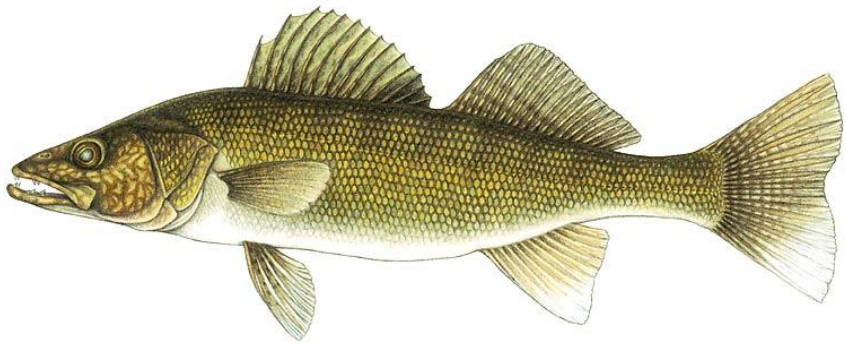
Report for 2022 by the

LAKE ERIE WALLEYE TASK GROUP

March 2023



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***Note**: Data and management summaries contained in this report are provisional. Every effort has been made to ensure their correctness. Contact individual agencies for complete state and provincial data.*

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Charges to the Walleye Task Group, 2022-2023

The charges from the Lake Erie Committee's (LEC) Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period of April 2022 to March 2023 were to:

1. Maintain and update the centralized time series of datasets:
    a. Required for bi-national population models and assessment and
    b. Produce the annual Recommended Allowable Harvest (RAH)

2. Supply needed technical support throughout the upcoming Walleye Management Plan review process.

3. Support LEC Walleye management efforts by:

    a. Maintain working knowledge of the most current academic and agency research related to Lake Erie Walleye population assessment and modeling including estimating and forecasting:
        - Abundance
        - Age/size/spatial stock structure (migration rates)
        - Recruitment and mortality (M)
    b. Provide critical evaluation and guidance for incorporating new research into Lake Erie Walleye management to produce the most scientifically sound and reliable population models.

Review of Walleye Fisheries in 2022

2022 fishery performance and characteristics

Fishery effort and Walleye harvest data were combined for all fisheries, jurisdictions and Management Units (MUs) to produce lake-wide summaries (Figure 1). The 2022 total estimated lake-wide harvest was 9.269 million Walleye, of which 8.743 million were harvested in the total allowable catch (TAC) area (Table 1). This TAC-area harvest represents 60% of the 2022 TAC (14.533 million Walleye) and includes Walleye harvested in commercial and sport fisheries in MUs 1-3. An additional 0.526 million Walleye (6% of the lake-wide total) were harvested outside of the TAC area in MUs 4&5 (Table 1). The estimated sport Walleye harvest was 3.089 million fish in 2022; harvest in 2022 was above the long-term mean (1975-2021 = 2.311 million Walleye; Table 2).

The 2022 Ontario commercial harvest was 6.180 million Walleye lake-wide, with 5.976 million caught in the TAC area (Table 2). The 2022 Ontario angler estimates of harvest and effort were derived from the 2014 lake-wide aerial creel survey because angler creel surveys are not conducted annually in Ontario waters. It assumes 72,000 Walleye were harvested in Ontario within the TAC area during 2022, which is included in total Walleye harvest, but not used in catch-at-age analysis. Total harvest of Walleye in Ontario TAC waters was 6.047 million Walleye, representing 97% of Ontario's 2022 TAC allocation of 6.258 million Walleye. In 2022, the lake-wide Ontario commercial harvest was above the long-term average (1976-2021 = 2.205 million Walleye; Table 2, Figure 2). Similarly, lake-wide harvest was well above the current Walleye Management Plan's performance metric of at least 4.0 million pounds of commercial yield (2022 commercial harvest = 13.6 million pounds).

Lake-wide sport fishing effort decreased slightly in 2022 to 4.412 million angler hours (Table 3, Figure 3). Sport effort decreased in MUs 1-3, but increased in MUs 4 and 5 (Table 3, Figure 4). Despite the drop in effort, the 2022 lake-wide average sport harvest per unit effort (HUE) increased to 0.68

Walleye/angler hour and remained above both the long-term (1975-2021) average of 0.45 Walleye/angler hour and the current Walleye Management Plan's performance metric of 0.40 Walleye/angler hour (Table 4, Figure 5). In 2022, the sport HUE remained above long-term averages in all MUs (Table 4).

The total commercial gill net HUE increased in 2022 (351 Walleye/kilometer of gill net) and remained above the long-term (1976-2021) lake-wide average (131 Walleye/kilometer of gill net; Table 4, Figure 5). Commercial gill net harvest rates increased in all areas of Lake Erie, with all MUs' HUE well above the long-term averages (Table 4).

Lake-wide harvest in the commercial fishery was composed of age 3 Walleye from the 2019 (49%) year class, along with large contributions from age 4 and age 7+ Walleye from the 2018 (21%) and 2015 and older (15%) year classes, respectively (Table 5; Table 6). The mean age of fish caught in the commercial fishery has remained steady since 2019 and in 2022 was near long-term average (Table 7, Figure 6). Age composition of the lake-wide sport harvest was more varied, with age 3 Walleye (32%; 2019 year class) and age 4 Walleye (29%; 2018 year class) making the largest contributions, with age 7+ fish (27%; 2015 year class and older) also contributing to the sport fishery (Table 6, Figure 6).

Statistical Catch-at-Age Analysis (SCAA): Abundance

The WTG uses a SCAA model to estimate the abundance of Walleye in Lake Erie from 1978 to 2022. This model estimates population abundance of age 2 and older Walleye using fishery-dependent and fishery-independent data sources, which includes fishery-dependent data from the Ontario commercial fishery (MUs 1-3) and sport fisheries in Ohio (MUs 1-3) and Michigan (MU 1), along with data collected from three fishery-independent gill net surveys (i.e., Ontario Partnership, Michigan, and Ohio).

Summary of 2023 SCAA model results

Based on the 2023 SCAA model, the 2022 west-central population (MUs 1-3) was estimated at 71.0 million age 2 and older Walleye (Table 8, Figure 7). An estimated 27.2 million age 3 (2019 year class) fish comprised 38% of the age 2 and older Walleye population. Fish from the 2015, 2018, and 2020 year classes represented the next most abundant ages. The number of age 2 recruits entering the population in 2023 (2021 year class) and 2024 (2022 year class) are projected to be 48.6 and 15.2 million Walleye, respectively (Table 9). The 2023 abundance of age 2 and older Walleye in the west-central population is projected to be 93.7 million fish (Table 8; Figure 7).

Harvest Policy and Recommended Allowable Harvest (RAH) for 2022

In March 2023, the WTG applied the following Harvest Control Rules as identified in the Walleye Management Plan (WMP; 2015-2024):

- *Target Fishing Mortality* of **60%** of the fishing mortality Maximum Sustainable Yield (60%F_{MSY});
- Threshold *Limit Reference Point* of **20%** of the Unfished Spawning Stock Biomass (20%SSB_0);
- Probabilistic Control Rule, P-star, P*= **0.05**;
- A limitation on the annual change in TAC of ± **20%**.

Using results from the 2023 SCAA model, the estimated abundance of 93.7 million age-2 and older Walleye in 2023, and the harvest policy described above, the calculated mean RAH for 2023 was 13.526 million Walleye, with a range from 10.772 (minimum) to 16.281 (maximum) million Walleye (Table 9). The WTG RAH range estimate is an AD Model Builder (ADMB, Fournier et al. 2012) generated value based on estimating ± one standard deviation of the mean RAH. AD Model Builder uses a statistical technique called the delta method to determine this standard deviation for the calculated RAH, incorporating the standard errors from abundance estimates at age and combined gear selectivity at age. The target fishing rate (60%F_{MSY} = 0.311) in the harvest policy was applied because the probability of the projected spawner biomass in 2024 (66.549 million kg) falling below the limit reference point (20% SSB_0 = 12.847 million kg) after fishing at 60% of F_{MSY} in 2023 was less than 5% ($p < 0.001$). Thus, the probabilistic control rule (P*) to reduce the target fishing rate and conserve spawner biomass was not invoked during the 2023 determination of RAH.

In addition to the RAH, the Harvest Control Rule adopted by LEPMAG limits the annual change in TAC to ± 20% of the previous year's TAC. According to this rule, the maximum change would be + or - 20% of the 2022 TAC (14.533 million fish) with a range from 11.626 to 16.281 million Walleye. Further, P* was not invoked and the 20% TAC constraints produce a range in 2023 TAC for LEC consideration from 11.626 to 16.281 million Walleye.

Other Walleye Task Group Activities

The following represents WTG progress and developments on Charge 3a and 3b. During 2022-2023, this work focused on *(1) Movements, Migrations and Spatial Ecology, (2) Stock Structure,* (3) *Recruitment*.

Movements, Migration and Spatial Ecology

Since 2011, WTG members have participated collaboratively in several Great Lakes Acoustic Telemetry Observation System (GLATOS; https://glatos.glos.us/) studies across Lake Erie. Insights from this ongoing work help to inform an evolving understanding of such things as stock contributions to mixed fisheries (see Stock Structure, below), spawning site fidelity, rates of skipped spawning, and spawning phenology. WTG members, together with colleagues from the University of Windsor, Michigan State University, USGS, and Ohio State University, anticipate publishing manuscripts focused on harvest composition, spawning site fidelity, and sex-specific differences in migration rates.

