Inland Seas Angler

GREAT LAKES BASIN REPORT©

Special Report – Lake Ontario

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Highlights of the Annual Lake Committee Meetings

Great Lakes Fishery Commission proceedings, Toronto, ON

This last of a series of annual special reports is an extensive summary of Lake Ontario. These lake committee reports are from the annual Lake Committee meetings hosted by the Great Lakes Fishery Commission in March/April 2018. We encourage reproduction with the appropriate credit to the GLSFC and the agencies involved. Our thanks to the staffs of the GLFC, OMNR, USFWS, USGS, NYSDEC and New York DEC for their contributions to these science documents. Thanks also to the Great Lakes Fishery Commission, its staff, Bob Lamb & Marc Gaden, for their efforts in again convening and hosting the Lower Lake Committee meetings in Toronto, Ontario.

Lake Ontario

Index of Reports

Key:

CPH = Catch per hectare
CPUE = Catch per unit effort
CWT = Coded Wire Tag
DEC = NY Dept. of Environment Conservation
DFO = Dept. of Fisheries and Oceans
LOC = Lake Ontario Committee
ODNR = Ohio Dept. of National Resources
OMNR = ON Ministry Natural Resources
USFWS = U.S. Fish and Wildlife Service
USGS = U.S. Geological Service
YAO = Age 1 and older
YOY = Young of the year (age 0)
1 kg = 2.205 lbs
Kt = kilotonnes
1 kiloton (kt) = 1000 metric tons

Highlights

- Offshore Zooplankton biomass declined drastically over the last 30 years (as much as 99% by the early 2000s)
- Since 2005, offshore zooplankton biomass improved but remains well below historic levels
- Round goby have dominated the diets of Cormorants in eastern Lake Ontario and the St. Lawrence River
- Two consecutive severe winters resulted in very small 2013 and 2014 (record low) alewife year classes
- Poor alewife year classes prompted NY and Ontario to reduce Chinook salmon and lake trout stocking by 20% each in 2017 and 2018.
- Abundance of yearling (age-1) alewife increased to a record high level in US waters.
- Abundance for smelt, cisco, and emerald shiner either declined or remained at low levels in 2017.

2017 Lake Ontario Unit Annual Report (NY)

For the full 326 page copy of the **Lake Ontario Annual Report 2017: www.dec.ny.gov/docs/fish_marine_pdf/lorpt17.pdf**

Executive Summary

The Lake Ontario ecosystem has undergone dramatic change since early European settlement, primarily due to human influences on the Lake and its watershed. The native fish community was comprised of a diverse forage base underpinned by coregonines (whitefish) and sculpins, with Atlantic salmon, lake trout and burbot as the dominant piscivores (fish-eaters) in the system. Nearshore waters were home to a host of warmwater fishes including yellow perch, walleye, northern pike, smallmouth bass, lake sturgeon, and American eel. The dominant prey species in nearshore areas included emerald and spottail shiners.

Habitat and water quality degradation, overfishing, and the introduction of exotic species played major roles in the decline of the native fish community. By the 1960's, these impacts culminated in the virtual elimination of large piscivores, the reduction or extinction of other native fishes, and uncontrolled populations of exotic alewife, smelt, and sea lamprey. Since the early 1970's, water quality improvements resulting from the Great Lakes Water Quality Agreement (International Joint Commission 1994), sea lamprey control, and extensive fish stocking programs in New York and Ontario have resulted in increased diversity in the Lake Ontario fish community and a robust sportfishery. In 2007, anglers fishing Lake Ontario and its tributaries contributed over $114 million to the New York State economy.

In the 1990s, the Lake Ontario ecosystem experienced dramatic changes resulting primarily from the introduction of exotic zebra and quagga mussels. In addition, improvements in wastewater treatment have reduced excessive nutrient concentrations in the open lake to historic, more natural levels, thereby lowering the productive capacity of the Lake Ontario ecosystem. Zooplankton biomass in Lake Ontario's offshore upper thermal layer declined drastically over the last 30 years (as much as 99% by the early 2000s), attributable to reduced lake productivity and invasive predatory zooplankton (i.e., *Bythotrephes* and *Cercopagis*, discovered in 1985 and 1998, respectively). Since 2005, offshore zooplankton biomass improved but remains well below historic levels. The abundance and distribution of the native deepwater amphipod, *Diporeia* deteriorated markedly, likely due to range expansion of quagga mussels into deeper waters. The exotic round goby was first documented in New York waters of Lake Ontario in 1998, and spread throughout Lake Ontario and the St. Lawrence River rapidly. Goby abundance and biomass grew exponentially, then stabilized at lower levels. Round goby have dominated the diets of Double-crested Cormorants from colonies in eastern Lake Ontario and the St. Lawrence River for nearly a decade. Goby have also been identified in the diets of numerous sportfish species including smallmouth bass, yellow perch, walleye, northern pike, brown trout, and lake trout, and are apparently responsible for markedly increased growth rates for some sportfish species including smallmouth bass and yellow perch. The effects of these ecosystem changes on the Lake Ontario fish community have not been manifested completely, nor are they fully understood.

Viral Hemorrhagic Septicemia virus (VHSv) was first documented in the New York waters of Lake Ontario and the St. Lawrence River in 2006. Substantial freshwater drum and round goby mortality events were observed, as well as numbers of dead muskie, smallmouth bass, and a moribund burbot. VHSv has also been identified in surveillance testing of healthy fish, including rock bass, bluegill, brown bullhead, emerald shiners and bluntnose minnows. The invasive "bloody red shrimp" is a small freshwater shrimp found near Oswego, NY in 2006, and has since spread in Lake Ontario and the St. Lawrence River. As with other aquatic invasive species in the Great Lakes system, the full impacts of these new invaders are unknown.

Maintaining balance between predators and prey, primarily salmonines (predominately Chinook salmon) and alewife, remains a substantive challenge in the face of lower trophic level disturbances and ongoing ecosystem changes. Two consecutive severe winters (2013/2014 and 2014/2015) followed by below average summer water temperatures resulted in very small 2013 and 2014 (record low) alewife year classes, which contributed to a markedly reduced adult alewife population in 2016 and 2017. Concerns over the impacts of the two consecutive poor alewife year classes to the future adult alewife population prompted the NYS Department of Environmental Conservation and the Ontario Ministry of Natural Resources and Forestry (OMNRF) to reduce Chinook salmon and lake trout stocking by 20% each in 2017 and 2018.

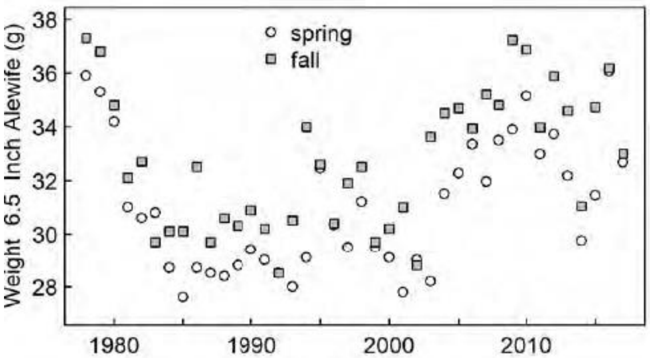
This report summarizes cooperative research and monitoring activities conducted on Lake Ontario and the St. Lawrence River by the DEC, U.S. Geological Survey, OMNRF, U.S. Fish and Wildlife Service, Fisheries and Oceans Canada, and the SUNY College of Environmental Science and Forestry in 2017.

Prey Fish Assessments

- Each year Lake Ontario preyfish populations (primarily alewife, smelt, and sculpins) are assessed with bottom trawls and hydroacoustics (sonar).
- In 2017, 341 (204 spring, 137 fall) bottom trawls were performed in U.S. and Canadian waters.
- The 341 total trawls represents a substantial increase in effort from historic methods, and beginning in 2016 the depth range sampled (20 ft – 738 ft) increased relative to historic surveys. The 2016-2017 distribution of trawl tows across depths more closely matches the distribution of depths available in the lake.

● In spring 2017 bottom trawl surveys, abundance of adult (age-2 and older) alewife increased from 2016 levels in US waters, but declined in Canadian waters. Abundance of yearling (age-1) alewife increased to a record high level in US waters.

● Adult alewife condition, measured in the fall of 2017, was well below the 10-year average, which may be a due to large numbers of age-1 alewife.



Alewife condition for spring and fall surveys illustrated as the predicted weight of a165mm (6.5 inch) adult Alewife.

● Abundance indices for rainbow smelt, cisco, and emerald shiner either declined or remained at low levels in 2017.

● Round goby abundance declined in 2017, and for the first time, deepwater sculpin were the most abundant benthic prey fish caught in the fall bottom trawl survey. Slimy sculpin abundance continued to decline and reached a record low in 2017.

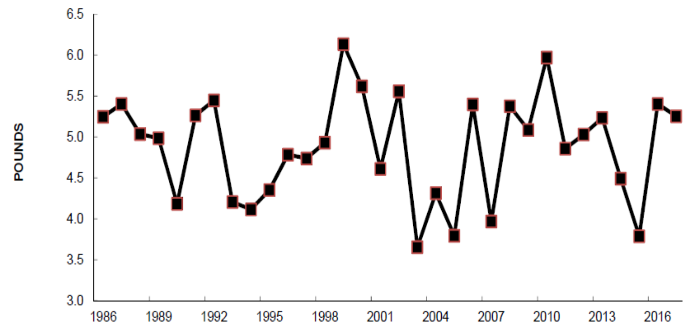
● The 2017 hydroacoustic survey of Lake Ontario preyfish populations consisted of the typical five cross-lake transects and an Eastern Basin transect, as well as six additional mid-water trawling transects. Estimated yearling and older alewife abundance increased by 140% in 2017. Beginning in 2016 the survey was expanded to include mid-water trawling targeting cisco. In 2017, the majority of cisco catches occurred within the eastern portion of the sampling area but one cisco was caught near Cobourg, ON. Midwater trawl catches of cisco declined in 2017 relative to 2016, however, the lakewide acoustic estimate of cisco density (18 fish per acre) increased relative to 2016. The rainbow smelt abundance estimate (15.1 million) declined in 2017.

● Ongoing research comparing hydroacoustic data collected with a hull-mounted transducer pointing downward (traditional approach; "downlooking") and a transducer at depth pointing upward (new approach; "uplooking") revealed substantial numbers of alewife at or near the surface on some nights. These fish were not previously detectable with "downlooking" hydroacoustics.

Coldwater Fisheries Management

● Fish stocking in the New York waters of Lake Ontario in 2017 included 1.35 million Chinook salmon, 232,020 coho salmon, 656,505 rainbow trout, 201,147 lake trout, 411,890 brown trout, 127,011 Atlantic salmon, 93,553 bloater, and 408,873 cisco. Of these, 134,480 brown trout and 39,302 lake trout were stocked offshore by military landing craft in an ongoing effort to reduce predation on newly stocked fish by Double-crested Cormorants and predatory fish (**Section 1).**

● Average weights and condition (a measure of "stoutness") of salmonines at a given age serve as a potential index of relative balance between the number of predators (primarily salmonines) and preyfish; however, water temperatures also influence fish growth and condition. Average weights and condition are calculated for salmonines examined from the open lake fishery (Section 2) and as spawning adults at the Salmon River Hatchery **(Section 9).**



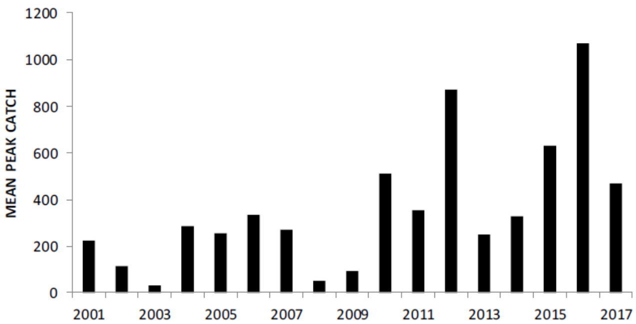
Weights of Chinook jacks at Salmon River Hatchery, 1986-2017.

● Chinook salmon growth measured from the open lake fishery was below average in 2014 – 2017. The August 2017 length (35 in) of age-3 Chinook salmon was over 1.7 in shorter than the long-term average. However, Chinook salmon condition or relative "stoutness" in 2017 was one of the heaviest values observed for Chinook salmon ≥ 28 in. Below average summer temperatures may have negatively impacted growth in length, however, the good condition of Chinook salmon ≥ 28 inches indicated that alewife (the primary forage of Chinook salmon) abundance was sufficient to maintain Chinook condition (**Section 2).**

● At the Salmon River Hatchery, average weight of age-1 Chinook males (jacks) sampled in 2017 was 5.3 pounds, the 12th highest value in the time series. Age-2 males (12.8 lbs) were 0.5 pounds below average and age-2 females (13.2 lbs) were 1.4 pounds below average. Age-3 males (15.8 lbs) and females (15.9 lbs) were both approximately 3 pounds below the long-term average. Chinook salmon condition (based on the predicted weight of a 36 inch long Chinook salmon) in fall 2017 was 0.7 pounds below to the long term average and the third lowest in the data series **(Section 9).**

● Steelhead are sampled in the spring at the Salmon River Hatchery and, unlike Chinook and coho salmon, do not reflect growth during the 2017 growing season. Weights reported here reflect conditions prior to and including 2016. The mean weights of age-3 males and females were 5.6 and 7.0 lbs, respectively. The males were 0.2 lighter and the females were 0.7 heavier than their respective long-term averages. The mean weights of age-4 males (6.4 lbs) and females (8.4 lbs) were both below their long-term averages **(Section 9).**

● Since the institution of seasonal base flows in the Salmon River in 1996, natural reproduction of Chinook salmon continues to be documented by an annual seining index conducted weekly during May and June at four sites. In 2017, the mean catch per seine haul (467 fish/haul) was estimated using the catches from the third week of May through the second week of June, and was the fifth highest on record (**Section 8).**



Peak catches of YOY Chinook salmon captured in the three consecutive weeks with the highest catches from the Salmon River seining program 2001-2017.

