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DISTRIBUTION AND MOVEMENTS OF CARIBOU IN RELATION TO THE KUPARUK DEVELOPMENT AREA

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SUMMARY

Results of calving surveys in the Kuparuk Development Area (KDA) indicated good initial calf production. However, calving activity in the KDA was relatively low, as in previous years with late snowmelt. The calving concentration area north of the West Sak Road (WSR) appeared to be split into 2 sections, 1 either side of the Milne Point Road.

In 1982, fewer total caribou (Rangifer tarandus granti) were observed during surveys along the WSR than in 1981, even though more surveys were conducted. Very few calves were observed from the WSR during the calving period. Calf representation along the WSR has declined over the past 5 years, and cow/calf numbers have been lowest in those segments with highest construction activity.

Survey observations along the Oliktok Road indicated that most parturient cows moved into the calving concentration area from the west, and not across the WSR.

The Kuparuk River remained an important caribou movement corridor. However, increasing traffic and development along the WSR have apparently diverted most movements into and out of the KDA to the west of CPF-1, resulting in a circular movement pattern between the coast and the WSR, similar to the pattern seen in 1981.

Key words: caribou, disturbance, oil field, pipelines, traffic.

* Funding by ARCO contract 1 January 1982 through 30 June 1982.

CONTENTS

BACKGROUND

The Kuparuk Development Area (KDA) is located immediately west of the main Prudhoe Bay oil field. The KDA is an active calving area and an important component of caribou (Rangifer tarandus granti) summer range. Detailed knowledge of regional caribou distribution and movements will assist in the design, placement, and construction of facilities that would accommodate caribou, hopefully within established geotechnical constraints. It will also provide an opportunity to identify and quantify the sources of local disturbance and the reactions of caribou to these stimuli. Finally, in conjunction with continued monitoring of the Central Arctic Herd (CAH) status, results of the present program will provide an opportunity to document any effects of oil field development on herd distribution and productivity. This report summarizes results of continued surveys of the CAH calving grounds within the KDA and along the West Sak Road (WSR) during 1982.

In 1982, the WSR survey program was expanded to include portions of the precalving (13-26 May) and calving (1-18 Jun) periods in the KDA. In addition, surveys were conducted along the newly constructed Oliktok Road during the calving period to monitor the movements of parturient cows into calving areas north of the WSR.

Three manuscripts were developed from data obtained in the Kuparuk area. Appendices A and B are abstracts of papers presented at the 1st North American Caribou Workshop held in conjunction with the 34th Alaska Science Conference (Whitehorse, Sep

1983). These deal with densities of calving caribou in and near the Prudhoe Bay oil field and factors affecting pipeline crossing success of caribou, respectively; both have been submitted for publication in the Workshop Proceedings. Appendix C is an abstract of a paper describing the responses of large groups of caribou to elevated pipelines in the KDA; the manuscript has been submitted to Arctic.

OBJECTIVES

To describe annual variations in the distribution of CAH caribou on their calving grounds, with special reference to calving activity in the vicinity of the KDA.

To determine between-year differences in the distribution, movements, and sex/age composition of caribou within or near the KDA during summer.

To determine the locations of road and/or pipeline crossings by caribou.

To characterize the responses of caribou to local structures and disturbance.

PROCEDURES

The distribution of calving caribou in the Kuparuk region was determined on 11-12 June. We sampled caribou along 12 north-south transects spaced at 3.2 km intervals and extending 40 km inland from the coast (Fig. 1). This area had been surveyed annually between 1978 and 1981 during the same period, although in previous years we were able to extend coverage both east and west within the coastal plain (Cameron and Whitten 1979, 1980; Cameron et al. 1981, 1983).

All transects were flown by Bell 206B helicopter, with the pilot and front-seat observer searching primarily in the direction of flight and 2 rear-seat observers searching to either side of the aircraft. USGS 1:63,360 maps were used for navigation and for recording locations of caribou groups; all groups within 1.6 km of each transect were used in the transect data analysis. Airspeeds of 110-130 km/hr and altitudes of 30-50 m were maintained until a group of caribou was sighted. Composition was ascertained by making a lower, slower pass or by hovering briefly at a distance of 50-300 m and using binoculars. Individuals were classified on the basis of genitalia, body size, and/or antler development as bulls, cows, calves, or yearlings.

