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Study G-I-I

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Annual Performance Report for

INVENTORY AND CATALOGING OF  
ARCTIC AREA WATERS

by

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RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project No.: F-9-12

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-I Job Title: Inventory and Cataloging of Arctic Area Waters

Period Covered: July 1, 1979 to June 30, 1980

ABSTRACT

Sport fishing along the North Slope haul road was monitored during the open water season of 1979. Angler pressure was light, but was concentrated at a few highly productive locations. Arctic grayling, Thymallus arcticus (Pallas), are the most widespread and frequently captured species, followed by lake trout, Salvelinus namaycush (Walbaum), and Arctic char, Salvelinus alpinus (Linnaeus). A limited creel census showed a catch per unit effort of 2.8 fish per hour for all locations and species combined.

Arctic char counts were conducted in the Ivishak River drainage and data are presented on the location of a recently observed fall concentration of Arctic char in the Anaktuvuk River.

Information is presented on the species captured and physical characteristics of winter sampling sites in the Colville River.

Eighteen lakes along the central North Slope were surveyed and data are presented on water chemistry, physical characteristics, and species present.

BACKGROUND

The Alaska Department of Fish and Game, Division of Sport Fish, has conducted fisheries investigations on the North Slope since 1968. Emphasis of this work has varied between drainages and species in an effort to meet the changing patterns of use and activities within this region. Construction of the Trans-Alaska oil pipeline and North Slope haul road has tied the North Slope into the existing State highway system. Petroleum exploration and support facilities have also improved fuel distribution and navigation aids for light aircraft, which have all combined to improve access and increase the demand for sport fishing, as well as other recreational pursuits, in this remote region of the State.

The report findings for this study are presented in four sections, each treated as a separate phase of the project; haul road creel census, Arctic char aerial counts, winter sampling in the Colville River, and lake surveys. Table 1 lists the species of fish present on the North Slope and along the haul road north of the Yukon River.

## RECOMMENDATIONS

### Research

1. Lake and stream surveys should continue on North Slope waters with emphasis on the haul road corridor and the National Petroleum Reserve - Alaska.
2. Assessment of overwintering fish habitats in North Slope waters should continue with emphasis on spring-fed systems and the winter biology of Arctic char.
3. Fall populations of Arctic char in the Sagavanirktok and Anaktuvuk Rivers should be enumerated.

### Management

1. Assessment of the fishing potential of area waters adjacent to the North Slope haul road should continue.
2. Sport fishing pressure on area waters should be monitored.

## OBJECTIVES

1. To conduct fall aerial surveys of selected waters within the Arctic Wildlife Range and the Colville River drainage to determine the locations and estimate the abundance of prespawning fish concentrations, with emphasis on anadromous species.
2. To determine the availability and use of overwintering habitat in selected waters within the North Slope haul road corridor, with emphasis on the Sagavanirktok River drainage and the Colville River drainage.
3. To provide recommendations for the management of sport fish resources of the job area and to direct the course of future studies.

## TECHNIQUES USED

### Lake and Stream Surveys

A float-equipped Cessna 185 aircraft was used to transport field crews and equipment to remote lakes within the study area. Waters adjacent to the haul road were surveyed using a Grumman sport canoe which was carried to the lake from the nearest road access.

Tabel 1. Fish species found along the haul road and central North Slope.

| Common Name           | Scientific Name and Author                | Abbreviation |
|-----------------------|---|--------------|
| Arctic char           | <u>Salvelinus alpinus</u> (Linnaeus)      | AC           |
| Arctic cisco          | <u>Coregonus autumnalis</u> (Pallas)      | ACI          |
| Arctic grayling       | <u>Thymallus arcticus</u> (Pallas)        | GR           |
| Broad whitefish       | <u>Coregonus nasus</u> (Pallas)           | BWF          |
| Burbot                | <u>Lota lota</u> (Linnaeus)               | BB           |
| Chum salmon           | <u>Oncorhynchus keta</u> (Walbaum)        | CS           |
| Humpback whitefish    | <u>Coregonus pidschian</u> (Gmelin)       | HWF          |
| King salmon           | <u>Oncorhynchus tshawytscha</u> (Walbaum) | KS           |
| Lake trout            | <u>Salvelinus namaycush</u> (Walbaum)     | LT           |
| Least cisco           | <u>Coregonus sardinella</u> Valenciennes  | LCI          |
| Longnose sucker       | <u>Catostomus catostomus</u> Forster      | LNS          |
| Ninespine stickleback | <u>Pungitius pungitius</u> (Linnaeus)     | NSB          |
| Northern pike         | <u>Esox lucius</u> Linnaeus               | NP           |
| Pink salmon           | <u>Oncorhynchus gorbuscha</u> (Walbaum)   | PS           |
| Round whitefish       | <u>Prosopium cylindraceum</u> (Pallas)    | RWF          |
| Sheefish              | <u>Stenodus leucichthys</u> (Guldenstadt) | SF           |
| Slimy sculpin         | <u>Cottus cognatus</u> Richardson         | SSC          |

Physiographic data, as well as longitude and latitude, were calculated from 1956 U.S. Geological Survey (USGS) 1:250,000 maps and sectional aeronautical charts.

Water chemistry data were recorded using a Hach AL-36B field test kit. Water depths were recorded with a Lowrance fathometer. A standard 10 in Secchi disc was used to determine water clarity.

Multifilament graduated mesh sinking or floating gill nets, measuring 125 x 6 ft and consisting of five 25-ft panels of 1/2 inch through 2 1/2 in bar mesh, were used to capture fish. Other sampling gear included 25 x 4 ft beach seines, 25 x 6 ft x 1/2 inch mesh multifilament gill nets and a Coffelt Model BP III backpack electroshocker. Hook and line sampling was used to capture burbot.

All data were recorded on standard Alaska Department of Fish and Game stream and lake survey forms.

All fish samples were grouped by data and location. Weights were recorded to the nearest gram using a Chatillon spring scale. Fork lengths were measured to the nearest millimeter, and sex and stage of maturity were determined by examining gonads.

A binocular microscope was used to determine ages of Arctic char, lake trout and burbot from otoliths wetted in zylene. All other fish were aged by reading scales. Scales were cleaned and impressed on 20 mil acetate sheets. A Bruning 200 microprojector was used to read scales.

#### Winter Sampling

Deep holes in the Colville River were located in the fall using a fathometer mounted in a riverboat and were marked with surveyors tape, as well as recorded on USGS 1:63,360 maps. Snow machines were then used to transport personnel and equipment to these locations during the sampling periods.

Ice, water and snow depths were measured to the nearest inch. Dissolved oxygen levels were obtained using a Hach AL-36B field test kit and the low range titration procedure.

Holes were drilled through ice using a gasoline-powered portable digger with a 10 in bit. Monofilament graduated mesh sinking gill nets measuring 125 x 6 ft or individual 50 ft and 25 ft panels from these nets were used to capture fish under the ice. Burbot were captured using large baited hooks attached to lines set under the ice.

A "Murphy Stick" was designed for stringing a net line under thick ice in shallow water. The Murphy Stick (Fig.1) consists of a handle constructed from 1 in steel pipe and several variable length 1 in aluminum extensions that are hinged to the handle with a pin. A rubatex sheath provides flotation at the outer end of the extension. A length of rope terminating in a stiff wire "basket" is attached to the extension through a large brass snap hook. The length of extension that is used coincides with the depth of water under the ice. Holes are drilled through the ice at intervals

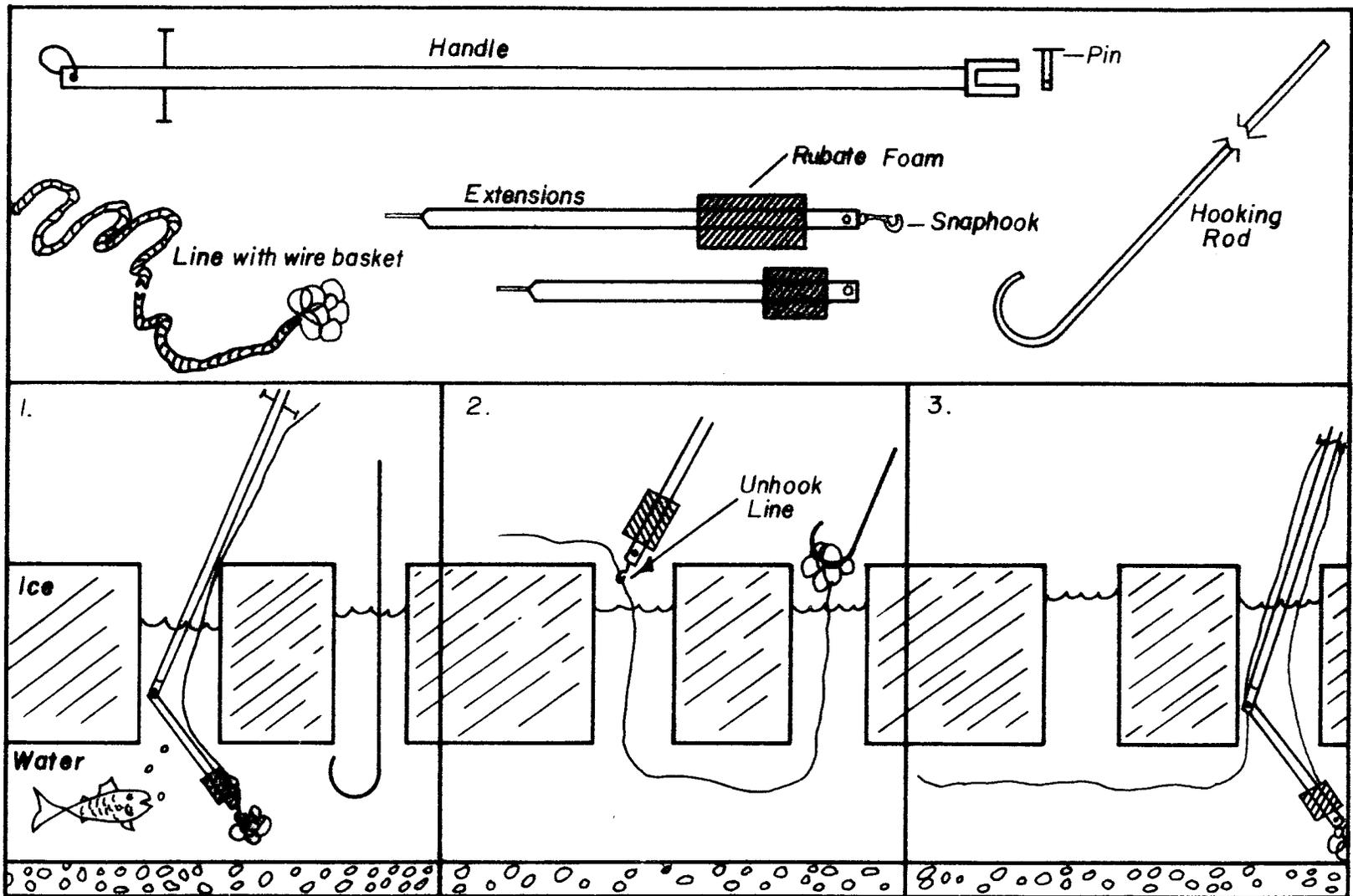


Figure 1. Murphy Stick Components. (1) Insert Murphy Stick and maneuver basket to adjacent hole; (2) hook basket, pull line to surface, remove Murphy Stick and unhook line; (3) rehook line to Murphy Stick at next hole and repeat the procedure.

that equal the length of the extension and the rope is passed from one hole to the next by hooking the wire basket, re-attaching the line to the Murphy Stick and repeating the procedure at the next hole until the length of line under the ice equals the length of net to be set. The net is then attached to the line and pulled under the ice.

## FINDINGS

### North Slope Haul Road Creel Census

The North Slope haul road was built in 1974 by Alyeska Pipeline Service Company to serve construction of the Trans-Alaska Pipeline and was transferred to the State in 1978. In May of 1974, by emergency field announcement, the Alaska Department of Fish and Game closed to sport fishing a strip within 5 miles on each side of the pipeline between the Yukon River and Prudhoe Bay. The closure was enacted because of the unknown impacts of construction camps, and the lack of biological information on affected fish populations. In the spring of 1979, as a result of a proposal initiated by Alyeska Pipeline Service Company, the Board of Fisheries rescinded the haul road closure, opening sport fishing for all species except sheefish and salmon. The State of Alaska controls use of the haul road north of the Yukon River. Use is presently limited to people associated with Alyeska, Prudhoe Bay oil companies and their subcontractors, State employees involved with highway maintenance and public safety, and several other commercial users such as guides and miners. A security check station located just north of the Yukon River bridge ensures that only "qualified" users gain access to the haul road.