During 2022-2023, three new tagging projects began in Lake Erie, with both projects either collaborating with or directly led by WTG members. The first project, led by OMNRF, is focused on identifying spawning habitat used by Walleye within the Thames River, Ontario. Tagged fish will also provide information on this stock's migratory behavior and dispersal throughout the Great Lakes and connecting waters. In 2022, a total of 59 fish were tagged and released within the Thames River. Additional Walleye will be tagged and released in 2023.

The second project, led by researchers from Trent University, aims to estimate field metabolic rates of Great Lakes Walleye using novel accelerometer transmitters to better understand sex-specific physiological and behavioral differences. A total of 56 Walleye were collected and tagged from Ohio's reef complex during April-May 2022. Additional Walleye were tagged from other populations throughout the Great Lakes and beyond (i.e., Lake Winnipeg), which will provide representative data from across the Walleye's native range.

Finally, a pilot project, led by ODNR, was also initiated in the central basin using recycled tags (N=50) from past GLATOS projects and focused on tagging Walleye in the Grand River, OH, and at nearshore spawning reef (Hardy Point, OH) in the spring of 2023. Preliminary findings from limited earlier releases in 2018 suggested that seasonal movements of central basin fish may differ from eastern and western basin stocks. Walleye from the Grand River were also found to be genetically different from the reef spawning population (Stepien et al 2018). The current project aims to examine the seasonal movements of central basin Walleye to quantify the duration of time spent 1) in Ohio waters and inside the TAC area during the fishing season, and 2) in Ohio waters during the fall to assess the likelihood of these fish being captured in the ODNR fall gill net survey. A secondary objective is to assess spawning-site fidelity of Walleye at the Grand River and Hardy Point Reef complex locations.

Recruitment

Evidence of multiple Walleye stocks in Lake Erie exists, with decreasing stock productivity from west to east. However, migrations and mixing of stocks throughout the lake make evaluation of individual stock productivity difficult. For example, adult Walleye from western basin spawning grounds in the spring migrate to the cooler waters of the central and eastern basins in the summer, and then return to the west basin before spawning. While juvenile Walleye from both the western and eastern basin are believed to disperse from natal basins during the summer and fall, it is unknown if their migrations are similar to those of adults. To address uncertainty surrounding juvenile dispersal and productivity of Walleye stocks across Lake Erie, the WTG has reported basin-specific densities of yearling Walleye with standardized gill net indices since 2011 (WTG 2012).

In Figure 8, site-specific yearling Walleye catches are presented for the bottom set interagency (ON, NY) monofilament nets; suspended (canned or kegged) Ohio monofilament nets; suspended Michigan multifilament nets; and suspended Ontario monofilament nets fished in 2022. Catches were standardized for net length (50 ft [15.2 m] panels) of mesh sizes ≤ 5.5" (140 mm) but correction factors were not applied to standardize fishing power between monofilament and multifilament nets. New York and Ontario monofilament nets share the same configurations with the exception that Ontario nets contain 2 panels instead of the one 50 ft (15.2 m) panel for mesh sizes ≥ 2" (51 mm). New York's index gill nets were fished exclusively on bottom and were confined to shallower depths than nets fished in Ontario's waters of eastern Lake Erie (Figure 8a). Catches in Ontario canned nets plotted include standard canned nets but excluded nets canned in the thermocline in the east basin and Pennsylvania Ridge surveys.

In 2022, yearling (2021 year class) Walleye catches occurred lake-wide where index nets were fished (Figures 8a and b). Yearlings were present in bottom and suspended nets and in nearshore and offshore areas. In the western basin interagency August trawl survey, yearling catch rates were 5th highest in the time series (24.23 fish/Ha). With few exceptions, most agency assessments ranked yearling walleye abundance in 2022 above their respective median catch rates. Based on Ontario's Partnership gillnet survey, yearlings were ranked 4th in the west/central part of the lake and were ranked 2nd highest over the east basin time series including the Pennsylvania Ridge. New York gillnet survey yearling catches in the east were ranked 8th highest in the time series.

Similar to recent years, mean lengths of age 0 (106 mm) and age 1 (213 mm) Walleye from western basin interagency bottom trawls during August 2022 were below average (Figure 9). This trend of declining size was also observed in agency gill net surveys at ages 1 through 4 as Walleye showed decreased mean size at age in recent years (Figure 10). These changes are likely related to the increased abundance of Walleye, which has been driven by several large year classes since 2015. As these fish enter the fisheries in 2023 at smaller than usual sizes, the WTG expects to see an increased release rate in the sport fisheries (because anglers may encounter many sub-legal Walleye) and that these smaller fish will exhibit delayed vulnerability to commercial Walleye gill net fisheries.

Currently, the young-of-the-year (YOY) index from the interagency west basin bottom trawl survey (Table 10) is integrated into the SCAA model to estimate age-2 Walleye abundance and forecast recruitment. In 2022, the YOY catch rates (reported as the number of YOY Walleye caught per hectare trawled) were 9th highest in the 35 year time series (83.413 fish per hectare; Table 10). YOY Walleye indices varied in strength throughout the lake in 2022 with catch rates equal to or exceeding time series medians.

To support the Walleye Management Plan technical review process, the WTG explored the use of additional age 0 and age 1 index trawl and gill net recruitment indices. Applications of this work may be considered as Lake Erie Walleye assessment and management options are reviewed.

WTG Centralized Datasets

WTG members currently manage several databases that consist of fishery-dependent and fishery-independent surveys conducted by the respective agencies. Annually, data are compiled by WTG members to form spatially-explicit versions of agency-specific harvest data (e.g., harvest-at-age and fishery effort by management unit) and population assessment (e.g., the interagency trawl program and gill net surveys) databases. These databases are used for trends and status evaluations, estimating population abundance, and to inform the decision-making process regarding RAH. Ultimately, annual population abundance estimates are used to assist LEC members with setting TACs for the upcoming year and evaluate past harvest policy decisions. Use of WTG databases by non-members is only permitted following a specific protocol established in 1994, described in the 1994 WTG Report and reprinted in the 2003 WTG Report (WTG 2003).

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Table 1. Annual Lake Erie walleye total allowable catch (TAC, top) and measured harvest (Har; bottom, bold), in numbers of fish from 2012 to 2022. TAC allocations are based on water area: Ohio, 51.11%; Ontario, 43.06%; and Michigan, 5.83% (Standing Technical Committee 2007). New York and Pennsylvania do not have assigned quotas, but are included in annual total harvest.

		TAC Area (MU-1, MU-2, MU-3)				Non-TAC Area (MUs 4&5)				All Areas
Year		Michigan	Ohio	Ontario [a]	Total	NY	Penn.	Ontario	Total	Total
2012	TAC	203,292	1,782,206	1,501,502	3,487,000				0	3,487,000
	Har	**86,658**	**921,390**	**1,355,522**	**2,363,570**	**36,975**	**44,796**	**30,260**	**112,031**	**2,475,601**
2013	TAC	195,655	1,715,252	1,445,094	3,356,000				0	3,356,000
	Har	**54,167**	**1,083,395**	**1,274,945**	**2,412,507**	**34,553**	**60,332**	**32,591**	**127,476**	**2,539,983**
2014	TAC	234,774	2,058,200	1,734,026	4,027,000				0	4,027,000
	Har	**42,142**	**1,303,133**	**1,324,201**	**2,669,476**	**61,982**	**84,843**	**52,675**	**199,500**	**2,868,977**
2015	TAC	239,846	2,102,665	1,771,488	4,114,000				0	4,114,000
	Har	**65,740**	**1,073,263**	**1,382,600**	**2,521,603**	**55,201**	**46,523**	**89,882**	**191,606**	**2,713,209**
2016	TAC	287,827	2,523,301	2,125,872	4,937,000				0	4,937,000
	Har	**65,816**	**855,820**	**1,959,573**	**2,881,209**	**50,963**	**32,937**	**112,743**	**196,643**	**3,077,852**
2017	TAC	345,369	3,027,756	2,550,874	5,924,000				0	5,924,000
	Har	**56,938**	**1,261,327**	**3,232,817**	**4,551,082**	**70,010**	**162,949**	**129,217**	**362,176**	**4,913,258**
2018	TAC	414,455	3,633,410	3,061,135	7,109,000				0	7,109,000
	Har	**176,089**	**1,972,295**	**3,478,713**	**5,627,097**	**123,503**	**270,189**	**263,204**	**656,896**	**6,283,993**
2019	TAC	497,357	4,360,194	3,673,449	8,531,000				0	8,531,000
	Har	**153,171**	**2,558,359**	**3,362,053**	**6,073,583**	**174,466**	**419,975**	**229,466**	**823,907**	**6,897,490**
2020	TAC	596,817	5,232,131	4,408,052	10,237,000				0	10,237,000
	Har	**191,490**	**1,973,038**	**3,680,335**	**5,844,863**	**84,615**	**208,760**	**243,175**	**536,550**	**6,381,413**
2021	TAC	716,000	6,278,352	5,289,490	12,284,000				0	12,284,000
	Har	**177,948**	**2,492,386**	**4,940,829**	**7,611,163**	**43,772**	**145,261**	**186,192**	**375,225**	**7,986,388**
2022	TAC	847,274	7,427,816	6,257,910	14,533,000				0	14,533,000
	Har	**114,465**	**2,581,307**	**6,047,336**	**8,743,108**	**75,774**	**232,780**	**217,116**	**525,670**	**9,268,777**

[a] Ontario sport harvest values were estimated from the 2014 lakewide aerial creel survey

These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis.

