Results of a Summer Profundal Index Netting (SPIN) Survey Conducted on Sucker Lake in 2013

File Report

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Sucker Lake is a moderately small (109 ha) lake located in Humphrey Township. It is also only moderately deep (Z_{max}= 17 m) but has an unusually high mean depth relative to the maximum depth (Z_{mean} = 11 m). It is an oligotrophic lake with high water clarity and low nutrient levels (Secchi depth = 5.3 m, TP = 5.2 ug/l, MOE 2011) (Figure 1). The lake is accessible via a public boat launch located at the end of Rosseauview Road.

The native fish community of the lake appears to have been dominated by lake trout and cisco. Interviews conducted with long time users of the lake in the 1980's led to the conclusion that lake trout were native. Smallmouth bass were first stocked in 1939 and stocking occurred regularly until 1956; although it is not certain, it is likely that that the early plantings were introductory in nature. Walleye were also stocked several times in the 1940's but these plantings did not result in the establishment of a self-sustaining population as the lake does not provide suitable habitat for this species. Lake trout stocking began in 1949 and has occurred regularly until the present (Table 1). Exotic rainbow smelt were first caught in a test net set in or prior to 1962 (undated field sheet with 1962 mail stamp). The first formal lake survey in 1968 documented all the species discussed above as well as pumpkinseed sunfish. A follow up survey in 1973 added white sucker, brown bullhead, burbot and yellow perch to the list of inhabiting species; all are probably native.

The first targetted assessment of the lake trout population occurred in 1977 (Thurston 1977). A total of seven lake trout were caught in 12 net sets. None were fin clipped; however the first year that fin clipping was recorded to occur was 1976, so it is not possible to determine how many of the lake trout were stocked and how many were naturally produced. However, the catch was dominated by large fish ranging from 3 to 5 kg in weight which is consistent with the next most recent stocking event occurring 10 years earlier (i.e no small fish that may have been naturally produced were caught). The lake manager at the time classified the lake as Category 2; meaning the catch was moderate and it was not conclusive whether lake should continue to be managed for lake trout.

A decade later, in 1988, a netting assessment was done following a stocking of splake that occurred in 1984 (Hill 1988). A total of two splake and eight lake trout were caught (plus catches of non-target species). Seven of the eight lake trout were fin clipped indicating they were stocked. The eighth fish was not clipped but was large enough that it may have been stocked prior to 1976, when fin clipping did not occur. Rock bass were documented for the first time in this survey. Lake trout abundance was rated as being low.

A spawning assessment in 1990 yielded only one lake trout which was fin clipped; although the amount of netting effort was low. It was suggested that the amount and quality of spawning habitat was a limiting factor in lake trout reproduction (Ross 1991).

The most recent work done was a Spring Littoral Index Netting (SLIN, Hicks 1999) survey completed in 1995. The results of this survey were not formally reported, although the data is archived in a FISHNET2 database (53M_IA95_SUL). Thirty-two standard SLIN sets caught 27 lake trout, all but one of which were fin clipped and all but one of the clipped fish were three year old fish originating from the 1993 planting.

Sucker Lake is currently designated for management as a put-grow-take lake trout lake (OMNR 2006). Currently stocking typically occurs biennially, with about 500 spring yearlings being stocked each time. The angling season for lake trout is open all year, in recognition that the fishery is supported by stocked fish.

A Summer Profundal Index Netting (SPIN) survey was conducted in 2013 to assess the current status of the lake trout population.

