



## **Fall Walleye Index Netting at Blackett Lake, Alberta, 2010**

*Fisheries Management  
Lac La Biche*

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#### Disclaimer

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## Abstract

In September 2010, a Fall Walleye Index Netting (FWIN) protocol was completed to assess the walleye (*Sander vitreus*) population of Blackett Lake. The mean catch-per-unit-effort for walleye was 21.8 walleye·100m<sup>-2</sup>·24h<sup>-1</sup> (95% CI = 18.2 – 24.9 walleye·100m<sup>-2</sup>·24h<sup>-1</sup>). Total length for walleye ranged from 123 mm to 531 mm, with a mean of 424 mm. Ninety five percent of walleye sampled were between 330 mm and 530 mm in total length, and 7% of the sample exceeded 500 mm total length (legally harvestable). Walleye ages ranged from 2 to 19 years with a mean age of 8.1. Walleye age distribution in Blackett Lake indicates three measureable year classes of 4, 9, and 13 year old fish, and there is evidence of significant recruitment failures in 2002, 2003, and 2004. For male walleye, 100% of fish 4 years or older were mature and for female walleye, 97% of fish 5 years or older were mature. For male walleye sampled, 5% exceeded 500 mm total length (legally harvestable) and were 13-16 years of age. For female walleye, 13% of fish sampled exceeded 500 mm total length and ranged from 9 to 16 years of age. Blackett 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 Blackett 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. Blackett 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.

## 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 lake's 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  $\pm$  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 and from yellow perch over 140 mm total length. Ages were interpreted 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 the additional 12 and 19 mm panels that were excluded from this analysis, were uploaded to the FWMIS database and referenced as Project ID#15755.

### Statistical Analyses

Catch-per-unit-effort (CUE) was calculated for walleye, northern pike, and yellow perch and expressed as fish $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup>. 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 & Maceina 2001).

## Results & Interpretation

The initial set date for the Blackett Lake FWIN survey was September 15, 2010 and it was completed on September 16, 2010. The surface temperature at all net locations fell between 12.1°C and 13.3°C and the mean net soak time was 23.1 h. A total of 295 fishes were captured (Table 1): 140 walleyes (47%), 44 northern pike (15%), 89 yellow perch (30%), 20 cisco (*Coregonus artedii*) (7%), and 2 spottail shiner (*Notropis hudsonius*) (1%). Calculated catch rates for sportfish were 21.8 walleye $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup> (95% C.I = 18.2 – 24.9), 6.9 northern pike $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup> (95% C.I = 4.3 – 9.9), and 17.0 yellow perch $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup> (95% C.I = 9.4 – 25.7) (Table 2). The calculated CUE for walleye (21.8 walleye $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup>) has a relative standard error of 0.08. The 2010 catch rate is consistent with the 2005 FWIN catch rate of 24.0 walleye $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup>. The CUE meets the criteria for a moderate catch rate, indicating a vulnerable population (Table 3), and is consistent with catch rates from other lakes in the province with the same classification.

A comparison of length distributions from 2005 and 2010 FWIN events suggests a nearly 60% decline (from 6.7 to 2.8 walleye $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup>) in density of walleye 470 – 500 mm in total length (Figure 1). This could be a result of illegal harvest of fish given the low probability of catching walleye over 500 mm total length in this system.

The 2005 FWIN indicated 2 measureable year-classes (having a catch rate of 3 fish $\cdot$ 100m<sup>-2</sup> $\cdot$ 24h<sup>-1</sup> or greater) of 4 (2001) and 9 (1996) year-old fish (Figure 2). In the 2010 age distribution, the 4 year-old fish from 2005 were evidently represented as a strong 9 year-old class; however, the 9 year-old fish from 2005 were not represented as a 14 year-old class in 2010. A strong 13 year-class is present in the 2010 data. The average age of

walleye sampled during the 2010 Blackett Lake FWIN survey was 8.06 years (n=139). Both the 2005 and 2010 FWINs provide evidence of recruitment failures in 2002, 2003, and 2004, contributing to classification of the fishery as vulnerable. Age-at-maturity analysis shows that male walleye began maturing at age 3 and 100% of 4-year-old male walleye were mature (Figure 3). Female walleye began maturing at age 4 and 100% of 6-year old female walleye were mature (Figure 4).