Table 2. Annual harvest (thousands of fish) of Lake Erie walleye by gear, management unit, and agency from 2012 to 2022. Means contain data from 1975 to 2021.

	Sport Fishery														Commercial Fishery					
	Unit 1				Unit 2			Unit 3			Units 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4		Grand
Year	OH	MI	ON[a]	Total	OH	ON[a]	Total	OH	ON[a]	Total	ON[a]	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
2012	596	87	44	726	233	2	235	93	0	93	2	45	37	84	1,138	834	285	191	28	1,338	2,476
2013	757	54	44	855	190	2	192	136	0	136	2	60	35	97	1,280	737	297	195	31	1,260	2,540
2014	909	42	45	996	177	13	190	218	13	231	13	85	62	160	1,577	756	259	238	40	1,292	2,869
2015	746	66	45	857	187	13	200	140	13	153	13	47	55	115	1,325	633	354	325	77	1,388	2,713
2016	577	66	45	688	139	13	152	140	13	153	13	33	51	97	1,090	946	594	348	100	1,988	3,078
2017	592	57	45	694	316	13	330	353	13	367	13	163	70	246	1,636	1,735	918	508	116	3,277	4,913
2018	955	176	45	1,177	666	13	679	351	13	365	13	270	124	407	2,627	1,523	1,433	451	250	3,657	6,284
2019	1,297	153	45	1,495	947	13	960	314	13	328	13	420	174	607	3,391	1,666	1,237	387	217	3,507	6,897
2020	537	191	45	774	908	13	921	528	13	541	13	209	85	306	2,543	1,938	1,185	486	230	3,839	6,381
2021	1,318	178	45	1,541	810	13	824	364	13	377	13	145	44	202	2,944	2,750	1,375	745	173	5,042	7,986
2022	1,298	114	45	1,458	771	13	784	513	13	526	13	233	76	321	3,089	3,222	1,976	778	204	6,180	9,269
Mean	1,431	243	41	1,715	316	10	323	191	12	201	9	100	47	94	2,311	1,416	520	314	71	2,205	4,517

[a] Ontario sport harvest values were estimated from the 2014 lakewide aerial creel survey. These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis.

Table 3. Annual fishing effort for Lake Erie walleye by gear, management unit, and agency from 2012 to 2022. Means contain data from 1975 to 2021.

	Sport Fishery [a]														Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Units 4 & 5					Unit 1	Unit 2	Unit 3	Units 4&5	
Year	OH	MI	ON[c,d]	Total	OH	ON[c,d]	Total	OH	ON[c,d]	Total	ON[c,d]	PA	NY	Total	Total	ON	ON	ON	ON	Total
2012	1,283	242	--	1,525	560	--	560	182	--	182	--	160	169	329	2,597	4,674	2,480	2,298	352	9,804
2013	1,424	182	--	1,606	503	--	503	236	--	236	--	154	143	297	2,641	3,802	2,774	2,624	304	9,503
2014	1,552	131	101	1,683	459	85	459	441	71	441	70	171	187	358	2,940	7,351	4,426	2,911	254	14,943
2015	1,430	165	--	1,595	564	--	564	341	--	341	--	162	215	377	2,876	6,980	6,487	5,379	792	19,637
2016	1,514	236	--	1,750	439	--	439	397	--	397	--	141	217	358	2,944	6,980	7,969	4,523	1,448	20,920
2017	1,351	187	--	1,538	726	--	726	501	--	501	--	228	213	441	3,207	8,056	7,239	3,636	1,527	20,458
2018	1,239	261	--	1,500	813	--	813	354	--	354	--	248	229	477	3,144	5,215	7,421	2,636	1,896	17,168
2019	1,739	265	--	2,004	1,036	--	1,036	307	--	307	--	439	297	736	4,083	4,165	6,365	2,402	1,353	14,285
2020	1,111	301	--	1,413	1,511	--	1,511	659	--	659	--	395	279	674	4,257	5,759	6,576	3,049	1,738	17,122
2021	2,148	325	--	2,473	1,430	--	1,430	584	--	584	--	258	183	441	4,928	7,279	6,528	3,168	1,236	18,212
2022	1,891	275	--	2,166	1,219	--	1,219	498	--	498	--	306	224	530	4,412	7,017	7,013	2,642	924	17,596
Mean	2,792	633	102.4	3,480	786	61.92	799	422	110.6	451	105.6	229	233	295	4,977	8,573	5,713	4,331	822	18,576

[a] Ohio, Michigan, Pennsylvania and New York sport units of effort are thousands of angler hours.

[b] Estimated Standard (Total) Effort in kilometers of gill net = (walleye targeted effort x walleye total harvest) / walleye targeted harvest.

[c] Ontario sport fishing effort was estimated from 2014 lakewide aerial creel survey, values are in rod hours

[d] Ontario sport fishing effort is not included in area and lakewide totals due to effort reporting in rod hours

Table 4. Annual catch per unit effort for Lake Erie walleye by gear, management unit, and agency. Means contain data from 1975 to 2021.

	Sport Fishery [a]															Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Units 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON [c,d]	Total	OH	ON [c,d]	Total	OH	ON [c,d]	Total	ON [c,d]	PA	NY	Total	Total	ON	ON	ON	ON	Total
2012	0.46	0.36	--	0.45	0.42	--	0.42	0.51	--	0.51	--	0.28	0.22	0.25	0.42	178.4	114.8	83.1	80.3	136.5
2013	0.53	0.30	--	0.51	0.38	--	0.38	0.58	--	0.58	--	0.39	0.24	0.32	0.47	194.0	107.0	74.2	100.7	132.5
2014	0.59	0.32	0.45	0.56	0.39	0.16	0.39	0.49	0.19	0.49	0.18	0.50	0.33	0.41	0.51	102.8	58.4	81.8	156.8	86.5
2015	0.52	0.40	--	0.51	0.33	--	0.33	0.41	--	0.41	--	0.29	0.26	0.27	0.43	90.6	54.5	60.3	97.3	70.7
2016	0.38	0.28	--	0.37	0.32	--	0.32	0.35	--	0.35	--	0.23	0.23	0.23	0.34	135.5	74.6	77.0	69.0	95.0
2017	0.44	0.30	--	0.42	0.44	--	0.44	0.70	--	0.70	--	0.71	0.33	0.53	0.48	215.3	126.9	139.6	76.2	160.2
2018	0.77	0.67	--	0.75	0.82	--	0.82	0.99	--	0.99	--	1.09	0.54	0.83	0.81	292.0	193.1	171.0	132.0	213.0
2019	0.75	0.58	--	0.72	0.91	--	0.91	1.02	--	1.02	--	0.96	0.59	0.81	0.81	399.9	194.4	161.3	160.1	245.5
2020	0.48	0.64	--	0.52	0.60	--	0.60	0.80	--	0.80	--	0.53	0.30	0.44	0.58	336.5	180.2	159.3	132.5	224.2
2021	0.61	0.55	--	0.60	0.57	--	0.57	0.62	--	0.62	--	0.56	0.24	0.43	0.58	377.7	210.6	235.0	140.1	276.9
2022	0.69	0.42	--	0.65	0.63	--	0.63	1.03	--	1.03	--	0.76	0.34	0.58	0.68	459.1	281.8	294.3	221.0	351.2
Mean	0.49	0.38	0.402	0.47	0.36	0.2623	0.36	0.44	0.193	0.43	0.114	0.40	0.20	0.28	0.45	186.8	96.5	83.1	81.1	131.3

[a] Ohio, Michigan, Pennsylvania and New York sport CPE = Number/angler hour

[b] Commercial CPE = Number/kilometer of gill net

[c] Ontario sport fishing CPE was estimated from the 2014 lakewide aerial creel survey values are in number/rod hour

[d] Ontario sport fishing CPE is not included in area and lakewide totals due to effort reporting in rod hours

Table 5. Catch at age of walleye harvest by management unit, gear, and agency in Lake Erie during 2022. Units 4 and 5 are combined in Unit 4.

		Commercial	Sport					All Gear
Unit	Age	Ontario	Ohio	Michigan	New York	Pennsylvania	Total	Total
1	1	94,808	277	0			277	95,085
	2	254,468	20,067	601			20,668	275,136
	3	1,536,261	341,832	38,181			380,013	1,916,274
	4	735,474	448,411	32,161			480,572	1,216,046
	5	86,600	78,222	11,591			89,813	176,413
	6	39,173	41,113	8,898			50,011	89,184
	7+	475,163	368,173	23,032			391,205	866,368
	Total	3,221,947	1,298,095	114,465	--	--	1,412,560	4,634,507
2	1	14,351	100				100	14,451
	2	92,254	5,360				5,360	97,614
	3	1,118,073	293,575				293,575	1,411,648
	4	401,162	227,223				227,223	628,385
	5	59,841	39,151				39,151	98,992
	6	12,422	25,644				25,644	38,066
	7+	277,866	179,452				179,452	457,318
	Total	1,975,969	770,505	--	--	--	770,505	2,746,474
3	1	113,111	0				0	113,111
	2	71,517	2,211				2,211	73,728
	3	291,278	153,286				153,286	444,564
	4	120,887	108,776				108,776	229,663
	5	22,134	49,678				49,678	71,812
	6	8,944	34,308				34,308	43,252
	7+	149,772	164,453				164,453	314,225
	Total	777,643	512,712	--	--	--	512,712	1,290,355
4	1	46,933			0	0	0	46,933
	2	23,564			438	2,206	2,644	26,208
	3	69,523			22,913	123,561	146,474	215,997
	4	21,790			10,375	41,371	51,745	73,535
	5	2,404			6,655	13,239	19,894	22,298
	6	6,529			17,397	6,068	23,465	29,994
	7+	33,514			17,997	46,335	64,332	97,846
	Total	204,257	--	--	75,774	232,780	308,554	512,811
All	1	269,203	377	0	0	0	377	269,580
	2	441,803	27,638	601	438	2,206	30,883	472,686
	3	3,015,135	788,693	38,181	22,913	123,561	973,348	3,988,483
	4	1,279,313	784,410	32,161	10,375	41,371	868,316	2,147,629
	5	170,979	167,051	11,591	6,655	13,239	198,535	369,514
	6	67,068	101,065	8,898	17,397	6,068	133,428	200,496
	7+	936,315	712,078	23,032	17,997	46,335	799,443	1,735,758
	Total	6,179,816	2,581,312	114,465	75,774	232,780	3,004,330	9,184,146

Table 6. Age composition (in percent) of walleye harvest by management unit, gear, and agency in Lake Erie during 2022. Units 4 and 5 are combined in Unit 4.

