

INFANT DEVELOPMENT

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The period of infancy in the orangutan is poorly documented and yet it is critical to the development of normal social and sexual behavior (Maple 1980). Several factors determine the infant's early experiences. The most critical is the mother's level of competence in raising her infant. Mothering has many learned components and each female develops her own "style" over time and with successive infants. There is a wide range of individual variation and therefore each infant's experience will differ, sometimes greatly, from that of its siblings and peers.

Secondary to this is the social group into which the infant is born. Siblings, peers, and other adults all play roles in the socialization and learning processes of the young, captive orangutan. Peer and adult contacts stimulate the development of play and other social behaviors and serve as role models in behavior acquisition. In captive situations the question becomes what parameters determine adequate social experience to develop normal social, sexual, and eventually parental behaviors. Although no exact numbers or amounts have been determined, maternal contact has been shown to be the most critical initial need (Harlow 1971; Maple 1977, 1980), followed by peer contact (Harrisson 1961; Maple 1980).

The third factor in infant development is the environment into which it is born. (The more complex and challenging the environment, both physically and socially, the greater the learning potential is for the developing infant.) A stimulating environment encourages learning and discourages the development of pathologic and self-directed behaviors.

The authors (Munn and Fernandez) conducted a brief survey of some Orangutan SSP® institutions in an effort to present information regarding infant development in captive orangutans (See Appendix I, this chapter for participant listing and survey). In attempting to gather information on orangutan infant development, it became evident that little concrete scientific documentation exists. Information that has been published tends to be anecdotal in nature. Basic trends in development can be found but reported variations make determining exact time spans of "normal" development stages, both physical and social, difficult.

It became obvious from questionnaire results that huge amounts of developmental data are being lost. This seems to be primarily due to a combination of lack of time to spend recording information, and recording systems from which it is difficult and time consuming to retrieve the desired information. An infant developmental data sheet is available from the SSP® (See Record Keeping Recommendations Chapter, this volume). This will allow the establishment of a database to determine parameters of development for captive orangutans. Similar systematic data collection has been used to record infant development of other primate species (Carol Sodaro, personal communication). Through the use of developmental data collection, comparative work could be accomplished with much greater ease.

MATERNAL CONTACT

What is so special in a primate mother-infant relationship is how long it lasts, how powerful the bond is between the mother and infant, and the role the primate mother plays in shaping their infant's experiences. A primate mother contributes to the infant's survival and to its social development. The primate mother gives emotional and physical support. This support is critical to the infant's emotional and social development (McKenna 1982). In orangutans, the mother-infant relationship will last for years. Both in the wild and in captivity, it's not unusual to see a seven-year-old offspring nursing and sharing a sleeping nest with its mother, even after the birth of her next infant. Because of the close proximity and protection provided by the mother after an infant's birth, the mother literally becomes the infant's "environment." This environment is a very important component of its development (Hoffer 1981).

Maternal contact is much the same for wild and captive orangutans. In the wild, mother and infant are in constant contact for the first four months of life. During the first two months, 90% of the time is spent in ventro-ventral contact. At the fifth month, contact decreases to 75%. By the sixth month 55% of their time is spent in contact, and this decreases to 25% by the eleventh month (Miller 1981).

Maple's (1980) findings were similar for captive orangutans. By an infant's nineteenth week it is in *ventro-ventral* contact less than 50% of the time. At the same age in the infant's life, it is out of contact with the mother less than 15% of the time. Some caregivers may worry about a mother who leaves an infant at an early age. Maple points out that many good mothers will have early breaks in contact.

There is much variation in maternal contact. Some mothers are more protective than others and infants vary in how independent they are.

In captivity, the relationship of the orangutan mother to other group members and to the caregiver staff may also influence the amount of maternal contact and the occurrence of the first break in contact with the infant. It is interesting to note that some mother-infant pairs break contact as early as 2 months old while in others it is not seen until 1.5 years of age. In five cases the mother initiated the break. Assuming that the mother responds to the infants needs and that the infant is at no risk from group members or its environment, caregivers should not be too concerned with the amount of contact. Kingsley (1988) noted a break in contact at twelve weeks of age. She stated that "early breaks in contact can be the onset of breakdowns in the mother-infant relationship".

