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GLACIATION AND THE PHYSICAL, CHEMICAL AND BIOLOGICAL LIMNOLOGY OF YUKON LAKES

by

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Lindsey, C. C., K. Patalas, R. A. Bodaly, and C. P. Archibald. 1981. Glaciation and the physical, chemical and biological limnology of Yukon lakes. Can. Tech. Rep. Fish. Aquat. Sci. 966: vi + 37 p.

A preliminary limnological characterization of 91 Yukon lakes is presented with data on lake morphometry, temperature, chemical composition, zooplankton species presence and abundance, and fish species presence. Most of the lakes sampled are situated in glaciated terrain. Summer epilimnion temperatures ranged from 8 to 18.5 C and were affected mainly by lake elevation and surface area (wind action). Total dissolved solids (TDS) ranged from about 50 to 910 mg/L. A distinct belt of lakes with TDS greater than 200 mg/L was evident in the upper Yukon River valley, centered at about Frenchman Lake, and this belt corresponds to an area over which a volcanic ash layer thicker than about 5 cm was laid down 1,400 years ago. In most lakes, major cations followed the patterns of concentration $Ca^{+2} > Mg^{+2} > Na^{+} > K^{+}$.

Thirty-two species of crustacean zooplankton were recorded; *Cyclops scutifer* and *Diaptomus pribilofensis* were present in almost all lakes and were dominant in most. The most common cladocerans were *Daphnia longiremis*, *Eubosmina longispina* and *Daphnia middendorffiana*. Most zooplankton species were widely distributed throughout all the drainage basins but some of the species were restricted to a particular area only. *Acanthodiaptomus denticornis* was found in only three shallow unglaciated lakes. *Senecella calanoides* was found in only four lakes in the southwestern corner of the Yukon Territory in lakes presently or formerly part of the Alsek drainage area. *Cyclops bicuspidatus thomasi* occurred only in southern-most part of the Yukon Territory (Upper Teslin drainage). *Limnocalanus macrurus*, a common northern species, was not found in any of the Yukon lakes.

Twenty-three fish species were found, the most common being lake whitefish *Coregonus clupeaformis*, lake trout *Salvelinus namaycush*, and northern pike *Esox lucius*. Post-glacial alterations in drainage patterns have profoundly affected the distribution of fish species in Yukon lakes. Parts of the drainage basins of the Alsek, Upper Liard and Peel Rivers all drained into the Yukon basin during deglaciation and these three areas have received much of their fish fauna directly from the Yukon River basin (Bering refugium). Lake whitefish electrophoretic patterns in Alsek, Upper Liard and Peel basin populations are very similar to Yukon basin populations. Three species of fish, the inconnu, *Stenodus leucichthys*, broad whitefish, *Coregonus nasus*, and least cisco, *Coregonus sardinella*, are present in the Yukon River basin but absent from Alsek, Upper Liard and Peel basins, apparently because they failed to disperse into the latter areas while they were tributary to the Yukon River. The rare high gill raker form of lake whitefish is found only in the absence of the least cisco in the Alsek basin, Squanga Creek drainage and South McQuesten drainage.

Key words: Yukon; limnology; water temperature; water chemistry; zooplankton; freshwater fish; biogeography; glaciation.

RESUME

Lindsey, C. C., K. Patalas, R. A. Bodaly, and C. P. Archibald. 1981. Glaciation and the physical, chemical and biological limnology of Yukon lakes. Can. Tech. Rep. Fish. Aquat. Sci. 966: vi + 37 p.

L'étude présente des caractéristiques limnologiques préliminaires pour 91 lacs du Yukon, avec données sur la morphométrie, la température, la composition chimique des lacs, la présente et l' abondance des espèces de zooplancton et la présente des espèces de poisson. La plupart des lacs échantillonnés sont situés en terrain moutonné. Les températures de l'épilimnion en été variaient de 8 à 18.5 C, surtout en fonction de l'altitude des lacs et de leur superficie (action du vent). Le total des solides dissous (TSD) variait de 50 à 910 mg/L. On a pu observer une ceinture distincte de lacs dans la vallée supérieure du Yukon River, où le TSD était supérieur à 200 mg/L, centrée aux environs du Frenchman Lake, cette ceinture correspondant à une région où la couche de cendre volcanique déposée il y a 1400 ans dépasse 5 centimètres d'épaisseur. Dans la plupart des lacs, on trouvait les principaux cations dans l'ordre de concentration suivant: $Ca^{+2} > Mg^{+2} > Na^{+} > K^{+}$.

On a observé 32 espèces de zooplancton crustacéen, *Cyclops scutifer* et *Diaptomus pribilofensis* étant présents dans presque tous les lacs et dominants dans la plupart. Les cladocères les plus communs étaient *Daphnia longiremis*, *Eubosmina longispina* et *Daphnia middendorffiana*. La plupart des especes de zooplancton étaient largement distribuées dans tous les bassins de drainage, mais certaines des espèces étaient limitées à une zone particulière seulement. *Acanthodiaptomus denticornis* a été observé dans seulement trois lacs non glaciaires peu profond. *Senecella calanoides* a été observé dans seulement quatre lacs de la partie sud-ouest du Territoire du Yukon, dans des lacs qui font ou qui ont fait partie du bassin de drainage de l'Alsek. On a trouvé *Cyclops bicuspidatus thomasi* uniquement dans la partie la plus septentrionale du Territoire du Yukon (bassin de drainage supérieur de la Teslin). *Limnocalanus macrurus*, espèce commune du nord, n'a été observé dans aucun des lacs du Yukon.

On a trouvé vingt-trois espèces de poisson, les plus communes étant le grand corégone (*Coregonus clupeaformis*), le touladi (*Salvelinus namaycush*), et le brochet (*Esox lucius*). Les modifications post-glaciaires des bassins de drainage ont grandement influé sur la distribution des espèces de poisson dans les lacs du Yukon. Certaines parties des bassins de drainage de l'Alsek, de la partie supérieure de la Liard et de la Peel se déversaient dans le bassin du Yukon au cours de la déglaciation et la plus grande partie de la faune halieutique de ces trois régions provient directement du bassin du Yukon ("refuge" de Bering). Les habitudes électrophorétiques du grand corégone dans les bassins de l'Alesk, la partie supérieure de la Liard et la Peel sont semblables à celles des populations du bassin du Yukon. Trois espèces de poisson, l'inconnu (*Stenodus leucichthys*), le corégone tschir (*Coregonus nasus*) et le cisco sardinelle (*Coregonus sardinella*) sont présentes dans le bassin du Yukon, mais absentes des bassins de l'Alsek, de la partie supérieure de la Laird et de la Peel, apparemment parce qu'elles n'ont pu se disperser dans ces cours d'eau au moment où ils étaient tributaires du Yukon River. La forme assez rare de grand corégone à hauts branchitecténies se trouve seulement en l'absence du cisco sardinelle dans le bassin de l'Alsek, dans la bassin de drainage du Squanga Creek et dans le bassin de drainage de la South McQuesten River.

Mots-clés: Yukon; limnologie; température de l'eau; chimie de l'eau; zooplancton; poisson d'eau douce; biogéographie; glaciation.

INTRODUCTION

The Yukon Territory is a zoogeographically diverse but little studied region of Canada. Parts of the Yukon were covered by ice during the Pleistocene glaciations, yet much of the Territory remained ice free. This unglaciated area formed a part of the Bering refugium and served as a refuge for terrestrial and aquatic organisms. At present, river drainage from the Yukon Territory is to the Bering Sea via the Yukon River, to the Pacific Ocean via the Alsek River and to the Mackenzie River and Arctic Ocean via the Peel and Liard Rivers. The distribution of fish in the Yukon has been affected by the presence of these watershed boundaries, by changed drainage patterns during deglaciation and by the presence of the Bering refuge. Some accounts of specific aspects of fish zoogeography in the Yukon have been previously published. These include studies on the glacial history and fish distribution of the Alsek basin (Lindsey 1975) and the Peel basin (Bodaly and Lindsey 1977), the post-glacial dispersal of the lake whitefish across western Canada (Lindsey et al. 1970; Franzin and Clayton 1977) and the zoogeography of the pygmy whitefish in western Canada (Lindsey and Franzin 1972).

It is the purpose of the present report to discuss the physical and biological limnology of 91 Yukon lakes, including their chemical composition, oxygen and temperature regimes, morphometry, zooplankton species presence and abundance, and the effect of the glacial history of the Yukon on the distribution of its fishes. The biological and limnological data are presented here in the hope that they will be of value in the management of the aquatic resources of the Yukon and in prediction of the impact of future development. Other data on the fisheries and limnology of Yukon lakes and streams not covered in the present report are available in Anon. (1973), Brown et al. (1976), Cleugh (1977), Elson (1974), McPhail and Lindsey (1970), Steigenberger et al. (1975a, 1975b), Steigenberger and Elson (1977), Walker (1976), Walker et al. (1973), and a variety of consultants reports arising from the assessment of possible effects of proposed pipeline construction in the region.

MATERIALS AND METHODS

Ninety-one lakes were sampled in Yukon Territory and adjacent areas from 1960 to 1978. Lakes are listed alphabetically in Tables 1 and 2 along with their location and present drainage. The location of lakes sampled is given in Fig. 1. The amount and type of information collected from each lake varied from lake to lake according to the particular purpose of the sampling. Data are from our own sampling and analyses unless otherwise stated.

Elevations are those given on the topographic maps or refer to the enclosing contour intervals. Maximum known depths are in most cases not based on extensive soundings over the whole lake, but rather on exploratory transects using an echo sounder. These transects were done before selecting deep-water netting sites and limnological sampling stations.

Limnological measurements were usually made in early afternoon at one station over the deepest part of the lake, generally mid-lake. Water transparency was measured with a 20 cm Secchi disc, and water temperature profiles were recorded with a YSI tele-thermometer calibrated periodically against a mercury thermometer. Water samples for oxygen determination were taken with a three litre van Dorn bottle and the oxygen content was measured with a YSI Model 54 oxygen meter. Although the meter was generally calibrated before use with air-saturated water of known temperature, altitude was not taken into account and this introduced an error of not more than 10%.

Prior to 1975, water samples for chemical analyses were taken from the surface, and in 1975 from 1 m depth. Samples were treated according to Stainton et al. (1974) for subsequent analysis of calcium, magnesium, sodium, potassium, chloride, sulphate, silicon, total dissolved solids (TDS), conductivity (prior to 1975 only) and in 1975 only chlorophyll a (uncorrected for phaeophytin). A Hach kit was used to measure the pH and hardness (expressed as mg/L of $CaCO_3$) of surface waters.

Zooplankton collections were made mostly in summer 1970 and 1975 with a few samples taken in summer 1974. All the samples in 1970 and 1974 were taken with a large Wisconsin net (mouth diameter 24 cm, mesh size 73 μm). A single or several vertical hauls were taken from near the lake bottom to the surface. In very deep lakes, however, only the top 20 or 30 m of the water column was filtered through the net, representing the epilimnion, metalimnion, and a substantial part of the hypolimnion. Rotifers were not counted in the 1970 and 1974 samples and crustacean abundance was expressed as the number of individuals per liter and per cm^2 of lake area, assuming the efficiency of the net to be 100%. In fact, the efficiency is between 45 and 85%, on the average 63% relative to the zooplankton trap (see below) (Patalas 1975).

In 1975 more quantitative samples were taken with a 26 liter Schindler-Patalas trap (Schindler 1969) fitted with a filtering net of 73 μm mesh. Samples were taken every 2 or 3 meters in the epilimnion and every 3-10 meters in the hypolimnion, depending on the depth. Samples from within each zone were combined, but the zones were kept separate, resulting in two samples per station. Numbers of rotifers and crustaceans were expressed per liter and total zooplankton abundance (rotifers plus crustaceans) was expressed as mg wet weight per liter and per cm^2 of lake surface (see Archibald 1977 for details of biomass calculations). Results obtained with the vertical hauls should be multiplied by 1.6 (1/0.63) before being compared with results from the trap method. In all samples the crustacean species composition was expressed as a percentage of the total number of crustaceans. Crustacean species identification was according to Brooks (1957, 1959), Wilson (1959), and Yeatman (1959).

Almost all records of fish distribution given here are based on personal observations by one or more of the authors. A few records are included where the authors have not seen specimens but have reason to trust the report. Of the many survey reports which have been produced recently under the spur of impending pipeline construction, only those where specimens were retained for verification have been considered here.

Unless otherwise noted, fish species records presented here are based on a minimum of one overnight gill netting per lake and do not necessarily constitute exhaustive lists. Several experimental gill nets of monofilament nylon (with panels of stretched mesh ranging from 1.91 or 2.54 to 7.62 cm) were usually set in each lake, some in shallow areas and some on the surface and bottom in a deep area. Seining was not always carried out and therefore small fish species (e.g. sculpins) may have been overlooked in some lakes. Scientific and common names for all fish species sampled are listed in Table 3.

RESULTS AND DISCUSSION

PHYSICAL LIMNOLOGY

Lake area

The areas of the lakes under study ranged from 0.2 to almost 2,000 km^2 (Tables 4, 5 and 6), with 80% of the lakes smaller than 20 km^2, 50% smaller than 5 km^2, and 12% smaller than 1 km^2. Most of the larger lakes are located in the southern part of the Yukon Territory, and the lakes in the northern part are small, usually less than 5 km^2. The distribution of sizes of the 91 lakes under study roughly reflects the overall size distribution of lakes in the Yukon.

Maximum depth

The information on maximum depth (Tables 4, 5 and 6) was not always adequate and in many cases represents rather the maximum depth sounded. Depth ranged from 2-283 m with 80% of the lakes shallower than 50 m, 20% shallower than 10 m, and 10% deeper than 100 m.

Elevation

Lake elevation ranged from 300 to 1,500 m above sea level (Tables 4, 5 and 6). Most of the lakes (70%) were located between 600 and 900 m. Five lakes were situated above 1,000 m and three lakes at about 400 m.

Temperature

Temperature profiles are presented in Tables 7, 8 and 9. The temperature of the upper 4 m layer, which in most cases corresponds to the epilimnetic temperature, was used for comparison between lakes and only measurements made between 1 July and 31 August were used. The lowest epilimnetic temperatures (8-11 C) were generally recorded in lakes of higher elevation (>900 m) and in large, deep lakes between 700 and 900 m in elevation. The highest epilimnetic temperatures (16.0-18.5 C) were generally found in small lakes (<20 km^2, 6.6 km^2 on the average) situated below 700 m.

CHEMICAL LIMNOLOGY

Total dissolved solids (TDS)

TDS ranged from about 50 to 910 mg/L (Tables 10, 11 and 12); the frequency distribution is shown in Fig. 2. TDS values below 130 mg/L were found in the northern lakes in the unglaciated area (Barlow, Chapman, Davis, Hungry, Margaret), in some of the lakes tributary to the Stewart River, in the higher lakes of the Alsek and Teslin systems, and in the central group of lakes in the south (Fig. 3). There was a distinct belt of lakes with TDS values over 200 mg/L situated in the upper Yukon River valley (Braeburn, Chadburn, Twin, Frenchman, Fox, Tatchun, Tatlmain, Von Wilczek). Approximately 1,400 years ago a volcanic eruption in the mountains near the present Alaska-Yukon boundary spread ash over much of the Yukon Territory, and this deposited layer of volcanic ash is particularly thick in the region of these high-TDS lakes (see Fig. 3 and Bostock 1952). Mandanna Lake is also situated in this area of thick ash deposit and although TDS was not measured in this lake, the high calcium hardness value (256 mg/L) indicates that it also has high concentrations of dissolved solids. Of course, local climate and geology also play a role in determining the TDS content of lakes, and these factors probably account for the four lakes which have high TDS values but are outside the area of heavy ash deposit (Finlayson, Kathleen, Squanga, Wheeler).

Major ions, chlorophyll a, and Secchi disc transparency

The raw data for major ions, chlorophyll *a* and Secchi disc transparency are presented in Tables 10, 11 and 12, frequency distributions are shown in Fig. 2. The ionic composition of Yukon lakes followed the general pattern where Ca^{+2} was the most abundant cation followed by $Mg^{+2} > Na^+ > K^+$ (on a molar basis).

Oxygen content

Oxygen concentrations in the hypolimnion ranged from 0.3 to 12.0 mg/L, but in 65% of the lakes with thermal stratification more than 8 mg/L O_2 was found (Tables 7, 8 and 9). Twenty-five percent of the lakes (7 in number) had less than 5 mg/L O_2 in the hypolimnion. This hypolimnetic oxygen deficit was not always related to high lake productivity as only two of the seven lakes had epilimnetic chlorophyll *a* values over 2 μg/L.

GLACIOLOGICAL BACKGROUND

Over half of Yukon Territory was glacier-covered three or four times during the Pleistocene period (about the last one million years). The rest of Yukon Territory and a strip west of the Mackenzie River in Northwest Territories persisted as an ice-free refugium within which organisms could survive (unlike the rest of Canada which was almost all inundated with ice) (Fig. 4). Each glacial advance and retreat disrupted drainage patterns, dammed up temporary lakes, and allowed aquatic organisms temporary passage between what are now separate drainage basins.

The most recent of the Pleistocene glacial advances is referred to as the Wisconsin (= Late Wisconsin, or Classical Wisconsin) in the rest of North America and is probably equivalent to the McConnell and Kluane advances in southern Yukon Territory. One of the earlier advances (the Reid) was somewhat more extensive than the Wisconsin so that the margins of the area unglaciated in the Wisconsin contain old and weathered moraines of pre-Wisconsin age. Only the margins of the

Wisconsin glaciation, which lasted from about 50,000 to 10,000 years ago, are shown in Fig. 4.

Ice-advance into southern Yukon Territory was generally from the south, forming at its maximum a northern extension of the Cordilleran ice sheet which had coalesced mostly from mountains in British Columbia. The general directions of advance at the margins of Cordilleran ice are shown by open arrows in Fig. 4. A northwest limit of the Laurentide ice sheet which covered most of Canada east of the Rocky Mountains intruded westward slightly into the Peel River area along lines shown by hatched arrows in Fig. 4. Between the Cordilleran and Laurentide ice sheets there persisted a strip of unglaciated land probably extending from the upper Peel River southeast at least to Nahanni Park; little is known so far about the glacial and biological history of this area.

Ice retreat probably followed the reverse directions of ice advance. Ice remnants remaining on high ground about 9,500 years ago are shown hachured in Fig. 5. During ice retreat large channels were cut by meltwater, and in some places temporary lakes deposited silt on their bottoms and cut wave-washed shorelines which are still visible. Spectacular changes were brought about in some drainage systems.

The detailed post-glacial history of Yukon Territory drainage basins will be discussed below in relation to the present distribution of zooplankton and fish species. Geological inferences are based on the following sources, which should be consulted for detailed background material: Bostock 1948, 1952, 1966, 1969; Campbell 1967; Ford 1976; Gabrielse 1963; Green 1971; Hughes 1969, 1972; Hughes et al. 1969; Kindle 1953; Mulligan 1963; Prest 1969, 1970; Prest et al. 1968; Tempelman-Kluit 1974; Vernon and Hughes 1966; Wheeler 1961.

ZOOPLANKTON DISTRIBUTION AND ABUNDANCE

Thirty-two crustacean zooplankton species were found in the 70 Yukon lakes where plankton collections were made (Tables 13, 14 and 15). Twenty-three of these species can be considered as pelagic and nine as littoral species (Table 16). The systematics of the genus *Daphnia* presented the most difficulty. Out of seven species of *Daphnia* listed in this paper only three have been previously recorded in the Yukon by Brooks (1957): *D. longiremis*, *D. pulex*, and *D. middendorffiana*. Of the four remaining species *D. schoedleri* was found in two, and *D. galeata mendotae* in three lakes. The other two species could not be identified using Brooks' system and are described here as *D. galeata galeata* Sars and *D. longispina microcephala* Sars. A more detailed description is given by Patalas and Archibald (in prep.).

Cyclops scutifer was the most common species (Table 16) and was also usually a dominant species (contributing more than 10% to the total number of crustaceans). The next most common species, *Diaptomus pribilofensis*, was a dominant in 70% of the lakes. *Heterocope septentrionalis*, although occurring in 60% of the lakes, rarely contributed more than 1% to the total number of crustaceans, but its contribution to the biomass was much higher due to its large size. None of the remaining species occurred in more than 50% of the lakes. The most common cladocerans were *Daphnia longiremis*, *Eubosmina longispina*, and *Daphnia middendorffiana*. Although they rarely were numerical dominants, cladocerans, particularly *Daphnia*, were often important in terms of biomass.

The more common zooplankton species (*C. scutifer*, *D. pribilofensis*), were distributed over the whole of the Yukon Territory. *H. septentrionalis* was spread over most of the Yukon with the exception of lakes situated between Squanga and Twin Lakes. A conspicuous absence from the zooplankton fauna of Yukon lakes is *Limnocalanus macrurus*, a large calanoid common throughout much of central and eastern Canada. This species prefers cool, deep lakes and its absence from central and southern Yukon Territory cannot be explained by the lack of suitable habitat. *Limnocalanus* is a "glaciomarine relict" whose distribution in Canada is largely a function of the past distribution of proglacial lakes east of the Rocky Mountains (Dadswell 1974). These proglacial lakes were not confluent with proglacial lakes in the Yukon and so *Limnocalanus* has apparently had no opportunity to disperse into the Yukon. Also, since *Limnocalanus* usually inhabits deeper layers, it is not as readily dispersed as other zooplankton species living closer to the surface.

