MONITORING LARGE MAMMAL CROSSING AT RIPARIAN ZONES IN THE BADAMI AREA, SUMMER 2001

INTRODUCTION

The eastern part of the summer range for the Central Arctic Caribou Herd (CAH) occupies the Arctic Coastal Plain between the Sagavanirktok River and the Staines River during calving and post-calving periods (Cameron and Whitten 1979). Studies of the Porcupine Caribou Herd (PCH) have shown that there is little use of the area west of the Staines River during post-calving and dispersal periods by large numbers of PCH caribou (Clough et al. 1987, PCTC 1993). During the post-calving period, caribou frequently seek relief from parasitic insect (mosquitoes, nose bot flies, and warble flies) harassment in coastal habitats, river deltas, river channels, and wind–swept uplands and ridges. Large groups of caribou 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 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. LGL Alaska Research Associates, Inc. has documented caribou use of the area between the Sagavanirktok River and the Staines River since 1993 (summarized in Noel and Olson 2001).

Caribou may frequently use riparian corridors for north-south movements to and from coastal insect relief habitats, as well as using the riparian habitats for insect relief habitat (Cameron and Whitten 1979; Murphy and Curatolo 1987; Walsh et al. 1992; Pollard et al. 1996a,b; Young and McCabe 1998). Blockage of movements by elevated pipelines on the tundra, however, may deflect increased numbers of caribou into riparian areas with buried crossings. During summer 2001, we propose to evaluate caribou use of riparian habitats on the Sagavanirktok and Shaviovik rivers in conjunction with buried pipeline crossings using time-lapse videography (Pollard and Noel 1994, Noel et al. 1998, Coltrane and Lanctot 2000). Post-calving caribou movements/use will be documented at 1) riparian buried pipeline crossings, 2) similar upstream riparian areas, 3) tundra near the buried pipeline crossing, and 4) tundra away from riparian influence.

ISSUES

Potential effects of the Badami pipeline on caribou movement within the area are:

- Blockage or delay of north-south movements of caribou to or from coastal insect-relief habitats, and
- Deflection of north-south movements along the pipeline corridor to buried riparian pipeline crossings.

OBJECTIVES

We suspect caribou movements at buried pipeline riparian crossings are influenced by the adjacent elevated pipeline sections. Caribou traveling close to riparian areas on their way to/from the coast may parallel the Badami pipeline and then proceed either north or south across

the nearby buried pipeline. This would result in higher movement rates through the buried pipeline riparian crossings than at upstream riparian areas. Observers at a tower along the Badami pipeline near the Sagavanirktok River documented caribou groups paralleling the Badami pipeline to continue across the pipeline corridor at the riparian buried pipeline section (Coltrane and Lanctot 2000). We also suspect that caribou crossing the pipeline away from the influence of riparian corridors are less likely to parallel the pipeline and movements are more likely to be directly under the pipeline.

Our objectives during 2001 are to determine:

- numbers of animals, sex/age composition of groups, frequency and direction of caribou movements at riparian corridors with and without a buried pipeline during the post-calving season,
- influence of the Badami pipeline on deflecting caribou movements to buried riparian crossings, and
- diel periodicity of movements and the relationship of movement rates to weather conditions.

METHODS

Study Area

Time-lapse video observations will be recorded along the East Channel Sagavanirktok River and the Shaviovik River on the Arctic Coastal Plain of Alaska. These are the 2 largest riparian corridors crossed by the Badami pipeline, and pipeline sections are buried at these crossings. The Sagavanirktok River pipeline crossing is approximately 3100 ft (BP 1995a). This is the largest river crossed by the pipeline at 180 mi long, 5600 mi^2 drainage, with a mean summer discharge ranging from 176 m^3/s to 333 m^3/s (BP 1995b). The Shaviovik River pipeline crossing is approximately 3000 ft (BP 1995a). The Shaviovik is the second largest river crossed by the pipeline at 100 mi long, with a 1740 mi^2 drainage (BP 1995b). Tundra above streams and river channels is characterized by a gently rolling thaw-lake plain landscape with elevation rises of 20 to 25 ft (Walker and Acevedo 1987).