We found some variation in maternal contact in the institutions we surveyed. Zoo Atlanta and Metropolitan Toronto Zoo note no break in mother-infant contact until one year of age or later. Fort Worth Zoological Park states that while a mother-infant dyad was in quarantine, the mother broke contact with her eight-month-old infant. The same infant initiated a break in contact at 14 months old. Lowry Park Zoological Garden reported one mother broke contact with her infant at 90 days while another mother broke contact at 2 months of age. Gladys Porter Zoo states that they saw a break in contact at 8 months of age. In this case the mother hung the infant on the cage bars. Chicago Zoological Park reported that an infant broke contact with her mother at 6 months of age and was more than 2 meters from her at 7 months old. Another Chicago Zoological Park infant broke contact at 3 months of age. Maple (1978) found in a case of the first break in maternal contact at 18 weeks, that the mother also hung the infant on the cage bars and moved away.

TRAVEL

Carrying positions are subject to maternal variations and it is important to note that there is no such thing as "normal".

Ventro-ventral travel

Captive reports give the most accurate breakdown of orangutan infant carrying postures. Ventro-ventral contact is almost continuous during an infant's first four months, although after two months the infants will climb about on their mothers bodies somewhat. After the fourth month ventro-ventral contact steadily decreases from approximately 75-90% to approximately 15-25% by one year of age (Miller and Nadler 1981; Nadler et al. 1981). Tuttle (1986) reported that wild-born infants are dependent on their mother for transport for the first year and generally cling *ventro-laterally*.

Dorsal travel

Unlike other great apes, the shift to dorsal travel in older infants is not seen in orangutans. Most likely it is due to their arboreal lifestyle; it is more functional and safer to the infant to cling under its mother rather than ride her back. Some dorsal carrying is seen but it is infrequent.

Buddy travel

This is travel in which the infant is walking and holding one-handed onto another animal. Questionnaire respondents reported buddy travel starting at about 18 months of age. This was most frequently seen with the mother although at times was observed with siblings and peers.

Independent travel

Questionnaire responses showed that the first independent trips begin between one and one and a half years of age. The most common mode of travel was climbing away from the mother. Independent travel on the ground generally appeared later. Harrison (1961) notes that in orphaned rehabilitants, infant skills in climbing and swinging in trees increases noticeably at about eighteen months, especially if the same cluster of trees is regularly used for exercise.

Other travel

Captive infants have been observed to ride on their mother's arms, legs or head.

PLAY

Play behavior may be solitary or social in captive orangutans. The simplest object will provide hours of activity for an orangutan, be it a piece of browse, a cardboard box or a paper bag. In captivity, it's not unusual for a youngster to have conspecifics with whom to play. Although another young orangutan may be the most consistent playmate, many adults will play enthusiastically with younger animals.

Solitary play involves such behaviors as swinging, spinning, brachiating, clapping, slapping, and placing objects on the head. Solitary play does not exist in the first three months of life and is infrequent before the age of five months. Between the ages of 6 and 11 months, solitary play increases to 50% of the infant's activity. 75-85% of solitary play takes place above the ground (Miller 1981). Young orangutans can entertain themselves for extended periods of time. Solitary play forms a normal and integral part of the

development process for orangutans (Singleton 1992).

Freeman and Alcock (1973) found that juvenile orangutans prefer hiding games such as crawling into gunny sacks. The introduction of novel objects created excitement among the animals. They preferred objects that could be manipulated or changed instead of their play structures. Since an animal's form of play depends on its environment and social structure, orangutans spend more time climbing, swinging, and dangling. Play is one of the most predominant and developmentally important activities. Play must be important since young primates invest so much time and energy in it. Through play, individuals develop social, physical, and communicative skills. Generally, males play longer and harder than females whereas females will play at mothering other infants (McKenna 1982). Zucker (1986) found that for juvenile males, "grabbing and biting were major components of play." Rolling was more common among adult orangutans. Juvenile males show the greatest diversity in play behaviors.

