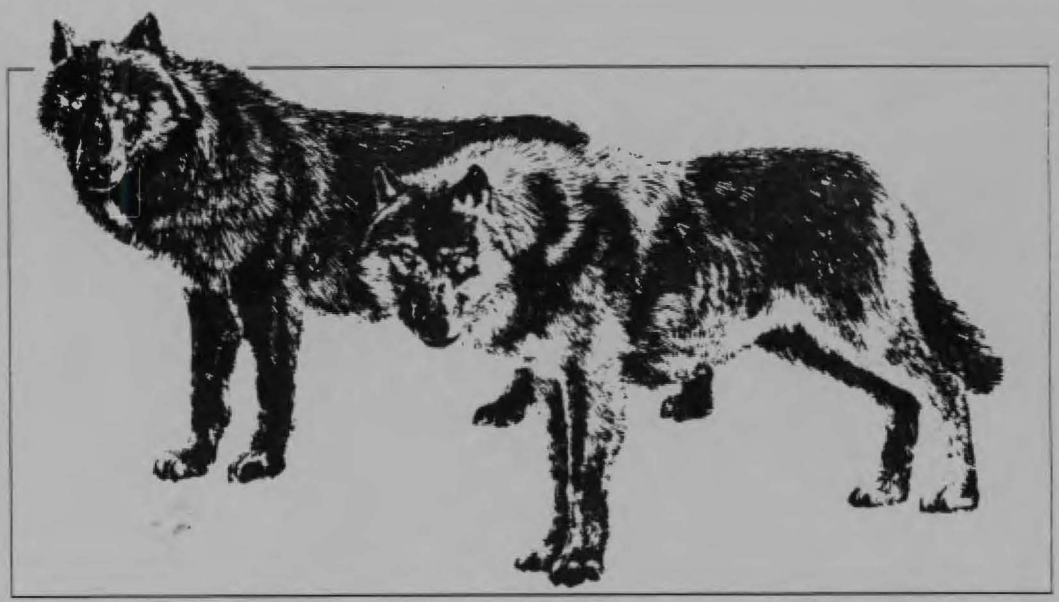
Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Research Progress Report

# TESTING SOCIALLY ACCEPTABLE METHODS OF MANAGING PREDATION: REDUCING PREDATION ON CARIBOU AND MOOSE NEONATES BY DIVERSIONARY FEEDING OF PREDATORS ON THE MACOMB PLATEAU



**by**
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**Project W-23-3**
**Study 1.40**
**December 1990**

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# Testing Socially Acceptable Methods Of Managing Predation: Reducing Predation on Caribou and Moose Neonates by Diversionary Feeding Of Predators on the Macomb Plateau

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# MEMORANDUM State of Alaska

TO: Recipients of Testing Socially Acceptable Methods of Managing Predation (Boertje et al. 1990)

DATE: December 28, 1990

FILE NO:

TELEPHONE NO: 907 465 4190

THRU:

SUBJECT: Correction of editing error in the text: Project W-23-3 Study 1.40, page 5

FROM: Sid O. Morgan
Publications Technician
Division of Wildlife Conservation

Please refer to page 5, the 2nd-order heading Monitoring Caribou Pregnancy and Survival. The last sentence of the only paragraph under that heading should read as follows:

> Using a Hughes-500 helicopter on 14 June, 600 caribou were classified as either calves, females ≥1 year old, or males ≥1 year old.

PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: Daniel Reed, ADF&G; Dean Cummings, land and sawmill owner; Alaska Railroad Corporation; U.S. Army-Fort Greely; National Park Service; Bureau of Land Management

Project No.: W-23-3 Project Title: Wildlife Research and Management

Study No.: 1.40 Study Title: Testing Socially Acceptable Methods of Managing Predation--Reducing Predation on Caribou and Moose Neonates by Diversionary Feeding of Predators, Macomb Plateau, 1990-94

Period Covered: 1 July 1989-30 June 1990

## SUMMARY

The purpose of this study is to test whether artificially feeding of grizzly bears (Ursus arctos) and wolves (Canis lupus) can reduce predation on newborn caribou (Rangifer tarandus) and moose (Alces alces). If successful, this technique could provide a means of enhancing caribou or moose populations without resorting to lethal methods of controlling predators. The controversy over lethal predator control has (1) polarized conservationists; (2) precluded attaining moose, caribou, and wolf management goals acceptable to these diverse conservationists; (3) adversely affected other conservation programs; and (4) cost untold dollars and time to many conservation organizations. Where society desires intensive management of wildlife in Alaska, it is imperative that the Alaska Department of Fish and Game investigate more socially acceptable ways (i.e., nonlethal methods) of managing moose-caribou-predator systems.

