Status of Walleye and Northern Pike Sport Fisheries at Long Lake, Alberta, 2004

Alberta Conservation Association

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Greg Fortier and John Tchir
Alberta Conservation Association
Bag 900-26
Peace River, Alberta, Canada
T8S 1T4

Alberta Conservation Association®

Report Series Editor
PETER AKU
Alberta Conservation Association
#101, 9 Chippewa Rd
Sherwood Park, AB T8A 6J7

KELLEY J. KISSNER
59 Hidden Green NW
Calgary, AB T3A 5K6

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Fax: (780) 464-0990
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EXECUTIVE SUMMARY

Increased access in the Red Earth area in northern Alberta has raised concerns about impacts of potential increases in angling pressure on sport fish populations of lakes in the region, including Long Lake. The present study was conducted on Long Lake to generate quantitative data on angler use and catch rates, as well as population structure and growth, of two sport fish species, walleye (*Sander vitreus*) and northern pike (*Esox lucius*). The information collected in this survey can be used to assess impacts of increased fishing pressure after increases in access.

An estimated 56 (95% CI = 29 - 92) anglers fished at Long Lake from 29 May to 22 August 2004, resulting in an angling pressure of 0.310 angler-h/ha (95% CI = 0.165 – 0.549). The overall catch rate (expressed as total catch-per-unit-effort) of walleye was 0.47 fish/h. No harvest of walleye was reported. In contrast, the overall catch rate of northern pike was 0.12 fish/h, with a total harvest-per-unit-effort of 0.018 fish/h. The total estimated harvest of northern pike was 0.046 kg/ha (95% CI = 0.0 - 0.101 kg/ha).

Length of walleye caught during test angling ranged from 227 to 563 mm with a mean (± SD) of 433.9 ± 77.0 mm (n = 21), ages ranged from 3 to 15 y with a mean of 7.2 ± 2.8 y (n = 21). In contrast, length of northern pike caught during the test angling ranged from 294 to 775 mm with a mean of 516.6 ± 110.6 mm (n = 87) and ages ranged from 1 to 10 y with a mean of 4.3 ± 2.0 y (n = 82). Based on von Bertalanffy growth estimates, walleye in Long Lake should reach harvestable size (> 50 cm TL) in 12 to 13 years. Northern pike may not reach harvestable size (> 70 cm TL) based on the growth parameters.

Results of our study will aid fisheries managers in formulating management guidelines for walleye and northern pike sport fisheries for priority lakes in the Red Earth area. Although our estimated angling pressures at Long Lake may be considered low, improved access and upgrading of facilities at the lake may result in increased fishing pressure in the future. Our data will serve as the baseline for assessing future impacts.

Key words: walleye, northern pike, catch-per-unit-effort, creel survey, Long Lake

ACKNOWLEDGEMENTS

This work was funded by the Alberta Conservation Association (ACA). In addition, the ACA received in-kind support from Alberta Sustainable Resource Development (ASRD), Fisheries Management Division in Peace River. We thank creel clerks, Nathan Carruthers, Clayton James, Kathleen Woodruff, and Kevin Yacyshyn who surveyed Long Lake anglers. We also thank all the volunteer test anglers for donating their time and personal expense to this project.

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1.0 INTRODUCTION

Improved access (upgraded and new roads) to lakes in the Red Earth area in northern Alberta has raised concerns about impacts of potential increases in angling pressure on the relatively unexploited sport fish populations of these lakes. However, very little quantitative data exist on angling pressure and sport fish harvest on most of these lakes, including Long Lake. To generate such data on Long Lake, a creel survey was conducted on the lake during the summer of 2004. Provincial sport fishing regulations in 2004 allowed harvesting of two northern pike (*Esox lucius*) > 70 cm total length (TL) and three walleye (*Sander vitreus*) > 50 cm TL (Alberta Sustainable Resource Development (ASRD) 2004) between 21 May and 31 March. The lake is closed to angling from 1 April to 20 May. The purpose of this survey was to describe the current level of angler use and provide data to fisheries managers that will aid in formulating management guidelines for walleye and northern pike sport fisheries for priority lakes in this area.

2.0 STUDY AREA

Long Lake is located approximately 41 km northeast of Red Earth, Alberta (Figure 1). It has a surface area of 539 ha, an average depth of 5 m and a maximum depth of 9 m. A gravel road and short truck trails are used to access the lake. There is no public development at the lake but there are a small number of private developments around the lake. The lake supports natural populations of white sucker (*Catostomus commersoni*), longnose sucker (*Catostomus catostomus*), cisco (*Coregonus artedi*), lake whitefish (*Coregonus clupeaformis*), northern pike, burbot (*Lota lota*), yellow perch (*Perca flavescens*), and walleye.

