Fisheries Research and Monitoring Activities of the Lake Erie Biological Station, 2024[1]

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Executive Summary

A comprehensive understanding of fish populations and their interactions is the cornerstone of modern fishery management and the basis for Lake Erie's Fish Community Objectives (FCOs) developed in 2020 (Francis et al. 2020). The 2024 U.S. Geological Survey (USGS) Lake Erie Biological Station Annual Report is responsive to these FCOs and the USGS obligations via a Memorandum of Understanding (MOU 2017) with the Great Lakes Fishery Commission (GLFC) Council of Lake Committees (CLC) to provide scientific information in support of fishery management. Goals for the USGS Great Lakes Deepwater Fish Assessment and Ecological Studies were to monitor long-term changes in the fish community and track population dynamics of key fishes of interest to management agencies. Specific to Lake Erie, expectations were sustained investigations of native percids, prey fish populations, and Lake Trout. All work was conducted as part of the Deepwater Science Program under the authority of the Great Lakes Fishery Research Authorization Act of 2019 (16 USC §941h).

The USGS 2024 Deepwater Science Program fieldwork began in Lake Erie in March and concluded in December, using trawl, gill net, hydroacoustic, lower trophic sampling devices, and telemetry methods. This work resulted in 44 bottom trawls covering 41 ha of lake bottom and catching 48,936 fish totaling 995 kg in the West Basin of Lake Erie, with detailed results described below. Overnight gill net sets (n=25) for coldwater species were performed in the East Basin of Lake Erie. A total of 8 km of gillnet was deployed during these surveys, which caught 106 fish, 92 of which were native coldwater species: Lake Trout, Burbot, and Lake Whitefish. Results from coldwater species assessments will be reported in the Coldwater Task Group report to the GLFC and the CLC (CTG 2025). These reports are used to inform Lake Trout stocking decisions and direct lamprey control measures (16 USC §939a). USGS hydroacoustic sampling included twenty-six 5-km transects (130 km total) in the Central Basin as part of a collaborative lake-wide survey with details and results reported by the Forage Task Group (FTG 2025). Lower trophic sampling provided data from zooplankton samples (n=12) and water quality profiles (n=12) to populate a database maintained by the Michigan Department of Natural Resources (MDNR), Ontario Ministry of Natural Resources (OMNR), Ohio Department of Natural Resources (ODNR), Pennsylvania Fish and Boat Commission (PFBC), and New York State Department of Environmental Conservation (NYSDEC). USGS also assisted CLC member agencies with deployment and maintenance of Great Lakes Acoustic Telemetry Observation System (GLATOS) infrastructure throughout all three Lake Erie basins and tributaries, supporting multiple coordinated telemetry investigations.

This report presents biomass-based summaries of fish communities in western Lake Erie derived from USGS bottom trawl surveys conducted from 2013 to 2024 during June and September. The survey design compliments the August ODNR- OMNRF effort by reinforcing stock assessments with more robust data. Analyses herein evaluated trends in total biomass, abundance of dominant predator and forage species, non-native species composition, biodiversity, and community structure. Data from this effort are accessible for download (Keretz et al. 2025).

Introduction

Lake Erie has the most populated watershed of all the Great Lakes and has undergone dramatic anthropogenic changes. Since the 1800s, overexploitation of fish populations, habitat destruction, non-native species proliferation, industrial contamination, and changes in nutrient loading have impacted the fish community including declines in or extirpation of many native species (Regier et al. 1969, Hartman 1973; Leach & Nepszy 1976; Ludsin et al. 2001). Implementation of the Clean Water Act and Great Lakes Water Quality Agreement in the 1970s improved habitat conditions (Reutter 2019), which contributed to several strong percid year-classes (Vandergoot et al. 2019). These strong year-classes also benefited from more restrictive management practices that reduced harvest, ultimately rehabilitating Lake Erie percid stocks (Kayle et al. 2015, STC 2020). Historically, Lake Erie supported a cool water fish community dominated by percids and salmonids. Recently updated FCOs set forth a vision that "Lake Erie will consist of diverse fish communities that support ongoing societal benefits, including thriving commercial and recreational fisheries, improved fish habitat and desirable ecosystem performance, and reduced adverse impacts from invasive fish" (Francis et al. 2020). Today, mixed fisheries resulting from seasonally changing cool and warm water habitats have developed in Lake Erie, and the new FCOs reflect a desire to manage both predator and prey fish communities within them.

Although Lake Erie management agencies have traditionally focused on numerical indices of a few economically important species, aquatic ecosystem models are typically evaluated in terms of entire fish community biomass. As a result, our understanding of fish community structure and ecosystem dynamics from biomass-based models has been limited to short-term investigations and proxy measurements (e.g., length-weight conversion; FTG 2020). Therefore, many Lake Erie fish community databases are now incorporating biomass-based measurements.

In response, USGS revised the Lake Erie trawl program to provide biomass-based measurements for all encountered species (Table 1). The survey design change occurred in 2012, coincident with commission of a new research vessel and a change in bottom trawl gear. These modifications already altered the existing time series; therefore, the survey design was also expanded to include greater spatial coverage and increased sample size generating a new time series. The purpose of this report is to develop a comprehensive understanding of the long-term changes and fish community dynamics including population dynamics of key fishes of interest to management agencies, such as native percids and their prey. Here, we summarize survey results for the most recent series of West Basin trawl data from 2013 through 2024.

Note that a detailed description of the sampling process along with traditional numerically-based catch data (e.g., fish/ha) for individual species can be downloaded online (Keretz et al. 2025) or obtained for earlier years (https://doi.org/10.5066/F75M63X0; U.S. Geological Survey, Great Lakes Science Center 2019).

Table 1. Scientific names correspond to the common names of fishes captured during surveys described in this report. Non-native species in **bold**.

