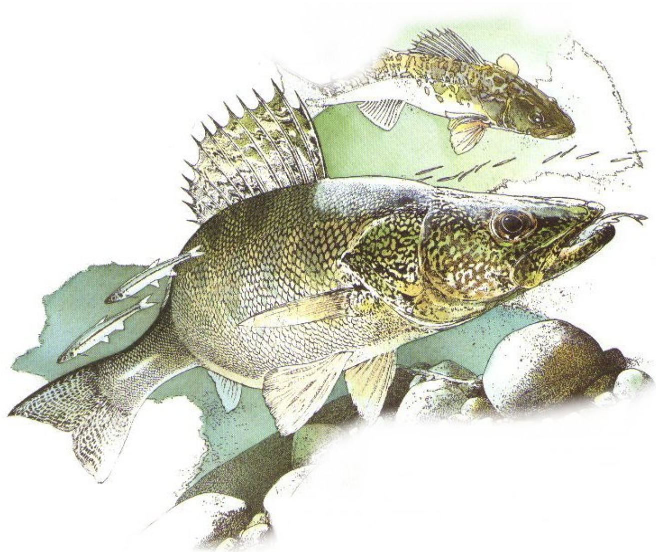
Report for 2017 by the

LAKE ERIE WALLEYE TASK GROUP

March 2018



Prepared by members:

Todd Wills (co-chair) — *Michigan Department of Natural Resources (MDNR)*
Jason Robinson — *New York Department of Environmental Conservation (NYDEC)*
Matt Faust — *Ohio Department of Natural Resources (ODNR)*
Ann Marie Gorman — *Ohio Department of Natural Resources (ODNR)*
Megan Belore — *Ontario Ministry of Natural Resources and Forestry (OMNRF)*
Andy Cook — *Ontario Ministry of Natural Resources and Forestry (OMNRF)*
Stephen Marklevitz (co-chair) — *Ontario Ministry of Natural Resources and Forestry (OMNRF)*
Tom MacDougall — *Ontario Ministry of Natural Resources and Forestry (OMNRF)*
Yingming Zhao — *Ontario Ministry of Natural Resources and Forestry (OMNRF)*
Mike Hosack — *Pennsylvania Fish and Boat Commission (PFBC)*

Presented to:

Standing Technical Committee
Lake Erie Committee
Great Lakes Fishery Commission
Toronto, Ontario; March 28th-29th, 2018

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.*

Cover art with permission from Mark Peloza, Hawg Heaven Guide Service, 9121 Bayshore Drive, Gladstone, MI, 49837

Charges to the Walleye Task Group, 2017-2018

The charges from the Lake Erie Committee's (LEC) Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period of April 2017 to March 2018 were to:

1. Maintain and update the centralized time series of datasets required for population models and assessment including:
    a. Tagging and population indices (abundance, growth, maturity).
    b. Fishing harvest and effort by grid.

2. Improve existing population models to produce the most scientifically defensible and reliable method for estimating and forecasting abundance, recruitment, and mortality.
    a. Explore additional recruitment indices for incorporation into catch-at-age model.
    b. Explore ways to account for tag loss and non-reporting in natural mortality (M) estimates for Statistical Catch-at-Age (SCAA) modeling.
    c. Explore the extent to which lake-wide assessment programs can be combined across jurisdictions to better support stock status models.

3. Report Recommended Allowable Harvest (RAH) levels for 2018.

4. Provide guidance/recommendations for tagging strategies that are expected to be implemented beginning in 2018 to the LEC.

Review of Walleye Fisheries in 2017

Fishery effort and Walleye harvest data were combined for all fisheries, jurisdictions and Management Units (MU) (Figure 1) to produce lake-wide summaries. The 2017 total estimated lake-wide harvest was 4.913 million Walleye (Table 1), with a total of 4.551 million harvested in the total allowable catch (TAC) area. This harvest represents 77% of the 2017 TAC (5.924 million Walleye) and includes Walleye harvested in commercial and sport fisheries in MU 1, 2, and 3. An additional 0.362 million Walleye (7% of the lake-wide total) were harvested outside of the TAC area in MU 4 and 5 (Table 1). The estimated sport fish harvest of 1.636 million Walleye in 2017 represented a 50% increase from the 2016 harvest of 1.090 million Walleye; this harvest was 28% below the long-term (1975-2016) average of 2.274 million fish (Table 2). The 2017 Ontario commercial harvest was 3.277 million Walleye lake-wide, with 3.161 million caught in the TAC area (Table 2). The 2017 Ontario angler estimates of harvest and effort were derived from the 2014 lake-wide aerial creel survey because angler creel surveys are not conduct on annually in Ontario waters. It assumes 72,000 Walleye were harvested in Ontario within the TAC area during 2017; an estimate included in total Walleye harvest, but not used in catch-at-age analysis. Total harvest of Walleye in Ontario TAC waters was 3.233 million Walleye, representing 127% of the 2017 Ontario TAC allocation of 2.551 million Walleye. Ontario Ministry of Natural Resources and Forestry converts the TAC in numbers of walleye to an allocation in weight. It is the allocation in weight that is provided to the Ontario commercial fishing industry. If the weight conversion factor is not identical to the average weight of walleye that are harvested, there is either an over-harvest or an under-harvest. In 2017, the Ontario commercial fishery did not exceed their allocated quota in weight of fish. However, more age-2 Walleye were harvested than predicted, and these fish were smaller than average size. Therefore the actual mean harvest weight in the commercial fishery was lower than the weight conversion factor used to allocate quota to the Ontario commercial fishery, and the commercial fishery harvested a higher number of fish than TAC. In 2017, the lake-wide Ontario commercial harvest was 65% higher than in 2016, and 63% above the long-term average (1976-2016; Table 2, Figure 2).

Sport fishing effort increased 9% in 2017 from 2016 to total 3.207 million angler hours (Table 3, Figure 3). Compared to 2016, sport effort decreased by 12% in MU 1 while it increased in MUs 2, 3, and 4&5 by 65%, 26%, and 23% respectively. Lake-wide commercial gill net effort (20,458 km) decreased 2% from 2016 but remains 9% above the long-term average (Table 3, Figure 4).

The 2017 lake-wide average sport harvest per unit effort (HUE) of 0.48 Walleye/angler hour was a 41% increase from 2016, which is above the long-term (1975-2016) average of 0.43 Walleye/angler hour (Table 4, Figure 5). In 2017, the sport HUE (Walleye/angler hour) for all agencies combined increased to levels at or above long-term averages across all Management Units except MU 1. Although the MU 1 HUE increased 14%, from 0.37 in 2016 to 0.42 in 2017, it remained below the long-term average of the time series. Increases in sport HUE of 38%, 100%, and 125% in MU 2, 3, and 4&5, respectively, lead to a 2017 annual HUE that was 33%, 89%, and 125% higher than the long-term average in each of these three MUs (Table 4).

The total commercial gill net HUE in 2017 (160.2 Walleye/kilometer of net) increased 69% relative to 2016 and was 34% above the long-term (1976-2016) lake-wide average (120.0 Walleye/kilometer; Table 4, Figure 5). Commercial gill net harvest rates increased in MU 1, 2, 3, and 4&5 by 59% (215.3 Walleye/kilometer of net), 70% (126.9 Walleye/kilometer of net), 81% (139.6 Walleye/kilometer of net), and 10% (76.2 Walleye/kilometer of net), respectively (Table 4).

Lake-wide harvest in the sport and commercial fisheries was comprised mostly of age 2 and age 3 Walleye from the 2015 (45%) and 2014 (36%) year classes (Table 5; Table 6). Age 7 and older Walleyes were the next most harvested age group, representing 8% of the total lake-wide harvest in 2017. Similarly, harvest in the commercial fishery was dominated by the 2014 (age 3; 30%) and 2015 year class (age 2; 55%), with harvest of the age 7 and older fish (5%) representing the next-highest contribution to the lake-wide commercial harvest. In the sport fishery, catches of the 2014 year class (age 3; 49%) exceeded catches of the 2015 year class (age 2; 23%) and age 7 and older fish (13%). The proportion of older fish (age 7+) in the sport harvest was greater in MU 4 (28%) compared to MU 1 (7%), 2 (4%), and 3 (7%). A higher proportion of older fish (44%) were also observed in the MU 4 commercial fishery, compared to MU 1, 2, and 3 where age 2 and age 3 fish combined comprised 85%, 92%, and 88% of the commercial harvest, respectively (Table 5; Table 6).

Across all jurisdictions, the mean age of Walleye harvested in 2017 ranged from 3.5 to 5.7 years old in the sport fishery, and from 2.7 to 5.9 years old in the Ontario commercial fishery (Table 7, Figure 6). The 2017 harvest marks the second consecutive year in which the mean age of harvested Walleye from the sport and commercial fishery combined decreased, which is the first time since 1996 that the mean age of harvested walleye has decreased for two years in a row (Figure 6). The mean age of Walleye declined across all Management Units in the sport and commercial fisheries. The mean age of Walleye harvested in the sport fishery decreased by less than 1 year in MU 1, 2 years in MU 2, and 3 years in MU 3 and 4&5. In the commercial fishery, mean age decreased by 0.3 years, 1.4 years, 2.1 years, and 2.8 years in MU 1, 2, 3, and 4&5 respectively (Table 7). The mean age in the sport fishery (4.1 years), commercial fishery (2.9 years), and lake-wide combined fisheries (3.3 years) are all below the long-term means (1975-2016; Table 7). This trend in decreasing age continues to represent the moderate/strong 2014 year class and strong 2015 year classes recruiting to the fisheries, with lesser dependence on the 2003, 2007, and 2010 year classes.

Catch-at-Age Population Analysis and Abundance

The WTG uses a SCAA model to estimate the abundance of Walleye in Lake Erie from 1978 to 2017. The stock assessment model estimates population abundance of age 2 and older Walleye using fishery-dependent and fishery-independent data sources. The model includes fishery-dependent data from the Ontario commercial fishery (MU 1-3) and sport fisheries in Ohio (MU 1-3) and Michigan (MU 1). Since 2002, the WTG model has included data collected from three fishery-independent, gill net assessment surveys (i.e., Ontario Partnership, Michigan, and Ohio). Beginning in 2011, Michigan and Ohio gill net survey data were pooled in the SCAA because of similarities between the surveys. In 2016, Ohio switched from multifilament to monofilament gill nets[1] after completing several years (2007, 2008, 2010-2013) of comparisons between the two gear types (see Vandergoot et al. 2011 and Kraus et al. 2017*)*. Michigan did not similarly change gear types. In 2017, to address the change in gear types, age-specific corrections of monofilament to multifilament catches were created using linear regression models for the Ohio survey data and again pooled with Michigan data in the SCAA model. This practice continued again in 2018 as the WTG and the Quantitative Fisheries Center at Michigan State University explored options for incorporating the new Ohio data set into the SCAA model.

The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. This model includes: 1) estimated selectivity for all ages within the model without the assumptions of known selectivity at age; 2) integrated age-0 trawl survey data into the model; 3) a multinomial distribution for the age composition data; and 4) time-varying catchability using a random walk for fishery and survey data including the age-0 trawl survey. Instantaneous natural mortality (*M)* is assumed to be constant (0.32) among years (1978-2017) and ages (ages 2 through 7and older). The abundances-at-age were derived from the estimated parameters using an exponential survival equation.