Time-Lapse Videography

A total of 9 remote time-lapse video camera assemblies will be used to monitor caribou and muskoxen movements and habitat use between 25 June and 15 August. Video cameras and recorders will be deployed to monitor caribou movements along the Badami pipeline in late-June 2001: 1) at the buried East Channel Sagavanirktok crossing, 2) on the west side of the Sagavanirktok crossing, 3) on the east side of the Sagavanirktok crossing, 4) upstream approximately 1 to 2 km from the buried Sagavanirktok crossing, 5) on the tundra midway between the Sagavanirktok and the Kadleroshilik rivers, 6) on the tundra midway between the Kadleroshilik and Shaviovik rivers, 7) at the buried Shaviovik crossing, 8) on the east side of the Shaviovik crossing, and 9) upstream approximately 1 to 2 km from the buried Shaviovik crossing.

Each camera assembly will consist of a GYYR™TLC1800-DC time-lapse videocassette recorder and a Panasonic™ WV-CL 322 color CCTV digital camera equipped with a Computar™ APC auto-iris 8.5 mm semi wide-angle lens (Pollard and Noel 1994, Noel et al. 1998). Each assembly will be powered by four 12-volt, 80-amp sealed lead acid batteries, charged by four Solarex™ SX-56 photovoltaic panels (Pollard and Noel 1994, Noel et al. 1998). The video recorder, camera, and batteries will be housed in insulated aluminum casings to protect them from weather and animals. The time-lapse video recorders will be set to record at 3 to 4-second intervals and will record continuously from late-June to 15 August 2001. Distance markers will be placed at intervals from the camera to assist in determining visibility and caribou location within the field of view. Several days after deployment, the cameras will be checked to ensure proper operation. Cameras will be checked and videotapes changed at 10 to 12 day intervals. Cameras will be demobilized in mid-August.

Weather and Insect Abundance Data

A remote weather monitoring station will be deployed near the Sagavanirktok River with probes on a gravel bar and on adjacent tundra (Pollard et al. 1996b, Pollard and Noel 1994). Weather data will also be obtained from the Badami and Deadhorse weather stations. A mosquito (Russell et al. 1993) and oestrid fly index (Mörschel 1999) will be calculated based on these weather data.

Data Recording

Videotapes will be reviewed for the presence of caribou. Groups were previously defined from this type of data as new individuals entered the field of view (Pollard and Noel 1994, Noel et al. 1998). If caribou are continually moving through the field of view in a single direction, it may be more appropriate to define groups based on periods with no caribou. Data will be reviewed prior to selecting appropriate definitions. For each observation, the following data will be recorded: date, time, camera location, number of caribou, sex/age category, predominant behavior, direction of movement. Caribou group behaviors will be recorded as: resting (lying), standing, walking, trotting, running, feeding, and overt reactions to insect harassment, e.g., erratic running, head-down stance, shaking of body and head, sneezing, scratching.

Data Analysis

Caribou occurrence will be compared within riparian corridors at and upstream from the buried pipeline crossing on an hourly and daily basis over the monitoring period. Caribou occurrence will be compared between buried riparian crossings and the adjacent pipeline sections on an hourly and daily basis over the monitoring period. Caribou occurrence will be compared between buried riparian crossings and tundra midway between riparian areas on an hourly and daily basis over the monitoring period. Daily caribou occurrence will be compared to corresponding weather data and calculated insect abundance.

SCHEDULE

TASK	DATE
Technical Plan	April
Permit Application	March
Camera Mobilization	23 to 25 June
Camera Monitoring	25 June to 15 August
Camera Demobilization	16 to 18 August
Video Review and Data Entry	August to December
Draft Report	January
BPXA Report Review	February
Final Report	March
Final Data and Report Delivery	March

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2001 Badami Pipeline Caribou Monitoring Budget

	Mobilization & Field	Data Entry & Analysis	Report Preparation	Total Days	Cost per Day	Total Costs
R. Rodrigues	12	10	15	37	$580	$21,460
L. Noel	5	5	10	20	$720	$14,400
M. Cronin			1	1	$920	$920
S. Haskell		25	5	30	$430	$12,900
J. Coltrane	10			10	$500	$5,000
					Total Personnel	$54,680
Equipment and Supplies						
Room and Board		16	days @	$75		$1,200
Camera Parts/Supplies						$4,500
Supplies/Film Processing						$400
Shipping						$500
					Total Direct Costs	$6,600
					Project Total	**$61,280**
BPXA Logistics						
Charter Costs (ANC to SCC)		8	trips @	$300		$2,400
Truck Rental		10	days @	$65		$650
Helicopter (Bell 206L)		32	hrs @	$1,114		$35,648
(4 d @ 6 hr, 4 d @ 2 hr)					Total BPXA Logistics	$38,698
					Total Plus BPXA Logistics	**$99,978**

