

**ASSESSMENT OF THE STATUS OF THE  
SPORT FISHERY FOR WALLEYE AND  
NORTHERN PIKE, AND STATISTICS FOR  
YELLOW PERCH AT FICKLE LAKE,  
SUMMER 1998**

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## **ABSTRACT**

Alberta's fisheries managers developed a walleye management plan in 1995 (Berry 1995) to provide provincial standards for classifying walleye stocks. A similar northern pike management plan has recently been completed (Berry 1999) and preliminary data analysis for yellow perch began in 1999. The walleye fishery at Fickle Lake was classified as collapsed in 1996 (Alberta Environmental Protection 1996). A daily bag limit of zero walleye (catch and release only) is associated with a collapsed population. A creel survey was conducted in the summer of 1998 in order to assess the status of the walleye fishery, and provide data on the northern pike and yellow perch fisheries.

Based on the classification criteria for walleye stocks in Alberta, the Fickle Lake walleye fishery should remain at the collapsed classification. Preliminary analysis of the data for northern pike suggests that this fishery should fit into the vulnerable classification, as seven of nine criteria placed it in this category. Based on the northern pike management plan (Berry 1999), such a classification would result in a minimum size limit of 63 cm total length and three fish per day harvest in 1999 and one fish per day harvest in 2000. Some data on yellow perch was collected and reported in anticipation of the development of a yellow perch management plan for Alberta.

## **ACKNOWLEDGEMENTS**

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## 1.0 INTRODUCTION

Many of Alberta's lakes receive substantial fishing pressure. This is a result of low lake density, compared to the number of anglers seeking fishing opportunities. High harvest levels have depressed many fish populations below historic levels, and resulted in the establishment of several provincial management strategies for key lake sport fish species, such as walleye (*Stizostedion vitreum*) (Berry 1995), northern pike (*Esox lucius*) (Berry 1999). Preliminary analysis of yellow perch (*Perca flavescens*) data in the province began in 1999.

Presently, creel surveys are the preferred management tool for assessing most fisheries in Alberta lakes. In this report, we use the term "creel survey" in the popular sense. In addition to assessing an angler's "creel", or harvested catch, we include the reported released catch. The management plan for walleye and northern pike are designed to use creel survey data to assess and manage these fisheries. The data required include catch and harvest rates, success rates, mean size of fish kept, distribution of the catch among anglers, age class structure and stability, length-at-age and age-at-maturity. These parameters are defined in the methods section.

In 1996, when Alberta's Walleye Management and Recovery Plan was introduced, Fickle Lake was classified as having a collapsed walleye fishery (Alberta Environmental Protection 1996). The collapsed walleye classification was accompanied with a zero bag limit (catch and release). This classification was based largely on opinion and the results of historic summer and winter creel surveys spanning the period from 1979 to 1994. The last in-depth creel survey was conducted in 1994, and a lack of monitoring of the response of the walleye population to the new fisheries regulations, prompted a review of this fishery in 1998.

A creel survey was conducted at Fickle Lake from May 20 to August 11, 1998 in order to determine the status of the walleye fishery. Data on the northern pike and yellow perch fisheries were also collected and analysed for management of these species. Work has been completed on a provincial management and recovery plan for northern pike (Berry 1999) and preliminary work on yellow perch began in 1999.

### Purpose and Objectives

The general purpose of the project was to evaluate the current status of walleye, northern pike and yellow perch stocks and the response of these populations to fisheries management regulatory strategies implemented in 1994 (walleye) and in 1998 (northern pike and yellow perch).

The specific objectives of the study were:

- 1) To collect, evaluate and compare catch rate, age-class structure, age-class stability, growth rate and age at maturity data for walleye, northern pike and yellow perch stocks in Fickle Lake.
- 2) To determine changes in angler demographics and attitudes created by current regulatory strategies.

- 3) To commence an ongoing lake monitoring program in the Northern East Slopes that will evaluate the effectiveness of current regulatory strategies designed to recover fish stocks and improve the recreational fishery
- 4) To provide an educational component focused on walleye, northern pike and yellow perch ecology and management.

## **2.0 METHODS**

### **2.1 Study Site**

Fickle Lake (52-19-W5M) is a eutrophic lake 456 hectares in area, located approximately 30 km southwest of Edson, Alberta (Figure 1) (AENV/NRS/FMD, Edson file data). The drainage basin for Fickle Lake is 133 square kilometres (AENV/NRS/FMD, Edson file data). A day-use area and campground exist at the northeast end of Fickle Lake. Walleye, northern pike, yellow perch, lake whitefish, white sucker and spottail shiner are known to exist in Fickle Lake (AENV/NRS/FMD, Edson file data).

Developments and provincial angling regulation changes from 1942 until present are displayed in Table 1. Commercial fishing, targeting mainly lake whitefish occurred every year from 1942 until its permanent closure in 1971 due to increased recreational demands (Konynenbelt 1995).

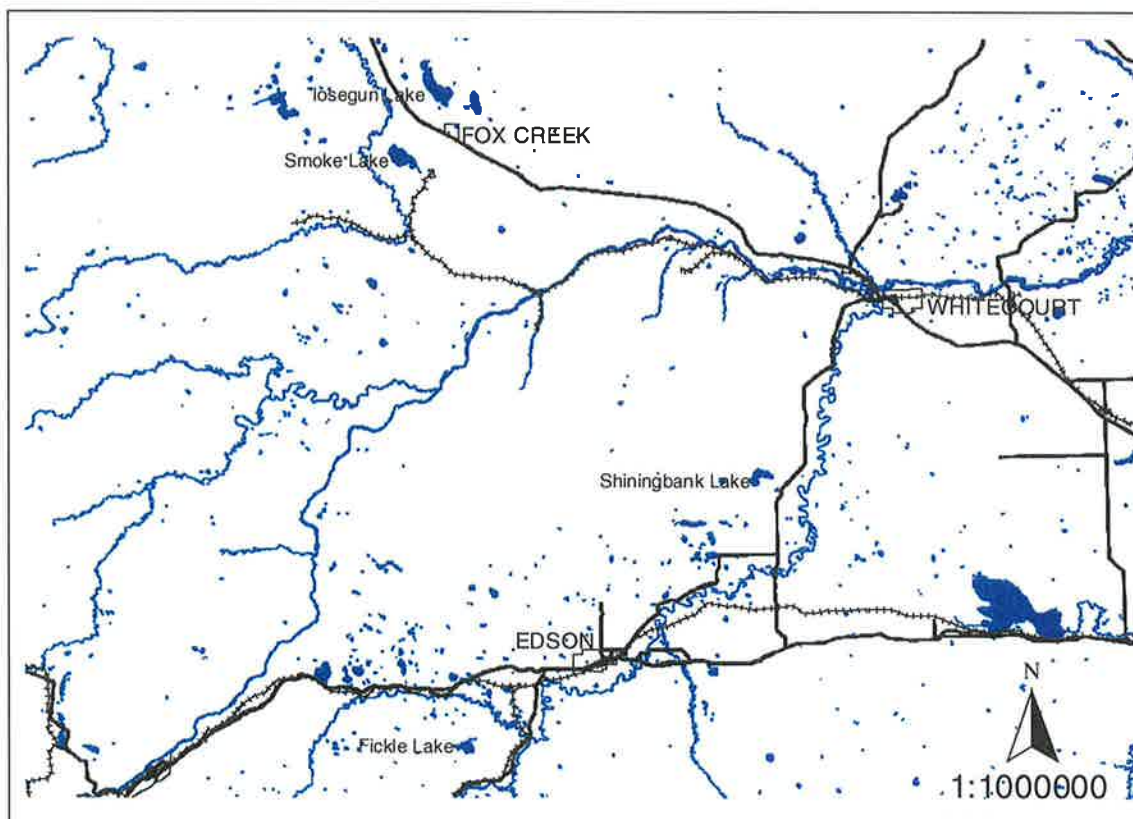


Figure 1. Map displaying the location of Fickle Lake.

Table 1. Historical developments and events, and fisheries management regulation changes at Fickle Lake.

Year	Development or Event
1942 <sup>b</sup>	Commercial fishing commenced.
1949 <sup>a</sup>	Yellow perch and goldeye: 25 fish of one species or 25 in aggregate. Northern pike and walleye: 15 fish of one species or 15 in aggregate. Northern pike and walleye, perch and goldeye: 25 fish in aggregate of which not more than 15 may be pike or walleye.
1960 <sup>a</sup>	Yellow perch: 25 fish; pike, walleye, sauger, and goldeye: 15 fish of one species or 15 in the aggregate. Size limits did not exist. Possession limit for the above was twice the daily limit.
1960 <sup>b</sup>	First road access to Fickle Lake.
1962 <sup>b</sup>	Random sampling of commercial catch.
1964 <sup>b</sup>	Yellow perch stocked (approximately 7000).
1965 <sup>b</sup>	Test netting conducted.
1967-71 <sup>b</sup>	Random sampling of commercial catch.
1968 <sup>a</sup>	Yellow perch: no limit.
1968 <sup>b</sup>	Campground developed.
1970 <sup>a</sup>	Northern pike, walleye, sauger, and goldeye: 10 fish of one speices or 10 in aggregate. Possession limit for the above was twice the daily limit.
1971 <sup>b</sup>	Permanent closure of the commercial fishing season after the 1971 season.
1971 <sup>b</sup>	Test netting conducted.
1972-73	Yellow perch: no limit; Northern pike, walleye and sauger: daily limit = 10 fish of one species or 10 fish in aggregate, possession limit = 20 of one species or 20 fish in aggregate; no size limits. Angling season open year round on Fickle Lake.
1974-75	Yellow perch: daily limit = 30, possession limit = 30.
1975 <sup>b</sup>	Test netting conducted.
1978-79	Northern pike: daily limit = 10, possession limit = 10; walleye and sauger: daily limit = 10 in aggregate, possession limit = 10 in aggregate.
1979-80	Walleye and sauger: daily limit = 5 in aggregate, possession limit = 10 in aggregate.
1979 <sup>b</sup>	Creel survey conducted (winter).
1980 <sup>b</sup>	Campground upgraded.
1981 <sup>b</sup>	Creel survey conducted (winter).
1986 <sup>b</sup>	Campground expanded; internal roads and parking.
1987-88	Walleye and sauger in the aggregate: April 1 to May 15 daily limit = 2, possession limit = 4; May 16 to March 31 daily limit = 5, possession limit = 5.
1988 <sup>b</sup>	Upgrades at campground <i>i.e.</i> vault toilets etc.
1988-90 <sup>b</sup>	Walleye stocking (approximately 40 000 per year).
1988-90	Walleye and sauger in the aggregate: April 1 to May 20 daily limit = 2, possession limit = 4; May 21 to March 31 daily limit = 5, possession limit = 5.

Table 1. Cont' d.

<b>Year</b>	<b>Development or Event</b>
1989 <sup>b</sup>	Walleye trapping (May 9 - 15).
1989-90	Walleye and sauger combined limit is 3, but none of the walleye may be under 38 cm.
1990 <sup>b</sup>	Creel survey conducted (summer).
1991 <sup>b</sup>	Creel survey conducted (summer).
1992 <sup>b</sup>	Creel survey conducted (summer).
1992 <sup>b</sup>	Mapping of rocky substrate areas (July).
1993 <sup>b</sup>	Creel survey conducted (summer).
1993 <sup>b</sup>	Walleye stocking evaluation.
1993-94 <sup>b</sup>	Water level control structure built of the outlet creek to maintain water levels at/or near historical full supply levels.
1994 <sup>b</sup>	Creel survey conducted (summer).
1995 <sup>b</sup>	Creel survey conducted (winter).
1996-97	Walleye Management and Recovery Plan implemented: Stable population - 3 walleye and a minimum-size limit of 43 cm, Vulnerable population - 3 walleye and a minimum-size limit of 50 cm, Collapsed population - zero catch limit (Fickle Lake classified as Col
1998	Creel survey conducted from May 20 to August 11.
	a-Dave Berry pers. comm. 1998
	b-AENV/NRS/FMD, Edson file data

## 2.2 Survey Schedule

Data were collected using two sampling procedures. The first was an access point creel survey (Hayne 1991). A team of two attendants located at the only boat launch and campground on Fickle Lake attempted to interview all anglers as they returned from the lake (complete angling trip). The survey targeted the summer fisheries for walleye, northern pike and yellow perch and covered the period of May 20 to August 11. The creel survey crew conducted surveys at Fickle Lake for five consecutive days, during a 14-day rotation. In order to survey anglers during weekends at Fickle Lake, days off were always weekdays. By sampling weekends, the number of angler interviews was maximised which improved the efficiency of sampling effort.

