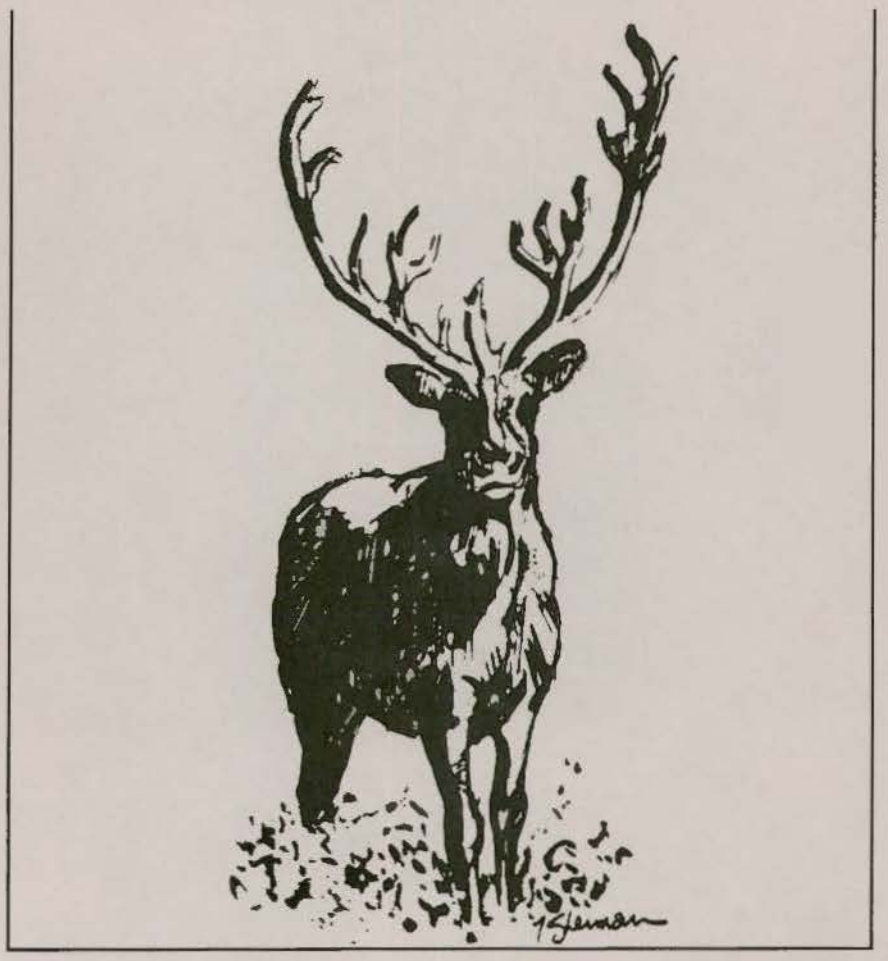
Alaska Department of Fish and Game
Division of Game
Federal Aid in Wildlife Restoration
Research Progress Report

STATUS, MOVEMENTS, RANGE USE PATTERNS, AND LIMITING FACTORS OF THE FORTYMILE CARIBOU HERD



by
Patrick Valkenburg and
James L. Davis

Project W-22-6
Job 3.32
May 1988

STATE OF ALASKA
Steve Cowper, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF GAME
W. Lewis Pamplin, Jr., Director
Steven R. Peterson, Research Chief

Additional copies of this report, or reports on other species covered in this series may be obtained from:

Publications Technician
ADF&G, Game Division
P.O. Box 3-2000
Juneau, AK 99802
(907) 465-4190

PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: David Kelleyhouse and Daniel Grangaard, Alaska Department of Fish and Game Biologists, Tok; Steven Ulvi, Yukon-Charley Rivers National Preserve, National Park Service; and Layne Adams, State Office, National Park Service

Project No.: W-22-6 W-23-1 Project Title: Big Game Investigations

Job No.: 3.32R Job Title: Status, Movements, Range Use Patterns, and Limiting Factors of the Fortymile Caribou Herd

Period Covered: 1 July 1986-30 June 1987
(Includes data through 30 September 1987)

SUMMARY

The natality rate of 19 radio-collared females (>3 years old) from the Fortymile Caribou (Rangifer tarandus granti) Herd (FCH) was 95% in 1987. Calf:females ratios declined by 54% from late May (80:100) to late September 1987 (37:100).

From 1983 to 1987 the mean annual mortality rate of 28 radio-collared female caribou was 8%, excluding 3 individuals whose fate was unknown; if these individuals had died, then the mean annual mortality rate of females would have been 10%. From 1984 to 1987 the corresponding mortality rate of 16 radio-collared males was 22%, excluding three whose fate was unknown; if these individuals had died, the mean annual mortality rate of males would have been 29%. Wolves (Canis lupus) killed at least four of the 6 females that died and may have killed a fifth; a grizzly bear (Ursus arctos) killed one. Of the 5 males that were known to have died, two were killed by hunters, one was killed by a wolf, and two died from unknown causes.

Despite the nearly threefold increase in the size of the herd since the mid-1970's, the geographic range of the FCH has increased only slightly; this slight expansion in range has resulted from (1) fall (October) excursions of FCH caribou into the Yukon Territory since 1984 and (2) year-round use of the mountainous area between Birch Creek and the Steese Highway since 1986.

Some Porcupine Herd caribou have been observed on or near the north bank of the Yukon River during October in at least five of 8 years since 1980. About 20,000 Porcupine Herd caribou spent the winter of 1981-82 in the FCH's range, but no apparent interchange of animals occurred. A few may also have wintered within the FCH's range again in 1986-87.

In fall 1986 an estimated 265 wolves were within the range of the FCH (241 wolves in 38 packs and 24 singles). Estimated diet of these wolves and kill rates obtained from the literature suggest that wolves may have consumed 2,250 caribou (16% of the FCH) ≥3 months old from 1 September 1986 to 1 September 1987.

Key Words: caribou, Fortymile Herd, mortality, predation, radio-collaring, Rangifer, wolf.

CONTENTS

BACKGROUND

The Fortymile Caribou Herd (FCH) was probably the largest caribou (Rangifer tarandus granti) herd in Alaska and one of the largest in the world during the 1920's. The herd ranged from Rampart on the Yukon River to Whitehorse in the Yukon Territory, and it provided much of the food needed by miners, Athapaskans, and other early residents (Murie 1935). Although the cause is unknown, the FCH declined from several hundred thousand in the late 1920's (Murie 1935) to 10,000-20,000 by the early 1940's (Skoog 1956). Factors that may have contributed to the herd's decline include emigration, large harvests by humans, a large increase in the wolf (Canis lupus) population, and destruction of the winter range by fire (Murie 1935; Leopold and Darling 1953; Skoog 1956, 1968; LeResche 1975; Davis et al. 1978).

The FCH apparently began increasing sometime during the 1940's. However, data are insufficient to determine if the caribou herd began to recover prior to or after the initiation of wolf control by the Federal Bureau of Predator and Rodent Control in 1947. The herd numbered approximately 65,000 (including calves) from 1955 through 1960 (Davis et al. 1978). No censuses were conducted between 1961 and 1973, but by 1973 the population numbered approximately 6,500 caribou (Davis et al. 1978). The decline was attributed to high harvests in the late 1960's and early 1970's and an increasing wolf population

(Davis et al. 1978), but little biological information was collected during the 1960's and early 1970's.

In retrospect, it is clear that the overharvesting of caribou contributed to the decline, especially during the late 1960's and early 1970's. Conventional wisdom of the time (and there was little evidence to refute it) was that predators generally did not control ungulate populations and that hunting mortality was often compensatory (i.e., hunters killed many animals that would have died soon anyway). In addition, the size of many ungulate populations was inadequately monitored, and the FCH was no exception.

As a result of management based on the invalid conventional wisdom of the late 1960's and early 1970's coupled with record severe winter weather, many Alaskan caribou and moose (Alces alces) populations declined to record low levels. Caribou herds that declined included the Nelchina, Western Arctic, Delta, and Fortymile (Gasaway et al. 1983). The Denali (formerly McKinley) Herd also declined, though hunting was apparently not a major factor.

Caribou populations recovered rapidly (i.e., 14-22% growth/year) in those areas where wolf populations were reduced through (1) control efforts by the Alaska Department of Fish and Game (ADF&G) (e.g., Delta Herd, 1976-77), (2) high wolf harvests by the public (e.g., Nelchina and Western Arctic Herds), and (3) natural mortality resulting from disease in the wolf population (e.g., Western Arctic Herd). The Nelchina Herd may have begun increasing slowly prior to wolf reduction (Van Ballenberghe 1985). From 1973 to 1983 during a period of apparent natural decline of wolf numbers, the FCH grew slowly (<6.5% per year). The Denali Herd apparently declined or was stable through the 1970's, and it then grew very slowly in the early and mid-1980's because of a largely declining or stable wolf population (Singer 1985).

