Report of the Lake Erie Yellow Perch Task Group

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Presented to:

Standing Technical Committee
Lake Erie Committee
Great Lakes Fishery Commission

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Note: The data and management summaries contained in this report are provisional. Every effort has been made to ensure their accuracy. Contact individual agencies for complete state and provincial data. Data reported in pounds for years prior to 1996 have been converted from metric tonnes. Please contact the Yellow Perch Task Group or individual agencies before using or citing data published herein.

Introduction

From April 2014 through March 2015 the Yellow Perch Task Group (YPTG) addressed the following charges:

1. Maintain and update the centralized time series of datasets required for population models and assessment including:
   a. Fishery harvest, effort, age composition, biological and stock parameters.
   b. Survey indices of young of year, juvenile and adult abundance, size at age and biological parameters.
   c. Fishing harvest and effort by grid.

2. Report Recommended Allowable Harvest (RAH) levels for 2015.

3. Participate in the LEPMAG yellow perch harvest strategy evaluation process by assisting the STC with the development of new catch-at-age models and exploitation strategies for yellow perch, leading to the development of a Yellow Perch Management Plan.

Charge 1: 2014 Fisheries Review and Population Dynamics

The lakewide total allowable catch (TAC) of Yellow Perch in 2014 was 11.081 million pounds. This allocation represented a 9.4% decrease from a TAC of 12.237 million pounds in 2013. For Yellow Perch assessment and allocation, Lake Erie is partitioned into four management units (Units, or MUs; Figure 1.1). The 2014 TAC allocation by management unit was 1.592, 3.699, 4.953, and 0.837 million pounds for Units 1 through 4, respectively. In 2014, the Lake Erie Committee (LEC) set the TAC for MU1, MU2, MU3, and MU4 higher than the mean RAH values suggested in the March 2014 YPTG report which were 1.136, 3.073, 3.605, and 0.584 million pounds, respectively. The lakewide harvest of Yellow Perch in 2014 was 8.972 million pounds, or 79.3% of the total 2014 TAC. This was an 8.3% decrease from the 2013 harvest of 9.583 million pounds. Harvest from Yellow Perch management units 1 through 4 was 1.100, 3.222, 3.818, and 0.652 million pounds, respectively (Table 1.1). The portion of TAC harvested was 69.1%, 87.1%, 77.1%, and 77.9%, in MUs 1 through 4, respectively. In 2014, Ontario harvested 5.455 million pounds, followed by Ohio (2.915 million lbs.), Pennsylvania (185 thousand lbs.), New York (150 thousand lbs.), and Michigan (88 thousand lbs.).

Ontario's fraction of allocation harvested was 96.1% in MU1, 99.5% in MU2, 103.0% in MU3, and 100.1% in MU4 (see comments below regarding Ontario's harvest reporting and commercial ice allowance policy). Ohio fishers attained 48.9% of their TAC in the western basin (MU1), 76.7% in the west central basin (MU2), and 61.1% in the east central basin (MU3). Michigan anglers in MU1 attained 60.4% of their TAC. Pennsylvania fisheries harvested 22.3% of

their TAC in MU3 and 18.1% of their TAC in MU4. New York fisheries attained 57.7% of their TAC in MU4.

Ontario's portion of the lakewide Yellow Perch harvest in 2014 (62.0%) was similar to 2013 (61.9%) (Table 1.1). Ohio's proportion of lakewide harvest in 2014 (33.2%) was also similar to 2013 (33.6%). Harvest in Michigan, Pennsylvania, and New York waters combined represented 4.8% of the lakewide harvest in 2014.

Ontario continued to employ a commercial ice allowance policy implemented in 2002, by which 3.3% is subtracted from commercial landed weight. This step was taken so that ice was not debited towards fishers' quotas. Ontario's landed weights in the YPTG report have not been adjusted to account for ice content. Ontario's reported Yellow Perch harvest in tables and figures is represented exclusively by the commercial gill net fishery. Reported sport harvests for Michigan, Ohio, Pennsylvania, and New York are based on creel survey estimates. Ohio, Pennsylvania, and New York trap net harvest and effort are based on commercial catch reports of landed fish. Additional fishery documentation is available in annual agency reports.

Harvest, fishing effort, and fishery harvest rates are summarized for the time period of 2000 to 2014 by management unit, year, agency, and gear type in Tables 1.2 to 1.5. Trends over a longer time series (1975 to 2014) are depicted graphically for harvest (Figure 1.2), fishing effort (Figure 1.3), and harvest rates (Figure 1.4) by management unit and gear type. The spatial distributions of harvest (all gears) and effort by gear type for 2014 in ten-minute interagency grids are presented in Figures 1.5 through 1.8.

Ontario's Yellow Perch harvest from large mesh (3 inches or greater) gill nets in 2014 was 3.8%, 7.6%, and 2.7% of the gill net harvest in management units 1, 2 and 3, respectively, but was negligible in MU4 (0.2%). Harvest, effort, and catch per unit effort from (1) small mesh Yellow Perch effort (<3 inch stretched mesh) and (2) larger mesh sizes, are distinguished in Tables 1.2 to 1.5. Harvest from targeted small mesh gill nets in 2014 decreased by 1.9% in MU1, 6.5% in MU2, 7.8% in MU3, and 1.9% in MU4. Ontario trap net harvest was minimal (78 pounds in 2014) and is included in the total harvest of Yellow Perch in MU1 (Tables 1.1 and 1.2). Ontario commercial smelt trawlers incidentally catch Yellow Perch in management units 2, 3 and 4, and this harvest is included in Tables 1.3 to 1.5. In 2014, 706 pounds of Yellow Perch were harvested in trawl nets in MU3, and 1,814 pounds were harvested in MU4.

Targeted (i.e., small mesh) gill net effort in 2014 was similar to 2013 in all management units. Gill net effort in 2014 decreased slightly from 2013 by 0.4% in MU1, 2.5% in MU2, and 5.9% in MU3, but increased 4.3% in MU4. Gill net effort in 2014 was also lower when compared

to the 1990s and earlier decades (Figure 1.3). Targeted gill net harvest rates in 2014 decreased by 1.4% in MU1, 4.1% in MU2, 2.0% in MU3, and 6.0% in MU4 from 2013 (Figure 1.4).

In 2014, sport harvest in U.S. waters decreased by 42.1% in MU1, 46.1% in MU2, and 12.5% in MU4, but increased by 44.8% in MU3 compared to the 2013 harvest (Figure 1.2). Angling effort in U.S. waters decreased in 2014 from 2013 in MU1 (-34.3%), MU2 (-34.6%), and MU4 (-20.3%), but increased in MU3 (+35.0%; Figure 1.3).

Sport fishing harvest rates are commonly expressed as fish harvested per angler hour for those anglers seeking Yellow Perch. These harvest rates are presented in Tables 1.2 to 1.5. Compared to 2013 rates, harvest per angler hour increased in Ohio waters of MU1 (+9.1%), in Michigan waters of MU1 (+29.4%), in Ohio waters of MU2 (+2.7%), and in New York waters of MU4 (+7.3%), but decreased in Ohio waters of MU3 (-20.5%), in Pennsylvania waters of MU3 (-10.0%), and in Pennsylvania waters of MU4 (-21.8%).

Angler harvest in kilograms per angler hour is presented graphically in Figure 1.4 for each management unit, by pooling jurisdictions' harvest weights and effort. In 2014, the sport harvest rate (in kg/hr) increased in MU3 (0.94; +7.2%), and MU4 (0.78; +9.7%), but decreased in MU1 (0.31; -11.9%), and MU2 (0.43; -17.6%) from 2013 rates. Differences between harvest rates reported in fish per angler hour and kg per angler hour reflect the influence of size and age composition on harvest rates.

Yellow Perch sport harvest in Ontario waters is assessed periodically. In 2014, Ontario performed a lakewide aerial creel survey with angler interviews at access points to assess sport effort and harvest. Although biological measurements occurred opportunistically, interviews were a higher priority, resulting in low samples sizes of measured Yellow Perch. Approximately 221,342 rod hours of effort were directed towards Yellow Perch in the Ontario waters of Lake Erie during summer 2014. Thirty-nine percent of this effort occurred in the east central basin, 33.8% of the effort occurred in the east basin (including Inner Long Point Bay), 16.8% in the west basin, and 10.1% in the west central basin. In total, 432,943 Yellow Perch were harvested in the Ontario waters of Lake Erie, 61.7% of the harvest occurred in the east central basin, 19.0% in the west basin, 14.7% in the east basin, and 4.6% of the harvest occurred in the west central basin.

Harvest from Ohio, Pennsylvania, and New York commercial trap nets in 2014 increased 4.1% in MU2, but decreased 11.5% in MU3, and 34.5% in MU4. Compared to 2013, trap net effort (lifts) in 2014 decreased in MU2 (-2.4%), MU3 (-26.2%), and MU4 (-41.5%). There was no Ohio trap net harvest or effort in MU1 in 2014. In 2014, trap net harvest rates increased in all management units compared to 2013: MU2 +6.5%; MU3 +19.9%; and MU4 +11.7%.

Age Composition and Growth

Lakewide, the Yellow Perch harvest in 2014 consisted mostly of age-6-and-older fish (40.8%) and age-4 fish (2010 year class, 29.3%; Table 1.6). In MU1, age-4 fish (2010 year class, 28.3%), age-2 (2012 year class, 27.2%), and age-6-and-older fish (17.3%) contributed most to the fishery. In MU2, the major age groups were: age-6-and-older fish (38.0%), age-4 fish (2010 year class, 30.0%), and age-2 (2012 year class, 14.4%). In MU3, age-6-and-older fish (55.9%) and age-4 (2010 year class, 27.2%) fish contributed most to the fishery. In MU4, age-4 fish (2010 year class, 40.0%) and age-3 fish (2011 year class, 22.7%) contributed most to the fishery.

Yellow Perch growth differs among life stages and between basins, as illustrated by trends in total length-at-age (Figure 1.9). For simplicity, Figure 1.9 is comprised of young-of-the-year data from summer and fall interagency trawls, while data for ages 1 through 4 are from Ontario Partnership gill net surveys (MUs 1 and 4) and Ohio fall trawls (MUs 2 and 3). As these data are taken from fall surveys, caution must be exercised when evaluating these figures. Seasonal exploitation patterns and density-dependent effects may alter the overall picture of growth trends. In addition, separate surveys in the same MU may show dissimilar trends in size-at-age due to north-south growth differences or fishery influences; however, size-at-age long-term time series results describe relatively stable length-at-age for ages 0 through 4 across the management units. Yellow Perch condition (K) in Figure 1.10 is comprised of data from Ontario Partnership gill net surveys (MUs 1 and 4) and Ohio fall trawls (MUs 2 and 3). Trends in condition may be influenced by seasonal differences in sampling. Additional data from Long Point Bay trawl surveys are used to determine condition of age-0 Yellow Perch in MU4.

The task group continues to update Yellow Perch growth data in: (1) weight-at-age values recorded annually in the harvest and (2) length- and weight-at-age values taken from interagency trawl and gill net surveys. These values are applied in the calculation of population biomass and the forecasting of harvest in the approaching year. Therefore, changes in weight-at-age factor into the changes in overall population biomass and determination of recommended allowable harvest (RAH). The YPTG uses a three-year average of weight-at-age to minimize the impacts of weak year classes on determining the mean weight-at-age of Yellow Perch in the population and in the harvest.

Statistical Catch-at-Age Analysis

Population size for each management unit was estimated by statistical catch-at-age analysis (SCAA) using the Auto Differentiation Model Builder (ADMB) computer program (Fournier et al. 2012), with a standard version that incorporates commercial gill net catchability coefficients based on the seasonal distribution of harvest and relative catch rates. Estimates of population size from 1994 to 2014, and projections for 2015 based on 2014 fishing, mortality and recruitment rates, are presented in Table 1.7. Abundance, biomass, survival, and exploitation rates are presented by management unit graphically for 1975 to 2014 in Figures 1.11 to 1.14. Mean weights-at-age from assessment surveys were applied to abundance estimates to generate population biomass estimates (Table 1.8 and Figure 1.12). Population abundance and biomass estimates are critical to monitoring the status of stocks and determining recommended allowable harvest.

Abundance estimates should be interpreted with several caveats. Inclusion of abundance estimates from 1975 to 2014 implies that the time series are continuous. Lack of data continuity for the entire time series weakens the validity of this assumption. Survey data from multiple agencies are represented only in the latter part of the time series (since the late 1980s); methods of fishery data collection have also varied. Some model parameters are constrained to constants, such as natural mortality, catchability, and selectivity blocks. This technique lessens our ability to directly compare abundance levels over three decades. In addition, commercial gill net selectivity is estimated independently in the latter part of the time series using gill net selectivity curves derived from index gillnet data by the method of Helser (1998), involving back calculation of length-at-age and weightings based on the monthly distribution of harvest-at-age. With SCAA the most recent year's population estimates inherently have the widest error bounds; this is to be expected for cohorts that remain at-large under less than full selectivity in the population.

The Partnership survey catchability estimate in MU4 was revised in 2013-2014 to use a single time block for the entire survey time series. Previously, MU4 Partnership survey catchability was estimated using two time blocks (due to two missing years in the data set). However, this was inconsistent with the constant catchability assumption applied in MUs 1 through 3. Estimating a single time block for MU4 Partnership survey catchability ensures consistency with how Partnership survey catchability is estimated in the model.

In the SCAA model, population estimates are derived by minimizing an objective function weighted by data sources, including fishery effort, fishery catch, and survey catch rates. In 2011-2012, the YPTG group determined data weightings (referred to as lambdas in ADMB) using an

expert opinion approach for evaluating potential sources of bias in data sets that could negatively influence model performance (YPTG 2012). These data weightings were also used again in 2013-2015 and are presented in Appendix A Table 1.

Recruitment Estimator for Incoming Age-2 Yellow Perch

In 2014, the YPTG implemented a multi-model inference (MMI) based approach for predicting age-2 recruitment; this method was continued in 2015. Previously, age-2 recruitment was predicted by robust regression of juvenile Yellow Perch trawl and gill net indices against SCAA estimates of two-year-old abundance in each management unit. Under the previous method, only young-of-year and yearling indices that performed well in the regressions ($r^2 > 0.50$) with age-2 abundance estimates were used for predicting age-2 recruitment (YPTG 2013) and mean values were generated from averaging results from those significant models. The newer approach, developed by Michigan State University's Quantitative Fishery Center (QFC) during the LEPMAG process, provides a more objective response by using a multi-model information-theoretic recruitment estimate that is calculated using R code (Calcagno 2013). This approach generates a list of all possible (2^n) non-redundant model formulas from a list of *n* explanatory variables (i.e. surveys) and fits each model with a pre-specified function (i.e. Generalized Linear Model or glm). All models falling within 2 AIC units of the 'best' model comprise the confidence set of models which generate the model-averaged coefficients. Surveys are not weighted equally in the models; the surveys which are more highly correlated with ADMB age-2 estimates are weighted more, thus having greater influence on the predictions. One caveat with the new approach is that years with any missing survey data cannot be used in the model, thereby truncating the time series. Furthermore, any survey required for the current year age-2 projection that was not performed must be removed from the list of *n* explanatory variables used by the *glmulti* analysis to generate possible candidate models. Only survey data from within each individual management unit was used to predict age-2 abundance in that management unit.

Estimates of 2015 age-2 Yellow Perch recruitment (the 2013 year class) were 22.250, 14.248, 5.879, and 0.580 million fish in management units 1 through 4, respectively (Table 1.7, Appendix A Table 2a). Parameter estimates for the model-averaged coefficients for each MU are detailed in Appendix A Table 2b. Despite lower selectivity of age-2 fish, the 2013 year class will make a moderate contribution to the fishery in management units 1 and 2, but a minimal contribution in management units 3 and 4, in 2015.

Data from trawl and gill net index series for the time period examined are presented in

Appendix A Table 3, while a key that summarizes abbreviations used for the trawl and gill net series is presented as a Legend in Appendix A Table 4. A subset of surveys listed in Appendix A Table 3 were excluded from the multi-model estimation. Excluded surveys (shaded grey) included unblocked versions of the Ohio fall and summer trawl surveys, and redundant composite survey components in MU1 (OHS10 and OHS11) and MU4 (OLPN40, OLPN41, ILP40, ILP41, and OLPO41). Unblocked surveys were excluded because they failed to account for unequal sampling among depth strata, and composite survey components were excluded because their data was incorporated into composite surveys that better represent the distribution of age-0 and age-1 Yellow Perch abundance.

2015 Population Size Projection

Stock size estimates for Yellow Perch ages-3-and-older in 2015 were projected from SCAA estimates of 2014 population size and age-specific survival rates in 2014 (Table 1.8). Projected age-2 Yellow Perch recruitment from the 2013 year class (method described above) was added to the 2015 population estimate for older fish in each unit, producing the total standing stock in 2015 (Table 1.8). Standard errors and ranges for estimates are provided for each age in 2014 and following estimated survival from SCAA, for 2015. Descriptions of *min, mean*, and *max* population estimates refer to the age-specific mean estimates minus or plus one standard deviation (Table 1.8).

Stock size estimates for 2014 from SCAA in this report (Table 1.7) were lower than those projected previously in management units 3 and 4 (YPTG 2014), and higher than previously projected in management units 1 and 2. Differences in stock size estimates were due to additional data in the model and differences in age-2 estimates projected in 2014 compared to those estimated by the model in 2015. Current estimates of age-2 fish in 2014 are from the SCAA's first assessment of this cohort and, as such, have the widest error bounds.

Stock size estimates projected for 2015 were lower than 2014 in management units 2, 3 and 4, but higher in management unit 1 (Table 1.8, Figure 1.11). Abundance projections for 2015 were 34.060, 66.569, 30.211, and 6.736 million age-2-and-older Yellow Perch in management units 1 through 4, respectively. Abundance estimates of age-2-and-older Yellow Perch in 2015 are projected to increase by 58.9% in MU1, and decrease by 28.1%, 32.3%, and 38.1% in MU2, MU3, and MU4 respectively compared to the 2014 abundance estimates. Ages-3-and-older Yellow Perch abundance in 2015 is projected to be 11.810, 52.321, 24.332, and 6.156 million fish in Units 1 through 4, respectively. Model estimates of abundance for age-3-and-older Yellow Perch for 2015

are projected to decrease from the 2014 estimates by 36.2% and 24.2% in MU3 and MU4 respectively, and increase 8.6% and 89.4% in MU1 and MU2 respectively.

As a function of population estimates and mean weight-at-age from surveys, total biomass estimates of age-2-and-older Yellow Perch for 2015 are projected to decline in MU2 (-18.9%), MU3 (-34.7%), and MU4 (-33.6%), and increase in MU1 (+27.4%) compared to 2014 (Table 1.8 and Figure 1.12). In 2015, age-2 (2013 year class) Yellow Perch are expected to represent the largest fraction of biomass in MU1, age-3 (2012 year class) Yellow Perch are expected to represent the largest fraction of biomass in MU2, age-6-and-older (pooled cohorts) Yellow Perch are expected to represent the largest fraction of biomass in MU3, and age-5 (2010 year class) Yellow Perch are expected to represent the largest fraction of biomass in MU4.

Estimates of Yellow Perch survival for ages-3-and-older in 2013 were 47.7%, 50.5%, 58.3%, and 54.5% in MUs 1 through 4, respectively (Figure 1.13). In 2014, estimated survival rates of ages-3-and-older fish were 49.8%, 45.9%, 53.0%, and 54.2% in Units 1 through 4 (Table 1.8 and Figure 1.13). Estimates of Yellow Perch survival in 2014 for ages-2-and-older fish were: 55.1% in MU1, 56.5% in MU2, 54.5% in MU3, and 56.6% in MU4 (Table 1.8 and Figure 1.13). Survival estimates are a function of natural mortality and age-specific fishing mortality. Yellow Perch SCAA models used in this report assume that natural mortality is 0.4.

Estimated exploitation rates of ages-3-and-older Yellow Perch in 2013 were 24.1%, 20.5%, 10.8%, and 15.5% in management units 1 through 4, respectively. Exploitation rates for ages-3-and-older fish in 2014 were estimated at 21.3%, 26.3%, 17.4%, and 15.8%, for MUs 1 through 4, respectively (Figure 1.14). Estimates of Yellow Perch exploitation for ages-2-and-older fish in 2014 were: 14.8% in MU1, 13.1% in MU2, 15.5% in MU3, and 12.9% in MU4 (Table 1.8 and Figure 1.14).

Charge 2: Harvest Strategy and RAH

Fishing rates applied in 2015 are presented in Table 2.1, along with associated recommended allowable harvest (RAH) values for each management unit. Harvest strategies were developed for a draft Yellow Perch Management Plan (YPMP) and tested using a Yellow Perch simulation (see YPTG 2010 report). The Yellow Perch simulation determined that fishing rates that were one-half of F_{msy} could support viable sport and commercial fisheries without inviting excessive biological risk. Fishing rates currently applied in calculating RAH in MUs 1, 2 and 3, are 0.67, 0.67, 0.70, and 0.30 for management units 1–4, respectively. These target fishing rates applied to population estimates and their standard errors, were used to determine *min*, *mean*, and

max RAH's for 2015 for each management unit (Tables 2.1 and 2.2).

