

## Management and breeding of Maned wolves

*Chrysocyon brachyurus* [Plate 45]

### at the National Zoological Park, Washington

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The Maned wolf *Chrysocyon brachyurus* is a rare South American species, inhabiting the open pampas and swampy mangrove forests from north-eastern Brazil to northern Argentina (Langguth, 1975). It is a large canid with extremely long legs, and moves with a high step, symmetrical swing gait (jog) which is apparently an adaptation for moving through and tracking small prey in open, tall grass areas (Krieg, 1940). In the wild it is reported to hunt and travel alone outside the breeding season, and to feed upon small vertebrates and invertebrates as well as fruit and carrion (Dennler de la Tour, 1968; Silveira, 1969). It is listed as vulnerable in the IUCN Red Data Book (Goodwin & Holloway, 1972) and although the size of present total wild populations is unknown, Silveira (1968) estimated that there were between 1500–2000 in Brazil.

The Maned wolf is also rare in captivity and there is a studbook on the captive population (Roeben, 1975). Until the last ten years most specimens died shortly after importation (Dennler de la Tour, 1968; Meritt, 1973) but more recently a number of zoos have been successful in maintaining the species and several ♀♀ have produced and reared litters.

Information on behaviour, reproduction and pup development was gathered on the Maned wolves at the National Zoological Park's Conservation and Research Center from June 1975 to April 1978. The collection consisted of 2.2 wild-caught adults, 1.3 zoo-born young from three litters, one hand-reared adult ♂ and a mother-reared juvenile ♂ born in 1977 at Lincoln Park Zoo, Chicago.

#### HOUSING

Each animal or group (up to three animals) is provided with a 4.8 × 3.6 × 4.8 m high den which has a cement floor and contains a 1.2 ×

1.2 m nestbox, a Lixit self-waterer and is heated by forced air. Heat is retained in the dens by Flexport porthole entrances which the animals easily learn to negotiate. Adjoining each den is a 12 × 4.5 m enclosure with a 2.7 m high chain-link fence, the bottom of which is buried to 0.3 m and reinforced with a perpendicular 0.5 m aluminium base mat to prevent the animals from digging beneath it. Maned wolves are not persistent diggers, but occasionally animals have dug down to the mat during the course of a day. The enclosures have shelters and tree stumps which are used as urine-marking posts.

The whelping dens are of similar design but the nestboxes are 2.5 m high and connect to an overhead window through which observations can be made and behaviour recorded with videotape equipment. Each connects to a small 4 × 4 m exercise yard which adjoins one of the main enclosures. The whelping dens are detached from the main building and provide complete seclusion. Different designs for Maned wolf facilities are presented in Faust & Scherpner (1967) and Kühme (1975).

#### GENERAL BEHAVIOUR

The wolves have been maintained singly, in ♂/♀ pairs, in twos (mother and daughter) and in a trio consisting of a mother with her mature daughter and an adult ♂. Animals housed together generally established dominant-subordinate relationships and coexisted peacefully by avoiding each other. A mother and daughter kept together were more amicable and groomed each other's face and ears frequently, even after the youngster was a year old. Two adult ♀♀ in a trio at the Tierpark Berlin also interacted with one another more frequently than with the ♂ (Altmann, 1972).

Precautions should be taken to prevent injuries when establishing a new group since

unfamiliar like-sexed individuals generally fight. Unfamiliar wolves should be introduced to one another in a neutral area rather than adding a new individual to an established group. Silveira (1968) found that occasional fights occurred when either a group of ♂♂ or a group of ♀♀ were housed together, although several zoos have been able to maintain trios (Altmann, 1972; Kühme, 1975). We found that like-sexed adults housed in adjacent pens fought through the chain-link fence. In newly formed pairs, the ♂ (or rarely the ♀) intimidates its partner by charging and head-darting with the mouth open. The partner, who fends off each charge with gaps and growls, is usually restricted to a small portion of the pen for the first several days of cohabitation. Once accustomed to each other, the animals tend to avoid any interactions and more amicable behaviour is usually not observed until the breeding season. All animals will fight over food, especially preferred items, so separate feeding stations should be established.

