Lake Ontario spring prey fish bottom trawl survey and Alewife assessment, 2025

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A report from the Lake Ontario Prey Fish Working Group to the Great Lakes Fishery Commission's Lake Ontario Committee

ABSTRACT

The multi-agency Lake Ontario spring prey fish survey quantifies changes in pelagic prey fish populations, in particular Alewife *Alosa pseudoharengus*, which are the primary prey supporting the lake's sport fishes. The 2025 survey included 230 trawls in the main lake and embayments and sampled depths from 5.5 to 245 m (15 – 810 ft). The survey captured 504,541 fish from 33 species with a total weight of 7,301 kg (16,095 lbs). Alewife were 85% of the total catch numerically, while Yellow Perch *Perca flavescens,* Round Goby *Neogobius melanostomus*, Deepwater Sculpin *Myoxocephalus thompsonii*, and Rainbow Smelt *Osmerus mordax*, comprised 5%, 4%, 3%, and 1% of the catch, respectively.

The Alewife biomass index decreased from 2024 to 2025 (83 to 78 kg·ha^{-1}) however due to an abundant 2024 Alewife year class the density index increased from 3,727 to 9,182 fish per ha^{-1}. The Age-1 biomass (2024 year class) was 27.5 kg·ha^{-1}, which was the greatest value estimated in the modern time series (since 1997). The abundance estimate for the 2024 Alewife year class (13.8 billion) was more than three times the number of all other Alewife combined (3.6 billion). Adult Alewife abundance decreased in 2025 which was consistent with predictions from 2024. Those predictive models suggested that adult Alewife biomass is likely to increase in 2026 and 2027, as the 2024 year class matures. Alewife condition declined in 2025, which was expected given the relatively high Alewife density. Acoustic-based prey fish densities were greater than previous years acoustic estimates especially at depths from 180 – 220 m (591 – 722 ft), however acoustic based densities continue to be substantially lower than trawl-based densities.

The 2025 biomass index was similar to 2024 for Emerald Shiner *Notropis atherinoides* and Threespine Stickleback *Gasterosteus aculeatus*, but was lower for Rainbow Smelt, and higher for Cisco *Coregonus artedi*. Three purported Bloater *Coregonus hoyi* were caught in the 2025 survey. Analysis of archived tissue identified five Bloater captured in previous surveys which increased the total number caught in Lake Ontario bottom trawl surveys to n = 24, since restoration stocking began in 2012. Whole lake density estimates of Lake Whitefish *Coregonus clupeaformis* increased in 2025 relative to 2024. Those density increases were due to increased catches in Canadian waters, as density in U.S. waters has remained low. The density index for wild or naturally reproduced juvenile Lake Trout *Salvelinus namaycush* increased in 2025 relative to 2024, with the most frequent catches occurring in waters around the Niagara River.

INTRODUCTION AND METHODS

Why study Lake Ontario prey fish?

Lake Ontario supports economically valuable sport fisheries for trout and salmon[1], and Alewife *Alosa pseudoharengus* are the primary prey fish supporting those sport fish populations[2–5]. Alewife are native to the Atlantic Coast and are thought to have gained access to Lake Ontario in the 1860s through canals that were connected to the Hudson River[6]. By 1878, Alewife were described as being found in "immense quantities" and by 1880 as "the dominant fish occurring in Lake Ontario"[7]. Prey fish surveys began approximately 100 years later (1978) and have shown Alewife continue to dominate the Lake Ontario fish community. Alewife abundance has declined since the 1980s and early 1990s, coincident with lake productivity declines[8] and natural reproduction of introduced salmonids[9]. Fishery managers use this report's information on the Alewife population status and trajectory, as well as information on other prey fish populations, to adjust predator stocking rates in Lake Ontario[10,11]. This survey also informs the status of native fish populations of restoration or conservation interest such as Bloater *Coregonus hoyi*[12] and Lake Trout *Salvelinus namaycush*[12,13].

This report presents results from the multi-agency 2025 Lake Ontario spring prey fish survey and Alewife assessment. Results are tailored to address the Fish Community Objectives: 2.3 "Increase prey fish diversity—maintain and restore a diverse prey fish community including Alewife, Cisco, Rainbow Smelt, Emerald Shiner, and Threespine Stickleback" and 2.4 "Maintain predator/prey balance—maintain abundance of top predators (stocked and wild) in balance with available prey fish" [14]. This research is also guided by the U.S. Geological Survey (USGS) Ecosystems Mission Area, Species Management Research Program to "provide science that is used by managers, policy makers, and others for decisions that protect, conserve, and enhance healthy fish and wildlife populations" (https://www.usgs.gov/programs/species-management-research-program).

Why are bottom trawl surveys used to study Alewife and other prey fish populations?

Bottom trawl surveys conducted in early spring (April) have been the most consistent method for quantifying the relative abundance of Lake Ontario Alewife. For most of the year, Alewife inhabit the lake's open water habitat[15], but in winter and early spring they are near the lake bottom[16,17]. This deep water habitat use is because winter surface temperatures are below Alewife's preferred temperature range (11 – 25°C, 52 – 77°F) and the warmest water (~ 4°C, 39°F) is on the lake bottom[16,18–20]. Historic data show Lake Ontario bottom trawl surveys conducted in June, July, and October capture fewer Alewife compared to the spring (April) survey because a substantial, but unknown portion of the Alewife are not near the lake bottom at those times of year[15]. Summer acoustic surveys have also been used to estimate Lake Ontario Alewife abundance however Alewife in near-surface waters can be difficult to quantify because of acoustic sampling limitations and surface fish can avoid acoustic survey vessels, both of which can bias acoustic-based biomass estimates[15,21].

How was the bottom trawl survey conducted?

The spring prey fish bottom trawl survey began in 1978 and was collaboratively conducted by the USGS and New York State Department of Environmental Conservation (NYSDEC) in U.S. waters of Lake Ontario. Daytime bottom trawling was conducted at ~100 fixed sites, at depths from 8 – 150 m (26 – 495 ft) and used an 11.8 m (39 ft.) headrope nylon trawl. That original trawl was replaced in 1997 due to large catches of dreissenid mussels. The replacement trawl is an 18.3 m (60 ft) headrope polypropylene '3N1' trawl with specialized footgear that keeps the footrope slightly off bottom to significantly reduce catches of mussels. In 2016, the survey was expanded to include Canadian waters, more trawl sites across a broader depth range, embayment sites, and the Province of Ontario's research vessel (Fig. 1)[22]. In this report, abundance indices are reported from 1997 to present, when surveys used the consistent '3N1' trawl design, while condition indices are reported from 1978 to present. Bottom trawl procedures and durations are standardized; however, the area of the lake bottom swept during a trawl varies substantially with sampling depth[22,23]. Sensors attached to the trawl estimate the trawl width, bottom contact time, and speed, which are multiplied to calculate the area of the lake bottom swept by the trawl. Accounting for the differences in area swept by different tows provides more accurate indices of prey fish biomass (weight per area) and density (number per area)[23]. Since 2019, Lake Ontario prey fish abundance indices have been reported in units relative to area (e.g., kilograms per hectare or $kg \cdot ha^{-1}$). For reference, a hectare is 10,000 m^2 or ~2.5 acres and the ratio 'kilogram per hectare' is similar to the 'pound per acre' ratio. Reporting prey fish abundance in area-standardized units facilitates comparisons among prey fish populations in different lakes. If observations on trawl wing width and bottom contact time were not available for a given trawl sample, those trawl mensuration values were estimated with established relationships based on sampling depth[24].