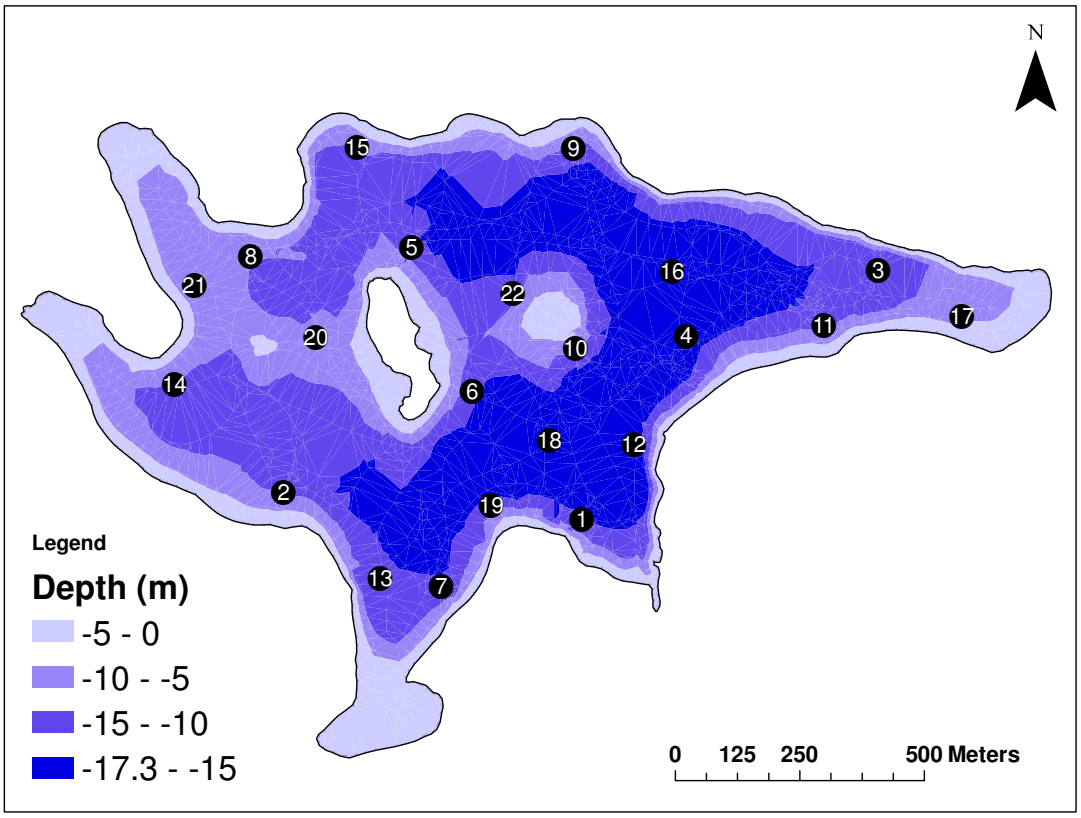


Figure 1 Map of Sucker Lake showing bathymetry and net set locations, 2013.

Table 1 Recent lake trout stocking history, Sucker Lake.

Year	Number	Fin Clip	Age in 2013
1985	2000	LP	29
1987	1650	RV	27
1989	1300	LV	25
1991	1300	RP	23
1993	1300	AD	21
1995	1300	LP	19
1997	800	RV	17
1999	800	LV	15
2001	800	RP	13
2003	800	AD	11
2005	800	LP	9
2007	800	RV	7
2009	800	LV	5
2011	525	RP	3
2013	500	AD	1

Methods

The SPIN protocol was followed (Sandstrom and Lester 2007). Gear consisted of gangs of eight panels of clear mono-filament gill net; each panel was 1.8 m high and 8.0 m long. Panel mesh sizes were 2.25 2.50 2.75 3.00 3.50 4.00 4.50 and 5.0 inch stretch measure, randomly arranged. Net sets consisted of single-gang straps due to the small size of the lake. The standard depth strata (6-10 m and 10-20 m) were combined into one due to the small size of the 6-10 m stratum. Nets were set for two-hour periods.

Captured fish had standard biological attributes measured.

A temperature and dissolved oxygen profile was collected to determine the depth of the thermocline at the time of netting and bathymetric data was collected.

Tissue samples were collected from lake trout mortalities and submitted to the MOE for analysis of contaminants, primarily mercury. Results will appear on the MOE Guide to Eating Ontario Sportfish.

Lake trout density and abundance estimates were generated using the SPIN Support Spreadsheet (ver. 9.07). Raw catch data were corrected for net selectivity, and weighted by stratum areas to produce a whole-lake catch-per-unit-effort (CUE). The CUE was converted to number and biomass estimates using calibration formulas developed for this netting protocol.

Project data is archived in FISHNET3 as PSD_IA13_SUCKER.

