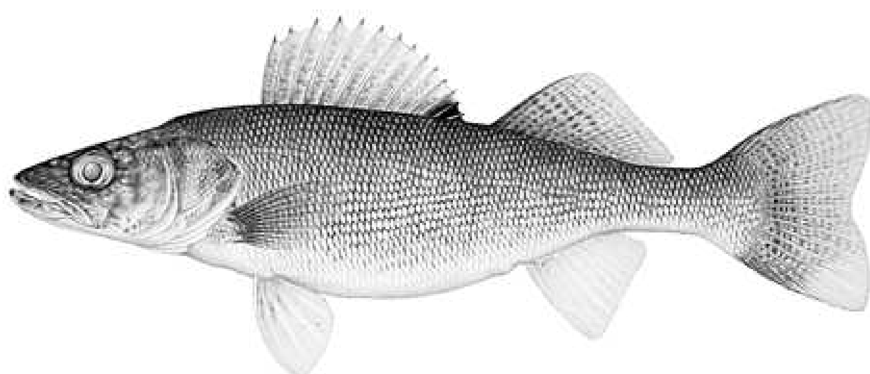
Revised Progress Report for 2001 by the

LAKE ERIE WALLEYE TASK GROUP

May 2002



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Presented to:

Standing Technical Committee
Lake Erie Committee
Great Lakes Fishery Commission

Introduction

This is a revised edition of the Lake Erie Walleye Task Groups Annual Report to the Lake Erie Committee. The WTG is comprised of scientists and fisheries biologists/managers from Michigan, New York, Ohio, Ontario and Pennsylvania (Figure 1). At the time the first edition of the report was submitted to the LEC, the Ontario Ministry of Natural Resources (OMNR) staff were in a labour dispute. Consequently, a full review of the report by all members was not possible. Because of this, the first edition included some figures and tables that were incorrect. This revised edition has corrected figures and tables. This new report incorporates the following changes:

1. The text regarding Allowable Harvest Recommendations and Walleye Distribution has been revised, page 7.
2. The Other Charges section discussing walleye distribution research has been revised to include stock discrimination and current research projects, page 8.
3. The section about Forage Task Group charges has been revised, page 8-9.
4. Correction of Table 8 since rounding errors caused it to be inaccurate, page 17.
5. Addition of a new Table 9 to illustrate our recruitment data, and results, page 18.
6. The old Table 9 is now Table 10 and it's title has been modified, page 19.
7. The old Table 10 is Table 11 and it has been revised to show the forecasted 2002, 2003 Recommended Allowable Harvests (RAHs) using only 2000 data and after addition of the 2001 data page 20.
8. The following figures have been either revised or removed,
    a) Figures 7-9 from the original document were removed and as a result Figure 10 becomes 7, and 11 is now 8.
    b) Figures 12-14 have been removed because they were unnecessary.
    c) The new Figures 8-9 include forecasted estimates to 2003.
    d) Figure 10 in this document shows the cumulative percent composition for all age classes of walleye.

Charges to the WTG from the STC, 2001-2002

The charges from the Standing Technical Committee to the Walleye Task Group for the period from March 2001 to February 2002 were to:

1) Continue analyses supporting development and refinement of the multi-year harvest strategy and evaluate long-term effects of different management strategies on sustainability of walleye as part of the Coordinated Percid Management Strategy.
2) Maintain and update centralized time series required for population models including tagging, fishing harvest and effort by grid, growth rate, maturity schedule, and agency or interagency abundance indices.
3) Assemble and analyze various data (harvest and effort, index fishing, tagging, genetic, etc.) on the spatial and temporal distribution of Lake Erie walleye to determine stock discreteness and contributions to lakewide fisheries.
4) Assist the Forage Task Group with bioenergetic analysis of walleye consumption of prey fish.

Review of Walleye Fisheries in 2001

The 2001 total estimated lakewide harvest of walleye was approximately 2.9 million fish, a 20% decline from 3.6 million in 2000 and was the lowest harvest since 1978 (Tables 1 and 2). The total harvest represented about 86% of the total allowable catch (TAC) of 3.4 million walleye and included walleye caught incidentally in commercial fisheries for other species. The sport harvest of 1.4 million fish was up 7% from similar total harvests in 1999 and 2000, but remained at one of the lowest levels since the late 1970's and was only half of the 1975-2001 mean (Table 2, Fig. 2). Commercial harvest of walleye dropped 35% to 1.5 million fish in 2001 and was a continuation of a significant drop since 1998 (Table 2, Fig. 2). The commercial harvest was one of the lowest levels since the early 1980's and only 67% of the 1975-2001 mean.

Total sport effort continued the declining trend seen since 1988 dropping 2% to 4,102 angler hours, the lowest since 1978 (Table 3, Figure 3). Management Units 1 and 3 exhibited similar declines, 7%, while Unit 2 increased 27%. Total commercial gill net effort decreased 52% to 20,778 kilometers of net with similar decreases in all Management Units (Table 3, Figure 4).

Sport catch-per-unit-effort (CUE) showed a 27% increase in Unit 1 with continuing declines in remaining Units. The average catch rate of 0.35 fish per angler hour was 19% below the 1975-2000 mean (Table 4, Figure 5). Commercial CUE increased substantially to 71 walleye/kilometer of net in 2001, the first real check in a trend of declining CUE's since the mid 1980's (Table 4, Figure 5). Increases were largest in Unit 1 (49%) and became less towards the east.

