Fall Walleye Index Netting at Sylvan Lake, Alberta, 2012

Fisheries Management
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Abstract

A total of 839 fish representing six species were caught during the Fall Walleye Index Netting (FWIN) survey. Walleye were the second most abundant species in the FWIN nets accounting for 14% of the catch. Individual net catches were variable ranging from 2 to 11 Walleye. The catch-per-unit effort (CPUE) for Walleye was 6.0 fish·100m^{-2}·24hrs^{-1} (95% C.I. 4.8–7.2), which is well below the Alberta mean of 18.6 Walleye·100m^{-2}·24hrs^{-1}. Walleye total lengths (TL) (n=121) ranged from 199 to 645 mm and fish over 500 mm TL represented 10% of the catch. The majority of fish were in the 280 to 380 mm TL size category. There were 10 age-classes present (ages 1, 3-7, 10 and 12-14) and 34% of the Walleye sampled were mature. Mean age-at-maturity is difficult to determine due to age-class gaps and low sample sizes in some year classes, but females and males first matured by age six. Walleye reached a mean TL of 500 mm by age 13 and the asymptotic average maximum body size (L_{inf}) could not be determined due to age-class gaps.

Lake Whitefish were the most abundant species caught in the FWIN nets and accounted for 72% of the catch. The CPUE for Lake Whitefish was 29.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 25.8–34.3). Lake Whitefish TLs (n=600) ranged from 119 to 565 mm and fish over 500 mm TL represented 0.2% of the catch. The majority of fish were in the 350 to 450 mm TL size category. There were 23 age-classes were present (ages 0 to 21 and 23), with age-classes 13 and 15 being the most abundant.

The CPUE for Yellow Perch was 2.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 1.8–4.0). Yellow Perch TLs (n=58) ranged from 107 to 264 mm.

The CPUE for Northern Pike was 1.1 fish·100m^{-2}·24hrs^{-1} (95% C.I. 0.4–2.0). Northern Pike TLs (n=23) ranged from 379 to 1027 mm.

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 (*Sander vitreus*), and also collect data on other species. Although FWIN is not designed specifically for managing and estimating abundance of other sport fish species, FWIN surveys have been useful as a tool in assessing and monitoring those populations as well. These data are essential to provide sustainable harvest allocations for sport fish, and provides insight into the current management strategies by comparing the results from previous FWIN surveys. This FWIN survey was conducted in September 2012 to determine abundance, structure, reproduction (recruitment), and monitor stocking success of the Walleye population in Sylvan Lake.

Methods

This FWIN survey was conducted from September 21 to 24, 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. Nets were set at 18 sites randomly selected and weighted by depth stratum. Nets were set for 24 hrs (± 3 hours) before being cleared of fish and reset at new locations. Set and pull times were recorded. 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 at all net locations, and ranged between 14.3 and 16.2 °C.

All fish species were kept for biological sampling. Catches were recorded by net location and mesh size. Net identification, 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, Lake Whitefish (*coregonus clupeaformis*), Northern Pike (*Esox lucius*) and Yellow Perch (*Perca flavescens*) were examined for gender and maturity, and a bony structure was removed for ageing. Otoliths were collected from Walleye, Lake Whitefish and Yellow Perch 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). Growth was described using the von Bertalanffy growth model in FAST 2.1 (Auburn University 2000-2001).

Relative abundance expressed as CPUE was calculated as number of fish caught·100m^{-2}·24hrs^{-1} with 95% confidence intervals empirically determined by bootstrapping catches to 50,000 replications (Haddon 2001).

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 # 16537.

