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BULLEN POINT TO STAINES RIVER LARGE MAMMAL DISTRIBUTION, SUMMER 2000

Prepared for

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ABSTRACT

We documented the distribution of large mammals within a study area that extended from the Beaufort Sea coastline south to lat 69°54.5'N between Bullen Point and the Staines/Canning rivers on the North Slope of Alaska. Five aerial strip-transect surveys, providing 100% coverage of the study area, were flown from 16 June through 24 July 2000. During the 16 June caribou (*Rangifer tarandus*) calving period survey, we counted 365 caribou, including 107 calves (44 calves:100 cows). During the first post-calving period survey (28 June), 2,596 caribou were counted. We saw fewer than 1000 caribou during all 3 July surveys. For the 4 post-calving period surveys, the pooled sex/age composition of classified caribou was 7% bulls, 57% cows, and 36% calves. Other large mammals observed during the surveys included grizzly bears (*Ursus arctos*) during 3 flights and muskoxen (*Ovibos moschatus*) during 4 flights. Multi-year comparisons of caribou distributions and densities within the study area were made using aerial survey data collected in 1993, 1995, and 1997 to 2000. Although calving and post-calving distributions within the study area varied among years, some general patterns were evident. Two trends in calving period (>20 June) distribution were consistent among years: (1) very few cow-calf pairs use the northeast corner of the study area, and (2) most cow-calf pairs used the 4 townships in the southwest corner of the study area (1993 = 84%, 1997 = 86%, 12 June 1998 = 88%, 19 June 1998 = 2%, 1999 = 85%, and 2000 = 96%). It is possible that cows with calves remained further inland than our survey area due to the late snow cover, while cows that either did not calve or lost calves early continued to the coastal plain. During the post-calving period or the 6 years of post-calving period surveys combined, >50% of the 5,038 total caribou recorded within 2 km of the coast were within 4 km of Bullen Point (32%) or Point Thomson (24%). Across study years, the mean total caribou density was 1.89 ± 1.15 caribou/km^2 during the calving period and 1.37 ± 0.72 caribou/km^2 during the post-calving period.

Key words: Alaska, caribou, Central Arctic Caribou Herd, grizzly bear, muskoxen, North Slope, oilfield, *Ovibos moschatus*, *Rangifer tarandus*, *Ursus arctos*

INTRODUCTION

STUDY RATIONALE

Caribou are the arctic coastal plain's most conspicuous summer resident. They are an important subsistence and cultural resource for Inupiat communities. Perceived detrimental effects of oil and gas development on caribou have and will inhibit this industry from accessing additional coastal plain resources. Controversy over potential development effects on caribou has been an issue since the beginning of oil and gas development on Alaska's North Slope. Perceptions that calving caribou and oilfield development cannot coexist, and that oilfield infrastructure blocks caribou movement to coastal insect-relief habitats are widely held. These beliefs persist despite a lack of evidence that oilfield developments have had any herd level effect on CAH caribou (Cronin et al. 1998, 2000). A lack of pre-development caribou calving distribution data, along with a lack of post-development calving caribou use, have led to speculation that development of the Prudhoe Bay oilfield caused caribou to abandon this area for calving (Whitten 2001).

Therefore, pre-development data on caribou distribution, abundance, and reproductive status in the Bullen Point to Staines River study area are necessary to assess potential development impacts and to develop effective mitigation measures. Potential impacts to caribou from oilfield development due to construction of roads, pipelines, or other related facilities and oilfield activities in the Bullen Point to Staines River study area include: (1) displacement or blocked access of CAH caribou to calving habitats, (2) displacement or blocked access of CAH caribou to post-calving and coastal insect-relief habitats, and (3) blocked PCH and CAH movements to and from the Arctic National Wildlife Refuge. Data collection in the adjacent Badami study area allows comparison of caribou distributions between these 2 areas. Monitoring caribou distribution and abundance at the neighboring Badami pipeline and coastal development will allow direct comparison to assess potential impacts from similar developments in the Point Thomson Unit. These data are critical to evaluate post-development effects on caribou distribution.

LARGE MAMMALS BETWEEN THE SAGAVANIRKTOK AND THE STAINES RIVERS

Caribou (*Rangifer tarandus*) from 2 herds may occur in the area between the Sagavanirktok and Staines/Canning rivers: the Central Arctic Caribou Herd (CAH) and the Porcupine Caribou Herd (PCH). Studies conducted over the past 20 years in the Arctic National Wildlife Refuge (ANWR) have shown that little, if any, PCH calving occurs west of the Canning River, nor is the area used by large numbers of PCH caribou during post-calving and dispersal periods (Clough et al. 1987, Russell et al. 1993). Most caribou observed within this area probably belong to the CAH.

