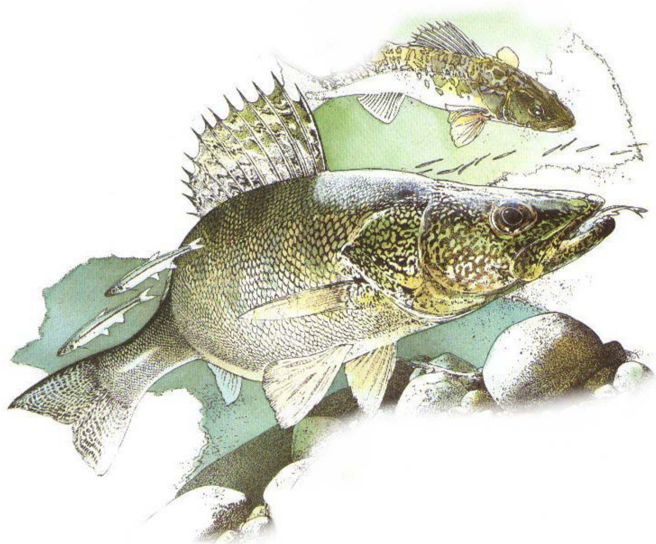
Report for 2014 by the

LAKE ERIE WALLEYE TASK GROUP

March 2015



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

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Charges to the Walleye Task Group, 2014-2015

The charges from the Lake Erie Committee's (LEC) Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period from April 2014 to March 2015 were to:

1. Maintain and update 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 modeling.
    c. Explore and advise on feasibility of integrating east basin walleye assessments into lake wide management.
3. Report Recommended Allowable Harvest (RAH) levels for 2015.
4. Provide guidance/recommendations for future tagging strategies to the LEC.

Review of Walleye Fisheries in 2014

Fishery effort and Walleye harvest data were combined for all fisheries, jurisdictions and Management Units (Figure 1) to produce lake-wide summaries. The 2014 total estimated lake-wide harvest of Walleye was 2.869 million Walleye (Table 1), with a total of 2.669 million Walleye harvested in the total allowable catch (TAC) area. This harvest represents 66% of the 2014 TAC (4.027 million Walleye) and includes Walleye harvested in commercial and sport fisheries in Management Units 1, 2, and 3. An additional 199,500 Walleye (7% of the lake-wide total) were harvested outside of the TAC area in Management Units 4 and 5 (also referred to as Unit 4 in the Tables; Table 1). The estimated sport fish harvest of 1.577 million Walleye in 2014 represents a 23% increase from the 2013 harvest of 1.280 million Walleye; this harvest is 33% below the long-term (1975-2013) average of 2.346 million fish. The 2014 Ontario commercial harvest was approximately 1.292 million Walleye lake-wide, with 1.252 million caught in the TAC area (Table 2). Although Ontario does not conduct angler creel surveys on an annual basis, and thus some estimates of harvest and effort for this fishery component are not compiled annually for Ontario waters, a lake-wide creel survey was completed in 2014. A total of 72,000 Walleye were harvested by the sport fishery in Ontario within the TAC area during 2014. Thus the total harvest of Walleye in Ontario waters was 1.324 million Walleye, representing 76% of the 2014 Ontario TAC allocation of 1.734 million Walleye. Although the lake-wide Ontario commercial harvest was 3% higher than in 2013, the 2014 harvest is 37% below the long-term average (1978-2013; Table 2, Figure 2).

Sport fishing effort increased 11% in 2014 from 2013, to a total of 2.940 million angler hours (Table 3, Figure 3). Compared to 2013, sport effort in 2014 increased by 5% in Management Unit 1, by 87% in Management Unit 3, by 21% in Management Units 4&5, and decreased by 9% in Management Unit 2. Ontario sport fishing effort from the 2014 creel survey is reported in rod hours and is not included in the estimate of total lake-wide sport fishing effort for 2014.

There was no estimate of sport fishing effort in Ontario waters in 2013. Lake-wide commercial gill net effort in 2014 (14,943 km) increased by 57% from 2013 but remains 20% below the long term-average observed effort since 1976 (Table 3, Figure 4).

The 2014 lake-wide average sport harvest per unit effort (HUE) of 0.51 Walleye/angler hours increased 9% from 2013 and was 19% higher than the long-term mean of 0.43 Walleye/angler hour. Sport harvest per unit of effort (Walleye/angler hour) for agencies combined increased in Management Unit 1 (0.56; +10%), Management Unit 2 (0.39; +3%) and Management Units 4&5 (0.41; +28%), and decreased in Management Unit 3 (0.49; -16%) in 2014 compared to 2013. In all Management Units, the sport harvest rate was above the long-term average (Table 4, Figure 5). Since Ontario does not conduct a lake-wide creel survey each year and units of effort are reported differently, Ontario sport harvest per unit of effort is excluded from the long-term average and annual means across jurisdictions. Management Unit 1 was 22% above the long-term average of 0.46 Walleye/angler hour and Management Units 2 and 3 were 18% and 32% above their long-term means in, respectively. The sport harvest rates in Management Units 4&5 were 86% above the long-term mean of 0.22 Walleye/angler hour.

In 2014, total commercial gill net HUE (86.5 Walleye/kilometer of net) decreased 35% relative to 2013, and was 30% below the long-term lake-wide average (122.8 Walleye/kilometer; Table 4, Figure 5). When compared to 2013 commercial gill net harvest rates, the catch rates decreased in 2014 for Management Unit 1 (47%) and Management Unit 2 (45%) and increased in Management Unit 3 (10%) and in Management Unit 4 (56%).

For the recreational and commercial fisheries, the harvest was dominated by Walleye originating from the 2003 (ages 7 and older group) year classes with moderate contributions by 2010 (age 4) and 2011 (age 3) (Tables 5 and 6). Ages 7-and-older Walleye comprised 40% and 38% of the lake-wide sport and commercial fishery harvest, respectively. The 2010 year class represented 21% of the total sportfish harvest and 19% of the total commercial fish harvest. Finally the 2011 year class represented 23% of the total sport harvest and 20% of the total commercial harvest. The proportion of older fish (age 7+) in the total sport and commercial Walleye harvest combined was greater in Management Unit 3 (65%) and Management Unit 4 (60%) compared to Management Unit 1 (29%) and Management Unit 2 (39%).

Across all jurisdictions, the mean age of Walleye in the 2014 harvest ranged from 5.8 to 8.3 years old in the sport fishery, and from 5.3 to 8.4 years old in Ontario's commercial fishery (Table 7, Figure 6). An increase in mean age of Walleye harvested was observed from 2013-2014 in both the recreational and commercial fisheries and in all Management Units, with the exception of the recreational fishery in Management Units 4&5. The mean age in the sport fishery (6.6 years) was above the long-term mean (1975-2013) of 4.3 years, and was the highest on record since 1975. In the commercial fishery, the mean age was 6.0 years, higher than the long-term mean (1975-2013) of 3.7 years, and also the highest value in the time series. The mean age of the total harvest (sport and commercial fisheries) in 2014 (6.3 years) rose to the highest value ever observed in the time series (1975-2013). This reflects the continued dependence of the fisheries on the 2003 and 2007 (age 7+) year classes, with contributions to the fisheries from the 2010 (age 4) and 2011 (age 3) cohorts in 2014.

Walleye Management Plan and Lake Erie Percid Management Advisory Group

The LEC formed the Lake Erie Percid Management Advisory Group (LEPMAG) in order to update the management plans for Walleye and Yellow Perch with increased stakeholder engagement and transparency. This group consists of stakeholders from all jurisdictions surrounding Lake Erie, along with Lake Erie managers and agency staff, and is being facilitated by Michigan State University's Quantitative Fisheries Center (QFC). In early 2013, LEPMAG terms of reference were modified to include Walleye and Yellow Perch Task Groups Members.

From November, 2010 through February, 2012, LEPMAG members were involved in a series of five facilitated workshops that defined common fisheries objectives for the Lake Erie Walleye population, described the current assessment programs, data sources, stock assessment model and LEC harvest policy. At the final workshop of the first round of LEPMAG meetings in February 2012, a Technical Review Panel comprised of modeling and fisheries management experts reviewed the statistical catch at age (SCAA) stock assessment model and made recommendations for the LEPMAG to consider with respect to potential improvements within the stock assessment model. The QFC incorporated these recommendations into a formal Walleye Management Strategy Evaluation (MSE).

