REPRODUCTION

Determining Gender

Slender Loris

The penis and clitoris of lorises are similar in size, shape, and color, which complicates gender determination. The slender lorises can be even harder to sex because their testes are sometimes partially or completely inguinal. The size and location of their testes vary. The vagina is often covered with fur in young females, and close examination is often necessary for safe determination. The tip of the slender loris' clitoris shows a gray patch (Meier et al., in preparation). The clitoris is smooth with the exception of hairs on the tip, as shown in Figure 13. The penis is covered with fine, velvet-like hairs that are barely visible.

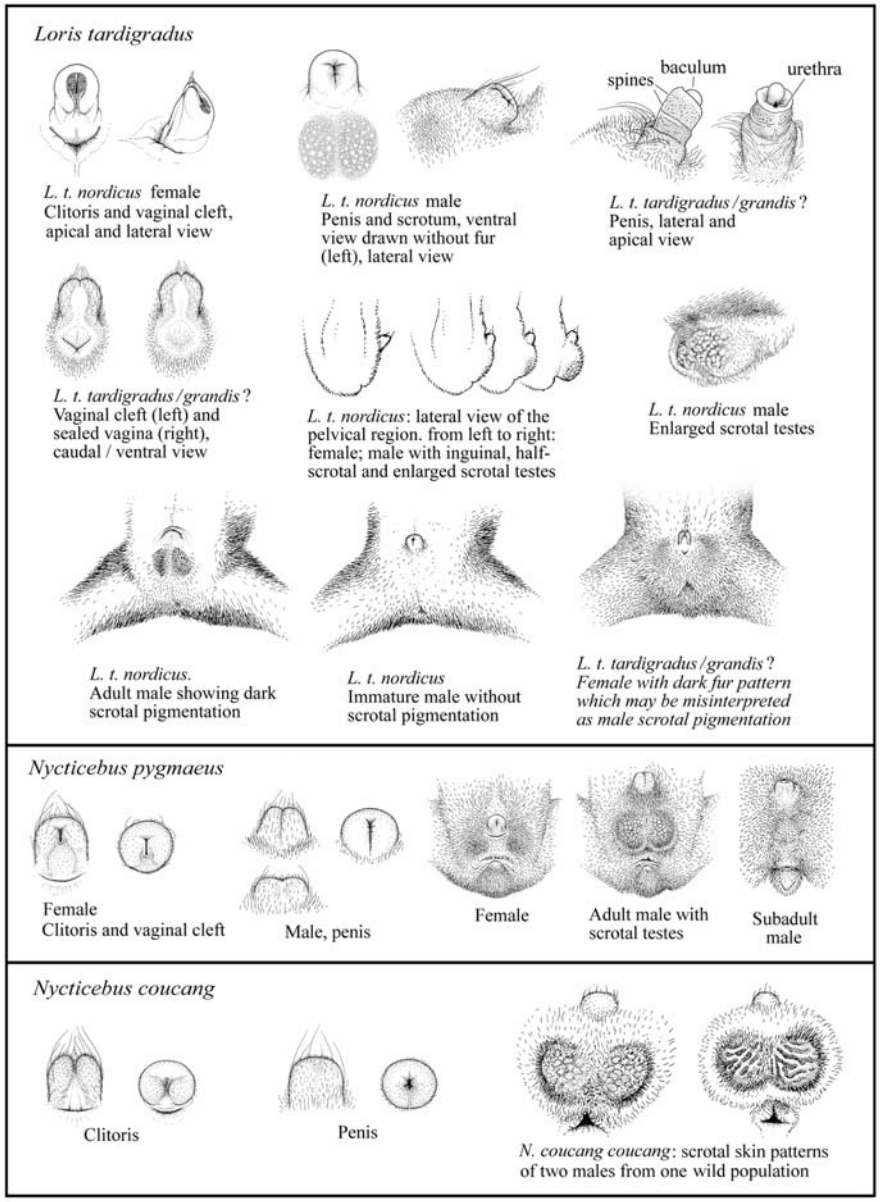


Figure 13: Discrimination of sex in lorises

Slow and Pygmy Loris

The penis of the slow and pygmy loris is shorter and thicker than the slender's penis. The baculum is more developed and the callous pad at the tip of the baculum is larger. The scrotum differs from the slender loris' scrotum by a distinct median ridge. The clitoris of the slow and pygmy loris is similar to the slender loris' clitoris but it is relatively shorter and much thicker. The urethra opens at the clitoris tip. The vaginal opening is V-shaped and is situated at the root of the clitoris. Sex determination can often be accomplished shortly after birth in slow and pygmy lorises. The clitoris has a vertical slit at the tip, whereas the penis tip is more blunt and the slit is absent. In adults, the male genitalia show seasonal changes, and testes increase in size during late summer. The skin of the scrotum is reticulated and is seasonally dark gray in the pygmy loris. The testes are of the same size in the slow and pygmy lorises, although the pygmy loris has a smaller body size. The vagina of the loris is usually sealed when the female is not in estrus. Females may sometimes have swollen or pigmented areas underneath the vagina, which can be mistaken for scrotum.

Adolescent Development

Slender Loris

Slender loris females typically exhibit signs of estrus at approximately one year of age. (Meier et al., unpublished). One captive female matured when she was 297 days old (approximately 10 months), which was determined through vaginal cytology. She was impregnated when 364 days old and delivered her first infant 166 days later (Izard and Rasmussen, 1985).

Ramakrishna and Prasad (1967) suggested that the period of immaturity in males lasts 10 to 11 months based on a study of *L. t. lydekkerianus*' reproductive organs. Six-month-old slender loris males may exhibit fully developed sexual behavior; however, *L. t. nordicus* males younger than 15 months usually do not breed successfully (Meier et al., unpublished). The youngest captive breeder recorded was a 13-month-old slender loris male (Fitch-Snyder, 1998).

Slow and Pygmy Loris

Slow and pygmy lorises can usually conceive by 1-1/2 years and produce their first offspring by two years of age. A slow loris male at Duke University Primate Center reproduced successfully when 17 months old. Three females in the same study were observed to reach maturity at 17, 20, and 23 months (Izard et al., 1988).

The earliest maturation on record of a male slow loris is less than 16 months. He was not quite 22 months old at the time his first offspring was born. The comparable age for the youngest slow loris female giving birth is 22-1/2 months, which translates to a maturation prior to 16-1/2 months of age.

Studbook data reveal that a pygmy loris female gave birth at Brookfield Zoological Park when she was less than 20 months old. She delivered male twins; only one survived through hand rearing. It is possible that the parturition was premature, because she must have reached maturity when approximately 14 months at the latest. This is earlier than any observed slow loris maturation.

Table 5: Studbook data of parental age in months at time of birth of first offspring.

