



## **Marie Lake Fall Walleye Index Netting, 2012**

*Fisheries Management  
Waterways/Lac La Biche, Cold Lake*

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**Abstract**

A Fall Walleye Index Netting (FWIN) survey was conducted on Marie Lake from September 17 to 20, 2012. A total of 632 fish of 8 species were caught, including 346 walleye, 29 pike, 54 yellow perch, 53 lake whitefish, and 1 burbot. The catch rate for walleye was 25.0 fish/100m<sup>2</sup>/24 hours (95% confidence interval 17.7-31.9). Walleye total lengths ranged from 124 to 723 mm (n= 346), and walleye over 500 mm made up 13% of the sample. The 5, 6, and 7 year-old age classes each had catch rates of at least 3 fish/100m<sup>2</sup>/24 hours, and made up 72% of the sample. Twenty-seven percent of captured walleye were mature; however, only 17 of those individuals were identified as females. Male walleye reached a mean total length of 500 mm by age 11 and females by age 9. Based on the results of the survey, this walleye population should be classified as vulnerable to collapsed.

## **Introduction**

Alberta Environment and Sustainable Resource Development implements strategies to sustainably manage fish populations and provide sustainable harvest allocations for sportfish. Monitoring is required to evaluate the effectiveness of these strategies. The Cold Lake area Fisheries Management team conducted a Fall Walleye Index Netting (FWIN) survey on Marie Lake during the third week of September 2012. The purpose of this survey is to assess the relative abundance and population structure of the walleye (*Sander vitreus*) fishery. The survey also provides insight into the current management strategies by comparing these results to those from previous FWIN surveys, the most recent having been conducted on Marie Lake in 2007. The current regulation regarding walleye in Marie Lake allows anglers to harvest one fish over 50 cm.

## **Methods**

This FWIN survey was conducted from September 17 to 20, 2012. A comprehensive description of equipment and methodology can be found in the Manual of Instructions Fall Walleye Index Netting (FWIN) (Morgan 2002). Thirteen sampling locations were used for this survey (Appendix 1). These sites were selected randomly and were weighted by depth stratum. 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 but separated from the standard gang by ten meter leads to collect data for an ongoing regional forage study. Nets were set for 24 hrs before being cleared of fish and reset at a new location. Nets were set perpendicular to depth contours, and minimum and maximum depths were recorded. Net location were recorded in Universal Transverse Mercator (UTM) projection coordinates using the North American Datum 1983 (NAD 83) on handheld GPS units. Surface water temperature was also recorded for most net locations, and ranged between 12.8-14.6 °C.

All fish species were kept for data collection. 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. Data was collected, including fork and total length (to the nearest millimetre) and weight (in grams) for all species, as well as sex and maturity from all sportfish. Bony aging structures were also collected from sport fish for age determination. Otoliths were collected from walleye and aged following criteria in Watkins and Spencer (2009). Due to the large sample size, a representative subsample of 163 walleye otoliths were used to extrapolate age related population indices. Ages were determined for every second walleye sampled. Cleithrum were collected from northern pike (*Esox lucius*) and aged following the criteria in Mackay et al. (1990).

For the analysis, only data from fish caught in the standard eight panel FWIN nets is presented in this report. The supplemental 12 and 19 mm mesh panels are not relevant to this FWIN survey. Relative abundance expressed as CPUE was calculated as number of fish caught/100 m<sup>2</sup>/net/24 hours with 95% confidence intervals empirically determined by bootstrapping catches to 50,000 replications. Growth was described using the von Bertalanffy growth model in FAMS 1.0 (Slipke 2010).

All statistics are reported to the standard fish/100m<sup>2</sup>/24hrs. The raw data from this FWIN survey, including the supplemental 12 and 19 mm panels, is stored digitally in the Fish and Wildlife Management Information System (FWMIS) under Project ID # 16507.

