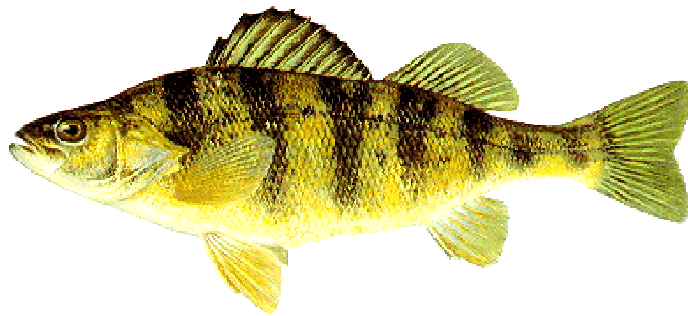


Report of the Lake Erie Yellow Perch Task Group

March 25th, 2010



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Note: The data and management summaries contained in this report are provisional. Every effort has been made to ensure their correctness. Contact individual agencies for complete state and provincial data. 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 2009 through March 2010, the Yellow Perch Task Group (YPTG) addressed the following charges:

1. Maintain and update centralized time series of datasets and methodology required for population models and assessment including:
 - a. Fishery harvest, effort, age composition, biological and stock parameters
 - b. Survey indices of juvenile and adult abundance, size at age and biological parameters
 - c. Fishing harvest and effort by grid.
2. Support a sustainable harvest policy by:
 - a. Examining exploitation strategies
 - b. Recommending an allowable harvest for 2010 for each management unit
 - c. Supporting decision/risk analysis strategies for yellow perch management.
3. Review and implement the most appropriate Michigan State University Quantitative Fisheries Center (QFC) recommendations and support completion of a Lake Erie Yellow Perch Management Plan.
4. Support QFC modeling efforts for catch-age models and harvest policies.

Charge 1: 2009 Fisheries Review and Population Dynamics

The lakewide total allowable catch (TAC) in 2009 was 12.012 million pounds. This allocation represented an 18.2% increase from a TAC of 10.160 million pounds in 2008. For yellow perch assessment and allocation, Lake Erie is partitioned into four management units (units, or MUs; Figure 1.1). The 2009 allocation by management unit was 2.040, 5.313, 4.200, and 0.459 million pounds for units 1 through 4, respectively. Please note that in 2009, the LEC set the TAC for MU1 lower (2.040 millions pounds) than the RAH suggested by the YPTG in March 2009 (2.272 millions pounds) and the MU3 TAC higher (4.200 million pounds) than the RAH suggested by the YPTG in March 2009 (3.933 million pounds). The lakewide harvest of yellow perch in 2009 was 9.137 million pounds, 76.1% of the total 2009 TAC. This was a 9.7% increase from the 2008 harvest of 8.330 million pounds. Harvest by Lake Erie management units 1 through 4 was 1.404, 4.298, 3.055, and 0.381 million pounds, respectively (Table 1.1). The portion of TAC harvested was 68.8%, 80.9%, 72.7%, and 82.9%, in MUs 1 through 4 respectively. In 2009, Ontario harvested 5.888 million pounds, followed by Ohio (2.863 million lbs.), Pennsylvania (229 thousand lbs.), Michigan (87 thousand lbs.), and New York (70 thousand lbs.).

Ontario's fraction of allocation harvested was 103.0% in MU1, 103.0% in MU2, 103.2% in MU3, and 102.5% in MU4 (see comments below regarding Ontario's harvest reporting and commercial ice allowance policy). Ohio fishers attained 45.2% of their TAC in the western basin (MU1), 62.4% in the west central basin (MU2), and 43.9% in the east central basin (MU3). Michigan anglers in MU1 attained 46.9% of their TAC. Pennsylvania fisheries harvested 29.7% of their TAC in MU3 and 76.0% of their TAC in MU4. New York fisheries attained 49.3% of their TAC in MU4.

Ontario's portion of the lakewide yellow perch harvest increased slightly to 64.4% in 2009 from 60.2% in 2008 (Table 1.1). Ohio's proportion of lakewide harvest decreased slightly to 31.3% in 2009, from 36.5% in 2008. Harvest in Michigan, Pennsylvania, and New York combined represented 4.2% of the lakewide harvest in 2009.

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 landed catch reports. Additional fishery documentation is available in annual agency reports.

Harvest, fishing effort, and fishery harvest rates are summarized for the time period 1999 to 2009 by management unit, year, agency, and gear type in Tables 1.2 to 1.5. Trends over a longer time series (1975 to 2009) 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 2009 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 2009 was 14.7% and 19.5% of the gill net harvest in MUs 1 and 2, respectively, but was negligible in MU3 and MU4 (3.4% and 1.7% respectively). 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 increased 50.3% in MU1, 19.4% in MU2, 1.0% in MU3 and 13.7% in MU4. Ontario trap net harvest is minimal and is included in the total harvest of yellow perch in MU1 (Tables 1.1 and 1.2), but is not summarized for catch-age analysis. Incidental catch of yellow perch in Ontario commercial

smelt trawls occurs in the central and eastern basin MUs 2-4. Trawl catches are included in the total harvest of yellow perch in Table 1.1 and documented by MU at the bottom of Tables 1.2 to 1.5.

Targeted gill net effort in 2009 increased from 2008 by 85.0% in MU1, 77.5% in MU2, 21.4% in MU3 and 26.2% in MU4. Gill net effort remained lower in 2009 compared to the 1990s and earlier decades (Figure 1.3). Targeted gill net harvest rates decreased in 2009 compared to 2008 in all management units (Figure 1.4). Targeted gill net harvest rates decreased 18.8% in MU1, 32.7% in MU2, 16.8% in MU3, and 9.9% in MU4.

In 2009, sport harvest in U.S. waters increased 21.4% in MU1, 2.9% in MU3, and 55.0% in MU4 from 2008 harvest. Sport harvest in U.S. waters decreased 26.3% in MU2 from 2008 harvest (Figure 1.2). Angling effort in U.S. waters increased in 2009 from 2008 in MU1 (15.3%), MU3 (24.5%), and MU4 (90.6%), but decreased in MU2 (7.2%; Figure 1.3). The sport harvest of yellow perch from Ontario waters is assessed periodically and was not assessed in 2009.

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 2008 rates, harvest per angler hour increased for Ohio anglers in MU1 (14.8%), but decreased in the rest of Ohio waters (down 14.3% in MU2 and 23.9% in MU3). Angler harvest rates also increased in Michigan waters in MU1 (80.0%), Pennsylvania waters in MU3 (6.7%), and New York waters in MU4 (5.4%). Angler harvest rates decreased in Pennsylvania waters in MU4 (50.0%).

Angler harvest in kg per angler hour is presented graphically in Figure 1.4 for each MU, by pooling jurisdictions harvest weights and effort. In 2009, the sport harvest rate (in kg/hr) increased in MU1 (4.5%), and decreased in MU2, MU3, and MU4 by 20.5%, 17.1%, and 17.8%, respectively, relative to 2008 rates.

Harvest from Ohio, Pennsylvania, and New York commercial trap nets in 2009 decreased 2.8% in MU2, and 9.0% in MU3, and increased 21.0% in MU4 from 2008. In 2008 and 2009, Ohio trap nets were restricted to the central basin, and there was no trap net harvest or effort in the Ohio waters of MU1. Compared to 2008, trap net effort (lifts) in 2009 decreased in MU3 (55.9%), but increased in MU2 (58.6%) and MU4 (56.9%). Trap net harvest rates decreased in MU2 (38.7%), and MU4 (23.0%), but increased MU3 (105.9%) from 2008.

Age Composition and Growth

The yellow perch harvest in 2009 consisted mostly of the 2003 (age 6) and 2005 (age 4) year classes across all MUs, with a fair contribution of the 2006 (age 3) year class in MU1, MU2 and MU4, and the 2007 (age 2) year class in MU1 (Table 1.6). The strong 2003 year class (age 6) was a major contributor to all fisheries across all MUs; however, the 2005 year class (age 4) did represent the second largest proportion (22.1%) of harvest across all MUs, and was the strongest contributor to the harvest in MU4. Overall, age 6 (2003 year class) and older fish accounted for the majority (52.6%) of the lakewide harvest.

Yellow perch growth differs among life stages and between basins as illustrated by trends in total length-at-age (Figure 1.9). A wealth of yellow perch growth data exists among Lake Erie agencies. For simplicity, Figure 1.9 is comprised of young-of-the-year data from summer and fall interagency trawls, while data for age 1 and successive ages to age 4 are from Ontario Partnership gill net surveys (MUs 1 and 4) and Ohio fall trawls (MUs 2 and 3). Size-at-age time series results describe relatively stable length-at-age for ages 0 to 4 across management units. However, in MU3 growth decreased for ages 1, 3, and 4 in 2009, after an increase in growth in 2008. Yellow perch condition 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). 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). In 2007, the YPTG moved from using a two-year average of weight-at-age to using a three-year average, and this was continued in 2009. This was done 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.

ADMB Catch-at-Age Analysis

Population size for each management unit was estimated by catch-at-age analysis using the Auto Differentiation Model Builder computer program (ADMB), with a standard version that incorporates commercial gill net catchability coefficients (the Ontario Commercial Selectivity

Index or CSI version) based on the seasonal distribution of harvest and relative catch rates. The approach was identical to methods used in 2009. Estimates of population size from 1990 to 2009 and projections for 2010 are presented in Table 1.7. Abundance, biomass and parameters such as survival and exploitation rates are presented by management unit graphically for 1975 to 2009 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 allowable harvest.

Abundance estimates should be interpreted with several caveats. Inclusion of abundance estimates from 1975 to 2009 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 (CSI) was 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 catch-at-age analysis, the most recent year's data 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.

Population estimates are derived by minimizing an objective function weighted by data sources including fishery effort, fishery catch, and survey catch rates. The weightings (referred to as lambdas in ADMB) for effort data are calculated by the ratio of variance of observed log-catch to log-effort (Quinn and Deriso 1999). Weightings of fishery catch and survey catch rates are solved iteratively until convergence occurs; *i.e.* until lambdas remain relatively constant (they do not change by a factor of 0.1). Although lambdas within similar parameter groups (effort, catch, and surveys) are solved and weighted unequally, the groups themselves are given equal weight (the greatest lambdas for catch, effort, and surveys are 1.0). Data weighting lambdas are presented in Appendix A, Table 1.

Recruitment Estimator for Incoming Age 2 Yellow Perch

Age 2 yellow perch recruitment in 2010 was predicted by linear regression of juvenile yellow perch trawl and gill net indices against catch-at-age analysis estimates of two-year-old abundance in each management unit. Age 2 yellow perch recruitment in 2010 was calculated using the mean of values predicted from the indices that correlated well ($F < 0.01$, $r^2 > 0.50$) with age 2 abundance estimates (Appendix A, Table 2). 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.

Estimates of age 2 yellow perch recruitment for 2010 (the 2008 year class) were below average in MUs 1 and 2, average in MU3 and above average in MU4 (Table 1.7, Appendix A, Table 2). The 2008 year class may contribute moderately to fisheries in 2010.

2010 Population Size Projection

Stock size estimates for 2010 yellow perch ages 3 and older were projected from statistical catch-at-age analysis (SCAA) estimates of 2009 population size and age-specific survival rates in 2009 (Table 1.8). Projected age 2 yellow perch recruitment from the 2008 year class (method described above) was added to the 2010 population estimate for older fish in each unit, producing the total standing stock in 2010 (Table 1.8). Standard errors and ranges for estimates are provided for each age in 2009, and following estimated survival from SCAA, for 2010. Descriptions of *min*, *mean*, and *max* population estimates refer to the age-specific estimates minus or plus one standard error (Table 1.8).

Management units 1 and 2 stock size estimates for 2009 from SCAA were lower than those projected in the spring of 2009 (YPTG 2009). This was primarily due to a lower SCAA estimate of age 2 fish, particularly evident in Management Unit 2. Stock size estimates for 2009 in Management Units 3 and 4 were slightly higher than those projected in last year's report. In spring of 2009 the abundance of age 2 recruits was determined using regression indices as described above (YPTG 2009). Current estimates of age 2 fish in 2009 are from the ADMB's first assessment of this cohort.

Stock size estimates projected for 2010 were slightly lower than 2009 in MUs 1, 2, and 3 due primarily to reduced recruitment. Stock size estimates projected for 2010 were slightly higher than 2009 in MU4 due primarily to increased recruitment (Tables 1.7, 1.8, Appendix A Table 2, and Figure 1.11). Abundance estimates of age 2 and older yellow perch in 2010 are

12.0%, 6.4%, and 14.9%, lower than the 2009 abundance estimates in management units 1 to 3, respectively, and 11.2% higher in MU4. Abundance projections for 2010 were 31.4, 52.4, 81.1, and 23.8 million age 2 and older yellow perch in management units 1 through 4, respectively. Model estimates of abundance for age 3 and older yellow perch in 2010 are lower compared to the 2009 estimates in MU2 (18.1%) and MU4 (2.3%); however, estimates of age 3 and older abundance were 36.3% higher in MU1 and 6.8% higher in MU3 for 2010 compared to 2009. Age 3 and older yellow perch abundance in 2010 is projected to be 20.6, 29.5, 61.6, and 14.1 million fish in Units 1 through 4 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 2009 remained about the same as 2008 in MUs 1 and 3 but increased in MU 4 (14.3%), and decreased in MU2 (16.5%) (Figure 1.12). The biomass estimates for 2009 are above the historic long-term (1975 to 2008) mean in MU3 (243.2% of the mean value), and MU4 (377.6%). In MU2, the 2009 biomass estimate is near the long term mean, and in MU1 the 2009 biomass estimate is below the long-term mean (87.1% of the mean value). In 2010, age 3 yellow perch (2007 year class) are expected to represent the largest fraction of biomass in MU1. In MU2, yellow perch ages 6 and older (2003 year class and older) are expected to represent the largest fraction of total biomass along with the 2008 year class (at age 2) and the 2007 year class (at age 3). In MU3 yellow perch ages 6 and older (2003 year class and older) are expected to represent the largest fraction of total biomass along with the 2007 year class (at age 3) and the 2006 year class (at age 4). The 2006 year class (at age 4) is expected to represent the largest fraction of yellow perch in MU4 along with the 2008 year class (at age 2) and the 2007 year class (at age 3).

Estimates of yellow perch survival for ages 3 and older in 2008 were 52.8%, 53.4%, 60.8%, and 64.4% in MUs 1 to 4, respectively (Figure 1.13). In 2009, estimated survival rates of age 3 and older were 51.3%, 46.5%, 63.3%, and 64.9% in Units 1 through 4 (Table 1.8 and Figure 1.13). Estimates of yellow perch survival in 2009 for ages 2 and older were 58.3% in MU1, 52.7% in MU2, 64.7% in MU3, and 65.6% in MU4 (Table 1.8 and Figure 1.13). Survival rates in 2009 compared to 2008 increased in MU3, decreased in MU2, and were similar in MU1 and MU4.

Estimated exploitation rates in 2008 were 17.6%, 16.9%, 7.7%, and 3.3% in management units 1 to 4, respectively, for age 3 and older. Exploitation rates for yellow perch age 3 and older in 2009 were estimated at 19.5%, 25.5%, 4.6%, and 2.6%, for MUs 1 to 4, respectively (Figure 1.14). Estimates of yellow perch exploitation in 2009 for ages 2 and older

were 10.8% in MU1, 17.8% in MU2, 2.9% in MU3, and 1.8% in MU4 (Table 1.8 and Figure 1.14). Exploitation rates of yellow perch age 2 and older in 2009 were slightly lower than in 2008 in MUs 1 and 3, increased in MU2, and they remained steady in MU4.

Charge 2: Harvest Strategy and RAH

Harvest Strategy Methodology

Fishing rates applied in 2010 are presented in Table 2.1, along with associated RAH values for each management unit. These fishing rates are slightly different from those used since 2005. The new harvest strategies are a part of the new Yellow Perch Management Plan (YPMP) and were determined using an updated yellow perch simulation (see below and Charge 3: Lake Erie Yellow Perch Management Plan)

Stock-Recruitment Simulation

In 2009, the yellow perch simulation was updated from the simulation documented in the 2004 YPTG report and used from 2004 to 2008 to assess the risk of various fishing rates on the yellow perch population. In February 2009, Michigan State University's Quantitative Fisheries Center (QFC) performed a technical review of the YPMP and the yellow perch exploitation strategies, including the yellow perch simulation. The QFC offered several suggestions to improve the simulation at that time. The QFC provided an updated yellow perch simulation with calculations performed using Visual Basic, which provided greater flexibility to the simulation. The spawner-recruit (S/R) relationship was changed from a gamma function to a Ricker function to reduce the number of parameters in the model. The time series of the S/R relationship used in the simulation was 1982 to 2007. Since environmental factors exert major influence on recruitment, the S/R relationship in the model continued to be influenced by environmental factors. Environment Factors (EF) were derived from residuals of the S/R relationship as:

$$EF = (observed\ recruitment)/(predicted\ recruitment).$$

Two years of recent abundance estimates were used to initiate simulations. Recruitment for each year was estimated from the S/R function, and then multiplied by an EF selected randomly from the observed distribution of residuals (EFs). The time frame of the simulation was extended from 20 years to 40 years with 100 replicates. In addition, simulation results were produced using a shorter time period of 5 years as an assessment of short term trends. Other model parameters included were consistent with ADMB catch-at-age analysis. This

process, applied to populations in each management unit, allowed the YPTG to quantify risk associated with various fishing rates, while giving consideration to stock-recruitment patterns and environmental influences experienced by yellow perch during recent decades in Lake Erie. Biological reference points such as survival rates, the probability of attaining abundance threshold values, and the probability of attaining low levels of abundance comparable to 1993-94 were included as outputs.

The YPTG used the updated yellow perch simulation to evaluate alternative exploitation strategies involving fishing rates associated with maximum sustainable yield (F_{msy}) and fractions of F_{msy} (i.e. $\frac{1}{2}F_{msy}$). Exploitation strategies were evaluated in the context of fishery performance and biological risk using constant fishing rate and variable fishing rate strategies. Effects of these fishing rates were examined using a variety of abundance thresholds for the Lake Erie Committee.