Quota allocation by management unit and jurisdiction for 2015 was determined by the same methods applied in 2009-2014, using GIS applications of jurisdictional surface area of waters within each MU (Figure 2.1).

The allocation of shares by management unit and jurisdiction are:

Allocation of TAC within Management Unit and Jurisdiction, 2015:

MU1:	ONT	40.6%	OH	50.3%	MI	9.1%
MU2:	ONT	45.6%	OH	54.4%		
MU3:	ONT	52.3%	OH	32.4%	PA	15.3%
MU4:	ONT	58.0%	NY	31.0%	PA	11.0%

Charge 3: Yellow Perch Management Plan and Lake Erie Percid Management Advisory Group Management Strategy Evaluation

Pursuant to the goal of developing the YPMP, the Lake Erie Committee (LEC), Standing Technical Committee (STC), QFC, and stakeholder groups from all Lake Erie jurisdictions have formed the Lake Erie Percid Management Advisory Group (LEPMAG), to address stakeholder objectives, modeling concerns, and exploitation policies for Lake Erie percids. In 2014, LEPMAG, facilitated by the QFC, reviewed existing YPTG models and data sources, discussed potential modifications to the assessment model, and continued discussion on stakeholder objectives and catch-at-age modeling concerns for Yellow Perch. These discussions are expected to produce updated SCAA models and new harvest exploitation strategies that lead to the completion of a new Lake Erie Yellow Perch Management Plan.

In 2014, a Technical Review Panel (TRP) was engaged to review potential modifications to the Yellow Perch assessment model. These proposed changes included: estimating all selectivities within the model, a constrained random walk catchability, commercial selectivity time blocks, Ontario survey catchability connection to account for the break in the time series in MU3 and MU4, multinomial distribution for age composition data, and the inclusion of additional datasets to the model. The TRP suggested additional modifications including incorporating sexual dimorphism into the model and expanding the number of age groups used in the model. These suggestions will continue to be evaluated during the upcoming year.

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Table 1.1.   Lake Erie Yellow Perch harvest in pounds by management unit (Unit) and agency, 2000-2014

		Ontario*		Ohio		Michigan		Pennsylvania		New York		Total
	Year	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest
Unit 1	2000	980,323	47	1,038,650	50	67,010	3	--	--	--	--	2,085,983
	2001	813,066	45	915,641	51	70,910	4	--	--	--	--	1,799,617
	2002	1,454,105	50	1,316,553	45	147,065	5	--	--	--	--	2,917,723
	2003	1,179,667	44	1,406,385	53	84,878	3	--	--	--	--	2,670,930
	2004	1,698,761	59	1,090,669	38	94,732	3	--	--	--	--	2,884,162
	2005	1,513,890	60	965,231	38	49,485	2	--	--	--	--	2,528,606
	2006	1,325,464	54	1,055,378	43	62,854	3	--	--	--	--	2,443,696
	2007	727,678	41	982,677	55	62,815	4	--	--	--	--	1,773,170
	2008	580,050	56	409,705	39	47,934	5	--	--	--	--	1,037,689
	2009	853,137	61	463,564	33	87,319	6	--	--	--	--	1,404,020
	2010	879,358	47	889,512	48	83,725	5	--	--	--	--	1,852,595
	2011	870,802	48	796,447	44	145,960	8	--	--	--	--	1,813,209
	2012	752,872	44	883,245	51	93,291	5	--	--	--	--	1,729,408
	2013	648,884	44	750,052	51	76,994	5	--	--	--	--	1,475,930
	2014	620,667	56	391,361	36	87,511	8	--	--	--	--	1,099,539
Unit 2	2000	1,484,125	56	1,169,234	44	--	--	--	--	--	--	2,653,359
	2001	1,794,275	51	1,747,069	49	--	--	--	--	--	--	3,541,344
	2002	2,190,621	52	1,986,730	48	--	--	--	--	--	--	4,177,351
	2003	2,107,639	50	2,113,285	50	--	--	--	--	--	--	4,220,924
	2004	2,051,473	48	2,246,264	52	--	--	--	--	--	--	4,297,737
	2005	2,666,231	59	1,843,190	41	--	--	--	--	--	--	4,509,421
	2006	3,102,269	69	1,393,732	31	--	--	--	--	--	--	4,496,001
	2007	1,847,139	45	2,244,656	55	--	--	--	--	--	--	4,091,795
	2008	1,990,237	50	2,005,000	50	--	--	--	--	--	--	3,995,237
	2009	2,495,611	58	1,801,978	42	--	--	--	--	--	--	4,297,589
	2010	1,888,876	56	1,457,823	44	--	--	--	--	--	--	3,346,699
	2011	1,665,258	54	1,399,503	46	--	--	--	--	--	--	3,064,761
	2012	1,877,615	50	1,851,846	50	--	--	--	--	--	--	3,729,461
	2013	1,803,684	51	1,718,270	49	--	--	--	--	--	--	3,521,954
	2014	1,679,175	52	1,543,226	48	--	--	--	--	--	--	3,222,401
Unit 3	2000	771,646	62	443,250	36	--	--	32,613	3	--	--	1,247,509
	2001	999,450	64	464,811	30	--	--	91,211	6	--	--	1,555,472
	2002	1,192,691	60	640,104	32	--	--	140,821	7	--	--	1,973,616
	2003	1,667,133	72	481,558	21	--	--	177,516	8	--	--	2,326,207
	2004	1,453,419	62	659,447	28	--	--	244,063	10	--	--	2,356,929
	2005	1,771,800	75	457,593	19	--	--	142,028	6	--	--	2,371,421
	2006	3,451,499	90	271,144	7	--	--	106,260	3	--	--	3,828,903
	2007	2,997,101	84	391,285	11	--	--	193,065	5	--	--	3,581,451
	2008	2,200,168	74	629,366	21	--	--	155,014	5	--	--	2,984,548
	2009	2,266,727	74	597,214	20	--	--	190,742	6	--	--	3,054,683
	2010	3,370,099	85	476,808	12	--	--	117,640	3	--	--	3,964,547
	2011	3,366,412	81	636,686	15	--	--	153,233	4	--	--	4,156,331
	2012	3,768,183	81	746,999	16	--	--	161,751	3	--	--	4,676,933
	2013	2,983,539	77	755,193	19	--	--	155,193	4	--	--	3,893,925
	2014	2,668,921	70	979,937	26	--	--	168,690	4	--	--	3,817,548
Unit 4	2000	35,686	73	--	--	--	--	10,950	22	2,458	5	49,094
	2001	35,893	60	--	--	--	--	8,337	14	15,319	26	59,549
	2002	87,541	54	--	--	--	--	46,903	29	26,903	17	161,347
	2003	84,772	60	--	--	--	--	39,821	28	16,511	12	141,104
	2004	98,733	49	--	--	--	--	46,344	23	54,862	27	199,939
	2005	195,347	67	--	--	--	--	42,226	15	53,468	18	291,041
	2006	230,226	69	--	--	--	--	57,005	17	48,107	14	335,338
	2007	185,954	78	--	--	--	--	25,859	11	25,935	11	237,748
	2008	240,270	77	--	--	--	--	31,325	10	40,809	13	312,404
	2009	272,579	72	--	--	--	--	37,991	10	70,030	18	380,600
	2010	467,612	89	--	--	--	--	19,989	4	37,730	7	525,331
	2011	468,001	80	--	--	--	--	37,040	6	80,848	14	585,889
	2012	502,778	77	--	--	--	--	41,362	6	106,499	16	650,639
	2013	496,666	72	--	--	--	--	74,277	11	119,869	17	690,812
	2014	485,899	74	--	--	--	--	16,671	3	149,668	23	652,238
Lakewide Totals	2000	3,271,780	54	2,651,134	44	67,010	1	43,563	<1	2,458	<1	6,035,945
	2001	3,642,684	52	3,127,521	45	70,910	1	99,548	1	15,319	<1	6,955,982
	2002	4,924,958	53	3,943,387	43	147,065	2	187,724	2	26,903	<1	9,230,037
	2003	5,039,211	54	4,001,228	43	84,878	1	217,337	2	16,511	<1	9,359,165
	2004	5,302,386	54	3,996,380	41	94,732	1	290,407	3	54,862	<1	9,738,767
	2005	6,147,268	63	3,266,014	34	49,485	<1	184,254	2	53,468	<1	9,700,489
	2006	8,109,458	73	2,720,254	24	62,854	<1	163,265	1	48,107	<1	11,103,938
	2007	5,757,872	59	3,618,618	37	62,815	<1	218,924	2	25,935	<1	9,684,164
	2008	5,010,725	60	3,044,071	37	47,934	<1	186,339	2	40,809	<1	8,329,878
	2009	5,888,054	64	2,862,756	31	87,319	1	228,733	3	70,030	1	9,136,892
	2010	6,605,945	68	2,824,143	29	83,725	1	137,629	1	37,730	<1	9,689,172
	2011	6,370,473	66	2,832,636	29	145,960	2	190,273	2	80,848	1	9,620,190
	2012	6,901,448	64	3,482,090	32	93,291	1	203,113	2	106,499	1	10,786,441
	2013	5,932,773	62	3,223,515	33.6	76,994	1	229,470	2	119,869	1	9,582,621
	2014	5,454,662	62.0	2,914,524	33.2	87,511	1	185,361	2	149,668	2	8,791,726

*processor weight (quota debit weight) to 2001; fisher/observer weight from 2002 to 2014 (negating ice allowance).

Table 1.2. Harvest, effort and harvest per unit effort summaries for Lake Erie Yellow Perch fisheries in Management Unit 1 (Western Basin) by agency and gear type, 2000-2014.

		Michigan	Ohio		Ontario Gill Nets		Ontario
	Year	Sport	Trap Nets	Sport	Small Mesh	Large Mesh*	Trap Nets
Harvest	2000	67,010	240,541	798,109	980,323	--	2,834
(pounds)	2001	70,910	179,234	736,407	711,745	101,321	11,904
	2002	147,065	337,829	978,724	1,359,637	94,468	8,326
	2003	84,879	250,456	1,155,929	1,151,358	28,309	5,443
	2004	94,732	289,136	801,533	1,637,488	61,273	1,634
	2005	49,485	357,182	608,049	1,402,523	111,082	5,605
	2006	62,854	235,852	819,526	1,264,370	61,094	5,270
	2007	62,815	200,818	781,859	671,536	56,142	6,721
	2008	47,934	0	409,705	484,409	49,378	46,263
	2009	87,319	0	463,564	728,012	125,024	70
	2010	83,725	195,674	693,838	815,170	64,188	0
	2011	145,960	156,138	640,309	792,336	78,363	103
	2012	93,291	0	883,245	718,585	34,172	115
	2013	76,994	0	750,052	608,241	40,617	26
	2014	87,511	0	391,361	596,956	23,633	78
Harvest	2000	30	109	362	445	--	1.3
(Metric)	2001	32	81	334	323	46	5.4
(tonnes)	2002	67	153	444	617	43	3.8
	2003	38	114	524	522	13	2.5
	2004	43	131	364	743	28	0.7
	2005	22	162	276	636	50	2.5
	2006	29	107	372	573	28	2.4
	2007	28	91	355	305	25	3.0
	2008	22	0	186	220	22	21.0
	2009	40	0	210	330	57	0.03
	2010	38	89	315	370	29	0.00
	2011	66	71	290	359	36	0.05
	2012	42	0	401	326	15	0.05
	2013	35	0	340	276	18	0.01
	2014	40	0	177	271	11	0.04
Effort	2000	122,447	4,026	965,628	6,741	--	
(a)	2001	97,761	1,518	720,923	2,167	2,142	
	2002	190,573	2,715	900,289	4,546	739	
	2003	121,638	2,213	1,182,694	3,725	395	
	2004	206,902	4,351	833,690	6,052	901	
	2005	98,429	3,903	816,959	5,170	1,182	
	2006	118,628	3,517	683,994	5,194	787	
	2007	181,698	2,951	823,624	2,230	1,125	
	2008	95,925	0	519,050	1,653	899	
	2009	130,556	0	578,303	3,058	1,680	
	2010	132,852	2,607	798,240	3,152	845	
	2011	139,344	3,219	729,369	2,571	682	
	2012	128,013	0	896,083	2,244	438	
	2013	130,809	0	946,138	3,412	547	
	2014	76,996	0	630,989	3,398	362	
Harvest Rates	2000	2.2	27.1	3.0	66.0	--	
(b)	2001	2.9	53.5	3.4	149.0	21.5	
	2002	2.5	56.4	3.4	135.6	58.0	
	2003	2.4	51.3	3.5	140.2	32.5	
	2004	1.6	30.1	3.0	122.7	30.8	
	2005	1.7	41.5	3.1	123.0	42.6	
	2006	1.7	30.4	4.2	110.4	35.2	
	2007	1.0	30.9	3.4	136.6	22.6	
	2008	1.5	--	2.7	132.9	24.9	
	2009	2.7	--	3.1	108.0	33.8	
	2010	2.3	34.0	3.4	117.3	34.4	
	2011	3.4	22.0	3.5	139.8	52.1	
	2012	2.4	--	3.6	145.3	35.4	
	2013	1.7	--	2.8	80.8	33.7	
	2014	2.2	--	3.0	79.7	29.6	

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts

(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift

(*) large mesh catch rates are not targeted and are therefore of limited value.

Table 1.3.   Harvest, effort and harvest per unit effort summaries for Lake Erie Yellow Perch fisheries in Management Unit 2 (western Central Basin) by agency and gear type, 2000-2014.

| | | Unit 2 | | | | |
| | | Ohio | | Ontario Gill Nets | | Ontario |
	Year	Trap Nets	Sport	Small Mesh	Large Mesh*	Trawls
Harvest	2000	565,009	604,225	1,484,125	--	13,089
(pounds)	2001	905,088	841,891	1,593,704	200,571	7,444
	2002	1,099,971	886,759	1,892,070	298,551	8,255
	2003	1,255,205	858,080	2,019,617	88,022	867
	2004	1,287,747	958,517	1,893,871	157,602	37,155
	2005	1,162,746	680,444	2,446,007	219,723	5,563
	2006	744,452	649,280	2,981,793	120,476	524
	2007	1,701,552	543,104	1,561,287	173,699	112,153
	2008	1,376,588	628,412	1,669,682	253,984	66,203
	2009	1,338,616	463,362	1,994,208	482,402	17,315
	2010	935,616	522,207	1,410,051	470,926	7,899
	2011	1,070,817	328,686	1,312,168	339,404	13,686
	2012	1,285,336	566,510	1,550,104	314,440	13,071
	2013	1,230,249	488,021	1,657,811	145,475	398
	2014	1,280,184	263,042	1,550,722	128,453	0
Harvest	2000	256	274	673	--	5.9
(Metric)	2001	410	382	723	91	3.4
(tonnes)	2002	499	402	858	135	3.7
	2003	569	389	916	40	0.4
	2004	584	435	859	71	16.9
	2005	527	309	1,109	100	2.5
	2006	338	294	1,352	55	0.2
	2007	772	246	708	79	50.9
	2008	624	285	757	115	30.0
	2009	607	210	904	219	7.9
	2010	424	237	639	214	3.6
	2011	486	149	595	154	6.2
	2012	583	257	703	143	5.9
	2013	558	221	752	66	0.2
	2014	581	119	703	58	0.0
Effort	2000	5,272	601,712	6,266	--	
(a)	2001	4,747	594,741	3,445	4,975	
	2002	7,675	658,799	4,786	3,209	
	2003	10,214	632,813	5,311	1,555	
	2004	12,023	659,454	4,929	2,787	
	2005	9,103	784,942	9,716	2,173	
	2006	7,544	499,412	11,692	1,925	
	2007	9,158	498,843	2,966	2,826	
	2008	3,983	450,060	3,124	2,629	
	2009	6,317	417,660	5,545	4,241	
	2010	6,701	502,507	3,783	3,905	
	2011	5,707	395,407	4,214	3,789	
	2012	6,919	456,404	4,616	2,942	
	2013	5,851	428,187	6,821	1,951	
	2014	5,713	280,018	6,653	1,816	
Harvest Rates	2000	48.6	2.9	107.4	--	
(b)	2001	86.5	3.2	209.9	18.3	
	2002	65.0	3.1	179.3	42.1	
	2003	55.7	3.3	172.5	25.7	
	2004	48.6	3.7	174.3	25.6	
	2005	57.9	2.8	114.2	45.9	
	2006	44.8	3.7	115.7	28.4	
	2007	84.3	2.8	238.7	27.9	
	2008	156.7	3.5	242.4	43.8	
	2009	96.1	3.0	163.1	51.6	
	2010	63.3	3.2	169.0	54.7	
	2011	85.1	2.6	141.2	40.6	
	2012	84.2	3.1	152.3	48.5	
	2013	95.4	2.6	110.2	33.8	
	2014	101.6	2.7	105.7	32.1	

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts
(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift
(*) large mesh catch rates are not targeted and therefore of limited value

Table 1.4. Harvest, effort and harvest per unit effort summaries for Lake Erie Yellow Perch fisheries in Management Unit 3 (eastern Central Basin) by agency and gear type, 2000-2014.

		Ohio		Pennsylvania		Ontario Gill Nets		Ontario
	Year	Trap Nets	Sport	Trap Nets	Sport	Small Mesh	Large Mesh*	Trawls
Harvest	2000	156,510	286,740	5,930	26,683	771,646	--	6,866
(pounds)	2001	4,472	460,339	2,602	96,946	948,622	50,828	8,928
	2002	0	640,104	2,009	138,812	1,094,894	97,797	8,157
	2003	0	481,559	5,050	172,467	1,647,047	20,086	6,280
	2004	0	659,447	7,753	236,310	1,443,314	10,105	38,096
	2005	43,253	414,340	15,228	126,800	1,657,498	113,969	5,116
	2006	70,310	200,834	20,467	85,793	3,332,037	119,461	8
	2007	48,286	342,999	23,471	169,594	2,941,451	42,570	13,080
	2008	139,023	490,343	22,927	132,087	2,160,041	32,673	7,454
	2009	112,030	485,184	35,296	155,446	2,180,834	77,858	8,035
	2010	153,097	323,711	36,026	104,224	3,065,336	302,410	2,353
	2011	327,871	308,815	1,542	151,691	2,911,506	451,628	3,278
	2012	469,401	277,598	15,405	146,346	3,653,296	114,640	247
	2013	300,346	454,847	790	154,403	2,818,241	164,712	586
	2014	265,963	713,974	506	168,184	2,597,079	71,136	706
Harvest	2000	71	130	2.7	12	350	--	3.1
(Metric)	2001	2.0	209	1.2	44	430	23	4.0
(tonnes)	2002	0	290	0.9	63	497	44	3.7
	2003	0	218	2.3	78	747	9.1	2.8
	2004	0	299	3.5	107	655	4.6	17.3
	2005	20	188	6.9	58	752	52	2.3
	2006	32	91	9.3	39	1,511	54	0.0
	2007	22	156	10.6	77	1,334	19	5.9
	2008	63	222	10.4	60	980	15	3.4
	2009	51	220	16.0	70	989	35	3.6
	2010	69	147	16.3	47	1,390	137	1.1
	2011	149	140	0.7	69	1,320	205	1.5
	2012	213	126	7.0	66	1,657	52	0.1
	2013	136	206	0.4	70	1,278	75	0.3
	2014	121	324	0.2	76	1,178	32	0.3
Effort	2000	1,640	214,825	231	48,561	2,342	--	
(a)	2001	32	269,062	175	90,214	2,451	1,047	
	2002	0	416,543	95	123,287	2,490	1,055	
	2003	0	256,890	87	138,720	4,617	316	
	2004	0	368,537	70	175,596	3,750	268	
	2005	947	305,885	129	127,462	5,098	743	
	2006	881	139,536	124	60,612	11,130	1,030	
	2007	713	218,683	88	135,611	6,115	614	
	2008	1,288	234,179	78	110,403	3,336	417	
	2009	482	289,602	121	139,438	4,050	728	
	2010	972	182,485	128	85,294	5,747	1,125	
	2011	1,108	182,630	37	94,025	6,093	1,481	
	2012	2,074	154,474	87	98,234	7,847	991	
	2013	1,014	232,234	25	83,739	6,037	968	
	2014	581	336,607	186	90,024	5,678	422	
Harvest Rates	2000	43.3	3.0	11.6	1.9	149.4	--	
(b)	2001	63.4	2.9	6.7	2.6	175.4	22.0	
	2002	--	2.7	9.6	3.6	199.6	41.7	
	2003	--	3.1	26.3	5.3	161.8	28.8	
	2004	--	4.3	50.2	3.9	174.6	17.1	
	2005	20.7	3.1	53.5	2.9	147.4	69.6	
	2006	36.2	3.3	74.9	3.7	135.8	52.6	
	2007	30.7	3.4	121.0	3.8	218.2	31.4	
	2008	49.0	4.6	133.3	4.5	293.6	35.5	
	2009	105.4	3.5	132.3	4.8	244.2	48.5	
	2010	71.4	4.0	127.6	4.0	241.9	121.9	
	2011	134.2	4.1	18.9	5.3	216.7	138.3	
	2012	102.6	4.5	80.3	4.7	211.1	52.5	
	2013	134.3	5.0	14.3	5.2	211.7	77.2	
	2014	207.6	4.0	1.2	4.7	207.4	76.4	