Von Bertalanffy growth curves for Blackett Lake provide evidence that only a small portion of the population will exceed 500 mm total length and be susceptible to legal harvest (Figure 5). Female walleye reached 500mm total length by approximately age 16. Male walleye had a  $L_{inf}$  of 497.5 mm total length, suggesting that the majority of male walleye will never reach 500 mm total length. Of the male walleye sampled during this FWIN survey, 5 of the 91 males met or exceeded 500 mm.

## Discussion

The mean walleye catch rate of  $21.8 \text{ walleye} \cdot 100\text{m}^{-2} \cdot 24\text{h}^{-1}$  is lower than the 2005 catch rate of  $24.0 \text{ walleye} \cdot 100\text{m}^{-2} \cdot 24\text{h}^{-1}$ . The walleye densities in Blackett and Jackson lakes remained relatively stable over the last 5 years.

The 2005 FWIN survey indicated two measurable year-classes of 4 and 9 year old walleye. The strong 4-year-old age class is represented in the 2010 FWIN data as a measurable age class of 9 year-old walleye. The second measurable age class from the 2005 survey was not represented as a strong 14-year class in the 2010 FWIN data; however, there was evidence of a strong 13 year-old age class. This suggests that the fish identified in 2005 as recruits from 1996, may be recruits from 1997. This is consistent with strong 1997 year-classes observed in other walleye populations throughout the Lakeland Area (D.Latty, personal communication). After reviewing the ageing data, this discrepancy may be attributed to walleye age determination being based on opercula in 2005 and otoliths in 2010. This may have been compounded by favorable growth conditions in 1998 making identification of early annuli more difficult on opercula.. 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.

Based on the maturation schedule (full maturation by age 6) and growth rates, female walleye should be provided the opportunity to spawn approximately ten times before being susceptible to legal harvest. Many walleye will never reach harvestable size.

Despite slow growth rates, the CUE and other matrix values provide strong evidence for a “vulnerable” stock classification.

Table 1. Total catch of all species for the Blackett Lake 2010 FWIN (8 panels). Set coordinates are Universal Transverse Mercator Zone 12, North American Datum 83.

Catch Summary for Blackett Lake 2010 FWIN (8 Panel)											
Set ID	Easting	Northing	Pull Date	Soak Time (Hours)	WALL	NRPK	YLPR	WHSC	CISC	SPSH	All Species Total
10	464421	6073577	14-Sep-10	25.5	14	1	2	0	2	0	19
12	464929	6074306	14-Sep-10	26.8	8	8	21	0	0	0	37
13	465442	6074005	14-Sep-10	24.5	12	6	16	0	4	2	40
16	465786	6073857	15-Sep-10	23.1	16	2	0	0	0	0	18
17	464662	6074080	15-Sep-10	23.0	13	5	3	0	4	0	25
18	465043	6073107	15-Sep-10	23.0	7	3	4	0	2	0	16
2	464471	6074585	14-Sep-10	25.6	12	1	2	0	1	0	16
5	464807	6072703	14-Sep-10	24.0	12	9	3	0	5	0	29
6	465871	6073302	14-Sep-10	24.3	12	3	4	0	1	0	20
7	463462	6074213	14-Sep-10	24.4	15	2	27	0	1	0	45
8	463176	6073645	14-Sep-10	24.0	5	2	2	0	0	0	9
9	463886	6074327	14-Sep-10	24.3	14	2	5	0	0	0	21
<b>Total:</b>					<b>140</b>	<b>44</b>	<b>89</b>	<b>0</b>	<b>20</b>	<b>2</b>	<b>295</b>

Table 2. CUE (fish·100m<sup>-2</sup>·24h<sup>-1</sup>) and 95% confidence intervals for 2005 and 2010 Blackett Lake FWINs.