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 2 general areas for calving: (1) west of the Sagavanirktok River (near the Kuparuk and Milne Point oilfields), and (2) east of the Sagavanirktok River and west of the Canning River. Two areas with CAH calving concentrations have been documented in most years since 1969: (1) between Oliktok Point and the Kuparuk River (Kuparuk and Milne Point), and (2) 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). Lower-density concentrations of calving caribou have been observed west of the Colville River and east of the Canning River (Carruthers and Jakimchuk 1986). Curatolo and Reges (1984) described the 1984 CAH calving distribution as low-density and relatively dispersed, especially in comparison with other herds. The number of caribou using east and west ranges fluctuate among years, probably due to movements across the Sagavanirktok River (Cronin et al. 2000).

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 fly-harassed caribou during the post-calving period. Large groups of caribou have often been 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, as well as along the coast between Oliktok Point and the Canning River. 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, 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*), grizzly bears (*Ursus arctos*), moose (*Alces alces*), and wolves (*Canis lupus*). 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 oilfield (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, muskoxen are found primarily in riparian habitats, which are important for travel and foraging, but they move to adjacent uplands in winter and spring (Clough et al. 1987).

Coastal areas are used seasonally by grizzly bears. Bears 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. In late July, most bears gradually return south to the foothills (Clough et al. 1987). 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 also uncommon, but were observed west of Bullen Point in the southern portion of the Badami study area during a summer 1999 survey (Noel and King 2000b).

Environmental assessments have been completed for 3 oil exploration and development areas between the Sagavanirktok River delta and the Staines River: (1) Sourdough, (2) Yukon Gold, and (3) Badami. In support of these environmental assessments, LGL Alaska Research Associates, Inc. (LGL) was contracted by BP Exploration (Alaska) Inc. to collect baseline large mammal distribution information during aerial surveys conducted between the Sagavanirktok and Staines rivers for most years since 1993 (Pollard and Noel 1994, 1995; Noel 1998; Noel and Olson 1998, 1999; Noel and King 2000a,b). In 1997, LGL established 2 study areas: (1) Badami, between the Sagavanirktok River delta and Bullen Point, and (2) Bullen Point to the Staines River (Fig. 1). These 2 study areas extend from the Beaufort Sea coastline south to lat 69°54.5'N in most years. Surveys of these 2 study areas continued during summer 2000 and this report includes our 2000 survey results and related data analyses for the Bullen Point to Staines River study area. Results of surveys in the Badami study area are presented in the report *Large Mammal Distribution in the Badami Study Area, Summer 2001* (Noel and Olson 2001).

SURVEY OBJECTIVES

Our summer 2000 survey efforts were to determine the distribution and abundance of caribou and other large mammals within the Bullen Point to Staines River study area during the calving and post-calving periods. Our primary objectives were to: (1) estimate the number, sex/age composition, and distribution of large mammals during the caribou calving and post-calving periods, (2) summarize data for the Bullen Point to Staines River study area across years, and (3) describe distribution and abundance of large mammals in the Bullen Point to Staines River study area in relation to the adjacent Badami study area (Noel and Olson 2001).

STUDY AREA

BULLEN POINT TO STAINES RIVER

The 2000 Bullen Point to Staines River study area was bounded on the west by Bullen Point, extended east to the Staines River, north to the Beaufort Sea, and south to approximately lat 69°54.5'N (Fig. 1). This area is part of the Arctic Coastal Plain, which is characterized by a gently rolling thaw lake plain landscape (Walker and Acevedo 1987). Tundra within 5 mi of the coast has little topographic relief. Further inland, the landscape begins a gradual assent from 25 to 350 ft above sea level at the southern edge of the study area (about 24 mi inland from the Beaufort Sea coast). Contours within the study area form concentric bands oriented north-northwest. The area has been referred to as the Canning alluvial fan, formed by sediment deposition from the Canning River. Calcarious loess deposited downwind of the Canning River results in soils with high silt content, high pH (6.0 to 8.4), and low organic content (Tedrow 1977, Gesper et al. 1980). 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 1981, Mt. Michelson, Map L-206).

