BEAVER LAKE FALL WALLEYE INDEX NETTING SURVEY, 2011

Fisheries Management
Waterways-Lac La Biche Area

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Abstract

This Fall Walleye Index Netting (FWIN) survey was conducted on Beaver Lake from October 5-7, 2011. A total of 223 fish representing seven species were caught during the survey. The catch rate for walleye (*Sander vitreus*) was 6.2 fish/100m^2/24 hr. The walleye total lengths (n=107) ranged from 120 to 600 mm with fish over 500 mm representing 44% of the catch. There were a wide range of age-classes present (ages 0-13, 15-19) in 2011, but only ten-year-olds were abundant above one fish/100m^2/24 hr. Eighty-three percent of the walleye sampled were mature. Males were first mature at age three and all were mature at age-four in the sample. Females were first mature at age-five and were also all mature at age-five in the sample. The growth curve for males reached 500 mm TL at age 10 and L_{inf} was 503.8 mm TL. Females reached 500 mm TL at age six and L_{inf} was 573.7 mm TL. For Beaver Lake in 2011 all five of the population metrics rate the walleye population as being collapsed, which is a downgrade from the stable-vulnerable classification it had in 2006.

Other species caught were northern pike (n=50), yellow perch (n=44), lake whitefish (n=15), white sucker (n=4), spottail shiner (n=2) and burbot (n=1).

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. These data are essential to provide sustainable harvest allocations for sport fish. This FWIN survey was conducted in early October 2011 as a follow-up to the 2006 survey to compare abundance, structure, and reproduction (recruitment) in the walleye population at Beaver Lake.

Methods

This FWIN survey was conducted from October 5-7, 2011. 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 to collect forage species information for a regional dataset. Nets were set at sixteen sites randomly selected and weighted by depth stratum. Nets were set for 24 hrs (± 3 hrs) 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 locations 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 10 and 12°C.

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*), and lake whitefish (*Coregonus clupeaformis*) were examined for gender and maturity, and a bony structure was removed for ageing. Otoliths were collected from walleye and yellow perch and aged following criteria in Watkins and Spencer (2009). Cleithrum 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 FAMS 1.0 (Slipke 2010).

For the analysis only data from fish caught in the standard eight panel FWIN nets is presented in the report. The additional data collected from the 12 and 19 mm panels is not relevant to this survey. Relative abundance expressed as CPUE was calculated as number of fish caught/100 m^2/net/24 hours with 95% confidence intervals empirically determined by bootstrapping catches to 10,000 replications (Haddon 2001).

Data from the 2006 Beaver Lake FWIN (Marios-Ewaskiw 2009) was reanalyzed for this report. 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, including that from the 12 and 19 mm panels, is stored digitally in the Fish and Wildlife Management Information System (FWMIS), project #7348.

Results

A total of 223 fish representing seven species were caught during the survey (Table 1). The catch rate for walleye was 6.2 fish/100m^2/24 hr (95% C.I. 4.0-8.7) (Table 2), which is similar to other lakes with collapsed populations in Alberta (Figure 1) and a 73% decrease from the 22.9 fish/100m^2/24 hr (95% C.I. 19.0-27.3) caught in 2006 (Table 2). Walleye total lengths (n=107) ranged from 120 to 600 mm (Figure 2) with fish over 500 mm representing 44% of the catch. Although the size range was similar between 2006 and 2011, the abundance of all size classes has markedly decreased, especially in the 350 to 500 mm TL size category. There were a wide range of age-classes present (ages 0-13, 15-19) in 2011, but only ten-year-olds were abundant above one fish/100m^2/24 hr (Figure 3). Eighty-three percent of the walleye sampled were mature. Mean age-at-maturity is difficult to determine due to age-class gaps and low sample sizes (Figure 4); however, some males were mature at age three and all were mature at age-four in the sample. Females were first mature at age-five and were also all mature at age-five in the sample, though the sample was small (n=3). The growth curve for males reached 500 mm TL at age 10 and L_{inf} was 503.8 mm TL. Females reached 500 mm TL at age six and L_{inf} was 573.7 mm TL.