		Slow loris	Pygmy loris	Slender loris
Females	**Mean**	38.8	28.5	37.2
	Standard Deviation	17.8	9.3	20
	Range	22 - 75	19 - 37	17 - 102
	number in sample (n)	17	4	18
	Mean	50.6	33.3	35.1
Males	**Standard Deviation**	26.8	5.5	12.3
	Range	21 - 98	27 - 37	17 - 53
	number in sample (n)	14	3	13

Estrous Cycles

Estrous cycles in prosimians range from 30 to 40 days. A mean cycle length for the slow loris is 42.3 days, with a range of 37 to 54 days. Captive slender lorises have a mean of 33.6 days with a range of 29-40 days (S.D. = 4.5 days, n = 7). *L. t. nordicus* estrous cycles are observed to have a mean of 42.8 days (n = 30), with a range of 32 to 67 days (Meier et al., in preparation). At the San Diego Zoo, a study of six female pygmy lorises during two years (n = 12) revealed that estrus lasted between 6 and 11 days (Jurke et al., 1997).

During much of the dioestrus interval, the external genitalia are largely obscured by fur drawn close in around them. The whole clitoris is pale and its central tract relatively flat; the labium, which is pressed against the basal area of the clitoris closing the vaginal cleft, is relatively small, flat and pale. At full estrus a considerable reddening and enlargement is evident, involving the central tract of the clitoris and the labium, all of which are taut-skinned, shiny, and strongly flushed. In addition, the labium is drawn down away from the base of the clitoris so that the vaginal opening is at its greatest lateral elongation, width, and depth (Manley, 1966).

Females should be closely monitored for signs of estrus: frequent vocalizing and the enlargement and reddening of the vaginal area. It is advisable to introduce males at the beginning of estrus and closely monitor the pair to confirm copulations and detect aggressive behavior. This will protect the female from possible injury and give accurate data concerning paternity and predicted dates for parturition. Cycle rating codes and a sample data sheet are provided in the appendix of this document.

Gonadal morphology in males

A comparison of slow and pygmy loris testicular volumes indicate that there is no significant difference between the two species (Fitch-Snyder and Perez, 1989). These are unexpected results, considering the difference in body size. It is possible that the large testes could have evolved to produce large amounts of sperm during restricted breeding periods. When all the females are

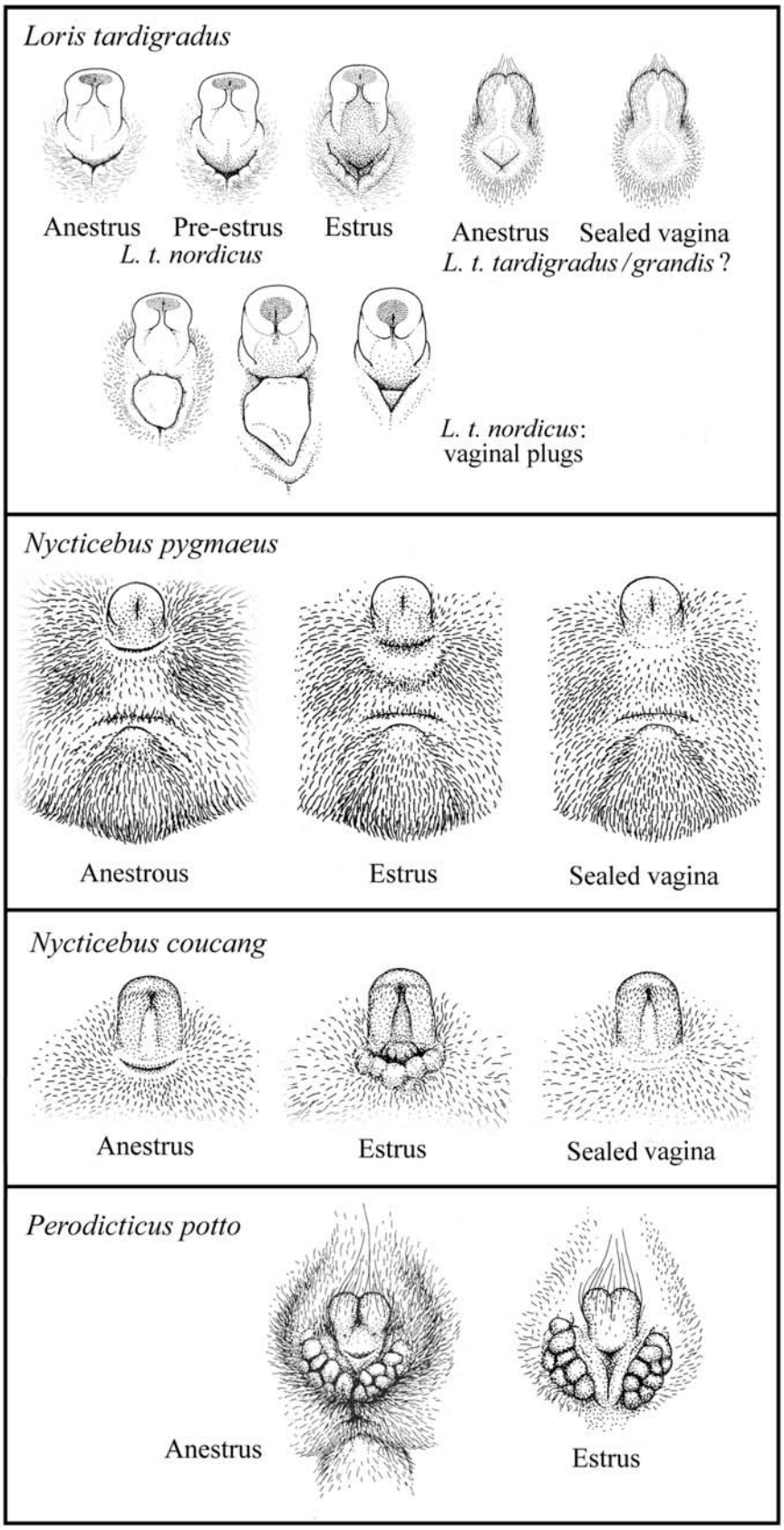


Figure 14: Signs of estrus in lorises and pottos

seasonally fertile, they would need to be capable of inseminating more than one female within a short period. Besides having disproportionately larger testes than the slow loris, pygmy lorises undergo changes in the pigment and texture of their scrotum during breeding season, thus making larger testes more conspicuous. The more conspicuous testes may be a factor that is selected for by estrus females.

Charles-Dominique (1977) found that potto males that occupied territories that overlapped with home ranges of females had bigger testes than those males that did not. In captive lorises, there does not appear to be any significant effect on testicular volume based on whether or not the male is housed with a female.

In slender lorises, the testes never descend into the scrotum at any time of the year (Ramaswami and Anand Kumar, 1965). A study of 151 slender lorises that were collected in the forests around Bangalore, India, showed that the testes are spermatogenically active throughout the year. However, there is a seasonal variation in the weight of the accessory glands; they reach the peak of activity in May prior to the period of mating in June-July (Ramakrishna and Prasad, 1967).