Scientific Name	Common Name	Scientific Name	Common Name
Acipenser fulvescens	Lake Sturgeon	*Micropterus salmoides*	Largemouth Bass
Alosa pseudoharengus	**Alewife**	***Morone americana***	**White Perch**
Ambloplites rupestris	Rock Bass	*Morone chrysops*	White Bass
Ameiurus nebulosus	Brown Bullhead	*Moxostoma anisurum*	Silver Redhorse
Aplodinotus grunniens	Freshwater Drum	*Moxostoma erythrurum*	Golden Redhorse
Carassius auratus	**Goldfish**	*Moxostoma macrolepidotum*	Shorthead Redhorse
Carpiodes cyprinus	Quillback	*Moxostoma valenciennesi*	Greater Redhorse
Catostomus commersonii	White Sucker	***Neogobius melanostomus***	**Round Goby**
Coregonus clupeaformis	Lake Whitefish	*Notemigonus crysoleucas*	Golden Shiner
Cyprinus carpio	**Common Carp**	*Notropis atherinoides*	Emerald Shiner
Dorosoma cepedianum	Gizzard Shad	*Notropis hudsonius*	Spottail Shiner
Esox masquinongy	Muskellunge	*Notropis volucellus*	Mimic Shiner
Ichthyomyzon unicuspis	Silver Lamprey	***Oncorhynchus mykiss***	**Rainbow Trout**
Ictalurus punctatus	Channel Catfish	***Osmerus mordax***	**Rainbow Smelt**
Labidesthes sicculus	Brook Silverside	*Perca flavescens*	Yellow Perch
Lepisosteus osseus	Longnose Gar	***Petromyzon marinus***	**Sea Lamprey**
Lepomis gibbosus	Pumpkinseed	*Percina caprodes*	Logperch
Lepomis macrochirus	Bluegill	*Percopsis omiscomaycus*	Trout-perch
Lota lota	Burbot	*Pomoxis annularis*	White Crappie
Macrhybopsis storeriana	Silver Chub	*Salvelinus namaycush*	Lake Trout
Micropterus dolomieu	Smallmouth Bass	*Sander vitreus*	Walleye

Methods

Survey Area and Sampling Design

From 2013 to 2024, USGS annually conducted a grid-based benthic prey fish bottom trawl survey (Figure 1) during the third weeks of June (spring) and September (autumn). The sampling domain was west of the Pelee-Lorain Ridge, which acts as a natural boundary between the relatively shallow West Basin and deeper Central Basin. Sampling locations were selected both to accommodate the trawl net deployed from the R/V *Muskie* (no shallower than head-rope height ~3 m), and to effectively evaluate fish populations at all deep-water habitats in the West Basin of Lake Erie, which included areas of the main basin, Lake Erie Islands (Kelleys Island, Pelee Island, the Bass Islands, and several smaller islands) and major river mouths (Detroit, Sandusky, and Maumee rivers).The spacing of the grid was six minutes of longitude (E-W) and latitude (N-S), and sampling took place at the grid center. This spacing was chosen to maximize our spatiotemporal coverage and provide the maximum number of locations that could be sampled within a week (n=41). After the 2013 spring survey, the entire grid was shifted south by 1.85 km to avoid interactions with large vessels using the shipping lanes. The survey design complemented a time series of combined ODNR and OMNR bottom trawl efforts conducted annually during August. Together, these surveys provide a foundation for addressing emerging issues and support FCOs detailed in Lake Erie task groups' charges.

Survey coverage was reduced during 2017, 2018, 2020, 2021, and 2024 for various reasons. During spring of 2017, only 36 sites were sampled due to a structural failure of the trawl gallows after the net became snagged on the lake bottom. During spring of 2018, no trawling was conducted as the research vessel was in dry-dock for maintenance and repair. Sampling in 2020 was restricted to September and U.S. waters only due to the SARS-CoV-2 pandemic. All 41 stations were sampled during spring 2021; however, stations were restricted to U.S. waters only due to the SARS-CoV-2 pandemic during autumn 2021. During 2024, hydraulic malfunctions with the vessel's net reel resulted in only partial survey coverage during spring (9 sites) and autumn (35 sites).

Data Summaries

Trawl catches from 2013 to 2024 encountered 42 species, including 8 non-native (Table 1). These species were grouped into multiple categories in this report based on family, life stage (age-0, age-1, age-1+, age-2+, and all), functional group (prey fish vs. non-prey fish), morphology (soft-rayed vs. spiny-rayed), and native vs. non-native. The prey fish categories included the family Osmeridae (all Rainbow Smelt), the family Clupeidae (age-0 Gizzard Shad and all Alewife [max total length = 220 mm]), soft-rayed fishes (all Brook Silverside, Emerald Shiner, Golden Shiner, Mimic Shiner, Round Goby, Silver Chub, Spottail Shiner, Trout Perch, and unidentified Leuciscidae), and spiny-rayed fishes (age-0 Freshwater Drum, Walleye, White Perch, White Bass, and Yellow Perch). The remainder of the species and life stages were grouped by family (Catostomidae, Ictaluridae, Moronidae, Percidae, Sciaenidae) or lumped into an "Other" category. Species were also grouped by native and non-native (the latter group includes Alewife, Goldfish, Common Carp, White Perch, Round Goby, Rainbow Trout, Rainbow Smelt, and Sea Lamprey).

Biomass (kg/ha) and catch (fish/ha) were calculated by first summing across groups within a sample (i.e., individual trawl station), and then averaging across samples within years and seasons. Annual diversity was calculated using the Shannon Diversity Index (Morris et al. 2014) and numerical catch (fish/ha), where the catches from all life stages of an individual species were summed across stations within year and season. This generated a total catch (fish/ha) for each species, year, and season. Average size for age-0 sportfish was calculated from individual total length (mm) and weight (g) measurements using species-specific length thresholds for autumn catches (i.e., Walleye < 190 mm; White Bass < 190 mm; White Perch < 120 mm; Yellow Perch < 120 mm).

