Fall Walleye Index Netting at Kinnaird Lake, Alberta, 2010

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Abstract

In September 2010, a Fall Walleye Index Netting (FWIN) protocol was used to assess the walleye (*Sander vitreus*) population at Kinnaird Lake. The mean catch-per-unit-effort for walleye was 21.6 walleye$\cdot$100m$^{-2}\cdot$24h^{-1} (95% CI = 16.7 – 26.3 walleye$\cdot$100m$^{-2}\cdot$24h^{-1}). Total length for walleye ranged from 186 mm to 577 mm, with a mean of 449 mm. 91% of walleye sampled were between 350 mm and 550 mm in total length, and 14% of the total sample exceeded 500 mm total length (legally harvestable). Walleye ages ranged from 1 to 17 years with a mean age of 9.3 years. Only two age classes, the 10 and 13 year old fish, are considered measureable. There is evidence of significant recruitment failures in 2001, 2002, and 2003. All male and female walleye six years of age or older were mature. Only 4% of male walleye sampled exceeded 500 mm total length, and all were 13 years of age; 30% of female walleye sampled exceeded 500 mm total length and ranged in age from 9 to 13 years. Kinnaird Lake meets the classification criteria for a vulnerable fishery.

Introduction

Alberta's lentic walleye (*Sander vitreus*) populations are assessed using a Fall Walleye Index Netting (FWIN) protocol developed by the Ontario Ministry of Natural Resources. This protocol also provides population data for other game and non-game fishes in the target system.

In September of 2010, a FWIN assessment was completed at Kinnaird Lake in order to assess the status of the walleye population and determine if adjustment to the regulations or management practices was necessary. Current regulations allow harvest of one walleye, over 500 mm total length, collectively for Jackson Lake, Kinnaird Lake, and Blackett Lake. This collective regulation is made necessary by unrestricted movement between these lakes and the associated enforcement issues. Kinnaird Lake was last assessed in 2005, at which time it was classified as a vulnerable walleye population.

The specific objectives for this survey were:

1. Determine a FWIN catch rate for walleye to compare to the 2005 catch rate as well as correlate with known density estimates.
2. Assess walleye stock parameters (length distribution, age distribution and stability, growth rate, age-at-maturity)
3. Determine a FWIN catch rate for northern pike (*Esox Lucius*), yellow perch (*Perca flavescens*), and any other species represented in the survey. These catch rates will be correlated with known density estimates if available.
4. Assess stock parameters for species other than walleye.

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Methods

Sampling Design

The Fall Walleye Index Netting protocol uses multi-panel gillnets to assess relative abundance of fish stocks and provide other biological indicators of stock status (Morgan 2002).

Based on the total surface area of the study site, 12 nets were set. Set locations were randomly selected using ArcGIS 9.0 and were depth stratified to reflect the proportion of the lakes surface area that fell within each strata [Shallow (2-5m) = 67% (8 nets), Deep (5+m) = 33% (4 nets)]. All nets were set between 09:00 and 11:00 and were pulled 24 h ±3 h later.

The standard monofilament gillnets used for FWIN assessments are 1.8 m deep, 61 m long and consist of 8 equal length panels arranged in decreasing stretched mesh sizes of 152 mm, 127 mm , 101 mm, 76 mm, 63 mm, 50 mm, 38 mm, and 25 mm. For this assessment there were two notable departures from the standard FWIN gear. The nets used were 38.1 m in length and included an additional 19 mm and 12 mm panel. Fish captured in these additional meshes were excluded from the analysis found in this report.

All fish caught were field processed to determine fork length, total length, weight, sex, and maturity stage. For age determination, cleithra were collected from all northern pike; otoliths were collected from all walleye as well as yellow perch over 140 mm total length. Ages were determined as described by MacKay et al. (1990). Sub-sampling based on total length and batch weight was used for meshes containing high numbers of small size class fish. Sub-sampled fish were included in subsequent analyses via randomly selected known total lengths of fish from the same size class. Individual fish measurements and associated catch data, including data collected from the 12 and 19 mm panels excluded from this analysis, were uploaded to the FWMIS database and referenced as Project ID #15760.