Walleye Stock Assessment Model and Harvest Control Rules

The LEPMAG process has dedicated twelve meetings over past four years (2010-2013) to identify common goals in Walleye management, with the opportunity for stakeholders to provide direct advice to the LEC specific to Walleye management objectives, alternatives, and to evaluate trade-offs between various management options. In December of 2013, after a review of the data, presentation of analyses, and comments and suggestions by stakeholders with respect to the Walleye assessment model and harvest control rule, the LEC announced that as of 2014, the WTG will employ an updated recruitment integrated Walleye assessment model. This updated model includes: 1) estimating selectivity for all ages within the model without the assumptions of known selectivity at age; 2) integrating age-0 trawl survey data into the model; 3) using a multinomial distribution for the age composition data; and 4) allowing catchability to vary from year to year using a random walk for fishery and survey data including the age-0 trawl survey.

The LEPMAG also developed a range of harvest policies based upon various reference points, and simulations were used to evaluate the performance of each harvest policy based upon a number of jointly developed performance indicators. The harvest strategies included a range of maximum Target Reference Points (TRP) based on the Maximum Sustainable Yield ($F_{40\%MSY}$, $F_{60\%MSY}$, $F_{80\%MSY}$, $F_{100\%MSY}$) and threshold Limit Reference Points (LRP) of (20% or 40%) of the unfished spawning stock biomass (SSB_0). When spawning stock biomass falls below this reference point, target fishing rates will decrease, as in methods previously employed in the sliding F formula. The LEPMAG also considered an inter-annual change constraint on TAC in the range of 10%, 20%, and an unconstrained harvest policy.

Lastly, the QFC presented a means for implementing a probabilistic control rule, or P-star (P*). A probabilistic control rule accounts for uncertainty in determining the risk of a harvest decision. This control rule calculates the probability that the spawning stock biomass will go below the SSB_0 threshold in the year following TAC implementation. P* can be viewed as an evaluation of the risk of falling below the 20% of SSB_0 threshold in the immediate future, based on the decision of where the TAC is set. It was suggested that incorporating a P* of 0.05 (no more than a 5% chance that spawning stock biomass would go below 20%SSB_0 based on the TAC implemented in the upcoming fishing year) could be used as a reference point. All harvest policies were evaluated by running 250 simulations over 100 year time period, and information was summarized for each performance metric and presented to the LEPMAG.

As a result of the ongoing discussions with the LEPMAG, and the consensual decision of the Harvest Control Rule process detailed above, as presented by the QFC, the Lake Erie Committee implemented the following Harvest Policy in March 2014:

- *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%**.

Catch-at-Age Population Analysis and Abundance

The WTG uses a SCAA model to estimate the abundance of Walleye in Lake Erie between the 1978 and 2014 time period. The stock assessment model estimates population abundance utilizing both fishery dependent and independent data sources. The model includes fishery-dependent data from the Ontario commercial fishery (Management Units 1-3) and sport fisheries in Ohio (Management Units 1-3) and Michigan (Management Unit 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). Due to similarities between Michigan and Ohio surveys and the desire for improved precision, Michigan gill net survey data were pooled with Ohio's data in the SCAA model. *M* is assumed to be constant (0.32) among years (1978-2014) and ages (ages 2 through 7+, i.e., seven and older). The abundances-at-age were derived from the estimated parameters using an exponential survival equation.

Based on the 2015 integrated SCAA model, the 2014 west-central population (Management Units 1-3) estimate was 25.124 million age 2 and older Walleye (Table 8, Figure 7). The estimated number of age-7+ fish originating from the 2007 and older year classes in 2014 was 6.137 million fish and represented 24% of the Walleye (age 2 and older) in the population. The second most abundant age group (23%) was age 3 Walleye, followed by the age 4 fish (21%). Based on the integrated model, the number of age 2 recruits entering the population in 2015 (2013 year-class) and 2016 (2014 year-class) will be 7.953 and 17.557 million Walleye, respectively (Table 9; Figure 8). The projected abundance of age 2 and older Walleye in the west-central population in 2015 is 24.039 million fish (Table 8; Figure 7).

Harvest Policy and Recommended Allowable Harvest (RAH) for 2015

Using results from the 2015 integrated SCAA model, the estimated abundance of 24.039 million age 2 and older Walleye in 2015, and a harvest policy (TRP $=F_{60\%MSY}$; LRP $=20\%SSB_0$), the calculated mean RAH for 2015 is 4.114 million Walleye, with a range from 3.108 (minimum) to 5.119 (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. ADMB uses a statistical technique called the delta method to determine this standard deviation for the calculated RAH, incorporating the standard errors from abundance estimate at age and combined gear selectivity at age that go into the calculation of the RAH. The target fishing rate, ($F_{60\%MSY}$ =0.316) in the harvest policy was applied since the probability that the projected spawner biomass in 2016 (25.858 million kg) could fall below the limit reference point ($SSB_{20\%}$ = 11.088 million kg) after fishing at $F_{60\%MSY}$ in 2015 was less than 5% ($P<0.0001$). Thus the probabilistic control rule that could have reduced the target fishing rate to conserve spawner biomass will not be invoked during the 2015 process to determine RAH.

In addition to the RAH, the Harvest Control Rule conceived by LEPMAG, which limits the annual change in TAC to ± 20%, was implemented in 2014. If the LEC were to invoke the 20% maximum change rule from the previous year's TAC, then the 2015 TAC range would be/vary (+) or (-) 20% of the 2014 TAC (4.027 million fish). This 2015 TAC range for LEC consideration would be from 3.222 million fish to 4.832 million fish.

Other Walleye Task Group Charges

Centralized Datasets

The WTG members currently manage several databases. These databases consist of harvest and population assessment surveys conducted by the respective agencies that manage the Walleye population in Lake Erie. Annually, information from these surveys is compiled to assist WTG members in the decision-making process regarding recommended harvest levels and current status and trends of the Walleye population. 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).

Fishery harvest and population assessment survey information are annually compiled by the WTG and are used for estimating the population abundance of Walleye in Lake Erie via SCAA analysis (Deriso et al. 1985). A spatially-explicit version 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 are maintained by the WTG. Annual population abundance estimates are used to assist LEC members with setting TACs for the upcoming year as well as to evaluate past harvest policy decisions.

The Lake Erie Walleye Tagging database consists of biological information collected from Walleye tagged in the tributaries and main lake areas of Lake Erie. The tagging program dates back to 1986, and is currently maintained at the Sandusky office of the Ohio Department of Natural Resources, Division of Wildlife. Annually, agencies submit information regarding tagging activities in their jurisdictions. In addition to updating the database with new tagging information, the database also maintains a record of the tagged Walleye which are reported as harvested in a given year. The information is used to estimate the movements of different spawning stocks within the lake proper and connecting waters of Lake Erie. In 2012, Vandergoot et al. (2012) published the findings of an interagency tag-loss study conducted between 2005 and 2009. Additionally, Vandergoot et al. (2012) estimated fishery and region specific jaw-tag reporting rates from the high-reward tagging studies conducted in 1990 and 2000. The results of this study were used to generate spatially explicit mortality parameters for Lake Erie Walleye (Vandergoot and Brenden 2014).

Investigating Auxiliary Recruitment Indices

Since 2011, the WTG have used comparable components of the Ontario (ON Partnership), New York (NYDEC warmwater) and Ohio (ODNR) bottom monofilament gillnet assessment programs to investigate the dynamics, production and relative abundance of yearling walleye throughout the lake. In 2012 the exercise was expanded to include yearling catches observed in the suspended monofilament gillnet assessment conducted by the ON Partnership and the suspended multifilament gillnet assessments from combined ODNR and Michigan (MDNR) surveys (WTG 2013). While acknowledging several limitations to incorporating the suspended gillnet data (lack of suspended gillnet data in NY; difficulty standardizing the catches across jurisdictions; trends in growth rates), the exercise was thought to have merit and was repeated with 2014 data.

In contrast to what was observed in 2013, comparable bottom set data from 2014 showed few differences in yearling abundance (2013 year class) between east and west; south shore eastern catches were not notably larger than those of more western locations (Figure 9). The spatial distribution of yearlings in suspended nets in 2014 showed the highest densities in Ohio, followed by Michigan waters. Yearling catches from suspended monofilament nets in Ontario waters, similar to Michigan catches in the west basin, declined as one moves from west to the east. It is important to re-iterate that differences in observed catches between programs using suspended nets are not directly quantitatively comparable and that caution needs to be taken before deriving definitive inferences from this exercise.