Results

Netting occurred on July 5 and 12, 2013. At the time of netting, the thermocline was well defined and occurred from approximately 5 to 9 m deep (Table 2). The dissolved oxygen profile displayed a positive heterograde pattern with a maximum occurring in the thermocline. The oxygen concentration remained above the threshold for optimal use by lake trout (6 ppm) almost to the bottom of the lake.

Table 2 Temperature and dissolved oxygen profile, Sucker Lake, July 3, 2012.

Depth (m)	Temp. (C)	D.O. (ppm)
0.5	24.6	7.8
1	24.3	7.8
2	24.1	7.9
3	24.1	7.9
4	21.9	9.6
5	17.9	11.2
6	13.8	10.9
7	11.0	9.9
8	9.1	9.2
9	7.8	8.7
10	6.9	8.5
11	6.2	8.3
12	5.8	8.3
13	5.4	8.1
14	5.2	7.5
15	5.0	6.5
16	4.8	4.9

A total of 22 net sets were completed (Table 3, Figure 1); 11 each day. Set depths ranged from 5 to 17 m deep. The 5 m starting depth was slightly above the thermocline but due to the steep nature of the shoreline in some locations sets were intentionally started somewhat shallow to ensure the net crossed the full depth of the thermocline.

Table 3 Net set details, Sucker Lake, 2013.

Effort	East	North	Set Date	Set Time	Lift Time	Start Depth (m)	Mid Depth (m)	End Depth (m)
1	603572	5011314	05/07/2013	09:40	11:42	8	14	16
2	602973	5011368	05/07/2013	10:00	12:03	6	10	14
3	604166	5011814	05/07/2013	10:20	12:20	10	13	13
4	603781	5011682	05/07/2013	10:40	12:40	17	15	16
5	603230	5011859	05/07/2013	11:00	12:56	7	12	15
6	603351	5011571	05/07/2013	11:20	13:19	8	14	16
7	603289	5011180	05/07/2013	12:00	14:03	7	14	15
8	602907	5011842	05/07/2013	12:15	14:15	6	9	10
9	603555	5012058	05/07/2013	12:30	14:34	5	12	14
10	603559	5011656	05/07/2013	12:47	14:47	5	10	14
11	604057	5011703	05/07/2013	13:07	15:07	6	12	14
12	603676	5011464	12/07/2013	09:40	11:40	15	16	17
13	603167	5011196	12/07/2013	10:05	12:03	13	14	15
14	602754	5011584	12/07/2013	10:20	12:25	8	16	18
15	603121	5012060	12/07/2013	10:40	12:40	6	10	12
16	603753	5011811	12/07/2013	11:00	13:00	17	17	17
17	604335	5011721	12/07/2013	11:20	13:21	6	7	7
18	603507	5011473	12/07/2013	11:35	13:46	17	17	17
19	603390	5011342	12/07/2013	11:55	13:56	6	15	17
20	603038	5011679	12/07/2013	12:50	14:25	8	9	9
21	602794	5011784	12/07/2013	12:35	14:35	6	8	8
22	603433	5011767	12/07/2013	12:50	14:54	6	10	15

A total of 13 lake trout were caught in nine different net sets (Table 4). Thirteen cisco, one rainbow smelt, five white suckers and three smallmouth bass were also caught.

The selectivity-adjusted and area-weighted catch rate of lake trout greater than 300 mm fork length was 0.83/net (S.E.=0.25, Appendix). Using the conversion equation developed for the SPIN protocol the estimated density of lake trout was 3.1 fish/ha (2.8 kg/ha) of lake trout habitat or a population of 269 fish (111-431, 68% prediction interval).

The lake trout ranged from 351 to 660 mm total length and 350 to 2500 g in weight (Table 5). Eleven of the 13 fish were fin clipped. Ages based on the clips (validated by ages obtained from otoliths and fin rays) ranged from 5 to 17 years old; five from the 2009 planting (5 years old), four from 2007 (7 years old), one from 2005 (9 years old) and one from 1997 (17 years old).

Two lake trout did not have any visible fin clips indicating that were naturally produced (it is possible that fins were not clipped in the hatchery or that they had regenerated). One was aged to be seven years old. Age structures were not collected from the other.

The cisco averaged 364 mm fork length (range: 285-380). The lengths of other species are found in Table 5.