Senecella calanoides is another large calanoid that is considered to be a glacial "relict" species, although its origin and distribution in North America are not as well understood as for *Limnocalanus* (Carter 1969; Dadswell 1974). *Senecella* was found in four lakes in this study (Aishihik, Frederick, Pine, Kusawa), all located in the southwestern corner of Yukon Territory. The first three lakes are part of the Alsek River system, and Kusawa Lake was at one time connected with the Alsek system, through Glacial Lake Champagne (Kindle 1953; Fig. 5). These occurrences of *Senecella* greatly extend the known distribution since according to Wilson (1959) and Dadswell (1974) this species is known only from eastern Canada west to the Great Slave Lake area.

Acanthodiaptomus denticornis was found in only three lakes (Hungry, Von Wilczek, and Willow), all of them shallow and situated in unglaciated terrain. *A. denticornis* is one of the very few species of Diaptomidae that is found in both North America and Eurasia.

Cyclops bicuspidatus thomasi, probably the most widely distributed cyclopoid in North America, was found in only two lakes in the southern-most part of Yukon Territory (Little Teslin and Squanga).

The cladoceran community in Yukon lakes was correlated with the presence or absence of planktivorous fish (mainly *Coregonus sardinella* and the high gill-raker form of *C. clupeaformis*). *Daphnia longiremis* and bosminids were dominant in their presence; *Daphnia middendorffiana*, a much larger species, was dominant in their absence (Archibald 1977; Archibald and Patalas, in prep.).

The total number of crustaceans was compared separately within the group of lakes where the trap was used and within lakes where the Wisconsin net was used. The trap samples ranged from 10 to 160 ind/L (average of entire water column) with the most frequent values from 20-40 and from 60-80 ind/L. The net samples ranged from 1 to 239 ind/L with the most frequent values from 10-30 and from

40-60 ind/L. The trap and net results are similar given that the net is only 63% efficient relative to the trap.

The abundance of planktonic crustaceans in Yukon lakes compares well with the abundance found in the Canadian Great Lakes. Patalas (1975) found that the number of crustaceans was highly correlated with average epilimnetic temperature in midsummer: $N = 0.7e^{0.25t}$ where N = number of crustaceans per liter, assuming Wisconsin net is 100% efficient, and t = mean epilimnetic temperature (r = 0.96). The predicted values for the temperature range 12-18 C, the range in Yukon lakes, are from 14-63 ind/L which coincides with the most frequent values found in Yukon lakes.

GLACIAL HISTORY AND FISH DISTRIBUTIONS

Yukon Territory contains the following principal drainage basins (Fig. 1):

a. the Yukon River system is the largest with an extensive southern basin (south of 65 N) draining most of southwestern Yukon Territory into the main Yukon River, and a northern basin draining via the Porcupine River;

b. the Mackenzie River has two separate basins in Yukon Territory, the Liard River draining southeastern Yukon and the Peel River in the north;

c. the Alsek River system is a small but zoogeographically significant basin draining the southwestern corner of Yukon Territory into the Pacific Ocean, and

d. a small coastal strip north of the Porcupine River basin contains several short rivers draining into the Arctic Ocean (no lakes sampled from these systems).

The fish species found in lakes of the various drainage and subdrainage basins are shown in Tables 17, 18, 19 and 20.

The distribution patterns of some fish species in Yukon Territory conform to these major drainage basins, probably reflecting the direction of their postglacial entry to the region. The following is a discussion of the fish distributions in major drainage areas as related to post-glacial history.

Alsek and White River drainages

The Alsek basin has had a complex post-glacial drainage history, having at first been tributary to the Yukon River and later receiving, until recently, the outflow from Kluane Lake which is now tributary to White and Yukon Rivers. No parts of the Alsek basin were unglaciated (Fig. 4) but during deglaciation ice blocked the outlets to the Pacific Ocean (roughly 10,000 years ago) and a large lake, Glacial Lake Champagne, backed up to an elevation of 700-850 m (Kindle 1953). This glacial lake covered the present Kusawa (presently Takhini-Yukon system), Frederick, Kathleen, Rainbow, Pine and Dezadeash Lakes (Fig. 5). Glacial Lake Champagne drained into the Yukon River system, probably via Taye Lake (and/or Klusha Creek) to the Nordenskiold River valley (Fig. 5). With the recession of ice in the lower Alsek basin, drainage to the Pacific Ocean was established.

Most of the fish fauna of the Alsek basin was probably established during the Glacial Lake Champagne phase, by dispersal from the Yukon River basin. The Alsek system is one of the few Pacific drainages containing northern pike, round whitefish and arctic grayling, and their presence is testimony to an earlier connection to the Yukon River system. Also, lake whitefish in the Alsek River system have electrophoretic patterns characteristic of lake whitefish from the Yukon River basin (Franzin and Clayton 1977). There are, however, a number of notable exceptions between the fish faunas of the two areas. Four species (exclusive of Pacific salmon) are absent in the Alsek system but present in the Yukon basin: the inconnu, broad whitefish, least cisco and lake chub (Table 20). These species evidently did not enter Glacial Lake Champagne while it drained northward and cannot now cross the drainage divide.

Rainbow trout are present in the Alsek basin in Kathleen, Rainbow and Klukshu lakes (Table 17) and in Aishihik River below Otter Falls. Rainbow trout are absent from the Yukon basin (Table 20). Rainbow trout reportedly were planted in Aishihik River during construction of the Alaska Highway but they probably are native to the Alsek system. Kindle (1953) reported that rainbow trout were present in the Kathleen River between 1946 and 1950 and Wynne-Edwards (1947) reported "first class rainbow trout fishing" in the Dezadeash and Alsek Rivers in 1945. It is unlikely that artificial introductions in Aishihik River in 1943 or later could be the basis for these reports. The absence of rainbow trout from Aishihik Lake is probably due to the presence of falls along the Aishihik River, including Otter Falls, which may have always prevented fish from entering Aishihik Lake from the south.

Kluane Lake basin probably was covered completely by the maximum McConnell (Kluane) ice advance (Fig. 4). During ice recession, Kluane Lake may have been confluent with Glacial Lake Champagne. When Glacial Lake Champagne receded, Kluane Lake became tributary to the Alsek River via Slims River and Kaskawulsh River, and remained so until relatively recently. About four centuries ago the Kaskawulsh Glacier advanced so as to cut across the valley containing the outlet river from Kluane Lake, reversing the river's flow (Bostock 1969). Kluane Lake then rose rapidly from 12 m below to 9 m above its present level. An overflow began to spill to the northwest into the course of the present Kluane River and a channel was quickly cut down to the bedrock level now controlling the lake level (Bostock 1969). This headwater capture of the Kluane Lake basin by the Yukon (White) River apparently has not resulted in the transfer of any fish species from the Alsek basin which were not already present in the Yukon drainage (Tables 17, 20). Rainbow trout and kokanee apparently were not present in hypsithermal Lake Kluane and therefore were not introduced into the Yukon drainage. Kluane Lake does now support inconnu (reported by Wynne-Edwards 1947) (Table 17) and since this species is not present in the Alsek basin, it probably entered Kluane Lake after the reversal of its drainage.

Both Marshall and Moraine Lakes were covered by ice of the last glaciation but were above the level of Glacial Lake Champagne. Marshall Lake was close to the shore of Glacial Lake Champagne but was nearly 610 m higher. It presently contains no fish (Table 17) and its outlet has probably always been impassable to fish. An esker and ice marginal stream lie along the west side of Moraine Lake, and drainage at one time during ice retreat was evidently northward, probably along Nordenskiold River (Kindle 1953; Hughes et al. 1969).

All five species of Pacific salmon (genus *Oncorhynchus*) are found in the Alsek drainage basin (Table 17). The upper Alsek basin sustained anadromous Pacific salmon and steelhead runs until a few centuries ago (Kindle 1953; Lindsey 1975). These runs probably were ended at the time of the creation of Recent Lake Alsek. In about 1720 A.D. and again in about 1845 A.D., Lowell Glacier advanced across the lower Alsek, backing up the river to an elevation of about 683 m, covering Pine Lake (Kindle 1953). No sea-going salmon are now known from the upper Alsek system, but landlocked *Oncorhynchus nerka* (kokanee) exist in Frederick, Kathleen and Sockeye (near Kathleen) lakes (Table 17). Only an eastern tributary of the Alsek, the Tatshenshini, supports anadromous trout and salmon, and these fish run into the headwaters of the Tatshenshini into and near Klukshu Lake (Table 17). The headwaters of the creek now entering the north end of Klukshu Lake are separated from those of a creek flowing north to Dezadeash, thereby preventing the re-establishment of anadromous salmon runs directly from the Tatshenshini to the Dezadeash system.

An important consequence of the failure of *Coregonus sardinella* to become established in the Alsek basin apparently has been the survival of the rare high gill raker form of lake whitefish in Dezadeash Lake; high gill raker lake whitefish are only known in the absence of *C. sardinella*. This rare and interesting lake whitefish form will be discussed in detail in the Squanga drainage section.

The pygmy whitefish, *Prosopium coulteri*, also is native to the Alsek basin, being known from Kathleen and a nearby lake, Sockeye Lake (Wickstrom 1977; Wynne-Edwards 1947). Their racial affinities to other pygmy whitefish (Lindsey and Franzin 1972) have not been investigated.

Yukon River drainages

The distribution of fish species over the lakes of the Yukon River basin sampled in this study is relatively homogeneous (Tables 18 and 19). Two major exceptions to this, Diamain Lake and the Squanga Creek drainage system, will be discussed below. Part of the area of the present Yukon drainage basin was unglaciated during the Pleistocene (Fig. 4) and acted as a refugium for fish species (McPhail and Lindsey 1970; Franzin and Clayton 1977). No lakes in the Yukon system have been sampled which were completely unglaciated; lakes tend to be the creation of recent glaciation and few lakes exist outside of glacial limits. Barlow Lake was not covered by the latest glaciation (McConnell) or the earlier, more extensive Reid glacial advance, but is within the limits of pre-Reid glaciation(s) (Hughes et al. 1969). Seven other Yukon River system lakes sampled, namely, Crystal, Diamain, Ethel, Minto, Reid, Von Wilczek and Willow, were covered by the Reid glaciation but not by the McConnell advance. The fish fauna of these lakes, unglaciated by the McConnell advance, does not contain any unusual elements which are absent from lakes in the glaciated areas of the Yukon basin (Tables 18 and 19). That is, there is no evidence of a failure of any fish species which may have survived Wisconsin (McConnell) glaciation in the unglaciated portions of the Yukon basin sampled in this study to disperse into the recently glaciated region. In fact, a total of only seven fish species were collected in these recently unglaciated lakes: *C. clupeaformis*, *P. cylindraceum*, *T. arcticus*, *S. namaycush*, *E. lucius*, *L. lota* and *C. cognatus* (Tables 18 and 19). Other species, such as the Alaska blackfish *Dallia pectoralis* and the Arctic char *Salvelinus alpinus* apparently survived Wisconsin glaciation in unglaciated parts of Alaska and have not expanded their post-glacial ranges appreciably (McPhail and Lindsey 1970).

With local exceptions, there are no present major barriers to fish dispersal within the Yukon River basin. Fish dispersal during the recession of McConnell ice was probably enhanced by the existence of numerous local proglacial lakes and glacial meltwater channels which crossed present subdrainage divides (Fig. 5) (Wheeler 1961; Hughes et al. 1969; Kindle 1953; Green 1971; Campbell 1967; Mulligan 1963).

Glacial Lake Champagne, while covering mostly Alsek basin lakes, also filled the valley of the present Kusawa Lake (Kindle 1953) (Fig. 5). The least cisco must have reached Kusawa Lake after its connection with the Alsek basin was broken, as this species is absent from the whole Alsek River drainage (Tables 17 and 19). It has been suggested that glacial silts in the area of Chadburn Lake may be from a lake bed at one time continuous with Glacial Lake Champagne some 65 km to the west (Wheeler 1961) and this is consistent with the occurrence of pygmy whitefish *Prosopium coulteri* in Chadburn Lake and two lakes (Kathleen and Sockeye) in the Alsek River basin (Tables 17 and 19).

Diamain Lake is a sizeable lake apparently offering all the necessities to support fish, but to which fish have been denied access by the fact that the outlet enters Pelly River in the midst of a canyon containing 7 km of rapids. Possibly, Diamain Lake has persisted this way ever since Reid glaciation since it was not covered by the most recent McConnell advance. Alternatively, the lake may not have been in existence until dammed up by debris formed by an ice tongue during the more recent McConnell glaciation. The lack of fish apparently has allowed the unique responses by those plant and animal species which have gained access there. For example zooplankters (*Daphnia middendorffiana* and *Heterocope septentrionalis*) and gammarids from Diamain Lake are of an unusually large size. Irretrievable loss to science might result if anyone were to plant any kind of fish in Diamain Lake.

A number of species of fish apparently have been denied access to the Squanga Creek drainage system, notably *C. nasus*, *C. sardinella*, and *P. cylindraceum* (Tables 19 and 20). During deglaciation, a major meltwater channel flowed across the present Teenah and Squanga Lakes, across the present drainage divide of the Squanga Creek drainage system, and continued across the present McClintock and

Michie Lakes to enter the Yukon River near the present outlet of Marsh Lake (Fig. 5) (Mulligan 1963). Squanga Creek now flows over 55 m high falls, joining Teslin River just downstream of the outlet of Teslin Lake, but these falls may have been flooded during deglaciation when the Teslin River was backed up (Mulligan 1963). Apparently, the fish species absent from the Squanga drainage area were not able to gain access before the present Squanga Creek falls were established.

The unique high gill raker form of lake whitefish (*Coregonus clupeaformis* species complex) occurs in four lakes in the Squanga Creek system; Squanga, Little Squanga, Little Teslin and Teenah lakes. Its existence in the area is probably related to the absence of the least cisco *Coregonus sardinella* which it resembles in diet (Lindsey 1963; Bodaly 1979). High gill raker lake whitefish also are known from Dezadeash Lake in the Alsek basin from which the least cisco was excluded also. Bimodal gill raker counts of lake whitefish specimens taken from Hanson Lakes before poisoning suggest that high gill raker lake whitefish were present in this lake until recently (Bodaly 1979). The least cisco is apparently absent from the South McQuesten River system, including Hanson and McQuesten lakes, although no barriers to fish movements are known. Biochemical evidence suggests that the high gill raker lake whitefish of the Squanga area lakes and Dezadeash Lake are a monophyletic group. The high gill raker lake whitefish formerly present in Hanson Lakes were probably also members of this monophyletic group. This is consistent with the known deglaciation sequence of the southern Yukon. Dispersal of fish between Glacial Lake Champagne and the Squanga area was possible during deglaciation since Glacial Lake Champagne possibly extended as far east as Chadburn Lake and the Squanga Creek area drained via meltwater channels into the Yukon River near the outlet of Marsh Lake (Fig. 5). Direct connections also existed between Hanson Lakes and Squanga Creek via extensive meltwater channels between the two areas (Fig. 5). The possibility exists that high raker lake whitefish are present in the area of extensive meltwater channels between Lake Laberge and Tatlmain Lake. The possible occurrence of high gill raker lake whitefish, partly introgressed with the low raker form, in Tatchun Lake is suggested by recent work by K. Martin (pers. comm.).

Liard River basin

The Upper Liard River basin (above Liard Canyon) has a fish fauna with many elements in common with the Upper Yukon basin to which it is adjacent (Tables 17 and 20). Also, all the lake whitefish populations in the Upper Liard system which have been tested, namely, Frances, Watson (Franzin and Clayton 1977) and Wheeler (Bodaly, unpubl. data) lakes, show electrophoretic patterns characteristic of lake whitefish found in the Yukon River basin and not other parts of the Mackenzie basin. Movement of fish from Yukon drainages into the Upper Liard basin was possible during deglaciation while drainage around Finlayson Lake was into the Yukon system. While Frances Lake was still blocked by ice extending south from Selwyn Mountains about 10,000 years B.P., Finlayson probably drained westward (Fig. 5). A northwesterly flowing meltwater channel at one time discharged towards Finlayson Lake along its present outlet stream, and large channels exist along Fortin Creek to the north and down Pelly River valley to the west. All other lakes sampled in the upper Liard drained into the Liard system even during deglaciation but evidently also received their fish fauna from the Yukon basin.

A number of fish species presently found in the Upper Yukon River basin are absent in the Upper Liard basin and they evidently did not disperse into the Liard basin during deglaciation via Finlayson Lake and have been excluded since. These fish species include three species of Pacific salmon, the least cisco and the broad whitefish (Tables 17, 18, 19 and 20). Conversely, some species which invaded post-glacially from the south have penetrated the Liard basin, but are absent from the Yukon River. The farthest upstream record for about eight of these species in the Liard is in northern British Columbia below Hell Gate in the Liard Canyon, although the mountain whitefish *Prosopium williamsoni* has reached Dease Lake at the southwestern headwaters of the Liard (McPhail and Lindsey 1970).

Divide Lake, presently tributary to South Nahanni and Liard Rivers probably always has drained to the southeast towards the Mackenzie River, however, present upstream migration to Divide Lake from Liard River is impeded although not totally blocked by three canyons which cut across the unglaciated Funeral Range. The isozyme gene frequencies for lake whitefish from Divide Lake are unique (Franzin and Clayton 1977), perhaps reflecting the great elevation and headwater location of the lake. There is also an intriguing possibility of previously undetected aquatic refugia having persisted between the Cordilleran and Laurentide ice sheets (C. J. Foote, pers. comm.; Ford 1976).

Peel and Porcupine River basins

The Peel River has had a complex history of drainage reversals during Pleistocene glaciations. Extensive portions of the present Peel drainage basin remained unglaciated during the last ice advance, including Chapman, Dog, Hungry, Margaret, North Fork and Popcornfish lakes (Fig. 4). Peel River presently drains north-central Yukon emptying into the Mackenzie River at Mackenzie Delta and Porcupine River presently drains north-central Yukon, eventually joining the Yukon River inside Alaska. At least twice during the Pleistocene the Peel River has been diverted from the Mackenzie into the Yukon River system through Davis Lake (Bodaly and Lindsey 1977). Prior to the Pleistocene, the upper Porcupine River was tributary to the Mackenzie River via McDougall Pass. A pre-Reid glacial advance blocked the eastward flow of the Porcupine River, and a large lake backed up in the basins of the Eagle, Porcupine and Old Crow rivers (Fig. 5). This lake discharged into the Yukon River. Water also backed up in the Peel River basin due to the ice blockage of the lower Peel River and this lake drained through a major channel presently occupied by Davis Lake, into the glacial lake in the Porcupine basin (Fig. 5). The Porcupine River flowed to the west into the Yukon River. With Wisconsin (McConnell) glaciation, this pattern was repeated. Ice blocked the Peel River at the junction of the Peel and Snake Rivers and a proglacial lake backed up at least as far as the junction of the Blackstone and

Ogilvie Rivers. Drainage of this lake was again through Davis Lake. With the recession of Wisconsin ice, drainage of the Peel basin resumed to the Mackenzie delta, but the Porcupine River continued to flow into the Yukon River with the downcutting of the Ramparts Canyon.

The Peel River basin contains races of at least six species of fish which either dispersed into the area from the Yukon basin during periods when the Peel drainage was to the west or developed *in situ* in unglaciated areas of the Peel (Bodaly and Lindsey 1977). Margaret Lake contains the only known population of lake whitefish in the Peel basin within Yukon Territory. The isozyme characteristics of this population indicate that they are closely allied to the lake whitefish of the Yukon basin. Furthermore, the morphology of lake trout, pike and slimy sculpins from the Peel area shows that races of these species are also more similar to Yukon basin forms than other Mackenzie forms (Bodaly and Lindsey 1977). However, the Peel basin does not now have a high fish species diversity. A number of fish species present in the Yukon basin adjacent to Peel basin failed to disperse into the Peel while it was tributary to the Yukon, namely the inconnu, broad whitefish, least cisco, Dolly Varden and three *Oncorhynchus* species (Tables 17, 18, 19 and 20). Also at least 18 fish species are present in the Mackenzie delta area but have not dispersed appreciably up the Peel River into Yukon Territory (McPhail and Lindsey 1970; Bodaly and Lindsey 1977; Table 17).

Races of two other fish species, the pygmy whitefish and arctic grayling found in the Peel River also possess distinctive characteristics (Lindsey and Franzin 1972; McCart and Pepper 1971) and may have developed these distinctive characteristics in unglaciated parts of the Peel basin. Elliott Lake, presently tributary to the Hart River in the Peel basin, contains the only pygmy whitefish population in the Peel drainage area (Table 17). This lake was covered by ice of the last (McConnell) glaciation but there has been excellent opportunities for fish dispersal from unglaciated parts of the Peel basin. A glacier tongue projected northwest from the Selwyn lobe to fill the valley now occupied by Elliott Lake (Fig. 4). During ice recession this tongue retreated upslope, past the divide between the Peel and Yukon drainages and downslope into the Yukon River basin. A proglacial lake was impounded at the ice front and this lake discharged northwest into the Hart River. The proximity of Elliott Lake to the unglaciated portions of the Peel basin and the known sequence of events during ice retreat are consistent with the view that the somewhat distinctive form of the pygmy whitefish in this lake may have originated from a refugium within the Peel drainage (Lindsey and Franzin 1972). The arctic grayling of the Peel basin also may represent a stock which developed distinctive characteristics in unglaciated parts of the Peel drainage during the Pleistocene (Bodaly and Lindsey 1977).