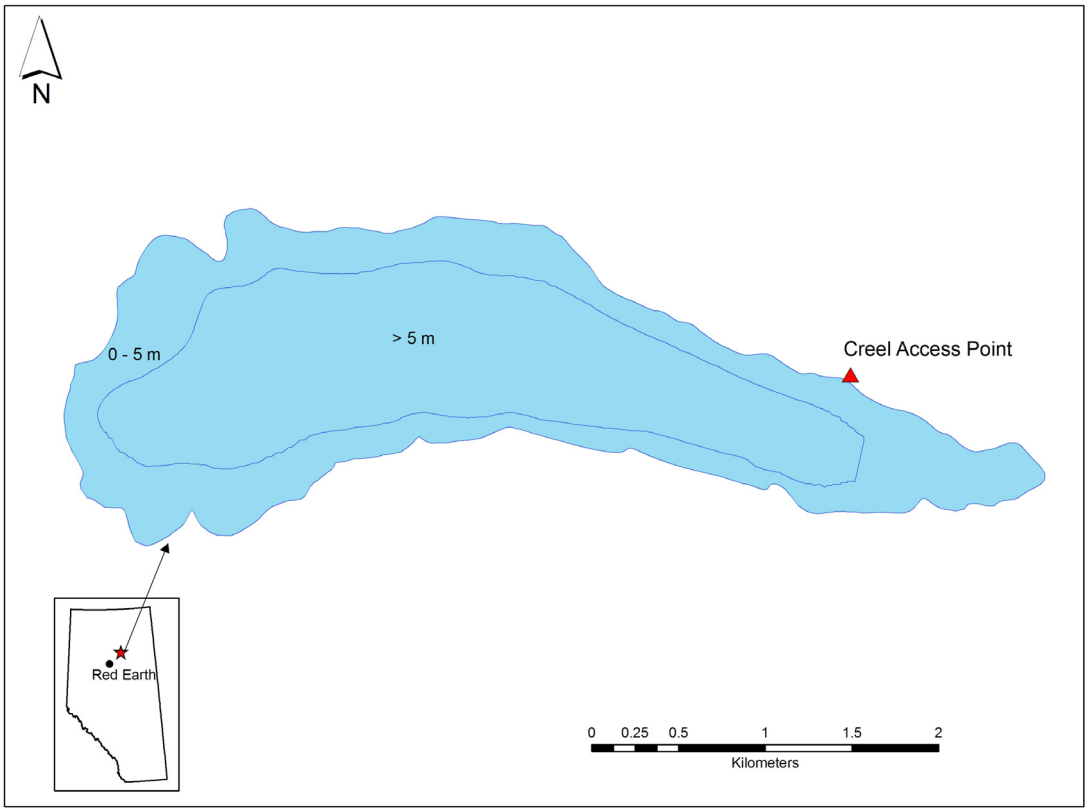

Figure 1. Map of Long Lake showing the 2004 creel survey site (red triangle). Inset is a map of the province of Alberta.

3.0 MATERIALS AND METHODS

3.1 Survey design

A reduced effort creel survey (Pollock et al. 1994) was conducted from a single access point at Long Lake from 3 June to 29 August 2004 to collect angler effort and sport fishery data. Two creel clerks interviewed anglers between 0800 and 2300 hours as they returned from completed trips. Surveys were conducted on a schedule of 10 days on, 4 days off. The 10-day shift was split with parallel studies on Vandersteene Lake and Round Lake, such that either three or four consecutive days of each 10-day shift were spent at each lake. The lake surveyed first was switched each shift so that all three lakes were sampled equally.

Upon returning to the survey access point, all angling parties were asked a series of questions regarding the number of anglers, number of hours fished, number of each species kept and released, use of bait, use of barbless hooks, and angler residence.

3.2 Biological fish data

When permitted, creel clerks collected biological data from fish that were harvested by anglers. Data collected included fork length (FL) and TL (± 1 mm), weight (± 10 g), ageing structures, sex, and state of maturity. Fish were dissected to determine sex and maturity through inspection of the gonads. Fish were aged according to Mackay et al. (1990) using the left operculum and left cleithrum for walleye and northern pike, respectively, as well as the first three rays of the left pelvic fin for both species. All data on sport fish as well as non-sport fish species (number caught, FL, and weight) were entered into the provincial government Fisheries Management Information System (FMIS), Project Location ID 6374. Data obtained from gill netting surveys on the lake in June 2004 (FMIS Project Location ID 6276) were used to supplement length and age distributions.

3.3 Test angling

To collect data on size and age of fish that could not be legally harvested by anglers (i.e., walleye < 50 cm and northern pike < 70 cm TL), test angling was conducted throughout the survey period. Test anglers included creel clerks, fisheries staff, and

volunteers, with varying skill levels, fishing for walleye and northern pike using techniques that anglers would normally use. Test anglers recorded the number of hours fished and FL of all fish caught. To minimize handling time, only FL was measured on all fish; TL was measured on representative samples only. In order to assess the rate of angler exaggeration (inaccurate reporting of released fish by anglers), the ratio of legal-length fish to protected-length fish sampled during the test angling was compared to the corresponding ratio reported by anglers (Sullivan 2003). The ratio of legal-length fish to protected-length fish from the test angling was used to extrapolate to the sport fishery using the number of legal-length fish captured by anglers. This estimate of protected-length fish was then compared to what was reported by anglers.

3.4 Data management and analysis

Bootstrap methods (Haddon 2001) were used to calculate the standardized probability of means for the following parameters: number of anglers, angling effort, and the catch and harvest of walleye and northern pike. Estimation of angler survey parameters followed Sullivan (2004). Samples were stratified by day type into weekdays (Monday-Thursday) and weekend days (Friday-Sunday, including statutory holidays). Each parameter (e.g., number of anglers) was bootstrapped (50,000 estimates) to obtain estimates for each day type. The estimates were then multiplied by the number of days missed (not surveyed) to produce estimates for all the days that were missed. The sum of all observed values of the parameter from each day type collected during the entire survey was then added to each of the 50,000 estimates. Weekday and weekend day estimates were then summed to produce combined estimates of each parameter for the entire study period. The maximum likelihood method was then used to estimate a total (95% CI) for each parameter for the entire study period. A flow chart describing these steps is presented in Figure 2.

