Wolf Lake Fall Walleye Index Netting, 2011

Fisheries Management
Cold Lake Area

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Abstract

In September 2011, Fisheries Management staff from Cold Lake conducted a Fall Walleye Index Netting (FWIN) survey on Wolf Lake to assess the walleye population and update the stock classification for this population. This was the fifth FWIN survey conducted on Wolf Lake over the last 10 years. This is part of the monitoring program for the Special Harvest License (SHL) regulations for sport fishing on Wolf Lake. The mean walleye catch rate was 27 fish/100m^2/24 hours. Walleye total-length distribution ranged from 122 mm to 763 mm with the majority of walleye caught being between 450–550 mm. The mean age of walleye in Wolf Lake was 7.4 years old and ranged from zero (young-of-the year) to 15 years. Walleye had early maturity with females maturing between 6 and 8 years old and males maturing by 5 years-of-age. Walleye populations exhibited moderate to fast growth to maturity but slower growth beyond maturity. Based on the walleye population indicies and the criteria for classifying walleye populations in Alberta, the Wolf Lake status is vulnerable.

Introduction

During the period of September 19 - 21, 2011, a Fall Walleye Index Netting (FWIN) survey was conducted on Wolf Lake to assess the overall stock status for walleye and compare its abundance, structure, and reproduction rates to other walleye populations surveyed using the FWIN methodology. These results will be used for monitoring and allocation of future Special Harvest Licenses for walleye at Wolf Lake.

The FWIN survey is a standardized method for indexing walleye populations that was developed in Ontario by the Ministry of Natural Resources (MNR) (Morgan, 2002), and has been adapted as a standard for fisheries management in Alberta. The FWIN protocol allows managers to compare trends within walleye populations over time, or between populations with less concern for sampling biases.

Wolf Lake is a locally important fishery that supports domestic, commercial and recreational fishers. Wolf Lake contains populations of walleye (*Sander vitreus*), northern pike (*Esox lucius*), and yellow perch (*Perca flavescens*), which are all highly sought after by recreational anglers as well as burbot (*Lota lota*,) and lake whitefish (*Coregonus clupeaformis*). The lake also contains cisco (*Coregonus artedii*), white sucker (*Catostomus commersoni*), longnose sucker (*Catostomus catostomus*) Iowa darter (*Etheostoma exile*), brook stickleback (*Culaea inconstans*), and ninespine stickleback (*Pungitius pungitius*) and spottail shiners (*Notropis hudsonius*) (Mitchell and Prepas 1990).

In 1996, Wolf Lake's walleye population was evaluated as collapsed and the regulation changed to a bag limit of zero. In 2006, with an upgraded vulnerable population status, a Walleye Special Harvest Licence was implemented to allow some harvest of walleye (2 large fish (>50 cm), 3 medium sized fish (43 cm – 50 cm) or 3 small fish (< 43 cm)) based on an applicants success in a draw system.

Methods

A comprehensive description of equipment and methodology may be found in the *Manual of Instructions Fall Walleye Index Netting* (FWIN) (Morgan 2002). Eighteen sampling locations were used for this survey. These sites were selected randomly using ArcGIS 9.2, and were weighted by depth stratum. The relative surface area was calculated to be approximately 30% for shallow and 70% for deep strata and sampling effort was portioned correspondingly. Five of the sample sites chosen were between a depth of 2.0 and 5.0 m, and thirteen were between 5.0 and 15.0 m.

The FWIN nets used in this survey were *half the standard length*; consisting of eight panels of different mesh sizes (25, 38, 51, 64, 76, 102, 127, and 152 mm stretched mesh) sewn together in ascending order of size, 1.8 m deep x 3.8 m long. The nets also included additional experimental panels of 12 and 19 mm separated from the standard gang by ten meter leads to collect data for an ongoing forage study headed by the Lac La Biche Fisheries Management office. For the purposes of this report, only fish caught in the eight standard panels are reported.

