Assessment of the Status of the Sport Fishery for Pike at Baptiste Lake, 1999.

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ABSTRACT

To recover or maintain Alberta's northern pike fisheries, a new pike management strategy was implemented in 1999. In 1999, the pike fishery at Baptiste Lake was classified as vulnerable (stable-recreational) and a 63 cm (maximum total length) minimum size limit, 3 fish daily limit on pike was implemented in the sport fishery. In order to assess the status of the pike fishery at Baptiste Lake, a creel survey was conducted during May to August 1999. During the 1999 survey, the number of anglers utilizing the creel site was 1572. The number estimated number of anglers during the survey in 1999 was 4,089. Angling pressure (angler-hours / hectare) was 14.9. This is a 25% decrease in angling pressure from 20.1 angler-hours / ha in 1997.

The estimated harvest of legal-sized pike was 29. The catch rate on legal-sized pike (>63 cm max TL) has decreased from 0.02 pike kept / hour in 1997 to 0.002 in 1999. The estimated release rate on sub-legal pike was 0.068 fish / hour.

The majority of pike in Baptiste Lake are protected by the minimum size limit (63 cm TL max). Extremely few anglers were successful in harvesting a legal-sized pike and most anglers caught no pike.

Historically, Baptiste Lake was known as a superlative pike fishery. It was noted that it was very easy to catch lots of fish with average weights between four and 20 pounds.

Based on the criteria used to classify pike stocks in Alberta and historical information, the Baptiste Lake pike population is collapsed.

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INTRODUCTION

Northern pike (*Esox lucius*) populations in Alberta have been subjected to heavy fishing pressure for many years. Most populations show signs of over-harvest, with many experiencing significant declines. Previous management strategies have focused on province-wide regulations designed to manage the pike harvest at an average fishery. The previous sport fishing regulation was a 10 fish daily bag limit with no size limit. Fisheries receiving heavier than average exploitation have not been adequately protected with these regulations and consequently many have declined or collapsed. To aid the recovery of these fisheries, a new pike management strategy was implemented in 1999. This strategy requires that each pike population be evaluated as to its degree of exploitation and then placed in one of three categories: collapsed, vulnerable, or stable. These categories are based on the classification system used during the walleye management review (Sullivan 1994). The fishery is assigned a standard sport fishing regulation based on this status (Berry 1999). In early 1999, the pike fishery at Baptiste Lake was assigned a vulnerable status. A 63 cm maximum total length (TL max) minimum size and a 3 fish daily bag limit on pike was therefore implemented at the fishery.

This report describes the creel survey conducted at Baptiste Lake during the summer of 1999. The purpose of the survey was to verify the status of the population and fishery.

METHODS

Study Site Description

Baptiste Lake (TWP 66-67, RNG 24, W4M) is approximately 16 kilometres west of the Town of Athabasca. Baptiste Lake has a surface area of 981 hectares and a maximum depth of 27.5 metres. The shoreline is heavily developed with several Summer Villages. One public campground and day-use area is located along the south corner of the lake.

The trophic status of Baptiste Lake is hypereutrophic. The lake is in the Athabasca River Basin, and is fed by 5 intermittent inlet streams and drained by the intermittent Baptiste River. A more complete description of the physical, chemical and biological characteristics may be found in Mitchell and Prepas (1990).

Methods of Study

One creel survey crew (two biotechnicians) collected information from both Baptiste Lake and Wolf Lake between 22 May - 22 August 1999. At Baptiste Lake, the crew was stationed at the County of Athabasca's campground and day-use area. A schedule of 5 survey days at Baptiste Lake (Wednesdays through Sundays) was preceded by 5 survey days (Fridays through Tuesdays) at the

alternate site (Wolf Lake) followed by 4 days off. This cycle was repeated 7 times during the study.

The survey technicians interviewed each angler returning to the survey site during all survey days (24 h survey). Anglers were approached and asked a series of questions regarding their time spent angling, the numbers of each species caught, target species, their gear types, residence, and their use of electronic equipment.

A subjective evaluation of their skill level was also made. Children and anglers with little equipment, knowledge or seriousness were considered to be novice anglers. Professional anglers demonstrated clear superiority in equipment and knowledge (and usually had their sponsors emblazoned on their hats, coats and boats). All other anglers were classified as having a moderate skill.

As time permitted during the survey period, sport fish retained by anglers were sampled for biological information. The fork length of each fish was recorded to the nearest millimetre; the weight was recorded to the nearest ten grams; and one or more skeletal structures were removed to determine the age of the fish. For this purpose, the left pelvic fin and cleithrum of pike, the left pelvic fin and operculum of walleye (*Stizostedion vitreum*), and the operculum and or anal fin of yellow perch (*Perca flavescens*) were collected. Ages were determined following Mackay et al. (1990). Sex and state of maturity of each fish was determined following Olynyk (1980). Stomach contents were removed and classified as to number and species of vertebrates, and approximate number and order of invertebrates. The complete biological data set for pike is reported in this study. Biological data for other species are partially reported in the Appendices, with the full data set stored in the Alberta Conservation Association (ACA) Fisheries Section and the Alberta Natural Resources Service (NRS), Fisheries Management Branch files, Edmonton Metropolitan office and in Ryerson (2000).

In the Alberta Guide to Sportfishing Regulations (1999), the size limits for pike are described in terms of maximum total length (TL max) with the tail pinched. A fork length (FL) - maximum total length (TL max) conversion was necessary to determine the number of legal and sub-legal pike in the creel and the test fisheries. This conversion was TL (max) = 1.0303(FL) + 19.05 (lengths in mm, r^2 = 0.99, n = 251 pike, Wolf, Touchwood, and Seibert lakes, 2000, Patterson). A length measurement of 630 mm TL (max) was equivalent to 593 mm FL.

An angling test-fishery was used to collect additional information regarding the size frequency distribution of pike in the population. Data from sport-harvested pike could not provide this information, due to the large minimum size limit for pike at this lake. Creel survey technicians, volunteer anglers, and fisheries staff participated in the collection of these data. Test fisheries occurred during creel survey days from 22 May to 22 August 1999. The test fishery catch rate (CUE) was not used in the calculation of angler effort or CUE.

