Results of a Summer Profundal Index Netting (SPIN) Survey Conducted on Bay Lake in 2012

File Report

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2013

Bay Lake is a medium-sized (135 ha) lake located in Perry Township. It is moderately deep (Z_{max}= 22 m, Z_{mean} = 8 m) and is an oligotrophic lake with moderately high water clarity and low nutrient levels (Secchi depth = 4.9 m, TP = 6.1 ug/l, 2005-2011, MOE 2011) (Figure 1).

The native sport fish community of the lake appears to have consisted of lake trout and lake whitefish. Stocking of lake trout and brook trout began in the mid 1940's (Table 1). Smallmouth bass and walleye were not documented in the 1955 survey but both were present in 1971, despite the absence of any stocking records. Both species have established self-sustaining populations. Rainbow smelt were also anecdotally reported to be present in 1971. Brook trout stocking was discontinued after 1961, probably in response to the introduction of bass. A targeted assessment in 1980 failed to capture any lake trout and it was recommended that stocking be discontinued (Chapple, 1980). The lake has an active lake association and as a result of discussions in the 1990's, lake trout stocking was started again. Private stocking of rainbow trout and walleye, by the association, occurred in that era as well.

Regular stocking of lake trout has occurred since 2001, with 400 to 1000 yearling fish of the Killala Lake strain being stocked on a biennial basis. In 1999 the open season for lake trout fishing changed to open all year, in recognition that the population was being supported solely by artificial stocking. In 2006, the lake was designated for management of a put-grow-take trout population (OMNR 2006).

