Hutch Lake Fall Walleye Index Netting Survey 2011

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HUTCH LAKE

FALL WALLEYE INDEX NETTING SURVEY 2011

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ABSTRACT

A Fall Walleye Index Netting (FWIN) survey was conducted at Hutch Lake reservoir in September 2011 to assess the abundance and structure of the walleye (*Sander vitreus*) population that was stocked and determine if natural recruitment is taking place. The current angling regulation provides a daily limit of one walleye over 50 cm total length.

The 2011 walleye catch rate was 12.9 fish·100m^{-2}·24hrs^{-1}. This catch rate is considered moderate (vulnerable status) based on current ASRD criteria and ranks well below the provincial average of 18.4 fish·100m^{-2}·24hrs^{-1}. The 2011 age-class distribution was poorly represented by only one age-class (age 4) and would be characterized as unstable. The lack of any other measurable age-class indicates there is no significant recruitment occurring. Walleye had fast growth rates reaching a mean total length of 500 mm by age 4, and early maturation rates with both males and females maturing at age 4.

Walleye population metrics for Hutch Lake in 2011 ranged from vulnerable to collapsed. The population status is best classified as collapsed and has not developed a self-sustaining population.

Hutch Lake is managed for northern pike with the current regulation allowing a harvest of one over 63 cm. The 2011 catch rate for northern pike was 3.8 fish·100m^{-2}·24hrs^{-1}. The lack of any pike smaller than 500 mm may indicate recruitment failures.

Previous surveys noted a lack of small-bodied forage fish. Brook stickleback appear to have become broadly established in Hutch Lake. They were present in small mesh nets and the only species present (identifiable remains) in walleye stomach contents. No other small bodied fish were present. White sucker (native) and yellow perch (stocked) were not captured.

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INTRODUCTION

The Fall Walleye Index Netting (FWIN) survey (Morgan 2000) is a standardized method for indexing walleye (*Sander vitreus*) populations that has been adapted as a fisheries management standard by the Fisheries Management Branch of Alberta Sustainable Resource Development (ASRD). The FWIN protocol allows fisheries managers to compare population trends over time or between populations in order to monitor the effects of management strategies. Individual populations are assessed and classified as stable, vulnerable, or collapsed as per Alberta's Walleye Management and Recovery Plan (Berry 1995). Management strategies are implemented with the goal of recovering and/or maintaining stable self-sustaining walleye fisheries.

Hutch Lake is a reservoir in the upper reach of the Meander River. The dam was completed in 1989 and attempts have been made to establish populations of walleye and yellow perch (*Perca flavescens*) through the fish stocking program. Northern pike (*Esox lucius*) and white sucker (*Catostomus commersoni*) were present as native species to the Meander River (Schroeder 1998).

The lake is eutrophic (Alberta Environment 2009) and experiences periodic winterkill events including partial winterkills in 2001/02 and 2002/03 which reduced fish densities (Schroeder 2003). A major winterkill in 2004/05 depleted fish stocks and transplants of both walleye and northern pike were made from Rainbow Lake. The last major walleye stocking was made in 2007 with approximately 250,000 fry stocked. The fish community in Hutch Lake is currently composed of walleye, northern pike and brook stickleback (*Culaea inconstans*). Yellow perch (stocked) and white suckers (native) were not present in this survey.

Fishing pressure in Hutch Lake is in the form of recreational angler harvest. The lake is currently being managed with a daily limit of 1 walleye over 50 cm and 1 northern pike over 63 cm. Hutch Lake has been test netted in previous years; however no prior FWIN survey has been conducted.

The Fisheries Management Branch conducted this FWIN survey at Hutch Lake on September 6 – 8, 2011 to obtain information regarding the current abundance and structure of the walleye population. Survey objectives included:

1. Determine the walleye catch rate (catch per unit effort) as an index of abundance.

2. Estimate other walleye population metrics including age-class distribution and stability, age-at-maturity, and growth rate.
3. Estimate northern pike catch rates and population metrics.

STUDY AREA

Hutch Lake (Twp 112, Rge 20, W5M; FWMIS Waterbody ID# 4886) is located approximately 630 km northwest of Edmonton, Alberta and 30 km north of High Level, Alberta (Fig. 1) near Mt Watt in the Boreal Forest natural subregion. Hutch Lake was created by damming the upper reach of the Meander River, a tributary to the Hay River.

Hutch Lake is long and narrow, approximately 11.5 km long and 0.5 km wide, with a surface area of 610 ha and a maximum depth of 8.0 meters (Schroeder 2003). The maximum depth recorded at netting sites during this survey was 7.2 m (Appendix 1). There are several intermittent inlet streams and a large wetland complex at the southeast end of the lake. The reservoir outlet is the source of the Meander River, which flows approximately 37.5 km (straight line distance) northwest to the Hay River confluence.

The Hutch Lake watershed lies within in an area of rolling topography with mixed boreal forest and wetlands. Forested areas in the watershed are developed for logging. The lake shoreline is largely undeveloped, consisting of a recreation area near the dam that includes a campground and boat launch; and a few small rural acreages to the north of the lake.

Overall, Hutch Lake is a small lake with limited productive capacity.