Results

A total of 839 fish representing six species were caught during the 2012 FWIN survey (Table 1). Walleye were the second most abundant species in the FWIN nets accounting for 14% of the catch. Individual net catches were variable ranging from 2 to 11 Walleye. The CPUE for Walleye was 6.0 fish·100m^{-2}·24hrs^{-1} (95% C.I. 4.8–7.2), which has decreased by 35% from the 2010 CPUE of 9.2 fish·100m^{-2}·24hrs^{-1} (95% C.I. 6.2–13.3) (Table 2). The CPUE for Walleye on Sylvan Lake is well below the Alberta average of 18.6 Walleye·100m^{-2}·24hrs^{-1}, but similar to other lakes with collapsed populations in Alberta, and steadily declining since Sylvan Lake was originally sampled in 2008 (Figure 1, Table 2). In 2012, Walleye TLs (n=121) ranged from 199 to 645 mm, and fish over 500 mm TL represented only 10% of the catch (Figure 2). The majority of fish captured were in the 280 to 380 mm TL size category, which is slightly larger than the 260 to 360 mm TL size range encountered in 2010. There was a collapse of Walleye in the 400 to 500 mm TL size category, which accounted for 36% of the catch in 2010. This loss was also evident with the 2000 stocked walleye year class, where the catch rate in 2010 of 3.5 fish·100m^{-2}·24hrs^{-1} (10 year olds) dropped to a catch rate of only 0.1 fish·100m^{-2}·24hrs^{-1} (12 year olds) in 2012 (Figure 3). In the most recent survey there were 10 age-classes present (ages 1, 3-7, 10 and 12-14), with only 1 stable age-class (> 3 fish·100m^{-2}·24hrs^{-1}) of 6-year-olds. This is comparable with the 2010 data where 10 age-classes were also represented, but few were stable (4 and 10-year-olds). In 2012, the most abundant age-classes were the 6 and 5-year-olds, which represented 53% and 25% of the sample, respectively. The most abundant age-class in 2010 was the 4-year-olds, which represented 50% of the catch. The catch rate of Walleye from stockings in 2006, 2007 and 2008 (age 4, 5, 6) year-classes was 4.8 fish·100m^{-2}·24hrs^{-1} and still account for 80% of the catch, which is a slight decrease from 4.9 fish·100m^{-2}·24hrs^{-1} from the previous year. In 2012, the mean Walleye age was 6.5 years and 34% of Walleye sampled were mature. Mean age-at-maturity is difficult to determine due

to age-class gaps and low sample sizes in some year-classes, however females and males first matured at age 6 and were fully recruited by age 10 (Figure 4). Walleye from Sylvan Lake 2012 FWIN survey reached a mean TL of 500 mm by age 13, but the growth curve could not determine the asymptotic average maximum body size (L_{inf}) due age-class gaps (Figure 5).

Lake Whitefish were the most abundant species caught in the FWIN nets and accounted for 72% of the catch. The CPUE for Lake Whitefish was 29.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 25.8–34.3), which increased by 37% from the 21.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 17.2–28.1) caught in 2010 (Table 2). Lake Whitefish TLs (n=600) ranged from 119 to 565 mm and fish over 500 mm TL represented 0.2% of the catch. The majority of fish were in the 350 to 450 mm TL size category, which is consistent with the 2010 data (Figure 6). In the most recent survey 23 age-classes were present (0 to 21 and 23), with age-classes 13 and 15 being the most abundant and stable. The rest of the age-classes had a CPUE of less than three fish·100m^{-2}·24hrs^{-1}. In 2010, only 17 age-classes were represented and none were stable (Figure 7).

The CPUE for Yellow Perch was 2.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 1.8–4.0), which increased slightly from 0.1 fish·100m^{-2}·24hrs^{-1} (95% C.I. 0.0–0.3) caught in 2010 (Table 2). In 2012, Yellow Perch TLs (n=58) ranged from 107 to 264 mm. Yellow Perch length frequency distribution between years cannot be compared due to the low sample size in 2010 (n=2) (Figure 8).

The CPUE for Northern Pike was 1.1 fish·100m^{-2}·24hrs^{-1} (95% C.I. 0.4–2.0), which decreased slightly from 1.8 fish·100m^{-2}·24hrs^{-1} (95% C.I. 0.5–3.4) caught in 2010 (Table 2). In 2012, Northern Pike TLs (n=23) ranged from 379 to 1027 mm. Northern Pike length frequency distribution between years cannot be compared due to the low sample size in 2010 and 2012 (n=28 and n=23, respectively) and low frequency of fish in each size category (Figure 9).

Interpretation

Stocking of Walleye in Sylvan Lake occurred most recently from 2006 to 2008 in order to re-establish a naturally reproducing population. Two additional stocking events of Walleye occurred in 2000 and 1998. Most of the Walleye being caught continue to be from the 2006 and 2007 stocking years, and the proportion of the population that has been naturally recruited within Sylvan Lake is very low, as is evident by age-class gaps (indicative of year-class failures) and the low abundance of younger fish since the last stocking event. This is compounded by the lack of reproductively mature fish to support the population. Sylvan Lake has remained within the bottom third of reported FWIN Walleye catch rates annually from across Alberta and has been on the decline since 2008. The 2012 population status classification for the Sylvan Lake Walleye fishery suggests a collapsed population, according to the criteria outlined in *Alberta's Walleye Management Recovery Plan* (Berry 1995). Of the 5 biological population metrics used as the criteria for classifying status of Walleye fisheries, modified for FWIN analysis from Sullivan (2003), 4 population metrics (catch rate, age-class distribution, age-class stability and age at maturity) indicate a collapsed population and 1 (length at age) indicates a trophy population (Table 3). This is consistent with the 2010 collapsed population status classification of the Walleye fishery in Sylvan Lake (Dick 2013).

The catch rate of Lake Whitefish has remained relatively high and has increased since the 2010 survey. It is evident that annual recruitment is occurring, due to the presence of smaller size categories of fish. Also, the high abundance of larger, reproductively mature fish indicates that the population is well supported and stable.