Harvest Strategies and RAH Determination

Fishing rates for 2010 were based on updated harvest strategies from the YPMP and yellow perch simulation results (see Charge 3: Lake Erie Yellow Perch Management Plan). 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. These fishing rates were used to determine RAH's for 2010 and can be found in Tables 2.1 and 2.2 along with RAH values for each management unit

In 2005, an exercise was completed to update the allocation area shares using geographical information system (GIS) mapping. In late 2008, the YPTG proposed that the line dividing MUs 3 and 4 be moved five minutes to the east in order to be consistent with Ontario's Eastern Basin Management Zone. The Lake Erie Committee (LEC) and Standing Technical Committee (STC) approved the change and new areas and allocation shares by jurisdiction were calculated (Figure 2.1). The change was implemented in 2009. These same allocation shares will be used in 2010. The allocation shares by management unit and jurisdiction are:

Allocation of TAC within Management Unit and Jurisdiction, 2010:

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

Charge 3: Lake Erie Yellow Perch Management Plan

With guidance from the STC, the YPTG was charged with the preparation of a Lake Erie Yellow Perch Management Plan (YPMP) as a companion document to the recently completed Walleye Management Plan. In February 2009, a draft YPMP was submitted to Michigan State University's QFC for a technical review of the background material, exploitation strategies and associated yellow perch simulation. The QFC returned preliminary comments in March 2009; however, they indicated that additional time would be required to carry out a more thorough review of the harvest strategies and thresholds defined in the management plan.

During 2009 the YPTG implemented some of the suggestions put forth by the QFC, including changes to the yellow perch simulation and YPMP exploitation policies (see Charge 2: Harvest Strategy and RAH). Although the yellow perch simulation was used to determine fishing rates for use in 2010, full yellow perch exploitation strategies have not been completed for each management unit. The Lake Erie Committee has determined target fishing rates and maintenance level abundance thresholds below which target fishing rates decrease. The abundance levels are based on age 3 and older fish since age 2 fish are not vulnerable to fishing gear until the fall. The 2010 stock size estimates for ages 3 and older were above these thresholds in each management unit. Fishing rates will still be applied to age 2 and older fish. The fishing rates for the maintenance level fishery in MUs 1, 2 and 3 are $\frac{1}{2}F_{msy}$. They are 0.67, 0.67, and 0.70 for management units 1–3 respectively. In MU4 a conservative fishing rate of 0.30 was chosen as the maintenance level fishing rate. It is expected that these fishing rates will form the basis of the YPMP exploitation strategy for each management unit and will be the maximum fishing rate used in the exploitation policy. However, fishing strategies for yellow perch abundances below maintenance levels have not been established. The YPTG will hold a workshop with staff from the QFC in the spring of 2010 to determine minimum threshold reference points and fishing strategies at low abundance levels.

Charge 4: Support QFC modeling efforts for catch-age models

In 2005-06, the YPTG was charged with reviewing the methodology of assigning weighting factors to data sources in the catch-at-age models. The current weighting methodology is described in Charge 1 of this report. The Lake Erie Walleye and Yellow Perch Task Groups continue to work with Dr. James Bence and Travis Brenden of Michigan State University's QFC and Yingming Zhao of OMNR to resolve the lambda weighting issues in the ADMB catch-at-age models. Previous external reviews by QFC modelers have shown that the

current methods, while adequate, could be improved (STC 2007).

The QFC has appointed Ph.D. student, Aaron Berger, to investigate the structure of the yellow perch and walleye models including an investigation of dataset weightings. Final results of this investigation are not expected for approximately two years; however, the task groups' modelers can incorporate valuable, substantial model improvements as they become available upon presentation and discussion with the STC and LEC. At this time, the YPTG is continuing to utilize the population abundance estimation models which weigh datasets by the ratio of variance of observed log-catch to log-effort.

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- Dr. Carol Stepien and Osvaldo J. Sepulveda-Villet of the University of Toledo;
- Mike Bur and Patrick Kocovsky of the U.S. Geological Survey, Biological Resources Division, Sandusky.

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Table 1.1. Lake Erie yellow perch harvest in pounds by management unit (Unit) and agency, 1999-2009.

	Year	Ontario*		Ohio		Michigan		Pennsylvania		New York		Total Harvest
		Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%	
Unit 1	1999	1,048,100	51	908,548	44	101,549	5	--	--	--	--	2,058,197
	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	
Unit 2	1999	1,572,829	62	974,123	38	--	--	--	--	--	--	2,546,952
	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	
Unit 3	1999	665,703	65	352,635	34	--	--	8,925	1	--	--	1,027,263
	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	
Unit 4	1999	59,842	92	--	--	--	--	2,216	3	3,234	5	65,292
	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	
Lakewide Totals	1999	3,346,474	59	2,235,306	39	101,549	2	11,141	<1	3,234	<1	5,697,704
	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	

*processor weight (quota debit weight) to 2001; fisher/observer weight from 2002 to 2009 (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, 1999-2009.

	Year	Unit 1				
		Michigan	Ohio		Ontario Gill Nets*	
		Sport	Trap Nets	Sport	Small Mesh	Large Mesh**
Harvest (pounds)	1999	101,549	200,939	707,609	1,048,100	--
	2000	67,010	240,541	798,109	980,323	--
	2001	70,910	179,234	736,407	711,745	101,321
	2002	147,065	337,829	978,724	1,359,637	94,468
	2003	84,879	250,456	1,155,929	1,151,358	28,309
	2004	94,732	289,136	801,533	1,637,488	61,273
	2005	49,485	357,182	608,049	1,402,523	111,082
	2006	62,854	235,852	819,526	1,264,370	61,094
	2007	62,815	200,818	781,859	671,536	56,142
	2008	47,934	0	409,705	484,409	49,378
	2009	87,319	0	463,564	728,012	125,024
Harvest (Metric) (tonnes)	1999	46	91	321	475	--
	2000	30	109	362	445	--
	2001	32	81	334	323	46
	2002	67	153	444	617	43
	2003	38	114	524	522	13
	2004	43	131	364	743	28
	2005	22	162	276	636	50
	2006	29	107	372	573	28
	2007	28	91	355	305	25
	2008	22	0	186	220	22
	2009	40	0	210	330	57
Effort (a)	1999	184,710	5,185	941,350	12,846	--
	2000	122,447	4,026	965,628	6,741	--
	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
Harvest Rates (b)	1999	2.1	17.6	3.3	37.0	--
	2000	2.2	27.1	3.0	66.0	--
	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

(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

(*) Ontario commercial trap netters harvested 46,263 pounds of yellow perch in MU1 in 2008.

(*) Ontario commercial trap netters harvested 70 pounds of yellow perch in MU1 in 2009.

(**) Large mesh catch rates are not targeted and 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, 1999-2009.

		Unit 2			
		Ohio		Ontario* Gill Nets	
	Year	Trap Nets	Sport	Small Mesh	Large Mesh**
Harvest (pounds)	1999	389,973	584,150	1,572,829	--
	2000	565,009	604,225	1,484,125	--
	2001	905,088	841,891	1,593,704	200,571
	2002	1,099,971	886,759	1,892,070	298,551
	2003	1,255,205	858,080	2,019,617	88,022
	2004	1,287,747	958,517	1,893,871	157,602
	2005	1,162,746	680,444	2,446,007	219,723
	2006	744,452	649,280	2,981,793	120,476
	2007	1,701,552	543,104	1,561,287	173,699
	2008	1,376,588	628,412	1,669,682	253,984
2009	1,338,616	463,362	1,994,208	482,402	
Harvest (Metric) (tonnes)	1999	177	265	713	--
	2000	256	274	673	--
	2001	410	382	723	91
	2002	499	402	858	135
	2003	569	389	916	40
	2004	584	435	859	71
	2005	527	309	1,109	100
	2006	338	294	1,352	55
	2007	772	246	708	79
	2008	624	285	757	115
2009	607	210	904	219	
Effort (a)	1999	7,502	563,819	13,179	--
	2000	5,272	601,712	6,266	--
	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	
Harvest Rates (b)	1999	23.6	3.0	54.1	--
	2000	48.6	2.9	107.4	--
	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	

(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

(*) Ontario commercial trawlers harvested 112,153 pounds of yellow perch in MU2 in 2007.

(*) Ontario commercial trawlers harvested 66,203 pounds of yellow perch in MU2 in 2008.

(*) Ontario commercial trawlers harvested 15,439 pounds of yellow perch in MU2 in 2009.

(**) 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, 1999-2009.

		Unit 3					
		Ohio		Ontario* Gill Nets		Pennsylvania	
	Year	Trap Nets	Sport	Small Mesh	Large Mesh**	Trap Nets	Sport
Harvest (pounds)	1999	106,258	246,377	665,703	--	2,905	6,020
	2000	156,510	286,740	771,646	--	5,930	26,683
	2001	4,472	460,339	948,622	50,828	2,602	96,946
	2002	0	640,104	1,094,894	97,797	2,009	138,812
	2003	0	481,559	1,647,047	20,086	5,050	172,467
	2004	0	659,447	1,443,314	10,105	7,753	236,310
	2005	43,253	414,340	1,657,498	113,969	15,228	126,800
	2006	70,310	200,834	3,332,037	119,461	20,467	85,793
	2007	48,286	342,999	2,941,451	42,570	23,471	169,594
	2008	139,023	490,343	2,160,041	32,673	22,927	132,087
2009	112,030	485,184	2,180,834	77,858	35,296	155,446	
Harvest (Metric (tonnes))	1999	48	112	302	--	1.3	2.7
	2000	71	130	350	--	2.7	12
	2001	2.0	209	430	23	1.2	44
	2002	0	290	497	44	0.9	63
	2003	0	218	747	9.1	2.3	78
	2004	0	299	655	4.6	3.5	107
	2005	20	188	752	52	6.9	58
	2006	32	91	1,511	54	9.3	39
	2007	22	156	1,334	19	10.6	77
	2008	63	222	980	15	10.4	60
2009	51	220	989	35	16.0	70	
Effort (a)	1999	2,388	176,603	4,338	--	243	28,485
	2000	1,640	214,825	2,342	--	231	48,561
	2001	32	269,062	2,451	1,047	175	90,214
	2002	0	416,543	2,490	1,055	95	123,287
	2003	0	256,890	4,617	316	87	138,720
	2004	0	368,537	3,750	268	70	175,596
	2005	947	305,885	5,098	743	129	127,462
	2006	881	139,536	11,130	1,030	124	60,612
	2007	713	218,683	6,115	614	88	135,611
	2008	1,288	234,179	3,336	417	78	110,403
2009	482	289,602	4,050	728	121	139,438	
Harvest Rates (b)	1999	20.2	3.5	69.6	--	5.4	1.3
	2000	43.3	3.0	149.4	--	11.6	1.9
	2001	63.4	2.9	175.4	22.0	6.7	2.6
	2002	--	2.7	199.6	41.7	9.6	3.6
	2003	--	3.1	161.8	28.8	26.3	5.3
	2004	--	4.3	174.6	17.1	50.2	3.9
	2005	20.7	3.1	147.4	69.6	53.5	2.9
	2006	36.2	3.3	135.8	52.6	74.9	3.7
	2007	30.7	3.4	218.2	31.4	121.0	3.8
	2008	49.0	4.6	293.6	35.5	133.3	4.5
2009	105.4	3.5	244.2	48.5	132.3	4.8	

(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

(*) Ontario commercial trawlers harvested 13,080 pounds of yellow perch in MU3 in 2007.

(*) Ontario commercial trawlers harvested 7,454 pounds of yellow perch in MU3 in 2008.

(*) Ontario commercial trawlers harvested 8,035 pounds of yellow perch in MU3 in 2009.

(**) 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, 1999-2009.

	Year	Unit 4					
		New York		Ontario* Gill Nets		Pennsylvania	
		Trap Nets	Sport	Small Mesh	Large Mesh**	Trap Nets	Sport
Harvest (pounds)	1999	694	2,540	59,842	--	0	2,216
	2000	625	1,833	35,686	--	0	10,950
	2001	27	15,292	34,284	1,608	0	8,337
	2002	1,951	24,952	85,935	1,606	29	46,874
	2003	1,048	15,464	84,648	124	0	39,822
	2004	3,907	50,955	98,716	17	0	90,514
	2005	7,726	45,742	195,258	52	0	42,226
	2006	9,423	38,684	229,063	1,163	0	57,005
	2007	9,511	16,424	179,595	3,076	0	25,859
	2008	11,136	29,673	234,366	2,689	0	31,325
	2009	13,476	56,554	266,425	4,738	0	37,991
Harvest (Metric) (tonnes)	1999	0.3	1.2	27.1	--	0	1.0
	2000	0.3	0.8	16.2	--	0	5.0
	2001	0.01	6.9	15.5	0.73	0	3.8
	2002	0.9	11.3	39.0	0.70	0.01	21.3
	2003	0.5	7.0	38.4	0.06	0	18.1
	2004	1.8	23.1	44.8	0.01	0	41.0
	2005	3.5	20.7	88.6	0.02	0	19.2
	2006	4.3	17.5	103.9	0.53	0	25.9
	2007	4.3	7.4	81.4	1.40	0	11.7
	2008	5.1	13.5	106.3	1.22	0	14.2
	2009	6.1	25.6	120.8	2.15	0	17.2
Effort (a)	1999	118	5,410	872	--	0	13,623
	2000	44	2,606	314	--	0	21,146
	2001	39	22,950	128	28.0	0	12,451
	2002	89	44,270	224	28.0	9	61,734
	2003	91	33,162	373	21.0	0	32,525
	2004	44	73,056	355	3.2	0	62,639
	2005	179	58,667	782	7.8	0	70,921
	2006	208	46,174	1,007	31.8	0	47,274
	2007	144	29,999	550	62.1	0	31,545
	2008	137	34,511	569	69.2	0	27,041
	2009	215	58,829	718	50.9	0	58,475
Harvest Rates (b)	1999	2.7	0.44	31.1	--	--	0.4
	2000	6.4	0.20	51.5	--	--	1.7
	2001	0.3	1.65	121.5	26.0	--	1.5
	2002	9.9	1.13	174.0	25.0	1.5	2.4
	2003	5.2	0.76	102.9	2.9	--	1.9
	2004	40.3	1.14	126.1	2.4	--	1.7
	2005	19.6	1.23	113.2	3.0	--	1.8
	2006	20.5	1.36	103.2	16.6	--	2.9
	2007	30.0	0.97	148.1	22.5	--	1.5
	2008	36.9	1.68	186.8	17.6	--	6.4
	2009	28.4	1.77	168.3	42.2	--	3.2

(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

(*) Ontario commercial trawlers harvested 3,283 pounds of yellow perch in MU4 in 2007.

(*) Ontario commercial trawlers harvested 3,215 pounds of yellow perch in MU4 in 2008.

(*) Ontario commercial trawlers harvested 1,416 pounds of yellow perch in MU4 in 2009.

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

Table 1.6. Estimated 2009 Lake Erie yellow perch harvest by age and numbers of fish by gear and management unit (Unit).

Gear	Age	Unit 1		Unit 2		Unit 3		Unit 4		Lakewide	
		Number	%	Number	%	Number	%	Number	%	Number	%
Gill Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	143,886	5.8	103,558	1.5	0	0.0	0	0.0	247,444	1.5
	3	988,245	39.6	745,794	11.1	219,349	3.5	122,415	17.5	2,075,804	12.8
	4	481,747	19.3	1,318,701	19.7	1,667,115	26.6	496,580	71.2	3,964,143	24.5
	5	61,034	2.4	255,272	3.8	486,661	7.8	23,550	3.4	826,517	5.1
	6+	818,811	32.8	4,284,303	63.9	3,902,338	62.2	55,156	7.9	9,060,608	56.0
	Total	2,493,724	53.7	6,707,628	57.8	6,275,463	76.8	697,702	74.4	16,174,516	63.7
Trap Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	0	0.0	53,849	1.5	5,728	1.5	676	2.0	60,253	1.5
	3	0	0.0	264,692	7.4	26,673	6.9	2,029	6.0	293,394	7.3
	4	0	0.0	713,683	19.9	75,364	19.4	6,086	18.0	795,133	19.9
	5	0	0.0	135,742	3.8	14,918	3.8	1,352	4.0	152,012	3.8
	6+	0	0.0	2,410,239	67.4	265,680	68.4	23,669	70.0	2,699,588	67.5
	Total	0	0.0	3,578,205	30.8	388,363	4.8	33,813	3.6	4,000,381	15.7
Sport	1	6,781	0.3	2,298	0.2	0	0.0	0	0.0	9,079	0.2
	2	1,149,676	52.1	293,805	22.3	130,482	8.7	14,538	7.1	1,588,500	30.3
	3	512,453	23.2	216,523	16.4	230,808	15.3	53,097	25.8	1,012,881	19.3
	4	152,961	6.9	236,245	17.9	396,380	26.3	63,883	31.1	849,469	16.2
	5	23,099	1.0	77,596	5.9	61,348	4.1	638	0.3	162,681	3.1
	6+	360,085	16.3	490,750	37.3	688,955	45.7	73,529	35.7	1,613,319	30.8
	Total	2,205,055	46.9	1,317,217	11.4	1,507,973	18.5	205,684	21.9	5,235,929	20.6
All Gear	1	6,781	0.1	2,298	0.0	0	0.0	0	0.0	9,079	0.0
	2	1,293,561	27.5	451,212	3.9	136,210	1.7	15,214	1.6	1,896,198	7.5
	3	1,500,699	31.9	1,227,009	10.6	476,830	5.8	177,541	18.9	3,382,079	13.3
	4	634,708	13.5	2,268,629	19.6	2,138,859	26.2	566,549	60.5	5,608,745	22.1
	5	84,133	1.8	468,610	4.0	562,927	6.9	25,541	2.7	1,141,211	4.5
	6+	1,178,896	25.1	7,185,292	61.9	4,856,973	59.4	152,354	16.3	13,373,515	52.6
	Total	4,698,778	18.5	11,603,050	45.7	8,171,799	32.2	937,199	3.7	25,410,826	100.0

Note: Italic percentages in boxes delineate percentage by gear in each MU, while the percentages in the All Gear boxes are for lakewide harvest.

