



Male-male sexual behaviour in adult captive stump-tailed macaque, *Macaca arctoides*

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Received 2 February 2011 | Revised 24 February 2011 | Accepted 28 February 2011

ABSTRACT

The present study represents the unique features of male homosexuality in forms and context, and determines whether this behaviour is sexually motivated or sociosexual in function in captive stump-tailed monkeys, *Macaca arctoides*. Ten incidents of homosexual encounters between α - and β -male were observed. No reciprocal mounting was observed. Every episode of homosexual encounters was initiated immediately after the heterosexual encounter between the β -male and receptive females. The main copulatory event was anal intromission followed by ejaculation outside the mountee's body and eating of semen by both the actors. The average number of pelvic thrust was 20. Duration of pelvic thrust and copulation were 12.3 and 54.7 sec, respectively. The α -male never copulated with any of the estrous female and there was no homosexual encounter observed between α -male and γ -male, except for brief mounts. Three lines of evidences indicated that the homosexual encounters between α - and β -male were sexual behaviour, not sociosexual ones. Firstly, mountings were observed only during the mating season. Secondly, these unique mountings did not serve any sociosexual roles and did not mimic generalized pattern of social affiliation. Finally the form of homosexual encounters was same as that of heterosexual encounters. More females in the population and occurrence of male-male homosexual encounter only during the mating season did not support the concept of intraspecific sexual differences in homosexuality.

Key words: Anal intromission; ejaculation; homosexuality; *Macaca arctoides*; pelvic thrust.

INTRODUCTION

Homosexuality is phylogenetically widespread among the anthropoid but totally absent among prosimians.¹ This has been reported in captive and in the wild primates.^{1,2}

Homosexual behaviour is often thought to be a developmental phase restricted to or more common among immature individuals. Nevertheless, it has been observed in all age classes of primates.¹ Earlier brief mounts were correlated contextually with dominant interactions.³⁻⁵ However, the prolonged genital stimulations, manual or oral, dorsal mountings with pelvic thrust and occasionally intromission without ejaculation between the adult

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and sub-adult males, and the sub-adult and infant males, considered homosexual behaviour by Chevalier-Skolnikoff.⁶

At an evolutionary level, homosexual behaviour in animal has traditionally been interpreted as socialsexual which may be defined as behaviour that are sexual in terms of their outward form, but enacted to facilitate some sort of adaptive social goal or breeding strategy.⁷⁻⁹ Sexual motivation is rarely ascribed to these interactions, because their sociosexual functions are often seen as their primary purpose.¹⁰ However, Wickler argued that same sex mounting interactions can be sexually motivated or occur in a sexual context such as estrous and still serve some social function.⁹ In addition Carpenter suggested that homosexual behaviour might be a substitute for heterosexual coitus.¹¹

But Chevalier-Skolnikoff working with captive stump-tailed macaque suggested that homosexuality was not due to the absence of an estrous female.⁶ Male-male mounting occurred most frequently in the non-breeding season without pelvic thrust. It did not occur in series or lead to ejaculation as breeding season mounts often did. He also suggested that female homosexual behaviour was directly elicited by observing heterosexual interactions. Homosexual behaviour appeared to be less characteristic of monogamous, polyandrous, and polygynous primates, and more common among multi-male multi-female groups.¹

With emergence of sociobiology, homosexuality is no longer viewed as an abnormality. It is viewed as the product of evolutionary processes and explicable in adaptive terms with no supporting evidence.^{12,13} The present study represents the unique features of male homosexuality in both form and context in captive stump tailed monkeys. The male-male homosexuality observed during breeding season adds a new dimension in sexual behaviour of stump-tailed monkey in particular and non-human primates in general.