The catch rate of Yellow Perch has shown signs of improvement and has increased by over doubling since the 2008 survey. Although the low abundance of Yellow Perch likely suggests that the population is in a vulnerable-collapsed state, there is evidence and signs of recovery occurring.

The catch rate of Northern Pike has been on the decline since 2008 and the low abundance of Northern Pike suggests that this population is in a collapsed state.

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

Set Number	Lift Date (2012)	Stratum	UTM Easting	UTM Northing	Meridian	Soak Time (h)	Fish Count per Species						
							EMSH	LKWH	NRPK	WALL	WHSC	YLPR	Set Total
10A	23-Sep	Deep	689226	5807715	-117 (Zone 11)	22.75		36		7		6	49
11A	23-Sep	Deep	690194	5807747	-117 (Zone 11)	23.08		39	2	11	5	1	58
18C	24-Sep	Deep	691786	5806214	-117 (Zone 11)	23.58		48		5		2	55
24C	24-Sep	Deep	690815	5805262	-117 (Zone 11)	24.00		24		9		3	36
26C	23-Sep	Deep	692831	5805259	-117 (Zone 11)	21.92		53		3			56
28C	22-Sep	Deep	694778	5805285	-117 (Zone 11)	26.00	1	28		6		4	39
28D	24-Sep	Deep	694276	5805302	-117 (Zone 11)	24.00		42		7		1	50
29C	22-Sep	Shallow	695916	5805119	-117 (Zone 11)	27.42		27	9	9		4	49
32A	23-Sep	Deep	690260	5804949	-117 (Zone 11)	23.50		31		2	5	8	46
33A	22-Sep	Deep	691276	5804713	-117 (Zone 11)	25.50		45	2	5	5	6	63
34A	23-Sep	Deep	692297	5804679	-117 (Zone 11)	23.33		36		5		2	43
41B	23-Sep	Shallow	692347	5803879	-117 (Zone 11)	23.50		31	1	8	10		49
43D	23-Sep	Deep	694776	5803204	-117 (Zone 11)	22.25		18	1	9	1	2	31
45D	22-Sep	Deep	696803	5803243	-117 (Zone 11)	24.50		27		8	2	1	38
53B	22-Sep	Shallow	698802	5802418	-117 (Zone 11)	25.25		36	4	3		1	44
59C	22-Sep	Shallow	698868	5801261	-117 (Zone 11)	26.50		38	3	3	3	1	47
5B	23-Sep	Deep	689216	5808776	-117 (Zone 11)	23.83		20	1	11	2	9	43
9D	24-Sep	Deep	688262	5807323	-117 (Zone 11)	24.58		23		10	1	7	41
Species Total							1	602	23	121	34	58	839

Table 2. Species catch rates from the 2008, 2010 and 2012 Sylvan Lake FWIN surveys.

Species	Year	CPUE	95% CI
EMSH	2008	0.00	N/A
	2010	0.00	N/A
	2012	0.05	(0.0 - 0.2)
LKWH	2008	28.19	(19.3 - 37.1)
	2010	21.94	(17.2 - 28.1)
	2012	29.91	(25.8 - 34.3)
NRPK	2008	2.75	(0.8 - 5.3)
	2010	1.81	(0.5 - 3.4)
	2012	1.07	(0.4 - 2.0)
WALL	2008	16.87	(10.9 - 27.2)
	2010	9.23	(6.2 - 13.3)
	2012	6.01	(4.8 - 7.2)
WHSC	2008	1.23	(0.0 - 3.1)
	2010	1.82	(0.5 - 3.4)
	2012	1.69	(0.4 - 3.4)
YLPR	2008	0.58	(0.1 - 1.1)
	2010	0.13	(0.0 - 0.3)
	2012	2.86	(1.8 - 4.0)