Table 1.7. Yellow perch stock size (millions of fish) in each Lake Erie management unit. The years 1990 to 2009 are estimated by ADMB catch-age analysis. The 2010 population estimates use age-2 yellow perch estimates derived from regressions of ADMB age-2 abundance values against YOY and yearling trawl index values.

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Unit 1																						
2	3.646	10.732	14.029	4.438	10.161	22.784	26.174	21.382	41.245	10.191	32.511	31.625	8.240	39.073	3.163	53.902	1.911	10.478	12.957	20.247	10.502	10.502
3	1.334	1.924	5.627	7.762	1.791	6.179	13.901	15.550	13.289	25.443	6.522	20.729	20.418	5.295	24.670	2.017	33.457	1.231	6.341	8.084	12.871	12.871
4	5.278	0.510	0.596	1.996	2.041	0.802	2.795	6.068	7.390	6.779	14.130	3.623	12.357	10.798	2.967	11.646	1.008	13.440	0.682	3.446	4.297	4.297
5	2.051	1.520	0.119	0.140	0.306	0.515	0.223	0.748	1.903	2.714	3.094	7.003	1.975	5.136	4.916	1.118	4.214	0.402	5.568	0.376	1.717	1.717
6+	1.541	0.666	0.314	0.073	0.025	0.080	0.176	0.102	0.183	0.485	1.216	1.916	4.649	2.387	3.145	2.376	1.025	1.560	0.779	3.239	1.754	1.754
2 and Older	13.850	15.352	20.685	14.409	14.323	30.360	43.269	43.850	64.009	45.611	57.472	64.896	47.638	62.688	38.861	71.059	41.614	27.110	26.326	35.392	31.141	31.141
3 and Older	10.204	4.621	6.655	9.971	4.163	7.576	17.095	22.467	22.764	35.420	24.962	33.271	39.399	23.618	35.698	17.158	39.703	16.632	13.369	15.145	20.639	20.639
Unit 2																						
2	5.966	16.656	23.242	7.361	12.489	13.836	27.818	15.640	59.926	13.768	48.271	38.124	9.354	79.173	5.300	168.759	4.864	20.800	16.163	19.981	22.940	22.940
3	1.550	2.466	6.626	11.243	3.459	7.171	7.642	13.530	8.373	31.690	8.521	29.082	22.372	5.836	46.959	3.439	108.169	3.196	13.507	10.617	12.740	12.740
4	8.322	0.569	0.796	2.419	4.249	1.264	2.619	3.076	4.820	3.636	17.666	4.686	16.257	11.611	3.193	24.299	1.969	60.529	1.899	8.042	5.968	5.968
5	2.472	2.186	0.118	0.219	0.663	0.915	0.245	0.584	0.638	1.056	1.763	8.339	2.225	6.922	4.609	1.438	10.450	1.124	28.944	0.961	3.507	3.507
6+	2.079	0.984	0.489	0.169	0.094	0.162	0.211	0.102	0.096	0.114	0.478	1.022	4.443	2.825	3.917	3.657	2.207	5.706	3.227	16.395	7.282	7.282
2 and Older	20.389	22.861	31.272	21.411	20.953	23.347	38.535	32.931	73.853	50.265	76.700	81.254	54.650	106.367	63.979	201.591	127.658	91.355	63.740	55.996	52.438	52.438
3 and Older	14.423	6.205	8.030	14.049	8.464	9.512	10.717	17.291	13.927	36.497	28.428	43.130	45.296	27.195	58.679	32.832	122.795	70.555	47.577	36.015	29.498	29.498
Unit 3																						
2	4.083	7.954	5.690	3.093	6.046	7.353	13.432	9.606	36.877	12.509	46.633	24.843	7.406	39.543	3.796	121.485	4.847	32.157	40.176	37.613	19.493	19.493
3	1.602	2.498	3.526	2.561	1.523	3.506	4.533	8.566	5.772	23.810	8.090	30.026	15.903	4.750	25.685	2.490	80.619	3.210	20.013	26.692	25.112	25.112
4	4.113	0.772	0.857	1.277	1.083	0.816	2.061	2.691	4.051	3.439	15.160	5.087	19.008	9.889	2.950	15.851	1.529	44.735	1.941	12.551	17.381	17.381
5	1.211	1.505	0.301	0.262	0.434	0.372	0.421	1.082	1.129	2.214	2.137	9.108	3.136	11.287	5.800	1.728	9.019	0.831	24.906	1.156	7.767	7.767
6+	4.461	1.824	0.845	0.372	0.221	0.250	0.326	0.387	0.530	0.828	1.838	2.355	7.006	6.046	10.168	9.308	6.326	6.743	4.153	17.313	11.383	11.383
2 and Older	15.470	14.554	11.219	7.564	9.307	12.297	20.772	22.331	48.360	42.800	73.858	71.419	52.459	71.516	48.398	150.862	102.340	87.675	91.188	95.326	81.136	81.136
3 and Older	11.387	6.599	5.528	4.471	3.261	4.944	7.340	12.726	11.483	30.290	27.224	46.577	45.053	31.973	44.602	29.377	97.493	55.518	51.013	57.713	61.643	61.643
Unit 4																						
2	0.574	0.414	0.106	0.282	0.149	1.290	0.812	0.355	4.359	1.672	14.048	3.143	2.631	8.162	1.476	11.093	0.827	9.910	10.559	7.054	9.775	9.775
3	0.752	0.372	0.265	0.071	0.179	0.096	0.853	0.537	0.234	2.920	1.110	9.379	2.107	1.763	5.456	0.980	7.356	0.552	6.572	7.029	4.724	4.724
4	1.036	0.378	0.168	0.171	0.031	0.088	0.057	0.508	0.317	0.154	1.868	0.733	6.264	1.395	1.156	3.539	0.620	4.402	0.359	4.280	4.632	4.632
5	0.446	0.400	0.118	0.097	0.051	0.012	0.046	0.030	0.269	0.201	0.097	1.215	0.488	4.066	0.892	0.731	2.181	0.359	2.822	0.231	2.760	2.760
6+	1.036	0.569	0.298	0.238	0.098	0.053	0.033	0.041	0.037	0.186	0.237	0.216	0.947	0.907	3.122	2.477	1.931	2.273	1.685	2.850	1.949	1.949
2 and Older	3.844	2.133	0.955	0.858	0.508	1.539	1.800	1.471	5.216	5.134	17.360	14.685	12.437	16.292	12.102	18.820	12.915	17.495	21.998	21.445	23.839	23.839
3 and Older	3.270	1.719	0.849	0.576	0.359	0.249	0.988	1.116	0.857	3.462	3.312	11.542	9.806	8.131	10.626	7.726	12.087	7.586	11.439	14.391	14.065	14.065

Table 1.8. Projection of the 2010 Lake Erie yellow perch population. Stock size estimates are derived from ADMB and age 2 estimates for 2010 are derived from regressions of ADMB age-2 abundance against YOY and yearling trawl indices (see Appendix A). Standard errors are produced from the ADMB catch-age analysis report.

	2009 Parameters						Rate Functions						2010 Parameters						Stock Biomass			
	Stock Size (numbers)			Mortality Rates			Survival Rate			Stock Size (numbers)			3-yr Mean Weight in			millions kg		millions lbs.				
	Age	Mean	Std. Err.	Min.	Max.	(F)	(Z)	(A)	(U)	(S)	Age	Mean	Min.	Max.	Pop'n. (kg)	2009	2010	2009	2010			
Unit 1	2	20.247	13.215	7.032	33.462	0.053	0.453	0.364	0.043	0.636	2	10.502	9.149	11.855	0.081	1.438	0.851	1.438	0.851			
	3	8.084	3.903	4.181	11.986	0.232	0.632	0.468	0.172	0.532	3	12.871	4.470	21.272	0.131	1.035	0.686	1.035	0.686			
	4	3.446	1.451	1.995	4.898	0.297	0.697	0.502	0.214	0.498	4	4.297	2.222	6.371	0.155	0.665	0.666	0.665	0.666			
	5	0.376	0.146	0.230	0.522	0.307	0.707	0.507	0.220	0.493	5	1.717	0.994	2.439	0.209	0.094	0.359	0.094	0.359			
	6+	3.239	1.377	1.862	4.616	0.325	0.725	0.516	0.231	0.484	6+	1.754	1.015	2.493	0.227	0.739	0.398	0.739	0.398			
Total		35.392		15.300	55.484	0.139	0.539	0.417	0.108	0.583	Total	31.141	17.851	44.431	0.127	3.970	3.960	3.970	3.960			
(3+)		15.145		8.268	22.022	0.268	0.668	0.487	0.195	0.513	(3+)	20.639	8.702	32.576	0.151	2.533	3.109	2.533	3.109			
Unit 2	2	19.981	10.715	9.266	30.696	0.050	0.450	0.362	0.040	0.638	2	22.940	19.595	26.285	0.079	1.499	1.812	1.499	1.812			
	3	10.617	4.152	6.465	14.769	0.176	0.576	0.438	0.134	0.562	3	12.740	5.908	19.573	0.129	1.295	1.644	1.295	1.644			
	4	8.042	2.686	5.356	10.729	0.430	0.830	0.564	0.292	0.436	4	5.968	3.634	8.302	0.176	1.472	1.050	1.472	1.050			
	5	0.961	0.307	0.654	1.268	0.477	0.877	0.584	0.318	0.416	5	3.507	2.336	4.678	0.171	0.187	0.600	0.187	0.600			
	6+	16.395	5.402	10.993	21.797	0.468	0.868	0.580	0.313	0.420	6+	7.282	4.887	9.678	0.250	3.754	1.821	3.754	1.821			
Total		55.996		32.734	79.258	0.241	0.641	0.473	0.178	0.527	Total	52.438	36.360	68.515	0.132	8.207	6.926	8.207	6.926			
(3+)		36.015		23.468	48.563	0.365	0.765	0.535	0.255	0.465	(3+)	29.498	16.765	42.231	0.173	6.709	5.114	6.709	5.114			
Unit 3	2	37.613	19.681	17.932	57.294	0.004	0.404	0.332	0.003	0.668	2	19.493	15.954	23.032	0.065	2.257	1.267	2.257	1.267			
	3	26.692	10.547	16.145	37.239	0.029	0.429	0.349	0.024	0.651	3	25.112	11.972	38.252	0.112	2.616	2.813	2.616	2.813			
	4	12.551	4.395	8.157	16.946	0.080	0.480	0.381	0.064	0.619	4	17.381	10.513	24.249	0.167	2.297	2.903	2.297	2.903			
	5	1.156	0.384	0.772	1.540	0.084	0.484	0.384	0.067	0.616	5	7.767	5.047	10.486	0.199	0.253	1.546	0.253	1.546			
	6+	17.313	5.838	11.475	23.151	0.084	0.484	0.384	0.067	0.616	6+	11.383	7.548	15.218	0.277	4.207	3.153	4.207	3.153			
Total		95.326		54.481	136.171	0.036	0.436	0.353	0.029	0.647	Total	81.136	51.035	111.236	0.144	11.630	11.681	11.630	11.681			
(3+)		57.713		36.549	78.877	0.057	0.457	0.367	0.046	0.633	(3+)	61.643	35.081	88.205	0.169	9.373	10.414	9.373	10.414			
Unit 4	2	7.054	5.012	2.042	12.067	0.001	0.401	0.330	0.001	0.670	2	9.775	8.540	11.009	0.103	0.614	1.007	0.614	1.007			
	3	7.029	4.094	2.935	11.123	0.017	0.417	0.341	0.014	0.659	3	4.724	1.367	8.080	0.186	1.153	0.879	1.153	0.879			
	4	4.280	2.304	1.976	6.584	0.039	0.439	0.355	0.032	0.645	4	4.632	1.934	7.331	0.243	1.109	1.126	1.109	1.126			
	5	0.231	0.120	0.111	0.351	0.059	0.459	0.368	0.047	0.632	5	2.760	1.274	4.245	0.279	0.064	0.770	0.064	0.770			
	6+	2.850	1.505	1.345	4.355	0.058	0.458	0.367	0.047	0.633	6+	1.949	0.921	2.977	0.322	0.918	0.628	0.918	0.628			
Total		21.445		8.409	34.481	0.022	0.422	0.344	0.018	0.656	Total	23.839	14.036	33.642	0.185	3.857	4.409	3.857	4.409			
(3+)		14.391		6.368	22.414	0.032	0.432	0.351	0.026	0.649	(3+)	14.065	5.497	22.633	0.242	3.243	3.402	3.243	3.402			

Table 2.1 Estimated harvest of Lake Erie yellow perch for 2010 using the proposed Yellow Perch Management Plan fishing policy and selectivity-at-age from combined fishing gears.

Age	2010				Exploitation Rate				2010				3-yr Mean				2010 Harvest Range			
	Stock Size (numbers)		F		s(age)		(F)		(u)		Catch (millions of fish)		Harvest (kg)		Catch (millions of kg)		Catch (millions of lbs)			
	Mean	Min.	Max.	F	s(age)	(F)	(u)	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	
Unit 1																				
2	10.502	9.149	11.855	0.670	0.173	0.116	0.091	0.951	0.829	1.074	0.104	0.099	0.086	0.112	0.218	0.190	0.246			
3	12.871	4.470	21.272	0.670	0.549	0.368	0.257	3.305	1.148	5.462	0.129	0.426	0.148	0.705	0.940	0.326	1.554			
4	4.297	2.222	6.371	0.670	0.754	0.505	0.332	1.428	0.739	2.118	0.149	0.213	0.110	0.316	0.469	0.243	0.696			
5	1.717	0.994	2.439	0.670	0.814	0.545	0.353	0.606	0.351	0.860	0.167	0.101	0.059	0.144	0.223	0.129	0.317			
6+	1.754	1.015	2.493	0.670	0.841	0.563	0.362	0.634	0.367	0.902	0.174	0.110	0.064	0.157	0.243	0.141	0.346			
Total (3+)	31.141	17.851	44.431				0.222	6.924	3.433	10.415	0.137	0.950	0.467	1.432	2.094	1.029	3.158			
	20.639	8.702	32.576				0.289	5.973	2.604	9.342	0.142	0.851	0.381	1.321	1.876	0.839	2.912			
Unit 2																				
2	22.940	19.595	26.285	0.670	0.135	0.090	0.071	1.640	1.401	1.879	0.111	0.182	0.156	0.209	0.401	0.343	0.460			
3	12.740	5.908	19.573	0.670	0.437	0.293	0.211	2.691	1.248	4.134	0.138	0.371	0.172	0.571	0.819	0.380	1.258			
4	5.968	3.634	8.302	0.670	0.790	0.529	0.345	2.057	1.253	2.862	0.149	0.307	0.187	0.426	0.676	0.412	0.940			
5	3.507	2.336	4.678	0.670	0.811	0.543	0.352	1.234	0.822	1.646	0.151	0.186	0.124	0.248	0.411	0.274	0.548			
6+	7.282	4.887	9.678	0.670	0.843	0.565	0.362	2.639	1.771	3.507	0.186	0.491	0.329	0.652	1.082	0.726	1.438			
Total (3+)	52.438	36.360	68.515				0.196	10.261	6.494	14.027	0.150	1.537	0.968	2.106	3.389	2.134	4.644			
	29.498	16.765	42.231				0.292	8.621	5.093	12.148	0.157	1.355	0.812	1.898	2.988	1.791	4.184			
Unit 3																				
2	19.493	15.954	23.032	0.700	0.078	0.055	0.044	0.855	0.700	1.011	0.118	0.101	0.083	0.119	0.223	0.182	0.263			
3	25.112	11.972	38.252	0.700	0.343	0.240	0.177	4.453	2.123	6.783	0.137	0.610	0.291	0.929	1.345	0.641	2.049			
4	17.381	10.513	24.249	0.700	0.754	0.528	0.344	5.978	3.616	8.340	0.151	0.903	0.546	1.259	1.990	1.204	2.777			
5	7.767	5.047	10.486	0.700	0.784	0.549	0.354	2.753	1.789	3.717	0.162	0.446	0.290	0.602	0.983	0.639	1.328			
6+	11.383	7.548	15.218	0.700	0.785	0.550	0.355	4.039	2.678	5.399	0.192	0.775	0.514	1.037	1.710	1.134	2.286			
Total (3+)	81.136	51.035	111.236				0.223	18.078	10.906	25.250	0.157	2.835	1.723	3.947	6.251	3.800	8.702			
	61.643	35.081	88.205				0.279	17.222	10.206	24.239	0.159	2.734	1.641	3.827	6.029	3.618	8.439			
Unit 4																				
2	9.775	8.540	11.009	0.300	0.071	0.021	0.017	0.170	0.148	0.191	0.124	0.021	0.018	0.024	0.046	0.041	0.052			
3	4.724	1.367	8.080	0.300	0.353	0.106	0.083	0.393	0.114	0.672	0.156	0.061	0.018	0.105	0.135	0.039	0.231			
4	4.632	1.934	7.331	0.300	0.548	0.164	0.126	0.582	0.243	0.921	0.185	0.108	0.045	0.170	0.237	0.099	0.376			
5	2.760	1.274	4.245	0.300	0.769	0.231	0.171	0.472	0.218	0.726	0.193	0.091	0.042	0.140	0.201	0.093	0.309			
6+	1.949	0.921	2.977	0.300	0.749	0.225	0.167	0.326	0.154	0.497	0.240	0.078	0.037	0.119	0.172	0.081	0.263			
Total (3+)	23.839	14.036	33.642				0.081	1.942	0.877	3.008	0.185	0.359	0.160	0.558	0.792	0.353	1.231			
	14.065	5.497	22.633				0.126	1.772	0.729	2.816	0.191	0.338	0.142	0.535	0.746	0.312	1.179			

Table 2.2. Lake Erie yellow perch fishing rates and the Recommended Allowable Harvest (RAH; in millions of lbs) for 2010 by Management Unit (Unit).

