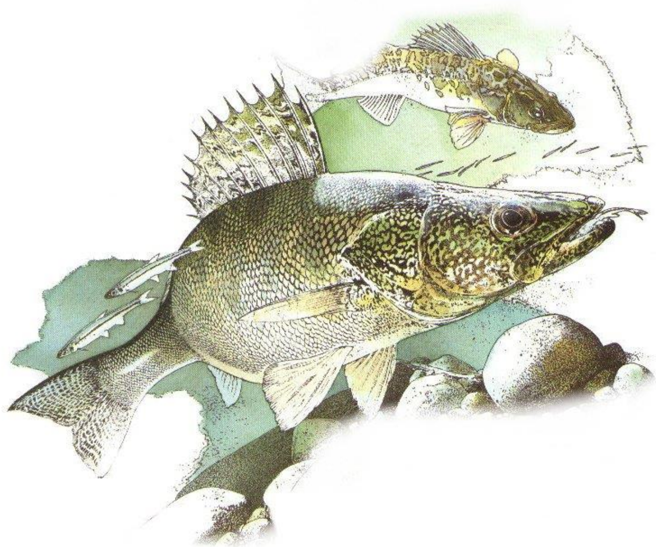
Report for 2016 by the

LAKE ERIE WALLEYE TASK GROUP

March 2017



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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.*

Charges to the Walleye Task Group, 2016-2017

The charges from the Lake Erie Committee's (LEC) Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period from April 2016 to March 2017 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 2017.
4. Provide guidance/recommendations for future tagging strategies to the LEC.

Review of Walleye Fisheries in 2016

Fishery effort and Walleye harvest data were combined for all fisheries, jurisdictions and Management Units (MU) (Figure 1) to produce lake-wide summaries. The 2016 total estimated lake-wide harvest of 3.078 million Walleye (Table 1), with a total of 2.881 million harvested in the total allowable catch (TAC) area. This harvest represents 58% of the 2016 TAC (4.937 million Walleye) and includes Walleye harvested in commercial and sport fisheries in MU 1, 2, and 3. An additional 0.197 million Walleye (6% 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 1.090 million Walleye in 2016 represented an 18% decrease from the 2015 harvest of 1.325 million Walleye; this harvest was 53% below the long-term (1975-2015) average of 2.302 million fish (Table 2). The 2016 Ontario commercial harvest was 1.988 million Walleye lake-wide, with 1.888 million caught in the TAC area (Table 2). The 2016 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 2016; an estimate included in total Walleye harvest, but not used in catch-at-age analysis Total harvest of Walleye in Ontario TAC waters was 1.960 million Walleye, representing 92% of the 2016 Ontario TAC allocation of 2.126 million Walleye. In 2016, the lake-wide Ontario commercial harvest was 43% higher than in 2015, and comparable to (1% below) the long-term average (1978-2015; Table 2, Figure 2).

Sport fishing effort increased 2% in 2016 from 2015 to total 2.944 million angler hours (Table 3, Figure 3). Compared to 2015, sport effort decreased by 22% in MU 2, and 5% in MU 4&5; while it increased in MU 1 and MU 3 by 10% and 16% respectively. Lake-wide commercial gill net effort (20,920 km) increased by 7% from 2015 and remains above the long-term average by 12% (Table 3, Figure 4).

The 2016 lake-wide average sport harvest per unit effort (HUE) of 0.34 Walleye/angler hours, was a 21% decrease from 2015, which was below the long-term average of 0.43 (1979-2015) Walleye/angler hours (Table 4, Figure 5). In 2016, sport harvest per unit of effort (Walleye/angler hour) for all agencies combined decreased to levels at or below long term averages (1979-2015) across all Management Units. MU 1 had the greatest decrease of 27% from 0.51 in 2015 to 0.37 in 2016; while MU 2, 3 and 4&5 decreased by 5% (0.32) ,14% (0.35) and 13%(0.23), respectively.

The total commercial gill net HUE in 2016 (95.0 Walleye/kilometer of net) increased 34% relative to 2015, but remained 21% below the long-term lake-wide average (120.6 Walleye/kilometer; Table 4, Figure 5). Commercial gill net harvest rates increased in MU 1, 2 and 3 by 49%(135.5), 37% (74.6) and 28% (70.4) but decreased by 29% (69.0) in MU 4&5.

Lake-wide harvest in the sport and commercial fisheries, was dominated by age 3 and younger Walleye from the 2013 (14 %), 2014 (32%), and 2015 (15%) year classes (Table 5; Table 6). This was the first time since the 2003 year class (as a part of the age 7 and older group) fully recruited to the fishery (at age 2 in 2005) that it did not comprise the greatest proportion of the fishery (21% of the harvested fish in 2016). In the commercial fishery, harvest of the 2014 (age 2; 39%) and 2015 year class (age 1; 22%) surpassed harvest of the age 7 and older fish that included the 2003 and 2007 age classes (19%). In the sport fishery, catches of the 2013 year class (age 3; 27%) exceeded age 7 and older fish (26%). The proportion of older fish (age 7+) in the sport harvest was greater in MU 3 (41%) and MU 4 (43%) compared to MU 1 (20%) and MU 2 (25%). A higher proportion of younger fish were also observed in the commercial fishery, especially in the western Lake Erie where age 2 fish comprised 55% and 39% of MU 1 and MU 2 harvest, respectively, and age 1 comprised 41% of MU 3 harvest.

Across all jurisdictions, the mean age of Walleye harvested in 2016 ranged from 5.0 to 8.0 yrs. old in the sport fishery, and from 3.3 to 6.8 yrs. old in the Ontario commercial fishery (Table 7, Figure 6). The 2016 harvest marks the first overall decrease in mean age of Walleye harvested since 2011 (Figure 6). Except for the commercial fishery in MU 4&5 this trend was consistent across all Management Units in the sport and commercial fisheries. The mean age of Walleye harvested in the sport fishery decreased by greater than 1 yr in MU 1, 2 and 3. In the commercial fishery, mean age decrease by 1.3 yrs., 2.2 yrs. and 3.6 yrs. in MU 1, 2 and 3, respectively (Table 7). In MU 4&5 the mean age remained relatively stable from 2015 in the sport fishery (decreased 0.06 yrs.) but increased in the commercial fishery (0.6 yrs.) (Table 7). The mean age in the sport fishery (5.7 yrs.), commercial fishery (4.1 yrs.) and total lake wide (4.6 yrs.) remain above the long-term means (1975-2015: 4.4 yrs.old, 3.9 yrs. old, 4.1 yrs. old, respectively). This reversal in age trends represents the moderate to strong 2014 and 2015 year classes recruiting to the fisheries and 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 between 1978 and 2016. 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. Moving forward, WTG and the Quantitative Fisheries Center at Michigan State University will explore options for incorporating the new Ohio data set into the SCAA model and provide recommendations to the LEC for 2018.