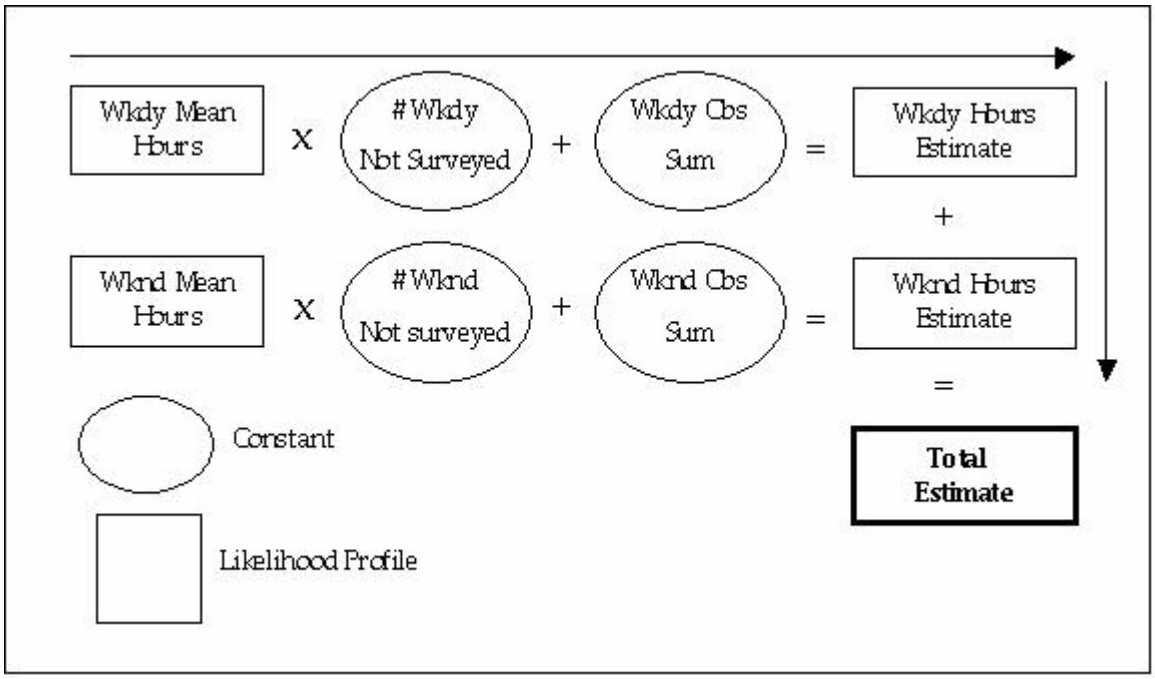

Figure 2. Flow chart outlining the process used for estimating parameters from the sport fishery at Long Lake in 2004. Circles represent values with no variance and rectangles represent values with probability density functions. Bold outline represents derived parameters used in the assessment of the sport fishery (e.g., number of anglers, total effort). Wkdy = weekday; Wknd = weekend, and Obs Sum = Sum of Observed value. (Adapted from Patterson 2004)

Total catch-per-unit-effort (TCUE) was calculated by dividing the total number of fish caught by recreational anglers (both kept and released) by the total number of hours spent angling (angler-hours, i.e., total amount of effort applied by surveyed anglers). Total harvest-per-unit-effort (THUE) was calculated by dividing the total number of fish kept by anglers by the total number of angler hours. Daily totals for catch-per-unit-effort (CPUE) and harvest-per-unit-effort (HPUE) were bootstrapped to estimate monthly means and 95% confidence limits. Estimated total harvest (kg/ha) was calculated by multiplying the estimated harvest by the mean weight (kg) of fish harvested and then dividing by the area of the lake (ha).

Length-frequency distributions were used to examine population structure of fish captured by anglers, test anglers, and gill nets. Because TL was not measured for all fish, it was estimated using the following linear regression relationships established with samples for which both TL and FL was measured:

Walleye:	TL = 1.046 FL + 6.749; (R^2 = 0.997, n = 116)
Northern pike:	TL = 1.039 FL + 11.387; (R^2 = 0.998, n = 199)

Age and length (FL) data from gill netting and from sport and test angling were combined to assess growth rate using the von Bertalanffy growth function (von Bertalanffy 1938).

$$L_t = L_\infty(1 - e^{-K(t-t_0)})$$

where:

L_t = length at age *t*

L_∞ = the asymptote or final maximum size,

K = the rate at which the growth curve approaches the asymptote, and

t = age

t_0 = a time scaler, the hypothetical time when the fish was size zero

The von Bertalanffy growth function is a non-linear equation that explains growth using three parameters (von Bertalanffy 1938). The parameter used to estimate growth is K, i.e., the rate at which the fish approaches maximum size (L_∞). Higher values of K represent faster growth and are usually associated with a lower L_∞. Due to small sample sizes of small fish t_0 was fixed at zero to reduce bias in the growth function. As with L_∞, t_0 can be highly variable due to small sample sizes of small fish. The estimates for L_∞ and K were then used to calculate an estimate for the time for a fish to reach a harvestable length.

4.0 RESULTS

4.1 Angler survey

Between 29 May and 22 August 2004, 19 anglers were interviewed at Long Lake. The estimated number of anglers was 56 (95% CI = 29 – 92) with an estimated effort of 167 angler-h (95% CI = 89 – 296) or 0.310 angler-h/ha (95% CI = 0.165 – 0.549). Parameter observations and estimates from angler interviews are presented in Table 1.