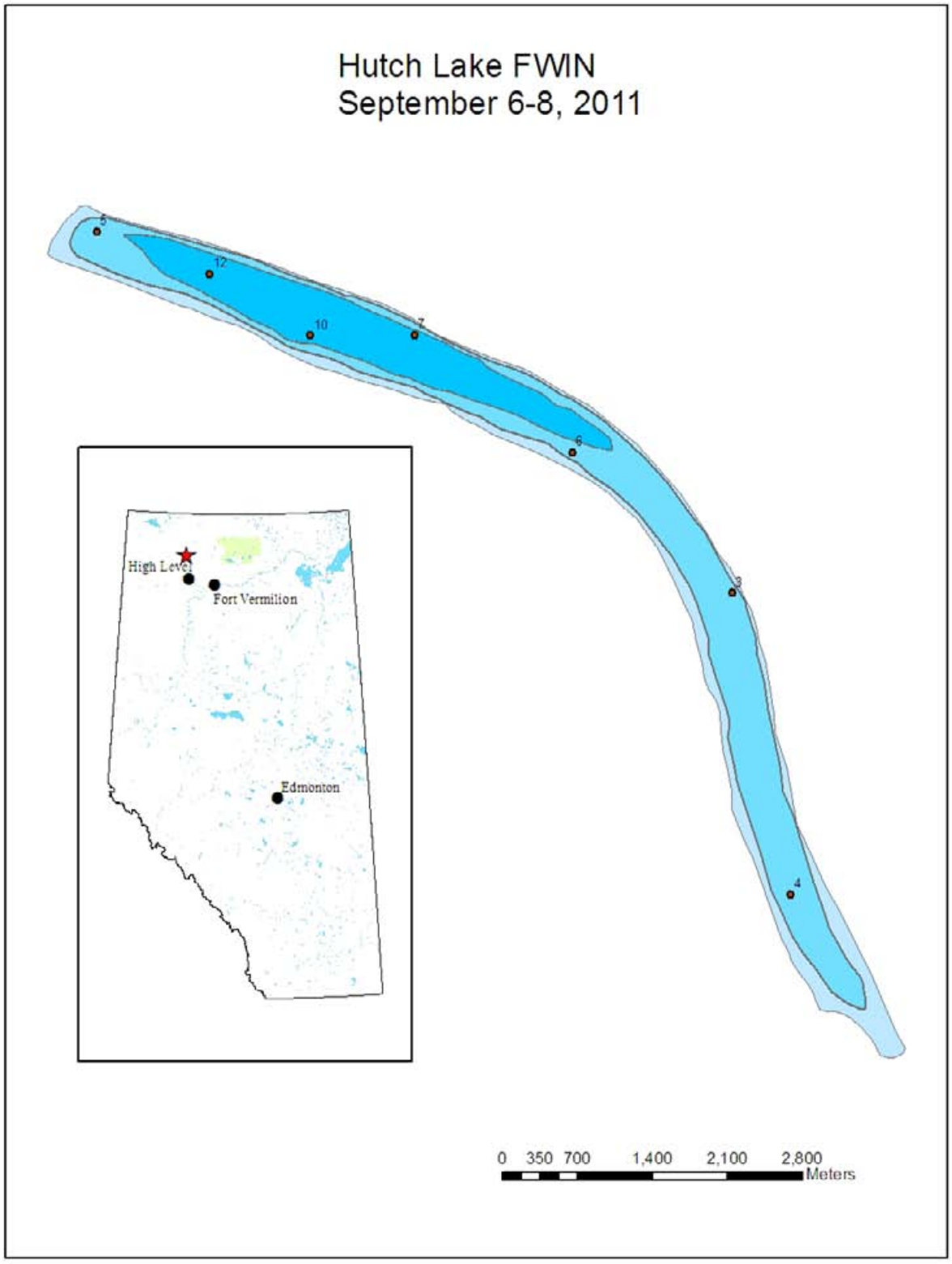

Figure 1. Location of Hutch Lake, Alberta and 2011 FWIN survey sample locations.

METHODS

Sampling Design

In general, the sampling design followed the Fall Walleye Index Netting (FWIN) protocol (Morgan 2000). A stratified random sampling design was employed. The lake was stratified by depth (shallow 2 – 5 m; deep 5 – 15 m) and sampling effort was allocated proportionately to the surface area of the depth stratum. A progressive sampling approach was used to ensure a minimal number of nets were set to reach precision levels adequate to detect biologically meaningful differences in the catch rate of walleye. Desired precision levels (< 20% relative standard error), and adequate biological samples were found after 7 sample sites: 4 sites were in the shallow stratum and 3 of the sample sites were in the deep stratum (Fig.1, Appendix 1).

The FWIN nets used in this survey were standard length; consisting of eight panels of different mesh sizes (25, 38, 51, 64, 76, 102, 127, and 152 mm stretched mesh) sewn together in ascending order of size, 1.8 m deep x 3.8 m long with a total net length of 61 m and an area of 109.8 m^2.

Net gangs at three sites (sites 6, 7, 10) included additional small mesh panels of 12 and 19 mm separated from the standard gang by ten meter leads to collect data on juveniles and small fish species (Appendices 1- 4). For the purposes of this report, only fish caught in the standard FWIN nets are included in the analysis.

Nets were set perpendicular to depth contours at each sample site. Net locations (Fig. 1) were identified with handheld GPS units, minimum and maximum depths for each net gang were identified by sonar. Surface water temperature was also recorded at all net locations. Nets were set for 24 hrs (+/- 3 hrs) before being retrieved and cleared of fish.

Biological Data

All fish species caught were collected, bagged and tallied at each sample site by mesh size. Biological data collected included: fork length (FL), total length (TL), weight, sex, maturity, gonad weight (mature female walleye only), and stomach contents. Otoliths were collected from walleye for ageing and prepared following Watkins and Spencer (2009).

Cleithrums were collected from northern pike for ageing and prepared following Mackay et al (1990). Fish ages were determined by C. Lyttle.

Data Analysis

Walleye catch per unit effort (CUE) was reported as fish·100m^{-2}·24hrs^{-1} and calculated for each sample site:

$$CUE = No.\ of\ fish \times \left(100\ m^2 / (109.8\ m^2)\right) \times (24\ hrs / set\ time\ hrs)$$

The CUEs were bootstrapped (50,000 replications) to determine upper and lower confidence intervals to 95% (Haddon 2001). The overall catch rate was calculated as a maximum likelihood estimate (MLE).

