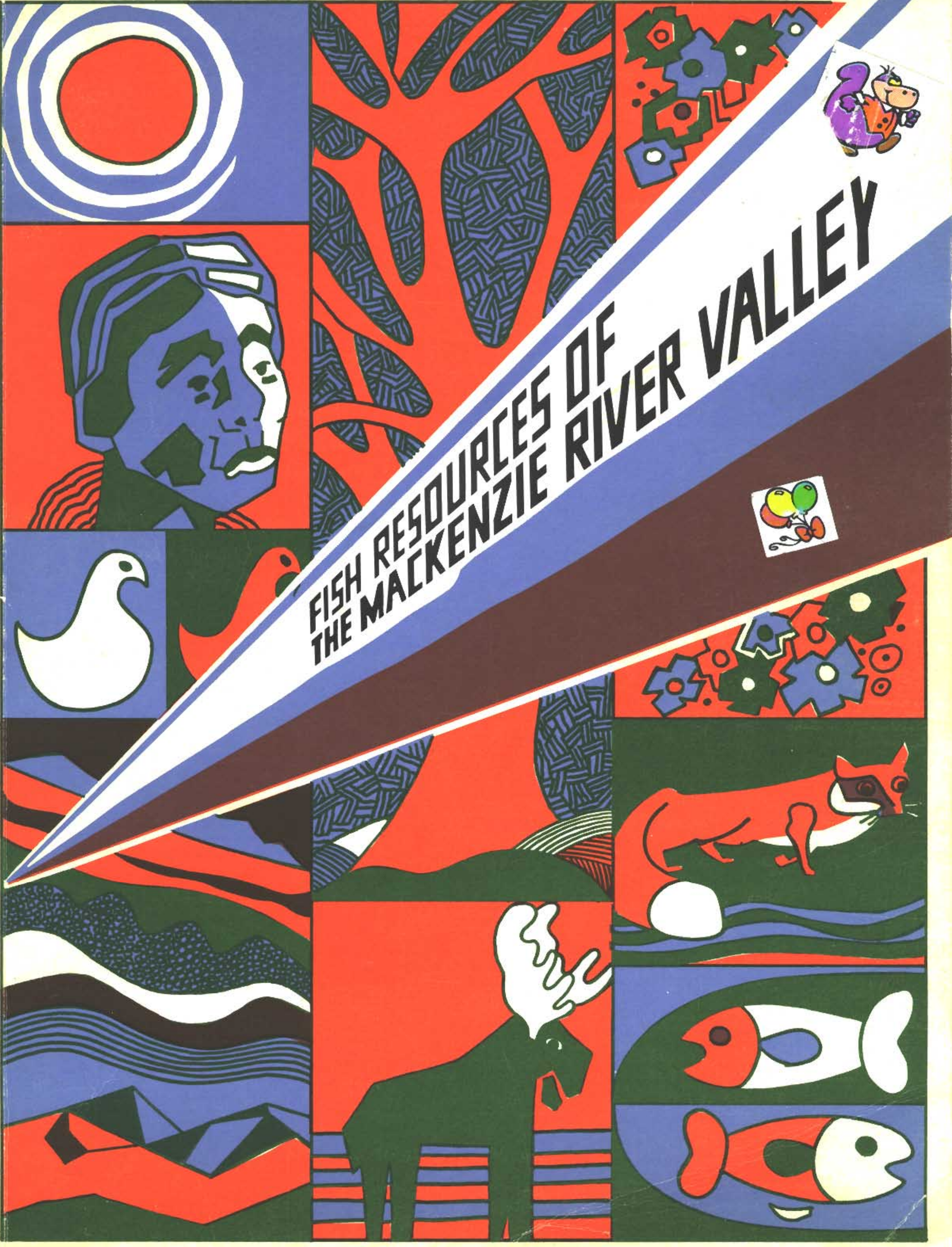
FISH RESOURCES OF
THE MACKENZIE RIVER VALLEY

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Interim Report II

by

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The data for this report were obtained as a result of investigations carried out under the Environmental-Social Program, Northern Pipelines, of the Task Force on Northern Oil Development, Government of Canada. While the studies and investigations were initiated to provide information necessary for the assessment of pipeline proposals, the knowledge gained is equally useful in planning and assessing highways and other development projects.

1. ABSTRACT

Detailed biological data are presented on the most abundant fish species of the Mackenzie River Valley, combining data from 1971 and 1972 where possible.

Numerical abundance and distribution data are presented. Distribution ranges were extended significantly northward for mountain whitefish, *Prosopium williamsoni* (Girard); lake cisco, *Coregonus artedii* (LeSueur); northern redbelly dace, *Chrosomus eos* (Cope); spottail shiner, *Notropis hudsonius* (Clinton); brook stickleback, *Culaea inconstans* (Kirtland) and goldeye, *Hiodon alosoides* (Rafinesque).

Migration routes and timing and spawning habits are described. Northern pike, *Esox lucius* (Linnaeus); longnose suckers, *Catostomus catostomus* (Forster); yellow walleye, *Stizostedion vitreum vitreum* (Mitchill) and Arctic grayling, *Thymallus arcticus* (Pallas) migrate up suitable tributaries to spawn immediately after ice breakup. Inconnu, *Stenodus leucichthys nelma* (Pallas); whitefish and cisco species migrate upstream through delta channels between August and October to spawn in large upstream tributaries during September and October. Arctic char, *Salvelinus alpinus* (Linnaeus) move through the western delta during August to spawn in the Big Fish and Rat river systems during September and October.

Nursery areas are described. Clear tributaries are the most important nursery areas for yellow walleye, Arctic grayling, Arctic char and burbot, *Lota lota* (Linnaeus). Nursery areas for whitefish, cisco, longnose sucker and northern pike range from clear to turbid.

Age-length relationships are given for major species. Northern pike, yellow walleye, burbot and boreal smelt, *Osmerus eperlanus* (Linnaeus) appeared to have faster growth rates than other populations from similar latitudes while growth rates of Arctic cisco, *Coregonus autumnalis* (Pallas) and least cisco, *Coregonus sardinella* (Valenciennes) appeared to be slower than those of Siberian cisco.

Age-class strengths, length-frequency distributions and length-weight relationships are also presented.

Food habits of major species are described. Most of the anadromous species ceased feeding during their spawning migration. Whitefish species fed predominantly upon benthic organisms, while northern pike, burbot and yellow walleye were piscivorous and Arctic grayling were insectivorous.

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5. INTRODUCTION

In May of 1971, the Department of the Environment, Fisheries Service, in conjunction with the Environmental-Social Program, Northern Pipelines, began a four year investigation into the fish resources of the Mackenzie River valley. Results of the first year's program were presented in two volumes (Hatfield et al. 1972). Volume I provided preliminary data on species distribution, relative abundance, general life history and growth, and tentative recommendations for protection of the resource. Volume II of the report presented details of methods, results and a stream catalogue.

The results and recommendations of the second year's program, as they relate to pipeline development, have been published by the Environmental-Social Committee. Volume I (Stein et al. 1973) highlighted pertinent biological findings and offered specific recommendations for the protection of the resource both during and after pipeline construction. The second volume (Dryden et al. 1973), is a summary of stream data collected during the past two years. Included are individual descriptions of major tributaries and their fish resources as well as engineering evaluations of stream bank stability.

The following report is an attempt to compile all of the biological data collected during the past two years of study, as well as the specific methods used. The results and conclusions presented are tentative and will be included in a final report to be published in 1975. Significant differences from the 1971 study include a major fish tagging program and the addition of a base camp at Aklavik to study the Mackenzie delta area.

Field camps were also established in Fort McPherson to monitor the domestic fishery on the Peel River system, and on the Rat and Rabbitskin rivers to intensively study the resources of two typical Mackenzie tributaries. Results of the latter program can be found in a separate report by Jessop et al. (1973).

6. METHODS

6.1 Description of the Area

The Mackenzie River flows northward from Great Slave Lake to the Arctic Ocean and has headwaters in the Yukon Territory, northern British Columbia, Alberta and Saskatchewan (Fig. 1). Greatest total distance from headwater to the Arctic Ocean is 4,321 km (2,685 miles). The Mackenzie is navigable by river tugs and barges during the ice-free period from mid-June to mid-October, and is the primary supply route for all towns from Fort Simpson downstream to Inuvik. The river is characterized by a heavy silt load, particularly north of Fort Simpson where the Liard River enters from northern British Columbia. Numerous tributaries enter the Mackenzie River system. However, many of these are seasonal streams which have peak discharge in late May or early June, and dry up over the summer, or freeze to the bottom during winter. Only 12 to 15 watersheds contribute significantly to the total flow of the river. A complex system of channels, islands, lakes and muskeg comprise the delta which is some 19,782 sq km (7,635 sq miles) in area (Fig. 2).

In winter, ice up to 2.4 m (8 ft) thick covers the main stem of the Mackenzie River. During spring run-off, the river may increase 3.0-6.1 m (10-20 ft) in depth. Throughout the summer, heavy rains in the mountains may result in a 1.5 m (5 ft) increase in water depth in both tributaries and the Mackenzie River. During peak discharges, there are large quantities of drifting debris.

Substantial domestic fisheries exist throughout the river system, particularly around tributary mouths near settlements, and in the Mackenzie delta. Much of the catch is taken during or immediately following freeze-up and breakup when the major fish runs occur.

Permafrost is continuous from Arctic Red River north and discontinuous but widespread to Fort Simpson in the south. Boreal forest lines the river to the Arctic Ocean. More information on river conditions and geology of the area may be found in Mackay (1963).

6.2 Sampling Locations

In addition to the three river bases, Arctic Red River, Norman Wells and Fort Simpson, established in 1971 (Hatfield et al. 1972. Vol. I), bases were also set up at Aklavik and Fort McPherson in 1972 (Fig. 1). Aklavik is centrally located for detailed biological study of the complex Mackenzie delta area. Fort McPherson gave access to a study of the Peel River system, which supports significant runs of broad whitefish, Arctic cisco, least cisco, and inconnu (Hatfield et al. 1972. Vol. II). (A list of generic nomenclature associated with the common fish names used in this report appears in Table 1).

An effort was made in each study area to select index sample locations that would give a representative sample of all fish species and an indication of migratory routes and nursery areas (Figs. 3, 4, 5, 6 and 7). However, river conditions frequently restricted the selection of locations to back eddies and to the confluence of tributaries. Locations sampled in 1971 were generally utilized in 1972 as index sample locations.

In the Arctic Red River study area, an intensive stream survey was undertaken on the Rat River (Fig. 3). A similar study was conducted on the Rabbitskin River (Fig. 7) in the Fort Simpson study area. Results of both intensive stream studies are presented in a separate report: Fish Resources of the Mackenzie River Valley, Special Report: An Intensive Study of the Fish Resources of Two Main Stem Tributaries.

Since many major tributaries were beyond easy access from base camps, a synoptic helicopter survey was conducted in 1971 and 1972 to assess the fish resources of these streams. The survey conducted in 1972 maintained for the most part the sample locations established in 1971 (Hatfield et al. 1972. Vol. II). With the inclusion of the Aklavik base, the survey was extended to include west side tributaries of the Mackenzie delta and a number of delta lakes. A more intensive survey of the Great Bear River was undertaken in late September and early October. On most tributaries, the gill net locations were primarily at or near stream outlets; seining locations were upstream. An engineering evaluation of river bank stability was also conducted on most major tributaries during June and July. A detailed account of synoptic methods and results is presented in a separate report: An Evaluation of the Fish Resources of the Mackenzie River Valley as Related to Pipeline Development, Volume II, 1973.

6.3 Sampling Techniques and Catch Analysis

Sampling techniques and catch analysis were similar for all bases. However, variations occurred due to changing river conditions.

6.3.1 Netting Crews

Sampling began shortly after breakup (late May-June) and ended by mid-November. One gill net set was made at the mouth of the Rabbitskin River and at the mouth of the Liard River during March, 1973.

In sampling gill net locations, on a two week cycle basis, three 22.9 m (25 yard) sections of 3.8, 7.6 and 12.7 cm (1½, 3, 5 inch) meshes were alternated with similar sections of 5.1, 10.2 and 14.0 cm (2, 4, 5½ inch) meshes. The three sections were either joined to form a 68.6 m (75 yard) gang or fished separately (Fig. 8). Nets were usually fished for 18 to 24 hr.

Seining locations were also sampled by two week cycles using 9.1 or 18.3 m (30 or 60 ft) beach seines of 0.3 or 0.6 cm (1/8 or 1/4 inch) mesh (Fig. 9).

Gill net caught fish were sampled for weight (g), fork length (mm), sex and maturity. Scale and otolith samples and the left pectoral fin of longnose suckers were taken for age determinations. (Otoliths are small ear bones located in the brain cavity.) Where possible, 15 stomach samples, from those species listed in Table 2, were collected per cycle by each river base crew. Large catches were subsampled for similar data.

Small fish in seine catches were preserved and sent to the Fisheries Service laboratory, Winnipeg, for analysis. Larger fish were sampled in the same manner as those taken in gill nets.

Frequently, live fish from both gill net and seine catches were tagged and released.

6.3.2 Tagging Crews

At each base, fish were collected for tagging purposes utilizing gill nets, trap nets (Fig. 10) and beach seines. In an effort to tag and recapture a representative number of fish, 23 to 57 tagging locations were distributed throughout each study area. Tagging effort was most intensive at locations where fish concentrations occurred.

Fish with length greater than 15 cm (6 inches) were tagged at the posterior base of the dorsal fin. Tags consisted of coded vinyl tubing and were inserted by means of a tagging gun (Fig. 11). Fork length and a small scale sample were taken from all tagged fish. Tagged fish were held in a holding pen for 15 to 30 minutes and, if swimming normally, were released. Complete data were taken from all fish that were not tagged and released. Recaptured fish, taken by study crews, were released if considered to be in good condition. Otherwise, they were completely sampled. A one dollar reward was offered for each tag returned by anglers or domestic fishermen. Posters, giving instructions for returning tags, were placed in most Mackenzie River settlements.

6.3.3 Intensive Stream Survey

Intensive stream survey crews utilized gill nets, seines, drift nets, angling and visual observations to determine relative abundance, spawning areas, nursery areas and general life history of fish species in the Rat and Rabbitskin rivers. Live fish caught were tagged using the techniques employed by the tagging crew (6.3.2). Other fish were completely analysed in the field or in the laboratory.

6.3.4 Synoptic Survey

The synoptic crew made two surveys of the Mackenzie River system. The first survey began on May 2 at Fort Simpson and working north, terminated July 13 in Aklavik. The second survey began August 25 in Aklavik and working south, terminated at Norman Wells by mid-October.

Fishing gear consisted of seines and gill nets. Sampling methods were similar to those used by the netting crews (6.3.1) with the exceptions that stomach contents were analysed in situ and otoliths and pectoral fins were not taken.

6.3.5 Domestic Catch Analysis

Statistics were collected on domestic fishery catches in the Fort McPherson area from July 12 to August 31, 1972. Of 24 camps checked, 20 were located along the Peel River from its mouth to 120.7 km (75 miles) upstream; four were on the Husky Channel near its junction with the Peel River. Some camps were active from breakup in June until after freeze-up in October. Most ceased operations in early September. Fishing (exclusively gill nets) was continuous and nets were lifted at least once each day.

Daily catches were recorded at three camps on the Peel River and one on the Husky Channel. Catches for the remaining camps were tabulated by counting all fish stored in the camp at the end of the study period (Fig. 12).

Additional sampling and tagging was done by Fisheries staff using gill nets and seines.

6.4 Laboratory Analysis

Seine catches were identified using taxonomic keys available in Faber (1970), Mansueti and Hardy (1967) and McPhail and Lindsey (1970). Most specimens were keyed to species; however, many larval fishes of the coregonid, salmonid and catostomid families could only be keyed to genus. A number of specimens were sent to the Canadian National Museum of Natural Science for identification and verification. Subsamples of each species were analysed for fork length, weight, age and stomach contents.

Stratified subsampling (Ketchen 1950) was used to determine the age distribution of each species. For each species, three specimens from each 10 mm length interval were aged. Arctic char and burbot were aged from otoliths: longnose suckers were aged from fin rays and all others were aged from scales. Scales and otoliths of Arctic grayling were aged as a comparison of the reliability of the two methods for this species. Otoliths were cleared using a solution of benzyl benzoate and wintergreen (3:1). The ages were determined using a black background, reflected light and a compound microscope. The dry fins of longnose suckers were covered with a clear epoxy and allowed to harden. Sections of the fin were cut with a sectioning device (Fig. 13) similar to the one used by Arthur (1961). The only major variation in this device was the type of saw blade. In the present analysis, a jeweller's ring cutting saw blade was used. The sections were cut at 0.5 mm to 1.0 mm in thickness, depending on the ease of distinguishing the annuli in a particular fin. Each section was cleaned and mounted on a glass slide with the synthetic mounting medium, diatex. The fin section was then read under a compound microscope.

The annuli appeared as translucent zones and the zones between annuli were opaque. The ages indicated in the results are the number of annuli that were counted on the scale, otolith or fin ray.

The age-length distribution was plotted by fitting a curve to the median for each age-class. Age class strength for the species caught in gill nets were determined by plotting the accumulative length-frequency distribution (Cassie 1954).

Stomach contents from a subsample of each species were examined. Identifications, numerical counts and volumetric measurements of food items were made.

6.5 Data Analysis

Data collected in the field were coded and later analysed by computer. Information retrieved from the computer included species distribution, percent species composition, sex ratios, catch per unit effort, length frequencies, and length-weight relationships.

Catch summaries were calculated on a catch per unit of effort basis (number of fish/standard gang/hour) for the index gill net catches by four-week intervals over the sampling period. Changes in numbers of fish caught over the season for major species at each base are thus illustrated.

Tag returns from field crews, sport and domestic fishermen, were combined to describe fish movements and migration routes. The net distance travelled and the time lapse between subsequent recaptures of a tagged fish were calculated from the time and place of its previous release. The distance between release and recapture locations was measured with a map measurer on 1:250,000 scale topographic maps, and expressed as river kilometers travelled. The recaptures made within one day, in the same general location, were not included in the movement and migration routes analysis. Descriptions of major fish movements in the Norman Wells and Fort Simpson areas were described individually; however, since major migrations occur between the delta and the Arctic Red River region, data from Aklavik, Arctic Red River and Fort McPherson were described jointly.

Where a significant number of tags were returned, the Peterson Method was used to estimate the approximate population size.

Estimates of the population of northern pike in the Fort Simpson study area were calculated at the end of each cycle by a Schnabel type formula (Lagler 1952).

Data collected in 1971 and 1972 were grouped to define the spawning and primary nursery areas of major fish species. Stream locations are presented in Figs. 14, 15 and 16. A stream was classified as a known spawning area if fry were captured upstream from the mouth, if both ripe and spent adults were abundant simultaneously, or if fish were observed spawning. A stream was classified as a suspected spawning area if fry or ripe adults were present in significant numbers. An area was considered a major nursery area if fry or juveniles were numerous.

7. RESULTS AND DISCUSSION

7.1 Arctic Grayling, Thymallus arcticus (Pallas)

Distribution: Arctic grayling were distributed throughout the Mackenzie system (Fig. 17) where, as in 1971, the species was generally found in the clear, swift tributaries flowing from the east side of the valley into the Mackenzie River.

Numerical Abundance: The greatest number of grayling was taken in the Norman Wells area (N = 1862), followed by Arctic Red River (N = 543) (Table 3). In Norman Wells, grayling constituted 50 percent of all fish caught whereas in Fort Simpson, Aklavik and Fort McPherson areas, they constituted less than 7 percent of the total catch. One contributing factor to the relative high proportion of grayling in Arctic Red River and Norman Wells areas was the effort made in 1972 to monitor the spring spawning run in the Swan Creek-Swan Lake and the Stewart Creek-Three Day Lake systems, respectively.

Index gill net catches decreased through the summer months after the initial peak in early June in both the Arctic Red River and Fort Simpson areas (Figs. 46 and 48); in the Norman Wells area, the peak was two weeks later (Fig. 47). Only Fort Simpson and Norman Wells showed an increase in catch per unit of effort in late September when fish moved out of diminishing tributary streams to overwintering grounds.

The late spring peak in Norman Wells can be explained by the post-spawning behaviour of the Stewart Creek grayling which moved out of the lake and into the Mackenzie River in late June. In contrast, the Swan Lake-Swan Creek fish appeared to remain in the lake for summer feeding. Index sampling may have ceased before any fall movements were detected in the Arctic Red River area.

Tagging Program: Tagging of Arctic grayling was sporadic during the summer months when catches from the main Mackenzie River were not large. The greatest numbers were tagged in the spring during spawning runs in Swan Creek and Stewart Creek. Of 1130 tagged in the Norman Wells area (Table 7), 861 were tagged during June in Three Day Lake near its outflow into Stewart Creek. Both Fort Simpson (Table 8) and Norman Wells (Table 7) had a 2 percent recapture rate, while Arctic Red River (Table 5) had 3.8 percent of their tagged fish recaptured.

In the Aklavik region (Table 4) tag returns came from a group of fish tagged on September 18-19 in "Fish Hole" on Cache Creek, a tributary of the Big Fish River (Fig. 49; loc. 3). These fish, recaptured after 6-48 days, had not moved out of "Fish Hole".

Of 394 grayling tagged in the Arctic Red River area, 85 were tagged at the mouth of Swan Creek (Fig. 49; loc. 23) on June 4. Five were recaptured 22.5 km (14 miles) upstream at Swan Lake (loc. 22) between July 4 and September 15.

In late June 861 grayling were tagged in Three Day Lake at its outflow into Stewart Creek (Fig. 50; loc. 1).

A post-spawning movement of spent adults came down Stewart Creek after June 15 and subsequent tag recoveries from this group provided insight on their dispersal. Two fish indicated that the 12.9 km (8 mile) trip to the creek's confluence with the Mackenzie River (loc. 2) may take at least 6 days. More tags were recovered upstream on the Mackenzie within a month at locations 3 and 4. Five more fish had moved upstream on the Great Bear River, the greatest distance being 159.0 km (99 miles) to location 7 at the outflow of Great Bear Lake into the Great Bear River.

Assuming that post-spawning fish remained exclusively in the drainage, tag returns from Swan Lake-Swan Creek indicate that the population of catchable size grayling during the summer in 1972 was 5000-6000 fish.

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged fish are shown in Tables 9, 10, 11, 12 and 13. The life cycle of Arctic grayling is complicated and aspects of its seasonal movements, as yet not fully delineated in the Mackenzie Valley, may vary for different populations.

In the Arctic Red River region grayling occurred in the Mackenzie and larger tributaries only during June and early July. The scarcity of grayling at index stations (Fig. 4) during the summer, as shown in the seasonal summary of index gill net catches (Fig. 46) may be explained in part by the behaviour of Swan Lake-Swan Creek grayling. The 1972 spawning population moved upstream into the lake during the first two weeks of June and, based strictly on tag returns, appeared to remain in the lake during the summer.

Summer grayling movements further south differed in that spent fish moved back into the Mackenzie in late June. Grayling occurred in all index fishing cycles in the Norman Wells and Fort Simpson areas (Figs. 47 and 48). Tag returns from fish recaptured at the outflow of Great Bear Lake indicated that some fish tagged at Three Day Lake contributed to the summer population in the Great Bear River system. Miller (1946) found the greatest numbers of grayling at the outflow of the lake during his investigation of Great Bear Lake. Data indicate that both summer resident adult and juvenile fish move out of some small tributaries in the fall to overwintering areas. This was evident at Stewart Creek in late August and early September when two size ranges of grayling (210-230 mm and 290-310 mm) moved out of Stewart Creek. By mid-September only immature fish in the 180-210 mm range were moving out of the creek.

Spawning and Nursery Areas: Spawning occurred following ice breakup on the rivers during late May and early June. Known spawning areas included the Rat River, Swan Creek and Swan Lake, Tree River (Fig. 14), Three Day Lake and tributary streams, Porcupine River (Fig. 15), Secret Creek, Martin River, Rabbitskin River, Spence River, Trout River and three unnamed streams (Fig. 16; loc. 1, 5 and

8). An unnamed tributary near Fort Providence was identified as a spawning area for grayling by Bishop (1971). Suspected spawning areas included Hare Indian River (Fig. 15), Trail River, Harris River, Blue Fish Creek, Jean-Marie Creek and one unnamed stream (Fig. 16; loc. 7).

Major nursery areas were Big Fish River, Cache Creek, Willow River, Rat River, Tsital Trein Creek, Tree River (Fig. 14), Hare Indian River, Donnelly River, Bluefish Creek, St. Charles Creek, Porcupine River (Fig. 15), Trail River, Rabbitskin River and Trout River (Fig. 16).

In the current study, spawning generally occurred in clear tributaries of the Mackenzie River, following ice breakup at water temperatures of 7-15 C (45-59 F). Grayling spawned during breakup at water temperatures of 8-10 C (46-50 F) in a tributary of the Mackenzie River studied by Bishop (1971). Although grayling generally spawn over rocks or gravel (Rawson 1950) spawning will occur over a variety of substrates (Reed 1964).

Age and Growth: The age of Arctic grayling ranged from 0-10 years (Table 14) with the oldest fish coming from the Norman Wells area. Ages determined from the otoliths of 63 fish corresponded with those read from scales in 54 percent of the cases. Thirteen percent of the comparisons were out by ± 2 years, while 32 percent differed by ± 1 year. Scale age determination underestimated by one year in 18 percent of the cases.

As in 1971 data, grayling in Fort Simpson displayed the slowest growth rate, especially in the 2-9 year classes (Fig. 52). Aklavik specimens appear to grow faster in the 1-2 year classes, whereas Arctic Red River fish showed more rapid growth in the 2-5 year range. Grayling in Norman Wells displayed the most uniform growth rate.

Contrary to 1971 data, the 1972 age-length curves indicate that fish at any age in the Norman Wells area and fish older than 3 years in the Arctic Red River area were greater in length than fish from Great Bear Lake or Lake Athabasca (Miller 1946).

The curves for Great Bear, Athabasca and Great Slave Lake fell between the curve for Norman Wells and Fort Simpson in the 3-9 year classes.

Year class strength could not be determined for Aklavik fish since the sample size was too small. In Arctic Red River, 5, 6 and 7 year old fish comprised 22, 42 and 16 percent of the population (Table 33) whereas in Fort Simpson, 2, 3 and 4 year olds made up 22, 27 and 37 percent. In Norman Wells, 34 and 38 percent of the population were in the 4 and 5 year classes, respectively.

Length frequency analysis of index fishing data showed no definite modal length interval in Arctic Red River (Fig. 60). In Norman Wells, catchable grayling were between 120 and 430 mm, the length-frequency polygon showing a trimodal characteristic (330-340, 240-250, 200-220 mm). Fort Simpson fish (160-400 mm) had one mode at 310-320 mm and another at 230-240 mm. Arctic grayling measured from seine hauls ranged from 21-140 mm (Table 41).

The length-weight analysis (Figs. 70 and 73b and Table 42) showed basically that females had a faster growth rate than males in weight relative to length. For the combined (male plus female) curve, the ponderal index increased from 2.74 in Arctic Red River to 3.45 in Fort Simpson, indicating faster growth in weight relative to length in the southern Mackenzie River valley.

Food Habits: About 90 percent of 84 stomachs from gill net caught grayling (119-402 mm in length), contained a wide variety of aquatic and terrestrial insects, the dominant forms being trichopteran, corixid, hymenopteran and dipteran remains. These occurred in approximately 43, 39, 24 and 15 percent, respectively, of the stomachs (Fig. 80). While ostracods only had a 13 percent occurrence, they comprised 23 percent of the total volume. Aquatic insects were predominant, comprising 97.9 percent of the total volume, whereas terrestrial forms only comprised 1.4 percent of the volume. About 2.6 percent of the stomachs contained fish remains and only one species, ninespine stickleback, was identified.

McPhail and Lindsey (1970) reported that grayling taken in the Seward Peninsula, Alaska, had eaten ninespine sticklebacks.

Stomachs of 36 juvenile fish (17-136 mm in length) contained, almost exclusively, aquatic insects, predominantly plecopterans and dipterans (Fig. 81). Chironomidae comprised 45.9 percent of the total number of organisms found and occurred in 58.8 percent of the stomachs. This latter observation is similar to 1971 data; however, only about 9 percent of the 1972 samples had insects of terrestrial origin, in contrast to 49 percent in 1971.

Miller (1940) commented on the opportunistic nature of Arctic grayling since all available food items seem to be utilized. Rawson (1950), while showing a detailed list of insect species found in grayling from north Saskatchewan, reported that such tables obscured cases where some specimens were gorged with a single organism, e.g. Trichoptera. In a chain of small lakes, adjacent to Norman Wells, immature fish caught in July had fed almost exclusively on chironomids.

7.2 Arctic Char, *Salvelinus alpinus* (Linnaeus) and Dolly Varden, *Salvelinus malma* (Walbaum)

Distribution: Because of taxonomic difficulties, Arctic char could not always be separated from Dolly Varden, in which case they were identified as the Arctic char-Dolly Varden complex (Fig. 19). Specimens from this complex were captured further north (in the delta) and further south (Martin River) than they were during 1971 (Hatfield et al. 1972). From 1972 data, the range of Arctic char was extended into the Peel and Big Fish rivers and the Husky and Peel channels, areas which were not extensively sampled during 1971.

Numerical Abundance: Arctic char were found almost exclusively in the Aklavik area, where 826 were caught (Table 3). The Big Fish and Rat rivers were the only systems with significant char populations.

Tagging Program: A total of 578 Arctic char were tagged in the Aklavik area (Table 4), almost entirely in the Big Fish River. Of these, 256 were recaptured, primarily by the domestic fishery.

Two Arctic char runs were observed in this study during August and September, 1972. Of 273 fish tagged on the lower part of Big Fish River (Fig. 49; loc. 1) between August 10 and 16, 52 were recaptured within a week by local fishermen in the vicinity of release. Sixty-nine fish were recaptured at "Fish Hole" in Cache Creek, 80.5 km (50 miles) upstream, between September 19 and November 5. Forty-four percent (117) of 265 char tagged in "Fish Hole" in September were recaptured in the same area.

Forty Arctic char were tagged at "Big Eddy" on the Husky Channel (Fig. 49; loc. 12) between August 29 and September 1. One fish reached the lower Rat River 45 miles away within two weeks, while another had moved in the opposite direction and was caught near Aklavik five days later.

Cache Creek, a tributary of the Big Fish River, near Aklavik, appears to be the major spawning area for Arctic char. Each year, domestic fishermen fish the area intensively with seine nets during October and November. Between 5,000 and 7,000 fish were taken in 1972 by the domestic fishery. Estimates indicate that the population of catchable char in Cache Creek during October and November was between 12,000 and 17,000 fish.

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged char are shown in Table 9.

During August, 1971, a spawning run of Arctic char was observed in Fish Creek, a tributary of the Rat River. Field observations in the delta during 1972 showed that Arctic char migrated from the Beaufort Sea and entered the lower part of the Big Fish River in mid-August, reaching "Fish Hole" on Cache Creek during late September and October (Fig. 49; loc. 3). "Fish Hole" is reported to be the only suitable spawning area in the Big Fish River system wherein the population resides during winter. An Arctic char run was detected at "Big Eddy" on the Husky Channel during late August and early September.

Adult fish of the anadromous form of Arctic char migrate to sea at breakup; however, observations have yet to be made as to the actual date when this occurs.

Spawning and Nursery Areas: Known spawning areas were Cache and Fish creeks (Fig. 14). At "Fish Hole", Cache Creek, char appeared to spawn over fine gravel in pools below rapids, during October, at water temperatures of 0-3 C (32-37 F). In Fish Creek, spawning occurred in a similar habitat during August at a water temperature of 8 C (46 F). McPhail and Lindsey (1970) also reported that char spawn over gravel in pools below rapids during autumn. Major nursery areas were Cache and Fish creeks.

Age and Growth: Because only 15 otoliths were taken for which ages ranged from 4-6 years (Table 16), an age-length relationship could not be drawn for Arctic char. Char from the Aklavik area appeared to grow faster than char from the Rat River (Jessop et al. 1973) and Siberian char (Berg 1948-49). Minimum age at maturity appeared to be 4 years for Aklavik char which was slightly lower than the 5-6 years reported for Rat River char (Jessop et al. 1973). Char from the Kara River, Siberia matured at 3-4 years of age (Nikolsky 1961). Arctic char caught in gill nets in the Aklavik area ranged from 311-500 mm in length (Fig. 61). Char caught in seines in the Aklavik area ranged from 61-80 mm (Table 41).

Length-weight relationships for male and female Arctic char were similar.

Food Habits: Stomachs of 21 Arctic char (228-545 mm) caught in gill nets were all empty (Table 43). A high incidence of empty stomachs in mature migrant Arctic char was similarly reported by McCart, Craig and Bain (In Press) and Jessop et al (1973). In contrast, juvenile char (35-132 mm) from the Aklavik area fed extensively, mainly upon chironomids and plecopterans (Table 44). Nilsson (1965) found that young char fed mainly upon amphipods and insect larvae.

7.3 Lake Trout, Salvelinus namaycush (Walbaum) and Chum Salmon, Oncorhynchus keta (Walbaum)

Distribution: Lake trout were captured at scattered locations throughout the Mackenzie system (Fig. 18). There was no significant change from the distribution reported by Hatfield et al. (1972).

During 1972, several chum salmon were caught at scattered locations throughout the delta and lower Mackenzie River as far south as Norman Wells (Fig. 18). During 1971, only one chum salmon was captured, but during 1972 the delta was sampled more extensively (Fig. 3). McPhail and Lindsey (1970) reported that small runs of chum salmon ascend the Mackenzie River to Great Slave Lake.

Numerical Abundance: During 1972, eight lake trout were captured in a lake west of Arctic Red River (Table 3). Ten chum salmon were captured in the Mackenzie River in the Arctic Red River study area, while one was caught in the Peel and one in the Mackenzie at Norman Wells (Table 3).

Tagging Program: No lake trout or chum salmon were tagged.

Migration Routes and Timing: Since no tagging was done on these species, migration routes and timing remain unknown. Catches of chum salmon indicated that they migrated upstream in the Mackenzie during late August and September as reported by McPhail and Lindsey (1970).

Spawning and Nursery Areas: No spawning areas of lake trout were found. Great Bear River (Fig. 50) was the only nursery area located. No spawning or nursery areas were found for chum salmon.

Age and Growth: No aging was done on lake trout. Four chum salmon (607-700 mm in length) caught in gill nets were all mature with ages ranging from 3-4 years (Table 15). Similarly, Yukon River chums mature at 3-5 years of age and return to the river to spawn (McPhail and Lindsey, 1970).

Food Habits: Stomachs of seven lake trout (388-525 mm in length), caught in a lake west of Arctic Red River, contained mainly copepods, corixids and fish remains (Table 43). No stomachs of chum salmon were analysed.

7.4 Inconnu, Stenodus leucichthys nelma (Pallas)

Distribution: During 1972, inconnu were found throughout the Mackenzie system (Fig. 20).

Numerical Abundance: Inconnu generally decreased in abundance in the catch from the north (Aklavik, N = 502) to the south (Fort Simpson, N = 154) (Table 3). Catch per unit effort gradually increased during early summer at all bases, peaking during July in the north (Figs. 45 and 46), early August in Norman Wells (Fig. 47) and late August in Fort Simpson (Fig. 48). Following these peaks, catch per unit effort decreased until the termination of index sampling.

Tagging Program: Tagging of inconnu was concentrated in the Aklavik and Arctic Red River areas, where 233 and 127 fish were tagged, respectively (Tables 4, 5, 6, 7 and 8). Of these, 14 and 26 were recaptured, respectively.

Only two inconnu were recaptured from fish tagged in the delta area. One fish tagged at Big Fish River (Fig. 49; loc. 1) was recaptured in the Peel Channel (loc. 7) in late October, 88.5 km (55 miles) upstream. The second fish, caught in Arctic Red River, had moved 61.1 km (38 miles) in 9 days from Frog Creek (loc. 15).

Twenty tag returns from the Arctic Red River base showed considerable movement. Nine of these fish, released in the vicinity of Arctic Red River (loc. 17) between July 26 and August 29, had reached the Fort Good Hope area between August 18 and October 13. Two fish tagged at Pierre Creek (loc. 19) travelled 530.1 km (330 miles) to Norman Wells between July 28 and September 14. One fish released at the mouth of the Peel in July had moved 61.1 km (38 miles) up the Peel within a month.

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged inconnu are shown in Tables 9, 10 and 11. As previously mentioned, catches of inconnu peaked from July in the north to late August in Fort Simpson (Figs. 45, 46, 47 and 48). This probably indicates an upstream migration in the Mackenzie River from the sea. From the delta to Norman Wells, the peaks in catch per unit effort generally corresponded with an increase in the number of ripe fish. The absence of ripe fish in the Fort Simpson area suggests that the migration does not reach the upper Mackenzie River. Tag returns also indicate upstream migrations of this species in the main stem Mackenzie as far as Norman Wells, as well as in the Peel and Arctic Red rivers. This upstream migration takes place over several summer months as described by McPhail and Lindsey (1970).

While tag returns did not show a post-spawning movement, the presence of spent fish in catches made during the first two weeks of October near the town of Arctic Red River corresponded with local reports of an annual downstream run out of the Arctic Red River. Some fish caught in the Peel and Mackenzie River in October and November were spent and emaciated. The downstream run in the Peel River, according to residents, is significant and occurs after freeze-up in early October.

Information on the actual times and secondary routes of inconnu movements in the upper Mackenzie River is still lacking.

Since no ripe inconnu were caught in the Fort Simpson area and since fish tagged in the delta were recaptured only as far upstream as Norman Wells, it appears probable that inconnu from the upper Mackenzie are a local population and are not anadromous. They are possibly part of the Great Slave Lake population described by McPhail and Lindsey (1970).

Inconnu were caught during early March at the mouth of the Liard River (Fig. 7), indicating a possible overwintering area.

Spawning and Nursery Areas: No spawning areas were located. Tributaries of the Peel and Arctic Red rivers (Fig. 14) are suspected spawning areas. Inconnu spawned over gravel in clear tributaries of the Yukon River during late September and early October at water temperatures of 3-5 C (37-41 F) (Alt 1969). A few inconnu fry were captured in the Rengleng River, Peel River, Mackenzie River at Arctic Red River, Pierre Creek (Fig. 14) and Oscar Creek (Fig. 15). It is probable that young inconnu are carried by spring floods to the lower reaches of the rivers or into brackish water, where the early years of life are spent (Alt 1969).

Age and Growth: Ages of inconnu ranged from 0-22 years (Fig. 53). Growth rates were similar for all areas with inconnu from the Fort Simpson and Arctic Red River areas exhibiting the fastest growth. Growth rates (Table 17) were slower than those reported by Fuller (1955) for Great Slave Lake and by Berg (1948-49) for Siberian forms. However, they compared favourably with those reported by Alt (1969) for Alaskan forms. Maximum ages determined were 22 (987 mm), 18 (903 mm), 17 (785 mm) and 7 (555 mm) for the Aklavik, Arctic Red River, Norman Wells and Fort Simpson areas, respectively. This would also indicate a local population in the Fort Simpson area. Minimum age at maturity was 6 years, which is slightly lower than the 7-10 years reported for inconnu from the Yenesei River (Nikolsky 1961). Year class strength exhibited considerable variation from north to south. In the Aklavik and Arctic Red River areas it was estimated that age classes 9-13 comprised 57.0 and 64.0 percent of the catchable populations, respectively (Table 34). In contrast, in the Norman Wells and Fort Simpson areas, age classes 3-5 were dominant, comprising an estimated 55.3 and 63.7 percent of the catchable populations, respectively.

Length-frequency distributions for inconnu caught in gill nets in the Aklavik and Arctic Red River areas had major modes at 691-750 mm while those from the Norman Wells and Fort Simpson areas had major modes at 211-270 mm (Fig. 62). From these distributions and year class strengths, it appears possible that catches in the north consist mainly of large spawners of the anadromous population, while in the Norman Wells and Fort Simpson areas there is a local population in which fish are relatively small in size and short-lived. Alternatively, it may be that the upper Mackenzie River serves as a nursery area for this species. In the Norman Wells area, the average size of inconnu captured increased with time during the summer. This increase was probably due to the influx of larger spawners from the anadromous population of the lower Mackenzie River. Inconnu caught in seines ranged from 31-110 mm (Table 41).

Length-weight relationships exhibited no consistent differences between males and females (Fig. 71 and Table 42). Ponderal indices were generally similar for all bases, except Fort Simpson, where they were considerably higher. This could again indicate a local population for this area with a faster growth in weight relative to length. Ponderal indices by sex and maturity are given in Table 42.

Food Habits: Of 212 stomachs of inconnu (147-894 mm in length) caught in gill nets, 45 percent were empty. The others analysed contained predominantly fish remains, of which ninespine sticklebacks, northern pike, ciscoes and whitefish were the major species identified (Fig. 82 and Table 45). Invertebrates were also consumed to a minor extent. In stomachs of 12 juvenile inconnu (42-110 mm in length) caught in seines, insect remains (including ceratopogonids, baetids and corixids), mysids and fish remains were the major food items (Fig. 83). There were no empty stomachs in the juvenile samples. Similarly, Alt (1965) reported that insect larvae were the most important food of young inconnu from the Yukon River, while larger fish were primarily piscivorous.

7.5 Humpback Whitefish, Coregonus clupeaformis (Mitchill)

Distribution: Humpback whitefish were distributed throughout the entire Mackenzie River drainage (Fig. 21).

Numerical Abundance: This species was most abundant in the Aklavik, Arctic Red River and Fort Simpson areas where the numbers caught were 1266, 1391 and 637, respectively (Table 3). In the Aklavik area, catch per unit effort generally decreased from May to September, whereas in the Arctic Red River area, it increased during this period (Figs. 45 and 46). In the Norman Wells and Fort Simpson areas, catch per unit effort did not change significantly throughout the season (Figs. 47 and 48).

Tagging Program: In the Aklavik and Arctic Red River areas, where tagging of this species was concentrated, 616 and 823 were tagged, respectively (Tables 4 and 5). Of these, there were 63 recaptures from each area. In the Norman Wells area, 35 whitefish were tagged with one recapture, while in the Fort Simpson area, 97 were tagged with six recaptures (Tables 7 and 8).

Two fish released in late August at the mouth of Big Fish River (Fig. 49; loc. 1) were recaptured upstream in the Peel River, 9-13 days later, the distance travelled being 119.0 km (74 miles). From a run of fish tagged at Horseshoe Bend (loc. 10) on September 13-15, one was recovered at Arctic Red River after 41 days while another was recaptured at Aklavik on November 14. Tagging of humpback whitefish in late October in the Aklavik Channel (loc. 9) produced three tag returns downstream in the West Channel (loc. 5 and 6).

Tag returns from the Arctic Red River base showed downstream movement. Five fish caught at Arctic Red River (loc. 17) during the fall had been tagged upstream in August at Tree River (loc. 21) and Thad's Creek (loc. 20). Two fish from location 20 were caught in the Peel River 8-63 days after release. Of fish tagged in August at Arctic Red River and Tree River, two were recaptured at Horseshoe Bend (October 4-8), two at Aklavik (October 4-8) and three in the Aklavik Channel in mid-November.

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged fish are shown in Tables 9, 10, 12 and 13.

Catch per unit effort data indicated an increasing abundance of humpback whitefish in the Arctic Red River area during late summer coincident with a decreasing abundance in the Aklavik area (Figs. 46 and 45). Catch and tag return data therefore indicated an upstream run of humpback whitefish along the main stem of the Mackenzie River and in major delta channels by mid-September. A heavy concentration of ripe fish was prevalent near Arctic Red River in the first week of October. There appeared to be no significant run of humpback whitefish up the Peel River during the fall.

Domestic catches and tag returns indicated that spent humpback whitefish moved downstream from the Arctic Red River area, past the Aklavik area in late October and early November. Data were insufficient to indicate clearly the movement of humpback whitefish in either the Norman Wells or Fort Simpson areas.

Humpback whitefish were captured during early March at the mouths of the Martin and Liard rivers (Fig. 7), indicating possible overwintering areas.

Spawning and Nursery Areas: Catches of both ripe and spent fish peaked during early October in back eddies of the Mackenzie River near Arctic Red River, indicating possible spawning areas. In Great Slave Lake, spawning occurred from mid-September to mid-October over rocky shoals or in the shallows of tributaries (McPhail and Lindsey, 1970).

Because of identification difficulties with whitefish fry, nursery areas for humpback and broad whitefish have been combined. Important nursery areas included the Rengleng River, Frog Creek, Tsital Trein Creek (Fig. 14), Travaillant River

(Fig. 1), Carcajou River, Oscar Creek, Loon Creek, Stewart Creek, Prohibition Creek, Vermilion Creek, Little Bear River (Fig. 15), Blue Fish Creek, Martin River, Harris River, Rabbitskin River and Spence River (Fig. 16). Back eddies of the Mackenzie were also important nursery areas, particularly at Point Separation (Fig. 14) and at Slater River (Fig. 15).

Age and Growth: Ages of humpback whitefish ranged from 0-16 years (Fig. 54). Growth rates were similar for all areas except for whitefish over 4 years old from the Fort Simpson area which exhibited a faster growth rate. Growth rates for the Mackenzie system (Table 18) were faster than those reported for Lake Superior (Edsall 1960), but slower than those reported for Lake Huron (Van Oosten 1939). Minimum age at maturity ranged from 7-11 years, which is similar to the 8 years reported for Great Slave and Great Bear lakes (McPhail and Lindsey 1970).

Year class strength exhibited considerable variation from north to south. In the Aklavik area, year classes 6-10 were dominant, comprising an estimated 75.0 percent of the catchable population. Since most of the catch in the Arctic Red River area was made during the spawning run, the distribution was peaked with age classes 9 and 10 comprising an estimated 64.0 percent of the catchable population. In contrast, in the Norman Wells and Fort Simpson areas, year classes 3-6 were dominant, comprising an estimated 48.7 and 48.6 percent of the catchable populations, respectively (Table 35).

Length-frequency distributions for humpback whitefish caught in gill nets in the Aklavik and Arctic Red River areas had major modes at 401-450 mm, while those from the Fort Simpson area had a major mode at 151-210 mm (Fig. 63). Numbers caught at Norman Wells were too small to show modes. From the length distributions and year class strengths, it seems possible that either there is a local population in the Norman Wells and Fort Simpson areas, with a different age class structure, or that the upper Mackenzie River serves as a nursery area for this species. Humpback whitefish caught in seines ranged from 21-190 mm (Table 41).

Length-weight relationships showed no consistent differences between males and females (Fig. 72 and Table 42). Ponderal indices in the Arctic Red River and Aklavik areas were similar, and compared well with the 3.333 reported for Great Slave Lake by Kennedy (1953). However, the indices for these northern areas were considerably higher than those for the Norman Wells area and much lower than those for the Fort Simpson area. This may again indicate local populations in the upper Mackenzie River with different growth patterns from populations of the lower Mackenzie. There may also be taxonomic differences between these populations. In support of this, one specimen from the Fort Simpson area was found to have an unusually high gill raker count (35) and a low lateral line scale count (67) (McAllister, pers. comm.), which are both outside the range given for this species by McPhail and Lindsey (1970).

<u>Food Habits</u>: Of 345 stomachs of humpback whitefish (149-562 mm in length) caught in gill nets, 79 percent were empty. Major food items consumed were molluscs (including pelecypods and gastropods), corixids, chironomids and dytiscids (Fig. 85). Humpback whitefish from Squanga Lake, Yukon had similar feeding habits (McPhail and Lindsey 1970). In stomachs of 42 juveniles (28-165 mm in length) caught in seines, insect remains, chironomids, ceratopogonids, ephemeropterans and ostracods were the major food items (Fig. 86). Fourteen percent of these stomachs were empty. Sixteen humpback whitefish (290-410 mm in length) caught in delta lakes fed mainly upon molluscs (including gastropods and pelecypods), trichopterans and ostracods (Table 45). In contrast to the Mackenzie River system, only 25 percent of the stomachs were empty, indicating that these lakes may be important feeding areas for this species.

7.6 Broad Whitefish, Coregonus nasus (Pallas)

Distribution: During 1972, broad whitefish were to be found distributed throughout the lower Mackenzie River system as far south as the Arctic Red River (Fig. 22). They were also captured at scattered locations in the upper Mackenzie River as far south as Fort Simpson. This is a slight range extension beyond the Camsell Bend southern limit reported by McPhail and Lindsey (1970).

Numerical Abundance: Broad whitefish generally decreased in catch from the north (Arctic Red River, N = 1307) to the south (Fort Simpson, N = 0) (Table 3). In the Aklavik area, catch per unit effort decreased during the May to July period, after which it remained relatively constant until late summer when it increased slightly (Fig. 45). In contrast, in the Arctic Red River area, it increased steadily throughout the summer (Fig. 46). Catch per unit effort at Norman Wells peaked during early summer with a subsequent decline (Fig. 47).

Tagging Program: Tagging of broad whitefish was almost exclusively in the Aklavik and Arctic Red River areas where 470 and 807 fish were tagged, respectively (Tables 4, 5 and 7). Of these, 74 and 219 were recaptured, respectively.

Fifteen fish released at Horseshoe Bend (Fig. 49; loc. 10) on September 13-14 were recaptured at Arctic Red River on November 8-11, 104.6 km (65 miles) upstream. Fourteen fish recaptured near the town of Arctic Red River had been released in July and August at upstream locations such as Pierre Creek (loc. 19), Thad's Creek (loc. 20), and Tree River (loc. 21). Several other fish tagged at these locations were recovered in the Peel River (loc. 16) in September. Two fish had travelled as far upstream as Fort Good Hope, 301.5 km (188 miles) within 21-26 days after their release at Arctic Red River in early September. Nine fish released at Arctic Red River in late October were recovered in the delta, 4-20 days later.

Movements, Migration Routes and Timing: Distances travelled and time between release and recovery of tagged broad whitefish are given in Tables 9 and 10. Broad whitefish moved upstream during late August, as suggested in Figures 45 and 46. Field observations and tag recapture data indicated that the run peaked during September and October. Fish were abundant near Arctic Red River between October 16 and November 10 with peak catches occurring November 3-5. Rapid decrease in total catches after this date coincided with a greater percentage of spent fish per catch.

Tag returns from the delta during the first two weeks of November indicated that the downstream post-spawning migration began during this period. It appeared that the Middle Channel was utilized by the greatest portion of the broad whitefish run. Significant numbers of fish were also found in the Aklavik and West channels during the second week of November.

Spawning and Nursery Areas: Back eddies of the Mackenzie River at the mouth of the Arctic Red River appeared to be spawning areas. Many ripe adults were recaptured at the mouth of the Arctic Red River, within a few days of tagging, indicating holding and possible spawning. Numbers of ripe and spent broad whitefish in catches peaked after freeze-up during late October at a water temperature of 0 C (32 F). This is considerably later than the August spawning run previously reported for this species in the Mackenzie River (Wynne-Edwards 1952). However, it corresponds with the spawning period reported by Berg (1948-49) for broad whitefish in Siberia. Because of identification difficulties with whitefish fry, nursery areas for broad and humpback whitefish are presented in the humpback whitefish section (7.5).

Age and Growth: Ages ranged from 0-15 years (Fig. 55). Growth rates were similar for the Aklavik and Arctic Red River areas, with fish older than 3 years of age from the latter area showing slightly faster growth. In contrast, the growth rate in the Norman

Wells area was much slower. Growth rates in the lower Mackenzie (Table 19) were similar to those reported for the Kolyma River in Siberia (Berg, 1948-49). However, growth was slightly faster than that for the Mackenzie River given by Muth (1969). The maximum age of 15 for the present study compared well with that determined for the Mackenzie by Muth (1969), but was lower than the maximum age of 18+ from the Coppermine River where growth is much slower.

Year class strength exhibited considerable variation from north to south. In the Aklavik and Arctic Red River areas, it was estimated that age classes 9 and 10 comprised 44.7 and 50.9 percent of the catchable populations, respectively (Table 36). Few fish under 4 years of age were taken in these areas. Muth (1969) similarly took few broad whitefish under 4 years of age in the Mackenzie and Coppermine rivers. In contrast, in the Norman Wells area, age classes 1-3 were dominant, but sample size was small.

The length-frequency distribution for broad whitefish caught in gill nets in the Aklavik area had a major mode at 431-510 mm, while the major mode from the Arctic Red River distribution was at 461-540 mm (Fig. 64). In contrast, in the Norman Wells area, the major mode was 161-170 mm, but sample size was small.

From these distributions and year class strengths, it appears that the Norman Wells area may serve as a nursery area, although numbers caught were small. Broad whitefish caught in seines ranged from 21-150 mm (Table 41).

Length-weight relationships exhibited no consistent differences between males and females (Fig. 73 and Table 42). Similarly, Muth (1969) found no significant sexual difference in the length-weight relationships for broad whitefish from the Mackenzie River. Ponderal indices were similar for all areas ranging from 3.15 to 3.27. These were similar to the 3.41 found by Muth (1969) for the Mackenzie River.

Food Habits: Of 325 stomachs of broad whitefish (155-639 mm in length) caught in gill nets in the Mackenzie River system, 87 percent were empty. Major food items were molluscs (including gastropods and pelecypods), corixids, trichopterans and chironomids (Fig. 84). These feeding habits are similar to those described for Siberian broad whitefish by Nikolsky (1961). In the stomachs of 13 juvenile broad whitefish (38-147 mm) caught in seines in the Mackenzie River system, insect remains including dipterans and corixids were the major food items (Fig. 83). Thirty-eight percent of these stomachs were empty. Stomachs of 27 broad whitefish (156-520 mm in length) from delta lakes contained predominant food items similar to those sampled from the river (Table 45); however, the percentage of empty stomachs (41 percent) was much lower than in the river, indicating that the lakes may be important feeding areas. Nikolsky (1961) found that broad whitefish usually fed in lakes connected with river channels in Siberia.

7.7 Round Whitefish, *Prosopium cylindraceum* (Pallas)

Distribution: During 1972, round whitefish were found throughout the Mackenzie system (Fig. 23). The range reported during 1971 by Hatfield et al. (1972) was extended into the Norman Wells and delta areas.

Numerical Abundance: Abundance of this species in catches was low for all areas of the Mackenzie River, with maximum numbers in the Aklavik and Norman Wells catches (N = 23 at both bases) (Table 3). This low abundance in catches may be explained by their preference for swift currents in clear headwater regions (Kennedy 1949). Such areas were not extensively sampled. Catch per unit effort for the Aklavik area could not be plotted because of small sample size. In the Norman Wells area, round whitefish were not caught until late August, after which catch per unit effort remained constant (Fig. 47). In the Fort Simpson area, this species was first caught during late June, after which catch per unit effort remained relatively constant (Fig. 48).

Tagging Program: Only 19 round whitefish were tagged in the entire Mackenzie system, of which three were recaptured (Tables 4, 6, 7 and 8).

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes.

Spawning and Nursery Areas: No spawning or nursery areas were located for round whitefish.

Age and Growth: Ages of round whitefish ranged from 0-15 years (Table 20). Sample sizes were too small to enable comparison of growth rates between different areas of the Mackenzie River system. Growth rates for the Mackenzie system were comparable to those reported for Great Slave Lake (Rawson 1951), but were much faster than those for the Ungava Bay area (Mackay and Power 1968).

Minimum age at maturity was 8 years, slightly higher than the 6-7 reported for Great Slave Lake (Kennedy 1949). Round whitefish caught in gill nets ranged from 151-436 mm, while those caught in seines ranged from 31-60 mm (Table 41). Ponderal indices ranged from 2.25 in the Fort Simpson area to 3.27 in the Norman Wells area, but sample sizes were small (Table 42).

Food Habits: Stomachs of 20 round whitefish (163-432 mm in length) caught in gill nets contained predominantly insect remains (including dipterans, plecopterans and trichopterans) and plant material (Table 43). Similarly, benthic insects were reported to be the major food of this species in Siberian rivers (Nikolsky 1961). Thirteen round whitefish (30-137 mm in length) caught in seines contained mainly insect remains (including dipterans, ephemeropterans, plecopterans and trichopterans) Table 44).

7.8 Mountain Whitefish, *Prosopium williamsoni* (Girard)

Distribution: Mountain whitefish were recorded in the Norman Wells and Fort Simpson areas (Fig. 24). This is a significant extension of the northern distribution range from the Stikine and upper Liard rivers, determined by McPhail and Lindsey (1970). It is suspected that the mountain whitefish entered the Mackenzie River by way of the Liard drainage.

Numerical Abundance: No adults were caught in the Norman Wells area. However, single juveniles were caught in seines at the mouths of Oscar and Canyon Creeks and Brackett River. Three juveniles were caught in Big Smith Creek. A total of 75 adults and four juveniles were caught in the Fort Simpson area.

Tagging Program: Seventeen mountain whitefish were tagged in the Fort Simpson area (Table 8). One of these was recaptured 22 days later 31 km (19 miles) downstream from point of release (Table 13).

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes.

Spawning and Nursery Areas: A small spawning run of mountain whitefish occurred in the Rabbitskin River (Fig. 16) from September 12 - October 4 (Jessop et al. 1973), and it is suspected that spawning occurred in Jean-Marie Creek. No nursery areas were found. Suspected nursery areas were the mouths of Rabbitskin River, Jean-Marie Creek, Martin River (Fig. 16) and back eddies in the Mackenzie River.

Age and Growth: Mountain whitefish caught in gill nets ranged in age from 4-16 years (Table 21) with a mean age of 8.3 years. Of the fish aged, the minimum age of maturity was 4 years for both females and males. The growth rate is similar to that found for mountain whitefish in Cultus Lake, Ghost River reservoir and Hoback River (McHugh 1941). The growth rate in Phelps Lake, Wyoming (Hagen 1956) is considerably slower than that found for mountain whitefish in the Mackenzie River system.

Mountain whitefish caught in gill nets ranged in length from 200-460 mm. The length distribution of fish caught in seines is given in Table 41.

Food Habits: The stomachs of eight mountain whitefish (318-446 mm in length) caught in gill nets contained predominantly trichopteran and plecopteran remains, perlodids and phryganeids (Table 43). The stomach contents of six mountain whitefish (36-90 mm in length) caught in seines were predominantly chironomids, simulids and baetids (Table 44).

7.9 Arctic Cisco, *Coregonus autumnalis* (Pallas)

Distribution: During 1971 and 1972, Arctic cisco were found throughout the lower Mackenzie River system, as far south as Fort Simpson (Fig. 25). This is a slight range extension over that reported by McPhail and Lindsey (1970), who reported it only as far south as Camsell Bend.

Numerical Abundance: During 1972 Arctic cisco decreased in catch abundance from the north (Aklavik, N = 2599) to the south (Fort Simpson, N = 0) (Table 3). Catch per unit effort in the Aklavik area gradually decreased from a maximum in late May to a minimum at the termination of index sampling in early September (Fig. 45). In contrast, in the Arctic Red River and Norman Wells areas, it increased from zero in late May to a maximum in midsummer (Figs. 46 and 47), after which it decreased until the termination of index sampling.

Tagging Program: Tagging was concentrated in the Aklavik and Arctic Red River areas where 1664 and 501 cisco were tagged, respectively (Tables 4, 5, 6 and 7). Of these, 74 and eight were recaptured, respectively.

Almost all Arctic cisco tag returns in the Aklavik area came from local people fishing in the immediate vicinity of the release site (Fig. 49; loc. 7). Two fish, released in mid-August in the Peel River below Fort McPherson, were recaptured near Aklavik, 30-50 days later.

Of fish tagged in the first week of August at Arctic Red River (loc. 17), two were caught at Aklavik after two to three months, while a third was recaptured at the mouth of the Peel River after only a few days.

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged cisco are shown in Tables 9, 10, 11 and 12. While catch per unit effort of cisco in the Aklavik area was decreasing during early summer, in the Arctic Red River and Norman Wells areas catch per unit effort increased from zero in late May to a maximum in early August (Figs. 45, 46 and 47). This indicated an upstream movement of Arctic cisco during the summer. Significant numbers of ripe Arctic cisco appeared in Norman Wells on August 2 on their way to suspected spawning grounds in the Great Bear River and its tributaries. In the Peel River, an upstream run peaked during August at the mouth and during September at a location 72 km (45 miles) upstream.

Post-spawning runs down the Arctic Red River, Peel River and Peel Channel occurred between October 6 and 26. Fish at this time were spent and noticeably emaciated.

Spawning and Nursery Areas: No spawning areas were located. Suspected spawning areas were tributaries of the Arctic Red, Peel (Fig. 14), Mountain and Great Bear (Fig. 15), rivers. Large numbers of mature cisco ascended these rivers during July and August. In Siberia, spawning occurred over gravel in clear tributaries of major rivers during late summer and early autumn (Berg 1948-49). A downstream migration of spent cisco was noted in the Peel Channel at Aklavik (Fig. 14) during early October, similar to that described by Wynne-Edwards (1952) for the Mackenzie River. Some spent cisco were caught at the mouth of the Arctic Red River during this period.

Because of identification difficulties with cisco fry, nursery areas for both Arctic and least cisco are combined. Major nursery areas included Peel Channel at Aklavik, Mackenzie River at Point Separation, Peel River and tributaries including Frog Creek, Stony Creek, Satah River and seven unnamed streams (Fig. 14; loc. 1-7), Vermilion Creek (Fig. 15) and Spence River (Fig. 16).

Age and Growth: Ages ranged from 0-11 years. Growth rates for the Aklavik and Arctic Red areas were almost identical (Fig. 56), while cisco from the Norman Wells area appeared to grow faster at ages 6-8 years and slower at ages 9-11 years than those from the two northern areas. However, only eight cisco were aged in year classes 9-11 for the Norman Wells area. Growth of Arctic cisco in the Mackenzie River system (Table 22) is considerably slower than that reported for the Yenesei River, Siberia (Berg 1948-49). Minimum age at maturity in the current study was 7 years which is slightly higher than the 5 years reported for Siberian cisco (Berg 1948-49). The dominant age classes in all areas were 7 and 8, which comprised an estimated 81.3, 91.7 and 71.1 percent of the catchable populations in the Aklavik, Arctic Red River and Norman Wells areas, respectively (Table 37). Dominant age groups among upstream migrants in the Yenesei River were 5+ and 6+ (Berg 1948-49). Few fish in age classes 2-6 were captured in the Mackenzie River system. Similarly, in the Kolyma River, Siberia, no young or sexually immature cisco are ever found except young-of-the-year migrating downstream (Berg 1948-49).

Length-frequency distributions for Arctic cisco caught in gill nets in the Aklavik, Arctic Red River and Norman Wells area had similar major modes at 361-400 mm (Fig. 61). Arctic cisco caught in seines ranged from 21-100 mm in length (Table 41).

Female cisco had higher ponderal indices than males in the Arctic Red River and Norman Wells areas (Fig. 74 and Table 42). One would expect this due to the large size of the ovaries compared to the testes in mature cisco. However, in the Aklavik area, the opposite was true.

Food Habits: Of 271 stomachs of Arctic cisco (191-434 mm in length) examined, 97 percent were empty. In those stomachs containing food, corixids, plecopterans, fish eggs and fish remains were the major food items (Fig. 87). McPhail and Lindsey (1970) reported that adult cisco feed mainly on crustaceans and small fishes. Of 23 stomachs of juvenile cisco (32-85 mm in length) examined, 17.4 percent were empty. The others contained predominantly chironomids, cladocerans, ephemeropterans and ostracods (Fig. 87).

7.10 Least Cisco, Coregonus sardinella (Valenciennes)

Distribution: Least cisco were distributed throughout the Mackenzie system as far south as the Spence River (Fig. 26), which is a slight extension of the Fort Simpson southern limit reported by McPhail and Lindsey (1970). During 1972, its range was extended into the Norman Wells and Fort Simpson areas where it was not found in 1971 by Hatfield et al. (1972).

Numerical Abundance: Least cisco were most abundant in the Aklavik and Arctic Red River areas where 533 and 755 were caught, respectively (Table 3). In the Aklavik and Arctic Red River areas, catch per unit effort remained relatively constant until late August when it increased significantly as the spawning run began (Figs. 45 and 46). In the Norman Wells area, catch per unit effort peaked during late June, but sample size was small, as it was in Fort Simpson where no trends were evident (Figs. 47 and 48).

Tagging Program: Tagging of this species was conducted almost exclusively in the Aklavik, Arctic Red River and Fort McPherson areas where 81, 336 and 18 cisco were tagged respectively (Tables 4, 5, 6, 7 and 8). Of these, only 11 least cisco were recaptured. Most of these returns were recovered close to the release point, within a day by domestic fishermen. Two of the fish tagged in the Peel River during September were recaptured downstream. One of these was caught in the Husky Channel (Fig. 49; loc. 13), the day after its release near Eight Mile Creek (loc. 18).

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged least cisco are shown in Tables 9 and 11. In the Aklavik area, catches increased during the last two weeks of August (Fig. 45) when an upstream migration occurred through the delta. Catches began to increase in late August at Arctic Red River (Fig. 46), and peaked around October 15. The sporadic nature of catches suggested that this species may travel in large schools. Suspected migration routes include the Mackenzie and

Peel rivers. However only small numbers of least cisco appeared in the Peel River domestic catch, probably due to the use of gill nets no smaller than 8.9 cm (3.5 inches). No information was obtained this year on the downstream movements of least cisco.

Spawning and Nursery Areas: No spawning areas were located. Runs of ripe fish were noted in the Peel and Husky channels, Peel and Mackenzie rivers (Fig. 14) during late September and early October at water temperatures of 1-1.5 C (34-35 F). In Alaska, spawning was observed in swift, clear water over gravel with some sand at 0-2 C (32-36 F) (Alt, pers. comm. 1971). In Siberia, least cisco spawned under the ice, over sand and gravel in the lower reaches of rivers (Berg 1948-49).

Because of identification difficulties with cisco fry, nursery areas for both Arctic and least cisco are presented in the Arctic cisco section (7.9).

Age and Growth: Ages ranged from 0-12 years (Fig. 57). Growth appeared to be considerably faster in the Aklavik area than in the Arctic Red River area. Growth rates for the Mackenzie River system (Table 23) were considerably slower than those reported for the Lena River, Siberia (Berg 1948-49), but compared favourably with those of Alaskan ciscoes (Cohen 1954). Minimum age at maturity for the Mackenzie River system is generally 5 years which is similar to the 5-6 years reported for the Kolyma River (Berg 1948-49). Year classes 6-8 were dominant in the Aklavik and Arctic Red River areas, where they comprised an estimated 69.8 and 68.7 percent of the catchable populations, respectively (Table 38). Sample sizes in the Norman Wells and Fort Simpson areas were too small to speculate upon year class strengths. Few fish under 4 years of age were caught, except in the Aklavik area.

Length-frequency distributions for least cisco caught in gill nets in the Aklavik and Arctic Red River areas had major modes at 271-280 mm (Fig. 65). Sample sizes in the Norman Wells and Fort Simpson areas were too small to show distinct modes. Least cisco caught in seines ranged from 21-100 mm in length (Table 41).

Ponderal indices were considerably higher for females than for males in all areas except Norman Wells where sample size was small (Fig. 75 and Table 42). One would expect this as the ovaries are very large compared to the testes in mature cisco.

Food Habits: Of 343 stomachs of least cisco (154-391 mm in length) caught in gill nets in the Mackenzie River system, 80 percent were empty. Major food items included ostracods, corixids, dipterans, coleopterans, amphipods and mysids (Fig. 88). Very few stomachs containing food were found during the spawning run, which is in accord with findings in Siberia that adults do not feed at this time (Berg 1948-49). He reported that amphipods and copepods were the main food of cisco in the Gulf of Yenesei, Siberia. In stomachs of 20 juvenile least cisco (26-68 mm in length) caught in seines in the Mackenzie River system, copepods, ostracods and chironomids were the major food items (Fig. 89). Ten percent of these stomachs were empty. Stomachs of 13 least cisco (171-308 mm in length) from delta lakes contained mainly corixids and ostracods (Table 45). The percentage of empty stomachs (46 percent) was much lower than in the river, indicating that these lakes may be important feeding areas for this species.

7.11 Lake Cisco, Coregonus artedii (LeSueur)

Distribution: The range of the lake cisco was extended from Great Bear Lake (McPhail and Lindsey 1970) to Pierre Creek (Fig. 27). A single specimen was taken in the Liard system at Manner's Creek.

Numerical Abundance: Ten lake cisco were caught in the Norman Wells area and 19 in the Fort Simpson area (Table 3). No concentrations of this species were found in either area.

Tagging Program: Two lake cisco were tagged in the Norman Wells area and four in the Fort Simpson area. There were no recaptures.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes. Adult lake cisco were generally found at the mouths of tributaries.

Spawning and Nursery Areas: No spawning or nursery areas were found. Spawning usually occurs in the fall over sandy or gravel shallows (McPhail and Lindsey 1970).

Age and Growth: In the Norman Wells area, lake cisco caught in gill nets ranged in age from 4-9 years (Table 24); whereas, in the Fort Simpson area the maximum age was 6 years. The minimum age of maturity could not be determined. However, 3 and 4 year old fish had moderate gonadal development.

Lake cisco caught in gill nets in the Norman Wells area ranged from 171-420 mm, while those from Fort Simpson ranged from 161-330 mm. The length distribution of lake cisco caught in seines is presented in Table 41.

Food Habits: The stomach contents of eight lake cisco 146-415 mm) contained predominantly fish remains (Table 43). This is in contrast to data collected by Hatfield et al. (1972) where insects dominated in occurrence and by volume.

7.12 Bering Cisco, *Coregonus lauretta*e (Bean)

Distribution: Three juvenile ciscoes, taken from a lake in the Willow River drainage (Fig. 3), were keyed out, using gill raker counts, to Bering cisco. The specimens were sent to the National Museum in Ottawa; however, their small size and the difficulty of counting scales, pyloric caeca and vertebrae made it impossible to obtain a positive identification.

No further data were obtained for this species.

7.13 Northern Pike, *Esox lucius* (Linnaeus)

Distribution: Northern pike were found throughout the Mackenzie River system from Great Slave Lake to the Mackenzie delta (Fig. 28).

Numerical Abundance: The catch per unit of effort (Figs. 45, 46 and 48) indicates that the abundance of northern pike is similar in the Aklavik, Arctic Red River and Fort Simpson study areas. However, northern pike made up 45 percent of the total catch at Fort Simpson but only 15 and 10 percent of the total catch at Aklavik and Arctic Red River respectively (Table 3).

The catches of northern pike do not necessarily reflect the relative abundance of this species. A greater selection for pike occurred since gill net sets were restricted to pike habitats (back eddies and tributary mouths).

Tagging Program: Fourteen percent of the total number of fish tagged in Aklavik study area were northern pike (Table 4). Six percent of these were recaptured. Four of the 32 pike recaptured more than 1 day after release were caught greater than 14 km (9 miles) from point of release (Table 9).

The numbers of pike tagged and recaptured for the Arctic Red River, Fort McPherson and Norman Wells study areas are presented in Tables 5, 6 and 7. The majority of recaptures occurred within 14 km of the point of release (Tables 10, 11 and 12). Northern pike, which comprised almost half of the fish tagged and released in the Fort Simpson area (Table 8), were found at 48 of 57 tagging locations. Sixteen percent of the tagged pike were recaptured.

The population of catchable pike in the main stem of the Mackenzie River in the Fort Simpson area was estimated to range from 4,500-5,200 in 1972. In other study areas, tag returns were not sufficient to estimate population sizes.

Migration Routes and Timing: In the Aklavik, Arctic Red River and Norman Wells study areas, tag returns indicated only minor movements of pike during the summer. In the delta region, pike apparently moved out of many shallow delta lakes and creeks between mid-August and freeze-up in September. These pike appeared to concentrate at creek mouths. This resulted in an increase in the catch per unit effort (Fig. 45).

Analysis of tag returns from individual tagging locations in the Fort Simpson area revealed that after spawning, pike dispersed to two general types of locations. The first type consisted of large weedy back eddies and mouths of tributaries which had a high abundance of forage fish. Included in this type were Roundup Creek, Blue Fish Creek, Rabbitskin River and Spence River (Fig. 5). Tag returns indicated that pike in these areas usually remained within close proximity to the release point throughout the summer. Spence River had the most significant returns of any location (22 of 68 released pike). Twenty of these were recaptured within a mile of the release point between one and 55 days later. The second general location type consisted of small back eddies or river mouths where released pike were captured considerable distances away. An example was Manners Creek where five of 10 released fish were recaptured. Of these five, four fish were recaptured 31-93 km (19-58 miles) away, between 7 and 106 days later.