Age 2, the 1999 year-class, walleye comprised the majority of harvests in both the sport (36%) and commercial (47%) fisheries followed by age 3, 1998 year-class, which comprised 24% and 18% respectively (Table 6). These two year-classes comprised 66% of the harvest in Unit 1 and 61% in Unit 2 but only 32% and 18% of the harvest in Units 3 and 4 respectively. Harvests of older age groups increased from west to east with 62% and 82% of the fish harvested in Unit 3 and 4 being age-7 and older.

Mean age of the catch typically increases from west to east by management unit, and in 2001 it ranged from 3.4 to 8.6 years in the sport fishery and from 3.2 to 6.0 in the commercial fishery, with a mean of 3.6 years for the combined fisheries (Table 7). Modest decreases were seen in both sport (4.4 to 4.3 years) and commercial (4.11 to 3.6 years) fisheries due primarily to recruitment of the strong 1999 year-class (Figure 10). Both fisheries and the lakewide average were above long-term means.

Coordinated Percid Management Strategy

The Lake Erie Committee (LEC) of the Great Lakes Fishery Commission announced in March, 2000 that it would develop a coordinated, long-term strategy to protect and rebuild the walleye and yellow perch stocks in Lake Erie, that was referred to as the Coordinated Percid Management Strategy (CPMS). In June the LEC, made up of fishery managers from around the lake, met to discuss the status of walleye stocks. The LEC had been increasingly concerned about the declining abundance of walleye in Lake Erie since the late 1980s. A number of indicators were reviewed which demonstrated large changes had occurred with the walleye population of Lake Erie in the 1990's:

- reduced and more variable fishing success for both sport and commercial fisheries
- declining indices of abundance (fishery and index cues; population estimates)
- truncated population structure (fewer older fish)
- increased reliance on juvenile fish in the harvest
- reduced survival
- geographic distribution declining in east and central basins to a stronghold in the west
- declining growth rates

The Committee noted that the harvest of walleye may not have been the sole cause of the problem (other factors include: exotics such as zebra mussels and gobies, habitat and food web changes), but if harvest levels were kept too high, the recovery of walleye stocks would be severely restricted or prevented. Concerns regarding the model and its parameters (M, Ft) were not believed to have caused serious stock assessment problems because harvests had fallen short of Total Allowable Catches (TAC) through the 1990's.

To halt these trends and promote recovery of walleye, the LEC proposed substantial changes in the walleye harvest. It was agreed that development of a conservative total allowable catch for 2001 that would not be increased for 3 years would be the most likely strategy to achieve the CPMS objectives.

Accordingly, a new charge was added to the Walleye Task Group for 2000/2001 to: " *to derive a recommended multi-year TAC that will "reverse declines and rebuild stocks of walleye and achieve a broad distribution of benefits throughout Lake Erie"*. The Walleye Task Group identified the following activities to meet this new charge:

a) develop and refine the essential analytical tools to support accurate estimation of walleye stock size by catch-at-age analysis.
b) update and refine estimates of walleye population parameters (survival, natural mortality, growth, …)
c) review the current yield model and analysis and evaluate the use of alternate yield analysis to derive a Recommended Allowable Harvest (RAH)
d) identify past and current walleye stock status, the relation of stock to recruitment and exploitation, the role of habitat, fish community and other factors that could influence walleye production, and identify potential constraints that could influence realization of the CPMS objective and its timeframe for achievement
e) define movement and exploitation of walleye stocks in L. Erie to support management of the stock concept

The WTG identified tasks a) to c) as priority steps which were the focus of their work in 2000. For the first task, the WTG explored and developed the use of Auto Differentiation Model Builder (ADMB) software (C++ based) to generate catch-at-age analysis as an alternate to the previously used R. Deriso CAGEAN software (Fortran based) that had been used since 1990. The new software alleviated some previous constraints: allowed the use of a longer data series (22 vs. 16 years), the addition of auxiliary sources of effort-catch data (e.g., index fishing survey gear which should add an 'unbiased' input expected to reduce residuals), and removed the terminal F parameter. For the second task, the WTG updated estimates of walleye population parameters (Z, S, M). For the third task, an alternate yield analysis was derived that should promote rebuilding of walleye stocks (see section: *"Allowable Harvest Recommendations for 2002 and 2003"*).

Relative Abundance and Catch-at-Age Analysis

The WTG presented a 2000 walleye abundance estimate of age-2 and older fish that was about 35.2 million fish (Table 8, March 2001 Report) and a total projected abundance of age-2 and older walleye for 2001 that was 34 to 63 million fish, or 48.4 million fish on average (Table 10, WTG Report, March 2001). However, one of the WTG's charges was to continue assessing the walleye catch at age model and suggestions by Jim Bence and Ransom Myers (the reviewers of the walleye stock assessment process). Accordingly, a revised population estimate of age 2+ walleye for the year 2000 was just over 21 million walleye.

There are two main reasons for the difference:

1) The current model uses separate agency survey data and a variance ratio technique (Quinn and Deriso, 1999) to estimate the λs. 'Unpooling' the agency survey data allows each data set to be represented and the use of variable, iteratively solved λs provides a weight to the variation each contributes in the modeling process.
2) λs for all fishery data are also estimated using the variance ratio technique providing an objective and iterative method to assigning weights to each of the fishery catch and effort data sets.

Walleye Models 2002: Details and Results

The current walleye catch at age model was derived from the model of Deriso et al. 1986. The walleye task group has been using this model for several years and started with the application version called CAGEAN (Deriso et al., 1986). In 2000, the WTG rewrote the CAGEAN algorithms into a compiled program in AutoDifferentiating Model Builder (ADMB) and Microsoft Visual C++. The catch at age model uses natural log (LN) transformed catch and effort data to estimate the abundance at age of fish. The solution of the catch at age equation is obtained using non-linear sums of squares and a penalized likelihood function.