Walleye total length and age distributions and age-at-maturity and were determined to assess the stock status according to modified guidelines of the Walleye Management and Recovery Plan (Berry 1995, Sullivan 2003). Growth rate (length-at-age) could not be estimated due to an insufficient number of age classes.

Northern pike catch rates and other metrics were also analysed but must be interpreted with caution.

All data were analysed and reported on Microsoft Office 2000 or 2007. The data set for this study is stored in the ASRD Fisheries and Wildlife Management Information System (FWMIS) provincial database under project number 16099.

RESULTS AND DISCUSSION

The 2011 FWIN survey at Hutch Lake was conducted September 6 – 8. Water temperatures ranged between 15.2 – 16.3ºC. Seven FWIN nets were set with a mean soak time of 22.4 hours, ranging from 21.7 to 23.1 hours (Appendix 1).

Overall Catch

A total of 119 fish representing three species were caught in the FWIN nets with walleye comprising 76% of the catch (n = 91). The remainder of the catch was composed of northern pike 23% (n = 27), and brook stickleback <1% (n = 1) (Appendices 2 – 3). An additional 8 brook stickleback were captured in the non-FWIN small mesh nets (Appendix 4). Additionally, brook stickleback were the only species present (identifiable remains) in stomach contents of

captured walleye and may represent the only small-bodied fish species present in Hutch Lake. White sucker (native) and yellow perch (stocked) were not captured in this survey.

Walleye Catch Rate

The walleye catch per unit effort (maximum likelihood estimate) was 12.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 16.3 – 19.4) (Fig. 2). This catch rate is considered low and indicates a stock status of 'vulnerable' (Table 1). The Hutch Lake catch rate ranks well below the provincial average of 18.4 fish·100m^{-2}·24hrs^{-1} (Fig. 3).

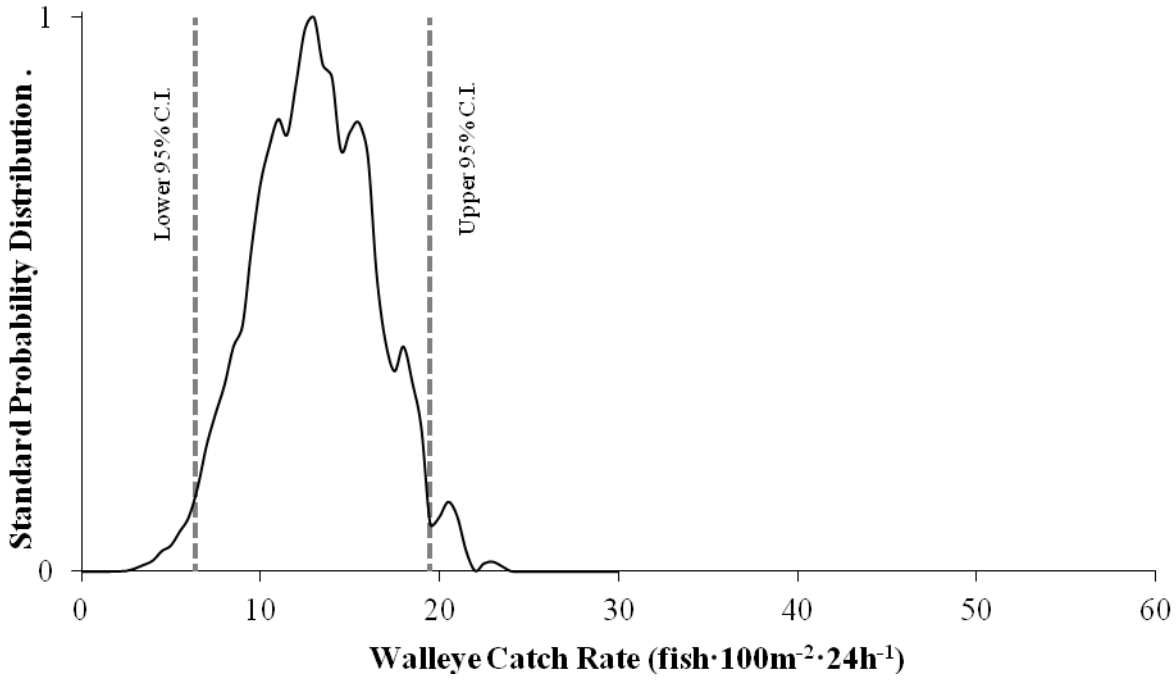

Figure 2. Walleye catch rate Hutch Lake 2011 FWIN survey. The catch rate (MLE) = 12.9 fish·100m^{-2}·24hrs^{-1} (95% C.I. 16.3 – 19.4, n = 91).

