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A Questionnaire Survey of Sport Fishing in the Yellowknife and Hay River Areas, Northwest Territories, 1979

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A QUESTIONNAIRE SURVEY OF SPORT FISHING
IN THE YELLOWKNIFE AND HAY RIVER AREAS,
NORTHWEST TERRITORIES, 1979

by

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ABSTRACT

Falk, M.R. 1981. A questionnaire survey of sport fishing in the Yellowknife and Hay River areas, Northwest Territories, 1979. Can. MS Rep. Fish. Aquat. Sci. 1584: iv + 19 p.

A hand-out questionnaire survey of sport fishing in the Yellowknife and Hay River areas, Northwest Territories, was carried out from May to September, 1979. The purpose of the survey was to determine locations fished, number of fish caught and retained, hours fished and fishing quality. The questionnaire method was used because a roving creel census of sport fishing in these areas was not practical.

Eight hundred forty-five and 206 questionnaires were distributed in the Yellowknife and Hay River areas respectively, with 168 responses (16%) from both areas. Fishing quality was generally rated as fair to poor (54%). Angler-success (catch per angler-hour) for the major sport fish species was 0.6 for northern pike, 0.2 for lake trout, 0.1 for walleye from the Yellowknife area; and 0.3 for northern pike, 1.2 for walleye, 0.2 for rainbow trout, and <0.1 for Arctic grayling from the Hay River area.

The method proved to be successful in gathering information on sport fishing over a broad area. Results of the survey and comments by anglers will be used in formulating management strategies appropriate to the Yellowknife and Hay River areas.

Key words: angling; catch composition; catch/effort; fishery management; fishery surveys; questionnaires; sport fishing statistics.

RESUME

Falk, M.R. 1981. A questionnaire survey of sport fishing in the Yellowknife and Hay River areas, Northwest Territories, 1979. Can. MS Rep. Fish. Aquat. Sci. 1584: iv + 19 p.

Aux fins d'une enquête sur la pêche sportive dans les régions de Yellowknife et Hay River, Northwest Territories, des questionnaires ont été distribués sur place de mai à septembre 1979. Il s'agissait de déterminer les lieux de pêche, le nombre de poissons capturés et conservés, le temps passé à cette activité et la qualité de la pêche. On a préféré cette méthode à une enquête par consultation directe des pêcheurs qui n'aurait pas été pratique dans ces régions.

Au total, 845 et 206 questionnaires ont été distribués dans les régions de Yellowknife et de Hay River respectivement, 168 questionnaires (16%) ayant été retournés dans chaque région. En général, les pêcheurs considéraient que la qualité de la pêche allait de passable à médiocre (54%). Le taux de réussite (prises par heure de pêche) pour les principales espèces était de 0.1 pour le grand brochet, 0.2 pour le touladi, 0.1 pour le doré jaune dans la région de Yellowknife; et de 0.3 pour le grand brochet, 1.2 pour le doré jaune, 0.2 pour le truite arc-en-ciel et moins de 0.1 pour l'ombre de l'arctique dans la région de Hay River.

La méthode s'est révélée très fructueuse pour la collecte de renseignements sur la pêche sportive dans une vaste région. Les résultats de l'enquête et les commentaires des pêcheurs serviront à formuler des méthodes de gestion convenant aux régions de Yellowknife et de Hay River.

Mot-clés: pêche à la ligne; composition des prises; prises/effort; gestion des pêches; enquêtes sur la pêche; questionnaires; statistiques sur la pêche sportive.

INTRODUCTION

The Department of Fisheries and Oceans - Western Region has conducted sport fishery studies in the Yellowknife and Hay River areas of the Northwest Territories since 1971. These studies have largely been project oriented and have addressed defined management problems on an individual waterbody basis. Projects have included: Mosquito Creek (walleye); Hay River (walleye); Providence Creek (Arctic grayling); Kakisa River (Arctic grayling); Brabant Island-Beaver Lake area (Arctic grayling and northern pike); Polar Lake (stocked rainbow trout); and others. The approach for most of these projects has been to adopt standard creel census procedures to determine fishing effort, harvest and biological characteristics of the retained catch. Some projects employed tagging of fish to determine movements and distribution, and fish fences (weirs) to determine population size and demography.

Prior studies in the Yellowknife and Hay River areas did not consider a generalized zone approach to sport fishery management for good reasons. First, the biological data base for northern species was poor and second, the demand by anglers for available fishing opportunities was not considered to be excessive in comparison to southern Canada. However, studies have indicated that fishing pressure by itinerant anglers and tourists in the Yellowknife and Hay River areas has increased to a point where demand may already exceed the supply of quality road access fishing opportunities and certain fish stocks are showing signs of over-exploitation. It is timely, therefore, that strategies be developed for more effective management of the sport fishery resource in the Yellowknife and Hay River areas.

Because of the project orientation in past studies it found that there is insufficient information upon which to develop management strategies appropriate to the Yellowknife and Hay River areas. The required information includes: 1) an inventory of all available angling opportunities; 2) fishing quality in terms of fish species present and catch per unit of effort at these locations, and 3) preferences and expectations of anglers. In an attempt to acquire this information in 1979 a hand-out questionnaire was employed. This method was adopted because of the diversity of the sport fishery in the Yellowknife and Hay River areas as well as budget and manpower limitations.

The purpose of this paper is to describe the success and limitations of the questionnaire method in acquiring the required information and to present data that may be used to develop management strategies for sport fisheries in the Yellowknife and Hay River areas.

THE QUESTIONNAIRE APPROACH

The questionnaire method was adopted to gather information on the sport fishery in the Yellowknife and Hay River areas for two major reasons. These were: 1) the nature and diversity of the various sport fisheries, and 2) funding and manpower constraints. Both of these reasons precluded the roving creel census method which is costly, manpower dependent and only applicable in certain

areas.

Sport fisheries in the Yellowknife and Hay River areas are similar to other road access fisheries with defined access points. In the Hay River area (Fig 1), sport fishing opportunities are limited by the seasonal nature of the majority of fisheries. In this area of the Western Interior Lowlands, which is sedimentary in origin, there are numerous streams in the area but few accessible lakes despite fairly extensive road development (Falk and Dahlke 1975). Sport fishing opportunities in the Yellowknife area (Fig. 2) are more numerous. The area is situated on the Canadian Shield where many lakes and streams are made accessible by even limited road development (Falk 1979). Fishing activity in this area is generally more continuous in nature, although most of the fishing effort occurs during the open water period.

