GREGOIRE LAKE FALL WALLEYE INDEX NETTING SURVEY, 2012

Fisheries Management
Waterways-Lac La Biche Area

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Abstract

A total of 578 fish representing nine species were caught during the survey. The catch rate for walleye was 23.2 fish/100 m^2/24 h (95% C.I. 19.7 – 27.6), which is within the range of the Alberta mean of 18.6 walleye/100 m^2/24 h (95% C.I. 13.4 – 23.6). Walleye total lengths (n=366) ranged from 102 to 556 mm TL with fish over 500 mm TL representing 0.8% of the catch. The largest group of fish was in the 360-450 mm TL size range. There were eleven age-classes present (ages 0-1, 4, 6-11, 14-15 & 18), with four age-classes having an abundance higher than one fish/100 m^2/24 h. Ninety-one percent of the walleye sampled were mature.

The catch rate for northern pike was 1.6 fish/100 m^2/24 h (95% C.I. 0.2 – 1.8). Northern pike total lengths (n=47) ranged from 180 to 803 mm with fish over 630 mm TL representing 4.3% of the catch.

Introduction

Alberta Environment and Sustainable Resource Development develops and implements strategies to sustainably manage fish populations and provide opportunities for harvest when suitable. Monitoring is required to evaluate the effectiveness of these strategies and to develop alternate strategies where evidence supports change. During Fall Walleye Index Netting (FWIN) our objective is to estimate relative abundance, population structure and growth of walleye, and also collect data on other species. These data are essential to provide sustainable harvest allocations for sport fish. This FWIN survey was conducted in September 2012 to determine abundance, structure, and reproduction (recruitment) of the walleye (*Sander vitreus*) population in Gregoire Lake.

Methods

This FWIN survey was conducted from September 10-12, 2012. A comprehensive description of equipment and methodology can be found in the Manual of Instructions Fall Walleye Index Netting (FWIN) (Morgan 2002). The FWIN nets consisted of eight panels, 7.62 m in length and 1.83 m in height with stretched mesh sizes of 25, 38, 51, 64, 76, 102, 127, and 152 mm. Two additional panels of 12 and 19 mm stretched mesh were attached with a 15 m section of rope. Nets were set at twelve sites randomly selected and weighted by depth stratum. Nets were set for 24 h (± 3 hours) before being cleared of fish and reset at new locations. Surface water temperatures ranged from 12 to 16^{o}C when nets were set. Set and pull times were recorded. Nets were set perpendicular to depth contours, and minimum and maximum depths were recorded. Net locations were recorded in Universal Transverse Mercator (UTM) projection coordinates using the North American Datum 1983 (NAD 83) on handheld GPS units.

All fish species were kept for biological sampling. Catches were recorded by net location and mesh size. A net ID, date, mesh size, and count of each species of fish caught were recorded for each panel for catch-per-unit-effort (CPUE) calculations. All fish were measured for fork length (FL), and total length (TL) to the nearest millimetre, and weighed in grams, with individual data recorded on a sample envelope for each fish. Walleye, northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), lake whitefish (*Coregonus clupeaformis*), and cisco (*Coregonus artedi*) were examined for gender and maturity, and a bony structure was removed for ageing. Otoliths were collected from walleye and aged following criteria in Watkins and Spencer (2009). Cleithra were collected from northern pike and aged following the criteria in Mackay et al. (1990). Scales were collected for cisco and lake whitefish. Walleye growth was described using the von Bertalanffy growth model in FAMS 1.0 (Slipke 2010).

Data analysis only included fish caught in the standard eight panel FWIN nets. Relative abundance expressed as CPUE was calculated as number of fish caught/100 m^2 /24 h with 95% confidence intervals empirically determined by bootstrapping catches to 10,000 replications (Haddon 2001). Three net sets (Sites 01GL, 04GL and 22GL) were removed from the CPUE analysis, since bad weather prevented the nets from being lifted within 24 h (± 3 hours). Data from all twelve sites were used for the rest of the analyses.

Interpretations of the walleye population status are based on criteria contained in the *Alberta's Walleye Management Recovery Plan* (Berry 1996, Sullivan 2003) modified for FWIN (Watters and Davis 2004).

The raw data is stored digitally in the Fish and Wildlife Management Information System (FWMIS), project #16688.