The second sampling procedure involved "test angling". This consisted of angling on the lake, and recording time fished and fork length (FL) or total length of all fish captured. Test angling was conducted to collect additional information on the size frequency distribution of the fish populations. Due to the catch and release regulation for walleye, sport anglers did not provide precise size distribution data on walleye. Also, since anglers often release smaller northern pike and yellow perch, the lengths of fish returned for measurement to the creel attendants were also biased for these species. Creel attendants, regional fisheries (ACA and AENV/NRS) staff and volunteer anglers conducted test angling from May 20 to August 11, 1998. The test fishery catch per unit of effort (CUE) was not included in the

calculation of angler effort as the CUE's for both fisheries were not directly comparable.

### **2.3 Angler Interviews**

Anglers were asked a series of questions following the completion of their angling trip (Appendix 1). The questions included the number of hours fished, number of walleye, northern pike and yellow perch kept and released. The fish kept and released were divided into size classifications outlined on the survey sheet (Appendix 1), and were recorded according to their respective size range.

Questions were also asked regarding target species, use of electronics, method, angler age and angler residence. Creel attendants made a subjective evaluation of each angler's skill level, and noted angler gender. Children and anglers with little equipment and knowledge regarding fishing were considered novice. Anglers with sponsorship advertisements on boats and other equipment, and/or a variety of rods and tackle were considered professionals. All other anglers were considered to have moderate skill. Results of the target species, use of electronics, methods and skill levels of anglers are displayed in Appendices 12, 13, 14 and 15.

Each angler was also asked a series of questions related to the quality of the fishery (Appendix 2). Anglers were asked to rate their fishing experience from 1=poor to 5=excellent. The questions asked related to the number of fish caught, size of the fish caught and the quality of the overall fishing experience. These data were not analysed in this report due to small sample size of returned questionnaires (n=3).

Creel attendants recorded the month, day, time of return and number of anglers in a party. The day of sampling was coded from 1=Monday to 7=Sunday and 8=holidays. Anglers were identified on the creel forms by their respective party number and angler number. These numbers started at 1.1 at the beginning of each day (e.g. two anglers in the same party would be identified as 1.1 and 1.2).

All data was recorded in pencil on data sheets, which were summarised each day and kept in binders. The daily summary of angler data is displayed in Appendix 9. Data collected during the field portion of the creel survey were entered into a Microsoft Excel spreadsheet by data entry technicians using double entry verification.

### **2.4 Future Management Recommendation Questionnaire**

During the latter part of the survey (August 1 to 11), anglers were asked a series of questions regarding their opinion on possible future management options. The questionnaire consisted of seven questions (Appendix 3), three pertaining to walleye and four to northern pike.

### **2.5 Fish Biological Data**

Creel attendants measured fork lengths (mm) of fish kept by anglers, weighed fish (g) and acquired ageing structures (*i.e.* opercula (lethal) or pelvic fin spines (non-lethal) for walleye, cleithra (lethal) or pelvic fin rays for pike (non-lethal)). The biological data obtained for walleye and northern pike are displayed in Appendices 18 and 19. Ageing structures were placed in sample envelopes, dried and stored for future analysis. During busy times not all



fish could be sampled, so creel attendants were instructed to attempt to obtain samples from as wide a size distribution as possible. This may have introduced some bias into the age and size distributions from the sport fishery. If this was the case, these distributions may be flatter in appearance than the true catch would have shown, as the more commonly caught age and size classes would have been neglected in favour of samples from fish of uncommon sizes.

Creel attendants also determined the maturity of fish that were lethally sampled. For these fish stomach contents were examined and identified to vertebrate species and abundance, and invertebrates were identified to approximate number and order. Stomach contents were not analysed for this report, although these data were entered into an Excel spreadsheet and were archived at the Edson area office (ACA computer files).

Upon completion of fieldwork for the creel survey, the four creel attendants who conducted the surveys in the Northern East Slopes Region determined fish ages. Ageing specimens were prepared and ages were determined for each fish according to Mackay *et al.* (1990). Cleithra were the primary structures used to age pike, pelvic fin spines for walleye and anal fin spines were used for yellow perch. If different ageing structures were used (pelvic fin rays for pike, opercula for walleye), the alternate structure was recorded. Each fish was aged by at least two people, in most cases by three people and sometimes by all four individuals. Each person determined an age independently and then results were compared. At least two people had to agree on the age in order for it to be considered correct. Ages were determined based on the number of complete annuli visible. Ages at sampling were converted to decimal ages based on annulus formation on May 15. The number of days from the date the ageing structure was obtained to May 15 was determined and was divided by 365 days in order to determine the percentage of a full year. This number was then added to the number of annuli observed to obtain the age at sampling (e.g. a walleye pelvic fin spine showing 4 annuli, collected on July 1 yielded an age of 4.129 years).

Scatterplots of weight against length (Appendix 6) and length against age (Figure 4) were made for northern pike to identify outliers. Any outliers identified were investigated to ensure proper values were input into the spreadsheets and samples sometimes had to be re-aged to determine if age values were initially identified correctly. Obvious outliers were eliminated from analyses if they could not be rectified and were deemed unrealistic.

## **2.6 Determination of Basic Sport Fishery Parameters**

Following data verification, fork lengths (FL) were converted to total lengths for estimation of some sport fishery parameters. For walleye the equation was  $TL_{max} = 1.0413 \cdot FL + 7.3977$ . The northern pike equation was  $TL_{max} = 1.03336 \cdot FL + 16.678$ . The perch equation was  $TL_{max} = (FL + 0.41) / 0.97$  (Mackay *et al.* 1990). Equations for northern pike and walleye are from 1989 from Wolf, Touchwood, and Seibert Lakes in the Northeast Boreal Region (from Patterson and Sullivan 1998). Calculation of maximum total lengths enabled determination of the number of legal and sub-legal walleye caught.

To summarise angler survey data and estimate total effort and fish harvest (for the period of May 20 to August 11), creel data parameters (*i.e.* number of anglers, number of hours fished, number of walleye harvested) were stratified into five categories. Weekdays included Monday (day 1) through Thursday (day 4). Fridays (day 5) were considered their

own category. Weekends included Saturday (day 6) and Sunday (day 7). Holidays (day 8) and holiday weekends made up the final stratum. Totals, means and variances of creel data parameters were calculated for each day category using Microsoft Excel (Appendix 7).

The estimated number of hours angled, anglers, and fish harvested were determined by weighting the totals obtained from the angler surveys by the available days in each stratum during the period May 20 to August 11 (Appendix 8). Variances of these estimates were calculated for each stratum.

All data entry was done in Microsoft Excel. Statistical analysis and graphics construction was done in either Excel or Statistica (StatSoft 1995). All raw data is stored in the Edson ACA office. All digital analyses are stored on ACA computers in Edson and also on compact discs.

## **2.7 Estimation of Compliance and Reporting Bias**

Several fishery parameters relating to compliance and reporting bias can be calculated from test angling and sport angling data by using parameters displayed in Table 2. These parameters can be calculated for walleye only, as this is the only species with restrictive enough regulations to justify the analysis.

The standardisation of catch rates can be further modified by the exaggeration factor to obtain catch rates that take into account reporting bias. "In many lakes, anglers appear to misreport the number of fish (mainly walleye) they release (pers comm Mike Sullivan, AENV/NRS/FMD, Edmonton)". Often this is in the form of an exaggeration, with anglers reporting more fish released than were likely caught. We did not make a correction for reporting bias in the values presented in this report. These calculations are complex and require assumptions regarding the release rates of harvestable-sized fish, and having a consistent size-relationship between test and sport anglers. To prevent possible misinterpretation of reported catch rates, we felt that these calculations were best left to individuals requiring that specific information. The data needed to make the adjustments are presented in Table 2.

Table 2. Definition of parameters relating to compliance and reporting bias and how each is calculated.

Parameter	Definition	Calculated
Illegal Harvest	Proportion of walleye that should have been released because of the minimum size limit, but were illegally harvested.	The number of sub-legal walleye observed kept by anglers divided by the number of sub-legal walleye estimated caught by anglers.
Non-Compliance	Proportion of anglers who reported illegally keeping sub-legal walleye, when presented with the opportunity to do so.	The number of anglers reported keeping sub-legal walleye divided by the number of anglers reported catching sub-legal walleye.
Encounter Rate	Probability of encountering an angler, on the lake whom is in possession of an illegal walleye.	One-half the number of anglers observed keeping sub-legal walleye divided by the number of anglers observed at the lake (this value represents the encounter rate of illegal anglers when incomplete-trip interviews are conducted, as are commonly conducted by enforcement staff).
Exaggeration Rate	Difference between the number of sub-legal walleye that the anglers report releasing and the estimated number they released.	The number of sub-legal walleye reported caught by anglers divided by the number of sub-legal walleye estimated caught by anglers.

Exaggeration rate calculation:

The required parameters are estimated as follows:

i) # sub-legal walleye <sub>(estimated, creel)</sub> = # sub-legal <sub>(test)</sub> / # legal <sub>(test)</sub> \* # legal <sub>(creel)</sub>

ii) # anglers catching sub-legal walleye = # legal <sub>(creel)</sub> / # successful anglers \* # sub-legal <sub>(estimated, creel)</sub>

Confidence limits for the estimate of the number of sub-legal walleye caught were calculated following Overton (1971). The procedure was similar to a Lincoln mark-recapture population estimate for sampling with replacement. The analogous parameters are:

N (population estimate) = number of walleye caught (legal and sub-legal) in creel

x (sub-sample of N) = number of walleye caught in the test fishery

r (marked animals in sub-sample) = number of legal walleye caught in test fishery

M (marked animals in population) = number of legal walleye in creel

The binomial approximation of confidence limits was used, resulting in asymmetrical confidence limits.

## **2.8 Data Interpretation and Presentation**

To present test-angling data with those of the sport anglers on graphs, the catch rates for the sport fishery were weighted by the harvested catch per unit of effort (HCUE) and the test fishery catch rates were weighted by the TCUE. Weighting the catch rates this way allowed for meaningful comparisons between the two fisheries, as it was expected that test anglers capture a representative sample of the angling-susceptible portion of the fish populations. The length and age-frequency of this population should therefore be representative of the catchable portion of the population, whereas sport anglers released smaller fish at a greater rate than larger fish, thus biasing the sample returned to the creel. Total frequencies would not allow an adequate comparison between test and sport anglers, as sport angling effort vastly exceeded that of test anglers. Also, direct comparisons of catch rates would not be valid, as test anglers did not represent average anglers. Thus, by weighting the test angler data according to the sport anglers reported catch rates, the frequency of capture of fish of various sizes and ages was standardised.

### 3.0 RESULTS AND DISCUSSION

From May 20 to August 11, 525 anglers were interviewed, which combined for a total of 1115 angling hours (Table 3). From the proportion of the season sampled at Fickle Lake, it was estimated that 48% of the total angler effort was surveyed from May 20 to August 11. The total estimated number of anglers was 1073 from May 20 to August 11, with an estimated effort of 2308 hours (Appendix 8) or 5.1 angler-hours per hectare. Of 79 lakes in the Northeast Boreal Region that were creeled in the past, 40 had greater fishing pressure than that observed at Fickle Lake in 1998 (pers comm Bill Patterson, ACA, Edmonton).

Anglers had total catch rates of  $0.022 \bullet h^{-1}$  for walleye,  $0.491 \bullet h^{-1}$  for northern pike and  $0.001 \bullet h^{-1}$  for yellow perch (Table 3). The estimated number of walleye, northern pike and yellow perch harvested was 0, 259 and 0 respectively. The reported number of walleye, northern pike and yellow perch harvested was 0, 125 and 0 respectively.

Table 3. Summary of reported catch rates from summer creel surveys (sport caught fish) conducted during the summer in 1990, 1991, 1992, 1993, 1994 and 1998, and during the winter in 1979, 1981, 1985, 1993 and 1994 at Fickle Lake.