The catch rate for northern pike was 2.9 fish/100m^2/24 hr (95% C.I. 1.9-3.9) in 2011 which is a 52% decrease from the 6.1 fish/100m^2/24 hr (95% C.I. 4.4-7.6) caught in 2006 (Table 2). Northern pike total lengths (n=50) ranged from 100 to 1020 mm TL (Figure 6) with fish over 630 mm TL representing 38% of the catch. Although the size range was similar between 2006 and 2011, the abundance of all size classes has decreased, especially in the 580 to 650 mm TL size category. There were a few more of the larger size classes (700-720, 1010-1020 mm) present in 2011 then in 2006. In 2011, the smaller size classes from 200-350 mm were absent. Although there were a similar number of age-classes present in both 2011 and 2006, year-class strengths were much lower in 2011, with the exception of age-three fish (Figure 7). The catch rate for yellow perch was 2.6 fish/100m^2/24 hr (95% C.I. 1.7-3.7) which is a large decrease from the 9.5 fish/100m^2/24 hr (95% C.I. 6.7-12.4) caught in 2006 (Table 2).

Other species caught were white sucker (*Catostomus commersonii*) (n=4), spottail shiner (*Notropis hudsonius*) (n=2) and burbot (*Lota lota*) (n=1) (Table 1).

Interpretation

For Beaver Lake in 2011 all five of the population metrics rate the walleye population as being collapsed (Table 3), which is a downgrade from the stable-vulnerable classification it had in 2006 (Marois-Ewaskiw 2009).

Table 1. Species catch summary by site, Beaver Lake, October 2011.

Site	Lift Date (2011)	Stratum	UTM Easting[a]	UTM Northing[a]	Set Duration (hours)	Number of fish caught							
						BURB	LKWH	NRPK	SPSH	WALL	WHSC	YLPR	Total
BL 02	Oct 7	Deep	700470	6068313	22.97	0	1	6	0	6	0	5	18
BL 03	Oct 7	Deep	701668	6066357	22.30	0	0	4	1	19	0	9	33
BL 06	Oct 6	Deep	701984	6065191	23.72	0	0	5	0	15	0	3	23
BL 07	Oct 6	Deep	703910	6065997	24.00	0	0	1	0	12	0	2	15
BL 09	Oct 6	Deep	710200	6061289	24.27	0	0	0	0	7	1	2	10
BL 10	Oct 7	Deep	707178	6063069	22.70	0	0	1	0	6	0	3	10
BL 13	Oct 6	Deep	707610	6060699	25.08	0	0	1	0	5	0	3	9
BL 17	Oct 6	Deep	699654	6069853	23.42	0	0	4	0	6	0	1	11
BL 19	Oct 6	Deep	707371	6062443	23.67	0	0	1	0	8	0	2	11
BL 21	Oct 7	Deep	704601	6064535	23.00	0	1	3	0	8	0	2	14
BL 22	Oct 7	Deep	710045	6060919	22.08	1	0	0	0	1	1	3	6
BL 30	Oct 6	Shallow	707105	6063645	23.32	0	1	4	0	2	0	0	7
BL 31	Oct 6	Shallow	705203	6062561	24.33	0	7	6	0	0	0	1	14
BL 33	Oct 6	Shallow	699260	6068543	22.65	0	1	6	0	8	0	4	19
BL 35	Oct 6	Shallow	700340	6066649	23.97	0	0	2	0	1	0	0	3
BL 36	Oct 7	Shallow	702309	6064883	22.88	0	4	6	1	3	2	4	20
				Grand Total		1	15	50	2	107	4	44	223

[a] UTM 12U, NAD 83 map datum

Table 2. Species catch rates from the 2006 and 2011 Beaver Lake FWIN surveys.

Species	Year	CPUE (fish/100m^2/24 hr)	95% CI
Burbot	2011	0.1	(0.0-0.2)
Lake whitefish	2011	0.9	(0.2-1.7)
Northern pike	2006	6.1	(4.4-7.6)
	2011	2.9	(1.9-3.9)
Spottail shiner	2011	0.1	(0.0-0.1)
Walleye	2006	22.9	(19.0-27.3)
	2011	6.2	(4.0-8.7)
White sucker	2011	0.2	(0.0-0.5)
Yellow perch	2006	9.5	(6.7-12.4)
	2011	2.6	(1.7-3.7)