We distributed a total of 26 metric tons of bait during 3 periods: 14-15 May, 21-22 May, and 30 May 1990 ($n$ = 87 baits, $\bar{X}$ = 300 kg). Time periods were chosen to enhance caribou and moose calf survivals from mid-May to mid-June. Bait consisted largely of train-killed moose unsalvageable for human consumption.

Diversionary feeding apparently did little to improve caribou calf survival during 1990; however, bears (mostly grizzly bears) and wolves consumed 79% of the baits by 14 June 1990, as evidenced by disarticulated skeletons and observations of bears and wolves at baits. Caribou calves experienced approximately

50% mortality by 14 June; this percentage of mortality is common among unmanipulated Interior Alaska caribou herds during late May and early June. Results on moose (Alces alces) calf survival and comparisons with control moose and caribou populations will not be available until the early winter of 1990.

Recommendations for next year's diversionary feeding experiment are to concentrate solely on reducing predation on caribou calves near high-elevation (1,500-1,900 m) birth sites during the critical 10 days after the median-peak calving date (22-24 May during 1988-90). This will involve distributing all bait as soon as weather permits from 16 to 24 May. Assuming that predation was the major cause of mortality, we speculate that either (1) some bears have small home ranges at higher elevations than those of the 1990 bait sites and were not diverted from calves (e.g., sows with young often remain at high elevations to avoid predation on young bears) or (2) diversionary feeding of predators to improve caribou calf survival is impractical in this study area. However, testing the success of diversionary feeding of predators to improve caribou calf survival is incomplete without specifically targeting predators near high-elevation caribou birth sites. We recommend concentrating baits at lower elevations (400-1,100 m) at a subsequent date to more fully test the effectiveness of diversionary feeding to improve moose calf survivals. Also, if funds are available, we recommend collaring 30 newborn caribou calves to verify that predation is the major cause of mortality.

Key Words: Alaska, baiting, bears, calving, caribou, diversionary feeding, predator-prey relationships, wolves.

CONTENTS



## BACKGROUND

Humans manage (i.e., manipulate) wildlife populations to influence a desired outcome. For example, humans sometimes desire more ungulates than occur naturally; i.e., in the absence of special management. The elevated numbers of ungulates may be important to help protect habitat from competing land uses and/or to provide for consumptive and/or nonconsumptive uses of wildlife.

To manage for elevated densities of caribou (Rangifer tarandus) and moose (Alces alces), managers must usually counter strong natural processes (Gasaway et al. 1983, 1990; Bergerud and Elliott 1986; Van Ballenberghe 1987). Although most Alaska caribou populations have periodically increased with little intervention by humans (Skoog 1968), growth of caribou populations is often limited at low densities by predation, and increases are temporary (Bergerud 1980, Bergerud and Elliott 1986). Mainland caribou densities (i.e., $\leq$400 caribou/1,000 $km^2$ in areas where wolves [Canis lupus] are nearly unexploited) are frequently well below those where food limitation has caused a reduction in caribou populations (Bergerud 1980, Skogland 1986).

Reductions in predator populations by the public (e.g., same-day-airborne shooting) and/or the Alaska Department of Fish and Game (ADF&G) have contributed to recent increases in many Alaska caribou herds (e.g., Nelchina, Delta, Fortymile, and Mulchatna) (Gasaway et al. 1983; Ballard et al. 1987; Valkenburg and Davis 1988; K. Taylor, ADF&G files). Recent widespread discontinuation of some of these controversial methods highlights the need for socially acceptable alternatives to lethal control so that moderate caribou densities can be maintained.

Moose populations in much of Alaska and the Yukon are more clearly limited by predators. For example, predation limits moose populations at chronically low densities where they are a

primary prey of lightly exploited wolf, black bear (Ursus americanus), and grizzly bear (Ursus arctos) populations. In areas where wolves and bears are at near-natural densities, the mean density was only 155 moose/1,000 $km^2$ (n = 20 areas, range = 45-417, SD = 86), compared with a mean of 647 moose/1,000 $km^2$ (n = 16 areas, range = 169-1,447, SD = 389) in areas where humans maintain wolves and, in some cases, bears below carrying capacity K (Gasaway et al. 1990).