The FCH has the greatest potential of any relatively accessible big game herd in the state for supporting a significantly larger population. However, even with mild winters, insignificant harvests, and a relatively low wolf population, the FCH probably grew at only about 6.5% annually from 1973 through 1983. The FCH numbered 12,500 in 1983, which was only 20% of the ADF&G interim goal of 65,000.

From 1981 through 1987 ADF&G advocated reducing bear and wolf predation in portions of Game Management Unit 12 and Subunit 20E to restore low moose and caribou numbers to higher levels. This study was initiated, in part, to gather detailed information necessary to direct management actions and to determine the effects and efficacy of predator reduction on the FCH.

GOAL

To determine the status, population trend, movements, distribution, range-use patterns, and limiting factors of the FCH.

OBJECTIVES AND PROCEDURES

Objective 1

To ascertain the growth rate of the FCH.

Procedure:

The herd was censused in 1983, 1984, and 1986 using the modified aerial photo-direct/count-extrapolation technique (Davis et al. 1979). Another census is scheduled for 1988.

Objective 2

To measure natality of the FCH and compare it with that of other herds with known demography.

Procedure:

In late may from 1983 through 1987, the natality rate of FCH females was determined each year by observing the proportion of radio-collared females with distended udders, hard antlers, and calves (Bergerud 1964). A helicopter and ground observers were used to conduct composition counts in late May 1984 and 1985. Results were compared with similar counts from the Delta and Western Arctic Herds.

Objective 3

To ascertain the mortality rates of calves and adults.

Procedure:

Calf mortality rates were estimated from composition data obtained by classifying caribou from a helicopter during late May, late June, September, October, and April. The annual mortality rate of females was estimated from the measured mortality rate of 28 females that had been radio-collared between 1983 and 1987 (White 1983). The annual mortality rate of males was estimated from the measured mortality rate of 15 males that had been radio-collared between 1984 and 1987 (White 1983).

Objective 4

To determine patterns of range use, habitat selection, and food habits of the FCH.

Procedure:

In August 1985, we presented a paper entitled Calving Distribution of Alaska's Steese-Fortymile Herd: A Case of Infidelity? at the 4th International Reindeer/Caribou Symposium, Whitehorse, Yukon (Valkenburg and Davis 1986). We also prepared a detailed analysis of the movements and distribution of the herd between 1981 and 1987, including maps of calving and winter distribution.

Objective 5

To determine predator:caribou ratios in the range of the FCH.

Procedure:

During the winter of 1986-87 we expanded coverage of previous wolf surveys to estimate the wolf population present within the range of the FCH. Surveys were primarily conducted by D. Grangaard in March and April 1987. Additional and corroborating information was obtained from sealing certificates and interviews with trappers as well as from incidental observations of wolves gathered by D. Haggstrom (ADF&G staff) for the Department's Big Game Data Index File.

In addition to collecting information on the distribution and abundance of wolves within the range of the FCH, we also estimated the winter diet of wolves from (1) general observations, (2) distribution of wolves in relation to that of moose, Dall sheep (Ovis dalli), and caribou, and (3) the concentration of C-137 (Holleman and Stephenson 1981) in 31 muscle tissue samples from wolves within the study area established by Boertje et al. (1987). Muscle tissue samples were obtained by paying area trappers $30 for each wolf carcass returned to the Fairbanks or Tok offices. Moreover, because some packs within the study area were not trapped, ADF&G staff collected 6 additional wolves in April at the end of the trapping season. One other wolf carcass that had apparently been killed by other wolves was found by D. Grangaard.

RESULTS AND DISCUSSION

Growth Rate of the Fortymile Caribou Herd

Inclement weather conditions in late June and conflicts with other caribou censuses in July precluded a FCH census in 1987. We were therefore unable to directly determine or further refine growth rate estimates of the herd through 1987; however, we accomplished these estimates indirectly by using recruitment (calves:100 females in Sep 1986) and mortality

data (see Adult Mortality and Population Modeling on pages 5-6 of this report).

Natality

The natality rate of the 19 radio-collared females was 95% in late May 1987. Seventeen had distended udders on 18 or 19 May 1987, one was judged to be pregnant by the presence of hard antlers alone, and the remaining one was probably not pregnant (i.e., no hard antlers, no distended udders on 19 May, and no calf present on 29 May). No composition counts were conducted in late May 1987.

Mortality

Calf Mortality:

The ratio of calves:females ≥12 months declined by 54% from late May (assuming 80 calves:100 females) until late September (37 calves:100 females). Calf survival is apparently improving as the herd increases in size. The fall 1987 ratio of 37 calves:100 females ≥12 months is the highest in many years (Table 1). Also, the calf:female ratio in late June 1985 and 1987 (48:100 and 45:100, respectively) are the highest June ratios in many years.

Adult Mortality and Population Modeling:

Excluding 3 female caribou whose fates were unknown, the mean annual mortality rate of 28 radio-collared adult females between 30 September 1983 and 30 September 1987 was 8% (95% CI = 2-14%). If the 3 females whose fates were unknown had actually died, then the mean annual mortality would have been 10% (95% CI = 4-16%). These mean annual rates were calculated by pooling all data between 1983 and 1987. There was no apparent trend in adult mortality over the 4-year period.

Wolf predation was responsible for at least four of the 6 known deaths of radio-collared females. One female was almost certainly killed by a grizzly bear (Ursus arctos) in August. Additionally, wolves may have been responsible for the deaths of the 3 female caribou whose fates are unknown as well as for the remaining known death. If predation was involved, wolves, rather than bears, would be the more likely candidates for causing the deaths of the additional 4 females because these caribou disappeared during the winter when bears are inactive. Other causes of death, such as disease and weather, have not been documented within the range of the FCH in recent years.

Excluding 3 male caribou whose fates were unknown, the mean annual mortality rate of 16 radio-collared adult males between

30 September 1984 and 30 September 1987 was 22% (95% CI = 6-38%). Assuming that the 3 males whose fates were unknown actually died increases the mean annual mortality rate to 29% (95% CI = 12-46%).

Of the 5 males that were known to have died, two were killed by hunters, one was killed by a wolf, and two died of unknown causes. In addition, 3 others may have either died or dropped their collars. Dropped collars are not uncommon with males.

Assuming that the adult portion of the FCH was composed of two-thirds females and one-third males, then the weighted mean annual adult mortality (verified deaths only) for both sexes between 1983 and 1987 was 13%. If all caribou whose fates were unknown had died, then the mean annual adult mortality rate would have been about 16%. Population modeling will be discussed further in the final report after the results of the 1988 census are available.

As a percent of herd size, harvest of the FCH has averaged less than 3% annually since 1973 and has been restricted to males. Hunting remains a minor influence on herd growth and sex composition. Location of the harvest within the Yukon Charley Rivers National Preserve during 1986-87 is summarized in Appendix A.

Range Use, Habitat Selection, and Food Habits

During this reporting period, we summarized the seasonal distribution of the FCH from 1981 through 1987 (Figs. 1-7). The November-March distribution of the herd has varied considerably among years, but the total inhabited area has increased only slightly since the mid-1970's, despite the nearly threefold increase in herd size. However, in 1984, 1985, and 1987 there was a substantial movement of caribou into the Yukon Territory in October. These movements brought caribou into the upper Sixtymile and North Fork of the Ladue Rivers. In all 3 years most of the caribou involved had returned to Alaska by early November. In 1984 the movement of caribou into the Yukon was early enough in the year for a few (about 12) to be harvested from the road system by Dawson residents who had not had an opportunity to hunt FCH caribou there for many years (Davis et al. 1978).

During October 1981 about 20,000 caribou from the Porcupine Herd crossed the Yukon River downstream from Eagle and wintered primarily in the vicinities of Slate Creek, the middle portion of the Salcha River, and the Birch Creek drainage which are within the range of the FCH. Only one of the 20,000 Porcupine Herd caribou and 4 FCH caribou were radio-collared at the time. The 4 radio-collared FCH caribou remained with the FCH in spring, and the 1 radio-collared

Porcupine Herd caribou was relocated in the calving area of the Porcupine Herd near Komakuk Beach in early June 1982. In 1984-1987 Porcupine Herd caribou moved to within a few kilometers of the Yukon River in early October, and a few of them apparently crossed the river in 1986, causing a rush of hunters to the area. S. Ulvi (National Park Service, Eagle) reported that about 200 Porcupine Herd caribou were shot during the 1981 crossing; whereas, in 1986 only four were taken.