Table 1. Summary of observed and estimated angler parameters, with 95% CI, from summer surveys conducted at Long Lake in 2004. LCL = lower confidence limit, UCL = upper confidence limit.

	Observed	**Estimated**	**LCL**	**UCL**
Number of anglers	19	56	29	92
Effort (angler hours)	59.75	167	89	296
Effort (hours/ha)	0.111	0.310	0.165	0.549

Anglers that visited Long Lake were primarily from the Peace River or Fairview areas (65.0%) (Figure 3). Significant numbers of anglers also came from the Red Earth (30.0%) and Calgary (5.0%) areas. Overall, 13.3% of anglers used bait and 100% of anglers used barbless hooks as mandated by ASRD.

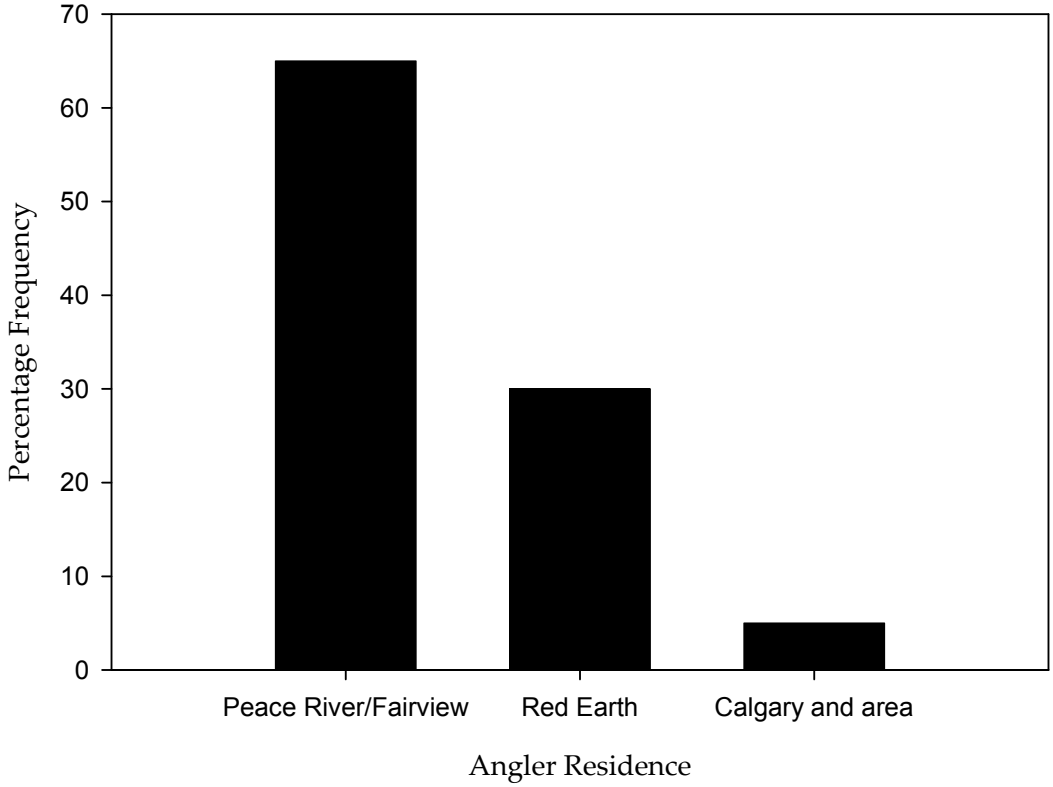

Figure 3. Residence of anglers interviewed during the angler survey at Long Lake in 2004 (n = 20).

4.2 Walleye catch and harvest

The total catch rate (TCUE) reported for walleye by sport anglers was 0.47 fish/h; TCUE for the test angling was 0.12 fish/h. No harvest of walleye was reported and no legal length fish (> 50 cm TL) were reported caught. Estimates and confidence intervals for catch could not be generated because all reported catch of walleye occurred on a single day. The estimated number of protected-length walleye released differed from the reported number by 27.5% (79.7 estimated, 110 reported). This value suggests that angler exaggeration was prevalent and anglers may have been understating their catch.

4.3 Walleye population structure and growth

Walleye captured during test angling ranged in size from 227 to 563 mm TL with a mean (± SD) of 434.9 ± 77.3 mm (n = 21), whereas those captured in gill nets in June ranged from 227 to 564 mm with a mean of 457.8 ± 59.9 mm (n = 111) (Figure 4). The length distributions of fish captured through test angling and gill netting were similar.