#### Stream and Lake Resources:

North of the Yukon River to Atigun Pass the haul road crosses 15 named streams and several lesser tributaries. All waters within this area are part of the Yukon River system and the majority are tributaries of the Koyukuk River. While the Koyukuk rivers support a diverse community of fish including salmon, sheefish, and northern pike, the streams and tributaries accessible by foot from the haul road are limited in sport fishing potential principally to Arctic grayling.

North of Atigun Pass to Prudhoe Bay streams crossed by the haul road are tributaries of the Sagavanirktok, Toolik, and Kuparuk Rivers. From Pump Station 3, north to Prudhoe Bay, the haul road parallels the Sagavanirktok River, and access to the river for sport fishing is available at several locations along this stretch of road. Grayling, lake trout, and Arctic char inhabit the streams north of Atigun Pass and, again, grayling are the most widespread and available species. Anadromous Arctic char run in the Sagavanirktok River in August and September and provide excellent sport fishing when water conditions and timing are appropriate.

Lakes along the haul road vary in sport fishing potential due to differences in size, shape, depth and productivity. More than 30 lakes are available to the sport fisherman within a short distance of the haul road. Some of the lakes are barren, others provide seasonal habitat such as

spawning and feeding areas, and still others support year-around populations of several fish species. Lakes on the south side of the Brooks Range in the upper Koyukuk River valley are inhabited by grayling. The small lakes adjacent to the haul road are used primarily as seasonal habitat for spawning, rearing, and summer feeding. Most of these waters are warm, shallow, and highly productive during the open water season. Olsons and Grayling Lakes and several unnamed waters in the vicinity of Coldfoot and Dietrich camps are typical of the above description.

Lakes north of Atigun Pass, in the upper Itkillik, Kuparuk and Sagavanirktok River drainages, are inhabited year-around by populations of lake trout, Arctic char, grayling, and in some cases burbot and whitefish. These waters are usually deep and cold with gravel bottoms and steep shorelines. Arctic char sampled from these waters rarely exceed 3 pounds in weight, and lake trout captured are usually under 10 pounds. Grayling sizes vary depending on location, but 1 1/2 to 2 pound fish are not uncommon.

There are dozens of small lakes within walking distance of the haul road between Pump Stations 3 and 4 that provide excellent sport fishing for the above species of fish. Galbraith, Toolik, Island and Tea Lakes are among the most popular waters north of Atigun Pass.

The coastal plain lakes north of Pump Station 2 are usually shallow and barren. While some of the larger lakes have small populations of grayling, the majority are too shallow to overwinter fish and lack sufficient inlets or outlets to provide migratory access for seasonal use.

#### Harvest Information:

During the summer of 1979, the Division of Sport Fish interviewed sport fishermen along the haul road; issued regulation booklets; posted summaries of current sport fishing regulations at pump stations, security check points, and several Prudhoe Bay facilities; and engaged in a voluntary creel census program at Pump Stations 3, 4 and 5.

To obtain a perspective of who was fishing along the haul road, 41 fish and game licenses were examined along the highway and 81 were examined in Prudhoe Bay. All of the license holders along the haul road were resident Alaskans and 100% of those sampled had included sport fishing in their fish and game licenses. In Prudhoe Bay, 71% of the license holders were resident Alaskans and 98% of those sampled had included sport fishing in their licenses. Seventy-eight percent of all licenses examined were purchased exclusively for sport fishing.

Sport fishing pressure throughout the haul road corridor in 1978 was light. Table 2 summarizes creel census data obtained through pump stations and roadside interviews. Catch per unit effort along the haul road was better than that reported for other Interior road systems, however the data are somewhat biased because many unsuccessful trips were not reported. The average time spent fishing along the haul road (based on 73 angler trips) was 2.6 hours. The most popular sport fishing locations south of Atigun

Table 2. Results of a limited creel census based on 73 angler interviews obtained along the haul road from June through August, 1979.

| Locations           | Hours Fished | Combined Catch | Catch Per Unit Effort (# fish/hr) | Percent Composition of Catch     |
|---------------------|--------------|----------------|-----------------------------------|----------------------------------|
| South Slope Streams | 82.5         | 251            | 3.0                               | GR: 100%                         |
| South Slope Lakes   | 28.0         | 147            | 5.3                               | GR: 100%                         |
| Sub Total           | 110.5        | 398            | 3.6                               | GR: 100%                         |
| North Slope Streams | 12.5         | 34             | 2.7                               | GR: 80%, AC: 20%                 |
| North Slope Lakes   | 95.5         | 192            | 2.0                               | GR: 64%, LT: 31%, AC: 4%, BB:<1% |
| Sub Total           | 108.0        | 226            | 2.1                               |                                  |
| Combined Totals     | 218.5        | 624            | 2.8                               |                                  |

Pass were Grayling Lake and the Jim River. North of Atigun Pass the most popular locations were Island and Toolik Lakes, and the upper Kuparuk River. There are no commercial or subsistence fisheries within the haul road corridor.

The sport fishing potential along the North Slope haul road is greater than that offered along most other road systems in the State. Multiple road crossings of streams occur only on the Jim River and middle fork of the Koyukuk River; thus most of highway access is only at a single point along a stream. Dozens of smaller lakes provide excellent sport fishing within a few miles hike of the haul road, particularly in the vicinity of Galbraith and Toolik Lakes.

#### Arctic Char Aerial Counts

Aerial counts of Arctic char have been attempted annually in the Sagavanirktok River system since 1971. All of the major tributaries to the Sagavanirktok River determined to be char spawning areas were counted between 1971 and 1975. Since 1976, only the Ivishak and Echooka Rivers have been counted. The Ivishak River contains the largest aggregation of char in the system and is considered an index to overall population levels. Prior to 1977, counts were conducted by helicopter; however, subsequent counts have been made using fixed wing (Piper PA18) aircraft. All of the estimates have been made during the second or third week of September.

Table 3 shows the comparative estimates for char in the Ivishak system between 1971 and 1979. In 1979, the estimate for the Ivishak River was more than twice as high as the annual average for the previous six counts. Based on a limited sampling effort and observations from the air, it appears that the higher count in 1979 is the result of a large increase in the number of small (1 to 3 lb) char in the population.

Spring areas and aufeis fields were located in several North Slope drainages west of the Sagavanirktok River by aerial survey in April of 1979. These areas were revisited in September to determine their use by char as spawning areas. An aggregation of fish which was comprised of spawning and non-spawning Arctic char as well as grayling and round whitefish was observed in the Anaktuvuk River. Char were found in slow moving pools below riffles in velocities of 1 to 2 fps. The maximum water depth was 6 ft and water temperature was 35°F. The "Tuluga" spawning area is located adjacent to Rooftop Ridge on the Anaktuvuk River at R.4E, T.6S and 7S of Umiat Meridian. An aerial estimate of 15,717 char was made on September 23, using a fixed-wing aircraft.

A second concentration of char was located in a spring area of Nanushuk Creek (an eastern tributary to the Anaktuvuk River) at R.6 and 7E; T7S of Umiat Meridian. Nine hundred thirty-four char (mostly small, non-spawning individuals) were counted on September 23.

There were no concentrations of fish observed in the Toolik, Kuparuk, Itkillik, Chandler, or Killik rivers during the fall of 1979.

Table 3. Comparative aerial estimates of Arctic char in Ivishak River System from 1971 through 1979.

| Location   | 1971   | 1972   | 1973   | 1974   | 1975  | 1976  | 1977* | 1978* | 1979   |
|------------|--------|--------|--------|--------|-------|-------|-------|-------|--------|
| Echooka R. | 1,137  | 1,688  | 1,883  | 2,160  | 852   | 2,254 | ...   | ...   | 814    |
| Ivishak R. | 13,958 | 11,937 | 10,009 | 13,140 | 8,643 | 8,570 | ...   | ...   | 24,403 |

\* Poor weather conditions prevented char counts during late September.

## Colville River Winter Sampling

Fisheries investigations on the North Slope during the past decade have concentrated on the biology of fish during the relatively short open water season. Consequently, the location and significance of overwintering areas for fish in northern waters is poorly understood. At the same time, domestic and commercial demands for fresh water, gravel, and other resources that affect aquatic habitats during winter months have been steadily increasing since the advent of petroleum development in the late 1960's. Past fisheries studies during winter months have included aerial surveys or observations during late fall and early spring (Craig and McCart 1974), or have emphasized the delineation of potential overwintering habitat by observing the physical characteristics of water bodies such as ice thickness, water depth, and dissolved oxygen levels, (Aquatic Environments, 1973 and Sloan, 1976). Furniss and Ward (1976), and Jones, (1976) assessed winter water availability along two proposed natural gas pipeline routes in northern Alaska. State and Federal agencies have addressed "instream flows" and water availability in an effort to establish guidelines or criteria for mitigating conflicting winter water uses in northern Alaska (Ott and Tarbox, 1977; and Wilson et al, 1977).

Few studies to date, however, have included a winter sampling program to add perspective to the descriptive habitat accounts. Mann (1975) sampled overwintering fish in the Mackenzie River delta while Kogl and Schell (1975), Bendock (1979) and Craig and Haldorson, (1979) netted sections of the Colville River during winter months. Unfrozen pools under thick ice in the Sagavanirktok River were netted by Alt and Furniss (1976), and Bendock (1977) netted the lower Kuparuk and Sagavanirktok Rivers.

The above studies indicate that overwintering habitats on the North Slope are much more restricted than summer habitats. The majority of streams freeze to the bottom or freeze intermittently, providing unsuitable space, quality of water, or dissolved oxygen levels to support populations of fish. Even the largest streams in Arctic Alaska (Colville and Sagavanirktok Rivers) freeze to the bottom intermittently and cease discharging during late winter months. Four types of habitat have been shown to provide suitable overwintering conditions for various species of North Slope fish. These are: (1) intermittent pools under river ice, (2) brackish river deltas, (3) spring or ground water areas, and (4) deep lakes. Due to their limited size, these areas appear to be vulnerable to extremes in weather conditions and the adverse impacts of human activity.

This report summarizes 2 years of netting in intermittent pools in the middle reaches of the Colville River. Results from summer and fall netting in the same area are reported in Bendock (1979).

### 1978 and 1979 Surveys:

Eight sites were netted under the ice throughout a 52-mile stretch of the Colville River between the Anaktuvuk River and Ninuluk Creek (Fig.2). Gill netting was conducted during March and April of 1978 and 1979. All of the sites represent a single habitat type. Table 4 lists the physical parameters and dissolved oxygen values obtained at each site during the sampling periods. Each of the pools was limited in length and breadth by