CREEL DATA	Summer Creel Data								Winter Creel Data				
	1990 <sup>a</sup>	1991 <sup>a</sup>	1992 <sup>a</sup>	1993 <sup>a</sup>	1994 <sup>a</sup>	1998	1979 <sup>a</sup>	1981 <sup>a</sup>	1985 <sup>a</sup>	1993 <sup>a</sup>	1994 <sup>a</sup>		
# of days surveyed	17	3	18	52	18	34	10	15	1	1	1		
# of anglers interviewed	59	20	101	228	146	525	161	167	6	123	79		
# of angling hours reported	151.5	77	312.3	648.8	406.5	1115	321.3	679.9	10	1003	569		
# of angling hours estimated	---	---	---	---	---	2308	---	4165	---	---	---		
<b>WALLEYE DATA</b>													
Walleye kept / angler-hour (HCUE)	0.007	---	0.016	0.035	0.000	0.000	---	---	0	0	0		
Walleye rel. (<38 cm TL) / angler-hour	---	---	---	---	---	8	---	---	---	---	---		
Walleye rel. (38-50 cm TL) / angler-hour	---	---	---	---	---	10	---	---	---	---	---		
Walleye rel. (>50 cm TL) / angler-hour	---	---	---	---	---	7	---	---	---	---	---		
Total walleye rel. / angler-hour (RCUE)	0.007	---	0.006	0.037	0.000	0.022	---	---	0	0.003	0		
Total walleye caught / angler-hour (TCUE)	0.013	---	0.022	0.072	0.000	0.022	---	---	0	0.003	0		
<b>NORTHERN PIKE DATA</b>													
Pike kept / angler-hour (HCUE)	0.475	0.221	0.192	0.176	0.534	0.112	---	---	---	0.079	0.037		
Pike rel. (<50 cm TL) / angler-hour	---	---	---	---	---	347	---	---	---	---	---		
Pike rel. (>50 cm TL) / angler-hour	---	---	---	---	---	75	---	---	---	---	---		
Total pike rel. / angler-hour (RCUE)	0.125	0.545	0.202	0.139	0.066	0.378	---	---	---	0.067	0.026		
Total pike caught / angler-hour (TCUE)	0.601	0.766	0.394	0.314	0.600	0.491	0.028	0.044	0.500	0.146	0.063		
<b>YELLOW PERCH DATA</b>													
Perch kept / angler-hour (HCUE)	0.033	0.026	0.000	0.000	0.000	0.000	---	---	0	0	0		
Perch rel. (<20 cm TL) / angler-hour	---	---	---	---	---	0	---	---	---	---	---		
Perch rel. (>20 cm TL) / angler-hour	---	---	---	---	---	1	---	---	---	---	---		
Total perch rel. / angler-hour (RCUE)	0.000	0.000	0.000	0.000	0.000	0.001	---	---	0	0.023	0		
Total perch caught / angler-hour (TCUE)	0.033	0.026	0.000	0.000	0.000	0.001	---	---	0	0.023	0		

<sup>a</sup> – AENV/NRS/FMD, Edson File Data

### **3.1 Walleye Status**

It was difficult to assess the status of the walleye population at Fickle Lake because of the collapsed classification and the associated catch and release designation. Sport anglers reported catching 25 walleye and test anglers only caught 3 walleye from May 20 to August 11. The biological data from the three test-caught walleye are displayed in Appendix 18. The catch rate was the only classification criteria where conclusions on the status of the walleye population could be made. The RCUE and TCUE for walleye were 0.022. All walleye were legally required to be released; therefore the RCUE and TCUE were identical. An RCUE of 0.022 would place the walleye population in the collapsed category according to the classification table.

Due to the lack of data collected on walleye at Fickle Lake during the creel survey, by both sport and test anglers, it was impossible to use the other classification parameters (*i.e.* age-class distribution, age-class stability, length-at-age and age-at-maturity) in the table to classify the walleye stock at Fickle Lake. The table with the classification criteria used to assess a walleye population is displayed in Appendix 5.

## 3.2 Northern Pike Status

### 3.2.1 Catch Rate

Catch rates for sport anglers in Fickle Lake were fairly low at  $0.112 \cdot h^{-1}$  (HCUE) and  $0.491 \cdot h^{-1}$  (TCUE). These values place the pike fishery in the vulnerable (low risk) categories.

Table 4. Criteria for classifying northern pike fisheries in Alberta and values for classification of Fickle Lake in 1998 (modified for Fickle Lake from Sullivan 1998).

Metric	Trophy	Stable	vulnerable (No risk)	Inerable (Low Ris	Collapsed
	Trophy	Stable	Vulnerable (No Risk)	Vulnerable (Low Risk)	Collapsed
CUE (kept)	>0.8	>0.8	0.3-0.8	0.1-0.3	<0.1
Fickle Lake, 1998				0.112 HCUE (Sport-caught fish)	
CUE (total)	>2	1-2	0.5-1	0.2-0.5	<0.2
Fickle Lake, 1998				0.491 TCUE (Sport-caught fish)	
Success (% anglers)	100%	>70%	>40%	20-40%	<20%
Fickle Lake, 1998			40.4% caught 1 or more fish		13.7% harvested 1 or more fish
GINI (total)	<0.3	0.3-0.5	0.5-0.7	0.7-0.9	>0.9
Fickle Lake, 1998					0.94 (Sport anglers)
Mean weight	>2 kg	1-2 kg	<1 kg	0.5-1.5 kg	0.5-3.5 kg
Fickle Lake, 1998			1.325 kg (Sport-caught fish) 0.746 kg (Test-caught fish)		
Number of Measureable Age-classes (CUE>0.02)	>10	7-12	3-7	1-2	0
Fickle Lake, 1998			5 (Sport and Test fishery)		
Growth Rate (lake specific)	Slow	Slow	Increasing	Increasing	Fast
Fickle Lake, 1998		Approximately 14 years at 63 cm TL for sport and test-caught fish combined			
PSD (%)	>80	>40	<40	Variable 20-70	Variable 10-100
Fickle Lake, 1998			37 (Sport anglers)		
RSD:stock-quality	<20	<50	>50	Variable 30-90	Variable 0-90
Fickle Lake, 1998			63 (Sport anglers)		



### 3.2.2 Angler Success Rate

Of all sports anglers, 40.4% (n=212) captured at least one pike and 13.7% (n=72) harvested at least one (Appendices 10 and 11). The HCUE value, which was used to classify the population, placed it in the vulnerable (low risk) category. These rates also meant that, of the anglers that caught pike, 34% kept at least one.

### 3.2.3 GINI Coefficient

The GINI coefficient (0.94) indicates that the catch of northern pike in Fickle Lake was not distributed evenly amongst anglers (Figure 2). In fact, 14% of the anglers accounted for 100% of the total harvest (Appendix 10). Such a skewed distribution implies a population of collapsed status.

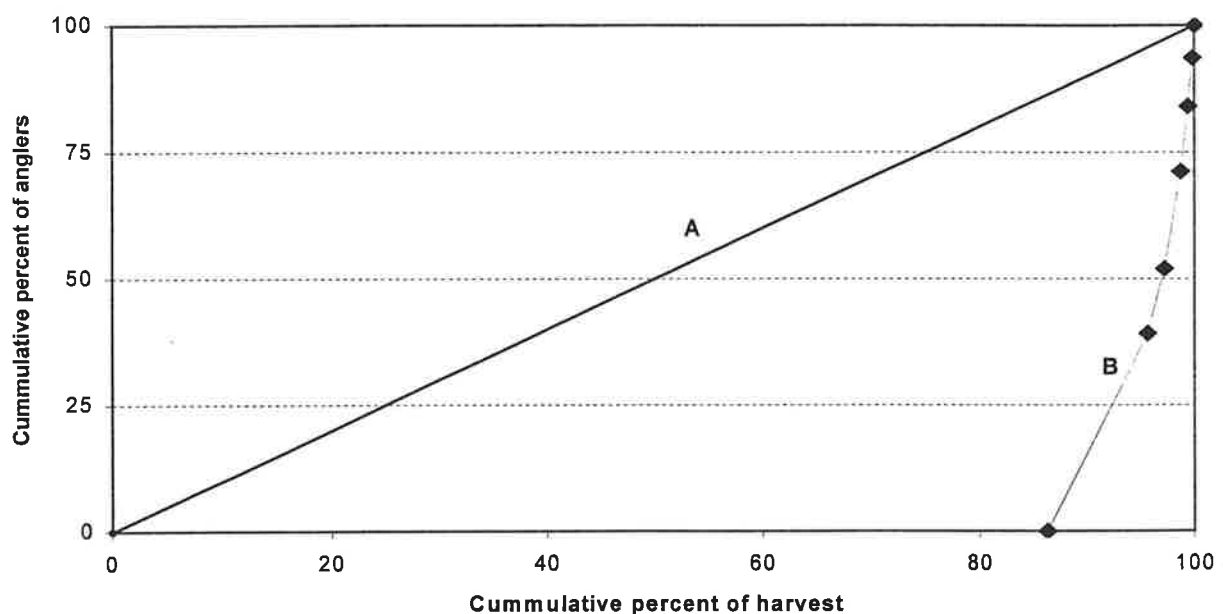


Figure 2. Lorenz curve for the Fickle Lake northern pike sport fishery, illustrating departure of the catch from equality. Line A represents perfect equality of catch among anglers (a GINI coefficient of 0), and line B shows the distribution of the harvest of northern pike for Fickle Lake in 1998 (GINI =0.94). (Modified from Baccante 1995, with data from Fickle Lake, 1998).

### 3.2.4 Mean Weight

Northern pike returned during the creel survey (n=15) averaged over one kilogram in weight (mean=1.325 kg), placing the population into the vulnerable (no risk) category. The mean weight as reported, was expected to be inflated from the average of all fish caught, because it included only sport angler catches and sport anglers tend to release smaller-sized fish. The mean weight of test caught northern pike was 0.746 kg (n=17).

### 3.2.5 Age-class Distribution

The age-class distribution for northern pike appeared fairly healthy (Figure 3). Sport anglers caught fish from ages three, five to nine, and eleven. Older fish were probably not abundant in Fickle Lake as evident by the low catch rates. Most young fish (two years old and younger) were less susceptible to angling; therefore a creel survey does not provide good information on this portion of the population. Five age classes were considered measurable (CUE > 0.02 fish h<sup>-1</sup>, ages 3 to 7) from the sport and test fishery, which indicated the population was vulnerable (no risk) according to the classification criteria.

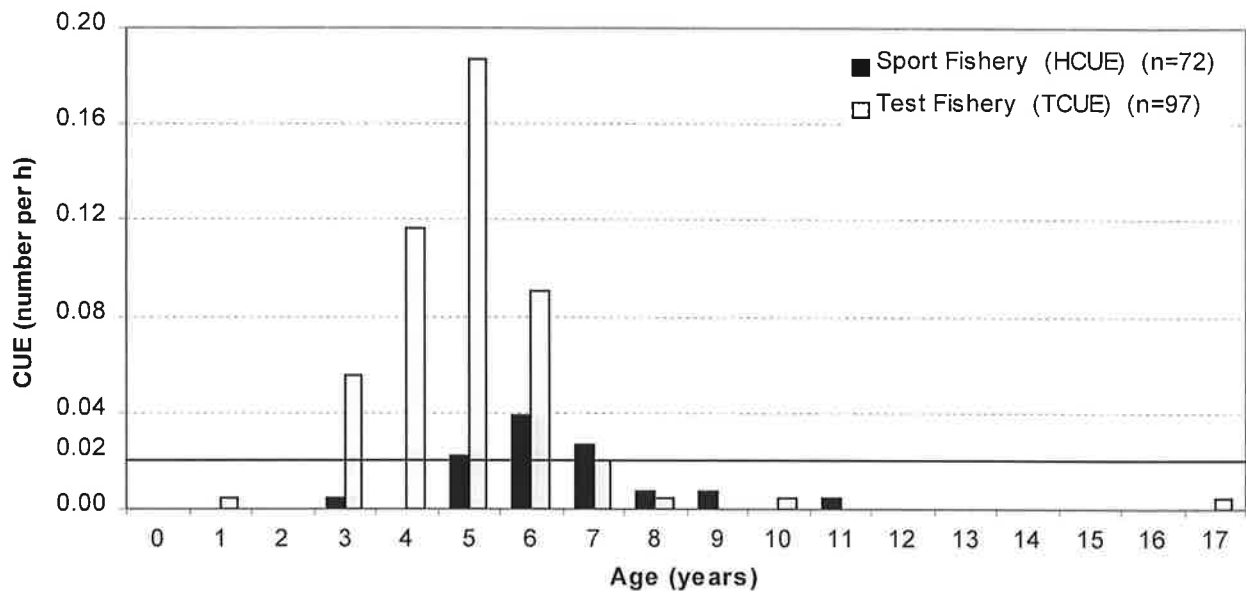


Figure 3. Age-class distribution of northern pike caught by both sport and test anglers in Fickle Lake from May 20 to August 11, 1998. The TCUE and HCUE are weighted by the number of anglers. The line at 0.02 CUE is used to classify the number of measurable age classes for northern pike.

### 3.2.6 Growth Rate

A 630 mm TL minimum size limit (595 mm FL) as proposed for 1999 corresponds to a fish approximately 14 years of age (Figure 4). This growth was considered slow, and was typical of a stable population according to the classification criteria.

