Animal Keepers' Forum

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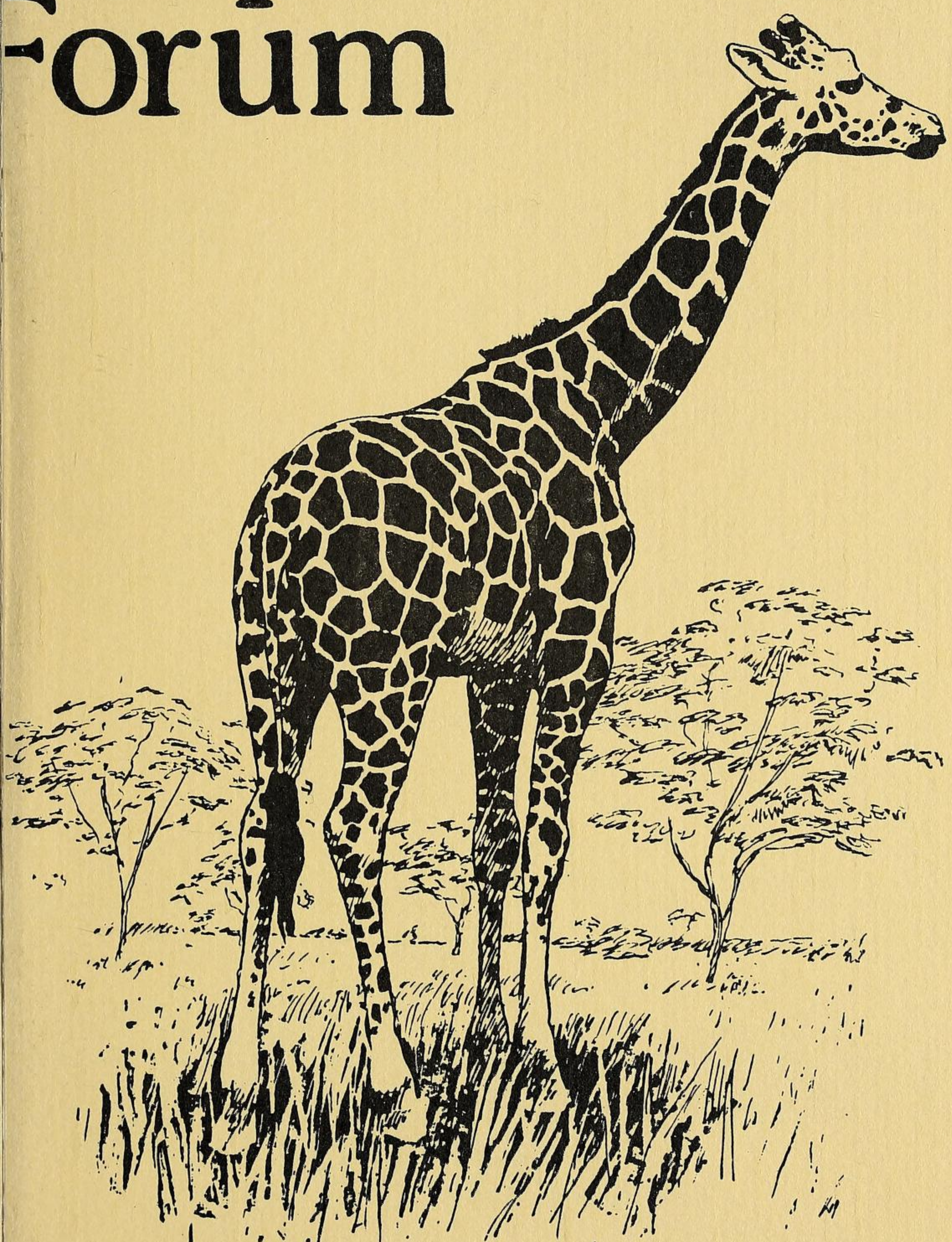

Dedicated to Professional Animal Care

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Detecting Estrus in the Black Rhinoceros at the Columbus Zoo

By

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The Columbus Zoo currently houses a pair of black rhinoceros *(Diceros bicornis)*. The male, Clyde, is 36 years old and the female, Kenya, is 13 years old. The zoo has tried to breed the rhinos both naturally and artificially. When natural breeding was attempted, the male became aggressive and knocked the female on her side. The zoo decided the only way to use the male for breeding is by artificial insemination.