All fish species were kept for biological sampling. Catch was recorded by net location and mesh size. All fish were measured for fork length (FL), and total length (TL) to the nearest millimetre, and weight in grams, with data being recorded on a sample envelope. Walleye, northern pike, yellow perch, and lake whitefish were also examined for sex and maturity, and a structure was removed for ageing purposes. Walleye and northern pike ages were determined by A. Foss and C. January, and verified by A. Morin. Gonad weight was also collected for female walleye.

Walleye catch rates were calculated as walleye·100m^{-2}·24hrs^{-1} and empirical confidence intervals to 95% were determined by bootstrapping net catches to 50,000 replications (Haddon, 2001). Size and age distributions, von Bertanlanffy growth curves, and maturity rates were calculated to assess the stock status according to modified guidelines of the Walleye Management and Recovery Plan (Berry 1996). Von Bertalanffy parameters were calculated using FAST 2.0 software (Slipke and Maceina, 2002). The raw data can be found in FWMIS in project #15577 (waterbody ID #6185).

Results

A total of 616 fish representing seven species were caught during the survey, with walleye and perch comprising the highest percentage of the catch (40.4% each) (Appendix 1). The remainder of the catch was composed of lake whitefish (14.1%), cisco (12.9%), northern pike (9.6%), white sucker (4.2%), and spottail shiners (0.2%).

The catch rate for walleye was 27 fish·100m^{-2}·24hrs^{-1} (19.5-36.7, 95% CI); which is greater than the mean provincial catch rate of 18.0 walleye·100m^{-2}·24hrs^{-1} of other surveyed populations (Figure 1). Catch rate for all species can be found in Table 1.

Walleye total lengths (n=249) ranged from 122-763 mm TL (Figure 2). Of the walleye captured, 53.8 percent were less than 430 mm TL, 30 percent were between 430 – 500 mm TL and 15.2 percent were greater than 500 mm TL.

The walleye sampled in 2011 ranged in age from one to fifteen years of age, however only three (age 2,3 and 13) individual age groups met the minimum criteria for a measurable age class of three fish·100m-^{2}·24hrs-1 (Figure 3). Of these three age classes, two were of immature 2 and 3 year olds. There were four age classes with catch rates over two fish·100m-2·24hrs-1, the one, six, seven and thirteen-year-olds. Mean age was 7years.

Sixty three percent of walleye sampled were mature (125 of 199). Of the 125 mature walleye that were identified to sex, 48 were female and 77 were male Figure 4 and 5). Average age-at-maturity is difficult to determine due to

age-class gaps and low sample sizes of four to eleven-year-old fish (Figure 5), however based on the minimum ages-at-maturity present in the sample, and observations from previous FWIN surveys on Wolf Lake in 2007 and 2008, female walleye were mostly mature by age eight, and males by age five.

Female walleye from the Wolf Lake 2011 FWIN survey reached a mean TL of 500 mm by age eleven, however only a few individual males attained that length. Maximum mean total length (L_{inf}) was calculated to be 486 mm for males (Figure 6).

Interpretation

Length-at-age measurements best fit stable population criteria. The remaining four indices, catch rate, age-class distribution, age at maturity and age-class stability are best characterized as vulnerable (Table 2). The balance of the evidence suggests walleye in 2011 at Wolf Lake is best classified as vulnerable, which is the consistent with the classification it had after the 2008 FWIN survey (Rider 2008).

Table 1. Species catch rates from the 2011 and 2008 Wolf Lake FWIN surveys.