Currently, an interagency west basin young-of-the-year (YOY) Walleye bottom trawl index (Table 10) is integrated in the SCAA model to contribute to age 2 abundance estimates and forecasts. While this survey is considered to be a reliable predictor of recruitment, the inclusion of additional recruitment data may compliment and improve the recruitment estimation process.

To address the charge for incorporating multiple Walleye recruitment indices into annual WTG assessment, the task group compiled 21 assessment indices from state, federal and provincial programs. These indices include young-of-the-year (YOY) and yearling indices. Data sets varied in time series length. The longest time series was from 1968 to 2014 and the shortest one with full continuity from 2004 to 2014. In addition, some indices have missing values in the middle or at the end of the time series. Several indices were not mutually exclusive where surveys exist in both spatially aggregated and separate forms. As a pilot approach, surveys were excluded if data were overlapping with a spatially aggregated series or if they were missing years of data at the end of the time series. Based on these criteria, 15 indices with 10 years of observations were included in analyses.

Each index was standardized to have a mean=0 and standard deviation=1 prior to analyses. There was high correlation among indices. A principle component analysis (PCA) was applied to the selected recruitment indices to reduce the number of dimensions without losing much information in the data sets. The resulting principle components are mutually orthogonal and thus used as independent variables to predict the number of age 2 fish from a linear regression analysis. Each principle component is a linear combination of the 15 selected indices and their coefficients (i.e. Eigenvectors) representing the contribution of each survey index to the corresponding principle component.

The PCA analysis on the selected 15 recruitment indices showed that the first principal component (PRIN 1) was able to explain 53% of total variance. By including a second principal component (PRIN 2), the cumulative variance explained was 70%. To predict age 2 abundance estimated from SCAA, a linear regression was conducted between log-transformed age 2 abundance (the dependent variable) and PRIN 1 or both PRIN1 and PRIN2 (independent variables). The linear regression excluded the most recent SCAA age 2 estimate (2014). The regression model which used 8 observations was significant (P=0.0003) with R^2=0.90. This was repeated using multiple regression with variables PRIN 1 and PRIN2, but PRIN2 was not considered significant (P=0.73).

A second PCA was run with 14 data sets limited to 16 observations, after excluding the time series with the fewest observations. The first principle component (PRIN 1) accounted for 71% of the variance; the addition of the PRIN 2 increased the total variance explained to 82%. Similar to the first linear bivariate and multiple regressions with PCA PRIN 1 and PRIN 2 with SCAA age 2 abundance estimates, only PRIN 1 was significant (P<0.0001) R^2=0.86 in this second PCA analysis.

PCA appears to be a reliable approach for objectively combining Walleye recruitment indices. Several considerations remain prior to implementation of this approach for assessment. There is currently no process for selecting recruitment indices to include for PCA. Reducing the number of indices may increase the sample size for integration in SCAA but the net trade-offs are not clear. Since both YOY and yearling indices may be used as recruitment predictors, two groups of data sets may be required; one to project recruitment for the TAC year; another which excludes yearling indices, to project recruitment one year beyond the year in which TACs are set. Currently, one YOY interagency trawl recruitment index (Table 10) is integrated in the SCAA model. Integration of a composite recruitment index in SCAA requires input from STC, LEC and LEPMAG to consider its' compatibility with the existing spawner biomass harvest control rule (P*). If a composite recruitment index is adopted, SCAA ADMB code may require some modification to accommodate this change in the assessment process.

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

Interagency Walleye tagging on Lake Erie extends over decades using jaw tags, PIT (Passive Integrated Transponder) tags or a combination since 2005, and more recently still, using acoustic tags. PIT tags have been used to quantify jaw tag loss in Walleye (Vandergoot et al. 2012), facilitating estimation of movement parameters and natural mortality rates of Lake Erie

Walleye (Vandergoot and Brendan 2014). To obtain an independent estimate of fishing mortality and natural morality of Lake Erie walleye, the task group is currently analyzing PIT tag mark recapture and fisheries data using Brownie's tag-recovery Model (Brownie et al. 1985) modified by Pollock et al. 1991. The model is implemented in ADMB and will be designed to test multiple spatial configurations of Lake Erie walleye populations; such as western central population, eastern basin population and lake-wide population if the information permits. Results of this work are expected in 2016.

East Basin Walleye Assessment

Catch-at-age assessment models assume that information collected from fisheries and surveys track the same cohorts through time. However, many studies have shown the Walleye resource in the east basin during harvest season is a mixture of Walleye sub-populations from both west basin and east basin (Einhouse and MacDougall 2010). In a recent study, Zhao et al. (2011) used a mark-recapture analysis to quantify the contribution of both sources. They estimated that, on average, about 90% of all Walleye harvested in the east basin were seasonal migrants from the west basin. However, there exists a large amount of uncertainty and variation associated with the annual age and size structure of the Walleye population migrating from the west basin. Further, it is unlikely that this migration occurs in a consistent way by exactly the same segment of the population each year. The study suggests that catch-at-age information cannot track the same cohort of Walleye from year to year in the east basin and the core assumption of tracking cohorts in a cohort-based model is likely violated.

At least part of the rationale for spatially investigating relative abundance of yearling walleye (*Investigating Auxiliary Recruitment Indices*; above), was to get a picture of relative annual eastern stock specific abundance, based on the assumption that yearling walleye have moved little beyond their basin of production. Ongoing work toward improved gear standardization will necessarily also contribute to describing and assessing eastern production independent of western.

The WTG member agencies from the east basin continue assessment surveys to track changes in the abundance of Walleye population, and Walleye fisheries are closely monitored and regulated in the east basin. In support of Charge 2c WTG members will continue to examine the Walleye resource inhabiting eastern Lake Erie to develop a multi-jurisdictional assessment that recognizes both expansive seasonal movements from the west-central quota management area, as well as the dynamics of smaller and localized east basin spawning stocks. This may include a stock assessment approach that does not utilize a catch-at-age modeling of absolute abundance. The task group is optimistic that upcoming eastern basin-specific additions to the Lake Erie Walleye Spatial Ecology study (below) will contribute substantially to this eastern exercise.

Additional Walleye Task Group Activities

Walleye Spatial Ecology Study

In 2010, an inter-lake walleye spatial ecology telemetry study was initiated between the Michigan Department of Natural Resources, Ohio Department of Natural Resources, United States Geological Survey, Carleton University, and Great Lakes Fishery Commission. The objectives of the study are to 1) determine the proportion of walleyes 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 the vicinity of (females) Toussaint Reef. An additional 108 walleye (n = 75 male and 33 female) were tagged in 2014. 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 http://data.glos.us/glatos, 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 telemetry study is funded by the Great Lakes Fishery Commission, Ohio Department of Natural Resources and the Ontario Ministry of Natural Resources and will be a collaborative effort of the LEC agencies, the United States Geological Survey 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. The objectives of this study 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 will begin, involving the New York State Department of Environmental Conservation, Ohio Department of Natural Resources, Pennsylvania Fish and Boat Commission, Ontario Ministry of Natural Resources and Forestry, Great Lakes Fishery Commission, and Michigan State University. The broad goal of this work is to address areas of uncertainty that prevent the inclusion of the eastern basin in a multi-jurisdictional assessment. The objectives of this study are to: 1) estimate the annual contribution of western basin walleye to the eastern basin fishery, 2) quantify the timing, magnitude, demographics, and spatial distribution of central and western basin migrants in the eastern basin, 3) estimate and compare spawning site fidelity rates in the eastern basin, 4) describe the movements of eastern basin walleye out of the eastern basin, and 5) estimate total mortality rates (i.e., fishing and natural) for the major spawning stocks in the eastern basin.

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

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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 1980 to 2014. TAC allocations for 2014 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
1981	TAC	367,400	2,187,900	1,620,000	4,175,300				0	4,175,300
	Har	95,147	2,942,900	1,229,017	4,267,064				0	4,267,064
1982	TAC	504,100	3,001,700	2,222,700	5,728,500				0	5,728,500
	Har	194,407	3,015,400	1,260,852	4,470,659				0	4,470,659
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

[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 2013.