Unit	Fishing Rate	Recommended Allowable Harvest (millions lbs.)		
		MIN	MEAN	MAX
1	0.670	1.029	2.094	3.158
2	0.670	2.134	3.389	4.644
3	0.700	3.800	6.251	8.702
4	0.300	0.353	0.792	1.231
Total		7.316	12.526	17.736

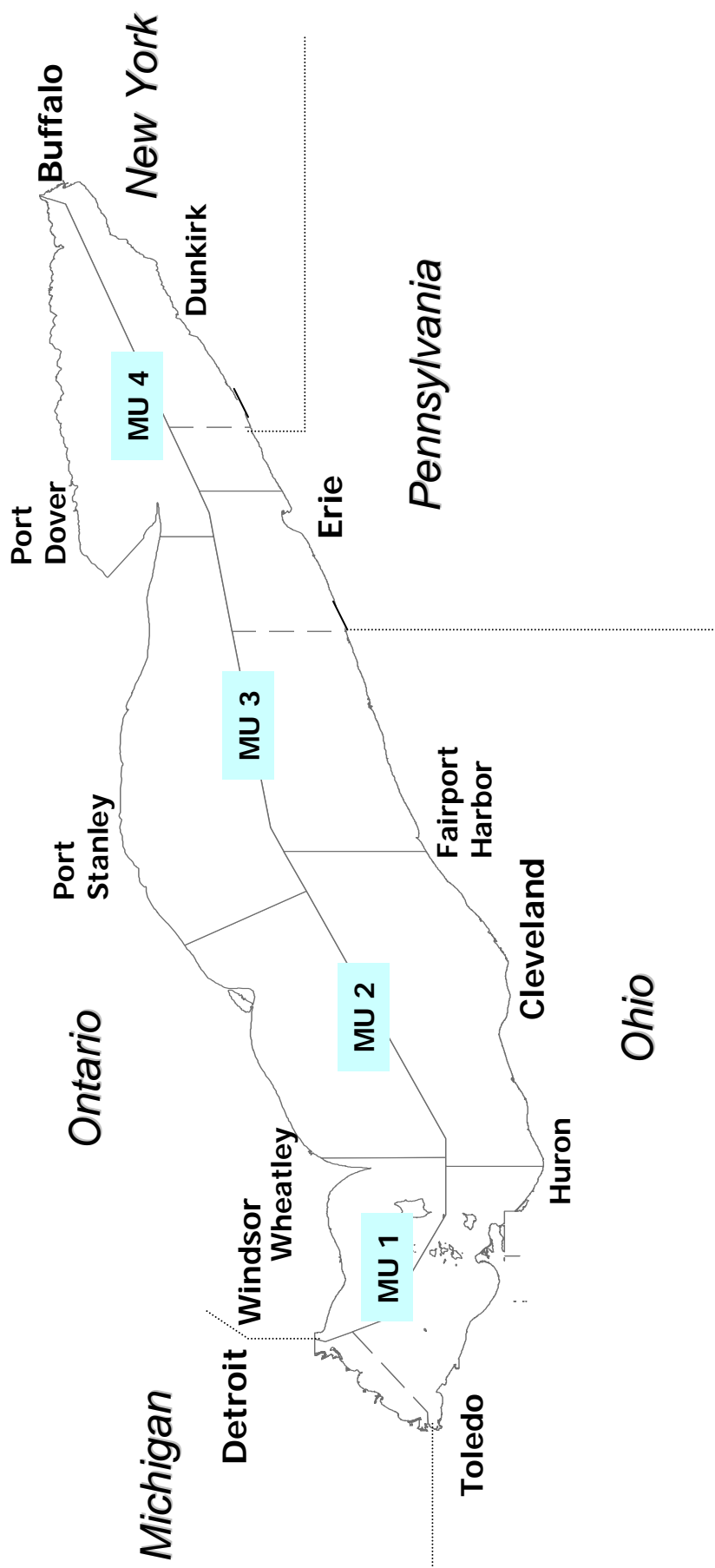


Figure 1.1. Yellow Perch Management Units (MUs) of Lake Erie. For illustrative purposes only, this map should not be used for quota determination or border delineation.

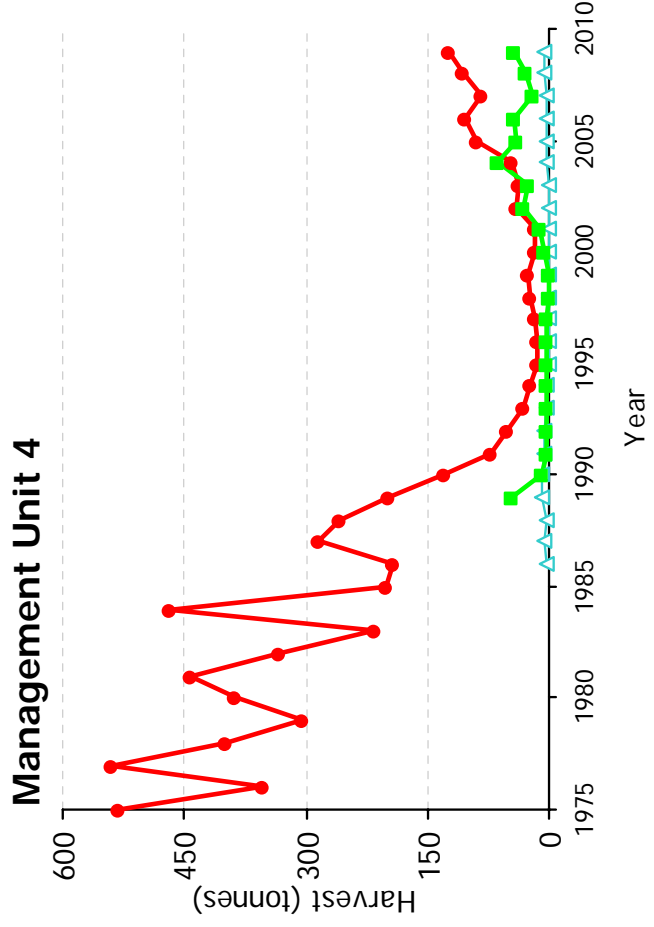
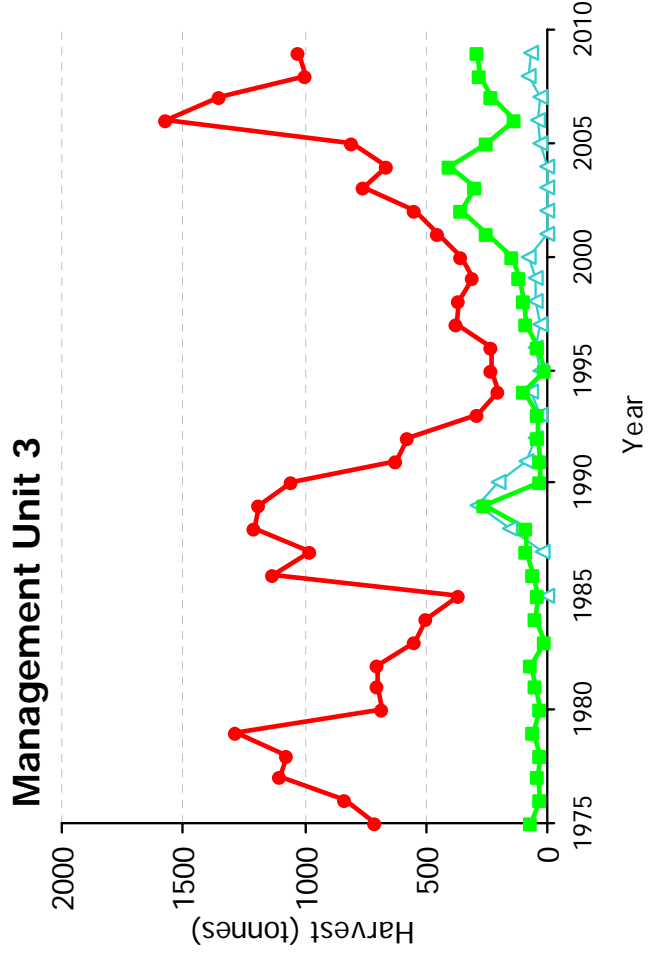
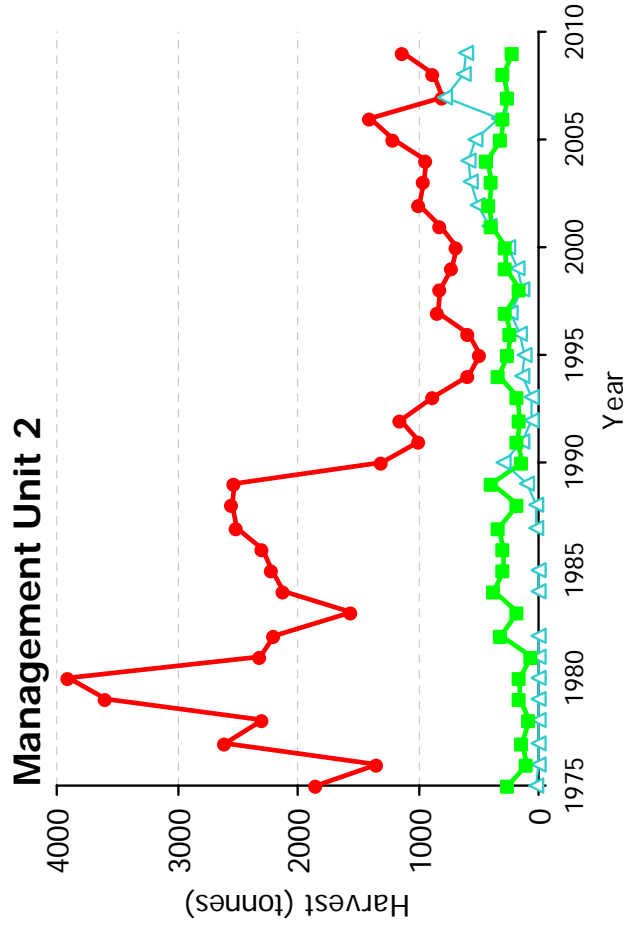
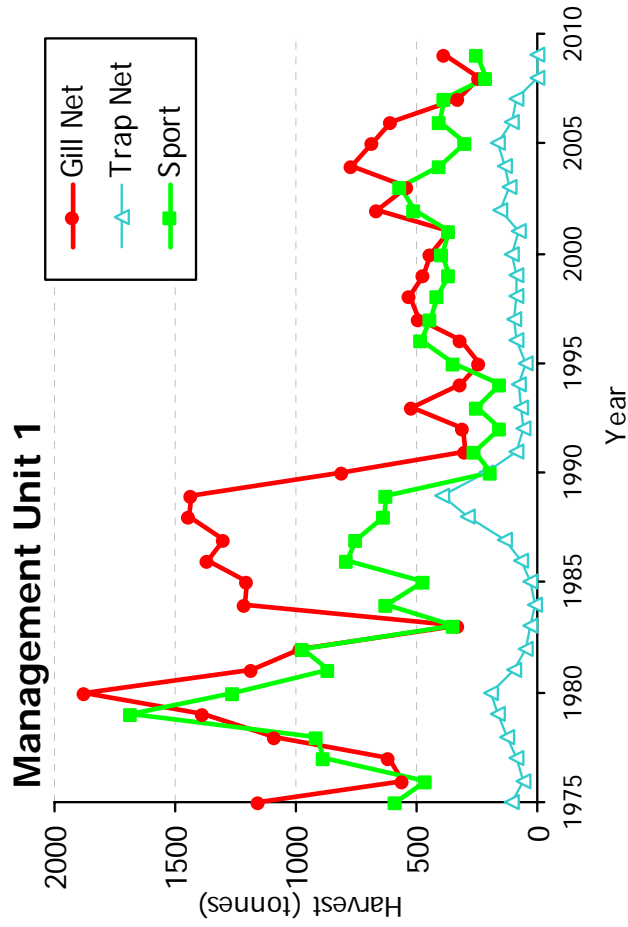


Figure 1.2. Lake Erie yellow perch harvest (metric tonnes) by management unit and gear type.

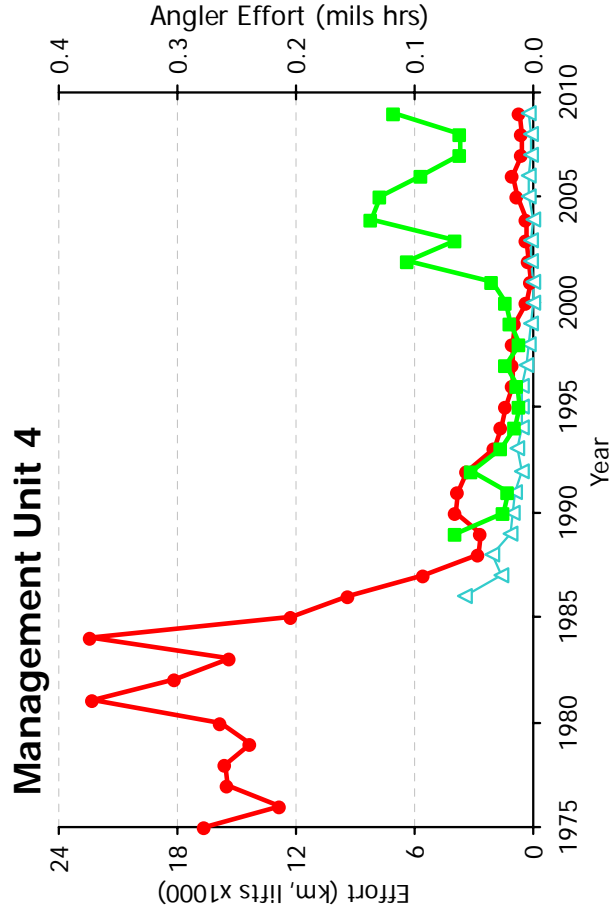
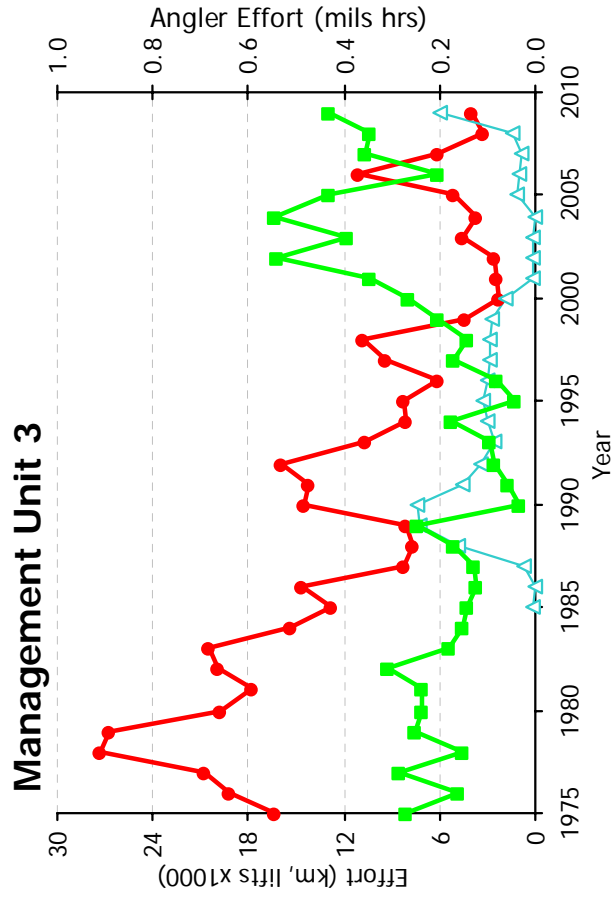
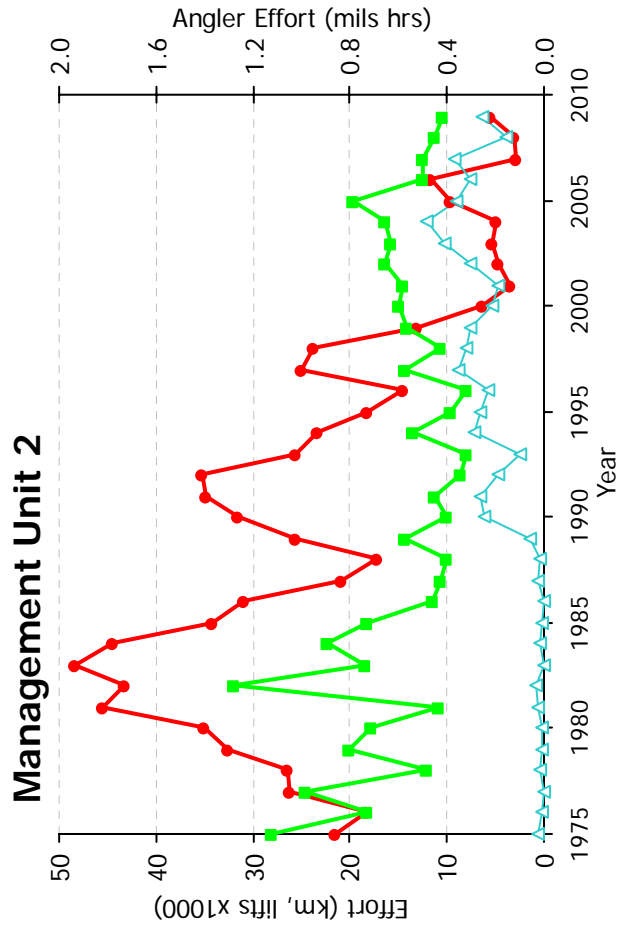
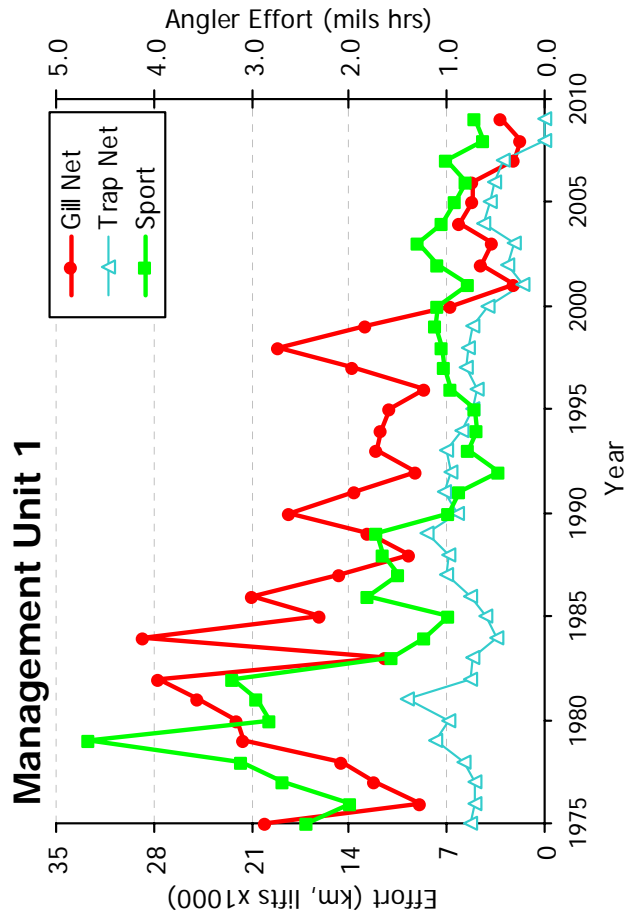


Figure 1.3. Lake Erie yellow perch effort by management unit and gear type. Note: gill net effort presented is targeted effort with small mesh (<3") only.

