

# THE GLOBAL STUDBOOK REPORT 2002 FOR SNOW LEOPARDS: DECLINE OF A PEDIGREE SPECIES

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## INTRODUCTION

Although snow leopards have been exhibited in captivity for more than 110 years and the first successful breeding took place as early as 1910

(*Blomqvist 2003a*), less than ten litters were bred before the 1960s. During the following decade, breeding was still regarded as a rare zoological event and not before the mid-1970s, did the species become more abundant in zoological collections. Survivorship of young was low in



the 1970's and early 1980's, but husbandry and management techniques soon improved and the captive population started to increase rapidly. Today the species is no longer regarded as difficult to breed and breeding programmes have been established in North America, Japan, Australasia and Europe. In North America the snow leopard is also managed on a regional studbook level (Varsik 1996; Tupa & Ryan 2000; Tupa 2003). The latest volume of the International Pedigree Book for the species was recently published (Blomqvist 2003b) and covers the period to 1.1.2002. The studbook has since been distributed to all holders and additional copies can be obtained upon request from the studbook keeper. This report summarizes the fluctuations in the captive stock in 2002 only, with a detailed report on individual births, deaths and transfers to be followed in the next volume of the Pedigree Book.

From the late 1970's, the global captive population increased quickly and continued to do so for the following 15 years until 1992, when the population for the first time in more than 30 years started to decrease, mainly as a result of strict breeding restrictions in three breeding programmes. Since then the population growth has levelled off, with a slow decline (Figure 2) continuing until today. At the beginning of 2003, the captive population thus stood at 545 (247,298) animals distributed over 224 institutions worldwide.

## FLUCTUATIONS IN THE STOCK IN 2002

In 2002, 53 cubs (15,34.4) were born in 28 litters distributed over four continents (Table 1). For the first time, a litter was also born in South America when a female cub was born in Sao Paulo Zoo. As the deaths in the same period totalled 68 animals (Table 1), and one female animal was wild-caught and included in the breeding programme, the global population increased by 5 animals in 2002. Unfortunately the wild-caught female died during the same year it arrived. Fifty-six animals were transferred on a global scale in 2002 (Table 1).

## FUTURE PROPAGATION

A critical statistic in the management of captive populations is the number of founders the stock descends from. These animals, when they breed, provide the genetic diversity of the population. Under-represented lines are therefore encouraged to be bred while breeding restrictions have been applied to animals with sufficient numbers of offspring and relatives.

For this taxon, 56 founders have living descendants. Four founders are at present alive outside China, of which a male in Tokyo Tama and a female in Zurich have no living offspring. Priority should therefore be given to

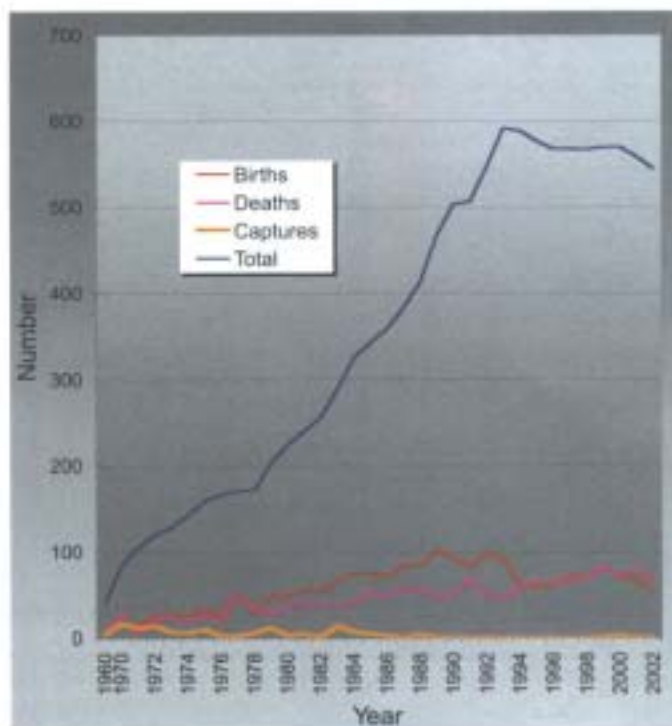


Figure 2 History of captive snow leopards 1960–2002.

breed these animals. The male in Tokyo which already is an older animal, has bred twice (in 2000 and 2001), while the Zurich female is only three years old and therefore just has entered the main breeding age. Matings attempts, although unsuccessful, were observed in 2003 in Zurich. The *Gene Drop* analysis (Lacy 1995) reveals that the current population has a sufficient number of founders and that only 3% of the species' wild genetic diversity has been lost over the years. Genetically the population is therefore doing well although the same analysis shows that due to both disparities in the founder representation and to losses at bottlenecks, only 18 wild-born animals would be required to obtain the same amount of diversity, which we can find in the present population of 545 snow leopards.

Accumulation of demographic data on a number of different individuals over prolonged periods of time is also useful in planning for future exhibits and management programmes (Foose 1981). This information not only pro-

Table 1 Main events in captive snow leopard stock in 2002.