The first ADMB version used by the WTG involved only catch and effort data from the commercial and recreational fisheries on Lake Erie. The WTG started by replicating the output of the CAGEAN application and then proceeded to add survey or auxiliary data. By the end of 2000, the task group had their assessment reviewed. The reviewers, Drs. Ransom Myers and Jim Bence, focused on the catch at age model and both agreed that the model was satisfactory but could be improved. The model they reviewed had data from 1978-1999, used catch and effort data from both commercial and recreational fisheries and also used a third data set. This third set represented the pooled survey data sets from Michigan, Ohio, and Ontario. One of the reviewers' main comments was to have separate data sets for each survey, let catchability vary annually and address the issue that the WTG may be overestimating the abundance of walleye.

During 2001, the WTG re-wrote the code for their model and included three survey data sets. All three are survey or index gillnets and represent Michigan (far west end of the west basin of Lake Erie), Ohio (southern half of the west basin of Lake Erie) and Ontario (northern half of the west basin of Lake Erie). The variance ratio technique was employed to estimate the weights assigned to the variances of each of the surveys (Deriso et al., 1986 and Quinn and Deriso, 1999). The result was a very conservative estimate of walleye abundance. In fact, the 2000 abundance was reduced to about 20 million walleye. Using a different approach, Dr. Myers also estimated abundance to be as low as this. The 2001 population estimate is about 37.9 million age 2+ walleye (Figure 9; Table 8) and only about 7 million 4+ walleye or spawners (Table 8).

The second model used involves linear regression to estimate recruitment coupled with simulating fishing mortality (Tables 9,10). Simulations were done to determine a level of harvest that would stop the decline in walleye numbers apparent since 1996 and perhaps, provide a basis for recovery. These simulations were based on a yield per recruit method developed by the WTG in 2000 (Table 10; contact Mark Turner, ODNR, Sandusky). The simulations allowed us to consider different levels of recruitment. This was important because the relative abundance of spawners and stochastic factors such as water temperature at hatch, combine to dictate the number of recruits 2 years later. Although there is no way to control the climate, the current fishery strategy should result in >14 million age 4+ walleye by 2003 (Table 10). For comparison purposes, the age 4+ abundance was >20 million walleye in the mid 80s (Table 8) when abundance was at an all time high.

Allowable Harvest Recommendations for 2002 and 2003

A major objective of the CPMS is to reverse declines and rebuild stocks of walleye in Lake Erie. To do this, the LEC desired a single TAC to serve as a ceiling for 2001-2003. A ceiling of 3.4 million walleye, based on average recruitment in 2003 and reduced fishing mortality, was recommended. Basically, the WTG abandoned the use of the past target fishing mortality rate ($F_{0.1}$) in favor of a simpler approach balancing mortality with recruitment gains. This approach is similar to a bank account; to rebuild, the number of walleye leaving the fishery has to be less than that entering the fishery. Age-2 recruitment for 2002 was forecasted to be poor (approx. 6 million fish) and for 2003 was forecasted to be better than average (about 13.5 million walleye)(Figures 7,8 ;Tables 9, 10). Given a natural mortality of 0.32, the WTG modeled different fishing mortality scenarios to 1) stop the declining trend, 2) increase the abundance of walleye relative to the 2000 estimate, and 3) remain at or below the ceiling of 3.4 million fish harvested. The optimum scenario for the years 2002 and 2003 is shown on Table 10.

Simulations show that the walleye population in western Lake Erie is still at a level vulnerable to decline. If recruitment is poor in 2004, the population will decline further and only the most conservative measures will continue the stability we appear to have achieved since 2000. Poor recruitment can occur if the number of spawners is low, spawning success is low or the walleye hatched in 2002 show poor survival to 2004. OMNR reduced the spring harvest from the normal 50% of the previous year's harvest to 6% of the 2000 allocation. This reduction was aimed at protecting the number of shoal spawners in Ontario waters and resulted in 514, 476 lbs. instead of approximately 4.3 million lbs. being allocated.

By applying the reduced fishing mortality rate to projected standing stock size estimates, we calculated expected catches, with 95% C.I.'s, for 2002 and 2003 (Table 10). In both years, mean catches (or RAHs) are about 3.4 million fish. The addition of the 1999 year class to the fishery and forecast of recruits using the 2001 year class allowed for a small increase in the forecasted 2003 RAH from 2.9 to 3.4 million walleye (Table 11). **The Walleye Task Group recommends the LEC continue to adopt a conservative TAC that would not exceed 3.4 million fish for any year within the 2002-03 period.** A conservative harvest strategy will:

1. *Continue to promote survival of the strong 1999 and average 2001 year class and enhance their contribution as maturing fish to the reproductive population by 2003 and 2005, respectively,*
2. *Increase potential quantity of eggs being deposited by the walleye population each year, and*
3. *Address continued uncertainty about the effects of reduced ecosystem productivity on sustainable fish yields, recruitment and natural mortality.*

Other Walleye Task Group Charges

Centralized Databases

WTG members currently manage several databases. The tagged walleye database, consisting of tag return and tagged population information dating back to 1986, is maintained by MDNR. Fishery characteristics (catch at age and effort) are part of the database used in catch-at-age analysis. A more resolute version of these data (e.g., catch and effort by statistical grid) is managed by MDNR. Growth and maturity data are stored in an interagency gill net database that has been managed by ODNR-Sandusky. This database needs to be updated to include monofilament data from the OMNR Partnership program at sites used for calculation of the age-1 index for Ontario, as well as data from New York and Ontario for the eastern end of the lake. This database will also be reformatted and converted into a relational database to make it easier to use. Relative abundance data from these gill net surveys has been managed in similar fashion. Growth and relative abundance data from the interagency trawl program in the western basin are stored in databases managed by MDNR. Use of WTG databases by non-members is permitted following protocol established in the 1994 WTG Report (Appendix A).