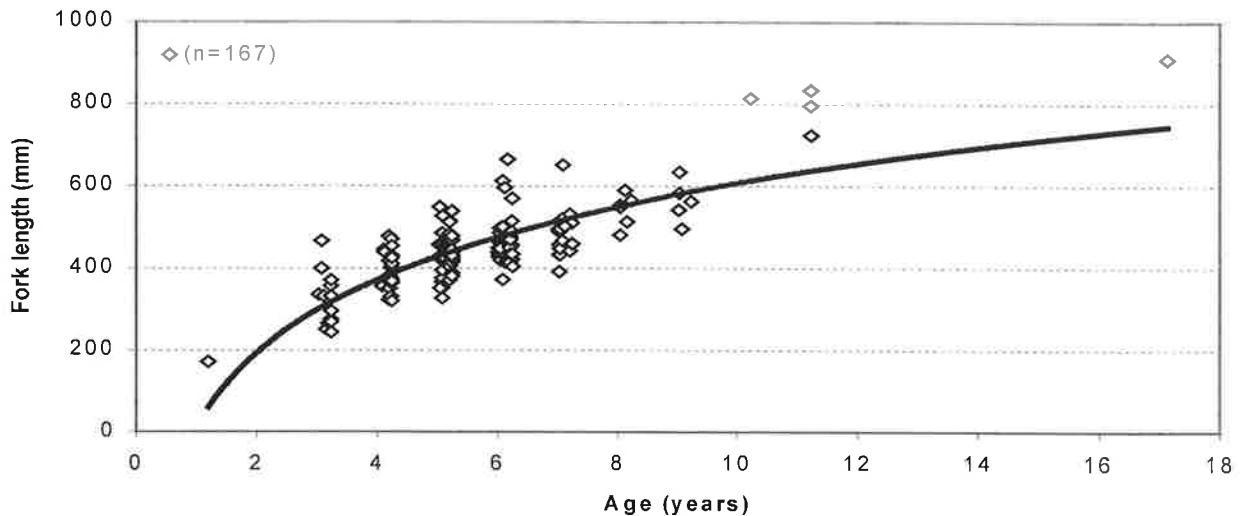


Figure 4. Fork length plotted against age for sport and test caught northern pike at Fickle Lake. Northern pike from 1998 were aged using cleithra. Northern pike from 1998 were caught from May 20 to August 11, 1998. The line is the best-fit logarithmic curve.

### 3.2.7 Proportional Stock Density

The proportional stock density (PSD) is defined as the number of northern pike harvested equal to or greater than 530 mm TL as a proportion of those that are equal to or greater than 350 mm TL. A higher PSD value indicates a larger average size and a greater proportion of fish of quality, preferred, memorable and trophy sizes (Gabelhouse 1984). Managers have indicated that these fisheries are considered as higher quality fisheries by anglers (from Gabelhouse 1984). The PSD determined for harvested pike was 37. No standards exist by which to compare the Fickle Lake population to other Alberta lakes, however "balanced" populations of other species are recommended to be in the range of 40-70 (Gabelhouse 1984). Using the PSD for harvested pike, in accordance with the northern pike management plan (Berry 1999), this population would be classified as vulnerable (no risk).

### 3.2.8 Relative Stock Density

The relative stock density for stock to quality northern pike (RSD S-Q) was measured as the proportion of harvested fish between 350 and 529 mm TL relative to the number of pike  $\geq 350$  mm TL. This makes it the reciprocal of the PSD. The RSD S-Q for harvested pike was calculated to be 63, which corresponds with a vulnerable (no risk) classification.

### 3.2.9 Summary

A summary of some selection criteria discussed at the technical workshop on the classification of pike fisheries (November 16 to 18, 1998) and others proposed by Michael Sullivan (Provincial Sportfishing Specialist) have been summarised in the northern pike management plan (Berry 1999). The northern pike fishery at Fickle Lake generally fits into the vulnerable category with seven of nine criteria falling under this classification.

### **3.3 Yellow Perch Status**

Sport anglers only caught one yellow perch during the creel survey. Test anglers did not catch any yellow perch from May 20 to August 11. It is impossible to describe the current status of the yellow perch population due to the lack of information collected. However, the low TCUE (0.001) indicates that the yellow perch population is likely small as displayed by the very low catch rates.

Currently in Alberta, there are no formal guidelines to manage yellow perch. Preliminary analysis of yellow perch data began in 1999; however, no formal management plan has been produced.

### **3.4 Management Recommendation Questionnaires**

Results from 44 anglers who filled out the management recommendation questionnaires are displayed in Appendix 4. The questions related to future management options for walleye and northern pike that could be applied at Fickle Lake.

### **3.5 Angler Information**

Of the 525 anglers interviewed at Fickle Lake, 76.8% were males, 23.0% were females and for 0.2% of the anglers, gender was not recorded (Appendix 21). A histogram displaying the age distribution of anglers at Fickle Lake is located in Appendix 22. Anglers indicated their place of residence and there were over 200 anglers from Edson (Appendix 23).

#### **4.0 CONCLUSIONS AND SUMMARY**

According to provincial criteria to classify walleye fisheries, Fickle Lake should remain at the collapsed classification due to the low catch rates observed. The collapsed status would result in a continuation of the catch-and-release walleye fishery at Fickle Lake. It was impossible to assess the age-class distribution, age-class stability, length-at-age or the age-at-maturity for walleye due to the low number of fish caught by both sport and test anglers.

According to the new classification criteria for northern pike (Berry 1999), the Fickle Lake population would be considered vulnerable. In 1999 the default classification will have an associated daily bag limit of 3 fish with a minimum size limit of 630 mm TL. In 2000, vulnerable northern pike populations will have a daily bag limit of one fish with a minimum size limit of 630 mm. The new regulations should reduce harvest, which should result in an increase in fish density.

The low catch rates observed during the creel survey and the lack of a provincial yellow perch management plan made it difficult to assess the status of the fishery. The establishment of a management plan for yellow perch in the near future would provide guidelines to assess the status of the perch population at Fickle Lake, but a greater sample size needs to be attained in order to make any conclusions regarding the yellow perch population at Fickle Lake.

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Appendix 1. Fickle Lake creel survey form, 1998.

1998 SPORT-FISH MONITORING PROGRAM  
ALBERTA CONSERVATION ASSOCIATION / NRS

**- Fickle Lake -**

'Collapsed' Walleye Fishery

[illegible]



## **Expectations of Anglers Regarding Fishery Quality 1998 Sport-fish Monitoring Program**

Alberta Conservation Association, Alberta Natural Resources Service, Alberta Fisheries Working Group

PLEASE CIRCLE YOUR ANSWERS BASED ON YOUR EXPECTATIONS OF THIS LAKE .  
(LAKE : \_\_\_\_\_)

1. How long would it take for an average angler to catch a legal-sized walleye at this lake?

- a) More than one per trip.
- b) One per trip
- c) One every two trips
- d) One every four trips
- e) Fewer than one every four trips

2. What percent of anglers would catch a walleye they are able to keep at this lake?

- a) 75% to 100%
- b) 50% to 75%
- c) 25% to 50%
- d) less than 25%

3. Of all the successful walleye anglers at this lake (meaning: of the people fishing here that catch a legal-sized walleye), how many would keep each number of walleye?  
Please circle one letter for each category.

One walleye	Two walleye	Three walleye
(a) 75%	(a) 75%	(a) 75%
(b) 50%	(b) 50%	(b) 50%
(c) 25%	(c) 25%	(c) 25%
(d) 10%	(d) 10%	(d) 10%
(e) < 5%	(e) < 5%	(e) < 5%

4. What is the average weight of walleye kept at this lake?

- a) over 5 lbs.
- b) 3 – 5 lbs.
- c) 2 – 3 lbs.
- d) under 2 lbs.

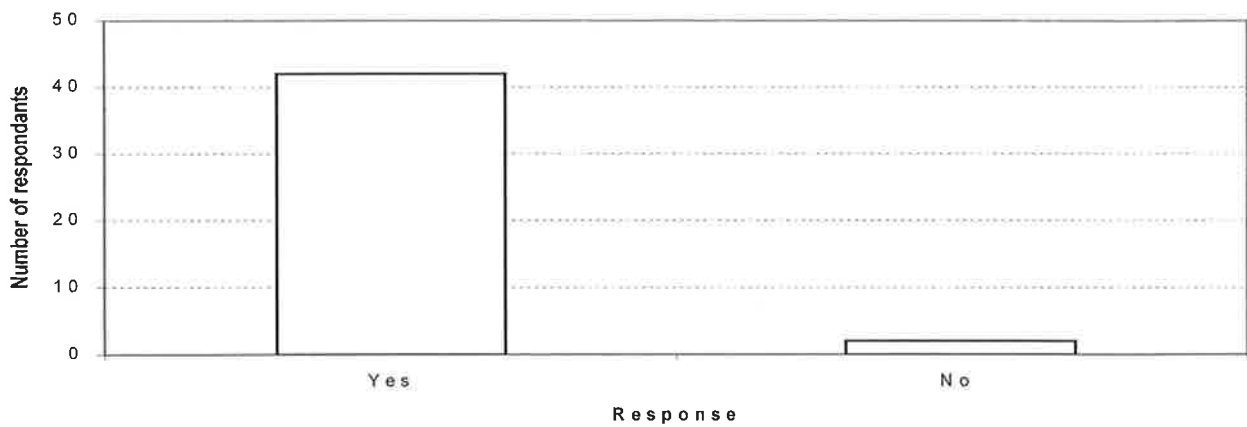
5. Rank your level of experience fishing at this lake. Please select one answer.

- a) First time ever.
- b) Occasional angler.
- c) Regular angler.
- d) Expert on this lake.

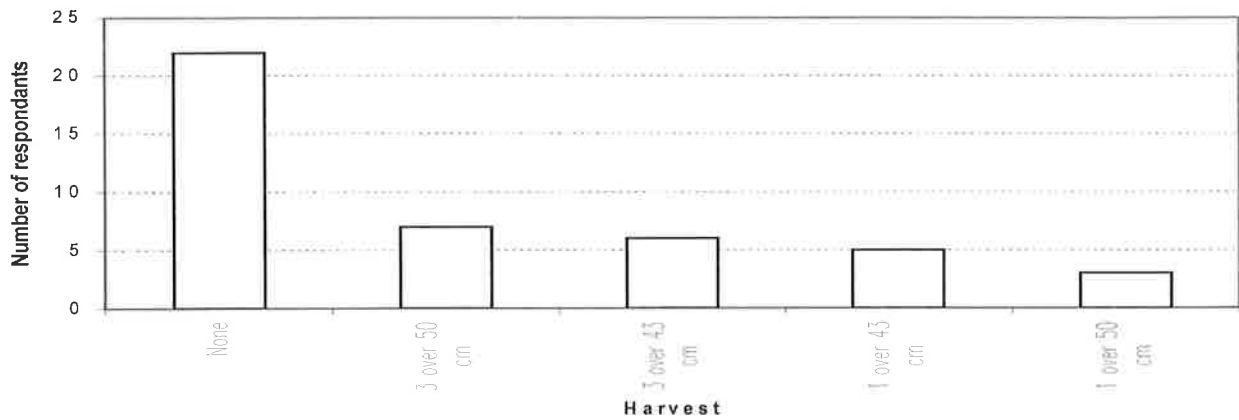
Thank you for taking time away from your fishing trip,  
ACA, NRS and the AFWG



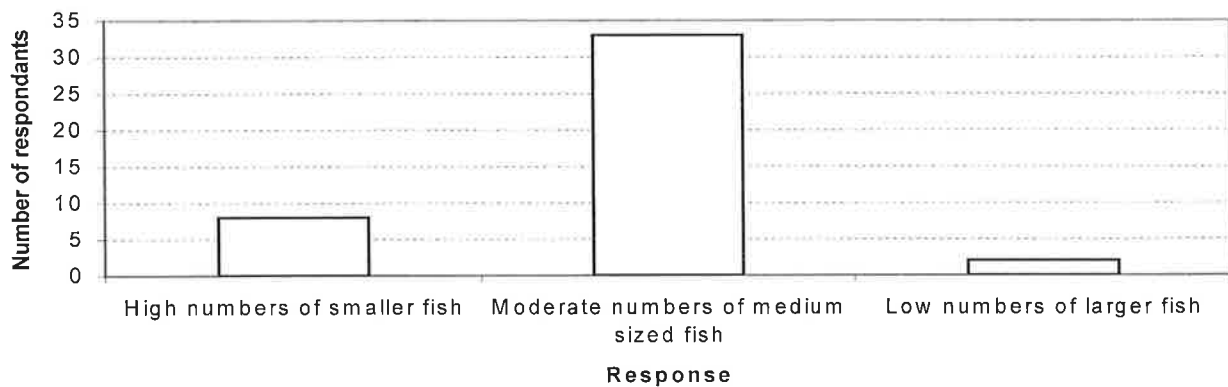
Appendix 4. Angler response to questionnaire requesting input into future management recommendations for Fickle Lake, 1998.