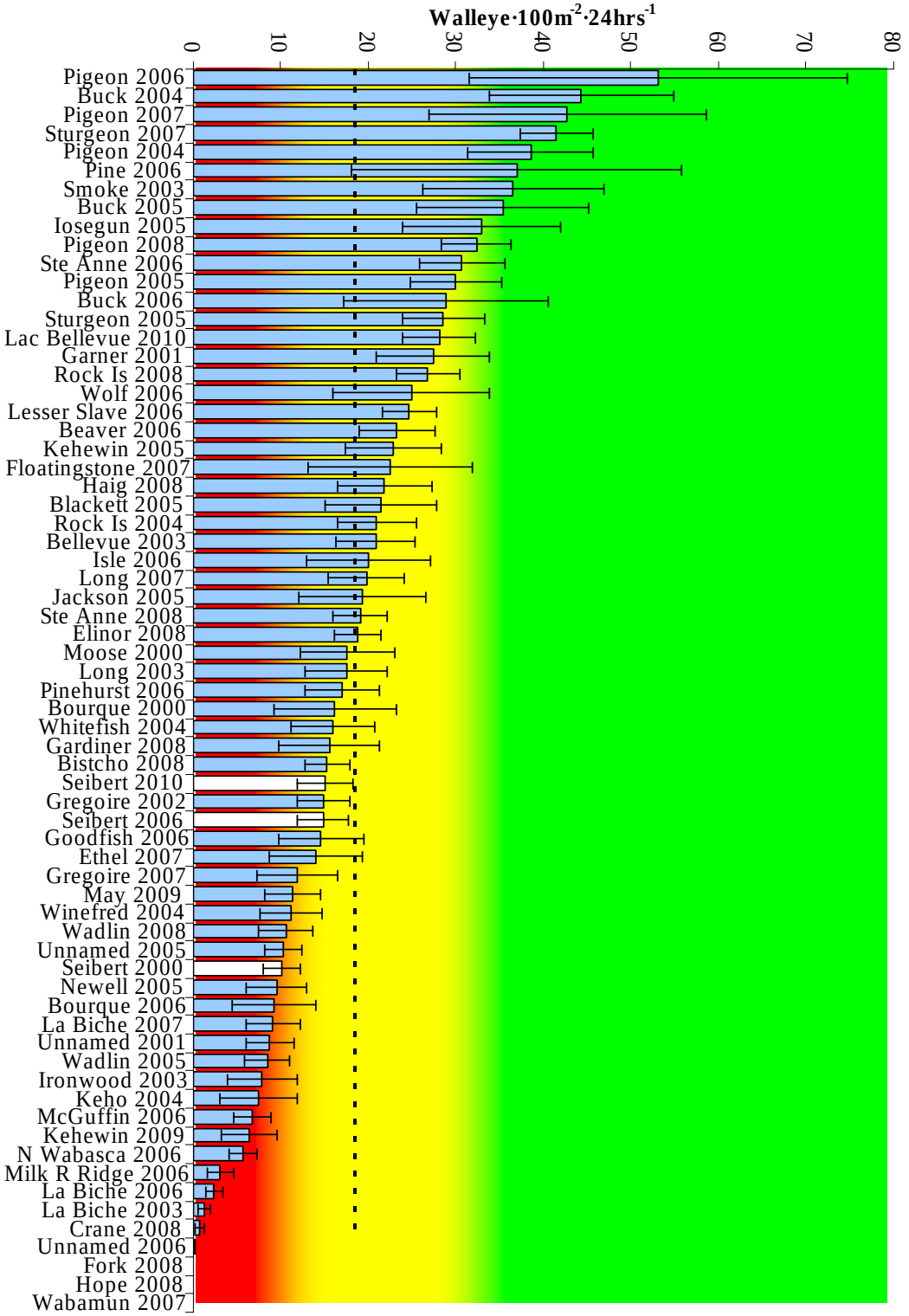

Figure 3. Alberta FWIN surveys (with 95% CI bars). Hutch Lake = 12.9 fish·100m^{-2}·24hrs^{-1}. The mean provincial catch rate (dashed line) = 18.4 fish·100m^{-2}·24hrs^{-1}. Collapsed, vulnerable, and stable catch rate ranges are indicated by red, yellow and green backgrounds.

Walleye Total Length Distribution

Walleye total lengths ranged from 175 – 579 mm TL with a mean of 536 mm (n = 91) (Fig. 4). Other than the single young-of-year fish captured all other walleye were 475 – 579 mm indicating no significant recruitment is occurring. Schroeder (1998) noted Hutch Lake did not appear to have suitable substrates for walleye spawning.

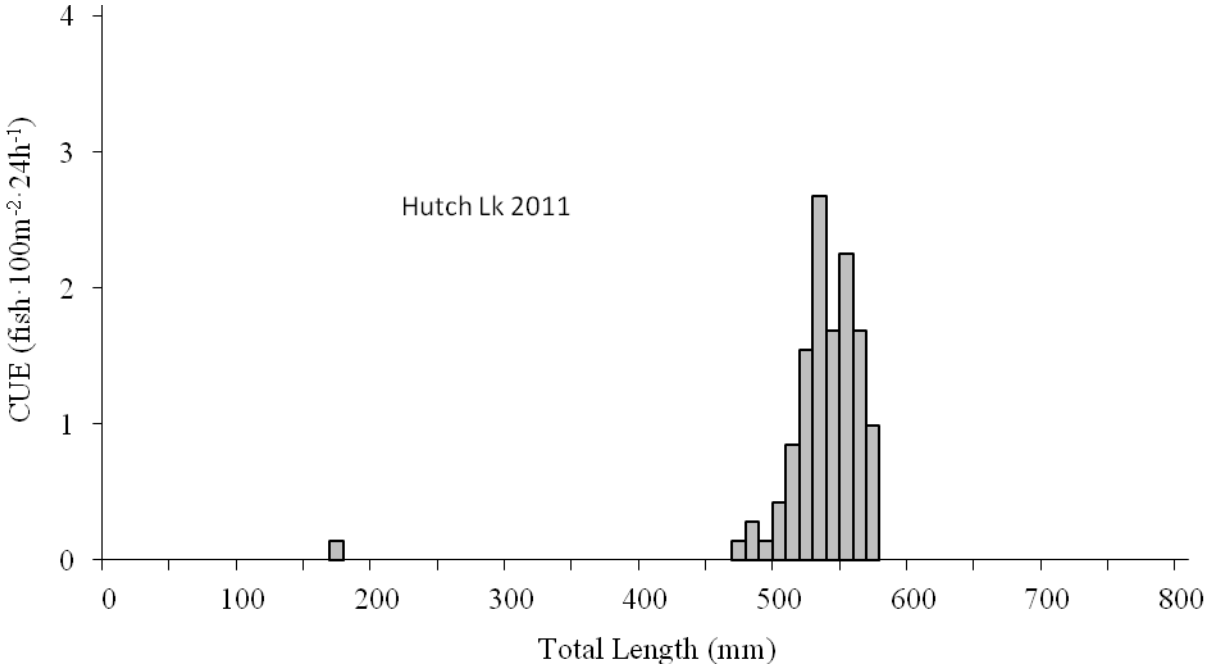

Figure 4. Walleye total length frequency distribution, Hutch Lake 2011 FWIN survey.