Based on the 2018 integrated SCAA model, the 2017 west-central population (MU 1-3) was estimated at 53.725 million age 2 and older Walleye (Table 8, Figure 7). An estimated 34.025

---

[1] In 2016, the ODNR switched to a new monofilament index gill net configuration. The ODNR's multifilament gill nets were 1,300 ft (396 m) in length, 6 ft (1.8m) deep, with thirteen 100-ft (30.5 m) panels consisting of mesh sizes from 2 to 5 inches (51-127 mm stretched) and twine diameter of 0.37mm. The new monofilament gill nets are 1,200 ft long (366 m) by 6 ft deep (1.8 m) with twelve 100-ft (30.5 m) panels with mesh sizes from 1.5 to 7 inches (38–178) mm and twine diameter that varies with mesh size from 0.20 to 0.33 mm. Comparisons between these multifilament and monofilament index gill net configurations are described in Vandergoot et al. (2011) and Kraus et al. (2017).

million age 2 (2015 year class) fish comprised 63% of the age 2 and older Walleye population. Age 3 (2014 year class) represented the second largest (20%) and age 7 and older (2009 and older year classes) the third largest (7%) components of the population. Based on the integrated model, the number of age 2 recruits entering the population in 2018 (2016 year class) and 2019 (2017 year class) are estimated to be 5.973 and 12.276 million Walleye, respectively (Table 9; Figure 8). The 2018 projected abundance of age 2 and older Walleye in the west-central population is estimated to be 41.405 million fish (Table 8; Figure 7).

Harvest Policy and Recommended Allowable Harvest (RAH) for 2018

In March 2018, the WTG applied the following Harvest Control Rules as identified in the Walleye Management Plan (WMP; 2015-2019):

- *Target Fishing Mortality* of **60%** of the 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 2018 integrated SCAA model, the estimated abundance of 41.405 million age-2 and older Walleye in 2018, and the harvest policy described above, the calculated mean RAH for 2018 was 8.809 million Walleye, with a range from 6.698 (minimum) to 10.921 (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} =0.323) in the harvest policy was applied since the probability of the projected spawner biomass in 2019 (36.037 million kg) falling below the limit reference point ($SSB_{20\%}$ = 12.155 million kg) after fishing at 60%F_{MSY} in 2018 was less than 5% (P=0.0001). Thus, the probabilistic control rule (P*) to reduce target fishing rate and conserve spawner biomass was not invoked during the 2018 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 in TAC would be (+) or (-) 20% of the 2017 TAC (5.924 million fish), and the range in 2018 TAC for LEC consideration would be from 6.689 million fish to 7.109 million fish.

Other Walleye Task Group Charges

Centralized Datasets

WTG members currently manage several databases that consist of fishery-dependent (harvest) and fishery-independent (population) assessment 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 size and abundance using SCAA analysis, and 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).

Investigating Auxiliary Recruitment Indices

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 appear to migrate from west basin spawning grounds in the spring, to the cooler waters of the central and east 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 they display similar migrations to those observed 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 9, site-specific yearling Walleye catches are presented for the bottom set interagency (ON, NY) monofilament nets; the new (as of 2016) suspended (canned or kegged) Ohio monofilament nets (see footnote #1, page 3 for description); suspended Michigan multifilament nets; and suspended Ontario monofilament nets fished in 2017. 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 of the Ontario nets containing 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 9a).

In 2017, yearling Walleye catches occurred lake-wide where index nets were fished (Figures 9a and b) albeit with lower densities offshore in the central and east basins. Yearling catches decreased compared to 2016 in west and central Lake Erie, suggesting the 2016 Walleye year class is smaller than the 2015 cohort for western stocks. Yearling Walleye catches in New York bottom set nets on the south shore were more extensive than nets fished on bottom in Ontario waters on the north shore (Figure 9a). Yearling Walleye catch rates in the east basin during 2017 may indicate a strong 2016 cohort for stocks of east basin origin. When bottom set and suspended nets were fished in the same area, yearling catches in bottom set nets exceeded suspended nets in the east basin, whereas suspended nets exceed bottom set nets in the west and central basins (Figure 9a, b). In Ontario Partnership index nets, average catches of age 1 Walleye are often greater in suspended nets than in bottom nets, however this phenomenon varies by year and basin.

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. While the interagency bottom trawl survey is considered to be a robust recruitment predictor, inclusion of additional YOY and yearling indices to form a composite recruitment index could supplement recruitment estimates. However, there are two factors limiting the integration of a composite recruitment index into the SCAA model:

1. Yearling indices are not available far enough in advance to forecast age-2 recruitment, as required for the probabilistic harvest control rule (P*) of the current Walleye Management Plan (Kayle et al. 2015). Options for overcoming this limitation would be exclusion of yearling indices from a composite recruitment index, removal of the P* control rule from the Walleye Management Plan Harvest Policy or running two integrated SCAA models; one with YOY and yearling data and the second model using only YOY data. It is important to note that the two SCAA model option could result in conflicting abundance estimates.

2. Spatial, temporal, and gear type (bottom set vs. suspended gill nets) variability exist in Walleye YOY and yearling indices, along with inconsistencies in sampling intensity and effort. Previous examination of the available recruitment indices using a Principal Components Analysis (PCA) approach revealed challenges for integrating a composite recruitment index into the SCAA model (WTG 2016). Data transformations and missing years of data in some indices were primary concerns.

The WTG will continue to work on auxiliary recruitment indices. However, composite Walleye recruitment indices will not be presented until concerns related to data transformations, missing years of data, and recent changes in index gear configuration are addressed. The WTG will also continue to explore and evaluate alternative recruitment estimation approaches to be considered for adoption in future Lake Erie Walleye Management Plans.

Explore ways to account for tag loss and non-reporting in natural mortality (M)

The WTG continues to be informed by ongoing research that explores contemporary values for natural mortality (M) in Lake Erie Walleye. Staff from the Quantitative Fisheries Center at Michigan State University have been developing methods for estimating natural mortality using acoustic telemetry (WTG 2017) and an integrated tagging and catch-at-age analysis approach. Researchers from Virginia Technological University are also exploring the use of Bayesian statistical techniques to derive M. In addition to these studies, agency efforts to estimate natural mortality using jaw and PIT (Passive Integrated Transponder) tags continue. Preliminary results for this work suggest a natural mortality rate of 0.29 with instantaneous fishing mortality rates ranging from 0.09 to 0.32 for west/central stocks. With the scheduled conclusion of the aforementioned university studies over the next two years, and ongoing agency work, future comparisons among the different methods for estimating natural mortality will be possible. The results of this work will be instrumental in informing the LEC on contemporary values for natural mortality, and what, if any, changes to M are necessary for ongoing SCAA modeling efforts.

Explore combining lake-wide assessment programs across jurisdictions

The resource management agencies responsible for managing Lake Erie fisheries use two primary survey gear types, gill nets and bottom trawls, to generate fishery-independent indices of abundance, support catch-at-age modelling efforts, and provide the LEC with RAH estimates each year. The protocols for deployment (for example, trawl door configuration or location of gill nets in the water column) and the characteristics of the gear (such as gill net material or mesh size) can vary from one agency to the next. While these differences in survey gear help to meet the informational needs of individual jurisdictions and maintain long-term data sets, they can also add complexity in comparing assessment results at basin- or lake-wide spatial scales. Accordingly, the WTG has been charged to explore options for combining lake-wide assessment programs across jurisdictions, using common survey gear, to promote comparisons of fishery-independent survey data across broader spatial scales. Work on this effort did not begin in 2017 as the WTG focused on its other charges. It is expected that this charge will garner more attention after efforts to explore contemporary estimates of natural mortality (above) and provide guidance on tagging strategies (below) conclude.

Provide guidance/recommendations for tagging strategies

Options for future tagging strategies include maintaining the status quo (jaw-tagging), incorporating alternative forms of tagging, (external or PIT tags), or a combined approach that uses a combination of external or PIT tags and acoustic telemetry. While the status quo builds on existing long-term data sets, tag shedding and non-reporting are known issues. Alternative external tags or PIT tags may improve tag shedding and non-reporting rates, but move away from the long-term standard and generate some concern associated with long-term visibility and reporting. A combined approach allows for the advantage of leveraging the existing GLATOS receiver network, but at substantially increased monetary costs. The WTG believes that pursuing contemporary estimates of natural mortality from the ongoing research mentioned above is important, and that this work will ultimately help inform the need for, and design of, any future lake-wide tagging studies. Therefore it is prudent to support ongoing research on natural mortality over the next two years before adopting a new tagging protocol.

Additional Walleye Task Group Activities

Studies Using Acoustic Telemetry

In 2010, an inter-lake Walleye spatial ecology study was initiated between the MDNR, ODNR, United States Geological Survey (USGS), Carleton University, and Great Lakes Fishery Commission (GLFC). The objectives of the study are to 1) determine the proportion of Walleye spawning in the Tittabawassee River or in the Maumee River that reside in the Lake Huron main basin population, move into and through the Huron-Erie-Corridor, and reside in Lake Erie, 2) identify the environmental characteristics associated with the timing and extent of Walleye movement from riverine spawning grounds into Lake Huron and back again, 3) determine whether Walleye demonstrate spawning site fidelity, and 4) compare unbiased estimates of mortality parameters of Walleyes from Saginaw Bay and the Maumee River.

A similar spatial ecology study was initiated during the spring of 2013. One hundred sixty-five Walleye (n = 100 male and 65 female) were collected with gill nets during the spawning period on (males) or in proximity (females) to Toussaint Reef. An additional 108 Walleye (n = 75 male and 33 female) were tagged in 2014, and another 120 fish (n = 62 male and 58 female) in

2016. Further, 104 Walleye have been tagged in the Detroit River during 2014–2016. Each fish was implanted with an acoustic transmitter and had an external reward tag ($100) attached. Captured fish should be reported to the phone number listed on the tags, via the internet by logging onto https://glatos.glos.us/, or by contacting one of the LEC agencies.
The objectives of this study are to: 1) determine the proportion of Walleye originating from two western basin spawning stocks (i.e., Toussaint Reef and Maumee River) that migrate out of the western basin of Lake Erie after spawning, 2) compare spawning site fidelity rates between these two spawning stocks, 3) determine if female Walleye from these spawning stocks are annual spawners, and 4) compare total mortality rates (i.e., fishing and natural) for these spawning stocks. This study was funded by the GLFC, ODNR, and OMNRF, and is a collaborative effort of the LEC agencies, the USGS and Carleton University.

An additional study focused on the effects of a dam removal in the Sandusky River began in 2014. Walleye (n = 101; 48 males and 53 females) were collected via electrofishing during the spawning period and tagged. Tagging continued in 2015, with an additional 101 (n = 45 males and 56 females) fish tagged. The objectives of this study are to: 1) determine if Sandusky River Walleye move upstream of the Ballville Dam once it is removed and hydrologic connectivity is reestablished, 2) determine the spatial distribution of Walleye spawning activity in the Sandusky River following dam removal, and 3) to compare survival rates of Sandusky River Walleye to other discrete Walleye spawning stocks in Lake Erie.

In 2015 a cooperative eastern basin Walleye acoustic telemetry study was initiated involving the NYDEC, ODNR, OMNRF, GLFC, and Michigan State University. In 2015 acoustic transmitters and external reward tags were applied to 70 spawning Walleye (35 males and 35 females) from the Van Buren Bay stock, and 70 Walleye (35 males and 35 females) from the Grand River, Ontario stock. In 2016 acoustic transmitters and external reward tags were applied to 36 spawning Walleye (all males) from the Smokes Creek stock, 70 spawning Walleye (35 males and 35 females) from the Grand River stock, and 52 Walleye from the south shore “mixed fishery”. In 2017 acoustic transmitters and external reward tags were applied to an additional 29 Walleye from the Van Buren Bay Stock (26 males and 3 females), and additional 24 Walleye from the Smokes Creek stock (all males), 70 Walleye from the Shorehaven Stock (69 males and 1 female), and 13 Walleye from the Cattaraugus Creek stock (all males).