The WSR (Fig. 2) was surveyed systematically by light truck (Cameron and Whitten 1979), generally twice daily, during 3 separate phases of study: 13-26 May, 1-18 June, and 1 July-5 August (precalving, calving, and midsummer periods, respectively). Between 1 and 18 June, an additional 13 surveys were conducted along the Oliktok Road between CPF-1 and Oliktok Point (Fig. 2).

For midsummer surveys, the level of insect harassment was estimated subjectively by direct observation as none, light, moderate, or severe. In addition, mean 4-hour insect levels were calculated using hourly weather reports for Deadhorse airport (obtained from the Arctic Environmental Information and Data Center, University of Alaska, Anchorage) and the weather/insect activity relationship of White et al. (1975). Caribou survey data obtained along the WSR (including location, observation distance, group composition, direction of movement, road/pipeline crossings, and insect levels) were entered in a computer file (Honeywell Model 20, University of Alaska, Fairbanks).

RESULTS AND DISCUSSION

Regional Distribution of Calving Caribou

In 1982, breakup was unusually late, and in mid-June most of the coastal plain was still covered by snow, ice, and/or meltwater. As in previous years of late snowmelt, much calving occurred south of the immediate coastal zone. Eight of 15 collared cows relocated in June calved more than 50 km inland, and 1 calved nearly 160 km south of the coast (Cameron et al. 1984). No caribou were observed in the Canning River delta during reconnaissance overflights. In past years, calving activity has been concentrated in this area (Cameron et al. 1983); in 1982, however, the delta was almost completely covered with aufeis and meltwater.

Within the KDA, 1,103 caribou were observed during helicopter surveys. As in all previous years of survey, caribou within this area were distributed mainly toward the coast. Initial calf production was relatively low (70 calves/100 cows; Table 1). However, some calves were born unusually late and, consequently, final calf production was considerably higher (ca. 80 calves/100 cows; J. Dau, pers. commun.).

Cows and calves appeared to avoid the WSR during the calving period. No newborn calves were observed within 4 km of the road.

As in previous years, the density of calving caribou was particularly high in the area between the WSR and Oliktok Point. A major difference, however, was that this calving concentration

area (Fig. 2) appeared to be split into 2 parts by a strip of low caribou density corresponding roughly to the new Milne Point Road. Density east of the road and in the area as a whole was low compared to previous years' estimates, but density west of the road area was quite high (Table 2).

Distribution of Caribou Along the West Sak Road

During the precalving period in 1982, 17.5% of the 412 caribou seen from the WSR were calves born the previous year (Table 3). This is in good agreement with an estimate of 17% yearlings (excluding calves born in 1982) obtained during helicopter surveys on 11 June (derived from data in Table 1), indicating that yearling numbers along the WSR were representative of caribou in the general region.

In contrast, newborn calves composed only 1.6% of the 310 caribou seen from the WSR during the calving period (Table 3), substantially lower than a corresponding estimate of 34% calves obtained by aerial survey (Table 1). This difference is consistent with the aerial survey observation that no calves were present within 4 km of the WSR on 11-12 June (see above). Thus, the combined data indicate that cows with neonatal calves were avoiding the road/pipeline corridor.

Additional surveys conducted along the Oliktok Road during the calving period afforded the opportunity to observe movements of caribou into the Milne Point calving area. During 13 surveys between 1 June and 18 June, 1,049 caribou were observed along this 26-km road, yielding a sighting rate of 3.2 caribou/km/survey. In contrast, data from 22 surveys along the WSR during the same period yielded only 0.4 caribou/km/survey, or an 8-fold difference. A mean of 13.6% calves were present among caribou observed from the Oliktok Road, and 10 groups (33 caribou) were observed crossing the Oliktok Road, compared with respective values of 1.6% calves (Table 3) and 1 crossing (4 caribou) for the WSR transect. These data indicate that most caribou moved into calving areas north of the WSR from the west and not from the south, across the WSR. It is unknown if this is a "traditional" movement zone or an alternate access route used to avoid the Kuparuk Pipeline corridor.