The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. This model also 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 (1978-2016) 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 2017 integrated SCAA model, the 2016 west-central population (MU 1-3) was estimated at 30.626 million age 2 and older Walleye (Table 8, Figure 7). An estimated, 15.882 million age 2 (2014 year class) fish represents 52% of the estimated Walleye population (age 2 and older). Age 7+ fish (2009 and older year classes) represented the second largest (15%) and age 3 (2013 year class) the third largest (13%) components of the population. Based on the integrated model, the number of age 2 recruits entering the population in 2017 (2015 year class) and 2018 (2016 year class) will be 35.384 and 6.121 million Walleye, respectively (Table 9; Figure 8). The 2017 projected abundance of age 2 and older Walleye in the west-central population will be 55.573 million fish (Table 8; Figure 7).

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[1] In 2016, ODNR switched to a new monofilament index gill net configuration. ODNR's multifilament gill nets were 1300 ft (396 m) in length, 6 ft (1.8m) deep with 100 ft panels consisting of mesh sizes 2 to 5 inches (51-127 mm stretched) and twine diameter of 0.37mm. The new monofilament gill nets are 1200 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).

Harvest Policy and Recommended Allowable Harvest (RAH) for 2017

In March 2017, 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 2017 integrated SCAA model, the estimated abundance of 55.573 million age 2 and older Walleye in 2017, and a harvest policy (described above), the calculated mean RAH for 2017 was 6.965 million Walleye, with a range from 5.180 (minimum) to 8.751 (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. The target fishing rate, (60%F_{MSY} =0.289) in the harvest policy was applied since the probability of the projected spawner biomass in 2018 (44.182 million kg) falling below the limit reference point ($SSB_{20\%}$ = 12.335 million kg) after fishing at 60%F_{MSY} in 2017 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 2017 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 2016 TAC (4.937 million fish), and the range in the 2017 TAC for LEC consideration would be from 3.950 million fish to 5.924 million fish.

Other Walleye Task Group Charges

Centralized Datasets

WTG members currently manage several databases. These databases 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

There is scientific evidence of multiple Walleye stocks in Lake Erie, 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 eastern waters in the summer, and then return to the west basin in late fall. While juvenile Walleye from both west or 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 Ohio 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; bottom set New York monofilament index nets; and, suspended and bottom set Ontario monofilament nets fished in 2016. Catches were standardized for net length (50ft 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 50ft panel for mesh sizes ≥ 2” (51 mm). New York’s index gill nets were fished exclusively on bottom and confined to shallower depths than nets fished in Ontario’s waters of eastern Lake Erie (Figure 9a).

In 2016, yearling Walleye catches occurred lake-wide where index nets were fished (Figures 9a and b). Yearling Walleye densities appeared greater in west and central basins than in the eastern basin. Yearling Walleye catches in New York bottom set nets on the south shore exceeded bottom set nets fished in Ontario waters on the north shore (Figure 9a). Yearling Walleye catches in suspended nets appeared comparable throughout western Lake Erie (Figure 9b). Catches of age 1 Walleye were extensive throughout central Lake Erie (Figure 9b). In Ontario waters of the central basin, yearling Walleye densities appeared higher in the east-central basin compared to the west-central basin, contrary to the more commonly observed west to east decline in yearling Walleye abundance.

When bottom set and suspended nets were fished in the same area, yearling catches in bottom set nets exceeded suspended nets in the west and central basins, whereas suspended nets exceed bottom set nets in eastern basin (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 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 a couple of factors limiting the integration of a composite recruitment index into the SCAA model.

First, 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.

The second issue is the spatial and temporal variability in Walleye YOY and yearling indices with gear type (bottom set vs. suspended gill nets), along with inconsistencies in sampling intensity and effort. Principal Components Analysis (PCA) of the available recruitment indices 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 2016 change in ODNR index gill net configuration represents another challenge as a correction factor for the new monofilament from the historical multifilament gill net has yet to be derived for this spatially and temporally extensive survey.

The WTG will continue working 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 task group will 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)

Lisa Peterson, a Ph.D. candidate at the Quantitative Fisheries Center at Michigan State University, has been developing methods for estimating natural mortality using acoustic telemetry. Using the Great Lake Acoustic Observatory system (GLATOS), she can take advantage of on-going (since 2010) acoustic tagging projects of Walleye in Lake Erie to evaluate mortality of adult Walleye. Unlike other methods for estimating mortality, acoustic tags are internal and do not require recapture and reporting by a fishery to acquire data. The goal of the project is to develop an approach for estimating mortality components and movements of Walleye from acoustic telemetry data, then use this approach to estimate mortality components for different Walleye spawning populations. To date a simulation framework has been used to evaluate different analytical approaches (both a spatial and non-spatial models) under different fisheries scenarios including different ‘true’ mortality rates and different configurations of acoustic receiver deployments (e.g. grids versus gates). Future work includes model diagnostics and sensitivity analysis to different fish movement scenarios. Preliminary results from the simulation framework were presented during the 2017 WTG meeting with future updates expected from Lisa as Lake Erie Walleye data are applied in the models and “real” estimates of natural mortality are generated.

In addition to acoustic tagging research, interagency 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 completion of the interagency and Lisa Peterson's work, future comparisons should be possible among the different methods for estimating natural mortality.

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 variability associated with the annual age and size structure of the Walleye population migrating from the west basin. Further, it is unlikely that migration occurs consistently each year. Zhao et al. (2011) suggested 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 better understand the 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 also contribute to describing and assessing eastern production independent of western. Apparent from that exercise is the potential for intra-basin differences in eastern production (Figure 9a), perhaps related to unique characteristics of local stocks. Assumptions based on movement patterns, and site fidelity, will also be informed in the future by ongoing, lake wide, spatial ecology studies (*Studies Using Acoustic Telemetry;* below)

The WTG member agencies from the east basin continue assessment surveys to track changes in the abundance of the 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. The task group is optimistic that ongoing eastern basin-specific additions to the Lake Erie Walleye Acoustic Telemetry Studies (below) will contribute substantially to incorporating the east basin into the lake-wide Walleye management structure.

Additional Walleye Task Group Activities

Studies Using Acoustic Telemetry

In 2010, an inter-lake Walleye spatial ecology 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 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). 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 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 study was funded by the Great Lakes Fishery Commission, Ohio Department of Natural Resources and the Ontario Ministry of Natural Resources and is 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. 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 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. Acoustic transmitters and external reward tags were applied to 70 spawning Walleye (35 males and 35 females) from the Van Burn Bay stock, and 70 Walleye (35 males and 35 females) from the Grand River stock in the spring 2015. 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”. 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.