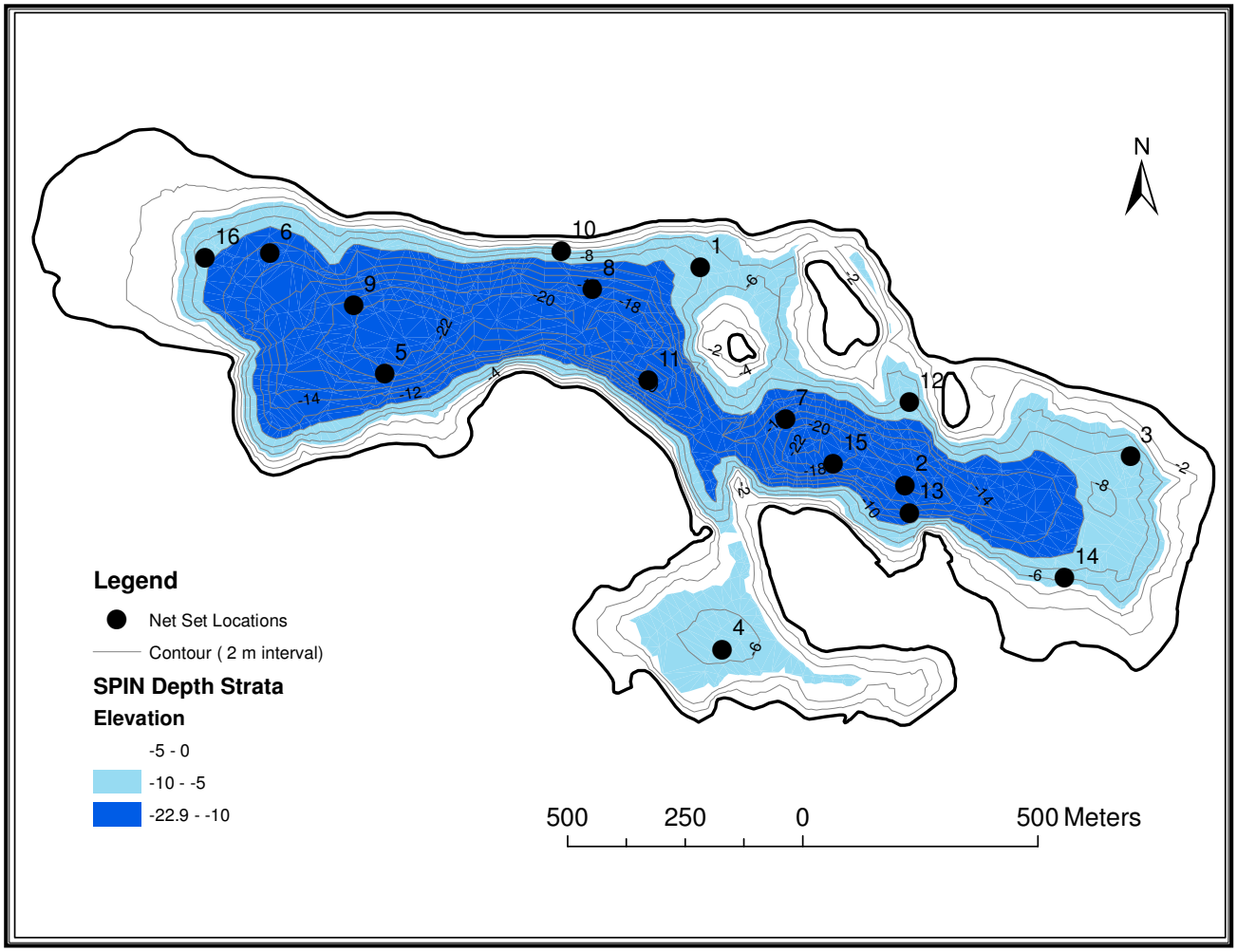


Figure 1 Map of Bay Lake showing bathymetry and net set locations, 2012.

Table 1 Stocking history, Bay Lake.

Species	Year	Life Stage	Number	Fin Clip
lake trout	1942	Fingerling	5,000	
lake trout	1943	Fingerling	5,000	
lake trout	1944	Fingerling	10,000	
lake trout	1945	Fingerling	10,000	
lake trout	1946	Fingerling	2,000	
lake trout	1949	Fingerling	1,000	
lake trout	1950	Fingerling	1,000	
lake trout	1951	Fingerling	1,000	
lake trout	1953	Fingerling	2,000	
lake trout	1954	Yearling	1,000	
lake trout	1956	Yearling	1,000	
lake trout	1958	Fingerling	2,000	
lake trout	1960	Yearling	1,000	
lake trout	1962	Yearling	1,000	
lake trout	1964	Yearling	1,000	
lake trout	1966	Yearling	2,000	
lake trout	1969	Yearling	3,000	LV
lake trout	1972	Yearling	4,200	
lake trout	1973	Yearling	3,200	
lake trout	1975	Yearling	3,000	LP
lake trout	1995	Yearling	400	LP
lake trout	2001	Yearling	1,000	RP
lake trout	2003	Yearling	1,000	AD
lake trout	2005	Yearling	1,000	LP
lake trout	2007	Yearling	500	RV
lake trout	2009	Yearling	500	LV
lake trout	2011	Yearling	400	RP

Species	Year	Life Stage	Number
brook trout	1944	Yearling	1,100
brook trout	1945	Yearling	500
brook trout	1950	Yearling	1,000
brook trout	1951	Yearling	1,000
brook trout	1952	Yearling	800
brook trout	1953	Yearling	1,000
brook trout	1954	Yearling	2,000
brook trout	1956	Yearling	1,000
brook trout	1958	Yearling	1,000
brook trout	1960	Yearling	1,000
brook trout	1961	Fingerling	2,000
rainbow trout	1989	Fingerling	100
rainbow trout	1991	Fingerling	100
walleye	1999	Fingerling	3,500
walleye	2000	Fingerling	1,000

A Summer Profundal Index Netting (SPIN) survey was conducted in 2012 to obtain information on the current status of the lake trout population.

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. Nets were set in two strata (3-10 m and 10-20 m), with the number of sets approximately proportional to the area in each 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 whitefish and submitted to the MOE for analysis of contaminants, primarily mercury. Results will appear on the MOE Guide to Eating Ontario Sportfish.

Project data is stored in FISHNET3 as PSD_IA12_BAY.

Results and Discussion

Netting occurred on July 3 and 10, 2012. At the time of netting the thermocline was well defined and occurred from approximately 5 to 9 m deep (Table 2). The dissolved oxygen level was above the threshold for optimal use by lake trout (6 ppm) to the bottom of the lake.

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

Depth (m)	Temp. (C)	D.O. (ppm)
0.5	23.5	7.6
1	23.4	7.8
2	23.3	8.0
3	23.0	8.1
4	22.5	8.0
5	20.5	8.6
6	15.8	8.7
7	12.5	8.6
8	10.4	8.2
9	9.3	8.2
10	8.9	8.5
11	8.4	8.4
12	8.3	8.2
13	8.0	8.2
14	7.9	8.1
15	7.7	7.8
16	7.6	7.5
17	7.5	7.3
18	7.4	7.0
19	7.4	7.0
20	7.4	6.9
21	7.3	6.7

A total of 16 net sets were completed (Table 3, Figure 1); seven in the shallow and nine in the deep stratum. One set was completed in the southern bay, the remainder in the main basin.

