

CANADA

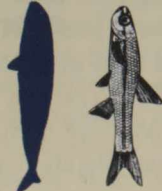
TODAY / D'AUJOURD'HUI

A B E S T I A R Y

With an emphasis on the NOXIOUS SUBSTANCES and DIFFICULT SITUATIONS which threaten the



WOOD BISON, NORTHERN KIT FOX, BLACK-TAILED PRAIRIE DOG, VANCOUVER ISLAND



MARMOT, EASTERN PEREGRINE FALCON, TIMBER RATTLESNAKE, BLUE WHALE, PUGNOSE MINNOW, BLACK-FOOTED FERRET, GREATER PRAIRIE CHICKEN, HIGH-RISE APARTMENT DWELLERS and other people, beasts, fish, birds, and reptiles



We are all endangered. To survive we must breathe safe air, eat safe food and drink safe water. We must not get too cold nor too hot.

By latest count, 22,598,000 people live in Canada. There are 163 species of land mammals (including mankind) and 33 species of whales. There are over 500 species of birds, some of which never leave home and some of which, like the Arctic tern, travel from pole to pole. There are many different kinds of fish in lakes, rivers, ponds and ocean seas. Some are flourishing; others are nearing extinction.

Many people assume that human beings are always responsible for the death of a species. This is not precisely the case. Other beings also alter environments — dam-building beavers and leaf-eating locusts to name two; and great changes in climates have caused the deaths of thousands of species.

Still, man has speeded up the natural processes. In the last four centuries, since the first great age of exploration, extinction rates have increased more than twelvefold. When man is at fault, it is not primarily man the hunter nor man the builder of golf courses. The great destroyers are the house and road builder, the farm fencer, the noise maker and the ingenious manufacturer. The bison did not disappear from the prairies simply because riflemen leaned out of train windows and shot them down by the tens-of-thousands. The bison herds, which once moved "like a brown carpet" over the grasslands, were gone by 1900, because prairie land had become farmland. The passenger pigeon was helped into oblivion by hunters who shot them out of the sky until their bodies formed feathered hills of carrion, but they were already doomed when other, less bloody men started cutting down the forests of oak and beech required for feeding and nesting.

The animal kingdom's greatest grievance against man is that he often needlessly destroys the life balances of other animals. He has found profitable ways to use chemicals in industry and has incidentally poisoned fish. Pesticides help produce abundant harvests, but birds who feed in the treated fields are rendered infertile. Washing detergents flushed into lakes foster algae which consume oxygen and choke fish. Modern man is also a clear and present danger to himself. He eats the mercury-poisoned fish, and the air over a traffic-choked city is as unfit for people as it is for robins.

In the following pages, we give a report on the status of some of Canada's more threatened animals. Some, like the caribou, are still abundant; some, like the northern kit fox, are now reduced to a few, isolated individuals. We also include information on the status of Canada's air, land and waters and on the efforts by governments and by private organizations to reverse the pollution that has occurred and to prevent that which is threatened.

M. E. Newman, Woodfin Camp & Assoc.



A Few Long and Short Range Words about Water

Canada has three hundred thousand square miles of inland water including its share of the Great Lakes. Other lakes are great both by name and by definition—Great Bear and Great Slave — and one, Winnipeg,



L. Sumner, FWS

would be considered a great lake anyplace else in the world. Canada has two huge bodies of salt water — the Gulf of St. Lawrence and Hudson Bay — which, with the addition of a couple of land bridges, could properly be called inland seas. It has, in addition, its frozen reserve, the ice of the Arctic.

This large supply has caused some to conclude that neither Canada nor the world will ever suffer from a final lack of potable water. It has even been suggested that man's final problem may be one of surplus rather than shortage — 87.3 per cent of the earth's 8 million cubic miles of fresh water is frozen. There is a school of thought which believes that increasing industrialization could heat the atmosphere and melt the ice. If it melted, the sea level would rise two hundred feet and cover most of the world's great cities. The Northwest Territories, which have slight rainfall, would then become an arid waste. Their innumerable lakes are cradled in rock and permafrost; and if the permafrost melted, the water now frozen would drain deep into the earth. The immediate

concern, however, is not with dangerous variations in the water supply but with its pollution by man.

