CARIBOU BEHAVIOUR IN THE VICINITY OF LUPIN GOLD MINE NORTHWEST TERRITORIES 1993

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ABSTRACT

We studied behaviour of barren-ground caribou (*Rangifer tarandus*) at the Lupin Gold Mine, Contwoyto Lake, Northwest Territories (NWT) during July and August, 1993. Lupin Gold Mine is on the Bathurst caribou herd's spring and summer migration path and each year thousands of caribou may pass the mine. In this study we began to examine the extent, duration and consequences of caribou exposure to mine activities by describing what caribou do at the mine site. We hypothesized that insect harassment would influence how caribou used bare ground (airstrip, roads, and tailings ponds) to reduce their exposure to insects. We used instantaneous scan sampling, focal animal sampling, and remote cameras with interval timers to record caribou behaviour. Our results showed that in August 1993 caribou used the bare ground areas (tailings pond, airstrip) at Lupin mine for lying, standing and walking and they would forage on adjacent areas. The abundance of biting insects was too low to monitor using sticky traps and sweep net samples and the low insect abundance prevented us from describing caribou behaviour during insect harassment. A second phase of this study, reported elsewhere, was to compile information on how to guide caribou away from airstrips or tailings ponds. As part of this second phase, the Department in 1994 contracted the Dogrib Renewable Resources Committee to bring together elder's knowledge of fences used to steer caribou to hunters.

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INTRODUCTION

Lupin Gold Mine, at Contwoyto Lake, Northwest Territories (NWT), is on the Bathurst caribou herd's spring and late summer migration path. In late May and early June, caribou (*Rangifer tarandus groenlandicus)* pass Contwoyto Lake as they move north-east to their traditional calving grounds at Bathurst Inlet (Urquhart 1981). During spring migration caribou cows are strongly motivated to reach the calving ground and apparently as they pass Lupin, they do not linger there. Later, in July and mid-August caribou moving south may detour around Contwoyto Lake's north end and pass through Lupin mine. Mine staff have reported a few thousand caribou in the mine's vicinity during August.

The mine's environmental review (Beak Consultants Ltd. 1980) identified no major concerns for caribou. The review predicted a few caribou could be expected to remain near the mine for the summer. Accidental deaths (vehicle collisions, entrapment in the tailings ponds) were predicted to be few and that prediction has been borne out. Echo Bay Mines has reported three caribou deaths since 1980 and notes a greater concern with caribou on the airstrip (Hohnstein 1996).

Hunters have expressed concerns about caribou at the tailings ponds (letters on file, Department of Renewable Resources). We have caribou observations around buildings, roads and the airstrip, crossing and foraging around the tailings ponds. But those observations tell us little about how long the caribou are there, what they do and

how their behaviour is influenced by ecological factors and the mine's activities. The extent, duration and consequences of caribou exposure to mine effluent and tailings is another unknown.

Mine construction started in 1980 and was completed by 1982. One of us (AG) spent 31 August - 2 September, 1982 watching the caribou. The tailings ponds were small but caribou were crossing them and feeding in their vicinity. A brief return visit was in June 1990 after hunters had reported concerns about 'sick' caribou. A few lame caribou were resting close to the buildings.

Staff shortages precluded a follow-up on the concerns about caribou at Lupin until 1993. In July 1993 diamond exploration was high and funds became available to investigate caribou at Lupin not only to address community concerns but also to describe caribou behaviour at an operational mine.

The research was conceived as having three phases and results of the first phase are presented in this report. The first phase was to describe caribou behaviour at the mine, in summer, and this was started in 1993 when the Department of Renewable Resources hired a biologist (FM) to investigate caribou behaviour. The study's second phase was to compile information on how to, if necessary, guide caribou away from sites such as airstrips or tailings ponds. And as part of this phase the Department in 1994 contracted the Dogrib Renewable Resources Committee to bring together elder's

knowledge of fences used to steer caribou to hunters. This is reported elsewhere (Zoe et al 1995). The study's third phase - to test guidance methods - was postponed when not enough caribou were reported at Lupin in July 1995.

In designing our investigation in 1993 we assumed that blood-sucking and parasitic insects could be a conspicuous factor influencing caribou behaviour in summer. Caribou responses to mosquitoes (*Culicidae)* and warble flies *(Hypoderma tarandi)* may mask or influence their responses to human activities and this is documented during research at the Alaskan Prudhoe Bay oil field. (Fancy 1985, Murphy and Curatolo 1987, Roby 1978, Smith and Cameron 1985, Curatolo and Murphy 1986). Caribou seek out bare ground especially if it is slightly elevated to reduce exposure to mosquitoes and that behaviour may partially explain why caribou use the tailings ponds, roads and other areas lacking vegetation at the mine.