BADAMI

The 2000 Badami study area was bounded on the west by the Sagavanirktok River, extended east to Bullen Point, north to the Beaufort Sea, and south to approximately lat 69°54.5'N (Fig. 1). We used a southern boundary of lat 69°0'N during the single calving period survey. The area is part of the Arctic Coastal Plain, and is characterized by a gently rolling thaw lake plain landscape (Walker and Acevedo 1987). Tundra in the area gradually rises 6 to 8 m above the level of streams and river channels. Topographic relief results in many well-drained areas; moist and dry tundra vegetation types are common on high-centered ice wedge polygon terrain. However, drainage is poor away from fluvial gradients and low-centered ice wedge polygons; strangmoor, thaw lakes and ponds, and drained lake basins predominate in these areas. The Badami pipeline extends 40 km across the northernmost section of the study area. The pipeline ranges from 1 to 5 km inland from the coast between the Endicott pipeline to the west and the Badami facility to the east (Fig. 1).

METHODS

AERIAL SURVEYS

During summer 2000, we conducted 5 aerial strip-transect aerial surveys (Caughley 1977) from a Cessna 206 fixed-wing aircraft. A single caribou calving period (≤20 June) survey was flown on 16 June, and post-calving period (>20 June) surveys were flown on 28 June and 6 July,

20 July, and 24 July. We completed 1 instead of the usual 2 calving period surveys in 2000, because the Alaska Department of Fish and Game (ADFG) was also flying a calving period survey within this study area. Because of a combination of problems with our additional survey aircraft and poor flying weather, we were unable to complete the 7 planned surveys. Between 1993 and 2000, 8 calving period (<21 June) surveys were conducted in 6 study years (1993 = 1, 1995 = 1, 1997 = 1, 1998 = 2, 1999 = 2, 2000 = 1; Pollard and Noel 1995, Noel 1998, Noel and Olson 1998, Noel and King 2000a). Twenty-nine post-calving period surveys were conducted between 1993 and 2000 in 6 study years (1993 = 7, 1995 = 2, 1997 = 6, 1998 = 5, 1999 = 5, 2000 = 4; Pollard and Noel 1994, 1995; Noel 1998; Noel and Olson 1998; Noel and King 2000a).

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-three transects (numbered 48 to 70; Fig. 1) were flown during each of the 5 Bullen Point to Staines River surveys. Surveys were flown at 90 m altitude and 115-125 km/hr airspeed (Pollard et al. 1992, 1996a). Two observers were used for each survey; each observer was responsible for searching an 800-m swath on one side of the transect centerline, providing for 100% transect coverage. Aircraft wing struts were marked to enable visual control of transect strip width (Pennycuick and Western 1972). Observers verified strut markings using inclinometers.

A Global Positioning System (GPS) receiver was used by the pilot to navigate the aircraft during surveys. Locations of the aircraft at the time of animal sightings were determined using a Motorola Workhorse™ GPS receiver linked to a notebook computer using Geolink® software. This system associated a real-time GPS-determined position with each sighting record. Sighting data were entered by a 3rd crewmember acting as a data recorder (16 and 28 June, 6 and 20 July) or by one of the two observers (24 July). Sighting entries included a visual estimate of distance from the aircraft, species, and number of individuals by sex/age classification. Coordinates of animal sightings were later calculated using the visual estimates of distance from the aircraft to offset the GPS aircraft positions. When possible, predominant behavior and habitat were noted along with group attributes and time of sighting on audiotapes; these data were later transcribed and added to the survey database. Behavior was defined as the activity of the majority of caribou in a group. Habitat types were categorized from the observer descriptions, which included comments on landform features and soil moisture following Walker's (1983) hierarchical classification system.

We counted and classified caribou as bulls, cows, calves, or unclassified based on body size, antler development, pelage, and calf presence. "Unclassified" caribou were adults (or yearlings) that could not be classified with confidence. Caribou near the outer margin of transect strips were most difficult to count and classify. Other factors that may have affected counting and

classification of caribou include observer experience, lighting conditions, caribou behavior, and survey weather conditions. When a large group of caribou was encountered, the survey aircraft often left the transect and circled the group to facilitate counting and classification. The GPS allowed the aircraft to return to the point of departure from the transect; therefore, no survey coverage was lost as a result of transect departures. In some cases, caribou group counts were refined using counts made from 35 mm slides taken during the surveys. Muskoxen were classified as bull, cow, unclassified, or calf; grizzly bears as adult or female with cubs; and arctic foxes as adult or kit.