Copulation

Slender Loris

The slender loris' estrus lasts for a rather short time, perhaps less than 24 hours (judging by mating behavior and based on a study by Izard and Rasmussen (1985), who never observed that the cytological criteria for estrus persisted more than a day). During this time, copulation occurs in multiple bouts. The female urine marks; the male follows her around and urine marks or urine washes over the area where the female's scent is present. *L. t. nordicus* males follow the female with appeasing vocalizations and repeatedly try to sniff her genital region. The female may answer his vocalization, and duets can sometimes be heard. The male's urine washing, in this context, appears to be a displacement behavior indicating excitement. When ready for copulation, the female increasingly shows locomotion suspended upside down. The male mounts the female dorsoventrally, grips the female's hind limbs with his feet and grips her midriff/torso with his forearms in order to support himself. The female supports them both during copulation. The copulation usually lasts for two to three minutes, although copulations lasting up to 16 minutes have been observed. The bouts can consist of multiple copulations interspersed with allogrooming and licking (Goonan, 1993; Izard and Rasmussen, 1985; Schulze and Meier, 1995b).

The males sometimes deposit a vaginal plug after successful copulation. The plug becomes hard and stearine-like. It is possible the plug aids in keeping the sperm inside the vagina; it may also prevent other males from copulating with the female (Schulze and Meier, 1995b)**.** (See also Figure 14.)

Slow and Pygmy Loris

Slow and pygmy lorises copulate in a manner very similar to the slender loris, although they also incorporate "whistle" calls into their courtship. The female urine marks and whistle calls, intermittently stopping and turning her head to verify the male's reaction. If he responds by sniffing, urine marking over her marks, whistling back and approaching her, she drops below a branch in a copulatory-invitation posture. The male then mounts the female in the same posture as the slender

loris. He ejaculates after four to ten intromission bouts. The couple segregates, assume normal sitting position and lick their genitalia. This behavior may be followed by social grooming or social play. Courtship and copulations may last over an extended period of time. One pygmy loris pair in San Diego continued these activities throughout a 24 hour period. As the female's willingness decreases, she announces this vocally with snarls, grunts, and biting if necessary (Zimmerman, 1989).

Gestation

The gestation length for both slow and pygmy loris range between 176 and 198 days; this translates to approximately six months. Four pygmy loris pregnancies at San Diego Zoo lasted between 187 and 198 days (Jurke et al., 1997). The slender loris gestation period is shorter than slow and pygmy lorises. Gestation length of four slender lorises documented at the Duke Primate Center ranged between 166 and 169 days (Izard and Rasmussen, 1985). *L. t. nordicus* exhibit a slightly shorter mean gestation length of 162.3 days (n = 14), with a range of 157 to 172 days (Meier et al., in preparation).

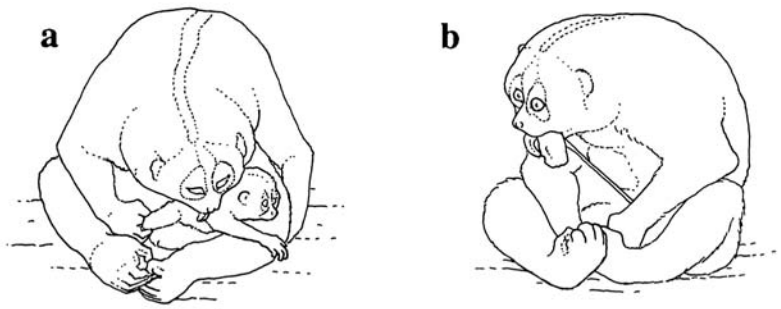
Parturition

Pregnancy may not be obvious in lorises. In the slow loris, the vaginal opening becomes sealed with a membrane approximately 55 to 127 days after conceiving. Non-pregnant females can exhibit sealed vaginas; however, the vagina usually remains perforate between cycles. Pregnancies are difficult to diagnose by abdominal palpation until three to four months have passed (Izard et al., 1988). Slender lorises exhibit a widening of the thorax rather than the abdominal area.

Confirmation of pregnancy can be accomplished non-invasively through analysis of fecal estrogen metabolites (Jurke, et al., 1997). This method may also be employed to determine if multiple fetuses are present (Jurke, et al., 1998).

The genitalia exhibit changes similar to estrus with a swollen reddish vulva and a widening of the vaginal opening within a day or two before birth. Birth often takes place during daylight hours; pygmy lorises more often appear to give birth before twilight. The female licks her genitalia intensively during the course of parturition.

The first observed slow loris birth at San Diego Zoo occurred at 8:23 a.m. and the placenta followed at 1:00 p.m. Signs of labor were visible for less than six minutes (Fitch-Snyder, 1988).



A slender loris parturition was observed at Duke University Primate Center. Contractions were observed shortly before dawn. The female began licking

Figure 15: a) Female *N. coucang* licking the infant after giving birth, still in the labor and delivery posture; b) Female *N. coucang* eating placenta.

her vagina intensively and the actual birth occurred rapidly. The head, then the rest of the infant's body, was expelled with two major contractions in less than a minute. The female received the infant with her hands and brought it up to her chest. The birth took place 20 minutes after dawn. The infant gained a grip on the mother's fur after almost three minutes had passed. It was pink and almost hairless with the exception of fine yellow fuzz on the top of the head and the back. The orbits were bluish-gray and bulged disproportionally from the head. The mother licked it constantly and supported it with a hand for an hour after the birth.

Slender loris infants are relatively inactive for days after birth, especially in comparison to slow loris infants. This is not surprising in light of the fact that their gestation length is approximately one month shorter. Slender lorises are born at a much earlier developmental stage.

