Report of the Lake Erie Forage Task Group
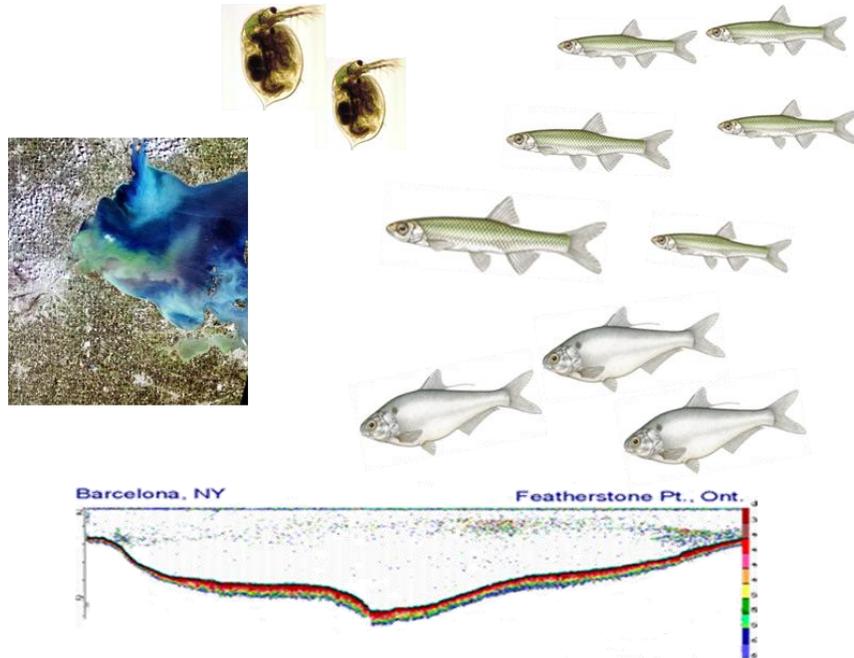
March 2026

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Presented to:
Standing Technical Committee
Lake Erie Committee
Great Lakes Fishery Commission

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Forage Task Group Executive Summary

Lake Erie Committee

REPRESENTING THE FISHERY MANAGEMENT AGENCIES OF LAKE ERIE AND LAKE ST. CLAIR

Introduction

The Lake Erie Committee Forage Task Group (FTG) report addresses progress made on four charges:

1. Report on the results of the interagency lower trophic level monitoring program and status of trophic conditions as they relate to the Lake Erie Environmental Priorities.
2. Describe the status and trends of forage fish in each basin of Lake Erie and evaluate alternate data sources and methods to enhance description of forage fish abundance.
   2.1. Describe forage fish abundance and status using trawl data.
   2.2. Report on the diets of important Lake Erie predator fish where available.
   2.3. Describe growth and condition of Walleye, Lake Trout, and Black Bass.
3. Continue hydroacoustic assessment of the pelagic forage fish community in Lake Erie.
   3.1. Report on annual hydroacoustic surveys, including the use of new methods in survey design and analysis following the GLFC's Great Lakes Hydro Acoustic Standard Operating Procedures.
   3.2. Explore autonomous technology integration into the survey design to increase program efficiency.
4. Act as a point of contact for any new/novel invasive aquatic species and incorporate into the USGS Nonindigenous Aquatic Species database.

The complete report is available from the Great Lakes Fishery Commission's Lake Erie Committee Forage Task Group website (http://www.glfc.org/lake-erie-committee.php) or upon request from a Lake Erie Committee, STC, or FTG representative.

Interagency Lower Trophic Level Monitoring

The Lower Trophic Level Assessment monitoring program has measured nine environmental variables at 18 stations around Lake Erie since 1999 to characterize trends in lake productivity. In 2025, lake productivity was down compared to 2024. The Trophic State Index, which is a combination of phosphorus levels, water transparency, and chlorophyll *a*, indicated that the Central Basin was within the targeted mesotrophic status. The West Basin remained in the above-target eutrophic classification. The East Basin offshore and nearshore areas were oligotrophic in 2025. Low hypolimnetic dissolved oxygen was not observed in this survey but continues to be an issue in the Central Basin during the summer months.
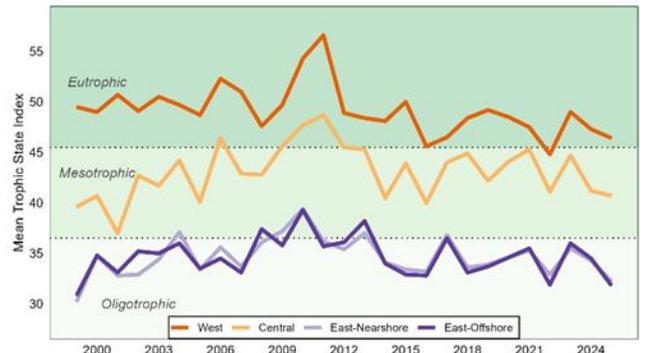
West Basin Status of Forage

In 2025, data from 67 trawl tows were used (down from 73 in 2024). Total forage density averaged 2,793 fish per hectare across the West Basin, similar to moderate levels for most years since 2019. Forage biomass (15.9 kg/ha) increased 16% from 2024. Age-0 White Perch abundance (1,471 fish/ha) declined for the second straight year. Age-0 Yellow Perch density (733 fish/ha) increased. Age-0 Gizzard Shad abundance (81 fish/ha) remained below the ten-year mean (332 fish/ha). Age-0 Alewife density (0.1 fish/ha) returned to minimal levels after a surprising 2024 (47 fish/ha). Densities of Emerald Shiners have remained low for a decade. Round Goby abundance (11 fish/ha) remained below the ten-year mean (27 fish/ha).
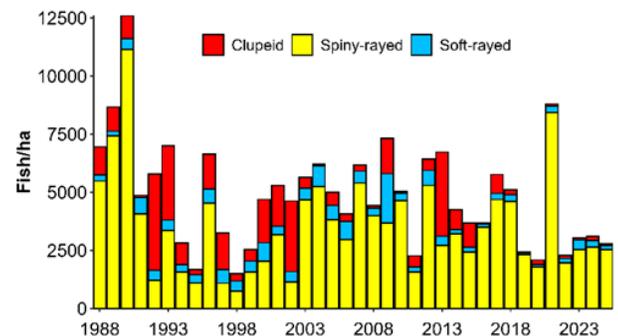
Central Basin Status of Forage

In 2025, 23 trawl tows were completed in the Ohio waters of the Central Basin. Total forage density averaged 349 fish per hectare across the Central Basin, well below the long-term mean. Total forage biomass was 5.286 kg/ha, like 2024. Age-0 Rainbow Smelt density increased slightly from 2024 and was well below the long-term average. Age-1+ Rainbow Smelt density increased slightly from 2024 and was well below the long-term mean. Round Goby indices decreased compared to 2024 but were still below the long-term mean. Spiny-rayed forage density (208 fish/ha) increased slightly from 2024. Age-0 Yellow Perch density decreased from 2024; these continue to be some of the lowest densities in the time series. Walleye densities were above the long-term mean.
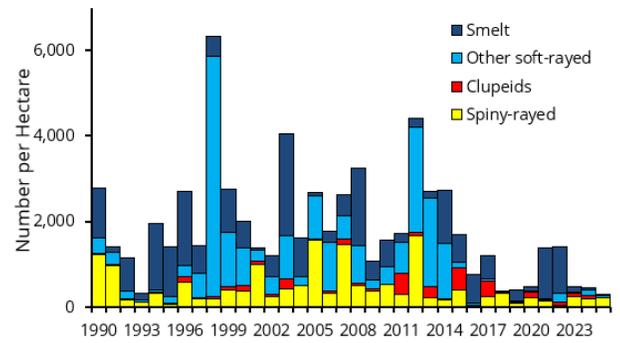
East Basin Status of Forage

In 2025, overall forage fish densities were below time series averages in New York and offshore Ontario waters. Total forage biomass was 4.8 kg/ha in New York and was the fourth lowest level in the time series. Catches of age-0 and age-1+ Rainbow Smelt were low in both New York and Ontario. Emerald Shiner catches of age-0 and age-1+ remain below the time series average in New York waters. Catches of Emerald Shiner in Ontario remain low in 2025. Round Goby densities were below average in New York but above average in Ontario. Abundance of Alewife (age-0 and age-1+) declined drastically in both New York and Ontario, likely due to a winter die-off. Catches of age-0 Walleye in New York were well above-average, while catches of age-1 Yellow Perch were below-average. Catch of age-0 Lake Whitefish was at the fourth highest level in the New York time series. Catches of most other species were low in New York. In Ontario waters, age-0 Yellow Perch and White Bass increased and abundance of Trout-perch remains high. Pennsylvania did not trawl in 2025.
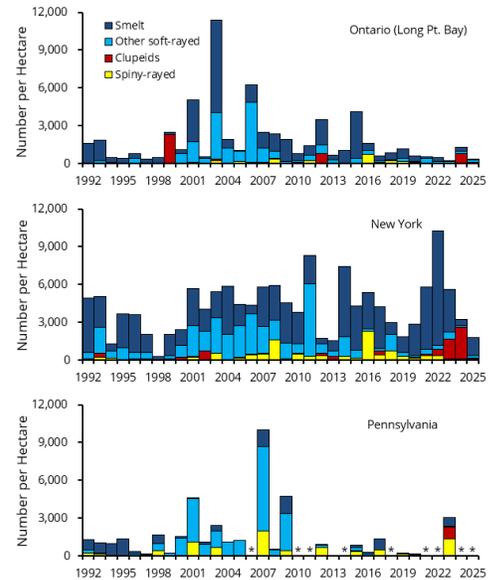
Hydroacoustic Assessments

The primary purpose of Lake Erie hydroacoustic surveys is to estimate densities of important forage fishes in each basin of Lake Erie in July during the new moon. After several years of comparison studies, the hydroacoustic surveys in Lake Erie adopted a common, stratified random transect design. Standardization of the survey design allows for results to be generated lake-wide and by basin. In 2025, a total of 450 km of transects were sampled, 66 water column profiles were measured, and 65 companion mid-water trawls were towed (the latter in the Central Basin only). Densities of fish (number per hectare) were highest in the East Basin, followed by the West Basin, and lowest in the Central Basin. In the East Basin, age-1+ Rainbow Smelt density declined sharply in 2025 relative to 2024. In the Central Basin, total density of fish remained low in 2025 but increased from 2024, with Rainbow Smelt being the most abundant single species in both the epilimnion and hypolimnion. In the West Basin, prey fish density decreased in 2025 and remains below the time series average.

Aquatic Invasive Species

In 2025, the USFWS Early Detection and Monitoring program did not capture any novel aquatic invasive species (AIS). No other Lake Erie agency encountered a novel AIS, either. However, the USFWS captured four Rudd (*Scardinius erythrophthalmus*) in September 2025 in Cleveland. According to the USGS Nonindigenous Aquatic Species (NAS) Database, this species was previously detected in Marblehead, OH in 2009 and in Ashtabula, OH in 2018. Additionally, one adult Rudd was reported to iNaturalist in Cleveland in 2021. USFWS also captured eight Threespine Stickleback (*Gasterosteus aculeatus*) across 3 sites in the St. Clair River in May 2025. The USGS NAS Database reports two other captures of this species in the Lake Erie basin: one near Toledo, OH in 1990, and one in Maumee Bay, OH in 1994. Lastly, a presumed Midas Cichlid (*Amphilophus citrinellus*) was found dead on a beach in Painesville, OH in August 2025 and reported to ODNR. The USGS NAS Database does not report any other captures of this species in the Lake Erie Basin. The FTG is continuing work towards incorporating the FTG Aquatic Invasive Species database as well as other agency data into the USGS NAS Database so that the data can be archived and help track AIS on a greater geographic scale.

Charges to the Forage Task Group 2025–2026

1. Report on the results of the interagency lower trophic level monitoring program and status of trophic conditions as they relate to the Lake Erie Environmental Priorities.

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    2.1. Describe forage fish abundance and status using trawl data.
    2.2. Report on the diets of important Lake Erie predator fish where available.
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3. Continue hydroacoustic assessment of the pelagic forage fish community in Lake Erie.

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4. Act as a point of contact for any new/novel invasive aquatic species and incorporate into the USGS Nonindigenous Aquatic Species database.

Acknowledgements

Charge 1: Report on the results of the interagency lower trophic level monitoring program and status of trophic conditions as they relate to the Lake Erie Fish Community Objectives.

(J. Markham, Z. Slagle)

Background

In 1999, the Forage Task Group (FTG) initiated the Lower Trophic Level Assessment program (LTLA) within Lake Erie and Lake St. Clair (Figure 1.0.1). Nine key variables, as identified by a panel of lower trophic level experts, were measured to characterize ecosystem change. These variables included temperature and dissolved oxygen profiles, water transparency (Secchi disc depth), nutrients (total phosphorus), chlorophyll *a*, phytoplankton, and zooplankton. The protocol called for each station to be visited every two weeks from May through September, totaling 12 sampling periods. For this report, we will summarize the last 26 years of data for summer surface temperature, summer bottom dissolved oxygen, chlorophyll *a* concentration, water transparency, total phosphorus, and zooplankton. Data from all sampled stations were included in the analysis unless noted. In 2025, stations 3–6 in the West Basin, 9–12 in the Central Basin, and 15-18 in the East Basin were sampled (Figure 1.0.1).

Lake Erie's Environmental Priorities (EP; LEC 2019), in prescribing actions that are critical for achievement of its Fish Community Objectives (Francis et al. 2020), describe desirable trophic conditions in Lake Erie. The EPs designate mesotrophic conditions in the West Basin, Central Basin, and nearshore waters of the East Basin and embayments as desirable. Conversely, an oligotrophic environment would most benefit the cold-water fish community that utilizes the deep, offshore waters of the East Basin (Ryan et al. 2003). Associated with these trophic classes are target ranges for total phosphorus, water transparency, and chlorophyll *a* (Table 1.0.1). For mesotrophic conditions, the total phosphorus range is 9–18 µg/L, summer (June-August) water transparency is 3–6 meters, and chlorophyll *a* concentrations between 2.5–5.0 µg/L (Leach et al. 1977). For the offshore waters of the East Basin, the target for total phosphorus is < 9 µg/L, summer water transparency > 6 m, and chlorophyll *a* concentrations < 2.5 µg/L.

A trophic state index (TSI; Carlson 1977) was used to produce a metric which merges three independent variables to report a single broad measure of trophic conditions. This index uses algal biomass as the basis for trophic state classification, which is independently estimated using measures of chlorophyll *a*, water transparency, and total phosphorus. Each independent measure is scored, and the average of the three indices reflects a trophic state value for that site and sampling event. The median value of the combined daily indices is used to determine an annual index for each basin. Because the number generated is only a relative measure of the trophic conditions and does not define trophic status, this index was calibrated to accept Lake Erie ranges for values of total phosphorus, chlorophyll *a*, and transparency (from Leach et al. 1977) that have long been used to assess

trophic conditions. In these terms, oligotrophic was determined to have a TSI < 36.5, mesotrophic between 36.5 and 45.5, eutrophic between 45.5 and 59.2, and hyper-eutrophic >59.2.

Mean Summer Surface Water Temperature

Summer surface water temperature represents the temperature of the water at 0–1 meters depth for offshore stations only. This index should provide a reliable measure of relative system production and growth rate potential for fishes, assuming prey resources are not limiting. Mean summer surface temperatures across all years are warmest in the West Basin (mean = 22.9 °C), becoming progressively cooler in the Central (mean = 21.9 °C) and East basins (mean = 20.6 °C; Figure 1.0.2). In 2025, the mean summer surface water temperature was above long-term averages in the West (23.5 °C) and East (21.1 °C) basins. In the Central Basin, the mean summer surface water temperature was 21.9 °C, which matches the time series average. An increasing trend in summer surface water temperature is evident in all three basins for this time series (Figure 1.0.2).

Hypolimnetic Dissolved Oxygen

Dissolved oxygen (DO) levels less than 2.0 mg/L are deemed stressful to fish and other aquatic biota (Craig 2012; Eby and Crowder 2002). Low DO can occur when the water column becomes stratified, which can begin in early June and continue through September in the Central and East basins. In the West Basin, shallow depths allow wind mixing to penetrate to the bottom, generally preventing thermal stratification. Consequently, there are only a few summer observations that detect low bottom DO concentrations in the time series (Figure 1.0.3). In 2025, there were no observed measurements from the West Basin stations of DO below the 2.0 mg/L threshold. However, there was widespread hypoxia during July 14-15, which affected the ODNR's West Basin trawl survey, likely causing an outlier catch of 31,824 individual fishes.

Low DO is more of an issue in the Central Basin, where it happens almost annually at the offshore stations (8, 10, and 11) and occasionally at nearshore stations (Figure 1.0.3). Dissolved oxygen of less than 2.0 mg/L has been observed as early as mid-June and can persist until late September when fall turnover remixes the water column. In 2025, bottom DO was below the 2.0 mg/L threshold in the Central Basin on only one occasion (Station 10: 8/11/2025 – 0.32 mg/L; Figure 1.0.3).

DO is rarely limiting in the East Basin due to greater water depths, a large hypolimnion, and cooler water temperatures. The only occasion when DO was below the 2.0 mg/L threshold was on July 14 and August 13, 2010 (Figure 1.0.3). In 2025, East Basin bottom DO measurements ranged between 6.58–14.13 mg/L and were never below the 2.0 mg/L threshold.

Chlorophyll a

Chlorophyll *a* concentrations indicate biomass of the phytoplankton resource, ultimately representing production at the lowest trophic level. In the West Basin, mean chlorophyll *a* concentrations have mostly been above targeted levels in the time series, signifying eutrophic status rather than the targeted mesotrophic status (Figure 1.0.4). Annual variability is also the highest in the West Basin. In 2025, the mean chlorophyll *a* concentration was 4.1 µg/L in the West Basin, which is classified as mesotrophic, within the targeted mesotrophic range. In the Central Basin, chlorophyll *a* concentrations have historically been less variable and within the targeted mesotrophic range; in 2025, Central Basin chlorophyll *a* mean concentration returned to mesotrophic status after the first eutrophic classification in 2024 (2025 mean = 4.3 µg/L; Figure 1.0.4). In the East Basin, chlorophyll *a* concentrations in the nearshore waters have been below the targeted mesotrophic level for the entire time series, including in 2025 (1.9 µg/L; Figure 1.0.4). Chlorophyll *a* levels in the offshore waters of the East Basin remain in, or slightly above, the targeted oligotrophic range (2025 = 2.4 µg/L). Relative to the other basins, chlorophyll *a* concentrations remain the most stable in the East Basin.

Total Phosphorus

Total phosphorus levels in the West Basin have exceeded EP targets since the beginning of the LTLA monitoring program; in some years, they have been in the hyper-eutrophic range (Figure 1.0.5). Mean total phosphorus concentrations in the West Basin increased for the third year in a row to 28.7 µg/L in 2025, remaining in eutrophic status. In the Central Basin, mean total phosphorus levels had exceeded FCO targets from 2006 through 2013, were borderline mesotrophic/eutrophic in 2014 and 2015, and then began to increase again in 2016 (Figure 1.0.5). Mean total phosphorus concentration in the Central Basin slightly increased in 2025 to 12.7 mg/L, classified as mesotrophic status. In the nearshore waters of the East Basin, total phosphorus levels have remained stable and within or near the targeted mesotrophic range for the entire time series (Figure 1.0.5). Total phosphorus levels in the offshore waters of the East Basin show a similar trend to nearshore waters and had risen above the targeted oligotrophic range from 2008 through 2013 but have declined in more recent years. In 2025, mean total phosphorus concentration decreased in both nearshore (6.9 µg/L) and offshore (7.7 µg/L) waters of the East Basin, both in the oligotrophic range which is within target for offshore waters but below target for the nearshore.

Water Transparency

In 2025, Secchi depths declined (i.e., became more turbid) across most basins of Lake Erie (Figure 1.0.6). Similar to other fish community ecosystem targets (i.e., chlorophyll *a*, total phosphorus), water transparency in the West Basin has been in the eutrophic range for the entire time series. Mean summer transparency in the West Basin was 2.3 m in 2025, similar to 2024 (2.2 m). In contrast, water transparency in the Central Basin has remained within the targeted mesotrophic range for most of the entire series (Figure 1.0.6). In 2025, water transparency decreased to 4.0 m. In the nearshore waters of the East Basin in 2025, water transparency (5.7 m) was in the mesotrophic range and within the FCO target (Figure 1.0.6). In the offshore waters of the East Basin, water transparency was within the oligotrophic target from 1999 through 2007, decreased into the mesotrophic range in five of the next six years, then increased thereafter. In contrast to the nearshore waters, water transparency in the offshore waters increased in 2025 (6.8 m) and fell within the oligotrophic range, returning to within the FCO target.

Trophic State Index (TSI) and Ecosystem Targets

The trophic state index for each Lake Erie basin has fluctuated over time (Figure 1.0.7), although none changed from 2024 to 2025. Median TSI values indicate that the West Basin remained in a eutrophic status from the beginning of the entire time series until 2016, which was more favorable for a centrarchid (black bass and sunfish) fish community. In some years, overall measures of productivity declined and were near or within the targeted mesotrophic status (2016 and 2022), which is more favorable for percid (Walleye and Yellow Perch) production. Central Basin waters have generally remained within the targeted mesotrophic range for the entire time series. Nearshore waters of the East Basin were mostly below the targeted mesotrophic range in the early years of the time series, increasing into the targeted mesotrophic zone in the late-2000s, then decreasing back into oligotrophic status since 2014. Offshore waters of the East Basin show a similar trend. TSI values for 2025 indicate eutrophic status in the West Basin (46.4), mesotrophic status in the Central Basin (40.7), and oligotrophic status in both the offshore (31.8) and nearshore (32.2) waters of the East Basin (Table 1.0.2). Trends in trophic status measures indicate that Lake Erie continues to decrease in overall productivity but generally remains in a favorable condition for percid production.

Zooplankton Biomass

Average zooplankton biomass varies across basins and among years and has recently only been measured in the West and Central basins. In the West Basin, the 2025 average biomass was 20.7 mg/m^3, a sharp decrease from 2025 (73.0 mg/m^3) and below the time series average of 136.1 mg/m^3 (Figure 1.0.8). This decline has been driven by lower biomass of cladocerans for two straight years (from 71.8 mg/m^3 in 2023 to 14.8 mg/m^3 in 2025). In the Central Basin, the 2025 average zooplankton biomass was 26.0 mg/m^3, which was well below the average time series biomass (135.3 mg/m^3). This represented a sharp decline from 2024 (103.2 mg/m^3; Figure 1.0.8). This decline was also driven by lower cladoceran biomass (from 62.5 mg/m^3 in 2023 to only 8.6 mg/m^3 in 2025). In the East Basin, overall zooplankton biomass is traditionally lower compared to the Central and West basins with cladocerans and calanoid copepods equally important (Figure 1.0.8). OMNR collected zooplankton samples in 2023 but has not yet received data yet, thus no data from 2023–present is available for sites 15–16. NYSDEC had a backlog of zooplankton data (2023–2025) that were added to the database this year. Over these years, zooplankton biomass was low but constant (mean = 36.9 mg/m^3 compared to a mean of 57.9 mg/m^3 from 2000–2022).

Table 1.0.1: Thresholds for trophic indicators and the trophic state index associated with each trophic state and fish community (Carlson 1977; Leach et al. 1977; Ryder and Kerr 1978).

Trophic status	Phosphorus (ug/L)	Chlorophyll *a* (ug/L)	Secchi depth (m)	Trophic State Index	Harmonic fish community
Oligotrophic	<9	<2.5	>6	<36.5	Salmonids
Mesotrophic	9–18	2.5–5.0	3–6	36.5–45.5	Percids
Eutrophic	18–50	5.0–15.0	1–3	45.5–59.2	Centrarchids
Hypereutrophic	>50	>15.0	<1	>59.2	Cyprinids

Table 1.0.2: Current trophic status, by basin, for Lake Erie in 2025.