The Columbus Zoo has made three attempts to artificially inseminate two female black rhinos. However, fertilization was never achieved. The main problem encountered is determining estrus in the female. Estrus is the period in the female's estrous cycle when she is receptive to the male. To successfully inseminate the female, the semen must be deposited into the female's uterus during estrus.

The Columbus Zoo is currently trying four methods to determine estrus in the female black rhino.

The first method is reading the vaginal cytology of the female. The female is directed into position. Next, the keeper enters the pen and rubs her rump. The tail is held to her side and the vulva opened. This eliminates debris from cluttering the smear. The keeper inserts a Q-tip swab into the vagina. The swab is taken out and rolled across a microscope slide. We take two smears once a day. One smear is stained and read by a veterinarian at the Ohio State University. The second smear is stained with methylene blue and read by me. The smears are examined for cell types and numbers. The cell types and numbers varied greatly from day to day. Thus, no estrus cycle could be charted by reading vaginal smears.

The second method, vaginal temperature, is recorded daily. A thermometer is inserted into the vagina for approximately three minutes. Figure 1 shows the daily vaginal temperature of the female black rhino. The line graph shows how the vaginal temperature fluctuated daily. No correlations between vaginal temperature and estrus was discovered. However, Dr. David Zartman of The Ohio State University, Department of Dairy Science, has invented an implant that monitors vaginal temperature. This implant can measure the temperature better than a regular thermometer and has shown a correlation between increases in temperature and estrus in cattle. We inspected our female rhino to see if an implant would work. We discovered our female has a partially blocked vagina and the implant could not be inserted.

The third method, vaginal discharge, is examined and recorded daily. The keeper, when taking the vaginal smear, will examine and feel the vaginal area of the female. When the female is in estrus, the vaginal discharge and vagina will be wet. After estrus, the discharge is sticky and becomes crusty. Figure 2 shows the relationship between the consistency of the vaginal mucous and the period of estrus. On some days, we had a problem with the female getting muddy, and thus concealing any vaginal discharge. We designed a system of 1 to 5 to label the discharge. 1 = dry, no discharge, 2 = sticky, little discharge, 3 = moist, little discharge, 4 = wet, discharge clear and noticeable, and 5 = crusty, little discharge. We kept records of the vaginal discharge from 8 December, 1985 to 25 January 1986. Unfortunately, we had no way to test our results. During the month of January, we had trouble finding time and manpower, so this method was discontinued.

