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Manuscript submitted 8 April 1974

Observations on the breeding and husbandry of Snow leopards

Panthera uncia

at Lincoln Park Zoo, Chicago

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Twenty-eight Snow leopards *Panthera uncia* have been born at the Lincoln Park Zoo between May 1960 and May 1973. Of the 12 separate births, eight occurred in May, three in June and one in September. There were three cubs in six litters, two in four litters and one in two litters; these single births were to separate ♀♀.

Snow leopards are said to breed every other year and this is certainly true for some individuals at least. 'Nikolai' and 'Tanya' bred here in 1960, 1962, 1964 and not again until 1967. However, 'Walter' and 'Ida' bred twice in 1967 (their first breeding year) and then again in 1969, 1971 and 1973. The two year interval between births holds true for these four wild-caught animals even though Kaunas Zoo (8) report that their wild-caught Snow leopards come into oestrus every year.

'Dasha', born to Walter-Ida in 1969, mated with a wild-caught ♂ 'Igor' and produced her first litter in May 1972 and another in May 1973. Her sister 'Basha' bred for the first time in May 1973. We believe a ♀ Snow leopard may reach sexual maturity before she is three years

old. Dasha and Basha have since mated again in February 1974.

Marma & Yunchis (8) claim that Snow leopards adjust with difficulty to living at a low altitude. However, Chicago's Lincoln Park and Brookfield Zoos (Wemmer, pers. comm.), Dallas (1), St Louis (4), Cincinnati (Maruska, pers. comm.) among others have kept Snow leopards successfully at low altitudes. Lincoln Park Zoo has had notable Snow leopard longevity records (see Table 1).

Crandall (2) reports longevities between six to eight while Marma & Yunchis (8) give a maximum of 11 years at Kaunas Zoo but some of our animals have survived longer. Walter was thought to be between four to eight years old on arrival in 1963 and he is still breeding at an estimated age of 15.

Statistics in the Rare Animal Census of the *International Zoo Yearbook* show how much the management of Snow leopards has improved over the years. Volume 4 records that out of the 34 Snow leopards living in 19 zoos only two were zoo born animals (6%). Volume 9 indicates 15 of 90 Snow leopards in 39 zoos (17%) were born in captivity whereas Volume 13 lists

NAME	SEX	DATE OF ARRIVAL	DATE OF DEATH	TIME SPENT IN CAPTIVITY	PRESUMED AGE AT DEATH
Tanya	♀	5 March 1957	15 Feb 1972	14 yrs 11 mths	17-19
Nikolai	♂	22 April 1959	1 Sept 1970	11 yrs 4 mths	14-16
Ida	♀	30 Sept 1964	27 May 1973	8 yrs 8 mths	11-13
Walter	♂	11 Dec 1963	still living (transferred to Chicago Brookfield)	—	

Table 1. Longevities of Snow leopards *Panthera uncia* at Lincoln Park Zoo.

32 of 112 in 45 zoos (29%) and Volume 14 shows 46 of 127 animals in 50 zoos (35%) as zoo born. This gives an encouraging picture for the future of breeding Snow leopards in captivity.

Lincoln Park Zoo keeps its Snow leopards outdoors all year around in cages measuring 3.05 × 3.06 × 5.49 m high, although ♀♀ remain inside to have their cubs and the cubs spend their first winter inside. Temperatures usually drop to -20°C and can reach -28°C. Unheated nestboxes measuring 1.53 × 1.22 × 1.22 m high with no added insulation are provided and seem to be sufficient cover. Temperatures may rise to 40°C in the summer for two or three days at a time and the animals begin to show discomfort by hyperventilating. A keeper douses them with water several times a day and water is provided *ad lib*.

Each Snow leopard is fed 3.6 kg of horsemeat four days a week. A vitamin-mineral supplement (one teaspoon Rib-Ad and one teaspoon Calcium gluconate) is added four days a week. Two whole chickens with head and feet removed are given to each animal twice a week. Pregnant ♀♀ receive additional calcium in their meat.

Our Snow leopards invariably come into oestrus which usually lasts four to eight days, in mid-February to early March. Brookfield Zoo, however, reports that oestrus always occurs between 2-25 February and lasts three to eight days (Wemmer, pers. comm.).

