

rivers studied often destroyed the seed that must mature within the capsule while still attached to the parent plant. The frequent destruction of the seed seems to increase the importance of vegetative propagation. On the basis of field observations and the experimental work described in this paper, vegetative propagation is almost certainly a part of the establishment strategy of *Justicia americana*.

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BRIEF NOTE

MOTHER-INFANT INTERACTIONS OF A CAPTIVE
LOWLAND GORILLA¹

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There is a paucity of age-specific data on gorilla mother-infant relations. Schaller (1963) traced the development of one mountain gorilla infant from birth to the age of 1½ years in the wild. He also recorded other mother-infant interactions for 10 to 12 consecutive months but was unable to determine the birth-dates of the infants. Many gorilla births have occurred in captivity, but only about a third of the captive-born full-term offspring remain with their mothers (Nadler 1974). The few published reports concerning the latter offspring contain little or no age-specific data on mother-infant relationships, although infancy lasts from 2½ to 3½ years (Schaller 1963).

The Cincinnati Zoo has had 10 successful lowland gorilla (*Gorilla gorilla gorilla*) births in the 9 years 1970 through 1978. Two of the Zoo's three reproducing female gorillas proved to be poor mothers.

All 4 infants born (on 31 January 1970, 12 July 1971, 13 July 1972, and 15 April 1974) to Penelope and King Tut and the single offspring born (on 25 December 1976) to Megara and Hatari had to be separated from their mothers shortly after birth. Mahari, the other female mated with Hatari, also was a poor primiparous mother, but became an ever-improving multiparous mother.

Mahari and Hatari were acquired by the Cincinnati Zoo in January 1965. At that time they were estimated to be 3 years old. Since their sexual maturity, they have mated repeatedly, producing 5 offspring through 1978. Mahari's first offspring, born 23 January 1970, was immediately removed and hand-raised (Lotshaw 1971). Her second infant, born 12 September 1971, was allowed to remain with Mahari following birth, but because Mahari picked wounds in the infant's skin, they were separated after 3 months (Nadler 1974). A third offspring, born 1 January 1973, remained with Mahari for 9 months before sickness required that

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the infant receive special medication. Mata Hari, the fourth offspring, was born 21 August 1974 and remained with Mahari for 31 months. They were finally separated so that the juvenile would socialize with other young, and Marhari could again be bred. A fifth offspring, born 23 January 1978, remained with Mahari for 2 months prior to the infant's removal for necessary medical treatment. In sum, only 4 of the Cincinnati Zoo's 10 captive-born gorillas remained with the mother, and only one remained with the mother throughout most of infancy. Interactions between the latter infant, Mata Hari, and her mother, Mahari, are described in this paper.

Mahari and Mata Hari were housed in a cage consisting of a public-viewing compartment, approximately 3.9 m × 3.3 m × 4.6 m high, and a retreat compartment, approximately 1.2 m × 1.5 m × 1.2 m high. All observations were made through the front bars of the public-viewing compartment. Whenever the animals entered the retreat compartment, observations were terminated. Data were collected on preprinted check sheets divided into one minute periods. A time sampling technique was employed wherein records were made of the behavior occurring as the second hand passed the minute mark. Twenty observers took part in the study, but the data concerned categories of behavior on which observer differences were almost non-existent. Tests of inter-observer reliability were used to validate the method.

The check sheets discriminated between the time spent by Mata Hari at a distance of more than 1 m from Mahari,

and the time spent off Mahari but within 1 m. One meter was chosen as being roughly the distance within which the mother could pick up the infant quickly in an emergency. The check sheets were also used to record frequency of social grooming and the proportion of time Mata Hari spent on the nipple.

All observations were made between 09.00 and 16.00 hours. Observation times were 30 min in length but were often terminated earlier due to the animals moving into the retreat compartment. Observations began on 6 December 1974, 107 days after the birth of Mata Hari. Mother and infant were watched during the 135-day period from 6 December 1974 through 19 April 1975, the 90-day period from 6 November 1975 through 3 February 1976, and the 45-day period from 8 October 1976 through 21 November 1976. For each of the 3 observation periods, the data were analyzed in terms of the number of minute intervals during which an item was recorded as a percentage of the number for which the animals were watched. The data from the first 2 observation periods were divided into 45-day segments for the analysis of the proportion of time that Mata Hari was on the nipple.