Similar to the Aklavik area, there was an increase in the catch per unit of effort of pike (Fig. 48) in the Fort Simpson area in September, suggesting a movement to overwintering areas. In March, 1973, five northern pike were caught in a gill net set at the confluence of the Rabbitskin and Mackenzie rivers indicating a possible overwintering area. One of the pike was a recapture which was tagged at that location in October, 1972. No pike were caught in a similar set at the mouth of the Liard River.

Spawning and Nursery Areas: Known spawning areas included Travaillant Lake (Fig. 1; loc. 18), Rabbitskin River, Jean-Marie Creek and Trout Lake (Fig. 16). In both Travaillant and Trout lakes, large numbers of ripe and spent pike were observed in the lake shallows. Suspected spawning areas were Rengleng River, Swan Creek, Rabbit Hay River, Rat Creek and an unnamed stream (Fig. 14; loc. 11), Stick Creek (Fig. 15), Trail River, Martin River, Harris River, Blue Fish Creek and the Mackenzie River in the vicinity of Fort Simpson. Tributary mouths and lake shallows with flooded vegetation were the most important spawning areas in the current study. Threinen et al. (1966) and Hassler (1970) indicated that flooded vegetation was one of the spawning requirements of this species. Hassler also suggested that if this condition was not met, the reproductive success would be low.

Spawning occurred after ice breakup from late May in the southern Mackenzie valley to early July in the northern valley. Water temperatures during the spawning period ranged from 7-16 C (45-61 F). In contrast, Wisconsin pike spawned during breakup at a water temperature of 4 C (39 F) (Threinen et al. 1966).

Major nursery areas for pike were the junction of Taylor and Aklavik channels (Fig. 14), Trail River, Harris River, Rabbitskin River, Spence River, Trout River and one unnamed stream (Fig. 16; loc. 7). The mouths of tributaries and large back eddies of the Mackenzie River also appeared to be significant nursery areas. In the Rabbitskin River, the first pike fry (34 mm) was caught on June 22. The above nursery areas were utilized during July, August and September.

Age and Growth: Northern pike ranged in age from 0-19 years (Table 25). The growth rate for pike from the Fort Simpson area was slightly faster than for pike from the Norman Wells, Arctic Red River and Aklavik areas (Fig. 58). The growth rates were not significantly different from the growth rates determined by Hatfield et al. (1972). While the growth rate of pike from the present study was greater than that for pike from Great Slave Lake, Lake Athabasca, Great Bear Lake, Lesser Slave Lake and Waskesiu Lake, it was considerably slower than that of pike from Lake Mendota (Miller and Kennedy 1948). One-year-old pike were found to attain a maximum length of 136 mm (5.4 inches) in the Mackenzie system. This is larger than the 10 cm (4 inches) reported by McPhail and Lindsey (1970). Minimum age at maturity was 3 years for males and 4 years for females. There appeared to be very little difference between pike from the four study areas in minimum age at maturity. In Great Bear Lake, males mature at 5 years of age and the females at 6 years (Miller and Kennedy 1948).

Seventy-one percent of pike caught in the Aklavik area and 73 percent caught in the Arctic Red River area were 5-8 years of age (Table 39). In the Norman Wells area 73 percent were 6-8 years of age; whereas, 73 percent were 5-7 years of age in the Fort Simpson area.

Length-frequency distributions for northern pike from the Aklavik, Arctic Red River and Fort Simpson study areas had major modes at the 571-600 mm, 511-540 mm and 421-451 mm length intervals, respectively (Fig. 66). There was no major mode for the Norman Wells area. It appears, from the length-frequency distributions, that pike in the northern Mackenzie River obtain a larger size than those in the Mackenzie River near Fort Simpson. Length-frequency distributions of pike caught in seines are shown in Table 41.

There was only a slight difference in the length-weight relationships of male and female pike within each study area (Fig. 76). A breakdown of the length-weight relationships by maturity is given in Table 42.

<u>Food Habits</u>: Stomachs of 281 northern pike (205-1070 mm in length) caught in gill nets contained predominantly whitefish, longnose suckers and northern pike (Fig. 92). Other species of fish and a number of species of aquatic insects were fed on to a lesser degree. Thirty-two pike (31-209 mm in length) which were caught in seines were primarily insectivorous (Fig. 91). However cisco, lake chub, longnose suckers and whitefish were found in some stomachs.

7.14 Yellow Walleye, Stizostedion vitreum vitreum (Mitchill)

Distribution: Distribution of yellow walleye during 1972 was similar to that established during 1971 (Fig. 29). The scarcity of walleye in the delta confirmed that this species is distributed throughout most of the Mackenzie River, as far north as the Arctic Red River area (McPhail and Lindsey 1970).

Numerical Abundance: Only one walleye was found in the Mackenzie delta near Aklavik and two were taken in the Peel River (Table 3). Proceeding south, the catch of walleye increased to 29 in Arctic Red River, 121 in Norman Wells and 109 in Fort Simpson. The total catch by all bases in 1972 accounted for only 1.07 percent of all fish taken.

Index gill net catches of walleye during the season differed at each base. There was no definite seasonal variation in catch per unit of effort in Norman Wells (Fig. 47) during most of the season: however, it declined in late September. In Fort Simpson, peak catches of walleye were in late June, after which they declined gradually during the rest of the season (Fig. 48). In Arctic Red River, the best catches occurred only in late summer (July 17-August 13) (Fig. 46).

Tagging Program: A total of 83 walleye were tagged by all bases in 1972, again indicating their relatively small numbers in the Mackenzie River. Four fish were recaptured. Tag returns were too few to provide a clear picture of walleye movement (Tables 5, 7 and 8).

Migration Routes and Timing: Distances travelled and time between release and recovery of tagged walleye are given in Tables 10, 12 and 13. During summer, some adult walleye appear to remain in Oscar Creek (Figure 50), where two recaptures showed no net movement within three days in July. One walleye, tagged at the mouth of Swan Creek (Fig. 49) was recaptured at the mouth of the Sainville River, a tributary of the Arctic Red River, 70.0 km (43.5

miles) from its site of release 51 days previously, thereby showing that the range of movement may be extensive.

In the Rabbitskin River near Fort Simpson (Fig. 51), yellow walleye moved at random among sampling locations within the river; almost all recaptures were found within 1.6 km (1 mile) of the point of release, while one fish moved to a point 29.8 km (18.5 miles) away in the Spence River (Jessop et al. 1973). Fish were absent in Oscar Creek by late August when water levels were lowest just prior to freeze-up. Hatfield et al. (1972) had reported that the decline in walleye catches was closely connected with the period of rapid decline in tributary water levels.

Spawning and Nursery Areas: Island River and Jean-Marie Creek (Fig. 1) were known spawning areas. Suspected spawning areas included Rengleng River, Pierre Creek (Fig. 14), Oscar Creek, Stewart Creek, Vermilion Creek, Slater River, Little Bear River, one unnamed stream (Fig. 15; loc. 2), Trail River, Roundup Creek, Martin River, Harris River, Rabbitskin River, Spence River and Trout River (Fig. 16).

Major nursery areas included Tsintu River (Fig. 1), Mackenzie River at Norman Wells, Vermilion Creek, Slater River, Little Bear River, one unnamed stream (Fig. 15; loc. 2), Trail River, Harris River, Spence River, Jean-Marie Creek (Fig. 16) and Trout Lake (Fig. 1).

Spawning in the Island River and Jean-Marie Creek occurred after ice breakup during late May at water temperatures of 7-8 C (45-46 F). In Lac la Ronge, Saskatchewan, walleye spawned after breakup at water temperatures of 7.7-10 C (45-50 F) (Rawson 1957). Similarly, Wisconsin walleye spawned after breakup at water temperatures of 8.9-10 C (48-50 F) (Niemuth et al. 1959). In Lake Simcoe, Ontario, walleye began to spawn in the Talbot River when the water reached 7-9 C (45-48 F) and continued until the water approached 15.5 C (60 F) (MacCrimmon and Skobe 1970).

Age and Growth: The age-length relationship for yellow walleye from the Fort Simpson area was almost identical to that from Norman Wells (Fig. 59). Walleye showed rapid growth during their first, second and third years. The average fork length of 8 year old fish (359.8 mm) from 1971 (Hatfield et al. 1972) was greater than the median determined for 8 year old walleye from 1972 (337.0 mm) (Table 26).

McPhail and Lindsey (1970) reported that the fork length of 5 year old walleye measured 480 mm in Iowa, 410 mm in Cree Lake, Saskatchewan, and 200 mm in Great Slave Lake. The median fork length for nine fish of this age in the Fort Simpson and Norman Wells areas was 281 mm.

Age classes 5-8 comprised 62.9 percent of the catchable population of walleye in Fort Simpson, with age class seven constituting 18.9 percent (Table 40). Seventy percent of the population was composed of 4-7 year old fish in Norman Wells, where the 6 year old class made up 20.4 percent of the population. Dominant age classes at Arctic Red River were 2, 8, and 5 (19.2, 15.8, and 13.8 percent, respectively) and were likely influenced by the small sample size.

No modal fork length interval was evident in the length-frequency distribution for walleye caught in Arctic Red River (Fig. 67). Walleye in Norman Wells ranged between 100-440 mm in length and showed two major modes at 181-190 mm and 231-240 mm. Fort Simpson fish ranged from 141-550 mm in length; the greatest numbers sampled were in the 321-330 mm fork length interval. Walleye from seine hauls in Arctic Red River and Norman Wells varied in size from 21-60 mm (Table 41). In Fort Simpson, walleye from seine catches ranged from 11-100 mm in length.

Length-weight relationships for yellow walleye in Arctic Red River, Norman Wells and Fort Simpson are shown in Figure 77 and Table 42. The ponderal indices among bases showed a similar pattern to that found during 1971. The most robust fish occurred in Arctic Red River ($b = 3.527$), followed by Fort

Simpson (b = 3.431) and Norman Wells (B = 2.631). Females grew faster than males in weight relative to length, especially in Fort Simpson. This comparison was based almost exclusively on immature fish.

Food Habits: Both adult and juvenile walleye feed on fish, the preferred species depending on the local and seasonal availability. In 1972, 94 stomachs, taken from walleye (117-513 mm in length) caught in gill nets, were examined. Forty-four percent of the stomachs were empty. Unidentified fish remains occupied 79.7 percent of the total volume of contents (Fig. 93). Identifiable fish remains included longnose sucker, northern pike and white sucker. Aquatic insects were found in trace amounts.

Fish remains were also the most frequently occurring food item in walleye (22-171 mm in length) from seine catches (Fig. 93). Longnose suckers were found in 10.4 percent of the stomachs. Aquatic insects constituted the remainder of the diet, with plecopterans and chironomids being the dominant items.

In 1971, coregonids and spoonhead sculpins were also found in the diet of adult walleye, while small coregonids and cyprinids were included in the diet of juvenile fish (Hatfield et al. 1972).

7.15 Burbot, Lota lota (Linnaeus)

Distribution: There was no significant change in 1972 from the wide distribution of burbot reported in 1971. Field crews based in Aklavik found this species at almost all sampling sites in the Mackenzie delta (Fig. 30).

Numerical Abundance: Burbot catches in index gill netting showed seasonal changes in Fort Simpson with peaks in June and September (Fig. 48). The fall increase coincided with the reappearance of burbot in creek mouths after their disappearance from these areas in the summer. In Arctic Red River, burbot were common in the spring but no increase in catches occurred in the fall (Fig. 46). Burbot were not evident in the spring at Aklavik or Norman Wells and catches showed little fluctuation throughout the rest of the season. Although index catches declined during the fall in Norman Wells (Fig. 47), the tagging crew found burbot at creek mouths, especially at Stewart Creek during the fall movement of Arctic grayling out of that tributary stream. Similarly, large numbers of burbot in the delta had congregated at specific stream or creek mouths in late fall, after index sampling had ceased. This latter phenomenon explains the large number of burbot caught in Aklavik (622 fish) while only 75, 58 and 34 were taken in Arctic Red River, Norman Wells and Fort Simpson, respectively (Table 3).

Tagging Program: Of all the burbot tagged during 1972 (Tables, 4, 5, 6, 7 and 8), only the Aklavik base had any significant tag returns (36 fish recaptured from a total of 568 tagged). In Norman Wells, one out of 32 tagged burbot was recaptured. Tagging crews at Fort Simpson, Arctic Red River and Fort McPherson tagged only 17, 23 and 9 burbot, respectively. One burbot tagged at Stewart Creek mouth on August 24 was recaptured 19 days later at the same location, supporting observations that burbot remained in the vicinity of certain tributary mouths in the fall. During both 1971 and 1972, increased burbot catches were coincident in time and place with migrations of Arctic grayling, upon which burbot fed.

Tag returns provided insight into the random pattern of burbot movements in the Mackenzie delta. These recaptures came primarily from fish tagged at location 8 and near location 9 (Fig. 49). Sixty-three percent of the returns came from fish caught within three miles of the release point, from 4-59 days later. Six fish from the vicinity of location 9 travelled 19.3-24.1 km (12-15 miles) up or down the Aklavik Channel. Another five fish tagged at location 8 in early September moved in various directions, with the furthest distance travelled being 90.0 km (56 miles) to the junction of Peel and Phillips Channels (Fig. 49; loc. 11) in 30 days.

Migration Routes and Timing: Distances travelled and the time between release and recovery of tagged burbot are shown in Tables 9 and 12.

Results of burbot tagging in the delta generally indicated little movement from their release points in the fall. Significant numbers were tagged in August and September as burbot moved out of delta lakes into creeks that are tributary to the main delta channels, particularly at location 8 and in the vicinity of location 9 (Fig. 49). Trap nets at these sites confirmed reports by local natives that burbot, as well as northern pike, moved out of some delta lakes in the fall. Feeding burbot were congregated at creek mouths during October and November, thereby accounting for the high tag returns mentioned previously. Local fishermen also report that by late October burbot move gradually upstream through the delta, presumably to upstream spawning areas. This movement, however, has yet to be confirmed although the one recapture at the junction of the Peel and Phillips channels suggests that this may be the case.

Spawning and Nursery Areas: Known spawning areas in the Mackenzie valley were Big Fish River, Tree River

(Fig. 14) and Martin River (Fig. 16). Suspected spawning areas included the Rengleng River (Fig. 14), Slater River, and one unnamed stream north of Fort Simpson (Fig. 16; loc. 4). Major nursery areas were Big Fish River, Tree River (Fig. 14), Slater River (Fig. 15) and Jean-Marie Creek (Fig. 16).

Burbot are known to spawn in streams or lake shallows under ice in late winter. The known spawning areas in the Mackenzie River system are characteristically clear tributary streams; however, the actual spawning period is unknown. Burbot in Minnesota spawned during early February at a water temperature of 1.5 C (35 F) (Cahn 1936). In Heming Lake, Manitoba, male burbot were ripe during late February at a bottom temperature of 3.9 C (39 F), while females matured later (Lawler 1963). Chen (1968) reported that burbot in the Tanana River, Alaska, spawned in early February; however, the length of the spawning period was not known. Spawning usually occurs over gravel substrate in streams or lake shallows in 0.3-1.3 m (1.0-4.3 ft) of water (McPhail and Lindsey 1970).

Age and Growth: Sample sizes of burbot for age determination were relatively small for the Fort Simpson (N = 10) and Norman Wells areas (N = 14) (Table 27). Fish from Aklavik appeared to have the fastest growth rate compared to the other areas, while Norman Wells fish had the slowest; Fort Simpson and Arctic Red River burbot had intermediate growth rates.

Despite its northerly location, the high productivity in the delta and the greater variety of food items may account for the faster growth rate of burbot in Aklavik. The size of burbot at any age in the Mackenzie valley appears to be greater than that for burbot in interior Alaska (Chen 1968). Maximum age recorded during 1972 was 15 years, whereas during 1971 a 19 year old burbot was caught in the Arctic Red River area. Chen (1968) reported that burbot over 15 years of age were rare; the oldest caught in Alaska was a female, 24 years old and 972 mm long. Year class strength was not determined for burbot.

The length frequency distribution for burbot in Aklavik (Fig. 68) has modes at 270-300 mm and 690-720 mm. Arctic Red River had modal length intervals at 270-300 mm, 720-750 mm and 540-600 mm. The distribution in Norman Wells and Fort Simpson was difficult to interpret because of small sample size. There was a conspicuous absence of intermediate sized fish (330-420 mm) in the Aklavik, Norman Wells and Arctic Red River areas. Assuming no gill net selectivity, age classes 3-5 appear poorly represented in the catch.

Burbot taken in seine hauls generally ranged from 20-50 mm in length (Table 41), although larger fish up to 220 mm were not uncommon.

Length-weight relationships showed no major differences among Aklavik, Norman Wells and Fort Simpson fish (Fig. 78 and Table 42). The ponderal index for fish from the Arctic Red River area was the highest (3.082), indicating that burbot were generally in better condition in this area, particularly the males which had a higher ponderal index than the females. Similarly, in the Fort Simpson area males had a higher ponderal index than females.

Food Habits: Twenty-eight percent of 65 stomachs taken from burbot (241-956 mm in length) were empty. At least eleven species of fish were identified among the stomach contents (Fig. 90); in addition, representatives of the cyprinid and coregonid families were found. While aquatic insects made up only 8.1 percent of the total stomach content volume, fish constituted 90.6 percent. Clemens (1951a) found that in Lake Erie burbot, fish comprised 85.3 percent and invertebrates 14.7 percent of the total volume of food consumed.

Feeding will vary with the availability of food organisms and this availability may direct the summer and fall movements of burbot. Appearance of this species in tributary mouths in the fall was related to active feeding; for example, burbot were observed in the vicinity of Stewart Creek in the fall when grayling moved out of the creek. Burbot, ninespine stickleback and Arctic lamprey were the most common fish in the diet (Fig. 90). Chen (1968), observing that Alaskan burbot fed on burbot, sculpin and lamprey, commented that burbot and lamprey were rarely taken by burbot in other areas of North America.

Nine of 27 burbot (21-272 mm in length) caught in seine nets had empty stomachs. Fish remains occurred in less than one-fifth of the stomachs, while aquatic invertebrates were the dominant food items (Fig. 89). The primary invertebrates found were plecopterans, copepods and chironomids. Copepods accounted for 63.1 percent of the total stomach content volume. Chen (1968) observed that plecopterans dominated the invertebrate food items of young Alaska burbot, followed by ephemeropterans and dipterans. In agreement with other studies, he found that while the diet of young burbot is mostly invertebrates, beginning as early as their first year, fish appeared in their diet. Fish become more important in the diet as the burbot grow larger. When burbot in Lake Erie reach a length of 400-450 mm, fish replaced invertebrates as the predominant food (Clemens 1951b).

7.16 Flathead Chub, Platygobio gracilis (Richardson)

Distribution: Flathead chub were again found throughout the areas sampled from Fort Simpson to Arctic Red River (Fig. 31). They were virtually absent in the Mackenzie delta.

Numerical Abundance: Only one flathead chub was caught in the delta in 1972 (Table 3). Catches increased progressively southwards, where 71, 179 and 241 specimens were captured in the Arctic Red River, Norman Wells and Fort Simpson areas, respectively. Flathead chub constituted only 2.03 percent of the total catch.

Flathead chub were caught most frequently from late June to mid-August in Norman Wells after which catches declined (Fig. 4). Numbers peaked during late June and early July in Fort Simpson, after which they decreased throughout the remainder of the season (Fig. 48). No fluctuation was evident in Arctic Red River catches (Fig. 46).

Tagging Program: Only the crews in Fort Simpson and Fort McPherson tagged flathead chub (Tables 8 and 6). There were no tag returns from the 29 fish tagged.

Migration Routes and Timing: Information was insufficient to reveal any pattern of movements or migrations of flathead chub as the season progressed. The peak in catch per unit effort, evident in Fort Simpson (Fig. 48) in late June, was related to a suspected spawning run detected at the mouth of the Martin River.

Spawning and Nursery Areas: No actual spawning or nursery areas were found. In 1971, a spawning run of flathead chub was noted in Little Bear River (Fig. 15). Ripe females were prevalent in Norman Wells during early July, 1972 in the vicinity of

Little Bear River, Slater River, Trapper Creek, Oscar Creek, and Carcajou River. Both ripe and spent females were found in the third week of June in the Fort Simpson area, especially in the vicinity of the Martin River (Fig. 16). McPhail and Lindsey (1970) had reported that in the Mackenzie River at 64°N spawning was probably in progress on June 27. Hatfield et al. (1972a) observed that flathead chub were ripe before and during their periods of peak abundance and spent during their decline.

Age and Growth: Few immature flathead chub were captured during 1972 as was the case in 1971. Ages determined from scales ranged from 4-13 years (Table 28). No difference in growth rate was evident among those areas sampled, nor did the median lengths at a given age in 1972 differ greatly from the 1971 measurements (Hatfield et al. 1972b). Difficulties in reading crowded annuli for older fish invariably caused errors in age determination of flathead chub.

The length-weight relationships for Arctic Red River, Norman Wells and Fort Simpson fish are shown in Table 42. Compared to the other bases, flathead chub in Norman Wells had the lowest ponderal index (b). A further breakdown of these length-weight relationships on the basis of sex and maturity shows that except for ripe males (b = 2.594) and mature females (b = 2.074) the other sex and maturity classes had very low values for b (-0.836 to 1.196). Reasons for the poor condition of Norman Wells fish are not apparent.

Flathead chub caught in gill nets ranged from 61-390 mm in length in the Norman Wells area, 101-300 mm in Fort Simpson, and from 161-310 mm in Arctic Red River. Only three flathead chub (81-100 mm in length) were taken in seine hauls in Norman Wells, while one specimen in the 131-140 mm length interval was captured in Fort Simpson (Table 41).

Food Habits: In the stomachs of 43 flathead chub (113-285 mm in length) from gill net catches, insect remains were the most frequently found food item (45.7 percent occurrence) (Fig. 85). Coleopterans (22.9 percent) and hymenopterans (11.4 percent occurrence) were the most common insects. Plant remains, in 11.4 percent of the stomachs, constituted 32.0 percent of the total stomach contents by volume; trichopterans and coleopterans comprised 12.6 and 11.6 percent of the total volume, respectively.

The stomachs of six flathead chub (87-155 mm in length) taken in seine hauls all contained unidentifiable food remains (Table 41).

7.17 Lake Chub, *Couesius plumbeus* (Agassiz); Longnose Dace, *Rhinichthys cataractae* (Valenciennes); Northern Redbelly Dace, *Chrosomus eos* (Cope); Finescale Dace, *Pfrille neogaea*; Spottail Shiner, *Notropis hudsonius* (Clinton); and Emerald Shiner, *Notropis atherinoides* (Rafinesque).

Distribution: Lake chub were found throughout the Mackenzie River system (Fig. 32). Longnose dace were found in a number of tributaries from Trout River to the delta (Fig. 33) which is a slight northward extension of the range reported by McPhail and Lindsey (1970). Longnose dace occupy rocky sections of tributaries and hence were not susceptible to most sampling gear used. It is possible that the distribution and abundance is greater than the data indicate.

Northern redbelly dace were found as far north as the mouth of the Arctic Red River during 1972 (Fig. 34), a northward extension from that reported during 1971 and that recorded by McPhail and Lindsey (1970). Finescale dace was first recorded in the Martin River during 1972 (Fig. 34).

Spottail shiners were found throughout the Mackenzie River system as far north as the edge of the delta (Fig. 35), an extension of the northern limit of Fort Good Hope reported by McPhail and Lindsey (1970). Emerald shiners were caught only in the Fort Simpson area, as far north as the Trail River (Fig. 36), a slight extension of the northern limit reported by McPhail and Lindsey (1970).

Numerical Abundance: Lake chub were very numerous in seine catches, particularly in the Arctic Red River and Norman Wells areas. Numbers of longnose, redbelly and finescale dace caught in the mainstem Mackenzie River were eight, 22 and two, respectively. However, seine catches by the Rabbitskin River and synoptic crews, which included upstream areas on tributaries, contained 70 longnose dace.

Spottail shiners were most abundant in the Fort Simpson and Arctic Red River seine catches, while emerald shiners were found only in the Fort Simpson area, where they were numerous.

Tagging Program: None of these species were tagged.

Migration Routes and Timing: Insufficient data were collected to determine migration routes for these species. However, in the Rabbitskin River, an out-migration of longnose dace occurred between July 30 and September 16 (Jessop et al. 1973).

Spawning and Nursery Areas: Lake chub spawning was observed during May in the Root and North Nahanni rivers (Fig. 1), while nursery areas were found at many locations in the Mackenzie River. An emerald shiner nursery area was found in Jean-Marie Creek (Fig. 16).

Age and Growth: No aging was done on these species. Table 41 gives the length distributions for those fish measured from seine catches.

Food Habits: Stomachs of 33 lake chub (29-97 mm in length) contained predominantly insect remains, including plecopterans, dipterans, hymenopterans and coleopterans (Table 44).

7.18 Longnose Sucker, Catostomus catostomus (Forster)

Distribution: Longnose suckers were found throughout the Mackenzie River system (Fig. 37). There was no significant change in distribution from that found by Hatfield et al. (1972).

Numerical Abundance: Longnose suckers increased in abundance from the Aklavik area southward to Fort Simpson (Table 3). Six hundred and eighty-seven longnose suckers were caught at Fort Simpson, representing 16 percent of the total catch. The catch per unit effort in the Aklavik area was relatively constant throughout the field season (Fig. 45). Peak catch per unit effort at the Arctic Red River and Fort Simpson study areas occurred during spawning migrations, May 22 to June 18 (Figs. 46 and 48). At Norman Wells the greatest catch per unit effort occurred between June 19 and July 16 (Fig. 47) during a suspected post-spawning migration.

Tagging Program: At the Aklavik, Arctic Red River, Fort McPherson, Norman Wells and Fort Simpson study areas, there were 25, 40, 9, 296 and 448 longnose suckers tagged, respectively (Tables 4, 5, 6, 7 and 8). Of these, the only significant recaptures (12) occurred in the Fort Simpson area (Table 8).

Migration Routes and Timing: No significant migration routes were found. Two of the eight recaptured longnose suckers in the Fort Simpson area which were released for more than one day (Table 13), suggested a possible widespread dispersal after spawning. Similar results were obtained for longnose suckers tagged in the Rabbitskin River (Jessop et al. 1973).

Spawning and Nursery Areas: Known spawning areas were Swan Creek, Pierre Creek, Rabbit Hay River, Tree River, one unnamed stream (Fig. 14; loc. 10), Three Day Lake and tributaries (Fig. 15), Trail River, Jean-Marie Creek, Trout River (Fig. 16) and Island

River (Fig. 1). Suspected spawning areas included Rengleng River, Frog Creek, Stony Creek, Cardinals Creek, Tsital Trein Creek, Rat Creek, one unnamed stream (Fig. 14; loc. 11), Loon River (Fig. 1), Carcajou River, Trapper Creek, Oscar Creek, Prohibition Creek, Vermilion Creek, Slater Creek, Little Bear River, Bluefish Creek, Brackett River, four unnamed streams (Fig. 15; loc. 2) and (Fig. 16; locs. 1, 2 and 3), and Martin River.

Spawning occurred in tributaries shortly after ice breakup, from late May in the southern Mackenzie valley to mid-June in the northern valley, at water temperatures of 8-16 C (46-61 F). Similarly, suckers from Great Slave Lake spawned from ice breakup in May to June 15 at water temperatures less than 15 C (59 F) (Harris 1962). Spawning generally occurs in streams or lake shallows (McPhail and Lindsey 1970). In the Kolyma River, Siberia, longnose suckers spawned after ice breakup in June over gravel in swift river sections (Nikolsky 1961).

Major nursery areas included Rengleng River, Stony Creek, Tree River (Fig. 14), Hare Indian River, Carcajou River, Oscar Creek, Vermilion Creek, Little Bear River, St. Charles River (Fig. 15), Trail River, Harris River (Fig. 16), Matou River, Blackstone River, Grainger River (Fig. 1), Rabbitskin River, Jean-Marie Creek, Trout River, Mackenzie River in the vicinity of Fort Simpson, and one unnamed stream (Fig. 16; loc. 3).

Age and Growth: Longnose suckers ranged in age from 0-20 years (Table 30). Generally the growth rates for the four study areas were similar. There was considerable variation in the median length of a specific age-class for longnose suckers from the four bases. This probably resulted from the small sample sizes and the possibility of grouping the ages of fish from populations with different growth rates. The growth rates for longnose sucker from the present study were similar to that determined by Hatfield et al. (1972).

Longnose suckers caught in gill nets ranged in length from 140-580 mm (Fig. 69). Modal length intervals from Arctic Red River and Fort Simpson study areas are 411-420 mm, and 301-310 mm, respectively. No major modes occurred for suckers caught at Aklavik or Norman Wells. Generally, suckers attained a greater length in the northern study areas. The length-frequency of longnose suckers caught in seines is shown in Table 41.

Length-weight relationships for Aklavik, Arctic Red River, Norman Wells and Fort Simpson areas are shown in Figure 79. Ponderal indices are given in Table 42.

Food Habits: The stomach contents of seven longnose suckers (196-416 mm) caught in gill nets were difficult to identify. Approximately 43.7 percent of the total volume was unidentifiable (Table 43). Pelecypods, chironomids and remains of plecopterans and trichopterans were identified. The stomach contents of 25 longnose suckers (13-99 mm) caught in seines contained primarily ostracods, chironomids and dipteran remains (Table 44). Rawson (1951) found that 63 percent of the stomach content volume for longnose suckers from Great Slave Lake consisted of amphipods.

7.19 White Sucker, Catostomus commersoni (Lacépède)

Distribution: White suckers were found as far north as the Ramparts River (Fig. 38). There was no extension of the range as determined by McPhail and Lindsey (1970).

Numerical Abundance: White sucker was a minor species and accounted for 0.08 and 1.53 percent of the total catch in the Norman Wells and Fort Simpson study areas, respectively (Table 3). This species was caught throughout the study period in the Fort Simpson area with catches peaking between June 19 and August 13 (Fig. 48).

Tagging Program: One white sucker was tagged in the Norman Wells area (Table 7); it was recaptured 67 days later, 185 km (115 miles) downstream from point of release (Table 12). There was no significance attributed to this recapture. Forty-six white suckers were tagged in the Fort Simpson area (Table 8). However, none of these were recaptured.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes.

Spawning and Nursery Areas: The only known spawning area was the Rabbitskin River (Jessop et al. 1973). Suspected spawning areas included Brackett River (Fig. 15), Trail River, and Martin River (Fig. 16). The Rabbitskin and Martin rivers were also nursery areas for white suckers.

Age and Growth: Six white suckers caught in seines in the Fort Simpson study area were aged. Three of these (80-88 mm in length) were 1 year old and three others (90-114 mm in length) were 2 years old. One fish, (80 mm in length) from the Norman Wells area was 2 years old.

White suckers caught in gill nets in the Norman Wells and Fort Simpson areas ranged in length from

211-220 mm and 101-520 mm, respectively. The length frequency distribution of suckers caught in seines is given in Table 41. There was little difference between the length-weight relationships of male and female white suckers from the Fort Simpson area (Table 42).

Food Habits: Nine white sucker stomachs contained chironomids, simulids and dipteran, plecopteran and trichopteran remains (Table 43).

7.20 Trout-perch, Percopsis omiscomaycus (Walbaum)

Distribution: There were no changes in the distribution of trout-perch (Fig. 39) as determined by McPhail and Lindsey (1970).

Numerical Abundance: Trout-perch comprised a high percentage of the seine haul catches in Aklavik, Arctic Red River, Norman Wells and Fort Simpson. Greatest abundance was found in deep pools and the mouths of both clear and turbid tributaries.

Tagging Program: No trout-perch were tagged.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes. Jessop et al. (1973) found an outmigration of this species from the Rabbitskin River from July 30 to October 14.

Spawning and Nursery Areas: The only known spawning area was the Trail River. Trout-perch eggs were found here on June 8. It is suspected that the lower sections of most tributaries of the Mackenzie River were both spawning and nursery areas. The back eddies of the Mackenzie River were also nursery areas.

Age and Growth: The ages of 12 trout-perch from the Norman Wells area and one from the Fort Simpson area ranged from 1-3 years (Table 31). Table 41 gives the length distribution of those trout-perch measured.

Food Habits: The stomach contents of 30 trout-perch (26-90 mm in length) contained predominantly chironomids, dipteran and plecopteran remains (Table 44).

7.21 Arctic Lamprey, *Lampetra japonica* (Martens)

Distribution: Arctic lamprey were found throughout the Mackenzie system from the Rabbitskin River to the delta (Fig. 40). Most specimens were taken from tributaries of the Mackenzie River. Ammocoetes were occasionally found in the stomachs of northern pike and inconnu.

Numerical Abundance: Insufficient data were collected to determine numerical abundance.

Tagging Program: No Arctic lamprey were tagged.

Migration Routes and Timing: Insufficient data were collected to determine migration routes. Observations on the lamprey of the Naknek River system of southeast Alaska indicated that most Arctic lamprey in this system completed their life cycle in freshwater, while only a few migrated to sea (Heard 1966). It was not determined whether or not the Arctic lamprey in the Mackenzie River system are anadromous. Nine metamorphosed ammocoetes were caught in drift nets approximately 9.7 km (6 miles) upstream in the Martin River (Fig. 51). In a winter study of the Martin River during 1972-73, recently metamorphosed lamprey migrated to the Mackenzie River under the ice during November and December (unpublished data).

Spawning and Nursery Areas: It is suspected that Arctic lamprey spawn in most tributaries of the Mackenzie River. Heard (1966) observed spawning between May 28 and July 2 at water temperatures from 12-15 C (54-59 F). Ammocoetes were caught in a number of tributaries by seining sections of the stream which had a muddy substrate.

Age and Growth: Ages were not determined for Arctic lamprey. Ammocoetes ranged in length from 31-150 mm (Table 41).

Food Habits: Stomach contents were not examined. However, in the delta area, lamprey scars were found on a large number of Arctic char and, to a lesser degree, on humpback and broad whitefish and inconnu. Fresh scars were also found on several Arctic cisco and inconnu in the Norman Wells area. It is suspected that the Arctic cisco and inconnu had migrated from the delta region and were probably parasitized before entering the main stem Mackenzie River. Fresh scars were also observed on several longnose suckers in the Norman Wells and Fort Simpson study areas.

7.22 Brook Stickleback, Culaea inconstans (Kirtland) and Ninespine Stickleback, Pungitius pungitius (Linnaeus)

Distribution: Brook sticklebacks were captured at scattered locations throughout the Mackenzie River system (Fig. 41). During 1972, their range was extended into the Norman Wells and Fort Simpson areas. The northward limit of their range was extended from the south shore of Great Slave Lake (McPhail and Lindsey 1970) to Arctic Red River.

Ninespine sticklebacks were distributed throughout the Mackenzie River system (Fig. 41). During 1972, specimens were captured in the Fort Simpson area where they were not recorded during 1971 by Hatfield et al. (1972).

Numerical Abundance: Four brook sticklebacks were captured in the Mackenzie River system. Ninespine sticklebacks were most abundant in seine catches from the delta.

Tagging Program: No sticklebacks were tagged.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes for these species. Movements of ninespine sticklebacks into small tributaries of the Rat River for spawning during late August were reported by Jessop et al. (1973).

Spawning and Nursery Areas: No spawning or nursery areas of brook sticklebacks were located. Ninespine sticklebacks were observed spawning in a small tributary of the Rat River on August 24 at a water temperature of 14 C (Jessop et al. 1973). Although there was no vegetation, roots, sticks and leaves provided coverts for spawning fish.

Age and Growth: No aging was done on sticklebacks. Table 41 gives the length distributions of brook and ninespine sticklebacks measured from seine catches.

<u>Food Habits</u>: No stomachs of brook sticklebacks were examined. Stomachs of 20 ninespine sticklebacks (25-53 mm in length) contained predominantly insect remains, dipterans and ostracods (Table 44). Similarly, McPhail and Lindsey (1970) reported that ninespine sticklebacks feed mainly on insect larvae, small crustaceans, ostracods and molluscs.

7.23 Slimy Sculpin, *Cottus cognatus* (Richardson) and Spoonhead Sculpin, *Cottus ricei* (Nelson)

Distribution: Both slimy and spoonhead sculpins were found throughout the Mackenzie River system (Figs. 43 and 42). Slimy sculpins had not been previously reported in the main stem Mackenzie River (McPhail and Lindsey 1970).

Numerical Abundance: Slimy sculpins were most abundant in seine catches from the upper Mackenzie River system, particularly in the Norman Wells area. Spoonhead sculpins were most abundant in seine catches from the lower Mackenzie River system, particularly in the Arctic Red River area.

Tagging Program: No sculpins were tagged.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes of these species.

Spawning and Nursery Areas: The only nursery area and suspected spawning area for sculpins was at the mouth of St. Charles Creek (Fig. 15), where fry were numerous.

Age and Growth: Thirty-nine slimy sculpins (28-64 mm in length) from the Martin River were aged at 1-3 years from otoliths. Table 41 gives the length distributions of slimy and spoonhead sculpins measured from seine catches.

Food Habits: Stomachs of 14 slimy sculpins (28-81 mm in length) contained mainly ostracods, plecopterans and trichopterans (Table 44). Stomachs of 11 spoonhead sculpins (20-55 mm in length) contained insect remains including chironomids and plecopterans (Table 44).

7.24 Boreal Smelt, *Osmerus eperlanus* (Linnaeus) and Pond Smelt, *Hypomesus olidus* (Pallas)

Distribution: Boreal smelt were found only in the lower Mackenzie River as far south as 40 miles upstream from Arctic Red River (Fig. 44), a slight extension of the range shown in McPhail and Lindsey (1970). Pond smelt were similarly found only in the lower Mackenzie River as far south as Norman Wells (Fig. 44).

Numerical Abundance: Boreal smelt were only captured in the Aklavik and Arctic Red River areas where one and 37 were caught in gill nets, respectively (Table 3). Pond smelt were most abundant in seine catches from the delta.

Tagging Program: No smelt were tagged.

Migration Routes and Timing: Although no tagging was done, catches of boreal smelt in the Arctic Red River area indicated that it migrated up the Mackenzie River just after breakup on a spawning migration. After mid-June, no adults were caught in the Mackenzie River system since they probably had returned to the sea. Insufficient data were collected to determine migration routes for pond smelt.

Spawning and Nursery Areas: No spawning areas of boreal smelt were located, although some ripe and spent smelt were caught at the mouth of the Arctic Red River in early June. The only other suspected spawning area was an unnamed stream (Fig. 14; loc. 10) just south of Arctic Red River. Single fry specimens were caught at the mouth of Thad's Creek (Fig. 14) and an unnamed stream (Fig. 14; loc. 11) in the Arctic Red River area. This probably indicates that the young drop down to sea during their first summer as postulated by McPhail and Lindsey (1970). No spawning or nursery areas of pond smelt were located.

Age and Growth: Ages of boreal smelt ranged from 6-8 years in the Arctic Red River area (Table 32). All these fish were ripe or spent. In contrast, in the Yenesei River, Siberia, smelt first spawn at 3-4 years of age (McPhail and Lindsey 1970). Growth rates for smelt from the Mackenzie River were faster than those reported for Siberian smelt (Nikolsky 1961). Boreal smelt caught in gill nets ranged from 245-383 mm in length and those caught in seines ranged from 41-50 mm (Table 41).

The ponderal index was considerably higher for female boreal smelt than for males (Table 42). This is probably because of the large size of the ovaries compared to the testes of mature smelt. No aging was done on pond smelt caught in seines, which ranged from 21-60 mm in length (Table 41).

Food Habits: Stomachs of 10 boreal smelt (260-294 mm in length) were all empty (Table 43) which indicates a cessation of feeding during the spawning run. During their feeding period at sea, adults are reported to feed primarily on pelagic crustaceans (Nikolsky 1961).

Stomachs of 11 juvenile pond smelt (30-61 mm in length) contained predominantly chironomids, copepods and cladocerans (Table 44). Similarly, McPhail and Lindsey (1970) reported that they are pelagic and feed mainly on zooplankton.

7.25 Goldeye, *Hiodon alosoides* (Rafinesque)

Distribution: Goldeye were found in the Arctic Red River, Norman Wells and Fort Simpson study areas (Fig. 36). This is an extension of the northern limit of their range, Fort Norman, as determined by McPhail and Lindsey (1970).

Numerical Abundance: In the present study (1972) one goldeye was caught at Fort Norman in the Norman Wells area and 44 in the Fort Simpson area (Table 3), primarily at the mouths of the Martin and Liard rivers. In the Fort Simpson area peak catch per unit effort occurred July 17-August 13 (Fig. 48).

Tagging Program: Seven goldeye were tagged in the Fort Simpson area; there were no recaptures.

Migration Routes and Timing: Insufficient data were collected to determine movements or migration routes.

Spawning and Nursery Areas: No spawning or nursery areas were found. Goldeye usually spawn in May or June over a fine substrate in pools, turbid rivers or in lakes and ponds which form back waters of such rivers (Kennedy and Sprules 1967).

Age and Growth: Twenty-four goldeye from Fort Simpson area ranged in age from 2-8 years (Table 29). The growth rate was considerably slower than that found for goldeye from North Saskatchewan River (Paterson 1966) and from Lake Winnipegosis, Saskatchewan Delta, Lake Claire and Sandy Lake (Kennedy and Sprules 1967). The goldeye caught in the Fort Simpson area ranged in length from 141-250 mm.

Food Habits: The stomach contents of 15 goldeye (165-255 mm in length) were found to contain predominantly trichopteran, coleopteran and other insect remains (Table 43).

8. CONCLUSIONS

8.1 Distribution

Distribution ranges, reported by McPhail and Lindsey (1970), were extended southward for broad whitefish, Arctic cisco, least cisco and boreal smelt, and northward for mountain whitefish, lake cisco, longnose dace, northern redbelly dace, spottail shiner, emerald shiner, brook stickleback, slimy sculpin and goldeye.

However, some of the apparent distribution gaps are due to the limited sampling which occurred in areas between the base camps. Headwater areas of most tributaries were not sampled intensively and may harbour different species. Gear limitations, such as the use of gill nets only in back eddies, may have resulted in the omission of species not found in these habitats.

8.2 Numerical Abundance

At the Aklavik base, 79.18 percent of the catch consisted of Arctic cisco, northern pike, humpback whitefish, broad whitefish and Arctic char.

At the Arctic Red River base, 78.31 percent of the catch consisted of humpback whitefish, broad whitefish, Arctic cisco, least cisco and northern pike.

At the Fort McPherson base, 72.84 percent of the catch consisted of Arctic cisco, broad whitefish, least cisco and longnose sucker.

At the Norman Wells base, 72.73 percent of the catch consisted of Arctic grayling, northern pike and longnose sucker.

At the Fort Simpson base, 75.45 percent of the catch consisted of northern pike, longnose sucker and humpback whitefish.

As mentioned previously, numerical abundance may have been affected by gear selectivity; for example, selectivity for species inhabiting back eddies where gill nets were most commonly set.

8.3 Tagging Program

A total of 11,712 fish were tagged during 1972 by Fisheries Service in the Mackenzie River valley. The major species tagged were Arctic cisco (19.6 percent), northern pike (15.4 percent), Arctic grayling (14.2 percent), humpback whitefish (13.4 percent) and burbot (5.5 percent). Eleven other species constituted the remaining 14 percent of fish tagged (Table 4, 5, 6, 7 and 8).

There were several factors that could have influenced the success of the tagging program in terms of detecting the range of movements of fish. Several coregonid species, such as Arctic cisco, inconnu and least cisco, appeared sensitive to handling and post-release mortality would reduce the percentage of significant tag returns. Tag losses from tagged fish, increased susceptibility to predators and the non-return of tags or information by fishermen also minimizes the success of any recapture information analysis. The movement of tagged fish populations into areas that were not sampled extensively, especially in the reaches between bases, would allow some aspects of their movement or migration destinations to remain unknown.

The tagging program in 1972 however, was generally successful. An average of 10.8 percent of tagged fish were recaptured, the success being high for several major species such that valuable information on their movements, routes and times could be described (see 8.4).

Any population estimates from tag return data are made with the assumption that many factors modifying the population size and distribution over a given time period are minimal; these factors include mortality, predation, emigration, immigration and a change in catchability. In as large a system as the Mackenzie River, all these factors invariably became involved. Consequently, estimates were made only in those cases where tag returns were sufficient, total catch data were available, and where conditions existed so that the spatial and temporal separateness of a specific population or unique group of fish could be identified.

In any attempt to estimate accurately the population of fish in a specific area, there exists the additional possibility that the data used were collected in a biased manner. The bias in the tagging program described was one of gear and fish size selectivity. Gill nets and trap nets were used to catch fish large enough to be tagged. Consequently, population estimates were made for "catchable size" Arctic grayling in the Swan Creek-Swan Lake area, Arctic char in Big Fish River and the northern pike in the Fort Simpson study area.

8.4 Migration Routes and Timing

Northern pike, longnose suckers, yellow walleye and Arctic grayling migrate up suitable streams to spawn immediately after ice breakup (late May to early June). While Arctic grayling may remain in a lake-stream system during the summer, post-spawning adults in some areas immediately migrate to the main stem of the Mackenzie in late June as was apparent with the Three-Day Lake grayling near Norman Wells. This same population appear to reside in the Great Bear River during the summer and possibly overwinter there as well. Summer resident adult and juvenile grayling move out of some small tributaries during the fall, to their overwintering areas.

Arctic char enter the delta by August. The spawning population of Big Fish River reach the river mouth by mid-August and move upstream to spawning grounds during September and October. The Rat River char spawning population proceed through the West, Peel and Husky channels during August and September.

Between mid-August and early October, major upstream spawning migrations of inconnu, humpback whitefish, broad whitefish and least cisco occur through the delta channels. These species proceed to spawning areas in the Peel River, Arctic Red River and other upstream tributaries of the Mackenzie River. Arctic cisco movements start as early as late July and, like inconnu, some fish may migrate as far upstream as Norman Wells, approximately 700 km (435 miles) up the Mackenzie River. Post-spawning migrations towards the delta occur in October and November. Such migrations of fish past ideal fishing areas are well known to domestic fishermen so that the locality and intensity of domestic fishing in the fall vary accordingly.

8.5 Spawning and Nursery Areas

Arctic grayling, yellow walleye, northern pike and longnose sucker spawn shortly after spring breakup on tributary streams (mid-May to mid-June). Inconnu, humpback whitefish, broad whitefish, Arctic cisco, least cisco and Arctic char have spawning periods ranging from early September to early November. The general breakup pattern of the Mackenzie River system is such that spring spawning activities can be expected to begin and end approximately two weeks earlier in southern reaches of the system than in the north. Conversely, the fall spawning cycle in the north is generally about two weeks ahead of that to the south.

Clear tributaries are the most important spawning and nursery areas for yellow walleye, Arctic grayling, Arctic char, and burbot. Spawning and nursery areas of whitefish, cisco, longnose sucker and northern pike range from clear to turbid. Tributary mouths and large back eddies of the Mackenzie River also appear to be significant nursery areas.

In several instances, juveniles were noted in streams not listed as spawning and nursery areas. It is not meant here to subordinate the importance of these streams to the resource. Rather, it is a list of known streams in which substantial numbers of fish were found throughout the field season or where numbers far exceeded those of other systems in the area at the time of sampling. Spawning and nursery areas described are limited primarily to those within base camp areas, where regular sampling occurred. In areas between bases, limited sampling by the synoptic crew enabled identification of only a few of the many potential spawning and nursery areas.

8.6 Age and Growth

There appeared to be no consistent difference in growth rates from north to south in the Mackenzie Valley. However, northern pike, walleye, burbot and boreal smelt from the Mackenzie system appeared to have faster growth rates than other populations from similar latitudes, while growth rates of Arctic and least cisco appeared to be slower than those of Siberian cisco. Humpback, broad, round and mountain whitefish, inconnu and Arctic grayling generally had similar lengths at a given age to those reported in other northern studies. However, average lengths obtained in the current study are subject to certain sampling errors. Mean lengths obtained for younger fish may be slightly higher than that of the actual stream population due to gear selectivity. Fish used for aging purposes were collected throughout the growing season. Thus, in a particular age group, one fish could have no growth, whereas another could have a full season's growth. This possibility resulted in a larger length range and larger standard deviation than present in the stream population. Other errors and variations may be attributed to counting false annuli, sex difference, year class strength and the movement of fish from areas having diverse growth rates.

Catches of humpback and broad whitefish and inconnu from the upper Mackenzie River system (Norman Wells and Fort Simpson areas) consisted of small-size individuals, while larger fish predominated in catches from the lower Mackenzie system (Aklavik and Arctic Red River areas). This could indicate that the upper Mackenzie River has local populations, or serves as a nursery area for these species.

Several species, including northern pike and longnose sucker, attained greater maximum lengths in the lower (northern) Mackenzie River.

8.7 Food Habits

Feeding habits were generally similar to those described in 1971 (Hatfield et al., 1972). Most of the anadromous species, such as Arctic char, inconnu, Arctic cisco, least cisco and boreal smelt, ceased feeding during their spawning run. Of the other major species, humpback and broad whitefish fed predominantly upon benthic organisms, while northern pike, yellow walleye and burbot were mainly piscivorous and Arctic grayling were insectivorous.

Capture of fish by gill nets imposes certain limitations on stomach content interpretation. Fish often remained in the net for several hours during which digestion of stomach contents continued. Regurgitation, as a result of stress, may have occurred. Fish with piscivorous feeding habits, such as pike, sometimes fed upon fish caught in gill nets before becoming entangled themselves. The stomach contents of such fish would not reflect normal food habits.

9. FUTURE AREAS OF STUDY

Results from the initial two years of study of Mackenzie River fish resources have provided sufficient base estimates for most of the biological parameters being studied. This includes the species composition for most of the river systems studied as well as the age class composition, length-weight relationships, food habits, age-growth characteristics, and sex ratios of the more abundant species. Baseline data on fish contamination levels were obtained in 1971. Major knowledge gaps still existing include migration routes and times, locations of spawning grounds, spawning characteristics, and life history details for uncommon species and the juvenile stages of abundant ones.

During the spring of 1973, weirs were constructed across two tributaries of the Mackenzie as an aid in conducting detailed life history studies of the species present. It is expected that emphasis will be placed on this and the tagging portions of the program until its completion in 1974-75. Additional studies planned include sample collection programs for the eastern delta and some major tributaries and a winter study to locate, describe and sample fish overwintering areas.

10. ACKNOWLEDGEMENTS

The authors wish to thank Mr. J.M. Millen, Head, Resource Impact Division, Fisheries and Marine Service, Winnipeg, and Mr. R.J. Paterson, Chief, Resource Management Branch, Fisheries and Marine Service, Winnipeg, for their invaluable support and guidance in carrying out this project.

We also wish to express sincere appreciation for the assistance and efforts of technicians D. Shepherd B. Sutherland, D. McGowan, G. Low, W. Eddy, F. Zaal, R. Ruggles, S. Harbicht, B. Bergman and R. Boychuk. Without their enthusiasm and expertise this report would not have been possible.

Field support was provided by Fisheries and Marine Service staff in Inuvik, Hay River and Yellowknife, N.W.T. Fish samples were identified by Dr. D.H. McAllister, National Museum of Natural Sciences. Assistance in age determinations was provided by Dr. R. Beamish, Research and Development Directorate, Winnipeg. Computer data compilation and analysis were done by the Economics Branch, Fisheries and Marine Service, Winnipeg.

Special thanks is extended to all Northwest Territories game officers and Mackenzie Forest Service personnel, hamlet councils and local residents along the Mackenzie who contributed their time, knowledge and, in many cases, equipment to the project. The cooperation of local fishermen in returning tags was greatly appreciated.

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12. FIGURES

LEGEND FOR FIGURE 1

1. Big Fish River
2. Cache Creek
3. Willow River
4. Rat River
5. Fish Creek
6. Rengleng River
7. Peel River
8. Stony Creek
9. Vittrekwa River
10. Satah River
11. Frog Creek
12. Arctic Red River
13. Swan Creek
14. Tsital Trein Creek
15. Pierre Creek
16. Rabbit Hay River
17. Tree River
18. Travaillant River
19. Ontaratue River
20. Tieda River - Yeltea Lake
21. Loon River
22. Hare Indian River
23. Bluefish River
24. Ramparts River
25. Tsintu River
26. Hume River
27. Mountain River
28. Carcajou River
29. Trapper Creek
30. Oscar Creek
31. Stewart Creek
32. Canyon Creek
33. Prohibition Creek
34. Vermilion Creek
35. Slater Creek
36. Little Bear River
37. Great Bear River
38. Brackett River
39. Loche River
40. St. Charles Creek
41. Wolverine Creek
42. Stick Creek
43. Porcupine River
44. Big Smith Creek
45. Keele River
46. Redstone River
47. Dahadinni River
48. Blackwater River
49. Johnson River
50. Ochre River
51. Wrigley River
52. Hodgson Creek
53. River between two Mountains
54. Willowlake River
55. Root River
56. North Nahanni River
57. Trail River
58. Martin River
59. Harris River
60. Liard River
61. Poplar River
62. Birch River
63. Matou River
64. Blackstone River
65. Grainger River
66. Rabbitskin River
67. Spence River
68. Jean-Marie Creek
69. Trout River
70. Island River
71. Redknife River
72. Bouvier River
74. Horn River
75. Kakisa River

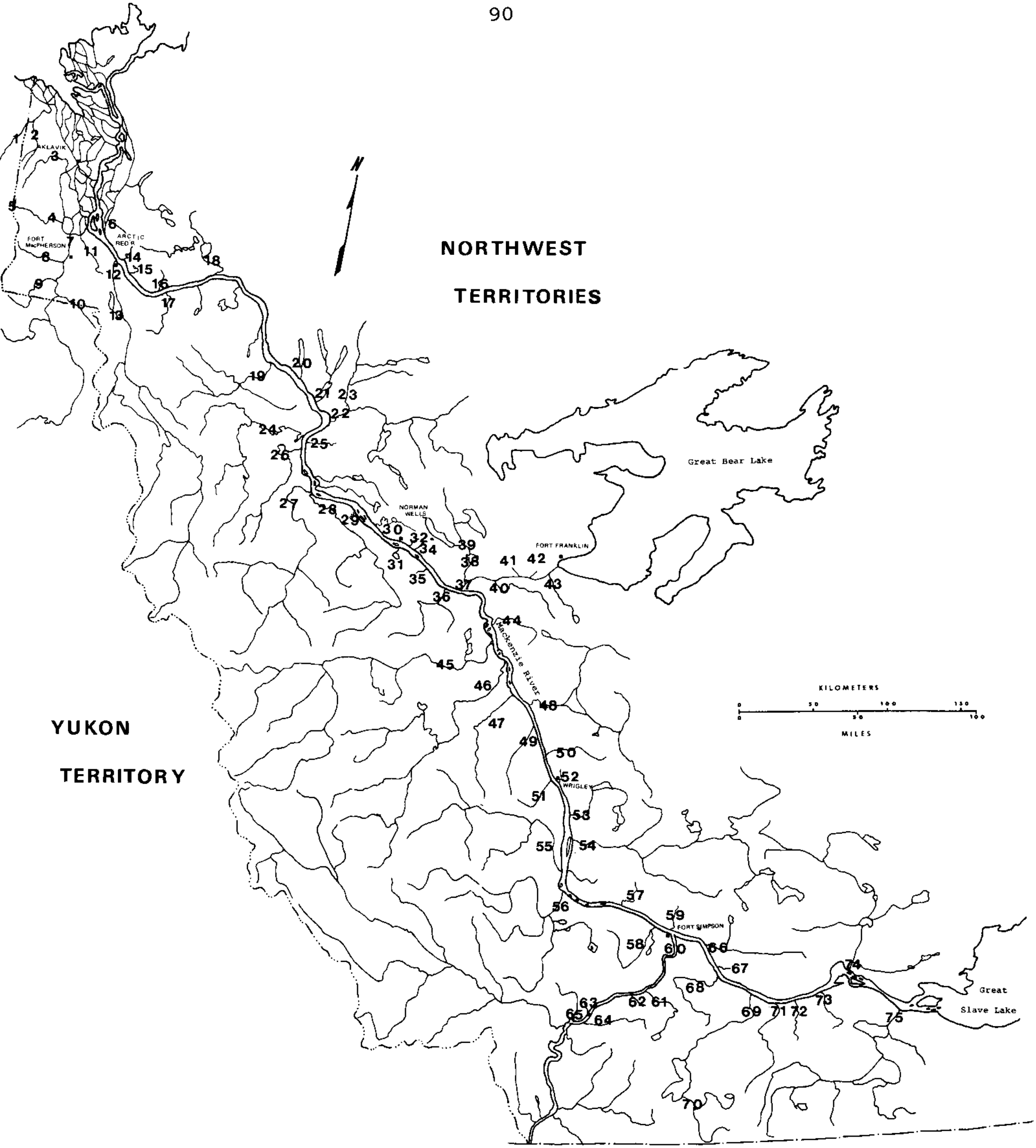


Fig. 1. Mackenzie River system and major tributaries.

Fig. 2. The Mackenzie River delta.

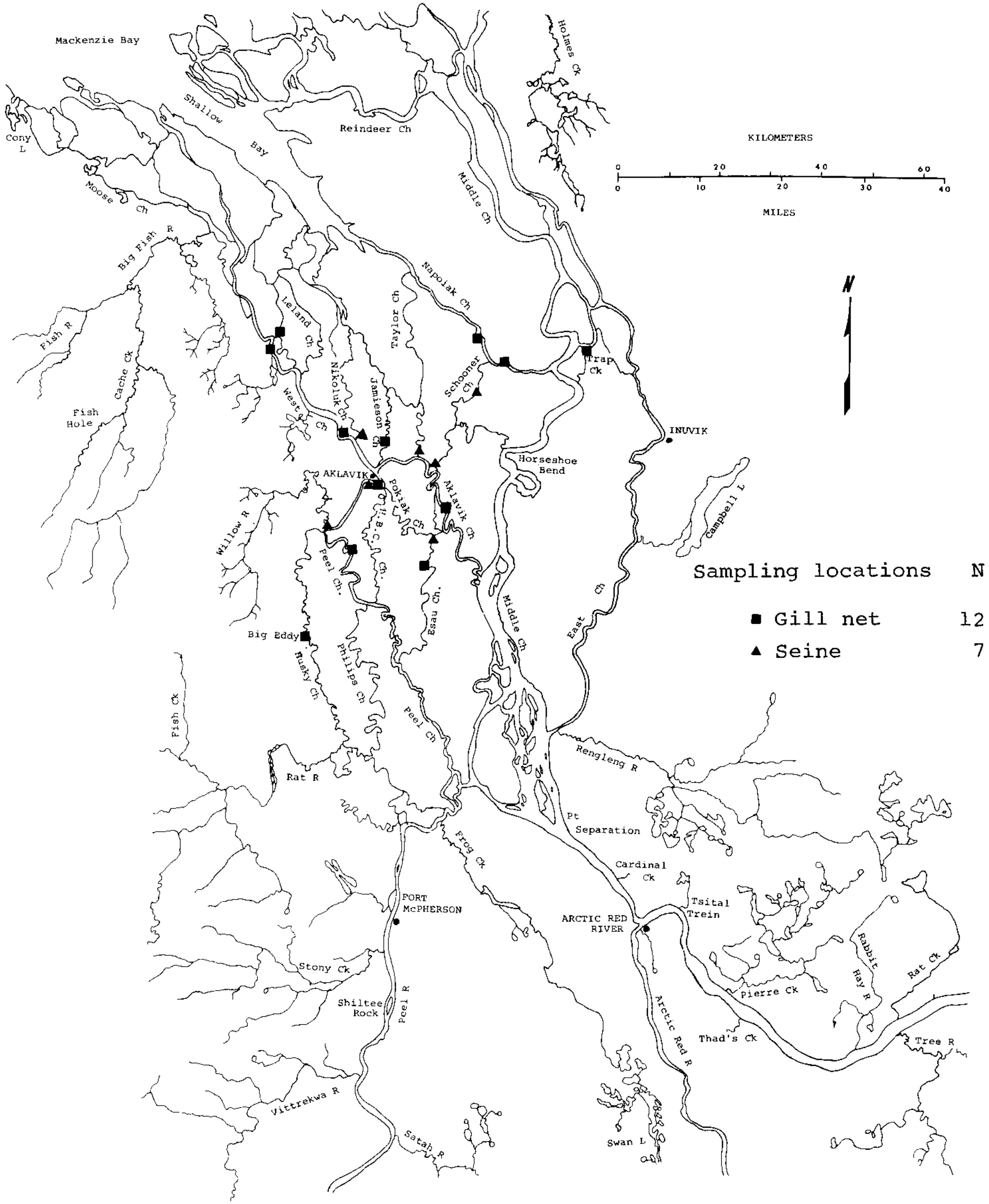


Fig. 3. Map of Aklavik study area showing index sampling locations.

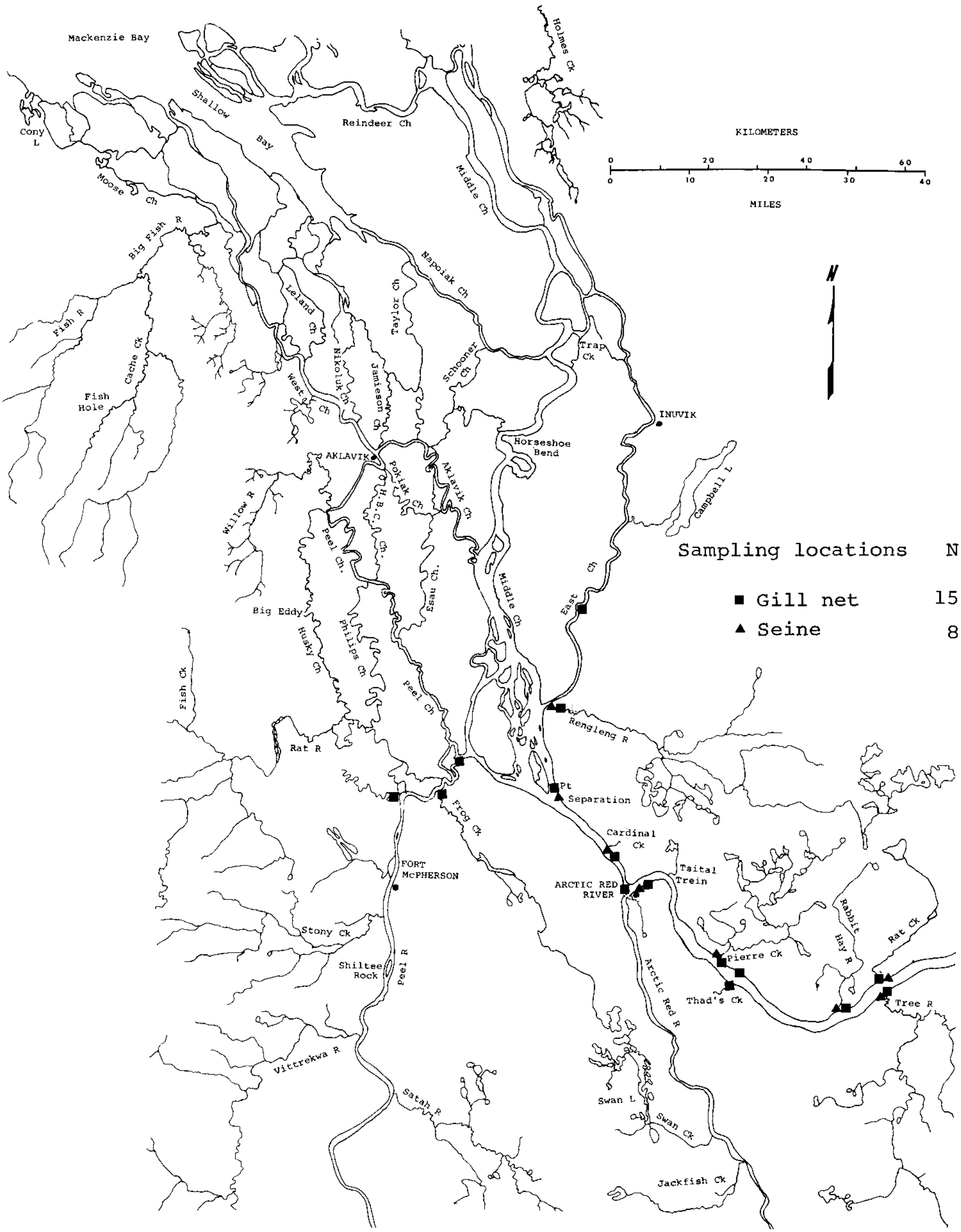


Fig. 4. Map of Arctic Red River study area showing index sampling locations.

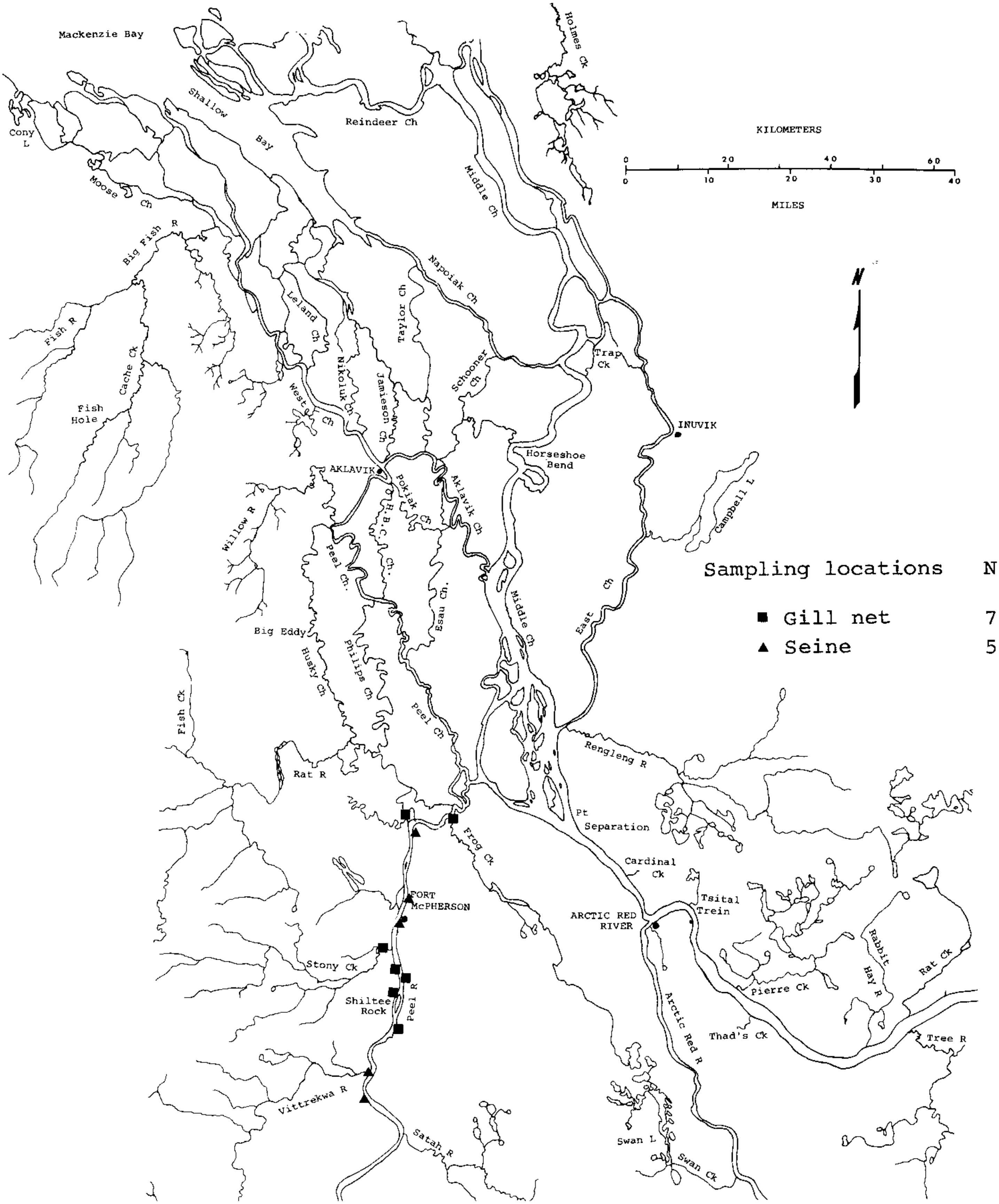


Fig. 5. Map of Fort McPherson study area showing index sampling locations.

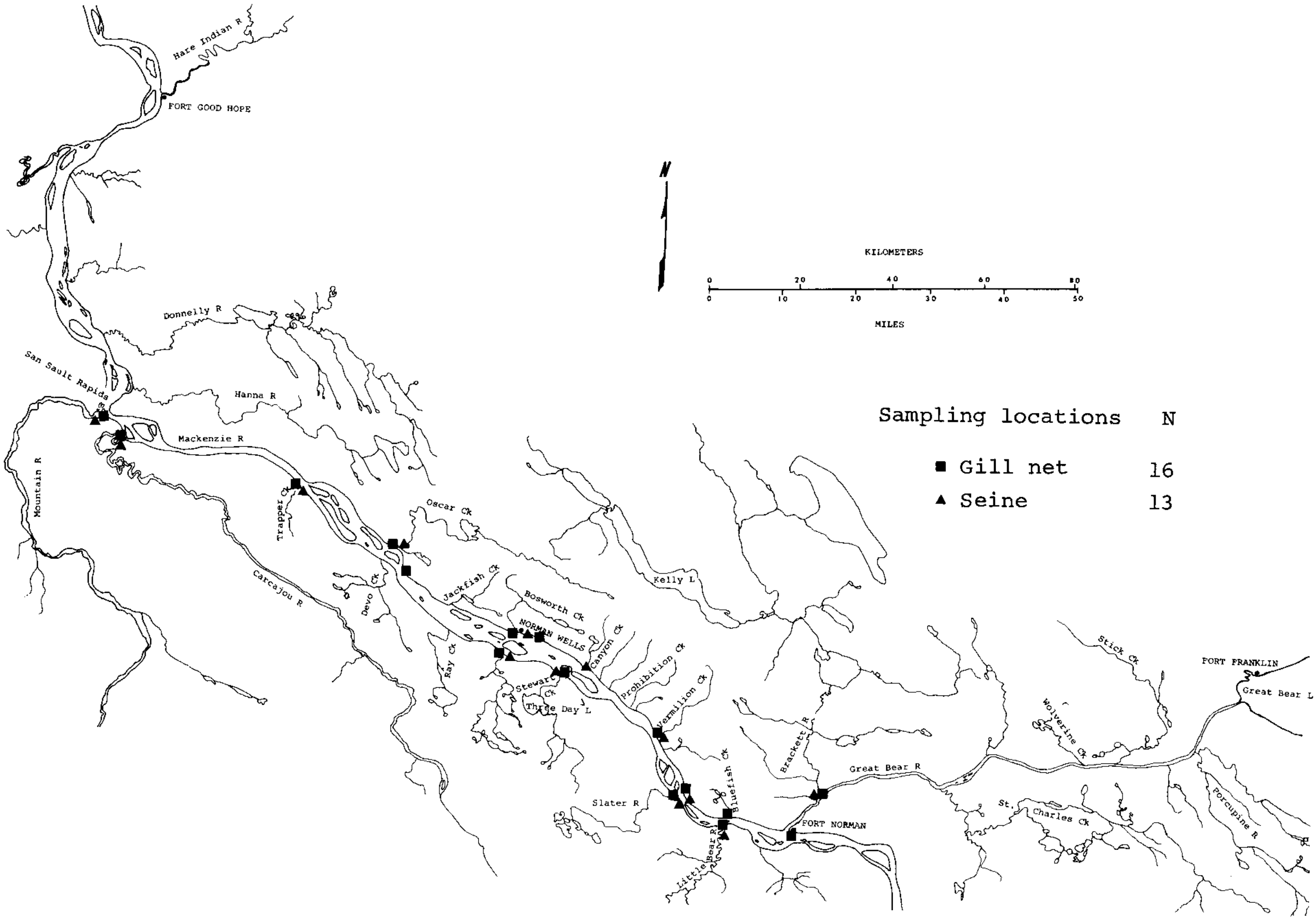


Fig. 6. Map of Norman Wells study area showing index sampling locations.