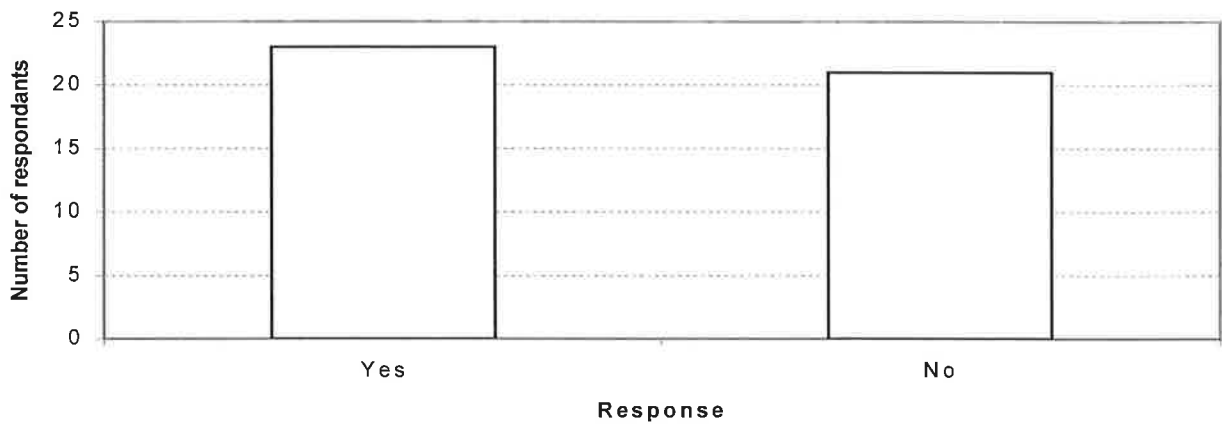
Question 1. Do you think the current regulations are sufficient to protect the walleye population at this lake?



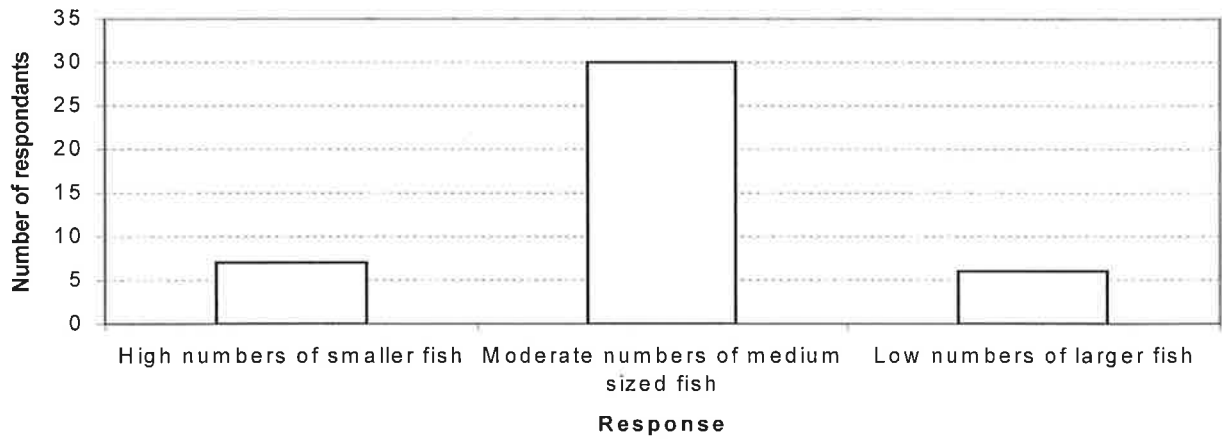
Question 2. What level of harvest would you prefer to see at this lake?



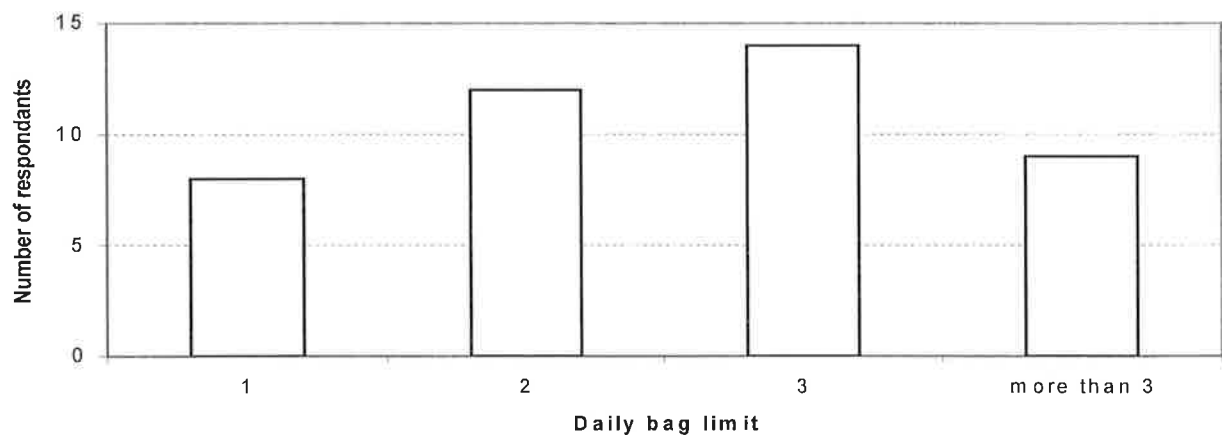
Question 3. What type of walleye fishery would you like to see at this lake?



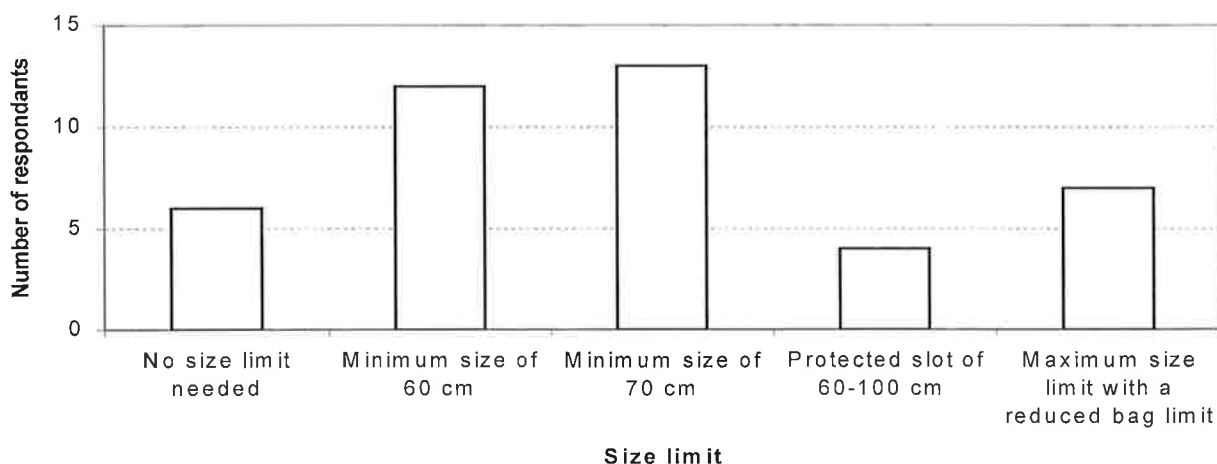
Question 4. Do you feel the current regulations protect northern pike in this lake?



Question 5. What type of northern pike fishery would you like to see in this lake?



Question 6. What do you feel the daily bag limit for pike on this lake should be?

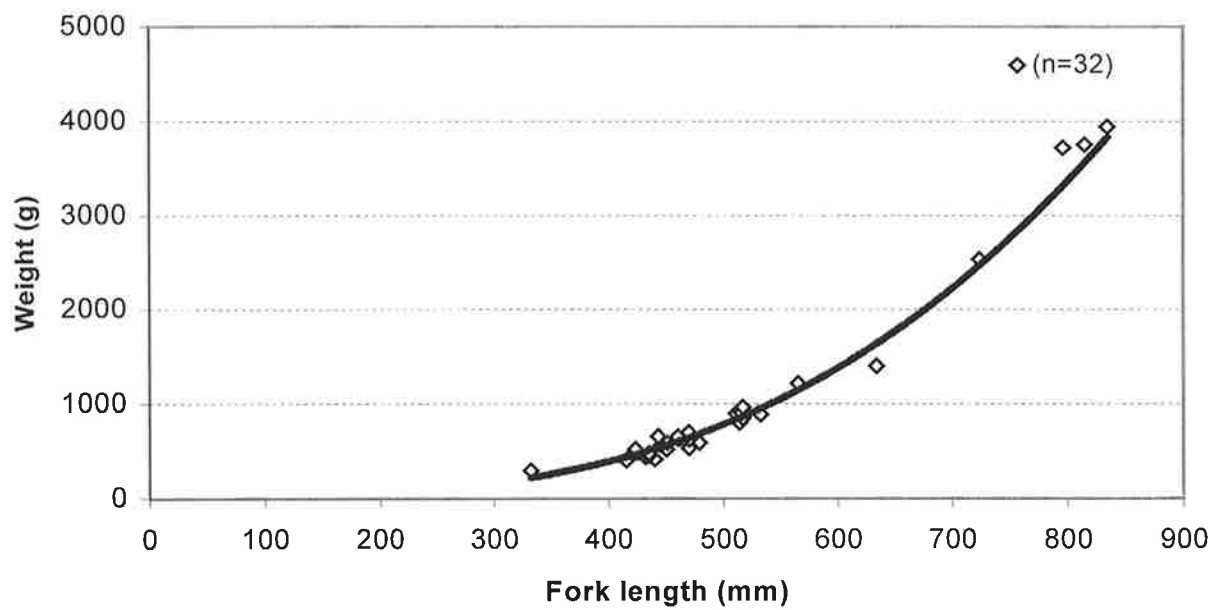


Question 7. What size limit, if any do you feel should be in place to protect spawning-sized fish?

Appendix 5. Criteria for classifying the status of walleye fisheries (Sullivan 1994).

	<b>TROPHY</b>	<b>STABLE</b>	<b>VULNERABLE</b>	<b>COLLAPSED</b>
<b>Age-class distribution</b>	Wide 8 or more age-classes mean age >9	Wide 8 or more age-classes mean age = 6 - 9	Narrow 1 - 3 age-classes mean age = 4 - 6 few old (> 10 years) fish	Wide or Narrow mean age = 6 - 10
<b>Age-class Stability</b>	Very stable 1 - 2 age-classes out of smooth catch curve	Relatively stable 2 - 3 age-classes out of smooth catch curve	Unstable 1 - 3 age-classes support fishery	Stable or unstable Recruitment failures
<b>Length-at-age</b>	Very slow 50 cm (FL) in 12 - 15 years	Slow 50 cm (FL) in 9 - 12 years	Moderate 50 cm (FL) in 7 - 9 years	Fast 50 cm (FL) in 4 - 7 years
<b>Catch rate</b>	Kept > 1 - 2 / h Rel. < 0.5 / h	Kept 0.25 - 0.75 / h Rel. > 0.5 / h	Kept 0.1 - 0.25 / h Rel. < 0.5 / h	Kept < 0.05 / h Rel. < 0.05 / h
<b>Age-at-maturity</b>	Females 10 - 20 Males 10 - 16	Females 8 - 10 Males 7 - 9	Females 7 - 8 Males 5 - 7	Females 4 - 7 Males 3 - 6 Ages will vary with Age-class distribution

Appendix 6. Scatterplot of weight plotted against length for sport and test-caught northern pike obtained during May 20 to August 11, 1998 from Fickle Lake. The line is the best-fit power curve.



Appendix 7. Values used for calculation of the total hours angled by category.

	Mean hours/angler	Variance	Mean angler- hours/day	Variance	N
Weekdays	1.954	0.577	10.750	139.606	14
Fridays	2.203	0.162	27.500	140.300	6
Weekend days	2.214	0.722	57.071	1335.725	14
Holiday weekend days	—	---	—	—	0
Holidays	—	---	—	—	0

Appendix 8. Sample calculation of weighting parameters for Fickle Lake from May 20 to August 11, 1998.

The mean number of hours per angler was determined for each day, which allowed the calculation of the total hours angled. To estimate parameters for days not surveyed, the above means of those categories were multiplied by the number of weekdays not surveyed and added to the observed parameters. The same procedure was used for the other four categories (Fridays, weekends, holidays, and holiday weekends). However, since no holidays or holiday weekends were surveyed the mean number of anglers and hours for weekends was substituted in to estimate the number of anglers and hours on holidays and holiday weekends. Estimated number of anglers, number of hours fished, and number of walleye harvested for all categories were added for total estimates.