Table 4 Catch summary, Sucker Lake SPIN, 2013.

Set	lake trout	cisco	rainbow smelt	white sucker	smallmouth bass
1	1		1		
2		1			
3					
4					
5	2				
6	2				
7		2			
8	2	2		1	
9		1			
10				1	
11		2			
12	1	1			
13	1	1			
14					
15					1
16		1			
17	1			1	1
18					
19	1	2			
20					
21	2			1	
22				1	1
Total	13	13	1	5	3

Table 5 Individual fish data, sorted by species and size, Sucker Lake SPIN, 2013.

Species	Effort	Fish	Fork Length (mm)	Total Length (mm)	Round Weight (g)	Sex	Gonad Condition	Fin Clip	Age (clip)	Age (calcified structure)
lake trout	8	13	319	351	350			LV	5	6
lake trout	19	29	330	365	350	F	Imm	LV	5	5
lake trout	8	14	332	367	360			LV	5	5
lake trout	17	26	363	400	500	F	Imm	LV	5	5
lake trout	21	32	371	410	520	F	Imm	LV	5	6
lake trout	6	6	394	435	620	M	Imm	RV	7	8
lake trout	21	30	443	492	1080	M	Dev	RV	7	8
lake trout	6	7	455	506	1080			RV	7	7
lake trout	5	4	456	505				RV	7	7
lake trout	12	18	500	551	1550			LP	9	9
lake trout	13	21	517	570				NC		7
lake trout	1	2	550	615				NC		
lake trout	5	5	610	660	2500			RV	17	16
cisco	19	27	285							
cisco	7	9	331							
cisco	7	8	332							
cisco	8	11	337							
cisco	12	19	339							
cisco	2	3	340							
cisco	19	28	340							
cisco	16	23	343							
cisco	8	12	360							
cisco	11	17	361							
cisco	11	16	365							
cisco	9	15	370							
cisco	13	20	380							
rainbow smelt	1	1	180							
white sucker	22	33	401							
white sucker	8	10	437							
white sucker	10	915	474							
white sucker	21	31	487							
white sucker	17	24	490							
smallmouth bass	15	22	346							
smallmouth bass	22	34	350							
smallmouth bass	17	25	356							

Discussion

The SPIN methodology samples large-bodied species that live in and below the thermocline in the summer. Warm water species such as bass and suckers are not typically captured other than as incidental catches and the results of this survey do not reflect their true abundance in the lake.

The amount of netting effort expended was sufficient to describe the general status of the population. Much more netting effort would have been required to improve the precision of the abundance estimates or to obtain a large enough sample of measured fish to make more robust statements about the structure of the population. That amount of effort was beyond the scope of this survey. The approach of starting some net sets a little shallow to ensure nets fished the full depth of the thermocline may have negatively biased the catch rate to a degree as small sections of nets would not have been in suitable lake trout habitat.

The lake trout population of Sucker Lake is dominated by stocked fish. Two unmarked fish were caught indicating that a low level of natural reproduction is occurring. In 1995, only one of 25 sampled fish was unmarked (and it was of a size and age suggesting it may have been stocked). Similarly, in 1998 at least seven of the eight lake trout caught were stocked. The relatively shallow maximum depth of the lake limits its ability to support a self-sustaining lake trout population. Notwithstanding that the lake apparently did support a native population, it has not been able to withstand the changes that have occurred to the lake; in particular, the introduction of non-native species that compete with or prey on lake trout (smelt and smallmouth bass), supplemental stocking of lake trout, ongoing angler exploitation and possibly changes to the physical habitat and water quality. Some of these changes cannot be reversed so it is likely that the capacity of the lake to support a natural population has been permanently altered. Stocking is a stress on a natural population that could be removed; however in the absence of stocking the population would likely persist only at a very low level and be capable of supporting virtually no fishery. If the genetic composition of the native stock was intact, managing for a natural population may be justified. However, with such a low occurrence of natural fish and non-native genes having been stocked for over 60 years it doesn't seem likely that the pure native stock persists.