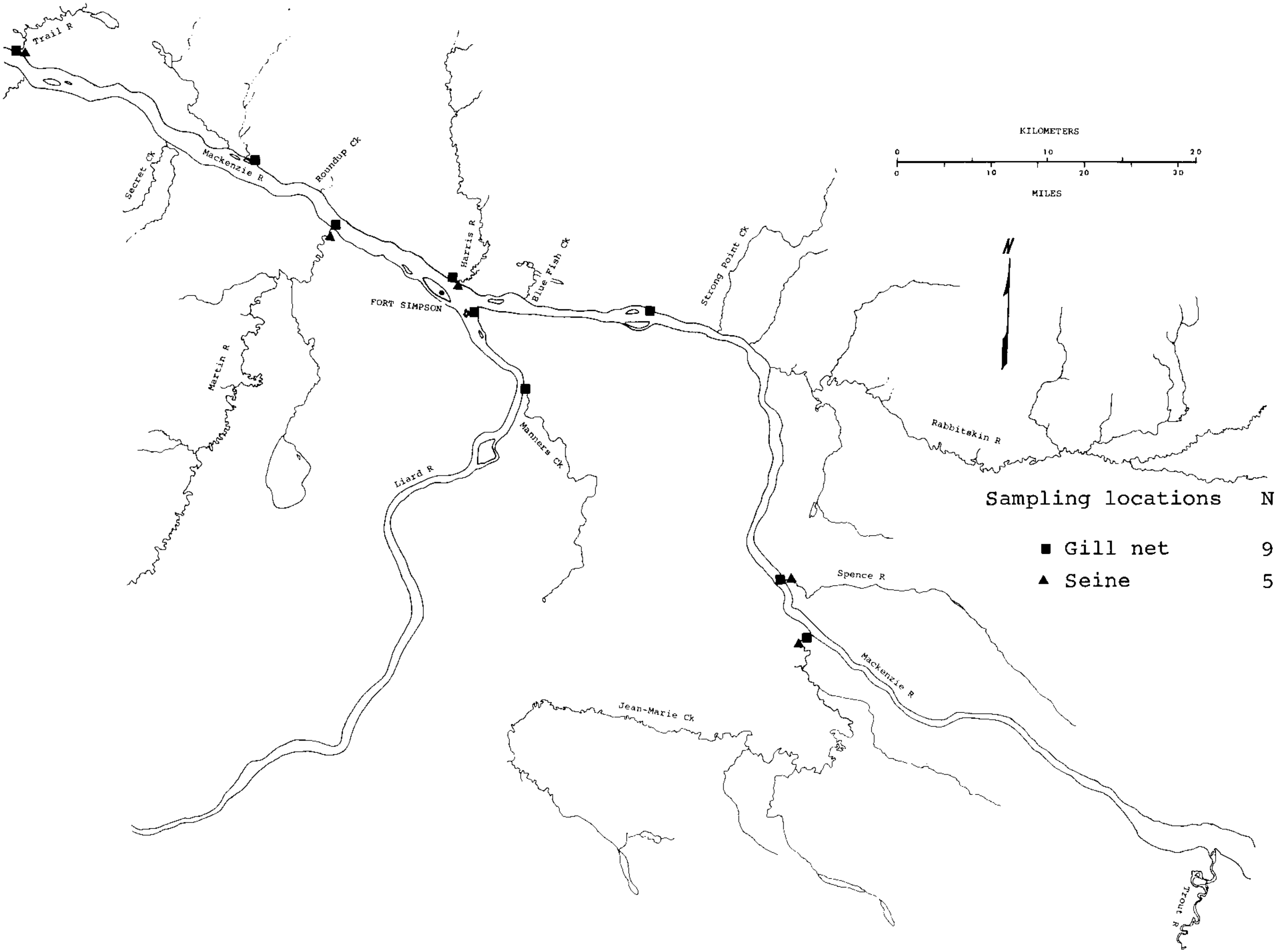


Fig. 7. Map of Fort Simpson study area showing index sampling locations.

Fig. 8. Retrieving a gill net from a tributary of the Mackenzie River.

Fig. 9. Seining a tributary of the Mackenzie River.

Fig. 10. A trap net, used to capture live fish for tagging.

Fig. 11. Applying a numbered tag to an inconnu from the Mackenzie River.

Fig. 12. Drying a domestic catch of whitefish

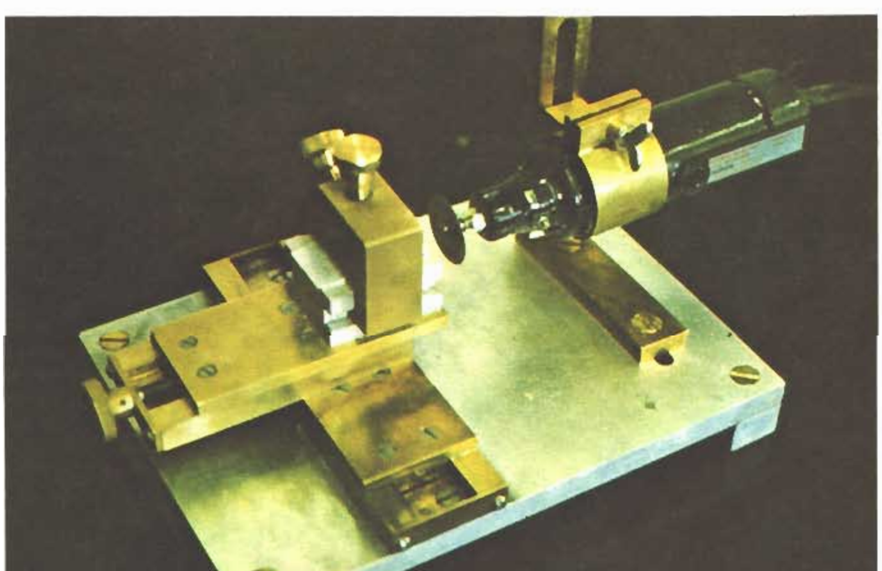


Fig. 13. Apparatus for sectioning fins in age determination.

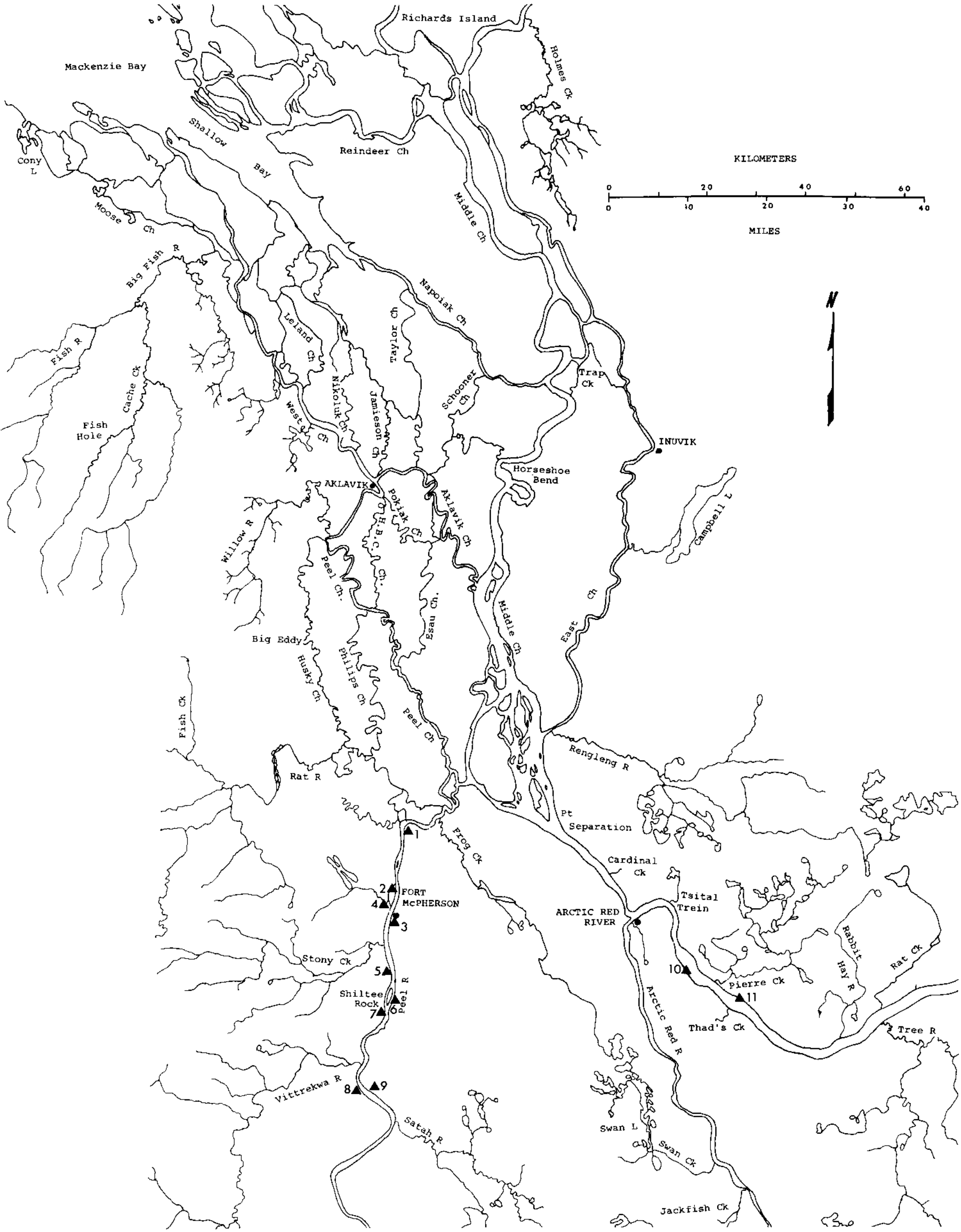


Fig. 14. Aklavik, Arctic Red River and Fort McPherson study areas. Unnamed tributaries are numbered.

Fig. 15. Norman Wells study area. Unnamed tributaries are numbered.

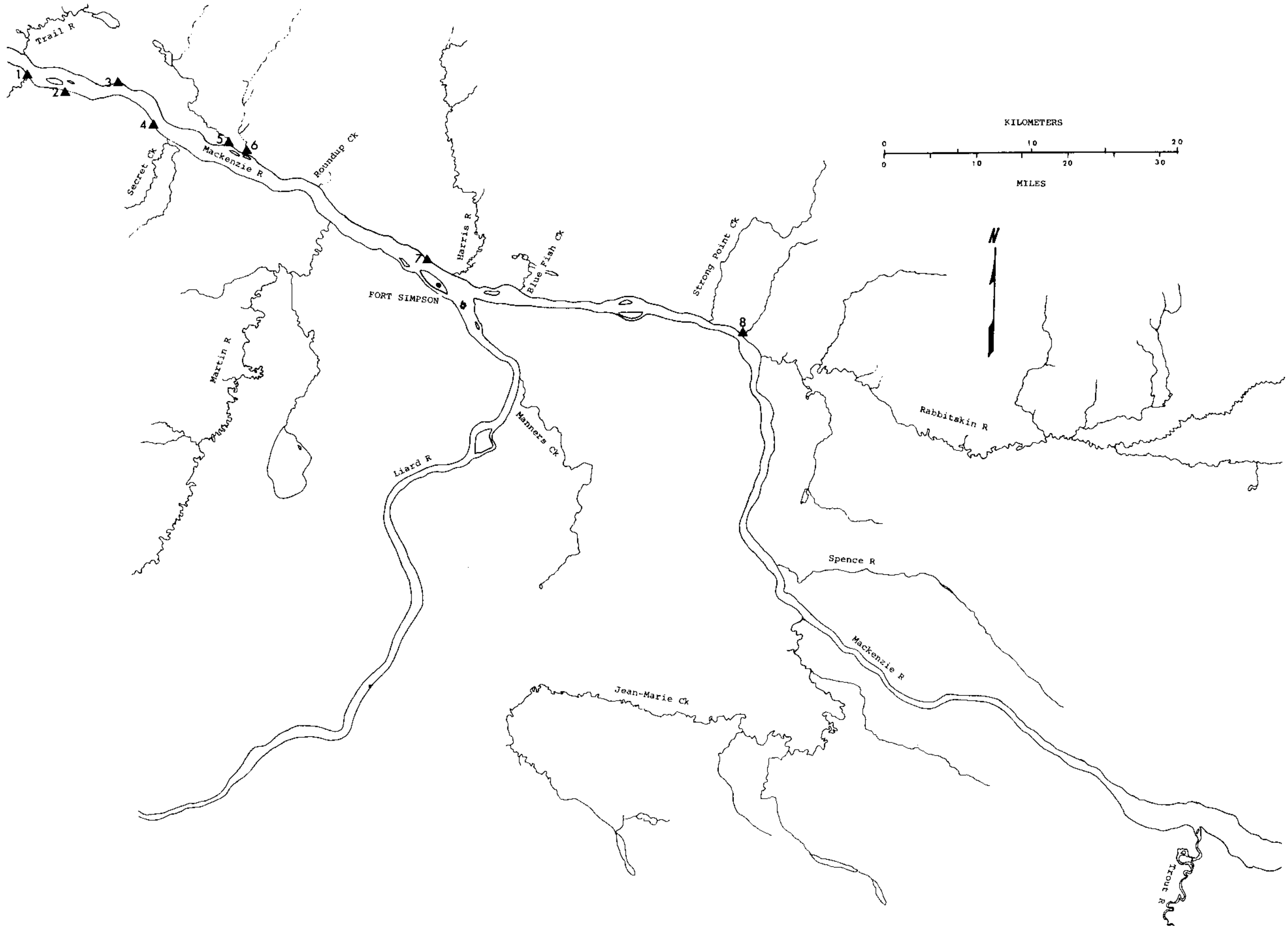


Fig. 16. Fort Simpson study area. Unnamed tributaries are numbered.

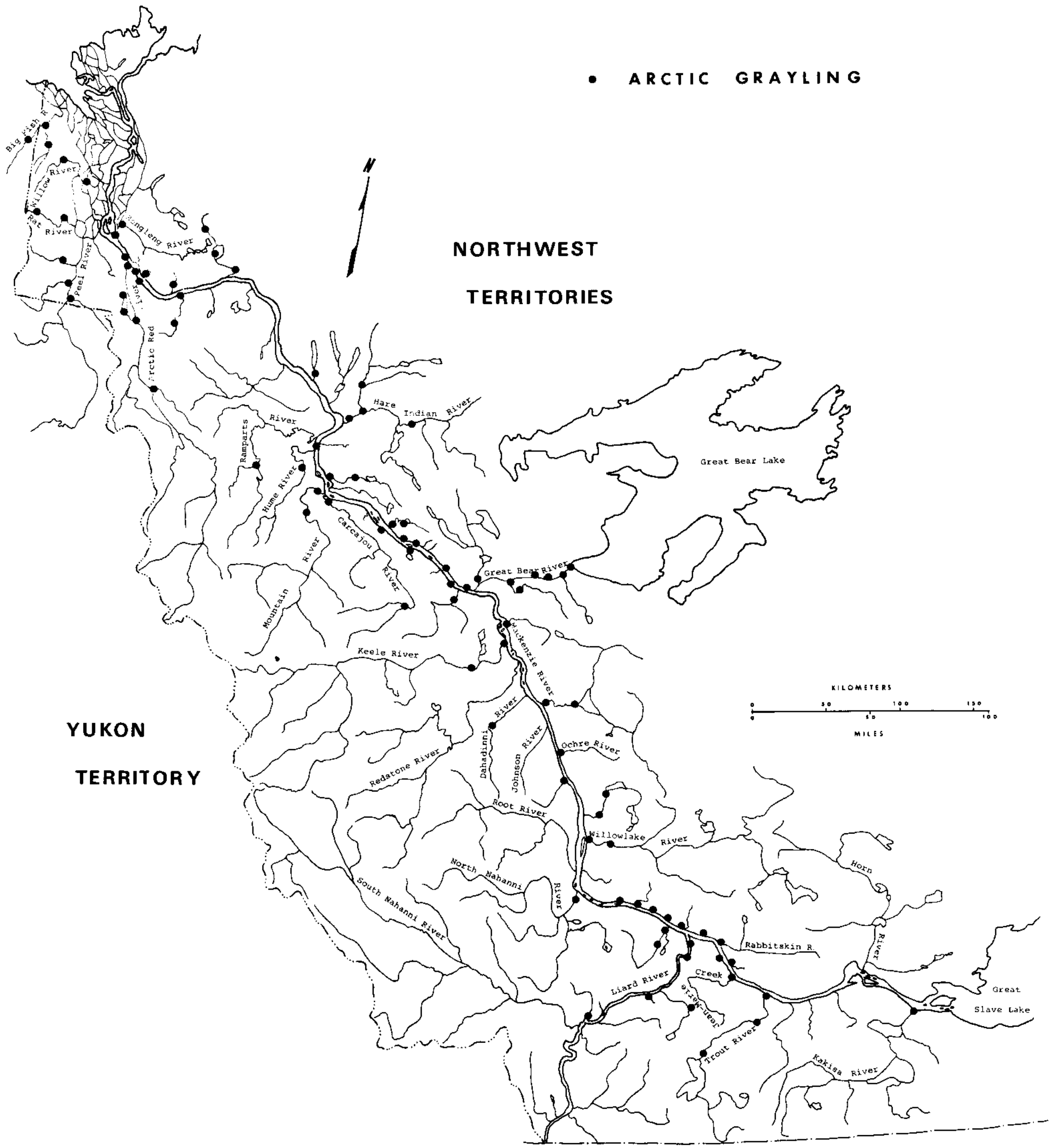


Fig. 17. Distribution of Arctic grayling, Thymallus arcticus (Pallas), in the Mackenzie River study, 1971 and 1972.

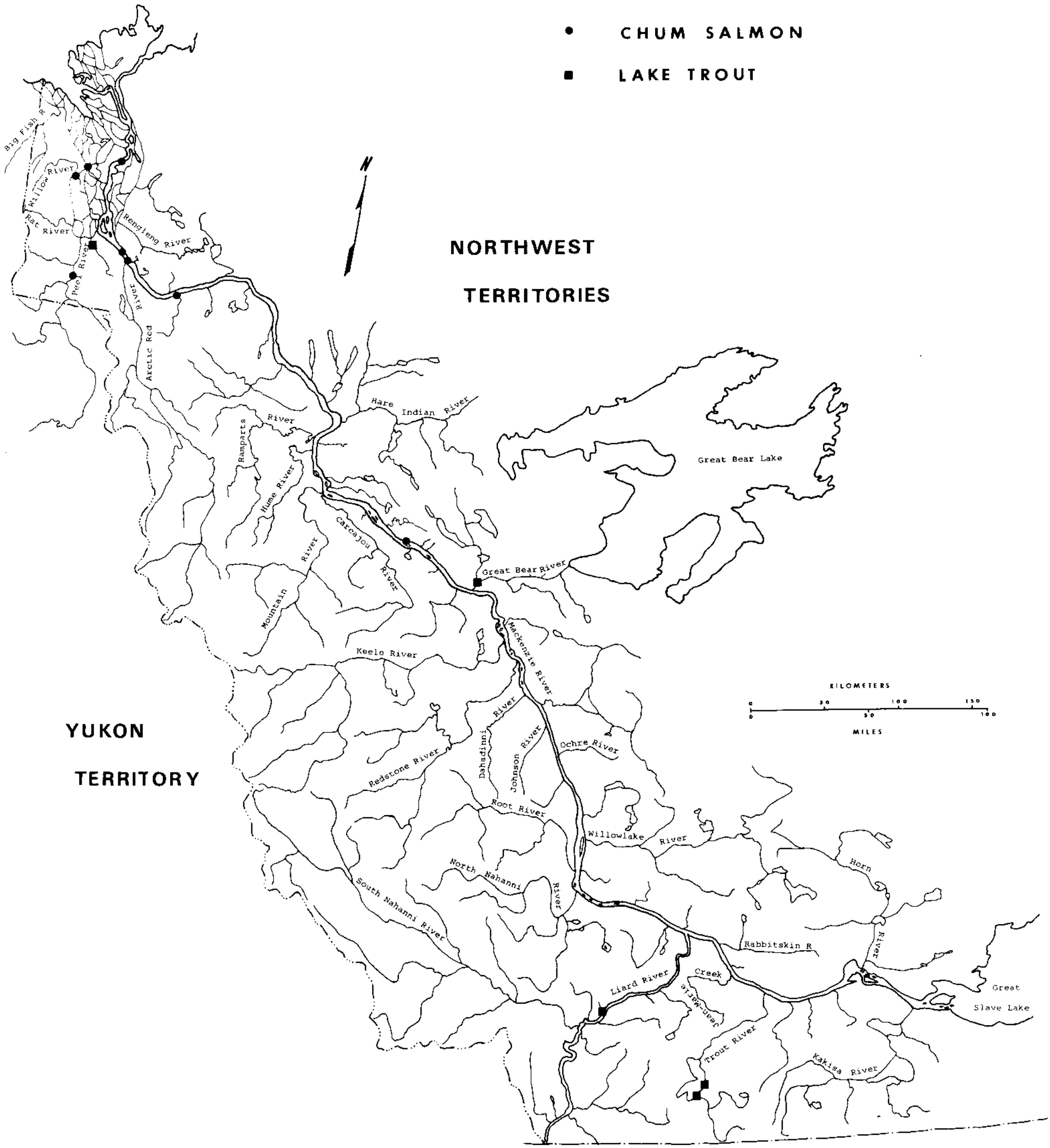


Fig. 18. Distribution of chum salmon, Oncorhynchus keta (Walbaum), and lake trout, Salvelinus namaycush (Walbaum), in the Mackenzie River study, 1971 and 1972.

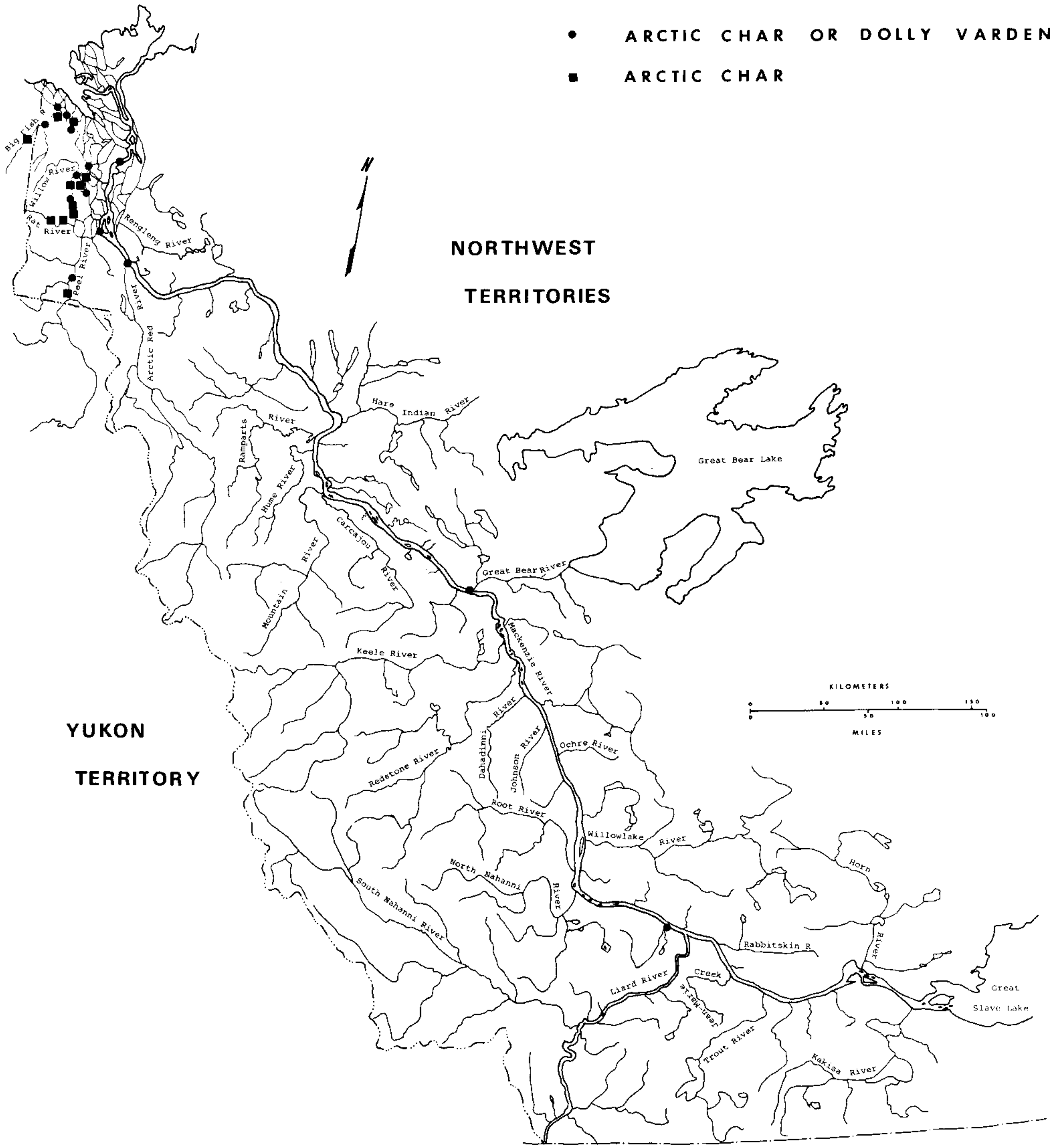


Fig. 19. Distribution of Arctic char, S. alpinus (Linnaeus), and Arctic char - Dolly Varden, S. malma (Walbaum), complex, in the Mackenzie River study, 1971 and 1972.

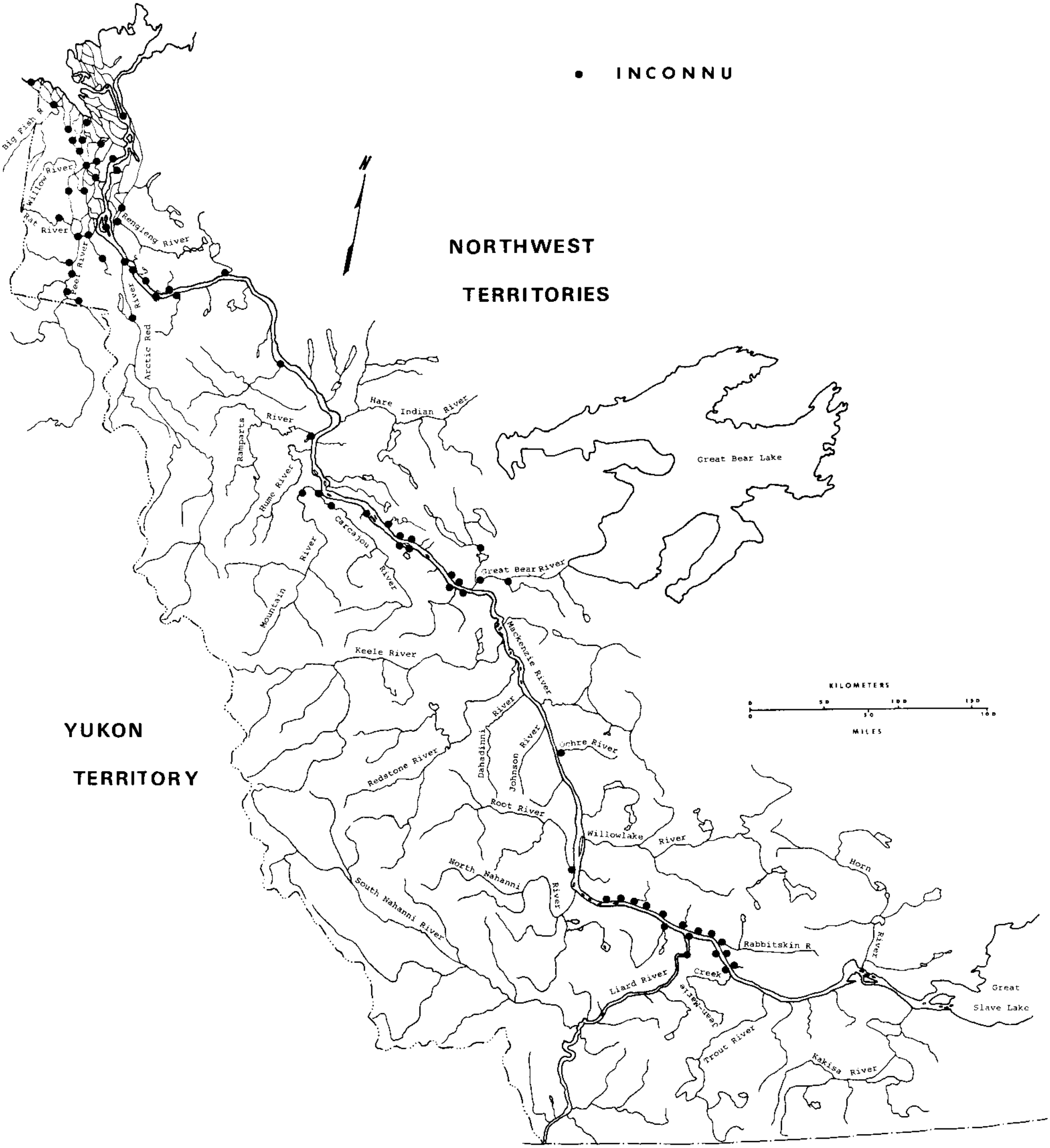


Fig. 20. Distribution of inconnu, Stenodus leucichthys nelma (Pallas), in the Mackenzie River study, 1971 and 1972.

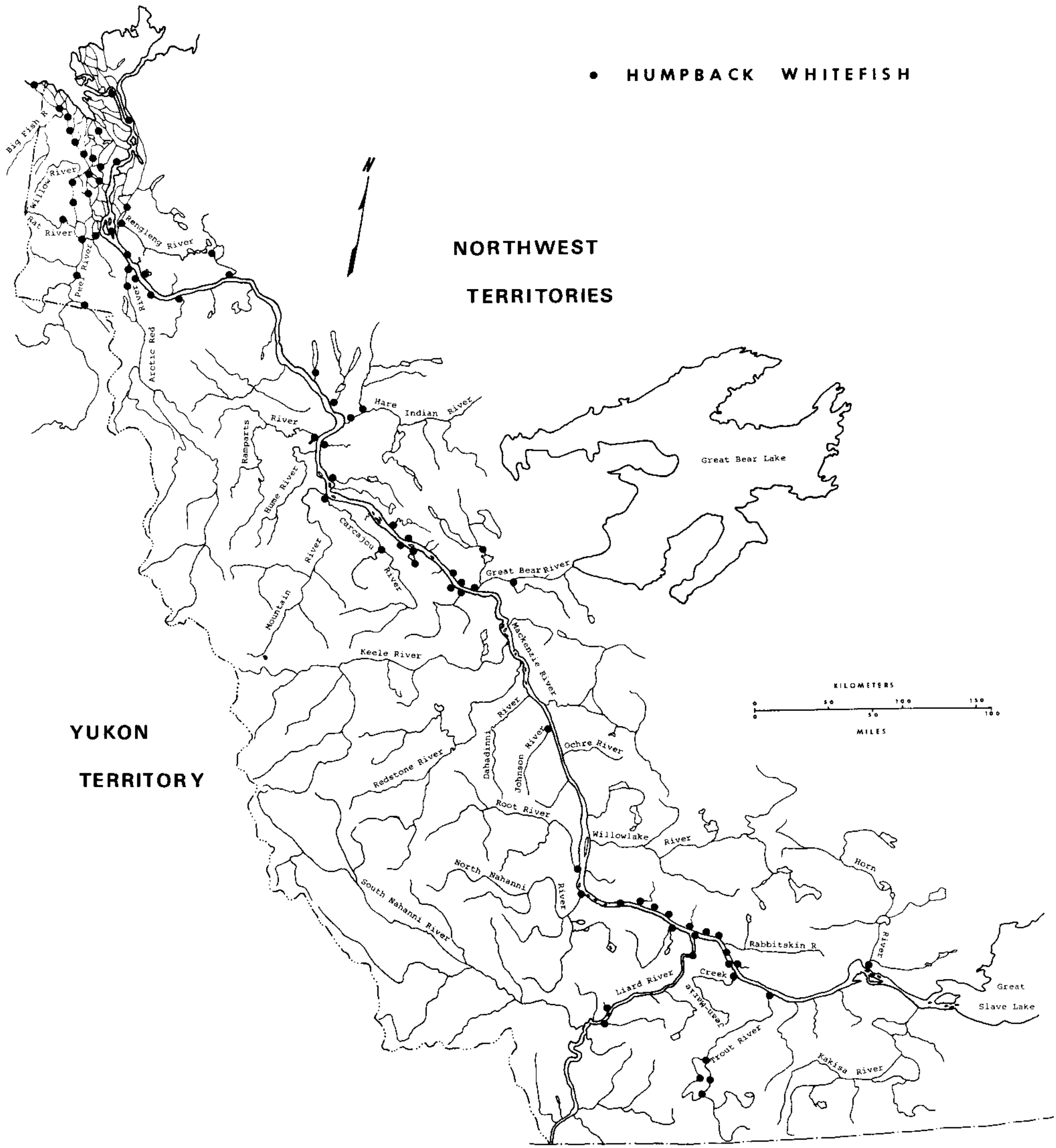


Fig. 21. Distribution of humpback whitefish, Coregonus clupeaformis (Mitchill), in the Mackenzie River study, 1971 and 1972.

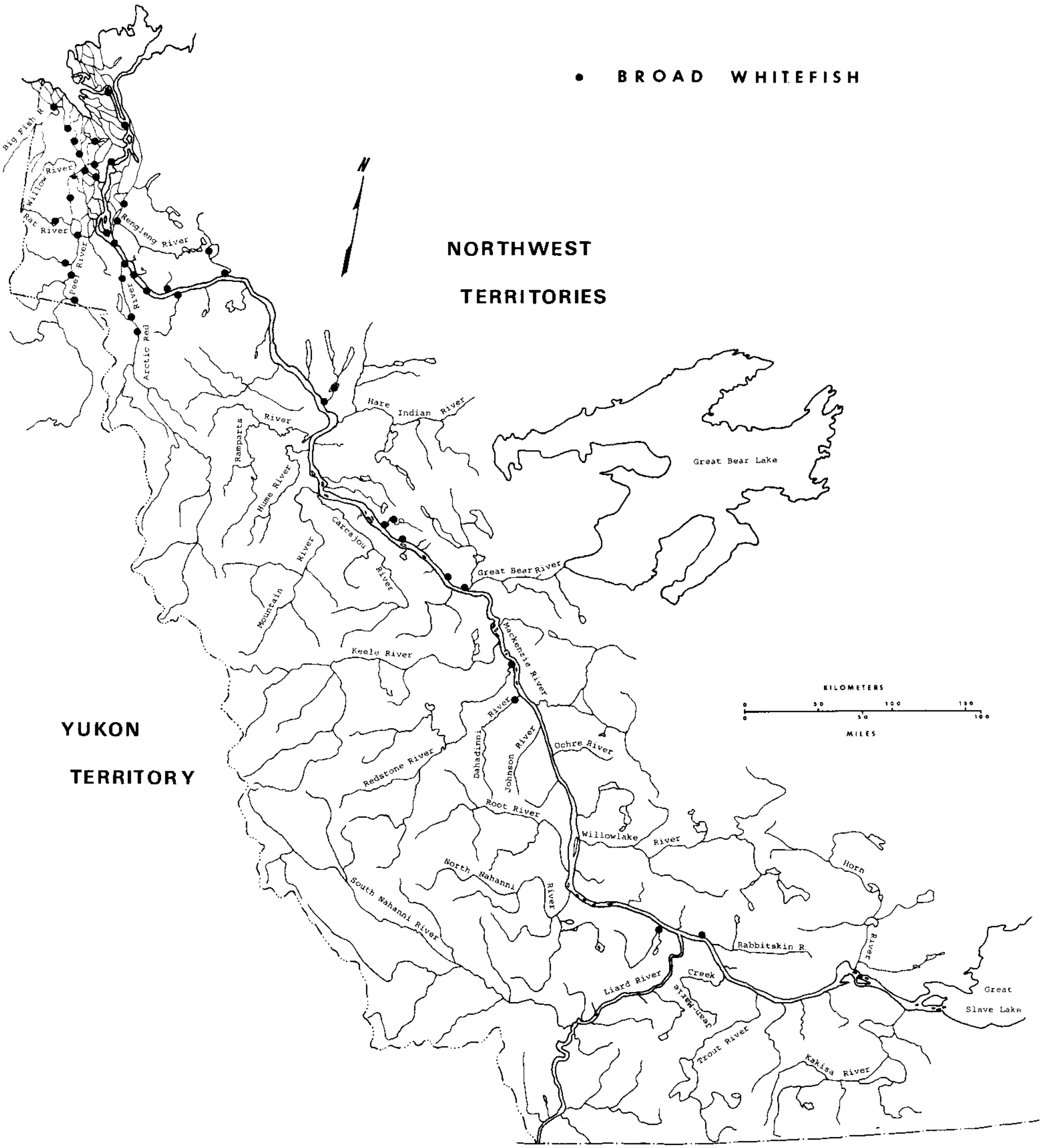


Fig. 22. Distribution of broad whitefish, C. nasus (Pallas), in the Mackenzie River study, 1971 and 1972.

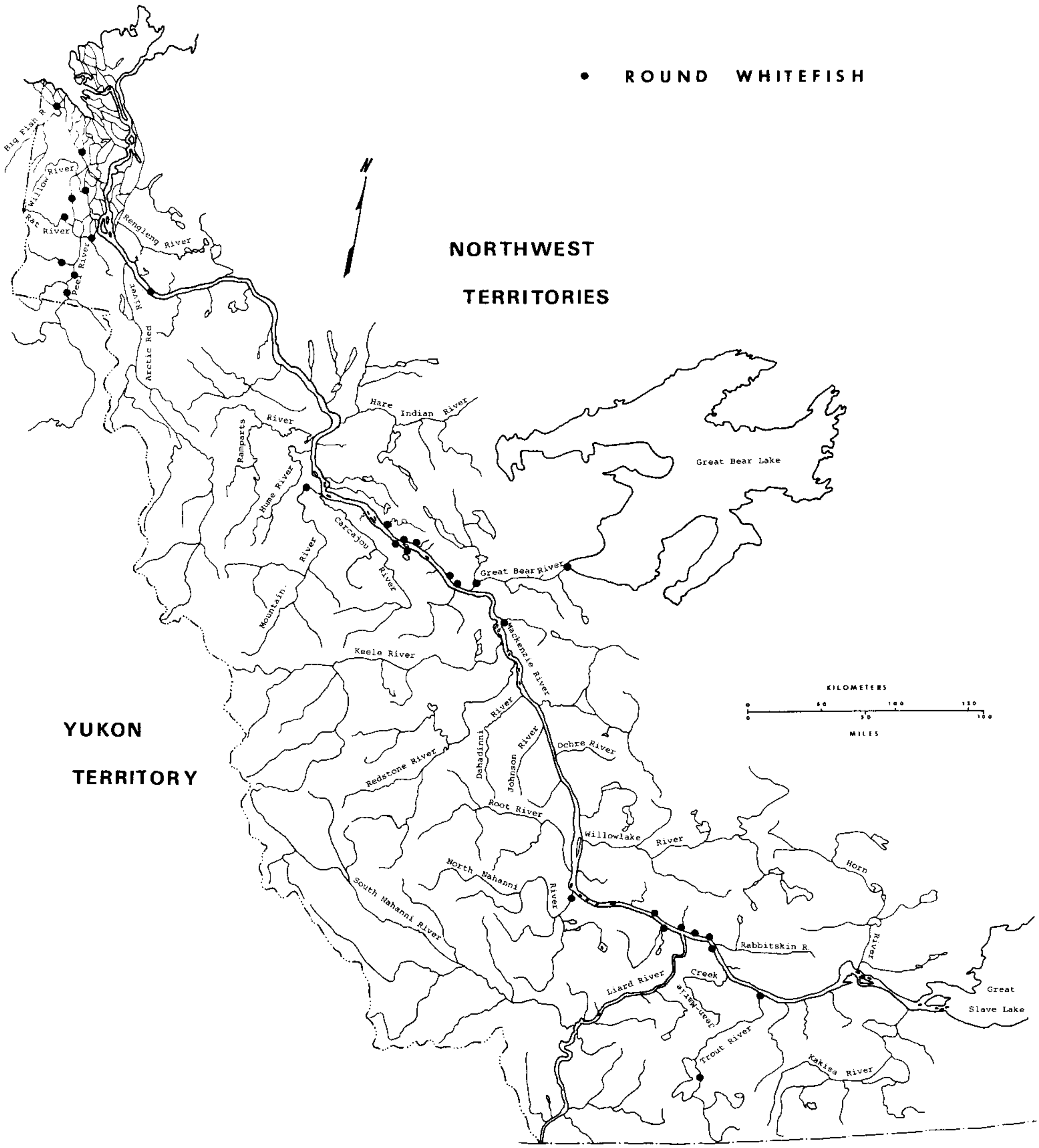


Fig. 23. Distribution of round whitefish, Prosopium cylindraceum (Pallas), in the Mackenzie River study, 1971 and 1972.

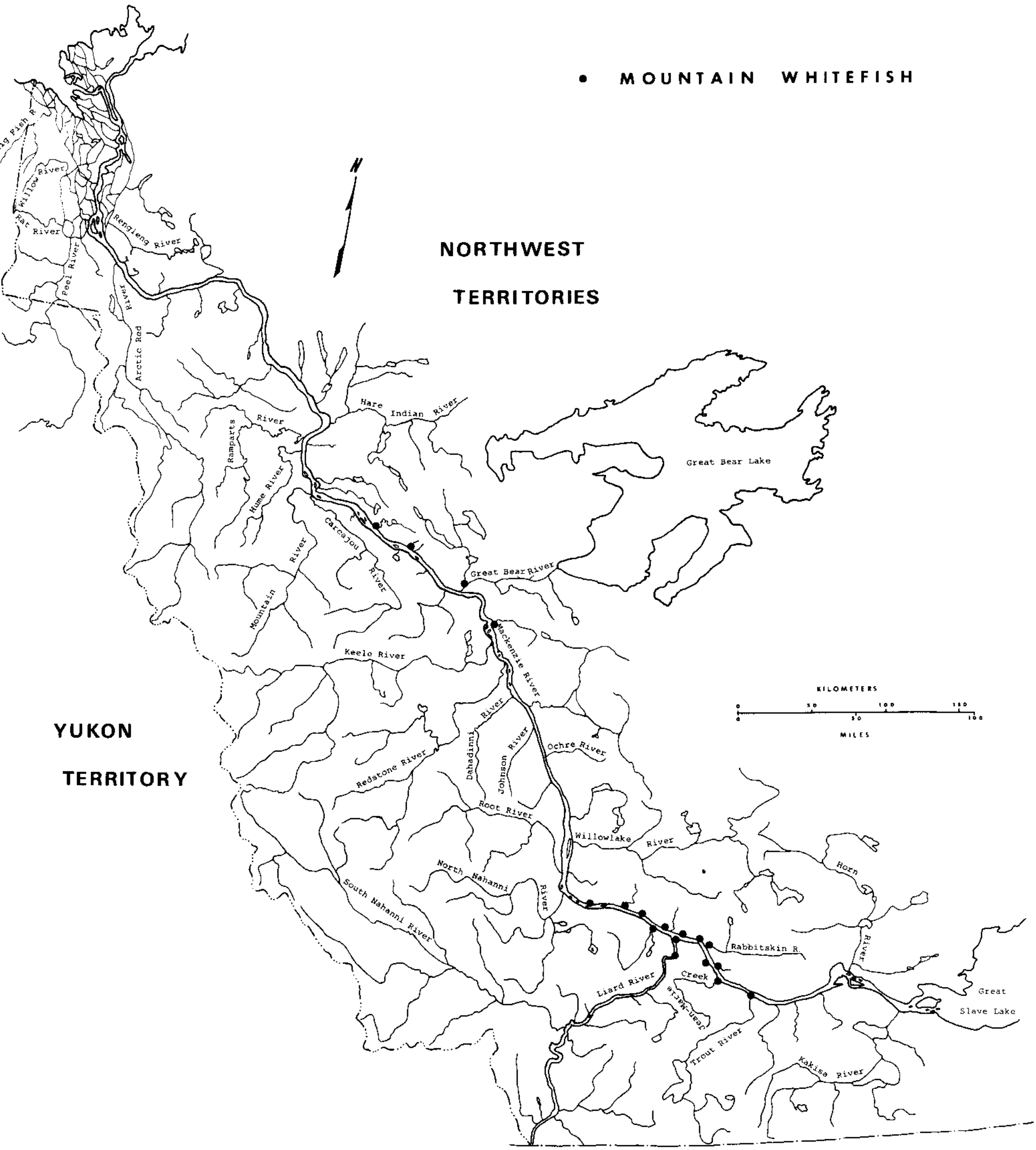


Fig. 24. Distribution of mountain whitefish, P. williamsoni (Girard), in the Mackenzie River study, 1971 and 1972.

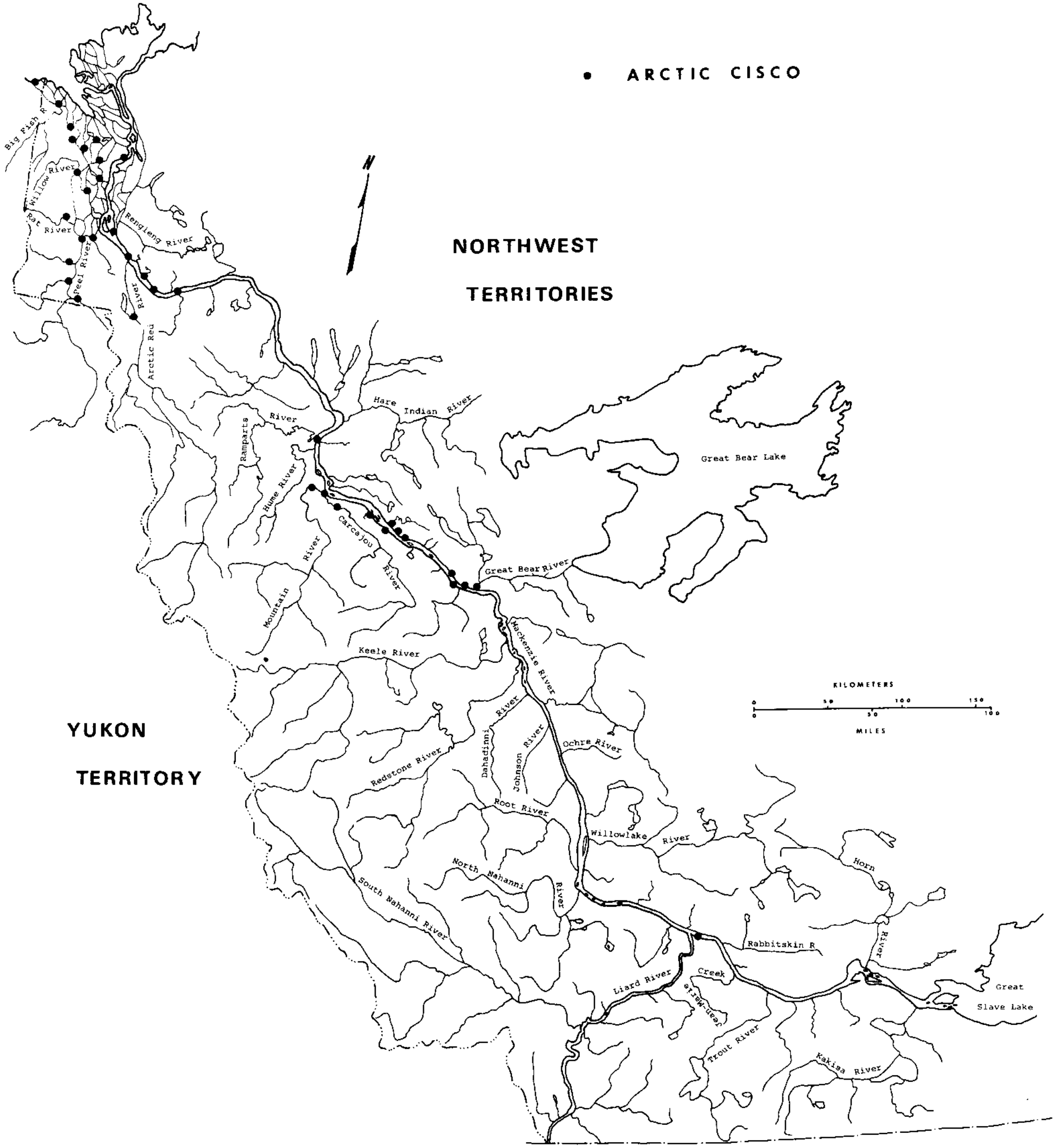


Fig. 25. Distribution of Arctic cisco, C. autumnalis (Pallas), in the Mackenzie River study, 1971 and 1972.

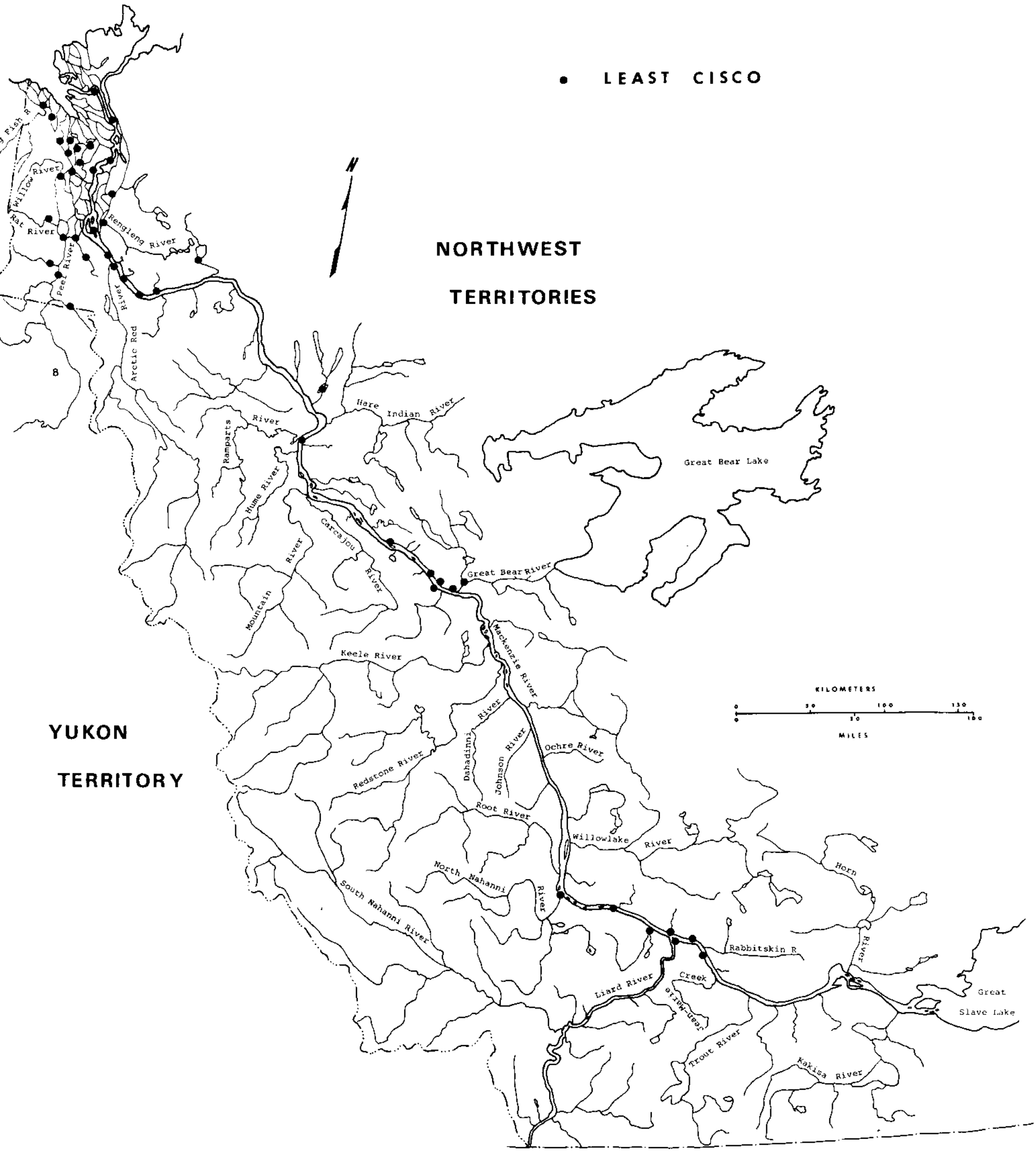


Fig. 26. Distribution of least cisco, C. sardinella (Valenciennes), in the Mackenzie River study, 1971 and 1972.

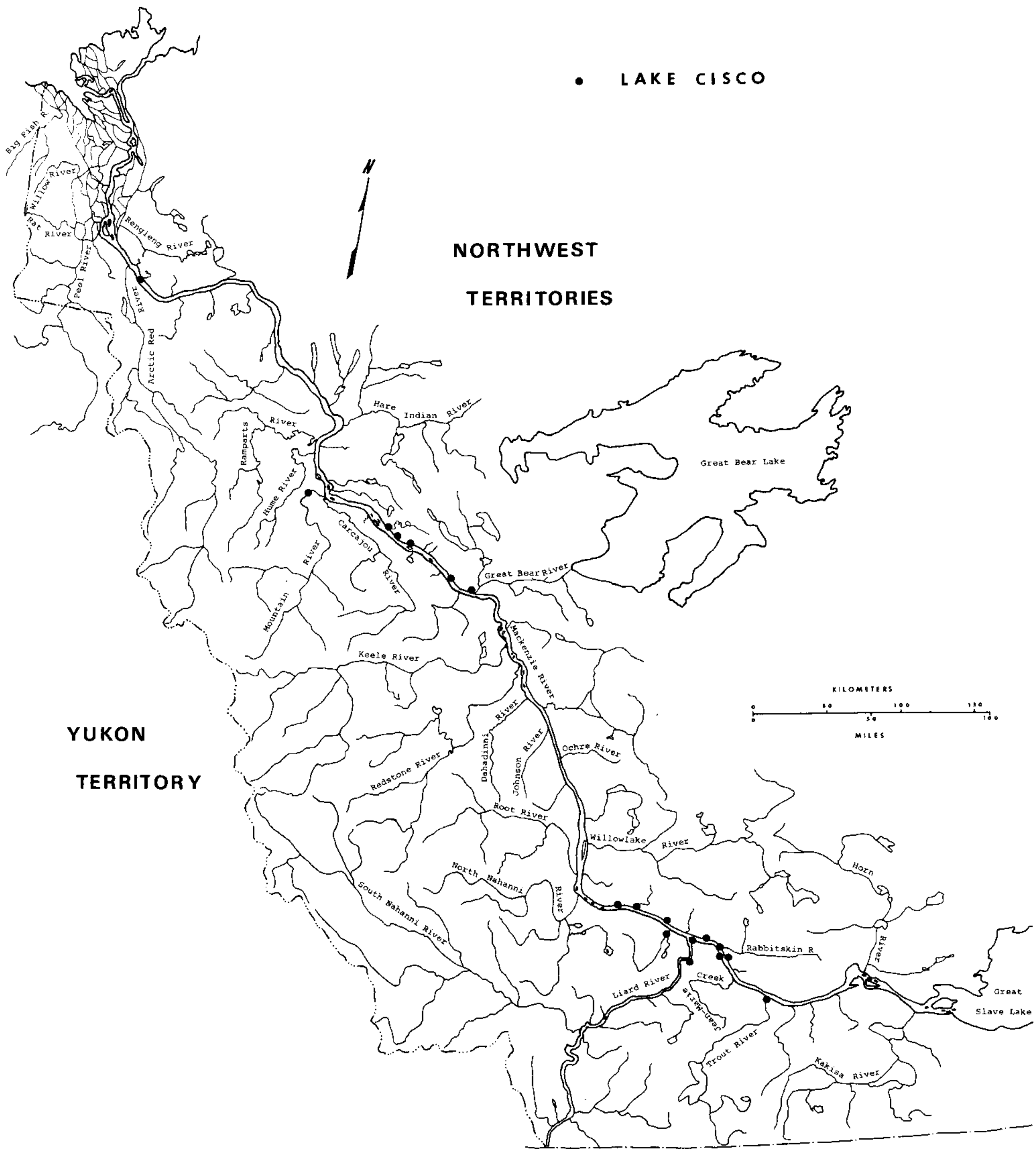


Fig. 27. Distribution of lake cisco, C. artedii (LeSueur), in the Mackenzie River study, 1971 and 1972.

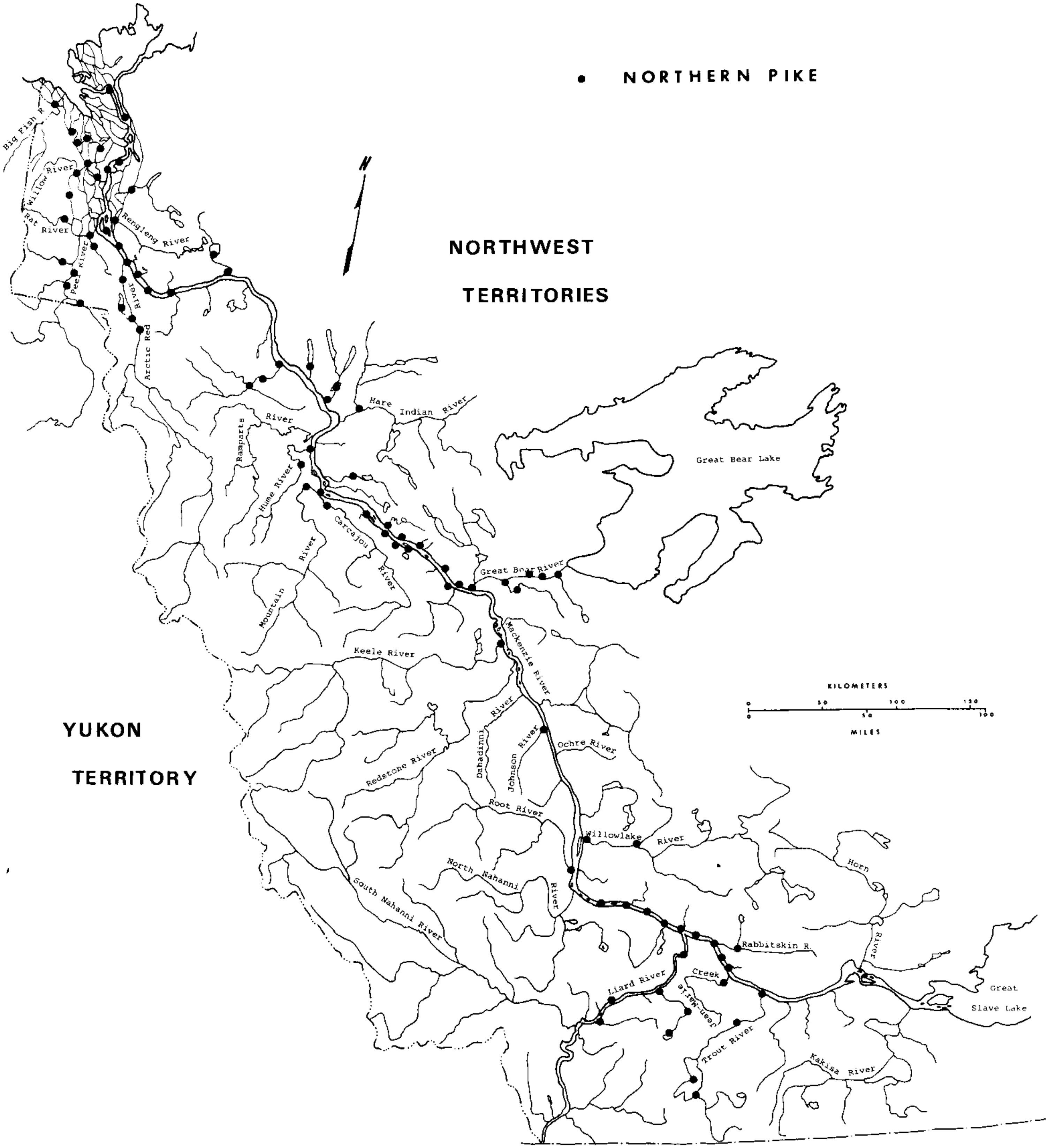


Fig. 28. Distribution of northern pike, Esox lucius (Linnaeus), in the Mackenzie River study, 1971 and 1972.

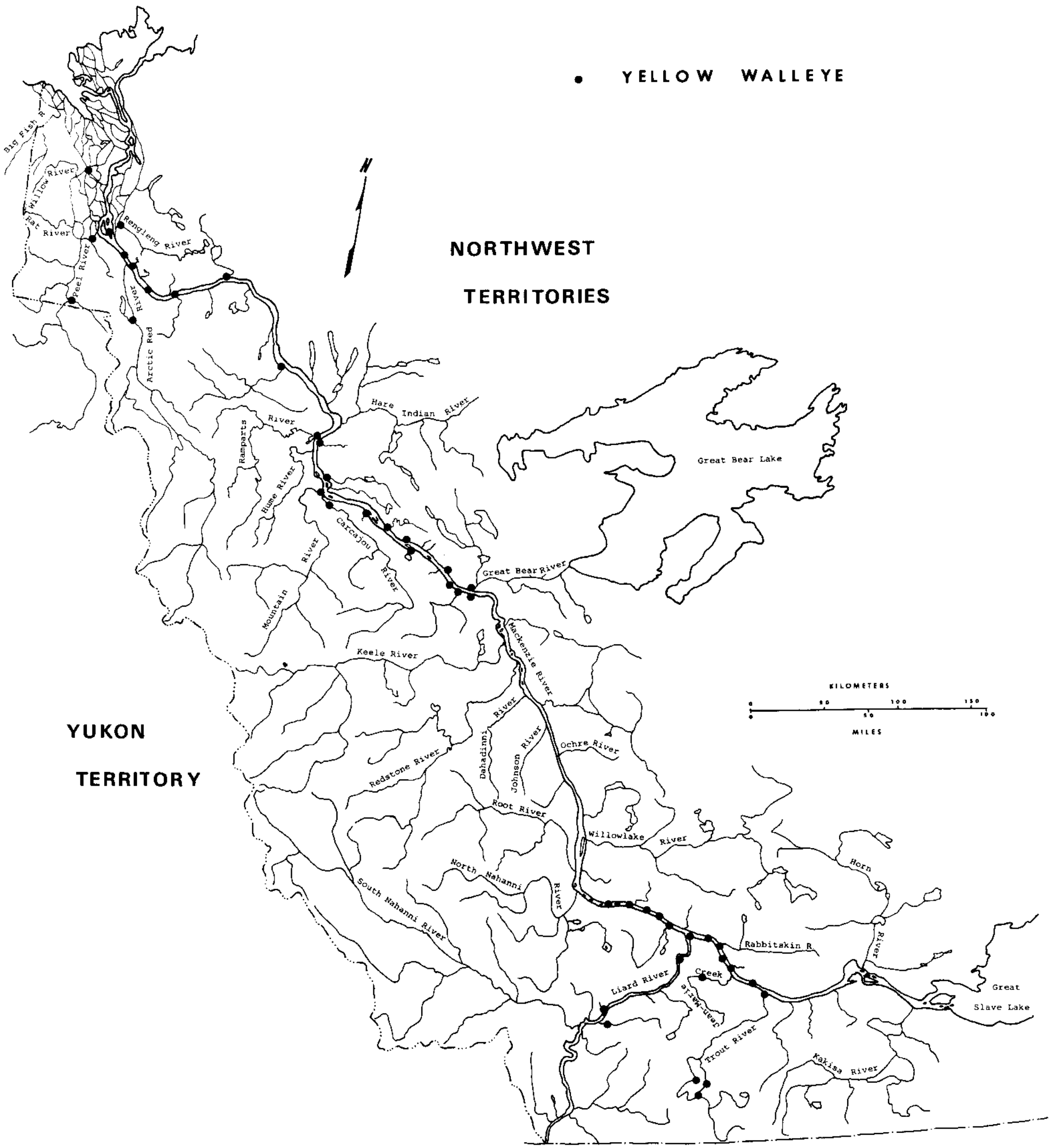


Fig. 29. Distribution of yellow walleye, Stizostedion vitreum vitreum (Mitchill), in the Mackenzie River study, 1971 and 1972.

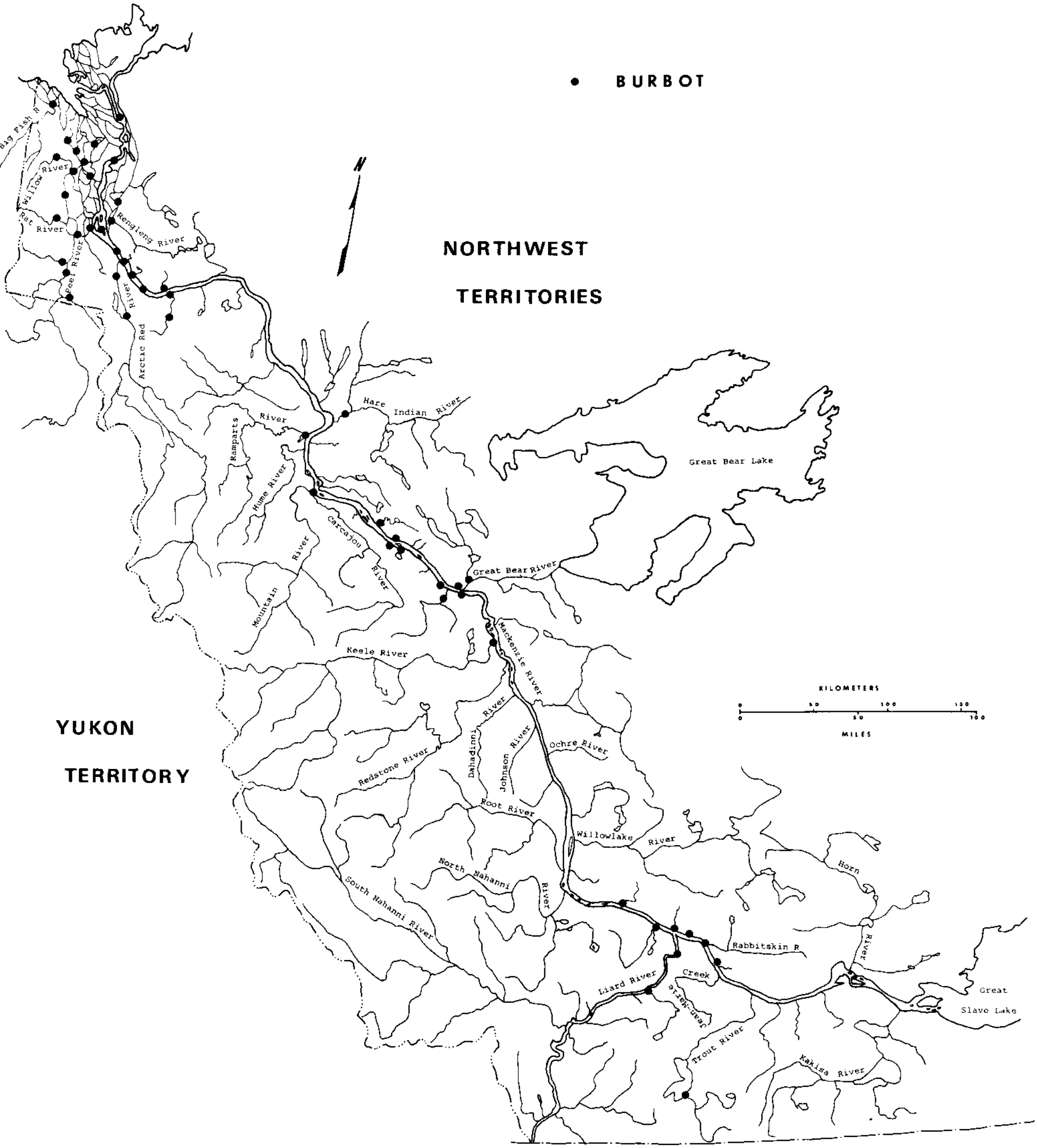


Fig. 30. Distribution of burbot, Lota lota (Linnaeus), in the Mackenzie River study, 1971 and 1972.

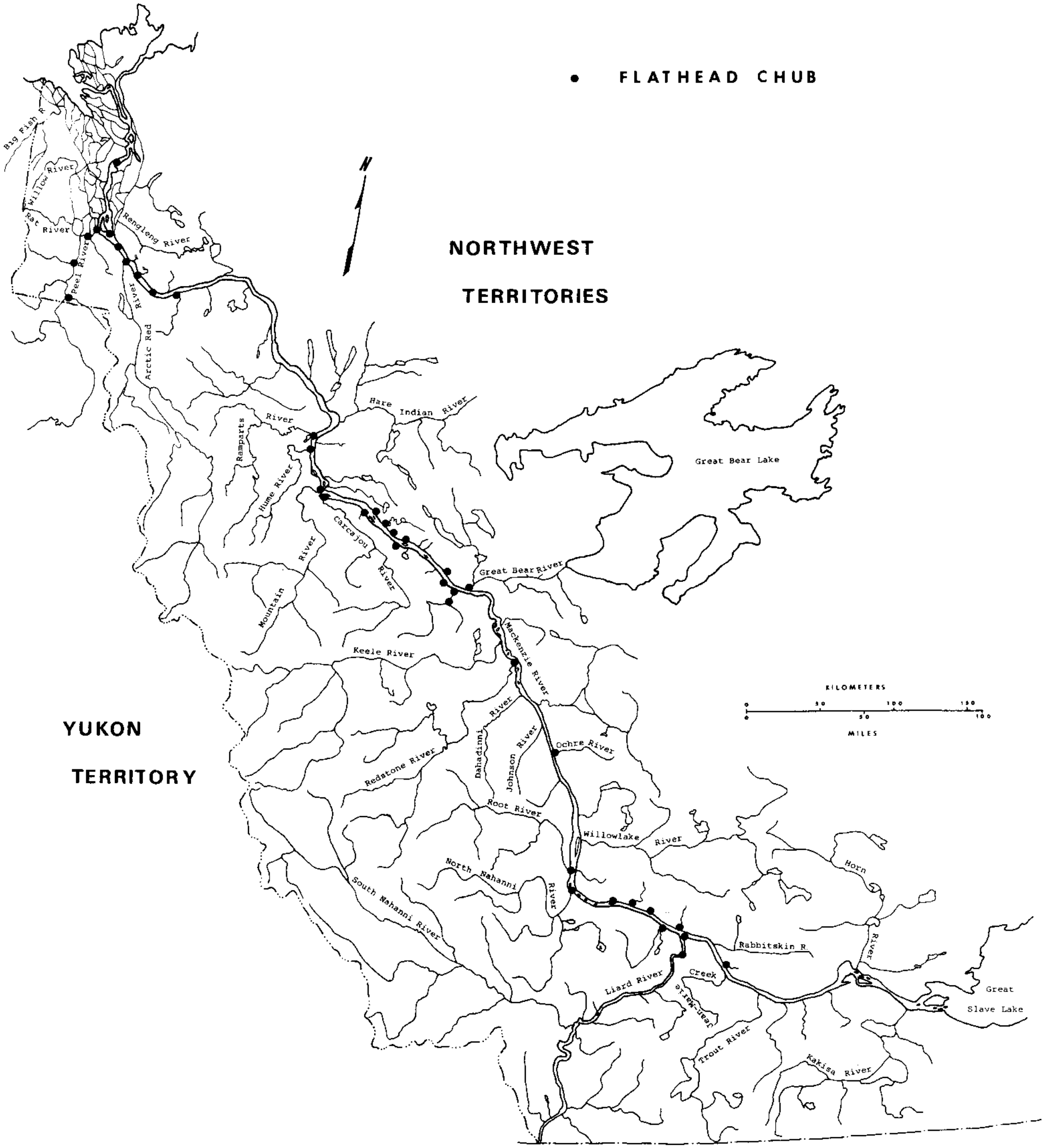


Fig. 31. Distribution of flathead chub, Platygobio gracilis (Richardson), in the Mackenzie River study, 1971 and 1972.