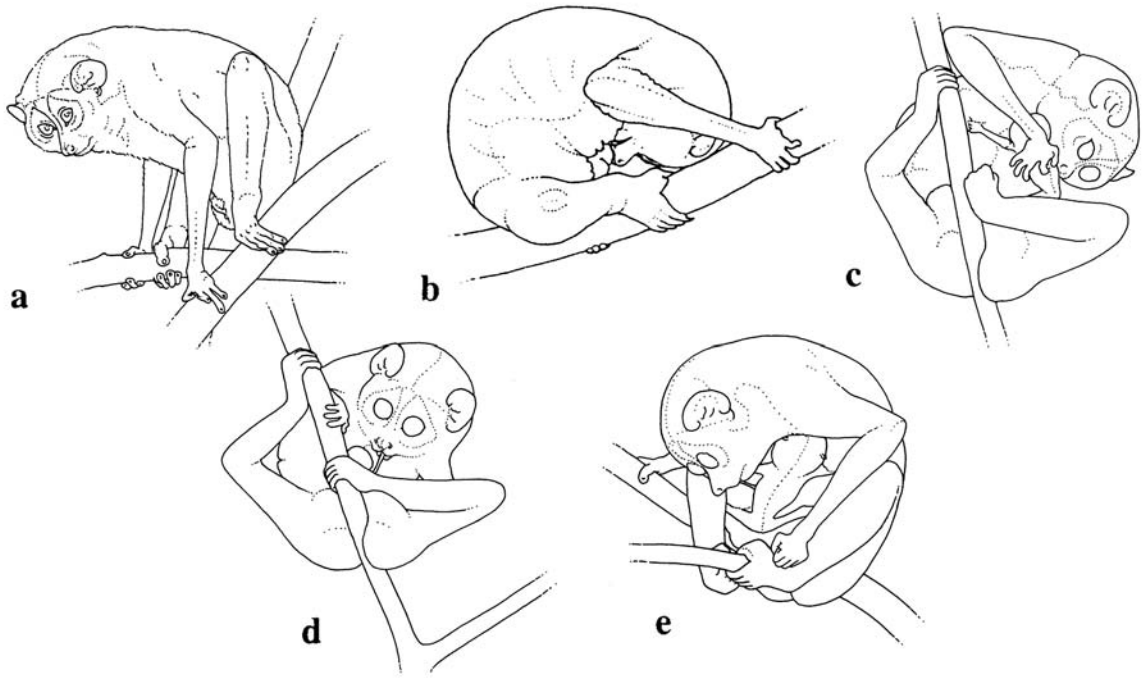


Figure 16: *L.t. nordicus* parturition: a) labor posture, b) licking during delivery, c) licking the baby, d) eating the umbilical cord, e) pulling and chewing the umbilical cord still attached to the neonate (a & b redrawn from photos by B. Meier).

Reaction of Others to Newborns

Although group rearing has been successful in many cases, it is important to identify pregnancies so that preparations can be made before parturition. If unsure about the reaction of the male, it is better to remove him before the birth occurs. The new mother may react aggressively towards the infant if she is stressed by the sudden removal of her cage partner. It is preferable to keep a group intact if they appear to get along, but it may not be possible to predict reactions of group members. In any case, the situation should be closely monitored.

Schulze and Meier (1995b) have found that slender loris pairs and families can remain together without conflict. However, new mothers occasionally become aggressive and fiercely defend their babies against curious conspecifics. The mother may allow her mate or older offspring to explore the

baby, and babies have been observed clinging to cage-mates for extended periods of time. Environmental stress can trigger adverse responses to babies resulting in their death or injury. Ruhr-University Bochum had three out of four new slender loris infants killed by conspecifics when transfers had to be made due to construction work.

The curiosity of other individuals can lead to quarreling as the mother attempts to keep the neonate away from them. A slow loris male was separated from mother and infant at the San Diego Zoo after a wound was detected on the female's forehead five days after parturition. The threesome appeared to be getting along prior to this incident. A similar event has been reported after a slender loris parturition: the baby was killed and the mother lost an eye when the formerly compatible parents fought (Durrell, 1964).

Observations at Ruhr-University Bochum indicate that slender loris neonates may occasionally be bitten or killed unintentionally, when they were between struggling parents and were bitten instead of adult opponents. In group situations, perpetrators of infant abuse are rarely confirmed, as few instances of wounding have actually been observed.

Resumption of Estrus

Fertile and immediate post-partum estrus have been observed among slender lorises. Slender loris females are capable of going into estrus a few days after giving birth. A copulation was observed two days after parturition. Lactating females may also become pregnant. In one case, a female rejected attempts of her infant to suckle and assumed a sleeping posture to prevent it from sleeping clinging to her belly. The next day she gave birth. Such 'non-stop breeding' may be costly energetically for the female. It appears more common for estrus to resume 6 to 7 weeks after a slender loris has given birth to a surviving infant (Izard and Rasmussen, 1985).

Slow and pygmy lorises have a longer recovery period before estrus resumes. Immediate postpartum estrus has been observed in cases were slow loris infants have died, however, the females did not conceive (Izard et al., 1988). The shortest interbirth interval is 10 months if the previous offspring survives six months and is mother-reared. A pygmy loris female came into postpartum estrus after 160 days (Jurke et al., 1997). In five cases of stillborn infants in the pygmy loris, the earliest birth took place nine months later. This indicates that there may be a minimum of a three-month delay before estrus resumes. More data are needed to confirm this pattern.

Interbirth Interval

Izard and Rasmussen (1985) calculated a 9-1/2 month interbirth interval based on three slender lorises. A sample of ten interbirth intervals gave a mean of 16.2 months for the slow loris, ranging between nine and 38 months (Izard et al., 1988).

Studbook data of interbirth intervals is summarized in Table 6. The record for shortest interbirth interval for slow loris is 209 days with previous offspring surviving. The sample size for the pygmy loris is small and the shortest interval exhibited is 252 days; however, the first offspring did not survive. The pygmy loris reproduces seasonally, which gives an interbirth interval of approximately one year. The shortest interval for slender loris is 201 days when the previous offspring survived, and 170 days when the previous offspring did not survive.

Table 6: Interbirth intervals from studbook (in months).

		Slow loris	Pygmy loris	Slender loris
Previous Offspring Survived	**Mean**	17.4	21.7	14.8
	Range	6 - 53	13 - 30	6 - 42
	Median	12	18.5	12
	number in sample (n)	53	6	29
Previous Offspring Did Not Survive	**Mean**	14.2	12	10.2
	Range	7 - 59	9 - 16	5 - 24
	Median	10	11.5	8
	number in sample (n)	19	4	13
Without Regard to Survival of Previous Offspring	**Mean**	16.5	17.8	13.4
	Range	6 - 59	9 - 43	5 - 42
	Median	12	15.5	10
	number in sample (n)	72	10	42

Reproductive Seasonality

Slow lorises produce offspring throughout the year. Zuckerman (1932) examined 146 pregnant females that were taken from the wild. Pregnant females were found in every month but July, and there was a slight increase in pregnancies during September through November. In captivity, slow loris females also cycle more often during the latter half of the year (Izard et al., 1988), and it appears that they preferentially conceive during this time. Relatively few slow loris births occur October through January (Figure 17). Pygmy lorises have a distinct breeding season in July to early September with births from early February to the middle of March (Feng et al., 1994). In captivity, over 75% of all pygmy loris litters in North America were born from January through April, with a sharp birth peak in February (Figure 18). Pygmy loris females have their estrus sometime between the end of July and the first third of October (Jurke et al., 1997). Captive slender loris births in North America have taken place mostly in April, May, and June (Figure 19).