Species	Year	CUE	95% CI
WALL	2005	24.0	18.3 - 30.6
	2010	21.8	18.2 - 24.9
NRPK	2005	9.6	7.6 - 11.3
	2010	6.9	4.3 - 9.9
YLPR	2005	11.9	4.9 - 17.7
	2010	14.0	4.5 - 10.0

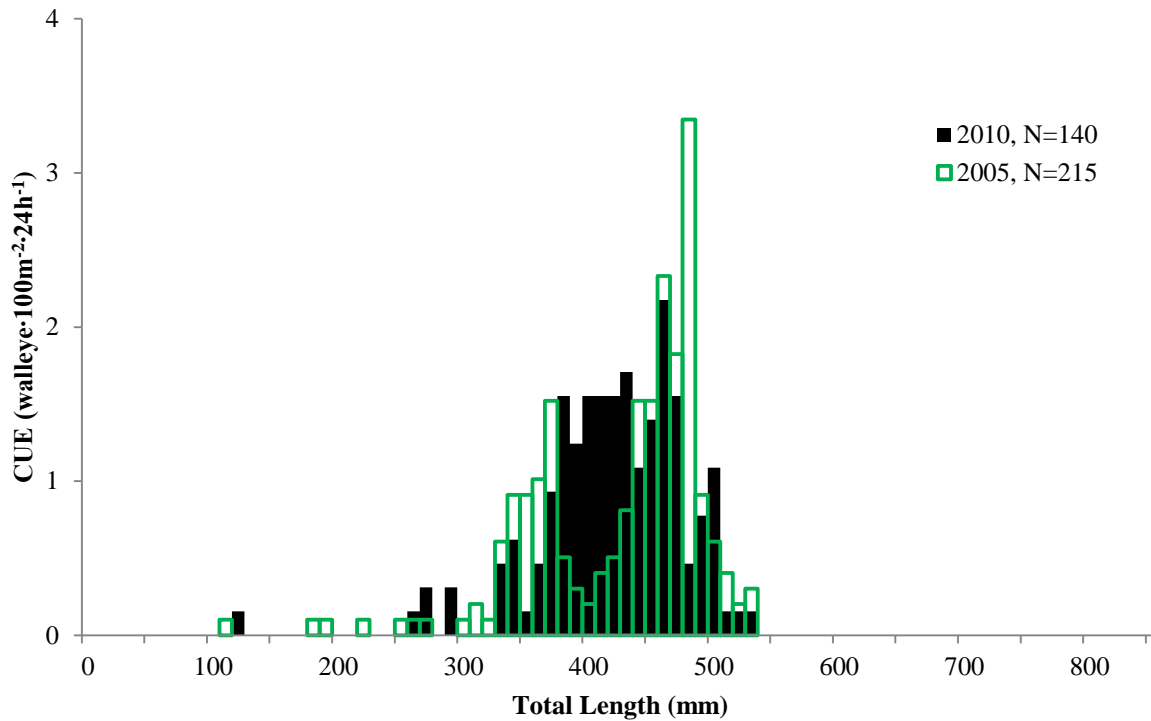


Figure 1. Comparison of walleye total-length frequency distributions for Blackett Lake 2005 and 2010 FWIN. Data are displayed as CUE for 10 mm total-length increments.