Results

A total of 578 fish representing nine species were caught during the survey (Table 1). A single spottail shiner (*Notropis hudsonius*), and a possible hybrid lake whitefish-cisco were collected but not included in the CPUE analysis, since they were caught in one of the nets set for approximately 48 hours. Walleye were the most abundant fish species in the FWIN nets, accounting for 63.3% of the catch. The catch rate for walleye was 23.2 fish/100 m^2/24 h (95% C.I. 19.7 – 27.6) (Table 2), which is within the range of the Alberta mean of 18.6 walleye/100 m^2/24 h (95% C.I. 13.4 – 23.6) (Figure 1). Individual net catches varied from 8 to 44 walleye (Table 1). Walleye total lengths (n=366) ranged from 102 to 556 mm TL (Figure 2) with fish over 500 mm TL representing 0.8% of the catch. The largest group of fish was in the 360-450 mm TL size range (Figure 2). The CPUE in 2012 was higher than Gregoire Lake FWINs conducted in 2002 (CPUE 15.6 fish/100 m^2/24 h, 95% C.I. 12.5 – 18.8) and 2007 (CPUE 11.8 fish/100 m^2/24 h; 95% C.I. 6.6 – 15.8), but few fish were larger than 500 mm in 2012 compared to the other two years (Figure 3). There were eleven age-classes present (ages 0-1, 4, 6-11, 14-15 & 18) (Figure 4), and four age-classes had abundances higher than one fish/100 m^2/24 h. Unlike the broad distribution of age classes observed in the 2002 and 2007 FWINs, 81% of the fish caught in 2012 were 6-8 year olds (Figure 5). Mean age was 7.9 for males (n = 83) and 7.4 for females (n = 113). Ninety-one percent of the walleye sampled were mature (Figure 6). Although mean age-at-maturity could not be calculated for males (no immature males captured), it is estimated to be less than six years, as all males sampled were mature by age-six (Figure 6). Mean age-at-maturity was 6.3 years for females (n = 113), they first matured at age-six and all were mature by age-seven (Figure 6). The von Bertalanffy growth curve for males reached 500 mm TL at age 16 (R^2 = 0.88, Prob < 0.0001with L_{inf} = 671.0 mm TL) (Figure 7). The von Bertalanffy growth curve for females was not included in Figure 7, since the growth curve was not a reasonable representation of a walleye population (R^2 = 0.37, Prob = 0.11)

The catch rate for northern pike was 1.6 fish/100 m^2/24 h (95% C.I. 0.2 – 1.8) (Table 2). Northern pike total lengths (n=47) ranged from 180 to 803 mm with fish over 630 mm TL representing 4.3% of the catch (Figure 8). The northern pike were spread out over the size range and there were no real concentration of them in any size classes. There were eleven age-classes present (ages 0-5, 9-11), however, the abundance of each year class was less than one fish/100 m^2/24 h (Figure 9).

Cisco (or Tullibee) (n=79) total lengths ranged from 92 to 436 mm TL (Figure 10). The catch rate for cisco was 5.2 fish/100 m^2/24 h (95% C.I. 4.7 – 7.3) (Table 2).

Other species caught were lake whitefish (n=6), yellow perch (n=59), white sucker (*Catostomus commersonii*) (n=17) and trout perch (*Percopsis omiscomaycus*) (n=2) (Table 1).

Interpretation

For Gregoire Lake in 2012, all the population metrics rate the walleye population as being vulnerable (Table 3). Given the narrow range in the total length distribution metric, and the lack of both young and old individuals, this walleye population should be considered vulnerable.

The northern pike population may be collapsed due to the low density and poor age distribution.

Table 1. Species catch summary by site, Gregoire Lake, September 2012.

Site	Lift Date (2012)	Stratum	Set			Number of fish caught									
			UTM Easting[a]	UTM Northing[a]	Duration (hours)	CISC	LKWH	NRPK	SPSH	TLWH	TRPR	WALL	WHSC	YLPR	Total
01GL	Sept 12	deep	491978	6256350	47.5	1		2	1			34	2	9	49
04GL	Sept 12	deep	491238	6257498	48.17	6		4		1		63	1	5	80
05GL	Sept 13	shallow	493409	6255878	22.5	2		2				12	2	1	19
12GL	Sept 11	deep	490637	6259255	24.33	13					2	19	2	1	37
13GL	Sept 12	deep	489372	6257720	24.38	1		1				23			25
14GL	Sept 13	deep	491423	6255751	21.53	6		2				16		2	26
15GL	Sept 13	deep	490505	6257741	21.88							43		3	46
22GL	Sept 12	shallow	492395	6254956	46.72	22	4	26				48	4	21	125
23GL	Sept 13	shallow	491064	6259934	22.22	6		1				44	2	3	56
28GL	Sept 13	shallow	493456	6255115	22.8	3	1	7				8		5	24
29GL	Sept 12	shallow	488764	6258805	23.28	14		2				24	1	9	50
30GL	Sept 11	shallow	489331	6259722	23.28	5	1					32	3		41
				Grand Total		79	6	47	1	1	2	366	17	59	578

[a] UTM 12U, NAD 83 map datum

Table 2. Species catch rates from the 2012 Gregoire Lake FWIN survey.