All field data were recorded in pencil on field data forms (Appendix 6). These data were transcribed into computer files (Microsoft Excel format) by a commercial keypunch service using double entry verification. Prior to analysis, all data were again subjected to verification procedures. These involved calculating frequency distributions of all creel survey parameters and using field diaries and notes to verify outlying values. Biological samples were verified by plotting weight measurements against the dependent variable of length, and length measurements against the dependent variable of age. Outlying values were investigated and eliminated if measurement error was suspected.

To determine sport fishery parameters specific to the creel survey site, the following equations were modified from Sullivan 1984:

Equation (1)

Hp = (Hwe) + (Hwd) + (#weekend days missed (mean Hwe)) + (#weekdays missed (mean Hwd))

Hp (se) = SQRT (((Hwe, se^2) x (#weekend days missed^2)) + ((Hwd, se^2) x (#weekday missed^2)))

Hp = estimated primary site harvest

Hp (se) = standard error of estimated harvest

Hwe = observed weekend day harvest

Hwd = observed weekday harvest

(Hwe, se) = standard error of mean daily harvest on weekends

(Hwd, se) = standard error of mean daily harvest on weekdays

At many surveyed lakes, anglers could access the lake from sites other than the creel survey site. In these instances, an estimate of the total use of the fishery was extrapolated from the proportion of angler numbers using the creel survey site compared to those observed during entire-lake surveys. These entire-lake surveys were conducted over several time periods and consisted of driving a boat over the entire lake and interviewing all anglers encountered. Total use estimators of the fishery were then calculated by simple extrapolation. Variances of these combined estimates were calculated following Pollock et al. (1994).

The total harvest was estimated using:

Equation (2)

He = Hp x R

(He, se) = SQRT (((Hp^2) x (R, se^2)) + ((Hp, se^2) x (R^2)))

He = estimated total harvest

R = mean ratio of use

R, se = standard error of mean ratio of use

The 95% confidence intervals for the total harvest were calculated as follows:

He ±95% CI = He +-T 0.05 (df) x (He, se)

df = (n – 1)

n = number of days surveyed

Gini coefficients and associated Lorenz curves were calculated using an Excel macro based on Baccante (1995). All Proportional Stock Density (PSD %) and Relative Stock Density (RSD stock - quality) classifications were calculated using fork lengths and the size categories suggested by Gablehouse (1984).

All statistical analyses and graphics were done on an IBM - type personal computer (Intel Pentium-II, 400 MHz) using Microsoft Office Professional. All data and analyses are stored in spreadsheet format on the ACA and NRS Edmonton Metropolitan office, Fisheries computers, on recordable compact discs (650 MB), and in Ryerson (2000).

RESULTS

Angler Survey

During 22 May - 22 August 1999, 643 anglers were interviewed (Table 1 and Appendix 1). Based on entire lake surveys, the creel site was estimated to receive 38% of the total angler effort at Baptiste Lake (Appendix 1.9). The total number of anglers was estimated at 4,089, with an estimated effort of 14.9 angler-hours / ha. The estimated harvest of legal-sized pike was 29 fish (Table 2). The estimated release was 1,002 sub-legal pike. The yield of harvested pike was estimated at 80.8 kg of legal-sized pike (0.082 kg / ha). Assuming 10% release mortality, the yield of released, but dead pike was 99.9 kg (1,002 pike*0.1 mortality*0.998 kg mean weight) or 0.10 kg / ha. The total sport yield of pike during the period of this survey was therefore 0.182 kg / ha, of which 55% (0.10/0.182*100) was released, dead pike.

The distributions of harvests and catches for pike are shown in Appendices 1.2 and 1.3. Biological samples were collected from 116 pike (11 sport harvest, 105 test fishery sample) (Appendix 2 and 3), 26 walleye (Appendix 4), and 41 perch (Appendix 5).

Test Angling

Test fisheries were conducted on 27 days, from 22 May to 22 August. A total of 214.75 hours

Table 1. Observed catch rates of anglers; Baptiste Lake, 1999.

CREEL DATA	1984	1995	1997	1999
# days surveyed	68	36	30	35
# anglers interviewed	830	696	825	643
# angling hours reported	2,472	2,096	2,888.5	2,338.25
PIKE DATA				
Pike kept / angler-hour	0.016	0.093	0.02	0.004
Pike released / angler-hour	0.015	0.37	0.17	0.38
WALLEYE DATA				
Walleye kept / angler-hour	0.039	0.050	0.031	0.012
Walleye released / angler-hour	0.015	0.44	0.60	0.77
YELLOW PERCH DATA				
Perch kept / angler-hour	0.026	0.099	0.16	0.02
Perch released / angler-hour	0.004	0.13	0.04	0.06

Table 2. Angler survey summary; Baptiste Lake, 1999.

	1984 WHOLE LAKE ESTIMATE (95% CI)	1995 WHOLE LAKE ESTIMATE (95% CI)	1997 WHOLE LAKE ESTIMATE (95% CI)	1999 WHOLE LAKE ESTIMATE (95% CI)
# Anglers	5232 (+-26.5%)	5,318 (+-24%)	5,699 (+-24.3%)	4,089 (+-23%)
# Hours	15,581 (+-26.4%)	15,607 (+-24%)	19,699 (+-25.4%)	14,738 (+-24.0%)
Hours / hectare	15.9 (+-26.4%)	15.9 (+-24%)	20.1 +-25.4%)	14.9 (+-24.0%)
# pike (legal-size) harvested	249 (+-26.4%)	281 (+-24%)	394 (+-25.4%)	29 (+-24.0%)

were spent test angling. A total of 105 pike were caught and measured. Of these, 102 were sub-legal (less than 63 cm TL max) and 3 were legal (63 cm TL max and larger).

Status of the Pike Fishery

The metrics associated with reference points for classifying pike fisheries are shown in Table 3.

Table 3. Assessment of the status of the pike fishery; Baptiste Lake, 1999.