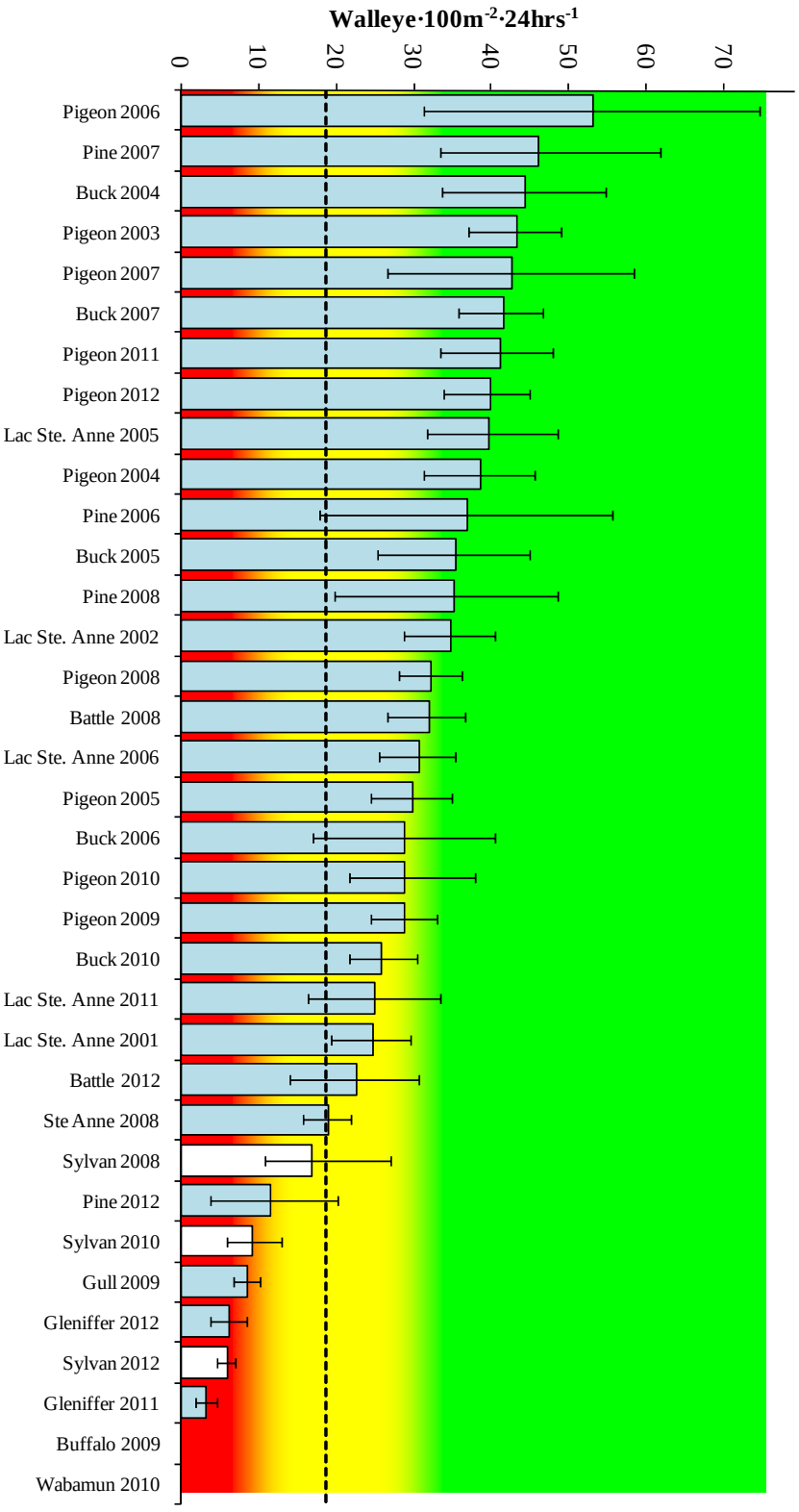


Figure 1. Mean Walleye catch rates with 95% CI from a representative sample of FWIN surveys from Across Central Alberta. The dashed line represents the mean provincial catch rate of 18.6 fish·100m^{-2}·24hrs^{-1}. Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds. The Walleye catch rates from the 2008 to 2012 Sylvan Lake FWIN surveys are highlighted.

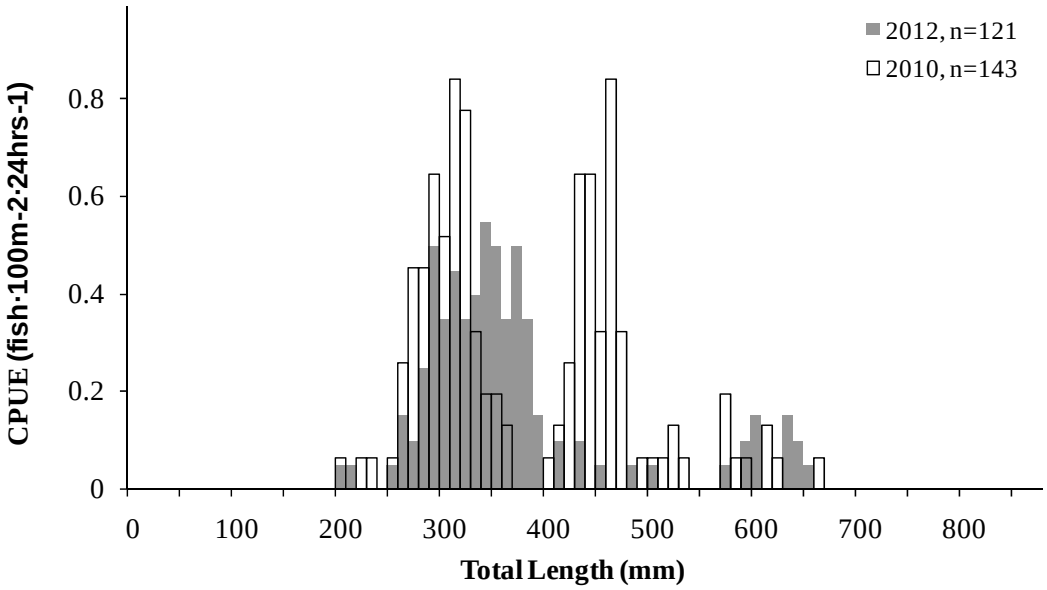


Figure 2. Walleye total length frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake.

