RESPONSES OF GRIZZLY BEARS TO HYDROCARBON EXPLORATION ON RICHARDS ISLAND, NORTHWEST TERRITORIES, CANADA

LEE HARDING, Environmental Protection Service, Department of Fisheries and Environment, P.O. Box 2310, Yellowknife, Northwest Territories X1A 2P7
JOHN A. NAGY, Canadian Wildlife Service, Fisheries and Environment Canada, 10025 Jasper Avenue, Edmonton, Alberta T5J 2X9

Abstract: Observations on numbers, distribution, locations of dens, and responses of grizzly bears (*Ursus arctos* L.) to industrial disturbances were noted on Richards Island, Northwest Territories, Canada, during 1972-75. During this period, 13-23 bears occupied the 2,460-km^2 study area. Bear responses to hydrocarbon exploration and related activities were observed 23 times, and 35 dens were located. Bears were distributed evenly over the study area during summer but avoided camps by 1 km or more. Density was comparable to that of other arctic mountain and coastal bear populations, and no decline was apparent. Effects of industrial activities included slight loss of habitat, disturbance of denning areas resulting in abandonment of dens, and relocation of problem bears. It is predicted that proposed natural gas production facilities will not be compatible with continued survival of grizzly bears in Richards Island.

Grizzly bears have so long been abundant in the Mackenzie Delta region that one of the Eskimo placenames is Aklavik, or "Bear Country" (Porsild 1945). Richards Island in particular has been the location of numerous reported sightings (Clarke 1944, Porsild 1945, Macpherson 1965, Nolan et al. 1973). Although generally protected east of the Mackenzie River, grizzly bears are hunted within the Reindeer Grazing Reserve, which includes Richards Island (Northwest Territories 1971). Yet arctic grizzly bears are slow to mature and reproduce (Curatolo and More 1975) and they probably cannot stand increased pressures on their populations (Macpherson 1965). The spread of modern culture has caused grave concern for the grizzly's continued survival, both in areas of the western Canadian Arctic (Macpherson 1965) and on the North Slope of Alaska (Bee and Hall 1956). The threat of hydrocarbon exploration to grizzly bears has been recognized since 1956 (Bee and Hall 1956, Barry 1959). Since then, bears have been studied by Quimby (1974), Slaney (1974), Pearson (1975), Pearson and Nagy (1976), and others in this general region in order to predict the impact of proposed industrial development.

Oil companies have explored Richards Island since the mid-1960s. Oil and natural gas have been found and construction of production facilities may begin soon.

Grizzly bear studies by F. F. Slaney and Co. Ltd. during 1072-75 were part of a broader environmental program to determine indices of mammal density and to identify and describe important habitats near areas of possible future facilities for natural gas production on Richards Island. Results were reported by Slaney (1974, 1975) and by Harding (1976). The purpose of the present paper is to discuss results from the above studies in the context of bear observations and den site locations in relation to existing gas exploration facilities and to present new observations on grizzly responses to hydrocarbon exploration collected by the senior author during the course of these studies.

The studies were supported by Imperial Oil Ltd., Gulf Oil Canada Ltd., Shell Canada Ltd., and Canadian Arctic Gas Study Ltd., who gave permission for the publication of data.

STUDY AREA

Richards Island, a part of the Mackenzie Delta, has an arctic climate and biota influenced by the Mackenzie River, with attendant warmer weather and seasonal flooding of lowlands (Gill 1972). Its southern apex 69°00′ N, 134°40′ W coincides with the northern tree limit. Vegetation is typical of arctic coastal tundra. Because the area is a complex interface between arctic and subarctic climates, forest and tundra biomes, lowland and upland terrain, and freshwater and marine ecosystems, it supports an abundance and a wide variety of wildlife (Harding 1974). Topography includes deltaic floodplains and Pleistocene uplands (Mackay 1963) ranging in elevation up to 70 m above sea level.

Hydrocarbon exploration facilities in the area include 3 base camps, drilling rigs (each with associated camp and airstrip), a communication tower with generating plant, gravel (borrow) pits, and a network of winter roads. These facilities and associated aircraft flight corridors are distributed over approximately half the study area and are concentrated in the southwest portion of the island.

Facilities proposed for the study area include wharf sites, more gravel mining sites, 2 natural gas processing plants, an elevated pipeline gathering system radiating from each plant (Slaney 1974), a 122-cm buried gas trunk line, and all-weather roads to Tuktoyaktuk and Inuvik (Foothills Pipe Lines Ltd. 1975, Pearson and Nagy 1976).

During 1972 and 1973, a miminum of 13 and 23 grizzly bears, respectively, occupied the 2,460-km^2

study area (Slaney 1974). During 1974 and 1975, 14 bears (including 3 sow-cub groups) and 16 bears (including 4 sow-cub groups), respectively, denned on the island (Harding 1976).

