School of Agriculture & Land Resources Management

Agricultural & Forestry Experiment Station

Reindeer Calf Productivity and Survival on the Seward Peninsula, Alaska

by

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Circular 100

November 1994

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Introduction

Reindeer were introduced to Alaska between 1891 and 1902 (Stern et al., 1980) to provide food to Alaskan Native peoples. Currently, reindeer are exploited for commercial and subsistence purposes. There are approximately 25,000 (R. Fosdick, personal communication, 1993) reindeer on the Seward Peninsula within 15 herds of 1,000 to 5,000 animals per herd. Herders handle their animals in late spring and winter each year to harvest velvet antlers for Oriental markets, and to treat for parasites, mark animals for identification, and to slaughter. Today, management of Alaska's reindeer is at a turning point. Interest in enhancing methods to enter markets and supply red meat to the USA and overseas is increasing. Ultimately, success will rely on high productivity, survival, and recruitment within these herds.

Factors influencing calf survival are predation, insects, weather, diseases, and–ultimately–dam condition (Fig. 1). In addition, reindeer calves on the Seward Peninsula are also subjected to annual herding and handling. The effects of any of these factors were unknown in reindeer herds on the Seward Peninsula. Our objectives were to determine the causes of mortality, particularly through purportedly high

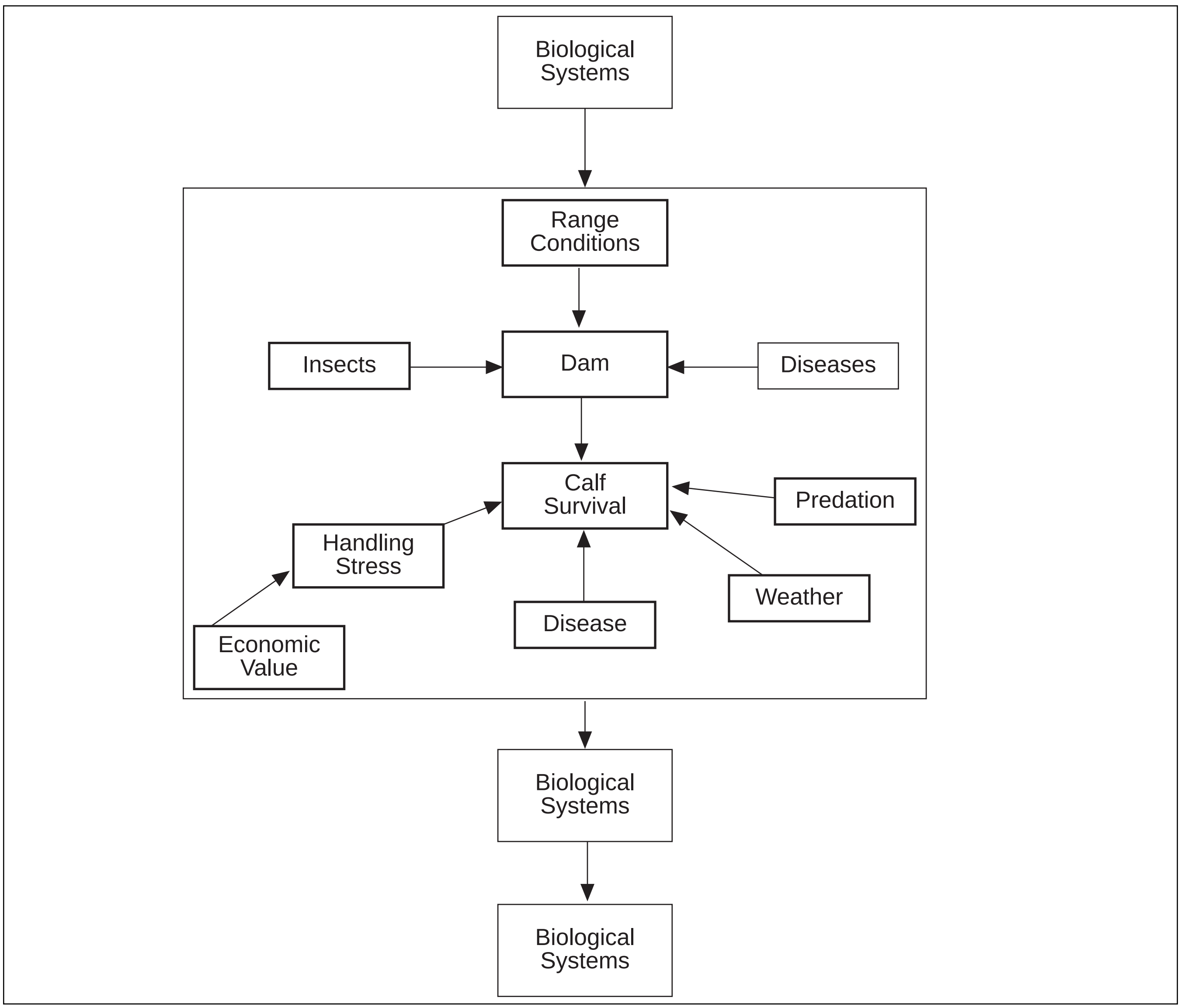

Figure 1. *Factors that influence reindeer calf survival and recruitment on the Seward Peninsula, Alaska.*

Figure 2. *Geographical location of the study area on the Seward Peninsula, Alaska.*

grizzly bear (*Ursus arctos*) predation; and to determine the survival rates of reindeer calves in one herd and provide management recommendations, based on a simple model, attempting to increase the herd numbers.

Study site

The Seward Peninsula, in northwest Alaska, is divided into a number of range allotments belonging to different Native herders. Our study focused on a herd near Nome (Fig. 2). The range is about 396,661 hectares and currently supports about 4,775 reindeer (total handled in 1992).

The habitat throughout the study area is variable. In the northern extremes, mountains remain snow covered until late July and are a source of snow bowls which reindeer use to reduce insect harassment during summer. During calving, the spring groups of reindeer congregate on wind blown tussock tundra slopes. In the summer, reindeer are found throughout the range, particularly on rolling hills and valleys dominated by willow (*Salix* spp.) and birch (*Betula* spp.). Toward the southern extremes, lakes and ponds appear with snow melt and reindeer take advantage of cottongrass (*Eriophorum vaginatum*) and include it in their diet.