METRIC	STABLE	VULNERABLE (No Risk)	VULNERABLE (Low Risk)	COLLAPSED
CUE kept (>63 cm TL) **Baptiste Lake, 1999**	> 0.1	> 0.02	> 0.01	< 0.01 **0.002**
CUE (estimated total) **Baptiste Lake, 1999**	1 – 2	0.5 - 1	0.2 - 0.5	< 0.2 **0.07**
# MEASURABLE AGE-CLASSES (> 0.02 / h) INCLUDES TEST FISHERY DATA **Baptiste Lake, 1999**	7 – 12	3 – 7	1 – 2 **1**	Almost none
GROWTH RATE INCLUDES TEST FISHERY DATA **Baptiste Lake, 1999**	Slow	Increasing	Increasing **Increasing in younger ages**	Fast
MEAN WT (kg) (>63 cm TL) INCLUDES TEST FISHERY DATA **Baptiste Lake, 1999**	1 – 2	< 1	0.5 – 1.5	0.5 – 3.5 **0.908 kg**
PSD (%) INCLUDES TEST FISHERY DATA **Baptiste Lake, 1999**	> 40	< 40	Variable (> 0.1 pike / h)	Variable (< 0.1 pike / h) **23**
RSD (%) (stock – quality) INCLUDES TEST FISHERY DATA **Baptiste Lake, 1999**	< 50	> 50	Variable (> 0.1 / h)	Variable (< 0.1 / h) **70.5**
SUCCESS (total CUE) (% anglers catching >= 1 legal-size pike) **Baptiste Lake, 1999**	> 70	< 70 **45 %**	< 40	< 20
GINI (total CUE) **Baptiste Lake, 1999**	0.3	0.5 – 0.7	0.7 – 0.9 **0.76 (6/11 pike were illegal size)**	> 0.9

Historical information indicates that the pike fishery seems to have been particularly strong. Average weights reported were more than four pounds and pike between 20 and 30 pounds were commonly caught (Valastin and Sullivan 1996).

1. Biological Metrics

The observed harvest rate on legal-sized pike was 0.002 kept / hour. The reported release rate on sub-legal pike was 0.38 released / hour. Based on the test fishery, the estimated release rate was 0.068 pike released / hour. The estimated total CUE on all sizes of pike would therefore be 0.070 fish / hour (0.002 + 0.068). Extremely low densities of larger, older fish (Figures 1 and 2) were sampled by both the sport and the test fishery. This lack of older fish has possibly diminished recruitment of young pike into the fishery. The estimated release rate (0.068 pike/ hr) suggest a low level of recruitment. The growth rate of young fish (age 3) seems to be increasing (Figure 3). Pike are first reaching the 630 cm TL (593 mm FL) size limit by age 5. Ninety-seven percent of pike in Baptiste Lake were protected by the minimum size limit (63 cm TL max.).

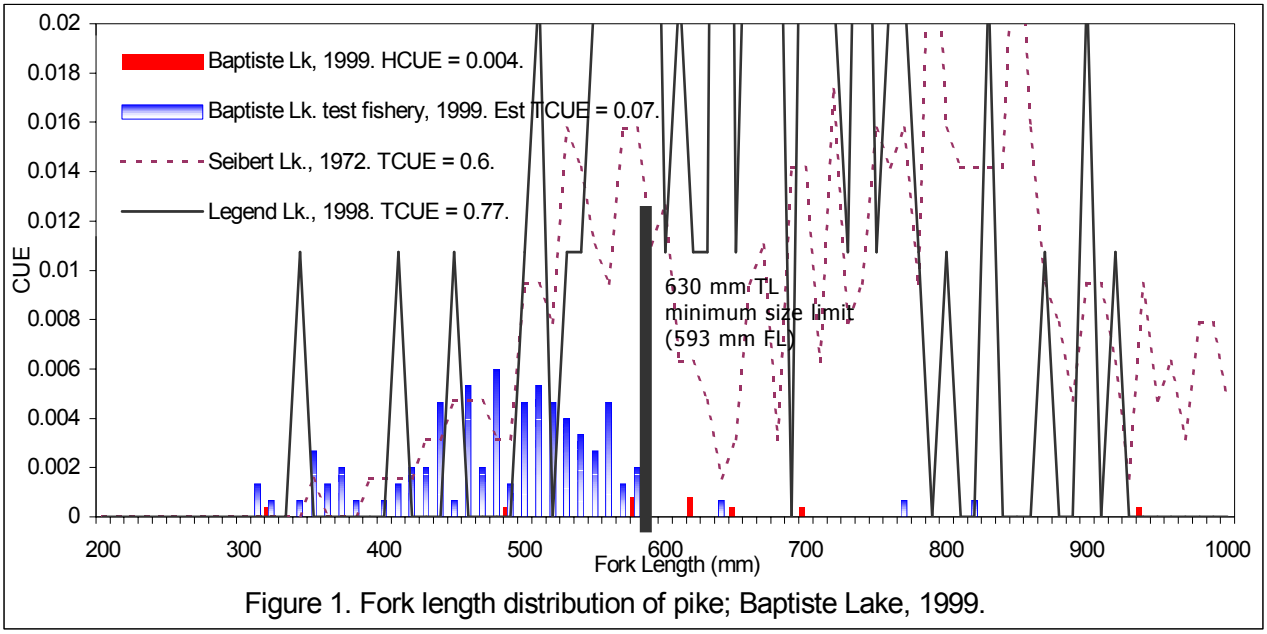


Figure 1. Fork length distribution of pike; Baptiste Lake, 1999.