## **Results**

A total of 632 fish of 8 species were caught during this FWIN, 346 of which were walleye (Appendix 1). The catch rate for walleye was 25.0 fish/100m<sup>2</sup>/24 hours (95% confidence interval 17.7-31.9), which is an 11% decrease from the catch rate of the last FWIN survey in 2007 (Table 1). This catch rate is similar to other

populations in Alberta with vulnerable status (Figure 1). Walleye total lengths ranged from 124 to 723 mm (n=346, Figure 2), and walleye over 500 mm made up 13% of the sample.

Three age-classes had catch rates of at least 3 fish/100m<sup>2</sup>/24 hours: ages 5, 6, and 7 years (Figure 3). Respectively, these classes represent 14%, 42%, and 16% of the walleye population. Subsampled walleye ranged in age from zero to twenty-one years, with an average age of 6.7 years. Twenty-seven percent of captured walleye were mature. Based on the minimum ages-at-maturity present in the subsample, male walleye started maturing by age 6 and females by age ten or eleven (Figure 4). There were seventeen mature female walleye sampled during the survey, and nine of those were represented in the age subsample. Male walleye from this survey reached a mean total length of 500 mm by age 11 and females by age 9 (Figure 5).

Other species caught included 29 northern pike (*Esox lucius*), 54 yellow perch (*Perca flavescens*), 53 lake whitefish (*Coregonus clupeaformis*), and one burbot (*Lota lota*). Figures for these fish were not included in the report due to the low sample size encountered. The total length of northern pike ranged from 502 to 1001 mm, and averaged 745.4 mm (n=29). Pike ages ranged between 2 and 13 years, with an average of 7 years (n=29). The total lengths of lake whitefish ranged between 176 and 535 mm, averaging to 328 mm (n=53). The total lengths of yellow perch ranged from 94 to 233 mm, and averaged 127 mm (n=54).

## Interpretation

Of the five population metrics used to classify walleye populations in Table 2, length-at-age and age-at-maturity best fit the “stable” category. Catch rate and age-class stability fit the “vulnerable” category, while the age-class distribution best matches the “collapsed” category. While length-at-age and age-at-maturity may fit into the stable categories, we do not think these two indicators are sensitive to the recent changes in population dynamics observed between 2007 and 2012, and are more representative of the population conditions from 5 to 10 years ago.

Angler effort is believed to have increased significantly in the last 5 to 10 years based on reports from anglers, enforcement officers, and campground operators. We believe that this increase has created sufficient mortality in the adult walleye population over that time resulting in growth overfishing conditions. However, there has likely been insufficient time for the typical growth rate and maturity schedule responses to growth overfishing pressure in the population. These population responses typically take several years to become observed.

Survival of adults between the last survey and this one has been low with the 1 over 50 cm size limit (Figure 3). With low adult (mature fish) densities observed, this in turn has resulted in multiple year class failures (ages 0 – 4). Currently, the population is being supported only by 5, 6, and 7 year-old fish that are not yet mature but approaching vulnerability with a 50 cm size limit. Overall, this population has gone from growth overfishing in 2007 to recruitment overfishing in 2012. This is the type of situation that the current management and recovery plan directs managers to avoid and is typically interpreted as vulnerable to collapsed.

Likely underlying these population- and angling-conditions is the fact that Marie Lake is a mesotrophic lake having naturally low to moderate productivity (Mitchell and Prepas 1990). This results in fish populations that have less resilience to harvest pressure and require more conservative management to meet the long-term sustainability goals.

This will be important for managers to consider in review of the regulations as well as considering the need for regular angler effort surveys through the use of creel survey techniques.

Table 1. Species catch rates from the 2012 and 2007 Marie Lake FWIN surveys.

Species	Year	CUE (fish/100m <sup>2</sup> /24 hr)	95% C.I.
WALL	2012	25.0	17.7- 31.9
	2007	27.9	19.1- 38.2
NRPK	2012	2.1	0.9- 3.9
	2007	4.1	2.2- 6.2
YLPR	2012	3.9	2.0- 6.2
	2007	56.1	28.9- 90.9
LKWH	2012	3.8	2.0- 5.8
	2007	3.6	2.0- 5.5

**Marie Lake Fall Walleye Index Netting, 2012**

Table 2. Walleye Stock Classification for Marie Lake based on the 2012 FWIN survey results