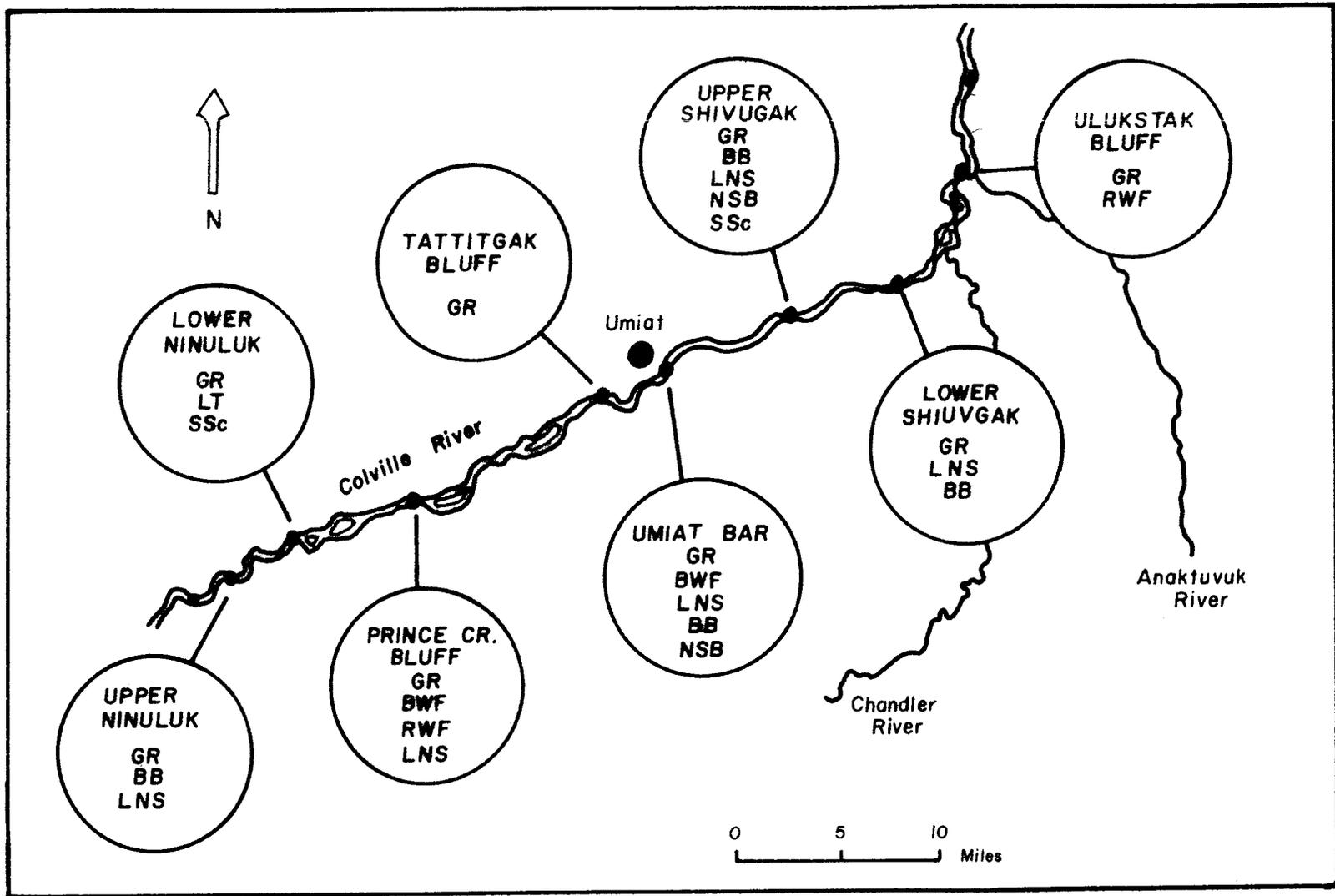


Figure 2. Winter Study area on Colville River showing species captured at each site.

Table 4. Physical characteristics and dissolved oxygen values at each Colville River netting site.

| Location         | Date    | D.O.    | Snow<br>Depth<br>(inches) | Ice<br>Depth<br>(inches) | Water<br>Depth<br>(inches) | Water<br>Temp<br>(°C) | Bottom<br>Material | Species Present   |
|------------------|---------|---------|---------------------------|--------------------------|----------------------------|-----------------------|--------------------|-------------------|
| Uluksrak Bluff   | 4-14-78 | 2.6     | 10                        | 62                       | 112                        | <1                    | Rubble             | GR, RWF           |
| Lower Shivugak   | 4-14-78 | 2.8     | 14                        | 42                       | 48                         | <1                    | Rubble             | No net            |
|                  | 3-11-79 | 1.6     | 3                         | 67                       | 173                        | <1                    | Rubble             | GR, LNS, BB       |
| Upper Shivugak   | 3-21-78 | 1.6     | 18                        | 39                       | 192                        | <1                    | Rubble             | GR, BB, LNS, NSB  |
|                  | 4-13-78 | 2.4     | 16                        | 37                       | 180                        | <1                    | Rubble             | GR, BB, SSc       |
|                  | 3-12-79 | 1.4     | 10                        | 36                       | 132                        | <1                    | Rubble             | GR, BB, LNS       |
| Umiat Bar        | 3-21-78 | 1.4     | 23                        | 36                       | 120                        | <1                    | Gravel             | GR, BWF, LNS, NSB |
|                  | 3-07-79 | 0.8     | 1                         | 55                       | 75                         | <1                    | Gravel             | No net            |
|                  | 4-14-79 | 1.0     | 5                         | 67                       | 99                         | <1                    | Gravel             | LNS, GR           |
| Tattitgak Bluff  | 3-07-79 | 1.0     | 10                        | 39                       | 123                        | <1                    | Sand               | GR                |
|                  | 4-07-79 | 0.6     | 16                        | 44                       | 58                         | <1                    | Sand               | GR                |
| Prince Cr Bluff  | 4-16-78 | 4.6     | 12                        | 48                       | 144                        | <1                    | Rubble             | GR, BWF, RWF, LNS |
|                  | 3-09-79 | 3.2     | 10                        | 48                       | 126                        | <1                    | Rubble             | No net            |
|                  | 4-13-79 | 2.2     | 9                         | 48                       | 104                        | <1                    | Rubble             | No net            |
| Lower Ninuluk    | 4-08-79 | 2.4     | 12                        | 48                       | 96                         | <1                    | Rubble             | GR, LT, SSc       |
| Upper Ninuluk    | 4-09-79 | 1.2     | 4                         | 52                       | 72                         | <1                    | Gravel             | GR, BB, LNS       |
| $\bar{x}$ values | ...     | 1.9     | 10.8                      | 48                       | 115.9                      | <1                    | ...                | ...               |
| Range            | ...     | 0.6-4.6 | 1-23                      | 36-67                    | 48-192                     |                       | ...                | ...               |

grounded ice, and netting was usually conducted in the deepest water available. There was no measurable flow and the water was transparent and odorless. The amount of frozen overflow varied between sites; however, there was no apparent ground water activity as evidenced by aufeis or open leads.

Snow depths were usually shallow and averaged 11 in for the combined sampling period at all sites. Ice thickness at the sampling sites averaged 48 in and ranged from 36 to 67 in. In 1979, there was approximately half as much snow (x 8 in vs. 15.5 in) but an average of 6 in more ice than in 1978. Water depths ranged from 48 to 192 in and averaged 116 in. At all sites, water temperature was less than 1°C.

Bottom material was either rubble, gravel or sand and was determined by observation through the end holes in the ice. Rubble bottoms were characteristic of sites located near high bluffs or cliffs. Gravel bottoms were characteristic of deep holes in the floodplain and a single sandy bottom was noted at a site along a cutbank in the floodplain. No correlation was found between substrate type and the fish species present.

Dissolved oxygen values ranged from 0.6 to 4.6 ppm and averaged 1.9 ppm. Some holes maintained consistently higher levels of D.O. than others over the 2-year period (i.e. Prince Creek Bluff versus Umiat Bar). In those holes for which we have comparable data, dissolved oxygen averaged 2.6 ppm in 1978 and 1.5 ppm in 1979.

#### Capture Effort and Species Present:

A total of 1,164 net hours yielded a catch of 375 fish comprised of six species. An additional two species (ninespine stickleback and slimy sculpin) were found as food items in burbot and the lake trout. Table 5 lists the numbers of species captured during each sampling period in 1978 and 1979.

All locations previously determined to be suitable for netting contained fish. Grayling accounted for 90% of the total catch and were found at all eight sampling sites. Fig. 2 shows the species captured at each of the sites. When locations were netted in consecutive months, the catch per unit effort dropped sharply, which may suggest that the total number of fish overwintering in each hole is low.

The species composition of fish inhabiting the Colville River near Umiat remains the same throughout the year (Bendock, 1979). The predominant fish species captured during open water periods (grayling, broad whitefish, round whitefish, burbot, longnose sucker, ninespine stickleback, and slimy sculpin) were also taken during the 2 years of winter sampling. Humpback whitefish, which migrate upstream past Umiat during the fall, were not captured during the winter netting. The relative abundance of grayling, as evidenced by the catch per unit effort, increased during the winter netting as a result of fish moving out of summer habitats that freeze to the bottom.

All of the principal species except broad whitefish contained food in their stomachs throughout the sampling periods. Mayfly and stonefly larvae

Table 5. Number of species captured by month during 1978 and 1979.

| SPECIES       | 3-78 | 4-78 | 3-79 | 4-79 | total | % of total catch |
|---------------|------|------|------|------|-------|------------------|
| GR            | 155  | 14   | 123  | 45   | 337   | 90%              |
| LNS           | 8    | 5    | 5    | 2    | 20    | 5%               |
| BB            | 2    | 2    | 2    | 2    | 8     | 2%               |
| BWF           | 1    | 6    | 0    | 0    | 7     | 2%               |
| RWF           | 0    | 3    | 0    | 0    | 3     | <1%              |
| LT            | 0    | 0    | 0    | 1    | 1     | <1%              |
| Total         | 166  | 30   | 130  | 50   | 376   | 100%             |
| fish/net hour | 0.65 | 0.08 | 0.77 | 0.12 | 0.32  | ...              |

Figure 3. "Mosquito Lake". Depths are shown in feet.

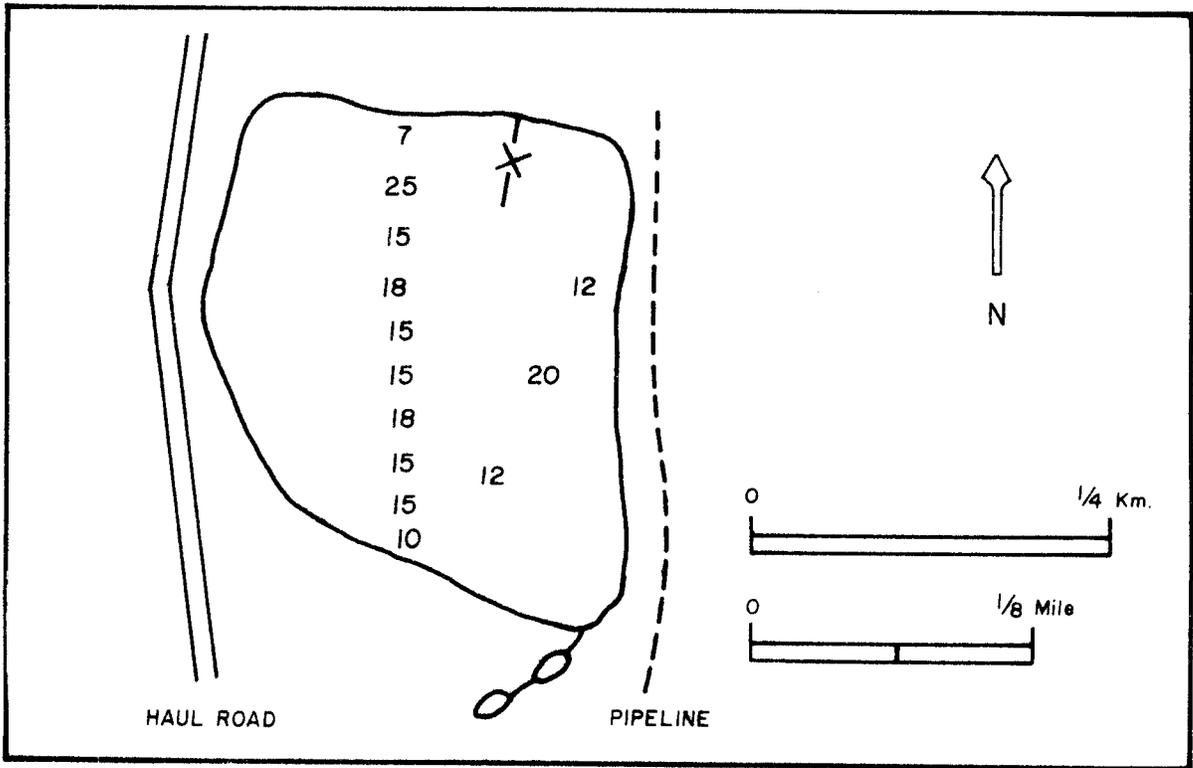
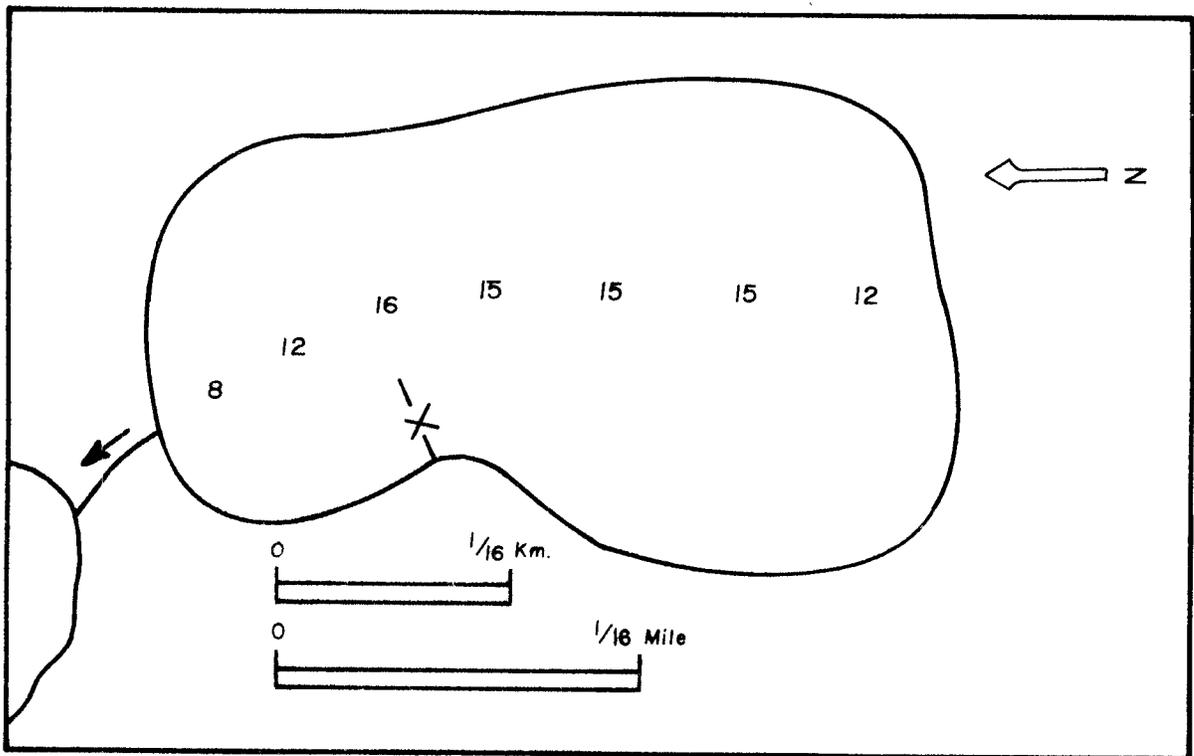


Figure 4. "Small Double Lake". Depths are shown in feet.



predominated as food items in grayling during March and April of both years.