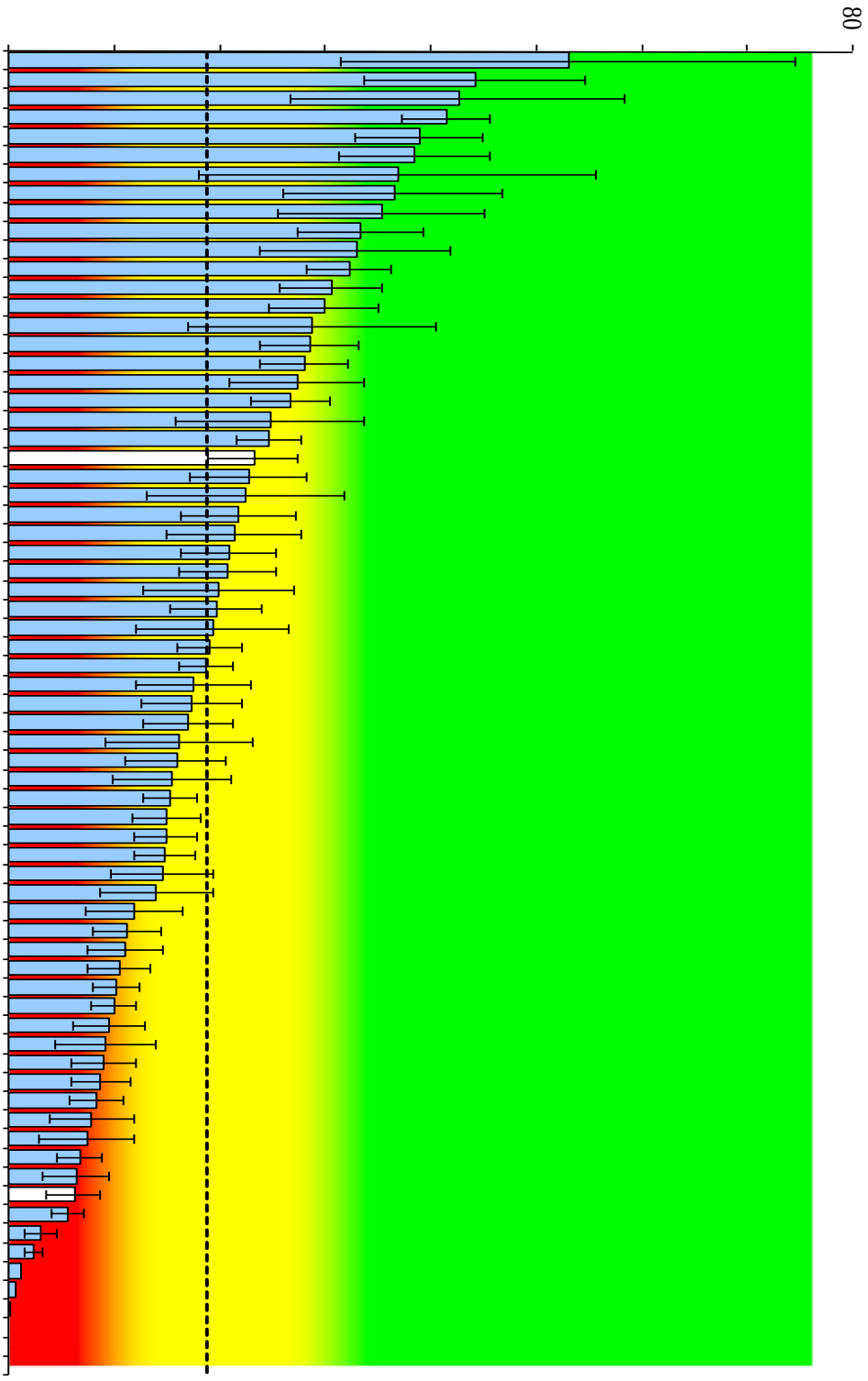

Figure 1. Mean walleye catch rates with 95% CI from a representative sample of FWIN surveys from across Alberta. The dashed line represents the mean provincial catch rate of 18.8 fish/100m^2/24 hr. Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds. The walleye catch rates from the 2006 and 2011 Beaver Lake FWIN surveys are highlighted.