A total of 8,801 caribou were observed along the WSR during the summer period, of which 16% were calves. No corresponding regional data are available for summer 1982. However, initial production in 1982 was high as in previous years. Assuming early calf survival was within the "normal" range and that bull and yearling representation was similar to that noted in past years, the regional calf proportion would have been approximately 25% in midsummer.

It is noteworthy that between 1978 and 1980, the percentages of calves among caribou observed along the WSR and the corresponding regional calf percentages, as determined by aerial surveys, were similar (Cameron et al. 1983). In 1981, however, the local calf percentage was substantially lower than regional estimates (Cameron et al. 1983). It appears that this trend continued in 1982.

The distribution of caribou and the mean calf percentage among 4 km segments of the WSR are depicted in Fig. 3. During pre-calving and calving, most caribou were located in the middle segments of the road, away from the major nodes of activity at the Kuparuk River and CPF-1 areas. Groups were often sighted repeatedly in the same locations, and only 1 crossing of the WSR was noted during both periods combined.

Midsummer distribution of caribou along the WSR was characterized by peaks at the 0-4, 16-20, and 28-32 road segments. Since 1978, relative numbers of caribou have been consistently high in the 0-4 km segment of the WSR, which includes the Kuparuk floodplain. This pattern was particularly pronounced in 1982 when one-third of all caribou were seen here. The proportion of caribou observed west of km 24 on the WSR decreased markedly from 42% in 1981 to 18% in 1982. We attribute this decrease to the higher levels of construction activity and traffic near CPF-1 and in newly developed areas to the west. During winter 1981-82, Mine Site C (at CPF-1) was opened to provide gravel for CPF-2 and associated road and drill pads, and there was extensive local gravel hauling during all survey periods in 1982. The peak at 16-20 km is attributed to the sighting of 1 large group of transient caribou (Appendix C) and does not necessarily indicate the existence of a node of occupancy.

Calf representation among caribou observed within various segments of the WSR did not correspond to the overall pattern of caribou distribution (Fig. 3). In fact, midsummer data indicate an inverse relationship at the east and west ends of the road, near the major nodes of construction activity. From 1978 through 1981, calf percentages near CPF-1 were approximately representative of regional values. It may be that the recent increase in the number of structures and level of activity near CPF-1 is related to the reduced calf representation locally. Calf percentages in the Kuparuk flood plain have been consistently lower than regional estimates. The Kuparuk River segment of the WSR area has always been an area of relatively high construction activity and correspondingly low calf percentages.

Insect-induced Movements

Midsummer movements of caribou in the KDA were greatly affected by weather-induced changes in insect activity. Radio-tracking data and observations along the Oliktok Road (M. Robus, pers. commun.) indicated that many caribou moved to the coast from west

of CPF-1 and then continued east along the coast as long as insect harassment was severe. Subsequent inland movements along the Kuparuk River and other drainages were apparently blocked at the WSR. Caribou then turned west, paralleled the WSR to CPF-1, recrossed the Oliktok Road, and dispersed to the southwest. This clockwise movement pattern was first noted in 1981 and occurred 3 times during 1982.

Few crossings of the WSR were observed during standard road surveys in midsummer 1982. Additional observations (B. Lawhead, pers. commun.) indicated that the Kuparuk River area was still an important caribou movement corridor. However, increasing traffic and development along the WSR have apparently changed the overall pattern of insect-induced movements within the KDA. Movements now appear to be primarily of a circular nature rather than as north-south oscillations, and routes of access and egress are primarily across the Oliktok Road, north of CPF-1. Fig. 4 depicts our overall impression of midsummer movements within the KDA.