Burbot, which spawn in the main reaches of the Colville River during winter, had completed spawning during both years prior to our March sampling period.

None of the fish captured appear to segregate by size or by species into separate overwintering areas.

### Lake Surveys

Eighteen lakes along the central North Slope were surveyed during the summer of 1979. All of the waters visited, with the exception of Porcupine Lake, are in the vicinity of the North Slope haul road and are representative of the waters available to sport fishermen in that area. Four of the lakes visited were shallow, with intermittent or seasonal outlets, and did not contain fish. The remainder of lakes supported at least one species of fish, with grayling being the most frequently captured. Arctic char was the second most common sport fish species, followed by lake trout and burbot. Round whitefish were found in five of the 14 lakes that contained fish. Only a single species of fish was captured in six of the lakes surveyed.

#### "Mosquito Lake":

Mosquito Lake (Fig. 3), lat. 68°57'N, long. 149°22'W, lies east of, and adjacent to the haul road approximately 1.5 mi north of Pump Station 4. It has a single outlet which drains into the Atigun River only during runoff or periods of high water. Surface elevation is 2,650 ft. The longest dimension of this small lake is approximately 1/4 mi and the maximum depth is 25 ft. The water color is blue-green with a Secchi reading of 15 ft. Water chemistry data on August 14 were: hardness 6 ppm, pH 9, and water temperature 58°F.

A single experimental gill net set overnight yielded a catch of 21 round whitefish ranging from 125 to 380 mm in length and 20 to 760 g in weight.

#### "Small Double Lake":

Small Double Lake (Fig. 4), lat. 68°28'N, long. 149°22'W, is the smaller of two lakes adjacent to, and draining into Galbraith Lake. It lies on the west side of the haul road approximately 2.5 mi north of Pump Station 4. It has tea colored water, a maximum depth of 16 ft and a Secchi reading of 11 ft. Surface elevation is 2,650 ft and the longest dimension of this small lake is less than 1/4 mi. The lake bottom is soft mud or sand and is partially vegetated. There is a single outlet to an adjacent small lake. Water chemistry data on August 14 were: hardness 6 ppm, pH 8, and water temperature 57°F.

A single experimental gill net set overnight yielded a catch of seven grayling which ranged in length from 120 to 270 mm, and two round whitefish that weighed in excess of three pounds each.

Figure 5. "Big Double Lake". Depths are shown in feet.

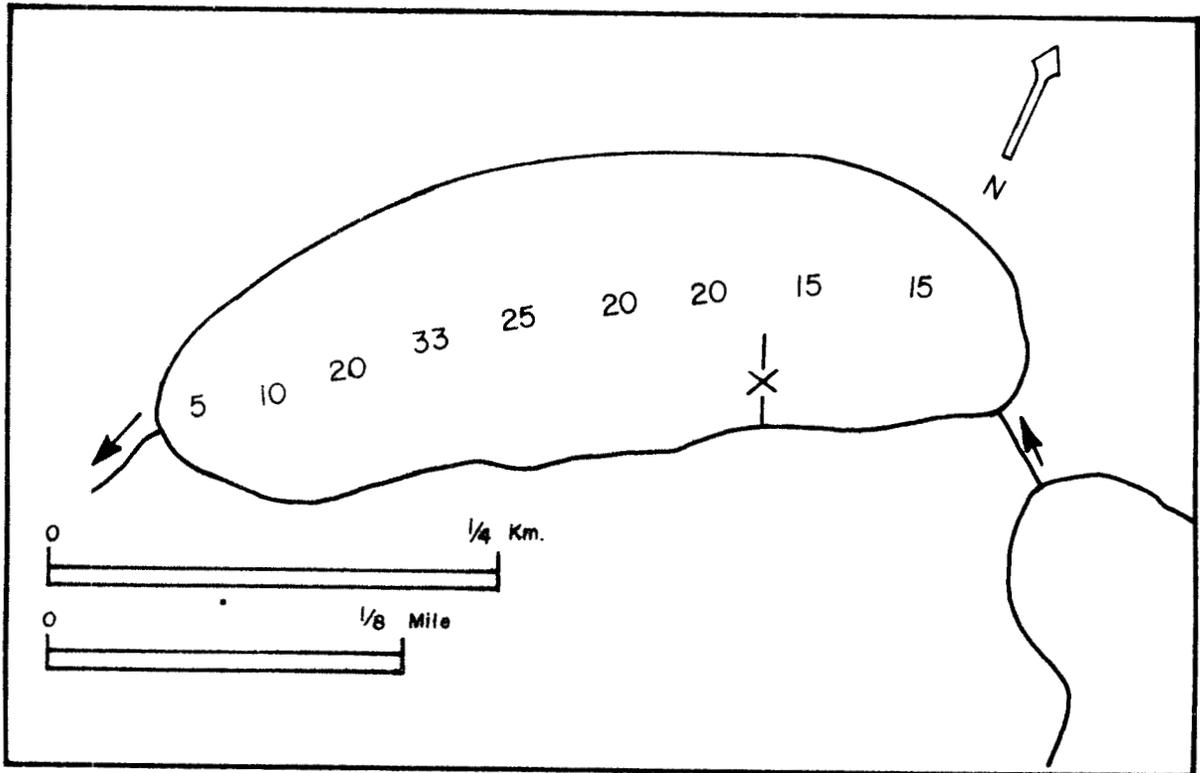
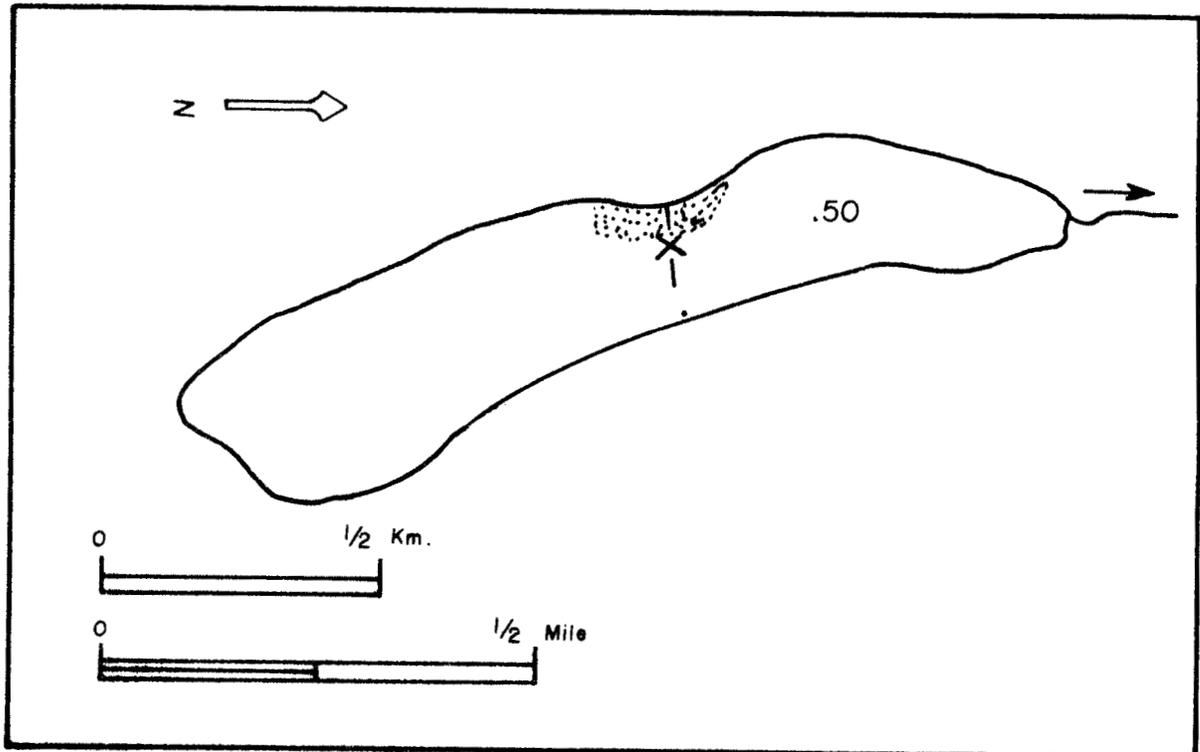


Figure 6. "Lota Lake". Depth is shown in feet.



"Big Double Lake":

Big Double Lake (Fig. 5 ), lat. 68°28'N, long. 149°22'W, is the larger of two small lakes on the west side of the haul road adjacent to Galbraith Lake. It is approximately 2.75 mi north of Pump Station 4 and has a surface elevation of 2,650 ft. There is a single inlet from "Small Double Lake" and a single outlet that flows into a marsh along the east shore of Galbraith Lake. The outlet is choked with vegetation and has a steep gradient. The maximum lake depth is 33 ft, Secchi reading 13 ft, and the water is tea colored. The longest dimension of the lake is 1/4 mi. Water chemistry data on August 14 were: hardness 5 ppm, pH 8.5, and water temperature 58°F.

A single experimental gill net set overnight yielded a catch of 16 round whitefish that ranged from 130 to 342 mm in length. Round whitefish fry were also observed in shallow water along the shoreline.

"Lota Lake":

Lota Lake (Fig. 6), lat. 68°35'N, long. 149°40'W, is a 1 mi long, narrow lake that lies 3.5 mi west of the haul road and approximately 9 road miles north of Pump Station 4. The surface elevation is 2,600 ft. The water color is green, maximum depth 50 ft, and Secchi reading 21 ft. There is no inlet and a single intermittent outlet that flows into Toolik Lake. It has a steep, rocky shoreline and a single shoal area near the center of the lake.

A single experimental gill net set overnight on July 15, yielded a catch of four burbot that ranged in length from 485 to 550 mm.

"Toolik Access Lake":

Toolik Access Lake (Fig. 7), lat. 68°38'N, long. 149°32'W, is a very small lake on the east side of the haul road. It is approximately 13 mi by road north of Pump Station 4, and is opposite the Toolik Lake access road. The surface elevation is 2,500 ft, water is tea colored, maximum depth 18 ft, and Secchi reading is 14 ft. It has a rocky shoreline and sparse aquatic vegetation. There is one inlet and a single outlet that passes through a culvert in the haul road and flows into Toolik Lake. Water chemistry data on August 14 were: hardness 3 ppm, pH 7.5, and water temperature 58°F.

A single experimental gill net set overnight yielded a catch of 18 grayling that ranged in length from 118 to 360 mm. Numerous grayling fry were observed in the outlet stream and angling for grayling was excellent.

