ANNUAL ASSESSMENTS OF MOOSE CALF PRODUCTION AND MORTALITY IN SOUTHCENTRAL ALASKA[1]

ROBERT A. RAUSCH and ARTHUR BRATLIE
ALASKA DEPARTMENT OF FISH AND GAME

In Alaska, where people still hunt to obtain food as well as for recreation, moose are sought by more hunters than any other big game species for which accurate records are available. Some 30,000 persons annually obtain moose harvest tickets and approximately 9,000 animals are harvested each year. The annual harvest could be much larger if more of the herds were accessible. The lack of access has directed intensive hunting pressure upon local herds accessible to the human population centers of Anchorage and Fairbanks.

The advent of antlerless (any sex or age) seasons in 1960 brought the realization that annual harvests from accessible areas could exceed the annual increment to the herd; thus a precise knowledge of population status became paramount to the success of management endeavors. The research program inaugurated included studies designed to measure annual harvests, to identify discrete populations, to reveal dynamics of the various populations and to assess the relationship of moose to the available range. This paper reports on techniques used to assess initial production of calves (potential and realized) and their subsequent survival through their first 12 months. This period was chosen because calves can be identified positively from light aircraft or helicopters until they are 12-24 months old and because yearlings (12-24 months old), particularly males, are an important age class to the harvest. Often their availability determines the success of the hunting season in some local areas. Yearling males may comprise 50 per cent to 80 per cent of the harvest of males in the Matanuska Valley, where many years of intensive hunting of only males has removed most of them. In past years as few as five males per 100 females, excluding calves, remained at the end of the hunting season. Therefore, a calf-crop failure could create havoc with the following hunting season and should be detected in advance to allow for adjustments of seasons and bag limits. The areas chosen for study include most of the areas readily accessible by automobile as preliminary analysis of harvest tickets (95% are returned) show that 60 per cent to 80 per cent of the moose reported are harvested within a few miles of the highway system.

For the purpose of this discussion two areas in southcentral Alaska, the Matanuska Valley and the Lower Susitna Valley, are used with selected references to other areas. These areas are within 50 miles of the largest population center within Alaska--Anchorage.

The attempts to assess production and survival of calves have been largely confined to four techniques:

1. Assessment of fertility (pregnancy rates) by area and age class.

[1]A contribution from Pittman-Robertson Research, Project W-6-R-6, Alaska Department of Fish and Game.

2. Estimates of natality (number of live births) by aerial counts in May and June.

3. Fall sex and age composition counts conducted largely in November and December.

4. Survival counts conducted in April, May and early June.

Fertility Rates

Fertility rate as used here refers to the proportion of female moose that are gravid. Yearling females exhibit a variable rate of fertility from range to range and no instance of calf moose bearing young has been recorded. These two generally non-productive age classes are included in the fertility rate computations because they are counted as adults for purposes of computing survival rates.

Generally microscopic evidence of pregnancy, an embryo or placental tissue, can be found in uteri from animals taken after mid-November (most moose breed between September 20th and October 10th but microscopic evidence in the cornu is not usually present for approximately three or four weeks). In case of early pregnancy where only a few strands of fetal membrane can be located, additional evidence confirming the pregnancy is obtained by sectioning the ovaries to determine if a primary corpus luteum is present. Collections of uteri and ovaries have been obtained from animals killed and turned in by hunters; those collected by Alaska Department of Fish and Game field personnel during antlerless seasons; from highway kills and railroad killed animals. The bulk of the collections for most years have been made in November and December. The uteri and ovaries are fixed in a 10 per cent formalin solution and examined in the laboratory.

