

**Assessment of the Status
of the Sport Fishery for Walleye
at Ethel Lake, 1997.**

Conducted as part of the
Walleye Monitoring Program
(Project No. H96010)

Prepared by

Bill Patterson,
Fisheries Section,
Northeast Boreal Region,
Alberta Conservation Association

and

M. G. Sullivan,
Fisheries Section,
Natural Resources Service,
Alberta Environmental Protection

March, 1998.

ABSTRACT

To recover or maintain Alberta's walleye fisheries, a new walleye management strategy was implemented in 1996. In 1996, the walleye fishery at Ethel Lake was classified as a collapsed walleye fishery and a zero (0) daily bag limit was implemented. In order to monitor the status of the walleye fishery at Ethel Lake, a creel survey was conducted during May to August 1997. Since the last creel survey conducted in 1986, the estimated number of anglers had increased less than 1.0 % from 1037 anglers to 1042 anglers, while the estimated angler effort increased by 19 % from 4.7 angler-hours / ha to 5.6 angler-hours / ha. The catch rate on released walleye increased since 1986 from < 0.001 to 0.070 fish / hour.

Only age 6 walleye exist in Ethel Lake. Consecutive recruitment failures are evident. Based on the criteria used to classify walleye stocks in Alberta the walleye in Ethel Lake should retain the classification of "collapsed". The Ethel Lake has, historically, only supported a minimal walleye fishery. Recovery to this level is certainly possible, although comments from local anglers suggests that poaching of walleye will increase if these restrictive regulations persist.

ACKNOWLEDGEMENTS

The creel survey attendants at Ethel Lake, Jason Blackburn and Jason Mckain deserve full credit for the success of this study. The primitiveness of their camping facilities at Hilda Lake made this survey one of the more difficult. The survey would have suffered if it were not for their tolerance and creativity.

The Alberta Conservation Association (ACA) would like to acknowledge the co-operation from Alberta Environmental Protection, Natural Resources Service (NRS), Northeastern Boreal Region, Fisheries Management Section staff that was received throughout the course of the survey. The assistance from NRS staff and the use of NRS equipment is greatly appreciated.

TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	iv
LIST OF APPENDICES	iv
INTRODUCTION	1
METHODS	1
Study Site Description	1
Methods of Study	1
RESULTS	4
Angler Survey	4
Status of the Walleye Fishery	6
DISCUSSION	7
LITERATURE CITED	8
APPENDICES	9

LIST OF TABLES

Table	Page
1. Observed catch rates of anglers; Ethel Lake, 1986 and 1997.	4
2. Angler survey summary; Ethel Lake, 1997.	5
3. Biological data from test-caught walleye; Ethel Lake, 1997.	5

LIST OF FIGURES

Figure	Page
1. Fork length / age scattergram of test-caught walleye from Ethel Lake, 1997.	6

LIST OF APPENDICES

Appendix	Page
1. Angler survey data; Ethel Lake, 1997.	
1.1. Daily summary of angler survey data.	9
1.2. Catch frequency distribution of released walleye.	10
1.3. Methods of angling and catch statistics for walleye.	11
1.4. Skill levels of anglers and catch statistics for walleye.	11
1.5. Target species of anglers and catch statistics for walleye.	11
1.6. Anglers use of electronic gear and catch statistics for walleye.	11
2. Biological data from sport-caught pike; Ethel Lake, 1997.	12
3. Biological data from sport-caught perch; Ethel Lake, 1997.	15
4. Creel survey form; Ethel Lake, 1997.	16

INTRODUCTION

Walleye (*Stizostedion vitreum*) populations in Alberta have been subjected to heavy fishing pressure for many years. Most populations show signs of over-harvest, with some experiencing significant declines. Previous management strategies have focused on province-wide regulations designed to manage the walleye harvest at an average fishery. Fisheries receiving heavier than average exploitation have not been adequately protected with these regulations and consequently many have declined or collapsed. To recover these fisheries and to maintain the stable fisheries, a new walleye management strategy was implemented in 1996 (Berry 1995). This strategy requires that each walleye population is evaluated as to its degree of exploitation and is then placed in one of these categories: collapsed, vulnerable, or stable. The fishery is assigned a standard sport fishing regulation based on this status (Sullivan 1994). In early 1996, the walleye fishery at Ethel Lake was assigned a collapsed status. A zero (0) daily bag limit on walleye was therefore implemented at the fishery.