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 lowhead dam 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 remove the first upstream barrier on the Grand River.

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 2016. TAC allocations for 2016 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 (MU 4&5)				All Areas
Year		Michigan	Ohio	Ontario [a]	Total	NY	Penn.	Ontario	Total	Total
1980	TAC	261,700	1,558,600	1,154,100	2,974,400				0	2,974,400
	Har	**183,140**	**2,169,800**	**1,049,269**	**3,402,209**				**0**	**3,402,209**
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**
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**

[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 (MU), and agency. Means contain data from 1975 to 2015.

	Sport Fishery															Commercial Fishery					
	MU 1				MU 2			MU 3			MU 4&5					MU 1	MU 2	MU 3	MU 4&5		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
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
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
Mean	1,512	259	40	1,811	270	10	276	166	12	175	8	66	38	62	2,302	1,364	430	285	34	2,008	4,311

[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 (MU), and agency. Means contain data from 1975 to 2015.

	Sport Fishery [a]															Commercial Fishery [b]				
	MU 1				MU 2			MU 3			MU 4&5					MU 1	MU 2	MU 3	MU 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
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	3,555	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
Mean	2,978	687	102	3,729	755	62	771	415	111	448	106	212	231.9	262	5,155	8,923	5,517	4,518	585	18,659

[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 (MU), and agency. Means contain data from 1975 to 2015.

	Sport Fishery [a]															Commercial Fishery [b]				
	MU 1				MU 2			MU 3			MU 4&5					MU 1	MU 2	MU 3	MU 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
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	0.18	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
Mean	0.48	0.36	0.40	0.46	0.33	0.26	0.33	0.38	0.19	0.37	0.11	0.32	0.17	0.23	0.43	170.9	86.4	70.4	68.7	120.6

[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 (MU), gear, and agency in Lake Erie during 2016.

		Commercial	Sport					All Gear
Unit	Age	Ontario	Ohio	Michigan	New York	Pennsylvania	Total	Total
MU 1	1	146,854					0	146,854
	2	518,794	102,003	9,464			111,467	630,261
	3	84,995	194,269	20,002			214,271	299,266
	4	31,596	49,553	8,890			58,443	90,039
	5	41,062	69,026	11,027			80,053	121,115
	6	21,752	43,984	3,542			47,526	69,278
	7+	100,448	118,202	12,891			131,093	231,541
	Total	945,501	577,037	65,816	--	--	642,853	1,588,354
MU 2	1	142,355					0	142,355
	2	233,249	41,766				41,766	275,015
	3	31,576	30,675				30,675	62,251
	4	18,653	7,197				7,197	25,850
	5	28,588	12,456				12,456	41,044
	6	23,923	11,658				11,658	35,581
	7+	115,757	35,177				35,177	150,934
	Total	594,101	138,929	--	--	--	138,929	733,030
MU 3	1	142,889					0	142,889
	2	12,198	33,467				33,467	45,665
	3	18,498	21,158				21,158	39,656
	4	20,762	5,586				5,586	26,348
	5	36,167	11,562				11,562	47,729
	6	20,768	10,474				10,474	31,242
	7+	96,912	57,604				57,604	154,516
	Total	348,194	139,851	--	--	--	139,851	488,045
MU 4&5	1	7,602					0	7,602
	2	1,492			0	6,383	6,383	7,875
	3	3,250			0	3,319	3,319	6,569
	4	5,041			20,602	3,830	24,432	29,473
	5	5,052			361	1,532	1,893	6,945
	6	19,180			7,952	3,575	11,527	30,707
	7+	58,267			22,048	14,298	36,346	94,613
	Total	99,884	--	--	50,963	32,937	83,900	183,784
All	1	439,700	0	0	0	0	0	439,700
	2	765,733	177,236	9,464	0	6,383	193,083	958,816
	3	138,319	246,102	20,002	0	3,319	269,423	407,742
	4	76,052	62,336	8,890	20,602	3,830	95,658	171,710
	5	110,869	93,044	11,027	361	1,532	105,964	216,833
	6	85,623	66,116	3,542	7,952	3,575	81,185	166,808
	7+	371,384	210,983	12,891	22,048	14,298	260,219	631,603
	Total	1,987,680	855,817	65,816	50,963	32,937	1,005,533	2,993,213

Table 6. Age composition (in percent) of Walleye harvest by management unit (MU), gear, and agency in Lake E during 2016.

		Commercial	Sport					All Gears
Unit	Age	Ontario	Ohio	Michigan	New York	Pennsylvania	Total	Total
MU 1	1	15.5	0.0	0.0	--	--	0.0	9.2
	2	54.9	17.7	14.4	--	--	17.3	39.7
	3	9.0	33.7	30.4	--	--	33.3	18.8
	4	3.3	8.6	13.5	--	--	9.1	5.7
	5	4.3	12.0	16.8	--	--	12.5	7.6
	6	2.3	7.6	5.4	--	--	7.4	4.4
	7+	10.6	20.5	19.6	--	--	20.4	14.6
	Total	100.0	100.0	100.0	--	--	100.0	100.0
MU 2	1	24.0	0.0	--	--	--	0.0	19.4
	2	39.3	30.1	--	--	--	30.1	37.5
	3	5.3	22.1	--	--	--	22.1	8.5
	4	3.1	5.2	--	--	--	5.2	3.5
	5	4.8	9.0	--	--	--	9.0	5.6
	6	4.0	8.4	--	--	--	8.4	4.9
	7+	19.5	25.3	--	--	--	25.3	20.6
	Total	100.0	100.0	--	--	--	100.0	100.0
MU 3	1	41.0	0.0	--	--	--	0.0	29.3
	2	3.5	23.9	--	--	--	23.9	9.4
	3	5.3	15.1	--	--	--	15.1	8.1
	4	6.0	4.0	--	--	--	4.0	5.4
	5	10.4	8.3	--	--	--	8.3	9.8
	6	6.0	7.5	--	--	--	7.5	6.4
	7+	27.8	41.2	--	--	--	41.2	31.7
	Total	100.0	100.0	--	--	--	100.0	100.0
MU 4&5	1	7.6	--	--	0.0	0.0	0.0	4.1
	2	1.5	--	--	0.0	19.4	7.6	4.3
	3	3.3	--	--	0.0	10.1	4.0	3.6
	4	5.0	--	--	40.4	11.6	29.1	16.0
	5	5.1	--	--	0.7	4.7	2.3	3.8
	6	19.2	--	--	15.6	10.9	13.7	16.7
	7+	58.3	--	--	43.3	43.4	43.3	51.5
	Total	100.0	--	--	100.0	100.0	100.0	100.0
All	1	22.1	0.0	0.0	0.0	0.0	0.0	14.7
	2	38.5	20.7	14.4	0.0	19.4	19.2	32.0
	3	7.0	28.8	30.4	0.0	10.1	26.8	13.6
	4	3.8	7.3	13.5	40.4	11.6	9.5	5.7
	5	5.6	10.9	16.8	0.7	4.7	10.5	7.2
	6	4.3	7.7	5.4	15.6	10.9	8.1	5.6
	7+	18.7	24.7	19.6	43.3	43.4	25.9	21.1
	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 (MU), and agency. Means include data from 1975 to 2015.