How were fish processed and abundance indices calculated?

Bottom trawl catches are separated to species, counted, and weighed in aggregate. Subsamples of all species are also measured for individual length and weight. Stomach contents, muscle tissue, and various aging structures are sampled from representative subsets of the catch. For each trawl, the number and weight caught are divided by the trawl area swept to estimate species-specific density and biomass. Abundance indices are expressed as the mean stratified biomass ($kg \cdot ha^{-1}$) or density ($N \cdot ha^{-1}$) in either U.S. or whole lake regions. Stratification is based on depth, where a stratum is a 20 m (66 ft) depth interval resulting in 9 strata in Canadian waters and 22 strata in U.S. waters. Strata weighting is based on the proportional area of a strata within U.S. and Canadian portions of the lake. Biomass and density values are considered indices because we lack estimates of trawl catchability (proportion of the true biomass or density captured by the trawl)[25].

How are Alewife population age structure, year class abundance, and condition determined?

Alewife indices are further refined to estimate age-specific and size-specific abundance. Alewife ages were interpreted from whole sagittal otoliths (ear stones) from n = 500 - 1,300 individual fish each year using compound microscopes, reflected light, and multiple interpreters[26]. To estimate age-specific Alewife abundance, the number of Alewife in a given stratum are apportioned into 5 mm length bins using stratum specific length frequency data. Country specific length weight relationships estimate the weight of Alewife, and a lake wide age-length key is used to apportion Alewife within a 5 mm length bin into specific ages. Estimating the abundance and weight of each Alewife year class through time allows us to estimate survival and growth and then predict how the Alewife biomass may change in the future. Alewife condition illustrates annual variability in the weight of a standard length Alewife (total length = 165 mm; ~ 6.5 inches)[27]. The average weight at 165 mm is predicted using a log linearized length to weight relationship based on n = 100 – 450 measurements each year from fish that are 150 – 180 mm (5.9 – 7.1 inches).

How were future Alewife biomass values predicted?

We use a Monte Carlo simulation approach (algorithm that uses repeated random sampling) to predict adult Alewife biomass two years into the future[28]. Simulations begin with the most recent year's abundance and mean weight for each Alewife year class. Survival and growth into the next year are randomly selected from previously observed distributions for those parameters, and the predicted biomass is the sum of all year class biomass predictions. The number and weight of Age-1 Alewife was randomly sampled from the previous years of Age-1 observations. We conducted 1,000 simulations as described above to predict a range of possible biomass levels. We also illustrate how previous years' predicted range of biomass values compare to the observed mean biomass from the trawls.

How were acoustic data collected and analyzed?

The density of prey fish in open water habitats, not sampled by bottom trawls, was estimated with acoustics[21,29]. Acoustic data from 3 m above the lake bottom (maximum height of the trawl) to the surface were collected using 120 kHz-split beam echosounder and standard procedures[21,29]. Acoustic data were collected preceding and following a bottom trawl at depths from 3 to 236 m. Acoustic-based prey fish density estimates were computed with Echoview version 14.0.230, assuming a mean target strength of -43 decibels (dB).

RESULTS AND DISCUSSION

The 2025 spring prey fish survey included 230 trawls in main lake and embayment sites (Fig.1), at depths from 5.5 to 245.6 m (18 – 810 ft). The survey captured 504,511 fish from 33 species with a total weight of 7,301 kg (16,096 lbs.) and 357 kg (787 lbs.) of dreissenid mussels (Table 1)[30]. Alewife were 85% of the total catch by number while Yellow Perch *Perca flavescens,* Round Goby *Neogobius melanostomus*, Deepwater Sculpin *Myoxocephalus thompsonii*, and Rainbow Smelt *Osmerus mordax*, comprised 5%, 4%, 3%, and 1% of the catch respectively (Table 1).

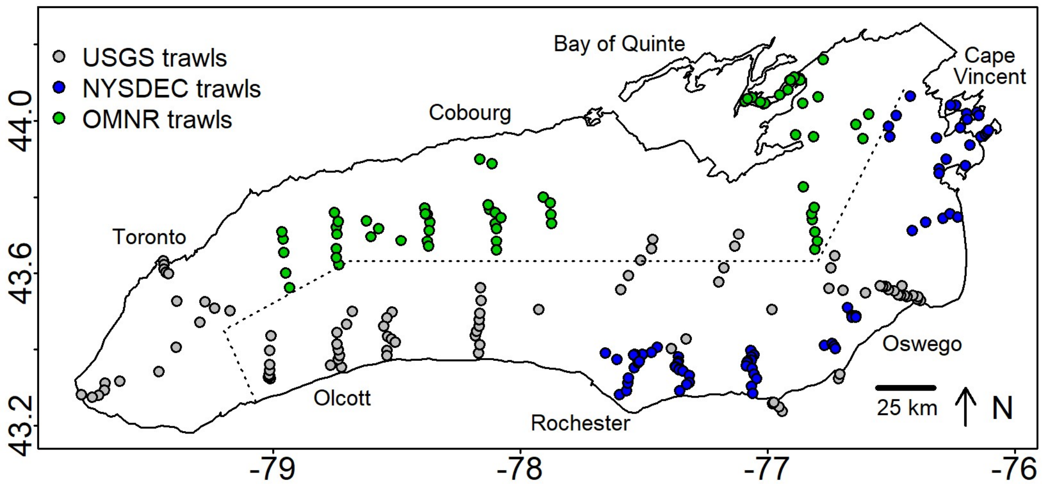

Figure 1. Lake Ontario bottom trawl sites from the 2025 multi-agency spring prey fish survey[31]. The dotted line represents the U.S. – Canada border.

Alewife biomass, density, condition, and spatial distribution

From 2024 to 2025, the total Lake Ontario Alewife biomass decreased from 83 to 78 kilograms per hectare while the density increased from 3,727 to 9,182 fish per hectare (Fig. 2). The density increase in 2025 was primarily due to an above average catch of Age-1 Alewife in 2025 as illustrated in Figure 3. The estimated number of Age-1 Alewife (13.8 billion) was over three times the estimated number for all other Alewife ages combined (3.6 billion). These Alewife density estimates for 2025 are the highest values observed in the modern time series (since 1997) and are the result of large Alewife year classes produced in 2020, 2022, and 2024. For comparison, in Lake Michigan, fall bottom trawl and summer acoustic surveys estimated Alewife biomass ranged from near zero to ~14 kg per hectare, from 1997 – 2024[31]. During that same period similar surveys on Lake Huron estimated Alewife biomass from zero to 12 kg per hectare[32].