DATA ANALYSIS

We used MapInfo® Geographic Information System (GIS) software to map and analyze the survey data. The base maps used for analyses were at a scale of 1:63,360. To assist with describing the summer 2000 distributions, we constructed a set of concentric 1-km intervals around the Beaufort Sea coastline in the Bullen Point to Staines River study area, and grouped caribou numbers by these distance intervals. Caribou densities (caribou/km^2) were calculated for each distance interval using the total land area of each interval. Caribou density within the study area was calculated using the total land area of the 2000 Bullen Point to Staines River study area (904.6 km^2) as the divisor.

Caribou observations recorded during surveys conducted in 1993, 1995, 1997, 1998, 1999, and 2000 compared caribou use of the study area among years. The southern boundary of some of the eastern transects varied among years; consequently, we established a common multi-year boundary and limited analysis to this area. Densities compared among years were calculated based on the land area within this multi-year study area (862.3 km^2). Because caribou behavior, distribution, and sex/age composition differ between the calving and post-calving periods (Whitten and Cameron 1980), we prepared separate analyses for each of these 2 periods using ≤20 June as the end of the calving period.

Between 1993 and 2000, 8 calving period (≤20 June) surveys were conducted in 6 study years (1993 = 1, 1995 = 1, 1997 = 1, 1998 = 2, 1999 = 2, 2000 = 1; Pollard and Noel 1995, Noel 1998, Noel and Olson 1998, Noel and King 2000a). We excluded 2 of these surveys (6 June 1995 and 19 June 1999) from the calving period analyses because survey coverages were incomplete. The combined multi-year distribution was converted to a grid format using inverse distance weighting interpolation (grid cell size = 200 m; 5-km radius; 100-point maximum) in Vertical Mapper™ for MapInfo®. The resulting grid was then contoured based on percentile occurrence for values of caribou calves, which ranged from 0 to 54. Prior reports have generated regions based on natural neighbor interpolation (Noel and Olson 1998, Noel and King 2000a).

Twenty-nine post-calving period surveys were conducted between 1993 and 2000 in 6 study years (1993 = 7, 1995 = 2, 1997 = 6, 1998 = 5, 1999 = 5, 2000 = 4; Pollard and Noel 1994, 1995; Noel 1998; Noel and Olson 1998; Noel and King 2000a). Because these surveys were primarily conducted in late June and July (23 of 29 surveys), and we were focusing on coastal insect-relief habitats, we limited our analyses to data collected during these months. The 1995 surveys included the 2-km area along the coast and were used in the post-calving analysis. The combined multi-year post-calving distribution for an area within 2 km of the coast was converted to a grid format using inverse distance weighting interpolation (grid cell size = 200 m, 2-km radius, 25-point maximum). The resulting grid was then contoured based on percentile occurrence for values of total caribou, which ranged from 0 to 600. We focused this analysis on the coastline because coastal areas have been consistently identified as potential insect-relief habitat (Roby 1978, Dau 1986, Johnson and Lawhead 1989, Pollard et al. 1996a,b).

We calculated parasitic insect activity based on weather parameters using predictive models of mosquito activity (Russell et al. 1993) and oestrid fly activity (Mörschel 1999; Appendix B). Mosquito and oestrid fly activity index values were calculated for each hour that temperature and wind data were recorded at the Deadhorse Weather Station (ASCC 2001; Appendix B). All mean values are presented with 95% confidence intervals.

RESULTS

SUMMER 2000 SURVEYS

Synopsis

Five aerial surveys of the Bullen Point to Staines River study area were completed (Figure 2, Table 1, Appendix A). All classified caribou on the 16 June calving period survey were cows and calves. Calf density on 16 June was 0.12 calves/km^2, while total caribou density was 0.40 caribou/km^2. Cows and calves also predominated during the post-calving period (Table 1). Calf density during the post-calving period ranged from <0.01 calves/km^2 (24 July) to 0.77 calves/km^2 (28 June). The largest number of caribou seen during a single survey occurred on 28 June, with a density of 2.87 caribou/km^2. Fewer than 1000 caribou were seen during the 3 surveys in July combined (Table 1).

Muskoxen were observed during 4 of the 5 surveys (Tables 1 and A-2). Of the 38 muskoxen recorded, 34 were within 3 km of the Staines/Canning rivers (Figures A-1, A-2, A-4, and A-5). Other mammals seen included grizzly bears during 3 surveys (all were west of the Point Hopson transect [transect 59]), and arctic foxes during 4 surveys (Figures A-1 through A-5; Table A-2).