Dog Lake is close to the Peel River canyon but is perched roughly 300 m above it. It lies about 10 km south of the maximum limit of the Wisconsin advances of Laurentide ice which moved south and west about to the junction of the Snake River and Peel River (Fig. 4). The level of the temporary lake which formed in the Peel basin was probably about the same as that of Dog Lake. The two may not have merged (no shore lines are known to suggest this), but access by fish was probably available between the two. The lake chub *Couesius plumbeus* evidently spread from the Mackenzie River to Yukon River but the time is unknown. The presence of lake chub in Dog Lake might suggest that they were present in the adjacent meltwater basin during maximum Wisconsin advance, and thereby gained access to the Yukon system. However, white suckers *Catostomus commersoni* are also in Dog Lake (Table 17); this species has not previously been found in the Peel River system in Yukon Territory. It is not present in the Yukon River system (Table 20) and therefore probably entered the lower Peel River and Dog Lake from the Mackenzie after the Davis Lake connection to the Yukon River was abandoned.

As noted above, Davis Lake occupies the floor of a large channel through which the lower Peel basin proglacial lakes discharged northward into the Eagle River and hence to the Yukon River (Fig. 5). The last discharge of Peel River waters through Davis Lake ceased before the Mackenzie River became ice-free, so fish in Davis Lake have either entered from Yukon River system through the northern lake outlet in recent times, or persisted there since the channel carried water from the Peel. At least three of the fish species present in Davis Lake, namely broad whitefish, least cisco and burbot, must have entered from the Yukon drainage since they are not now present in the Peel basin (Table 20). Lake whitefish in Davis Lake are Yukon-type, not Mackenzie-type, in allele frequencies of two isozymes (Bodaly and Lindsey 1977). In addition to the fish species listed for Davis Lake, four individuals were collected from the north lake which had total gill raker numbers of 27, 32, 34 and 35, higher than any *C. clupeaformis* collected. The mouths of these fish appeared intermediate between the subterminal mouth of *C. clupeaformis* and *C. nasus* and the terminal mouth of *C. sardinella* and they are suspected *C. clupeaformis* x *C. sardinella* or *C. nasus* x *C. sardinella* hybrids. Enzyme patterns for three enzyme systems examined were identical for lake whitefish, broad whitefish, least cisco and the suspected hybrids.

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Table 1. List of lakes sampled (A-K), their location, present drainage and associated comments. Names given are official names (Gazeteer of Canada 1976) unless otherwise noted (*). All lakes in Yukon unless otherwise indicated.

Lake name	Location (N latitude x W longitude)		Present Drainage	Comments
Aishihik	61° 25'	137° 07'	Drains south through Canyon L. to Aishihik R. to Dezadeash R. to Alsek R.	
Atlin	60° 00'	133° 50'	Drains west via Atlin R. into Tagish L. to Yukon R.	
Barlow	63° 45'	137° 43'	Drains via Slough Cr. to Stewart R. to Yukon R.	
Bennett	60° 06'	134° 52'	Outlet at east end via Nares L. to Marsh L. to Yukon R.	
Bonnet Plume	64° 18'	132° 00'	Drains northeast via 1.5 km stream to Bonnet Plume R. to Peel R.	
Braeburn	61° 27'	135° 48'	Expansion of Klusha Cr. tributary to Nordenskiold R. to Yukon R.	
Bruce	61° 49'	132° 06'	Drains via short stream to Pelly R. to Yukon R.	
Caribou	60° 32'	134° 16'	Tributary to northeast side Marsh L. to Yukon R.	Not Caribou lake at 60° 23'N, 130 43'W.
Chadburn	60° 39'	134° 57'	Map shows no surface drainage. Lies adjacent to Yukon R.	
Chapman	64° 51'	138° 21'	No surface outlet. Close to Blackstone R. (Peel R. drainage)	
Clark Lakes	64° 08'	134° 56'	Drain east via Scougale Creek to Beaver R. to Stewart R. to Yukon R.	East lake only sampled.
Crystal	63° 14'	136° 05'	Drains via Crystal Creek to Crooked Cr. to Stewart R. to Yukon R.	
Dalayee	60° 20'	133° 38'	Tributary via Seaforth and Squanga Creeks to Teslin R. to Yukon R.	
Daughney	60° 10'	130° 55'	Drains south into Rancheria R. to Liard R.	
Davis	66° 11'	136° 25'	Drain north via Eagle R. to Porcupine R.	Actually 2 lakes joined by a short river. North lake named Davis, south lake officially unnamed. These are the Palmer Lakes of Hughes (1972)
Dezadeash	60° 28'	136° 58'	Outlet tributary via Sixmile L. to Dezadeash R. and Alsek R.	
Diamain	62° 55'	136° 19'	Drains south by a 4 km stream to Pelly R. (in Granite Canyon) to Yukon R.	
Divide L., N.W.T.	62° 02'	128° 20'	Drains southeast via Flat R. to S. Nahanni R. to Liard R.	Known as Cache Lake prior to Gazetteer of Canada, 1968.
Dog	65° 54'	134° 13'	Drains via Solo Cr. to Peel R.	
Dragon	62° 35'	131° 30'	Drains via Riddell R. to S. Macmillan R. to Pelly R. to Yukon R.	
Dwarf*	60° 14'	133° 22'	Drains through Teenah L. to Squanga Cr. to Teslin R. to Yukon R.	Name derived from local rumor of very small lake whitefish in lake.
Elliott	64° 29'	135° 34'	Head of Elliott Cr. to Hart R. to Peel R.	
Ethel	63° 22'	136° 06'	Drains east via Ethel Cr. to Nogold Cr. to Stewart R. to Yukon R.	
Fairchild	64° 58'	133° 46'	Drains by 3 km stream to Bonnet Plume R. to Peel R.	
Finlayson	61° 41'	130° 38'	Drains via Finlayson R. to Frances L. to Frances R. to Liard R.	
Fish	60° 36'	135° 14'	Drains northwest via Jackson Cr. and Ibex R. to Takhini R. to Yukon R.	
Fox	61° 14'	135° 28'	Drains south via Richthofen Cr. to Lake Laberge and Yukon R.	Earlier called Richthofen Lake.
Frances	61° 23'	129° 30'	Drains south via Frances R. to Liard R.	
Frederick	60° 23'	136° 40'	Tributary via Kluhini R. to Dezadeash L. to Dezadeash R. to Alsek R.	
Frenchman	62° 10'	135° 50'	Drains into Tatchun R. to Yukon R.	
Gillespie	64° 44'	134° 00'	Drains via Gillespie Cr. to Bonnet Plume R. and Peel R.	
Halfway Lakes	63° 48'	135° 48'	Both lakes drain to Mud Cr. to Stewart R. to Yukon R.	Two lakes, one on either side of Mayo to Elsa road.
Hanson Lakes	64° 00'	135° 22'	Outlet creek joins S. McQuesten R. to Stewart R. to Yukon R.	Two lakes joined by short stream.
Hungry	65° 39'	136° 00'	Drains into Hungry Cr. to Wind R. to Peel R.	Not Hungry Lake at 60°59'N, 138° 10'W.
Jackfish*	61° 56'	132° 32'	Outlet at west end apparently drains to Lapie R. to Pelly R. to Yukon R.	Local name.
Janet	63° 40'	135° 30'	Drains south via Janet Cr. to Stewart R. and Yukon R.	
Jo-Jo	60° 34'	136° 21'	Drains south into Kusawa L. to Takhini R. to Yukon R.	
Kathleen Lakes	60° 33'	137° 23'	Drains via Kathleen R. through Rainbow L. to Dezadeash R. to Alsek R.	Two lakes joined by 1.5 km river. Upper lake also known as Louise Lake.
Kathleen Lakes	64° 14'	134° 11'	Drains east into Rackla R. to Beaver R. to Stewart R. to Yukon R.	Three lakes joined by a stream. Largest lake only sampled.
Kloo	60° 58'	137° 52'	Drains south via Jarvis and Kaskawulsh Rivers to Alsek R.	
Kluane	61° 15'	138° 45'	Drains northwest via Kluane R. to Donjek R. to White R. to Yukon R.	
Klukshu	60° 19'	136° 59'	Head of Klukshu (or Unahini) R. to Tatshenshini R. to Alsek R.	
Kookatsoon	60° 33'	134° 52'	Tributary to Cowley Cr. to Yukon R.	
Kusawa	60° 20'	136° 22'	Expansion to Takhini R. which drains to Yukon R.	

Table 2. List of lakes sampled (L-Z), their location, present drainage and associated comments. Names given are official names (Gazeteer of Canada 1976) unless otherwise noted (*). All lakes in Yukon unless otherwise indicated.

Lake name	Location (N latitude x W longitude)		Present Drainage	Comments
Laberge	61° 11'	135° 12'	Expansion of Yukon R.	
Ladue	64° 01'	135° 15'	Drains via Keno Ladue R. to Stewart R. to Yukon R.	
Little Atlin	60° 15'	133° 57'	Drains south via Lubbock R. to Atlin L. to Atlin R. to Tagish L. to Yukon R.	
Little Salmon	62° 11'	134° 40'	Drains via Little Salmon R. to Yukon R.	
Little Teslin	60° 29'	133° 24'	No surface outlet. Within Squanga Cr. (Teslin-Yukon) drainage.	
Long*	60° 44'	135° 02'	No surface outlet. Within upper Yukon (Lewes) drainage.	
Lower Snafu*	60° 06'	133° 42'	Expansion of Snafu Cr., tributary to Lubbock R., Atlin L (which see).	Not Snafu Lake at 60° 11'N, 133° 26'W.
Mandanna	61° 55'	135° 47'	Drains north via Mandanna Cr. to Yukon R.	
Margaret	65° 21'	134° 30'	No surface outlet. Lies adjacent to Bonnet Plume R. (Peel).	
Marsh	60° 25'	134° 18'	Head of upper Yukon R. (Lewes).	
Marshall*	60° 57'	137° 16'	Drains south to Marshall Cr. to Dezadeash R. to Alsek R.	
Mayo	63° 43'	135° 04'	Drains via Mayo R. to Stewart R. to Yukon R.	
McClintock	60° 35'	133° 55'	Drains northwest through short creek to Fox L., to Michie Cr. to McClintock R. to Marsh L. (upper Yukon R.)	Not McClintock Lakes on upper McClintock River.
McQuesten	64° 07'	135° 19'	Head of S. McQuesten R. which flows to Stewart R. to Yukon R.	
Michie	60° 41'	134° 10'	Drains via Michie Cr. and McClintock R. to Marsh L. (upper Yukon R.).	
Minto	63° 41'	136° 10'	Drains via Minto Cr. to Mayo R. to Stewart R. to Yukon R.	
Moraine	60° 57'	136° 45'	Drains into Cracker Cr. to Dezadeash R. to Alsek R.	
Morley	60° 00'	132° 05'	Enlargement of Morley R. which drains into Teslin L. to Teslin R. to Yukon R.	Lake straddles B.C./Yukon border.
Nares	60° 10'	134° 39'	Discharges into Tagish L. to Marsh L. to Yukon R.	
North Fork*	64° 38'	138° 23'	Drains via short creek to E. Blackstone R. to Peel R.	
Palmer L.,B.C.	59° 26'	133° 35'	No surface outlet. Adjacent to Atlin L. (upper Yukon system).	
Pine	60° 49'	137° 27'	Drains via Pine Cr. to Dezadeash R. to Alsek R.	
Pinguicula	64° 41'	133° 24'	Drains west via Pinguicula Cr. to Bonnet Plume R. to Peel R.	
Popcornfish	65° 28'	133° 47'	Drains northwest via east fork Noisy Cr. to Bonnet Plume R. to Peel R.	Name derived from reports of a "popcorn fish" with warts covering its head. Also called Crooked Lake.
Quiet	61° 05'	133° 05'	Tributary via Big Salmon R. to Yukon R.	
Rainbow	60° 39'	137° 15'	Expansion of Kathleen R. to Dezadeash R. to Alsek R.	
Reid Lakes	63° 26'	137° 13'	Discharge northwest to Stewart R. to Yukon R.	Largest lake only sampled.
Simpson	60° 44'	129° 15'	Drains south via short stream to Frances R. to Liard R.	
Smart L.,B.C.*	59° 57'	131° 46'	No surface drainage. Adjacent to Smart R. (Teslin-Yukon system).	
Snafu	60° 11'	133° 26'	Drains via Snafu Creek to Atlin L. and Yukon R.	
Squanga	60° 29'	133° 38'	Tributary via Squanga Creek to Teslin R. to Yukon R.	
Sulphur	60° 57'	137° 58'	No surface outlet. Within White R. (Yukon) drainage.	
Summit	60° 26'	133° 39'	Tributary to Squanga L. to Squanga Cr. to Teslin R. to Yukon R.	
Swan L., B.C.	59° 53'	131° 24'	Enlargement of Swift R. which flows west to Teslin R. to Yukon R.	
Tagish	60° 10'	134° 20'	Drains north to Marsh L. to upper Yukon (Lewes) R.	Straddles B.C./Yukon border.
Tarfu	60° 03'	133° 43'	Enlargement of Tarfu Cr. which drains to Lubbock R. to Atlin L. to Yukon R.	
Tatchun	62° 17'	136° 08'	Drains by Tatchun R. to Yukon R.	
Tatlmain	62° 37'	135° 59'	Drains via Mica Cr. to Pelly R. to Yukon R.	
Taye	60° 56'	136° 21'	Drains via Mendenhall R. to Takhini R. to Yukon R.	
Teenah	60° 18'	133° 25'	Drains via Teenah Cr. and Seaforth Cr. to Squanga Cr. to Teslin (Yukon) R.	Also known locally as Wolf Lake.
Teslin	60° 15'	132° 57'	Drains north via Teslin R. to Yukon R.	Straddles B.C./Yukon border.
Twin Lakes	61° 42'	135° 57'	Expansion of Klusha Cr., tributary to Nordenskiold R. to Yukon R.	Formerly called Emerald Lake.
Von Wilczek Lakes	62° 42'	136° 42'	North lake has no surface outlet. South Lake drains to Von Wilczek Cr. to Yukon River.	Only north lake sampled.
Watson	60° 06'	128° 49'	Drains to Liard R.	
Wheeler L.,B.C.*	59° 41'	129° 10'	Drains south to Dease R. below Dease Canyon and hence to Liard R.	Local name.
Willow	63° 11'	136° 47'	Head of Willow Cr. tributary to Pelly R. to Yukon R.	
Wolf	60° 39'	131° 40'	Drains into Wolf R. to Teslin L. to Teslin R. to Yukon R.	

Table 3. List of scientific and common names of fish species referred to in text.

Scientific Name	Common Name
Stenodus leucichthys (Pallas)	inconnu
Coregonus clupeaformis (Mitchill)	humpback whitefish complex
Coregonus nasus (Pallas)	broad whitefish
Coregonus sardinella Valenciennes	least cisco
Prosopium cylindraceum (Pallas)	round whitefish
Prosopium coulteri (Eigenmann and Eigenmann)	pygmy whitefish
Prosopium williamsoni (Girard)	mountain whitefish
Thymallus arcticus (Pallas)	arctic grayling
Salvelinus namaycush (Walbaum)	lake trout
Salvelinus alpinus (Linnaeus)	arctic char
Salvelinus malma (Walbaum)	Dolly Varden
Salmo gairdneri Richardson	rainbow trout, steelhead trout
Oncorhynchus nerka (Walbaum)	sockeye salmon; kokanee
Oncorhynchus kisutch (Walbaum)	coho salmon
Oncorhynchus tshawytscha (Walbaum)	chinook salmon
Oncorhynchus keta (Walbaum)	chum salmon
Oncorhynchus gorbuscha (Walbaum)	pink salmon
Esox lucius Linnaeus	northern pike
Couesius plumbeus (Agassiz)	lake chub
Catostomus commersoni (Lacépède)	white sucker
Catostomus catostomus (Forster)	longnose sucker
Lota lota (Linnaeus)	burbot
Cottus cognatus Richardson	slimy sculpin

Table 4. Elevation, surface area, length, width, and maximum known depth for lakes of the Alsek, Liard, Peel and Porcupine River drainage systems.

Drainage	Subdrainage	Lake	Elevation (m)	Surface Area (km^2)	Length (km)	Width (km)	Maximum known depth (m)	Comments
Alsek	Dezadeash	Aishihik	915	151.0	54.2		120	Mean depth 33 m. Narrow and deep except for extreme ends which are quite shallow. Contour map available (Dept. Fisheries, Whitehorse, Y.T.). Shore line length approximately 140 km.
		Dezadeash	702	77.2	20.	9.7	7.6	Extensive soundings over whole lake.
		Frederick	703-762	4.95	9.	0.7	24.5	Depth 3.5 km from west end was 24.5 m; 1.5 km from west end: 13.7 m; 0.5 km from west end: 1.8 m.
		Kathleen (Upper)	736	5.38	5.5	1.4	110	Upper Kathleen drains by 1.5 km river to Lower Kathleen. Contour map of both lakes is available (Walker et al. 1973: 32)
		(Lower)	734.5	33.8	11.	8.		
		Kloo	860	12.8			12	
		Marshall	~1430	0.44	1.8	0.5	2.1	
		Moraine	910-1070	4.2	7		32	
		Pine	610-760	4.3	5.5	0.8	27	See Archibald (1977) for approximate bathymetric map and Kindle (1953) for discussion of marl beds at west end of lake.
		Rainbow	610-735	1.44			2	
	Tatshanshini	Klukshu	<700	1.25	5	0.5	5.5	Spot soundings near south end only.
Liard	Dease	Wheeler	610-760	2.8			30	Extensive shallow areas in lake.
	Flat	Divide	~1040	0.2	1.4	0.2	10.4	
	Frances	Finlayson	946	19.9	14.5	2.2	11.3	Spot soundings at east end of lake only.
		Frances	774	106.1	37	2.4	18	Spot soundings at centre of west arm only.
		Simpson	610-760	20.5	11	2	55	
	Rancheria	Daughney	915-1065	4.8	6		27	
	Watson	Watson	680	14.3	8	2.9	19.8	Spot soundings off south east shore only.
Peel	Blackstone	Chapman	915-1065	1.31	2.0	1.3	12	Most of lake is under 3 m with trenches along northwest shore and southeast bay.
		North Fork	1067-1220	0.16	0.9	0.8	3.6	
	Bonnet Plume	Bonnet Plume	1067-1121	3.7			12	
		Fairchild	610-760	1.69	4.0	0.8	4.5	
		Gillespie	~1370	0.63	2.8	0.5	22.3	
		Margaret	490	4.5	5	1.5	26	
		Pinguicula	914	1.13	3.2	0.5	12.2	Spot soundings off northwest shore only.
		Popcornfish	~760	0.56	2.2	0.2	12.2	
	Dog	Dog	300-460	0.81	1.9	0.6		Lake not sounded.
	Hart	Elliott	915-1065	1.13	1.9	0.8	22	
	Wind	Hungry	305-460	6.6	8		4	
Porcupine	Eagle	Davis (north)	305-460	2.8	2.5		23.	
		(south)	305-460		2.5		27.	

Table 5. Elevation, surface area, length, width, and maximum known depth for lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon and Little Salmon subdrainages of the Yukon River drainage system.

Drainage	Subdrainage	Lake	Elevation (m)	Surface Area (km^2)	Length (km)	Width (km)	Maximum known depth (m)	Comments
Yukon	Atlin	Atlin	668	588.7	102.5	3-8	283	Mean depth 85.6 m. See Withler (1956) for contour map.
		Little Atlin	686	39.8	21.	3.2	14	Extensive mud shallows over southern half of lake.
		Lower Snafu	771	3.5	5.2	1.3	37	See Archibald (1977) for sounding transects.
		Palmer	670-760	1.0	1.6	0.8	13.7	
		Snafu	878	4.7	9.	1.	29.	
		Tarfu	760	3.3	4.		33.	
	Lewes	Bennett	656	80.2	40.	3.7	120.	Contour map of west arm available (Dept. Fisheries, Whitehorse, Y.T.)
		Caribou	760-910	0.44	1.5	0.5		
		Chadburn	<700	1.8	4.5	1.1	42.5	See Walker et al. (1973:18) for contour map.
		Fox	760-910	15.9	17.	1.3	75.	See Brown et al. (1976) and Archibald (1977) for sounding transects.
		Kookatsoon	<762	0.18	0.8			
		Laberge	628	213.6	58.1	6.4		
		Long	<700	0.39	1.3		17.	See Walker et al. (1973:34) for contour map.
		Marsh	656	94.5	29.	3.7	53	Contour map available (Dept. Fisheries, Whitehorse, Y.T.)
		McClintock	790-825	1.8	2.8	1.3	22.	Southern third of lake shallow.
		Michie	742	2.75	4.3	1.6	>30	
		Nares	656	5.3	5.0	2.6	15	Contour map available (Dept. Fisheries, Whitehorse, Y.T.)
		Tagish	656	340.8	95.4	3.	214	Contour map available (Dept. Fisheries, Whitehorse, Y.T.). See also Withler (1956).
		Von Wilczek (N)	460-610	3.2	2.4	1.6	3.7	
		(S)	460-610	2.5				
	Mandanna	Mandanna	<610	6.0	5.	1.2	38	
	Nordenskiold	Braeburn	<760	6.0	6.2	1.9	36.5	
		Twin	610-760	1.5	2.3	1.8	51.	See Walker et al. (1973:49) for contour map.
	Pelly	Bruce	760-910	2.5	4.4		35	
		Diamain	460-610	18.8	10	2	25	See Archibald (1977) for approximate bathymetric map.
		Dragon	760-910	7.3	16	0.6	10	Spot soundings at south end only.
		Jackfish	760-910	1.7			17	
		Tatlmain	558	33.2	12	1.0	40	
		Willow	760-910	1.9	3.5	0.8	1.8	
	Big Salmon	Quiet	802	53.0	32	3.2	>100 m	
	Little Salmon	Little Salmon	608	62.6	33	1.6	96.	