The current abundance of lake trout can be classified as moderate. Diagnostics being developed for the SPIN protocol indicate that a 'good' or 'healthy' exploited population should have a biomass of about 5 kg/ha, whereas the estimate for Sucker Lake is just less than 3 kg/ha. The catch rates from the 1995 SLIN survey cannot be directly compared to this survey since the netting protocol differed and density or biomass conversions have not been developed for SLIN. The SLIN catch rate of 0.8 lake trout/net could be considered moderate for that method; however most of the fish caught were only 3 years old. Only 2 harvestable-sized trout were caught, a low catch indeed and suggestive that the population of catchable-sized fish was at least as large, if not considerably larger in 2013 than it was in 1995.

The amount and quality of lake trout habitat can be expressed in different ways. Measures include the maximum or mean depth of the lake, the volume or percentage of useable (<15 C and > 4 ppm D.O.) or optimal (<10 C and > 6 ppm D.O.) habitat and the mean hypolimnetic oxygen level. Compared to other lake trout lakes in Parry Sound District, Sucker Lake has amongst the lowest maximum depth, though the mean depth is unusually high in relation to the maximum depth (Figure 2). The low maximum depth is a major limitation to strong natural reproduction but the moderate mean depth indicates suitability for put-grow-take (PGT) stocking.

Cisco and rainbow smelt are the primary species which share deep water habitat with lake trout in Sucker Lake. Both species are important prey for, but also potential predators of, very small lake trout. The absence of deep water nursery habitat for lake trout fry means that predation by these species on lake trout fry would be more intense than in a deeper lake; a further limitation to the potential for natural reproduction. Burbot were not caught in this survey but have been documented in the past. The species is under-represented in gill net catches, especially nets that are not set overnight when they are active. They are a potential predator of small lake trout as well. Stocking of yearling lake trout bypasses the very early life stages that are most vulnerable to impacts from other species.

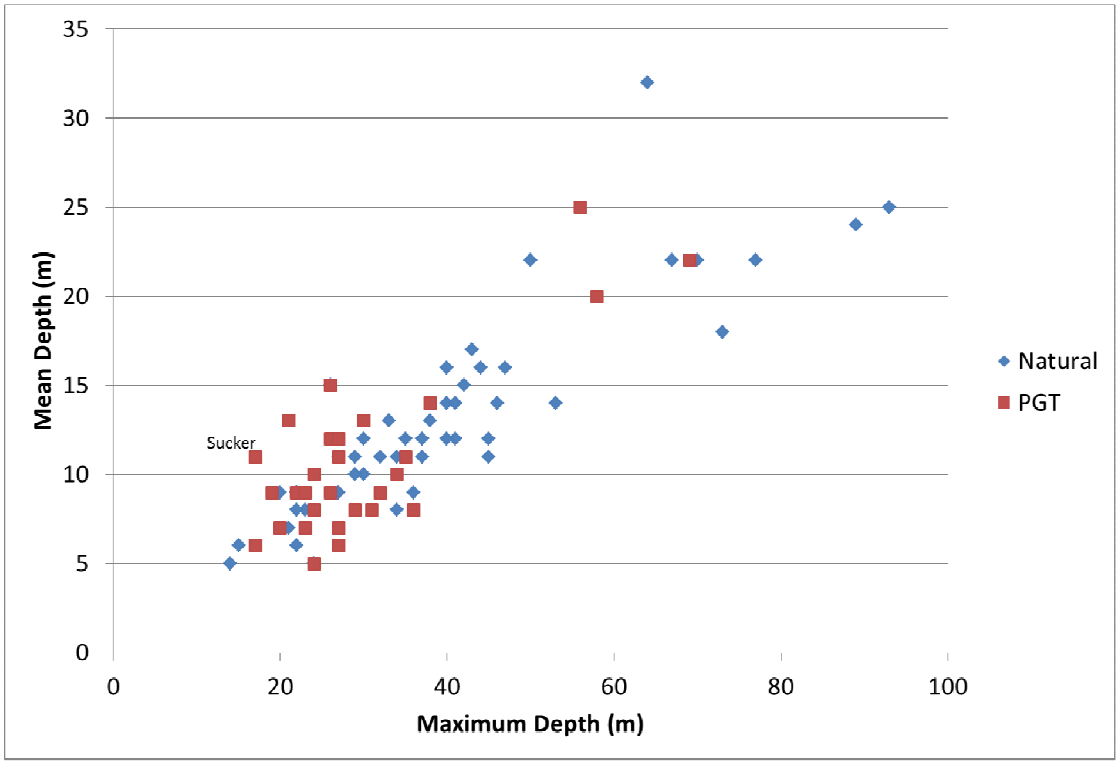


Figure 2 Relationship between maximum and mean depth for designated lake trout lakes in Parry Sound District.