These observations support the contention that Maned wolves have a solitary type of social organisation; however, a young ♂ and ♀ introduced at eight months of age coexisted peacefully, interacted often in a friendly fashion, and rested in contact with one another. Similar patterns observed in mated pairs during the gestation period suggest that the animals may form pair bonds under certain conditions.

The Maned wolf is thought to be nocturnal in the wild, but the wolves at our facility are quite active in the late afternoon prior to feeding. In zoos where the wolves are locked in at night they are active upon release in the morning and again before being locked up (Altmann, 1972). Usually they will begin and end their activity period with repeated barking and this is especially pronounced in the autumn, the animals in separate enclosures often barking back and forth alternately (Brady, in prep.).

Behaviour varies with time of year, group composition and type of housing. Familiar ♂/♀ pairs generally increase the number of friendly interactions during the breeding season, but fighting and threatening may occur between unfamiliar animals introduced at this time. Aggressive behaviour consists of opened-mouth threats, chasing, forepaw contact, hip slamming and general body contact. If biting occurs the

animals should be separated. Friendly interactions include approaching one another with elevated tails, chasing, pushing one another with extended forepaws, grappling, and biting scruffs and muzzles in a playful manner. Several more complete descriptions of behaviour are available (Encke *et al.*, 1970; Altmann, 1972; Kleiman, 1972).

Another important aspect of behaviour is urine marking, and mature individuals of each sex utilise a different type of raised-leg posture (Kleiman, 1966). The presence or absence of urine marking indicates how well animals are adjusted to their surroundings and cohabitants. Animals which are intimidated by a dominant conspecific or the proximity of humans will squat while eliminating rather than use the raised-leg posture. The ♂ uses a shallow squat with the tail arched, and the ♀ a deep squat. Besides urine marking, Maned wolves mark with locus-specific defaecations and anal gland secretions.

#### REPRODUCTION

Maned wolves are monoestrous and heat periods have been recorded from October throughout January in the northern hemisphere. Examination of the studbook indicates that 72% of copulations ( $n=22$ ) in the northern hemisphere occurred in October and November. Mating occurs in April to June in the southern hemisphere (Silveira, 1968) and pregnancy should be suspected in any ♀ imported at this time of the year. It appears that decreasing photoperiods trigger breeding activity. One ♀ which was imported from Brazil in June 1975 mated in December of the same year; a second was pregnant when imported and did not mate again until November 1976 (Table 1).

Behaviour is useful in diagnosing the onset of the breeding season, including an increase in the number of friendly interactions between familiar animals and an increase in the rate of urine marking by both sexes. About one month prior to copulation ♂♂ begin to lick the ♀♀'s urine and show a flehmen-like response, which appears as chattering of the teeth. At this time ♂♂ frequently attempt anogenital investigation, but the ♀♀ generally avoid the contact by wheeling around to keep the hind quarters away. They begin to allow the ♂♂ to approach about two weeks before copulation, twisting the tail to one side to expose the vulva which the ♂♂ lick

LITTER NO.	PARENTS		DATE OF LAST COPULATION	PARTURITION DATE	GESTATION PERIOD (days)	LITTER SIZE	NUMBER REARED	COMMENTS
	STUDBOOK NUMBERS ♀	♂						
1	50	106	?	18 Jul 75	?	0.2	0	Copulation occurred in Brazil
2	53	106	11 Dec 75	15 Feb 76	66	1	0	Pup died shortly after birth; sex unknown
3	53	109	27 Oct 76	31 Dec 76	65	0.1	0.1	
4	50	109	26 Nov 76	29 Jan 77	64	0.2	0.2	
	53	109	15 Nov 77	—	—	—	—	Copulation occurred over two days but ♀ failed to conceive
5	50	109	18 Nov 77	19 Jan 78	62	1.1	1.1	

Table 1. Data on two breeding ♀ Maned wolves *Chrysocyon brachyurus* at the National Zoological Park, Washington, DC.

and investigate, sometimes for over a minute, and then display flehmen. When oestrus is imminent, play behaviour becomes frequent and the ♂♂ often mount or put their forelegs on the ♀♀'s backs. The vulva is pink and swollen at this time and appears to be red-ringed about one week before copulation. Whether this is pro-oestrous bleeding or some other type of irritation is unknown.

