

New York Zoological Society

Observations on the Social Interactions and Development of Sexual Behavior in Three Sub-adult, One-horned Indian Rhinoceros (*Rhinoceros unicornis*) Maintained in Captivity

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Introduction

Due to the generally poor breeding record for Indian Rhinos in captivity, observational studies on 3 juvenile One-horned Indian Rhinoceros were initiated during the summer of 1978 in order to learn more about the development of social and sexual behavior in sub-adult rhinos. Both the National Zoo (BUECHNER et al. 1975, BUECHNER and MACKLER 1978) and the Basel Zoo (LANG 1961) have reported that a long period of orientation is required for immature or sexually inexperienced Indian rhinoceroses prior to successful copulation. A total of 152 hours of observation was recorded systematically in addition to frequent casual observations throughout each day between April 1, 1978 and January 20, 1979.

A ♂ and 2 ♀♀ Indian Rhinos were acquired by the Bronx Zoo in 1975. "Patrick", the ♂, was born on January 30, 1974, at the National Zoo in Washington, D.C., and arrived in New York on October 31, 1975. "Radha" and "Mayang", the ♀♀, were both wild caught as juveniles in Kaziranga National Park, India, and maintained by the Assam State Zoo, until they were acquired by the Bronx Zoo on January 30, 1975. Their ages, on arrival, were estimated at 2 years and 2 months. Since August 1977, they have been housed at the recently constructed "Wild Asia" exhibit.

Methods

All observations were made between 8.00 and 15.00 hours for periods of up to 4 hours. However, because long periods of inactivity commonly occurred, short, intermittent periods of observation were considered more productive. 100 hours of observation were recorded in a notebook, and 52 hours were recorded on pre-designed check sheets. The rhinos were observed during active periods and checked periodically during inactive periods. The animals were most active between 14.00 and 15.00 hours, apparently in anticipation of being fed their daily feed ration. Most social interactions occurred at this time.

Facility and Management

Their two-acre wooded outdoor exhibit contains several elevated rock ledges, large, relatively flat hard-packed earthen areas, and 3 naturally-occurring, low, wet areas. One of the low, wet areas has been enlarged by the rhinos to form a wallow approximately 12 feet long and 8 feet wide. At night and during inclement weather, the rhinos are housed in indoor 12'×19' stalls.

At approximately 8.30 hours, the rhinos are moved from their overnight stalls to a large outside holding pen; and at 9.30 hours, they are moved out into their exhibit. While on exhibit, they are fed timothy hay free choice. Each evening between 14.00 and 15.00 hours, the rhinos are brought into their inside stalls for the night and given their daily ration of feed and additional timothy hay.

Animals

"*Mayang*" and "*Radha*" are estimated to be 6.0 years old. "*Radha*" measures 60 inches at the shoulder and appears heavier than "*Mayang*". Her horn is also the most developed, about 4 inches long. "*Mayang*" looks thinner than both "*Radha*" and "*Patrick*" and measures 57 inches at the shoulder. "*Patrick*" is 4.5 years old and is about the same size as "*Radha*", measuring 61 inches at the shoulder. His horn, although much wider at the base, has been worn flat and is much less pronounced than the ♀♀.

Results: Social Activity

Casual observation soon indicated that wallowing was a major activity. 54.23% of the hours of data recorded on check sheets were spent wallowing; 29.37% pacing; 5.65% standing; 3.1% "*Patrick*" chasing a ♀, 1.66% head-to-head pushing; and 0.91% nuzzling. According to ANDREW LAURIE (1977), the wallow is a center for social interaction among Indian One-horned Rhinos in the wild. Although, during this study, wallowing was the only group activity. There was little social activity at the wallow — specifically, aggressive interactions, displays and pursuit of the ♀ by the ♂ were lacking.

The spatial orientation of the individuals appeared independent of sex. One wallow was used and was usually occupied by all three animals simultaneously. The mean length of time spent per day wallowing was 3 hours, 17 minutes; but frequently, during hot days, it lasted up to 4.5 hours.

Defecation and urination was restricted to 2 places — the wallow and a dung pile located at the opposite end of the exhibit. Although the dung pile was removed daily by keepers, the rhinos, especially "*Patrick*", returned to defecate at the same spot every day. Flehmen displays were performed at various times by all 3 animals and were usually associated with lipping urine.

At the start of this study, most social interaction involved "*Patrick*" and "*Radha*". Specific behaviors observed were head-to-head pushing, chasing, ventral ramming, baring of teeth and lunging. The first category, head-to-head pushing, was frequently very physical, each animal lowers its horn to approximately 3 inches off the ground and then pushing against the other animal's head. "Chasing" involved the active pursuit of one animal by another. Both "*Patrick*" and "*Radha*" chased each other at a rapid trot. Ventral ramming was observed in both. Typically, it would occur during the more physical interactions in which head-to-head pushing and chasing also took place. From a distance ranging from 3—10 feet, one animal would charge at a fast trot into the side of another and occasionally knock the other animal down. Baring of teeth and lunging were associated with these behaviors; and frequently, they opened their mouth just prior to lunging, charging, or engaging in the head-to-head push.