Objectives

The objectives in July-August 1993 for the study's first year were:

1. to describe caribou activities and numbers at Lupin Mine.
2. to compare caribou activities at different levels of mosquito abundance.
3. to test the hypothesis that caribou use the Lupin Mine airstrip and tailings ponds for relief from parasitic and biting insects.

The hypothesis that caribou are using mine airstrip and tailings ponds for relief from mosquitoes is testable by determining whether more caribou use mine structures when insect abundance is high compared to when low. Air temperature and wind speed should also correlate with caribou numbers on mine structures as mosquito activity is influenced by air temperature and wind speed.

METHODS

Study Area

The study area was Echo Bay Mines's Ltd. Lupin Gold Mine (Figures 1, 2, and 3) on the western shore of Contwoyto Lake (65° 46' N, 111° 14' W) in the central barrens. The area around the north-west end of Contwoyto Lake is a rolling, rocky plateau with numerous lakes. Small drumlin fields and bedrock outcrops are common. The vegetation is mostly lichen tundra with sedges and dwarf birch in the wetter areas. Beak Consultants Ltd. (1980) describe the region's climate and geology.

Behavioural observations

We described caribou behaviour from direct observations and indirectly from photos taken by automatic cameras. To observe caribou, we approached them using a mountain bike and chose a vantage point about 1 km from the caribou. We waited several minutes before beginning observations. We watched caribou through 25 power, wide-field, binoculars and recorded data into a notebook. Tally counters were used for counting caribou and behaviours.

We distinguished calves, yearlings, cows, young bulls, and prime-bulls. Unless a penis was visible sex identification was based on the presence or absence of a vulva. Calves were distinguished by small body size and rounded face profile.