Walleye Age-Class Distribution and Stability

The catch included 2 ages (age 0 and 4) with a mean age of 4 years (n = 89, Fig. 5). There was one age-class (age 4) meeting the measurable age-class threshold of ≥ 3 fish·100m^{-2}·24hrs^{-1}. The only other age-class captured was a single young-of-the-year fish. No additional walleye were captured in the non-FWIN small mesh nets.

Overall, the 2011 walleye catch in Hutch Lake displayed a narrow (vulnerable) and unstable (collapsed) age-class distribution (Table 1) characterized by a single age-class.

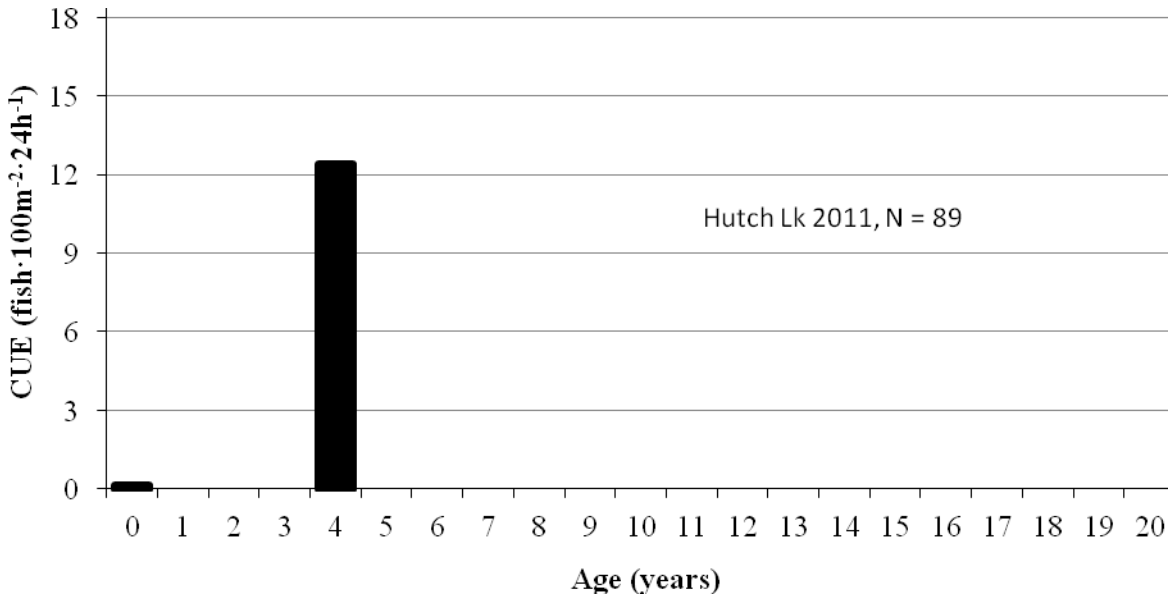

Figure 5. Walleye age frequency distribution, Hutch Lake 2011 FWIN survey.

Walleye Age-at-Maturity

A total of 81 walleye were identified to age, gender and sexual maturity. All were mature fish with females comprising 75% (n = 61) and males 25% (n = 20) of the sample (Fig. 5). Total lengths of mature females ranged from 475 – 579 mm, with < 2% of mature females being less than 500 mm TL. Total lengths of mature males ranged from 482 – 530 mm TL with 15% of mature males less than 500 mm TL. The lack of mature adults under the 500 mm TL harvest threshold would have important implications in a naturally reproducing population, however in Hutch Lake natural recruitment appears to be severely restricted.

There were 88 fish (age-class 4) identified to maturity (mature/immature). A total of 92% (n = 81) were mature adult fish, and 8% (n = 7) were immature (gender unknown) indicating that not all age 4 fish were mature. Maturation for males and females at age 4 is considered fast and is indicative of a 'collapsed' population.