"North Itgaknit Lake":

North Itgaknit Lake (Fig. 8 ), lat. 68°42'N, long. 149°38'W, is one branch of a large shallow lake system that lies approximately 4 mi northwest of Toolik Lake. It has a rocky shoreline and uneven bottom with holes up to 60 ft deep. Water color is blue-green and the Secchi reading was 20 ft. The shoreline is irregular and aquatic vegetation is sparse. There is one inlet from Itgaknit Lake and a single outlet that connects two smaller lakes before draining into the Kuparuk River.

Figure 7. "Toolik Access Lake". Depths are shown in feet.

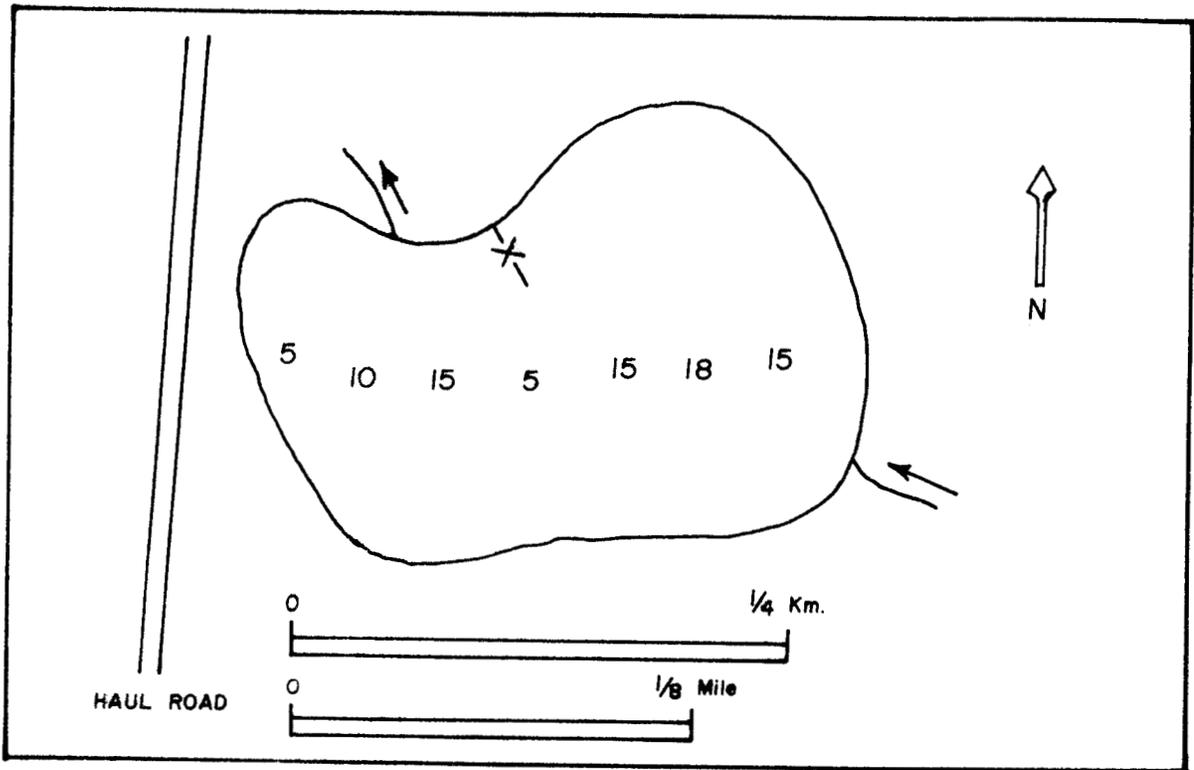
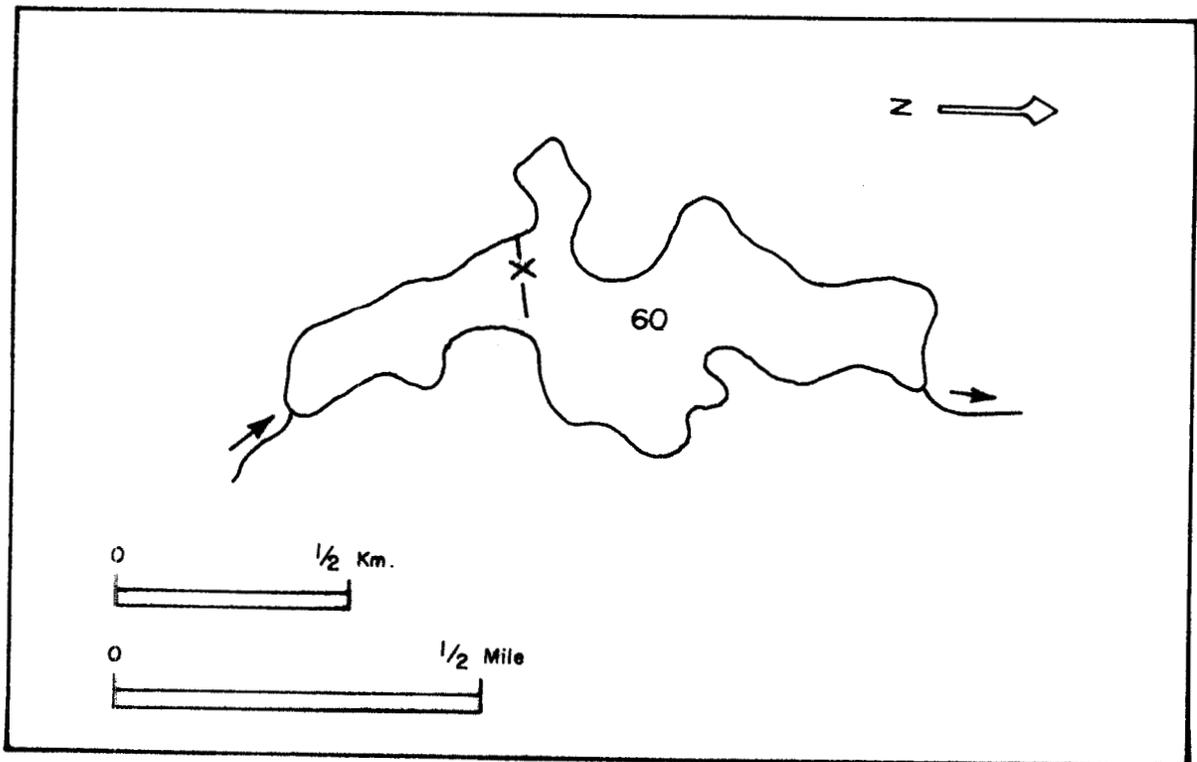


Figure 8. North Itgaknit Lake. Depths are shown in feet.



One experimental gill net set overnight on July 15, yielded a catch of 19 lake trout and two grayling. The lake trout ranged in length from 275 to 500 mm. Sport fishing for small lake trout was excellent.

"Fossil Lake":

Fossil Lake (Fig. 9), lat 68°55'N, long. 149°59'W, is a small, deep lake that lies in the Itkillik River drainage approximately 10 mi southwest of Toolik Lake. It is just over 3/4 of a mile in length and the surface elevation is 2,750 ft. It has a steep, rocky shoreline and a maximum depth of 120 ft. Water color is blue and the Secchi reading was 25 ft. There are no beaches along the shoreline and aquatic vegetation is sparse. A single shoal area exists at the north end of the lake. There are no inlets and a single outlet that drains into the Itkillik River. The water temperature on July 14 was 53°F.

One experimental gill net set overnight yielded a catch of 40 Arctic char that ranged in length from 115 to 360 mm. Sport fishing was good for small Arctic char.

"Horizon Lake":

Horizon Lake (Fig. 10), lat. 68°38'N, long. 149°25'W, is a small lake that lies just south of the haul road approximately 4 mi north of the Toolik Lake cutoff. Surface elevation is 2,700 ft, maximum depth 40 ft, and Secchi reading 14 ft. The water is tea colored and aquatic vegetation is sparse. There are no inlets and a single outlet that drains into the Kuparuk River. The outlet flow is intermittent and has a steep gradient. On August 15, the hardness was 1 ppm, pH 7, and water temperature 58°F.

One experimental gill net set overnight yielded a catch of 13 Arctic char that ranged in length from 126 mm to 355 mm. Slimy sculpins were observed along the shoreline.

Campsite Lake:

Campsite Lake (Fig. 11), lat. 68°56'N, long. 149°10'W, is the largest of several lakes in the upper Oksrukuyik Creek drainage. The surface elevation is 2,800 ft and the longest dimension of the lake is 1 mi. It has a rocky shoreline, irregular bottom and perimeter, and a large shoal area near the southern shore. The water color is blue, maximum depth 100 ft and Secchi reading 20 ft. There are three small inlets and a single outlet (Oksrukuyik Creek) which flows through several smaller lakes, and drains into the Sagavanirktok River north of Pump Station 3. The outlet is crossed by the haul road at two locations. On July 15, the water temperature was 52°F.

One experimental gill net set overnight yielded a catch of six lake trout and one Arctic char. Slimy sculpins were found as a food item in lake trout. Sport fishing was excellent for lake trout and Arctic char.

"Little Taho Lake":

Little Taho Lake (Fig. 12 ), lat. 68°41'N, long. 149°05'W, is a small lake just south of the haul road approximately 14 road mi south of Pump Station

Figure 9. "Fossil Lake". Depths are shown in feet.

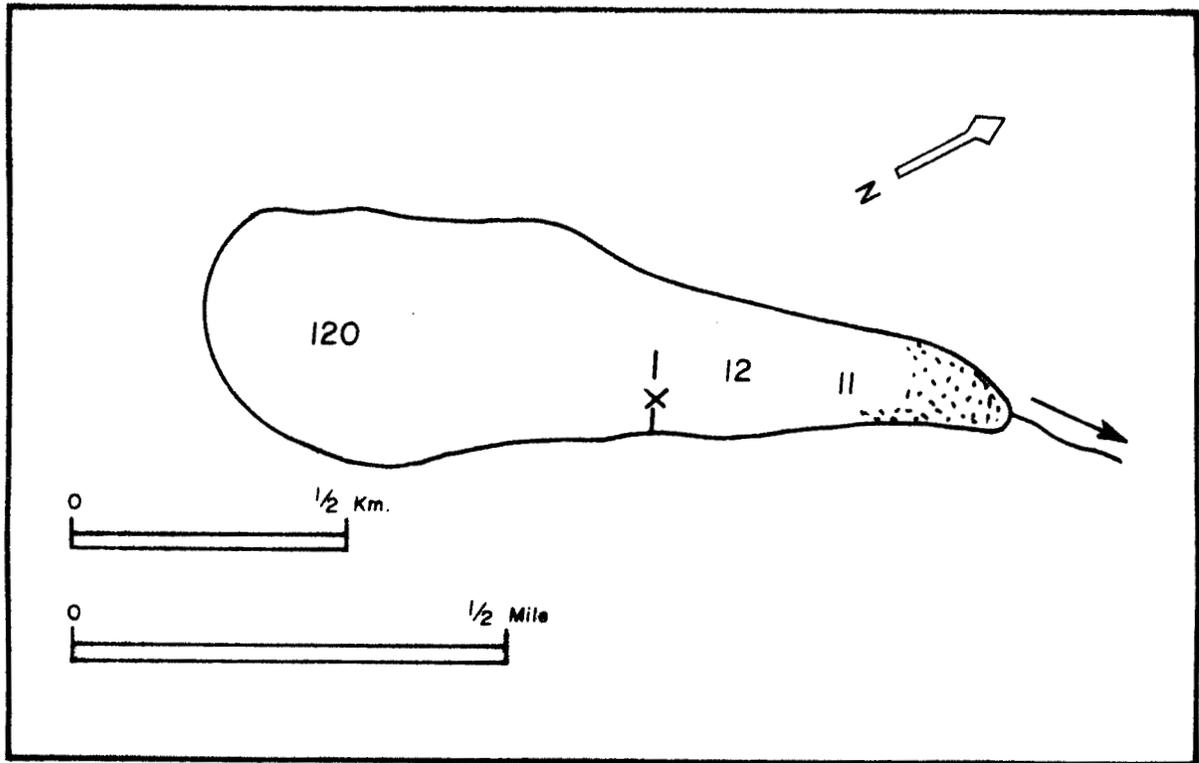


Figure 10. "Horizon Lake". Depths are shown in feet.