Figure 1: Daily Vaginal Temperature

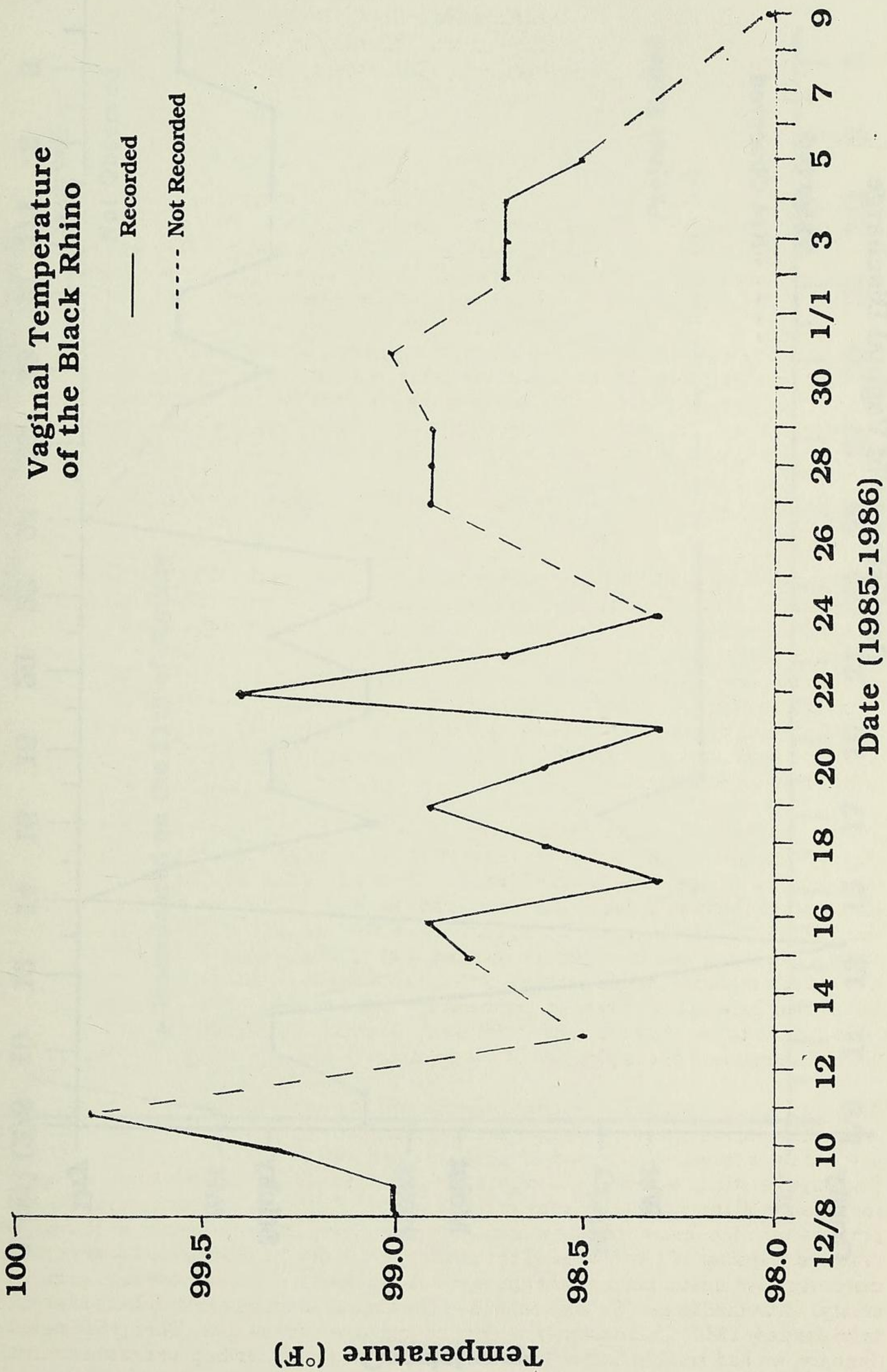