	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
1975	77	4	7	88	10	--	10	--	--	--	--	--	--	0	98	--	--	--	--	0	98
1976	605	30	50	685	35	--	35	--	--	--	--	--	--	0	720	113	44	--	--	157	877
1977	2,131	107	69	2,307	37	--	37	--	--	--	--	--	--	0	2,344	235	67	--	--	302	2,645
1978	1,550	72	112	1,734	37	--	37	--	--	--	--	--	--	0	1,771	274	60	--	--	334	2,106
1979	3,254	162	79	3,495	60	--	60	--	--	--	--	--	--	0	3,555	625	30	--	--	655	4,211
1980	2,096	183	57	2,336	49	--	49	24	--	24	--	--	--	0	2,409	953	40	--	--	993	3,402
1981	2,857	95	70	3,022	38	--	38	48	--	48	--	--	--	0	3,108	1,037	119	3	--	1,159	4,268
1982	2,959	194	49	3,202	49	--	49	8	--	8	--	--	--	0	3,259	1,077	134	2	--	1,213	4,470
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
Mean	1,547	269	40	1,856	274	10	280	165	12	174	7	68	36	58	2,346	1,400	436	285	31	2,042	4,389

[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 2013.

	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
1975	486	30	46	562	61	--	61	--	--	--	--	--	--	0	623	--	--	--	--	--
1976	1,356	84	98	1,538	163	--	163	--	--	--	--	--	--	0	1,701	1,796	1,933	--	--	3,729
1977	2,768	171	130	3,069	151	--	151	--	--	--	--	--	--	0	3,220	4,282	1,572	--	--	5,854
1978	2,880	176	148	3,204	154	--	154	--	--	--	--	--	--	0	3,358	5,253	436	--	--	5,689
1979	4,179	257	97	4,533	169	--	169	--	--	--	--	--	--	0	4,702	5,798	1,798	--	--	7,596
1980	3,938	624	92	4,654	237	--	237	187	--	187	--	--	--	0	5,078	6,229	1,565	--	--	7,794
1981	5,766	447	138	6,351	264	--	264	382	--	382	--	--	--	0	6,997	6,881	2,144	622	--	9,647
1982	5,928	449	108	6,484	223	--	223	114	--	114	--	--	--	0	6,821	10,531	2,913	689	--	14,133
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	3,616	440	144	4,200	1,241	79	1,320	724	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
Mean	3,056	714	102	3,836	768	60	785	416	114	451	124	217	234.2	256	5,270	9,015	5,520	4,541	592	18,731

[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 2013.

	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
1975	0.16	0.13	0.16	0.16	0.17	--	0.17	--	--		--	--	--		0.16					
1976	0.45	0.36	0.50	0.45	0.22	--	0.22	--	--		--	--	--		0.42	63.0	22.9			42.2
1977	0.77	0.62	0.53	0.75	0.24	--	0.24	--	--		--	--	--		0.73	54.9	42.6			51.6
1978	0.54	0.41	0.76	0.54	0.24	--	0.24	--	--		--	--	--		0.53	52.2	138.2			58.8
1979	0.78	0.63	0.81	0.77	0.36	--	0.36	--	--		--	--	--		0.76	107.9	16.7			86.3
1980	0.53	0.29	0.62	0.50	0.21	--	0.21	0.13	--	0.13	--	--	--		0.47	153.0	25.3			127.3
1981	0.50	0.21	0.51	0.48	0.14	--	0.14	0.12	--	0.12	--	--	--		0.44	150.7	55.4	4.9		120.1
1982	0.50	0.43	0.45	0.49	0.22	--	0.22	0.07	--	0.07	--	--	--		0.48	102.2	45.9	2.8		85.8
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	0.17	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
Mean	0.48	0.36	0.40	0.46	0.33	0.27	0.33	0.38	0.19	0.37	0.08	0.31	0.16	0.22	0.43	174.8	88.0	70.3	61.5	122.8

[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 2014. 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	28,638	0	0			0	28,638
	2	95,668	45,305	2,113			47,418	143,086
	3	188,403	263,471	7,893			271,364	459,767
	4	154,775	212,298	9,828			222,126	376,901
	5	42,721	79,801	5,006			84,807	127,528
	6	30,869	36,926	1,905			38,831	69,700
	7+	214,760	270,979	15,398			286,377	501,137
	Total	755,834	908,780	42,142	--	--	950,922	1,706,756
2	1	5,330	0				0	5,330
	2	21,498	3,178				3,178	24,676
	3	63,833	30,694				30,694	94,527
	4	50,213	32,267				32,267	82,480
	5	17,318	16,075				16,075	33,393
	6	12,113	12,915				12,915	25,028
	7+	88,252	81,498				81,498	169,750
	Total	258,557	176,627	--	--	--	176,627	435,184
3	1	0	0				0	0
	2	0	2,420				2,420	2,420
	3	8,601	28,917				28,917	37,518
	4	32,808	27,646				27,646	60,454
	5	20,141	12,273				12,273	32,414
	6	15,406	11,186				11,186	26,592
	7+	161,077	135,286				135,286	296,363
	Total	238,033	217,728	--	--	--	217,728	455,761
4	1	0			0	0	0	0
	2	0			4492	2,303	6,795	6,795
	3	378			1,123	3,455	4,578	4,956
	4	4,929			18,640	15,740	34,380	39,309
	5	2,045			898	3,839	4,737	6,782
	6	6,364			4,716	5,375	10,091	16,455
	7+	26,100			32,113	54,131	86,244	112,344
	Total	39,816	--	--	61,982	84,843	146,825	186,641
All	1	33,968	0	0	0	0	0	33,968
	2	117,166	50,903	2,113	4,492	2,303	59,811	176,977
	3	261,215	323,082	7,893	1,123	3,455	335,554	596,769
	4	242,725	272,211	9,828	18,640	15,740	316,419	559,144
	5	82,225	108,149	5,006	898	3,839	117,892	200,117
	6	64,752	61,027	1,905	4,716	5,375	73,022	137,774
	7+	490,189	487,763	15,398	32,113	54,131	589,405	1,079,594
	Total	1,292,240	1,303,135	42,142	61,982	84,843	1,492,103	2,784,343

[a] Ontario sport harvest values by age were not estimated from the 2014 creel survey; they are not used in catch-at-age analysis.

Table 6. Age composition (in percent) of walleye harvest by management unit, gear, and agency in Lake Erie during 2014. Units 4 and 5 are combined in Unit 4.

Unit	Age	Commercial Ontario	Sport Ohio	Sport Michigan	Sport New York	Sport Pennsylvania	Sport Total	All Gears Total
1	1	3.8	0.0	0.0	--	--	0.0	1.7
	2	12.7	5.0	5.0	--	--	5.0	8.4
	3	24.9	29.0	18.7	--	--	28.5	26.9
	4	20.5	23.4	23.3	--	--	23.4	22.1
	5	5.7	8.8	11.9	--	--	8.9	7.5
	6	4.1	4.1	4.5	--	--	4.1	4.1
	7+	28.4	29.8	36.5	--	--	30.1	29.4
	Total	100.0	100.0	100.0	--	--	100.0	100.0
2	1	2.1	0.0	--	--	--	0.0	1.2
	2	8.3	1.8	--	--	--	1.8	5.7
	3	24.7	17.4	--	--	--	17.4	21.7
	4	19.4	18.3	--	--	--	18.3	19.0
	5	6.7	9.1	--	--	--	9.1	7.7
	6	4.7	7.3	--	--	--	7.3	5.8
	7+	34.1	46.1	--	--	--	46.1	39.0
	Total	100.0	100.0	--	--	--	100.0	100.0
3	1	0.0	0.0	--	--	--	0.0	0.0
	2	0.0	1.1	--	--	--	1.1	0.5
	3	3.6	13.3	--	--	--	13.3	8.2
	4	13.8	12.7	--	--	--	12.7	13.3
	5	8.5	5.6	--	--	--	5.6	7.1
	6	6.5	5.1	--	--	--	5.1	5.8
	7+	67.7	62.1	--	--	--	62.1	65.0
	Total	100.0	100.0	--	--	--	100.0	100.0
4	1	0.0	--	--	0.0	0.0	0.0	0.0
	2	0.0	--	--	7.2	2.7	4.6	3.6
	3	0.9	--	--	1.8	4.1	3.1	2.7
	4	12.4	--	--	30.1	18.6	23.4	21.1
	5	5.1	--	--	1.4	4.5	3.2	3.6
	6	16.0	--	--	7.6	6.3	6.9	8.8
	7+	65.6	--	--	51.8	63.8	58.7	60.2
	Total	100.0	--	--	100.0	100.0	100.0	100.0
All	1	2.6	0.0	0.0	0.0	0.0	0.0	1.2
	2	9.1	3.9	5.0	7.2	2.7	4.0	6.4
	3	20.2	24.8	18.7	1.8	4.1	22.5	21.4
	4	18.8	20.9	23.3	30.1	18.6	21.2	20.1
	5	6.4	8.3	11.9	1.4	4.5	7.9	7.2
	6	5.0	4.7	4.5	7.6	6.3	4.9	4.9
	7+	37.9	37.4	36.5	51.8	63.8	39.5	38.8
	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 2013.

