Status and Trends in the Lake Superior Fish Community, 2025

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Abstract

The U.S. Geological Survey has conducted annual trawl surveys across Lake Superior since 1978 that describe trends in fish species occurrence and relative abundance to support fisheries science and management. In 2025, the Lake Superior fish community was sampled with daytime bottom and surface trawls at 72 nearshore stations in May and June and 36 offshore locations in July. Nearshore bottom trawls collected 63,005 fish represented by 30 species or morphotypes. The number of species collected at each location ranged from 1 to 13, with a median of 7.0 species. Estimated fish biomass density at individual stations ranged from <0.1 to 125.7 kg per ha with a lakewide mean of 7.6 kg per ha. Offshore bottom trawls collected 30,342 fish represented by 13 species or morphotypes. Estimated fish biomass density at individual stations ranged from 1.6 to 34.7 kg per ha with a lakewide mean of 9.1 kg per ha, which was the highest since the offshore survey began in 2011. Lakewide average numerical densities (fish per ha) of age-1 fish were 0.67 per ha for Bloater, 0.01 per ha for Cisco, 1.15 per ha for Kiyi, 0.95 per ha for Lake Whitefish, and 336.33 per ha for Rainbow Smelt. Surface trawling collected 1,562 larval *Coregonus* individuals which was the fewest *Coregonus* larvae collected in a whole lake survey since the larval fish survey began in 2014. Nearshore mean larval *Coregonus* numerical densities were 156 fish per ha in May and June 2025 and 21 fish per ha in July 2025. May mean surface water temperatures (6.1°C) were near the warmest for the period-of-record, while June (6.8°C) and July (10.0°C) were near average or below.

Introduction

The U.S. Geological Survey, Great Lakes Science Center (GLSC), Lake Superior Biological Station, based in Ashland, Wisconsin conducts annual daytime lakewide fish community bottom trawl surveys in nearshore (~15-80 m depths) and offshore (~90-300 m depths) waters. Both surveys provide data for assessing species occurrence and trends in relative abundance and biomass for principal fishes and estimates of year-class strength for age-1 Bloater, Cisco, Kiyi, Lake Whitefish, and Rainbow Smelt (scientific names are provided in Table 1). The number of age-1 fish per ha has been used historically as a relative measure of year-class strength to predict future populations sizes for these important species.

The nearshore bottom trawl survey has been conducted annually since 1978 in waters of the United States and was expanded to Canadian waters in 1989. The offshore bottom trawl survey has been conducted annually since 2011 in U.S. and Canadian waters. Surface trawling has occurred annually during the nearshore and offshore surveys since 2014. In 2020 only nearshore stations in the Apostle Islands (Management Unit WI-2) were sampled and in 2021 only nearshore stations in U.S. waters were sampled due to COVID-related travel restrictions. Starting in 2014, surface trawling has been conducted to collect larval *Coregonus* spp. as measures of species occurrence and relative abundance, and to evaluate factors influencing recruitment to age-1. Larval *Coregonus* spp. collected in the surface trawls have been identified using genomics since 2019. Genomic data for 2023 through 2025 are not yet available. In addition to fish collections, an electronic water column sampler (SBE19plus profiler, SeaBird Inc., Bellevue, Washington) was deployed at each trawl location, which collects data on depth, temperature, beam transmission specific conductance, dissolved oxygen, pH, chlorophyll *a*, and photosynthetic activity.

Methods

Nearshore Bottom Trawl Fish Collections

Nearshore stations are fixed sites located around the perimeter of the lake (Figure 1). Stations are sampled with only slight annual variations due to commercial fishing operations, vessel crew manning, mechanical issues, and weather. In 2025, 72 of 78 planned stations were sampled and 69 of those 72 were completed without issue during daylight hours from May 14 to June 15. Two stations, 451-Dog River and 459-Maple were not sampled due to insufficient time remaining in the day. Assessment of past surveys led to the decision to drop location 85-Gay from the survey entirely due to its propensity to tear bottom trawls and inconsistent sampling. Location 174-Iroquois Island had commercial fishing nets scattered throughout the transect and was not sampled. The trawl door chain broke at location 205-Port Wing resulting in the trawl being aborted and 187-Big Sucker River was not sampled due to trawl repairs. The trawls were omitted at three stations due to net entanglements: 120-Shot Point, 158-Huron Bay, and 208-Cascade River. At each location sampled, a single bottom trawl tow was conducted along a cross-contour transect with a 12-m Yankee bottom trawl with a chain or rubber roller disk foot rope. The rubber roller disk foot rope trawl was fished at steeper rockier stations. The median start and end depths for bottom trawl tows were 15 (range 6 – 34 m) and 51 m (range 20 – 132 m), respectively. The median distance trawled was 1.5 km (range 0.4 – 4.0 km) at a speed of ~4.0 km per h. Specific location and trawling data for each sampling location are provided in Appendix A. Bottom trawl fishing area-swept was calculated based on a fixed trawl wing spread of 7.8 m and the distance the trawl was on the lake bottom as determined using a trawl mensuration system (Marport.com) and the global positioning system of the Research Vessel (R/V) *Kiyi*.

Offshore Bottom Trawl Fish Collections

In 2025, all 36 stations were sampled during daylight hours from July 9-25. A single bottom trawl tow was conducted at each location using a 12-m Yankee bottom trawl with a rubber roller disk foot rope. All tows were made on-contour for 20 minutes. Station depths ranged from 84 to 301 m. The median trawl distance was 1.35 km (range 1.3 – 1.4 km) at a speed of ~4.0 km per h. Specific location and trawling data for each sampling location are provided in Appendix A. Bottom trawl fishing area-swept was calculated the same way as the nearshore survey.

Surface Trawl Fish Collections

Surface trawling was conducted at all nearshore and offshore bottom trawl stations sampled in 2025, with the exception of location 422-Heron Bay due to strong winds. Surface trawls occurred during daylight hours predominantly at the same time as bottom trawling (Figure 1, Appendix A). Fish were collected using a paired one-square-meter 1,000-micron mesh neuston net (model 9550, Sea-Gear

Corporation, Melbourne, Florida). The bottom of the net frame was fished ~0.5 m below the lake surface, such that approximately half the net's height was submerged to reduce waves washing over the top of the net. The net was fished for 10 minutes at ~4.0 km per h for ~0.7 km as determined from the global positioning system of the R/V *Kiyi*.

Water Temperatures

Water column temperatures associated with each trawl sample were collected near the beginning and end for nearshore stations and near the end for offshore stations using an electronic water profiler (conductivity, temperature, depth (CTD)) (SBE19plus profiler, SeaBird Inc., Bellevue, Washington). The profiler was calibrated annually by the manufacturer and has a reported temperature accuracy of 0.01 °C. Reported temperatures were the average temperature within 3 m of the surface collected as the CTD was descending to the bottom of the lake.

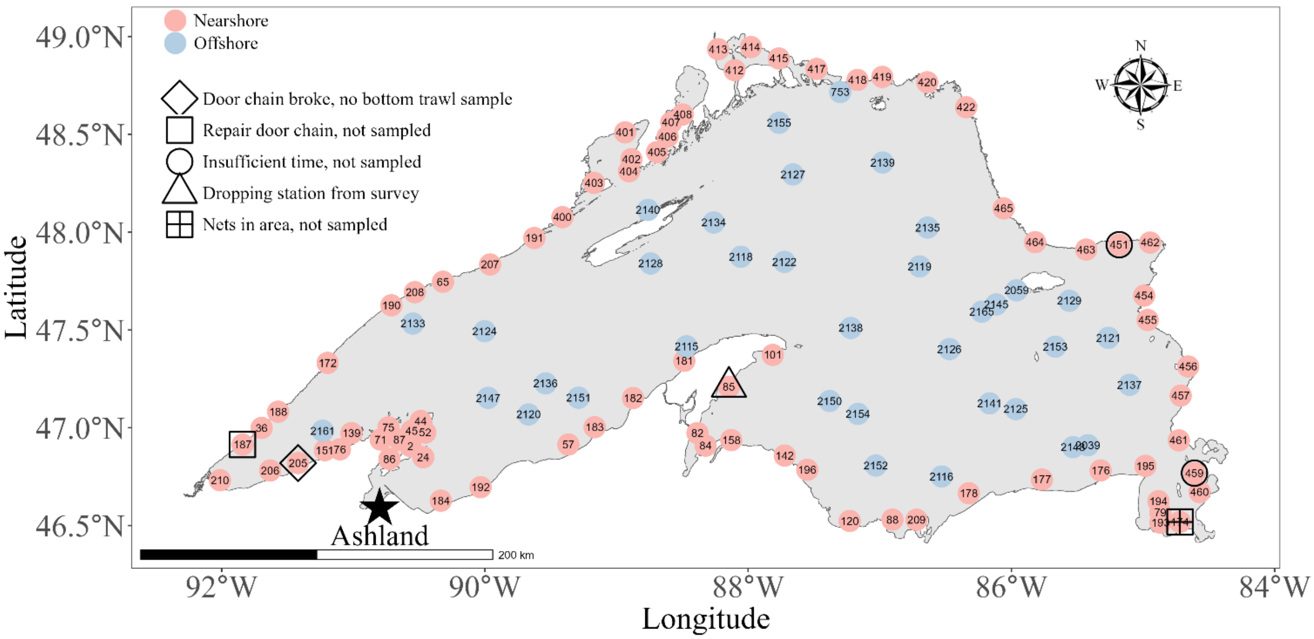

Figure 1. *Map showing 78 nearshore (pink) and 36 offshore (blue) planned sampling stations in U.S. and Canadian waters of Lake Superior in 2025. These are long-term sampling stations traditionally sampled with bottom and surface trawls and an electronic water column profiler. In 2025, bottom trawling for benthic and demersal fish occurred at 72 nearshore and 36 offshore stations. Surface trawling was completed at 71 nearshore and 36 offshore stations; water column profiles at 72 nearshore and 36 offshore stations. Six stations were not completed during 2025 for reasons identified in the legend and as described in the methods section. Additional location and trawling data for each sampling location are provided in Appendix A.*

Catch Processing

Fish collected with bottom trawls were sorted by species, counted, and weighed in aggregate to the nearest gram. Lake Trout were identified to morphotype (lean vs. siscowet) and origin (hatchery vs. wild). Total length was measured for a maximum of 50 individuals per species per trawl. Lengths of these individuals were extrapolated to the entire catch when more than 50 individuals were collected. The length composition of the subsamples of species collected was assumed to be representative of the total trawl catch for the species. Numerical density (fish per ha) and biomass density (kg per ha) were estimated by dividing sample counts and aggregate weights by the area swept by each trawl tow (ha). For annual nearshore bottom trawl collections, biomass density estimates are reported for all species combined, Sculpin species combined (Slimy, Spoonhead, and Deepwater Sculpin), and individually for Bloater, Cisco, Lake Whitefish, and Rainbow Smelt. A composite estimate is also reported for less-common species (Table 1). For offshore bottom trawl collections, biomass density estimates are reported for all species combined and individually for Deepwater Sculpin, Kiyi, and siscowet Lake Trout. Age-1 year-class strength was estimated as the mean nearshore lakewide abundance (fish per ha) of age-1 fish determined by applying total length thresholds: Cisco ≤140 mm (Dryer and Beil, 1964), Bloater ≤130 mm (Dryer and Beil, 1968), Lake Whitefish ≤160 mm (Edsall 1960; Dryer 1964; Seider and Schram, 2009; Fera et al. 2015), Kiyi ≤110 mm (Lepak et al. 2017), and Rainbow Smelt ≤100 mm (Luey and Adelman, 1984). These age-size thresholds are approximate and are known to vary among years (Lepak et al. 2017).