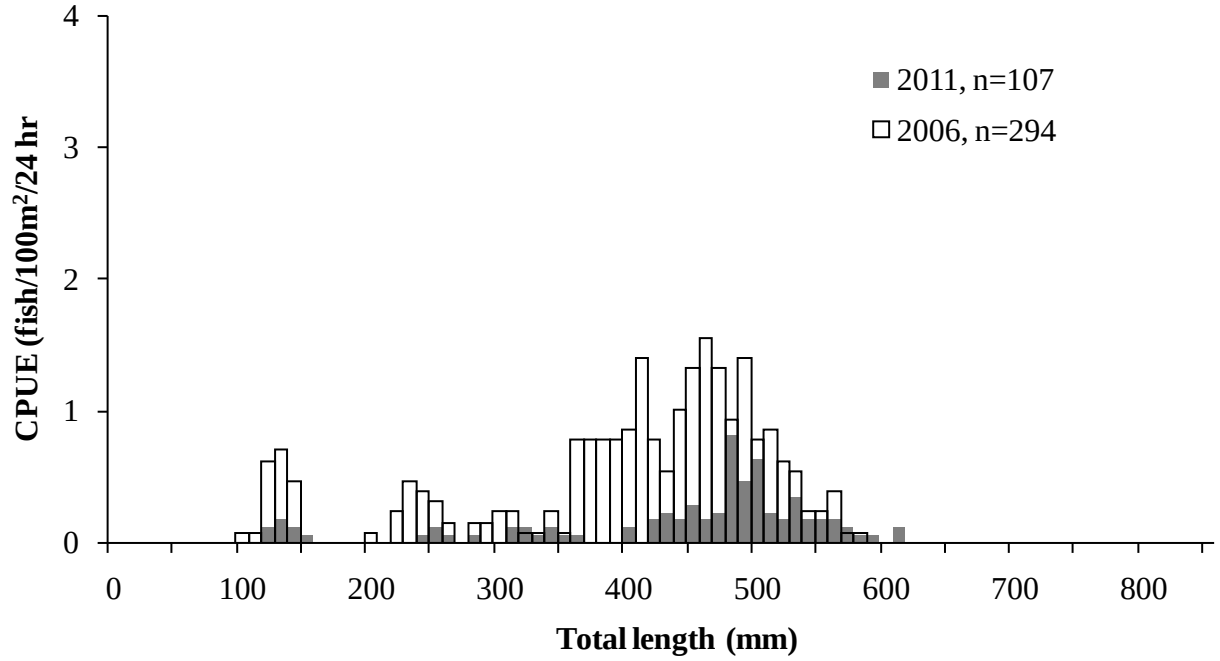

Figure 2. Walleye total length frequency distributions from the 2006 and 2011 FWIN surveys on Beaver Lake. Dashed line denotes the 50 cm TL minimum size limit.

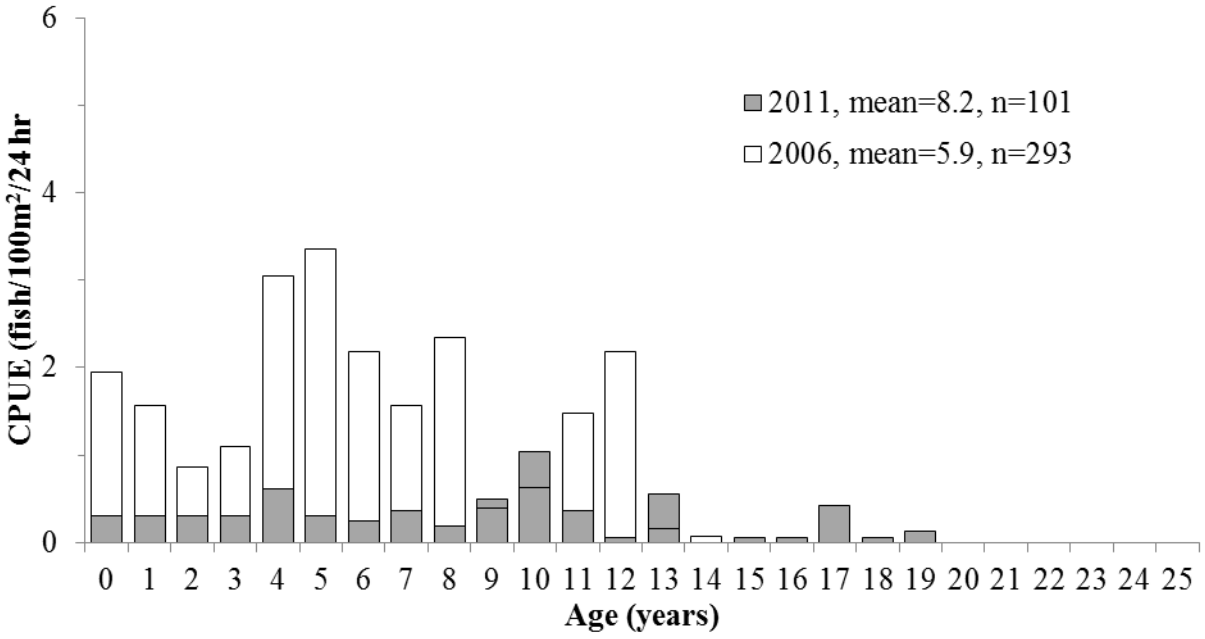

Figure 3. Walleye age frequency distributions from the 2006 and 2011 FWIN surveys on Beaver Lake.

