INUVIALUIT WILDLIFE STUDIES

WESTERN ARCTIC WOLF RESEARCH PROJECT

PROGRESS REPORT

1987-1988

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ABSTRACT

During the first year of research 42 wolves were captured and radio-collared. Four wolves died of capture related causes and 13 were killed by hunters. Twenty four wolves representing 15 packs were monitored from March 1987 to March 1988.

The wolves in the study area appear to have two strategies concerning movement. Some packs remain in a relatively small area all year long, while other packs will cover extensive areas. The areas covered by wolf packs ranged from 2518 to 25,286 sq km. Wolves that depend primarily on caribou would need to travel greater distances to maintain access to caribou and would therefore have larger ranges.

Female wolves appear to come into breeding condition from mid to late March. Nine dens were located in May-July 1987. Seven of the dens were found in the Anderson - Horton River area. This area might be selected by wolves to optimize their access to caribou. The area lies almost in the center of the Bluenose caribou herd migration route and would have some caribou in the area for most of the year. Nine packs were seen with pups at least once during summer and fall monitoring.

Forty-three prey kill sites were located (40 caribou, one reindeer and two moose). Cesium testing of muscle tissue from wolves taken in the area supports the assumption that the wolves are primarily caribou eaters.

Natural mortality during the first year of the study was low and the wolves captured appeared to be in good condition. Hunter and trapper harvest is low except where the wolves come above the treeline south of Husky (Eskimo) Lakes. Wolves in this area are vulnerable to hunting.

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1.0 INTRODUCTION

Wolves (Canis lupus) in the Inuvialuit Settlement Area are important to the natural ecosystem and the Inuvialuit. With the approval and signing of the Inuvialuit Final Agreement in 1984, wildlife research was identified as a priority to ensure that wildlife populations are properly managed. The Wildlife Management Advisory Council (WMAC) and the Inuvialuit Game Council (IGC) approved a wolf-prey research program because wolves in the area prey predominately on caribou (Rangifer tarandus), which is an important food species for Inuvialuit. Wolves are also an important fur resource used in the communities or sold for economic benefit. The Inuvialuit are interested in maintaining a wolf population that is a part of the natural environment and can meet their needs, yet not jeopardize their opportunity to harvest caribou.

The wolf and caribou populations appear healthy and increasing in the settlement area. Improving our understanding of wolf-prey relationships at this time provides the Department of Renewable Resources and the Inuvialuit with information necessary for responsible management. A wolf research commitment is particularly important in light of current widespread controversy over wolf population control and the fur harvest. This paper presents and discusses interim results of the first year (1987-88) of the research program.

1.1 Goals, Objectives and Hypotheses

Goals

1. To define and evaluate the relationship between wolves and caribou within the range of the Bluenose caribou herd, using research data and indigenous knowledge.
2. To collect information on wolf movements, pack structure, and range use.
3. To obtain data on wolf productivity and cohort survival.

Objectives (1987-88)

1. To radio-instrument up to 40 wolves found in association with the Bluenose caribou herd.
2. To collect data on the sex, age and condition of wolves in collared packs.
3. To monitor collared wolves and their associated packs to obtain information on wolf movement, territoriality, pack structure, breeding success and predation rates.
4. To investigate the productivity and pup survival of at least four wolf packs during summer.
5. To collect wolf skulls and carcasses harvested by hunters and trappers from the communities within and near the study area to determine: 1) reproductive history of females, 2) sex and age composition of the sample, and 3) location of harvested wolves.

6. To evaluate wolf food habits through: 1) the study of prey types killed by radio-instrumented packs; 2) radiocesium analyses of wolf muscle tissue and 3) investigation of stomach contents from necropsied wolves.

Hypotheses

1. Wolf distribution, pack size and den site locations within the range of the Bluenose caribou herd, will correlate with the presence of the Bluenose caribou herd.
2. Wolves associated with a caribou herd that exhibits migratory behavior, will not be territorial throughout the year.
3. Age and sex classes of the hunter and trapper wolf harvest will be similar to the sample of wolves captured for radio-collaring.
4. The wolf population is increasing in conjunction with the caribou, which will be reflected by a low adult cohort and high recruitment rates of wolves.
5. The number of female wolves that successfully breed in the spring is not related to pack size.
6. Pup survival in summer is not affected by prey availability to supporting adults.

Objective 4 and Hypothesis 6 are being investigated in part by Mark Williams (Caribou Technician, Renewable Resources, Yellowknife) as part of a Masters Degree.

1.2 Wolf-Prey Population Background

Wolves

The theory and approach to evaluating wolf-prey relationships has been discussed by Keith (1983), Packard et al. (1983), Packard and Mech (1983), Heard and Boutin (1982), Bergerud (1974) and others. This work has shown that the utility of such evaluation to the management of a given predator-prey population, is dependent on our collective understanding of predator-prey relationships obtained from studies throughout the range of wolves, and more specifically, on our understanding of the particular population or area of concern.

Recent studies of wolf-prey relationships in the north have been undertaken in the Yukon (Hayes and Barichello 1986, Hayes and Baer 1985, Hayes et al. 1985, Jakimchuk et al. 1974) and Alaska (Weiler et al. 1985, and 1986, Stephenson and James 1982, Ballard et al. 1981).

Wolf populations and wolf predation associated with large caribou herds have also been studied in the Northwest Territories (Heard et al. (In prep.), Miller 1983, Parker 1973, Kuyt 1972, Clark 1971). Heard et al. (In prep.) conducted the first project in the Northwest Territories that used radio-collared wolves to determine movements and home range.

Incidental information on wolves within the Western Arctic claim area has been recorded during previous research on the Bluenose caribou herd (Carruthers et al. 1986, Latour et al. 1986, Williams and Elliott 1985, Carruthers and Sopuk 1982, Carruthers and Jakimchuk 1981, Thomas 1969, Hawley and Pearson 1966). This work primarily documented the occurrence of wolves, but did not provide detailed information of wolf-caribou relationships. The present study represents the first intensive study of wolves associated with the arctic barrenlands ecosystem in North America.

Caribou

Caribou are the predominant ungulate prey species in the study area. The barren ground caribou within the study area belong to the Bluenose herd which migrates from their calving grounds near Bluenose Lake to their winter feeding grounds as far west as the Mackenzie River. Past surveys and studies have been done on the Bluenose herd to determine their numbers, distribution, movements and recruitment (Carruthers et al. 1986, Latour et al. 1986, Latour and Heard 1985, Williams and Elliott 1985, Latour 1983, Carruthers and Sopuk 1982, Carruthers and Jakimchuck 1981, Hawley et al. 1979, Wooley and Mair 1977, Decker 1976, Thomas 1969, Hawley and Pearson 1966).

Recent caribou research involving radio telemetry has refined previous survey techniques and has produced more accurate population estimates, classified counts and calving ground

and the west shore of Bluenose Lake serve as the eastern limit; and the southern boundary curves to the southwest from the south tip of Bluenose Lake passing across the southeast shore of Horton Lake and through the community of Colville Lake on its return to Inuvik.

2.1 Climate

Classified as a polar continental climate region, the study area is characterized by long periods of extreme cold in winter, short cool summers and light precipitation. The nearest descriptive weather station data (Atmospheric Environment Services 1982) was obtained from Inuvik which is located inland on the western edge of the study area. Inuvik weather data will indicate the general climate, but do not accurately reflect coastal conditions. Detailed weather data for most of the area are unavailable.

Mean daily temperatures for the coldest month and warmest month for Inuvik are -29.6 (January) and 13.6 (July) degrees Celsius. Extreme maximum and minimum temperatures recorded from 1951-1980 are 31.7 and -56.7 degrees Celsius respectively.

Precipitation is generally light throughout the study area. The mean annual precipitation for Inuvik is 27 cm and the mean annual snowfall is 177 cm. Most of the snowfall occurs from

October to February. The accumulation of snow is not excessive, however, the snowcover generally persists into June for much of the study area.

Fog and low lying clouds are common, particularly on the coast, from September to October when lake ice and landfast sea ice begin to form and then again during spring break-up in May and June.

Solar Radiation is minimal during December and January. The mean total bright sunshine hours for December is 0.0 and for January, 7.3 hours. Solar radiation increases rapidly from February until June with the onset of continuous daylight and a monthly mean of 375.1 total bright sunshine hours.

2.2 Physiography

The study area can be subdivided into two basic physiographic regions; Arctic Coastal Plain and Interior Plateaus and Plains (Mackay 1963).

Arctic Coastal Plain

This region is characterized by low topography underlain by stratified sediments and covered by clay loam/loam surface materials. Much of the region is carpeted by a peat layer, 1-3 m thick and a high percentage of the land area is occupied by small lakes, connecting creeks and streams (Mackay 1963). The study area included in this region consists of the Tuktoyaktuk Peninsula, Bathurst Peninsula and the upland area between the lower Horton and Anderson Rivers.

As a result of the extreme and harsh climate the ground is perennially frozen. Permafrost exists throughout except beneath the larger lakes and rivers. The soil moisture content in the active layer of the permafrost is generally high. Frost action disturbing the surface materials, results in a landscape marred by earth hummocks, polygons and pingos.

Interior Plateaus and Plains

The remainder of the study area is classified as interior plateaus and plains and is referred to as the MacKenzie Uplands (Bird and Bird 1961). The most notable upland areas include the Melville Hills, Smoking Hills and Colville Hills. The characteristic plateaus and plains have developed from sedimentary rock deposited on top of the Canadian Shield.

This area is typified by low rolling hills, numerous lakes and three prominent river systems (Anderson, Horton and Hornaday Rivers) which enter the Arctic Ocean. The Smoking Hills/Horton River badlands are an exception as few lakes can be found amongst these eroded cretaceous shale uplands.

In much of the area evidence of fresh glacial landforms such as eskers, moraines, drumlins, hummocky terrain, and a profusion of glacial till can be found.

2.3 Vegetation

The predominant vegetation type in the arctic is perennial. For most plant species, the growing season is far too short for growth and propagation to be completed in one season. Many plants grow close to the ground to avoid wind abrasion and desiccation. Arctic flora is characterized by a rapid development with a low annual growth rate.

The study area may be subdivided into four general vegetation communities; sedge tundra, shrub tundra, forest-tundra transition and open forest.

Sedge Tundra

Lowland areas on Tuktoyaktuk Peninsula support extensive areas of sedge meadows dominated by sedge (Carex spp.) and cottongrass (Eriophorum spp.) tussocks. Willows (Salix spp.) are scattered throughout. Dwarf birch (Betula glandulosa) and Labrador tea (Ledum palustre) are found in drier areas which support patches of shrub tundra communities.

Shrub Tundra

The area is dominated by low growing shrubs such as dwarf birch, willow, alder (Alnus crispa), Labrador tea, Lapland rosebay (Rhododendron lapponicum) and Arctic white heather (Cassiope tetragona). Tree species present, like the birch and willow, have had to adopt a dwarfed form to escape the desiccative effect of strong winds (Watts 1968). Dry upland areas may only support low shrubby and herbaceous tundra vegetation. Peat bogs and sedge-willow marshes are characteristic of wet low lying areas. There are also scattered sedge and cottongrass tussock meadows and sedge meadows within shrub tundra areas.

White spruce (Picea glauca) occurs only in the moist, sheltered river valleys and creek beds together with stands of tall shrubs (2-3m). Associated plant species include willow, birch, ericoids, lupins and mosses.

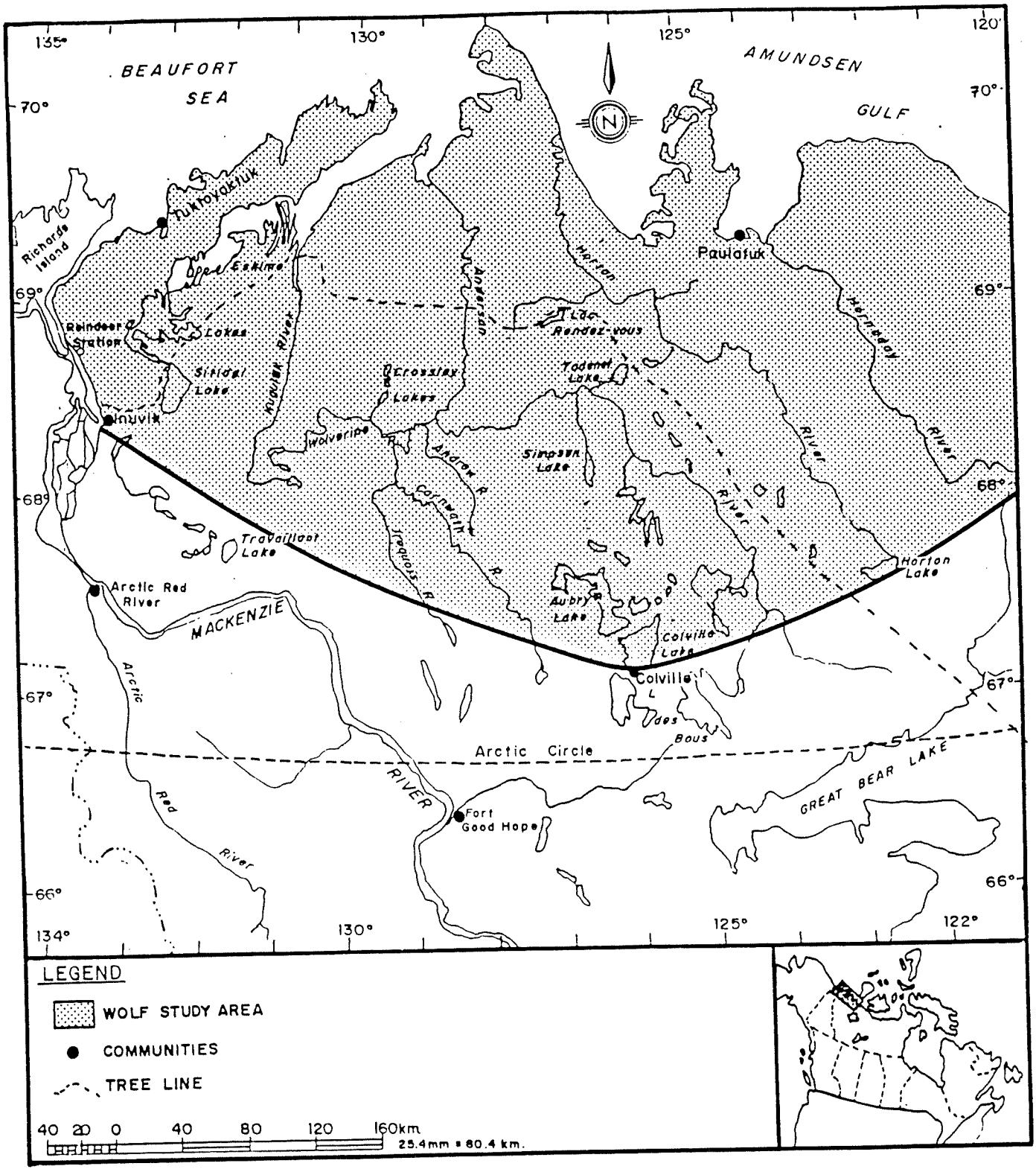

Figure 1. Western Arctic Wolf Research Study Area, 1987-88.

Forest-Tundra Transition

Between the forest and the tundra there is a transition zone where plant species from both areas intermingle. Wind sheltered creeks and stream beds support stands of white spruce while upland areas form a mosaic of scattered stands of spruce (Picea sp.) and shrub tundra. Periodic fires, low temperatures, wind exposure and instability of permafrost soils keep the trees from completely taking over and thus tundra plant communities persist in the upland areas.

Open Forest

The major forest type is dominated by white spruce. On open slopes and hilltops, stands may be composed entirely of white spruce with a ground cover of lichens. Trees are generally under 7 m in height and are widely spaced. On poorly drained soils black spruce (Picea mariana) and tamarack (Larix laricina) predominate. Earth hummocks are commonly covered with lichens (Cladina sp., Cladonia sp. and Cetraria sp.) and depressions between hummocks contain sphagnum moss (Sphagnum sp.). The dominant shrub species include willow and alder. These grow in dense stands along moist stream and creek valleys.

2.4 Wildlife

The study area is inhabited by a variety of wildlife species which form the basis of the hunting and trapping economies. Wolves

are found throughout the study area. Grizzly Bears (Ursus arctos) inhabit most of the study area. Black bears (Ursus americanus) are common in the forested areas. Muskrat (Ondatra zibethicus), marten (Martes americana), red fox (Vulpes vulpes) and arctic fox (Alopex lagopus) are common. Barren-ground caribou are the predominant ungulate. The Bluenose herd, ranges from its calving grounds, near Bluenose Lake to its wintering grounds which extend as far west as the MacKenzie River. Woodland caribou (Rangifer tarandus caribou) are common below treeline. Muskox are found in the eastern half of the study area. Moose inhabit the river drainages.

3.0 METHODS

3.1 Capture, Collaring and Tagging

Search and Capture

Criteria used to select initial search areas for wolves included:

1) the presence of large caribou aggregations,
2) local knowledge of recent and traditional wolf activity patterns (Pokiak pers comm. 1987, Jacobson pers comm. 1987) and
3) logistical considerations.

The search and capture effort focused on two areas. The Husky Lakes area from Parsons Lake to the Kugaluk River was worked from

20 February to 9 March 1987. The Lac Rendezvous (henceforth referred to by the local name of Rendezvous Lake) - Anderson River area was worked from 17-21 March 1987.

Wolves in both areas were located by observers in a Cessna 206, PA - 18 Super Cub or Bell 206 helicopter. Once located the wolves were darted from the Bell 206 helicopter. During darting the Cessna 206 or Super Cub were used to monitor the movements of other pack members so that a minimum of two wolves per pack could be collared. The helicopter crew would dart the first wolf and maintain visual contact with it until sufficient drug induction. The location of the next target wolf would be provided by the fixed-wing aircraft. This technique often resulted in collaring two to three wolves at one time. The dominant male and female of the pack were given capture priority whenever possible.

Two different drug mixtures were used to immobilize the wolves. The first drug was Ketamine Hydrochloride (Parke-Davis) and Xylazine (Rompun, Cutter Laboratories) mixed at a 2.5:1 ratio at 166 mg/ml (Hayes et al. 1985). The second drug used was Telazol (a 1:1 mixture of tiletamine HCl (CI - 634) and zolazepam HCl (CI - 716, flupyrazapon) (A.H. Robins) (Schobert 1987)). Telazol was used at a concentration of 166 mg/ml. Both drugs were placed in disposable darts with gel collars or gel barbs on the needle (Pneu-Dart Inc., Williamsport, PA). The darts were fired from a Capchur dart gun (Palmer Chemical and Equipment Co. Douglasville, Ga.).

Data Recorded and Samples Collected

Wolves were weighed, measured and pertinent information about the wolf pack structure and location was recorded (Appendix 1). A premolar tooth was removed from all wolves for cementum aging (Stephenson and Sexton 1974). A 10 cc blood sample was taken from the wolves when possible for later disease analysis. Disease analysis by the University of Saskatoon, will involve checking samples for rabies, canine distemper, canine hepatitis and parvovirus. The remaining blood serum will be stored at the Agriculture Canada Wildlife Serum Storage Facility in Saskatoon and will be available for later testing and research.

Tagging and Collaring

All wolves were ear-tagged on the right ear with a plastic numbered tag (Western Industrial Research, Edmonton, Alta.). The tags were numbered W1 - W40. Each wolf was also lip tattooed on the upper right lip. Radio-collars (Lotek Engineer Inc. Aurora, Ontario and Telonics, Mesa, Arizona) were fitted on each wolf captured.

3.2 Movements and Distribution

All radio-collared wolves were monitored to determine their movements and distribution and to delineate home ranges/territories (Mech 1974). Radio-tracking flights were done in a Cessna 185, 206 or 310 at three to four week intervals depending on weather conditions. Relocation information collected included observations of wolf behavior, associated pack members, prey availability and local habitat (Appendix 2).

All telemetry information was analyzed to determine wolf home ranges and possible territoriality, and overall wolf distribution. Territory area was calculated using the minimum polygon method.

3.3 Wolf Predation

Wolf-killed ungulate remains were located during collaring and monitoring work. Information was recorded on the prey species and circumstances of the kill (Appendix 3). A lower incisor bar was collected to determine the age of the preyed animal and a femur or metatarsal bone was taken for marrow fat content analysis to indicate the condition of the prey (Neiland 1970).

Some kill sites located during regular monitoring flights were not visited due to time constraints and fixed-wing aircraft landing

restrictions. These kill site locations were recorded on the radio-relocation forms of the associated wolf or wolves. Wolf food habits at the den site were also closely monitored during the summer of 1987 by Williams (1988).

3.4 Reproduction

Observations related to wolf pair bonding, breeding condition, denning activity, pup production and pup survival were recorded. Probable mated pair bonds were assigned based on capture observations and subsequent observations of wolf associations and behaviors, made while monitoring the movements of the collared wolves.

At the time of capture, female wolves were examined for evidence of proestrus, a state characterized by the swelling of the vulva and sanguineous discharge (Mech 1970).

Wolf packs were monitored to locate their whelping dens, and later denning and rendezvous sites. Aerial observations were used to determine the number of pups produced. Other information pertaining to fecundity is derived from the ongoing wolf carcass collection. All female reproductive tracts were examined as described in section 3.5.

Williams (1988) intensively monitored activity at several of the study den sites using both time-lapse photography techniques and ground visual observations.

The survival rate of pups into the fall and early winter was obtained from aerial observations made while radio-tracking collared wolves.

3.5 Skull and Carcass Collection and Analysis

To obtain further information on the wolf population in the study area, and particularly the sector of the population taken by hunters and trappers, wolf skulls and carcasses were purchased. Collections were coordinated with Renewable Resource Officers who paid $15.00 for wolf skulls and $25.00 for entire carcasses. For economic reasons carcasses were purchased only from communities on the permanent or ice road system. Information about location, pack size and colour of wolves seen were collected from the hunters and trappers when samples were purchased (Appendix 4).

Samples were purchased from communities within and outside the study area to obtain a comparison between wolves in the study area and other wolves from the mountains and southern forested areas.

Necropsy and Measurements

Wolf skulls and carcasses were measured and necropsied as described by Hayes et al. (1985). Information collected was recorded on a wolf physical data form adapted from the Yukon Wildlife Branch (Appendix 5). Wolf skulls were cleaned and measured to determine possible subspecies differences in the wolf population (Pedersen 1978). The skull collection was retained, and will be expanded upon for reference purposes.