Seasonal fisheries are primarily carried out in the spring for spawning populations of Arctic grayling (e.g. Kakisa River) and walleye (e.g. Mosquito Creek). Examples of continuous fisheries include Polar Lake (rainbow trout) and Prosperous and Prelude lakes (lake trout, northern pike). Since these fisheries are distributed over a broad area it is extremely difficult to obtain the required information on all or most of them throughout the various fishing seasons by a roving creel census.

Another problem of the roving creel census approach is the difficulty in encountering anglers while fishing or at the end of their fishing trip. Typically, fishermen drive to an access point (bridge, boat launch, etc.) and proceed to favored fishing locations on foot or by boat. Creel census workers normally pursue anglers or wait for them to return from a day's fishing. With limited funds and manpower this is not always feasible, especially over a broad area encompassing many separate sport fisheries. While there are a few sport fishing locations with adjacent road access (e.g. the Hay River) most angling is remote with respect to access (e.g. Prosperous and Prelude lakes).

The questionnaire method was viewed as a means to overcome these problems. It was thought that by distributing a large number of questionnaires in the Yellowknife and Hay River areas at major road access locations the portion of anglers returning the completed questionnaire would provide the required information on catch-effort, fishing quality, etc. This is essentially the same information that would be gathered through a partial roving creel census. It was recognized at the onset that the questionnaire method has certain limitations but it was considered to be the best approach available in view of the nature and diversity of the sport fishery, and manpower and funding constraints. Further, the use of this method requires the statement of assumptions. These are as follows:

1. The proportion of respondents will provide information that is representative of the total population of anglers.
2. Respondents will provide information that is reliable and representative of actual catches, hours fished, etc.
3. Information provided by respondents

will be adequate to develop management strategies appropriate to the sport fisheries in the areas under study.

The limitations and assumptions of the questionnaire approach are discussed later in this report.

MATERIALS AND METHODS

THE QUESTIONNAIRE

The questionnaire form (Fig. 3) was designed to obtain information on individual (one-day) fishing trips. Anglers were asked to record the data when the questionnaire was received, location(s) and hours fished on that date and the number in the fishing party. Space was provided for anglers to record the number of fish caught and retained by species. In addition, questions were asked regarding the quality of fishing and the place of residence. Space was provided for anglers to make comments concerning the present and future direction of sport fishery management in the Northwest Territories. Also, it was indicated on the form that a copy of the survey results would be provided to the angler if requested.

A covering letter (Fig. 4) was attached to the form which explained the purpose of the questionnaire survey as well as the use of the information and directed the angler to complete the form and return it in the addressed, postage-paid return envelope. It was indicated that all information recorded will remain confidential. In the Yellowknife area, members of the local fish and game club were made aware of the survey in June by personal contact and local anglers were advised accordingly in July by a newspaper article.

METHOD OF DISTRIBUTION

The questionnaire form, complete with covering letter, was folded in the return envelope. Each envelope was numbered. Questionnaires were distributed by Fish and Marine Mammal Management Division staff based in Yellowknife and Hay River during the open water fishing season. Field personnel were instructed to distribute as many questionnaires as possible during this period, concentrating on road access fishing locations. Questionnaires were primarily distributed by placement under windshield wipers of vehicles at popular fishing locations (indirect) and, to a lesser extent, by hand to anglers while fishing or upon completion of a fishing trip (direct). Field personnel recorded information on questionnaire numbers and the date, location and method of distribution (direct or indirect).

In the Hay River area questionnaires were distributed according to fishing effort and the availability of staff. In the Yellowknife area field personnel were instructed to distribute questionnaires on one week day (Monday to Friday) per week and on one week-end day (Saturday or Sunday) per week chosen at random, as well as all statutory holidays. Most questionnaires were distributed in the afternoon and early evening from 1200 to 2100 h.

DATA ANALYSIS

Questionnaire responses from the Yellowknife and Hay River areas were recorded and master summary tables generated by hand. Because of the low response rate in depth computer analysis was not attempted. Basic calculations and statistical analysis were performed using a Hewlett-Packard programmable hand calculator (Model 9820-A).

RESULTS AND DISCUSSION

DISTRIBUTION OF QUESTIONNAIRES

A total of 1051 questionnaires were distributed in the Yellowknife (845) and Hay River (206) areas from May to September, 1979. The majority of angling is reported to occur over this period (Topolinski 1975). In the Yellowknife area, 99 (12%) were distributed directly to anglers and 746 (88%) were placed on the windshields of vehicles (indirect). All 206 questionnaires distributed in the Hay River area were indirect.

The number of questionnaires distributed by month and by location in the Yellowknife and Hay River areas are summarized in Tables 1 and 2, respectively. In the Yellowknife area, 99% of the questionnaires were distributed over a three month period from June to August and 74% were dispensed at three locations (Prelude, Prosperous and Vee Lake; Fig. 1). The remaining 26% were distributed at 14 other locations. In the Hay River area 95% of the questionnaires were distributed during July and August. Two locations (Hay River, Polar Lake; Fig. 2) accounted for 95% of the questionnaires.

It was not always possible to determine which vehicles were used by anglers. As a result, it is believed that an unknown number of questionnaires were left on vehicles which were used by individuals pursuing other activities including: boating, canoeing, hiking, backpacking, sight-seeing, etc. In the Yellowknife area cottage owners on Prosperous and Prelude lakes (and others) who may or may not fish themselves may have received a substantial number of questionnaires because of their frequency of use.

RESPONSE TO QUESTIONNAIRES

A total of 168 responses were received from questionnaires distributed in the Yellowknife (135) and Hay River (33) areas. All responses were used in the analysis of information on sport fishing. The rate of response for the direct method was 23% and 15% for the indirect method. Overall rate of response was 16%. The higher percentage from the direct method may be attributed to personal contact and the fact that the recipient was known to be an angler. In such cases field personnel explained the nature and purpose of the questionnaire to the angler.

The number of questionnaires responded to by month and by location in the Yellowknife and Hay River areas are summarized in Tables 1 and 2, respectively. The rate of response decreased from 25% in June to 10% in August from the Yellowknife area. An insufficient number of

questionnaires was distributed in the Hay River area to detect such a trend. The reasons for the decrease in response rate from the Yellowknife area is not fully understood but it may be attributed to the reluctance of individuals to complete subsequent questionnaires. The rates of response for second and third time respondents were low; being 10% and 1%, respectively, from the Yellowknife areas.

