Results of a Fall Walleye Index Netting Survey Conducted on Wood Lake in 2008

File Report

Andrew Ivany
Stephen Scholten
Ontario Ministry of Natural Resources
Bracebridge

2010

Wood Lake is located in Oakley Township within the Bracebridge administrative area of the Parry Sound District of the Ministry of Natural Resources. It is easily accessible from Highway 118, just east of the Town of Bracebridge. It is approximately 368 hectares surface area, with a maximum depth of 15 meters and mean depth of 5 m. Water clarity is moderate, with a long term secchi depth reading of 4.3 m. It is located in the watershed of the South Muskoka River.

Wood Lake apparently did not have any native large sport fish species; the historic community was probably dominated by yellow perch and cisco (lake herring). Smallmouth bass were introduced shortly after the turn of the century (Table 1), quickly became the dominant predator in the lake and attracted a sport fishery. A 1943 Fish Collection Report stated that the lake was "very heavily fished" and "last year over a thousand different tourists fished on this lake".

A 1953 biological survey report recommended the stocking of walleye to extend the tourism season. Consequently, an introduction was attempted, most notably the stocking of 225 sub-adult walleye from Three Mile Lake in Watt Township. By the time of the 1964 survey, walleye were described as being "fairly abundant'. Walleye were the most abundant species caught in gill netting done in 1979 to collect samples for contaminant testing. A trap netting assessment in 1989 (Anderson 1989) concluded that walleye were 'numerous'; however, the age distribution was dominated by only two age classes and it was speculated that recruitment may have been declining.

Rock bass became established some time between 1979 and 1989. Largemouth bass are also now present, though it is not certain when they became established. An invasive zooplankter, the spiny water flea, is also now present. These successive introductions have resulted in a near constant state of change in the fish community. The historic abundance of smallmouth (prior to walleye) and walleye (prior to rock bass) will probably not been experienced again as the available habitat is now shared among more competing species. Cisco were present in the past, but no sightings have been reported since the 1979 collection. The 1943 report stated that "large schools of herring…. come up on spawning beds in thousands", but the 1974 inventory reported "residents report lake herring population which appears to have disappeared".

The current potential for supporting walleye is probably limited by a combination of the diversity of the fish community, the size and depth of the lake and water clarity; conditions which put walleye at a competitive disadvantage. No information on the current state of the fishery exists. Anecdotally, the lake continues to support a modest walleye fishery. Assessment is required to determine the current status of the walleye population. A Fall Walleye Index Netting (FWIN) survey was completed on the lake in 2008 to obtain current information on the status of the walleye population.

Methods

The FWIN protocol (Morgan 2002) was followed. Gear consisted of gill net gangs comprised of 8 panels, each 1.8 m (6 ft) deep and 7.6 m (25 ft) long. Mesh sizes were 25, 38, 51, 64, 76, 102, 127 and 152 mm stretched measurement. Some nets were sequentially arranged, while others had a random arrangement of mesh size.

Nets were set in the fall when the surface water temperature was between 10 and 15°C. Nets were set for 24 hours periods. Effort was allocated, proportional to area, in two depth strata: 2-5, and 5-15 m. To ensure the full range of the 5-15 m stratum was sampled, it was subdivided into 5-10 and 10-15 m depths and effort allocated proportional to area within them as well.

Captured fish were tallied by the net number and mesh size in which they were caught. Sport fish were sampled for length, round weight, gender, and maturity. Scales and dorsal spines were

collected for age determination. Otoliths were taken from deceased walleye. Stomach contents were described. All other species were counted and measured for fork length only.

Tissue samples were collected from walleye and bass and forwarded to the Ministry of the Environment for analysis of mercury content.

Ages reported are the actual assessed age at the time of sampling. One year can be added to reflect the number of growing seasons completed.

Data is archived in FISHNET 3 as project code IA08_WOO.