Female reproductive tracts were examined to determine whether or not the wolf had previously been in breeding condition. Ovaries were dissected and the numbers of mature follicles and corpora lutea were noted. Uterine horns were dissected longitudinally and the presence/absence of placentae and placental scars were recorded.

A lower premolar was removed from the skulls for later cementum aging. Tooth wear and eruption age estimates were made for comparison with subsequent cementum analysis age estimates.

Cesium Analysis

Wolves primarily feeding on caribou can be expected to accumulate relatively high amounts of radiocesium in their tissue (Holleman and Stephenson 1981). Cesium analysis was conducted on muscle tissue samples taken from the wolf carcasses. A 500-1000 gm tissue sample was taken from the hindquarter of the wolf.

Radioassay for Cesium 137 was done on a nuclear data spectrometer at the Institute of Arctic Biology, Fairbanks Alaska. To obtain levels of cesium in caribou from the study area information from testing of the Chernobyl accident was used (McLean pers. comm. 1988).

Genetic Analysis

To learn more about wolf population genetics, tissue samples were taken from the skull and carcasses for genetic analysis. Samples included muscle, liver and kidney tissue. The samples were sent to Memphis State University, Memphis Tennessee for analysis. Using a starch gel electrophoresis Dr. M. Kennedy analyzed the wolf samples to determine protein variation, heterozygosity and interlocality variation (Hamilton and Kennedy 1986). Muscle and organ samples were also sent to Dr. L. Densmore and Shawn Neff at Texas Tech University, Houston, for mitochondrial DNA analysis.

3.6 Indigenous Knowledge

Local knowledge of wolves and their prey was collected at every available opportunity. Indigenous knowledge was used during the capture and collaring phase of the study to efficiently locate wolves. Valuable information regarding wolf pack structure and activity was obtained through regular contact with hunters and trappers in camps and when they turned in wolf skulls or carcasses.

4.0 RESULTS AND DISCUSSION

The results from the first year of research are preliminary. As the project continues more will be learned about wolves and their relationship with caribou in the Western Arctic. Some of the data collected during the first year are presently being analyzed and are not available for this report. As results are tentative and analysis is not complete this report does not include a detailed discussion comparing results with other research.

4.1 Capture Data

Search and Capture

Finding wolves in the study area proved a challenge. Wolves that had been hunted previously near Husky Lakes had learned to avoid open tundra areas. Most of the wolves spotted and subsequently captured were below treeline. The Bell 206 helicopter worked well for locating or tracking wolves. The Cessna 206 aircraft was used to visually spot wolves, however, it was not capable of tracking wolves. The Cessna can carry more observers, but must fly at a faster air speed than the Supercub. The Supercub worked well for tracking, visually spotting and maintaining visual contact with wolves. Experience and knowledge of local trappers hired for the capturing program increased the overall efficiency of initial search efforts.

It was not possible to track wolves in most areas as wolf tracks were quickly lost in the thousands of caribou tracks present in the search area. Hard, drifted snow also made tracking difficult in wind swept areas above the treeline.

Of the two drugs used to immobilize wolves Telazol was far superior. Ketamine-Rompun (K-R) was used on the first 16 wolves and several problems were encountered. The mixture of K-R was crystallizing because of the cold temperatures (-20 to -30 degrees Celsius) in February. If the drug was crystallizing in the darts the wolves would not have received sufficient drug dosage for immobilization. In five of 16 wolves immobilized with K-R the initial dosage given was insufficient and an additional 1-2 cc's was necessary to immobilize the wolves. The initial injection was given in a 3 cc disposable dart with either a 2.5 cm gel barbed or gel collared needle. The 3 cc's of K-R were sufficient to immobilize a wolf when the dart hit a large muscle mass and did not bounce out. The gel barbed and gel collared needles often did not affix the needle. When a dart bounced off a wolf it was impossible to determine how much drug the wolf received. The dart bounce problem has been solved by Pneu-Dart by placing wire barbs on the needles (Waldeisen pers. comm. 1987).

Telazol was used to immobilize 26 wolves. It proved to be the preferred drug. There was no crystallization problem with Telazol.

Initially 3 cc's of Telazol (166mg/ml) were used, however, 2 cc's were found to be sufficient. Dart bounce problems were still present, but the wolves that were injected with even a partial dart load were immobilized enough to be safely hand injected.

Wolves immobilized with Telazol appeared calm, were able to blink their eyes and maintained a normal resting respiration. The degree of immobilization caused by Telazol was easy to read and most wolves began to recover by the end of the handling process (30-45 min.). Induction time with both drugs ranged from 2-10 minutes depending on wolf size and dart hit location and injection. Average induction time was about four minutes. All wolves revisited one-two hours later had recovered and moved from their capture site. Unfortunately time and cost restrictions did not allow visual observations of wolves recovering from Telazol.

Wolves Captured

A total of 42 wolves were captured in 1987, 16 were captured south of Husky Lakes in February, 25 along the Anderson River in March and one wolf on the Smoking Hills in August (Table 1) (Figure 2). Of the wolves captured, 19 were male and 23 were female. The age of these wolves is presently being determined by cementum analysis.

During the capturing work four wolves were killed. The first mortality resulted from a dart penetrating the skin just behind

the last rib and puncturing a lung. The wolf was dead within 3 minutes of being hit by the dart. A combination of wolf and helicopter movement and shooter error resulted in poor dart placement. The green charges used with the Capchur dart gun were considered too powerful and brown charges were subsequently used.

The second wolf death resulted from dart penetration and a broken leg. It is not known how the leg was broken, but the fresh break indicated that the leg must have been broken during the capturing work.

The third wolf mortality occurred when a wolf suffocated on a piece of meat. It is possible that she regurgitated the meat which subsequently lodged in her windpipe while she was transported to th0e handling site of two other wolves. Under the influence of T0elazol the wolf was unable to expel the piece of meat from her trachea.

Table 1. Wolves Captured and Radio-Collared, Western Arctic Wolf Research, 1987-88.

Wolf	Coordinates	Wolf pack (current)	Sex	Tag/ tattoo	Weight (kg)
8701	68 48 x 133 01	Husky Lakes	f	W1/8701	34*
8702	68 45 x 133 14	Husky Lakes	m	W2/8702	41*
8703	68 43 x 132 50	Williams Lake	f	W3/8703	40
8704	68 45 x 132 53	Sitidgi Lake	m	W4/8704	48
8705	68 46 x 133 28	Whale Point	f	W5/8705	36
8706	68 53 x 132 18	500 Lake	f	W6/8706	30
8707	68 53 x 132 14	500 Lake	m	W7/8707	26
8708	68 50 x 132 26	Dennis Creek	m	W8/8708	43
8709	68 59 x 132 13	Old Man Lake	f	W9/8709	25*
8710	69 02 x 132 10	Old Man Lake	m	W10/8710	29
8711	68 47 x 132 28	Dennis Creek	f	W11/8711	32
8712	68 45 x 131 42	Miner River	f	W12/8712	25
8713	68 39 x 131 42	Wolverine River	m	W13/8713	35
8714	68 39 x 131 42	Wolverine River	f	W14/8714	25
8715	68 39 x 131 42	Wolverine River	f	W15/8715	26
8716	68 39 x 131 42	Crossley Lakes	m	W16/8716	31
8717	68 34 x 126 45	Anderson River	m	W17/8717	28
8718	68 32 x 126 54	Anderson River	f	W18/8718	28
8719	68 36 x 126 50	Anderson River	m	W19/8719	35
8720	68 37 x 127 34	Horton River	m	W20/8720	27
8721	68 37 x 127 30	Horton River	f	W21/8721	29
8722	68 33 x 127 28	Granet Lake	f	W22/8722	30
8723	68 34 x 127 28	Smoke River	m	W23/8723	32
8224	68 34 x 127 28	Tedji Lake	f	W24/8724	34
8725	68 22 x 127 58	Tadenet Lake	f	W25/8725	21
8726	68 33 x 127 34	Ridge	f	W26/8726	20
8727	68 33 x 127 34	Ridge	f	W27/8727	22
8728	68 34 x 127 35	Ridge	f	W28/8728	28
8729	68 48 x 127 09	Rendezvous Lake	f	W29/8729	31
8730	68 48 x 127 09	Rendezvous Lake	m	barW1/8730	32
8731	68 37 x 127 06	Horton River	f	barW2/8731	24
8732	68 37 x 127 06	Ridge	m	barW3/8732	31
8733	68 35 x 126 37	Ewariege	m	barW4/8733	40
8734	68 33 x 126 45	Andrew River	f	barW5/8734	22
8734	68 33 x 126 45	Anderson River	m	barW6/8735	27
8736	68 33 x 127 00	Horton River	m	barW7/8736	26
8737	68 42 x 127 05	lone wolf	m	W37/8737	39
8738	68 30 x 126 52	Hars Travellers	f	W38/8738	26
8739b	68 35 x 126 58	Horton River	f	W39/8739	20
8739w	69 38 x 126 42	Melville Hills	m	W39/8739	21

*estimated

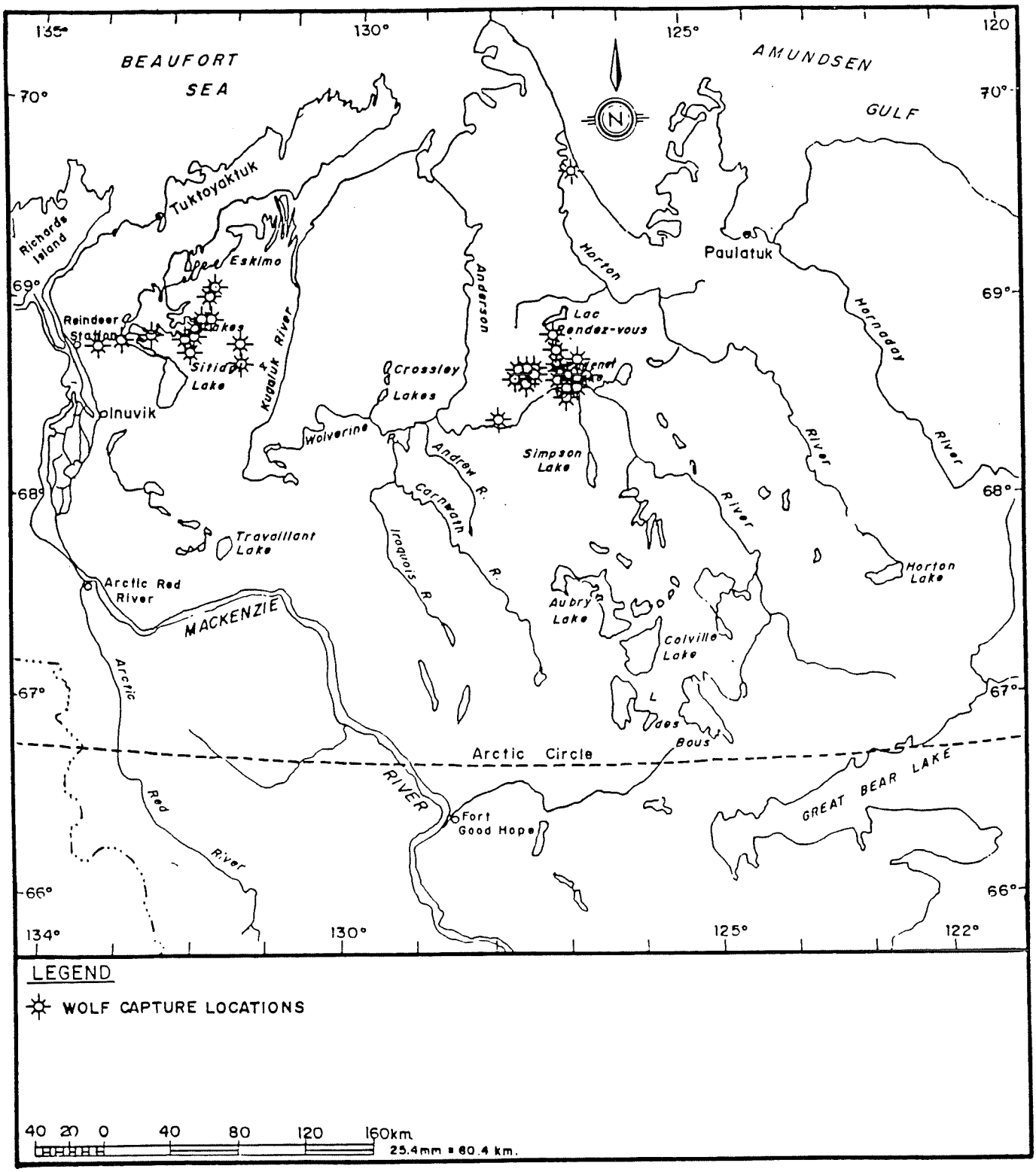

Figure 2. Wolf capture locations, Western Arctic Wolf Research, 1987-88.

The fourth wolf mortality occurred when a male wolf was hit with a dart above the rear legs near its spine. The dart did not kill the wolf, but the pressure of the injection near the spine paralysed the wolf's hind legs. The wolf was brought back to camp and observed. After three days the wolf had not recovered and was destroyed.

Physical Characteristics

All wolves captured appeared to be in good condition with no cases of manage or other visible parasites. Oral papilloma was found in the mouth of four wolves. The average weight for the wolves captured was 32.4 kg for males (n = 17, SD = 6.8 kg) and 28.1 kg for females (n = 22, SD = 2 kg) (Table 1 and 2). The wolves in this study appear lighter when compared to wolves from other studies in Alaska or Northern Canada (Table 2). These findings are inconclusive as wolves from this study have not been aged and some 10 month old pups may have been included in the mean weight calculations which would lower the average weights. Weight relationships between wolves from different study areas must be compared with caution as wolf weight can vary depending on the method of capture, season and biased selection of wolves from the pack. Hayes and Baer (1986) stated that in their capture efforts larger wolves were selected from the pack in an attempt to capture dominant adults. Other body measurements taken during capture work are listed in Appendix 6.

Pelt color of captured wolves varied from black to almost pure white. Of the 42 wolves captured 27 were grey, (light grey, grey, grey-tan) 9 black, 4 black-grey, 1 cream and 1 light (white with a small amount of grey). Heard et al. (In prep.) found fewer black and more white wolves and noted that all of the black wolves were males. Kuyt (1972) also noted that all black wolves captured were males. Five of the black wolves in this study were females. Ballard et al. (1981) found both male and female black wolves.

Thirty-three blood samples were collected from captured wolves and sent to Dr. F. Laiton, Dept. of Veterinary Pathology, University of Saskatoon. The results are not available for inclusion in this report.

4.2 Collared Wolf Mortality and Remaining Active Collars

During the spring of 1987, 10 of the collared wolves were taken by hunters, (8 by Tuktoyaktuk hunters and 2 by Paulatuk hunters). Wolf 35 was taken by a Coppermine hunter in January 1988. Wolf 13 appeared to have died of natural causes and is discussed further in section 4.8.

The mortality of 12 collared wolves resulted in 26 possible radio-collared wolves remaining in the population. Of the 26 collared wolves there is location information on 24 of them. Wolf

5 has not been located since she was collared in February, 1987 and collar failure is suspected. Wolf 14 has not been located since 11 August 1987 and collar failure or movement out of the study area is suspected.

4.3 Wolf Packs and Lone Wolves

Determining individual wolf packs within the study area has been a difficult task, however by careful monitoring of the collared wolves and other associated wolves over the first year, separate packs have been identified. Determining which packs individual collared wolves were associated with was initially difficult because of the large number of wolves in the Rendezvous - Anderson River area in March - May 1987. Some wolves were located with one to two other identifiable packs before separating and having pups. Some wolves split off from the main pack and created new packs. To provide a more detailed picture of the identifiable wolf packs each pack is discussed separately followed by a general discussion. Collared wolves are identified by "W1 - W39" (Table 1). Wolf packs are given a name based on some geographical location that describes the packs den location, capture location or center of activity. Some of the packs no longer exist because of hunter and trapper harvest. Capture locations and movement information for the following packs are discussed in other parts of this report.

Table 2. Average Body Weights of Wolves from Several Areas in North America.

Weight				Location	Source
male	(n)	female	(n)		
45.0	(4)	37.2	(3)	Quesnel, B.C.	Cowan & Guiguet, 1965
44.6	(18)	38.8	(21)	Wood Buffalo Natl.Park,NWT	Fuller & Novakowski, 1955
44.5	(33)	39.2	(26)	Nelchina Basin, Alaska	Ballard et al. 1981
43.8	(80)	37.6	(66)	Great Slave Lake, NWT	Kelsall, 1968
43.8	(12)	34.9	(14)	Finlayson Area, Yellowknife	Hayes & Farnell, 1986
43.4	(9)	41.0	(4)	Horseranch Range, B.C.	B.C. Fish & Wildl. Branch (unpub.)
40.1		30.1		Central NWT	Heard et al., in prep.
38.6*	(60)	32.2	(50)	Alaska	Rausch, 1967
37.4	(8)	29.4	(14)	N.W. Miner	Fritts & Mech, 1981
38.2	(5)	30.8	(8)	S.W. Yukon	Hayes et al., 1985
36.2	(4)	30.5	(3)	Vancouver Island, B.C.	Scott and Shackleton, 1982
35.5	(84)	27.5	(60)	Northeastern Min-nesota	Stenlund, 1955
34.5	(172)	28.2	(182)	Central-western Ontario	Kolenosky & Stan-field, 1975
32.4*	(17)	27.3*	(21)	Western NWT	(This Study)
30.6	(36)	26.3	(32)	Northeastern Min-nesota	Van Ballenberghe, 1977
28.0	(17)	24.8	(26)	Central-western Quebec	Huot et al., 1978
27.7	(40)	24.8	(33)	Ontario	Pimlott et al., 1969
27.5	(129)	23.5	(112)	Southeastern Ontario	Kolenosky & Stan-field, 1975

*Includes weights of pups 10 months old.
Adapted from Scott and Shackleton (1982).

Husky Lakes Pack

W1 (female) and W2 (male) were captured together on 20 February 1987. Both wolves were relocated 23 February, 1,4 and 10 March 87 in the same area but not together. W1 was reported shot by a Tuktoyaktuk hunter on 14 April 87. W2 was reported shot by a Tuktoyaktuk hunter on 14 March 1987 on the Miner River.

Sitidgi Lake Pack

W3 (female) and W4 (male) were captured together on 23 February 1987. Both wolves remained together and were assumed to be a breeding pair until 2 April 1987. The wolves were in the same area but were not located together during the summer. On 9 September 1987, W3 was seen with another uncollared wolf and W4 was seen with three other wolves one of which was a pup. Because W3 separated from W4, she and the other wolf she had been seen with were given the name the Williams Lake Pack. W4 and the wolves that are with him remain the Sitidgi Lake Pack. On 7 February 1988, W4 was seen with 2 other wolves (1 grey, 1 black).

Williams Lake Pack

W3 (female) and an uncollared grey adult wolf were first seen together on 11 August 1987 and have remained together. W3 was initially collared on 23 February 1987 with W4, but was last seen with him on 2 April 1987. Between 2 April 1987 and 11 August 1987, W3 was located alone.

Five Hundred Lakes Pack

W6 (female) and W7 (male) were captured together near Five Hundred Lakes on 25 February 1987. When captured they were with four other wolves. Both wolves were located together on 2, 4, 6 and 10 March 1987 and then shortly after that were reported taken by Tuktoyaktuk hunters.

Dennis Creek Pack

W8 (male) was captured alone on 26 February 1987 and remained alone until 6 March 1987 when W11 (female) was captured with him. Both wolves were taken by Tuktoyaktuk hunters W8 around 16 March and W11 around 23 March 1987.

Old Man Lake Pack

W9 (female) and W10 (male) were captured together near Old Man Lake on 1 March 1987. Two other wolves were seen with W9 and W10 when captured. Unfortunately W9 died at the capture site from a broken rear leg and a dart wound in the abdomen. W10 was located alone on 2, 4, 10, 16, 19 and 23 March 1987. On 26 March 1987, W10 was shot by a Tuktoyaktuk hunter at the Husky Lakes Fingers. When W10 was shot he was with five other wolves.

Miner River Pack

W12 (female), 0187 (male killed by dart penetration) and one other wolf were located on the Miner River on 6 March 1987. W12 was located on 9 and 10 March 1987 and was taken by a Tuktoyaktuk

hunter between 10 and 23 March 1987.

Wolverine River Pack

W13 (male) and W14 (female) were captured together on the Miner River on 8 March 1987. There were six other wolves with the pack. On 9 March 1987, W15 (female) and W16 (male) were captured by locating W13 and W14. Four other wolves were still with the pack. W13, W14 and W15 remained together until 9 April 1987. W16 has not been relocated with the other pack members since his capture date. Between 9 and 19 April 1987, W13 was involved in a fight and was killed (based on a field necropsy and bite marks seen on his neck). It was not possible to determine if W13 was fighting with a member of his own pack or another pack. W15 denned south of Crossley Lakes near the Wolverine River. On 9 October 1987, W15 was seen with three pups and one other adult. On 8 November 1987, W15 was located with eight other wolves. W14 has not been located since 11 August 1987 and it is thought that she has either dispersed from the study area or her collar is no longer working.

Anderson River Pack

W17 (male), W18 (female) and W19 (male) were captured together with 9 other uncollared wolves on 17 March 1987. These three wolves have remained together or in close proximity to each other over the past year. On 2 April 1987 all three wolves were seen with W33, W34 and W35. W34 was also located with this pack on 9 and 20 April and 29 May 1987. On 22 June 1987, W18 was seen with

two black pups at her den site.

Ridge Pack

W26 (female), W27 (female), W28 (female) and 0287 (female which suffocated during capture work) were captured together with two other wolves on 20 March 1987. W32 was located with this pack on 29 March 1987. All four wolves have remained together for the past year. On 9 September 1987, W32 was seen with four pups (3 black-grey, 1 grey). All four collared wolves were together in the fall and winter but no pups were seen.

Tadenet Lake Pack

W25 (female) was captured alone on 20 March 1987. On 5 May 1987 she was seen with two other grey wolves. All three wolves have been seen together for most of the past year. No pups were ever seen with this pack.

Rendezvous Lake Pack

W29 (female) and W30 (male) were captured together on 21 March 1987. These two wolves have remained together throughout the first year of the study and have never been seen with other adult wolves. On 23 June 1987 five pups (2 grey, 3 black) were seen at their den site. At the time this pack was being observed by Williams and Liepins and W29 and W30 moved the pups to another den. Two pups were shot in the same area by the resident trapper in November-December 1987 (Jacobson pers. comm 1987). Both W29 and W30 were

located on 7 February 1988 and no pups or other wolves were seen.