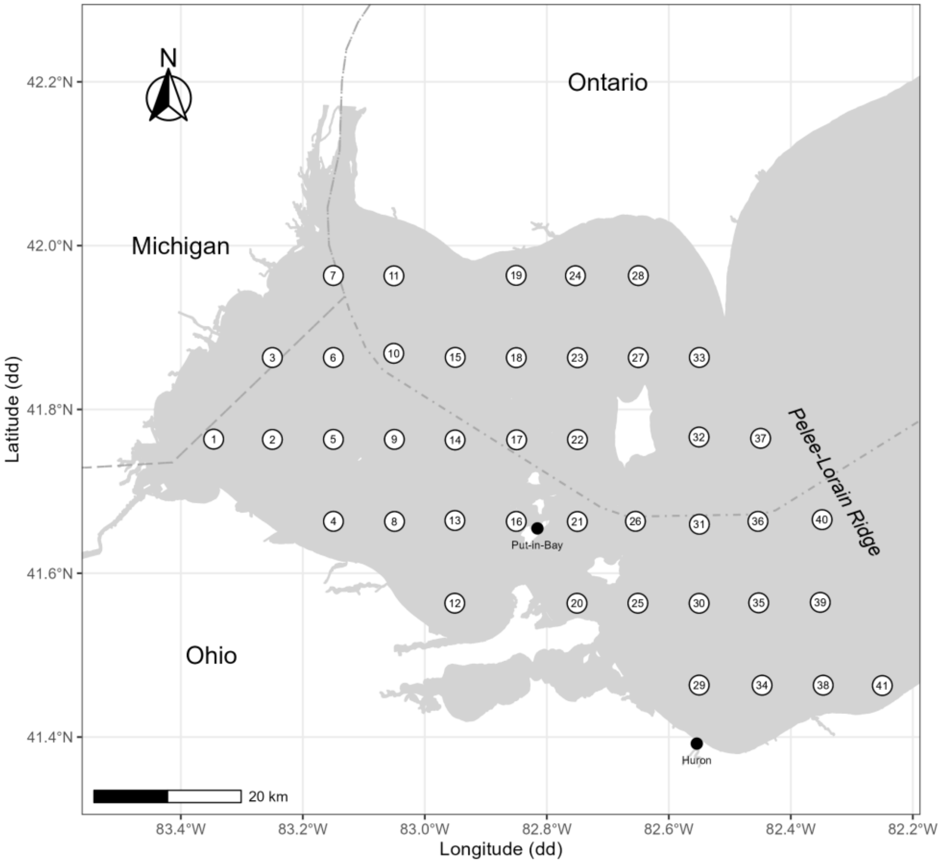

Figure 1. U.S. Geological Survey's benthic prey fish bottom trawl stations (white circles) located in U.S. and Canadian waters of western Lake Erie including home port (Huron, Ohio) and staging port (Put-In-Bay, Ohio).

Results and Discussion

The 2024 spring survey took place during the week of June 24 and only 9 stations were sampled before a hydraulic failure terminated net reel operation; the net reel was repaired during August. The 2024 autumn survey took place during the week of September 24 and 35 stations were sampled before a hydraulic issue caused the net reel to operate erratically; the survey was terminated due to safety concerns. Surveys caught a cumulative fish biomass of 995 kg (48,936 fish), with spring biomass totaling 361 kg (26,413 fish) and autumn biomass totaling 634 kg (22,523 fish). Although biomass was higher during autumn, an exceptionally large sample of age-0 Yellow Perch lead to higher catches (total fish) during spring.

Trends in Biomass and Community Composition

Spring biomass declined from 157 kg/ha during 2013 to 48 kg/ha in 2017 (Table 2; Figure 2) and has fluctuated between 34 and 65 kg/ha since. Autumn biomass declined from 118 kg/ha during 2013 to 23 kg/ha during 2017 and has fluctuated between 20 and 49 kg/ha since. The lowest recorded biomass (20 kg/ha) occurred during autumn 2024. Although declines in prey fish have occurred, total biomass declines and subsequent fluctuations can be attributed to loss and variability in biomass across taxon.

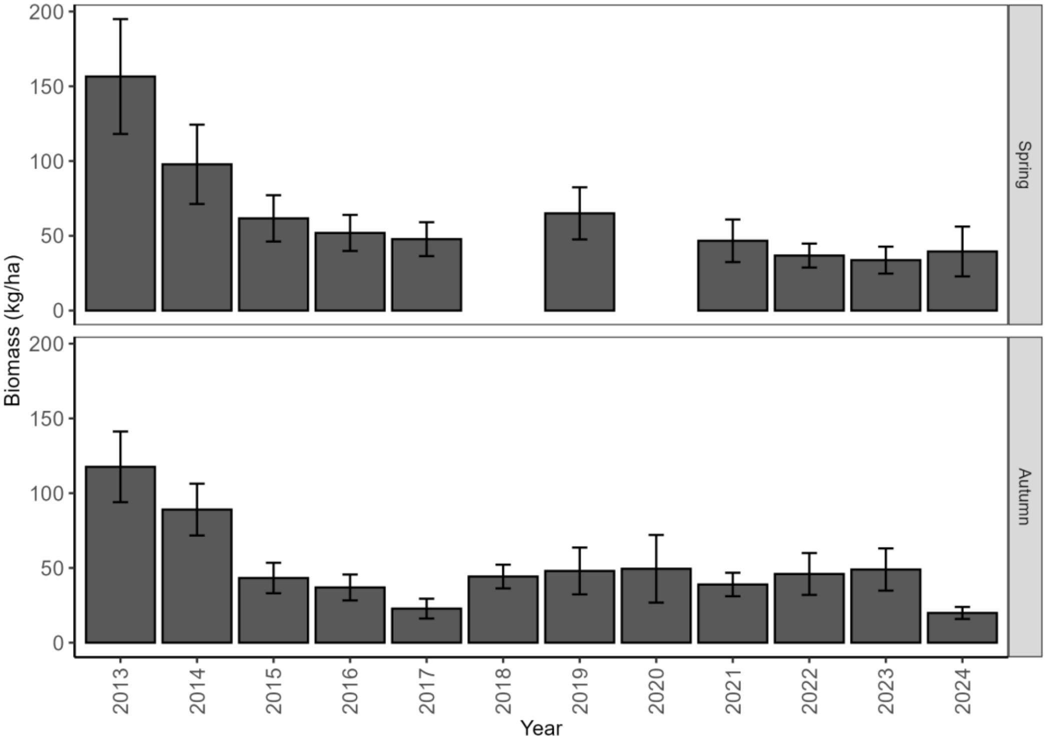

Figure 2. Average biomass (kg/ha) through time (2013–2024) for all species (± 2 SE) from bottom trawls in the West Basin of Lake Erie conducted during spring (upper) and autumn (lower). Bottom trawl samples were not collected during spring 2018 or spring 2020.