	Sport Fishery															Commercial Fishery					All Gears
	MU 1				MU 2			MU 3			MU 4&5					MU 1	MU 2	MU 3	MU 4&5		
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
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
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
Mean	4.18	3.85	3.66	4.13	4.51	6.58	4.53	5.56	6.72	5.58	8.07	6.96	7.51	7.09	4.43	3.63	3.89	5.02	6.87	3.86	4.10

Table 8. Estimated abundance at age, survival (S), fishing mortality (F) and exploitation (u) for Lake Erie Walleye, 1980-2017 (from ADMB 2017 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	10,875,700	9,611,310	599,933	1,675,430	612,543	153,385	23,528,301	0.604	0.184	0.145
1981	7,609,860	6,985,850	5,516,140	337,380	945,799	424,233	21,819,262	0.572	0.238	0.182
1982	18,518,800	4,780,340	3,845,770	2,961,890	181,862	718,386	31,007,048	0.615	0.166	0.132
1983	10,910,000	11,943,800	2,754,230	2,179,560	1,688,550	496,585	29,972,725	0.630	0.142	0.114
1984	83,202,000	7,272,130	7,282,260	1,669,800	1,332,760	1,327,220	102,086,170	0.669	0.082	0.068
1985	7,026,050	56,400,700	4,598,560	4,576,300	1,055,340	1,664,060	75,321,010	0.656	0.101	0.083
1986	24,933,200	4,837,840	36,862,700	2,987,210	2,983,220	1,753,850	74,358,020	0.641	0.124	0.100
1987	24,889,300	16,824,200	3,037,760	22,977,900	1,879,190	2,958,090	72,566,440	0.646	0.117	0.095
1988	58,075,000	16,820,200	10,610,300	1,900,760	14,517,800	3,025,730	104,949,790	0.643	0.122	0.099
1989	12,433,900	38,695,600	10,323,200	6,454,530	1,174,100	10,802,100	79,883,430	0.639	0.127	0.103
1990	10,537,100	8,420,500	24,477,800	6,491,750	4,113,280	7,573,880	61,614,310	0.647	0.116	0.094
1991	5,311,190	7,185,840	5,378,300	15,592,800	4,183,770	7,508,190	45,160,090	0.656	0.101	0.082
1992	17,180,400	3,656,200	4,667,080	3,489,550	10,201,300	7,626,040	46,820,570	0.650	0.111	0.090
1993	23,450,700	11,655,200	2,303,630	2,936,920	2,221,020	11,322,700	53,890,170	0.626	0.148	0.118
1994	3,581,820	15,499,200	6,930,500	1,370,910	1,777,000	8,174,440	37,333,870	0.615	0.165	0.131
1995	19,787,900	2,389,910	9,380,540	4,206,800	846,370	6,155,090	42,766,610	0.624	0.152	0.121
1996	21,895,800	13,017,400	1,398,010	5,518,450	2,523,130	4,215,730	48,568,520	0.601	0.189	0.148
1997	2,536,650	14,087,100	7,261,670	784,672	3,171,860	3,888,400	31,730,352	0.594	0.201	0.157
1998	23,560,600	1,665,870	8,224,850	4,258,370	469,016	4,229,260	42,407,966	0.607	0.179	0.141
1999	11,720,100	15,112,200	922,046	4,584,890	2,432,500	2,697,430	37,469,166	0.622	0.155	0.123
2000	10,842,500	7,780,580	9,018,830	553,201	2,801,880	3,147,460	34,144,451	0.634	0.136	0.109
2001	33,833,200	7,275,240	4,752,820	5,536,850	345,558	3,733,440	55,477,108	0.681	0.065	0.054
2002	3,997,850	23,461,000	4,794,140	3,131,350	3,676,910	2,702,900	41,764,150	0.680	0.065	0.054
2003	26,944,300	2,807,150	15,875,100	3,244,060	2,133,230	4,346,940	55,350,780	0.689	0.053	0.044
2004	410,126	18,905,800	1,896,980	10,723,000	2,203,480	4,394,220	38,533,606	0.687	0.055	0.046
2005	109,455,000	292,063	12,964,200	1,300,040	7,382,990	4,536,450	135,930,743	0.702	0.034	0.029
2006	3,717,460	77,402,400	197,667	8,790,770	887,143	8,143,270	99,138,710	0.677	0.070	0.058
2007	7,307,580	2,631,460	52,260,300	133,460	5,971,650	6,126,600	74,431,050	0.678	0.069	0.057
2008	1,904,140	5,179,630	1,776,710	35,227,500	90,407	8,173,140	52,351,527	0.683	0.061	0.051
2009	18,447,900	1,350,030	3,515,310	1,206,110	24,052,600	5,637,030	54,208,980	0.694	0.046	0.038
2010	6,744,450	13,112,500	921,405	2,398,270	826,936	20,348,700	44,352,261	0.691	0.050	0.041
2011	6,810,660	4,809,130	9,013,180	632,550	1,652,550	14,541,000	37,459,070	0.692	0.049	0.041
2012	11,167,000	4,839,960	3,292,080	6,175,990	435,728	11,159,400	37,070,158	0.676	0.071	0.059
2013	8,427,630	7,844,420	3,201,560	2,178,670	4,119,270	7,724,390	33,495,940	0.671	0.079	0.065
2014	4,005,200	5,921,560	5,173,020	2,108,710	1,444,750	7,828,180	26,481,420	0.647	0.116	0.094
2015	5,747,760	2,780,610	3,775,360	3,293,970	1,354,790	5,926,060	22,878,550	0.644	0.119	0.097
2016	15,881,700	3,963,630	1,741,890	2,363,760	2,085,120	4,589,830	30,625,930	0.659	0.097	0.079
2017	35,384,100	10,935,000	2,473,200	1,086,670	1,492,210	4,201,990	55,573,170			

Table 9. Estimated harvest of Lake Erie Walleye for 2017, and population projection for 2018 when fishing with 60% F_{msy}. The 2017 and 2018 projected spawning stock biomass values are from the ADMB-2017 recruitment-integrated model. The range in the RAH was calculated using ± one standard deviation from the mean RAH.