Statistical Analyses

Catch-per-unit-effort (CUE) was calculated for walleye, northern pike, and yellow perch and expressed as fish$\cdot$100m$^{-2}\cdot$24h^{-1}. The calculated CUE values were bootstrapped to 10,000 repetitions and the resulting frequency distribution used to estimate 95% confidence intervals (Haddon 2001). Relative standard error (RSE) was calculated by dividing the standard deviation of bootstrapped means by the overall mean. Size, age, and maturity frequencies were calculated using Microsoft Excel 2003, and von Bertalanffy growth curves plotted with FAST 2.0 (Slipke and Maceina, 2001).

Results & Interpretation

Nets were set on September 15, 2010 and the FWIN was completed on September 17, 2010. The surface temperature at all net locations fell between 12.5°C and 14.1°C and the mean net soak time was 22.9 h (Table 1). A total of 302 fishes were captured: 138 walleye (46%), 44 northern pike (15%), 65 yellow perch (22%), and 55 cisco (*Coregonus artedi*) (18%). Calculated catch rates (CUE) for sportfish were 21.6 walleye$\cdot$100m$^{-2}\cdot$24h^{-1} (95% C.I = 16.7 – 26.3), 6.9 northern pike$\cdot$100m$^{-2}\cdot$24h^{-1} (95% C.I = 4.6 – 9.7), and 10.0 yellow perch$\cdot$100m^{-2} (95% C.I = 7.2 – 12.8) (Table 2). The CUE for walleye (21.6 walleye$\cdot$100m$^{-2}\cdot$24h^{-1}) with a relative standard error of 0.11 is higher than the 2005 FWIN catch rate of 11.2 walleye$\cdot$100m$^{-2}\cdot$24h^{-1}. The CUE meets the criteria for a moderate catch rate, indicating a vulnerable population, and is consistent with catch rates from other lakes in the province with the same classification (Table 3).

Total length for walleye ranged from 186 mm to 577 mm, with a mean of 449 mm. The distribution is unimodal with 91% of recorded total lengths between 350 mm and 550 mm (Figure 1). 14% of the walleye sampled exceeded the 500 mm total length minimum harvest regulation, compared to 16% in 2005. Only 4% of male walleye sampled exceeded 500 mm total length and were consistently 13 years old.

Walleye ages ranged from 1 to 17 with a mean age of 9.3 overall; average age was 9.9 years for males and 8.4 years for females (Figure 2). The dominant year-class of 13 year old fish is several magnitudes larger in representation than any other. Low catch rates for 7, 8, and 9 year old fish suggests poor recruitment in 2001, 2002 and 2003. Young-of-year to 2 year-old fish are also poorly represented but this may be a gear recruitment issue and not an indication of failed year classes. When a CUE threshold value of 3.0 walleye$\cdot$100m$^{-2}\cdot$24h^{-1} is

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applied, only two measureable year classes are identified: 10 and 13years. It is unexpected that the strong age 9 year-class from the 2005 data are not represented as a notable age 14 year-class in 2010. All male walleye 4 years of age or older were mature (Figure 3), and 96% of female walleye 5 years of age or older were mature (Figure 4). There was negligible maturity for both sexes in year-classes younger than 5.

The von Bertalanffy growth curve calculations indicate asymptotic growth at 472 mm total length for male walleye (Figure 5). Female walleye exceed 500 mm total length at 10 years old. When males and females are combined, the von Bertalanffy growth equation indicates asymptotic growth at 478 mm total length. Of all walleye sampled, 17% were over 500 mm in total length. The 2010 length-at-age data were not compared to 2005 as there appear to be issues with unrepresented year classes that indicate the 2005 growth calculations are inaccurate.