The ratio of newborn calves per 100 cows, as mentioned earlier, includes two non-productive age classes, yearlings and calves, because these age classes are counted as adults when the fall sex and age composition counts and spring survival counts are made. Yearlings do produce some calves, but with the exception of the 1964 sample, fewer than 10 per cent of those examined were gravid. The number of fetuses per 100 total females, (adults, yearling and calves) in the sample forms the basic unit for comparison with the subsequent production and survival checks. The data is recorded in such a manner as to allow for a percentage breakdown which is more amenable to statistical analysis. The incidence of twin fetuses is also recorded.

Computations based upon the age composition of the Matanuska Valley moose populations (Rausch, 1957, 8th Alaska Science Conference, pp. 41-49, and 1959, unpublished Master's thesis) show that 90 to 110 calves should be born for every 100 females including the usually non-productive females, if in utero mortality is low. We have found little evidence of resorption, abortion or stillbirth even during or following severe winters when literally thousands of moose perish.

Natality

The incidence and timing of parturition is obtained by making periodic aerial surveys of calving grounds from May 15--June 15th.

Concentrations of parturient cows have been found only in association with wet marshy areas representing tidal flats, bogs created by fires and subsequent slumping and thawing of permafrost areas, flooding by beaver, low land areas associated with major rivers and shallow partially filled lakes. All of the calving centers examined to date can be characterized as having openings with abundant early spring forage including horsetail (Equisetum spp.), sedges (Carex spp.) and aquatic vegetation. Almost without exception the areas are interspersed with "islands," elevated areas with better drainage that have a dense cover of trees or shrubs 10 to 60 feet tall. Most cows give birth on these "islands."

Counts made since 1957 have shown that on Alaskan range calving commences around May 15th--peaks between May 23rd and May 28th and is largely completed by June 10th. The estimate of initial calf production is based upon the highest counts, usually obtained in late May or early June. These counts are compared to the fertility index for the particular area as a check on initial calf production. The technique of observing cows with newborn calves does in all probability slightly underestimate the initial production of calves because:

1. Some calves are born after the counts are completed,
2. Early mortality, and
3. The questionable category female.

The last bias can be partially evaluated because cows with calves exhibit definite behavioral patterns when "buzzed" by a low flying aircraft and their physical appearance also aides in determining if they have given birth. When buzzed, cows with calves almost invariably glance toward the calf's position, which may be from a few feet to one-fourth mile from the female. Following this she engages in displacement feeding and ignores the aircraft with a "who ME expression," seemingly implying, "I'm really not here." In physical appearance they are slab sided, whereas pregnant moose are obviously rotund when viewed dorsally.

The behavioral characteristics are reliable and frequently calves are spotted on the 4th or 5th low level pass when the cow finally runs to the calf or the calf becomes alarmed and moves to the cow, or occasionally the observers will spot the rust-colored calf which blends perfectly with the understory.

Still some questionable category females remain and they are computed both as having a calf and as cows without calves. For purposes of this paper, we have included them as having calves.

Fall Sex and Age Composition Counts

The fall counts utilize light aircraft, principally the Supercub, PA-18, and are timed to coincide with the period immediately after the breeding season--mid-October to late November when the animals are grouped homogeneously and males have not shed their antlers. Suitable snow cover does not always coincide with the desired period and some counts are made after the males have shed antlers. The counts attempt either to total count an area if it is small with good boundaries or strip count with the strips approximately one-fourth of a mile wide on pre-determined units which coincide with the areas previously subjected to fertility and natality

studies. The fall counts provide a measure of the survival of calves from birth to six to 10 months depending upon when the counts are made. We recognize six categories of animals on the fall aerial counts: adult males, subadult males (generally yearlings), females without calves, females with one calf, females with two calves, and calves that are by themselves.

Spring Survival Counts

The fourth and final portion of this attempt to trace a calf through its first year of life is made in April, May or early June--most frequently in May or early June concurrent with the natality or parturition counts, and represents the final assessment of survival. These counts again employ light aircraft or occasionally the helicopter and generally are made on the calfing grounds or adjacent to the calving grounds. The objective of this survey is to measure the survival of calves from November through May--the critical winter period.