Typically, "*Radha*" was the aggressor once "*Patrick*" had initiated the interaction. It was usually "*Patrick*" who approached "*Radha*", tossing his head repeatedly and opening his mouth. If "*Radha*" did not turn to face "*Patrick*", he would lunge at her.

ramming her in the head, neck or side. If "Radha" was still not provoked, "Patrick" would back up, feint a lunge, and then actually lunge into her again. This was usually enough to force "Radha" to turn around, lower her head and engage in the head-to-head pushing. During June and early July, it was "Radha" who usually retreated in these encounters by suddenly trotting off. However, as the summer progressed, "Patrick" began to retreat from "Radha". By September, "Patrick" almost always gave way to "Radha", and physical interactions between the two decreased by 85%. A typical encounter involved 6 head tossings while in the process of approach, followed by one or 2 lunges and ventral ramming, and then head-to-head pushing, with short pauses occurring, during which one or both would again toss its head and resume, either by lunging or pushing against each other. The interaction would end when one individual walked away.

Encounters such as these occurred as often as 14 times in an hour. Interactions were not continuous: either individual was easily distracted. There was a noticeably greater frequency of such displays when the rhinos appeared nervous, due to weather change or disturbance.

Social behavior involving "Patrick" and "Radha" was often very physical. "Patrick" was seen lifting "Radha" off of her feet on 2 occasions. He accomplished this by hooking his horn between her front legs and tossing his head. "Radha" was equally rough with "Patrick", however, so that by mid-August, such displays were rare. Towards late summer, "Radha" seemed to have established herself as the dominant animal over both "Patrick" and the other ♀. The possibility of ♀ dominance over a ♂ is supported by LAURIE's 1975 observations in the wild. He reports an apparent dominance hierarchy independent of sex. "Radha" appears to maintain a dominant position by aggressive displays and mounting of both "Patrick" and "Mayang".

Originally, "Mayang" stayed off by herself, except when in the wallow. Gradually, during July, "Patrick" shifted his attentions: until by August, the majority of his interactions involved "Mayang". The same behaviors of head-to-head pushing and chasing were observed; but with "Mayang", it was "Patrick" who was the aggressor. Head-to-head pushing was briefer, with "Mayang" usually retreating quickly. Chasing occurred for longer periods of time, although "Mayang" was never seen chasing "Patrick". By August, "Patrick" and "Mayang" were constantly together. Contact was frequently observed, and "Mayang" initiated it by rubbing her head along his neck and side. In addition, they spent a great deal of time in close proximity, browsing and walking around the exhibit.

Sexual Behavior

The signs of estrus were usually obvious and lasted from 30 minutes to several hours. Occasionally, the ♀ became aggressive towards keepers, sometimes chasing and threatening them and refusing to enter her stall at night. Increased activity was also noticeable, and constant pacing and head moving occurred.

On April 1, 1978, "Mayang" first displayed several behaviors commonly associated with estrus, including: a milky vaginal discharge, flashing of the vulva, rhythmic contractions, isolated, spontaneous squirting of urine, whistling and exceptionally long periods of pacing. These symptoms were observed for about 90 minutes. Neither "Patrick" nor "Radha" seemed interested or behaved unusually. On May 17, 1978, 47 days later, both "Radha" and "Mayang" displayed these behaviors. The period of maximum

excitement, pacing, whistling, labored breathing, shaking and urine squirting, lasted about 4 hours for each. According to reports by TONG (1958), the average period between estrus is 40–50 days. It appeared that “*Mayang*” and “*Radha*” were beginning to show signs of sexual maturity.

On July 2, 1978, 46 days later, “*Radha*” was heard whistling in the morning, and again on August 15, 44 days later. Only the whistling was heard on both occasions; no other estrus behaviors were displayed. No interest or deviation from usual behavior was noted in either “*Patrick*” or the other ♀.

“*Mayang*” was heard whistling from 7.30 to 8.00 on July 26. The previous day, “*Patrick*” had been especially active in chasing “*Mayang*”. He had mounted her 4 times. “*Mayang*” was not receptive and walked away while “*Patrick*” attempted to mount. On the 26th, despite “*Mayang*’s” whistling, “*Patrick*” was uninterested. On August 19, 94 days after her second display of estrus behavior, she was heard whistling. This time, however, she was seen performing flehmen during the day and was reluctant to come in that night. On August 20, she appeared to be in full estrus, whistling, trembling, pacing and squirting a milky vaginal discharge. “*Patrick*” showed no interest, but “*Radha*” was seen mounting “*Mayang*” 3 times. By 16.00 hours, the milky discharge had stopped and “*Mayang*” was much calmer, although she still whistled occasionally. The following day, she showed no signs of estrus.