Another unusual movement of caribou within the range of the FCH occurred in late August 1984 when an unseasonably severe storm dropped over 60 cm of snow in the Fortymile River drainage. Within a few days thousands of caribou began crossing the Taylor Highway from west to east in the vicinity of Mount Fairplay, and the hunting season was closed by emergency order to prevent an overharvest. In other years since 1980, most FCH caribou have remained in the Charley River drainage in August, but in 1985 and 1986 there was a movement of several thousand caribou to within a few kilometers of the Taylor Highway near Taylor Mountain and Chicken late in August. By 1 September most caribou had moved back to the west and did not cross the road until after the hunting season had closed (20 September).

The radio-collaring of 9 and 3 males in 1984 and 1985, respectively, enabled us to document substantial segregation of males and females on winter range. The Ladue, lower Fortymile, and Birch Creek drainages were used by males almost exclusively. Most radio-collared males remained on these winter ranges until late May before moving toward postcalving aggregations forming near Mount Harper.

In August 1986, 1 radio-collared male began using the area near Mastodon Dome (near the Steese Highway). We believe this represented an increased use of this area because hunters also reported seeing and bagging more caribou there since 1986. E. Crain (ADF&G staff) interviewed hunters using the Steese Highway in September 1987 and estimated that 20-30 caribou were shot there in 1987 versus less than a dozen in 1986 and far fewer than that in previous years.

Predator:Caribou Ratios

In winter 1986-87 we expanded wolf surveys to cover as much of the range of the FCH as possible; new areas included Crescent Creek and the lower Fortymile, upper Sixtymile, Goodpaster, and upper Charley Rivers. Based on the spring and winter wolf surveys and the wolf harvest (42), we estimated that at least 38 packs of wolves (totaling 241 individuals) occurred within the greater range of the FCH (Table 2, Fig. 8). In addition, we assumed there were an additional 24 single wolves (10%) in

the population in the fall. In 1986-87 few caribou were available to many of the wolves, particularly those living on the periphery of the caribou range, and additional packs occurred in areas used primarily by bull caribou. Thus the calculation of a meaningful wolf:caribou ratio becomes quite complicated.

If there had been about 14,000 caribou within the FCH range after the fall hunting season in 1986 (Valkenburg and Davis 1987), then the wolf:caribou ratio would have been about 1:53. However, all packs also had moose available as prey, and eight of the 38 packs had a few Dall sheep available as prey. Moose density within the range of the FCH was roughly estimated to be 100 moose/1,000 km² (Boertje et al. 1987; Gasaway, pers. comm.). Based on a range size of 44,000 km² for the FCH in 1986-87, there were about 4,400 moose within the range of the herd. Assuming 1 moose = 3 caribou (Van Ballenberghe 1985), there were about 265 wolves:27,200 caribou equivalents present, or 1 wolf:103 caribou equivalents. The approximately 400 sheep present in the area were excluded from the calculations of ungulate biomass because their numbers were insignificant: approximately 200 caribou equivalents assuming 2 sheep = 1 caribou, after Van Ballenberghe (1985).

It is instructive to compare wolf:ungulate ratios in 1986, when the caribou population was increasing at slightly less than 10% per year, with the probable ratio present 10 years earlier, when caribou numbers first began increasing. Assuming little or no increase from 1973 to 1976, the caribou population in the fall of 1976 probably numbered about 6,000 (Valkenburg and Davis 1987). Moose and wolf numbers in 1976 were probably about the same as in 1986: 4,400 and 265, respectively (Davis et al. 1978; Boertje et al. 1987; Gasaway et al. 1988; Gasaway, pers. comm.).

If the above assumptions are correct, then in 1976 there were 1 wolf:23 caribou and 1 wolf:72 caribou equivalents (including caribou and moose). These ratios are considerably lower than the ratio at which wolves are considered likely to control caribou numbers (Pimlott 1967, Mech 1970, Parker 1972, Bergerud 1983). This apparent contradiction has several possible explanations, including possibly biased estimates of wolves and prey. However, we suspect that the most likely explanation is that wolves were forced to switch from caribou to other prey when the herd declined in size and the caribou range shrank. The wolf population declined dramatically from 1973 to 1976, probably from natural causes and, perhaps, increased vulnerability to trapping (Gasaway et al. 1988). Alternate prey (i.e., moose and sheep) also declined in the mid-1970's and have not recovered significantly, despite the existence of lowered wolf numbers for over 10 years (Gasaway and Heimer, pers. comm.).

Caribou Consumption by Wolves

To understand the FCH's population dynamics, it is essential to ascertain the annual take of caribou by wolves. We estimated the number of adult caribou that the wolf population within the FCH range consumed from 1 September 1986 through 31 August 1987. Observations and analyses by Burkholder (1959), Skoog (1968), Kuyt (1969), and Davis et al. (1978) suggest each wolf kills the equivalent of about 24 caribou/year. In addition, Kelleyhouse (unpubl. data) estimated that 3 wolf packs just south of the FCH range killed at a rate of 0.71 moose equivalents/wolf/month during the winter of 1986-87. Assuming that 1 moose = 3 caribou, the 25.5 caribou/wolf/year estimate is very similar to the others.

The winter (Sep-May) diet assumptions for the 38 wolf packs in the FCH's range were as follows: (1) 8 packs (38 wolves) consumed 52.6 caribou (Table 2), which composed 75% of their diet; (2) 12 other packs (87 wolves) consumed more caribou (66% or 1,034 caribou) than moose (Table 2); (3) 8 other packs (56 wolves) consumed more moose than caribou (33% or 333 caribou); and (4) the remaining ten packs (60 wolves) consumed only about 108 caribou (10%) and were thought to be living on mostly moose. Using the above assumptions about diet, the average wolf within the FCH range would have eaten about 8.3 caribou/year. Assuming a similar diet for the 24 lone wolves, about 2,200 caribou ($\geq$3 months) would have been killed by wolves during 1986-87. However, from November 1986 to April 1987, 42 wolves were removed from the population. Assuming these removed wolves had killed only half as many caribou as the others, about 2,025 caribou would have been killed from September through May. Assuming wolves had killed caribou (older than calves) in the summer of 1987 at about half the winter rate, 227 caribou would have been killed in summer 1987. Therefore, about 2,250 caribou ($\geq$3 months) were killed between 1 September 1986 and 1 September 1987.

The 2,250 caribou calculated to have been killed by wolves equates to 16% of 14,000 caribou ($\geq$3 months); this annual mortality rate compares with that (i.e., 13%) for the radio-collared adults. From 1985 to 1987 the mean calf:female ratio in the fall was 34:100. Based on an assumed mean recruitment of 34 calves:100 females and a male:female ratio of 42:100, the maximum rate of increase for the population (assuming no adult mortality) was 24.3% per year. With 16% adult mortality estimated for wolf predation, the observed rate of population growth should have been about 8.3%, which compares with an estimated 10% rate of annual growth from 1984 to 1986 (Valkenburg and Davis 1987).

ACKNOWLEDGMENTS

We are grateful to Rod Boertje for helping with field work and to Chuck Gewin for his voluntary assistance with field work and creation of a computerized data storage file. Researchers in Alaska and other areas where flying is a necessary part of field activities are fortunate when they can find unusually competent pilots who also share an interest in the work. We feel particularly fortunate to have had Ron Warbelow's assistance with both Super Cub and helicopter flying. We also are grateful for Wayne Regelin's and Steve Peterson's continued support for the project and critical review of manuscripts.

LITERATURE CITED

Bergerud, A. T. 1964. A field method to determine annual parturition rates for Newfoundland caribou. J. Wildl. Manage. 28(3):477-480.

_____. 1983. The natural population control of caribou. Pages 14-61 in F. L. Bunnell, D. S. Eastman, and J. M. Peek, eds. Symposium on the natural regulation of wildlife populations. Univ. Idaho For. Wildl. and Range Exp. Sta.

Boertje, R. D., W. C. Gasaway, D. V. Grangaard, D. G. Kelleyhouse, and R. O. Stephenson. 1987. Factors limiting moose population growth in Game Management Unit 20E. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-5. Juneau. 86pp.

Burkholder, B. L. 1959. Movements and behavior of a wolf pack in Alaska. J. Wildl. Manage. 23(1):1-11.

Davis, J. L., R. T. Shideler, and R. E. LeResche. 1978. Fortymile caribou herd studies. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-17-6 and W-17-7. Juneau. 153pp.

_____, P. Valkenburg, and S. J. Harbo. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-17-11. Juneau. 23pp..

Gasaway, W. C., R. D. Boertje, D. V. Grangaard, D. G. Kelleyhouse, and R. O. Stephenson. 1988. Factors limiting moose population growth in Game Management Unit 20E. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Juneau. In press.