Figure 2: Vaginal Discharge

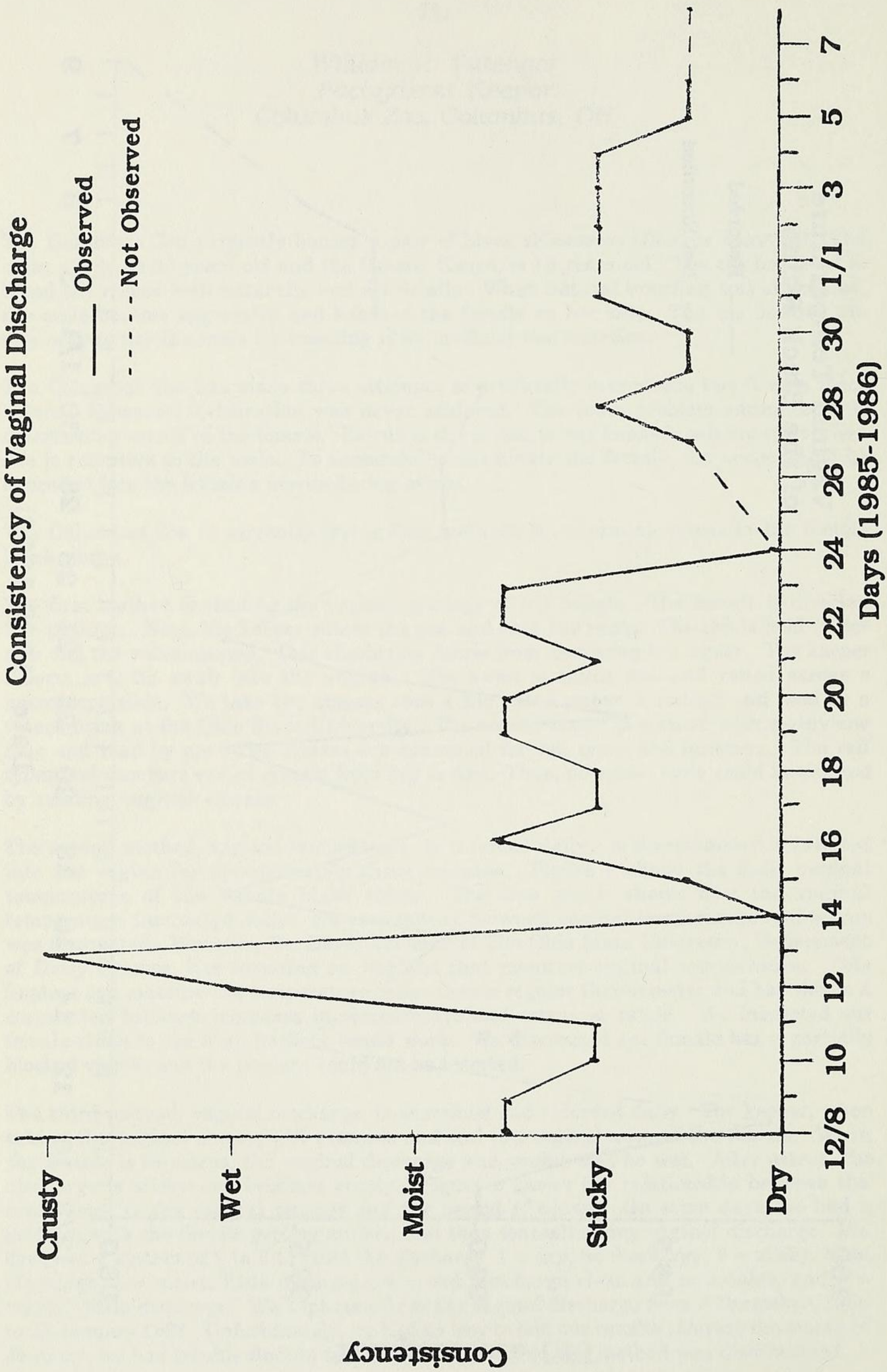


Figure 2 (cont'd): Vaginal Discharge