Table 6. Elevation, surface area, length, width, and maximum known depth for lakes of the Stewart, Takhini, Tatchun, Teslin, and White subdrainages of the Yukon River drainage system.

Drainage	Subdrainage	Lake	Elevation (m)	Surface Area (km^2)	Length (km)	Width (km)	Maximum known depth (m)	Comments
Yukon	Stewart	Barlow	610-760	0.9	1.2	0.7	5.5	
		Clark	610-760	3.0			23	
		Crystal	760-915	1.77	2.5	0.8		
		Ethel	764	41.0	19	2.5	45	
		Halfway (W)	<760		1.5		4.7	
		(E)	<760		1.5		4.2	
		Hanson (N)	<760	1.0				
		(S)	<760	3.2	5.0	0.8	33	See Walker et al. (1973) for contour map.
		Janet	572	17.2	11	2	103	
		Kathleen	610-760	4.5			60	
		Ladue	<760	2.4			24	
		Mayo	671	94.9	35.4	3.2		Elevation given prior to outlet dam construction.
		McQuesten	<760	13.0	13	2	8	Spot soundings at south end of lake only.
		Minto	610-760	4.3	3.7	1.3	33	See Archibald (1977) for approximate bathymetric map.
		Reid	460-610	14.8	5.6	3.5	15.5	
	Takhini	Fish	1114	13.6	10.5	1.8	9.0	
		Jo-Jo	888	6.6	12	<1.0	52	
		Kusawa	671	142.7	57	2.5	16.8	Spot soundings at north end of lake only.
		Taye	610-760	8.1	7	1	3	
	Tatchun	Frenchman	460-610	14.1	18	1.6	39	
		Tatchun	460-610	6.6	10.5	1.0	53	
	Teslin (Squanga)	Dalayee	970	11.1	10.3	1.6	46	Spot soundings near southwest end only.
		Dwarf	760-910	0.5			18	
		Little Teslin	790	3.2	3.2	1.2	20	Half of surface area <10 m deep.
		Squanga	790	11.1	8.8	1.2	40	Extensive shallows, 21% of lake area less than 3 m.
		Summit	838	1.6	3.2	0.5	13	
		Teenah	855-885	2.5	3.9	0.8	19.2	
	Teslin (rest)	Morley	760-910	13.2			34	
		Smart	760-910	1.4	1.3		6	
		Swan	841	8.9	7	1.4	65	See Archibald (1977) for approximate bathymetric map.
		Teslin	683	355	108	3.0	214	Mean depth 59 m. See Clemens et al. (1968) for bathymetric map.
		Wolf	991	74.4	22	6	66	
	White	Kluane	781	409.5	74	8	82	
		Sulphur	760-910	1.5	2.8	0.6	2	

Table 7. Temperature (temp) (°C) and oxygen (mg/l) profiles for lakes of the Alsek, Liard, Peel, and Porcupine River drainage systems. Depth (m) of each measurement given in brackets following measurement. Depths rounded to nearest m (0-30 m) or to nearest 2 m (>30 m). Asterisks denote measurements taken at lake bottom.

Drainage	Subdrainage	Lake	Date	Parameter														
Alsek	Dezadeash	Aishihik[1]	1972															
		Dezadeash	11 Aug 70	temp	11.5(0)	11.5*(2)												
			1974[2]															
		Frederick[3]	12 Aug 74	temp	13.3(0)	13.3(2)	13.1(4)	12.6(6)	12.2(7)	11.9(8)	11.2(9)	11.0*(10)						
		Kathleen	no data															
		Kloo	12 Jul 75	temp	18.8(0)	17.3(1)	16.5(3)	15.5(4)	13.3(6)	13.0(8)	12.8(9)	12.7(11)						
				oxygen	9.15(0)	9.2(3)	8.7(6)	8.1(9)										
		Marshall	24 Jul 74	temp	8.0(0)													
		Moraine	16 Jul 75	temp	14.0(0)	13.9(4)	13.3(6)	12.0(8)	10.8(9)	10.4(11)	10.2(12)	10.0(14)	9.7(17)	9.5(20)	9.3(23)	8.7*(28)		
				oxygen	9.8(0)	9.9(6)	10.4(10)	10.2(20)										
		Pine	12 Jun 75	temp	10.6(0)	9.7(3)	9.6(4)	9.2(6)	7.1(12)	6.6(16)	6.0(20)							
				oxygen	11.7(0)	11.2(5)	11.0(10)	10.8(15)										
			27 Jul 75	temp	16.5(0)	16.2(2)	15.9(5)	15.5(7)	13.6(8)	11.5(9)	11.0(10)	10.3(11)	9.3(13)	8.5(15)	7.7(19)	7.0(23)	6.9*(26)	
				oxygen	10.8(0)	11.4(9)	10.0(18)	8.8*(26)										
			31 Aug 75	temp	14.2(0)	13.8(1)	13.6(9)	12.8(10)	12.0(11)	11.1(12)	10.1(13)	9.8(14)	8.8(16)	7.7(18)	7.2(20)	6.8(25)		
				oxygen	11.0(0)	10.9(6)	10.7(12)	9.0(20)	8.1(26)									
		Rainbow	26 Aug 73	temp	9.0(0)													
	Tatshenshini	Klukshu[4]	25 Aug 73	temp	10.8(0)													
Liard	Dease	Wheeler	19 Aug 75	temp	17.4(0)	16.9(2)	16.6(4)	15.6(5)	15.2(6)	14.7(7)	14.1(8)	13.0(9)	11.4(10)	10.3(11)	9.7(12)	8.7(15)	7.2(19)	6.7(29)
				oxygen	7.6(0)	8.8(11)	6.3(20)	4.6(29)										
	Flat	Divide	6 Aug 70	temp	13.5(0)	13.4(3)	12.5(4)	12.1(5)	11.7(6)	11.0(7)	9.0(8)	8.0(9)	6.9(10)					
	Frances	Finlayson	4 Aug 70	temp	14.3(0)	14.3(5)	14.2(6)	13.9(8)	13.3(9)	11.7(10)	9.1*(11)							
		Frances[5]	5 Aug 70	temp	16.5(0)	15.8(2)	15.5(3)	15.2(5)	14.2(6)	13.6(7)	12.3(8)	11.7(9)	10.5(12)	9.9(13)	8.9(15)	7.0(16)	6.5*(18)	
		Simpson	18 Aug 75	temp	16.7(0)	16.6(5)	16.1(7)	15.8(9)	15.5(11)	12.2(12)	11.5(13)	10.3(14)	9.4(15)	9.0(16)	8.0(20)	7.1(26)	6.8(34)	
				oxygen	9.8(0)	11.4(15)	10.4(30)											
	Rancheria	Daughney	17 Aug 75	temp	14.0(0)	13.7(4)	12.5(6)	12.0(7)	11.6(8)	11.3(10)	10.9(12)	9.1(14)	7.4(16)	7.0(18)	6.8(20)			
				oxygen	9.7(1)	9.2(10)	9.1(14)	8.4(20)										
	Watson	Watson	7 Aug 70	temp	17.4(0)	17.4(5)	17.3(8)	16.6(9)	14.7(10)	13.4(11)	12.3(12)	11.2(13)	9.6(15)	8.5(17)	8.0(18)	7.7*(20)		
Peel	Blackstone	Chapman	18 Jul 70	temp	14.5(0)	14.5(4)	14.2(5)	12.4(6)	8.5(7)	7.3(8)	6.7(9)	6.5(10)	5.9*(11)					
		North Fork	19 Jul 70	temp	11.9(0)	11.9(2)												
	Bonnet Plume	Bonnet Plume	21 Jul 74	temp	10.5(0)	10.5(6)	10.0(9)	9.0(11)	7.5*(12)									
		Fairchild	no data															
		Gillespie	18 Jul 74	temp	7.0(0)	6.9(2)	6.6(5)	6.2(6)	5.4(12)	5.0(17)	4.0*(22)							
		Margaret	3 Aug 75	temp	15.0(0)	15.0(2)	14.9(3)	14.5(4)	13.0(5)	11.6(6)	9.3(7)	7.6(8)	7.2(9)	7.0(10)	6.5(12)	6.1(16)	5.9(20)	
		Pinguicula	20 Jul 74	temp	11.1(0)	9.9(5)	9.0(6)	7.7(8)	6.0(9)	4.8*(14)								
		Popcornfish	no data															
	Dog	Dog	no data															
	Hart	Elliott	13 Jul 70	temp	12.7(0)	12.7(3)	11.0(4)	8.3(5)	6.6(6)	6.0(7)	5.6(8)	5.2(9)	5.0(14)	4.9(18)	4.8*(22)			
	Wind	Hungry	5 Aug 75	temp	15.3(0)	15.3(1)	13.3(2)	13.2(3)	13.1(4)									
Porcupine	Eagle	Davis (N)	6 Aug 75	temp	13.9(0)	13.7(4)	13.4(6)	8.3(7)	6.6(8)	6.2(9)	5.9(10)	5.3(14)	4.9(18)	4.7(21)				
		(S)	9 Aug 75	temp	13.0(0)	12.7(4)	12.6(5)	11.8(6)	10.2(7)	8.6(8)	7.4(9)	6.8(10)	6.4(12)	5.9(14)	5.3(20)			

1 Average summer epilimnetic temperature 10.7°C in northern region and 8.4°C in southern region; oxygen concentrations above 90% saturation throughout water column (Kussat 1973).

2 Surface temp reached a high for the summer on August 14 (16.0°C); the difference between surface and bottom (4.5 m) temp never exceeded 2.5°C and was more usually 0 to 0.5°C.

3 Station 1.5 km from west end.

4 Station near south end.

5 Station in centre of west arm.

Table 8. Temperature (temp) (°C) and oxygen (mg/l) profiles for lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon, and Little Salmon subdrainages of the Yukon River drainage system. Depth (m) of each measurement given in brackets following measurement. Depths rounded to nearest m (0-30 m), to nearest 2 m (32-40 m) or to nearest 5 m (>40 m). Asterisks denote measurements taken at lake bottom.

Drainage	Subdrainage	Lake	Date	Parameter													
Yukon	Atlin	Atlin	30 Jul 70	temp	9.9(0)	9.8(4)	9.8(6)	9.7(9)	9.7(12)	9.7(17)	(See also Withler 1956)						
		Little Atlin	9 Jul 70	temp	13.4(0)	12.9(2)	12.8(3)	12.7(5)	12.5(8)	12.5(9)	12.3(11)	11.8*(14)					
		Lower Snafu	10 Jul 70	temp	12.7(0)	12.7(5)	12.7(7)	12.6(8)	12.2*(9)								
			14 Jun 75	temp	10.8(0)	10.5(4)	10.3(6)	6.9(8)	5.2(9)	5.0(11)	4.5(16)	4.1(22)	4.0(27)				
				oxygen	10.6(0)	10.6(6)	9.6(10)	8.6(17)	8.1(25)								
			29 Jul 75	temp	14.9(0)	14.8(5)	14.5(6)	13.2(7)	10.3(8)	8.3(9)	6.7(10)	6.2(11)	5.5(13)	5.1(15)	4.6(19)	4.3(25)	
				oxygen	10.4(0)	11.0(9)	7.8(18)	7.2(25)									
			3 Sep 75	temp	12.5(0)	12.5(5)	12.5(9)	8.0(10)	6.8(11)	6.4(12)	5.9(13)	5.5(15)	4.6(27)				
				oxygen	11.0(0)	10.9(7)	9.2(13)	6.8(20)	5.6(26)								
		Palmer	30 Jul 70	temp	16.5(0)	16.5(2)	16.0(5)	15.2(6)	13.8*(7)								
		Snafu	20 Jul 75	temp	14.2(0)	14.2(4)	14.1(6)	13.2(8)	12.2(9)	9.9(11)	9.1(12)	8.2(14)	7.8(17)				
				oxygen	10.4(0)	10.2(7)	8.0(17)										
		Tarfu	13 Aug 75	temp	15.0(0)	14.8(2)	14.2(4)	14.0(7)	13.6(8)	13.0(9)	11.8(10)	8.9(11)	7.5(12)	6.8(13)	6.2(15)	5.7(20)	5.1(30)
				oxygen	10.6(0)	10.2(10)	8.4(15)	6.8(25)									
	Lewes	Bennett	no data														
		Caribou	no data														
		Chadburn	14 Aug 70	temp	Epilimnion of about 13 C extending to about 12 m; sharp temperature decrease between 12 and 15 m.												
		Fox	29 Jul 70	temp	13.8(0)	13.2(3)	12.9(6)	11.6(9)	10.9(12)	10.3(13)	9.0(14)	7.9(15)	6.1(20)	5.3(24)	5.1(30)	4.7*(38)	
			22 Jun 75	temp	6.7(0)	6.7(4)	6.4(6)	5.8(8)	5.6(9)	5.2(16)	4.9(22)	4.4(32)	4.0(40)				
				oxygen	12.4(0)	12.4(10)	12.0(25)	11.6(40)									
			1 Aug 75	temp	13.1(0)	12.8(3)	12.4(6)	12.0(9)	11.6(10)	9.9(11)	9.0(12)	8.4(13)	7.5(15)	6.5(18)	6.2(21)	5.4(26)	
				oxygen	11.6(0)	11.3(10)	12.4(15)	11.9(30)	11.4(40)								
			3 Sep 75	temp	11.8(0)	11.7(8)	11.5(15)	10.6(16)	8.1(17)	7.4(18)	7.1(19)	6.7(20)	5.7(25)	5.0(30)	4.5(40)		
				oxygen	10.7(0)	10.7(12)	10.9(25)	10.1(45)									
		Kookatsoon	no data														
		Laberge	no data														
		Long	29 Jun 63	temp	6.7(16)												
				oxygen	10.1(0)	10.0(1)	10.1(6)	11.1(10)	11.5(11)	0.3(15)							
		Marsh	8 Jul 70	temp	12.0(0)	12.0(5)	12.0*(10)	(Station at NW end of lake)									
		McClintock	8 Jul 70	temp	13.5(0)	13.5(3)	13.0(4)	12.5(5)	8.5(6)	7.5(7)	6.0(8)	5.5(11)	5.0(20)				
		Michie	31 May 60	temp	9.2(0)	9.0(2)	7.9(4)	7.0(5)	6.2(6)	5.0(11)	(Data from Dept. Fisheries, Pacific Region)						
		Nares	31 Jul 70	temp	11.4(0)	10.8(2)	10.6(3)	10.4(5)	10.2(6)	9.9(8)	(Station 2 km E of Carcross)						
		Tagish	16 Aug 55	temp	8.3(0)	5.3*(60)	(From Withler 1956)										
			26 Aug 55	temp	10.6(0)	4.7(60)	(Temp gradient steepest between 23 and 46 m - from Withler 1956)										
		Von Wilczek	15 Jul 70	temp	17.5(0)	17.3(1)	17.2(2)	16.7(3)	14.8*(4)								
			8 Sep 75	temp	11.3(0)												
	Mandanna	Mandanna	9 Aug 78	temp	18.3(0)	17.6(2)	17.2(3)	17.2(6)	17.1(8)	13.9(9)	11.4(11)	10.6(12)	8.9(14)	8.6(15)	7.8(18)	7.4(21)	7.2(38)
	Nordenskiold	Braeburn	7 Jul 57	temp	13.9(0)	8.3(1)	5.3(5)	5.0(6)	4.4(9)	4.2*(28)							
			28 Jul 70	temp	16.7(0)	16.0(5)	13.1(9)	7.6(15)	7.4(18)	5.7(24)	5.5*(34)						
		Twin	4 Jun 57	temp	14.4(0)	10.0(1)	8.9(2)	8.3(3)	7.2(5)	5.6(6)	5.0(9)	4.4(12)	3.9(15)				
	Pelly	Bruce	24 Aug 75	temp	16.4(0)	15.5(2)	15.4(5)	11.5(6)	9.6(7)	7.8(8)	6.8(9)	6.2(10)	5.8(11)	4.7(15)	4.4(25)	4.3(34)	
				oxygen	9.6(0)	5.6(10)	3.3(21)	0.4(32)									
		Diamain	14 Jul 70	temp	10.6(0)	10.6(6)	10.5(9)	10.4(13)	10.3*(14)								
			19 Jun 75	temp	12.2(0)	11.9(6)	11.4(9)	11.0(11)	10.6(12)	9.2(14)	8.2(15)	7.4(17)	6.2(18)	5.6(20)	5.0(23)		
				oxygen	13.1(0)	13.0(3)	13.1(7)	13.6(15)	13.5(23)								
			5 Aug 75	temp	15.3(0)	14.8(3)	14.0(9)	13.7(11)	12.1(12)	8.8(14)	7.5(15)	7.1(17)	6.0(20)	5.3(23)			
				oxygen	11.2(0)	11.4(14)	11.2(20)	11.0(24)									
			6 Sep 75	temp	12.4(0)	12.4(10)	12.1(16)	11.4(17)	8.9(18)	7.6(19)	7.0(20)	6.1(25)					
				oxygen	13.1(0)	13.0(12)	12.7(18)	11.0(24)									
		Dragon	3 Aug 70	temp	16.0(0)	15.9(2)	15.8(3)	14.9(4)	12.9(5)	11.2(6)	10.5(7)	9.0(8)	7.1(9)	6.9*(10)			
		Jackfish	23 Aug 75	temp	16.0(0)	16.0(3)	15.9(5)	15.7(7)	13.1(8)	10.8(9)	9.0(10)	8.0(11)	7.0(12)	6.0(13)	5.6(14)	5.4(15)	
				oxygen	11.0(0)	11.0(6)	8.0(11)	2.7(14)									
		Tatlmain	7 Sep 75	temp	12.5(0)	12.5(12)	10.1(13)	8.6(14)	7.3(15)	6.7(16)	5.2(20)	4.7(25)	4.2(34)	4.2*(40)			
				oxygen	12.7(0)	12.8(10)	8.8(20)	7.8(30)	5.1(38)								
		Willow	no data														
	Big Salmon	Quiet	2 Aug 70	temp	12.3(0)	12.0(5)	11.9(9)	11.7(15)	11.6(18)	8.9(19)	6.0(20)	5.8(21)	4.9(30)	4.7*(38)			
	Little Salmon	Little Salmon	22 Aug 75	temp	13.1(0)	13.1(2)	12.3(3)	11.6(4)	10.8(5)	10.5(6)	9.5(8)	8.4(10)	6.0(14)	5.0(18)	4.5(25)	4.4(30)	
				oxygen	11.9(0)	12.2(15)	13.8(30)	14.0(50)									

Table 9. Temperature (temp) (^{o}C) and oxygen (mg/l) profiles for lakes of the Stewart, Takhini, Tatchun, Teslin, and White subdrainages of the Yukon River drainage system. Depth (m) of each measurement given in brackets following measurement. Depths rounded to nearest m (0-30 m), to nearest 2 m (32-40 m) and to nearest 5 m (>40 m). Asterisks denote measurements taken at lake bottom.