Basin	2025 TSI	2025 Trophic Status
West	46.4	Eutrophic
Central	40.7	Mesotrophic
East-Nearshore	32.2	Oligotrophic
East-Offshore	31.8	Oligotrophic
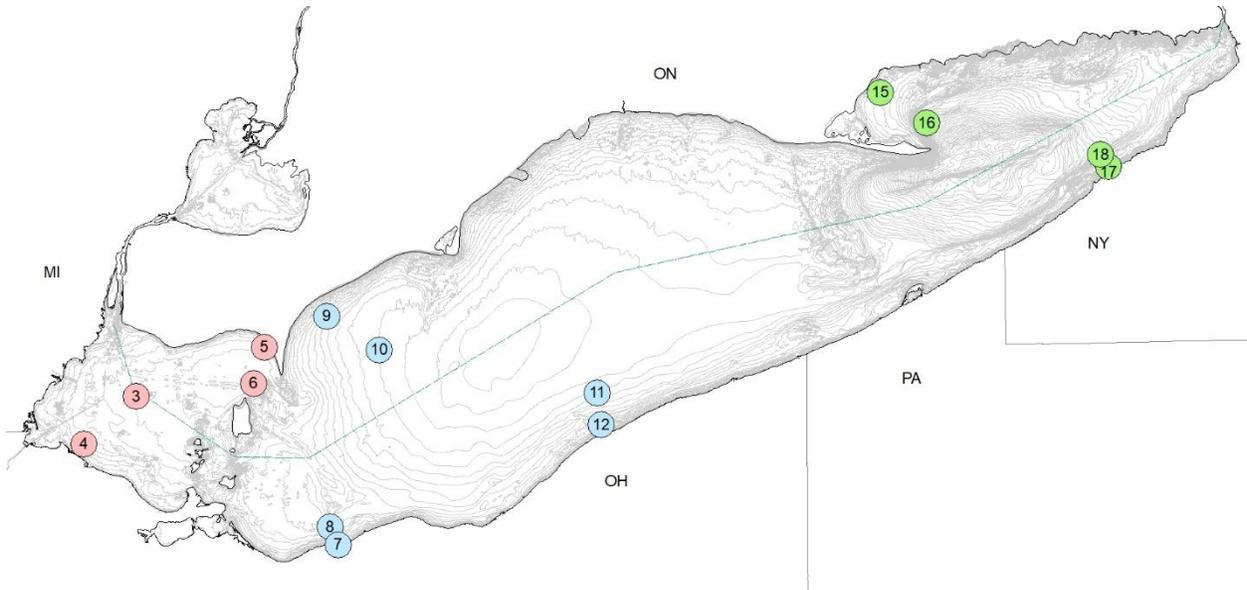
Figure 1.0.1: Lower trophic level sampling stations in Lake Erie (red = West Basin, blue = Central Basin, and green = East Basin).
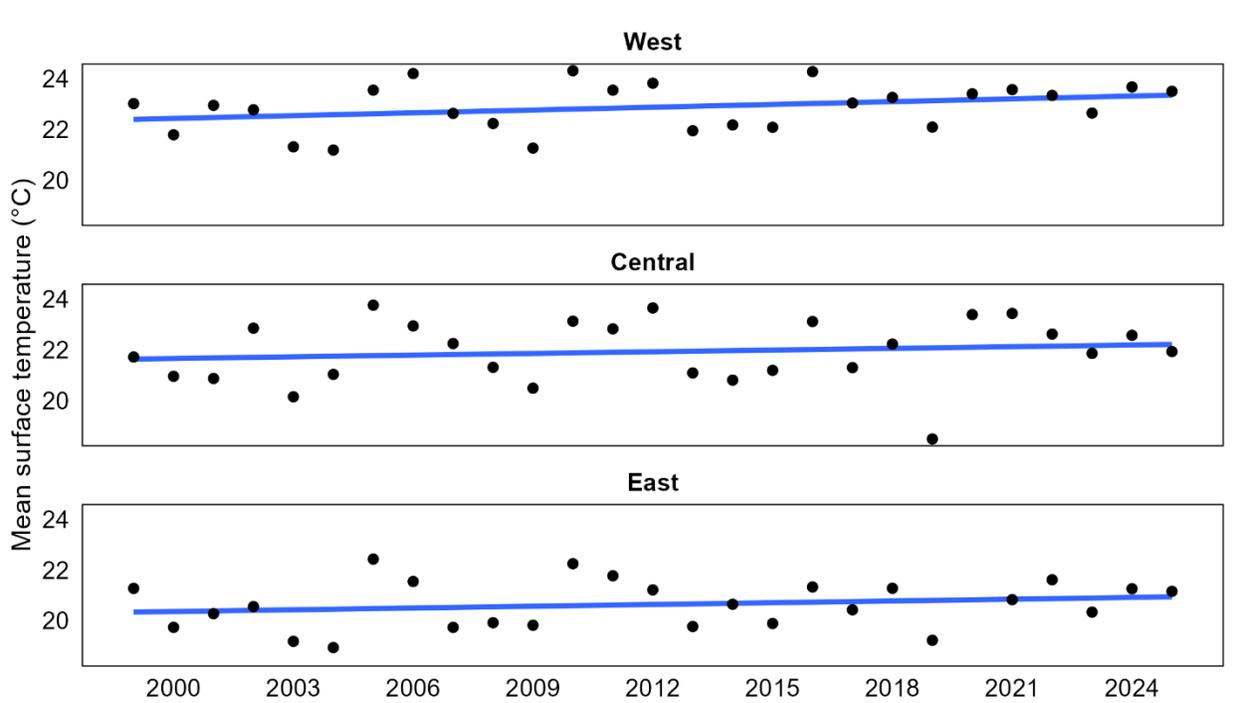
Figure 1.0.2: Mean summer (June-August) surface water temperature (°C) at offshore stations weighted by month for each basin in Lake Erie, 1999–2025. Solid blue lines represent linear models of time series trends.
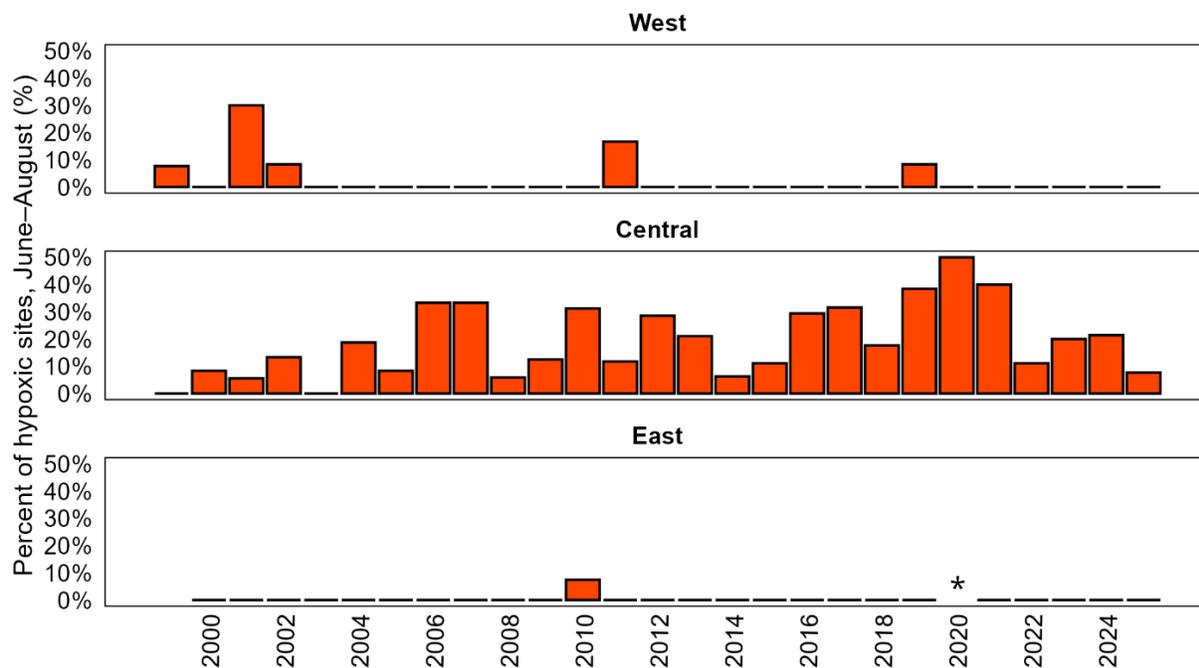
Figure 1.0.3: Annual percent of summer (June-August) offshore sampling events where hypoxic conditions (dissolved oxygen <2.0 mg/L) were measured, by basin in Lake Erie, 1999–2025. Years of missing data are denoted with asterisks (*).
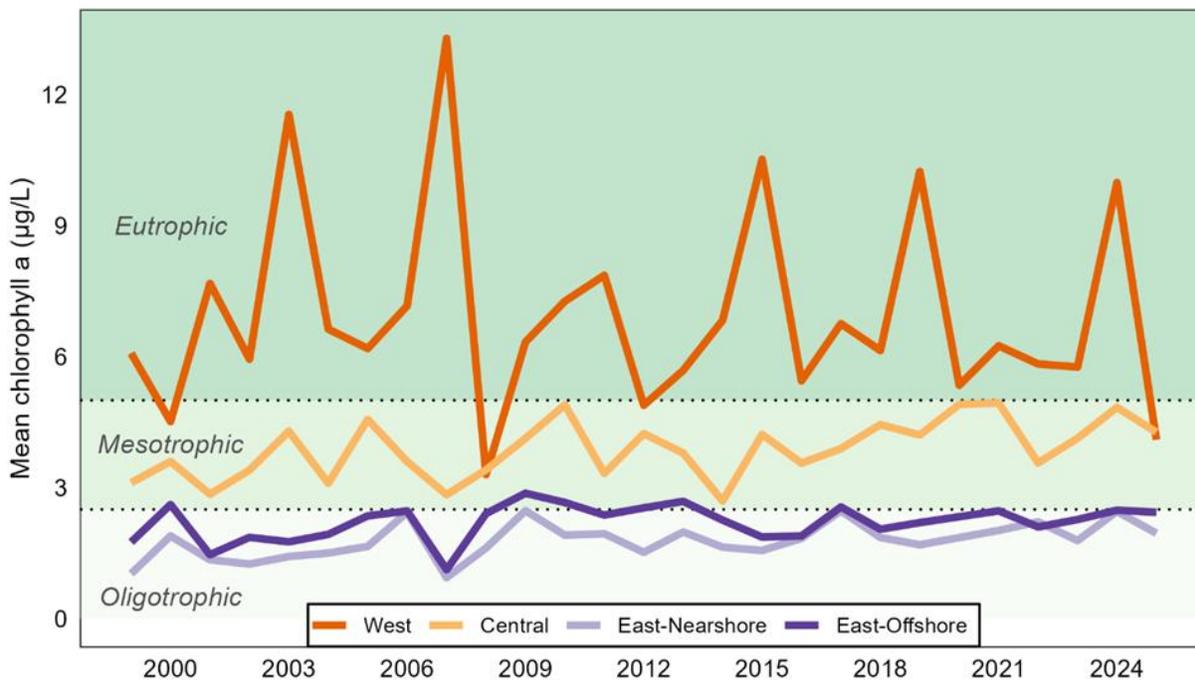
Figure 1.0.4: Mean chlorophyll *a* concentration (μg/L), weighted by month, for each basin in Lake Erie, 1999–2025. The East Basin is separated into nearshore and offshore. Shaded areas represent trophic class ranges.
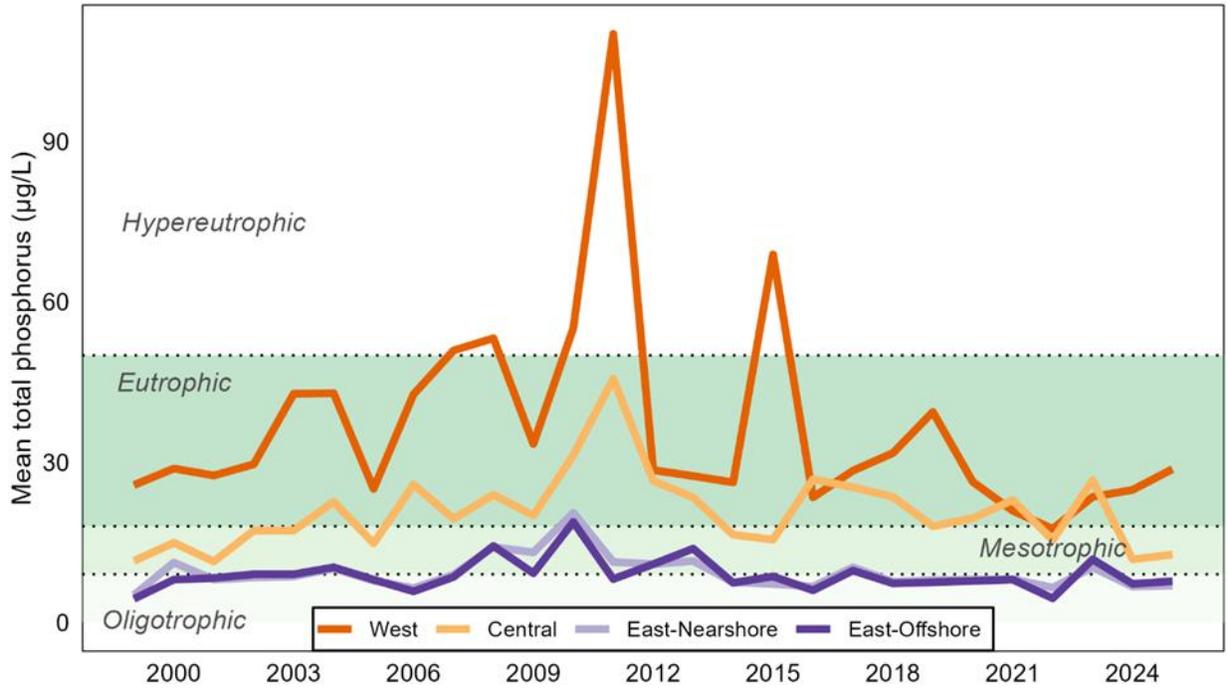
Figure 1.0.5: Mean total phosphorus (μg/L), weighted by month, for offshore sites in each basin of Lake Erie, 1999–2025. The East Basin is separated into nearshore and offshore. Shaded areas represent the trophic class ranges.
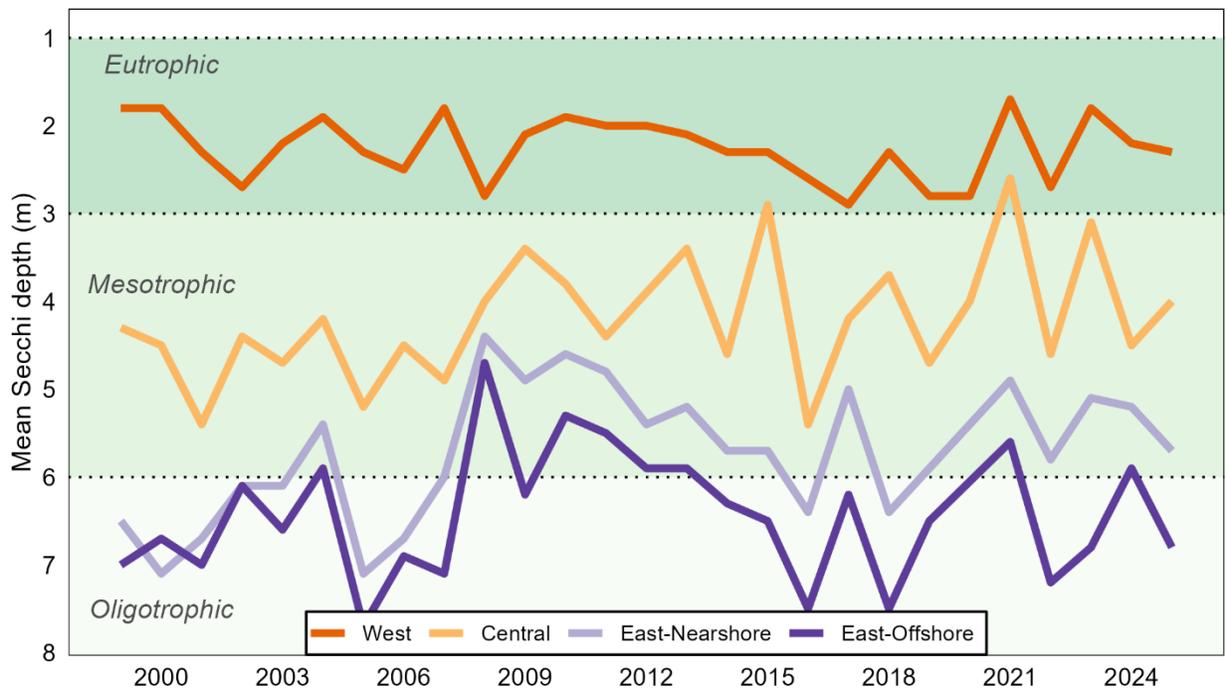
Figure 1.0.6: Mean summer (June–August) Secchi depth (m), weighted by month in each basin of Lake Erie, 1999–2025. The East Basin is separated into nearshore and offshore. Shaded areas represent the trophic class ranges.
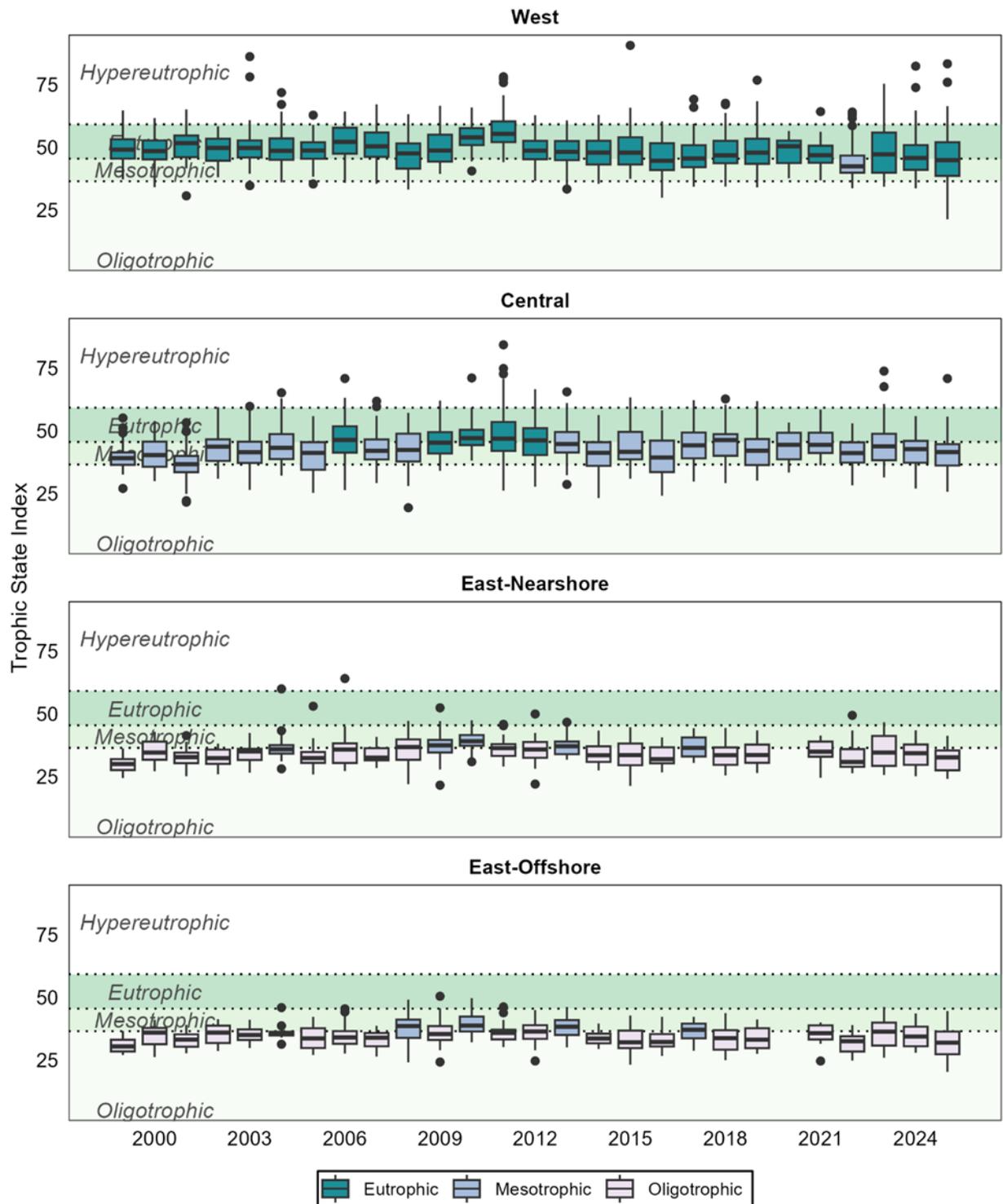
Figure 1.0.7: Box and whisker plot of trophic state indices by basin in Lake Erie, 1999–2025. Shaded areas represent trophic class ranges. Boxes indicate 25th and 75th quartiles of the values with the median (thicker line). Vertical lines show the range of values with individual points representing outliers.
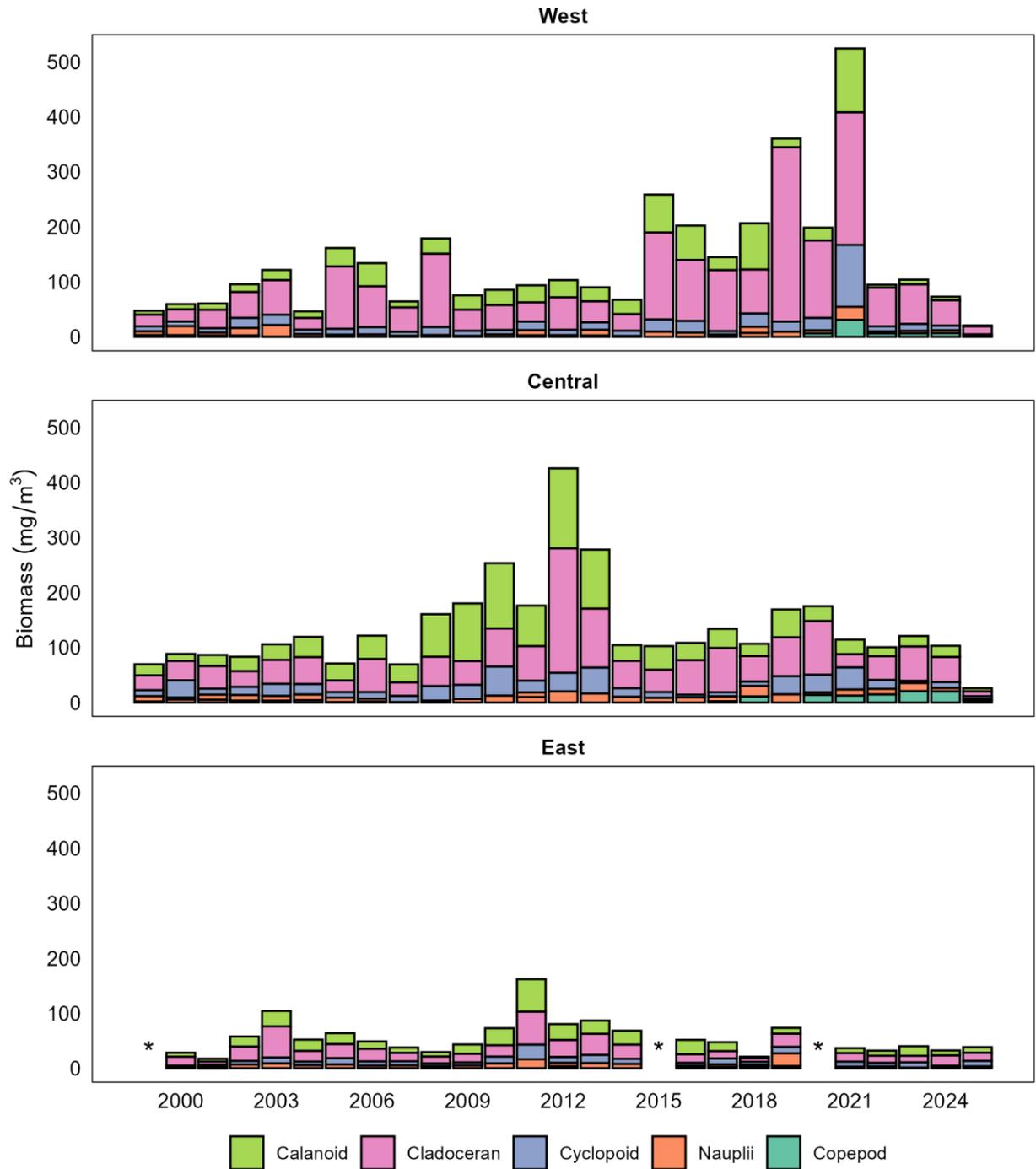
Figure 1.0.8: Average zooplankton biomass (mg/m^3) by major taxonomic group by basin, 1999–2025. Years of missing data are denoted with asterisks (*). Data excludes rotifers and veligers. Harpacticoid zooplankton comprise a miniscule biomass for most years and are not included in the graph. NYSDEC data for 2023–2025 were added for this report.

Charge 2: Describe the status and trends of forage fish in each basin of Lake Erie and evaluate alternate data sources and methods to enhance description of forage fish abundance.

Note: A full species list and their scientific names can be found in Appendix 1.

2.1: Describe forage fish abundance and status using trawl data.

For reporting purposes, species are pooled into three or four functional groups, following Knight et al. (1984): clupeids (age-0 age classes of Gizzard Shad and Alewife); soft-rayed fish (all age classes of Rainbow Smelt, Emerald Shiner, Spottail Shiner, other leucicids, Silver Chub, Trout-perch, and Round Goby); and spiny-rayed fish (age-0 age classes of White Perch, White Bass, Yellow Perch, Walleye, and Freshwater Drum). In the Central and East basins, Rainbow Smelt are broken out of soft-rayed fish due to their importance in those basins. Total forage is calculated by summing these functional groups.

2.1.1   East Basin Status of Forage (J. Ludwig, A. Bonsall, M. Hosack)

Forage fish abundance and distribution is determined primarily from long-term bottom trawl assessments conducted by the basin agencies (also see East Basin Hydroacoustic Survey, Section 3.1). In 2025, a total of 34 trawl tows were sampled across New York waters and 110 trawl tows in the nearshore (n = 70) and offshore (n = 40) waters of Long Point Bay in Ontario (Figure 2.1.1.1). Pennsylvania did not trawl in 2025.