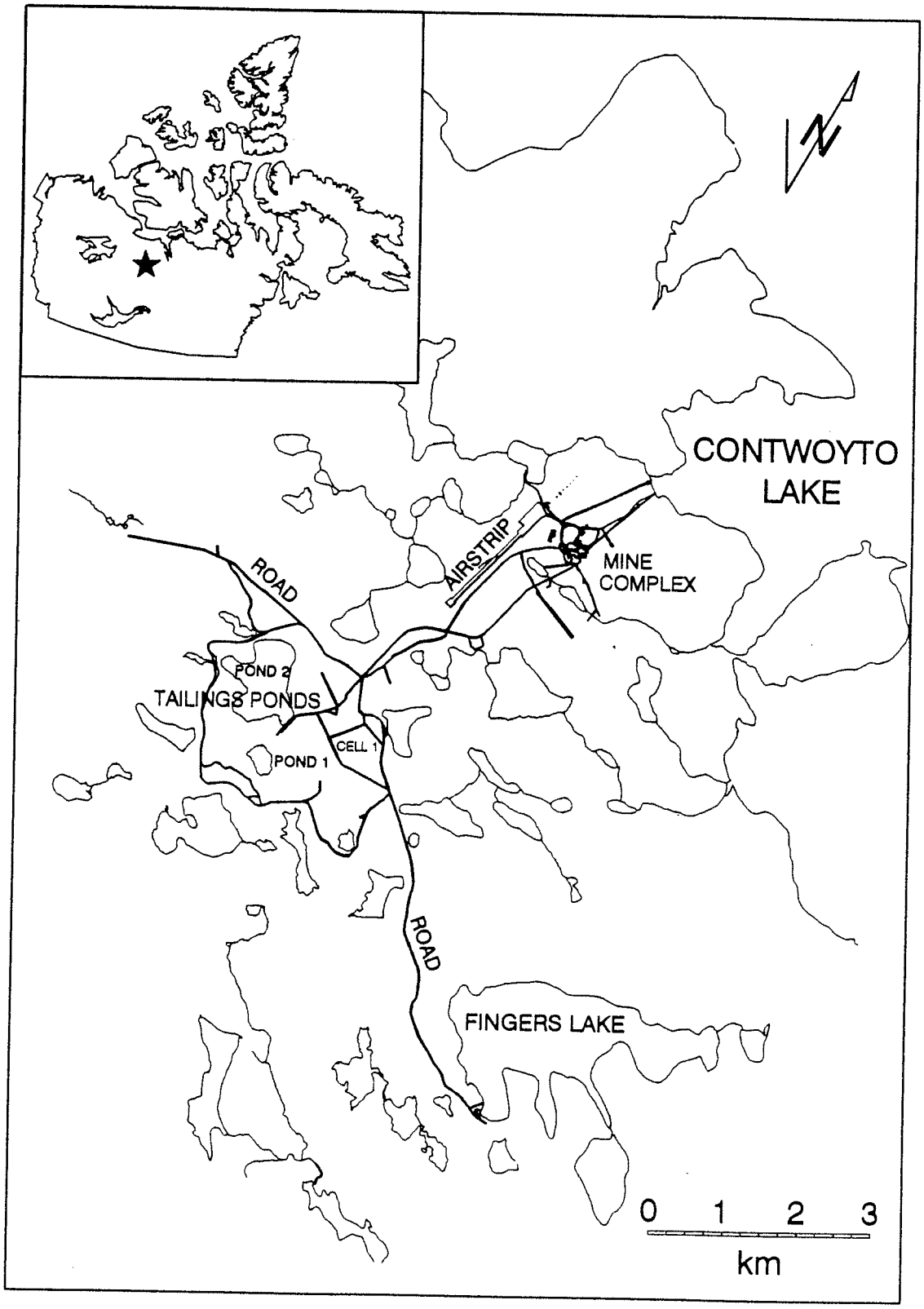

Figure 1. Map of Lupin Gold Mine and surrounding region. The inset shows the location of Lupin within the Northwest Territories.

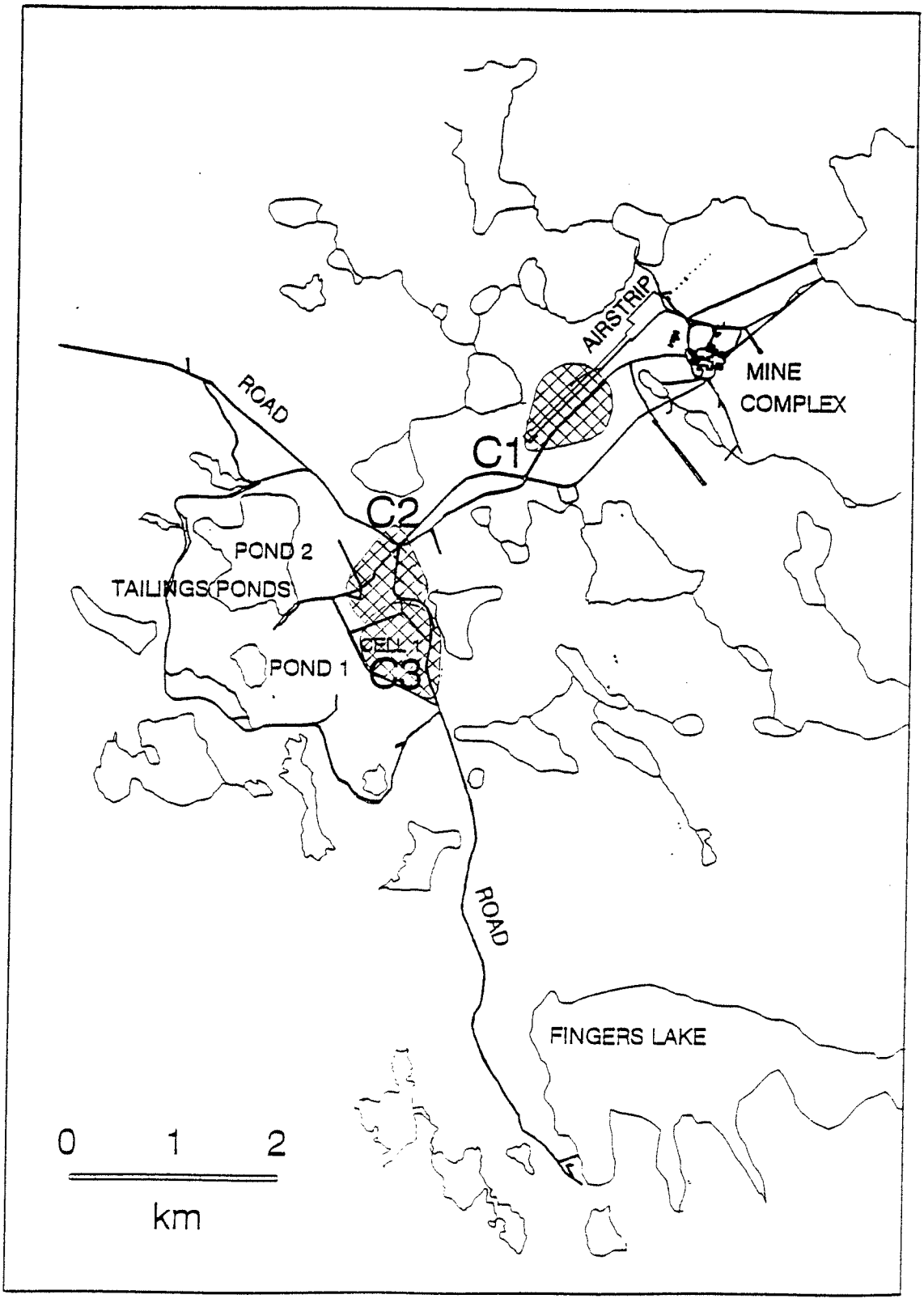

Figure 2. Detail of Lupin Mine Property. Numbers indicate the locations of the remote cameras (C1-C3). The shaded areas indicate approximate areas of coverage by remote cameras.