In the Yellowknife area 87% of the responses were from five locations - Prelude, Prosperous, Vee and Reid lakes and Yellowknife River (Fig. 1). The remaining 13% was from 12 other locations. In the Hay River area 73% of the responses were from the Hay River (Fig. 2).

In the Yellowknife area it was found that some responses were from locations other than those where the questionnaires were distributed. For example, out of 133 questionnaires distributed at Vee Lake 10 responses were received from Walsh Lake and 2 responses were received from Banting Lake. Also, 5 responses from Hidden Lake were traced to questionnaires distributed at Prelude Lake. Locations such as Vee Lake, Prelude Lake and others in the Yellowknife area serve as access points to other fishing locations. This point further emphasizes the value of the questionnaire approach in covering a wide area with limited manpower and funding resources, and in obtaining a broader picture of angler activity.

FISH SPECIES CAUGHT

Information on the fish species caught by waterbody from the Yellowknife and Hay River areas is presented in Tables 3 and 4, respectively. In the Yellowknife area, northern pike dominated the overall catch (68%) followed by lake trout (17%), lake whitefish (12%), walleye (2%) and burbot (1%). Walleye appeared to be the most favored species with all of the catch retained. The percentages retained for the remaining species were: lake whitefish - 92%; lake trout - 83% and burbot - 50%. Walleye comprised most of the catch in the Hay River area (71%), followed by northern pike (15%), rainbow trout (11%), Arctic grayling (2%) and suckers (1%). All rainbow trout, Arctic grayling and suckers were retained while 68% and 63% of walleye and northern pike were retained, respectively. The percentage of anglers that were successful in catching at least one fish was 76% from the Yellowknife area and 100% from the Hay River area. These percentages are considered to be high since it is probable that unsuccessful anglers would be less likely to return the completed questionnaire.

ANGLER SUCCESS

From the 168 questionnaire responses, 130 from the Yellowknife area and 33 from the Hay River area provided information on hours fished and number in the fishing party (Table 5). The average time spent fishing was 4.4 h for the Yellowknife area and 3.1 h for the Hay River area. Angling party size was 2.8 and 2.3 for the Yellowknife and Hay River areas, respectively.

Information on the catch per angler by waterbody from the Yellowknife area is presented in Table 6. Catch rates ranged from 0 fish per angler on the Cameron River to 11 per angler from

Banting Lake, catches of greater than 5 fish per angler were also reported from Reid, Martin and Hidden lakes. Catches of less than 3 fish per angler were reported from Prosperous, Vee and Madeline lakes and the Yellowknife River. Catch rates were highest for northern pike (2.7 per angler), followed by lake trout (0.7), lake whitefish (0.5), walleye (0.1) and burbot (<0.1). The highest catch rates by species were: 10.5 northern pike per angler from Banting Lake; 1.9 lake trout per angler from Reid Lake; 1.9 lake whitefish per angler from Prosperous Lake; 2.5 walleye per angler from Martin Lake and 2 burbot per angler from Reid Lake.

Overall catch rates from the Yellowknife area were highest during August with 4.3 fish caught per angler followed by June (4.0 per angler) and July (2.9 per angler) (Table 7). Catch rates for September were not considered here because of the small sample size ($N = 2$). Catches of northern pike per angler increased from 2.5 in June and 2.3 in July to 3.9 per angler in August. Lake trout catches steadily decreased from 1.1 per angler in June to 0.1 per angler in August. Insufficient data precluded similar comparisons for the other species.

Catch per angler-hour results from the Yellowknife area provided similar catch-effort information to that for catch per angler. The overall catch per angler-hour was 0.94 with individual catch rates of 0.64 for northern pike, 0.16 for lake trout, 0.11 for lake whitefish, 0.02 for walleye and <0.01 for burbot (Table 7). Catches of northern pike per angler-hour increased from 0.57 in June to 0.88 in August while those for lake trout decreased from 0.26 to 0.01 per angler-hour in August.

Information on the catch per angler by waterbody from the Hay River area is presented in Table 8. Catch rates were 5.7 fish per angler from the Hay River, 2.8 from the Kakisa River and 3.6 from Polar Lake. The highest catch rate by species was 3.6 walleye per angler followed by 0.8 for northern pike, 0.6 for rainbow trout, 0.1 for Arctic grayling and 0.1 for suckers. Catches of fish per angler and per angler-hour by month are presented in Table 9.

Estimates of catch per angler and catch per angler-hour by species determined using questionnaire method compared favorably with those determined using the creel census method from previous studies by Falk (1979), Falk and Gillman (In prep.) A comparison of catch-effort information using the questionnaire and creel-census methods in Prelude Lake, Prosperous Lake and the Hay River is presented in Table 10. It should be noted that the catch per angler tends to be higher for the questionnaire method since the creel census method often includes incomplete fishing trips.

FISHING QUALITY

Fishing quality was rated by 160 of the 168 respondents from the Yellowknife and Hay River areas (Table 11). Most anglers rated fishing quality as poor in the Yellowknife area (41%) while most Hay River anglers rated fishing quality as good (42%). Overall fishing quality in both areas was rated as fair to poor by 54% of the respondents. This proportion was 60% for the

Yellowknife area and 36% for the Hay River area. Mean values of fishing quality were 3.8 for the Yellowknife area and 3.2 for the Hay River area (1=excellent, 5=poor). While the quality of fishing in the Hay River area appears better than that in the Yellowknife area it should be noted that for the Hay River area questionnaires were, for the most part, distributed seasonally according to fishing activity. In the Yellowknife area, questionnaires were distributed throughout the summer months regardless of fishing activity. For comparison, respondents from a mail-out questionnaire survey on recreational fishing in the Northwest Territories in 1974 rated fishing quality as poor in Yellowknife and Hay River areas (Topolniski 1975).

From questionnaire responses it was possible to determine if non-residents rated fishing quality different than residents of the Northwest Territories. In the Yellowknife area, most non-residents rated fishing quality in the good category (36%) while most residents rated fishing quality as poor (43%). The difference in rating was significant at $P = 0.05$ ($\chi^2 = 11.61$; 4 df). In the Hay River area most non-residents rated fishing quality as fair (38%) while most residents rated fishing quality as good (48%). This difference was not significant at $P = 0.05$ ($\chi^2 = 5.74$; 4 df).

Fishing quality appeared to decrease over the summer in the Yellowknife area. The majority of anglers rated fishing quality as good in June (31%) but most rated it as poor during July (42%) and August (61%). Mean values of fishing quality increased from 3.7 in June to 4.1 in August. Seasonal changes in fishing quality was not determined for the Hay River area because of insufficient data.