LARGE MAMMAL DISTRIBUTION AND ABUNDANCE BETWEEN THE SAGAVANIRKTOK AND STAINES RIVERS, SUMMER 2001

INTRODUCTION

Caribou from two different herds may occur in the Point Thomson Unit area (PTU): the Porcupine Caribou Herd (PCH) and the Central Arctic Caribou Herd (CAH). Studies of the PCH conducted over the past 20 years 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 the 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, and 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 reflect east and west summer ranges of the CAH, which contain calving groups that may exchange animals both within and between years. The CAH uses a broad area along the Arctic Coastal Plain between the Colville and Canning rivers for summer range (Fig. 1, Smith 1996).

Since studies of caribou in the Central Arctic region began in 1969, considerable effort has been expended to document calving distributions on the coastal plain. Several general areas of "concentrated calving" have been reported over the years, but the distribution of calving caribou is variable among years. Two high-density concentration areas, between Oliktok Point and the Kuparuk River (Milne Point) and between Bullen Point and the Canning River, have been used consistently by calving caribou in most years since at least 1969 (Cameron and Whitten 1978; Gavin 1983; Lawhead and Curatolo 1984; Whitten and Cameron 1985; Cameron et al. 1989). Lower-density concentrations of calving caribou often have been observed at upland sites near the Franklin Bluffs, the White Hills, and the Kavik Hills. Calving caribou of the CAH have also 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. Calving caribou generally scatter throughout the calving grounds in groups of less than 10 animals (Bergerud 1978). LGL Alaska Research Associates, Inc. has conducted calving and post-calving distribution surveys between the Sagavanirktok and Staines rivers in most years since 1993 (summarized in Noel and Olson 2001).

There is no consistent tendency for a larger proportion of calving caribou to use a given portion of the calving grounds (e.g., the western or eastern concentration areas). In all years 1970-1977, Gavin (1978) reported observing more calves east of the Sagavanirktok River than west of the Kuparuk River. In 1984, however, a larger proportion of CAH cows were observed calving in the Milne Point area than in the Bullen Point area, and nearly 50 percent of the cows calved outside the two concentration areas (Curatolo and Reges 1984). Sopuck and Jakimchuk (1986) reported that an average of 64 percent of cows and calves observed on transects during mid-June surveys in 1981-1985 were west of the Sagavanirktok River. In contrast, most cows apparently calved east of the Sagavanirktok River in 1986 in response to extensive snow cover on calving grounds west of the river

Cameron (1995) and Cameron et al. (1992, 1995) characterize the impacts of oil field development as avoidance of infrastructure, primarily by cows and their calves, and reduced fecundity by female caribou as a result of habitat loss and disruption of movements resulting in a reduced plane of nutrition. It has been suggested by the Alaska Department of Fish and Game (ADF&G) that female caribou in the west segment of the CAH (which occurs around existing oil fields) have lower reproductive rates than females in the east segment (which occur in the undeveloped areas including the PTU). It has been speculated that this is due to disturbance or stress effects of the oil fields on the nutritional status of west segment animals. However, Cronin et al. (1997) have shown that factors other than oil field impacts (e.g. movement between the areas) are equally likely to affect the numbers of animals in each segment. The comparison of the east and west segments of the CAH has been considered as a natural experiment showing that oil fields can depress caribou reproduction (BLM & MMS 1997). A thorough assessment of data is needed to address this issue, however the population level data for the CAH does not support this hypothesis.

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 oil field development cannot coexist, and that oil field infrastructure blocks caribou movement to coastal insect-relief habitats are widely held. These beliefs persist despite a lack of evidence that oil field 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 oil field 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. 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.

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 or blocked access of CAH caribou to calving habitats,
- displacement or blocked access of CAH caribou to post-calving and coastal insect-relief habitats; and

- blocked PCH and CAH movements to and from the Arctic National Wildlife Refuge.

SURVEY OBJECTIVES

Our summer 2001 survey efforts will be to determine the distribution and abundance of caribou and other large mammals between the Sagavanirktok River and the Staines River area during the calving and post-calving periods. Our primary objectives are to:

- determine the number, sex/age composition, and distribution of large mammals during the caribou calving and post-calving seasons;
- compare distribution and abundance of large mammals in the Bullen Point to Staines River study area with the adjacent Badami study area, and
- evaluate the effects of the Badami pipeline on caribou movements between the Beaufort Sea coast and areas south of the pipeline.