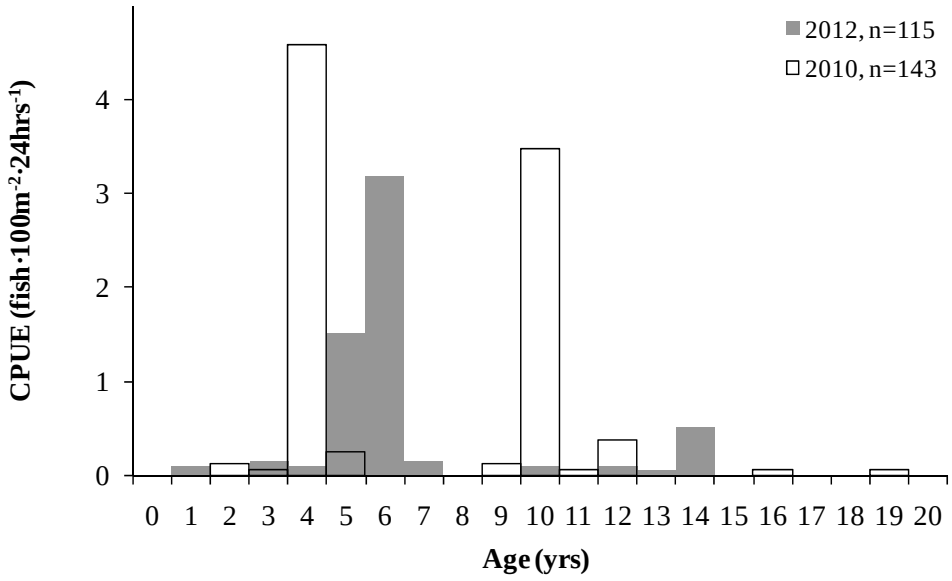
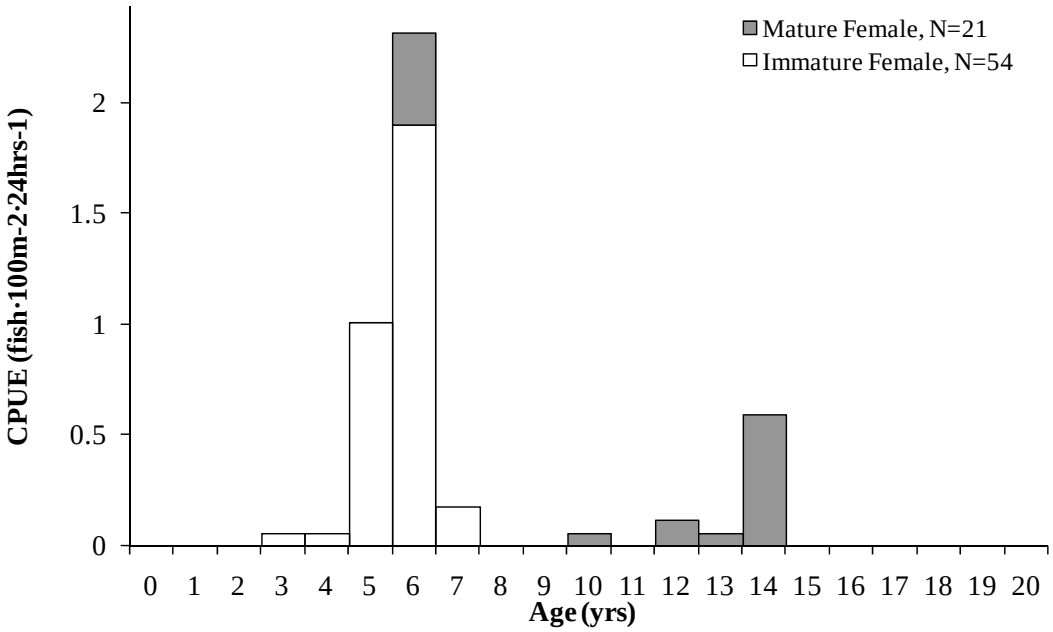


Figure 3. Walleye age frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake. Mean ages were 6.9 and 6.5 years, respectively.