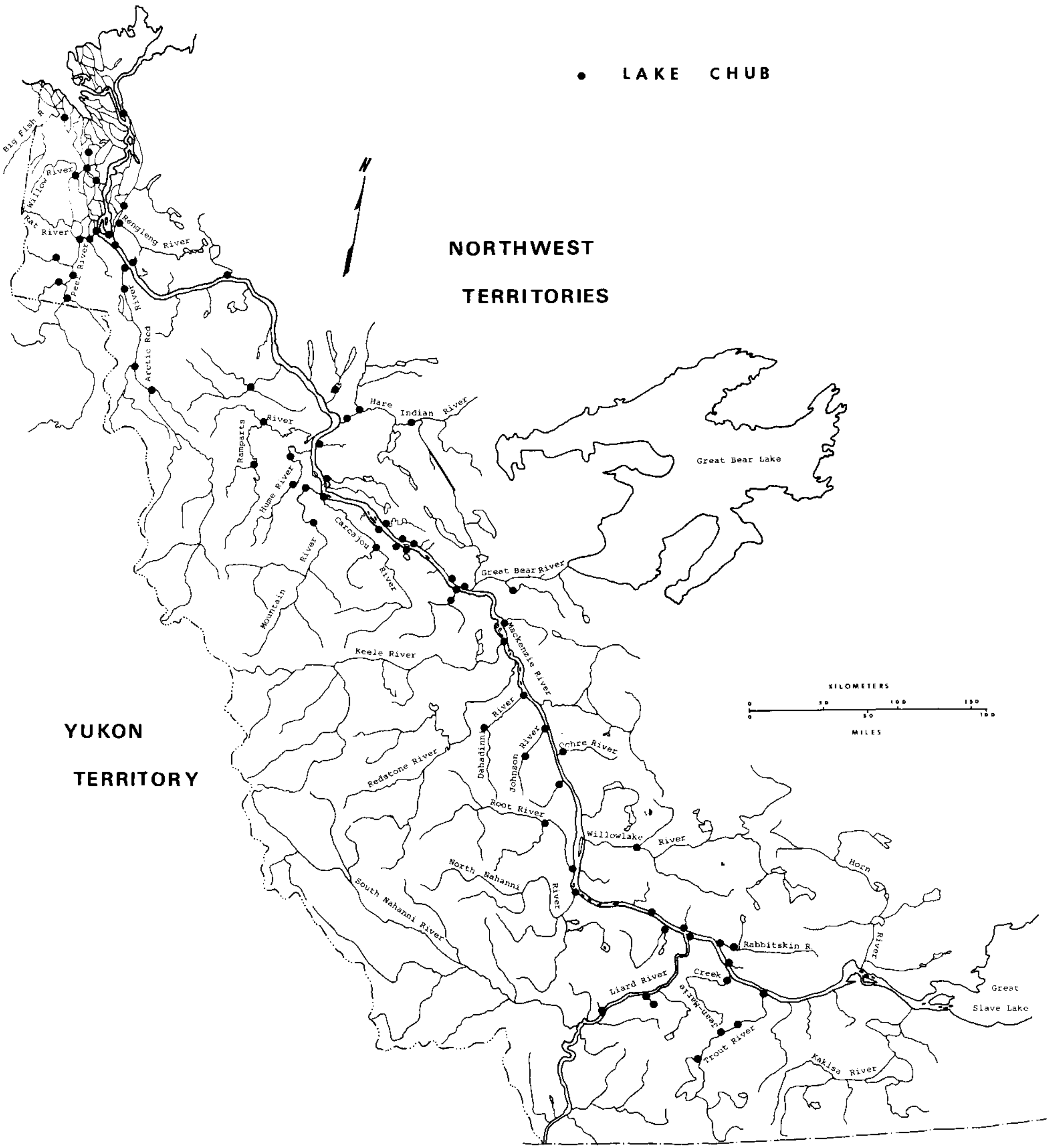


Fig. 32. Distribution of lake chub, Couesius plumbeus (Agassiz), in the Mackenzie River study, 1971 and 1972.

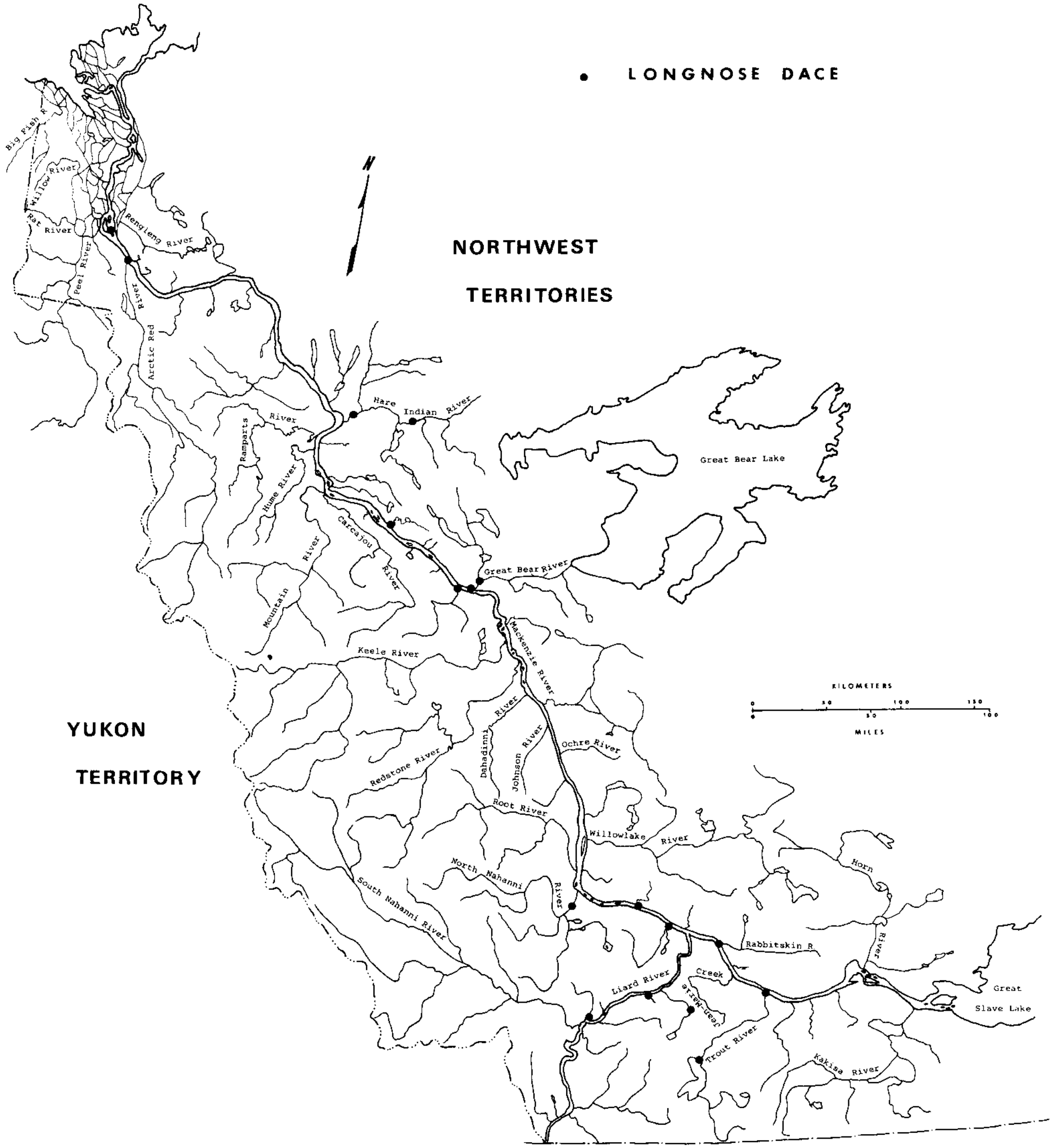


Fig. 33. Distribution of longnose dace, Rhinichthys cataractae (Valenciennes), in the Mackenzie River study, 1971 and 1972.

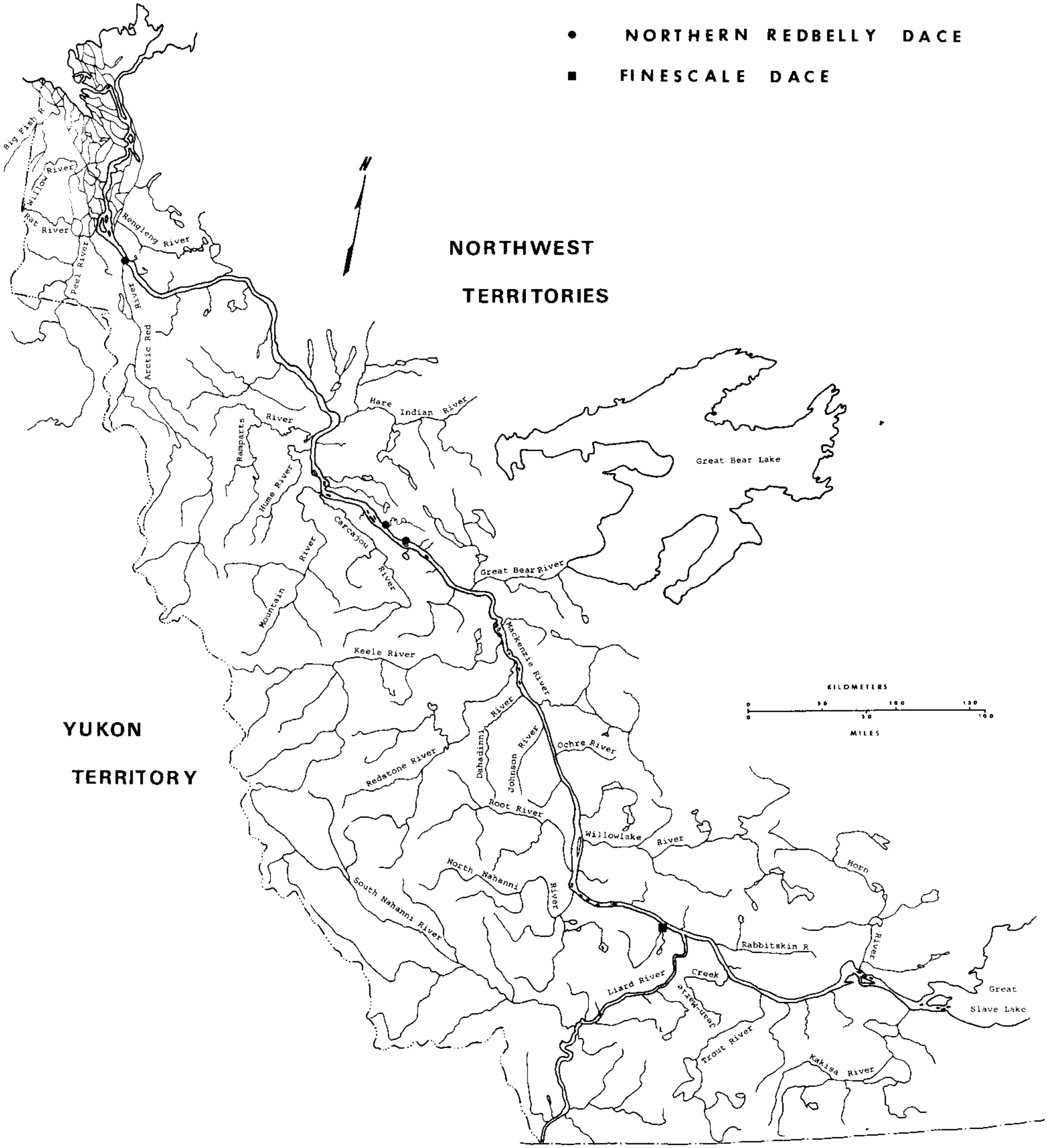


Fig. 34. Distribution of northern redbelly dace, Chrosomus eos (Cope) and finescale dace, Pfrille neogaea (Cope), in the Mackenzie River study, 1971 and 1972.

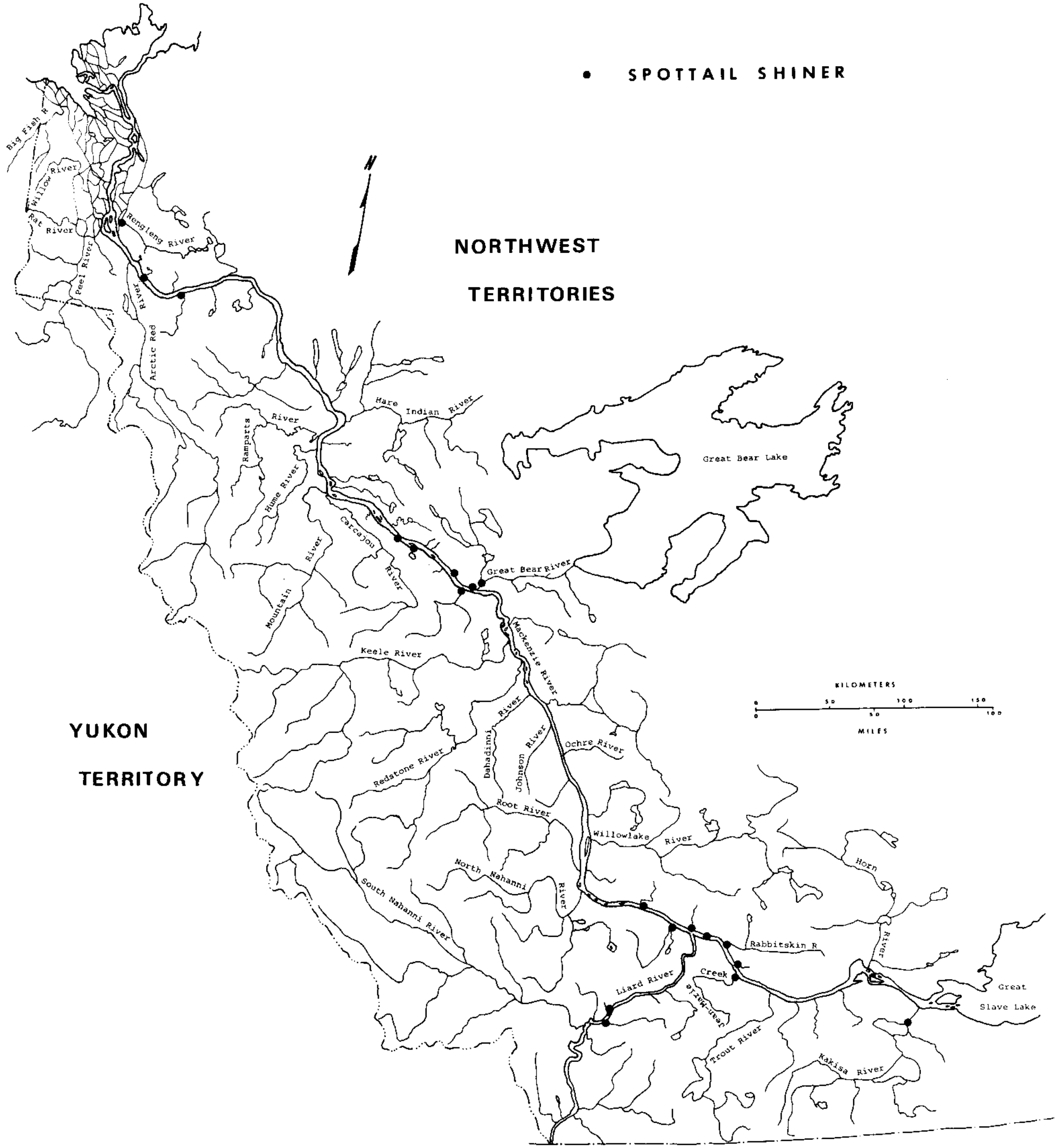


Fig. 35. Distribution of spottail shiner, Notropis hudsonius (Clinton), in the Mackenzie River study, 1971 and 1972.

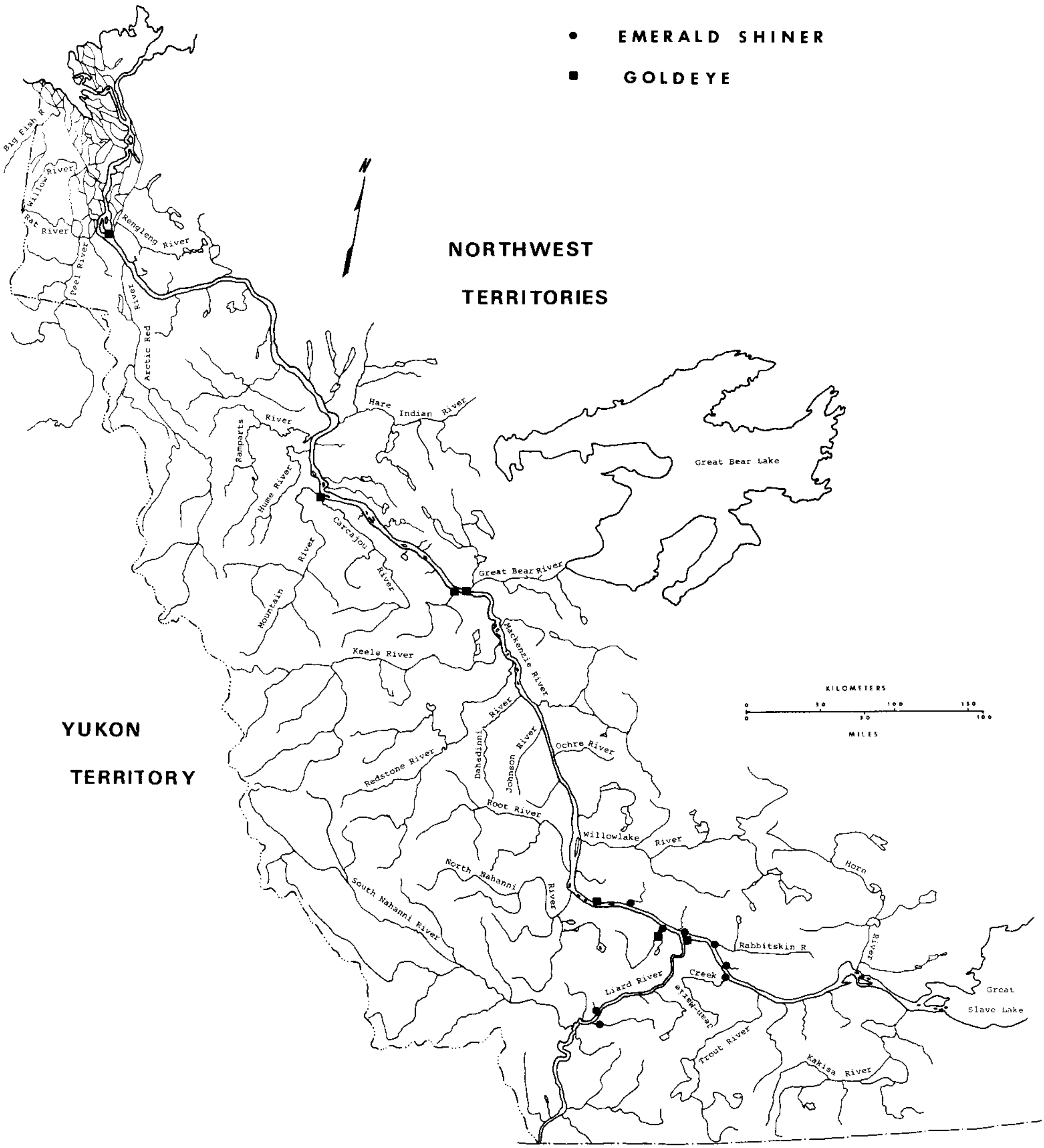


Fig. 36. Distribution of emerald shiner, N. atherinoides (Rafinesque) and goldeye, Hiodon alosoides (Rafinesque), in the Mackenzie River study, 1971 and 1972.

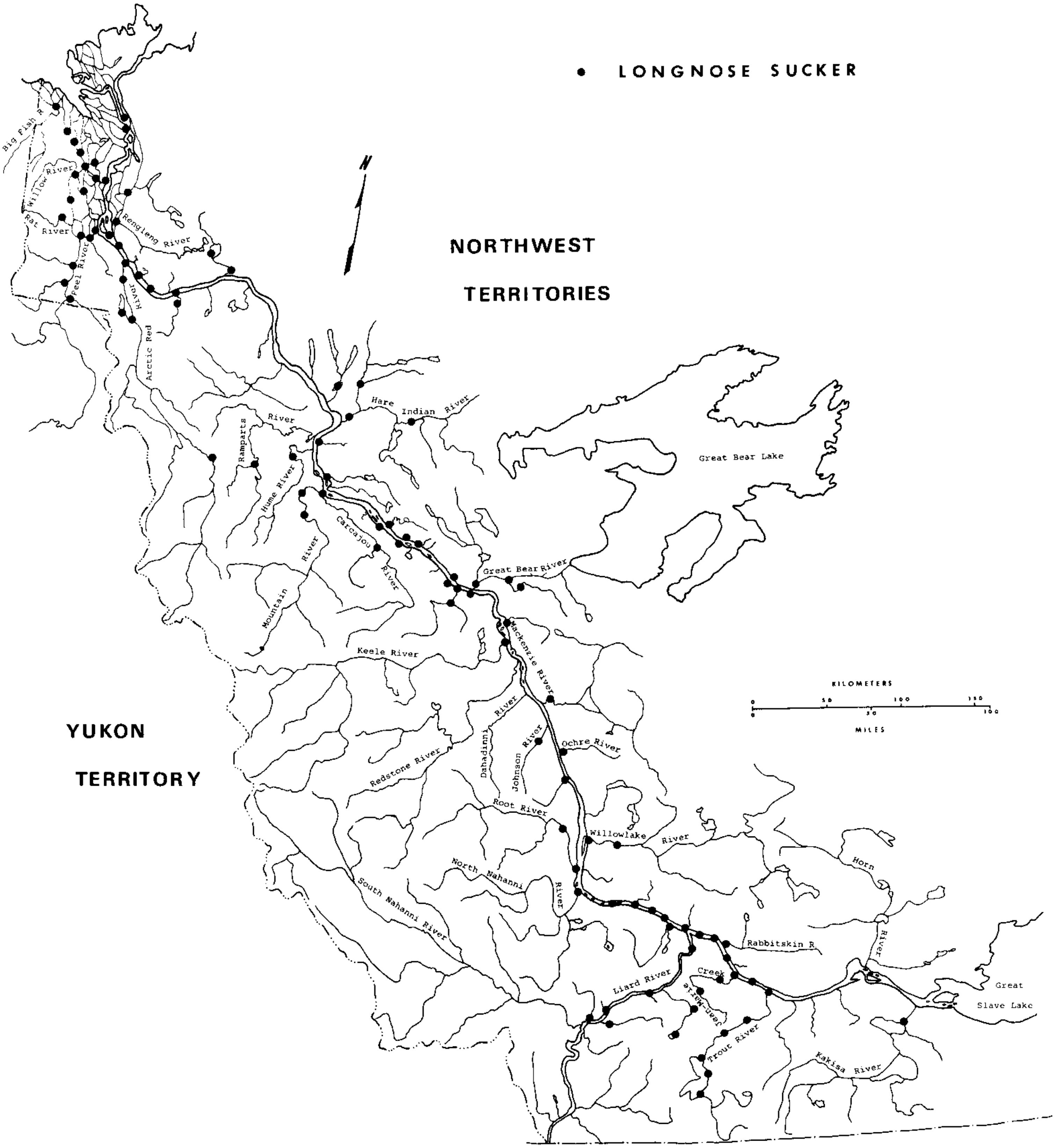


Fig. 37. Distribution of longnose sucker, Catostomus catostomus (Forster), in the Mackenzie River study, 1971 and 1972.

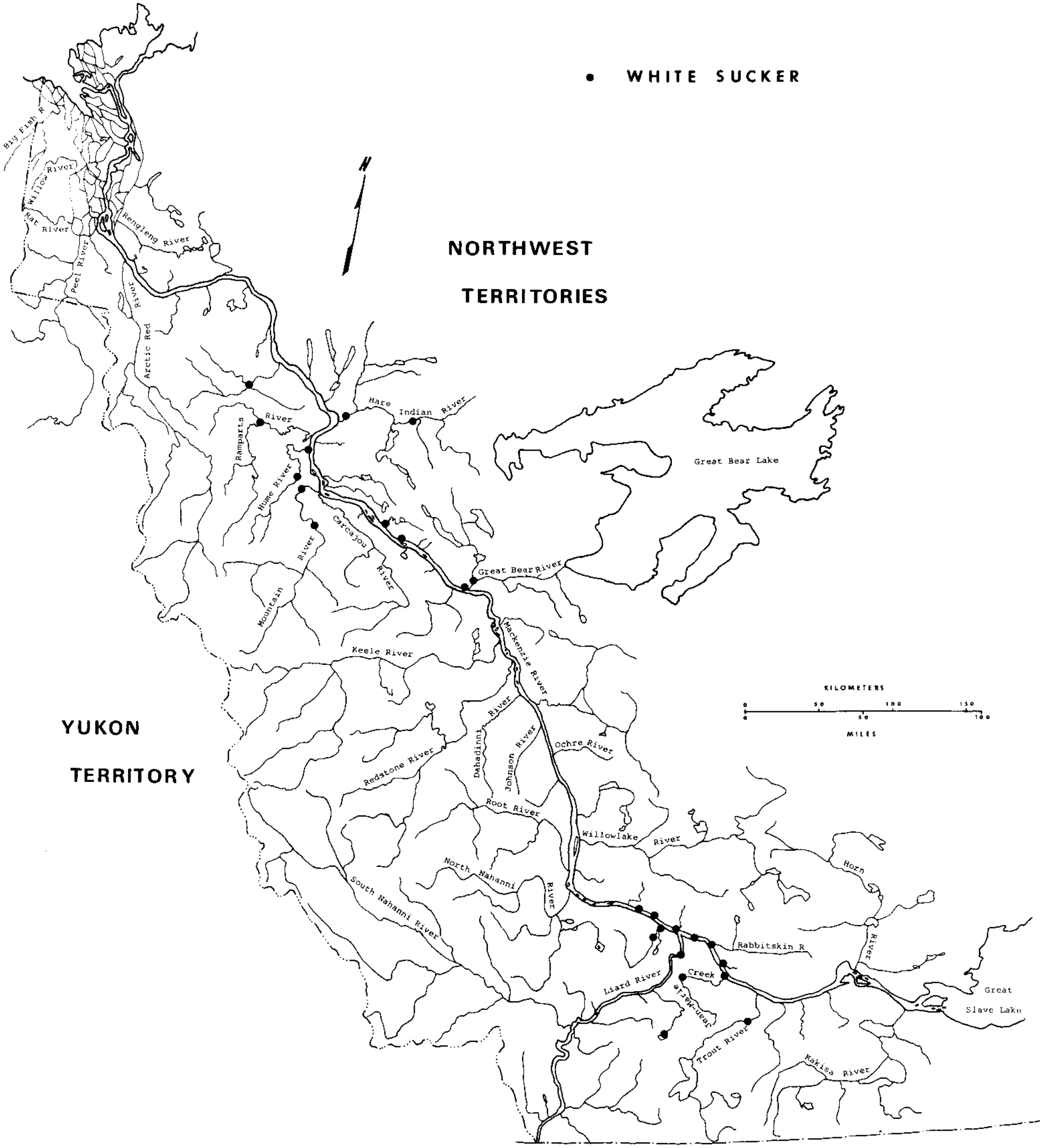


Fig. 38. Distribution of white sucker, C. commersoni (Lacepede), in the Mackenzie River study, 1971 and 1972.

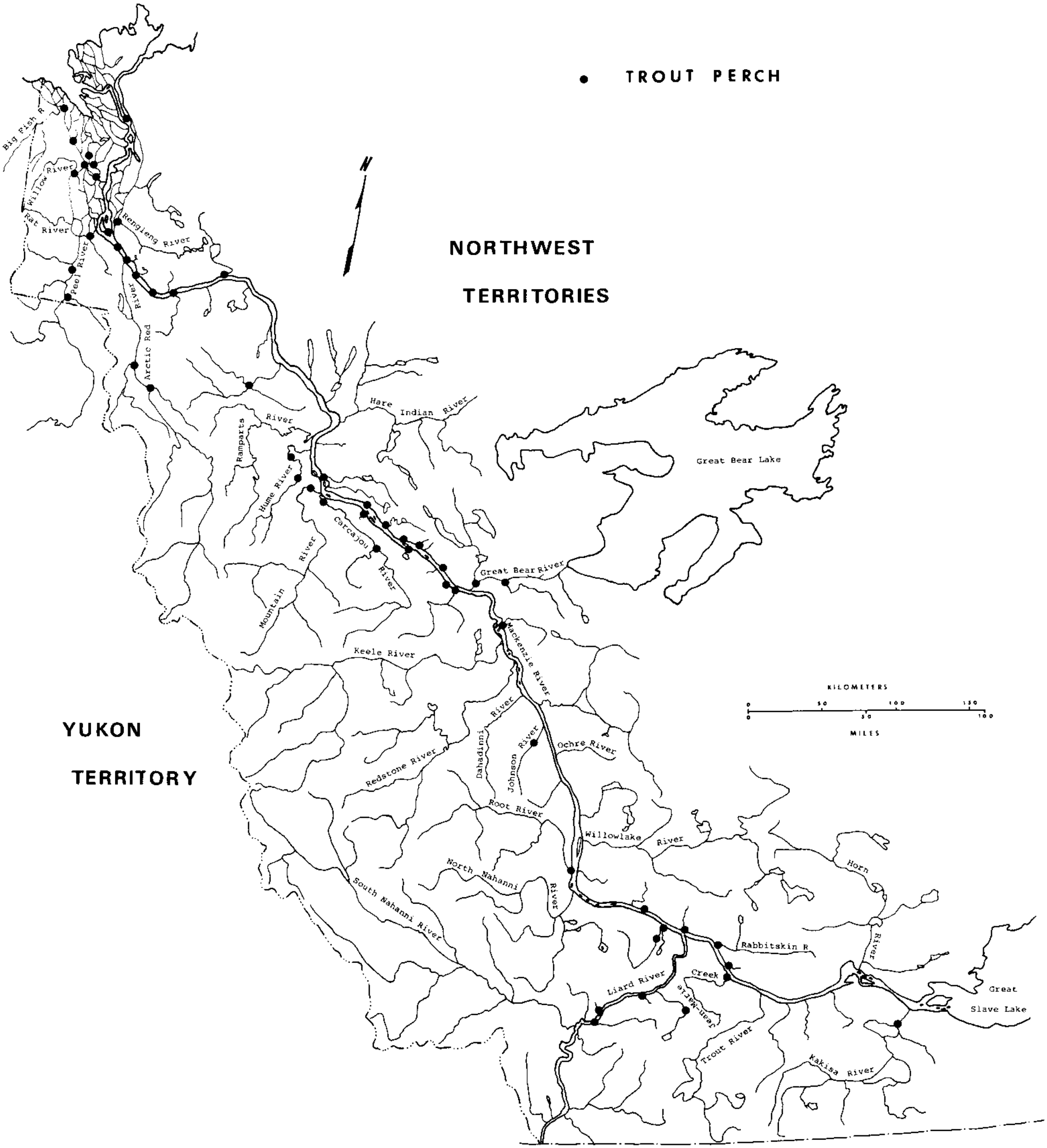


Fig. 39. Distribution of trout-perch, Percopsis omiscomaycus (Walbaum), in the Mackenzie River study, 1971 and 1972.

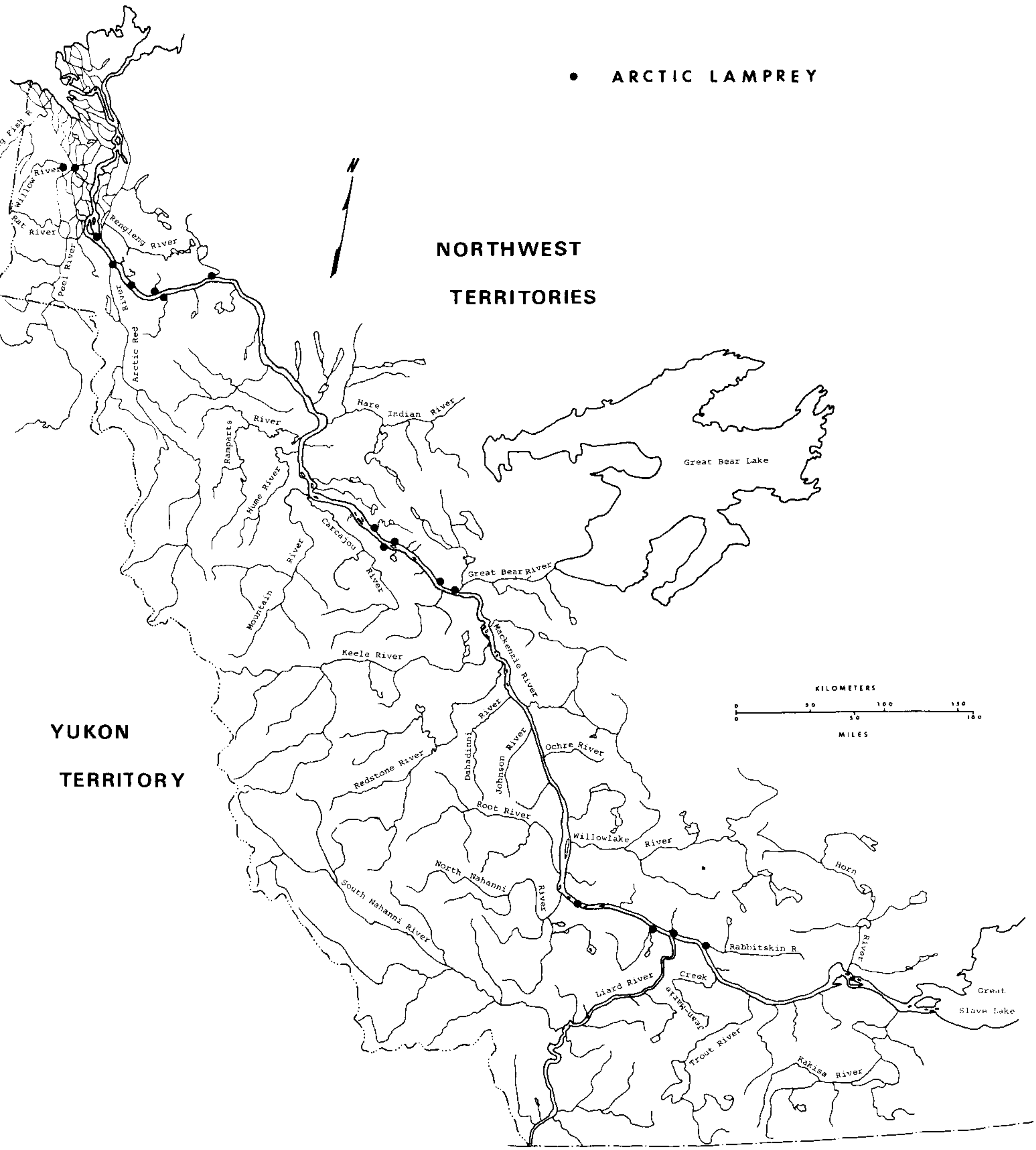


Fig. 40. Distribution of Arctic lamprey, Lampetra japonica (Martens), in the Mackenzie River study, 1971 and 1972.

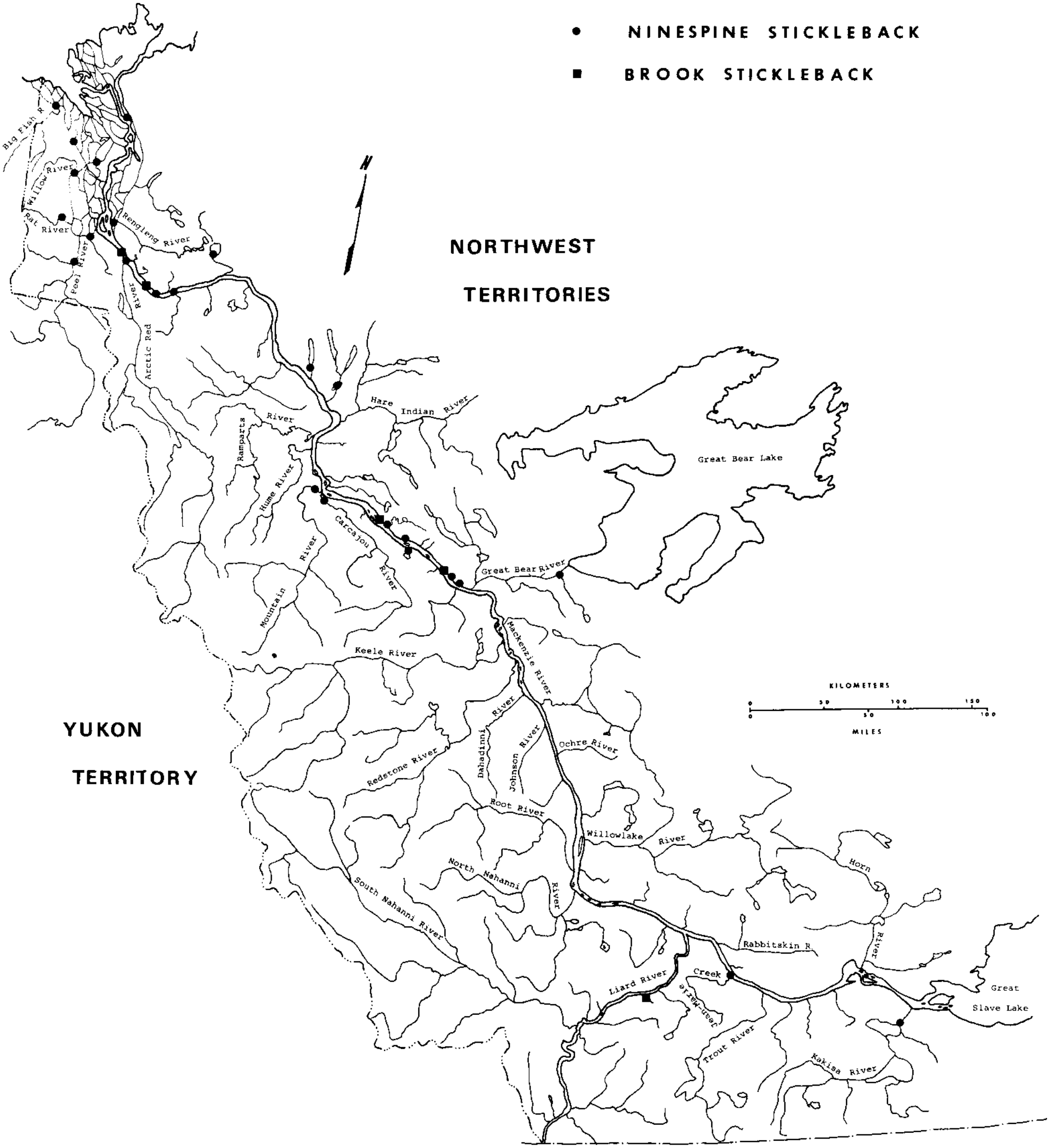


Fig. 41. Distribution of ninespine stickleback, <u>Pungitius pungitius</u> (Linnaeus), and brook stickleback, <u>Culaea inconstans</u> (Kirtland), in the Mackenzie River study, 1971 and 1972.

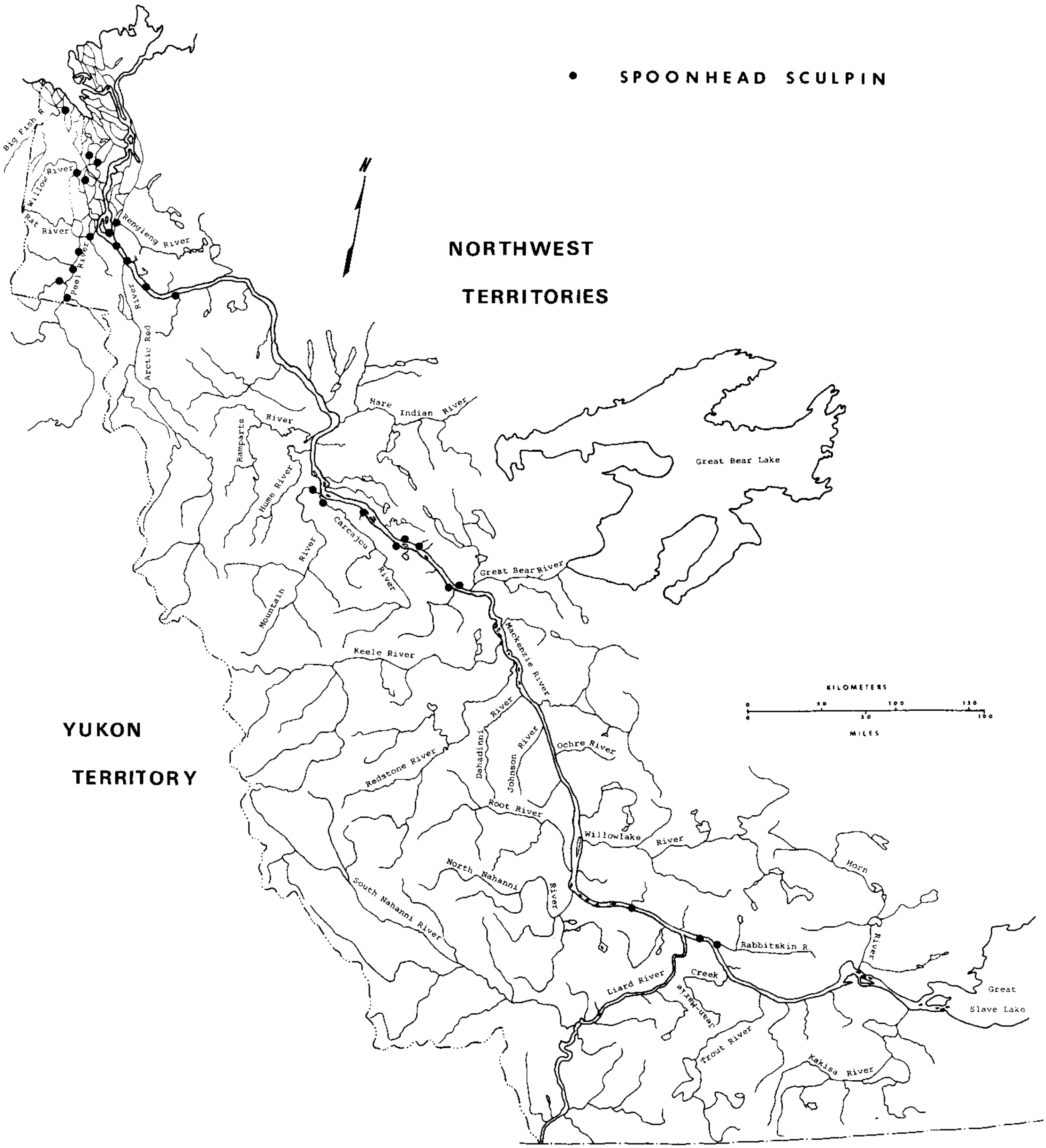


Fig. 42. Distribution of spoonhead sculpin, Cottus ricei (Nelson), in the Mackenzie River study, 1971 and 1972.

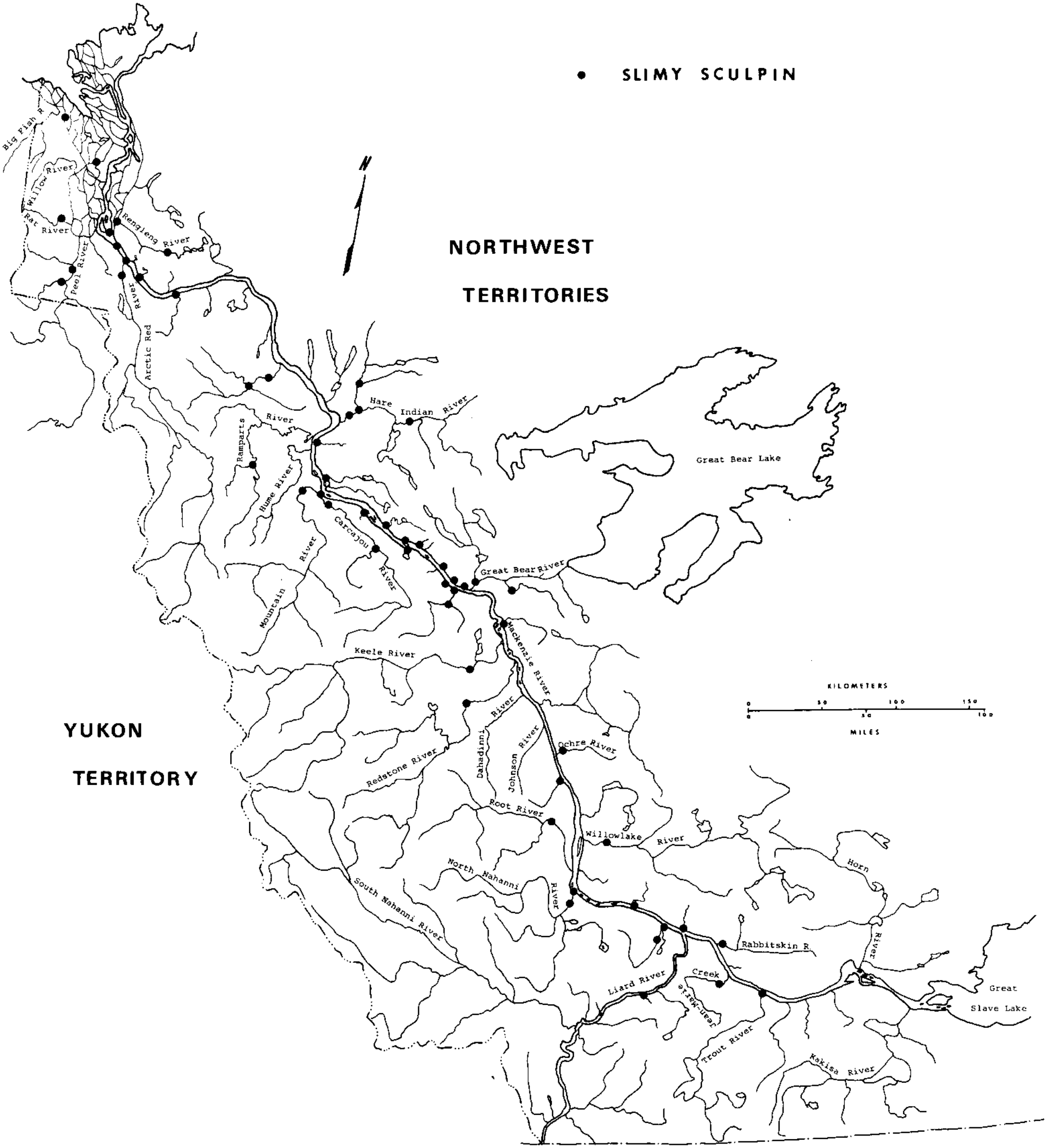


Fig. 43. Distribution of slimy sculpin, C. cognatus (Richardson), in the Mackenzie River study, 1971 and 1972.

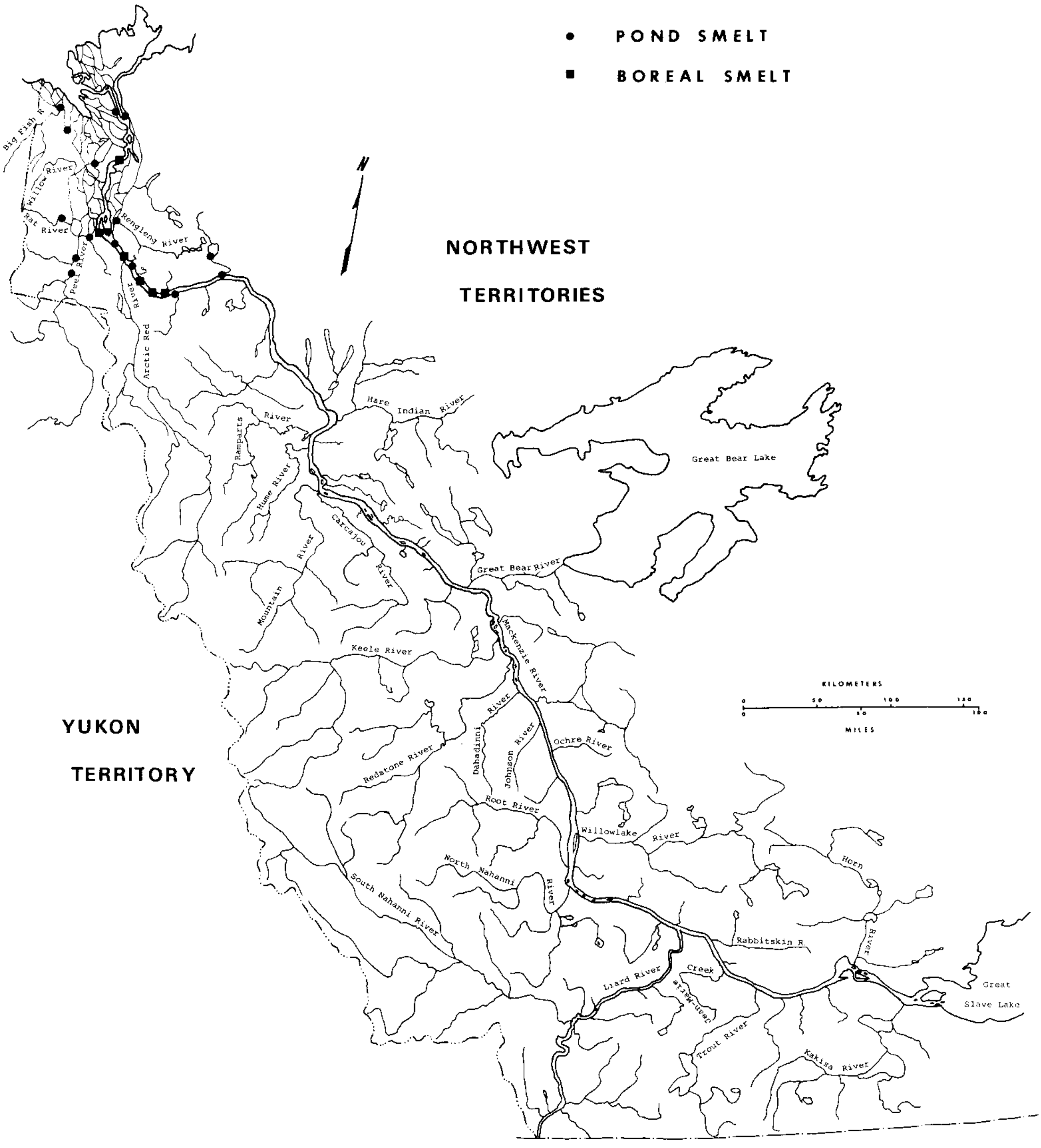


Fig. 44. Distribution of pond smelt, Hypomesus olidus (Pallas) and boreal smelt, Osmerus eperlanus (Linnaeus), in the Mackenzie River study, 1971 and 1972.

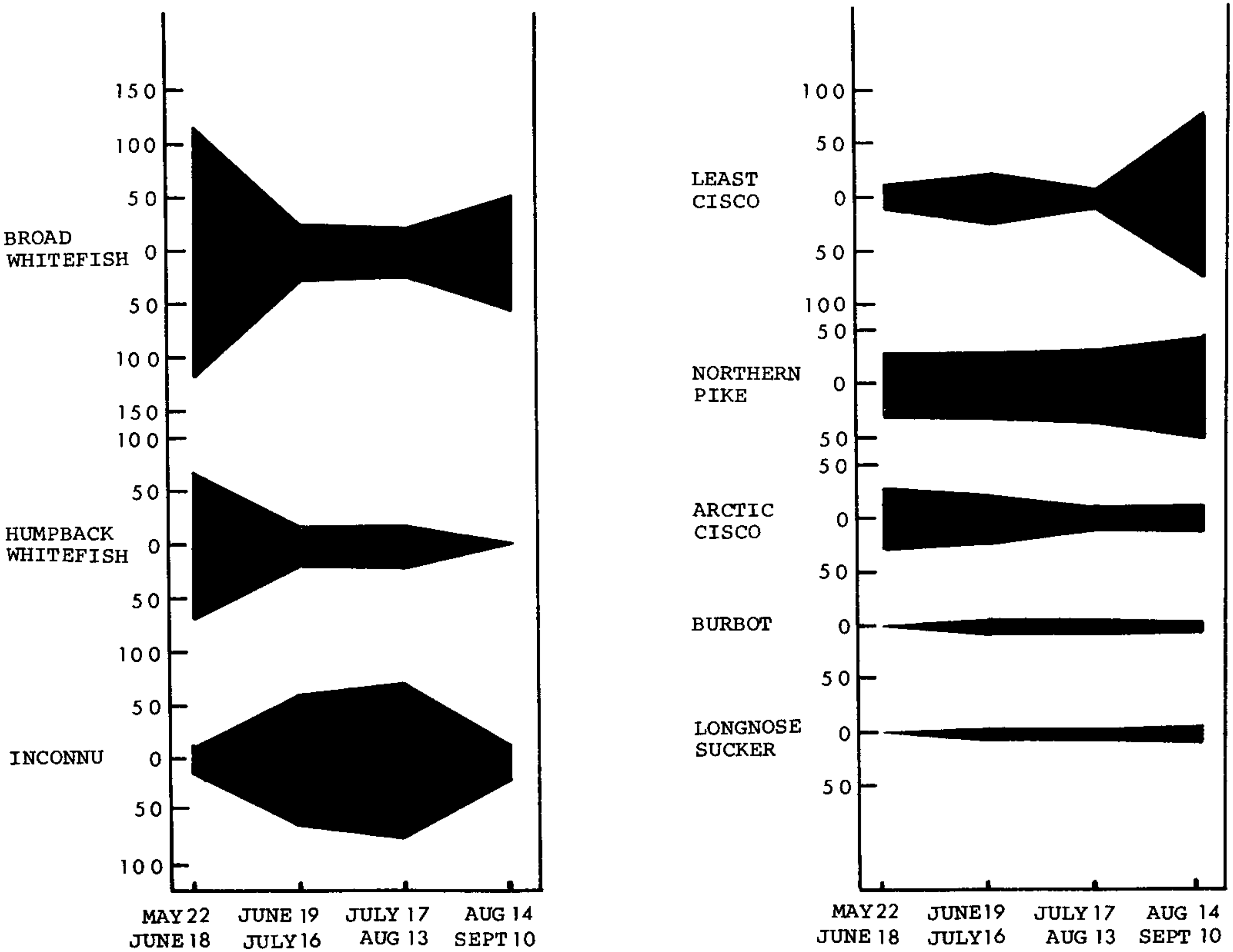


Fig. 45. Seasonal change of index gill net catches (catch per unit of effort x 1000) - Aklavik, 1972.

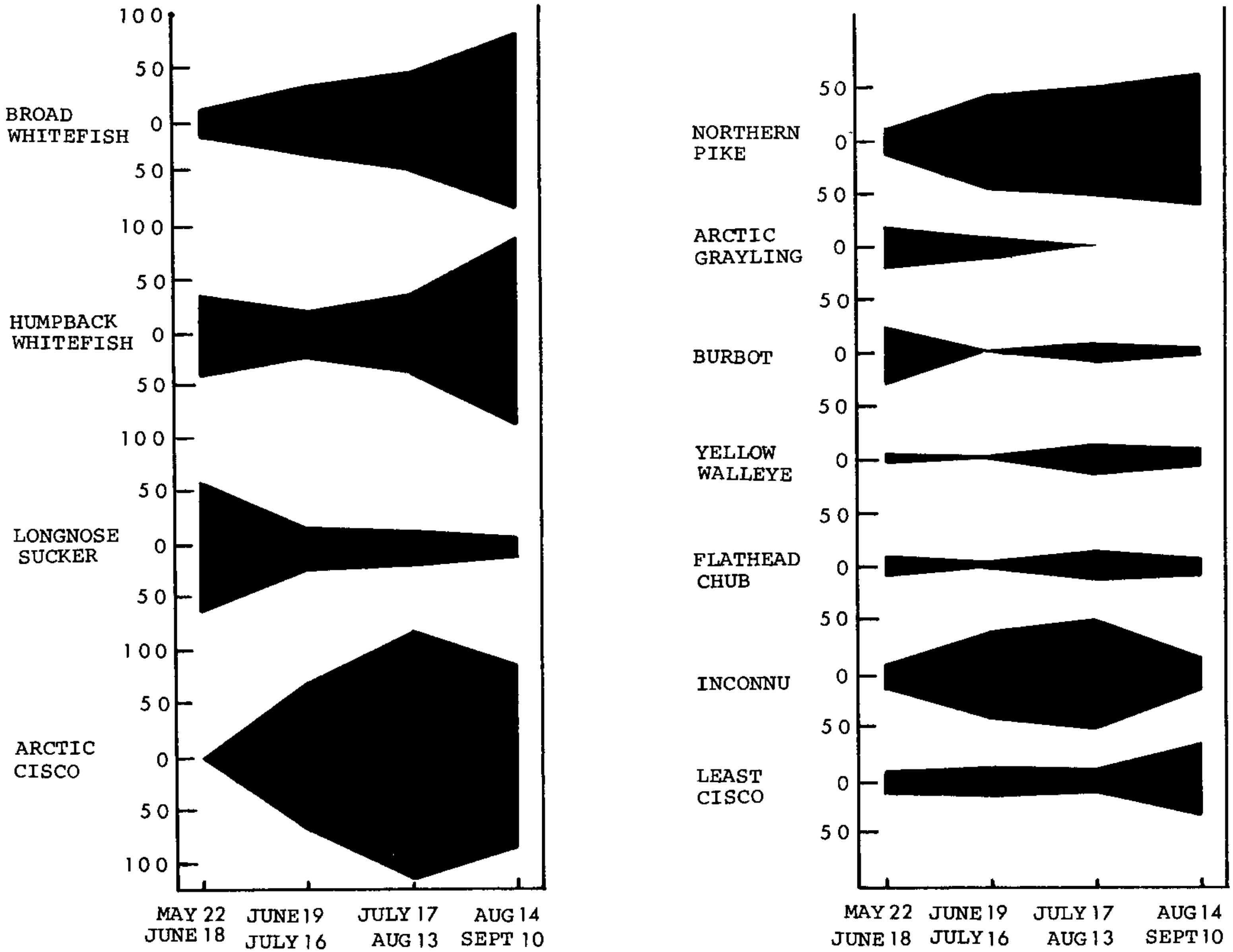


Fig. 46. Seasonal change of index gill net catches (catch per unit of effort x 1000) - Arctic Red River, 1972.

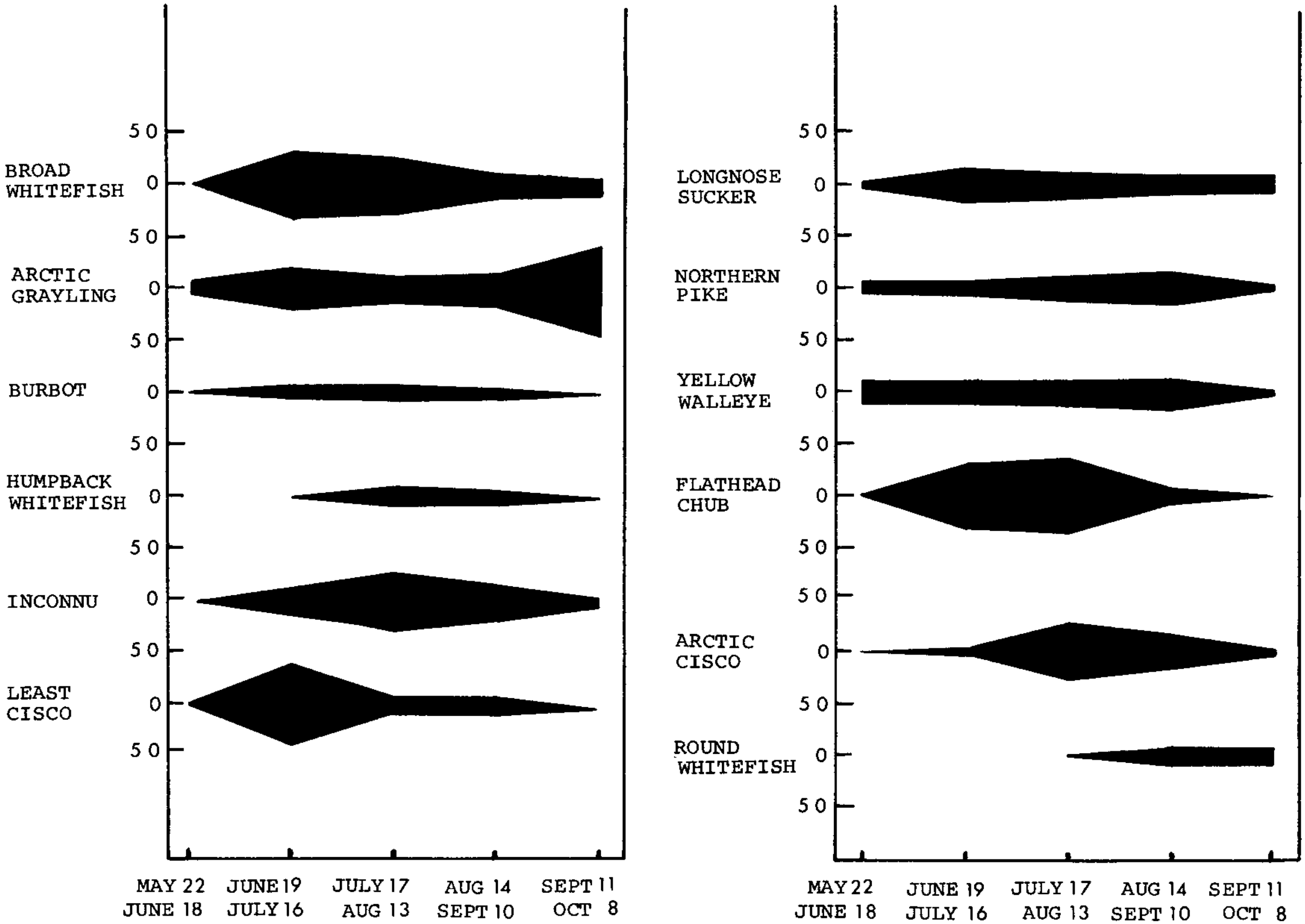


Fig. 47. Seasonal change of index gill net catches (catch per unit of effort x 1000) - Norman Wells, 1972.

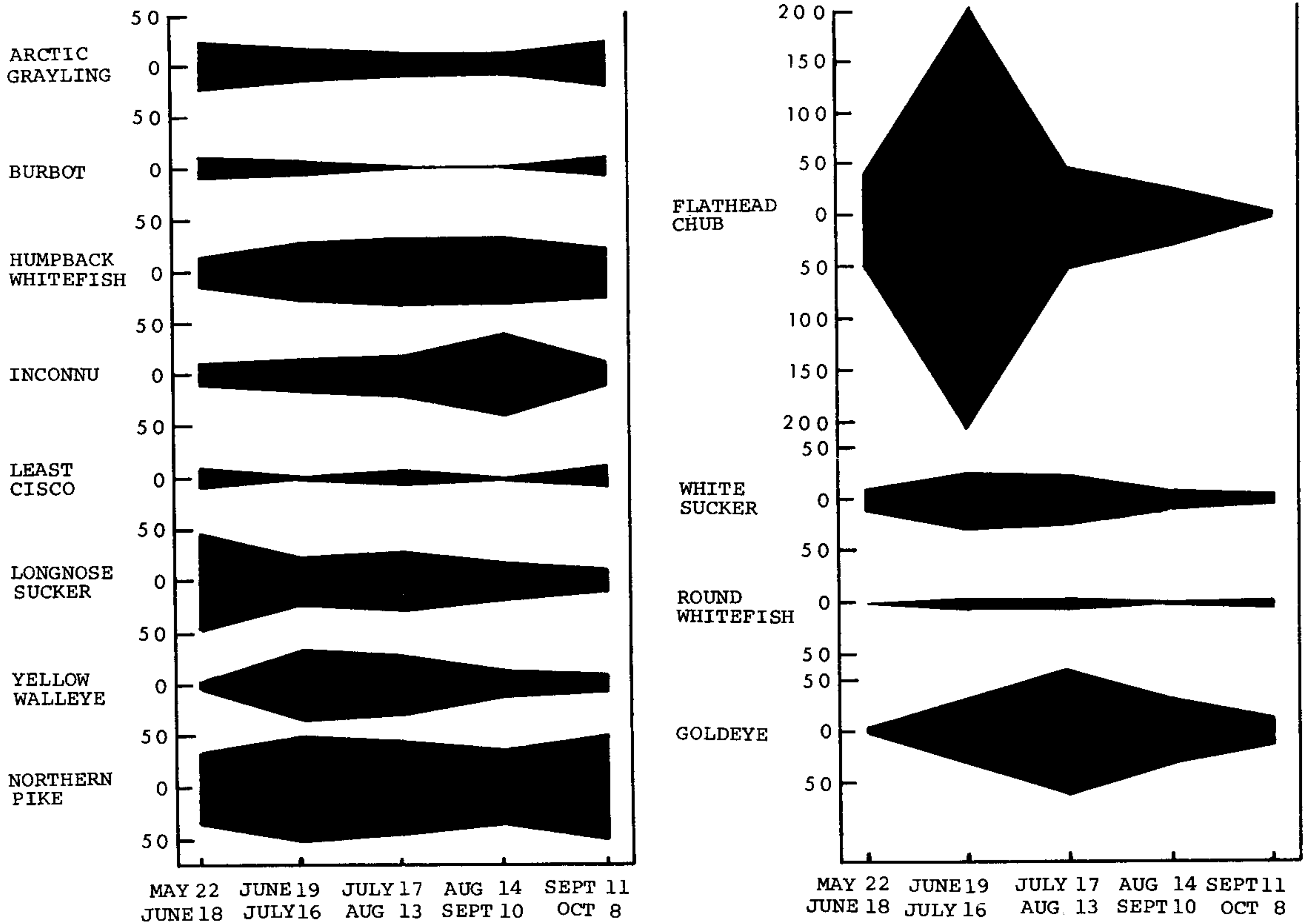


Fig. 48. Seasonal change of index gill net catches (catch per unit of effort x 1000) - Fort Simpson, 1972.

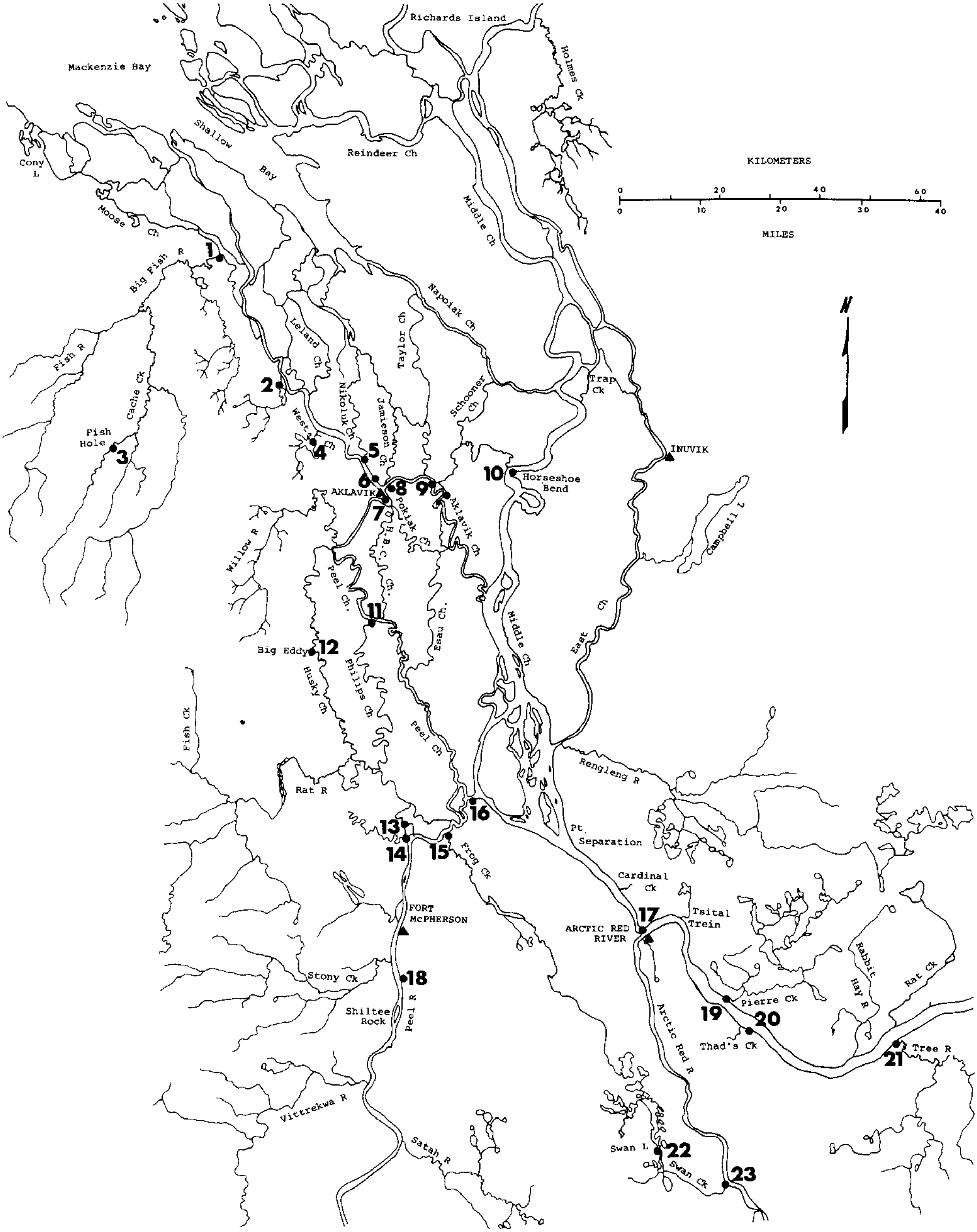


Fig. 49. Aklavik, Arctic Red River and Fort McPherson study areas showing pertinent tagging and recovery locations.

Fig. 50. Norman Wells study areas showing pertinent tagging and recovery locations.

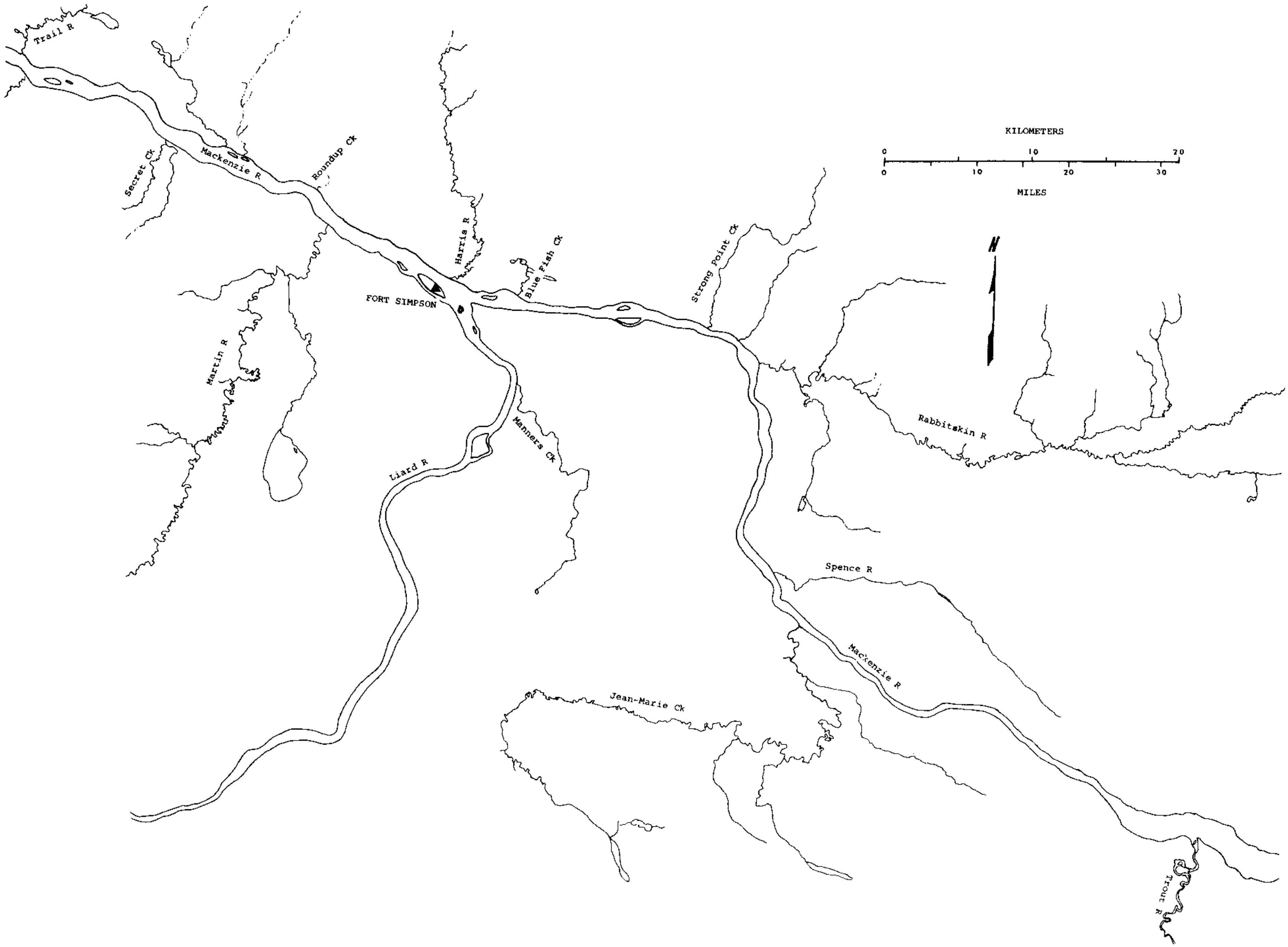


Fig. 51. Fort Simpson study areas showing pertinent tagging and recovery locations.