		Commercial	Sport					All Gears
Unit	Age	Ontario	Ohio	Michigan	New York	Pennsylvania	Total	Total
1	1	2.9	0.0	0.0	--	--	0.0	2.1
	2	7.9	1.5	0.5	--	--	1.5	5.9
	3	47.7	26.3	33.4	--	--	26.9	41.3
	4	22.8	34.5	28.1	--	--	34.0	26.2
	5	2.7	6.0	10.1	--	--	6.4	3.8
	6	1.2	3.2	7.8	--	--	3.5	1.9
	7+	14.7	28.4	20.1	--	--	27.7	18.7
	Total	100.0	100.0	100.0	--	--	100.0	100.0
2	1	0.7	0.0	--	--	--	0.0	0.5
	2	4.7	0.7	--	--	--	0.7	3.6
	3	56.6	38.1	--	--	--	38.1	51.4
	4	20.3	29.5	--	--	--	29.5	22.9
	5	3.0	5.1	--	--	--	5.1	3.6
	6	0.6	3.3	--	--	--	3.3	1.4
	7+	14.1	23.3	--	--	--	23.3	16.7
	Total	100.0	100.0	--	--	--	100.0	100.0
3	1	14.5	0.0	--	--	--	0.0	8.8
	2	9.2	0.4	--	--	--	0.4	.
	3	37.5	29.9	--	--	--	29.9	34.5
	4	15.5	21.2	--	--	--	21.2	17.8
	5	2.8	9.7	--	--	--	9.7	5.6
	6	1.2	6.7	--	--	--	6.7	3.4
	7+	19.3	32.1	--	--	--	32.1	24.4
	Total	100.0	100.0	--	--	--	100.0	100.0
4	1	23.0	--	--	0.0	0.0	0.0	9.2
	2	11.5	--	--	0.6	0.9	0.9	5.1
	3	34.0	--	--	30.2	53.1	47.5	42.1
	4	10.7	--	--	13.7	17.8	16.8	14.3
	5	1.2	--	--	8.8	5.7	6.4	4.3
	6	3.2	--	--	23.0	2.6	7.6	5.8
	7+	16.4	--	--	23.8	19.9	20.8	19.1
	Total	100.0	--	--	100.0	100.0	100.0	100.0
All	1	4.4	0.0	0.0	0.0	0.0	0.0	2.9
	2	7.1	1.1	0.5	0.6	0.9	1.0	5.1
	3	48.8	30.6	33.4	30.2	53.1	32.4	43.4
	4	20.7	30.4	28.1	13.7	17.8	28.9	23.4
	5	2.8	6.5	10.1	8.8	5.7	6.6	4.0
	6	1.1	3.9	7.8	23.0	2.6	4.4	2.2
	7+	15.2	27.6	20.1	23.8	19.9	26.6	18.9
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 7. Annual mean age (years) of Lake Erie walleye by gear, management unit, and agency from 2012 to 2022. Means include data from 1975 to 2021.

	Sport Fishery														Commercial Fishery					All Gears
	Unit 1				Unit 2			Unit 3			Units 4 & 5				Unit 1	Unit 2	Unit 3	Unit 4		
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
2012	4.97	4.46	--	4.91	5.78	--	5.78	8.13	--	8.13	--	8.92	7.65	8.35	5.60	4.86	5.33	7.15	7.25	5.34	5.47
2013	5.16	4.26	--	5.10	6.91	--	6.91	8.09	--	8.09	--	8.79	8.13	8.55	5.95	4.91	4.64	7.09	7.36	5.24	5.60
2014	5.79	6.05	--	5.80	7.13	--	7.13	8.30	--	8.30	--	8.29	8.00	8.17	6.57	5.26	5.80	8.29	8.35	6.02	6.31
2015	6.23	5.85	--	6.20	6.88	--	6.88	8.73	--	8.73	--	7.43	8.29	7.89	6.74	4.57	6.30	8.58	8.08	6.14	6.42
2016	5.17	4.98	--	5.15	5.46	--	5.46	6.91	--	6.91	--	7.48	8.06	7.83	5.68	3.25	4.07	4.97	8.69	4.07	4.61
2017	4.54	4.39	--	4.52	3.52	--	3.52	3.67	--	3.67	--	4.17	5.68	4.63	4.14	2.90	2.65	2.86	5.86	2.93	3.32
2018	3.91	3.73	--	3.88	3.56	--	3.56	3.95	--	3.95	--	4.09	4.92	4.35	3.88	3.25	3.18	3.18	4.19	3.28	3.53
2019	4.36	4.12	--	4.33	4.37	--	4.37	4.53	--	4.53	--	4.70	5.10	4.82	4.45	3.82	3.99	3.86	4.29	3.91	4.17
2020	NA	NA	--	--	NA	--	--	NA	--	--	--	4.95	6.05	5.27	NA	3.83	4.11	4.12	3.63	3.94	NA
2021	5.05	5.16	--	5.06	4.54	--	4.54	4.65	--	4.65	--	4.59	5.99	4.91	4.85	4.21	4.32	3.11	3.38	4.05	4.34
2022	4.82	4.65	--	4.80	4.62	--	4.62	5.03	--	5.03	--	4.26	5.47	4.56	4.77	3.79	3.81	3.66	3.42	3.77	4.10
Mean	4.23	3.91	3.66	4.18	4.49	6.58	4.50	5.46	6.72	5.48	8.07	6.40	7.24	6.77	4.45	3.62	3.86	4.83	6.40	3.84	4.09

Table 8. Estimated abundance at age, survival (S), fishing mortality (F) and exploitation (u) for Lake Erie walleye, 1986-2023 (from ADMB 2023 catch at age analysis recruitment integrated model, M=0.32).