Discussion

The mean walleye catch rate of 21.6 walleye$\cdot 100m^{-2} \cdot 24h^{-1}$is significantly higher than the 2005 catch rate of 11.2 walleye$\cdot 100m^{-2} \cdot 24h^{-1}$. Given the observed stability of the walleye densities in Jackson and Blackett, it is unlikely that the catch rates calculated for the 2005 FWIN were representative of the population but there is some evidence in age class distribution that strong recruitment in 2004 and 2005 could have contributed to an increase in walleye density.

The 2005 FWIN survey indicated a single measurable year-class of 9 year old walleye. Unexpectedly, these fish were not represented as a strong 14 year-old class in the 2010 FWIN; however, there was evidence of a strong 13 year-old age class. After reviewing the ageing data, it is likely that this discrepancy is due to walleye age determination being based on opercula in 2005 and otoliths in 2010. It is reasonable to conclude that the 2005 9 year-old class and 2010 13 year-old class are recruits from the same year and the ageing data from one of the FWIN events is inaccurate. Both FWIN samples provide evidence of recruitment failures in 2001, 2002, and 2003.

Based on the maturation schedule (full maturation by age 6) and growth rates, male walleye should be provided the opportunity to spawn twice before being susceptible to legal harvest and female walleye become vulnerable at age of maturity.

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Table 1. Total catch for Kinnaird Lake 2012 FWIN.

Catch Summary for Kinnaird Lake 2010 FWIN (8 Panel)											
Set ID	**Easting**	**Northing**	**Pull Date**	**Soak Time (Hours)**	**WALL**	**NRPK**	**YLPR**	**WHSC**	**CISC**	**SPSH**	**All Species Total**
3	464421	6073577	14-Sep-10	25.5	19	0	2	0	9	0	30
5	464929	6074306	14-Sep-10	26.8	6	3	10	0	4	0	23
6	465442	6074005	14-Sep-10	24.5	2	7	1	0	1	0	11
11	465786	6073857	15-Sep-10	23.1	13	2	6	0	3	0	24
2	464662	6074080	15-Sep-10	23.0	18	5	7	0	9	0	39
19	465043	6073107	15-Sep-10	23.0	14	3	5	0	5	0	27
8	464471	6074585	14-Sep-10	25.6	13	2	4	0	5	0	24
13	464807	6072703	14-Sep-10	24.0	12	3	3	0	6	0	24
10	465871	6073302	14-Sep-10	24.3	12	4	5	0	3	0	24
15	463462	6074213	14-Sep-10	24.4	10	9	6	0	5	0	30
16	463176	6073645	14-Sep-10	24.0	11	4	11	0	5	0	31
14	463886	6074327	14-Sep-10	24.3	8	2	5	0	0	0	15
				Total:	**138**	**44**	**65**	**0**	**55**	**0**	**302**

Table 2. CUE (fish·100m^{-2}·24h^{-1}) and 95% confidence intervals for 2005 and 2010 Kinnaird Lake FWINs.

Species	Year	CUE	95% CI
WALL	2005	11.2	8.0 - 14.6
	2010	21.6	16.7 - 26.3
NRPK	2005	8.6	5.0 - 12.1
	2010	6.9	4.6 - 9.7
YLPR	2005	5.0	2.1 - 9.0
	2010	10.0	7.2 - 12.8