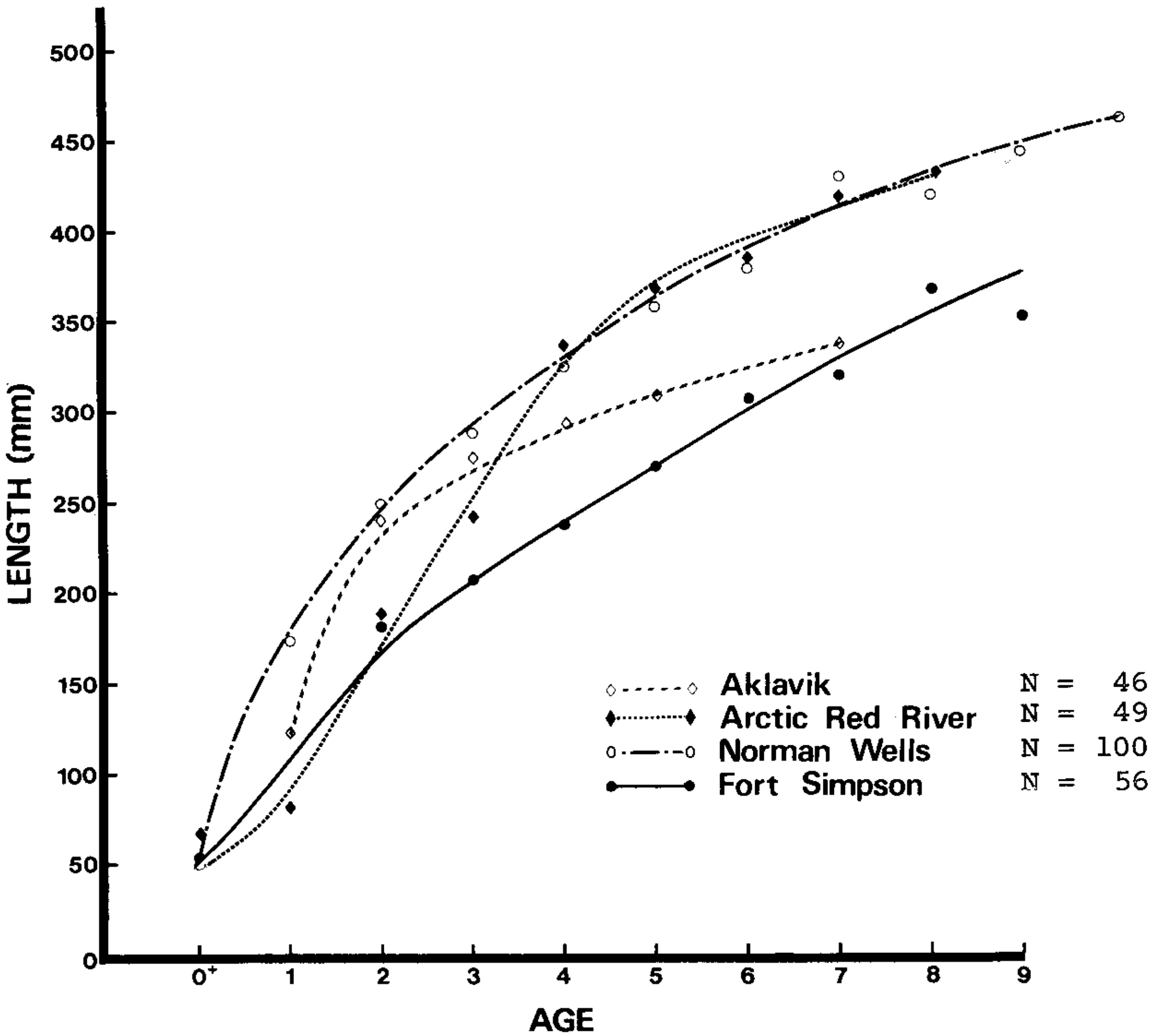


Fig. 52. Age-length relationship of Arctic grayling, Mackenzie River, 1972.

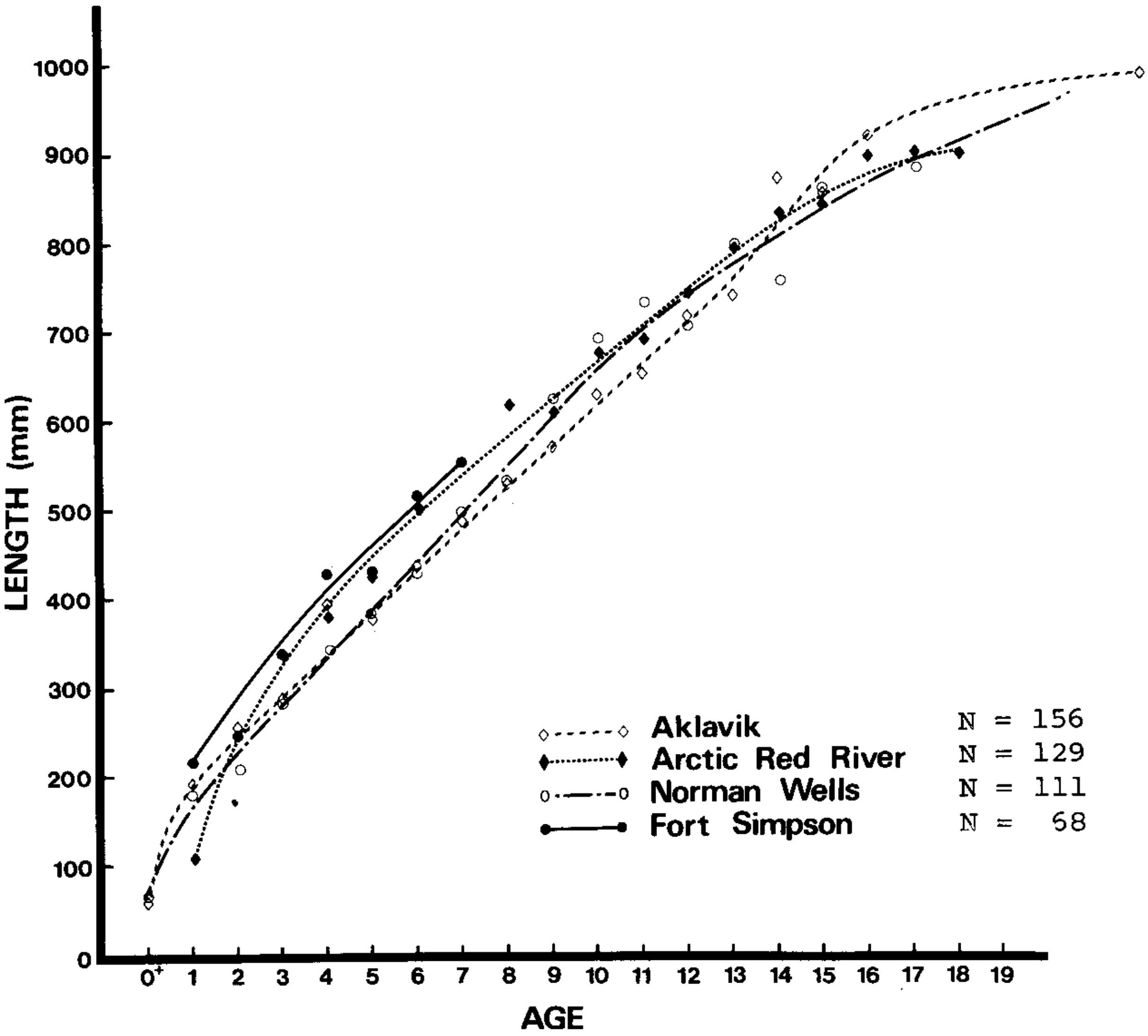


Fig. 53. Age-length relationship of inconnu, Mackenzie River, 1972

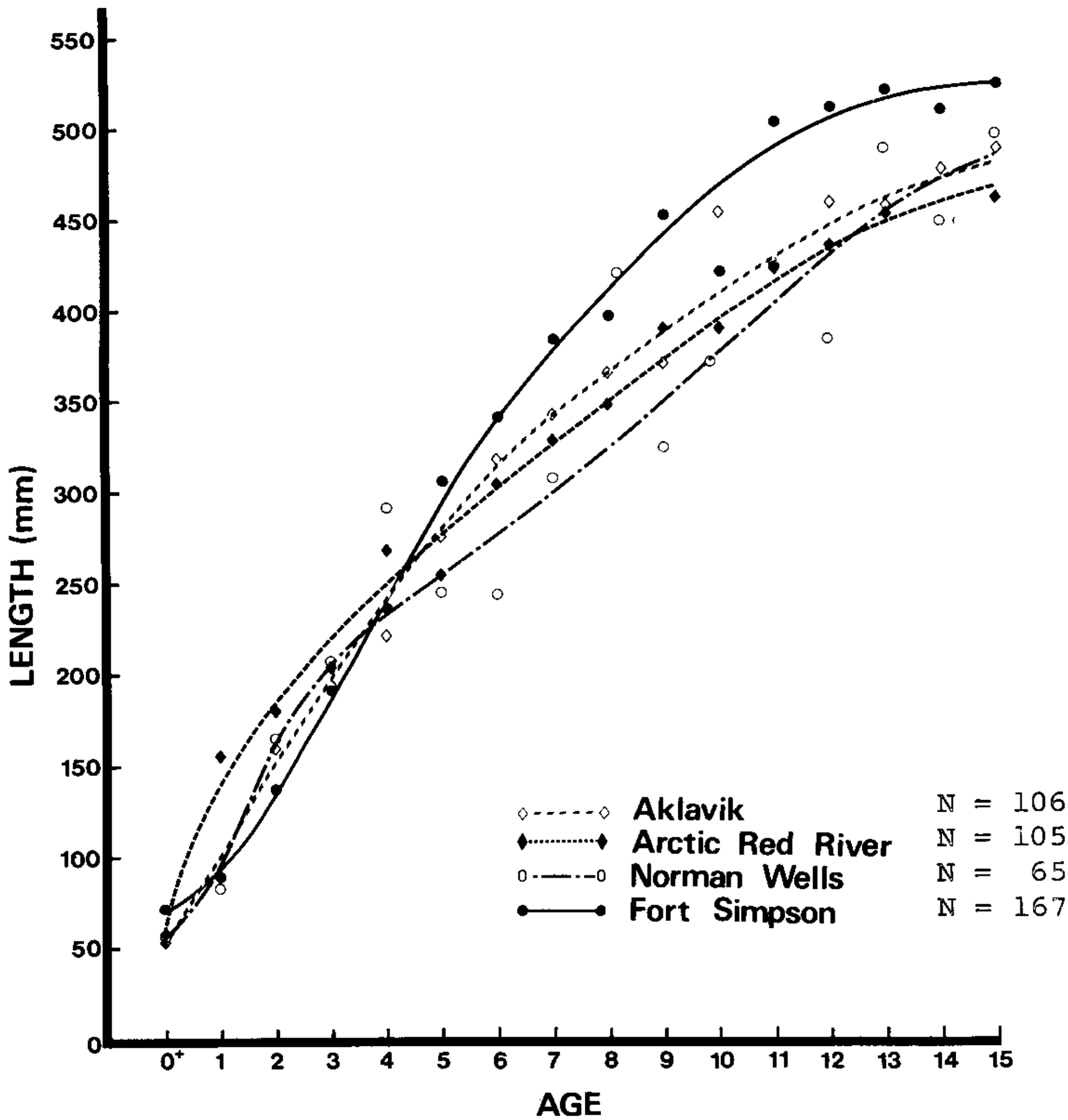


Fig. 54. Age-length relationship of humpback whitefish, Mackenzie River, 1972.

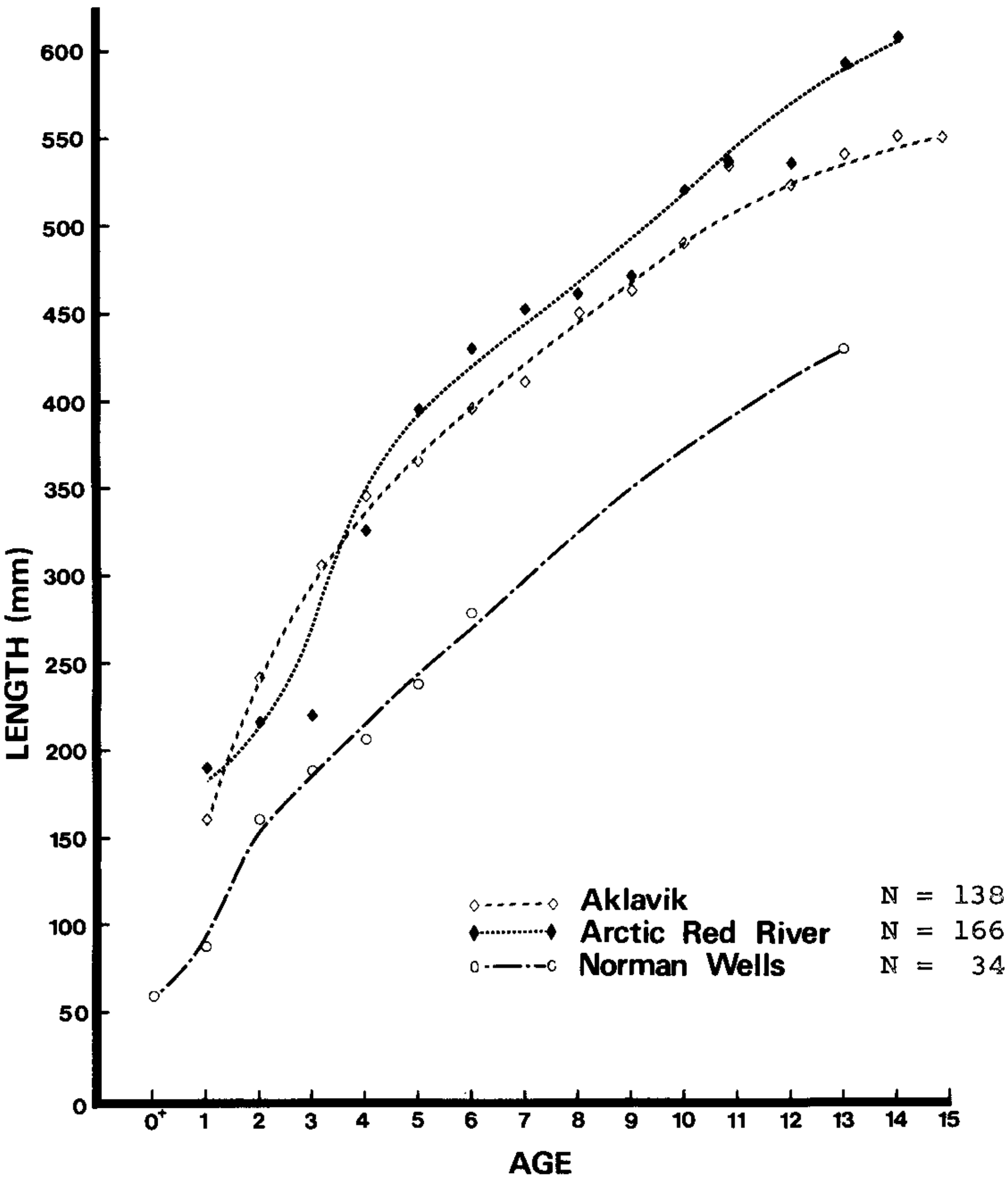


Fig. 55. Age-length relationship of broad whitefish, Mackenzie River, 1972.

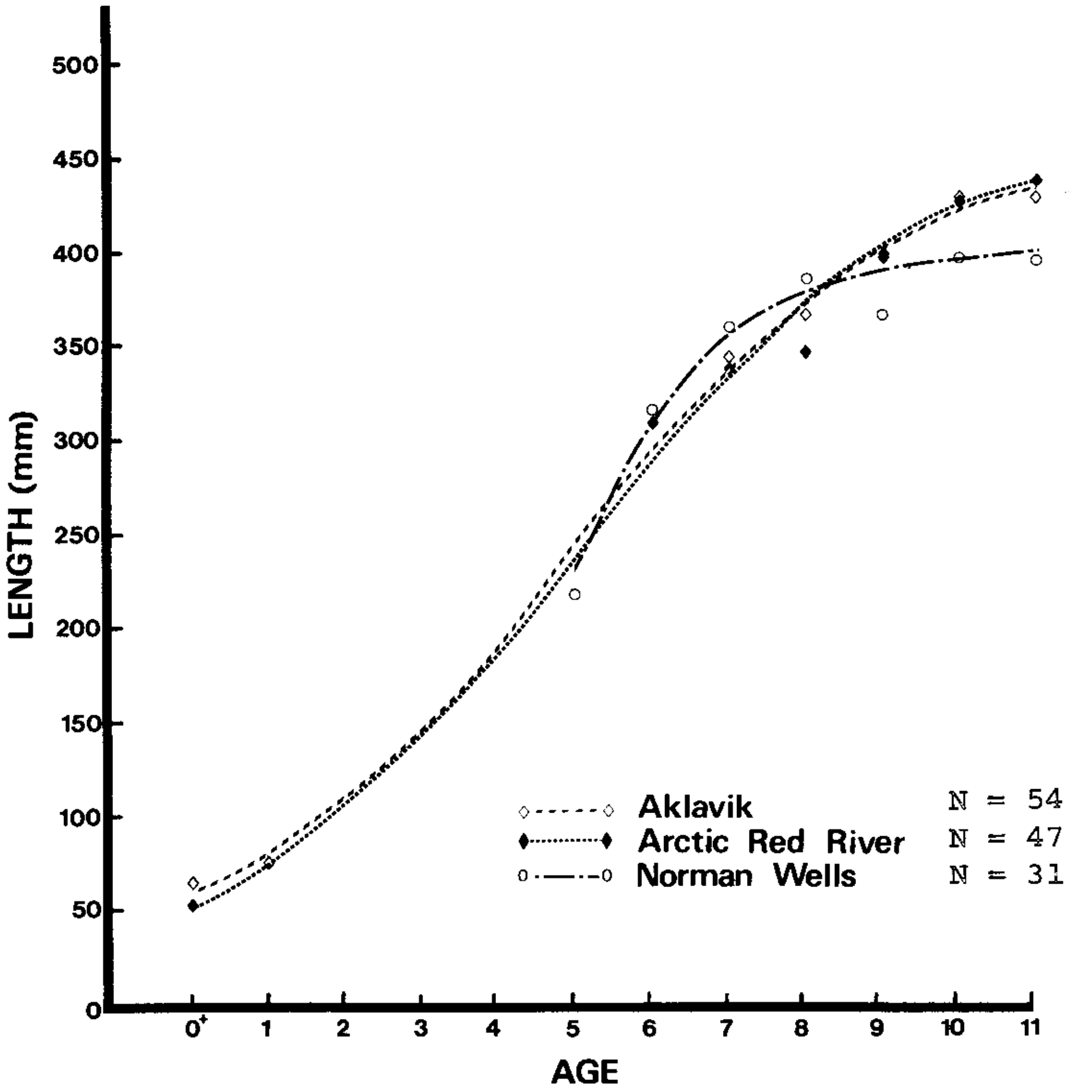


Fig. 56. Age-length relationship of Arctic cisco, Mackenzie River, 1972.

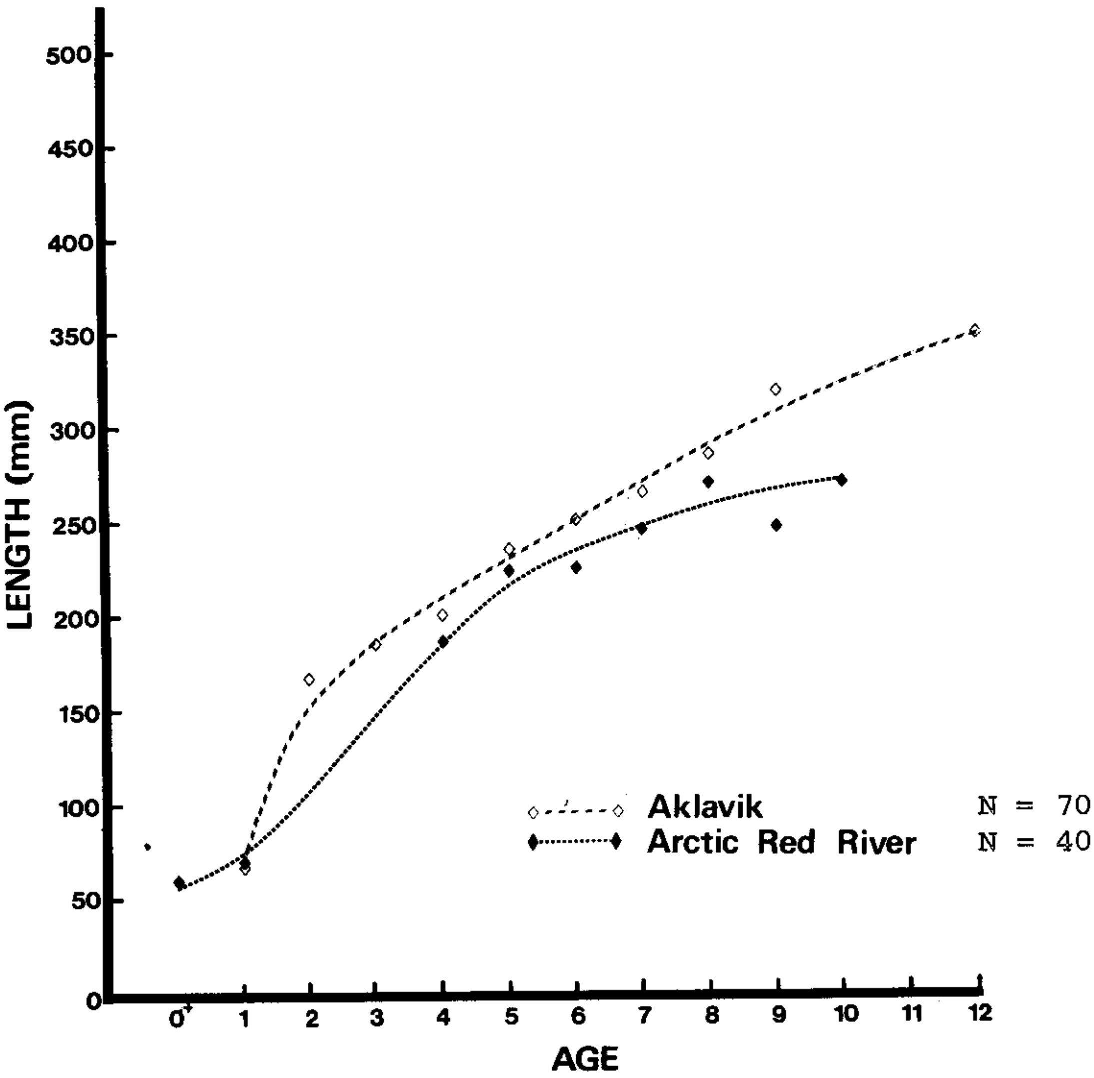


Fig. 57. Age-length relationship of least cisco, Mackenzie River, 1972.

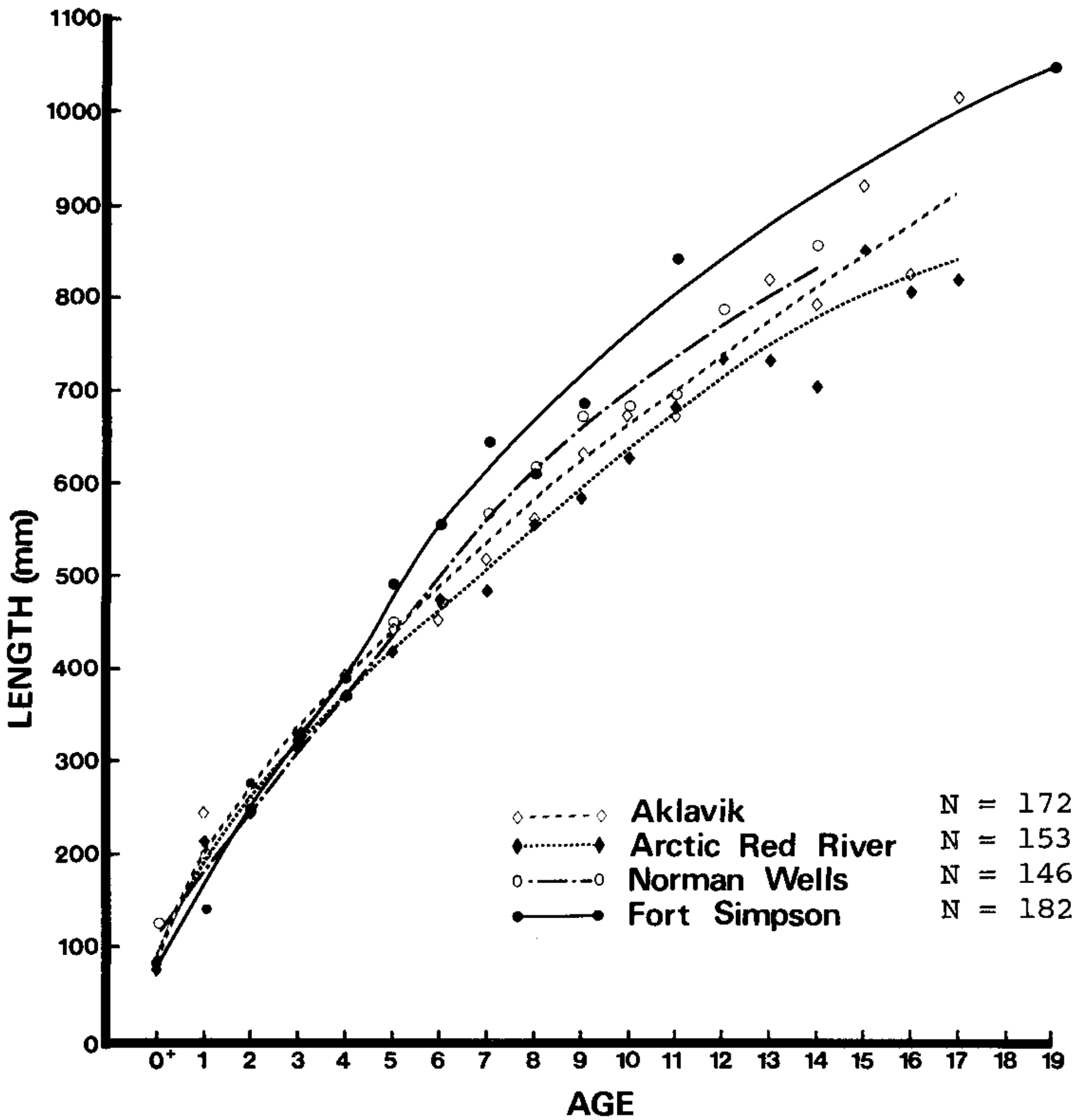


Fig. 58. Age-length relationship of northern pike, Mackenzie River, 1972.

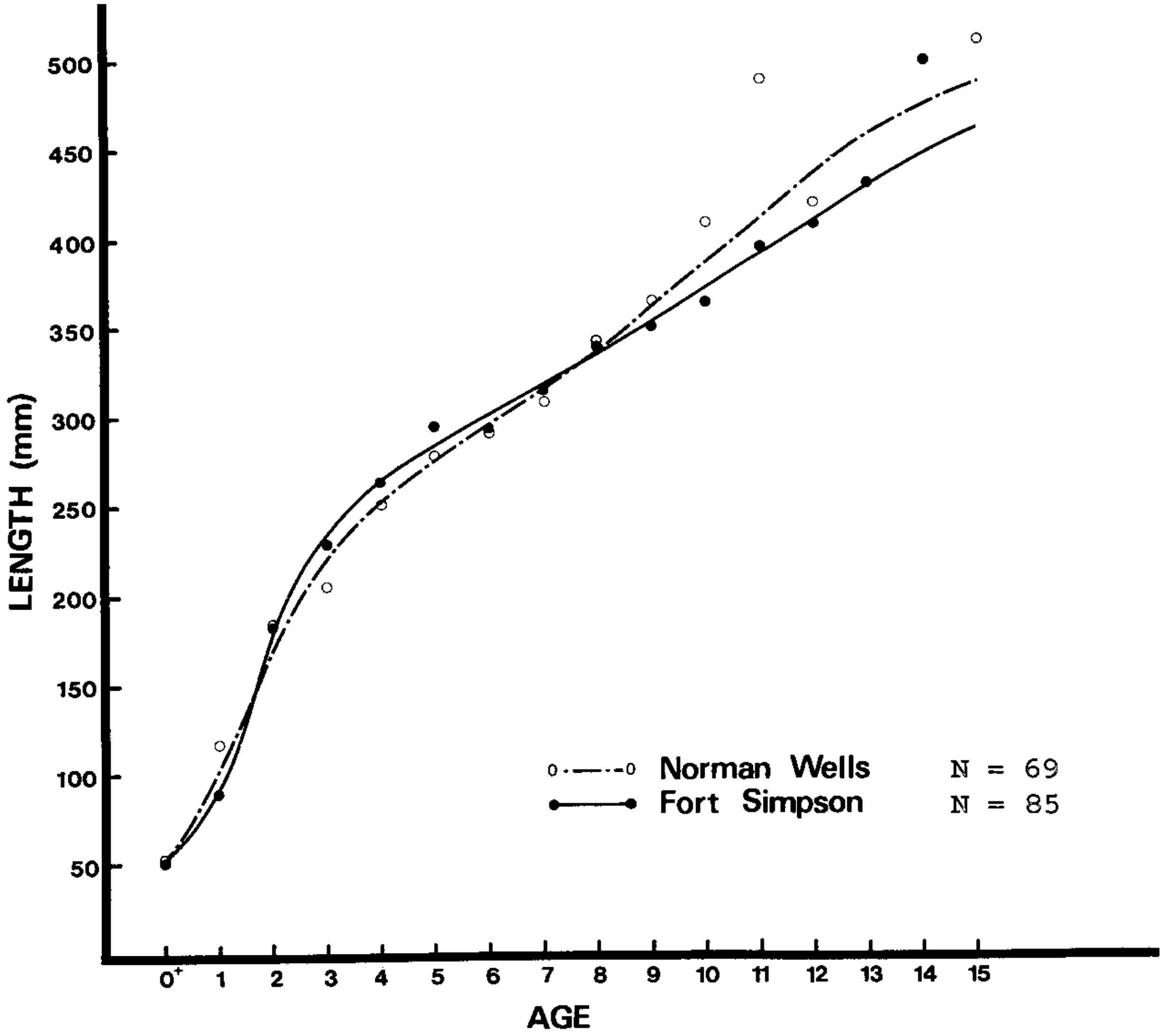


Fig. 59. Age-length relationship of yellow walleye, Mackenzie River, 1972.

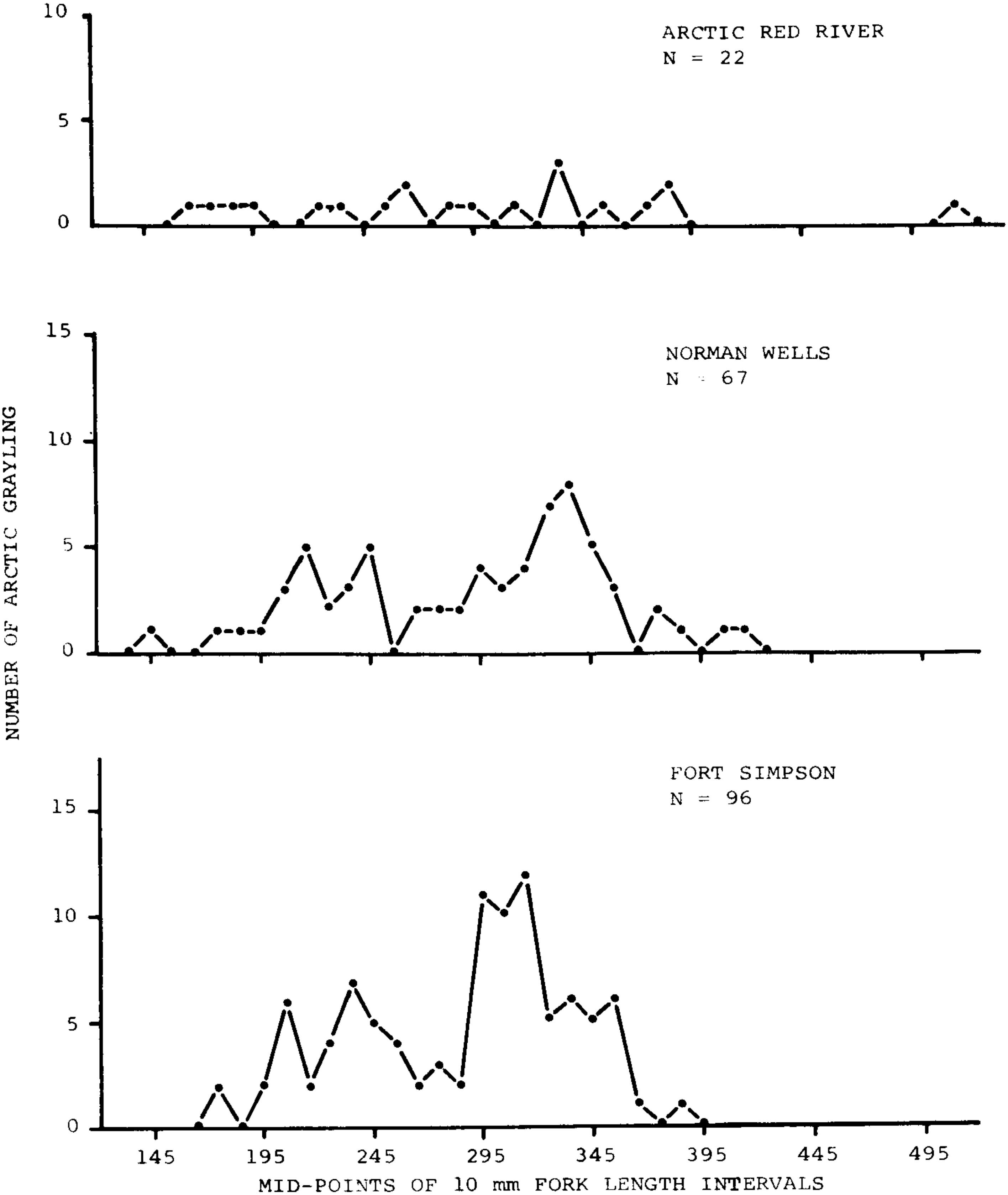


Fig. 60. Length frequency polygons for Arctic grayling, Mackenzie River, 1972.

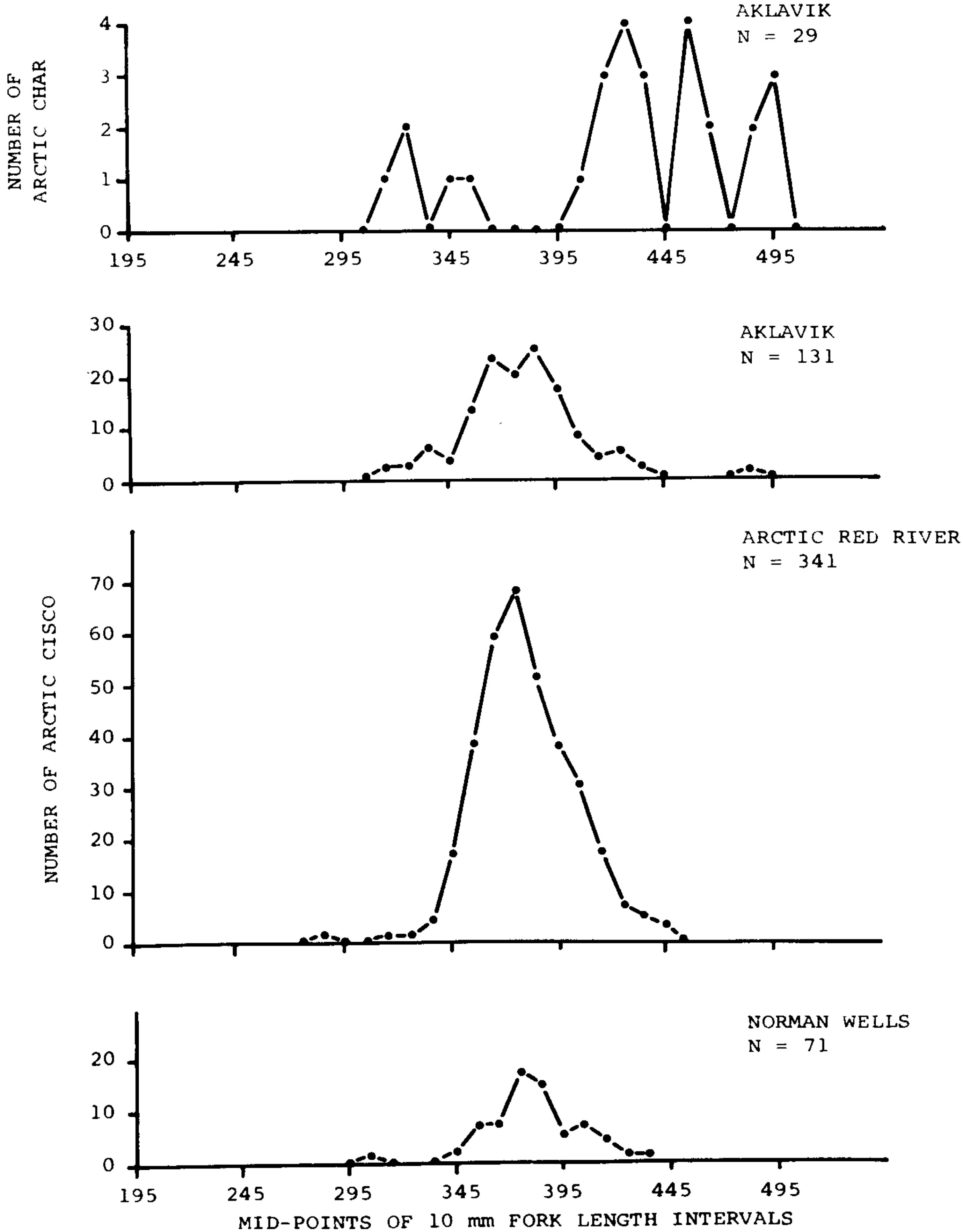


Fig. 61. Length frequency polygons for Arctic char and Arctic cisco, Mackenzie River, 1972.

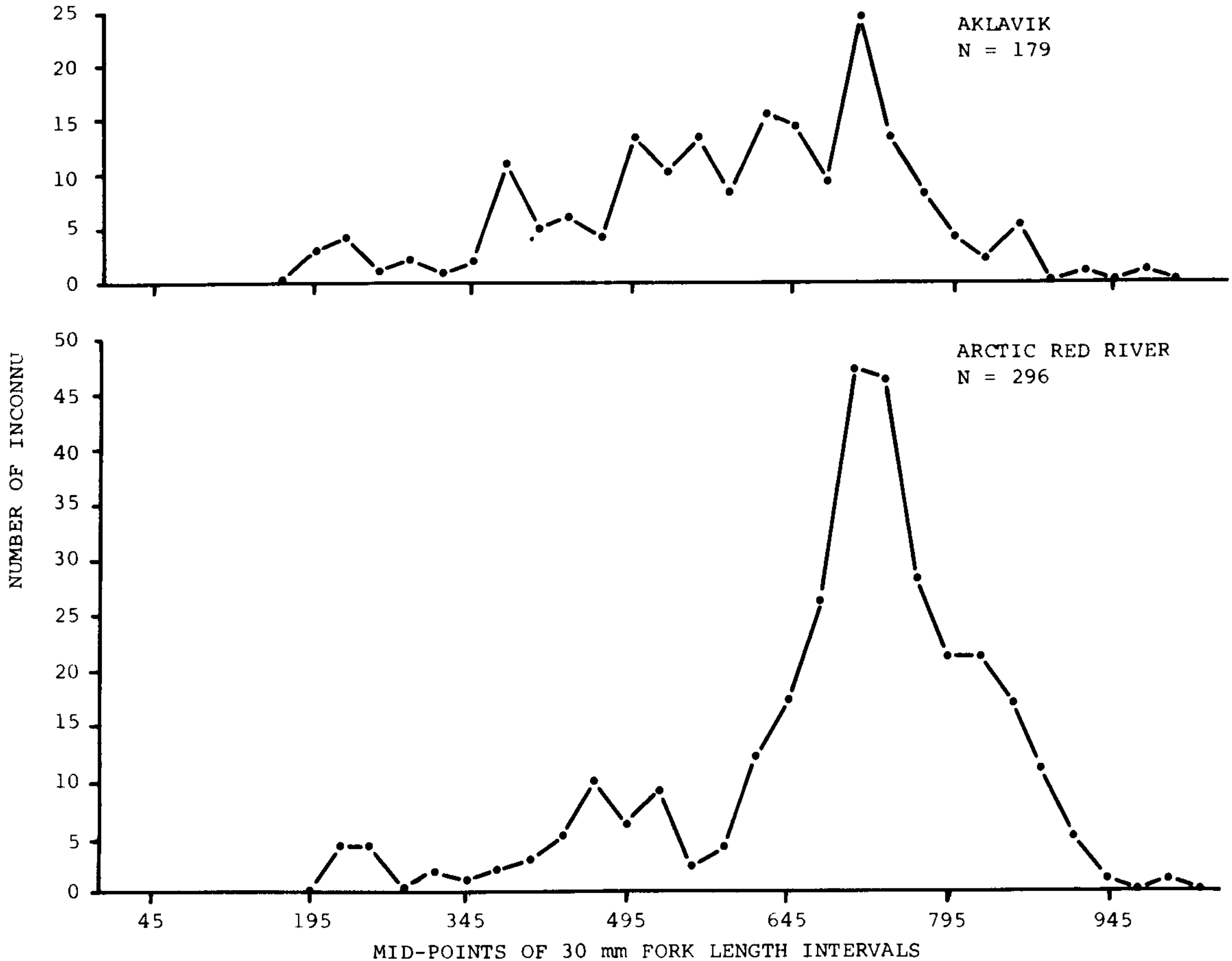


Fig. 62. Length frequency polygons for inconnu, Mackenzie River, 1972.

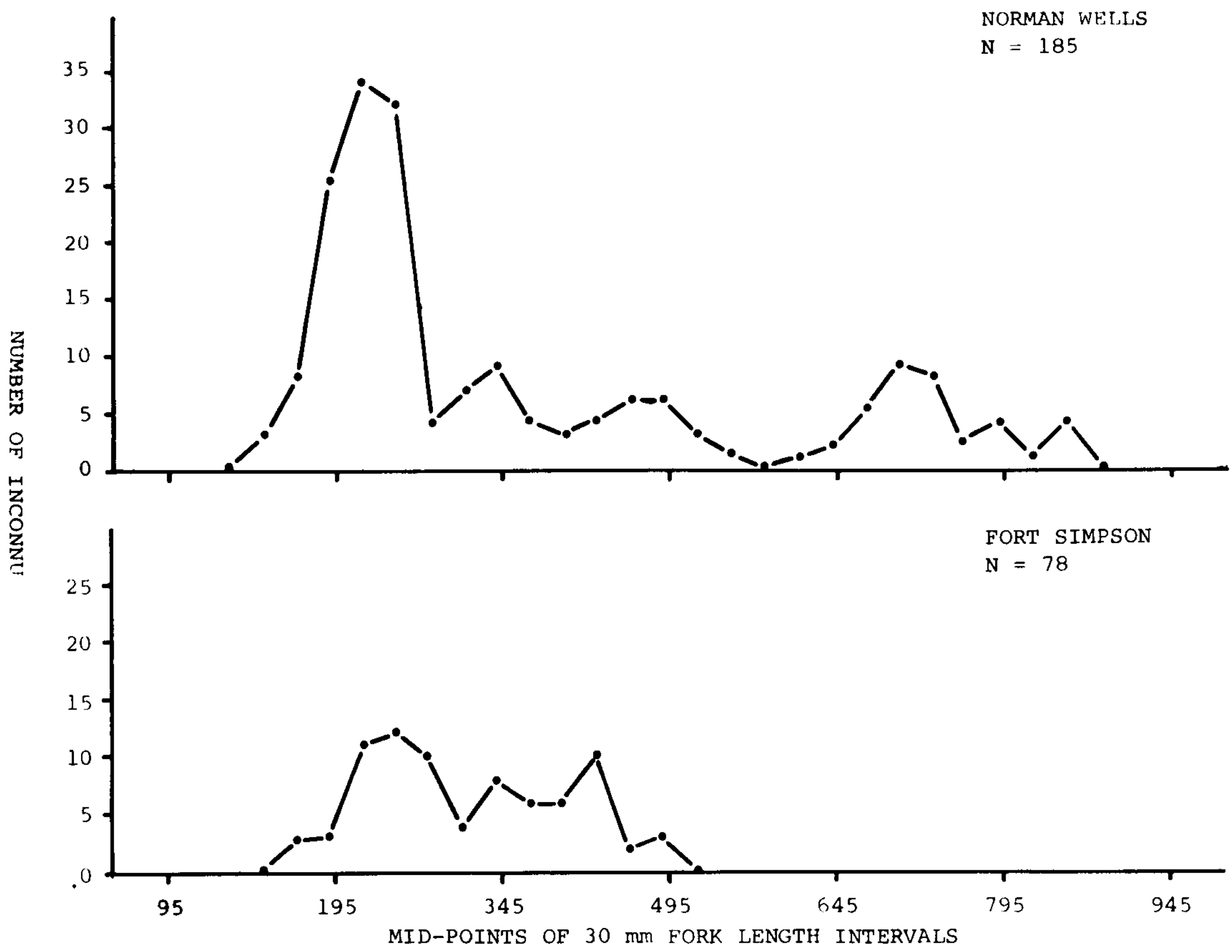


Fig. 62. (cont'd). Length frequency polygons for inconnu, Mackenzie River, 1972.

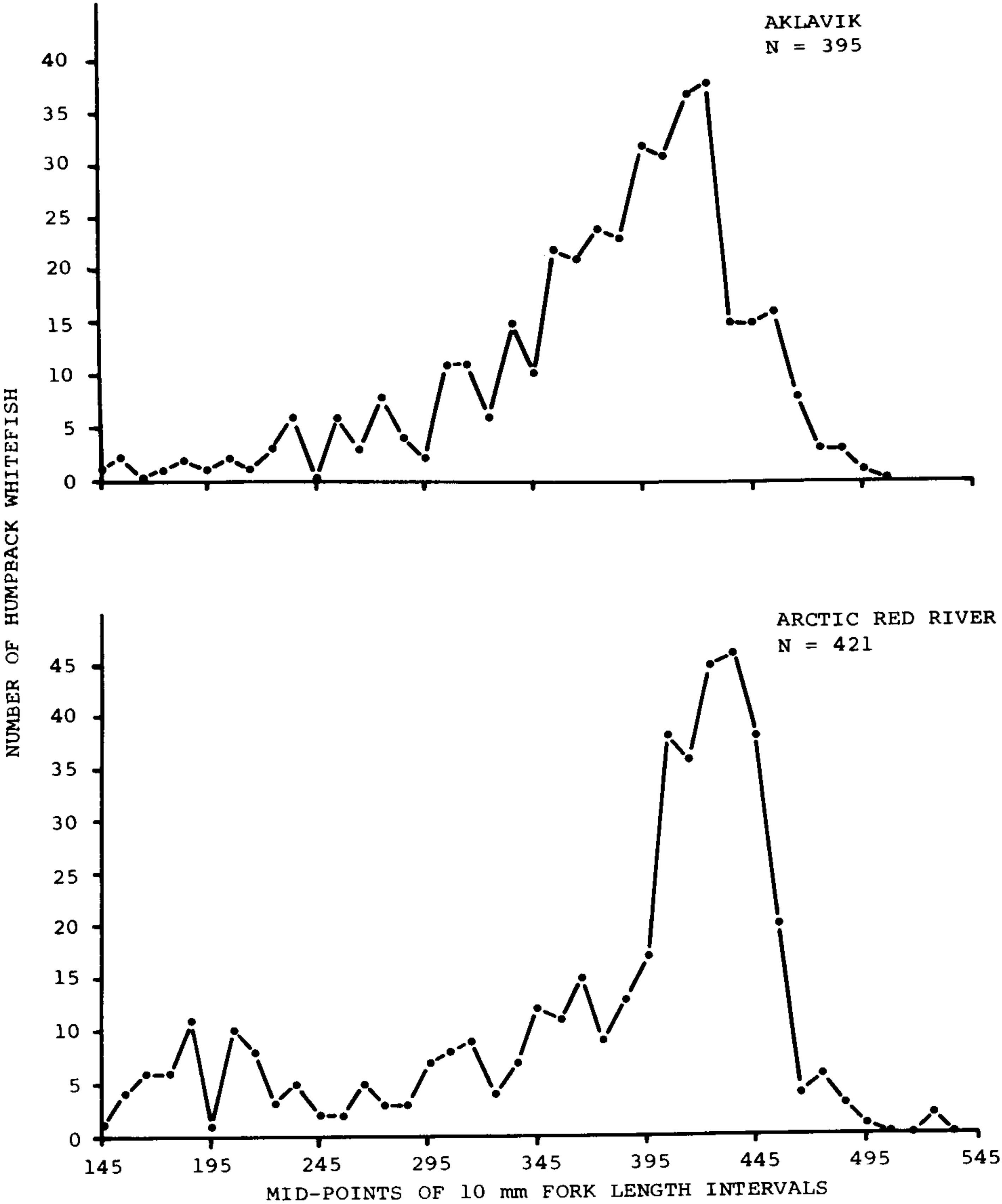


Fig. 63. Length frequency polygons for humpback whitefish, Mackenzie River, 1972.

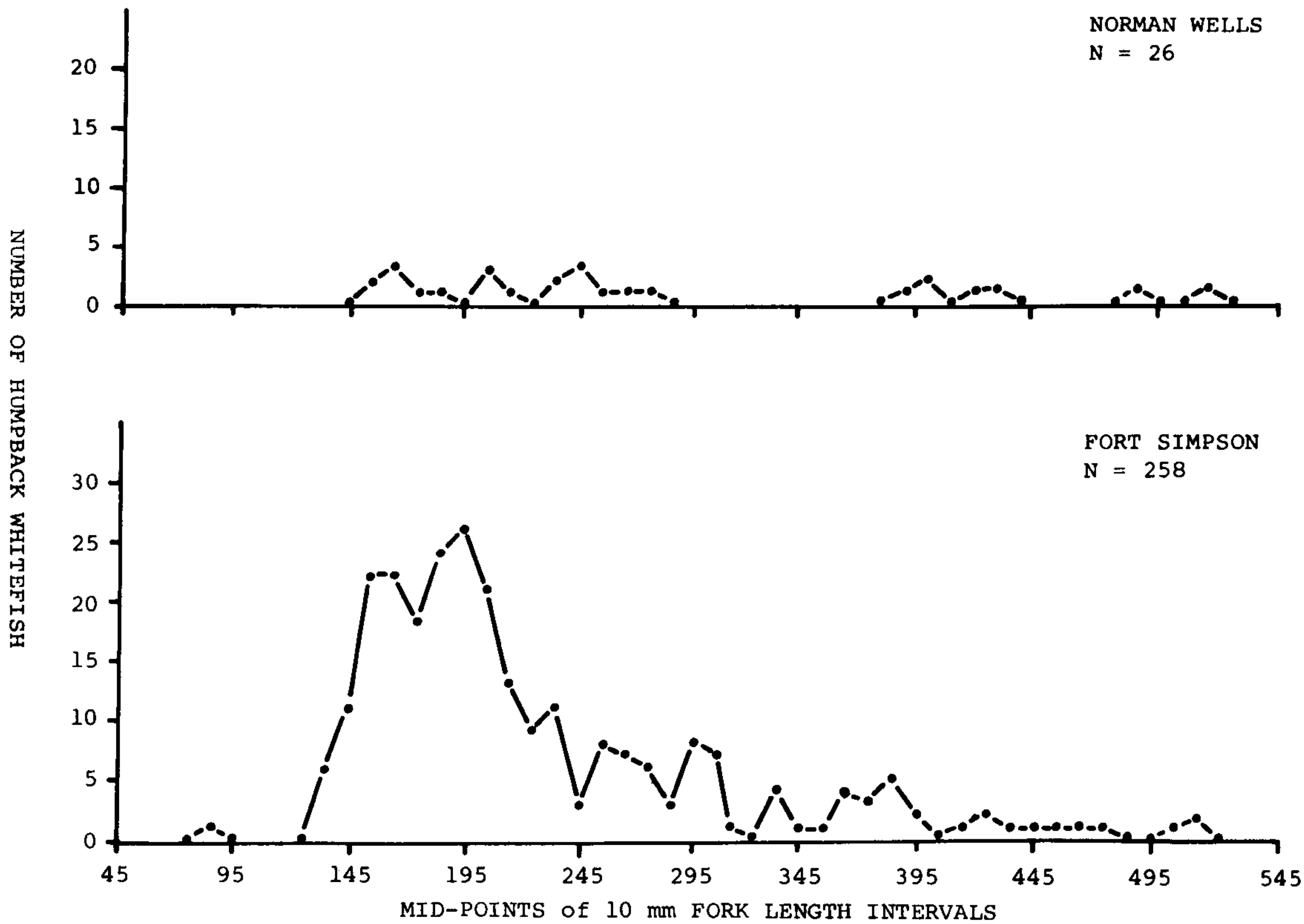


Fig. 63. (cont'd). Length frequency polygons for humpback whitefish, Mackenzie River, 1972.

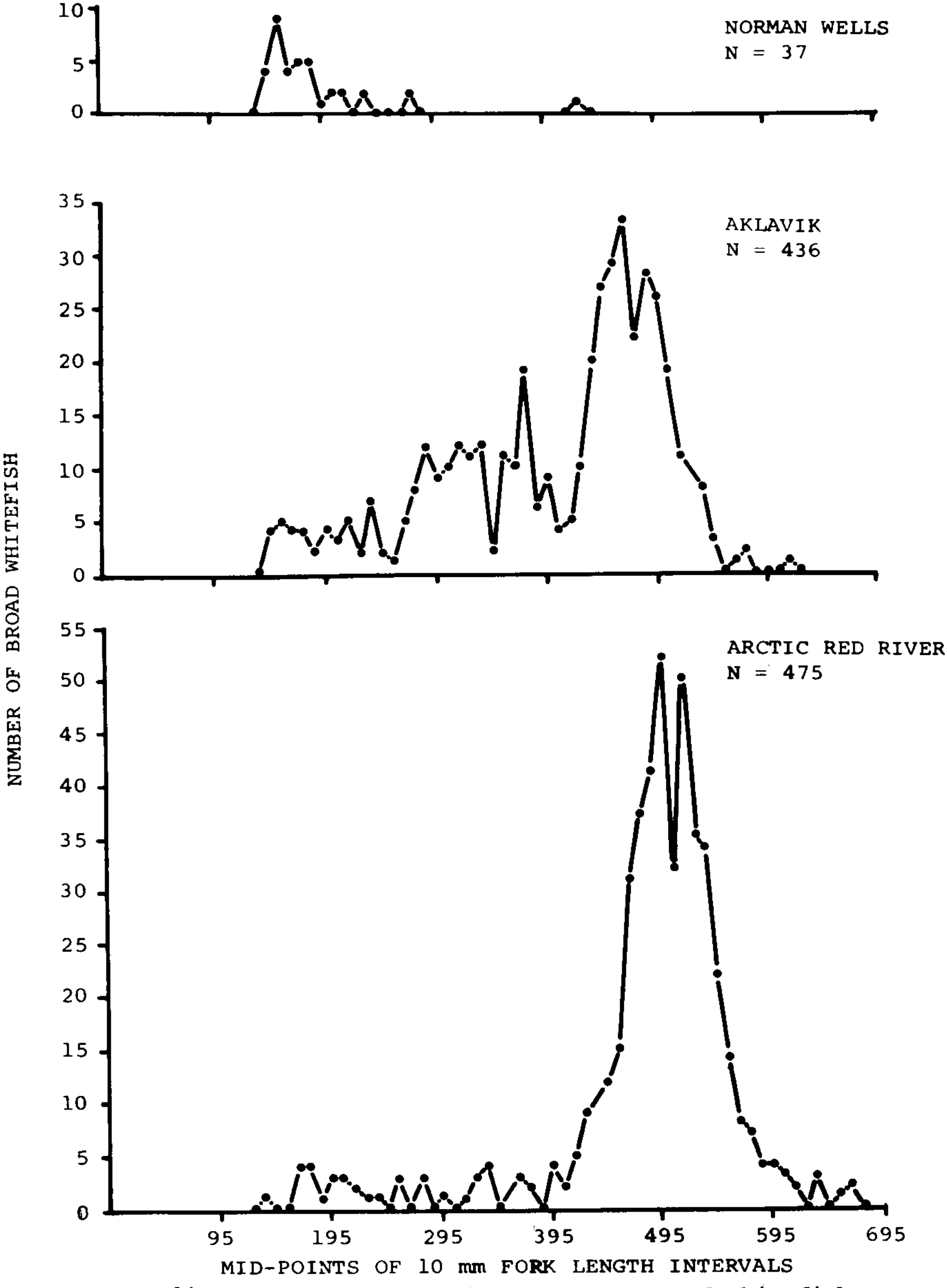


Fig. 64. Length frequency polygons for broad whitefish, Mackenzie River, 1972.

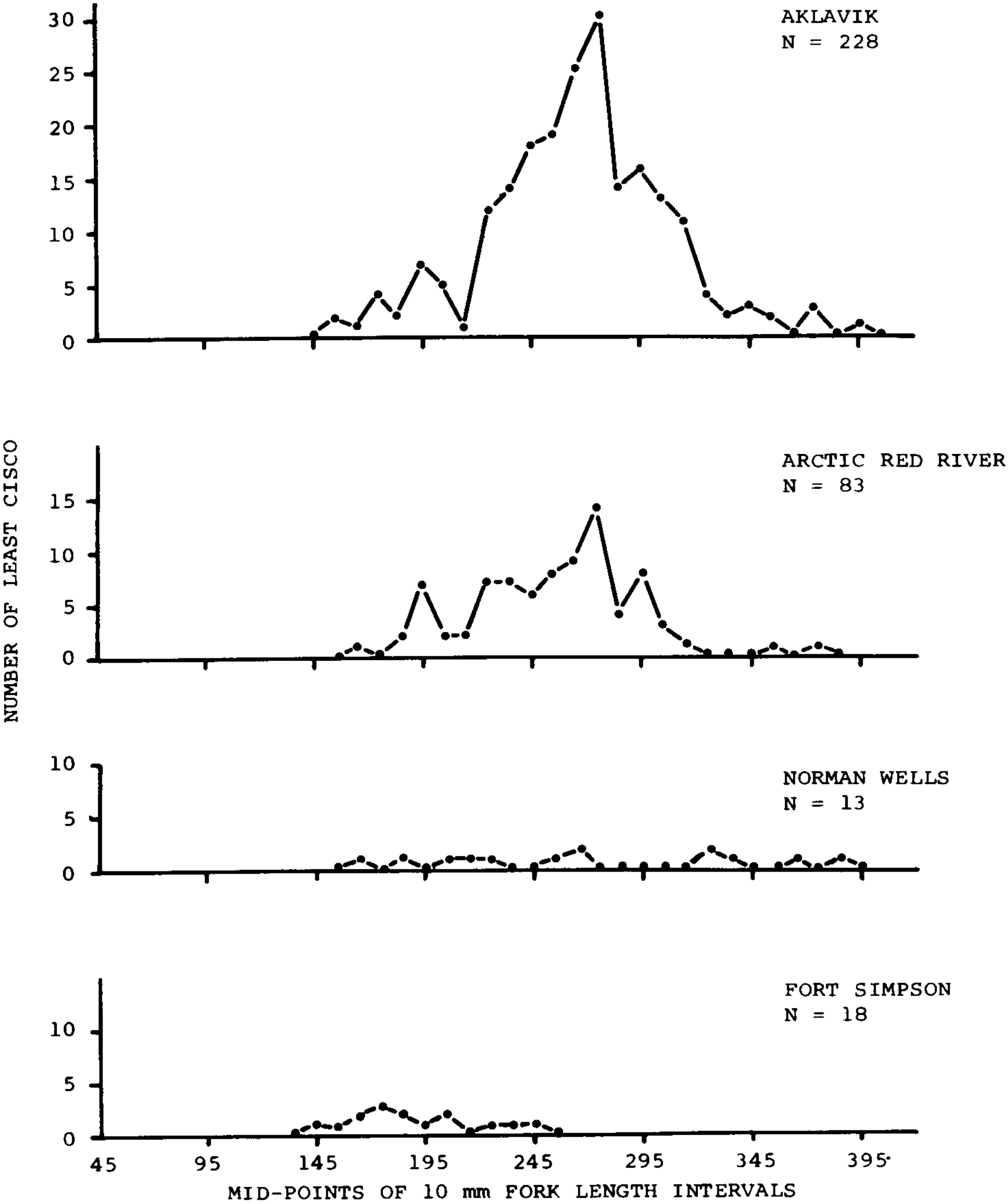


Fig. 65. Length frequency polygons for least cisco, Mackenzie River, 1972.

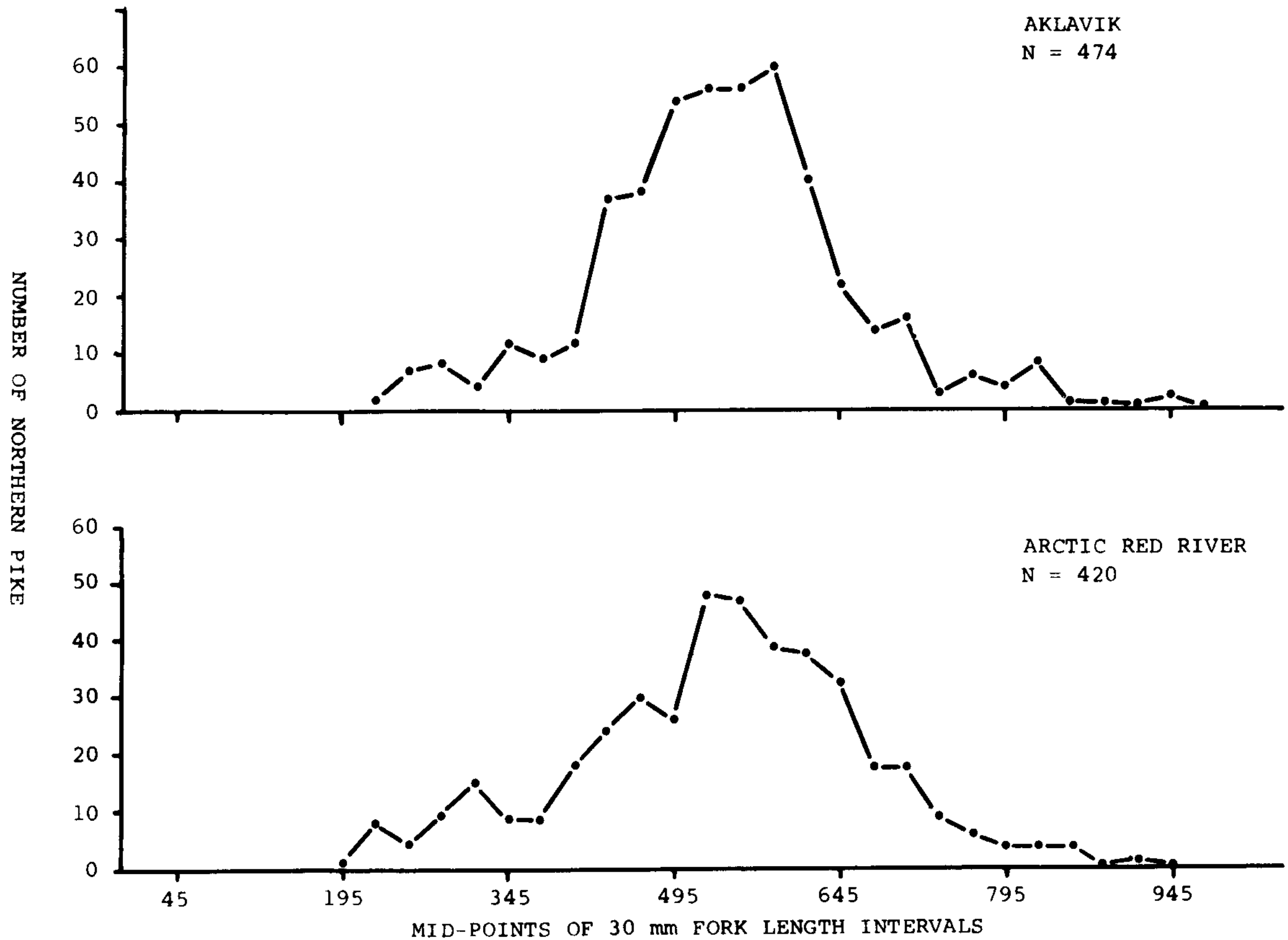


Fig. 66. Length frequency polygons for northern pike, Mackenzie River, 1972.

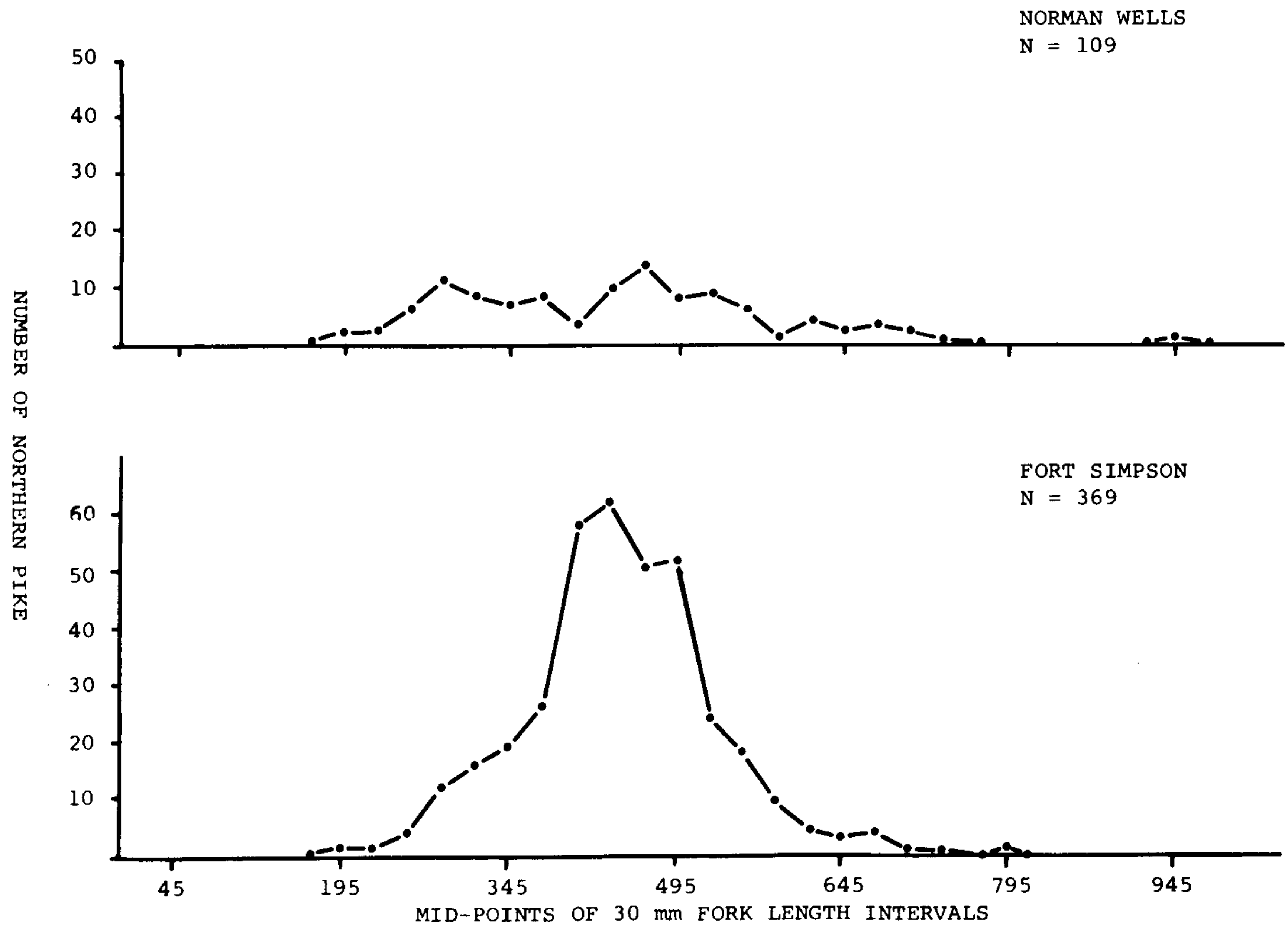


Fig. 66. (cont'd). Length frequency polygons for northern pike, Mackenzie River, 1972.