_____, R. O. Stephenson, J. L. Davis, P. E. K. Shepherd, and O. E. Burris. 1983. Interrelationships of wolves, prey, and man in Interior Alaska. Wildl. Monogr. 84. 50pp.

Holleman, D. F., and R. O. Stephenson. 1981. Prey selection and consumption by Alaskan wolves in winter. J. Wildl. Manage. 45:620-628.

Kuyt, E. 1969. Feeding ecology of wolves on barren-ground caribou range in the Northwest Territories. M.A. Thesis. Univ. Saskatchewan, Saskatoon, Canada.

Leopold, A. S., and F. F. Darling. 1953. Wildlife in Alaska. Ronald Press Company, New York. 129pp.

LeResche, R. E. 1975. The international herds: Present knowledge of the Fortymile and Porcupine Caribou Herds. Pages 127-139 in J. R. Luick, P. C. Lent, D. R. Klein, and R. G. White, eds. 1st Intl. Reindeer/Caribou Symp., Univ. Alaska, Fairbanks. Biol. Pap. Univ. Alaska, Spec. Rep. No. 1.

Mech, L. D. 1970. The wolf: ecology of an endangered species. Doubleday, New York, N.Y. 384pp.

Murie, O. J. 1935. Alaska-Yukon caribou. North American Fauna No. 54. U.S. Dep. Agric., Washington, D.C. 93pp.

Parker, G. H. 1972. Biology and the Kaminuriak population of barren-ground caribou. Part I. Can. Wildl. Serv. Rep. Ser. 20. Ottawa. 95pp.

Pimlott, D. H. 1967. Wolf predation and ungulate populations. Am. Zool. 267-278.

Singer, F. J. 1985. Dynamics of caribou and wolves in Denali National Park, 1898-1985. U.S. National Park Service, Anchorage. Unpubl. rep. 47pp.

Skoog, R. O. 1956. Range, movements, population, and food habits of the Steese-Fortymile caribou herd. M.S. Thesis. Univ. Alaska, Fairbanks. 145pp.

_____. 1968. Ecology of the caribou (Rangifer tarandus granti) in Alaska. Ph.D. Thesis. Univ. California, Berkeley. 699pp.

Valkenburg, P., and J. L. Davis. 1986. Calving distribution of Alaska's Steese-Fortymile Herd: A case of infidelity? Rangifer. Spec. Issue No. 1.

_____, and _____. 1987. Population status of the Fortymile Caribou Herd and identification of limiting factors. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-5 and W-22-6. Juneau. 17pp.

Van Ballenberghe, V. 1985. Wolf predation on caribou: The Nelchina Herd case history. J. Wildl. Manage. 49(3):711-720.

White, G. C. 1983. Numerical estimation of survival rates from band recovery and biotelemetry data. J. Wildl. Manage. 47:716:728.

PREPARED BY:

Patrick Valkenburg
Game Biologist II

James L. Davis
Game Biologist III

SUBMITTED BY:

Wayne L. Regelin
Regional Research Coordinator

APPROVED BY:

W. Lewis Pamplin, Jr.
Director, Game Division

Steven R. Peterson
Chief of Research, Game Division

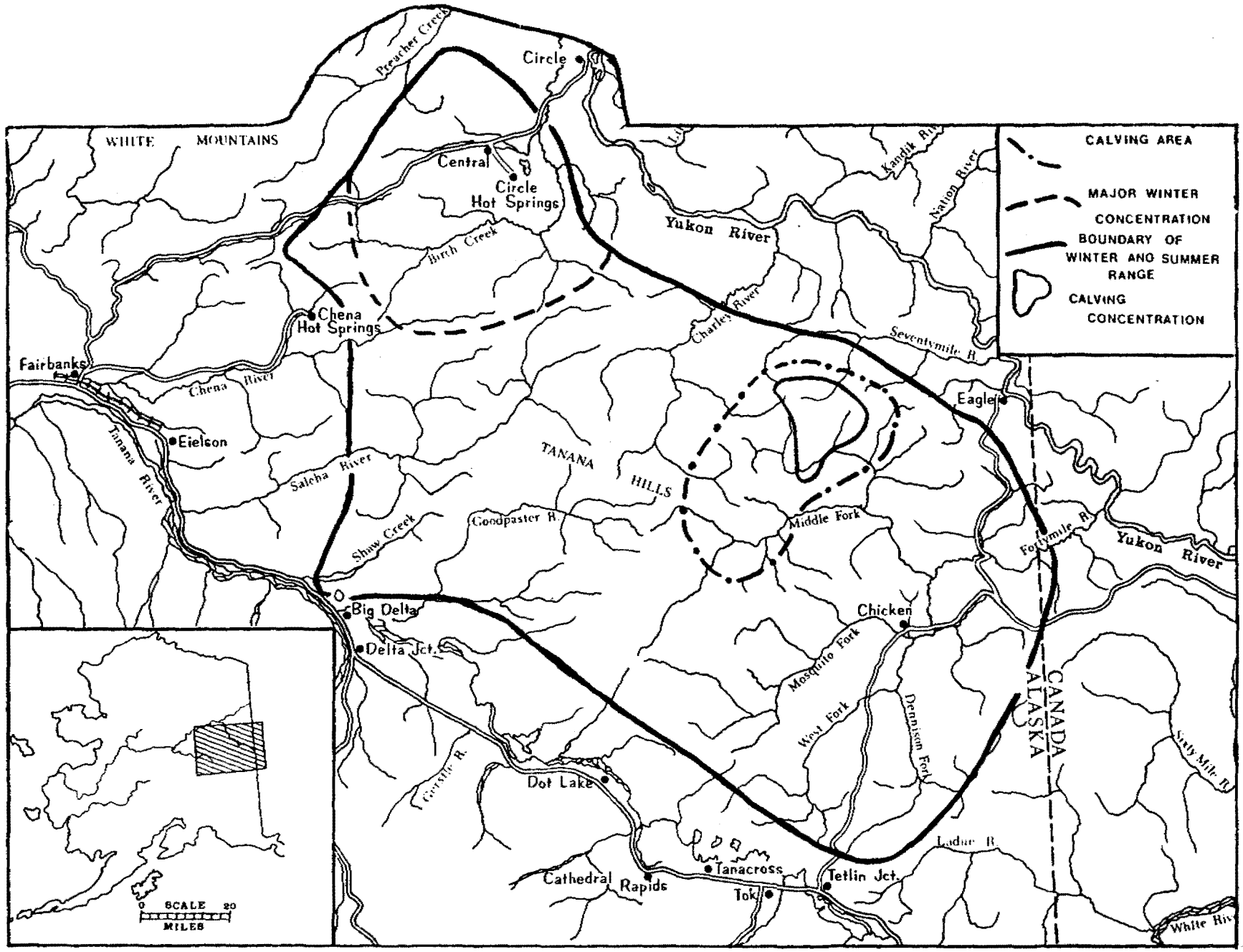


Fig. 1. Distribution of the Fortymile Caribou Herd (FCH), 1 October 1981-30 September 1982.