Analysis of Walleye Distribution Data and Stock Discrimination

To answer the third charge and address issues that are important to the rebuilding of walleye stocks in Lake Erie, several research projects are underway. Three separate teams of researchers are examining walleye stock structure using different genetic techniques, morphometrics, and analysis of chemical composition and shape of otoliths. These researches are complimentary and will provide different levels of stock discrimination, information about walleye life history in relation to habitat, and an economically feasible and practical method to discriminate stocks. They are occurring at Case University in Ohio (for information contact Roger Knight, ODNR), and at Trent University and the University of Windsor in Ontario (for information contact Tim Johnson OMNR, respectively). Two other complimentary projects, which are both funded primarily by the Great Lake Fisheries Commission, are focused on modeling walleye distribution. At Cornell University, Dr. Pat Sullivan and an M.Sc. candidate are developing a spatio-temporal model using catch and effort data. At the University of Michigan, Dr. Ed Rutherford and his graduate students are developing ecologically based spatial models relating walleye to their habitat.

Assistance to the Forage Task Group

The WTG provided the Forage Task Group with a special version of the current catch-at-age model. This model had age classes 2-12+ instead of 2-7+. The FTG used the results of this modeling exercise to estimate how much prey fish walleye consume. The model will be useful to the WTG in future analysis of age class composition and simulations.

Regulation Changes

The following walleye regulation changes were implemented in 2001 and will remain in effect in 2002:

Ontario: 2002 Sport Fishing
- Bag Limit reduced to 4 fish March – April; 6 fish May – Feb.

2002 Commercial Fishing
- No regulation changes

Michigan: 2002 Sport Fishing
– Bag Limit reduced from 10 fish to 6 fish

Ohio: 2002 Sport Fishing
– Bag Limit reduced to 4 fish March – April, 6 fish May – Feb.

Pennsylvania: 2002 Sport Fishing
– Closed season during spawning, March 15 through May 3

New York: 2002 Sport Fishing
– Bag limit reduced to 4 fish from 6 effective mid-October, 2002

Recommended Charges to the Walleye Task Group in 2002-2003

The WTG recommends the 2001-2002 charges except for the FTG assistance charge, remain in effect for 2002-2003**.**

Literature Cited

Henderson, B., R. Haas, R. Knight, R. Lorantas, M. Rawson. 1990. Quota estimation for Lake Erie walleye: model and results. Statistics and Modeling Group Report, Ontario Ministry of Natural Resources, 48 pp.

Deriso, R.B., T.J. Quinn II and P.R. Neal. 1985. Catch-age analysis with auxiliary information. Can. J. Fish. Aquat. Sci. 42: 815 –824.

Quinn, Terrance and Richard Deriso. 1999. *Quantitative Fish Dynamics*. Oxford University Press. London.

Table 1. Lake Erie walleye total allowable catch (top) and measured harvest (bottom), in numbers of fish, from 1977 to 2001. Allocations based on water area are: Ohio, 51.4%; Ontario, 43.3%; and Michigan, 5.3%. New York and Pennsylvania do not have assigned quotas but are included in the annual catch total.