POPULATION METRIC	POPULATION STATUS CLASSIFICATION			
	TROPHY	STABLE	VULNERABLE	COLLAPSED
CATCH RATE (FWIN)	High - >30 Walleye/100m <sup>2</sup> /24hr	High - >30 Walleye/100m <sup>2</sup> /24hr	Moderate: 15-30 Walleye/100m <sup>2</sup> /24hr	Low: <15 Walleye/100m <sup>2</sup> /24hr
			<b>CPUE= 25.0</b>	
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.
				<b>3 age classes (n=163); mean age = 6</b>
AGE-CLASS STABILITY	Very stable: 1 to 2 "measureable" (> 3 Walleye/100m <sup>2</sup> /24hr) 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.
			<b>3 measureable age classes; 5, 6 and 7-year-olds</b>	
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
		<b>Females: 10 years</b>		
		<b>(There were only 17 mature females in the entire FWIN sample (n=346))</b>		
		<b>Males: 6-7 years</b>		
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
		<b>Males reach 50cm by age 11 years, females by age 9</b>		

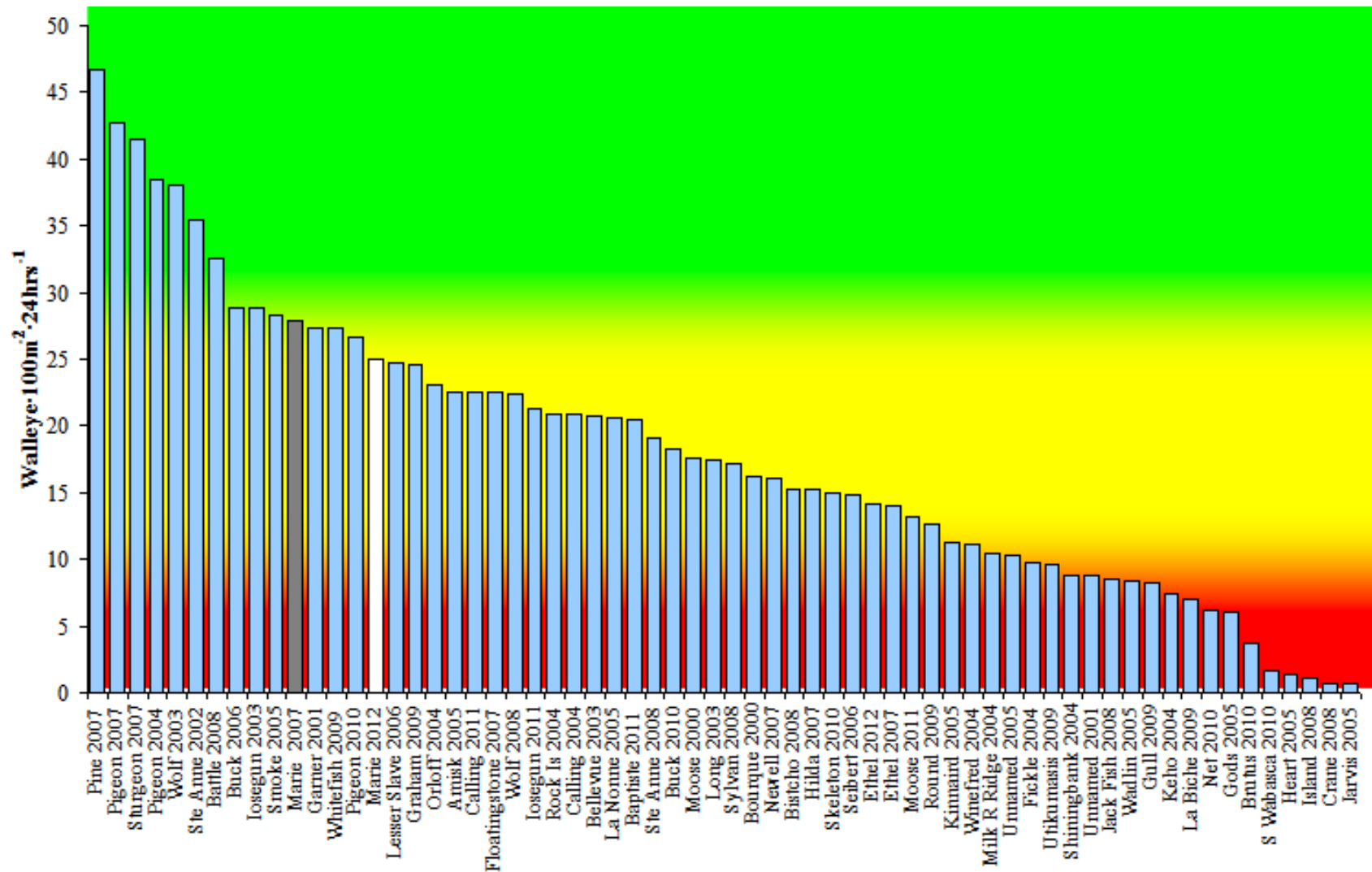


Figure 1. Mean walleye catch rates from a representative sample of FWIN surveys from across Alberta. The black line represents the mean provincial catch rate of 17.1 fish/100m<sup>2</sup>/24 hours. Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds. The walleye catch rates from the 2007 and 2012 Marie Lake FWIN surveys are highlighted in grey and white, respectively.