Water is polluted when something is added that interferes with its use or enjoyment. Even heat can

pollute — brook trout cannot live in water over 21.1°C (70°F). Chemicals and algae can give water a taste that makes it undrinkable; and bacteria, chemicals and minerals can make it a direct danger to health.

Canada's old Fisheries Act and more recent laws and amendments give the federal government power to prevent or minimize pollution. One result is the chlor-alkali industry's reduction of mercury discharges by 98 per cent, but much control work remains. The Canada Water Act provides for the control of phosphates in detergents, and the Canada Shipping Act limits the discharge of waste by vessels in Canadian waters.

The Environmental Contaminants Act is the broadest and most recent effort at control. Passed December 2, 1975, it is designed to prevent dangerous substances from entering the air and the soil as well as the waters. Companies importing, handling or using dangerous substances must report the toxicity of the substance, the amount involved and how much is dispersed in particular places. Persons or companies violating the act may be fined as much as \$100,000.

A Discouraging Report on a Great Lake

Lake Ontario contains at least forty long-lasting, toxic chemicals — including industrial wastes and pesticides which threaten humans, fish and birds. The Great Lakes Water Quality Board has also listed ten inorganic substances found in the lake, including nickel, copper, iron, chromium, arsenic, cadmium and mercury. The board recommended immediate and intensive studies to determine how dangerous each toxic substance is and how each can be controlled. One poisoned colony of herring gulls on Lake Ontario failed to produce a single chick in a recent spring because of birth abnormalities, infertile eggs and abnormal parental behaviour.

MERCURY In the past, pulp and paper mills used mercury to control the growth of slimes, but they stopped using it in 1969-1970. In the chlor-alkali industry, a mercury cell process was once used extensively to produce chlorine; but since 1970 the amounts of mercury in liquid effluents have been reduced from around 148,000 pounds to around 1,000 pounds per year. In 1972 Environment Canada set the maximum permitted discharge rate at .005 pound of mercury per ton of chlorine produced and required plants to report mercury purchases and discharges. Most recently some chlor-alkali plants have switched from mercury to permeable membrane cells. Unfortunately past mercury

THE WHALES — BLUE, HUMPBACK, RIGHT, GREY — are all protected by the International Whaling Commission. The British, the Norwegians and the Dutch stopped commercial whaling first; the United States followed in 1971, and Canada in 1972. Today Japan and the USSR take over 85 per cent of the annual catch.



P. Beamish

THE RIGHT WHALE, about sixty feet long with a large wartlike lump on its snout, was the first whale hunted — its name derives from the hunter's joyful shout, "that's the right one." It was almost wiped out during the eighteenth and nineteenth centuries. It now has full protection, but its recovery rate is very slow and its numbers few.

THE BLUE WHALE is the largest animal on earth (up to one hundred feet and weighing up to 145 tons). Its heart weighs as much as a thousand pounds, and its brain can weigh as much as twenty. Its arteries are as broad as fire hoses and are protected from the cold by blubber two feet thick. Once abundant around the world, it now numbers between three thousand and six thousand.

THE HUMPBACK, short (fifty feet), has never recovered from the hunting excesses of the late nineteenth century and now numbers between seven thousand and eight thousand.

THE GREY WHALE, about fifty feet long, was almost exterminated by whalers in the nineteenth century. It is now fully protected; and, it is pleasant to report, it has made an impressive comeback and now numbers about seventeen thousand.

In addition to the whales which are protected fully, quotas have been set to protect other species. The International Whaling Commission agreed last June to set the permissible total for 1977 at 28,050, a reduction of 4,528 from the quota last year. The quotas for sperm, fin, sei and brydes whales were reduced, and first quotas were set on sei and sperm in the North Atlantic.

pollution remains a continuing problem. It takes decades to eliminate the chemical from a river system by natural processes.