Horton River Pack

W31 (female), W36 (male) and W39b (female) were captured alone on 21 and 22 March 1987. W38 (female) was captured on 22 March 1987 and was with one other grey wolf. On 9 March 1987 all four collared wolves were located together with W22. W31 and W22 had been seen together previously on 27 March 1987. On 22 June 1987, W22 was in the same area as W31, W38 and W39b. This pack denned on the Horton River and was seen with five pups (3 grey, 2 black) during the wolf pup survival observations (Williams 1988). Throughout the spring and summer this pack had nine adult wolves. W38 was located with or close to the Horton River Pack denning area up to 22 June 1987. After this time W38 was located alone away from the pack. On 20 September 1987 W38 was seen with four pups (2 black, 2 grey) and one grey adult. W38 and her pups and the other grey wolf were given the name the Hars Pack. W39b is usually located with the Horton River pack, but is often found one to two kilometers away. On 8 February 1988, W31, W36 and three other wolves were located together. W39b was not with the pack.

Hars Pack

W38 (female) was with a grey wolf when captured. As discussed above, W38 was seen with W22, W31, W36 and W39b in the spring and summer of 1987. On 20 September 1987 she was seen with four pups (2 grey, 2 black) and one larger grey wolf. The pack of four to

five wolves has remained together throughout the fall and winter.

Granet Lake Pack

W22 (female) was captured on 19 March 1987 with W20, W21, W23 and W24. Seven other wolves were also with this group at the time of their capture. The group of 12 wolves did not remain together as on 9 April 1987, W22 was seen with W31, W36, W38 and W39b. On 22 June 1987, W22 was seen with W31, W38, W39b (Horton River Pack) near their den. On 11 August 1987, W22 was seen at a den site, however no pups were seen with her until 15 October 1987. W22 was with three black pups and a grey adult wolf on 15 October and 18 November 1987.

Smoke River Pack

W23 (male) was collared with W20, W21, W22, W24 and seven other uncaptured wolves. By 9 April 1987, W23 was no longer with any of the other collared wolves but was seen with a grey wolf. On 8 October he was seen with one grey pup. The pup was not seen after this date but W23 was seen with a grey adult wolf on 24 November and 28 December 1987.

Tedgi Lake Pack

W24 (female) was collared with W20, W21, W22, W23 and seven other uncaptured wolves on 19 March 1987. After her capture W24 was not located with another collared wolf. W24 was seen alone on 20 April 1987 and then was not located until 26 November 1987 when

she was seen with two black wolves. On 29 December 1987, W24 was seen with 13 black and two grey wolves. On 8 February she was seen with nine other wolves.

Ewariege Pack

W33 (male) was captured alone on 21 March 1987. On 2 April 1987, W33 was located with W17, W18, W19, W34 and W35. Through most of the summer and fall W33 was located alone. On 18 November 1987 he was seen with one other grey wolf.

Andrew River Pack

W34 (female) was captured with W35 (male) and four uncollared black-grey wolves. On 2 April 1987 she was seen with W17, W18, W19, W33 and W35. W34 remained with W17, W18 and W19 until 29 May 1987. Since 22 June 1987, W34 has not been located with any other collared wolves, however there has usually been another uncollared wolf with her.

Melville Hills Pack

W39w (male) was captured alone on 28 August 1987. On 15 October 1987, W39w was seen with a minimum of 10 other light coloured wolves of which at least two were identified as pups. W39w was again located on 26 November 1987 with three other light coloured wolves. On 12 March 1988, W39w was located east of Simpson Lake with five other wolves.

Lone Wolves

Some wolves were captured alone or remained alone after capture. Other wolves were captured with their pack, but then dispersed and were subsequently killed by hunters. The following briefly describes the activities and fate of lone wolves.

W5

W5 (female) was captured alone on the south end of Husky Lakes on 23 February 1987. After being located on 25 February 1987, W5 has not been located since. W5 has either dispersed from the study area or her collar has malfunctioned.

W16

W16 (male) was captured with W13, W14, and W15 on 9 March 1987, but has not been located with them since. Throughout the past year W16 has been located alone. On 11 March 1988, W16 was seen with two other wolves on a kill.

W20

W20 was collared with W21, W22, W23, W24 and seven other uncaptured wolves. On 20 April 1987, W20 was seen with five other wolves (2 black, 3 grey). W20 was killed by a Paulatuk hunter between 20-30 April 1987 on the southeast end of Delease Lake.

W35

W35 (male) was captured with W34 and four other black-grey wolves. On 2 April 1987, W35 was located with W17, W18, W19, W33 and W34. W35 was located alone on 20 April 1987 and then was not located until his death was reported on 17 January 1988 (Gunn pers. comm. 1988). A hunter from Coppermine shot W35 south of Dismal Lakes approximately 500 km from his capture location (John Kapakatoak pers. comm. 1988). A female wolf which had pups last summer was also shot with W35. Both wolves were in good condition.

W37

W37 (male) was captured alone on 22 March 1987 and not located after. On 19 April 1987, W37 was shot by a Paulatuk hunter on Tsoko Lake.

Table 3. Wolf Pack and Lone Wolf Areas Determined by Telemetry Locations, Western Arctic Wolf Research, 1987-88.

Wolf Pack or Lone Wolf	Collars/ Pack	Wolves/ Pack	Telemetry Locations	Area (km^2)
Husky Lakes Pack**	2	2	13	2684.31
Sitidgi Lake Pack	(2)1*	(2)-4	16	2518.28
Williams Lake Pack	1	2	14	3015.38
500 Lakes Pack	2	6	8	1342.15
Dennis Creek Pack**	2		10	1027.30
Old Man Lake Pack**	2	4	8	1317.3
Miner River Pack**	(4)1*	(8)6-8	25	2856.9
Wolverine River Pack	1	3-2	3	636.6
Anderson River pack	3	6	29	7986.3
Ridge Pack	4	6	40	18,113.9
Tadenet Lake Pack	1	2	17	25,285.8
Lac Rendezvous Pack	2	2	24	2584.9
Horton River Pack	(4)3*	9	35	8516.8
Hars Pack	1	4	11	13,255.9
Granet Lake Pack	1	5	13	4473.8
Smoke River Pack	1	2	15	21,507.3
Tedgi Lake Pack	1	9-15	6	3579.1
Ewariege Pack	1	2	10	9941.7
Andrew River Pack		2	17	7555.8
Melville Hills Pack	1	10	5	18,856.2
W5	1	1		
W16	1	1	11	23,383.0
W20**	1	1	4	3745.1
W35**	1	2	7	16,666.0
W37**	1	1		

* Collared wolves separated and formed separate packs.
** Collared wolves taken by hunters.
( ) Indicates collar or wolf numbers in a pack before a split.

General observations from the first year of research show that the structure and composition of wolf packs in the study area is flexible. Some wolves were seen with members of two other packs before separating to initiate their own pack. The close association between some packs and individual wolves suggests little or no territoriality at certain times of the year between wolves associated with the Bluenose Caribou herd.

4.4 Movements and Distribution

Describing and mapping pack movements is ambiguous for some wolves as they have been associated with two to three packs during the first year of monitoring. A total of 20 packs were monitored since 20 February 1987 (Table 3). Five of the 20 packs were monitored for a short term due to hunter harvesting of collared wolves (Figures 3,6,7,8 and 9). The other 15 packs were monitored from the time they were collared, however some packs were formed during the year when collared wolves separated and were subsequently seen with other uncollared wolves (Figures 4,5 and 10-22). One lone wolf, W16 was monitored during the past year (Figure 23). Two other wolves W20 and W35 were monitored until they were taken by hunters (Figures 24 and 25).

Monitoring the different collared wolves over the past year has shown two separate strategies concerning movements and distribution. Some wolves such as the Sitidgi Lake pack, Williams

Lake Pack and Lac Rendezvous Pack have remained in a relatively small area over the past year (Table 3, Figures 3,4, and 17). Other packs such as the Wolverine River Pack, Horton River Pack and Hars Pack have travelled extensively in the study area (Table 3, Figures 10, 18 and 21). The reasons for the different strategies have not been determined, but will be addressed during the second year of monitoring. It is possible that some packs have enough alternative prey that they are able to survive without following the caribou.

Areas traveled by packs during the first year ranged from 2518 to 28,569 sq. km (Table 3). It is questionable that these can be called territories as it would be impossible for packs to defend such large areas. It would also be impossible for a pack of two wolves such as the Lac Rendezvous Pack to defend its small territory against a large pack of wolves such as the Horton River Pack.

4.5 Den Sites

A total of nine wolf dens were located by monitoring the radio-collared wolves (Table 4) (Figure 26). Most of the dens were located around the end of May and a few during June or July 1987. Collared wolves were located in the area near their dens as early as the beginning of May. The location of the dens is important when determining what prey may be available to the wolves during

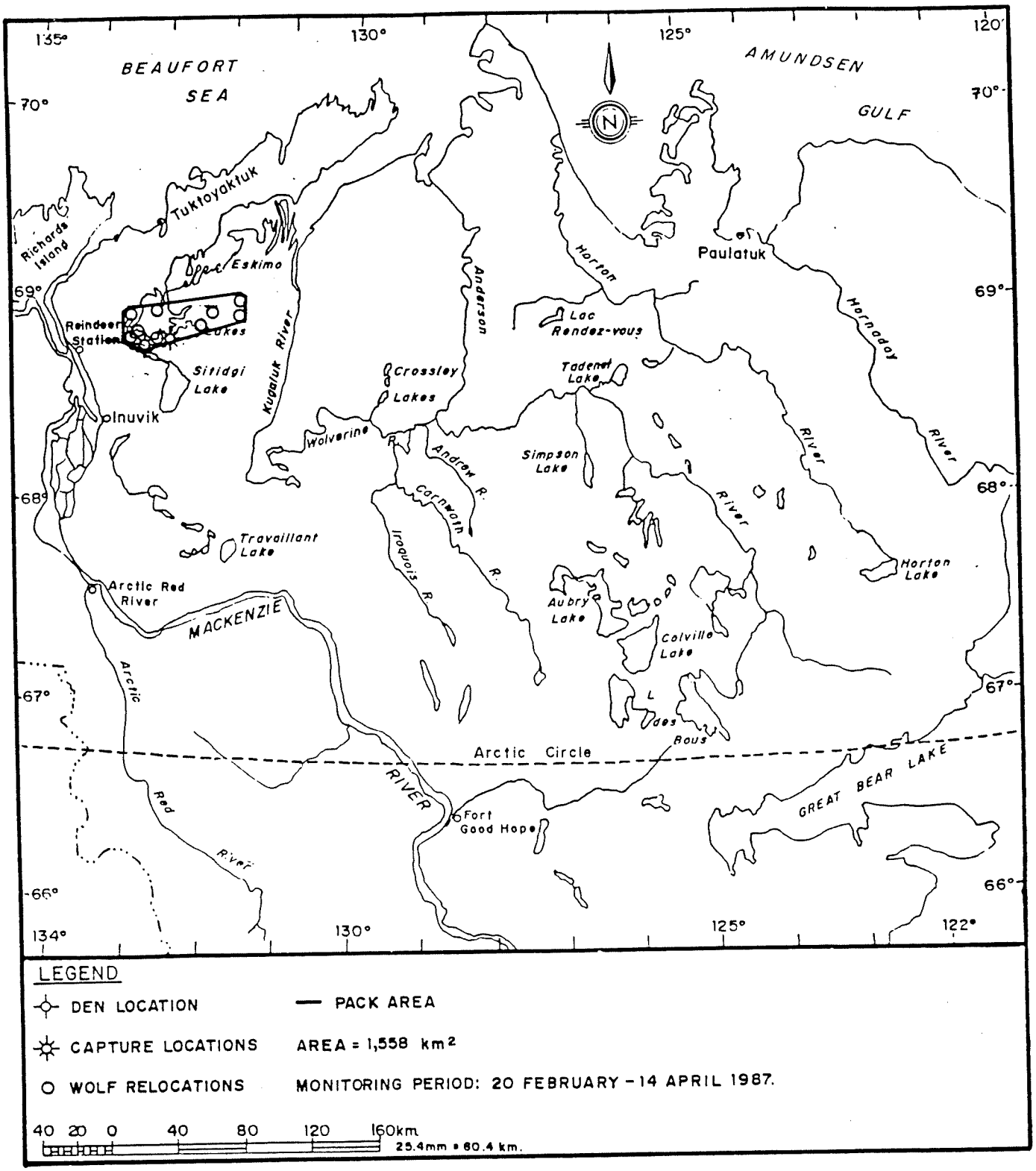

Figure 3. Telemetry locations and area for the Husky Lake Pack, Western Arctic Wolf Research, 1987-88.

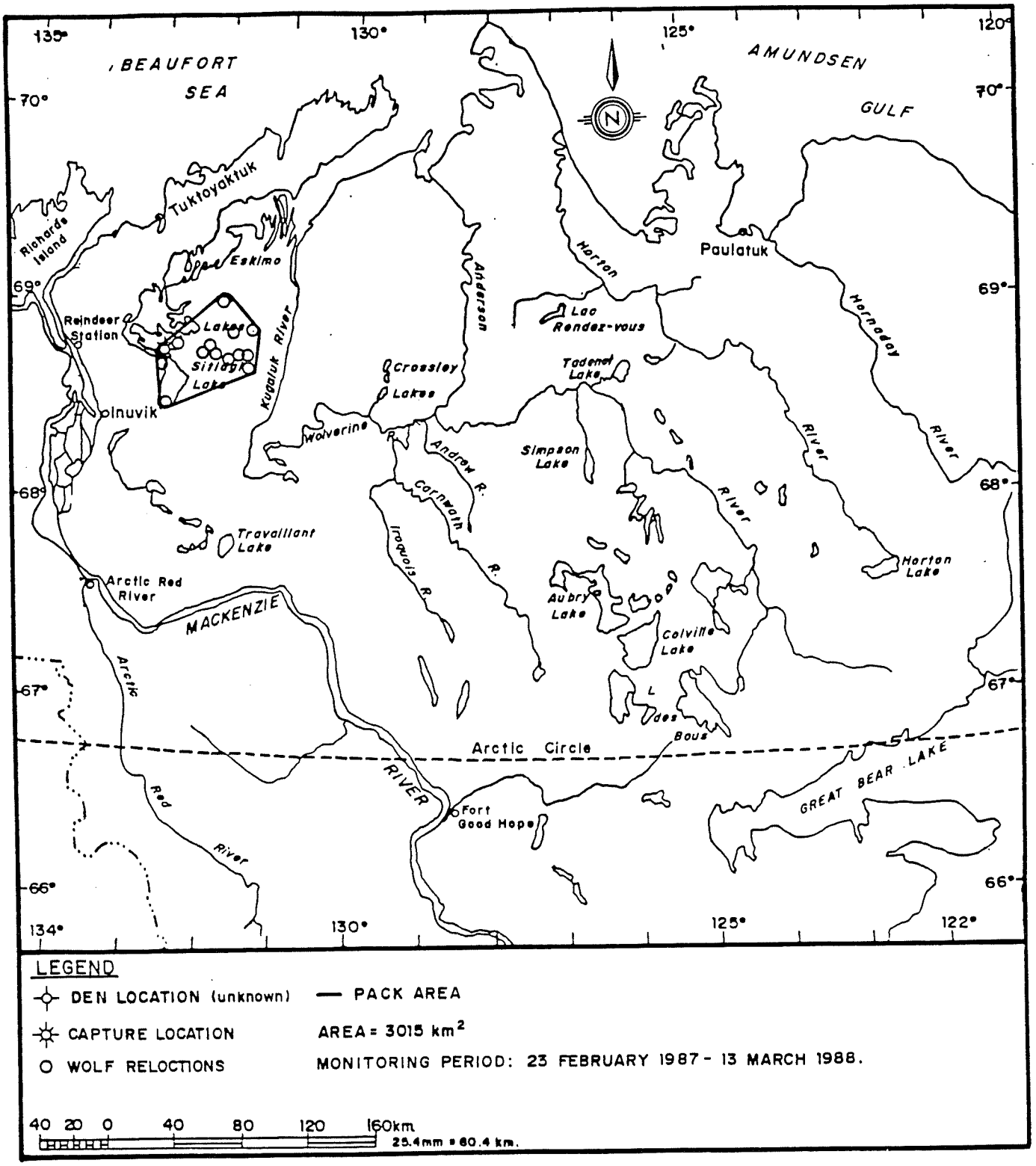

Figure 4. Telemetry locations and area for the Williams Lake Pack, Western Arctic Wolf Research, 1987-88.

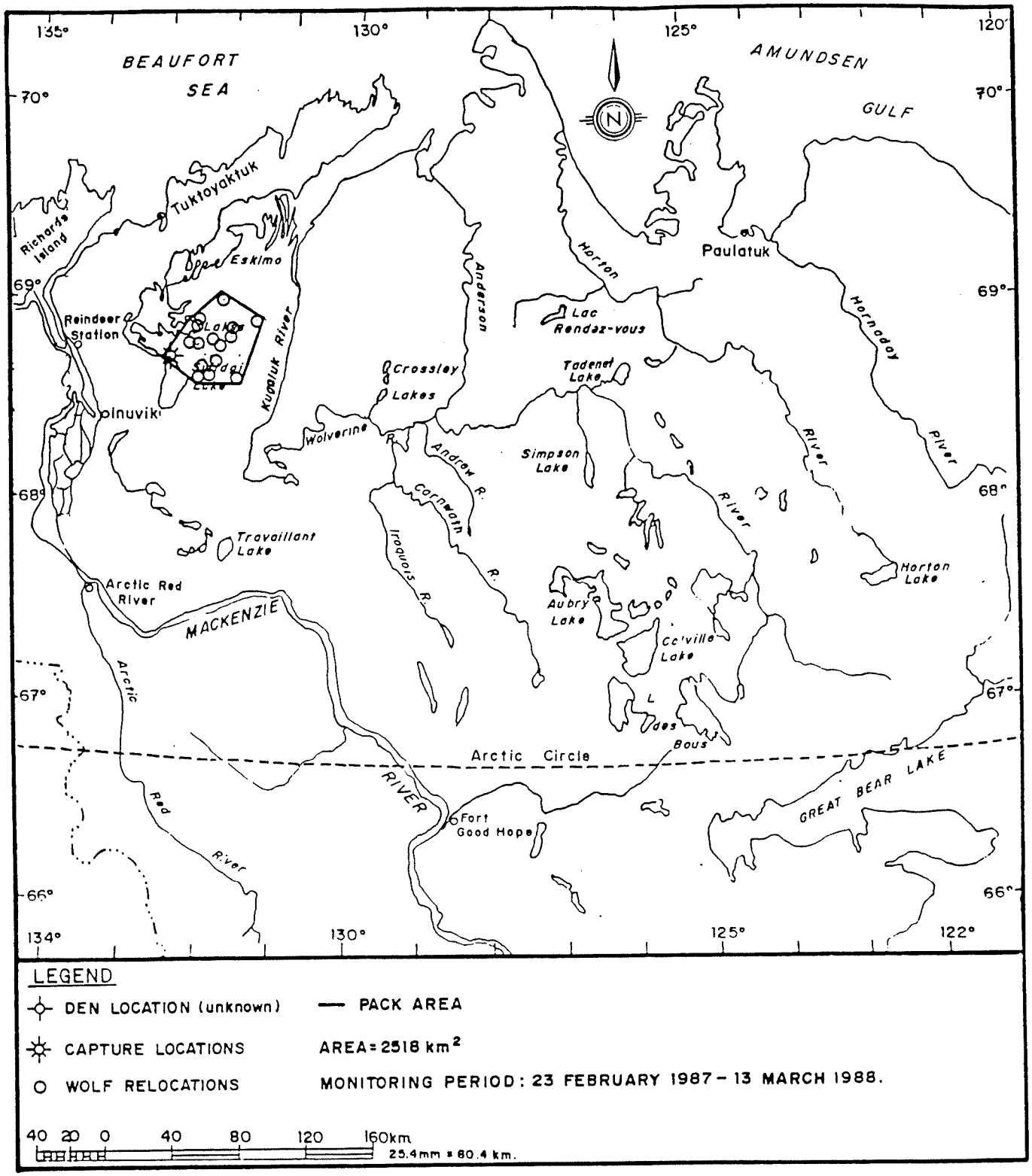

Figure 5. Telemetry locations and area for the Sitidgi Lake Pack, Western Arctic Wolf Research, 1987-88.