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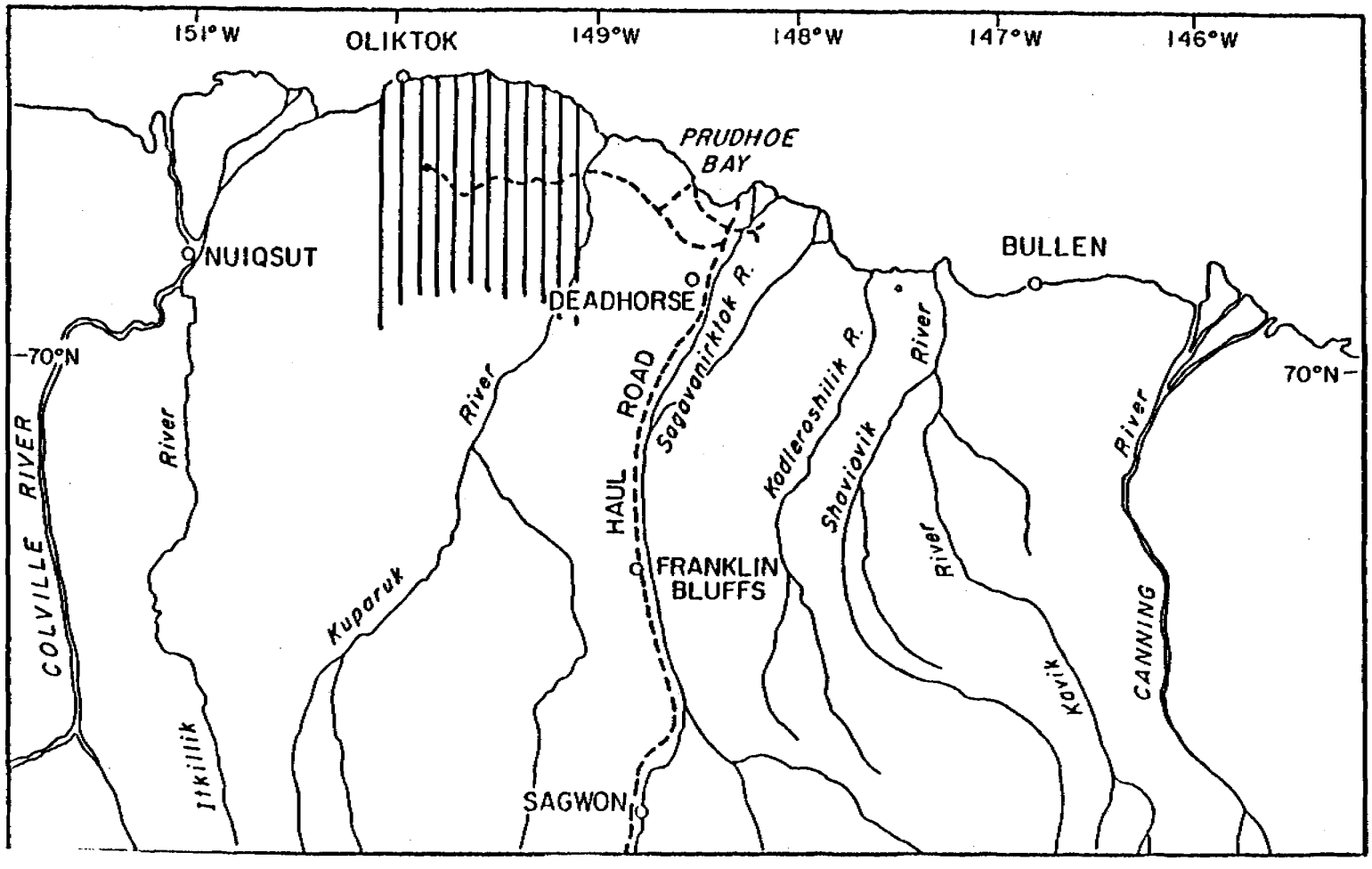

Fig. 1. Aerial survey transects within the Kuparuk Development Area, 11-12 June 1982.