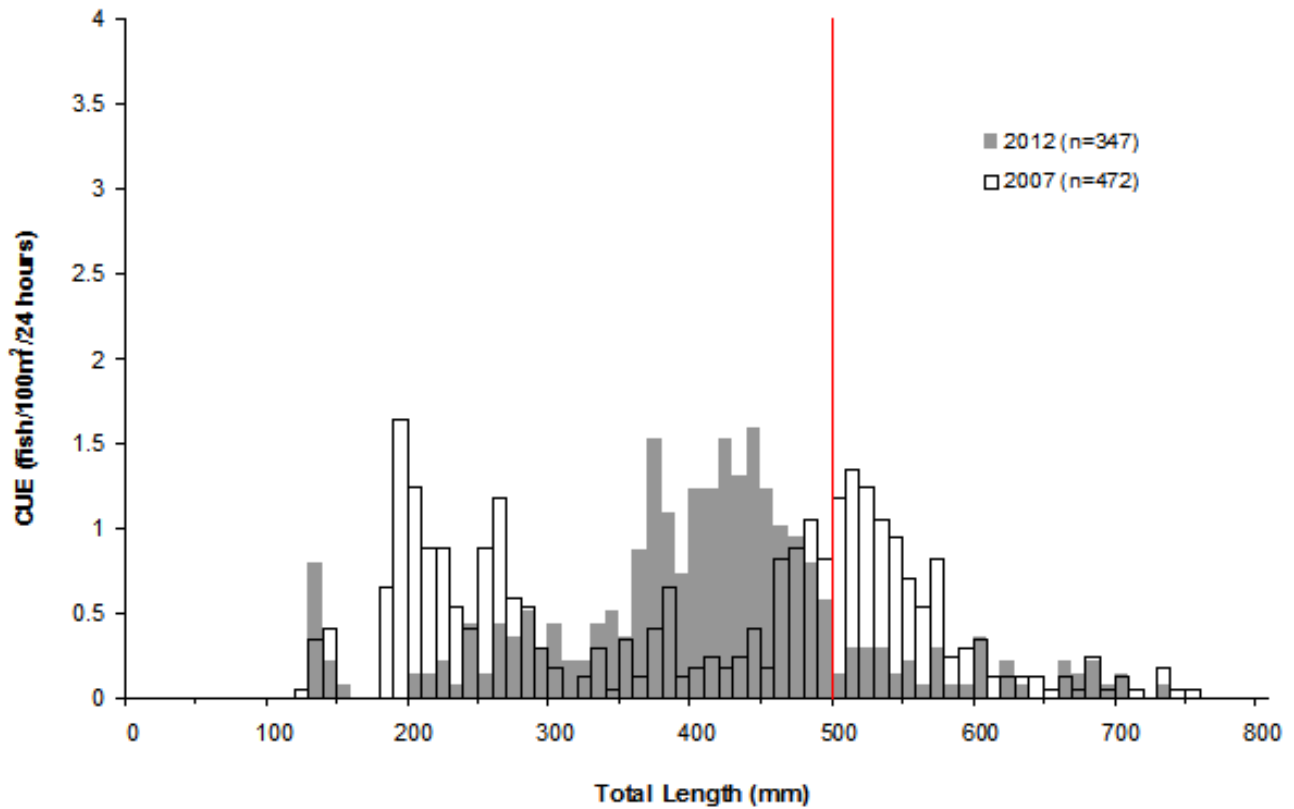


Figure 2. Walleye total length-frequency distributions from the 2007 and 2012 FWIN surveys on Marie Lake.

