

OBSERVATIONS ON THE MANAGEMENT, PHYSIOLOGY, BREEDING
AND HAND-REARING OF SNOW LEOPARD (*Panthera uncia*) AT
LINCOLN PARK ZOO, CHICAGO, FROM 1960 TO 1974.

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In the 13 year period between May 1960 and May 1973, the Lincoln Park Zoo has had a total of 28 (11/17) Snow Leopards (*Panthera uncia*) born. Of the twelve separate births eight occurred in May, three in June, and one in September. There were six litters of 3, four of 2, and two of 1. The single births occurred to two different females and in one case it was her third litter while it was the other's fourth.

It has been thought that Snow Leopards breed only every other year. This apparently does hold true for at least some animals. At Lincoln Park Zoo the pair Nikolai & Tanya bred in 1960, 1962, 1964 and then not again until three years later in 1967. The pair Walter & Ida bred twice and for the first time in 1967 (the only time this has ever occurred at Lincoln Park) again in 1969, 1971 and 1973. For these animals, at least, the theory of breeding every two years holds true. These four animals were wild-caught. At Kaunas Zoo (8) their wild-caught animals came into oestrous every year, however.

One of the two females, Dasha, born to Walter & Ida in 1969 reproduced with a wild-caught male, Igor, for the first time in May 1972. She again had cubs May 1973. Her sister, Basha, did not have cubs for the first time until May 1973, however. This would indicate that a female Snow Leopard can reach sexual maturity before her third year. Both of these animals came into oestrous and bred again in February, 1974.

Although Marma & Yunchis (8) claim that Snow Leopards have a difficult time adjusting and living in a low altitude Zoo this has been proved untrue in the U. S. Lincoln Park, Dallas (1), St. Louis (4), Brookfield (11), and Cincinnati (9) Zoos, among others, have all done well with Snow Leopards. None of these areas are known for their altitude and, in fact, the opposite is true.

At Lincoln Park Zoo we have attained what we believe are excellent longevity for Snow Leopard. Crandall (2) reports longevities between $6\frac{1}{2}$ and $8\frac{1}{2}$ years, while Marma & Yunchis (8) report a high of 11 years. At Lincoln Park Zoo a female, Tanya, arrived March 5, 1957 as an adult animal and died February 15, 1972. She therefore lived at Lincoln Park 18 days less than fifteen years. Since she was an adult on arrival it can be assumed she must have been 17-19 years old at death. A male, Nikolai, arrived as an adult April 22, 1959 and died September 1, 1970 a span of over 11 years, 4 months. He bred Tanya early in 1960 and cubs were produced from that breeding. He therefore must have been at least 3 on arrival and 14-16 when he died.

A female, Ida, arrived as an adult September 30, 1964 and died of pneumonia May 27, 1973, a span of 8 years, 8 months and was probably 11-13 at death. A male, Walter, arrived as an adult December 11, 1963 and is still living in vigorous health. This animal was thought by some to be about 8 years old on arrival because of the condition of

his teeth. Although this age is doubtful he must have been at least 4 years old at that time. This would make him 15 now and he is still breeding. He was transferred to Brookfield Zoo early in 1974 and reportedly bred a female there in February, 1974 (11).

That the management of Snow Leopards has improved over the years is evident when looking at statistics in the International Zoo Yearbooks. Volume 4 shows that only 2 of 34 Snow Leopards living in 19 Zoos were born in captivity, 6%; five years later Volume 9 indicates 15 of 90 in 39 Zoos born in captivity, 17%; while four years later still Volume 13 indicates 32 of 112 in 45 Zoos born in captivity, 29%. In a period of nine years the percentage of Zoo-born Snow Leopards therefore increased 23%. We feel this is a significant increase and bodes well for the future of this species in captivity.

Lincoln Park Zoo maintains Snow Leopards in outdoor cages all year, although females are brought inside to cub and cubs spend their first winter inside. Temperatures normally drop to -20°C and it is not unusual for us to experience temperatures of -28°C . For protection the Snow Leopards have non-insulated, unheated wooden nest boxes. They have never shown any signs of discomfort when it is cold. Temperatures usually rise to 40°C in the summer for 2 or 3 days and frequently range between 30°C and 35°C . During these hot periods the Snow Leopards do show some discomfort and hyper-ventilate. At these times they are bathed by a keeper with

a hose a number of times during the day, and water bowls are double-checked to make sure there is an adequate supply at all times.