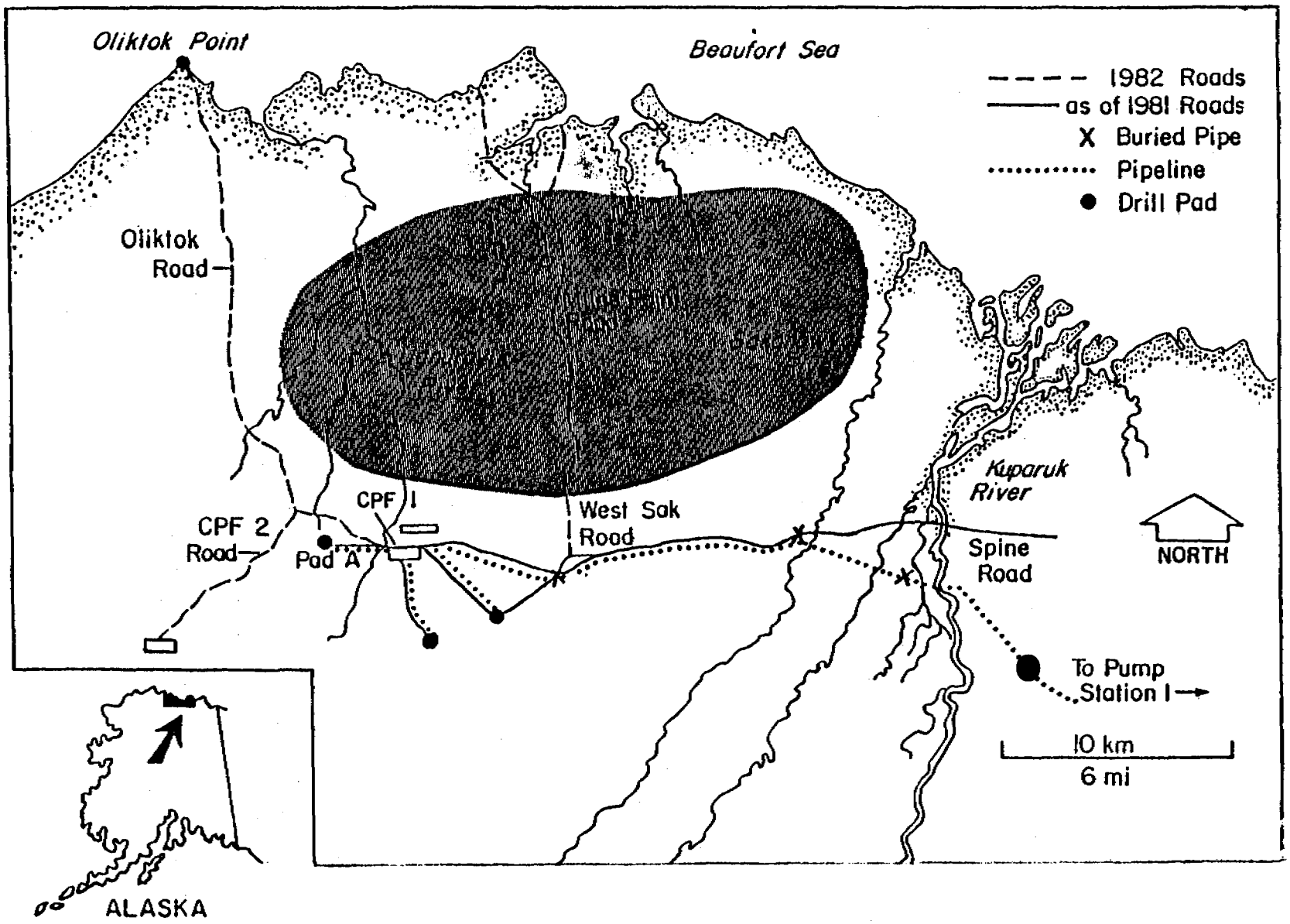

Fig. 2. Calving concentration (shaded area) north of the West Sak Road, 11-12 June 1982.