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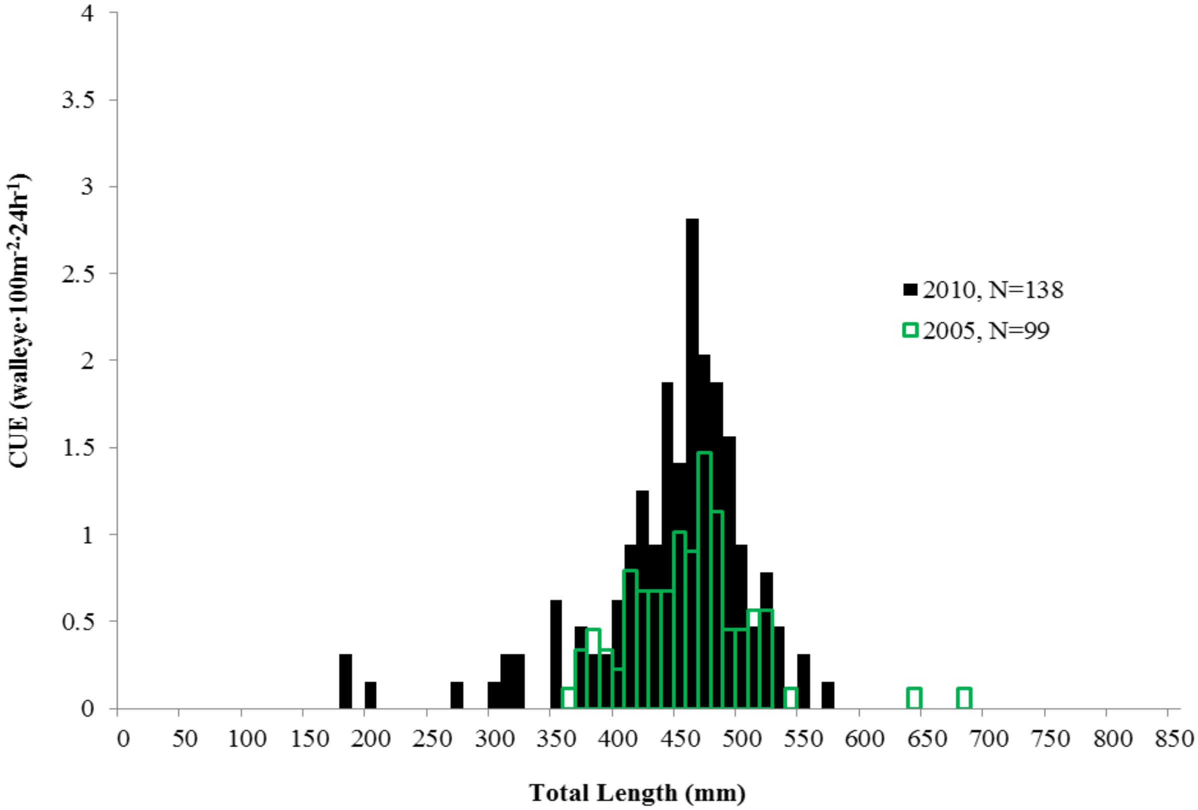

Figure 1. Comparison of walleye total-length frequency distributions for Kinnaird Lake 2005 and 2010 FWIN. Data are displayed as CUE for 10 mm total-length increments.