A number of copulations occur over one to four days. As animals which were disturbed or observed closely appeared reluctant to copulate, pairs suspected of mating should be secluded. The mating mechanics are similar to those described for other canids and ties lasting up to 14 minutes occurred with the pair standing back-to-back (Kleiman, 1968; Lippert, 1973).

In trios containing two ♀♀, the ♀ not in oestrus has been reported to attack the mating pair and disrupt the mating (Altmann, 1972). At the NZP we have been able to leave a young ♀ with her mother during mating but, as a general rule, unless close surveillance is maintained youngsters and non-oestrous ♀♀ should be removed. Two incompatible ♀♀ may be mated with the same ♂ by introducing him to each on alternate days until copulation occurs.

The gestation period is c. 65 days and the whelping den should be prepared well in advance of parturition. Females will rear their young if provided with a secure, secluded area in which to whelp but any disturbance will trigger attempted transfers of the pups to a more suitable spot; if none exists the ♀ may neglect or

kill the infants (Faust & Scherpner, 1967; Silveira, 1968).

Signs of a successful conception include increased food caching by the ♀♀ as well as long bouts of anogenital licking. The teats become swollen as pregnancy progresses and some hair loss occurs around them. Also, the ♀♀ become aggressive towards humans about one week before parturition and this behaviour continues for several months afterwards. We remove the ♂ at this time although the pairs still appear to be compatible and it is not known whether the ♂ would participate in rearing.

Three births have been monitored via closed-circuit television at NZP and Hammerling & Lippert (1975) monitored a birth in Tierpark Berlin. The process of parturition is typical of canids. The ♀ becomes restless several hours before birth and the first contractions begin approximately two hours prior to delivery. During the process the ♀ often stands and paws the substrate and rearranges the bedding with her muzzle using movements similar to covering a food cache. She lies on her side during birth and drags the infant to her head region where she severs the umbilicus and licks the pup dry. In the two multiple births observed, the first infant was not suckled until the second pup was delivered even though both interbirth intervals were four hours.

#### MATERNAL BEHAVIOUR

Females are attentive to the pups for the first four weeks after parturition, and suckling bouts occur

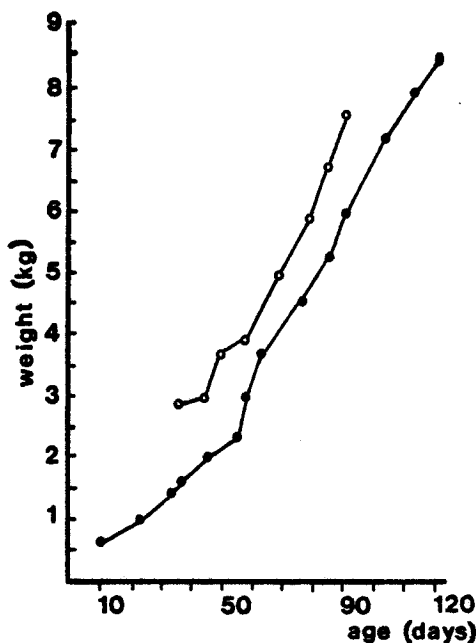


Fig. 1. The growth curves for two mother-reared litters of maned wolves *Chrysocyon brachyurus* born at the National Zoological Park. The open circle curve is for a single ♀ pup (litter 3) and the solid circle curve is the average of two ♀ siblings (litter 4).

every two to three hours. After the first month, the number per day decreases and for litter 4 during week 6, eight bouts were recorded in a 24-hour period. The number of bouts declined further as the youngsters became more and more dependent on solid food and by week 15 only one nursing bout was recorded during a 24-hour period.