● The twentieth year of pen-rearing steelhead and Chinook salmon along the New York shoreline of Lake Ontario was successful due to low fish mortality and a substantial percentage of fish reaching target weights. A total of 21,600 Washington strain steelhead were raised at seven pen sites, comprising 3.7% of DEC's Lake Ontario yearling steelhead stocking allotment in 2017. Seven pen-rearing sites raised a total of 303,420 Chinook salmon, representing 22.5% of DEC's 2017 Chinook salmon stocking allotment **(Sections 1 and 10).**

Lake Trout Restoration

● Restoration of a naturally reproducing population of lake trout is the focus of a major international effort in Lake Ontario. Each year several surveys measure progress toward lake trout rehabilitation **(Section 5).**

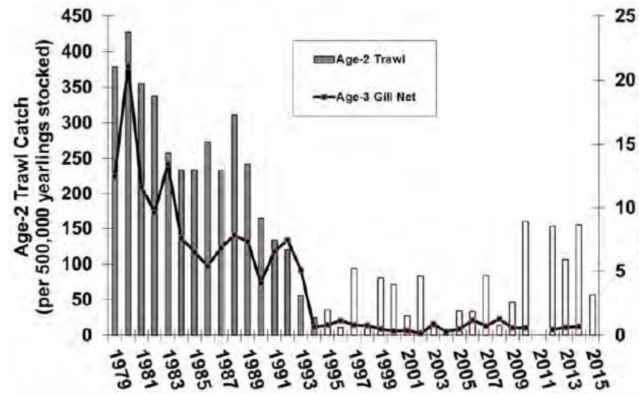
● Adult lake trout abundance in index gill nets increased each year from 2008-2014, recovering from historic lows recorded during 2005-2007, then declined each year 2015-2017. Adult abundance in 2017 was 35% below the 2014 peak.

● The sea lamprey wounding rate on lake trout caught in gill nets was 0.5 fresh (A1) wounds per 100 lake trout, the lowest value in the data series and well below the target of 2.0 wounds per 100 lake trout.

● The survival indices for age 2 lake trout stocked in 2016 (2015 year class) declined by 64% relative to the 2014 year class, which was the highest observed since 1990.

● Naturally reproduced lake trout were documented in 23 years since 1994. The largest catches of naturally produced lake trout occurred from 2014 – 2017.

● Adult lake trout condition (measured by the predicted weight of a 27.6 in fish) in 2017 was the highest observed for the 1984 – 2017 time series. Condition of juvenile lake trout in 2017 was above average for the 1979 – 2017 time series.

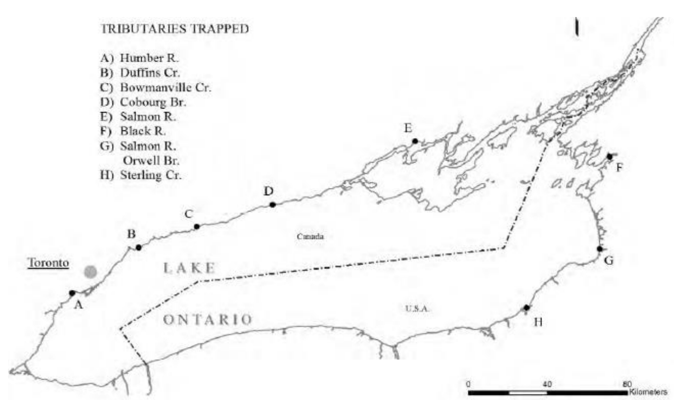


Survival indices for lake trout stocked in U.S. waters of Lake Ontario. Survival was indexed at age 2 as the total catch from bottom trawls fished in July-August per 500,000 fish stocked . (Note: White bars representdata collected with a new trawl configuration which employed roller gear on the footrope and did not fish as hard on the lake bottom as the old trawl).

● In 2017, angler catch (15,444 fish) and harvest (8,592 fish) of lake trout were both below the previous 5-year average. The decrease in lake trout catch and harvest may be partially attributed to excellent fishing quality for other salmonines (i.e., fewer anglers specifically targeting lake trout).

Status of Sea Lamprey Control

● The sea lamprey is a destructive invasive species in the Great Lakes that contributed to the collapse of lake trout and other native species in the mid-20th century and continues to affect efforts to restore and rehabilitate the fish-community. Sea lampreys attach to large bodied fish and extract blood and body fluids. It is estimated that about half of sea lamprey attacks result in the death of their prey and an estimated 40 lbs of fish are killed by every sea lamprey that reaches adulthood. The Sea Lamprey Control Program is a critical component of Great Lakes fisheries management, facilitating the rehabilitation of important fish stocks by significantly reducing sea lamprey-induced mortality (**Section 11).**



Location of Lake Ontario tributaries where assessment traps were operated during 2017

● In 2017, eight Lake Ontario tributaries (three Canada, five NY) were treated with lampricides. Treatments in New York included South Sandy Creek, Lindsey Creek, Salmon River, Little Salmon River and Nine Mile Creek. A total of 5,006 sea lamprey were trapped in eight tributaries, five of which are index locations.

● The estimated population of adult sea lamprey was 12,536, slightly above the fish community objective target of 11,368.

● Larval assessments were conducted on a total of 62 tributaries (35 Canada, 27 NY). Surveys to estimate abundance of larval sea lampreys were conducted in 10 tributaries (3 Canada, 7 NY). Surveys to detect the presence of new larval sea lamprey populations were conducted in 16 tributaries (13 Canada, 3 NY), with no new populations detected.

● Post-treatment assessments were conducted in nine tributaries (4 Canada, 5 NY) to determine the effectiveness of lampricide treatments conducted during 2016 and 2017. Surveys in New York's Salmon River and Lindsey Creek found many residuals and both systems are scheduled for retreatment in 2018.

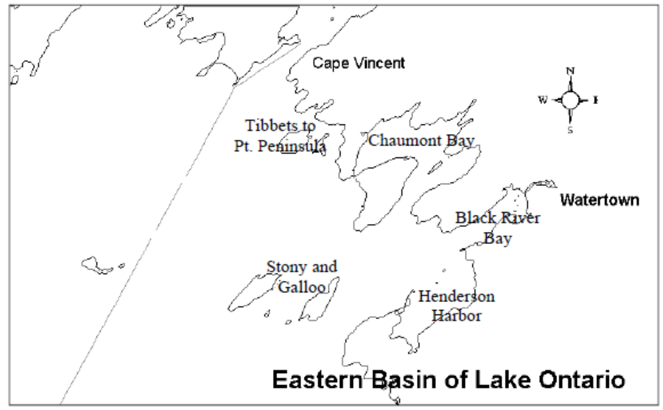
● Surveys to evaluate barrier effectiveness were conducted in 10 tributaries (7 Canada, 3 U.S.).

● The rate of wounding by sea lamprey on lake trout caught in gill nets was 0.5 fresh (A1) wounds per 100 lake trout, well below the target of 2 wounds per 100 lake trout (Section 5). There were an estimated 14.7 lamprey observed per 1,000 trout or salmon caught by anglers, comparable to the previous five-year average **(Section 2).**

Warmwater Fisheries

● A total of 170,000 fingerling walleye were stocked in the lower Niagara River (23,200), Sodus Bay (73,900), Irondequoit Bay (62,500), and Port Bay (10,400) **(Section 1).**

● The Eastern Basin warmwater index gill netting survey is conducted annually to assess relative abundance and population characteristics of warm and coolwater fish species. Total catch-per-unit effort (CPUE or relative abundance) of all species in 2017 was 36.1 fish/gill net, a 107.9% increase from 2014-2016. Yellow perch and smallmouth bass were the most commonly caught species **(Section 4).**



Map of New York waters of Lake Ontario's eastern basin showing five area strata used in the1980-2017 warmwater assessment.

● Smallmouth bass abundance (6.8 fish/net) remained low but was 13% higher than the previous 5- year average. Historically, the Eastern Basin smallmouth bass population periodically experienced years of strong natural reproduction, and these individual "year classes" often sustained the population and sportfisheries for many years. For example, fish resulting from strong natural reproduction in 1983 (1983 year class) were still contributing strongly to the sportfishery in 1998 as age 15 fish. Despite conditions favoring strong reproduction in recent years, data indicate that the Eastern Basin smallmouth bass population is no longer producing strong year classes.

Table 1. Stratified mean catch per unit effort data from the 1976-2017 warmwater assessment netting conducted late July through mid-August in New York waters of Lake Ontario's eastern basin.

	Stratified Mean Catch per 450 ft Monofilament Gill Net Gang												
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Lake Sturgeon	0	0	0	0	0	0.02	0	0	0	0	0	0	0
Longnose Gar	0	0	0	0	0.04	0	0	0.04	0	1.19	0.04	0	0
Bowfin	0	0	0	0	0.02	0.02	0	0	0	0	0	0	0
American Eel	0	0	0.06	0.03	0	0	0	0	0	0	0	0	0
Alewife	20.96	2.07	14.83	11.57	4.30	8.18	7.53	6.90	17.65	3.35	7.61	2.32	9.64
Gizzard Shad	17.82	53.45	47.38	19.95	4.52	2.78	0.10	0.29	0.87	0.50	0.48	0.44	0.24
Northern Pike	0.83	1.04	0.93	0.16	0.08	0.02	0.04	0.06	0.02	0.17	0.17	0.08	0
Chain Pickerel	0	0	0	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	0	0	0	0	0
Goldfish X Carp	0	0	0	0.17	0	0	0	0	0	0	0	0	0
Common Carp	0.25	0.55	0.33	0.45	0.17	0.10	0.35	0.21	0.17	0.17	0.10	0.20	0.23
Golden Shiner	0	0	0	0	0.02	0	0	0	0.04	0.02	0	0	0
Spottail Shiner	0	0	0	0	0	0	0	0.15	0	0	0	0	0
Quillback	0	0	0	0.31	0.04	0.06	0	0.04	0	0	0.02	0	0.02
Longnose Sucker	0	0	0	0	0.02	0	0	0	0	0	0	0	0
White Sucker	4.04	0.63	2.90	3.11	1.84	1.42	4.34	1.40	1.58	0.93	2.47	1.49	0.91
Silver Redhorse	0.06	0.05	0.20	0.43	0.04	0.10	0.15	0.38	0.06	0	0.02	0.02	0.07
Shorthead Redhorse	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	1.12	0.2	1.41	4.17	0.66	0.23	1.29	0.76	0.86	1.70	2.14	1.96	0.61
Channel Catfish	0.41	1.03	1.75	3.64	0.6	0.56	1.27	0.86	0.29	0.63	1.25	0.77	0.97
Stonecat	0	0.04	0.26	0.08	0	0.23	0.30	0.02	0.04	0.06	0.04	0	0
Trout-perch	0	0	0	0	0	0.15	0.15	0	0.08	0	0	0.08	0.15
White Perch	63	136.4	74.11	86.98	26.2	44.53	25.98	34.02	20.78	12.23	13.94	11.14	4.87
White Bass	0	0	0.13	0	0.02	0.06	0.26	0	0.06	0.02	0.06	0.06	0.13
Rock Bass	7.10	10.75	22.13	13.94	14.69	10.09	7.06	4.69	6.99	3.96	7.58	4.76	4.94
Pumpkinseed	0	0.44	0.06	3.06	0.14	0.32	0.73	0.43	0.09	0.59	0.57	0.40	0.25
Bluegill	0	0	0	0	0	0	0.04	0	0	0	0	0	0
Smallmouth Bass	24.51	24.05	26.04	35.74	38.02	23.47	14.55	14.96	12.44	9.76	18.14	10.89	15.92
Largemouth Bass	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Crappie	0	0	0	0.04	0.02	0.02	0.02	0.06	0.02	0.1	0	0	0.02
Yellow Perch	69.09	26.20	44.44	67.32	27.63	43.81	36.07	50.85	24.02	15.35	13.32	8.36	2.19
Walleye	0.05	0.20	0.12	0.27	0.28	0.12	0.59	0.09	0.09	0.41	0.19	0.75	0.80
Freshwater Drum	0.19	0	0.74	1.43	0.34	0.09	0.34	0.59	0.31	0.25	0.16	0.25	0.45
Round Goby	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	209.4	257.1	237.8	252.8	119.7	136.4	101.2	116.8	86.50	51.38	68.30	43.98	42.42