A gestation period of 93 days is frequently reported (9; 2) but this is not borne out by our experience, which indicates that 98-105 days is more accurate. The Russians (8) report a range of 98-103 days, Dallas Zoo (1) reports 99 days and St Louis Zoo (4) 96-104 days. When the date of copulation was recorded for four litters at the Brookfield Zoo (Wemmer, pers. comm.) gestation ranged from 92-103 days calculated from the last mating. In the case of the 92 day gestation however, conception may in fact have taken place as early as 98 days; three other litters ranged from 96-103 days. The Snow leopard's gestation period probably ranges from 97-103 days. Both Lincoln Park and Brookfield Zoos have noticed postpartum oestrus. At Brookfield the ♀ came into heat 18-21 June, 23 days after giving birth to a single stillborn ♀. Copulation occurred but no cubs were born. A ♀ at Lincoln Park gave birth to her first litter of three cubs (2.1) on 28 May 1967, which were removed immediately for hand-rearing. She came into oestrus again on 14 and 15 and also on 20 and 21 June (20 June being 23 days after birth as at Brookfield). On 25 September she gave birth to a second litter of three cubs (2.1). She did not breed again until 11 June 1969 when she was allowed to raise her own cubs and then settled into a cycle of birth every two years.

It is conceivable that in the wild postpartum oestrus ensures that if the first litter is lost the ♀ does not have to wait

another two years to conceive again. As we normally do not return the ♀♀ to the ♂ for about a month after birth (by which time post-partum oestrus is probably over), this was the only occasion where we noted this phenomenon.

We usually keep Snow leopards in pairs, although we have kept an adult trio (1.2) together successfully. During the first year the ♂ mated with both ♀♀ but only one produced cubs. The second year both ♀♀ had litters.

The ♀♀ are separated from the ♂♂ and moved inside three to four weeks before the estimated birth date, although they remain on public view. Our animals never 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 take place in the middle of the day. All our ♀♀ are given the opportunity to raise their own cubs. Whilst any ♀ is caring for young the Large Cat building is closed to the public for several weeks and for the first two weeks only regular Lion House personnel are allowed in so that disturbance, which obviously upsets the ♀♀, is reduced to a minimum. One ♀ raised all the cubs in two litters and attempted to care for the cubs of a third but she unfortunately died of pneumonia two days after the last birth.

Hand-raising these animals is extremely difficult and the success rate very low. Brookfield Zoo raised four cubs (3.1) out of ten (4.6) or 40%; St Louis Zoo succeeded with one out of seven or 14% (4); and prior to 1973 we successfully hand-reared two out of 14 or 14%.

Until 1973 Snow leopards were hand-reared according to accepted techniques used with other large cats (5). The cubs were taken to the Zoo Nursery where they came into contact with other animals, including other felids. One died from bacterial causes but most died from viral infections resembling encephalitis. It was therefore decided to use another method to hand-rear six cubs in 1973 (seven had been born but one lived only

20 minutes). Immediately the cubs were removed from their mothers, they were put into an isolation room in the Lion House. Only the authors and two wives were allowed into the room during the first month. After that the Nursery Keeper was given the exclusive job of caring for the cubs during the day and was not allowed near any other animals, especially felids. Only nine or ten people were ever allowed near until the cubs were weaned and we consider this isolation extremely important.

The cubs were fed initially with equal parts of KMR and distilled water which was changed on Day 5 to three parts KMR and one of water. From Day 10 the KMR was being fed undiluted. The feeds were given six times a day from 0830 to 2230 hours. We began with 37 g of the formula, increasing to 56 g around Day 30, when we also began offering solid food. We used Zu/Preem canned feline diet because of its homogenized consistency and sterility. One quarter of a teaspoon of Zu/Preem was offered twice a day and readily accepted from the start. KMR was increased to 65 g per feed around Day 40. At Day 50, Zu/Preem was increased to one teaspoon three times a day and by Day 60 it was again increased to two teaspoons four times a day. Zu/Preem was mixed with KMR in a bowl and was avidly eaten by the cubs so that by Day 70 they were being given ten teaspoons of Zu/Preem and 65 g KMR per feed. By that time the cubs were fed only three times a day: 0830, 1100 and 1600 hours. Diarrhoea occurred occasionally and was successfully treated with Kaopectate and Biosol-M, but the formula was never diluted with water as had been done in the past.