Species	Year	Mean	95% CI
WALL	2011	27.0	(19.7 – 34.4)
	2008	22.4	(17.2 – 27.9)
NRPK	2011	2.7	(1.3 – 4.2)
	2008	3.3	(4.2 – 8.4)
YLPR	2011	27.3	(17.1 – 39.1)
	2008	7.5	(1.6 – 14.9)
LKWH	2011	3.7	(2.1 – 5.6)
	2008	6.2	(4.2 – 8.4)
WHSC	2011	2.8	(1.5 – 4.3)
	2008	3.3	(1.6 – 5.2)
CISC	2011	3.5	(1.5 – 6.3)
	2008	1.6	(0.4 – 3.6)
SPSH	2011	0.1	(0.0 – 0.3)
	2008	0.1	(0.0 – 0.2)

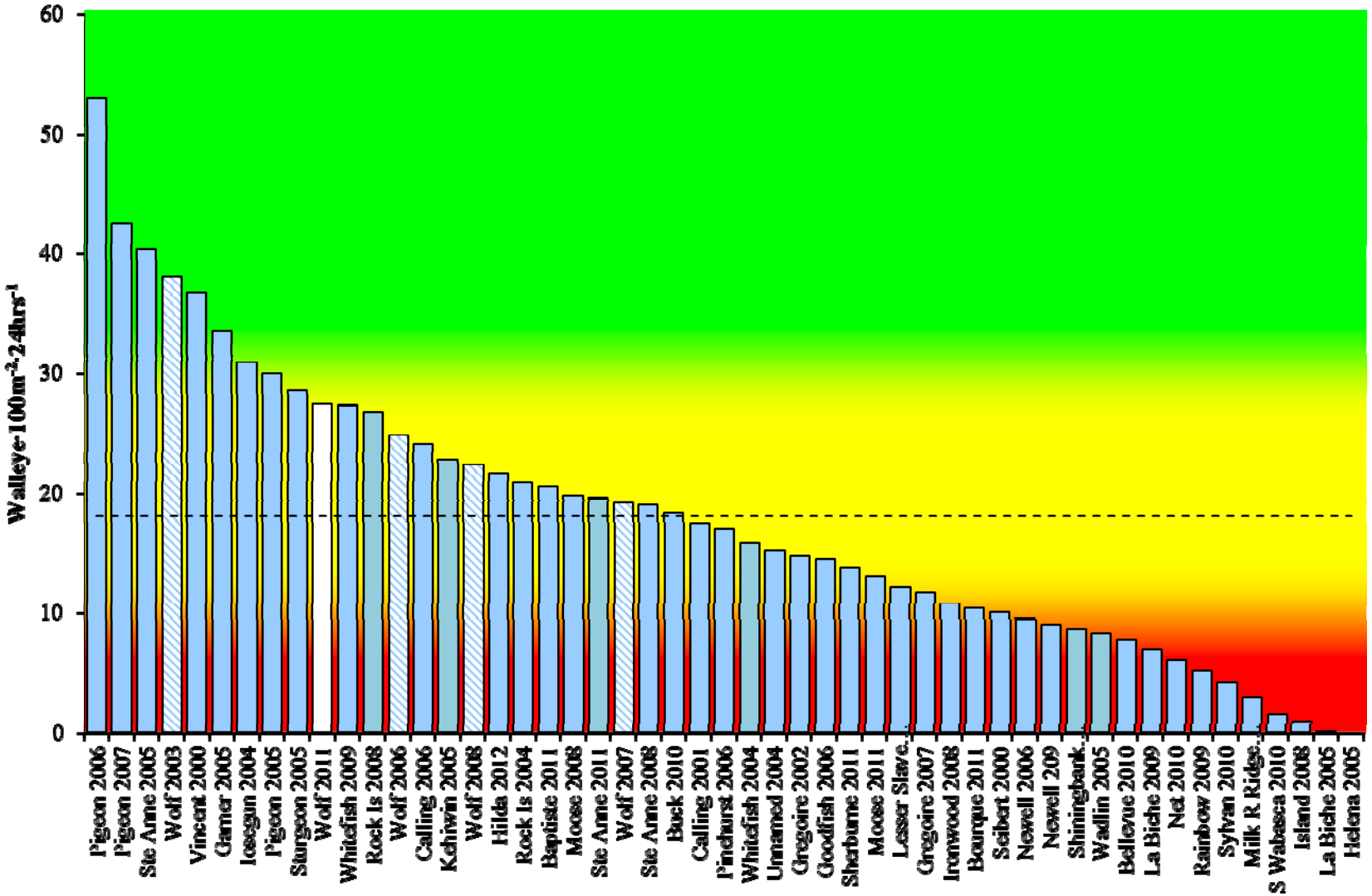

Figure 1. Wolf Lake 2011 walleye catch rate compared to FWIN catch rates from a representative subsample of Alberta lakes surveyed from 2000-2011. The dashed line represents the mean provincial catch rate of 18.0 fish•100m^{-2}•24hrs^{-1}.Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds.