In 2025, overall forage fish densities were below time series averages in New York and offshore Ontario waters (Figure 2.1.1.2). Total forage biomass (4.8 kg/ha) was fourth lowest in the time series in New York. Rainbow Smelt is typically the most abundant forage species in most years and jurisdictions. In 2025, Rainbow Smelt catches were dominated by age-0 individuals in New York, but overall abundance was minimal. The age-0 index in New York was below the time series average. In Ontario, catches continue to be primarily composed of age-0 individuals with low densities of age-1+ Rainbow Smelt. Age-0 and age-1+ Emerald Shiner catches were below average in 2025 in all surveys. Round Goby, an important species in the East Basin forage fish community since it appeared in the late 1990s, peaked in the mid-2000s and have since generally remained at a lower but stable abundance in all jurisdictions. The abundance of Round Goby remained below average in New York in 2025 but has remained slightly above average in Ontario. Clupeid species [Gizzard Shad, Alewife] abundance was well below average in both the New York and Ontario time series after record high Alewife abundances in 2024. These declines appear to be the result of a major winter die-off. Alewife die-offs are common in certain areas of the Great Lakes, with severity influenced by lake bathymetry, winter weather conditions, and overall abundance (Weidel et al. 2025). New York recorded its fourth highest abundance of age-0 Lake Whitefish in their time series in 2025 but below average catches of age-1 Yellow Perch. Catches of age-0 Yellow Perch in offshore Ontario waters were above average in 2025, while catches of age-1

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Yellow Perch were below average. Catches of most other species were low in 2025, although White Bass increased in Ontario waters and Trout-perch remain high in that region.

2.1.2   Central Basin Status of Forage (P. Jenkins, M. Hosack)

Central Basin bottom trawl surveys to assess age-0 percid and forage fish abundance and distributions began in Pennsylvania in 1982 and in Ohio in 1990. Trawl locations in Pennsylvania range from 13 to 24 m in depth and Ohio trawl locations range from 5 to >20 m in depth (Figure 2.1.2.1). Ohio covers the area from Lorain, Ohio to the Pennsylvania state line. Methods for this survey can be found in the appendix of the ODNR Lake Erie Data Report (Ohio Division of Wildlife 2025). The Pennsylvania survey covers the area from the Pennsylvania state line to Erie. In 2025, only 23 trawl tows were completed in Ohio due to persistent, unfavourable weather conditions. Pennsylvania did not trawl in 2025. Ontario began bottom trawling the Central Basin in 2016 and data from this program will be included in future Forage Task Group reports.

Overall, Central Basin forage abundance was low in Ohio waters. Rainbow Smelt densities were very similar to 2024 (Figure 2.1.2.2). The density of spiny-rayed fishes increased by 18% relative to the 2024 density. Clupeid density decreased 96% relative to their 2024 density. Other soft-rayed fish density decreased 66% relative to their 2024 density. Age-0 and age-1 Yellow Perch densities decreased in 2025 relative to 2024 and continue to be some of the lowest in the time series. Age-0 walleye densities increased from 2024 rising above the long term mean and age-1+ declined compared to 2024 and was below the long-term mean.

2.1.3   West Basin Status of Forage – Interagency (Z. Slagle)

Background

Annual interagency bottom trawling has been conducted in August within the Ontario and Ohio waters of the West Basin, Lake Erie since 1987, though missing effort data from 1987 has resulted in the use of data since 1988. In 2003, an interagency trawl comparison exercise was conducted that allows catches to be standardized across vessels using Fishing Power Correction (FPC) factors and basin-wide estimates to be calculated (Tyson et al. 2006; FTG 2001, 2017). To estimate forage abundance, species are first enumerated by age class in each trawl based on total length. Trawls are then filtered to remove catches where the trawl net was damaged or hung on the bottom. Since 2009, trawls beginning with bottom dissolved oxygen <2.0 mg/L have also been removed as an "interim policy" to deal with hypoxia (FTG 2012). Catches are then divided by area fished (square metres of bottom, calculated by multiplying vessel-specific wing widths from SCANMAR estimates and GPS-measured distance travelled while trawling with the net assumed to be on bottom) to yield catch/m^2 (catch per effort, CPE). Arithmetic mean CPE is then converted to hectares and averaged by depth (0–6 m and >6m) and country (US/CAN) strata. CPE by strata are

multiplied by strata areas and summed to yield a basin-wide total abundance and are then divided by total basin area to yield basin-wide catch per hectare.

To estimate species biomass, a similar process to the abundance calculation is conducted. On deck, a minimum of 30 fish by species and age class are measured for total length. In summary calculations, a length for each unmeasured fish is randomly drawn from a normal distribution with mean and standard deviation calculated from the measured fish within the specific trawl-species-age class combination. Biomass (in grams) is then estimated for each fish (measured and unmeasured) by applying a species-age-class specific length-weight regression generated from historical data.

2025 Results

In 2025, hypolimnetic dissolved oxygen levels were not below the 2.0 mg/L threshold (i.e., hypoxic) at any sites during the August trawling survey. Ohio skipped six sites due to poor weather. In total, data from 67 sites were used in 2025, which is down from 73 in 2024 (Figure 2.1.3.1).

Total forage density in 2025 was similar to 2024 and has been relatively constant for eight years (Figure 2.1.3.2; Table 2.1.3.1; note that the 2021 high abundance was likely influenced by a hypoxia-induced outlier catch of forage fishes). Total forage density averaged 2,793 fish/ha across the West Basin, which is 31% below the ten-year mean (4,041 fish/ha). Spiny-rayed density decreased 4% from 2024. Soft-rayed species abundance dropped 36% and is 19% below the ten-year mean. Clupeid density declined 57% from 2024. Clupeid density was 81 fish/ha (ten-year mean 336 fish/ha), soft-rayed fish density was 180 fish/ha (mean 221 fish/ha), and spiny-rayed fish density was 2,533 fish/ha (mean 3,484 fish/ha). Age-0 White Perch (53%), Yellow Perch (26%), Walleye (5%), and Freshwater Drum (4%) made up the majority of forage fish abundance.

Total forage biomass (15.9 kg/ha; Figure 2.1.3.3) increased 16% from 2024 (13.9 kg/ha). Spiny-rayed prey biomass (14.1 kg/ha) increased 28% from the previous year. Soft-rayed forage (1.0 kg/ha) and clupeid biomass (0.8 kg/ha) each declined 32%, contrasting with their ten-year means of 0.7 and 2.8 kg/ha, respectively. Biomass of Age-0 White Perch (7.5 kg/ha) was near the ten-year mean (9.2 kg/ha), while Yellow Perch biomass (2.9 kg/ha) was above the ten-year mean (2.1 kg/ha). Age-0 Gizzard Shad biomass (0.8 kg/ha) was well below the ten-year mean (2.8 kg/ha).

Recruitment of individual species remains highly variable in the West Basin (Table 2.1.3.2). Age-0 Walleye density in 2025 (128 fish/ha) returned to above the ten-year mean (119 fish/ha; Figure 2.1.3.4). Age-0 Yellow Perch density (732 fish/ha; Figure 2.1.3.4) was above the ten-year mean (662 fish/ha). Age-0 White Perch density (1,471 fish/ha) was below the ten-year mean (2,543 fish/ha) in 2025 (Figure 2.1.3.5). Age-0 Gizzard Shad density (81 fish/ha) remained well below the ten-year mean (332 fish/ha), continuing a trend of low

abundance (Figure 2.1.3.5). Densities of age-0 (1.2 fish/ha) and age-1+ Emerald Shiners (0.1 fish/ha) were again nearly non-existent, with minimal densities for ten straight years (Figure 2.1.3.6). Round Goby (all ages) declined in density (11 fish/ha). Age-0 Alewife density (0.1 fish/ha) returned to minimal levels after an explosion in 2024 (47 fish/ha). Age-0 White Bass (99 fish/ha), age-0 Mimic Shiner (62 fish/ha), and age-1+ Yellow Perch (48 fish/ha) were the remaining species with large proportional increases from 2024.

2.1.4   West Basin Status of Forage – Michigan (J.-M. Hessenauer)

Michigan initiated a trawling program to assess the forage and age-0 sportfish community in Michigan waters of Lake Erie in August of 2014. This assessment samples eight, two-minute index grids for one five- or ten-minute tow, typically sampling an area of approximately 0.2-0.4 ha depending on tow time. The otter trawl has a 10-meter head rope and 9.5-mm terminal mesh and is deployed with a single warp and 45.7-meter bridle. In 2025, all eight sites (Figure 2.1.3.1) were sampled on August 4 and 5, 2025. Additionally, information on the consumption of forage species is obtained by sampling the diets of adult Walleye captured as part of the trawl survey as well as an annual gill net survey. The Michigan gill net survey occurred from September 30 to October 2, 2025.

The 2025 trawl survey captured 3,207 forage-sized individuals per hectare trawled, up 22.3% from 2024 and 4.8% from the 2014-2024 average (Figure 2.1.4.1; Table 2.1.4.1). Age-0 Yellow Perch (1,890 per ha trawled) and age-0 White Perch (1,144 per ha trawled) were the two most abundant species in the catch (Tables 2.1.4.1 & 2.1.4.2), comprising a combined 94.6% percent of the catch by number. Yellow Perch were up 372% from 2024, while White Perch were down 29.8% from 2024. Catches of most other species were down, some sharply from 2024 (Table 2.1.4.1). Spottail Shiner were the most abundant soft-rayed species and were captured at a rate of 70.6 per ha trawled, down 24.2% from 2024 but 62.3% above the 2014-2024 mean. Gizzard Shad were down 74.8% from 2024 and 75.4% from the 2014-2024 mean. Silver Chub were captured at a rate of 15.4 per ha trawled, down 60.5% from the record catch observed in 2024. Catches of Round Goby declined nearly 85% from 2024 and were 81.2% below the 2014-2024 mean catch. Age-0 Walleye catch was 21 fish per hectare up 76.5% from 2024 but 14.2% below the 2014-2024 mean (Table 2.1.4.2).

2.1.5 **Rainbow Smelt Commercial Harvest** (A. Bonsall)

A commercial trawl fishery for Rainbow Smelt has existed within the Ontario waters of Lake Erie since the early 1960s (MacCallum and Regier 1970). Rainbow Smelt are managed according to five statistical districts (OE-1 to OE-5), which form three quota areas (QA-1 to QA-3). QA-1 and QA-2 are equivalent to OE-1 and OE-2, respectively. QA-3 is the largest quota area and is formed from districts OE-3 to OE-5. A Daily Catch Report (DCR) program is in place to provide information on commercial harvest. The OMNR also samples Rainbow Smelt from the commercial fishery to obtain biological information such as length, weight, age, and maturity.

The lake-wide quota of Rainbow Smelt allocated to the commercial fishery in 2025 was 12,428,883 lbs. Total landings of Rainbow Smelt from Ontario waters declined 57% to 2.2 million lbs. in 2025 (Figure 2.1.5.1), which represented 18% of the allocated quota. The harvest was mainly taken from OE-4 (98%) and OE-5 (2%). Age-2 Rainbow Smelt contributed most to the harvest (56%), followed by age-1 (24%), age-3 (18%), and age-4 fish (2%).

2.2: Report on the use of forage fish in the diets of selected commercially or recreationally important Lake Erie predator fish.

2.2.1 Black Bass

West and Central Basin – Ohio (Z. Slagle)

Smallmouth Bass diet percent occurrence (n = 83) in 2025 was dominated by Round Goby (83%), which is typical for the species (Figure 2.2.1.1). White Perch (13%) made up much of the remainder of gut contents. These data come from the ODNR Smallmouth Bass gill net survey (September of each year in West and Central basins).

Largemouth Bass diets (n = 47) are more varied than Smallmouth Bass, with six distinct prey species identified in 2025 (excluding lures and unidentified fishes; Figure 2.2.1.2). Round Goby (60%) made up the majority of stomach contents by percent occurrence, but White Perch (21%) and crayfish (infraorder Astacidea; 8%) also made significant contributions. These data come from the ODNR nearshore electrofishing survey (June–August of each year in West and Central basins). Methods for both surveys can be found in the appendix of the ODNR Lake Erie Data Report (Ohio Division of Wildlife 2025).

2.2.2 Lake Trout

East Basin – New York (J. Ludwig)

Lake Trout diet information was collected from fish caught in New York waters during August 2025 (n = 52) as part of the interagency cold-water gill net assessment survey in the East Basin of Lake Erie. Rainbow Smelt have traditionally been the main prey item for Lake Trout, typically comprising 80–90% of Lake Trout diet items. Round Goby became a common prey item since they invaded the East Basin of Lake Erie in the early 2000s and in years of lower adult Rainbow Smelt abundance, Lake Trout prey more on Round Goby. In 2025, Round Goby were the prominent prey fish for Lake Trout, occurring in 64% of the non-empty stomachs. Rainbow Smelt was the next most common species (24%), followed by Yellow Perch (12%; Figure 2.2.2.1). The 'other fishes' group, which is comprised mostly of unidentifiable fish remains, was found in 29% of non-empty stomachs.

2.2.3 Walleye

West Basin – Michigan (J.-M. Hessenauer)

During August trawls, a total of 10 Walleye were sampled for stomach contents, of these 70% had non-empty stomachs (Table 2.2.3.1). Unidentifiable fish remains (73%) were the most abundant items in non-empty stomachs. Gizzard Shad were the only identifiable fish species and were found in 9% of stomachs. During the October gill net survey, 199

Walleye were sampled of which 52% contained food items (Table 2.2.3.2). Digested liquid was the most abundant diet item (74%), followed by unidentifiable fish remains (21%). Gizzard Shad, White Perch, Emerald Shiners, and Yellow Perch were also observed at low frequencies.

West and Central Basin – Ohio (Z. Slagle)

Walleye diets in the fall of 2025 were comprised mostly of clupeids (65%; mostly Gizzard Shad), typical for the time of year (Figure 2.2.3.1). Unidentified fishes (26%) made up much of the remainder. Alewife disappeared from Walleye diets after making up 11% in 2024. Unidentified *Notropis* (4%) and Round Goby (3%) made up much of the remainder. Empty stomachs were excluded from the analysis. These data come from the ODNR fall gill net survey (September–October of each year in West and Central basins). Methods can be found in the appendix of the ODNR Lake Erie Data Report (Ohio Division of Wildlife 2025).

East Basin – New York (J. Ludwig)

Beginning in 1993, annual summertime (June–August) visits were made to fish cleaning stations by the NYSDEC to gather stomach content information from angler-caught Walleye in the New York waters of Lake Erie. In 2025, 394 Walleye stomachs were examined, of which only 158 (40.1%) contained food remains (Ludwig 2026b). Angler-caught adult Walleye diets were dominated by volume by Mayflies (81.7%) followed by Round Goby (12.8%; Figure 2.2.3.2). The presence of Mayflies in Walleye stomachs at this magnitude is a rare occurrence, likely due to the overlap in timing of sampling and a large Mayfly hatch in 2025. No Yellow Perch were found in Walleye diets in 2025.

2.3: Describe growth and condition of selected commercially or recreationally important Lake Erie predator fish

2.3.1 East Basin Predator Growth and Condition (J. Ludwig)

Walleye and Yellow Perch

Walleye length at age-1 and age-2 from netting surveys targeting juveniles in New York has largely declined over the past ten years. Growth for age-1 Walleye, however, increased in 2025 but remains 4 mm below the long-term average length. Age-2 Walleye growth decreased again in 2025, which is 36 mm below the time series average. Age-1 and age-2 length in 2025 ranked as the 17th and second lowest, respectively, in the 45-year time series (Ludwig 2026a). Age-0 and age-1 Yellow Perch sampled in fall trawl surveys in New York have exhibited stable growth rates since 2006. In 2025, age-0 Yellow Perch mean length was below the time series average of 81 mm while age-1 Yellow Perch mean length (145 mm) was above the time series average (140 mm; Wilkins and Ludwig 2026).

Adult Walleye condition in the New York waters of Lake Erie has generally been trending down over the last decade. In 2025, the relative weight of the average 18–24 inch Walleye was 79, below the time series average of 84 (Figure 2.3.1.1). Decreasing weight at length may indicate a lack of suitable forage in recent years, especially Rainbow Smelt, and increasing predator demand.

Lake Trout

Lake Trout in Lake Erie are primarily of stocked origin. When using mean length and weights as an indication of condition, consideration must be given to the fact that a variety of strains, with different growth trajectories, have been differentially stocked over time. Most fish stocked since 2010 can be categorized as 'lean' strains. The mean length of age-5 lean-strain Lake Trout in the East Basin of Lake Erie (ON, NY, PA waters) had generally remained stable between 2011 and 2024, with lower values in 2016 and 2019 (Figure 2.3.1.2). In 2025, age-5 lean-strain Lake Trout mean total length was 654 mm, a 35-year time series low. The mean weight of age-5 lean-strain Lake Trout in 2025 (2,715 g) was similarly low for the time series.

2.3.2 West and Central Basin Predator Growth and Condition (Z. Slagle)

Age-0 Sportfishes

Overall, mean lengths of age-0 sport fishes from the West Basin interagency trawl in 2025 were similar to or greater than 2024 (Figure 2.3.2.1). Lengths of select age-0 species in 2025 include Walleye (106 mm), Yellow Perch (73 mm), White Bass (83 mm), and White Perch (72 mm). Walleye average length declined after four straight years of increases and was below the ten-year mean (111 mm). Age-0 White Bass average length declined from a high in 2024 (ten-year mean = 68 mm). Age-0 White Perch and Yellow Perch lengths were above the ten-year averages (65 mm and 68 mm, respectively).

Walleye

Trends in Walleye total length at age-2 through age-4 were variable in 2025 (Figure 2.3.2.2). Lengths at age-2 (393 mm) and age-3 (439 mm) increased for the first time in three years but remain below the ten-year means (403 mm and 461 mm, respectively), while length at age-4 (471 mm) continued to fall below the ten-year mean (505 mm). Length-at-age data come from the ODNR fall gill net survey (September–October of each year in West and Central basins). Methods can be found in the appendix of the ODNR Lake Erie Data Report (Ohio Division of Wildlife 2025).

Black Bass

Smallmouth Bass total length at age-2 through age-4 exhibit different patterns depending on the age (Figure 2.3.2.3). Smallmouth Bass length at age-2 has increased for five straight years (mean total length = 352 mm), while age-3 and age-4 fish display relatively constant growth over time (373 mm and 396 mm, respectively). All lengths-at-age in 2025 were above their ten-year means (326 mm, 367 mm, and 392 mm for ages 2, 3, and 4, respectively). Length-at-age data come from the ODNR Smallmouth Bass gill net survey (September of each year in West and Central basins). Methods can be found in the appendix of the ODNR Lake Erie Data Report (Ohio Division of Wildlife 2025).

2.3.3 West Basin Predator Growth – Michigan (J.-M. Hessenauer)

Average length of age-0 Walleye decreased 19.2% from 2024 to 100.8 mm in 2025. Size of age-0 Walleye appears to correlate with catch in Michigan trawls (Figure 2.3.3.1). Average length of male Walleye at age-2 and age-4 increased 7% and 1.5%, respectively, from 2024, while length at age-3 declined 2.1% compared to 2024 (Figure 2.3.3.2; A). Length at age-2, 3, and 4 for female Walleye increased 8.1%, 4.7%, and 3.1%, respectively, compared to 2024 (Figure 2.3.3.2; B). Sample sizes for both males and females declined in the October survey compared to 2024.

The development of this dataset will allow for the evaluation of trends in forage abundance and the recruitment of sportfish in Michigan's Lake Erie waters in future years, while contributing to a greater understanding of forage dynamics in Lake Erie's West Basin.

Table 2.1.3.1: Ten-year mean density (arithmetic mean number per hectare), 2025 density, and the percent difference between 2025 and the ten-year average for forage fish functional groups from fall trawl surveys in the West Basin Lake Erie. Data are collected by OMNR and ODNR and combined using FPC factors.

Functional Group	Mean: 2015–2024	2025	+/-
All forage species	4041	2793.2	-30.9%
Clupeid	336.1	80.7	-76.0%
Soft-rayed	221	179.5	-18.8%
Spiny-rayed	3483.9	2533.1	-27.3%

Table 2.1.3.2: Ten-year mean density (arithmetic mean number per hectare), 2025 density, and the percent difference between 2025 and the ten-year average for selected forage species from fall trawl surveys in West Basin Lake Erie. Data are collected by OMNR and ODNR and combined using FPC factors.

Species	Age class	Mean: 2015–2024	2025	+/-
Emerald shiner	Age-0	3.2	1.2	-62.5%
Emerald shiner	Ages-1+	5.2	0.1	-98.1%
Freshwater drum	Age-0	90.1	102.4	+13.7%
Gizzard shad	Age-0	331.6	80.6	-75.7%
Rainbow smelt	Age-0	35.5	0	-100%
Rainbow smelt	Ages-1+	0.3	0	-100%
Round goby	All ages	27.5	11.4	-58.5%
Walleye	Age-0	118.6	127.8	+7.8%
White bass	Age-0	70	99.3	+41.9%
White perch	Age-0	2543.4	1471	-42.2%
Yellow perch	Age-0	661.8	732.7	10.7%

Table 2.1.4.1: Average density (number of fish per hectare) of select forage sized fish captured during the Michigan trawl survey. Age group for each species presented in first row. Yr/Yr% is the percent change in 2025 compared to 2024. Yr/2014-2024% is the percent change from 2025 to the 2014-2024 average.

Age Group/Year	White Perch	Mimic Shiner	Gizzard Shad	Trout-perch	Round Goby	Spottail Shiner	Silver Chub	Emerald Shiner	Dreissenid mussels*
	YOY	All	YOY	All	All	All	All	All	All
2014	715.5	5.3	55.4	25.6	43.4	54.2	0	2.1	0.41
2015	783.2	617.9	2.7	16.8	135.8	18.8	11.3	0	0.55
2016	448.5	170.6	11.4	68.8	19.2	26.6	0.6	0	0.81
2017	1896.4	120.2	730.9	62.1	41.4	2.2	3.4	0	0.45
2018	8,100	40.1	259.4	290.4	58.6	6.3	5.9	7.2	0.60
2019	389.1	141.5	0.5	19	24.7	10.6	5.2	11.4	0.66
2020	1193.8	53	15.2	25.4	125.7	24.2	21.6	0	0.68
2021	1633.3	6	40.9	75.3	84.1	57.7	5.8	0	0.53
2022	846.5	6.3	58.2	60.7	9	73.8	4.9	7.9	0.47
2023	1546.9	33.2	102.9	117.9	13.2	111	34.6	16.9	1.02
2024	1628.9	132.1	124.2	44.4	70.9	93.1	39.0	0.50	0.14
2025	1143.6	4.5	31.3	3.3	10.7	70.6	15.4	0	0.03
Yr/Yr %	-29.8	-96.6	-74.8	-92.6	-84.9	-24.2	-60.5	-100	-78.6
Yr/ 2014–2024 %	-34.4	-96.3	-75.4	-95.5	-81.2	62.3	28.0	-100	-94.1

*Dreissenid mussels reported as kilograms captured per hectare trawled and are not included in the grand total catch per hectare values.

Table 2.1.4.2: Average density (number of fish per hectare) of select age-0 sportfish captured during the Michigan trawl survey. Yr/Yr% is the percent change in 2025 compared to 2024. Yr/2014–2024% is the percent change from 2025 to the 2014–2024 average.

	Yellow Perch	Walleye	White Bass	Smallmouth Bass
2014	129.5	0.6	1.2	5.4
2015	335.8	4.8	7	0.3
2016	313.5	3	8.4	1.9
2017	274.6	16.6	101.8	0
2018	1683	50.3	48.2	3.2
2019	1291	68.5	15.5	0
2020	675.2	31.9	11.4	59.9
2021	2724.6	25.6	9.3	14
2022	293.4	30.3	5.3	0.5
2023	387.4	25.5	40.9	2.4
2024	400.0	11.9	10.2	0.5
2025	1889.6	21.0	9	4.1
Yr/Yr %	372.4	76.5	-11.8	720
Yr/ 2014–2024 %	144.3	-14.2	-61.8	-48.8

Table 2.2.3.1: Diet composition of Walleye sampled by year during the Michigan August trawl survey. Table represents the number of fish sampled, the percent with stomach contents (% With contents), and of fish with stomach contents the percent of prey items that were Gizzard Shad (% G. Shad), White Perch (% White Perch), Mimic Shiner (%Mimic Shiner), Yellow Perch (%Yellow Perch), unidentifiable fish remains (%Unid Fish), and digested liquid (%Digested Liquid).

Year	Fish Sampled	% With Contents	% G. Shad	% White Perch	%Mimic Shiner	%Yellow Perch	%Unid Fish	%Digested Liquid
2014	15	73	62	0	0	0	33	5
2015	19	42	7	60	7	13	7	7
2016	86	64	17	9	0	7	53	14
2017	55	53	34	22	0	14	22	9
2018	18	67	23	31	0	8	38	0
2019	19	16	0	0	0	67	33	0
2020	54	43	8	4	0	0	79	8
2021	51	35	14	10	0	19	57	0
2022	26	38	5	50	0	9	32	9
2023	64	64	12	15	0	0	46	24
2024	46	46	0	21	4	0	33	38
2025	10	70	9	0	0	0	73	18

Table 2.2.3.2: Diet composition of Walleye sampled by year during the Michigan October gill net survey. Table represents the number of fish sampled, the percent with stomach contents (%With contents), and of fish with stomach contents the percent of prey items that were Gizzard Shad (%G. Shad), White Perch (%White Perch), Emerald Shiner (%Emerald Shiner), Yellow Perch (%Yellow Perch), Round Goby (%Round Goby), unidentifiable fish remains (%Unid. Fish), and digested liquid (%Digested Liquid). The survey was not completed in 2020 due to COVID-19 restrictions.