The mother-infant bond in primates is maintained by close contact, maternal grooming, and the infant's attachment to the nipple. An obvious indication of the growing independence of mother and infant is the decreasing amount of time they spend in close proximity to each other. The proportion of minutes which Mata Hari spent in contact with her mother was 63% during her 107th through 241st

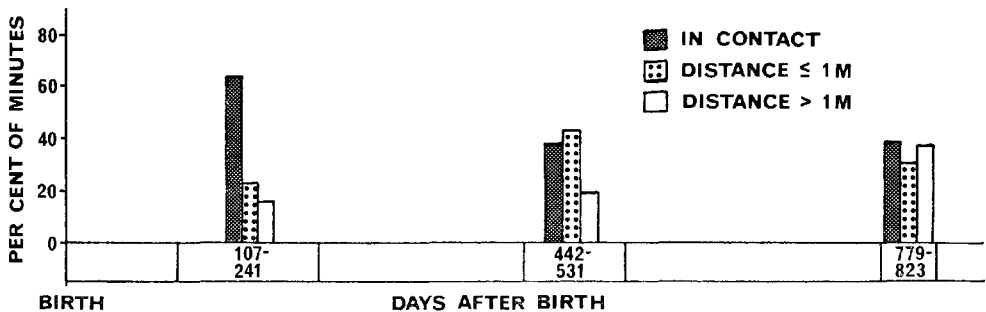


FIGURE 1. Number of minute intervals during which a distance between mother and infant was recorded, expressed as a percentage of the number of minute intervals for which mother and infant were watched.

days of life (fig. 1). Schaller (1963) reported that mothers and infants in the wild begin to sever social ties by the age of 1 year. Accordingly, the frequency of contact between Mahari and Mata Hari decreased to 38% during days 442-531 and 38% during days 779-823. This pattern parallels the behavior of rhesus monkeys, where the proportion of time that an infant spends in contact with its mother steadily decreases to 40% and then remains at that level for many months before resuming its decline (Hinde and Spencer-Booth 1967).

During her early infancy, Mata Hari was seldom recorded more than 1 m from Mahari (fig. 1). She exceeded this distance only 16% of the time during days 107-241, and 19% of the time during days 442-531. Toward the end of her infancy, during days 779-823, Mata Hari spent 37% of the time separated from Mahari by more than 1 m.

There is a minimal amount of social grooming in gorillas as compared to other primates (Simonds 1974). The most common form of social grooming in gorillas is maternal grooming (Schaller 1963). As in all primate species reported except the chimpanzee (Van Lawick-Goodall 1967), grooming by Mahari decreased as the infant matured. The proportions of minutes that Mahari spent grooming Mata Hari were 8.2% during days 107-241, 4.1% during days 442-531, and 1.1% during days 779-823. The frequencies of Mata Hari grooming Mahari were 0.9%, 1.2%, and 1.1%, respectively. As in rhesus monkeys (Hinde and Spencer-Booth 1967), the frequency of mother-infant grooming equalled that of infant-mother grooming during the latter part of infancy.

Schaller (1963) recorded 76 observations of mothers grooming infants, but only 11 observations of mothers nursing infants. He concluded that infant gorillas suckle infrequently, are partially weaned by 1 year, and are completely weaned by 1.5 years. In the case of Mata Hari, conditions of observation did not permit discrimination between active suckling and passive oral contact with the nipple. The percentage of minutes that Mata Hari was on the nipple was

4.9% during days 107-151, 2.7% during days 152-196, 1.6% during days 197-241, 0.8% during days 442-486, and 0.0% during days 487-531. The last observations of nipple contact were recorded on day 456.

It should be emphasized that the mother and infant in this study lived in a physical and social setting quite different from that found in nature. As shown by Jensen *et al* (1968) and Castell and Wilson (1971), the physical environment strongly influences the mother-infant relationship in primates. The social environment is also of great importance (Wolfheim *et al* 1970, Kaplan 1972). In the present study, Mahari and Mata Hari may have behaved differently if they had been housed in a different physical setting and/or with other gorillas.

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