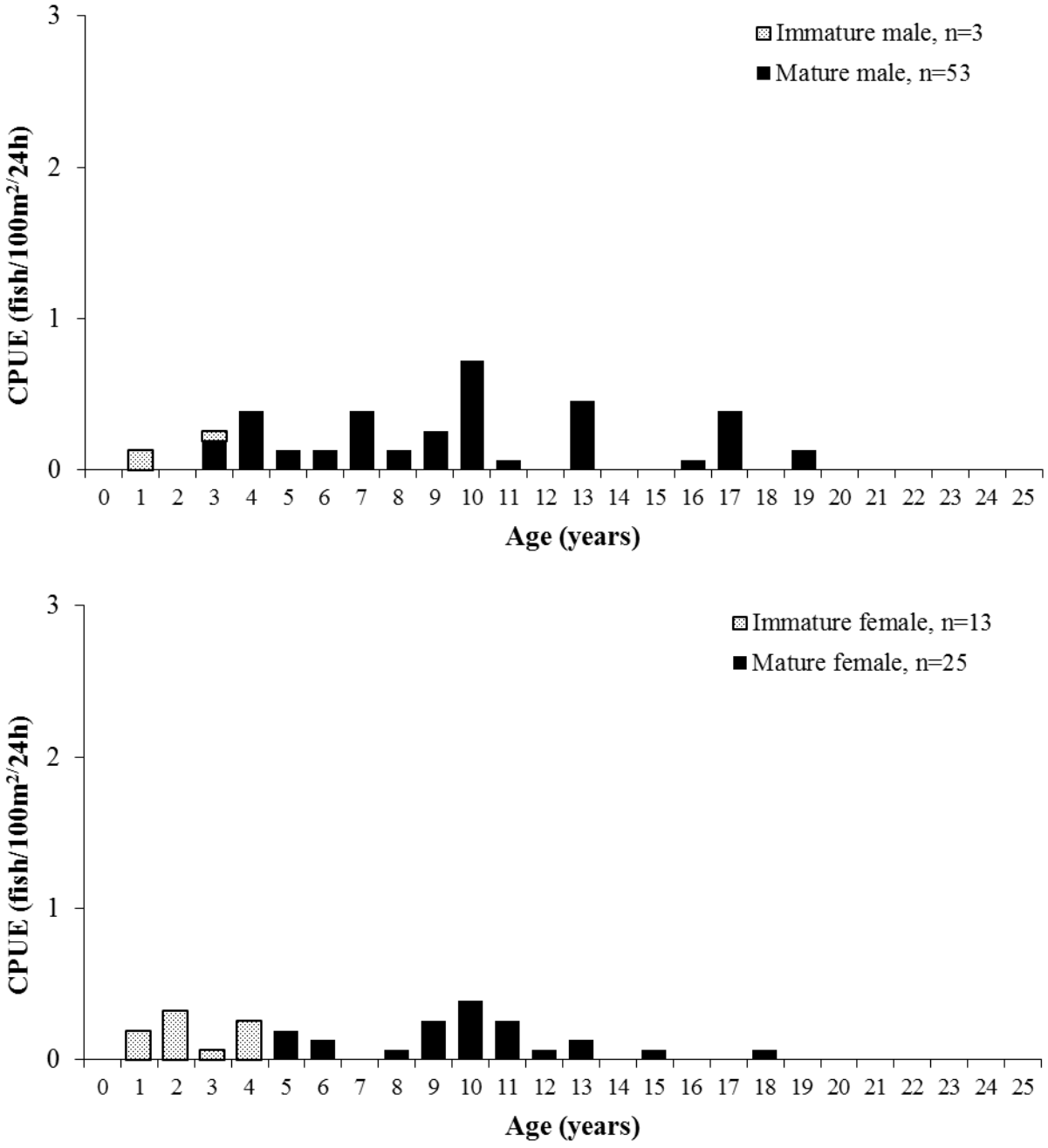

Figure 4. Age-at-maturity distributions for male (top) and female (bottom) walleye from the 2011 FWIN survey on Beaver Lake.