Spring prey fish biomass was primarily comprised of soft-rayed fishes (including Emerald Shiner) and Osmeridae (Rainbow Smelt) and declined precipitously between 2013 and 2015 (Table 2; Figure 3). Since 2015, spring prey fish biomass has averaged only ~0.3 kg/ha. Autumn prey fish biomass was primarily comprised of Clupeidae (age-0 Gizzard Shad and all Alewife) and age-0 spiny-rayed fishes, averaging ~6 kg/ha between 2013 and 2024. Decreases in spring prey fish biomass were attributed mostly to declines in age-1+ Emerald Shiner (Figure 4). Fluctuations in autumn prey fish biomass were driven by variable age-0 Gizzard Shad abundance, periodic emergence (2013, 2023, and 2024) of age-0 Alewife (Figure 4), and variable production of age-0 spiny-rayed fish (Sciaenidae, Percidae, and Moronidae).

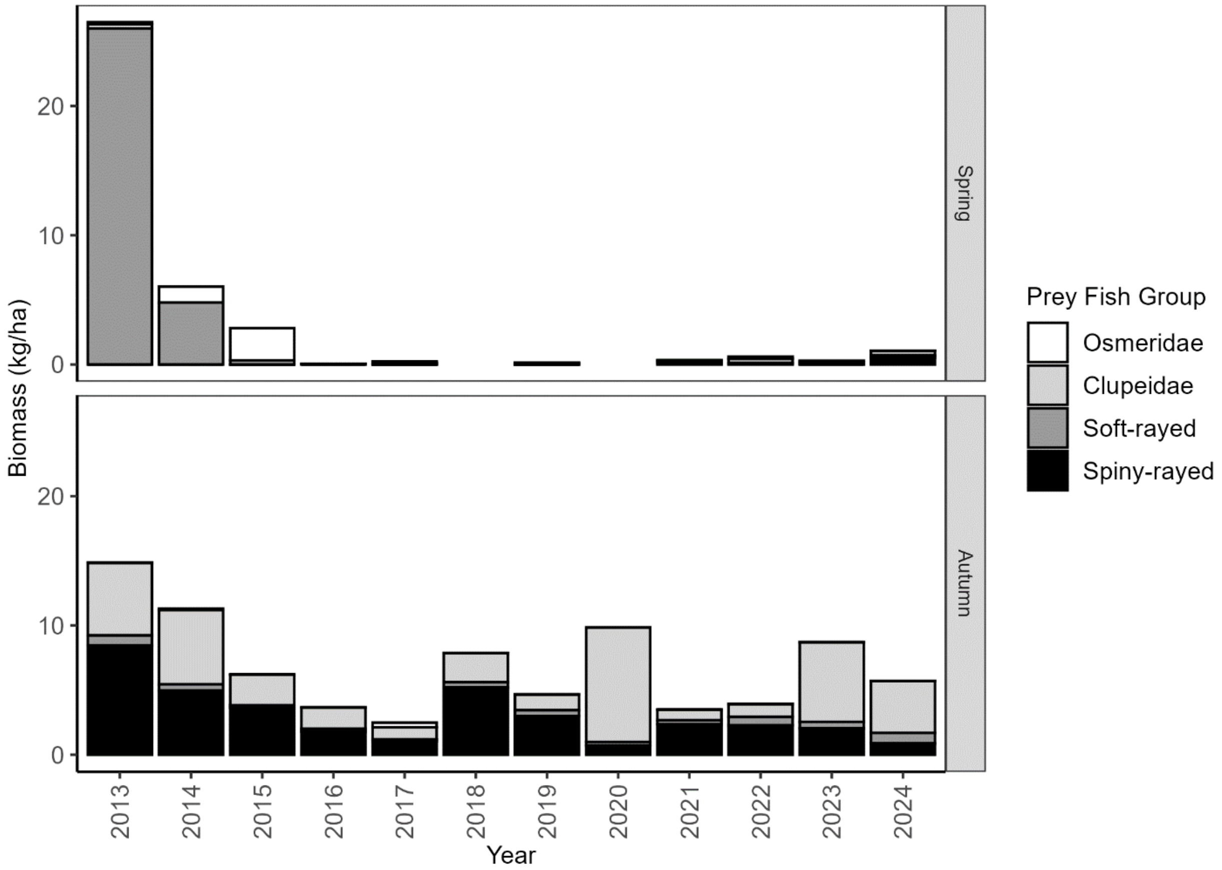

Figure 3. Stacked bar plots through time (2013–2024) including average prey fish group (Osmeridae, Clupeidae, Soft-rayed, and Spiny-rayed) biomass (kg/ha) from trawls in the West Basin of Lake Erie during spring (upper) and autumn (lower). Bottom trawl samples were not collected during spring 2018 or spring 2020.