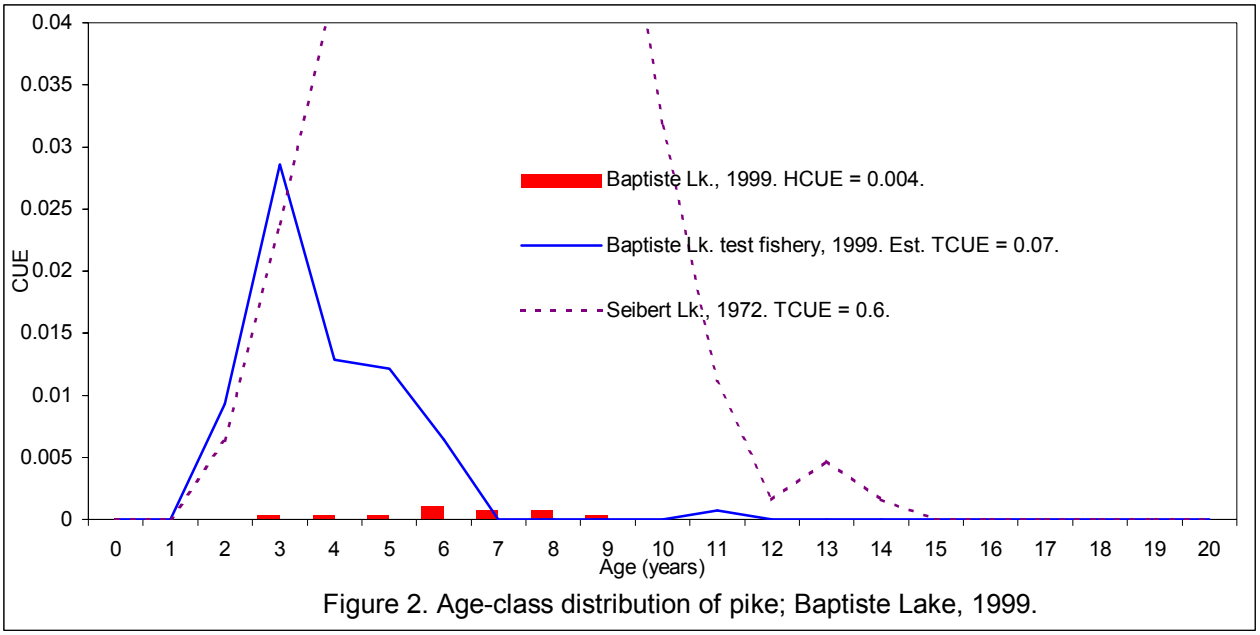


Figure 2. Age-class distribution of pike; Baptiste Lake, 1999.

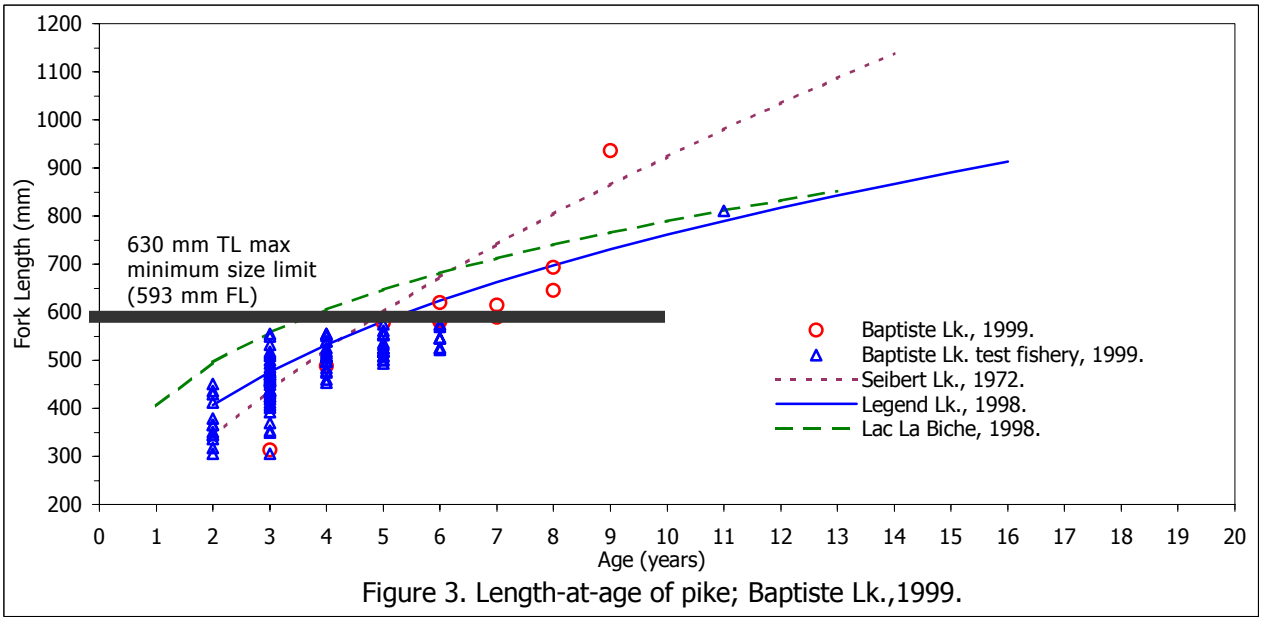


Figure 3. Length-at-age of pike; Baptiste Lk.,1999.

2. Social Metrics

Forty-five percent of all anglers were successful in catching 1 or more legal-sized pike. There was a high degree of inequality in the catch of pike.

DISCUSSION

Historical information mentions that Baptiste Lake was a superlative pike fishery and catching very large pike was not uncommon. Given the present 63 cm TL minimum size limit, Baptiste Lake is effectively a catch and release pike fishery; the catch rate on legal-size pike was 0.002 fish / hr. The total estimated catch rate was extremely low at 0.07 pike / hr. The test fishery shows a low level of recruitment. The length-at-age of Baptiste Lake pike suggests that the growth rate of younger fish is increasing. Most anglers did not catch a single pike. Based on the criteria used to classify pike stocks in Alberta, the Baptiste Lake pike fishery is likely collapsed.

LITERATURE CITED

Berry, D.K. 1999. Alberta's northern pike management and recovery plan. Alta. Environ. Nat. Res. Ser. No. T/459. 22 p.

Baccante, D. Assessing catch inequality in walleye angling fisheries. pp. 661 – 664. NAJFM Vol. 15, No. 3, Aug.,1995.

Gablehouse, D. A length-categorization system to assess fish stocks. NAJFM 4: 273 – 285, 1984.

Mackay, W.C., G.R. Ash, and H.J. Norris (eds.).1990. Fish Ageing Methods for Alberta. R.L.&L. Environmental Services Ltd. in assoc. with Alberta Fish and Wildl. Div. and Univ. of Alberta, Edmonton. 113 p.

Mitchell, P. and E. Prepas. 1990. Atlas of Alberta Lakes. University of Alberta Press, Edmonton. 675 p.