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts
(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift
(*) large mesh catch rates are not targeted and therefore of limited value

Table 1.5.   Harvest, effort and harvest per unit effort summaries for Lake Erie Yellow Perch fisheries in Management Unit 4 (Eastern Basin) by agency and gear type, 2000-2014.

| | | Unit 4 | | | | | | |
| | | New York | | Pennsylvania | | Ontario Gill Nets | | Ontario |
	Year	Trap Nets	Sport	Trap Nets	Sport	Small Mesh	Large Mesh*	Trawls
Harvest	2000	625	1,833	0	10,950	35,686	--	232
(pounds)	2001	27	15,292	0	8,337	34,284	1,608	4,817
	2002	1,951	24,952	29	46,874	85,935	1,606	15,518
	2003	1,048	15,464	0	39,822	84,648	124	7,328
	2004	3,907	50,955	0	90,514	98,716	17	822
	2005	7,726	45,742	0	42,226	195,258	52	672
	2006	9,423	38,684	0	57,005	229,063	1,163	2,488
	2007	9,511	16,424	0	25,859	179,595	3,076	3,283
	2008	11,136	29,673	0	31,325	234,366	2,689	3,215
	2009	13,476	56,554	0	37,991	266,425	4,738	1,416
	2010	11,772	25,958	0	26,263	465,775	1,517	320
	2011	15,045	65,803	0	37,040	464,331	2,761	909
	2012	17,709	88,790	0	41,362	499,359	833	2,586
	2013	15,814	104,055	0	74,277	492,233	2,778	1,665
	2014	10,355	139,313	0	16,671	482,925	1,160	1,814
Harvest	2000	0.3	0.8	0	5.0	16.2	--	0.1
(Metric)	2001	0.01	6.9	0	3.8	15.5	0.73	2.2
(tonnes)	2002	0.9	11.3	0.01	21.3	39.0	0.70	7.0
	2003	0.5	7.0	0	18.1	38.4	0.06	3.3
	2004	1.8	23.1	0	41.0	44.8	0.01	0.4
	2005	3.5	20.7	0	19.2	88.6	0.02	0.3
	2006	4.3	17.5	0	25.9	103.9	0.53	1.1
	2007	4.3	7.4	0	11.7	81.4	1.40	1.5
	2008	5.1	13.5	0	14.2	106.3	1.22	1.5
	2009	6.1	25.6	0	17.2	120.8	2.15	0.6
	2010	5.3	11.8	0	11.9	211.2	0.69	0.1
	2011	6.8	29.8	0	16.8	210.6	1.25	0.4
	2012	8.0	40.3	0	18.8	226.5	0.38	1.2
	2013	7.2	47.2	0	33.7	223.2	1.26	0.8
	2014	4.7	63.2	0	7.6	219.0	0.53	0.8
Effort	2000	44	2,606	0	21,146	314	--	
(a)	2001	39	22,950	0	12,451	128	28.0	
	2002	89	44,270	9	61,734	224	28.0	
	2003	91	33,162	0	32,525	373	21.0	
	2004	44	73,056	0	62,639	355	3.2	
	2005	179	58,667	0	70,921	782	7.8	
	2006	208	46,174	0	47,274	1,007	31.8	
	2007	144	29,999	0	31,545	550	62.1	
	2008	137	34,511	0	27,041	569	69.2	
	2009	215	58,829	0	58,475	718	50.9	
	2010	287	35,526	0	26,544	1,227	21.7	
	2011	383	50,479	0	48,537	1,564	28.6	
	2012	428	58,621	0	49,577	1,770	12.9	
	2013	364	65,750	0	48,093	1,932	14.5	
	2014	213	76,817	0	13,959	2,016	8.3	
Harvest Rates	2000	6.4	0.20	--	1.7	51.5	--	
(b)	2001	0.3	1.65	--	1.5	121.5	26.0	
	2002	9.9	1.13	1.5	2.4	174.0	25.0	
	2003	5.2	0.76	--	1.9	102.9	2.9	
	2004	40.3	1.14	--	1.7	126.1	2.4	
	2005	19.6	1.23	--	1.8	113.2	3.0	
	2006	20.5	1.36	--	2.9	103.2	16.6	
	2007	30.0	0.97	--	1.5	148.1	22.5	
	2008	36.9	1.68	--	6.4	186.8	17.6	
	2009	28.4	1.77	--	3.2	168.3	42.2	
	2010	18.6	1.31	--	2.2	172.1	31.7	
	2011	17.8	2.01	--	2.9	134.6	43.8	
	2012	18.8	2.17	--	2.5	127.9	29.3	
	2013	19.7	2.59	--	2.9	115.5	87.1	
	2014	22.0	2.78	--	2.3	108.6	63.4	

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts
(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift
(*) large mesh catch rates are not targeted and therefore of limited value

Table 1.6. Estimated 2014 Lake Erie Yellow Perch harvest by age and numbers of fish by gear and management unit (Unit).

Gear	Age	Unit 1 Number	Unit 1 %	Unit 2 Number	Unit 2 %	Unit 3 Number	Unit 3 %	Unit 4 Number	Unit 4 %	Lakewide Number	Lakewide %
Gill Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	209,534	10.8	794,861	15.2	30,757	0.4	298,562	22.2	1,333,714	8.0
	3	226,523	11.7	880,127	16.9	753,408	9.3	357,628	26.6	2,217,686	13.3
	4	802,834	41.4	1,538,815	29.5	2,186,354	26.9	518,276	38.5	5,046,279	30.4
	5	199,121	10.3	345,070	6.6	267,029	3.3	11,593	0.9	822,813	5.0
	6+	502,215	25.9	1,663,522	31.9	4,876,907	60.1	158,579	11.8	7,201,223	43.3
	Total	1,940,227	*49.0*	5,222,395	*52.1*	8,114,455	*76.7*	1,344,638	*83.1*	16,621,715	*63.5*
Trap Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	0	0.0	330,546	8.2	0	0.0	0	0.0	330,546	7.0
	3	0	0.0	135,510	3.4	30,516	4.4	691	2.7	166,717	3.5
	4	0	0.0	1,350,973	33.5	253,839	36.4	9,845	38.0	1,614,657	34.0
	5	0	0.0	212,903	5.3	31,904	4.6	1,209	4.7	246,016	5.2
	6+	0	0.0	2,000,735	49.6	381,453	54.7	14,163	54.7	2,396,351	50.4
	Total	0	*0.0*	4,030,667	*40.2*	697,712	*6.6*	25,908	*1.6*	4,754,287	*18.2*
Sport	1	348,142	17.3	6,945	0.9	2,507	0.1	0	0.0	357,594	7.4
	2	865,569	42.9	321,362	41.9	93,619	5.3	2,222	0.9	1,282,772	26.7
	3	153,613	7.6	132,452	17.3	311,401	17.6	9,524	3.8	606,990	12.6
	4	318,489	15.8	119,461	15.6	441,288	24.9	118,787	47.8	998,025	20.8
	5	151,159	7.5	41,233	5.4	264,307	14.9	15,595	6.3	472,294	9.8
	6+	180,915	9.0	146,250	19.1	659,956	37.2	102,337	41.2	1,089,458	22.7
	Total	2,017,887	*51.0*	767,703	*7.7*	1,773,078	*16.8*	248,465	*15.3*	4,807,133	*18.4*
All Gear	1	348,142	8.8	6,945	0.1	2,507	0.0	0	0.0	357,594	1.4
	2	1,075,103	27.2	1,446,769	14.4	124,376	1.2	300,784	18.6	2,947,032	11.3
	3	380,136	9.6	1,148,089	11.5	1,095,325	10.3	367,843	22.7	2,991,393	11.4
	4	1,121,323	28.3	3,009,249	30.0	2,881,481	27.2	646,908	40.0	7,658,961	29.3
	5	350,280	8.8	599,206	6.0	563,240	5.3	28,397	1.8	1,541,123	5.9
	6+	683,130	17.3	3,810,507	38.0	5,918,316	55.9	275,079	17.0	10,687,032	40.8
	Total	3,958,114	*15.1*	10,020,765	*38.3*	10,585,245	*40.4*	1,619,011	*6.2*	26,183,135	*100.0*

Note: Values in *italics* delineate harvest percentage by gear in each Unit, while the values in the 'All Gear' boxes are for lakewide harvest percentage by Unit.

Table 1.7. Yellow Perch stock size (millions of fish) in each Lake Erie management unit. Abundance in the years 1995 to 2014 are estimated by ADMB catch-age analysis. The 2015 population estimates use age-2 Yellow Perch estimate derived from multi-model averaging of generalized linear models of ADMB age-2 abundance against YOY and yearling survey indices (see Appendix A) in an R program.

	Age	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Unit 1	2	9.385	23.388	29.295	22.733	44.207	10.529	34.383	33.764	7.842	41.038	3.257	53.663	1.604	9.369	10.326	24.867	16.186	10.418	14.446	3.742	10.565	22.250
	3	1.531	5.644	14.242	17.379	14.050	27.119	6.711	21.854	21.758	5.015	25.788	2.070	33.252	1.029	5.638	6.374	15.716	10.343	6.686	9.092	2.306	6.389
	4	2.206	0.647	2.514	6.129	8.036	7.002	14.805	3.680	12.909	11.242	2.753	11.962	1.023	13.288	0.557	2.961	3.300	8.339	5.665	3.561	4.547	1.215
	5	0.315	0.509	0.182	0.688	1.942	3.021	3.218	7.457	2.011	5.337	5.058	1.029	4.366	0.419	5.386	0.304	1.455	1.589	4.030	2.777	1.635	2.267
	6+	0.028	0.076	0.175	0.094	0.170	0.497	1.337	2.052	4.972	2.488	3.229	2.422	1.024	1.663	0.808	3.093	1.622	1.428	1.377	2.549	2.388	1.940
	2 and Older	13.465	30.263	46.408	47.024	68.405	48.167	60.453	68.807	49.492	65.119	40.085	71.146	41.268	25.768	22.715	37.599	38.279	32.115	32.203	21.721	21.440	34.060
	3 and Older	4.080	6.875	17.113	24.291	24.198	37.638	26.071	35.043	41.650	24.081	36.828	17.483	39.664	16.399	12.389	12.732	22.093	21.698	17.758	17.979	10.875	11.810
Unit 2	2	12.745	13.228	27.185	14.485	62.304	15.584	55.204	48.702	11.418	89.073	5.140	200.718	5.384	24.222	27.926	57.350	49.509	8.481	22.182	13.123	65.019	14.248
	3	3.022	7.299	7.368	13.242	7.523	33.117	9.648	33.323	28.920	7.196	53.907	3.349	129.334	3.547	15.784	18.432	37.215	32.202	5.583	13.989	8.266	39.634
	4	4.058	1.065	2.670	2.921	4.287	3.238	18.455	5.325	18.910	15.532	4.052	28.693	1.948	73.778	2.125	9.622	10.970	22.259	19.877	3.356	7.929	4.536
	5	0.681	0.827	0.211	0.587	0.521	0.922	1.597	8.918	2.614	8.654	6.657	1.959	12.965	1.155	35.986	1.140	4.819	5.895	12.371	10.417	1.585	3.430
	6+	0.105	0.160	0.198	0.090	0.078	0.092	0.422	0.943	4.841	3.398	5.217	5.495	3.395	7.793	4.315	21.729	11.172	8.295	7.713	10.553	9.849	4.721
	2 and Older	20.611	22.579	37.633	31.325	74.713	52.953	85.326	97.212	66.703	123.853	74.973	240.215	153.026	110.495	86.137	108.273	113.684	77.133	67.726	51.437	92.648	66.569
	3 and Older	7.866	9.351	10.447	16.840	12.410	37.369	30.122	48.510	55.286	34.780	69.833	39.497	147.642	86.273	58.211	50.923	64.176	68.652	45.545	38.315	27.629	52.321
Unit 3	2	6.571	7.434	14.038	11.114	45.437	12.872	48.503	28.259	7.088	39.870	4.772	164.879	6.545	34.057	52.028	48.811	58.280	6.666	30.271	10.288	6.492	5.879
	3	1.539	3.797	4.618	8.955	7.047	29.523	8.377	31.447	18.155	4.564	25.901	3.133	109.566	4.341	21.521	34.627	32.624	38.662	4.457	19.496	6.629	4.144
	4	1.018	0.813	2.238	2.725	4.997	4.284	18.971	5.322	20.020	11.374	2.839	16.050	1.946	61.908	2.680	13.659	22.699	20.934	25.446	2.708	11.743	3.832
	5	0.451	0.335	0.412	1.138	1.405	2.828	2.696	11.557	3.310	12.031	6.696	1.676	9.314	1.079	35.735	1.628	8.595	13.736	13.338	14.257	1.601	6.242
	6+	0.195	0.234	0.293	0.353	0.713	1.111	2.422	3.082	9.035	7.448	11.473	10.676	7.220	7.571	4.933	24.703	16.520	14.864	18.016	17.606	18.152	10.114
	2 and Older	9.774	12.613	21.599	24.285	59.599	50.617	80.969	79.667	57.608	75.286	51.681	196.414	134.590	108.956	116.898	123.428	138.718	94.862	91.528	64.355	44.618	30.211
	3 and Older	3.203	5.178	7.561	13.171	14.162	37.745	32.466	51.408	50.520	35.416	46.909	31.535	128.045	74.899	64.870	74.617	80.438	88.196	61.257	54.067	38.126	24.332
Unit 4	2	0.136	1.213	0.716	0.318	3.786	1.497	12.167	2.605	1.743	6.535	1.195	9.212	0.782	7.098	7.501	6.113	9.817	0.934	11.315	2.712	2.762	0.580
	3	0.149	0.088	0.799	0.471	0.209	2.536	0.992	8.118	1.746	1.167	4.365	0.792	6.091	0.521	4.694	4.982	4.094	6.513	0.619	7.162	1.747	1.752
	4	0.024	0.072	0.051	0.462	0.271	0.137	1.609	0.653	5.423	1.155	0.762	2.806	0.493	3.572	0.337	3.031	3.280	2.576	3.983	0.376	4.059	1.012
	5	0.044	0.008	0.035	0.025	0.230	0.170	0.085	1.042	0.435	3.508	0.730	0.474	1.690	0.278	2.264	0.214	1.941	1.968	1.535	2.192	0.202	2.199
	6+	0.080	0.042	0.023	0.028	0.026	0.153	0.195	0.180	0.810	0.783	2.656	2.054	1.484	1.699	1.253	2.190	1.506	2.026	2.280	1.948	2.109	1.193
	2 and Older	0.433	1.423	1.624	1.304	4.522	4.493	15.048	12.597	10.156	13.148	9.708	15.338	10.541	13.168	16.049	16.530	20.638	14.018	19.733	14.391	10.879	6.736
	3 and Older	0.296	0.210	0.908	0.986	0.736	2.996	2.881	9.993	8.413	6.613	8.512	6.126	9.759	6.071	8.548	10.417	10.821	13.084	8.417	11.679	8.117	6.156

Table 1.8. Projection of the 2015 Lake Erie Yellow Perch population. Stock size estimates are derived from ADMB 2014 abundance and survival, and incoming age-2 estimates for 2015 are derived from multi-model averaging of generalized linear models of ADMB age-2 abundance against YOY and yearling survey indices (See Appendix A) in an R program. Standard errors are produced from ADMB catch-age and MMI analyses.

| | | 2014 Parameters — Stock Size (millions of fish) | | | | Rate Functions — Mortality Rates | | | | Survival Rate | 2015 Parameters — Stock Size (millions of fish) | | | 3-yr Mean Weight in Pop'n. (kg) | Stock Biomass millions kg | | millions lbs. |
	Age	Mean	Std. Error	Min.	Max.	(F)	(Z)	(A)	(u)	(S)	Min.	Mean	Max.		2014	2015	2015
Unit 1	2	10.565	6.283	4.282	16.848	0.103	0.503	0.395	0.081	0.605	18.873	22.250	26.231	0.074	0.877	1.647	3.631
	3	2.306	1.000	1.306	3.307	0.241	0.641	0.473	0.178	0.527	2.589	6.389	10.188	0.107	0.272	0.684	1.507
	4	4.547	1.746	2.801	6.292	0.296	0.696	0.501	0.213	0.499	0.688	1.215	1.742	0.135	0.646	0.164	0.362
	5	1.635	0.622	1.012	2.257	0.317	0.717	0.512	0.226	0.488	1.396	2.267	3.137	0.163	0.283	0.369	0.815
	6+	2.388	0.870	1.518	3.257	0.338	0.738	0.522	0.239	0.478	1.220	1.940	2.659	0.205	0.482	0.398	0.877
	Total (3+)	21.440		10.919	31.961	0.196	0.596	0.449	0.148	0.551	24.767	34.060	43.957	0.096	2.560	3.261	7.191
	Total (3+)	10.875		6.637	15.113	0.296	0.696	0.502	0.213	0.498	5.894	11.810	17.726	0.137	1.683	1.615	3.560
Unit 2	2	65.019	34.468	30.551	99.487	0.095	0.495	0.390	0.075	0.610	12.581	14.248	16.135	0.084	5.592	1.197	2.639
	3	8.266	3.197	5.069	11.463	0.200	0.600	0.451	0.150	0.549	18.623	39.634	60.644	0.127	1.000	5.033	11.099
	4	7.929	2.626	5.303	10.555	0.438	0.838	0.567	0.297	0.433	2.782	4.536	6.291	0.157	1.316	0.712	1.570
	5	1.585	0.509	1.076	2.094	0.439	0.839	0.568	0.297	0.432	2.294	3.430	4.566	0.188	0.293	0.645	1.422
	6+	9.849	2.931	6.919	12.780	0.492	0.892	0.590	0.326	0.410	3.300	4.721	6.143	0.253	2.630	1.195	2.634
	Total (3+)	92.648		48.917	136.379	0.171	0.571	0.435	0.131	0.565	39.580	66.569	93.779	0.132	10.831	8.782	19.364
	Total (3+)	27.629		18.366	36.892	0.378	0.778	0.541	0.263	0.459	26.999	52.321	77.644	0.145	5.239	7.585	16.725
Unit 3	2	6.492	4.068	2.424	10.560	0.049	0.449	0.362	0.039	0.638	4.572	5.879	7.560	0.069	0.422	0.406	0.894
	3	6.629	3.076	3.553	9.706	0.148	0.548	0.422	0.114	0.578	1.547	4.144	6.740	0.118	0.736	0.489	1.078
	4	11.743	4.730	7.013	16.473	0.232	0.632	0.468	0.172	0.532	2.054	3.832	5.611	0.143	1.797	0.548	1.208
	5	1.601	0.598	1.004	2.199	0.230	0.630	0.467	0.171	0.533	3.728	6.242	8.756	0.171	0.290	1.067	2.353
	6+	18.152	5.923	12.229	24.075	0.273	0.673	0.490	0.199	0.510	6.773	10.114	13.454	0.223	4.048	2.255	4.973
	Total (3+)	44.618		26.223	63.013	0.206	0.606	0.455	0.155	0.545	18.674	30.211	42.121	0.158	7.292	4.765	10.508
	Total (3+)	38.126		23.798	52.453	0.236	0.636	0.470	0.174	0.530	14.102	24.332	34.561	0.179	6.870	4.360	9.613
Unit 4	2	2.762	1.825	0.937	4.587	0.055	0.455	0.366	0.044	0.634	0.194	0.580	1.736	0.084	0.240	0.049	0.107
	3	1.747	0.896	0.851	2.643	0.146	0.546	0.421	0.113	0.579	0.594	1.752	2.910	0.151	0.278	0.265	0.583
	4	4.059	1.924	2.135	5.983	0.213	0.613	0.458	0.159	0.542	0.493	1.012	1.531	0.215	0.954	0.218	0.480
	5	0.202	0.093	0.109	0.295	0.257	0.657	0.482	0.188	0.518	1.157	2.199	3.241	0.253	0.055	0.556	1.227
	6+	2.109	1.030	1.079	3.139	0.262	0.662	0.484	0.192	0.516	0.613	1.193	1.772	0.320	0.685	0.382	0.841
	Total (3+)	10.879		5.111	16.647	0.169	0.569	0.434	0.129	0.566	3.051	6.736	11.190	0.218	2.212	1.469	3.239
	Total (3+)	8.117		4.174	12.060	0.212	0.612	0.458	0.158	0.542	2.857	6.156	9.454	0.231	1.972	1.420	3.131

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Table 2.1. Estimated harvest of Lake Erie Yellow Perch for 2015 using the proposed fishing policy and selectivity-at-age from combined fishing gears.