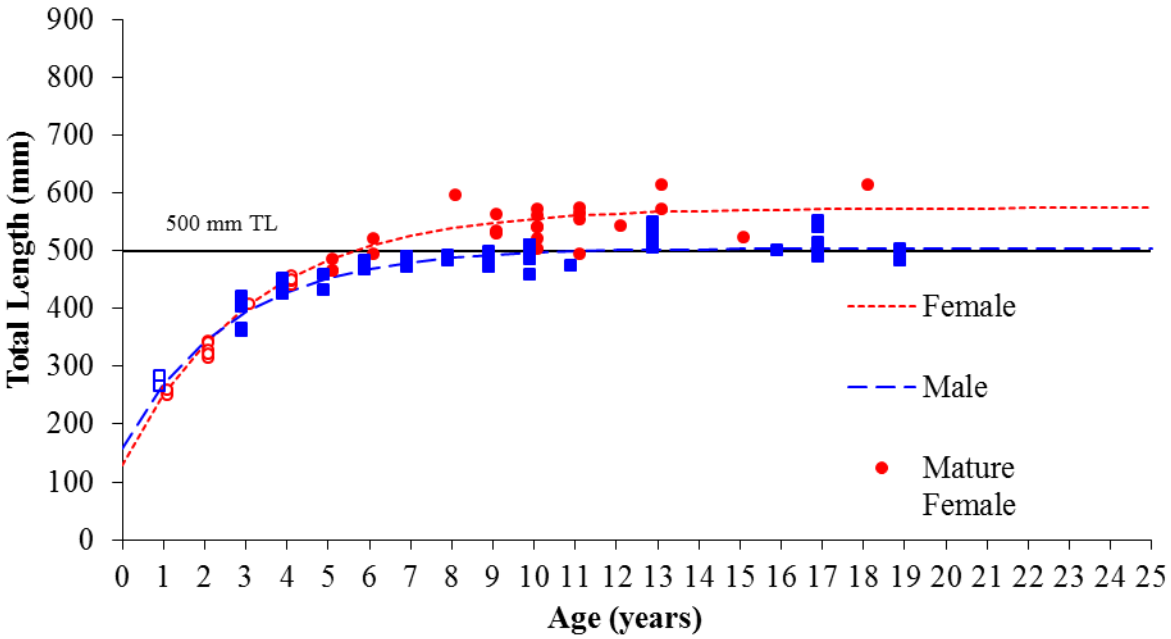

Figure 5. Von Bertalanffy growth curves for female (L_{inf} = 573.7, K = 0.319, t_o = -0.8, R^2 = 0.93, Prob > 0.0001) and male (L_{inf} = 503.8, K = 0.383, t_o = -0.984, R^2 = 0.99, Prob > 0.0001) walleye from the Beaver Lake FWIN survey, 2011.