	Age							Ages 2+		
Year	2	3	4	5	6	7+	Total	S	F	u
1986	24,834,300	4,409,490	35,425,400	2,801,450	2,849,610	1,589,760	71,910,010	0.638	0.129	0.104
1987	23,973,700	16,747,200	2,766,200	21,884,800	1,739,800	2,756,640	69,868,340	0.643	0.122	0.099
1988	56,474,700	16,191,100	10,556,300	1,716,020	13,655,600	2,792,330	101,386,050	0.641	0.125	0.101
1989	11,695,300	37,574,700	9,928,160	6,349,010	1,043,220	10,046,800	76,637,190	0.636	0.132	0.106
1990	10,236,800	7,908,470	23,733,900	6,181,000	3,991,910	6,938,150	58,990,230	0.643	0.122	0.098
1991	5,236,080	6,976,270	5,046,000	14,995,300	3,939,440	6,966,310	43,159,400	0.653	0.106	0.086
1992	16,788,100	3,604,280	4,527,840	3,253,430	9,725,430	7,071,570	44,970,650	0.648	0.114	0.093
1993	22,499,700	11,390,200	2,270,460	2,827,990	2,048,790	10,597,900	51,635,040	0.624	0.152	0.121
1994	3,615,710	14,872,900	6,767,140	1,336,720	1,686,120	7,548,230	35,826,820	0.613	0.170	0.134
1995	18,747,300	2,413,180	8,996,660	4,068,800	814,800	5,654,790	40,695,530	0.619	0.159	0.127
1996	21,347,000	12,327,100	1,406,750	5,221,870	2,399,670	3,843,130	46,545,520	0.597	0.196	0.153
1997	2,443,430	13,711,500	6,833,550	774,944	2,933,920	3,536,600	30,233,944	0.587	0.213	0.165
1998	22,342,600	1,600,400	7,941,350	3,934,260	453,294	3,808,570	40,080,474	0.600	0.190	0.149
1999	10,944,500	14,280,200	876,177	4,323,680	2,186,900	2,391,540	35,002,997	0.615	0.167	0.132
2000	10,150,900	7,236,330	8,428,670	515,099	2,583,040	2,755,020	31,669,059	0.626	0.148	0.118
2001	31,709,500	6,782,120	4,371,840	5,075,170	315,002	3,287,880	51,541,512	0.677	0.070	0.058
2002	3,673,660	21,927,000	4,440,170	2,847,100	3,326,210	2,360,430	38,574,570	0.676	0.071	0.059
2003	25,203,500	2,573,900	14,767,300	2,978,730	1,920,920	3,843,730	51,288,080	0.685	0.058	0.048
2004	360,199	17,646,100	1,730,820	9,887,640	2,003,060	3,876,620	35,504,439	0.683	0.061	0.051
2005	107,287,000	256,775	12,053,200	1,177,680	6,752,040	4,014,900	131,541,595	0.701	0.035	0.029
2006	3,535,870	75,902,100	172,990	8,106,690	796,348	7,297,210	95,811,208	0.675	0.074	0.061
2007	7,219,570	2,507,100	51,097,900	116,006	5,462,280	5,452,720	71,855,576	0.675	0.073	0.060
2008	1,925,680	5,131,140	1,690,940	34,275,300	78,065	7,343,010	50,444,135	0.681	0.065	0.054
2009	18,410,500	1,368,470	3,482,900	1,144,170	23,294,100	5,043,800	52,743,940	0.693	0.046	0.039
2010	6,732,550	13,115,900	933,740	2,367,750	780,571	19,365,000	43,295,511	0.690	0.051	0.043
2011	6,824,070	4,811,280	9,012,590	638,959	1,624,100	13,783,700	36,694,699	0.690	0.051	0.042
2012	11,430,900	4,857,660	3,293,170	6,157,230	438,357	10,584,000	36,761,317	0.675	0.073	0.061
2013	8,520,290	8,052,550	3,211,050	2,167,800	4,077,390	7,300,630	33,329,710	0.669	0.081	0.067
2014	4,199,610	6,006,230	5,302,850	2,101,600	1,425,370	7,475,480	26,511,140	0.644	0.120	0.097
2015	6,339,780	2,928,410	3,824,180	3,350,290	1,335,820	5,642,650	23,421,130	0.645	0.118	0.096
2016	22,129,800	4,399,720	1,840,840	2,385,520	2,105,610	4,380,210	37,241,700	0.672	0.078	0.064
2017	85,029,200	15,410,400	2,797,730	1,162,560	1,517,670	4,127,350	110,044,910	0.688	0.053	0.045
2018	8,317,700	59,559,800	9,981,680	1,801,310	752,908	3,653,910	84,067,308	0.666	0.086	0.071
2019	10,776,100	5,868,320	39,448,200	6,578,580	1,193,160	2,916,920	66,781,280	0.662	0.093	0.076
2020	28,764,600	7,592,100	3,854,320	25,740,900	4,312,660	2,690,450	72,955,030	0.666	0.087	0.071
2021	39,229,000	20,101,500	4,886,420	2,465,980	16,584,600	4,521,930	87,789,430	0.656	0.102	0.083
2022	13,396,700	27,162,300	12,575,300	3,034,930	1,544,500	13,269,700	70,983,430	0.635	0.134	0.107
2023	48,566,700	9,238,650	16,902,400	7,783,450	1,896,820	9,275,370	93,663,390			

Table 9. Estimated harvest of Lake Erie walleye for 2023, and population projection for 2024 when fishing with 60% F_{msy}. The 2023 and 2024 projected spawning stock biomass values are from the ADMB-2023 recruitment-integrated model. The range in the RAH was calculated using ± one standard deviation from the mean RAH.

SSB_0= 64.236 million kilograms

20% SSB_0= 12.847 million kilograms

F_{msy} = 0.519

	2023 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2023 RAH (millions of fish)			Projected 2024 Stock Size (millions)
Age	**Mean**	**F**	**Sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	48.567		0.271	0.084	0.667	0.069	2.539	3.372	4.205	15.165
3	9.239		0.932	0.290	0.543	0.217	1.630	2.005	2.381	32.412
4	16.902		1.000	0.311	0.532	0.231	3.189	3.900	4.611	5.020
5	7.783		0.953	0.297	0.540	0.221	1.390	1.723	2.055	8.992
6	1.897		0.917	0.285	0.546	0.214	0.324	0.406	0.488	4.202
7+	9.275		0.989	0.308	0.534	0.229	1.699	2.120	2.541	5.986
Total (2+)	93.663	0.311				0.144	10.772	13.526	16.281	71.776
Total (3+)	45.097						8.233	10.154	12.076	56.611
SSB	69.057	mil. kgs								66.549 mil. kgs

probability of 2024 spawning stock biomass being less than 20% SSB_0 = 0.000%

Table 10. Mean catch per hectare of age-0 Walleye observed in bottom trawls towed in the western basin by the Ontario Ministry of Natural Resources (ONT) and Ohio Department of Natural Resources (OH) between 2000 and 2022.

Year Class	Year of Recruitment to Fisheries	OH+ONT Trawl Age-0 CPHa
2000	2002	4.113
2001	2003	28.499
2002	2004	0.139
2003	2005	183.015
2004	2006	5.402
2005	2007	12.665
2006	2008	2.051
2007	2009	25.408
2008	2010	7.238
2009	2011	7.107
2010	2012	26.260
2011	2013	6.502
2012	2014	6.417
2013	2015	10.584
2014	2016	29.050
2015	2017	84.105
2016	2018	9.224
2017	2019	22.852
2018	2020	255.581
2019	2021	225.310
2020	2022	97.480
2021	2023	345.599
2022	2024	83.413

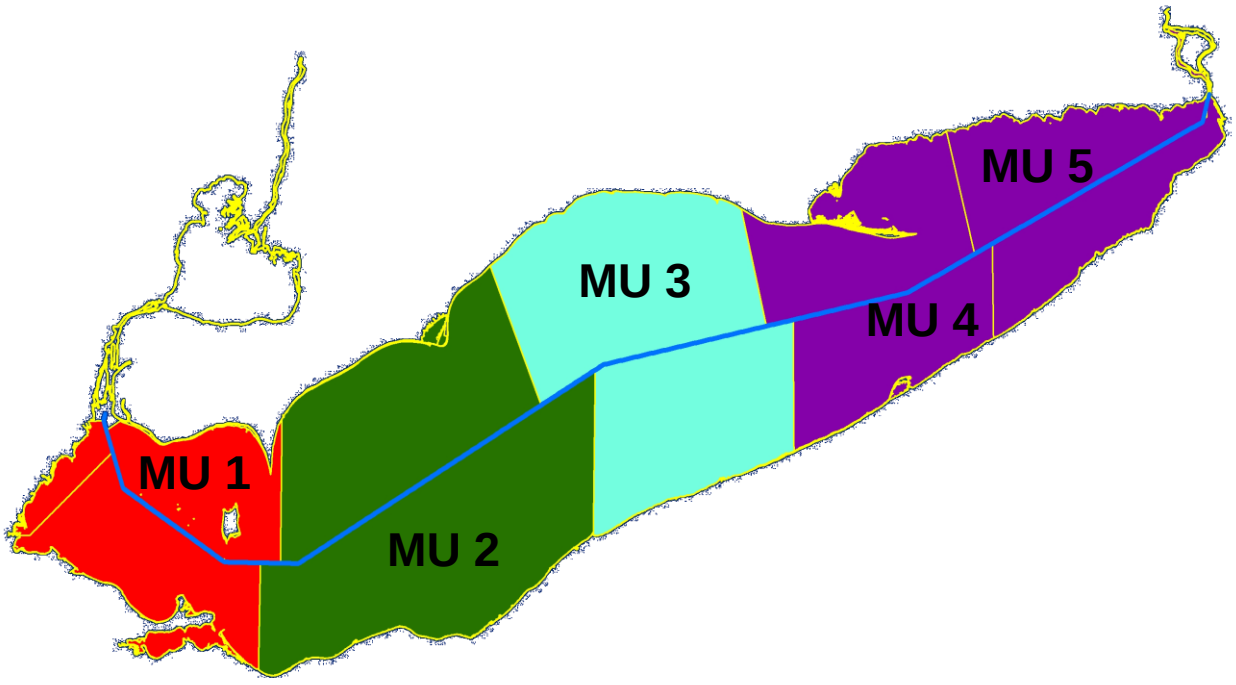

Figure 1. Map of Lake Erie with management units (MU) recognized by the Walleye Task Group for interagency management of Walleye.

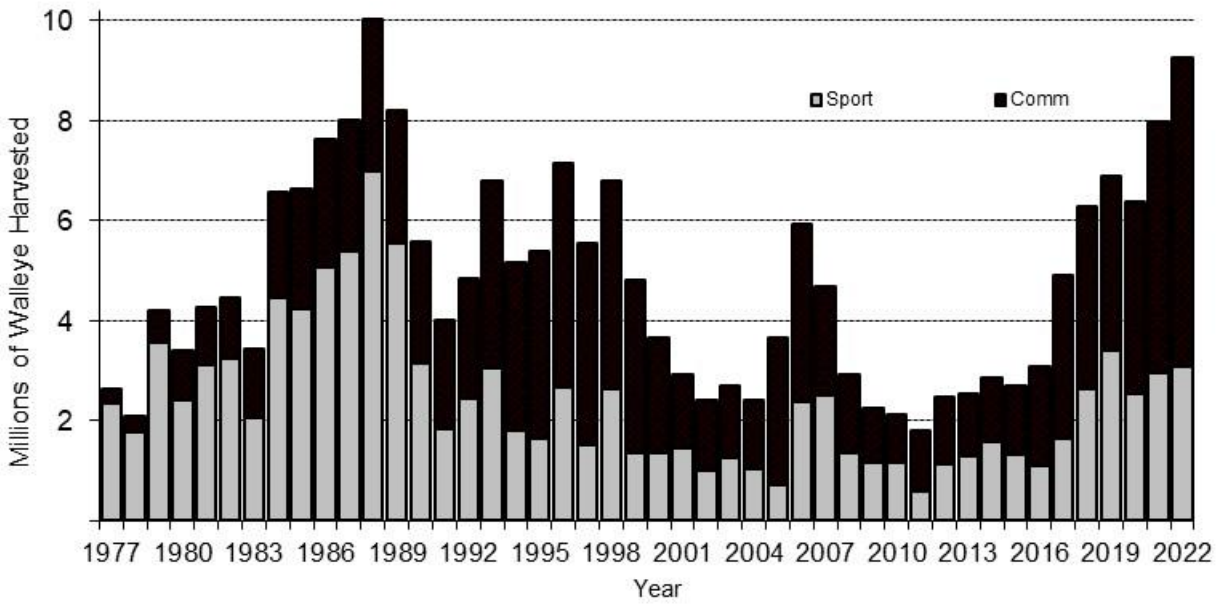

Figure 2. Lake-wide harvest of Lake Erie Walleye by sport and commercial fisheries during 1977-2022.