This report describes the creel survey conducted at Ethel Lake during the summer of 1997. The purpose of the survey was to monitor the walleye sport fishery and verify the status of the population and fishery

METHODS

Study Site Description

Ethel Lake (TWP 64, RNG 3, W4M) is approximately 15 km north of the town of Cold Lake. Ethel Lake has a surface area of 467 hectares and a maximum depth of 26 metres. The Ethel Lake Recreation Area is located along the north shoreline. A small recreational development is located on the northeast corner of the lake. The trophic status of Ethel Lake is mesotrophic. Ethel Lake is in the Beaver River Basin. 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 technicians) collected information from both Ethel Lake and Hilda Lake between 17 May - 17 August 1997. The crew camped at the Hilda Lake Recreation Area for each 10 day shift. They travelled daily to survey the Ethel Lake Recreation Area. A schedule of 5 survey days at Ethel Lake (Wednesdays through Sundays) was preceded by 5

survey days (Fridays through Tuesdays) at the alternate site (Hilda Lake). 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 concerning their time spent angling, the numbers of each species caught or released, species sought, their gear types, 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 operculum of walleye, the left cleithrum of northern pike (*Esox lucius*), 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 walleye 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.

An angling test-fishery was used to collect additional information regarding the size frequency distribution of walleye in the population. Data from sport-harvested walleye could not provide this information, due to the zero (0) daily bag limit for walleye at this lake. Creel survey technicians, volunteer anglers, and fisheries staff participated in the collection of data. Test fisheries occurred during creel survey days from 17 May to 17 August 1997. The test fishery catch rate (CUE) was not used in the calculation of angler effort and the CUEs for both fisheries are in no way related.

All field data were recorded in pencil on field data forms (Appendix 6). Data were transcribed into computer files (Lotus 1-2-3 format) by commercial keypunch services 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 procedure was used:

- creel data categories (i.e. # anglers, # hours fishing, # walleye harvested) were separated into daily weekday totals. Weekdays included Monday (day 1) through Thursday (day 4). Weekends included Friday (day 5) through Sunday (day 7) and long weekends (day 8) either on a Monday or a Friday.
- totals, means and standard deviations of # anglers / weekdays, # hours / weekdays and # walleye harvested / weekdays were calculated using Lotus 123 @functions: total (@SUM), mean (@AVG), and standard deviation (@STD). Standard error (SE) for each category was calculated by ($\text{@STD of each category} / (\text{@SQRT (n days surveyed)})$).
- to estimate parameters for days NOT surveyed, the above means and SE of those categories were multiplied by the # weekdays not surveyed and added to the observed parameters.
- the same procedure was used for weekend days.
- estimated # anglers, # hours fishing and # walleye harvested for weekdays and weekend days were added for total estimates.
- variances of these estimates were combined following Pollock et al. (1994) for stratified sampling, by adding the separate estimates of variances.
- 95% confidence intervals for estimated # anglers, # angling hours and # walleye harvested were calculated using $t_{0.05(df)} \times \text{SE}$.

Total use estimators of the fishery were then calculated by simple extrapolation. Variances of these combined estimates were calculated following Pollock et al. (1994).

All statistical analyses and graphics were done on an IBM - type personal computer (Intel Pentium, 133 MHz) using Lotus 1-2-3 Release 5 and Microsoft Office '97. All frequency analysis was conducted using Microsoft Office '97 (Excel spreadsheet). All data and analyses are stored in spreadsheet format on the ACA / NRS Edmonton Metropolitan office Fisheries computers and on Iomega Zip 100 MB disk cartridges.

RESULTS

Angler Survey

During 17 May - 17 August 1997, 439 anglers were interviewed (Table 1 and Appendix 1). The total number of anglers was estimated at 1042, with an estimated effort of 5.6 angler-hours / ha (Table 2). Seventy-six walleye were reported released in 1098 hours of fishing (0.070 walleye released / hr). The test fishery sampled 10 walleye in 46.5 hours of angling (Table 3 and Figure 1). Distributions of released walleye are shown in Appendices 1.2. Biological samples were collected from 101 pike (Appendix 2), and 14 perch (Appendix 3).

Table 1. Observed catch rates of anglers; Ethel Lake, 1986 and 1997.