RADON Last year radon gas, which can cause lung cancer, was found in land-fill and building materials in Port Hope, Ontario. It probably came from radium disposed of by Eldorado Nuclear Ltd. twenty to twenty-five years ago. The Atomic Energy Control Board reported about seventy locations with above-normal levels of the gas.

PCBs Polychlorinated biphenyls, which are carcinogenic, have been used for over forty years in hydraulic fluids, printing inks, copying paper, paints and plasticizers and as insulating oils and dielectric fluid in electrical transformers and capacitors. PCB control regulations, the first issued under Canada's new Environmental Contaminants Act, will take effect on January 1, 1978. They will

prohibit their nonelectrical use and their release through effluents, air emissions or solid waste disposal.

Salty Solution

Great Lakes Power Company's Number 2 kraft mill in Thunder Bay, Ontario, has installed the Rapson-Reeve closed-cycle system to eliminate chlorine discharges. The system replaces much of the chlorine in the bleaching process with chlorine dioxide and removes the remainder by combining it with sodium to form ordinary table salt. The salt is then used to manufacture more bleaching chemical.

Environment Canada gave Great Lakes a \$1,158,000 Development and Demonstration of Pollution Abatement Technology (DPAT) grant. Great Lakes will make the results of its testing experiences available to other Canadian companies.

Dirty Places

Man has been polluting the air since at least the fourteenth century, when coal was first used as a source of heat. In recent decades he has done so with increased intensity. A number of Canadian laws are designed to deal directly with this problem.

Motor vehicles are responsible for about 60 per cent of urban air pollution. The 1971 Motor Vehicle Safety Act sets emission standards for motor vehicles. An auto manufacturer violating them may be fined as much as \$200,000.

The 1971 Clean Air Act attacked the broader problem and set up a network of 150 stations to measure five major pollutants in forty-eight cities across Canada. The lowest levels are rated "desirable." Levels that represent presently attainable degrees of purity are rated "acceptable," and those which indicate a need for prompt abatement are termed "maximum tolerable." (Tolerable levels have been proposed but not yet formally approved.) Acceptable levels are usually far below tolerable ones. For example the maximum tolerable level for particulates suspended in air is four

hundred micrograms per cubic metre over a twenty-four-hour period, but the "maximum annual acceptable level" is only seventy micrograms.

The 1975 survey showed a number of testing places with particulate averages disconcertingly high. The station at Duncan and Décarie in Montreal had the highest (136 micrograms). Calgary's 7th Avenue and 2nd Street, S.E., station scored 125. Lethbridge, Alberta, had the lowest score, 37 micrograms, and the police station in Victoria had 44.

Sulphur dioxide pollution is caused by the burning of fossil fuels or industrial processes. Its twenty-four-hour maximum acceptable average level is eleven parts per hundred million compared with a maximum one-time-only US level of fourteen.* Its maximum annual acceptable level is two parts. The maximum tolerable level, at which the pollution would be critically dangerous, is thirty-

*The US maximum levels are legally enforceable; the Canadian federal levels are not — they are goals to be pursued. Provinces may, however, set them, or others, as legal levels.

THE ARCTIC FOX is usually abundant. It has short legs, a round head, a blunt nose and a forward manner. Its valuable winter pelt, most frequently white, can also be blue; and some scientists believe the blues and the whites are really separate races. Arctic foxes, among the most hunted of animals, are also great hunters. (They can smell the nests of lemmings under the snows.) They are great thieves as well and will steal anything, edible or not, which they can carry away from a camp. Their numbers change dramatically, peaking every three to five years and reflecting the rise and fall of the lemming population. They live in the same dens — in sandy soils in river banks or hillocks or occasionally among rocks — for generations. In 1971-1972 the pelts of 33,655 white foxes were sold at an average price of \$11.33 each.