MATERIALS AND METHODS

Subjects and study site

The study was conducted among captive animals at the Aizawl Zoological Park, Aizawl, India. The study group of stump-tailed macaque (*Macaca arctoides* I. Geoffroy, 1831; family Cercopithecidae) consisted 4 adult males, 9 adult females, 3 juvenile males, 1 juvenile female, 1 infant male and 2 infant females. The details of individuals are given in Table 1. All individuals in the study could be uniquely identified by natural (face and genital colour, nipple shapes, and the pattern of dark patches on nose for juveniles) and/or acquired (scars on face and fingers) physical features. The monkeys lived in two indoor rooms and one outdoor enclosure. All members of the study group were readily observable regardless of the room or enclosure they occupied. The first two males, 29 and 27 years of age were named as α - and β -male, respectively. The male died on July 2010 and the fourth male named δ -male was introduced to the group on December 2010. This captive group of stump-tailed macaque does not breed throughout the year unlike those reported by Smith.¹⁴ According to the record of the zoo-keeper, mating season was during the months of November to January and birth season in the months of May to July. The birth of seven infants in the months of June and July was witnessed during the present study covering three years.

Data collection

Observations were based on focal animal sampling technique developed by Altmann.¹⁵ Sampling day was divided into two periods, 0600 hrs to 1130 hrs and 1130 hrs to 1700 hrs. All sexual activities of both heterosexual and homosexual (i.e. sexual solicitations, copulatory attempts, mounting, copulatory series, etc.) were recorded during the study period

Table 1. Population structure of stump-tailed macaque at Aizawl Zoological Park.

Name of the Animal	Sex	Approximate age (yr)	Reproductive condition	Dominance status
Alpha (α)	Male	29	Breeding	1
Beta (β)	Male	27	Breeding	2
Gamma (γ)	Male	7	Breeding	3
Delta (δ)	Male	9	Breeding	4
Pitari	Female	20	Cycling	5
Buangi	Female	18	Cycling	6
Kci	Female	18	Cycling	7
Hnupi	Female	12	Lactating	8
Nutei	Female	12	Lactating	9
Seni	Female	8	Cycling	10
Mci	Female	8	Cycling	11
Rani	Female	7	Pregnant, cycling	12
Dali	Female	6	Cycling	13
Nui	Female	2.5	Immature	14
Jv1	Male	2.5	Immature	15
Jv2	Male	2.5	Immature	16
Jv3	Male	2.5	Immature	17
Neo1	Male	1.5	Infant	18
Neo2	Female	1.5	Infant	19
Neo3	Female	0.5	Infant	20

between June 2009 and January 2011. Focal data was collected daily for male stump-tailed macaque engaged in homosexual encounters. The observations of homosexual encounters involved, sexual solicitations, time of copulation, methods of stimulation, mounting position, number of pelvic thrust, duration of copulation and the post-copulation activities.

For statistical analysis one sample *t*-test was conducted to find the variation within the sample data.

Definitions

Double foot-clasp mount occurred when the mounter grasped the mountee's loins with his hands and his feet just above the mountee's ankles. *Solicitations* served to prompt mounting.¹⁶ Three types of solicitations were chosen for analysis:

1. *Hindquarters presentations* were performed

by the potential mountees who stood quadrupedally with their arms and legs flexed and their perineum oriented towards the potential mounter.

2. *Back presentations* were performed by potential mountees who sat with their forearms slightly bent and their backs inclined and oriented towards the potential mounter. Hind-quarter presentation and Back presentation are the signs of request to be mounted.

3. *Hands-on-hindquarters* were performed by potential mounters who grasped or placed one or both hands on the hindquarters of the potential mountee. It is a sign used for requesting to mount.

Pelvic thrust was defined as movement of the mounter's pelvic girdle toward the mountee's perineum. *Thrusting rates* were calculated by dividing the number of thrusts an individual executed during double foot-clasp mounts with thrusting by the number of double foot-

clasp mounts with thrusting they performed.

RESULTS

Ten incidents of unique male homosexual behaviour occurred in January 2010 in four different days during the mating season. Details of homosexual encounters are given in Table 2&3. The α -male always mounted over the β -male (Fig. 1A). Ejaculation was observed in all the episodes. Every episode of homosexual encounter was initiated immediately after the heterosexual encounter between the β -male and receptive females.