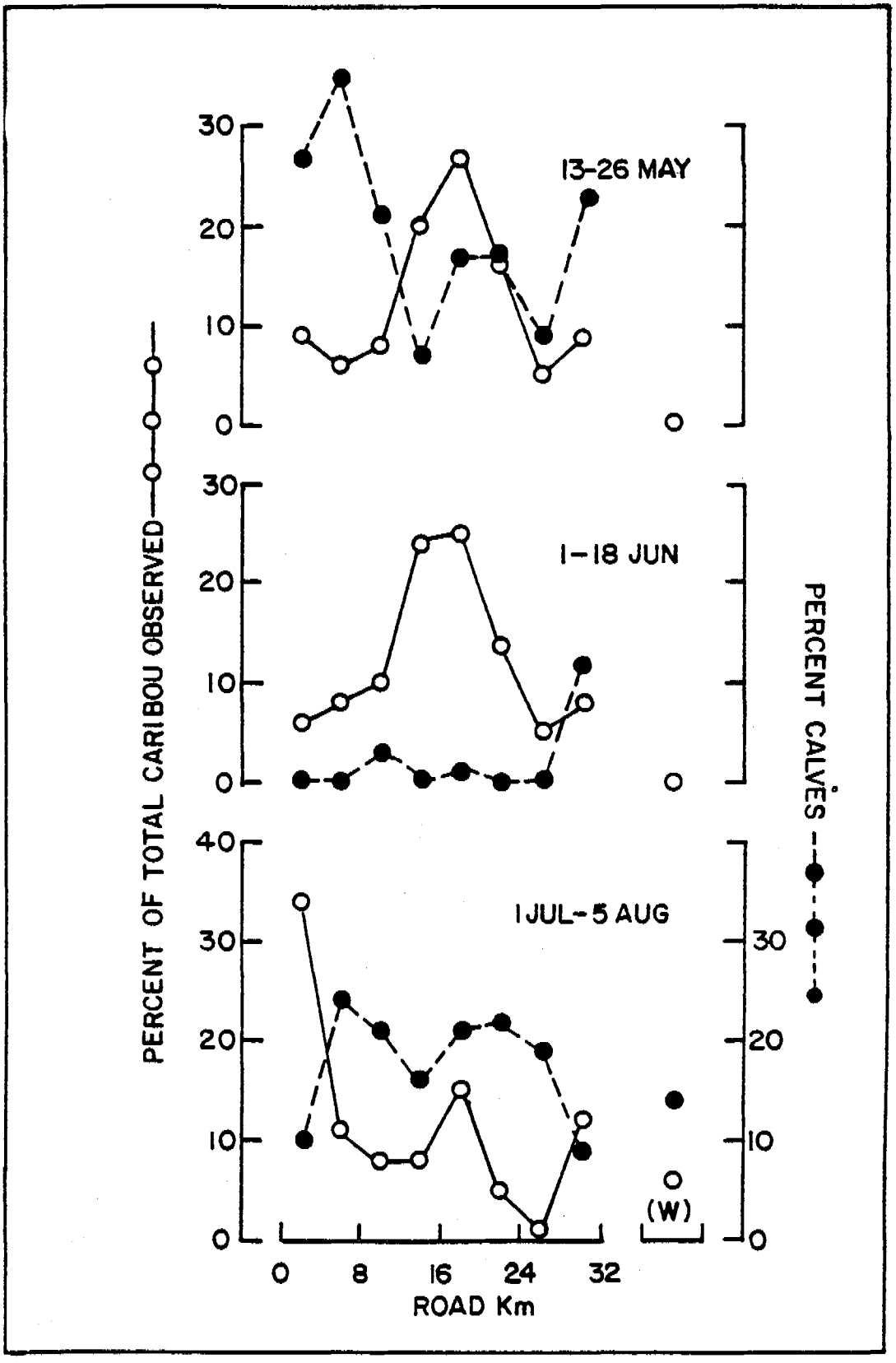

Fig. 3. Distribution of caribou observed from the West Sak Road, spring and summer 1982. Note: Calves observed in May are short yearlings of the 1981 calf cohort.