L. Rhodes, *Animals Animals*



one parts per hundred million. The highest average level in 1975, 3.6 parts, was found at 1212 Drummond in Montreal. The lowest were low indeed — no sulphur dioxide was reported at stations in Saskatoon, Regina, Moose Jaw, Edmonton and Calgary.

Carbon monoxide is introduced into the air by the incomplete combustion of carbon-containing fuels — notably from auto exhausts. The maximum acceptable average is thirteen parts per million over an eight-hour period (the US maximum is a single reading of nine parts per million, which may not be exceeded more than once a year). The high annual average was found at 471 University, Windsor, Ontario (4.8 parts per million). The low was at the Saskatoon, Saskatchewan, City Library (0.7 parts per million).

Oxidants or ozone pollutants occur when hydrocarbons (such as auto exhaust fumes) are exposed to sunlight in the presence of nitrogen oxides. The proposed maximum tolerable level is fifteen parts per hundred million over one hour. The maximum average annual acceptable level is 1.5 parts. The high average for oxidants was registered at 67 College in Toronto (2.4 parts per hundred million); and the lowest, in Winnipeg and at Duncan and Décarie in Montreal (both one part).

Nitrogen dioxide is caused by high temperature combustion, such as that which occurs in auto engines. The proposed maximum tolerable twenty-four-hour level is sixteen parts per hundred million. The maximum acceptable annual average is 5.5 parts. The initial testing for nitrogen dioxide was at four stations in 1975. The highest was at 109th Street and 98th Avenue in Edmonton (4.8 parts per hundred million). The low (2.1 parts) was at 1125 Ontario in Montreal.



F. W. Lahrman

THE GREATER PRAIRIE CHICKEN is now found predictably only on Manitoulin Island in Ontario, although sightings have been made in Saskatchewan. The conversion of grassland to farmland destroyed its habitat. Hybridization with the sharp-tailed grouse may be so extensive that the pure species no longer exists in Canada.

ARSENIC A study released in January by the National Indian Brotherhood, the United Steelworkers of America and the University of Toronto indicated that waste from two gold mines in Yellowknife, Northwest Territories, contained dangerous amounts of arsenic. The report said arsenic was found in the hair of mine workers and Indian children in the area. An earlier government report had concluded that there is no health danger, though arsenic absorbed over a period of time can cause respiratory problems, nervous disorders, cancer and death.

L. C. Goldman, FWS



THE WOOD BISON is fully protected but close to extinction. It is larger, darker and woolier than the bison of the plains, and once there were tens-of-thousands roaming across Alberta to the slopes of the Rockies. Hunters and the conversion of grassland to farms reduced the number to about three hundred by the late nineteenth century. In 1893 the remnant was given official protection, and the population climbed until it reached some two thousand by 1922. The herd was then hit by a sequence of diseases, and the remaining animals began mating with the bison of the plains. Today no more than three hundred of the pure strain survive, many in the isolation of Elk Island National Park in Alberta. The uncertain fate of the wood bison illustrates the difficulty of preserving a species once its natural habitat has been seriously altered.

THE WHOOPING CRANE is fully protected; it has been on the edge of extinction for decades. In 1850 there were perhaps fifteen hundred birds. Habitat destruction and over-hunting contributed to a swift decline, and by 1941 there were only fifteen birds remaining. Since then, extraordinary efforts have brought the number to about seventy, of which fifty are in a wild state, migrating between Canada and Texas. The others are in a captive breeding program in Patuxent, Maryland.



F. W. Lahrman

Belugas, Birds and Mr. Justice Berger

The sometimes subtle conflict between the well being of animals and mankind's plans, ambitions and expanding interests has been underscored by testimony before the Berger Commission.

The commission, headed by Justice Thomas Berger, conducted hearings for almost two years to determine the impact of gas or oil pipelines on the peoples and animals of the Mackenzie Valley. Justice Berger said the commission considered "the whole future of the north" and concluded that "Canada is the guardian" of beluga whales, caribou, moose, polar bears, grizzlies, foxes and Arctic birds.