Table 1 (continued)

	Stratified Mean Catch per 450 ft Monofilament Gill Net Gang													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Lake Sturgeon	0	0	0	0	0	0	0.02	0	0.02	0.06	0.04	0.10	0.02	0
Longnose Gar	0	0.08	0	0	0.48	0.35	0	0	0.02	0.02	0.08	0	0.02	0
Bowfin	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0
American Eel	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0
Alewife	0.59	1.29	1.27	2.26	0.18	0	0.48	0.92	0	0.06	0.12	0.26	0.95	0.02
Gizzard Shad	0.69	1.26	1.39	1.79	0.12	0.06	0	0	0	0.08	0.08	0.13	0	0.06
Northern Pike	0.02	0	0.15	0.04	0.10	0.06	0.04	0.04	0.08	0.06	0.06	0.08	0.07	0.19
Chain Pickerel	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goldfish X Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Carp	0.37	0.35	0.29	0.33	0.35	0.06	0.10	0.15	0.12	0.10	0.33	0.04	0	0
Golden Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spottail Shiner	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0
Quillback	0.04	0.04	0.08	0	0.04	0	0	0.04	0	0.04	0	0	0	0
Longnose Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	0.75	3.47	0.41	0.88	1.18	0.81	1.13	2.01	1.31	1.02	1.02	0.35	0.38	0.78
Silver Redhorse	0.17	0.29	0.22	0.18	0	0.08	0.12	0.02	0.13	0.12	0.10	0.12	0.05	0.17
Shorthead Redhorse	0	0	0	0	0	0.02	0	0	0.02	0	0	0	0.02	0
Brown Bullhead	0.84	0.66	0.86	0.87	0.35	0.35	0.06	0	0.83	0.06	0.21	0.21	0.32	0.21
Channel Catfish	2.40	3.34	1.20	1.35	1.12	0.35	0.19	0.47	1.42	0.75	0.68	0.54	0.09	0.21
Stonecat	0.02	0	0.02	0	0	0	0	0	0	0	0	0	0	0
Trout-perch	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0
White Perch	7.95	4.36	7.83	5.49	5.04	6.01	0.06	0.31	0.48	0.29	1.36	0.92	1.04	1.09
White Bass	0.08	0	0.10	0	0.02	0	0	0	0	0.04	0	0	0	0
Rock Bass	7.53	8.08	6.86	3.09	6.99	3.99	1.41	3.79	2.33	2.13	3.08	1.47	1.22	1.10
Pumpkinseed	0.64	0.78	0.14	0.34	0.23	0.04	0.06	0.04	0.08	0.29	0.27	0.31	0.28	0.46
Bluegill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	39.05	21.72	29.4	19.13	19.91	11.99	5.01	6.98	6.03	9.36	10.68	5.01	2.99	3.76
Largemouth Bass	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0
Black Crappie	0.02	0.06	0	0	0.04	0	0	0	0	0.02	0	0	0	0.06
Yellow Perch	10.06	13.61	6.97	6.72	2.78	5.87	3.68	8.76	5.53	5.01	4.47	8.58	6.37	9.65
Walleye	0.96	1.31	1.68	1.59	3.84	3.29	1.91	2.97	1.76	2.13	1.32	1.53	1.70	1.08
Freshwater Drum	0.53	0.62	0.34	0.43	0.52	0.74	0.63	0.23	0.41	0.25	0.50	0.25	0.20	0.23
Round Goby	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	72.71	61.35	59.34	44.57	43.32	34.08	14.91	26.73	20.58	21.94	24.40	19.92	15.73	19.06

Table 1 (continued)

	Stratified Mean Catch per 450 ft Monofilament Gill Net Gang														
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Lake Sturgeon	0.04	0.02	0.02	0.09	0.10	0	0	0.08	0.02	0	0.02	0	0.063	0.05	0.09
Longnose Gar	0	0.06	0.17	0.12	0.08	0.10	0.21	0.75	0.62	0.02	0.23	0.44	0.67	0	0
Bowfin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Eel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alewife	0.08	0	0	0.07	0.14	0.19	1.19	0	0.16	0.46	0	0.31	0.47	0.02	0.09
Gizzard Shad	0	0	0	0	0	0	0.10	0	0.12	0.19	2.08	0.32	1.09	0.70	2.83
Northern Pike	0.15	0.17	0.19	0.08	0.06	0.23	0.09	0.10	0.02	0.02	0.12	0.12	0.02	0.02	0
Chain Pickerel	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0
Muskellunge	0	0.02	0.02	0	0	0	0	0	0	0	0	0	0	0	0
Goldfish X Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Carp	0.02	0.15	0.14	0.11	0.02	0.05	0.10	0.02	0.02	0	0.15	0.11	0.05	0.08	0.07
Golden Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spottail Shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quillback	0	0	0	0	0	0	0	0	0	0	0.08	0.02	0.02	0.03	0.02
Longnose Sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	1.66	0.41	1.03	0.72	0.573	0.65	1.31	0.48	0.25	2.35	0.19	0.16	0.57	0.22	1.17
Silver Redhorse	0.10	0.42	0.33	0.02	0.02	0.08	0.07	0.04	0	0.06	0.06	0	0	0.05	0.05
Shorthead Redhorse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	0.40	0.35	0.48	0.31	0.54	2.12	0.81	1.48	0.42	0.82	1.97	1.54	0.46	0.60	0.12
Channel Catfish	0.12	0.79	0.81	0.15	0.12	0.57	0.54	0.42	0.17	0.21	0.42	0.07	0.31	0.13	0.05
Stonecat	0	0	0.06	0.02	0	0	0	0.04	0.02	0.02	0	0	0	0	0
Trout-perch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Perch	0.42	1.18	1.94	0.92	0.81	7.75	3.02	6.22	3.72	1.04	6.41	7.87	3.69	3.55	4.80
White Bass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock Bass	1.84	2.09	2.70	2.43	0.70	3.27	2.52	1.54	1.31	0.75	1.21	1.00	1.06	1.43	1.82
Pumpkinseed	0.46	0.52	0.50	1.15	0.21	0.10	0.28	0.04	0.21	0.29	0.38	0.02	0.04	0.03	0.12
Bluegill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	5.43	3.84	11.33	10.45	6.39	9.27	9.81	7.90	6.09	8.12	7.65	5.01	4.36	4.98	6.83
Largemouth Bass	0	0.02	0.02	0.02	0	0	0.03	0.02	0	0	0.02	0	0	0	0
Black Crappie	0	0.02	0.06	0	0.04	0.05	0.03	0.04	0.04	0.02	0.06	0.02	0	0	0.23
Yellow Perch	9.82	6.74	8.93	9.13	13.95	16.91	7.37	16.31	15.29	14.99	10.32	1.70	0.82	3.15	15.21
Walleye	2.12	1.69	2.38	1.94	1.33	2.33	2.65	1.91	1.97	2.38	1.34	1.55	0.97	1.28	1.99
Freshwater Drum	0.27	0.60	0.19	0.32	0.23	0.26	0.36	0.08	0.19	0.19	0.29	0.34	0.26	0.16	0.52
Round Goby	0	0	0.04	0.10	0.26	0.42	0.95	0.36	0.08	0.07	0.02	0	0	0.06	0.07
Total	22.92	19.1	31.36	28.16	25.6	44.36	31.44	37.84	30.73	32.02	33.09	20.62	14.92	16.52	36.08

● Walleye CPUE in 2017 was 2.0 fish/net night, 12% higher than the previous 10-year average.
● Yellow perch CPUE (15.21 fish/net) improved in 2017 and was 51% higher than the previous 10-year average.
● Round goby first appeared in this assessment in 2005 in both gillnet catches and smallmouth bass diets. In 2017, 77.0% of the 139 non-empty bass stomachs contained round goby. Round goby have also been found in walleye, northern pike, brown trout, lake trout, and lake whitefish.
● At least one lake sturgeon was collected in the Eastern Basin gill netting survey in 17 of the last 23 years, suggesting improved population status.
● Similar to the Eastern Basin index gill netting survey, surveys are conducted annually on the St. Lawrence River to assess warm and coolwater fish populations in the Thousand

Islands and Lake St. Lawrence (**Sections 6 and 7,** respectively).

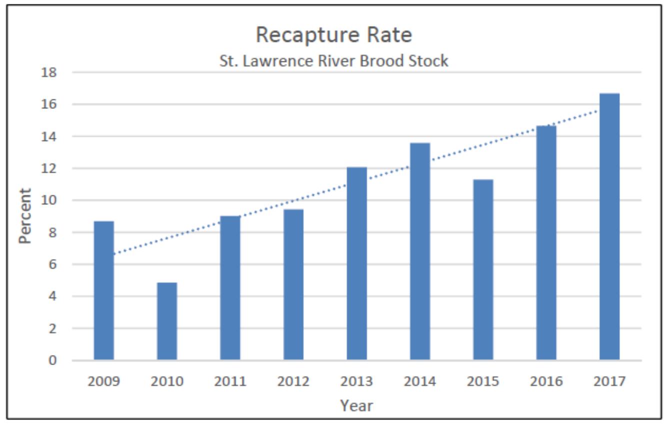
● Thousand Islands smallmouth bass abundance increased from low 1996-2006 levels, varied at relatively high levels from 2007 to 2012, then declined to a near record low by 2015. Abundance in 2016 and 2017, however, was moderate suggesting that the very low 2015 value may have been a sampling anomaly. Yellow perch abundance remained low in 2017 and was similar to the previous five-year average. From 1996 to 2017, northern pike abundance has remained relatively low. Ongoing poor recruitment of northern pike is likely related to spawning habitat limited by water level regulation, and possibly by Double-crested Cormorant predation (**Section 6).**

● Lake St. Lawrence yellow perch abundance was variable at a higher level from 2007-2017 as compared to most years during the 1990s and 2000s. Smallmouth bass catch has been variable since 2005, reached its second highest level in 2013, and was slightly below the long-term average in 2017. Catches of age 1 and age 2 smallmouth bass were well above the previous ten-year average in 2016 and 2017, suggesting potentially strong year classes. Walleye abundance increased 13% in 2017, but remained below the long-term average **(Section 7).**

● Abundance of spawning adult and young-of-the-year (YOY) northern pike in the Thousand Islands region of the St. Lawrence River continues to be suppressed likely due to habitat degradation resulting from long-term management of Lake Ontario/St. Lawrence River water levels. Overall, natural reproduction at natural and managed spawning marshes remains poor, due to low abundance of spawning adults and sex ratio dominance of females. Habitat restoration efforts including excavated channels and spawning pools have improved natural reproduction of YOY at many sites.
(Section 17).

● Muskellunge population indices in the Thousand Islands region of the St. Lawrence River continue to show signs of stress. Spring trap net surveys, summer seining surveys and an angler diary index all indicate reduced adult and YOY abundance. It is plausible that adult muskellunge mortality events attributed to outbreaks of the invasive Viral Hemorrhagic Septicemia virus are contributing to lower adult muskellunge numbers and reduced natural reproduction **(Section 19).**

● Targeted gill net sampling for lake sturgeon in Lake Ontario, Black River Bay, and the St. Lawrence River in 2017 produced a total catch of 159 fish. Passive integrated transponder (PIT) tags, which allow for future identification of individual fish, were implanted in 122 fish to monitor fish growth, movements, and to manage brood stock genetics in restoration stocking efforts. Thirty-seven previously tagged sturgeon were re-captured in 2017 **(Section 16).**

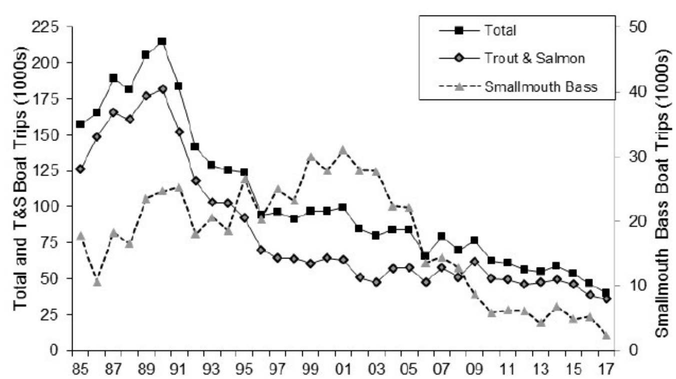


Lake sturgeon recapture rates from 2009-2017 during broodstock collection on the St. Lawrence River at Massena NY.

Sport Fishery Assessment

● Each year from 1985-2017 the DEC surveyed boats operating in New York waters of Lake Ontario's main basin. The data collected from boat counts and interviews of fishing boats are used for management of the salmonid fishery and provide valuable information on other fish species **(Section 2).**

● Overall during 2017, fishing quality for trout and salmon was good to excellent. The four most sought after species are Chinook salmon, brown trout, rainbow trout, and coho salmon, and regulations allow a daily harvest limit of "3 in any combination" of these four species. In 2017, charter boat fishing quality (catch rate = number of fish caught per hour of angling) for these four species combined increased 45% from 2016 to the third highest level on record.