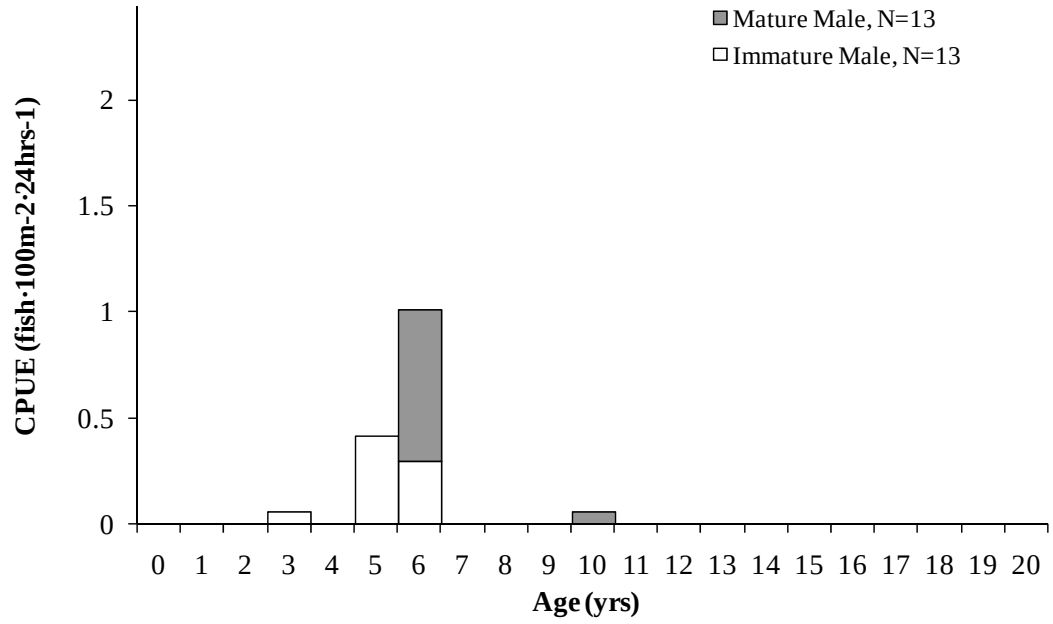


Figure 4. Age-at-maturity distributions for female and male Walleye from the 2012 FWIN survey on Sylvan Lake.

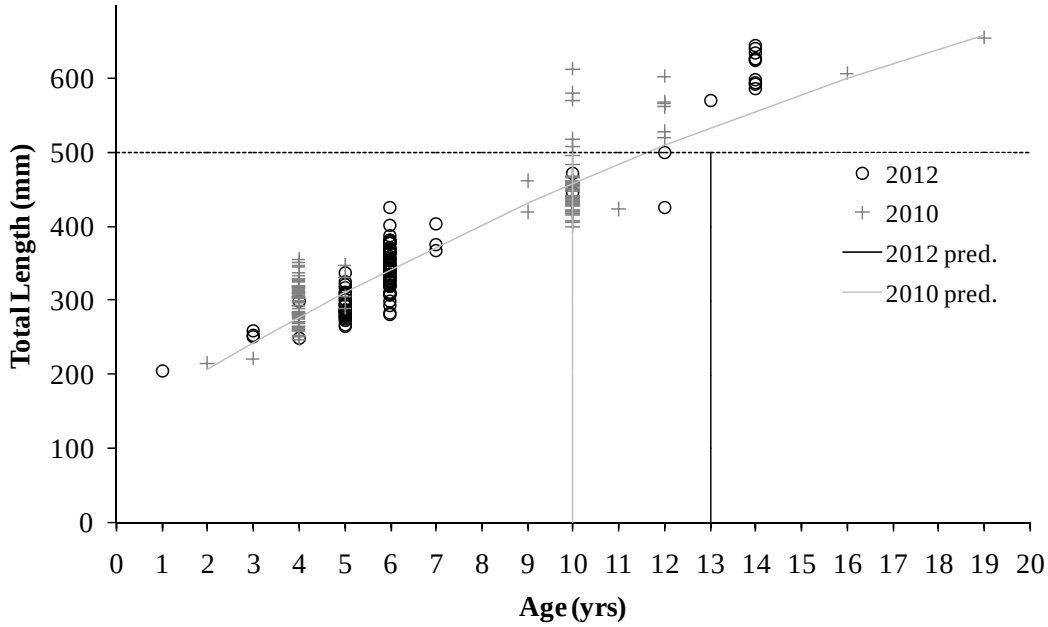


Figure 5. Total length-at-age for Sylvan Lake Walleye from the 2010 (L_{inf} = 1108.9, K = 0.041, t_o = -3.049, R^2 = 0.97, Prob > 0.0001) and 2012 (No Feasible Solution Found) FWIN survey data.

