Nearshore Community Index Netting (NSCIN) Survey Report

Salmon Lake
Foley Geographic Township,
Summer, 2004

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Executive Summary:

During the summer of 2004, a Nearshore Community Index Netting (NSCIN) survey was conducted on Salmon Lake to assess the status of the nearshore fish community and individual species which comprise it.

The nearshore fish community of Salmon Lake is relatively simple with only seven different species being captured in this survey. The catch – and by inference, the fish community, was almost completely dominated by smallmouth and largemouth bass. Together, these two species comprised 88% of all fish caught and 93% of the total catch weight.

Relative to Provincial benchmarks, smallmouth bass abundance was "medium" and largemouth bass abundance was "high". Relative abundance for all other species (northern pike, brown bullhead, rock and pumpkinseed) was "low", except common white sucker which was "medium". Biosampling data (size distribution) for smallmouth bass indicated a robust and healthy population characterized by high levels of reproduction and recruitment and moderate levels of exploitation. The largemouth bass population was also characterized by good levels of reproduction and recruitment, but the scarcity of large individuals in the catch may be symptomatic of high levels of exploitation.

Ministry records strongly suggest smallmouth and largemouth bass are both recently (post 1971) introduced species to the lake, but not by the MNR. Northern pike, which probably is an original species, appears to be languishing. We suspect this may be due to unsuitable or limited habitat for pike.

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1.0 Introduction

Salmon Lake is located in the Geographic Township of Foley, now in the Municipality of Seguin. At 68.1 hectares (160 acres) in size, it is a 'small' size lake, quite typical of those found in the Parry Sound area. The lake has a maxim depth of 14.3 meters (47') and a mean depth of 7.4 meters (24') (OMNR, 1971). The lake has 'moderate' shoreline development with a cottage count of 44 taken during this survey. Approximately 10% of the shoreline is Crown Land.

The lake is a 'headwater' lake; it has no inlet from another lake. Salmon Lake flows into Otter Lake, which is part of the very small Boyne River watershed. The water is typical of a Canadian Shield lake with low alkalinity, slightly acidic water, low productivity (as measured by Total Dissolved Solids) and moderate light transparency (secchi – 3.7 meters) (OMNR, 1971).

Notwithstanding its ready access and close proximity to Parry Sound, Salmon lake has had limited fisheries work conducted on it. Seemingly, the first was a cursory field investigation in 1961; although the lake had previously received several plantings of lake trout. The brief (1961) field report indicates pike, lake herring and "chub" were present. A standard, *Aquatic Habitat Inventory Survey* (i.e. lake survey) was conducted in 1971. This survey again confirmed the presence of pike and lake herring but also documented the presence of common white sucker. Interestingly, no smallmouth or largemouth bass were caught, although mention is made of smallmouth being "reported" in the lake. It appears probable that both smallmouth and largemouth bass are introduced species to the lake, although not through MNR efforts as there is no record of these species being stocked in the lake by the Ministry. Interestingly, the lake survey also mentions yellow perch as being present, but there is no documentation to this effect in the catch record for the survey. Also, there is no reference to rock bass, pumpkinseed or brown bullhead being present; all of which were caught in this survey.

The lake has been stocked with lake trout on six occasions between 1949 and 1963. A 1975 letter on file indicates that plantings were discontinued due to unsuitable habitat for this species.

The purpose of this survey was to assess the status (health) of the various fish species that comprise the nearshore fish community. This goal was largely achieve by comparing data collected on Salmon Lake with "benchmarks" – or Provincial standards, established through compilation of the *Nearshore Community Index Netting* (NSCIN) database for similarly surveyed lakes throughout the Province of Ontario.

2.0 Methods:

2.1 Field Operations:

Our survey followed field procedures as specified in the Ministry's *Manual of Instructions for Nearshore Community Index Netting* (NSCIN) projects (OMNR, 1999). Basically, this survey uses live capture, 6'-trapnets that are set overnight for approximately 24-hour duration. Net set locations were randomly selected. All fish captured were enumerated (Appendix A) and sampled for total and fork length as well as weight determination (Appendix B – D). Scale samples were collected from largemouth and smallmouth bass for age assessment. All fish were live-released at the site of capture. Incidental mortality for this type of survey is generally negligible.

Our survey commenced on August 16th and terminated on August 20th. A total of 16 trapnet sets were made.

Set Locations:

As per the NSCIN manual, we segmented the shoreline of Salmon Lake into 111 units, each approximately 100 meters in length. These were then numbered and selection of which segment would be chosen for a net set was determined from a table of random numbers. The netting crew reported they were 'very hard pressed' to find suitable netting sites and were forced to seek alternate sites – also on a random basis. In addition to the foregoing random site selection, crews were advised to:

- Only fish sites suitable for the net to fish effectively. (Consequently – factors such as: contour of the lake bottom, absence of obstructions, depth, sufficient lead length, etc. were considered.)
- Nets were to be set far enough apart such that they were not competing with each other.
- Avoid areas of potential conflict where there was human habitation.
- Avoid areas where nets could act as a navigational hazard.