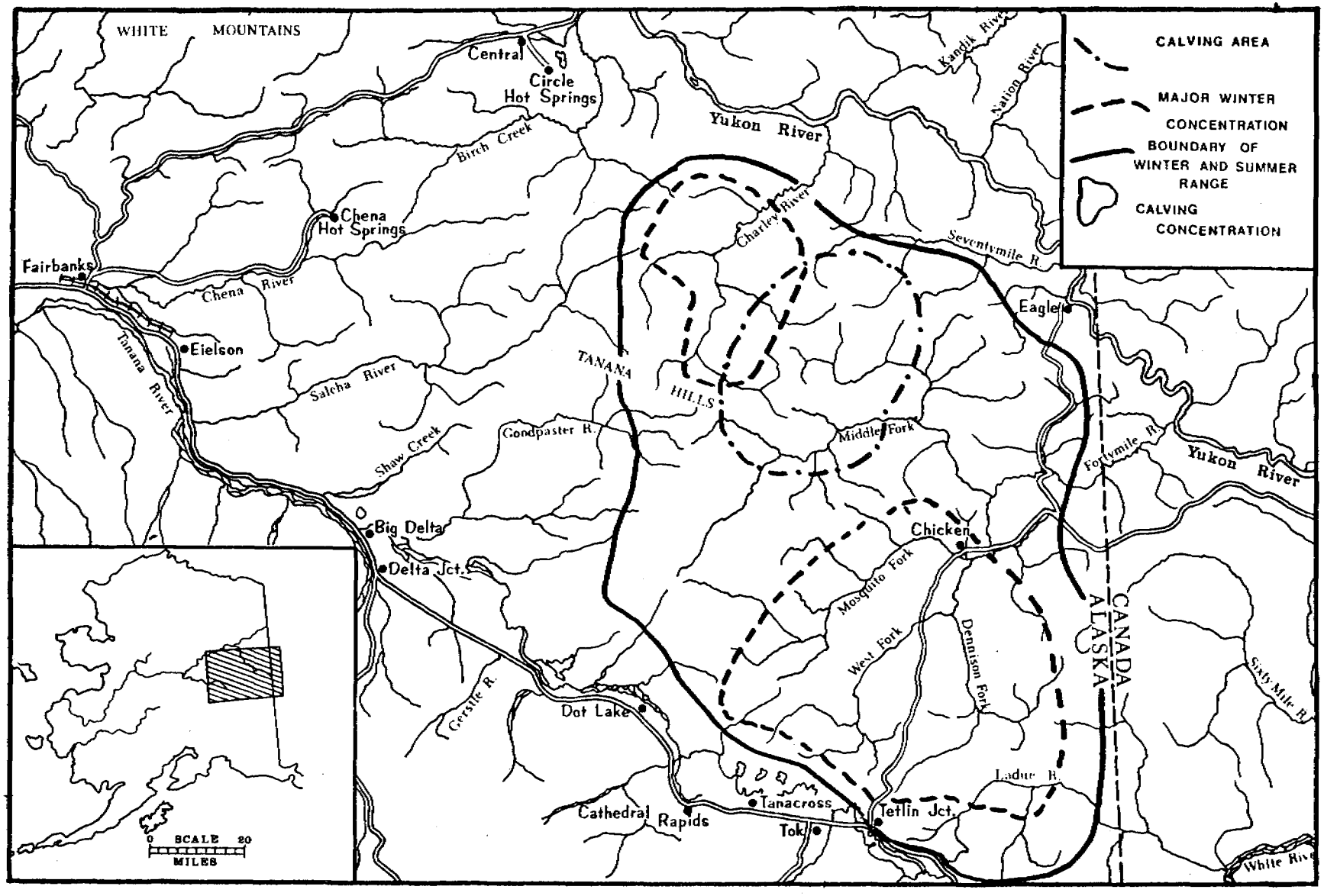


Fig. 2. Distribution of the FCH, 1 October 1982-30 September 1983.

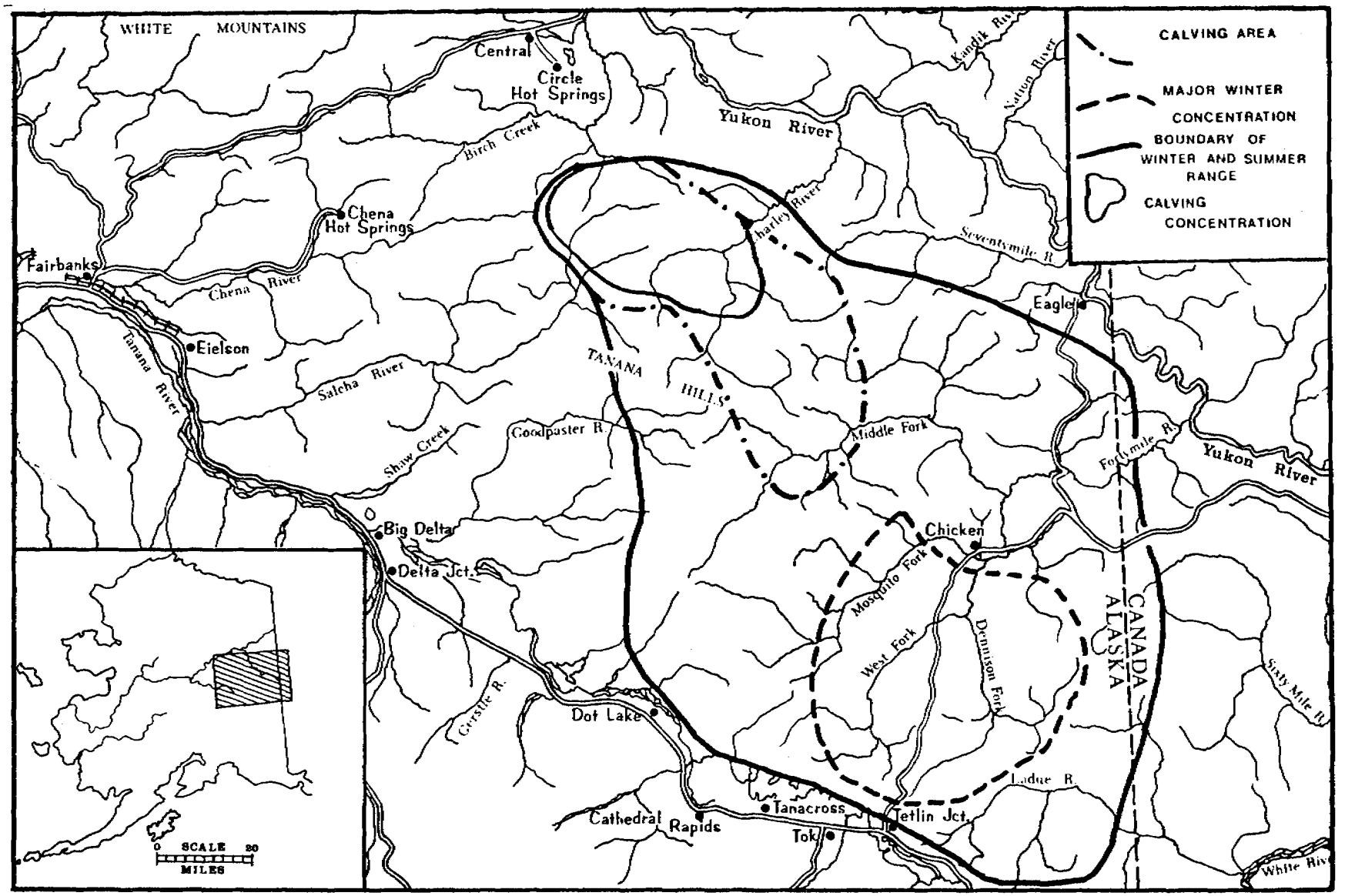


Fig. 3. Distribution of the FCH, 1 October 1983-30 September 1984.