Date	No. of Anglers	Weekday Hours	Hours/Angler	Mean hours/angler	Variance	Mean hours/category	Variance		
20-May-98	3	9.5	3.167						
21-May-98	6	9	1.500						
01-Jun-98	2	3	1.500						
02-Jun-98	1	2	2.000						
15-Jun-98	0	0							
16-Jun-98	6	4	0.667						
29-Jun-98	2	6	3.000						
30-Jun-98	6	14	2.333						
13-Jul-98	1	1	1.000						
14-Jul-98	8	13	1.625						
27-Jul-98	7	18.5	2.643						
28-Jul-98	7	13	1.857						
10-Aug-98	18	47	2.611						
11-Aug-98	7	10.5	1.500	1.954	0.576893231	10.75	139.606		
Friday Hours									
22-May-98	8	19.5	2.438						
29-May-98	22	47	2.136						
12-Jun-98	11	26.5	2.409						
26-Jun-98	6	12.5	2.083						
10-Jul-98	10	26.5	2.650						
24-Jul-98	22	33	1.500	2.203	0.162	27.5	140.300		
Weekend Hours									
23-May-98	27	53.5	1.981						
24-May-98	19	34.5	1.816						
30-May-98	24	57.5	2.396						
31-May-98	19	22.5	1.184						
13-Jun-98	36	107	2.972						
14-Jun-98	13	25.5	1.962						
27-Jun-98	25	35.5	1.420						
28-Jun-98	3	13.5	4.500						
11-Jul-98	20	44.5	2.225						
12-Jul-98	23	39	1.696						
25-Jul-98	34	43	1.265						
26-Jul-98	48	107.5	2.240						
08-Aug-98	51	134.5	2.637						
09-Aug-98	30	81	2.700	2.214	0.722	57.07142857	1335.725		
Holiday Hours									
				0.000	0	0	0.000		
Holiday Weekend Hours									
				0.000	0	0	0.000		
	Hours	Anglers							
Weekday hours sur.	150.5	77.01913614		Monday-Thursday	Saturday-Sunday	Holidays	Friday	Holiday weekends	
Weekday hours est.	344.0	176.0437397	Surveyed	14	14	0	6	0	
Friday hours sur.	165.0	74.90756929	Off	32	8	2	6	2	
Friday hours est.	165.0	74.90756929	Totals	46	22	2	12	2	
Weekend hours sur.	799.0	360.9170428							
Weekend hours est.	456.6	206.2383101							
Holiday hours sur.	0.0	0							
Holiday hours est.	114.1	51.55957754							
Weekend hours sur.	0.0	0							
Weekend hours est.	114.1	51.55957754							
Total	2308.4	1073.152522							



Appendix 9. Summary of angler survey data for Fickle Lake for the period of May 20 to August 11, 1998. Angler interview data are summed for each day surveyed in terms of the total number of anglers interviewed, total angling hours reported, and the total numbers of fish observed kept and reported released for 3 species: walleye, northern pike and yellow perch. For released fish, numbers were totalled for different size categories as shown (intervals are in mm total length).

Date	Total anglers	Total hours	Walleye				Northern Pike			Yellow Perch		
			Kept	Released (mm TL)			Kept	Released (mm TL)		Kept	Released (mm TL)	
				<380	380-500	>500		<500	>500		<200	>200
20-May-98	3	9.5	0	0	0	0	0	3	0	0	0	0
21-May-98	6	9.0	0	0	0	0	1	0	0	0	0	0
22-May-98	8	19.5	0	0	0	0	2	2	0	0	0	0
23-May-98	27	53.5	0	1	1	0	7	10	1	0	0	0
24-May-98	19	34.5	0	0	0	1	1	4	7	0	0	0
29-May-98	22	47.0	0	0	3	0	14	10	6	0	0	0
30-May-98	24	57.5	0	0	0	0	7	33	8	0	0	0
31-May-98	19	22.5	0	0	2	0	3	3	0	0	0	0
1-Jun-98	2	3.0	0	0	0	0	0	0	0	0	0	0
2-Jun-98	1	2.0	0	0	0	0	0	1	0	0	0	0
12-Jun-98	11	26.5	0	1	0	0	0	9	4	0	0	1
13-Jun-98	36	107.0	0	0	0	0	22	42	10	0	0	0
14-Jun-98	13	25.5	0	0	0	1	1	10	1	0	0	0
15-Jun-98	0	0.0	0	0	0	0	0	0	0	0	0	0
16-Jun-98	6	4.0	0	0	0	0	0	0	0	0	0	0
26-Jun-98	6	12.5	0	0	0	0	1	3	0	0	0	0
27-Jun-98	25	35.5	0	0	0	0	5	18	1	0	0	0
28-Jun-98	3	13.5	0	1	0	1	0	24	5	0	0	0
29-Jun-98	2	6.0	0	0	0	0	0	1	0	0	0	0
30-Jun-98	6	14.0	0	0	0	0	0	3	2	0	0	0
10-Jul-98	10	26.5	0	0	0	0	1	9	0	0	0	0
11-Jul-98	20	44.5	0	0	1	0	1	5	0	0	0	0
12-Jul-98	23	39.0	0	0	0	2	0	4	1	0	0	0
13-Jul-98	1	1.0	0	0	0	0				0	0	0
14-Jul-98	8	13.0	0	0	0	0	0	4	0	0	0	0
24-Jul-98	22	33.0	0	0	0	0	0	5	0	0	0	0
25-Jul-98	34	43.0	0	0	0	0	5	20	0	0	0	0
26-Jul-98	48	107.5	0	1	1	1	17	24	18	0	0	0
27-Jul-98	7	18.5	0	0	0	0	0	3	0	0	0	0
28-Jul-98	7	13.0	0	0	0	0	0	8	1	0	0	0
8-Aug-98	51	134.5	0	0	0	0	20	27	1	0	0	0
9-Aug-98	30	81.0	0	4	2	0	16	40	7	0	0	0
10-Aug-98	18	47.0	0	0	0	1	1	13	1	0	0	0
11-Aug-98	7	10.5	0	0	0	0	0	9	1	0	0	0
Totals	525	1114.5	0	8	10	7	125	347	75	0	0	1

Appendix 10. Catch frequency distribution of harvested walleye, northern pike, and yellow perch from May 20 to August 11, 1998 in Fickle Lake.

Species	Number kept per angler	Number of anglers	Number harvested	Percent of total anglers	Percent of harvest	Cummulative percent of anglers	Cumulative percent of harvest
Walleye	0	525	0	100.0	---	100.0	---
Northern pike	0	453	0	86.3	0.0	86.3	0.0
	1	49	49	9.3	39.2	95.6	39.2
	2	8	16	1.5	12.8	97.2	52.0
	3	8	24	1.5	19.2	98.7	71.2
	4	4	16	0.8	12.8	99.4	84.0
	6	2	12	0.4	9.6	99.8	93.6
	8	1	8	0.2	6.4	100.0	100.0
Yellow perch	0	525	0	100.0	---	100.0	---

Appendix 11. Catch frequency distribution of the total number of walleye, northern pike, and yellow perch caught from May 20 to August 11, 1998 in Fickle Lake.

Species	Number kept per angler	Number of anglers	Number caught	Percent of total anglers	Percent of fish caught	Cummulative percent of anglers	Cummulative percent of fish caught
Walleye	0	504	0	96.0	0.0	96.0	0.0
	1	19	19	3.6	76.0	99.6	76.0
	2	1	2	0.2	8.0	99.8	84.0
	4	1	4	0.2	16.0	100.0	100.0
Northern pike	0	313	0	59.6	0.0	59.6	0.0
	1	105	105	20.0	19.2	79.6	19.2
	2	40	80	7.6	14.6	87.2	33.8
	3	20	60	3.8	11.0	91.0	44.8
	4	15	60	2.9	11.0	93.9	55.8
	5	10	50	1.9	9.1	95.8	64.9
	6	8	48	1.5	8.8	97.3	73.7
	7	2	14	0.4	2.6	97.7	76.2
	8	2	16	0.4	2.9	98.1	79.2
	9	4	36	0.8	6.6	98.8	85.7
	10	2	20	0.4	3.7	99.2	89.4
	11	1	11	0.2	2.0	99.4	91.4
	15	1	15	0.2	2.7	99.6	94.1
	16	2	32	0.4	5.9	100.0	100.0
Yellow perch	0	524	0	99.8	0.0	99.8	0.0
	1	1	1	0.2	100.0	100.0	100.0

Appendix 12. Target species of anglers and catch statistics for walleye, northern pike, and yellow perch from May 20 to August 11, 1998 at Fickle Lake. The number of fish released by anglers is indicated by (Rel.). HCUE is the harvest catch per unit of effort and TCUE is the total catch per unit of effort.

Target species	Total			Walleye				Northern Pike				Yellow Perch			
	anglers	Percent of anglers	hours	Kept	Rel.	HCUE	TCUE	Kept	Rel.	HCUE	TCUE	Kept	Rel.	HCUE	TCUE
Walleye	6		18.5	0	6	0.000	0.324	0	7	0.000	0.378	0	0	0.000	0.000
Northern Pike	473		1019.5	0	18	0.000	0.018	124	379	0.122	0.493	0	1	0.000	0.001
Yellow Perch	3		5.5	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
Any species	43		71.0	0	1	0.000	0.014	1	36	0.014	0.521	0	0	0.000	0.000
Totals	525	0.0	1114.5	0	25	* 0.000	* 0.022	125	422	* 0.112	* 0.491	0	1	* 0.000	* 0.001

\* Mean HCUE and TCUE which have been weighted by the number of anglers.

Appendix 13. Anglers use of electronic gear and catch statistics for walleye, northern pike, and yellow perch from May 20 to August 11, 1998 at Fickle Lake. The number of fish released by anglers is indicated by (Rel.). HCUE is the harvest catch per unit of effort and TCUE is the total catch per unit of effort.

Electronics	Total			Walleye			Northern Pike			Yellow Perch					
	anglers	Percent of anglers	hours	Kept	Rel.	HCUE	TCUE	Kept	Rel.	HCUE	TCUE	Kept	Rel.	HCUE	TCUE
None	432	82.3	884.5	0	21	0.000	0.024	116	317	0.131	0.490	0	0	0.000	0.000
G.P.S	0	0.0	0	---	---	---	---	---	---	---	---	---	---	---	---
Depth Sounder and G.P.S.	0	0.0	0	---	---	---	---	---	---	---	---	---	---	---	---
Depth Sounder	93	17.7	230	0	4	0.000	0.017	9	105	0.039	0.496	0	1	0.000	0.004
Totals	525	100.0	1114.5	0	25	* 0.000	* 0.022	125	422	0.112	0.491	0	1	* 0.000	* 0.001

\* Mean HCUE and TCUE which have been weighted by the number of anglers.

Appendix 14. Angling methods and catch statistics for walleye, northern pike, and yellow perch from May 20 to August 11, 1998 at Fickle Lake. The number of fish released by anglers is indicated by (Rel.). HCUE is the harvest catch per unit of effort and TCUE is the total catch per unit of effort. Comm. baitfish (commercial baitfish) consists of dead, often frozen fish (e.g. minnows, smelts).