On January 13, 1979, “*Mayang*” was observed during the peak of an estrus period for 2 hours from 13.35–15.35. During the 120 minutes of observation, horizontal urine squirting occurred 48 times, vulva flashing occurred 16 times, and flehmen occurred 11 times. Whistling, grunting, pacing and shaking occurred almost continuously.

Urine squirting usually consisted of 2 rapid squirts in succession, with the tail raised 20°–45° and sometimes up to 180°. Vulva flashing was usually accompanied by the squirting of large quantities of urine, and with the tail held in a horizontal position. Flehmen was performed only after the lipping of her own urine or that of the ♂.

“*Patrick*” has never exhibited any interest in the ♀♀ while they were in estrus. However, he has displayed signs of approaching sexual maturity in his typical behavior of lipping their urine and performing flehmen, which was first observed in late July on 2 occasions; and by August, it generally occurred following all urinations by the ♀♀. During the study, mounting became more coordinated and positioning better. A partial erection was first observed on August 28, 1978, which lasted for approximately 3 minutes but was not correlated with either of the ♀♀’ estrus cycle. This lack of sexual activity, despite the estrus behaviors exhibited by the ♀♀, may indicate that “*Patrick*” is still immature.

Discussion

The observations are similar to other reports on the estrus behavior of captive Indian rhinos, specifically those from the National Zoo and Whipsnade Zoo. In addition, there appears to be a linear dominance hierarchy: “*Radha*” → “*Patrick*” → “*Mayang*”, in which a ♀, in this case “*Radha*”, dominates over a ♂ (“*Patrick*”). This is similar to observations made by ANDREW LAIRIE (1977) in the Chitawan Valley, Nepal.

Both "Radha" and "Mayang" are considered to have been in full estrus on May 17, 1978, and "Mayang" on 2 additional days, April 1, 1978, and August 20, 1978. The gap of 95 days between 2 full estrus periods is roughly double the average period of 40–50 days. The failure to cycle regularly every 45–50 days may be attributed to immaturity.

Estrus behaviors were manifested for a few hours during each cycle, at which time the ♀♀ were highly excited. They were rarely seen to approach or present to "Patrick", possibly implying that beyond display of symptomatic signs of estrus, the initiation of mating is dependent on the ♂.

Table 1

Date	Individual	Estrus Behaviors Observed
1. 4. 1978	"Mayang"	Behaviors included labored breathing, whistling, urine squirting, trembling and flehmen.
17. 5. 1978	"Mayang" "Radha"	Behaviors included labored breathing, whistling, urine squirting, trembling and flehmen.
2. 7. 1978 7. 7. 1978	"Radha"	Whistling heard sporadically for 6 days.
26. 7. 1978 27. 7. 1978	"Mayang"	Whistling heard occasionally 2 days. "Patrick" chases "Mayang" more than usual on 25. 7.
15. 8. 1978	"Radha"	Whistling heard several times.
20. 8. 1978	"Mayang"	Whistling heard several times.
18. 9. 1978	"Mayang"	Several squirts of dark orange urine.
25. 9. 1978	"Radha"	Behaviors included labored breathing, whistling, urine squirting, trembling and flehmen.
7. 10. 1978 8. 10. 1978	"Mayang"	Whistling and urine squirting.
14. 11. 1978 15. 11. 1978	"Radha"	Behaviors included labored breathing, whistling, urine squirting, trembling and flehmen. Pacing more than normal and spends a lot of times following "Patrick".
16. 11. 1978	"Radha"	No longer showing signs of heat. "Patrick" observed mounting her.
13. 1. 1979	"Mayang"	Behaviors included labored breathing, whistling, urine squirting, trembling and flehmen.
20. 1. 1979		Observations end.

Summary

Observations on the social interactions and development of sexual behavior of 3 sub-adult Great Indian Rhinoceroses maintained at the New York Zoological Society are described. Wallowing was observed to be the dominant social activity, occurring 54.23% of

the total amount of observation time. Social interactions were primarily ♂—♀ and were often aggressive, including: head-to-head pushing, chasing, ramming with the head, baring of teeth and lunging.

Behavioral changes associated with estrus are described for a ♀ during her first heat cycle, which occurred at 5.5 years of age. Both ♀♀ appear to be cycling regularly at 6 years of age.

The ♂ rhino licks and smells ♀ urine but has exhibited no other sexual behavior or interest toward the ♀♀.

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