Year		TAC Area (MU-1, MU-2, MU-3)				Non TAC Area (MU-4)				All Areas
		Michigan	Ohio	Ontario	Total	NY	Penn.	Ontario	Total	Total
1977	TAC	87,600	521,600	386,300	995,500				0	995,500
	Har	**106,530**	**2,167,500**	**371,403**	**2,645,433**				**0**	**2,645,433**
1978	TAC	73,000	433,000	321,000	827,000				0	827,000
	Har	**72,195**	**1,586,756**	**446,774**	**2,105,725**				**0**	**2,105,725**
1979	TAC	207,000	1,230,000	911,000	2,348,000				0	2,348,000
	Har	**162,375**	**3,314,442**	**734,082**	**4,210,899**				**0**	**4,210,899**
1980	TAC	261,700	1,558,600	1,154,100	2,974,400				0	2,974,400
	Har	**183,140**	**2,169,800**	**1,049,269**	**3,402,209**				**0**	**3,402,209**
1981	TAC	367,400	2,187,900	1,620,000	4,175,300				0	4,175,300
	Har	**95,147**	**2,942,900**	**1,229,017**	**4,267,064**				**0**	**4,267,064**
1982	TAC	504,100	3,001,700	2,222,700	5,728,500				0	5,728,500
	Har	**194,407**	**3,015,400**	**1,260,852**	**4,470,659**				**0**	**4,470,659**
1983	TAC	572,000	3,406,000	2,522,000	6,500,000				0	6,500,000
	Har	**145,847**	**1,864,200**	**1,416,101**	**3,426,148**				**0**	**3,426,148**
1984	TAC	676,500	4,028,400	2,982,900	7,687,800				0	7,687,800
	Har	**351,169**	**4,055,000**	**2,178,409**	**6,584,578**				**0**	**6,584,578**
1985	TAC	430,700	2,564,400	1,898,800	4,893,900				0	4,893,900
	Har	**460,933**	**3,730,100**	**2,435,627**	**6,626,660**				**0**	**6,626,660**
1986	TAC	660,000	3,930,000	2,910,000	7,500,000				0	7,500,000
	Har	**605,600**	**4,399,400**	**2,617,507**	**7,622,507**				**0**	**7,622,507**
1987	TAC	490,100	2,918,500	2,161,100	5,569,700				0	5,569,700
	Har	**902,500**	**4,433,600**	**2,688,558**	**8,024,658**				**0**	**8,024,658**
1988	TAC	397,500	3,855,000	3,247,500	7,500,000				0	7,500,000
	Har	**1,996,788**	**4,890,367**	**3,054,402**	**9,941,557**	**85,282**			**85,282**	**10,026,839**
1989	TAC	383,000	3,710,000	3,125,000	7,218,000				0	7,218,000
	Har	**1,091,641**	**4,191,711**	**2,793,051**	**8,076,403**	**129,226**			**129,226**	**8,205,629**
1990	TAC	616,000	3,475,500	2,908,500	7,000,000				0	7,000,000
	Har	**747,128**	**2,282,520**	**2,517,922**	**5,547,570**	**47,443**			**47,443**	**5,595,013**
1991	TAC	440,000	2,485,000	2,075,000	5,000,000				0	5,000,000
	Har	**132,118**	**1,577,813**	**2,266,380**	**3,976,311**	**34,137**			**34,137**	**4,010,448**
1992	TAC	329,000	3,187,000	2,685,000	6,201,000				0	6,201,000
	Har	**249,518**	**2,081,919**	**2,497,705**	**4,829,142**	**14,384**			**14,384**	**4,843,526**
1993	TAC	556,500	5,397,000	4,546,500	10,500,000				0	10,500,000
	Har	**270,376**	**2,668,684**	**3,821,386**	**6,760,446**	**40,032**			**40,032**	**6,800,478**
1994	TAC	400,000	4,100,000	3,500,000	8,000,000				0	8,000,000
	Har	**216,038**	**1,468,739**	**3,431,119**	**5,115,896**	**59,345**			**59,345**	**5,175,241**
1995	TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
	Har	**107,909**	**1,435,188**	**3,813,527**	**5,356,624**	**26,964**			**26,964**	**5,383,588**
1996	TAC	583,000	5,654,000	4,763,000	11,000,000				0	11,000,000
	Har	**174,607**	**2,316,425**	**4,524,639**	**7,015,671**	**38,728**	**89,087**		**127,815**	**7,143,486**
1997	TAC	514,000	4,986,000	4,200,000	9,700,000				0	9,700,000
	Har	**122,400**	**1,248,846**	**4,072,779**	**5,444,025**	**29,395**	**88,682**		**118,077**	**5,562,102**
1998	TAC	546,000	5,294,000	4,460,000	10,300,000				0	10,300,000
	Har	**114,606**	**2,303,911**	**4,173,042**	**6,591,559**	**34,090**	**124,814**	**47,000**	**205,904**	**6,797,463**
1999	TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
	Har	**140,269**	**1,033,733**	**3,454,250**	**4,628,252**	**23,133**	**89,038**	**87,000**	**199,171**	**4,827,423**
2000	TAC	408,100	3,957,800	3,334,100	7,700,000	0	0		0	7,700,000
	Har	**252,280**	**932,297**	**2,287,533**	**3,472,110**	**28,599**	**77,512**	**67,000**	**173,111**	**3,645,221**
2001	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**159,186**	**1,157,914**	**1,498,816**	**2,815,916**	**14,669**	**52,796**	**39,498**	**106,963**	**2,922,879**

Table 2. Annual harvest (thousands of fish) of Lake Erie walleye by gear, management unit, and agency.

	Sport Fishery															Commercial Fishery					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4		
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
75	77	4	7	88	10	--	10	--	--	--	--	--	--	0	98	--	--	--	--	0	98
76	605	30	50	685	35	--	35	--	--	--	--	--	--	0	720	113	44	--	--	157	877
77	2,131	107	69	2,307	37	--	37	--	--	--	--	--	--	0	2,344	235	67	--	--	302	2,645
78	1,550	72	112	1,734	37	--	37	--	--	--	--	--	--	0	1,771	274	60	--	--	334	2,106
79	3,254	162	79	3,495	60	--	60	--	--	--	--	--	--	0	3,555	625	30	--	--	655	4,211
80	2,096	183	57	2,336	49	--	49	24	--	24	--	--	--	0	2,409	953	40	--	--	993	3,402
81	2,857	95	70	3,022	38	--	38	48	--	48	--	--	--	0	3,108	1,037	119	3	--	1,159	4,268
82	2,959	194	49	3,202	49	--	49	8	--	8	--	--	--	0	3,259	1,077	134	2	--	1,213	4,470
83	1,626	146	41	1,813	212	--	212	26	--	26	--	--	--	0	2,051	1,129	167	80	--	1,376	3,427
84	3,089	351	39	3,479	787	--	787	179	--	179	--	--	--	0	4,445	1,639	392	108	--	2,139	6,584
85	3,347	461	57	3,865	294	--	294	89	--	89	--	--	--	0	4,248	1,721	432	225	--	2,378	6,627
86	3,743	606	52	4,401	480	--	480	176	--	176	--	--	--	0	5,057	1,651	558	356	--	2,565	7,622
87	3,751	902	51	4,704	550	--	550	132	--	132	--	--	--	0	5,386	1,611	622	405	--	2,638	8,024
88	3,744	1,997	18	5,759	584	--	584	562	--	562	--	--	85	85	6,990	1,866	762	409	--	3,037	10,026
89	2,891	1,092	14	3,997	867	35	902	434	80	514	--	--	129	129	5,542	1,656	621	386	--	2,663	8,206
90	1,467	747	35	2,249	389	14	403	426	23	449	--	--	47	47	3,148	1,615	529	302	--	2,446	5,595
91	1,104	132	39	1,275	216	24	240	258	44	302	--	--	34	34	1,851	1,446	440	274	--	2,160	4,011
92	1,479	250	20	1,749	338	56	394	265	25	290	--	--	14	14	2,447	1,547	534	316	--	2,397	4,844
93	1,846	270	37	2,153	450	26	476	372	12	384	--	--	40	40	3,053	2,488	762	496	--	3,746	6,800
94	992	216	21	1,229	291	20	311	186	21	207	--	--	59	59	1,806	2,307	630	432	--	3,369	5,176
95	1,161	108	32	1,301	159	7	166	115	27	141	--	--	27	27	1,635	2,578	681	489	--	3,748	5,384
96	1,442	175	17	1,634	645	8	653	229	27	256	--	89	39	128	2,671	2,777	1,107	589	--	4,473	7,143
97	929	122	8	1,059	188	2	190	132	5	138	--	89	29	118	1,505	2,585	928	544	--	4,057	5,563
98	1,790	115	34	1,939	215	5	220	299	5	304	19	125	34	178	2,641	2,497	1,166	462	28	4,153	6,793
99	812	140	34	986	139	5	144	83	5	88	19	89	23	131	1,349	2,461	631	317	68	3,477	4,827
00	674	252	34	961	165	5	170	93	5	98	19	78	29	125	1,354	1,603	444	196	48	2,291	3,645
01	941	160	34	1,135	171	5	176	46	5	51	19	53	15	87	1,449	1,004	310	141	20	1,475	2,924
Mean	1,939	337	41	2,317	276	16	284	190	22	203	19	87	43	149	2,811	1,557	470	311	41	2,200	5,011