Larval fish collected in surface trawls were immediately removed from the nets and identified as *Coregonus*, Deepwater Sculpin, Rainbow Smelt, or Pacific salmonid based on morphological characters (Hinrichs 1979; Auer 1982). *Coregonus* larvae were counted and stored in 20 mL polyethylene scintillation vials with 90% ethanol. Presence of other larval species, if encountered, were recorded and discarded. Larval fish densities were calculated based on the width of the sampling nets and the distance towed. Data are not reported for 2020 and 2021 as fewer stations were sampled due to COVID restrictions.

Sampling and handling of fish during GLSC surveys are carried out in accordance with Guidelines for the Use of Fish in Research (Use of Fishes in Research Committee 2014), a joint publication of the American Fisheries Society, the American Institute of Fishery Research Biologists, and the American Society of Ichthyologists and Herpetologists.

Data Analysis, Visualization, and Availability and USGS Disclaimer

All data manipulations, statistical analyses, and visualizations were performed in R version 4.4.1 (R Development Core Team 2024). Data visualizations were produced using ggplot2 (Wickham 2016). Data for 1978-2025 are publicly available (U.S. Geological Survey 2026, https://doi.org/10.5066/P1VPWUNH. Additional data for years prior to 2023 are publicly available (U.S. Geological Survey 2022, https://doi.org/10.5066/P9XVOLR17).

Results

Nearshore Fish Collections

In 2025, a total of 63,005 fish from 30 species or morphotypes were collected across 69 nearshore stations (Table 1). The number of species collected at each location ranged from 1 to 13, with a median of 7.0 species. Estimated fish biomass density at individual stations ranged from <0.1 to 125.7 kg per ha (Figure 2). The three stations with the highest biomass density in 2025 were 86-Basswood Island (125.7 kg per ha), 209-Grand Island (55.9 kg per ha), and 460-Goulais Point (42.8 kg per ha). Average lakewide fish biomass density across all stations was 7.6 kg per ha, which was higher than in 2024 (3.7 kg per ha) but substantially less than the 18.3 kg per ha estimated in 2023 (Figure 3). Average lakewide biomass density in 2025 was highest for Cisco (2.4 kg per ha), Rainbow Smelt (2.4 kg per ha), Lake Whitefish (0.8 kg per ha), and Bloater (0.5 kg per ha, Table 1). The number of fish species or morphotypes collected in 2025 was higher than the mean and median of 23 species/morphotypes typically collected during this survey (Table 2). This may be related to the warmer than normal water temperatures present during the nearshore survey at the locations sampled. These warmer-water fishes included Alewife, Threespine Stickleback, Spottail Shiner, White Sucker, Johnny Darter, Yellow Perch, and Walleye.

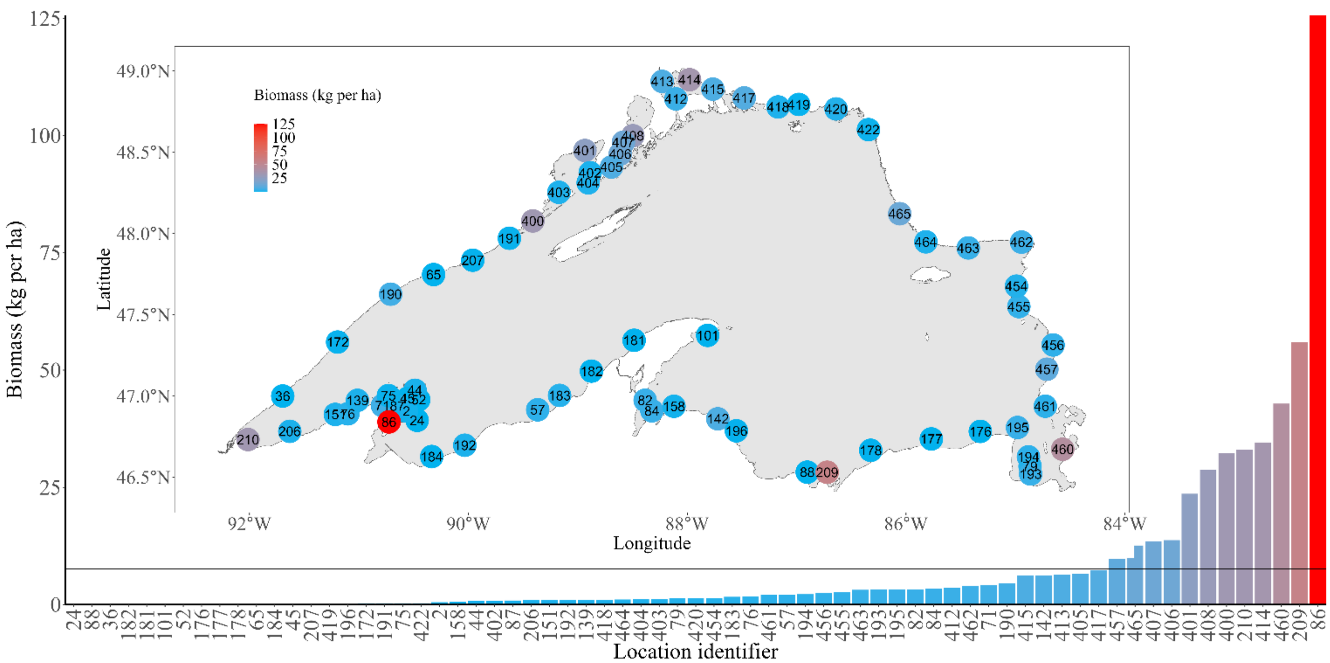

Figure 2. Estimated fish biomass densities (kg per ha) at 69 nearshore bottom trawling stations in nearshore U.S. and Canadian waters of Lake Superior in 2025. Nearshore sampling stations were 6-132 m deep. The horizontal line is the 2025 average biomass density across all stations (7.6 kg per ha). The inset figure shows sampling stations colored by their estimated biomass density (kg per ha) in 2025. Colors within inset map correspond to colors in the histogram.

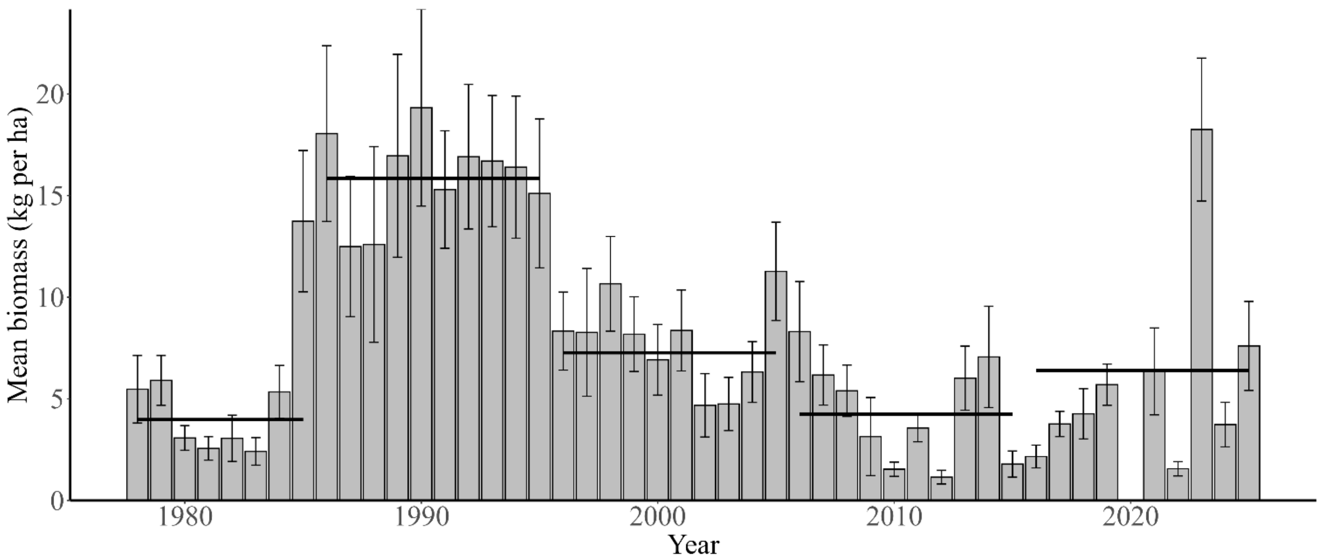

Figure 3. *Annual mean fish biomass density estimates (± standard error) for all fish species combined from bottom trawl tows from 1978 – 2025 in nearshore U.S. uvbhgand Canadian waters of Lake Superior. Nearshore sampling stations were 6 – 132 m deep. Horizontal lines are 10-year averages across different periods. In 2020 sampling occurred outside the standard sampling window and only 11 stations were sampled in the Apostle Islands, north of Ashland, Wisconsin (Figure 1), so these data were excluded. From 1978 – 1988 and in 2021 only U.S. waters were sampled. The number of stations sampled in each year is presented in Table 2.*

Nearshore Fishes Year-Class Strength

The number of age-1 fish per ha has been used historically as a measure of year-class strength of Lake Superior ciscoes and Rainbow Smelt. In 2025, age-1 Bloater were caught at 9 of 69 stations (Figure 4) and the average lakewide age-1 numerical density was 0.7 fish per ha (Figure 5). Age-1 Cisco were caught at 1 of 69 stations (Figure 4) and the average lakewide age-1 numerical density was 0.01 per ha, a three-way tie with the 2013 and 2017 year-classes for the lowest numerical density since 1978 (Figure 5). Age-1 Lake Whitefish were caught at 15 of 69 stations (Figure 4) and the average age-1 numerical density was 1.0 fish per ha (Figure 5, Table 3). Age-1 Rainbow Smelt were caught at 67 of 69 stations (Figure 4) and the average lakewide age-1 numerical density was 336.3 per ha which was the fourth highest since 1978 (range = 5 – 615 age-1 Rainbow Smelt per ha, Figure 5, Table 3).