	Age	2015 Stock Size (millions of fish)			F	Exploitation Rate			2015 Catch (millions of fish)			3-yr Mean Weight in Harvest (kg)	2015 Harvest Range Catch (millions of kg)			Catch (millions of lbs)		
		Min.	MEAN	Max.		s(age)	F(age)	(u)	Min.	MEAN	Max.		Min.	MEAN	Max.	Min.	MEAN	Max.
Unit 1	2	18.873	22.250	26.231	0.670	0.171	0.115	0.090	1.690	1.993	2.349	0.099	0.167	0.197	0.233	0.369	0.435	0.513
	3	2.589	6.389	10.188	0.670	0.587	0.393	0.272	0.703	1.735	2.766	0.120	0.084	0.208	0.332	0.186	0.459	0.732
	4	0.688	1.215	1.742	0.670	0.762	0.511	0.335	0.231	0.407	0.584	0.137	0.032	0.056	0.080	0.070	0.123	0.176
	5	1.396	2.267	3.137	0.670	0.795	0.533	0.346	0.484	0.785	1.087	0.157	0.076	0.123	0.171	0.167	0.272	0.376
	6+	1.220	1.940	2.659	0.670	0.812	0.544	0.352	0.430	0.683	0.936	0.174	0.075	0.119	0.163	0.165	0.262	0.359
	Total	24.767	34.060	43.957				0.164	3.537	5.603	7.722	0.126	0.434	0.703	0.978	0.957	1.551	2.156
	(3+)	5.894	11.810	17.726				0.306	1.847	3.610	5.373	0.140	0.267	0.506	0.745	0.588	1.116	1.644
Unit 2	2	12.581	14.248	16.135	0.670	0.188	0.126	0.098	1.232	1.396	1.580	0.130	0.160	0.181	0.205	0.353	0.400	0.453
	3	18.623	39.634	60.644	0.670	0.431	0.289	0.209	3.887	8.272	12.657	0.138	0.536	1.142	1.747	1.183	2.517	3.851
	4	2.782	4.536	6.291	0.670	0.763	0.511	0.335	0.933	1.522	2.110	0.147	0.137	0.224	0.310	0.302	0.493	0.684
	5	2.294	3.430	4.566	0.670	0.768	0.515	0.337	0.773	1.157	1.540	0.161	0.125	0.186	0.248	0.275	0.411	0.547
	6+	3.300	4.721	6.143	0.670	0.786	0.527	0.343	1.133	1.621	2.109	0.176	0.199	0.285	0.371	0.440	0.629	0.818
	Total	39.580	66.569	93.779				0.210	7.959	13.967	19.996	0.144	1.158	2.018	2.881	2.553	4.450	6.353
	(3+)	26.999	52.321	77.644				0.240	6.727	12.571	18.416	0.146	0.998	1.837	2.676	2.200	4.050	5.900
Unit 3	2	4.572	5.879	7.560	0.700	0.102	0.071	0.057	0.260	0.335	0.430	0.122	0.032	0.041	0.053	0.070	0.090	0.116
	3	1.547	4.144	6.740	0.700	0.345	0.242	0.178	0.276	0.739	1.201	0.139	0.038	0.103	0.167	0.085	0.226	0.368
	4	2.054	3.832	5.611	0.700	0.664	0.465	0.311	0.639	1.192	1.746	0.149	0.095	0.178	0.260	0.210	0.392	0.574
	5	3.728	6.242	8.756	0.700	0.693	0.485	0.322	1.200	2.009	2.818	0.162	0.194	0.325	0.457	0.429	0.718	1.007
	6+	6.773	10.114	13.454	0.700	0.712	0.498	0.329	2.227	3.326	4.424	0.179	0.399	0.595	0.792	0.879	1.313	1.746
	Total	18.674	30.211	42.121				0.252	4.602	7.601	10.620	0.163	0.758	1.242	1.728	1.672	2.739	3.811