Estimated number of total fishing boat trips, trips targeting trout and salmon, and trips targeting smallmouth bass during the traditional open season, 1985-2017.

● Chinook salmon fishing quality among charter boats has been excellent from 2003-2017. Fishing quality in 2017 (0.14 fish/hr) was the highest recorded, primarily due to good to excellent fishing during July and August in all regions.

● The charter boat catch rate for coho salmon in 2017 (.02 fish/hr) was among the best in the 33 years surveyed.

● Rainbow trout fishing quality was at record high levels each year 2008-2014; however, declined markedly during 2015 and 2016. The 2017 carter boat catch rate (0.03 fish/hr) improved 46% from the 2015 low and was similar to (-9%) the long-term average. For the third consecutive year, fishing quality for brown trout was among the lowest recorded. Although fishing quality for brown trout was excellent in May (third best recorded), charter boat catch rates were well below average during much of the open lake season resulting in an overall 2017 catch rate (0.03 fish/hr) that was 20% below the long-term average.

● Following the 2007 record low, lake trout fishing quality improved each year 2008-2013, remained relatively stable from 2013-2016, then declined in 2017 (25% below the long-term average). The decline is partly attributed to good to excellent fishing quality for other trout and salmon species (i.e., Chinook salmon, coho salmon and rainbow trout) which may have reduced fishing effort specifically targeted at lake trout.

● Fishing quality for Atlantic salmon remained relatively high and was 12.6 times higher than the 1995- 2008 average (i.e., the period of lowest catch rates; catch rates are very low when compared to other salmonines).

● An estimated 162,341 trout and salmon were caught (primarily Chinook salmon [59%] and rainbow trout [14%]). Trout and salmon harvest was estimated at 93,524 fish, dominated by Chinook salmon (58%) and rainbow trout (13%)

● Fishing effort directed at trout and salmon remained relatively stable from the early 2000s through 2015, then declined in 2016 and 2017. Effort in 2017 was the lowest level on record (35,865 boat trips targeting trout and salmon). The decline is partly attributed to extremely high water levels on Lake ntario that persisted into early July, hindering boating activity.

● From early May to early July numerous public and private launches along the entire NY shoreline were closed or available for limited use only, many docks were nearly or completely submerged and not usable, many boaters were concerned about floating debris, and reduced boat speed limits were established along the entire shoreline. All of these factors contributed to record low boating activity of all types on Lake Ontario in 2017, including fishing (39,964 boat trips), recreational (52,445 excursions), and sailing (10,013 excursions).

● The number of lamprey observed per 1,000 trout and salmon caught was estimated at 14.7 in 2017 (comparable to [-5%] the previous 5-year average), indicating effective sea lamprey control.

● The estimated number of fishing boat trips targeting smallmouth bass during the traditional open season (3rd Saturday in June through September 30 when the creel survey ends) was 2,294 bass trips in 2017, the lowest recorded and partly attributed to extremely high water levels on Lake Ontario. Bass fishing quality in 2017 (0.7 fish/hr) was the highest since 2006 and a 94% increase compared to the 2010 record low.

	Number Harvested	Number Caught
Coho salmon	8,291	10,630
Chinook salmon	53,871	96,226
Rainbow trout	12,015	22,556
Atlantic salmon	151	394
Brown trout	10,604	17,092
Lake trout	8,592	15,444
Smallmouth bass (includes pre-season)	2,305	12,079
Yellow perch	5,204	19,459
Walleye	152	208
Round goby	3,986	5,817
Other fish	189	1,036

Harvest and catch estimates for April 15 – September 30, 2017 from the NYSDEC Lake Ontario fishing boat survey.

● NYSDEC initiated a Salmon River angler survey in September 2017 that will continue through mid-May 2018. Total estimated fishing effort from September – November was 96,456 angler trips totaling 655,706 angler hours, the second highest effort estimate on record (2011 - 751,127 angler hours).

● Chinook salmon was the most abundant species caught in fall 2017 with an estimated 109,840 fish caught and 34,934 harvested, the highest estimated since the early 1990s.

● Steelhead was the second most caught species during the fall season with an estimated 17,165 fish caught and 2,344 harvested, a substantial increase from the low numbers estimated in fall 2015 (6,378 caught and 837 harvested) the last time the survey was conducted.

● Estimated catch and harvest of coho salmon during fall 2017 was 15,167 and 5,746, respectively, also a substantial increase from the low estimates in fall 2015 (5,380 caught and 2,163 harvested). Fewer brown trout and Atlantic salmon were caught (1,399 and 36 fish, respectively) during September - November.

Double-crested Cormorant Management and Impacts on Sportfish Populations

● Cormorant population management, along with a major cormorant diet shift to round goby, was essentially meeting objectives related to cormorant predation for protecting fish populations, other colonial waterbird species, private property and other ecological values. However, cormorant management activities were suspended in 2016 and the future impacts to fish populations are unknown in the absences of an effective cormorant management program **(Section 13).**

Island		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Little Galloo I.	Peak nests oiled	4,301	3,865	3,707	3,389	3,359	2,896	2,275	2,502	1,804	2,166	1,104	2,000	1,600	1,456	1,625	1,546	914	0
	Nests removed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	DCCO culled	-	-	-	-	18	686	620	709	382	798	145	569	362	366	150	0	0	0
Bass I.	Peak nests oiled	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nests removed	793 (757)	0 (0)	986 (279)	260 (117)	959 (348)	935 (600)	477 (174)	470 (110)	x	x	x	x	x	x	x	x	x	x
	DCCO culled	-	-	-	-	167	281	200	124	x	x	x	x	x	x	x	x	x	x
Gull I.	Peak nests oiled	0	0	0	0	0	0	0	0	x	x	x	x	x	x	x	x	x	x
	Nests removed	574 (478)	21 (21)	157 (77)	1,427 (486)	485 (188)	0 (0)	113 (110)	273 (137)	671 (266)	741 (261)	604 (275)	659 (302)	711 (391)	1,072 (276)	603 (235)	769 (276)	149 (149)	0 (0)
	DCCO culled	-	-	-	-	3	0	0	20	2	0	0	0	29	0	0	0	0	0
Calf I.	Peak nests oiled	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nests removed	0	0	0	0	0	415 (539)	0	0	0	161 (111)	55 (52)	0	0	0	0	0	0	0
	DCCO culled	-	-	-	-	37	0	0	0	6	2	0	0	0	0	0	0	0	0

Number of cormorant nests removed or oiled and cormorant adults culled; nests with no intact eggs were not oiled. **Cumulative nests removed. Number in ( ) is peak one day count, x-management unnecessary due to landowner activity.**

● In May 2016, a U.S. Federal Court decision vacated an extension of the Public Resource Depredation Order, which had allowed DEC and other agencies to conduct cormorant management activities. As a result, only limited cormorant management activities were done in 2016 and no cormorant management was conducted in 2017.

● The number of cormorant feeding days at the Little Gallo Island colony were near or below the management target of 780,000 from 2010 - 2015. However, the number of feeding days increased in 2016 and 2017 primarily due to large numbers of chicks that resulted from reduced cormorant management activity. The estimated number of feeding days in 2017 (1,044,278) was well above the management target.

For the full 326 page copy of the **Lake Ontario Annual Report 2017:** **www.dec.ny.gov/docs/fish_marine_pdf/lorpt17.pdf** ✧

Overview regarding 2018 Salmon/Trout Stocking Levels in Lake Ontario (NY)

Key Points:

● In 2016, Lake Ontario fisheries management agencies were concerned about declining numbers of adult Alewife over the next few years due to poor Alewife production in 2013 and 2014.

● In 2016, the Lake Ontario Committee (New York DEC and the Ontario Ministry of Natural Resources and Forestry [OMNRF]) announced that stocking levels for Chinook Salmon and Lake Trout would be adjusted down 20% in 2017 to reduce predator demand on adult Alewife in order to protect the valuable fishery.

● In 2017, the lake wide spring Alewife survey showed a strong first step toward recovery with a record number of young Alewife produced in 2016 and caught as age-1 fish in 2017.

● The record numbers of Alewife produced in 2016 is great news, but additional strong Alewife reproduction and survival is needed in upcoming years to rebuild the adult population.
● Lake Ontario's Alewife population is currently composed of primarily Age 1, 2 and 5 fish.
● New York and Ontario will maintain 2018 stocking levels at the adjusted 2017 targets while continuing to monitor the status of the fishery.
● Chinook Salmon fishing in 2017 has been excellent. Lake Ontario should continue to provide a world class fishery supported by stocking and significant wild Chinook Salmon production.
● The Lake Ontario Committee remains optimistic about the state of the fishery and its future.
● Lake Ontario supports a world class fishery for trout and salmon and produces the largest Chinook Salmon in the Great Lakes, with some individuals exceeding 40 pounds.
● The primary prey fish in Lake Ontario is the Alewife, a type of herring native to the Atlantic Ocean that invaded the Great Lakes over 100 years ago.
● Chinook Salmon feed almost exclusively on Alewife, requiring large numbers of Alewife to support a voracious appetite that allows a salmon to grow to over 30 pounds in four years.

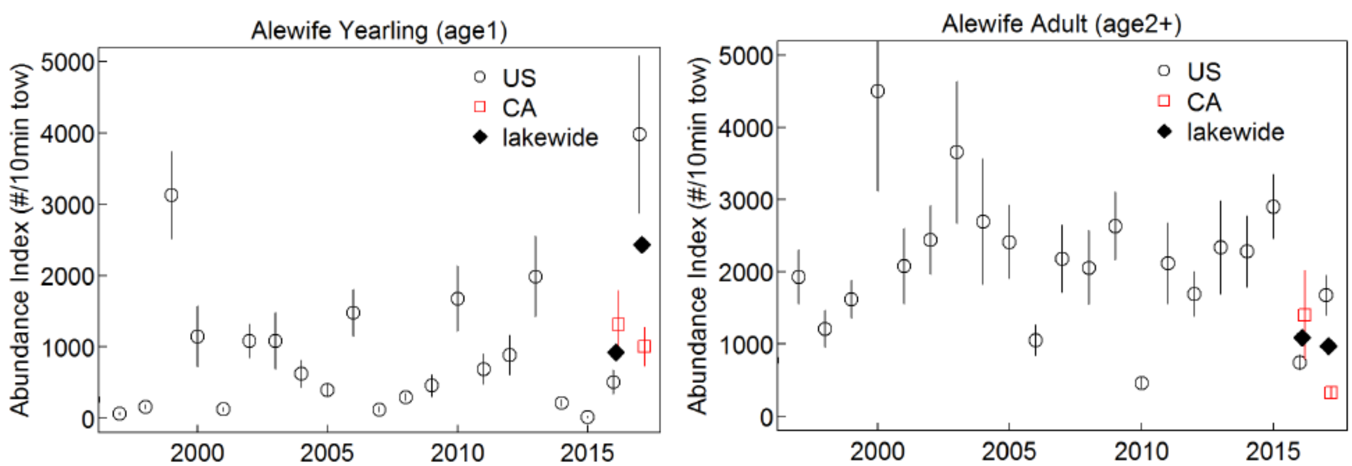


Fig 1-Average numbers of yearling (left) and adult (right) Alewife caught in Lake Ontario bottom trawl survey, 1997-2017. Red "squares" represent trawling results from Ontario waters during enhanced surveys conducted in 2016 and 2017. The black diamonds represent estimates based on combined US and Ontario trawl results.

● Bottom trawl survey results in 2017 indicate a dramatic increase in yearling (age-1) Alewife numbers in NY waters (black dots); the increase was much less pronounced in Ontario (red squares) waters (Figure 1, left panel). Catches of adult (age-2 and older) Alewife in 2017 also increased in NY waters relative to 2016, however, the opposite was true for trawls performed in Ontario waters (**Fig 1**, right panel).
● These differences illustrate the importance of bottom trawling throughout the lake.
● The numbers of Alewife (bar height; y axis) at a given size (inches on x axis) and age (color) in 2017 are presented in **Fig 2**.
● Very high catches of yearling (age-1) Alewife from the 2016 year class are represented by the green bars in Figure 3.
● In 2017, "larger" size Alewife that support both Alewife spawning and food for large Chinook salmon are primarily composed of age-2 (yellow bars; 2015 year class) and age-5 fish (black bars; 2012 year class).
● As expected, catches of age-3 (2014 year class; red bars) and age-4 (2013 year class; blue bars) Alewife were poor. The extreme long, cold winters of 2013/2014 and 2014/2015 contributed to the poor 2013 and 2014 year classes, and these poor year classes will continue to affect the overall stability of Lake Ontario's Alewife population for several more years.
● The adult Alewife population in 2018 will be composed primarily of Alewife ages 2, 3, and 6. The Lake Ontario Committee is cautiously optimistic that the 2018 Alewife population can support both successful spawning (given favorable weather conditions) and prey demand from Chinook Salmon, Lake Trout and other trout and salmon.