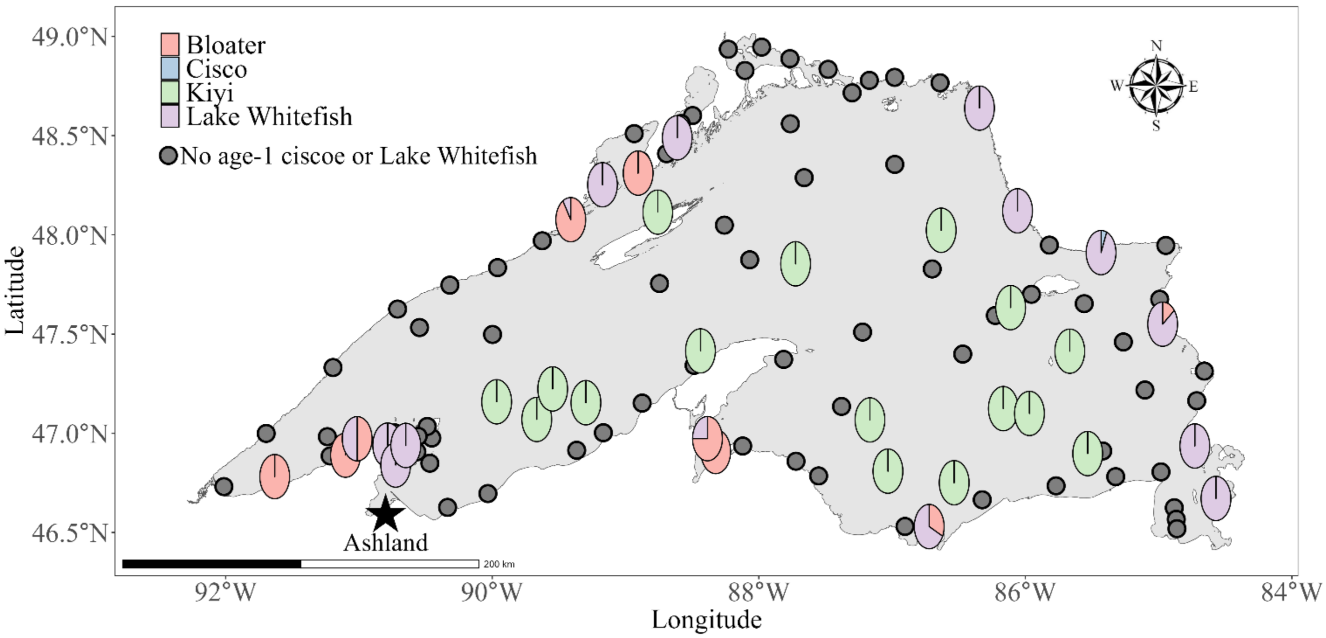

Figure 4. *Proportional numerical density of age-1 Bloater, Cisco, Kiyi, and Lake Whitefish collected in near- and off-shore surveys in U.S. and Canadian waters of Lake Superior in 2025. Nearshore sampling stations were 6 – 132 m deep and offshore stations were 84 – 301 m deep. Gray solid points indicate no age-1 Bloater, Cisco, Kiyi, or Lake Whitefish were collected at that location. The location of individual stations by identification number is shown in Figure 1.*

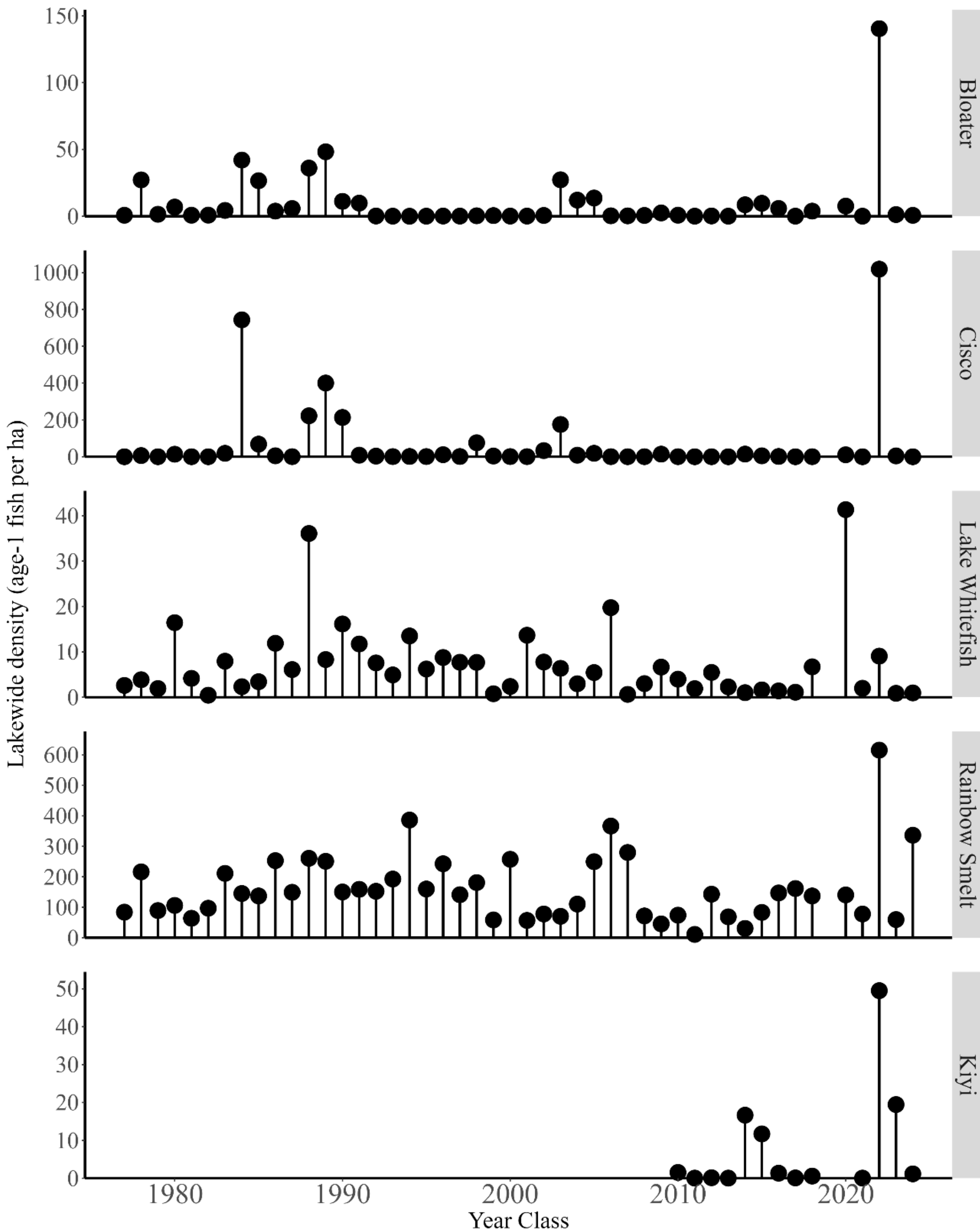

Figure 5. *Annual mean age-1 nearshore survey Bloater, Cisco, Lake Whitefish, and Rainbow Smelt and offshore survey Kiyi numerical density estimates (fish per ha) collected using bottom trawls in U.S. and Canadian waters of Lake Superior. From 1978–1988 the nearshore survey was only conducted in U.S. waters. In 2020 sampling occurred outside the standard sampling window and only 11 stations were sampled in the Apostle Islands (Figure 1). Thus, data for the 2019 year-class were excluded for nearshore Bloater, Cisco, Lake Whitefish, and Rainbow Smelt. Similarly, no data were available for the 2020 and 2021 offshore surveys and thus Kiyi year-class strength could not be estimated. The number of stations sampled in each year is presented in Table 3.*

Annual Offshore Fish Collections

Thirty-six offshore stations were sampled in 2025 from which 30,342 fish from 13 species or morphotypes were collected (Table 1). Estimated fish biomass density at individual stations ranged from 1.6 to 34.7 kg per ha (Figure 6). Individual stations with the highest biomass density in 2025 were spread throughout the lake and had depths greater than the lakewide mean depth of 147 m. These stations were 2139 (34.7 kg per ha), a 175 m deep location south of Patterson Island, Ontario, Canada; location 2137 (18.7 kg per ha), a 191 m deep location east of Caribou Island, Ontario, Canada; location 2133 (18.4 kg per ha), a 178 m deep location near Grand Marais, Minnesota; and location 2154 (17.6 kg per ha), a 170 m deep stations near Stannard Rock, Michigan (Figure 6). The lakewide offshore mean biomass density was 9.1 kg per ha, which was the highest for the period of record and 27% higher than the long-term (2011 – 2025) annual average of 6.6 kg per ha.