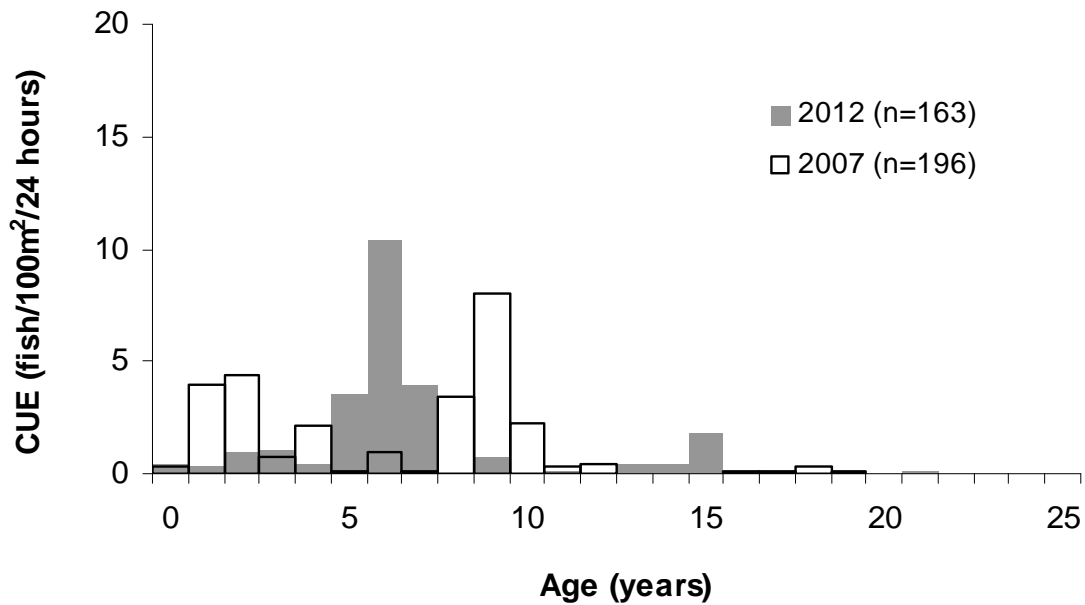


Figure 3. Walleye age-frequency distributions from the 2007 and 2012 FWIN surveys on Marie Lake.