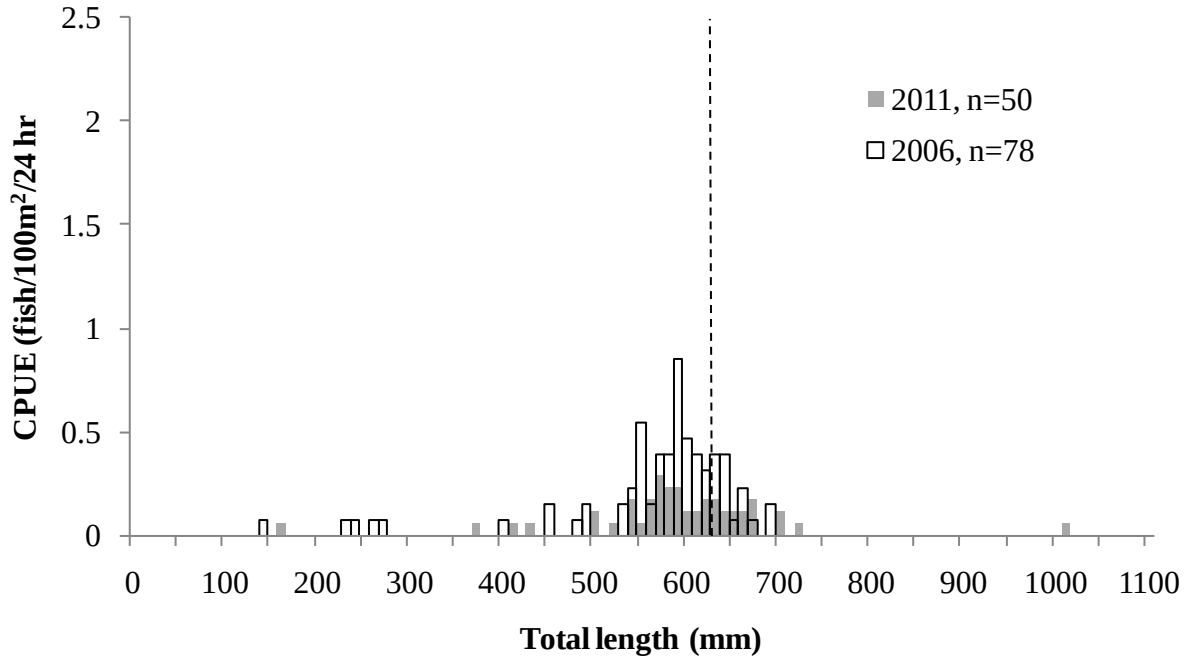

Figure 6. Northern pike total length frequency distributions from the 2006 and 2011 FWIN surveys on Beaver Lake. Dashed line denotes the 63 cm TL minimum size limit.

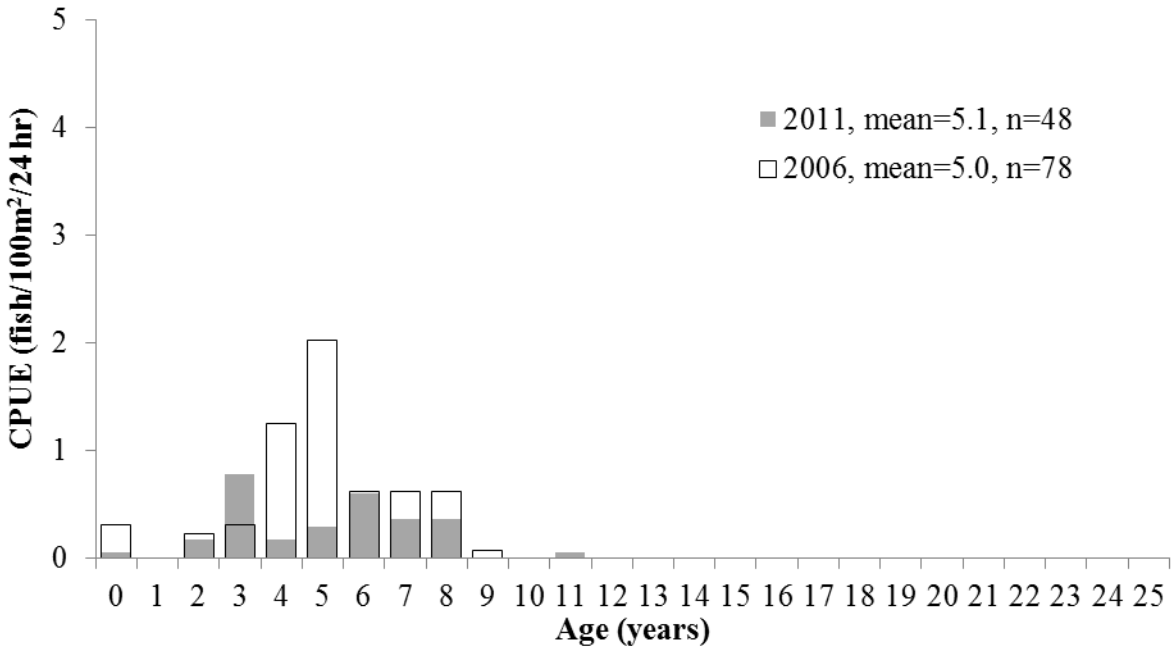

Figure 7. Northern pike age frequency distributions from the 2006 and 2011 FWIN surveys on Beaver Lake.

Table 3. Walleye stock classification for Beaver Lake based on the 2011 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 = 6.16
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=101); mean age = 8.2
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.
				No measureable age class; low abundance of several 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 5; males fully recruited at age 4.
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 6; males reach 50 cm at age 9; pooled reach 50 cm at age 7.

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