Results

Netting on Wood Lake commenced on Oct. 07, 2008, and continued to Oct. 10, 2008. Conditions were generally fair, with periods of rain. Surface water temperature ranged from 14.4 to 12.9 C (Table 2).

A total of 15 nets were set; five per day; nine in the shallow (0-5m) stratum and six in the deep (5-15 m) stratum (Figure 1).

A total of 178 fish comprised of 7 species were caught (Table 3, Figure 2). The most common species captured were rock bass (108 caught) and smallmouth bass (27). Smaller numbers of white sucker (13), walleye (13), yellow perch (12), pumpkinseed (3) and largemouth bass (3) were captured. One of the 13 walleye was a recapture (fish number 1 was captured in net set 1 and 8).

Walleye were caught at a rate of 0.87 (geometric mean = 0.64) fish per net. Walleye were present in 8 of the 15 net sets and were caught in roughly equal proportions in the two depth strata.

Walleye ranged in length from 305 to 731mm FL, and in weight from 290g to 4500g (Table 4). Ages ranged from 1 to 29 years old, but only four year classes were represented; 1, 3, 17 and 29 (Table 5). Six of the twelve fish were one year old. The length distribution was poorly developed because of the small sample size (Table 6). The six youngest fish formed a mode between 325 and 275 mm FL, while the older fish were of a scattered range of size classes.

Three of the one year old walleye were male, of which two were mature. All three of the one year old females were immature. Both three year old fish were live released so their state of maturity is not known. All older walleye, two male and two female, were mature.

The mercury content of the walleye, by size, is shown in Figure 3. Fish less than 40 cm TL (one year old, were relatively low in mercury. Older fish had varying degrees of consumption guidelines.

Discussion

The number of nets set was the minimum recommended for the size of Wood Lake. The locations, depths and habitats in which the nets were set appeared to be representative of the lake. Additional netting effort would not have added much value to the survey, other than a marginal increase in the walleye biological sample.

The species occurrence in the catch was similar to the 1989 survey. Largemouth bass were reported as being stocked in 1939 but they were not caught in any assessment prior to this one, so it is not clear if they have been present but not caught, or have become established through a more recent introduction. Regardless, their abundance seems to be limited by the limited amount

of suitable habitat. The absence of cisco, despite sets at suitable depths confirms that the species has been extirpated from the lake. The amount of habitat available for this species is limited; apparently the population could not be sustained in the presence of a large number of introduced predators. Water level fluctuations and water quality changes may have been factors in their disappearance as well.

Direct comparison of species abundance between this survey and the 1979 and 1989 surveys is not possible because of the different gear used but some generalizations can be made. The gill nets used in this survey should provide a more complete sampling of the fish community due to the range of mesh sizes used and habitats and depths sampled. Overall, the proportional abundance of the major species in 2008 was similar to 1989; rock bass, smallmouth bass and walleye, in that order by number, dominate the fish community (Table 7).

The current abundance of walleye is low. The geometric mean catch rate of 0.6 walleye/net is considered low for the Parry Sound District and Southern Ontario (Figure 4). Despite the different gear, abundance appears to have been declined considerably since the 1979 and 1989 surveys. In 1979, three overnight gillnet sets caught 78 walleye. The length of the nets used was not recorded. It is possible they were similar to the standard lake survey net commonly used at the time (400 ft multi-mesh net); if so the catch rate would be considered to be high. In 1989, the catch rate of about 7 walleye per trap night was moderately high for that gear. Observations of spawning walleye were done in 1991 and over 100 walleye were seen on two separate nights. It is unlikely that a FWIN catch of 0.6/net could generate spawning concentrations of that magnitude. Finally, anecdotal reports from anglers support all these observations that walleye abundance has declined.

Benchmarks statistics for FWIN surveys conducted in the Southern Region were compiled by Morgan et al. (2003). Unfortunately, the sample size of walleye collected in this project is too small to make meaningful comparisons in many cases. A summary of the major benchmarks is found in the appendix.

