

FINAL REPORT  
28 April 2000

**Bullen Point to Staines River  
Large Mammal Distribution,  
Summer 1999**



Prepared by

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Prepared for

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Prepared by

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## ABSTRACT

Large mammal distribution was documented from Bullen Point on the west to the Staines/Canning rivers on the east and from the Beaufort Sea coast on the north, south to 69°54.5' north latitude, on the North Slope of Alaska. Nine systematic strip-transect surveys designed for 100% aerial coverage were flown from 4 June to 28 July 1999. During the caribou calving period surveys, from 1 to 20 June, caribou numbers within the study area ranged from 115 on 4 June (2.3 caribou per group) to 2252 on 14 June (10.8 caribou per group). The 4 and 19 June surveys covered only 64% and 75% of the study area, respectively. Sex-age composition of classified caribou for the combined calving period surveys was 68% cows and 32% calves. Calf:cow ratio was 37 calves:100 cows on 4 June and 48 calves:100 cows for both the 14 and 19 June 1999 surveys. The distribution of cow/calf caribou pairs during the calving period, 1 to 20 June, has varied both within and among years since surveys were initiated in 1993. All except the 1995 survey, have shown a consistently higher concentration of calving caribou between the western edge of the study area east to Point Hopson in the southwestern corner of the study area. In all study years the northeastern portion of the Bullen Point to Staines River study area did not appear to be heavily used by calving caribou. Calving period distribution may reflect survey timing within the calving period and/or spring snow cover and snowmelt flood patterns. During six post-calving period surveys, caribou numbers within the study area ranged from 0 on 9 July to 2529 on 29 June 1999 (mean 20.6 caribou per group), and mean group size ranged from 1.6 caribou per group on 18 July to 100.0 caribou per group on 15 July 1999. Sex-age composition of classified caribou for the combined post-calving period surveys was 8% bulls, 65% cows, and 27% calves. During 1999, caribou did not appear to be using coastal habitats during post-calving surveys. Caribou groups occurred within 2 km of the coast on 15 of 25 post-calving surveys from 1993 to 1999. The coastal area with the highest concentration of caribou was located near the estuary just east of Bullen Point. Coastal areas with 100 to 500 total caribou for the combined surveys were: an estuary and spit between Bullen Point and Point Gordon, Point Gordon and the area southwest of Point Gordon, the unnamed point between Point Sweeney and Point Thomson, the point near Point Thomson Unit #3 pad, and the area near the North Staines River #1 pad. A grizzly bear was observed within the study area on 9 July and on 15 July. Muskoxen were observed during five of nine surveys, including a group of between seven and nine muskoxen along the East Badami creek corridor on each of the last four post-calving surveys from 9 July to 28 July 1999.

Key words: Caribou, *Rangifer tarandus*, Alaska, Central Arctic Herd, oil field, muskoxen, North Slope, *Ovibos moschatus*

## INTRODUCTION

Two caribou herds may occur in the area between the Sagavanirktok and Staines rivers: the Porcupine Caribou Herd (PCH) and the Central Arctic Caribou Herd (CAH). PCH studies conducted over the past 20 years in the Arctic National Wildlife Refuge (ANWR) have shown that little, if any, calving occurs west of the Staines River, nor is the area used by large numbers of PCH caribou during post-calving and dispersal periods (Clough et al. 1987). During spring migration, CAH caribou move from the northern foothills of the Brooks Range to the coastal plain. In general, cows arrive on the coastal plain between late April and early June, while bulls do not arrive until post-calving in early July (Whitten and Cameron 1980, Jakimchuk et al. 1987). The CAH uses two areas for calving, one west of the Sagavanirktok River (near the Kuparuk and Milne Point oil fields), and one east of the Sagavanirktok River. These are thought to reflect east and west segments of the CAH (Lawhead and Curatolo 1984). Within the eastern and western CAH calving areas, several general areas of concentrated calving have been reported; although the distribution of calving caribou varies annually. Two areas with calving caribou concentrations have been documented in most years since 1969: between Oliktok Point and the Kuparuk River (Milne Point) and between Bullen Point and the Canning River (Cameron and Whitten 1978, Gavin 1983, Lawhead and Curatolo 1984, Whitten and Cameron 1985, Cameron et al. 1989).

