

THE SNOW LEOPARD IN NORTH AMERICA: CAPTIVE BREEDING UNDER THE SPECIES SURVIVAL PLAN

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In 1965, William Conway, General Director of the New York Zoological Society wrote: ". . .zoos have become repositories of living treasures. We struggle in uncoordinated attempts to keep filled dwindling puddles of irreplaceable genetic characters; characters that comprise spectacular creatures gradually vanishing all about us."

Twenty-one years have come and gone since that statement was made and zoos all around the world have responded to these concerns in many different ways. International studbooks have been established. The "breeding loan" concept is almost universal, allowing zoos to move rare and endangered animals quite freely from zoo to zoo. Breeding priorities take precedence over the details of commercial transaction. The International Species Inventory System (ISIS) began operation in 1974, and along with the proliferation of international studbooks, has provided much of the data and expertise for serious genetic and demographic analysis of captive populations.

HISTORY OF SPECIES SURVIVAL PLAN

In 1980, the American Association of Zoological Parks and Aquariums (AAZPA) introduced the Species Survival Plan (SSP) concept. The Species Survival Plan is a particularly noteworthy step in the zoo profession's shift toward species conservation priority. The SSP represents a significant point at which the conservation rhetoric and programs of earlier years were no longer acceptable without marriage to a tangible, linear plan of action. The SSP recognizes that species conservation in captivity, like everything else, cannot be effected without specific organization to achieve that end and will not occur as a mere side effect of enlightened exhibition and husbandry practices. It must occur by design, leadership in coordination, as well as a large amount of cooperation among all zoos concerned with a particular species.

To date, the AAZPA has established almost forty SSP programs in North America. The Snow Leopard SSP was first announced in 1983 and was fully organized by 1984 with Seattle's Helen Freeman as Species Coordinator. A committee of ten called the Propagation Group, elected from among the participating institutions, serves the Species Coordinator. Propagation Group member, Dan Wharfon of the New York Zoological Society, was named Vice-chairman of the program in 1985 (succeeding Helen Freeman as Species Coordinator in 1987). Leif Blomqvist, International Studbook Keeper for the snow leopard in Helsinki, serves as a special advisor to the program. Dr. Janis Ott-Joslin serves as veterinarian consultant.

Beginning about 1980, it became apparent that the captive snow leopard population in North America was moving toward population explosion (Foose, 1982). This prediction was met with some skepticism in that the zoo community had so recently solved snow leopard management problems well enough to obtain adequately reliable

breeding. One of the major goals of managing a species under the Species Survival Plan is to stabilize the captive population in a way that is not generally possible without careful analysis of the population and coordination of breeding. A typical captive population cycle without coordination often involves (1) initial establishment in captivity; (2) rapid breeding; (3) saturation of all available captive space; (4) cessation of breeding; (5) decline of the captive population; and (6) extinction of the population in captivity or repetition of the same cycle until extinction is accomplished. Rare and endangered species are not exempt from this cycle as the story of the Siberian tiger proves. At the onset of SSP treatment of this species in 1981, serious demographic problems were clearly evident because of breeding cessation and continuing decline in numbers. A loss of genetic representation from earlier wild caught animals was a major result of allowing the population characteristics to go unmanaged, in terms of demographics and genetics, for more than twenty years (Seal and Foose, 1982).

The North American snow leopard population grew from a little more than 100 animals in 1980 to 205 by 1984, the first year of SSP management. In 1986, the population stands at 234. Through a formula established by Soule et al (1986), we determined that an N_e or effective population of about 160 to 180 was necessary to maintain a reasonable amount of genetic diversity in the North American captive population for decades, even centuries to come (see Soule et al, 1986). Since N_e or effective population is a figure representing effective breeders in a population as well as measures of equal offspring contribution from all males and females, it is generally accepted the N_e is, in reality, always lower than the population's actual census. That is, it is unlikely that any captive population can be managed so perfectly as to obtain equal offspring contribution from all of its members. Therefore, in order to obtain the desired N_e , it was estimated that a stable census population of around 225 snow leopards should be managed in North America. Fortunately, the North American snow leopard population was in rather good shape demographically and genetically in 1984 when SSP management began. In Figure 1, we see the population illustrated as one with roughly even sexes with more animals in the younger age classes than in the older, an indication of a healthy population. Unlike the Siberian tiger story, snow leopard SSP management began when the population was still in an expansion phase before non-coordinated cessation of breeding in response to market collapse could occur. Through the efforts of the International Studbook Keeper, the avoidance of inbreeding in the population had been occurring for most of the years during population expansion, and as a result, about 30 wild caught ancestors or founders were still well-represented in the population.