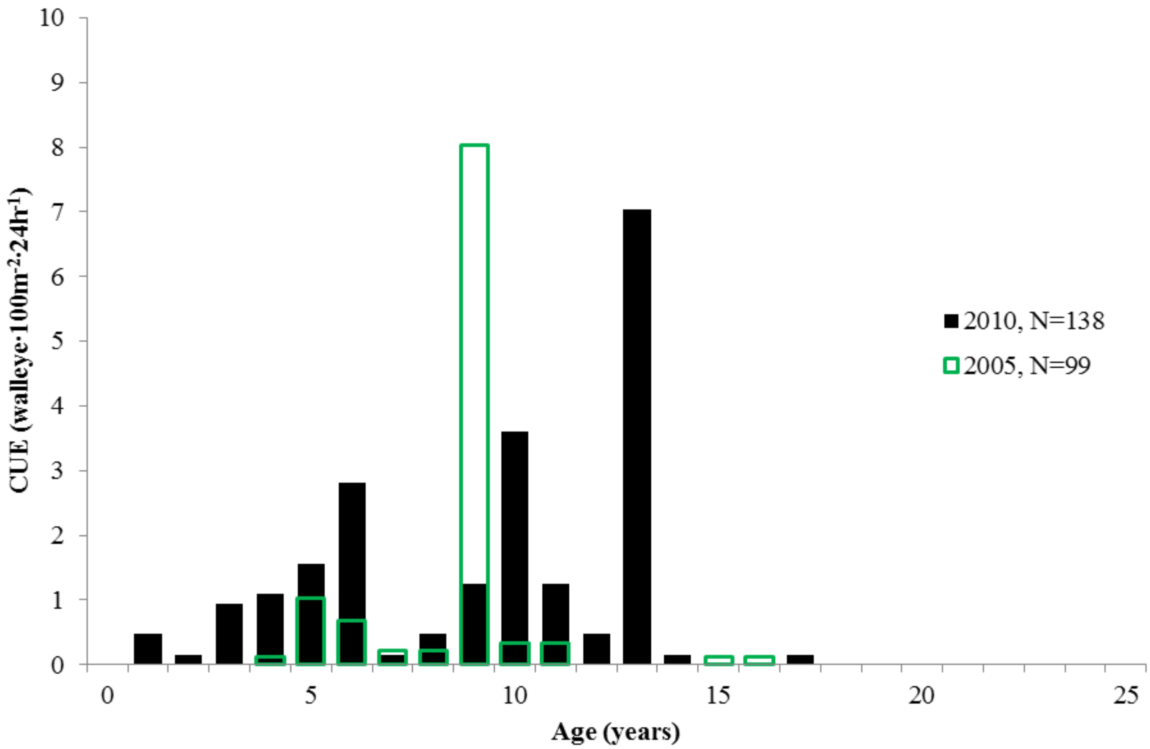

Figure 2. Comparison of walleye age frequency distributions for Kinnaird Lake 2005 and 2010 FWIN. Data are displayed as CUE (walleye·$100m^{-2}$·$24h^{-1}$) for individual year classes.

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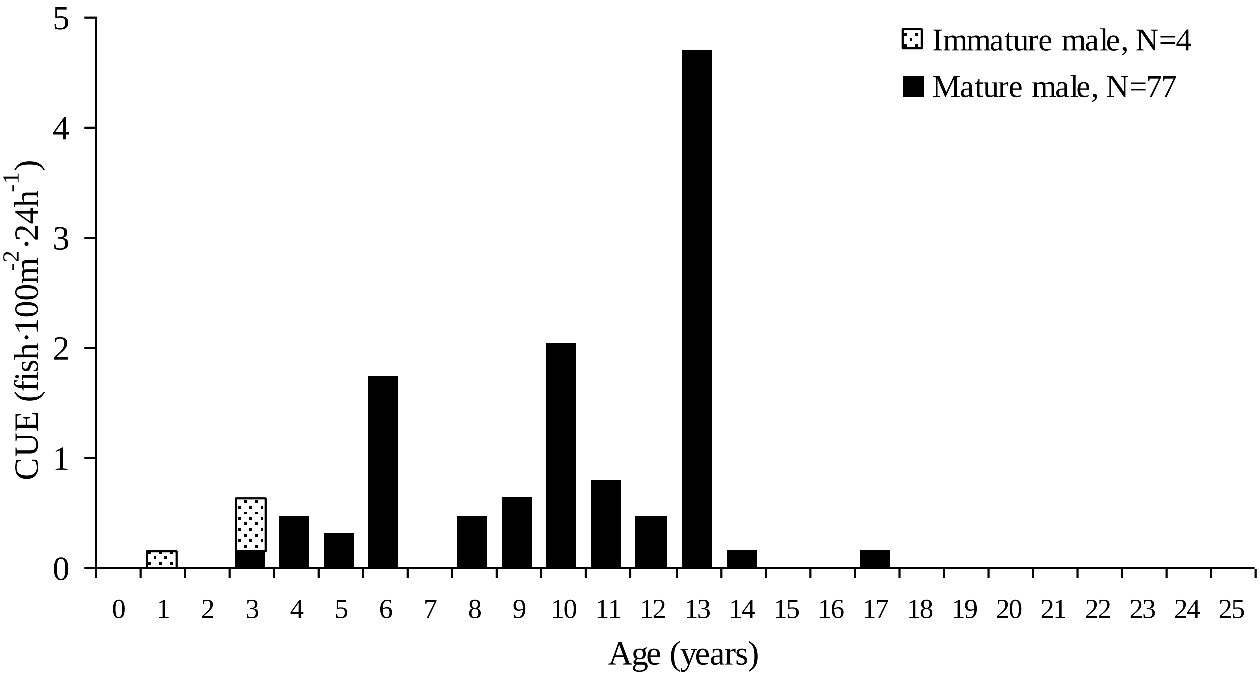

