOR'S BEHAVIOUR	REACTOR'S BEHAVIOUR	GROUP EFFECT	FUNCTION
Conditional Reassurance	Reconciliation Social Tolerance	Submission	Dominance Hierarchy	Social Cohesion
Formalization of Status	Ritualization of Behaviours Directed Toward Reactor	Ritualization of Behaviours Directed Toward Actor	Continuance of Dominance Hierarchy	Social Stability
Status Striving	Assertion	Retaliation	Conflict	Social Dynamics

(adapted from de Waal, 1986b:475)

the social context. At the group level, formalization of status is maintained even during incidental reversals of rank order during conflict such as when a lower ranking female threatens a higher ranking male in defense of her offspring, or during refusals of submission. It is thus considered that formalization of status leads to consistency of behavioural interaction patterns between any two individuals. This results in social stability because of the fixed dominance positions of individuals in a dyad.

Status Striving: At the individual level, status striving is the attempt by one individual to become dominant over other members of the group. At the group level, status striving results in conflict and consequently, it contributes to the disruption of the dominance structure and of the patterns of association among the members of the group.

These social mechanisms, conditional reassurance, formalization of status, and status striving

operate at the level of inter-individual relationships and affect those relationships in such a manner that certain overall patterns emerge at the group level... conditional reassurance and formalization, go hand in hand... formalization and status-striving, exclude each other and alternate with one another (de Waal, 1986:475).

The cooperative aspect of de Waal's model is summarized in the following quote.

"Members of the same [primate] group maintain a cohesive network of social bonds and mutual dependencies. There is a general interest among them in keeping the costs of competition low" (de Waal, 1986b:475). The model suggests that behaviours occurring in the context of conditional reassurance, formalization of status and status striving are limited to prescribed patterns of behaviour within the group such as specific appeasement

behaviours or specific agonistic behaviours. By limiting the displays to adaptive behaviours, the cost of competition is reduced and social cohesion and stability are ensured.

We now turn to a discussion of how the patterns of reconciliation among Japanese monkeys found in this study follow the concepts put forward in the reconciled hierarchy model. In this section several underlying assumptions of the model are investigated.

To begin, the simple but key underlying aspect to be recognized in the reconciled hierarchy model is that there is communication between the opponents involved. Communication enables each individual to view the behaviours displayed by their opponent in the post-conflict period. By the very nature of this, the opponents need to remain in proximity to one another in order for this communication to occur. This behaviour could be viewed as attentiveness toward the opponent.

Attentiveness toward other troop member's behaviours has been observed in *Ethythrocebus patas*. This behaviour pattern has been termed visual monitoring (Rowell and Olson, 1983). These researchers suggest that visual monitoring provides information concerning the behaviour of the individual being monitored. And more specifically, visual monitoring allows each monkey to see what other individuals are doing and where they are doing it. It was found that patas monkeys monitor other group member's behaviours and adapt their behaviour to what they perceive as the other monkey's activity. In this way, communication between troop members is maintained.

Interestingly, it can be speculated that visual monitoring occurred between the Japanese monkey opponents in the post-conflict periods because of the following

behaviour patterns observed in this study. Firstly, after a conflict, monkeys were more often observed sitting either facing or sideways to their opponents. These orientations occurred at high frequencies and were not restricted to any sociological or contextual factors of the conflict. Secondly, most opponents stayed within seven meters of each other in the post-conflict period for at least a minimal period of time regardless of conflict intensity. This distance may be considered "safe," however, the distances were close enough to allow inter-individual communication. And thirdly, after conflicts when opponents immediately separated, at least some opponent pairs recontacted one another shortly thereafter. These recontacts were initiated by both actors and reactors.

As suggested by the research on patas monkeys, visual monitoring among the Japanese macaques in Texas appears to be the most obvious way of perceiving the behaviours of other group members. In many of the post-conflict periods in this study, actors and reactors were observed behaving in a manner that ensured visual contact with their opponents. From this, it appears that the Japanese monkey opponents were behaving in ways that maintained communication distances by limiting the dispersive nature of the conflict interaction.

It is thus assumed that Japanese monkeys monitor their opponent's behaviour in the post-conflict period and this behaviour pattern is the key underlying aspect to the reconciled hierarchy model due to its communicative nature.

We now turn to the social mechanisms of the model and discuss them in terms of the patterns of reconciliation behaviour that were observed in this study.

Conditional Reassurance and Formalization of Status: Behavioural interactions

between opponents in the context of conditional reassurance and formalization of status, express the idea that these social mechanisms contribute to social cohesion and stability among the members of the group. Following the theoretical framework of the reconciled hierarchy model, three assumptions can be made concerning the relationship between these social mechanisms and the pattern of reconciliation observed in this study.