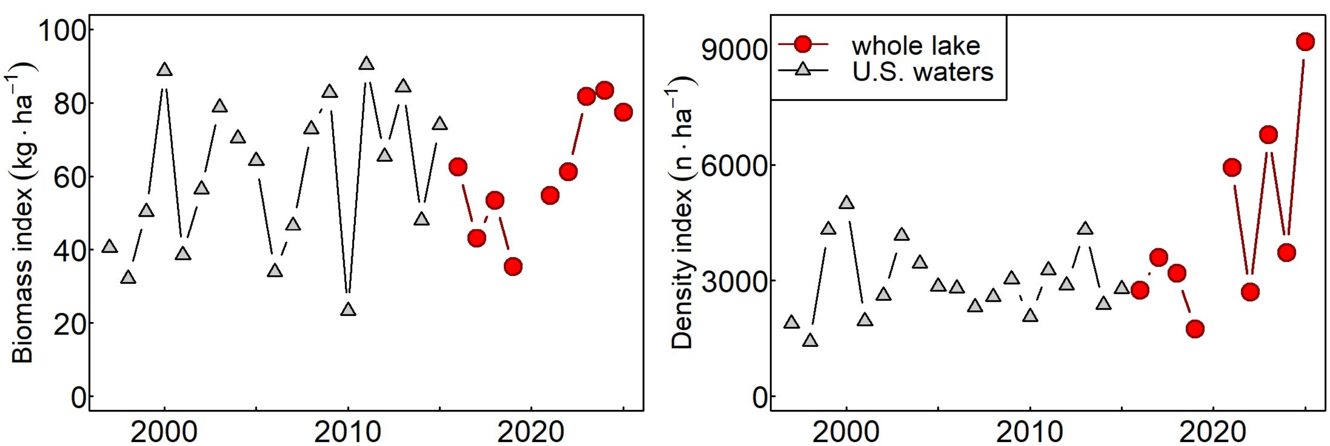

Figure 2. Total Alewife *Alosa pseudoharengus* biomass (left) and density (right) indices from the Lake Ontario spring bottom trawl survey, 1997 – 2025[31]. No survey was conducted in 2020.

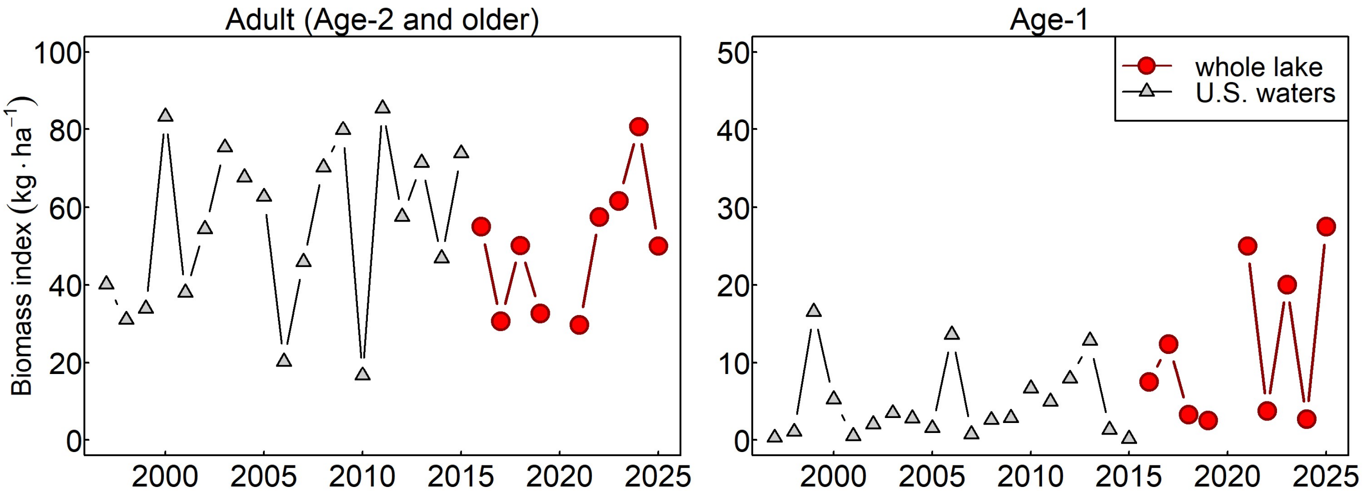

Figure 3. Alewife *Alosa pseudoharengus* biomass indices for adults Age-2 and older (left) and Age-1 (right) from the spring prey fish bottom trawl survey in Lake Ontario, 1997 – 2025[31]. The Age-1 biomass value indexes the reproductive success of the Alewife population one year prior (i.e., a high Age-1 biomass in 2025 represents a large year class produced in 2024). No survey was conducted in 2020.

The biomass of adult Alewife (Age-2 and older) decreased from 2024 to 2025 as predicted in last year's report (Fig. 3, left panel), while the estimated biomass of Age-1 Alewife (27.5 kg·ha^{-1}) is the highest value in the modern time series (Fig. 3, right panel).

Adult Alewife condition decreased in 2025 relative to 2024, which would be expected given that Alewife density increased (Fig. 4). The condition of individual Alewife can be influenced by a suite of interacting factors including the previous year's condition, Alewife density, water temperature, and food availability[19,33]. In general, condition increases when Alewife densities are lower, and condition decreases when Alewife density is higher[26,33]. For instance, Figure 4 illustrates an abrupt decline in Alewife condition at the beginning of the time series (1978 to the 1980s) when the population abundance increased dramatically following a mass mortality event in 1976 – 1977[33].

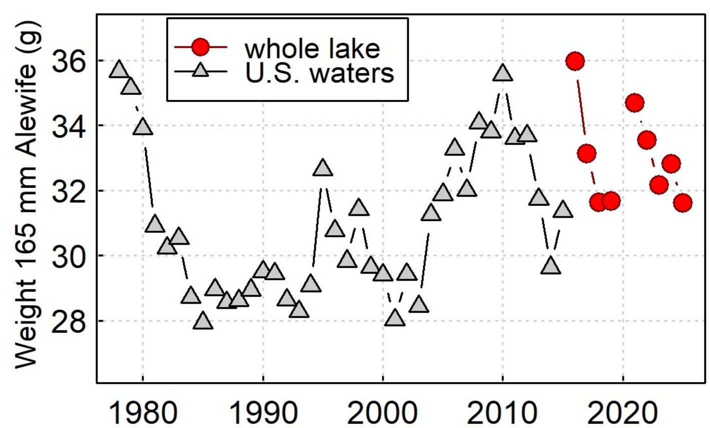

Figure 4. Alewife condition values as indexed by the predicted weight of a standard length (165 mm; ~6.5 inches) Alewife *Alosa pseudoharengus* in Lake Ontario from the spring bottom trawl, 1978 – 2025[29]. No survey was conducted in 2020.