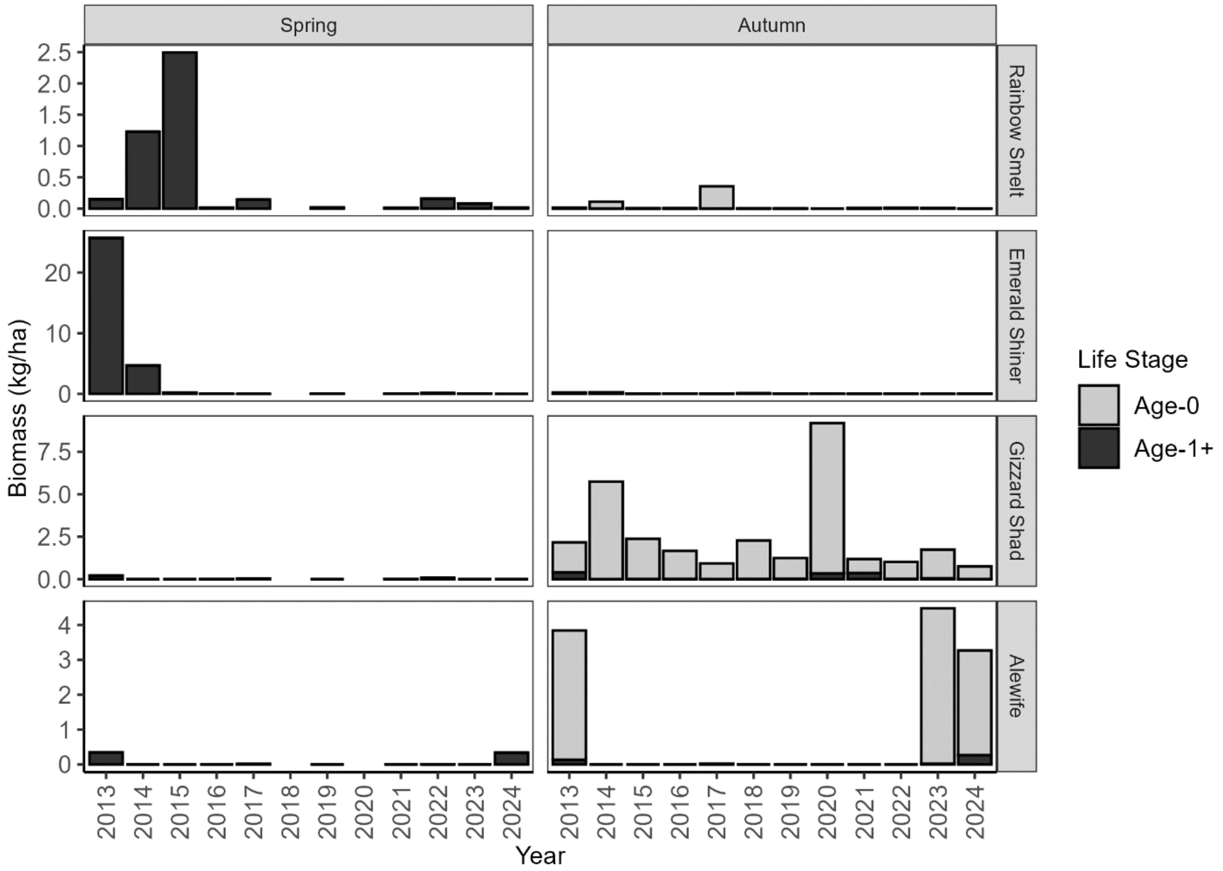

Figure 4. Stacked bar plots through time (2013–2024) including life stage (age-0 and age-1+) average biomass (kg/ha) for Rainbow Smelt, Emerald Shiner, Gizzard Shad, and Alewife from trawls in the West Basin of Lake Erie during spring (left) and autumn (right)

Despite the decrease in total biomass, proportions by species groups have followed similar patterns through time (Figure 5 - left). During spring and fall, Sciaenidae (age-1+ Freshwater Drum), Percidae (primarily age-1+ Walleye and Yellow Perch), and Moronidae (age-1+ White Bass and White Perch) have dominated the catch. However, there is typically an increase in the proportion of Ictaluridae, Catostomidae, and prey fish biomass during autumn. “Other” low abundance species make up a small proportion of total biomass with a slight increase during autumn.

The biomass proportion of non-native species was generally low and fluctuated without trend, ranging between 0.04–0.17 during the spring and 0.11–0.26 during autumn (Table 2). The dominant non-native species included Alewife, White Perch, and Common Carp while other non-native species (Round Goby, Goldfish, Sea Lamprey, etc.) were captured in low abundances. Increased proportions of non-native species during autumn are driven by within-year production of age-0 Alewife and White Perch.

Biomass (kg/ha) provides a unique perspective on the benthic fish community relative catch (fish/ha). As a comparison, catch proportions by species group (Figure 5 - right) show that prey fish make up a much higher proportion of the catch suggesting they dominate fish community structure. While large benthic or semi-pelagic species (Sciaenidae, Percidae, Moronidae, Ictaluridae, and Catostomidae) were not numerically dominant, they accounted for > 75% of biomass during nearly every sampling season and year (Figure 5 - left). Biodiversity, calculated from catch (fish/ha) using Shannon's Diversity Index (Morris et al. 2014, Table 2) showed similar patterns to biomass. Diversity was variable and ranged between 0.35–2.06 during the spring and between 1.77–2.02 during autumn (Shannon Diversity Index; Morris et al. 2014, Table 1). Diversity tended to be higher during autumn than spring, as autumn catches are more evenly distributed across species and groups (Figure 5 - left).