Species	Mean	95% CI
CISC	5.2	(4.7 - 7.3)
LKWH	0.2	(0 - 0.5)
NRPK	1.6	(0.22 - 1.8)
TRPR	0.2	(0 - 0.6)
WALL	23.2	(19.7 - 27.6)
WHSC	1.0	(0.8 - 1.8)
YLPR	2.5	(2.0 - 1.6)

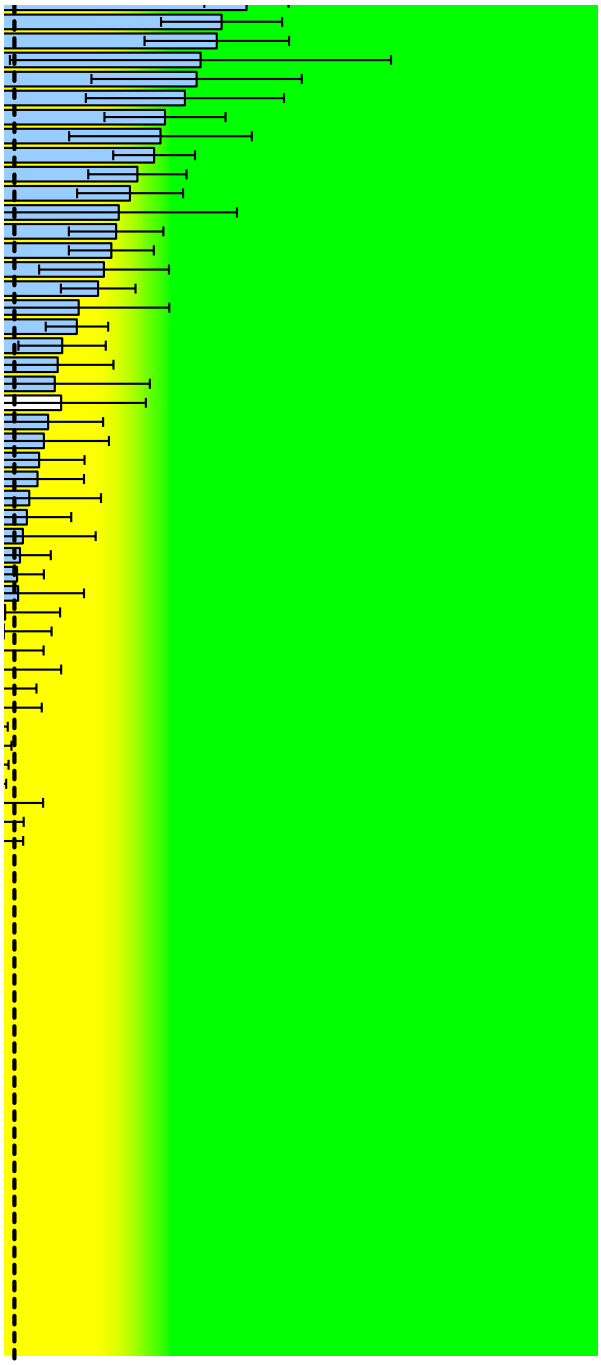

Figure 1. Mean walleye catch rates with 95% CI from a representative sample of FWIN surveys from across Alberta. The dashed line represents the mean provincial catch rate of 18.6 fish/100 m^2/24 h. Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds. The walleye catch rate from the 2002, 2007 and 2012 Gregoire Lake FWIN surveys are identified by white bars.

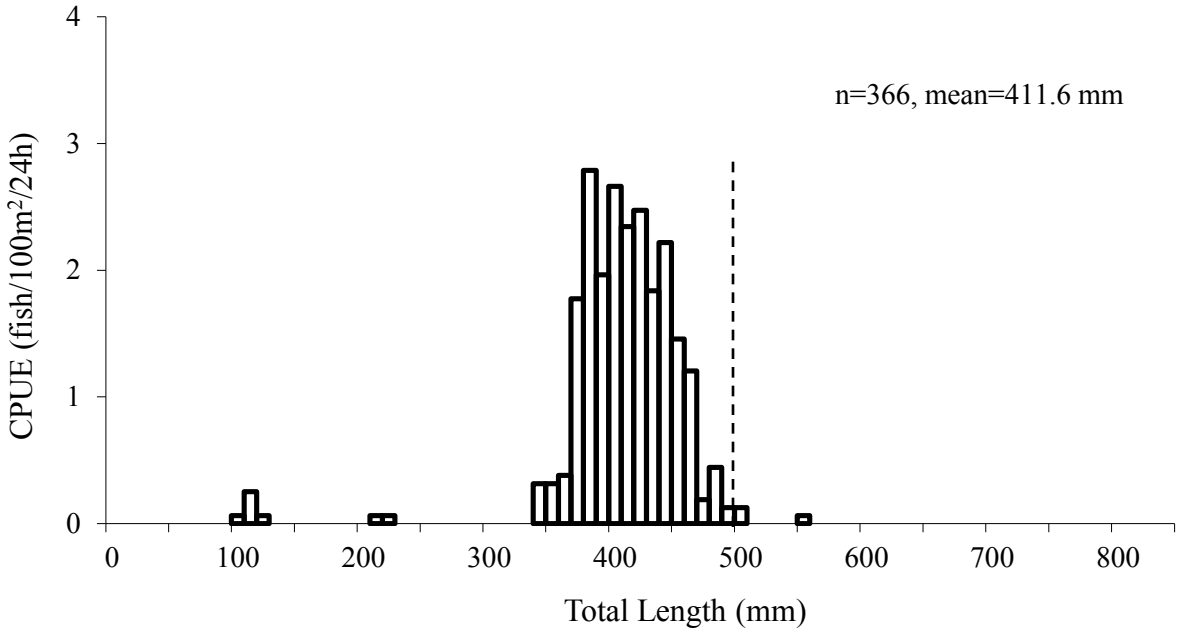

Figure 2. Walleye total length frequency distributions from the 2012 FWIN survey on Gregoire Lake. Dashed line denotes where the 50 cm TL minimum size limit would be if it was used.