Of special concern in this year's analysis was a single large Alewife catch in Canadian waters that had an unusually strong influence on Alewife abundance estimates. At the Rocky Point transect, a bottom trawl captured 63,308 Alewife, in 3.1 minutes of bottom contact time, yielding a density of 281,480 Alewife per hectare, most of which were Age-1 sized fish. This is the second highest Alewife density recorded from a trawl in the modern time series (1997 – present). The mean density of Alewife in the three other trawls in the stratum was 303 fish per hectare but including the large catch the stratum mean density was 70,597 fish per hectare. Excluding that large trawl catch from the analysis decreased the overall mean Alewife biomass estimate from 78 to 54 kg·ha^{-1} and the Age-1 biomass estimate from 27. 5 to 9.7 kg·ha^{-1}. The substantial influence of this single trawl catch was due to the small number of observations within the 61- 80 m stratum (n = 4) and because that stratum represents ~8% of the lake by area. Historically, it has been difficult to identify safe trawl sites within the Canadian 61 – 80 m stratum because sporadic rock substrates often tear trawls. The influence of this trawl catch on the survey results reinforces the value of locating and sampling additional sites within that stratum.

In 2025, the mean Alewife biomass values differed between Canadian (104 kg·ha^{-1}) and U.S. waters (48 kg·ha^{-1}) of Lake Ontario, partially driven by the previously mentioned large catch in Canadian waters (Fig. 5). Whole lake surveys have shown Alewife abundance can be considerably different in Canadian and U.S. portions of Lake Ontario (Figure 6; years: 2016, 2017, 2018, 2025). Interestingly, in the nine years of whole lake surveys, Canadian waters have had greater percentage of the Age-1 Alewife caught (mean = 64%, range = 32 to 92%) relative to U.S. waters (mean = 36%; range = 8 to 68%). In 2025, 92% of the Age-1 Alewife were captured in Canadian waters. Historic surveys that sampled only U.S. waters would have substantially underestimated age-1 Alewife abundance in 2025. At this time, we do not understand what drives the variability in Alewife distributions at the time of the spring survey or why Age-1 Alewife tend to be more abundant in Canadian waters.

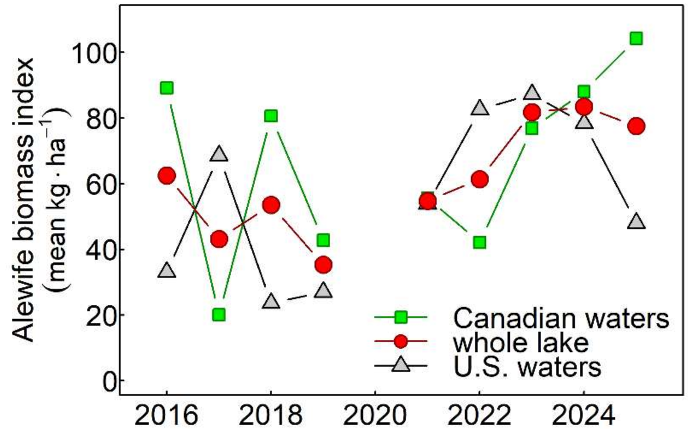

Figure 5. Mean biomass index of Alewife *Alosa pseudoharengus* (all ages) from the spring prey fish survey, 2016 – 2019 and 2021 – 2025 based on different lake regions[29]. No survey was conducted in 2020.

Alewife age structure, survival, growth

In 2025, 1,235 Alewife ages were interpreted from whole sagitta otoliths collected from fish that ranged in total length from 55 to 237 mm (2.2 to 9.3 inches). The oldest Alewife interpretation was Age-9, which would have been from the 2016 year class. In 2025 the Alewife population was primarily comprised of the 2020, 2022 and 2024 year classes (Fig. 6, bottom panels).

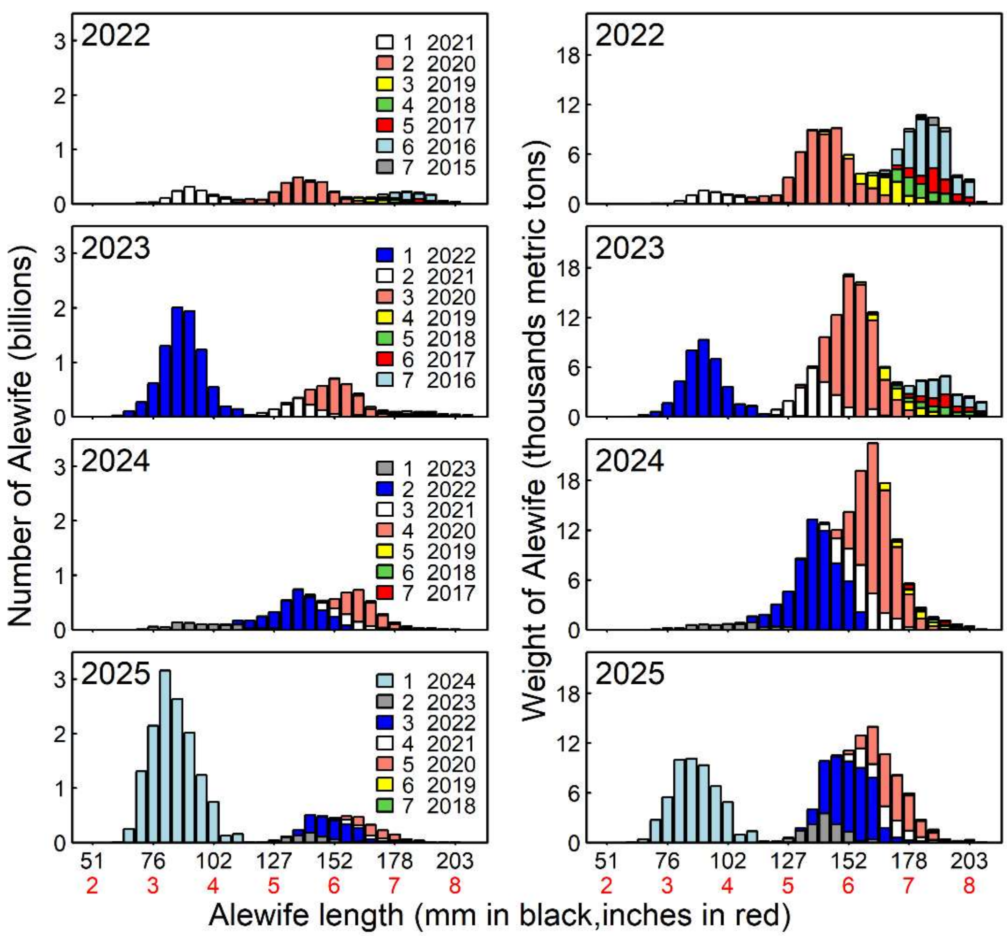

Figure 6. Alewife *Alosa pseudoharengus* size and age distribution in Lake Ontario from the spring prey fish survey, 2022 – 2025[31]. Bar height represents the number of Alewife (left panels) or weight (right panels) for each size bin (~1/5th inch or 5 mm). Bar colors represent distinct year classes and are consistent across the panels.