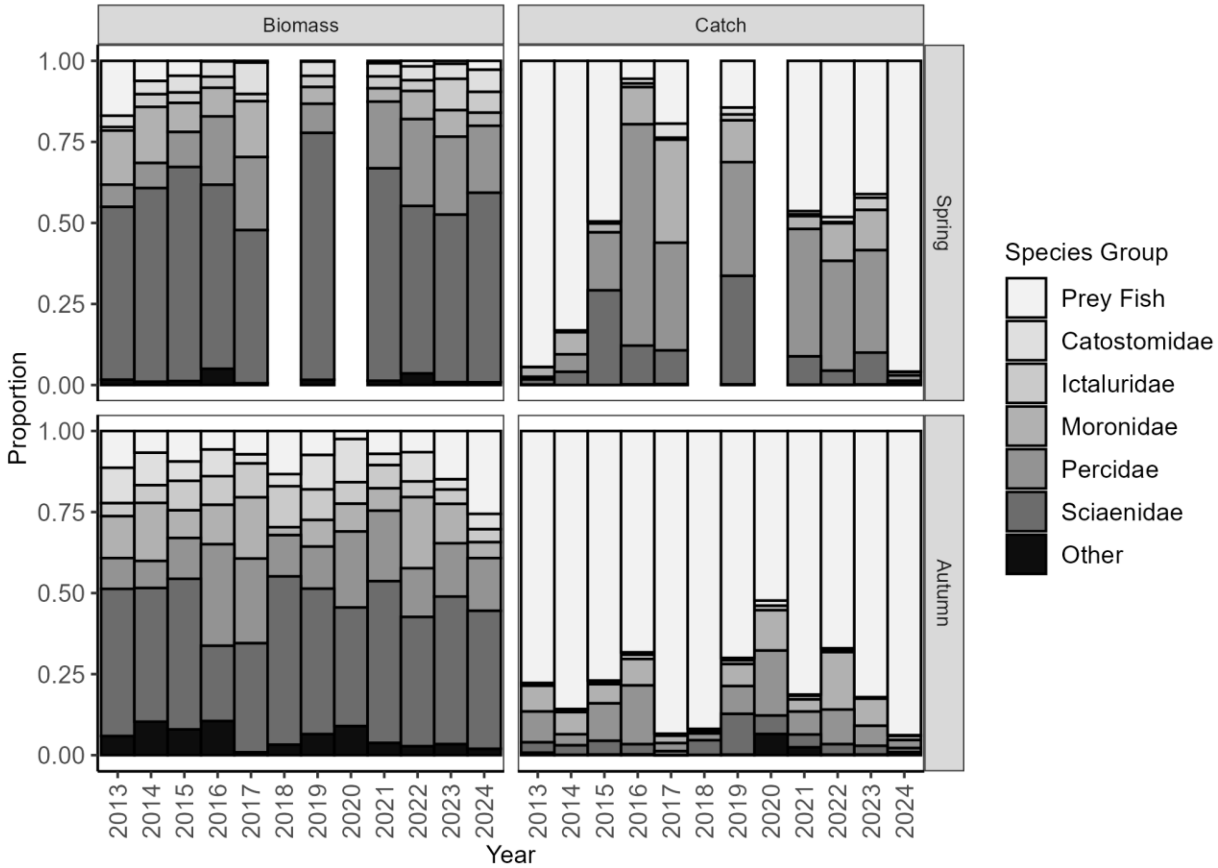

Figure 5. Species group composition (Proportion) through time (2013–2024) for biomass (kg/ha) and catch (fish/ha) from bottom trawls in the West Basin of Lake Erie conducted during spring (June) and autumn (September).

Table 2. Summaries for bottom trawls in the West Basin of Lake Erie including number of stations surveyed (N), biomass summaries (kg/ha) for total and prey fish species (± SE), biomass proportion of non-native species, and Shannon Diversity Index (Morris et al. 2014) values.

Year	Season	N	Total (SE)	Prey Fish (SE)	Non-native	Diversity
2013	Spring	41	156.5 (19.6)	26.5 (8.7)	0.12	0.35
2014	Spring	41	97.8 (13.5)	6.0 (2.0)	0.13	1.09
2015	Spring	41	61.7 (7.9)	2.8 (1.5)	0.09	1.41
2016	Spring	41	51.9 (6.2)	0.1 (0.0)	0.09	1.65
2017	Spring	36	47.8 (5.8)	0.2 (0.1)	0.17	1.97
2018	Spring					
2019	Spring	41	65.0 (8.9)	0.1 (0.0)	0.05	1.89
2020	Spring					
2021	Spring	41	46.7 (7.3)	0.3 (0.1)	0.04	1.60
2022	Spring	41	36.8 (4.1)	0.6 (0.1)	0.11	1.72
2023	Spring	41	33.7 (4.6)	0.3 (0.1)	0.07	2.06
2024	Spring	9	39.5 (8.5)	1.1 (0.4)	0.04	0.43
2013	Autumn	41	117.6 (12.1)	14.9 (3.3)	0.24	1.63
2014	Autumn	41	89.0 (8.8)	11.3 (1.8)	0.25	1.63
2015	Autumn	41	43.3 (5.2)	6.2 (0.9)	0.15	1.90
2016	Autumn	41	36.9 (4.4)	3.7 (0.6)	0.23	2.02
2017	Autumn	41	22.8 (3.4)	2.5 (0.4)	0.20	1.22
2018	Autumn	41	44.3 (4.0)	7.9 (1.9)	0.11	1.64
2019	Autumn	41	48.0 (8.0)	4.7 (0.8)	0.15	1.90
2020	Autumn	26	49.4 (11.5)	9.9 (7.0)	0.13	1.16
2021	Autumn	26	38.9 (4.0)	3.5 (0.7)	0.12	1.75
2022	Autumn	41	46.0 (7.1)	3.9 (0.8)	0.26	1.72
2023	Autumn	41	48.9 (7.2)	8.7 (3.8)	0.25	1.68
2024	Autumn	35	19.9 (2.1)	5.7 (1.0)	0.24	1.56

Sportfish Size at Age-0

Size-at-age is a metric used by the Lake Erie Forage Task Group to evaluate sportfish growth and condition from autumn catches. Presumably, larger size-at-age suggests profitable growing conditions, including adequate food availability. Larger size at age-0 during autumn may correlate with overwinter survival to age-1 and is viewed as favorable for fishery production (Madenjian et al. 1996). Average total length and weight of age-0 Walleye (140 mm; 21.4 g) and White Bass (134 mm; 28.4 g) increased from 2023 to 2024, and have shown an upward trend since 2019 (Figure 6). Walleye size was near the time series average (142.2 mm; 23.8 g), while White Bass size was above the time series average (112.1 mm; 19.1 g). Average total length and weight of age-0 White Perch (81.5 mm; 6.6 g) and Yellow Perch (80.5 mm; 5.6 g) decreased from 2023 to 2024, and have varied annually over the time series. White Perch size (total length and weight) was slightly below the time series average (82.6 mm; 7.3 g), while Yellow Perch size was above the time series average (84.5 mm; 6.5 g).