The stocking rate in Sucker Lake has been reduced twice; from 1,300/event to 800 and is currently 500/event. The recommended stocking rate is 20 yearlings/per hectare of water between 15-35 m deep (OMNR 2002). This translates to about 600 fish per event (30 ha > 15 m deep). This is an average rate that should be adjusted based on local observations of survival and growth. The catch from this survey mostly reflects the abundance produced by the stocking rate of 800/event. The 1995 survey caught fish that were stocked at the rate of 1300/event. The earlier survey yielded mostly small, young fish. It seems somewhat counter intuitive that a lower stocking rate appears to be yielding a better representation of older, larger fish but the higher stocking rate may have been excessive resulting in poor early growth and survival. It isn't possible to evaluate the stocking rate of 500 versus 800 yet and given the fairly modest difference it is perhaps unlikely that it will be possible to detect a difference without intensive monitoring. Given that a stocking rate of 800/event seems to be an improvement over 1300, continued stocking of 500/event is recommended until it can be evaluated.

Sucker Lake is being stocked on a put-grow-take basis to provide angling opportunities. The expected users would be local residents but also, due to its location, anglers wanting to fish for lake trout before the winter season on Lake Joseph opens (February 15) or when ice conditions may not be good on the bigger, deeper lakes, such as Rosseau. As we have only limited anecdotal information on the fishery we can only speculate as to whether good value is being realized for the stocking investment. The fishery should be surveyed.

Currently, PGT lake trout stocking is yielding a modest population of lake trout that is limited in abundance by the natural characteristics of the lake basin and interactions with introduced species. The population is supporting a small fishery, of which the details are not known. Alternates to the current management regime include discontinue stocking and manage for a natural lake trout population (which might be able to persist at a very low abundance) or discontinue managing for lake trout altogether. The latter option could entail either no further active management (i.e. no stocking) or stocking of another species, such as splake. The success of stocking another species is unproven and would probably be dependent on being able to stock fish that are large enough to escape depredation by bass. Given the uncertainties of the value of the current stocked fishery or potential for another species, there is no strong indication of the best management approach. That being the case, continuing the current PGT lake trout stocking is recommended.

In summary, the lake trout population in Sucker Lake is being sustained almost entirely by stocking. The stocking rate of 800 fish every two years has resulted in a moderate abundance which is probably limited by the natural habitat and fish community limitations of the lake. The abundance of catchable-sized fish appears to be better than it was in 1995 when the stocking rate was higher. The lake has very limited capacity to support a self-sustaining population due to habitat limitations and the introduction of smallmouth bass and smelt. Given the long history of stocking, continued management for a put-grow-take fishery is recommended. The characteristics of the fishery should be monitored to confirm whether reasonable levels of fishing effort for and catches of stocked fish are occurring.

Acknowledgements

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Appendix SPIN Support Spreadsheet Report, Sucker Lake, 2013.

Lake: Sucker (all) | Office: Bracebridge Area | Secchi: | TDS: | Phosphorus: | Linf: | GDD: | Xfield 1:

Date: 2013 (Year) 7 (Month) | Total Area: 108 | Sampled Area: 87 | Max Depth: 10.8 | Mean Depth: 11 | Lmat: | Z: | Xfield 2:

Using Large Body Conversion

Area Wt. Selectivity Adj Values	Total Catch	Arith CUE	SE CUE	RSE CUE
Lake Trout >=300 and <=1000mm	18	0.83	0.25	0.30