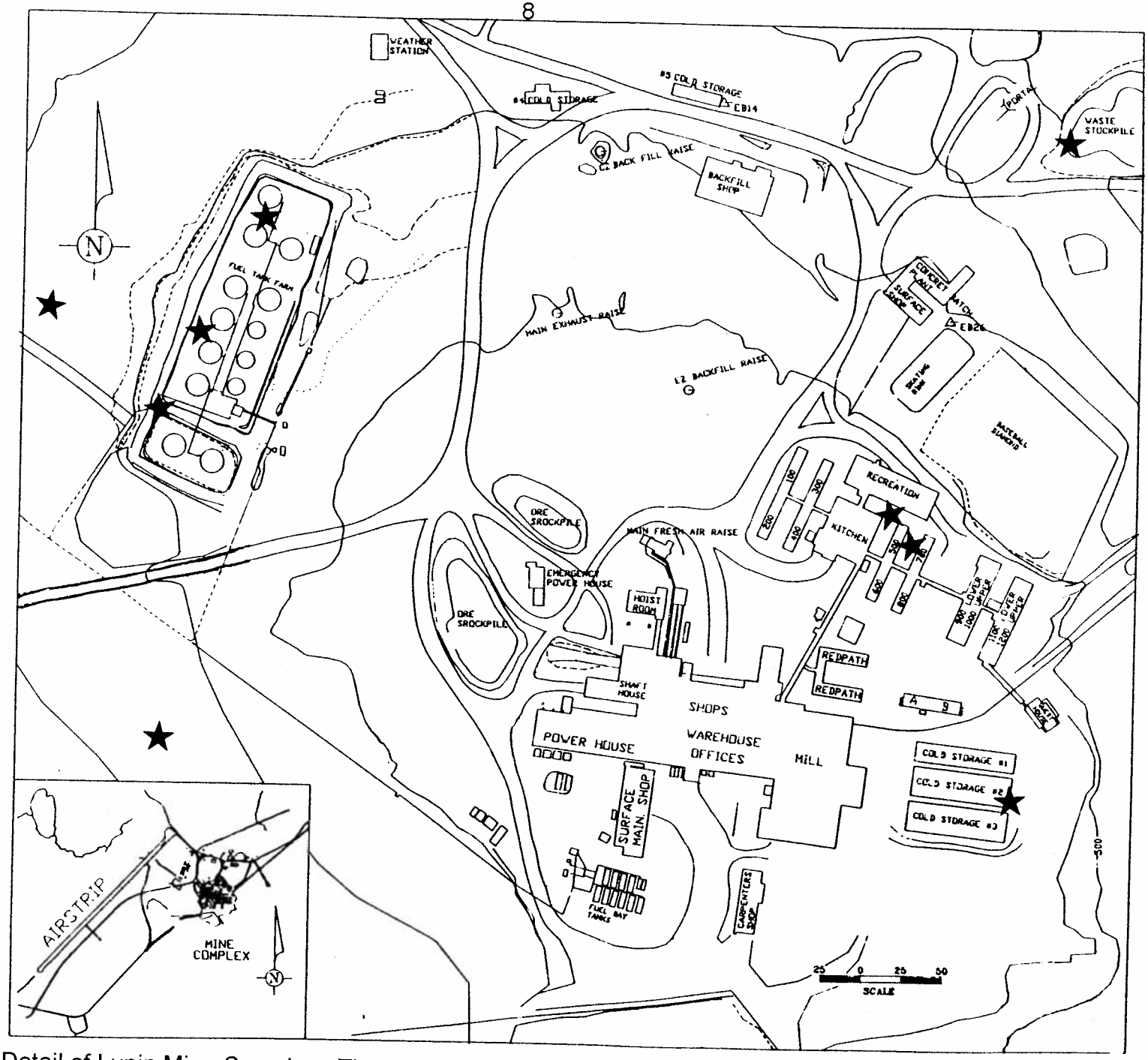

Figure 3. Detail of Lupin Mine Complex. The star symbols indicate locations that were frequently used by bull caribou.