Of these six cubs two died of pneumonia but these were the offspring of the ♀ which had died of pneumonia shortly after giving birth. The remaining cubs were vigorous and healthy. There was a severe loss of hair at about Day 10 but their appetites remained good and

SEX	DATE OF BIRTH	WEIGHT (g)									
		Day 1	10	20	40	55	60	65	90	110	150
Lincoln Park Hand-reared 1973 technique											
♀	20 May 1973	624	737	851	2041	—	4309	—	4309	—	10,886
♀	20 May 1973	595	766	1304	2041	—	3402	—	5783	—	10,433
♀	24 May 1973	624	822	1333	1985*						
♂	24 May 1973	567	851	1361	1928	—	3062	—	3856*		
♀	28 May 1973	652	936	1276	2098	—	3969	—	6861	—	11,340
♀	28 May 1973	595	907	1333	2155	—	3884	—	5557	—	11,340
Lincoln Park Hand-reared 1960 technique											
♂	30 May 1962	539	680	1021	1814	—	2126	—	2580*		
♀	30 May 1962	510	652	992	1729	—	2098	—	2637*		
♀	30 May 1962	510	624	992	1588	—	1985	—	2381*		
♂	28 May 1967	595	851	907	1928	—	3062	—	5216	8165	
Kaunas, USSR Mother reared											
♀	22 April 1967					3000		3920		6690	
♂	22 April 1967					2930		3790		6560	
♀	22 April 1967					2620		3420		6350	

*Indicates animal deceased

Table 2. Comparative weights of Snow leopard *Panthera uncia* cubs hand-reared at Lincoln Park Zoo between 1962–1973 and cubs reared by mother at Kaunas Zoo.

they were active. Their coats improved within a few weeks without special treatment or medication. They were kept in incubators for convenience although it was never necessary for these to be switched on and in fact the tops were kept slightly open to provide maximum ventilation. The only time the cubs showed discomfort was when it became too hot and then a rotating fan in the isolation room helped to ameliorate the situation.

Table 2 shows a comparison between animals hand-raised with our new method and the old one, and mother-reared cubs from Kaunas Zoo (8). There is no doubt that the procedure used in 1973 is superior to the original one of 1960. The nutritive aspect alone obviously makes a great difference, as shown by comparing weights at Day 60. What may be more significant, however, is that

our 1973 cubs were heavier than the mother-reared cubs from Kaunas Zoo. For example, a ♀ born at Lincoln Park Zoo on 28 May 1973 weighed 6861 g at Day 88 while the heaviest Kaunas cub weighed 6690 g at Day 105. Comparisons with other animals are equally dramatic. Fig. 1 shows weight curves for selected hand-reared animals.

Rectal temperatures at birth range between 32.2°C and 33°C. The cubs' eyes opened between Days 7 and 10, and the first teeth appeared between Days 13 and 18. We immunized on Days 1 and 8 with 2 cc normal feline serum. They also received Felocine vaccine 0.25 cc on Day 15; 0.50 cc on Day 29; 0.75 cc on Day 43; 1.00 cc on Days 57, 71 and 85; and 1.25 cc on Day 156. At the the age of five months they could easily jump over a 127 cm barrier.