Overton, W.S. 1971. Estimating the numbers of animals in wildlife populations. pp 403 – 55. In R.H. Giles (ed.) Wildlife Management Techniques, The Wildlife Society, Wash., D.C.

Patterson, B. and M. Sullivan. 1998. Assessment of the status of the sport fishery for walleye at Baptiste Lake, 1997. Alta. Conserv. Assoc., Alta. Environ. Prot., Nat. Res. Ser. 31 p.

Pollock, K.H.,C.M. Jones, and T.L. Brown. 1994. Angler survey methods and their applications in fisheries management. Am. Fish. Soc. Spec. Pub. 25. 371 p.

Ryerson, D. 2000. A comparative summary of the walleye, pike, and perch sport fisheries of northeastern and central Alberta; 1980s and 1990s. Alta. Environ. Prot., Nat. Res. Ser. CD.

Sullivan, M.G. 1996. Test angling fisheries and reporting bias in creel surveys. Alberta Fisheries Workshop, 24 Oct. 1996. Edmonton, AB.

Valastin, P. and M.G. Sullivan. 1996. A Historical survey of the sport fisheries in northeastern Alberta: Baptiste Lake, from 1920 - 1975. Alta. Fish & Wildl. Div. unpubl. MS. 51 p.

APPENDICES

Appendix 1.1. Daily summary of angler survey data. [Baptiste Lake, 1999]

Month	Date Survey Days 35	# Anglers	# Hours	# Wall Kept	# Wall Released < 50 cm TL max	# Wall Released > 50 cm TL max	# Pike Kept	# Pike Released < 63 cm TL max	# Pike Released > 63 cm TL max	# Perch Kept	# Perch Released
	Totals	**643**	**2338.25**	**27**	**1786**	**6**	**10**	**867**	**21**	**56**	**130**
5	26	3	19.5	0	4	0	0	3	1	0	0
5	27	15	42.25	0	11	0	2	41	0	1	0
5	28	17	58	1	0	1	1	72	0	0	0
5	29	54	196	2	32	0	1	148	4	0	0
5	30	19	70	1	21	0	0	21	1	0	0
6	9	2	3	0	12	0	0	0	0	0	0
6	10	10	31	1	31	0	0	1	0	0	0
6	11	21	102	2	65	0	0	33	3	0	0
6	12	45	155	3	227	0	0	39	0	0	0
6	13	35	144	5	118	3	0	24	1	1	0
6	23	0	0	0	0	0	0	0	0	0	0
6	24	26	86.75	1	32	0	0	112	3	2	2
6	25	12	53.5	1	70	0	1	16	0	4	1
6	26	40	172.25	3	152	0	1	40	3	2	3
6	27	42	170.25	0	58	1	2	110	0	20	78
7	7	4	18.5	0	31	0	0	2	0	0	0
7	8	14	43.5	0	23	0	0	6	0	0	0
7	9	15	33	0	17	0	1	4	0	0	0
7	10	48	256.5	2	246	1	1	58	2	17	32
7	11	17	37.5	0	29	0	0	2	1	0	0
7	21	10	31.75	0	20	0	0	7	0	0	0
7	22	12	38.5	0	19	0	0	18	0	0	0
7	23	6	19	0	20	0	0	3	0	0	0
7	24	22	71	1	94	0	0	16	0	0	0
7	25	11	35	0	116	0	0	8	2	1	1
8	4	4	4	0	0	0	0	0	0	0	0
8	5	15	52	2	26	0	0	10	0	0	0
8	6	10	17.5	0	7	0	0	0	0	0	1
8	7	19	81.5	1	10	0	0	7	0	8	12
8	8	14	38.5	0	13	0	0	3	0	0	0
8	18	10	60	0	65	0	0	26	0	0	0
8	19	14	38	0	41	0	0	13	0	0	0
8	20	16	53	0	111	0	0	7	0	0	0
8	21	23	52.5	1	15	0	0	3	0	0	0
8	22	18	53.5	0	50	0	0	14	0	0	0

Appendix 1.2. Catch frequency distribution of harvested pike. [Baptiste Lake, 1999]

# Pike Kept	# Anglers	% Anglers	Harvest	% Pike Harvested	Cumulative % Pike Harvested
0	633	98.4	0	0.0	0.0
1	10	1.6	10	100.0	100.0
2	0	0.0	0	0.0	
3	0	0.0	0	0.0	
4	0	0.0	0	0.0	
5	0	0.0	0	0.0	
>5	0	0.0	0	0.0	
Totals	643	100.0	10	100.0	

Appendix 1.3. Catch frequency distribution of released pike. [Baptiste Lake, 1999]

# Pike Released	# Anglers	% Anglers	# Pike Released	% Pike Released
0	361	56.1	0	0.0
1	113	17.6	113	12.7
2	59	9.2	118	13.3
3	35	5.4	105	11.8
4	19	3.0	76	8.6
5	11	1.7	55	6.2
6	12	1.9	72	8.1
7	6	0.9	42	4.7
8	6	0.9	48	5.4
9	2	0.3	18	2.0
10	6	0.9	60	6.8
>10	13	2.0	181	20.4
Totals	643	100.0	888	100.0

Appendix 1.4. Methods of anglers and catch statistics for pike. [Baptiste Lake, 1999]

METHOD	# Anglers	% Anglers	# Hours	Pike Kept	Pike Rel.	Harvest CUE	Rel. CUE
Artificial	233	36.2	734.25	6	458	0.008	0.624
Commercial Baitfish	61	9.5	203.75	1	58	0.005	0.285
Seined Baitfish	6	0.9	23.5	0	7	0.000	0.298
Leeches	206	32.0	842.25	2	224	0.002	0.266
Dewworms	50	7.8	172.25	0	44	0.000	0.255
Scent baits	9	1.4	26.5	1	6	0.038	0.226
Miscellaneous	78	12.1	335.75	0	91	0.000	0.271
Totals	643	100	2338.25	10	888		

Appendix 1.5. Skill levels of anglers and catch statistics for pike. [Baptiste Lake, 1999]

SKILL	# Anglers	% Anglers	# Hours	Pike Kept	Pike Rel.	Harvest CUE	Rel. CUE
Novice	58	9.0	177	1	10	0.006	0.056
Average	571	88.8	2100.5	8	818	0.004	0.389
Professional	14	2.2	60.75	1	60	0.016	0.988
Totals	643	100	2338.25	10	888		