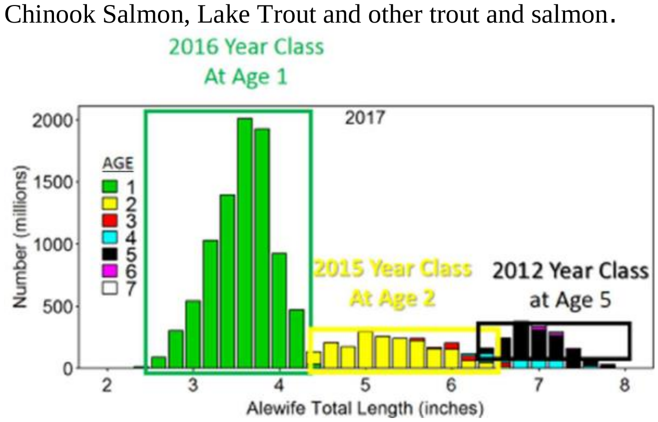


Fig 2-Abundance of Alewife in 2017, arranged by age (color) and length. The Green bars represent the 2016 Alewife Year class (spawned in 2016) and measured at age 1 in 2017. The height of each green bar is the relative number of age 1 alewife at a given total length (inches).

Summary and Next Steps

● The strong 2016 Alewife year class is a very positive sign, but it does not change the very poor year classes from 2013 and 2014 and the impact those poor year classes will have on the adult Alewife population in upcoming years.
● A cautious approach to sustaining the adult Alewife population to feed predators and successfully reproduce is needed at least through 2019. The LOC believes that maintaining Chinook Salmon and Lake Trout stocking at 2017 levels, coupled with natural reproduction, should sustain good fishing opportunities in future years.
● New York will hold public meetings during late August and September to discuss this decision.

The numbers of Alewife (bar height; y axis) at a given size (inches on x axis) and age (color) in 2017 are presented in **Fig 1.**
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Bottom Trawl Assessment of Lake Ontario Prey Fishes (USGS)

Abstract

Managing Lake Ontario fisheries in an ecosystem-context requires prey fish community and population data. Since 1978, multiple annual bottom trawl surveys have quantified prey fish dynamics to inform management relative to published Fish Community Objectives. In 2017, two whole-lake surveys collected 341 bottom trawls (spring: 204, fall: 137), at depths from 8-225m, and captured 751,350 fish from 29 species. Alewife were 90% of the total fish catch while Deepwater Sculpin, Round Goby, and Rainbow Smelt comprised the majority of the remaining total catch (3.8, 3.1, and 1.1% respectively). The adult Alewife abundance index for US waters increased in 2017 relative to 2016, however the index for Canadian waters declined. Adult Alewife condition, assessed by the predicted weight of a 165 mm fish (6.5 inches), declined in 2017 from record high values observed in spring 2016. Spring 2017 Alewife condition was slightly less than the 10-year average, but the fall value was well below the 10-year average, likely due to increased Age-1 Alewife abundance. The Age-1 Alewife abundance index was the highest observed in 40 years, and 8-times higher than the previous year. The Age-1 index estimates Alewife reproductive success the preceding year. The warm summer and winter of 2016 likely contributed to the large year class. In contrast the relatively cool 2017 spring and cold winter may result in a lower than average 2017 year class. Abundance indices for Rainbow Smelt, Cisco, and Emerald Shiner either declined or remained at low levels in 2017. Pelagic prey fish diversity continues to be low since a single species, Alewife, dominates the catch. Deepwater Sculpin were the most abundant benthic prey fish in 2017 because Round Goby abundance declined sharply from 2016. Slimy Sculpin density continued to decline and the 2017 biomass index for US waters was the lowest ever observed. Prior to Round Goby proliferation, juvenile Slimy Sculpin comprised ~10% of the Slimy Sculpin catch, but since 2004, the percent of juveniles within the total catch is less than 0.5%, suggesting Round Goby are limiting Slimy Sculpin reproduction. Despite Slimy Sculpin declines, benthic prey fish community diversity has increased as Deepwater Sculpin and Round Goby comprise more of the community.

Since 2016, trawls have been collected from 8- 225m (26-743 ft), with sites organized in 23 transects or regions distributed around the lake **(Fig 1)**

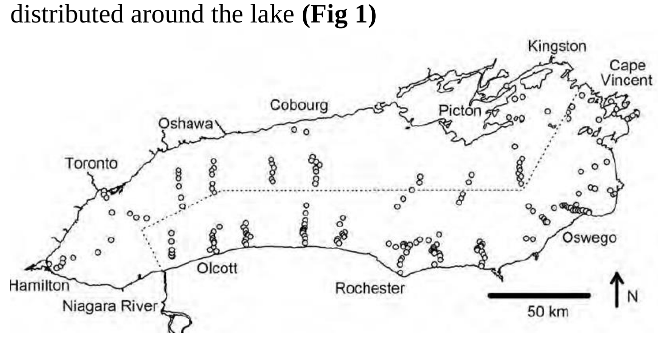

Fig 1- Sampling sites from the 2017 spring bottom trawl survey

Alewife

The adult Alewife (Age-2 and older) abundance index for US waters increased in 2017 (1672 Alewife per 10 minute tow) relative to 2016 (746) but was below the 10-year average (10-yr avg =1940, **Fig 2**). The increase is relevant since the 2016 US adult Alewife abundance index value was likely the lowest observed since the current survey and trawl design began in 1997. A lower value was observed in 2010 (460 Alewife per 10 minute tow), but cohort analyses indicated that value was biased low. In contrast to the US index, the adult Alewife index in Canadian waters declined from 2016 to 2017 **(Fig 2).** The Age-1 Alewife abundance index for US waters increased in 2017 (3977 fish per 10 minute trawl) relative to 2016 (506) and was approximately 5 times higher than the 10-year average (2007:2016 average = 684; **Fig 2**).

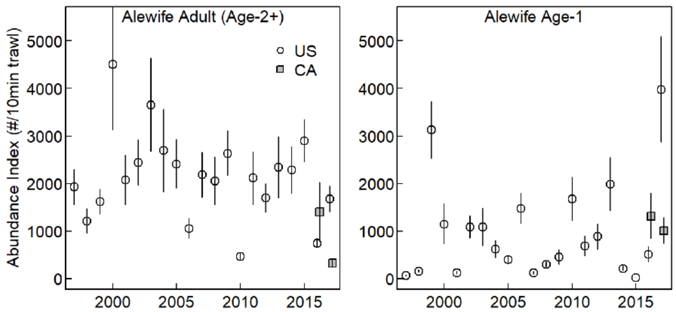

Fig 2-Spring bottom trawl-based abundance indices for adult Alewife (Age-2and older, left panel) and Age-1 Alewife (right panel). Values represent a stratified, area-weighted mean number of Alewife captured in a 10 minute trawl.

The low Alewife abundance observed in 2016 is consistent with the two consecutive years of low Alewife reproductive success observed in 2013 and 2014. Alewife reproductive success for a given year is measured the following year, so those low year classes from 2013 and 2014 are illustrated as low numbers of Age-1 Alewife captured in 2014 and 2015. The increased catch in adult Alewife, from 2016 to 2017 (US index) was attributable to the moderate 2015 Alewife year class, which first counted towards the adult index when they reached age-2 in 2017. Since the record high 2016 Alewife year class will be Age-2 in 2018, we expect the 2018 adult Alewife index value to increase relative to 2017. The relatively cool 2017 spring and cold winter may result in a lower than average 2017 year class since temperature has been shown to influence Alewife year class strength in Lake Ontario.

The seasonal timing of trawl surveys, within a given year, has a strong influence on Lake Ontario Alewife catches. For example, in 2017, the average biomass of all Alewife captured in the spring trawls was 72 kilograms per hectare, while the average of the 137 fall trawls was 2 kilograms per hectare **(Fig 3).** In addition to the broad seasonal effects, survey timing within the spring survey period may also

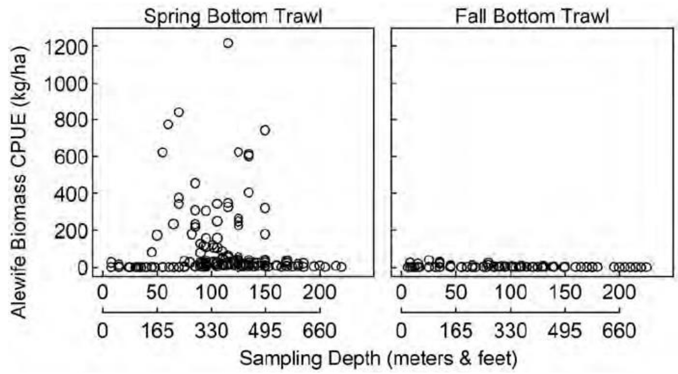

Fig 3- The biomass of all ages of Alewife caught in 2017 bottom trawls varies across sampling depths and between the spring (left panel) and fall (right panel) surveys .

influence Alewife catches. An experimental effort in 2017sampled the Oswego transect twice, 21 days apart, and the mean biomass value for that transect was 75% less during the second sampling. This may explain the relatively lower Alewife abundance index in Canadian waters in 2017, where trawling occurred slightly later than in US waters. The direction and magnitude of the differences in US and Canadian trawl indices in 2016 and 2017 accentuates the need for a lake wide survey. Seasonal effect on Alewife susceptibility to bottom trawls was also apparent in Lake Michigan in 1964. Future research efforts should consider evaluating how Alewife behavior changes in the spring with respect to photoperiod and temperature and how those behavior changes influence abundance estimates. Adult Alewife condition, assessed by the predicted weight of a 165 mm fish (6.5 inches) declined in 2017 from a record high spring value observed in 2016**.** Condition in spring 2017 was slightly less than the 10-year average, but the fall value was well below the 10-year average, likely due to record high Age-1 Alewife abundance that would have increased competition for zooplankton resources.

Other Pelagic Fishes

Bottom trawl abundance indices for Rainbow Smelt, Cisco, and Emerald Shiner either declined or remained at low levels in 2017 **(Fig 4**). Alewife dominance relative to Rainbow Smelt in Lake Ontario trawl catches may be related to adult Alewife predation on Age-0 Rainbow Smelt and competition for zooplankton. The habitat distribution of Age-0 Rainbow Smelt overlaps with adult Alewife during the summer. Increased Cisco catches observed in 2015 were not evident in 2017 **(Fig 4**), however bottom trawl surveys have been shown to underestimate Cisco abundance compared to acoustic and midwater sampling.

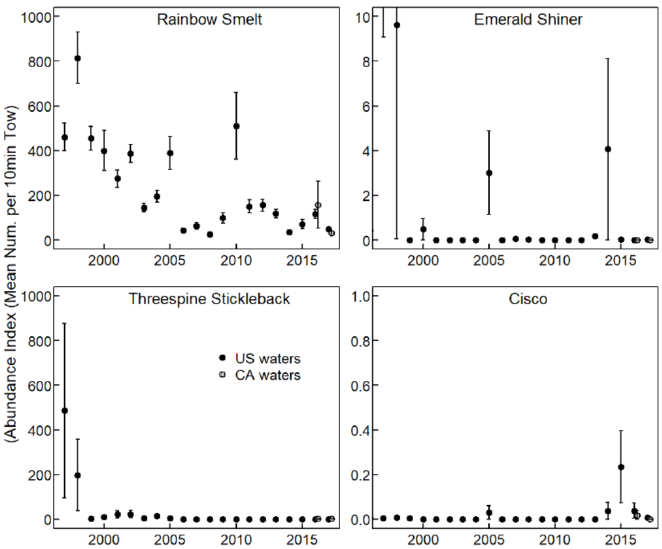

Fig 4- Abundance indices for other Lake Ontario pelagic prey fishes based on bottom trawls in U.S. and Canadian waters, 1997-2017.