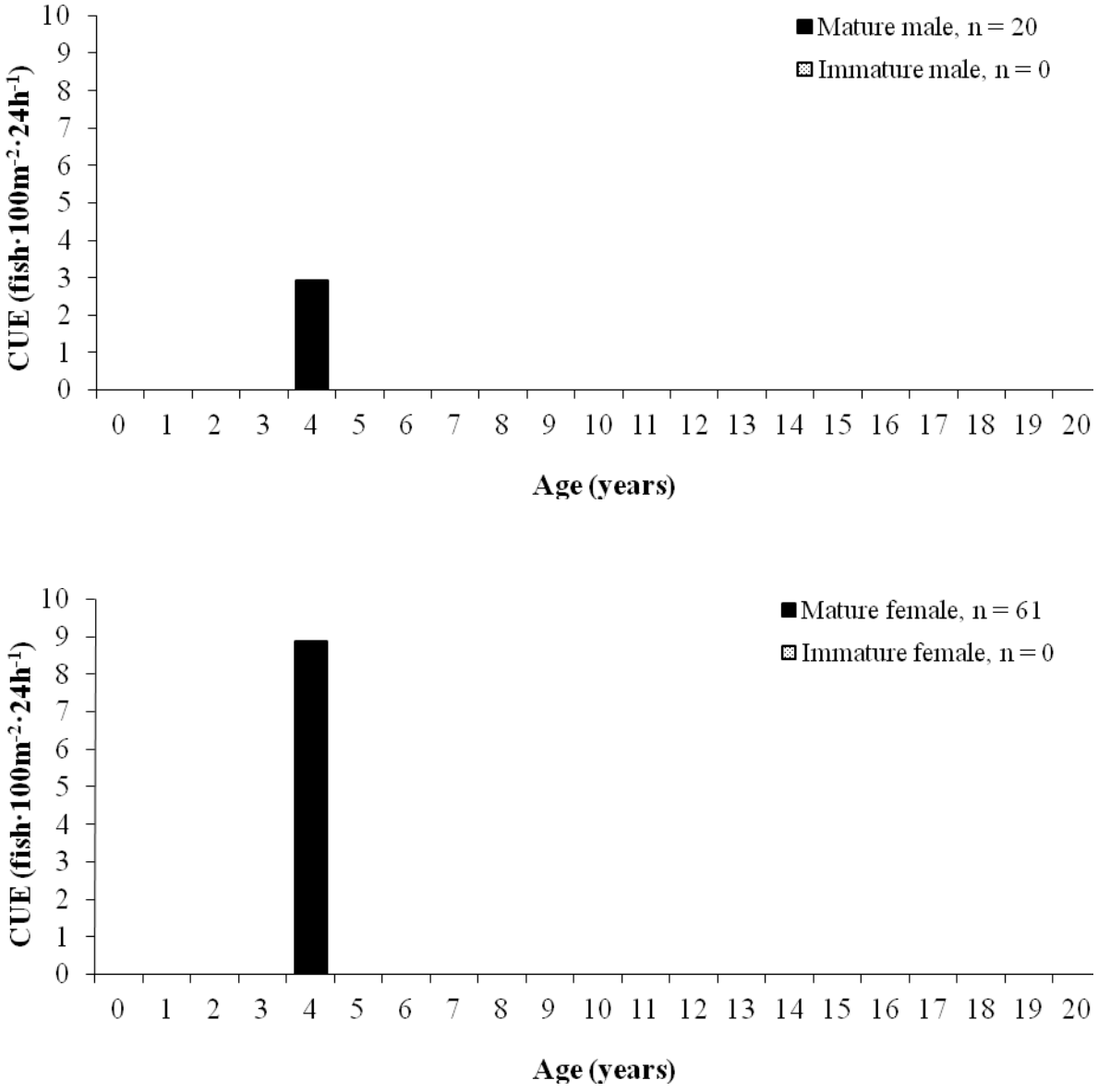

Figure 6. Age-at-maturity distribution for male and female walleye, Hutch Lake 2011 FWIN survey.

Walleye Length-at-Age

There were insufficient age-classes present to generate a length-at-age growth curve for this survey. However, age 4 fish had a mean length of 540 mm with a range of 475 – 579 mm, with only 5% of the fish below 500 mm TL. This is a fast growth rate indicative of a collapsed population.

Table 1. Walleye population status indices for Hutch Lake 2011. Criteria for classifying Alberta walleye fisheries modified for FWIN analysis (Sullivan 2003).

STATUS OF STOCK	TROPHY[1]	STABLE	VULNERABLE	COLLAPSED
Catch Rate (CUE)		High >30	Moderate 10-30	Low <10
2011			**12.9**	
Age class Distribution	Wide *>8 age-classes* *Mean age >9*	Wide *>8 age-classes* *Mean age = 6-9*	Narrow *1-3 age-classes* *Mean age = 4-6* *Few old fish (>10 yr)*	Wide or Narrow *Mean age = 6-10*
2011			**1 age-class**	
Age class[2] Stability	Very Stable *1-2 measurable age-classes missing from smooth catch curve*	Relatively Stable *2-3 measurable age-classes missing from smooth catch curve*	Unstable *1-2 age-classes support fishery*	Stable or Unstable *recruitment failures*
2011				**near zero recruitment**
Age-at-Maturity (50% Maturity)	Females 10-20 Males 10-16	Females 8-10 Males 7-9	Females 7-8 Males 5-7	Females 4-7 Males 3-6
2011				**F = 4; M = 4**
Growth (Length-at-Age)	Very slow 50cm (TL) in 12-15 years	Slow 50cm (TL) in 9-12 years	Moderate 50cm (TL) in 7-9 years	Fast 50cm (TL) in 4-7 years
2011				**4**

[1] Trophy (old growth) fisheries are sensitive populations that support low densities of large old walleye.
[2] Measurable age-class ≥ 3 fish·100m^{-2}·24hrs^{-1}

Northern Pike Catch Rate

A total of 27 northern pike were captured, comprised of 70% female (n = 19) and 30% males (n = 8). The northern pike catch per unit effort (maximum likelihood estimate) was 3.8 fish·100m^{-2}·24hrs^{-1} (95% C.I. 2.2 – 5.5) (Fig. 7).