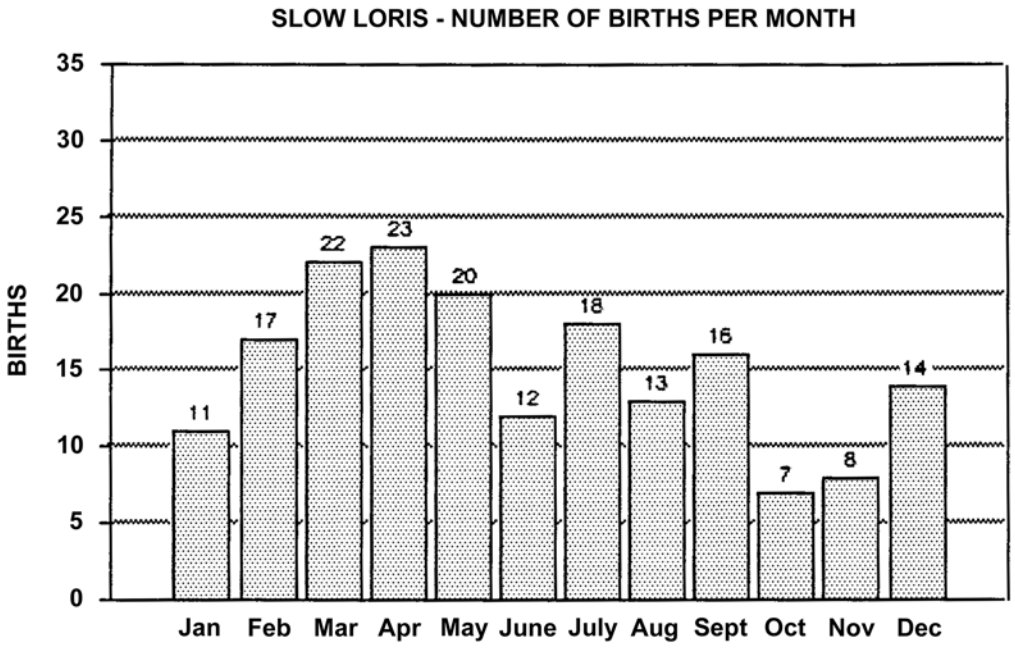


Figure 17: North American Regional studbook data of slow loris' months of parturition (n=181).

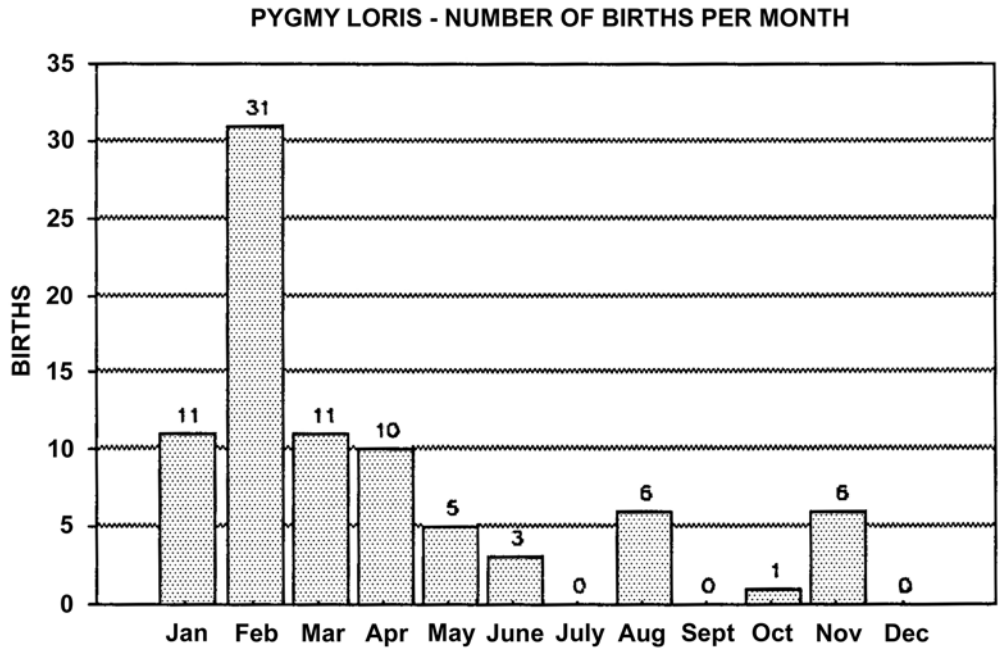


Figure 18: North American Regional studbook data of pygmy loris' months of parturition (n=84).

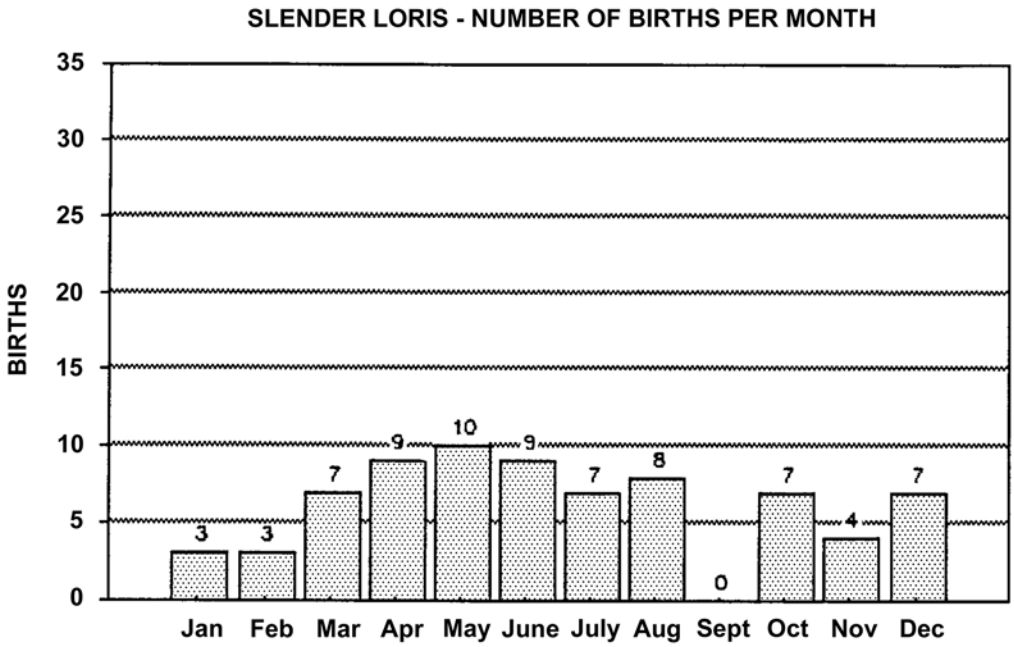


Figure 19: North American Regional studbook data of slender loris' months of parturition (n=74).

Timing of estrus and birth may be influenced by environmental factors such as lighting. This may be especially true for the pygmy lorises, which show the greatest seasonal reproductive patterns of the three loris species. At the San Diego Zoo, pygmy lorises are kept on a natural lighting cycle. This is unlike the other breeding facilities in North America, which maintain their animals under artificial lighting with reversed day/night conditions. All 14 of the pygmy loris litters in San Diego were born from the middle of January through the end of March.

Litter Size

A long-term look at captive breeding through analysis of studbook data through 1997 shows that a total of 181 slow loris litters have been produced. Six of these were twins and only one pair survived past infancy. Slightly over 97% of all litters were singletons.

These data contrast with results from studbook analysis of the pygmy loris. Out of 56 litters produced, 55% of all pregnancies contained more than one fetus. There were 31 singletons, 25 sets of twins, and one set of quadruplets. Data from a captive breeding program at the Kunming Institute in China suggest that the rate of multiple births could be even higher than seen in North America. Nineteen litters have been born there, and in each case but one, litter size was two. The exception was a litter of three (Feng et al., 1994).

Number of offspring produced by slender lorises differs between subspecies. Studbook data of *L. t. nordicus* show twinning in approximately half of the births. Of 78 captive slender loris births in North America, only eight cases of twinning have occurred. Four of these cases were *L. t. nordicus* , while the subspecies in the other cases is unknown.