Demersal prey fishes

In 2017, Deepwater Sculpin were the most abundant benthic prey fish because Round Goby abundance declined sharply from 2016 **(Fig 5).** Deepwater Sculpin were once thought to be extirpated from Lake Ontario, but their abundance and weight indices have increased steadily since 2004. Slimy Sculpin density has continued to decline and the 2017 biomass index for US waters was the lowest observed **(Fig 5).** Slimy Sculpin declines in the 1990s were attributed to the collapse of their preferred prey, the amphipod Diporeia. The declines that occurred in the mid-2000s appear to be related to Round Goby. Since Round Goby numbers have increased the proportion of juvenile Slimy Sculpin in the total catch of Slimy Sculpins dropped from ~10% to less than 0.5%. These data suggest Round Goby are limiting Slimy Sculpin reproduction or possibly recruitment of juvenile Slimy Sculpin to adult stages. Interestingly, Slimy Sculpin biomass is higher in Canadian waters but may also be declining although the time series only includes three years **(Fig 5).**

Prey fish diversity

Lake Ontario Fish Community Objectives call for increased prey fish diversity. Bottom trawl data suggest that pelagic prey fish community diversity remains low since a single species, Alewife, dominates the catch **(Fig 6).** Actions to improve pelagic community diversity are currently underway in Lake Ontario, including Bloater restoration and Cisco rehabilitation. Despite Slimy Sculpin declines, benthic prey fish community diversity has generally increased over the time series. In the 1970s – 1990s a single species, Slimy Sculpin, dominated the catch, resulting in lower diversity values. More recently, increases in Deepwater Sculpin and the introduction of Round Goby, which make up more even portions of the catch, have caused the index value to increase **(Fig 6).**

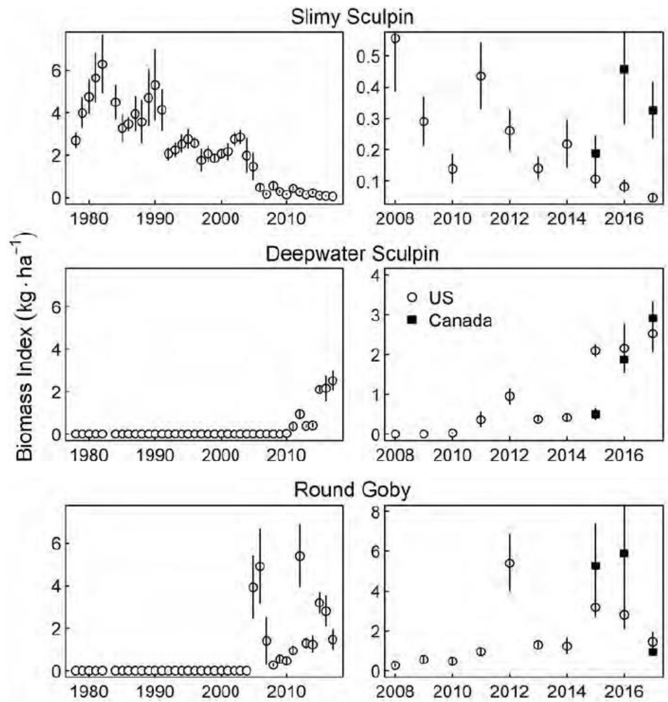

Fig 5- Prey fish trends for demersal or bottom-oriented species from 1978-2017 (left panels) and 2008-2017 (right panels). The survey is conducted in late-September and early-October. Sampling in Canadian waters began in 2015.

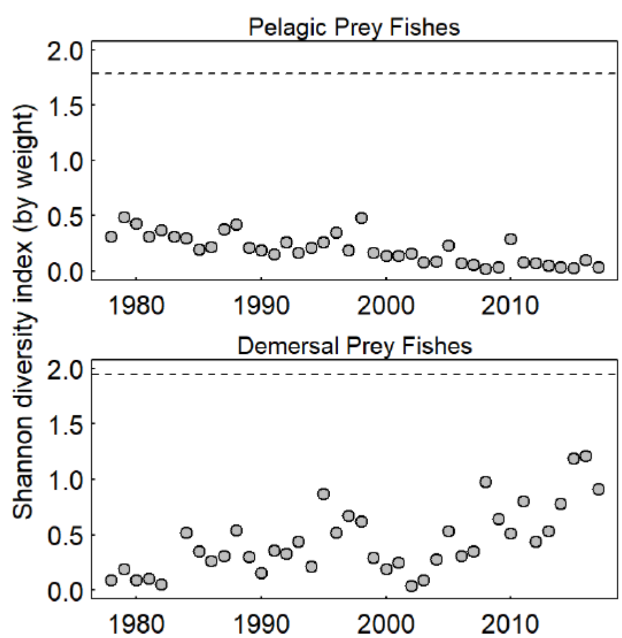

Fig 6- Prey fish diversity indices for pelagic and demersal prey fishcommunities based on bottom trawl catch weights 1978-2017. The dashed lines represent the maximum diversity index value if allspecies considered made up equal proportions of the catch by weight. ✧

Hydroacoustic Assessment of Pelagic Planktivores, 2017 (USGS)

Alewife and rainbow smelt are the most abundant pelagic planktivores in Lake Ontario, and the most important prey for salmon and trout which support a multimillion dollar sportfishery. Alewife make up greater than 90% of the diet of the top predator, Chinook salmon, and are also important prey for warm water predators, notably Walleye. The abundance of alewife and rainbow smelt has declined since the 1980s, likely due to reduced nutrient loading, proliferation of invasive dreissenid mussels, and predation by stocked salmon and trout. Cisco and Bloater, both native planktivores, historically dominated the offshore pelagic prey fish community of Lake Ontario, but their populations were severely reduced in the mid-20th century due to overfishing and competition with alewife and smelt. Remnant cisco populations still exist, mostly in the eastern basin, producing strong year classes only once or twice per decade, most recently in 2012 and 2014. Bloater was extirpated from Lake Ontario during the mid-20th century; however, from 2012-2017, this species has been stocked by Canadian and U.S. agencies in order to reestablish this species in the lake.

Hydroacoustic assessments of Lake Ontario prey fish have been conducted since 1991, with a standardized mid-summer survey initiated in 1997. The survey is conducted jointly by the Ontario Ministry of Natural Resources and Forestry and the New York State Department of Environmental Conservation. Results from the hydroacoustic survey complement information obtained in spring bottom trawling surveys and provide whole-lake abundance indices for alewife and rainbow smelt. In addition, the results provide insights into the midsummer distribution of these species. We present results from the 2017 survey in this report. Cisco was previously a minor component in midwater trawling conducted during the hydroacoustic survey from 1991-2005. Recent evidence of strong cisco year classes in OMNRF trawling surveys of juveniles in 2012 and 2014 and increasing cisco catches during bottom trawling by USGS and NYSDEC suggest that cisco populations are increasing. Cisco are still relatively rare in existing surveys, although these surveys do not target this generally pelagic fish. In 2016 and 2017, the NYSDEC, OMNRF and USGS conducted midwater trawling along with hydroacoustics in eastern and central portions of Lake Ontario as a pilot effort to evaluate methods for assessment of native Coregonine species (cisco and bloater). The preliminary results of those efforts are also reported here.

The hydroacoustic survey indexes pelagic preyfish abundance, and like other assessments, this survey employs a consistent approach. Increasingly, however, there is strong interest by Great Lakes scientists in knowing the total abundance and biomass of prey fish (and predators) for understanding and modeling predator-prey balance. This information is important for fisheries managers when making decisions regarding predator stocking levels. As with other assessment gears (e.g. bottom trawls), making the transition from relative to absolute abundance with acoustics requires rigorous testing of assumptions of gear catchability. Bottom trawling has its own assumptions and unknowns regarding gear catchability and we are currently addressing these.

We have also been exploring the “catchability” of hydroacoustic gear. Experimental sampling with vertical gillnets and upward looking hydroacoustics conducted during 2008-2014 identified some limitations to using the traditional down-looking hydroacoustic approach for achieving accurate, whole-lake estimates of alewife abundance. Increasing evidence indicates that alewife can be oriented near the surface at night and potentially undetectable with traditional down-looking acoustics because vessel draft, transducer depth, and acoustic “cone” area create a near-field acoustic “blind-spot” in the first 4 m (13.1 ft) of surface water (Connerton and Holden 2015). In addition, the sound and/or vibration of the research vessel may cause surface-oriented alewife to scatter or dive which affects fish target strength (TS), detectability and ultimately abundance estimates. NYSDEC and OMNRF have been experimentally towing submersible acoustic equipment suspended away from the boat hull in deep water with the transducer aimed upward to detect fish near the surface. Results of upward looking acoustics conducted from 2010-2014 suggested that an average of 50% of the alewife are near the surface during the survey and undetected by downlooking acoustic methods. The values for alewife reported herein do not include a conversion factor to account for this unmeasured biomass and thus should be treated as an index of abundance between years and not as a whole lake population estimate

We also continue to explore other potential biases of this survey. For example, the hydroacoustic survey samples most depths in proportion to the lake area except for shallow habitats (<40 m or 131 ft). This may potentially bias the alewife estimate low if significant numbers of alewife occupy these habitats and the measured densities are highly variable. Although the survey has certain limitations for sampling inside of 10 m (32.8 ft) due to vessel draft, additional sampling is possible from 10-40 m (32.8-131 ft). In 2016, we sampled additional areas over 10-40 m bottom depths to test whether increased sampling in shallow water would significantly change the survey estimate, and found that the alewife acoustic estimate was about 15% higher compared with normal transects although this difference was not statistically significantly. In 2017, we repeated this experiment and compared the results.

Species	Catch Total in Trawls below 10˚C	Catch Total in Trawls 10˚C and above	Number Sampled	Mean Total Length	Max. Total Length	Min. Total Length	Mean Weight
Alewife	3547	6433	227	146	201	25	24.8
Rainbow Smelt	138	19	45	85	169	30	7.0
Cisco	15	2	17	318	371	257	271.4
Chinook Salmon	2	1	3	508	860	140	3329.0
Round Goby	1	0	1	30	30	30	0.1
Gizzard Shad	0	1	1	145	145	145	27
Threespine Stickleback	0	1	0	-	-	-	-

Table 1-Summary of catch data for all species captured in mid-water trawls in 2017.

The survey transects included acoustic data collected over 311 km (193 mi), plus an additional 247 km (154 mi) collected and paired with mid-water trawl tows**.** There were 58 mid-water tows conducted which captured seven species of fish. alewife, rainbow smelt and cisco were the most frequently caught and most abundant species. Tows in the surface layer (≥ 10 °C) were 99% alewife. Tows in the deep layer (< 10 °C) were also 95% alewife; however, we hypothesize that catch ontamination from the upper layer significantly impacted these results. Headrope and footrope temperatures were not recorded on all tows and thus a fishing temperature of 9°C at the footrope and a net with a vertical opening of 5-7 m (16.4-23 ft) is likely fishing some portion of the net in temperatures greater than 9°C. In the future we expect to have temperature loggers on both the footrope and headrope to better quantify this potential bias. We feel the potential for catch contamination is high while letting out and hauling in the trawl, as the net must pass through the warm portion of the water column to reach the target fishing depth. For instance, a tow conducted in 2016 with no fishing time (i.e. trawl let out to 34 m fishing depth then immediately returned) captured alewife, cisco and rainbow smelt which indicates that the net fishes during either or both the let out or haul in period of the tow. rainbow smelt and cisco were predominantly (88% for each) caught in tows conducted in water less than 9°C.

The length distribution shows a clear size separation between cisco and both alewife and rainbow smelt **(Fig1).** The thermal separation between alewife and rainbow smelt and the size difference between these species and cisco supports the current approach of species apportionment of acoustic density estimates**.**

Cisco

Catches of cisco were confined geographically within the eastern region of Lake Ontario in 2016. The majority of cisco were also caught at eastern sites in 2017, although one cisco was caught near Cobourg, ON suggesting a broader distribution across the north shore than inferred by 2016 trawling **(Fig 2).** Cisco catches in 2017 (N = 15, mean CUE = 0.15 fish/5 min tow) were well below catches observed in

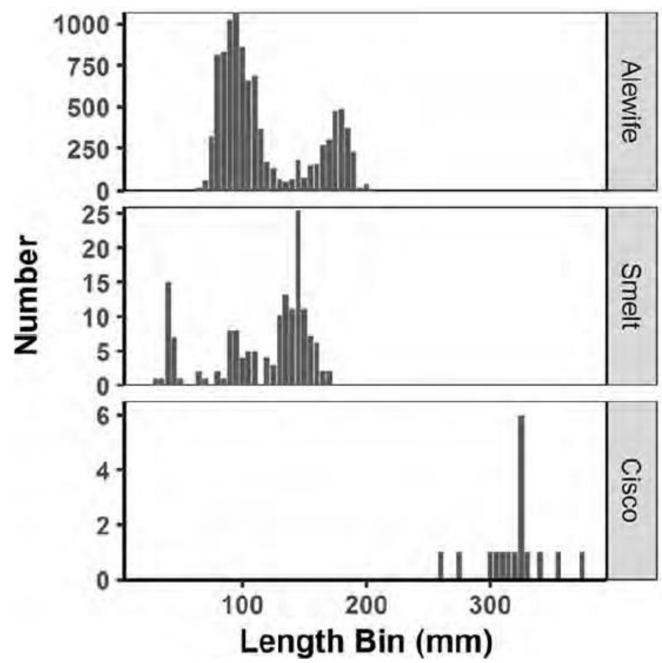

Fig 1- Length frequencies of alewife, rainbow smelt and cisco caught in midwater trawling in 2017.

2016 (N = 361, mean CUE = 3.83 fish/5 min tow). Cisco occupied both upper and lower thermal layers in 2017 with trawl catches in water temperatures of 7-15 °C compared to 2016 when they were concentrated in the 10-15 °C layer. Length of captured cisco ranged from 260-380 mm (10.2-15 in). Hydroacoustic data, using only transects where cisco were captured, estimated a mean density of 45 cisco per hectare, markedly higher than 2016 (25 cisco per hectare). Using the average cisco weight captured in midwater trawls (210g and 271 g in 2016 and 2017, respectively, cisco biomass density was ~5.25 kg/ha and 11.9 kg/ha in 2016 and 2017, respectively. If we conservatively assume the limited area where cisco were observed represented 1/10th of the total lake area, and cisco were absent elsewhere, whole-lake biomass densities were 0.5 kg/ha in 2016 and 1.2 kg/ha in 2017. Biomass values are still well below comparable Lake Superior hydroacoustic estimates.