A subcomponent of the eastern basin study, begun in 2015 and continued in 2016, asks questions about access to spawning habitat and behavior in relation to a low-head dam on the Grand River, Ontario at Dunnville, 8km upstream from the lake. The eastern basin acoustic receiver network was extended 34km upstream in order to monitor tagged Walleye placed above the barrier (35 of the 70 noted in each of 2015 and 2016). Subcomponent objectives include 1) determining the extent to which previously mapped habitat (above and below) is utilized during spawning and 2) determining the timing of movement between river and lake relative to environmental variables (temperature and hydrology) particularly if differences in behaviour exist between above- and below-dam individuals. Information gained about the timing of migration will also be used to assess current sport fish regulations meant to protect the stock during spawning. Whereas the Sandusky River study will monitor behavior following a dam removal, results from this study will inform decisions around whether to remove the first upstream barrier on the Grand River.

In 2017, a cooperative study was initiated involving the NYDEC, ODNR, OMNRF, USGS, MSU, and OSU that was designed to use acoustic telemetry to understand stock contributions to Lake Erie's Walleye fisheries. Nearly 200 Walleye were tagged during May – July from western and central basin sport and commercial fisheries, and spawning habitat will be monitored to estimate where tagged fish spawning during 2018-2020. Additional tags will be released during 2018 and 2019.

Results from these telemetry studies will be forthcoming during the coming years.

Acknowledgments

The WTG would like to express its appreciation for support during the past year from the Great Lakes Fishery Commission, which continued to disperse reward tag payments, and to the Quantitative Fisheries Center at Michigan State University, particularly Lisa Peterson and Travis Brenden, for assistance in exploring options to incorporate the new Ohio monofilament gill net data set into the SCAA model. The WTG greatly appreciates the efforts of Andrew Bade, Zoe Almeida, and David Dippold from The Ohio State University, and Matt Vincent from Michigan State University, to attend and present the results of their Lake Erie Walleye research at the 2018 WTG annual meeting. The WTG would also like to thank all of the stakeholders for their continued participation and contributions in the LEPMAG process, and the staff of the ODNR Old Woman Creek National Estuarine Research Reserve for providing accommodations for the 2018 WTG annual meeting.

Literature Cited

Fournier, D.A., H.J. Skaug, J. Ancheta, J. Ianelli, A. Magnusson, M.N. Maunder, A. Nielsen, and J. Sibert. 2012. AD Model Builder: using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optim. Methods Softw. 27:233-249.

Kayle, K., Oldenburg, K., Murray, C., Francis, J., & Markham, J. 2015. Lake Erie Walleye Management Plan 2015-2019. Lake Erie Committee, Great Lakes Fishery Commission. 42 pp.

Kraus, R.T., Vandergoot, C.S., Kocovshy, P.M., Roger, M.W., Cook, H.H., and Brenden, T.O. 2017. Reconciling catch differences from multiple fishery independent gill net surveys. Fisheries Research. 188:17-22

Vandergoot, C.S., Kocovsky, P.M., T.O. Brenden, and W. Liu. 2011. Selectivity evaluation for two experimental gill-net configuration used to sample Lake Erie Walleyes. North American Journal of Fisheries Management 31:832-842.

Walleye Task Group (WTG). 2003. Report of the Lake Erie Walleye Task Group to the Standing Technical Committee, Lake Erie Committee of the Great Lakes Fishery Commission. 26 pp.

Walleye Task Group (WTG). 2012. Report of the Lake Erie Walleye Task Group to the Standing Technical Committee, Lake Erie Committee of the Great Lakes Fishery Commission. 28 pp.

Walleye Task Group (WTG). 2016. Report of the Lake Erie Walleye Task Group to the Standing Technical Committee, Lake Erie Committee of the Great Lakes Fishery Commission. 26 pp.

Walleye Task Group (WTG). 2017. Report of the Lake Erie Walleye Task Group to the Standing Technical Committee, Lake Erie Committee of the Great Lakes Fishery Commission. 26 pp.

Zhao, Y., D.W. Einhouse, and T.M. MacDougall. 2011. Resolving some of the complexity of a mixed-origin Walleye population in the East Basin of Lake Erie using a mark–recapture study. North American Journal of Fisheries Management 31: 379-389.

Table 1. Annual Lake Erie walleye total allowable catch (TAC, top) and measured harvest (Har; bottom, bold), in numbers of fish from 1983 to 2017. TAC allocations for 2017 on are based on water area: Ohio, 51.11%; Ontario, 43.06%; and Michigan, 5.83%. 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
1983	TAC	572,000	3,406,000	2,522,000	6,500,000				0	6,500,000
	Har	**145,847**	**1,864,200**	**1,416,101**	**3,426,148**				**0**	**3,426,148**
1984	TAC	676,500	4,028,400	2,982,900	7,687,800				0	7,687,800
	Har	**351,169**	**4,055,000**	**2,178,409**	**6,584,578**				**0**	**6,584,578**
1985	TAC	430,700	2,564,400	1,898,800	4,893,900				0	4,893,900
	Har	**460,933**	**3,730,100**	**2,435,627**	**6,626,660**				**0**	**6,626,660**
1986	TAC	660,000	3,930,000	2,910,000	7,500,000				0	7,500,000
	Har	**605,600**	**4,399,400**	**2,617,507**	**7,622,507**				**0**	**7,622,507**
1987	TAC	490,100	2,918,500	2,161,100	5,569,700				0	5,569,700
	Har	**902,500**	**4,433,600**	**2,688,558**	**8,024,658**				**0**	**8,024,658**
1988	TAC	397,500	3,855,000	3,247,500	7,500,000				0	7,500,000
	Har	**1,996,788**	**4,890,367**	**3,054,402**	**9,941,557**	**85,282**			**85,282**	**10,026,839**
1989	TAC	383,000	3,710,000	3,125,000	7,218,000				0	7,218,000
	Har	**1,091,641**	**4,191,711**	**2,793,051**	**8,076,403**	**129,226**			**129,226**	**8,205,629**
1990	TAC	616,000	3,475,500	2,908,500	7,000,000				0	7,000,000
	Har	**747,128**	**2,282,520**	**2,517,922**	**5,547,570**	**47,443**			**47,443**	**5,595,013**
1991	TAC	440,000	2,485,000	2,075,000	5,000,000				0	5,000,000
	Har	**132,118**	**1,577,813**	**2,266,380**	**3,976,311**	**34,137**			**34,137**	**4,010,448**
1992	TAC	329,000	3,187,000	2,685,000	6,201,000				0	6,201,000
	Har	**249,518**	**2,081,919**	**2,497,705**	**4,829,142**	**14,384**			**14,384**	**4,843,526**
1993	TAC	556,500	5,397,000	4,546,500	10,500,000				0	10,500,000
	Har	**270,376**	**2,668,684**	**3,821,386**	**6,760,446**	**40,032**			**40,032**	**6,800,478**
1994	TAC	400,000	4,100,000	3,500,000	8,000,000				0	8,000,000
	Har	**216,038**	**1,468,739**	**3,431,119**	**5,115,896**	**59,345**			**59,345**	**5,175,241**
1995	TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
	Har	**107,909**	**1,435,188**	**3,813,527**	**5,356,624**	**26,964**			**26,964**	**5,383,588**
1996	TAC	583,000	5,654,000	4,763,000	11,000,000				0	11,000,000
	Har	**174,607**	**2,316,425**	**4,524,639**	**7,015,671**	**38,728**	**89,087**		**127,815**	**7,143,486**
1997	TAC	514,000	4,986,000	4,200,000	9,700,000				0	9,700,000
	Har	**122,400**	**1,248,846**	**4,072,779**	**5,444,025**	**29,395**	**88,682**		**118,077**	**5,562,102**
1998	TAC	546,000	5,294,000	4,460,000	10,300,000				0	10,300,000
	Har	**114,606**	**2,303,911**	**4,173,042**	**6,591,559**	**34,090**	**124,814**	**47,000**	**205,904**	**6,797,463**
1999	TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
	Har	**140,269**	**1,033,733**	**3,454,250**	**4,628,252**	**23,133**	**89,038**	**87,000**	**199,171**	**4,827,423**
2000	TAC	408,100	3,957,800	3,334,100	7,700,000				0	7,700,000
	Har	**252,280**	**932,297**	**2,287,533**	**3,472,110**	**28,599**	**77,512**	**67,000**	**173,111**	**3,645,221**
2001	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**159,186**	**1,157,914**	**1,498,816**	**2,815,916**	**14,669**	**52,796**	**39,498**	**106,963**	**2,922,879**
2002	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**193,515**	**703,000**	**1,436,000**	**2,332,515**	**18,377**	**22,000**	**36,000**	**76,377**	**2,408,892**
2003	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**128,852**	**1,014,688**	**1,457,014**	**2,600,554**	**27,480**	**43,581**	**32,692**	**103,753**	**2,704,307**
2004	TAC	127,200	1,233,600	1,039,200	2,400,000				0	2,400,000
	Har	**114,958**	**859,366**	**1,419,237**	**2,393,561**	**8,400**	**19,969**	**29,864**	**58,233**	**2,451,794**
2005	TAC	308,195	2,988,910	2,517,895	5,815,000				0	5,815,000
	Har	**37,599**	**610,449**	**2,933,393**	**3,581,441**	**27,370**	**20,316**	**17,394**	**65,080**	**3,646,521**
2006	TAC	523,958	5,081,404	4,280,638	9,886,000				0	9,886,000
	Har	**305,548**	**1,868,520**	**3,494,551**	**5,668,619**	**37,161**	**151,614**	**68,774**	**257,549**	**5,926,168**
2007	TAC	284,080	2,755,040	2,320,880	5,360,000				0	5,360,000
	Har	**165,551**	**2,160,459**	**2,159,965**	**4,485,975**	**29,134**	**116,671**	**37,566**	**183,371**	**4,669,346**
2008	TAC	209,530	1,836,893	1,547,576	3,594,000				0	3,594,000
	Har	**121,072**	**1,082,636**	**1,574,723**	**2,778,431**	**29,017**	**74,250**	**34,906**	**138,173**	**2,916,604**
2009	TAC	142,835	1,252,195	1,054,970	2,450,000				0	2,450,000
	Har	**94,048**	**967,476**	**1,095,500**	**2,157,024**	**13,727**	**42,422**	**27,725**	**83,874**	**2,240,898**
2010	TAC	128,260	1,124,420	947,320	2,200,000				0	2,200,000
	Har	**55,248**	**958,366**	**983,397**	**1,997,011**	**34,552**	**54,056**	**23,324**	**111,932**	**2,108,943**
2011	TAC	170,178	1,491,901	1,256,921	2,919,000				0	2,919,000
	Har	**50,490**	**417,314**	**1,224,057**	**1,691,861**	**31,506**	**45,369**	**28,873**	**105,748**	**1,797,609**
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**	**28,260**	**110,031**	**2,473,601**
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**	**30,591**	**125,476**	**2,537,983**
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**

[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. Means contain data from 1975 to 2016.