Location	Cubs born	N of litters	Deaths	Transfers
N.America	4.8 (12)	6	12.14 (26)	12.13 (25)
Europe/Russia	7.22.4 (33)	18	12.21.4 (37)	15.11 (26)
Japan	0.0 (0)	0	3.1.0 (4)	1.1 (2)
India	4.3 (7)	3	0.0.0 (0)	0.0 (0)
S.America	0.1 (1)	1	0.1 (1)	0.0 (0)
C.America	0.0 (0)	0	0.0 (0)	1.2 (3)
Australasia	0.0 (0)	0	0.0 (0)	0.1 (1)
<b>TOTAL</b>	<b>15.34.4 (53)</b>	<b>28</b>	<b>27.37.4 (68)</b>	<b>30.26 (56)</b>

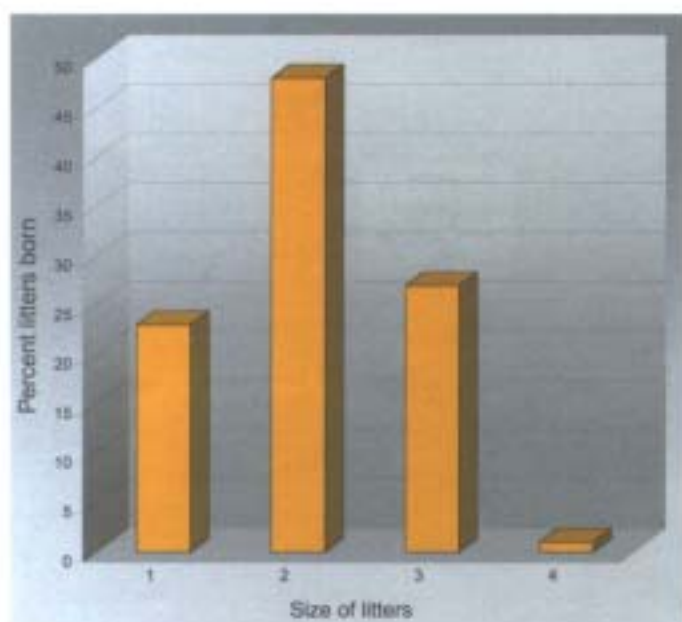


Figure 3 Litter size in last 270 captive bred snow leopard litters. Mean litter size = 2.1.

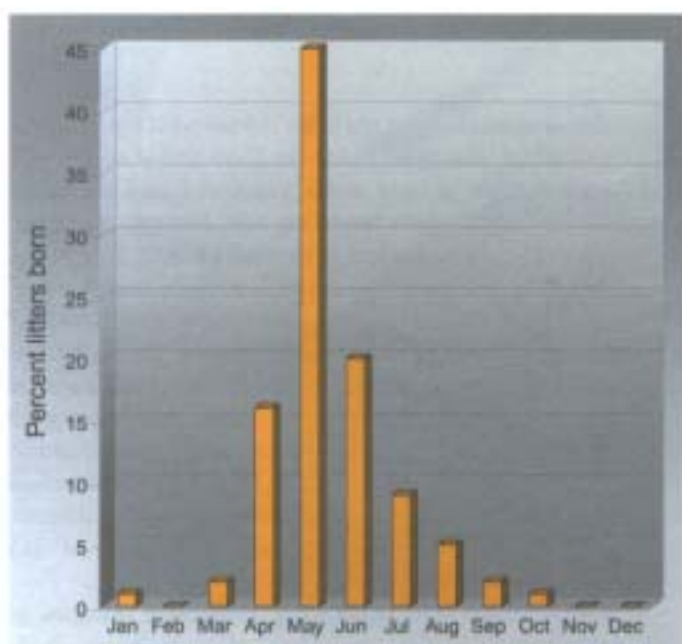


Figure 4 Birth seasonality in captive snow leopards.

vides census data, but also gives insight into the reproductive potential of the snow leopard and some of the management problems confronting it. The mean litter size is 2.1 (Figure 3) with a vast majority of all births taking place in May (Figure 4).

One of the goals for all breeding programmes is to retain 90% of genetic diversity for the next century. Applying statistics generated from the studbook to the *Capacity* programme (Ballou 1992) enables us to estimate the size of the snow leopard population required to ensure its continuation within the determined criteria (Table 2). "Generation time" is the average age at which males

Table 2 Carrying capacity of the current snow leopard population.

Generation time $T$	7.14
Pop. growth rate	0.99
Diversity retained	97.3%
Actual population size $N$	565 (257,308)
Effective pop. size $N_e$	223
$N_e/N$ ratio	0.39

and females produce young. " $N_e$ " is the effective population size (number of breeding animals) while " $N$ " stands for the total population. Of the 565 animals alive at 1.1.2003, 107 males and 117 females have bred at least once in their life-time. This number therefore permits the computation of  $N_e$  for the 2002 population using the formula  $N_e = 4x (M \times F) / (M + F)$ , where  $M$  &  $F$  are the number of breeding males and females. Given the current  $N_e/N$  of 0.4 and allowing for 90% retention of genetic diversity for 100 years, it can be calculated that there is a need to keep a captive population of 300 snow leopards. The Felid TAGs in North America and Europe have recommended captive populations of 250 and 200 snow leopards to be managed in these two regions (Wildt & Mellen 1996, Blomqvist et al. 1998). With a current stock of nearly 30 animals in the SSCJ breeding programme in Japan, and plans to increase their number to 50 (Nishine 2003), a global population of +500 animals seems to be a realistic number for the following years to come. This number can well be considered to be theoretically sufficient to manage the species in captivity in such a way that there will still be a viable and healthy population of snow leopards in captivity after one hundred years.

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