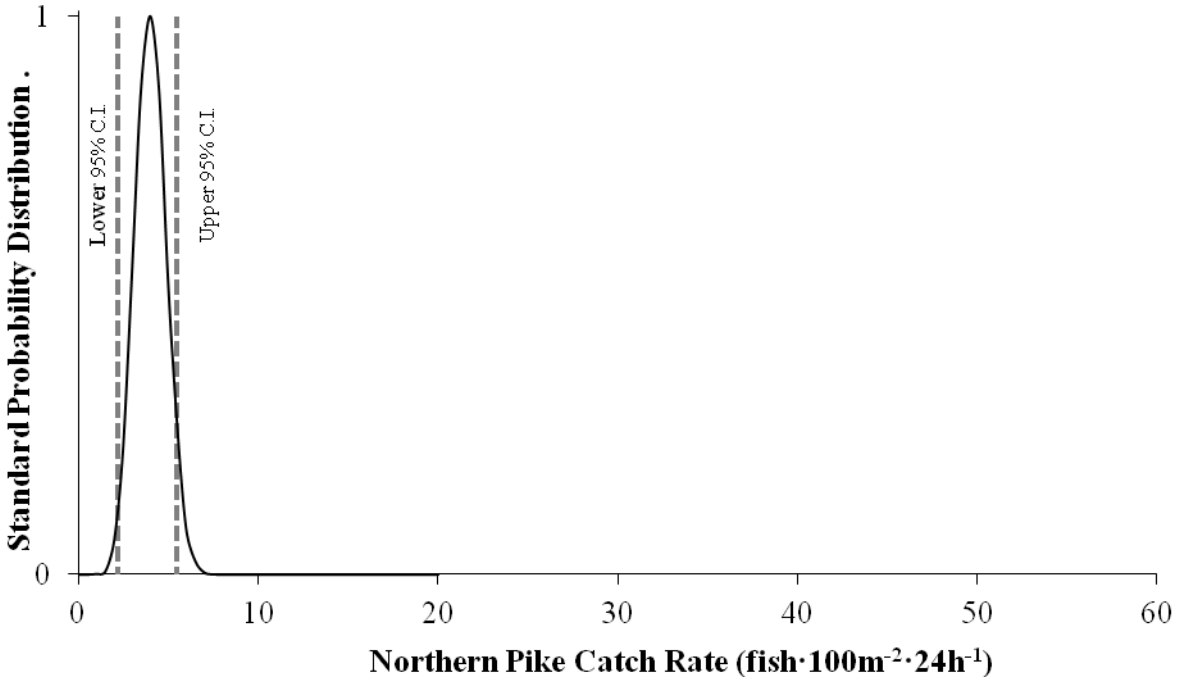

Figure 7. Northern pike catch rate, Hutch Lake 2009 FWIN survey. Catch rate (MLE) = 3.8 fish·100m^{-2}·24hrs^{-1} (95% C.I. 2.2 – 5.5).

Northern Pike Total Length Distribution

Northern pike total lengths ranged from 541 – 758 mm TL with a mean of 668 mm (n = 27) (Figure 8). Total length distribution was dominated by fish larger than 500 mm with a complete absence of pike below this size. Harvestable northern pike (> 630 mm) made up 81% of the sample.

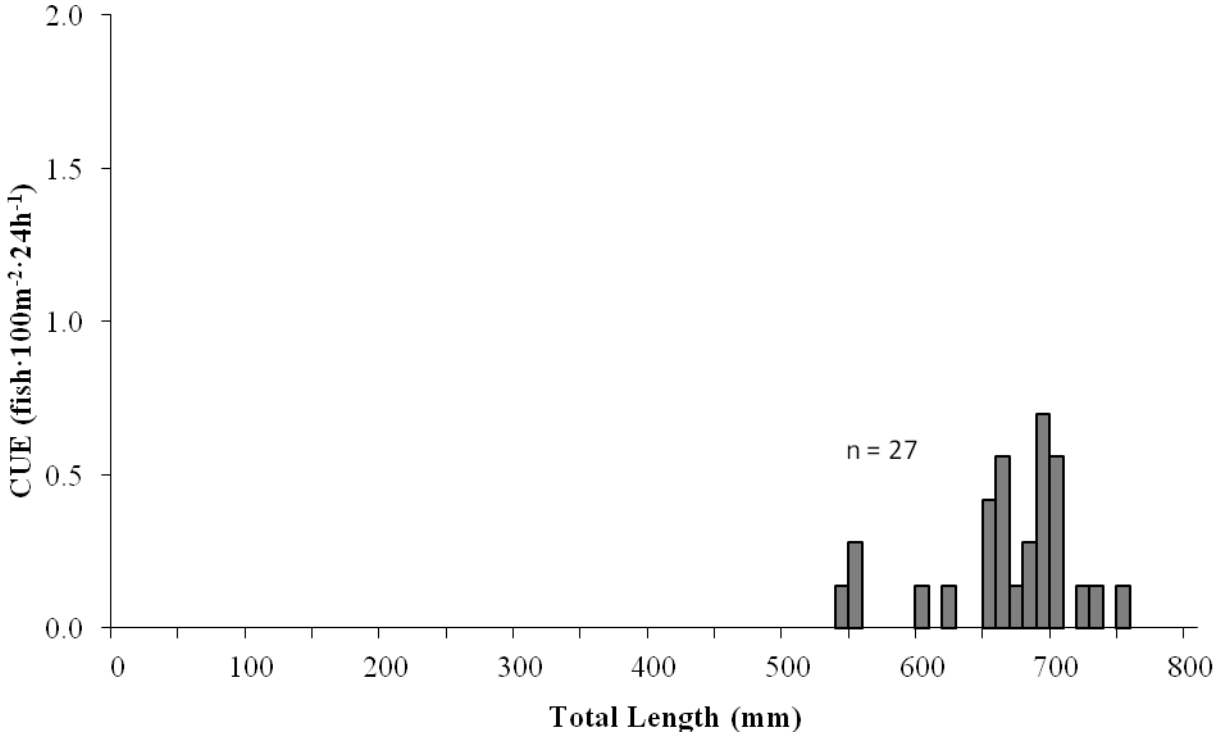

Figure 8. Northern pike total length frequency distribution, Hutch Lake 2011 FWIN survey.

Northern Pike Age-Class Distribution and Stability

The catch included 3 ages (age 1 – 3) with a mean age of 1.9 years (n = 27, Fig. 9). There was one age-class (age 2) meeting the measurable age-class threshold of ≥ 3 fish·100m^{-2}·24hrs^{-1}. No additional northern pike were captured in the non-FWIN small mesh nets.