Density (ha)	Pop Est	Low Est	Upper Est	Pred. Level
3.1	269	111	431	68%

Stratum Info	Sites #	Total # Nets	% Sites	% Samp Area	Tot Catch #	Tot Catch %	Mean CUE	SE CUE	RSE CUE	Mean FLEN	SE FLEN
Stratum 1 (0-6m)	0	0			0						
Stratum 2 (6-20m)	22	22	100%	100%	18	100%	0.83	0.08	0.10	437	29.16
Stratum 3 (20-30m)	0	0			0						
Stratum 4 (30-40m)	0	0			0						
Stratum 5 (40-60m)	0	0			0						
Stratum 6 (60-80m)	0	0			0						
Stratum 7 (80+m)	0	0			0						
Total	22	22	100%	100%	18	100%	0.83	0.25	0.30	437	29.16
				actual	13						

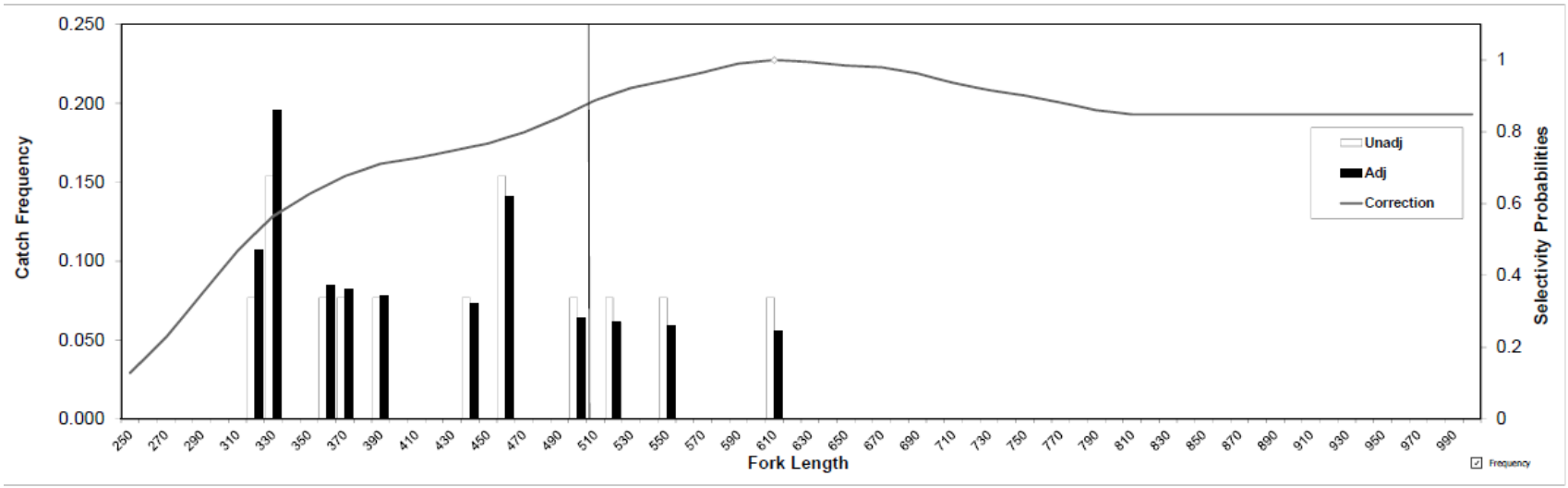
Total Biomass >300mm: 2.79 kg/ha sampled

avg wt of a fish: 0.90 kg

Previous Arith Mean:
Previous Arith Stdev:
Previous n=
p-Value:
Previous Mean,Stdev, n= not specified

Power Observed: 31%
Power Desired: 80%
Change Detectable: 25%
Sets Required (n=): 147

Thermocline(top): n/a m
Thermocline(bottom): 0 m



Selectivity Model
- no correction
- J_Paloheimo
- gamma
- S_Walker (use this)
- bi-modal

(density relationship available)

% zero S1	
% zero S2	59%
% zero S3	
% zero S4	
% zero S5	
% zero S6	
% zero S7	
Area Wt % zero	59%

No. of Sets Next Day	
Stratum 1	
Stratum 2	10
Stratum 3	
Stratum 4	
Stratum 5	
Stratum 6	
Stratum 7	

Report generated with ver. 9.07

Print Date 01/27/2014

Appendix Net set and catch details, Sucker Lake, SLIN, 1995.