Table 3. Annual fishing effort for Lake Erie walleye by gear, management unit, and agency.

	Sport Fishery [a]															Commercial Fishery [b]					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4		
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
1975	486	30	46	562	61	--	61	--	--	--	--	--	--	0	623	--	--	--	--	--	623
1976	1,356	84	98	1,538	163	--	163	--	--	--	--	--	--	0	1,701	1,796	1,933	--	--	3,729	5,430
1977	2,768	171	130	3,069	151	--	151	--	--	--	--	--	--	0	3,220	4,282	1,572	--	--	5,854	9,074
1978	2,880	176	148	3,204	154	--	154	--	--	--	--	--	--	0	3,358	5,253	436	--	--	5,689	9,047
1979	4,179	257	97	4,533	169	--	169	--	--	--	--	--	--	0	4,702	5,798	1,798	--	--	7,596	12,298
1980	3,938	624	92	4,654	237	--	237	187	--	187	--	--	--	0	5,078	6,229	1,565	--	--	7,794	12,872
1981	5,766	447	138	6,351	264	--	264	382	--	382	--	--	--	0	6,997	6,881	2,144	622	--	9,647	16,644
1982	5,928	449	108	6,484	223	--	223	114	--	114	--	--	--	0	6,821	10,531	2,913	689	--	14,133	20,954
1983	4,168	451	118	4,737	568	--	568	128	--	128	--	--	--	0	5,433	11,205	5,352	5,814	--	22,371	27,804
1984	4,077	557	82	4,716	1,322	--	1,322	392	--	392	--	--	--	0	6,430	11,550	6,008	2,438	--	19,996	26,426
1985	4,606	926	84	5,616	1,078	--	1,078	464	--	464	--	--	--	0	7,158	7,496	2,800	2,983	--	13,279	20,437
1986	6,437	1,840	107	8,384	1,086	--	1,086	538	--	538	--	--	--	0	10,008	7,824	5,637	3,804	--	17,265	27,273
1987	6,631	2,193	84	8,908	1,431	--	1,431	472	--	472	--	--	--	0	10,811	6,595	4,243	3,045	--	13,883	24,694
1988	7,547	4,362	87	11,996	1,677	--	1,677	1,081	--	1,081	--	--	462	462	15,216	7,495	5,794	3,778	--	17,067	32,283
1989	5,246	3,794	81	9,121	1,532	77	1,609	883	205	1,088	--	--	556	556	12,374	7,846	5,514	3,473	--	16,833	29,207
1990	4,116	1,803	121	6,040	1,675	33	1,708	869	83	952	--	--	432	432	9,132	9,016	5,829	5,544	--	20,389	29,521
1991	3,616	440	144	4,200	1,241	79	1,320	724	155	880	--	--	440	440	6,840	10,418	5,055	3,146	--	18,619	25,459
1992	3,955	715	105	4,775	1,169	81	1,249	640	145	786	--	--	299	299	7,109	9,486	6,906	6,043	--	22,435	29,544
1993	3,943	691	125	4,759	1,349	70	1,418	1,062	125	1,187	--	--	305	305	7,669	16,283	11,656	7,420	--	35,359	43,028
1994	2,808	788	125	3,721	1,025	65	1,090	599	130	729	--	--	355	355	5,894	16,698	9,968	6,459	--	33,125	39,019
1995	3,188	277	125	3,589	803	65	868	355	130	485	--	--	259	259	5,201	20,521	12,113	7,850	--	40,484	45,685
1996	3,060	521	125	3,706	1,132	65	1,197	495	130	625	--	316	256	572	6,101	19,976	15,685	10,990	--	46,651	52,752
1997	2,748	374	88	3,210	864	45	909	492	91	583	--	388	273	661	5,363	15,708	11,588	9,094	--	36,390	41,753
1998	3,010	374	103	3,487	635	51	686	409	55	464	217	390	280	887	5,524	19,027	19,397	13,253	818	52,495	58,019
1999	2,368	411	103	2,882	603	51	654	323	55	379	217	397	171	785	4,699	21,432	10,955	7,630	1,444	41,461	46,160
2000	1,975	540	103	2,618	540	51	591	281	55	336	217	244	177	638	4,183	22,238	11,049	7,896	1,781	43,054	47,237
2001	1,952	362	103	2,417	697	51	748	261	55	316	217	241	163	621	4,102	9,372	5,746	5,021	639	20,778	24,880
Mean	3,806	876	106	4788	809	60	838	507	109	571	217	329	316	863	6361	11191	6679	5571	1171	22,553	28,914

a Sport units of effort are thousands of angler hours.

b Estimated Standard (Total) Effort in kilometers of gill net = (walleye targeted effort x walleye total harvest)/ walleye targeted harvest.