Angling Methods	Total		Percent of anglers	Total hours	Walleye			Northern Pike			Yellow Perch					
	anglers	496			94.5	1045.5	Kept	Rel.	HCUE	TCUE	Kept	Rel.	HCUE	TCUE	Kept	Rel.
Artificial	13		2.5	35.5	0	1	0.000	0.028	4	10	0.113	0.394	0	0	0.000	0.000
Comm. Baitfish	3		0.6	5	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
Leeches	0		0.0	0	---	---	---	---	---	---	---	---	---	---	---	---
Scentbaits	7		1.3	18.5	0	2	0.000	0.108	0	6	0.000	0.324	0	0	0.000	0.000
Dewworms	6		1.1	10	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
Miscellaneous	0		0.0	0	---	---	---	---	---	---	---	---	---	---	---	---
Seined Baitfish	525		100.0	1114.5	0	25	* 0.000	* 0.022	125	422	* 0.112	0.491	0	1	* 0.000	* 0.001
Totals																

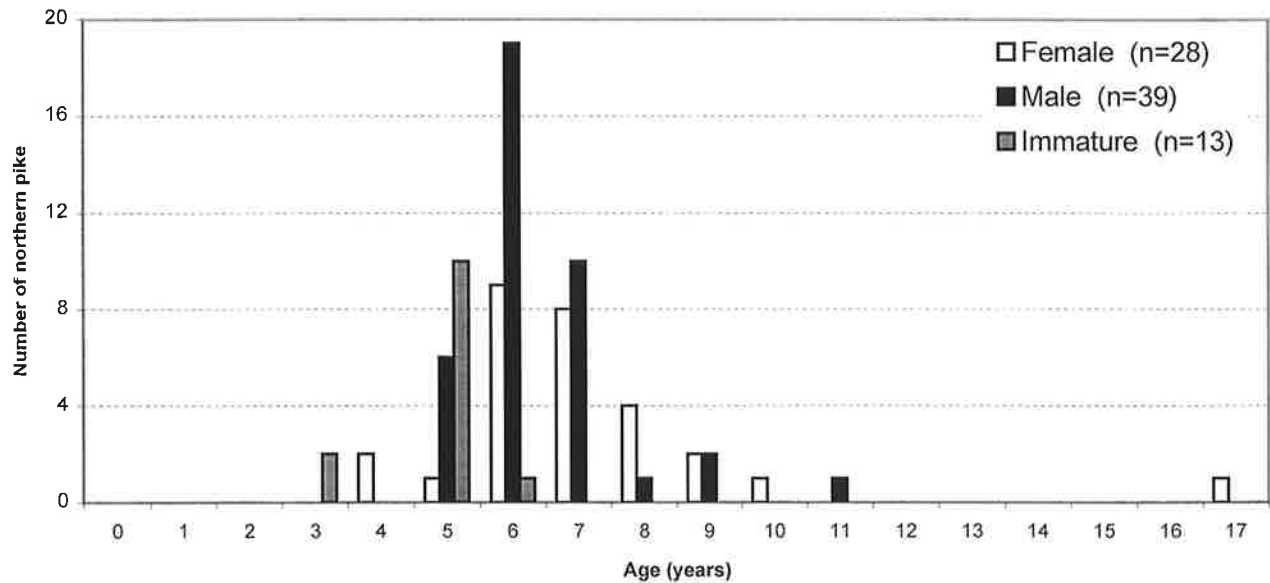
\* Mean HCUE and TCUE which have been weighted by the number of anglers.

Appendix 15. Skill levels of anglers and catch statistics for walleye, northern pike, and yellow perch from May 20 to August 11, 1998 at Fickle Lake. The number of fish released by anglers is indicated by (Rel.). HCUE is the harvest catch per unit of effort and TCUE is the total catch per unit of effort. Skill classification is defined in Section 2.2.

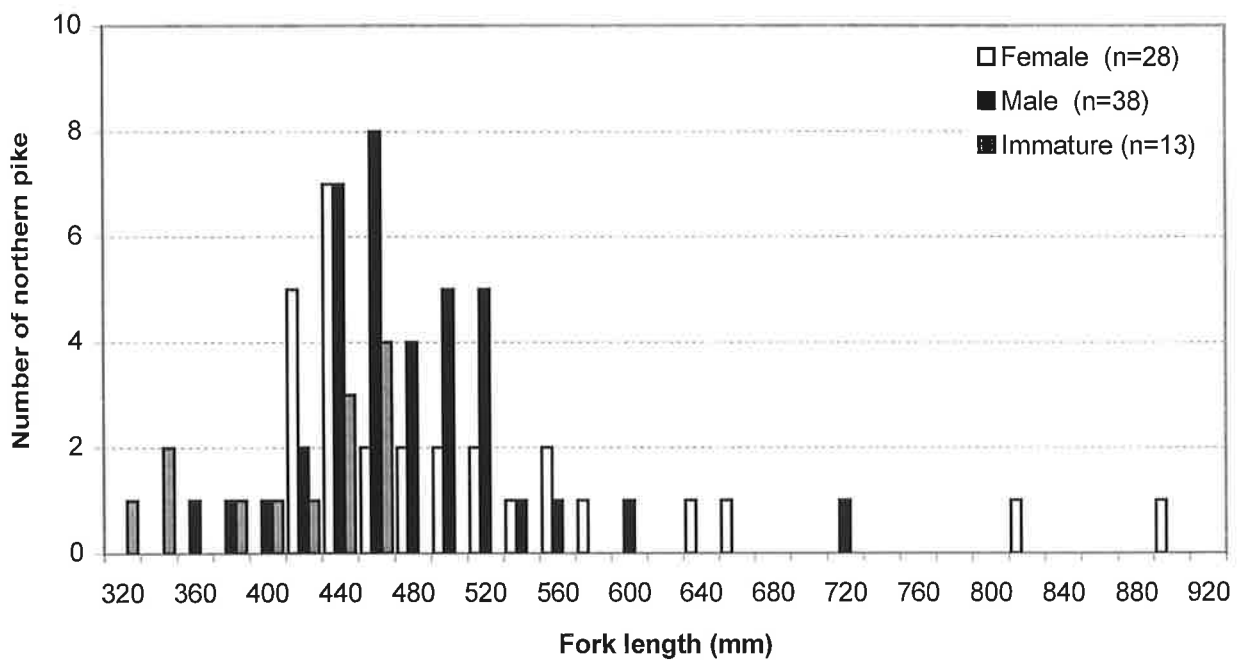
Skill	Total anglers	Percent of anglers	Total hours	Walleye			Northern Pike			Yellow Perch		
				Kept	Rel.	HCUE TCUE	Kept	Rel.	HCUE TCUE	Kept	Rel.	HCUE TCUE
Average	463	88.2	1019	0	21	0.000 0.021	120	380	0.118 0.491	0	1	0.000 0.001
Novice	60	11.4	83.5	0	4	0.000 0.048	5	23	0.060 0.335	0	0	0.000 0.000
Professional	2	0.4	12	0	0	0.000 0.000	0	19	0.000 1.583	0	0	0.000 0.000
Totals	525	100.0	1114.5	0	25	* 0.000 * 0.022	125	422	* 0.112 * 0.491	0	1	* 0.000 * 0.001

\* Mean HCUE and TCUE which have been weighted by the number of anglers.

Appendix 16. Age and sex of sport and test-caught northern pike in Fickle Lake from May 20 to August 11 1998. Northern pike data were aged using cleithra and pelvic fin rays.



Appendix 17. Frequencies of sex and maturity of sport and test-caught northern pike by length in Fickle Lake from May 20 to August 11, 1998.



Appendix 18. Biological data from test-caught walleye from May 20 to August 11, 1998 in Fickle Lake. The sex of fish is displayed as M=male. The fish were aged using pelvic fin spines and in some cases opercula.

Fishery	Fork length (mm)	Weight (g)	Age (years)	Sex	Date
Test-caught	438		5		23-May-98
	431		10	M	18-May-98
	610	2400	15		3-Jun-98

Appendix 19. Biological data from sport and test-caught northern pike from May 20 to August 11, 1998 in Fickle Lake. The sex of fish is displayed as F=female, M=male, and I=immature. The fish were aged using cleithra and in some cases pelvic fin rays.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Sport-caught	21-May-98	496		7	M
	22-May-98			6	M
	22-May-98	429		6	M
	22-May-98	497		7	F
	23-May-98	458		5	M
	23-May-98	441		6	M
	23-May-98	450		6	F
	23-May-98	439		6	M
	23-May-98	472		6	M
	23-May-98	434		7	M
	23-May-98	516		7	F
	23-May-98	490		7	
	23-May-98	458		7	
	23-May-98	543		9	
	24-May-98	392		7	M
	29-May-98	336		3	I
	29-May-98	424		5	M
	29-May-98	550		5	
	29-May-98	434		6	M
	29-May-98	463		6	F
	29-May-98	468		6	
	29-May-98	487		6	M
	29-May-98	497		7	M
	29-May-98	497		7	M
	29-May-98	434		7	F
	29-May-98	448		7	F
	29-May-98	482		8	F
	29-May-98	555		8	F
	29-May-98	584		9	F
	29-May-98	634	1400	9	F
	30-May-98	499		6	
	31-May-98	448		6	F
	31-May-98	550		8	M
	1-Jun-98	352		5	
	2-Jun-98	419		6	F
	13-Jun-98	366		5	
	13-Jun-98	352		5	M
	13-Jun-98	453		5	I
	13-Jun-98	376		5	I
	13-Jun-98	424		5	I
	13-Jun-98	487		5	M
	13-Jun-98	327		5	I
	13-Jun-98	395		5	I
	13-Jun-98	501		6	M

Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Sport-caught	13-Jun-98	373		6	M
	13-Jun-98	434		6	F
	13-Jun-98	453		6	M
	13-Jun-98	472		6	M
	13-Jun-98	468		6	M
	13-Jun-98	521		7	M
	13-Jun-98	468		7	F
	13-Jun-98	497		9	M
	14-Jun-98	613		6	
	16-Jun-98	400		3	
	16-Jun-98	439		6	M
	16-Jun-98	651		7	F
	27-Jun-98	332	296	3	I
	10-Jul-98	514	799	8	F
	25-Jul-98	517	967	5	M
	25-Jul-98	470	700	5	I
	25-Jul-98	517	852	7	M
	8-Aug-98	724	2537	11	M
	8-Aug-98	457		6	M
	8-Aug-98	516	903	6	M
	8-Aug-98	423	526	6	F
	8-Aug-98	421	475	6	F
	8-Aug-98	461	628	7	M
	8-Aug-98	511	901	7	M
	8-Aug-98	565	1219	8	F
	8-Aug-98	563		9	M
	9-Aug-98	834	3946	11	
	9-Aug-98	797	3719	11	
Test-caught	20-May-98	520			
	21-May-98	427		5	
	21-May-98	520			
	23-May-98	435			
	23-May-98	470			
	23-May-98	510			
	29-May-98	423			
	29-May-98	435			
	29-May-98	405			
	29-May-98	510			
	29-May-98	400			
	2-Jun-98	287			
	2-Jun-98	337			
	2-Jun-98	390			
	2-Jun-98	482			
	2-Jun-98	400			
	2-Jun-98	453			



Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	2-Jun-98	424			
	2-Jun-98	530			
	2-Jun-98	458			
	2-Jun-98	511			
	2-Jun-98	434			
	2-Jun-98	378			
	2-Jun-98	419			
	2-Jun-98	468			
	2-Jun-98	429			
	6-Jun-98	298			
	13-Jun-98	365		4	
	14-Jun-98	467		3	
	14-Jun-98	429			
	14-Jun-98	397			
	14-Jun-98	390			
	14-Jun-98	410			
	14-Jun-98	289			
	14-Jun-98	439			
	14-Jun-98	313			
	14-Jun-98	429			
	14-Jun-98	487			
	14-Jun-98	426			
	14-Jun-98	337			
	14-Jun-98	516			
	14-Jun-98	324			
	14-Jun-98	497			
	14-Jun-98	528			
	14-Jun-98	487			
	14-Jun-98	482			
	14-Jun-98	436			
	14-Jun-98	421			
	14-Jun-98	463			
	15-Jun-98	390			
	15-Jun-98	390			
	15-Jun-98	400			
	15-Jun-98	361			
	15-Jun-98	376			
	15-Jun-98	342			
	15-Jun-98	293			
	15-Jun-98	434			
	15-Jun-98	410			
	15-Jun-98	443			
	15-Jun-98	443			
	15-Jun-98	361			
	15-Jun-98	313			

Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	15-Jun-98	501			
	15-Jun-98	400			
	15-Jun-98	385			
	15-Jun-98	424			
	15-Jun-98	390			
	15-Jun-98	390			
	15-Jun-98	390			
	15-Jun-98	487			
	15-Jun-98	439			
	15-Jun-98	448			
	15-Jun-98	371			
	15-Jun-98	434			
	15-Jun-98	371			
	15-Jun-98	393			
	15-Jun-98	223			
	16-Jun-98	356		4	
	16-Jun-98	460		5	
	16-Jun-98	528		5	
	16-Jun-98	535			
	16-Jun-98	458			
	16-Jun-98	381			
	16-Jun-98	487			
	16-Jun-98	429			
	16-Jun-98	400			
	16-Jun-98	656			
	16-Jun-98	356			
	16-Jun-98	453			
	16-Jun-98	400			
	16-Jun-98	434			
	16-Jun-98	521			
	16-Jun-98	405			
	16-Jun-98	419			
	16-Jun-98	443			
	16-Jun-98	414			
	16-Jun-98	410			
	26-Jun-98	480			
	26-Jun-98	520			
	26-Jun-98	450			
	27-Jun-98	446		4	
	27-Jun-98	596		6	M
	27-Jun-98	485			
	27-Jun-98	455			
	27-Jun-98	425			
	27-Jun-98	435			
	27-Jun-98	452			
	27-Jun-98	430			