We recorded activity as caribou lying, standing, feeding, walking, and running (White et al. 1975 and Duquette and Klein 1986). Caribou responses to insects were classified as annoyance behaviour - standing head down, head tossing, foot stamping, twitching, group milling, or galloping . We collected the behavioural data with methods adapted from Altmann (1974), Collins and Smith (1989), and Duquette and Klein (1987). Two techniques were used to systematically collect behaviour observations:

1. Instantaneous scan samples. We scanned all caribou within a defined area at 10 minute intervals and recorded the number in each behaviour category. We either watched the caribou directly or recorded the data from 35mm photographic slides taken by remote cameras with 10 and 20 minute interval timers.

2. Focal animal samples. Individuals that could be identified by new antler growth, were used for focal animal observations. We described the duration and frequency of activities for an individual caribou for 10 minute periods by recording each new behaviour and the time each behaviour changed.

3. Data Collection. For each observation, we recorded time, topography, habitat, age, sex, group size, behaviour, categorized insect abundance, temperature, and wind speed.

Remote Cameras

We positioned three remote cameras with interval timers (PENTAX Zoom 90-WR) next to the airstrip and the tailings ponds (Figure 2) to record caribou position, behaviour, and numbers. The remote timers were set for every 10 or 20 minutes. The "Airstrip" camera (C1) was positioned on a hill at the west end of the airstrip. This elevated position (about 25 m) and the wide-angle lens allowed almost the entire airstrip to be remotely monitored. Two cameras (C2 and C3) were on elevated locations overlooking the tailings ponds (Figure 2). The percentage of animals in the different behaviour categories and on various mine infrastructure was determined later from the 35mm slides.

We also noted incidentally caribou behaviour around the mine and mine activities. These observations were descriptive and unsystematically collected. Temperature and wind speed data were from the Lupin Mine weather station.

We indexed abundance for mosquitoes, black flies (Simulidae), horse flies (Tabanidae, *Hybomitra tetrida*), nose bot flies (Oestridae, *Cephenemyia trompe*), and warble flies in vegetated areas, the airstrip and tailings pond using the following methods:

1. Sweep net. Systematic sweeps with a butterfly net every 1 or 2 hours.
2. "Leslie's bug traps". A large wind sock net with built in baffle trap and collection jar and sampled periodically (Wakelyn L. per. comm.).

3. Sticky traps. Six traps (30 cm x 30 cm plexiglass covered with tangle foot coated plastic wrap) each on 2 x 2 post were sampled hourly by counting and removing all insects or replacing the plastic wrap.

RESULTS

Behaviour Observation

We monitored caribou behaviour between August 8 - 16, 1993, using group scans and focal animal sampling (Tables 1 and 2) and incidental observations of caribou in Appendix A. During a preliminary trip on 15 July too few caribou (4) were seen to start the study but we estimated that 3,000 to 4,000 caribou moved through the Lupin Mine between August 4 and 16, 1993. In addition, mine employees estimated that several thousand caribou passed by Lupin between August 17 and 19.

Table 1. Sample size and weather for instantaneous scans, Lupin mine, Contwoyto Lake, NWT, August 1993.

Date	Scan Start	Finish	No. Scans	No. Caribou	Temp. °C.	Wind kmph	Insect Rating
6	0750	0755	1	132	8	5-10	Low
7	0950	1125	5	3-203	6	--	Low
8	0830	0920	3	269	7	15	Low
	0945	1052	5	132	8	10	Low
9	0930	0935	1	54	7	7	None
10	1235	1444	11	18-51	10	0	Low
11	1400	1653	27	46-77	12	1-2	Low-Medium
12	1530	1530	1	4	12	3	Low
13	1320	1540	10	20-46	10	5-10	Low
14	0750	0910	8	5-21	9	0	None
	1350	1440	6	7-15	12	10	None
15	1040	1050	2	2-3	10	15-25	None
	1320	1440	12	5-15	12	15-25	Low

One of us (FM) watched caribou on 10 days between 6 and 15 August (Table 1) and recorded caribou behaviour during 92 instantaneous scans of groups (mean 48 ± 1, SE, range 2-271). Caribou spent half their time foraging, followed by walking, standing and lying (Table 2). The activity budgets of caribou at Lupin during August show no apparent trends with time or day, or temperature.

Table 2. Activity budgets of caribou at Lupin Gold Mine. Mean percent time (SE) of caribou activities determined with (A) Instantaneous Scan and (B) Focal Animal sampling.