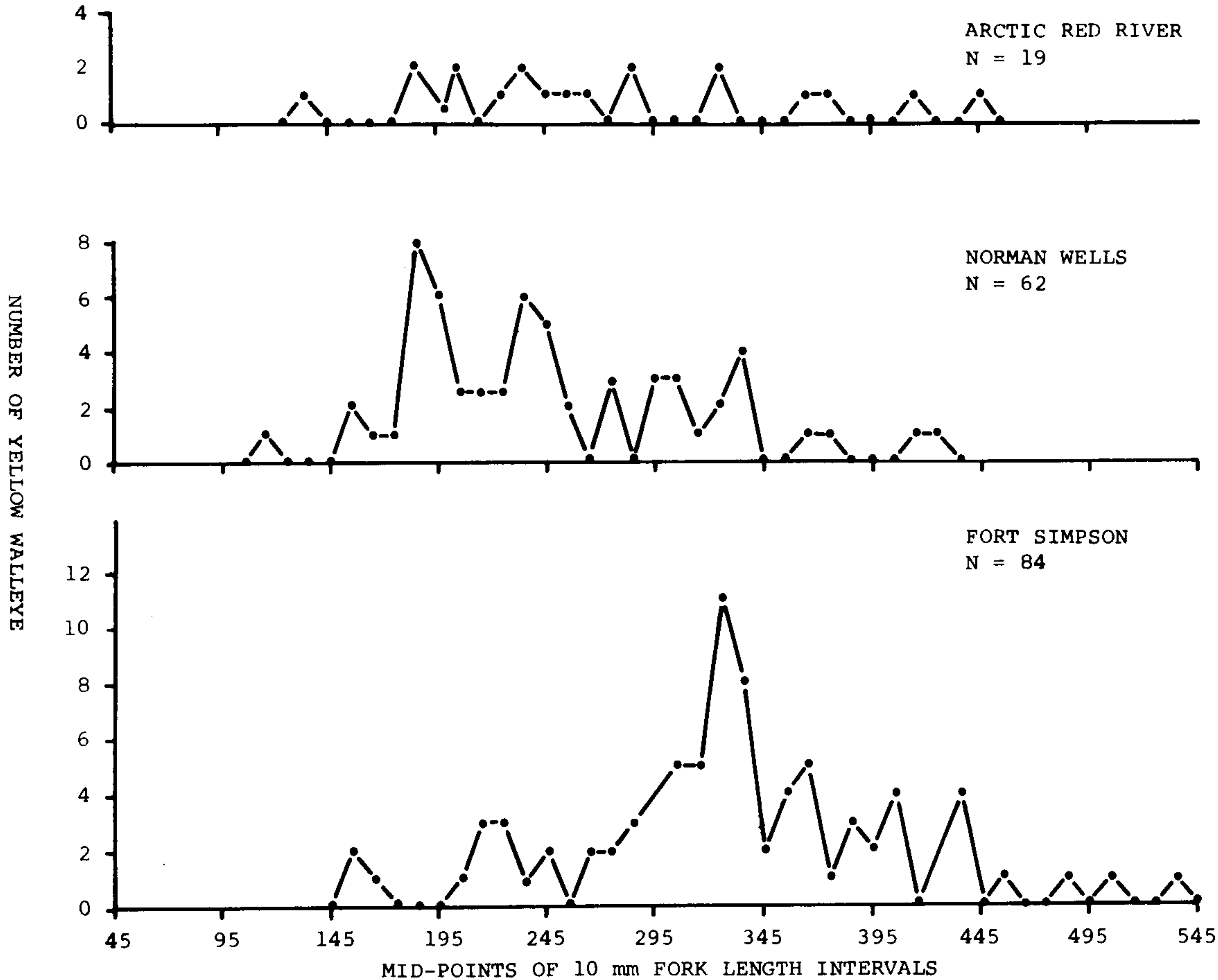


Fig. 67. Length frequency polygons for yellow walleye, Mackenzie River, 1972.

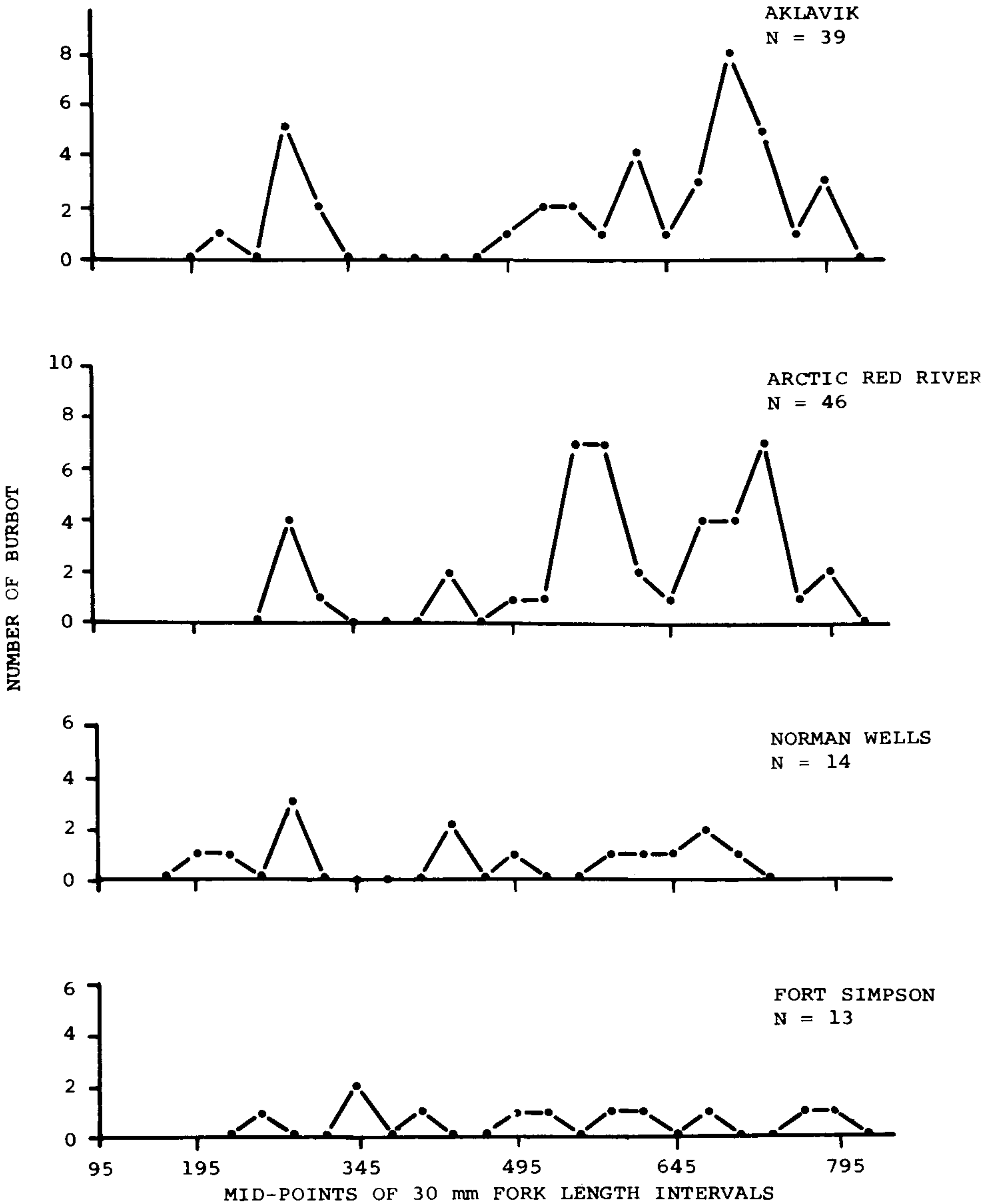


Fig. 68. Length frequency polygons for burbot, Mackenzie River, 1972.

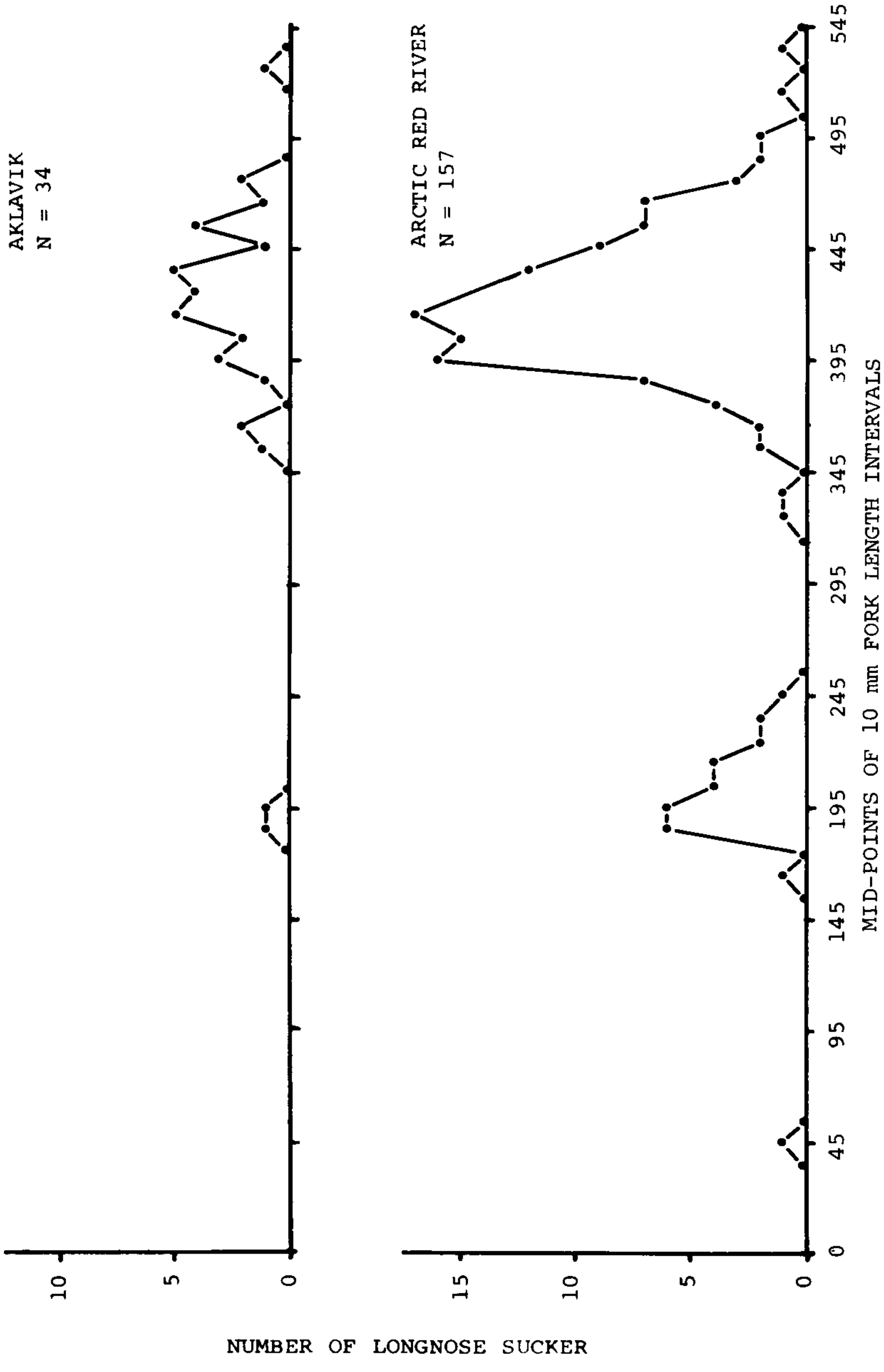


Fig. 69. Length frequency polygons for longnose sucker, Mackenzie River, 1972.

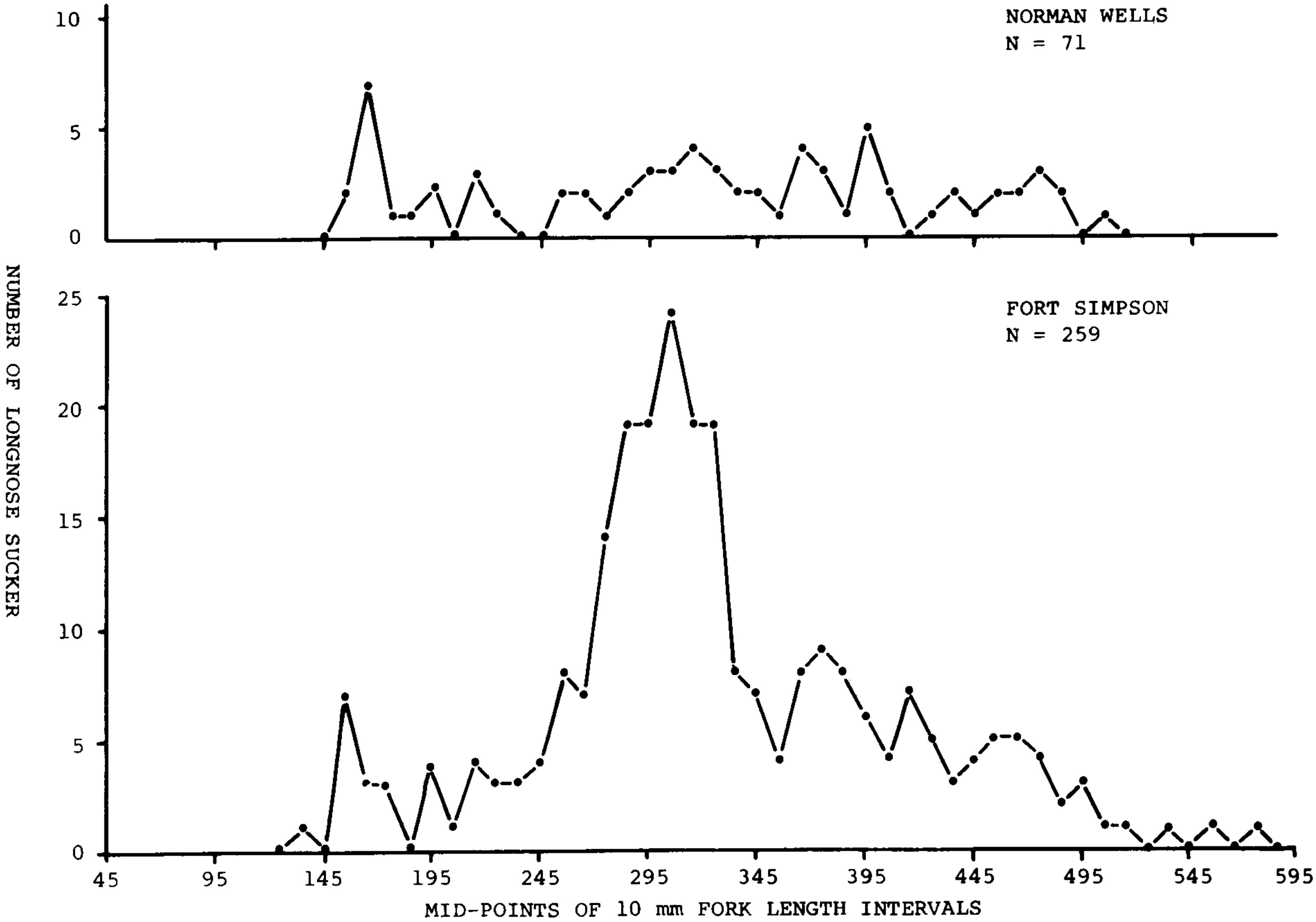


Fig. 69. (cont'd). Length frequency polygons for longnose sucker, Mackenzie River, 1972.

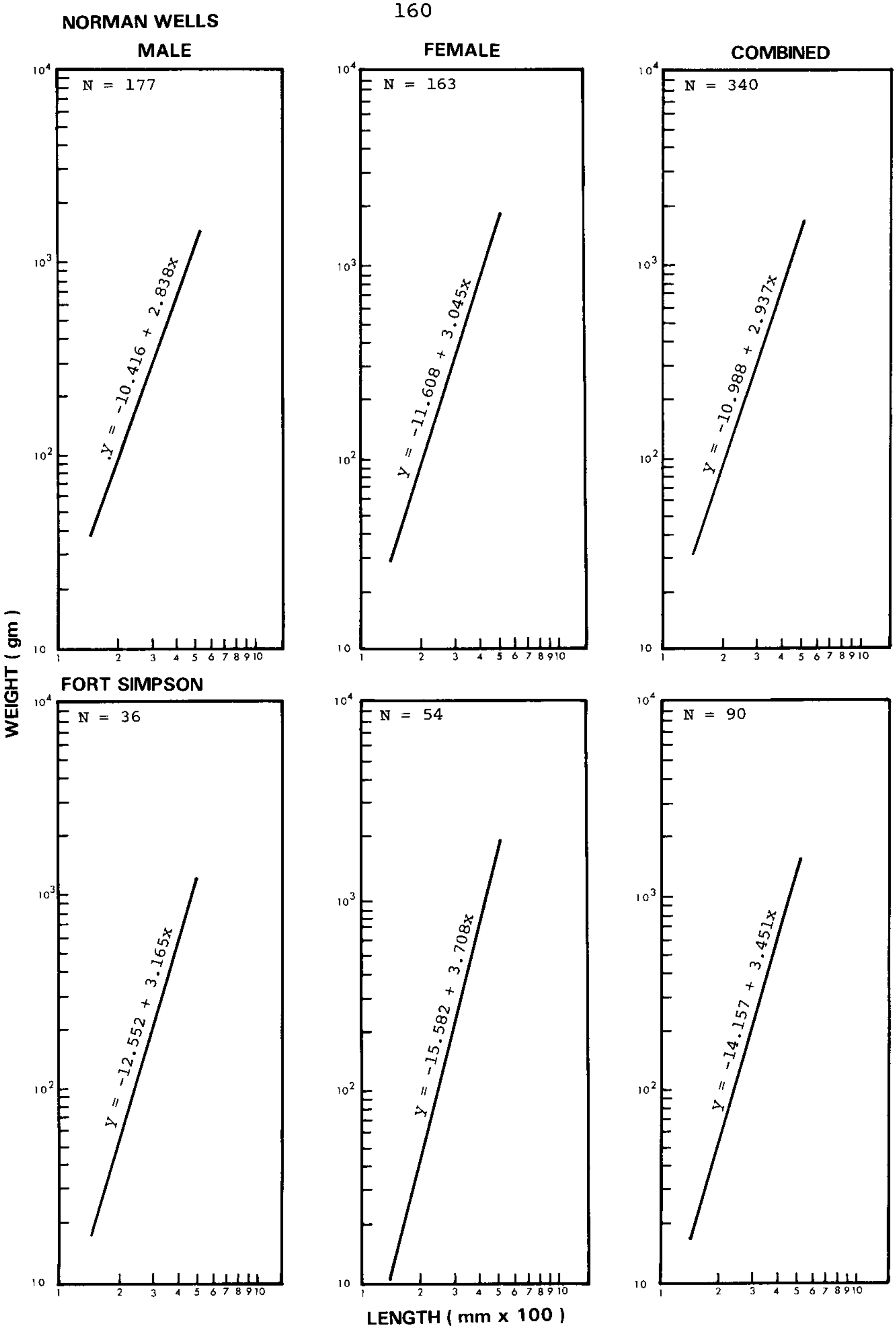


Figure 70. Length-weight relationship for Arctic grayling, Mackenzie River, 1972.

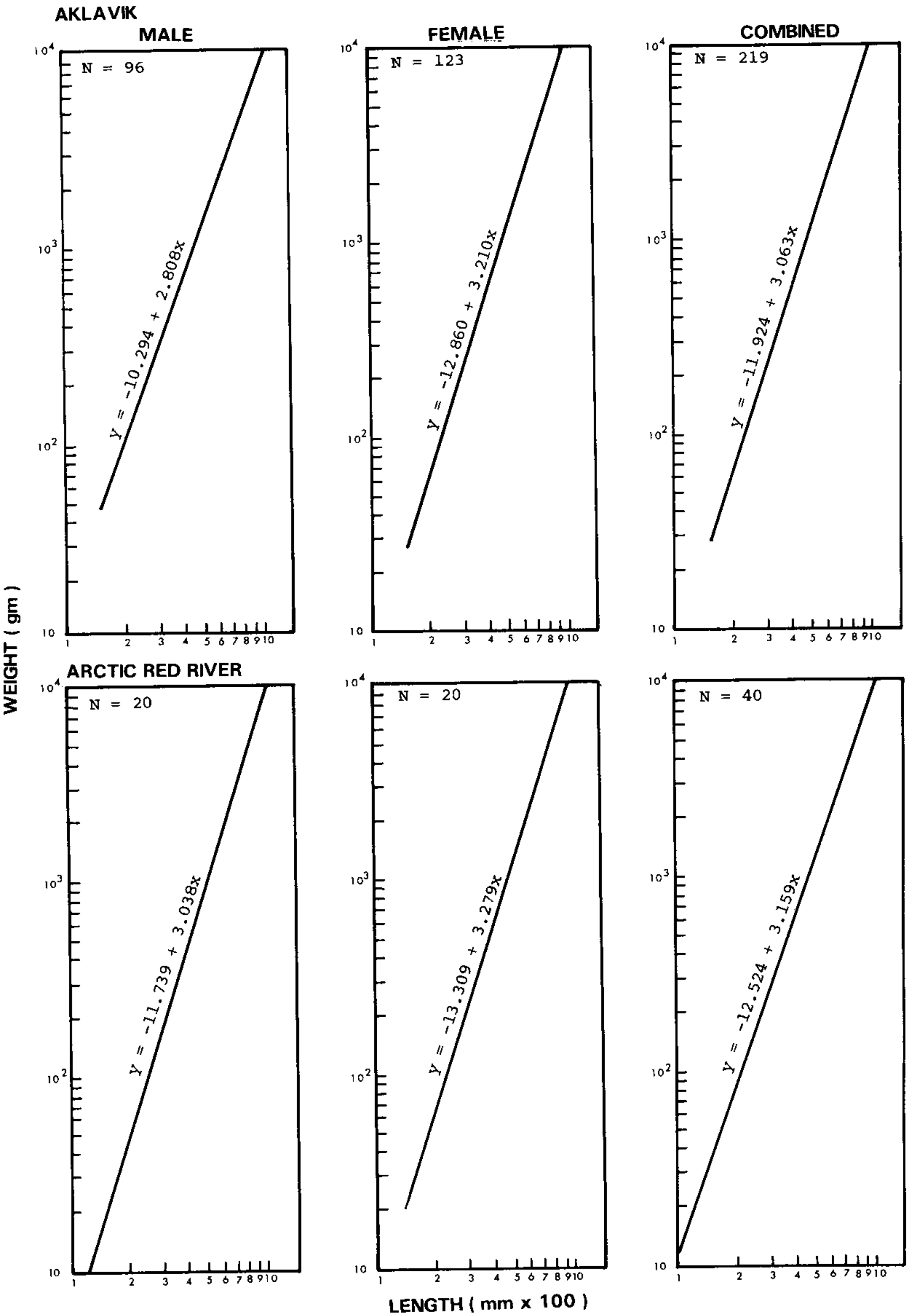


Figure 71. Length-weight relationship for inconnu, Mackenzie River, 1972.

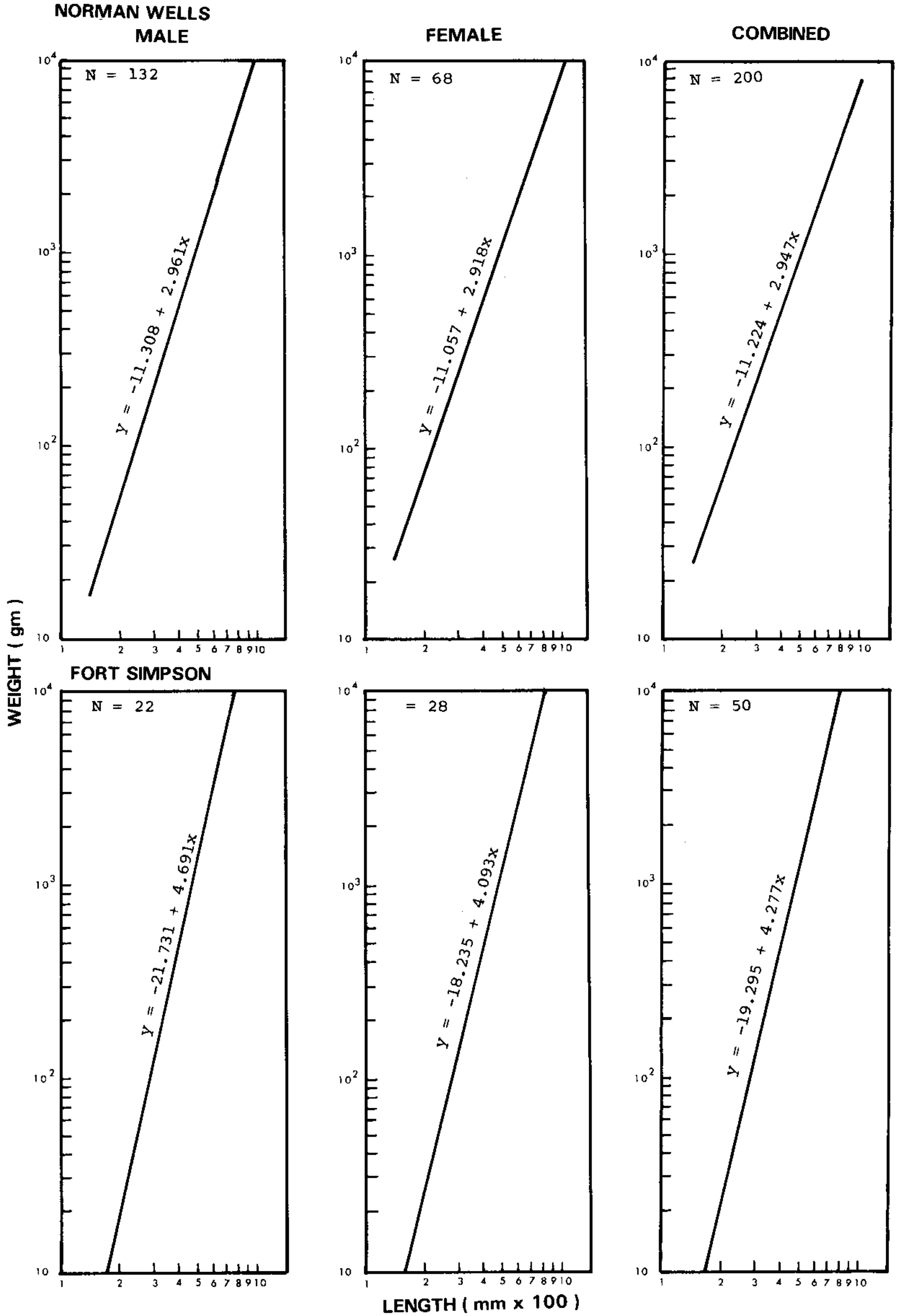


Figure 71 (cont'd)

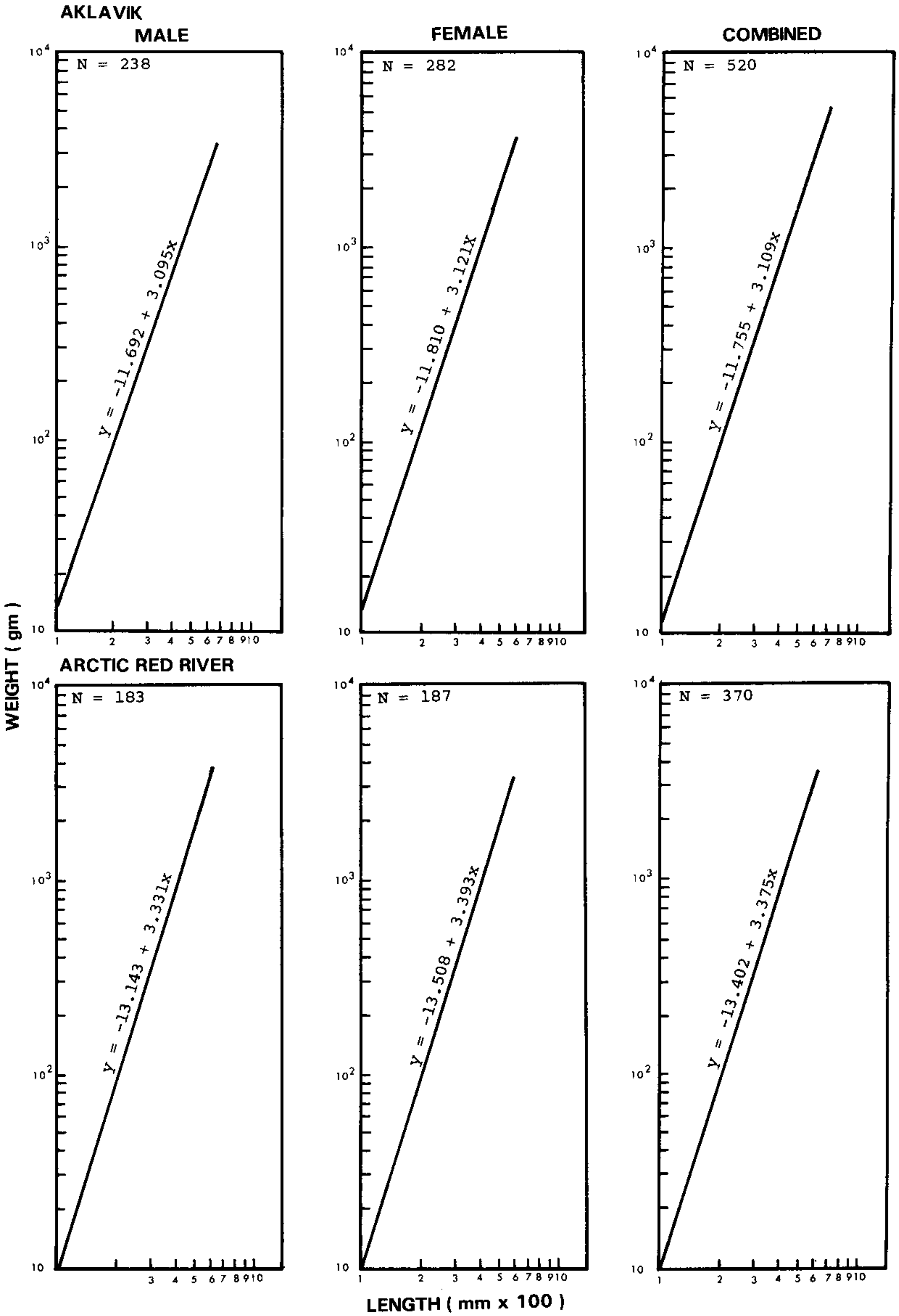
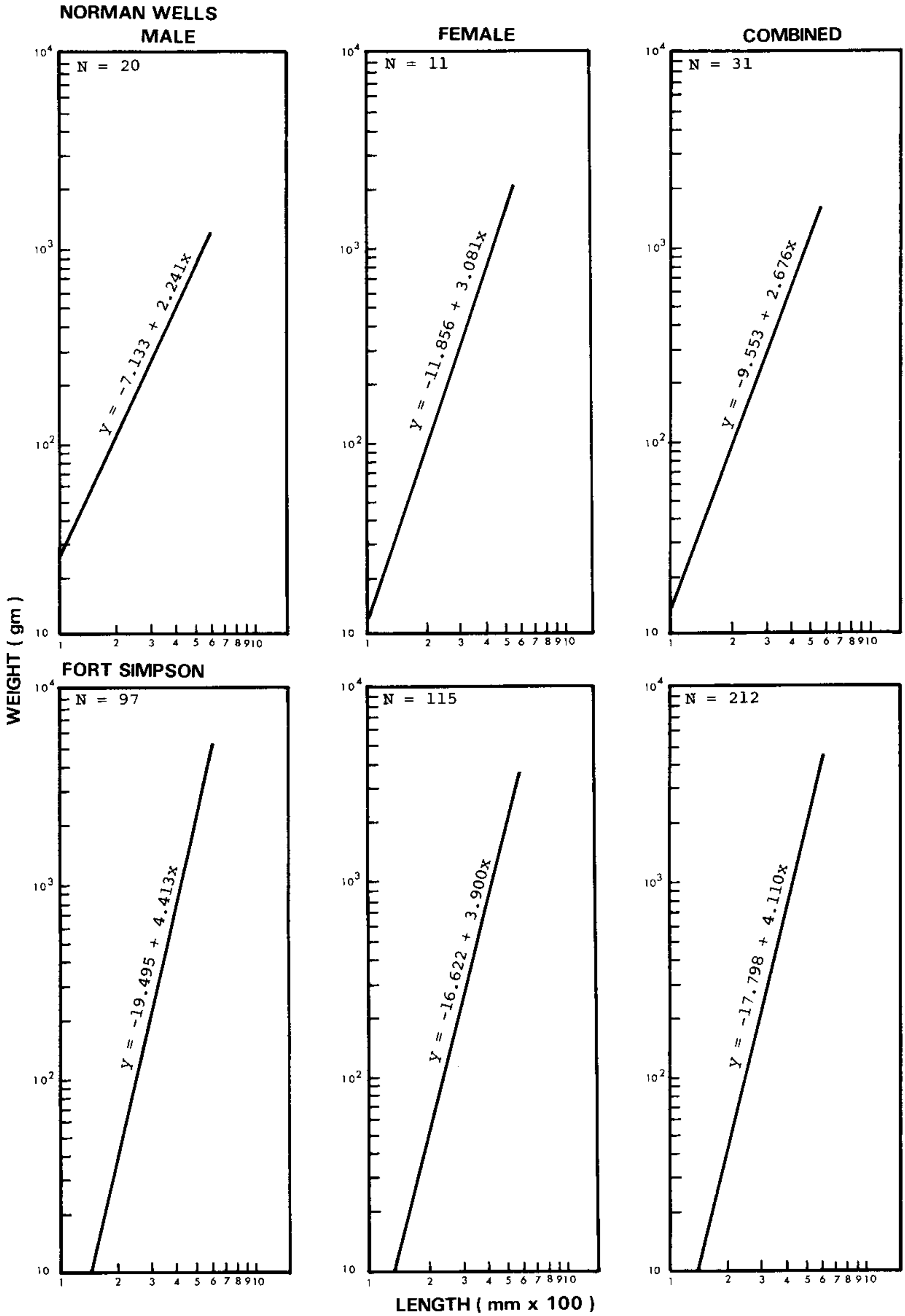


Figure 72. Length-weight relationship for humpback whitefish, Mackenzie River, 1972.



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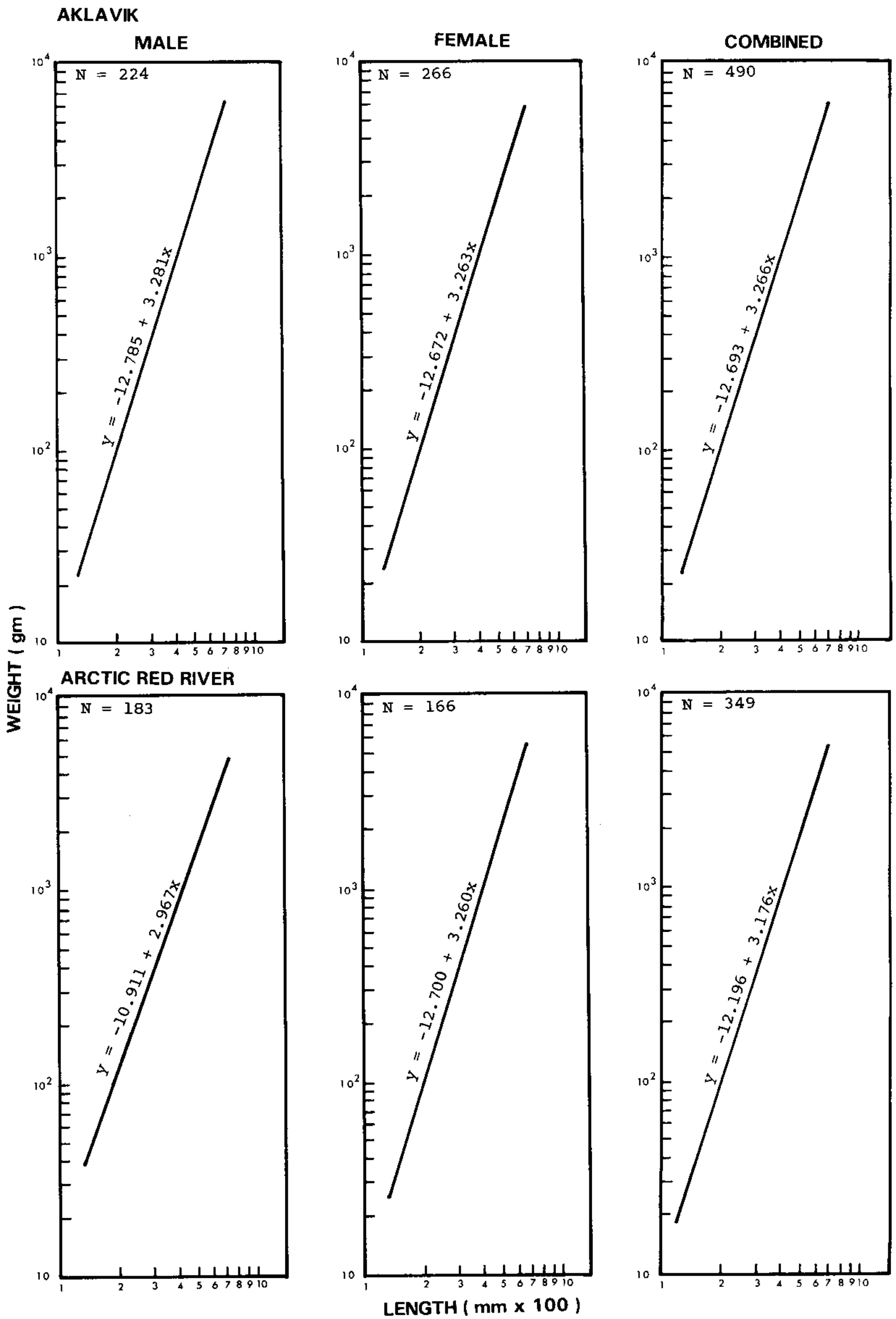


Figure 73a. Length-weight relationship for broad whitefish, Mackenzie River, 1972.

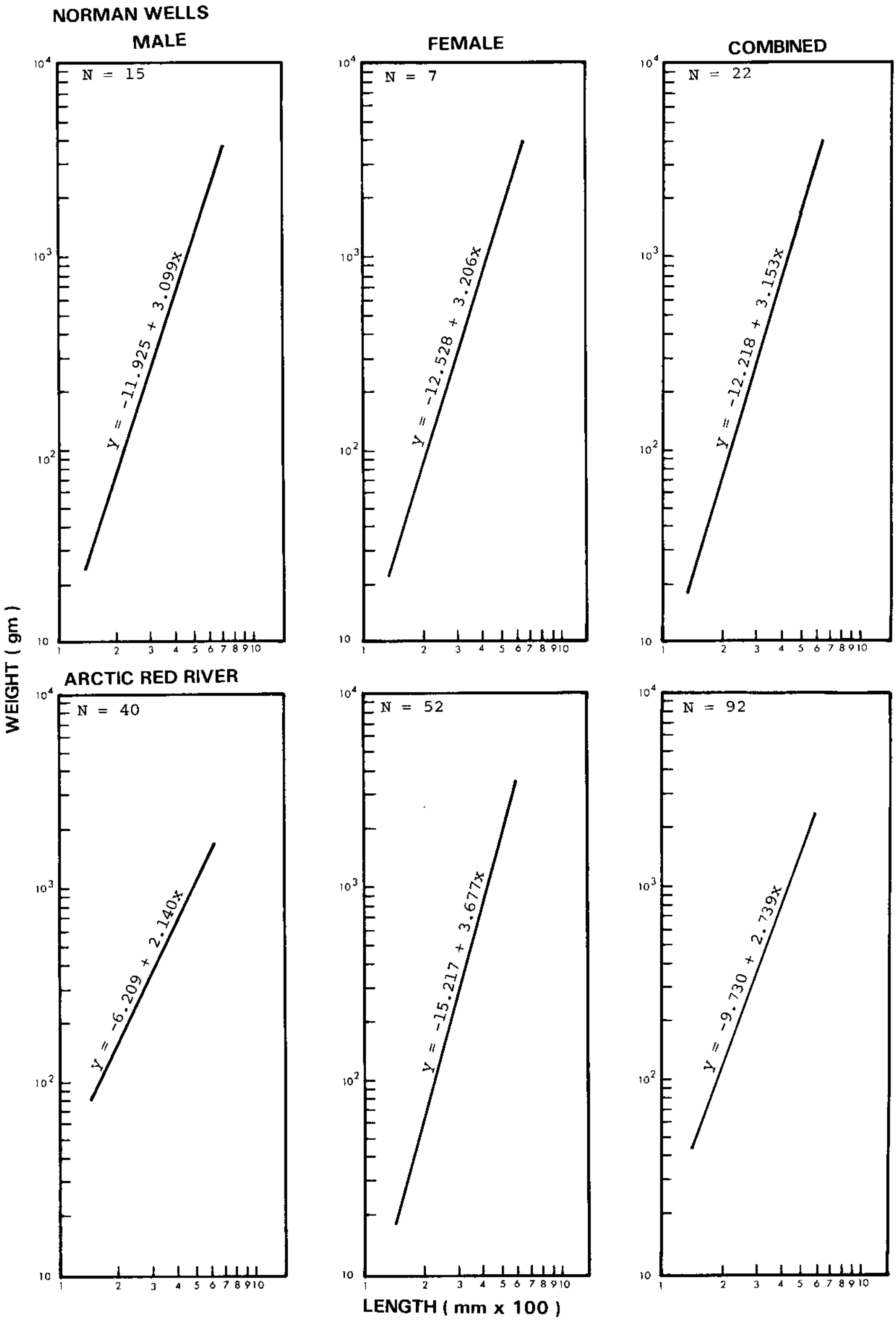


Figure 73b. Length-weight relationship for broad whitefish (Norman Wells) and Arctic grayling (Arctic Red River), Mackenzie River, 1972.

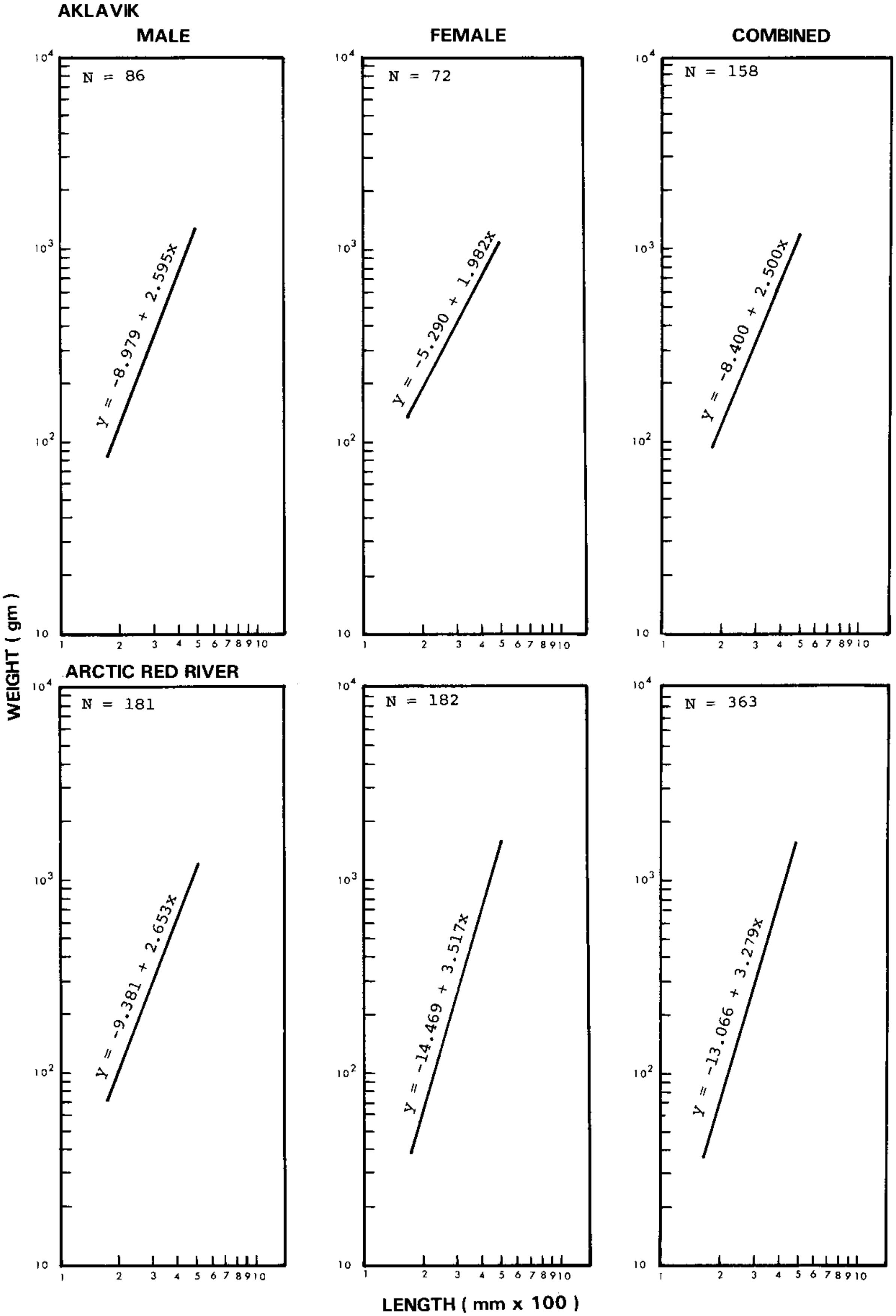


Figure 74a. Length-weight relationship for Arctic cisco, Mackenzie River, 1972.

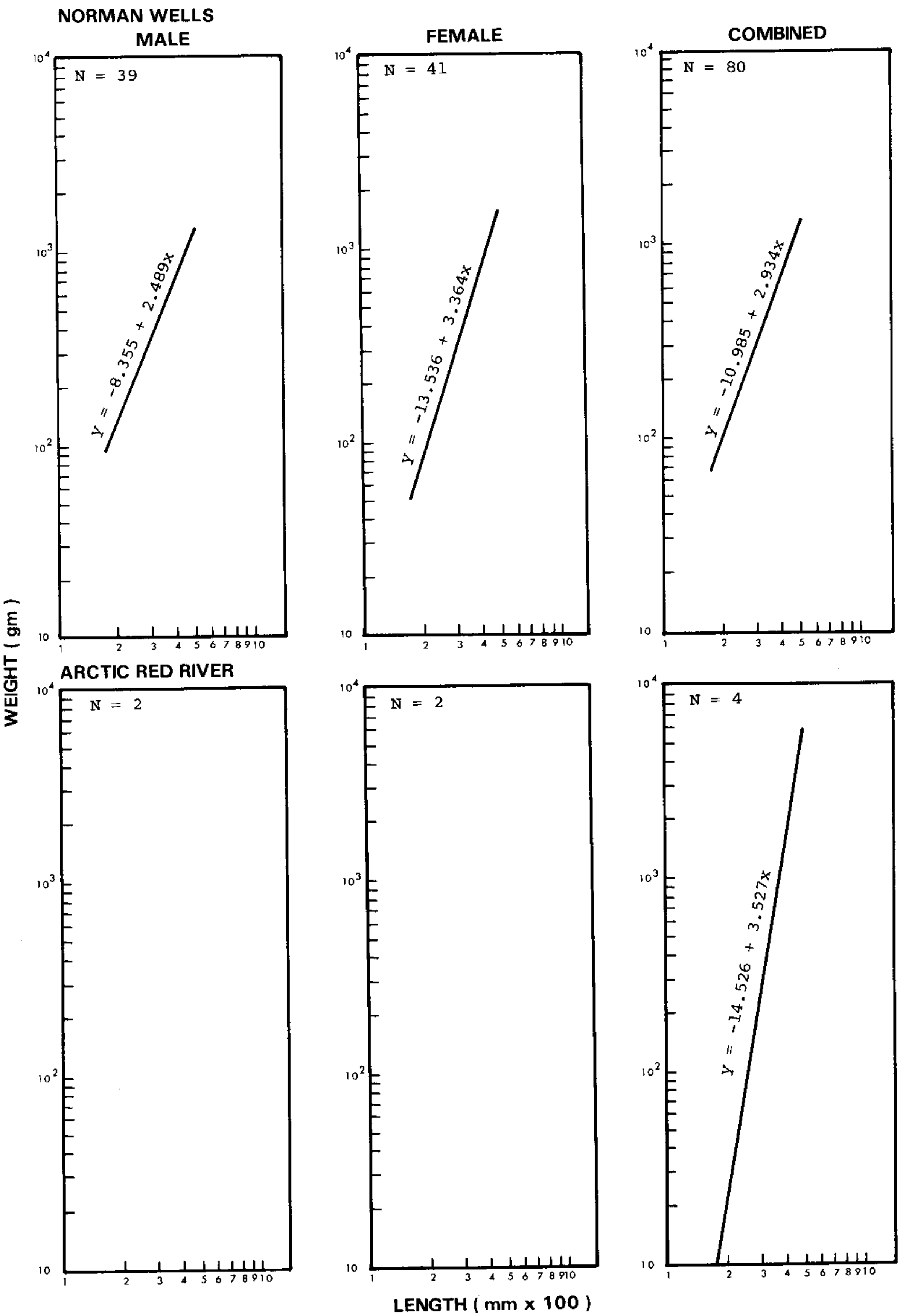


Figure 74b. Length-weight relationship for Arctic cisco (Norman Wells) and walleye (Arctic Red River), Mackenzie River, 1972.

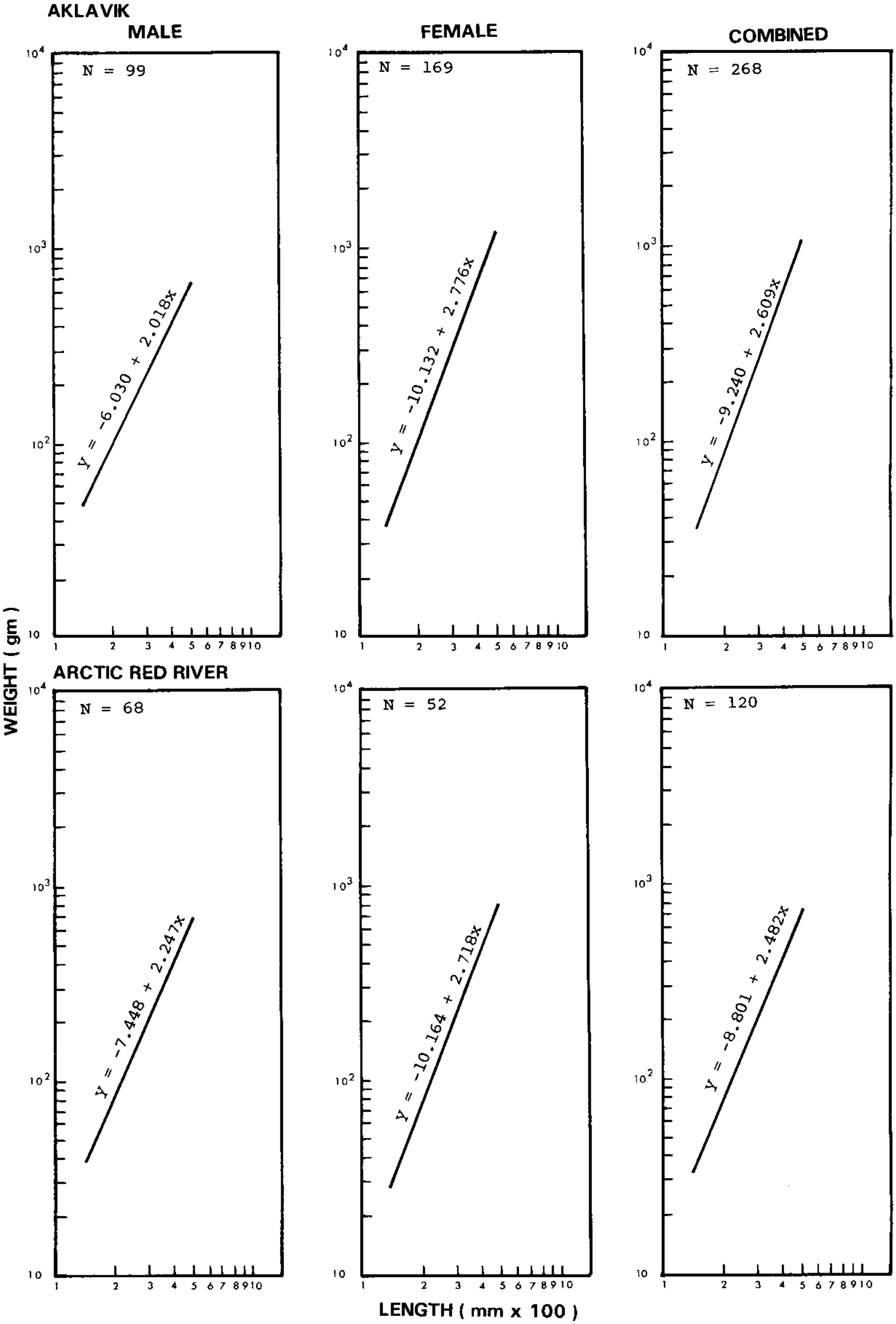


Figure 75. Length-weight relationship for least cisco, Mackenzie River, 1972.

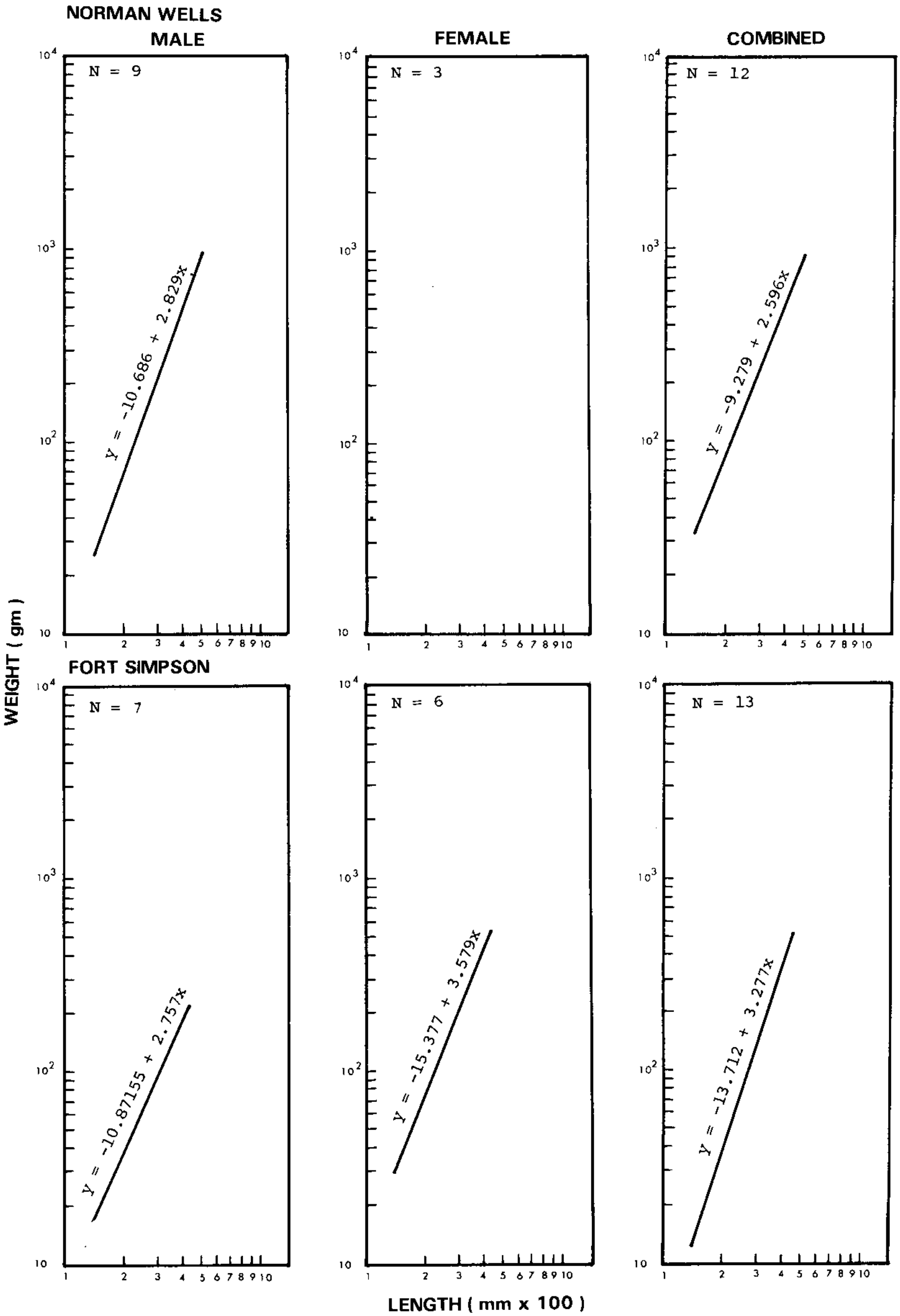


Figure 75. (cont'd)

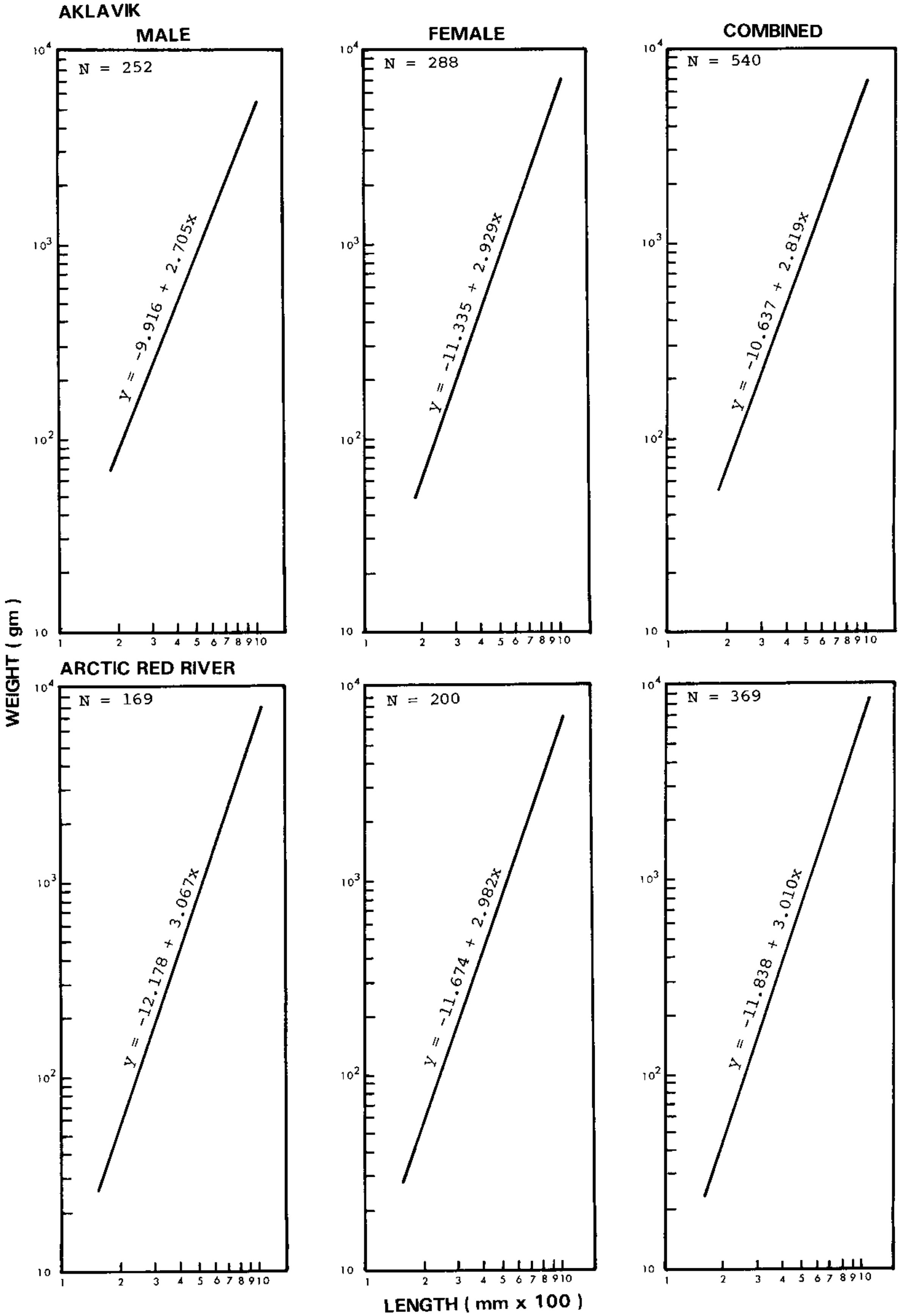


Figure 76. Length-weight relationship for northern pike, Mackenzie River, 1972.

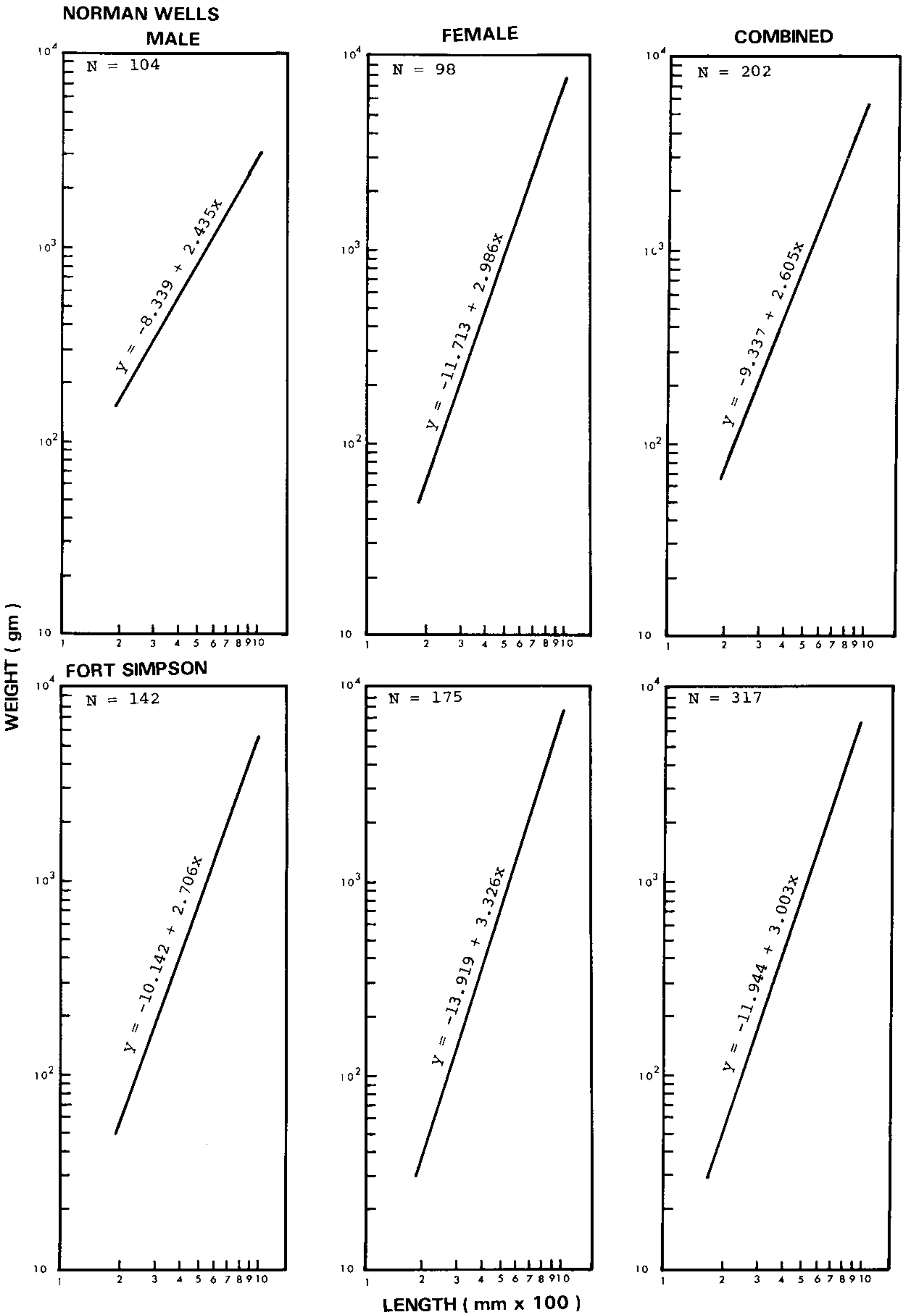


Figure 76. (cont'd)

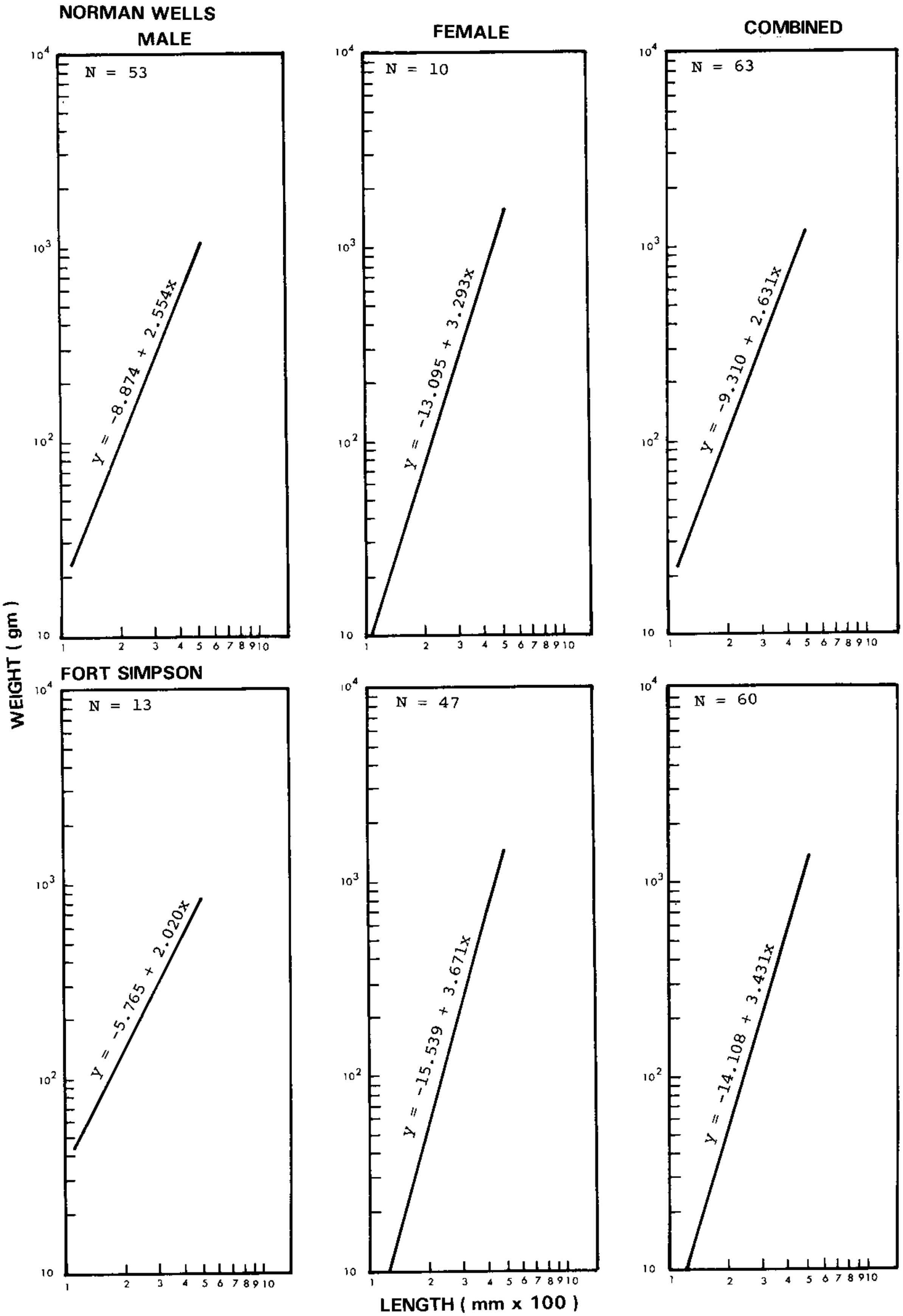


Figure 77. Length-weight relationship for yellow walleye, Mackenzie River, 1972.

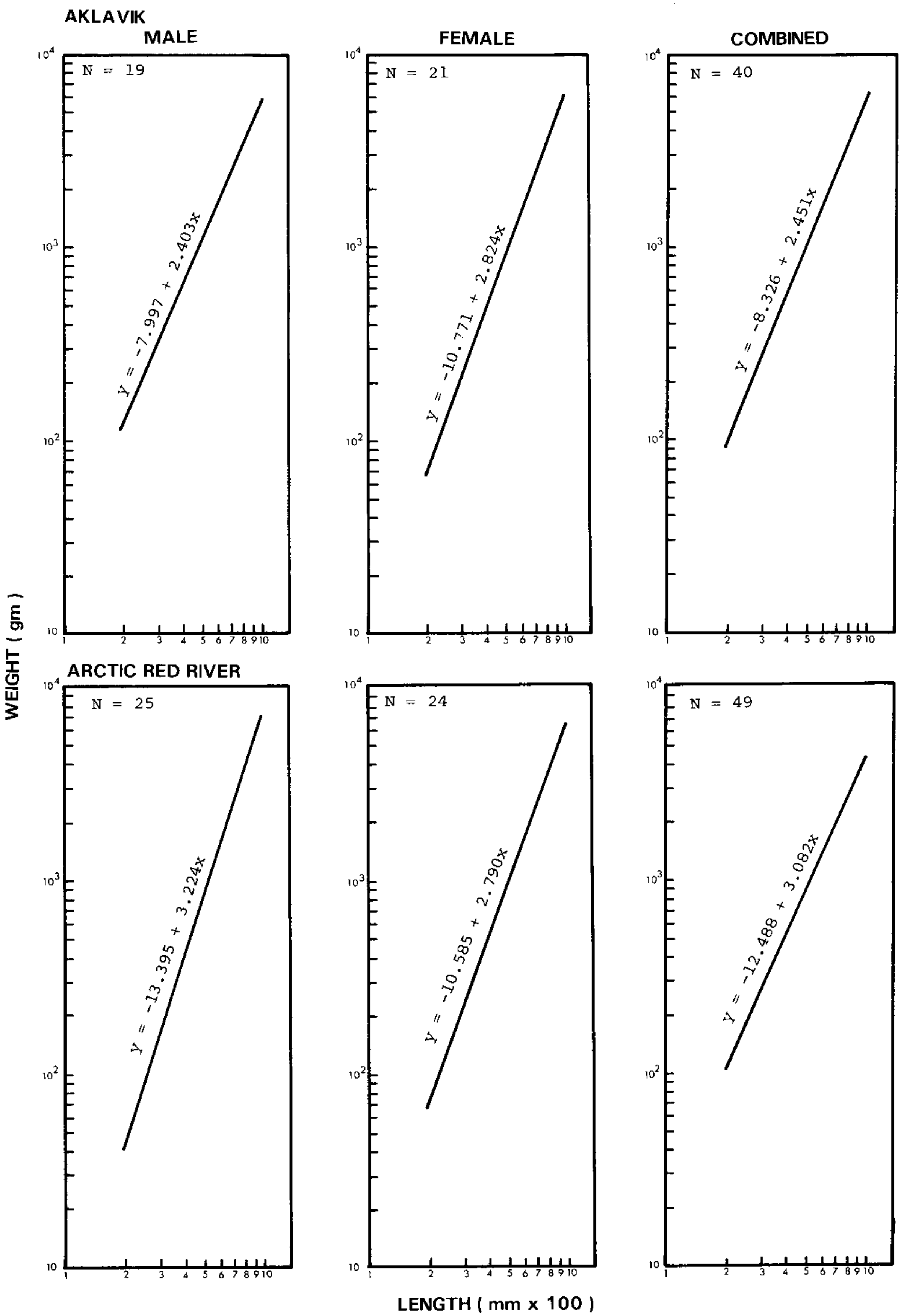
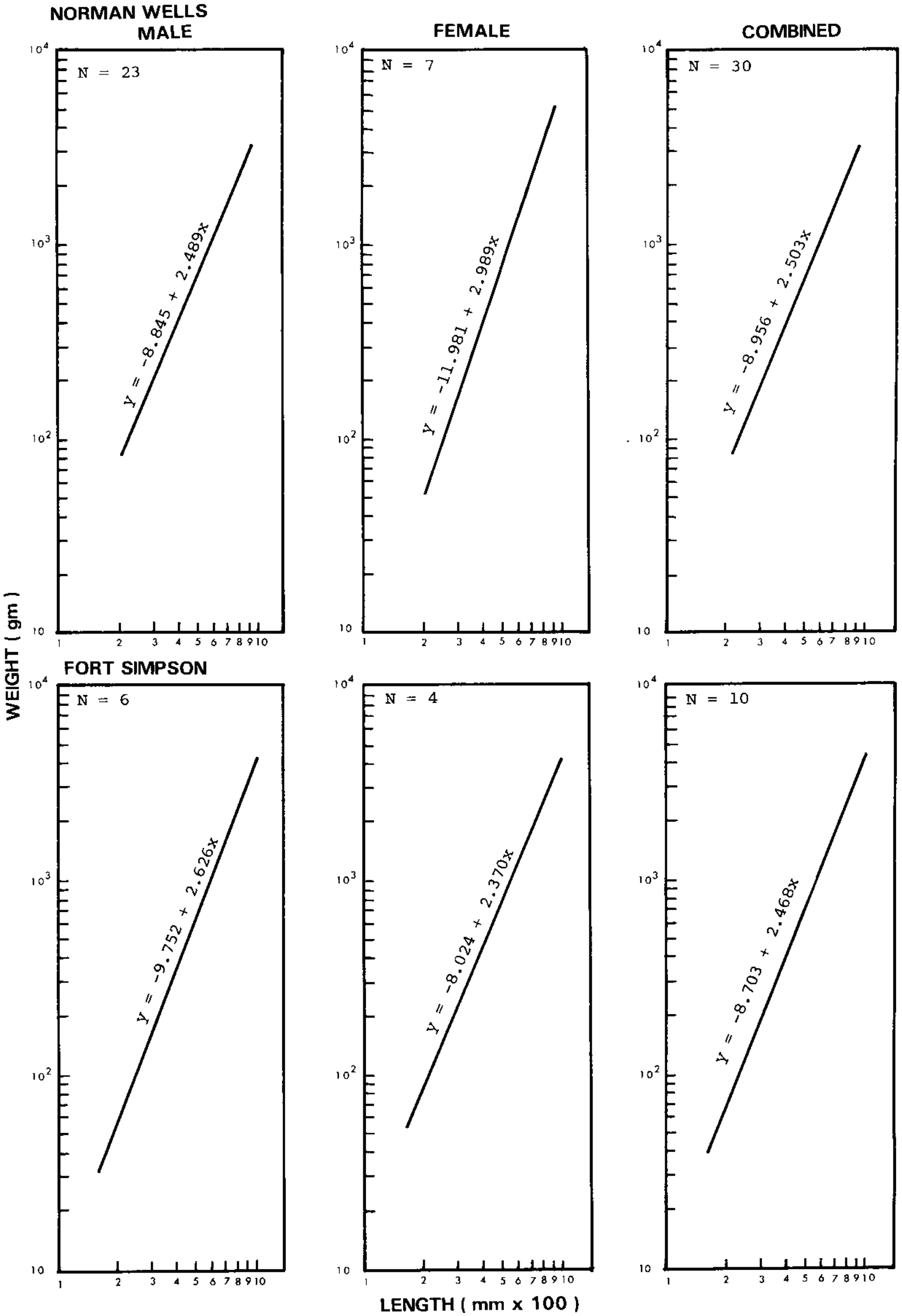


Figure 78. Length-weight relationship for burbot, Mackenzie River, 1972.