	(3+)	14.102	24.332	34.561				0.299	4.342	7.266	10.190	0.165	0.727	1.201	1.676	1.602	2.649	3.695
Unit 4	2	0.194	0.580	1.736	0.300	0.093	0.028	0.023	0.004	0.013	0.039	0.131	0.001	0.002	0.005	0.004	0.004	0.011
	3	0.594	1.752	2.910	0.300	0.294	0.088	0.070	0.041	0.122	0.203	0.152	0.006	0.019	0.031	0.014	0.041	0.068
	4	0.493	1.012	1.531	0.300	0.498	0.149	0.115	0.057	0.116	0.176	0.175	0.010	0.020	0.031	0.022	0.045	0.068
	5	1.157	2.199	3.241	0.300	0.722	0.217	0.162	0.187	0.355	0.524	0.201	0.038	0.071	0.105	0.083	0.158	0.232
	6+	0.613	1.193	1.772	0.300	0.740	0.222	0.165	0.101	0.197	0.293	0.223	0.023	0.044	0.065	0.050	0.097	0.144
	Total	3.051	6.736	11.190				0.119	0.391	0.804	1.235	0.194	0.077	0.156	0.237	0.170	0.344	0.524
	(3+)	2.857	6.156	9.454				0.129	0.386	0.791	1.196	0.195	0.076	0.154	0.232	0.168	0.340	0.512

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Table 2.2. Lake Erie Yellow Perch fishing rates and the Recommended Allowable Harvest (RAH; in millions of pounds) for 2015 by Management Unit (Unit).

Unit	Fishing Rate	Recommended Allowable Harvest (millions lbs.)		
		MIN	MEAN	MAX
1	0.670	0.957	1.551	2.156
2	0.670	2.553	4.450	6.353
3	0.700	1.672	2.739	3.811
4	0.300	0.170	0.344	0.524
Total		5.352	9.084	12.844
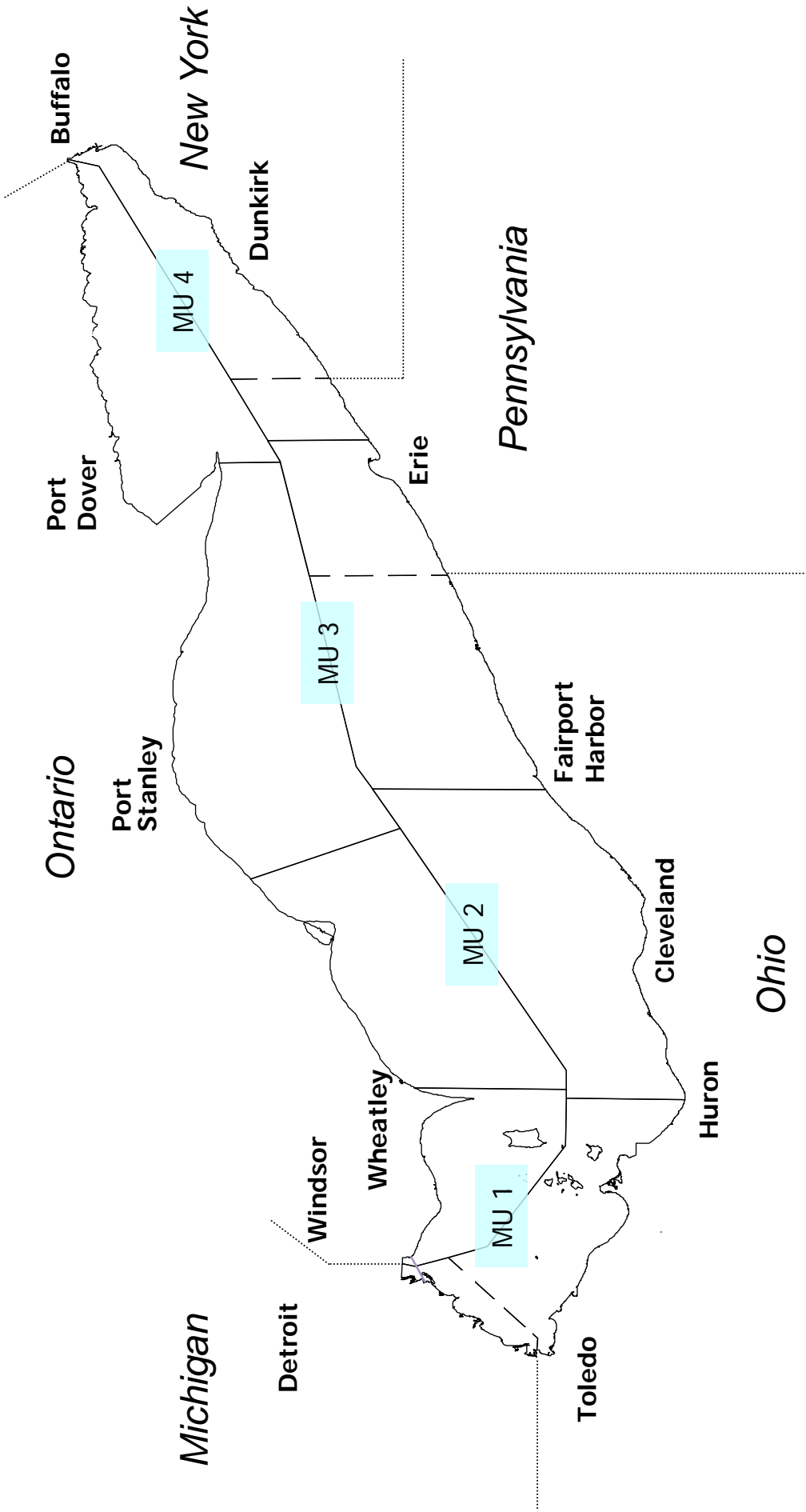
Figure 1.1. The Yellow Perch Management Units (MUs) of Lake Erie defined by the YPTG and LEC, for illustrative purposes.
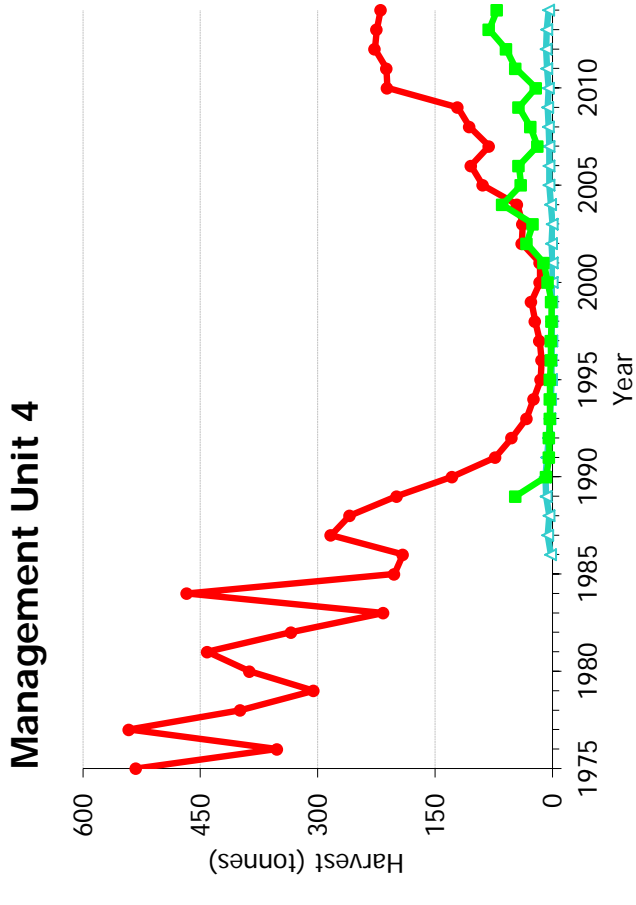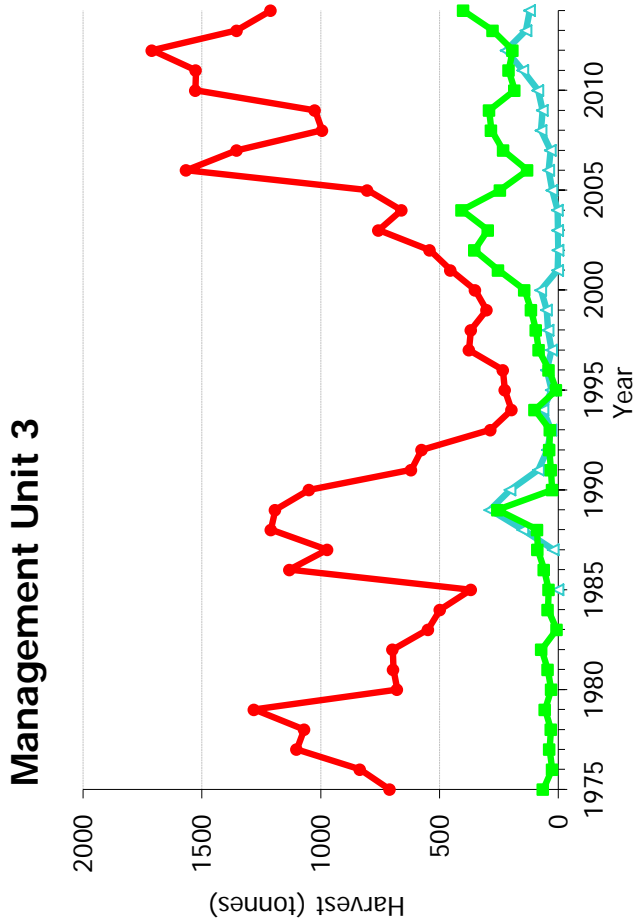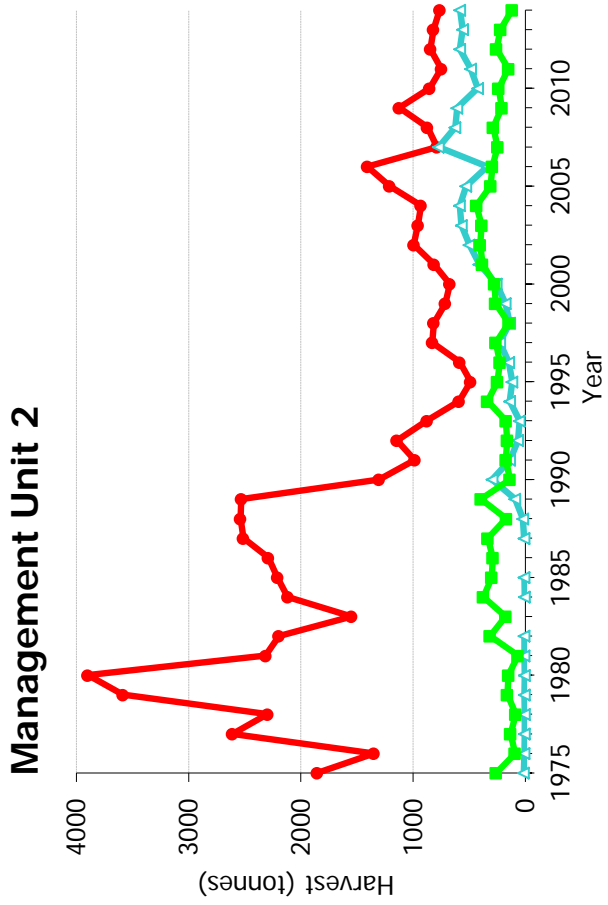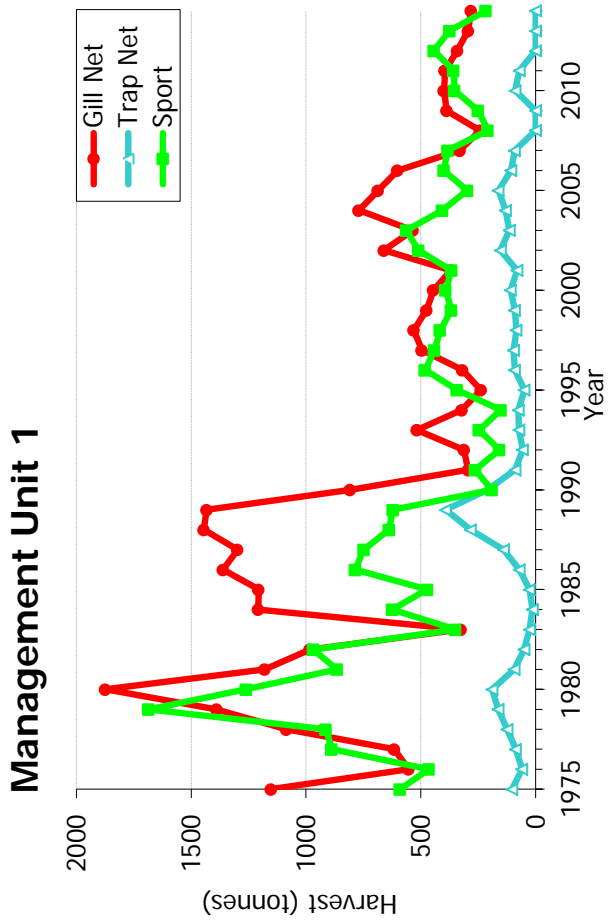
Figure 1.2. Historic Lake Erie Yellow Perch harvest (metric tonnes) by management unit and gear type.
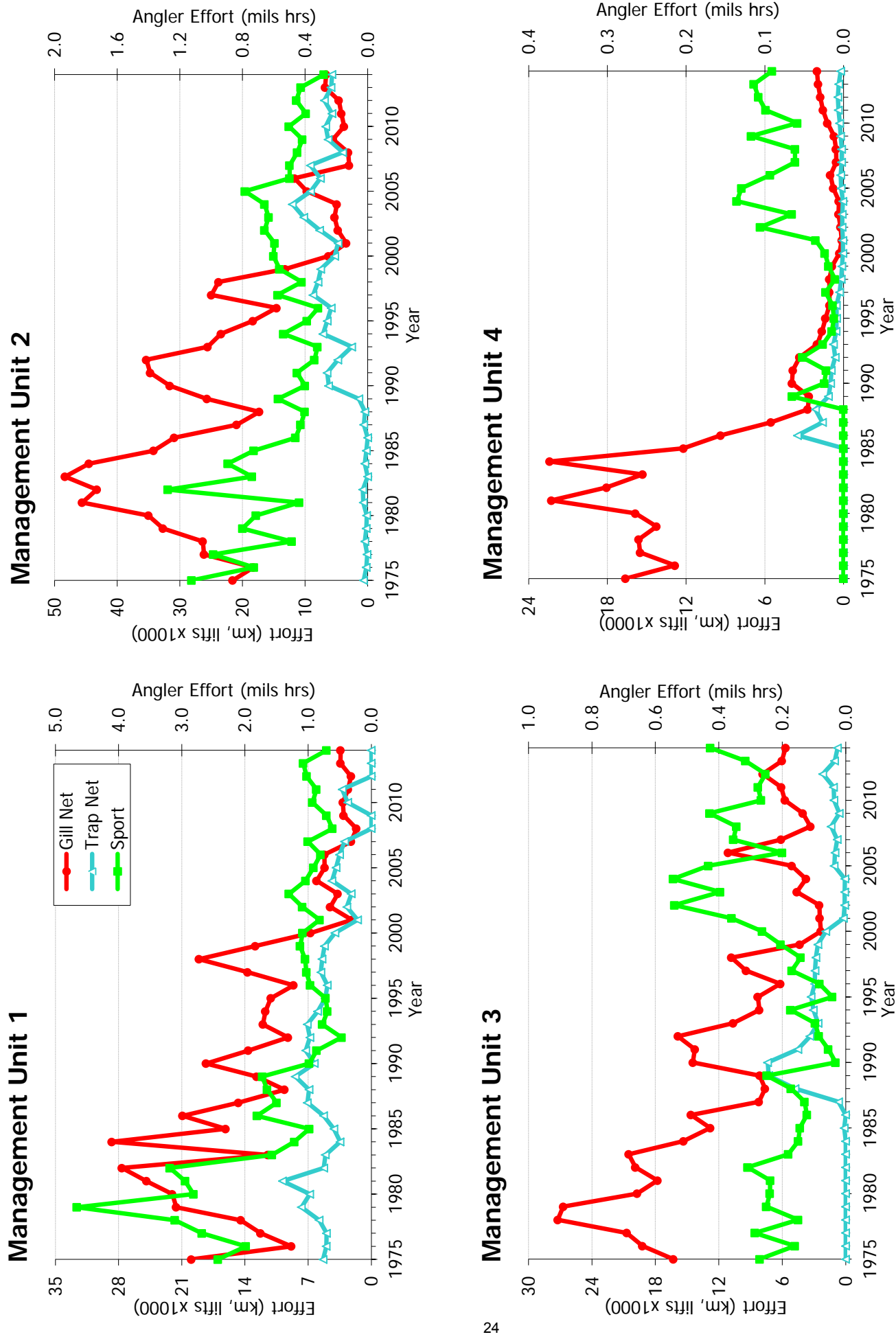
Figure 1.3. Historic Lake Erie Yellow Perch effort by management unit and gear type. Note: gill net effort presented is targeted effort with small mesh (< 3").
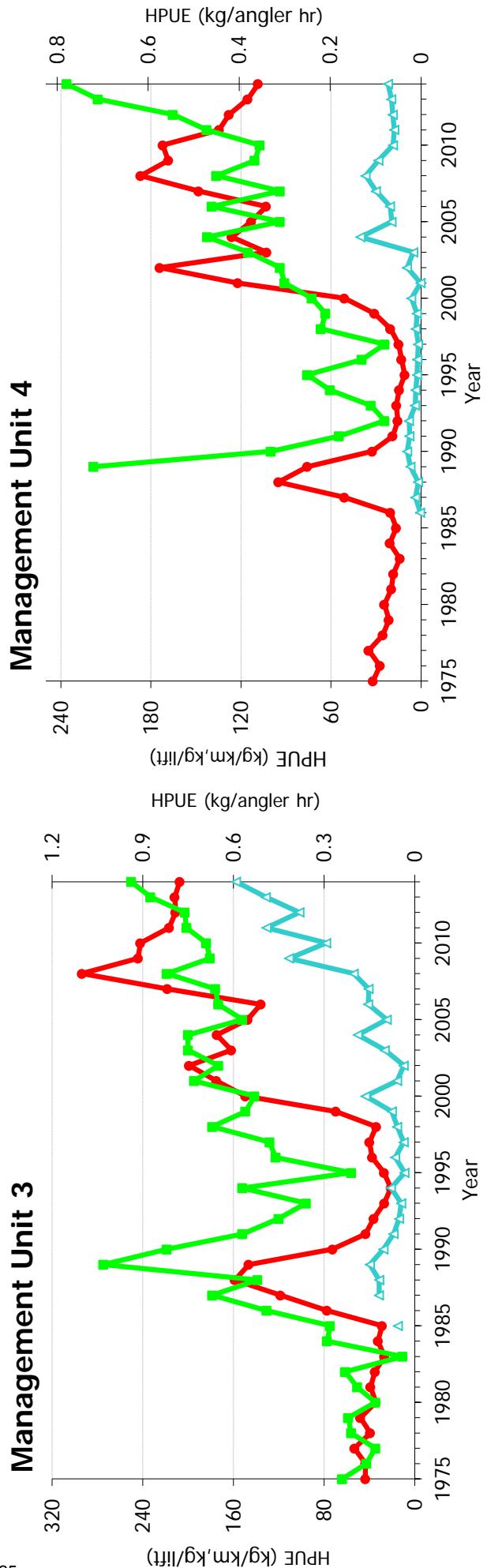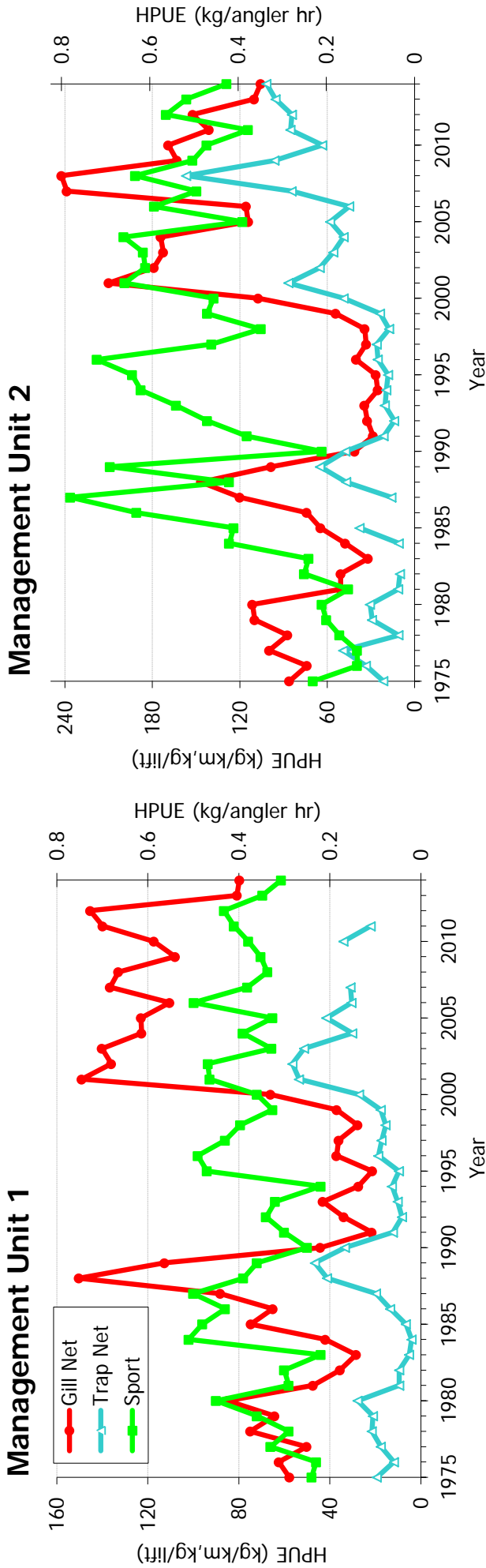
Figure 1.4. Historic Lake Erie Yellow Perch harvest per unit effort (HPUE) by management unit and gear type. Note: gill net CPUE for 2001 to 2013 is for small mesh (< 3") only.
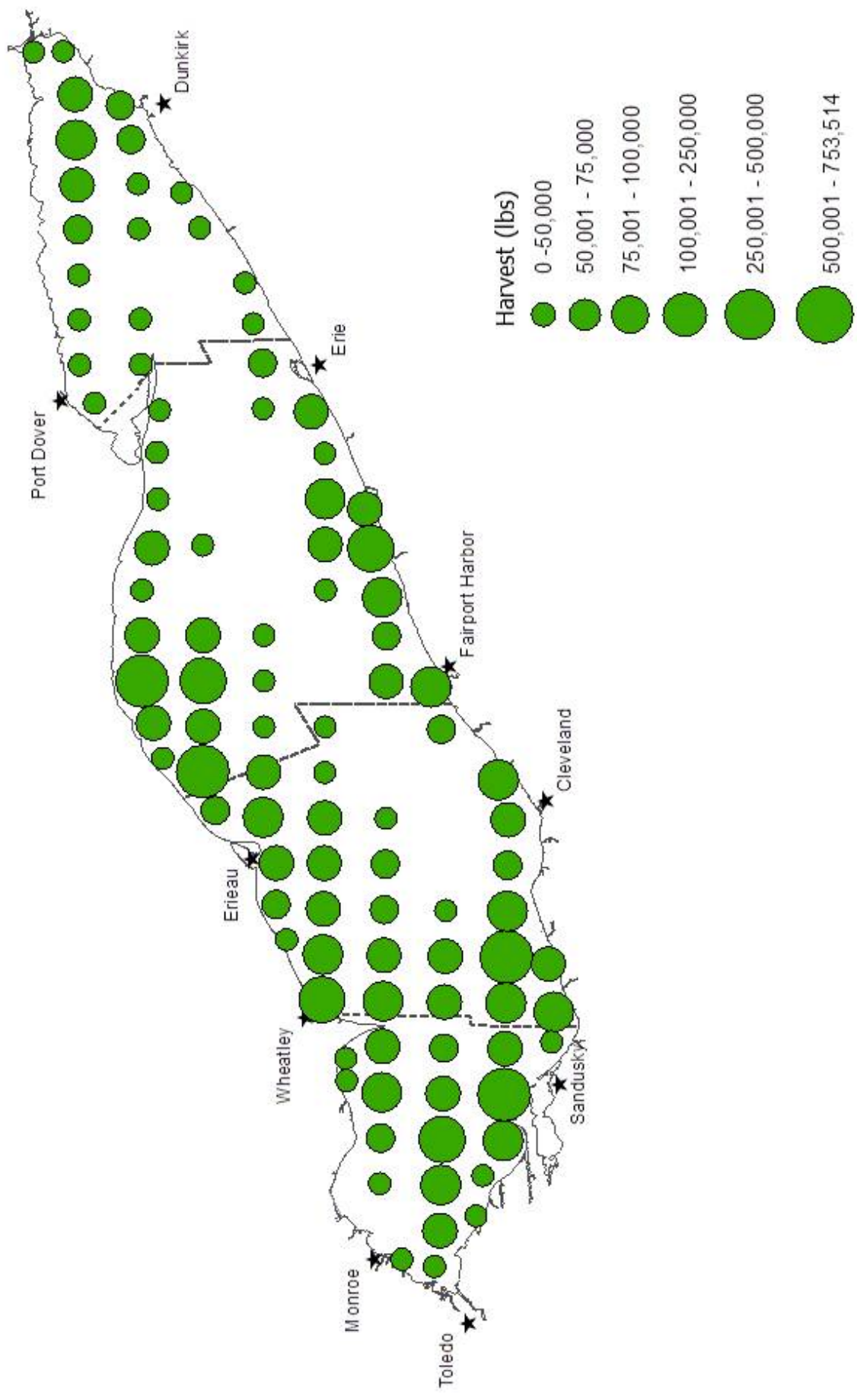
Figure 1.5. Spatial distribution of Yellow Perch total harvest (lbs.) in 2014 by 10-minute grid.
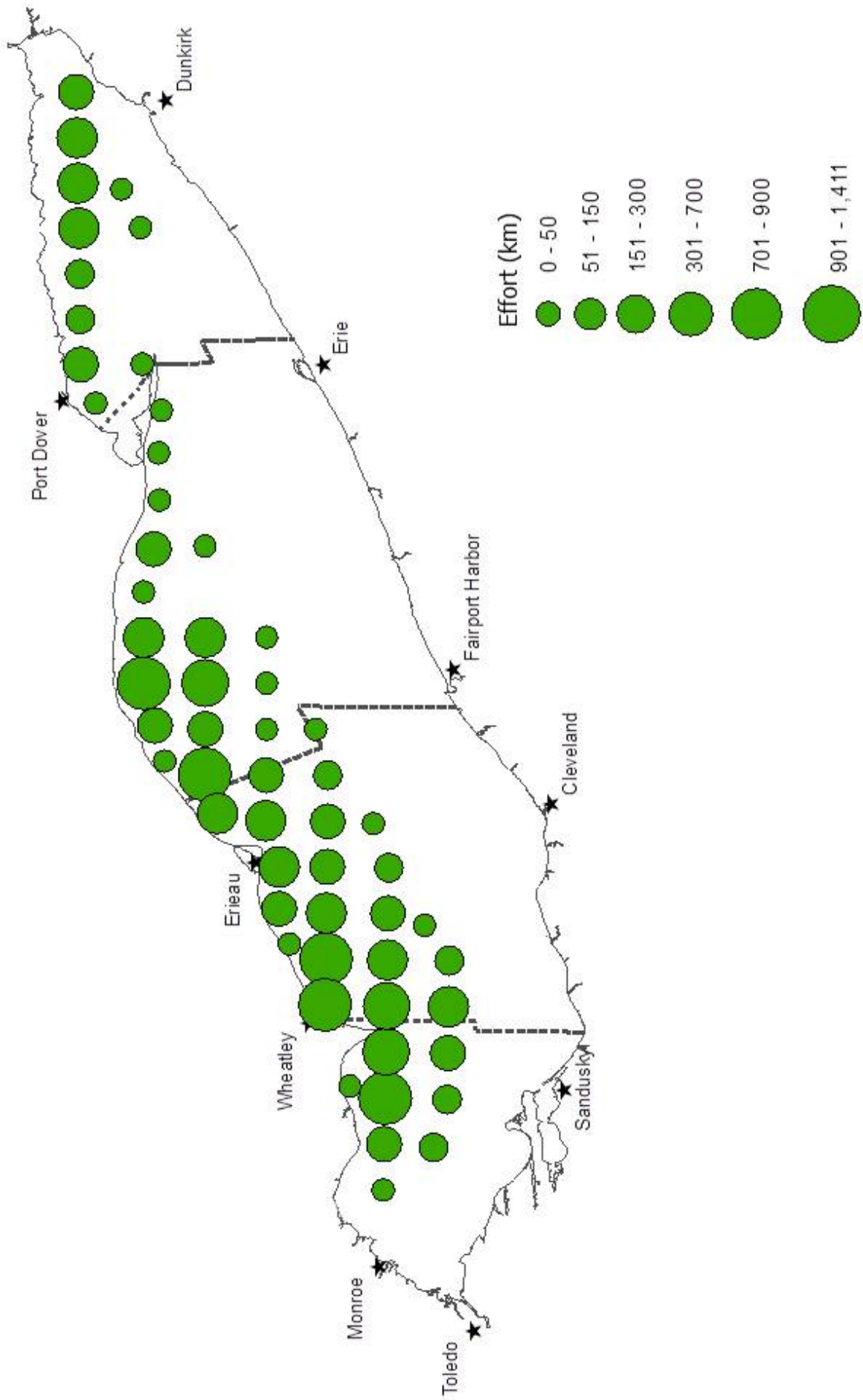
Figure 1.6. Spatial distribution of Yellow Perch small mesh gill net effort (km) in 2014 by 10-minute grid.