Overall, the age structure is poor; limited to four year classes with half of the fish being the same age. Recruitment of young fish into the population is very sporadic. This indicates that factors that act on early life stages such as fish community interactions or habitat limitations are the cause of the low abundance. The growth rate of the walleye is very fast. The average size of the three one year old females (374 mm TL) was above the 95th percentile for populations sampled in the Southern Region (Appendix, Morgan et al. 2003). Rapid growth is a result of the combination of food supply and population abundance. In this case the low abundance of walleye is contributing to the rate of growth.

The introduction of rock bass was a major change to the fish community that has occurred between the 1979 and 1989 surveys. The rock bass population is abundant and robust. Their presence is likely a major cause of the decline of walleye in Wood Lake. The likely mechanism is predation by bass (of all species) on very young walleye (Krishka et al. 1996). Immediately after hatching walleye are pelagic, feed on zooplankton for several weeks and are very vulnerable to predators. As they grow and begin to feed on larger food items they become bottom oriented and gradually become less vulnerable. However, the relative scarcity of cover and moderately clear water of Wood Lake and high abundance of rock bass probably combine to continue to result in high mortality of walleye fry.

Angler exploitation on Wood Lake has not been measured. However, judging by the high number of cottages on the lake, and the ease of access, it may be high. Due to the lack of knowledge of angling pressure, the extent in which it is effecting the walleye population can not be known. In 2008, a new FMZ-wide catch and size limit for walleye was implemented; a limit of 4 fish of which only one may be greater than 46 cm. Given the relatively low abundance of walleye in general and of larger individuals, it is doubtful that the new regulation will have a significant impact on walleye harvest relative to the old regulation (6 walleye of any size).

Previous observations of spawning habitat and activity and the occurrence of a larger population size in the past indicate that spawning habitat does not limit the population. However, it has been almost 20 years since the last observations. Observations should be conducted again to determine the current condition of spawning areas and their use by walleye.

The supplemental stocking (stocking when some natural reproduction occurs) of walleye is a commonly used management tool that has been subject to a considerable amount of scientific scrutiny. Kerr et al. (1996) conducted a review of the subject and made a series of recommendations. In general, the level of success of stocking is highly variable and is dependent on factors such as the complexity of the fish community, habitat quality and the size of the fish stocked.

The decision of whether a lake should be stocked depends on local management objectives, genetic considerations, potential ecological impacts (spread to other waterbodies, impact on species at risk, etc.) and angler demand. Based on the decision tree presented in Kerr et al. (1996) there are no factors that absolutely preclude stocking in Wood Lake. However, there is considerable doubt as to how successful it would be. As an introduced population that currently has limited productivity, supplemental stocking could be done on a trial basis. Assessment of stocking success would be critical to justify further stocking. Stocking by a private group under a Licence to Stock Fish could also be permitted.

In summary, the abundance of walleye in Wood Lake is currently low. The population is subject to sporadic recruitment probably due to interaction with the three species of bass in the lake. Harvest regulations would be unlikely to make a significant improvement in the population. Observations of spawning habitat and activity should be done to determine if enhancement would be likely to improve the population. Supplemental stocking could be attempted, though the chance of it being very successful is probably fairly low. If supplemental stocking is done, follow-up assessment should be done to justify further efforts.

References

Anderson, P.G. 1989. Trap netting assessment of Brandy, Wood and Jack's Lakes, 1989. Ontario Ministry of Natural Resources, Bracebridge. 33 p.

Kerr, S.J., B.W. Corbett, D.D. Flowers, D. Fluri, P.E. Ihssen, B.A. Potter and D.E. Seip. 1996. Walleye stocking as a management tool. Percid Community Synthesis. Walleye Stocking Working Group. Ontario Ministry of Natural Resources. Peterborough. 79 p.

Krishka, B.A., R.F. Cholmondeley, A.J. Dextrase and P.J. Colby. 1996. Impacts of introductions and removals on Ontario Percid communities. Percid Community Synthesis, Introductions and removals Working Group. Ontario Ministry of Natural Resources. Peterborough. 11p.