	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
1983	1,626	146	41	1,813	212	--	212	26	--	26	--	--	--	0	2,051	1,129	167	80	--	1,376	3,427
1984	3,089	351	39	3,479	787	--	787	179	--	179	--	--	--	0	4,445	1,639	392	108	--	2,139	6,584
1985	3,347	461	57	3,865	294	--	294	89	--	89	--	--	--	0	4,248	1,721	432	225	--	2,378	6,627
1986	3,743	606	52	4,401	480	--	480	176	--	176	--	--	--	0	5,057	1,651	558	356	--	2,565	7,622
1987	3,751	902	51	4,704	550	--	550	132	--	132	--	--	--	0	5,386	1,611	622	405	--	2,638	8,024
1988	3,744	1,997	18	5,759	584	--	584	562	--	562	--	--	85	85	6,990	1,866	762	409	--	3,037	10,026
1989	2,891	1,092	14	3,997	867	35	902	434	80	514	--	--	129	129	5,542	1,656	621	386	--	2,663	8,206
1990	1,467	747	35	2,249	389	14	403	426	23	449	--	--	47	47	3,148	1,615	529	302	--	2,446	5,595
1991	1,104	132	39	1,275	216	24	240	258	44	302	--	--	34	34	1,851	1,446	440	274	--	2,160	4,011
1992	1,479	250	20	1,749	338	56	394	265	25	290	--	--	14	14	2,447	1,547	534	316	--	2,397	4,844
1993	1,846	270	37	2,153	450	26	476	372	12	384	--	--	40	40	3,053	2,488	762	496	--	3,746	6,800
1994	992	216	21	1,229	291	20	311	186	21	207	--	--	59	59	1,806	2,307	630	432	--	3,369	5,176
1995	1,161	108	32	1,301	159	7	166	115	27	141	--	--	27	27	1,635	2,578	681	489	--	3,748	5,384
1996	1,442	175	17	1,634	645	8	653	229	27	256	--	89	39	128	2,671	2,777	1,107	589	--	4,473	7,143
1997	929	122	8	1,059	188	2	190	132	5	138	--	89	29	118	1,505	2,585	928	544	--	4,057	5,563
1998	1,790	115	34	1,939	215	5	220	299	5	304	19	125	34	178	2,641	2,497	1,166	462	28	4,153	6,793
1999	812	140	34	986	139	5	144	83	5	88	19	89	23	131	1,349	2,461	631	317	68	3,477	4,827
2000	674	252	34	961	165	5	170	93	5	98	19	78	29	125	1,354	1,603	444	196	48	2,291	3,645
2001	941	160	34	1,135	171	5	176	46	5	51	19	53	15	87	1,449	1,004	310	141	20	1,475	2,924
2002	516	194	34	744	141	5	146	46	5	51	19	22	18	59	1,000	937	309	146	17	1,409	2,409
2003	715	129	34	878	232	5	237	68	5	73	2	44	27	73	1,261	948	283	182	14	1,427	2,688
2004	515	115	34	664	272	2	274	72	0	72	2	20	8	30	1,040	866	334	175	11	1,386	2,426
2005	374	38	27	438	110	2	112	126	0	126	2	20	27	49	725	1,878	625	401	15	2,920	3,645
2006	1,194	306	27	1,526	503	2	505	170	0	170	2	152	37	191	2,392	2,137	784	545	66	3,532	5,924
2007	1,414	166	27	1,607	578	2	580	169	0	169	2	116	29	147	2,502	1,348	450	333	35	2,167	4,669
2008	524	121	44	689	333	2	335	225	0	225	2	74	29	105	1,354	954	335	241	35	1,565	2,919
2009	553	94	44	691	287	2	288	128	0	128	2	42	14	58	1,166	705	212	135	28	1,079	2,244
2010	587	55	44	686	257	2	259	114	0	115	2	54	37	93	1,152	607	184	147	23	962	2,115
2011	224	50	44	318	104	2	106	89	0	90	2	45	32	79	593	736	262	181	29	1,208	1,801
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
Mean	1,489	254	40	1,784	267	10	273	165	12	174	8	66	38	63	2,274	1,354	434	287	38	2,008	4,281

[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. Means contain data from 1975 to 2016.

	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]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1983	4,168	451	118	4,737	568	--	568	128	--	128	--	--	--	0	5,433	11,205	5,352	5,814	--	22,371
1984	4,077	557	82	4,716	1,322	--	1,322	392	--	392	--	--	--	0	6,430	11,550	6,008	2,438	--	19,996
1985	4,606	926	84	5,616	1,078	--	1,078	464	--	464	--	--	--	0	7,158	7,496	2,800	2,983	--	13,279
1986	6,437	1,840	107	8,384	1,086	--	1,086	538	--	538	--	--	--	0	10,008	7,824	5,637	3,804	--	17,265
1987	6,631	2,193	84	8,908	1,431	--	1,431	472	--	472	--	--	--	0	10,811	6,595	4,243	3,045	--	13,883
1988	7,547	4,362	87	11,996	1,677	--	1,677	1,081	--	1,081	--	--	462	462	15,216	7,495	5,794	3,778	--	17,067
1989	5,246	3,794	81	9,121	1,532	77	1,609	883	205	1,088	--	--	556	556	12,374	7,846	5,514	3,473	--	16,833
1990	4,116	1,803	121	6,040	1,675	33	1,708	869	83	952	--	--	432	432	9,132	9,016	5,829	5,544	--	20,389
1991	3,555	440	144	4,200	1,220	79	1,320	715	155	880	--	--	440	440	6,840	10,418	5,055	3,146	--	18,619
1992	3,955	715	105	4,775	1,169	81	1,249	640	145	786	--	--	299	299	7,109	9,486	6,906	6,043	--	22,435
1993	3,943	691	125	4,759	1,349	70	1,418	1,062	125	1,187	--	--	305	305	7,669	16,283	11,656	7,420	--	35,359
1994	2,808	788	125	3,721	1,025	65	1,090	599	130	729	--	--	355	355	5,894	16,698	9,968	6,459	--	33,125
1995	3,188	277	125	3,589	803	65	868	355	130	485	--	--	259	259	5,201	20,521	12,113	7,850	--	40,484
1996	3,060	521	125	3,706	1,132	65	1,197	495	130	625	--	316	256	572	6,100	19,976	15,685	10,990	--	46,651
1997	2,748	374	88	3,210	864	45	909	492	91	583	--	388	273	661	5,363	15,708	11,588	9,094	--	36,390
1998	3,010	374	103	3,487	635	51	686	409	55	409	217	390	280	670	5,252	19,027	19,397	13,253	818	52,495
1999	2,368	411	--	2,779	603	--	603	323	--	323	--	397	171	568	4,273	21,432	10,955	7,630	1,444	41,461
2000	1,975	540	--	2,516	540	--	540	281	--	281	--	244	177	421	3,757	22,238	11,049	7,896	1,781	43,054
2001	1,952	362	--	2,314	697	--	697	261	--	261	--	241	163	404	3,676	9,372	5,746	5,021	639	20,778
2002	1,393	606	--	1,999	444	--	444	246	--	246	--	130	132	262	2,951	4,431	4,212	4,427	445	13,515
2003	1,719	326	--	2,045	675	--	675	236	--	236	30	159	162	321	3,277	4,476	3,946	3,725	365	12,512
2004	1,257	504	--	1,761	736	27	736	178	7	178	--	88	101	189	2,864	3,875	2,977	2,401	240	9,493
2005	1,180	212	40	1,392	573	--	573	261	--	261	--	109	142	251	2,477	7,083	4,174	4,503	174	15,934
2006	1,757	587	--	2,344	899	--	899	260	--	260	--	239	137	376	3,879	5,689	4,008	3,589	822	14,107
2007	2,076	448	--	2,524	1,147	--	1,147	321	--	321	--	232	135	367	4,358	4,509	2,927	2,665	383	10,484
2008	1,027	392	63	1,419	809	--	809	356	--	356	--	187	156	343	2,927	4,990	3,193	1,909	497	10,590
2009	1,063	310	--	1,373	777	--	777	289	--	289	--	124	100	224	2,663	3,537	2,164	1,746	478	7,925
2010	1,403	226	--	1,629	652	--	652	219	--	219	--	188	140	328	2,828	1,918	1,371	1,401	247	4,937
2011	862	165	--	1,026	346	--	346	217	--	217	--	156	145	301	1,891	2,646	1,884	1,572	489	6,591
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
Mean	2,944	676	102.4	3,682	748	61.9	763	414	111	447	106	208	231	264	5,103	8,876	5,577	4,518	630	18,714

[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 harvest per unit effort (HPE) for Lake Erie walleye by gear, management unit, and agency. Means contain data from 1975 to 2016.

	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]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1983	0.39	0.32	0.34	0.38	0.37	--	0.37	0.20	--	0.20	--	--	--		0.38	100.7	31.2	13.7		61.5
1984	0.76	0.63	0.48	0.74	0.60	--	0.60	0.46	--	0.46	--	--	--		0.69	141.9	65.3	44.4		107.0
1985	0.73	0.50	0.68	0.69	0.27	--	0.27	0.19	--	0.19	--	--	--		0.59	229.6	154.5	75.6		179.1
1986	0.58	0.33	0.49	0.52	0.44	--	0.44	0.33	--	0.33	--	--	--		0.51	211.0	99.0	93.7		148.6
1987	0.57	0.41	0.61	0.53	0.38	--	0.38	0.28	--	0.28	--	--	--		0.50	244.2	146.5	133.1		190.0
1988	0.50	0.46	0.21	0.48	0.35	--	0.35	0.52	--	0.52	--	--	0.18	0.18	0.46	249.0	131.4	108.2		177.9
1989	0.55	0.29	0.17	0.44	0.57	0.45	0.56	0.49	0.39	0.47	--	--	0.23	0.23	0.45	211.1	112.7	111.2		158.3
1990	0.36	0.41	0.29	0.37	0.23	0.42	0.24	0.49	0.28	0.47	--	--	0.11	0.11	0.34	179.1	90.7	54.5		120.0
1991	0.31	0.30	0.27	0.30	0.18	0.30	0.18	0.36	0.28	0.34	--	--	0.08	0.08	0.27	138.8	87.0	87.1		116.0
1992	0.37	0.35	0.19	0.37	0.29	0.69	0.32	0.41	0.18	0.37	--	--	0.05	0.05	0.34	163.1	77.3	52.3		106.8
1993	0.47	0.39	0.30	0.45	0.33	0.37	0.34	0.35	0.09	0.32	--	--	0.13	0.13	0.40	152.8	65.4	66.8		106.0
1994	0.35	0.27	0.17	0.33	0.28	0.31	0.28	0.31	0.16	0.28	--	--	0.17	0.17	0.31	138.2	63.2	66.9		101.7
1995	0.36	0.39	0.25	0.36	0.20	0.12	0.19	0.32	0.21	0.29	--	--	0.10	0.10	0.31	125.7	56.2	62.2		92.6
1996	0.47	0.34	0.13	0.44	0.57	0.13	0.55	0.46	0.21	0.41	--	0.28	0.15	0.22	0.44	139.0	70.6	53.6		95.9
1997	0.34	0.33	0.10	0.33	0.22	0.04	0.21	0.27	0.06	0.24	--	0.23	0.11	0.17	0.28	164.6	80.1	59.8		111.5
1998	0.59	0.31	0.33	0.56	0.34	0.10	0.32	0.73	0.08	0.65	0.09	0.32	0.12	0.18	0.48	131.3	60.1	34.8	34.2	79.1
1999	0.34	0.34	--	0.34	0.23	--	0.23	0.26	--	0.26	--	0.22	0.14	0.22	0.30	114.8	57.6	41.6	47.4	83.9
2000	0.34	0.47	--	0.37	0.31	--	0.31	0.33	--	0.33	--	0.32	0.16	0.32	0.34	72.1	40.2	24.8	27.1	53.2
2001	0.48	0.44	--	0.48	0.25	--	0.25	0.18	--	0.18	--	0.22	0.09	0.22	0.38	107.1	54.0	28.1	32.1	71.0
2002	0.37	0.32	--	0.36	0.32	--	0.32	0.19	--	0.19	--	0.17	0.14	0.17	0.32	211.5	73.4	33.0	37.4	104.3
2003	0.42	0.40	--	0.41	0.34	--	0.34	0.29	--	0.29	0.07	0.28	0.17	0.21	0.37	211.8	71.7	48.9	38.4	114.1
2004	0.41	0.23	--	0.36	0.37	0.06	0.36	0.40	--	0.40	--	0.23	0.08	0.15	0.35	223.5	112.2	73.0	45.3	146.0
2005	0.32	0.18	0.67	0.31	0.19	--	0.19	0.48	--	0.48	--	0.18	0.19	0.19	0.28	265.2	149.8	89.1	86.4	183.2
2006	0.68	0.52	--	0.64	0.56	--	0.56	0.65	--	0.65	--	0.63	0.27	0.50	0.61	375.7	195.6	151.9	80.8	250.4
2007	0.68	0.37	--	0.63	0.50	--	0.50	0.53	--	0.53	--	0.50	0.21	0.40	0.57	298.9	153.8	124.9	91.4	206.7
2008	0.51	0.31	--	0.45	0.41	--	0.41	0.63	--	0.63	--	0.40	0.19	0.30	0.45	191.2	104.9	126.2	70.4	147.8
2009	0.52	0.30	--	0.47	0.37	--	0.37	0.44	--	0.44	--	0.34	0.14	0.25	0.42	199.2	97.9	77.1	58.0	136.1
2010	0.42	0.24	--	0.39	0.39	--	0.39	0.52	--	0.52	--	0.29	0.26	0.28	0.39	316.7	134.5	105.0	94.5	194.9
2011	0.26	0.31	--	0.27	0.30	--	0.30	0.41	--	0.41	--	0.29	0.22	0.26	0.29	278.3	138.9	115.0	59.0	183.3
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
Mean	0.48	0.36	0.4	0.46	0.33	0.2623	0.33	0.38	0.19	0.37	0.11	0.31	0.17	0.23	0.43	170.0	86.1	70.6	68.8	120.0