Appendix 1.6. Target species of anglers and catch statistics for pike. [Baptiste Lake, 1999]

TARGET	# Anglers	% Anglers	# Hours	Pike Kept	Pike Rel.	Harvest CUE	Rel. CUE
Walleye	385	59.9	1509.75	3	425	0.002	0.282
Northern Pike	105	16.3	351.75	5	346	0.014	0.984
Yellow Perch	13	2.0	61.75	0	26	0.000	0.421
Any species	140	21.8	415	2	91	0.005	0.219
Totals	643	100	2338.25	10	888		

Appendix 1.7. Angler's use of electronic gear and catch statistics for pike. [Baptiste Lake, 1999]

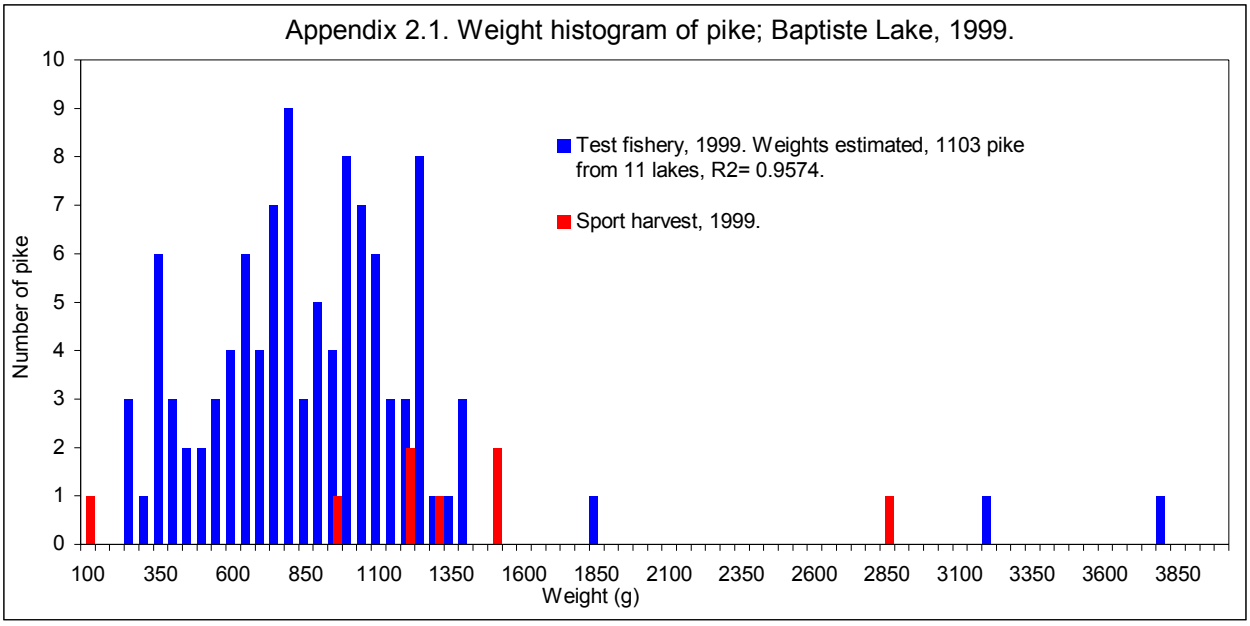
ELECTRONICS	# Anglers	% Anglers	# Hours	Pike Kept	Pike Rel.	Harvest CUE	Rel. CUE
None	306	47.6	1026	7	454	0.007	0.442
Depth Sounder	321	49.9	1231.25	3	419	0.002	0.340
G.P.S.	2	0.3	5	0	0	0.000	0.000
Depth Sounder + G.P.S.	14	2.2	76	0	15	0.000	0.197
Other	0	0.0	0	0	0		
Totals	643	100	2338.25	10	888		

Appendix 1.8. Residence of anglers and catch statistics for pike. [Baptiste Lake, 1999]

RESIDENCE	# Anglers	% Anglers	# Hours	Pike Kept	Pike Rel.	Harvest CUE	Rel. CUE
Local (50 km radius)	156	24.3	463.75	2	109	0.004	0.235
Edmonton	429	66.7	1657	6	620	0.004	0.374
Ft. McMurray	0	0.0	0	0	0		
Lac La Biche	2	0.3	8	0	1	0.000	0.125
Peace River	5	0.8	9	0	3	0.000	0.333
St. Paul / Bonnyville	5	0.8	19.75	0	10	0.000	0.506
Edson / Hinton	4	0.6	8	0	0	0.000	0.000
Vegreville / Lloydminster	3	0.5	15	0	3	0.000	0.200
Red Deer and west	14	2.2	50.5	2	64	0.040	1.267
Rocky Mtn. House / Nordegg	0	0.0	0	0	0		
South east slopes	0	0.0	0	0	0		
Calgary and west	9	1.4	33	0	46	0.000	1.394
Southern Alberta	3	0.5	19	0	11	0.000	0.579
Out of province	13	2.0	55.25	0	21	0.000	0.380
Totals	643	100	2338.25	10	888		

Appendix 1.9. Summary of entire lake surveys. [Baptiste Lake, 1999]

Date	# Anglers Surveyed on Lake	# Anglers using survey site (County campground and day-use area)	Ratio of use
29 May '99	44	27	1.63
30 May '99	30	8	3.75
11 June '99	51	25	2.04
13 June '99	59	36	1.64
24 June '99	9	4	2.25
26 June '99	13	6	2.17
27 June '99	14	7	2.00
10 July '99	39	20	1.95
11 July '99	24	13	1.85
11 July '99	19	9	2.11
23 July '99	10	3	3.33
24 July '99	64	14	4.57
25 July '99	11	4	2.75
8 Aug '99	24	5	4.80
19 Aug '99	9	5	1.80
20 Aug '99	35	11	3.18
Mean ratio =	2.61	SE = 0.255	n = 16



Appendix 2.2. Biological data from sport-caught pike. [Baptiste Lake, 1999]