A. Instantaneous Scan.

Sex/Age	n	Lying	Stand	Feed	Walk	Trot	Gallop	Other
All Caribou	92	11.9 (1.4)	15.3 (1.4)	51.9 (1.9)	17.4 (1.3)	2.9 (0.6)	0.6 (0.2)	0.0 (0.0)

B. Focal animal.

Sex/Age	n	Lying	Stand	Feed	Walk	Trot	Gallop	Other
Bull	31	18.8 (5.5)	20.0 (4.8)	32.4 (5.9)	19.1 (3.3)	8.5 (3.5)	1.0 (0.6)	0.0 (0.0)
Cow	31	9.4 (4.0)	26.4 (6.4)	36.0 (5.6)	19.3 (3.3)	8.6 (3.2)	0.1 (0.1)	0.3 (0.2)
Yearling and calf	6	4.2 (4.2)	23.4 (10.3)	48.1 (16.5)	15.0 (5.1)	5.5 (3.9)	4.0 (2.8)	0.0 (0.0)
All Caribou	68	13.0 (3.0)	23.2 (3.7)	35.4 (4.0)	19.0 (2.0)	8.0 (2.0)	1.0 (0.0)	0.1 (0.1)

We recorded all behaviours during 68 10-min bouts of focal animal sampling and the mean percent time for the different behaviours were estimated (Tables 2 and 3). Restricting the observation periods to 10 minutes was necessitated by the observer

also doing the group scans. But it also meant that less frequent behaviours could be under-estimated. Annoyance behaviours were infrequent and head down, head toss and twitch occurred at similar frequencies (1.5%). Stamping and aberrant running were recorded at lower frequencies (0.3%).

Insect abundance and activity was low in August, which prevented comparing caribou behaviour during high and low insect activity. So few insects were collected that the sweeps and traps were discontinued.

Remote Cameras

The three automatic cameras with interval timers to monitor caribou activities took 870 photographs between 9 August and 15 August, 1993 of the Lupin airstrip (one camera) and the tailings ponds (two cameras).

Tailings Ponds

From August 4 to 16, two remote cameras took 112 photographs with caribou on or near the tailings ponds: 48 were on the tailings in Cells 1 and 2 compared to 30 on the road and 34 on the vegetation. For the caribou whose activity was discernible on the tailings ponds, 28% were lying, 64% standing, and 8% walking across the tailings. On the road, the proportions of caribou standing (65%), lying (25%) and walking (10%) were similar to the tailings ponds but in contrast, caribou photographed on nearby vegetated areas were mostly feeding (feeding 93%, standing 2%, walking 5%).

Table 3. Sample size and weather for focal animal sampling, Lupin mine, Contwoyto Lake, NWT, August 1993.

Date	Scan Start	Finish	Caribou	Temp. °C.	Wind kmph	Insect Rating	Habitat
8	0952	1002	Calf	8	10	Low	Vegetation
	1008	1018	Young bull	10	10	Low	Vegetation
	1023	1033	Cow	12	10	Low	Vegetation
	1042	1052	Yearling	12	10	Low	Vegetation
9	1245	1252	Prime bull	10	5	Low	Vegetation
	1300	1310	Cow	10	5	Low	Tailings
	1315	1320	Cow	10	5	Low	Vegetation
	1415	1425	Young bull	10	5	Low	Vegetation
	1431	1441	Cow	10	5	Low	Vegetation
	1449	1459	Young bull	10	5	Low	Vegetation
	1506	1516	Yearling	10	5	Low	Vegetation
	1529	1539	Cow	10	5	Low	Vegetation
	1545	1555	Cow	10	5	Low	Vegetation
	1603	1613	Cow	10	5	Low	Vegetation
	1620	1630	Young bull	10	5	Low	Vegetation
10	1325	1335	Prime bull	10	7	Low	Vegetation
	1336	1346	Young bull	10	7	Low	Tailings/Veg.
	1354	1404	Young bull	10	7	Low	Vegetation
	1420	1430	Young bull	12	7	Low	Vegetation
	1434	1444	Young bull	12	7	Low	Vegetation
11	1405	1415	Young bull	12	0	Moderate	Tailings
	1416	1426	Young bull	12	0	Moderate	Airstrip
	1434	1444	Young bull	12	0	Moderate	Airstrip/Veg.
	1445	1455	Young bull	12	0	Moderate	Airstrip/Veg.
	1456	1506	Cow	12	0	Moderate	Airstrip/Veg.
	1512	1522	Cow	12	2	Low	Vegetated
	1532	1542	Cow	12	2	Low	Vegetated
	1554	1604	Cow	12	2	Low	Vegetated
	1615	1625	Cow	12	2	Low	Vegetated
	1633	1643	Cow	10	5	Low	Airstrip/Veg.
12	1504	1541	Prime bull	13	6	Low	Tailings
	1610	1620	Young bull	10	3	Low	Tailings
13	1320	1330	Young bull	8	15	Low	Vegetation
	1330	1337	Cow	8	15	Low	Vegetation
	1342	1352	Calf	9	15	Low	Vegetation
	1358	1406	Cow	9	--	--	Vegetation
	1410	1420	Prime bull	9	--	Low	Vegetation
	1430	1440	Prime bull	10	15	Low	Vegetation
	1442	1452	Cow	11	15	Low	Vegetation