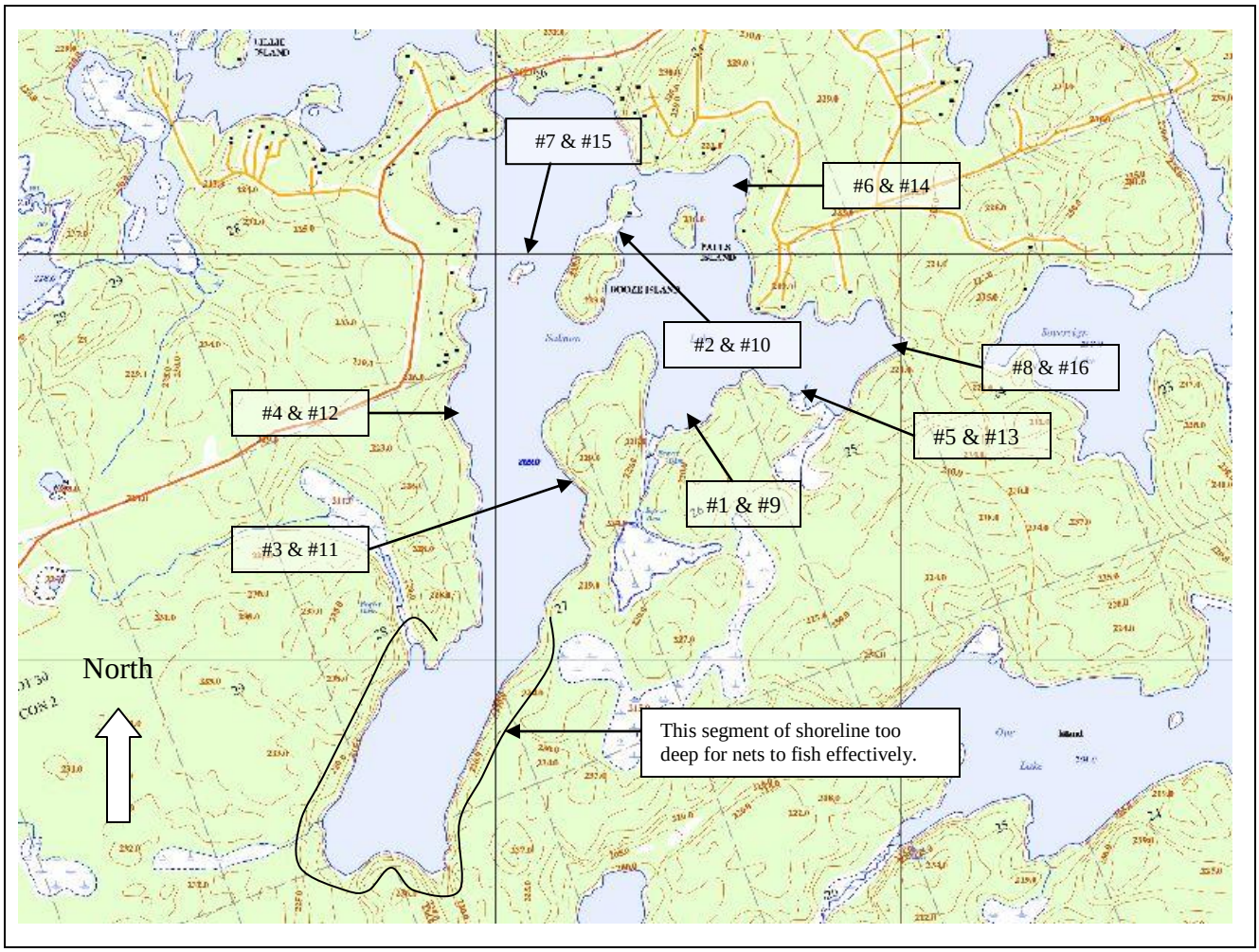
Due to the shortage of suitable netting sites, we were forced to re-use each of the eight sites selected. Nets set locations are indicated in Figure 1.

2.2 Data Analysis:

Age determination for smallmouth and largemouth bass was by the scale reading method. As there are no known-age fish in Salmon Lake, our age assessment is un-validated. Campbell and Babaluk (1979) concluded that scale aging consistently underestimates the true age of fish, particularly in older age classes. We suspect this for our age assessment as our mean age for both basses was below the Provincial benchmark (average), but our size-at-age was well above. This is an untenable situation that is readily explained by under-aging our fish.

We compare abundance (Catch-Per-Unit-Effort - CPUE) and size (mean fork length) indices with Provincial 'benchmarks' for various species. We caution our readers that comparisons between Salmon Lake data and the Provincial NSCIN benchmarks lacks rigour. The provincial database we make comparisons to, is comprised of 86 surveys conducted on 48 different waterbodies between 1991 and 1998. Ideally, this database should be filtered according to size of lake, productivity (TDS and growing-degree-days), water characteristics (secchi reading) and fish community to make valid comparisons with Salmon Lake. We are unable to do this 'filtering' because none of the surveys in the Provincial database are for lakes less than 100 hectares in size.

Figure 1. Map of Salmon Lake showing trap net set locations (indicated by set number).