Morgan, G.E., M.D. Malette, R.S. Kushneriuk and S.E. Mann. 2003. Regional summaries of walleye life history characteristics based on Ontario's Fall Walleye Index Netting (FWIN) program 1993 to 2001. Diagnostics and Sampling Standards Working Group, Percid Community Synthesis, Ont. Min. Nat. Resourc., Peterborough.

Morgan, G.E. 2002. Manual of instructions – fall walleye index netting (FWIN). Percid Community Synthesis, Diagnostics and Sampling Standards Working Group. Ontario Ministry of Natural Resources, Peterborough. 20 p.

OMNR. 2002. Guidelines for stocking fish in inland waters of Ontario. Ont. Min. Nat. Resourc., Peterborough.

Table 1 Summary of stocking history, Wood Lake.

Species	First Year	Last Year	Number Times Stocked
largemouth bass	1937	1937	1
brook trout	1945	1945	1
walleye	1922	1959	4
smallmouth bass	1919	1961	17

Table 2 Net set summary, Wood Lake FWIN, 2008.

Sample Number	Site Number	Index Effort Status Code	Effort Duration	Start Date	Start Time	End Date	End Time
1	6	1	24.0	2008/10/07	1000	2008/10/08	1000
2	12	1	24.0	2008/10/07	1115	2008/10/08	1115
3	2	1	24.0	2008/10/07	1215	2008/10/08	1215
4	4	1	24.0	2008/10/07	1300	2008/10/08	1300
5	3	1	24.0	2008/10/07	1400	2008/10/08	1400
6	11	1	24.1	2008/10/08	0945	2008/10/09	0950
7	7	1	24.0	2008/10/08	1045	2008/10/09	1045
8	8	1	24.0	2008/10/08	1145	2008/10/09	1145
9	10	1	24.0	2008/10/08	1245	2008/10/09	1245
10	5	1	24.0	2008/10/08	1350	2008/10/09	1350
11	13	1	24.0	2008/10/09	0945	2008/10/10	0945
12	14	1	24.5	2008/10/09	1030	2008/10/10	1100
13	15	1	24.0	2008/10/09	1120	2008/10/10	1120
14	1	1	24.1	2008/10/09	1210	2008/10/10	1215
15	9	1	23.4	2008/10/09	1335	2008/10/10	1300

Sample Number	UTM Start	Gear depth min. (m)	Gear depth Max (m)	Water Temp °C	Crew at net lift
1	176507504985600	2.0	3.6	14.4	Ivany, Scholten, Draycott
2	176524724985510	2.7	3.7	14.4	Ivany, Scholten, Draycott
3	176531124986014	8.0	8.9	14.1	Ivany, Scholten, Draycott
4	176519224987158	7.6	9.4	14.4	Ivany, Scholten, Draycott
5	176515074985725	7.0	7.1	14.7	Ivany, Scholten, Draycott
6	176515534985507	2.0	3.7	12.9	Ivany, Scholten, Draycott
7	176509784986534	4.0	4.0	12.8	Ivany, Scholten, Draycott
8	176519424986024	2.0	4.6	12.8	Ivany, Scholten, Draycott
9	176531214986447	2.0	5.1	12.7	Ivany, Scholten, Draycott
10	176515004986250	7.4	7.5	13.0	Ivany, Scholten, Draycott
11	176518004985900	6.7	13.0	13.0	Ivany, Draycott
12	176512004985450	2.4	2.7	13.0	Ivany, Draycott
13	176506004986700	2.2	2.3	13.0	Ivany, Draycott
14	176519654986617	12.9	13.7	13.1	Ivany, Draycott
15	176511504987075	2.0	5.0	12.9	Ivany, Draycott

Table 3 Catch summary, Wood Lake FWIN, 2008.