Appendix 19. Cont'd

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	27-Jun-98	535			
	27-Jun-98	384			
	27-Jun-98	535			
	28-Jun-98	440	418	4	F
	28-Jun-98	425	487	5	F
	28-Jun-98	503		6	F
	28-Jun-98	415	404	6	F
	28-Jun-98	445			
	28-Jun-98	450			
	28-Jun-98	325			
	28-Jun-98	385			
	28-Jun-98	430			
	28-Jun-98	345			
	28-Jun-98	370			
	28-Jun-98	440			
	28-Jun-98	370			
	28-Jun-98	265			
	28-Jun-98	340			
	29-Jun-98	590		8	
	30-Jun-98	910		17	F
	30-Jun-98	455		5	
	30-Jun-98	455			
	30-Jun-98	455			
	30-Jun-98	405			
	30-Jun-98	385			
	30-Jun-98	435			
	30-Jun-98	318			
	30-Jun-98	440			
	30-Jun-98	435			
	30-Jun-98	345			
	30-Jun-98	430			
	30-Jun-98	380			
	30-Jun-98	380			
	30-Jun-98	480			
	30-Jun-98	375			
	30-Jun-98	480			
	10-Jul-98	470	532	6	I
	10-Jul-98	275			
	10-Jul-98	320			
	10-Jul-98	425			
	10-Jul-98	425			
	10-Jul-98	370			
	10-Jul-98	425			
	10-Jul-98	520			
	10-Jul-98	425			
	10-Jul-98	430			

Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	10-Jul-98	445			
	10-Jul-98	400			
	10-Jul-98	450			
	10-Jul-98	369			
	10-Jul-98	525			
	10-Jul-98	375			
	10-Jul-98	407			
	10-Jul-98	455			
	10-Jul-98	465			
	10-Jul-98	445			
	11-Jul-98	250		3	
	11-Jul-98	450	522	5	I
	12-Jul-98	430			
	12-Jul-98	360			
	12-Jul-98	465			
	12-Jul-98	430			
	12-Jul-98	320			
	12-Jul-98	455			
	12-Jul-98	430			
	14-Jul-98	665		6	
	25-Jul-98	172		1	
	25-Jul-98	465		5	
	25-Jul-98	407		5	
	25-Jul-98	482		5	
	25-Jul-98	438		6	
	25-Jul-98	451	587	6	M
	25-Jul-98			7	
	25-Jul-98	506			
	25-Jul-98	434			
	25-Jul-98	420			
	25-Jul-98	438			
	25-Jul-98	526			
	25-Jul-98	429			
	25-Jul-98	436			
	25-Jul-98	444			
	25-Jul-98	326			
	25-Jul-98	501			
	26-Jul-98	265		3	
	26-Jul-98	479	592	4	F
	26-Jul-98	465	629	5	I
	26-Jul-98	415		6	
	26-Jul-98	385			
	26-Jul-98	399			
	26-Jul-98	436			
	26-Jul-98	370			
	26-Jul-98	419			

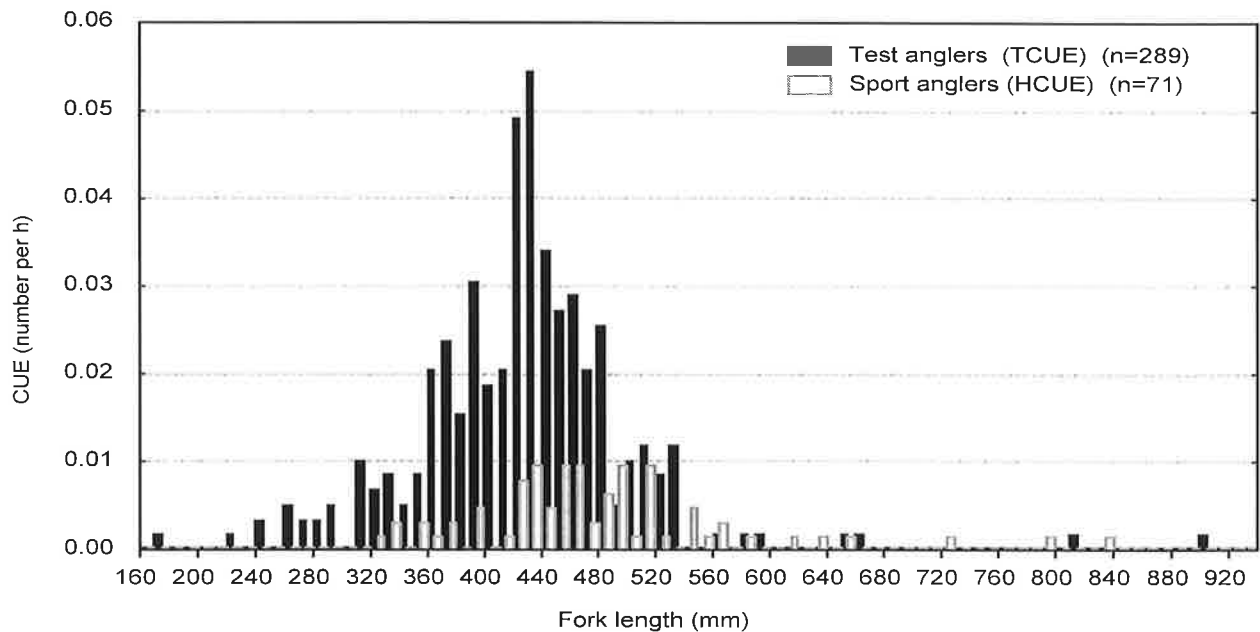
Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	26-Jul-98	372			
	26-Jul-98	370			
	26-Jul-98	452			
	26-Jul-98	488			
	26-Jul-98	499			
	26-Jul-98	430			
	26-Jul-98	475			
	26-Jul-98	437			
	26-Jul-98	435			
	27-Jul-98	323		4	
	27-Jul-98	477		5	
	27-Jul-98	513		5	
	27-Jul-98	371		5	
	27-Jul-98	480		6	
	27-Jul-98	490		6	
	27-Jul-98	465			
	27-Jul-98	468			
	27-Jul-98	485			
	28-Jul-98	382		3	
	28-Jul-98	375		4	
	28-Jul-98	418		4	
	28-Jul-98	372		4	
	28-Jul-98	351		4	
	28-Jul-98	367		4	
	28-Jul-98	435	455	5	I
	28-Jul-98	464		5	
	28-Jul-98	443		5	
	28-Jul-98	450		5	
	28-Jul-98	442		5	
	28-Jul-98	471		5	
	28-Jul-98	405		5	
	28-Jul-98	447		5	
	28-Jul-98	485		5	
	28-Jul-98	438		5	
	28-Jul-98	475		6	
	28-Jul-98	435		6	
	28-Jul-98	470	627	6	M
	28-Jul-98	443	657	7	F
	28-Jul-98	532	890	7	F
	28-Jul-98	465			
	28-Jul-98	470			
	28-Jul-98	419			
	28-Jul-98	540			
	8-Aug-98	275		3	
	8-Aug-98	331		4	

## Appendix 19. Cont'd.

Fishery	Date	Fork length (mm)	Weight (g)	Age (years)	Sex
Test-caught	8-Aug-98	375		4	
	8-Aug-98	440		5	
	8-Aug-98	420		5	
	8-Aug-98	491		6	
	8-Aug-98	432			
	9-Aug-98	357		3	
	9-Aug-98	364		3	
	9-Aug-98	400		4	
	9-Aug-98	445	561	5	M
	9-Aug-98	417		5	
	9-Aug-98	432	438	5	I
	9-Aug-98	415		5	
	9-Aug-98	435	481	6	M
	9-Aug-98	425			
	10-Aug-98	815	3752	10	F
	10-Aug-98	371		3	
	10-Aug-98	295		3	
	10-Aug-98	332		3	
	10-Aug-98	269		3	
	10-Aug-98	403		4	
	10-Aug-98	472		4	
	10-Aug-98	439		5	
	10-Aug-98	425		5	
	10-Aug-98	540		5	
	10-Aug-98	570		6	
	10-Aug-98	469		6	
	10-Aug-98	485			
	10-Aug-98	481			
	10-Aug-98	465			
	11-Aug-98	369		4	
	11-Aug-98	320		4	
	11-Aug-98	426		4	
	11-Aug-98	455		4	
	11-Aug-98	431		4	
	11-Aug-98	411		4	
	11-Aug-98	243		4	
	11-Aug-98	446		5	
	11-Aug-98	381		5	
	11-Aug-98	431		5	
	11-Aug-98	479		5	
	11-Aug-98	389		5	
	11-Aug-98	405		6	
	11-Aug-98	460	656	7	M
	11-Aug-98	485			
	11-Aug-98	471			

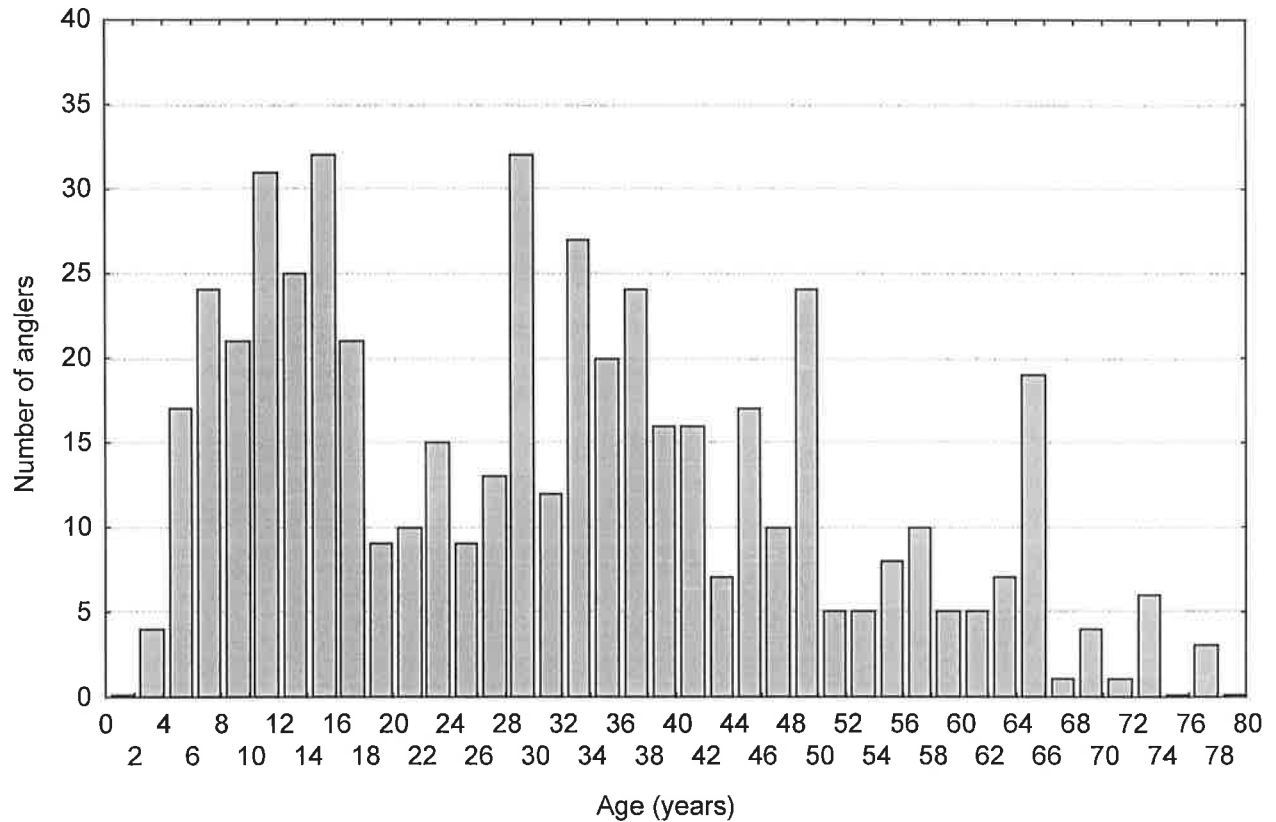
Appendix 20. Fork lengths of northern pike captured in Fickle Lake, May 20 to August 11, 1998. Frequency of capture is plotted at a catch rate (number •h-1) for each 10 mm increment. Catch rates for fish angled by project volunteers (test anglers) are weighted by the total (reported release plus observed kept) northern pike catch rate for anglers interviewed during the creel survey (sport anglers). The sport angler catch frequencies are for kept fish only.



Appendix 21. Angler gender at Fickle Lake from May 20 to August 11, 1998.

	Number of anglers	Percent of anglers
Males	403	76.8%
Females	121	23.0%
Not recorded	1	0.2%
Totals	525	100.0%

Appendix 22. Angler age at Fickle Lake from May 20 to August 11, 1998.





Appendix 23. Angler residence as given to creel attendants at Fickle Lake from May 20 to August 11, 1998.