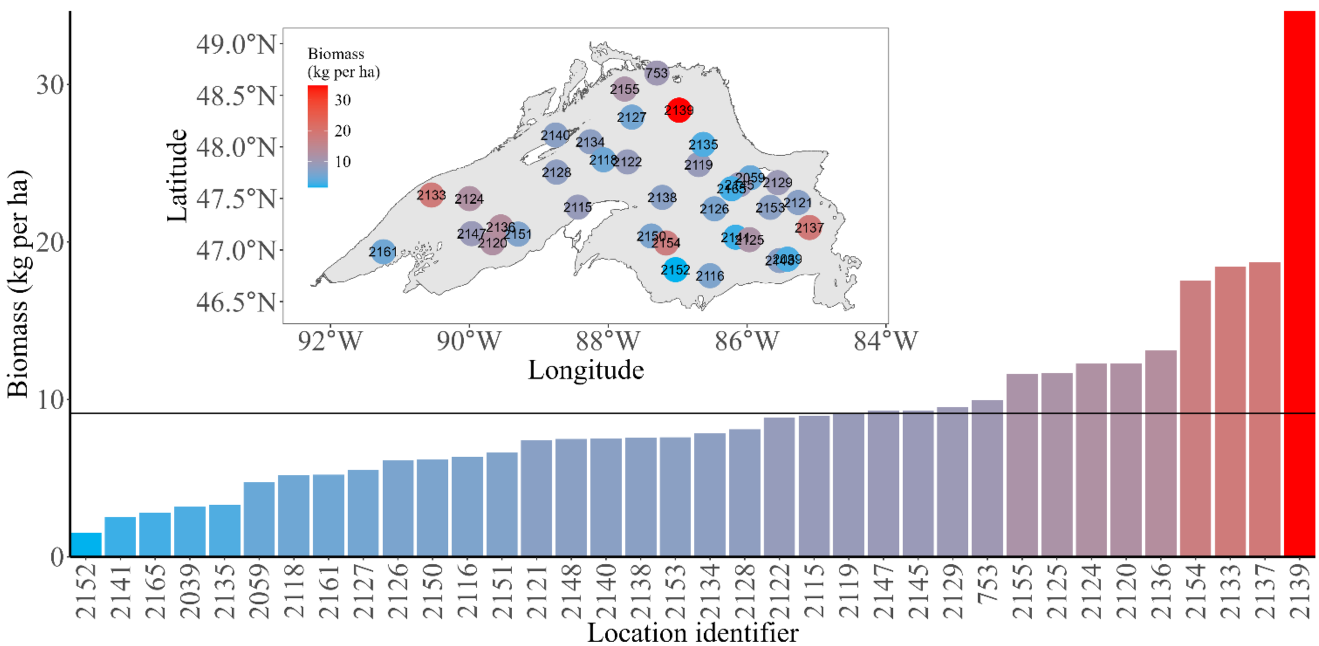

Figure 6. *Estimated combined biomass density (kg per ha) at individual offshore stations in U.S. and Canadian waters of Lake Superior in 2025. The horizontal line is the 2025 lakewide offshore average biomass density (9.1 kg per ha). Stations were 84 – 301 m deep. The inset map shows sampling stations colored by their estimated biomass density (kg per ha) in 2025. Colors within the map correspond to colors in the histogram.*

Deepwater Sculpin, Kiyi, and siscowet Lake Trout made up 99% of the total number of individuals and 98% of the biomass collected in offshore waters (Table 1). Other fish collected in much lower numbers were Bloater (n = 76), Pygmy Whitefish (n = 63), Spoonhead Sculpin (n = 31), Ninespine Stickleback (n = 11), Rainbow Smelt (n = 8), Burbot (n = 7), Slimy Sculpin (n = 7), Cisco (n = 5), lean Lake Trout (n = 5) and Shortnose Cisco (n = 2) (Table 1). Deepwater Sculpin offshore biomass density averaged 3.3 kg per ha in 2025, which was the second highest for the period of record and 35% higher than the long-term average of 2.2 kg per ha (Figure 7). Kiyi offshore biomass density averaged 2.5 kg per ha in 2025 which was the second highest for the period of record and 46% higher than the long-term average of 1.3 kg per ha (Figure 8). Siscowet Lake Trout biomass density averaged 3.1 kg per ha in 2025, which was similar to the long-term average of 2.9 kg per ha (Figure 7).

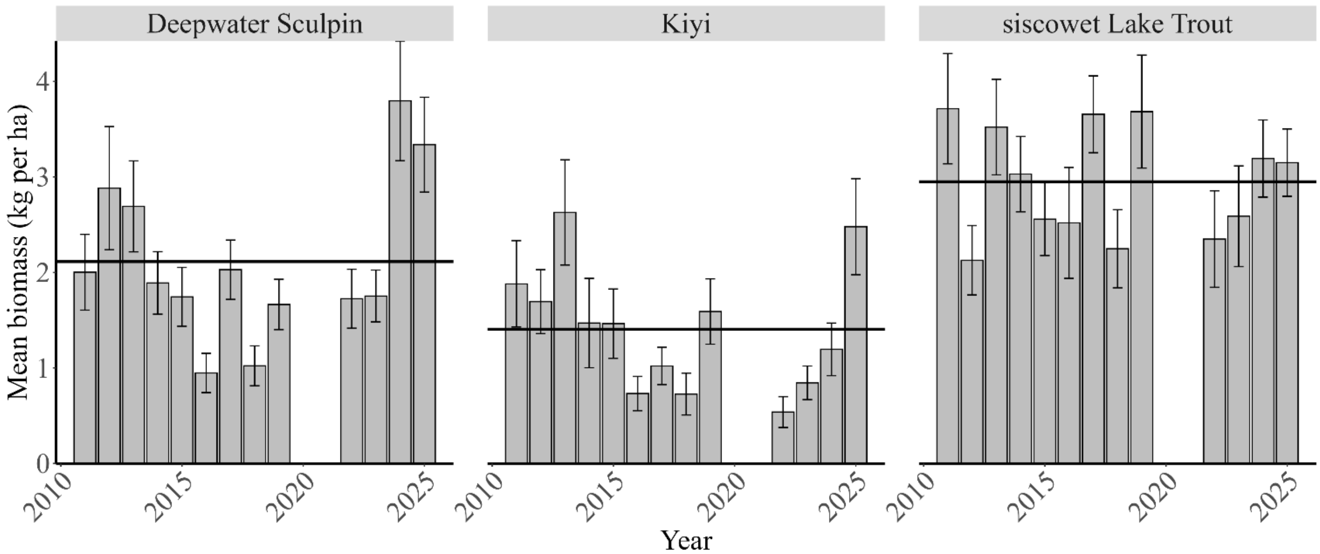

Figure 7. *Annual offshore biomass density estimates (mean lakewide kg per ha ± standard error) for Deepwater Sculpin, Kiyi and siscowet Lake Trout in U.S. and Canadian waters of Lake Superior from 2011 – 2025. Stations were 84 – 301 m deep. Annual offshore sampling stations were not sampled in 2020 and 2021 due to COVID-related travel restrictions. Scientific names are presented in Table 1.*

Kiyi Year-class Strength

Age-1 Kiyi (i.e., ≤110 mm), were caught at 16 of 36 stations (Figure 4) and averaged 1.2 fish per ha (Figure 5, Table 3), which was low for the period-of-record (6.8 fish per ha, 2011-2025, Figure 5, Table 3). Past trawl data indicate that Bloater, Cisco, and Kiyi recruitment to age-1 was synchronized, thus indicating that high survival for one of these species typically corresponds to high survival for all three species (Figure 5).

Larval sampling (refer to *Surface Trawl Fish Collections* section) and age-1 data for Bloater and Cisco (Figure 5) indicate that larval ciscoe survival was likely near zero in 2023 and 2024, which led to near zero age-1 Bloater and Cisco collected in both 2024 and 2025, and near zero age-1 Kiyi in 2025 (Figure 5). While age-1 Kiyi collections in 2024 were the second highest for the period-of-record, it is hypothesized that many may have been slow growing members of the 2022 year-class. The length frequency distribution of Kiyi collected in the offshore survey since 2011 also supports the slow growth hypothesis (Figure 8). Growth of successful year-classes can be observed in subsequent years, with several ≤110 mm fish overlapping into the next year (Figure 8). Future aging of a subset of Kiyi collected from this survey could resolve this dilemma, but growth is interannually variable.

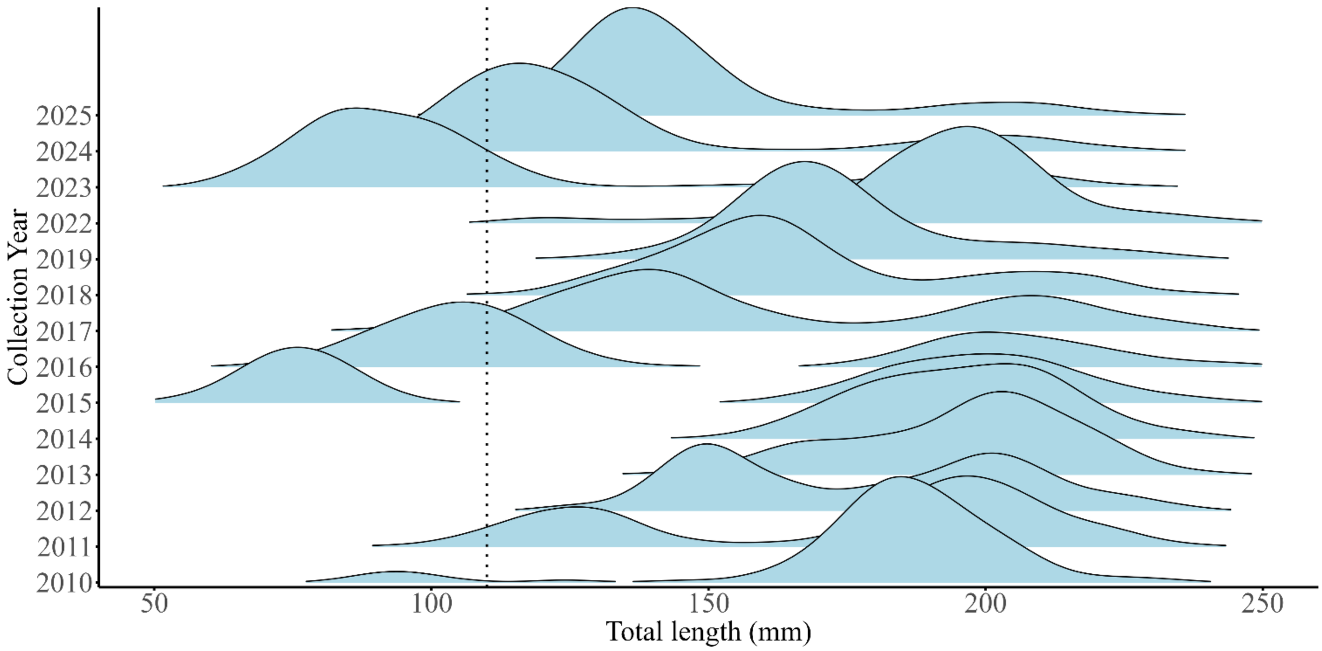

Figure 8. *Length frequency distributions of Lake Superior Kiyi collected from 2010 – 2025 in the July offshore surveys. The vertical dotted line at 110 mm is the total length cut-off for age-1 fish from Lepak et al. (2017). Collections occurred at the same offshore assessment stations, 84 – 301 m deep (Figure 1), in July 2010-2025. In 2010 Kiyi were collected from a mix of nearshore and offshore July collections. No Kiyi collections occurred in July 2020 and 2021, therefore no data are shown for these years.*