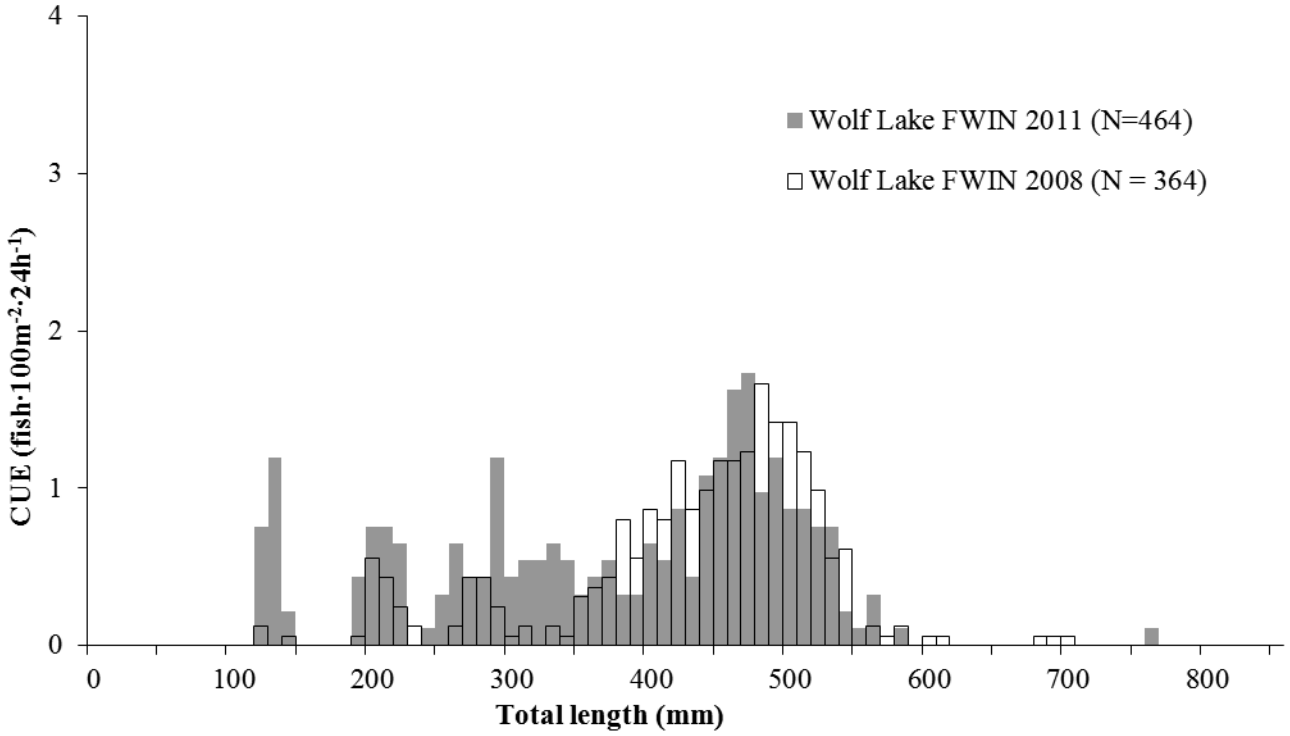

Figure 2. Walleye total length frequency distributions from the 2008 and 2011 FWIN surveys on Wolf Lake.