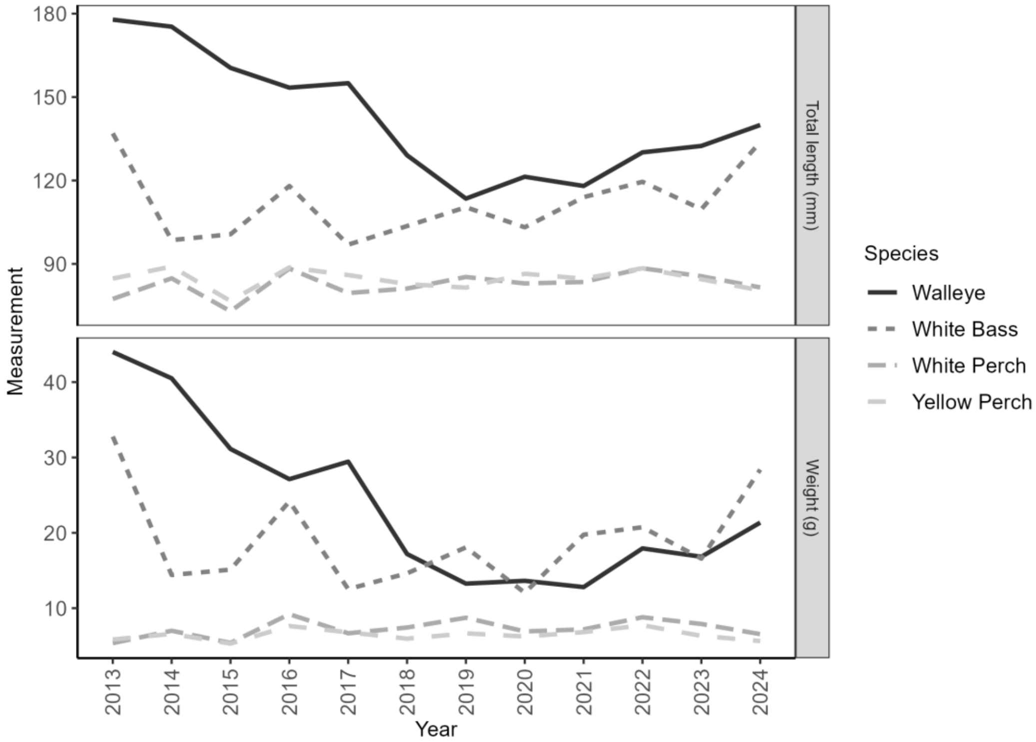

Figure 6. Average autumn total length (mm) and weight (g) for age-0 sportfish (Walleye, White Bass, White Perch, and Yellow Perch) from western Lake Erie bottom trawls.

Trends in Percid Catch and Biomass

Age-0 and age-1 percid indices are used by the Lake Erie Walleye and Yellow Perch task groups to inform stock assessment models and establish recommended allowable harvest, annually. Percid indices are typically generated from catch data and reported as fish/ha. Here, we include biomass (kg/ha) based indices which take into account both numerical abundance and size-at-age (g). Biomass-based indices may reduce index variability by buffering against annually variable growth conditions and survey timing. Here, percid indices were generated from the autumn survey which occurs near the end of the growing season and is most likely representative of age-0 recruitment (Figure 7; Table 3). Walleye age-0 catch rates decreased substantially during 2024 (4.90 fish/ha) compared to 2023 (40.55 fish/ha), while biomass-based indices suggest a less substantial decline in 2024 (0.21 kg/ha) when compared to 2023 (0.71 kg/ha). Walleye age-1 catch rates decreased during 2024 (3.90 fish/ha) when compared to 2023 (8.47 fish/ha), while biomass-based indices also suggested a decline in 2024 (0.56 kg/ha) when compared to 2023 (1.25 kg/ha). Yellow Perch age-0 catch rates increased slightly during 2024 (24.77 fish/ha) compared to 2023 (22.03 fish/ha), while biomass-based indices suggested a slight decline in 2024 (0.13 kg/ha) when compared to 2023 (0.15 kg/ha). Yellow Perch age-1 catch rates decreased substantially during 2024 (3.13 fish/ha) when compared to 2023 (12.23 fish/ha), while biomass-based indices suggested a slightly less dramatic decline in 2024 (0.23 kg/ha) when compared to 2023 (0.74 kg/ha). All 2024 indices were below time series mean values (Age-0 Walleye = 31.53 fish/ha and 0.71 kg/ha; Age-1 Walleye = 10.99 fish/ha and 1.94 kg/ha; Age-0 Yellow Perch = 144.58 fish/ha and 0.70 kg/ha; Age-1 Yellow Perch = 28.28 fish/ha and 0.65 kg/ha).