In the Yellowknife area fishing quality was rated as the best from Hidden Lake (3.4) followed by Pontoon Lake (3.5), Walsh Lake (3.5), Prosperous Lake (3.6), Reid Lake (3.9), Yellowknife River (4.1), Madeline Lake (4.3) and Prelude Lake (4.4). Sample sizes less than 5 were omitted from this comparison. Further, there was no apparent correlation between fishing quality and catch per angler. Fishing quality for the Hay River area was rated at 3.0 for Polar Lake and 4.3 for the Kakisa River.

ANGLER RESIDENCE

The majority (87%) of anglers who responded to questionnaires from the Yellowknife and Hay River areas were from the Northwest Territories (Table 12). Non-residents accounted for 11% of the respondents from the Yellowknife area and 24% from the Hay River area. Non-residents were found to be from southern Canada (61%), United States (35%) and other countries (4%).

COMMENTS ON SPORT FISHING

Anglers were asked to comment on the present and future direction of sport fishery management in the Northwest Territories. Of the 168 respondents, 73 provided comments useful to the study. Comments were grouped according to similarity and are summarized in Table 13. The most frequent comments were stocking of waterbodies (23%), more enforcement (16%), against net fishing (15%), develop better access and

facilities for sport fishing (12%), stricter regulations (10%), more liberal regulations (8%) and more information for anglers (7%). Other comments included: for and against trophy fishery management (50:50), restrictions on boats and motors, closing waters during spawning, increase licence fees and use of barbless hooks. In general, most comments pertained to improvement and protection of sport fishing in the Yellowknife and Hay River area. This follows from the fair to poor rating of fishing in these areas as discussed previously.

LIMITATIONS OF THE STUDY

The hand-out questionnaire provided valuable information on the sport fishery in the Yellowknife and Hay River areas. Information on the catch of fish by area, waterbody, species, month and angler as well as that on fishing quality, residence of anglers and angler attitudes provide a broad picture of sport fishing in the study area. Such information may be vital to the development of sound and effective fishery management strategies. However, it was recognized that the questionnaire method possesses inherent limitations or some form of bias. Such biases have been discussed in terms of age, interest groups, residency and time delay by Duttweiler (1976), frequency of use by Sinclair and Morley (1975) and response bias by Jones et al. (1977). Examples of response bias relate to higher than actual reported angling times (Edwards 1971; Radford 1973) and numbers of fish caught and retained by species (Johnson and Wroblewski 1962). An advantage of the hand-out questionnaire over the mail-out form is that anglers are more likely to remember the details of days fishing than what and how many fish they caught at a later date.

In short, limitations of the questionnaire method are well-documented. McFadden et al. (1964) stated that: "When a choice in program must be made among alternatives which are all compatible with biologically sound management of natural resources, the opinion of the public is an appropriate basis of choice. Unbiased estimates of public opinion, which can be obtained, by properly designed questionnaires are preferable to estimates provided by avenues of personnel and group expression".

The major limitation of the hand-out questionnaire used for the present study was the low response rate (16%) in comparison to those typical of mail-out questionnaires using licence sales as a basis for sampling: 86% - McFadden et al. (1964); 73% - Duttweiler (1976); 40% - Calhoun (1953); and 74% (Topolniski 1975). Peppar and Pickard (1978) and Peppar 1977 report response rates of 18 - 41% using a direct hand-out questionnaire in New Brunswick. The low response rate obtained for the present study makes the results subject to non-response bias (Robinson and Agism 1951) and serves to question assumptions of representativeness and adequacy.

While the reasons for the low response rate are not known, non-respondents may fall into three categories. In order of relative proportion these are:

1. persons not angling

2. unsuccessful anglers
3. successful anglers

Persons not angling or involved in non-consumptive uses of the natural resource such as sight-seeing, boating, canoeing, hiking, backpacking, etc. are thought to make up the majority of non-respondents. Cottage owners on several of the lakes, particularly Prosperous and Prelude lakes, who are not likely to fish each day may account for a portion of these non-respondents from the Yellowknife area. The higher rate of return for questionnaires distributed by the direct method over the indirect method lends some support to this. Unsuccessful anglers are considered to constitute the next category of non-respondents because of their dissatisfaction. Also, the questionnaire was not specific in this regard. Anglers who were successful but did not complete a questionnaire are believed to comprise a minority of non-respondents. While it is impossible to determine which category accounted for most of the respondents the low response rate is disappointing because questionnaires were primarily distributed at popular road access fishing locations.

Another limitation of the hand-out questionnaire method is that alone it does not provide the necessary information to determine total fishing effort and total harvest. Only a sampling of the total population of anglers is possible yielding indications of average catch/effort and angler attitudes/preferences. Knowledge of total catch in relation to potential yield is necessary for effective management of individual waterbodies but not for the development of management strategies over a broad area. This aspect was recognized and the determination of total harvest by waterbody was not an objective of the present study. The questionnaire method is more likely to detect problem areas requiring attention so that the appropriate follow-up investigations may be carried out.

IMPLICATIONS FOR MANAGEMENT

Despite the limitations of the study the questionnaire survey of sport fishing in the Yellowknife and Hay River areas has provided information that may be used in the development of an overall management plan for the sport fishery in these areas. Such a plan is considered necessary in view of many of the sport fisheries in the study area (Falk and Gillman 1974, 1980, In prep.; Falk et al. 1980; Bond et al. 1978; Moshenko and Low In prep.) as well as the results of the present questionnaire survey.

Effective management of the sport fishery in the Yellowknife and Hay River areas must recognize the nature of the resource as well as the needs and preferences of the fishermen. The road access sport fishery is restricted to the immediate vicinity of the study area since road development is not extensive. Available angling opportunities are generally well known to local residents who make heavy use of them during the open-water period. Ice fishing is carried out on some lakes but it is not as popular because of the severe climate and resulting ice conditions. The number of angling opportunities is also

limited with more accessible waterbodies in the Yellowknife area situated on the Canadian Shield than the Hay River area situated in the Western Interior Lowlands. Sport fishing in the study area is also diverse in that a variety of game fish species are available in a variety of situations. Several spawning and feeding migrations of Arctic grayling, walleye and northern pike constitute the primary sport fisheries in the Hay River area. In the Yellowknife area these seasonal fisheries are augmented with more popular continuous fisheries for lake trout and northern pike.