Sample #	Weight	Fork	Age	Sex	Month	Day
	(g)	Length (mm)	(yrs)	1 = immature		
				5 = mature female		
mean =	1325.0	604.0	6.3	10 = mature male		
n =	8	11	11			
1	1500	615	7		5	26
2	1300	580	6	5	5	27
3	1200	578	5	5	5	27
4		694	8	10	5	28
5	1200	590	7	5	5	29
6	100	314	3	6	5	29
7		584	6	5	6	25
8		936	9	5	6	26
9	2850	645	8		6	27
10	1500	620	6	5	7	9
11	950	488	4	5	7	10

Appendix 3. Biological data from test-caught pike. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
mean =	480.6	3.6		
n =	105	98		
1	318	2	5	26
2	555	5	5	27
3	500	3	5	27
4	476	3	5	27
5	459	3	5	27
6	453	4	5	27
7	451	2	5	27
8	438	3	5	27
9	508	5	5	28
10	532	3	5	28
11	455	3	5	28
12	540	4	5	28
13	547	6	5	29
14	478	4	5	29
15	546	6	5	29
16	438	3	5	29
17	479	3	6	3
18	424	3	6	3
19	354	3	6	3
20	345	2	6	3
21	401	3	6	3
22	485	3	6	3
23	484	4	6	3
24	555	3	6	3
25	407	3	6	3
26	392	3	6	3
27	524	5	6	3
28	555	4	6	3
29	532	5	6	3
30	561	5	6	3
31	519	4	6	3
32	379	2	6	10
33	505	4	6	10
34	365	2	6	10
35	412	2	6	10
36	575	6	6	10
37	570	6	6	10
38	525	6	6	10
39	425	3	6	10
40	552	5	6	10
41	431	3	6	10
42	494	5	6	10

Appendix 3. Biological data from test-caught pike, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
43	500	5	6	10
44	469	3	6	10
45	525	5	6	10
46	436	2	6	11
47	513	3	6	11
48	435	3	6	11
49	460	3	6	11
50	458	3	6	11
51	475	4	6	24
52	419	3	6	24
53	510	4	6	24
54	450	3	6	24
55	497	4	6	24
56	574	6	6	25
57	509	4	6	25
58	509	3	6	25
59	458	3	6	25
60	575	5	6	25
61	550	3	6	25
62	539	4	6	25
63	369	3	6	25
64	519	5	6	26
65	526	4	6	26
66	465	3	6	26
67	336	2	6	26
68	344	2	6	26
69	475	3	6	26
70	536	5	6	26
71	365	2	6	26
72	635		6	26
73	471	3	6	26
74	498	4	7	9
75	554	5	7	9
76	412	3	7	21
77	501	5	7	22
78	435	3	7	22
79	351	2	7	22
80	493	3	7	22
81	515	4	7	23
82	439	3	7	23
83	545	6	7	24
84	460	4	7	24
85	518	5	7	25
86	471	3	8	25
87	551	4	8	4
88	350	3	8	4

Appendix 3. Biological data from test-caught pike, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
89	811	11	8	4
90	521	6	8	4
91	519	5	8	5
92	555	4	8	5
93	429	2	8	5
94	305	3	8	5
95	463	3	8	7
96	518	3	8	15
97	508		8	19
98	348		8	19
99	492		8	19
100	510	5	8	19
101	525	6	8	20
102	305	2	8	20
103	474		8	20
104	765		8	20
105	476		8	20

Appendix 4.1. Biological data from sport-caught walleye. [Baptiste Lake, 1999]

Sample #	Weight	Fork	Age	Sex	Month	Day
	(g)	Length (mm)	(yrs)	1 = immature		
				5 = mature female		
mean =	1424.8	528.1	8.9	10 = mature male		
n =	23	26	26			
1	1150	509	8		5	29
2	1600	550	9		5	29
3	1400	570	10	5	5	30
4	1100	480	6	5	6	3
5	1150	525	7	5	6	10
6	1120	505		5	6	11
7	1600	531	8	5	6	11
8	1250	479	8		6	12
9	1400	529	8		6	12
10	2050	584	14	5	6	12
11	1100	513	8		6	13
12	1600	593	9		6	13
13	1800	580	10		6	13
14	1300	499	7		6	13
15	1300	529	8		6	13
16		550	9	5	6	24
17		527	8	5	6	24
18	1000	474	7	10	6	25
19		485	7	5	6	26
20	1400	550	10	5	6	26
21	1250	500	7		6	26
22	1500	525	8	5	6	26
23	1100	479	8	5	6	26
24	1650	515	9		8	5
25	1950	570	11	5	8	5
26			10	10	8	7
27	2000	580	17		8	21

Appendix 4.2. Biological data from test-caught walleye. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
mean =	321.8	4.95		
n =	259	123		
1	397	6	5	26
2	350		5	26
3	367	6	5	26
4	339		5	26
5	430	6	5	26
6	408		5	26
7	400	7	5	26
8	255		5	27
9	428	7	5	28
10	380		5	28
11	416	7	5	28
12	380		5	28
13	349	5	5	28
14	350		6	2
15	355	5	6	2
16	325		6	2
17	329	4	6	2
18	353		6	2
19	409	7	6	2
20	325		6	2
21	291	4	6	2
22	428		6	2
23	228	3	6	2
24	425		6	2
25	380		6	3
26	362	6	6	3
27	395	5	6	3
28	428		6	9
29	302	4	6	10
30	364		6	10
31	395	7	6	10
32	357		6	10
33	255	3	6	10
34	231		6	10
35	248	3	6	10
36	311		6	10
37	255	3	6	10
38	318		6	10
39	260	4	6	10
40	252		6	10
41	243	3	6	10
42	254		6	10
43	266	3	6	10
44	371		6	10