Pre-copulatory event included hindquarters presentation that always ended with simple manual genital stimulation and back presentation that led to actual mounting. Hands-on-hindquarters leading to mounting occurred in 7 of the 10 homosexual encounters. No oral genital stimulation was observed and the mounting was in double foot-clasp position similar to heterosexual encounters (Fig. 1B). Ejaculation was observed in all the homosexual encounters. During the α - and β -male homosexual encounters, the average number of

pelvic thrust was 19.9 (± 3.67)/encounter, ranged from 15 to 25, exhibited by the mounter followed by ejaculation. In all the events pelvic thrusts led to ejaculation on the back of the mountee. The number of pelvic thrust varied extremely significant ($p < 0.01$) in all the episodes. The average duration of pelvic thrust was 12.3 (± 4.06) seconds, ranges from 7 to 18 seconds and the duration also varied significantly ($p < 0.01$). The average duration of copulation including ejaculatory period was 54.7 (± 5.36) seconds, ranges from 45 to 60 seconds and the duration of copulation varied significantly ($p < 0.01$). The ejaculatory phase was distinguished by a pause followed by stiffening of the body, muscular spasm and rhythmic expiration vocalization (Fig. 1C). Visually it appeared that in initial 2-3 copulation the semen was consistent white jelly-like substance that becomes thinner and lesser in quantity in subsequent mounting. After each ejaculation, both the actors ate the semen which was the main post-copulatory event. Most frequent copulatory event occurred was five times within a short duration of about 40 minutes and shortest intervals was 5 minutes (Table 2).

Table 2. Homosexual encounters on different days in January 2010.

Date of encounter	No. of Copulation bout	Time of copulation (am)	No. of pelvic thrust	Duration of pelvic thrust (sec)	Duration of copulation (sec)
7 th	05	7:30	20	15	60
		7:37	25	17	60
		7:45	22	12	55
		7:50	15	8	50
		8:10	17	8	52
9 th	02	8:00	15	7	45
		8:10	18	9	50
11 th	02	9:00	20	14	55
		9:08	25	18	60
15 th	01	8:45	22	15	60
Average			19.9	12.3	54.7
SD			(± 3.67)	(± 4.06)	(± 5.36)
<i>t</i> -value			17.17	9.589	32.302
<i>p</i> -value			<0.01	<0.01	<0.01

Table 3. Methods of stimulation observed in male homosexual encounters.

Sl No.	Methods of stimulation	Numbers of incidence	Types of male participants	Season of occurrence
1.	The second male stimulating the anus of presenting male without mounting.	72	Both adult and immature males	Both mating and non-mating seasons
2.	Mounting with manual stimulation of mounter by animal mounted.	35	Only immature males	Both mating and non-mating seasons
3.	Mounting without pelvic thrust (brief mount).	147	Both adult and immature males	Both mating and non-mating seasons
4.	Mounting with pelvic thrust without anal intromission, the mounter stimulating himself by rubbing his penis against the animal mounted.	205	Only immature males	Both mating and non-mating seasons
5.	Mounting with anal intromission leading to ejaculation.	10	Only between α -male and β -male	Only mating season