Because there was no apparent seasonal movement to or from denning areas, the numbers of bears denning in the study area were considered representative of the population densities. These densities of 1 bear per 176 km^2 and 154 km^2 are similar to those reported by Curatolo and More (1975) of 1 bear per 119-228 km^2 in arctic mountains, and 1 per 200 km^2 by Pearson and Nagy (1976) on the arctic coast. Of the 35 dens located, 28 (80 percent) were within general areas of hydrocarbon exploration activity as indicated by flight corridors (Slaney 1974, 1975).

METHODS

During May-September, 1972 and 1973, observations were collected opportunistically during the course of other studies. These observations covered the study area but concentrated on known bear denning areas and areas of proposed hydrocarbon development.

During 1974-75, aircraft, snowmobiles, and snowshoes were used to track bears after their emergence from winter dens, and in areas of industrial activity. The Canadian Wildlife Service began a capture-marking program in 1974 on the study area. Radiocollars and color-coded markings facilitated the monitoring of individual bear movements. Reactions of bears to Cessna 185 and 337 and Bell 206 aircraft approaches at various altitudes and horizontal distances were recorded during the den surveys of 1973, 1974, and 1975. Industrial personnel were interviewed with respect to bear-man encounters.

RESULTS AND DISCUSSION

Den Disturbance

At least 2 denning bears were disturbed by hydrocarbon-related operations during the study. In January 1973, a seismic vehicle was driven over an active den, causing the bear to abandon it. The bear left the area and was observed several times before it was shot by an Eskimo trapper during March or April. Again, In November 1973, a denning bear was disturbed during gravel mining operations. The bear fled the area and its den was destroyed. Although these 2 denning bears were disturbed, others wintered successfully in dens 1.6-6.4 km from active camps. Their movements after emergence are discussed below.

Industry-related Movements

Of 17 instances where bear movements were followed in detail within 7.2 km of camps, 16 of the bear groups did not venture closer than 1.0 km to the camps. Tracks measured during the summer of 1973 indicated that on at least 8 occasions, bears foraged or traveled within 2.6-7.4 km of industry camps without being seen and without entering the camps. A good example occurred in July 1973 when tracks of a large single bear were located and followed along a beach towards a drilling rig. The tracks indicated that as the bear came in sight of a drilling rig 1.4 km away, it turned and then bypassed the rig, keeping approximately the same distance from it. On a ninth occasion, tracks of 1 bear were found adjacent to an active gravel pit, although the bear had not been noticed by shift workers.

In April 1974, 3 bear dens were located within 4.8 km south of a borrow pit and the associated camp. Upon abandoning their dens, 2 single bears and a sow-cub group traveled generally northward toward the camp, bypassing it by 1.2, 1.0, and 2.0 km, respectively. An adult male spent several days foraging 3.0 km from a drilling rig that was audible to the investigator at that distance but was not visible because of a low, intervening hill. Similarly, another adult male foraged for several days approximately 7.2 km from a staging camp. The camp was visible to the investigator at that distance. Tracks indicated that these male bears finally left the vicinity of the camps without venturing closer.

In 1975, a single bear vacated a den 1.6 km from a gravel excavation camp and bypassed the camp by approximately 1.0 km. Similarly, a single adult and a sow-cub group, which denned 3.2 and 6.4 km, respectively, from a staging camp, did not approach the camp.

Only twice did bears persist in remaining near camps. In July 1974, a subadult female grizzly was seen repeatedly near a camp's sewage lagoon. At the request of camp administrators, Canadian Wildlife Service personnel tranquilized and relocated the bear. In 1975, personnel of the same camp again requested the removal of a bear that had been observed for several days among the buildings. Later, however, the bear left of its own accord. Bears entered camps briefly on 4 other occasions. Each of 3 different industry staging camps were approached once by single bears during summer 1973. In May 1974, a single bear entered a drilling rig camp. In all of these instances, camp personnel chased the bear away, twice assisted with, respectively, a light truck and a forklift.

These observations showed that although bears did not avoid general areas of industrial activity, they appeared to avoid drilling and staging camps by distances of at least 1 km. Whether bears consciously avoided those areas or their travel routes bypassed the camps for other reasons could not be ascertained. However, during 4 years of study, a minimum of 13-23 bears coexisted with industrial activity on the island. Presumably, most had an opportunity to enter camps. Since only 6 such instances were recorded, it must be assumed that most bears actively avoid industrial camps.

Disposal methods have usually been adequate to prevent bear attraction to garbage. The bears that did enter camps fled quickly from crowds of people or from motorized vehicles. In the 2 instances mentioned previously where bears persisted in remaining near a camp, area personnel requested that the bears be relocated.