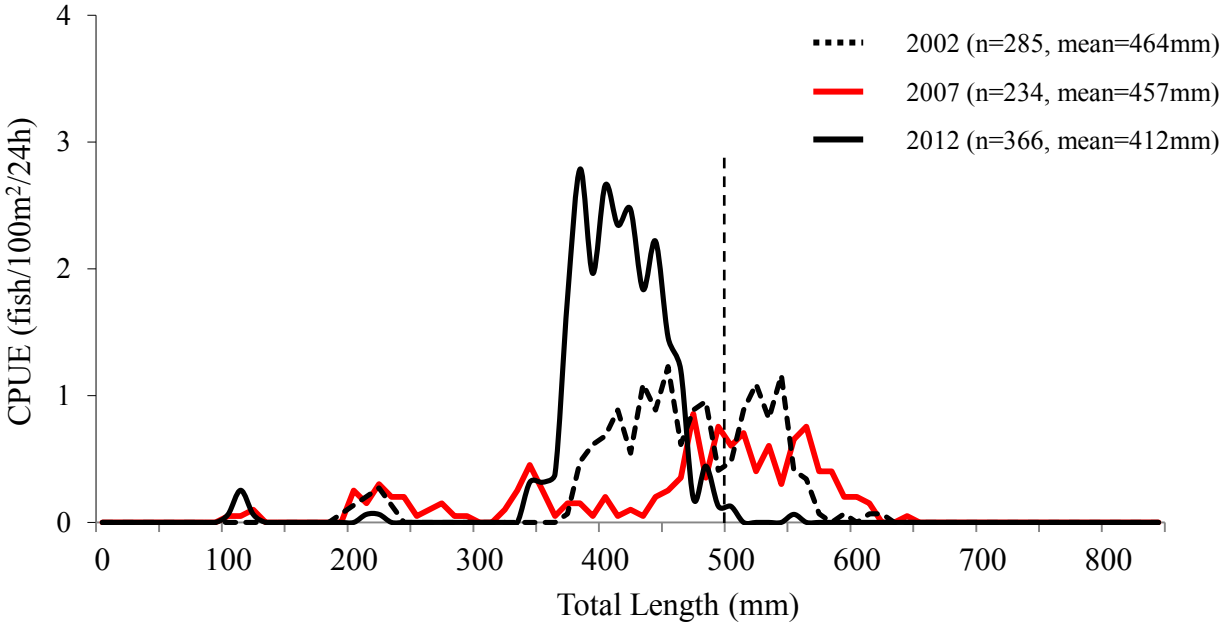

Figure 3. Comparison of walleye total length frequency distributions from 2002, 2007 and 2012 FWIN surveys on Gregoire Lake. Dashed line denotes where the 50 cm TL minimum size limit would be if it was used.