3.0 Results:

3.1 Catch Results:

Our suite of 16 over-night trap-net sets captured at total of 115 smallmouth bass, 50 largemouth bass, 9 rock bass, 6 common white sucker, 5 pumpkinseed, 1 brown bullhead and 1 northern pike (Appendix A). Total catch was 187 fish.

3.2 Near-Shore Fish Community:

The near-shore fish community in Salmon Lake is relatively simple with only 7 species in the catch. The dominance of smallmouth and largemouth bass in the catch was quite remarkable. Smallmouth bass comprised 61% of all fish caught and 80% of the total weight (Figures 2a and 2b). Largemouth comprised 27% of fish caught and 13% of the total catch weight. Combined, they comprised a remarkably high 88% of fish caught and 93% of the total catch weight. In the Provincial NSCIN database, smallmouth and largemouth bass only comprise just over 6% of mean catch by number (Brereton, 2000).

Figure 2a Salmon Lake NSCIN survey catch composition by weight.

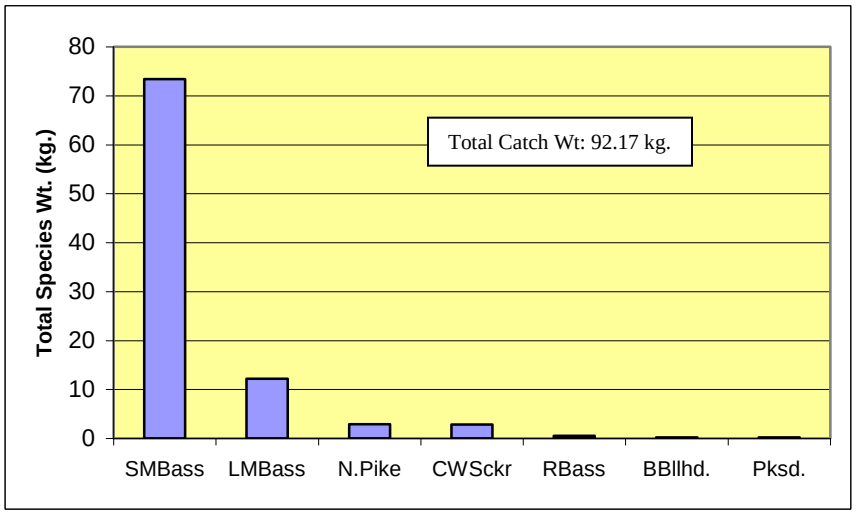
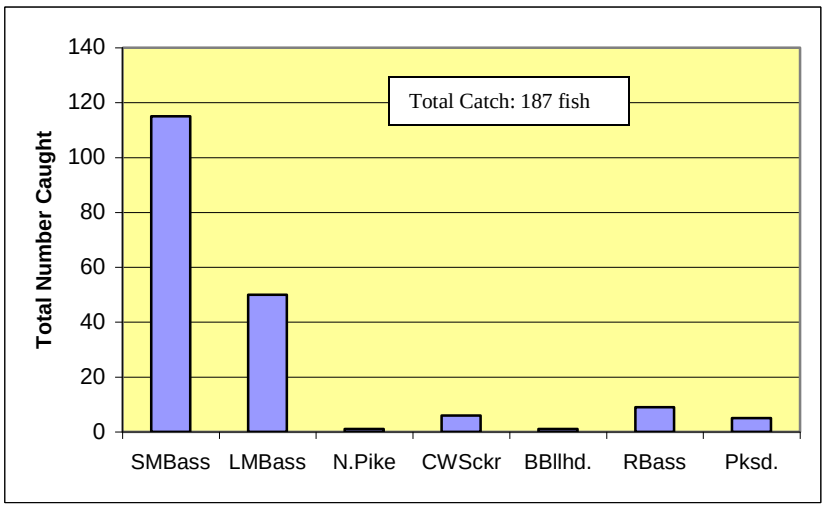


Figure 2b. Salmon Lake NSCIN survey catch composition by number.