SSB_0= 61.673 million kilograms

20% SSB_0= 12.335 million kilograms

F_{msy} = 0.481

	2017 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2017 RAH (millions of fish)			Projected 2018 Stock Size (millions)
Age	**Mean**	**F**	**Sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	35.384		0.322	0.093	0.662	0.076	1.962	2.690	3.418	6.121
3	10.935		0.977	0.282	0.548	0.212	1.765	2.316	2.867	23.417
4	2.473		1.000	0.289	0.544	0.216	0.400	0.535	0.669	5.990
5	1.087		0.929	0.268	0.555	0.203	0.162	0.220	0.278	1.346
6	1.492		0.937	0.270	0.554	0.204	0.224	0.305	0.386	0.603
7+	4.202		0.989	0.285	0.546	0.214	0.667	0.900	1.133	3.120
Total (2+)	55.573	0.289				0.125	5.180	6.965	8.751	40.598
Total (3+)	20.189						3.218	4.275	5.333	34.477
SSB	37.583	mil. kgs								44.182 mil. kgs

probability of 2017 spawning stock biomass being less than 20% SSB_0 = 0.000%

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 2016.

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

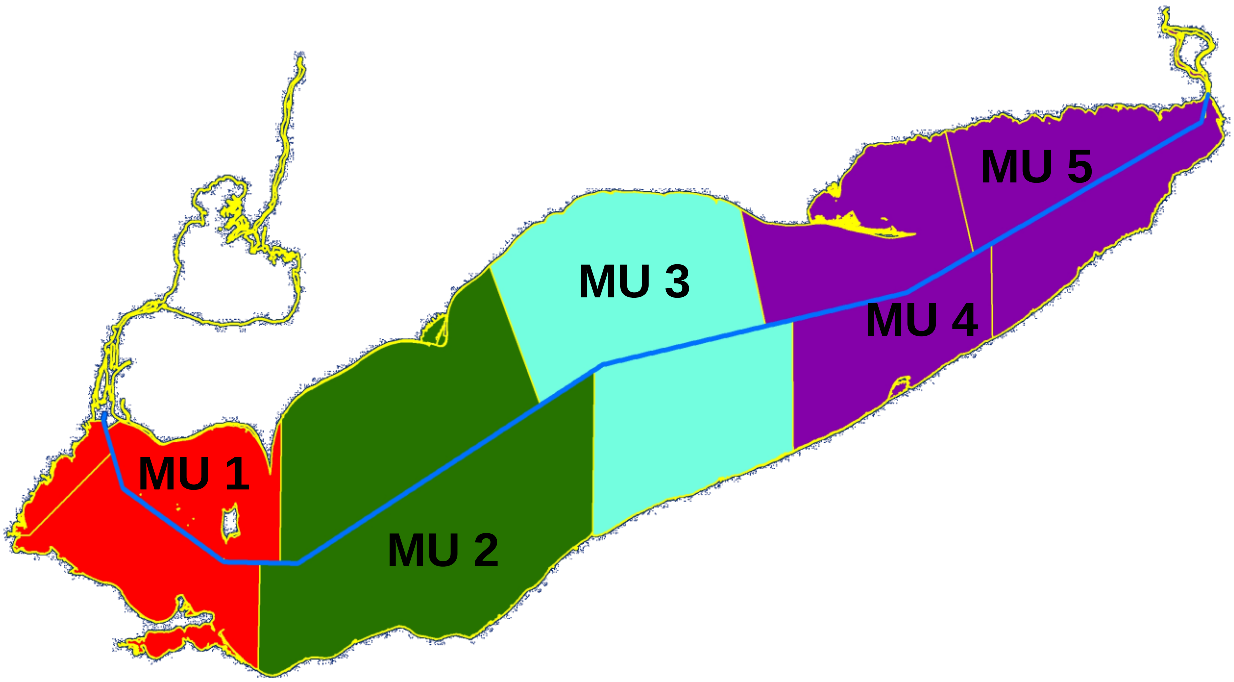

Figure 1. Map of Lake Erie with management units (MU) recognized by the Walleye Task Group for interagency management of Walleye.

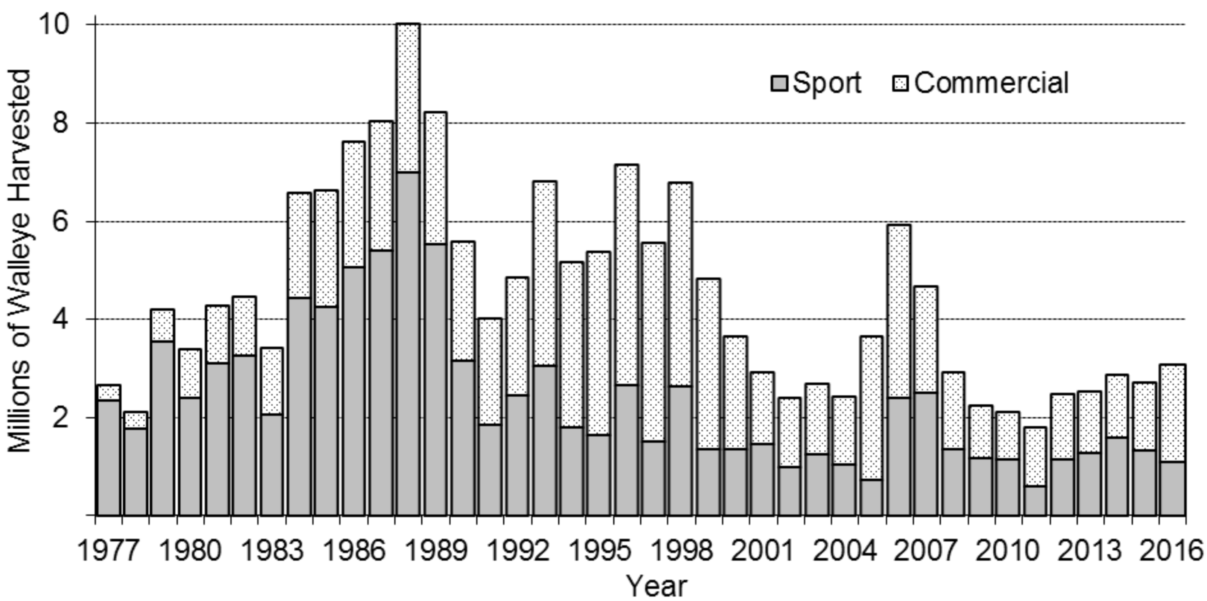

Figure 2. Lake-wide harvest of Lake Erie Walleye by sport and commercial fisheries, 1977-2016.