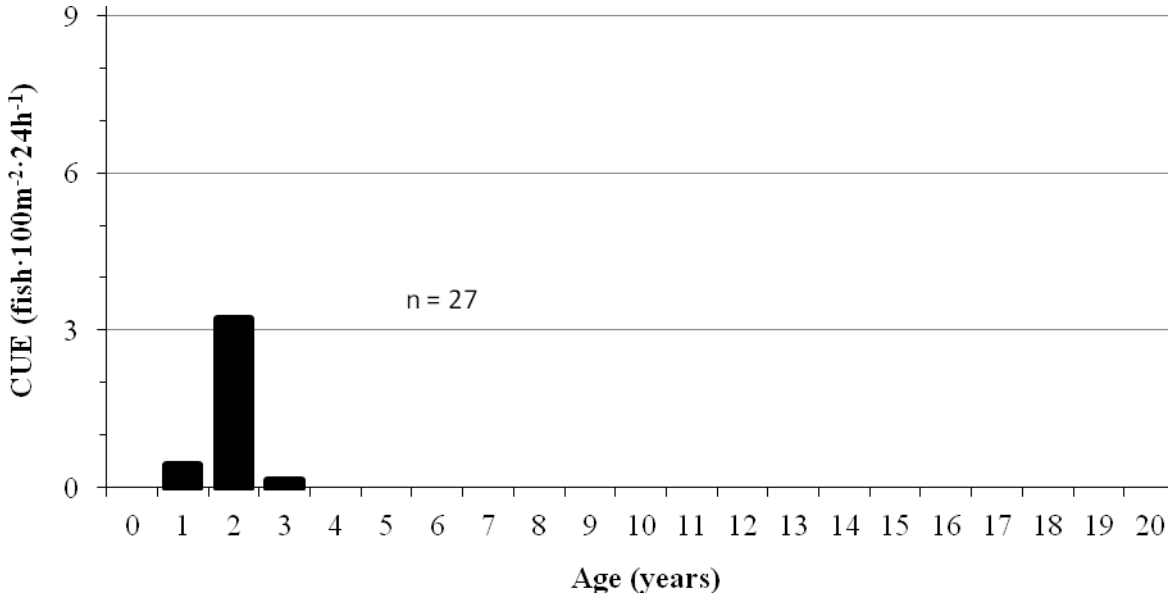

Figure 9. Northern pike age frequency distribution, Hutch Lake 2011 FWIN survey.

SUMMARY

The 2011 walleye catch rate was 12.9 fish·100m^{-2}·24hrs^{-1}. This catch rate is considered moderate (vulnerable) but ranks well below the provincial average of 18.4 fish·100m^{-2}·24hrs^{-1}. The 2011 age-class distribution was poorly represented by only one age-class (age 4) and would be characterized as unstable. The lack of any other measurable age-class indicates there is no significant recruitment occurring. Walleye had fast growth rates reaching a mean total length of 500 mm by age 4, and early maturation rates with both males and females maturing at age 4.

Walleye population metrics for Hutch Lake in 2011 ranged from vulnerable to collapsed. The population status is best classified as collapsed and has not developed a self-sustaining population.

Hutch Lake is also managed for northern pike with the current regulation allowing a harvest of one over 63 cm. The catch rate for northern pike was 3.8 fish·100m^{-2}·24hrs^{-1}. The lack of any pike smaller than 500 mm may indicate recruitment failures.

Brook stickleback appear to have become broadly established in Hutch Lake. They were present in small mesh nets and the only species present (identifiable remains) in walleye stomach contents. No other small bodied fish were present. White sucker (native) and yellow perch (stocked) were not captured.

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APPENDICES

Appendix 1. Hutch Lake 2011 FWIN net locations and site data.

Site	UTM Easting[1]	UTM Northing[1]	Lift Date	Soak Time (h)	Depth Stratum	Min Depth (m)	Max Depth (m)
3	484764	6510774	8-Sep-09	22.92	Shallow	2.1	5.2
4	485424	6508768	7-Sep-09	21.75	Shallow	2	3.3
5	479005	6514104	8-Sep-09	22	Shallow	4.8	4.8
6	483083	6511872	7-Sep-09	22.08	Shallow	2.2	4
7	481931	6512919	7-Sep-09	22.58	Deep	6.6	6.8
10	480977	6513022	8-Sep-09	22.08	Deep	6.7	7.1
12	479898	6513643	7-Sep-09	23.08	Deep	6.8	7.2

[1] Universal Transverse Mercator grid, NAD 83.

Appendix 2. Walleye catch summary at Hutch Lake FWIN 2011.

Set ID	FWIN Nets, Mesh size (mm)									Non-FWIN nets, Mesh size (mm)[1]		
	25	38	51	63	76	102	127	152	Totals	12	19	Totals
3				1	1	3	3		8	NA	NA	NA
4		1			2	5	6	7	21	NA	NA	NA
5					4	2	3		9	NA	NA	NA
6		1	3	3	6	2	9		24			0
7		1	2	6	3	8	3	1	24			0
10		1		1	1	1			4			0
12					1				1	NA	NA	NA
Totals	0	4	5	11	18	21	24	8	91	0	0	0

[1] Non-FWIN nets are additional small mesh experimental panels.

Appendix 3. Northern pike catch summary at Hutch Lake FWIN 2011.

Set ID	FWIN nets, Mesh size (mm)									Non-FWIN nets, Mesh size (mm) [1]		
	25	38	51	63	76	102	127	152	Totals	12	19	Totals
3				2	1				3	NA	NA	NA
4					1				1	NA	NA	NA
5			1	1	2		1		5	NA	NA	NA
6		1			4	3			8			0
7				1					1			0
10				4	1				5			0
12					2	1	1		4	NA	NA	NA
Totals	0	1	1	8	11	4	2	0	27	0	0	0

[1] Non-FWIN nets are additional small mesh experimental panels.

Appendix 4. Catch summary of brook stickleback at Hutch Lake FWIN 2011.

Set ID	FWIN nets[1]	Non-FWIN nets[2]
3		NA
4		NA
5		NA
6		4
7	1	
10		4
12		NA
Totals	1	8

[1] Standard FWIN net gang (25, 38, 51, 63, 76, 102, 127, 152 mm).
[2] Non-FWIN nets are additional small mesh (12, 19 mm) experimental panels.