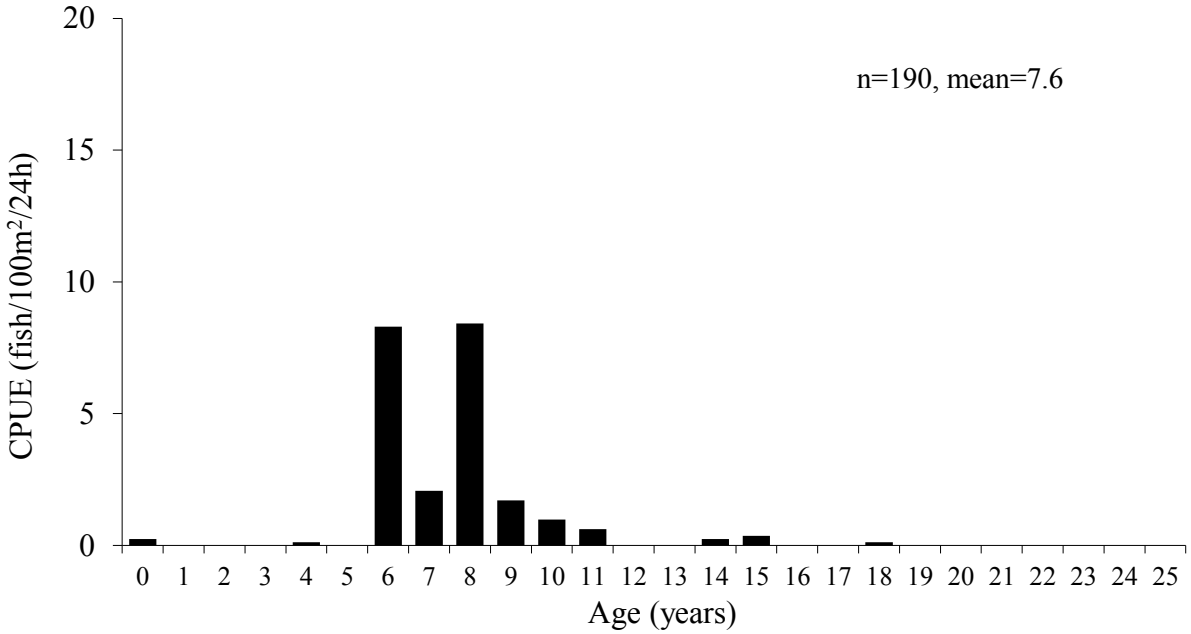

Figure 4. Walleye age frequency distributions from the 2012 FWIN survey on Gregoire Lake.

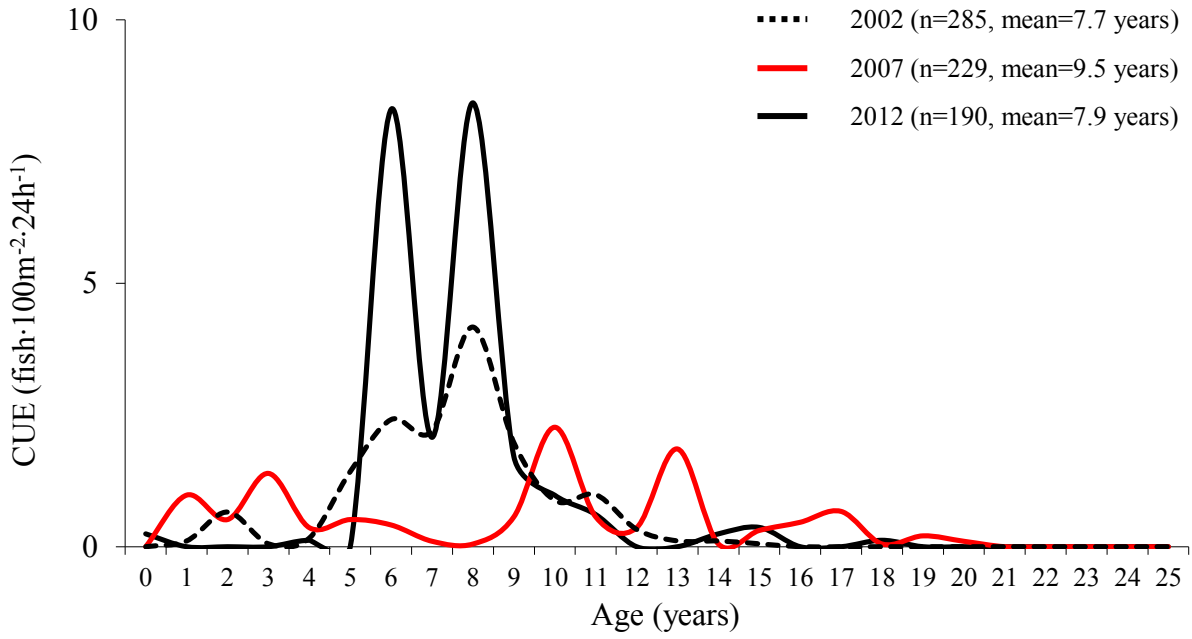

Figure 5. Comparison of walleye age frequency distributions from 2002, 2007 and 2012 FWIN surveys on Gregoire Lake.