At public hearings the commission heard facts about the animals of the north, including these:

- All beluga, or white whales, in the Beaufort Sea

O. J. Murie. FWS



THE NORTHERN KIT FOX is almost extinct. At one time it thrived in Saskatchewan, Alberta and Manitoba; but farms replaced grasslands, and farmers killed it as a pest. Perhaps there are still a few in Saskatchewan's Cypress Hills.

(about four thousand) calve each summer in the warmer waters of the Mackenzie River Delta. Dr. D. F. Sergeant of Canada's Environment department said oil and gas activities in the delta could so disturb the whales that they would be unable to reproduce, causing the herd to die out.

- Nearly half of the birds breeding in Canada meet in the Mackenzie Valley — including such rare species as the peregrine falcon, golden eagle, Eskimo curlew and trumpeter swan.

Justice Berger's recommendations are expected soon.

Caribou

THE CARIBOU run across the barren ground in enormous herds (the largest has some 240,000 members), and as they run their tendons snap, making a sharp clicking sound which can be heard for miles. They are remarkable animals. They survive the bitterest cold, howling winds, scant food, clouds of summer insects, Inuit hunters and swarms of scientists. There are perhaps four hundred thousand of them now in thirteen major herds. The largest, the Arctic herd, ranges over 140,000 square miles. It was once assumed that the number of caribou had declined drastically. Some scientists now suspect that though the number fluctuates, the general level has been much the same for centuries. Early observers who saw valleys full of moving caribou concluded that hundreds of other valleys were filled too; but this was probably never true. Each herd was surrounded by thousands of empty miles.

In a 1972 study of the Kaminurial Herd for the Canadian Wildlife Service, Gerald Parker concluded that "the caribou has survived because it has evolved marvelously to fit its environment. They seem to seek out the cold — the Porcupine Herd of the Yukon winters in the coldest spot in North America, Ogilvie Range, where the temper-



J. M. Greany, FWS

ature often drops to 80 degrees below and where it may remain at 50 to 60 degrees below for a month." They can do this because their bodies maintain a high temperature, 39.4°C (103°F). They are insulated from the cold both by fur and by the curious fact that their legs and hooves maintain a much lower temperature, down to 10°C (50°F). They reproduce easily. The calf is born within minutes; it can stand and walk almost immediately; and in three days it can run as fast as its mother. Infant mortality is high — up to 40 per cent — and quite clearly the fittest survive.

The barren ground caribou eat whatever is available. They migrate most of the year, using centuries-old trails, some worn two feet deep. They eat sedges, grasses, willow shoots, leaves, dwarf birches, horsetails, mushrooms and lichens. Lichens are the food essential — they grow on rock and take their sustenance from the air.

At present, conservationists are concerned with the possible effects on the caribou of gas and oil pipelines and the increasing presence of man. The first problem involves the caribou's willingness to cross over or under pipelines while migrating. When a two-mile simulated pipeline was constructed across migration paths, out of 5,599 animals approaching the pipe, only 994 crossed over on gravel ramps. Some 300 used underpasses, about 2,500 went around the pipe, and some 2,000 turned back. The test results are suggestive, but they do not permit positive conclusions.

Beavers

THE BEAVER was — ten thousand years ago — as big as a bear. Now a large one weighs ninety pounds. It was Canada's first exploited natural resource and became, in time, its national emblem.

Beavers move gracefully in water and are as fast below water — two to three miles per hour

THE BLACK-TAILED PRAIRIE DOG — a yellowish-brown rodent, closely related to the ground squirrel — is now found only in a narrow strip of dry plains, between southern Saskatchewan and central Texas. It was once abundant, and the change from grassland to farms was to its apparent advantage, since it eliminated competitors and natural enemies. The prairie dog population exploded, making it a most conspicuous agricultural pest. Massive poisoning and trapping campaigns were arranged.