The CAH uses a broad area along the Arctic Coastal Plain between the Colville and Canning rivers for summer range (Smith 1996). Coastal areas, river deltas, river channels, and wind-swept uplands and ridges are used as insect-relief habitats by mosquito- and oestrid-harassed caribou during the post-calving period. Large groups are often observed near Franklin Bluffs and on the deltas of the Kadleroshilik, Sagavanirktok, Shaviovik, and Staines rivers (Gavin 1983, Carruthers et al. 1984). Lawhead and Curatolo (1984) reported that large aggregations of caribou sought relief on or near deltas of the Kuparuk, Shaviovik, and Canning rivers during intense insect harassment; although caribou groups were observed along the coast within the entire Oliktok Point to Canning River area. Beginning in late-July or early-August, caribou begin to disperse across the coastal plain as mosquito harassment abates and oestrid fly harassment increases (Curatolo 1975, Lawhead and Curatolo 1984, Carruthers et al. 1987). Caribou gradually drift inland as gregariousness diminishes, group sizes decrease, and movement patterns become less directed (Carruthers et al. 1987, Jakimchuk et al. 1987, Cameron et al. 1989).

Other large mammals that occur between the Sagavanirktok and Staines rivers include muskoxen (*Ovibos moschatus*), moose (*Alces alces*), grizzly bear (*Ursus arctos*), and wolf (*Canis lupis*). By the late 1800s, muskoxen were exterminated from the North Slope of Alaska

and little is known about historic levels (Clough et al. 1987). Muskoxen were reintroduced into ANWR in 1969 and 1970 and the population has grown exponentially since 1974. Mixed-sex herds have dispersed into areas east of the Aichilik River (Clough et al. 1987), and they have also dispersed to the west as far as the Colville River (J. Helmericks, pers. comm.). Muskoxen have been regularly sighted as far west as the Sagavanirktok River near the Prudhoe Bay oil field (Pollard and Noel 1994, 1995; Noel 1998). Muskoxen are non-migratory, but move in response to seasonal changes in snow cover and vegetation. During summer and fall, they are found primarily in riparian habitats, but move to adjacent uplands in winter and spring (Clough et al. 1987). Riparian habitats are important travel corridors and foraging areas.

Coastal areas are used seasonally by grizzly bears. They generally move north from denning areas in the foothills of the Brooks Range in late May and are most abundant in the study area during June and July when caribou are on the coastal plain. In late July, they gradually return south to the foothills (Clough et al. 1987). Riparian areas are used as travel corridors and contain abundant prey and preferred vegetation.

Moose are uncommon on the North Slope, but they were observed in the area during 1994 and 1995 summer surveys (Pollard and Noel 1994, 1995). Wolves are rare on the Arctic Coastal Plain, but were observed in the southern portion of the Badami study area in 1999 (Noel and King, in prep.).

### ISSUES

Potential impacts to caribou from oil field development due to construction of roads, pipelines, or other related facilities and oil field activities in the Bullen Point to Staines River study area include:

- Displacement from or blocked access of CAH caribou to calving habitats,
- Displacement from or blocked access of CAH caribou to post-calving and insect-relief habitats, and
- Blocked westward movements of the PCH from ANWR or blocked eastward movements of the CAH into ANWR

Pre-development data necessary to assess development impacts and mitigate oil field impacts include distribution and abundance, and reproductive status of caribou in the Bullen Point to Staines River area.



## OBJECTIVES

During 1999, LGL Alaska Research Associates, Inc. (LGL) conducted systematic aerial surveys of large mammals within the area from Bullen Point to the Staines River to the east of Prudhoe Bay, Alaska. Effort focused on calving and post-calving caribou distribution within the study area. Our objectives during 1999 were:

- 1) to determine the number, sex/age composition, and distribution of caribou and the distribution of other large mammals during the calving and post-calving seasons, and
- 2) to compare distribution and abundance of large mammals in the Bullen Point to Staines river study area with the adjacent Badami study area, between the Sagavanirktok River and Bullen Point (Fig. 1).

## STUDY AREA

The study area is bounded on the west by Bullen Point, extended east to the Staines River, north to the Beaufort Sea, and south to approximately 69°54.5' latitude (Fig. 1). The Bullen Point to Staines River study area included transect numbers 48 to 70 (Fig. 1). The study area lies within Alaska's Arctic Coastal Plain and is characterized by a gently rolling thaw-lake plain landscape (Walker and Acevedo 1987). Tundra within five miles of the coast has little topographic relief. Further inland the landscape begins a gradual ascent from 25 feet above sea level to 350 feet above sea level at the southern edge of the study area, about 24 miles inland. Contours within the study area form concentric bands oriented north-northwest. This area has been referred to as the Canning alluvial fan, formed by sediment deposition from the Canning River. Vegetation in the southern portion of the study area is a mixture of dry or moist herbaceous tundra and wet herbaceous tundra. Moisture increases to the east, approaching the Canning River, and toward the coast (U.S. Geological Survey, Alaska Vegetation and Land Cover Series, Mt. Michelson Quadrangle, Map L-206).