Northern fish species possess characteristics of slow growth, late age of first maturity, longevity and limited reproductive potential which have been documented for the study area by Falk (1979), Falk et al. (1980), Falk and Gillman (1974, 1980, In prep.), Bond et al. (1978) and Moshenko and Low (In prep.). These characteristics are a result of the harsh environment, short growing season and, in many instances, low productivity. Consequently, game fish species are more susceptible to over-exploitation than those in southern Canada and once over-fishing occurs the recovery period is longer.

With a limited number of angling opportunities in the Yellowknife and Hay River areas and an ever increasing number of fishermen it is inevitable that the resulting angling pressure will lead to local over-fishing and a decline in fishing quality. This scenario is similar to many case histories in North America and is to be expected to occur even with conservative fishery management practices. The demand for sport fishing simply exceeds the supply of fish. The non-resilient nature of northern game fish species makes the situation more serious and requires the implementation of sound fishery management strategies to maintain quality sport fisheries and, where possible, to enhance fishing quality.

The available information suggests that the sport fisheries in the study areas are no longer so plentiful that they can be considered abundant. Increasingly, they are becoming a scarce resource. An option exists to manage these fisheries in light of this scarcity. Control measures can be used to ration the available stocks to users. Alternatives to the open access approach include the use of a price system to allocate the scarce stocks to those most willing to pay for the right of access. Alternatively, there would be administrative mechanisms to ration the stocks. Such as the lottery system for hunting privileges which exists in other jurisdictions. In conjunction with the control measures, the possibility of expanding the supply warrants consideration. Relative to the cost of improving access to more remote fisheries or alternatively, of enhancement of existing fisheries, it may be possible to demonstrate that the beneficiaries of such development would realize benefits in excess of the costs. It has been stated that a price system provides both the "discipline" and the "information" to assist public sector managers in deciding whether or not such an expansion of capacity is warranted (Milliman 1972).

A number of sport fishery management strategies may be developed based on available

biological information and questionnaire results that should be employed in the formulation of an overall management plan for the Yellowknife and Hay River areas. The most apparent strategies are as follows:

1. Improvement of access to lightly fished waterbodies in the Yellowknife and Hay River areas. This will serve to disperse fishing effort over a wider area and may reduce fishing effort on presently accessible lakes.
2. Implementation of measures to improve fishing quality over the long-term on accessible waterbodies that are showing signs of overexploitation. Such measures may include the protection of spawning stocks to increase eventual recruitment to the sport fishery.
3. Promote fishing for underutilized game fish species such as lake whitefish. This strategy will reduce fishing effort on the presently more preferred species.
4. Further explore the feasibility of stocking waterbodies in the Yellowknife and Hay River areas to disperse fishing effort and to create new angling opportunities.
5. Provide more information to anglers on sport fishing in the Yellowknife and Hay River areas. The thrust of this strategy should be to educate fishermen about the present status, future potential and conservation methods of sport fishing in their respective areas.

Based on experience in other regions of North America it is imperative that local anglers cooperate and participate in the management of the sport fishery resource. Results from the present questionnaire survey constitute the first step in this process.

ACKNOWLEDGMENTS

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Table 1. Number of questionnaires distributed and responses by month and by location from the Yellowknife area, 1979.

Waterbody	Number Distributed					Number of Responses				
	June	July	August	Sept.	Total(%)	June	July	August	Sept.	Total(%)
Prelude Lake	36	127	130	0	293 (35)	8	16	14	0	38 (28)
Prosperous Lake	61	72	42	4	179 (21)	12	8	4	2	26 (19)
Vee Lake	21	48	64	0	133 (16)	5	7	6	0	18 (13)
Yellowknife River	22	35	19	0	76 (9)	8	8	2	0	18 (13)
Reid Lake	28	13	16	2	59 (7)	11	3	3	0	17 (13)
Pontoon Lake	11	14	12	0	37 (4)	2	3	1	0	6 (4)
Madeline Lake	9	8	5	0	22 (3)	4	1	1	0	6 (4)
Pickereel Lake	6	1	2	0	9 (1)	0	0	0	0	0 (-)
Cameron River	8	1	0	0	9 (1)	2	0	0	0	2 (1)
Martin Lake	5	0	1	0	6 (1)	0	0	1	0	1 (1)
Tibbit Lake	3	3	0	0	6 (1)	0	0	0	0	0 (-)
Mosquito Creek	6	0	0	0	6 (1)	2	0	0	0	2 (1)
Grace Lake ^a	0	3	0	0	3 (<1)	0	1	0	0	1 (1)
Cabin Lakes ^a	2	1	1	0	4 (<1)	0	0	0	0	0 (-)
Float Lake ^a	1	0	0	0	1 (<1)	0	0	0	0	0 (-)
Terry Lake ^a	1	0	0	0	1 (<1)	0	0	0	0	0 (-)
Quarry Lake ^a	1	0	0	0	1 (<1)	0	0	0	0	0 (-)
Total	221	326	292	6	845	54	47	32	2	135
%	26	39	35	1		40	35	24	1	

^a local names.

Table 2. Number of questionnaires distributed and responses by month and by location from the Hay River area, 1979.

Waterbody	Number Distributed					Number of Responses				
	May	June	July	August	Total(%)	May	June	July	August	Total(%)
Hay River	0	0	0	118	118 (57)	0	0	0	24	24 (73)
Polar Lake	0	0	78	0	78 (38)	0	0	5	0	5 (15)
Kakisa River	5	5	0	10	10 (5)	3	1	0	0	4 (12)
Total	5	5	78	118	206	3	1	5	24	33
%	2	2	38	57		9	3	15	73	

Table 3. Number of fish caught by waterbody from the Yellowknife area, 1979.

Waterbody	Fish Species					Total(%)
	Northern Pike	Lake Trout	Lake Whitefish	Walleye	Burbot	
Prelude Lake	54	15	2	0	0	71 (13)
Prosperous Lake	59	23	54	0	0	136 (15)
Vee Lake	5	0	0	0	0	5 (1)
Banting Lake	21	1	0	0	0	22 (4)
Walsh Lake	36	6	1	0	0	43 (8)
Yellowknife River	37	0	3	0	0	40 (7)
Reid Lake	72	30	5	0	2	109 (20)
Pontoon Lake	21	0	0	0	0	21 (4)
Madeline Lake	19	0	0	0	0	19 (4)
Cameron River	0	0	0	0	0	0 (-)
Martin Lake	7	0	0	5	0	12 (2)
Mosquito Creek	11	0	0	5	0	16 (3)
Grace Lake	3	0	0	0	0	3 (1)
River Lake	4	1	0	0	0	5 (1)
Hidden Lake	12	16	0	0	0	28 (5)
Penninsula Lake	5	0	0	0	0	5 (1)
Total	366	92	65	10	2	535
%	68	17	12	2	<1	

Table 4. Number of fish caught by waterbody from the Hay River area, 1979.