Table 3 Net set details, Bay Lake, 2012.

Effort	Easting	Northing	Set Date	Set Time	Lift Time	Total Gangs	Stratum	Depth Start	Depth Mid	Depth End
1	640023	5040851	03/07/2012	10:40 AM	12:40 PM	1	3	4.3	7.5	9.0
2	640459	5040388	03/07/2012	11:00 AM	1:02 PM	1	10	15.1	17.9	18.3
3	640938	5040449	03/07/2012	11:20 AM	1:21 PM	1	3	4.7	9.0	9.2
4	640070	5040039	03/07/2012	11:40 AM	1:40 PM	1	3	5.2	5.9	7.0
5	639352	5040626	03/07/2012	12:00 PM	2:05 PM	1	10	10.5	18.4	22.1
6	639108	5040882	03/07/2012	12:20 PM	2:25 PM	1	10	11.0	12.6	13.7
7	640205	5040529	03/07/2012	1:00 PM	3:06 PM	1	10	10.5	14.5	18.4
8	639794	5040806	03/07/2012	1:15 PM	3:18 PM	1	10	11.3	16.7	18.1
9	639286	5040771	10/07/2012	10:00 AM	12:00 PM	1	10	22.8	22.3	21.6
10	639728	5040887	10/07/2012	10:20 AM	12:23 PM	1	3	6.4	7.7	7.8
11	639913	5040611	10/07/2012	10:40 AM	12:45 PM	1	10	10.6	17.0	19.7
12	640468	5040565	10/07/2012	11:00 AM	1:00 PM	1	3	6.5	7.8	8.5
13	640468	5040330	10/07/2012	11:20 AM	1:20 PM	1	10	9.0	13.5	17.0
14	640798	5040192	10/07/2012	11:40 AM	1:40 PM	1	3	5.2	6.7	7.3
15	640306	5040433	10/07/2012	12:20 PM	2:20 PM	1	10	18.5	20.0	22.4
16	638970	5040872	10/07/2012	12:49 PM	2:40 PM	1	3	5.8	8.6	9.8

Two lake trout were caught in two different net sets (Table 4); both in the deep stratum. A total of 41 lake whitefish, 17 white suckers and 4 smallmouth bass were also caught.

The lake trout were 538 and 562 mm FL in size. The smaller fish had a left pectoral fin clip, indicating it was an 8 year old fish, stocked in 2005. The other had an adipose fin clip, was 10 years old and was stocked in 2003.

The lake whitefish ranged from 379 to 555 mm FL long and 680 to 2,500 g in round weight with most being between 450 and 550 mm long and 1,500 to 2,000 g in weight. Ages ranged from 3 to 23 years old, with a large proportion being in excess of 15 years old (Figure 2).

Table 4 Catch summary, Bay Lake SPIN, 2012.

Set	lake trout	lake whitefish	white sucker	smallmouth bass
1		4	2	
2				
3		4		
4		1	6	3
5		6		
6		9		
7		1		
8		5	1	
9	1			
10		2	2	
11	1			
12			4	1
13		2		
14				
15				
16		7	2	
Total	2	41	17	4