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

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

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

[d] Ontario sport fishing HPE 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 2017. 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	34,576	0	314			314	34,890
	2	874,720	87,241	6,049			93,290	968,010
	3	591,023	302,276	26,739			329,015	920,038
	4	103,187	59,254	7,335			66,589	169,776
	5	28,223	22,525	2,570			25,095	53,318
	6	36,368	28,249	5,682			33,931	70,299
	7+	66,802	92,113	8,250			100,363	167,165
	Total	1,734,899	591,658	56,938	--	--	648,596	2,383,495
2	1	9,930	0				0	9,930
	2	583,020	72,268				72,268	655,288
	3	257,516	185,485				185,485	443,001
	4	27,396	25,721				25,721	53,117
	5	7,619	6,394				6,394	14,013
	6	9,302	5,763				5,763	15,065
	7+	23,684	20,860				20,860	44,544
	Total	918,467	316,491	--	--	--	316,491	1,234,958
3	1	2,276	0				0	2,276
	2	320,908	116,457				116,457	437,365
	3	124,975	167,812				167,812	292,787
	4	18,206	20,082				20,082	38,288
	5	9,832	6,414				6,414	16,246
	6	7,807	9,137				9,137	16,944
	7+	23,670	33,272				33,272	56,942
	Total	507,674	353,174	--	--	--	353,174	860,848
4	1	5,243			0	0	0	5,243
	2	34,573			13,546	59,965	73,511	108,084
	3	14,016			18,708	59,965	78,673	92,689
	4	2,752			1,547	8,256	9,803	12,555
	5	6,941			16,537	4,780	21,317	28,258
	6	2,223			315	2,607	2,922	5,145
	7+	50,610			19,358	27,375	46,733	97,343
	Total	116,358	--	--	70,011	162,949	232,960	349,318
All	1	52,025	0	314	0	0	314	52,339
	2	1,813,221	275,966	6,049	13,546	59,965	355,526	2,168,747
	3	987,530	655,573	26,739	18,708	59,965	760,985	1,748,515
	4	151,541	105,057	7,335	1,547	8,256	122,195	273,736
	5	52,615	35,333	2,570	16,537	4,780	59,220	111,835
	6	55,700	43,149	5,682	315	2,607	51,753	107,453
	7+	164,766	146,245	8,250	19,358	27,375	201,229	365,995
	Total	3,277,398	1,261,323	56,938	70,011	162,949	1,551,221	4,828,619

Table 6. Age composition (in percent) of walleye harvest by management unit, gear, and agency in Lake Erie during 2017. 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	2.0	0.0	0.6	--	--	0.0	1.5
	2	50.4	14.7	10.6	--	--	14.4	40.6
	3	34.1	51.1	47.0	--	--	50.7	38.6
	4	5.9	10.0	12.9	--	--	10.3	7.1
	5	1.6	3.8	4.5	--	--	3.9	2.2
	6	2.1	4.8	10.0	--	--	5.2	2.9
	7+	3.9	15.6	14.5	--	--	15.5	7.0
	Total	100.0	100.0	100.0	--	--	100.0	100.0
2	1	1.1	0.0	--	--	--	0.0	0.8
	2	63.5	22.8	--	--	--	22.8	53.1
	3	28.0	58.6	--	--	--	58.6	35.9
	4	3.0	8.1	--	--	--	8.1	4.3
	5	0.8	2.0	--	--	--	2.0	1.1
	6	1.0	1.8	--	--	--	1.8	1.2
	7+	2.6	6.6	--	--	--	6.6	3.6
	Total	100.0	100.0	--	--	--	100.0	100.0
3	1	0.4	0.0	--	--	--	0.0	0.3
	2	63.2	33.0	--	--	--	33.0	50.8
	3	24.6	47.5	--	--	--	47.5	34.0
	4	3.6	5.7	--	--	--	5.7	4.4
	5	1.9	1.8	--	--	--	1.8	1.9
	6	1.5	2.6	--	--	--	2.6	2.0
	7+	4.7	9.4	--	--	--	9.4	6.6
	Total	100.0	100.0	--	--	--	100.0	100.0
4	1	4.5	--	--	0.0	0.0	0.0	1.5
	2	29.7	--	--	19.3	36.8	31.6	30.9
	3	12.0	--	--	26.7	36.8	33.8	26.5
	4	2.4	--	--	2.2	5.1	4.2	3.6
	5	6.0	--	--	23.6	2.9	9.2	8.1
	6	1.9	--	--	0.4	1.6	1.3	1.5
	7+	43.5	--	--	27.6	16.8	20.1	27.9
	Total	100.0	--	--	100.0	100.0	100.0	100.0
All	1	1.6	0.0	0.6	0.0	0.0	0.0	1.1
	2	55.3	21.9	10.6	19.3	36.8	22.9	44.9
	3	30.1	52.0	47.0	26.7	36.8	49.1	36.2
	4	4.6	8.3	12.9	2.2	5.1	7.9	5.7
	5	1.6	2.8	4.5	23.6	2.9	3.8	2.3
	6	1.7	3.4	10.0	0.4	1.6	3.3	2.2
	7+	5.0	11.6	14.5	27.6	16.8	13.0	7.6
	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. Means include data from 1975 to 2016.

	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
1983	3.03	3.03	3.17	3.03	2.25	--	2.25	2.07	--	2.07	--	--	--	--	2.94	3.47	3.47	3.47	--	3.47	3.15
1984	2.64	2.64	2.90	2.64	2.61	--	2.61	2.68	--	2.68	--	--	--	--	2.64	2.89	2.89	2.89	--	2.89	2.72
1985	3.36	3.36	3.17	3.36	3.24	--	3.24	3.58	--	3.58	--	--	--	--	3.35	3.04	3.04	3.04	--	3.04	3.24
1986	3.73	3.61	3.54	3.71	3.69	--	3.69	4.08	--	4.08	--	--	--	--	3.72	3.61	3.70	4.22	--	3.71	3.72
1987	3.83	3.32	3.78	3.73	3.68	--	3.68	4.10	--	4.10	--	--	--	--	3.73	3.71	3.47	3.40	--	3.61	3.69
1988	3.97	3.43	4.58	3.78	3.81	--	3.81	5.37	--	5.37	--	--	4.87	4.87	3.93	3.27	3.15	3.89	--	3.32	3.74
1989	4.48	3.75	4.29	4.28	4.65	4.29	4.64	5.13	4.29	5.00	--	--	5.59	5.59	4.44	3.49	3.51	4.22	--	3.60	4.16
1990	4.44	4.64	5.00	4.52	5.31	5.41	5.31	6.41	5.41	6.36	--	--	5.70	5.70	4.90	3.91	3.90	4.60	--	3.99	4.49
1991	4.91	5.29	5.01	4.95	6.22	6.03	6.20	6.70	5.91	6.58	--	--	6.36	6.36	5.41	4.21	4.63	5.14	--	4.41	4.85
1992	4.60	3.49	3.45	4.43	4.89	6.72	5.15	5.67	6.42	5.73	--	--	6.35	6.35	4.71	4.03	4.23	5.49	--	4.27	4.46
1993	4.60	4.41	4.09	4.57	5.79	6.45	5.83	5.98	6.17	5.99	--	--	6.15	6.15	4.96	3.64	4.38	5.21	--	4.00	4.42
1994	4.53	4.19	5.84	4.49	5.38	6.41	5.45	6.22	6.85	6.28	--	--	6.49	6.49	4.93	3.65	4.36	5.60	--	4.03	4.32
1995	4.04	3.55	4.74	4.02	6.07	7.29	6.12	6.08	7.17	6.33	--	--	6.80	6.80	4.48	3.38	4.63	5.92	--	3.94	4.08
1996	3.98	3.46	4.31	3.93	4.22	7.22	4.26	6.06	7.57	6.22	--	--	6.47	6.47	4.35	3.57	3.36	5.21	--	3.73	3.91
1997	4.21	3.99	4.21	4.18	5.30	5.30	5.30	6.27	6.27	6.22	--	--	6.25	6.25	4.67	3.87	3.68	4.83	--	3.96	4.11
1998	3.74	3.13	3.15	3.69	4.66	8.09	4.74	4.64	7.81	4.69	9.55	--	10.13	9.92	4.32	3.26	4.00	5.26	7.00	3.72	3.82
1999	3.72	3.16	3.43	3.63	5.35	9.17	5.48	5.95	10.00	6.18	8.15	--	10.29	9.32	4.55	3.41	4.29	5.28	6.76	3.81	3.89
2000	3.94	3.27	--	3.76	4.12	--	4.12	6.36	--	6.36	--	--	9.75	9.75	4.55	3.69	4.67	5.65	6.46	4.11	4.12
2001	3.66	3.02	--	3.57	4.09	--	4.09	6.14	--	6.14	--	7.70	9.09	8.01	3.99	3.19	3.77	5.52	6.00	3.57	3.75
2002	3.80	3.83	--	3.81	4.57	--	4.57	5.46	--	5.46	--	6.59	8.05	7.25	4.21	3.22	3.50	5.37	5.80	3.54	3.78
2003	4.67	4.16	--	4.59	4.67	--	4.67	5.87	--	5.87	6.50	7.50	10.01	8.40	4.90	3.68	4.36	5.58	6.59	4.09	4.46
2004	4.77	4.41	--	4.70	5.11	6.56	5.12	6.42	--	6.42	--	5.86	11.11	7.41	5.01	2.96	2.59	3.49	6.07	2.96	3.82
2005	5.33	4.26	3.35	5.12	4.21	--	4.21	5.53	--	5.53	--	6.61	6.72	6.68	5.15	3.61	3.16	4.64	4.70	3.66	3.96
2006	3.86	3.24	--	3.73	3.68	--	3.68	4.57	--	4.57	--	4.10	6.38	4.55	3.85	3.19	3.19	3.44	4.82	3.26	3.50
2007	4.64	4.42	--	4.62	4.79	--	4.79	4.89	--	4.89	--	4.89	6.80	5.27	4.71	4.20	4.29	4.25	6.55	4.26	4.50
2008	5.42	5.60	--	5.46	5.90	--	5.90	5.21	--	5.21	--	5.67	7.21	6.10	5.57	5.21	5.38	5.06	8.28	5.29	5.42
2009	5.39	4.78	--	5.30	6.14	--	6.14	6.43	--	6.43	--	6.47	6.84	6.56	5.70	4.67	5.17	5.40	7.45	4.93	5.33
2010	5.72	5.38	--	5.69	6.37	--	6.37	7.30	--	7.30	--	7.16	7.16	7.16	6.12	4.11	4.82	6.14	7.79	4.64	5.44
2011	5.98	4.35	--	5.68	7.79	--	7.79	8.03	--	8.03	--	8.40	7.76	8.13	6.74	4.86	5.26	6.73	8.33	5.31	5.78
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
Mean	4.21	3.87	3.66	4.15	4.54	6.58	4.55	5.60	6.72	5.61	8.07	6.99	7.53	7.12	4.46	3.62	3.89	5.02	6.96	3.87	4.11