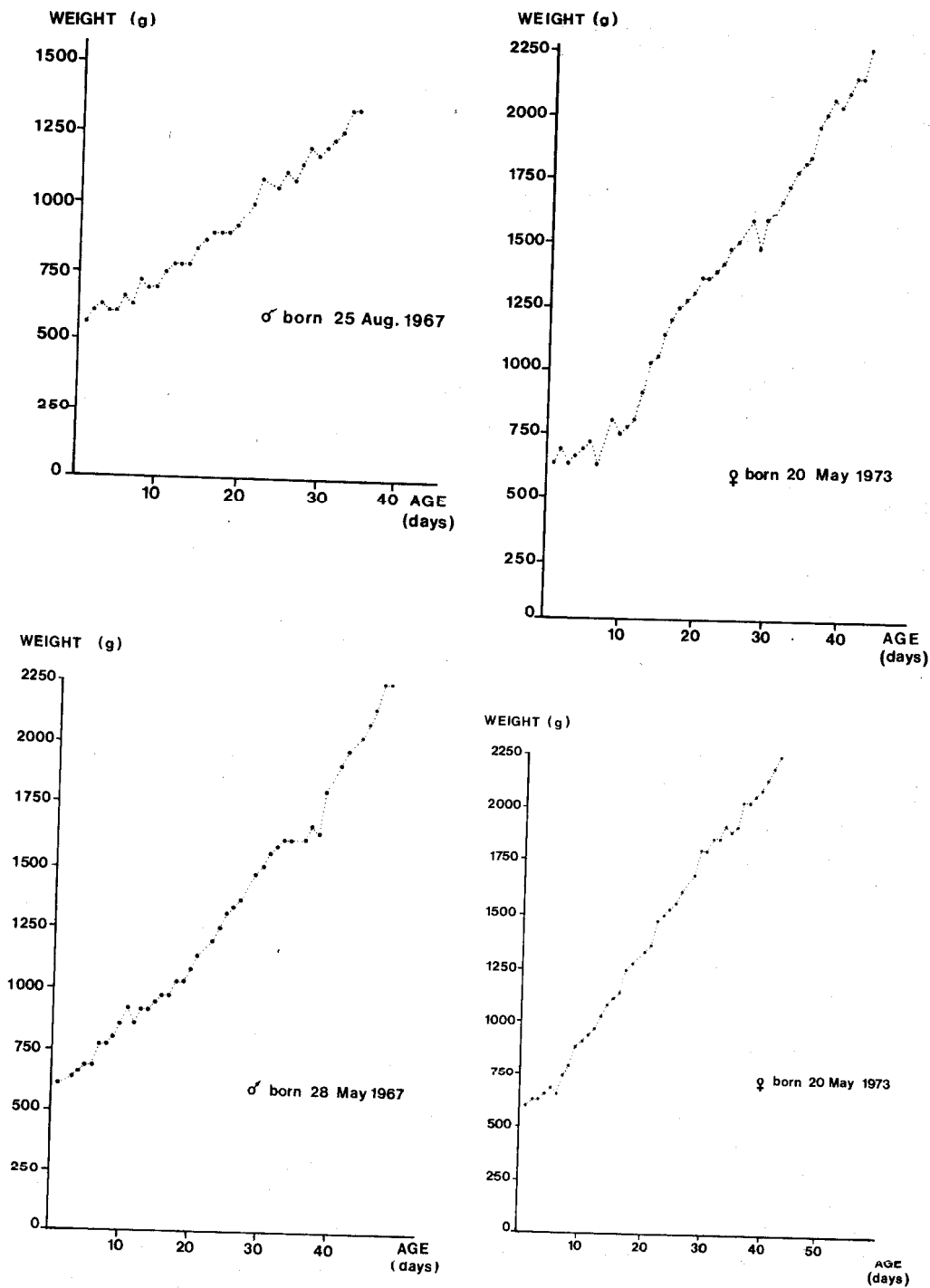


Fig. 1. Comparison of growth rates of four Snow leopard *Panthera uncia* cubs born and hand-reared at Lincoln Park Zoo, Chicago.

ACKNOWLEDGEMENTS

We are grateful to A. Martinez and D. Downs for their assistance in the rearing of the Snow Leopards.

PRODUCTS MENTIONED IN THE TEXT

Biosol-M: an anti-diarrhoeal manufactured by The Upjohn Company, Kalamazoo, Michigan 49001, USA.

Calcium gluconate: USP powder manufactured by Holmes Serum Company, Chicago, Illinois, USA.

Esbilac: a milk substitute manufactured by Smith-Douglass Division, Bordon Chemical Company, Bordon Inc., Norfolk, Virginia 23501, USA.

Felocine: feline distemper vaccine manufactured by Norden Laboratories, Lincoln, Nebraska, 68501, USA.

Kaopectate: an anti-diarrhoeal manufactured by The Upjohn Company, Kalamazoo, Michigan 49001, USA.

KMR: kitten milk replacer manufactured by Smith-Douglass Division, Bordon Chemical, Bordon Inc., Norfolk, Virginia 23501, USA.

Normal Serum Feline Origin: vaccine serum manufactured by Fromm Laboratories Inc., Grafton, Wisconsin 53024, USA.

Rib-Ad: a vitamin-mineral powder manufactured by Vitamin Mineral Products Company, Peoria, Illinois 61601, USA.

Zu/Preem, Feline Diet: Riviana Foods, Inc., Hills Division, Topeka, Kansas 66601, USA.

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Manuscript submitted 2 May 1974

A preliminary study of the behaviour of captive Snow leopards

Panthera uncia

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The purpose of this study was to determine whether any observable behavioural changes took place over a period of time when a pair of wild-caught Snow leopards *Panthera uncia* was introduced to captivity. We also wished to compare the behaviour of ♂ and ♀, and to analyse how the enclosure was used.

The Snow leopards were captured in the USSR in December 1971, when both animals were about three years old. After a brief sojourn in a Soviet zoo, they were shipped *via* the Netherlands and arrived at the Woodland Park Zoo, Seattle, on 1 March 1972. At the time of their

arrival at the zoo they had been in contact with man for only about three months.

ENCLOSURES

For the first few weeks the leopards were kept in separate isolation cages where they were in visual contact only. From there they were transferred first to a single isolation cage and then on 7 April to a 4.5 × 3 m glass-fronted enclosure containing a ledge 1.5 m long and 1 m from the ground. The observer could watch the animals from a 3 m high service walkway. On 1 June a larger, perma-