Waterbody	Fish Species					Total(%)
	Walleye	Northern Pike	Rainbow Trout	Arctic Grayling	Suckers	
Hay River	118	19	0	0	0	137 (83)
Kakisa River	0	6	0	3	2	11 (7)
Polar Lake	0	0	18	0	0	18 (11)
Total	118	25	18	3	2	166
%	71	15	11	2	1	

Table 5. Number of anglers, number of hours fished and number in fishing party from the Yellowknife and Hay River areas, 1979.

Area	Number of Anglers	Number of Hours Fished			Number in Fishing Party		
		N	Total	Mean	N	Total	Mean
Yellowknife	130	130	572	4.40	130	365	2.81
Hay River	33	32	98	3.06	32	74	2.31
Total	163	162	679	4.14	162	439	2.71

Table 6. Catches of fish per angler by waterbody from the Yellowknife area, 1979.

Waterbody	Fish Species					Total
	Northern Pike	Lake Trout	Lake Whitefish	Walleye	Burbot	
Prelude Lake	1.80	0.50	0.07	-	-	2.37
Prosperous Lake	2.03	0.79	1.86	-	-	4.69
Vee Lake	2.50	-	0.00	-	-	2.50
Banting Lake	10.50	0.50	0.00	-	-	11.00
Walsh Lake	2.57	0.43	0.07	-	-	3.07
Yellowknife River	2.47	-	0.21	-	-	2.67
Reid Lake	4.50	1.88	0.31	-	2.00	6.81
Pontoon Lake	3.50	-	-	-	-	3.50
Madeline Lake	2.71	-	-	-	-	2.71
Cameron River	-	-	-	-	-	-
Martin Lake	3.50	-	-	2.50	-	6.00
Mosquito Creek	3.67	-	-	1.67	-	5.33
Grace Lake	3.00	-	-	-	-	3.00
River Lake	4.00	1.00	-	-	-	5.00
Hidden Lake	2.40	3.20	-	-	-	5.60
Penninsula Lake	5.00	-	-	-	-	5.00
Total	2.71	0.68	0.48	0.07	0.01	3.95

Table 7. Catches of fish per angler and per angler-hour by month from the Yellowknife area, 1979.

Fish Species	Month												Total		
	June			July			August			September					
	No. Caught	No. Caught per Angler	No. Caught per Angler-h	No. Caught	No. Caught per Angler	No. Caught per Angler-h	No. Caught	No. Caught per Angler	No. Caught per Angler-h	No. Caught	No. Caught per Angler	No. Caught per Angler-h	No. Caught	No. Caught per Angler	No. Caught per Angler-h
Northern pike	138	2.46	0.57	110	2.34	0.60	118	3.93	0.88	0	-	-	366	2.71	0.64
Lake trout	63	1.13	0.26	24	0.51	0.13	2	0.07	0.01	3	1.50	0.23	92	0.68	0.16
Walleye	9	0.16	0.04	0	-	-	1	0.03	<0.01	0	-	-	10	0.07	0.02
Lake whitefish	14	0.25	0.06	4	0.09	0.02	8	0.27	0.06	39	19.50	3.00	65	0.48	0.11
Burbot	2	0.04	0.01	0	-	-	0	-	-	0	-	-	2	0.01	<0.01
Total	226	4.04	0.94	138	2.94	0.75	129	4.30	0.97	42	21.00	3.23	535	3.95	0.94

Table 8. Catches of fish per angler by waterbody from the Hay River area, 1979.

Waterbody	Fish Species					Total
	Walleye	Northern Pike	Rainbow Trout	Arctic Grayling	Suckers	
Hay River	4.92	0.79	-	-	-	5.71
Kakisa River	-	1.50	-	0.75	0.50	2.75
Polar Lake	-	-	3.60	-	-	3.60
Total	3.58	0.76	0.55	0.09	0.06	5.03

Table 9. Catches of fish per angler and per angler-hour by month from the Hay River area, 1979.

Fish Species	Month												Total		
	May			June			July			August					
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
	Caught	Caught per Angler	Caught per Angler-h	Caught	Caught per Angler	Caught per Angler-h	Caught	Caught per Angler	Caught per Angler-h	Caught	Caught per Angler	Caught per Angler-h	Caught	Caught per Angler	Caught per Angler-h
Walleye	0	-	-	0	-	-	0	-	-	118	5.13	1.90	118	3.58	1.20
Northern pike	5	1.67	0.29	1	1.00	1.00	0	-	-	19	0.83	0.31	25	0.76	0.26
Rainbow trout	0	-	-	0	-	-	18	3.00	1.00	0	-	-	18	0.55	0.18
Arctic grayling	3	1.00	0.18	0	-	-	0	-	-	0	-	-	3	0.09	0.03
Suckers	0	-	-	2	2.00	2.00	0	-	-	0	-	-	2	0.06	<0.01
Total	8	2.67	0.47	3	3.00	3.00	18	3.00	1.00	137	5.96	2.21	166	5.03	1.69

Table 10. Comparison of catches per angler and per angler-h determined from the questionnaire method to those determined from the creel census method, 1973-78.

Location	Date (D/M/Y)	Method	No. Anglers	Catch per Angler				Catch per Angler-h			
				Lake Trout	Northern Pike	Walleye	All Species	Lake Trout	Northern Pike	Walleye	All Species
Prosperous Lake	13/6-1/7/73 ^a	Roving	16	0.89	2.19	-	3.06	0.25	0.63	-	0.89
	1/7/79 ^b	Roving	24	-	0.29	-	0.29	-	0.09	-	0.09
	-/7/79	Questionnaire	11	0.12	3.91	-	4.73	-	0.73	-	0.88
Prelude Lake	14/6-5/7/73 ^a	Roving	21	0.43	1.43	-	1.91	0.13	0.44	-	0.58
	1/7/79 ^b	Roving	18	0.61	0.61	-	1.28	0.17	0.17	-	0.36
	-/7/79	Questionnaire	15	0.73	0.60	-	1.33	0.20	0.16	-	0.36
Hay River	13/6-21/8/75 ^c	Roving	4748	-	0.05	1.57	1.65	-	0.04	1.23	1.29
	19/6-31/8/78 ^d	Roving	1388	-	0.08	1.56	1.70	-	0.06	1.17	1.20
	-8/79	Questionnaire	24	-	0.79	4.92	5.71	-	0.31	1.90	2.21

^a Falk (1979).