Drainage	Subdrainage	Lake	Date	Parameter														
Yukon	Stewart	Barlow	20 Jul 70	temp	16.0(0)	16.0(2)	15.9(3)	15.8(4)	15.8(5)	15.7*(6)								
		Clark	6 Jul 75	temp	17.6(0)	17.6(1)	15.1(3)	12.4(5)	9.5(7)	7.1(9)	5.3(11)	5.0(13)	4.0(20)					
				oxygen	10.2(0)	10.5(5)	9.3(9)	8.9(13)	8.0(20)									
		Crystal	no data															
		Ethel	14 Jul 70	temp	9.4(0)	9.4(1)	8.8(3)	8.5(5)	8.1(6)	7.7(7)	7.2(9)	6.9(11)	5.4(15)	5.0*(22) (station at west end of lake).				
		Halfway (W)	2 Jul 75	temp	17.5(0)	11.0*(5)	(from Walker et al. 1973)											
		(E)	8 Aug 75	temp	16.0(0)													
		Hanson	11 Jun 60	temp	13.4(0)	13.3(1)	13.0(2)	12.8(4)	11.5(5)	9.8(6)	8.4(7)	7.8(8)	6.9(10)					
		(S)	12 Jul 70	temp	16.4(0)	16.0(5)	15.0(6)	10.8(7)	9.8(8)	8.8(9)	8.2(11)							
		(S)	7 Aug 75	temp	16.5(0)													
		(N)	1 Jul 75	temp	19.2(0)	17.2(4)	10.0(7)	5.5(10)										
		Janet	4 Jul 75	temp	19.0(0)	18.7(3)	18.6(4)	18.1(6)	17.6(7)	12.9(9)	8.9(11)	7.9(12)	7.3(14)	6.6(16)	6.2(19)	5.4(22)	4.9(25)	4.6(28)
				oxygen	10.6(0)	10.6(7)	11.2(11)	10.6(30)										
		Kathleen	7 Jul 75	temp	19.8(0)	17.3(1)	15.5(3)	10.3(4)	5.9(6)	5.1(8)	4.8(11)	4.4(14)	4.0(18)					
				oxygen	9.3(1)	9.1(5)	7.9(10)	6.8(30)										
		Ladue	5 Jul 75	temp	18.5(0)	18.5(2)	15.0(3)	11.6(4)	7.6(6)	7.0(8)	6.7*(9)							
				oxygen	9.4(0)	9.2(5)	8.7(9)											
		Mayo	24 Jul 70	temp	14.6(0)	14.6(2)	12.9(5)	11.8(6)	11.1(8)	10.7(9)	10.4(11)	9.9(14)	9.1(17)	8.6(21)	7.7(27)	7.3(34)	7.2(36)	7.1(45)
		McQuesten	13 Jul 70	temp	15.8(0)	15.7(2)	15.4(3)	14.9(4)	14.0(5)	13.4*(6)								
		Minto	20 Jul 70	temp	16.0(0)	15.7(3)	14.7(5)	11.4(6)	10.1(7)	8.5(8)	7.9(9)	7.3(11)	6.2(15)	5.5(21)	5.4(27)			
			17 Jun 75	temp	13.0(0)	9.0(3)	7.3(4)	6.9(6)	6.3(7)	5.5(9)	5.3(11)	4.7(15)	4.1(19)	3.8(22)				
				oxygen	12.0(0)	12.0(5)	11.7(10)	11.6(15)	11.2(20)									
			3 Aug 75	temp	15.5(0)	15.4(5)	14.3(6)	9.6(8)	7.6(9)	7.0(11)	6.2(12)	5.2(15)	4.7(18)	4.1(23)				
				oxygen	9.0(0)	9.1(8)	8.8(15)	8.4(22)										
			5 Sep 75	temp	11.7(0)	11.7(5)	11.0(6)	10.0(7)	7.2(8)	6.1(9)	5.8(10)	4.5(15)	4.1(22)					
				oxygen	10.5(0)	9.8(11)	9.3(16)	8.2(21)										
		Reid	21 Jul 70	temp	17.0(0)	16.0(1)	15.4(3)	15.4(6)	15.2(9)	15.1(10)	13.4(11)	10.6(12)	10.2(13)					
	Takhini	Fish	9 Aug 70	temp	13.1(0)	13.1(3)	13.0(6)	13.0(8)	12.8(9)									
		Jo-Jo	15 Jul 75	temp	10.6(0)	10.6(1)	10.4(3)	10.1(4)	8.1(6)	7.8(8)	7.7(9)	7.3(11)	7.1(14)	6.9(17)	6.7(20)	6.4(28)		
				oxygen	10.7(0)	11.0(6)	11.0(15)	11.0(30)										
		Kusawa	10 Aug 70	temp	15.6(0)	15.6(3)	15.6(6)	15.5(9)	15.4(14)	15.3(15)	15.1*(17)							
		Taye	17 Jul 75	temp	17.7(0)	17.7(1)	17.3(3)											
				oxygen	10.6(0)	10.4(1)	10.6(2)											
	Tatchun	Frenchman	21 Aug 75	temp	16.0(0)	15.8(6)	15.7(8)	13.4(9)	10.9(10)	9.3(11)	8.4(12)	7.6(13)	7.2(14)	6.7(16)	5.8(20)	5.4(25)	5.3(30)	
				oxygen	10.4(0)	11.8(10)	6.5(20)	4.8(30)										
		Tatchun	25 Jul 70	temp	15.8(0)	15.3(1)	14.3(3)	13.6(4)	12.1(5)	9.9(6)	8.8(8)	7.5(9)	6.7(11)	5.2(15)	4.8(21)	4.7*(26)		
			21 Jun 75	temp	13.2(0)	12.6(3)	8.0(4)	6.4(6)	5.5(9)	5.2(12)	4.6(15)	4.4(19)						
	Teslin (Squanga)	Dalayee	11 Jul 70	temp	7.8(0)	7.8(6)	7.5(9)	7.2(12)	7.0(23)									
		Dwarf	21 Jul 75	temp	14.6(0)	14.6(3)	13.5(4)	9.3(6)	8.5(7)	7.8(9)	7.2(11)	7.0(14)						
		Little Teslin	16 Aug 70	temp	13.0(0)	13.0(3)	13.0(10)	12.0(12)	11.5*(15)									
			26 Jun 75	temp	12.4(0)	12.4(4)	12.4(6)	11.2(7)	9.8(9)	9.2(11)	8.6(14)	8.5*(16)						
				oxygen	11.3(0)	10.8(5)	10.4(10)	8.4(15)										
			27 Aug 75	temp	14.2(0)	14.2(3)	14.0(5)	13.9(7)	12.6(8)	11.6(9)	11.0(10)	10.1(11)	9.4(12)	9.0(13)	8.7(14)	8.5*(17)		
				oxygen	11.3(0)	11.3(5)	7.7(10)	1.5(17)										
		Squanga	8 Jun 60	temp	9.4(0)	9.4(3)	8.6(6)	4.7(12)	4.7*(26)									
			16 Aug 70	temp	13.0(0)	13.0(2)	12.8(5)	12.7(7)	12.2(9)	12.0(10)	11.0(11)	8.5(12)	8.0(13)					
		Summit	28 Jun 75	temp	14.1(0)	12.9(1)	12.7(4)	12.5(6)	11.7(7)	9.4(9)	8.3(11)							
				oxygen	10.4(0)	10.2(5)	9.5(8)	7.4(11)										
		Teenah	9 Jul 70	temp	12.0(0)	11.9(2)	11.9(5)	11.5(7)	10.0(8)	7.7(9)	6.5(12)	6.2(15)	6.9*(19)					
	Teslin (rest)	Morley	14 Aug 75	temp	15.7(0)	13.3(2)	12.5(4)	12.1(6)	11.3(8)	10.9(10)	10.4(12)	10.2(14)	9.5(16)	8.4(18)	8.0(20)	7.5(25)	7.4(28)	
				oxygen	10.3(0)	9.7(10)	8.6(20)	8.1(28)										
		Smart	15 Aug 75	temp	16.1(0)	16.1(2)	15.4(3)	13.8(4)	13.6(5)	13.4*(6)								
				oxygen	11.2(0)	9.4(5)												
		Swan	25 Jun 75	temp	11.5(0)	9.0(1)	8.5(7)	8.2(9)	7.0(11)	7.0(15)	6.6(19)	5.8(20)	5.6(23)	4.9(28)	4.7(34)			
				oxygen	11.5(0)	11.4(10)	11.4(25)											
			30 Jul 75	temp	12.6(0)	12.3(2)	12.2(7)	12.1(11)	11.2(12)	10.8(13)	10.7(14)	10.3(16)	9.5(20)	6.3(25)	5.0(34)			
				oxygen	10.4(0)	10.2(15)	10.4(25)	10.4(45)										
			10 Sep 75	temp	10.2(0)	9.9(5)	9.8(9)	9.7(18)	9.3(23)	8.6(30)	6.3(34)	5.2(40)						
				oxygen	10.6(0)	10.7(20)	9.5(50)											
		Teslin	1944	temp/oxygen	See Clemens et al. (1968)													
		Wolf	22 Jul 75	temp	12.2(0)	12.2(4)	11.5(6)	11.0(7)	9.8(9)	9.6(11)	9.0(12)	8.5(14)	7.3(17)	6.9(19)	6.7(20)	6.6(22)	6.4(25)	5.9(28)
				oxygen	11.0(0)	11.4(10)	11.6(20)											
	White	Kluane	11 Aug 70	temp	12.5(0)	12.5*(5)	(station between Burwash Landing and Sandspit Point; 1975 station (below) offshore at Alaksa Hwy. Mile 1066.5).											
			11 Jul 75	temp	10.6(0)	9.4(1)	9.3(3)	9.0(4)	8.1(6)	8.0(9)	7.9(11)	7.7(14)	6.9(17)	5.8(20)	5.6(23)	5.6(28)		
		Sulphur	no data															

Table 10. Water chemistry of lakes of the Alsek, Liard, Peel, and Porcupine River drainage systems. See Sources and Methods for further information.

Drainage	Subdrainage	Lake	Date	Secchi transp. (m)	Chl a (µg/l)	pH	TDS (mg/l)	Conductivity (µS/cm)	Hardness (mg $CaCO_3$ per l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO_4 (mg/l)	Cl (mg/l)	Si (mg/l)
Alsek	Dezadeash	Aishihik[1]	13 Aug 73	8.5		7.5		120	68	19.7	2.4	2.8	1.5	4.0	1.4	2.7
		Dezadeash[2]	11 Aug 70	>2.5		8.0	100	120	62	19.7	2.4	2.2	1.2	8.0	1.5	1.55
			1974	0.6-4.0												
			26 Jul 75		1.34		90			16.3	2.19	2.12	1.08	6.0	1.0	1.87
		Frederick[3]	12 Aug 74	6.1		7.0-7.5			<17							
		Kathleen	no data													
		Kloo	12 Jul 75	2.4	1.08		110			21.9	2.27	2.52	1.82	6.8	0.6	2.4
		Marshall	24 Jul 74	>2.1		7.0-7.5			<17							
		Moraine	16 Jul 75	6.1	0.74		80			14.1	11.3	1.80	1.53	4.8	1.0	2.41
		Pine	12 Jun 75	6.7												
			27 Jul 75	9.8	0.48		185			35.2	15.7	4.11	2.80	10.7	0.6	3.07
			31 Aug 75	12.8												
		Rainbow	26 Aug 73			9.5-10.0			136							
	Tatshenshini	Klukshu[4]	25 Aug 73			9.5			360							
Liard	Dease	Wheeler	19 Aug 75	3.3	1.30		280			52.3	30.2	3.53	1.60	32.0	<0.2	4.99
	Flat	Divide	6 Aug 70	8.0		8.0			205							
	Frances	Finlayson	4 Aug 70	7.5		8.0-8.5	230	290	171	38.1	14.7	2.2	1.2	34.0	1.6	3.68
		Frances[5]	5 Aug 70	4.0		8.0	140	190	120	30.4	7.0	1.7	0.5	15.0	2.0	2.24
		Simpson	18 Aug 75	9.8	0.2		190			37.1	11.9	3.39	1.15	8.4	0.4	3.32
	Rancheria	Daughney	17 Aug 75	5.8	0.4		60			6.94	1.14	1.27	0.24	2.2	0.4	2.74
	Watson	Watson	7 Aug 70	7.0		8.0	140	200	137	33.0	6.7	1.7	0.7	4.0	0.9	3.4
Peel	Blackstone	Chapman	18 Jul 70	4.5		7.5	60	60	51	7.3	3.1	1.4	0.6	9.0	1.6	0.12
		North Fork	19 Jul 70	>2.1		8.0			120							
	Bonnet Plume	Bonnet Plume	21 Jul 74	8.3		9.5			137							
		Fairchild	no data													
		Gillespie	18 Jul 74	11.3		9.5			85							
		Margaret	3 Aug 75	2.4	1.66		60			10.6	3.75	0.52	0.38	6.8	1.8	0.6
		Pinguicula	20 Jul 74	10.0		9.5			308							
		Popcornfish	no data													
	Dog	Dog	no data													
	Hart	Elliott	13 Jul 70	5.8		8.0	140	210	154	29.9	11.4	0.4	0.5	11.0	1.4	35.5
	Wind	Hungry	5 Aug 75	0.9	7.31		70			4.82	1.05	1.69	0.26	10.2	1.4	0.89
Porcupine	Eagle	Davis (N)[6]	6 Aug 75	1.2	1.92		80			9.82	2.44	2.0	0.85	25.5	<0.2	1.45
		(S)[6]	9 Aug 75	0.7	1.47		80			7.0	1.98	2.06	0.67	18.6	0.4	1.46

1 Station near south end. See also Kussat (1973).

2 1974 O_2 levels high throughout water column.

3 Station 1.5 km from west end.

4 Station near south end.

5 Station in centre of west arm.

6 Water muddy.

Table 11. Water chemistry of lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon, and Little Salmon subdrainages of the Yukon River drainage system. See Sources and Methods for further information.

Drainage	Subdrainage	Lake	Date	Secchi transp. (m)	Chl a (µg/l)	pH	TDS (mg/l)	Conductivity (µS/cm)	Hardness (mg $CaCO_3$ per l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO_4 (mg/l)	Cl (mg/l)	Si (mg/l)
Yukon	Atlin	Atlin[1]	30 Jul 70	10.0		7.5	81	109	68	12.2	3.2	2.1	0.92	6.0	0.5	
		Little Atlin	9 Jul 70	8.0			170	260		34.4	15.1	4.1	1.5	12.0	2.6	2.84
		Lower Snafu	10 Jul 70	4.2			190	270		34.4	16.6	4.1	2.1	27.0	1.8	3.28
			14 Jun 75	3.6												
			29 Jul 75	3.6	1.21		195			42.7	13.0	4.5	1.42	21.4	<0.2	3.27
			3 Sep 75	6.6												
		Palmer	30 Jul 70	4.5		8.0	150	200	120	30.5	8.2	1.5	1.3	5.0	1.6	3.9
		Snafu	20 Jul 70	3.7	5.0		160			34.3	11.2	4.08	1.34	14.8	<0.2	3.77
		Tarfu	13 Aug 75	5.2	1.0		160			33.8	12.6	4.32	1.63	13.6	0.6	3.71
	Lewes	Bennett[2]	13 Jun 57	8.0			65									
		Caribou	no data													
		Chadburn	14 Aug 70	>11.0		9.0	910		684	19.7	202.0	46.2	11.2	316.0	<0.5	0.61
		Fox	29 Jul 70	11.5		8.0	243	369	222	34.2	20.6	9.2	2.5	37.0	<0.2	
			22 Jun 75	5.8												
			1 Aug 75	8.2	0.68		265			42.2	21.1	9.0	1.69	31.5	4.9	2.24
			3 Sep 75	8.5												
		Kookatsoon	no data													
		Laberge	no data													
		Long	19 Jul 60	6.7												
		Marsh[3]	8 Jul 70	5.0			60	90		13.0	2.1	1.9	0.6	6.0	2.6	1.32
		McClintock	8 Jul 70	4.6		8.0	100	220	170	31.7	10.9	2.2	0.9	6.0	1.5	4.5
		Michie	no data													
		Nares[4]	31 Jul 70	1.5		7.5	100	90	33	11.9	2.7	2.0	0.8	7.0	1.6	2.28
		Tagish[5]	1955	1.0-6.1			75									
		Von Wilczek	15 Jul 70				290	340		34.6	27.4	4.0	3.3	38.0	2.6	2.24
			8 Sep 75	0.9	17.0		290			24.2	21.2	4.43	3.23	30.4	1.2	5.65
	Mandanna	Mandanna	9 Aug 78						256							
	Nordenskiold	Braeburn	7 Jul 57	4.0			250									
			28 Jul 70	9.0		8.0	236	348	239	38.7	14.5	7.4	2.8	24.0	<0.2	
		Twin	4 Jun 57	4.0			257									
	Pelly	Bruce	24 Aug 75	4.0	2.3		170			21.9	11.5	5.74	1.67	16.6	4.0	0.22
		Diamain	14 Jul 70	7.6		7.5	110	140	85	18.3	6.1	2.0	1.63	19.0	1.7	3.38
			19 Jun 75	6.1												
			5 Aug 75	7.3	0.69		115			20.3	6.68	2.8	1.32	10.0	0.4	3.37
			6 Sep 75	5.5												
		Dragon	3 Aug 70	4.5		8.0	170	180	120	29.0	6.7	2.5	0.7	7.0	2.0	2.74
		Jackfish	23 Aug 75		1.3		450			75.4	33.8	4.88	2.0	199.0	<0.2	2.17
		Tatlmain[6]	7 Sep 75	2.7	3.1		200			44.4	11.8	4.39	2.68	15.8	1.0	1.50
		Willow	14 Jul 70	0.8		>10.0	110	120	85	18.1	3.2	3.1	0.2	3.0	1.8	3.4
	Big Salmon	Quiet	2 Aug 70	9.5		7.5	80	80	44	10.5	2.9	2.0	0.7	4.0	1.6	2.82
	Little Salmon	Little Salmon	22 Aug 75	6.4	0.6		150			31.5	9.81	1.78	0.88	17.6	0.4	2.92

1 See also Withler (1956).

2 Results from Dept. of Fisheries, Pacific Region.

3 Station at NW end of lake.

4 Station 2 km E of Carcross; water slightly milky.

5 From Withler (1956).

6 Station in centre of bend in southern part of lake.

Table 12. Water chemistry of lakes of the Stewart, Takhini, Tatchun, Teslin, and White subdrainages of the Yukon River drainage system. See Sources and Methods for further information.

Drainage	Subdrainage	Lake	Date	Secchi transp. (m)	Chl a (μg/l)	pH	TDS (mg/l)	Conductivity (μS/cm)	Hardness (mg $CaCO_3$ per l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO_4 (mg/l)	Cl (mg/l)	Si (mg/l)
Yukon	Stewart	Barlow	20 Jul 70	1.0		8.0	60	60	51.3	5.9	1.2	1.2	1.6	16.0	2.0	0.48
		Clark	6 Jul 75	4.0	0.26		110			20.8	6.12	1.24	0.11	16.0	1.0	1.44
		Crystal	no data													
		Ethel[1]	14 Jul 70	6.0			90	100		14.9	3.5	2.7	0.8	17.0	2.4	0.67
		Halfway (E)	8 Aug 75	>4.2						24.8	8.54	0.49	0.58			0.64
		Hanson	11 Jun 60[2]	6.5			226									
		(S)	12 Jul 70	13.0			160	230		26.6	13.1	3.4	1.1	28.0	3.0	2.92
		(S)	7 Aug 75	5.8						33.8	11.1	3.51	0.98			1.70
		Janet	4 Jul 75	4.0	0.7		140			31.5	5.91	1.40	0.58	15.6	0.6	2.01
		Kathleen	7 Jul 75	4.6	0.38		200			33.8	16.6	1.59	0.45	20.8	1.4	1.81
		Ladue	5 Jul 75	3.0	0.72		120			21.9	6.79	1.36	0.29	29.5	<0.2	1.70
		Mayo	24 Jul 70	5.6		7.5	112	156	85	19.2	4.6	1.9	0.8	15.0	0.5	
		McQuesten	13 Jul 70	3.3			160	240		32.7	9.2	0.9	0.3	27.0	1.4	1.36
		Minto	20 Jul 70	5.0		8.0	130	200	120	29.3	7.7	1.9	0.6	13.0	1.8	2.16
			17 Jun 75	3.2												
			3 Aug 75	5.4	1.32		145			29.0	8.02	1.84	0.58	11.8	0.2	2.14
			5 Sep 75	4.9												
		Reid	21 Jul 70	4.0		8.5	160	240	171	31.8	12.3	5.1	2.2	5.0	2.8	0.44
	Takhini	Fish	9 Aug 70	8.0		7.5		140	85	21.6	3.7	2.8	1.0	7.0	1.1	3.58
		Jo-Jo	15 Jul 75	7.0	0.36		40			5.19	1.93	1.81	1.03	2.2	1.0	2.7
		Kusawa[3]	10 Aug 70	6.5		7.0	40	40	15	4.8		0.9	0.8	3.0	1.5	1.44
		Taye	17 Jul 75	2.1	2.38		120			23.6	3.49	2.44	1.38	8.0	0.6	3.14
	Tatchun	Frenchman	21 Aug 75	6.7	0.7		340			43.3	11.0	16.3	3.96	75.0	3.2	2.12
		Tatchun[4]	25 Jul 70	5.0		8.0-8.5	221	276	205	36.7	13.8	6.1	2.5	23.0	0.6	
			21 Jun 75	1.8												
	Teslin (Squanga)	Dalayee	11 Jul 70	9.8		8.0	150	220	137	35.8	7.8	1.9	1.0	11.0	1.2	2.82
		Dwarf	21 Jul 75	2.4	5.96		110			23.6	7.68	2.69	0.83	10.4	0.4	4.09
		Little Teslin	16 Aug 70	4.0			150	200	137	34.6	11.4	1.4	2.4	3.0	1.5	1.42
			26 Jun 75	4.6	1.33		150			25.9	11.7	2.1	1.61	3.8	0.6	2.18
			27 Aug 75	5.5	1.90		170			23.6	12.1	2.02	1.52	3.6	<0.2	1.89
		Squanga	8 Jun 60	4.0			243									
			16 Aug 70			8.0	160	260	137	30.2	19.8	2.6	2.1	11.0	1.1	2.23
		Summit	28 Jun 75	3.4	3.62		130			19.2	13.4	1.21	0.85	5.0	1.0	4.5
		Teenah	9 Jul 70	4.3		8.0	150	200	154	30.2	8.2	2.1	1.8	10.0	1.4	3.24
	Teslin (rest)	Morley	14 Aug 75	4.0	0.8		70			13.4	2.86	1.32	0.43	3.6	0.4	2.85
		Smart	15 Aug 75	2.0	2.6		80			12.6	3.41	1.48	0.51	2.8	0.6	2.46
		Swan	29 Jun 75	3.8												
			30 Jul 75	5.4	1.0		50			7.75	1.6	1.08	0.36	2.2	0.5	2.78
			10 Sep 75	6.0												
		Teslin[5]	1944			7.5-8.1										
		Wolf[6]	22 Jul 75	6.1	1.2		80			16.3	3.19	1.50	0.71	4.6	0.6	2.89
	White	Kluane	11 Aug 70[7]	>4.2		7.5	160	200	120	33.5	8.5	2.3	2.6	37.0	1.6	1.44
			11 Jul 75[8]	3.4	0.13		180			31.5	9.08	2.88	2.38	35.5	4.0	1.43
		Sulphur	11 Jul 75	>2.0												

1 Station at west end of lake.

2 From Walker et al. (1973).

3 Water slightly milky.

4 Water tea-coloured.

5 See Clemens et al. (1968).

6 Station slightly west of lake centre.

7 Station between Burwash Landing and Sandspit Point.

8 Station offshore at Alaska Hwy Mile 1066.5. Water turbid.

Table 13 (first part). Absolute abundance of crustaceans, rotifers, and total zooplankton (crustaceans plus rotifers) for lakes of the Alsek, Liard, Peel and Porcupine River drainage systems. Zones sampled are epilimnion (e), hypolimnion (h), and entire water column (wc); wet weight per unit area (mg/cm^2) is always expressed for the entire water column. See second part of table (below) for relative abundance of crustacean species by lake.