Surface Trawl Fish Collections

In 2025, a total of 1,562 larval *Coregonus* individuals were collected at 63 of 106 stations sampled lakewide between May – July 2025. Stations 454, 456, and 2121 were unable to be processed due to the samples being fouled with insects and location 422 was not sampled due to high winds. The 2025 sampling year had the fewest *Coregonus* larvae collected (n = 1,562) in a whole lake survey since the larval survey began in 2014 (range: 4,300 – 21,208 fish). Mean larval *Coregonus* numerical densities in 2025 were 82 fish per ha in June and 19 fish per ha in July (Figure 9). Overall average lakewide larval *Coregonus* numerical densities in June and July were the second lowest (ranges: 44 – 1,006 and 7 – 496 fish per ha, respectively) since 2014. These low 2025 larval *Coregonus* numerical density estimates were a stark contrast to those observed in 2022 when survival through July was the highest for the period-of-record for this survey, which in turn, led to high survival of *Coregonus* species to age-1 and suggests that survival of the 2025 ciscoe year-classes to age-1 will likely be near zero.

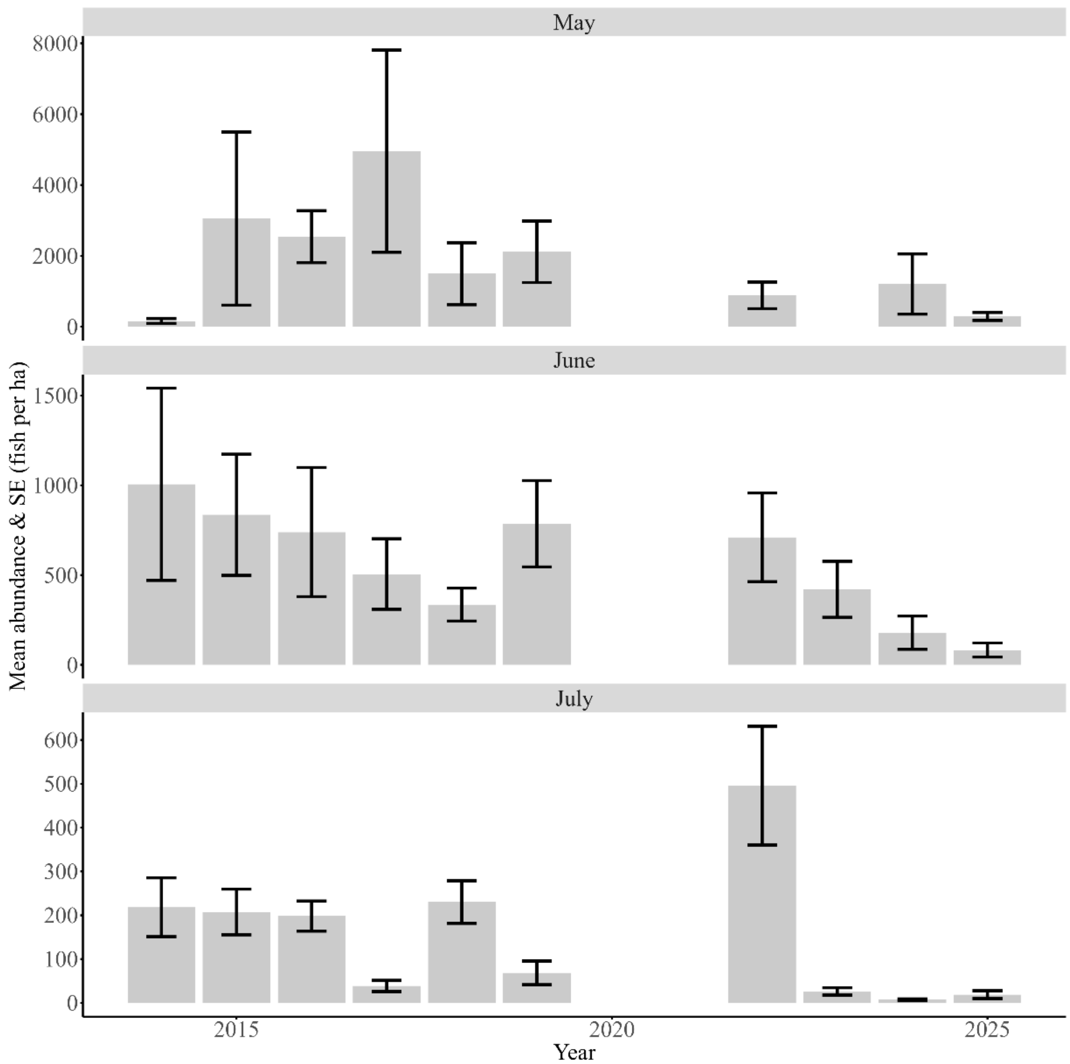

Figure 9. *Monthly mean larval Coregonus numerical density estimates (fish per ha ± standard error) for nearshore (May, June) and for offshore (July) collections from U.S. and Canadian waters of Lake Superior from 2014 – 2019, and 2022 – 2025. Note: y-axis scales differ.*

Water Temperatures

Surface water temperatures in June and July were near the time-period average (2011 – 2025) during the 2025 nearshore and offshore surveys. However, the mean surface temperature in May of 6.14°C was higher than the time-period average of 4.90°C (Figure 10). The mean June surface water temperatures at nearshore stations (Figure 1) were 6.85°C, slightly below the 2011 – 2025 mean of 7.47°C and mean offshore surface temperatures in July were 9.99°C, also below the 2011 – 2025 mean of 11.39°C (Figure 10).

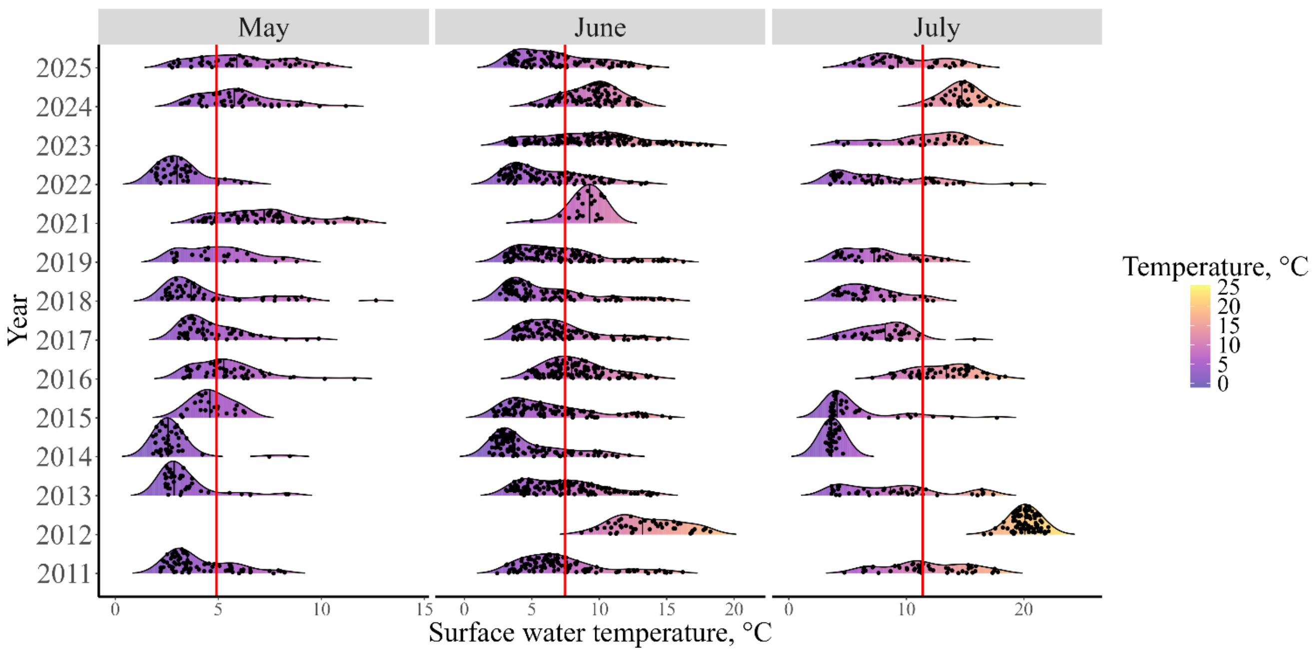

Figure 10. *Lake Superior near-surface (<3 m deep) May, June, and July water temperatures from 2011 – 2025. No water temperatures were collected in 2020 nearshore and offshore in 2021 due to COVID travel restrictions. The vertical red lines are the mean monthly temperature from 2011 – 2025. Individual points are individual sampling stations. Individual sampling stations were sampled approximately the same day each year.*

Summary

Over the 47-year history of the U.S. Geological Survey's Lake Superior nearshore fish community survey, total estimated biomass density of benthic and demersal fish species combined has largely been driven by the recruitment of Bloater, Cisco, and Lake Whitefish. In 2025, nearshore fish biomass density estimates were higher than the recent 10-year average and lower than the near-record biomass density estimates in 2023 (dominated by the 2022 ciscoe year-class). Offshore fish biomass density estimates in 2025 were above average for Deepwater Sculpin and Kiyi and similar to the long-term average for siscowet Lake Trout. As the 2022 year-class of Cisco matures and exhibits more pelagic behavior, they are likely to be less susceptible to our bottom trawl. Age-1 and larval ciscoe abundance remained low in 2025. The status of the 2022 ciscoe year-classes was evaluated by a lakewide survey using fish acoustic methods deployed from SailDrones® and a mid-water trawl survey conducted in September-October 2024 by the U.S. Geological Survey Lake Superior Biological Station. The results of this work are expected to be available by summer 2026.

The combination of near- and offshore bottom and surface trawl surveys provides a lakewide assessment of the status and trends of the Lake Superior fish community susceptible to these trawls, particularly larval and age-1 *Coregonus* species, Rainbow Smelt, and offshore Deepwater Sculpin, Kiyi. These data are of high interest to fishery managers around the lake and there are no surrogate assessments that could provide similar information. Any future surveys will be adapted, as needed, to address emerging issues.