^b Falk and Gillman (In prep.).

^c Bond et al. (1978).

^d Moshenko and Low (In prep.).

Table 11. Rating of fishing quality in the Yellowknife and Hay River areas, 1979.

Area	Fishing Quality					Total
	1 Excellent	2 Very Good	3 Good	4 Fair	5 Poor	
Yellowknife	3 (2) ^a	15 (12)	34 (27)	23 (18)	52 (41)	127
Hay River	3 (9)	4 (12)	14 (42)	8 (24)	4 (12)	33
Total	6 (4)	19 (12)	48 (30)	31 (19)	56 (35)	160

^a Percent.

Table 12. Residence of anglers from the Yellowknife and Hay River areas, 1979.

Area	Place of Residence							Total
	Northwest Territories	Alberta	British Columbia	Ontario	New Brunswick	United States	Other Countries	
Yellowknife	116 (89) ^a	4 (3)	2 (2)	1 (1)	1 (1)	6 (5)	1 (1)	131
Hay River	25 (76)	3 (9)	1 (3)	2 (6)	0 (-)	2 (6)	0 (-)	33
Total	141 (86)	7 (4)	3 (2)	3 (2)	1 (1)	8 (5)	1 (1)	164

^a Percent.

Table 13. Summary of anglers' comments (by category) on sport fishery management in the Yellowknife and Hay River areas, 1979.

Comment	N	%
Stocking of waterbodies to disperse fishing effort, increase angling opportunities and improve fishing quality	17	23
More enforcement of sport fishing regulations (net fishing, overpossession, illegal fishing methods etc.)	12	16
Prohibit the use of nets for any purpose in sport fishing lakes	11	15
More and better access (roads, trails) to sport fishing lakes and development of related facilities (boat launches, docks)	9	12
More restrictive regulations such as size and possession limits	7	10
More liberal catch and possession limits	6	8
More information on sport fishing (species, locations, access, marked trails)	5	7
For trophy fish management - Great Slave and Great Bear lakes	2	3
Against trophy fish management - Great Slave and Great Bear lakes	2	3
Restrictions on boats and motors on stocked waters	2	3
Good sport fishery management	2	3
Closure of certain waters during spawning	1	1
Inadequate sport fishery management	1	1
Increase sport fishing licence fees	1	1
Lower age for sport fishing licence	1	1
Removal of coarse fish	1	1
Implement recreational net fishery in certain waters	1	1
Use of barbless hooks	1	1
Remove sport fishing licence requirement for residents at the Northwest Territories	1	1

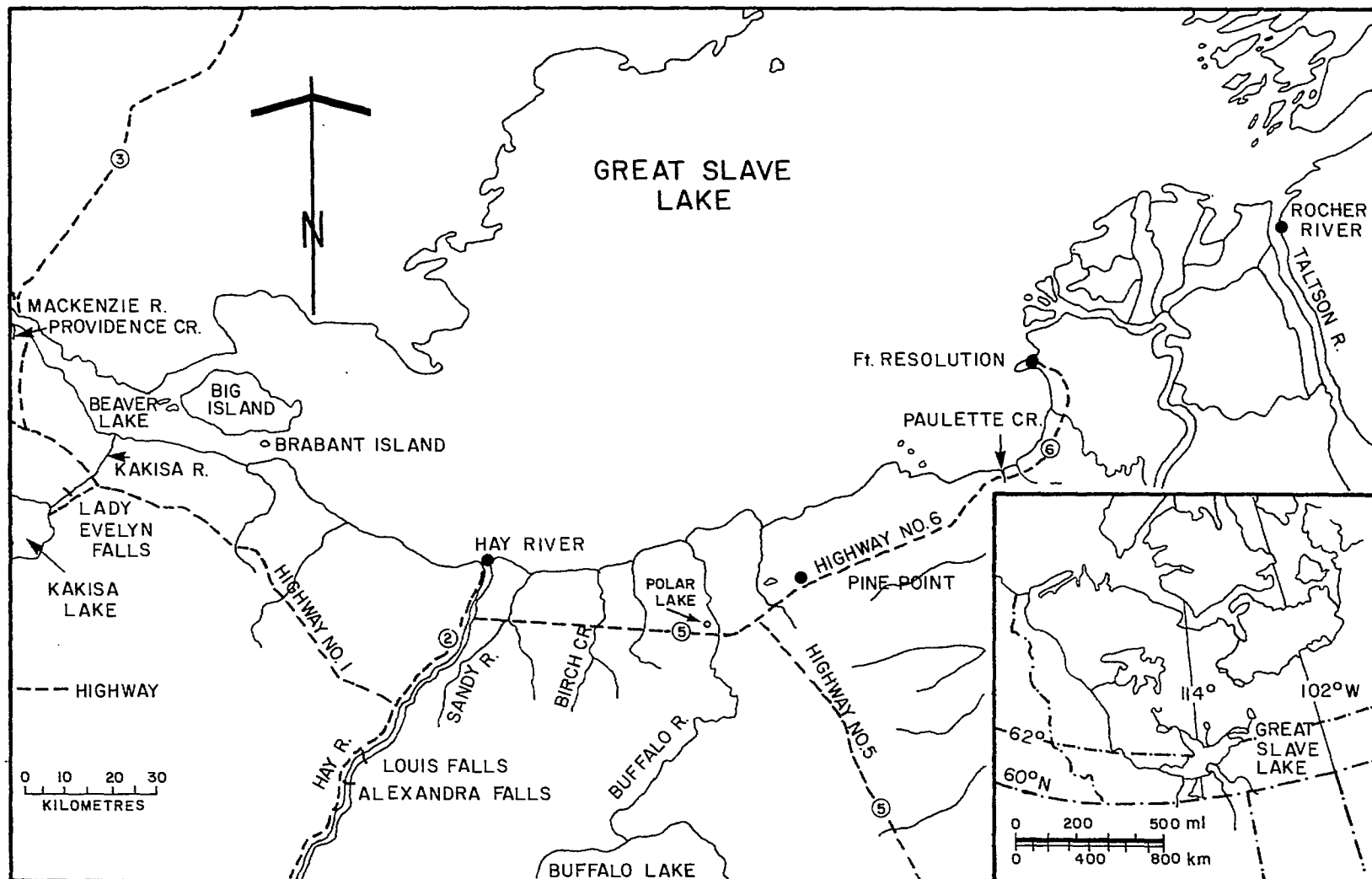


Fig. 1. Map of the Hay River area showing the locations where questionnaires were distributed, 1979.