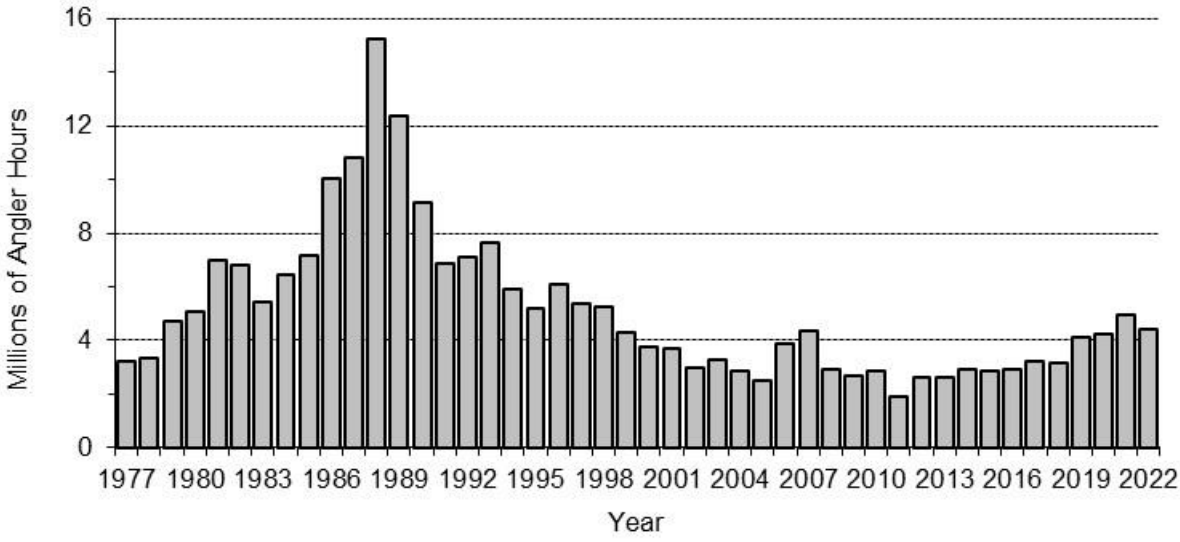

Figure 3. Lake-wide total effort (angler hours) by sport fisheries for Lake Erie Walleye during 1977-2022.

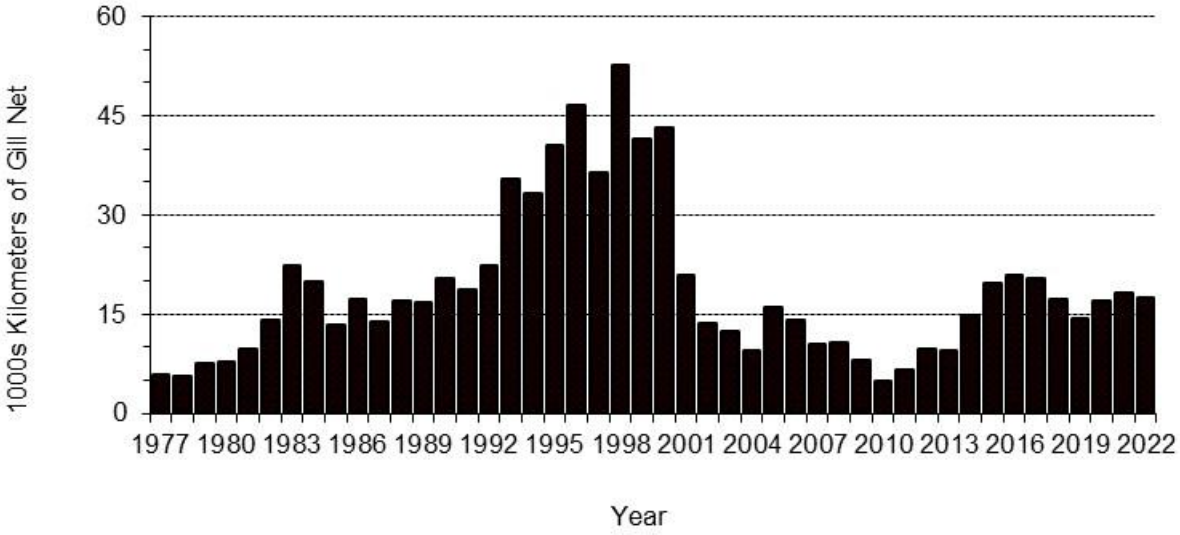

Figure 4. Lake-wide total effort (thousand kilometers of gill net) by commercial fisheries for Lake Erie Walleye during 1977-2022.

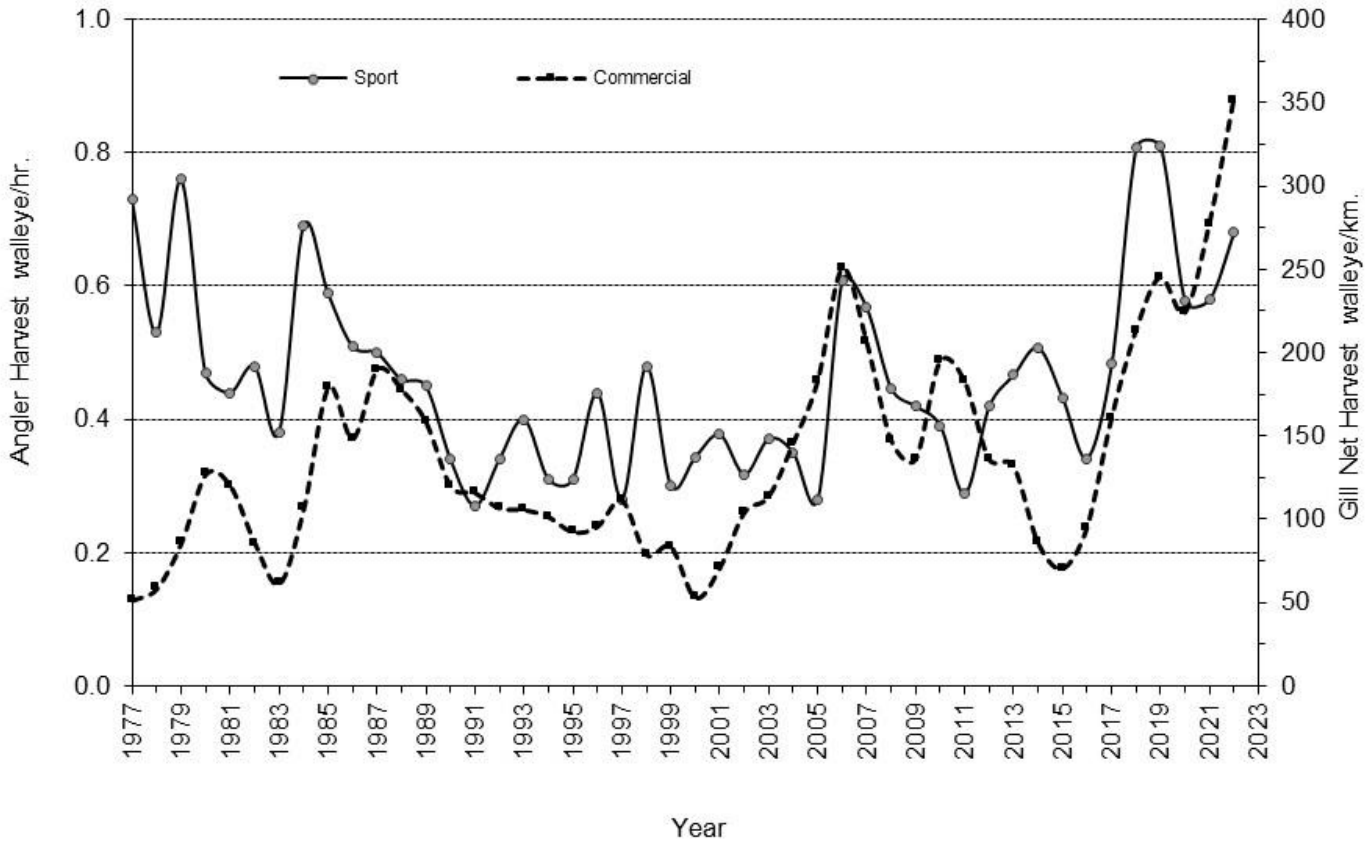

Figure 5. Lake-wide harvest per unit effort (HPE) for Lake Erie sport and commercial Walleye fisheries during 1977-2022.