Table 8. Estimated abundance at age, survival (S), fishing mortality (F) and exploitation (u) for Lake Erie walleye, 1984-2018 (from ADMB 2018 catch at age analysis recruitment integrated model, M=0.32).

	Age							Ages 2+		
Year	2	3	4	5	6	7+	Total	S	F	u
1984	81,219,900	7,089,220	7,082,830	1,629,940	1,298,060	1,291,020	99,610,970	0.668	0.084	0.069
1985	6,882,290	54,961,800	4,465,240	4,438,920	1,026,930	1,613,280	73,388,460	0.654	0.104	0.085
1986	24,450,400	4,732,520	35,806,700	2,894,370	2,886,510	1,697,090	72,467,590	0.639	0.127	0.103
1987	24,431,400	16,464,200	2,957,940	22,242,100	1,813,790	2,849,220	70,758,650	0.644	0.120	0.097
1988	57,007,800	16,478,500	10,337,800	1,844,730	14,001,500	2,902,190	102,572,520	0.641	0.125	0.101
1989	12,190,100	37,898,100	10,063,700	6,264,530	1,134,620	10,358,600	77,909,650	0.637	0.131	0.105
1990	10,346,700	8,240,040	23,879,500	6,308,810	3,978,550	7,230,260	59,983,860	0.645	0.119	0.096
1991	5,199,140	7,042,770	5,243,500	15,165,100	4,052,390	7,169,070	43,871,970	0.654	0.104	0.085
1992	16,879,900	3,573,040	4,559,130	3,392,990	9,892,690	7,291,500	45,589,250	0.648	0.114	0.092
1993	23,025,800	11,427,400	2,242,190	2,859,520	2,151,780	10,867,300	52,573,990	0.624	0.152	0.121
1994	3,499,220	15,174,900	6,759,360	1,328,490	1,721,910	7,804,510	36,288,390	0.612	0.170	0.135
1995	19,389,300	2,328,390	9,139,690	4,085,560	816,493	5,855,980	41,615,413	0.621	0.157	0.125
1996	21,339,100	12,710,700	1,353,710	5,347,680	2,436,490	3,986,790	47,174,470	0.597	0.196	0.153
1997	2,438,050	13,664,600	7,030,750	754,086	3,049,810	3,671,440	30,608,736	0.589	0.209	0.162
1998	22,762,700	1,594,260	7,914,860	4,093,640	447,464	3,992,260	40,805,184	0.602	0.187	0.147
1999	11,223,200	14,512,500	872,509	4,366,910	2,314,400	2,516,430	35,805,949	0.617	0.163	0.129
2000	10,312,600	7,414,120	8,580,440	518,985	2,646,090	2,936,190	32,408,425	0.629	0.143	0.115
2001	32,056,600	6,886,690	4,487,960	5,223,060	321,515	3,471,500	52,447,325	0.678	0.068	0.057
2002	3,788,320	22,165,600	4,512,280	2,941,410	3,450,600	2,497,370	39,355,580	0.677	0.069	0.058
2003	25,506,500	2,654,200	14,933,600	3,041,010	1,995,970	4,035,440	52,166,720	0.687	0.056	0.047
2004	385,605	17,856,100	1,785,390	10,044,500	2,056,920	4,070,060	36,198,575	0.685	0.059	0.049
2005	105,277,000	274,363	12,199,200	1,219,380	6,892,490	4,196,280	130,058,713	0.701	0.035	0.030
2006	3,598,990	74,347,600	184,971	8,242,050	829,133	7,546,830	94,749,574	0.674	0.074	0.061
2007	7,070,980	2,545,010	49,999,500	124,437	5,578,840	5,657,350	70,976,117	0.675	0.072	0.060
2008	1,846,500	5,007,830	1,711,330	33,580,000	83,981	7,558,440	49,788,081	0.681	0.064	0.053
2009	17,921,800	1,307,970	3,386,910	1,158,020	22,854,900	5,192,130	51,821,730	0.692	0.048	0.040
2010	6,552,860	12,729,500	889,889	2,304,050	791,666	19,164,900	42,432,865	0.689	0.052	0.043
2011	6,626,980	4,670,340	8,726,650	609,481	1,583,790	13,659,000	35,876,241	0.690	0.051	0.043
2012	10,906,400	4,705,870	3,189,050	5,965,930	418,865	10,473,400	35,659,515	0.674	0.074	0.061
2013	8,245,100	7,653,550	3,100,430	2,102,870	3,964,560	7,220,970	32,287,480	0.669	0.082	0.068
2014	4,065,730	5,788,150	5,025,480	2,034,390	1,389,050	7,357,940	25,660,740	0.644	0.120	0.097
2015	5,594,360	2,818,880	3,669,160	3,184,030	1,300,290	5,552,550	22,119,270	0.641	0.125	0.101
2016	15,838,400	3,850,890	1,754,000	2,283,820	2,003,530	4,288,070	30,018,710	0.656	0.101	0.083
2017	34,025,400	10,873,200	2,381,680	1,085,880	1,430,970	3,927,940	53,725,070	0.659	0.096	0.079
2018	5,973,310	23,293,000	6,677,840	1,464,440	675,788	3,320,600	41,404,978			

Table 9. Estimated harvest of Lake Erie walleye for 2018, and population projection for 2019 when fishing with 60% Fmsy. The 2018 and 2019 projected spawning stock biomass values are from the ADMB-2018 recruitment-integrated model. The range in the RAH was calculated using ± one standard deviation from the mean RAH.

SSB_0=	60.774	million kilograms
20% SSB_0=	12.155	million kilograms
F_{msy} =	0.538	

	2018 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2018 RAH (millions of fish)			Projected 2019 Stock Size (millions)
Age	**Mean**	**F**	**Sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	5.973		0.316	0.102	0.656	0.083	0.367	0.497	0.628	12.276
3	23.293		0.981	0.317	0.529	0.234	4.199	5.456	6.712	3.917
4	6.678		0.997	0.322	0.526	0.238	1.198	1.586	1.975	12.324
5	1.464		0.930	0.300	0.538	0.224	0.243	0.327	0.412	3.515
6	0.676		0.935	0.302	0.537	0.225	0.112	0.152	0.192	0.788
7+	3.321		1.000	0.323	0.526	0.238	0.579	0.791	1.003	2.109
Total (2+)	41.405	0.323				0.213	6.698	8.809	10.921	34.928
Total (3+)	35.432						6.331	8.312	10.293	22.652
SSB	44.958	mil. kgs								36.037 mil. kgs

probability of 2018 spawning stock biomass being less than 20% SSB_0 = 0.001%

Table 10. Western basin age-0 walleye recruitment index observed in bottom trawls by the Ontario Ministry of Natural Resources (ONT) and Ohio Department of Natural Resources (OH) between 1988 and 2017.

Year Class	Year of Recruitment to Fisheries	OH+ONT Trawl Age-0 CPHa
1988	1990	18.280
1989	1991	6.094
1990	1992	39.432
1991	1993	59.862
1992	1994	6.711
1993	1995	108.817
1994	1996	63.921
1995	1997	2.965
1996	1998	85.340
1997	1999	24.185
1998	2000	14.313
1999	2001	44.189
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

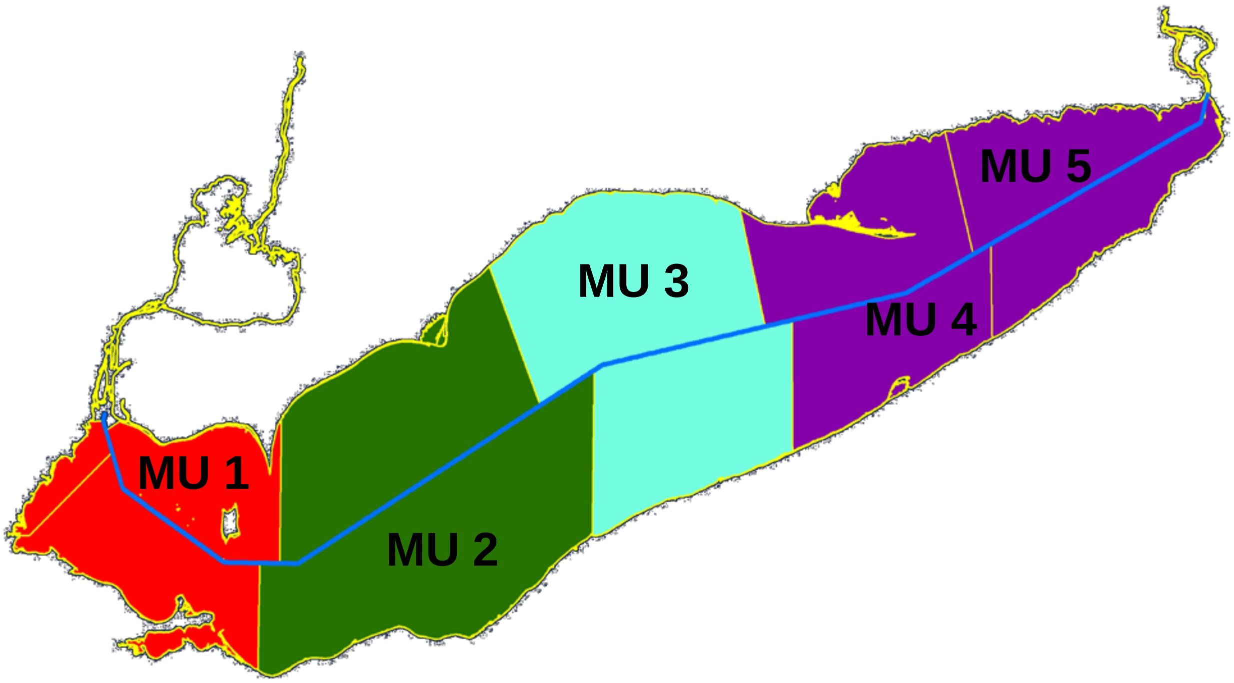


Figure 1. Map of Lake Erie with management units (MU) recognized by the Walleye Task Group for interagency management of Walleye.