Year	Fish Sampled	%With contents	%G. Shad	%White Perch	%Emerald Shiner	%Yellow Perch	%Round Goby	%Unid. Fish	%Digested Liquid
2007	44	66	49	11	0	0	0	40	0
2008	322	83	24	0	17	0	0	25	34
2009	136	82	10	11	0	1	0	79	0
2010	137	91	28	0	5	0	0	54	13
2011	166	88	28	1	0	0	0	24	46
2012	223	96	19	1	1	0	0	78	0
2013	160	38	33	6	6	0	0	37	17
2014	283	74	25	11	14	1	0	43	6
2015	198	61	39	1	0	0	0	37	23
2016	482	63	38	17	1	1	0	35	9
2017	319	55	33	1	0	0	0	40	25
2018	652	73	43	1	1	0	0	17	38
2019	334	57	32	19	1	0	0	14	33
2020									
2021	295	60	42	9	0	7	0	17	24
2022	404	79	66	2	0	0	0	14	17
2023	182	48	14	0	3	0	0	42	40
2024	787	57	40	3	1	1	0	14	41
2025	199	52	3	1	3	1	0	21	74
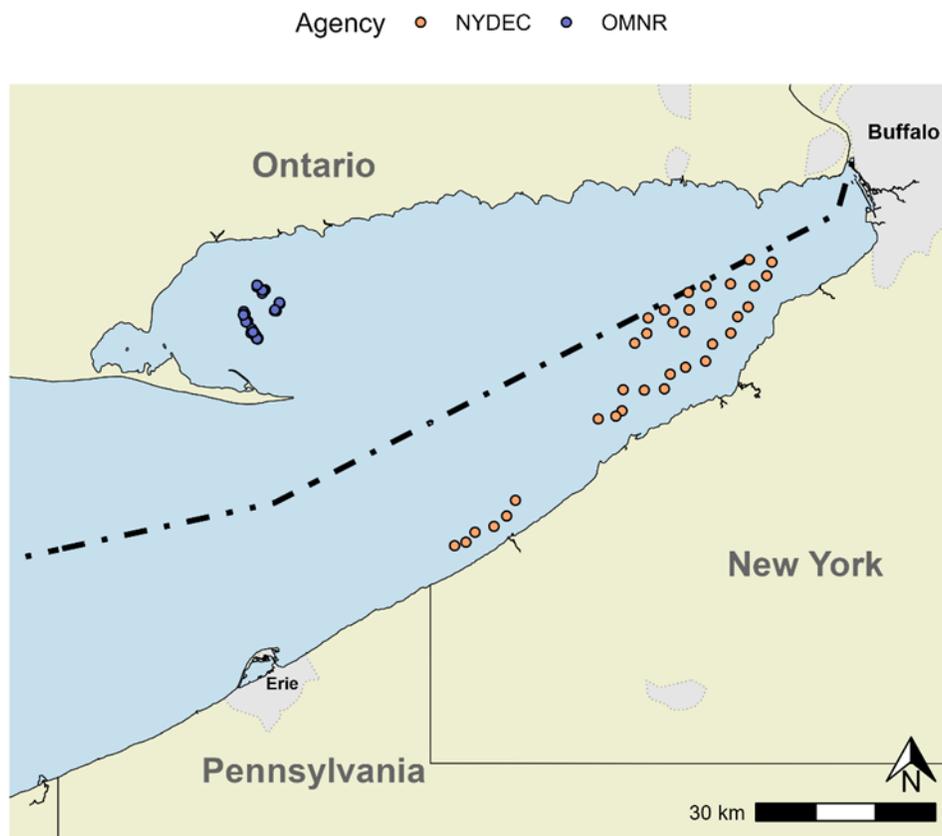
Figure 2.1.1.1. Locations of standard index bottom trawls by Ontario (blue) and New York (orange) to assess forage fish abundance in the East Basin of Lake Erie in 2025.
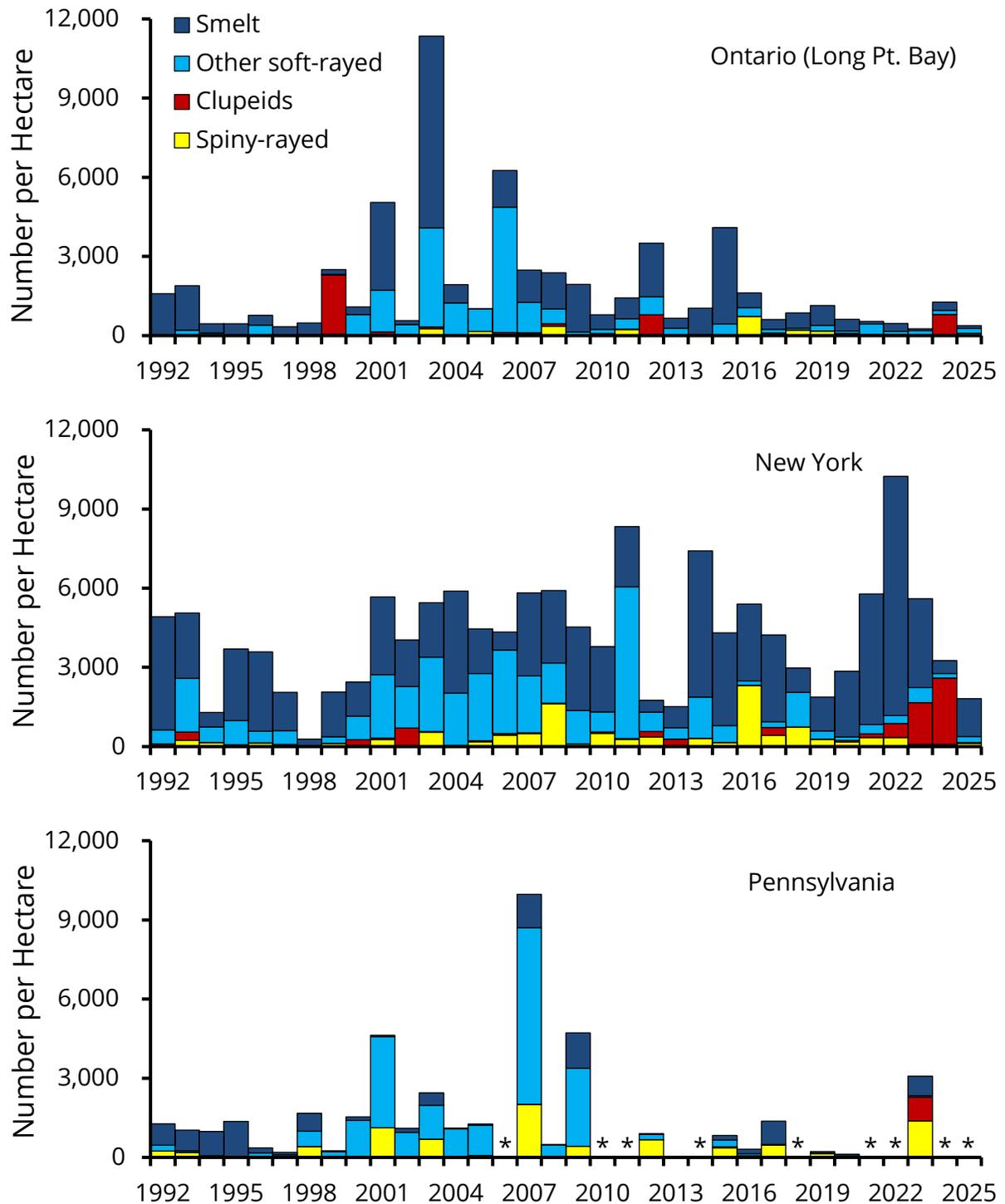
Figure 2.1.1.2: Mean density of prey fish (number per hectare) by functional group in the Ontario, New York, and Pennsylvania waters of the East Basin, Lake Erie, 1992-2025. Years without sampling are indicated by an asterisk (*).
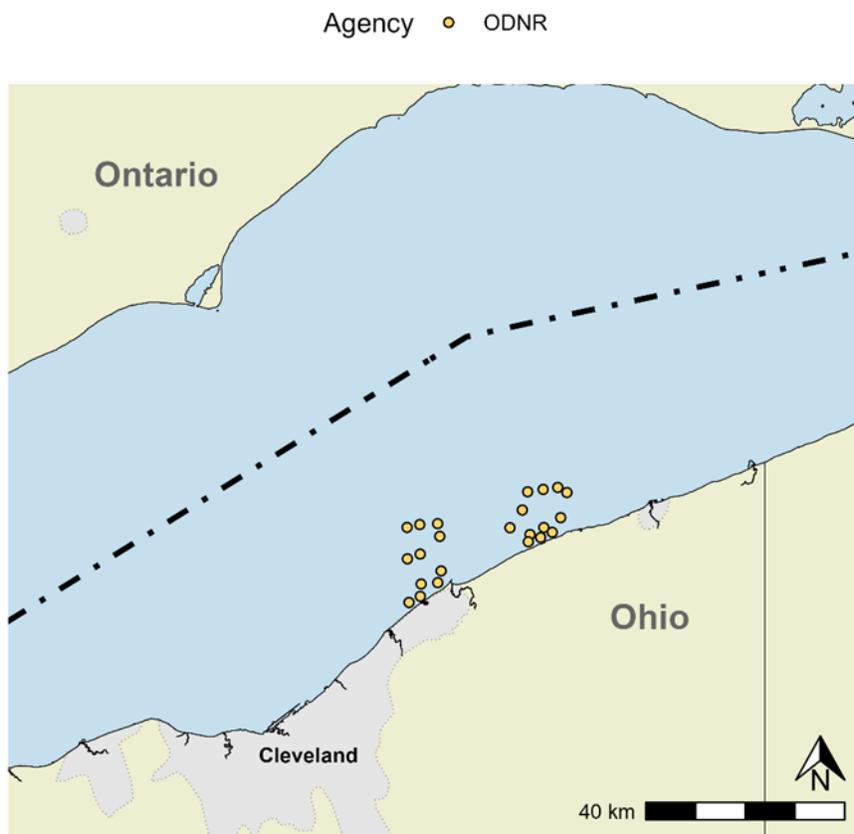
Figure 2.1.2.1. Locations sampled by Ohio (yellow) with index bottom trawls to assess forage fish abundance in the Central Basin, Lake Erie during 2025. The 2025 survey was not completed due to persistent, unfavorable weather.
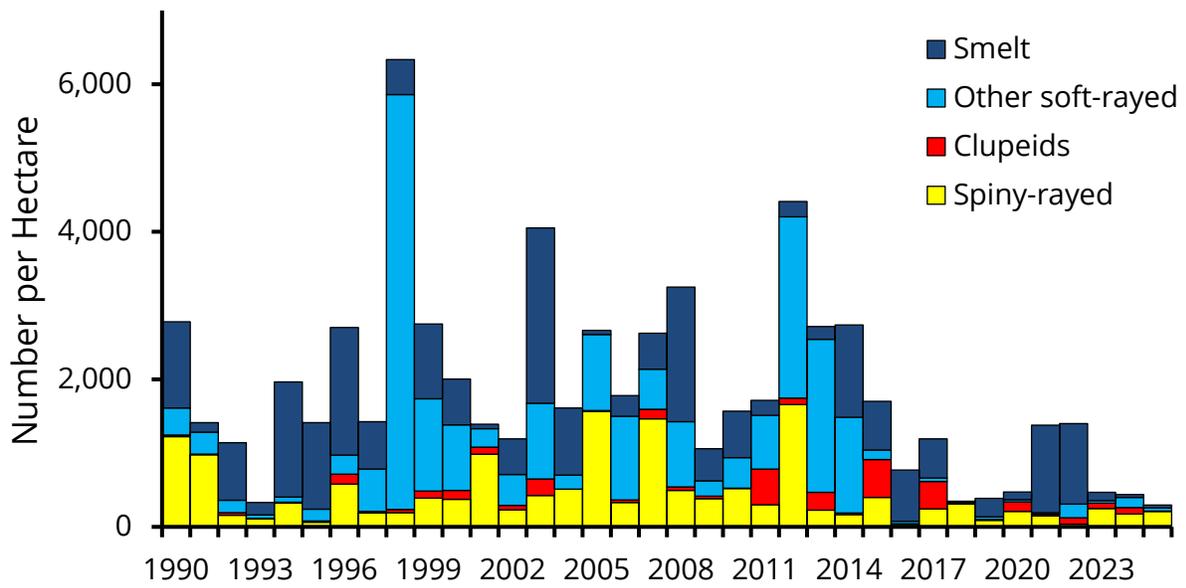
Figure 2.1.2.2: Mean density of prey fish (number per hectare) by functional group in Ohio waters of the Central Basin, Lake Erie, 1990–2025.
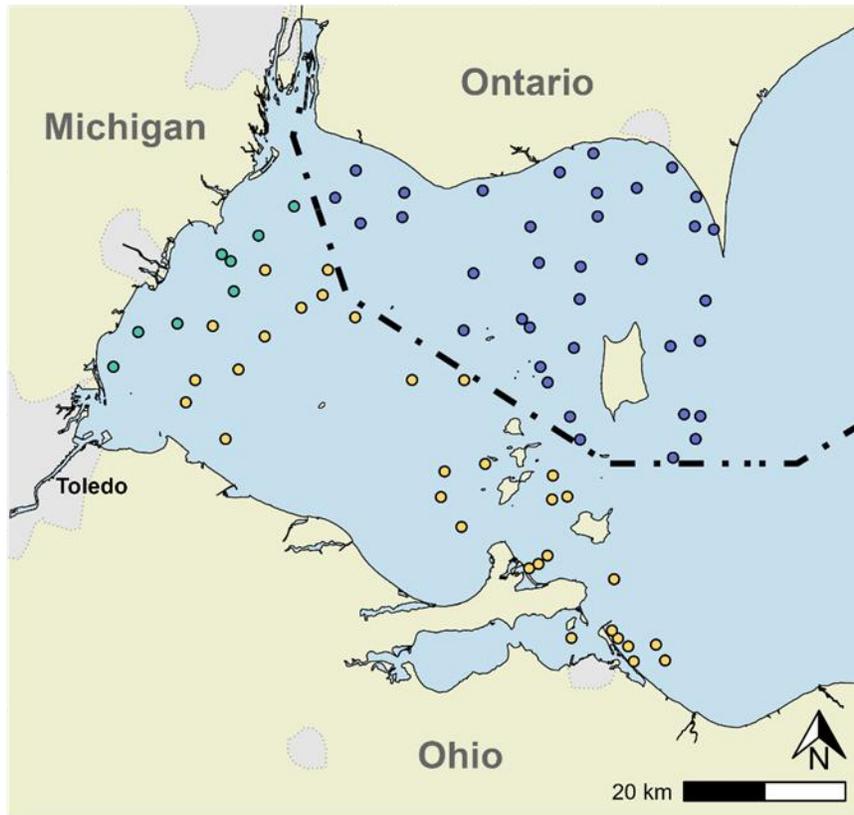
Figure 2.1.3.1: Trawl locations for West Basin bottom trawl surveys in 2025. Ohio (yellow) and Ontario (blue) trawls are combined to summarize the interagency indices, while Michigan (green) cannot yet be included due to lacking trawl comparison data.
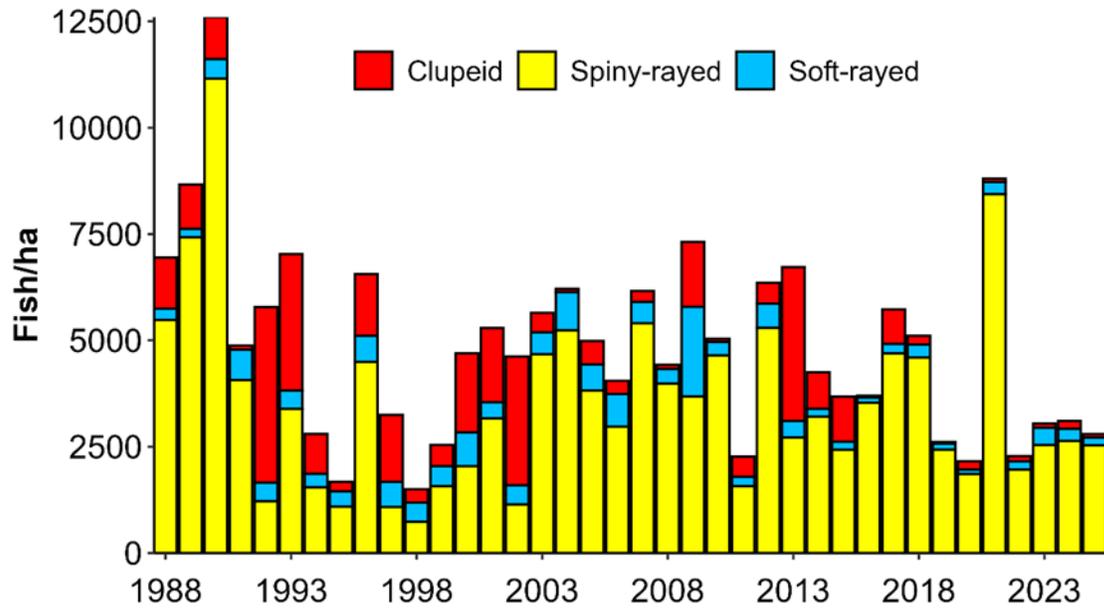
Figure 2.1.3.2: Mean density (number per hectare) of prey fish by functional group in the West Basin of Lake Erie, August 1988–2025
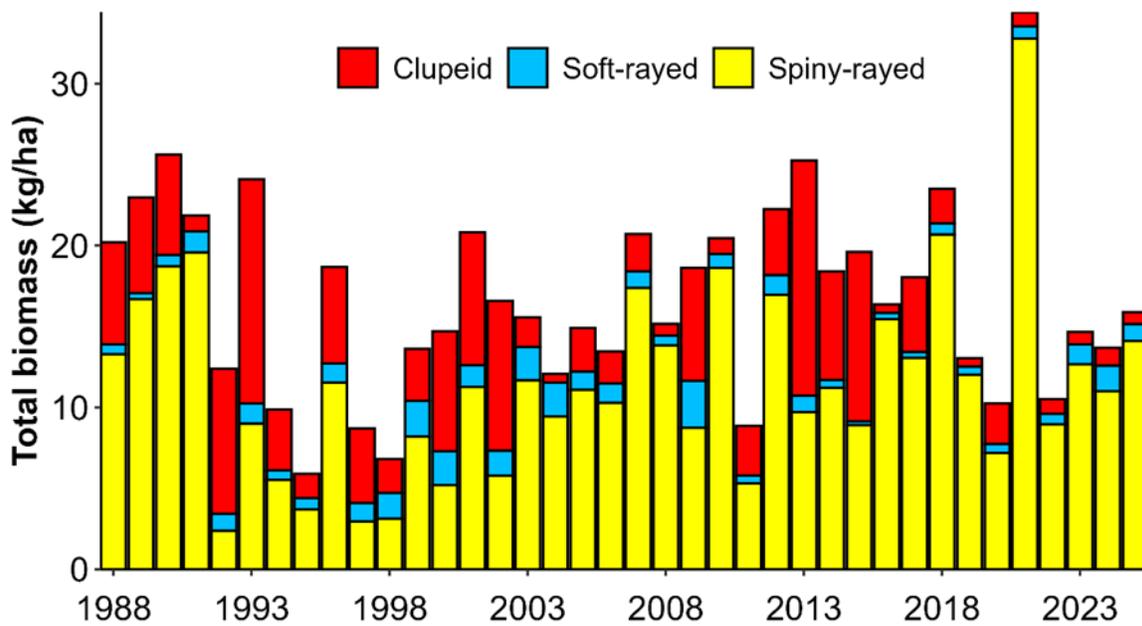
Figure 2.1.3.3: Mean biomass (kilograms per hectare) of prey fish by functional group in the West Basin of Lake Erie, August 1988–2025.
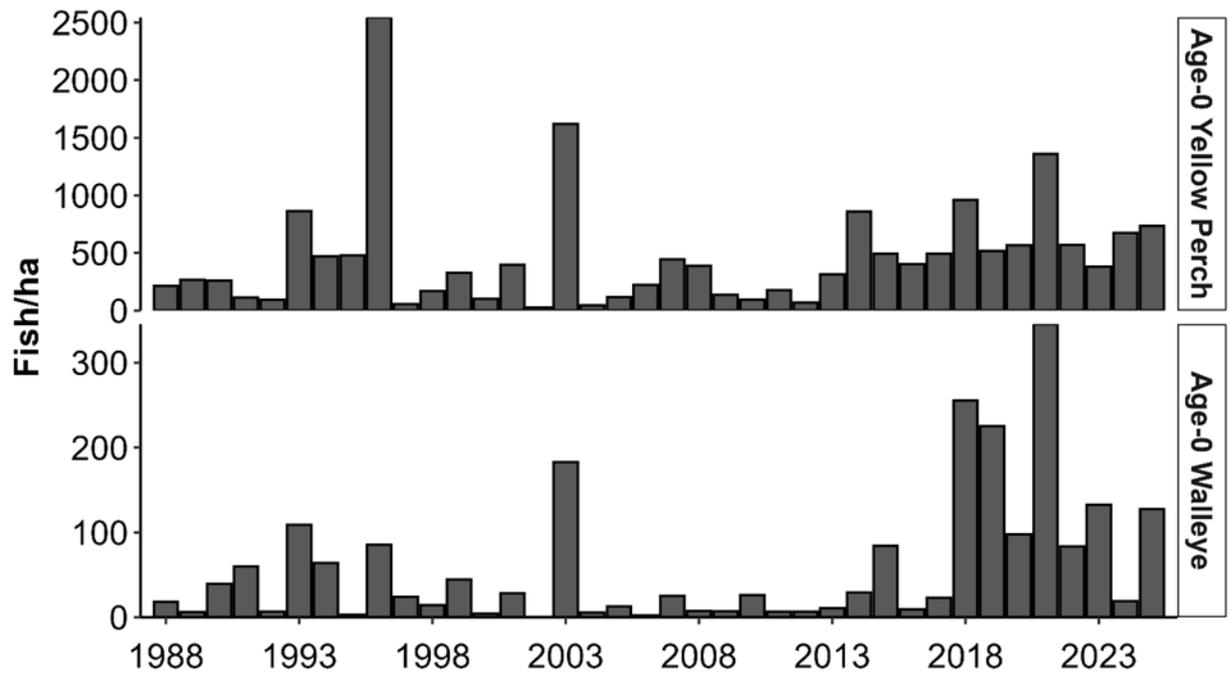
Figure 2.1.3.4: Densities of age-0 Yellow Perch (top) and age-0 Walleye (bottom) in the West Basin of Lake Erie, August 1988–2025. Note that the Y-axis scales differ.
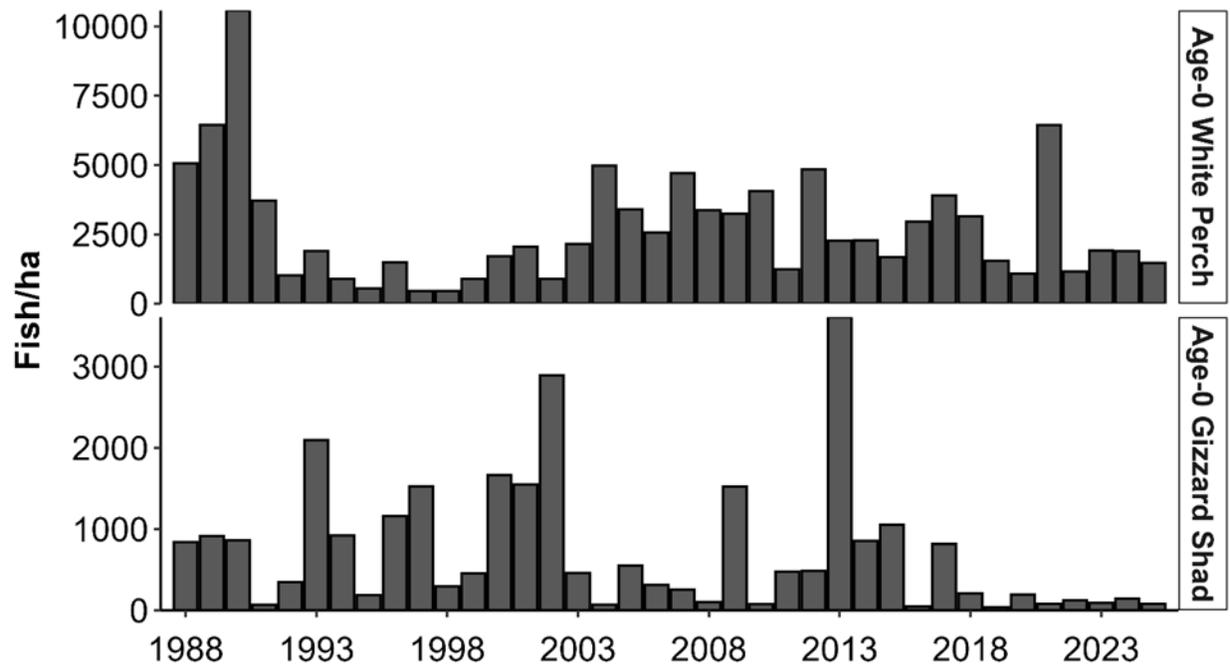