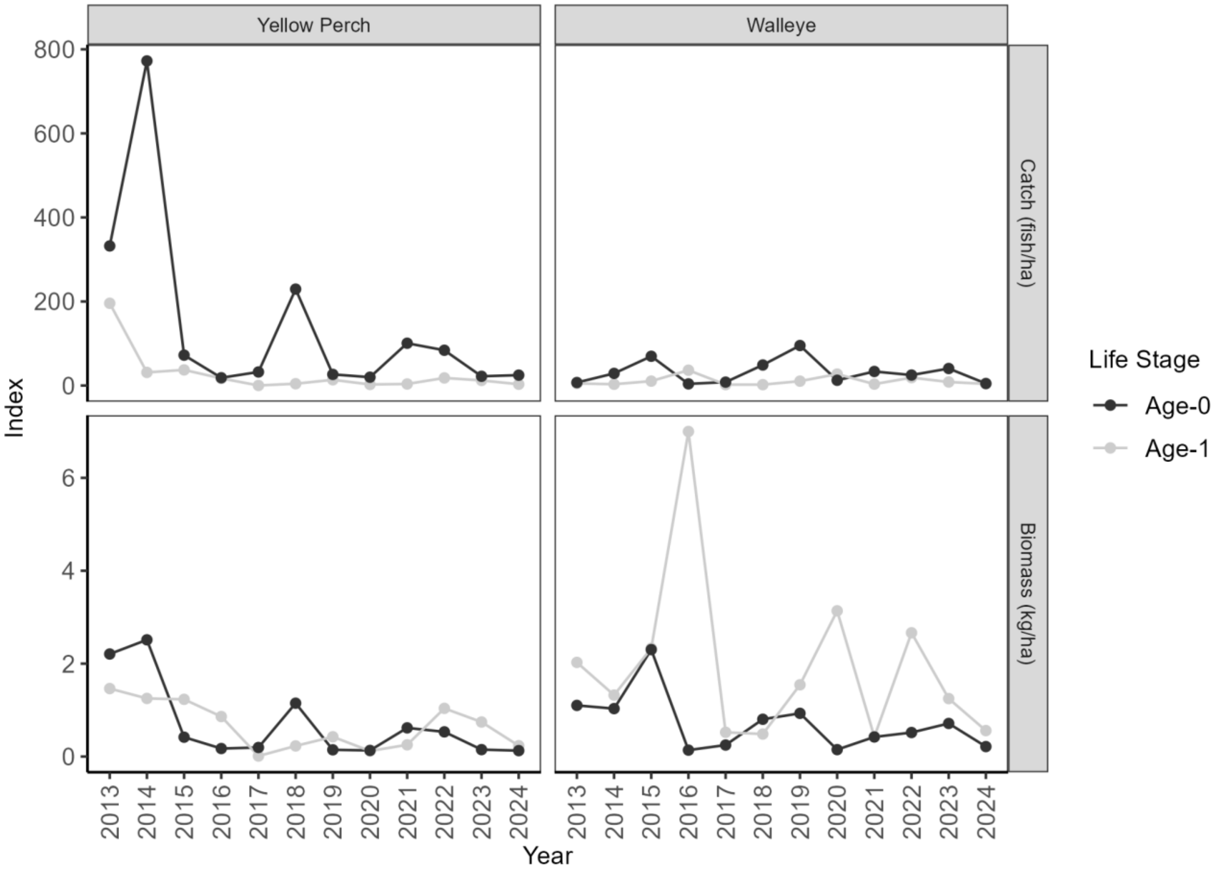

Figure 7. Mean autumn catch (fish/ha) and biomass (kg/ha) of age-0 and age-1 Walleye and Yellow Perch from western Lake Erie bottom trawls.

Table 3. Age-0 and age-1 Walleye and Yellow Perch indices from autumn bottom trawls in western Lake Erie including number of stations surveyed (N), mean catch (fish/ha) and mean biomass (kg/ha).

Species	Year	N	Age-0 Catch	Age-0 Biomass	Age-1 Catch	Age-1 Biomass
Walleye	2013	41	5.02	2.03	7.17	1.1
Walleye	2014	41	3.12	1.32	28.89	1.03
Walleye	2015	41	10.51	2.33	69.67	2.3
Walleye	2016	41	36.49	7	3.98	0.14
Walleye	2017	41	2.22	0.52	8.14	0.25
Walleye	2018	41	2.14	0.48	48.88	0.8
Walleye	2019	41	10.46	1.54	95.21	0.93
Walleye	2020	26	27.29	3.14	12.55	0.15
Walleye	2021	26	3.43	0.42	33.48	0.42
Walleye	2022	41	18.88	2.66	24.94	0.52
Walleye	2023	41	8.47	1.25	40.55	0.71
Walleye	2024	35	3.9	0.56	4.9	0.21
Yellow Perch	2013	41	195.7	1.46	332.2	2.21
Yellow Perch	2014	41	31.29	1.25	772.4	2.51
Yellow Perch	2015	41	37.24	1.23	72.32	0.42
Yellow Perch	2016	41	17.12	0.86	18.52	0.17
Yellow Perch	2017	41	0.2	0.01	32.31	0.19
Yellow Perch	2018	41	4.33	0.23	229.4	1.15
Yellow Perch	2019	41	13.67	0.43	26.55	0.14
Yellow Perch	2020	26	2.59	0.12	19.9	0.13
Yellow Perch	2021	26	3.7	0.25	100.7	0.62
Yellow Perch	2022	41	18.13	1.04	83.97	0.53
Yellow Perch	2023	41	12.23	0.74	22.03	0.15
Yellow Perch	2024	35	3.13	0.23	24.77	0.13

Summary

The USGS western Lake Erie bottom trawl survey provides unique information not immediately available from existing monitoring efforts. Although this survey complements the time series of combined trawling efforts between ODNR and OMNR during August, providing spatially contiguous prey fish and recruitment indices, it also generates biomass estimates for the entire fish community which support Lake Erie Fish Community Objectives including thriving commercial and recreational fisheries, improved fish habitat, desirable ecosystem performance, and reduced adverse impacts from non-native fish (Francis et al. 2020).

For example, biomass estimates indicated the contribution of large benthic and semi-pelagic fishes (e.g., Sciaenidae, Percidae, Moronidae, Ictaluridae, and Catostomidae) to the community may be under-represented in numerical measures of relative abundance. This is an important realization as the potential for Sciaenidae (i.e., Freshwater Drum) to reduce invasive dreissenid mussel abundance has only been evaluated superficially (French & Bur 1996), but due to its dominance in the fish community, this species has potential to contribute substantially to the remineralization of phosphorous in Lake Erie through the consumption of mussels (e.g., Johnson et al. 2005).

In addition, the reduction in prey fish biomass highlights the need for top-down and bottom-up approaches to better understand mechanisms driving abundance. For example, little information currently exists on prey fish diets, while changes in phytoplankton and zooplankton biomass and community structure are well documented (O’Donnell et al. 2023a, O’Donnell et al. 2023b). In addition, Walleye and Yellow Perch have historically relied on Gizzard Shad, Emerald Shiner, and other species as prey in the West and Central basins (Knight et al. 1984; Schmitt et al. 2024); however, walleye seasonally occupy other parts of Lake Erie (Wang et al. 2007, Raby et al. 2018) while yellow perch seasonal movements remain largely unknown. Inconsistent prey fish abundance in the West Basin, as well as other basins of Lake Erie, may result in a pattern of reduced growth and early seasonal emigration (Madenjian et al. 1996). As a result, continued seasonal diet investigations for both prey and predator fishes that incorporate ontogenetic changes in spatial distribution may better inform potential management actions that would ensure sustainable fisheries in Lake Erie.

Finally, the impact of broad-scale climatic conditions on Lake Erie’s fish community are not fully understood. However, relatively mild winter conditions in Lake Erie during 2023–2024 (NOAA-GLERL 2024) may have contributed to an increase in age-0 Alewife (non-native) biomass. A recent study indicated that reduced winter severity resulted in an increase in growing degree days during spring and summer, which in turn led to increased growth of age-0 Alewife and greater age-1 overwinter survival in lakes Michigan, Huron, and Ontario (Warren et al. 2024). The occurrence of mild winter conditions and improved age-1 survival in Lake Erie could be contributing to increased age-0 Alewife abundances. Continued long-term bottom trawl surveys coupled with broad-scale climatic data provide the type of information managers need to evaluate the influence of climatic conditions on fishes.

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