Play can be an indicator of contentment, security, and lack of stress. Generally, you will see little play behavior in an animal that exhibits stereotypes such as rocking and self-clasping (sometimes seen in hand-reared animals). In addition, if an animal feels stressed, play will be absent. Freeman (1973) states, "play is voluntary and dependent on a stress-free environment. Play is the first behavior pattern to be inhibited when animals become apprehensive or nervous."

The institutions surveyed noted solitary play began at 4 months and up to 2 years of age. Usually, the infants played with novel objects, manipulated food and played with bedding.

Dolhinow (1972) found that with most primates, social play is preferred over solitary play. Primates may spend hours a day in play. This seems to be true with young orangutans. The repetition found in play improves the development of motor behavior and social interactions. Dominance interactions among juvenile primates occurs more during play than any other activity.

Social play includes mouthing, touching, wrestling and chasing another animal. Miller (1981) states that social play increases between 4-7 months of age and is non-existent at ages 1-3 months. In months 7-11, social play fluctuates between 15-25% of the infant's activity.

Harrison (1961) found that wild orangutan infants began social play at 10 months of age. In the wild, social play may not always involve other orangutans. Rodman (1988) relates that "at Ketambe, one

juvenile male orangutan consistently initiated play with a juvenile siamang with little reciprocation, when the two fed in the same fruit tree." When juvenile orangutans become more independent of their mothers they seek out play with neighboring peers. MacKinnon (1971) found that in the wild, when adult female/young units met, the mothers ignored each other but the youngsters would play. Juvenile orangutans would leave their mothers to play for hours with peers in other groups.

Four of the institutions contacted stated that social play in their orangutans began around 1.5 years old. Generally, the play was with other juvenile orangutans or their caregivers. One infant began showing interest in playing with the adult male when it was eight months old. Another animal began social play at two years of age.

NEST BUILDING

Nest building by young orangutans may be considered a form of play. Often, nest building is first observed in juvenile orangutans when their mothers refuse to let them sleep in their nest. This may also induce tantrums which involves loud vocalization and thrashing about. Generally, male juveniles are excluded from the sleeping nests at an earlier age than females (Horr 1975).

Harrisson (1961) found infants at 18 months and younger attempting to nest build. The animals would pull the branches toward themselves while sitting, and then pat them down with the backs of their hands. Orangutan youngsters will practice at nest building, repeatedly reconstructing the same nest. By two years old, an orangutan may be able to make a usable nest in a tree fork.

All great apes are known to construct sleeping nests. If they are given materials such as hay, branches or other browse, they will spend hours forming these structures (Maple 1979). Audubon Park and Zoological Gardens has seen nest building begin at under one year of age. Often the youngsters will make nests using bedding, browse, boxes and rubber tubs and guard the materials from the other group members. At Brookfield Zoo (Chicago Zoological Society), an infant born 27 July 1993 was observed nest building on 9 December 1993 (139 days of age). Only one other zoo reported nest building at an early age (1 - 1.5 years). In many cases, a young orangutan may practice nest building but still sleep in its mother's nest.

NURSING, WEANING AND SOLID FOOD CONSUMPTION

Great apes will nurse their young for several years. Weaning may be

completely self-motivated or influenced by the mother. The weaning process depends on how persistent the juvenile is and how determined the mother is. An infant orangutan may eat its first solid food when just a few months old, yet may nurse until seven years old or longer.

Harrison (1961) notes that young orangutans show an interest in their mother's feeding habits at an early age. A mother may share bits of food when the infant is four months old. When orangutans reach a year old, they drink water from the hollows of trees. Orangutan infants spend very little time on the nipple by one year of age and there is an increase in solid food consumption and water drinking. Horwich (1989) describes that all apes show a regressive or reattachment period. During this time, mother-infant contact and nursing rates increase between 6-12 months of age. Orangutans show the latest reattachment peak at 11-12 months. One study subject had a second nursing peak at 19-21 months of age.

In captivity, a stressful event such as the introduction of a new animal may cause a nursing regression in older juveniles who are already weaned. Whether or not infants are self weaning, by 2-3 years of age, orangutan mothers are attempting to encourage this process by limiting the amount or frequency of nursing. Weaning tantrums are often observed in captivity and "the noisy tantrums of (orangutan) youngsters are especially audible in the forest" (Horr 1977).