Effort (km)

0 - 50
51 - 150
151 - 300
301 - 700
701 - 900
901 - 1,411

Dunkirk
Erie
Fairport Harbor
Cleveland
Sandusky
Monroe
Toledo
Port Dover
Erieau
Wheatley
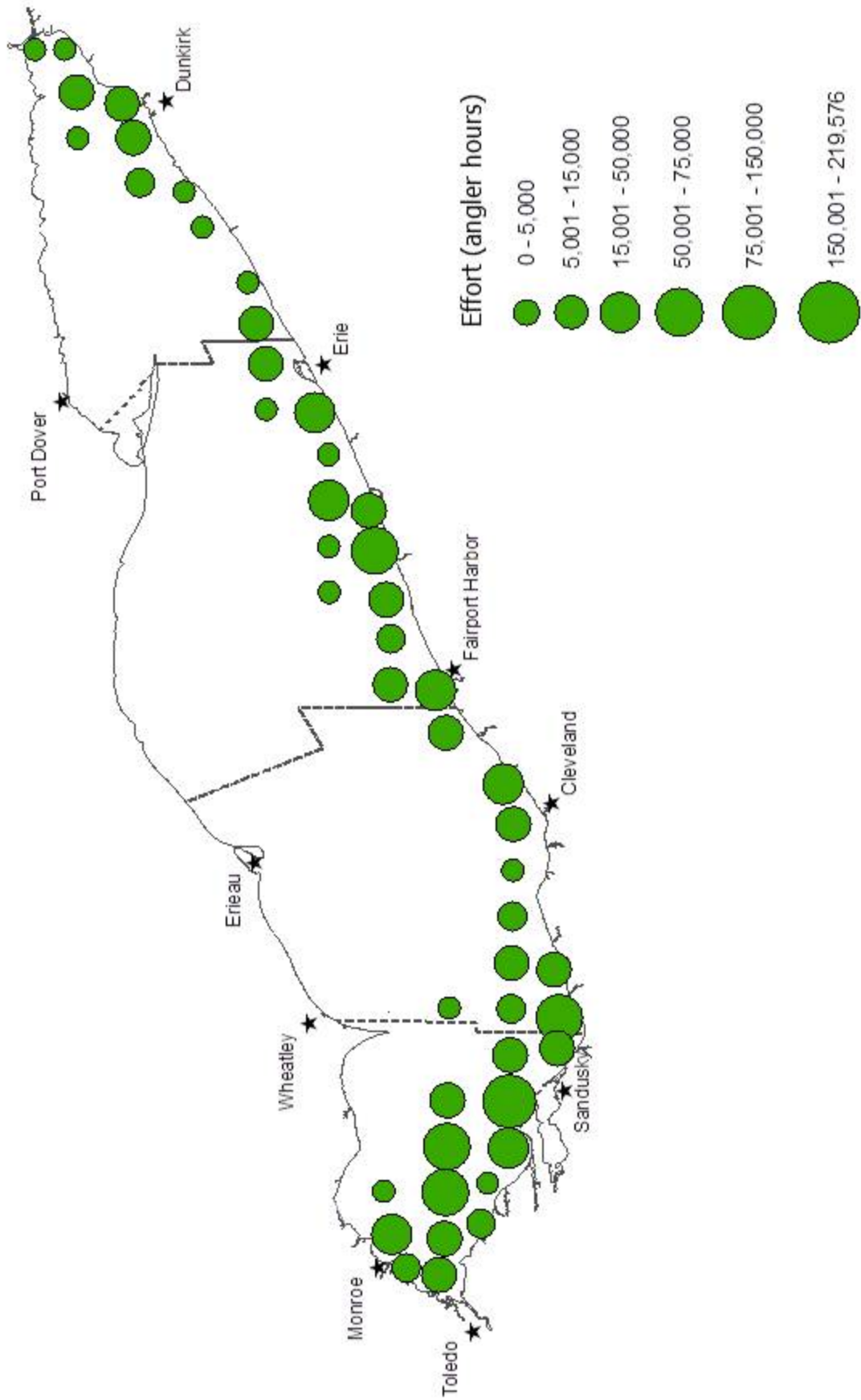
Figure 1.7. Spatial distribution of Yellow Perch sport effort (angler hours) in 2014 by 10-minute grid.
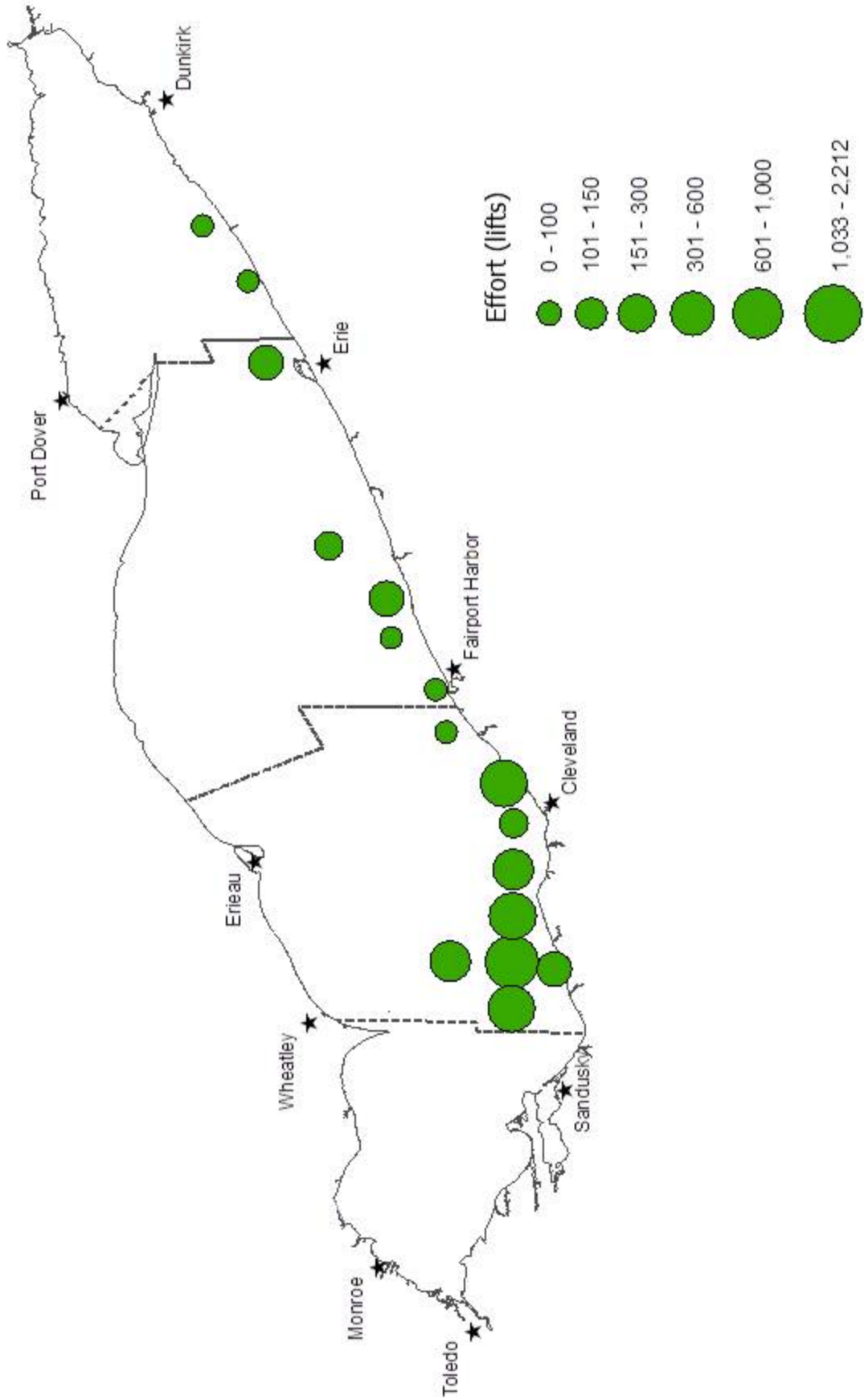
Figure 1.8. Spatial distribution of Yellow Perch trap net effort (lifts) in 2014 by 10-minute grid.
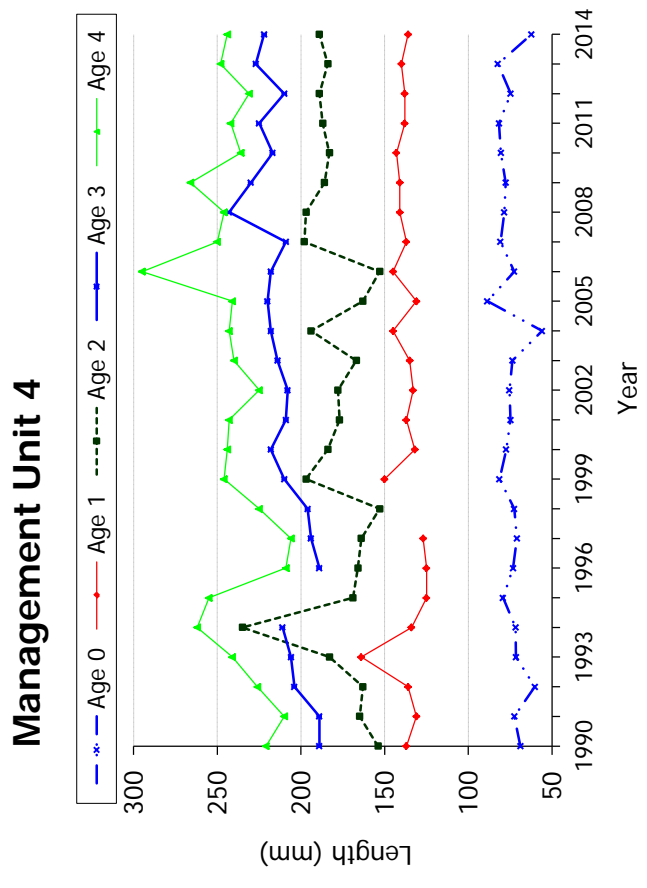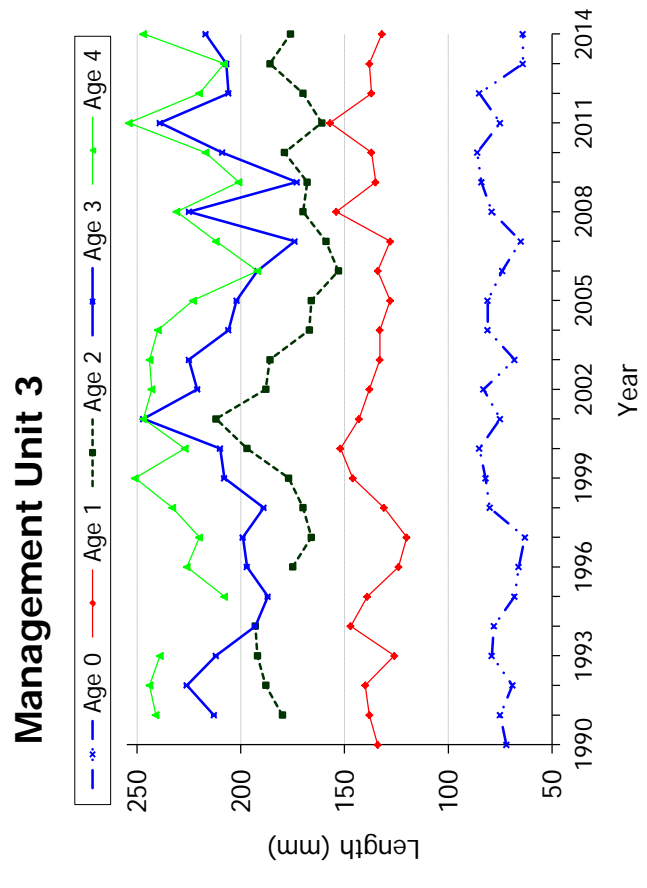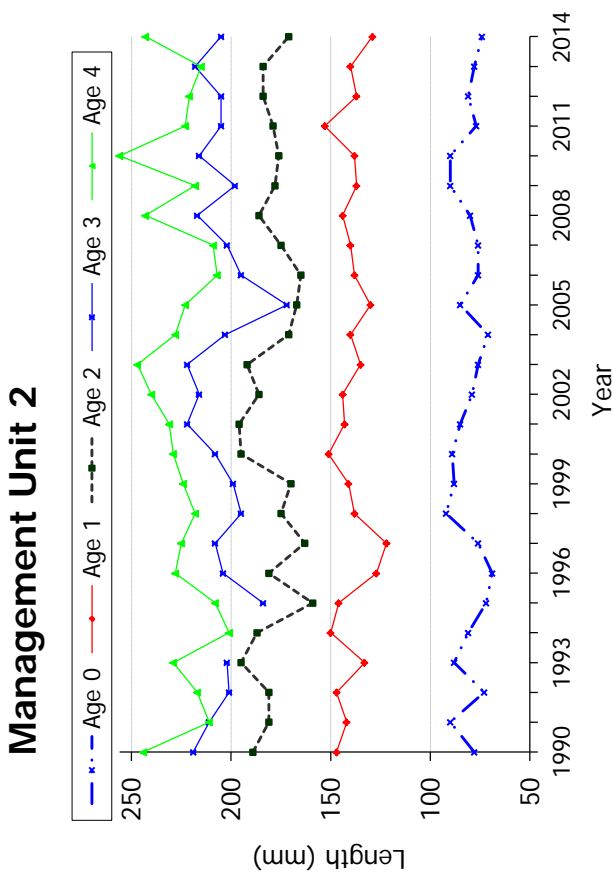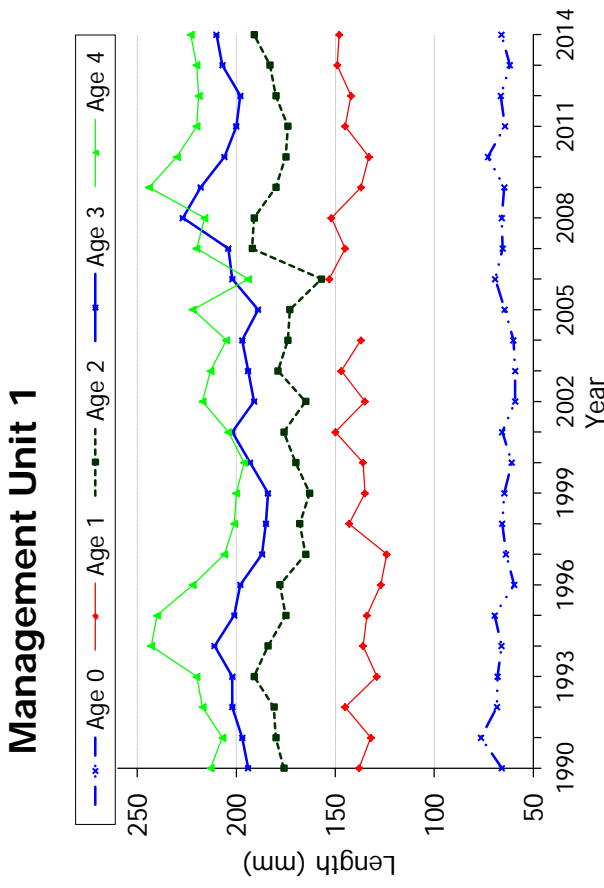
Figure 1.9. Yellow Perch total length-at-age from 1990-2014 fall interagency experimental samples for ages 0-4 by management unit (MU).
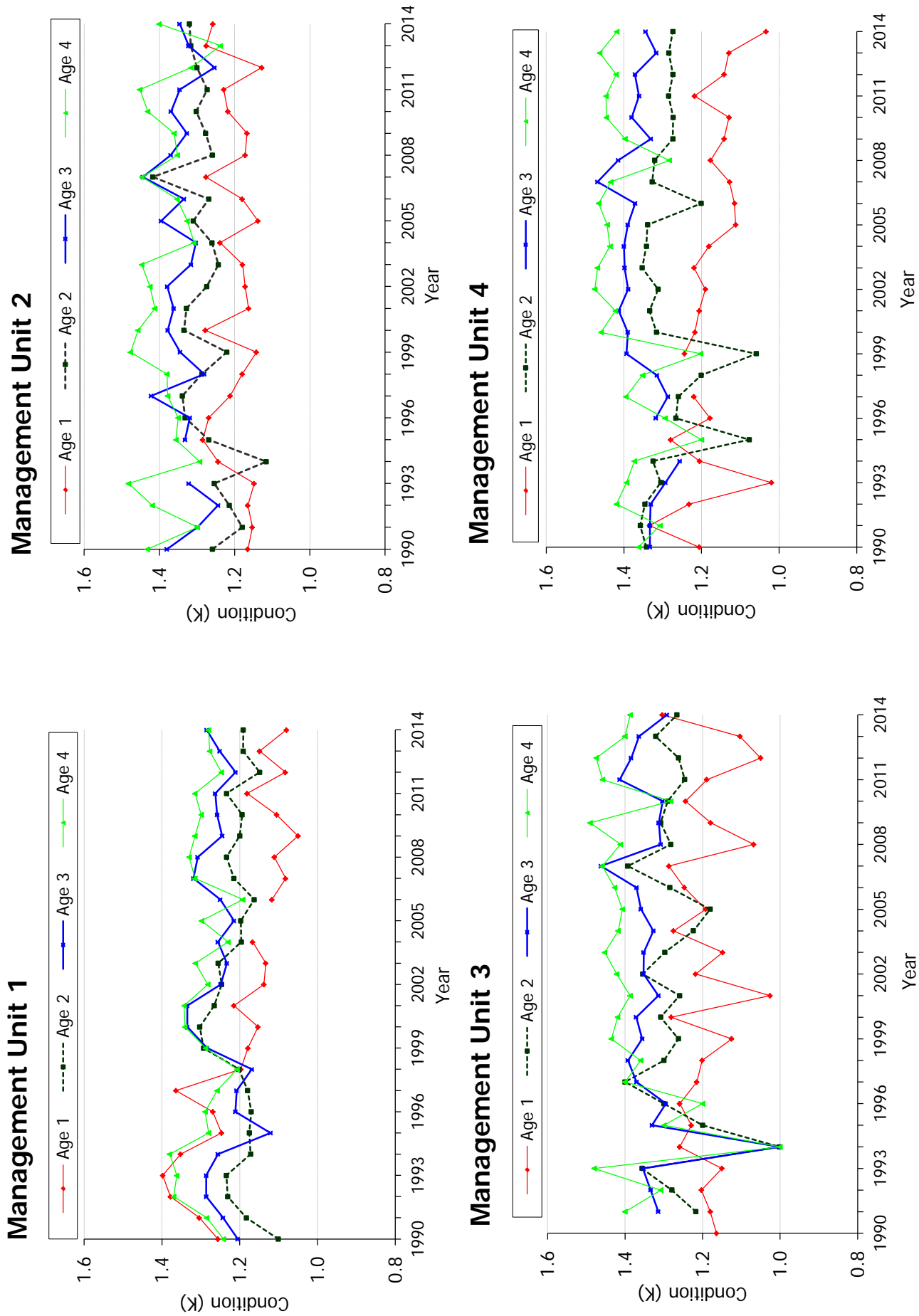
Figure 1.10. Yellow Perch condition (K) at age from 1990-2014 fall interagency experimental samples for ages 1-4 by management unit (MU).
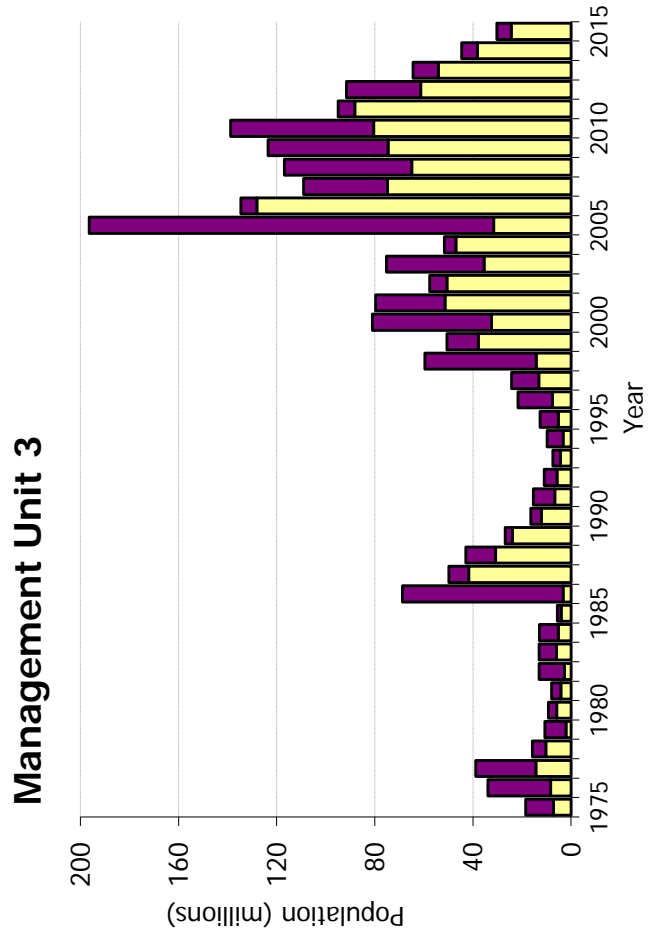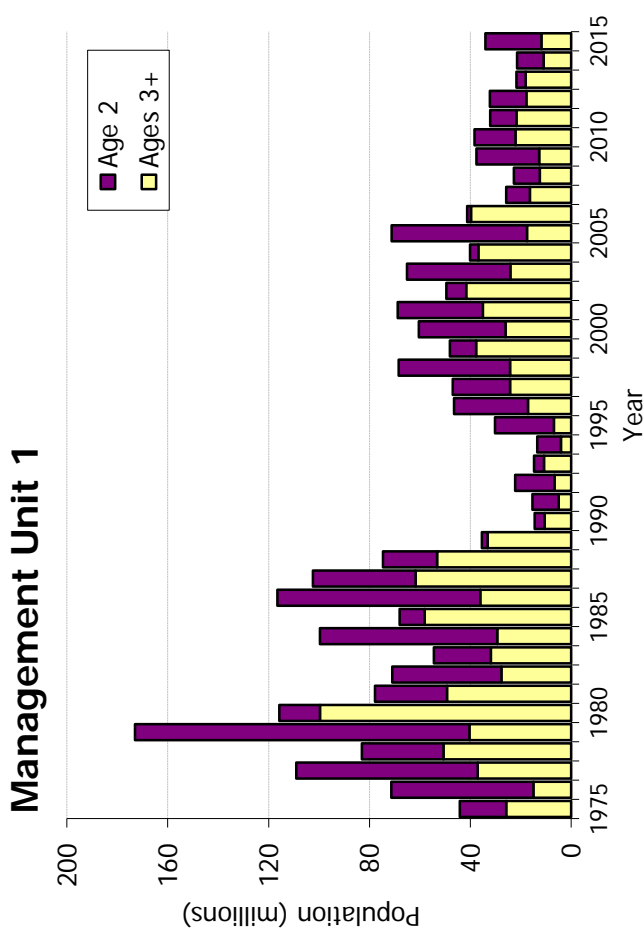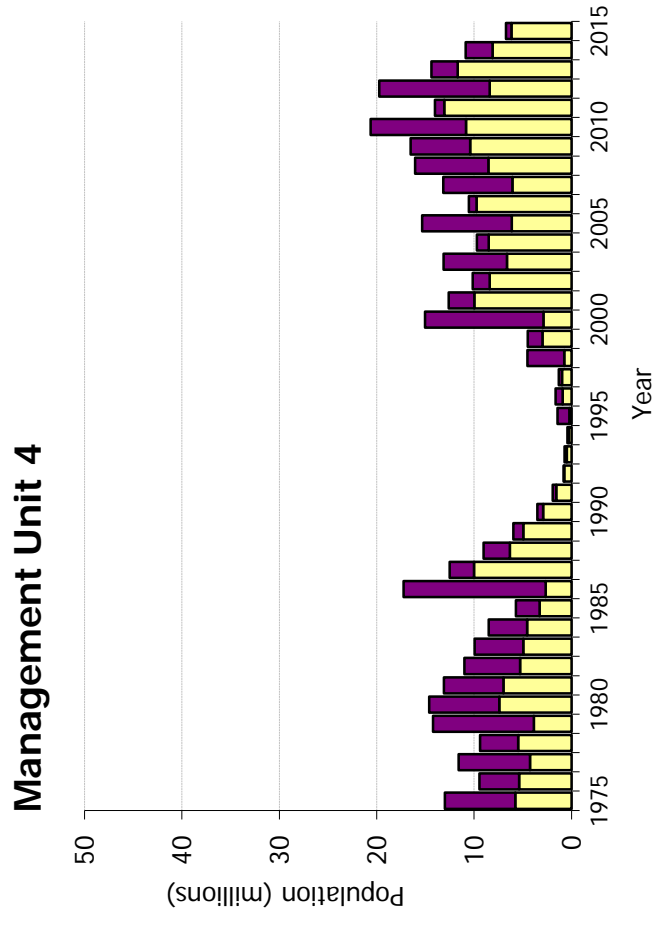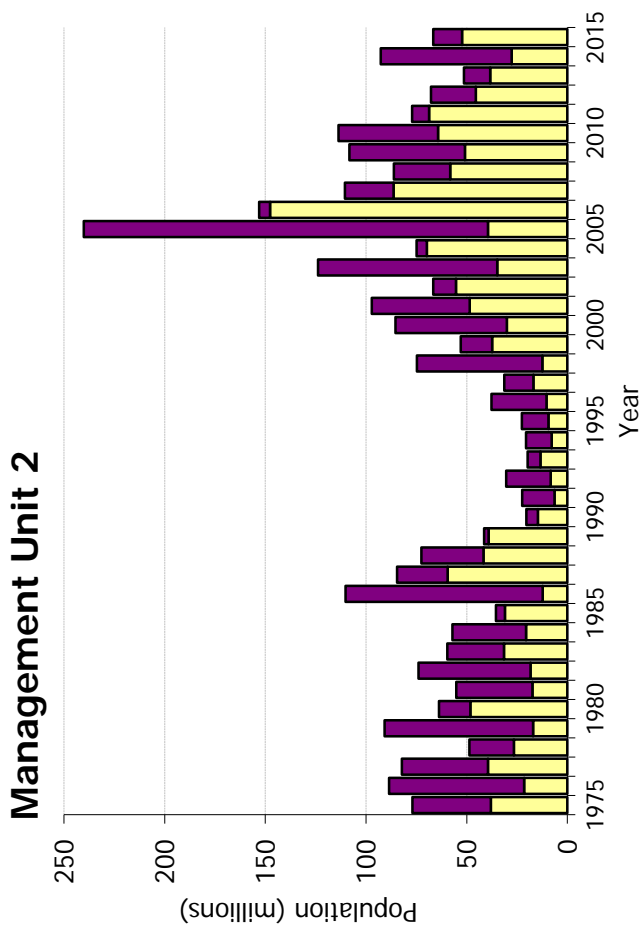
Figure 1.11. Lake Erie Yellow Perch population estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2015 are from ADMB and regressions for age 2 from survey gears.