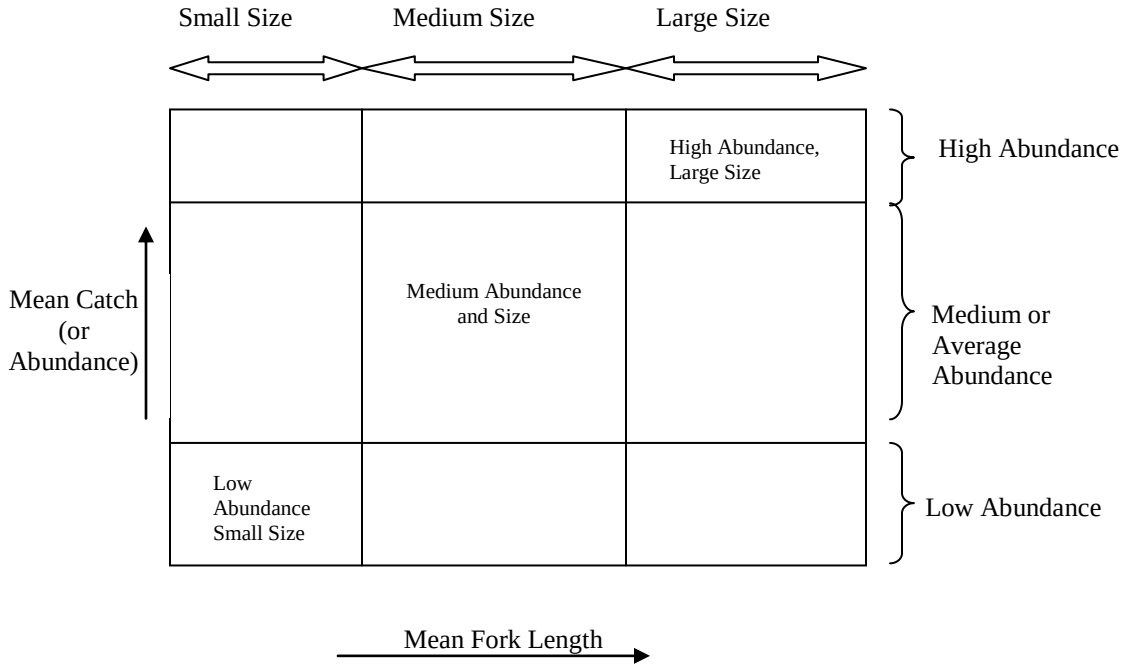
Game-fish (smallmouth, largemouth and northern pike combined) comprised a remarkable 96% of the total catch weight (Appendix A and Figure 2a). Relative to other trap net surveys recently conducted in the Parry Sound Area, the dominance of game-fish in the Salmon Lake catch is exceptionally high. Typically, about 60% of the total catch weight is comprised of game-fish.

3.3 Abundance and Size Indices:

We compared data for the various species caught in Salmon Lake data with Provincial benchmarks for abundance and size. These "benchmarks" are a classification system that divides the mean catch (abundance)* as well as mean fork length (size) into three categories (low, medium and high for abundance, and small, medium and large for size) as delineated by the 25th and 75th percentiles for each parameter (Brereton, 2000). To graphically illustrate these benchmarks the mean catch was plotted on a log scale (to address the skewness of the mean catch) against the mean fork length for various species. Lakes that lie above the 75th percentile are considered to have a high abundance and large size relative to other sampled lakes, and those that lie below the 25th percentile are considered to have a low abundance and small size. Those in the middle have a medium or 'average' abundance and size (Figure 3).

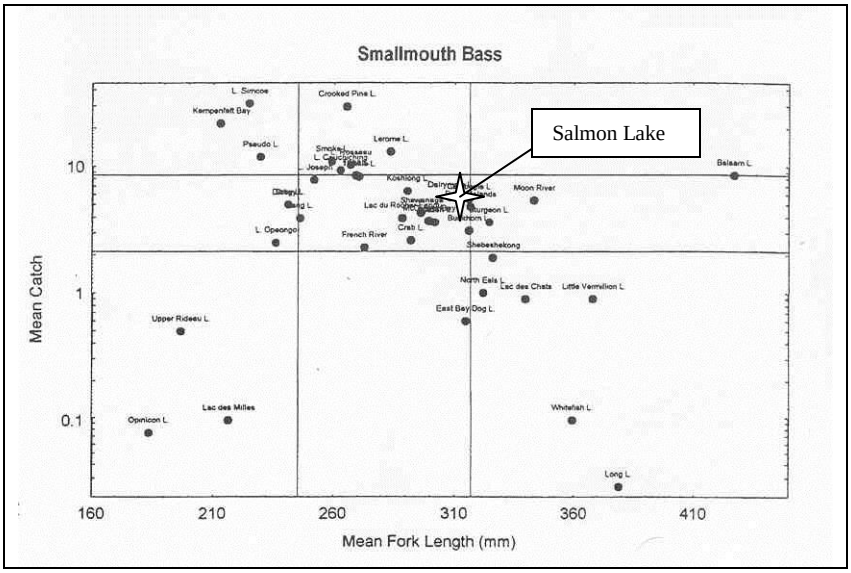
(* Note: Mean catch or abundance is measured by the Catch-Per-Unit-Effort (CPUE-no) or mean number of a particular species caught per net set.)