Discussion

Mortality of calves during the first 12 months of life, as revealed by these assessments, varies from 30 to 80 per cent of the observed fertility rates. Tables 1 and 2 indicate several examples of mortality as revealed by these techniques. The reasons for the different mortality rates between the Matanuska Valley and Lower Susitna areas are not clearly understood at this time, but are believed to represent differences in the environmental conditions between the two areas.

The former area is windblown, seldom having deep snow and all foodstuffs available are available throughout the year. The area north of Willow to Talkeetna experiences deep snow cover and a winter of longer duration. In addition, the winter range is decadent. It would appear that the severe environmental conditions have resulted in a high annual mortality of calves with relatively little change in fertility rates. The fact that a larger percentage of yearling females are producing calves on ranges where moose populations were reduced through hunting does suggest that the crowded conditions existing prior to the herd reduction may have delayed the age of sexual maturity of female moose, but once matured the fertility rates were consistently at or above 90 per cent.

The nature and timing of calf mortality is not known. In some instances it seems to be a gradual attrition throughout the year, Matanuska Valley, Tables 1 and 2; in others, Willow-Talkeetna area, the loss of calves in 1964 seems to have occurred between June and March when the sex and age composition counts were made. Still other surveys indicate that calves perished during the period from December to June. We have speculated that calf survival may be directly related to severity of the winter. In 1963-64 snow accumulation was quite deep on the Willow-Talkeetna area and persisted into June. Nearly 50 per cent of the calving area was snow covered in late May and few calves survived to the time when the full counts were made.

Survival of calves in other areas of the State also suggest natural phenomena may at times be responsible for the wide variations in calf survival. In Interior Alaska the moose populations on the Koyukuk River exhibited the highest survival recorded, ranging from 60 to 90 calves per 100

Table 1

Estimated Production and Survival of Moose Calves*

Area	Year	Fetuses	Calves at Birth	Calves (6-9 Mo.)	Yearling Calves (11-13 Mo.)	Per cent Mortality
Matanuska Valley	1963-64	86	70	50	40	57
Matanuska Valley	1964-65	80	61	?	?	-
Willow-Talkeetna	1963-64	93	81	16	16	81
Willow-Talkeetna	1964-65	91	86	?	?	-

*All figures based on ratio of 100 total females.

Table 2

Estimated Production and Survival of Calf Moose in Three Local Populations in South Central Alaska, 1958

Area	Cows older than 24 months.	Cows 24 months (Class I).	Cows 11 to 12 months (short yearlings).	Pregnant cows (95% of cows older than 24 months)	Singletons.	Sets of twins	Calves/100 cows (Class I and older)	Calves/100 total cows	Sets of twins/100 total cows	Calves/100 total cows in November	Twins/100 total cows in November	Per cent mortality of calves (birth to 6 mo.)	Per cent mortality of one of twins	Sample size, fall 1958 cows only
Matanuska Valley	88	12	20	84	59	25	109	91	21	47	2.6	48	88	873
Willow	88	12	20	84	59	25	109	91	21	42	3.1	54	85	476
Kashwitna	88	12	20	84	59	25	109	91	21	35	3.7	61	82	570

cows on sizeable samples for three years, then a late spring followed by extensive, prolonged flooding preceded calf survival figures of 10 calves: 100 females. Floods have occurred during two of the last three years and calf survival has been uniformly low.

We suspect that mortality factors affecting calves varies from area to area. Fertility rates and incidence of twinning also vary but on the areas examined in Alaska mortality of calves rather than reduced fertility rates seems to be the reason for widely fluctuating rates of moose calf survival.

PROCEEDINGS

OF

FORTY-FIFTH ANNUAL CONFERENCE

OF

WESTERN ASSOCIATION OF STATE GAME AND FISH COMMISSIONERS

ANCHORAGE, ALASKA

JULY 7-9, 1965