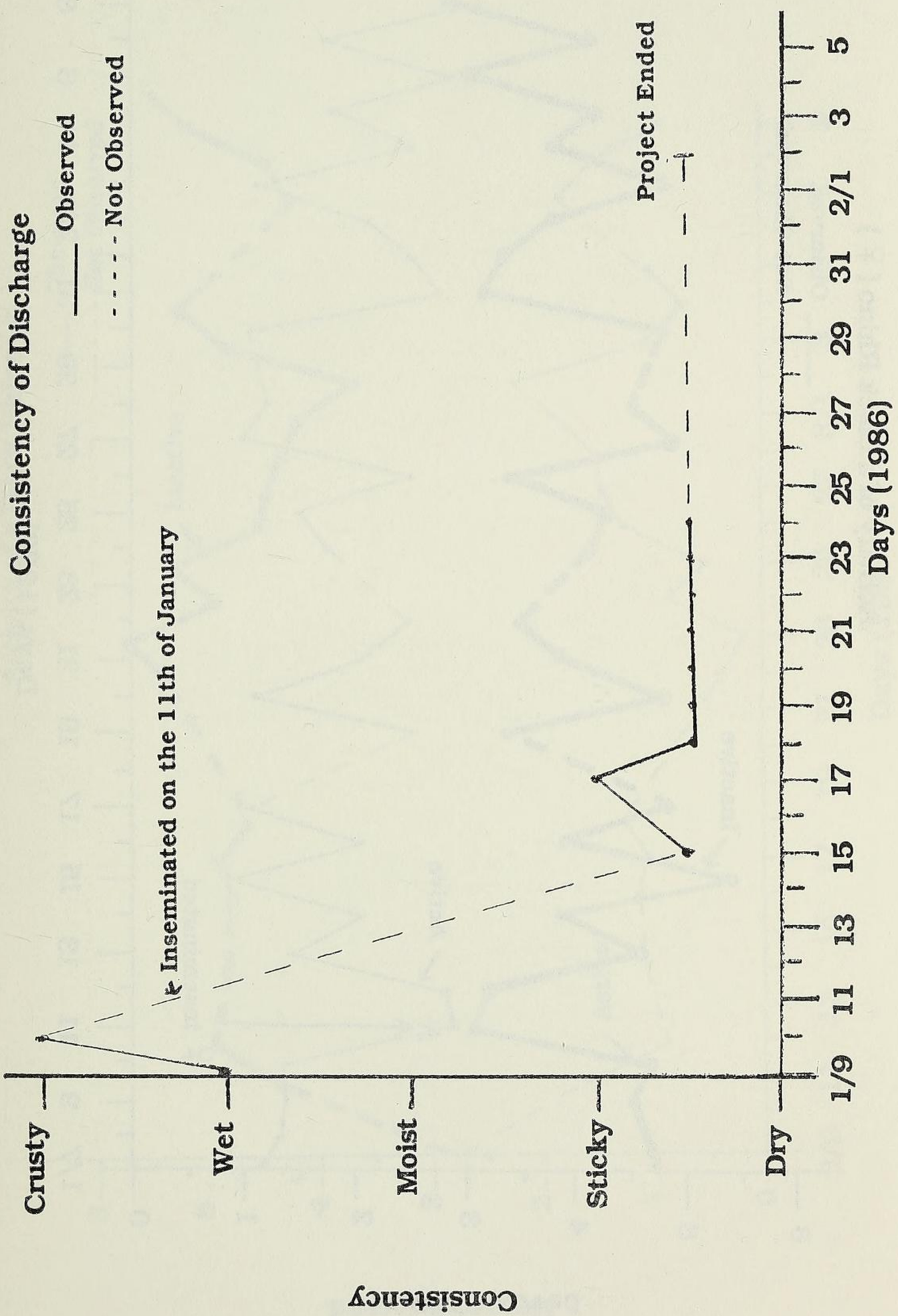


Figure 3: Effects of Estrus on Activity