Figure 2.1.3.5: Densities of age-0 White Perch (top) and age-0 Gizzard Shad (bottom) in the West Basin of Lake Erie, August 1988–2025. Note that the Y-axis scales differ.
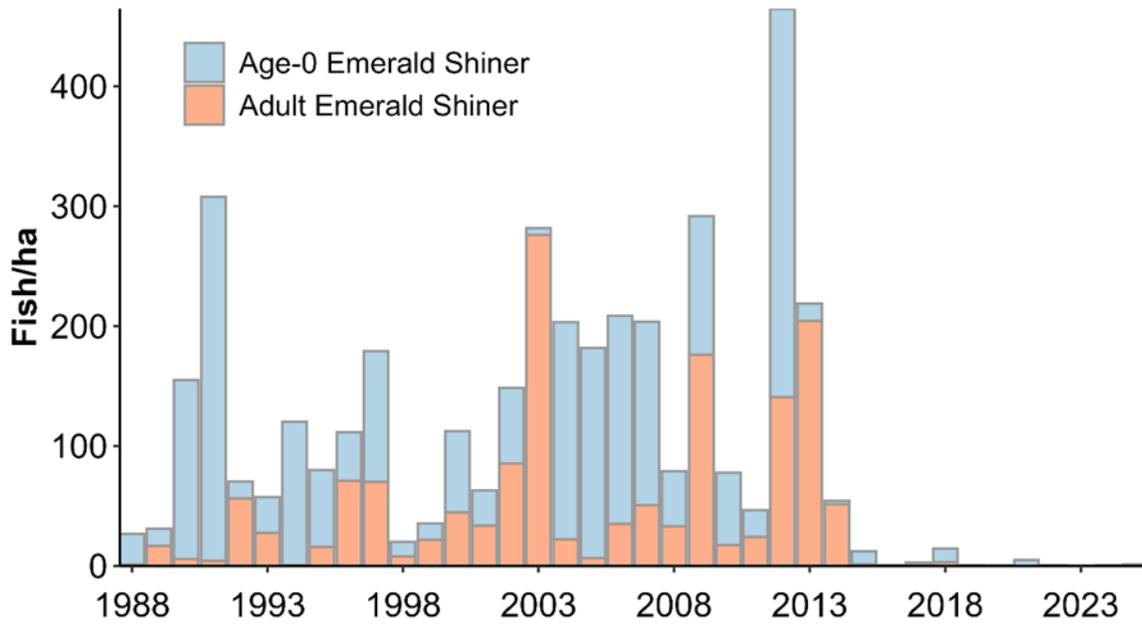
Figure 2.1.3.6: Densities of age-0 (blue) and age-1+ (red) Emerald Shiner in the West Basin of Lake Erie, August 1988–2025. Densities for both groups have remained minimal for ten years.
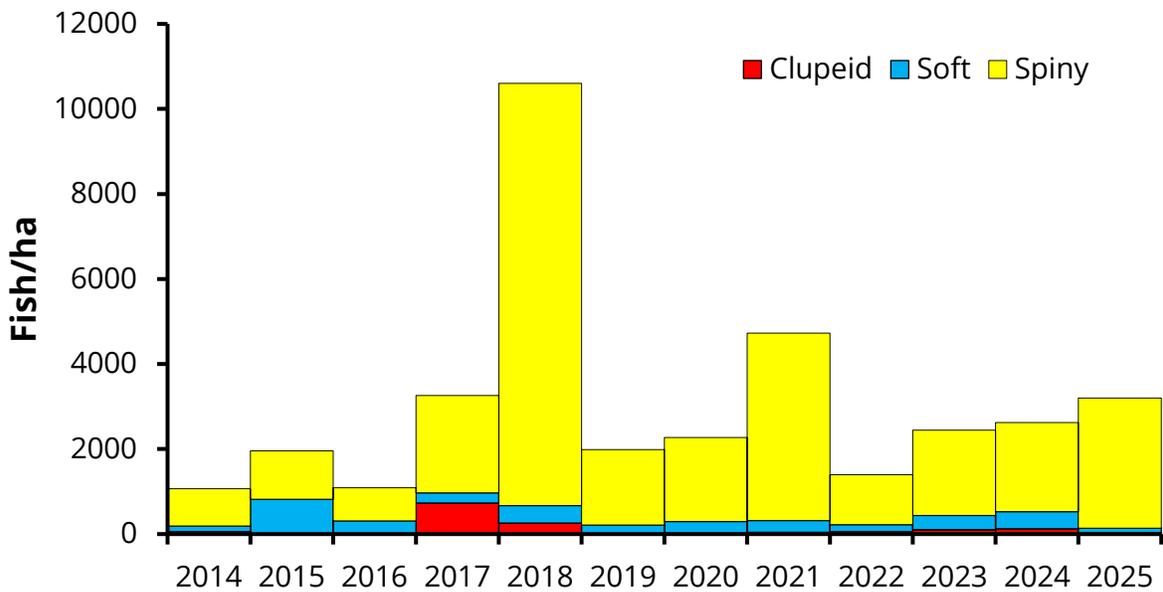

Figure 2.1.4.1: Mean density (number per hectare) of prey fish by functional group in Michigan waters of Lake Erie, August 2014–2025.
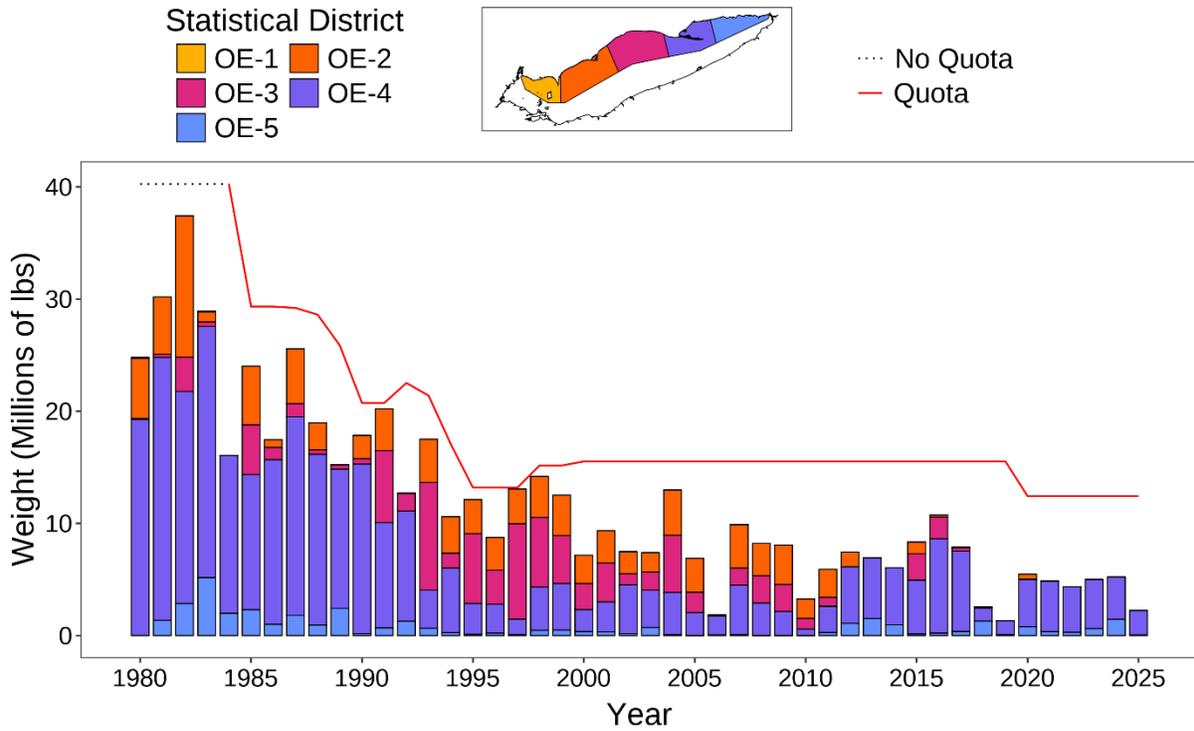
Figure 2.1.5.1: Commercial harvest of Rainbow Smelt by statistical district from the Ontario trawl fishery from 1980–2025. The solid red line indicates the available quota for each year. No quota was in place prior to 1984.
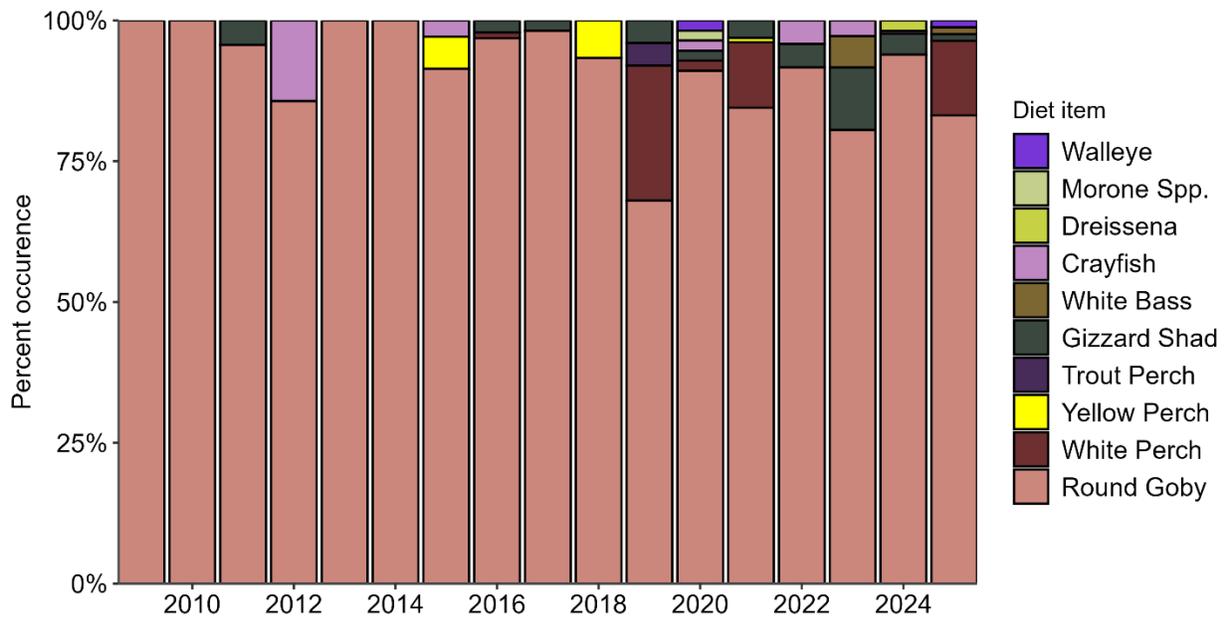

Figure 2.2.1.1: Percent occurrence of diet items from non-empty stomachs of Smallmouth Bass collected in West and Central Basin gill net assessments, September, 2009–2025.
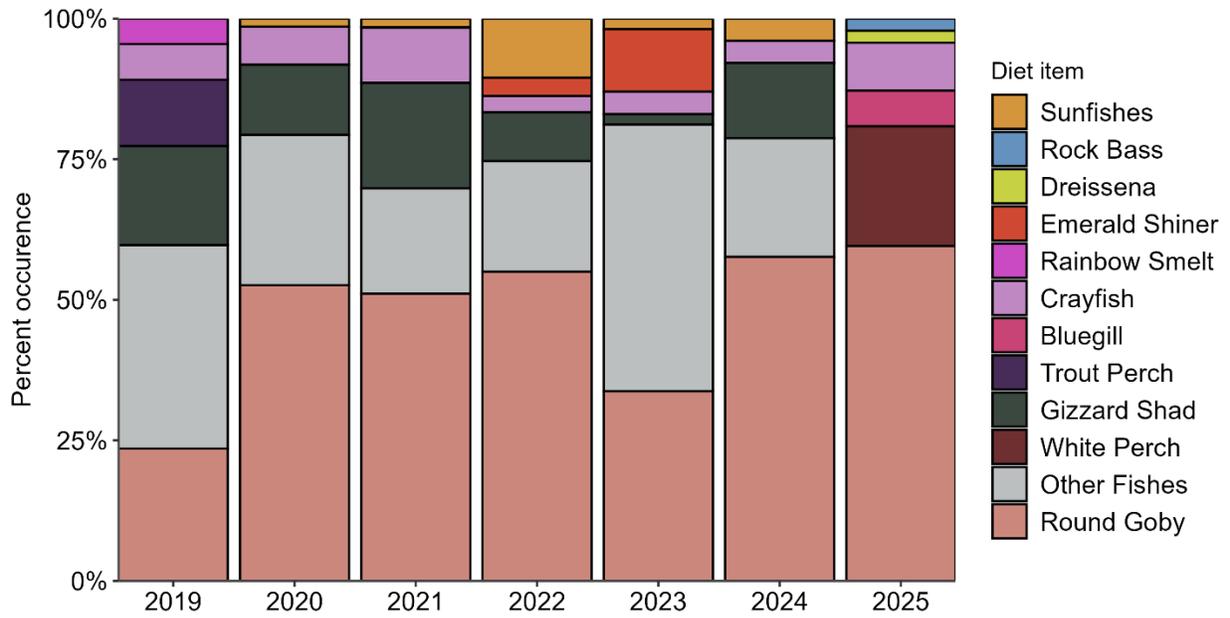
Figure 2.2.1.2: Percent occurrence of diet items from non-empty stomachs of Largemouth Bass collected in West and Central Basin electrofishing assessments, June–August, 2019–2025.
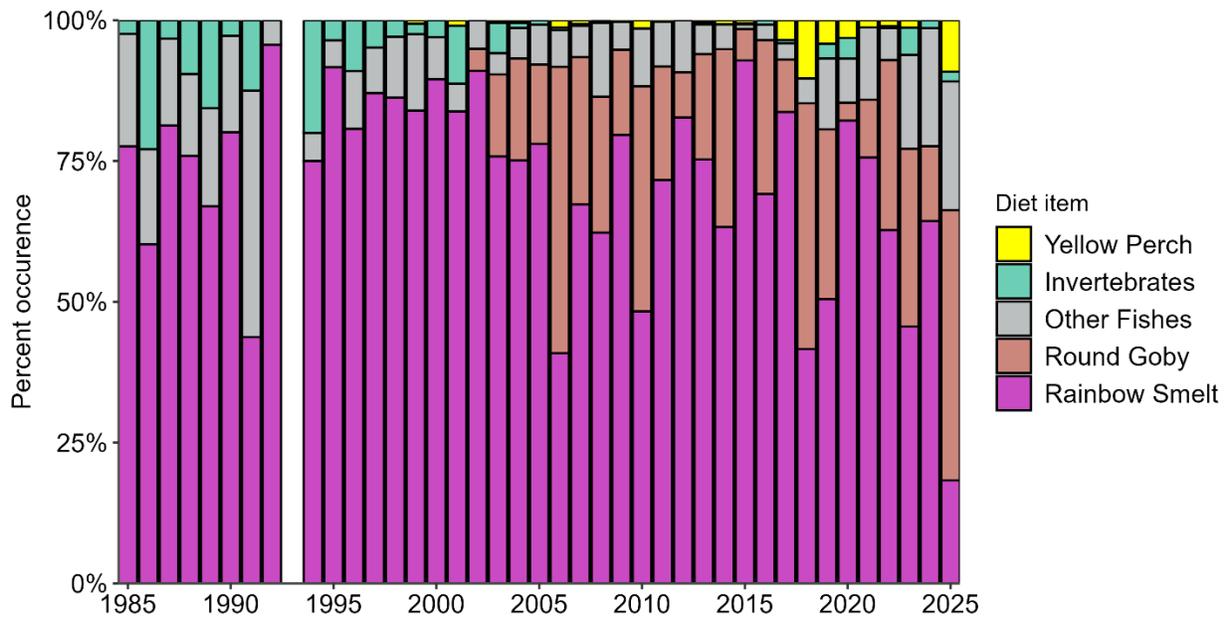

Figure 2.2.2.1: Percent occurrence of diet items from non-empty stomachs of lean-strain Lake Trout collected from gill net assessment surveys in the East Basin of Lake Erie, August, 1985-2025.
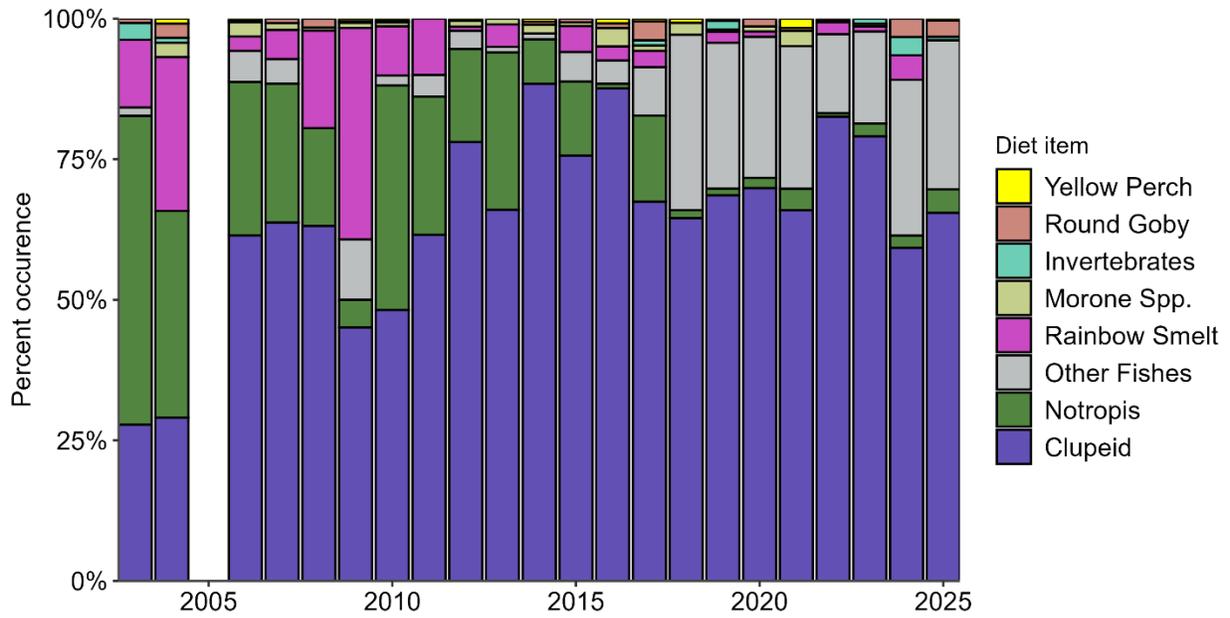
Figure 2.2.3.1: Percent occurrence of diet items from non-empty stomachs of Walleye collected in West and Central Basin gill net assessments, September–November, 2003–2025.
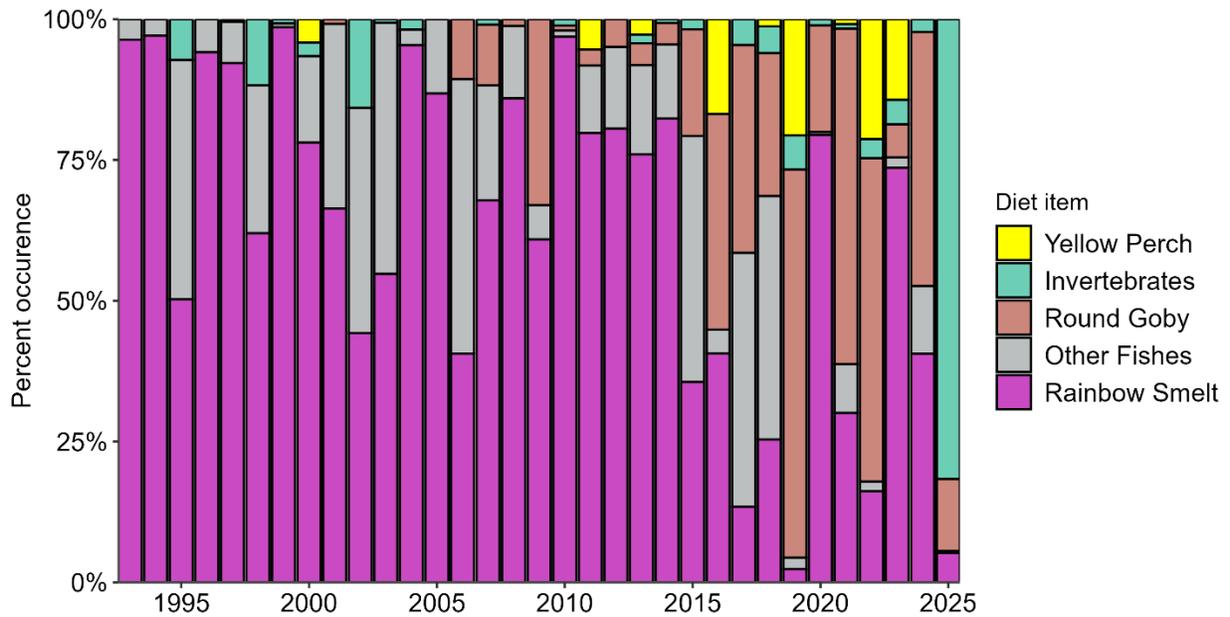
Figure 2.2.3.2: The percent contribution (by volume) of identifiable prey in non-empty stomachs of adult Walleye caught by anglers in New York's portion of Lake Erie, June–August, 1993–2025.
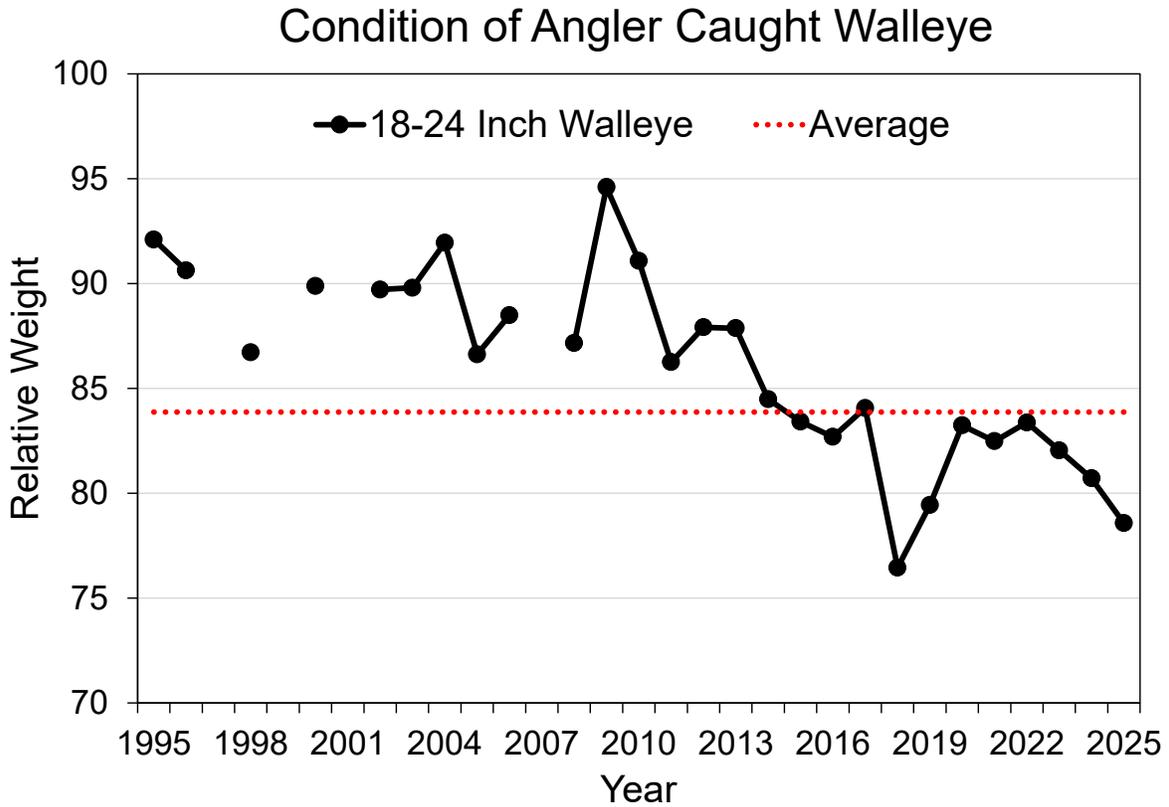
Figure 2.3.1.1: Relative weight of angler-caught walleye in the New York waters of Lake Erie at 18–24 inches from 1995-2025.