Figure 3. Interpretive illustration of NSCIN Mean Catch and Size Benchmarks



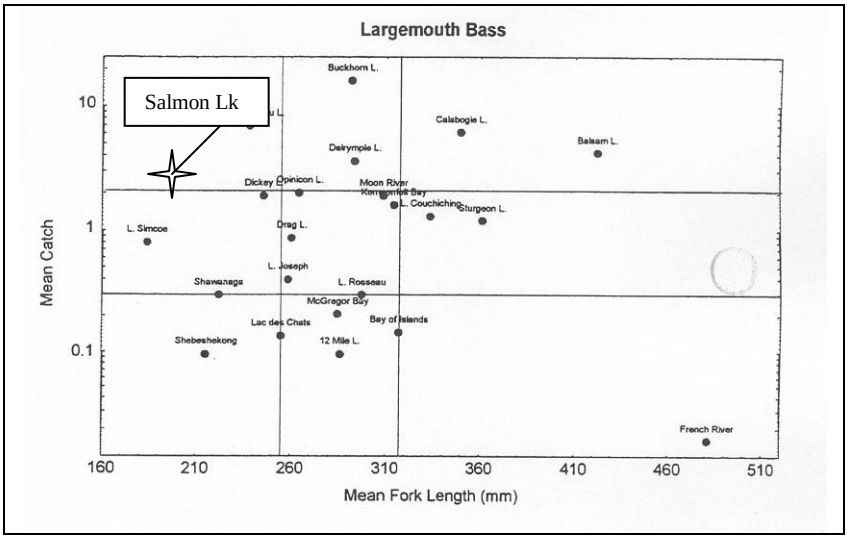
For smallmouth bass, our observed CPUE was 7.2 ± 1.9 (S.E.) fish / net set (Appendix A) and mean fork length was 30.5 cm. (Appendix B). Relative to provincial benchmarks, both these indices are medium or 'average' (Figure 4). We do note however, both are close to the 75th percentile and 'just shy' of the high abundance and large size category standards.

Figure 4. Mean Catch (CPUE-no) and size (fork length) benchmarks for smallmouth bass in the NSCIN Provincial database and relative position of Salmon Lake.



For largemouth bass, our CPUE was 3.1 ± 0.5 (S.E.) fish per net set (Appendix A) and mean fork length was 20.7 cm. (Appendix C). Relative to Provincial benchmarks, largemouth abundance was high, but size was small (Figure 5.)

Figure 5. Mean Catch (CPUE-no) and size (fork length) benchmarks for largemouth bass in the NSCIN Provincial database and relative position of Salmon Lake.



The relative position with respect to Provincial benchmarks for abundance and size, for all species captured in Salmon Lake is shown in Table 1. It is noteworthy that only one northern pike and one brown bullhead were caught, making any categorization with respect to mean size very dubious.

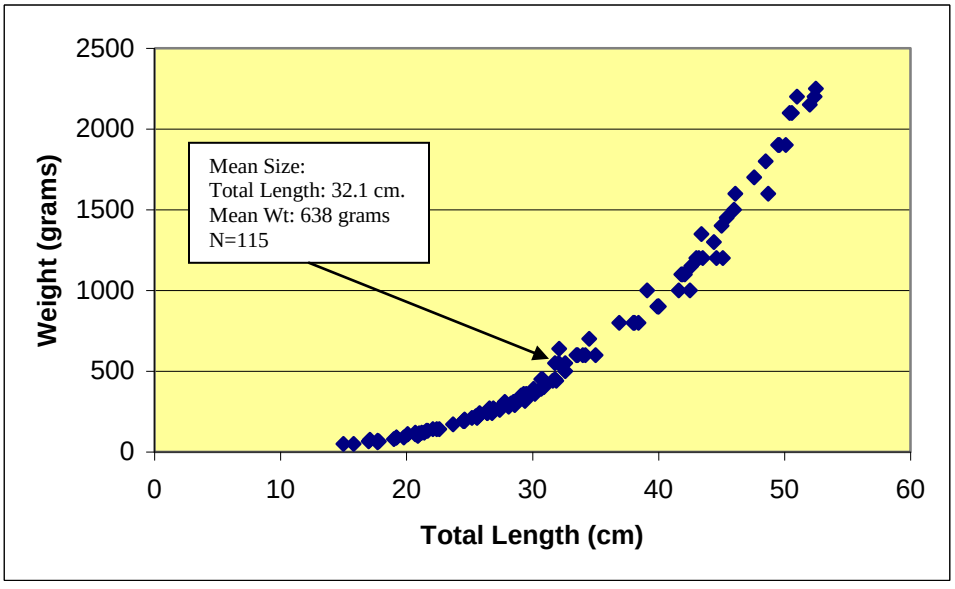
Table 1. Abundance and Size Benchmark Categories for Fish Species Captured on Salmon Lake.

Species	Abundance (Mean Catch or CPUE-no.)	Mean Size (fork length)
Smallmouth Bass	Medium	Medium
Largemouth Bass	High	Small
Northern Pike	Low	Large (N=1)
Common Wt. Sucker	Medium	Small
Brown Bullhead	Low	Medium (N=1)
Rock Bass	Low	Small
Pumpkinseed	Low	Small