Sample	Largemouth Bass	Pumpkinseed	Rock Bass	Smallmouth Bass	Walleye	White Sucker	Yellow Perch
1	0	0	14	0	1	0	1
2	0	0	4	0	0	1	0
3	0	1	1	3	0	2	0
4	0	0	10	5	2	1	0
5	0	0	5	1	1	0	1
6	0	0	1	0	0	0	1
7	0	0	1	0	1	0	0
8	0	0	5	0	2	0	0
9	3	1	5	1	0	2	5
10	0	1	3	3	0	0	0
11	0	0	18	11	2	0	2
12	0	0	2	1	3	0	0
13	0	0	5	0	0	2	0
14	0	0	0	0	0	0	0
15	0	0	35	2	1	5	2
Total	3	3	109	27	13	13	12
Mean	0.2	0.2	7.3	1.8	0.9	0.9	0.8

Table 4 Descriptive statistics for fish captured in Wood Lake FWIN, 2008.

	Large-mouth Bass	Pumpkin seed	Rock Bass	Smallmouth Bass			Walleye				White Sucker	Yellow Perch
	FL	FL	FL	FL	TL	RWT	FL	TL	RWT	AGE	FL	FL
Mean	254.3	163.7	186.1	266.8	281.0	334.3	444.6	467.0	1316.8	7.7	466.8	132.2
Std. Err.	73.9	8.1	4.4	7.3	8.0	45.1	39.3	40.4	387.8	2.8	16.5	12.2
Median	203.0	165.0	185.5	261.0	274.0	280.0	381.0	402.0	775.5	2.0	486.0	115.0
Std. Dev.	128.0	14.0	45.8	38.0	41.4	206.6	136.1	139.9	1343.2	9.7	59.7	42.2
Minimum	160	149	103	203	214	120	305	323	290	1	312	96
Maximum	400	177	303	393	415	950	731	758	4500	29	522	228
Count	3	3	108	27	27	21	12	12	12	12	13	12

Table 5 Biological characteristics of walleye caught in Wood Lake FWIN, 2008.

Fish	Fork Length (mm)	Total Length (mm)	Round Weight (g)	Sex	Maturity	Age (years)
243	305	323	290	1	imm	1
245	330	351	400	1	mat	1
244	348	364	450	2	imm	1
272	350	369	450	1	mat	1
230	356	377	480	2	imm	1
154	367	382	690	2	imm	1
155	395	422	861			3
47	470	493	1000	1	mat	29
55	507	532	1580	1	mat	17
1	521	548	1600			3
46	655	685	3500	2	mat	17
231	731	758	4500	2	mat	17

Table 6 Fork length distribution, by species, Wood Lake FWIN, 2008.

Fork Length	Largemouth Bass	Pumpkinseed	Rock Bass	Smallmouth Bass	Walleye	White Sucker	Yellow Perch
76-100							1
101-125			9				8
126-150		1	20				
151-175	1	1	17				
176-200		1	19				2
201-225	1		24	1			
226-250			10	8			1
251-275			5	13			
276-300			3	3			
301-325			1		1	1	
326-350					3		
351-375				1	2		
376-400	1			1	1		
401-425						2	
426-450						1	
451-475					1		
476-500						5	
501-525					2	4	
651-675					1		
726-750					1		
Total	3	3	108	27	12	13	12

Table 7 Catch summary, Wood Lake, 1979 and 1989.