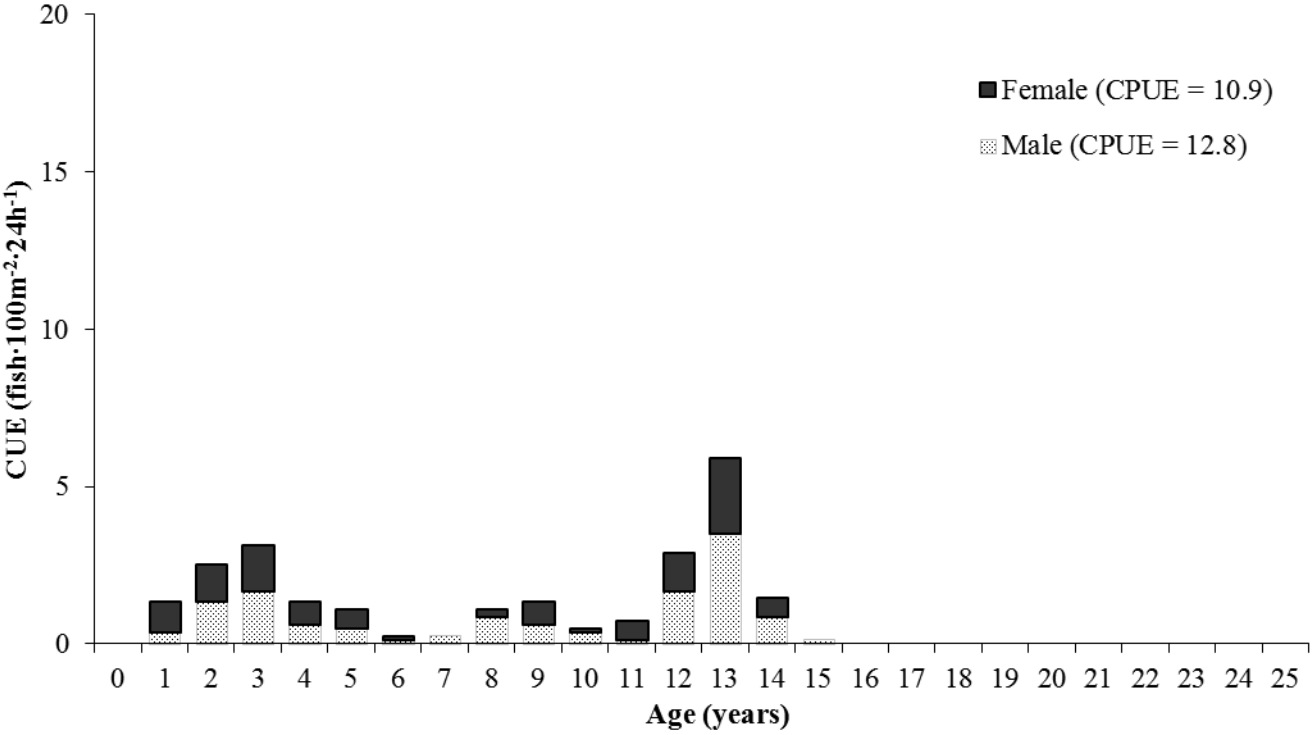

Figure 3. Walleye age frequency distributions from the 2011 FWIN survey on Wolf Lake. Mean age was 7.4 years.