3.4 Size Distribution of Smallmouth and Largemouth Bass:

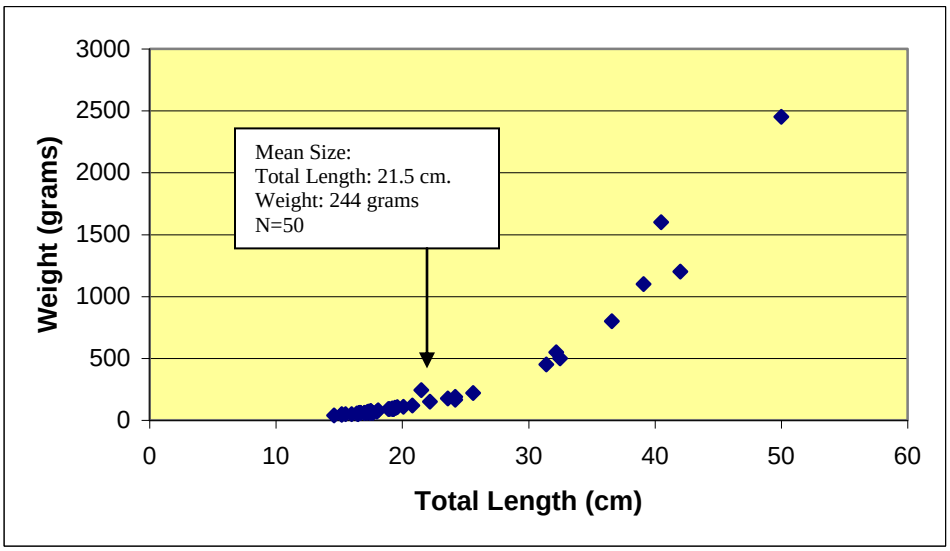
We sampled the complete catch of 115 smallmouth bass and calculated a mean total length of 32.1 cm. (12.5") and mean weight of 638 grams (1.4 lbs) (Appendix B). The size distribution (Figure 6) shows an excellent distribution of all size classes with good representation of both juvenile and older fish in the catch sample. This in conjunction with the 'good' abundance of smallmouth bass (CPUE 7.2) are persuasive indicators the population is enjoying good levels of recruitment and moderate exploitation. The population appears healthy and is certainly in a viable, self-sustaining condition.

Figure 6. Size Distribution of Smallmouth Bass sampled during the Salmon Lake NSCIN survey, 2004.



We also sampled the complete catch of 50 largemouth bass and calculated a mean total length of 21.5 cm. (8.5") and mean weight of 244 grams (0.54 lbs) (Appendix C). The size distribution (Figure 7) for largemouth bass indicates a high abundance of juvenile fish (<25 cm), but a scarcity of older individuals. This may be symptomatic of high exploitation. Notwithstanding this possibility, population abundance is still high (CPUE 3.1). This is largely due to excellent reproduction and recruitment of juvenile fish. We believe the population is healthy in terms of successful reproduction and recruitment, but mortality – possibly attributable to angling, appears to be high.

Figure 7. Size Distribution of Largemouth Bass sampled during the Salmon Lake NSCIN survey, 2004.



3.5 Other Species:

It is rather surprising that northern pike, common white sucker, rock bass, pumpkinseed and brown bullhead are such minor components of the fish community. In many lakes these species can become very abundance and quite dominant in trap-net catches, both in terms of number and weight. There is little we can say about the health of these populations because so little data was collected on them. The low abundance of brown bullhead and northern pike may be related to a scarcity of vegetated littoral habitat, which is preferred by these species.

4.0 Literature Cited:

Brereton, C. 2000. Nearshore Community Index Netting (NSCIN) in Ontario – A Summary Report, 1991 – 1998. OMNR, Fisheries Assessment Unit (FAU) Network Report 2000-1. 24 p.

Campbell, J.S. and J.A. Babaluk. 1979. Age determination of walleye, *Stizostedion vitreum vitreum* (Mitchell) based on the examination of eight different structures. Fisheries & Marine Service Technical Report No. 849, Department of Fisheries and the Environment, Winnipeg, Manitoba. 23 p.

OMNR, 1971. Aquatic Habitat Inventory Survey (lake survey). Parry Sound District Office fisheries files.

OMNR, 1999. Manual of Instruction: Nearshore Community Index Netting (NSCIN). Queen's Printer for Ontario. 40 p. + forms.

5.0 Acknowledgements:

Field operations were supervised by Jim Palmer (Fish and Wildlife Technician), with assistance from summer students Joey Simon and Rosemary Themer, and technicians Bart Brown and Dean Timson.

We thank Ms. Marg Morden for allowing us to store our boat at her cottage during the project.

Appendix A.

Trap-net Catch Summary for a Near-Shore Community Index Netting (NSCIN) Project conducted on Salmon Lake, 2004.

Set No.	Date Set	Date Lifted	Catch (number) SM. Bass	LM. Bass	Northern Pike	C.White Sucker	Brown Bullhead	Rock Bass	Pumpkin-seed	Grand Total
1	Aug.16	Aug.17	17	1	0	0	0	1	0	
2	Aug.16	Aug.17	4	3	0	0	0	0	0	
3	Aug.16	Aug.17	16	2	0	0	0	0	0	
4	Aug.16	Aug.17	0	0	0	0	0	0	0	
5	Aug.17	Aug.18	25	5	0	0	0	0	0	
6	Aug.17	Aug.18	0	1	0	0	0	1	0	
7	Aug.17	Aug.18	17	4	0	0	0	0	0	
8	Aug.17	Aug.18	1	6	0	6	0	0	0	
9	Aug.18	Aug.19	2	6	0	0	0	0	0	
10	Aug.18	Aug.19	5	2	0	0	0	0	0	
11	Aug.18	Aug.19	10	3	0	0	0	0	0	
12	Aug.18	Aug.19	0	4	0	0	0	6	0	
13	Aug.19	Aug.20	2	7	0	0	1	1	4	
14	Aug.19	Aug.20	5	1	0	0	0	0	0	
15	Aug.19	Aug.20	8	2	0	0	0	0	1	
16	Aug.19	Aug.20	3	3	1	0	0	0	0	
CPUE-no (number / net set)			7.2	3.1	0.1	0.4	0.1	0.6	0.3	
Standard Error			1.915	0.515	0.063	0.375	0.063	0.376	0.254	
Standard Deviation			7.661	2.062	0.250	1.500	0.250	1.504	1.014	
Confidence Level(95.0%)			4.082	1.099	0.133	0.799	0.133	0.802	0.541	
Median catch			4.5	3	0	0	0	0	0	
Total catch (sum)			115	50	1	6	1	9	5	187
Sample Size (# net sets)			16	16	16	16	16	16	16	
CPUE-wt (kg. / net set)			4.587	0.762	0.181	0.174	0.12	0.033	0.011	5.761
Species Catch Weight (kg)			73.385	12.195	2.900	2.790	0.190	0.535	0.175	92.170
Mean Species Weight (grams)			638.1	243.9	2900.0	465.0	190.0	59.4	35.0	