	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
1975	2.53	2.53	3.26	2.59	1.53	--	1.53	--	--	--	--	--	--	--	2.48	--	--	--	--	--	2.42
1976	2.49	2.49	2.35	2.48	2.05	--	2.05	--	--	--	--	--	--	--	2.46	1.51	1.51	--	--	1.51	2.29
1977	3.29	3.29	2.64	3.27	2.44	--	2.44	--	--	--	--	--	--	--	3.26	2.74	2.74	--	--	2.74	3.21
1978	3.50	3.62	3.07	3.48	3.33	--	3.33	--	--	--	--	--	--	--	3.48	2.69	2.69	--	--	2.69	3.37
1979	2.71	2.71	2.67	2.71	2.29	--	2.29	--	--	--	--	--	--	--	2.70	2.83	2.83	--	--	2.83	2.72
1980	3.00	3.00	2.84	3.00	2.92	--	2.92	2.65	--	2.65	--	--	--	--	2.99	2.96	2.96	--	--	2.96	2.98
1981	3.61	2.97	3.47	3.59	2.62	--	2.62	2.72	--	2.72	--	--	--	--	3.56	3.00	3.00	2.99	--	3.00	3.41
1982	3.25	3.25	2.76	3.24	2.58	--	2.58	2.51	--	2.51	--	--	--	--	3.23	2.81	2.81	2.81	--	2.81	3.12
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
Mean	4.09	3.74	3.66	4.03	4.38	6.58	4.40	5.39	6.72	5.41	8.07	6.82	7.47	7.02	4.31	3.56	3.77	4.82	6.70	3.74	3.98

Table 8. Estimated abundance at age, survival (S), fishing mortality (F) and exploitation (u) for Lake Erie walleye, 1980-2015 (from ADMB 2015 catch at age analysis recruitment integrated model, M=0.32).

	Age							Ages 2+		
Year	2	3	4	5	6	7+	Total	S	F	u
1980	10,170,900	8,946,810	549,322	1,499,090	528,418	118,201	21,812,741	0.594	0.201	0.156
1981	7,077,010	6,473,470	5,032,970	300,646	814,136	339,084	20,037,316	0.559	0.262	0.199
1982	17,099,700	4,391,670	3,472,560	2,610,220	154,366	562,584	28,291,100	0.604	0.184	0.145
1983	10,012,200	10,913,900	2,470,820	1,908,650	1,427,920	367,700	27,101,190	0.620	0.158	0.126
1984	76,638,300	6,625,690	6,528,090	1,463,400	1,132,900	1,048,660	93,437,040	0.664	0.090	0.074
1985	6,488,470	51,652,900	4,128,860	4,028,490	903,298	1,317,500	68,519,518	0.649	0.112	0.091
1986	23,105,000	4,448,920	33,417,900	2,647,260	2,580,300	1,392,020	67,591,400	0.633	0.138	0.110
1987	22,981,300	15,508,400	2,757,230	20,479,400	1,629,310	2,401,590	65,757,230	0.638	0.130	0.105
1988	53,768,900	15,454,100	9,663,610	1,698,050	12,678,800	2,437,660	95,701,120	0.635	0.134	0.108
1989	11,569,800	35,618,400	9,351,870	5,769,480	1,025,110	9,011,190	72,345,850	0.631	0.141	0.113
1990	9,834,070	7,800,360	22,275,100	5,793,140	3,610,500	6,143,440	55,456,610	0.638	0.129	0.104
1991	4,975,350	6,683,240	4,930,570	14,002,500	3,673,060	6,108,370	40,373,090	0.648	0.114	0.093
1992	16,063,300	3,415,600	4,301,200	3,162,830	9,028,360	6,240,640	42,211,930	0.642	0.123	0.099
1993	21,782,200	10,865,100	2,129,330	2,670,790	1,978,920	9,461,680	48,888,020	0.617	0.163	0.129
1994	3,335,550	14,335,400	6,357,260	1,242,530	1,576,720	6,652,140	33,499,600	0.603	0.186	0.146
1995	18,200,000	2,215,730	8,533,380	3,783,840	749,320	4,923,560	38,405,830	0.613	0.170	0.134
1996	19,878,100	11,898,400	1,266,760	4,890,630	2,200,920	3,278,270	43,413,080	0.587	0.213	0.165
1997	2,294,670	12,667,400	6,428,690	685,856	2,697,300	2,998,390	27,772,306	0.575	0.234	0.180
1998	20,777,200	1,492,310	7,174,900	3,644,590	394,597	3,251,650	36,735,247	0.590	0.207	0.161
1999	10,185,400	13,140,400	791,303	3,816,450	1,976,940	1,960,620	31,871,113	0.604	0.185	0.145
2000	9,283,370	6,678,950	7,565,580	456,733	2,237,250	2,299,040	28,520,923	0.616	0.165	0.131
2001	28,672,900	6,152,750	3,939,450	4,474,060	274,313	2,718,840	46,232,313	0.672	0.078	0.064
2002	3,425,950	19,729,800	3,974,800	2,539,250	2,901,250	1,920,900	34,491,950	0.670	0.080	0.066
2003	22,950,800	2,392,210	13,161,600	2,647,550	1,701,100	3,218,560	46,071,820	0.681	0.064	0.053
2004	364,639	16,012,800	1,593,520	8,749,130	1,766,940	3,259,960	31,746,989	0.678	0.068	0.057
2005	94,026,700	259,081	10,858,700	1,078,450	5,941,430	3,393,650	115,558,011	0.698	0.039	0.033
2006	3,248,970	66,268,800	172,859	7,250,740	723,878	6,255,270	83,920,517	0.668	0.084	0.069
2007	6,389,300	2,293,820	44,161,300	115,007	4,846,110	4,630,410	62,435,947	0.669	0.083	0.068
2008	1,697,390	4,519,730	1,530,140	29,354,800	76,664	6,264,750	43,443,474	0.674	0.074	0.061
2009	16,306,700	1,201,020	3,035,120	1,026,410	19,777,700	4,245,960	45,592,910	0.688	0.054	0.045
2010	6,021,820	11,572,200	812,291	2,049,300	695,451	16,226,300	37,377,362	0.684	0.059	0.049
2011	6,531,500	4,289,370	7,896,780	552,922	1,397,960	11,438,900	32,107,432	0.686	0.057	0.048
2012	11,383,000	4,634,820	2,913,210	5,363,480	377,094	8,728,890	33,400,494	0.670	0.080	0.066
2013	8,316,460	7,984,630	3,034,200	1,904,830	3,526,640	5,940,380	30,707,140	0.665	0.088	0.072
2014	4,696,860	5,841,030	5,223,140	1,978,710	1,247,080	6,137,150	25,123,970	0.640	0.126	0.102
2015	7,952,860	3,258,930	3,686,970	3,286,070	1,251,410	4,602,790	24,039,030			

Table 9. Estimated harvest of Lake Erie walleye for 2015, and population projection for 2016 when fishing with 60% Fmsy. The 2015 and 2016 projected spawning stock biomass values are from the ADMB-2015 recruitment-integrated model. The range in the RAH was calculated using ± one standard deviation from the mean RAH.

SSB_0=	55.438	million kilograms
20% SSB_0=	11.088	million kilograms
F_{msy} =	0.526	

	2015 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2015 RAH (millions of fish)			Projected 2016 Stock Size (millions)
Age	**Mean**	**F**	**sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	7.953		0.281	0.089	0.665	0.073	0.426	0.579	0.731	17.557
3	3.259		0.896	0.283	0.547	0.212	0.533	0.692	0.851	5.285
4	3.687		0.927	0.293	0.542	0.219	0.616	0.806	0.997	1.784
5	3.286		0.885	0.279	0.549	0.210	0.524	0.690	0.856	1.998
6	1.251		0.918	0.290	0.544	0.217	0.205	0.271	0.338	1.805
7+	4.603		1.000	0.316	0.530	0.234	0.804	1.075	1.346	3.118
Total (2+)	24.039	0.316				0.171	3.108	4.114	5.119	31.547
Total (3+)	16.086						2.682	3.535	4.388	13.990
SSB	28.634	mil. kgs								25.858 mil. kgs

probability of 2016 spawning stock biomass being less than 20% SSB_0 = 0.048%

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 2014.