Figure 3. Age-at-Maturity frequency distribution for male walleye for Kinnaird Lake 2010. Data are displayed as CUE for individual year classes by maturity.

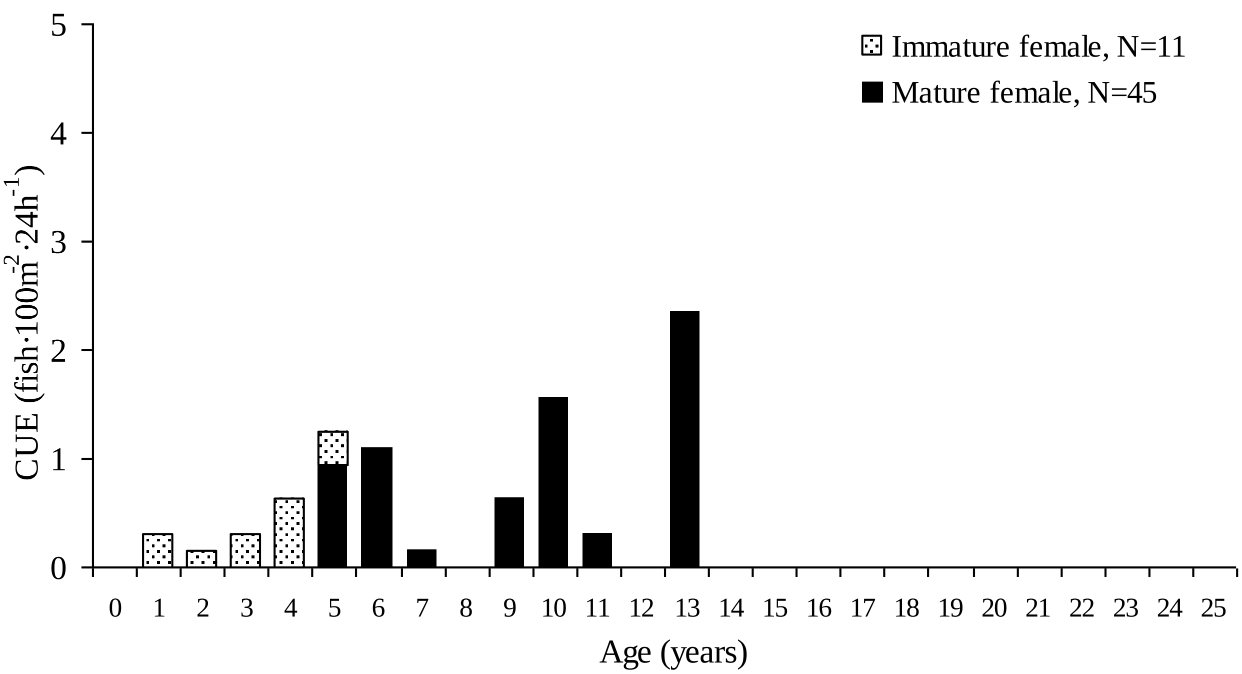

Figure 4. Age-at-Maturity frequency distribution for female walleye for Kinnaird Lake 2010. Data are displayed as CUE for individual year classes by maturity.