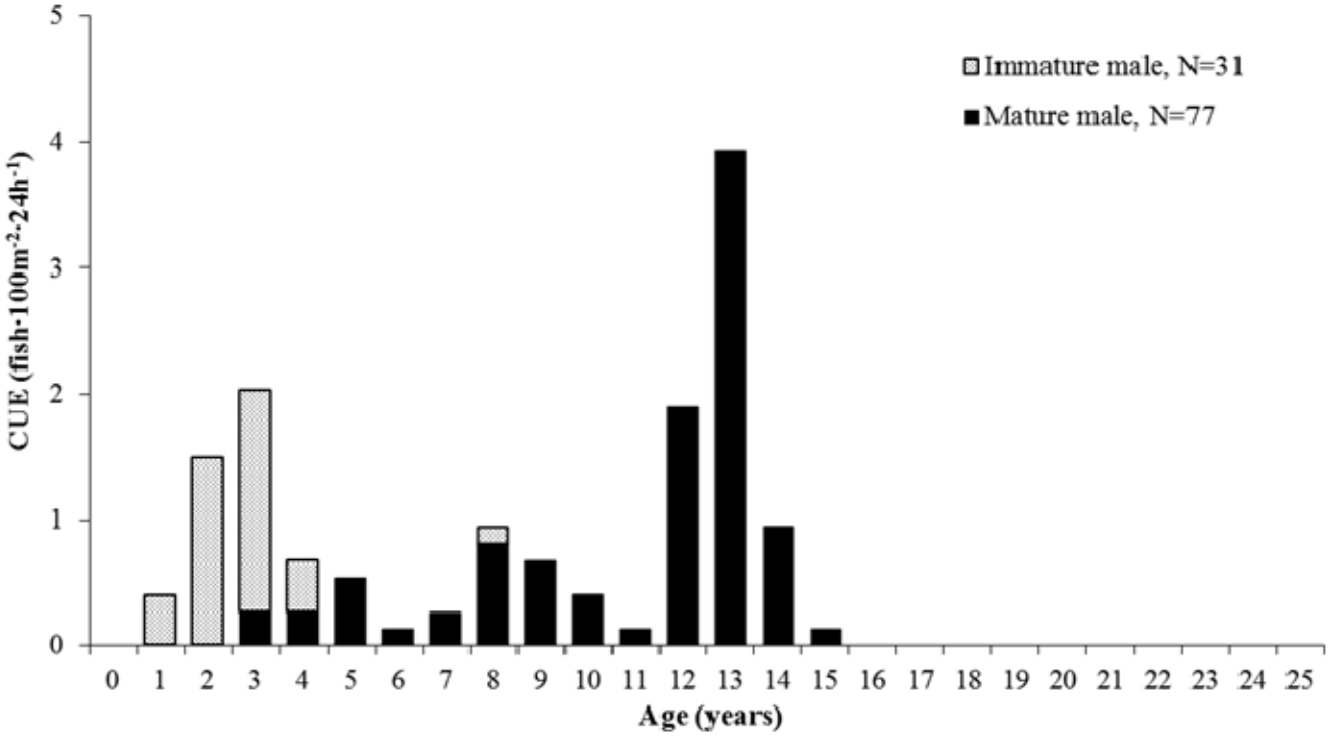

Figure 4. Age-at-maturity distribution for male walleye from the 2011 FWIN survey on Wolf Lake.