Additional support for lightly exploited predator populations limiting moose at a low-density equilibrium is presented in Gasaway et al. (1990). We found no evidence for moose maintaining a high-density equilibrium without continued predator management, except where moose were (1) preyed on by only 1 predator species (Messier and Crete 1985, Crete 1987, Bergerud and Snider 1988, Messier 1988), (2) preyed on by black bears and grizzly bears (wolves extirpated) with or without alternate ungulate prey (Houston 1968, Bailey 1978, Peterson et al. 1984), and (3) minor prey in wolf-bear multiprey systems (Crete 1987, Bergerud and Snider 1988). In Alaska wolves, moose, and one or both species of bears are sympatric and caribou are rarely the primary prey, except in portions of the Brooks Range and arctic coastal plain. Therefore, Alaska moose populations occur at low densities, except where wolf and/or bear populations are strongly manipulated by humans.

The Division of Wildlife Conservation is obligated to provide for the long-term conservation of large carnivore populations throughout Alaska as well as to reduce the controversy surrounding the management of large carnivores, especially wolves. As a 1st step, the Division is establishing a framework for citizen involvement in developing a wolf management plan. Integral with this process is the evaluation of more socially acceptable ways (i.e., nonlethal) of managing predator-prey relationships in areas where the public desires that ungulate-predator systems be managed for increased human use of ungulates.

Several alternatives to intense, lethal government-conducted or public predator control hold promise for managing predator-prey relationships (Gasaway et al. 1990). This study assesses if and to what extent diversionary feeding of predators will reduce predation and facilitate the management of caribou-moose-predator relationships. Preliminary evidence indicates that diversionary feeding of predators may increase the neonatal survivals of caribou and/or moose.

During May and June 1985, we air-dropped approximately 12-15 tons of train-killed moose and scrap meat to attract grizzly bears for collaring purposes in and near the Mosquito Flats, an important moose calving area north of Tok. We observed that grizzly bears, wolves, and black bears consumed much of this meat and that fall moose calf:cow ratios were higher than normal. The 1985 early winter calf:cow ratio was 53:100 (n = 17 cows), compared with a range of 11-15:100 (n = 26-39) during the 3 preceding years and a

range of 26-36:100 ($n$ = 25-27) during 1986 and 1987. Also the 1985 response was not observed in untreated adjacent areas (10-19:100, $n$ = 25-70); however, some of the increase in calf survival may have resulted from immobilization and slow recovery of bears (4-5 days), rather than the introductions of meat.

Other circumstantial evidence also suggests that diversionary feeding for 1 month during and immediately following the calving season may increase caribou and moose calf survivals. Most mortalities among caribou and moose populations in central and southern Alaska and the Yukon occur on neonates during the first 2-3 weeks of life, and predation is the major cause of these mortalities (Franzmann et al. 1980; Ballard et al. 1981; Boertje et al. 1987, 1988; Larsen et al. 1989; Adams et al. 1988).

The Macomb Caribou Herd has been small (≤800 caribou, 200 caribou/1,000 $km^2$) for 2 decades or more, yet management goals for the herd call for increasing the herd to 1,000-1,500 caribou. The herd's location along the road system makes it ideally suited to this study. Substantial public benefits would be incurred from increased caribou, moose, and wolves in this area. Since intensive wolf removal during the winter of 1980-81, the herd may have grown from 500-600 caribou to about 800 during October 1988; however, neonatal calf mortalities have remained high since wolf removal. Causes and chronology of these mortalities are probably similar to those recently documented in the Denali Caribou Herd (Adams et al. 1988); from 1984 to 1988 predators (i.e., primarily grizzly bears) killed about 39% of calves by 1 June.

## OBJECTIVES

To estimate the changes in the survival of neonate caribou and size of the caribou population resulting from diversionary feeding of wolves, bears, golden eagles (*Aquila chrysaetos*), and bald eagles (*Haliaeetus leucocephalus*) on and adjacent to the Macomb Plateau during the years 1990 to 1994.

To estimate the change in survival of neonate moose and density of the moose population resulting from diversionary feeding of wolves and bears on and adjacent to the Macomb Plateau from 1990 to 1994.