## METHODS

### AERIAL SURVEYS

During summer 1999, nine systematic, strip-transect aerial surveys (Caughley 1977) were conducted from both a Cessna 206 (seven survey days) and a Cessna 207 (two survey days) fixed-wing aircraft. Two observers recorded mammal sightings. Transect centerlines, spaced at 1.6-km intervals, were oriented north-south and centered on township and section lines mapped

on 1:63,360 scale U.S. Geological Survey (USGS) topographic maps. Twenty-seven transects (numbers 48 to 70, Fig. 1) were flown during each of the nine surveys. Surveys were flown 90 m above ground level at approximately 115 km/hr airspeed. During surveys, each of the two observers was responsible for searching an 800-m wide swath on one side of the transect centerline, providing for 100% study area coverage. A third observer, when available, entered data into a computer and assisted with spotting caribou. Aircraft wing struts were marked to enable visual control of transect strip-width (Pennycuik and Western 1972). Observers verified strut markings with inclinometers and by comparison to survey maps.

As with previous aerial surveys conducted by LGL in the Prudhoe Bay oil field and adjacent areas (Pollard et al. 1992a,b and others), Global Positioning System (GPS) receivers were used to navigate the aircraft during surveys and to record the location of the aircraft when animals were observed. Coordinates of animal sightings were determined using the GPS in combination with visual estimates of their distance from the aircraft. At the time of sighting, all data were entered directly into a notebook computer that was linked to a Motorola Workhorse™ GPS receiver using Geolink® software. For each sighting, a real-time GPS-determined position is associated with group attributes (e.g., species, number of individuals, sex/age classification, distance and direction from the aircraft) that are entered by either one of the observers or by a data recorder. When possible, behavior and habitat types were also recorded along with the group attributes and time of sighting into an audio recorder. Behavior was defined as the activity of the majority of caribou in a group, and was classified as rest, stand, feed, move, walk, trot, and run. Habitat types were categorized from field descriptions following Walker's (1983) hierarchical classification system.

Caribou were counted and classified as bulls, cows, calves, or unclassified based on body size, antler development, pelage, and calf presence. "Unclassified" caribou are adults (or yearlings), that could not be classified with confidence; caribou near the outer margin of transect strips were most difficult to classify. When large groups of caribou were encountered, the survey aircraft left the transect and circled the group to facilitate counting and classifying. The GPS allowed the aircraft to return to the point of departure from the transect, and no survey coverage was lost as a consequence of transect departures. Muskoxen were classified as adult or calves, and grizzly bears were classified as adult or female with cubs.

## GEOGRAPHIC ANALYSIS

Large mammal observation data were combined with base-map data in MapInfo® Geographic Information System (GIS). Spatial data were used to produce maps of distributions for each survey and to conduct spatial analyses in MapInfo® and Vertical Mapper™. Data

collected in the study area during 1999 were analyzed using the distribution and abundance of calves and all caribou. These classes of caribou were chosen because previous research has suggested that bulls and maternal cows respond differently to habitat features (Pollard et al. 1992b), and adult bulls and calves were easiest to identify during the surveys. Some analyses were based on individual caribou rather than on groups. Individual caribou were used because: (1) during aerial surveys, groups were sometimes difficult to distinguish; (2) groups were disparate in size, ranging from 1 to 975 individuals; and (3) groups are not of fixed membership. However, location data are collected by caribou group; therefore individual caribou locations are not necessarily independent.

### MODELED PARASITIC INSECT ACTIVITY

Predictive models for mosquito (Russell et al. 1993) and oestrid fly (Mörschel 1999) activity were used to identify days with conditions suitable for insect activity. Index values were calculated for each hour that temperature and wind data were recorded at the Deadhorse Weather Station (ASCC 1999). Sweep net sampling for mosquitoes was conducted from 29 June to 24 July 1999 in conjunction with monitoring at the Badami pipeline. Mosquito and oestrid activity indices for the 1999 field season, and the syntax used to calculate the indices, are presented in Appendix B.