Methods

Radio-collaring reindeer calves

During April to May, 1991 and 1992, we used snowmobiles to locate groups of calving reindeer. When we spotted a small group, we approached it and, where possible, we pushed the cows and calves uphill. Since calves could not keep up with the cows, they would lay down and we could capture them. Calves were then sexed, aged, and weighed using a loop of fabric, covered in sterile plastic, fitting around the forelimbs and attached to a scale (Fig. 3). The calf was then fitted with a lightweight, expandable radio-neck collar and released. This process averaged 60 seconds. We wore new rubber gloves for each neonate handled, changed the plastic covering the strap after each weighing, and kept the collars in lichen-filled bags to reduce human and industrial smells to reduce abandonment of the calf by the cow. The calf typically moved off toward its mother after we processed it. We immediately left the vicinity and, when possible, watched the calf and its mother to see if they found each other and if suckling occurred. We then tracked radio-collared calves daily from a Super Cub fixed wing aircraft for four weeks, and thereafter, every other day until the annual June handlings. After the handlings, calves were tracked daily for one week, and every three days in July, five days in August, once a week in September, and once every two weeks in October. This schedule varied with weather conditions and aircraft availability.

Mortality protocol

Radio-collars were equipped with mortality sensors that quickened the pulse rate if the animal was still for at least one hour. When this occurred, we visited the carcass within 24 hours and examined the mortality site and carcass characteristics. The criteria examined at each site were based on descriptions of mortality sites associated with predators and scavengers from other studies. Bear predation was evidenced by the calf being disarticulated and the presence of bear scat, caches, or tracks. Typically, the head was missing and the hide inverted. Calf mortality due to fox predation was evidenced by the presence of fox scat, tracks, or urine, and calf hide and bone fragments. Non-predation cases frequently involved intact carcasses with little exterior damage. Mortality sites where the cause of death was uncertain typically lacked scats or predator hair, or evidenced multiple predator signs around a fragmentary carcass. The carcass was then removed to a laboratory where it was necropsied and standard tissue collections were made for pathological analysis. We used a helicopter to remove calves that died in areas inaccessible by foot.