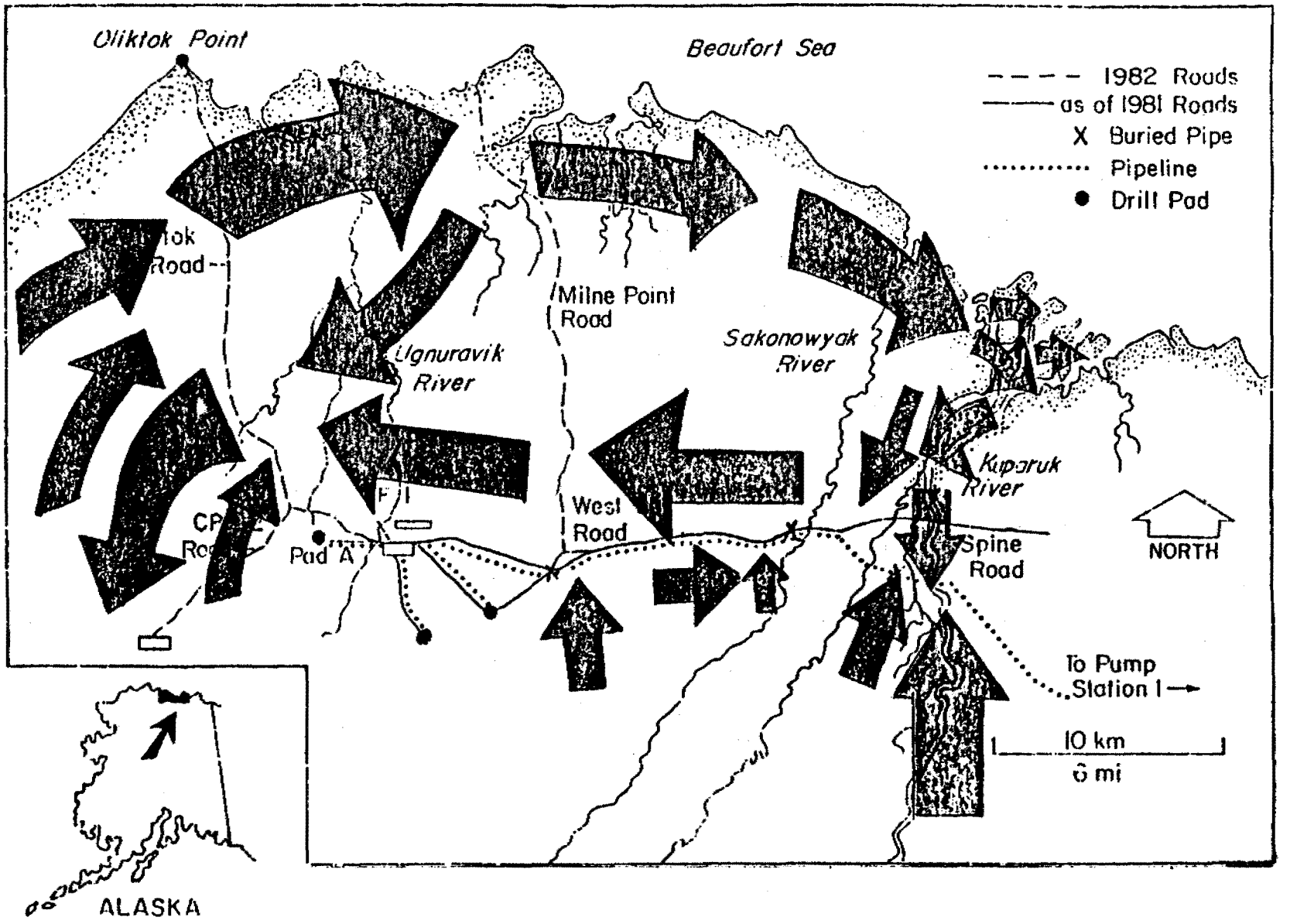

Fig. 4. Summary of caribou movements within the Kuparuk Development Area, summer 1982.

Table 1. Composition of Central Arctic Herd caribou on the calving grounds west of the Kuparuk River, 1978-82.

Year	% calves	Calves/ 100 cows	Bulls/ 100 cows	Yearlings/ 100 cows[a]
1978	36	82	3	39 (40)
1979	37	85	7	26 (60)
1980	30	68	4	48 (50)
1981	40	85	9	22 (34)
1982	34	70	11	23 (60)

[a] ( ) = Yearlings/100 cows estimated from overwinter calf survival counts (Cameron et al. 1983).

Table 2. Caribou densities in the Kuparuk calving concentration area north of the West Sak Road, 1978-82.