Acknowledgements
We thank the crew of the R/V *Kiyi* for their dedication to the 2025 field season. The work by Isabel Field was done while serving as a student contractor with the U.S. Geological Survey. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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Table 1. *Summary of 2025 nearshore and offshore bottom trawl catch (individuals collected), numerical density (number of fish per ha), and biomass density (kg per ha) for species and morphotypes from U.S. and Canadian waters of Lake Superior. There were 69 nearshore and 36 offshore stations sampled in Lake Superior in 2025. See Figure 1 for sampling station locations.*

		Nearshore				Offshore			
Common name	**Scientific name**	**Collection stations**	**Individuals collected**	**Number per ha**	**Kg per ha**	**Collection stations**	**Individuals collected**	**Number per ha**	**Kg per ha**
Alewife	*Alosa pseudoharengus*	5	7	0.1	0.0	0	0	0	0
Bloater	*Coregonus hoyi*	18	946	10.8	0.5	6	76	2.0	0.0
Brook Stickleback	*Eucalia inconstans*	1	1	0.0	0.0	0	0	0	0
Burbot	*Lota lota*	7	14	0.1	0.1	5	7	0.2	0.0
Cisco	*Coregonus artedii*	11	2527	32.0	2.4	3	5	0.1	0.0
Deepwater Sculpin	*Myoxocephalus thompsoni*	15	394	3.3	0.0	35	24931	661.4	3.3
Emeral Shiner	*Notropis atherinoides*	1	1	0.0	0.0	0	0	0	0
Hatchery Lake Trout	*Salvelinus namaycush*	3	6	0.1	0.0	0	0	0	0
Johnny Darter	*Etheostoma nigrum*	10	37	0.4	0.0	0	0	0	0
Kiyi	*Coregonus kiyi*	7	36	0.4	0.0	31	4950	131.1	2.5
Lake Whitefish	*Coregonus clupeaformis*	26	351	4.5	0.8	0	0	0	0
Lean Lake Trout	*Salvelinus namaycush*	17	42	0.4	0.2	4	5	0.1	0.0
Longnose Sucker	*Catostomus catostomus*	13	78	1.0	0.5	0	0	0	0
Ninespine Stickleback	*Pungitius pungitius*	66	8694	113.3	0.1	4	11	0.3	0.0
Pygmy Whitefish	*Prosopium coulteri*	29	930	11.5	0.1	3	63	1.7	0.0
Rainbow Smelt	*Osmerus mordax*	67	42361	666.6	2.4	4	8	0.2	0.0
Ruffe	*Gymnocephalus cernuus*	7	24	0.3	0.0	0	0	0	0
Sculpin	*Cottus*	4	13	0.1	0.0	0	0	0	0
Shortnose Cisco	*Coregonus reighardi*	1	1	0.0	0.0	2	2	0.1	0.0
Siscowet Lake Trout	*Salvelinus namaycush siscowet*	12	61	0.7	0.2	35	246	6.5	3.1
Slimy Sculpin	*Cottus cognatus*	51	1475	14.1	0.0	3	7	0.2	0.0
Smallmouth Bass	*Micropterus dolomieui*	1	1	0.0	0.0	0	0	0	0
Spoonhead Sculpin	*Cottus ricei*	16	238	2.0	0.0	13	31	0.8	0.0
Spottail Shiner	*Notropis hudsonius*	2	11	0.2	0.0	0	0	0	0
Threespine Stickleback	*Gasterosteus aculeatus*	9	81	1.2	0.0	0	0	0	0
Trout-perch	*Percopsis omiscomaycus*	49	4665	50.4	0.2	0	0	0	0
Unidentified coregonine	*Coregonus*	1	1	0.0	0.0	0	0	0	0
Walleye	*Sander vitreus*	1	1	0.0	0.0	0	0	0	0
White Sucker	*Catostomus commersoni*	1	3	0.0	0.0	0	0	0	0
Yellow Perch	*Perca flavescens*	3	5	0.1	0.0	0	0	0	0

Table 2. *Annual lakewide bottom trawl biomass density (kg per ha) estimates for all species combined and for key prey fishes collected in the nearshore bottom trawl survey in U.S. and Canadian waters of Lake Superior, 1978-2025. Nearshore sampling stations were 6 – 132 m deep. Sculpins include Slimy, Spoonhead, and Deepwater Sculpin. Mean and median total biomass densities (kg per ha) include all species. Other fishes include Ninespine Stickleback, Trout-perch, Kiyi, Shortjaw Cisco, Pygmy Whitefish, Round Whitefish, Longnose Sucker, and Lake Trout (lean, siscowet, and hatchery). Scientific names are presented in Table 1. Zero fish stations are the number of stations where no fish were collected.*

Year	Sampling stations	Zero fish stations	Total species	Mean Species per station	Mean total biomass	Median total biomass	Bloater	Cisco	Lake Whitefish	Rainbow Smelt	Sculpins	Other fishes
1978	43	0	17	5.81	5.47	0.74	0.12	0.01	0.7	3.72	0.12	0.8
1979	49	0	17	6.98	5.91	2.25	0.4	0.06	1.27	2	0.18	2
1980	48	0	16	6.54	3.08	1.11	0.27	0.26	0.57	0.81	0.16	1
1981	48	2	19	6.19	2.56	0.39	0.41	0.36	0.67	0.2	0.16	0.77
1982	32	0	18	6.03	3.06	0.29	0.43	0.35	0.85	0.25	0.03	1.16
1983	50	0	19	6.12	2.41	0.54	0.42	0.16	0.2	0.9	0.05	0.68
1984	53	0	21	7.25	5.34	1.43	1.5	0.59	1.23	0.72	0.05	1.24
1985	53	0	19	7.98	13.74	3.52	2.28	6.45	1.94	1.2	0.07	1.8
1986	53	2	19	7.74	18.05	3.53	3.22	8.25	2.61	2.68	0.06	1.21
1987	53	0	16	7.06	12.49	1.21	2.31	5.34	1.93	1.74	0.06	1.1
1988	53	0	19	6.21	12.59	0.82	5.15	2.93	2.26	1.13	0.04	1.08
1989	76	0	21	7.49	16.96	3.23	1.57	5.95	5.43	2.03	0.07	1.9
1990	81	0	22	7.9	19.32	5.04	4.09	9.08	2.29	1.88	0.08	1.9
1991	84	1	22	7.85	15.3	3.32	0.74	9.02	2.63	1.12	0.09	1.69
1992	85	0	24	7.53	16.91	3.21	7.26	3.06	3.59	0.94	0.07	1.99
1993	87	1	23	7.75	16.7	5.12	3.62	4.51	3.56	2.06	0.08	2.86
1994	87	0	23	7.32	16.4	3.59	0.42	6.52	5.33	1.84	0.08	2.22
1995	87	0	27	7.6	15.11	2.54	0.54	3.42	5.8	2.1	0.09	3.16
1996	87	0	26	7.41	8.33	2.35	2.79	0.93	1.5	1.23	0.1	1.78
1997	85	1	30	6.91	8.27	2.06	0.81	1.34	2.73	1.3	0.05	2.04
1998	87	0	22	6.98	10.66	1.66	3.86	1.06	2.2	1.43	0.06	2.05
1999	83	5	23	5.1	8.18	1.39	2.62	2.28	1.07	0.93	0.03	1.25
2000	85	4	25	5.55	6.92	1.12	0.94	2.42	1.6	0.83	0.04	1.09
2001	83	1	32	7.24	8.37	1.7	1.19	1.15	2.78	1.52	0.04	1.68
2002	84	2	26	6.21	4.68	0.53	0.57	1.48	1.69	0.18	0.02	0.74
2003	86	8	26	5.4	4.75	0.98	0.88	0.64	1.84	0.31	0.02	1.06
2004	75	1	25	7.64	6.32	1.87	1.15	1.8	1.88	0.32	0.03	1.14
2005	52	0	27	7	11.27	4.39	1.65	2.23	4.37	1	0.01	2.02
2006	55	2	24	6.49	8.31	1.57	1.79	2.25	1.7	0.95	0.02	1.59
2007	56	0	31	6.21	6.17	0.97	0.9	0.27	1.86	1.77	0.02	1.34
2008	59	3	23	6.39	5.4	1.57	0.17	0.38	2.37	0.94	0.02	1.52
2009	64	6	20	4.02	3.14	0.14	1.18	0.3	0.15	0.38	0.02	1.12
2010	76	11	24	4.01	1.54	0.13	0.23	0.31	0.27	0.22	0.05	0.46

Year	Sampling stations	Zero fish stations	Total species	Mean Species per station	Mean total biomass	Median total biomass	Bloater	Cisco	Lake Whitefish	Rainbow Smelt	Sculpins	Other fishes
2011	82	6	21	5.63	3.56	1.28	0.56	0.41	0.94	0.62	0.05	0.98
2012	72	16	25	4.22	1.15	0.31	0.35	0.02	0.15	0.16	0.03	0.44
2013	79	3	27	5.53	6.01	1.17	0.49	0.52	2.98	0.53	0.02	1.47
2014	73	3	28	5.36	7.06	1.86	0.5	0.35	4.31	0.43	0.02	1.46
2015	76	4	21	4.34	1.79	0.19	0.4	0.23	0.54	0.22	0.02	0.38
2016	76	5	23	4.75	2.16	0.23	0.38	0.22	0.53	0.44	0.02	0.59
2017	76	4	27	5.53	3.77	1.81	0.49	0.16	1.11	0.94	0.01	1.05
2018	77	10	24	4.55	4.26	0.28	0.13	0.36	1.52	1.24	0.02	1
2019	76	8	25	5.59	5.7	1.38	0.68	0.14	2.48	0.96	0.02	1.42
2020	11	1	17	6.36	10.55	3.35	6.23	0.95	2.27	0.34	0.01	0.75
2021	45	6	23	5.69	6.35	0.79	1.45	0.32	3.22	0.5	0.02	0.84
2022	71	1	25	4.55	1.56	0.52	0.21	0.05	0.39	0.29	0.01	0.62
2023	57	0	25	8.72	18.25	6.77	1.14	10.53	2.41	2.35	0.1	1.73
2024	72	0	27	5.54	3.73	0.7	0.37	1.27	0.53	0.74	0.02	0.8
2025	69	1	33	6.7	7.6	1.38	0.52	2.44	0.76	2.35	0.06	1.46
Mean	68	2	23.27	6.31	8.07	1.80	1.45	2.15	1.98	1.10	0.05	1.34
Median	74	1	23	6.29	6.34	1.39	0.78	0.94	1.85	0.94	0.04	1.23