Species	1979 gill net	1989 trap net
Walleye	78	41
Smallmouth Bass	14	43
White Sucker	35	61
Pumpkinseed		5
Rock Bass		120
Brown Bullhead	2	
Yellow Perch	5	
Cisco*	1	

* reported as ‘whitefish’

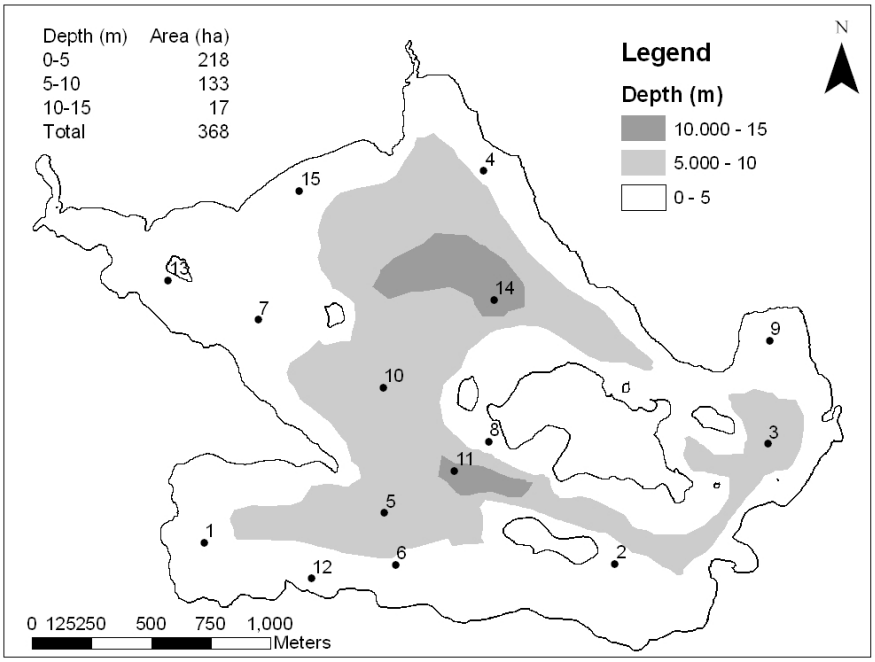


Figure 1 Map of Wood Lake showing depth strata. Strata 5-10 and 10-15 are combined into one for the FWIN protocol. FWIN gill net set numbers and locations are shown.

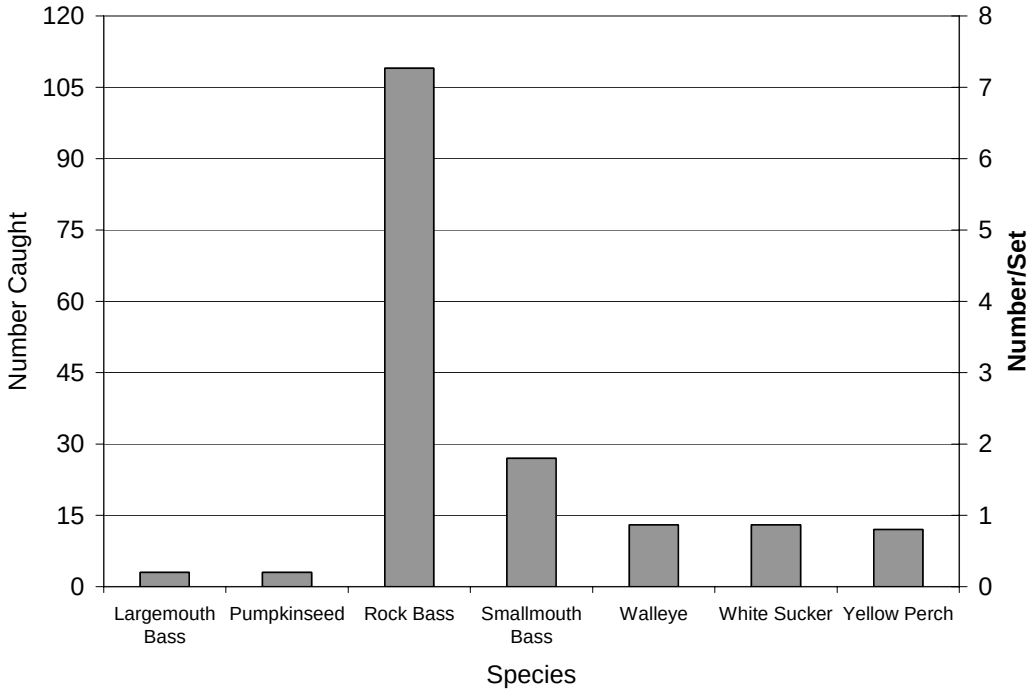


Figure 2 Catch composition, Wood Lake FWIN, 2008.