Table 4. Annual catch per unit effort for Lake Erie walleye by gear, management unit, and agency.

	Sport Fishery [a]															Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total
1975	.16	.13	.16	.16	.17	--	.17	--	--	--	--	--	--		.16	--	--	--	--	--
1976	.45	.36	.50	.45	.22	--	.22	--	--	--	--	--	--		.42	63.0	22.9	--	--	42.2
1977	.77	.62	.53	.75	.24	--	.24	--	--	-	--	--	--		.73	54.9	42.6	--	--	51.6
1978	.54	.41	.76	.54	.24	--	.24	--	--	--	--	--	--		.53	52.2	138.2	--	--	58.8
1979	.78	.63	.81	.77	.36	--	.36	--	--	--	--	--	--		.76	107.9	16.7	--	--	86.3
1980	.53	.29	.62	.50	.21	--	.21	.13	--	.13	--	--	--		.47	153.0	25.3	--	--	127.3
1981	.50	.21	.51	.48	.14	--	.14	.12	--	.12	--	--	--		.44	150.7	55.4	4.9	--	120.1
1982	.50	.43	.45	.49	.22	--	.22	.07	--	.07	--	--	--		.48	102.2	45.9	2.8	--	85.8
1983	.39	.32	.34	.38	.37	--	.37	.20	--	.20	--	--	--		.38	100.7	31.2	13.7	--	61.5
1984	.76	.63	.48	.74	.60	--	.60	.46	--	.46	--	--	--		.69	141.9	65.3	44.4	--	107.0
1985	.73	.50	.68	.69	.27	--	.27	.19	--	.19	--	--	--		.59	229.6	154.5	75.6	--	179.1
1986	.58	.33	.49	.52	.44	--	.44	.33	--	.33	--	--	--		.51	211.0	99.0	93.7	--	148.6
1987	.57	.41	.61	.53	.38	--	.38	.28	--	.28	--	--	--		.50	244.2	146.5	133.1	--	190.0
1988	.50	.46	.21	.48	.35	--	.35	.52	--	.52	--	--	.18	.18	.46	249.0	131.4	108.2	--	177.9
1989	.55	.29	.17	.44	.57	.45	.56	.49	.39	.47	--	--	.23	.23	.45	211.1	112.7	111.2	--	158.3
1990	.36	.41	.29	.37	.23	.42	.24	.49	.28	.47	--	--	.11	.11	.34	179.1	90.7	54.5	--	120.0
1991	.31	.30	.27	.30	.17	.30	.18	.36	.28	.34	--	--	.08	.08	.27	138.8	87.0	87.1	--	116.0
1992	.37	.35	.19	.37	.29	.69	.32	.41	.18	.37	--	--	.05	.05	.34	163.1	77.3	52.3	--	106.8
1993	.47	.39	.30	.45	.33	.37	.34	.35	.09	.32	--	--	.13	.13	.40	152.8	65.4	66.8	--	106.0
1994	.35	.27	.17	.33	.28	.31	.28	.31	.16	.28	--	--	.17	.17	.31	138.2	63.2	66.9	--	101.7
1995	.36	.39	.25	.36	.20	.12	.19	.32	.21	.29	--	--	.10	.10	.31	125.7	56.2	62.2	--	92.6
1996	.47	.34	.13	.44	.57	.13	.55	.46	.21	.41	--	.28	.15	.22	.44	139.0	70.6	53.6	--	95.9
1997	.34	.33	.10	.33	.22	.04	.21	.27	.06	.24	--	.23	.11	.17	.28	164.6	80.1	59.8	--	111.5
1998	.59	.31	.33	.56	.34	.10	.32	.73	.08	.65	.09	.32	.12	.18	.48	131.3	60.1	34.8	34.2	79.1
1999	.34	.34	.33	.34	.23	.10	.22	.26	.08	.23	.09	.22	.14	.15	.29	114.8	57.6	41.6	47.4	83.9
2000	.34	.47	.33	.37	.31	.10	.29	.33	.08	.29	.09	.32	.16	.19	.32	72.1	40.2	24.8	27.1	53.2
2001	.48	.44	.33	.47	.25	.10	.24	.18	.08	.16	.09	.22	.09	.13	.35	107.1	54.0	28.1	32.9	71.0
Mean	.48	.38	.38	.47	.30	.25	.30	.33	.17	.31	.09	.26	.13	.16	.43	142.2	72.7	58.1	35.4	105.1

a Sport CPE = Number/angler hour

b Commercial CPE = Number/kilometer of gill net

Table 5. Catch at age of walleye harvest by management unit, gear, and agency in Lake Erie during 2001. Units 4 and 5 are combined in Unit 4.