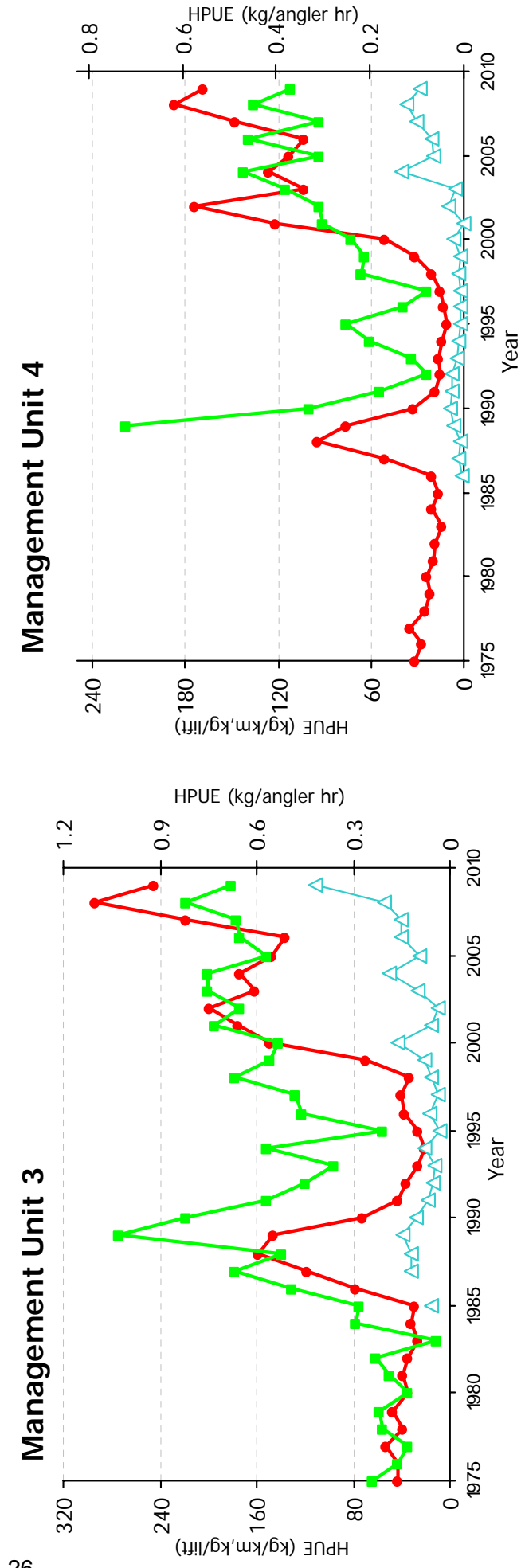
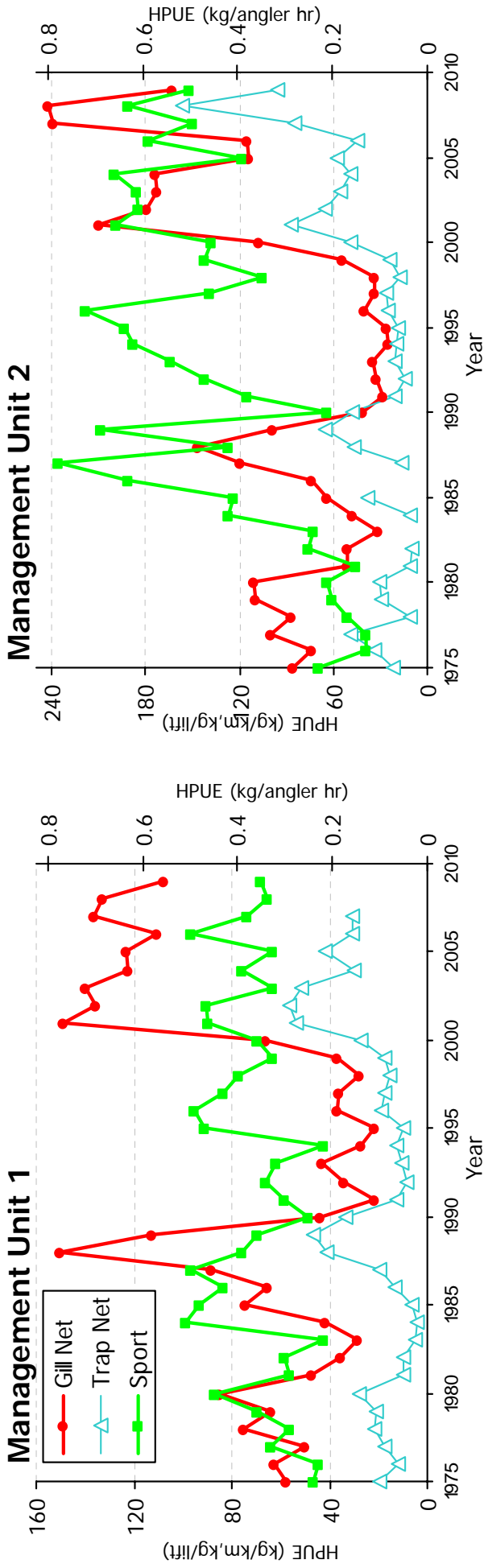


Figure 1.4. Lake Erie yellow perch harvest per unit effort (HPUE) by management unit and gear type. Note: 2001 to 2009 gill net CPUE is for small mesh (<3") only.

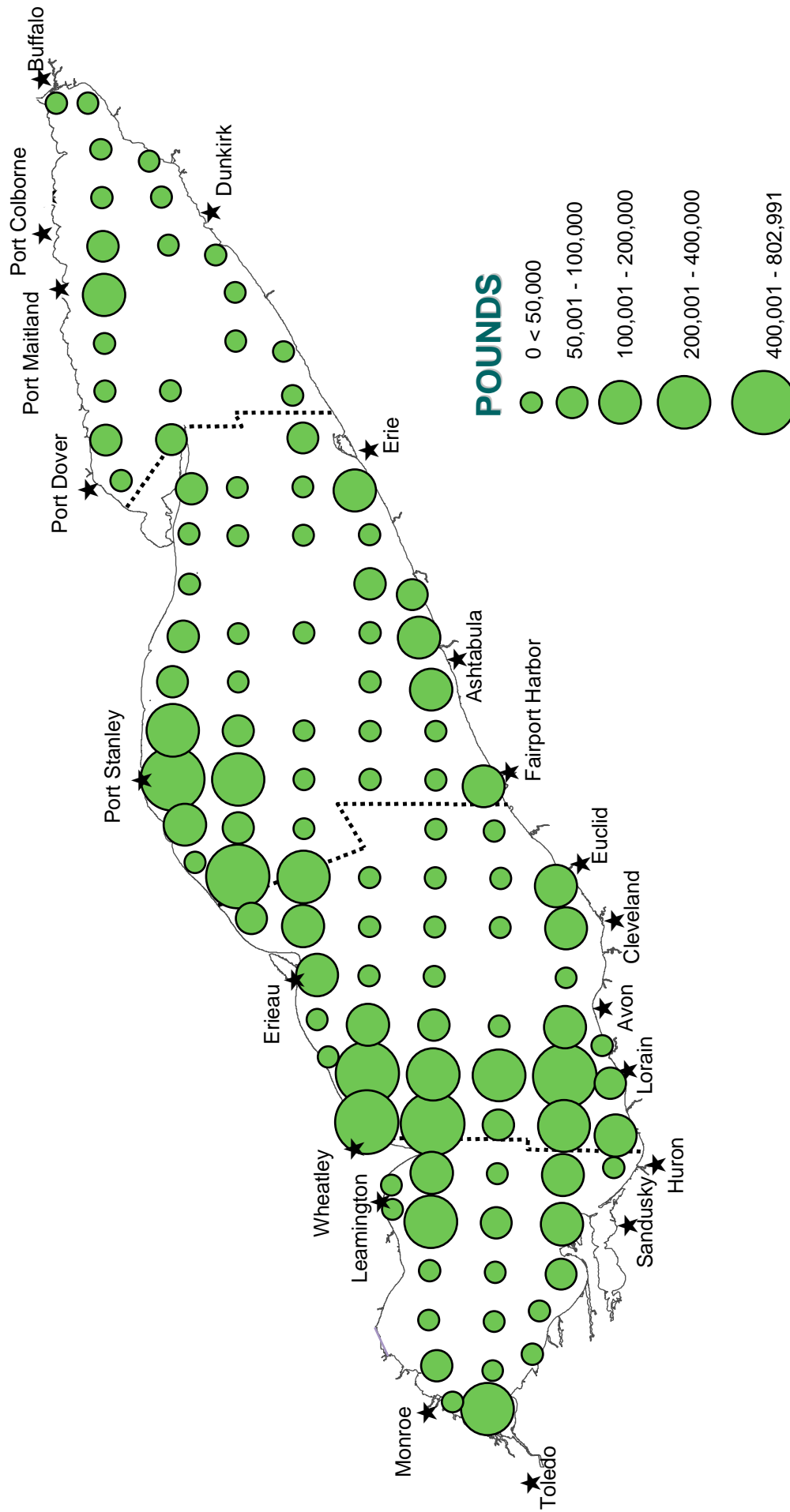


Figure 1.5. Spatial distribution of yellow perch total harvest (lbs.) in 2009 by 10-minute grid.

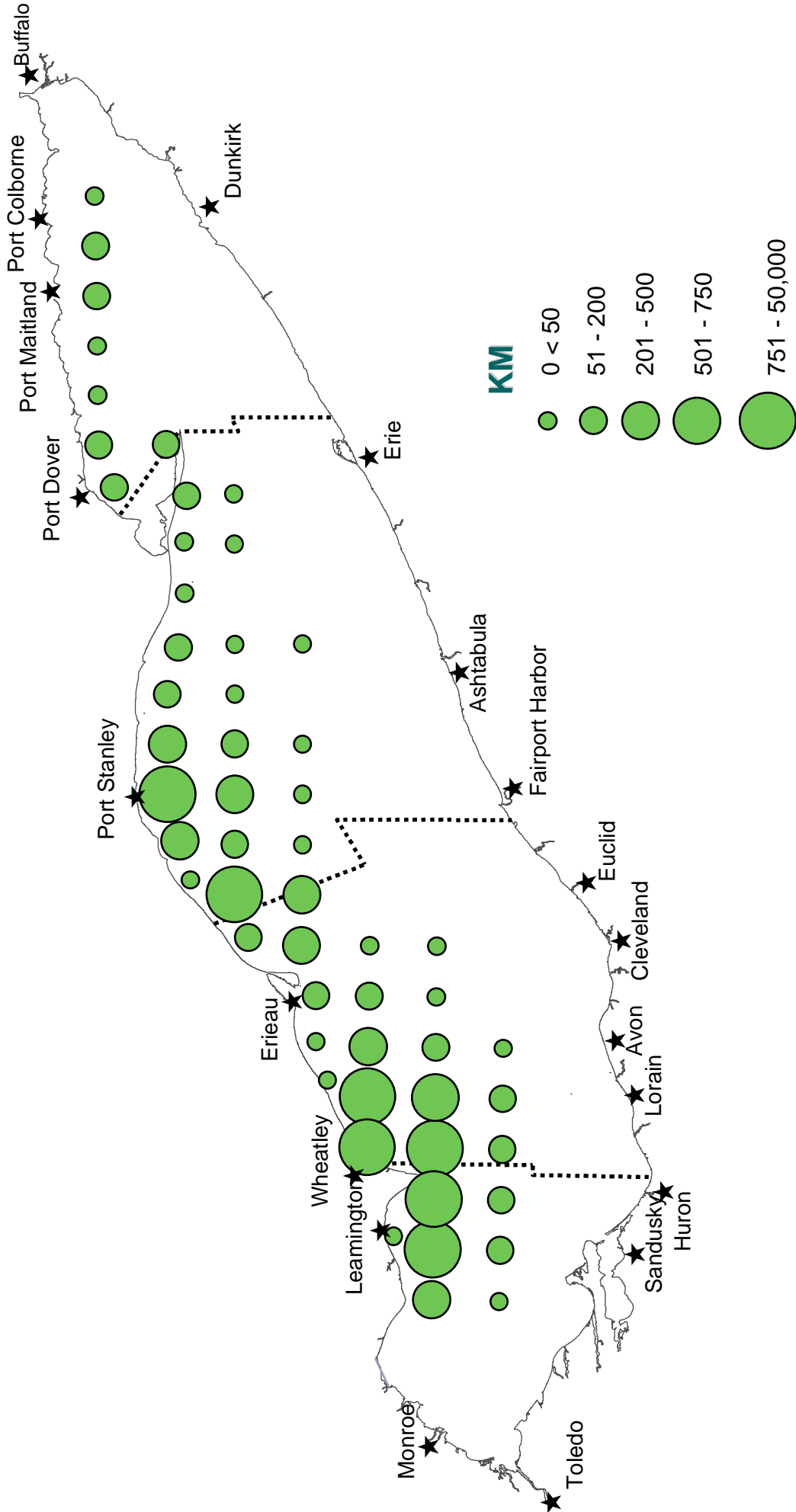


Figure 1.6. Spatial distribution of yellow perch gill net effort (km) in 2009 by 10-minute grid.

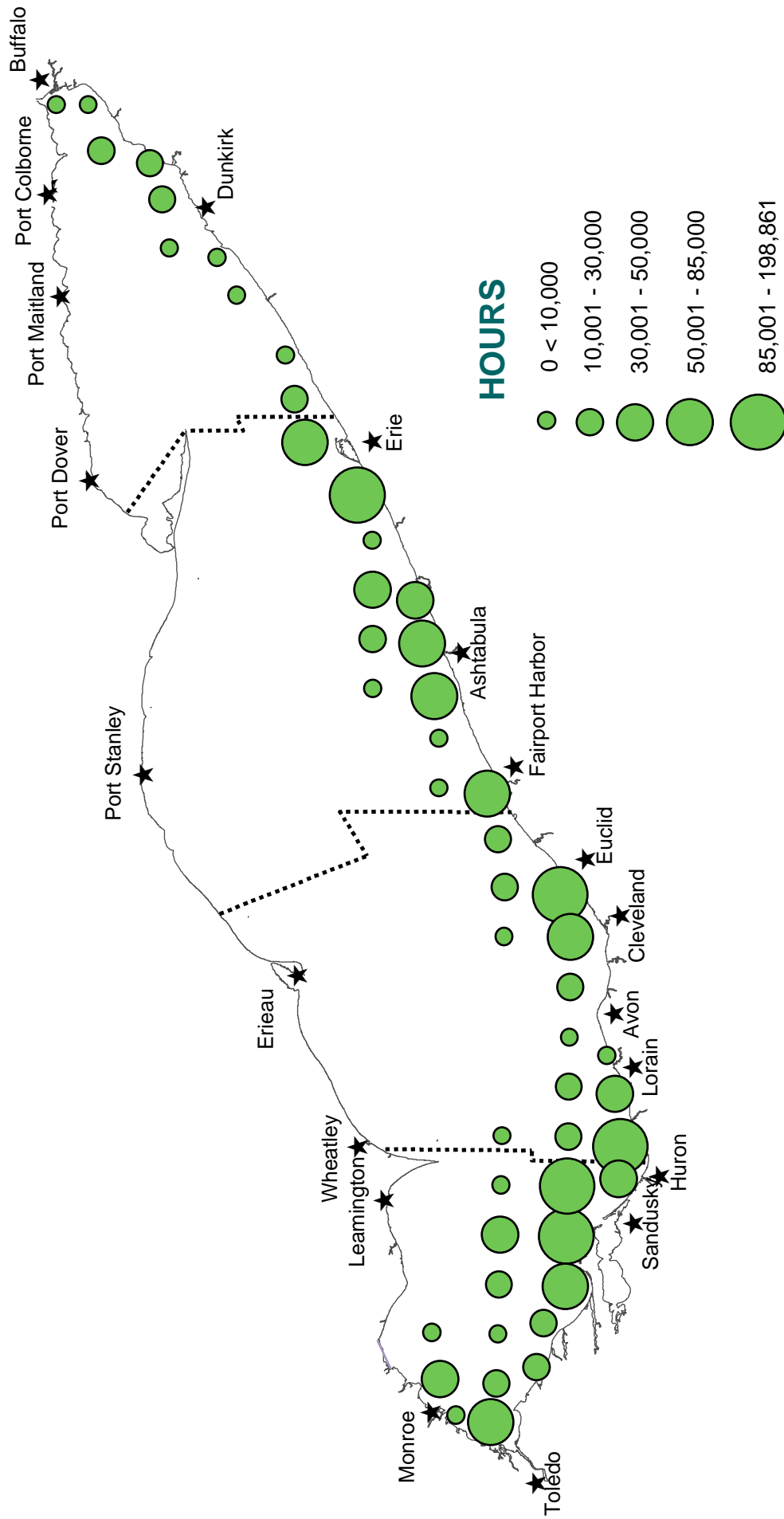


Figure 1.7. Spatial distribution of yellow perch sport angling effort (angler hours) in 2009 by 10-minute grid.