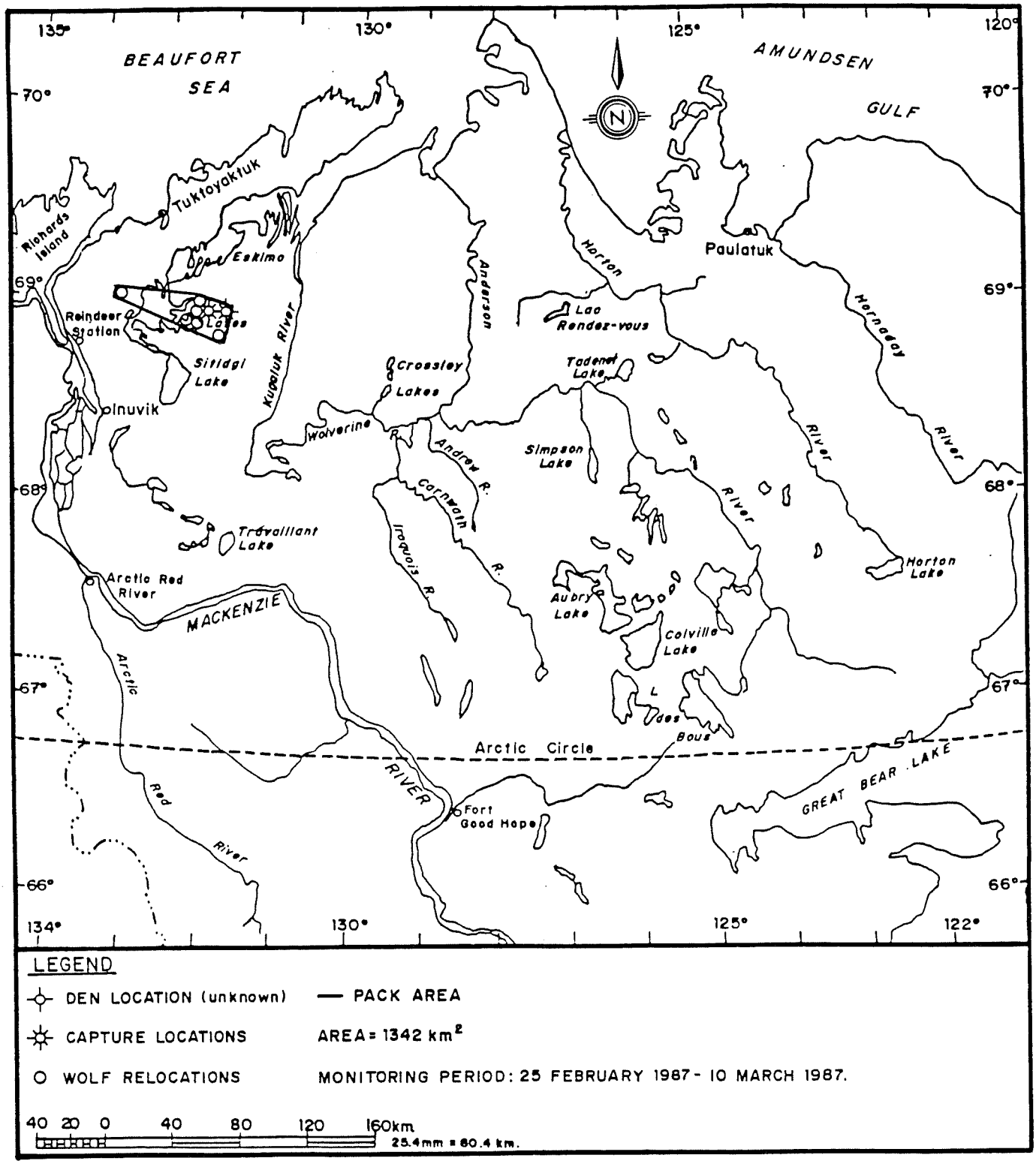

Figure 6. Telemetry locations and area for the 500 Lake Pack, Western Arctic Wolf Research, 1987-88.

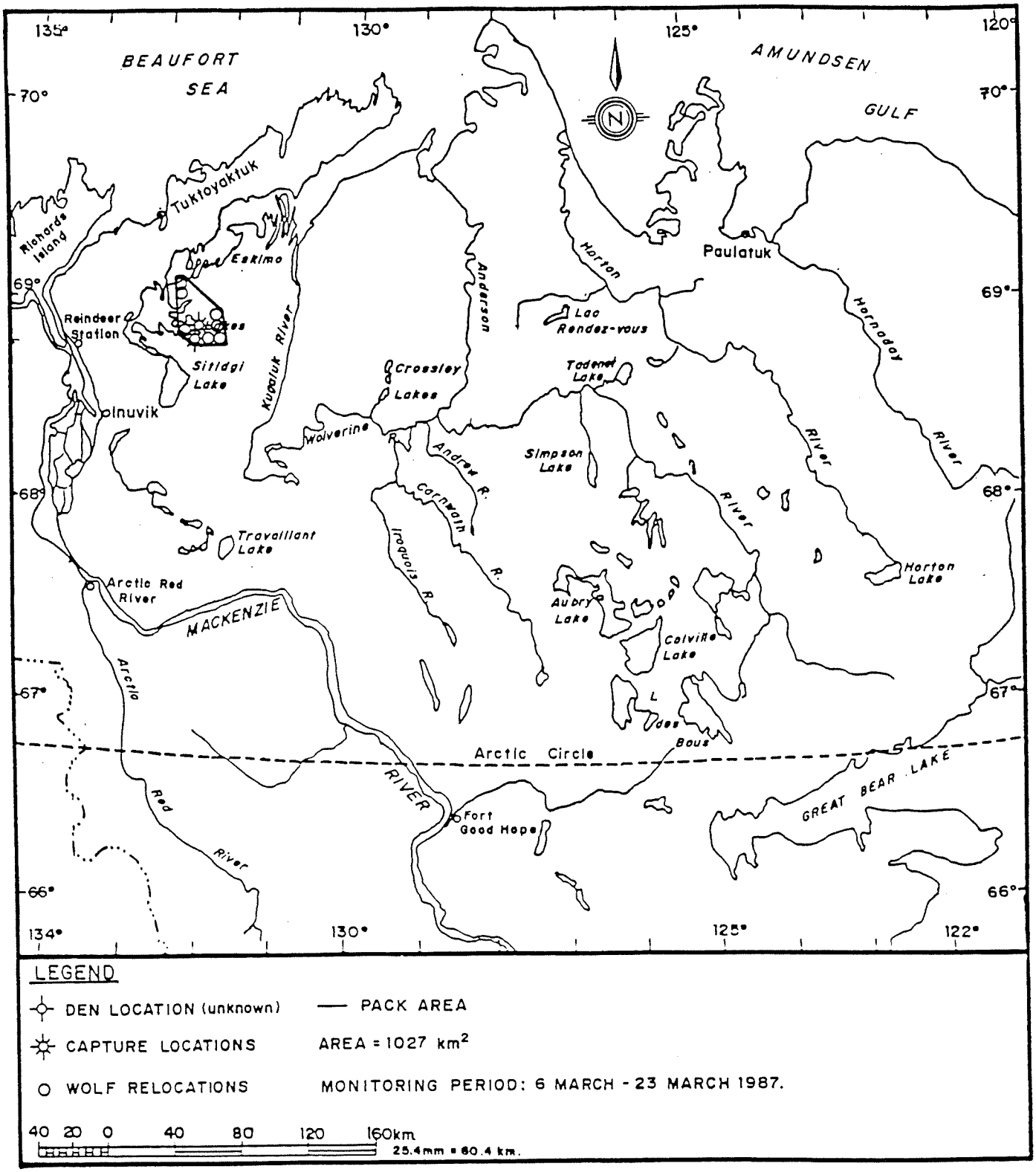

Figure 7. Telemetry locations and area for the Dennis Creek Pack, Western Arctic Wolf Research, 1987-88.

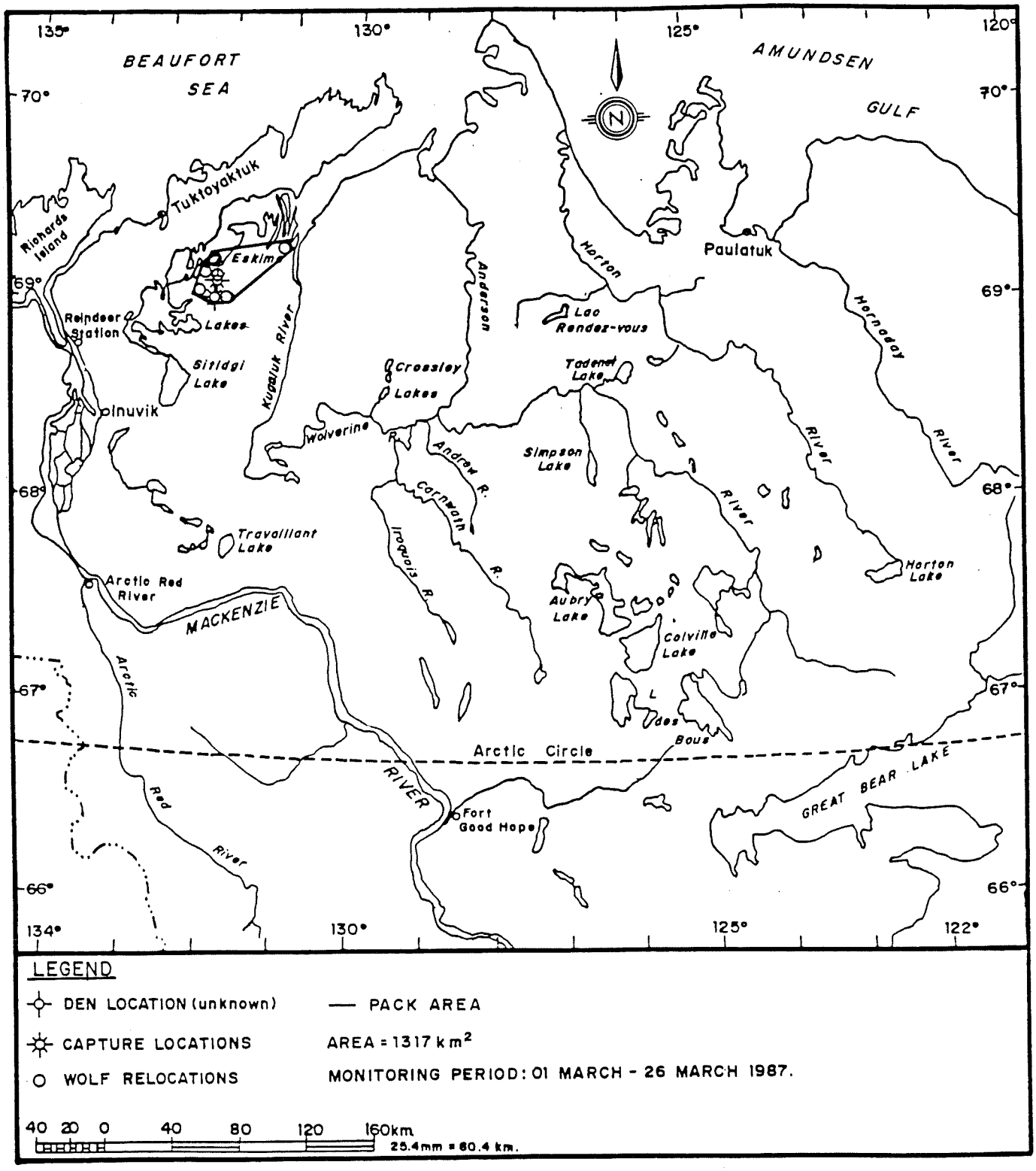

Figure 8. Telemetry locations and area for the Old Man Lake Pack, Western Arctic Wolf Research, 1987-88.

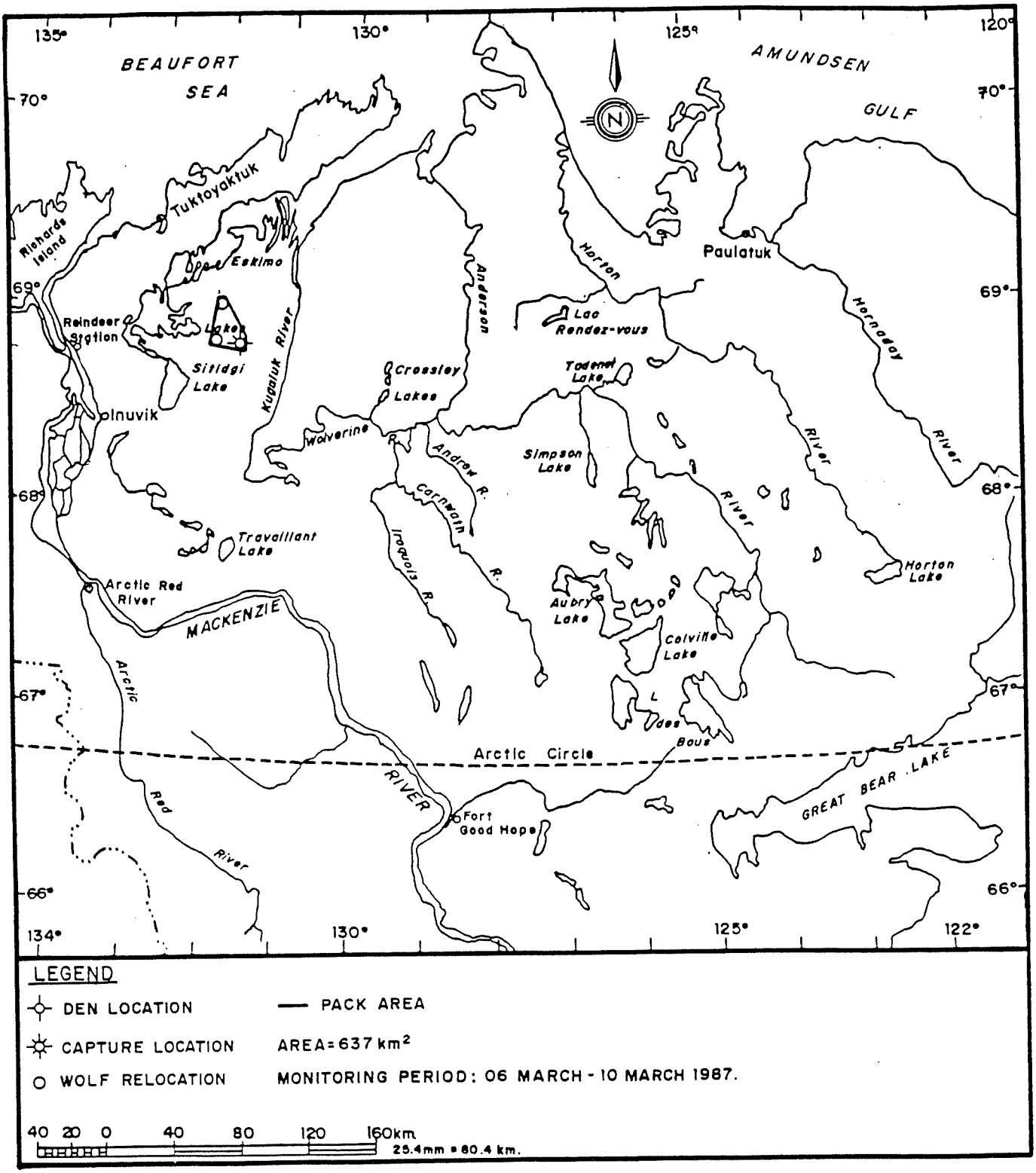

Figure 9. Telemetry locations and area for the Miner River Pack, Western Arctic Wolf Research, 1987-88.

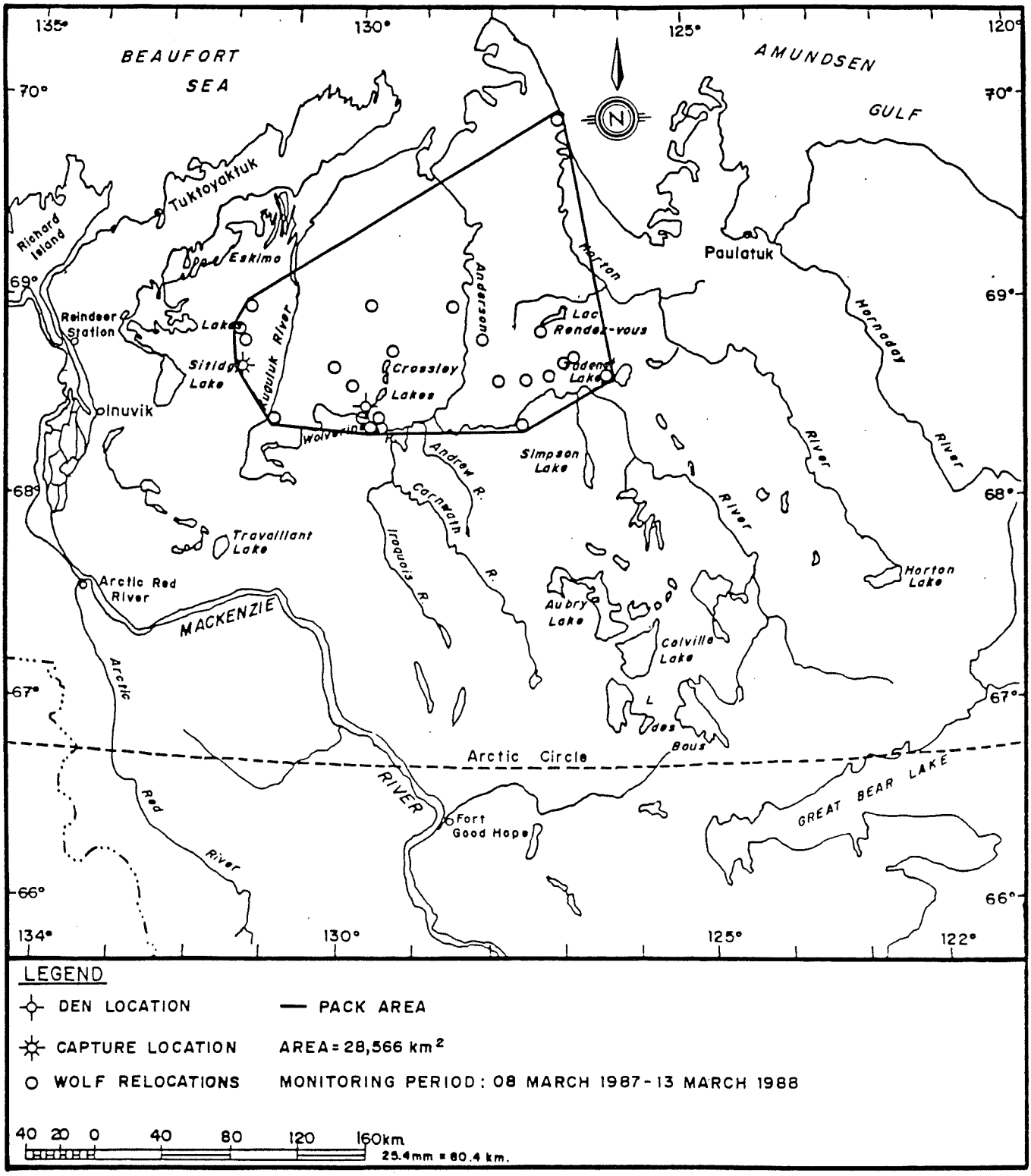

Figure 10. Telemetry locations and area for the Wolverine River Pack, Western Arctic Wolf Research, 1987-88.

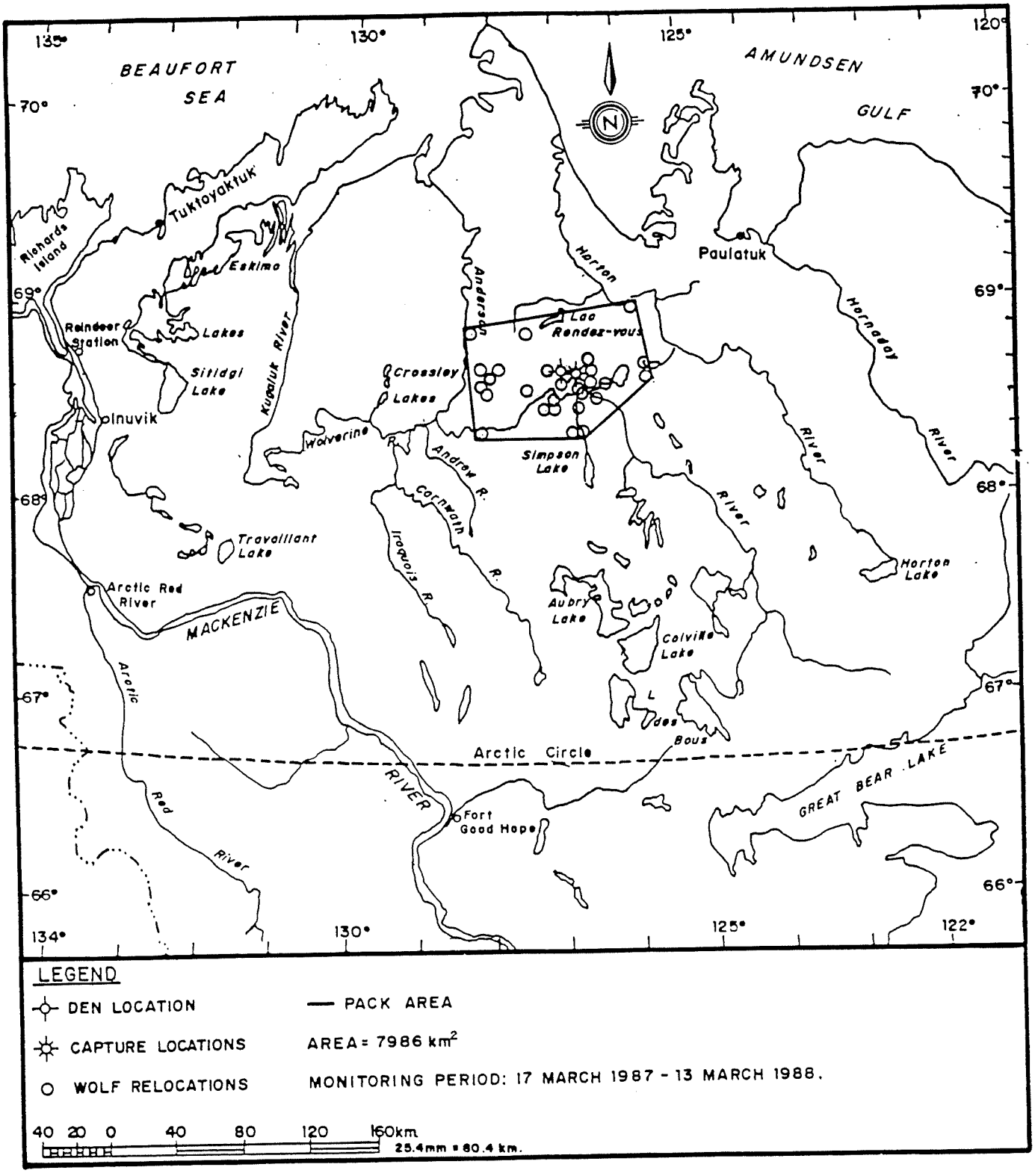

Figure 11. Telemetry locations and area for the Anderson River Pack, Western Arctic Wolf Research, 1987-88.