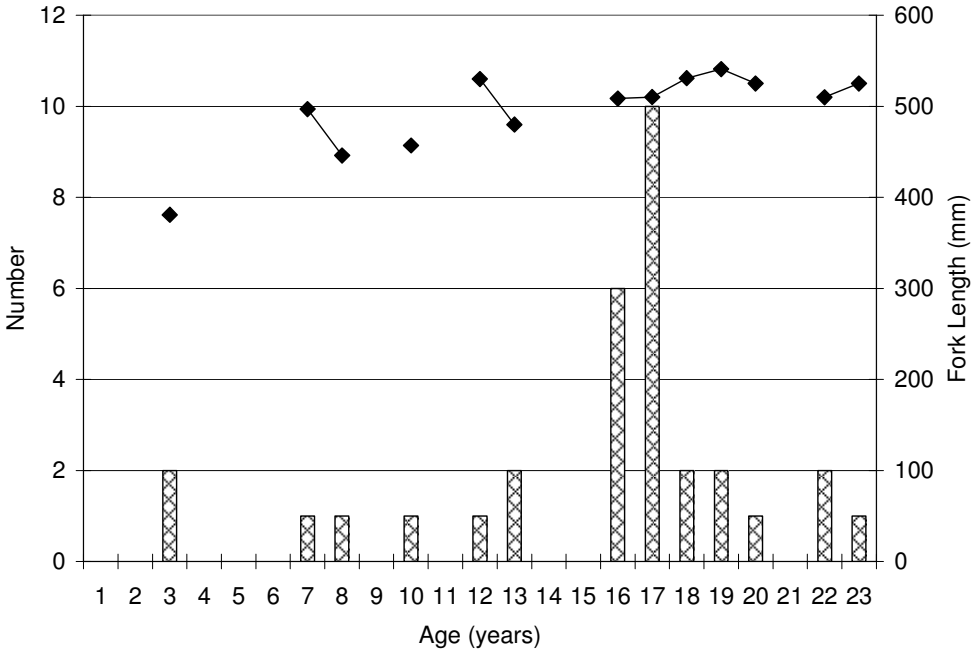


Figure 2 Lake whitefish age distribution and mean fork length, by age, Bay Lake, SPIN, 2012.

The SPIN methodology samples large-bodied species that live in and below the thermocline in the summer. Warm water species such as bass and walleye are not typically captured other than as incidental catches.

The lake trout population in Bay Lake is at a low level of abundance and is dominated by stocked fish. It is possible that a small number of naturally reproduced lake trout persist in the lake but their number must be very small. The abundance in the lake has been consistently low since 1971 (Table 5). The abundance appears to have been higher in 1955 prior to the introduction of walleye and smallmouth bass; both species are large predators that compete with and may prey on lake trout. The change in the fish community prevents the lake from being able to support the abundance of lake trout that it once did.

Table 5 Catch summary for previous assessment of Bay Lake. The 1955, 1971 and 1980 assessments used multi-mesh gill nets set overnight. The 2001 survey used trap nets which are set in shallow water only and typically do not capture trout or whitefish.

	1955	1971	1980	2001
lake trout	20	5		
brook trout	5	4		
walleye		5	15	129
smallmouth bass		3	11	284
lake whitefish	77	65	319	
white sucker	291	81	133	108
yellow perch			102	
burbot		5	2	
brown bullhead	4	2	3	14
yellow perch		6		1
pumpkinseed				10

The modest depth of the lake results in low levels of dissolved oxygen in the deep waters of the lake by late summer (Figure 3). The volume-weighted hypolimnetic dissolved oxygen (VWHDO) concentration has averaged 2.1 ppm since 1990 (n=6). A criterion of 7 ppm has been established; at VWHDO values progressively less than 7 ppm, lakes typically have a lower ability to support a self-sustaining and ultimately any population of lake trout. A value of 2.1 ppm indicates a limited ability to support lake trout. It is very unlikely that a self-sustaining population could be re-established in the lake and put-grow-take stocking has only been able to establish a low abundance population.

The lake whitefish density was relatively high in 2012 and has been consistently high in previous assessments that targeted the depths where whitefish occur. A relatively large proportion of the lake consists of flats of intermediate depth; conditions that frequently favour this species.

The lake whitefish population is currently dominated by large old individuals, indicative of a low level of exploitation and limited recruitment of young fish into the adult population. The 1955 assessment recorded most whitefish as being in the less than 30 cm long, much smaller than the fish caught in 2012. The reason for this is at least partly due to the different methods used but it appears that there has been a major shift in the size structure of the population such that it is currently dominated more by older and larger fish than previously. With only two data points, separated by more than 50 years, one can only speculate as to the cause of the change in the population size structure. The reasons could include inter-specific interactions with introduced predators (bass and walleye), cyclic changes due intra-specific competition or lower exploitation now than occurred in the past.

The purpose of put-grow-take stocking is to provide angling opportunities. The source of these anglers can vary from local residents to destination anglers from a broader area. Spot checks done in the winter of 2012 indicate that the lake is being fished by a small number of local residents largely due to convenience and stocking is not attracting anglers from elsewhere. Bay Lake has other species that provide summer and winter opportunities for

local anglers and stocking is not being successful in attracting anglers from further afield and therefore is having very little value. It is recommended that stocking be discontinued, the all year open season regulation be removed and that Bay Lake no longer be managed for lake trout. Stocking of other species is not recommended due to the presence of an already diverse fish community.