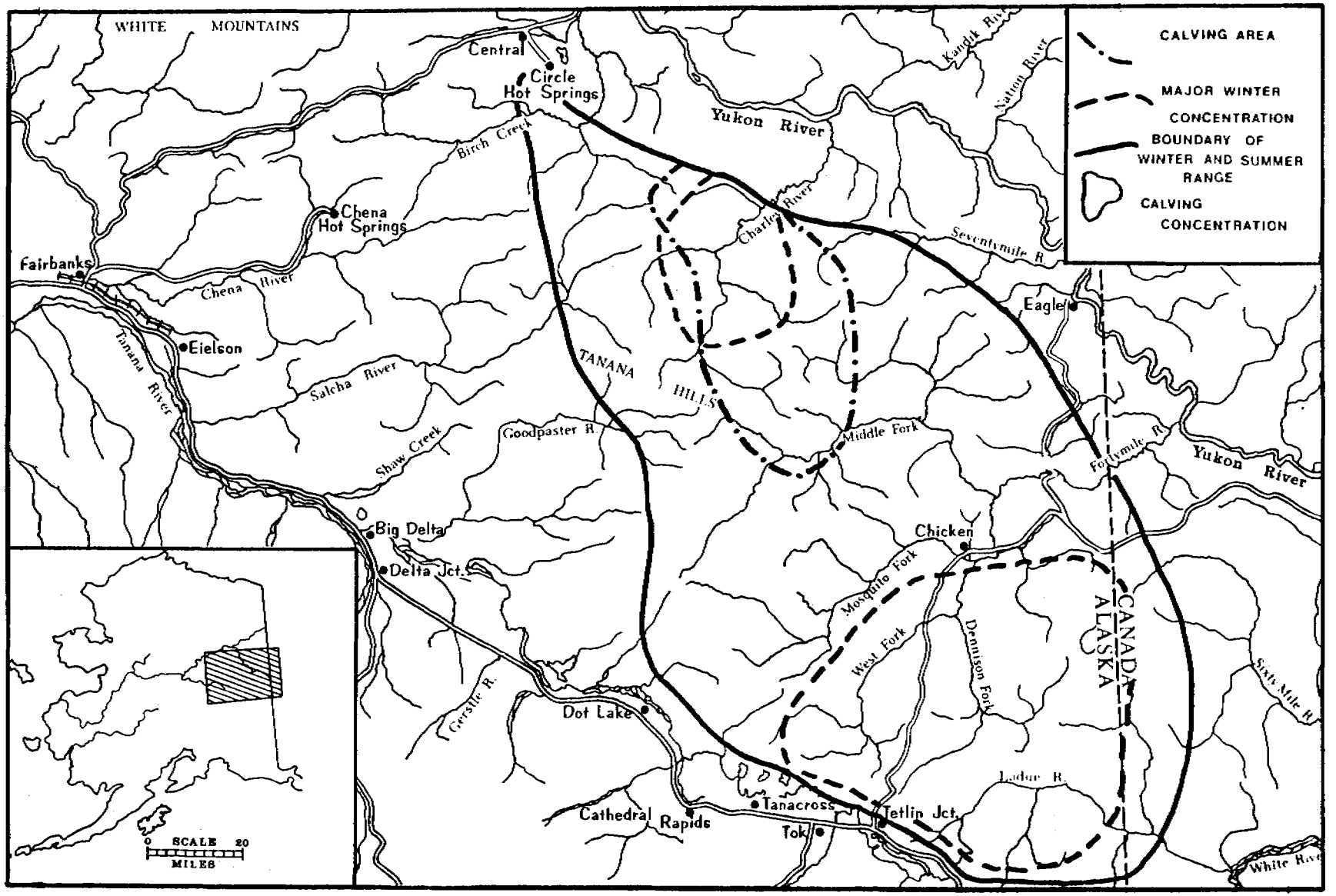


Fig. 4. Distribution of the FCH, 1 October 1984-30 September 1985.

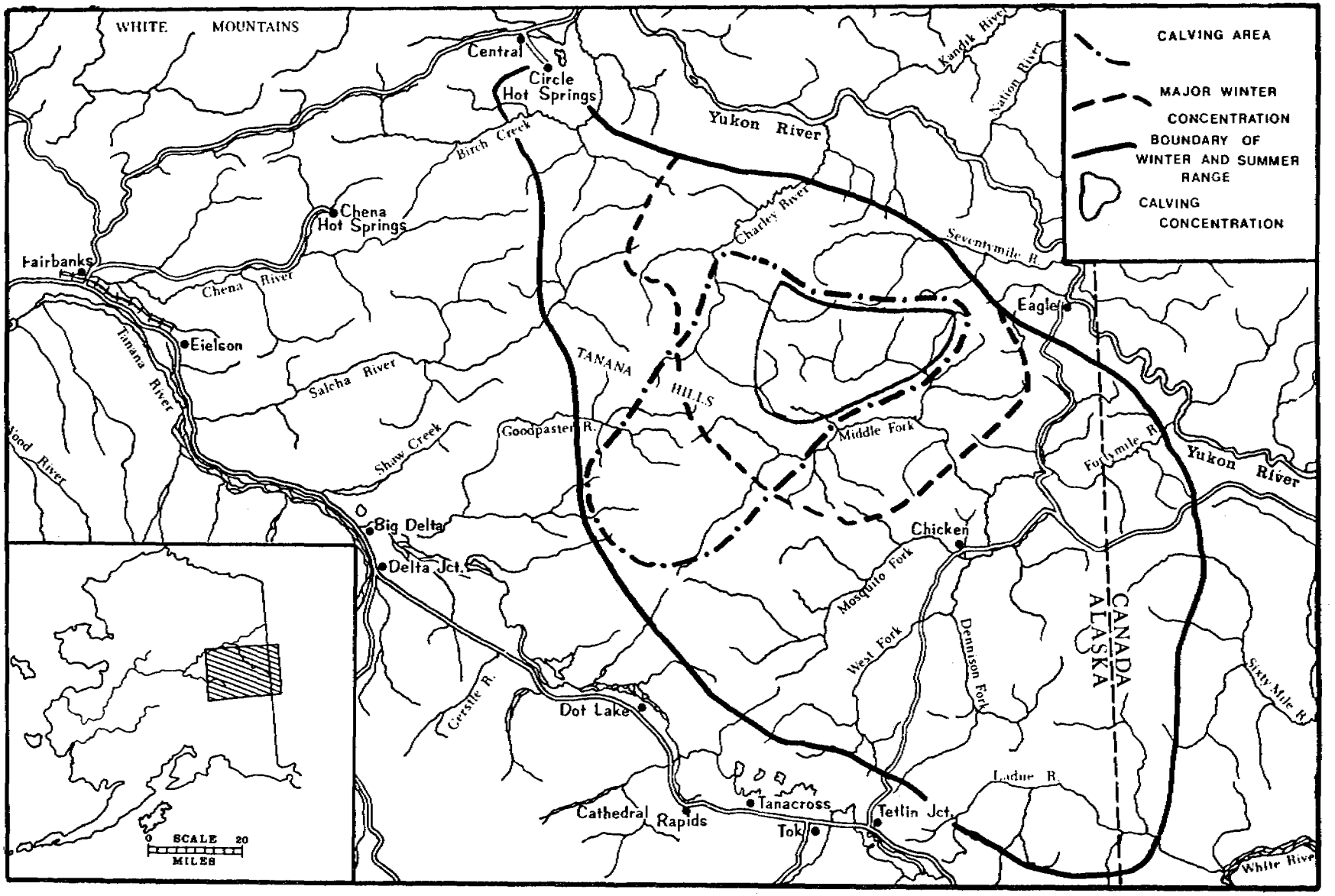


Fig. 5. Distribution of the FCH, 1 October 1985-30 September 1986.

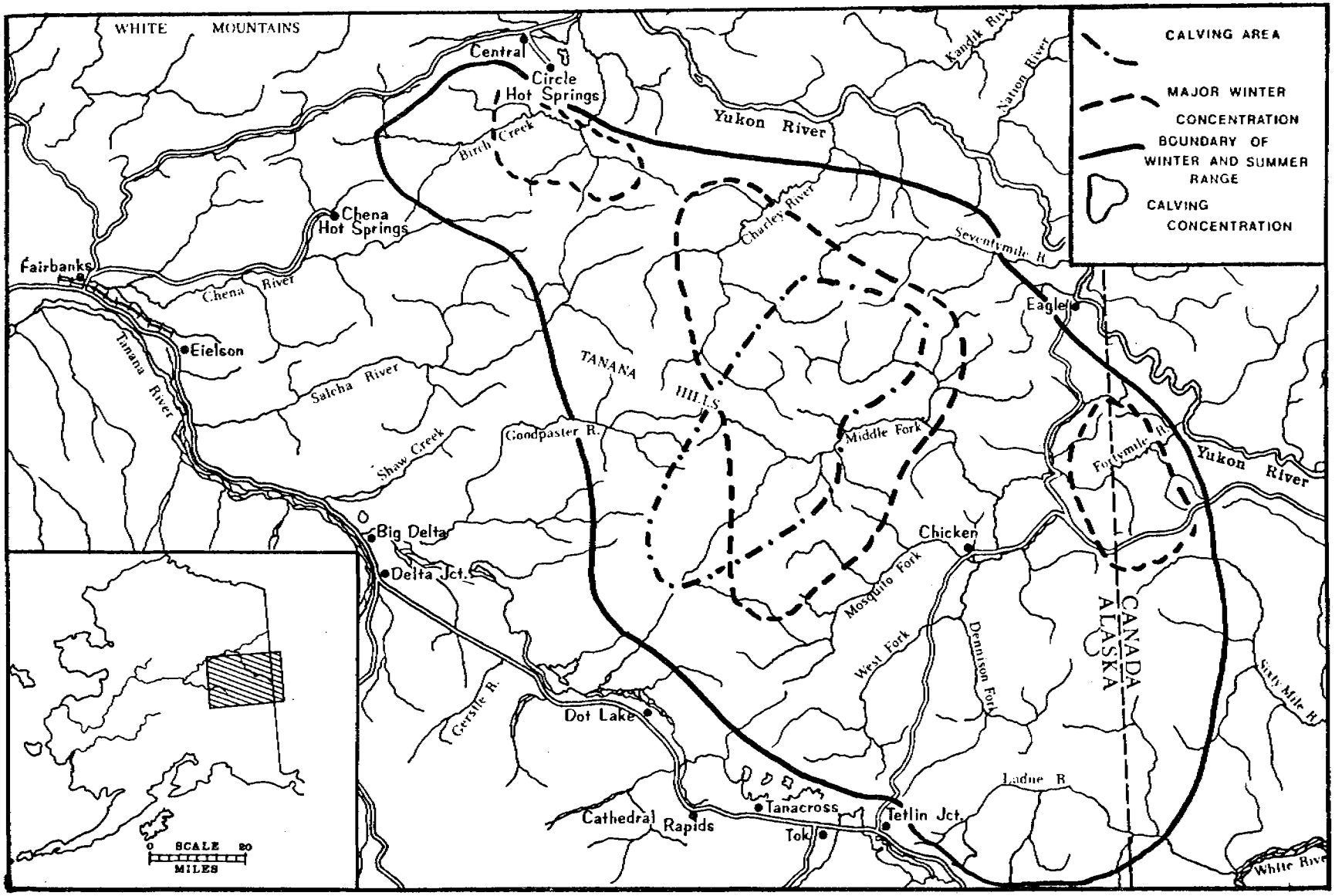


Fig. 6. Distribution of the FCH, 1 October 1986-30 September 1987.