Sixty-two percent of institutions responding to our survey reported orangutans will nurse until approximately seven years of age. At this age it is often seen only during times of stress. Some mothers will wean their youngsters as early as four years old. Two institutions also reported juveniles nursed from females other than their own mothers. Youngsters tend to self-wean themselves as their solid food intake increases. Over time, nursing is more for comfort than for nourishment. Infants begin eating solid foods as early as four months of age. This food often consists of pieces that the mother has dropped. Usually the first water that an infant orangutan drinks is supplied by the caregiver in a cup or from the hose. Seven institutions contacted reported that infant orangutans showed interest in water at about 1 year old, though one reported water drinking at 6 months old. Quite possibly, water drinking is occurring before 1 year of age from lixits.

GROOMING

Social grooming is not a common occurrence among orangutans. Adult orangutans are rarely seen to groom each other in captivity and

even less, if ever, in the wild. Observers note that the behavior is rare and usually confined to mothers and their infants (MacKinnon 1971; Maple 1978). McKenna (1982) found that mothers do groom their infants intensely during the first few months. Maple (1980) cites a case of an orangutan mother who kept her two month old infant's hair cleaned and combed and that she bit off fingernails and toenails when they got long. The information from the institutions contacted was much the same; grooming between orangutans is unusual. Sixty percent reported that even grooming between mothers and infants is rare. One institution reported that occasionally adult females will groom, two never see social grooming and only one reported frequent grooming between adult orangutans. Two institutions reported seeing orangutans autogroom which often involves cleaning and picking at small scabs and wounds.

ADULT MALE-INFANT INTERACTIONS

Wild adult male orangutans are basically solitary animals and have virtually no parental investment. The female assumes the absolute role in interactions and socialization.

In captivity, an adult male may spend considerable time with infants and juveniles. Male orangutans do possess a potential for intense social interactions. Some males spend considerable time with other group members and they seem to object to being separated. Zucker (1978) states that males seem enthusiastic in their interactions with infants and juveniles but typically do not seek out younger animals for play partners. The play between an adult male and an infant male is characterized as "rough and tumble." This play varied from the play behavior between the female and infant male which is gentler. Maple (1982) also makes reference to the character of the adult male play. Adult males occasionally engage in vigorous play bouts with their offspring through mouthing and wrestling. In general, the youngster initiates play but some adult males invite play.

There is some data that aggression may vary between the subspecies. Maple (1982) refers to Markham's data showing that Bornean males are a greater risk to injure infants. Obviously, the relationship between an adult male and an infant needs to be monitored closely.

Survey results showed that male orangutans were very tolerant of infants with only one report of aggression between an adult male and infant. The age that interactions between the male and infants first began varied from 1.5 to 4 years of age. The interactions included hair pulling and food and play solicitation by the infant. In general, the infant initiated contact. There were no reported differences in the male's behavior towards male and female infants. Lowry Park

Zoological Garden reported that their adult male has a good relationship with one adult female and an aggressive relationship with another adult female. However, he treats the females' offspring the same. The difference is that the female to whom he is aggressive limits the interactions of her infant with the male. The National Zoological Park has an infant who is housed with an unrelated adult male who is not the father. The youngster often initiates play with the male but the infant's mother does not allow many interactions. This male has always been good with infants and has never shown any negative behavior with this infant. Lowry Park Zoological Garden reported an infant who hit and bit an adult male when the male copulated with its mother.

In conclusion, the survey showed 90% of males in captivity are very tolerant, if not playful, with the infants.

SOCIOSEXUAL BEHAVIOR IN INFANTS

An infant orangutan's socio-sexual learning usually begins shortly after birth. Behaviors associated with this include genital inspection, and oral and digital manipulation of the infant's genitals by its mother (Rijksen 1978; Maple 1980). This common behavior is also exhibited by siblings and in captivity with peers. Mounting and thrusting on infants of both sexes by the mother within a few hours of birth was reported both by questionnaire respondents and Maple (1980). It has not been documented in the wild.