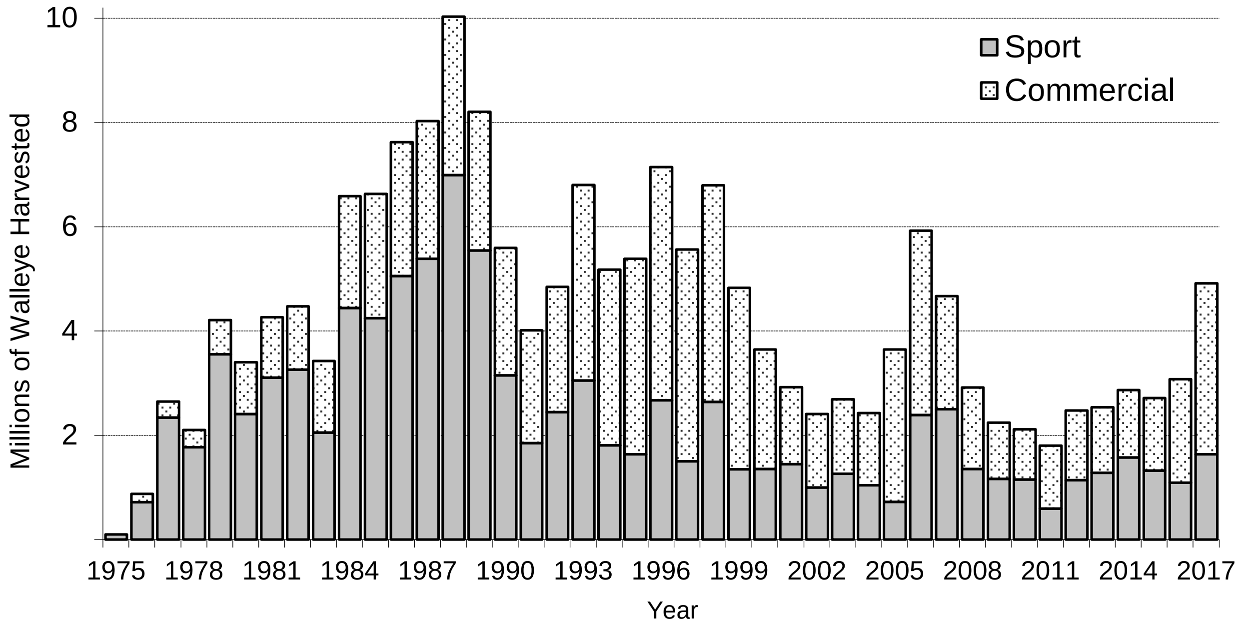


Figure 2. Lake-wide harvest of Lake Erie Walleye by sport and commercial fisheries, 1975-2017.

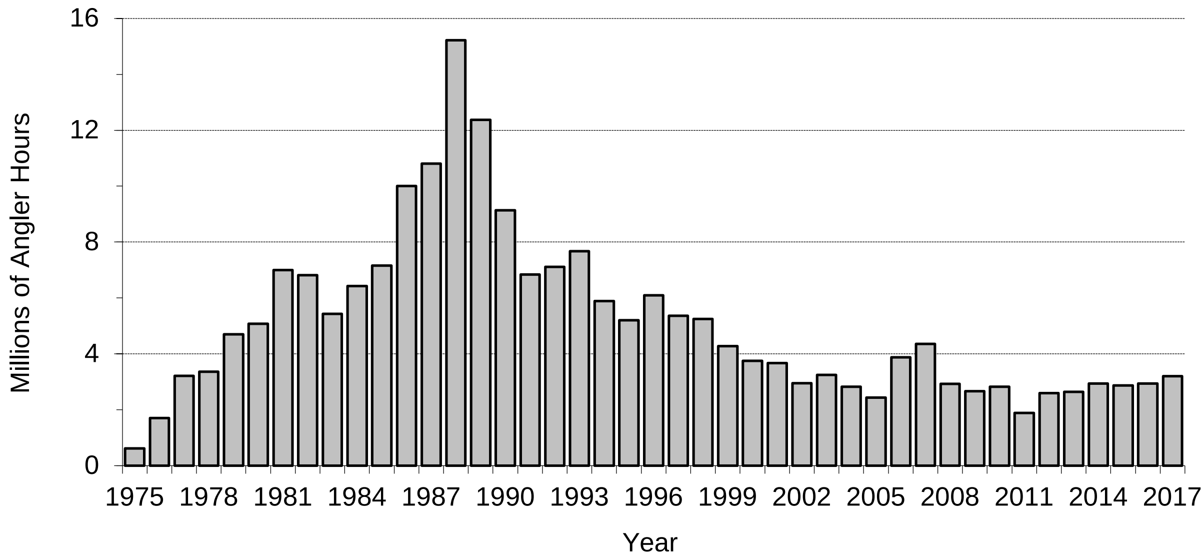


Figure 3. Lake-wide total effort (angler hours) by sport fisheries for Lake Erie Walleye, 1975-2017.

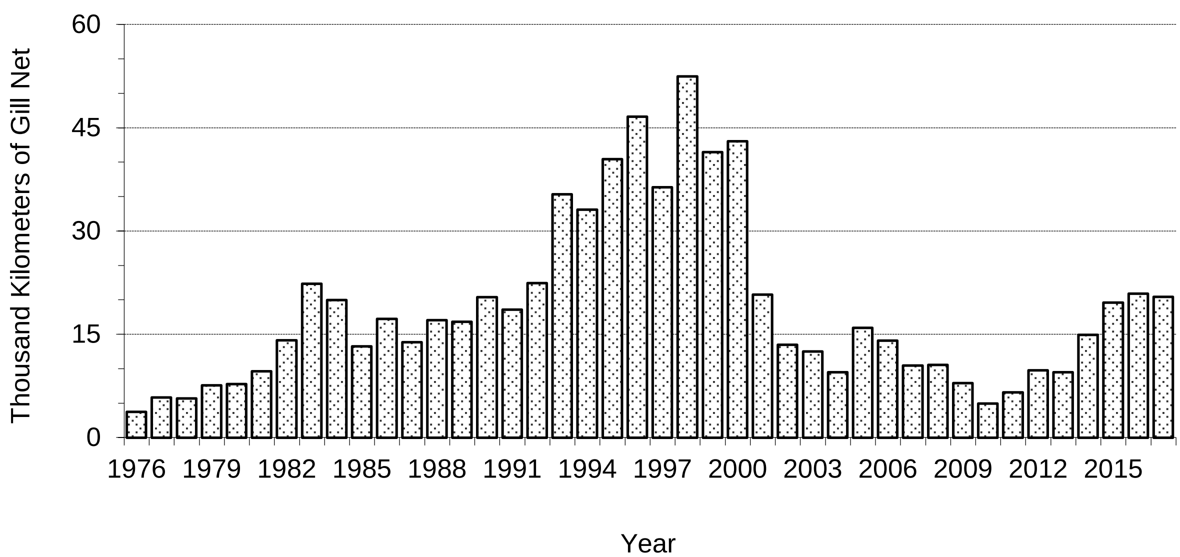


Figure 4. Lake-wide total effort (thousand kilometers of gill net) by commercial fisheries for Lake Erie Walleye, 1976-2017.

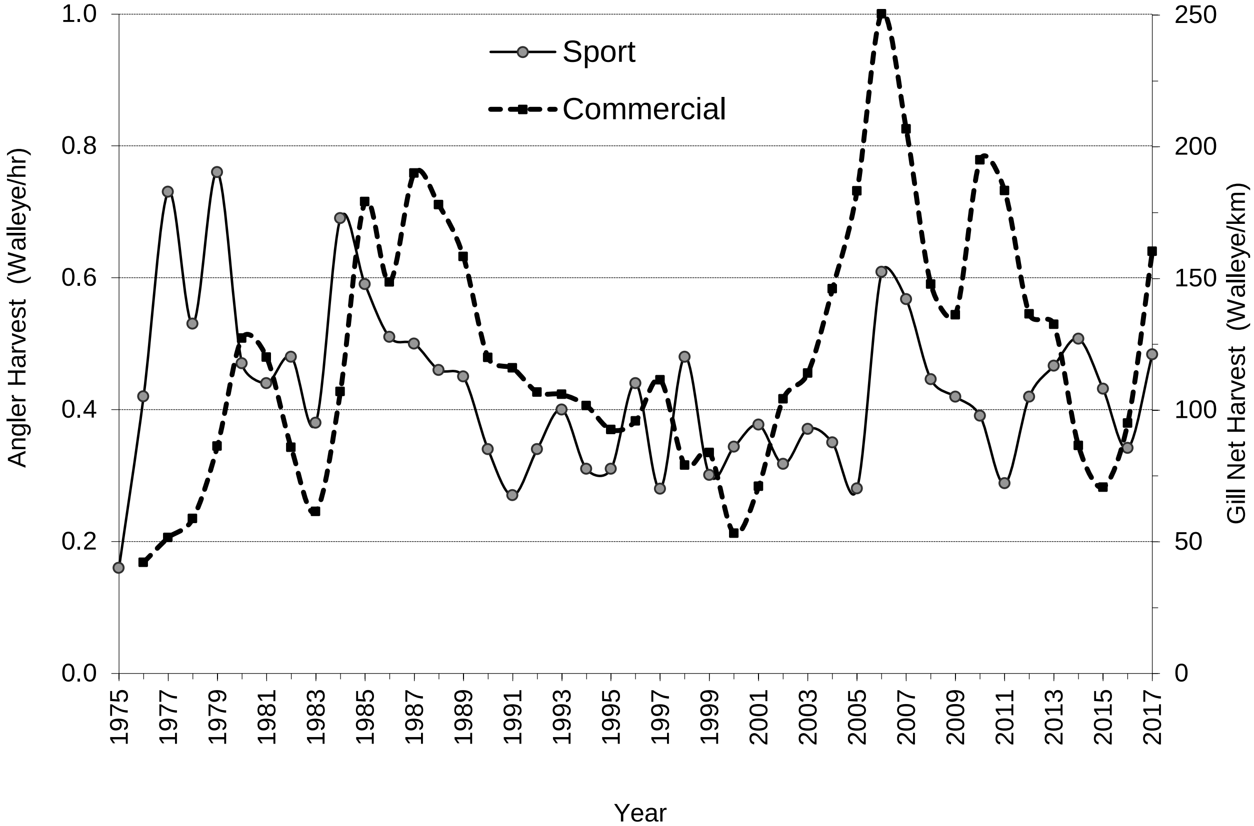


Figure 5. Lake-wide harvest per unit effort (HPE) for Lake Erie sport and commercial Walleye fisheries, 1975-2017.