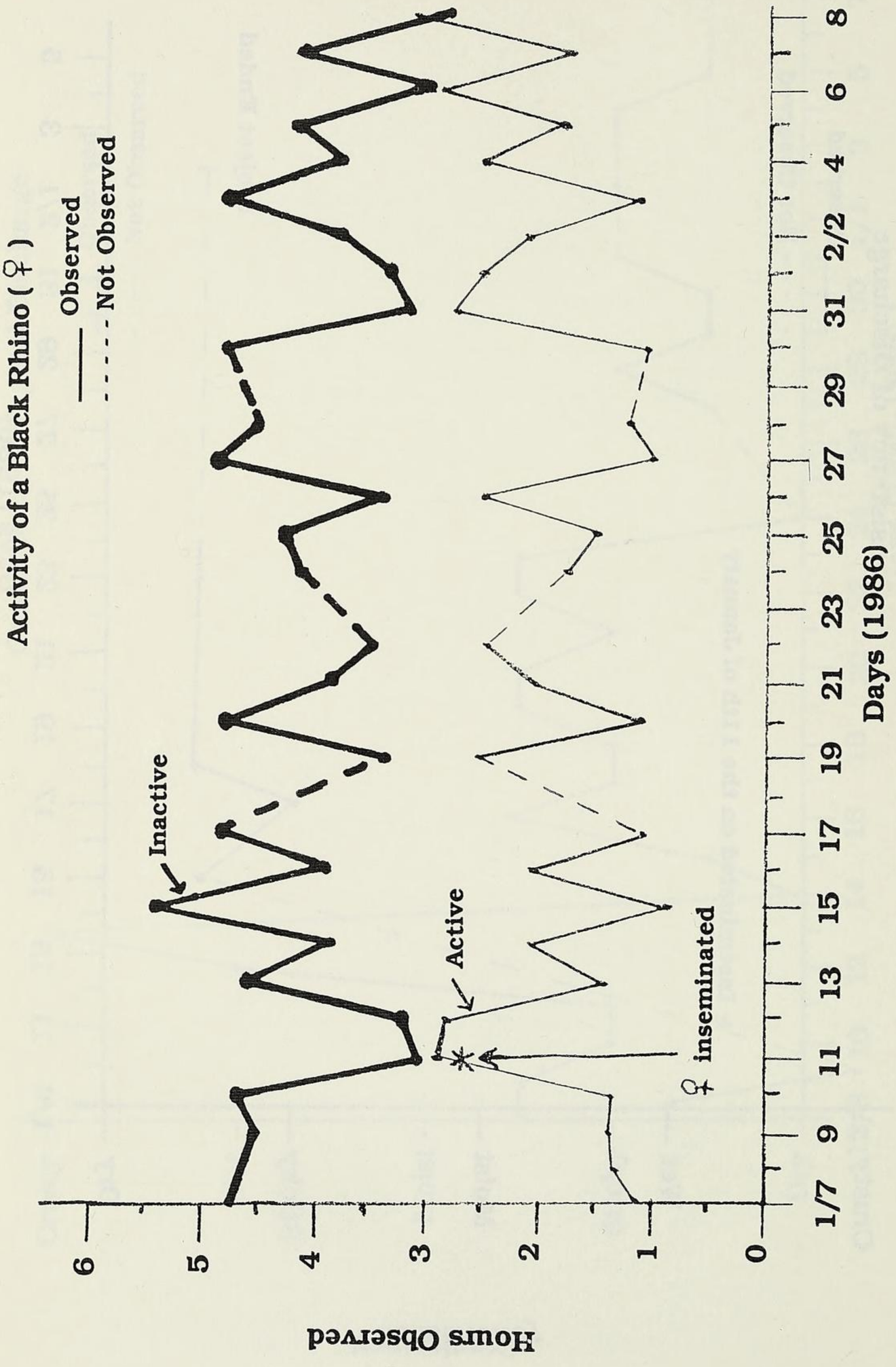


Figure 3 (cont'd): Effects of Estrus on Activity