F. W. Lahrman

L. Goldman, FWS



THE BLACK-FOOTED FERRET may be the rarest mammal in North America. Once it lived on the grasslands and preyed on the prairie dog. The destruction of its habitat and the extermination of its prey contributed to its marked decline. It is considered extinct in Alberta and extremely rare in Saskatchewan, where a few individuals may still remain in remote areas.



H. Gritscher, *Animals Animals*

— as above. Their most remarkable achievements are in engineering. The first feature of a new colony is the dam. Sticks are laid parallel in the narrow part of a slow-moving stream, then plastered with stones, roots and mud. The dam grows row on row until it is perhaps fifty yards long and six feet high. It forms a pond six to ten feet deep, enough to permit swimming under winter ice. Water spills over only at the centre. It is repaired frequently, primarily by the male. The lodge, in the middle of the pond or on the bank — six to nine feet high, ten to twenty feet in diameter and constructed on a base of sunken poles — may be occupied for many years. The centre chamber has a sloping floor of dry, shredded willow bark. A family usually has ten to twelve members — the adult pair, kits and yearlings of the previous year.

Heavy indiscriminate trapping had almost wiped the beaver out by 1930, but conservation management by northern Ontario Indians soon restored the population to abundance. They are now found all over Canada, south of the Arctic treeline, and are naturally absent only on Anticosti and the Queen Charlotte Islands.

THE TIMBER RATTLESNAKE *was once found in southern Ontario; it is now believed extinct in Canada. Its habit of congregating at winter den areas in spring and fall made it extremely vulnerable to slaughter. It is protected by the Ontario Endangered Species Act.*

Z. Leszczynski, *Animals Animals*



S. Grossman, *Woodfin Camp & Assoc.*

THE EASTERN PEREGRINE FALCON, *often called the duck hawk, has been almost wiped out by toxic pesticides which cause sterility. Formerly the falcon flourished from Mexico to Labrador and in every province and territory of Canada. It is now believed extinct through most of its former range. Fortunately, captive breeding programs are in operation, and some birds are being released into parts of the former range.*

A Few, Bold Words about Harp Seals

The harp seal flourishes as a long-lived species off Canada's east coast. Although it is extensively (and conspicuously) hunted each year, its numbers appear to be increasing. Canada, accepting the recommendations of the International Commission for the Northwest Atlantic Fisheries has set a total allowable catch for 1977 of 170,000. This will not reduce herd numbers or endanger the species. It will prevent overexpansion, which could upset the present marine ecosystem, and permit the herd to grow, slowly, from about 1.2 million adults to 1.6 million.

The harvested seals are used for oil and food as well as fur. Seal flippers bring two dollars each in retail markets, and canneries buy over three hundred thousand pounds of seal meat annually.

The traditional harvesting method for both Northwest Atlantic seals and those taken under US government supervision on the Pribilof Islands off Alaska is clubbing. In recent years this method

has been criticized, as has been the taking of seals itself. Other methods have been considered — gunshot, drugs, carbon dioxide poisoning and concussion bolts — and each has been found to be less humane. The blow with a hardwood bat kills the seal outright or renders it irreversibly unconscious.

Most Canadian sealing vessels are captained and manned by Newfoundland fishermen. The average income earned by each sealer during the harvesting month is around \$2,300, a sum which may provide 40 per cent or more of a sealer's annual family income.

The Problem at Martinique Beach

Some years ago the government of Nova Scotia laid a gravel road half a mile out on the dunes of Martinique Beach. Officials added parking lots,

change houses and picnic tables. The beach stretches for over a mile, across the entrance of Musquodoboit Harbour and contains a game sanctuary used by thousands of migrating Canada geese and a variety of other waterfowl.

Hunters soon began to drive beyond the road to launch their boats, and other people drove dune buggies across the sands. According to *Nature Canada*, the motorized human presence has hastened the rate of natural erosion by hundreds, perhaps thousands of years. *Nature Canada* has reported a breakthrough by the sea at the far end of the beach and concluded that several more breaks are imminent. The Nova Scotia Resources Council has recommended that the existing road be closed and that vehicle-proof barriers be erected to prevent dune buggy riding. The Nova Scotia Wildlife Federation, on the other hand, has recommended that the existing road be extended through the bird sanctuary and that a full-time warden be hired to make sure that the motorized visitors are confined to this road.