Year	Caribou/100 km^2	Cow-calf pairs/100 km^2
1978	281	112
1979	630	279
1980	276	90
1981	589	274
1982	256	104
(East)[a]	(234)	(95)
(West)[a]	(534)	(218)

[a] East and west of the low density area along the Milne Point Road.

Table 3. Summary of total numbers and calf percentages of caribou observed from the West Sak Road, 1978-82.

Year	Inclusive survey dates	No. of surveys	No. of groups observed	No. of caribou observed	% calves
1978	18 Jul-18 Aug	28	190	1,670	25.2
1979	26 Jun-21 Aug	31	438	2,692	22.6
1980	16 Jul-6 Aug	38	343	4,552	19.8
1981	15 Jun-7 Aug	86	1,120	14,148	17.8
1982					
Precalving	13 May-26 May	13	136	412	(17.5)[a]
Calving	1 Jun-18 Jun	22	118	310	1.6
Summer	1 Jul-5 Aug	60	522	8,801	16.0

[a] ( ) = 1981 cohort (i.e., short yearlings).

Appendix A.

Distribution of Caribou Calving in Relation to the Prudhoe Bay Oil Field

K. R. Whitten and R. D. Cameron

(Manuscript submitted for publication in the Proceedings of the First North American Caribou Workshop)

ABSTRACT. The calving grounds of the Central Arctic Herd (CAH) were surveyed annually from 1978 to 1982 to determine caribou distribution and density. Consistently low numbers of caribou and generally low percentages of calves were observed in the Prudhoe Bay Oil Field. Mean densities of caribou in 5 other regions of the calving grounds were 2 to 18 times higher than at Prudhoe Bay, presumably due to avoidance of the oil field by parturient cows. So far, displacement of calving caribou from Prudhoe has been to adjacent areas already used for calving. The CAH has increased rapidly in spite of displacement from part of its calving grounds. This paradox is best explained by the relatively low density of the CAH on its calving grounds. Effective density of CAH caribou on calving grounds is about one-third to one-fifth that of the nearby Western Arctic and Porcupine Caribou Herds, suggesting that CAH caribou have more options for selection of a calving site.

Appendix B.

Factors Affecting Pipeline Crossing Success of Caribou

Walter T. Smith and Raymond D. Cameron

(Manuscript submitted for publication in the Proceedings of the First North American Caribou Workshop)

ABSTRACT. Early simulation studies on the Arctic Slope of Alaska showed that caribou would not pass freely beneath elevated pipelines. Our recent observations during summer indicate that crossing success varies with pipeline design, caribou group structure, and a number of environmental stimuli. Absolute barriers to caribou movement exist where surface-to-pipe clearance is inadequate for physical passage, or when drifting snow along road/pipeline complexes reduces the effective clearance. Where pipeline elevation is sufficient, the outcome of an encounter is related to other circumstances. Factors that appear to influence crossing success include group size/composition, topography, insect activity, traffic level, and the intensity of local construction, as well as road and/or pipeline configuration. Present studies are aimed at describing local movements and evaluating the effectiveness of special pipeline crossing structures. Maintaining caribou passage through oil fields requires careful planning based on an assessment of both local and regional movements.

Appendix C.

Reactions of Caribou to an Above-Ground Pipeline on the Arctic Coastal Plain of Alaska

Walter T. Smith and Raymond D. Cameron

(Manuscript submitted to Arctic)

ABSTRACT. We describe in detail two instances in which large groups of mosquito-harassed caribou (Rangifer tarandus granti) were followed for 8-12 hours as they repeatedly attempted to cross an elevated pipeline in the Kuparuk Development Area near Prudhoe Bay, Alaska. In 1981, 46% of a group of 917 eventually crossed beneath elevated portions of the pipeline in 26 separate attempts, 13% crossed a section of buried pipe in two attempts, 19% separated from the group and were not accounted for, and 22% trotted parallel to the pipeline for 37 km and did not cross. In 1982, 26% of a group of 655 crossed under elevated portions of the pipeline in 36 attempts, 37% crossed at a buried section in one attempt, and 37% left the main group and could not be accounted for. The majority of crossing attempts occurred near intersections of lakes with the road/pipeline complex, but crossing success was highest at a section of buried pipe isolated from road traffic.