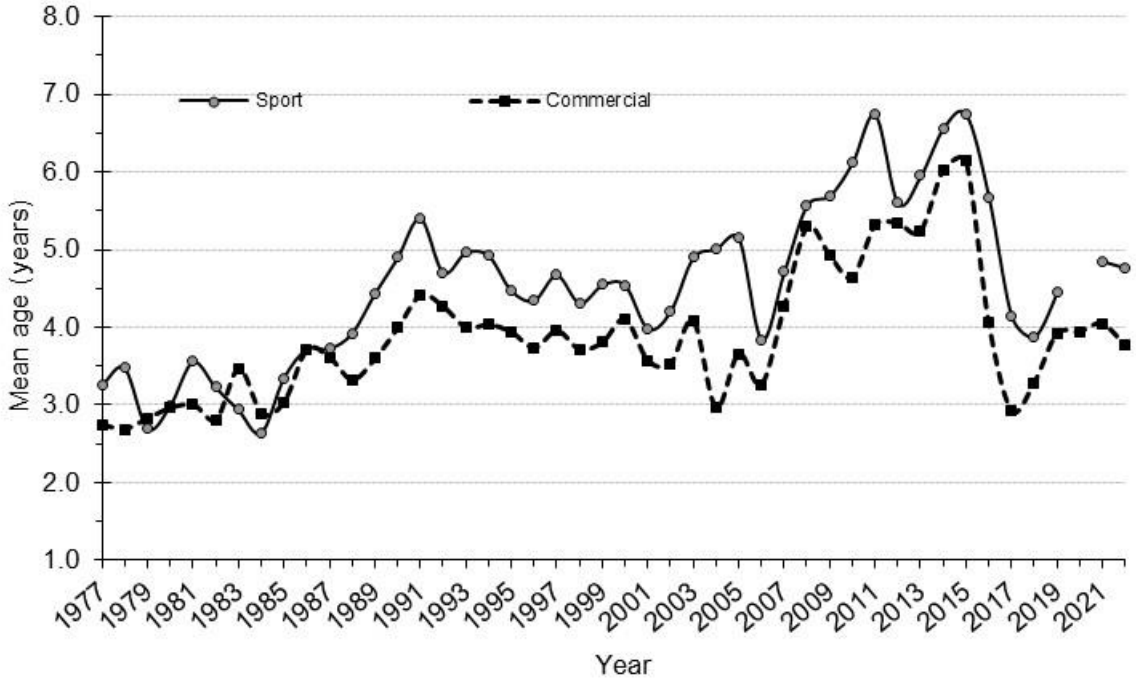

Figure 6. Lake-wide mean age of Lake Erie Walleye in sport and commercial harvests during 1977-2022.

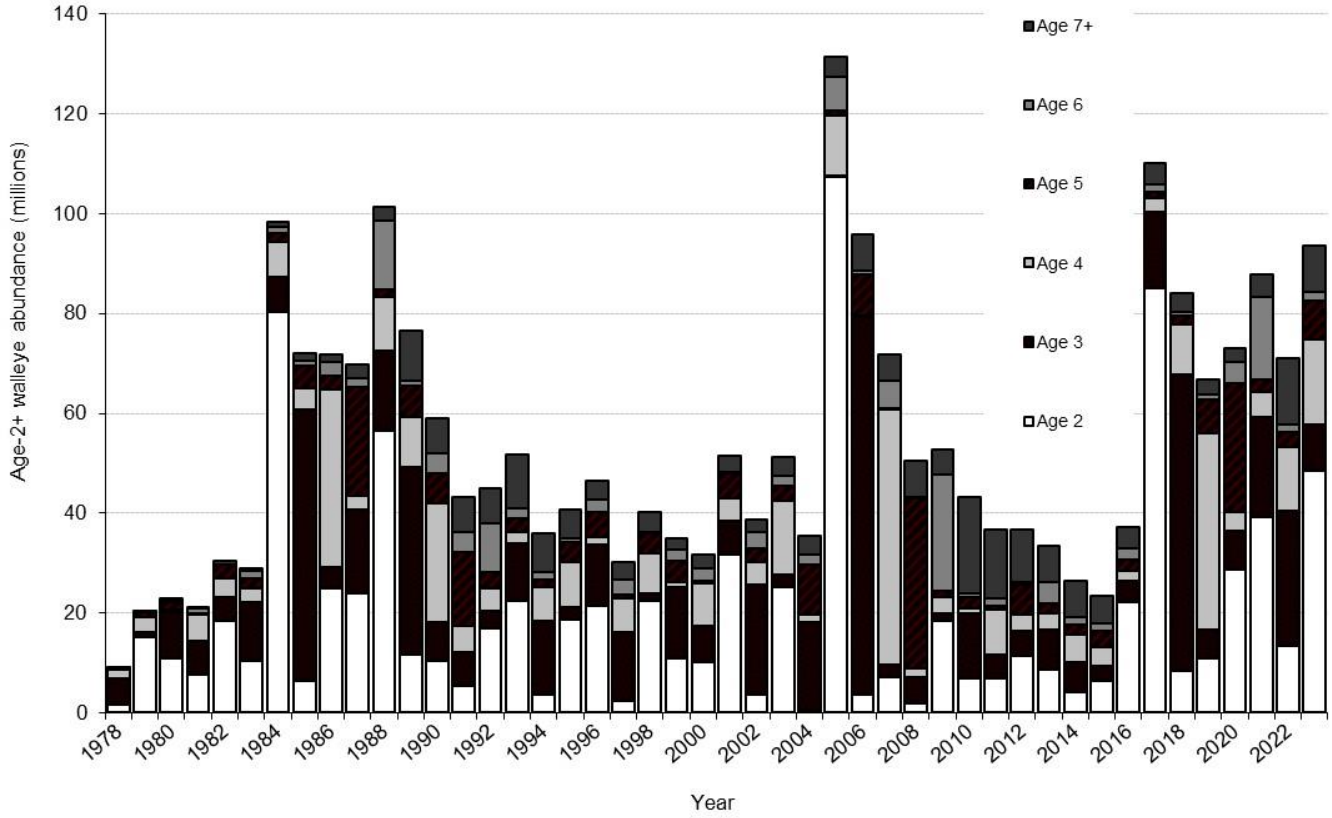

Figure 7. Abundance at age for age-2 and older Walleye in Lake Erie's west and central basins during 1978-2022 and the 2023 projection, estimated from the ADMB model. Data shown are from Table 8.

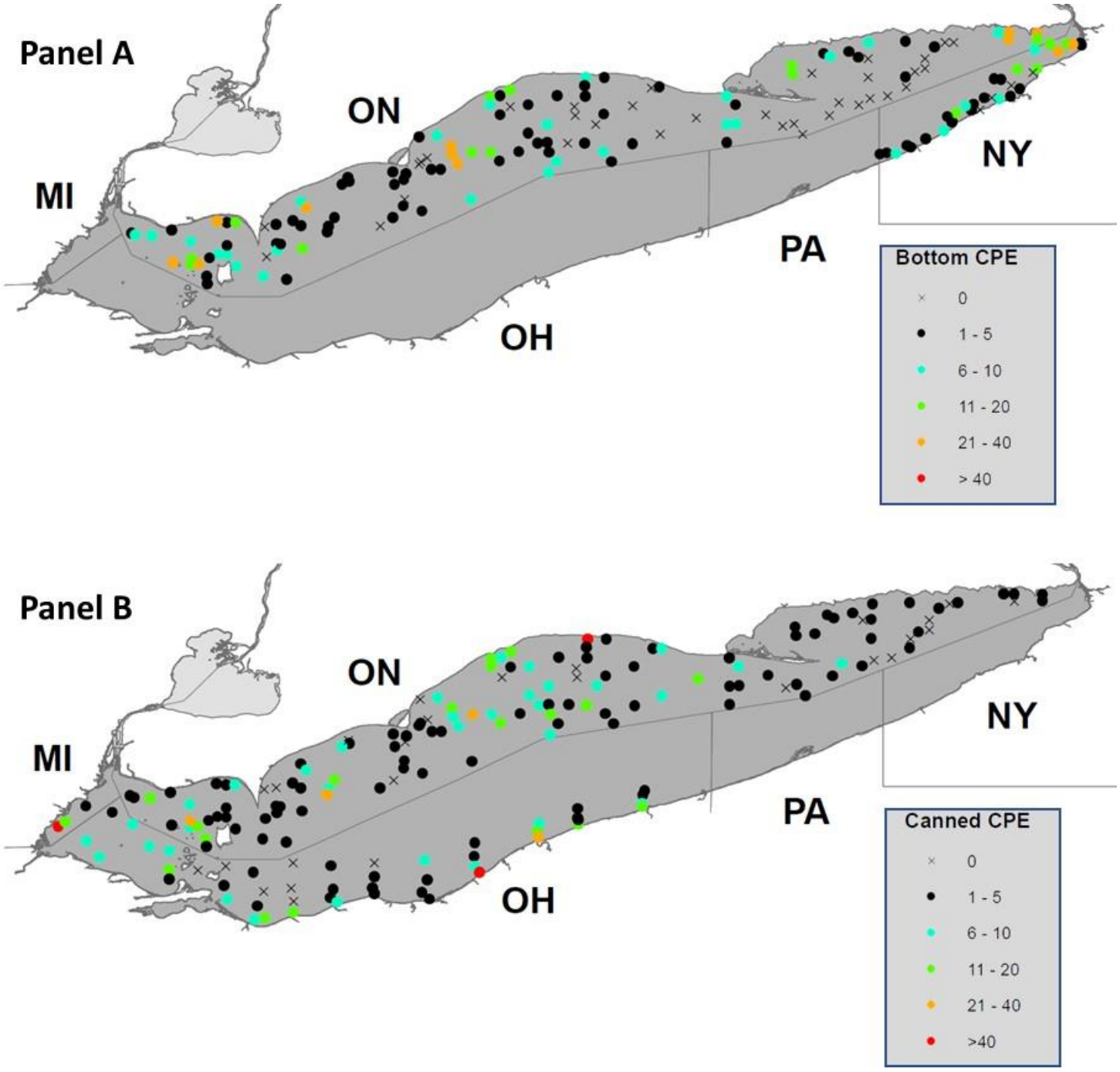

Figure 8. Relative abundance of yearling Walleye captured in bottom-set (Panel A) and suspended or kegged (canned) multifilament (Panel B) gillnets from Michigan, and monofilament gillnets from Ohio, New York, and Ontario waters in 2022. Catches have been adjusted to reflect panel length (standardized to 50 ft panels) and differences in the presence of large mesh (>5.5" excluded).