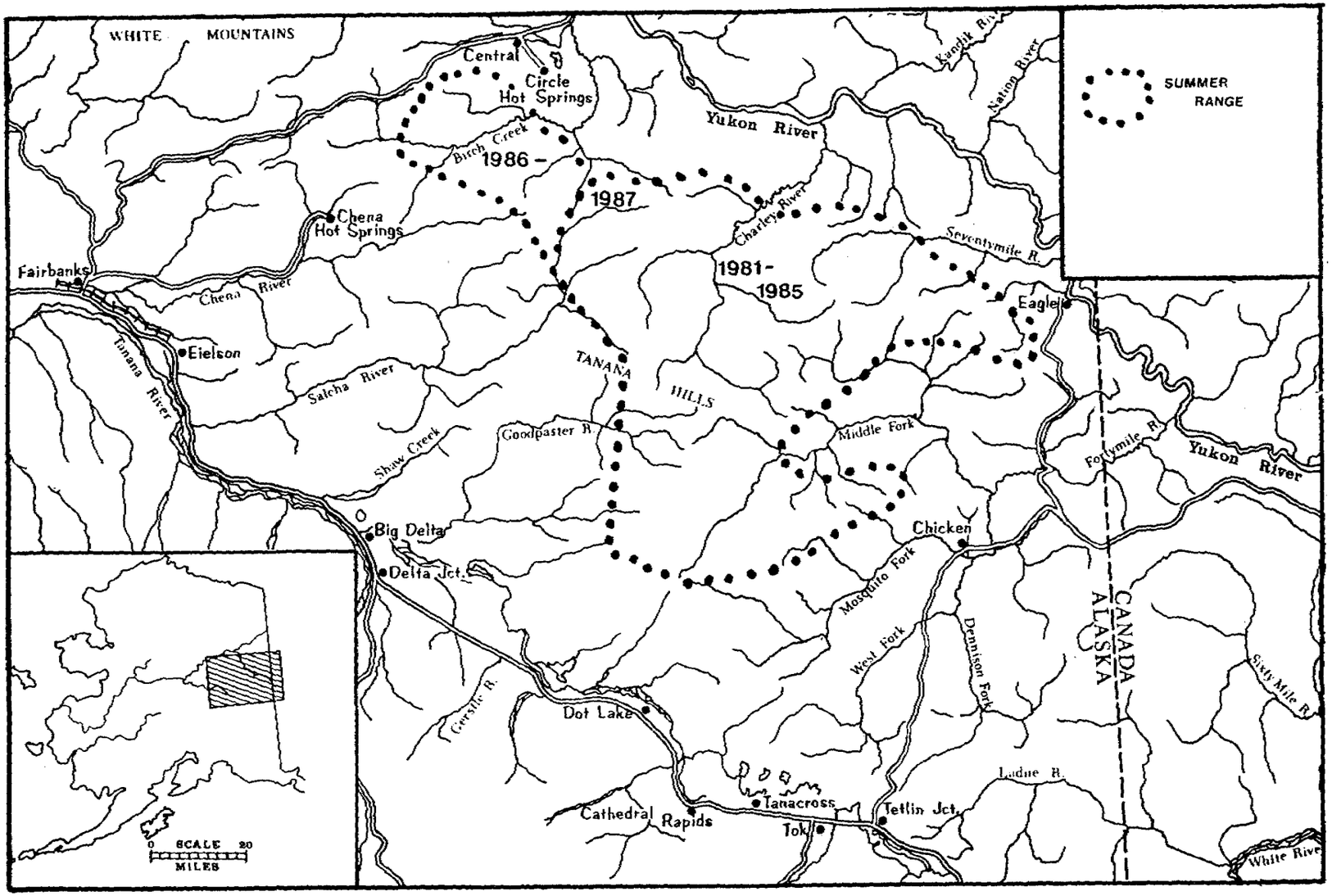


Fig. 7. Summer range of the FCH, 1981-87.

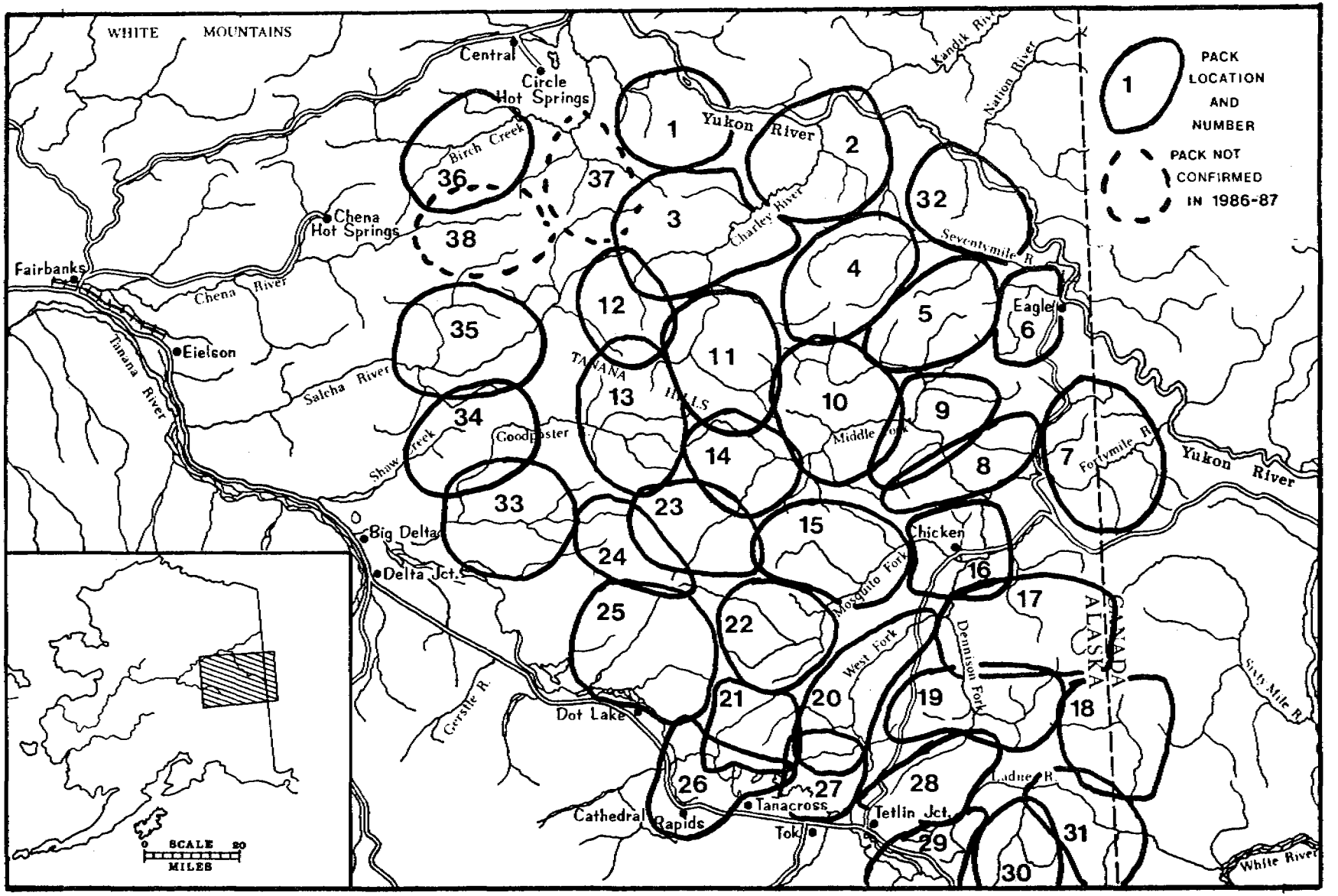


Fig. 8. Location and pack number of wolf packs within the range of the Fortymile Caribou Herd. Note: pack number corresponds to numbers in Table 2.

Table 1. Sex and age composition of the Fortymile Caribou Herd, 1953-87.