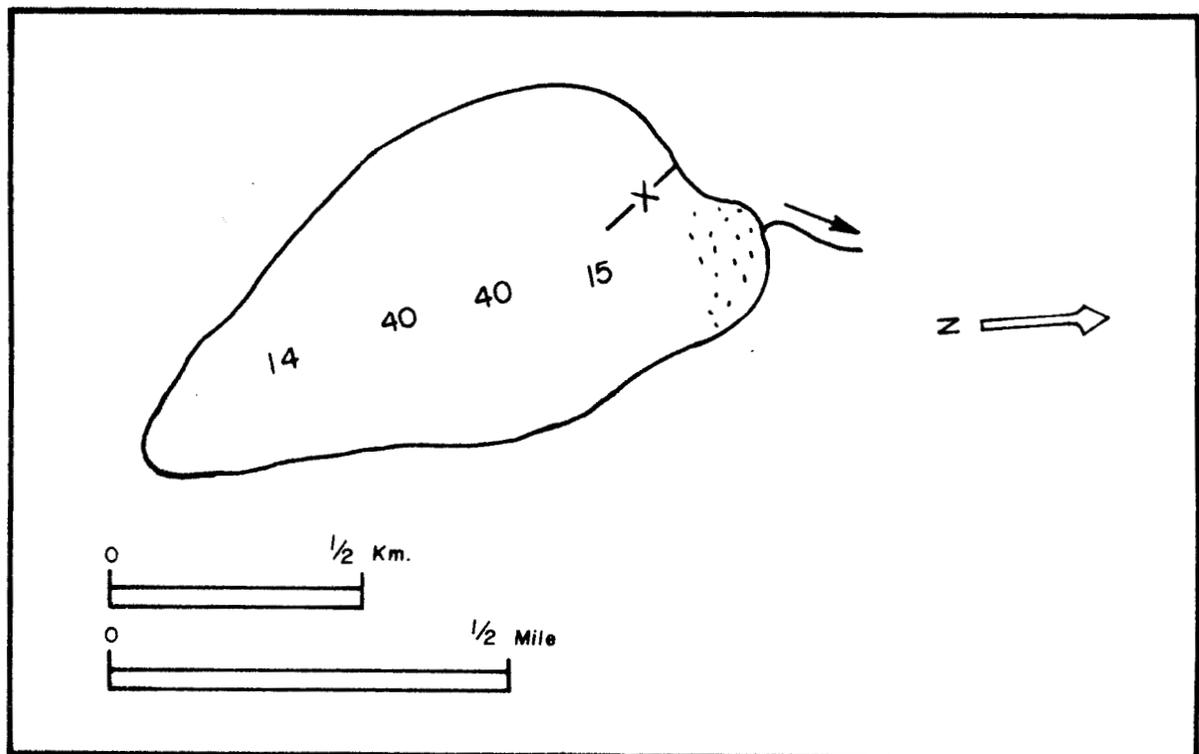


Figure 11. "Campsite Lake". Depths are shown in feet.

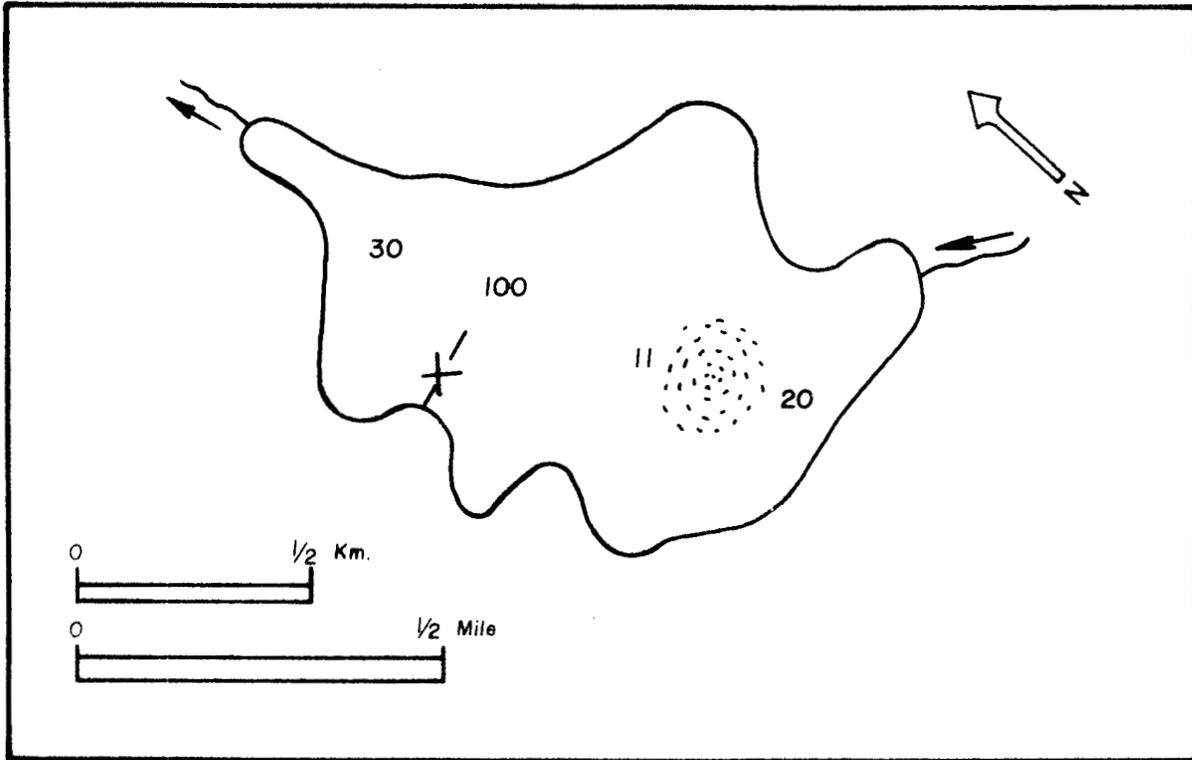
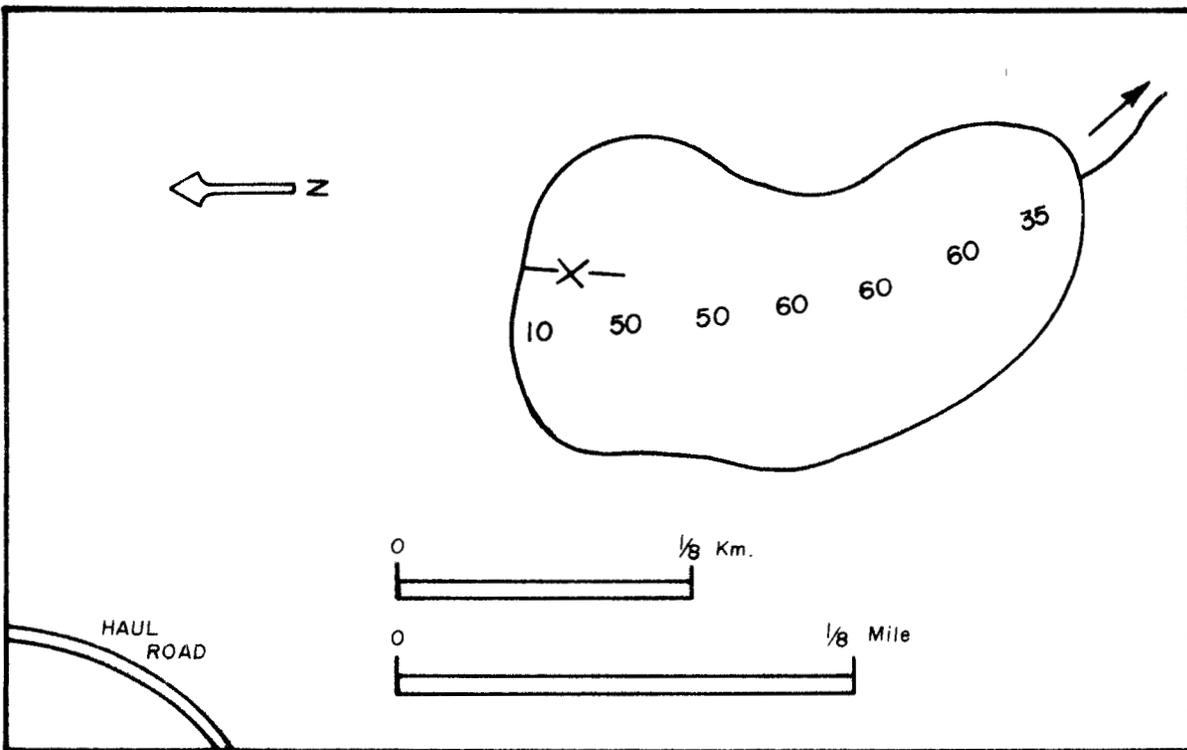


Figure 12. "Little Taho Lake". Depths are shown in feet.



3. The surface elevation is 2,500 ft. The water color is blue, maximum depth 60 ft, and Secchi reading in excess of 25 ft. There are no inlets and a single discontinuous outlet that flows into the Sagavanirktok River. On August 15, hardness was 5 ppm, pH 9, and water temperature 58°F.

Fifteen Arctic char were captured in a single experimental gill net set overnight. Slimy sculpins were observed in shallow water.

"Oly Lake":

Oly Lake (Fig. 13), lat. 68°44'N, long. 148°55'W, lies east of the haul road approximately 8 mi south of Pump Station 3. The surface elevation is 1,800 ft, water is tea colored, maximum depth 11 ft, and Secchi reading 5 ft. Aquatic vegetation is sparse and the bottom material is gravel. There are two small inlets (one from "Lucky" Lake) and a single outlet that flows into the Sagavanirktok River. Water chemistry data on August 15, were: hardness 4 ppm, pH 8, and water temperature was 49°F.

No fish were captured in an experimental gill net set overnight. It appears that this lake is too shallow to successfully overwinter fish.

"Lucky Lake":

Lucky Lake (Fig. 14), lat. 68°44'N, long. 148°55'W, lies east of the haul road approximately 8 mi south of Pump Station 3. The surface elevation is 1,800 ft, maximum depth 8 ft, and Secchi reading 5 ft. The lake has tea colored water and a gravel bottom. There is one inlet and a single outlet that flows into "Oly Lake". On August 15, water chemistry data were: hardness 3 ppm, pH 8, and water temperature 60°F.

There were no fish captured in an experimental gill net set overnight. This lake is apparently too shallow to successfully overwinter fish.

"Round Lake":

Round Lake (Fig. 15), lat. 68°49'N, long. 149°03'W, is a small circular lake located 9 mi south of VABM 2171 and 6 mi southwest of Pump Station 3. It has a maximum depth of 30 ft, blue water color, and a Secchi reading of 10 ft. The surface elevation 2,327 ft. The majority of this lake is shallow with the exception of a single deep hole in the southwest corner. The bottom is composed of sand and gravel. There is a single inlet and one outlet that flows to the Toolik River. On July 14, the water temperature was 50°F.

One experimental gill net set overnight yielded a catch of 13 grayling, the largest of which was 428 mm in fork length.

"Pump 3 Lake":

Pump 3 Lake (Fig. 16), lat. 68°50'N, long. 148°55'W, is a small irregular shaped lake located approximately 3 mi west of Pump Station 3. The surface elevation is 1,665 ft. It has a maximum depth of 35 ft, Secchi reading of 8 ft, and blue colored water. The deepest water was located at the south end of the lake while several shoals and submerged reefs exist at the

Figure 13. "Oly Lake". Depths are shown in feet.