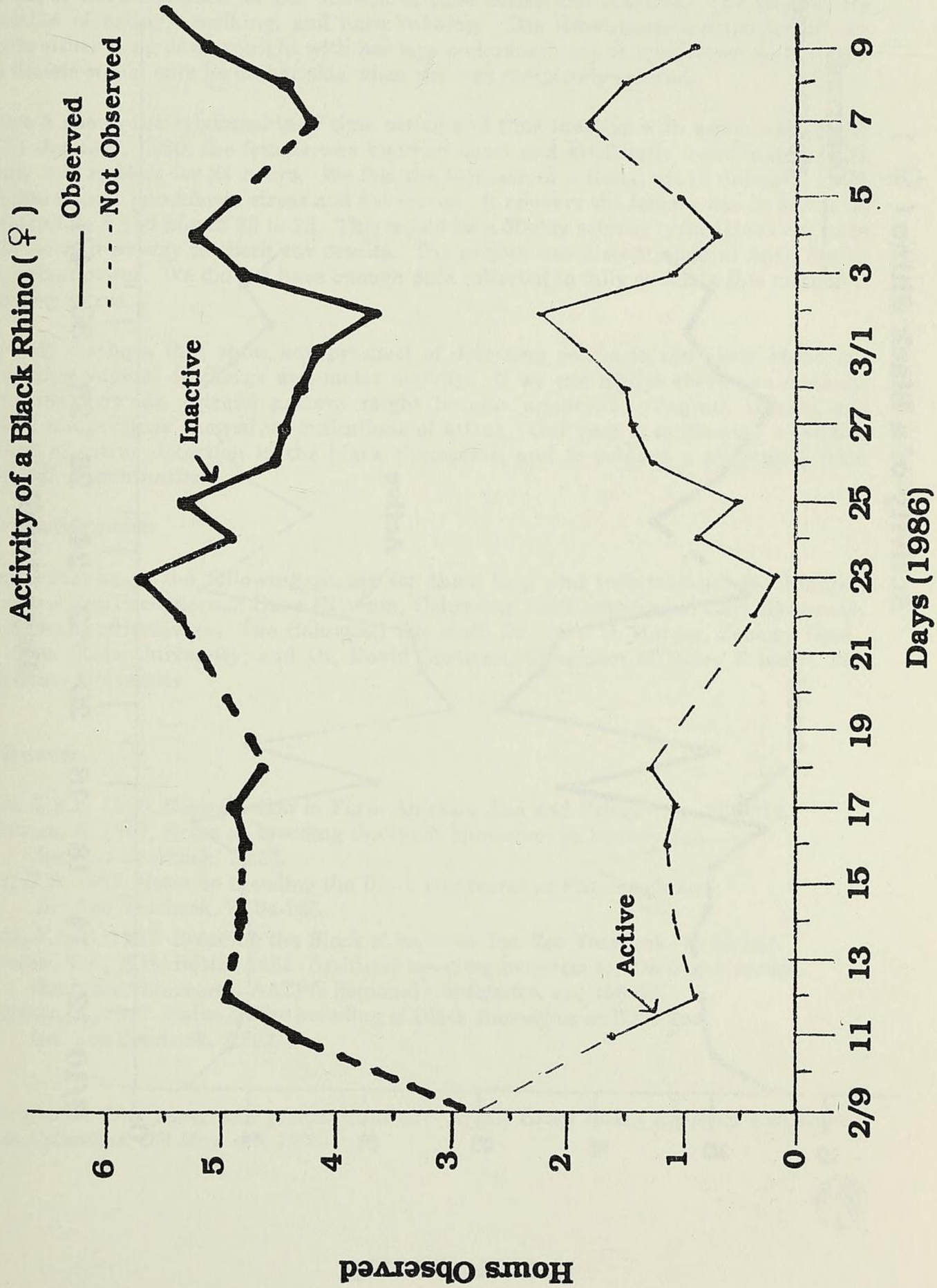
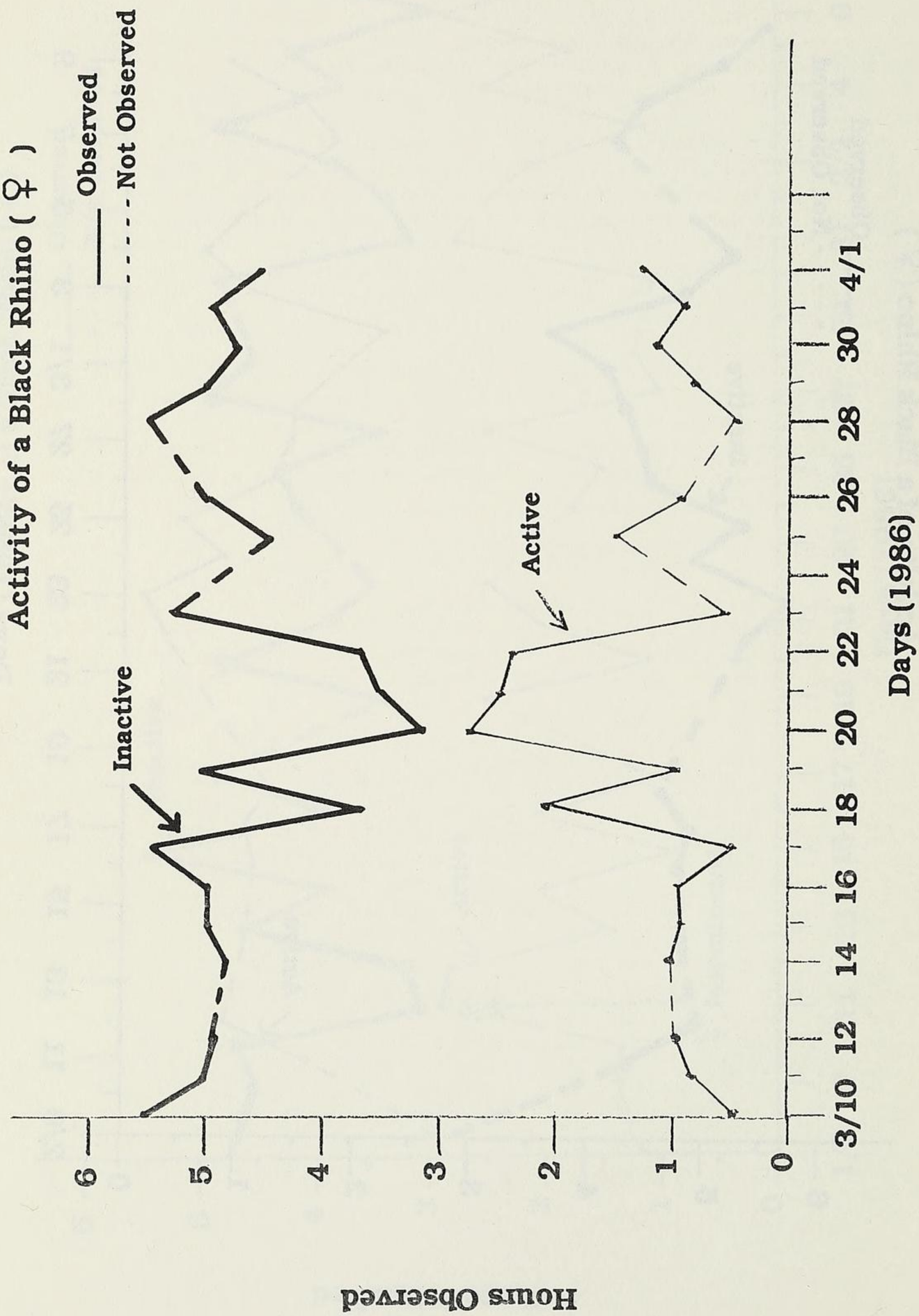