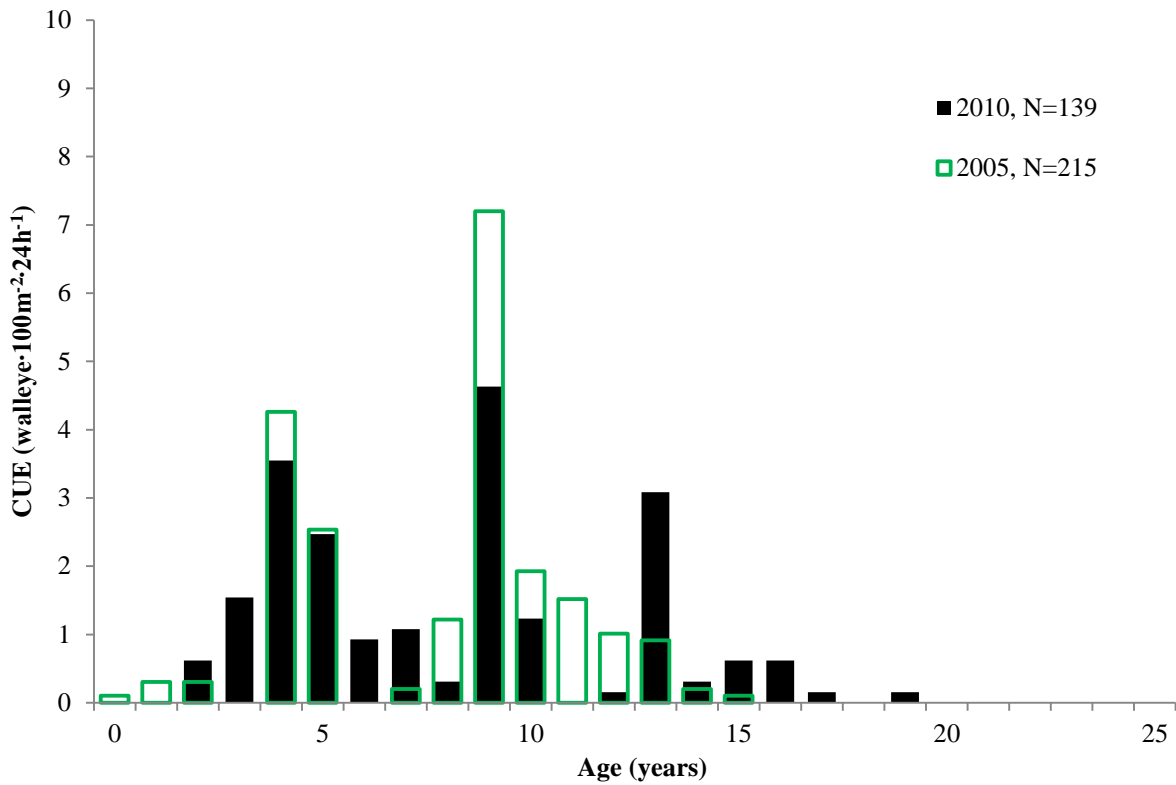


Figure 2. Comparison of walleye age frequency distributions for Blackett Lake 2005 and 2010 FWIN. Data are displayed as CUE (walleye·100m<sup>-2</sup>·24h<sup>-1</sup>) for individual year classes.