Table 3. Walleye stock classification for Sylvan Lake based on the 2012 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 = 6.001.
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.
				Wide age class distribution (n=115); mean age = 6.5 years.
AGE CLASS STABILITY	Very stable: 1 to 2 "measureable" (> 3 walleye•100m^{-2}•24h^{-1}) 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.
				1 measurable age class of 6-year old fish; gaps in 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 at age 6; males 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
	500mm TL reached at 13 years			

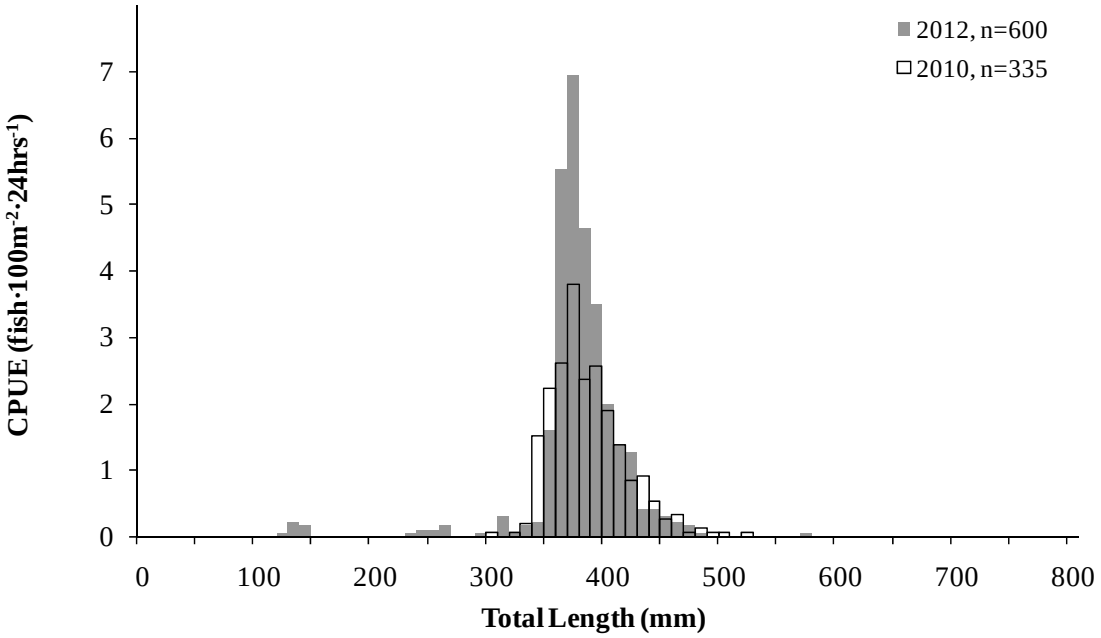


Figure 6. Lake Whitefish total length frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake.

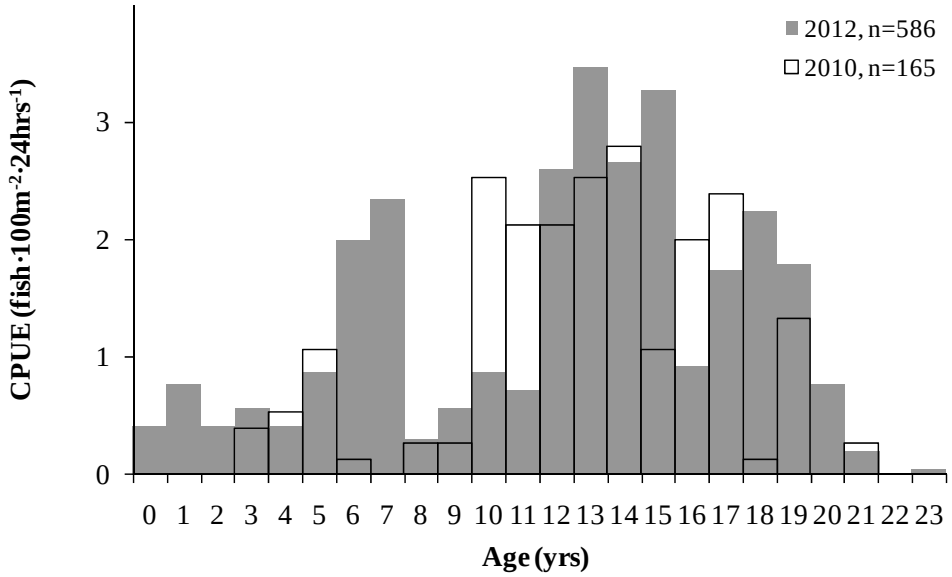


Figure 7. Lake Whitefish age frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake. Mean ages were 12.8 and 12.2 years, respectively.