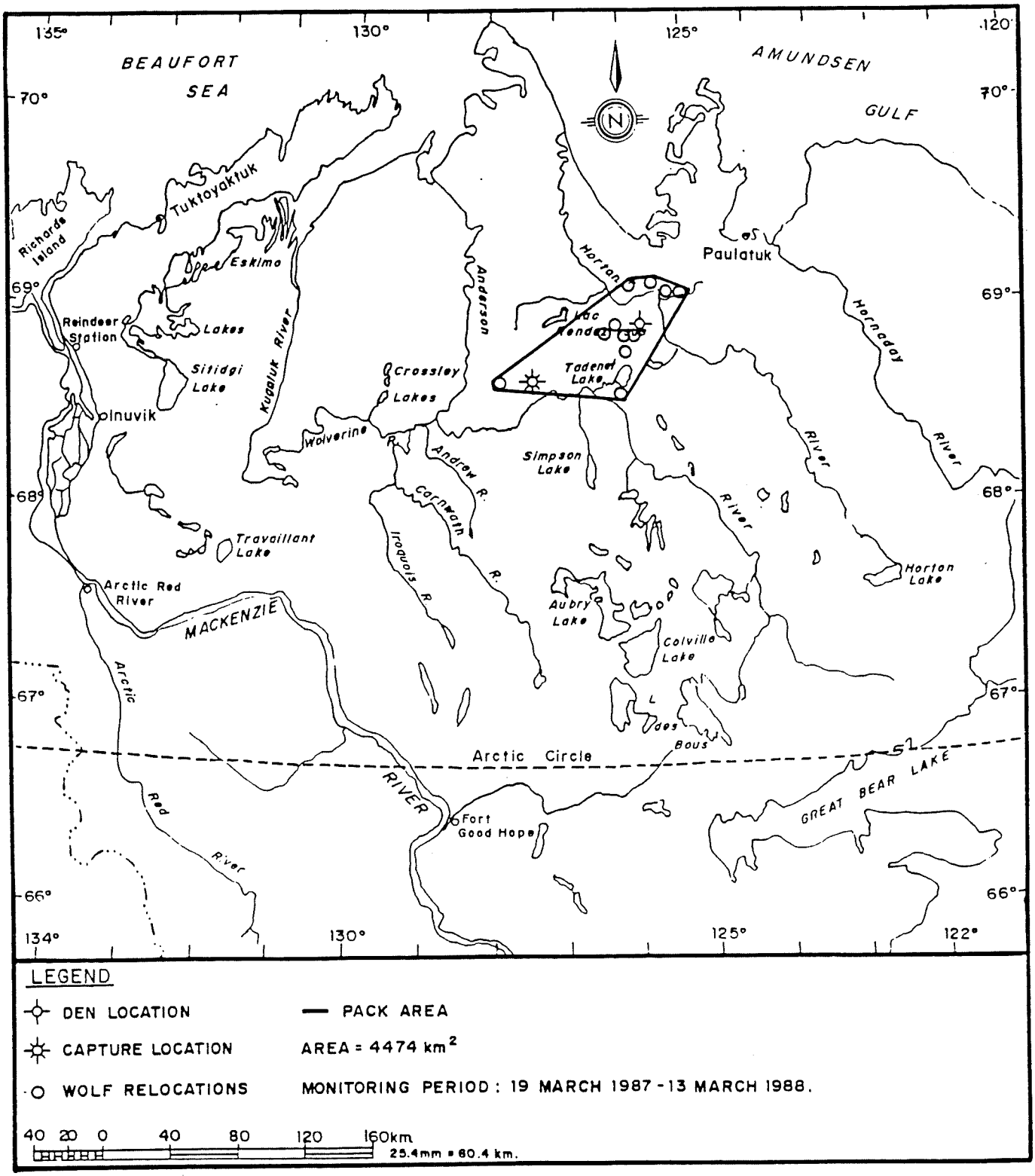

Figure 12. Telemetry locations and area for the Granet Lake Pack, Western Arctic Wolf Research, 1987-88.

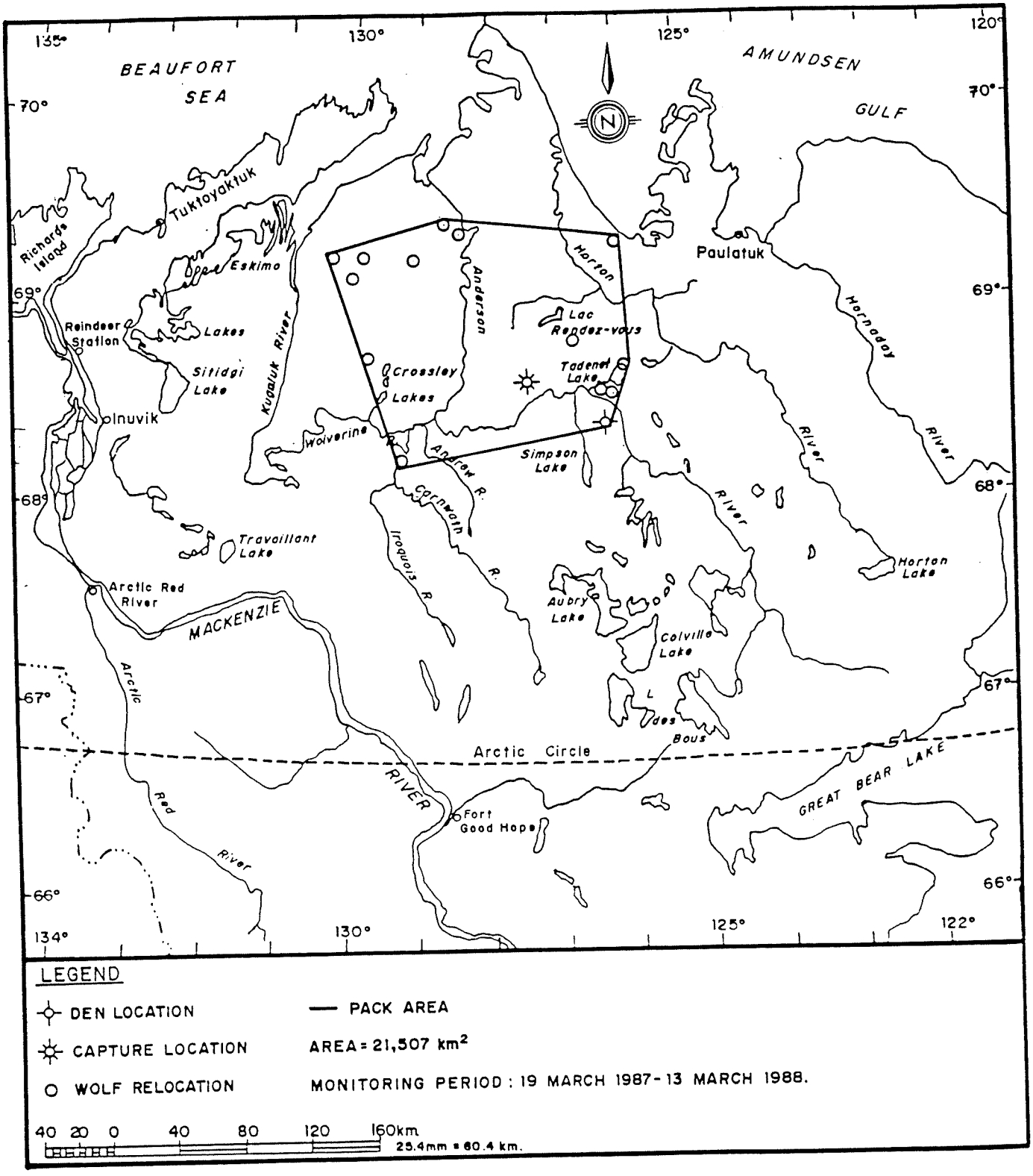

Figure 13. Telemetry locations and area for the Smoke River Pack, Western Arctic Wolf Research, 1987-88.

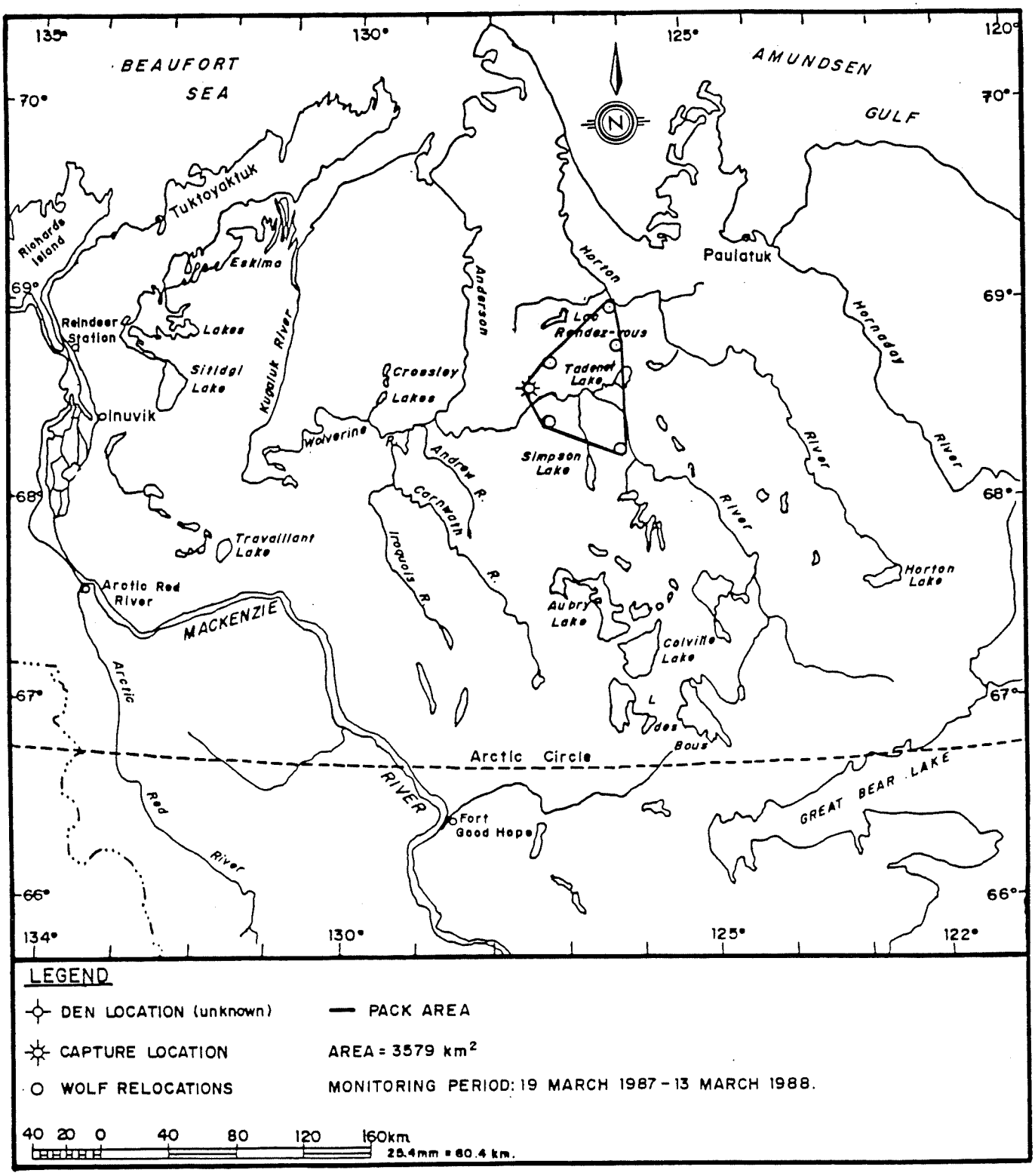

Figure 14. Telemetry locations and area for the Tedgi Lake Pack, Western Arctic Wolf Research, 1987-88.

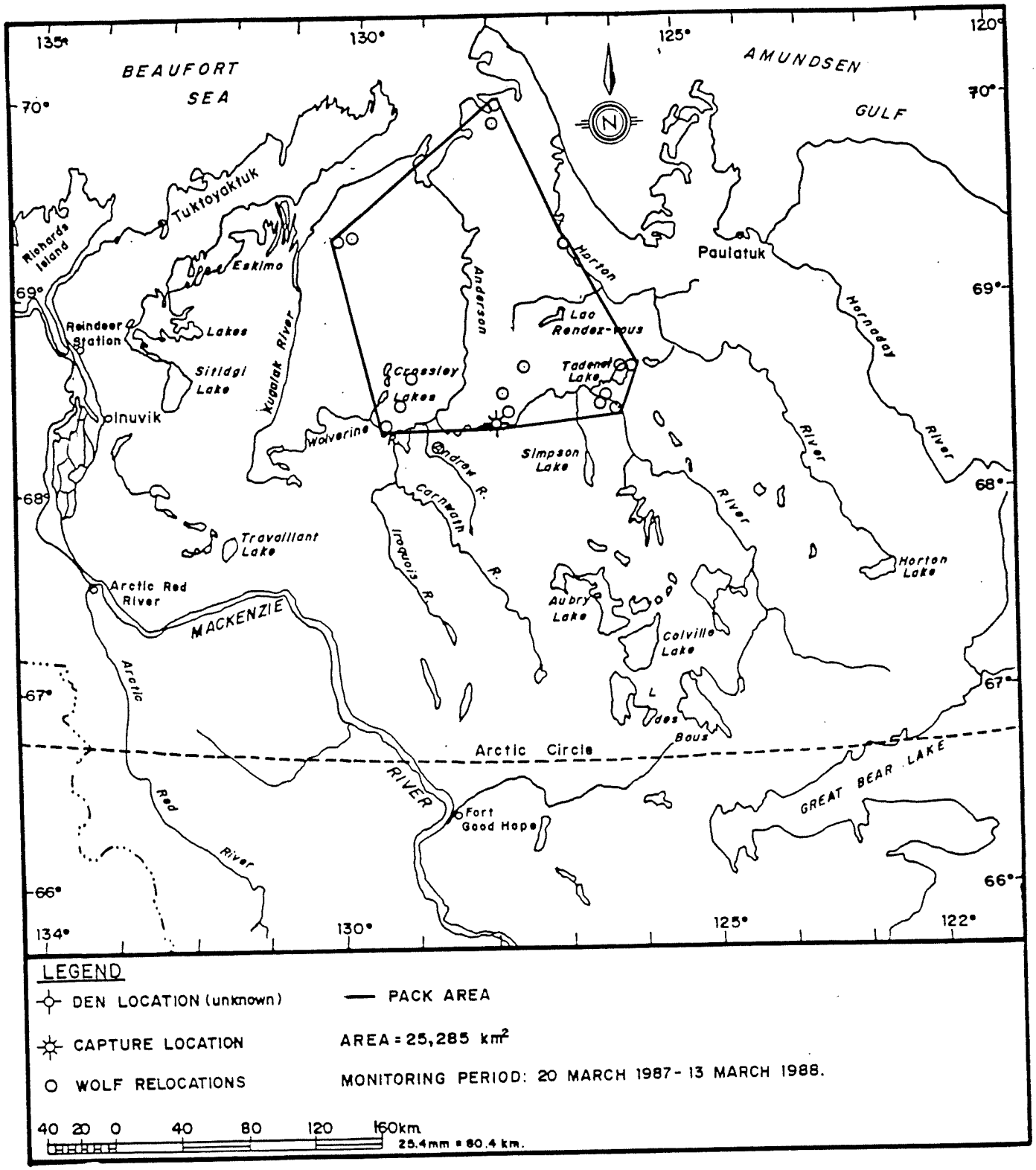

Figure 15. Telemetry locations and area for the Tadenet Lake Pack, Western Arctic Wolf Research, 1987-88.

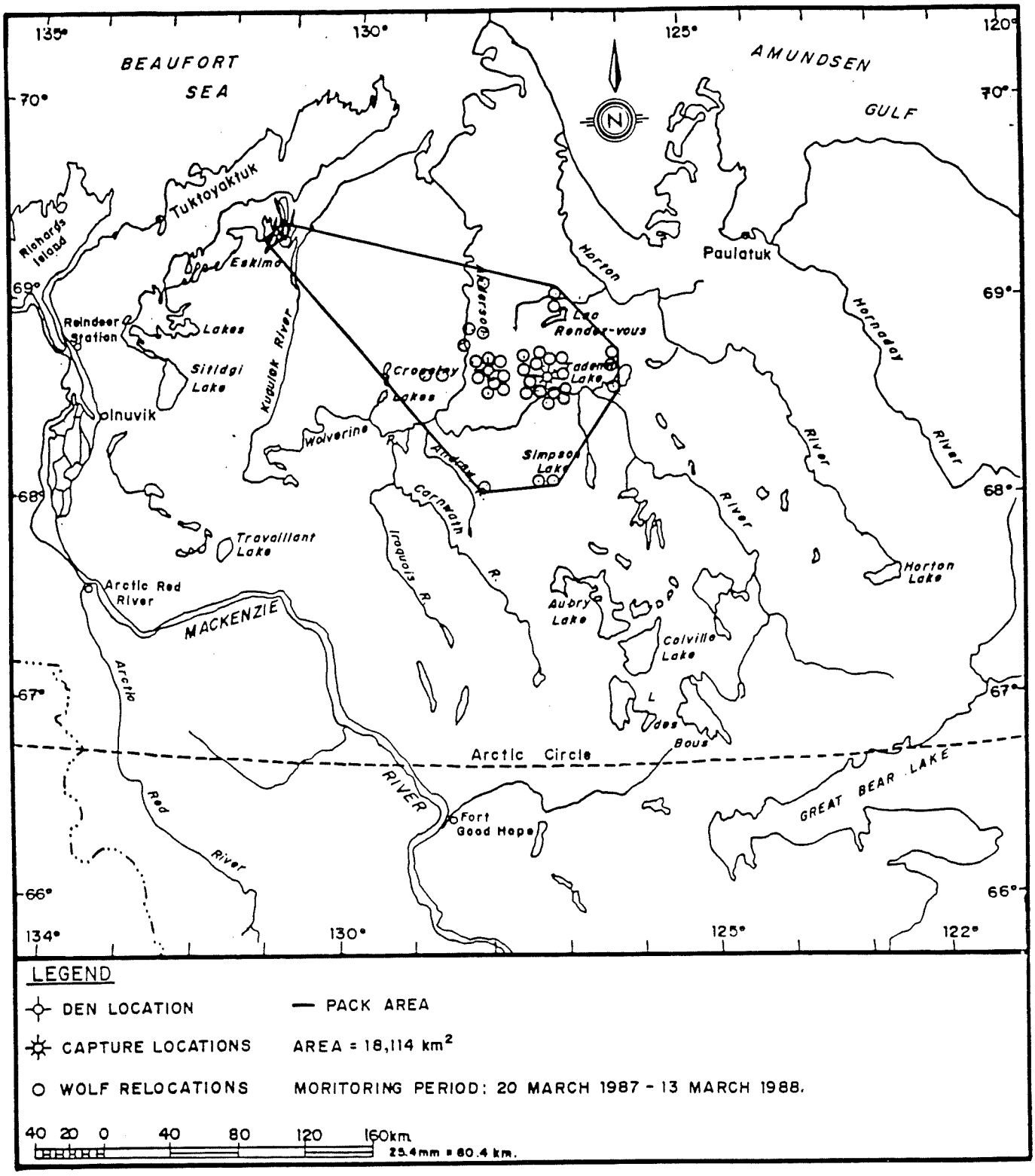

Figure 16. Telemetry locations and area for the Ridge Pack, Western Arctic Wolf Research, 1987-88.

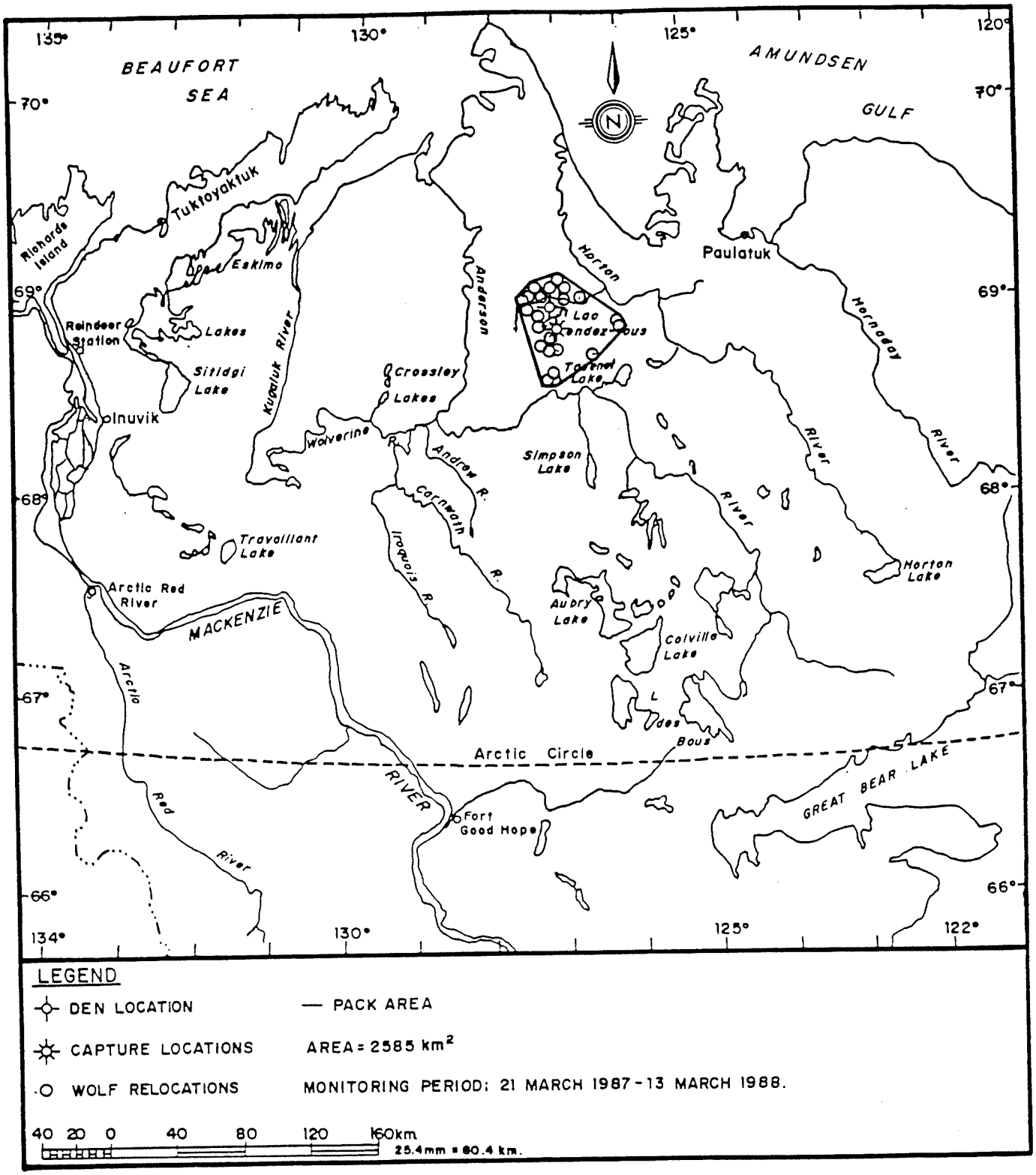

Figure 17. Telemetry locations and area for the Lac Rendez-vous Pack, Western Arctic Wolf Research, 1987-88.