Further analysis of the population revealed that about twenty cubs per year would need to be produced to offset about twenty expected deaths in order to stabilize the population. Litter size was averaging between 2 and 2.5 cubs cumulatively by 1984 indicating that just under ten litters per year would be necessary to obtain the twenty cubs.

A more difficult figure to obtain has been one of "mating success" because of the expected inconsistencies among numerous institutions regarding the definition of "mating attempt". On the basis of past records, it appeared that approximately 68% of mating attempts (as roughly defined by participating institutions) actually resulted in litters. This indicated to us that upwards of twenty recommendations would be necessary to obtain the ten litters desired per year, particularly when one considered that several recommendations would be made for breeding attempts on animals that were representative of rare founders but not likely to breed (considering age and/or past

breeding history).

Our experience for 1985 and 1986, the two years for which explicit breeding recommendations were put forth to the more than forty participating institutions, was that fewer than half of the breeding recommendations resulted in cubs. Similarly, litter size average dropped to just over two cubs per litter in 1985 and 1986. We have attributed these changes to the fact that the "old reliables" or consistent breeders are not now included among the breeders. Since demographic and genetic stability is dependent upon cub production not to exceed four per pair per lifetime (except for founders), the easy breeders fulfill this quota rapidly while the more reluctant ones are the subject of breeding recommendation more often. There are also more first-time breeders in the population under SSP management. This is likely the cause of lower average litter size as well as a somewhat higher neonatal mortality figure (42% in 1985 versus 30% and 32% in 1983 and 1984 respectively). As a result of all these observations, we found that upwards of thirty breeding recommendations have not been too excessive in managing the North American population for stability (i.e. births equaling deaths).

PROGRAM RECOMMENDATIONS

In general, animals are first bred at five years of age, ideally to produce three or four viable cubs. Although snow leopards can breed by their third year, holding animals until their fifth year before breeding has the effect of elongating intergenerational time span, thereby retarding the rate at which genetic drift can take place in long-term breeding programs.

Computerization, plus the efforts of a diligent Propagation Group and International Studbook Keeper, have allowed us to closely monitor the population, animal by animal, and come to know each animal's current status and place within the whole populational framework. Each year several months prior to the breeding season, a letter is sent to each participating institution which contains the recommendations for its collection for the coming year. Recommendations often include suggested moves for pairing animals which lack suitable mates at their current locations. Altogether, the animal recommendations are of five general types:

1. Animals which should be bred to increase the less than ideal representation of the breeding lines to which they belong. These animals are usually founders or the too-few remaining offspring of deceased founders.

2. Animals which should be bred for routine demographic replacement. These animals are not particularly noteworthy in regard to lineage but are representative of several founders and comprise the bulk of the population. These animals are often first-time breeders and always those that have not yet produced their lifetime quota of cubs.

3. Animals for which there are no specific recommendations other than for holding for future breeding. These are the young animals under five years of age.

4. Animals which are declared surplus by virtue of age (ten to twelve years) combined with successful reproduction in the past. When declared surplus, it is expected that the animals will be removed from the SSP population so that space will be available for younger animals. It is the responsibility of the participating institution to determine how it will handle snow leopards that are declared surplus.

5. Animals which probably will not be bred again because they appear already to have produced sufficient cubs. Note however that these animals are not yet surplus and are to be maintained in the SSP population. Snow leopards which have produced the required number of cubs (usually by age seven to nine) are maintained in the SSP population until declared surplus. Thus, post-production SSP animals are

available for re-breeding In case of disaster among their original cubs and/or gamete and embryo retrieval for storage If these techniques become available. Some of the younger of these animals are also made available to overseas colleagues who desire healthy proven breeders for their collections.

In addition to ongoing demographic analysis of the population and the annual production of animal by animal, institution by institution recommendations, the managers of the Snow Leopard SSP also set out to address management questions for which clear answers are still lacking. These include questions regarding housing and breeding management to the incidence of hip dysplasia. Eventually, a snow leopard management manual will be produced.