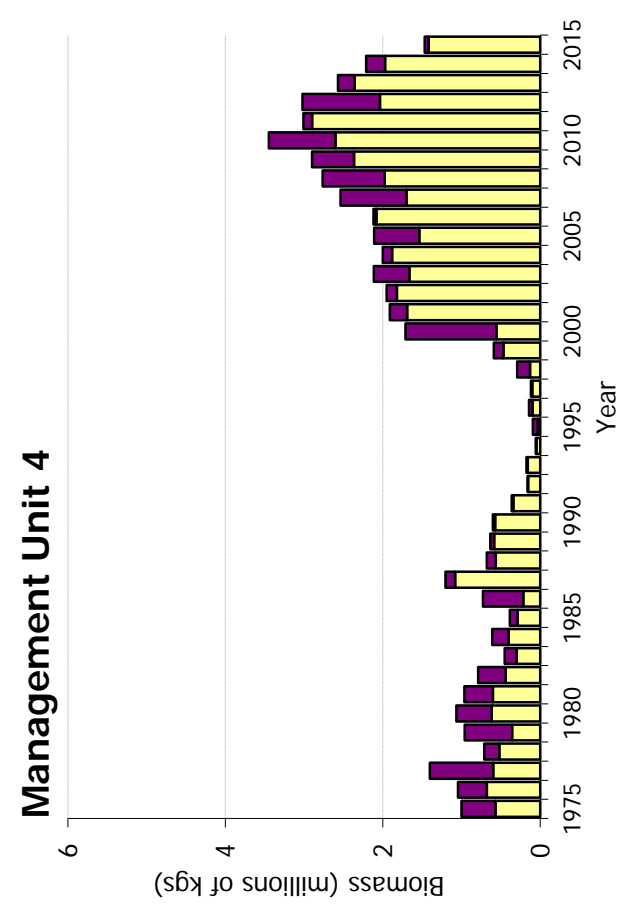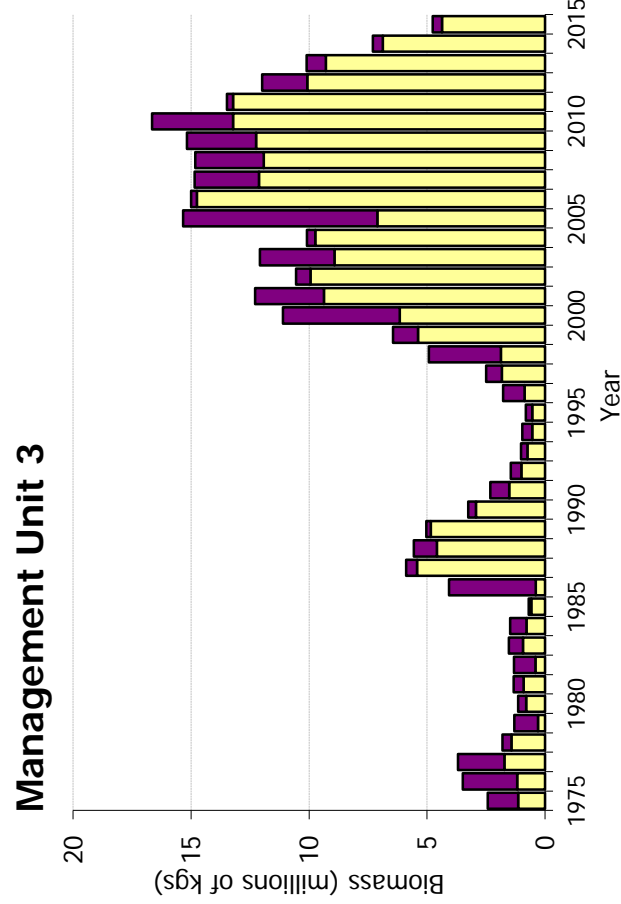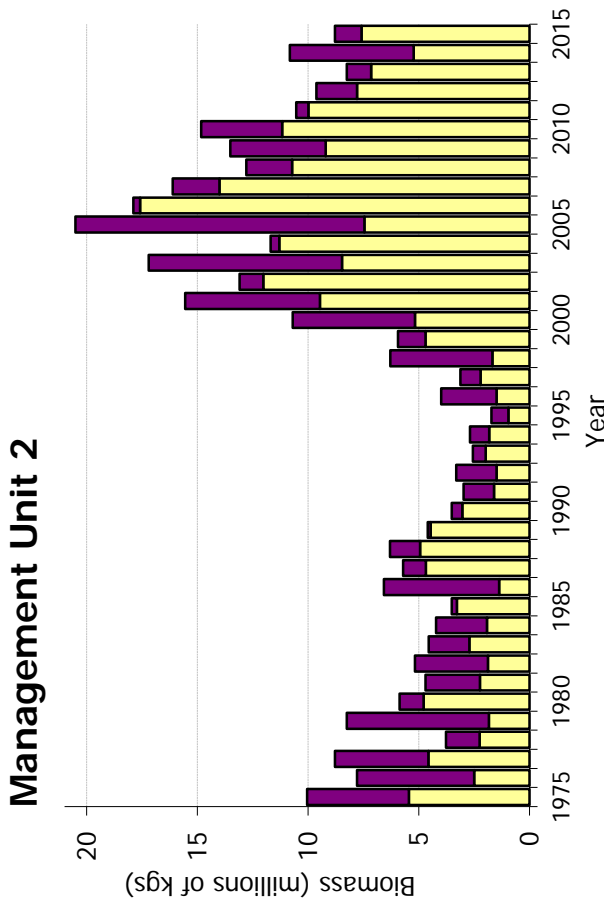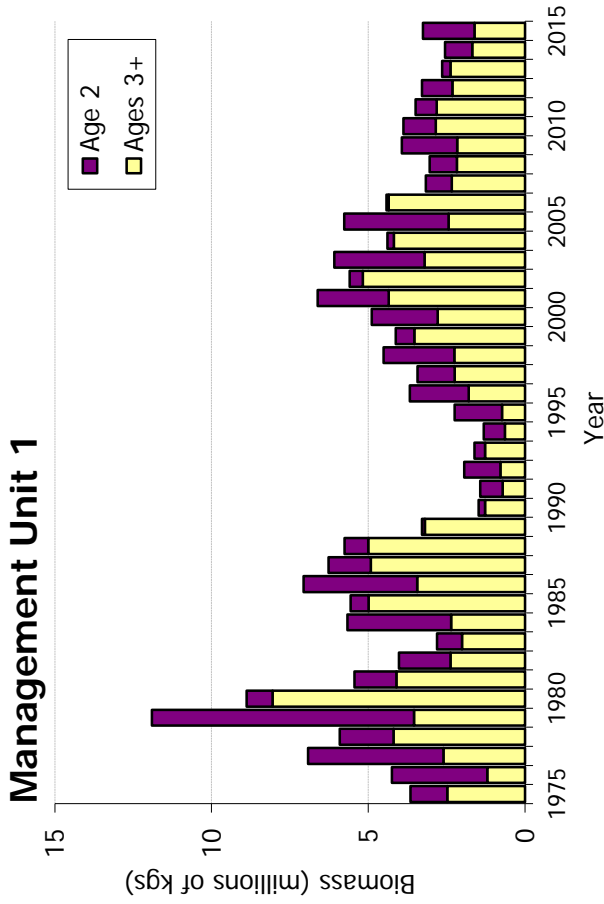
Figure 1.12. Lake Erie Yellow Perch biomass estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2014 are from ADMB and regressions for age 2 from survey gears.
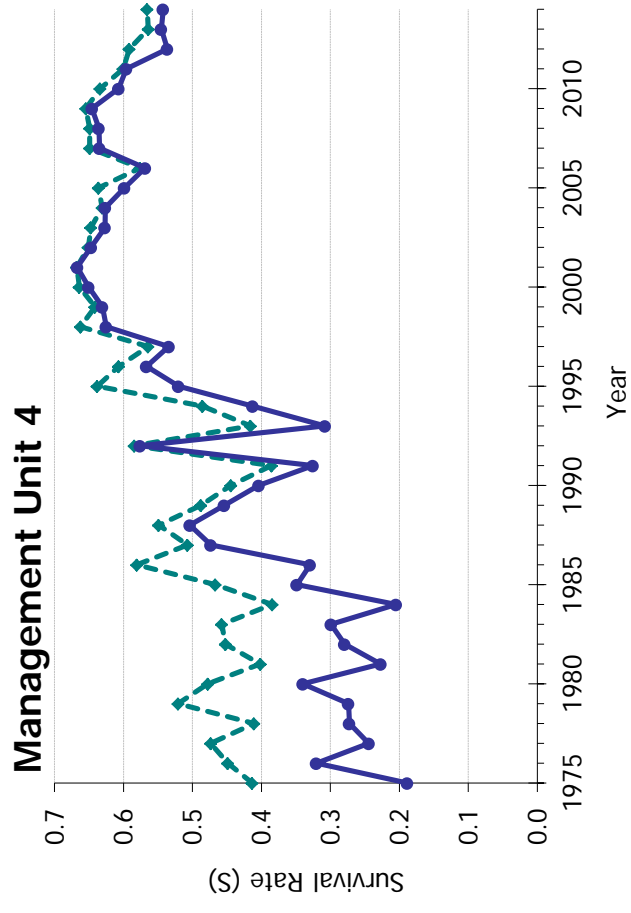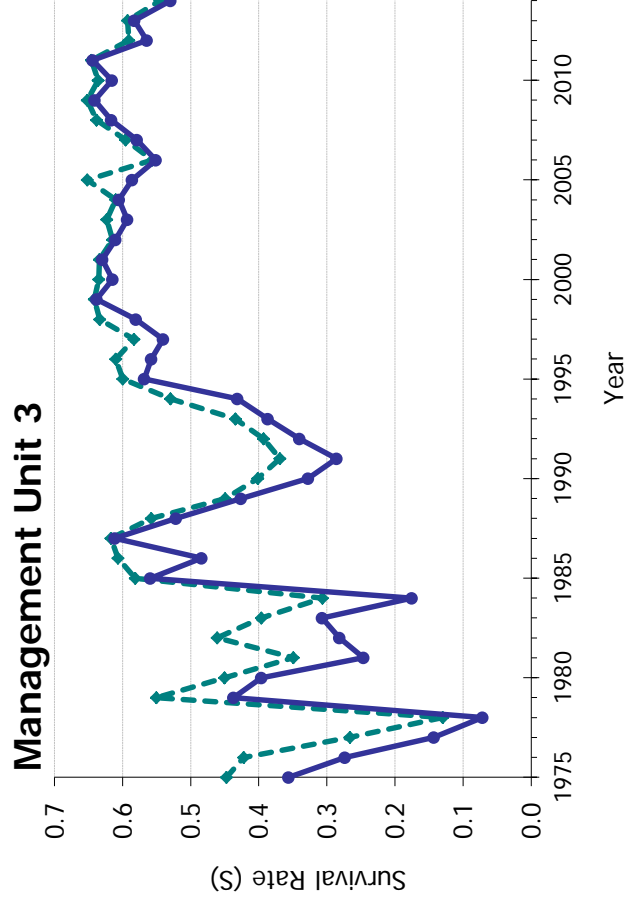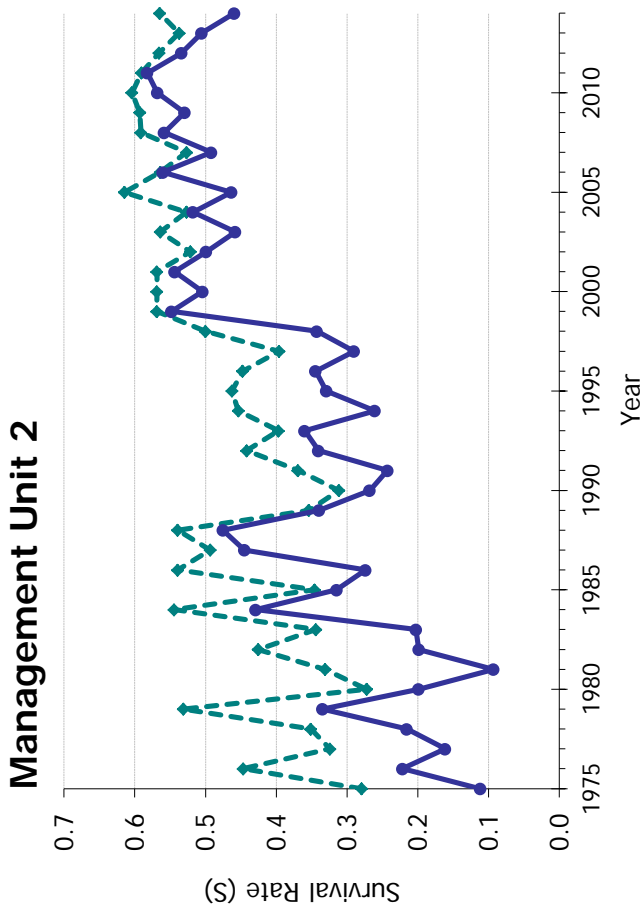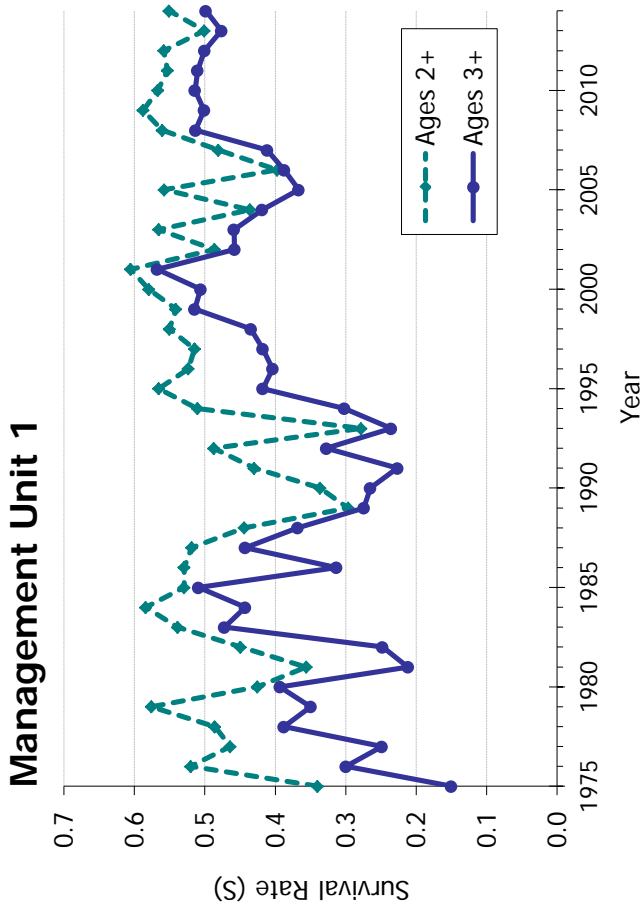
Figure 1.13. Lake Erie Yellow Perch survival rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.
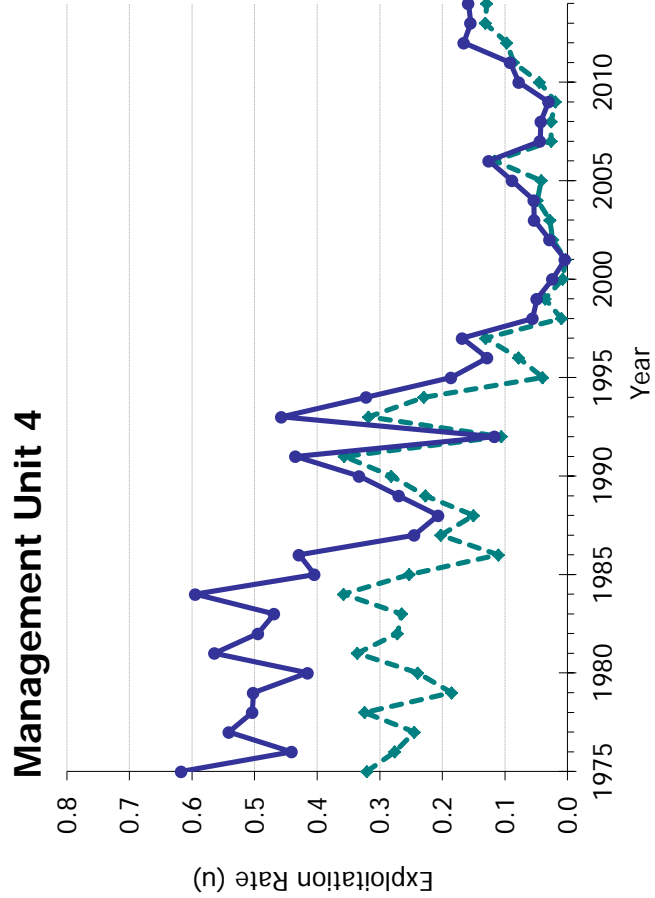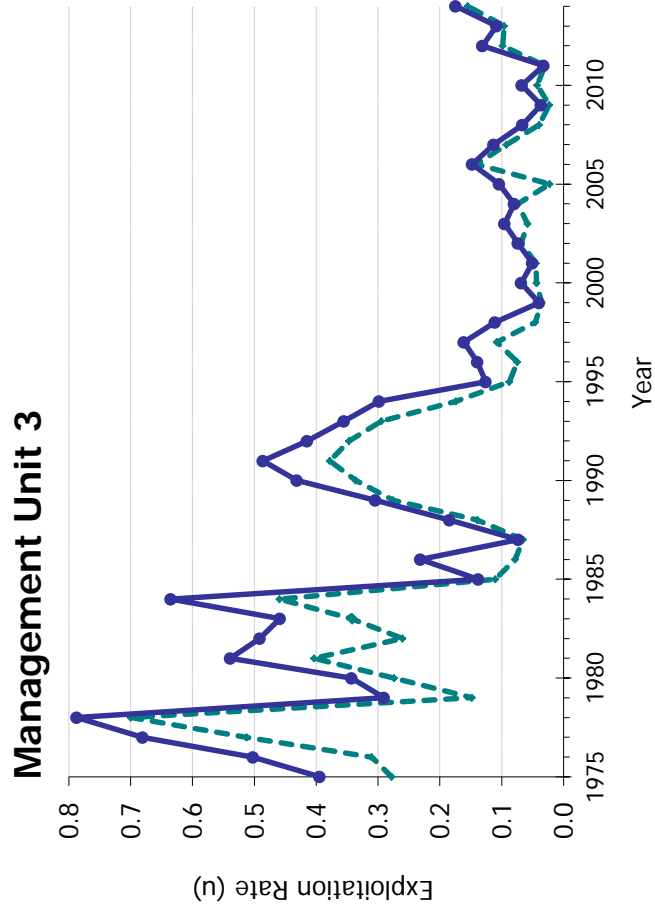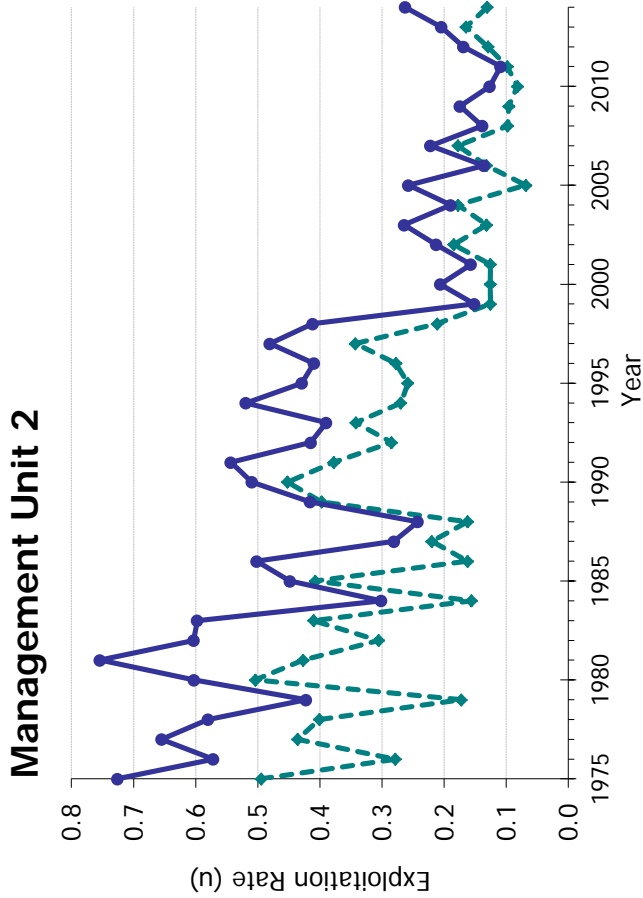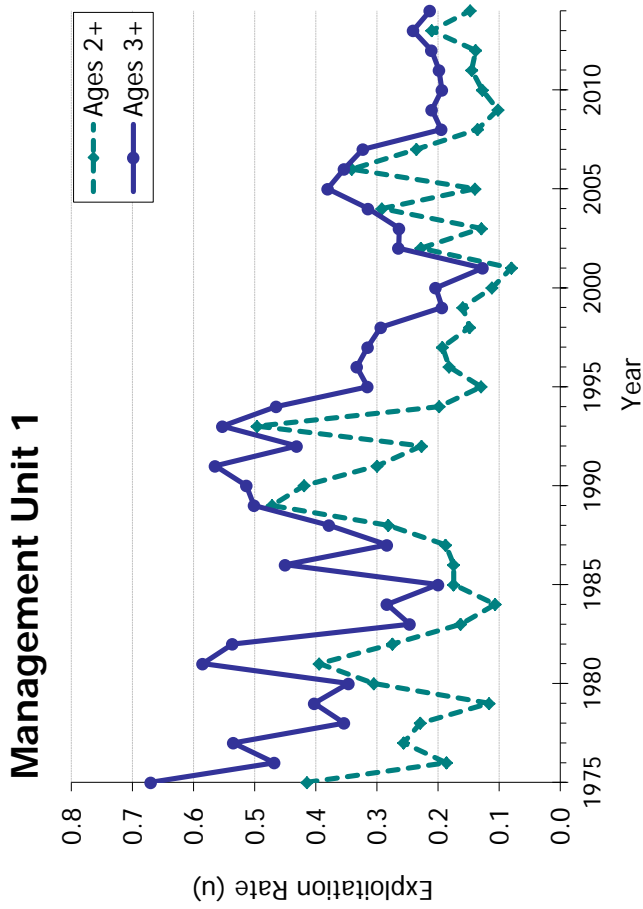
Figure 1.14. Lake Erie Yellow Perch exploitation rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.
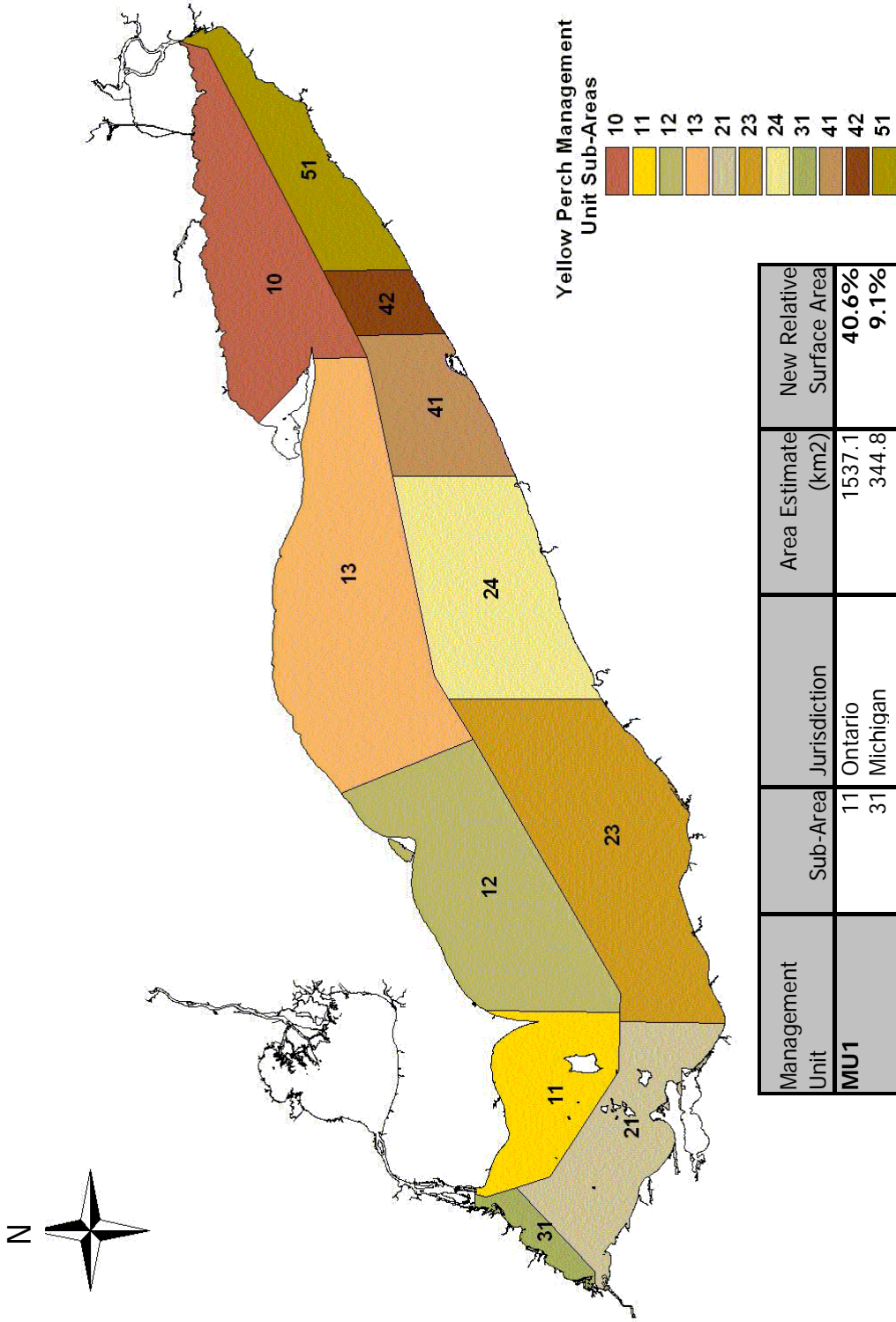
Management Unit	Sub-Area	Jurisdiction	Area Estimate (km2)	New Relative Surface Area
MU1	11	Ontario	1537.1	**40.6%**
	31	Michigan	344.8	**9.1%**
	21	Ohio	1905.6	**50.3%**
		MU1 Total	**3787.5**	
MU2	12	Ontario	3497.4	**45.6%**
	23	Ohio	4175.3	**54.4%**
		MU2 Total	**7672.7**	
MU3	13	Ontario	4749.9	**52.3%**
	24	Ohio	2943.7	**32.4%**
	41	Pennsylvania	1385.8	**15.3%**
		MU3 Total	**9079.4**	
MU4	10	Ontario	2818.7	**58.0%**
	42	Pennsylvania	535.6	**11.0%**
	51	New York	1507.2	**31.0%**
		MU4 Total	**4861.4**	