CREEL DATA	1986	1997
# days surveyed	56	36
# anglers interviewed	713	439
# angling hours reported	1475.5	1098
# angling hours estimated	2183	2611
WALLEYE DATA		
Walleye kept / angler-hour (HCUE)	0.022	N/A
Walleye rel. (<38 cm TL) / angler-hour	N/A	0.011
Walleye rel. (38 - 50 cm TL) / angler-hour	N/A	0.046
Walleye rel. (>50 cm TL) / angler-hour	N/A	0.013
Total walleye rel. / angler-hour	< 0.001	0.070
NORTHERN PIKE DATA		
Pike kept / angler-hour	0.374	0.20
Pike rel. (<50 cm TL) / angler-hour	N/A	0.59
Pike rel. (>50 cm TL) / angler-hour	N/A	0.10
Total pike rel. / angler-hour	0.451	0.69
YELLOW PERCH DATA		
Perch kept / angler-hour	0.041	0.013
Perch rel. (<20 cm TL) / angler-hour	N/A	0.022
Perch rel. (>20 cm TL) / angler-hour	N/A	0.008
Total perch rel. / angler-hour	0.006	0.03

Table 2. Angler survey summary; Ethel Lake, 1997.

PARAMETER	1986 EST.	REPORTED (1997)	ESTIMATED (1997)
# Anglers	1037	439	1042
# Hours	2183	1098	2611
Hours / hectare	4.7	2.4	5.6
# walleye harvested	49	N/A	N/A

Table 3. Biological data from test-caught walleye; Ethel Lake, 1997.

Sample #	Fork Length (mm)	Age (years)	Month	Day
1	400	6	July	2
2	454	6	July	2
3	383	6	July	2
4	392	6	July	2
5	458	6	July	2
6	446	6	July	3
7	433	6	July	3
8	468	6	July	3
9	413	6	July	3
10	424	6	July	3

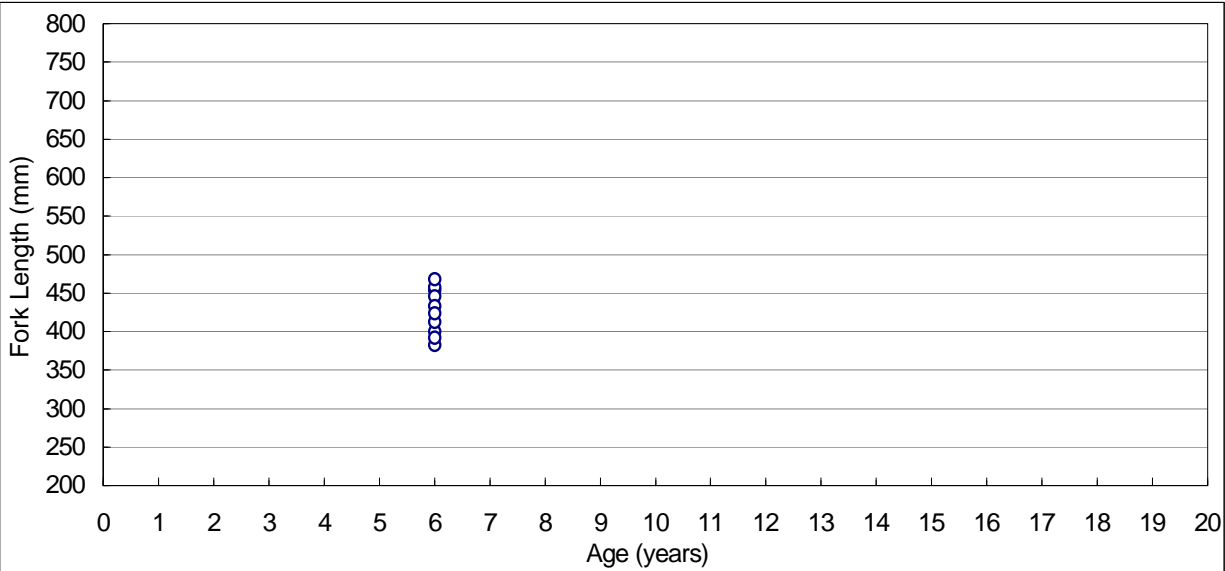


Figure 1. Fork length / age scattergram of test-caught walleye from Ethel Lake, 1997.

Status of the Walleye Fishery

Only 76 walleye were reported released in over 1098 hours of angling. Only 10 walleye were sampled by the test-fishery. The observed total release rate (0.070 fish / hr) is indicative of a walleye stock with a collapsed status.

Only age 6 walleye were sampled by the test fishery. There is no evidence of recruitment. The reported release rates for walleye were possibly false information. Five comparative test fisheries completed during the 1996 walleye stock monitoring surveys indicate that reported release rates were exaggerated (Sullivan 1996). The index of growth was fast (approximately 40 cm fork length in 6 years).