Drilling in the Beaufort Sea

In 1973 the Canadian government gave "approval in principle" to exploratory drilling for oil in the Beaufort Sea on condition that a comprehensive study of possible consequences be made. The study stated that extensive drilling operations would have substantial environmental and sociological impacts, whether or not a major polluting incident occurred. It concluded, however, that drilling of two exploratory holes would not produce a sufficiently large increase in activity to have a major impact unless an oil blowout occurred.

The Canadian Cabinet balanced the study against the need to determine Canada's potential resources and gave permission to drill exploratory wells. Drillers were required to maintain elaborate technical backup equipment and to stop a full month before the end of the 1976 operating season. The incident most feared — though not the most probable — was a blowout, which would spout oil until the well was exhausted or until a relief well was drilled. No blowouts occurred during the six-week 1976 season.

Dr. R. W. Stewart, of Environment Canada, was the chairman of the committee conducting the study. The excerpts below are from an interview with him in *Contact**

*Volume One, No. 1, October/November 1976, pp. 5-6, published by Environment Canada.

Q. What is the chance of a blowout?

A. There is no objective way of ascertaining the probability. . . . We used existing information to judge that the probability was somewhere between 1 in 1,000 and 1 in 10,000. Doug Pimlott of COPE [the Committee for Original Peoples Entitlement] puts the probability between 1 in 200 and 1 in 500 and John Hnatiuk of Gulf Oil uses a figure of 1 in 20,000.

Q. What effects would a blowout have on native peoples?

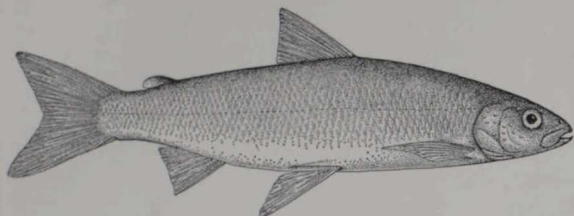
A. It is probable that the major effect would be on their attitudes. It would affect their view of the industry and of government. The mess that would be produced would affect their view of the area in which they live. The economic effect would probably be fairly small.

Q. What is the capability to control a blowout and clean up oil?

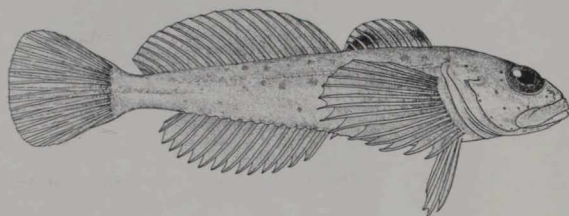
A. There is as yet no known way of controlling a blowout which does not seal itself, except by drilling a relief well. The problems of drilling a relief well are . . . about the same in difficulty as those of drilling a well in the first place. . . . The difficulty with the Beaufort Sea is that one cannot be sure that the required time will be available. . . .

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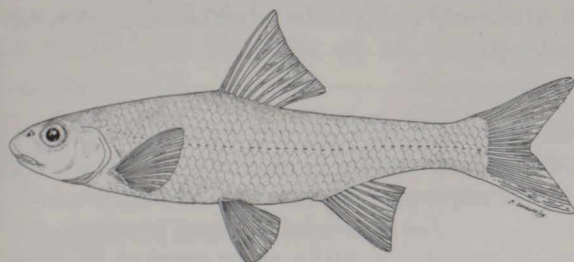
ENDANGERED FRESHWATER FISH



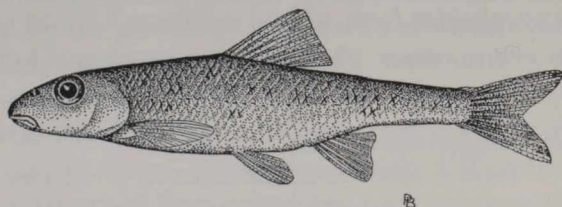
THE ATLANTIC WHITEFISH was abundant in the Millisigate Lake and Tusket River systems of southern Nova Scotia until the construction of an unsupervised fish ladder near a hydro-electric dam exposed the Tusket River fish to dip netting by poachers. The fish is currently protected by Nova Scotia law.