Firstly, because the likelihood of continued agonism decreased when reconciliation behaviours were displayed among the Japanese monkey opponents studied, it can be said that, in these cases, conditional reassurance had been granted by the actor. It should be emphasized here that the winner of the conflict is not necessarily required to show affiliative behaviours for conditional reassurance to occur, however it is important for the individual in the subordinate position to behave in the appropriate manner because without submission, there cannot be peace (de Waal, 1986b). To illustrate this, the following example is given.

monkey B may [submit to] monkey A in 99 cases in the absence of an action or display on A's part. On the hundredth occasion he fails to [submit], and is attacked and chased away by A. As a result he is likely to initiate subsequent [submission] without waiting for A to respond ...[It can be stated then that monkey B's behaviour is required] ... Yet it is A's behaviour which largely controls the relationship(Clutton-Brock and Harvey, 1978:303).

This type of inter-individual process was demonstrated in the analysis when appeasement behaviours were shown to occur more often by reactors than by actors and that in many cases actors did not respond to the reactor's appeasement behaviours with

affiliative behaviours. In essence, submissive behaviours replaces escape behaviours by the reactor in conflict interaction. This is an interesting point as the antisocial effects of the concept of aggression were not demonstrated in this study. Further examples of this are that among the Japanese monkeys in Texas, almost 40% of the post-conflict periods involved a decrease in distance between opponents. And, almost 20% of opponent pairs were still in the same vicinity ten minutes after the end of the conflict. Clearly, conflict does not result in antisocial behaviours instead the conflict and reconciliation complex appears as a triangular interaction between conflict, fear and attraction (de Waal and Yoshihara, 1983). The "social attraction and dependency turn fear into submission and respect" (de Waal, 1986b:471).

The second assumption concerning the relationship between the social mechanisms of the reconciled hierarchy and the pattern of reconciliation observed in this study states that when conditional reassurance was granted, the reconciliation behaviours observed in the post-conflict period reflected the formal dominance status existing between the two opponents involved (de Waal, 1986b). Submissive behaviours, in particular, warbles and lip smacks, were displayed by reactors *and* these behaviours were apparently recognized as submission by actors. The direction of these behaviours was found to follow the dominance hierarchy from subordinate to dominant (ordinarily from reactor to actor) and therefore the reconciliation behaviours return the interactions between the Japanese monkey opponents to non-conflict context levels. It should be noted here that the reconciliation behaviours were different than first behaviours in the matched-control period indicating that the reconciliation behaviours have this function of normalizing the

relationship.

The third assumption is that two behavioural repertoires exist in the situations involving conditional reassurance and formalization of status: one for the winner and one for the loser. Accordingly, behaviours should be unidirectional in that behaviours should be displayed consistently either by actors or by reactors.

The idea of unidirectional behaviour displays was evident in this study. Mounting and groom solicitations were consistently displayed by the actors of the conflict whereas appeasement behaviours were almost always displayed by reactors. In other words, in this study, the winner of the conflict did not offer reconciliation with the same behaviours with which the loser displayed submission.

Status Striving: Two of the social mechanisms of the reconciled hierarchy, conditional reassurance and formalization of status serve to maintain social cohesion and stability whereas the third mechanism, status striving, allows for individuals to challenge the more dominant individuals of the group. The challenges observed in this study included retaliation and assertion. On several occasions apparent retaliations were observed when reactors initiated a conflict to the actor after the initial conflict had ended. "Refusals of reconciliation" were also observed. In these cases, groom solicitations by actors were not followed by grooming by reactors. These interactions can contribute to changes in the dominance order and to patterns of association among the troop members.

It is suggested here that because there is a high rate of mutual monitoring by Japanese monkey actors and reactors in the post-conflict period, and because each opponent's role in the reconciliation context is different, actors were monitoring

something different than reactors. Using the theoretical framework of the reconciled hierarchy model, it appears that in the post-conflict period among the Arashiyama monkeys, actors were monitoring reactor's behaviour for submissive signals and reactors were monitoring actor's behaviours for affiliative behaviours or for social tolerance such as proximity behaviours of sit or feed near. The conditional reassurance granted to the reactor, appeared to be acknowledged by the patterns of behaviour by actors, however not all appeasement behaviours were followed by specific conditional reassurance behaviours by actors. This reflects de Waal's hierarchy model in that appeasement behaviours are more important than specific behaviours by actors for the maintenance of the cohesive social structure. This is because it is the submissive behaviours that are required for formalization of status and conditional reassurance interactions.

One final point must be made. There appears to be a need for reassurance by both opponents after a conflict as it was found that reactors *and* actors initiated the consolation interaction more frequently than the consoler. This may be an important reassurance aspect of the post-conflict period as consolations occurred whether or not there was a reconciliation.