Historical information indicates that Ethel Lake once supported a marginal walleye fishery (Sullivan 1991). Walleye have never been stocked in Ethel Lake. The survey results and historical information indicate that the walleye population in Ethel Lake is collapsed.

DISCUSSION

Based on the criteria used to classify walleye stocks in Alberta the walleye population in Ethel Lake is collapsed. Between 1986 and 1997, the number of anglers increased < 1.0 % and the angling effort increased 19 %. The release rate of walleye also increased from < 0.001 to 0.070 fish / hr. The test fishery sampled only age 6 walleye. There was no evidence of recruitment and the index of growth was accelerated.

Historical information indicates that Ethel Lake has supported a marginal walleye fishery and has never been stocked with walleye. Cold Lake area Natural Resources Service fisheries staff has suggested that Ethel Lake may not be a self-sustaining walleye population, but instead receives immigrant walleye from either Beaver River or Marie Lake. Control structures and culverts, which are not being maintained, would also be a contributing factor in the lack of immigration. Also, comments from local anglers imply that the poaching of walleye will certainly persist if the restrictive regulations are not modified. Ethel Lake cannot support any form of walleye harvest, whether it is sport-harvest or illegal harvest.

In 1989, a province-wide regulation modification reduced bag limits from 5 to 3 walleye per day and a 38 cm TL size limit was imposed. These regulations have been ineffective in preventing the continued collapse of walleye at Ethel Lake. The regulation recommended in Alberta's walleye management strategy (Berry 1995) for a walleye fishery with a collapsed status is a zero (0) daily bag limit (catch and release for walleye). Ethel Lake can support higher densities of walleye. The proper maintenance or removal of control structures and culverts would certainly allow immigration to continue and perhaps natural recruitment. The poaching concerns also need to be addressed.

LITERATURE CITED

- Berry, D.K. 1995. Alberta's walleye management and recovery plan. Alta. Environ. Prot., Nat. Res. Ser. No. T/310. 32 p.
- 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.
- Olynyk, J.P.R. 1980. An analysis of sauger maturity regimes in southern Lake Winnipeg. Manitoba D.N.R. Report No. 80-36. 52 p.
- Pollock, K.H. and 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.
- Sullivan, M.G. 1991. Ethel lake sport fishery survey, summer 1986. Alta. Fish & Wildl. Div. unpubl. MS. 43 p.
- Sullivan, M.G. 1994. A classification system for walleye fisheries based on a stock-recruitment curve. Alta. Fish & Wildl. Div. unpubl. MS. 11 p.
- Sullivan, M.G. 1996. Test angling fisheries and reporting bias in creel surveys. Alberta Fisheries Workshop, 24 Oct. 1996. Edmonton, Ab.

APPENDICES

Appendix 1.1. Daily summary of angler survey data. [Ethel Lake, 1997]

Date	# Anglers	# Hours	# WALL Released < 38 cm	# WALL Released 38 - 50 cm	# WALL Released > 50 cm	# NRPK Kept	# NRPK Released < 50 cm	# NRPK Released > 50 cm	# YLPR Kept	# YLPR Released < 20 cm	# YLPR Released > 20 cm
Totals 36	439	1098	12	50	14	219	642	113	14	24	9
21-May-97	0	0	0	0	0	0	0	0	0	0	0
22-May-97	8	19	0	0	0	1	1	1	0	0	0
23-May-97	6	13	0	0	0	2	0	0	0	0	0
24-May-97	14	43	0	1	0	0	12	2	1	0	0
25-May-97	13	32	0	0	0	4	4	0	0	0	0
4-Jun-97	4	8	0	0	0	0	1	0	0	0	0
5-Jun-97	2	4	0	0	0	1	0	0	0	0	0
6-Jun-97	4	10	0	0	0	3	7	1	0	0	0
7-Jun-97	14	38	0	3	1	5	26	17	0	0	0
8-Jun-97	6	15	0	0	0	1	6	0	0	0	0
18-Jun-97	0	0	0	0	0	0	0	0	0	0	0
19-Jun-97	0	0	0	0	0	0	0	0	0	0	0
20-Jun-97	6	11	0	4	0	0	8	0	0	0	0
21-Jun-97	14	45	7	2	0	8	2	1	0	0	1
22-Jun-97	23	53	0	0	0	4	15	5	0	0	0
2-Jul-97	5	7	0	2	0	0	3	0	0	0	0
3-Jul-97	16	35	1	3	0	5	9	1	0	1	0
4-Jul-97	20	50	0	5	2	0	28	4	0	1	1
5-Jul-97	38	101	0	0	5	12	69	39	1	2	4
6-Jul-97	18	49	0	5	0	17	34	2	0	1	2
16-Jul-97	12	49	0	5	0	4	13	0	0	2	0
17-Jul-97	29	89	0	2	0	33	65	7	11	12	0
18-Jul-97	9	18	0	0	2	6	14	0	0	0	0
19-Jul-97	25	59	0	5	1	10	28	4	0	0	0
20-Jul-97	3	5	0	3	0	4	12	0	0	0	0
30-Jul-97	10	19	1	0	0	4	14	0	0	0	0
31-Jul-97	10	23	0	0	0	9	2	0	0	0	0
1-Aug-97	8	23	0	0	0	5	23	3	1	0	0
2-Aug-97	34	97	0	2	1	27	52	1	0	1	1
3-Aug-97	29	67	2	2	0	18	36	7	0	0	0
4-Aug-97	9	18	0	2	0	1	12	6	0	0	0
13-Aug-97	9	18	0	0	1	7	21	1	0	0	0
14-Aug-97	4	7	0	2	0	4	11	0	0	0	0
15-Aug-97	19	31	0	1	1	8	31	10	0	4	0
16-Aug-97	18	46	1	1	0	16	83	1	0	0	0
17-Aug-97	0	0	0	0	0	0	0	0	0	0	0