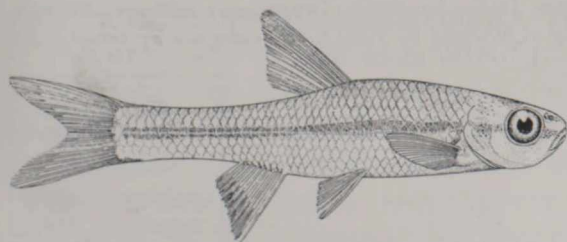
THE SHORthead SCULPIN occurs in Canada only in the cold water riffles of the Flathead River in southeastern British Columbia. Its extremely restricted habitat makes it very vulnerable to sudden changes of environment.



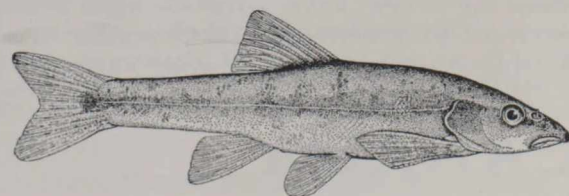
THE SILVER CHUB lived in Lake Erie and the Red and Assiniboine river systems of Manitoba; but pollution and the loss of its major food, the mayfly nymphs of a particular genus, brought about its sharp decline. The last one taken in Canada was from Lake Erie more than fifteen years ago.



THE GRAVEL CHUB of Canada was an isolated population in the Thames River in Ontario. Its decline is attributed to the siltation of its preferred gravel-bottomed streams. Specimens have not been recorded in Canada for twenty years.



THE PUGNOSE MINNOW was known to exist in the Detroit, Thames and North Sydenham rivers of Ontario; but it was not able to adjust to the increasing turbidity of these waters.



THE BANFF LONGNOSE DACE is restricted to Cave and Basin hot springs in Banff National Park, Alberta. Its existence is threatened by the introduction of various species of more competitive, tropical aquarium fish.

THE AURORA BROOK TROUT was only reported in three lakes in Ontario, but hybridization with other trout has, apparently, wiped it out as a pure species.

THE LONGJAW CISCO was abundant in Lakes Huron and Michigan and present in Lake Erie. It was subjected to intense commercial fishing until the 1950s. It has since continued to decline because of water pollution and the presence of its natural enemy, the sea lamprey.

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Atlantic Whitefish, Gravel Chub, Longnose Dace reproduced by permission of the Minister of Supply & Services Canada from *Freshwater Fishes of Canada*, Bulletin 184, Fisheries Research Board of Canada, Ottawa 1973. Shorthead Sculpin, Silver Chub, Pugnose Minnow, National Museum of Natural Sciences, Museums Canada.



S. Grossman, Woodfin Camp & Assoc.

THE VANCOUVER ISLAND MARMOT is so near extinction that we could find no pictures of it. It closely resembles its cousin, the hoary marmot, pictured here. Found only on the rocky mountainsides of western Vancouver Island, it is extremely vulnerable to sudden changes in its environment. There are fewer than one hundred left.

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If there is open water, the situation is not very different from that which one would find in other offshore drilling situations, except that in the Arctic there is greater probability of finding calm seas than, for example, in the Gulf of Mexico or the North Sea. . . . If there is firm ice cover, not

moving much and from which one can work, we learned from studies in the Beaufort Sea Project that a very large proportion of oil may be dealt with. . . . The particularly messy situation, for which we have virtually no answers at all right now, is that of moving, badly fractured ice with many open regions.

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