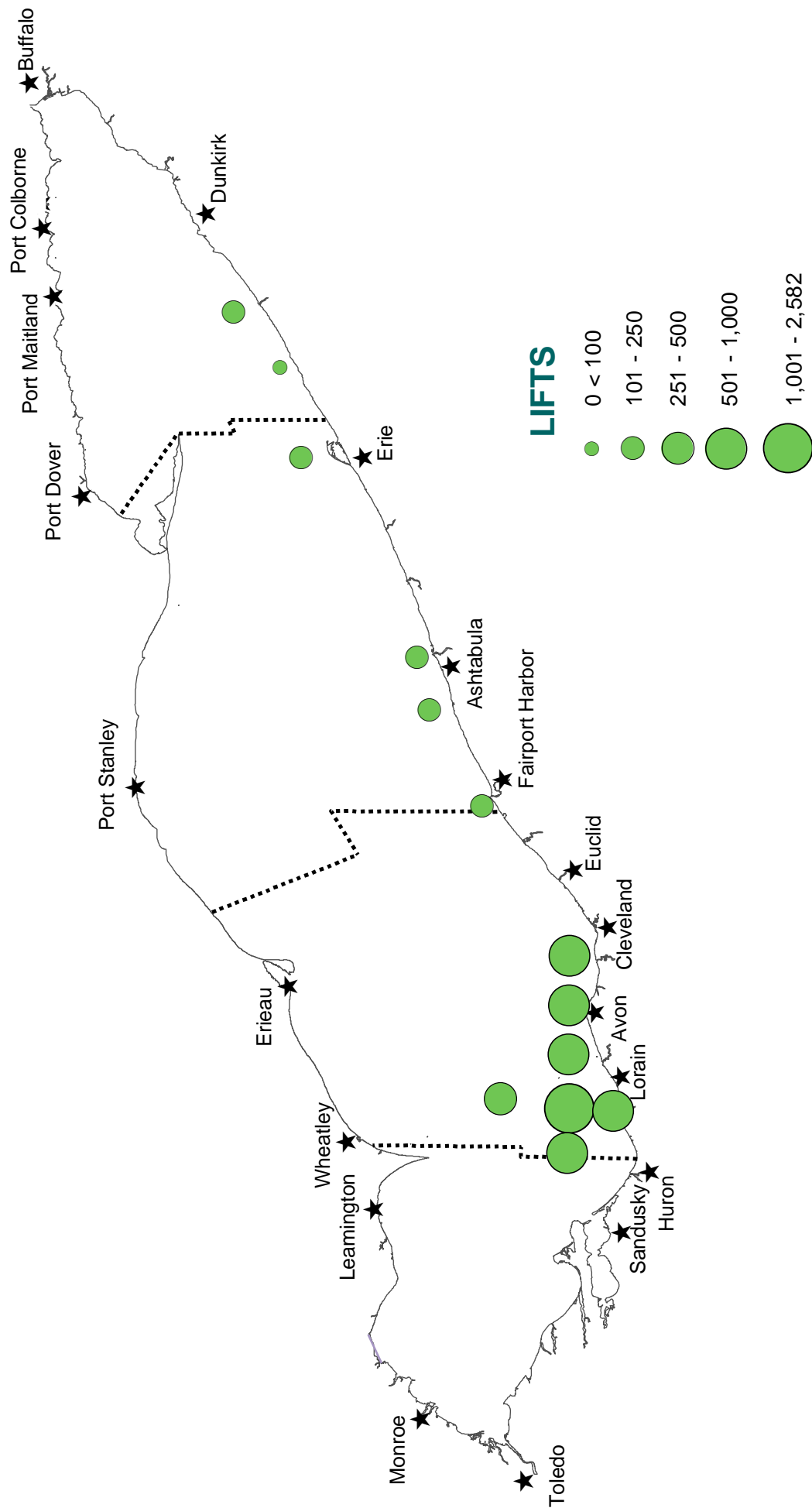


Figure 1.8. Spatial distribution of yellow perch trap net effort (lifts) in 2009 by 10-minute grid.

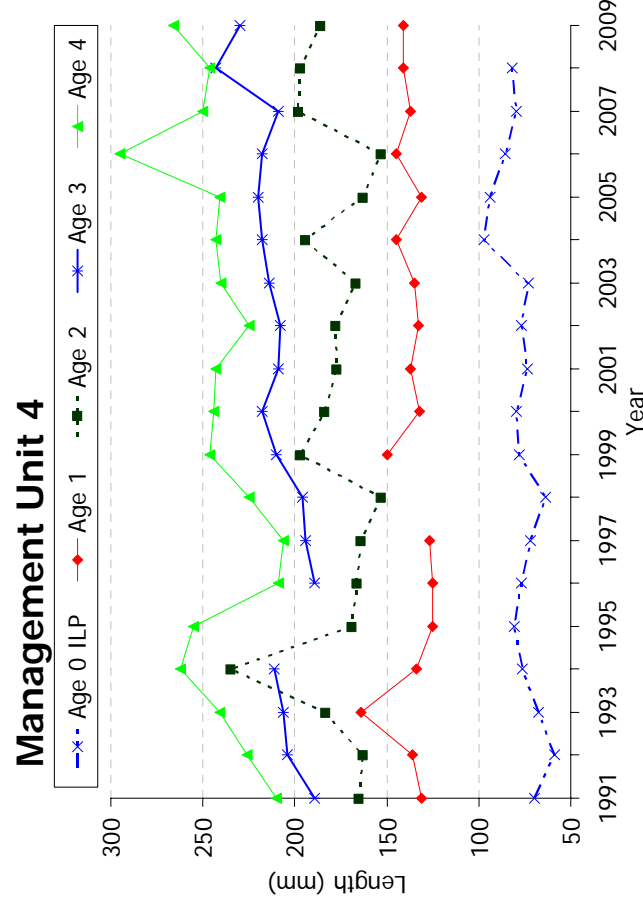
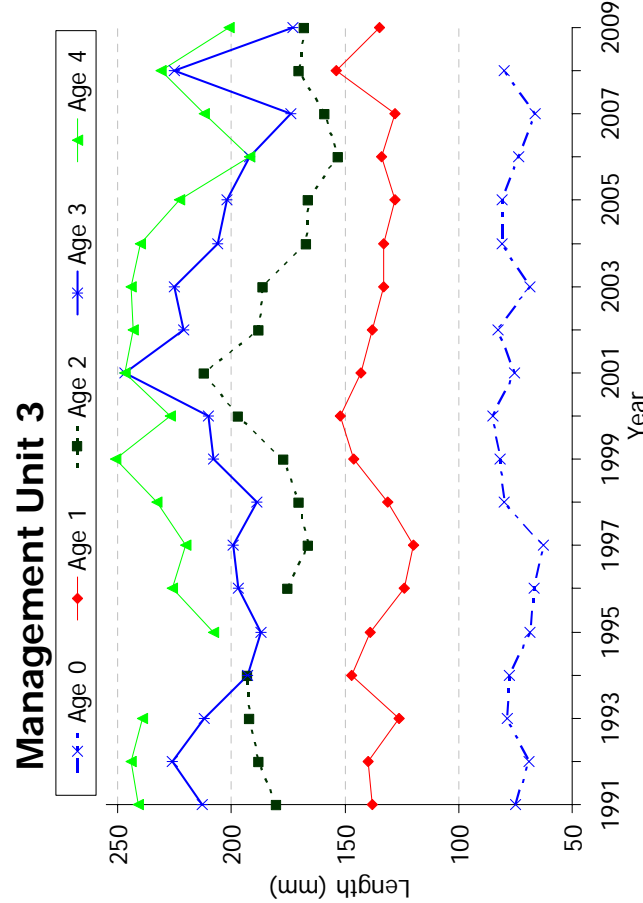
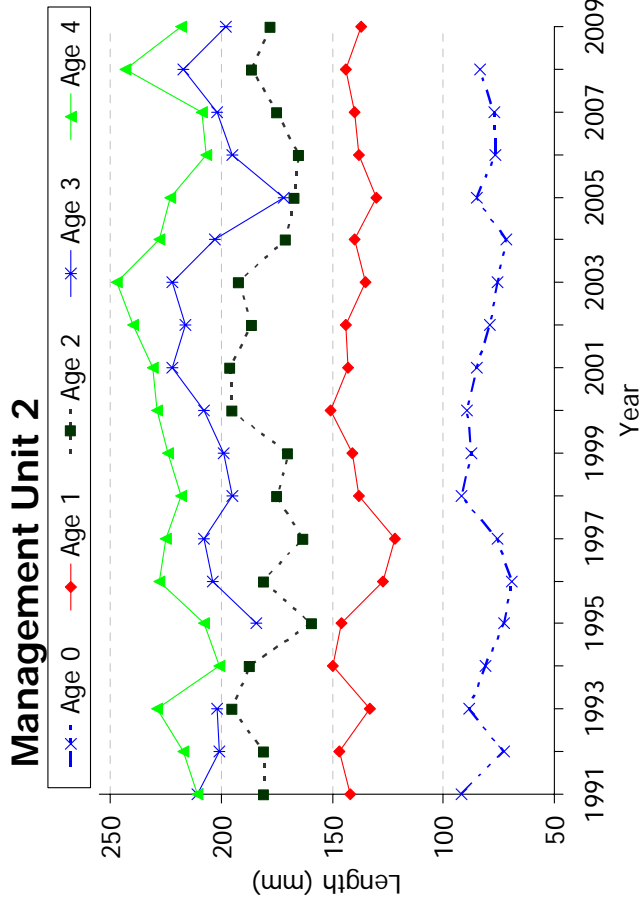
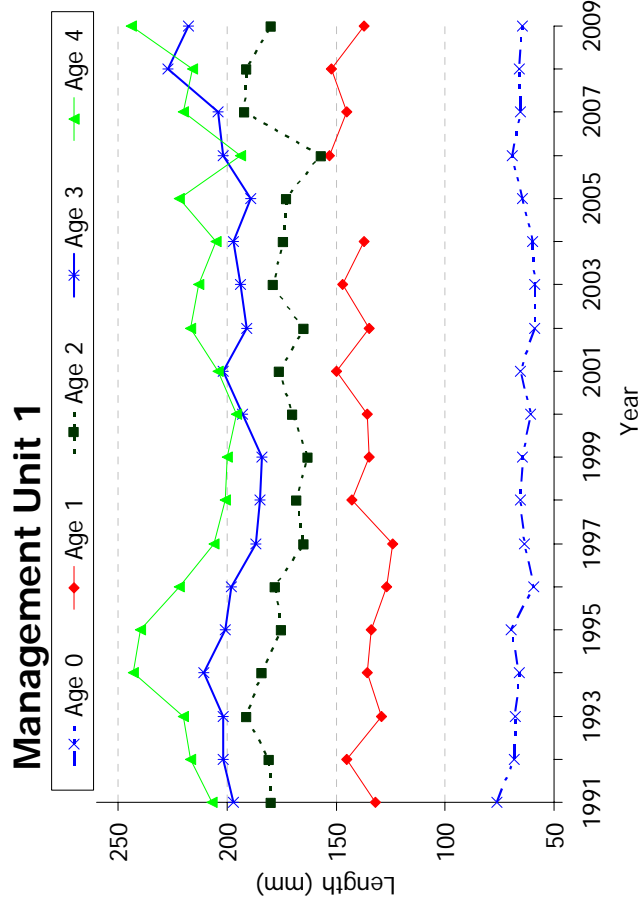


Figure 1.9. Yellow perch total length-at-age from 1991-2009 fall interagency experimental samples for ages 0-4 by management unit (MU). In MU4, ILP represents the Inner Long Point Bay series.

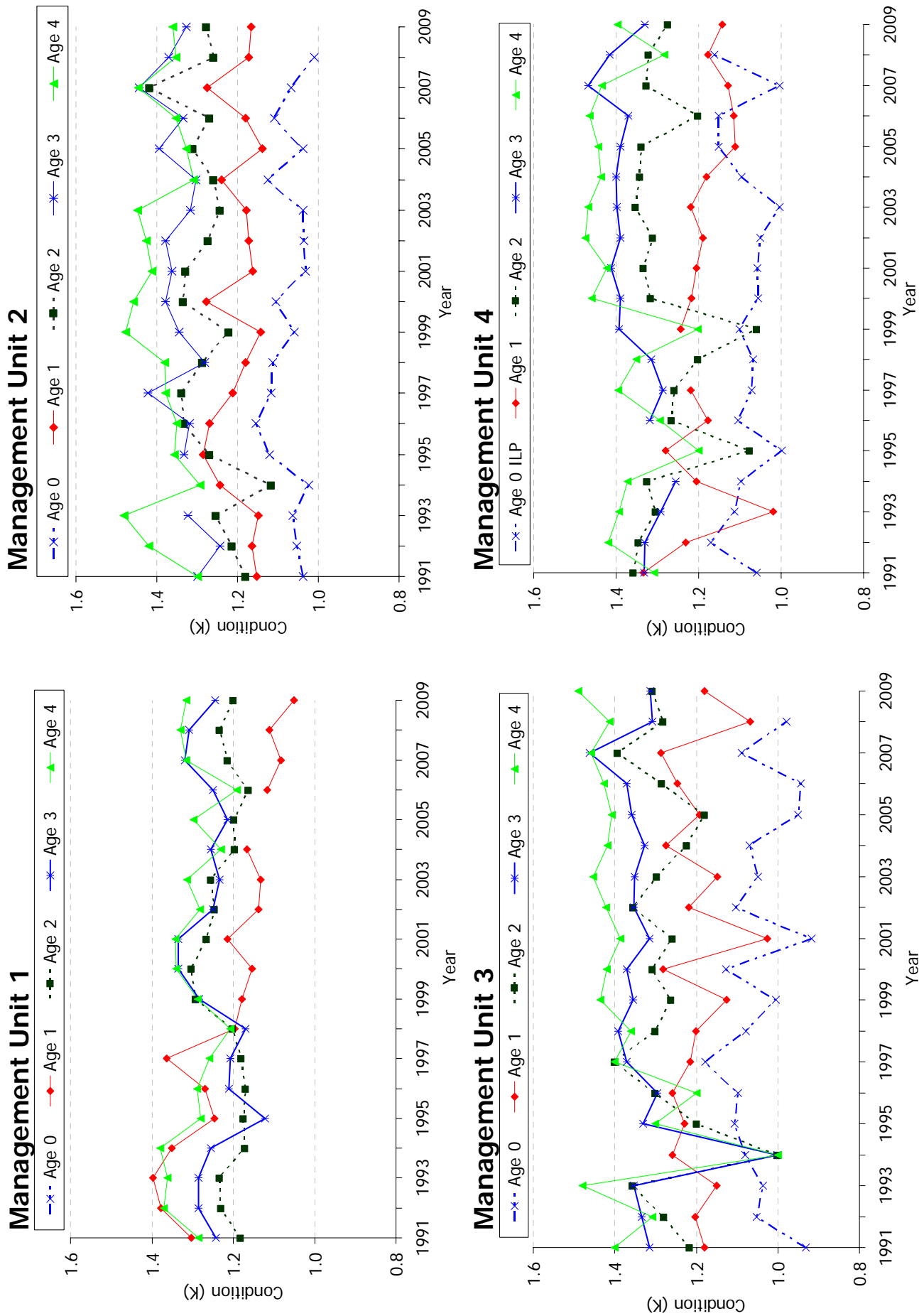


Figure 1.10. Yellow perch condition (K) at age from 1991-2009 fall interagency experimental samples for ages 0-4 by management unit (MU). In MU4, ILP represents the Inner Long Point Bay series.

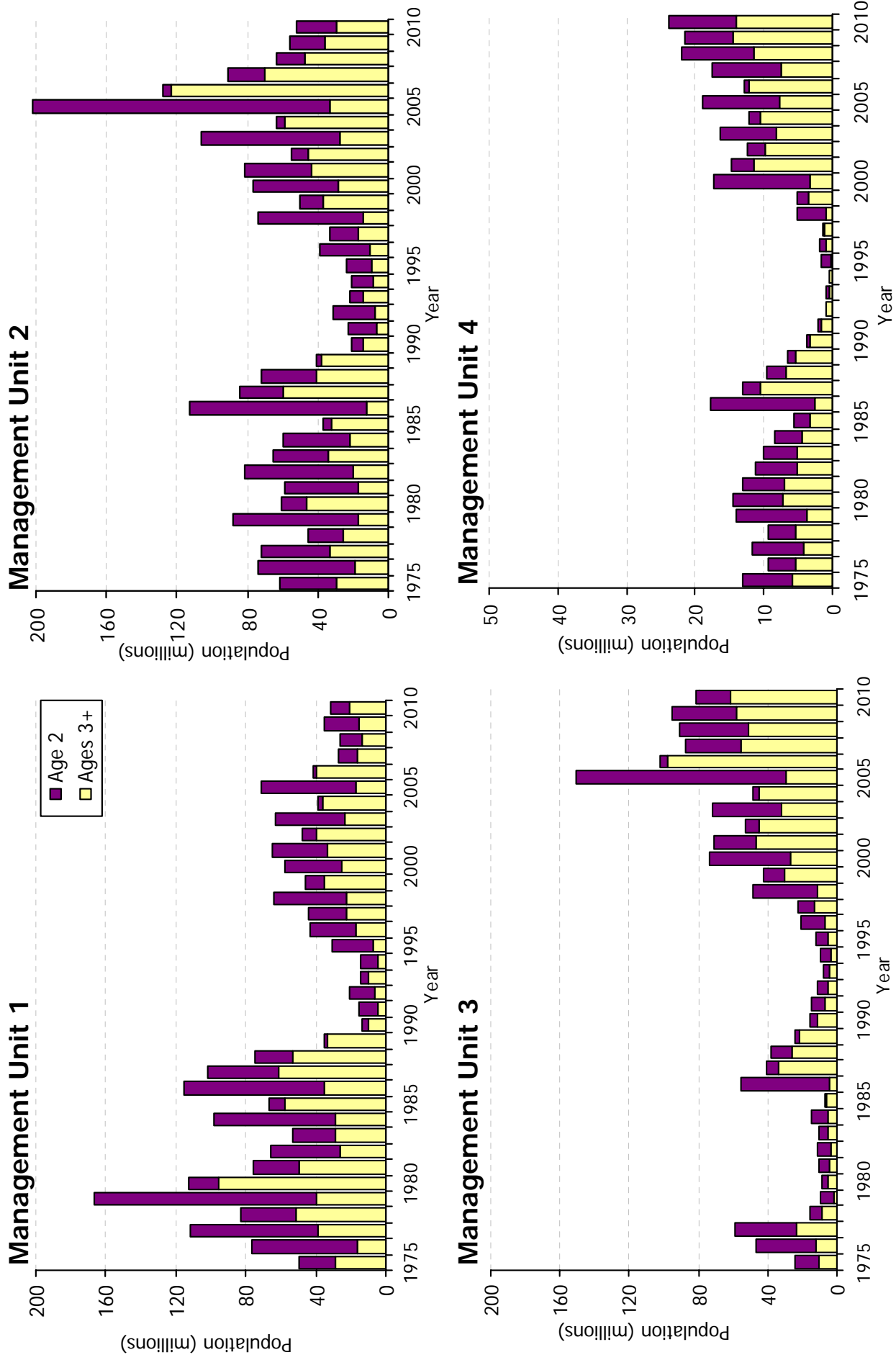


Figure 1.11. Lake Erie yellow perch population estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2010 are from ADMB and parametric regressions for age 2 from survey gears.