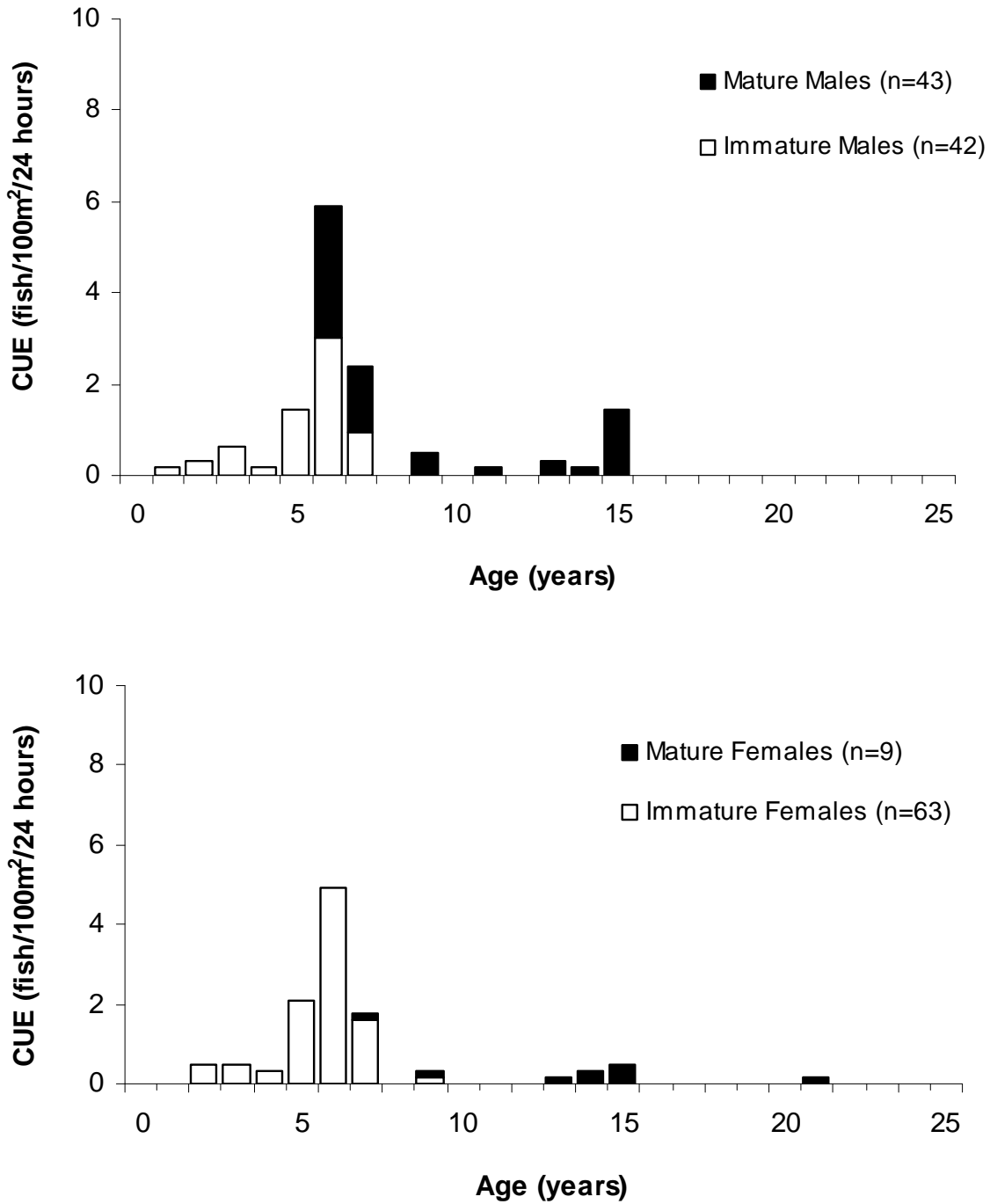


Figure 4. Age-at-maturity distributions for male and female walleye from the 2012 FWIN survey on Marie Lake (stacked bar graph).