Chapman et al. (1990) have found that a diet of a large amount of insects in primates allows a

relatively high metabolism rate and facilitates large litters. When effects of body size are statistically removed, litter size increases as the proportion of insects in the diet increases. In most North American zoos, pygmy lorises are generally fed the same diets given to slow lorises with variations only in quantities. It is possible that the captive diets that are given in North America may inhibit the full reproductive potential of this species.

In Chapman's paper on litter size, he concluded that primates that have large litters tend to be small, have short gestation periods and give birth to small infants, which are weaned quickly and mature rapidly. Species in which multiple births are common also have short interbirth intervals and sometimes paternal care. Following the birth of a litter, females from small-sized species are capable of quickly becoming pregnant and producing a second litter. Chapman did not consider the pygmy loris in his analysis of litter size in primates. Examination of the points listed above indicates that while most factors appear to be as predicted, some conditions are not true for this species.

One difference is that pygmy lorises do not have shorter gestation periods compared to slow lorises. Analysis of gestation length records from the San Diego Zoo and Duke Primate Center indicates that both species range from 185 to 197 days with no significant species differences (Izard and Weisenseel, 1989; Jurke et al., 1997).

Pygmy lorises also do not give birth to smaller infants. The ratio of neonatal litter weight versus maternal body weight was larger for both pygmy loris twins and singletons than for slow loris singletons (Izard and Weisenseel, 1989).

In regards to age at first reproduction, studbook analysis may not give an absolute picture, because the first captive-born pygmy lorises became sexually mature only eight years ago, and the sample size is still small. In addition, it is unknown if younger animals of either species could have bred successfully but were not given the opportunity, due to captive housing conditions. With this in mind, studbook records show that in the slow loris, the youngest age at reproduction is two years for both males and females. Because gestation lasts six months, these animals were sexually mature by 18 months. In the pygmy loris, the youngest male to sire offspring was also 18 months, but there have also been two cases of successful conceptions in females at 16 months. Additional data are needed to confirm whether there is a trend towards earlier reproduction in this species.

Infant Development and Parental Behavior

Slow and pygmy loris infants are well developed at birth, fully furred, and have open eyes. For the first few months, the fur contains long fluffy hairs that disappear as the animal matures. Slender loris infants are often born almost hairless and require a longer postpartum developmental period. *Nycticebus* sp. mothers "park" their babies hanging from a branch while they go off to feed or engage in other activities. Infants can be weaned at six months, but slow loris (and probably pygmy loris) juveniles will continue to attempt nursing until sexual maturity if allowed to remain with the mother.

Female lorises' behavior changes little as they become mothers. They can engage in social grooming and play-wrestling with adult males on the first day after giving birth. Mothers devote less time to eating during the first ten days after birth even though lactation incurs a high energy cost (Rasmussen, 1986a).

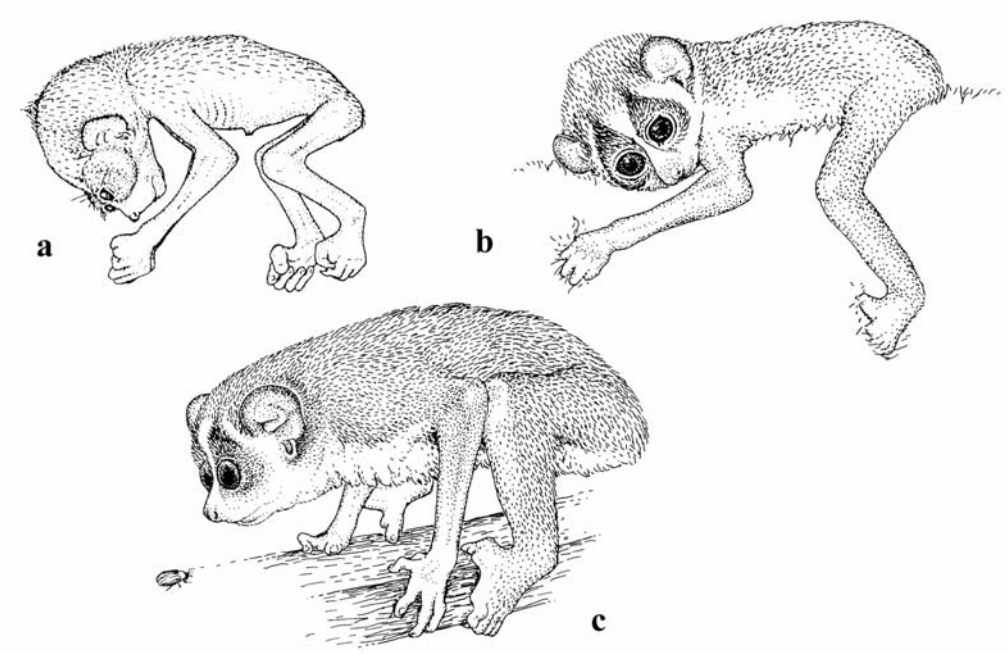


Figure 20: The early developmental stages of a slender loris *(L. t. nordicus):* a) neonate; b) 4 weeks old; c) 4 months old.

The time allocated to carrying and suckling differs between slow and slender lorises as the infants develop. A slender loris infant needs more care during its first month and is rarely parked. It also spends more time riding on the mother during its second month than slow loris infants do. As the slender loris infant grows older it develops rather rapidly. It discontinues suckling during nighttime when approximately four months old. The change from milk to solid food happens rather suddenly at age 70 to 80 days. Independence from the mother occurs after the fifth month. The initial slow development is made up by relatively rapid changes with dramatic shifts in behavior and time budget over short periods. The slow loris is weaned slowly over a longer period (Rasmussen, 1986a).

Bernhard Meier (unpublished) found that duration of the suckling period in single *L. nordicus* offspring (n=7) were approximately 148 days. Twins (n=2 pairs) grew more slowly, and their suckling period was 175 days. (See Figure 20.) This period is nearly identical to their gestation length (157-172 days, mean 162.3 days, n=14). Since females may have a postpartum estrus, they are often still lactating during pregnancy, and the infants are weaned shortly before the next birth.

The slow and pygmy loris infant is more independent of the mother and can be parked its first day after birth. Original duration of parking is not long, but the proportion of time spent parked increases with age. The development is more gradual in comparison with the slender loris. They maintain a close social relationship with the mother long after becoming independent. Slow lorises spend more time on social activities rather than solitary play, which appears to be more preferred by the slender loris (Rasmussen, 1986a).

Mothers are very responsive to infants click calls, and will immediately return to the infant if it vocalizes while it is parked. The social interaction between mother and offspring is predominantly composed of passive physical contact, followed by allogrooming directed from mother to offspring.

The entire body is regularly groomed at young age with special attention given to the anogenital area. Licking of the anogenital region is probably to stimulate urination and defecation by the infant. Slow lorises spend more time following and play-wrestling (and soliciting play wrestling) with the mother than do the slender lorises (Rasmussen, 1986a).