Figure 3. *Weighing a reindeer calf after applying a radio-collar (photo by Lyle Renecker).*

Handling Protocol

During June and early July 1991 and 1992, we handled calves when we removed velvet antlers from adults. The corral system is designed so that calves are separated from the adults and put into their own pen. Each calf was captured and physically restrained, then marked with herd identification ear tags. Radio-collared calves were weighed, examined, and marked with the same identification ear tags. The sex of each calf was verified and the radio-collars were adjusted or replaced if necessary. Brucellosis (*Brucella suis* biovar IV) testing in 1991 and 1992 required that all calves be blood sampled. We then continued aircraft radio tracking.

Results

Ninety-three neonate calves were radio-collared over the two years. Sex ratios for 1991 and 1992 were approximately 1–to–1. Four calves died due to capture-induced abandonment and were excluded from further analyses.

Mortality causes

There were a number of causes of death for radio-collared reindeer calves (Table 1). Grizzly bears caused 23 percent of the total mortality of radio-collared calves primarily during the first month of life and during the first month following the summer handlings. Foxes accounted for 12 percent of the deaths of radio-collared calves and were limited to the perinatal period (less than 48 hours). There were a number of unknown causes due to weather that hindered visiting and recovering mortalities, particularly in Fall 1991. Wolves had been extirpated from the Peninsula by hunters and herders in the past although we had one confirmed case of wolf predation on a radio-collared calf in Fall 1992. There was one confirmed death due to wolverine predation. Through dissection, we observed disease in some reindeer calves. After the 1991 and 1992 June handlings, a number of calves were seen alone and away from the herd, and were either limping or appeared uninjured. When two such radio-collared

Table 1. *Causes of mortality in radio-collared reindeer calves in the study herd during 1991-1992.*

	Year		Grand Total	
	1991	1992	n	%
Radio-collared	52	41	93	
Abandoned	1	3	4	
Remaining	51	38	89	100.0
Mortality	25	18	43	48.3
Predation				
Grizzly Bears	3	7[a]	10	11.2
Foxes	5	0	5	5.6
Wolverine	1	0	1	1.1
Wolves	0	1	1	1.1
Uncertain	1	4	5	5.6
Non-predation				
Disease	2	2	4	4.5
Drowning	1	1	2	2.2
Uncertain	12	3	15	16.8

[a] Includes two calves with debilitating foot injuries.

Table 2. *Survivorship of radio-collared calves in the study herd during 1991–1992.*

1991				1992			
Month	**n**	**Rate[a]**	**SE**	**Month**	**n**	**Rate[a]**	**SE**
4/22–5/21[b]	53	.74	.05	4/17–5/16	38	.79	.06
5/22–6/20	38	.72	.06	5/17–6/15	30	.76	.07
6/21–7/20	42	.70	.06	6/16–7/15	29	.74	.07
7/21–8/19	42	.68	.06	7/16–8/14	28	.63	.07
8/20–9/18	41	.68	.06	8/15–9/13	24	.55	.07
9/19–10/18	41	.68	.06	9/14–10/13	21	.53	.08
10/19–11/18	41	.55	.06	10/14–10/28	20	.50	.08

[a] Calculated using methods described by Pollock et al. , 1989.
[b] Dates are expressed as month/day

calves died, we recovered their carcasses and found necrotic lesions on the foot of one calf and necrotic lesions in the mouth and on the foot of the second calf. These calves were also in poor body condition and could not feed. They, and other calves detected alone, were killed by grizzly bears possibly because they were alone and compromised by infection. Other non-predatory causes of death included drowning and occurred at a site that was too dangerous to land a helicopter. The site usually had deer tracks leading into and out of a water crossing and the radio signal was coming from the water. The carcass was not visible and once the water receded the calf was scavenged.