For the first two weeks, mothers spend the majority of the day lying with the pups and only begin to leave the den for extended periods during the third week. They lick the pups often and stimulate the pups to eliminate by licking the anogenital region. They also ingest all waste material in the nest until week 7. They are careful to avoid sitting on the pups and occasionally before reclining pick up one or both pups or reposition the litter with the muzzle.

Regurgitation of food to the youngsters begins in week 4 and ♀♀ announce their intentions by emitting mew-like whines. These repetitive whines last from a few seconds to 20

minutes and have also been heard in several other contexts, all of which are related to establishing contact with or feeding the pups (Brady, in prep.).

The pups are still strongly dependent on the mother after weaning, and regurgitation of food has been recorded up to seven months after parturition. During the first three months, the ♀♀ initiate feeding and often seek the pups out after eating and induce them to beg by repetitive whines. Later, however, they attempt to avoid pups that beg and will punish youngsters which attempt it with muzzle bites.

#### PUP DEVELOPMENT

Maned wolf pups are born with a slate grey coat except for a white-tipped tail and white patch in the inguinal area. The ears and eyes are closed until day 8 or 9 and, although the ears open at this time, the pinnae do not stand erect until week 4. At this time the pelage begins to lighten, especially on the head and tail region, with the appearance of red and white hair. The transition to adult pelage is, however, slow and not complete until week 10 (Seidel, 1972).

The pups' rectal temperature fluctuates from 35.7–37°C for the first 18 days of life and then elevates to the adult level of 37.7°C (Seidel, 1972). At birth the pups weighed c. 350 g (litter 1) and weight gain was rapid (Fig. 1).

Physical development is also quite rapid, but the long legs characteristic of adults do not develop until pups are almost one year of age (see Kühme, 1975 for measurements). Weekly measurements were made of the pups of litter 4 (Table 2). Frequent weighing and measuring, however, is not recommended unless the health of the litter is in question since it disturbs the ♀ and young. The rate of weight gain and physical development of mother-reared pups is similar to that previously reported for hand-reared litters (Acosta, 1972; Seidel, 1972).

#### PUP BEHAVIOUR

The pups generally remain close to the mother and recline in her inguinal region during the first month of life. Like most infant canids they huddle into a ball when the ♀ leaves and whine while alone. The first interactions between littermates occur around day 8 when the youngsters, lying side by side, push at one

AGE (days)	TOTAL LENGTH (cm)	TAIL LENGTH (cm)	GIRTH (cm)	NECK (cm)	EAR (cm)
13	38.8	9	17.5	12.5	2.6
24	47	11.8	22	14.5	4
32	53.5	13.5	23.5	15	6.5
37	56.5	14.5	26.8	15.5	7
45	64	17	27	16.3	8.4
53	68.5	18.3	30	17.3	9.7
60	75.5	21.5	31	17.5	10
67	76	22	32.5	18.8	10.8
74	80	22.5	33.2	19.8	11.5
81	84.5	24	35.5	21	11.6
88	88.5	28	37.5	21.8	11.9
102	101	31.3	40	22.5	12.7
109	102	31.5	41.3	23	12.9

Table 2. The average body measurements of a litter (0.2) of mother-reared Maned wolves. All numbers are the litter mean.

another with extended forepaws. They also grope with an open mouth towards one another's heads after suckling. The huddling transforms into attempts to stand on each other's backs during week 3, and bites to the head and legs are observed. As the pups' motor systems mature the tempo and duration of interactions increases and by day 21 grappling, muzzle wrestling, pinning a sibling with scruff bites and most of the components of infant canid play are observed. The intensity of pup interactions noticeably increases during weeks 6-10 but in no case has there been bodily harm or bloodshed. The frequency of interactions between pups decreases after week 10 but they rest in contact with each other until separated at seven months.