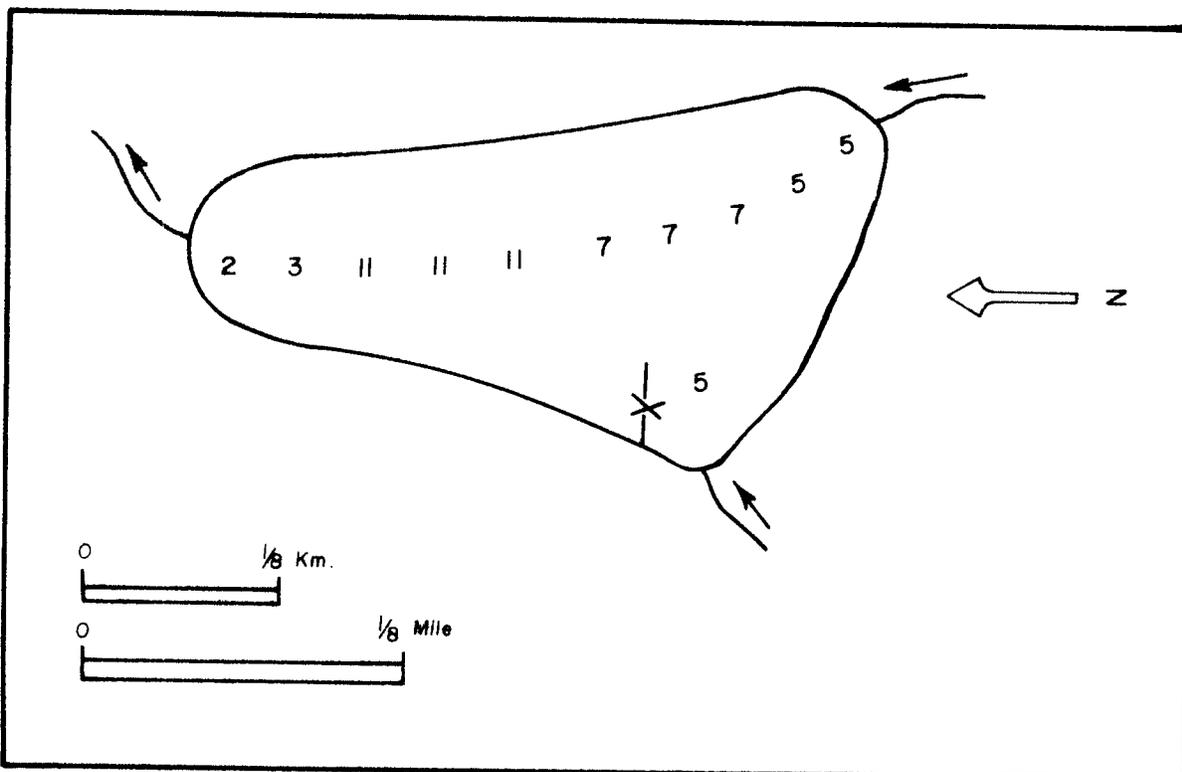


Figure 14. "Lucky Lake". Depths are shown in feet.

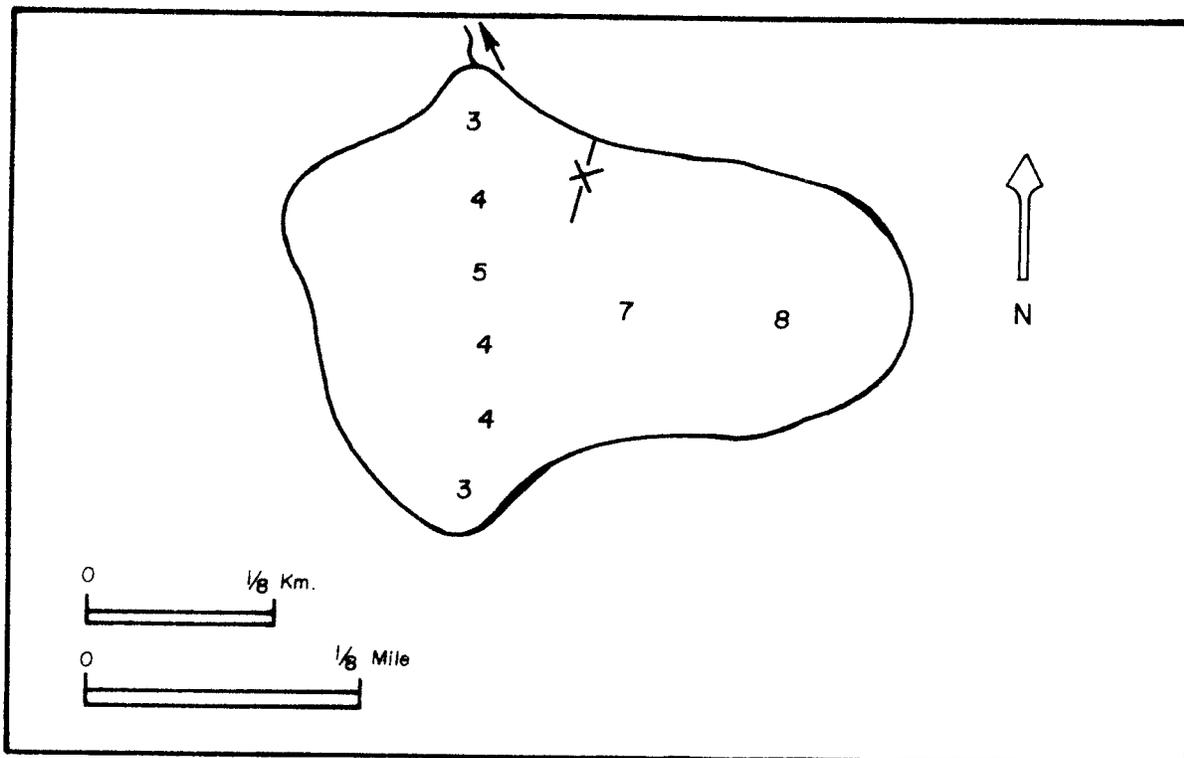


Figure 15. "Round Lake". Depths are shown in feet.

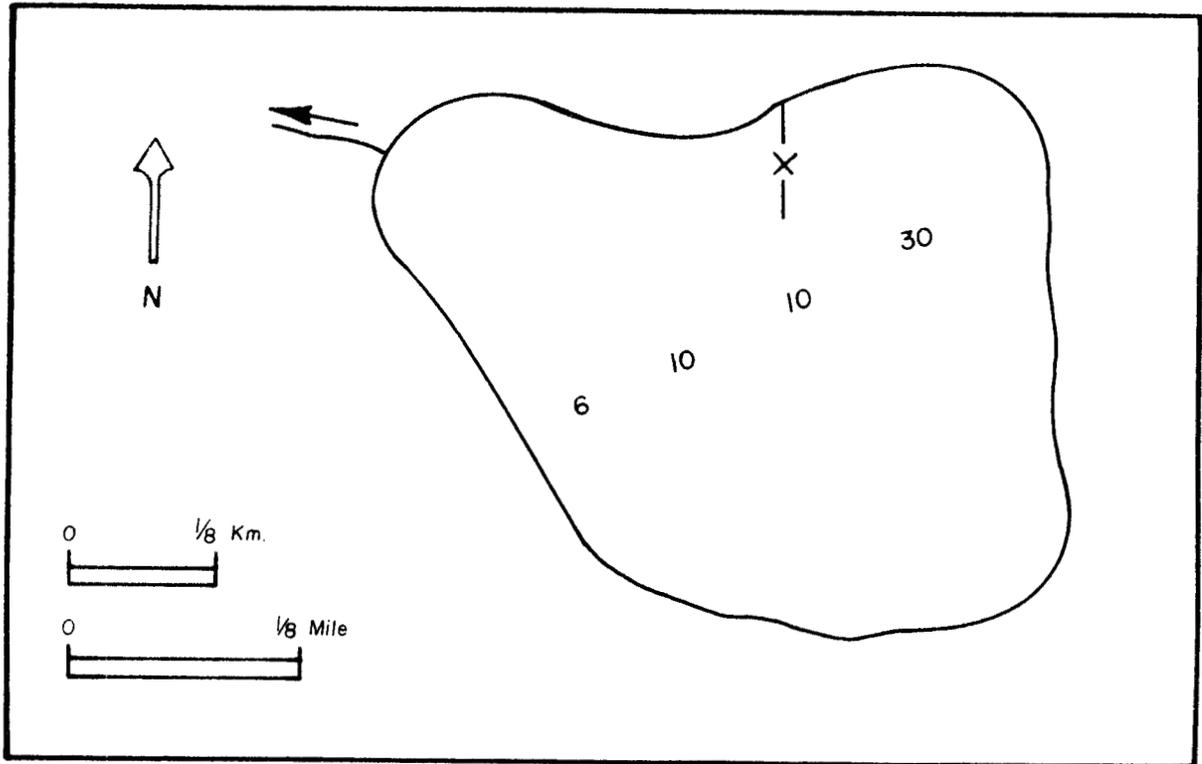
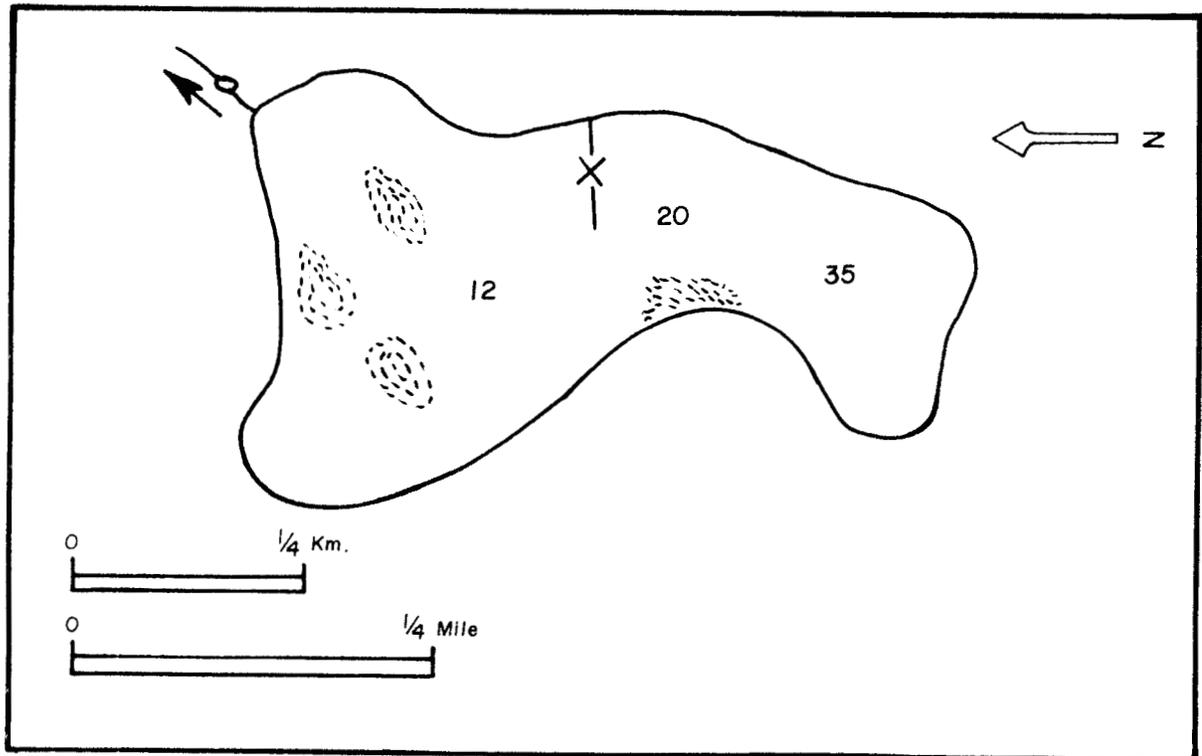


Figure 16. "Pump 3 Lake". Depths are shown in feet.



northern end. Aquatic vegetation is sparse and shoreline and bottom material is large angular gravel. There are no inlets and a single discontinuous outlet that flows to the Sagavanirktok River during periods of high water. On July 14, the water temperature was 59°F.

A single experimental gill net set overnight yielded a catch of nine round whitefish.

"Roadcamp Lake":

Roadcamp Lake (Fig. 17), lat. 69°02'N, long. 148°51'W, is a small shallow lake located 1/2 mi west of the haul road and approximately 8 mi by highway south of Happy Valley Camp. The surface elevation is 1,255 ft, maximum depth 7 1/2 ft, and Secchi reading 5 ft. The water is tea colored and the bottom is covered with mud, sand and aquatic vegetation. There are no inlets, and a single discontinuous outlet that flows into the Sagavanirktok River during periods of high water. The water temperature was 66°F on July 16. No fish were captured by a single experimental gill net set overnight.

"VABM 1703 Lake":

VABM 1703 Lake (Fig. 18), lat. 69°08'N, long. 149°05'W, is a small shallow lake in the Toolik River drainage that lies approximately 6 mi west of Happy Valley Camp. The surface elevation is 1,280 ft, maximum depth 7 ft, and Secchi reading 5 ft. The water is tea colored and the bottom is soft mud and sand. There is one beaded inlet and a small, beaded outlet to the Toolik River. The water temperature was 68°F on July 16. There were no fish captured in a single experimental gill net set overnight.

"VABM 1507 Lake":

VABM 1507 Lake (Fig. 19), lat. 69°14'N, long. 148°57'W, is a shallow lake that lies 6 1/2 mi northwest of Happy Valley Camp. The surface elevation is 1,065 ft. The water is tea colored, maximum depth 10 ft, and Secchi reading 6 ft. It has gravel shorelines and several small tundra islands in the north eastern end. There is one inlet and one outlet that drains into the Sagavanirktok River. The water temperature on July 16, was 68°F.

A single experimental gill net set overnight yielded a catch of six grayling that ranged up to 390 mm in fork length.