Appendix 4.2. Biological data from test-caught walleye, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
45	315	5	6	10
46	243		6	10
47	224	3	6	10
48	229		6	10
49	255	3	6	10
50	249		6	10
51	282	5	6	10
52	356		6	10
53	352	6	6	11
54	386		6	11
55	287	4	6	11
56	205		6	11
57	362	5	6	11
58	325		6	11
59			6	11
60	305	5	6	12
61	263	3	6	12
62	256		6	12
63	363	5	6	12
64	312		6	12
65	317	5	6	12
66	214		6	12
67	306		6	12
68	340		6	12
69	320	5	6	12
70	235		6	12
71	256	4	6	13
72	370		6	13
73	265	3	6	13
74	260		6	13
75	320	5	6	13
76	332		6	13
77	484	11	6	24
78	368		6	24
79	447	6	6	24
80	353		6	24
81	420	7	6	24
82	558		6	24
83	344	5	6	24
84	331		6	24
85	395	5	6	24
86	320		6	24
87	330	5	6	24
88	335		6	24
89	439	6	6	24
90	239		6	24
91	345	5	6	24

Appendix 4.2. Biological data from test-caught walleye, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
92	405		6	24
93	401	8	6	24
94	370		6	24
95	394	5	6	24
96	440		6	24
97	361	5	6	24
98	359		6	24
99	367	6	6	24
100	336		6	24
101	418	6	6	24
102	398		6	25
103	369	5	6	25
104	400		6	25
105			6	25
106	328	5	6	25
107	356	5	6	25
108	440		6	25
109	217	2	6	25
110	344		6	25
111	406	5	6	25
112	321		6	25
113	389	5	6	25
114	362		6	26
115	393	6	6	26
116	351		6	26
117	355	5	6	26
118	345		6	26
119	421		6	26
120	344		6	26
121	371		6	26
122	445		6	26
123	321		6	26
124	358	5	6	26
125	450	8	6	26
126	347	5	6	26
127	304	5	6	26
128	305		6	26
129	350	4	6	26
130	340		6	26
131	333	4	6	26
132	403		6	26
133	388	5	7	8
134	266		7	8
135	218	3	7	8
136	334		7	8
137	359	5	7	8
138	245		7	8

Appendix 4.2. Biological data from test-caught walleye, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
139	280	3	7	8
140	359		7	8
141	372	5	7	8
142	366		7	8
143	285	3	7	8
144	380		7	8
145	360	5	7	8
146	233		7	8
147	233		7	8
148	321	4	7	8
149	338	6	7	8
150	332		7	8
151	304	4	7	9
152	275		7	9
153	334	5	7	9
154	312		7	9
155	219	2	7	9
156	261		7	9
157	360	5	7	9
158	326		7	9
159	319	6	7	9
160	308		7	9
161	308	4	7	9
162	360		7	9
163	245		7	9
164	259		7	9
165	216	2	7	9
166	200		7	9
167	298	5	7	9
168	255		7	9
169	258	3	7	9
170	362		7	9
171	245		7	9
172	245	3	7	9
173	237	3	7	9
174	270		7	9
175	280	3	7	9
176	295		7	9
177	258	3	7	9
178	232		7	9
179	252	4	7	9
180	325		7	9
181	362	6	7	9
182	329		7	9
183	364	6	7	9
184	285		7	9
185	235	3	7	9

Appendix 4.2. Biological data from test-caught walleye, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
186	288		7	9
187	212	2	7	9
188	245		7	9
189	328	5	7	9
190	275		7	18
191	274	3	7	21
192	249		7	21
193	342	4	7	21
194	310		7	21
195	370	6	7	21
196	244		7	21
197	345	5	7	22
198	389		7	22
199	310	3	7	22
200	335		7	22
201	449	7	7	22
202	239		7	22
203	262	3	7	22
204	256		7	23
205	294	3	7	23
206	267		7	23
207	329	5	7	23
208	265		7	23
209	291		7	23
210	255	3	7	23
211	152	2	7	23
212	350		7	24
213	343	4	7	24
214	375		7	24
215	362	5	7	24
216	274		7	24
217	292	3	7	24
218	385		7	24
219	506	8	7	24
220	266		7	24
221	286	3	7	24
222	343		7	24
223	372	5	7	24
224	372		7	24
225	291	4	7	25
226	270		7	25
227	227	3	7	25
228	338		7	25
229	269	3	7	25
230	243		7	25
231	234	3	7	25
232	425		7	25

Appendix 4.2. Biological data from test-caught walleye, con't. [Baptiste Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
233	355	5	7	25
234	319		7	25
235	315	5	7	25
236	310		7	25
237	289	3	7	25
238	415		7	25
239	314	4	7	25
240	342		7	25
241	368	6	7	25
242	330		7	25
243	352	3	7	25
244	274		7	25
245	280	3	7	25
246	215		8	4
247	447	8	8	4
248	238		8	4
249	222		8	4
250	291		8	4
251	275		8	4
252	265		8	4
253	168		8	6
254	257		8	19
255	255		8	19
256	250		8	19
257	256		8	19
258	390		8	19
259	180		8	19
260	476	8	5	26
261	340	5	5	26

Appendix 5. Biological data from sport-caught perch. [Baptiste Lake, 1999]

Sample #	Weight	Fork	Age	Sex	Month	Day
	(g)	Length (mm)	(yrs)	1 = immature		
				5 = mature female		
mean =	358.2	276.4	5.9	10 = mature male		
n =	11	40	41			
1		323	7	5	6	24
2		297	9	5	6	24
3	500	300	8	5	6	24
4	300	265	4	5	6	25
5	450	289	9	5	6	25
6		203	3	5	6	25
7		255	4		6	26
8		325	9		6	27
9		267	5		6	27
10		299	7		6	27
11		268	5		6	27
12		263	5		6	27
13		310	7		6	27
14		234	4		6	27
15		295	7		6	27
16		306	6	5	6	27
17		252	4		7	10
18		285	8		7	10
19		284	8		7	70
20		255	5		7	10
21		316	8		7	10
22		294	8		7	10
23	420	305	7		7	24
24	300	256	5	5	7	25
25		230	3	5	7	25
26	280	265	8	5	7	25
27	350	272	4	5	7	25
28	250	217	5	5	7	25
29	200	227	4	5	7	25
30		232	4	5	7	25
31		245	4	5	7	25
32	340	263	5	5	7	25
33			4	5	7	25
34	550	312	6		8	7
35		286	5		8	7
36		312	8		8	7
37		315	7		8	7
38		289	7		8	7
39		300	7		8	7
40		255	3		8	7
41		289	7		8	7

Appendix 6. Creel survey form. [Baptiste Lake, 1999]