Responses to Aircraft

Grizzly bears were observed from aircraft by the senior author 53 times during 1972-75. Because industrial operators have used fixed-wing and helicopter aircraft intensively in the area for years, bears had had prior experience with them. The value of these data was primarily in the indication of wide variability and unpredictability in responses. Of 36 bear responses to fixed-wing aircraft, 22 (61 percent) were overt (running or hiding), indicating aversion and some degree of energy expenditure. Most (15, or 88 percent) of the 17 bear responses to helicopters were overt. Bears that had been tranquilized and captured usually tried to avoid subsequent approaching aircraft by hiding or fleeing, suggesting learned avoidance behavior. Such learned avoidance could occur, and probably has, in relation to camps as well as to aircraft.

CONCLUSIONS

We have no evidence to suggest that the current numbers and distribution of grizzly bears are being affected by hydrocarbon exploration or associated activities, but neither can we show that the population has not been affected. The fact that observed densities are within the range of those of other arctic mountain and arctic coastal bear populations indicates at least that grizzlies on Richards Island have not as yet been decimated by industrial activity. Individual bears are, however, being affected through (1) slight loss of habitat due to avoidance of drilling and staging camps; (2) disturbance of bears during dormancy, causing abandonment of dens; and (3) relocation of problem bears frequenting camps.

The implications of these findings with respect to proposed gas production facilities are serious. Although pre-impact data are unavailable, the population has apparently stabilized in relation to existing facilities. The addition of proposed facilities and the intensity of related activities will undoubtedly cause bears to withdraw or be removed from industrialized areas. The construction of proposed all-weather roads will make the area more accessible to hunters from Tuktoyaktuk and Inuvik, further threatening the population. For these reasons we feel that the cumulative impact of the proposed hydrocarbon development facilities will be that of reducing the current grizzly bear population on Richards Island to the point where continued existence of the population will depend on immigration from adjacent areas.

LITERATURE CITED

BARRY, T. 1959. Barren-ground grizzly bears on goose colonies. Canadian Wildlife Service, Edmonton. 8pp. (Unpubl.)

BEE, J. W., AND E. R. HALL. 1956. Mammals of northern Alaska on the arctic slope. Univ. of Kansas Mus. Nat. Hist. Misc. Publ. 8. 307pp.

CLARKE, C. H. D. 1944. Notes on the status and distribution of certain mammals and birds in the Mackenzie River and western arctic area, 1943-44. Can. Field-Nat. 58(1):97-103.

CURATOLO, J. E., AND G. D. MORE. 1975. Home range and population dynamics of grizzly bears (*Ursus arctos* L.) in the eastern Brooks Range, Alaska. Pages 1-79 *in* R. D. Jakimchuk, ed. Studies of large mammals along the proposed Mackenzie Valley gas pipeline route from Alaska to British Columbia. Renewable Resources Consulting Services Ltd., for Canadian Arctic Gas Studies Ltd.

GILL, D. 1972. Modification of northern alluvial habitat by river development. Can. Geog. 17(2):138-153.

HARDING, L. 1974. The Mackenzie Delta: home of abounding life. Can. Geog. J. 88(5):4-13.

———. 1976. Den site characteristics of arctic coastal grizzly bears (*Ursus arctos* L.) on Richards Island, Northwest Territories, Canada. Can. Zool. 54:1357-1363.

MACKAY, J. R. 1963. The Mackenzie Delta area, N.W.T. Dept. Mines and Minerals Tech. Surv. Memo 8. 202pp.

MACPHERSON, A. H. 1965. The barren-ground grizzly bear and its survival in northern Canada. Can. Audubon 27(1):2-8.

NOLAN, J. W., B. C. GOSKI, AND G. Wilde. 1973. Atlas of Dall sheep and grizzly bear habitat maps. Can. Wildl. Serv. Wildl. Inventory.

NORTHWEST TERRITORIES. 1971. Game ordinance and regulations and related legislation. 76pp.

PEARSON, A. M. 1975. Northern pipeline development and its implications to wildlife — grizzly bears. Environ. Social Program Prelim. Rep. Northern Pipelines Task Force on Northern Oil Development. 41pp.

———, AND J. A. NAGY. 1976. The arctic coastal grizzly bear and the potential impact of the proposed Inuvik-Tuktoyaktuk highway. Can. Wildl. Serv. Rep. 24-76. 9pp.

PORSILD, A. E. 1945. Mammals of the Mackenzie Delta. Can. Field-Nat. 59(1):4-22.

QUIMBY, A. E. 1974. Grizzly bear. *In* R. D. Jakimchuk, ed. Mammal studies in northeastern Alaska with emphasis within the Canning River drainage. Canadian Arctic Gas Studies Ltd. Biol. Rep. Ser. Vol. 24.

SLANEY, F. F., AND COMPANY LTD. 1974. 1972-1974 environmental program. Mackenzie Delta, N.W.T., Canada. Imperial Oil Canada Ltd., Shell Canada Ltd., Canadian Arctic Gas Studies Ltd. Vols. 1-8.

———. 1975. Grizzly bear denning survey, Mackenzie Delta, N.W.T., Canada: spring 1975. Imperial Oil Ltd., Shell Canada Ltd., Gulf Oil Canada Ltd. 13pp.