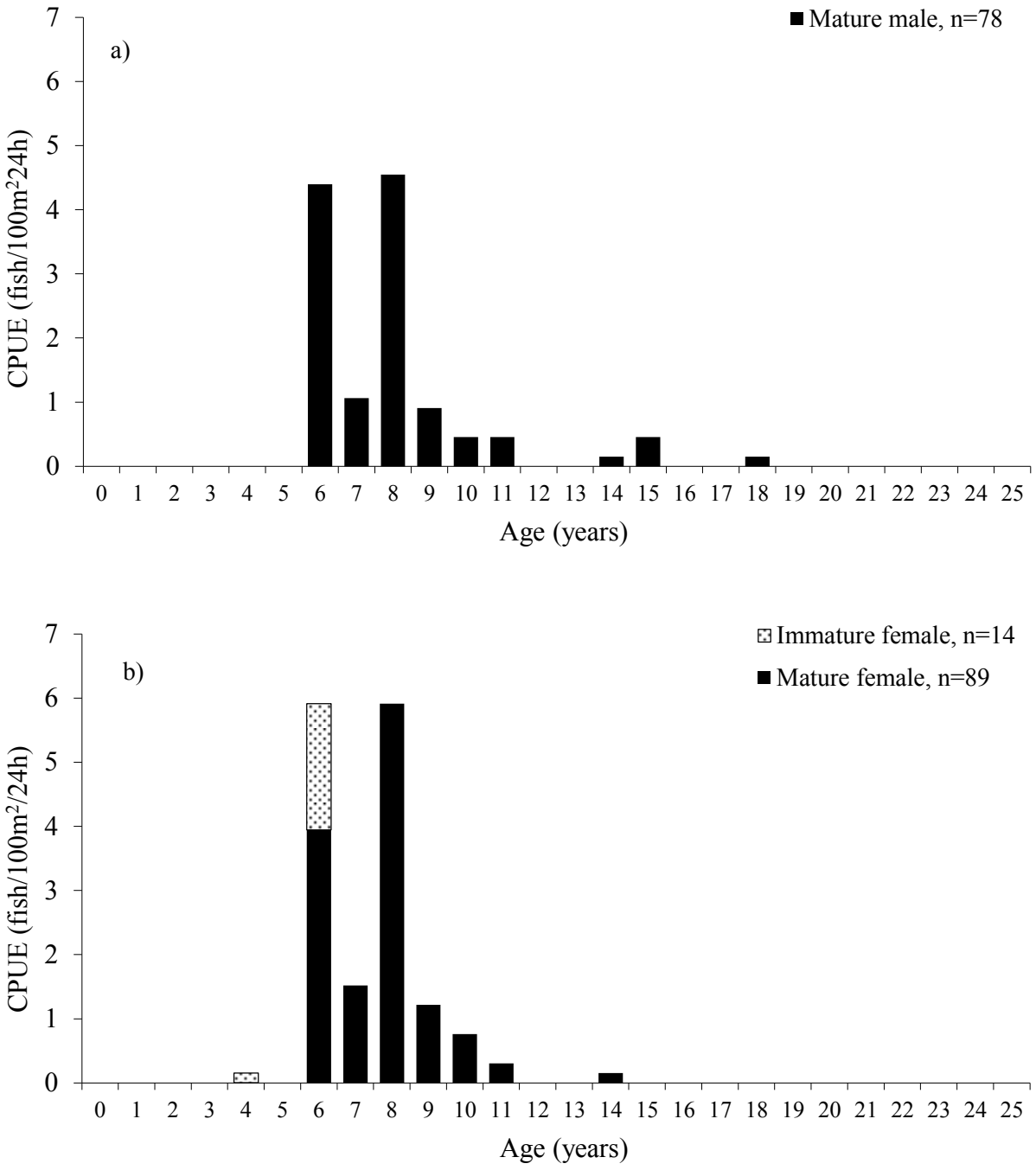

Figure 6. Age-at-maturity distributions for a) male and b) female walleye from the 2012 FWIN survey on Gregoire Lake.

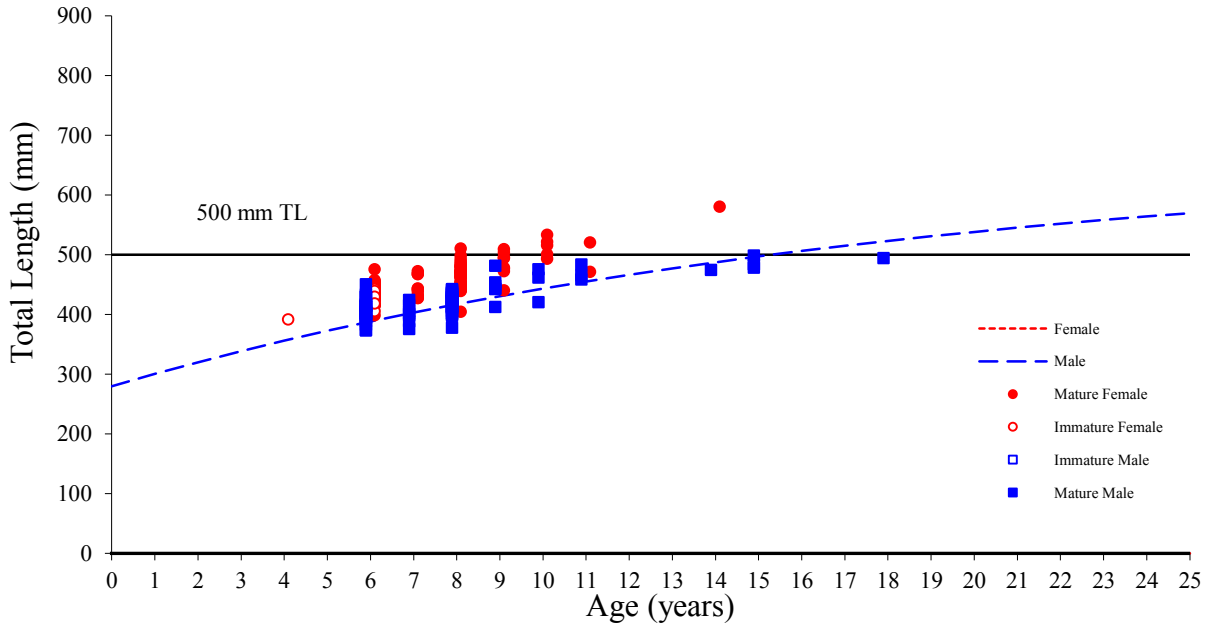

Figure 7. Von Bertalanffy growth curve for male walleye (L_{inf} = 671.0, K = 0.054, t_o = -9.999, R^2 = 0.88, Prob < 0.0001) from the Gregoire Lake FWIN survey in 2012. Growth curve not included for female walleye, since the curve was not calculable (R^2 = 0.37, Prob = 0.11).