Appendix 1.2. Catch frequency distribution of released walleye. [Ethel Lake, 1997]

# WALL Released	# Anglers	% Anglers	# WALL Released	% WALL Released
0	398	90.7	0	0.0
1	25	5.7	25	32.9
2	6	1.4	12	15.8
3	5	1.1	15	19.7
4	2	0.5	8	10.5
5	2	0.5	10	13.2
6	1	0.2	6	7.9
7	0	0.0	0	0.0
8	0	0.0	0	0.0
9	0	0.0	0	0.0
10	0	0.0	0	0.0
>10	0	0.0	0	0.0
Totals	439	100	76	100

Appendix 1.3. Methods of anglers and catch statistics for walleye.
[Ethel Lake, 1997]

METHOD	# Anglers	% Anglers	# Hours	WALL Released	Released CUE
Artificial	363	82.7	893	41	0.046
Commercial Baitfish	13	3.0	41	4	0.098
Seined Baitfish	1	0.2	1.5	3	2.000
Leeches	22	5.0	40	3	0.075
Dewworms	12	2.7	41.5	7	0.169
Scent baits	5	1.1	7	0	0.000
Miscellaneous	23	5.2	74	8	0.108
TOTALS	439	100.0	1098	66	

Appendix 1.4. Skill level of anglers and catch statistics for walleye.
[Ethel Lake, 1997]

SKILL	# Anglers	% Anglers	# Hours	WALL Released	Released CUE
Novice	94	21.4	218	1	0.005
Average	343	78.1	876	74	0.084
Professional	2	0.5	4	1	0.250
TOTALS	439	100	1098	76	

Appendix 1.5. Target species of anglers and catch statistics for walleye. [Ethel Lake, 1997]

TARGET	# Anglers	% Anglers	# Hours	WALL Released	Released CUE
Walleye	13	3.0	29.5	26	0.881
Northern Pike	365	83.1	901.5	24	0.027
Yellow Perch	9	2.1	35.5	1	0.028
Any species	52	11.8	131.5	25	0.190
TOTALS	439	100	1098	76	

Appendix 1.6. Angler use of electronic gear and catch statistics for walleye. [Ethel Lake, 1997]

ELECTRONICS	# Anglers	% Anglers	# Hours	WALL Released	Released CUE
None	262	59.7	645.5	41	0.064
Depth Sounder	177	40.3	452.5	35	0.077
G.P.S.	0	0.0	0	0	
Depth Sounder + G.P.S.	0	0.0	0	0	
Other	0	0.0	0	0	
TOTALS	439	100	1098	76	

Appendix 2. Biological data from sport-caught pike. [Ethel Lake, 1997]