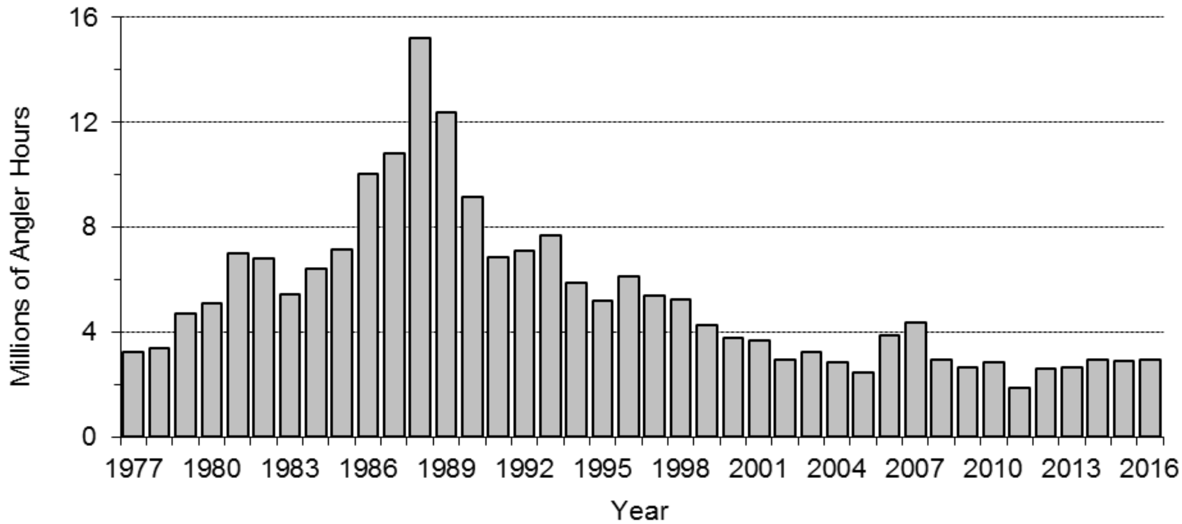

Figure 3. Lake-wide total effort (angler hours) by sport fisheries for Lake Erie Walleye, 1977-2016.

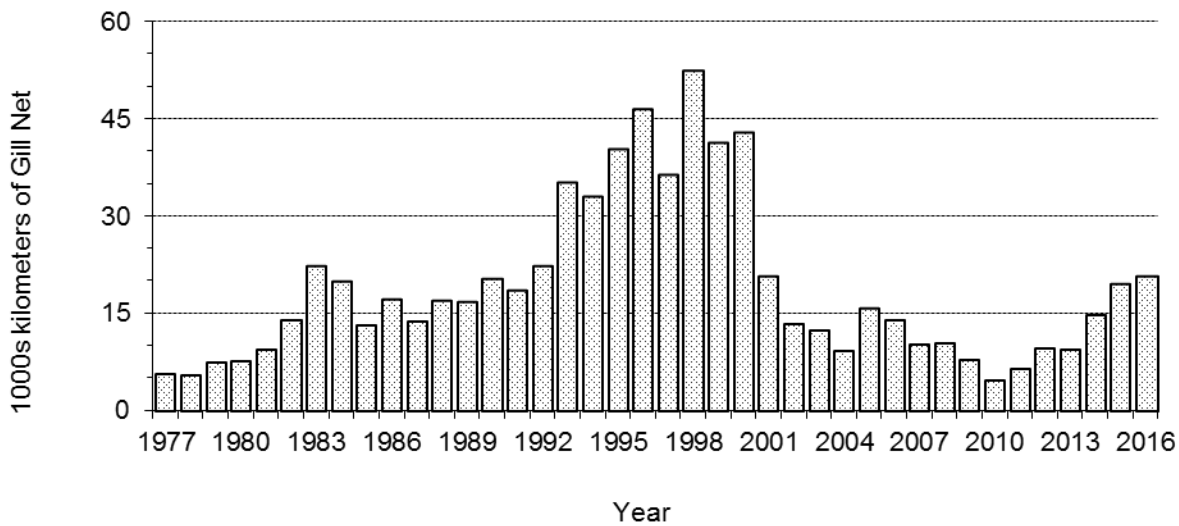

Figure 4. Lake-wide total effort (kilometers of gill net) by commercial fisheries for Lake Erie Walleye, 1977-2016.