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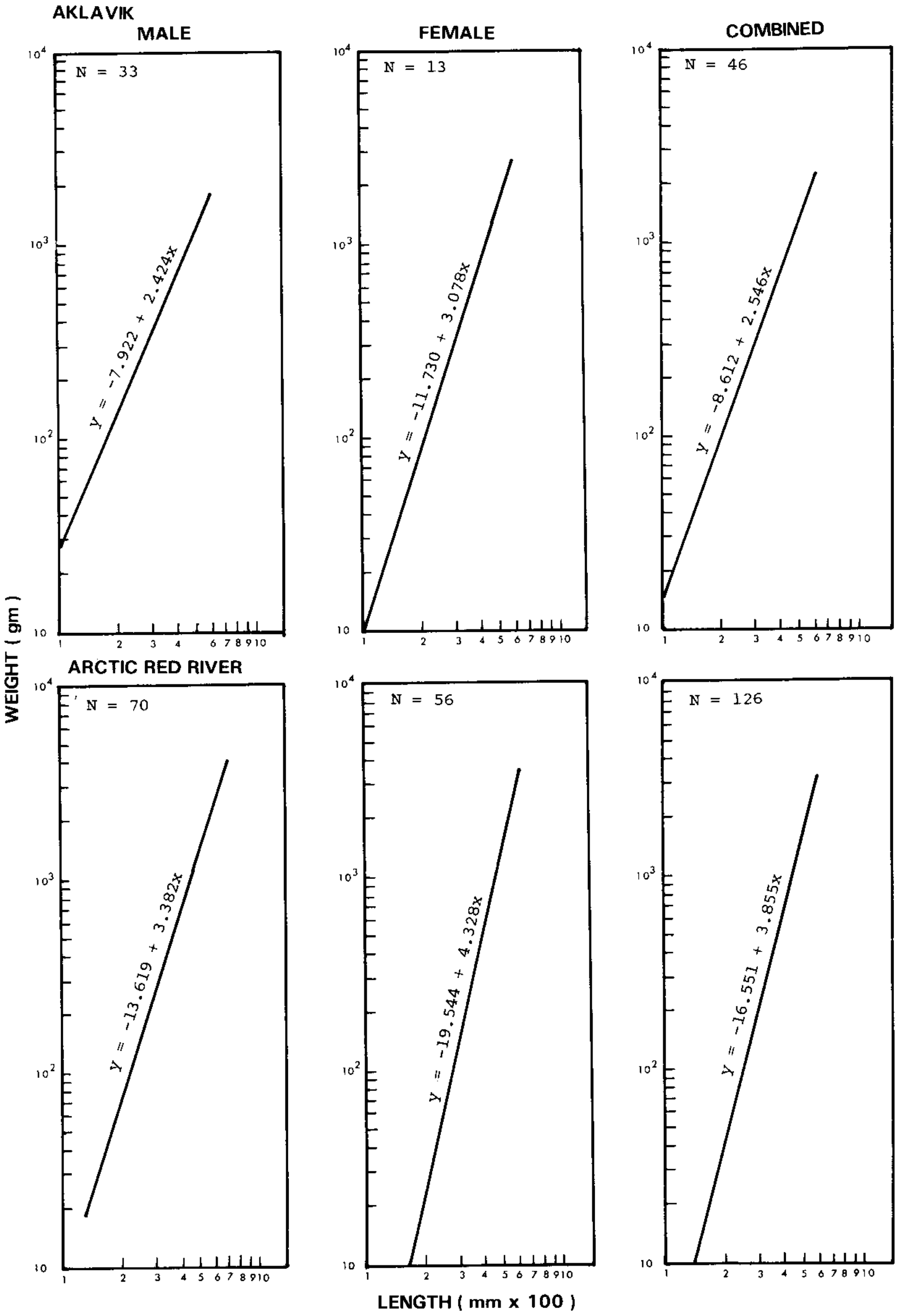
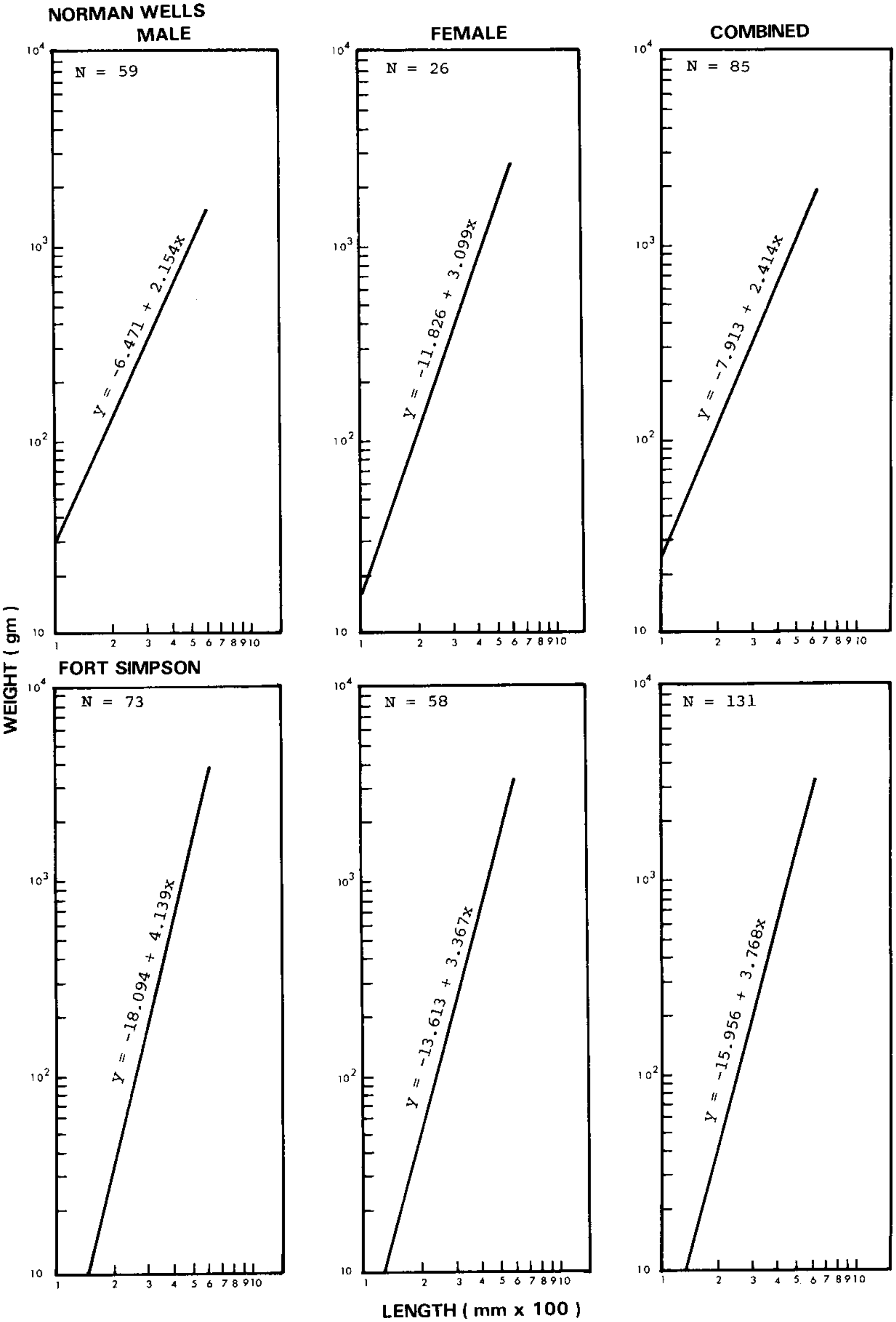


Figure 79. Length-weight relationship for longnose sucker, Mackenzie River, 1972.



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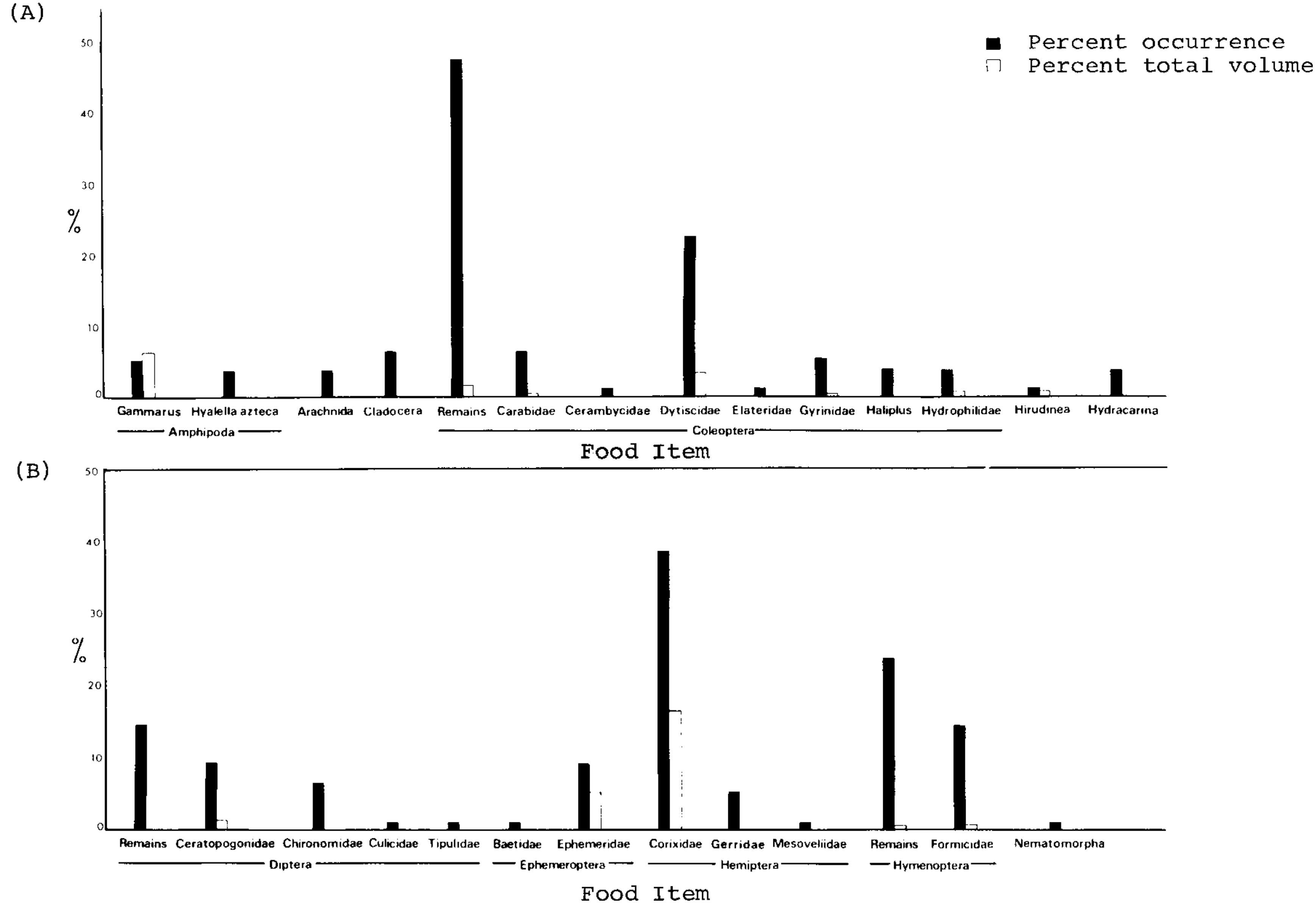

Fig. 80. Summary of stomach contents of 84 Arctic grayling (119-402 mm) caught in gill nets, Mackenzie River, 1972.

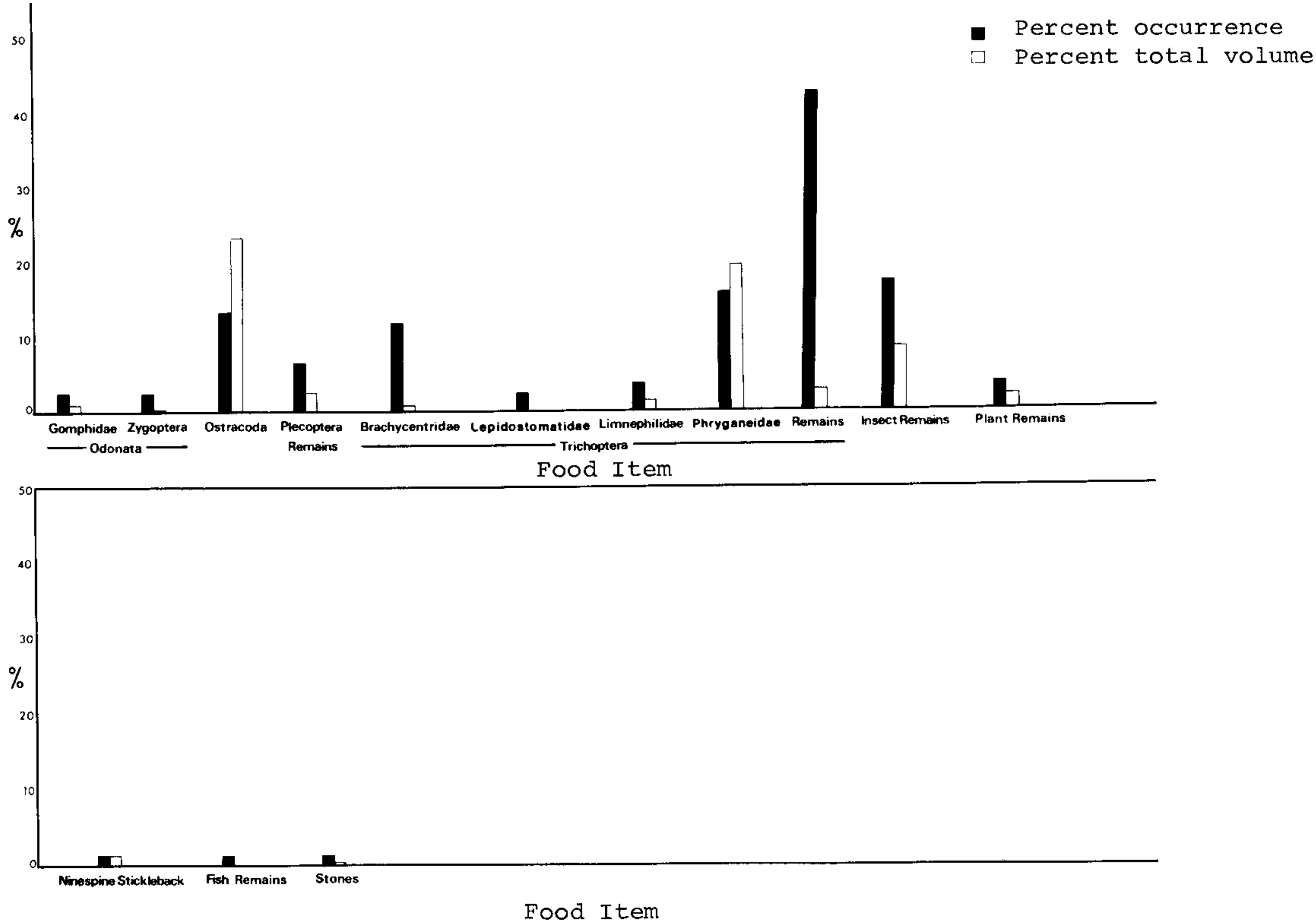

Fig. 80. (cont'd). Summary of stomach contents of 84 Arctic grayling (119-402 mm) caught in gill nets, Mackenzie River, 1972.

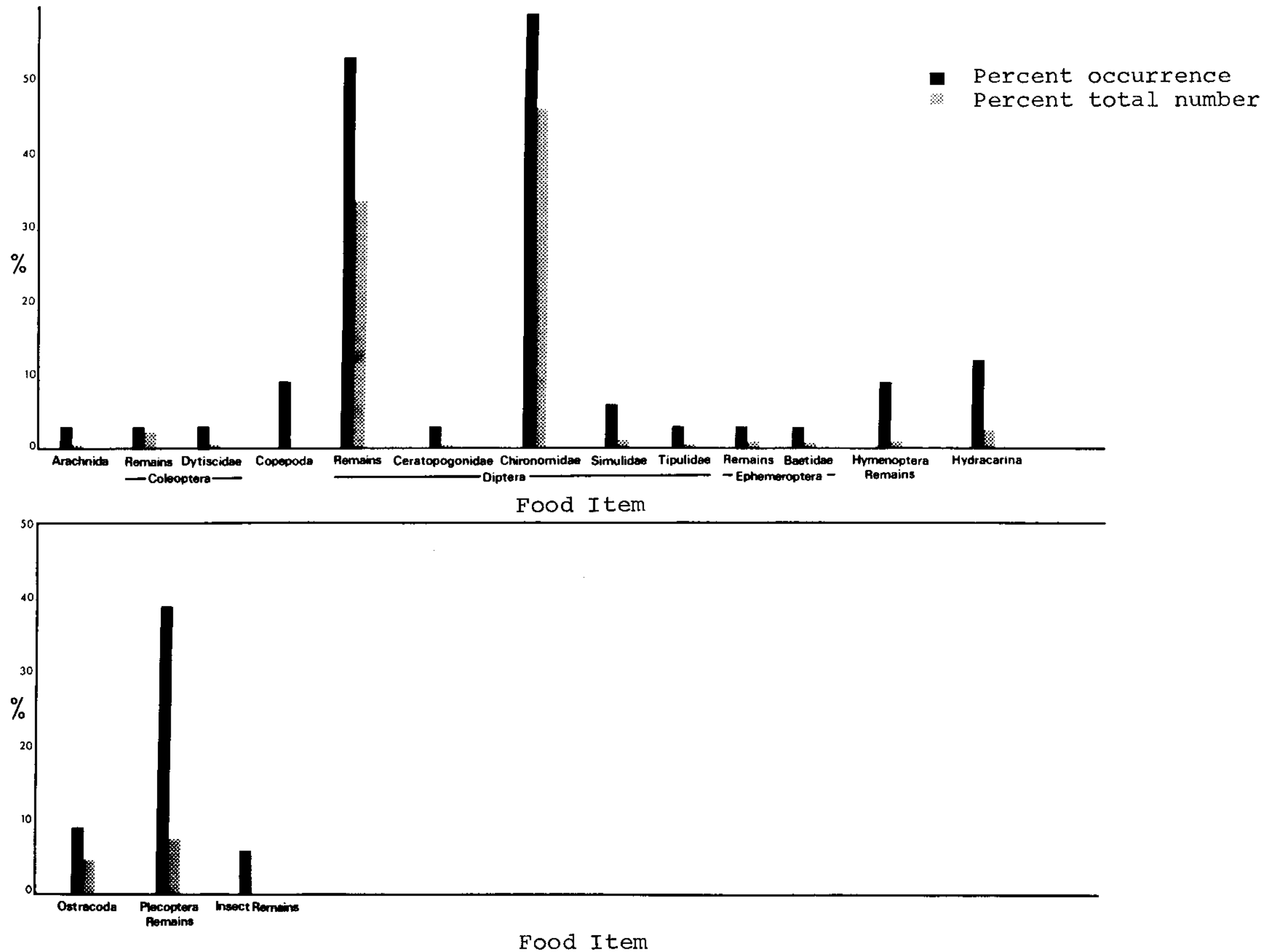

Fig. 81. Summary of stomach contents of 36 Arctic grayling (17-136 mm) caught in seines, Mackenzie River, 1972.

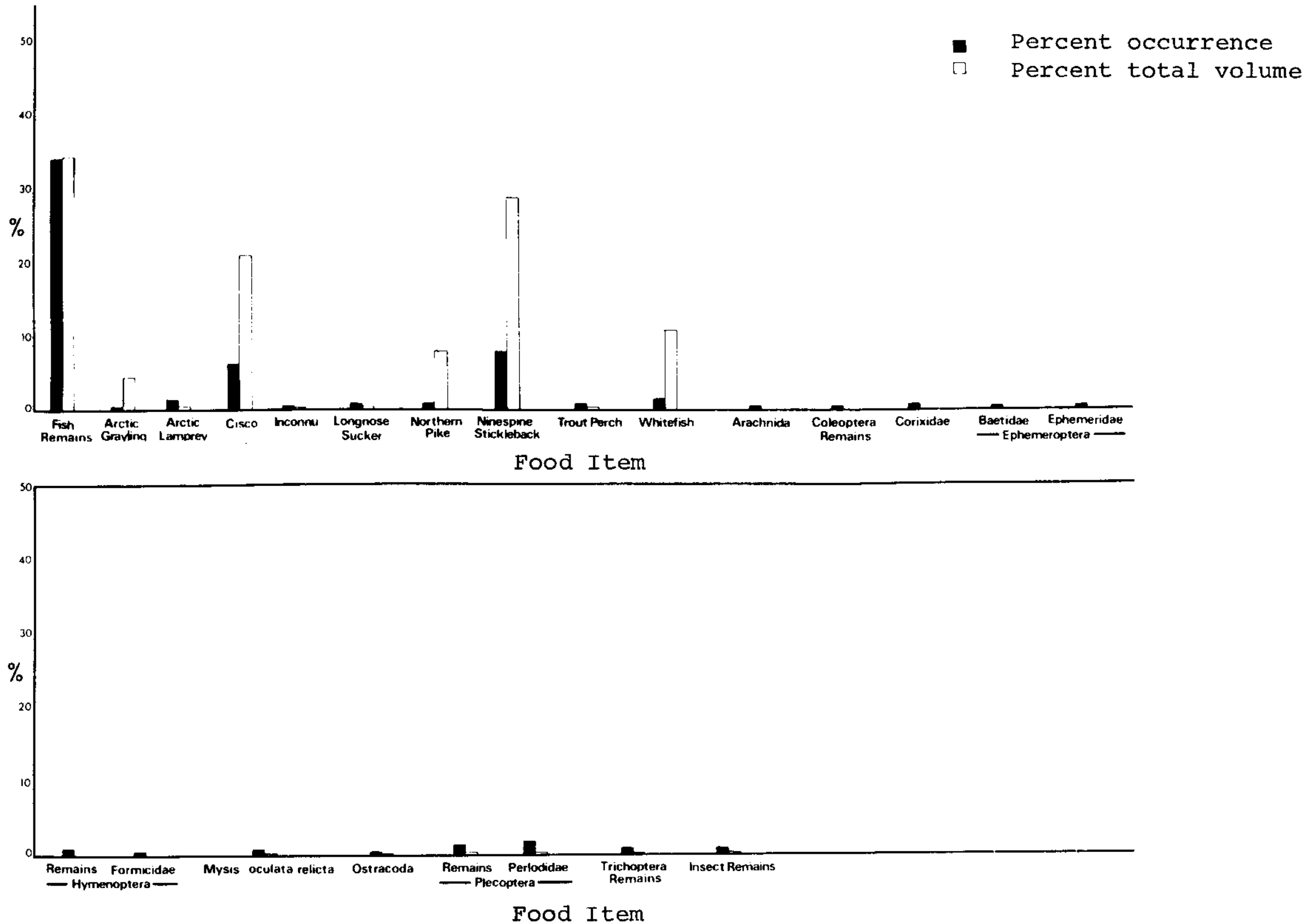

Fig. 82. Summary of stomach contents of 212 inconnu (147-894 mm) caught in gill nets, Mackenzie River, 1972.

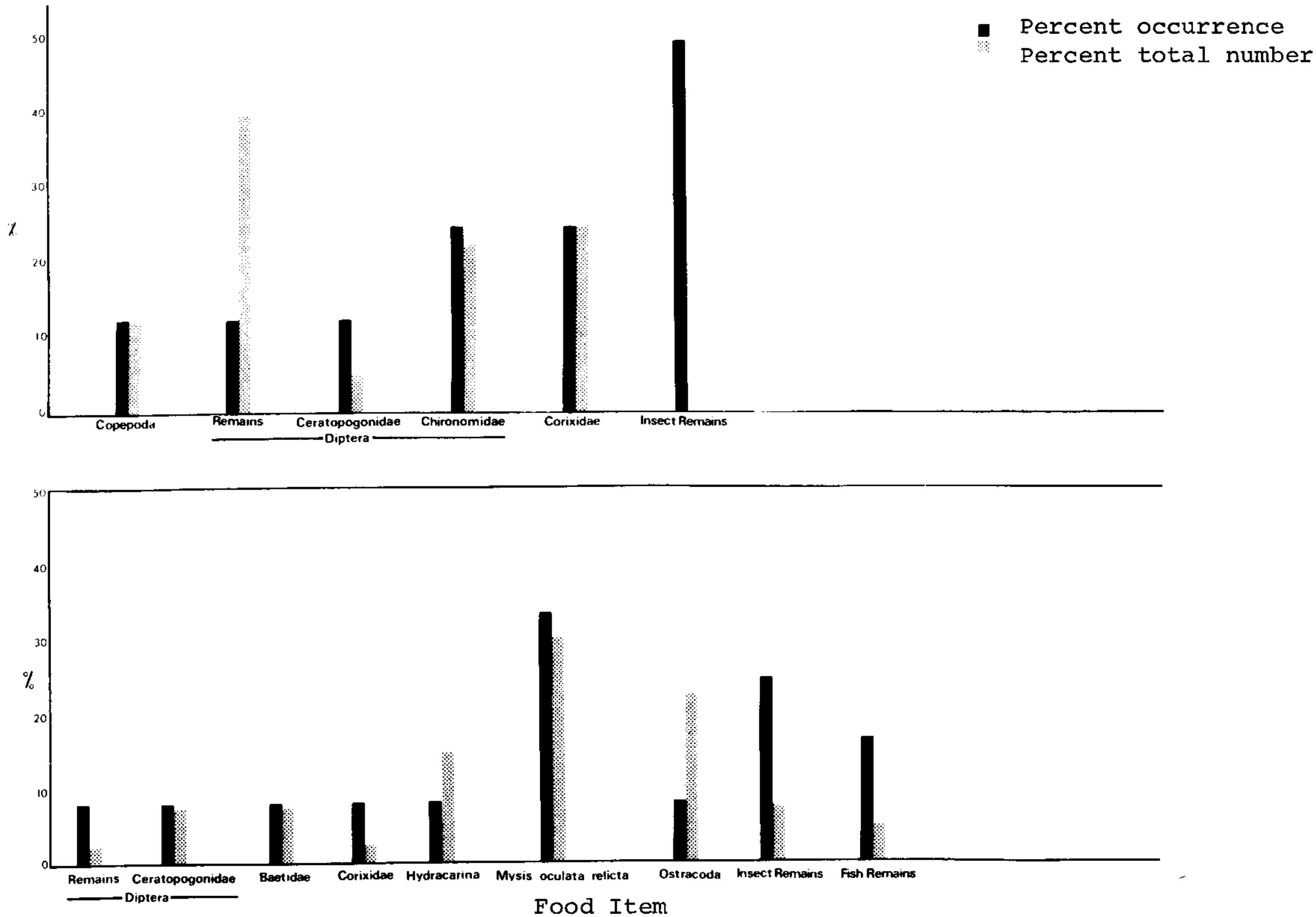

Fig. 83. Summary of stomach contents of (A) 13 broad whitefish (38-147 mm) and (B) 12 inconnu (42-110) caught in seines, Mackenzie River, 1972.

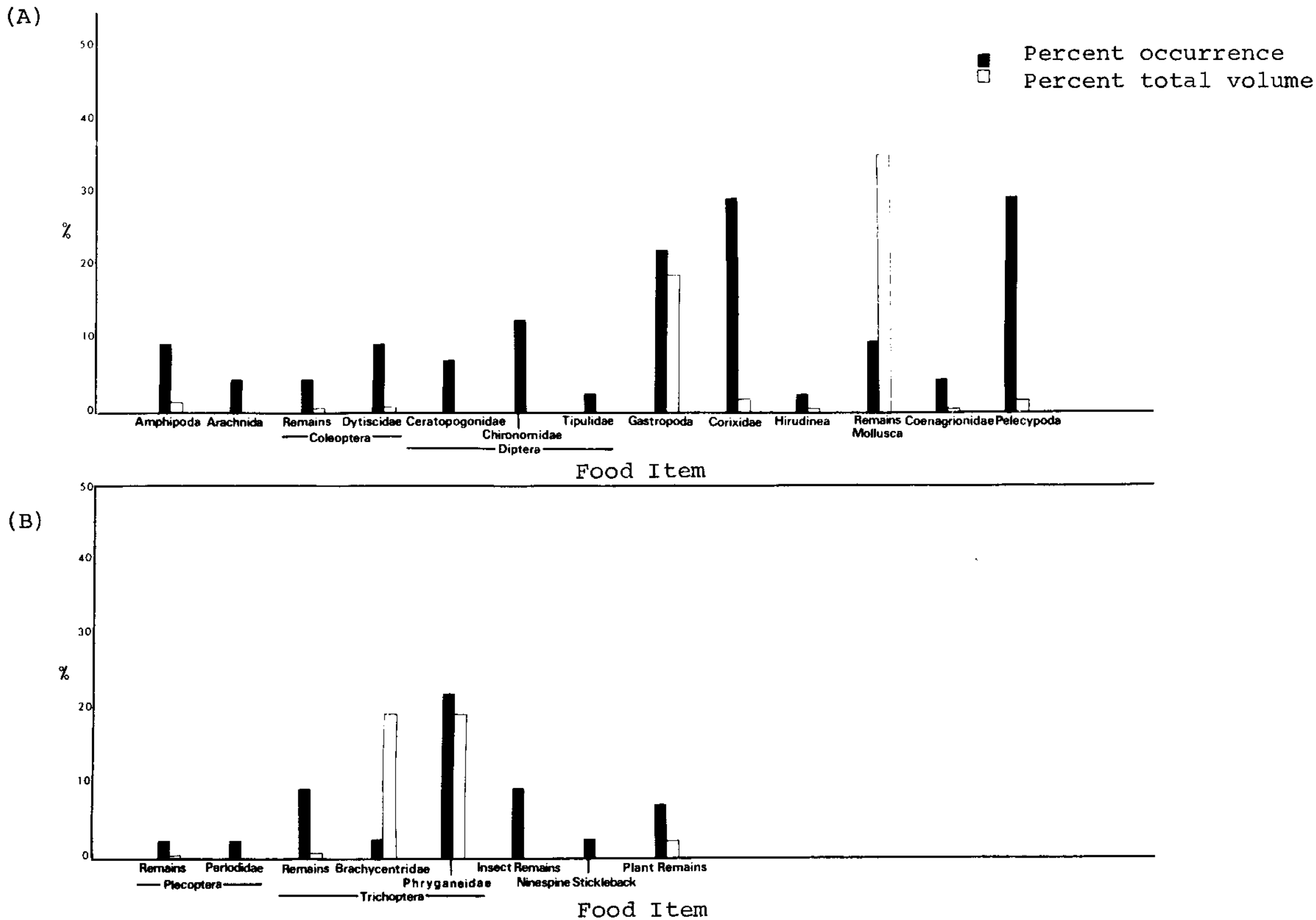

Fig. 84. Summary of stomach contents of 325 broad whitefish (155-639 mm) caught in gill nets, Mackenzie River, 1972.

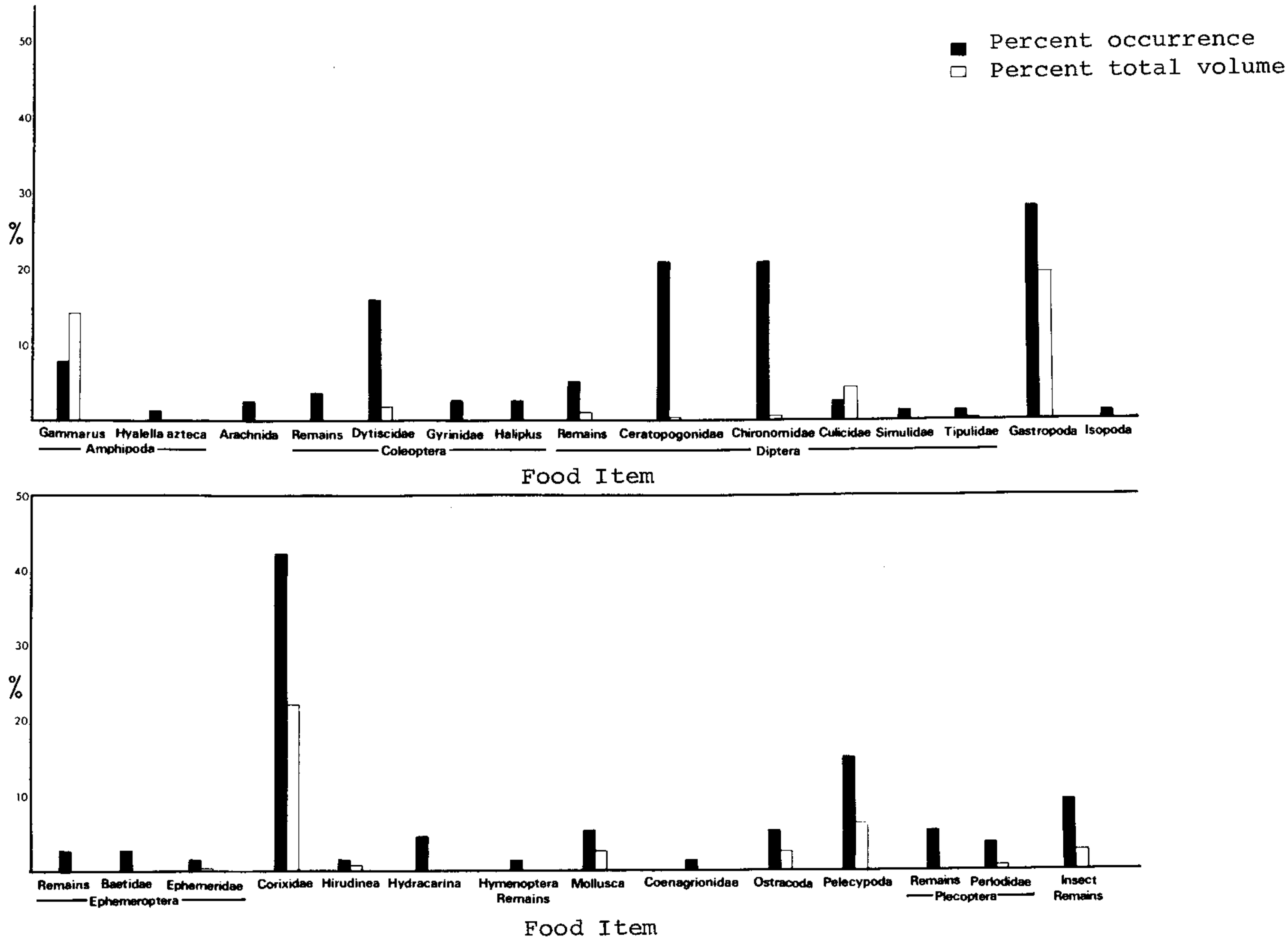

Fig. 85a. Summary of stomach contents of 345 humpback whitefish (149-562 mm), caught in gill nets, Mackenzie River, 1972.

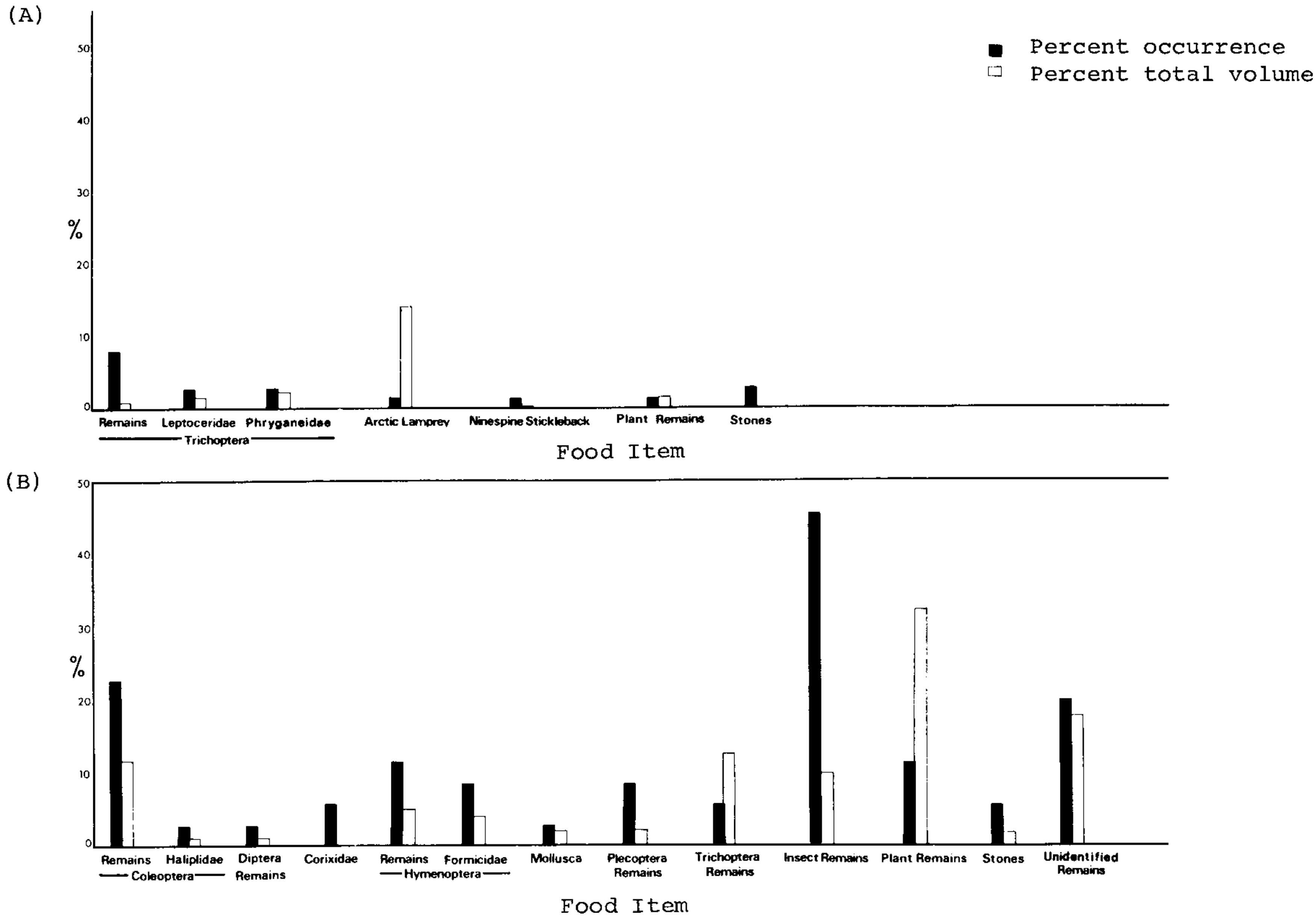

Fig. 85b. Summary of stomach contents of (A) 345 humpback whitefish (149-562 mm) and (B) 43 flathead chub (113-285 mm) caught in gill nets, Mackenzie River, 1972.

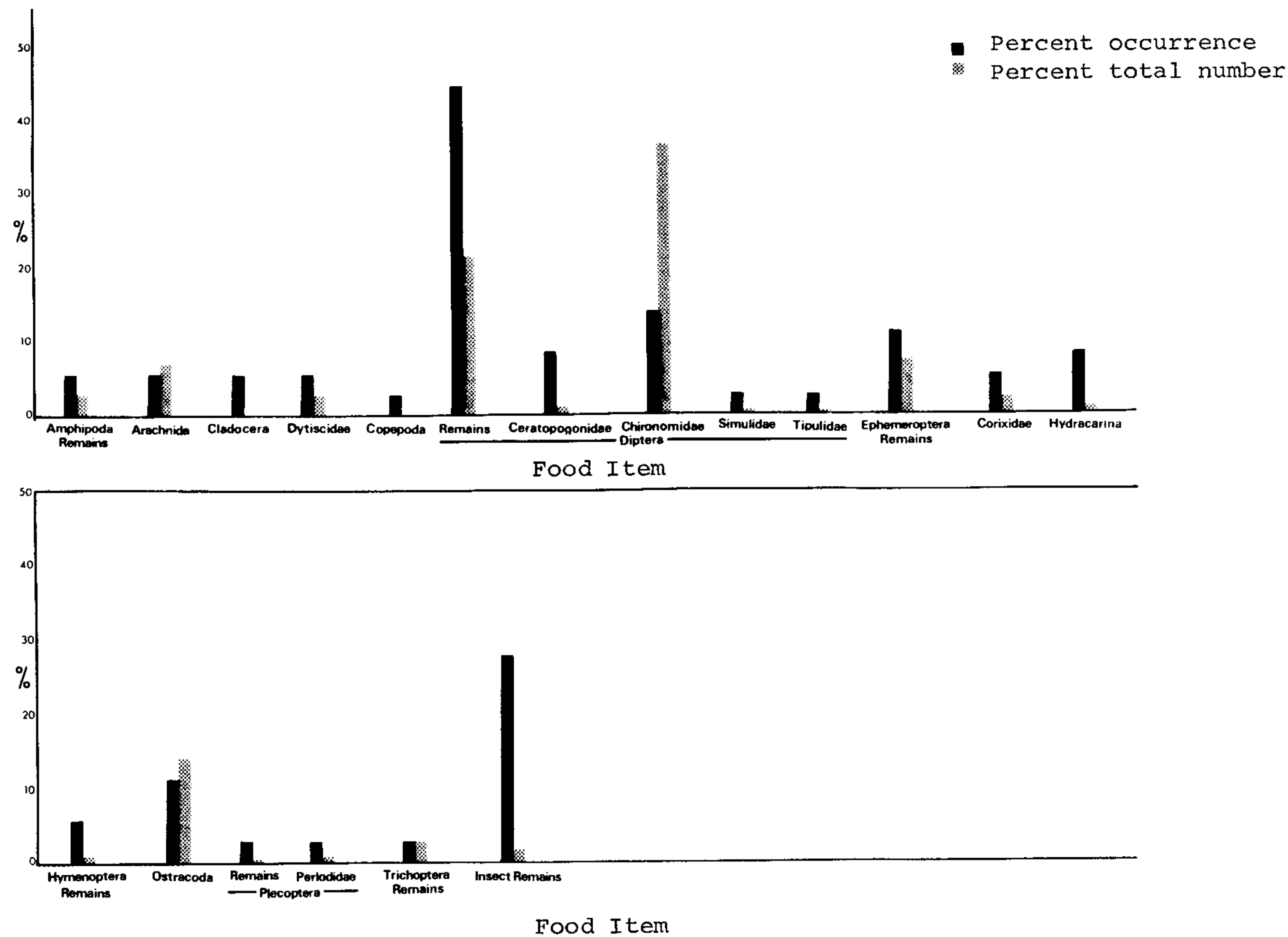

Fig.86. Summary of stomach contents of 42 humpback whitefish (28-165 mm) caught in seines, Mackenzie River, 1972.

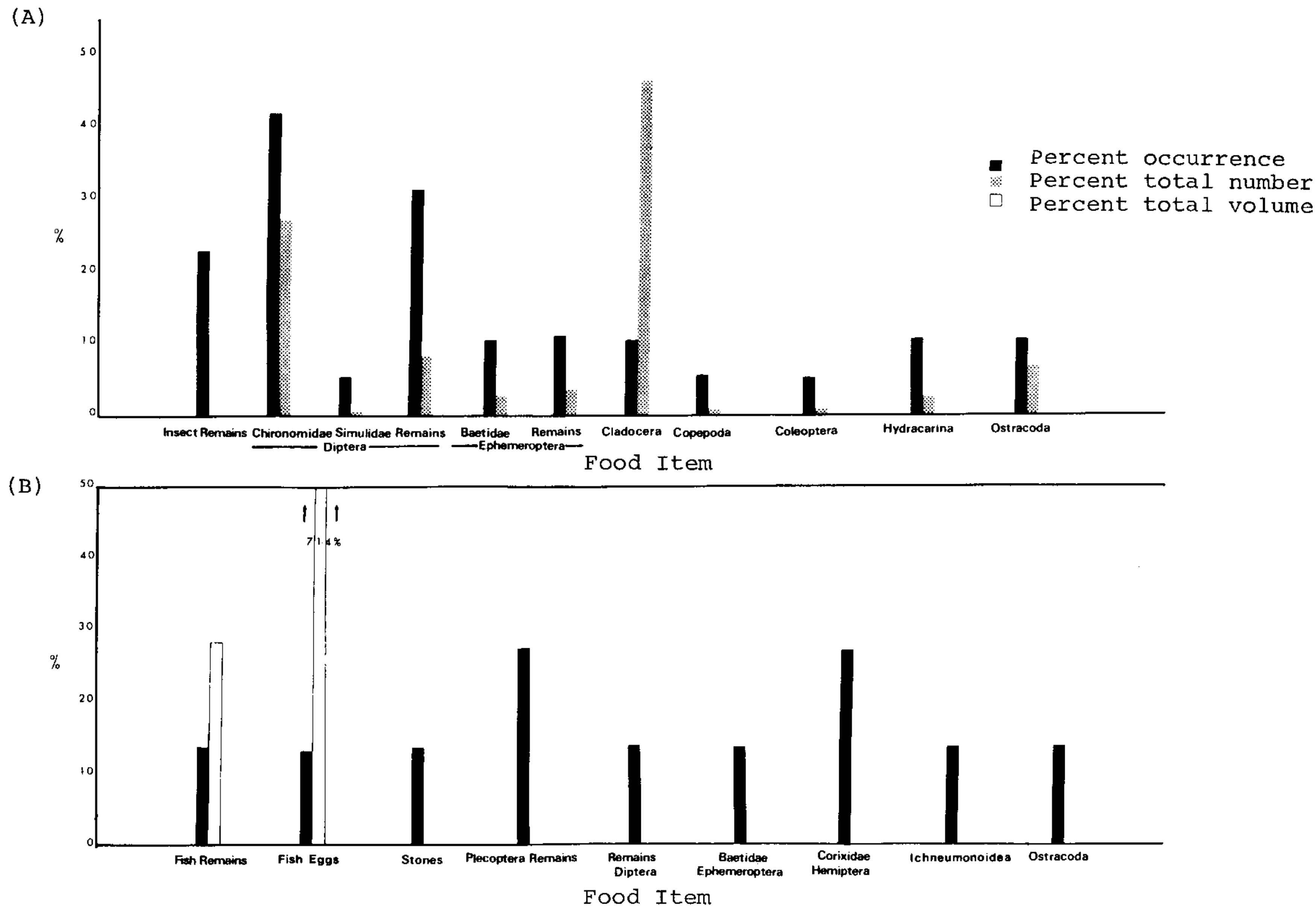

Fig. 87. Summary of stomach contents of (A) 23 Arctic cisco (32-85 mm) caught in seines and (B) 271 Arctic cisco (191-434 mm) caught in gill nets, Mackenzie River, 1972.

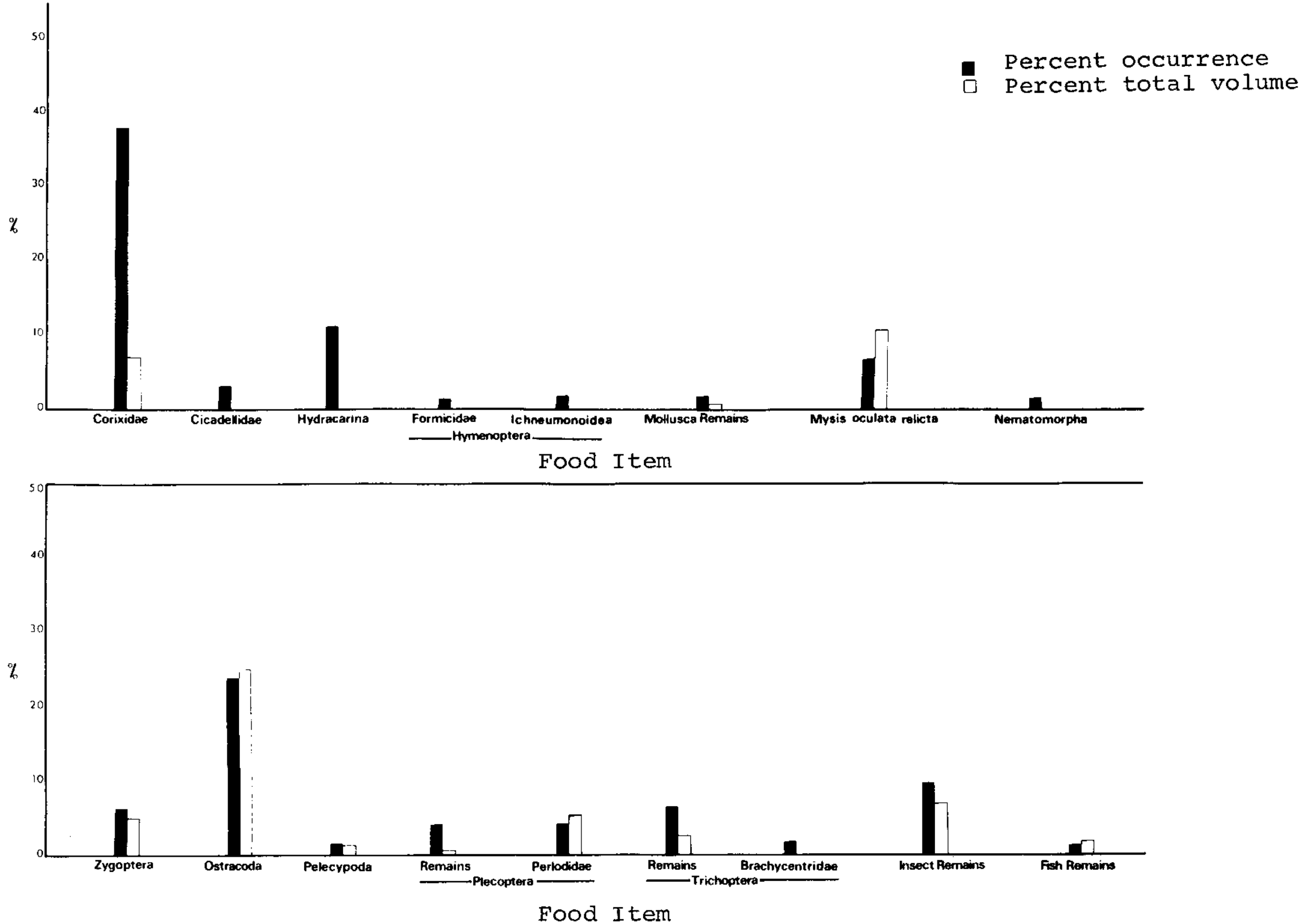

Fig. 88. Summary of stomach contents of 343 least cisco (154-391 mm) caught in gill nets, Mackenzie River, 1972.

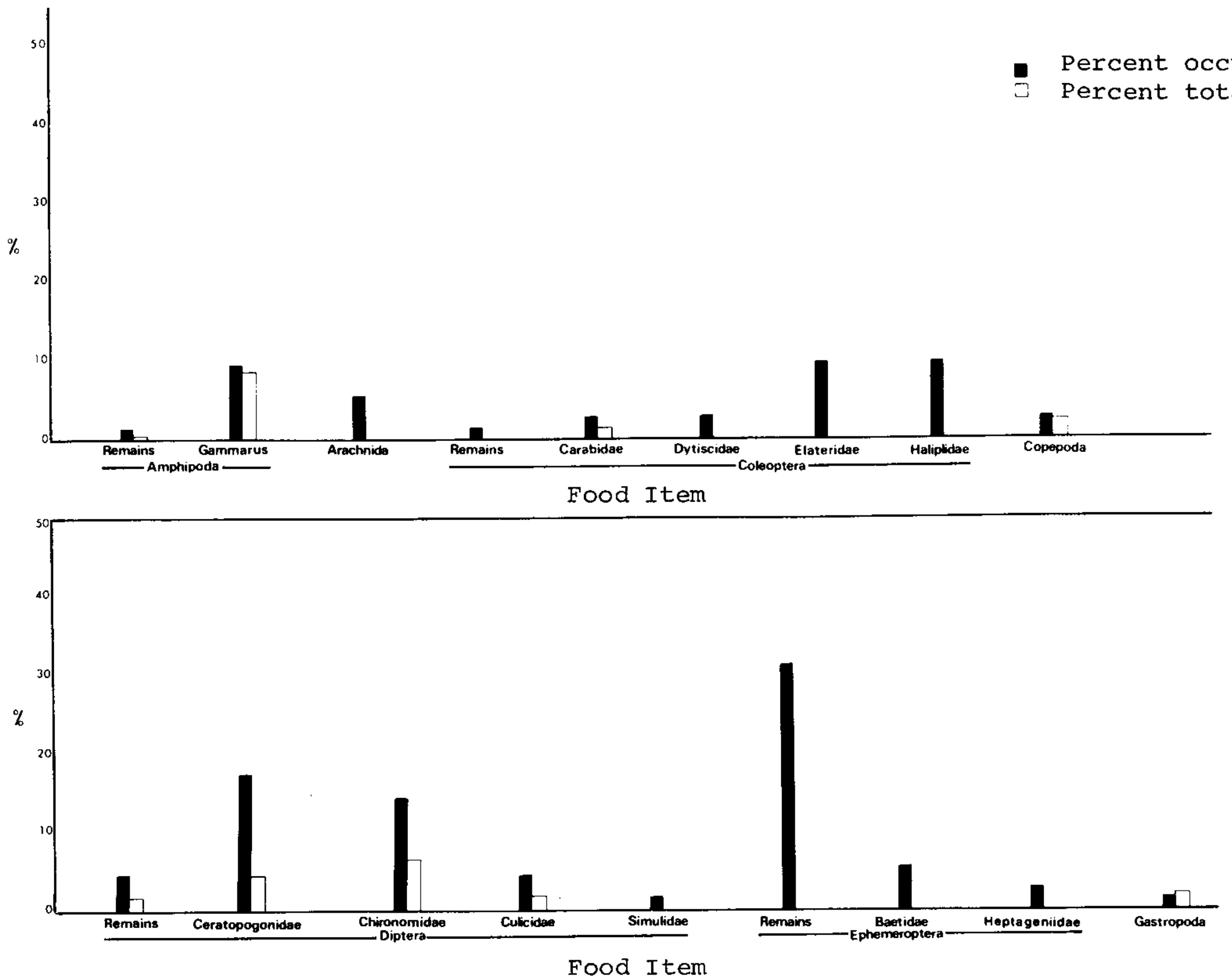

Fig. 88. (cont'd). Summary of stomach contents of 343 least cisco (154-391 mm) caught in gill nets, Mackenzie River, 1972.

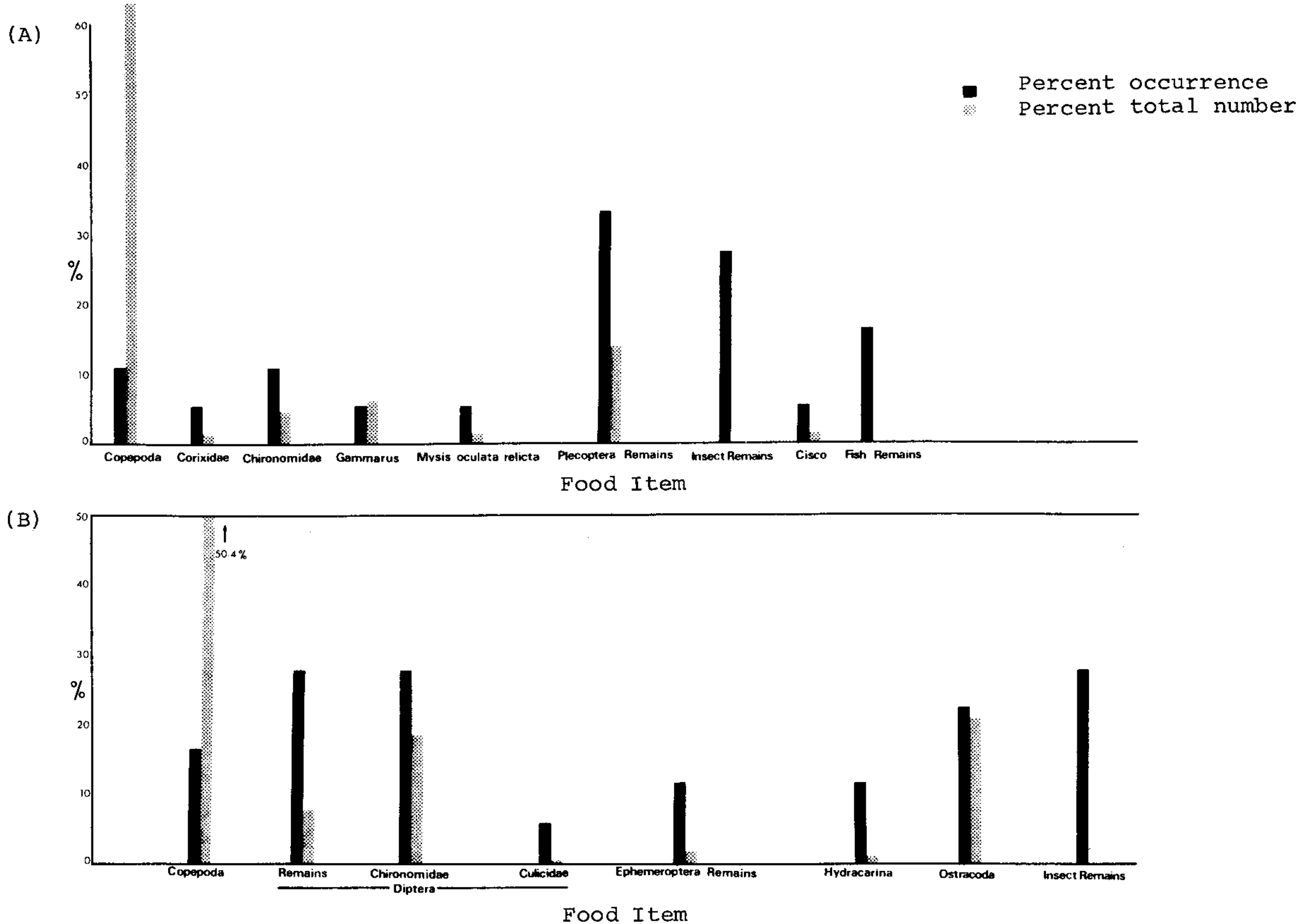

Fig. 89. Summary of stomach contents of (A) 27 burbot (21-272 mm) and (B) 20 least cisco (26-68 mm) caught in seines, Mackenzie River, 1972.

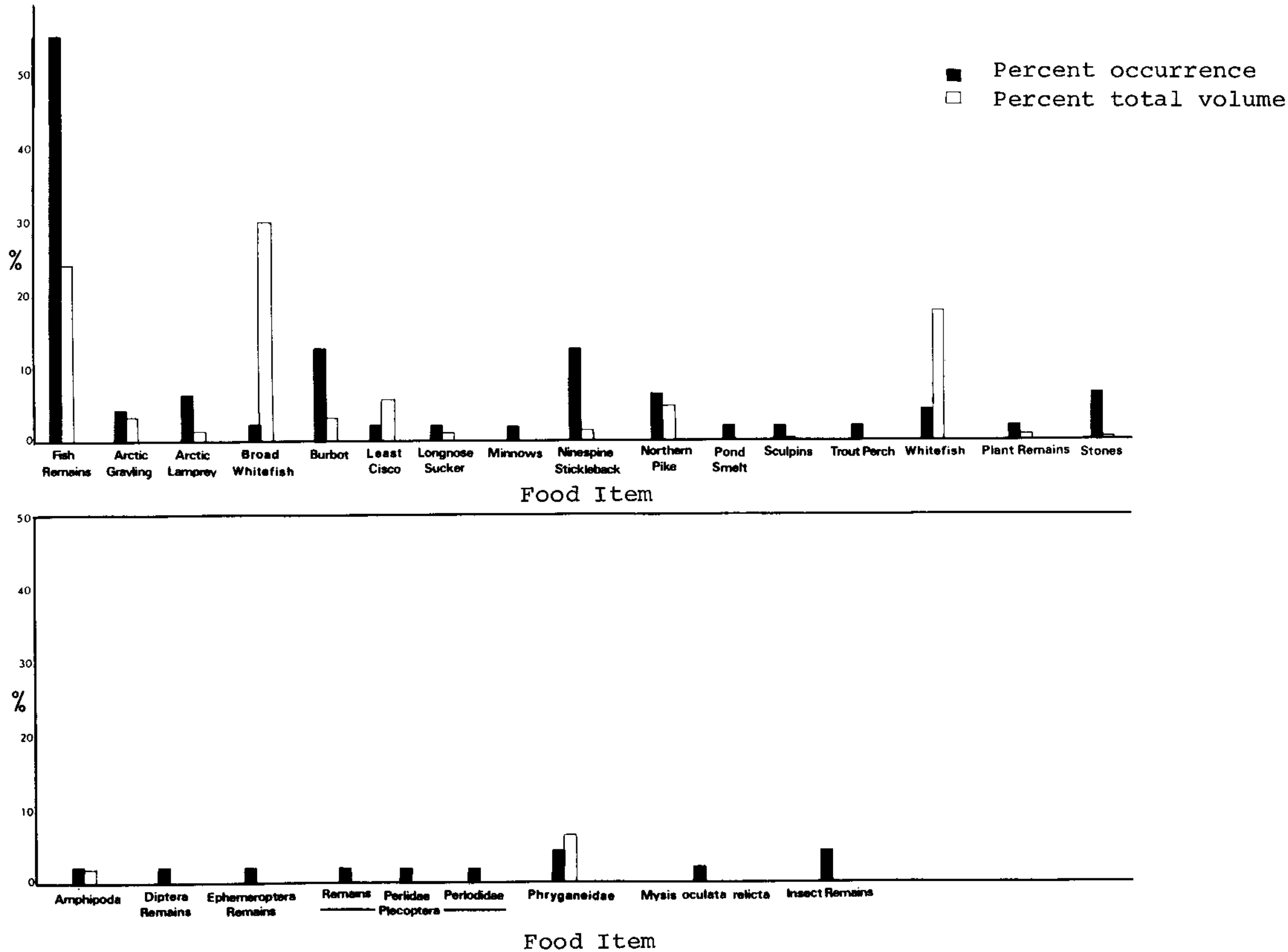

Fig. 90. Summary of stomach contents of 65 burbot (241-956 mm) caught in gill nets, Mackenzie River, 1972.

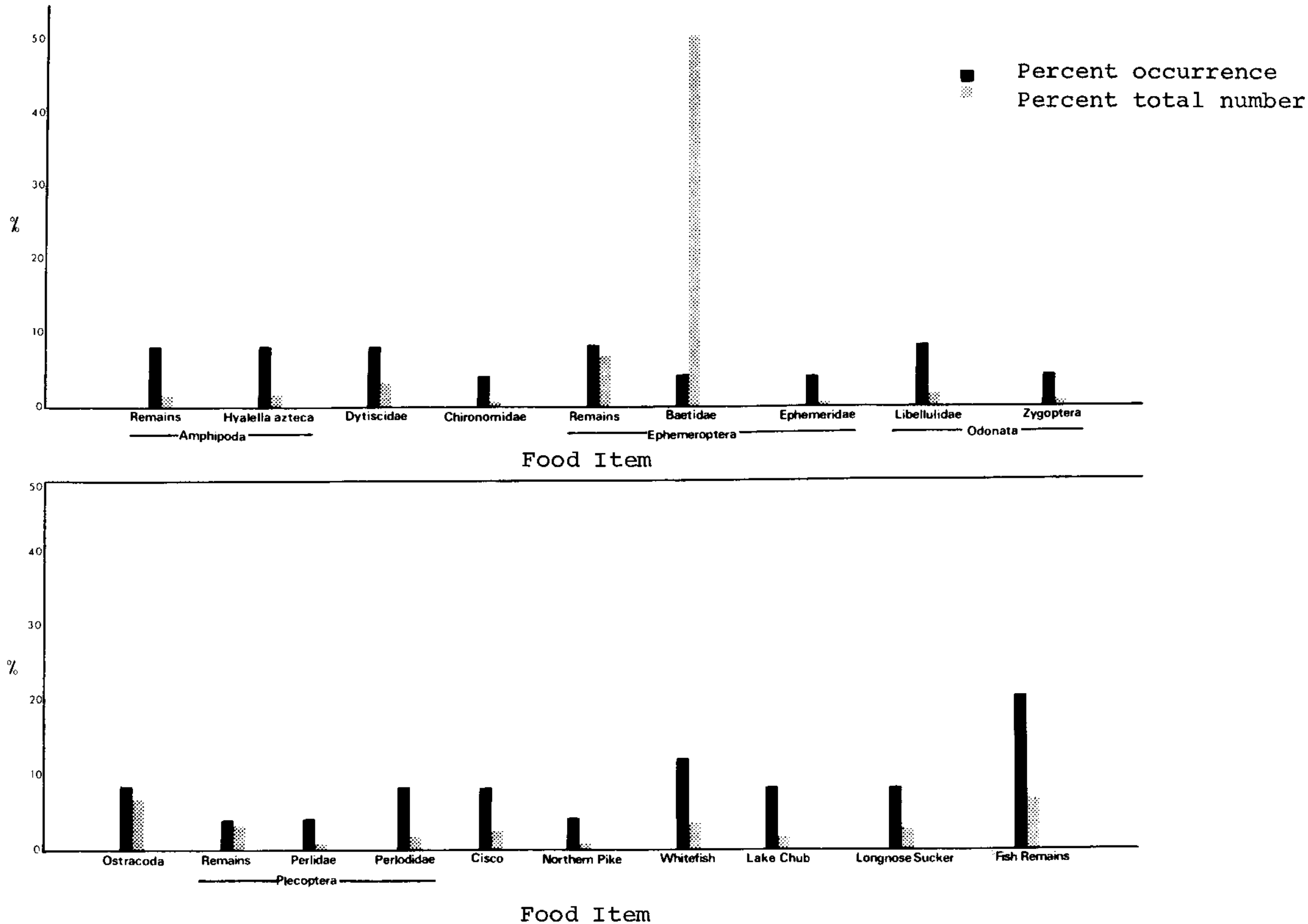

Fig. 91. Summary of stomach contents of 32 northern pike (31-209 mm) caught in seines, Mackenzie River, 1972.

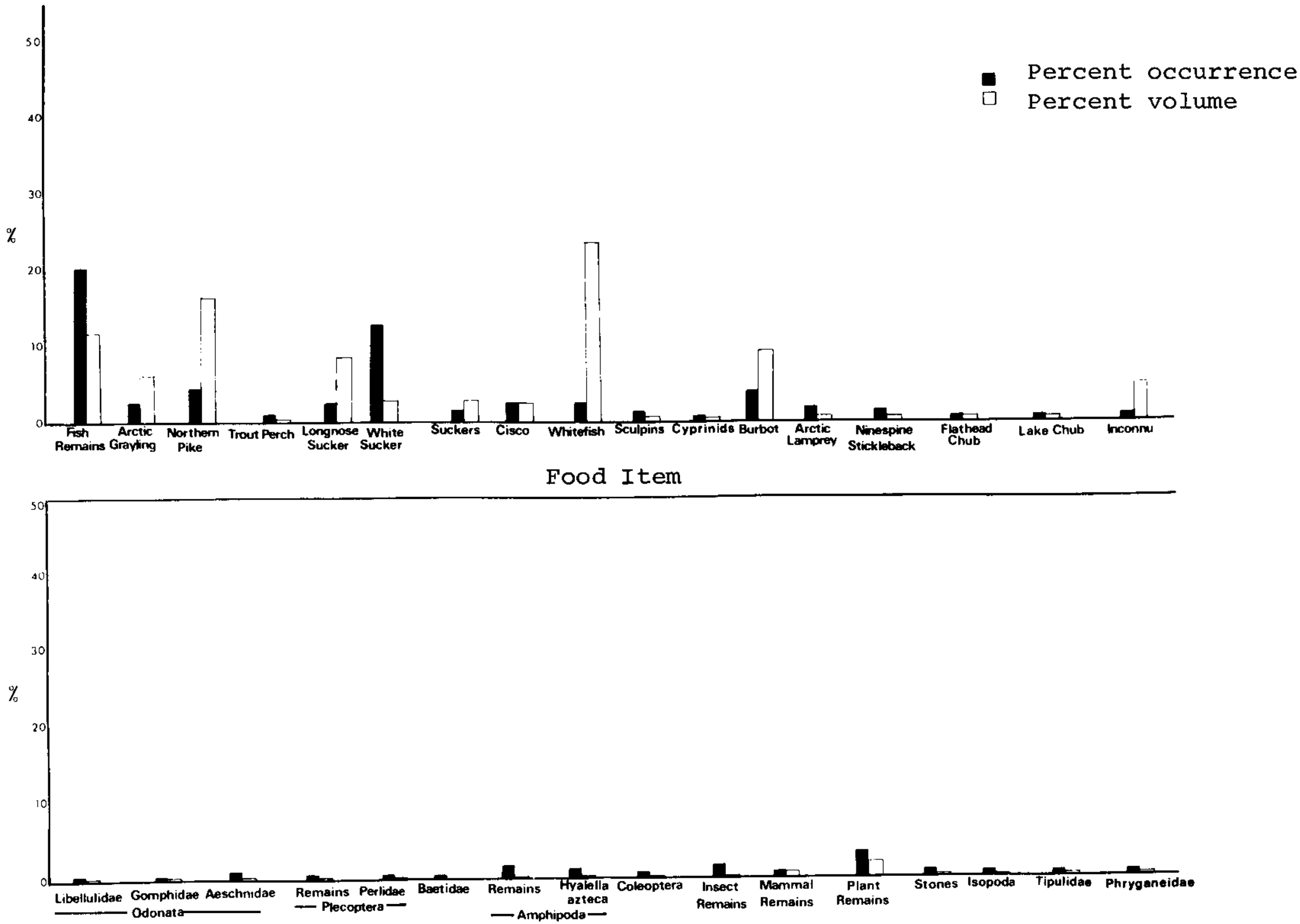

Fig. 92. Summary of stomach contents of 281 northern pike (205-1070 mm) caught in gill nets, Mackenzie River, 1972.