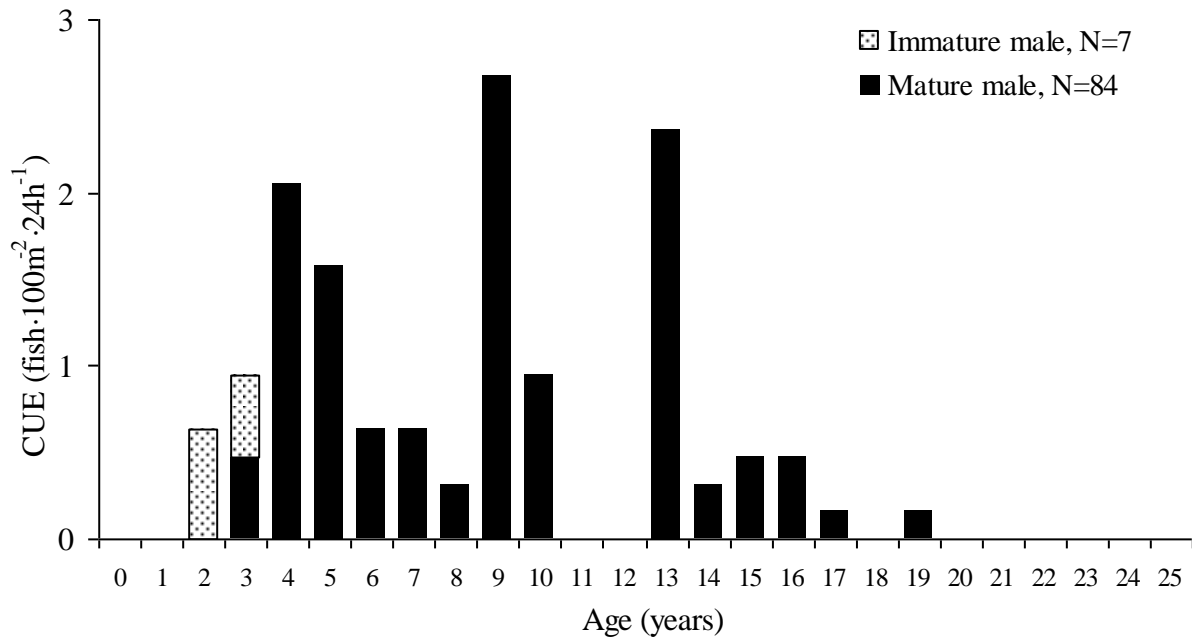


Figure 3. Age-at-Maturity frequency distribution for male walleye for Blackett Lake 2010. Data are displayed as CUE for individual year classes by maturity.

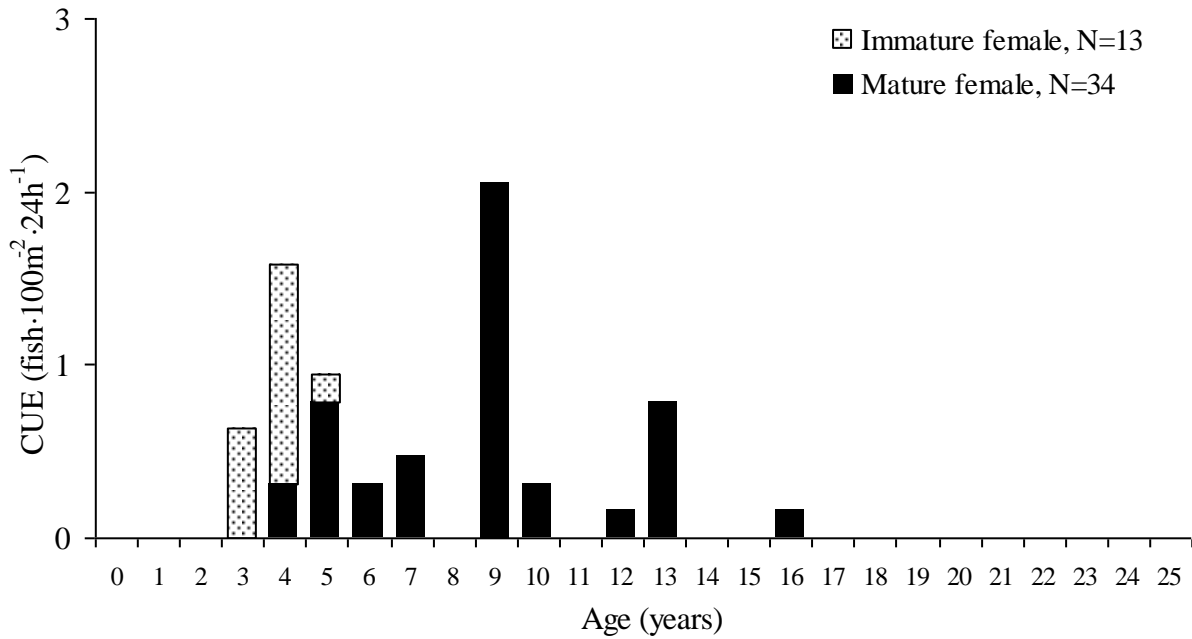


Figure 4. Age-at-Maturity frequency distribution for female walleye for Blackett Lake 2010. Data are displayed as CUE for individual year classes by maturity.