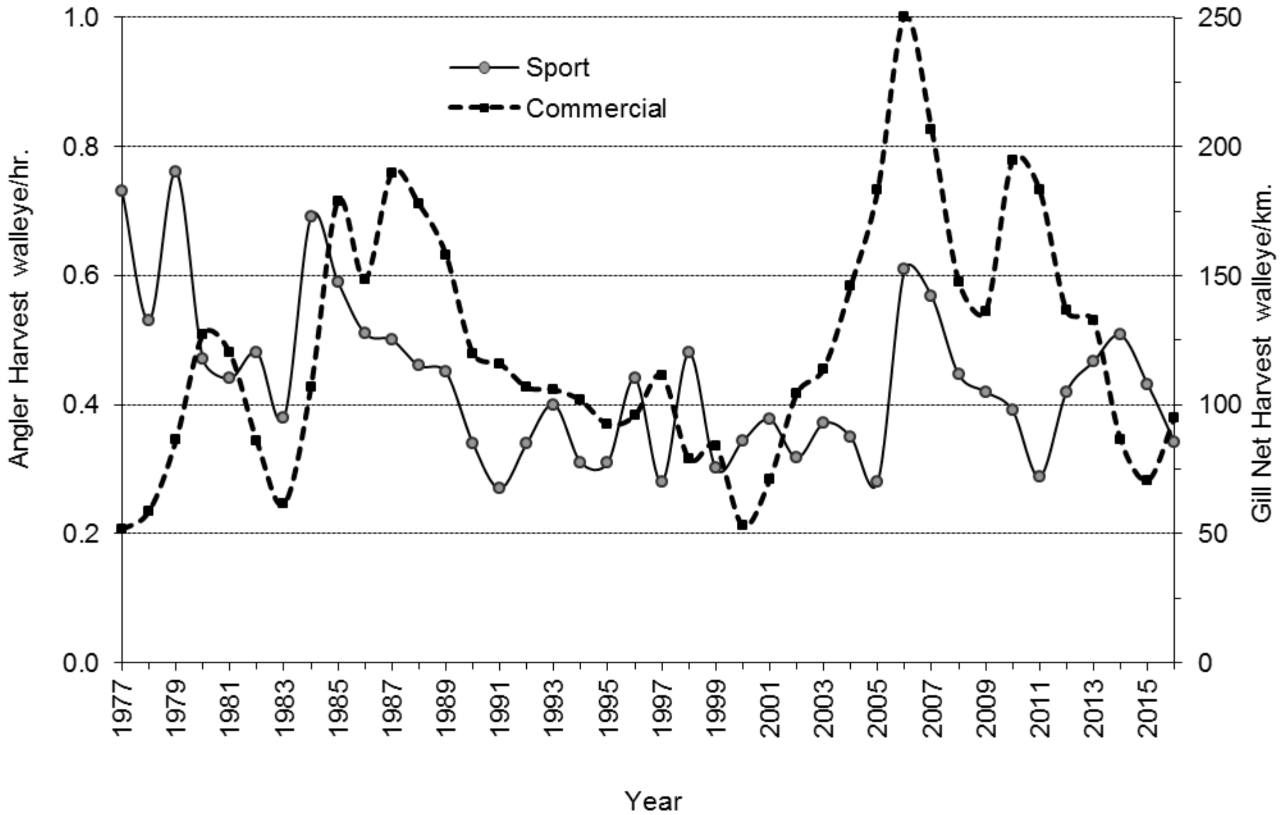

Figure 5. Lake-wide harvest per unit effort (HPE) for Lake Erie sport and commercial Walleye fisheries, 1977-2016.

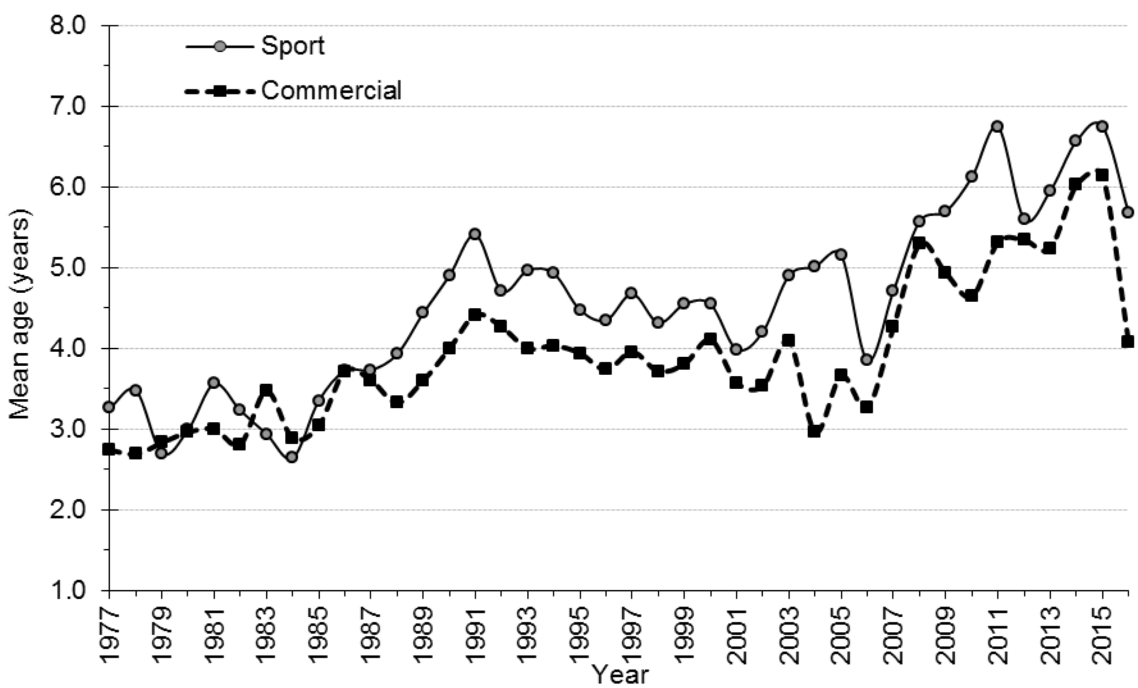

Figure 6. Lake-wide mean age of Lake Erie Walleye in sport and commercial harvests, 1977-2016.

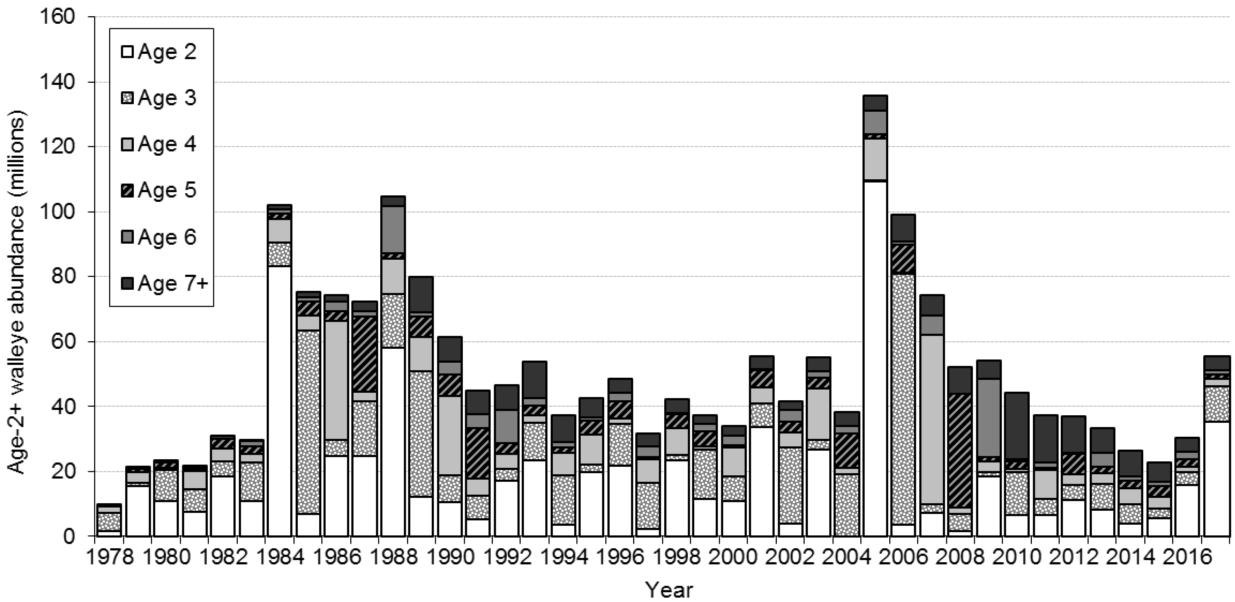

Figure 7. Abundance at age for age-2 and older Walleye in Lake Erie's west and central basins from 1978 to 2017, estimated from the latest ADMB integrated model run. Data shown are from Table 8.