Survival rates

We calculated survival rates for each month of the study (Table 2). After seven months, the average calf survival for 1991 and 1992 was 52 percent. Twenty-five percent of the mortality occurred during the first month of life. Lower survival rates after the handlings were detected in August and September 1992.

Nome reindeer herd modeling

We developed a simple, Lotus® spreadsheet computer model of the Nome reindeer herd. It was based on survival rates of radio-collared calves from birth to handling, a predation rate for grizzly bears based on the number of radio-collared calves killed by bears in 1991 and 1992 versus the total number of radio-collared calves in 1991 and 1992, and the survivorship parameters for other age classes from data collected at the annual reindeer handlings during 1991 and 1992 (Table 3). We projected the population for 10 years based on the starting popu-

Table 3. *Biological parameters used in herd growth projections of the study herd.*

Age Class	Survival (%)	Fecundity (%)	Predation rate (%)
Calves (spring)		89	4
Calves (winter)		54	
Yearlings			
Males	83		
Females	78	8[a]	
Subadults			
Males	79		
Females	78	100[b]	
Adults			
Bulls[c]	55		
Cows[d]	71	100	
Aged			
Males[e]	50		
Females[f]	64	100	

[a] Determined from the average number of udders counted at handlings in 1991-1992.
[b] Determined from serum progesterone analysis of females less than one year old from 1986-1990.
[c] Average of the three to five–year–old age class; average was used in the model.
[d] Average of the three to six year old age class; average was used in the model.
[e] Average of the six to seven year old age class; average was used in the model.
[f] An average of the seven to nine year old age class; average was used in the model.

lation at the 1990 handling. The number of cows with calves (fecundity rate) was determined from serum progesterone analysis for females more than one year old that had been blood sampled at the handlings. We also used the average number of female yearlings observed with udders at each handling to determine fecundity of yearlings.

We used the computer model to determine which parameters could be manipulated to produce an increase in the population given the 1990 starting population. We modified the overwinter survival rate, which determines how many calves survive to become yearlings at the next handling. The model predicts that only when 75 percent of the calves survive to yearlings will there be an increase in herd numbers (Fig. 4). Similarly, we modified spring survival rate, which determines how many calves survive from calving to the handling, and could not produce an increase in population (Fig. 5). Finally, we manipulated grizzly bear predation rates to determine the sensitivity of population increase to this rate. Even with zero predation, the reindeer population did not increase (Fig. 6). This model suggests that based on the parameters, given the data, the greatest effects to population growth could be obtained by enhancing the survival of calves after the handling, through the winter to the next handling.

Management options

We looked at three possible courses of action given present data: no action; reducing predator populations; and improved handling and herding.

No action will most likely fail to increase herd growth. The computer model currently predicts a decline which tends toward extinction by attrition (Fig. 7).

Based on the conditions observed in 1991 and 1992, the computer model also predicts that reducing the grizzly bear predation rate will not produce the desired increase. Fox predation was not modeled and, according to our data, was limited to the perinatal period (48 hours old or younger). We expect that fox predation is only important during this period. Studies document that older females are quite capable of defending their offspring unless the bond is disturbed through physical separation or if drugs are used to immobilize the mother.

The third option is to improve handling and herding management. The computer model predicts that this could potentially enhance the number of calves surviving post-handling to the following year and increase herd numbers. This conclusion is also evidenced by failure of the model to produce an increase in herd numbers when the period from birth to handlings is set to 100 percent survival. We think diseases and parasites, and handling stresses