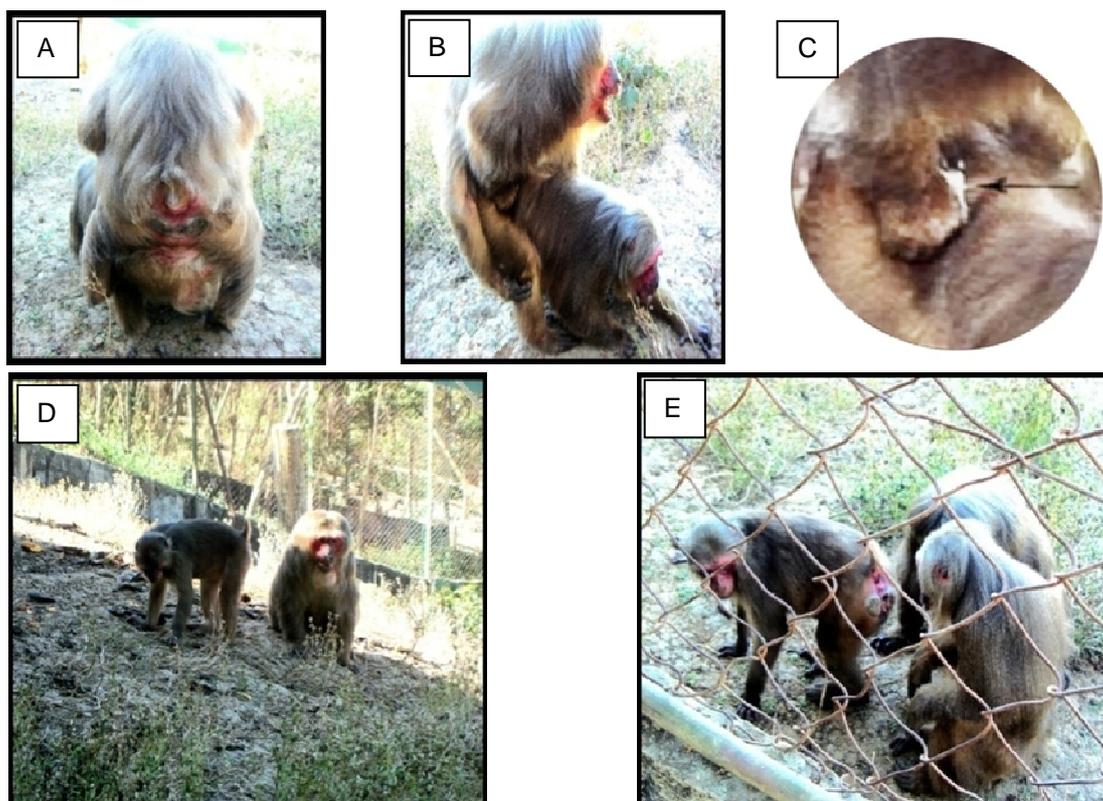


Figure 1. A. Copulatory event between α - and β -male; B & C. The ejaculatory phase; D. & E. Shows the estrous female presenting her rear to α -male.

DISCUSSION

Mounting interactions between same-sex individuals are taxonomically widespread and occur fairly frequently in certain species, but their functional significance, if any, remain obscure.¹ Chevalier-Skolnikoff⁶ studied the homosexual potential of captive stump tailed macaque in term of forms, context and functions. He reported that homosexual behaviour in non-human primates is not limited to any specific age group and sexes, it occurred between individuals who have strong positive emotional ties. The infants, in heterosexual and homosexual interactions with peers and with adults may be training for sexual role. He reported thirteen incidents of male homosexual behaviour in stump-tailed macaque, all the three males in the group (adult, sub-adult and infant males) participated in the encounters. The most dominant male in the group never assumed a female role. There seemed to be a definite relationship between dominance status and sexual role in the male homosexual interactions. Homosexuality in female stump-tailed macaque is known to be sexually motivated where the individuals exhibit copulatory facial expressions and undergo orgasmic uterine contractions.¹⁷

Our observations of homosexual encounters indicated that the α -male never assumed a female role. It is only the β -male that exhibited the female's role. However, both the males are of almost of same age. No encounters were observed between adult and young male like Chevalier-Skolnikoff's observations.⁶ Both individual showed rigid propensity towards their role. Same was not encounter by Chevalier-Skolnikoff but in the contrary both male acted as females in some incidence and also changed their role other time. Homosexual encounters in this study were observed only during the mating season when the estrous females were available. The α -male never copulated with any of the estrous female. In several occasions estrous female presented herself to α -male, he rejected the fe-

male and copulated with β -male (Fig. 1D&E). Interestingly, all the encounters occurred after the heterosexual encounter between the β -male and the estrous female. During their heterosexual encounter the α -male chased away the female and approaches the β -male. Sexual solicitations were both request to mount (where α -male placed one or both hands on the hindquarter of the β -male, this incidence occurred in 70% of the total homosexual encounters between them) and request to be mounted (where β -male exhibited back presentation, which occurred in 30% of the total homosexual encounters between them). In every episodes of homosexual encounter the interaction is initiated by manual anal manipulation. However, the extent of anal manipulation was inconsistent during the episode.

The γ -male was introduced from the breeding centre to the study group on 15 November 2010. Both α - and β -male had been living together in the same enclosure since their infant stage. Therefore, most of the members of the group were the descendants of these two adult males. However, it was unlikely that the α - and the β -male were behaving in an altruistic way for the reproductive benefit of the γ -male and also, sexual selection would not likely to favoured such altruistic behaviour. Majority of the primates did not exhibited sexual difference in the frequency with which homosexual behaviour is expressed.¹ The sexual differences in frequency of expression of homosexual encounter in some intraspecific group may also be due to factors such as living condition, group composition, and seasonality. However, the study group being living together in the same condition throughout the year, having more female animals in the population, and occurring of male-male homosexual encounter only during the breeding season did not support the concept of intraspecific sexual differences in homosexuality. Three main lines of evidences indicated that the unique homosexual encounters occurred between α -