Young lorises play-wrestle more with adult males than they do with their mothers. They also direct solicitation of play-wrestling more commonly toward the males. Males tend to allogroom and sniff offspring rather extensively. Occasionally they kidnap the youngster and a tug-of-war can ensue between the kidnapper and the mother as she tries to regain her offspring. Solitary play-like activity consumes a relatively large portion of a young loris' time and energy, even more so than social interactions with other lorises (Rasmussen, 1986a).

Captive Reproductive History

The North American Regional studbook, which encompasses life histories of North American lorises through 1997, provides demographic and reproductive information on these captive populations. The slow loris rarely reproduced prior to 1968 (Figure 21); the population became larger and 57 animals were born during the 1970s. Pygmy lorises have a short history with a comparably much smaller captive population (Figure 22). The first pygmy lorises that reproduced successfully were imported in 1986. The slender lorises fall somewhere in between the numbers of births by slow and pygmy lorises, with a total of 99 captive births (see Figure 23; seven births are not included because birth year was not known).

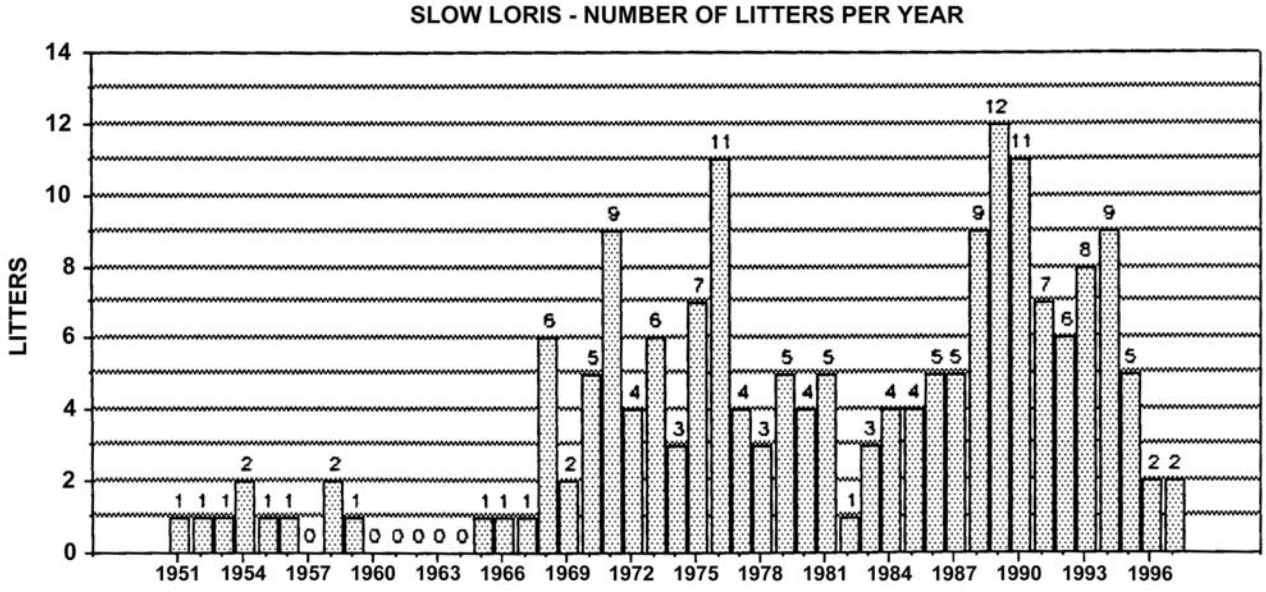


Figure 21: Slow loris births in North America, 1951-1998, n = 287

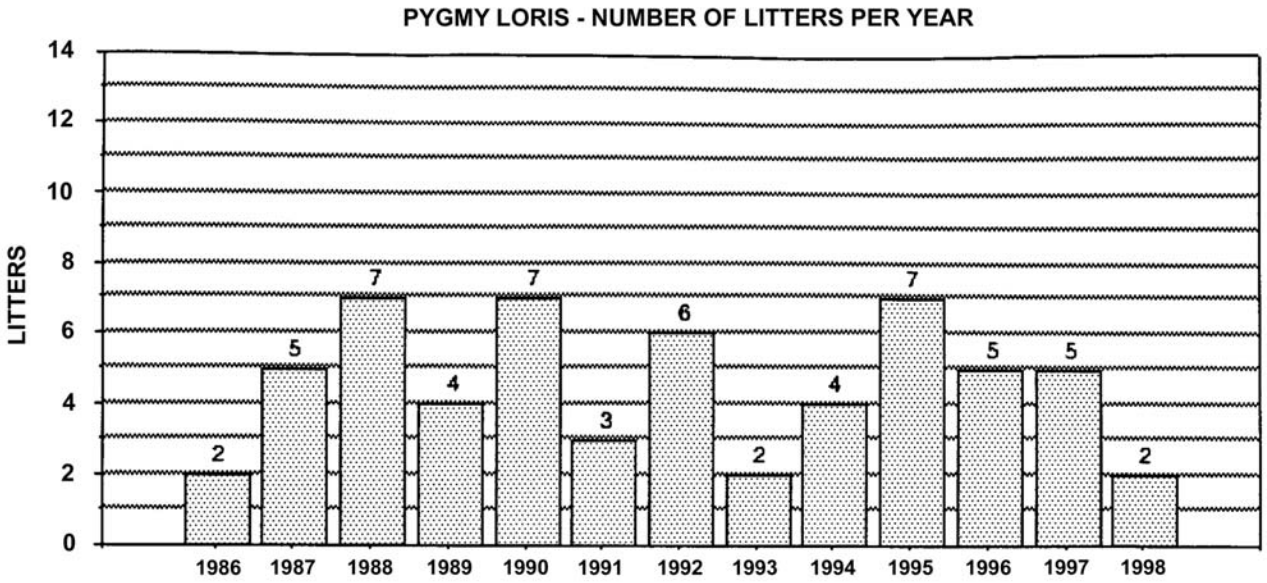


Figure 22: Pygmy loris births in North America, 1986-1994, n = 59.