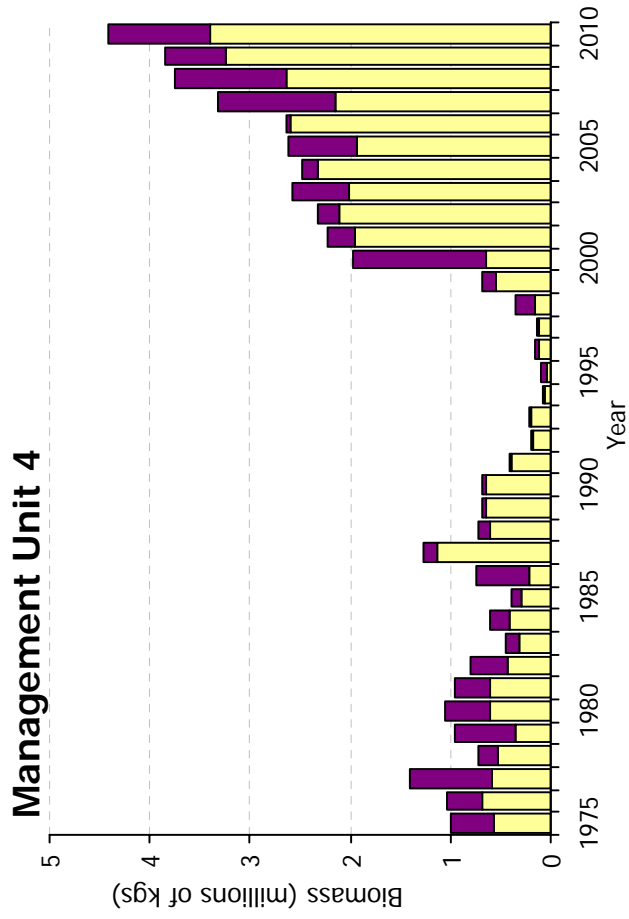
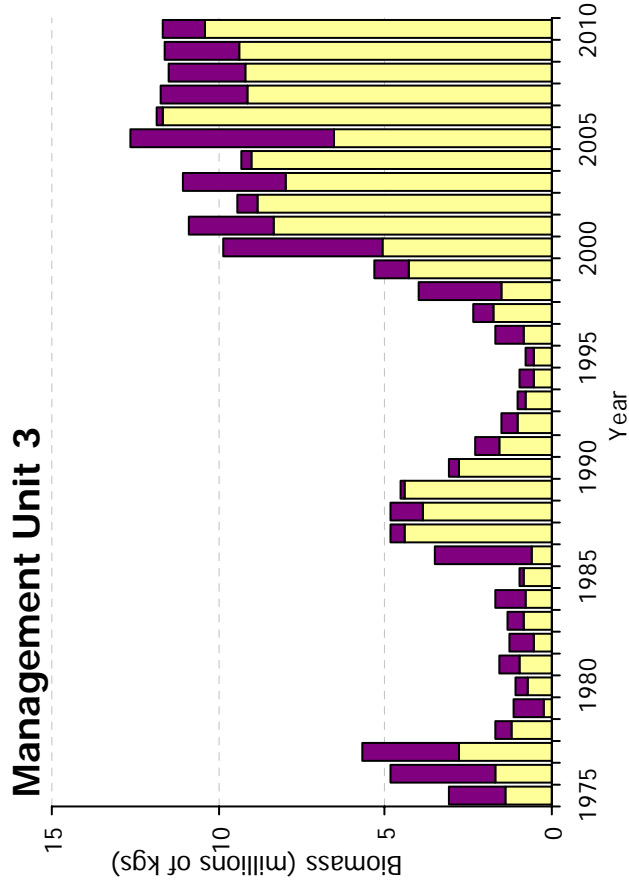
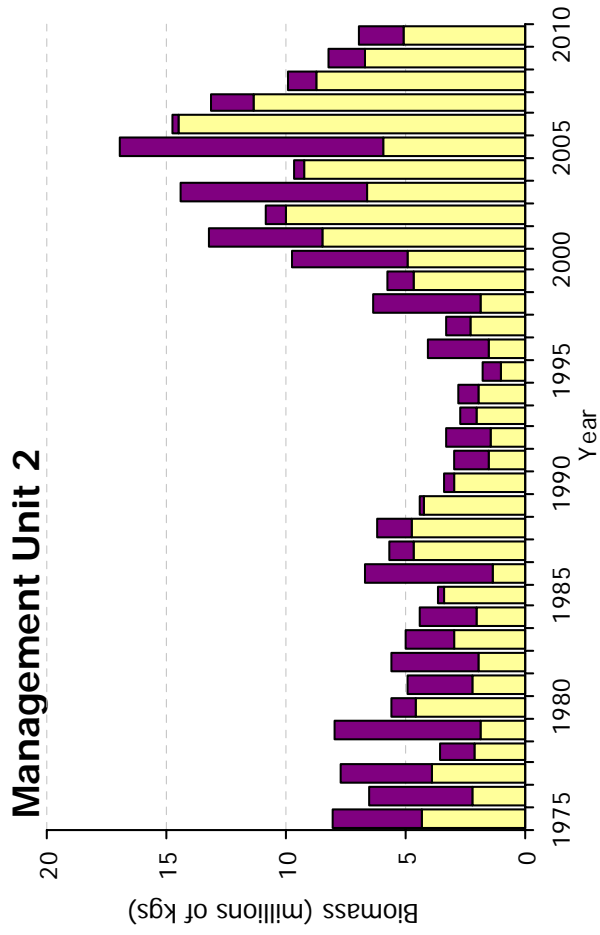
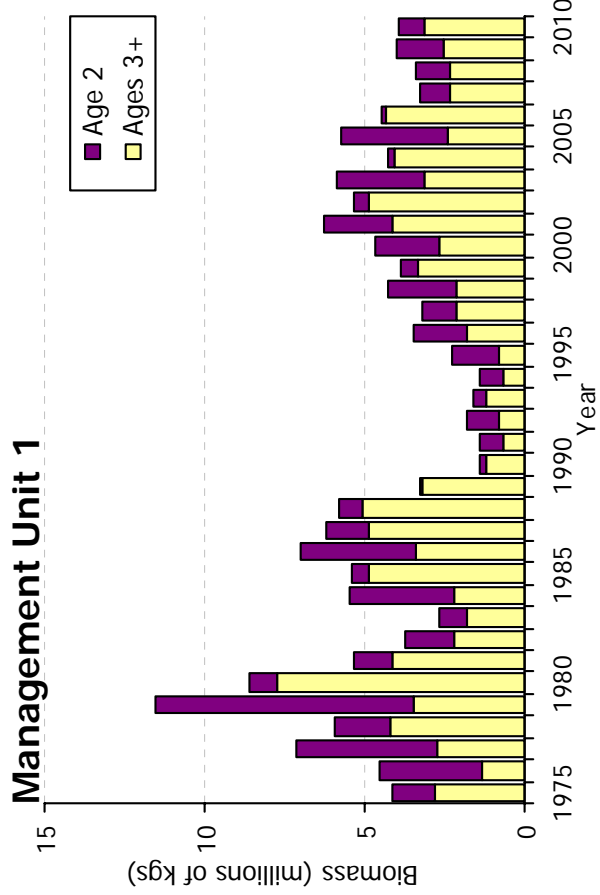


Figure 1.12. Lake Erie yellow perch biomass estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2010 are from ADMB and parametric regressions for age 2 from survey gears.

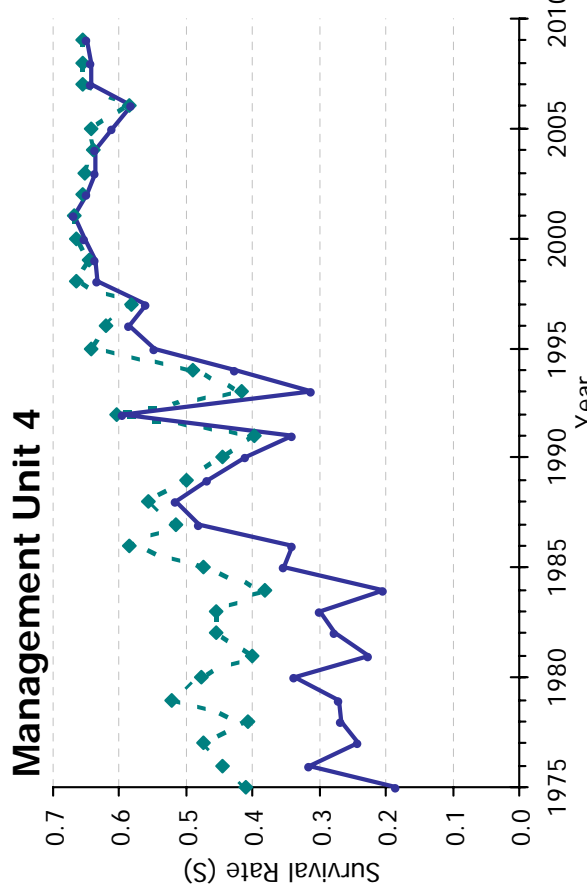
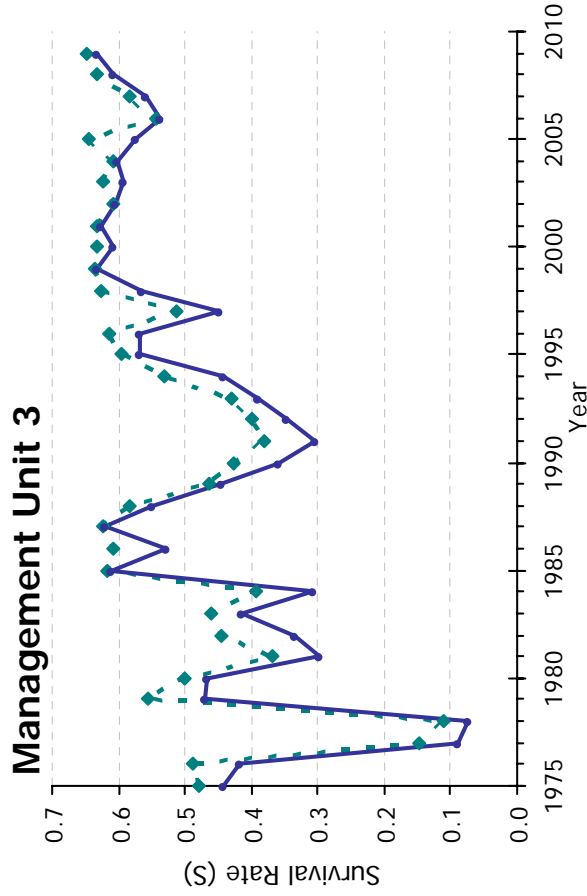
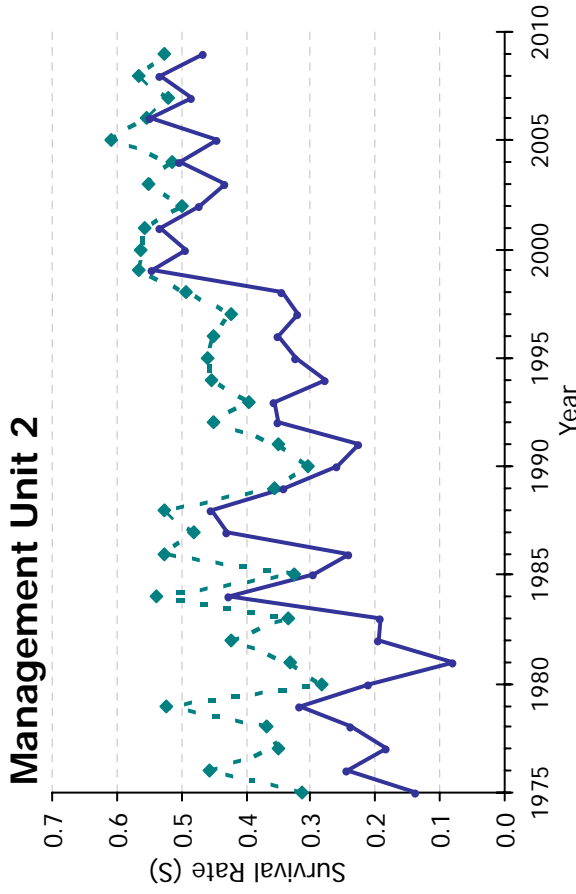
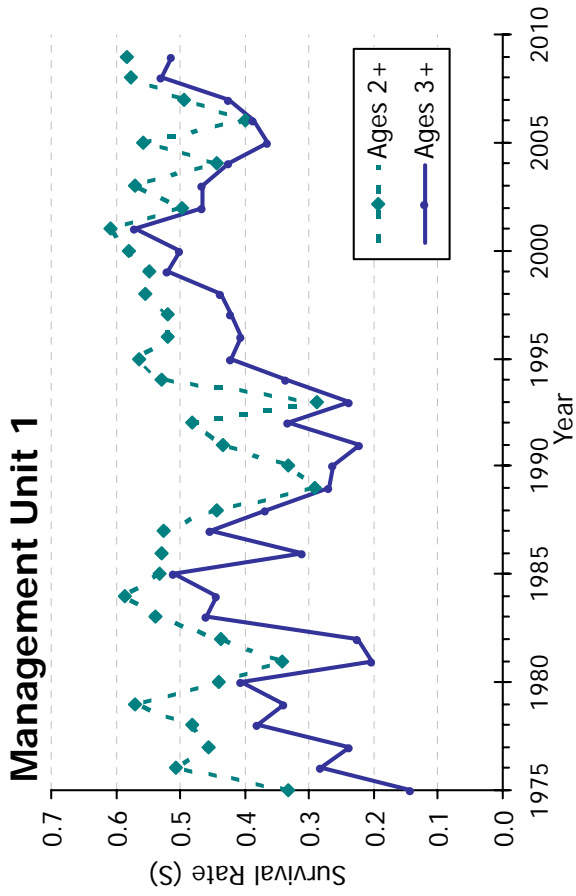


Figure 1.13. Lake Erie yellow perch survival rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.

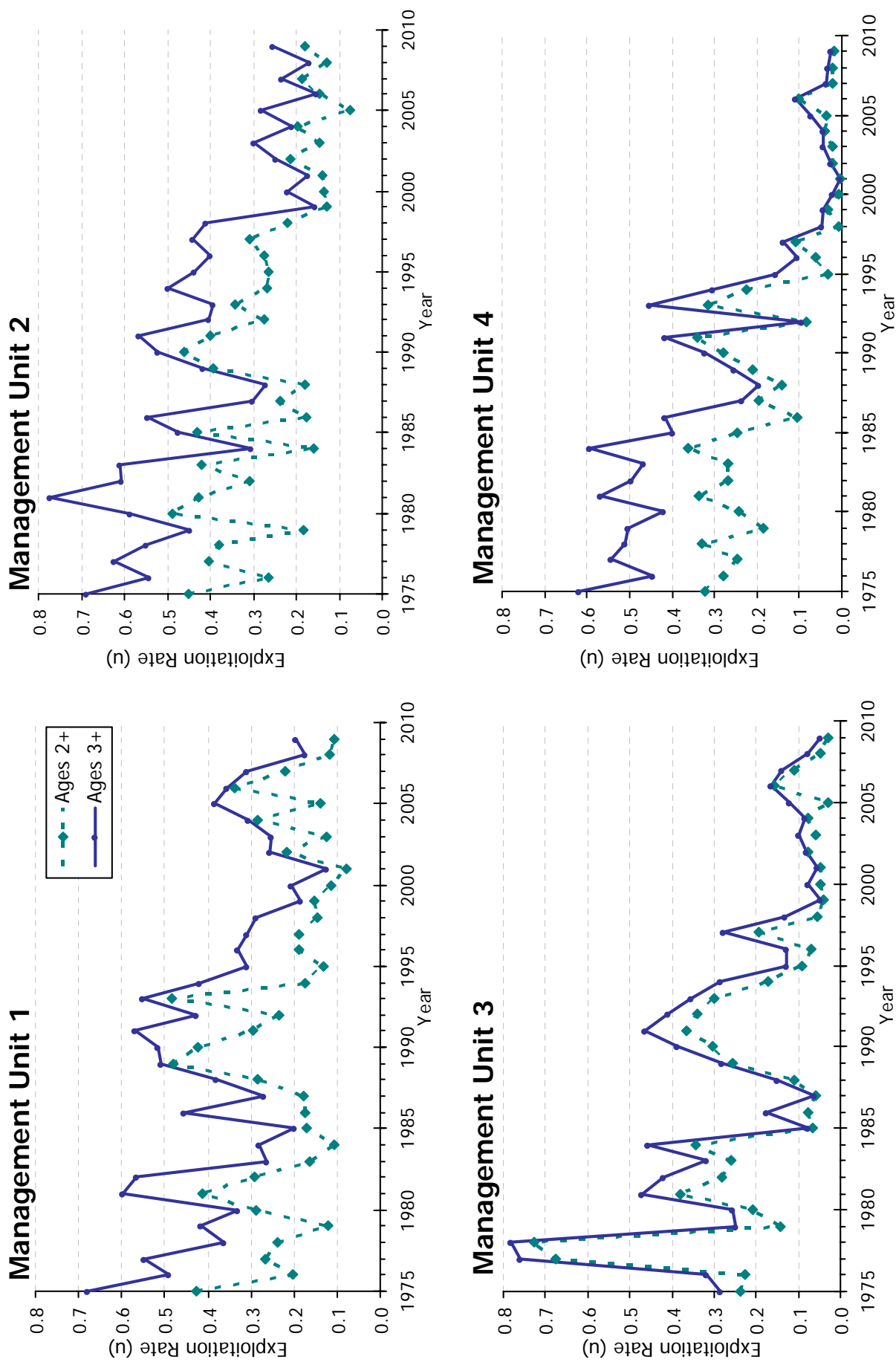


Figure 1.14. Lake Erie yellow perch exploitation rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.