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

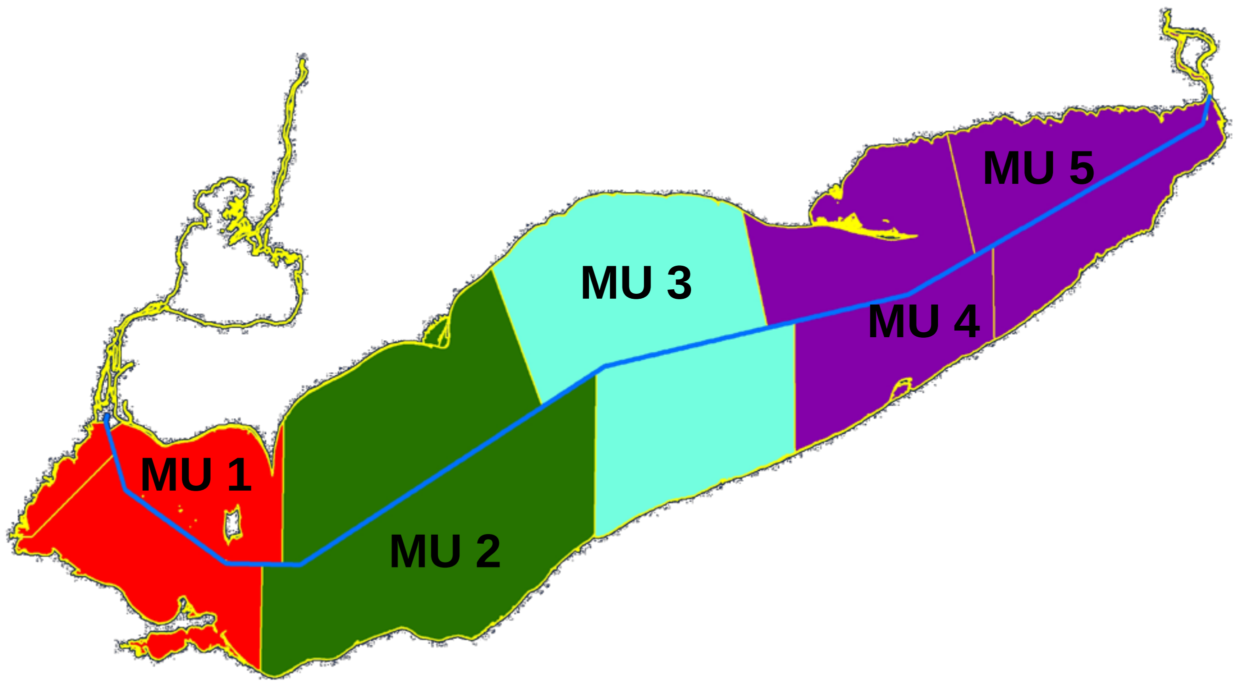

Figure 1. Map of Lake Erie with management units recognized by the Walleye Task Group for interagency management of Walleye.

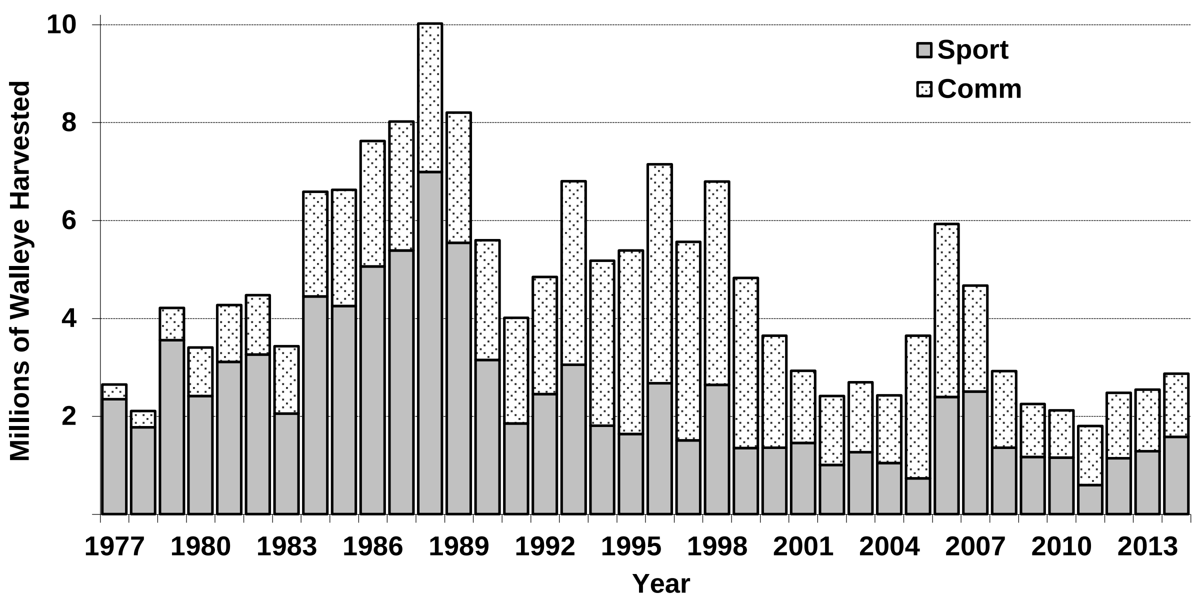

Figure 2. Lake-wide harvest of Lake Erie Walleye by sport and commercial fisheries, 1977-2014.

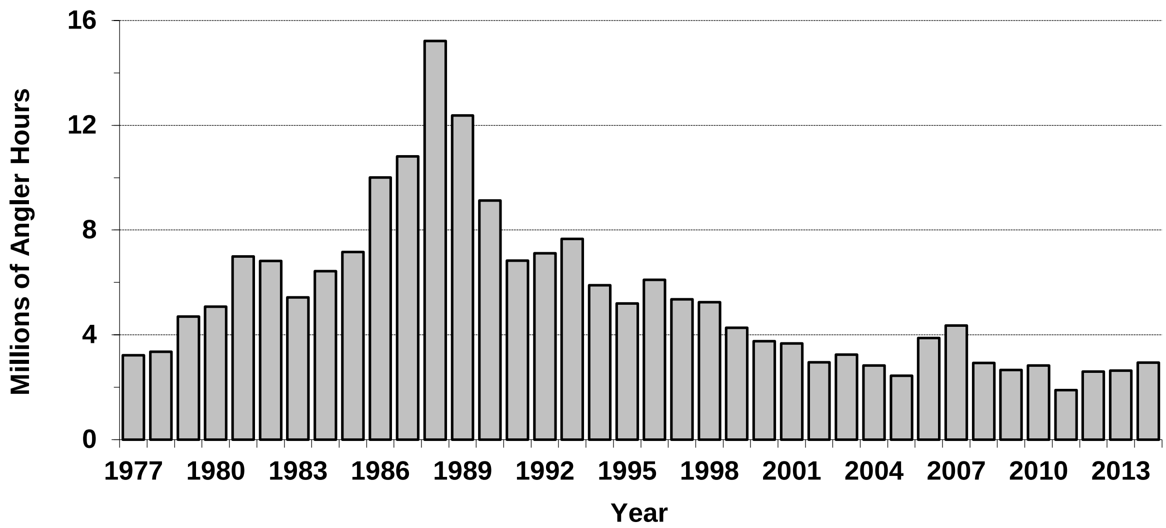

Figure 3. Lake-wide total effort (angler hours) by sport fisheries for Lake Erie Walleye, 1977-2014.