Table 3. *Annual estimated age-1 densities (fish per ha) and number of stations each species was present for nearshore Bloater, Cisco, Lake Whitefish, and Rainbow Smelt and offshore Kiyi in U.S. and Canadian waters of Lake Superior. The total number of stations (n) sampled in each annual survey is provided as Nearshore/Offshore (NS/OS). Nearshore sampling stations were 6 – 132 m deep and offshore stations were 84 – 301 m deep. Age-1 fish were defined by species-specific lengths: Cisco ≤140 mm, Bloater <130 mm, Kiyi ≤110 mm, Lake Whitefish ≤160 mm, and Rainbow Smelt ≤100 mm. Scientific names are presented in Table 1. Offshore sampling for Kiyi began in 2011.*

Sampling Year	Year-Class	n NS/OS	Bloater		Cisco		Lake Whitefish		Rainbow Smelt		Kiyi	
			Density	Stations	Density	Stations	Density	Stations	Density	Stations	Density	Stations
1978	1977	43 / -	0.72	12	0.02	1	2.6	10	83.85	40	-	-
1979	1978	49 / -	27.18	42	6.3	2	3.86	14	216.06	49	-	-
1980	1979	48 / -	1.44	19	0.09	3	1.91	14	89.18	46	-	-
1981	1980	48 / -	6.85	16	13.47	27	16.43	10	105.9	45	-	-
1982	1981	32 / -	0.75	11	0.16	5	4.16	10	63.81	31	-	-
1983	1982	50 / -	0.81	18	0.05	3	0.45	8	96.77	49	-	-
1984	1983	53 / -	4.35	26	18.48	23	7.93	13	211.03	51	-	-
1985	1984	53 / -	42.02	31	743.43	40	2.32	10	145.1	50	-	-
1986	1985	53 / -	26.57	25	68.32	30	3.41	12	137.11	49	-	-
1987	1986	53 / -	3.82	24	5.1	26	11.88	14	252.95	53	-	-
1988	1987	53 / -	5.76	13	0.44	4	6.09	14	149	53	-	-
1989	1988	76 / -	36.07	31	222.37	46	36.08	22	260.68	76	-	-
1990	1989	81 / -	48.23	32	400.22	70	8.3	21	250.74	78	-	-
1991	1990	84 / -	11.13	33	213.27	65	16.15	23	150.12	83	-	-
1992	1991	85 / -	9.81	31	8.33	39	11.73	22	158.81	81	-	-
1993	1992	87 / -	0.18	4	3.32	37	7.56	22	152.38	84	-	-
1994	1993	87 / -	0.06	5	0.75	10	4.92	23	192.62	84	-	-
1995	1994	87 / -	0	0	1.43	31	13.5	31	386.15	86	-	-
1996	1995	87 / -	0.05	4	0.91	21	6.22	32	159.81	86	-	-
1997	1996	85 / -	0.15	7	11.08	29	8.75	21	242.7	81	-	-
1998	1997	87 / -	0.12	7	1.18	20	7.7	24	141.15	84	-	-
1999	1998	83 / -	0.34	3	75.83	41	7.68	15	180.88	72	-	-
2000	1999	85 / -	0.48	13	3.85	24	0.77	10	58.39	77	-	-
2001	2000	83 / -	0.12	6	0.84	16	2.37	22	257.37	76	-	-
2002	2001	84 / -	0.12	6	0.53	8	13.66	18	56.79	73	-	-
2003	2002	86 / -	0.59	5	33.23	39	7.75	21	77.88	71	-	-
2004	2003	75 / -	27.26	36	175.35	47	6.36	23	70.28	71	-	-
2005	2004	51 / -	12.07	23	8.19	21	2.97	16	110.39	52	-	-
2006	2005	55 / -	13.61	19	18.58	22	5.43	15	249.53	49	-	-
2007	2006	54 / -	0.32	6	0.41	10	19.74	13	366.45	53	-	-
2008	2007	58 / -	0.28	7	0.2	10	0.63	13	279.75	54	-	-
2009	2008	63 / -	0.59	7	0.27	9	3	7	71.55	52	-	-
2010	2009	62 / -	2.46	12	14.03	19	6.64	10	45.37	53	-	-
2011	2010	82 / 35	0.76	8	0.3	11	3.98	17	73.98	69	1.52	17

Sampling Year	Year-Class	n NS/OS	Bloater		Cisco		Lake Whitefish		Rainbow Smelt		Kiyi	
			Density	Stations	Density	Stations	Density	Stations	Density	Stations	Density	Stations
2012	2011	72 / 34	0.06	2	0.03	1	1.9	9	10.9	36	0.03	1
2013	2012	79 / 35	0.22	9	0.17	9	5.46	24	142.9	70	0.13	5
2014	2013	73 / 30	0.06	6	0.01	1	2.27	12	68.46	67	0.03	1
2015	2014	76 / 33	8.57	25	14.31	25	1	11	30.66	70	16.65	19
2016	2015	76 / 35	9.68	26	4.99	22	1.62	11	83.04	67	11.7	22
2017	2016	76 / 36	5.81	16	1.37	17	1.39	15	146.95	70	1.33	17
2018	2017	77 / 35	0.07	4	0.01	1	1.1	8	161.39	64	0.08	3
2019	2018	76 / 35	3.82	17	0.31	11	6.7	14	137.07	68	0.56	11
2020	2019	11 / -	0.89	5	0.14	1	12.45	3	5.14	9	-	-
2021	2020	45 / -	7.59	12	10.58	13	41.33	16	140.45	37	-	-
2022	2021	71 / 35	0.04	5	0.06	4	1.98	8	77.83	64	0.03	1
2023	2022	57 / 31	140.39	38	1018.73	43	9.06	17	615.46	56	49.52	24
2024	2023	72 / 36	1.24	10	4.62	23	0.86	13	59.62	69	19.45	30
2025	2024	69 / 36	0.67	9	0.01	1	0.95	15	336.33	67	1.15	16
Mean		67 / 34	9.67	15.13	34.70	20.44	7.31	15.54	157.52	61.98	6.84	11.33
Median		73 / 35	0.85	12.00	2.38	19.50	5.45	14.00	142.03	67.00	0.56	11.00

Appendix A. *Lake Superior benthic fish community survey stations from the United States (USA) and Canada and trawling data for stations sampled in 2025. The location of individual stations by identification number is shown in Figure 1.*

Survey	Date	Time	Location Code	Management Unit	Country	Mid-Latitude	Mid-Longitude	Begin Depth (m)	End Depth (m)	Surface Temperature (°C)	Bottom Temperature (°C)	Bottom Trawl Distance (km)
Nearshore	5/14/2025	1046	52	WI2	USA	46.976	-90.453	15	70	4.5	4.3	1.63
Nearshore	5/14/2025	1246	44	WI2	USA	47.035	-90.488	10	49	6.5	5.2	1.43
Nearshore	5/14/2025	1425	45	WI2	USA	46.985	-90.556	9	59	5.6	4.3	1.03
Nearshore	5/15/2025	1025	24	WI2	USA	46.849	-90.468	14	56	4.1	3.9	1.09
Nearshore	5/15/2025	1159	2	WI2	USA	46.907	-90.565	9	89	6.1	4.2	2.62
Nearshore	5/15/2025	1413	87	WI2	USA	46.939	-90.649	6	54	6.1	4.2	1.21
Nearshore	5/16/2025	917	71	WI2	USA	46.940	-90.785	9	36	7.9	6.3	1.19
Nearshore	5/16/2025	1102	75	WI2	USA	47.002	-90.731	34	46	6.3	5.2	0.77
Nearshore	5/16/2025	1311	86	WI2	USA	46.840	-90.725	23	49	7.3	5.1	1.21
Nearshore	5/17/2025	1146	190	MN2	USA	47.626	-90.710	21	51	3.2	2.9	1.34
Nearshore	5/17/2025	1623	65	MN3	USA	47.747	-90.318	15	61	2.9	2.7	0.77
Nearshore	5/28/2025	1046	184	MI2	USA	46.627	-90.335	13	38	9.2	4.3	2.94
Nearshore	5/28/2025	1331	192	MI2	USA	46.696	-90.033	11	37	8.9	4.4	2.11
Nearshore	5/28/2025	1735	57	MI2	USA	46.914	-89.366	17	46	10.5	4.9	4.01
Nearshore	5/29/2025	818	183	MI2	USA	47.003	-89.166	15	45	8.5	5.5	3.52
Nearshore	5/29/2025	1129	182	MI3	USA	47.152	-88.875	27	50	5.9	4.1	3.52
Nearshore	5/29/2025	1452	181	MI3	USA	47.342	-88.485	20	68	5.7	4.2	1.26
Nearshore	5/30/2025	1012	82	MI4	USA	46.973	-88.385	13	63	6.3	4.0	2.37
Nearshore	5/30/2025	1158	84	MI4	USA	46.908	-88.323	15	132	8.1	5.6	3.83
Nearshore	5/30/2025	1707	101	MI4	USA	47.372	-87.813	17	55	5.1	4.2	1.87
Nearshore	5/31/2025	905	158	MI4	USA	46.936	-88.121	13	50	9.1	5.2	2.51
Nearshore	5/31/2025	1203	142	MI5	USA	46.859	-87.721	18	65	7.0	5.1	1.67
Nearshore	5/31/2025	1411	196	MI5	USA	46.785	-87.551	28	80	4.7	4.2	1.95
Nearshore	6/1/2025	1100	88	MI6	USA	46.531	-86.903	27	79	5.6	4.6	3.23
Nearshore	6/1/2025	1417	209	MI6	USA	46.530	-86.721	28	87	9.1	6.2	1.27
Nearshore	6/1/2025	1651	178	MI6	USA	46.665	-86.323	27	86	7.3	4.5	3.20
Nearshore	6/2/2025	659	177	MI7	USA	46.735	-85.769	16	60	4.5	4.2	3.64
Nearshore	6/2/2025	1018	176	MI7	USA	46.781	-85.322	18	48	6.1	4.9	1.88
Nearshore	6/2/2025	1249	195	MI8	USA	46.805	-84.982	10	60	7.0	4.8	1.98
Nearshore	6/3/2025	1040	194	MI8	USA	46.625	-84.882	26	91	6.2	4.5	2.85