Pups beg food from the mother by crouching low to the ground and approaching her with ears flattened and tails wagging, and nudging the side of her mouth with their muzzles. If the ♀ punishes a pup with muzzle bites, it rolls on its back and whines. Some fighting occurs over the regurgitated bolus and serious fights can occur over preferred food items such as whole rats and rabbits.

The age of sexual maturity is difficult to assess and is generally considered to be the age when juveniles begin to use adult urination postures and urine mark their home area regularly. A young ♂ began to urine mark at ten months and the ♀ housed with him was occasionally observed urinating with a raised-leg posture at the same age, but she did not mark regularly

until one year old. Neither this pair nor a young ♀ housed with an adult ♂ reproduced as yearlings.

#### HEALTH AND FEEDING

Several health problems may occur with Maned wolves. The parasite *Diocetophyme renale*, which destroys the kidney and is fatal if left unchecked, is believed to be transmitted to wolves when they eat infested intermediate hosts such as fish and molluscs which occur in their natural habitat (Matera *et al.*, 1968). Silveira (1969) suggests that the fruit *Solanum grandiflorum* has therapeutic properties against the parasite. Infestations can be diagnosed by screening the animal's urine for parasite eggs.

Maned wolves are also susceptible to the common intestinal parasites of dogs and routine faecal examinations and worming are recommended. In addition, several zoos have reported heart-worm infestations; wolves in areas where heart-worm is prevalent should be tested.

Maned wolves in our collection have a rapid food passage time or gut mobility and adults (weight 22-32 kg) are fed 1000-1200 g of Nebraska Canine Diet daily. Some older animals are thin, have a rough coat and chronically loose stools, even though they are free from parasites and disease. This can be alleviated by adding fruits, whole animals, and grains to the diet to act as bulk and decrease the rate of passage. The addition of an enzyme extract to the food mix was found to be effective in the case of an older ♀ which was lactating.

Another problem is that the wolves consume large quantities of grass during the summer and autumn months, usually when the alimentary tract is empty. The grass passes through extremely rapidly; we have recorded passage times of 20 minutes while Tierpark Berlin reported 6-7 minutes (Altmann, 1972). Grass ingested in this manner can irritate the intestinal mucosa and mild bleeding often occurs. We have found that feeding twice daily often alleviates the problem.

With our animals, the most serious complaint is cystinuria. Urological analyses of the wolves indicate that all our specimens are affected and granuli were also present in wolves shipped to us from two other North American zoos. One adult ♂ died due to a urethra blockage by calculi and other zoos have reported similar difficulties (Jensen, 1977). Possible preventive measures are currently being researched by our veterinary staff.

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#### PRODUCTS MENTIONED IN THE TEXT

**FlexPort portholes:** manufactured by Turen Inc., Box 286, Lebanon, New Hampshire 03766, USA.

**Lixit Self-waterers:** manufactured by Atco Manufacturing Co., Napa, California, USA.

**Nebraska Brand Canine Diet:** manufactured by Central Nebraska Packing Co., North Platte, Nebraska 69101, USA.

**Viokase:** enzyme extract manufactured by Viobin Corp., Monticello, Illinois 68156, USA.

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Maned wolves are sometimes cited as crepuscular animals, meaning that they mainly come out at dawn and dusk. This is an oversimplification. In reality, activity patterns vary wildly depending on the date and where a particular animal lives. Additionally, maned wolves are susceptible to diseases spread by domestic dogs, many of whom act aggressively towards their distant cousins. But the biggest threat to the animals is habitat loss. As grasslands and forests regularly become farmlands and villages, maned wolves are caught in the middle. Accordingly, the International Union for Conservation of Nature (IUCN) regards this species as a near-threatened one. This means that, in the not-too-distant future, the maned wolf might well become vulnerable—or worse.