In 2025, most Alewife survival estimates were near the range of previously observed values (Table 2; Fig. 7, top panel). A proportional survival value near or greater than one is not possible and likely reflects an underestimated abundance in a previous year's survey. Age specific growth estimates (weight change) observed in 2025 were also similar to previously observed values (Table 2; Fig. 7, bottom panel). Negative growth estimates, such as those observed for Age-7 to Age-8 in 2025, occur when the largest individuals of a cohort do not survive to the next year leaving only the smaller individuals resulting in negative growth estimates.

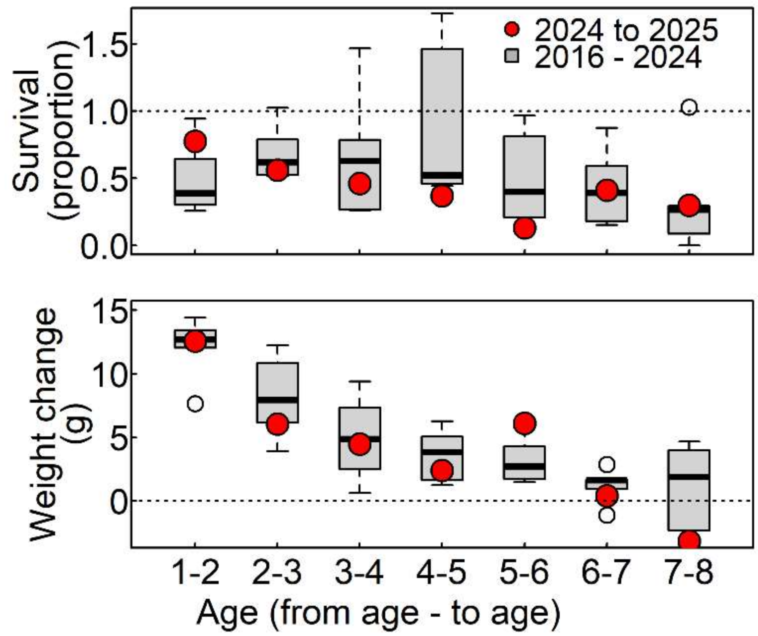

Figure 7. Estimates of Lake Ontario Alewife *Alosa pseudoharengus* survival (top) and weight change (bottom) since 2016[31]. The gray boxes represent the 25th and 75th quartiles of the estimates, black bars represent the median, and the whiskers represent the remaining range. Values considered outliers are represented as open circles.

Predicted Alewife biomass

Adult Alewife biomass is predicted to increase in 2026 and 2027 in Lake Ontario as the abundant 2024 year class matures (Figure 8). Biomass predictions have become more variable in recent years which is due to simulations that randomly select Age-1 abundance from the large 2020, 2022, 2024 year classes (Fig. 3). It is important to note that predictions do not account for Alewife mortality events that occurred after the April survey. Online news media from regions around Lake Ontario, including Toronto[34], Niagara-On-The-Lake[35], and Rochester[36] suggest Alewife experienced substantial mortality in May through June 2025. Alewife mortality events in spring are not uncommon in Lake Ontario and are have been shown to occur more frequently following more severe winter conditions[33,37]. The high density of Alewife also likely contributes to mortality events as increased density results in lower individual fish condition (Fig. 4) and greater numbers contribute to more visible mortality events. While spawning stress can contribute to mortality in some fishes, Lake Ontario Alewife spawning in the main lake primarily occurs in July and August, after spring mortality events are typically observed[38–40].

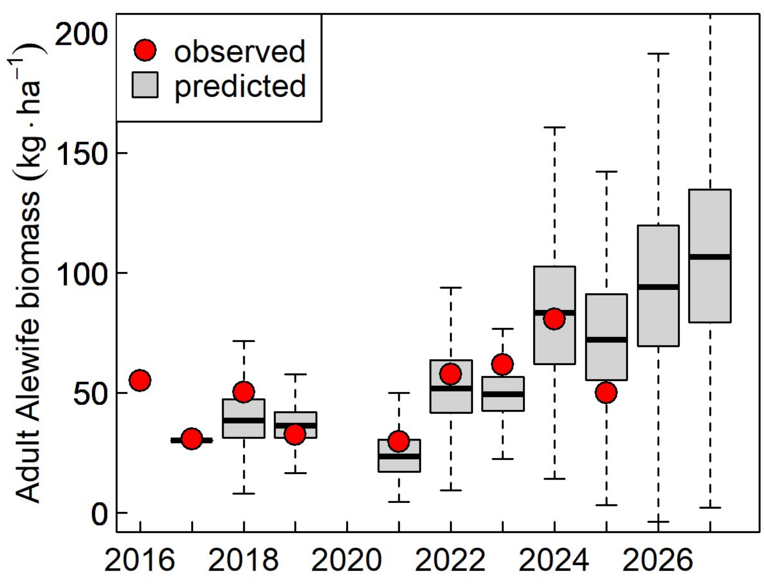

Figure 8. Simulated adult Alewife *Alosa pseudoharengus* (Age-2 and older) biomass (boxplots) and observed values (red circle) in Lake Ontario, 2016 – 2027[29]. In the gray boxplots the thick black bars represent the median, the boxes represent the 25th and 75th quartiles, and the whiskers represent the remaining range. No survey was conducted in 2020 therefore 2021 predictions were based on two years of predictions from the 2019 observations.

Acoustic prey fish density

Acoustic prey fish density estimates in open water, above the bottom trawl, have generally been less than bottom trawl densities[23,41]. The 2025 results illustrated a similar pattern, however for depths from 181 - 240 m (594 – 722 ft), acoustic density estimates were similar to, or slightly greater than, trawl densities (Fig. 9, left panel). Interestingly, the 2025 acoustic estimates were greater than previous years and may be the result of the large 2024 Alewife year class (Fig. 9, right panel). These higher than previously observed acoustic densities, centered over deep regions, support the use of alternative midwater trawling or gill nets to identify the species and size of these fish that are not being captured in bottom trawls.

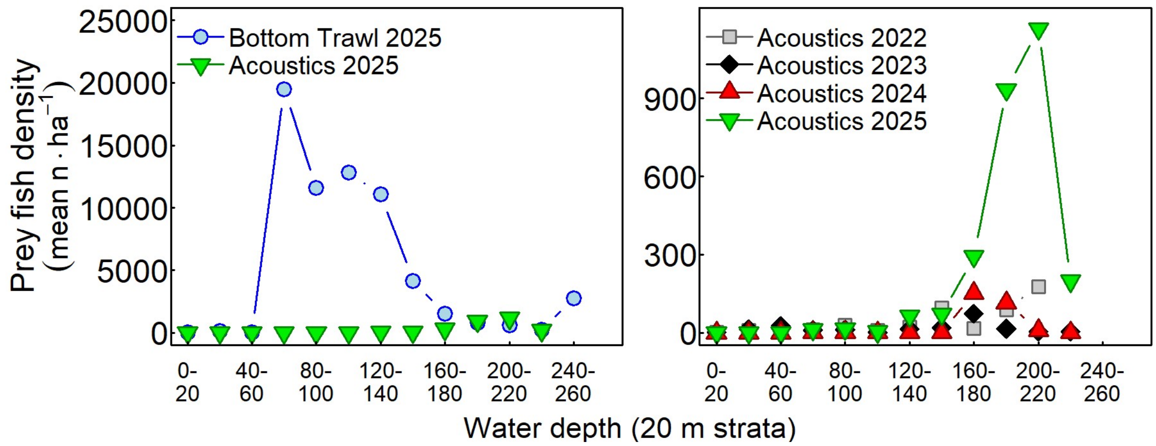

Figure 9. Mean prey fish density from bottom trawl and acoustics by depth in Lake Ontario, April 2024 (left panel) and acoustic densities relative to depth over differing years (right panel)[31]. Bottom trawl densities represent the sum of Alewife *Alosa pseudoharengus* and Rainbow Smelt *Osmerus mordax*. Note the vertical scales differ between the plots.