and β -male were sexual behaviours, not socio-sexual ones. Firstly, the mounting with ejaculations observed between only α - and β -male occurred only during the mating season. During the study period several incidence of male homosexual encounters were observed throughout the year in all age classes but mounting with anal intromission and ejaculation was observed only between α - and β -male in the month of January 2010. The same type of homosexual interaction was not observed among other adult males even in the next mating season. Secondly, this type of homosexual encounter did not serve any of the sociosexual roles and did not mimic generalised pattern of social affiliation. For example, the frequency of grooming between α - and β -male did not differ between observation days and non-observation days of homosexual interaction between them, and this behaviour did not seemed to reduce aggression nor regulated tension between the participants. Finally, the form of homosexual encounters between these two males were same as that of heterosexual encounters where the mounter exhibited double foot-clasp mounting with pelvic thrust leading to ejaculation with loud rhythmic expiration vocalisation.

Several incidents of brief mount also occur between α - and γ -male. But they were unlike the homosexual encounters between α - and β -male, and did not involved any pelvic thrust and served to performed sociosexual functions like tension regulation, reconciliation and dominance assertion. For example, most of the brief mounts between α - and γ -male were observed during the feeding time (provisioned food) which worked to calmed anxiety and increased tolerance which made food sharing smooth. Brief mounts also occurs between the juvenile male and the infant male. The juvenile male spent much time with the infant male and give parental care consisting of caring, grooming and playing and occasionally leading to a brief mounts without any pelvic thrust. Handy and Brown reported that infantile homosexual mounts in Japanese ma-

caque (*Macaca fuscata*) occurred in the context of play (70%); proximity or contact (27%), and remaining (3%) occurred in aggressive context.¹⁸ Isosexually reared male *M. arctoides*¹⁹ and *M. mulatta*²⁰ indicated that a lack of heterosexual experience at immature stage does not necessarily affect the expression of competent heterosexual copulation during adulthood. Homosexual encounter between juvenile male and infant male, in the present study, did not seem to be elicited by observing sexual interactions since they exhibited homosexual interaction even before heterosexual encounter was observed. Brief mounts among immature males was observed throughout the year most of which occurred in the context of play.

No homosexual behaviour has been reported so far among the free-ranging stump-tailed macaque.^{6,21,22} In the captive environment, both male and female stump-tailed macaque showed homosexual encounter occasionally; approximately 6-24% as frequently as heterosexual behaviour.^{6,22} However, in the present study, homosexual encounters for all age classes of males were found to be almost equally frequent to that of heterosexual interactions. Wolfe compared demographic trends and frequency of homosexual behaviour between females in two populations of *M. fuscata*.^{13,23} She observed that females living with less number of sexually active males were engaged more in homosexual behaviour. However, demography seems to have no effects on the expression of homosexual behaviour between α - and β -male since there were more sexually active females in the group. Some studies of group living *M. fuscata* and *M. mulatta* indicated that male-male mounting increased significantly when androgen levels are at lower ranges.^{24,25} However, similar studies on *M. arctoides* and *M. mulatta* showed no such correlation.^{26,27} Even in the present study, since all the encounters result in ejaculation and the form of interaction was same as that of heterosexual coitus, this behaviour was unlikely to be the product of abnormal ex-

cesses or deficiencies in androgen. However, the number of pelvic thrust and the duration of copulation vary in homosexual and heterosexual conditions. The average number of pelvic thrust during homosexual encounter was 20 where it was 65 during heterosexual. Duration of copulation was also higher (120-360 sec) in heterosexual encounter as compared to that of homosexual (45-60 sec).

ACKNOWLEDGMENTS

The authors are thankful to the University Grants Commission, Government of India, for providing financial support. We acknowledge the permission, cooperation and logistic support provide by Chief wildlife Warden, Department of Environment and Forest, Government of Mizoram for the study. We thankfully acknowledge the academic and infrastructure support extended by the department of Zoology, Mizoram University, India.

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Male-male sexual behaviour in adult captive stump-tailed macaque, Macaca arctoides

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