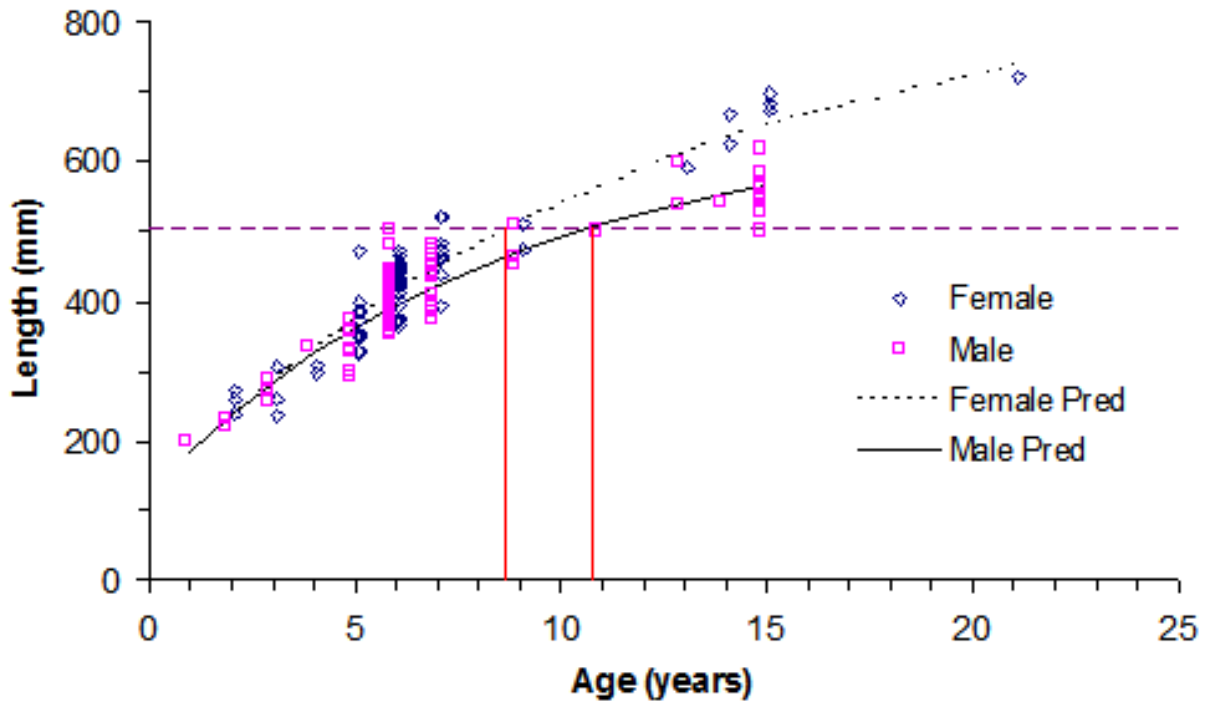


Figure 5. Total length-at-age for Marie Lake walleye from the 2012 Marie Lake FWIN survey (Females:  $L_{inf} = 868.92$ ,  $K = 0.083$ ,  $t_0 = -1.742$ ,  $R^2 = 0.98$ ,  $Prob > F = 0.0001$ ; Males:  $L_{inf} = 658.75$ ,  $K = 0.116$ ,  $t_0 = -1.839$ ,  $R^2 = 0.99$ ,  $Prob > F = 0.0001$ ).

**Literature Cited**

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## APPENDICES

Appendix 1. Catch summaries from the Marie Lake FWIN September 17 to 20, 2012. Set coordinates are Universal Transverse Mercator Zone 12, North American Datum 83.

Set Number	UTM Easting	UTM Northing	Lift Date	Set Duration (hours)	Number of fish caught								Total
					WALL	NRPK	YLPR	LKWH	WHSC	CISC	BURB	SPSH	
ML10	548878	6053635	20-Sep-12	22.75	39	1	3	10	10	6	0	1	70
ML2	543683	6052408	20-Sep-12	23.33	9	13	0	6	2	0	0	0	30
ML31	541365	6053379	18-Sep-12	22.83	3	3	1	0	3	0	0	0	10
ML32	542687	6056103	19-Sep-12	23.53	4	1	2	1	0	2	0	0	10
ML34	541755	6055373	18-Sep-12	22.67	32	0	2	5	2	20	1	0	62
ML36	547575	6051741	20-Sep-12	23.80	51	1	16	7	4	5	0	0	84
ML37	542291	6052981	20-Sep-12	22.85	18	1	7	0	4	4	0	0	34
ML4	548527	6052873	18-Sep-12	23.08	35	3	9	2	3	4	0	0	56
ML40	542887	6055697	20-Sep-12	22.50	20	0	3	10	4	6	0	0	43
ML41	541915	6056334	19-Sep-12	22.58	33	2	3	9	2	12	0	0	61
ML5	547693	6055529	19-Sep-12	22.12	33	0	2	0	1	6	0	0	42
ML8	5415228	6053114	19-Sep-12	22.57	33	2	0	1	4	18	0	0	58
ML9	544485	6052674	19-Sep-12	23.22	36	2	6	2	3	23	0	0	72
Total					346	29	54	53	42	106	1	1	632