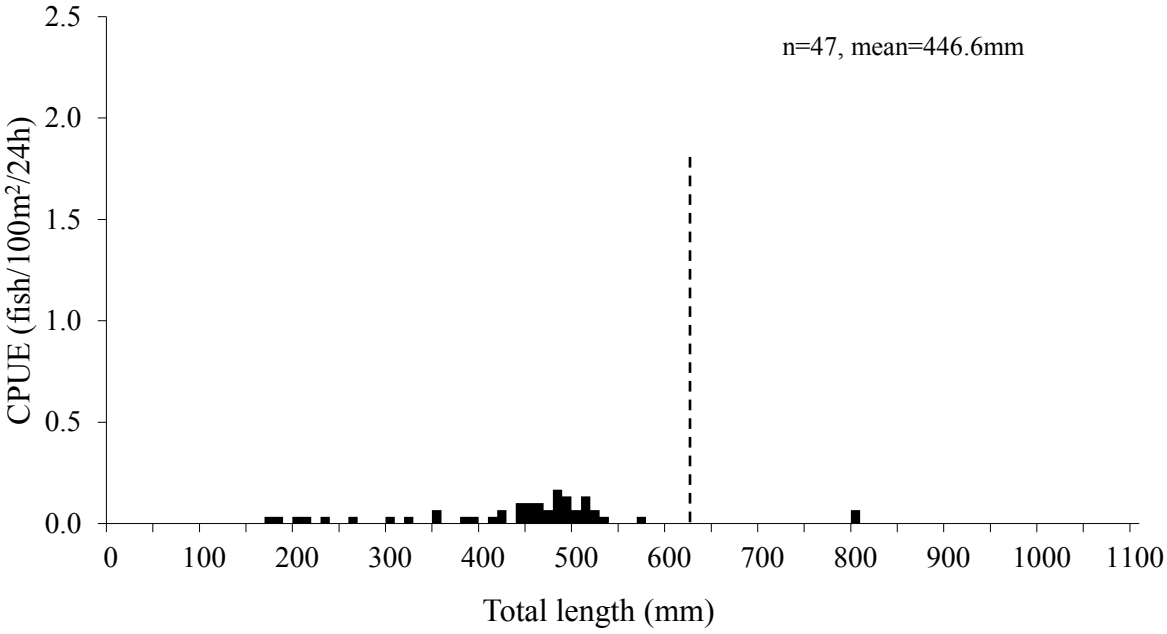

Figure 8. Northern pike total length frequency distributions from the 2012 FWIN survey on Gregoire Lake. Dashed line denotes the 63 cm TL minimum size limit

Table 3. Walleye stock classification for Big Island Lake based on the 2008 FWIN survey results.

POPULATION METRIC	POPULATION STATUS CLASSIFICATION			
	TROPHY	STABLE	VULNERABLE	COLLAPSED
CATCH RATE (FWIN)	High - >30 Walleye•100m^{-2}•24h^{-1}	High - >30 Walleye•100m^{-2}•24h^{-1}	Moderate: 15-30 Walleye•100m^{-2}•24h^{-1}	Low: <15 Walleye•100m^{-2}•24h^{-1}
			CPUE = 23.2	
AGE CLASS DISTRIBUTION	Wide: 8 or more age classes (n=200); mean age >9 years.	Wide: 8 or more age classes (n=200); mean age 6 to 9 years.	Narrow: 1 to 3 age classes; mean age 4 to 6 years; few old (>10 years).	Can be wide or narrow; mean age 6 to 10 years.
		10 age-classes; mean age =7.6		
AGE CLASS STABILITY	Very stable: 1 to 2 "measureable" (> 3 Walleye/•100m^2/ 24h) age classes out of a smooth catch curve.	Relatively stable: 2 to 3 "measureable" age classes out of a smooth catch curve.	Unstable: 1 to 3 "measureable" age classes, with gaps in age classes.	Stable or unstable: 1 or fewer "measurable" age classes.
			2 measureable age-classes	
AGE AT MATURITY	Females: 10-20 years Males: 10-16 years	Females: 8-10 years Males: 7-9 years	Females: 7-8 years Males: 5-7 years	Females: 4-7 years Males:3-6 years
			Females fully recruited at age 7; males fully recruited at age 6	
LENGTH AT AGE	Very Slow 50 cm in 12-15 years	Slow 50 cm in 9-12 years	Moderate 50 cm in 7-9 years	Fast 50 cm in 4-7 years
			Females reach 50 cm at age 8-9; males reach 50 cm at age older than 18; pooled reach 50 cm at age around 11 (few fish at or greater than 50 cm).	