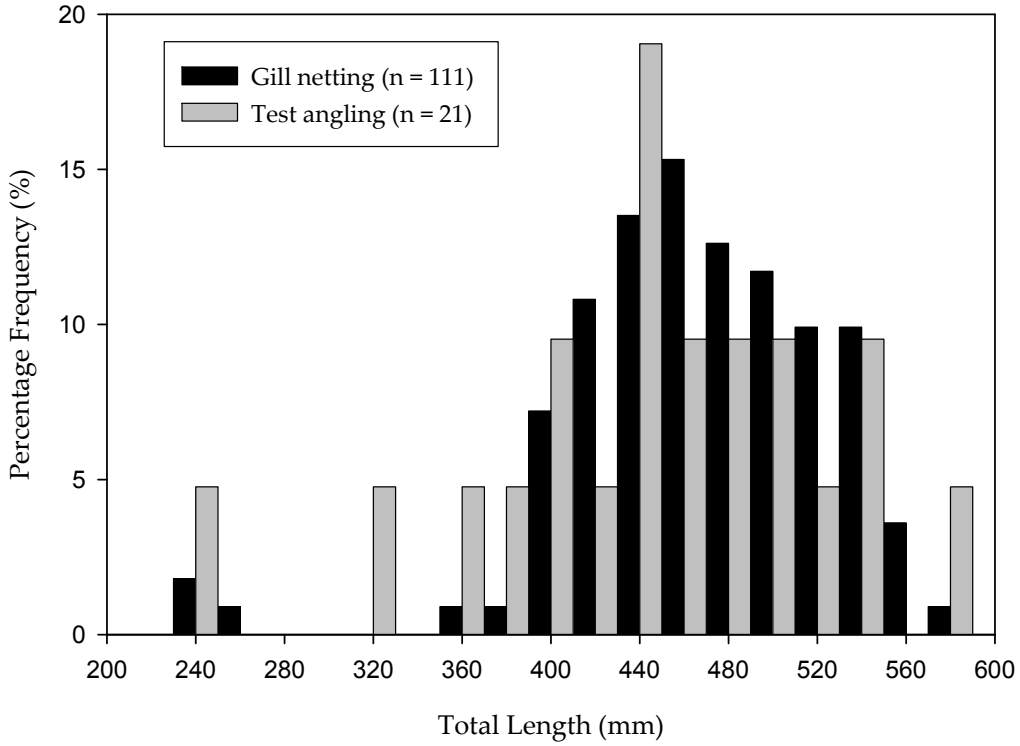

Figure 4. Length-frequency distributions of walleye captured during the 2004 survey of Long Lake using gill nets and test angling.

Age of walleye captured by test anglers ranged from 3 to 15 y with a mean of 7.2 ± 2.8 y (n = 21), whereas those captured by gill nets ranged from 3 to 18 y with a mean of 9.6 ± 2.9 y (n = 67) (Figure 5).

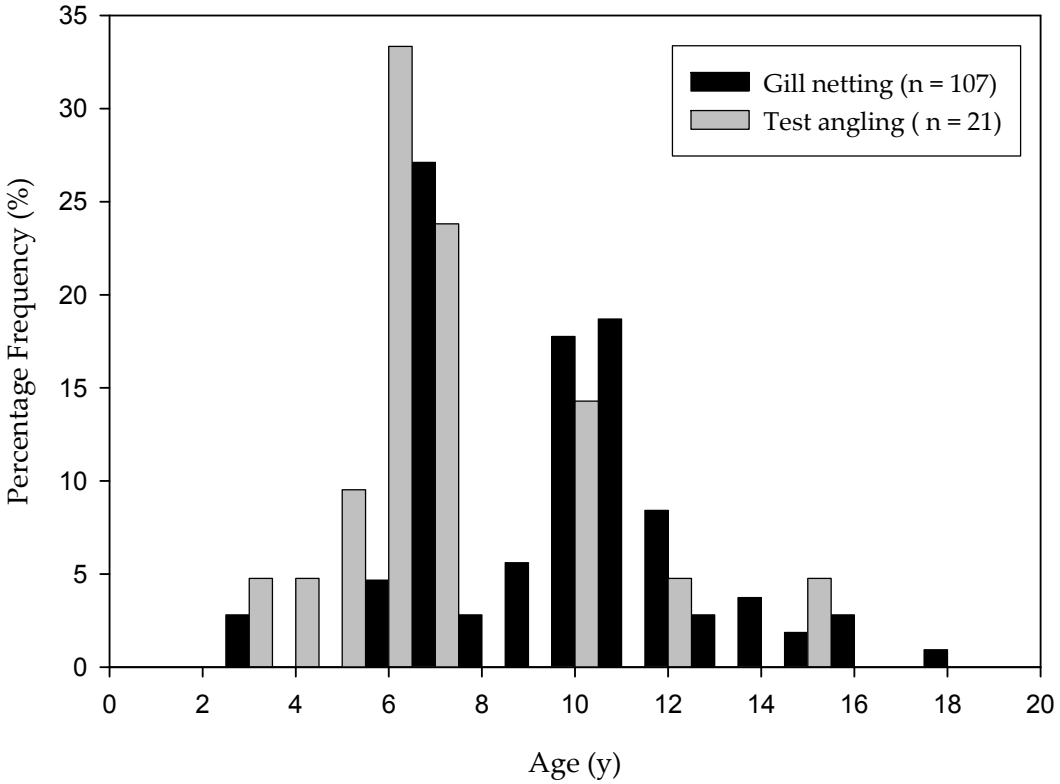

Figure 5. Age distributions of walleye captured during the 2004 survey of Long Lake using gill nets and test angling.

The theoretical maximum length (L_∞) of walleye was 539.9 mm TL with a growth coefficient (K) of 0.222. With these growth characteristics it would take between 12 and 13 y to produce a harvestable walleye (> 50 cm TL) (Figure 6).