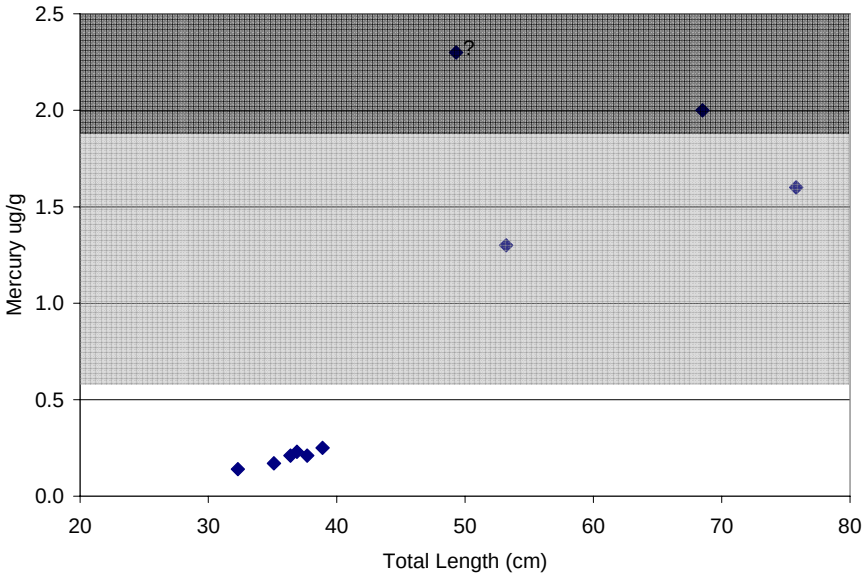


Figure 3 Mercury concentrations in the flesh of walleye, Wood Lake FWIN, 2008. Shading indicates consumption guidelines for general population based on MOE guide: white: unlimited; light grey: limited; dark grey: no consumption. Guidelines for sensitive population (reproductive women and children) are more restrictive. Question mark indicates suspected measurement error (E. Awad, MOE pers. comm.).