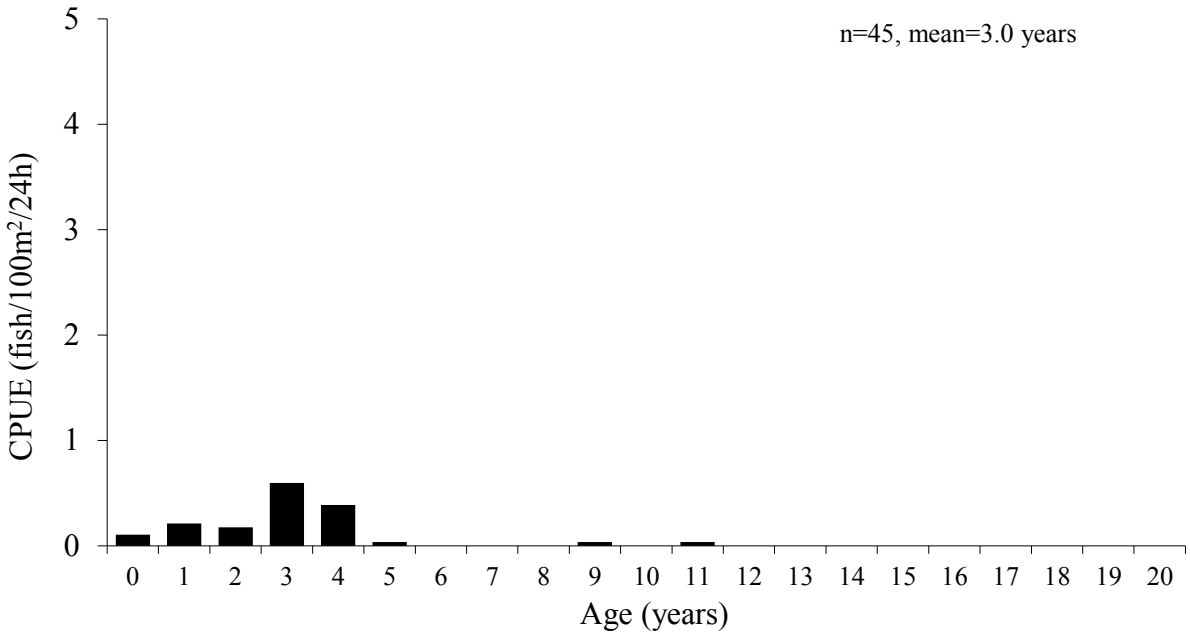

Figure 9. Northern pike age frequency distributions from the 2012 FWIN survey on Gregoire Lake.

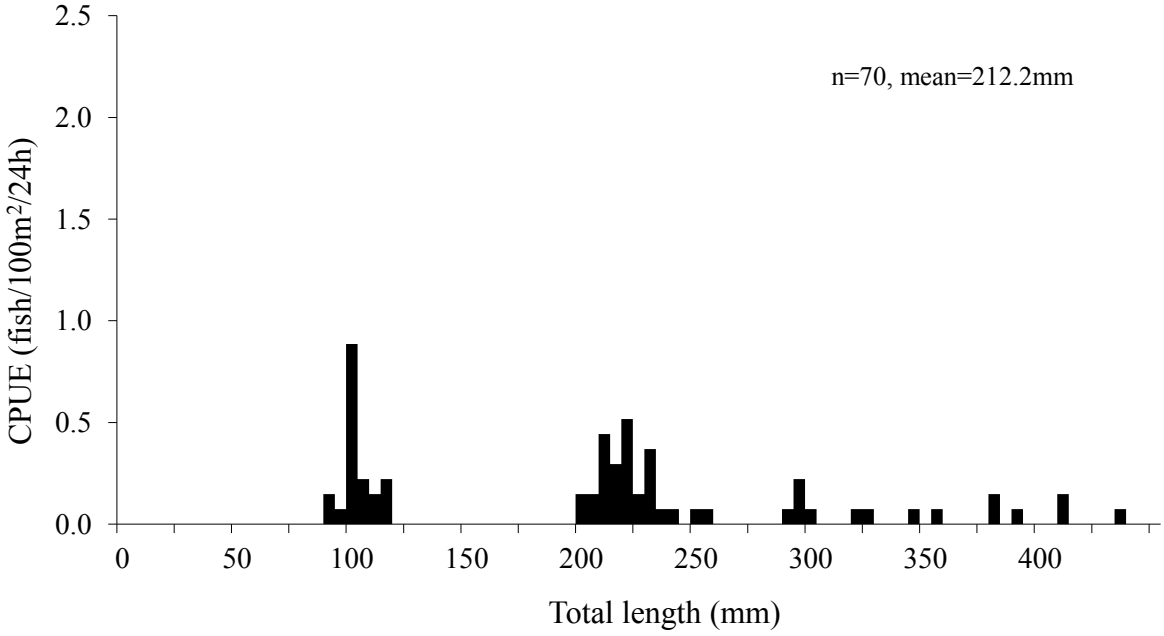

Figure 10. Cisco total length frequency distribution from the 2012 FWIN surveys on Gregoire Lake.

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