Effort	Gear	Start Depth (m)	End Depth (m)	Date	Set Time	Lift Time	Effort Status	Surface Temp ©	Lake Trout	Cisco	White Sucker	Rock Bass	Yellow Perch
1	GL15	3	16	05/02/1995	11:03	12:33	2	7		3			
2	GL20	3	18	05/02/1995	11:33	13:03	2	8	3	3			1
3	GL25	3	17	05/02/1995	12:03	13:49	1	8	1	3			
4	GL15	3	19	05/02/1995	14:15	15:45	2	9	1	1			8
5	GL20	3	19	05/02/1995	14:45	16:15	2	9	1				2
6	GL25	3	19	05/02/1995	15:15	16:45	1	8		2			
7	GL15	2	7	05/03/1995	10:10	11:40	1	8		0			
8	GL20	2	16	05/03/1995	10:50	12:20	1	8	1	6		1	
9	GL25	2	11	05/03/1995	11:20	12:50	1	8					
10	GL15	2	17	05/03/1995	11:55	13:30	1	9		7	1		1
11	GL25	2	17	05/03/1995	13:10	14:40	1	8		7			
12	GL20	2	16	05/03/1995	13:25	14:55	1	9	1	5	1		
13	GL15	2	17	05/03/1995	14:10	15:40	1	8	2	9			2
14	GL25	2	18	05/03/1995	15:25	17:00	1	9					
15	GL15	3	15	05/04/1995	10:35	12:05	1	9					
16	GL20	3	18	05/04/1995	11:05	12:35	2	8	4	3		1	1
17	GL25	3	18	05/04/1995	11:35	13:35	1	8					
18	GL15	3	17	05/04/1995	14:00	15:30	1	10					
19	GL20	3	18	05/04/1995	14:30	16:00	2	10	3				
20	GL25	3	17	05/04/1995	15:00	16:40	1	8	1				
21	GL15	3	20	05/05/1995	10:15	11:45	1	9	1				
22	GL20	3	19	05/05/1995	10:45	12:15	2	9	5		1		
23	GL25	3	18	05/05/1995	11:15	13:00	1	9	1				
24	GL15	3	20	05/05/1995	14:15	15:45	1	10					
25	GL20	3	17	05/05/1995	14:45	16:15	2	9					
26	GL25	3	12	05/05/1995	15:15	16:45	1	10	1				
27	GL15	3	13	05/08/1995	9:45	11:15	1	10					
28	GL20	3	7	05/08/1995	10:15	11:45	1	10					
29	GL25	3	13	05/08/1995	10:45	12:15	1	10	1				
30	GL15	3	13	05/08/1995	12:37	14:07	1	11					
31	GL20	4	17	05/08/1995	13:07	14:37	1	11		2			
32	GL25	3	7	05/08/1995	13:37	15:07	1	11					
								Total	27	51	3	2	15
								Mean	0.8	1.6			
								S.D.	1.3	2.6			

Appendix Biological attributes of sampled lake trout, Sucker Lake, SLIN, 1995 (ages based on fin clip).

Effort	Fish	Fork Length (mm)	Total Length (mm)	Round Weight (g)	Fin Clip	Age
2	1	225	260	130	AD	3
2	2	322	351		AD	3
2	3	484	535	1250	LV	7
3	4	282	305	210	AD	3
4	5	243	262	120	AD	3
5	6	282	305	210	AD	3
8	7	396	484		RP	5
12	8	255	280	145	AD	3
13	9	275	295	175		3
13	10	230	250	75	AD	3
16	11	279	305	170	AD	3
16	12	223	259	100	AD	3
16	13	252	273	130	AD	3
16	14	260	285	140	AD	3
19	15	256	266	110	AD	3
19	16	238	251	100	AD	3
19	17	240	260	90	AD	3
20	18	358	380	390	AD	3
21	19	224	232	70	AD	3
22	20	235	258	100	AD	3
22	21	252	274	120	AD	3
22	22	271	296	190	AD	3
22	23	235	256	90	AD	3
22	24	293	315	220	AD	3
23	25	312	341	280	AD	3
26	26	300	330	270	AD	3
29	27	320	341	310	AD	3
	n	25	25	24		3
	Mean	266	289	164		3
	Min.	223	232	70		3
	Max.	358	380	390		3
	S.D.	36	37	82		3