Adult pairs of Snow Leopards are kept in cages 3.05m Long x 3.06m Deep x 5.49m High with wooden shelves and the above mentioned wooden box. The box is 1.53m Long x 1.22m Deep x 1.22m High.

They are fed six days a week. An adult Snow Leopard receives 8 lbs. (3.6kg) of horsemeat with vitamin-mineral supplements added 4 days per week. 1 teaspoon Rib-Ad and 1 teaspoon Calcium gluconate are the additives. Twice a week each animal also gets two whole chickens with heads and feet removed, but entrails intact. Pregnant females are given extra calcium in their meat.

Oestrous invariably occurs in mid-February to early March at Lincoln Park Zoo. It lasts an average of 4-8 days. Brookfield Zoo reports oestrous always in February. As early as February 2 to February 25. Oestrous cycles lasted 3-8 days there (11).

The gestation period of 93 days frequently encountered in the literature (10 & 2) is incorrect. Our gestation periods range from 98-105 days. The Russians (8) report a range of 98-103 days, Dallas (1) reports 99 days and St. Louis (4) 96-104. Where copulation was recorded for four litters at Brookfield Zoo (11) gestation ranged from 92-103 days. (The litter where 92 was recorded ranged to 98 days and was atypical since their other three litters ranged from 96-103) The gestation period for Snow Leopard should probably be expressed as ranging from 97-103 days.

Both Lincoln Park and Brookfield (11) have experienced the phenomenon of post-partum oestrus in Snow Leopard. At Brookfield the female came into heat June 18-21, 1973, 23 days after giving birth to a single stillborn female. Copulation occurred, but no cubs were born. A female at Lincoln Park gave birth to her first litter of 2/1 on May 28, 1967. The cubs were taken immediately for hand-rearing. September 25, 1967 this same female gave birth to another litter of 2/1. She came into oestrous June 14 and 15, and again June 20 and 21. June 20 was 23 days after birth, exactly what it was at Brookfield. It is conceivable post-partum oestrous is a safety factor in the wild. If a litter is lost the female can conceive again and not have to wait another two years. We have never encountered this again since normally we have not put our females back with the male for about a month after birth, probably after post-partum oestrous is over.

This female did not give birth again until June 11, 1969 when she was allowed to raise her own cubs, and then appeared to settle into a cycle of birth every two years.

We usually keep Snow Leopards as pairs, although we have successfully kept an adult trio, 1/2, together. The first year the trio was together, the male bred both females although only one produced cubs. The second year both females produced viable offspring.

The females are separated from the males and moved inside approximately 3-4 weeks before giving birth, although they remain on public view. None of our animals ever used a box or pallet and seemed to prefer a corner of the cage to give birth. We have frequently observed these births and although most occur at night, some happen in the middle of the day. The public is not allowed inside our Large Cat building for many weeks if the females will care for their young. In fact, only regular Lion House personnel are allowed in the building during the first two weeks and they do as little cleaning and make the least amount of noise as possible. The proximity of anyone is very disturbing to the cats.

All females are given a chance to raise their own cubs. Hand-raising Snow Leopards is difficult at best. Because of a variety of factors the success ratio of hand-rearing Snow Leopards is very low. Brookfield raised 3/1 of 4/6, 40% (11); St. Louis was successful with 1 of 7, 14% (4); and prior to 1973 we successfully hand-reared only 2 of 14, 14%. The female who took care of her own raised all of two litters, however, 4 of 4. Although she was dying of pneumonia, this same female tried to raise her last litter in 1973. She unfortunately died of pneumonia as did her cubs; although they did not die immediately. The female offspring died on the 37th day and the male at 83 days of age.

Prior to 1973 Snow Leopards were hand-raised using techniques as with other large cats. The procedure is fully explained by Hoff (5). The

baby Snow Leopards were taken to the Zoo Nursery where they came into contact with other animals, cats included. One died from bacterial causes (5), but most died from viral causes resembling encephalitis. Because of this poor record it was decided to attempt to raise the six animals born in 1973 differently. Although seven were actually born, one lived only 20 minutes.

When the animals were taken from their mothers who refused to care for them, they were put into isolation. Although the isolation room was in the Lion House no one but the authors and two wives were allowed into the room for the first month. After that the Nursery Keeper was given the exclusive job of taking care of them during the day. He could not have any contact with any other animals, especially cats. Until they were eating solid food almost exclusively a total of 9 or 10 people were ever allowed near them. We consider this isolation extremely important.