METHODS

During 2001, we will conduct 6 to 7 systematic aerial surveys of large mammals within the Badami and PTU development areas including the possible pipeline corridor between the Sagavanirktok River and the Staines River (Fig. 1). Two caribou calving period survey will be conducted between 12 June and 20 June. Four to five post-calving period surveys will focus on large mammals, including caribou, muskoxen, and grizzly bear in coastal and inland areas, during the period from 20 June through 30 July. Survey area will be reduced in the Badami area during post-calving period surveys (Fig. 1). Systematic surveys will generally be scheduled at weekly intervals, but will be adjusted with prevailing weather patterns, results of telemetry reconnaissance flights, and reports of caribou movements in adjacent areas from other biologists in the area. Methodology will follow that used during 1997 to 2000.

As with previous aerial surveys conducted by LGL in the Prudhoe Bay oil field (Pollard et al. 1992a,b; 1996a,b), a Motorola *Workhorse*™ Global Positioning System (GPS) receiver will be used to navigate the aircraft during systematic surveys. Locations of animals will be determined by using the GPS in combination with visual estimates of their distance from the airplane. At the time of sighting, all data will be entered directly into a portable laptop computer that is linked to a GPS receiver. For each animal sighting (whether of a group or an individual), the computer associates a GPS position (latitude and longitude of the survey aircraft) with attributes (e.g., number of individuals in the group and sex/age classification) entered into the computer by the observer.

Caribou will be 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 cannot be classified with confidence; caribou near the outer margin of transect strips are most difficult to classify. When large groups of caribou are encountered, the survey aircraft will leave the transect and circle the group to facilitate counting and classifying. Direction of movements will also be noted. The GPS allows the aircraft to return to the exact point of departure from the transect, and no survey coverage will be lost as a consequence of transect departures.

Caribou data will be combined with base map data in MapInfo® Geographic Information System (GIS). A GIS is a tool that facilitates storage, retrieval, display, integration, and analysis of geo-referenced data sets (i.e., data associated with a location on the earth's surface). Within the GIS, "attribute" data such as animal numbers and sex/age classification are associated with point locations of animal ("spatial" data). Sets of data in the GIS include locations of lakes, rivers, coastline, and topographic contours. Data collected during each survey and each set of base–map data exist as separate data coverages or "layers" in the GIS; analyses can be tailored to address questions of interest by combining specific layers of GIS data. Spatial data will be used to produce maps of caribou distribution for each survey, which will enable us to analyze and describe the general distribution and abundance of caribou over the course of the study period.

During 2001, LGL will work with Dr. Warren Ballard of Texas Tech University under a cooperative agreement with the Alaska Department of Fish and Game (ADFG) to look for VHF collared caribou using a scanning receiver. This scanning receiver will be operated by one observer during most of the systematic surveys and during flights dedicated to searching for VHF equipped caribou. During systematic surveys presence within a defined area will be determined based on signal strength and approximate bearing. During dedicated searches the animal will be located, if possible. Flightlines and point locations will be recorded during search flights as with systematic flights. We will listen for caribou from all adjacent herds using the scanning receiver.

SCHEDULE

TASK	DATE
Technical Plan	April
Aerial Survey Permit Application	March
Aerial Surveys	10 June to 30 July
Data Entry/Analysis	August to December
Survey Data Analysis and Mapping	September to December
Draft Report	December to February
BPXA Report Review	February
Final Report	March
Final Data and Report Delivery	March