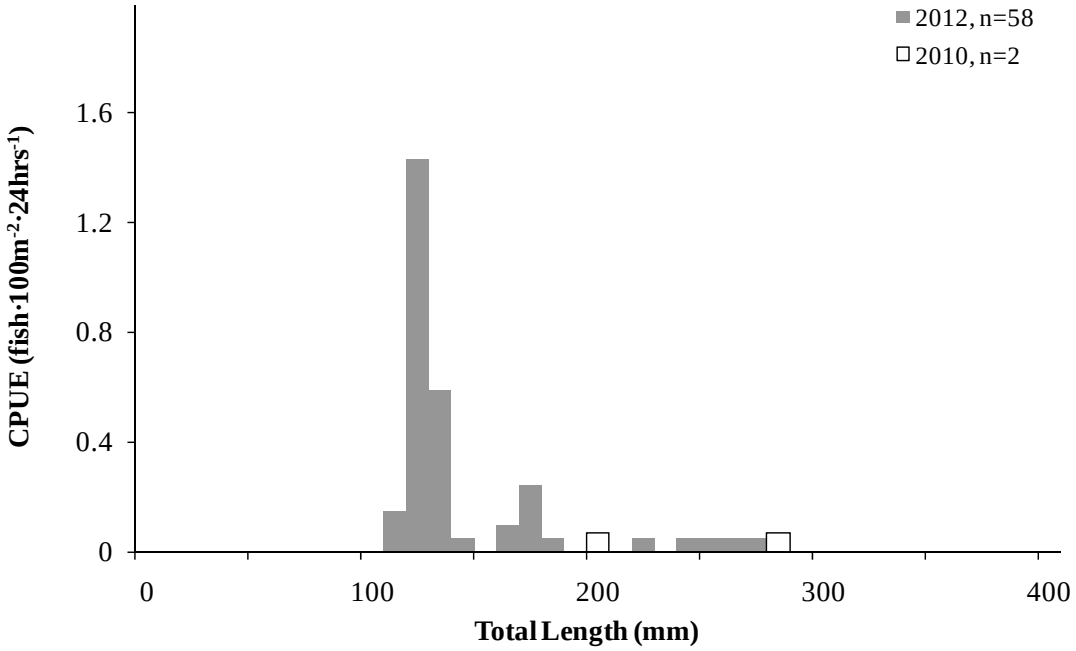


Figure 8. Yellow Perch total length-frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake.

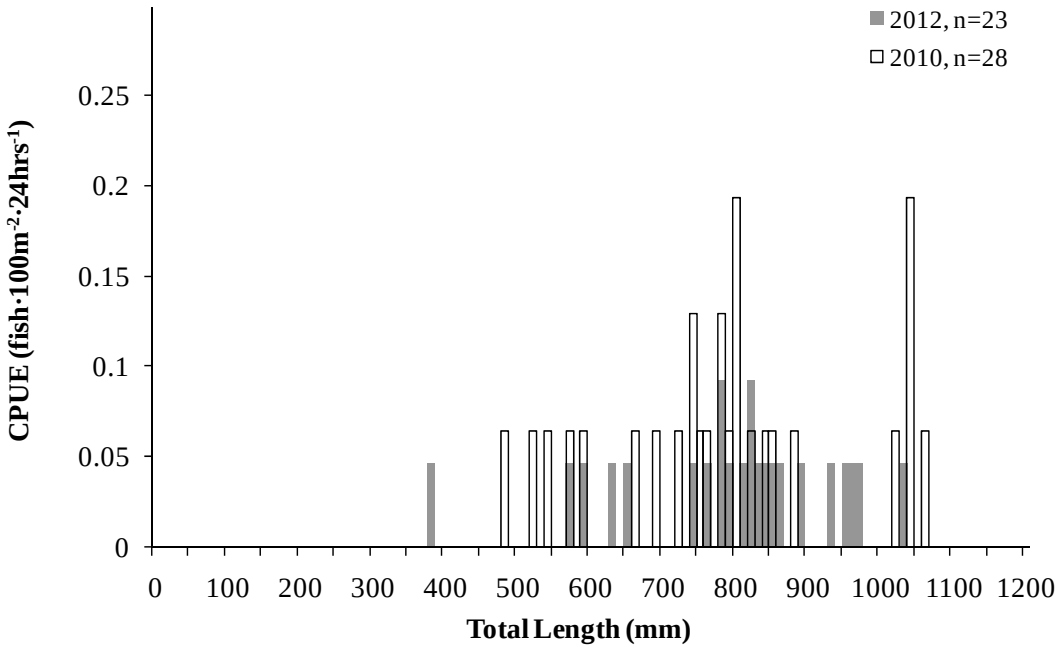


Figure 9. Northern Pike total length-frequency distributions from the 2010 and 2012 FWIN surveys on Sylvan Lake.

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