## STUDY AREA

We distributed food for predators in a 1,650-$km^2$ portion of the Alaska Range and adjacent lowlands between elevations of 400 and 1,550 m (Fig. 1). This experimental area includes the Macomb caribou calving ground (Fig. 2) and portions of the Knob Ridge and Robertson River moose calving grounds. The experimental area is centered around 63°35'N latitude and 144°30'E longitude.

Assuming data are available, control caribou populations will include the Denali, Delta, and White Mountains herds, which are 290 km west, 160 km west, and 290 km north of the treatment area, respectively. Control moose populations will include the Central Creek and eastern Subunit 20E moose populations, which are 80 km north and 120 km east of the treatment area, respectively.

The climate is subarctic and continental in the experimental and control areas. "Winter" includes the months from October to April. Leaves emerged on most shrubs on the Macomb Plateau during 26-27 May 1990, and leaf senescence usually occurs during the last 2 weeks of August. Total annual precipitation averages 24 cm at Tok, 60 km east of the plateau (National Climatic Data Center 1986).

Wolves, black bears, and grizzly bears occur at near-natural densities in the experimental and control areas; i.e., predator-prey relationships had not been strongly manipulated by humans during the decade prior to this study. Moose, caribou, and Dall sheep (Ovis canadensis) are the major prey in the experimental and control areas, except the Central Creek area where sheep do not exist. Minor prey in these areas include snowshoe hares (Lepus americanus), beavers (Castor canadensis), hoary marmots (Marmota caligata), and except in the Central Creek and O'Brien Creek control areas, arctic ground squirrels (Citellus parryi).

## METHODS

### Carcass Collection and Storage

Twenty-six metric tons of bait were collected. The Alaska Railroad Corporation collected 60 train-killed moose, using a crane or ditcher mounted on a railroad car. These carcasses were stored in Willow until they could be transported to Cummings' Sawmill (Fig. 1). An additional 30 unsalvagable carcasses were collected near Delta Junction and Fairbanks; most of these carcasses were winter-killed moose calves. About 4% of the bait were spawned red salmon carcasses collected from the Paxson Hatchery, frozen, and stored in Fairbanks until April. Upon arrival at the sawmill (Jan-Apr 1990), bait was covered with sawdust for cold storage until distribution.

### Distribution and Monitoring Use of Baits

Bait ($n$ = 87 baits, $\bar{x}$ = 300 kg) was distributed using Army UH-1 helicopters (40 flight hours) on 14 and 15 May ($n$ = 29 baits), 21 and 22 May ($n$ = 25 baits), and 30 May 1990 ($n$ = 33 baits). Baiting occurred in a 1,650-$km^2$ area on and around the Macomb Plateau near calving caribou and moose (Fig. 1). To aid relocation of carcasses, we directed the helicopters to each bait site using light fixed-wing aircraft (Citabria Scout or Piper Super Cub). One bait was deposited at each site ($n$ = 61 sites) and replenished as necessary during successive baiting periods.

To monitor use of baits, we made several low passes over bait sites using light fixed-wing aircraft at 4- to 10-day intervals through 14 June. A bait was deemed "largely consumed" when over 50% of the bait was gone. In a large majority of these cases, only hair and scattered bones remained, but in a few cases hides and a low percentage (<20%) of meat remained.

Monitoring Caribou Pregnancy and Survival

Using light fixed-wing aircraft, we examined the 18 adult (≥3 years old) radio-collared Macomb caribou on 14 and 20 May 1990 for evidence of pregnancy; i.e., retention of antlers and presence of extended udder. Using a Hughes-500 helicopter, pregnant collared caribou were radio-tracked after 20 May at 2- to 6-day intervals through 8 June to determine calving distribution and survival of calves. On 14 June, 600 caribou were classified as calves (i.e., females or males ≥1 year old).

## RESULTS AND DISCUSSION

Consumption of Bait

Scavengers largely consumed 76 (88%) of the 87 baits by 14 June 1990 (Fig. 2). Approximately 45-50% of the baits were largely consumed within 10 days of distribution, and an additional 30-40% during the following 10 days. Bears (mostly grizzly bears) and wolves consumed 79% of the baits, as evidenced by observations of disarticulated skeletons and bears and wolves at baits. Removal and/or burial of baits occurred at 44% of the 87 drop sites, indicating grizzly or black bear use; however, because bears did not always move or bury baits, they may have consumed >44% of the baits. Because golden and bald eagles were frequently observed at 36% of the baits and skeletons were intact, they accounted for 9% of the baits.