Drainage	Subdrainage	Lake	Date	Sampling gear	Depth (m) of total vertical haul with net	Zone sampled	No. crustaceans/cm^2	No. crustaceans/l	No. rotifers/l	Total zooplankton (mg/l)	Total zooplankton (mg/cm^2)	Comments
Alsek	Dezadeash	Aishihik	13 Aug 70	net	12	wc	6.0	5.0				See also Kussat (1973).
		Dezadeash	11 Aug 70	net	0	surface						One minute surface tow.
			26 Jul 75	trap		wc		41.4	183	2.6	1.3	
		Frederick	13 Aug 74	net	22.5	wc	26.0	12.0				
		Kathleen	no data									
		Kloo	12 Jul 75	trap		e		45.0	311	3.07	2.17	
						h		81.5	86.8	1.26		
		Marshall	24 Jul 74	net								Adult phyllopods (*Polyartemiella hazeni* Murdoch) taken in surface tow.
		Moraine	16 Jul 75	trap		e		56.9	42.9	1.49	3.68	
						h		100	31.2	1.23		
		Pine	12 Jun 75	trap		e		80.8	165	2.21	4.00	
						h		111	48.0	1.67		
			27 Jul 75	trap		e		60.3	35.2	2.23	6.67	
						h		150	6.8	3.06		
			31 Aug 75	trap		e		84.4	153	2.71	6.93	
						h		204	119	3.78		
		Rainbow	no data									
	Tatshenshini	Klukshu	no data									
Liard	Dease	Wheeler	19 Aug 75	trap		e		39.6	182	2.03	5.85	
						h		95.5	105	1.91		
	Flat	Divide	no data									
	Frances	Finlayson	4 Aug 70	net	7	wc	8.0	11.0				
		Frances	5 Aug 70	net	15	wc	20.0	13.0				Station in centre of west arm.
		Simpson	no data									
	Rancheria	Daughney	no data									
	Watson	Watson	7 Aug 70	net	15	wc	41	27.4				
Peel	Blackstone	Chapman	18 Jul 70	net	11	wc	30.6	27.8				
		North Fork	19 Jul 70	net	3	wc	21.3	71				
	Bonnet Plume	Bonnet Plume	21 Jul 74	net	12	wc	15.4	18.5				
		Fairchild	no data									
		Gillespie	18 Jul 74	net	21	wc	15.0	7.0				Sample also contained 3 individuals of *Polyartemiella* sp. and 20 *Chaoborus* larvae.
		Margaret	3 Aug 75	net	20	wc		24.3	15.0	0.81	1.62	
		Pinguicula	20 Jul 74	net	12	wc	29.4	24.5				
		Popcornfish	no data									
	Dog	Dog	no data									
	Hart	Elliott	13 Jul 70	net	22	wc	58.0	26.0				
	Wind	Hungry	5 Aug 75	net	4	wc		106	163	2.23	0.89	
Porcupine	Eagle	Davis (N)	6 Aug 75	net	21	wc		26.0	25.8	0.55	1.15	
		(S)	9 Aug 75	net	19.5	wc		51.2	26.3	0.82	1.63	

Table 13 (second part). Relative abundance (% by number) of crustacean plankton for lakes of the Alsek, Liard, Peel, and Porcupine River drainage systems. See first part of table (above) for sampling gear, depth of total vertical haul with net, and for absolute abundance of crustaceans, rotifers, and total zooplankton. The following zooplankton species, not recorded from these lakes but recorded from other Yukon lakes sampled (see Tables 14 and 15), are omitted from this table: <u>Cyclops bicuspidatus thomasi</u>, <u>C. navus</u>, <u>Eucyclops agilis</u>, <u>Macrocyclops albidus</u>, <u>Daphnia galeata mendotae</u>, <u>D. schoedleri</u>, <u>Ceriodaphnia affinis</u>, <u>Scapholeberis kingi</u>, <u>Sida crystallina</u>, <u>Alona affinis</u>, <u>Camptocercus rectirostris</u> and <u>Leydigia quadrangularis</u>.

Drainage	Subdrainage	Lake	Date	Zone sampled	Cyclops scutifer	Cyclops capillatus	Eucyclops speratus	Diaptomus pribilofensis	Diaptomus sicilis	Acanthodiaptomus denticornis	Heterocope septentrionalis	Senecella calanoides	Daphnia longiremis	Daphnia middendorffiana	Daphnia galeata galeata	Daphnia longispina microcephala	Daphnia pulex	Eubosmina longispina	Bosmina longirostris	Chydorus sphaericus	Holopedium gibberum	Leptodora kindtii	Polyphemus pediculus	Eurycercus lamellatus
Alsek	Dezadeash	Aishihik	13 Aug 70	wc	28.5			9.8				1.3			59.2			1.2						
		Dezadeash	11 Aug 70	surface	47.8			23.6								26.4		2.2						
			26 Jul 75	wc	47.4	0.1		36.2			1.7		<0.1					14.2		0.3	0.1			0.8
		Frederick	13 Aug 74	wc	36.0			17.3				0.2				46.5								
		Kathleen	no data																					
		Kloo	12 Jul 75	e	16.6			59.6	2.2		0.2		19.6					1.7						
				h	91.2			5.0	0.5		0.3		2.6					0.6						
		Marshall	24 Jul 74		see Table 13 (first part)																			
		Moraine	16 Jul 75	e	64.3			35.5			0.1			0.1										
				h	94.2			5.8			<0.1			<0.1										
		Pine	12 Jun 75	e	36.6	<0.1		2.2	58.0			0.1	<0.1	0.4		1.8		0.6						
				h	59.0	<0.1		8.7	31.5			0.3	<0.1	0.1		0.5		0.1						
			27 Jul 75	e	35.2			18.9	37.6			0.1		4.3		2.7		1.1					<0.1	
				h	80.0			14.0	3.0			0.3	0.3	1.4		1.2		0.1					<0.1	
			31 Aug 75	e	68.1			1.6	21.3			0.2	0.2	6.6		1.2		0.9						
				h	85.3			3.6	8.4			0.2	0.2	1.9		0.5		0.3						
		Rainbow	no data																					
	Tatshenshini	Klukshu	no data																					
Liard	Dease	Wheeler	19 Aug 75	e	32.8			61.1	5.3		0.4							0.2						
				h	81.8			6.6	11.5		0.1							<0.1						
	Flat	Divide	no data																					
	Frances	Finlayson	4 Aug 70	wc	70.5			17.6			0.3			0.4				11.2						
		Frances	5 Aug 70	wc	41.9			55.3			0.2		0.2	0.1				2.3						
		Simpson	no data																					
	Rancheria	Daughney	no data																					
	Watson	Watson	7 Aug 70	wc	83.0			0.6					1.2	<.1	9.9		<.1	5.3						
Peel	Blackstone	Chapman	18 Jul 70	wc	52.6		<.1	46.0			0.6		0.8								<.1			
		North Fork	19 Jul 70	wc	59.2			38.5			0.4			1.9										
	Bonnet Plume	Bonnet Plume	21 Jul 74	wc	17.9			51.6						12.1					18.5					
		Fairchild	no data																					
		Gillespie	16 Jul 74	wc	100																			
		Margaret	3 Aug 75	wc	76	<.1		0.8	22.1		0.1		0.3					0.3			<.1			
		Pinguicula	2 Jul 74	wc	77.9			21.6(?)			0.3			0.1										
		Popcornfish	no data																					
	Dog	Dog	no data																					
	Hart	Elliott	13 Jul 70	wc	72.0						1.0													
	Wind	Hungry	5 Aug 75	wc	67.0			10.2		22.3	<.1			0.4										
Porcupine	Eagle	Davis (N)	6 Aug 75	wc	85.4			9.6					4.1			1.1			<.1			<.1		
		(S)	9 Aug 75	wc	88.3			4.4					5.8			1.3			0.3			<.1		

Table 14 (first part). Absolute abundance of crustaceans, rotifers and total zooplankton (crustaceans plus rotifers) for lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon and Little Salmon subdrainages of the Yukon River drainage system. Zones sampled are epilimnion (e), hypolimnion (h), and entire water column (wc); wet weight per unit area (mg/cm²) is always expressed for the the entire water column. See second part of the table (below) for relative abundance of crustacean species by lake.

Drainage	Subdrainage	Lake	Date	Sampling gear	Depth (m) of total vertical haul with net	Zone sampled	No. crustaceans/cm²	No. crustaceans/l	No. rotifers/l	Total zooplankton (mg/l)	Total zooplankton (mg/cm²)	Comments
Yukon	Atlin	Atlin	30 Jul 70	net	16.7	wc	3.6	2.4				See also Withler (1956).
		Little Atlin	9 Jul 70	net	13.5	wc	75.0	55.0				
		Lower Snafu	14 Jun 75	trap		e		83.0	206	2.30	4.94	
						h		57.2	84.1	1.91		
			29 Jul 75	trap		e		128	60.1	2.48	9.67	
						h		183	277	4.80		
			3 Sep 75	trap		e		115	51.8	1.90	5.73	
						h		180	152	2.95		
		Palmer	30 Jul 70	net	7	wc	9.2	13.1				
		Snafu	20 Jul 75	trap		e						
						h		105	189	1.89		
		Tarfu	13 Aug 75	trap		e		60.9	130	1.80	5.91	
						h		78.7	66.9	1.87		
	Lewes	Bennett	13 Jun 57	net	46	wc						Two hauls yielded settled plankton volumes of 0.05 & 0.10 ml (Dept. of Fisheries, Pacific Region).
		Caribou	no data									
		Chadburn	14 Aug 70	net	15	wc	0.3	0.2	81.0			Rotifers mainly _Kellicotia longispina_.
		Fox	22 Jun 75	trap		e		69.2	13.3	1.48	4.68	
						h		74.8	6.8	0.84		
			1 Aug 75	trap		e		77.8	40.2	1.94	8.58	
						h		104	40.9	1.84		
			4 Sep 75	trap		e		74.9	22.5	1.97	7.45	
						h		99.0	28.1	1.42		
		Kookatsoon	no data									
		Laberge	no data									
		Long	no data									
		Marsh	8 Jul 70	net	10.5	wc	3.2	2.9				Five 4.6 ml vertical hauls on 21 Jun 57 yielded settled plankton volumes ranging from 0.10 to 0.12 ml (Dept. Fisheries, Pacific Region).
		McClintock	8 Jul 70	net	20	wc	53.0	26.5				
		Michie	no data									
		Nares	31 Jul 70	net	8.5	wc	1.0	1.1				Station 2 km E of Carcross.
		Tagish	Jun 56	net	13.4	wc						Four hauls yielded settled plankton volumes of 0.05, 0.10, 0.20 & 0.25 ml (Dept. Fisheries, Pacific Region). See also Withler (1956).
		Von Wilczek	15 Jul 70	net	3.3	wc	21.6	65.5				
	Mandanna	Mandanna	no data									
	Nordenskiold	Braeburn	28 Jul 70	net	15	wc	18.4	12.4				
		Twin	4 Jun 57	net	35	wc						Two hauls yielded settled plankton volumes of 0.12 & 0.16 ml.
	Pelly	Bruce	24 Aug 75	trap		e		44.7	144	2.88	7.12	
						h		55.8	42.6	1.99		
		Diamain	14 Jul 70	net	14	wc	3.0	2.0				_Chaoborus_ larvae & amphipods were occasionally found in both epilimnion & hypolimnion samples.
			19 Jun 75	trap		e		51.8	14.9	0.74	1.28	
						h		50.4	17.4	0.46		
			5 Aug 75	trap		e		20.3	25.2	1.06	2.06	
						h		56.9	22.4	0.76		
			6 Sep 75	trap		e		19.2	8.20	0.99	2.34	
						h		62.0	9.40	0.81		
		Dragon	3 Aug 72	net	9	wc	13.0	14.5				
		Jackfish	23 Aug 75	trap		e		56.5	130	2.6	4.73	
						h		169	310	3.97		
		Tatlmain	7 Sep 75	trap		e		71.2	28.8	2.73	10.3	Station in centre of bend in southern part of lake.
						h		85.3	33.2	2.48		
		Willow	14 Jul 70	net	1.8	wc						A dense bloom of blue-green algae was observed.
	Big Salmon	Quiet	2 Aug 70	net	15	wc	49.0	32.8				
	Little Salmon	Little Salmon	22 Aug 75	trap		e		59.8	41.7	0.44		
				net	77	wc		23.1	7.0	0.13	1.0	

Table 14 (second part). Relative abundance (% by number) of crustacean plankton for lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon and Little Salmon subdrainages of the Yukon River drainage system. See first part of table (above) for sampling gear, depth of total vertical haul with net, and for absolute abundance of crustaceans, rotifers, and total zooplankton. The following zooplankton species, not recorded from these lakes but recorded from other Yukon lakes sampled (see Tables 13 and 15) are omitted from this table: Cyclops bicuspidatus thomasi, Eucyclops speratus, E. agilis, Senecella calanoides, Polyphemus pediculus, Scapholeberis kingi, Sida crystallina, Eurycercus lamellatus, and Camptocercus rectirostris.

Drainage	Subdrainage	Lake	Date	Zone sampled	Cyclops scutifer	Cyclops capillatus	Cyclops navus	Macrocyclops albidus	Diaptomus pribilofensis	Diaptomus sicilis	Acanthodiaptomus denticornis	Heterocope septentrionalis	Daphnia longiremis	Daphnia middendorffiana	Daphnia galeata galeata	Daphnia longispina microcephala	Daphnia galeata mendotae	Daphnia pulex	Daphnia schoedleri	Eubosmina longispina	Bosmina longirostris	Chydorus sphaericus	Holopedium gibberum	Leptodora kindtii	Ceriodaphnia affinis	Alona affinis	Leydigia quadrangularis
Yukon	Atlin	Atlin	30 Jul 70	wc	58.6				41.2			0.1		0.1													
		Little Atlin	9 Jul 70	wc	63.8				20.1			<.1	10.8		2.5					2.9							
		Lower Snafu	14 Jun 75	e	62.0	<.1			31.4			<.1	5.0		0.4					1.0							
				h	85.1				12.4			0.1	1.8		0.2					0.3							
			29 Jul 75	e	49.1				22.0				13.0		15.6					0.7				<.1			
				h	71.6				4.8			<.1	18.4		3.3					2.1				<.1			
			3 Sep 75	e	69.9	<.1			2.8				16.7		10.0					0.3		<.1		<.1			
				h	85.0				2.7				8.6		2.7					0.7		<.1		<.1			
		Palmer	30 Jul 70	wc	21.7				20.1				5.2 (either D. longiremus or D. ambigua)							19.1	33.9						
		Snafu	20 Jul 75	e	97.6				1.4			0.1	0.4		0.3												
				h	88.7				11.0			<.1	0.3		<.1												
		Tarfu	13 Aug 75	e	62.4				36.8			0.4		0.3													
				h	71.9				24.3	3.2		0.4		0.1													
	Lewes	Bennett	13 Jun 57	wc	see Table 14 (first part)																						
		Caribou	no data																								
		Chadburn	14 Aug 70	wc	78.4				10.5											7.8		0.6	2.6				
		Fox	22 Jun 75	e	36.7	<.1				62.9			0.1			0.2				0.1							
				h	72.7					27.1			<.1			<.1				0.1							
			1 Aug 75	e	48.6					43.2			0.2			7.3				0.8							
				h	85.5					11.9			0.1			2.2				0.5							
			4 Sep 75	e	58.6					33.2			0.3			5.5				2.3							
				h	89.3					7.8			0.3			1.2				1.3							<.1
		Kookatsoon	no data																								
		Laberge	no data																								
		Long	no data																								
		Marsh	8 Jul 70	wc	8.3				35.9											0.7		0.1	55.1				
		McClintock	8 Jul 70	wc	63.7				17.8				11.2							7.3		<.1			<.1		
		Michie	no data																								
		Nares	31 Jul 70	wc	26.6				73.2				0.2														
		Tagish	Jun 56	wc	see Table 14 (first part)																						
		Van Wilczek	15 Jul 70	wc			52.7				14.6								32.7								
	Mandanna	Mandanna	no data																								
	Nordenskiold	Braeburn	28 Jul 70	wc	41.0				3.2				28.1	<.1			9.6			15.2	2.8						
		Twin	4 Jun 57	wc	see Table 14 (first part)																						
	Pelly	Bruce	24 Aug 75	e	33.6				53.7			0.1			0.3					12.5							
				h	78.1				12.8			0.1			<.1					8.9							
		Diamain	14 Jul 70	wc	37.0				22.5			0.8		39.1													
			19 Jun 75	e	60.2					39.2		1.0		0.1													
				h	77.0					22.8		0.5		0.1													
			5 Aug 75	e	36.9				49.8	11.6		0.3		1.1													
				h	92.4				6.7	0.5		0.1		0.1													
			6 Sep 75	e	63.0				18.5	16.6		0.3		1.8													
				h	94.4				3.9	1.5		<.1		0.2													
		Dragon	3 Aug 72	wc	81.1				18.5			0.1	0.3	<.1													
		Jackfish	23 Aug 75	e	67.4	<.1			23.5			<.1		5.8													
				h	87.6			<.1	7.9					1.2						3.3							
		Tatlmain	7 Sep 75	e	41.8				3.06	18.4		<.1		<.1	7.9					3.2						<.1	
				h	67.6				4.44	11.1		<.1		<.1	1.99												
		Willow	14 Jul 70	wc				0.17			9.9																
	Big Salmon	Quiet	2 Aug 70	wc	27.7					34.9			22.3			15.1		90.									
	Little Salmon	Little Salmon	22 Aug 75	e	97.8				1.0				0.3		0.1						0.7						
				wc	98.7				1.1				0.1		<.1						0.1	<.1					

Table 15 (first part). Absolute abundance of crustaceans, rotifers, and total zooplankton (crustaceans plus rotifers) for lakes of the Stewart, Takhini, Teslin, and White subdrainages of the Yukon River drainage system. Zones sampled are epilimnion (e), hypolimnion (h), and entire water column (wc); wet weight per unit area (mg/cm^2) is always expressed for the entire water column. See second part of table (below) for relative abundance of crustacean species by lake.