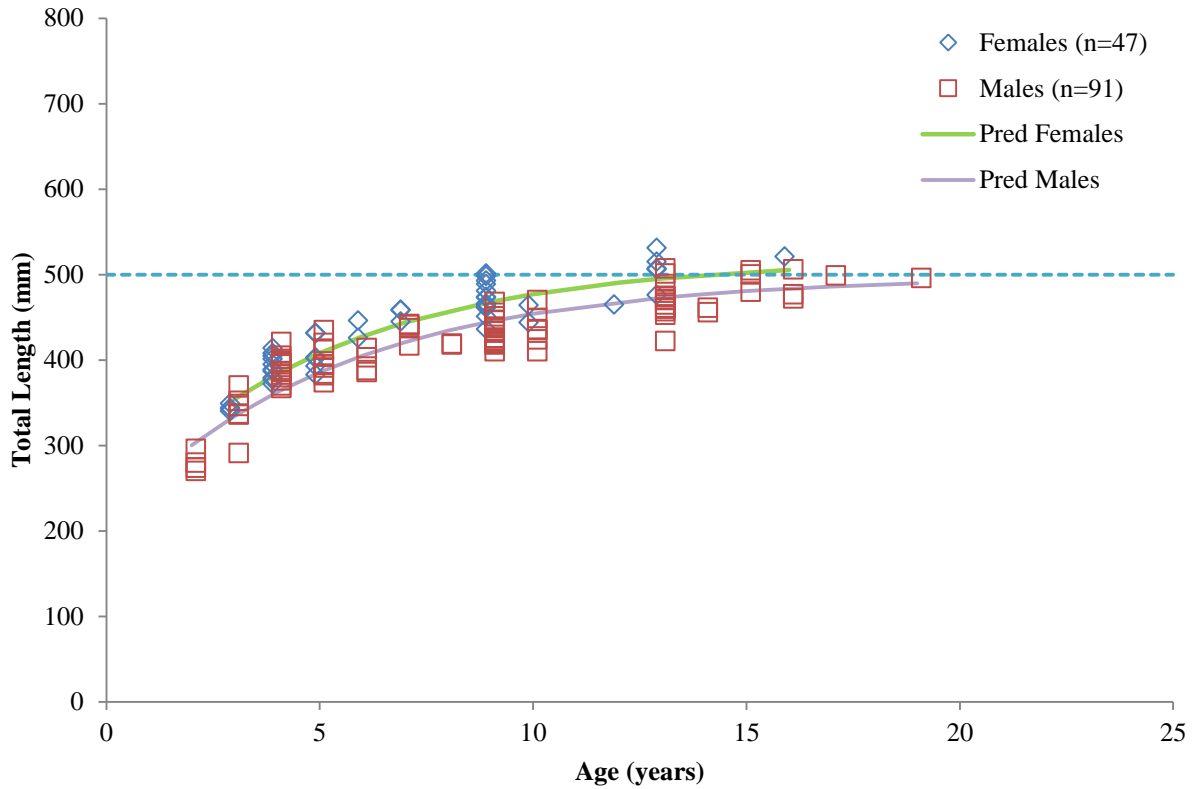


Figure 5. Length-at-Age function and Von Bertalanffy growth curve for male and female walleye for Blackett Lake 2010 FWIN. Data are displayed as total length for individual year classes by sex. Female walleye total length-at-age ( $L_{inf} = 517.6$  K = 0.199,  $t_0 = -2.783$ ), male walleye total length-at-age ( $L_{inf} = 497.5$  mm, K = 0.189,  $t_0 = -2.885$ ).



Table 3. Walleye Stock Classification for Blackett 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 <sup>-2</sup> ·24h <sup>-1</sup>	High - >30 Walleye: 100m <sup>-2</sup> ·24h <sup>-1</sup>	Moderate: 15-30 Walleye: 100m <sup>-2</sup> ·24h <sup>-1</sup>	Low: <15 Walleye: 100m <sup>-2</sup> ·24h <sup>-1</sup>
<b>CUE= 24.0</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 mean age = 8</b>				
AGE-CLASS STABILITY	Very stable: 1 to 2 "measureable" (> 3 walleye: 100m <sup>-2</sup> ·24h <sup>-1</sup> ) 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 "measureable" age classes.
<b>3 measureable age classes; 4, 9 and 13-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: approx. 5 years Males: 3-4 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: L<sub>inf</sub> is 497.5 mm Females: by age 16</b>				

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