Date	Bulls: 100 cows	Yrlgs: 100 cows	Calves: 100 cows	Yrlg % in herd	Total yrlgs counted	Calf % in herd	Total calves counted	Cow % in herd	Total cows counted	Bull % in herd	Total bulls counted	Total caribou counted
11/53	--	--	--	--	--	29	66	--	--	--	--	228
10/54	78	--	64	--	--	26	50	41	78	32	61	189
10/55	--	--	--	--	--	16	268	--	--	--	--	1,659
10/56	--	--	--	--	--	5	34	--	--	--	--	737
10/57	--	--	--	--	--	5	26	--	--	--	--	576
8/58	--	--	--	--	--	33	40	--	--	--	--	127
10/59	--	--	--	--	--	36	164	--	--	--	--	124
1960	No data											
10/61	75	30	45	12	133	18	200	40	444	30	333	1,110
10-11/62	--	--	--	--	--	11	85	--	--	--	--	743
1963-71	No data											
10/72	31	17	21	10	66	13	84	60	400	18	122	672
6/6/73	--	--	57	--	--	--	638	--	1,120	--	--	1,758
9-10/73	43	9	16	5	170	10	318	60	1,974	26	845	3,307
6/4/74	0	0	50	0	6	33	502	67	1,011	0	0	1,519
6/6/74	0	0	55	0	0	36	183	64	330	0	0	513
6/28/74	18	3	24	2	37	17	276	69	1,148	13	211	1,672
9/20/74	32	6	20	4	35	12	108	63	553	20	176	872
9/21/74	35	9	21	5	46	13	110	61	525	21	185	866
9/74	33	8	20	5	81	13	218	62	1,078	21	361	1,738
1975	No data											
9/23-24/76	42	11	35	6	54	18	164	53	476	22	202	896
6/13/77	--	--	39	--	--	39	631	--	1,621	--	--	2,252
9/27-28/77	52	14	45	7	75	21	245	47	543	25	287	1150
6/14/78	--	--	35	--	--	26	123	74	356	--	--	479
10/19-20/78	39	14	26	8	59	15	109	56	417	22	163	748
1979	No data											
6/11/80	25	10	41	6	132	23	559	57	1,371	14	338	2,400
10/14-15/80[a]	109	--	61	--	--	23	222	37	364	40	396	928[a]

Table 1. Continued.

Date	Bulls: 100 cows	Yrlgs: 100 cows	Calves: 100 cows	Yrlg % in herd	Total yrlgs counted	Calf % in herd	Total calves counted	Cow % in herd	Total cows counted	Bull % in herd	Total bulls counted	Total caribou counted
6/10/81	22	--	31	--	--	20	600	65	1,928	14	427	2,956
9/26/81	52	--	31	--	--	17	171	54	547	29	286	1,004
9/29/82	54	--	27	--	--	15	241	55	901	30	483	1,625
4/19/83	35	--	25	--	--	18	68	61	236	21	83	387
6/8/83	6	7	35	5	142	24	743	67	2,097	4	136	3,118
6/19/83	22	9	38	6	70	22	279	59	741	13	162	1,252
9/20/83	44	--	30	--	--	17	166	58	560	25	247	973
10/7/83	61	--	36	--	--	18	180	51	498	31	302	980
3/22/84	16	--	27	--	--	19	206	70	754	11	123	1,083
5/30-6/1/84	1	2	72	1	29	41	1,072	57	1,478	1	10	2,589
6/20/84	42	--	45	--	--	24	954	53	2,098	23	888	3,940
4/27/85	16	--	32	--	--	22	190	68	593	11	93	876
5/25/85[a]	8	70	39	32	135	18	75	46	193	4	15	418
6/19/85	18	--	48	--	--	29	1,103	60	2,285	11	415	3,803
10/16/85	50	--	36	--	--	19	208	54	574	27	285	1,067
4/29/86	14	--	40	--	--	26	153	65	380	9	53	586
10/13/86	36	--	30	--	--	17	235	61	842	22	304	1,381
6/27/87	46	--	47	--	--	25	883	52	1,860	24	853	3,596
9/28/87	40	--	37	--	--	21	475	57	1,274	22	504	2,253

[a] These counts were probably not representative of the herd.

Table 2. Estimated size, harvest, and suspected diet of wolf packs within the range of the Fortymile Caribou Herd, 1986-87.

Pack No.[a]	Pack name	Size in fall 1986[b]	Harvest in 1986-87[c]	Size and composition spring 1987[d]	Estimated diet	Radiocesium concentration (pCi/kg) in wolf muscle tissue $\bar{x}$, SD (n)
1	Webber	4	0	4	Mostly moose	--
2	Bonanza	5	1 Black	4	Mostly moose	--
3	Twin Mountain	9	0	8 All black	Caribou, moose, sheep	--
4	Seventymile	8	0	8	Caribou, moose, sheep	--
5	Copper/Slate	3	0	3	Mostly caribou, sheep	--
6	Mission	4	0	4	Moose, caribou, sheep	--
7	Steele	5	0	5	Bull caribou, moose	--
8	Alder	2	0	2	Mostly caribou	--
9	Portage	13	3 All black	10 Mostly black	Caribou, moose	1568,13 (3)
10	Slate	13	1 Black	12 Mostly black	Mostly caribou	8131,n.a.(1)
11	Copper Mountain	7	0	7	Mostly caribou	--
12	Paldo/Crescent	3	0	3	Caribou, moose, sheep	--
13	Eisenmenger	7	1 Gray	6	Caribou, moose, sheep	--
14	Joseph	5	0	5 All black	Caribou, sheep	--
15	Gold Creek	9	3 All black	6 All black	Caribou, moose	1451,264(3)
16	Chicken	7	4 3 black, 1 gray	3 2 gray, 1 black	Caribou, moose	4803,198(4)
17	Liberty	6	0	6 All gray	Caribou, moose	--
18	McCord	9	0	9	Bull caribou, moose	--
19	Fairplay	2	2 Both gray	0	Mostly caribou	813,356(2)
20	West Fork	2	0	2	Mostly caribou	--
21	Mansfield	12	4 3 gray, 1 black	8 Mostly gray	Mostly moose	2053,1523(3)
22	Mitchels Ranch	8	3 All gray	5 All gray	Moose, caribou	4624,730(2)
23	Middle Fork	5	1 Gray	4 Mostly gray	Caribou, moose, sheep	3077,n.a.(1)
24	Divide	2	0	2	Caribou, moose	--
25	Billy	10	7 All gray	3 All gray	Mostly moose	513,47(8)
26	Cathedral	2	0	1 1 black, 1 gray	Mostly moose	--

Table 2. Continued.

Pack No.[a]	Pack name	Size in fall 1986[b]	Harvest in 1986-87[c]	Size and composition[d] spring 1987	Estimated diet	Radiocesium concentration (pCi/kg) in wolf muscle tissue $\bar{x}$, SD (n)
27	Mosquito Flats	5	3 All black	2 Mostly black	Moose, caribou	5229,2762(3)
28	Dennison	3	0	3 Mostly gray	Mostly bull caribou	--
29	Big John	6	0	6	Moose, caribou	--
30	Black	7	2 Both black	5 All black	Moose, caribou	--
31	Ladue	7	1 Black	6	Mostly bull caribou	514,n.a.(1)
32	Michigan	5	0	5 All gray	Mostly moose	--
33	S Fk Goodpaster	10	0	10	Moose, caribou	--
34	Shaw	6	3 All gray	3 Mostly gray	Mostly moose	--
35	Caribou	9	3 All gray	6 Mostly gray	Mostly moose	--
36	Upper Birch	7	0	7 All gray	Mostly moose	--
37	South Birch	8	0	8	Moose, caribou	--
38	E Fk Chena	7	0	7	Mostly moose	--
Totals		241	42	199		
Plus 10% for lone wolves		24		20		
Grand total		265		219		

[a] Corresponds to numbers in Fig. 8.
[b] Size at start of trapping season. Estimated from results of spring wolf survey and harvest.
[c] Includes only reported harvest and wolves collected by ADF&G.
[d] Size after trapping (wolf surveys were conducted after the trapping season).
[e] These areas were not surveyed in 1987. Observations are from previous years.

Appendix A. Distribution of reported caribou harvest within the Yukon-Charley Rivers National Preserve, 1986-87.

Area	Number of hunters		
	Successful	Unsuccessful	Total
Upper Charley (including Threefinger Charley)	4	0	4
Upper Seventymile/ Mt. Sorensen	2	0	2
Diamond Fork/Arctic Dome	4	0	4
Total	10	0	10

Federal Aid Project
funded by your purchase of
hunting equipment