THE VARIABLES: KINSHIP AND SOCIAL BOND STRENGTH

In chapter five, it was concluded that Japanese monkeys are discriminatory with whom they reconcile. This is evident from the analysis showing that reconciliation behaviours occurred more frequently between related opponents than between unrelated opponents and between opponents with stronger social bonds than between opponents

with weaker social bonds. In other words, reconciliation behaviours were preferentially directed toward kin, and "friends" where "friendships" cross-cut genealogical lines. From this, we can state that there is a greater likelihood that reconciliation will occur between opponents that interact frequently in non-conflict contexts.

Kinship and "friendship" have also been identified in other reconciliation studies as variables affecting reconciliation behaviours (York and Rowell, 1988; Aureli et al, 1989; de Waal and Ren, 1988; Judge, 1983; de Waal and Yoshihara, 1983). The assumption that is prevalent in many of these studies is that it is the quality of the relationship between the opponents that determines whether or not reconciliation occurs. The quality of the relationship reflects the degree to which individuals give and receive affiliative integrative behaviours including behaviours such as huddling, sleeping, grooming, and aiding in conflict situations. Individuals with which one spends more time is interconnected with that individual's social, alliance and coalition network, thus the quality of the relationship is considered high. Among the Japanese monkeys in Texas, the results of the present study appears to follow the assumption that the quality of the relationship between the opponents largely determines the likelihood of a reconciliation. Opponents that were kin related or that were "friends" were more likely to display reconciliation behaviours and to be closer together and to stay together for longer periods of time after a conflict than nonkin and opponents with weak social bonds.

Accordingly, because there was a difference in the quality of relationships for each of the dyads observed, reconciliation should not occur after all conflicts. We can predict then, to some degree, whether or not reconciliation will occur based on the quality of the

relationship of the opponents involved. The point is, the likelihood that a reconciliation occurred increased in this study with the benefits associated with the relationship. Unreconciled conflicts would jeopardize the benefits involved in such relationships. In addition, not only does reconciliation maintain the relationship between the opponents but its influence extends outside the dyad to other members of the troop. Because of the complex systems of power relations involved in the troop, a reconciled (or unreconciled) conflict can possibly change the patterns of interactions with the opponent's kin and "friends".

The unreconciled conflicts, approximately four-fifths of the conflicts observed generally represent situations where there exists little or no social bonds between the opponents thus there are no social bonds in need of repair.

The percentage of reconciliation that occurred among the Japanese monkeys in Texas appears at the lower end as compared to the percentages of reconciliation that occurred in other primate species studied thus far. At this point, determining the effect of the captive versus feral living conditions on the pattern of reconciliation remains as no one species has been studied in both conditions. However, because reconciliation appears to be based on the quality of the relationship between the opponents, the living conditions may well affect the pattern of reconciliation for several reasons. Firstly, in captive settings escape from an opponent is impossible and avoidance is difficult. Secondly, because captive groups are generally smaller than feral groups each individual in a captive group is interconnected socially to a greater extent with all the other group members than in a feral group. These points suggest that in captive settings reconciliation may occur more

frequently than among free-living individuals because in captive settings the social reliance on each other is greater and there is no opportunity to leave. This does not diminish the point that reconciliation between kin opponents, regardless of the living conditions, should occur at higher rates as compared to nonkin opponents.

SUMMARY

From the analysis, it was found that many of the post-conflict interactions limited the dispersive effects of the opponents involved. Certain behaviour patterns emerged that appeared to return the relationship to base interaction levels sooner than what would be expected if reconciliation did not occur. In this way, the monkeys appeared to behave in ways that reduced the costs of competition among the members of the group. These behaviour patterns are very interesting as the monkeys acted in a way contrary to that expected employing the antisocial assumptions of the term aggression. Indeed, these behaviours may be explained by stating that the monkeys are acting in a way that is adaptive for the actor and the reactor. Opponents with good relationships tended to reconcile at higher frequencies than other opponent pairs and therefore these individuals are maintaining the benefits associated with their relationships. The unreconciled conflicts generally represent situations where there exists little or no social bonds between the opponents thus there are no social bonds in need of repair. The effect at the group level of reconciliation is a maintenance of social cohesion and stability and the continuation of the benefits associated with living in social groups.

The mechanisms involved in the interaction between conflict and reconciliation

creates a system that allows for change in the relationship between individuals and stabilizes this relationship after the conflict *until* the conditions of peace are challenged once again.