Survey	Date	Time	Location Code	Management Unit	Country	Mid-Latitude	Mid-Longitude	Begin Depth (m)	End Depth (m)	Surface Temperature (°C)	Bottom Temperature (°C)	Bottom Trawl Distance (km)
Nearshore	6/3/2025	1238	79	MI8	USA	46.567	-84.867	20	76	6.6	4.2	2.86
Nearshore	6/3/2025	1438	193	MI8	USA	46.519	-84.862	32	59	5.9	4.3	1.16
Nearshore	6/5/2025	1102	460	ONT12	Canada	46.672	-84.569	13	50	9.7	6.0	2.28
Nearshore	6/5/2025	1402	461	ONT11	Canada	46.936	-84.728	11	69	9.1	5.4	2.33
Nearshore	6/5/2025	1708	457	ONT11	Canada	47.164	-84.714	18	117	6.2	3.7	1.35
Nearshore	6/6/2025	733	456	ONT11	Canada	47.313	-84.657	21	81	9.3	3.9	2.03
Nearshore	6/6/2025	1048	455	ONT11	Canada	47.550	-84.970	21	101	5.5	4.1	1.93
Nearshore	6/6/2025	1325	454	ONT9	Canada	47.675	-84.992	10	80	3.4	3.3	1.13
Nearshore	6/6/2025	1609	462	ONT9	Canada	47.946	-84.946	17	107	3.7	3.6	1.61
Nearshore	6/7/2025	834	463	ONT9	Canada	47.911	-85.432	16	74	3.5	3.5	1.85
Nearshore	6/7/2025	1119	464	ONT9	Canada	47.948	-85.819	13	81	3.7	3.6	1.53
Nearshore	6/7/2025	1410	465	ONT7	Canada	48.121	-86.058	12	95	4.6	3.9	1.38
Nearshore	6/8/2025	656	422	ONT7	Canada	48.639	-86.344	24	47	4.5	4.1	0.74
Nearshore	6/8/2025	913	420	ONT7	Canada	48.766	-86.640	13	43	3.9	3.7	1.48
Nearshore	6/8/2025	1206	419	ONT7	Canada	48.794	-86.980	20	42	4.8	4.0	0.69
Nearshore	6/8/2025	1401	418	ONT4	Canada	48.778	-87.170	13	37	7.9	4.4	0.92
Nearshore	6/8/2025	1627	417	ONT4	Canada	48.834	-87.479	10	61	6.9	4.6	0.87
Nearshore	6/9/2025	832	415	ONT4	Canada	48.888	-87.766	12	39	7.7	5.8	1.09
Nearshore	6/9/2025	1033	414	ONT4	Canada	48.946	-87.978	12	24	9.9	8.8	1.24
Nearshore	6/9/2025	1237	413	ONT4	Canada	48.935	-88.229	13	29	12.3	11.7	1.05
Nearshore	6/9/2025	1424	412	ONT4	Canada	48.828	-88.103	11	47	11.7	8.2	1.34
Nearshore	6/10/2025	958	408	ONT3	Canada	48.601	-88.497	16	20	13.8	10.1	0.66
Nearshore	6/10/2025	1116	407	ONT3	Canada	48.561	-88.583	14	29	12.6	7.6	1.05
Nearshore	6/10/2025	1244	406	ONT3	Canada	48.489	-88.612	14	34	12.0	6.9	1.27
Nearshore	6/10/2025	1426	405	ONT3	Canada	48.409	-88.692	16	51	10.2	5.1	0.97
Nearshore	6/11/2025	853	401	ONT1	Canada	48.510	-88.935	13	44	9.6	5.1	1.16
Nearshore	6/11/2025	1036	402	ONT1	Canada	48.373	-88.887	12	44	11.0	5.2	2.14
Nearshore	6/11/2025	1247	404	ONT2	Canada	48.311	-88.905	15	55	6.7	4.4	1.05
Nearshore	6/12/2025	835	403	ONT1	Canada	48.253	-89.173	22	40	8.3	5.9	0.58
Nearshore	6/12/2025	1049	400	ONT2	Canada	48.077	-89.411	16	54	6.2	4.7	2.12
Nearshore	6/12/2025	1350	191	MN3	USA	47.970	-89.625	18	49	5.9	4.2	2.00
Nearshore	6/12/2025	1641	207	MN3	USA	47.835	-89.960	15	42	3.6	3.4	0.55

Survey	Date	Time	Location Code	Management Unit	Country	Mid-Latitude	Mid-Longitude	Begin Depth (m)	End Depth (m)	Surface Temperature (°C)	Bottom Temperature (°C)	Bottom Trawl Distance (km)
Nearshore	6/13/2025	1027	172	MN2	USA	47.331	-91.195	17	30	4.3	4.0	0.40
Nearshore	6/13/2025	1537	36	MN1	USA	46.999	-91.696	22	34	4.9	4.5	0.64
Nearshore	6/14/2025	740	210	WI1	USA	46.731	-92.014	14	22	10.7	10.1	2.12
Nearshore	6/14/2025	1047	206	WI1	USA	46.782	-91.632	25	46	5.0	4.5	2.32
Nearshore	6/15/2025	1049	151	WI1	USA	46.886	-91.216	12	68	5.7	4.1	1.74
Nearshore	6/15/2025	1231	76	WI2	USA	46.890	-91.101	13	35	8.1	4.4	1.48
Nearshore	6/15/2025	1427	139	WI2	USA	46.973	-91.013	24	47	9.7	4.3	2.03
Offshore	7/9/2025	1214	2161	WI1	USA	46.983	-91.237	132	133	15.1	3.8	1.27
Offshore	7/9/2025	1735	2133	MN3	USA	47.533	-90.546	178	177	14.9	3.8	1.35
Offshore	7/10/2025	910	2124	MN3	USA	47.498	-89.998	150	149	10.2	3.8	1.37
Offshore	7/10/2025	1210	2147	MI2	USA	47.159	-89.967	167	165	8.8	3.7	1.30
Offshore	7/10/2025	1449	2120	MI2	USA	47.070	-89.666	203	195	14.4	3.7	1.37
Offshore	7/11/2025	931	2136	MI2	USA	47.224	-89.547	188	191	14.3	3.7	1.29
Offshore	7/11/2025	1147	2151	MI2	USA	47.154	-89.297	135	134	16.6	3.8	1.30
Offshore	7/12/2025	947	2115	MI3	USA	47.415	-88.438	191	197	12.6	3.7	1.35
Offshore	7/12/2025	1354	2128	MI1	USA	47.755	-88.745	224	225	9.0	3.6	1.38
Offshore	7/12/2025	1730	2134	MI1	USA	48.049	-88.258	237	241	5.7	3.6	1.35
Offshore	7/13/2025	937	2118	MI1	USA	47.874	-88.068	235	232	5.0	3.6	1.35
Offshore	7/13/2025	1213	2122	MI3	USA	47.854	-87.724	210	210	6.4	3.7	1.30
Offshore	7/13/2025	1616	2138	MI4	USA	47.510	-87.221	277	283	7.2	3.5	1.38
Offshore	7/14/2025	846	2150	MI5	USA	47.135	-87.379	125	123	12.8	3.8	1.37
Offshore	7/14/2025	1046	2154	MI5	USA	47.068	-87.166	168	170	12.7	3.7	1.34
Offshore	7/14/2025	1321	2152	MI5	USA	46.809	-87.031	138	138	16.4	3.8	1.35
Offshore	7/15/2025	914	2116	MI6	USA	46.751	-86.534	163	165	14.9	3.9	1.37
Offshore	7/15/2025	1246	2141	MI6	USA	47.124	-86.165	135	136	7.8	3.8	1.37
Offshore	7/15/2025	1508	2125	MI7	USA	47.100	-85.969	176	179	8.4	3.8	1.37
Offshore	7/16/2025	926	2148	MI7	USA	46.898	-85.532	145	148	9.5	3.8	1.38
Offshore	7/16/2025	1106	2039	MI7	USA	46.911	-85.419	84	88	12.3	3.9	1.35
Offshore	7/18/2025	1428	2137	ONT10	Canada	47.218	-85.103	183	198	9.1	3.7	1.35
Offshore	7/18/2025	1716	2121	ONT10	Canada	47.460	-85.264	257	266	9.2	3.6	1.35
Offshore	7/19/2025	947	2129	ONT10	Canada	47.653	-85.558	193	187	7.5	3.8	1.29
Offshore	7/19/2025	1216	2153	ONT10	Canada	47.414	-85.666	142	139	6.5	3.8	1.38

Survey	Date	Time	Location Code	Management Unit	Country	Mid-Latitude	Mid-Longitude	Begin Depth (m)	End Depth (m)	Surface Temperature (°C)	Bottom Temperature (°C)	Bottom Trawl Distance (km)
Offshore	7/19/2025	1535	2059	ONT10	Canada	47.700	-85.954	100	98	10.9	4.1	1.37
Offshore	7/20/2025	849	2145	ONT10	Canada	47.634	-86.110	135	133	10.5	3.8	1.37
Offshore	7/20/2025	1025	2165	ONT10	Canada	47.594	-86.225	121	124	9.5	3.8	1.37
Offshore	7/20/2025	1306	2126	MI6	USA	47.399	-86.470	284	301	8.7	3.7	1.35
Offshore	7/21/2025	1108	2119	ONT8	Canada	47.828	-86.699	253	251	8.1	3.6	1.37
Offshore	7/21/2025	1334	2135	ONT8	Canada	48.023	-86.631	137	133	6.7	3.7	1.37
Offshore	7/22/2025	1309	2139	ONT8	Canada	48.355	-86.979	172	178	7.5	3.7	1.34
Offshore	7/22/2025	1634	753	ONT4	Canada	48.715	-87.300	155	156	8.6	3.8	1.40
Offshore	7/23/2025	910	2155	ONT6	Canada	48.560	-87.763	144	139	12.1	3.8	1.35
Offshore	7/23/2025	1152	2127	ONT6	Canada	48.288	-87.659	213	220	7.7	3.7	1.37
Offshore	7/24/2025	917	2140	MI1	USA	48.114	-88.758	130	145	14.7	3.9	1.35