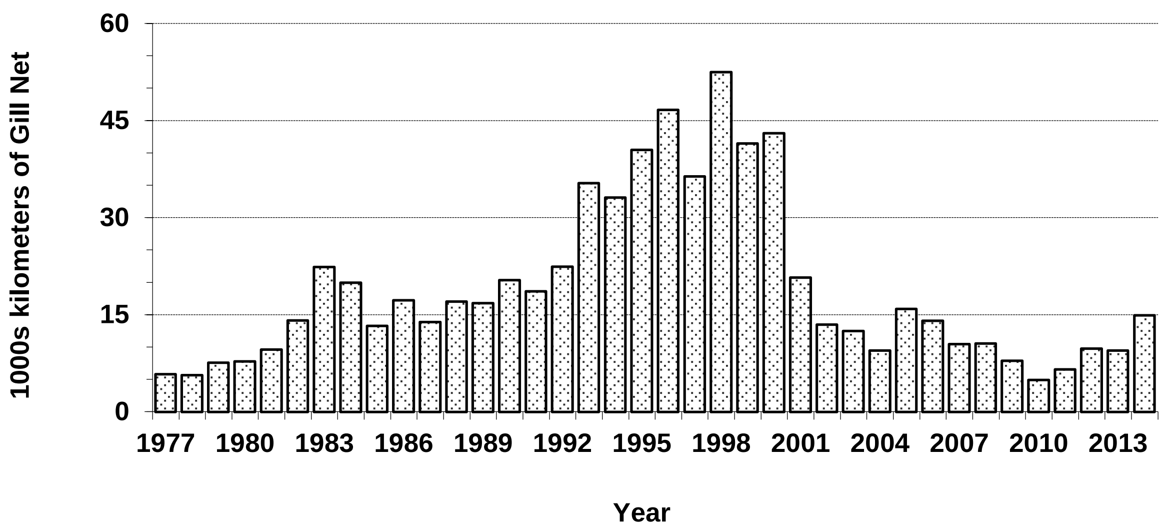

Figure 4. Lake-wide total effort (kilometers of gill net) by commercial fisheries for Lake Erie Walleye, 1977-2014.

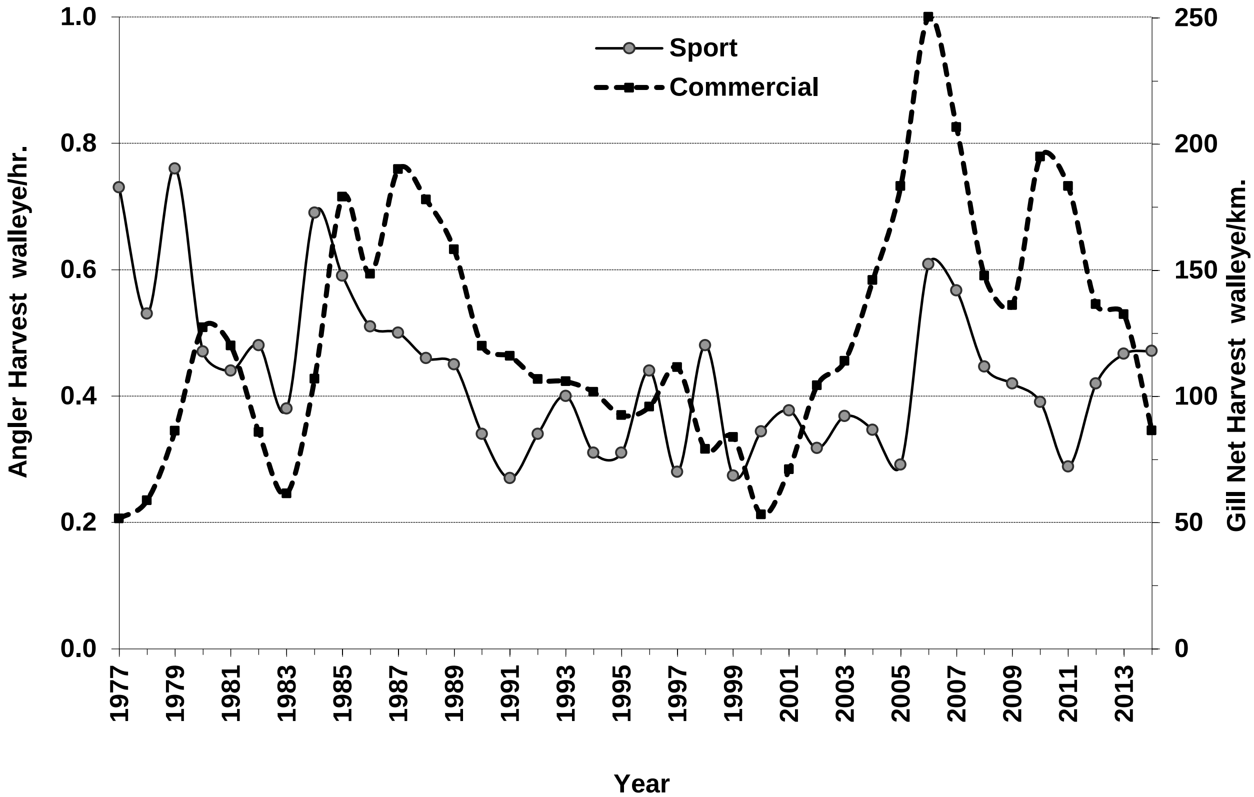

Figure 5. Lake-wide harvest per unit effort (HPE) for Lake Erie sport and commercial Walleye fisheries, 1977-2014.

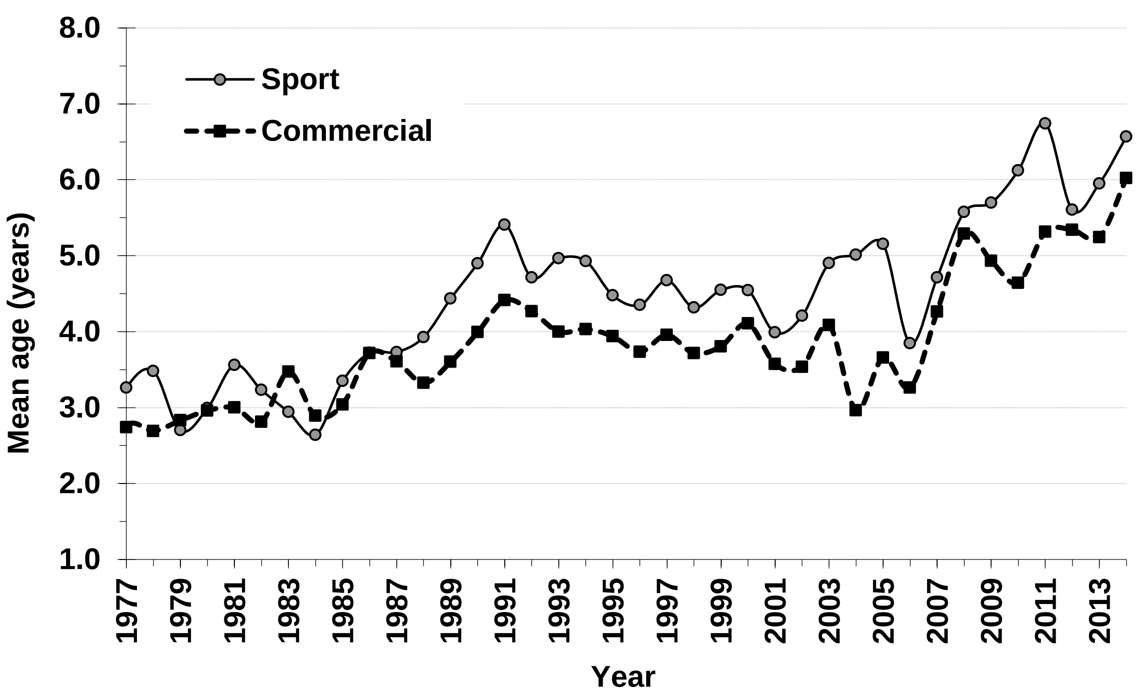

Figure 6. Lake-wide mean age of Lake Erie Walleye in sport and commercial harvests, 1977-2014.