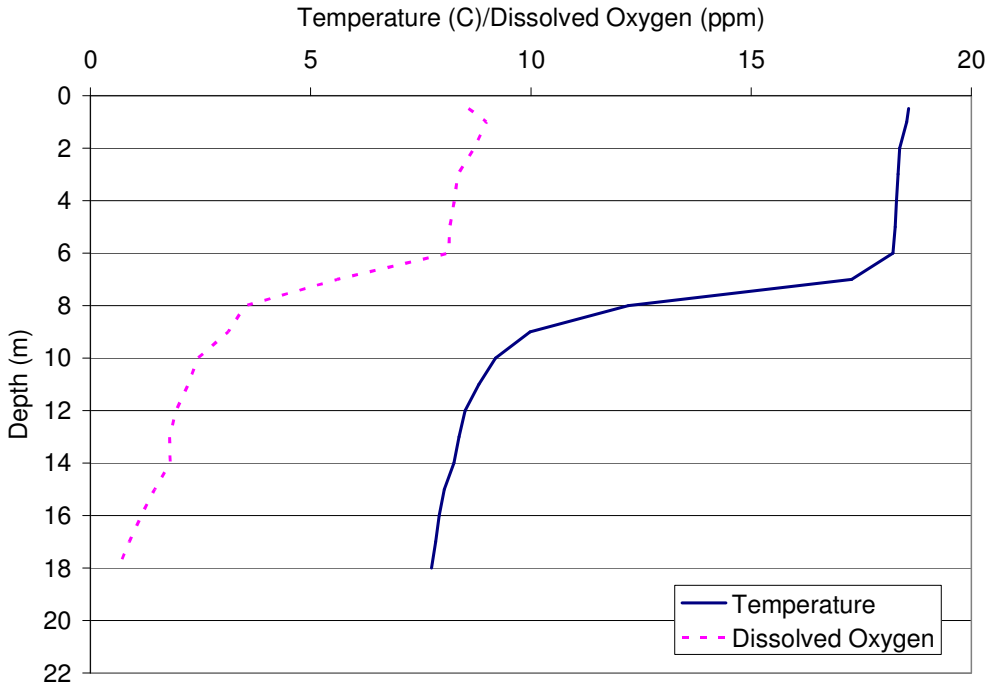


Figure 3 Temperature and dissolved oxygen profile, Bay Lake, September 10, 2010. Dissolved oxygen less than 4 ppm and temperature greater than 15 ^{o}C is considered not useable by lake trout. Virtually no useable habitat is available by late summer.

References

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Appendix Biological attributes of sampled fish, Bay Lake, 2012.

Effort	FISH	FLEN	TLEN	RWT	SEX	GON	AGE
			Lake Trout				
9	201	562		AD clip			10
11	206	538		LP clip			8
			Lake Whitefish				
1	1	460					
1	4	446		1575	1	22	8
1	5	490		1450	1	22	17
3	6	520					
3	7	525					
3	8	457		1500	2	22	10
3	9	480					
5	19	555					
5	20	540		1520	2	22	17
5	21	530		1550	1	22	19
5	22	540		2050	1	22	17
5	23	527		1950	2	22	18
6	24	505		1500	1	22	22
6	25	525		1900	1	22	20
6	26	530		1750	1	22	17
6	27	515		1500	1	22	22
6	28	530		2500	2	22	12
6	29	525		2250	2	22	16
6	30	525		1250	1	22	23
6	31	480		1700	2	22	16
6	32	535		1850	2	22	18
8	33	510		1700	1	22	17
8	34	530		1750	1	22	17
8	35	517		1700	1	22	16
8	36	480		1750	1	22	17
1	100	465		1350	2	22	13
4	101	495		1700	2	22	13
5	102	500		1800	2	22	16
10	202	385					
10	205	463					
13	212	508					16
13	213	522		1660	2	22	16
16	214	476		1500	1	22	17
16	215	552		1840	2	22	19
16	216	379		680	1	22	3
16	217	497		1660	1	22	17
16	218	509		1440	1	22	17
16	219	497		1620	1	22	7
16	221	383		800	1	22	3
7	901	510					
8	902	480					

Effort	FISH	FLEN
White Sucker		
1	2	480
1	3	510
4	10	490
4	11	465
4	12	420
4	13	420
4	14	490
4	15	422
10	203	434
10	204	408
12	207	409
12	208	427
12	209	455
12	210	456
16	220	523
16	222	498
Smallmouth Bass		
4	16	382
4	17	312
4	18	335
12	211	337