Drainage	Subdrainage	Lake	Date	Sampling gear	Depth (m) of total vertical haul with net	Zone sampled	No. crustaceans/cm^2	No. crustaceans/l	No. rotifers/l	Total zooplankton (mg/l)	Total zooplankton (mg/cm^2)	Comments
Yukon	Stewart	Barlow	20 Jul 70	net	5.5	wc	132	239				
		Clark	6 Jul 75	trap		e		37.2	52.8	0.82	1.34	
						h		22.3	24.5	0.48		
		Crystal	no data									
		Ethel	14 Jul 70	net	22	wc	16.0	7.0				Station at west end of lake.
		Halfway (W)	2 Jul 75	trap		wc		78.0	427	3.61	1.80	
		Hanson (S)	12 Jul 70	net	12	wc	35.0	29.0				
		(N)	1 Jul 75	trap		e		88.4	23.0	2.98	3.58	
						h		43.0	12.0	1.01		
		Janet	4 Jul 75	trap		e		22.8	168	1.26	3.59	
						h		21.8	28.0	0.39		
		Kathleen	7 Jul 75	trap		e		14.3	70.4	0.99	1.95	
						h		24.3	9.2	0.42		
		Ladue	5 Jul 75	trap		e		77.5	91.1	1.61	1.25	
						h		31.1	32.0	1.0		
		Mayo	23 Jul 70	net	15	e	16.3	10.8				Net haul from 15 m at station of 39 m depth.
		McQuesten	13 Jul 70	net	6	wc	27.5	46.0				
		Minto	21 Jul 70	net	14	wc	56.0	40.0				
			17 Jun 75	trap		e		137	34.7	1.60	2.06	
						h		50.6	5.3	0.36		
			3 Aug 75	trap		e		61.4	30.5	2.43	4.08	
						h		82.2	101	1.42		
			5 Sep 75	trap		e		45.8	45.1	2.09	3.18	
						h		70.7	30.7	0.72		
		Reid	22 Jul 70	net	13	wc	53.8	41.4				
	Takhini	Fish	9 Aug 70	net	10	wc	10.0	10.0				
		Jo-Jo	15 Jul 75	trap		e		28.4	32.2	0.51	2.19	
						h		36.0	17.1	0.43		
		Kusawa	10 Aug 70	net	15		2.5	1.7				
		Taye	17 Jul 75	trap		wc	7.6	25.2	3.9	1.60	0.48	
	Tatchun	Frenchman	21 Aug 75	trap		e		54.9	267	2.09	10.6	
						h		197	143	4.14		
		Tatchun	25 Jul 70	net	15	wc	41.0	27.3				
			21 Jun 75	trap		e		57.0	274	0.40	1.51	
						h		30.7	52.1	0.54		
	Teslin (Squanga)	Dalayee	10 Jul 70	net	23	wc	34.0	15.0				
		Dwarf	21 Jul 75	trap		e		38.8	98.5	1.66	2.59	
						h		37.7	46.4	1.77		
		Little Teslin	16 Aug 70	net	14	wc	26.0	18.0				
			26 Jun 75	trap		e		81.7	176	2.75	4.43	
						h		129	352	2.8		
			27 Aug 75	trap		e		75.7	26.3	2.38	4.66	
						h		197	115	3.14		
		Squanga	8 Jun 60	net	27.4	wc						Single haul yielded settled plankton volume of 2.3 ml.
			16 Aug 70	net	12	wc	51.7	43.0				
		Summit	28 Jun 75	trap		e		88.6	485	3.35	3.48	
						h		215	148	1.59		
		Teenah	9 Jul 70	net	18	wc	140	77.7				
	Teslin (rest)	Morley	14 Aug 75	trap		e		13.7	58.8	0.17	1.37	
						h		43.0	16.5	0.67		
		Smart	15 Aug 75	trap		wc	48.1	96.2	35.7	1.53	0.92	
		Swan	25 Jun 75	trap		e		9.6	5.0	0.3	1.85	
						h		13.2	10.4	0.33		
			30 Jul 75	trap		e		18.7	8.2	0.36	1.71	
						h		18.5	11.4	0.36		
			10 Sep 75	trap		e		31.8	51.4	0.77	2.79	
						h		60.0	33.7	0.47		
		Teslin	1944	net	30.5	wc						Hauls yielded average settled plankton volume of 0.86 ml. See Clemens et al. (1968).
		Wolf	22 Jul 75	trap		e		24.5	61.6	1.13	4.75	Station slightly west of lake centre.
						h		35.5	40.2	0.87		
	White	Kluane	12 Aug 70	net	5	wc	14.3	28.0				Station midway between Burwash Landing and Sandspit Point.
			11 Jul 75	trap		e		16.0	23.7	0.33	1.11	Station 38 m deep, situated off mile 1066.5, Alaska Hwy.
						h		19.2	6.6	0.28		
		Sulfur	11 Jul 75	trap		wc	12.3	61.8	7.2	1.67	0.33	

Table 15 (second part). Relative abundance (% by number) of crustacean plankton for lakes of the Stewart, Takhini, Teslin, and White subdrainages of the Yukon River drainage system. See first part of table (above) for sampling gear, depth of total vertical haul with net, and for absolute abundance of crustaceans, rotifers, and total zooplankton. The following species, not recorded from these lakes but recorded from other Yukon lakes sampled (see Tables 13 and 14), are omitted from this table: Cyclops navus, Macrocyclops albidus, Acanthodiaptomus denticornis, Ceriodaphnia affinis, Sida crystallina, Alona affinis, Eurycercus lamellatus, Leydigia quadrangularis.

Drainage	Subdrainage	Lake	Date	Zone sampled	Cyclops scutifer	Cyclops capillatus	Cyclops bicuspidatus thomasi	Eucyclops speratus	Eucyclops agilis	Diaptomus pribilofensis	Diaptomus sicilis	Heterocope septentrionalis	Senecella calanoides	Daphnia longiremis	Daphnia middendorffiana	Daphnia galeata galeata	Daphnia longispina microcephala	Daphnia galeata mendotae	Daphnia pulex	Daphnia schoedleri	Eubosmina longispina	Bosmina longirostris	Chydorus sphaericus	Holopedium gibberum	Leptodora kindtii	Polyphemus pediculus	Scapholeberis kingi	Camptocercus rectirostris
Yukon	Stewart	Barlow	20 Jul 70	wc	80.4					12.6				4.7					0.1		2.2							
		Clark	6 Jul 75	e	67.5					11.1				4.0	0.5	13.9					3.2		<.1			<.1		
				h	88.8					2.8				1.6		6.7					0.3							
		Crystal	no data																									
		Ethel	14 Jul 70	wc	75.1					24.8		<.1			0.1													
		Halfway (W)	2 Jul 75	wc	77.6					<.1										22.2						0.1		
		Hanson (S)	12 Jul 70	wc	69.2					28.2		0.1		0.1	1.3						1.1							
		(N)	1 Jul 75	e	81.8					13.5		0.2			4.6													
				h	91.6					5.3		0.2			2.8													
		Janet	4 Jul 75	e	30.7					25.5	5.5			4.4			33.8									<.1	0.1	
				h	78.4					11.5	4.2			0.5			5.1									0.3		
		Kathleen	7 Jul 75	e	23.8					5.1	65.9	0.8			3.5	0.2												
				h	86.4					0.7	12.9	<.1			0.1													
		Ladue	5 Jul 75	e	70.6					29.3		0.2			<.1													
				h	60.5					39.1		0.4			<.1													
		Mayo	23 Jul 70	e	50.4					49.0		0.6									<.1							
		McQuesten	13 Jul 70	wc	78.9					20.0		0.1		<.1	<.1													
		Minto	21 Jul 70	wc	59.9						21.1							19.1							<.1			
			17 Jun 75	e	53.3						46.4							0.5			<.1							
				h	75.7						23.9							0.2			<.1							
			3 Aug 75	e	34.5						49.0							16.3			0.1				0.1			
				h	87.1						9.0							3.9			<.1				<.1			
			5 Sep 75	e	39.7						48.7							11.2			0.5				<.1			
				h	93.5						5.0							1.3			0.1				<.1			
		Reid	22 Jul 70	wc	41.7					6.4				2.0		47.9												
	Takhini	Fish	9 Aug 70	wc	65.9					33.2	0.6	0.2			0.1													
		Jo-Jo	15 Jul 75	e	85.9						11.2						3.0				0.2							
				h	97.2						2.5			<.1			0.2				0.1							
		Kusawa	10 Aug 70		42.9					38.4			<.1	0.5			18.1											
		Taye	17 Jul 75	wc	1.1				<.1	95.1		2.0			1.6								0.2					
	Tatchun	Frenchman	21 Aug 75	e	62.8					18.2		<.1		0.3	2.4	16.4												
				h	92.4	<.1(?)			<.1(?)	3.1		<.1		2.1	0.5	1.8												
		Tatchun	25 Jul 70	wc	95.0					1.2				0.4							3.0	0.4						
			21 Jun 75	e	84.6					14.1				0.2							0.6	0.4						
				h	98.0					1.0				0.8			0.1				0.3	<.1			<.1			
	Teslin (Squanga)	Dalayee	10 Jul 70	wc	63.2					36.1		0.7																
		Dwarf	21 Jul 75	e	14.2					85.6		0.3		<.1														
				h	71.6					26.5		1.5		0.1														
		Little Teslin	16 Aug 70	wc	65.8					11.9		<.1		0.3				21.9							0.1			
			26 Jun 75	e	59.0					28.6		<.1		3.2				2.3			6.8							
				h	88.7					8.4		<.1		1.0				0.4			1.5							
			27 Aug 75	e	75.3					9.0				2.2				13.3			<.1				0.1			
				h	89.8		<.1	<.1		2.1		<.1		4.8				3.0			0.1				<.1			
		Squanga	8 Jun 60	wc	see Table 15 (first part)																							
			16 Aug 70	wc	48.5		7.0			8.0				14.5		17.8					4.2				<.1			
		Summit	28 Jun 75	e	64.6					35.0		0.5			<.1													
				h	96.3					3.6		0.1			<.1													
		Teenah	9 Jul 70	wc	68.4					16.1		<.1		3.9			2.6				9.0							
	Teslin (rest)	Morley	14 Aug 75	e	63.5					33.0				1.5							1.6							
				h	87.4					10.9		0.1		0.1							1.3			<.1				
		Smart	15 Aug 75	wc	78.8					20.7		0.2			0.2													
		Swan	25 Jun 75	e	72.9	<.1				15.1				7.3							4.9		<.1					
				h	87.9					5.0				6.1							1.1							
			30 Jul 75	e	64.7					16.0				8.6							11.3							
				h	88.1					5.6				2.9							2.9							
			10 Sep 75	e	60.1					13.2				11.9							14.7		<.1					<.1
				h	90.3					2.6				2.8							4.1		<.1					<.1
		Teslin	1944	wc	see Table 15 (first part)																							
		Wolf	22 Jul 75	e	38.1					60.8		0.4			0.5													
				h	92.6					6.8		0.2			0.1													
	White	Kluane	12 Aug 70	wc	66.0						34.0																	
			11 Jul 75	e	35.9						63.8																	
				h	42.4						57.8																	
		Sulfur	11 Jul 75	wc	13.1					85.0		0.1			1.8								<.1					

Table 16. Frequency of occurrence of the 32 species of crustacean zooplankton found in 70 Yukon lakes. Asterisks denote littoral species, all others are pelagic.

Species	No. of lakes in which species was found	%
Cyclops scutifer Sars	68	97
Diaptomus pribilofensis Juday & Muttkowski	63	90
Heterocope septentrionalis Juday & Muttkowski	42	60
Daphnia longiremis Sars	34	49
Eubosmina longispina (Leydig)	31	44
Daphnia middendorffiana Fischer	29	41
Diaptomus sicilis Forbes	14	20
Daphnia galeata galeata Sars	13	19
Daphnia longispina microcephala Sars	10	14
Chydorus sphaericus (O.F. Muller)	8	11
Bosmina longirostris (O.F. Muller)	6	9
Holopedium gibberum Zaddach	6	9
Leptodora kindtii Focke	5	7
Cyclops capillatus Sars	4	6
**Polyphemus pediculus* (Linne)	4	6
Senecella calanoides Juday	4	6
Daphnia galeata mendotae Birge	3	4
Daphnia pulex Leydig	3	4
Acanthodiaptomus denticornis (Wierzejski)	3	4
Eucyclops speratus (Lilljeborg)	2	3
Cyclops bicuspidatus thomasi Forbes	2	3
**Macrocyclops albidus* (Jurine)	2	3
Daphnia schoedleri Sars	2	3
Cyclops navus Herrick	1	1
**Eucyclops agilis* (Koch)	1	1
Ceriodaphnia affinis Lilljeborg	1	1
**Scapholeberis kingi* Sars	1	1
**Sida crystallina* (O.F. Muller)	1	1
**Alona affinis* (Leydig)	1	1
**Eurycercus lamellatus* (O.F. Muller)	1	1
**Camptocercus rectirostris* Schoedler	1	1
**Leydigia quadrangularis* (Leydig)	1	1

Table 17. Known presence of fish species in lakes of the Alsek, Liard, Peel and Porcupine River drainage systems. Confirmed species presence recorded as X and reliable report of presence as (X). See Table 3 for list of common names.

Drainage	Subdrainage	Lake	Lampetra spp.	Stenodus leucichthys	Coregonus clupeaformis	C. nasus	C. sardinella	Prosopium cylindraceum	P. coulteri	P. williamsoni	Thymallus arcticus	Salvelinus namaycush	S. alpinus	S. malma	Salmo gairdneri	Oncorhynchus nerka	O. kisutch	O. tshawytcha	O. keta	O. gorbuscha	Esox lucius	Couesius plumbeus	Catostomus commersoni	C. catostomus	Lota lota	Cottus cognatus
Alsek	Dezadeash	Aishihik			X			X			X	X									X			X	X	X
		Dezadeash[1]			X			X			X	X		X							X			X	X	X
		Frederick[2]									X	X				X					X				X	(X)
		Kathleen[3]						X	(X)		X	X		(X)	X	X									(X)	X
		Kloo			X							(X)														
		Marshall[4]																								
		Moraine									X	X									X				X	
		Pine[5]			X			(X)			(X)	X									X				X	X
		Rainbow						X			X	X			X											
	Tatshenshini	Klukshu[6]						X				X		X	(X)	X	X	X	X	(X)					X	X
Liard	Dease	Wheeler			X						(X)	X									X					
	Flat	Divide[7]			X			X			(X)			(X)												
	Frances	Finlayson			X			X			X	X														X
		Frances[8]			X			X			X	X										X		X	X	X
		Simpson[9]			X			X	X	X	X	X									X			X	X	X
	Rancheria	Daughney						X			X			X												
	Watson	Watson			X						X	X									X			X		
Peel	Blackstone	Chapmen						X			X													X	(X)	
		North Fork						X			X															
	Bonnet Plume	Bonnet Plume						X			X	X														X
		Fairchild[10]										X														X
		Gillespie[11]																								
		Margaret			X							X									X					X
		Pinguicula[12]						X				X														
		Popcornfish						X			X													X		
	Dog	Dog[13]																				X	X			
	Hart	Elliott[14]						X	X		X	X	X											X		X
	Wind	Hungry																			X					
Porcupine	Eagle	Davis[15]			X	X	X														X			X	X	

1 Both high and low gill raker forms of C. clupeaformis present. S. malma in tributaries only.

2 O. nerka is landlocked form (kokanee).

3 P. coulteri and S. malma reported by Wickstrom (1977). O. nerka is landlocked form (kokanee).

4 No fish caught in overnight gill net sets.

5 P. cylindraceum and Thymallus arcticus reported by Wickstrom (1977).

6 S. gairdneri, O. kisutch, O. tshawytcha and O. gorbuscha in outlet only. S. gairdneri and O. gorbuscha reported by Wynne-Edwards (1947).

7 Dolly Varden also occur in nearby Glacier Lake (Royal Ontario Museum No. 26616).

8 The record of white sucker (C. commersoni) from Frances Lake shown in McPhail and Lindsey (1970) and Scott and Crossman (1973) is in error and is based on misidentification of C. catostomus (see discussion).

9 P. coulteri identified from lake trout stomach.

10 Daytime gill net sets and one outlet collection only.

11 No fish were caught in several gillnet sets.

12 Daytime gill net sets only.

13 Fish collection on centre east shore, in warm, weedy waters.

14 S. alpinus in tributaries only.

15 C. nasus scarce; caught in north lake only.

Table 18. Known presence of fish species in lakes of the Atlin, Lewes, Mandanna, Nordenskiold, Pelly, Big Salmon and Little Salmon subdrainages of the Yukon River drainage system. Confirmed species presence recorded as X and reliable report of presence as (X). See Table 3 for list of common names.

Drainage	Subdrainage	Lake	Lampetra spp.	Stenodus leucichthys	Coregonus clupeaformis	C. nasus	C. sardinella	Prosopium cylindraceum	P. coulteri	P. williamsoni	Thymallus arcticus	Salvelinus namaycush	S. alpinus	S. malma	Salmo gairdneri	Oncorhynchus nerka	O. kisutch	O. tshawytscha	O. keta	O. gorbuscha	Esox lucius	Couesius plumbeus	Catostomus commersoni	C. catostomus	Lota lota	Cottus cognatus
Yukon	Atlin	Atlin[1]			X		X	X			X	X									X	X		X	X	X
		Little Atlin[2]			X			(X)			(X)	(X)									X			X	X	X
		Lower Snafu			X		X				X	X									X				X	
		Palmer			X		X														X					
		Snafu			X						X	X									(X)				X	
		Tarfu						X			X	X									X					
	Lewes	Bennett[3]			X			X			X	X						X			X			X	X	X
		Caribou[4]									(X)	(X)									(X)	X				X
		Chadburn						X	X			X													X	X
		Fox[5]			X			X			X	X									(X)				X	X
		Kookatsoon																				X				
		Laberge[6]		(X)	X	X	X	X				X						(X)						X		X
		Long[7]																								
		Marsh[3]			X			X				X														
		McClintock			X		X					X									X					X
		Michie[8]										(X)						X			(X)			X	X	X
		Nares[3]			X		X	X				X												X		
		Tagish[3,9]			X		X	X			X	X									X			X		X
		Von Wilczek																			X					
	Mandanna	Mandanna			X		X					X									X				X	X
	Nordenskiold	Braeburn[10]	X		X		X	(X)			X	X									X					(X)
		Twin			X		X				X	(X)									X					
	Pelly	Bruce						X			X											X		X		
		Diamain[11]																								
		Dragon[12]					X					X						(X)			X				(X)	
		Jackfish									X										X					
		Tatlmain	(X)		X							X									X				X	
		Willow																			X					
	Big Salmon	Quiet[13]			X		X	X	X		X	X													X	X
	Little Salmon	Little Salmon			X	X	X	X				X												X		

1 C. plumbeus in inlet creek.

2 P. cylindraceum, T. arcticus and S. namaycush reported by Brown et al. (1976).

3 Bennett, Marsh, Nares and Tagish lakes are interconnected and probably share a common fish fauna.

4 Lake not sampled by gill net. E. lucius reported by Brown et al. (1976).

5 E. lucius reported by Brown et al. (1976).

6 O. tshawytscha reported to spawn in Richthofen Creek.

7 No fish were present in 1958, S. gairdneri were later introduced but no young were found in 1966.

8 S. namaycush and E. lucius reported by Brown et al. (1976).

9 See Withler (1956) for data on fish growth rates and spawning.

10 P. cylindraceum and C. cognatus reported in this system by Brown et al. (1976).

11 Bottom and surface gill net sets in 1970 and 1975 and seining in 1970 yielded no fish.

12 C. sardinella is large, spotted form. O. tshawytscha and L. lota reported by Elson (1974).

13 C. sardinella is large, spotted form.

Table 19. Known presence of fish species in lakes of the Stewart, Takhini, Tatchun, Teslin and White subdrainages of the Yukon River drainage system. Confirmed species presence recorded as X and reliable report of presence as (X). See Table 3 for list of common names.

Drainage	Subdrainage	Lake	Lampetra spp.	Stenodus leucichthys	Coregonus clupeaformis	C. nasus	C. sardinella	Prosopium cylindraceum	P. coulteri	P. williamsoni	Thymallus arcticus	Salvelinus namaycush	S. alpinus	S. malma	Salmo gairdneri	Oncorhynchus nerka	O. kisutch	O. tshawytscha	O. keta	O. gorbuscha	Esox lucius	Couesius plumbeus	Catostomus commersoni	C. catostomus	Lota lota	Cottus cognatus
Yukon	Stewart	Barlow									X															
		Clark		X	X		X				X	X									X					
		Crystal[1]						X			X															X
		Ethel[2]						X			X	X														X
		Halfway																			X					
		Hanson[3]																			X					
		Janet										(X)									X			X	X	
		Kathleen[4]			X						X	X									X				(X)	
		Ladue			X							X									X				X	
		Mayo			X			X				X									X			X	X	
		McQuesten[5]			X																X					
		Minto			X							X									X				X	
		Reid			X																X				X	
	Takhini	Fish						X			X	X														
		Jo-Jo									X	X														
		Kusawa[6]			X		X	X			X							(X)						X		
		Taye																			X					
	Tatchun	Frenchman			X							X									X					X
		Tatchun[7]			X		X		X												X				X	X
	Teslin (Squanga)	Dalayee									X	X													X	X
		Dwarf			X																X				X	X
		Little Teslin[8]			X																			X	X	X
		Squanga[8]			X						X										X				X	X
		Summit			X																X				X	
		Teenah[8]			X						X										X					X
	Teslin (rest)	Morley			X		X	X				X									X			X	X	X
		Smart			X		X	X													X					
		Swan[9]			X		X	X	X		X	X		X				(X)			X				X	X
		Teslin[10]		X	X	X	X	X			X	X						(X)			X			X	X	X
		Wolf						X				X													X	
	White	Kluane[11]		(X)	X			X			X	X						(X)	X		(X)			X	(X)	X
		Sulphur																			X					

1 Lake contains a dense population of stunted T. arcticus.

2 Lake sampled with short daytime gill net set and seining only.

3 Prior to poisoning in 1963, C. clupeaformis (two forms), P. cylindraceum, E. lucius and C. cognatus were present. Rainbow trout eggs were planted but only E. lucius were captured in 1970 and 1975.

4 L. lota reported by Elson (1974).

5 C. sardinella and S. namaycush have been reported but not captured in two years of gill netting.

6 O. tshawytscha reported to spawn in outlet.

7 C. clupeaformis from this lake are bimodal with respect to gill raker length (K. Martin, pers. comm.) (see discussion on high gill raker lake whitefish). Some C. sardinella captured were the rare large, spotted form.

8 Both high and low raker forms of C. clupeaformis are present in Little Teslin, Squanga and Teenah lakes and in Little Squanga Lake as well.

9 O. tshawytscha reported to spawn in outlet.

10 O. tshawytscha reported as moving through lake to spawn in Nisutlin River tributaries. O. keta was reported by Clemens et al. (1968) but this is in doubt.

11 S. leucichthys reported by Wynne-Edwards (1947:17). E. lucius and L. lota reported by Wickstrom (1977).

Table 20. Presence/absence data for fish species in the different drainage and subdrainage basins in Yukon Territory. Confirmed species presence is recorded as X, and a reported presence as (X). C. autumnalis, P. gracilis, R. cataractae, P. omiscomaycus, and C. ricei were not sampled in the present study; their presence has been recorded by McPhail and Lindsey (1970) and Bodaly and Lindsey (1977).