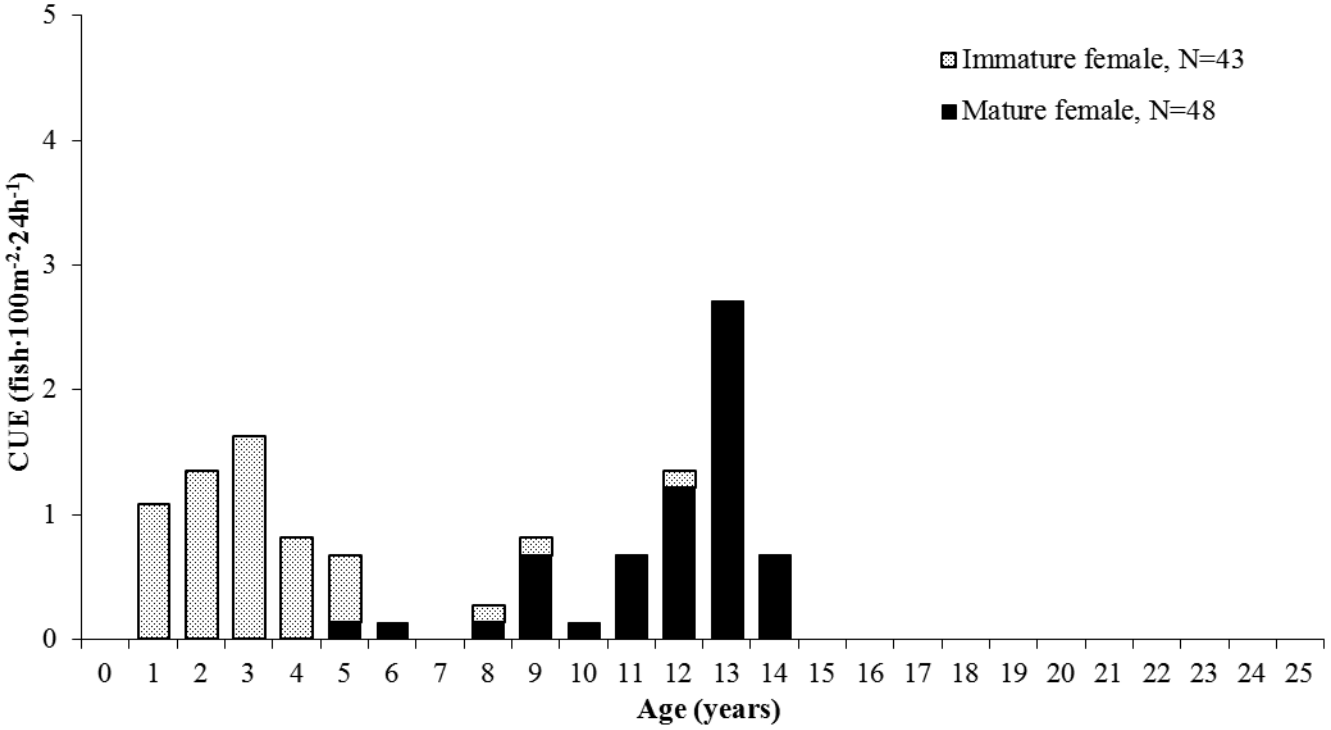

Figure 5. Age-at-maturity distributions for female walleye from the 2011 FWIN survey on Wolf Lake.