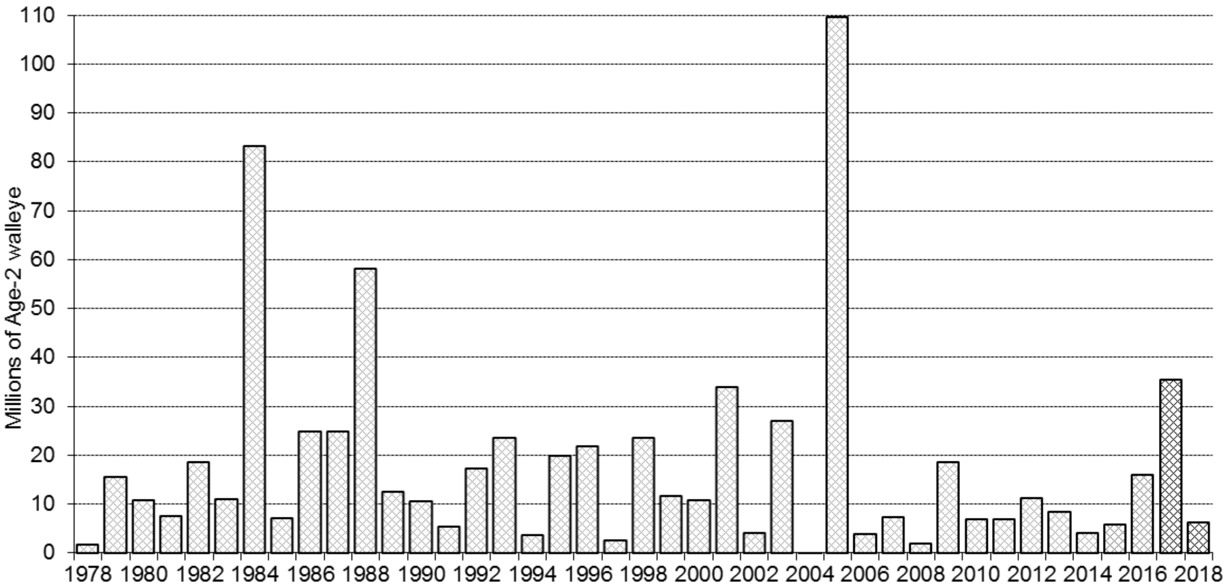

Figure 8. Estimated (1978 – 2016) and projected (2017 and 2018) number of age 2 Walleye in the west-central Lake Erie Walleye population between using the 2017 ADMB statistical catch at age model.

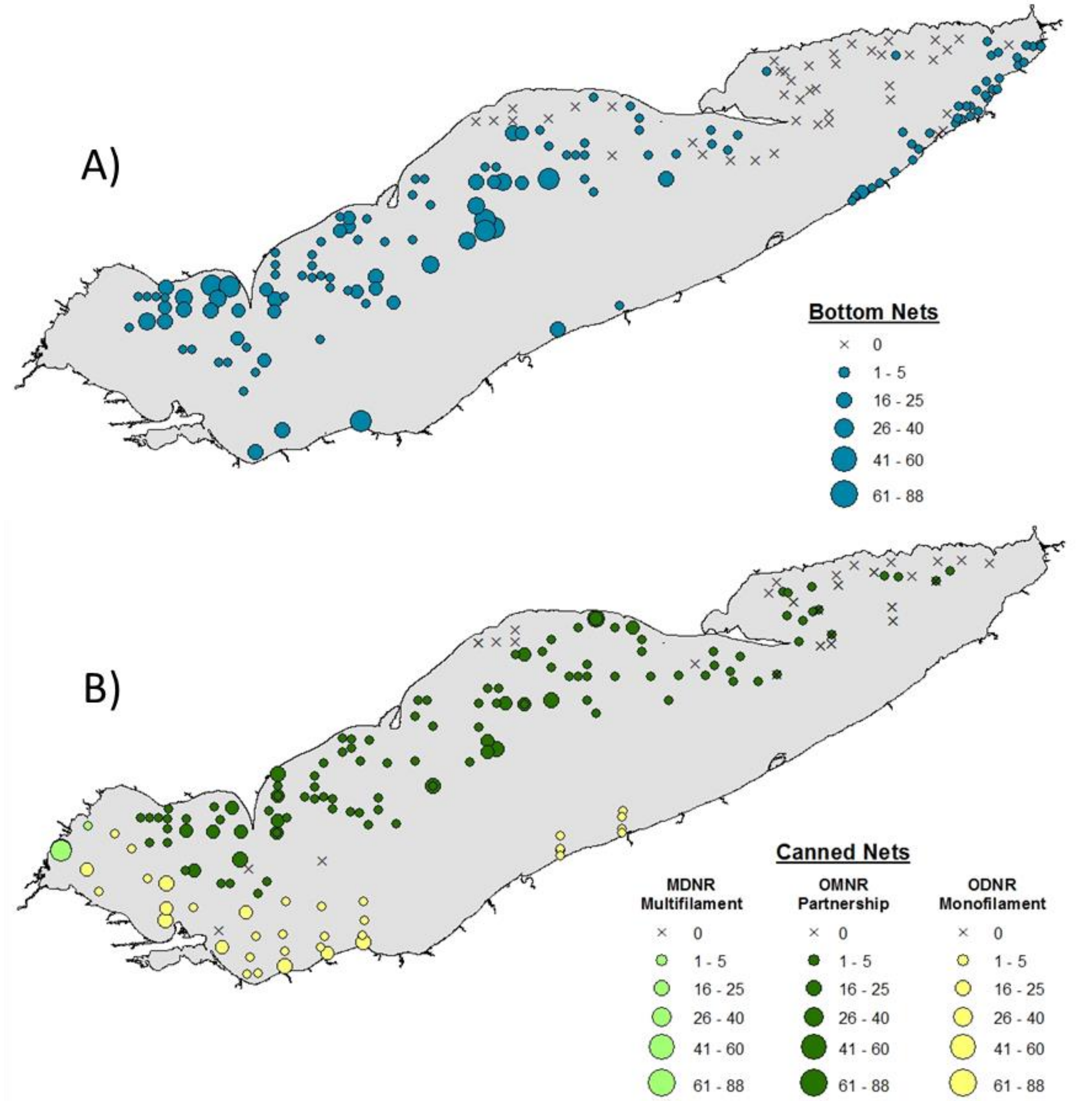

Figure 9. Relative abundance of yearling Walleye captured in bottom-set (A) and suspended or kegged (canned) multifilament (B) gillnets from Michigan, Ohio, New York, and Ontario waters in 2016. Catches have been adjusted to reflect panel length (standardized to 50 ft panels) and differences in the presence of large mesh (>5.5" excluded).