Large predators observed during 100 flight hours included 8 different grizzly bears ≥3 years old and one 2-year-old at 8 bait sites, 2 black bears at 1 site, and 1 radio-collared wolf at 3 bait sites. Only 1 predator, a grizzly bear, was observed by a ground crew, who spent a total of 80 hours watching 4 baits on the Macomb Plateau from 20 to 28 May 1990.

Caribou Calf Mortality

Preliminary data on herd composition during June 1990 indicated mortality of Macomb caribou calves was similar to untreated herds (ADF&G files), despite diversionary feeding of bears and wolves. About 50% of the calves died prior to 14 June. This calculation was derived from a count of 32 calves per 100 females ≥1 year old on 14 June ($n$ = 600 caribou) and a pregnancy rate of 64 calves per 100 females ≥1 year old (i.e., 83 calves born/100 adult radio-collared females [$n$ = 18], zero calves born/100 female

yearlings and 2-year-olds, and 30 female yearlings and 2-year-olds/100 adult females).

Although the survival of calves among the 18 adult radio-collared females (12/18) suggested a herd composition of 50 calves:100 females ≥1 year old, this discrepancy is probably attributable to the small sample size. Comparisons with control caribou populations will be made following early winter composition surveys.

Causes of calf mortality were not verified, but predation by bears and wolves has consistently been the major mortality factor on caribou and moose calves in Interior Alaska (Ballard et al. 1981; Boertje et al. 1987, 1988; Adams et al. 1988). Assuming that predation was the major cause of mortality, we speculate that either (1) some bears had small home ranges at higher elevations than bait sites and were not diverted from calves (e.g., sows with young that often remain at high elevations to avoid bear predation on cubs) or (2) diversionary feeding of predators to improve caribou calf survival is impractical in this herd.

Testing the effectiveness of diversionary feeding will be incomplete without specifically targeting predators near high-elevation (1,500-1,900 m) caribou birth sites (Fig. 1) during the critical 10 days after the median-peak calving date (i.e., 22-24 May during 1988-90). Adams et al. (1988) identified this period as the most critical in terms of vulnerability of caribou calves to predation. Most radio-collared caribou that calved occupied high-elevation sites (>1,450 m) through 8 June. However, extensive baiting did not occur above 1,400 m until 30 May, when most calf mortalities had likely already occurred. Also, only about 25% (6.6 metric tons) of the bait was consumed during the critical 22-31 May postcalving period. Female grizzly bears with young may be the dominant predator on neonatal caribou (L. Adams, pers. commun.), because they have small home ranges during the spring and often select the same high-elevation sites as calving caribou, presumably to avoid predation by male grizzly bears on young bears (R. Boertje, H. Reynolds, S. Miller, ADF&G files). A scarcity of vegetation at these high elevations suggests bears have little food other than caribou calves.

## RECOMMENDATIONS

During 1991 we recommend concentrating solely on diverting predation from caribou calves near high-elevation (1,500-1,900 m) birth sites during the first 10 days following the median-peak calving date. To accomplish this, all bait should be distributed from 16 to 24 May as weather permits. Baits should encompass the core high-elevation calving areas, because female grizzly bears, who maintain small home ranges, may be major predators. If bait consumption occurs similar to rates observed in 1990, placement of all baits near the peak of calving will maximize the

consumption-diversion rate during the critical 10-day period. We recommend concentrating baits at lower elevations (400-1,100 m) at a subsequent date to more fully test the effectiveness of diversionary feeding to improve moose calf survivals. Also, if funds are available, we recommend collaring 30 newborn caribou calves to verify that predation is the major cause of mortality.

## ACKNOWLEDGMENTS

We are indebted to the following for their contribution to this study. The Alaska Railroad Corporation graciously collected moose carcasses for this study. Highway transportation of carcasses was provided by H. Sanders of Delta Junction. The Cummings family of Delta Junction provided technical support for the unloading, loading, and cold-storing of carcasses. The U.S. Army 72nd Light Infantry Division of Fort Greely graciously provided about 40 hours each of ground and aerial support for the transportation of carcasses to the study area and technical support for the development of appropriate slings for carrying the carcasses. Aerial support supplemented Army training exercises. Military pilots R. Pickard and R. Pappa deserve special recognition. Civilian pilots who assisted with the project included J. W. Musgrove, D. Miller, and R. Warbelow. A field camp was supervised by E. Lenart and included A. Kennedy, D. Arnet, and R. DeLong. Funding was provided by Federal Aid in Wildlife Restoration Projects and the ADF&G.