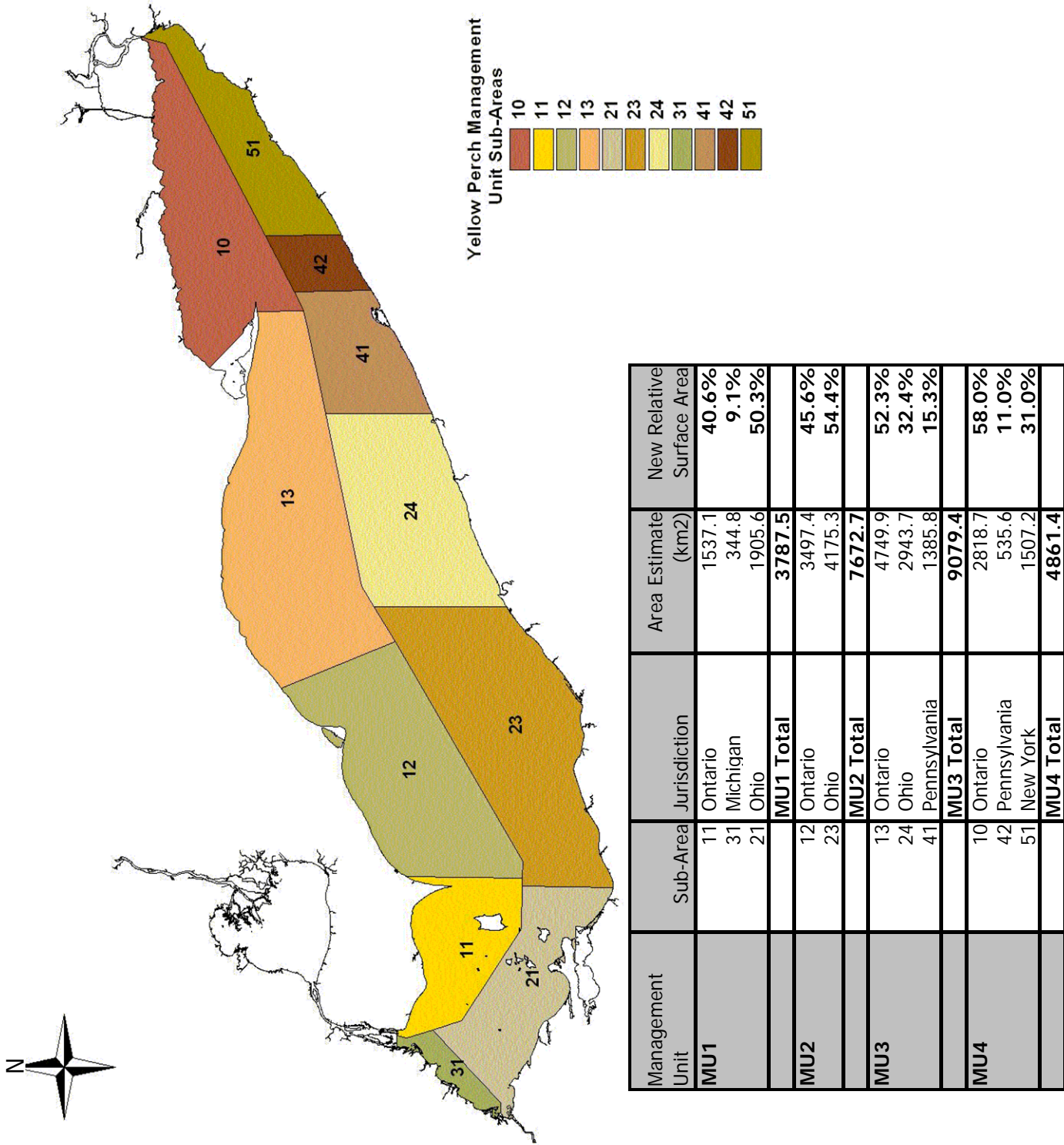


Figure 2.1 Area calculations by subunit area for Yellow Perch Task Group Management Units

Appendix A Table 1. 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	0.3	1
	Sport Effort	0.4	1
	Commercial Trap Net Effort	1.0	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.9	5
	Commercial Trap Net Harvest	0.5	5
	Trawl Survey Catch Rates	0.4	3
	Partnership Gill Net Index Catch Rates	1.0	5
2	Commercial Gill Net Effort	0.3	1
	Sport Effort	1.0	1
	Commercial Trap Net Effort	1.0	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.6	5
	Commercial Trap Net Harvest	0.4	5
	Trawl Survey Catch Rates	1.0	4
	Partnership Gill Net Index Catch Rates	0.5	5
3	Commercial Gill Net Effort	0.3	1
	Sport Effort	1.0	1
	Commercial Trap Net Effort	0.5	1
	Commercial Gill Net Harvest	0.3	5
	Sport Harvest	1.0	5
	Commercial Trap Net Harvest	0.3	5
	Trawl Survey Catch Rates	1.0	4
	Partnership Gill Net Index Catch Rates	0.9	5
4	Commercial Gill Net Effort	0.3	1
	Sport Effort	1.0	1
	Commercial Trap Net Effort	0.5	1
	Commercial Gill Net Harvest	0.7	5
	Sport Harvest	1.0	5
	Commercial Trap Net Harvest	0.6	5
	NY Gill Net Survey Catch Rates	0.8	5
	Partnership Gill Net Index Catch Rates	1.0	5

Appendix A Table 2. Trawl regression indices used for projecting estimates of age-2 yellow perch recruiting in 2010 by management unit.

Management Unit 1

Index	R-SQUARE	Slope	Index Value	Age-2 estimate	SE of slope	Lower Age 2 CI.	Upper Age 2 CI.
OHS11A	0.893	0.30452	83.3	25.367	0.02303	23.448	27.285
OHF11A	0.844	0.25792	12.4	3.198	0.02617	2.874	3.523
OHF20A	0.798	0.29774	37.3	11.106	0.03639	9.748	12.463
OHF21A	0.796	0.32542	20.7	6.736	0.03887	5.932	7.541
OHF10A	0.770	0.05949	74.7	4.444	0.00788	3.855	5.033
OOS10A	0.667	0.02613	387.2	10.118	0.00414	8.515	11.721
OHS20A	0.656	0.05840	287.2	16.772	0.01026	13.826	19.719
OHS21A	0.572	0.09950	63.1	6.278	0.02029	4.998	7.559
mean				10.502		9.149	11.855

Management Unit 2

Index	R-SQUARE	Slope	Index Value	Age-2 estimate	SE of slope	Lower Age 2 CI.	Upper Age 2 CI.
OHF21A	0.883	0.69440	20.7	14.374	0.05955	13.141	15.607
OHF11A	0.863	0.52822	12.4	6.550	0.04970	5.934	7.166
OHS11A	0.830	0.58924	83.3	49.084	0.05828	44.229	53.938
OHS20A	0.824	0.13286	287.2	38.157	0.01491	33.875	42.440
OHF10A	0.814	0.12416	74.7	9.275	0.01439	8.200	10.350
OHF20A	0.698	0.56546	37.3	21.092	0.09019	17.728	24.456
OOS10A	0.578	0.04890	387.2	18.934	0.00959	15.221	22.647
OHS30A	0.558	0.06607	558.3	36.887	0.01471	28.674	45.099
OHS21A	0.519	0.19189	63.1	12.108	0.04359	9.358	14.859
mean				22.940		19.595	26.285

Management Unit 3

Index	R-SQUARE	Slope	Index Value	Age-2 estimate	SE of slope	Lower Age 2 CI.	Upper Age 2 CI.
OHF21A	0.803	0.49171	20.7	10.178	0.05746	8.989	11.368
OHS20A	0.761	0.09503	287.2	27.293	0.01291	23.585	31.000
OHF20A	0.705	0.42273	37.3	15.768	0.06636	13.293	18.243
OHS30A	0.454	0.04430	558.3	24.733	0.01215	17.949	31.516
mean				19.493		15.954	23.032

Management Unit 4

Index	R-SQUARE	Slope	Index Value	Age-2 estimate	SE of slope	Lower Age 2 CI.	Upper Age 2 CI.
NYF41A	0.852	0.27181	62.5	16.988	0.02831	15.219	18.758
LPC40A	0.692	0.07040	279.2	19.656	0.00979	16.922	22.389
LPS41A	0.662	0.52648	0.7	0.369	0.08013	0.312	0.425
LPC41A	0.556	0.19865	10.5	2.086	0.03626	1.705	2.467
mean				9.775		8.540	11.009

Appendix A Table 3. Interagency trawl surveys indices. All series are reported in arithmetic mean catch per hectare.

Year	OHS10A	OHF10A	OHS11A	OHF11A	OOS10A	OOS11A	OHS20A	OHF20A	OHS21A	OHF21A	OHS30A	OHF30A
1984	.	.	.	.	.	.	.	.	.	.	.	.
1985	.	.	.	.	.	.	.	.	.	.	.	.
1986	.	.	.	.	.	.	.	.	.	.	.	.
1987	16.3	.	74.9	.	.	.	.	.	.	.	.	.
1988	188.6	.	11.2	.	212.6	13.3	.	.	.	.	.	.
1989	106.1	.	11.8	.	265.4	12.5	.	.	.	.	.	.
1990	144.4	310.1	20.7	82.0	259.2	35.2	1.7	52.2	67.4	23.0	0.6	20.5
1991	146.9	58.1	27.6	10.7	113.2	42.1	5.4	9.3	43.5	50.0	6.4	1.2
1992	60.7	90.9	9.5	27.7	94.1	16.5	7.2	35.8	8.0	14.3	24.3	31.8
1993	1164.2	256.4	14.4	16.9	862.5	39.5	41.7	10.6	29.1	49.0	39.7	27.3
1994	508.5	287.1	57.7	50.9	469.7	62.9	73.3	71.9	5.0	12.0	77.2	16.1
1995	348.9	82.4	128.8	83.2	478.7	113.5	2.2	2.5	151.1	82.3	30.5	12.4
1996	3290.8	579.3	79.9	136.4	2544.9	122.8	843.3	119.1	15.7	11.2	1785.8	128.4
1997	52.2	33.7	121.8	102.4	55.2	93.8	29.0	12.3	677.7	110.2	.	2.6
1998	174.5	250.9	4.8	17.5	170.6	8.2	223.8	69.8	2.9	6.3	298.9	38.1
1999	270.1	155.3	68.5	77.0	330.0	75.0	26.8	73.6	19.4	40.7	44.8	21.0
2000	186.4	41.5	85.3	50.1	102.5	113.6	0.6	21.9	86.6	61.6	0.0	1.3
2001	322.1	246.3	12.8	21.7	398.4	11.3	341.9	114.6	6.4	5.7	1283.7	13.6
2002	33.1	30.4	77.1	119.3	26.4	59.5	0.3	6.0	191.0	51.7	1.7	2.5
2003	1509.9	1111.6	3.0	4.1	1620.8	12.3	1077.5	149.0	4.2	3.2	844.6	47.5
2004	40.9	9.3	210.7	261.4	39.5	240.2	39.7	8.7	323.7	216.5	3.6	1.9
2005	124.2	62.3	5.2	0.5	114.8	5.2	118.8	37.8	25.0	18.3	278.2	156.2
2006	180.2	121.9	6.4	21.0	222.8	12.4	4.9	10.0	2.2	4.2	60.7	18.9
2007	592.9	631.5	14.5	28.5	444.6	18.8	244.5	167.0	25.1	19.8	237.0	177.8
2008	267.0	74.7	23.5	44.6	387.2	142.1	287.2	37.3	66.6	56.6	558.3	52.8
2009	186.0	69.4	83.3	12.4	132.4	88.4	12.2	1.3	63.1	20.7	0.1	0.5

Year	OHS31A	OHF31A	OLP40A	OLP41A	ILP40A	ILP41A	NYF40A	NYF41A	LPS41A	LPC40A	LPC41A
1984	.	.	237.8	6.6	1031.3	65.1	.	.	.	143.3	7.8
1985	.	.	3.1	61.5	21.8	122.5	.	.	.	3.6	33.3
1986	.	.	105.9	0.7	1169.5	36.4	.	.	7.6	138.3	4.3
1987	.	.	2.3	178.0	2.5	26.5	.	.	5.5	0.5	23.9
1988	.	.	410.6	0.6	238.0	3.1	.	.	1.1	70.7	0.4
1989	.	.	174.0	32.6	317.4	59.1	.	.	6.3	53.6	11.4
1990	7.2	14.3	31.4	10.0	160.3	27.9	.	.	0.0	20.8	6.1
1991	103.4	18.5	9.0	0.9	93.7	22.7	.	.	1.7	11.8	3.1
1992	2.7	3.4	34.1	6.9	378.3	21.5	10.4	2.3	5.6	44.7	3.2
1993	16.0	12.1	21.1	3.3	159.5	13.6	110.1	3.0	7.9	22.1	2.0
1994	16.7	3.4	98.8	10.9	59.2	20.3	47.7	8.4	2.7	19.6	3.4
1995	18.7	27.3	5.0	24.0	3.5	41.2	5.7	14.2	15.2	4.7	8.8
1996	2.7	3.9	130.0	2.2	37.5	4.2	106.3	0.3	0.4	24.3	0.8
1997	.	34.0	12.6	34.1	18.1	6.3	0.2	5.5	4.4	3.4	4.4
1998	3.5	3.7	84.1	1.2	854.2	14.3	1.5	0.2	8.4	108.1	1.7
1999	63.5	40.0	1.7	41.3	23.2	105.5	36.1	33.5	23.0	14.0	101.5
2000	84.8	19.3	8.7	2.8	1.9	3.0	23.1	6.6	0.7	3.5	11.1
2001	10.2	0.4	55.9	1.2	479.3	5.0	97.9	11.5	4.8	68.8	2.2
2002	749.6	38.3	0.3	10.8	6.5	36.7	9.3	15.5	6.8	0.7	5.7
2003	1.5	1.2	48.8	0.4	117.0	0.9	472.5	1.9	1.3	206.4	2.2
2004	61.9	45.2	0.3	3.5	0.1	15.5	1.5	28.7	6.5	0.1	11.6
2005	82.3	132.3	10.3	0.1	8.8	0.2	57.8	5.4	0.4	124.4	0.1
2006	10.8	12.5	2.0	1.0	0.6	3.9	283.2	39.9	19.5	30.0	11.9
2007	40.9	37.0	4.0	0.5	45.5	1.8	401.3	41.2	9.1	60.2	7.8
2008	150.2	26.4	3.1	4.1	0.2	3.0	1088.3	44.3	5.7	279.2	20.4
2009	104.3	139.4	0.9	2.4	0.0	0.0	11.6	62.5	0.7	0.4	10.5

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 LPS41A, a gill net index which is reported in fish per lift.

Abbreviation	Series
OHS10A	Ohio Management Unit 1 summer age 0 arithmetic
OHS11A	Ohio Management Unit 1 summer age 1 arithmetic
OHF10A	Ohio Management Unit 1 fall age 0 arithmetic
OHF11A	Ohio Management Unit 1 fall age 1 arithmetic
OOS10A	Ontario/Ohio Management Unit 1 summer age 0 arithmetic
OOS11A	Ontario/Ohio Management Unit 1 summer age 1 arithmetic
OHS20A	Ohio Management Unit 2 summer age 0 arithmetic
OHF20A	Ohio Management Unit 2 fall age 0 arithmetic
OHS21A	Ohio Management Unit 2 summer age 1 arithmetic
OHF21A	Ohio Management Unit 2 fall age 1 arithmetic
OHS30A	Ohio Management Unit 3 summer age 0 arithmetic
OHF30A	Ohio Management Unit 3 fall age 0 arithmetic
OHS31A	Ohio Management Unit 3 summer age 1 arithmetic
OHF31A	Ohio Management Unit 3 fall age 1 arithmetic
OLP40A	Outer Long Point Bay Management Unit 4 age 0 arithmetic
OLP41A	Outer Long Point Bay Management Unit 4 age 1 arithmetic
ILP40A	Inner Long Point Bay Management Unit 4 age 0 arithmetic
ILP41A	Inner Long Point Bay Management Unit 4 age 1 arithmetic
LPS41A	Long Point Bay Unit 4 summer Gill Net age 1 arithmetic
LPC40A	Long Point Composite Unit 4 age 0 arithmetic
LPC41A	Long Point Composite Unit 4 age 1 arithmetic
NYF40A	New York Management Unit 4 fall age 0 arithmetic
NYF41A	New York Management Unit 4 fall age 1 arithmetic