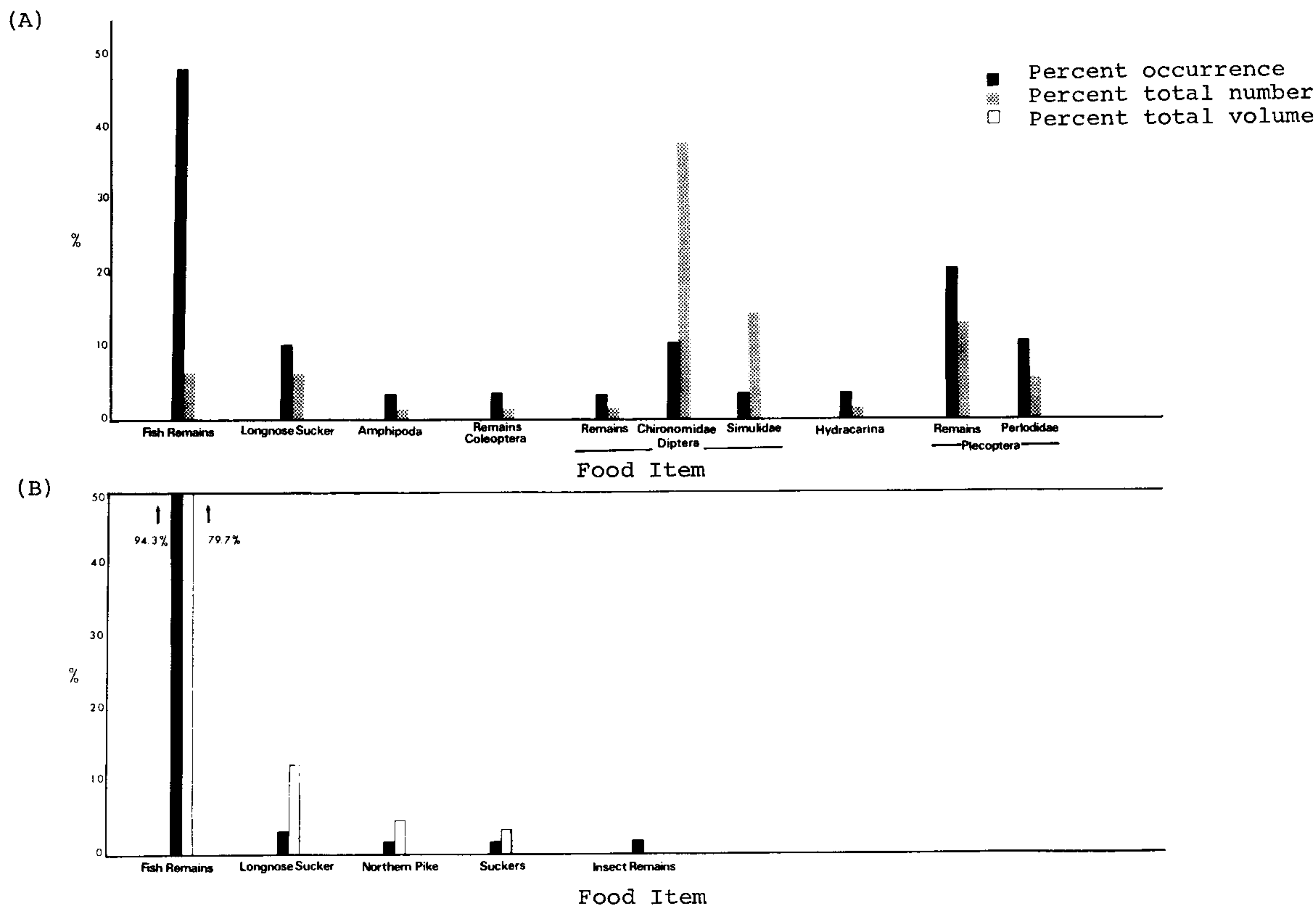

Fig. 93. Summary of stomach contents of (A) 38 yellow walleye (22-177 mm) caught in seines and (B) 94 yellow walleye (117-513 mm) caught in gill nets, Mackenzie River, 1972.

13. TABLES

Table 1. Alphabetical list of common names and associated generic names for Mackenzie valley fish species.

Arctic char - *Salvelinus alpinus* (Linnaeus)
Arctic cisco - *Coregonus autumnalis* (Pallas)
Arctic grayling - *Thymallus arcticus* (Pallas)
Arctic lamprey - *Lampetra japonica* (Martens)
Bering cisco - *Coregonus laurettae* (Bean)
Boreal smelt - *Osmerus eperlanus* (Linnaeus)
Broad whitefish - *Coregonus nasus* (Pallas)
Brook stickleback - *Culaea inconstans* (Kirtland)
Burbot - *Lota lota* (Linnaeus)
Chum salmon - *Oncorhynchus keta* (Walbaum)
Dolly Varden - *Salvelinus malma* (Walbaum)
Emerald shiner - *Notropis atherinoides* (Rafinesque)
Finescale dace - *Pfrille neogaea* (Cope)
Flathead chub - *Platygobio gracilis* (Richardson)
Goldeye - *Hiodon alosoides* (Rafinesque)
Humpback whitefish - *Coregonus clupeaformis* (Mitchill)
Inconnu - *Stenodus leucichthys nelma* (Pallas)
Lake chub - *Couesius plumbeus* (Agassiz)
Lake cisco - *Coregonus artedii* (LeSueur)
Lake trout - *Salvelinus namaycush* (Walbaum)
Least cisco - *Coregonus sardinella* (Valenciennes)
Longnose dace - *Rhinichthys cataractae* (Valenciennes)
Longnose sucker - *Catostomus catostomus* (Forster)
Mountain whitefish - *Prosopium williamsoni* (Girard)
Ninespine stickleback - *Pungitius pungitius* (Linnaeus)
Northern pike - *Esox lucius* (Linnaeus)
Northern redbelly dace - *Chrosomus eos* (Cope)
Pond smelt - *Hypomesus olidus* (Pallas)
Round whitefish - *Prosopium cylindraceum* (Pallas)
Slimy sculpin - *Cottus cognatus* (Richardson)
Spoonhead sculpin - *Cottus ricei* (Nelson)
Spottail shiner - *Notropis hudsonius* (Clinton)
Trout-perch - *Percopsis omiscomaycus* (Walbaum)
White sucker - *Catostomus commersoni* (Lacépède)
Yellow walleye - *Stizostedion vitreum vitreum* (Mitchill)

Table 2. Size groups from which five stomach samples per 2 week interval were collected.

Species	Size Group (mm)		
Arctic cisco	0-100	100-300	300 plus
Arctic grayling	0-100	100-200	200 plus
Broad whitefish	0-100	100-200	200 plus
Inconnu	0-100	100-400	400 plus
Least cisco	0-100	100-200	200 plus
Northern pike	0-100	100-400	400 plus
Yellow walleye	0-100	100-200	200 plus
Flathead chub		Small Subsample	
Longnose sucker		Small Subsample	
White sucker		Small Subsample	

Table 3. Numerical abundance and percent composition for fish species caught in gill nets and trap nets at each base during 1972 field season.

Species	Aklavik No.	Aklavik (%)	Arctic Red R. No.	Arctic Red R. (%)	Ft. McPherson No.	Ft. McPherson (%)	Norman Wells No.	Norman Wells (%)	Ft. Simpson No.	Ft. Simpson (%)	Total No.	Total (%)
Arctic grayling	125	(1.39)	543	(8.13)	30	(3.91)	1862	(50.21)	299	(6.81)	2859	(11.65)
Lake trout	0		8	(0.12)	0		0		0		8	(0.03)
Arctic char	826	(9.16)	0		1	(0.13)	0		0		827	(3.37)
Chum salmon	0		10	(0.15)	1	(0.13)	1	(0.03)	0		12	(0.05)
Inconnu	502	(5.57)	465	(6.96)	38	(4.95)	267	(7.20)	154	(3.51)	1426	(5.81)
Humpback whitefish	1266	(14.04)	1391	(20.82)	33	(4.30)	64	(1.73)	637	(14.51)	3391	(13.81)
Broad whitefish	1090	(12.09)	1307	(19.57)	107	(13.95)	42	(1.13)	0		2546	(10.37)
Least cisco	533	(5.91)	755	(11.30)	101	(13.91)	13	(0.35)	22	(0.50)	1424	(5.80)
Arctic cisco	2599	(28.83)	1086	(16.26)	275	(35.85)	202	(5.45)	0		4162	(16.96)
Lake cisco	0		0		0		10	(0.27)	19	(0.39)	29	(0.11)
Round whitefish	23	(0.26)	0		17	(2.22)	23	(0.62)	7	(0.16)	70	(0.28)

Table 3. Continued

Species	Aklavik No. (%)	Arctic Red R. No. (%)	Ft. McPherson No. (%)	Norman Wells No. (%)	Ft. Simpson No. (%)	Total No. (%)
Mountain whitefish	0	0	0	0	75 (1.71)	75 (0.31)
Northern pike	1358 (15.06)	692 (10.36)	54 (7.04)	445 (12.00)	1988 (45.29)	4537 (18.48)
Yellow walleye	1 (0.01)	29 (0.44)	2 (0.26)	121 (3.26)	109 (2.48)	262 (1.07)
Burbot	622 (6.90)	75 (1.12)	18 (2.35)	58 (1.56)	34 (0.78)	807 (3.29)
Flathead chub	1 (0.01)	71 (1.06)	6 (0.78)	179 (4.83)	240 (5.45)	497 (2.03)
Longnose sucker	64 (0.71)	210 (3.14)	70 (9.13)	390 (10.52)	687 (15.65)	1421 (5.79)
White sucker	0	0	0	3 (0.08)	67 (1.53)	70 (0.28)
Boreal smelt	1 (0.01)	37 (0.55)	0	0	0	38 (0.16)
Goldeye	0	0	0	1 (0.03)	44 (1.00)	45 (0.18)
Other	5 (0.05)	1 (0.02)	0	27 (0.73)	8 (0.18)	41 (0.17)
Total	9016 (100.00)	6680 (100.00)	753 (100.00)	3708 (100.00)	4390 (100.00)	24547 (100.00)

Table 4. Summary of all tag releases and recaptures by species for the Aklavik base in 1972.

Species	Number Tagged	Per Cent of Total Number Tagged	Number Recaptured	Per Cent Recaptured
Arctic char	578	11.6	256	44.3
Arctic cisco	1664	33.3	74	4.4
Arctic grayling	43	0.9	23	53.5
Broad whitefish	470	9.4	74	15.7
Burbot	568	11.4	36	6.3
Humpback whitefish	616	12.3	63	10.2
Inconnu	233	4.7	14	6.0
Least cisco	81	1.6	8	9.9
Longnose sucker	25	0.5	0	0
Northern pike	714	14.3	44	6.2
Round whitefish	10	0.2	3	30.0
Yellow walleye	1	0.02	0	0
Total	5003	100.0	595	11.9

Table 5. Summary of all tag releases and recaptures by species for the Arctic Red River base in 1972.

Species	Number Tagged	Per cent of Total Number Tagged	Number Recaptured	Per cent Recaptured
Arctic cisco	501	15.2	8	1.6
Arctic grayling	394	11.9	15	3.8
Broad whitefish	807	24.4	219	27.1
Burbot	23	0.7	0	0.0
Humpback whitefish	823	24.9	63	7.7
Inconnu	127	3.8	26	20.5
Least cisco	336	10.2	1	0.3
Longnose sucker	40	1.2	2	5.0
Northern pike	251	7.6	14	5.6
Yellow walleye	5	0.2	1	20.0
Total	3307	100	349	10.6

Table 6. Summary of all tag releases and recaptures by species for the Fort McPherson base in 1972.

Species	Number Tagged	Per cent of Total Number Tagged	Number Recaptured	Per cent Recaptured
Arctic cisco	56	56.6	4	7.1
Burbot	9	9.1	0	0
Inconnu	2	2.0	1	50.0
Least cisco	18	18.2	2	11.1
Longnose sucker	9	9.1	0	0
Northern pike	2	2.0	0	0
Round whitefish	1	1.0	0	0
Flathead chub	2	2.0	0	0
Total	99	100.0	7	7.1

Table 7. Summary of all tag releases and recaptures by species for the Norman Wells base in 1972.

Species	Number Tagged	Per cent of Total Number Tagged	Number Recaptured	Per cent Recaptured
Arctic cisco	70	3.9	2	2.9
Arctic grayling	1130	64.1	23	2.0
Broad whitefish	1	0.1	1	100.0
Burbot	32	1.8	1	3.1
Humpback whitefish	35	1.9	1	2.9
Lake cisco	2	0.1	0	0
Least cisco	1	0.1	0	0
Inconnu	24	1.4	0	0
Longnose sucker	296	16.8	5	1.7
Northern pike	130	7.4	17	13.1
Round whitefish	6	0.3	0	0
White sucker	1	0.1	1	100.0
Yellow walleye	31	1.8	2	6.5
Whitefish	3	0.2	0	0
Total	1762	100.0	53	3.0

Table 8. Summary of all tag releases and recaptures by species for the Fort Simpson base in 1972.

Species	Number Tagged	Per cent of Total Number Tagged	Number Recaptured	Per cent Recaptured
Arctic grayling	101	6.6	2	2.0
Burbot	17	1.1	0	0
Goldeye	7	0.5	0	0
Humpback whitefish	97	6.3	6	6.2
Inconnu	15	0.9	0	0
Least cisco	1	0.1	0	0
Longnose sucker	448	29.1	12	2.7
Northern pike	712	46.2	140	19.7
Round whitefish	2	0.1	0	0
White sucker	46	2.9	0	0
Yellow walleye	46	2.9	1	2.2
Flathead chub	27	1.8	0	0
Lake chub	1	0.1	0	0
Mountain whitefish	17	1.1	1	5.9
Cisco	4	0.3	0	0
Total	1541	100	162	10.5

Table 9. Range of distance travelled from point of release and elapsed time between release and recovery for fish tagged by the Aklavik crew.

Species	Distance							
	0-14 km (0-9 miles)		15-49 km (10-30 miles)		50-79 km (31-50 miles)		80 km (50 miles)	
	Number	Days	Number	Days	Number	Days	Number	Days
Arctic char	127	2-63	1	6	2	5-14	74	34-88
Arctic cisco	19	2-22						
Arctic grayling	23	5-47						
Broad whitefish	29	2-35	6	4-63	6	14-70	18	23-63
Burbot	28	4-62	6	5-54	1	56		
Humpback whitefish	40	2-32	2	4-73	2	53-62	3	9-41
Inconnu	7	3-17					1	78
Least cisco	4	3-7						
Northern pike	28	2-114	2	16-23	1	22	1	15
Round whitefish	1	2						

Table 10. Range of distance travelled from point of release and elapsed time between release and recovery for fish tagged by the Arctic Red River crew.

Species	Distance							
	0-14 km (0-9 miles)		15-49 km (10-30 miles)		50-79 km (31-50 miles)		80 km (50 miles)	
	Number	Days	Number	Days	Number	Days	Number	Days
Arctic cisco			1	4			3	22-99
Arctic grayling	2	73	5	29-102				
Broad whitefish	145	2-90	19	0-98	4	15-79	13	4-26
Humpback whitefish	34	2-73	3	14-43	2	34-83	11	4-95
Inconnu	6	6-51	3	5-61	5	9-94	12	8-45
Longnose sucker					1	13		
Northern pike	4	2-22			1	84	1	34
Yellow walleye					1	51		

Table 11. Range of distance travelled from point of release and elapsed time between release and recovery for fish tagged by the Fort McPherson crew.

Species	Distance							
	0-14 km (0-9 miles)		15-49 km (10-30 miles)		50-79 km (31-50 miles)		80 km (50 miles)	
	Number	Days	Number	Days	Number	Days	Number	Days
Arctic cisco							2	34-50
Inconnu	1	6						
Least cisco	1	6	1	1				

Table 12. Range of distance travelled from point of release and elapsed time between release and recovery for fish tagged by the Norman Wells crew.

Species	Distance							
	0-14 km (0-9 miles)		15-49 km (10-30 miles)		50-79 km (31-50 miles)		80 km (50 miles)	
	Number	Days	Number	Days	Number	Days	Number	Days
Arctic grayling	8	2-9			4	9-27	3	18-60
Arctic cisco							1	30
Burbot	1	19						
Humpback whitefish	1	7						
Longnose sucker	1	7						
Northern pike	7	1-68						
White sucker							1	67
Yellow walleye	2	3						

Table 13. Range of distance travelled from point of release and elapsed time between release and recovery for fish tagged by the Fort Simpson crew.

Species	Distance							
	0-14 km (0-9 miles)		15-49 km (10-30 miles)		50-79 km (31-50 miles)		80 km (50 miles)	
	Number	Days	Number	Days	Number	Days	Number	Days
Arctic grayling			1	6				
Humpback whitefish	2	1-52	2	37-49				
Longnose sucker	6	14-57	1	7	1	3		
Northern pike	86	1-89	22	2-106	5	28-136	1	7
Yellow walleye	1	21						
Mountain whitefish			1	22				

Table 14. Number (N) aged, range (R) and median lengths (X) by age class for 246 Arctic grayling, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	4	7	2	16	14	2	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	52	112	242	274	291	315	--	337	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	49	100	237	242	253	302	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		57	134	247	318	325	328	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	1	3	4	7	7	9	9	5	1	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	68	85	183	254	327	366	386	414	433	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	83	170	223	256	325	353	387	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	90	199	293	349	399	419	426	--	--	--	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	3	19	14	10	10	13	13	12	3	2	1	--	--	--	--	--	--	--	--	--	--
	X̃	51	162	237	277	314	354	371	428	426	444	464	--	--	--	--	--	--	--	--	--	--
	R	49	100	180	227	228	288	315	396	402	415	--	--	--	--	--	--	--	--	--	--	--
		52	238	271	306	389	396	405	476	457	472	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	1	3	4	11	7	7	14	3	3	1	--	--	--	--	--	--	--	--	--	--	--
	X̃	59	82	191	211	237	290	318	323	365	353	--	--	--	--	--	--	--	--	--	--	--
	R	--	65	174	165	212	250	267	318	348	--	--	--	--	--	--	--	--	--	--	--	--
		--	92	217	261	255	341	389	331	379	--	--	--	--	--	--	--	--	--	--	--	--
All	N	9	32	24	44	38	31	36	21	7	3	1	--	--	--	--	--	--	--	--	--	--
	X̃	54	136	221	256	294	341	354	405	401	413	464	--	--	--	--	--	--	--	--	--	--
	R	49	65	170	165	212	250	267	318	348	353	--	--	--	--	--	--	--	--	--	--	--
		68	238	271	318	389	399	419	476	457	472	--	--	--	--	--	--	--	--	--	--	--

Table 15. Number (N) aged, range (R) and median lengths (X) by age class for 4 chum salmon, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	671	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	642	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	607	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	682	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	--	--	--	1	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	607	674	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	671	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 16. Number (N) aged, range (R) and median lengths (X) by age class for 16 Arctic char, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	9	6	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	444	450	509	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	391	355	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	492	510	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	--	--	--	--	9	6	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	444	450	509	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	391	355	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	492	510	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 17. Number (N) aged, range (R) and median lengths (X) by age class for 464 inconnu, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Aklavik	N	7	3	4	2	9	11	4	8	11	21	12	14	14	13	10	9	1	1	1	--	--	--	--
	X̃	54	184	258	290	397	378	438	489	530	573	632	654	720	742	798	800	875	858	924	--	--	--	987
	R	45	186	222	249	318	363	384	412	445	438	524	518	660	688	750	746	--	--	--	--	--	--	--
		67	237	303	320	472	447	497	546	625	631	678	715	818	815	853	896	--	--	--	--	--	--	--
Arctic Red River	N	--	3	--	2	5	8	11	8	3	14	10	12	11	15	12	6	7	1	1	--	--	--	--
	X̃	--	184	--	338	380	423	501	588	619	610	677	692	745	793	834	843	897	905	903	--	--	--	--
	R	--	107	--	327	369	386	418	466	575	513	578	640	668	710	719	820	845	--	--	--	--	--	--
		--	259	--	349	522	484	569	658	635	657	770	784	869	818	894	879	935	--	--	--	--	--	--
Norman Wells	N	1	4	9	11	14	9	17	3	6	5	8	8	4	6	2	2	1	1	--	--	--	--	--
	X̃	61	178	224	280	336	372	430	503	525	624	706	742	712	798	757	860	653	785	--	--	--	--	--
	R	--	150	110	198	210	250	249	466	508	568	663	692	690	737	717	842	--	--	--	--	--	--	--
		--	195	274	360	458	502	498	541	532	658	909	810	744	855	796	877	--	--	--	--	--	--	--
Fort Simpson	N	--	2	13	22	14	15	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	218	248	339	430	432	518	555	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	198	205	245	210	296	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	237	283	413	482	511	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	8	12	26	37	42	43	33	20	20	40	30	34	29	34	24	17	9	3	2	--	--	--	1
	X̃	55	199	241	319	386	404	457	526	542	592	667	688	728	774	813	822	867	849	914	--	--	--	987
	R	45	150	205	198	210	250	249	412	445	438	524	578	660	688	717	746	653	785	903	--	--	--	--
		67	259	303	413	522	511	569	658	635	658	909	810	869	855	894	896	935	905	924	--	--	--	--

Table 18. Number (N) aged, range (R) and median lengths (X) by age class for 443 humpback whitefish, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	3	--	5	8	14	8	8	10	8	10	7	9	5	4	5	2	--	--	--	--	--
	$\tilde{X}$	55	--	170	197	246	273	326	349	363	397	465	436	455	462	470	492	--	--	--	--	--
	R	53	--	150	178	165	240	255	305	312	330	403	378	414	437	435	480	--	--	--	--	--
		58	--	213	213	308	295	478	410	402	518	564	569	495	495	490	504	--	--	--	--	--
Arctic Red River	N	6	4	8	8	12	4	4	13	6	11	5	10	4	4	5	1	--	--	--	--	--
	$\tilde{X}$	52	156	179	206	258	252	309	330	345	388	388	454	443	443	474	458	--	--	--	--	--
	R	41	145	155	179	205	235	285	285	316	331	328	390	421	402	447	--	--	--	--	--	--
		65	164	195	245	300	262	342	388	370	442	420	556	477	461	495	--	--	--	--	--	--
Norman Wells	N	13	3	5	13	10	4	2	3	1	4	3	3	--	--	--	--	1	--	--	--	--
	$\tilde{X}$	56	86	196	294	279	243	249	369	349	343	426	445	--	--	--	--	492	--	--	--	--
	R	41	79	154	250	204	231	244	308	--	299	372	440	--	--	--	--	--	--	--	--	--
		80	96	272	335	340	250	254	420	--	387	484	488	--	--	--	--	--	--	--	--	--
Fort Simpson	N	22	8	20	24	19	11	15	18	10	6	7	2	2	1	1	1	--	--	--	--	--
	$\tilde{X}$	70	87	132	195	240	302	340	384	405	441	440	505	512	522	510	525	--	--	--	--	--
	R	41	73	100	149	172	266	255	303	352	388	363	500	512	--	--	--	--	--	--	--	--
		97	97	163	278	320	349	417	466	460	484	518	510	512	--	--	--	--	--	--	--	--
All	N	44	15	38	53	55	27	29	44	25	31	22	24	11	9	11	4	1	--	--	--	--
	$\tilde{X}$	62	105	155	221	253	277	325	359	375	395	434	450	461	460	475	492	492	--	--	--	--
	R	41	73	100	149	165	231	249	285	312	299	328	378	414	402	435	458	--	--	--	--	--
		97	164	272	335	340	349	478	466	460	518	564	569	512	522	510	525	--	--	--	--	--

Table 19. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 338 broad whitefish, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	27	15	18	10	6	6	10	5	8	9	2	11	5	2	4	--	--	--	--	--
	$\tilde{X}$	--	173	235	285	339	359	387	407	448	462	483	529	527	521	551	555	--	--	--	--	--
	R	--	109	169	169	230	288	335	350	390	423	422	498	464	474	550	529	--	--	--	--	--
		--	261	303	373	389	390	437	463	487	517	587	560	627	541	552	590	--	--	--	--	--
Arctic Red River	N	--	10	12	6	7	7	6	10	20	21	27	18	10	9	3	--	--	--	--	--	--
	$\tilde{X}$	--	178	230	232	319	355	419	448	467	476	517	543	538	593	598	--	--	--	--	--	--
	R	--	108	160	178	257	297	370	407	320	358	391	480	480	513	556	--	--	--	--	--	--
		--	218	325	330	361	393	450	501	657	560	651	629	585	664	630	--	--	--	--	--	--
Norman Wells	N	2	3	19	3	2	3	1	--	--	--	--	--	--	1	--	--	--	--	--	--	--
	$\tilde{X}$	58	80	163	186	206	244	278	--	--	--	--	--	--	430	--	--	--	--	--	--	--
	R	50	76	147	180	202	218	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		66	82	189	190	209	275	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	2	40	46	27	19	16	13	20	25	29	36	20	21	15	5	4	--	--	--	--	--
	$\tilde{X}$	58	167	204	262	318	335	393	428	463	472	509	542	532	558	579	555	--	--	--	--	--
	R	50	76	147	169	202	218	278	350	320	358	391	480	464	430	550	529	--	--	--	--	--
		66	261	325	373	389	393	450	501	657	560	651	629	627	664	630	590	--	--	--	--	--

Table 20. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 53 round whitefish, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	--	3	3	6	5	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	343	365	375	388	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	320	357	358	366	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	355	380	403	407	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	1	1	10	2	1	--	2	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	248	260	260	317	345	--	379	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	234	292	--	--	367	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	293	342	--	--	390	--	--	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	2	--	--	1	1	4	3	1	--	1	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	177	--	--	357	358	392	397	397	--	432	--	--	--	--	--	--	--	--
	R	--	--	--	163	--	--	--	--	361	384	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	191	--	--	--	--	413	403	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	1	--	--	--	--	--	2	--	--	--	--	1	--	--	1	1	--	--	--	--	--
	$\tilde{X}$	59	--	--	--	--	--	351	--	--	--	--	382	--	--	436	402	--	--	--	--	--
	R	--	--	--	--	--	--	342	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	1	--	1	3	10	5	7	7	11	3	1	1	1	--	1	1	--	--	--	--	--
	$\tilde{X}$	59	--	248	205	260	333	357	373	388	397	397	382	432	--	436	402	--	--	--	--	--
	R	--	--	--	163	234	292	342	358	361	384	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	260	293	355	380	403	413	403	--	--	--	--	--	--	--	--	--	--	--

Table 21. Number (N) aged, range (R) and median lengths (X) by age class for 39 mountain whitefish, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Norman Wells	N	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	60	89	--	140	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	1	1	--	--	4	3	3	5	5	4	4	1	1	2	1	--	1	--	--	--	--
	$\tilde{X}$	50	60	--	--	233	282	324	353	352	397	398	381	457	418	440	--	--	--	--	--	--
	R	--	--	--	--	200	243	319	318	333	385	350	--	--	385	--	--	--	--	--	--	--
		--	--	--	--	297	358	328	374	367	408	438	--	--	450	--	--	--	--	--	--	--
All	N	2	2	--	1	4	3	3	5	5	4	4	1	1	2	1	--	1	--	--	--	--
	$\tilde{X}$	55	75	--	140	233	282	324	353	352	397	398	381	457	418	440	--	--	--	--	--	--
	R	50	60	--	--	200	243	319	318	333	385	350	--	--	385	--	--	--	--	--	--	--
		60	89	--	--	297	358	328	374	367	408	438	--	--	450	--	--	--	--	--	--	--

Table 22. Number (N) aged, range (R) and median lengths (X) by age class for 132 Arctic cisco, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	4	6	--	--	--	--	--	10	13	12	4	5	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	66	76	--	--	--	--	--	346	369	402	434	433									
	R	54	60	--	--	--	--	--	319	336	312	394	421	--	--	--	--	--	--	--	--	--
		69	93	--	--	--	--	--	434	390	441	440	489									
Arctic Red River	N	3	--	--	--	--	--	1	13	13	5	7	5	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	53	--	--	--	--	--	312	340	381	401	429	442	--	--	--	--	--	--	--	--	--
	R	45	--	--	--	--	--	--	290	349	352	376	412									
		56	--	--	--	--	--	--	391	404	422	453	448									
Norman Wells	N	--	--	--	--	--	1	2	10	10	5	1	2	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	220	318	363	388	368	401	397	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	293	355	347	324	--	387	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	342	410	422	435	--	407	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	7	6	--	--	--	1	3	33	36	22	12	12	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	60	76	--	--	--	220	316	349	378	394	428	431	--	--	--	--	--	--	--	--	--
	R	45	60	--	--	--	--	293	319	336	312	376	387	--	--	--	--	--	--	--	--	--
		69	93	--	--	--	--	342	434	422	441	453	489									

Table 23. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 130 least cisco, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	9	2	7	5	1	13	9	10	8	4	--	2	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	65	156	179	200	234	250	266	287	319	317	--	347	--	--	--	--	--	--	--	--
	R	--	59	154	157	189	--	202	154	240	299	307	--	346	--	--	--	--	--	--	--	--
		--	92	175	203	294	--	342	394	332	359	360	--	347	--	--	--	--	--	--	--	--
Arctic Red River	N	1	2	--	--	3	7	8	5	7	3	4	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	59	68	--	--	189	223	225	245	270	246	269	--	--	--	--	--	--	--	--	--	--
	R	--	66	--	--	169	191	185	254	222	236	252	--	--	--	--	--	--	--	--	--	--
		--	69	--	--	200	293	315	322	330	310	261	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	--	--	--	2	1	2	2	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	284	230	306	273	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	231	--	269	273	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	336	--	343	272	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	2	1	1	4	2	1	1	--	1	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	174	184	218	214	226	256	260	--	285	--	--	--	--	--	--	--	--	--
	R	--	--	--	172	--	--	193	212	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	177	--	--	245	240	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	1	11	2	9	9	9	25	18	19	14	10	1	2	--	--	--	--	--	--	--	--
	$\tilde{X}$	59	66	156	178	195	224	236	258	276	297	289	285	347	--	--	--	--	--	--	--	--
	R	--	59	154	157	169	191	185	154	230	236	252	--	346								
		--	92	175	203	294	293	342	394	332	359	360	--	347								

Table 24. Number (N) aged, range (R) and median lengths (X) by age class for 41 lake cisco, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Norman Wells	N	9	--	--	--	2	1	--	--	5	3	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	51	--	--	--	181	260	--	--	381	407	--	--	--	--	--	--	--	--	--	--	--
	R	38	--	--	--	177	--	--	--	366	400	--	--	--	--	--	--	--	--	--	--	--
		69	--	--	--	185	--	--	--	394	415	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	6	--	1	1	3	4	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	48	--	191	209	234	278	278	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	49	--	--	--	214	238	252	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		54	--	--	--	256	297	307	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	15	--	1	1	5	5	6	--	5	3	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	49	--	191	209	213	274	278	--	381	407	--	--	--	--	--	--	--	--	--	--	--
	R	38	--	--	--	177	238	252	--	366	400	--	--	--	--	--	--	--	--	--	--	--
		69	--	--	--	256	297	307	--	394	415	--	--	--	--	--	--	--	--	--	--	--

Table 25. Number (N) aged, range (R) and median lengths (X) by age class for 653 northern pike, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	5	2	6	16	15	6	9	18	20	20	21	7	8	4	6	2	1	4	1	1	--
	X̃	96	243	274	335	390	431	452	512	573	633	657	700	748	800	801	921	827	1023	900	830	--
	R	86	232	238	274	342	374	405	417	464	466	529	614	663	720	767	870	--	935	--	--	--
		121	253	304	404	440	480	493	594	710	756	800	815	882	838	859	972	--	1118	--	--	--
Arctic Red River	N	1	4	12	14	13	11	15	11	10	12	14	10	13	7	2	2	1	1	--	--	--
	X̃	72	212	243	306	368	414	466	503	526	579	626	691	735	742	703	851	807	820	--	--	--
	R	--	204	205	233	296	365	334	431	455	515	512	605	625	604	667	775	--	--	--	--	--
		--	261	292	352	439	492	553	642	574	685	711	835	870	860	739	927	--	--	--	--	--
Norman Wells	N	3	1	11	16	11	17	24	18	13	12	4	5	4	2	3	1	1	--	--	--	--
	X̃	115	198	244	328	378	450	480	568	616	679	664	702	779	772	857	822	987	--	--	--	--
	R	83	--	196	251	294	324	285	494	487	604	521	588	723	754	814	--	--	--	--	--	--
		136	--	318	420	436	580	620	656	706	772	771	836	817	790	900	--	--	--	--	--	--
Fort Simpson	N	17	21	14	18	25	34	18	14	11	6	--	3	--	--	--	--	--	--	--	1	--
	X̃	77	154	269	338	402	487	539	637	609	698	--	842	--	--	--	--	--	--	--	1050	--
	R	53	110	126	282	186	394	375	529	485	643	--	792	--	--	--	--	--	--	--	--	--
		107	244	310	407	562	602	672	709	713	792	--	892	--	--	--	--	--	--	--	--	--
All	N	26	28	43	64	64	68	66	61	54	50	39	25	25	13	11	5	3	5	1	2	--
	X̃	85	170	255	328	388	461	489	556	582	639	647	714	746	764	798	873	874	982	900	940	--
	R	53	110	126	233	186	324	285	417	455	466	512	588	625	604	667	775	807	820	--	830	--
		136	261	318	420	562	602	672	709	713	792	800	892	882	860	900	972	987	1118	--	1050	--

Table 26. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 173 yellow walleye, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	1	--	3	--	--	--	4	3	--	2	2	1	2	1	--	--	--	--	--	--	--
	$\tilde{X}$	50	--	201	--	--	--	245	290	--	305	362	448	411	410	--	--	--	--	--	--	--
	R	--	--	182	--	--	--	224	265	--	281	361	--	403	--	--	--	--	--	--	--	--
		--	--	205	--	--	--	324	298	--	328	362	--	418	--	--	--	--	--	--	--	--
Norman Wells	N	5	1	8	10	6	5	4	7	7	7	3	--	4	1	1	--	--	--	--	--	--
	$\tilde{X}$	53	117	184	205	251	278	287	308	339	366	410	--	488	420	513	--	--	--	--	--	--
	R	50	--	155	167	216	213	278	271	294	304	333	--	446	--	--	--	--	--	--	--	--
		57	--	245	239	289	294	321	339	387	391	421	--	573	--	--	--	--	--	--	--	--
Fort Simpson	N	8	4	3	10	6	4	6	7	4	4	8	5	7	5	4	--	--	--	--	--	--
	$\tilde{X}$	52	89	182	230	263	295	294	315	342	351	365	396	408	432	503	--	--	--	--	--	--
	R	34	80	159	169	254	279	243	261	289	335	312	385	376	411	452	--	--	--	--	--	--
		68	160	205	274	299	363	329	341	372	362	435	437	450	559	542	--	--	--	--	--	--
All	N	14	5	14	20	12	9	14	17	11	13	13	6	13	7	5	--	--	--	--	--	--
	$\tilde{X}$	52	95	187	218	257	286	278	308	340	352	375	405	433	427	505	--	--	--	--	--	--
	R	50	80	155	167	216	213	224	261	289	281	312	385	376	410	452	--	--	--	--	--	--
		68	160	245	274	299	363	329	341	387	391	435	448	573	559	542	--	--	--	--	--	--

Table 27. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 85 burbot, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	5	2	--	1	3	3	5	13	4	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	279	291	--	556	559	641	667	696	776	--	--	--	--	--	--	--	--	--	--
	R	--	--	263	277	--	--	491	579	589	538	705	--	--	--	--	--	--	--	--	--	--
		--	--	293	305	--	--	640	728	715	787	869	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	--	--	--	--	5	4	3	5	2	4	2	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	507	556	659	669	714	687	785	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	442	504	547	600	689	558	775	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	600	598	740	739	739	792	794	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	1	3	2	1	1	2	--	2	2	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	320	413	463	487	683	571	--	628	701	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	305	327	--	--	523	--	531	692	--	--	--	--	--	--	--	--
		--	--	--	--	--	476	598	--	--	619	--	725	709	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	2	--	1	--	1	3	--	1	1	--	--	1					
	$\tilde{X}$	--	--	--	--	299	--	402	--	756	595	--	674	915	--	--	895	--	--	--	--	--
	R	--	--	--	--	247	--	--	--	--	502	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	350	--	--	--	--	692	--	--	--	--	--	--	--	--	--	--	--
All	N	--	--	5	2	3	4	11	8	10	23	6	7	5	--	--	1	--	--	--	--	--
	$\tilde{X}$	--	--	279	291	306	449	504	579	675	666	708	668	777	--	--	895	--	--	--	--	--
	R	--	--	263	277	299	305	402	487	589	502	705	558	692	--	--	--	--	--	--	--	--
		--	--	293	305	350	556	640	728	756	787	869	792	915	--	--	--	--	--	--	--	--

Table 28. Number (N) aged, range (R) and median lengths (X̃) by age class for 112 flathead chub, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	167	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	--	--	--	5	8	6	--	7	5	4	1	--	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	183	190	206	--	248	262	262	298	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	169	159	182	--	230	226	225	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	208	222	235	--	271	288	296	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	--	3	5	6	8	6	5	2	1	1	--	--	--	--	--	--	--
	X̃	--	--	--	--	--	167	191	199	225	258	268	327	266	270	--	--	--	--	--	--	--
	R	--	--	--	--	--	154	170	177	205	235	246	272	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	182	213	226	241	287	290	382	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	2	6	5	7	3	9	3	1	1	1	--	--	--	--	--	--	--
	X̃	--	--	--	--	173	181	198	225	209	247	258	272	274	256	--	--	--	--	--	--	--
	R	--	--	--	--	172	169	190	206	201	218	248	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	173	189	216	265	219	275	265	--	--	--	--	--	--	--	--	--	--
All	N	--	--	--	--	2	15	18	19	11	22	13	7	3	2	--	--	--	--	--	--	--
	X̃	--	--	--	--	173	178	193	211	221	250	263	282	279	263	--	--	--	--	--	--	--
	R	--	--	--	--	172	154	159	177	201	218	226	225	266	256	--	--	--	--	--	--	--
		--	--	--	--	173	208	222	265	241	287	290	382	298	270	--	--	--	--	--	--	--

Table 29. Number (N) aged, range (R) and median lengths (X) by age class for 24 goldeye, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Fort Simpson	N	--	--	1	7	6	4	3	1	2	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	144	163	188	204	224	250	225	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	143	160	196	181	--	225	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	178	203	212	245	--	225	--	--	--	--	--	--	--	--	--	--	--	--

Table 30. Number (N) aged, range (R) and median lengths (X) by age class for 146 longnose suckers, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	1	3	--	--	1	--	--	1	--	4	4	5	3	--	1	--	--	--	--	--	1
	$\tilde{X}$	46	67	--	--	185	--	--	359	--	386	413	432	428	--	435	--	--	--	--	--	530
	R	46	51	--	--	185	--	--	359	--	366	361	426	413	--	435	--	--	--	--	--	530
		--	70	--	--	--	--	--	--	--	402	418	456	468	--	--	--	--	--	--	--	--
Arctic Red River	N	--	7	1	1	--	--	--	--	4	6	1	2	2	2	--	--	--	--	--	--	--
	$\tilde{X}$	--	64	171	214	--	--	--	--	405	406	366	395	465	458	--	--	--	--	--	--	--
	R	--	51	171	214	--	--	--	--	391	378	366	391	454	440	--	--	--	--	--	--	--
		--	89	--	--	--	--	--	--	429	426	--	398	475	476	--	--	--	--	--	--	--
Norman Wells	N	8	7	2	2	1	4	5	2	2	4	6	3	1	1	3	1	3	1	1	--	--
	$\tilde{X}$	57	74	151	162	261	215	244	273	247	332	369	467	365	508	481	465	458	451	434	--	--
	R	49	60	134	153	261	184	220	254	331	314	322	446	365	508	401	465	410	451	434	--	--
		82	116	169	172	--	277	354	293	364	375	400	473	--	--	485	--	480	--	--	--	--
Fort Simpson	N	--	5	3	1	1	--	2	3	6	7	6	4	3	--	--	1	--	--	--	--	1
	$\tilde{X}$	--	66	92	231	219	--	310	375	334	385	360	430	466	--	--	508	--	--	--	--	557
	R	--	55	91	231	219	--	268	256	272	257	279	349	446	--	--	508	--	--	--	--	557
		--	81	110	--	--	--	345	375	412	429	389	479	467	--	--	--	--	--	--	--	--
All	N	9	22	6	4	3	4	7	6	12	21	17	14	9	3	4	2	3	1	1	--	2
	$\tilde{X}$	57	69	122	193	219	206	266	306	359	385	371	436	454	476	458	487	458	451	434	--	544
	R	46	54	91	153	185	184	220	254	272	257	279	349	365	440	401	465	410	451	434	--	530
		82	116	171	231	261	277	354	375	429	429	418	456	475	508	485	508	480	--	--	--	557

Table 31. Number (N) aged, range (R) and median lengths ($\tilde{X}$) by age class for 12 trout-perch, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Norman Wells	N	--	3	7	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	40	61	83	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	33	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	55	74	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	76	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	--	3	7	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	40	61	80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	33	55	76	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	55	74	83	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 32. Number (N) aged, range (R) and median lengths (X) by age class for 26 boreal smelt, 1972.

Age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aklavik	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arctic Red River	N	--	--	--	--	--	--	12	9	5	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	279	281	304	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	249	270	277	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	363	303	383	--	--	--	--	--	--	--	--	--	--	--	--
Norman Wells	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fort Simpson	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
All	N	--	--	--	--	--	--	12	9	5	--	--	--	--	--	--	--	--	--	--	--	--
	$\tilde{X}$	--	--	--	--	--	--	279	281	304	--	--	--	--	--	--	--	--	--	--	--	--
	R	--	--	--	--	--	--	249	270	277	--	--	--	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	363	303	383	--	--	--	--	--	--	--	--	--	--	--	--

Table 33. Age-class strength (percent) of Arctic grayling caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
0	--	0.53	0.20	0.36
1	--	0.53	1.09	7.89
2	--	1.26	3.86	22.68
3	--	5.99	5.55	26.80
4	--	7.88	33.66	37.11
5	--	22.06	37.62	4.12
6	--	42.02	12.38	1.03
7	--	15.75	4.95	--
8	--	3.46	0.40	--
9	--	0.53	0.30	--

Table 34. Age-class strength (percent) of inconnu caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
1	--	2.60	6.32	8.79
2	4.29	1.56	6.84	6.59
3	(4.51	4.68	25.79	16.48
4	(	(7.80	20.00	14.29
5	(13.54	(	9.47	32.97
6	(	5.20	7.37	12.09
7	(13.54	10.41	8.42	8.79
8	(	(	1.05	--
9	7.34	(34.34	1.05	--
10	(22.01	(	3.16	--
11	(	(22.37	4.21	--
12	14.67	(	4.21	--
13	12.98	7.28	2.11	--
14	4.18	3.75	--	--
15	2.93	--	--	--

Table 35. Age-class strength (percent) of humpback whitefish caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
0	0.30	1.12	4.58	6.80
1	0.40	2.25	3.83	7.77
2	1.28	2.25	5.13	11.65
3	3.16	1.57	10.02	18.45
4	5.92	1.12	10.06	8.74
5	7.90	0.90	16.70	11.65
6	11.85	4.49	11.87	9.71
7	13.81	5.62	3.50	8.74
8	19.74	5.62	3.36	4.85
9	15.79	16.85	4.08	2.91
10	13.81	47.17	4.04	1.46
11	4.35	9.43	3.71	0.97
12	1.19	1.01	3.16	1.07
13	0.40	0.45	--	1.36
14	--	0.16	--	--

Table 36. Age-class strength (percent) of broad whitefish caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
1	1.95	1.08	33.17	--
2	2.92	2.25	38.19	--
3	3.54	1.37	18.09	--
4	3.54	0.98	5.53	--
5	21.24	3.13	5.03	--
6	8.85	4.41	--	--
7	4.42	10.77	--	--
8	4.42	18.12	--	--
9	26.55	(50.93 (ages 9–10 combined)	--	--
10	18.14		--	--
11	3.54	3.43	--	--
12	0.27	2.55	--	--
13	0.62	0.98	--	--

Table 37. Age-class strength (percent) of Arctic cisco caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
0	--	--	--	--
1	--	--	--	--
2	--	--	--	--
3	--	--	--	--
4	--	--	--	--
5	0.79	1.67	2.50	--
6	8.93	2.36	8.29	--
7	40.67	52.56	39.56	--
8	40.67	39.17	31.57	--
9	8.04	3.44	11.29	--
10	0.89	0.79	6.79	--

Table 38. Age-class strength (percent) of least cisco caught in gill nets, Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
0	--	--	--	--
1	--	--	--	--
2	--	--	--	--
3	--	--	--	--
4	1.30	1.54	--	23.08
5	1.99	11.79	--	7.69
6	6.98	23.59	--	30.77
7	27.92	24.62	28.57	15.38
8	34.90	20.51	14.29	7.69
9	19.94	11.78	28.57	7.69
10	4.49	4.92	28.57	7.69
11	1.99	1.44	--	--
12	0.50	--	--	--

Table 39. Age-class strength (percent) of northern pike caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
1	1.12	1.77	1.18	0.18
2	1.11	2.16	1.88	0.67
3	3.42	5.30	5.75	5.16
4	11.87	4.71	6.59	10.02
5	17.10	16.78	5.93	(50.07
6	23.14	18.16	33.91	(
7	22.13	27.67	29.30	22.89
8	9.05	11.78	10.08	6.51
9	4.02	7.16	1.79	2.30
10	7.04	2.75	1.79	3.21
11	--	1.08	1.06	--
12	--	0.39	0.26	--
13	--	0.29	0.47	--

Table 40. Age-class strength (percent) of yellow walleye caught in gill nets. Mackenzie River, 1972.

Age	Aklavik	Arctic Red River	Norman Wells	Fort Simpson
1	--	2.07	4.84	--
2	--	19.19	14.53	3.30
3	--	9.84	8.72	6.13
4	--	11.81	13.57	4.72
5	--	13.78	19.38	16.04
6	--	7.87	20.35	13.21
7	--	--	10.66	18.87
8	--	15.75	3.39	14.15
9	--	--	2.13	8.49
10	--	5.91	2.42	5.66
11	--	3.94	--	5.19
12	--	9.84	--	2.36
13	--	--	--	1.89

Table 41. Length-frequency for fish species caught in seines.

Species		Fork length interval (mm) 11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Arctic grayling	Aklavik				5	8				1	2	4		1								
	Arctic Red River		1	1					3													
	Norman Wells			5	5	5	3	3				2	2									
	Fort Simpson		6	5	1	1	1		1	2												
Arctic char	Aklavik						9	1														
	Arctic Red River																					
	Norman Wells																					
	Fort Simpson																					
Inconnu	Aklavik			1	4	3	2															
	Arctic Red River										2											
	Norman Wells				2		1															
	Fort Simpson																					
Humpback whitefish	Aklavik			1	5	4	1							1			1					
	Arctic Red River		1	5	5	7	1															
	Norman Wells		4	16	18	10	4	2	2	1												
	Fort Simpson		2	3	11	7	6	6	11	6	3	2		1	2	1	1	1	2			
Broad whitefish	Aklavik										1	3	2	1	1							
	Arctic Red River				2	3		1			1	1										
	Norman Wells		1	1	2		1	1	2													
	Fort Simpson																					

Table 41. (continued)

Species		Fork length interval (mm)																				
		11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Round whitefish	Aklavik																					
	Arctic Red River			1																		
	Norman Wells			5	2	3																
	Fort Simpson			7		1																
Mountain whitefish	Aklavik																					
	Arctic Red River																					
	Norman Wells					1			1					1								
	Fort Simpson				3	3																
Whitefish	Aklavik																					
	Arctic Red River		4	6	9	9																
	Norman Wells																					
	Fort Simpson		3	3	8																	
Arctic cisco	Aklavik		8	21	25	12	4	2	1	1												
	Arctic Red River		2	5	2	4																
	Norman Wells																					
	Fort Simpson																					
Least cisco	Aklavik		3	7	16	34	15	3	1	1												
	Arctic Red River				1	1	2															
	Norman Wells			1			1															
	Fort Simpson																					
Ciscoes	Aklavik	1	19	23	9																	
	Arctic Red River		12	11	1		1															
	Norman Wells		2																			
	Fort Simpson			1																		

Table 41. (continued)

Species		Fork length interval (mm)																				
		11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Lake cisco	Aklavik																					
	Arctic Red River																					
	Norman Wells		3	2	4	2	1															
	Fort Simpson			1	3	2		1			1			2								
Northern pike	Aklavik					1		1	3			1	1				2	1			1	
	Arctic Red River				1			1									1					
	Norman Wells								1				1	1								
	Fort Simpson		4	4	2	5	6	3	3	3	4	7	5	6	2			1				
Yellow walleye	Aklavik																					
	Arctic Red River		1	4	3	3																
	Norman Wells		12	45	17	4												1				
	Fort Simpson	1	11	13	8	3	2	1	1	1												
Burbot	Aklavik			3					1		1	3	1		1							
	Arctic Red River		2	3			2									1	1					
	Norman Wells		4	3	2	2					1	1	1	1						1		1
	Fort Simpson																					
Flathead chub	Aklavik																					
	Arctic Red River																					
	Norman Wells								1				1			1						
	Fort Simpson													1								
Lake chub	Aklavik																					
	Arctic Red River																					
	Norman Wells		4	62	94	43	11	3	1			2										
	Fort Simpson				1								1									

Table 41. (continued)

Species		Fork length interval (mm) 11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Longnose dace	Aklavik																					
	Arctic Red River						1															
	Norman Wells			3																		
	Fort Simpson		1	2																		
Northern redbelly dace	Aklavik																					
	Arctic Red River					1																
	Norman Wells		1	10	1																	
	Fort Simpson				2	1																
Spottail shiner	Aklavik																					
	Arctic Red River			1																		
	Norman Wells		5		2			1														
	Fort Simpson		18	44	21	6																
Emerald shiner	Aklavik																					
	Arctic Red River																					
	Norman Wells																					
	Fort Simpson		5	27	8	4	10	4														
Longnose sucker	Aklavik	3	37	28	9	3	2		1	2	1											
	Arctic Red River	4	47	51	31	19	7		1									1				
	Norman Wells		6	19	28	25	12	3	1	1				1								
	Fort Simpson	2	30	47	34	23	8	1	2	1												
White sucker	Aklavik																					
	Arctic Red River																					
	Norman Wells			1	1			1														
	Fort Simpson		3					1	3	1		1										

Table 41. (continued)

Species		Fork length interval (mm)																				
		11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Trout-perch	Aklavik					1																
	Arctic Red River																					
	Norman Wells	1	7	20	16	11	3	2	1													
	Fort Simpson					1		1														
Arctic lamprey ammocoetes	Aklavik								1			1	1									
	Arctic Red River			3	1	1		4	7	3	1	1			1							
	Norman Wells				1				3													
	Fort Simpson																					
Brook stickleback	Aklavik																					
	Arctic Red River		1																			
	Norman Wells		1																			
	Fort Simpson																					
Ninespine stickleback	Aklavik		25	35	4	1																
	Arctic Red River		3	5																		
	Norman Wells		1	11	1																	
	Fort Simpson																					
Spoonhead sculpin	Aklavik	1	6	6	4	4	1															
	Arctic Red River	17	8	6	2	4	3	1														
	Norman Wells		1	6		1	1															
	Fort Simpson	1			1																	
Slimy sculpin	Aklavik		1	2																		
	Arctic Red River			3																		
	Norman Wells		6	20	4	1		2														
	Fort Simpson	1	2	6	2	2	2															

Table 41. (continued)

Species		Fork length interval (mm)																				
		11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	201 to 210	211 to 220
Boreal smelt	Aklavik																					
	Arctic Red River				2																	
	Norman Wells																					
	Fort Simpson																					
Pond smelt	Aklavik		5	15	14	3																
	Arctic Red River		1	3	15	1																
	Norman Wells																					
	Fort Simpson																					

Table 42. Length-weight relationship by sex and maturity for major fish species in the Mackenzie River, 1972.

N = sample size
a = intercept
b = ponderal index (slope)
sb = standard deviation of b.

		Aklavik				Arctic Red River				Norman Wells				Fort Simpson			
		N	a	b	sb	N	a	b	sb	N	a	b	sb	N	a	b	sb
Arctic grayling																	
Male	Immature	1	-	-	-	2	-	-	-	23	-10.780	2.900	0.503	16	-12.838	3.106	0.580
	Mature	-	-	-	-	18	-10.700	2.917	0.291	119	-9.985	2.766	0.408	13	-8.280	2.439	0.387
	Ripe	-	-	-	-	15	-13.657	3.389	0.287	34	-12.702	3.223	0.303	-	-	-	-
	Spent	-	-	-	-	5	-6.453	2.116	0.542	1	-	-	-	7	-9.540	2.662	0.366
Female	Immature	-	-	-	-	2	-	-	-	14	-10.371	2.801	0.651	14	-12.667	3.167	0.641
	Mature	1	-	-	-	22	-16.101	3.843	0.234	96	-10.561	2.866	0.450	19	-21.833	4.803	0.709
	Ripe	-	-	-	-	24	-10.532	2.868	0.230	45	-12.963	3.280	0.420	2	-	-	-
	Spent	-	-	-	-	4	-11.754	3.041	0.466	8	+10.575	-0.747	0.150	19	-13.867	3.423	0.464
Arctic char																	
Male	Immature	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mature	19	-11.308	3.001	0.282	-	-	-	-	-	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	5	-10.841	2.916	0.487	-	-	-	-	-	-	-	-	-	-	-	-
	Mature	35	-10.256	2.816	0.518	-	-	-	-	-	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inconnu																	
Male	Immature	18	-9.092	2.610	0.431	23	-11.615	3.012	0.836	23	-10.068	2.723	0.499	20	-22.994	4.911	0.884
	Mature	78	-11.171	2.943	0.328	152	+13.143	-0.762	0.848	87	-10.945	2.902	0.896	2	-	-	-
	Ripe	-	-	-	-	-	-	-	-	22	-12.817	3.195	0.765	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	31	-13.453	3.306	0.523	18	-13.516	3.320	0.554	11	+0.686	0.773	0.325	25	-18.282	4.112	0.911
	Mature	92	-12.595	3.170	0.463	89	-10.585	2.868	0.223	42	-10.952	2.886	0.800	3	-11.981	2.889	1.700
	Ripe	-	-	-	-	2	-	-	-	13	-12.368	3.132	1.078	-	-	-	-
	Spent	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-

Table 42. (cont'd)

		Aklavik				Arctic Red River				Norman Wells				Fort Simpson			
		N	a	b	sb	N	a	b	sb	N	a	b	sb	N	a	b	sb
Arctic cisco																	
Male	Immature	14	-12.867	3.251	0.358	1	-	-	-	1	-	-	-	-	-	-	-
	Mature	72	-3.858	1.727	0.177	180	-9.565	2.684	0.190	18	-8.565	2.525	0.310	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	18	-7.745	2.382	0.142	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	2	-	-	-	1	-	-	-	1.	-	-	-
	Mature	71	-5.613	2.036	0.129	149	-15.290	3.653	0.176	5	-33.428	6.657	0.550	2	-	-	-
	Ripe	-	-	-	-	31	-11.826	3.076	0.172	35	-12.971	3.272	0.153	-	-	-	-
	Spent	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Least cisco																	
Male	Immature	11	-4.423	1.664	0.390	5	-13.391	3.321	0.363	3	-0.939	0.975	0.028	9	+4.652	-0.210	0.642
	Mature	88	-4.032	1.665	0.244	55	-12.906	3.221	0.249	3	-15.778	3.658	1.125	-	-	-	-
	Ripe	-	-	-	-	8	+1.879	0.606	0.192	3	-21.762	4.801	0.689	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	23	-10.947	2.911	0.475	5	-9.875	2.631	0.352	-	-	-	-	6	-20.205	4.503	0.542
	Mature	145	-8.487	2.486	0.304	46	-8.928	2.500	0.334	3	+14.427	-1.667	0.345	2	-	-	-
	Ripe	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Cisco																	
Male	Immature	4	-8.407	2.527	0.579	3	-23.046	4.810	0.427	20	-13.255	3.284	0.705	2	-	-	-
	Mature	-	-	-	-	-	-	-	-	4	-14.670	3.598	1.356	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mature	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	4	+6.356	0.069	0.131	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 42. (cont'd)

		Aklavik				Arctic Red River				Norman Wells				Fort Simpson			
		N	a	b	sb	N	a	b	sb	N	a	b	sb	N	a	b	sb
Humpback whitefish																	
Male	Immature	32	-8.626	2.547	0.427	15	-11.246	2.996	0.559	4	-5.829	1.988	0.295	88	-19.481	4.410	1.020
	Mature	203	-12.040	3.155	0.241	139	-13.901	3.457	0.315	15	-6.461	2.119	0.453	9	-16.488	3.901	0.465
	Ripe	3	-13.791	3.471	0.302	29	-10.098	2.830	0.132	1	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	45	-12.593	3.243	0.424	45	-12.133	3.140	0.627	5	+4.819	-0.096	0.538	105	-17.313	4.027	0.928
	Mature	237	-9.923	2.809	0.298	134	-13.377	3.373	0.312	2	-	-	-	10	-6.800	2.245	0.683
	Ripe	-	-	-	-	8	-18.722	4.268	0.577	4	-13.565	3.411	0.401	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Broad whitefish																	
Male	Immature	28	-11.510	3.055	0.434	7	-13.068	3.314	0.532	7	-12.508	3.206	0.475	-	-	-	-
	Mature	194	-12.587	3.249	0.328	176	-9.644	2.709	0.290	8	-11.701	3.059	0.598				
	Ripe	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	58	-11.138	2.993	0.475	22	-12.802	3.271	0.687	4	-15.354	3.747	0.572	-	-	-	-
	Mature	208	-13.065	3.328	0.365	144	-11.202	3.020	0.273	2	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Round whitefish																	
Male	Immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mature	3	-11.769	3.049	0.343	-	-	-	-	2	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Mature	4	-10.177	2.785	0.110	-	-	-	-	3	-13.117	3.307	1.639	3	-6.919	2.249	0.230
	Ripe	-	-	-	-	-	-	-	-	3	-17.034	3.967	0.302	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 42. (cont'd)

		Aklavik				Arctic Red River				Norman Wells				Fort Simpson			
		N	a	b	sb	N	a	b	sb	N	a	b	sb	N	a	b	sb
Northern pike																	
Male	Immature	8	-9.860	2.679	0.717	20	-15.617	3.656	0.498	21	-1.659	1.214	0.758	62	-10.659	2.777	0.457
	Mature	226	-9.762	2.681	0.393	129	-11.752	3.000	0.365	80	-10.614	2.817	0.635	67	-7.120	2.226	0.380
	Ripe	-	-	-	-	3	-6.188	2.133	0.165	3	-11.136	2.886	0.757	7	-14.090	3.368	0.861
	Spent	18	-11.912	3.019	0.204	17	-12.983	3.195	0.326	-	-	-	-	6	-11.156	2.875	0.318
Female	Immature	11	-13.573	3.301	0.326	24	-12.389	3.104	0.367	5	-15.330	3.581	0.807	73	-14.390	3.403	0.608
	Mature	234	-11.088	2.890	0.408	125	-11.614	2.974	0.330	85	-11.533	2.958	0.415	49	-14.676	3.454	0.358
	Ripe	1	-	-	-	5	-14.208	3.370	0.627	5	+7.585	-0.109	0.344	10	-13.861	3.319	0.313
	Spent	42	-12.072	3.043	0.373	46	-11.084	2.887	0.321	3	-15.270	3.533	0.242	43	-11.416	2.915	0.324
Walleye																	
Male	Immature	-	-	-	-	2	-	-	-	9	+3.779	0.156	0.514	12	-5.688	2.006	0.284
	Mature	-	-	-	-	-	-	-	-	36	-10.955	2.922	0.550	1	-	-	-
	Ripe	-	-	-	-	-	-	-	-	6	-11.370	2.993	0.827	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	2	-	-	-	2	-	-	-	43	-15.953	3.740	0.595
	Mature	-	-	-	-	2	-	-	-	8	-14.090	3.464	0.573	2	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Burbot																	
Male	Immature	2	-	-	-	6	-14.711	3.435	1.080	12	-10.608	2.838	0.286	5	-9.603	2.604	0.550
	Mature	17	-11.690	2.963	0.362	19	-11.813	2.978	0.298	11	-12.920	3.125	0.613	1	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	1	-	-	-	1	-	-	-	3	-8.038	2.372	0.719
	Mature	21	-10.771	2.824	0.262	23	-10.297	2.746	0.242	5	-13.319	3.208	0.617	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

Table 42. (cont'd)

		Aklavik				Arctic Red River				Norman Wells				Fort Simpson			
		N	a	b	sb	N	a	b	sb	N	a	b	sb	N	a	b	sb
Flathead chub																	
Male	Immature	-	-	-	-	-	-	-	-	5	+8.976	-0.836	0.675	19	-19.676	4.387	0.443
	Mature	-	-	-	-	6	-11.839	3.058	0.268	40	-1.686	1.196	0.301	3	-30.544	6.352	0.502
	Ripe	-	-	-	-	-	-	-	-	6	-9.078	2.594	0.341	-	-	-	-
	Spent	-	-	-	-	1	-	-	-	3	+8.270	-0.614	0.302	5	-14.171	3.480	0.368
Female	Immature	-	-	-	-	3	+1.937	0.500	0.157	-	-	-	-	44	-1.217	0.993	0.582
	Mature	-	-	-	-	15	-14.535	3.535	0.449	22	-6.288	2.074	0.240	37	-25.301	5.443	0.465
	Ripe	-	-	-	-	2	-	-	-	36	-0.487	0.849	0.236	5	-38.806	7.958	0.526
	Spent	-	-	-	-	1	-	-	-	2	-	-	-	14	-12.891	3.256	0.196
Longnose sucker																	
Male	Immature	10	+1.879	0.633	0.391	10	-11.877	3.047	0.609	8	-10.467	2.848	0.732	17	-20.936	4.643	1.180
	Mature	22	-10.720	2.908	0.168	19	+2.312	0.721	0.189	43	-3.493	1.653	0.610	24	-14.165	3.470	0.478
	Ripe	-	-	-	-	34	-5.380	2.010	0.990	5	-5.113	1.916	0.262	23	-16.439	3.842	0.553
	Spent	1	-	-	-	7	-9.262	2.643	0.111	3	-10.138	2.787	0.947	9	-14.380	3.506	0.325
Female	Immature	2	-	-	-	-	-	-	-	2	-	-	-	25	-13.075	3.258	0.789
	Mature	11	-8.668	2.575	0.161	20	+7.072	-0.014	0.670	16	-8.306	2.504	0.310	16	-11.879	3.086	0.458
	Ripe	-	-	-	-	13	-10.241	2.827	0.100	7	-11.994	3.141	0.544	-	-	-	-
	Spent	-	-	-	-	23	0.893	1.274	0.223	1	-	-	-	17	-13.847	3.414	0.487
White sucker																	
Male	Immature	-	-	-	-	-	-	-	-	1	-	-	-	3	-12.865	3.288	0.632
	Mature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	Immature	-	-	-	-	-	-	-	-	-	-	-	-	9	-15.289	3.711	0.851
	Mature	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
	Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spent	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

Table 43. Summary of stomach contents of fish caught in gill nets, Mackenzie River, 1972.

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Arctic Char	21	228-545	100.0			
Boreal Smelt	10	260-294	100.0			
Goldeye	15	165-255	0.0	Coleoptera remains	46.9	8.4
				Dytiscidae	6.7	0.6
				Gyrinidae	13.4	
				Diptera remains	6.7	0.6
				Ephemeroptera remains	13.4	
				Hirudinea	6.7	0.6
				Hydracarina	6.7	
				Hymenoptera remains	20.1	
				Formicidae	6.7	
				Vespoidea	6.7	0.6
				Nematomorpha	20.1	1.2
				Plecoptera remains	33.5	3.0
				Perlidae	6.7	1.8

Table 43. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Goldeye				Trichoptera remains	60.3	41.4
				Insect remains	60.3	40.8
				Fish remains	13.4	1.2
Lake Cisco	8	146-415	75.0	Ephemeroptera Baetidae	50.0	
				Insect remains	50.0	1.8
				Fish remains	50.0	98.2
Lake Trout	7	388-525	14.3	Copepoda	83.4	79.1
				Hemiptera Corixidae	50.1	0.6
				Ninespine Stickleback	16.7	0.8
				Fish remains	16.7	18.7
				Plant material	16.7	0.2
				Stones	16.7	0.8

Table 43. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Longnose Sucker	7	196-416	14.3	Diptera		
				Chironomidae	16.7	56.3
				Pelecypoda	33.4	
				Plecoptera remains	16.7	
				Trichoptera remains	16.7	
				Plant material	16.7	
				Unidentifiable remains	66.8	43.7
Round Whitefish	20	163-432	80.0	Diptera remains	25.0	2.4
				Plecoptera remains	50.0	2.4
				Perlodidae	25.0	2.4
				Trichoptera remains	25.0	19.0
				Insect remains	25.0	19.0
				Plant material	50.0	57.1

Table 43. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Mountain Whitefish	8	318-446	0.0	Coleoptera		
				Dytiscidae	12.5	
				Ephemeroptera		
				Baetidae	12.5	0.9
				Odonata		
				Gomphidae	12.5	1.8
				Plecoptera remains	37.5	4.5
				Perlodidae	25.0	2.9
				Trichoptera remains	62.5	44.4
				Leptoceridae	12.5	0.7
				Phryganeidae	25.0	31.3
				Insect remains	37.5	7.1
				Sculpins	12.5	5.1
				Fish remains	12.5	0.7
				Stones	25.0	0.7

Table 44. Summary of stomach contents of fish caught in seine nets, Mackenzie River, 1972.

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Arctic char	13	35-132	0.0	Diptera remains	61.5	6.7
				Chironomidae	92.3	85.2
				Tabanidae	7.7	0.2
				Tipulidae	7.7	0.2
				Hydracarina	7.7	0.2
				Lepidoptera	7.7	0.2
				Plecoptera remains	30.8	4.4
				Nemouridae	7.7	2.1
				Perlidae	7.7	0.2
				Perlodidae	7.7	0.8
Longnose sucker	25	13-99	4.0	Diptera remains	25.0	5.2
				Chironomidae	25.0	10.8
				Hydracarina	4.2	0.8
				Ostracoda	16.7	82.8
				Plecoptera remains	4.2	0.4
				Trichoptera remains	4.2	0.4
				Unidentifiable remains	62.6	--
				Insect remains	4.2	0.4

Table 44. (Continued).

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Pond smelt	11	30-61	27.3	Cladocera	25.0	6.2
				Copepoda	50.0	48.4
				Diptera remains	37.5	6.2
				Chironomidae	75.0	31.2
				Simulidae	12.5	3.2
				Ephemeroptera remains	12.5	1.6
				Mysidacea		
				Mysis relicta oculata	12.5	1.6
				Plecoptera remains	12.5	1.6
Round Whitefish	13	30-137	0.0	Diptera remains	7.7	2.5
				Ceratopogonidae	15.4	30.7
				Chironomidae	23.1	43.5
				Ephemeroptera remains	7.7	2.5
				Baetidae	15.4	12.8
				Gastropoda	7.7	2.5
				Plecoptera		
				Perlodidae	7.7	2.5
				Trichoptera remains	7.7	2.5

Table 44. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Round Whitefish				Insect remains	46.1	
Trout-perch	30	26-91	20.0	Coleoptera remains	4.2	0.4
				Diptera remains	37.5	6.4
				Ceratopogonidae	16.7	3.0
				Chironomidae	58.4	74.8
				Culicidae	4.2	2.2
				Ephemeroptera remains	4.2	0.4
				Mysidacea		
				Mysis relicta oculata	4.2	0.4
				Ostracoda	16.7	4.3
				Plecoptera remains	20.9	6.4
				Perlodidae	4.2	1.7
				Trichoptera		
				Hydropsychidae	4.2	0.4
White Sucker	9	23-89	11.1	Diptera remains	25.0	
				Chironomidae	62.5	97.8
				Simulidae	25.0	1.6
				Plecoptera remains	12.5	0.6

Table 44. (continued).

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
White Sucker				Trichoptera remains	12.5	
				Unidentifiable remains	12.5	
Ninespine Stickleback	20	25-53	25.0	Copepoda	6.7	8.0
				Diptera remains	46.7	27.2
				Chironomidae	6.7	1.6
				Hemiptera remains	13.3	3.2
				Ostracoda	20.0	44.8
				Pelecypoda	6.7	3.2
				Plecoptera remains	13.3	4.8
				Insect remains	20.0	6.4
Flathead Chub	6	87-155	0	Unidentifiable remains	100.0	-
Lake Chub	33	29-97	18.2	Cladocera	3.7	12.5
				Coleoptera remains	3.7	2.5

Table 44. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Lake Chub				Diptera remains	14.8	15.0
				Chironomidae	7.4	5.0
				Culicidae	7.4	17.5
				Tabanidae	3.7	2.5
				Hydracarina	3.7	10.0
				Hymenoptera remains	7.4	7.5
				Formicidae	3.7	5.0
				Pelecypoda	3.7	-
				Plecoptera remains	11.1	22.5
				Insect remains	40.7	-
Spoonhead Sculpin	11	20-55	18.2	Diptera		
				Chironomidae	33.3	61.5
				Plecoptera remains	44.4	38.5
				Insect remains	22.3	
Slimy Sculpin	14	28-81	14.2	Diptera remains	8.3	14.3
				Chironomidae	8.3	7.1

Table 44. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Slimy Sculpin				Ephemeroptera		
				Baetidae	8.3	7.1
				Odonata	8.3	7.1
				Ostracoda	16.7	21.4
				Plecoptera remains	24.9	28.6
				Trichoptera remains	16.7	14.3
				Insect remains	41.6	-
				Sand	8.3	-
Mountain Whitefish	6	36-90	0.0	Coleoptera remains	16.7	0.3
				Dytiscidae	16.7	0.3
				Diptera remains	33.4	2.7
				Ceratopogonidae	33.4	11.4
				Chironomidae	83.5	14.7
				Simulidae	66.8	7.5
				Tipulidae	33.4	0.9
				Ephemeroptera		
				Baetidae	16.7	63.0
				Hemiptera		
				Notonectidae	16.7	0.3

Table 44. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Number
Mountain Whitefish				Plecoptera		
				Perlodidae	16.7	0.9
				Insect remains	16.7	-

Table 45. Summary of stomach contents of fish caught in gill nets from ten lakes in the Mackenzie delta, 1972.

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Broad Whitefish	27	156-520	40.7	Diptera		
				Chironomidae	43.7	7.9
				Gastropoda	50.0	23.2
				Hemiptera		
				Corixidae	62.5	1.9
				Pentatomidae	6.3	0.2
				Nematoda	6.3	0.2
				Ostracoda	18.7	0.6
				Pelecypoda	50.0	2.4
				Trichoptera remains	6.3	0.2
				Hydropsychidae	6.3	0.2
				Limnephilidae	6.3	5.9
				Phryganeidae	50.0	51.8
				Insect remains	25.0	2.9
				Plant remains	31.2	3.5

Table 45. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Humpback Whitefish	16	290-410	25.0	Diptera		
				Chironomidae	8.3	0.9
				Gastropoda	75.0	66.7
				Ostracoda	16.6	1.8
				Pelecypoda	16.6	1.8
				Trichoptera		
				Limnephilidae	16.6	3.7
				Phryganeidae	33.2	8.3
				Unidentified remains	41.6	16.7
Inconnu	11	444-704	63.6	Coregonids	25.0	
				Ninespine Stickleback	75.0	
				Northern Pike	25.0	
Least Cisco	13	171-308	46.1	Hemiptera		
				Corixidae	100.0	49.9
				Hydracarina	14.2	0.2

Table 45. (continued)

Species	No. Sampled	Fork Length Range (mm)	Percent Empty	Food Item Taxa	Percent Occurrence	Percent Total Volume
Least Cisco				Ostracoda	14.2	49.9
Northern Pike	108	278-915	84.2	Burbot	5.8	
				Ciscoes	5.8	
				Coregonids	35.3	
				Northern Pike	17.6	
				Fish remains	35.2	