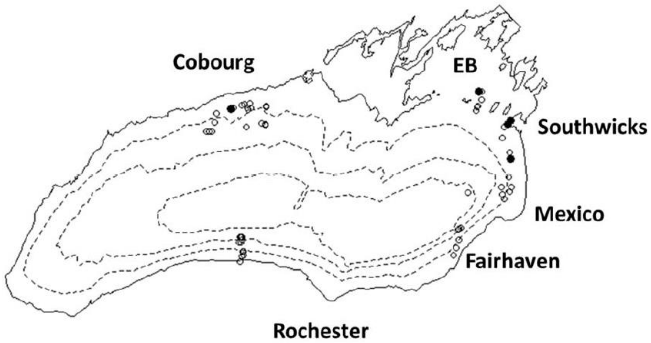

Fig 2- Distribution of cisco caught during midwater in July, 2017. Open circlesare trawl locations where no cisco were caught and closed circles are locations where cisco were caught.

Rainbow Smelt

Rainbow smelt abundance (15.1 million) in 2017 decreased relative to 2016 **(Fig 3**). However, inclusion of the additional near-shore transects in 2016 and 2017 resulted in a significantly larger population estimate (32 million and 50.3 million, respectively)

than the traditional cross-lake transects would have estimated. The largest midwater trawl catches of rainbow smelt occurred in the eastern portion of the Lake (Mexico Bay), similar to previous analyses. Only one rainbow smelt was caught in OMNRF tows conducted near Cobourg.

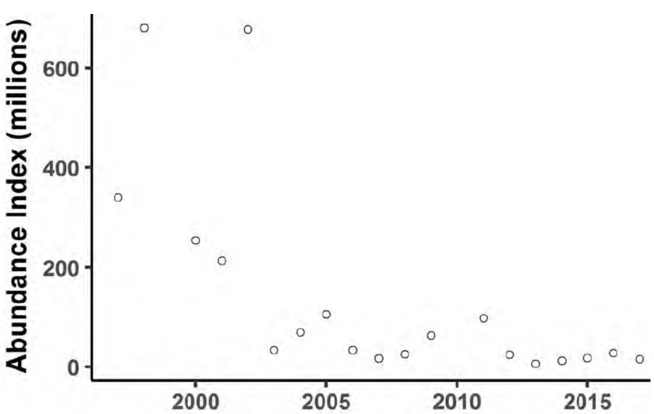

Fig 3- Abundance (in millions of fish) of yearling-and-older rainbow smelt in Lake Ontario from 1997-2017 as determined by the bootstrapping method.

Alewife

The YAO alewife abundance index in 2017 (1.183 billion) based on the area weighted method increased 140% relative to 2016 **(Fig 4).** This increase is likely explained by the moderate to strong alewife year classes produced in 2015 and 2016. Spring bottom trawls in 2017 caught record numbers of age-1 alewife in U.S. waters, moderate numbers of age-1 fish in 2016, and very low catches of age-1 fish in 2014 and 2015. Differences between acoustic target strength distributions throughout these years supports these observations **(Fig 5**), i.e. there was a noticeable lack of small targets in 2014 and 2015, followed by noticeable increases in small targets observed in 2016 and 2017, corresponding to weak year classes in 2013 and 2014, and then moderate and strong year classes in 2015 and 2016. While total alewife abundance may be higher than recent years, most of the population consists of either young alewife or fish age-5 and older **(Fig 3**), prompting concerns by fisheries managers about the future status of the population.

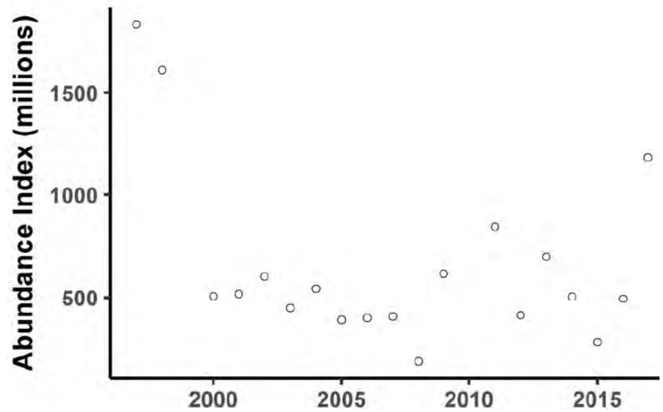

Fig 4- Abundance (in millions of fish) of yearling-and-older alewife in Lake Ontario from 1997-2017 as determined by the area weighted method.

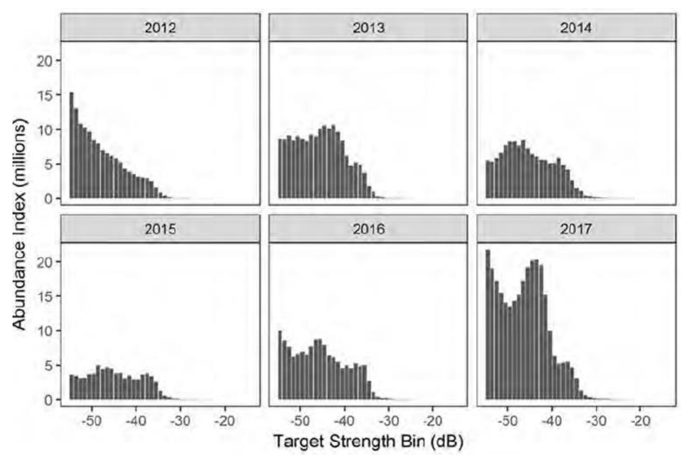

Fig 5- Target strength frequency histograms of single targets detected in the upper layer during summer hydroacoustic surveys conducted in July 2012-2017. Note the relatively low number of targets with smalltarget strengths (i.e., small alewife) in 2014 and 2015, compared to the relatively large numbers of thesetargets in 2017.

Alewife were spatially distributed throughout the lake but showed a bimodal distribution with bottom depth in 2017 **(Fig 6).** Distribution of alewife during the survey, however, varies from year to year. Previous analyses found no discernable consistent geographic patterns in alewife distribution in 2013-2014, nor any consistent regional trends from 2006-2014. Distribution of alewife may be more related to recent physical (e.g. weekly prevailing winds) and biological factors (e.g. zooplankton blooms) but more research is needed in this area and we are currently exploring other factors potentially affecting distribution.

The inclusion of the additional nearshore transects in 2017 resulted in a marginally lower whole-lake estimate (1.102 billion) compared with the estimate using the traditional cross-lake transects. In 2016, additional nearshore sampling resulted in a 15% higher lakewide estimate than using cross-lake transects alone, although these estimates were not significantly different. Midwater trawl catches in 2017 expanded to a whole lake population abundance (1.743 billion) estimated a higher abundance than the acoustic estimate, but was likely biased high because trawling effort generally targeted concentrations of fish in areas where acoustics showed fish to be more abundant over depths from 30-70 m (98.4-229.6 ft, **Fig 6).**

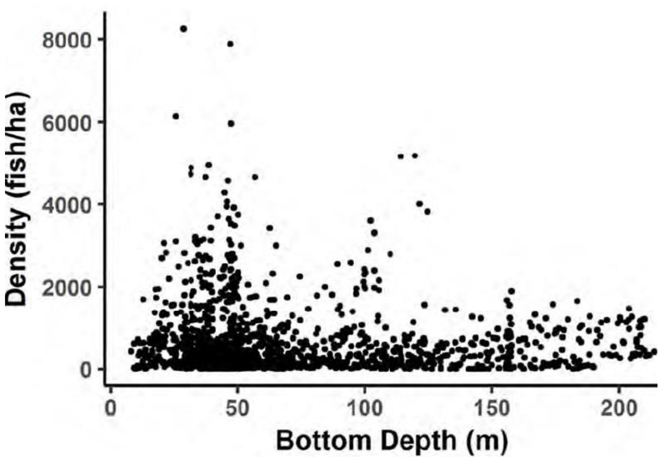

Fig 6- Distribution of alewife (fish per ha) relative to bottom depth as determined by acoustics.

The acoustic abundance of alewife is presented as an index as it produces a significantly lower abundance than spring bottom trawl estimates (e.g., ~4 kg/ha with acoustics vs 69 kg/ha with bottom trawls 2004-2006. Vertical gillnets and towed up-looking acoustics show that a large proportion (on average 50%) of alewife occupy the near-surface portion of the water column (<4 m depth) and are not detectable with the down looking transducer used in the survey. While a significant proportion of the alewife biomass is detected in this portion of the water column, the conversion still does not reconcile the difference between bottom trawl and acoustics population estimates. Stationary up-looking data is being analyzed to investigate the role that boat avoidance may contribute to explaining the differences.

Hydroacoustics remains an important method for indexing midsummer pelagic preyfish abundance. Midwater trawling has shown to be a useful method for informing species apportionment of this survey's acoustic data and for assessing Coregonines. Although the Lake Ontario offshore pelagic fish community is still dominated by alewife and rainbow smelt, cisco is a present and perhaps growing species of importance. While hydroacoustics has its challenges, this research has identified new opportunities, including estimating the abundance of other important animals in the Lake Ontario foodweb like Mysis, zooplankton, and now cisco. Our results support previous conclusions proposed that cisco are mainly restricted to eastern portions of the Lake. Hydroacoustic surveys may also prove useful in assessing success of ongoing efforts to re-establish bloater in Lake Ontario.✧

DEC Releases Final Lake Sturgeon Recovery Plan

Plan Will Help Guide Recovery Efforts Over Next Decade

New York State Department of Environmental Conservation (DEC) Commissioner Basil Seggos announced the release of the final Lake Sturgeon Recovery Plan for New York.

"Lake Sturgeon have been listed as a threatened species in New York since 1983, and this plan will provide DEC and our partners with a clear blueprint to achieve recovery of this ancient fish within our waters," Commissioner Seggos said. "This report is the culmination of dedicated work by our staff and the U.S. Fish and Wildlife Service, U.S. Geological Survey, Cornell University, St. Regis Mohawk Tribe, and others, including the New York Power Authority, since recovery activities began in 1992."

The purpose of this recovery plan is to ensure perpetuation of the species in the state, restore self-sustaining populations, and remove the species from the threatened species list in New York. The plan sets clear metrics to demonstrated recovery in six of the seven management units across the species' range in the state. DEC anticipates the agency will gather enough evidence of recovery of lake sturgeon to initiate removal from the list of threatened species in New York no later than 2024.

The plan was completed after incorporating comments from the public and partners and is the culmination of dedicated work by DEC, the New York Power Authority (NYPA), U.S. Fish and Wildlife Service, U.S. Geological Survey, Cornell University, St. Regis Mohawk Tribe, and others since recovery activities began in 1992. NYPA was integral in the development of three spawning beds on the St. Lawrence.

A summary of comments is included in the **final Lake Sturgeon Recovery Plan**, and are available on DEC's website. Lake sturgeon were once abundant in New York, but commercial fishing, dam building, and habitat loss decimated populations. Today the fish can still be found in Lake Erie, the Niagara River, Lake Ontario, the St. Lawrence River, Grasse River, Oswegatchie River, and Black Lake, as well as Lake Champlain, Cayuga Lake, Oneida Lake, Seneca River, and the Cayuga Canal. While sturgeon numbers have improved, their populations are still low compared to historical levels both in New York and the rest of the Great Lakes states. It is estimated that fishing removed 80 percent of the sturgeon from Lake Erie by 1900. Sturgeon were once prized for their meat and caviar and constituted an important industry in the state.

Lake Sturgeon are native to the Mississippi River Basin, Great Lakes Basin, and Hudson Bay region of North America. They are the largest fish native to the Great Lakes, growing up to seven or more feet in length and achieving weights of up to 300 pounds. A specimen that was 7 ft. 4 in. long and weighed 240 pounds was found in Lake Erie in 1998.

Lake sturgeon from New York's inland waters are smaller on average and may grow to three to five feet in length and about 80 pounds as adults. Male sturgeon become sexually mature between eight and 12 years of age and may live as long as 55 years. Females become sexually mature between 14 and 33 years of age and live as long as 80 to 150 years. The slow rate of maturity and reproduction make the fish particularly vulnerable to overfishing.

Sea Lamprey Control in Lake Ontario 2017

Introduction

This report summarizes Sea Lamprey control activities conducted by Fisheries and Oceans Canada (Department) and the United States Fish and Wildlife Service (Service) as agents of the Great Lakes Fishery Commission (Commission) in Lake Michigan during 2017. The Sea Lamprey is a destructive invasive species in the Great Lakes that contributed to the collapse of Lake Trout and other native species in the mid-20th century and continues to affect efforts to restore and rehabilitate the fish-community. Sea Lampreys subsist on the blood and body fluids of large-bodied fish. It is estimated that about half of Sea Lamprey attacks result in the death of their prey and up to 18 kg (40 lbs) of fish are killed by every Sea Lamprey that reaches adulthood. The Sea Lamprey Control Program (SLCP) is a critical component of fisheries management in the Great Lakes because it facilitates the rehabilitation of important fish stocks by significantly reducing Sea Lamprey-induced mortality.