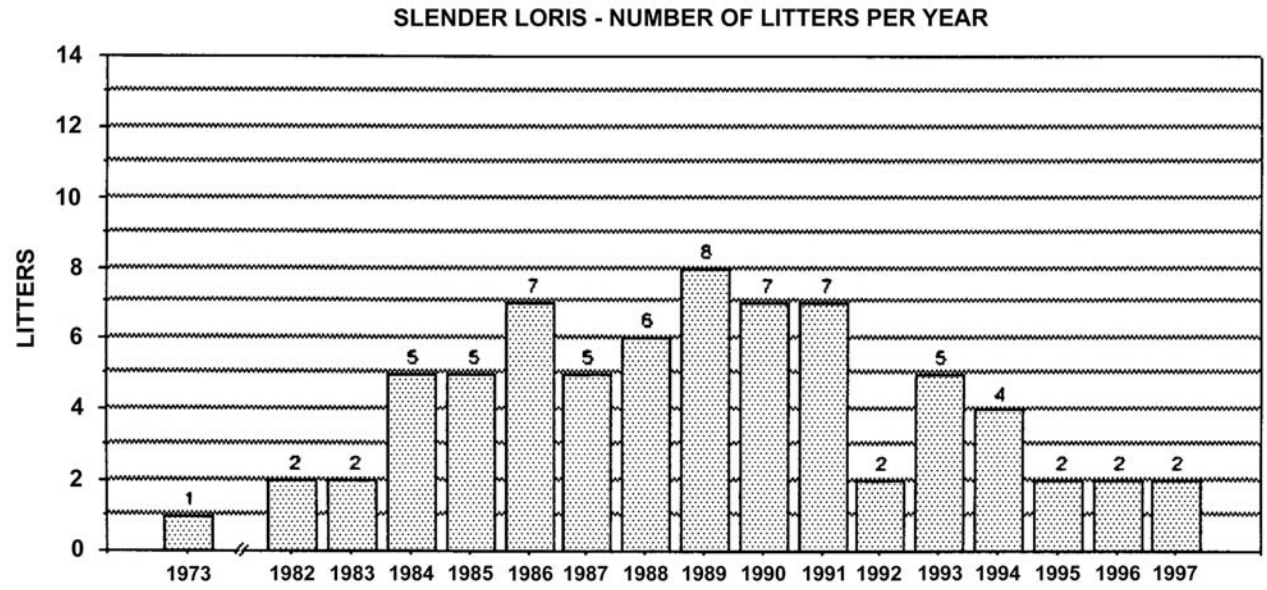


Figure 23: Slender loris births in North America, 1963-1994, n = 72.

Age-class fertility rates (Table 7) are based on slow and slender lorises' whose exact ages are known. The pygmy loris data include breeders of both estimated and exact age, because the sample size is small (the exact age is only known for four of each gender).

Table 7: Age-specific fertility rates*

Age class (years)	Fertility					
	Slow loris		**Pygmy loris**		**Slender loris**	
	Females	**Males**	**Females**	**Males**	**Females**	**Males**
0-1						
1 - 2	.015	.033	.067	.033	.045	.052
2-3	.111	.050	.119	.067	.159	.117
3-4	.095	.035	.115	.190	.141	.097
4-5	.044	.018	.109	.062	.217	.169
5-6	.029	.022	.063	.076	.069	.038
6-7	.031	.025	.071	.054	.057	.018
7 - 8	.038	.030			.016	.025
8-9	.037	.025			.037	.055
9 - 10	.025	.031				.100
10- 11		.009				
> 11						

* Fertility per age group is the sum of infants born to a given age group divided by the number of years lived by individuals of each sex in that group. (Data for older pygmy lorises are not available.)

Maximum fertility was reached at age two for the slow loris. Female pygmy lorises had the maximum fertility at the same age, while the male pygmy lorises lag a year behind. The slender lorises did not reach their maximum levels until four years old. The length of reproductive life differs between the slow and the slender lorises. However, the fertility rates shown is these figures may be misleading because it is not known if all the lorises in this analysis had equal opportunities to breed. Additionally, fertility rates in the pygmy loris are incomplete due to the fact that they have only been kept in North American zoos since 1987.

Table 8: Mean number of litters produced by successful breeders of known age (pygmy loris includes individuals of estimated age).

	Slow Loris		**Pygmy Loris**		**Slender Loris**	
	Females	**Males**	**Females**	**Males**	**Females**	**Males**
Mean	2.1	2.8	1.7	1.6	2.6	2.7
Sd. Dev.	1.2	1.6	0.8	0.7	1.9	2.6
Range	1 - 4	1 - 5	1 - 3	1 - 3	1 - 6	1 - 9
n	17	14	15	15	18	13

The natality was the highest for the slender loris, with 46.2% of females reproducing at least once and averaging 2.6 (± 1.9 S.D.) litters by successful breeders (Tables 8 and 9 and Figure 24).

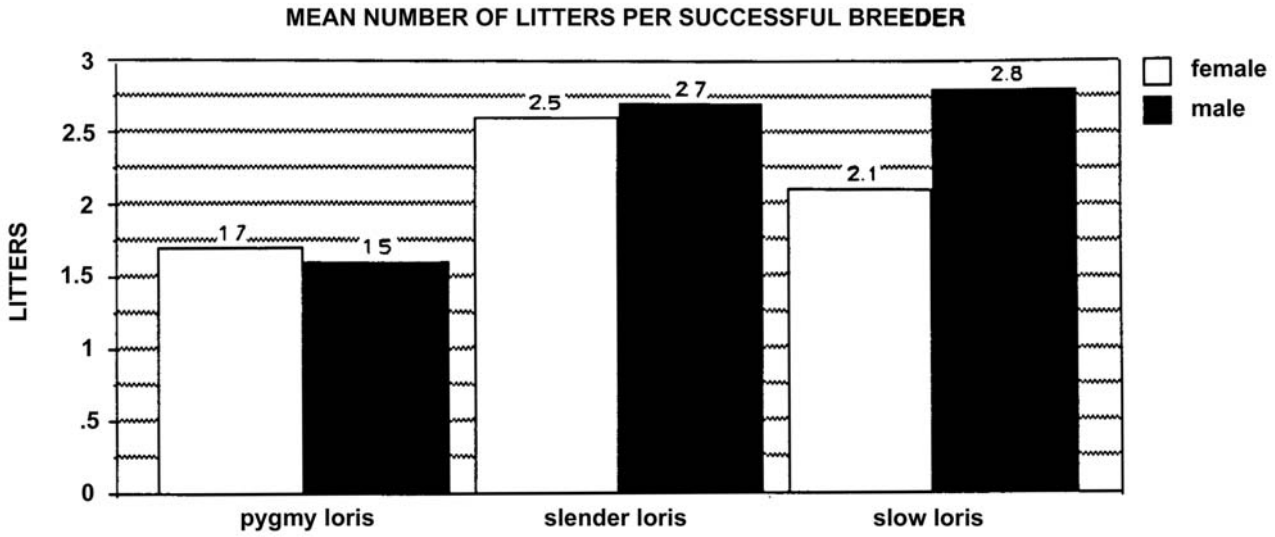


Figure 24: Mean number of litters produced by successful breeders of known age (pygmy loris includes individuals of estimated age).

Table 9: Litter production by adults

	Slow loris		Pygmy Loris		Slender Loris	
	Female	**Male**	**Female**	**Male**	**Female**	**Male**
n	40	54	10	15	39	34
Breeders n (%)	17 (42.5%)	14 (25.9%)	4 (40.0%)	3 (20.0%)	18 (46.2%)	13 (38.2%)
Mean no. of litters per adult	.90 ± 1.32	.72 ± 1.46	.50 ± .71	.27 ± .59	1.2 ± 1.82	1.1 ± 2.2
Range	0-4	0-5	0-2	0-2	0-6	0- 10
No. of litters per year of adult life	0.206	0.137	0.278	0.16	0.418	0.369