Date	Scan Start	Finish	Caribou	Temp. °C.	Wind kmph	Insect Rating	Habitat
13 cont.	1458	1508	Prime bull	11	--	Low	Vegetation
	1510	1520	Prime bull	11	--	--	Vegetation
	1524	1532	Cow	11	--	Low	--
	1540	1550	Cow	10	5	Low	--
	1625	1635	Young bull	12	--	--	--
	1640	1650	Young bull	12	15	--	Vegetation
14	0755	0805	--	8	0	Low	Vegetation
	0805	0815	Yearling	--	--	Low	Vegetation
	0815	0825	Cow	--	--	Low	Vegetation
	0830	0840	Cow	--	--	Low	--
	0840	0850	Young bull	10	0	Low	Vegetation
	0850	0900	Cow	10	0	Low	Vegetation
	0900	0910	Yearling	9	0	Low	Vegetation
	1350	1400	Prime bull	12	10	Low	Vegetation
	1400	1410	Cow	--	--	--	--
	1410	1420	Prime bull	--	--	--	--
	1430	1440	Cow	12	10	Low	Vegetation
15	1040	1050	Cow	10	25	Low	Vegetation
	1050	1100	Cow	10	25	Low	Vegetation
	1330	1340	Prime bull	12	25	Low	Vegetation
	1340	1350	Cow	12	25	Low	Vegetation
	1350	1400	Prime bull	12	25	Low	Vegetation
	1400	1410	Young bull	10	25	Low	Vegetation
	1410	1420	Young bull	10	25	Low	Vegetation
	1420	1430	Calf	12	25	Low	Vegetation
	1430	1440	Cow	12	25	Low	Vegetation
	1440	1450	Cow	12	25	Low	Vegetation
	1530	1540	Cow	12	25	Low	Vegetation
	1540	1550	Yearling	12	25	Low	Vegetation

Airstrip

The remote camera photographed 58 different caribou: 10 caribou (18%) were on the airstrip, 6 (11%) were on the road adjacent to the airstrip, and 41 (71%) were on unaltered habitat next to the airstrip. Of the caribou on the airstrip, 8 (73%) were

standing and 3 (27%) were walking. As at the tailings ponds, caribou on adjacent natural habitat were mostly feeding.

DISCUSSION

Our results showed that in August 1993, caribou used the tailings ponds, roads and airstrip at Lupin mine for lying, standing and walking and they would forage on adjacent areas. A few bulls sought shade or protection next to buildings. Low insect numbers prevented us from meeting two of the study's three objectives (to describe caribou behaviour during insect harassment).

Studies have found strong correlations between caribou behaviour and insect activity which, in turn, correlates with weather and month (Russell *et. al* 1993). Wind speed was the best predictor for mosquito activity - no mosquitoes were caught when winds exceeded 6 m/s. Temperatures greater than 13°c favoured mosquito activity. Russell *et al.*(1993) also recorded a significant decrease in mosquito numbers between early and late July which suggests that the low numbers of mosquitoes that we observed was probably a seasonal change rather than the weather.

Our prediction was that had there been insect harassment, the caribou numbers on bare ground would have increased is based on studies elsewhere. Nixon (1991) caught fewer mosquitoes in sparsely vegetated areas. During periods of high insect abundance, caribou preferred to rest on sandy areas (Helle and Aspi 1984). At the Prudhoe Bay oil field caribou sought refuge on gravel pads, piles of road material, and haul roads during severe insect harassment (Roby 1978).

Caribou respond differently to oestrid flies and to mosquitoes (Klein, D. per. comm., Roby 1978). During high levels of oestrid fly activity caribou were frequently seen running panicked at top speed (aberrant running) and the spacing between individuals increased (dispersal). Caribou, especially bulls, will also seek shade to avoid oestrid flies and Roby (1978) observed bull caribou in the shade of buildings, machinery, and the elevated pipeline on the Alaska North Slope. Downes *et al.* (1985) recorded that male nose bot flies were sensitive to light as well as temperature. The flies became inactive when the sun passed behind a cloud which may be why caribou seek shade.

This was a preliminary year and it did point out some sampling problems. Having the same person attempt both focal animal and instantaneous scans was a mistake as the focal animal sampling was restricted to 10 min bouts. Additional cameras or another observer could be used to record instantaneous scans. Our study design did not allow us to determine if the caribou selected areas such as the tailings ponds in preference to other areas or whether their distribution was proportional to availability.

Sampling for insect abundance will need refinement especially to index oestrid fly activity. Oestrid flies are powerful fliers and need specialised traps (Nixon 1991). As well it may be possible to determine if the flies are using points of higher relief. Both warble and nose bot flies use hilltops as male aggregation sites to which the female flies are attracted (Downes et al 1985).