### RESULTS

Nine systematic surveys of the Bullen Point to Staines River study area were completed (Appendix A; Figures A-1 to A-8 and Tables A-1 to A-3). Five surveys included 100% coverage of the study area, and four surveys covered the northern portion study area to approximately 70°00' north latitude; 4 June Survey-64% of study area (Fig. A-1), 19 June Survey-75% of study area (Fig. A-3), 18 July Survey-78% of study area (Fig. A-7), 28 July Survey-76% of study area (Fig. A-8). A total of 8941 caribou in 541 groups was recorded within the study area during the nine systematic surveys from 4 June to 28 July 1999 (Table 1). The total number of caribou within the study area during a survey day ranged from 0 on 9 July to 2529 on 29 June (Table 1). The first three surveys were conducted during the calving period (1 to 20 June). Most classified caribou sighted during the calving period were cows and calves; 68% cows (1691 of 2499), 32% calves (803 of 2499), and <1% bulls (5 of 2499). During the six post-calving period surveys, cows and calves again predominated; 65% cows (3379 of 5238), 27% calves (1437 of 5238), and 8% bulls (422 of 5238). Thirty-two muskoxen in four groups were observed during the systematic surveys, as well as two grizzly bear sightings on 9 and 15 July, (Table A-2; Figures A-1, A-6, A-7, and A-8).

## CARIBOU

### Calving Period Surveys

#### *Survey 0—4 June 1999*

Survey weather conditions were good, with scattered to broken clouds, winds from 5.1 to 8.2 meters per second (mps) from the west (280° to 290°), and temperature 0 to 1°C between 1000 and 1400 ADST (ASCC 1999). A total of 115 caribou, all cows and calves, in 51 groups was recorded within 64% of the study area (Fig. A-1, Table 1). Mean and 95% confidence interval (95% CI) of group size was  $2.3 \pm 0.45$  caribou. Calf production was 37 calves:100 cows. Sixty-five percent of caribou (75 of 115) and 58% of calves (18 of 31) were located in the southwest half of the study area. Daily mean temperature was -0.1°C and daily mean wind speed was 5.8 mps. Indices of parasitic insect activity indicated conditions were not suitable for mosquito or oestrid activity on 4 June (Fig. 2, Table B-1).

#### *Survey 1—14 June 1999*

Survey weather conditions were good, with few clouds, winds at 2.6 to 5.1 mps primarily from the northwest (300° to 340°), and temperature 6 to 8°C between 1100 and 1600 ADST (ASCC 1999). A total of 2252 caribou in 208 groups were recorded within the study area, including 702 cow-calf pairs (Fig. A-2, Tables 1 and A-1). Mean and 95% CI of group size was  $10.8 \pm 2.48$  caribou. The composition of classified caribou was 67% cows (1462 of 2166) and 32% calves (702 of 2166, Table 1). Calf production was 48 calves:100 cows. Most caribou groups (69%, 143 of 208) contained less than 10 animals. Caribou were concentrated (83%, 1880 of 2252) in the southwestern half of the study area. Daily mean temperature was 4.7°C and daily mean wind speed was 3.6 mps (Table B-1). Indices of parasitic insect activity indicated conditions were not suitable for mosquito or oestrid activity on 14 June (Fig. 2, Table B-1). Direction of travel was recorded for four caribou groups: three groups were headed into crosswinds, and one group was headed downwind (Table 2).

#### *Survey 2—19 June 1999*

Survey weather conditions were moderate, with overcast skies, winds at 2.0 to 3.6 mps from the west-northwest (290° to 320°), and temperature 2 to 4°C between 1100 and 1600 ADST (ASCC 1999). Low-lying fog prevented flying transect lines south of 70°00' north latitude, resulting in 75% coverage of the study area. A total of 269 caribou in 50 groups was observed, including 70 cow-calf pairs (Fig. A-3, Tables 1 and A-1). Mean and 95% CI of group size was  $5.4 \pm 1.63$ . The composition of classified caribou was 67% cows (145 of 218) and 32% calves (70 of 218, Table 1). Calf production was 48 calves:100cows. Most caribou were in the western

and southern portions of the survey area; only two groups with a total of three caribou were located in the northeast corner of the survey area. Fifty-one percent of caribou (137 of 269) and 57% of calves (40 of 70) were in the nine groups of 10 or more animals. Daily mean temperature was 2.1°C and daily mean wind speed was 3.8 mps (Table B-1) Indices of parasitic insect activity indicated conditions were not suitable for mosquito or oestrid activity on 19 June (Fig. 2, Table B-1). Direction of travel was recorded for 2 caribou groups. Both groups were headed downwind to the south (Table 2).

### Calving Period Distributions

The distribution of cow/calf caribou pairs during the calving period (1 to 20 June) has varied both within years and between years since surveys were initiated in 1993 (Figures 3 and 4). In most years, except 1995 when survey coverage was limited in extent, the area between the western study area boundary east to Point Hopson appears to show a consistently higher concentration of cows and calves. In all years, the four townships in the southwest corner of the study area appear to have a consistently larger proportion of area with increased calf numbers (Fig. 4). In 1993 and 1998 there also appeared to be increased calf numbers southwest of Bullen Point, toward Badami, which carries through in the aggregated surveys (Fig. 4). In all study years (1993, 1995, 1997, 1998, and 1999) the northeastern portion of the Bullen Point to Staines River study area did not appear to be heavily used by calving caribou (Fig. 3).