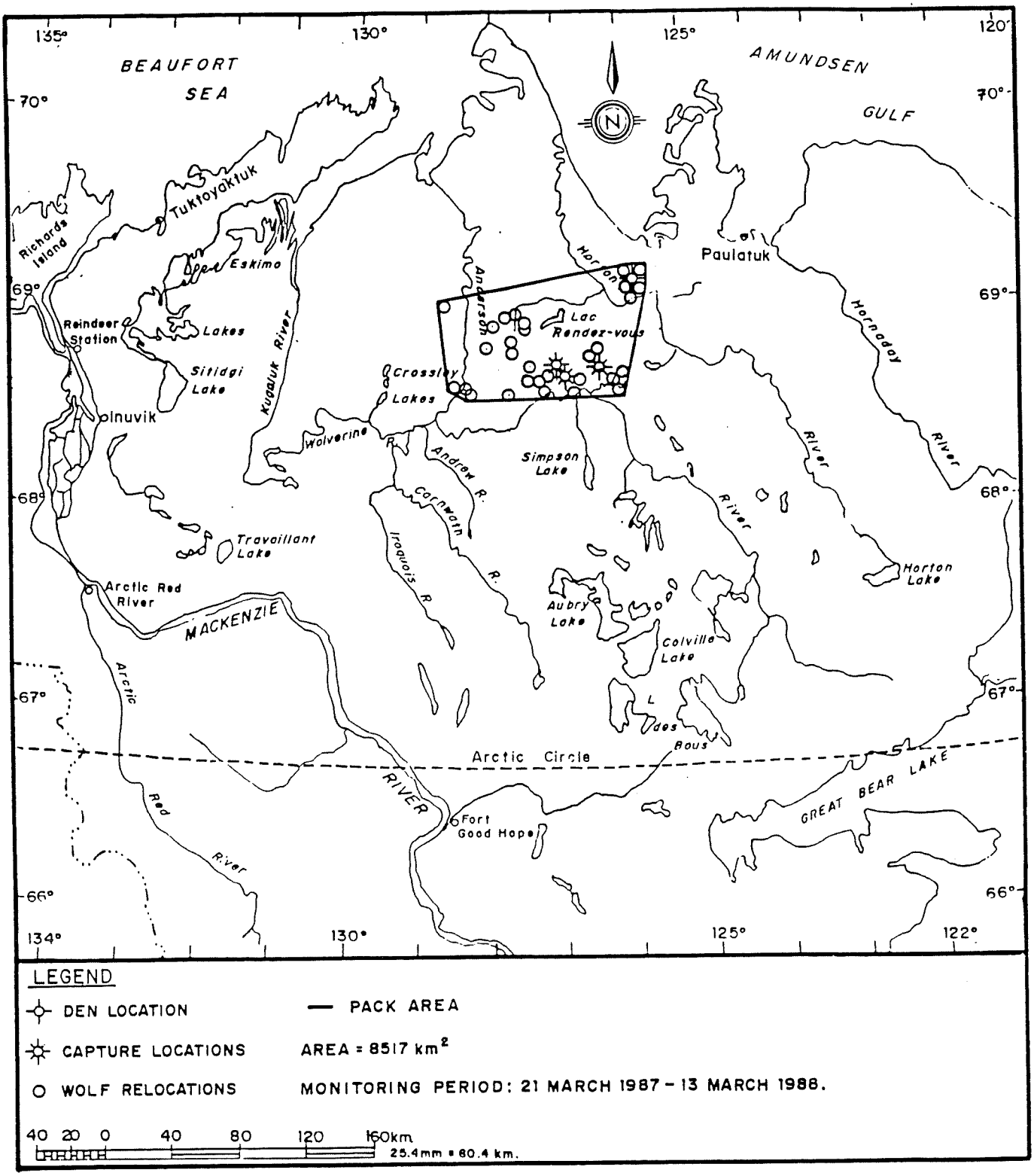

Figure 18. Telemetry locations and area for the Horton River Pack, Western Arctic Wolf Research, 1987-88.

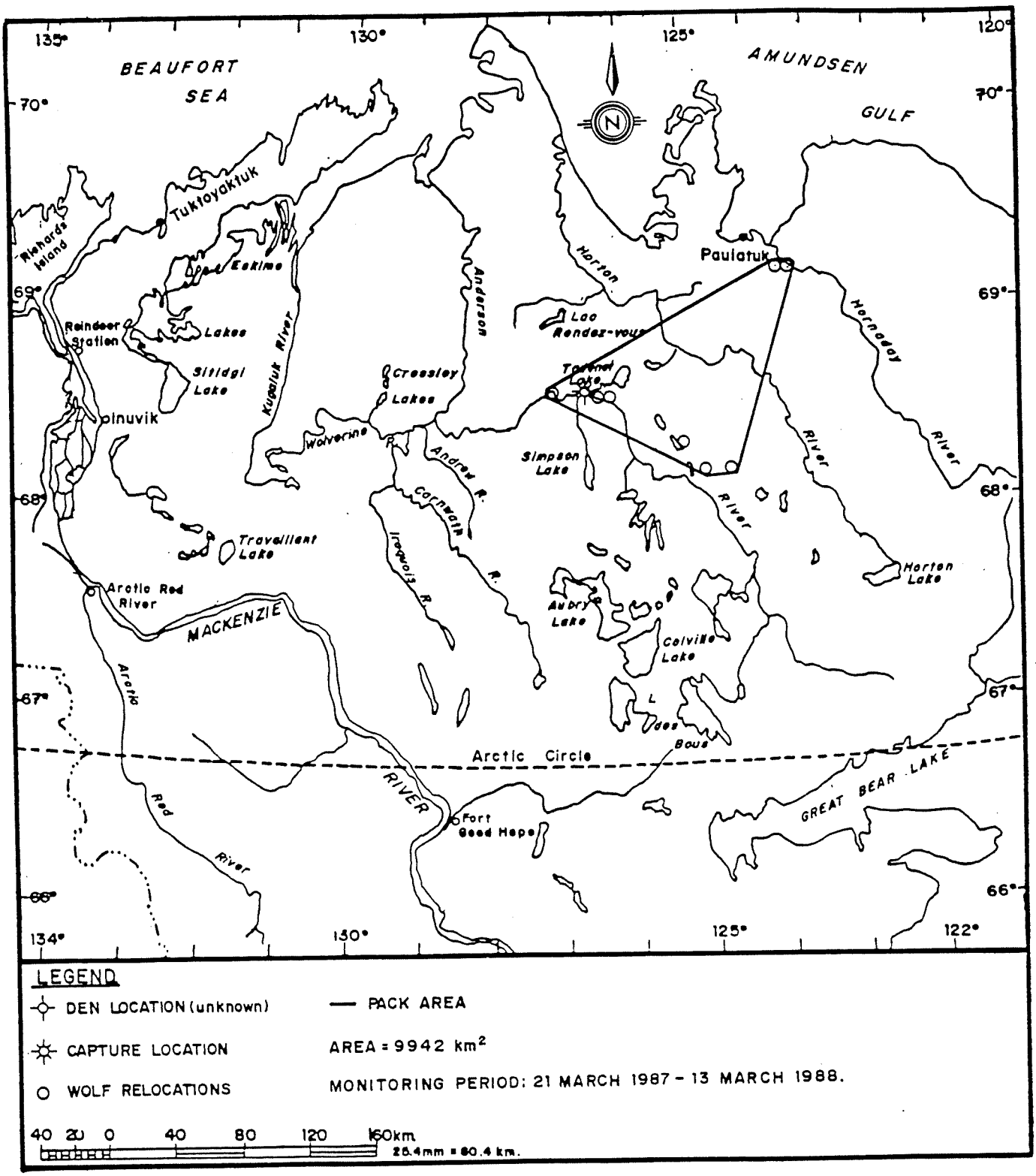

Figure 19. Telemetry locations and area for the Ewariege Pack, Western Arctic Wolf Research, 1987-88.

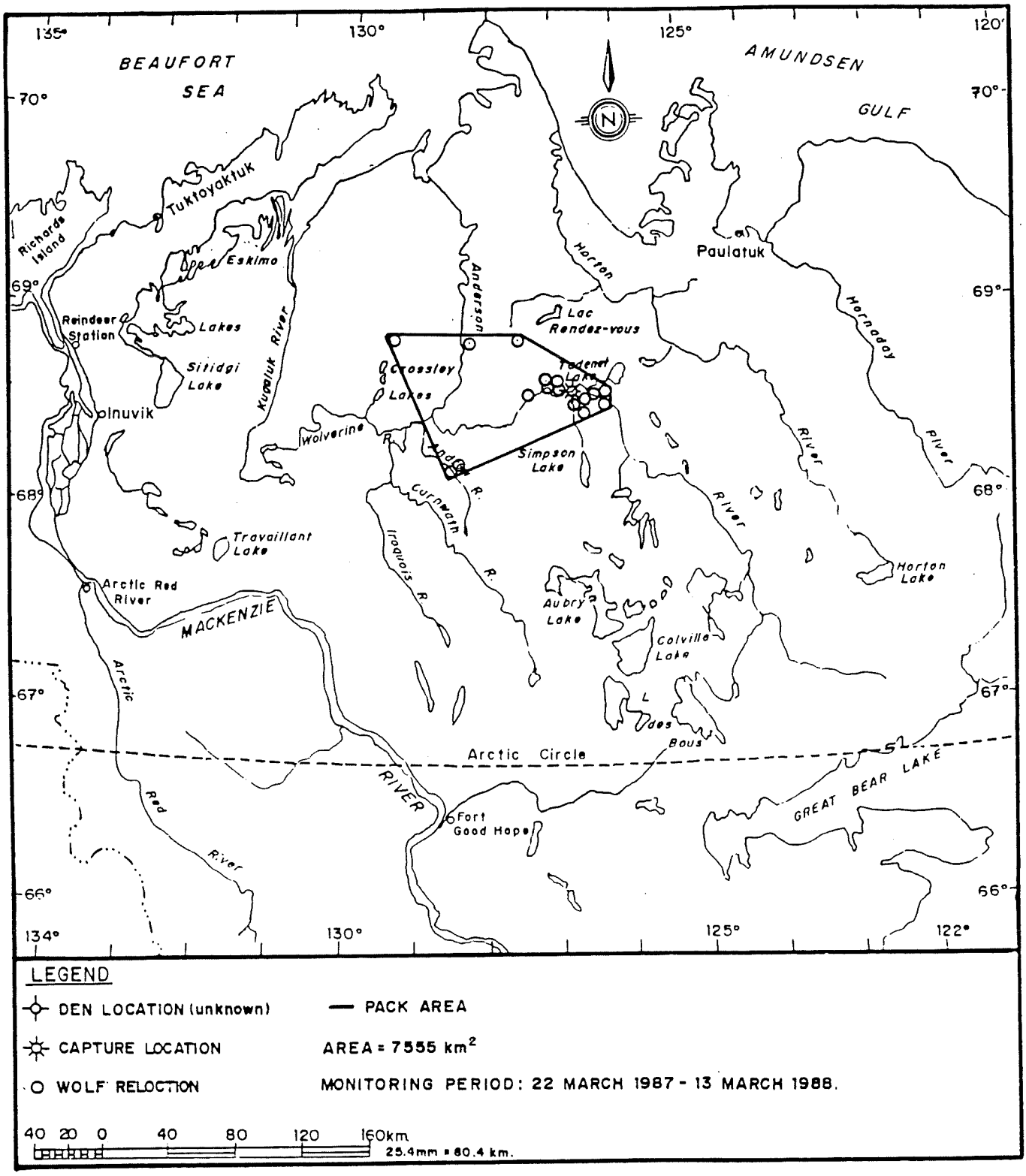

Figure 20. Telemetry locations and area for the Andrew River Pack, Western Arctic Wolf Research, 1987-88.

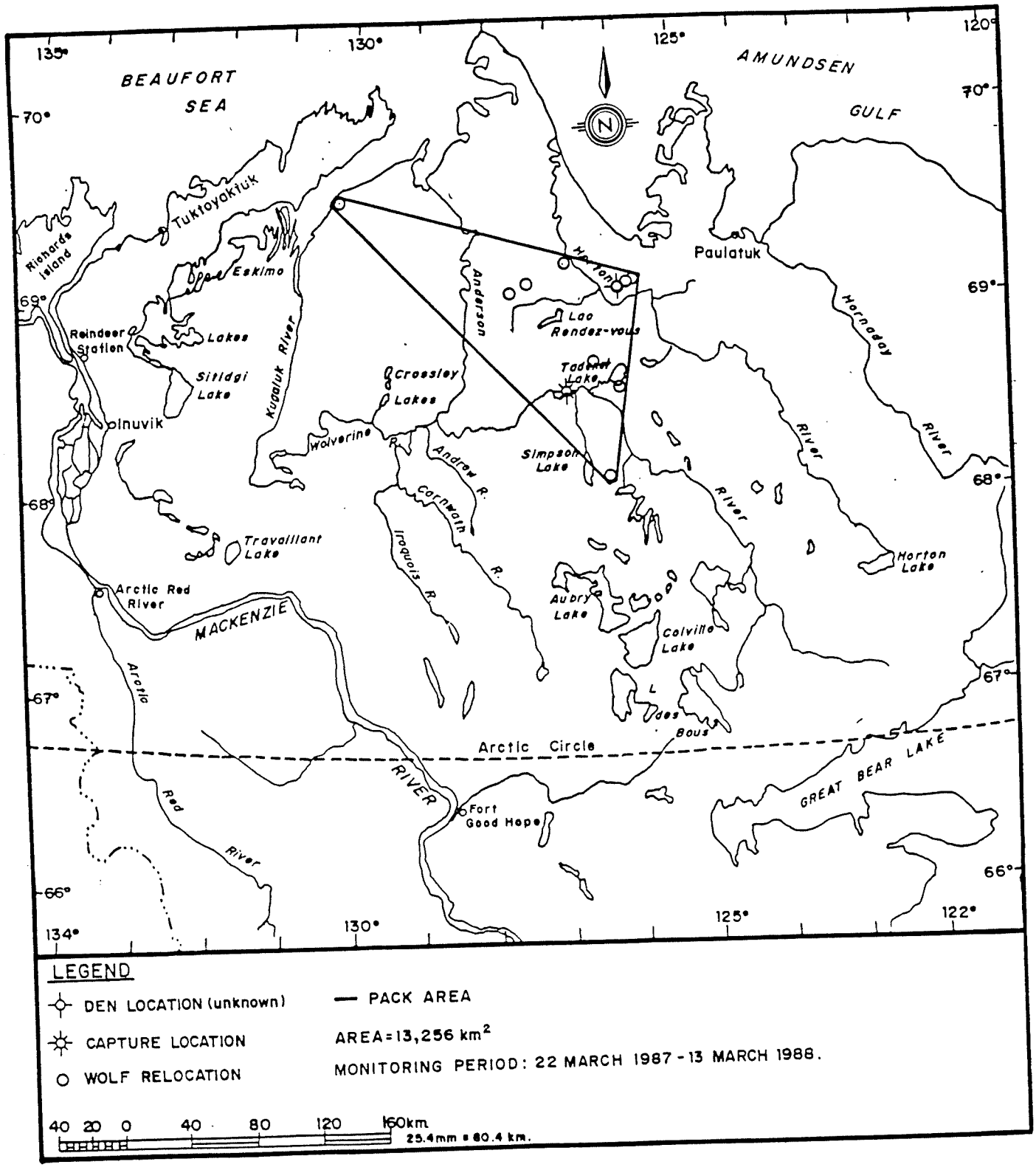

Figure 21. Telemetry locations and area for the Hars Pack, Western Arctic Wolf Research, 1987-88.

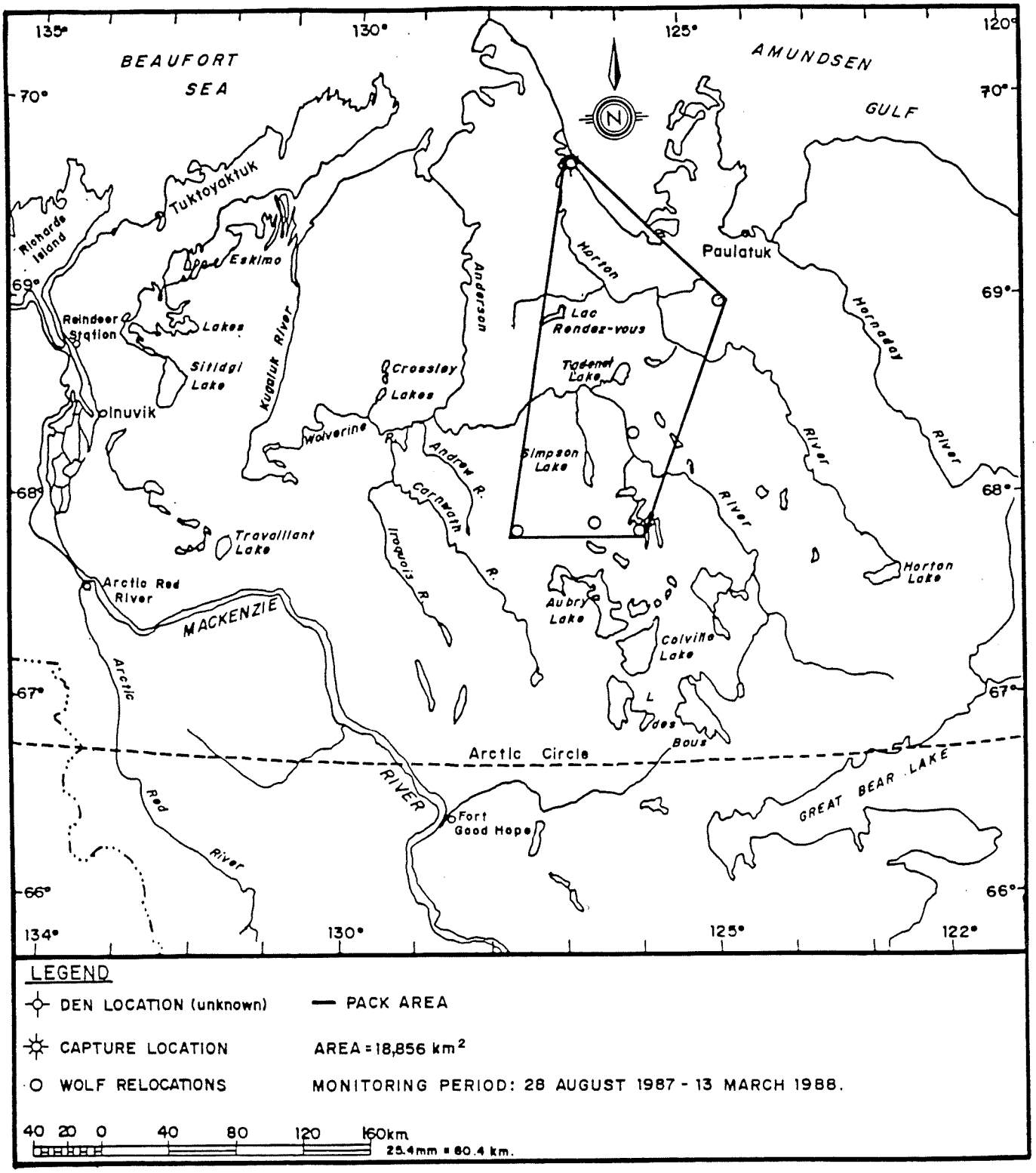

Figure 22. Telemetry locations and area for the Melville Hills Pack, Western Arctic Wolf Research, 1987-88.

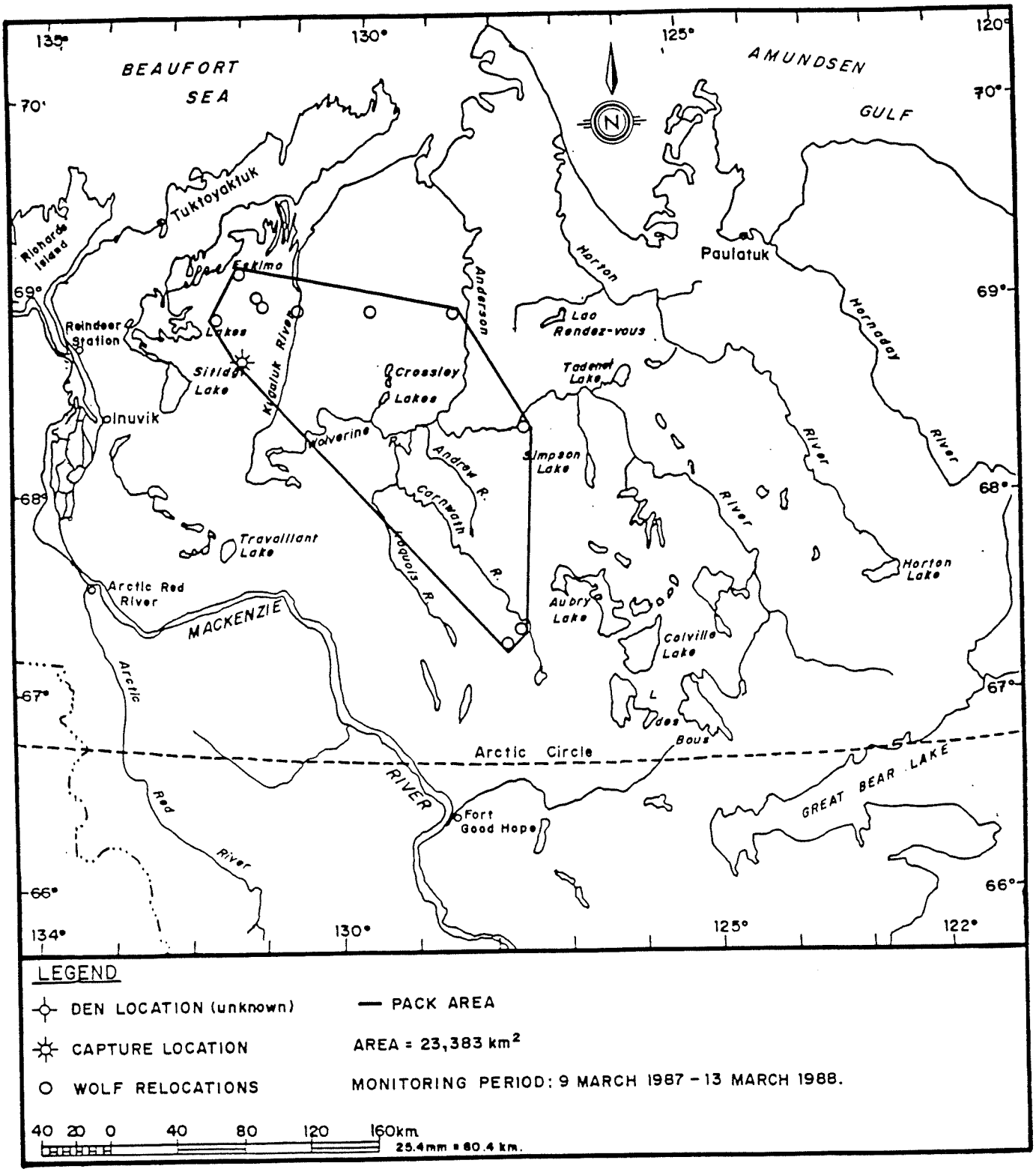

Figure 23. Telemetry locations and area for Wolf 16, Western Arctic Wolf Research, 1987-88.