Pelagic fish biomass indices (non-Alewife)

The 2025 biomass index was similar to 2024 for Emerald Shiner *Notropis atherinoides* and Threespine Stickleback *Gasterosteus aculeatus*, but was lower for Rainbow Smelt, and higher for Cisco (Fig. 10).

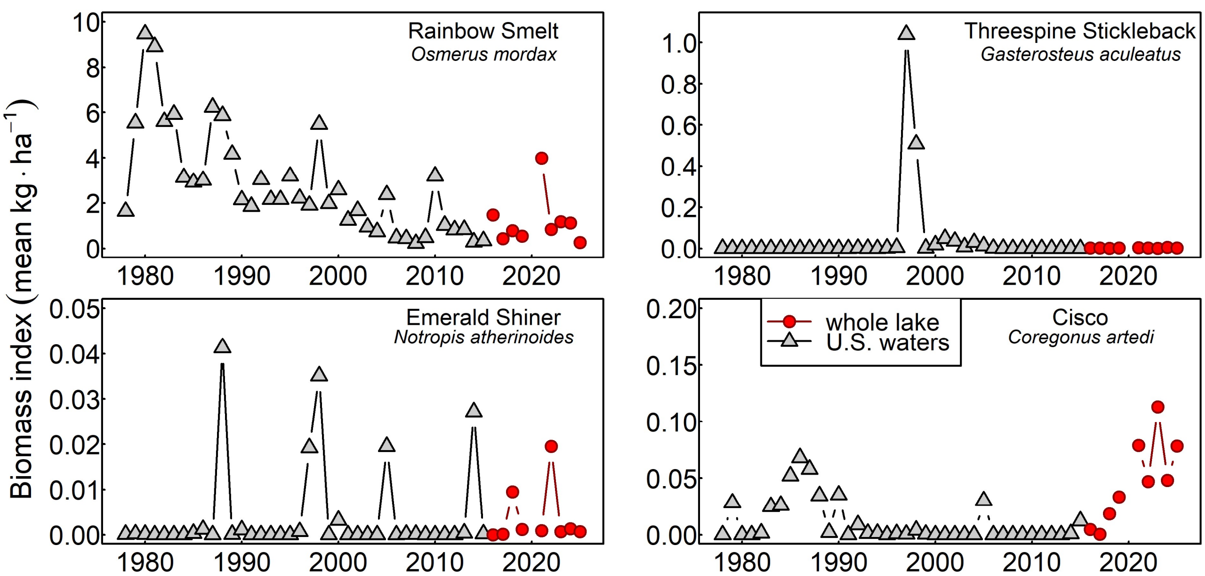

Figure 10. Biomass indices for Lake Ontario pelagic prey fishes from the spring prey fish survey, 1997 – 2025[31]. No survey was conducted in 2020. Note differing vertical scales on each of the panels. Increasing trends in Cisco biomass are influenced by the survey expansion to Canadian waters near the Bay of Quinte.

Native species of interest – Bloater, Lake Whitefish, Lake Trout

Bloater – Bloater are a native pelagic prey fish that was historically abundant in Lake Ontario, was thought to be extirpated by the mid-1900s, and is currently being reintroduced[12]. This species closely resembles Cisco; therefore, identification is confirmed using genetic analyses of fin tissue[42]. Restoration stocking began in 2012 and since 2015, a total of 24 Bloater have been captured in Lake Ontario bottom trawl surveys including three individuals caught during the 2025 spring survey (Figure 11; Table 4). Analysis of archived tissue from past surveys identified Bloater that had been classified as unknown or Cisco (Table 4). Additional analyses are required to determine if any of these Bloater originated from natural reproduction.

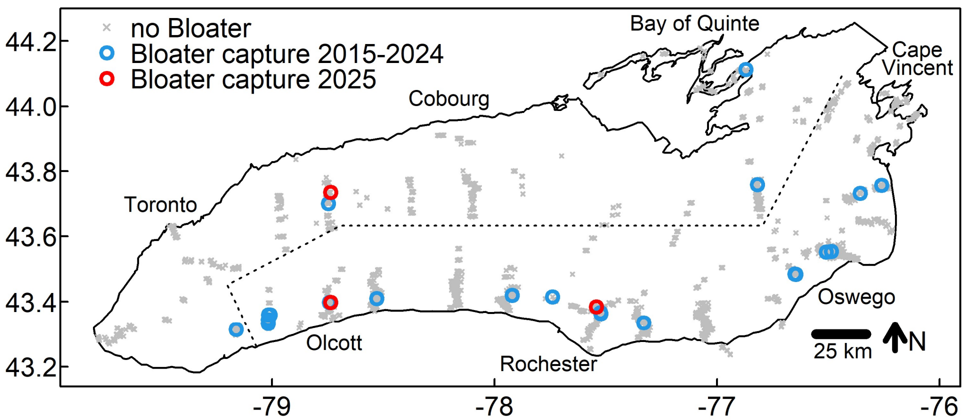

Figure 11. Spatial distribution where Lake Ontario trawls were conducted (small grey x) and those where Bloater were caught (blue and red circles) during bottom trawl surveys in Lake Ontario, 2015-2025.

Images above– Two images of the same Bloater captured during the 2025 Lake Ontario spring prey fish survey. The left image shows the fish with a 'bloated' swim bladder that occurs when the fish are brought up from depths and the swim bladder air expands due to less pressure. The right image depicts the more natural shape of Bloater once the swim bladder has deflated to a normal size. This fish was caught in 98 m (322 ft) near Olcott, NY.

Lake Whitefish – Lake Whitefish *Coregonus clupeaformis* are native to Lake Ontario and still support a commercial fishery in Canadian waters; however, that fishery has declined since the late 1800s and is currently a fraction of historic levels[43,44]. The lake-wide coverage of the spring survey provides a unique perspective for quantifying Lake Whitefish distribution and population status. Lake Whitefish are more regularly captured in Canadian waters near the Bay of Quinte, which accounts for the greater density estimates in the whole lake index relative to the index for the U.S. waters (Fig. 12). A component of what appears as density increases may be due to increased effort as sampling in the Lower Bay of Quinte (Adolphus Reach) has increased from 0 in 2016 to 13 in 2025.