Porcupine Lake:

Porcupine Lake (Fig. 20), lat. 68°47'N, long. 146°27'W, is a large Brooks Range Lake that lies between the headwaters of the Ivishak and Marsh Fork of the Canning River. Surface elevation is 3,000 ft and the surrounding mountains rise to 6,000 ft. The water color is green and extremely transparent with a Secchi reading in excess of 30 ft. The maximum depth is 90 ft. Small gravel beaches line the north, south, and east shorelines. Aquatic vegetation is sparse and the bottom is covered with sand and small gravel. There are no inlets and a small beaded outlet that drains into the Ivishak River. The water temperature was 54°F on July 15.

Figure 17. "Road Camp Lake". Depths are shown in feet.

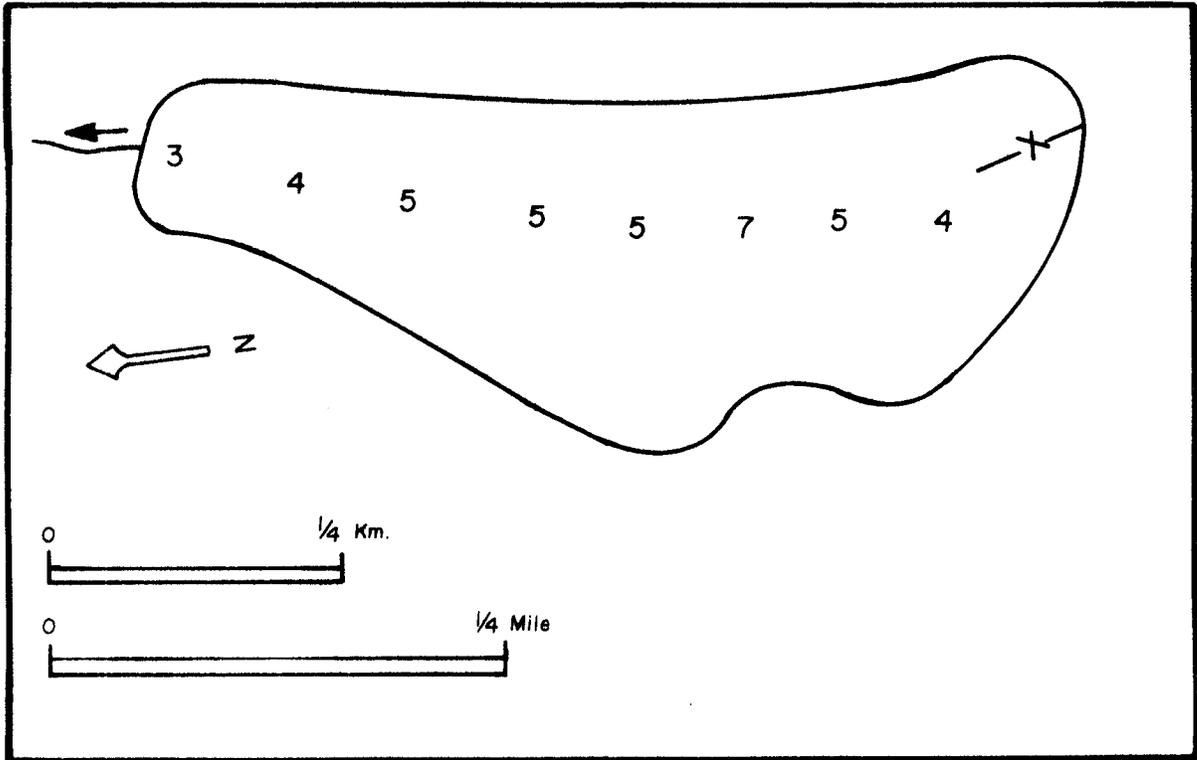


Figure 18. "VABM 1703 Lake". Depths are shown in feet.

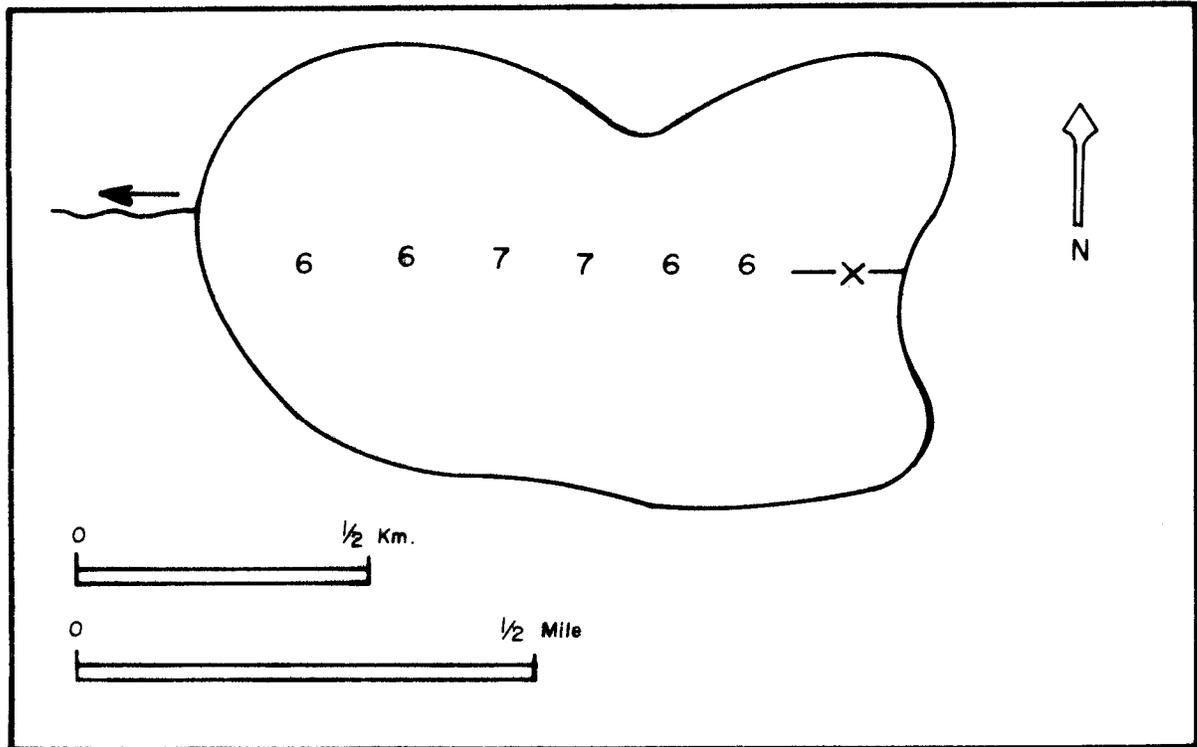


Figure 19. "VABM 1507 Lake". Depths are shown in feet.

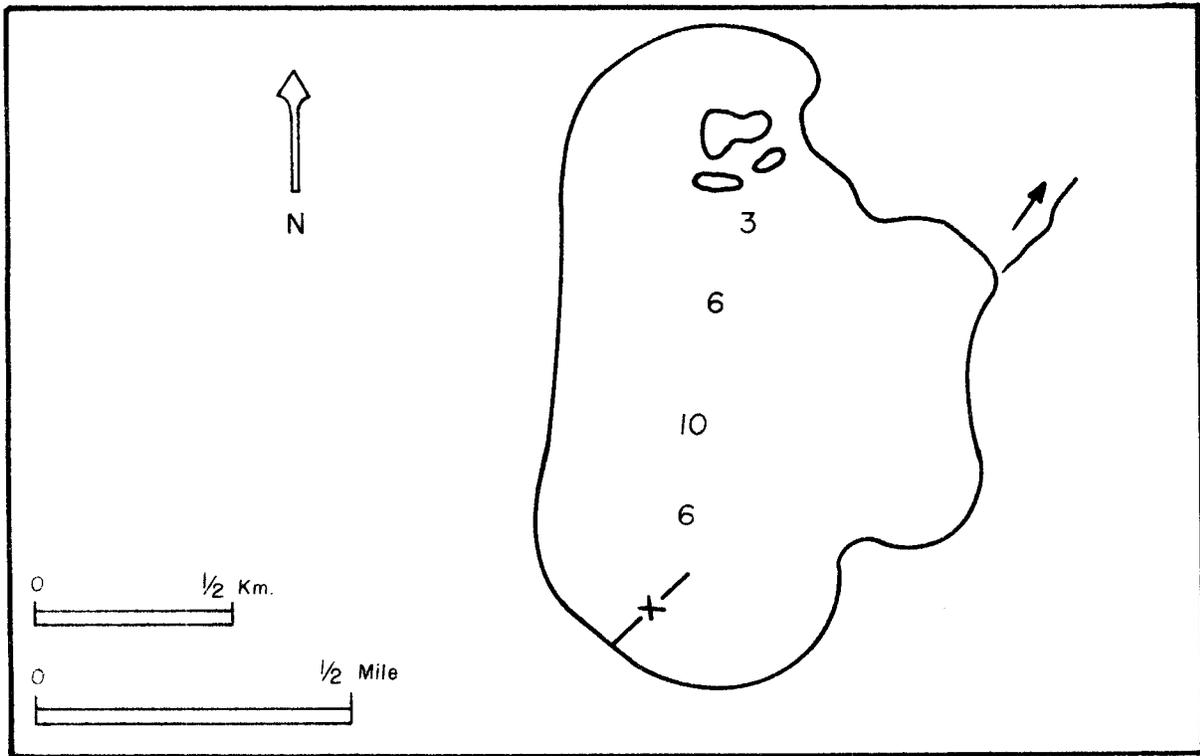
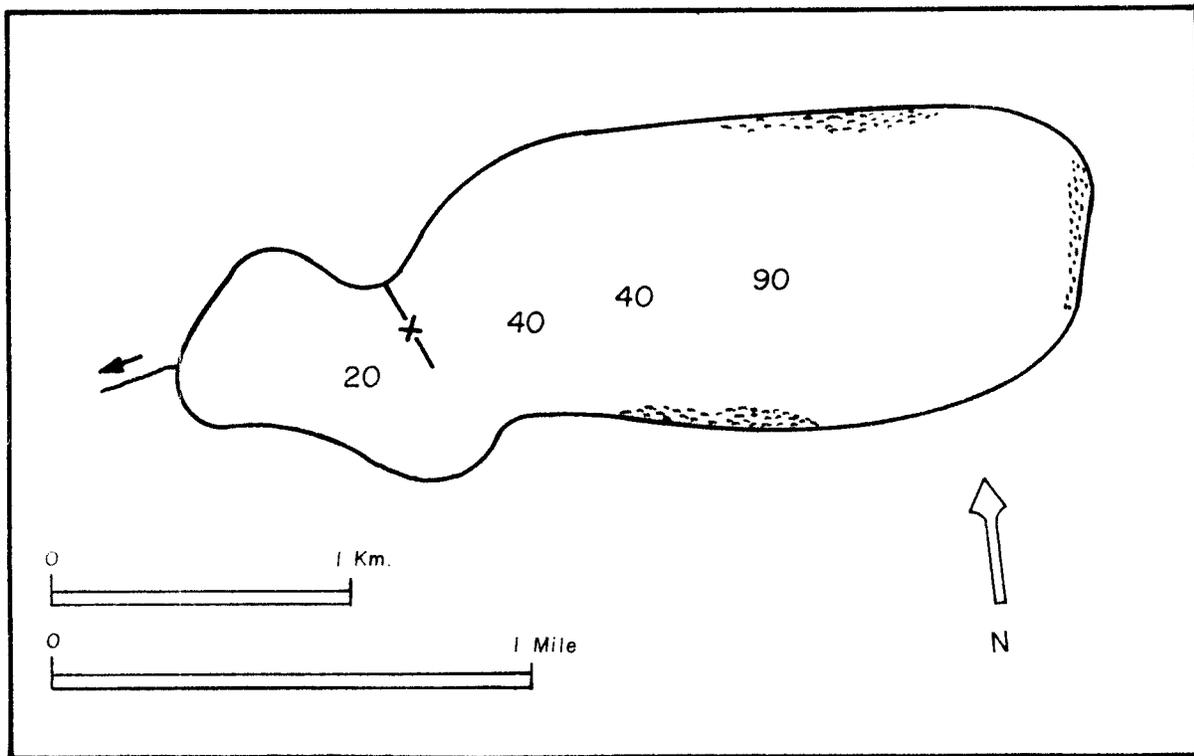


Figure 20. Porcupine Lake. Depths are shown in feet.



A single experimental gill net set overnight yielded a catch of 20 round whitefish and one small Arctic char.

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