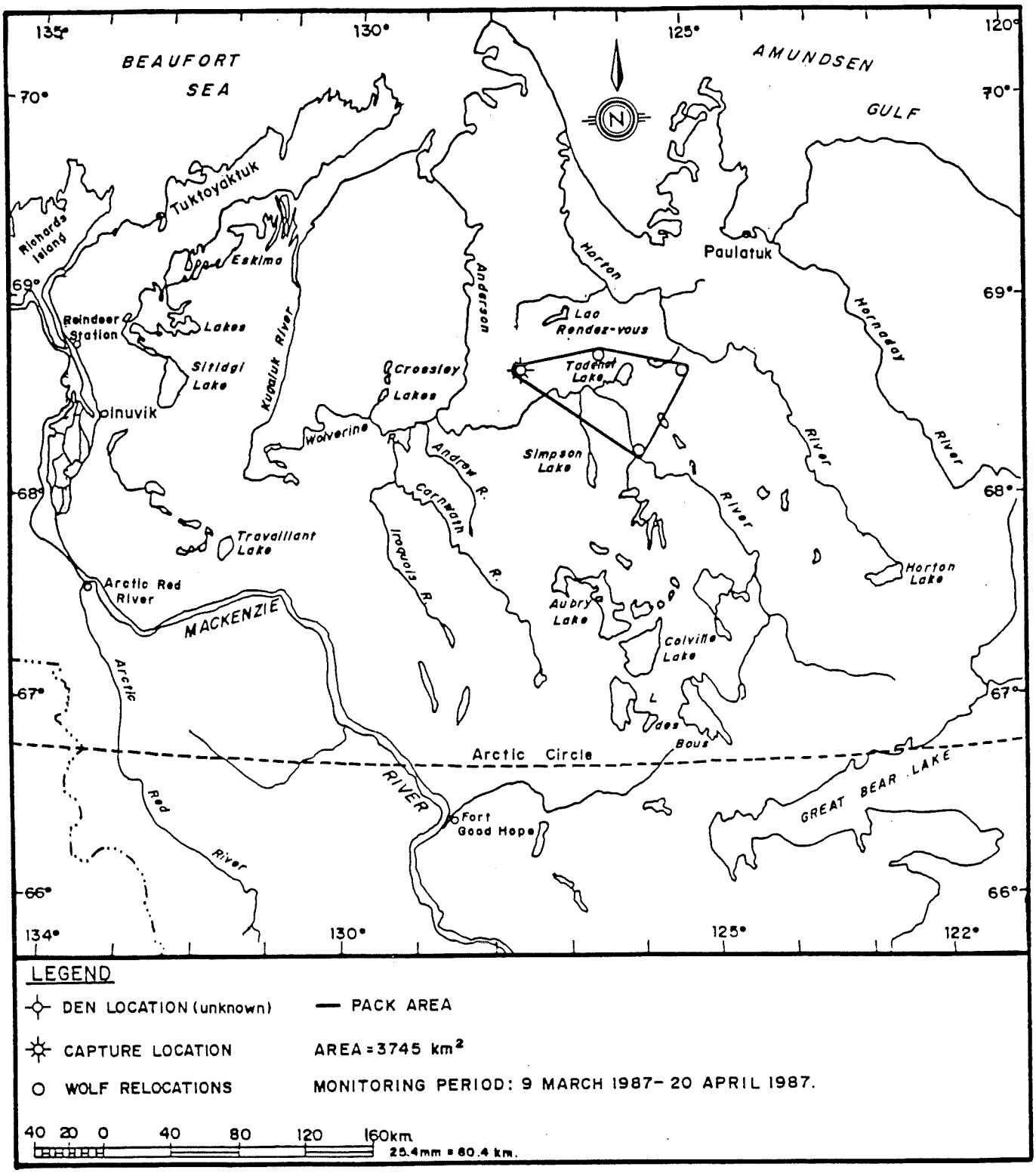

Figure 24. Telemetry locations and area for Wolf 20, Western Arctic Wolf Research, 1987-88.

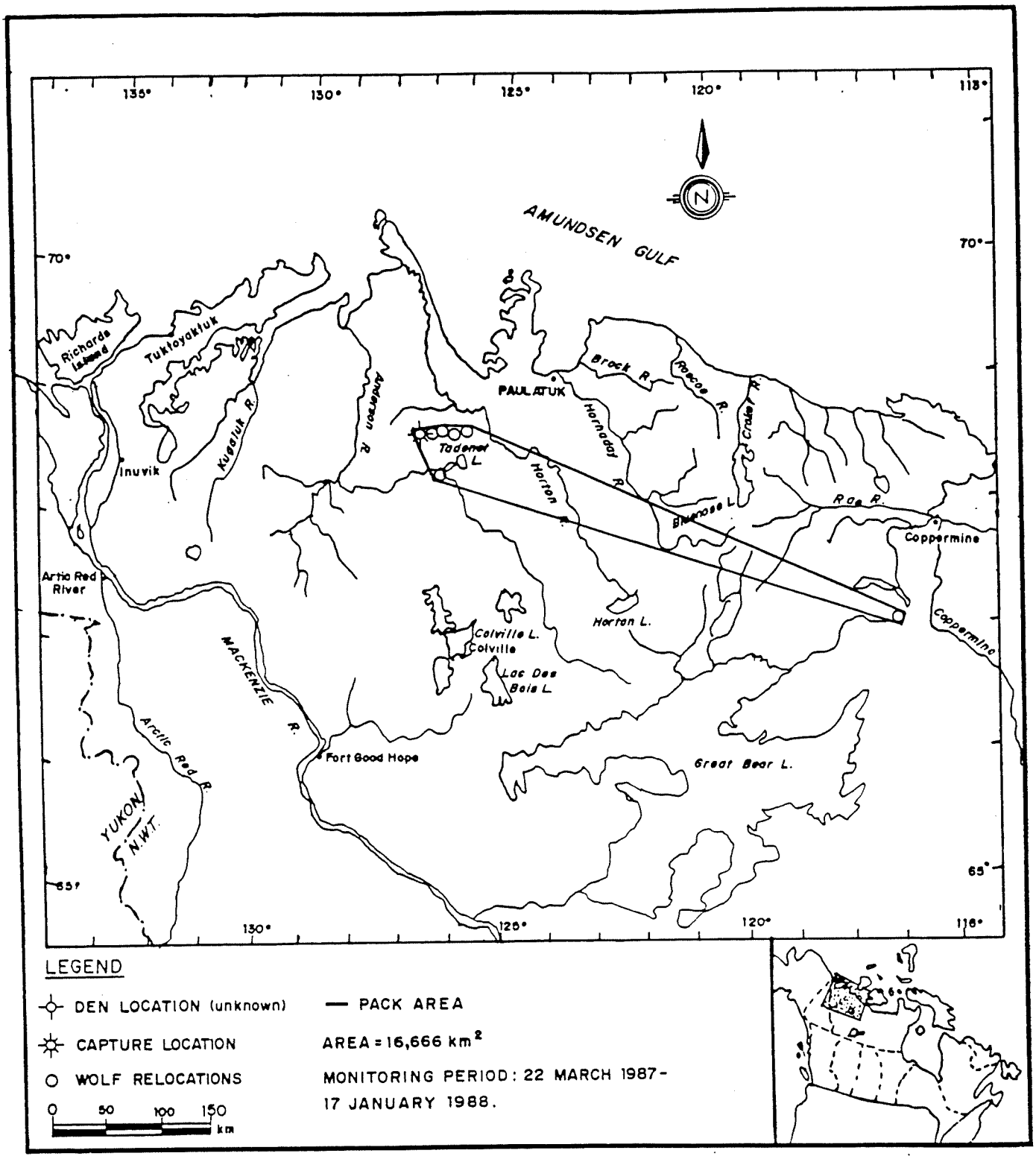

Figure 25. Telemetry locations and area for Wolf 35, Western Arctic Wolf Research, 1987-88.

the denning period. For a wolf pack to successfully raise a litter of pups it must have sufficient prey available.

A general observation of den site locations is that wolves dependent on the Bluenose caribou herd as their major prey source have chosen the area between the Anderson and Horton River as a denning area because they can maximize their access to caribou. The den sites are located near the center of the Bluenose caribou herd range. Situating their dens in the Anderson-Horton River area allows the wolves access to caribou in the spring as the caribou are migrating through to their calving grounds east of the Hornaday River. In the spring the wolves would have access to cows and last years calves in March and April and to bulls and yearlings in April, May and June as they follow behind. Some caribou may even stay in the area throughout the summer. In August and September the caribou are again throughout the area as they migrate west. This would provide access to caribou when the pups are ready to leave their dens and begin travelling with the pack. Of the entire Bluenose caribou herd range, the area between the Anderson and Horton Rivers probably has access to caribou for more months throughout the year than any other area.

During 1988-89 den sites will be visited and information taken on the den and site characteristics. Wolves will be monitored throughout 1988 to determine if den site fidelity exists for wolves associated with the Bluenose caribou herd.

4.6 Reproduction

In February and early March wolves were located in packs or male-female pairs, however there was no physical evidence (bleeding or swollen vulva) that female wolves were in breeding condition. From 19-22 March 1987, eight out of twelve females collared were in breeding condition and regular monitoring indicates that at least five of them had pups during the spring of 1987 (Table 5). Pups were probably born from the middle to end of May. Observations by Williams (1988) of the Lac Rendezvous and Hars Packs identified five pups per pack at the den site. During monitoring flights one to five pups were seen with collared adults (Tables 4 and 5).

In at least one and possibly two cases, more than one female in a pack bred and successfully produced young. W31 of the Horton River Pack and W38 of the Hars Pack, both produced a litter of pups. These two females were located together before and during the denning season. The den site for W38 was located and observed but W31's den was not located, however it must have been close by as W31 was located in the same area as W38. Female W22 from the Granet Lake Pack, was also associated with W31 and W38 as late as 22 June 1987 and then was seen at her own den site on 14 July 1987.

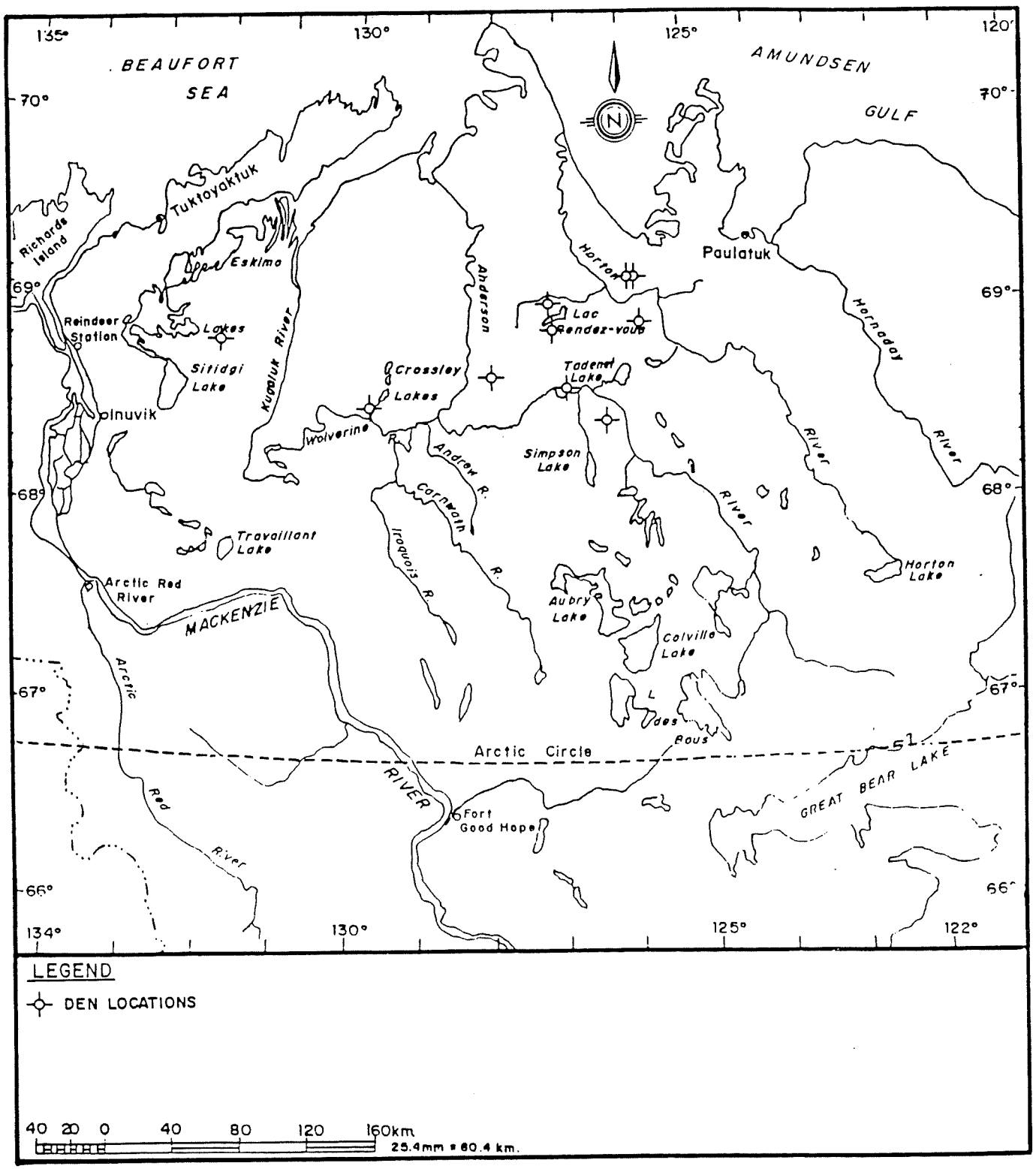

Figure 26 Wolf den locations, Western Arctic Wolf Research, 1987-88.

Table 4. Western Arctic Wolf Research Den Site Locations and Pups Produced per Wolf Pack, 1987-88.

Wolf Pack	Den Location	Pups at Den*	Pups Seen Later*/Date
Sitidgi Lake Pack	unknown		1/9-9-87
Wolverine River Pack	68.20 139.24		3/9-10-87
Anderson River Pack	68.32 126.57	2	
Ridge Pack	68.35 128.00		4/9-9-87
Lac Rendezvous Pack	68.49 127.04	5**	2/28-12-87
Horton River Pack	69.06 125.50		5/20-9-87
			5/14-10-87
Hars Pack	69.05 125.52	5**	4/20-9-87
Granet Lake Pack	68.51 125.46		3/15-10-87
Smoke River Pack	68.23 126.20		1/8-10-87

* Pups are difficult to see from the aircraft when wolves are at the den and when wolves are travelling, observations represent minimum numbers.

** Pups observed at the den during Williams pup survival research, observations represent total number of pups.

Table 5. Western Arctic Wolf Study Females in Breeding Condition* and Pups Produced, 1987.

Wolf	Pack Association	Date Breeding Condition Observed	Pups Seen/ Date
W22	Granet	19-3-87	3/15-10-87
W24	Tedgi	19-3-87	
W26	Ridge	20-3-87	4/9-9-87
W28	Ridge	20-3-87	
W29	Rendezvous Lk	21-3-87	5/24-6-87,2/29-12-87
W31	Horton	21-3-87	5/20-9-87, 14-10-87
W38	Hars	22-3-87	5/11-9-87,4/20-9-87
W39b	Horton	22-3-87	

*Breeding condition identified by bleeding or swollen vulva.

4.7 Wolf Predation

In total 43 (40 caribou, 2 moose, 1 reindeer) kill sites were identified (Figure 27). Samples taken from the kill sites have not been analyzed. When the samples are analyzed the age and physical condition of the kills will be identified. Kill site locations varied from lakes to heavy bush and tree cover. However, kills on lakes are easily seen and therefore the number of kills found on lakes may be over represented. No actual predation was observed during monitoring, but wolves were often seen in close proximity to caribou, moose or muskoxen. In one case in the fall of 1987 a pack of wolves had wounded a bull caribou and had it trapped in the middle of a small lake. The caribou was standing in about 75 cm of water and the wolves were lying on the edge of the lake.

In May 1987 three separate kill sites were observed with grizzly bears on the kill and collared wolves nearby. It is difficult to determine, but it is speculated that the wolves had killed the caribou which were later taken over by the grizzly bears. A more detailed wolf predation rate study will be conducted during April 1988. At this time four to five of the collared packs will be monitored daily to determine the age class of and number of caribou, wolves are able to take in the late winter.

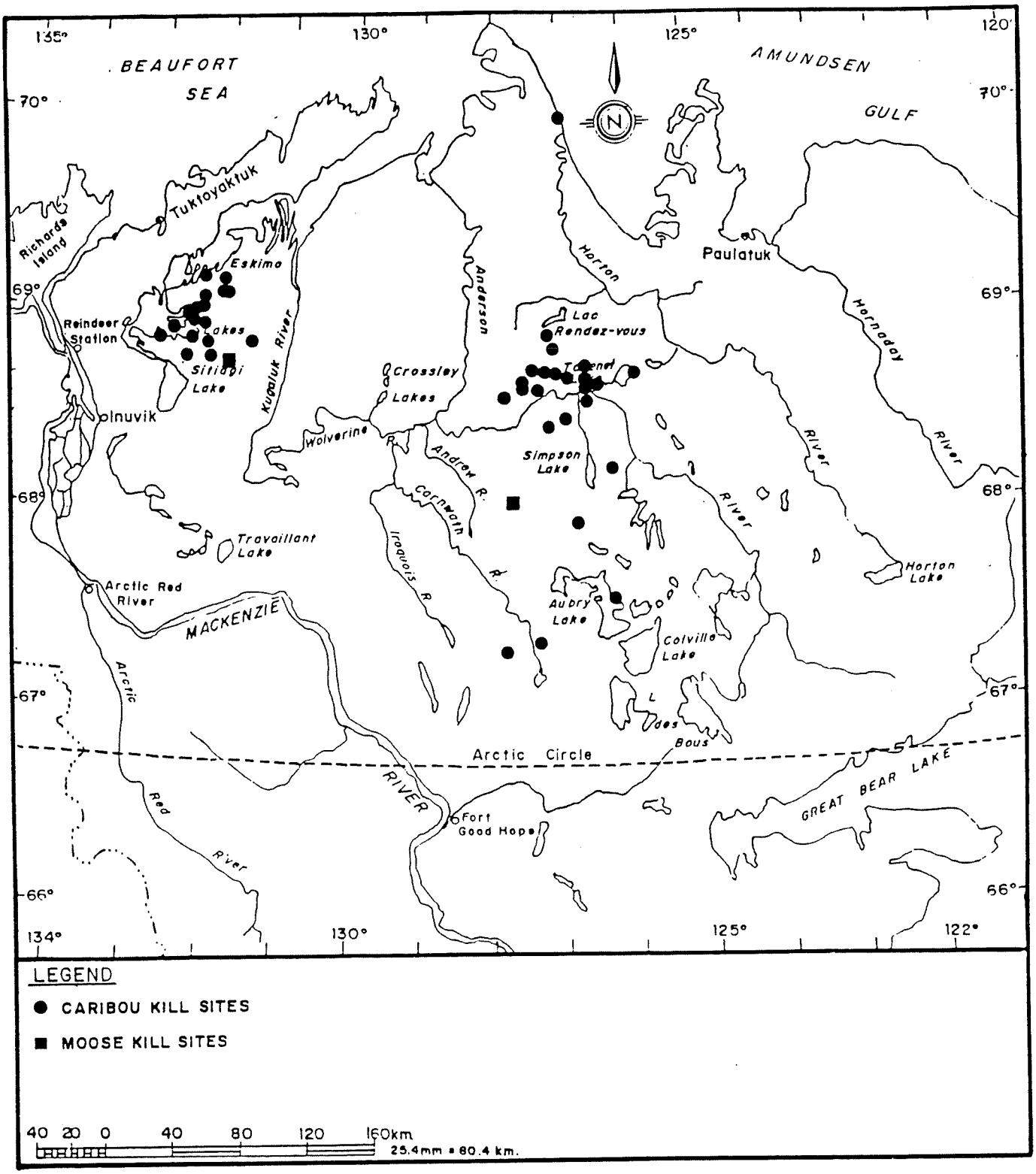

Figure 27. Wolf prey kill sites, Western Arctic Wolf Research, 1987-88.

4.8 Wolf Mortality

An important part of any wolf population dynamics is the amount of natural and man-caused mortality experienced. Throughout the study information on wolf mortality is being collected to help determine overall population, health and survival. In a healthy, productive population one would expect low natural mortality. Information on man-caused mortality helps determine the influence man is having on the population.

Natural Mortality

Of the 38 radio-collared wolves only W13 has been identified to have died of natural causes. W13 was part of the Wolverine River Pack and had travelled with the pack from the Miner River to an area south of Luemat Lake, north of the Anderson River. W13 was first located in the area on 19 April 1987, but a visual was not obtained until 20 May 1987 when it was concluded that W13 was dead. A field necropsy showed that W13 had several bite marks (presumed wolf bite marks because of their size) on his neck and back. There was also evidence that W13 was bleeding from the nose and mouth when he died. Ravens had fed on the body but the body was still mostly intact when found. It was not possible to determine if W13 had been killed by a member of the Wolverine Pack or by a member of some other pack in the area.

In 1987 during Williams's (1988) study of pup mortality and survival at the den site (n = 2), no pup mortality was observed. However, it does appear that in the fall and early winter of 1987 some pups died as fewer were seen with collared females in September, October and November (Tables 4 and 5).