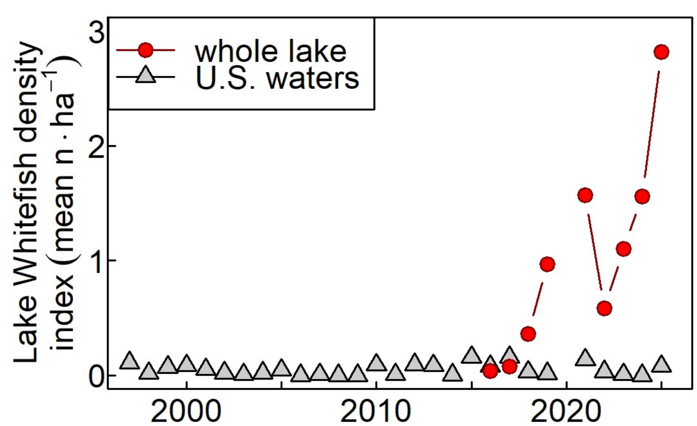

Figure 12. Density estimates for Lake Whitefish *Coregonus clupeaformis* in Lake Ontario from the April bottom trawl survey, 1997 – 2025[31]. No survey was conducted in 2020.

Lake Trout – Lake Ontario Lake Trout restoration began in the 1970s[45] and the spring prey fish survey informs that restoration by providing abundance indices of naturally reproduced or wild juvenile Lake Trout (total length < 500 mm). Catches of these fish were generally rare, but over the past 10 years these naturally reproduced fish have been encountered more frequently in trawls, mostly in southern regions of Lake Ontario and near the Niagara River (Fig. 13, Fig. 14).

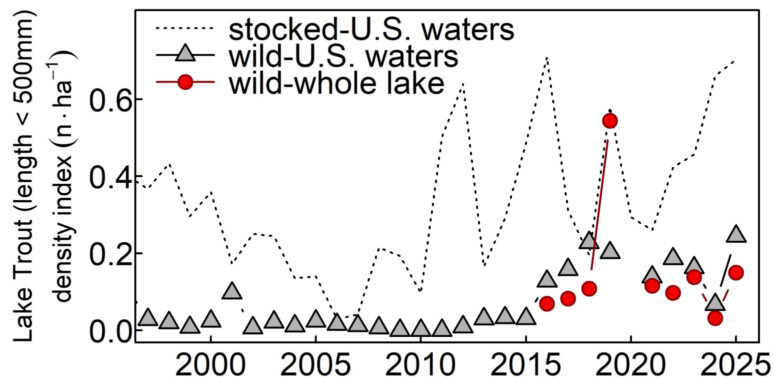

Figure 13. Density estimates for stocked and naturally reproduced (wild) juvenile Lake Trout *Salvelinus namaycush* (total length < 500 mm) in Lake Ontario from the spring prey fish survey 1997 – 2025[31]. No survey was conducted in 2020.

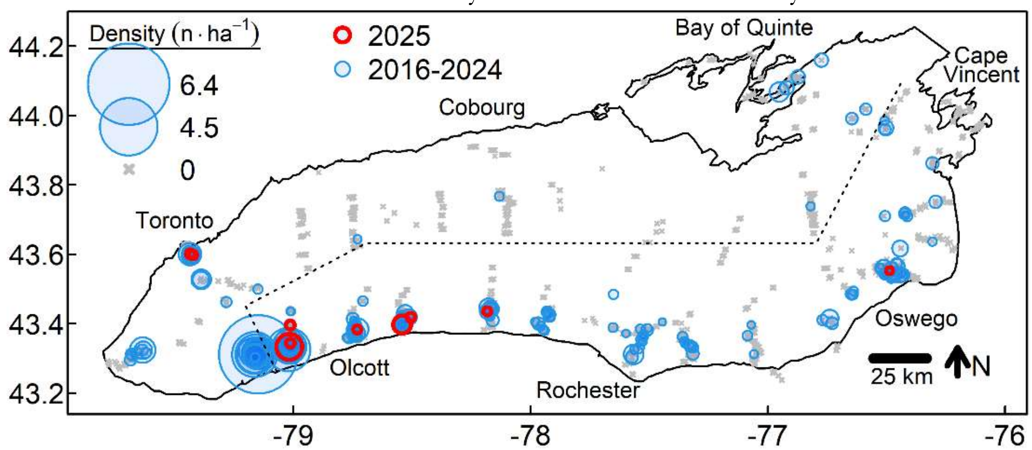

Figure 14. Spatial distribution of naturally reproduced juvenile (total length <500 mm) Lake Trout *Salvelinus namaycush* during the spring prey fish bottom trawl survey in Lake Ontario from 2016 – 2025[31]. No survey was conducted in 2020. The size of the circles is proportional to the natural reproduced Lake Trout density ($n \cdot ha^{-1}$). The dotted line represents the U.S. – Canada border.

ACKNOWLEDGMENTS

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Table 1. Number of fish captured with bottom trawling during the 2025 Lake Ontario spring prey fish survey. The density and biomass columns represent the lake wide, area-stratified mean values. Lake trout are separated into stocked and wild, or naturally reproduced categories. The "NA" represents not available. Lake Trout have been separated into two categories for stocked and naturally reproduced or wild fish.

Common Name	Scientific Name	Number	Proportion (number)	Density ($n \cdot ha^{-1}$)	Biomass ($kg \cdot ha^{-1}$)
Alewife	*Alosa pseudoharengus*	427102	0.85	9182.11	81.18
Yellow Perch	*Perca flavescens*	26412	0.05	240.78	1.24
Round Goby	*Neogobius melanostomus*	21116	0.04	120.35	1.51
Deepwater Sculpin	*Myoxocephalus thompsonii*	16756	0.03	211.19	6.04
Rainbow Smelt	*Osmerus mordax*	5343	0.01	75.85	0.27
White Perch	*Morone americana*	5309	0.01	125.62	1.46
Trout-perch	*Percopsis omiscomaycus*	1505	< 0.01	32.16	0.31
Spottail Shiner	*Notropis hudsonius*	291	< 0.01	4.35	0.04
Lake Whitefish	*Coregonus clupeaformis*	103	< 0.01	2.82	0.40
Lake Trout stocked	*Salvelinus namaycush*	101	< 0.01	1.02	1.60
Walleye	*Sander vitreus*	72	< 0.01	1.37	0.35
Pumpkinseed	*Lepomis gibbosus*	69	< 0.01	0.67	0.06
Cisco	*Coregonus artedi*	61	< 0.01	1.21	0.08
Threespine Stickleback	*Gasterosteus aculeatus*	53	< 0.01	1.09	0.00
Channel Catfish	*Ictalurus punctatus*	41	< 0.01	0.45	0.02
Lake Trout wild	*Salvelinus namaycush*	29	< 0.01	0.22	0.29
Slimy Sculpin	*Cottus cognatus*	29	< 0.01	1.18	0.01
White Sucker	*Catostomus commersonii*	26	< 0.01	0.38	0.06
Brown Bullhead	*Ameiurus nebulosus*	14	< 0.01	0.16	0.05
Northern Pike	*Esox lucius*	14	< 0.01	0.16	0.04
Chinook Salmon	*Oncorhynchus tshawytscha*	13	< 0.01	0.12	0.00
Freshwater Drum	*Aplodinotus grunniens*	9	< 0.01	0.20	0.27
Quillback	*Carpiodes cyprinus*	9	< 0.01	0.11	0.01
White Bass	*Morone chrysops*	9	< 0.01	0.20	0.04
Common Carp	*Cyprinus carpio*	7	< 0.01	0.07	0.60
Emerald Shiner	*Notropis atherinoides*	7	< 0.01	0.12	0.00
Bloater	*Coregonus hoyi*	3	< 0.01	0.03	0.00
Bluegill	*Lepomis macrochirus*	2	< 0.01	0.05	0.01
Brook Stickleback	*Culaea inconstans*	1	< 0.01	NA	NA
Lake Sturgeon	*Acipenser fulvescens*	1	< 0.01	0.01	0.01
Largemouth Bass	*Micropterus nigricans*	1	< 0.01	0.01	0.00
Longnose Dace	*Rhinichthys cataractae*	1	< 0.01	NA	NA
Rock Bass	*Ambloplites rupestris*	1	< 0.01	0.01	0.00
Smallmouth Bass	*Micropterus dolomieu*	1	< 0.01	0.01	0.02