Drainage	Subdrainage	No. of lakes sampled	Lampetra sp.	Stenodus leucichthys	Coregonus clupeaformis	Coregonus nasus	Coregonus sardinella	Coregonus autumnalis	Prosopium cylindraceum	Prosopium coulteri	Prosopium williamsoni	Thymallus arcticus	Salvelinus namaycush	Salvelinus alpinus	Salvelinus malma	Salmo gairdneri	Oncorhynchus nerka	Oncorhynchus kisutch	Oncorhynchus tshawytscha	Oncorhynchus keta	Orconhynchus gorbuscha	Esox lucius	Platygobio gracilis	Couesius plumbeus	Rhinichthys cataractae	Catostomus commersoni	Catostomus catostomus	Percopsis omiscomaycus	Lota lota	Cottus cognatus	Cottus ricei
Alsek	Dezadeash	9			X				X	X		X	X		X	X	X					X					X		X	X	
	Tatshenshini	1							X				X		X	X	X	X	X	X	X								X	X	
Liard	Dease	1			X							(X)	X									X									
	Flat	1			X				X			(X)			(X)																
	Frances	3			X				X	X	X	X	X									X		X			X		X	X	
	Rancheria	1							X			X			X																
	Watson	1			X							X	X									X					X				
Peel	Blackstone	2							X			X															X		X		
	Bonnet Plume	6			X				X			X	X									X					X			X	
	Dog	1																						X		X					
	Hart	1							X	X		X	X	X													X			X	
	Wind	1																				X									
Yukon	Atlin	6			X		X		X			X	X									X		X			X		X	X	
	Lewes	13		(X)	X	X	X		X	X		X	X						X			X		X			X		X	X	
	Mandanna Creek	1			X		X						X									X							X	X	
	Nordenskiold	2	X		X		X		(X)			X	X									X								(X)	
	Pelly	6	(X)		X		X		X			X	X						X			X		X			X		X		
	Big Salmon	1			X		X		X	X		X	X																X	X	
	Little Salmon	1			X	X	X		X				X														X				
	Stewart	13		X	X		X		X			X	X									X					X		X	X	
	Takhini	4			X		X		X			X	X						(X)			X									
	Tatchun	2			X		X			X			X									X							X	X	
	Teslin (Squanga)	6			X							X	X									X					X		X	X	
	Teslin (rest)	5		X	X	X	X		X	X		X	X		X				X			X					X		X	X	
	White	2		(X)	X				X			X	X						(X)			X					X		(X)	X	
Porcupine	Eagle	1			X	X	X															X					X		X	X	
Subtotals																															
Alsek		10			X				X	X		X	X		X	X	X	X	X	X	X	X					X		X	X	
Mackenzie	Liard	7			X				X	X	X	X	X		X							X		X			X		X	X	
	Peel	11			X			X	X	X		X	X	X								X	X	X	X	X	X			X	X
Yukon	main river	62	X	X	X	X	X		X	X		X	X		X				X	X		X		X			X		X	X	
	Porcupine	1			X	X	X															X					X	X		X	

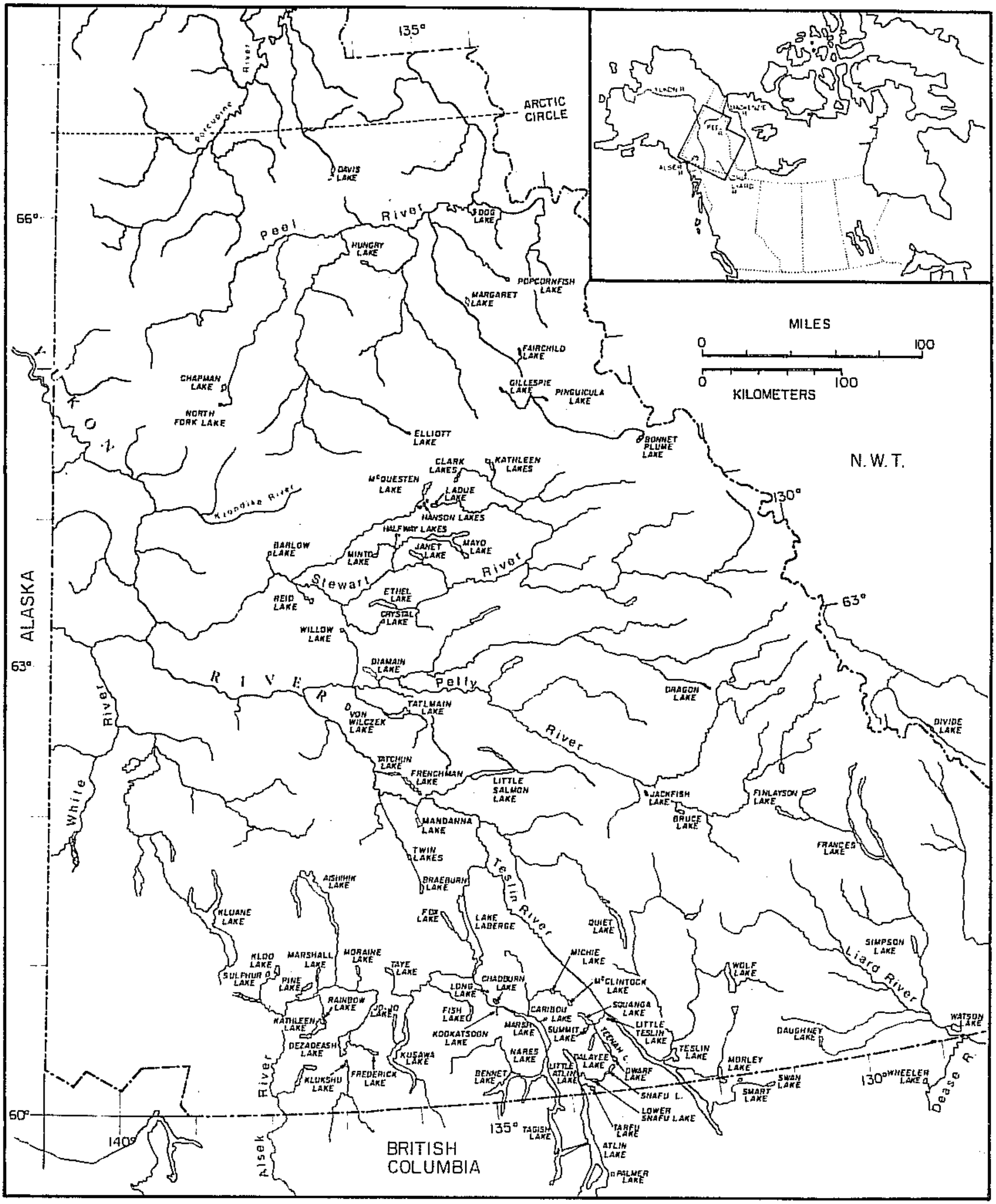

Fig. 1. Map of southern and central Yukon Territory indicating lakes sampled.

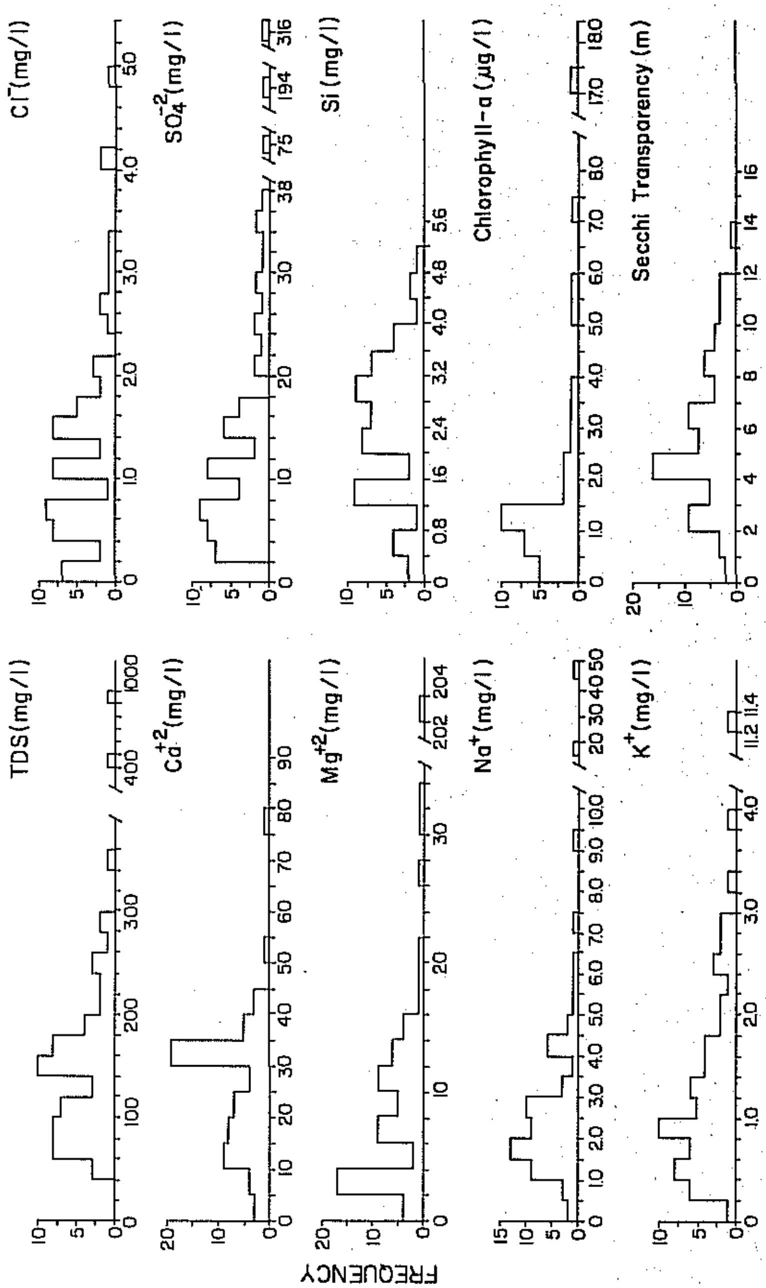

Fig. 2. Frequency distributions of total dissolved solids (TDS), major ions, chlorophyll *a* values, and Secchi disc transparencies in Yukon lakes.

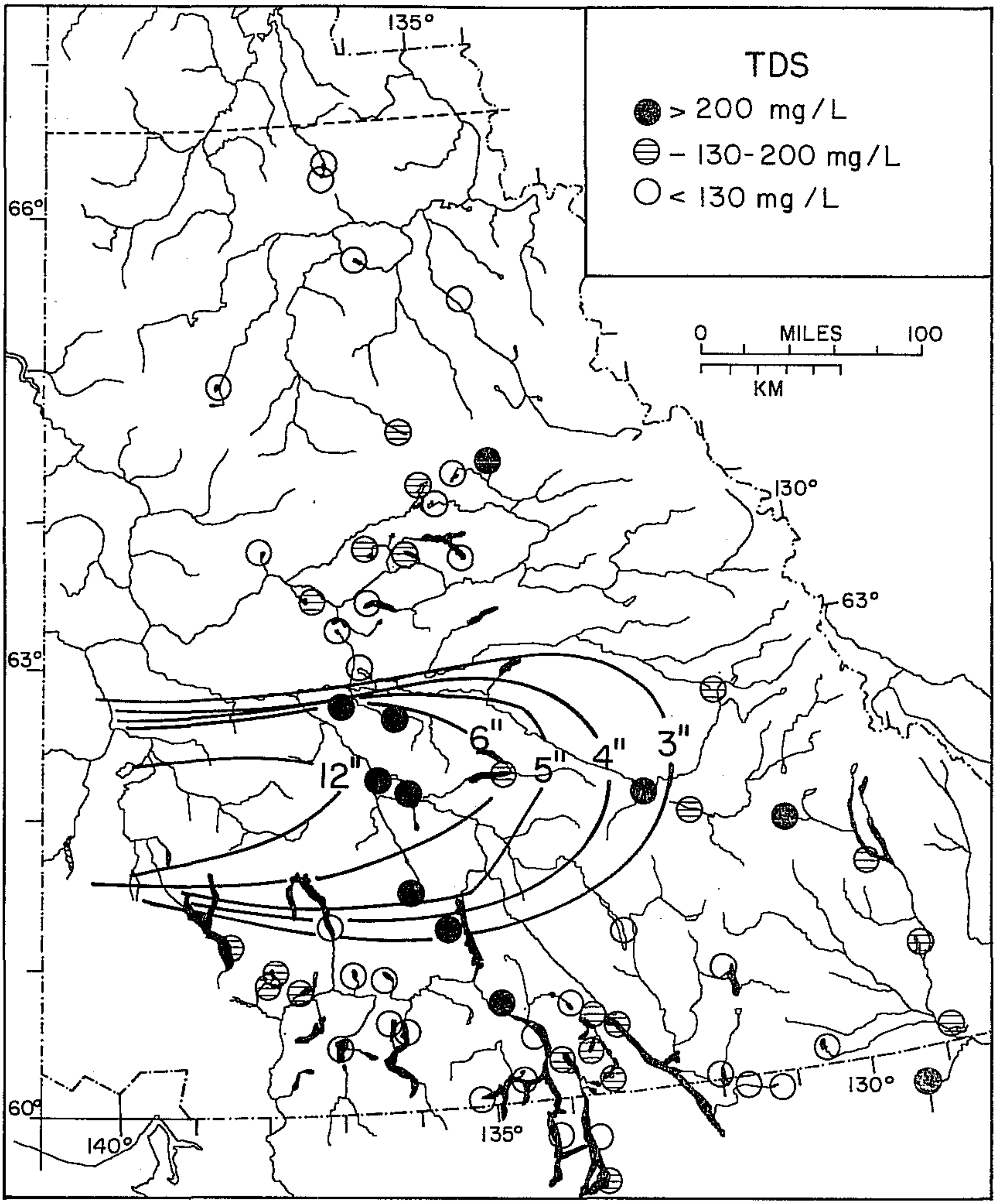

Fig. 3. The geographic distribution of total dissolved solid (TDS) values in Yukon lakes and isopleths of volcanic ash thickness.

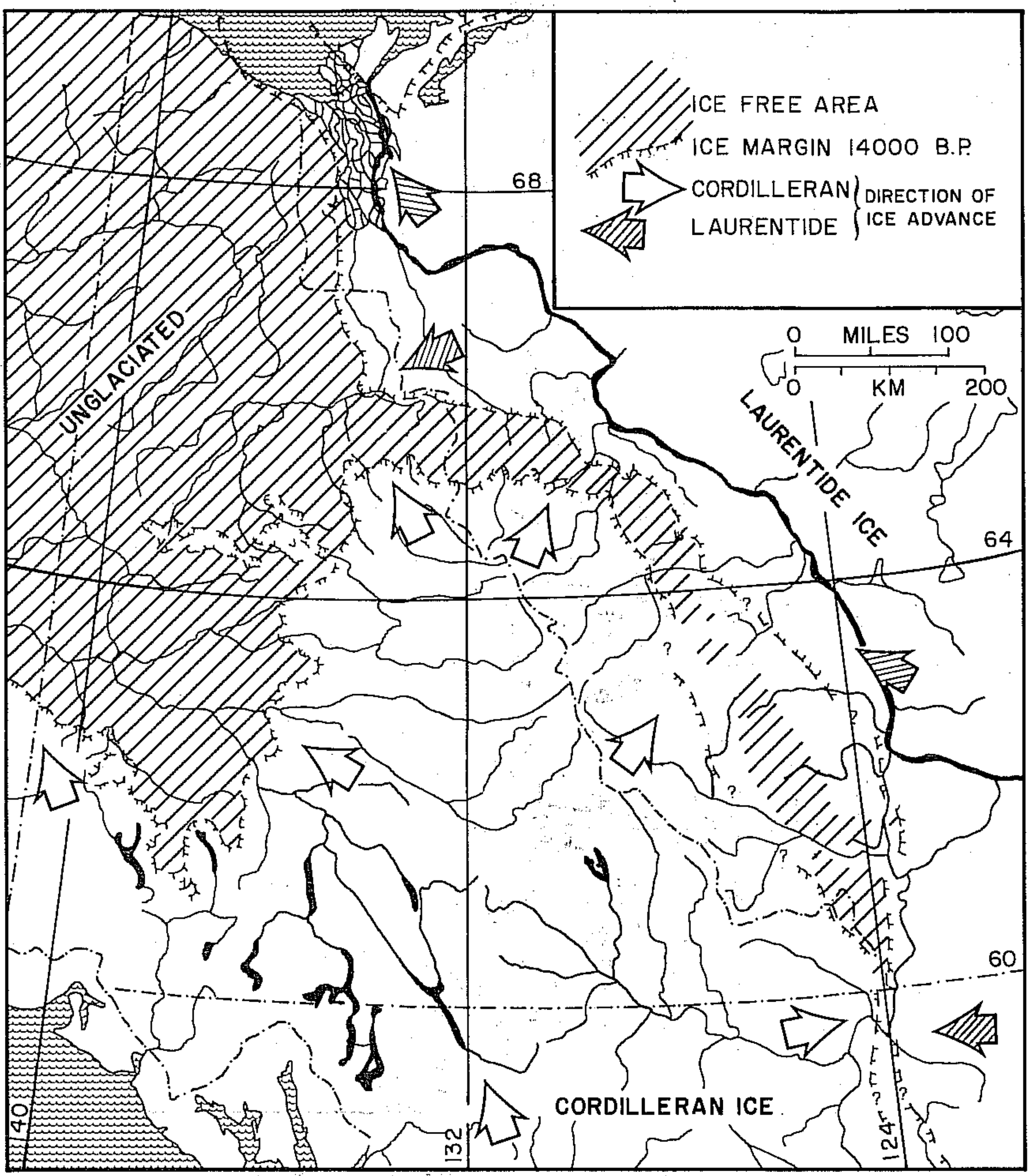

Fig. 4. Glacial map of Yukon Territory showing maximum extent of advance of last (Wisconsin) ice sheet (about 14,000 years ago).

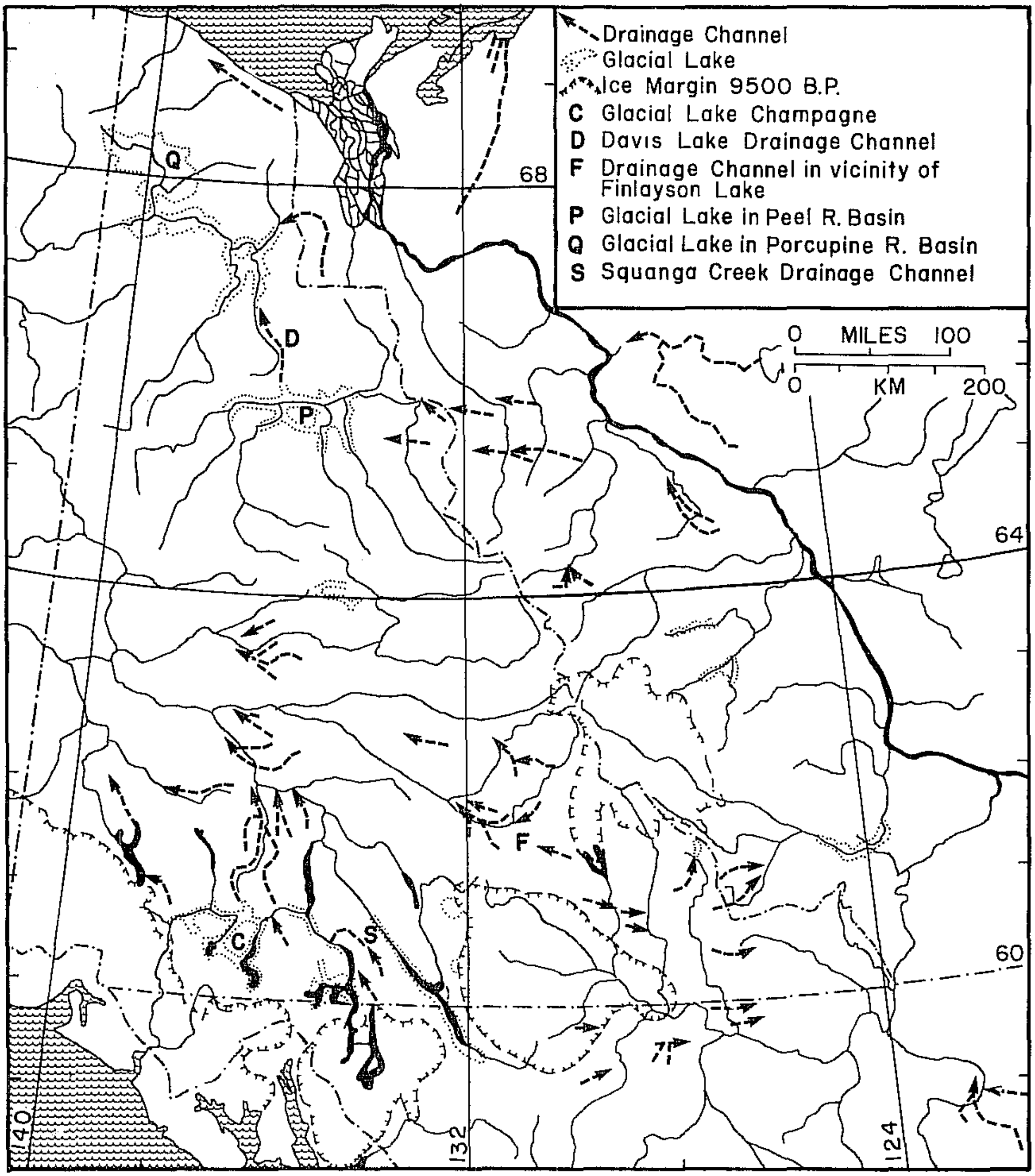

Fig. 5. Glacial map of Yukon Territory showing position of ice margin 9,500 years ago, and major glacial lakes and meltwater drainage channels.