Both wild and captive orangutans exhibit sexual behaviors at an early age. Males have been reported masturbating at four and a half months of age (Harrisson 1961). Galdikas (1981) reported one infant masturbated between his mother's toes. By six to seven months, male genital self-manipulation includes stroking, object usage, and rubbing on other animals (MacKinnon 1974; Rijksen 1978). Female masturbation is also reported to be frequent but appears to start later, at around two years of age (Rijksen 1978).

The context in which masturbation occurs also differs by gender according to Rijksen (1978). Males masturbated most commonly during quiet times and resting periods, whereas females masturbated when the level of social excitement was high. Harrisson (1961) reported that the rate of masturbation decreased with age as the need to fend for themselves increased.

Older infants are frequently the object of sexual interest by juvenile siblings and peers. Genital exploration and mountings by both same sex and mixed sex animals are very common. Questionnaire

responses on captive animals also document anal copulation between older and younger males (in two cases with enough frequency to cause hemorrhoids). Male infants have been seen attempting to mount their mothers as early as two years of age. In general, the level of sexual interest and exploration by both sexes is high throughout the years of the infant development period. Perhaps the early development of these behaviors, as compared to other apes, is linked to the solitary nature of wild orangutans beginning in adolescence (Maple 1980). Early sexual experiences would replace the observational learning from adults in other great ape species.

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APPENDIX

An informal written survey was conducted by the authors (Munn and Fernandez) regarding infant development and parental care. The

following institutions responded to the survey and the contact person is noted.

Audubon Park & Zoological Garden	Carolyn Munn and Marsha Fernandez
Chicago Zoological Park	Carol Sodaro
Fort Worth Zoological Park	Vern McGrann
Gladys Porter Zoo	
Omaha's Henry Doorly Zoo	Dan Morris
Lowry Park Zoological Garden	Lee Ann Rottman
Metropolitan Toronto Zoo	Oliver Claffey
National Zoological Park	Melanie Bond
Zoo Atlanta	Christine Mallar and Laura Mayo

A copy of the survey follows:

INFANT DEVELOPMENT AND PARENTAL CARE OF MOTHER-REARED INFANTS

1. Do you have an infant development sheet?
Can you send us a copy?
2. At what age have you first seen a break in contact between
and infant? Who initiated this break?
3. Percentage of infant/mother contact: 1-3 months_____

4-6 months_____

6-9 months_____

9-12 months_____
4. Does your female exhibit any unusual carrying postures? At
what age did the mother allow another animal to carry
the infant?
5. Have you seen dorsal travel by the infant? At what age?
6. Have you seen buddy travel (walking but holding onto one
another)? At what age and who was the "buddy"?
7. At what age is independent travel seen? What is the
circumstance (i.e., shifting, foraging, play)? Is it climbing or
ground travel?
8. At what age does the infant begin to brachiate?
9. At what age do you see solitary play? (Please describe)
10. At what age do you see social play? (w/whom) (Please
describe)
11. At what age is nest building first observed?
12. Number of times/day nursing is observed and the
average duration?

0-3 months_____

3-6 months_____

6-9 months_____

9-12 months_____
13. Until what age do you see nursing?
Describe the infant's weaning. What age? Was the infant
self-weaned or mother initiated? Did you see weaning
tantrums?
14. Do you see a regression stage after weaning is underway?
15. When was the infant first observed to eat solid? What food
items?
16. When was the infant seen first drinking water? From what
source (lix-it, moat, supplied by caretaker, cup)?
17. Have you seen social grooming?
18. At what age have you first seen auto-grooming?
19. Describe the interactions of the adult male to the infant.
Identify the sex of the infant and the type of interaction.

20. Does the infant initiate interactions with the adult male? At what age?
21. Have you seen a difference in adult male/infant interactions based on the relationship between the male and the mother?
22. Was the adult male wild or captive born, hand-raised or mother-raised? Did he have prior infant experience?
23. Is the male separated before or at birth? When is he allowed access to the baby?
24. What is your exhibit like? Does size affect the contact between the male and infant?
25. Do you see genital grooming or other manipulation and by whom?
26. Describe any mounting behaviors by peers or adults? Mother mounting of offspring?
27. Do the infants masturbate? At what age?
28. Do you see differences in socio-sexual behavior due to the gender of the infant?