Hunter/Trapper Harvest

Monitoring the hunter/trapper harvest of wolves within the study area and in bordering areas has helped determine the influence people have on wolf productivity and survival. The locations of all hunter/trapper killed wolves are shown on Figure 28. Hunters are able to take more wolves in the area above the treeline south of Husky Lakes (Figure 28). All of the wolves taken in this area are shot when hunters are out hunting with snowmobiles. When the wolves are below the treeline they are difficult to hunt on snowmobile because of the trees and rougher terrain. Wolves taken below the treeline are often caught on large lakes or trapped.

Hunters and trappers took a minimum of 74 wolves from the study area based on skull and carcass samples submitted. From talking to hunters and trappers in Tuktoyaktuk and Paulatuk it is likely that another 30 wolves may have been taken without samples being turned in.

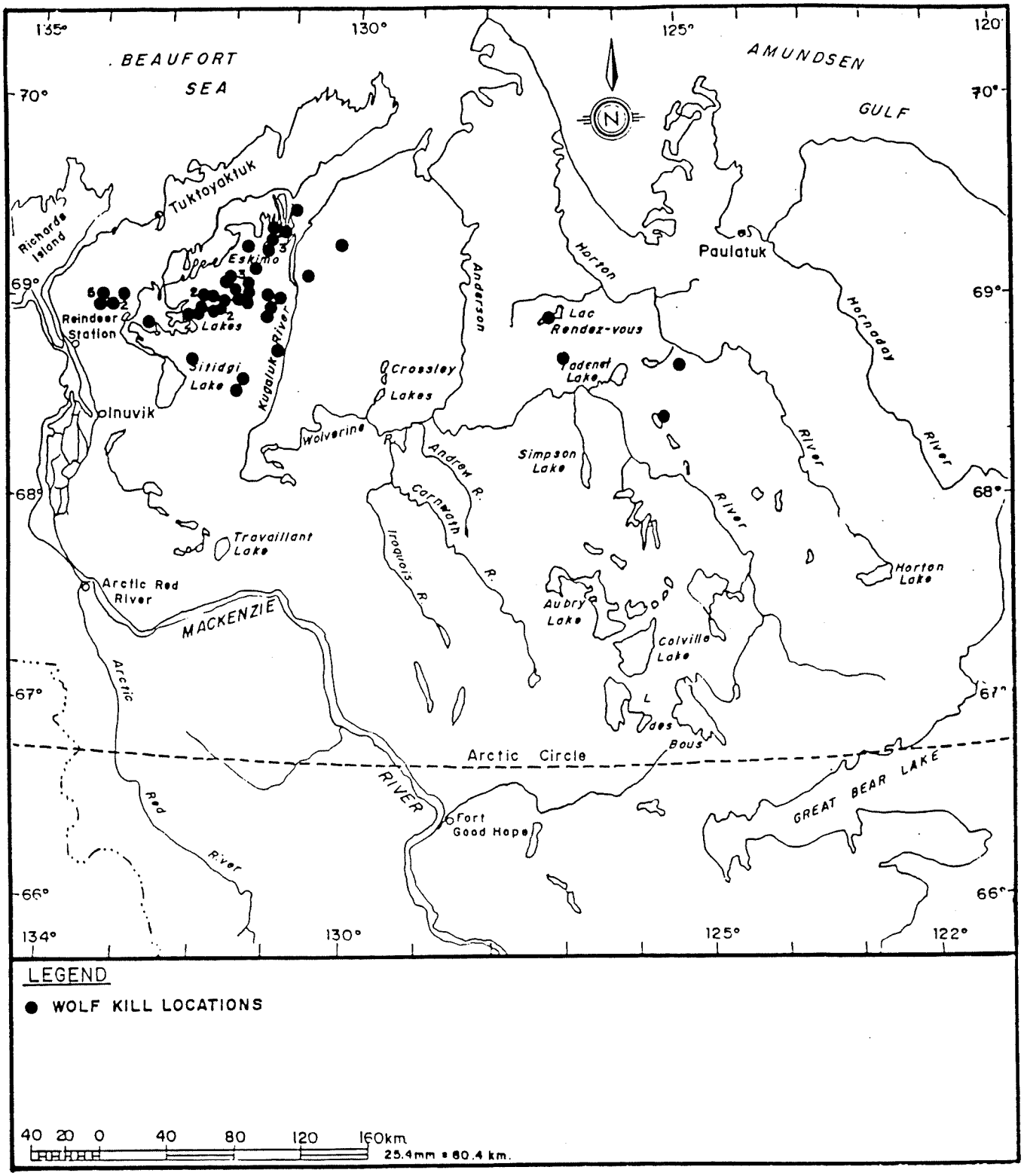

Figure 28. Hunter/Trapper wolf kill locations, Western Arctic Wolf Research, 1987-88.

Eleven collared wolves were taken by hunters and trappers. As discussed previously Tuktoyaktuk hunters shot eight collared wolves, Paulatuk hunters two and a Coppermine hunter one. Information on the hunter and trapper wolf harvest is presently being analyzed and will be presented in subsequent reports.

4.9 Skull and Carcass Information

Collection

A total of 106 samples (67 skulls, 39 carcasses) were submitted during the 1986-87 wolf hunting and trapping season. Wolf hunters from Tuktoyaktuk contributed 56 samples (37 skulls, 19 carcasses). The other communities submitted fewer samples; Paulatuk 13, Aklavik 15, Inuvik 5, Fort McPherson 6, Fort Good Hope 3, Norman Wells 3, Fort Norman 3, and Fort Franklin 2. When the skulls or carcasses were collected the location where the wolves were taken was recorded. Figure 28 shows the locations of wolves taken within the study area. Wolves from other areas were also collected for comparison work on skulls, body condition, weight and size.

Measurements

All of the skulls and carcasses have been examined and measured. The information is being put on computer and will be analyzed during 1988-89. The wolf skull measurements and

characteristics will be compared with existing descriptions for the wolf subspecies in the study area.

Cementum Aging

Cementum aging of premolars from wolves captured for collaring and from skulls and carcasses are being analyzed and the data will be presented in a subsequent report.

Cesium Analysis

Wolf tissue samples from carcasses were sent to Dan Holleman (Institute of Arctic Biology, University of Alaska, Fairbanks, Alaska) for analysis. Thirty nine samples from Tuktoyaktuk, Aklavik and Inuvik were analysed and radiocesium concentrations determined (Table 6). The samples (24) from the Tuktoyaktuk area had a mean Cesium-137 concentration of 6375.2 pCi/kg (pico-curies per kg net weight of muscle tissue) or 223.2 Bq/kg (becquerels per kg wet weight of muscle tissue)(n = 24, Sd = 59.1 Bq/kg). A concentration this high would indicate that the wolves were primarily caribou eaters (Holleman pers. comm 1987). The Cesium-137 levels for the Bluenose caribou herd for 1986-87 were 175 Bq/kg (Table 7).

The wolves in the study area had considerably higher Cesium-137 levels compared to wolves taken in the Richardson Mountains by Aklavik hunters (Table 6). Wolves taken west of Aklavik had a mean Cesium-137 concentration of 1073.5 pCi/kg or 39.7 Bq/kg (n =

10, SD = 12.6 Bq/kg). Cesium levels this low would suggest that the wolves are feeding on moose or sheep (Holleman and Stephenson 1981).

Genetic Analysis

One hundred and eight wolf tissue samples were frozen and shipped to Dr. M. Kennedy (Memphis State University, Memphis Tennessee) for genetic analysis. The wolf samples were from Tuktoyaktuk, Paulatuk, Aklavik, Inuvik, Fort McPherson, Fort Good Hope, Fort Franklin and Norman Wells. The samples were received in Tennessee in good condition and prepared for analysis. Initial analysis has identified some polymorphic systems which would indicate that some genetic variability exists within the wolf population (Kennedy per. comm. 1988). Further testing and analysis on the samples will be completed by June 1988 and more conclusive and detailed information will be available.

Dr. Kennedy has sent portions of some of the samples to Dr. Densmore (Texas Tech University, Houston Texas) for mitochondrial DNA analysis and this work should be conducted over the next year.

Table 6. Cesium-137 Concentrations from Wolf Tissue Samples, Western Arctic Wolf Research, 1987-88.

Sample ID	Community	Weight (g)	Radiocesium Conc. pCi/kg	Bq/kg	Coefficient of Variation (%)
31	AK	1075	898	33.2	5.0
32	TK	963	4855	179.6	2.2
33	TK	910	8347	308.8	2.0
34	AK	1043	903	33.4	4.0
35	AK	871	690	25.5	5.6
36	AK	1030	1475	54.6	2.8
37	AK	1117	1024	37.9	3.4
38	TK	981	5837	216.0	1.5
39	TK	451	10339	382.5	1.5
40	TK	1020	8320	307.8	1.3
60	TK	461	4080	151.0	2.2
61	TK	375	8813	326.1	1.6
62	TK	177	5693	210.6	2.9
76	TK	544	5272	195.1	1.7
319	TK	467	4335	160.4	2.0
320	TK	471	8481	313.8	1.5
321	TK	482	5751	212.8	1.7
322	TK	422	6244	231.0	1.7
323	TK	549	6172	228.4	1.6
324	IN	381	8930	330.4	1.5
363	TK	344	7444	275.4	1.7
364	TK	266	7171	265.3	2.0
365	TK	502	5192	192.1	1.8
366A	IN	502	8237	304.8	1.5
366		172	8169	302.2	2.3
367	TK	505	2691	99.6	2.6
368	TK	313	5325	197.0	2.2
371	TK	517	5516	204.1	1.7
372	TK	417	4632	171.4	2.1

373	TK	538	4721	174.7	1.8
374	AK	409	894	33.1	7.3
401	IN	1101	780	28.9	5.1
402	AK	1059	1716	63.5	3.0
403	AK	850	640	23.7	7.3
404	TK	912	4415	163.4	2.1
405	AK	1086	1037	38.4	4.4
406	TK	985	7806	288.8	2.0
407	AK	986	1458	54.0	3.7

Radiocesium concentrations (Cesium-137) are in pico-curies (pCi) or becquerels (Bq - same as dps) per kg wet weight (muscle tissue).

Coefficient of variation is the standard deviation divided by the mean value and only reflects variation due to sample counting.

Communities: AK-Aklavik, TK-Tuktoyaktuk, IN-Inuvik

Table 7. Cesium-137 Levels In Caribou Meat, Agriculture Canada Study, 1987.

Caribou herd	Cesium-137 level (Bq/kg)
Porcupine	150
Bluenose	175
Bathurst	475
Beverly	350
Kaminuriak	275
North Baffin	50

Information supplied by Agriculture Canada monitoring of Chernobyl Accident.

Reproductive Tract Analysis

A total of 20 female reproductive tracts were examined from hunter killed wolves. Seventeen of the tracts did not show any sign of past or present breeding condition. Three reproductive tracts showed signs of previous breeding activity, one of the three was pregnant when killed, one was in breeding condition and the third showed no signs of current reproductive activity. Many of the wolves taken by hunters are young (pups or yearlings) and it is expected that they would not have a past reproductive history or be in breeding condition. Some of the wolves taken by hunters were taken in January and February and would not have come into breeding condition.

4.10 Indigenous Knowledge

During the first year of research there have been several opportunities to discuss wolves with the Tuktoyaktuk and Paulatuk hunters and trappers. The discussions have focused on wolves seen during different seasons (Pokiak pers. comm. 1987, Jacobson pers. comm. 1987). Most hunters and trappers agree that there are wolves that follow the caribou ("caribou wolves") and wolves that remain in one area all year long (Steen pers. comm. 1987).

Hunters and trappers have more exposure to wolves during the winter months when they are on their traplines or hunting caribou. As a result most of what they know about wolves is associated with

this time. Some hunters from Tuktoyaktuk who have focused on wolf hunting have become quite knowledgeable of wolf movements, travel patterns, pack behavior and hunting strategies. Much of this information they have learned from following wolf tracks to find wolves. Many of the wolf hunters also respect how smart some wolves can be in avoiding being captured (Nasogaluak pers. comm. 1987).

During 1988-89 more time will be spent talking to hunters and trappers and recording what is known about wolves in their area. Information on past and present wolf presence and activity will be discussed.

5.0 CONCLUSIONS

After the first year of research the conclusions reached are tentative and subject to change as more information on the wolf population is collected. Although it is too early to accept or reject any of the hypotheses set down at the beginning of the research some general comments can be made about the wolf population and its relationship with caribou.

The wolf population in the study area appears to be healthy and have a low rate of natural mortality. Only one of the 38 radio-collared wolves died of natural causes. During capture work all of the wolves were in good condition and no cases of mange or other external parasites were found. Necropsies of thirty nine wolves taken by hunters did not reveal any heavy loads of internal parasites in the stomach, intestines or liver.

The predominant wolf prey in the area is caribou. Some packs cover extensive areas over the course of the year which may help maximize their access to caribou. Other packs remain in relatively small areas and are still able to survive. The two strategies used by different wolf packs will be investigated further. The wolves also seem to select a denning area that will give them the most access to caribou. The Anderson-Horton River area lies in the center of the Bluenose caribou herd's range and would have caribou present for most of the year.

Pack structure of collared wolves varies. Some male - female pairs collared in February - March 1987 have remained together and separate from other collared wolves. Other wolves have been located with several packs and have still maintained their own separate pack and produced pups. Many of the collared wolves and their associated pack members are found in a relatively small area along the Anderson River in late February, March and April. During this time several packs can be located in the same area and there appears to be no territoriality or inter-pack aggression. With the thousands of caribou in the area at this time there may be enough prey for all the wolves present and defending any given area would be a waste of time as the caribou are migrating through the area.

In May the packs disperse from the previously concentrated area to den sites where they focus their activity for June, July and most of August. By September and October some of the wolves are again travelling greater distances to find caribou.

The first year of research has begun to provide answers to the many questions about wolves and wolf-caribou relationships in the Western Arctic. As the project continues in the future more information will be collected and our understanding of the wolf-caribou ecosystem will be more complete.

ACKNOWLEDGEMENTS

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6.2 Personal Communications

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7.0 APPENDICES

Appendix 7.1

WOLF CAPTURE FORM

Perm ID_____ Capture Date_____/_____/_____/YYMMDD
Est % Canopy_____ Died_____/_____/_____/YYMMDD
UTM sheet_____ Easting_____ Northing_____
Nearest Place Name_____
Dart Gunner_____Data Recorder_____

WOLF PACK INFORMATION
Packname_____Number of Wolves_____
Pack Colour Composition LC____ GT____ BG____ GR____
Kill Present? 1 = Y 2 = N Killsite Form #_____
Kill Species_____

VITAL STATISTICS Radio Frequency_____(xxx.xxx)
Collar type_____Sex 1=M 2=F
Est Age_____(months) Cemtage_____(months) Photo 1=Y 2=N
Color (LC) (GT) (BG) (GR) Weight (kgs)_____.__guessed? 1=Y 2=N
Length_____(mm) Neck circ_____(mm) Chest Circ_____(mm)
Canine L_____W_____ Blood sample? 1=Y 2=N Tooth taken? 1=Y 2=N

TIME DATA (24 HOUR CLOCK)
First Hit_____ 2nd Hit_____ First Effects_____
Unconscious_____ First Activity_____ Standing_____

DRUGGING DATA
Drug Concentration_____.___mg/kg Wolf Total Drug_____.___(cc)
# of Darts Shot_____ # of Hits_____
Needle Length_____ (mm) 3/4" = 19mm 1" = 25 mm
1-1/8" = 28 mm 1-1/4" = 31mm
1-1/2" = 38 mm
Hit Locations (left or right, eg. 5L 3R) see map below __ __ __
Comments: (128 spaces)_____
_____
_____

Appendix 7.2

RADIO RELOCATION FORM

Perm I.D._____ Date_____/_____/_____ Aircraft_____
YY MM DD

Observer_____
Wolfpack_____
Recorder_____ Freq 1_____
Visual 1 = Y 2 = N Nmbwolves_____ Freq 2_____
LC_____ BG_____ GT_____GR_____ Freq 3_____
Location Information 1 Freq 4_____

Time Location 24 hour
UTM_____ Contacted_____ Time_____ clock

Activity 1=walking 2=resting 3=sleeping 4=hunting
5=feeding 6=unknown 7=running 8=other (comment)
Habitat 1=alpine 2=subalpine 3=forest 4=riparian riv.
5=meadow 6=lake ice 7=river ice 8=riparian lake
Elevation_____

Kill Present Information
Carcass 1 = Y 2 = N 3= Unk Species_____
Kill form #_____ Preyfreq_____
Sex 1 = M 2 = F Est. Age 1 = Adult 2 =Calf 3 = Yearling
Cement Age_____.___ Other Predators Near? 1 = Y 2 = N
Other Predator Name_____

Prey Available
Prey Name_____ Distance_____
Numbers of: cow/ewe_____ bull/ram_____
calf/lamb_____ unkadult_____
Comments: (146 spaces)_____
_____
_____

Appendix 7.3

KILLSITE OBSERVATIONS

Kill Number:_____ Observer Name:_____
Site Co-ordinates:_____x_____ Location:_____
Date of 1st Observation:____/____/87 Check: aerial/ground
Subsequent Ground Check:____/____/87 Examiner:_____

Prey Species: caribou / unknown / _____ Sex: M / F / unk
Estimated Age: Calf / Yearling / unknown

Estimated Kill Age: fresh / 1 day / 2 day / < 1 week / unk
% Consumed: overall_____, head_____, body_____, viscera_____, hide_____
Suspected Cause of Death: wolf / human / _____
Tracks Present: wolf / grizzly / fox / _____
Specimens Taken: jaw / femur / muscle / _____

Associated Wolf Pack:_____
Frequencies: 15_____, 15_____, 15_____, 15_____
Total Visuals on Wolves:_____ Other Predators:_____
Wolves: light_____ lightgrey_____greytan_____grey_____black-grey_____black_____

Habitat: tundra / taiga / forest / creek / river / lake
Local Cover: none / sparse / moderate / heavy

Lab Results: cementum age_____years, marrow fat_____%
cesium_____pCi/g

Computer Entry:_____

Appendix 7.4

SKULL & CARCASS PURCHASE DATA SHEET

Specimen Number_____ Lab Code_____
Specimen Collected: skull only / entire carcass
Community:_____ Collector:_____

Sex: male / female / unknown
Ear tagged or Radio-collared: yes (identity:_____) / no
Pelt Colour: light / grey / black
Abnormalities: none / _____
Killdate:_____(day/month/year)
Kill location:_____
Lat.___.___ x Long.___.___

Pack Structure
Total number of wolves observed:_____
light wolves_____, # grey wolves_____, # black wolves_____
Specimen #'s of other pack member killed:_____

Hunter's/Trapper's name:_____
Method Used: hunted / trapped

Comments:_____
_____
_____

Computer Entry:_____

Appendix 7.5

WOLF PHYSICAL DATA SHEET

Lab I.D._____

****General Information****
Killdate:_____/_____/_____(YY/MM/DD)
Placename:_____ Lat.___.___xLong.___.___

****Pack Information****
Packname:_____ # escape_____ # killed_____
Pack colors: Gtan___ Bgrey___ Bchoc___ Lghtcrm___ grey___

****Physical Data****
Necropsy Date:___/___/___ Sex 1=M 2=F 3=? Est.age_____(months)
Color 1 =GT 2 =BG 3 =BC 4 =LC 5 =GR Cementum age_____(months)
Whole wght_____.___(kg) Weight Method 1 =estimated
Skinned wght_____.___(kg) 2 =weighted
Body Measurements (mm) 1 =Whole 2 =Skinned
Contour length_____ Sternum fat_____
Chest circ._____ Back fat_____
Neck circ._____ Rump fat_____
Canine L_____ W_____ Total fat_____
Xiphoid fat_____(gms) Omental fat 0 =absent 1 =low 2 =moderate
3 = high
Stomach weight_____.___(kg) Stomach species_____
# of broken ribs: Left____Right____ # of Broken Canines_____
# of broken legs:_____ Parasites present? 1 = Y 2 = N
Collected? 1 = Y 2 = N

****Specimens Taken**** <u>circle each sample taken</u>

Visera Repro Cesium Muscle Blood Skeleton Skull Long bone tooth

****Repro Analysis****

	Left	Right
Placental Scars (total)	____	____
Placental Scars (last litter)	____	____
Corpora Albicantia	____	____
Corpora Lutea	____	____

Number of fetuses_____ Male_____ Female_____ Unknown_____
testes weight_____.___(g)

Appendix 7.6 Wolf Body Measurements and Capture Data, Western Arctic Wolf Research, 1987-88.

Wolf	Sex	Colour	Length (mm)	Neck Circ. (mm)	Chest Circ. (mm)	Canine Length (mm)	Canine Width (mm)
8701	f	light	1245	455	735	25	13
8702	m	grey tan	1310	450	830		
8703	f	light grey	1360	450	840	25	15
8704	m	light grey	1430	460	840	30	15
8705	f	grey	1240	390	700	33	17
8706	f	grey	1220	450	800	26	15
8707	m	grey	1170	360	685	27	15
8708	m	grey	1330	470	885	29	17
8709	f	grey	1260	380	680	23	12
8710	m	grey					
8711	f	grey	1230	455	795	25	14
8712	f	grey	1232	413	744	26	15
8713	m	grey tan	1230	500	790	31	17
8714	f	grey	1285	501	800	30	15
8715	f	grey tan	1200	420	695	27	14
8716	m	dark grey	1150	440	750	27	15
8717	m	black	1190	440	760	140	27
8718	f	black grey	1240	410		29	14
8719	m	black grey	1310	440	770	30	17
8720	m	black	1300	400	660	25	15
8721	f	black	1260	400	740	25	15
8722	f	black	1250	420	760	26	15
8723	m	black	1280	300?	780	30	17
8724	f	dark grey	1300	460	740	12	16
8725	f	grey	1120	370	700	22	11
8726	f	light grey	1130	395	640	25	12
8727	f	black	1220	360	655	22	10
8728	f	grey	1195	345	640	24	12
8729	f	black	1255	395	730	28	15
8730	m	grey	1355	440	720	28	15
8731	f	black grey	1180	370	745	26	14
8732	m	black	1340	440	750	24	16
8733	m	grey	1260	430	740	30	16
8734	f	grey	1210	380	660	25	14
8735	m	grey	1210	390	660	23	12
8736	m	grey	1295	440	790	30	15
8737	m	light grey	1260	440	780	30	15
8738	f	black grey	1155	370	800	26	14
8739b	f	black	1140				
8739w	m	cream	1220				