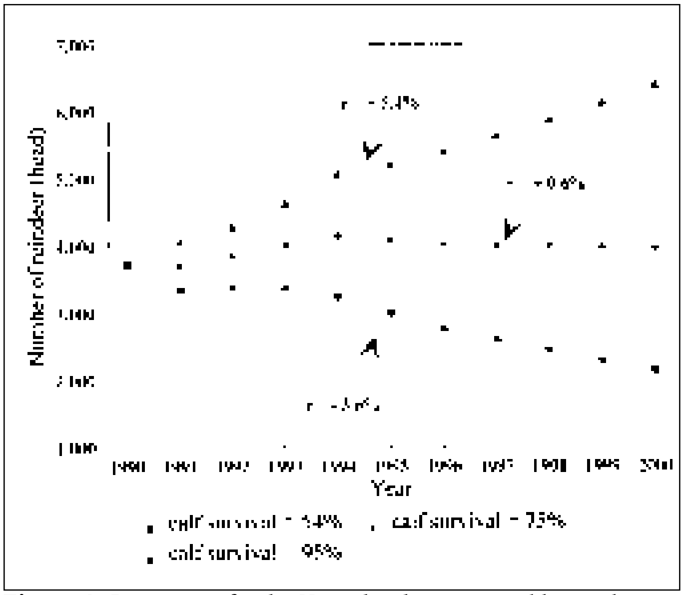

Figure 4. *Projections for the Nome herd given variable yearly calf survival rates.*

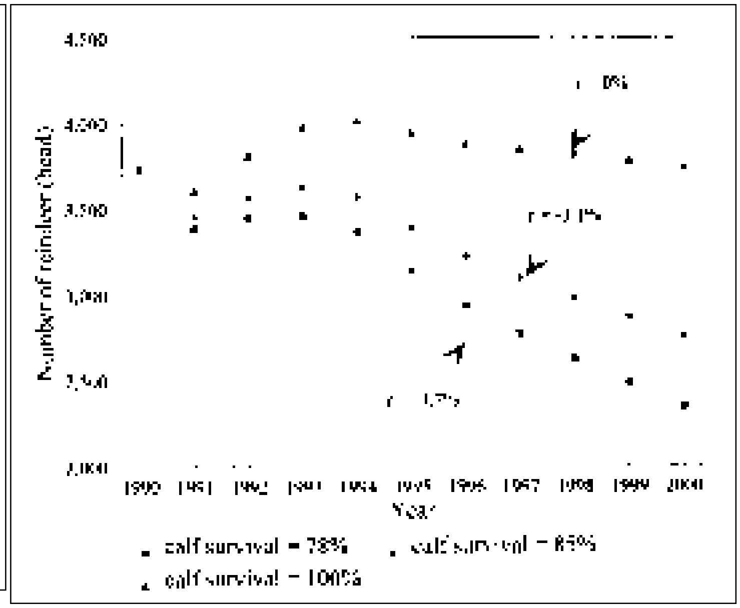

Figure 5. *Projections for the Nome herd given variable calf survival from birth to the June handlings.*

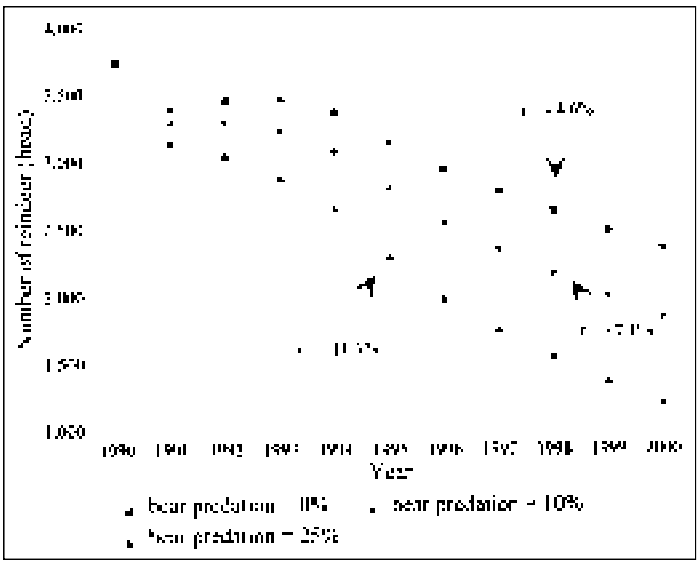

Figure 6. *Projections for the Nome herd given variable bear predation rates on calves from birth to the June handlings.*