Figure 2.3.1.2: Mean total length (mm) of age-5 lean-strain Lake Trout caught in gill net assessment surveys from the East Basin of Lake Erie, August, 1989–2025.
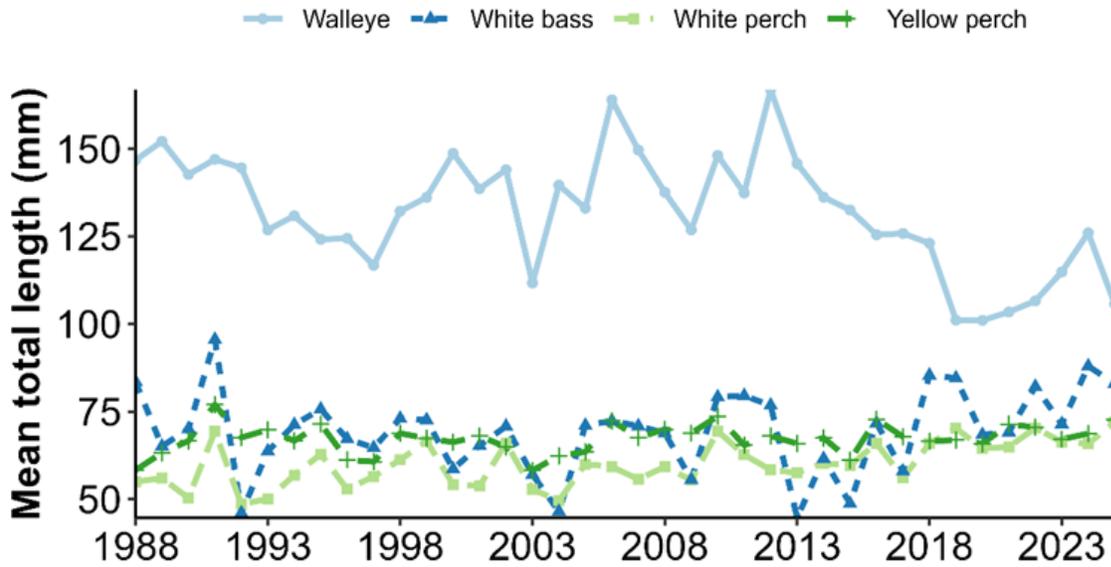
Figure 2.3.2.1: Mean total length of select age-0 fishes in West Basin Lake Erie, August, 1988–2025. Data are from the Interagency Trawl Survey.
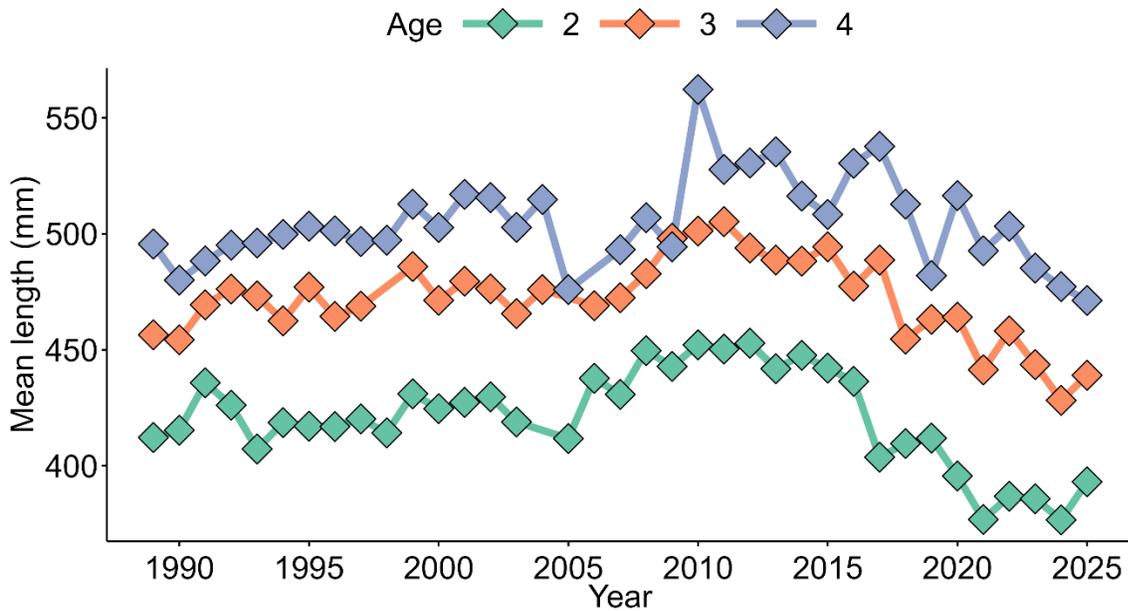
Figure 2.3.2.2: Mean total length of Walleye (ages 2–4) in West and Central basins of Lake Erie, 1988–2025. Data are from the ODNR fall gill net survey (September–November).
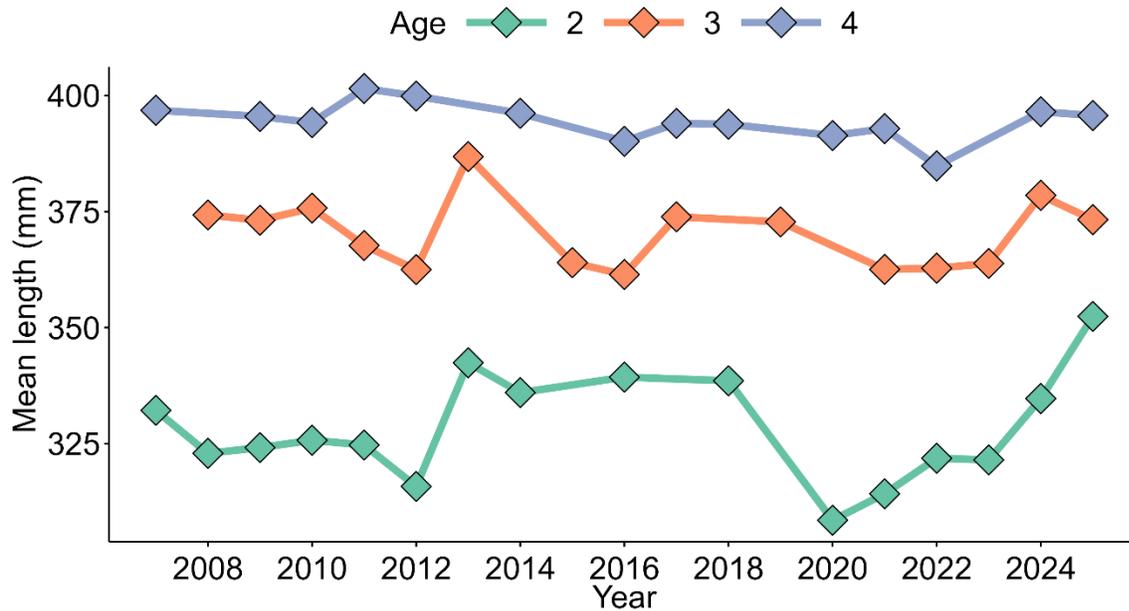
Figure 2.3.2.3: Mean total length of Smallmouth Bass (ages 2–4) in West and Central basins of Lake Erie, 2005–2025. Data are from the ODNR gill net survey (September).
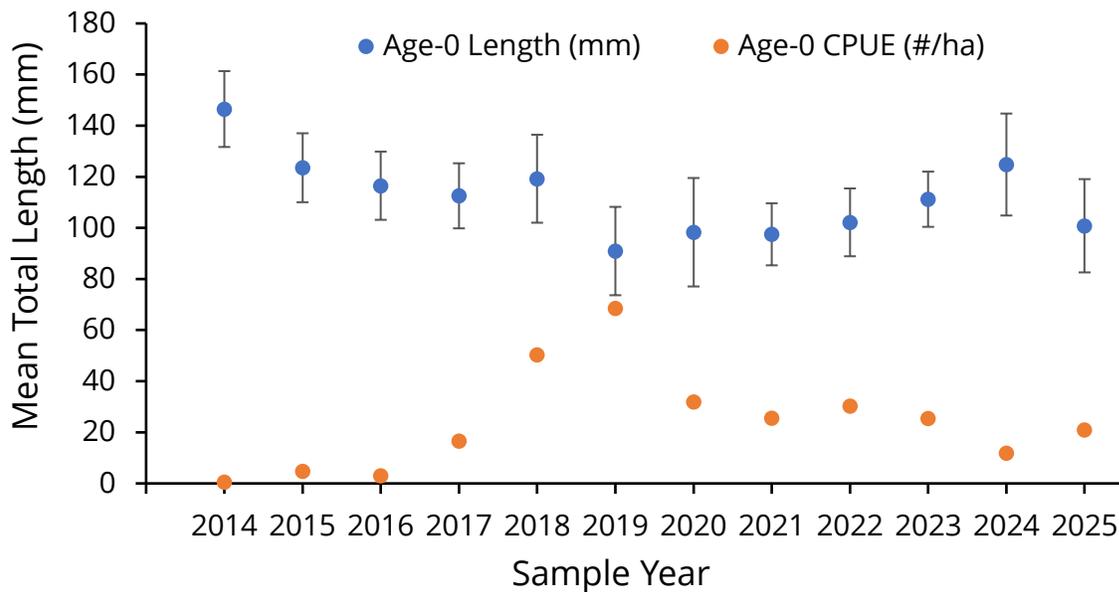
Figure 2.3.3.1: Average length (mm) of age-0 Walleye (blue dots) $\pm$ SD compared with number of age-0 Walleye captured per ha of trawling (orange dots) in Michigan waters of Lake Erie, August, 2014-2025.
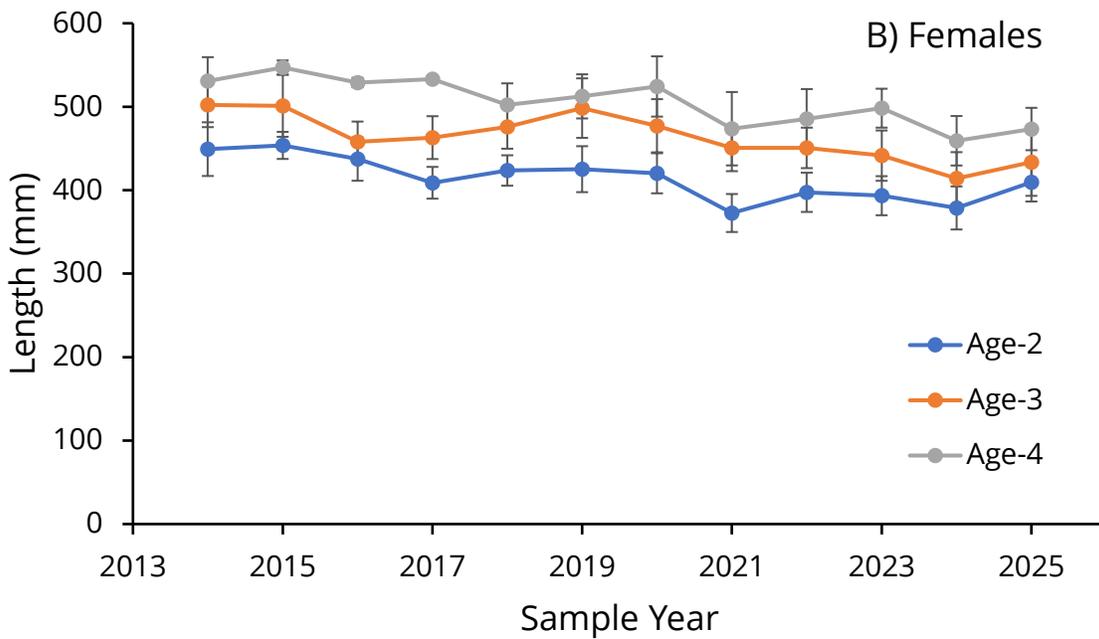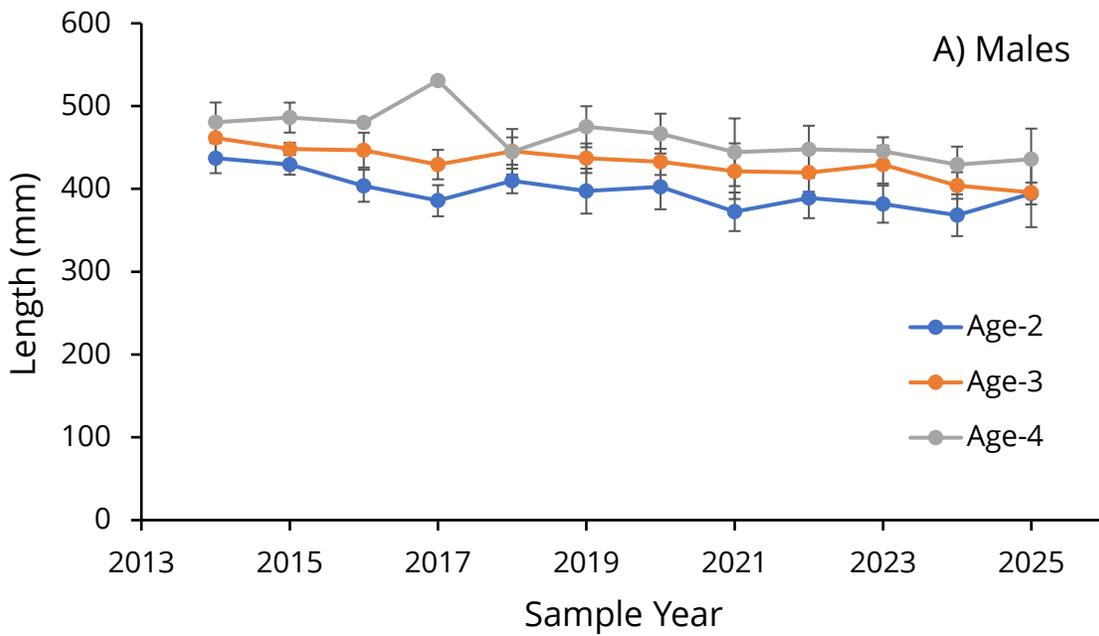
Figure 2.3.3.2: Average length (mm) ± SD at age for Walleye by sex captured in Michigan waters of Lake Erie, October, 2014-2025.

Charge 3: Continue hydroacoustic assessment of the pelagic forage fish community in Lake Erie

3.1 Report on annual hydroacoustic surveys, including the use of new methods in survey design and analysis following the GLFC's Great Lakes Hydro Acoustic Standard Operating Procedures (M. DuFour, H. Luken, A. Bonsall)

Introduction

Lake Erie hydroacoustic surveys estimate important prey-fish densities including Gizzard Shad and Emerald Shiner in the West Basin (WB), Rainbow Smelt and Emerald Shiner in the Central Basin (CB), and Rainbow Smelt in the East Basin (EB). Historical survey designs were based on cross-lake transects that routinely experienced logistical challenges that inhibited survey completion. In 2022, hydroacoustic surveys across the three basins implemented a new standardized whole-lake approach following a multi-year survey evaluation and redesign process. The new stratified-random grid approach reduces the overall survey effort, emphasizes data collection in strata with the greatest variability, and provides greater operational flexibility. A thorough description of historical surveys and the redesign process can be found in FTG (2022).

Methods

The whole-lake survey design uses a stratified approach within each of the three basins (Figure 3.1.1). Each basin is subdivided into smaller strata based in part on depth, water quality characteristics, forage species compositions, and historical strata. Total sampling effort (i.e., kilometer of transect) in each basin was established through an analysis of historical data to achieve a target precision (Relative Standard Error < 15%). Within basins, sampling effort across strata was apportioned based on strata size and historical data variance. Random sites are selected from within each strata using a 5-minute grid. Transects (5 km) must pass through the centroid of the grid but can be surveyed in any direction based on weather or logistical considerations. Hydroacoustic transect data are collected with the ODNR R/V *Almar* in the WB, USGS R/V *Muskie* in the CB, and OMNR R/V *Erie Explorer* in the EB.

Data collection begins 0.5 h after sunset and is completed by 0.5 h before sunrise. Collection settings during the survey in the Central and East basins include 4 $pings * s^{-1}$, a 0.4 ms pulse duration, and a -130 (S_v, dB re 1 m^{-1}) minimum collection threshold (Table 3.1.1), following recommendations in Parker-Stetter et al. (2009). Collection settings in the West Basin use 10 $pings * s^{-1}$ and a 0.2 ms pulse duration to accommodate shallower waters and high fish densities. The sampling environment (water temperature) is set to the temperature at 2-m depth on the evening of sampling. Temperature and dissolved oxygen profiles are collected with regular frequency across the survey. Sampling occurred from July 20–28, 2025.

Currently, midwater trawling only occurs in the CB with the OMNR R/V *Keenosay* operating in Ontario waters and the ODNR R/V *Grandon* operating in U.S. waters. Midwater trawl samples are collected at grid locations in concordance with the hydroacoustic data collection. Up to four

midwater trawls are conducted in each grid, with trawl depths distributed among the epilimnion, metalimnion, and hypolimnion to capture the fish community distribution across depths. Trawl catch is sorted by species and age group, and a sub-sample of fish are measured for total length (TL in mm). Temperature (°C) and dissolved oxygen (mg/L) profiles are collected at each sample grid where a midwater trawl occurs.

Data Analysis

Hydroacoustic data were analyzed using the 'erieacoustics' R package (Holden and DuFour 2023) which interacts with standardized processing templates developed in Myriax software Echoview 15.1 (Echoview Software Pty Ltd 2025). Each 5-km transect was broken up into 500-m elementary distance sampling units (EDSU) and partitioned vertically into epilimnetic and hypolimnetic layers based on fish distribution and water temperature profiles. Analyses produced areal fish density (fish/ha) estimates and size frequency distributions, based on *in situ* target strength (TS, dB re 1 m^2) and area backscattering coefficient (ABC, m^2m^{-2}) measurements, for each EDSU and layer along each 5-km transect.

Trawl catches were associated with the sampled stratum, grid, and layer. Similar to hydroacoustic data, trawl samples were partitioned into epilimnetic and hypolimnetic layers based on trawl depth and thermocline depths identified by hydroacoustic data and temperature profiles. Trawl catches were clustered into five species groups, including all ages of Emerald Shiner, age-0 Rainbow Smelt, age-1+ Rainbow Smelt, age-0 Yellow Perch, and others.

Survey Effort

Lake-wide hydroacoustic effort included 90 sampled grids (WB: n = 21, CB: n = 27, and EB: n = 42), totaling 450 km of sampled transect (Figure 3.1.2). Water column profiles (n = 66) associated with sampled grids were strategically collected to inform partitioning of hydroacoustic and trawl data into epilimnetic and hypolimnetic layers. A total of 65 midwater trawls were collected across 22 sample grids in 8 strata of the Central Basin.

Water Column Profiles

Water column profiles demonstrated increasing depth from west to east, decreasing temperature with depth from west to east, and occasional instances of low dissolved oxygen near bottom (Figure 3.1.3). Most of the WB was isothermal, as only 2 grids displayed thermal stratification. All grids in the CB and EB were stratified with variable thermocline depths. Low near-bottom dissolved oxygen (< 5 mg/L) was observed at 6 grids in the WB, 22 grids in the CB, and 2 grids in the EB. Hypoxic conditions (< 2 mg/L) were evident at 6 grids along the southern shore of the WB and CB.

Lake-wide Size Distribution and Fish Density

Hydroacoustic surveys observed two abundant size groups including age-0 fishes between -64 and -53 dB, and age-1+ fishes greater than -53 dB (Figure 3.1.4). High frequencies of age-0 fish were observed in epilimnetic waters across the survey. Age-1+ fish were more frequent in the hypolimnion of the EB and in the epilimnion of the CB. The modal size of age-0 fishes appeared to decline from west to east as cooler waters likely contribute to later hatching dates and slower growth. While no historical midwater trawling data exist in the WB, the CB data suggest epilimnetic catches were a mix of age-0 Rainbow Smelt, Emerald Shiner and other species, and the EB data suggest primarily age-0 Rainbow Smelt and age-0 Yellow Perch based on 2019 midwater trawl data. Hypolimnetic waters in both the CB and EB are typically dominated by age-1+ Rainbow Smelt.

Lake-wide areal densities (1,000 fish/ha), in general, were highest in the EB followed by the WB and CB, respectively (Figure 3.1.5). Epilimnetic densities were consistently higher when compared to hypolimnetic densities, with some extremely high observations (~ 800,000 fish/ha) in the EB. High EB densities in the epilimnion tend to be generated by high abundances of small age-0 Rainbow Smelt (< -53 dB) and do not contribute proportionally to total biomass. However, age-0 Yellow Perch also contribute to density estimates in years of high abundance. Hypolimnetic habitat was minimal in the WB but consistently observed in the CB and EB.

West Basin Results

The WB survey consisted of 21 5-km transects with 21 associated water column profiles sampled between July 22-28 (Table 3.1.2; Figure 3.1.2). In previous years since the survey was redesigned, many sites had to be changed after random selection because shallow depths or limited area precluded completion of a full 5-km transect inside the grid. Therefore, before site selection, we removed 28 of the 80 potential grids based on three criteria: 1) the grid was less than 10 km^2 in area, 2) the width or height of the grid was less than 3 km, so a particular wind direction would be problematic, and 3) shallow depths or other obstructions similarly constrained the available area. Midwater trawl samples were not collected.

Hypolimnetic habitat was observed in two grids within the furthest east strata (G194 and G133). Otherwise, results represent prey fish densities in the epilimnion. Most single targets were measured at a target strength around -60 dB, likely representing age-0 Percidae and Moronidae species as well as Emerald Shiner and Gizzard Shad (Figure 3.1.4). A greater proportion of larger targets (-50 dB) were observed in the 'Islands' stratum (S04). Prey fish densities were highest in nearshore grids just east of Maumee Bay (G245) and near Pidgeon Bay (G431 and G492). Mean strata fish density was lowest in S01 and S05 (<6,000 fish/ha) and highest in S03 (23,039 fish/ha). Annual mean prey fish density in the West Basin marginally decreased to 8,177 fish/ha in 2025, just below the time series median of 10,907 fish/ha (Figure 3.1.6).

Central Basin Results

The CB survey consisted of 27 5-km transects with associated water column profiles sampled between July 20-24. One targeted 5-minute grid (G621) was omitted from sampling due to daylight limitations, but all remaining targeted grids were sampled including additional grids in stratum S08, S09, S10, S12, S13, and S14 (Table 3.1.2; Figure 3.1.2). Annual mean areal fish density increased to 6,167 fish/ha in 2025 (Figure 3.1.7) with higher densities in the epilimnion (Figure 3.1.5). Thirty-Five midwater trawl samples were collected in Canadian waters across four strata (S7, S8, S11, and S12) while 30 midwater trawl samples were collected in U.S. waters across four strata (S09, S10, S13, and S14; Table 3.1.2). Midwater trawls captured 3,904 fish across 14 species (Table 3.1.3). In general, the highest midwater trawl catches occurred in the epilimnion and were comprised of many species and age-groups (bolded values in Table 3.1.3), age-0 Rainbow Smelt (RSYOY), age-0 Yellow Perch (YPYOY), and Emerald Shiner (ES). Hypolimnetic catches were comprised primarily of RSYOY and YPYOY (Figure 3.1.8). Age-1+ Rainbow Smelt (RSYAO) catches, which typically make up a high proportion of total catch, were relatively low in both the epilimnion and hypolimnion compared to previous years. Relative to water column depth, ES catches were greater in offshore waters (>20 m) and more consistent across the survey than previous years (Figure 3.1.9). Several large YPYOY catches occurred around the thermocline, with consistent catches occurring near the 20 m contour. Similar to YPYOY, the greatest RSYOY catches occurred near the 20 m contour but were more consistently encountered across the survey. RSYAO were primarily restricted to offshore waters (>20 m), typically occurring at or below the thermocline. OTHER species were ubiquitous across the survey depths.

East Basin Results

The EB survey consisted of 42 5-km transects with 20 associated water column profiles sampled between July 20-28. Representative water column profiles were taken in each stratum, although not for each sampled 5-minute grid. Midwater trawl samples were not collected. The time series of age-1+ Rainbow Smelt is an index of fish abundance in the hypolimnion that have target strengths consistent with age-1+ sized Rainbow Smelt (-60 dB to -40 dB). Companion midwater trawls completed by NYSDEC in early years of the survey (up to 2007) found that age-1+ Rainbow Smelt made up greater than 95% of catches of fish of their acoustic target strength in meta-hypolimnion trawls. Midwater trawl catches by OMNR in 2019 again confirmed the assumption. Grids that did not have hypolimnetic conditions were assumed to not have any yearling and older Rainbow Smelt (i.e., 0 fish/ha). Strata density is the mean density of all the 500 m EDSU within the strata. The basin estimate is an area weighted mean of the combined strata. The highest densities of age-1+ Rainbow Smelt were observed in S22, S17, and S20 (mean fish/ha = 801, 557, and 521, respectively). The density of age-1+ Rainbow Smelt decreased notably to 404 fish/ha in 2025 from 3,311 fish/ha in 2024 (Figure 3.1.10).

3.2 Explore autonomous technology integration into the survey design to increase program efficiency (M. DuFour)

Uncrewed surface vessels (USV) could enhance Lake Erie acoustic prey-fish surveys

The U.S. Geological Survey, Cornell University, SUNY Brockport, CUNY Brooklyn, and Michigan Technological University, in cooperation with ODNR and OMNR, evaluated the use of a wind-powered uncrewed surface vessel (USV; Saildrone Inc.) to enhance acoustic prey-fish surveys on Lake Erie between August 1 and September 27, 2023. The USV collected 3,600 km of acoustic data during its 58 days at large (Figure 3.2.1). The primary objective was to collect acoustic data alongside traditional fisheries research vessels (R/V) to evaluate the potential for vessel avoidance bias in the existing hydroacoustic surveys, as the USV is a much quieter platform. Four agency vessels participated in the comparison, including the USGS R/V *Muskie*, ODNR R/V *Almar*, ODNR R/V *Grandon*, and OMNR R/V *Erie Explorer*. These R/Vs interacted with the USV in the West, West-Central, East-Central, and East basins (Figure 3.2.1).

Paired hydroacoustic data were collected using overtake maneuvers (Figure 3.2.2). An overtake maneuver began with the slower USV collecting data along a pre-planned course for approximately 2 km, at which time a R/V would maneuver to that course and collect data as it approached the USV. Once the USV was reached, the R/V would move off course and hold as the USV continued along course for another 2 km. These maneuvers were repeated through the night, across multiple nights, at multiple locations, and with each R/V totaling 51 paired R/V-USV measurements. Data, including target strength (TS, dB re 1 m^2), area backscattering coefficient (ABC, $m^2 m^{-2}$), and areal fish density (fish/ha), were statistically compared to estimate correlation and proportional differences in magnitude. Analyses concluded that there was strong correlation between paired USV and R/V measurements and, although there were some situational differences in magnitude related to spatiotemporal variation in fish distributions and variability in platform responses to survey conditions, survey level areal fish density estimates were comparable (R/V ~ 94% of USV; Figure 3.2.3). As a result, the USV is now viewed as a viable acoustic sampling platform for Lake Erie prey-fish surveys.

The USV brings with it several benefits, including the opportunity for greater spatial coverage. This would lead to increased precision and operational flexibility to collect data during optimal survey conditions and result in higher quality survey data. Most importantly, incorporating a USV into Lake Erie hydroacoustic surveys could allow R/Vs to be re-tasked, bolstering the collection of midwater trawl data to support species-specific apportionment across basins. Data for this study are publicly available at DuFour et al. (2026a), while a full description of the study is available at DuFour et al. (2026b).

Table 3.1.1: Lake-wide hydroacoustic data collection summary.

Basin	Sounder	Frequency	Ping Rate	Pulse Length	Collection Threshold	WC Profiles	Companion MTR
WB	Biosonics	201 kHz	10 pps	0.2 msec	-130 dB	Yes	No
CB	Biosonics	120 kHz	4 pps	0.4 msec	-130 dB	Yes	Yes
EB	Simrad EK80	120 kHz	4 pps	0.256 msec	-130 dB	Yes	No

Table 3.1.2: Number of targeted and completed 5-minute sample grids and trawls for each stratum and basin.