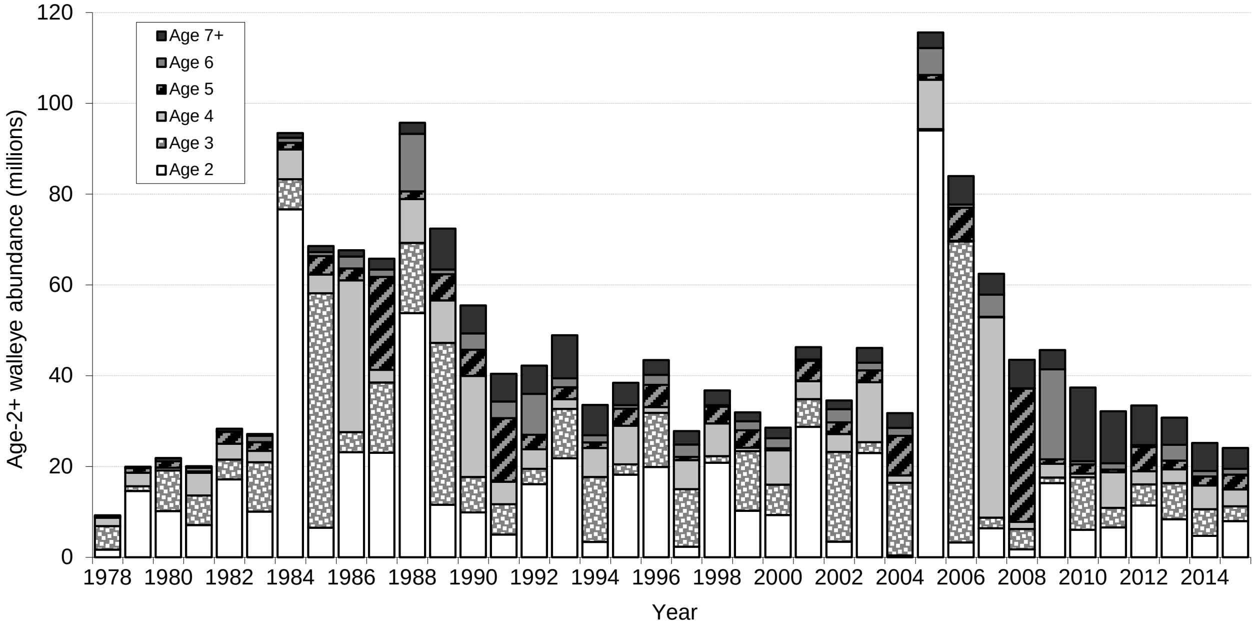

Figure 7. Abundance at age for age-2 and older walleye in Lake Erie's west and central basins from 1978 to 2015, estimated from the latest ADMB integrated model run. Data shown are from Table 8.

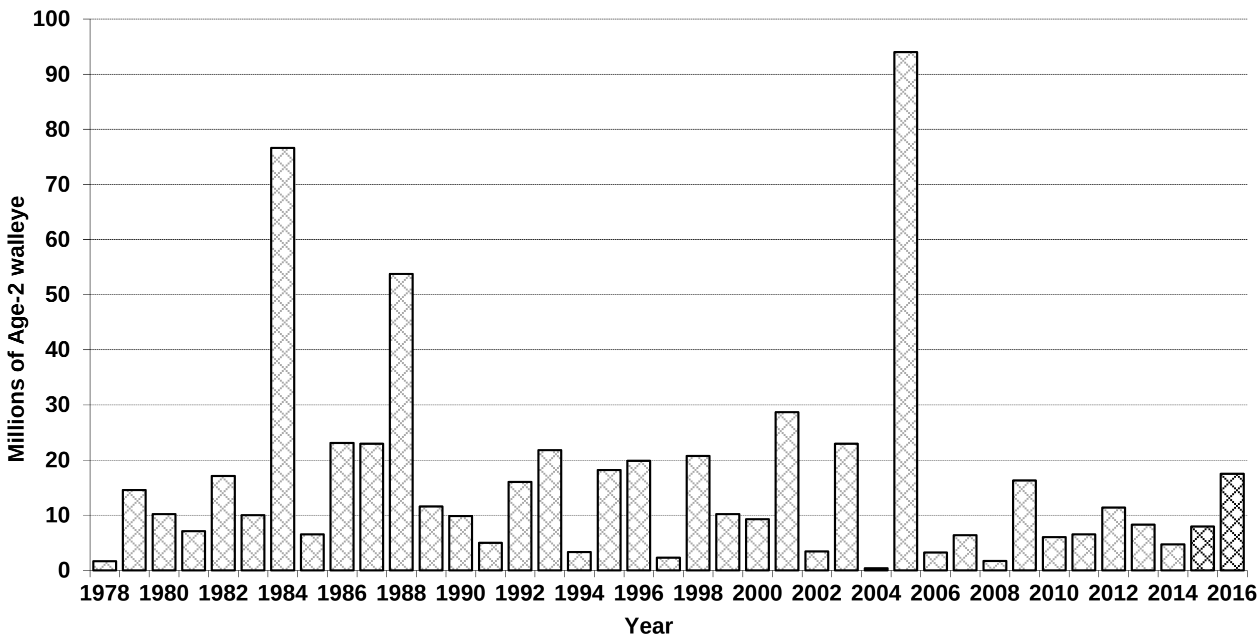

Figure 8. Estimated (1978 – 2014) and projected (2015 and 2016) number of age 2 Walleye in the west-central Lake Erie Walleye population between using the 2015 ADMB statistical catch at age model.

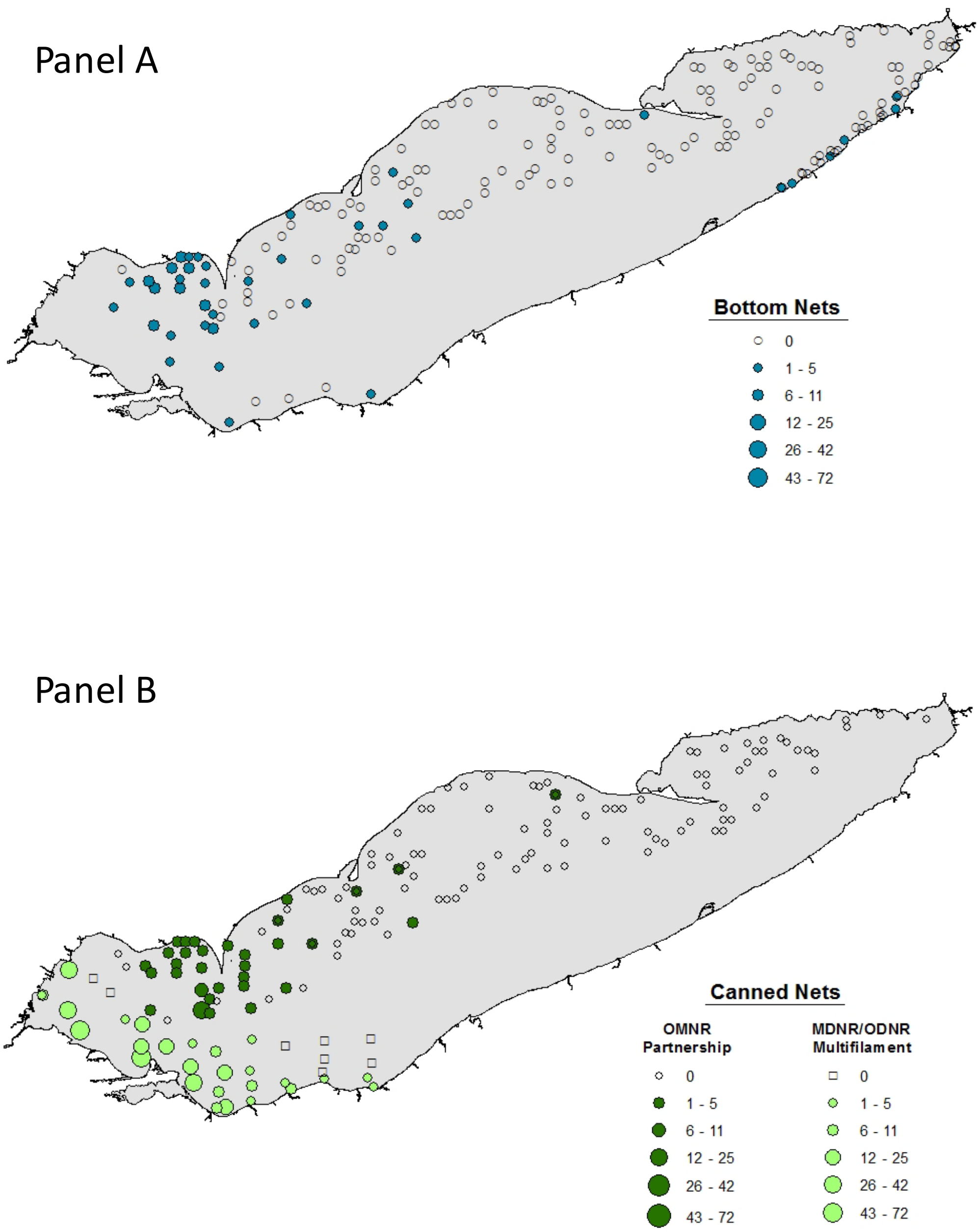

Figure 9. Relative abundance of yearling walleye captured in bottom-set (Panel A) and suspended or kegged multifilament (Panel B) gillnets from Michigan, Ohio, New York, and Ontario waters in 2014. Catches in the bottom-set nets have been adjusted to reflect panel length (standardized to 50ft panels of monofilament) and differences in the presence of large mesh (>5”). Catches in the kegged multifilament gillnets are the observed catches