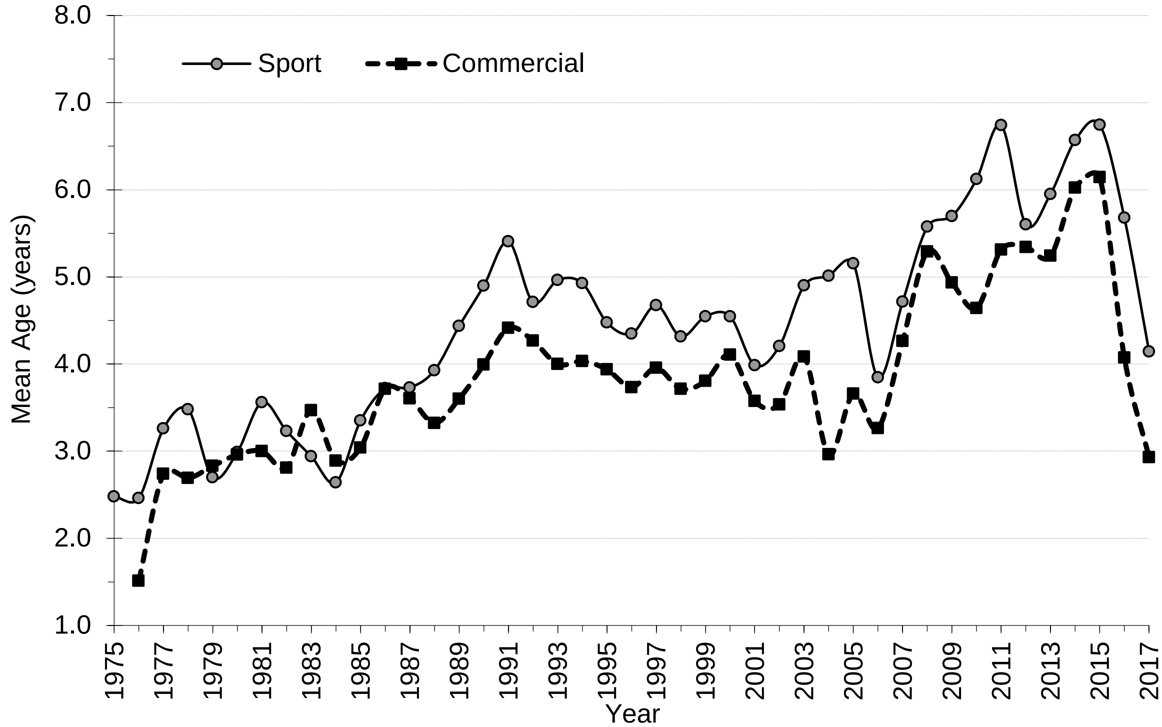


Figure 6. Lake-wide mean age of Lake Erie Walleye in sport and commercial harvests, 1975-2017.

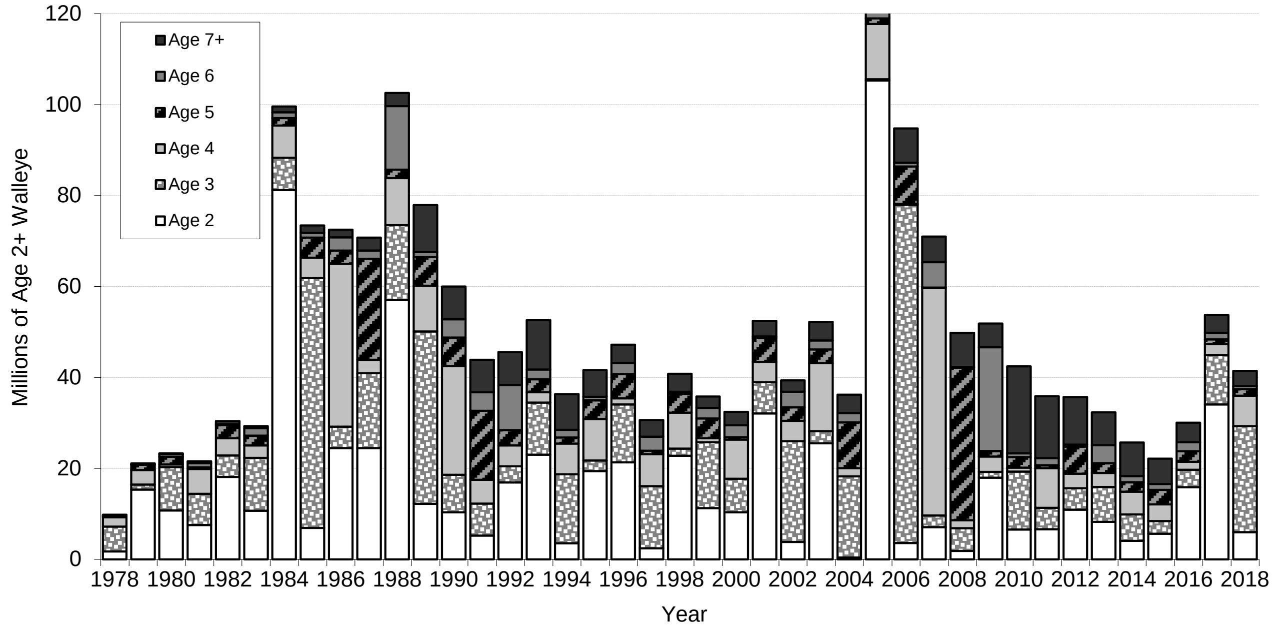


Figure 7. Abundance at age for age-2 and older Walleye in Lake Erie's west and central basins from 1978-2018, estimated from the latest ADMB integrated model run. Data shown are from Table 8.

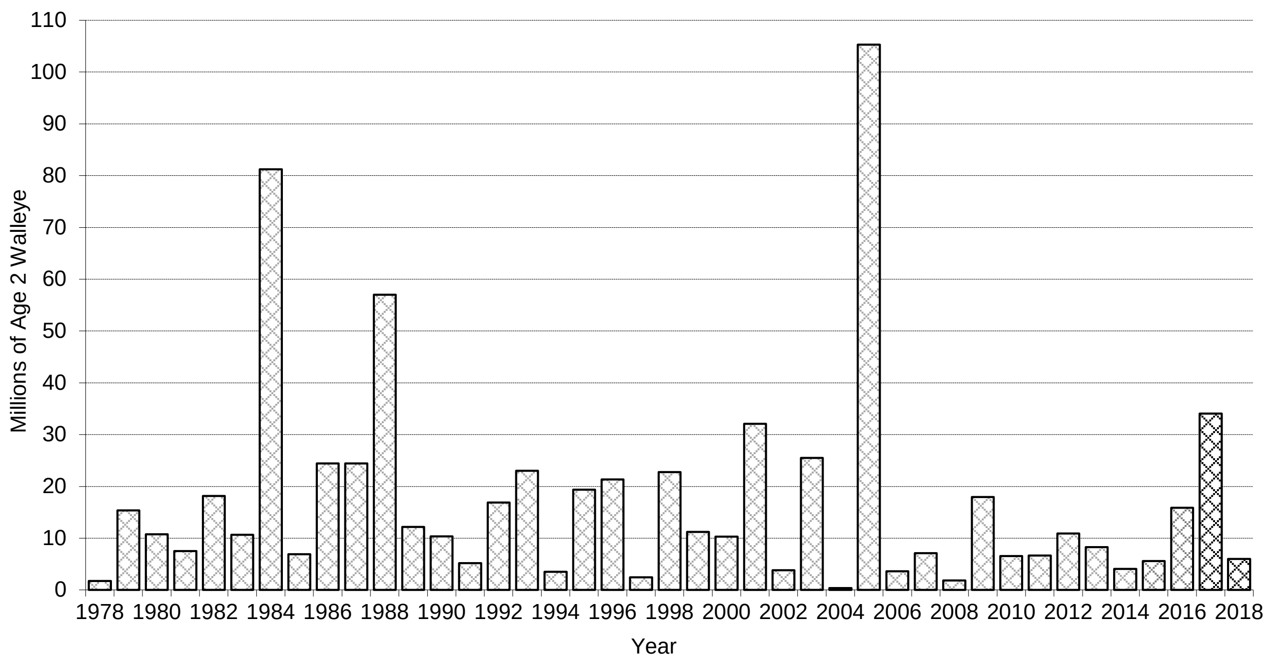


Figure 8. Estimated (1978 – 2016) and projected (2017 and 2018) number of age-2 Walleye in the west-central Lake Erie Walleye population from the latest ADMB integrated model run.

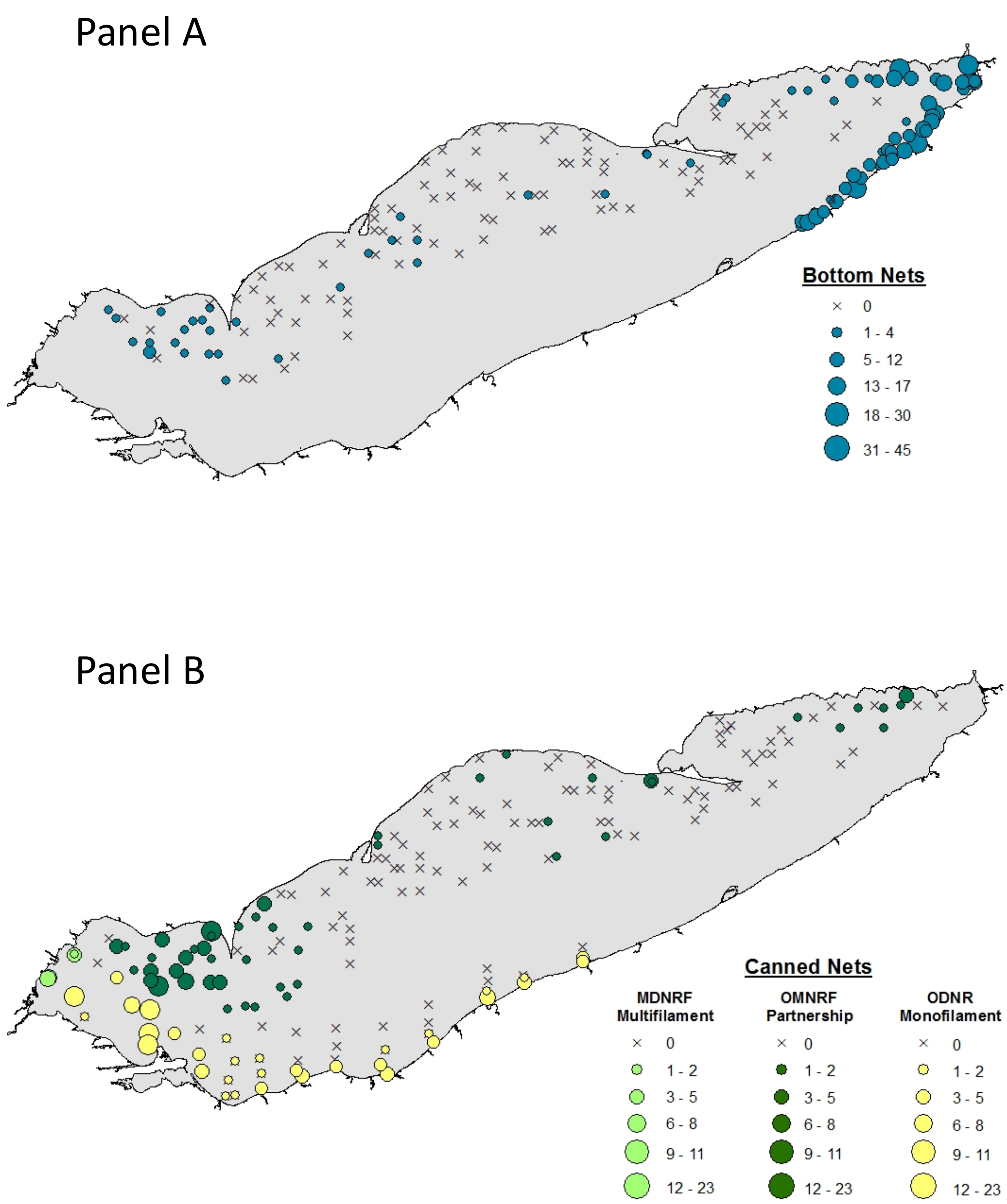


Figure 9. Relative abundance of yearling Walleye captured in bottom-set (A) and suspended or kegged (canned) multifilament (B) gillnets from Michigan, Ohio, New York, and Ontario waters in 2017. Catches have been adjusted to reflect panel length (standardized to 50 ft panels) and differences in the presence of large mesh (>5.5” excluded).