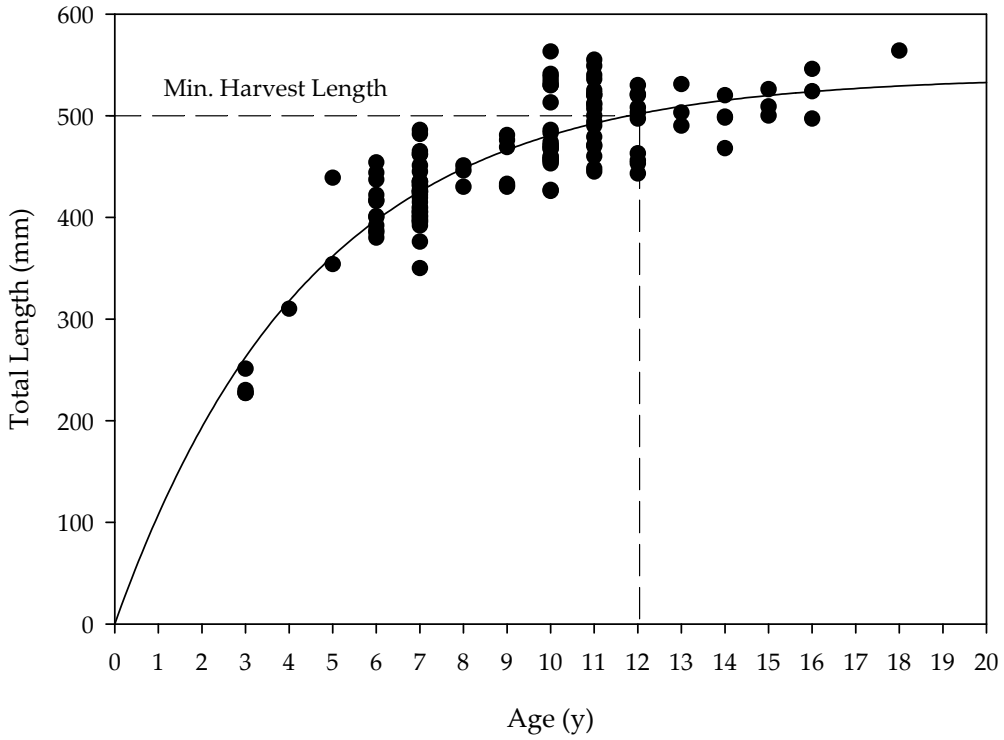

Figure 6. The von Bertalanffy plot for walleye from Long Lake, Alberta in 2004. n = 128, $L_\infty = 539.9$, K = 0.222.

4.4 Northern pike catch and harvest

The total catch rate (TCUE) reported for northern pike by sport anglers was 0.12 fish/h; TCUE for the test angling was 0.49 fish/h. Total harvest rate (THUE) and TCUE of legal-length northern pike (> 70 cm TL) were both 0.018 fish/h. The mean daily CPUE (± SD) of sport anglers was 0.389 ± 0.144 fish/h (n = 5). Of the 20 days that Long Lake was surveyed, anglers were only observed on 5 days.

Estimated total angler catch of northern pike during the 2004 survey was 64 fish (95% CI = 28 – 108) (Table 2). Estimated total angler harvest was 10 fish (95% CI = 0 – 22). The mean weight of harvested northern pike was 2.47 kg/fish (95% CI = 0 – 4.99) which

resulted in an estimated total harvest of 24.73 kg (95% CI = 0 – 54.41) northern pike or 0.046 kg/ha (95% CI = 0.0 – 0.101).

Table 2. Summary of northern pike catch and harvest estimates, with 95% CI from summer surveys conducted at Long Lake in 2004.

	Observed	**Estimated**	**95% CI**
Northern pike caught	20	64	28 - 108
Northern pike kept	3	10	0 - 22
Northern pike harvested (kg)	7.41	24.70	0 - 54.34
Northern pike harvested (kg/ha)	0.014	0.046	0 - 0.101

The estimated number of protected-length northern pike released differed from the reported number by 264.7% (62 estimated, 17 reported). This result is not likely a clear representation of angler exaggeration, but rather an artifact of small sample size.

4.5 Northern pike population structure and growth

Northern pike captured during test angling ranged from 294 to 775 mm TL with a mean of 516.6 ± 110.6 mm (n = 87), whereas those captured by gill netting ranged from 238 to 931 mm TL with a mean of 538.1 ± 100.6 mm (n = 200) (Figure 7). The length distributions from test angling and gill netting were similar, with the distribution of fish captured by test angling showing slightly greater representation of small fish.