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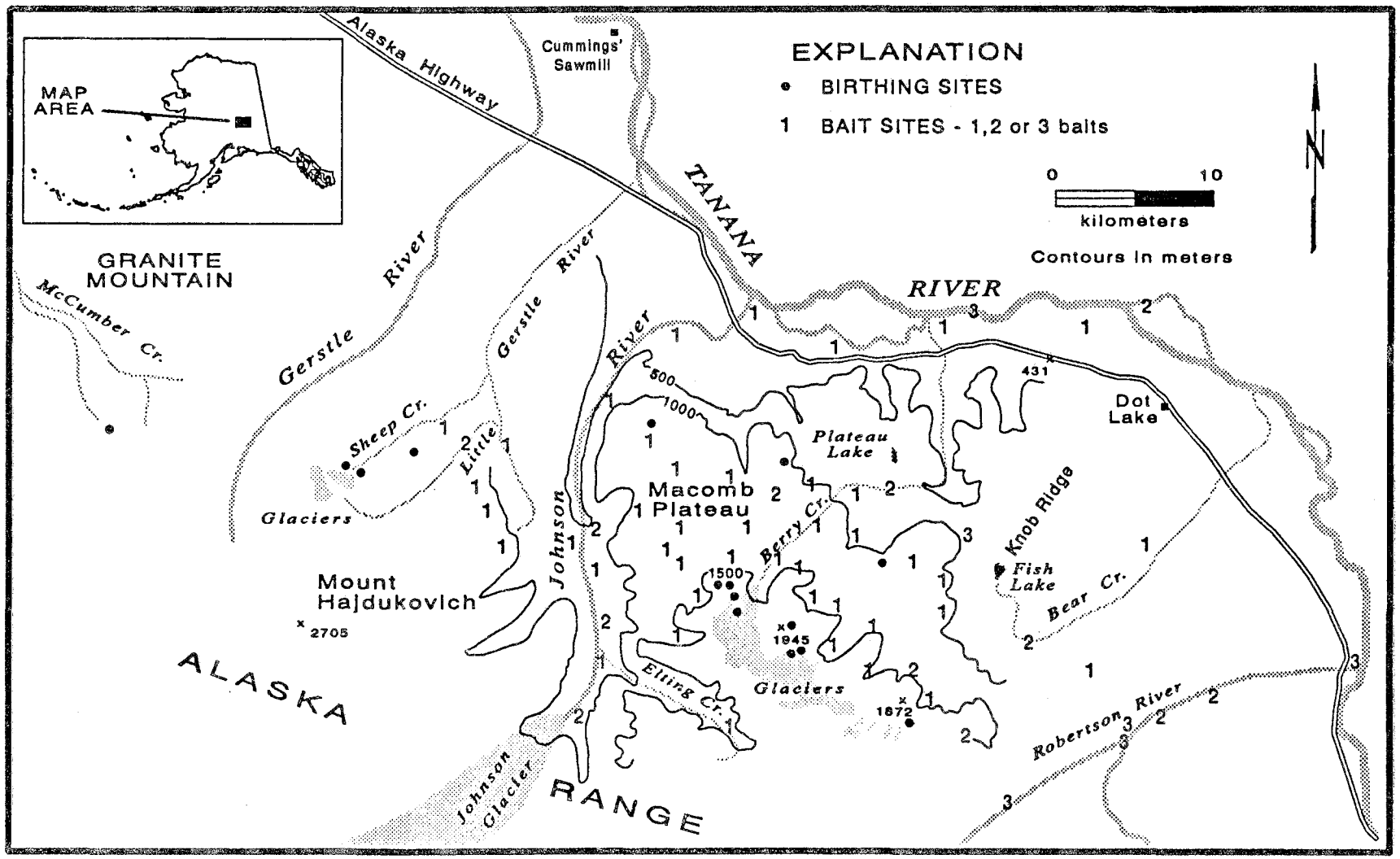


Fig. 1. Birthing sites (·) of 15 adult radio-collared Macomb caribou and location of bait sites (1, 2, or 3 baits), east-central Alaska, May 1990. Bait sites ($n$ = 61) were replenished up to 3 times at weekly intervals as necessary ($n$ = 87 baits, $\bar{x}$ = 300 kg).