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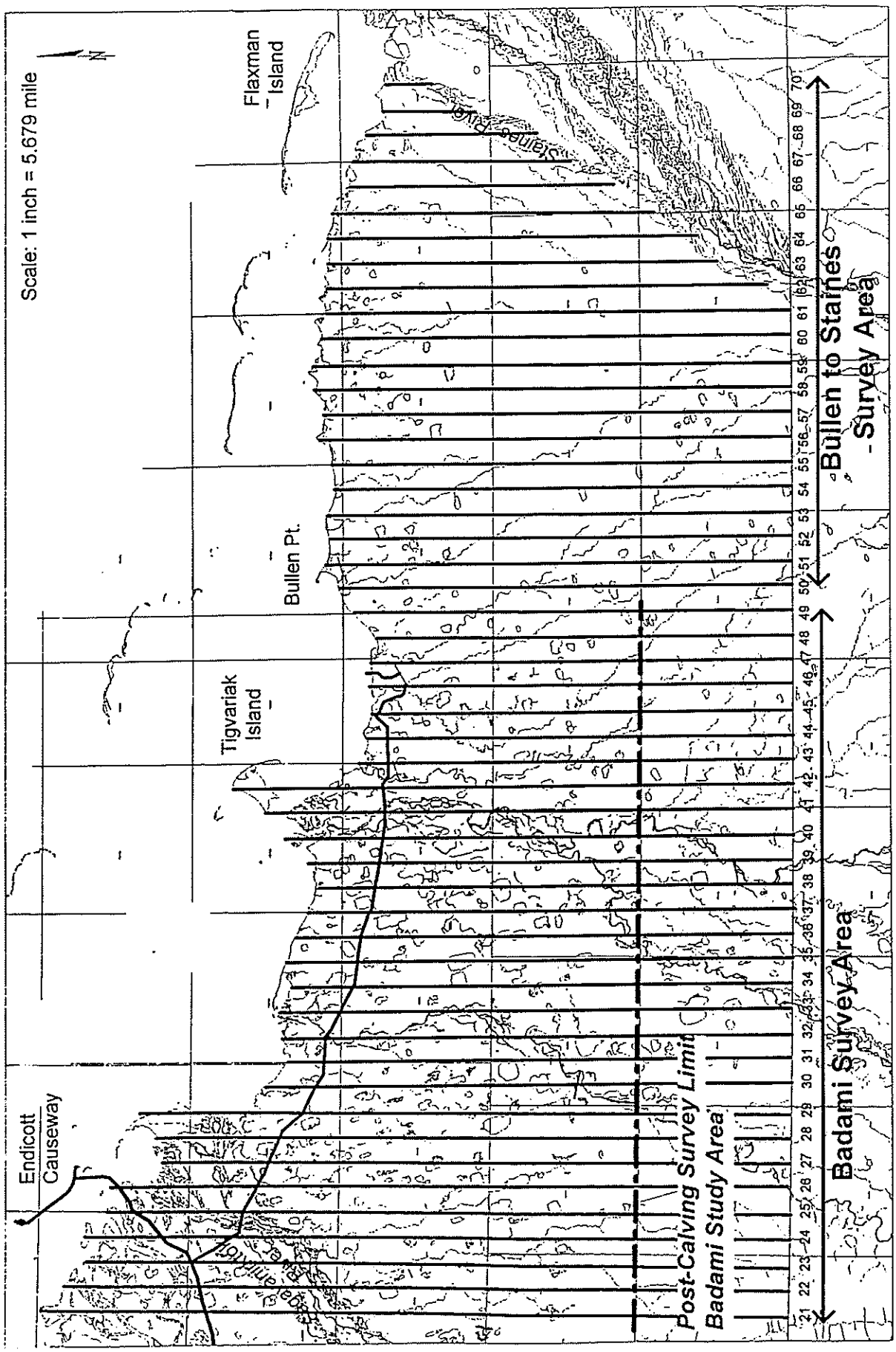

Figure 1. Proposed survey transects between the Sagavanirktok River and the Staines River, covering the Point Thomson Unit, summer 2001.

2001 Sagavanirktok to Staines River Large Mammal Survey Budget

Personnel	Mobilization & Field	Data Analysis	Report Preparation	Total	Rate per Day	Total Cost
L. Noel	9	5	5	19	$720	$13,680
S. Wolfe	20	10	20	50	$500	$25,000
H. Whitlaw	15	5		20	$640	$12,800
W. Ballard	2	2	1	5	$840	$4,200
S. Haskell	15			15	$430	$6,450
M. Cronin			1	1	$920	$920
				Total Personnel		$63,050

Direct Expenses				
Fixed-wing Aircraft	100	Hours @	$345	$34,500
Lodging Costs	60	Nights @	$75	$4,500
Lodging Costs	5	Nights @	$110	$550
Travel (Lubbock to ANC)				$1,800
Communications				$500
Equipment and Supplies				$2,000
			Total Direct	$43,850
			Project Total	**$106,900**

BPXA Covered Logistics				
Charter Costs (Anchorage to Prudhoe)	21	Trips @	$300	$6,300
Vehicle Rental	25	Days @	$65	$1,625
			Total BPXA Logistics	$7,925
			Project Total with BPXA Logistics	**$114,825**