Sample #	Fork Length (mm)	Weight (g)	Age (years)	Sex 1 = immature 3, 5 = mature females 8 = mature males	Month	Date
mean =	503.5	894.6	5.0			
1	390	300	4	5	5	22
2	471	600	4	5	5	23
3	519	750	4	5	5	23
4	532	950	5	8	6	5
5	491	700	5	8	6	6
6	538	1100	6	3	6	6
7	449	650	5	8	6	6
8	582	1300	7	8	6	7
9	502	900	6	3	6	7
10	518	800	7	8	6	7
11	522	1000	4	3	6	7
12	469	800	5	8	6	7
13	456	650	4	8	6	21
14	476	600	4	3	6	21
15	411	450	3	8	6	21
16	546	1050	6	8	6	21
17	551	1050	5	3	6	21
18	455	600	4		6	21
19	532	900	5	8	6	21
20	437	500	4	8	6	21
21	470	700	4	8	6	22
22	523	850	4	8	6	22
23	523	800	4	3	6	22
24	471	700	4	8	6	22
25	904		11	3	7	2
26	455	750	6	3	7	3
27	437	650	5	8	7	3
28	456	700	5	8	7	3
29	447	650	5	3	7	3
30	464	750	5	8	7	3
31	521	950	5	8	7	5
32	445		4	3	7	5
33	748	2570	9	3	7	5
34	500	950	6	3	7	5
35	456	700	4	3	7	5
36	383	450	4	3	7	5
37	477	900	5	8	7	5
38	338	250	3	1	7	5
39	417	600	4	3	7	5
40	521	1000	6	3	7	5
41	592		5		7	6
42	408	405	4	3	7	6
43	445		4		7	6
44	578		5		7	6

Appendix 2. Biological data from sport-caught pike, con't. [Ethel Lake, 1997]

Sample #	Fork Length (mm)	Weight (g)	Age (years)	Sex	Month	Date
45	489	900	5	3	7	6
46	360	300	3	1	7	6
47	470	700	6	8	7	6
48	519	850	6	3	7	6
49	504	1800	5	8	7	16
50	498	900	4	8	7	16
51	485	1800	3	3	7	16
52	503	900	4	3	7	17
53	446	650	3	3	7	17
54	518	950	4	3	7	17
55	506	1000	4	8	7	17
56	556	1100	5	3	7	17
57	515	1050	4	8	7	17
58	492	900	4	8	7	17
59	539	1000	4	3	7	17
60	430	550	3	3	7	17
61	520	975	4	3	7	17
62	624	2000	4		7	17
63	544	1200	4	8	7	17
64	517	1100	4	3	7	17
65	482	700	6	8	7	17
66	411	550	4	3	7	17
67	459	650	4	8	7	17
68	563	1100	7	3	7	17
69	486	750	4	8	7	17
70	437	550	4	3	7	17
71	489	900	5	3	7	17
72	460	700	4	8	7	17
73	496	900	5	3	7	18
74	561	1000	6	3	7	18
75	524	1100	5	3	7	18
76	411	450	3	3	7	18
77	506	800	6	8	7	18
78	744	2650	10	3	7	18
79	651	1350	8	3	7	19
80	464	900	5	8	7	19
81	555	1200	6	3	7	19
82	480	750	3	3	7	20
83	505	900	5	3	7	20
84	444	700	4	3	7	20
85	533	1050	7	8	7	30
86	583	1300	6	3	7	30
87	420	900	5	8	7	30
88	452	700	4	3	7	30
89	515	900	6	3	8	1
90	511		7	8	8	1
91	433	550	5	8	8	2

Appendix 2. Biological data from sport-caught pike, con't. [Ethel Lake, 1997]

Sample #	Fork Length (mm)	Weight (g)	Age (years)	Sex	Month	Date
92	445	500	5	3	8	2
93	550	446	4	3	8	2
94	530	900	6	8	8	2
95	678	1550	11	3	8	2
96	507	750	7	8	8	2
97	568		6	3	8	3
98	547	1200	5	3	8	3
99	547	1000	5	3	8	3
100	552	1200	5	8	8	3
101	492	950	5	3	8	4

Appendix 3. Biological data from sport-caught perch. [Ethel Lake, 1997]

Sample #	Fork Length (mm)	Weight (g)	Age (years)	Sex 1 = immature 3 = mature females 8 = mature males	Month	Date
mean =	259.6	325.4	5.4			
1	300		6		6	21
2	292	500	6	3	6	5
3	289	350	7	3	7	17
4	181	100	3	3	7	17
5	172	100	3	3	7	17
6	199	150	4	3	7	17
7	253	350	6	8	7	17
8	248	350	4		7	17
9	271	320	5	3	7	17
10	326	600	8	3	7	17
11	234	250	4	3	7	17
12	327	510	8	3	7	17
13	299	450	8	3	7	17
14	244	200	4	8	8	1

Appendix 4. Creel survey form. [Ethel Lake, 1997]