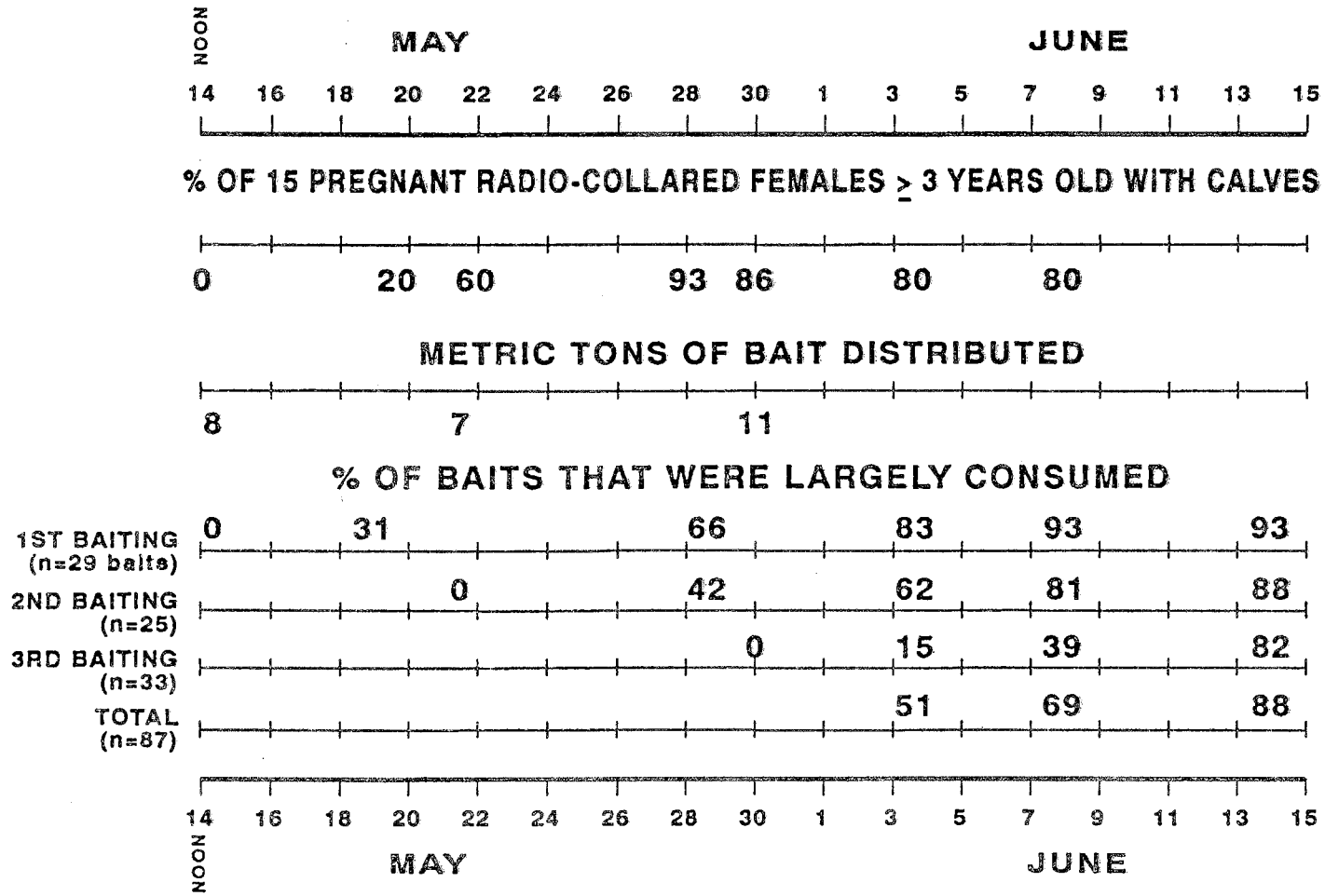


Fig. 2. Chronology of caribou calving, calf survival of collared adults, baiting, and consumption of baits on and near the Macomb Plateau, east-central Alaska, 1990.


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