Figure 2.1. Calculations for subunit areas in the Yellow Perch Task Group Management Units.

Appendix A Table 1. Expert Opinion (EO) Lambda (λ) values and relative number of terms associated with catch-at-age analysis data sources by management unit (Unit).

Unit	Data Source	λ	Relative Number of Terms
1	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.7	1
	Commercial Trap Net Effort	0.5	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.9	5
	Commercial Trap Net Harvest	0.7	5
	Trawl Survey Catch Rates	1.0	3
	Partnership Gill Net Index Catch Rates	1.0	5
2	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.8	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.9	5
	Commercial Trap Net Harvest	0.7	5
	Trawl Survey Catch Rates	0.9	4
	Partnership Gill Net Index Catch Rates	1.0	5
3	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.8	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.8	5
	Commercial Trap Net Harvest	0.6	5
	Trawl Survey Catch Rates	1.0	4
	Partnership Gill Net Index Catch Rates	1.0	5
4	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.7	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.7	5
	Commercial Trap Net Harvest	0.6	5
	NY Gill Net Survey Catch Rates	1.0	5
	Partnership Gill Net Index Catch Rates	0.9	5

Appendix A Table 2a. Projected Lake Erie Yellow Perch age-2 estimates (in millions of fish) from multi-model inference recruitment models run for each management unit.

2015 Age-2 Projections

Management Unit	Age-2 Recruitment Estimates			Number of years in model	Number of models averaged
	2015				
	Min.	Mean	Max.		
1	18.873	22.250	26.231	22	8
2	12.581	14.248	16.135	19	2
3	4.572	5.879	7.560	15	2
4	0.194	0.580	1.736	18	2

Appendix A Table 2b. Parameters from multi-model inference age-2 recruitment models run for each management unit.

2015 Age-2 Projections

MU1

Age_2 ~ Intercept + OPSF11 + OOS11 + OHF11 + OOS10 + OHF10

Survey	Estimate	Uncond. variance	Number of models	Importance	+/- (alpha = 0.05)
OOS10	0.022	0.002	1	0.115	0.093
OHF10	0.161	0.031	4	0.559	0.370
OHF11	0.058	0.004	4	0.601	0.126
OPSF11	0.079	0.002	6	0.857	0.105
OOS11	0.372	0.033	6	0.899	0.384
(Intercept)	-0.049	0.163	7	1.000	0.849

MU2

Age_2 ~ Intercept + OHF20B + OHS20B + OPSF21

Survey	Estimate	Uncond. variance	Number of models	Importance	+/- (alpha = 0.05)
OHF20B	0.065	0.009	1	0.389	0.206
(Intercept)	1.080	0.055	2	1.000	0.499
OHS20B	0.130	0.002	2	1.000	0.105
OPSF21	0.370	0.005	2	1.000	0.145

MU3

Age_2 ~ Intercept + OHS30B + OHF31B

Survey	Estimate	Uncond. variance	Number of models	Importance	+/- (alpha = 0.05)
OHF31B	0.065	0.010	1	0.349	0.222
(Intercept)	1.010	0.130	2	1.000	0.782
OHS30B	0.443	0.005	2	1.000	0.159

MU4

Age_2 ~ Intercept + NYF41 + LPC41

Survey	Estimate	Uncond. variance	Number of models	Importance	+/- (alpha = 0.05)
LPC41	0.093	0.019	1	0.405	0.291
(Intercept)	-0.434	0.176	2	1.000	0.891
NYF41	0.514	0.026	2	1.000	0.343

Appendix A Table 3. Interagency trawl surveys indices. All trawl series are reported in arithmetic mean catch per hectare, all gill net series are in numbers of fish per lift. Series in grey are excluded from recruitment estimates in Appendix Table 2.

Year	OHS10	OHF10	OHS11	OHF11	OOS10	OOS11	OHS20	OHF20	OHS21	OHF21	OHS30	OHF30	OHF20B	OHF21B	OHF30B	OHF31B	OHS20B	OHS21B	OHS30B	OHS31B	OHJ21B	OHJ31B	OHJ21	OHJ31
1984	.	.	.	.	.	13.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1985	.	.	.	.	.	12.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1986	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1987	16.3	.	74.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1988	188.6	.	11.2	.	212.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1989	106.1	.	11.8	.	265.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1990	144.4	310.1	20.7	82.0	259.2	35.2	1.7	43.6	67.4	24.0	0.9	21.1	52.2	23.0	21.2	12.4	1.7	67.4	1.2	7.5	216.5	19.7	216.5	19.7
1991	146.9	58.1	27.6	0.4	113.2	42.1	5.4	10.8	43.5	51.6	4.5	1.3	9.3	50.0	1.2	19.7	5.4	43.5	5.2	77.7	18.5	0.8	18.5	0.8
1992	60.7	90.9	9.5	0.7	94.1	16.5	7.2	40.2	8.0	15.6	19.6	27.5	36.3	15.0	31.3	3.3	7.2	8.0	24.3	2.7	10.1	4.7	10.1	4.7
1993	1164.2	256.4	14.4	3.7	862.5	39.5	41.7	10.3	29.1	39.6	39.7	16.0	10.6	49.0	27.3	12.1	41.7	29.1	39.7	16.0	23.3	10.2	23.3	10.2
1994	508.5	287.1	57.7	73.1	469.7	62.9	73.3	77.1	5.0	11.1	77.2	14.7	71.9	12.0	16.1	3.4	73.3	5.0	77.2	16.7	.	.	.	.
1995	348.9	82.4	128.8	0.1	478.7	113.5	3.2	2.9	102.2	67.7	25.3	10.0	2.8	73.5	14.1	27.5	2.8	120.5	27.3	21.0	8.9	0.9	7.9	0.9
1996	3290.8	579.3	79.9	82.3	2544.9	122.8	998.1	128.7	11.6	13.0	1912.1	122.0	129.6	13.2	116.5	3.5	1059.9	12.1	2006.8	3.6	493.9	64.0	506.2	63.8
1997	52.2	33.7	121.8	104.9	55.2	93.8	29.0	9.3	677.7	148.0	2.9	2.9	11.6	147.3	2.6	40.0	29.0	677.7	.	.	21.5	16.2	22.5	16.2
1998	174.5	250.9	4.8	16.0	170.6	8.2	235.1	74.4	3.5	6.4	275.5	38.9	72.6	6.0	38.1	3.7	225.4	3.4	275.5	3.7	402.8	97.3	399.2	85.3
1999	270.1	155.3	68.5	47.1	330.0	75.0	31.4	63.1	19.4	41.7	44.8	22.0	68.3	41.8	25.7	41.7	29.5	19.4	44.8	63.5	51.4	10.2	50.6	10.3
2000	186.4	41.5	85.3	38.0	102.5	113.6	0.6	18.0	86.6	57.1	1.0	1.0	18.2	56.9	1.6	19.4	0.6	86.6	.	84.8	279.8	4.3	299.0	4.3
2001	322.1	246.3	12.8	10.3	398.4	11.3	313.2	118.0	7.7	5.2	1283.7	13.2	119.2	5.3	13.6	0.4	341.9	6.4	1283.7	10.2	239.6	37.7	247.1	39.0
2002	33.1	30.4	77.1	86.5	26.4	59.5	0.3	3.8	191.0	45.9	1.7	3.1	3.3	46.1	3.0	51.9	0.3	191.0	1.7	749.6	9.5	2.5	10.4	2.6
2003	1509.9	1111.6	3.0	7.1	1620.8	12.3	1174.9	126.7	3.8	2.5	1170.2	56.5	136.9	2.9	53.2	1.0	1180.4	3.8	1170.2	2.5	410.3	42.7	422.0	42.7
2004	40.9	9.3	210.7	127.7	45.2	240.7	35.1	8.2	313.0	206.1	3.6	2.0	7.7	224.2	1.9	45.2	32.8	316.2	3.6	61.9	51.2	19.3	44.9	19.3
2005	124.2	62.3	5.2	2.0	114.8	5.2	108.8	43.9	23.1	19.2	278.2	126.8	43.9	19.2	156.2	132.3	105.2	22.3	278.2	82.3	29.7	113.6	29.7	113.6
2006	180.2	121.9	6.4	12.5	222.8	12.4	4.9	3.6	2.2	5.1	60.7	18.9	8.3	4.6	4.6	11.9	4.9	2.2	60.7	10.8	287.6	281.8	287.6	281.8
2007	592.9	631.5	14.5	23.6	444.6	18.8	237.0	150.6	22.6	20.2	237.0	166.5	151.0	20.7	177.8	37.0	245.8	21.3	237.0	40.9	303.5	97.2	303.5	97.2
2008	267.0	74.7	23.5	15.3	387.2	142.1	219.5	31.2	63.1	53.4	558.3	52.8	31.5	53.4	52.8	26.4	210.5	62.6	558.3	150.2	125.9	48.2	125.9	48.2
2009	186.0	69.4	85.3	57.0	136.6	88.4	16.0	1.6	58.3	20.2	0.1	0.5	1.6	20.2	0.5	139.4	14.2	62.7	0.1	104.3	29.2	12.1	28.8	12.1
2010	58.2	26.9	22.2	17.8	96.9	26.4	.	41.1	.	11.9	.	96.3	41.1	11.9	96.3	12.4	.	.	.	.	70.8	41.7	70.8	40.8
2011	29.9	12.0	15.5	10.0	178.0	25.9	7.1	10.5	34.5	6.4	14.1	15.1	10.3	6.3	15.1	55.5	7.1	34.5	14.1	41.3	42.5	76.5	46.4	76.5
2012	74.5	35.0	2.2	6.0	68.1	4.0	64.0	69.2	9.3	7.4	157.0	134.4	69.2	7.4	134.4	23.3	65.9	9.2	154.3	23.5	84.2	116.2	83.8	116.2
2013	398.7	337.0	10.3	3.7	315.6	17.8	2.6	8.9	52.2	34.9	3.4	8.9	8.9	34.9	8.9	109.5	2.6	52.2	3.5	272.9	.	.	.	.
2014	668.9	521.7	17.4	17.8	859.6	51.1	33.6	37.7	2.8	15.4	45.8	49.1	37.7	15.4	49.1	24.2	33.6	2.8	45.8	15.4	.	.	.	.

Year	OHS31	OHF31	OLPN40	OLPN41	ILP40	ILP41	NYF40	NYF41	LPS41	LPC40	LPC41	LPO40	LPO41	OPSF11	OPSF21	OPSF31	OPSF41
1984	.	.	283.9	9.7	761.7	44.5	.	.	.	119.1	5.9	7.3	0.0	.	.	.	.
1985	.	.	2.4	32.6	20.8	125.5	.	.	.	3.8	30.5	1.6	17.1	.	.	.	.
1986	.	.	102.0	0.2	1859.5	61.7	.	.	7.6	212.7	6.9	0.0	0.3	.	.	.	.
1987	.	.	3.4	284.1	3.8	39.7	.	.	5.5	0.8	36.7	0.4	2.1	.	.	.	.
1988	.	.	667.7	0.8	305.0	2.9	.	.	1.1	105.8	0.4	0.4	0.0	.	.	.	.
1989	.	.	296.9	53.2	457.7	84.6	.	.	6.3	82.1	16.4	0.4	1.9	.	.	.	.
1990	9.2	13.4	43.3	12.0	202.6	21.0	.	.	0.0	26.7	5.6	1.9	2.6	41.3	68.9	6.8	76.6
1991	66.6	19.6	15.5	1.0	144.0	24.5	.	.	1.7	17.8	3.2	2.6	0.6	63.3	56.6	29.7	0.6
1992	4.4	3.1	54.3	9.0	594.0	32.8	10.4	2.3	5.6	70.3	4.6	0.7	0.1	47.5	8.0	3.8	1.6
1993	16.0	12.0	21.6	4.5	239.8	17.9	110.1	3.0	7.9	30.6	2.6	0.0	0.2	146.9	112.0	5.7	6.3
1994	16.7	4.0	159.8	15.3	84.0	29.8	47.7	8.4	2.7	34.7	6.2	2.9	1.7	317.8	22.5	93.2	0.1
1995	22.4	32.7	6.0	33.7	5.3	54.3	5.7	14.2	15.2	4.3	10.9	10.6	1.7	362.5	81.3	39.7	7.4
1996	3.2	3.7	199.1	2.6	53.6	6.1	106.3	0.3	0.4	33.6	1.1	4.0	0.1	198.4	70.8	55.2	9.6
1997	.	47.5	18.9	59.8	21.5	5.4	0.2	5.5	4.4	127.8	7.1	7.9	0.1	139.3	350.5	177.9	.
1998	3.7	4.0	114.9	1.2	1005.9	14.9	1.5	0.2	0.2	16.1	1.7	7.1	0.0	17.5	6.7	6.2	0.0
1999	63.5	40.6	2.5	69.5	34.0	155.7	36.1	33.5	8.4	3.6	11.0	8.1	0.1	440.6	107.6	67.9	119.9
2000	84.8	19.9	10.2	2.1	1.2	4.8	23.1	6.6	23.0	69.4	11.3	15.5	109.3	106.1	162.4	55.5	36.9
2001	10.2	0.4	76.7	2.0	463.8	2.7	97.9	11.5	4.8	1.0	3.0	3.0	13.4	12.9	9.6	1.9	9.5
2002	749.6	49.5	0.6	13.9	8.3	42.6	9.3	15.5	6.8	222.8	2.0	13.8	1.9	198.7	245.2	186.6	19.7
2003	2.3	1.1	93.3	0.8	224.0	1.5	472.5	1.9	1.9	0.1	6.6	0.0	0.7	2.7	2.6	7.2	3.2
2004	61.7	44.4	0.5	4.3	0.1	21.4	1.5	28.7	6.5	124.4	2.3	240.6	2.6	976.5	1188.5	332.5	7.7
2005	82.3	131.6	10.3	0.1	8.8	0.2	57.8	5.4	0.4	30.1	12.4	0.1	12.2	0.0	2.2	2.5	0.2
2006	10.8	13.6	2.8	1.4	0.3	4.8	283.2	39.9	19.5	63.5	0.1	156.2	0.0	15.7	28.5	94.8	129.7
2007	40.9	34.5	6.3	0.9	73.9	3.0	401.3	41.2	9.1	279.4	12.1	38.0	14.6	184.4	203.9	202.5	43.4
2008	150.2	26.4	4.9	6.6	0.3	4.1	1088.3	44.3	5.7	0.4	7.9	70.0	9.6	333.1	310.6	150.6	87.0
2009	104.3	137.2	1.5	4.2	0.0	0.0	11.6	62.5	0.7	51.8	20.8	356.0	25.1	265.2	121.4	190.0	30.6
2010	.	12.4	13.2	0.6	5.7	0.6	192.7	4.0	1.7	176.7	10.7	0.3	13.1	49.5	18.1	36.2	15.7
2011	41.3	55.5	3.9	1.9	3.9	12.8	87.2	138.2	5.0	27.4	0.2	63.5	1.3	158.7	101.8	218.6	95.4
2012	22.3	23.3	11.3	1.1	1.6	1.7	272.9	16.3	13.7	0.5	2.6	224.6	2.2	53.1	21.9	48.7	117.8
2013	262.6	109.5	1.8	0.5	2.1	5.6	4.2	23.8	2.2	28.4	2.0	33.2	2.2	64.1	71.4	152.1	30.4
2014	15.4	24.2	80.1	0.2	4.7	0.0	267.2	2.8	0.9	.	0.8	0.5	0.1	315.0	34.7	16.4	1.9

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Appendix A Table 4.	Legend. Lakewide trawl index codes and series names used in Appendix A Tables 2 and 3. All series are reported in arithmetic mean catch per hectare, except LPS41 and OPSF11-41, gill net indices which are reported in mean catch per lift. Abbreviations in Appendix T3 ending with a 'B' represent survey indices blocked by depth strata.

Abbreviation	Series
OHS10	Ohio Management Unit 1 summer age 0
OHS11	Ohio Management Unit 1 summer age 1
OHF10	Ohio Management Unit 1 fall age 0
OHF11	Ohio Management Unit 1 fall age 1
OOS10	Ontario/Ohio Management Unit 1 summer age 0
OOS11	Ontario/Ohio Management Unit 1 summer age 1
OHS20	Ohio Management Unit 2 summer age 0
OHF20	Ohio Management Unit 2 fall age 0
OHS21	Ohio Management Unit 2 summer age 1
OHF21	Ohio Management Unit 2 fall age 1
OHS30	Ohio Management Unit 3 summer age 0
OHF30	Ohio Management Unit 3 fall age 0
OHS31	Ohio Management Unit 3 summer age 1
OHF31	Ohio Management Unit 3 fall age 1
OHJ21	Ohio Management Unit 2 June age 1
OHJ31	Ohio Management Unit 3 June age 1
OLPN40	Outer Long Point Bay Nearshore Management Unit 4 age 0
OLPN41	Outer Long Point Bay Nearshore Management Unit 4 age 1
OLPO40	Outer Long Point Bay Offshore Management Unit 4 age 0
OLPO41	Outer Long Point Bay Offshore Management Unit 4 age 1
ILPF40	Inner Long Point Bay Management Unit 4 age 0
ILPF41	Inner Long Point Bay Management Unit 4 age 1
LPC40	Long Point Composite Management Unit 4 age 0
LPC41	Long Point Composite Unit 4 age 1
LPS41	Long Point Bay Management Unit 4 summer Gill Net age 1
NYF40	New York Management Unit 4 fall age 0
NYF41	New York Management Unit 4 fall age 1
OPSF11	Ontario Partnership Gill Net Management Unit 1 fall age 1
OPSF21	Ontario Partnership Gill Net Management Unit 2 fall age 1
OPSF31	Ontario Partnership Gill Net Management Unit 3 fall age 1
OPSF41	Ontario Partnership Gill Net Management Unit 4 fall age 1