Appendix B.
Salmon Lake – Smallmouth Bass Biosampling Data

Set No.	Fish No.	Fk. Lg. (cm)	Tot. Lg. (cm)	Weight (grams)	Age
1	1	23.6	24.5	190	2
1	2	16.2	17.0	65	1
1	3	30.7	32.6	550	3
1	4	27.6	29.3	360	2
1	5	25.3	26.4	250	2
1	6	24.4	25.7	220	2
1	7	19.8	20.9	100	1
1	8	41.0	43.5	1200	6
1	9	25.2	26.4	240	2
1	10	20.8	21.7	130	2
1	11	16.9	17.7	60	1
1	12	25.5	26.8	240	2
1	13	25.8	26.9	270	2
1	14	20.4	21.4	120	2
1	15	22.6	23.7	170	2
1	16	26.9	28.3	300	3
1	17	42.6	45.0	1400	8
2	1	29.1	30.7	450	4
2	2	37.7	40.0	900	6
2	3	28.2	29.7	350	3
2	4	41.0	43.2	1200	5
3	1	46.6	49.5	1900	7
3	2	19.7	20.7	120	1
3	3	32.7	34.5	700	3
3	4	30.0	31.8	450	3
3	5	24.4	25.8	240	2
3	6	16.2	17.1	75	1
3	7	27.0	28.5	310	2
3	8	25.7	27.0	260	2
3	9	39.7	41.9	1100	5
3	10	42.4	45.1	1200	5
3	11	39.9	42.5	1000	4
3	12	14.0	15.0	50	1
3	13	47.0	49.6	1900	7
3	14	43.8	46.0	1500	5
3	15	43.8	46.1	1600	6
3	16	45.6	47.6	1700	6
5	1	18.1	19.0	80	1
5	2	26.6	27.8	310	3
5	3	28.5	29.9	360	3
5	4	32.4	34.0	600	4
5	5	24.3	25.6	210	2
5	6	16.9	17.7	70	1
5	7	39.7	41.8	1100	6
5	8	24.4	25.2	210	2
5	9	21.2	22.4	140	2
5	10	21.1	22.1	140	2
5	11	23.9	24.6	190	2
5	12	27.0	28.6	290	3
5	13	28.5	30.1	390	3
5	14	29.8	30.7	390	3
5	15	27.9	29.5	360	2
5	16	31.1	32.6	500	4
5	17	21.5	22.6	140	2
5	18	26.8	28.1	280	3
5	19	26.3	27.4	260	2
5	20	32.5	34.2	600	4
5	21	29.3	30.8	450	3
5	22	41.9	44.4	1300	6
5	23	18.8	19.8	90	1
5	24	29.5	31.0	420	3
5	25	19.9	21.0	110	1
7	1	27.4	28.9	320	2
7	2	24.9	26.4	240	2
7	3	25.8	26.6	270	3
7	4	29.9	31.6	440	4
7	5	18.4	19.2	90	1
7	6	24.5	25.5	220	2
7	7	27.7	29.1	350	3
7	8	20.6	21.6	130	2
7	9	29.0	30.2	360	3
7	10	28.6	30.1	380	3
7	11	39.5	41.6	1000	5
7	12	26.0	27.6	290	2
7	13	18.4	19.2	90	2
7	14	20.3	21.2	120	2
7	15	26.3	27.7	290	2
7	16	36.2	38.1	800	4
7	17	46.3	48.5	1800	8
8	1	40.2	42.6	1150	6
9	1	19.9	21.0	115	1
9	2	28.0	29.4	315	2