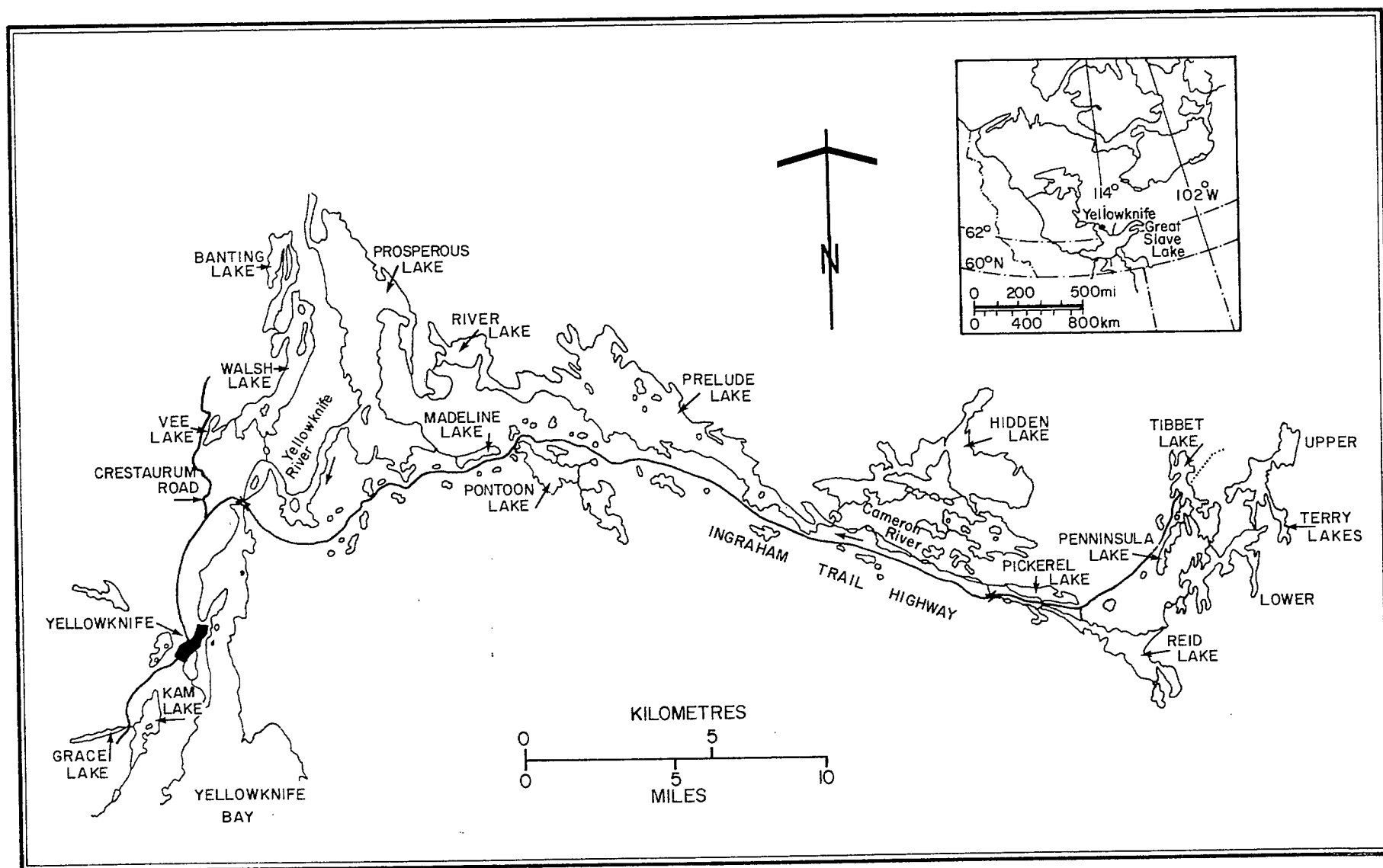


Fig. 2. Map of the Yellowknife area showing the locations where questionnaires were distributed, 1979.

QUESTIONNAIRE ON RECREATIONAL FISHING IN THE NORTHWEST
TERRITORIES

1. Have you completed one of these forms previously?

Yes ☐ No ☐ If "yes" when? _____

2. Date on which questionnaire was received

_____, 1979.

3. Location(s) fished on the above date _____

4. Hours fished ☐

5. Number in party ☐

6. How many of each of the following species of fish did you yourself, catch and retain?

<u>Species</u>	<u>Caught</u>	<u>Retained</u>
Arctic grayling	☐	☐
lake trout	☐	☐
northern pike	☐	☐
walleye	☐	☐
whitefish	☐	☐
suckers	☐	☐
rainbow trout	☐	☐
brook trout	☐	☐
inconnu	☐	☐
other (specify) _____	☐	☐

7. Place of residence: Community if in the Northwest Territories _____

Province, state or country if not in NWT _____

8. How would you rate your fishing on the above date?

Excellent ☐ ☐ ☐ ☐ ☐ Poor
1 2 3 4 5

9. Do you have any comments concerning present and future direction of sport fishery management in the Northwest Territories?

10. Would you like a copy of the survey results?

Yes ☐ No ☐

11. Return address:

Fig. 3. Questionnaire form used in the survey of sport fishing in the Yellowknife and Hay River areas, 1979.



Your file Votre référence

Our file Notre référence 726-6-3

Dear Angler:

The Fishery Management Division of the Federal Department of Fisheries and Oceans is conducting a voluntary creel census program in the Great Slave Lake area during 1979-80. The purpose of this program is to provide more effective management of the sport fishery resource in the Northwest Territories. As part of this program, the Fishery Management Division is requesting your cooperation in completing the enclosed questionnaire on recreational fishing.

The questionnaire is designed to obtain information on the lakes and rivers fished, hours fished, as well as the numbers of fish caught and retained. Space is provided for your comments on present and future direction of sport fishery management in the Northwest Territories. All information recorded will remain confidential. A copy of the survey results will be made available upon request.

We hope you share our objective in making fishery management programs more responsive to the needs of present and future anglers. Your assistance in taking a few minutes to complete the questionnaire will be greatly appreciated.

Yours very truly,

Mel R. Falk
Sport Fishery Management Biologist

MRF/map

Enclosure

Fig. 4. Covering letter used in conjunction with the questionnaire survey of sport fishing in the Yellowknife and Hay River areas, 1979.

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