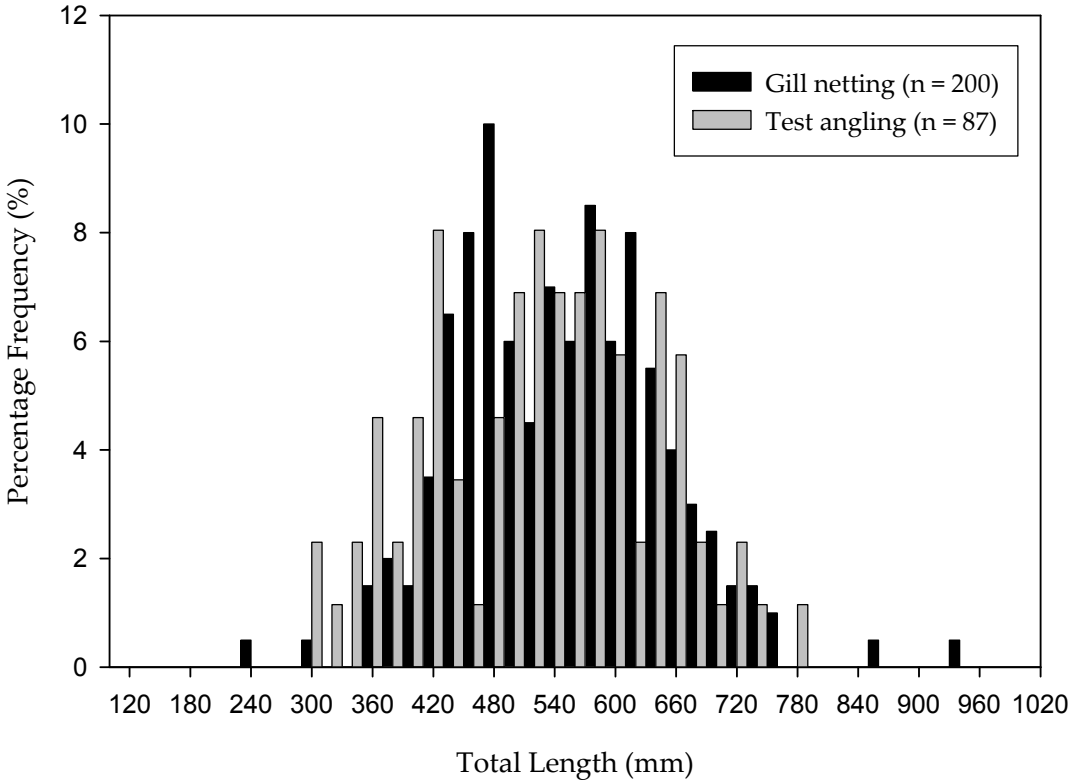

Figure 7. Length-frequency distributions of northern pike captured during the 2004 survey of Long Lake using gill nets and test angling.

Age of test angled northern pike ranged from 1 to 10 y with a mean of 4.3 ± 2.0 y (n = 82), whereas those captured through gill netting ranged from 1 to 15 y with a mean of 6.4 ± 2.4 y (n = 176) (Figure 8).

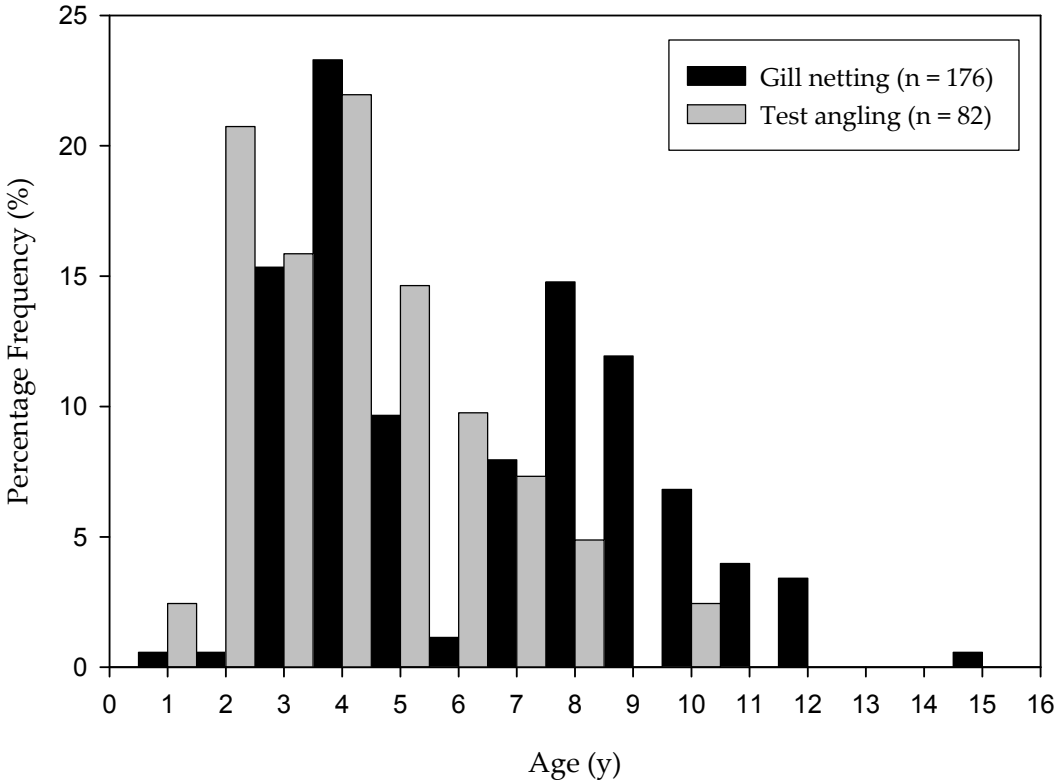

Figure 8. Age distributions of northern pike captured during the 2004 survey of Long Lake using gill nets and test angling.

The theoretical maximum length (L_∞) of northern pike was 658.0 mm TL with a growth coefficient (K) of 0.350. With these growth characteristics northern pike would not reach a harvestable size (Figure 9).