Table 2. Mean, standard deviations (s.d.) and number of estimates (n) for Alewife *Alosa pseudoharengus* growth as weight change (grams) and survival (proportion) by age used for Lake Ontario population simulations. These values represent observations from 2016 – 2019 and from 2021 – 2025. Insufficient numbers of Age-9 through Age-11 Alewife were captured in successive years to estimate growth or survival therefore simulation values for ages were conservatively assumed to be zero for all simulations.

Age	Weight change			Survival		
(from – to)	mean	s.d.	n	mean	s.d.	n
1 – 2	12.22	2.19	7	0.53	0.26	7
2 – 3	7.86	3.07	7	0.66	0.18	7
3 – 4	4.85	3.04	7	0.64	0.41	7
4 – 5	3.46	1.94	7	0.79	0.56	7
5 – 6	3.52	1.91	7	0.43	0.35	7
6 – 7	1.14	1.25	7	0.43	0.25	7
7 – 8	-0.93	5.7	6	0.32	0.33	7
8 – 9	8.45	11.94	3	0.14	0.28	6
9 – 10	0.00	0.00	0	0.00	0.00	0
10 – 11	0.00	0.00	0	0.00	0.00	0

Table 3. Acoustic density estimates and standard deviations (s.d.) sampling regions during the 2025 Lake Ontario spring prey fish survey. Densities were estimated for depths from 3 m from the surface to 3 m above the lake bottom. Geographic coordinates are in decimal degrees and represent the approximate center of that region of acoustic observations.

Region	Latitude	Longitude	Mean density ($N \cdot ha^{-1}$)	s.d.	n
Hamilton	43.3432	-79.5605	1.94	3.6	18
Hamlin	43.5042	-77.9261	15.49	2.7	2
Oak Orchard	43.4771	-78.1654	10.24	15.0	24
Olcott	43.4159	-78.7222	15.01	26.8	19
Oswego	43.5519	-76.5188	443.87	1243.6	39
Point Petre	43.6419	-77.1534	76.70	74.8	12
Scotch Bonnet	43.6223	-77.5277	45.20	103.7	12
Smoky Point	43.4141	-77.3599	10.30	2.6	6
Sodus Main Lake	43.5729	-76.8469	423.50	831.5	11
Thirty Mile	43.4396	-78.5302	24.25	68.6	24
Toronto	43.5517	-79.3204	4.27	15.0	26
Youngstown	43.3564	-79.0170	2.10	2.3	12

Table 4. Bloater (n = 24) captured in Lake Ontario with bottom trawls since restoration stocking began in 2012[12]. Abbreviations in the Survey column refer to the spring prey fish bottom trawl survey (SPF), the Ontario Ministry of Natural Resources conducted Community Index bottom trawl survey (CI), the formerly conducted juvenile Lake Trout survey[47] (JLT), and the benthic prey fish survey[48] (BPF).

Date	Port or Region	Depth	Temp	Length	Weight	Sex	Latitude	Longitude	Survey
08-May-2015	Oswego	95	3.5	125	10.2		43.5533	-76.4864	SPF
21-Apr-2016	Rochester	115	3.8	90	3.5		43.3666	-77.5231	SPF
05-Jul-2017	Rocky Pt.	90		130	14.0		43.7590	-76.8187	CI
22-Apr-2018	Youngstown	60	2.7	108	6.0		43.3333	-79.0168	SPF
22-Apr-2018	Youngstown	75	2.7	102	4.0		43.3447	-79.0163	SPF
25-Apr-2018	Hamlin	95	2.6	96	5.0		43.4197	-77.9203	SPF
14-Oct-2018	Thirty Mile Pt.	75	4.1	117	8.9		43.4102	-78.5296	BPF
23-Oct-2018	Smoky Pt.	78	9.8	240	122.0	female	43.3353	-77.3298	BPF
23-Apr-2019	Fairhaven	65	2.6	87	2.8		43.4150	-77.7391	SPF
19-Jul-2019	Southwick	26	6.4	160	20.9	male	43.7566	-76.2605	JLT
24-Jul-2019	Niagara	73	4.1	123	13.6	male	43.3150	-79.1608	JLT
20-Oct-2020	Southwick	43	12.6	162	27.2	male	43.7322	-76.3569	BPF
12-Oct-2021	Oswego	106	3.9	243	145.7		43.5511	-76.5092	BPF
15-Oct-2021	Fairhaven	111	4.5	211	85.3		43.4839	-76.6469	BPF
04-Oct-2022	Youngstown	90	4.0	187	54.4	female	43.3596	-79.0085	BPF
30-Mar-2023	Youngstown	92		220	79.0		43.3601	-79.0154	SPF
03-Apr-2023	Olcott	97		144	20.2		43.3979	-78.7417	SPF
16-Apr-2023	Fairhaven	113	3.7	153	19.0	female	43.4845	-76.6507	SPF
26-Mar-2024	Adolphus Reach	49	3.0	140	13.8		44.1122	-76.8708	SPF
16-Apr-2024	Rochester	70	4.5	148	17.5	female	43.3638	-77.5227	BPF
27-Sep-2024	Oshawa-Whitby	109	4.2	247	137.7		43.7013	-78.7464	BPF
05-Apr-2025	Olcott	98	3.5	242	91.7	female	43.3986	-78.7366	SPF
09-Apr-2025	Oshawa-Whitby	94	2.9	243	111.9		43.7356	-78.7368	SPF
23-Apr-2025	Rochester	127	3.1	180	37.5	female	43.3843	-77.5419	SPF