Cow caribou density in the Bullen Point to Staines River study area (904.53 km<sup>2</sup> land area) was 1.62 cows/km<sup>2</sup> on 14 June 1999. In the adjacent Badami study area (1313.60 km<sup>2</sup> land area), cow caribou density was approximately 0.62 cows/km<sup>2</sup> on 15 June 1999. The density of total caribou in the Bullen Point to Staines River study area was 2.49 caribou/km<sup>2</sup> on 14 June 1999, compared to 0.87 caribou/km<sup>2</sup> observed on 15 June in the Badami study area (Fig. 1, Table 1).

Calving caribou use of the Bullen Point to Staines River study area, for the four years of study area coverage, ranged from 358 cows in 1997 (0.40 cows/km<sup>2</sup>) to 1462 cows in 1999 (1.62 cows/km<sup>2</sup>). Mean and 95% CI of cow density was 1.16 ± 0.91 cows/km<sup>2</sup>. Calf production has ranged from 48 calves:100 cows in 1999 to 70 calves:100 cows in 1997. Total caribou density during the calving period has ranged from 0.69 to 2.07 caribou/km<sup>2</sup>. Mean and 95% CI of total caribou density during calving was 1.93 ± 1.47 caribou/km<sup>2</sup>.

Activity was recorded for 99 caribou groups during the calving period (Table 3). For most groups of less than 10 caribou, activity was evenly split between resting (43%, 29 of 67) and feeding (42%, 28 of 67), while 13% of groups (9 of 67) were moving (Table 3). For groups of 10 to 100 animals, feeding was the predominant activity (61%, 19 of 31) followed by resting

(32%, 10 of 31; Table 3). For all groups that were resting and feeding, 57% (50 of 87) were on moist sedge, dwarf shrub tundra; and 80% (70 of 87) were on moist to dry tundra types (Table 4). For 10 caribou groups that were recorded as moving, 50% (5 of 10) were on wet/moist or moist/wet tundra complexes (Table 4).

## **Post-Calving Period Surveys**

### ***Survey 3—25 June 1999***

Survey weather conditions were good, with a few scattered clouds, winds at 3.1 to 4.6 mps from the east northeast (40° to 80°), and temperature 7 to 9°C between 1100 and 1600 ADST (ASCC 1999). A total of 1721 caribou in 76 groups was recorded, including 487 cow-calf pairs (Figures 5 and A-4, Tables 1 and A-1). Mean and 95% CI of group size was  $22.6 \pm 10.62$  caribou. The composition of classified caribou was <1% bulls, 66% cows, and 34% calves (Table 1). Forty-three percent of caribou were in four cow/calf dominated groups of greater than 100 caribou, located in the southeast corner of the study area, just north of the Staines River (Fig. A-4, Table A-1). Forty-eight percent (829 of 1721) of caribou were in 28 groups of 10 to 100 caribou. Caribou groups were scattered throughout the study area, but most groups were adjacent to riparian habitats. Daily mean temperature was 5.3°C and daily mean wind speed was 5.0 mps (Table B-1). Insect activity indices indicated that conditions were not suitable for insect activity on 25 June and were also not suitable for mosquito or oestrid activity during the two days prior to the survey (Fig. 2, Table B-1). Direction of travel was recorded for seven caribou groups. All groups were headed into the east to northeast winds or crosswinds (Table 2).

### ***Survey 4—29 June 1999***

Survey weather conditions were good with clear skies, winds at 6.2 to 8.2 mps from the east northeast (50° to 80°), and temperature 6 to 8°C between 1100 to 1600 ADST (ASCC 1999). A total of 2529 caribou in 123 groups was recorded, including 644 cow-calf pairs (Figures 5 and A-5, Tables 1 and A-1). Mean and 95% CI of group size was  $20.6 \pm 5.50$  caribou. The composition of classified caribou was <1% bulls, 69% cows, and 31% calves (Table 1). Scattered caribou groups occurred throughout the study area, but most caribou were concentrated in the northwestern corner including the 27% of caribou (682 of 2529) occurring in the 5 groups of more than 100 caribou. Daily mean temperature was 4.8°C and daily mean wind speed was 6.4 mps (Table B-1). Indices of parasitic insect activity indicated conditions were not suitable for mosquito or oestrid activity on 29 June or during the two days prior to the survey (Fig. 2, Table B-1).