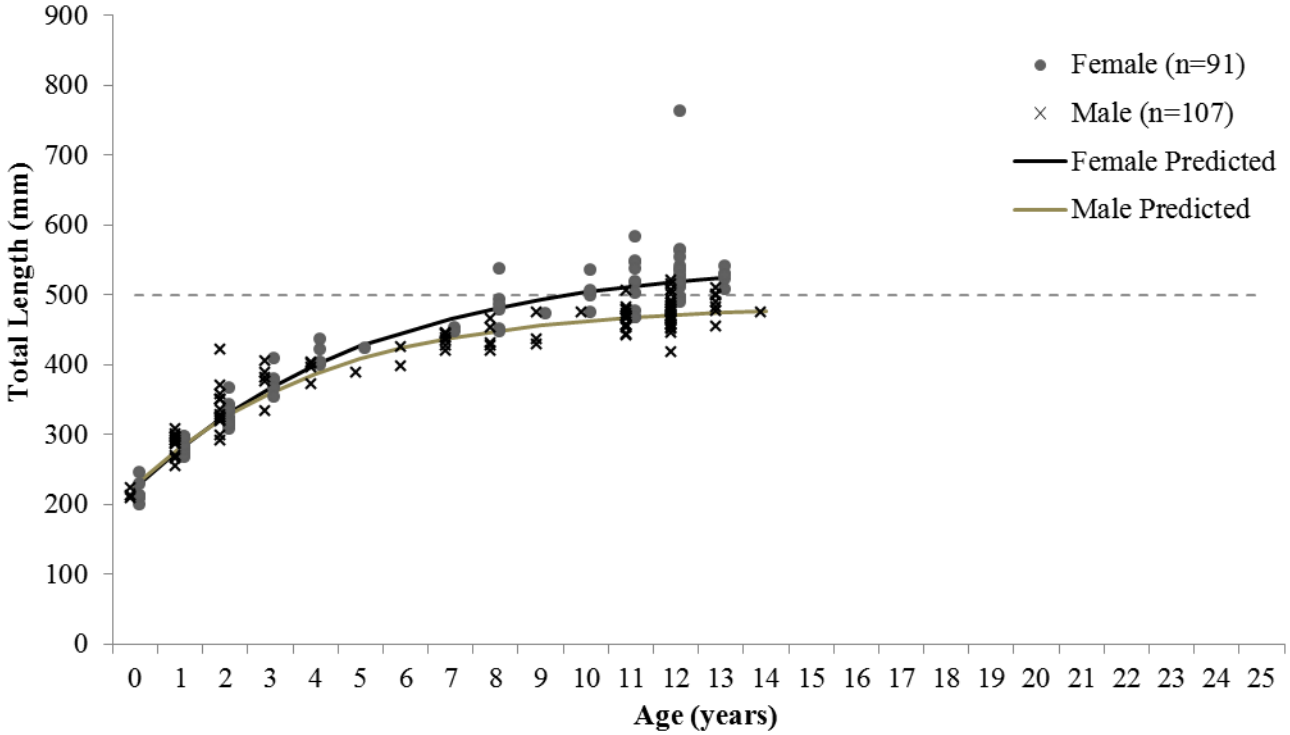

Figure 6. Total length-at-age for female (L_{inf} = 551 mm, K = 0.194, t_o = -1.673, R^2 = 0.99, Prob > 0.0001) and male (L_{inf} = 486 mm, K = 0.241, t_o = -1.605, R^2 = 0.98, Prob > 0.0001) walleye from the 2011Wolf Lake FWIN survey.

Table 2 Walleye population indices from the Wolf Lake 2011 FWIN survey compared to criteria for classifying walleye fisheries in Alberta, modified for FWIN analysis (From Sullivan, 2003).

Population Metric	Walleye Population Status Classification			
	Trophy	**Stable**	**Vulnerable**	**Collapsed**
Catch Rate		High, >30 per net	Moderate, 10–30 per net	Low, <10 per net
			27 (19.7 -34.4)	
Age-class Distribution	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 yrs) fish	Narrow or wide. Mean age 6–10
			3 measurable age-classes[†]. Mean age 7	
Age-class Stability	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
			3 measurable age classes	
Age-at-maturity	Females 10–20, Males 10–16	Females 8–10, Males 7–9	Females 7–8, Males 5–7	Females 4–7, Males 3–6
			Females mature by age 7, males by age 5	
Length-at-age	Very slow, 50 cm (TL) in 12–15 years	Slow, 50 cm (TL) in 9–12 years	Moderate, 50 cm (TL) in 7–9 years	Fast, 50 cm (TL) in 4–7 years
		Females average 50 cm by age 11, males in this sample do not average 50 cm at any age[‡].		

[†]Measurable age-class ≥ 3 fish•100m^{-2}•24hrs^{-1}

[‡]L_{inf} for males was 48.6 cm TL, however some individual males were reaching 50 cm TL by age 11.

Appendix

Catch summaries from the Wolf Lake 2011 FWIN

Set ID	WALL	NRPK	YLPR	LKWH	WHSC	CISC	SPSH	Total
WL1	8	1	3	2	2	1	0	17
WL11	13	0	5	1	0	3	0	22
WL13	17	0	10	0	2	0	0	29
WL14	0	0	0	9	0	0	0	9
WL15	10	0	48	0	0	1	0	59
WL17	10	2	33	1	0	0	0	46
WL18	20	2	16	1	0	4	0	43
WL20	27	2	13	1	0	1	0	44
WL21	8	1	16	5	4	1	0	35
WL22	2	0	6	3	2	4	0	17
WL23	23	3	28	0	1	1	0	56
WL24	14	1	0	3	1	0	0	19
WL26	24	0	5	0	1	2	0	32
WL3	4	5	17	1	1	3	0	31
WL4	16	5	18	3	5	11	0	58
WL5	30	2	13	2	2	0	1	50
WL7	23	0	18	3	5	0	0	49
	249	24	249	35	26	32	1	616

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