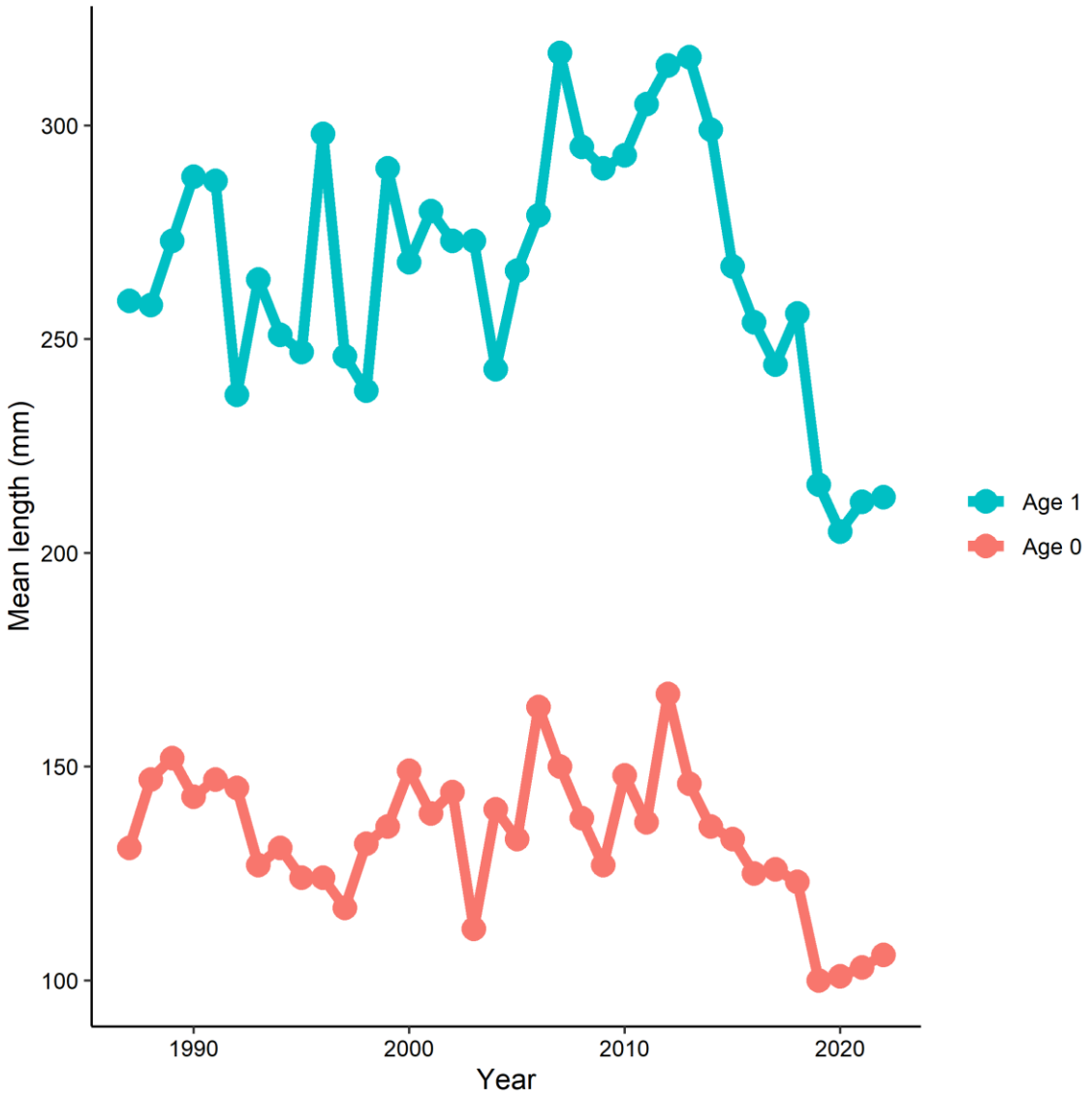

Figure 9. Mean total length of age 0 and 1 Walleye sampled using fisheries-independent bottom trawls in Ohio and Ontario waters of western Lake Erie (MU 1) during 1987-2022.

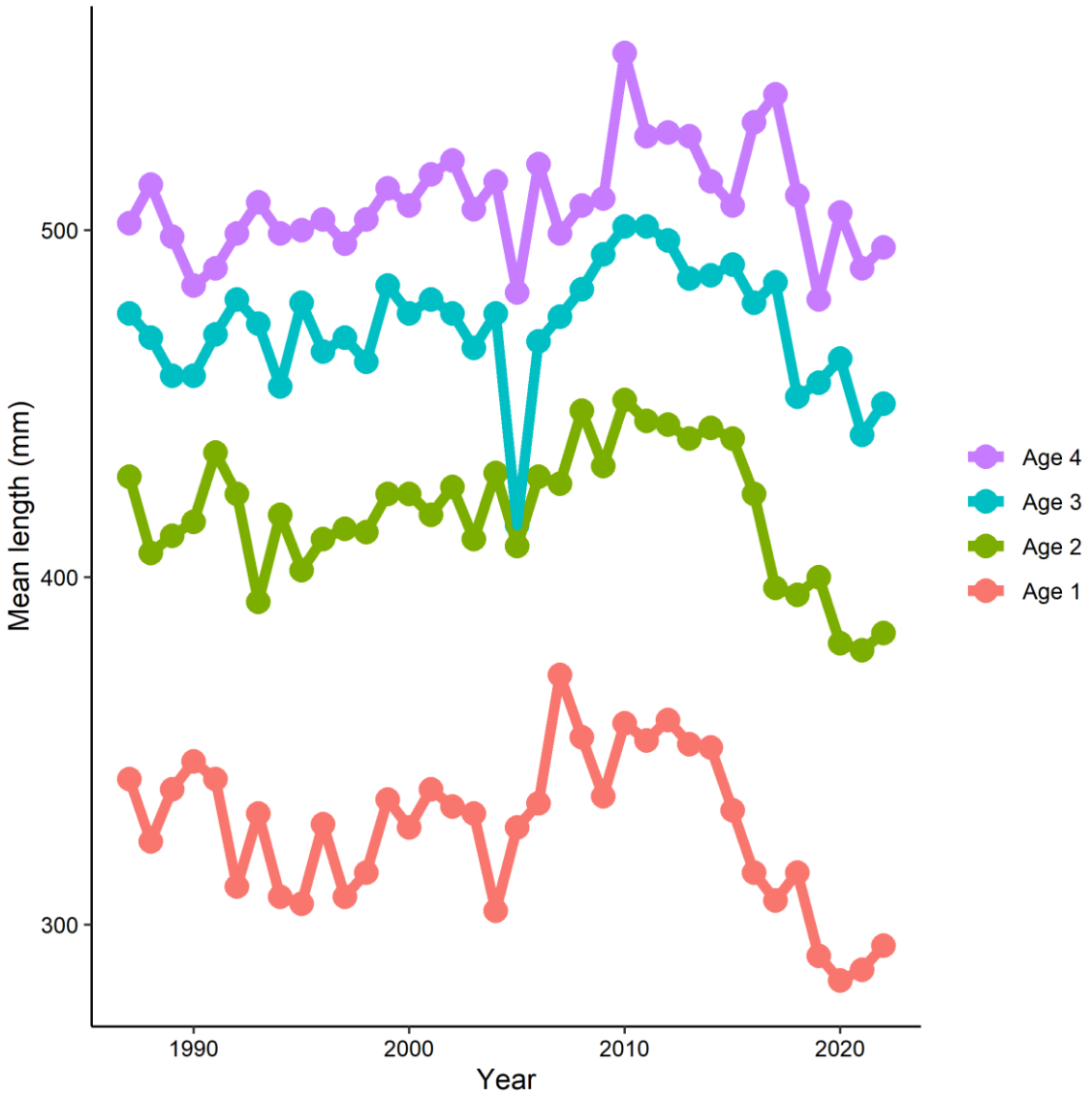

Figure 10. Mean lengths of age 1 through age 4 Walleye sampled using fisheries-independent gill nets in Ohio and Ontario waters of Lake Erie during 1987-2022. Data shown for the TAC area (i.e., MUs 1-3).