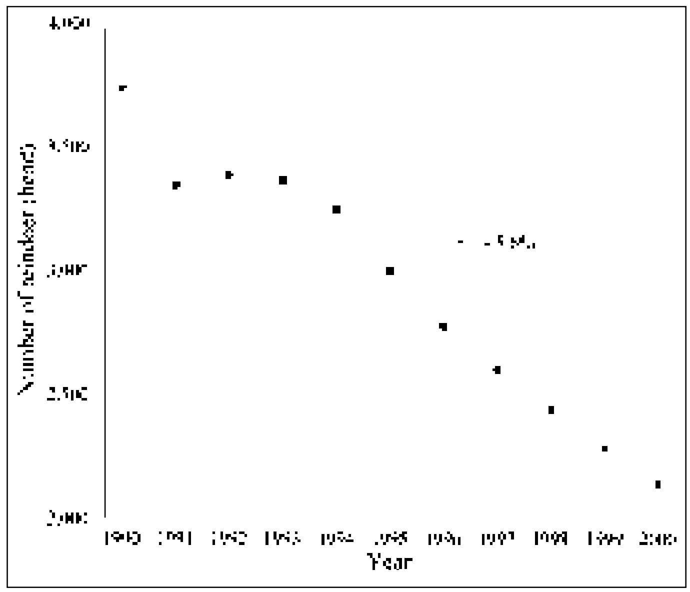

Figure 7. *Projections for the Nome herd given data collected in 1991-1992.*

should be addressed.

Brucellosis is present in the population and could influence calf production in the spring since it causes spontaneous abortion. Reindeer can be, and usually are, vaccinated against brucellosis. The difficulty lies in rounding up all the deer and slowing down the handling when vaccinating each individual, especially one and two-year old animals. Warble flies (*Oedemagena tarandi*) present a different problem. These parasites lay their eggs in reindeer hide in the summer. The eggs overwinter and emerge in the summer. Warble flies cause an inflammatory response, and can subject reindeer to increased activity due to harassment during the summer. Insect harassment increases energy loss when reindeer attempt to avoid harassment by milling on snow patches rather than feeding. These snow patches are excellent sources for bacteria since they are covered in feces and are wet. This can lead to an increase in foot rot and, consequently, lameness. Warble larvae can be destroyed with Ivermectin®, however, this is usually administered in the winter. Weather and difficulties in locating reindeer in the winter often interfere with roundups for treatment. Consequently, reindeer may go for years between treatments.

We must address handling reindeer stress. We herd reindeer toward the corral using helicopters. This is typically a hurried process due to the costs of helicopter time, and reindeer are often herded more than 20 kilometers. The length of the handling varies with the number of animals that can be rounded up each time and sometimes these handlings occur during the heat of the day. There is usually no water or food provided throughout the handling which can last from 12 to 18 hours. Calf injuries within the corral are minimized through the use of a separator which limits interactions between calves and adults in smaller pockets. However, calves at the end of the handling can be injured and can break their antlers, legs, and backs.

Finally, one important aspect is abandonment and orphaning. Because calves are separated, the adults are typically moving through the system faster. A mothering-up pen may provide a final staging area where calves and cows can find each other. The inconsistent use of this pen during 1991 and 1992 resulted in groups of calves milling around the corral after adults had gone. Our data suggest that these animals were predisposed to predation and possibly insufficient nutrition to successfully survive until the subsequent spring.

This study with radio collars has shown that reindeer calf survival is compromised due to a number of factors. Predation does not currently appear to limit population growth. Greater rewards in terms of population growth will likely be derived from improved herding and handling management to enhance calf survival post handling. We suggest conducting future research in this area.

Acknowledgments

We would like to thank W. Ballard and R. Nelson, Alaska Department of Fish and Game; T. Smith and M.O. Olsen for fixed-wing and helicopter support; Mr. L. Davis for his cooperation with this study; the Reindeer Herders' Association for their support; staff of the UAF-Reindeer and Game Farming Research Program for assistance in data collection. Also, we thank anyone we may have inadvertently forgotten but who helped.

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