Lake Ontario has 659 tributaries (405 Canada, 254 U.S.). Sixty-six tributaries (31 Canada, 35 U.S.) have historical records of larval Sea Lamprey production, and of these, 36 tributaries (18 Canada, 18 U.S.) have been treated with lampricides at least once during 2008-2017. Twenty-eight tributaries (14 Canada, 14 U.S.) are treated on a regular 3-5 year cycle. Details on lampricide applications to Lake Ontario tributaries and lentic areas during 2017 are found in **Table 1 and Figure 1.**

▪ Lampricide applications were conducted in 8 streams (3 Canada, 5 U.S.).
▪ Bowmanville Creek was treated above the Goodyear Dam for the first time. Fish community assessment and benthic surveys were completed pre- and post-treatment. Non-target mortality was negligible.
▪ High lake levels caused issues with treatment effectiveness on all 8 tributaries treated in 2017.

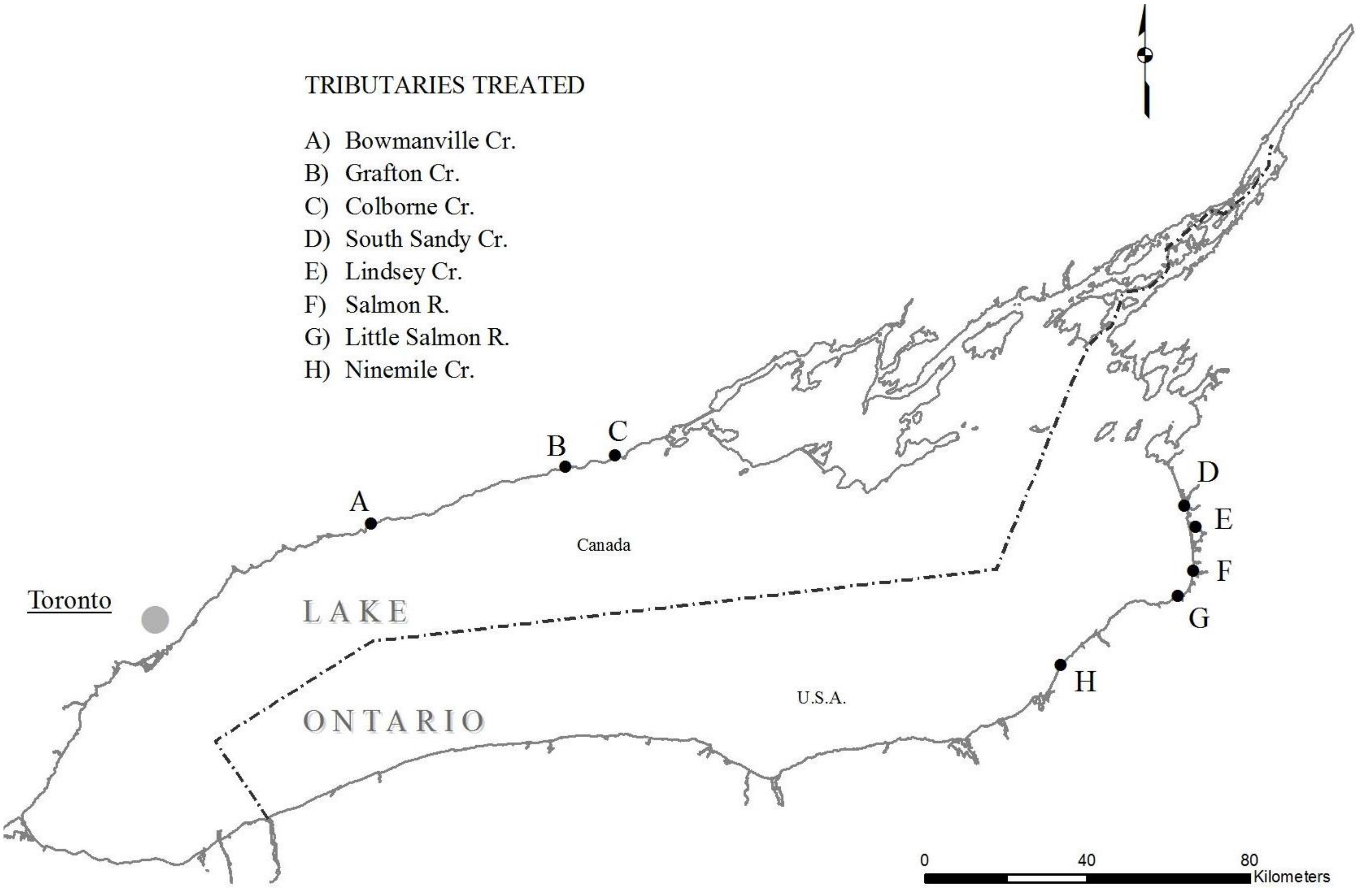

Fig 1-Location of Lake Ontario tributaries treated with lampricides (corresponding letters in Table 1) during 2017.

Barriers

The Sea Lamprey Barrier Program priorities are to:

1) Operate and maintain existing Sea Lamprey barriers that were built or modified by the SLCP.

2) Ensure Sea Lamprey migration is blocked at important non-SLCP barrier sites.

3) Construct new structures in streams where they:

a. provide a cost-effective alternative to lampricide control;

b. provide control where other options are impossible, excessively expensive, or ineffective;

c. improve cost-effective control in conjunction with attractant and repellent based control, trapping, and lampricide treatments; and

d. are compatible with a system's watershed plan.

The Commission has invested in 16 barriers on Lake Ontario **(Fig 2).** Of these, 10 were purpose-built as Sea Lamprey barriers and 6 were constructed for other purposes, but have been modified to block Sea Lamprey migrations.

▪ Field crews visited one structure on a tributary to Lake Ontario to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

▪ Routine maintenance, spring start-up, and safety inspections were performed on 12 barriers (9 Canada, 3 U.S.).

▪ Fish community assessments were conducted on Cobourg, Colborne, Grafton, Graham, Port Britain, Shelter Valley, and Wesleyville creeks to evaluate any changes that may be associated with the existence of purpose-built Sea Lamprey Barriers.

▪ Bowmanville Creek – A new fishway at the Goodyear Dam was constructed in 2014. Since then, there has been upstream escapement of adult Sea Lampreys in successive years, leading to the establishment of a larval populationp Potential Sea Lamprey escapement routes and remediation options are being investigated including an old fishway/water intake on one side of the dam.

▪ Consultations to ensure blockage were conducted with partner agencies for one site during 2017 **(Table 1).**

New Construction

▪ Rouge River –Plans to conduct a Sea Lamprey barrier feasibility study are on hold, pending transfer of land from Toronto Regional Conservation Authority to Parks Canada, as part of the initiative to establish an Urban National Park on the Rouge River.

Larval Assessment

Tributaries considered for lampricide treatment during 2018 were assessed during 2017 to define the distribution and estimate the abundance and size structure of larval Sea Lamprey populations. Assessments were conducted with backpack electrofishers in waters <0.8 m deep, while waters ≥0.8 m in depth were surveyed with gB or by deep-water electrofishing (DWEF). Additional surveys are used to define the distribution of Sea Lampreys within a stream, detect new populations, evaluate lampricide treatments, evaluate barrier effectiveness, and to establish the sites for lampricide application.

▪ Larval assessments were conducted on 62 tributaries (35 Canada, 27 U.S.).

▪ Surveys to estimate abundance of larval Sea Lampreys were conducted in 10 tributaries (3 Canada, 7 U.S.).

▪ Surveys to detect the presence of new larval Sea Lamprey populations were conducted in 16 tributaries (13 Canada, 3 U.S.). No new populations were detected.

▪ Post-treatment assessments were conducted in 9 tributaries (4 Canada, 5 U.S.) to determine the effectiveness of lampricide treatments conducted during 2016 and 2017. Surveys on New York's Salmon River and Lindsey Creek found many residuals, resulting in the scheduling of both systems for treatment during 2018.

▪ Surveys to evaluate barrier effectiveness were conducted in 10 tributaries (7 Canada, 3 U.S.). All barriers assessed continue to be effective in blocking Sea Lampreys.

▪ Larval assessment surveys were conducted in non-wadable lentic and lotic areas using 20.24 kg active ingredient of gB (10.42 Canada; 9.82 U.S**.**

▪ Surveys performed on Lake Ontario's Credit River in 2017 indicate larval Sea Lamprey growth that may justify a 2- year treatment cycle. The Credit River has ranked again for treatment in 2018.

Juvenile Assessment

▪ Lake Trout marking data for Lake Ontario are provided by the U.S. Geological Survey, OMNRF, and the New York State Department of Environmental Conservation. The data is analyzed by the Service's GBFWCO.

Tributary	Bayluscide (kg)1	Area Surveyed
Canada		
Niagara R. (lotic)	4.42	0.79
Trent R. (lotic)	1.68	0.30
Moira R. (lotic)	1.12	0.20
Salmon R. (lotic)	1.68	0.30
Napanee R. (lotic)	0.92	0.17
Total (Canada)	**9.82**	**1.76**
United States		
Niagara R. (lotic)	3.36	0.6
Black R. (lentic)	0.56	0.10
Black R. (lotic)	1.12	0.20
Little Sandy Cr. (lotic)	1.12	0.20
Genesee R. (lotic)	2.24	0.40
Niagara R. (lotic)	3.36	0.6
Oak Orchard Cr.	2.02	0.36
Total (United States)	**10.42**	**1.86**
Total for Lake	**20.24**	**3.62**

Table 1. Details on application of granular Bayluscide to tributaries and lentic areas of Lake Ontario for larval assessment purposes during 2017.

▪ The number of A1 marks per 100 Lake Trout >431 mm from standardized fall assessments during 2017 were submitted in February 2018 and have yet to be analyzed.

▪ Based on standardized fall assessment data, the marking rate during 2016 (plotted as the 2017 sea lamprey spawning year) was 1.4 A1 marks per 100 Lake Trout >431 mm which is less than the target of 2 A1 marks per 100 Lake Trout **(Fig 2).**

Adult Assessment

▪ A total of 5,006 Sea Lampreys were trapped in 8 tributaries, 5 of which are index locations. Adult population estimates based on mark-recapture were obtained from each index location (**Table 2.**

▪ The index of adult Sea Lamprey abundance was 12,536 (95% CI; 9,828 – 15,244), which is higher than the target of 11,368**.**

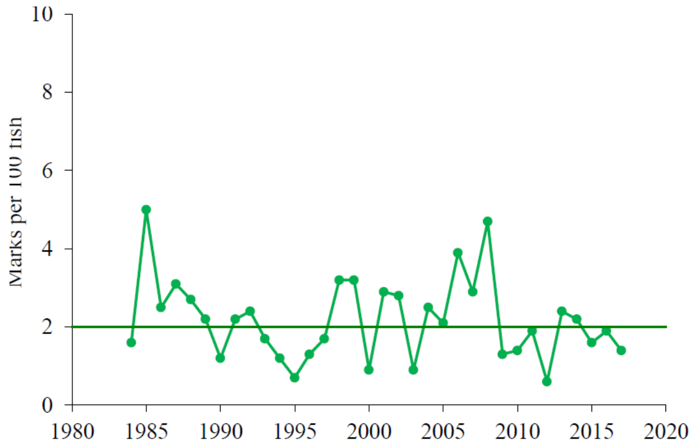

Fig 2- Number of A1 marks per 100 Lake Trout >431 mm from standardized fall assessments in Lake Ontario. The horizontal line represents the target of 2 A1 marks per 100 Lake Trout. The spawning year is used rather than the survey year (shifted by one year) to provide a comparison with the adult index.

Tributary	Number Caught	Adult Estimate	Trap Efficiency (%)	Number Sampled[1]	Percent Males[2]	Mean Length (mm) Males	Mean Length (mm) Females	Mean Weight (g) Males	Mean Weight (g) Females
Canada									
Humber R. (A)	3,282	6,992	47	122	56	509	500	296	287
Duffins Cr. (B)	365	1,035	35	18	56	528	508	319	285
Bowmanville Cr. (C)	755	1,461	52	84	57	505	515	281	304
Cobourg Cr.[3] (D)	227	347	66	132	49	491	486	248	248
Salmon R.[3] (E)	2	---	---	---	---	---	---	---	---
Total or Mean (Canada)	**4,631**	---	---	**356**	**54**	**503**	**498**	**277**	**275**
United States									
Black R. (F)	206	1,157	18	14	79	501	550	290	336
Salmon R.(G)									
Orwell Br.[3]	520	2,062	25	48	69	516	512	299	290
Sterling Cr. (H)	398	1,891	21	42	62	507	498	295	289
Total or Mean (U.S.)	**1,124**	---	---	**104**	**67**	**510**	**508**	**296**	**292**
Total or Mean (for lake)	**5,755**	---	---	**460**	**57**	**505**	**500**	**282**	**278**

Table 2. Information regarding adult Sea Lampreys captured in assessment traps or nets in tributaries of Lake Ontario during 2017. ✧

End