CHAPTER SEVEN

CONCLUSION

Aggressive behaviours vary dramatically in form and frequency both within and between species and can range from mild threats to overt violence. Because of this diversity in aggressive actions, finding a definition that encompasses all acts of aggression and the meaning of these acts has proven to be difficult. Definitions of aggression have generally consisted of the assumption that an individual is attempting to injure another, and with this assumption comes the connotation that aggression is "bad." As well, aggression has also been considered to be a dispersal mechanism as it's functions have been linked to the inter-individual regulation of distances which presumably is based on inter-individual competition. These assumptions and connotations associated with the term aggression present a theoretical dichotomy between the sociability and the aggressiveness of primate groups. The term aggression was thus limited in it's methodological use. In response to ideas such as these, Scott and Frederickson (1954) introduced the term agonism. Agonism refers to "behavior which is adaptive in situations involving conflict between members of the same species" (Scott, 1974:417). Of paramount importance to the change in definition was the concept that behaviours in agonistic interactions were adaptive for each opponent, the actor and the reactor: the cost-benefit dichotomy between the actor and the reactor of the conflict was alleviated. Instead, the shift in focus was turned toward understanding the maintenance of social integration based on inter-individual cohesion not inter-individual competition.

Another important turn in the literature was the introduction of the concept of reconciliation. Reconciliation, it was suggested, occurred after conflict interactions to actively repair the social bonds between opponents. Reconciliation is the attraction

between opponents which maintains the balance between the "cohesive and disruptive social forces" among individuals of a group (de Waal, 1986a:341). Reconciliation appears to be one mechanism which is involved in maintaining the cohesiveness of primate social groups in spite of the dispersive effects of conflict.

Reconciliation has been studied in seven primate species thus far. This research supplements the literature by investigating reconciliation in Japanese monkeys, a previously unstudied species in this research area. The study was conducted in a semi-free ranging troop just outside Dilley, Texas.

Several identifying patterns emerged from this study. These patterns include: (1) opponents do not necessarily disperse after an agonistic confrontation; (2) monkeys tend to remain in visual contact with their opponent; (3) opponents that have strong social bonds such as kin and "friends" reconcile more often than opponents that have weak social bonds; (4) intensity of the conflict does not play a major role in determining post-conflict behaviours; and (5) no single behaviour is diagnostic of reconciliation, either by actors or reactors however, behaviours clearly directed toward the opponent do occur in almost one-fifth of the post-conflict periods.

Visual monitoring occurred between opponents in the post-conflict period. It appears that this behaviour pattern allows each opponent to view the behaviour of the other. In this way, actors can watch for submission from reactors and reactors can watch for conditional reassurance from actors. Behaviours in this context are generally unidirectional in that actor's behaviours are different than reactor's behaviours. In general, if conditional reassurance is granted it can be assumed that a formalization of status has

occurred. In this context, the submission of the reactor is an important element during reconciliation and thus submission is important to return behaviour patterns between opponents to base level interactions. When reconciliation behaviours were displayed the likelihood of a continued conflict decreased. It can be said then, that conditional reassurance and ritualization of status aspects of the reconciliation behaviours promotes social integration, conflict resolution and tension reduction.

The data showed that two variables largely determined whether or not reconciliation would occur after a conflict. These variables were the degree of relatedness between the opponents and the strength of the social bond between the opponents. This conclusion appears to follow the assumption made in prior reconciliation studies which suggests that the likelihood of reconciliation should increase with the benefits associated with the relationship of the opponents. Among kin and "friends" the benefits are assumed to be high as these relationships reflect the social, alliance and coalition networks of each individual involved. Variations occur in the pattern of reconciliation because there is variation in the quality of the social relationships of different dyads.

Few studies have been conducted investigating reconciliation in primates. Except for the present study, all research has been done on captive groups. Interestingly, all the studies including this one have similar data results, in that reconciliation occurs more frequently among opponents with stronger social bonds than with weaker social bonds. Depending on the species, these bonds may or may not reflect relatedness. Further research in the reconciliation field may discern the role of the environment on the role of reconciliation by exploring and comparing reconciliation patterns between a single

species in captivity and in the wild. Specifically, differences may occur because in captive situations each individual of the group is a greater proportion of the other's social network than in feral groups. As well, individuals in captivity have no opportunity for escape and of course, no other troops to join.

It has been shown that reconciliation is of paramount importance to the understanding of social cohesion, conflict resolution, and tension reduction. Reconciliation is thus an effective social mechanism. Further research will provide a fuller understanding concerning the interaction between conflict and reconciliation, reconciliation and social bonds, and reconciliation and the environment. Reconciliation behaviours between former adversaries indicate that "reconciliations may be not so much what you do, as whom you do it with" (York and Rowell, 1988:507) because "conflicts are not forgotten, they are resolved" (de Waal and Yoshihara, 1983:239).

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