Figure 3 (cont'd): Effects of Estrus on Activity



The fourth method, estrous behavior, is recorded daily for six hours. Females, when is estrus, will display various special behaviors (Hafez, pp. 307, 1980). In sheep, cattle, horses, swine, and goats, there have been noted increases in motor activity during estrus (Hafez, 307, 1980). We decided to monitor the motor activity of our female. We could only record for six hours, so we decided to film the female from 11:00 p.m. to 5:00 a.m. This time period was selected due to the female being less active and no public on the zoo grounds. We felt an increase in activity would be easier to detect during this time period.

The tapes were analyzed for the amount of time active and inactive. The time active consisted of eating, walking, and horn rubbing. The time inactive consisted of the female either lying down upright with her legs underneath her or lying down on her side. The female would only lie on her side when she was completely relaxed.

Figure 3 shows the relationship of time active and time inactive with estrous behavior. On 11 January, 1986, the female was knocked down and artificially inseminated. The female was restless for 24 hours. We feel the increase in activity, on 12 January, 1986, was due to post knockdown stress and not estrus. It appears the female was in estrus on January 6 to 8 and March 20 to 22. This would be a 50-day estrous cycle. However, once again we had no way to check our results. The project was discontinued in April due to lack of manpower. We did not have enough data collected to fully evaluate this method of detecting estrus.

The only methods that show any prospect of detecting estrus in the black rhino are monitoring vaginal discharge and motor activity. If we can utilize these two methods simultaneously, an estrous pattern might become apparent. Vaginal smears and vaginal temperature showed no indications of estrus. Our goal is to discover a reliable method of estrus detection in the black rhinoceros, and to achieve a pregnancy from artificial insemination.

Acknowledgments

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Editor's note: This paper was presented at the AAZK Great Lakes Regional Conference held in Columbus, OH May 4-7, 1986)