The formula was also changed. We began with equal parts of KMR and distilled water. On the fifth day the formula was changed to 3 parts KMR and 1 of water. On the tenth day the formula was changed to straight KMR. They were fed six times per day, the first feeding in the morning at 8:30 and the last at 10:30 P.M. We began by feeding $1\frac{1}{2}$ oz. of formula and increased it to 2 oz. around the 30th day. Solid food was also started around the 30th day. We used Zu-Preem canned feline diet because of its homogenized consistency and sterility.

One-fourth of a teaspoon of Zu-Preem was offered twice a day and readily accepted to start with. KMR was increased to $2\frac{1}{2}$ ozs. per feeding around the 40th day. At day 50, Zu-Preem was increased to one teaspoon three times per day. Day 60 saw Zu-Preem increased to two teaspoons four times per day. The Zu-Preem was mixed with the KMR in a bowl and was relished by the cubs so much so that by the 70th day they were getting ten teaspoons each along with $2\frac{1}{2}$ ozs. KMR.

At about the two month mark the animals were fed only three times a day; 8:30 A.M., 11:00 A.M. and 4:00 P.M. On occasion they got diarrhea, but the formula was never cut with water as was done in the past. It was treated successfully with Kaopectate and Biosol-M.

Although, as was mentioned above, two of the six died of pneumonia it may be significant they were from the female who had pneumonia and died from this infection the day after the cubs were born. The cubs were vigorous and healthy. Though they each lost a great deal of hair when about 10 days old this did not affect their behavior. They remained vigorous eaters and were active. Their hair grew back in a few weeks without special treatment or medication.

Although they were kept in incubators for convenience, these were not in operation and, in fact the tops were kept slightly open to provide maximum ventilation. The only time they showed any discomfort was when it became hot. A rotating fan in the isolation room helped to alleviate these situations.

Figure 1 shows a comparison between animals raised on our new regimen, animals raised on our old regimen and mother-reared animals from Kaunas Zoo (8). There can be no doubt from these figures that the method we used in 1973 is superior to the original method begun in 1960. The nutritive aspect alone obviously makes a great difference. At 60 days the difference between systems for example, is dramatic. The animals raised under the new regimen far outweighed those raised under the old system. What may be more significant, however, the 1973 animals outweighed the mother-reared animals from Kaunas Zoo (8). A female, for example, born Lincoln Park Zoo May 28, 1973, weighed 6,861 grams at 88 days of age, while the heaviest Kaunas animal weighed 6,690 grams at 105 days of age, 171 grams less, but 17 days older. Comparisons with the other animals are as dramatic. Figure 2 shows weight curves for selected hand reared animals.

Rectal temperatures at birth range between 90.1°F and 91.5°F. The cubs' eyes open between 7 and 10 days and they begin to cut their first teeth between 13 and 18 days.

We immunize during day one and day eight with 2cc normal feline serum. They also receive Felocine vaccine .25cc day fifteen; .50cc day twenty-nine; .75cc day forty-three; 1.0cc days fifty seven, seventy-one and eighty-five; and 1.25cc on day one hundred fifty-six.

For the sake of being complete it was duly noted that at the age of five months the Snow Leopards could easily jump over a 127cm barrier.

SNOW LEOPARD DEVELOPMENT

<u>Sex</u>	<u>Date of Birth</u>	<u>Age in Days:</u>									
		<u>1</u>	<u>10</u>	<u>20</u>	<u>40</u>	<u>60</u>	<u>90</u>	<u>110</u>	<u>150</u>		
<u>New Technique Lincoln Park (Hand Reared)</u>											
Female	5/20/73	624	737	851	2041	4309	4309	10,885			
Female	5/20/73	595	765	1304	2041	3402	5783	10,433			
Female	5/24/73	624	822	1333	1985*						
Male	5/24/73	567	851	1361	1923	3062	3856*				
Female	5/28/73	652	936	1276	2098	3969	6861			11,340	
Female	5/28/73	595	907	1333	2155	3884	5557			11,340	
<u>Old Technique Lincoln Park (Hand Reared)</u>											
Male	5/30/62	539	680	1021	1814	2126	2580*				
Female	5/30/62	510	652	992	1729	2098	2637*				
Female	5/30/62	510	624	992	1588	1985	2381*				
Male	5/28/67	595	851	907	1923	3062	5216	8165			
<u>Kaunas, USSR (Mother Reared)</u>											
Female	4/22/67					3000 (55 days)	6690				
						3920 (65 days)					
Male	4/22/67					2930 (55 days)	6560				
						3790 (65 days)					
Female	4/22/67					2620 (55 days)	6350				
						3420 (65 days)					

* Indicates animal deceased.

FIGURE ONE (1)

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