Basin	Stratum	Target	# Complete	# Trawls
WB	S01	5	5	-
WB	S02	4	4	-
WB	S03	2	2	-
WB	S04	3	3	-
WB	S05	6	6	-
WB	S06	1	1	-
CB	S07	1	1	5
CB	S08	2	3	11
CB	S09	3	4	12
CB	S10	2	3	4
CB	S11	2	2	5
CB	S12	4	5	14
CB	S13	5	7	12
CB	S14	1	2	2
EB	S15	2	2	-
EB	S16	4	4	-
EB	S17	5	5	-
EB	S18	6	6	-
EB	S19	5	6	-
EB	S20	5	6	-
EB	S21	4	4	-
EB	S22	3	3	-
EB	S23	2	2	-
EB	S24	3	4	-

Table 3.1.3: Midwater trawl catch summary by species and age-group including age-0 or young-of-the-year (YOY) and age-1+ or yearling-and-older (YAO). Bolded values indicate species and age groups included in the OTHER species category.

| Common Name	Scientific Name	YOY	YAO	Total
Gizzard Shad	*Dorosoma cepedianum*	**336**	**7**	343
Rainbow Trout	*Oncorhynchus mykiss*	**0**	**5**	5
Lake Whitefish	*Coregonus clupeaformis*	**1**	**1**	2
Rainbow Smelt	*Osmerus mordax*	1314	251	1565
White Sucker	*Catostomus commersoni*	**0**	**8**	8
Emerald Shiner	*Notropis atherinoides*	237	167	404
Channel Catfish	*Ictalurus punctatus*	**0**	**2**	2
Burbot	*Lota lota*	**2**	**0**	2
White Perch	*Morone americana*	**55**	**7**	62
White Bass	*Morone chrysops*	**211**	**4**	215
Yellow Perch	*Perca flavescens*	787	**3**	790
Walleye	*Sander vitreus*	**117**	**185**	302
Round Goby	*Neogobius melanstomus*	**0**	**2**	2
Freshwater Drum	*Aplodinotus grunniens*	**0**	**202**	202
	Total	3060	844	3904
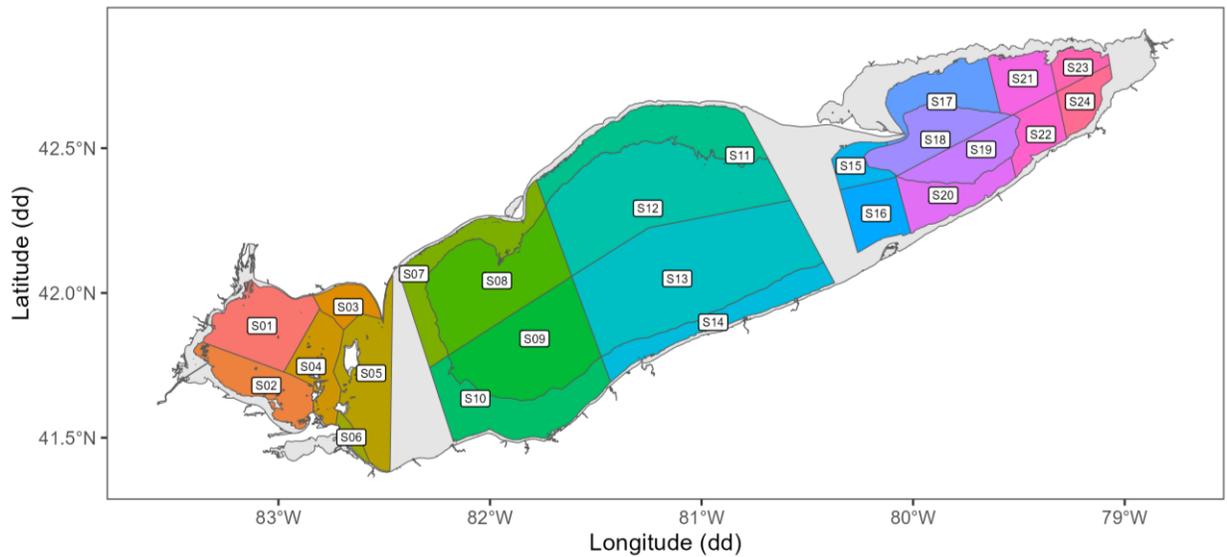
Figure 3.1.1. Lake Erie forage fish acoustic survey strata used since the survey redesign. The West Basin strata are S01-S06; Central Basin are S07-S14, and the East Basin are S15-S24.
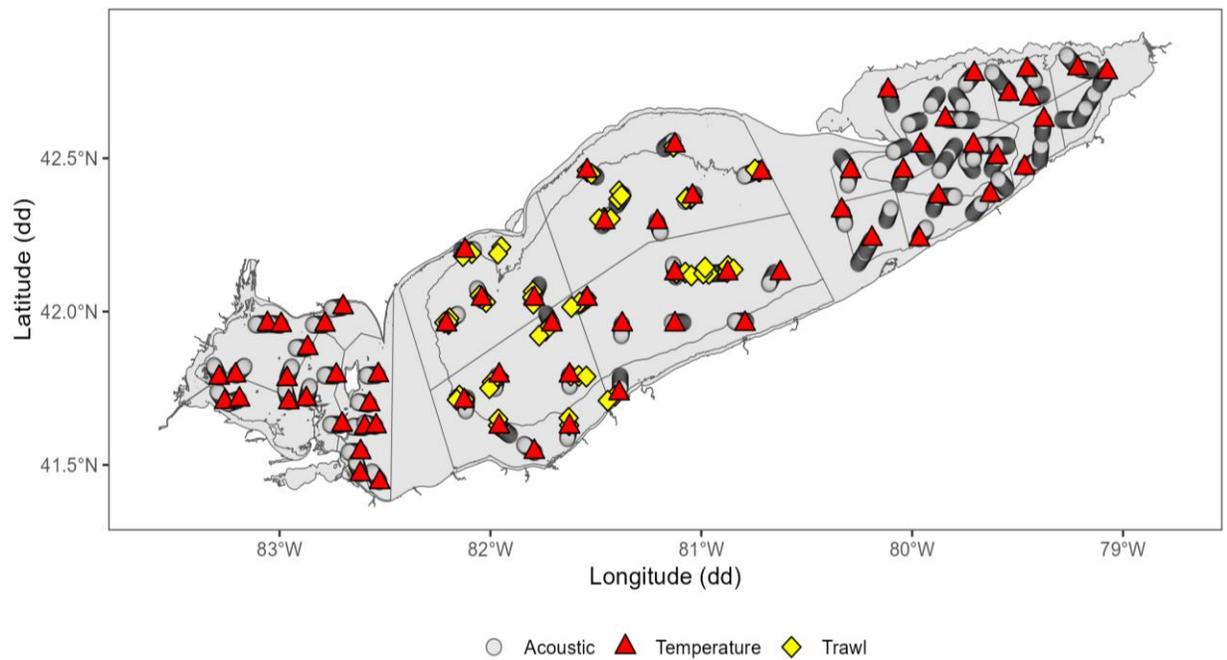