More work needs to be done to determine the most applicable means to guide caribou away from specific sites and the conditions under which methods work when. The Dogrib elders contributed their knowledge for redirecting caribou in the fall and late winter mostly in treed areas and the account emphasises how some techniques were more applicable to one season than another. The next step is, in cooperation with an appropriate Inuit organization, to compile Inuit knowledge for guiding caribou. Traditional knowledge for guiding caribou should be experimentally tested at operating mines.

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PERSONAL COMMUNICATIONS

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APPENDIX A. Unquantified caribou observations, July-August 1993, Lupin mine.

Caribou were regularly seen at the following sites within the mine. Caribou observed at Lupin were mainly bulls and cows without calves. Cows were not observed among the mine buildings.

Caribou were seen in the shade of the elevated tailings line, on the gravel roadways and gravel airstrip, on the tailings ponds, or among the mine complex (horseshoe pits, cold storage buildings or tank farm).

1. Fuel tank farm.

   In July 1993, 1 to 4 individual male caribou were repeatedly seen in the tank farm. Four bulls, two lame, bedded and stood on both the gravel berm and the sand pad between the fuel tanks. In August, three bulls and a new yearling male were also using the tank farm at all hours of the day. The three bulls looked the same as the bulls seen in July.

   The three bulls and yearlings feed a few hundred metres to the west and to the south of the tank farm. If disturbed, they would walk or gallop back to the tank farm. No new caribou were seen to start using the tank farm in August when large numbers of caribou began moving past Lupin. Several mine employees suggested that injured caribou used the tank farm to reduce risk of being killed by wolves.

2. Cold storage building.

   A single caribou was often seen in the open garage door of the cold storage building. Miners also reported regularly seeing one or several caribou in this location in previous years.

3. Horse shoe pit and barbecue area.

   Caribou were also occasionally in these areas, often laying on the sand/gravel pad.

4. Tailings material spill

   Over 30 caribou were seen to spend a great deal of time laying on a tailing spill along the tailings line (location A in Figure 2).

5. Waste rock piles to north of mine complex.

Several caribou were seen here once during a period when several hundred caribou were moving past the mine property.

6. Mine roads, water pipelines, and tailings lines.

Caribou were able to negotiate most linear structures with relatively little delay. A raised road, about 4 m high, between the mine site and Contwoyto Lake deflected caribou either towards the mine or towards the lake where they then crossed the road and pipeline. At a location where the pipeline and road converged caribou often hesitated for several minutes before crossing. Caribou appeared to delay and abandon attempted crossing when vehicles used the road. When traffic approached, either mine vehicles or the mountain bike, caribou usually reacted by running ahead of the vehicle or off to one side for a short distance, and then often returned to the road or cut across in front of the moving vehicle. Cows with calves tended to immediately leave the area while bulls and yearlings in particular would often become curious and would often approach quite close. Crossing of linear structures was often initiated by one individual with other individuals following single file. In only a few instances were caribou seen to travel along roadways for any distance. Caribou were occasionally seen standing below elevated sections of the tailings pipeline.

7. Tailings ponds

We saw two caribou drinking from the tailing ponds and a bull swam across one of the large tailings ponds (Pond 1). Mine workers reported 100s of caribou on Pond 1 on 18 August 1993 when 6000 to 8000 caribou were in the mine area.

APPENDIX B. Other Wildlife observations, July-August 1993, Lupin mine.

1. Arctic Hares - several dozen hares lived on or near the mine complex. They and their young were often seen hopping around, between, and under the outside storage areas. Several hares were also regularly seen in the open garbage pit to the southeast of the mine complex.

2. Arctic ground squirrels - were seen in and near the garbage containers.

3. Barren-ground grizzly bears have been seen near or at Lupin every year by mine employees. In 1993, according to mine employees, over 10 different bears came to the Lupin mine site. On August 17 a sow was seen in camp and was shot at with rubber bullets - she was not seen again.

4. Arctic Wolves are occasionally seen on the mine property or near the mine complex. Two arctic wolves were seen at the mine complex on the morning of August 16 by mine employees. Wolves are reported by mine employees to have had dens near the powder storage building, to the west of the mine complex, and on the esker south of Fingers Lake.

5. Ravens and seagulls were fairly common around the mine complex, especially at the open garbage pit to the south east of the facilities.

6. Red fox - A pair of red foxes were regularly seen on or near the airstrip. They had a den in an old culvert on the northeast end of the airstrip, near the tank farm. A second fox den was found on the esker just south of Fingers Lake.

7. Muskoxen - several herds of muskoxen used the area around the mine. The largest herd I saw was 39 animals. Animals were often seen feeding in areas adjacent to the tailings ponds.