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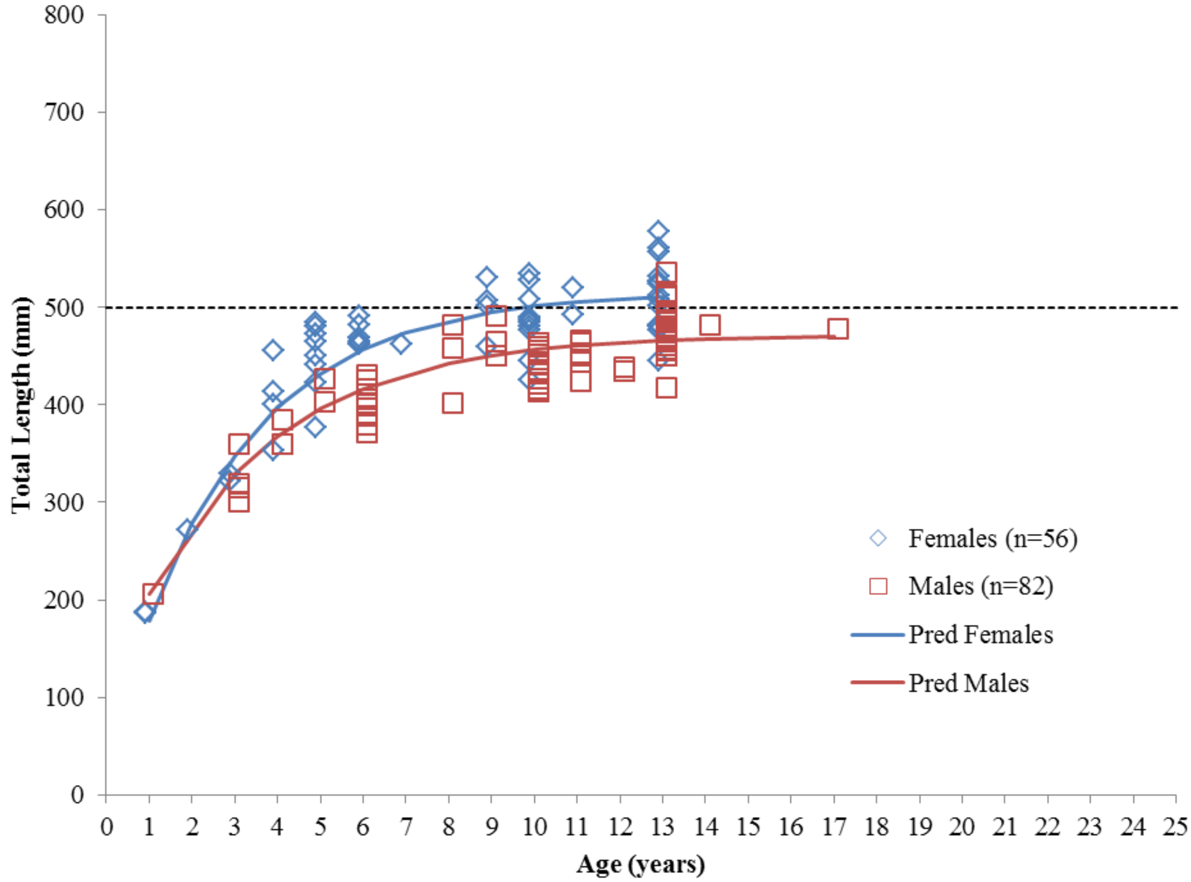

Figure 5. Length-at-Age function and von Bertalanffy growth curve for male and female walleye for Kinnaird Lake 2010 FWIN. Data are displayed as total length for individual year classes by sex. Female walleye total length-at-age (Linf = 515.314, K = 0.349, t0 = -0.222), male walleye total length-at-age (Linf = 472.078).

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Table 3. Walleye Stock Classification for Kinnaird Lake based on the results of the 2010 FWIN survey.

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}
			CUE= 21.6	
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.
		mean age = 9.3	**2 age classes (10 and 13)**	
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.
			2 age classes (10 and 13); age-classes missing (7, 8, and 12)	
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: approx. 5 years **Males: 4 years**
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: by age 9 **Males: by age 6**	

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FAST 2.0 Fishery Analyses and Simulation Tools. Copyright © 2000-2001. Auburn University.

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