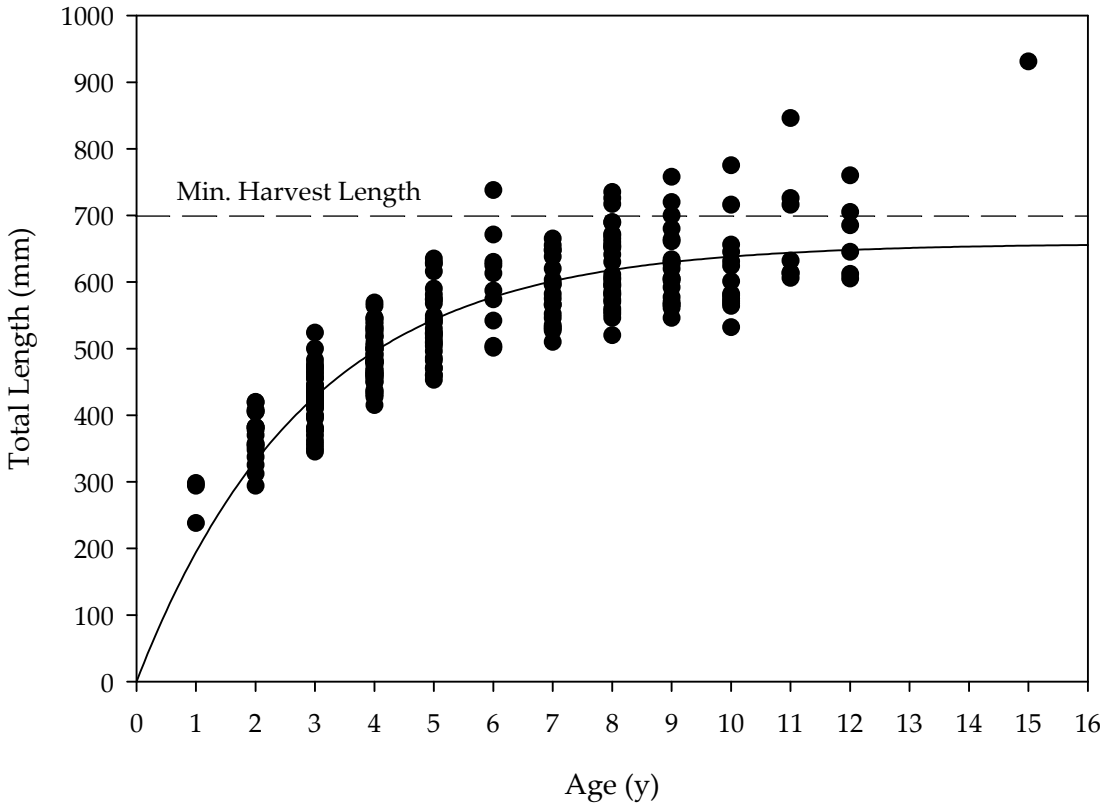

Figure 9. The von Bertalanffy plot for northern pike from Long Lake, Alberta in 2004. n = 258, L_∞ = 658.0, K = 0.350.

4.6 Summary

An estimated 56 anglers (95% CI = 29 - 92) fished at Long Lake from 29 May to 22 August 2004 resulting in an angling pressure of 0.310 angler-h/ha (95% CI = 0.165 – 0.549). The overall catch rate of walleye (expressed as TCUE) was 0.47 fish/h. There was no reported harvest of walleye. In contrast, the overall catch rate of northern pike was 0.12 fish/h, with an estimated THUE of 0.02 fish/h. Based on the von Bertalanffy growth estimates, walleye in Long Lake should reach harvestable size (> 50 cm TL) in 12 to 13 y, whereas northern pike may not attain harvestable size (> 70 cm TL) according to the von Bertalanffy growth function.

5.0 LITERATURE CITED

Alberta Sustainable Resource Development. 2004. 2004 Alberta guide to sportfishing regulations. Sports Scene Publications, Edmonton, Alberta. 92 pp.

Haddon, M. 2001. Modeling and quantitative methods in fisheries. Chapman and Hall/CRC, Boca Raton, Florida. 406 pp.

Mackay, W.C., G.R. Ash, and H.J. Norris (eds.). 1990. Fish ageing methods for Alberta. R.L. & L. Environmental Services Ltd. in association with Alberta Fish and Wildlife Division and University of Alberta, Edmonton, Alberta. 113 pp.

Patterson, B. 2004. An assessment of the summer sport fishery for walleye and northern pike at Pigeon Lake, 2003. Data report, D-2004-015, produced by the Alberta Conservation Association, Edmonton, Alberta, Canada. 26 pp + App.

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society Special Publication 25. 371 pp.

Sullivan, M.G. 2004. Computer simulation of sport fishery parameters. Alberta Fish and Wildlife Division Memorandum. 16 pp.

Sullivan, M.G. 2003. Exaggeration of walleye catches by Alberta anglers. North American Journal of Fisheries Management 23: 573-580.

von Bertalanffy, L. 1938. A quantitative theory of organic growth. Human Biology 10: 181-21.

6.0 APPENDICES

Appendix 1. Summarized walleye parameters from sport fishery, test angling and index netting.

Parameter	Data Value
Fish harvested/h (HPUE) (> 50 cm TL)	0
Fish caught/h (TCUE)	0.47
# Measurable age-classes from index netting and angler survey	15
Age at 50 cm TL	12 - 13
Mean weight (kg) (> 50 cm TL) from index netting	1.3
% Success (% anglers catching ≥ 1 legal-size walleye)	0%

Appendix 2. Summarized northern pike parameters from sport fishery, test angling and index netting.

Parameter	Data Value
Fish harvested/h (HPUE) (> 70 cm TL)	0.018
Fish caught/h (TCUE)	0.12
# Measurable age-classes from index netting and angler survey	13
Age at 70 cm TL	N/A
Mean weight (kg) (> 70 cm TL) from angler survey	2.47
% Success (% anglers catching ≥ 1 legal-size pike)	15.8%

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Alberta

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