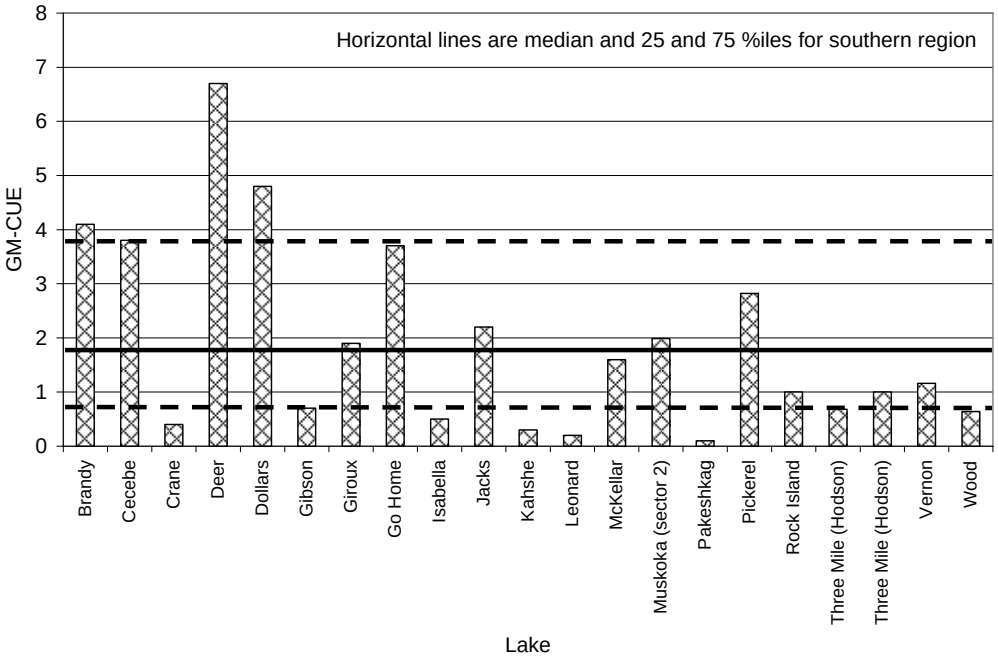


Figure 4 Catch rate (geometric mean catch-per-set) of walleye from FWIN surveys conducted in Parry Sound District up to 2008, compared to Southern Region benchmarks.

Appendix Selected descriptive statistics for walleye caught in FWIN surveys conducted in Ontario's Southern Region, 1993 to 2001 (Morgan et al. 2003).

		Mean	Minimum	Maximum	Median	5th percentile	25th percentile	75th percentile	95th percentile	Sample size
Surface Area (ha)		1209	45	13598	513	68	138	1219	5349	99
Mean Depth (m)		6	0.9	24.3	5.5	1.8	3.9	7.7	10.7	94
Max. Depth (m)		19.6	2.3	87.5	18.3	6.1	11.8	25	39.6	96
Secchi Depth (m)		3.6	0.2	7.3	3.5	1.1	2.4	4.6	6.7	96
Average Catch (Geo. Mean)		2.8	0	27.7	1.7	0.1	0.7	3.8	8.3	100
GM-CUE > 450		0.6	0.0	8.1	0.4	0.1	0.2	0.7	1.8	98
Age Classes		5.6	1.0	13.0	5.0	1.0	4.0	7.0	11.0	95
Max Age		11.5	2.0	26.0	11.0	5.0	8.3	14.0	19.0	98
Shannon Index of Mature Females		0.43	0.00	0.96	0.45	0.00	0.29	0.63	0.84	90
Average Size (TL)		406	265	634	393	296	348	442	574	96
Female Total Length at Age	1	283	271	373	286	234	256	306	365	31
	2	348	286	482	337	300	320	372	429	51
	3	405	316	542	403	340	370	434	493	48
	4	459	378	590	460	401	421	483	566	26
	5	492	417	591	490	417	450	523	591	15
	6	550	477	644	542	477	529	587	644	13
	7	599	513	680	590	513	572	651	680	9
	8	604	538	682	612	538	568	627	682	8
	9	658	620	692	661	620	620	692	692	3
	10	646	567	701	658	567	602	690	701	4
Male Total Length at Age	1	275	226	364	271	231	245	301	347	30
	2	352	271	448	351	294	325	375	441	55
	3	394	318	505	388	336	368	416	480	62
	4	429	337	526	425	358	399	456	513	39
	5	444	363	529	442	363	416	474	529	16
	6	475	425	590	464	425	444	500	590	13
	7	479	429	619	475	429	451	494	619	15
	8	528	486	570	520	486	513	554	570	5
	9	517	486	585	497	483	492	565	585	7
	10									
Female Maturity by Age	10%	2.8	0.8	4.4	2.7	1.1	2.3	3.3	4.0	43
	50%	3.6	2.0	5.4	3.7	2.1	3.0	4.3	4.8	43
	90%	4.4	2.4	7.8	4.4	3.1	3.6	5.2	5.9	43
Female Maturity by Size	10%	413	292	532	420	345	392	434	472	43
	50%	445	368	557	441	374	417	475	491	43
	90%	477	382	581	477	419	441	512	540	43
Female Condition	350	389	355	439	387	359	368	402	436	33
	400	598	539	670	597	549	569	615	669	33
	450	876	778	976	877	785	842	901	973	33
	500	1231	1077	1369	1236	1080	1180	1276	1359	33
	550	1676	1435	1859	1694	1455	1591	1757	1845	33