continued

Appendix B continuation …

Set No.	Fish No.	Fk. Lg. (cm)	Tot. Lg. (cm)	Weight (grams)	Age
10	1	19.1	20.1	110	1
10	2	19.1	20.1	110	1
10	3	35.1	36.9	800	5
10	4	36.8	39.1	1000	6
10	5	40.9	43.0	1200	6
11	1	42.3	45.4	1450	8
11	2	46.4	48.7	1600	9
11	3	49.4	52.0	2150	13
11	4	48.1	50.6	2100	12
11	5	49.5	52.5	2250	13
11	6	30.0	31.8	550	3
11	7	28.4	29.9	370	3
11	8	23.4	24.6	200	2
11	9	16.9	17.8	65	1
11	10	19.7	20.7	110	1
13	1	41.9	44.6	1200	
13	2	15.1	15.8	50	
14	1	47.6	50.4	2100	
14	2	49.7	52.4	2200	
14	3	36.1	38.0	800	
14	4	39.9	42.1	1100	
14	5	36.3	38.4	800	
15	1	31.8	33.5	600	
15	2	30.5	32.1	550	
15	3	29.4	30.9	400	
15	4	33.1	35.0	600	
15	5	48.4	51.0	2200	
15	6	47.7	50.1	1900	
15	7	37.7	40.0	900	
15	8	31.9	33.6	600	
16	1	37.9	39.9	900	
16	2	41.1	43.4	1350	
16	3	30.2	31.9	440	
		30.5	32.1	638.1	3.4	Mean
		0.883	0.936	56.270	0.257	Standard Error
		28.5	30.1	370	3	Median
		24.4	26.4	1200	2	Mode
		9.465	10.043	603.433	2.528	Standard Deviation
				73385		Sum
		115	115	115	97	Count
		1.749	1.855	111.471	0.510	Confidence Level (95.0%)

Appendix C.
Salmon Lake – Largemouth Bass Biosampling Data

Set No.	Fish No.	Fk. Lg. (cm)	Tot. Lg. (cm)	Weight (grams)	Age
1	1	35.1	36.6	800	5
2	1	31.1	32.2	550	4
2	2	17	17.7	60	1
2	3	48.2	50	2450	13
3	1	20	20.8	120	1
3	2	18.5	19.3	90	1
5	1	30.4	31.4	450	4
5	2	18.5	19.3	90	1
5	3	24.6	25.6	220	3
5	4	16	17.2	60	1
5	5	23.2	24.2	165	2
6	1	16.7	17.4	60	1
7	1	17.2	18	70	1
7	2	16	16.6	60	1
7	3	16.6	17.3	70	1
7	4	16.6	17.4	70	1
8	1	31.2	32.5	500	5
8	2	16.5	17.5	70	1
8	3	15.7	16.5	55	1
8	4	18.3	19.2	95	1
8	5	14.8	15.5	50	1
8	6	21.2	22.2	150	2
9	1	16.2	16.7	60	1
9	2	18.1	18.9	90	1
9	3	17	17.5	75	1
9	4	16.6	17.2	65	1
9	5	22.9	23.6	175	2
9	6	16.4	17	60	1
10	1	19.4	20.1	110	1
10	2	40.4	39.1	1100	8
11	1	16.9	17.5	60	1
11	2	18.5	19.4	100	1
11	3	18.5	19.2	90	1
12	1	18.3	19	90	1
12	2	18.6	19.6	105	1
12	3	18.9	19.5	100	1
12	4	14	14.6	40	1
13		16.9	17.5	70	
13		17.3	18.1	80	
13		15.3	16	50	
13		15.9	16.5	50	
13		23.4	24.2	190	
13		16.3	17	60	
13		15.8	16.4	55	
14		16	16.7	60	
15		15.9	16.6	60	
15		14.5	15.2	50	
16		14.5	15.2	45	
16		40.6	42	1200	
16		38.8	40.5	1600	

Mean	20.7	21.5	243.9	2.0
Standard Error	1.114	1.133	63.892	0.398
Standard Deviation	7.875	8.009	451.787	2.421
Confidence Level(95.0%)	2.238	2.276	128.396	0.807
Sum			12195	
Count	50	50	50	37

Appendix D.
Salmon Lake – Biosampling Data for 'Other' Species

Species	Set No.	Fish No.	Fk. Lg. (cm)	Tot. Lg. (cm)	Weight (grams)
N. Pike	16	1	70.8	75.4	2900
Br. Bullhead	13	1		24.7	190
Rock Bass	1	1	17.9	18.6	130
Rock Bass	6	1	15.1	16	80
Rock Bass	12	1	12.6	12.9	45
Rock Bass	12	2	14.3	14.9	65
Rock Bass	12	3	12.6	13	40
Rock Bass	12	4	14.5	15	65
Rock Bass	12	5	11.4	11.8	30
Rock Bass	12	6	11.9	12.4	35
Rock Bass	13	1	12.9	13.4	45
Mean			13.7	14.2	59.4
Sum					535
CW Sucker	8	1	32.5	34.5	400
CW Sucker	8	2	28	30.3	290
CW Sucker	8	3	19.2	20.2	90
CW Sucker	8	4	43.5	47	1200
CW Sucker	8	5	33.3	35.8	600
CW Sucker	8	6	24.8	26.9	210
Mean			30.2	32.5	465.0
Sum					2790
Pumpkinseed	13	1	12.1	12.6	30
Pumpkinseed	13	2	12	12.7	35
Pumpkinseed	13	3	11.1	11.7	30
Pumpkinseed	13	4	14.6	15.3	50
Pumpkinseed	15	1	11.4	12	30
Mean			12.2	12.9	35.0
Sum					175