Figure 3.1.2: Lake-wide forage fish survey effort distributed across sample stratum including hydroacoustic transects (open grey circles), midwater trawling (yellow diamonds), and water column profiles (red triangles).
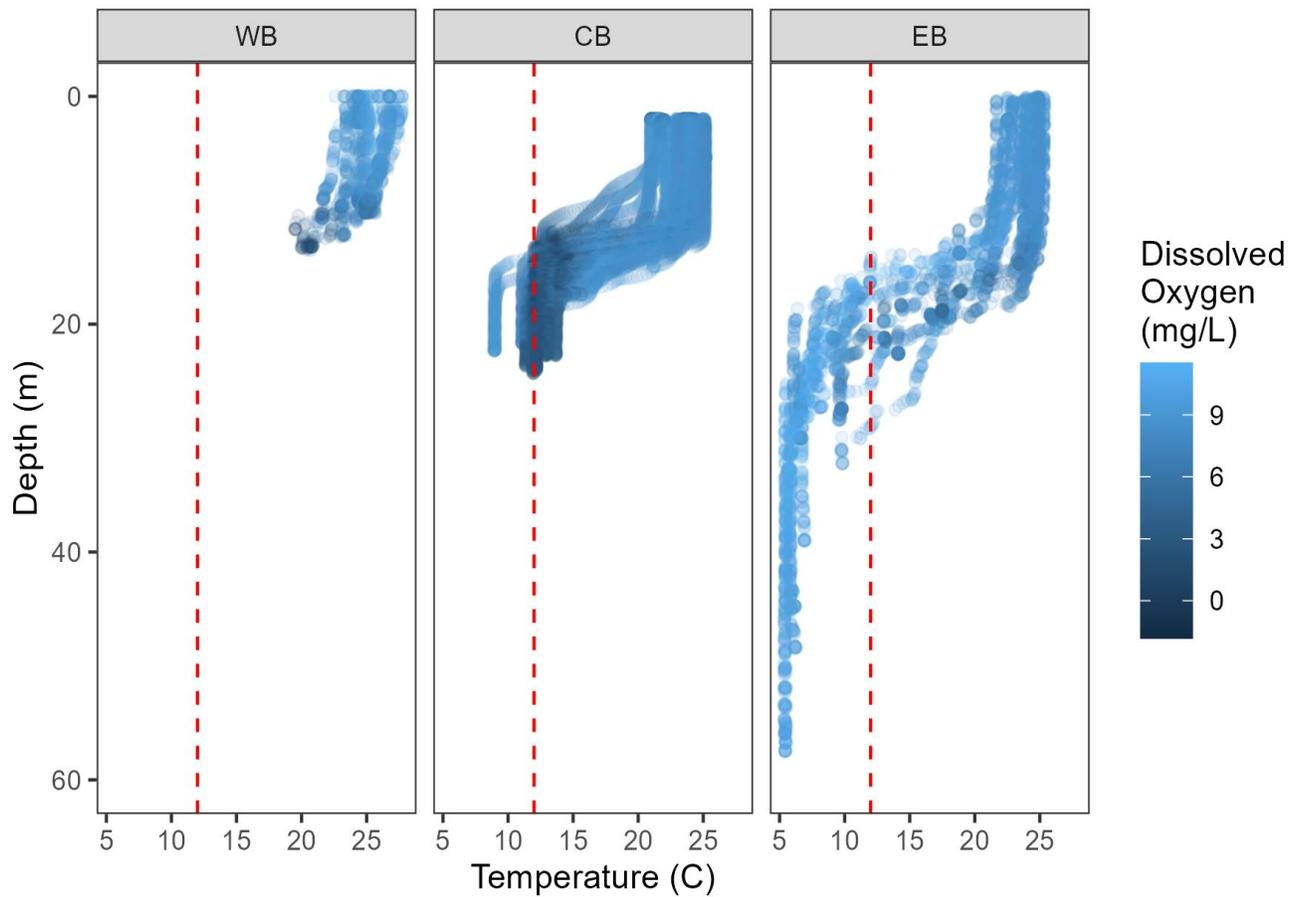
Figure 3.1.3: Water column profiles displayed by basin (West Basin = WB, Central Basin = CB, and East Basin = EB) with depth on the x-axis, temperature (°C) on the y-axis, and color associated with the level of dissolved oxygen (mg/L). The dashed vertical line indicates 12 °C.
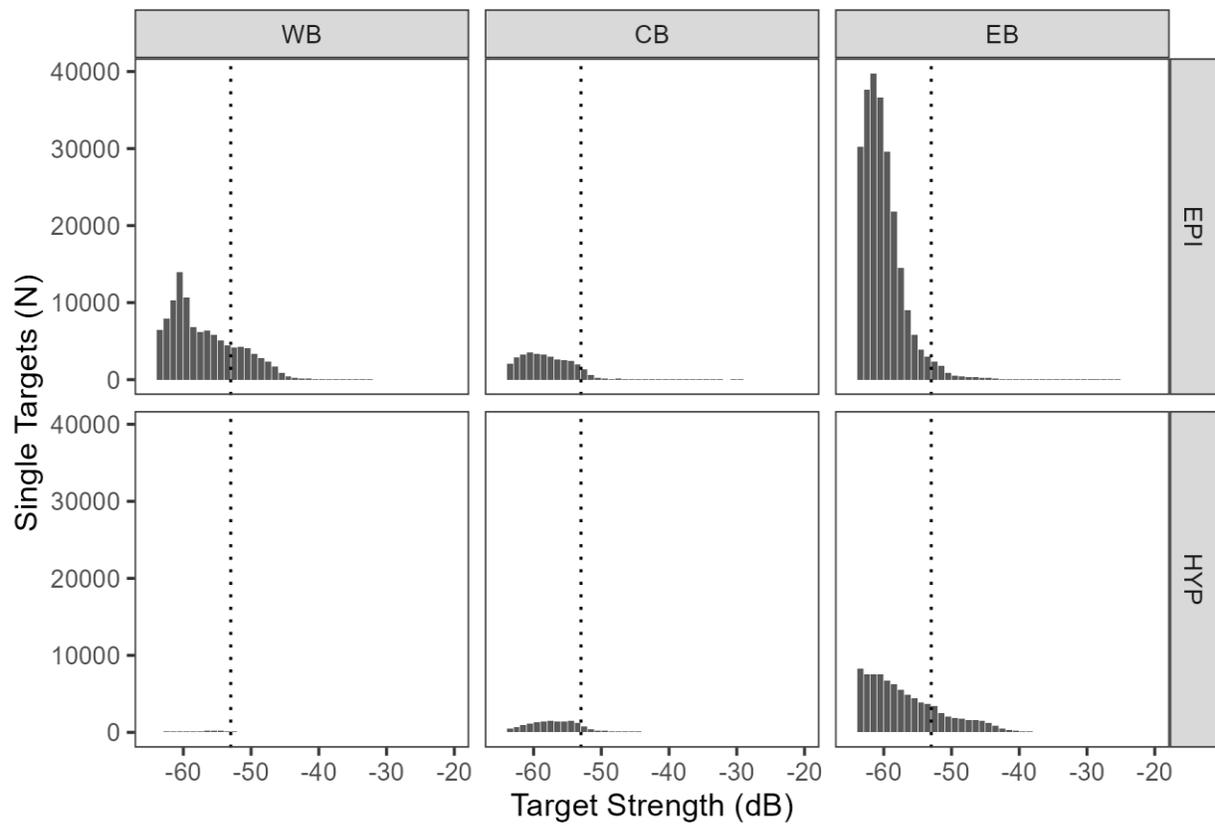
Figure 3.1.4: Target strength distributions of single targets by layer and across basins. Target strength is a measure of echo intensity that is relative to fish size. Single targets are individual echoes produced by fish encountered in the acoustic beam. In general, age-0 fishes are < -53 dB while age-1+ fishes are > -53 dB.
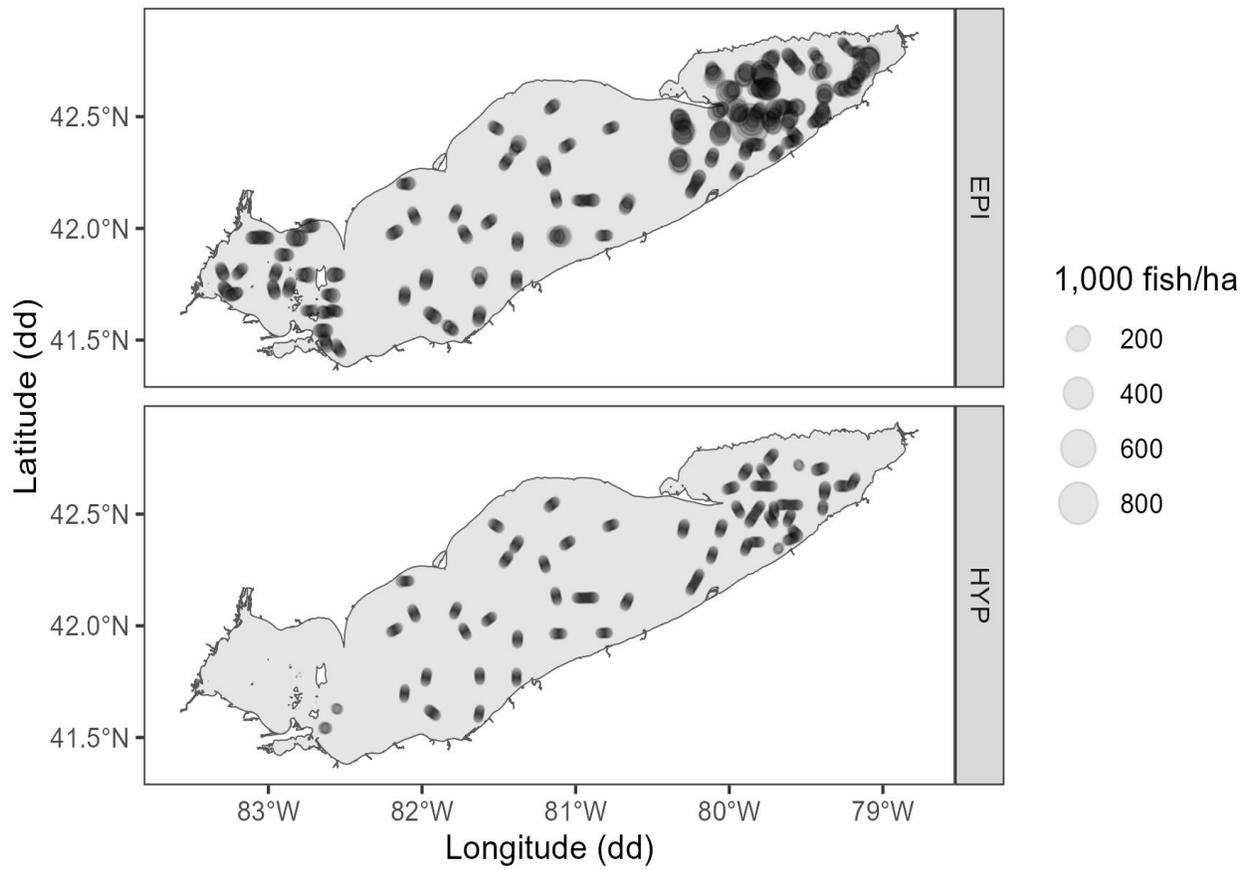
Figure 3.1.5: Lake-wide fish densities (fish/ha) by lake layer (epilimnetic [EPI], hypolimnetic [HYPO]). Larger open circles display increased density in epilimnetic waters of the West and East basins, and increased density in the hypolimnetic waters of the East Basin.
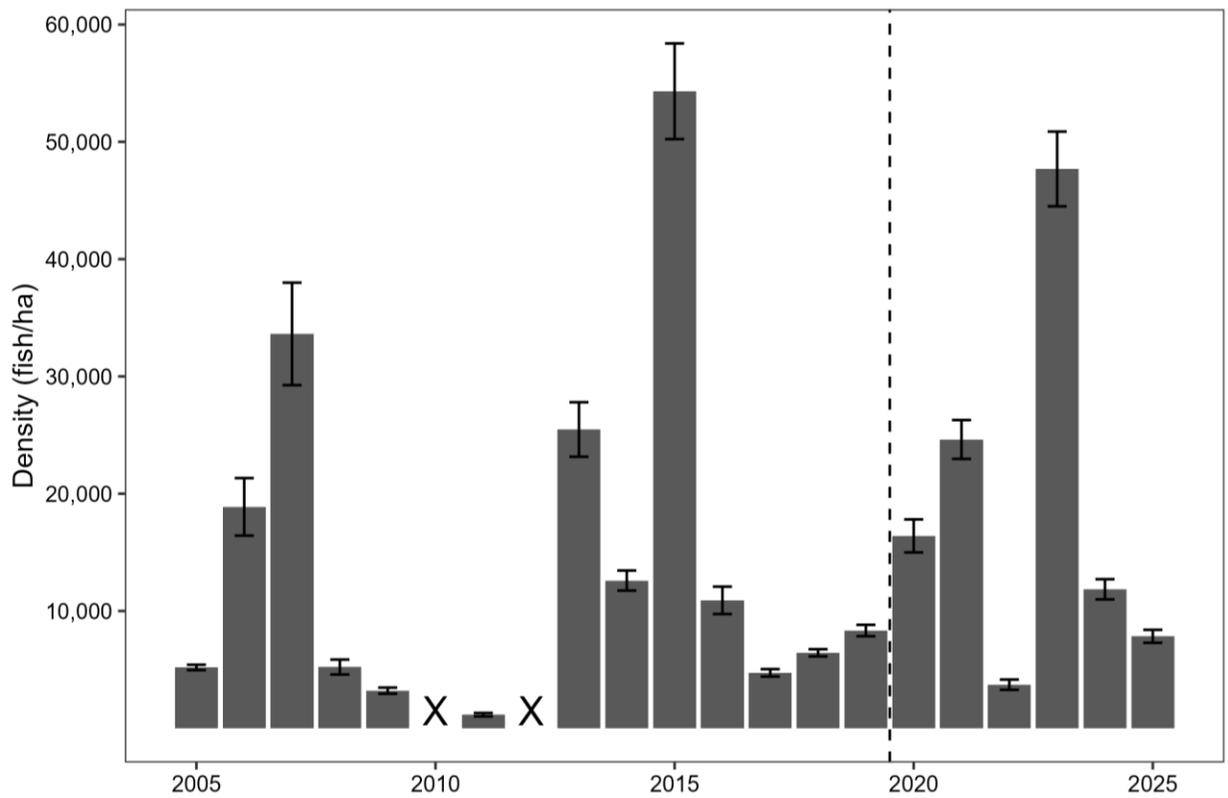
Figure 3.1.6: West Basin mean areal density (fish/ha) estimates over time. Error bars represent ±1 standard error. Survey years with no data (2010 and 2012) are denoted with an "X" and the vertical dashed line signifies the change in sampling design.
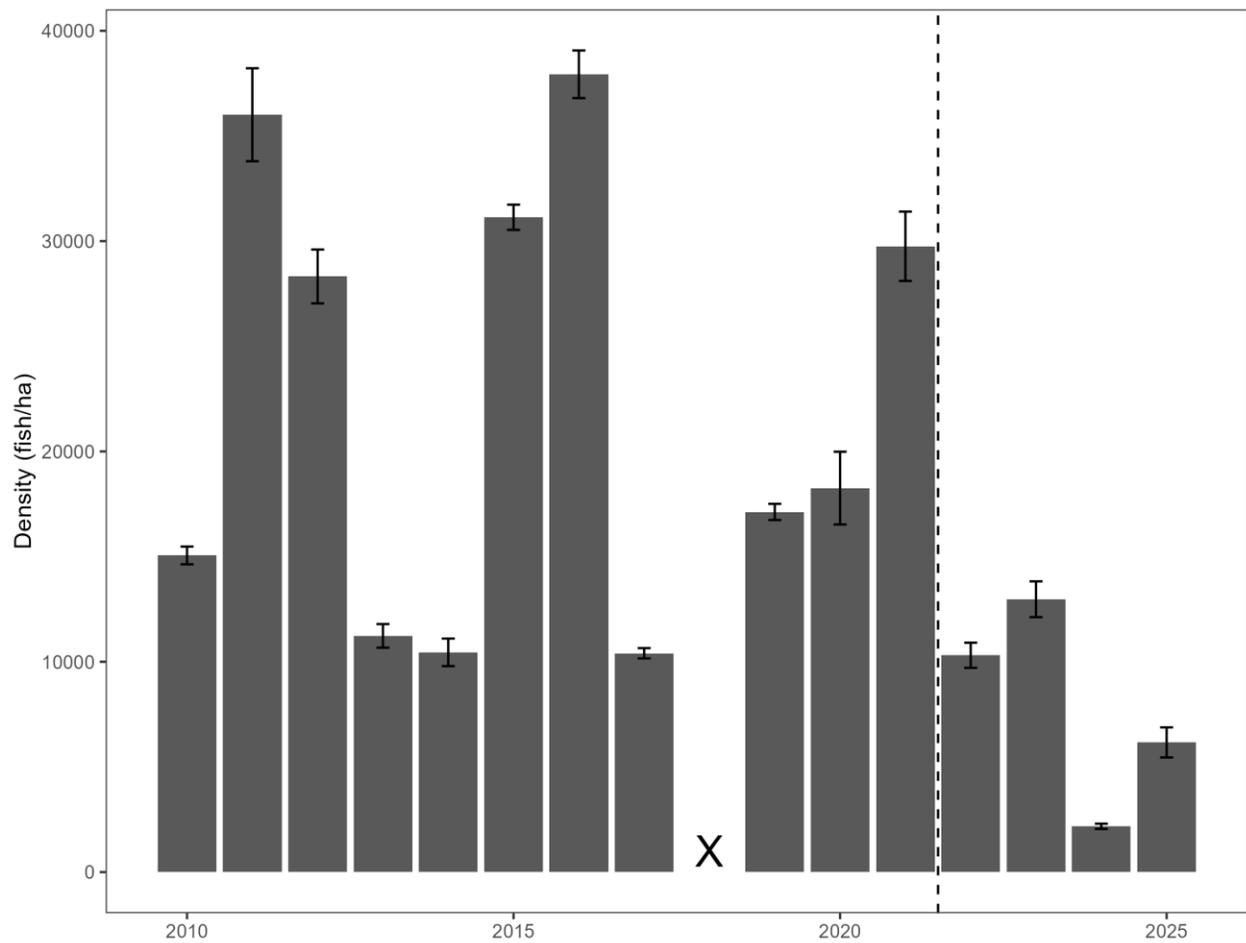
Figure 3.1.7: Central Basin mean areal density (fish/ha) estimates over time. Error bars represent ±1 standard error. Survey years with no data (2018) are denoted with an "X" and the vertical dashed line signifies the change in sampling design.
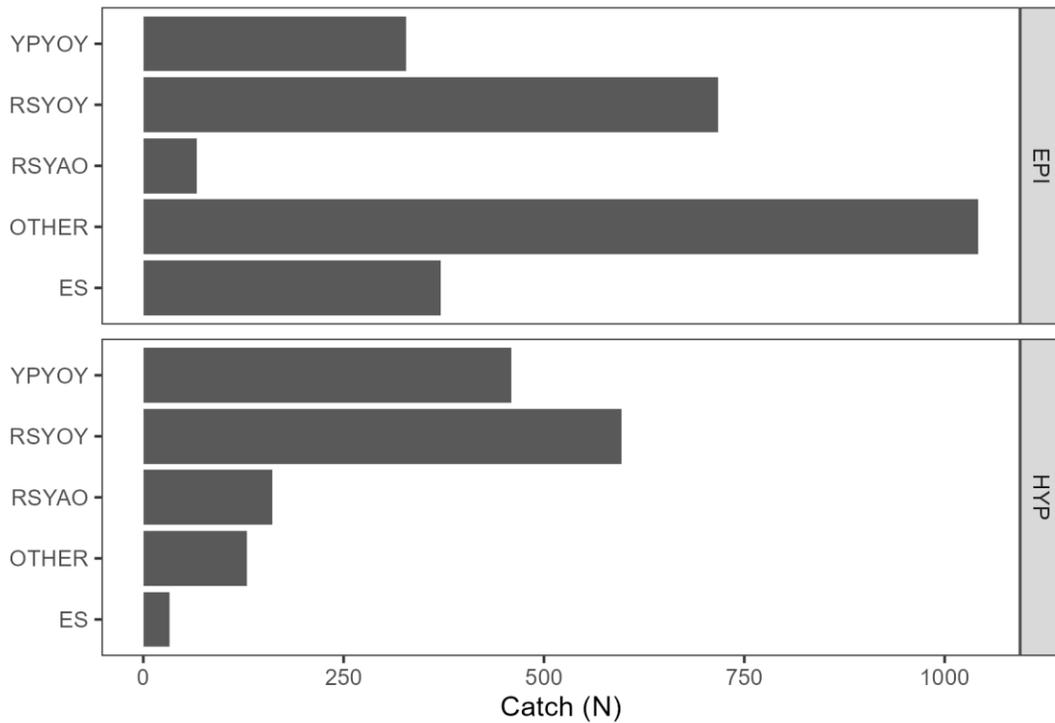
Figure 3.1.8: Total midwater trawl catch from epilimnetic (EPI) and hypolimnetic (HYP) tows across the Canadian waters and a portion of U.S. waters of the Central Basin, including species groups age-0 Rainbow Smelt (RSYOY), age-1+ Rainbow Smelt (RSYAO), Emerald Shiner (ES), age-0 Yellow Perch, and other species (OTHER).
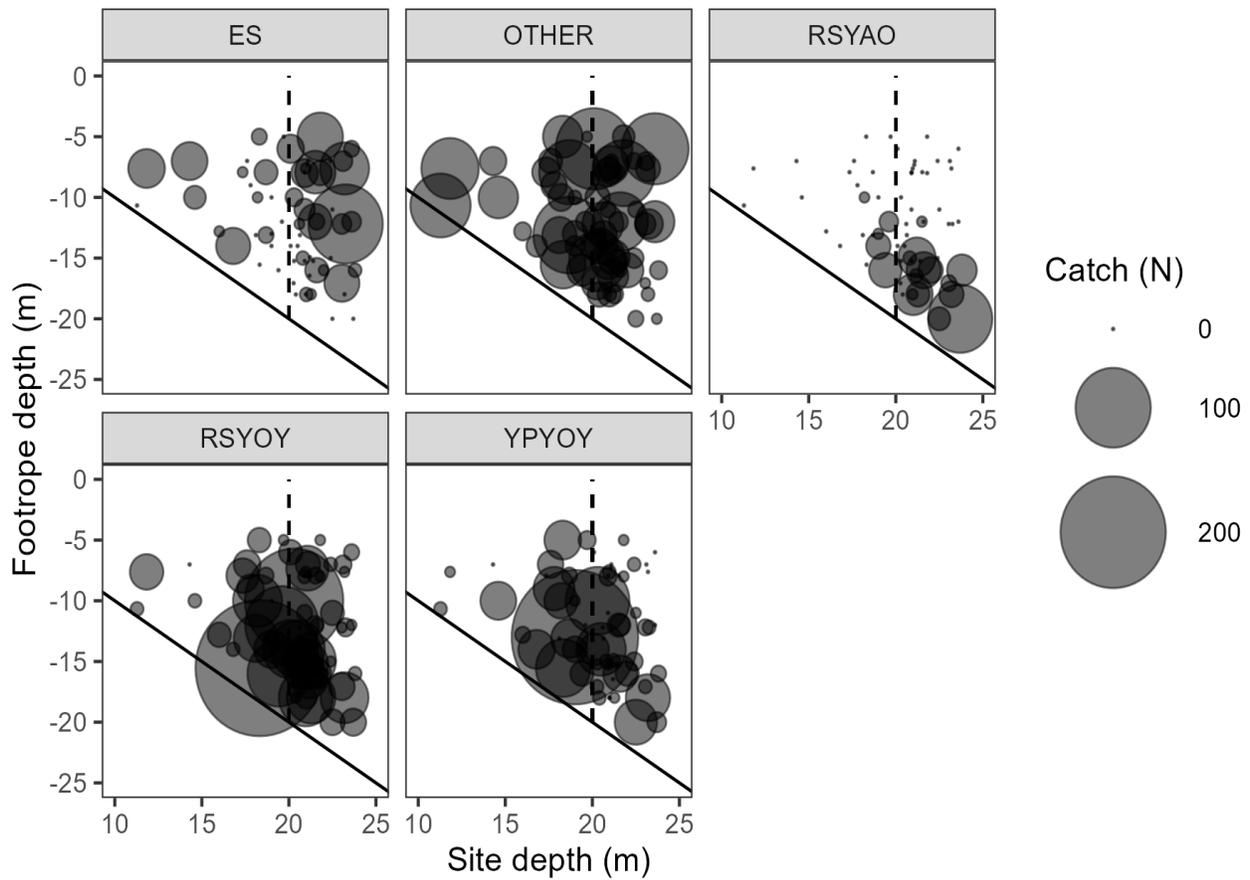
Figure 3.1.9: Species group catches (N) relative to water column depth (diagonal black line) in Canadian and U.S. waters of the Central Basin including Emerald Shiner (ES), other species (OTHER), age-1+ Rainbow Smelt (RSYAO), age-0 Rainbow Smelt (RSYOY), and age-0 Yellow Perch (YPYOY). Water column depths < 20 (dashed vertical line) correspond to near shore strata (S07, S10, S11, and S14) and depths > 20 m correspond to offshore strata (S08, S09, S12, and S13).
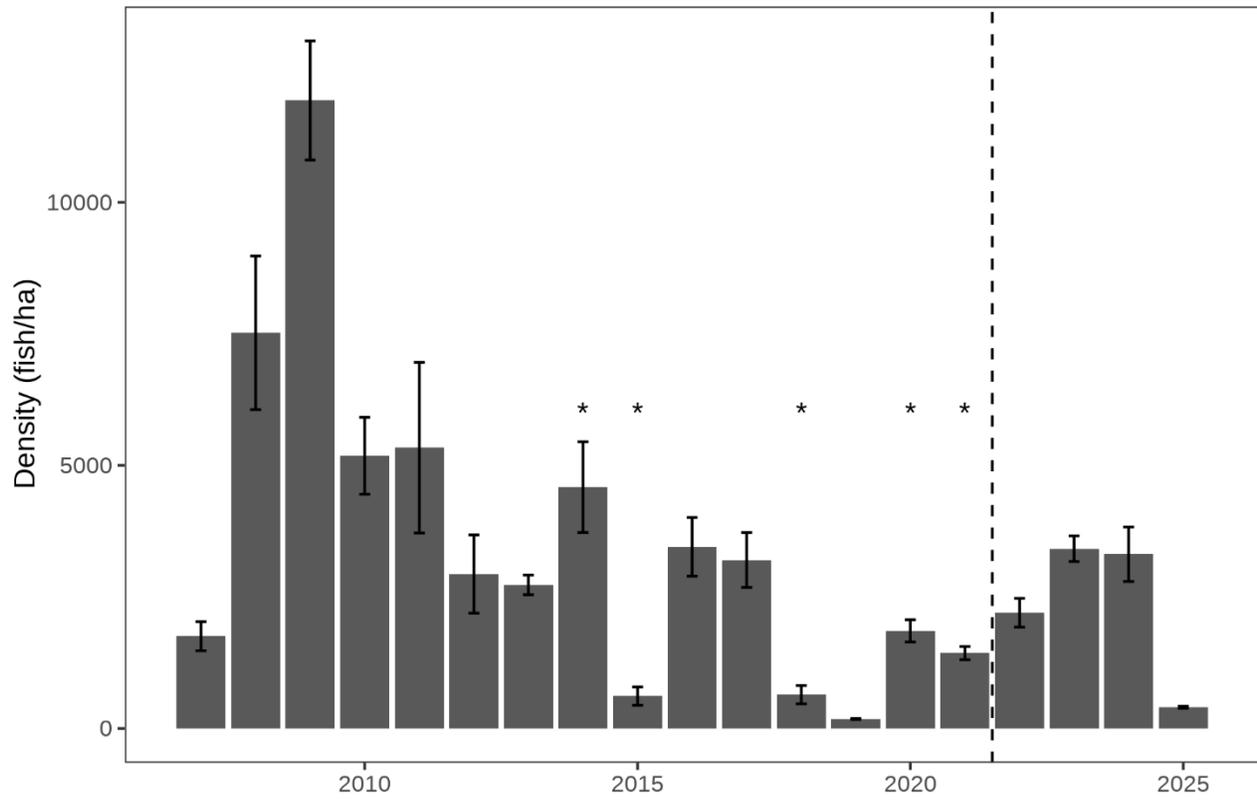
Figures 3.1.10: East Basin index of age-1+ Rainbow Smelt. Error bars represent ±1 standard error. A single asterisk (*) indicates years where not all transects were completed and vertical dashed line signifies when the change in sampling design occurred.
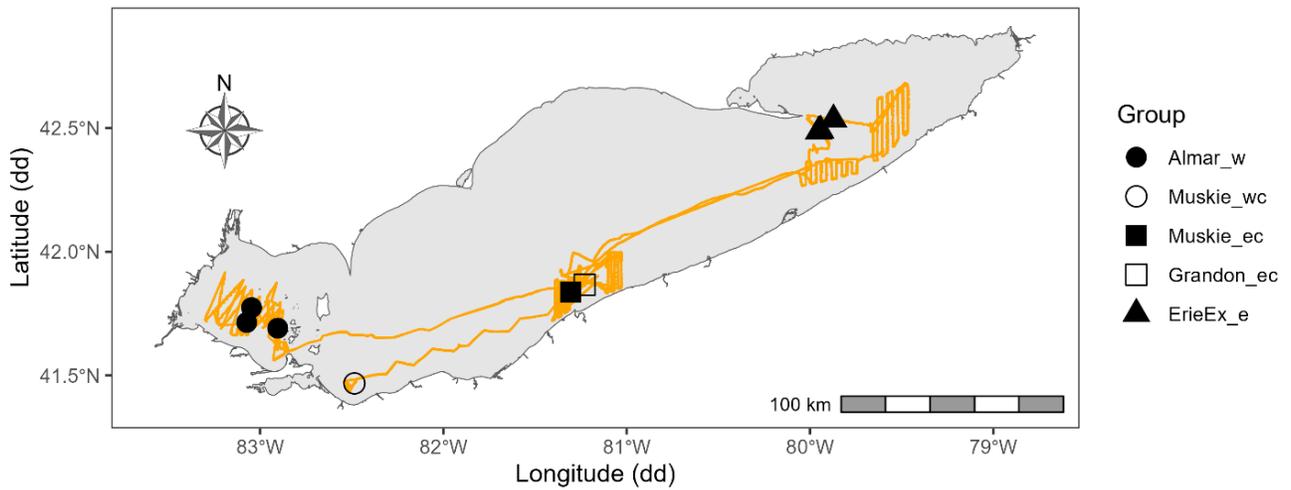
Figure 3.2.1: Uncrewed sailing vessel (USV) cruise tracks (orange lines) in Lake Erie between August 1 and September 26, 2023. Points represent the general locations and vessels that participated in the vessel avoidance bias objective including the R/V *Almar* in the West Basin (Almar_w), R/V *Muskie* in the West-Central (Muskie_wc) and East-Central (Muskie_ec) basins, R/V *Grandon* in the East-Central Basin (Grandon_ec), and the R/V *Erie Explorer* in the East Basin (ErieEx_e).
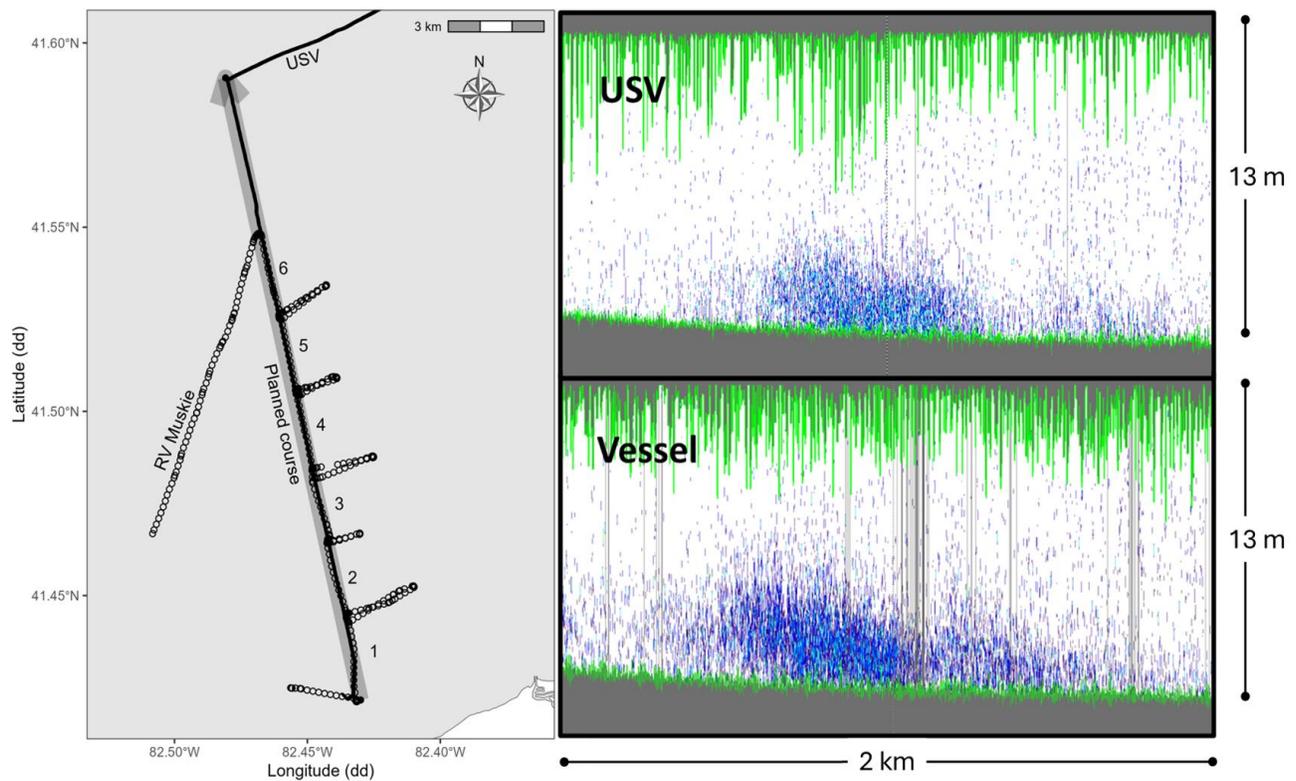
Figure 3.2.2: Nightly overtake maneuvers (left), which collected six paired transects (1-6) between the uncrewed surface vessel (USV) and the R/V *Muskie* during the night of September 25–26, 2023, near Huron, Ohio (i.e., Muskie_wc). The gray band and arrow represent planned coordinates and direction of the USV course. The black open circles represent navigational coordinates of the R/V *Muskie* and the black line represents navigational coordinates of the USV. A comparison of USV and R/V echograms (right) is provided for transect 3.
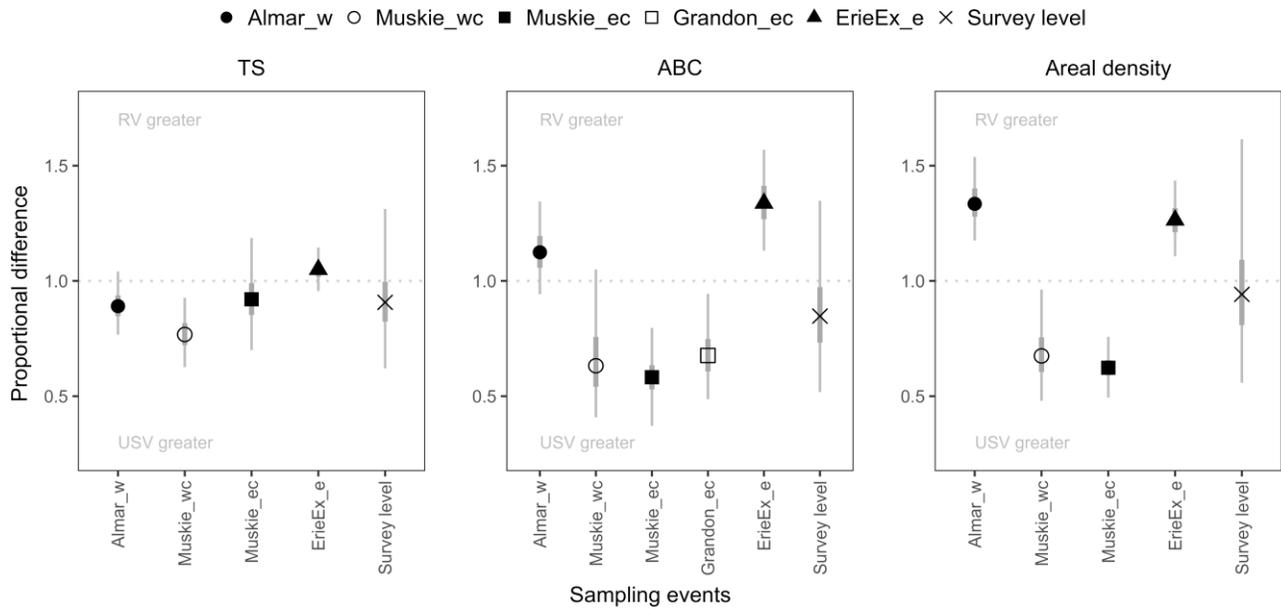
Figure 3.2.3: Proportional differences between research vessels (R/V) and the uncrewed surface vessel (USV) for target strength (TS, dB re 1 m^2), area backscattering coefficient (ABC, m^2m^{-2}), and areal density (fish/ha) ranging from 50% higher (1.5) to 50% lower (0.5). The dashed horizontal line at 1 depicts no difference. Proportional differences were calculated for each sampling event as indicated by the name of the R/V and the associated basin (w = West, wc = West-Central, ec = East-Central, e = East). Survey level differences (X) represent a weighted average between individual sampling events. Dark gray and light gray vertical bars represent 50% and 95% credible intervals, respectively. Single target data from the R/V *Grandon* displayed irregularities and, as a result, the *in situ* TS data were omitted from further analysis which precluded the calculation of areal fish density.

Charge 4: Act as a point of contact for any new/novel invasive aquatic species.

(K. Towne)

Since 2016, the Forage Task Group has maintained a database to track Aquatic Invasive Species (AIS) in Lake Erie. Recently, the FTG has been working with the USGS Nonindigenous Aquatic Species (NAS) database team to incorporate the FTG database and other agency data into the USGS NAS Database so that the Lake Erie data can be better archived and help track AIS on a greater geographic scale.

The FTG is actively monitoring for any new aquatic invasive species that enters the Lake Erie watershed. A few AIS that are not yet in Lake Erie but are of particular concern to the FTG are Black Carp, Silver Carp, Bighead Carp, and Tench. Black, Silver, and Bighead carps are present throughout the Mississippi Basin and have been found in tributaries close to Lake Michigan. Tench was first detected in a tributary of the St. Lawrence River in 1994 and has since spread into the St. Lawrence River and eastern Lake Ontario (Bay of Quinte; Avlijas et al. 2018). The rapid expansion of Tench suggests there is an elevated risk of Tench entering Lake Erie should their expansion into Lake Ontario continue. No Black Carp, Silver Carp, Bighead Carp, Tench, or any other novel non-native fish species were captured in Lake Erie waters in 2025.

Three notable non-native species were captured in Lake Erie in 2025. The first capture was eight Threespine Stickleback (*Gasterosteus aculeatus*) across three sites while boat electrofishing in the St. Clair River from May 27-29, 2025 (site coordinates: 42.704046, -82.498579; 42.813756, -82.499955; 43.023924, -82.434745). The USGS NAS Database reports three other captures of this species in the Lake Erie Basin: one near Cooley Canal (near Toledo, OH) in 1990, one in Maumee Bay, OH in 1994, and one in the Detroit River by USFWS in 2022. Threespine Stickleback has an overall risk assessment category of 'High' due to their history of invasiveness, high climate match, and predicted impacts through hybridization with native sticklebacks, introduction of parasites, and aggressive foraging (USFWS 2017). The second notable species detected was a presumed Midas Cichlid (*Amphilophus citrinellus*) found dead on a bank in Painesville, OH in August 2025 and reported to ODNR. The USGS NAS Database does not report any other captures of this species in the Lake Erie Basin. Midas Cichlid have an overall risk assessment category of 'Uncertain' due to a lack of documented history of invasiveness and resulting impacts, as well as a low climate match for the Lake Erie Basin (USFWS 2018). Lastly, four Rudd (*Scardinius erythrophthalmus*) were captured while boat electrofishing in Cleveland, OH (41.533633, -81.653278) on September 10, 2025. According to the USGS NAS Database, this species was previously detected in Marblehead, OH in 2009 and in Ashtabula, OH in 2018. Additionally, one adult Rudd was reported to iNaturalist in Cleveland in 2021. Rudd has an overall risk assessment of 'High' due to their high climate match, their history of invasiveness, and their predicted impacts on established macrophytes (USFWS 2015).

Protocol for Use of Forage Task Group Data and Reports

- The Forage Task Group has standardized methods, equipment, and protocols as much as possible; however, data are not identical across agencies, management units, or basins. The data are based on surveys that have limitations due to gear, depth, time, and weather constraints that vary from year to year. Any results, conclusions, or abundance information must be treated with respect to these limitations. Caution should be exercised by outside researchers not familiar with each agency's collection and analysis methods to avoid misinterpretation.

- The FTG strongly encourages outside researchers to contact and involve the FTG in the use of any specific data contained in this report. Coordination with the FTG can only enhance the final output or publication and benefit all parties involved. Raw data and summaries are available upon request; please contact the co-chairs (Arthur Bonsall [arthur.bonsall@ontario.ca] and Zak Slagle [zachary.slagle@dnr.ohio.gov]) to initiate a request.

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Appendix 1: List of Species Common and Scientific Names

Common name	Scientific name	Comments
Alewife	*Alosa pseudoharengus*	Invasive species
Bighead Carp	*Hypophthalmichthys nobilis*	Invasive species, not present in Lake Erie
Black Carp	*Mylopharyngodon piceus*	Invasive species, not present in Lake Erie
Bluegill	*Lepomis macrochirus*	
Brook Silverside	*Labidesthes sicculus*	
Channel Catfish	*Ictalurus punctatus*	
Channel Darter	*Percina copelandi*	
Common Carp	*Cyprinus carpio*	Invasive species
Crayfish	*Astacoidea* spp.	
Emerald Shiner	*Notropis atherinoides*	
Freshwater Drum	*Aplodinotus grunniens*	
Gizzard Shad	*Dorosoma cepedianum*	
Grass Carp	*Ctenopharangydon idella*	Invasive species
Johnny Darter	*Etheostoma nigrum*	
Lake Sturgeon	*Acipenser fulvescens*	
Largemouth Bass	*Micropterus nigricans*	Formerly *Micropterus salmoides*
Logperch	*Percina caprodes*	
Mimic Shiner	*Paranotropis volucellus*	Formerly *Notropis volucellus*
Mudpuppy	*Necturus maculosus*	Native salamander
Rainbow Smelt	*Osmerus mordax*	Invasive species
Rock Bass	*Ambloplites rupestris*	
Round Goby	*Neogobius melanstomus*	Invasive species
Rudd	*Scardinius erythrophthalmus*	Invasive species
Ruffe	*Gymnocephalus cernuus*	Invasive species
Silver Carp	*Hypophthalmichthys molitrix*	Invasive species, not present in Lake Erie
Silver Chub	*Macrhybopsis storeriana*	
Smallmouth Bass	*Micropterus dolomieu*	
Spottail Shiner	*Hudsonius hudsonius*	Formerly *Notropis hudsonius*
Tench	*Tinca tinca*	Invasive species, not present in Lake Erie
Trout-perch	*Percopsis omiscomaycus*	
Tubenose Goby	*Proterorhinus semilunaris*	Invasive species
Walleye	*Sander vitreus*	
White Bass	*Morone chrysops*	
White Perch	*Morone americana*	Invasive species
White Sucker	*Catostomus commersoni*	
Yellow Perch	*Perca flavescens*	