		Comm'l	Sport						All Gears	
Unit	Age	OMNR	OMNR	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	1,507		1,842	0	--	--	1,842	1,507	3,349
	2	500,280		326,581	79,361	--	--	405,942	500,280	906,222
	3	188,445		230,741	37,953	--	--	268,694	188,445	457,139
	4	130,001		123,807	22,274	--	--	146,081	130,001	276,082
	5	105,042		129,050	11,160	--	--	140,210	105,042	245,252
	6	20,434		26,512	3486.311	--	--	29,998	20,434	50,432
	7+	58,739		102,330	5,379	--	--	107,709	58,739	166,448
	Total	1,004,448	34,000	940,863	159,613	--	--	1,134,476	1,038,448	2,138,924
2	1	13		0	--	--	--	0	13	13
	2	143,653		64,482	--	--	--	64,482	143,653	208,135
	3	47,977		37,455	--	--	--	37,455	47,977	85,432
	4	28,236		11,025	--	--	--	11,025	28,236	39,261
	5	35,662		19,458	--	--	--	19,458	35,662	55,120
	6	11,275		2,395	--	--	--	2,395	11,275	13,670
	7+	42,664		36,082	--	--	--	36,082	42,664	78,746
	Total	309,480	5,000	170,897	--	--	--	175,897	314,480	485,377
3	1	208		0	--	--	--	0	208	208
	2	30,523		7,483	--	--	--	7,483	30,523	38,006
	3	16,834		4,424	--	--	--	4,424	16,834	21,258
	4	10,783		3,457	--	--	--	3,457	10,783	14,240
	5	21,011		7,275	--	--	--	7,275	21,011	28,286
	6	7,705		1,361	--	--	--	1,361	7,705	9,066
	7+	53,824		22,154	--	--	--	22,154	53,824	75,978
	Total	140,888	5,000	46,154	--	--	--	51,154	145,888	192,042
4	1	3		--	--	0	0	0	3	3
	2	1,266		--	--	606	0	606	1,266	1,872
	3	1,513		--	--	2,919	8905	11,824	1,513	13,337
	4	1,839		--	--	464	6534	6,998	1,839	8,837
	5	4,683		--	--	2,564	1791	4,355	4,683	9,038
	6	1,533		--	--	0	2951	2,951	1,533	4,484
	7+	9,661		--	--	8116	32615	40,731	9,661	50,392
	Total	20,498	19,000	--	--	14,669	52,796	86,465	39,498	106,963
All	1	1,731		1,842	0	0	0	1,842	1,731	3,573
	2	675,722		398,546	79,361	606	0	478,513	675,722	1,154,235
	3	254,769		272,620	37,953	2,919	8905	322,397	254,769	577,166
	4	170,859		138,289	22,274	464	6534	167,561	170,859	338,420
	5	166,398		155,783	11,160	2,564	1791	171,298	166,398	337,696
	6	40,947		30,268	3,486	0	2951	36,705	40,947	77,652
	7+	164,888		160,566	5,379	8,116	32,615	206,676	164,888	371,564
	Total	1,475,314	98,000	1,157,914	159,613	14,669	52,796	1,447,992	1,475,314	2,923,306

Table 6. Percent age composition of walleye harvest by management unit, gear, and agency in Lake Erie during 2001. Units 4 and 5 are combined in Unit 4.

		Comm'l	Sport						All Gears	
Unit	Age	OMNR	OMNR	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	0.15	--	0.20	0.00	--	--	0.16	0.15	0.16
	2	49.81	--	34.71	49.72	--	--	35.78	48.18	42.37
	3	18.76	--	24.52	23.78	--	--	23.68	18.15	21.37
	4	12.94	--	13.16	13.96	--	--	12.88	12.52	12.91
	5	10.46	--	13.72	6.99	--	--	12.36	10.12	11.47
	6	2.03	--	2.82	2.18	--	--	2.64	1.97	2.36
	7+	5.85	--	10.88	3.37	--	--	9.49	5.66	7.78
	Total	100	--	100	100	--	--	100	100	100
2	1	0.00	--	0.00	--	--		0.00	0.00	0.00
	2	46.42	--	37.73	--	--		36.66	45.68	42.88
	3	15.50	--	21.92	--	--		21.29	15.26	17.60
	4	9.12	--	6.45	--	--		6.27	8.98	8.09
	5	11.52	--	11.39	--	--		11.06	11.34	11.36
	6	3.64	--	1.40	--	--		1.36	3.59	2.82
	7+	13.79	--	21.11	--	--		20.51	13.57	16.22
	Total	100	--	100	--	--		100	100	100
3	1	0.15	--	0.00	--	--		0.00	0.14	0.11
	2	21.66	--	16.21	--	--		14.63	20.92	19.79
	3	11.95	--	9.59	--	--		8.65	11.54	11.07
	4	7.65	--	7.49	--	--		6.76	7.39	7.42
	5	14.91	--	15.76	--	--		14.22	14.40	14.73
	6	5.47	--	2.95	--	--		2.66	5.28	4.72
	7+	38.20	--	48.00	--	--		43.31	36.89	39.56
	Total	100	--	100	--	--		100	100	100
4	1	0.01	--	--	--	--		--	0.01	0.00
	2	6.18	--	--	--	4.13		0.70	3.21	1.75
	3	7.38	--	--	--	19.90		13.67	3.83	12.47
	4	8.97	--	--	--	3.16		8.09	4.66	8.26
	5	22.85	--	--	--	17.48		5.04	11.86	8.45
	6	7.48	--	--	--	0.00		3.41	3.88	4.19
	7+	47.13	--	--	--	55.33		47.11	24.46	47.11
	Total	100	--	--	--	100		100	100	100
All	1	0.12	--	0.16	0.00	--		0.13	0.12	0.12
	2	45.80	--	34.42	49.72	4.13		33.05	45.80	39.48
	3	17.27	--	23.54	23.78	19.90		22.27	17.27	19.74
	4	11.58	--	11.94	13.96	3.16		11.57	11.58	11.58
	5	11.28	--	13.45	6.99	17.48		11.83	11.28	11.55
	6	2.78	--	2.61	2.18	0.00		2.53	2.78	2.66
	7+	11.18	--	13.87	3.37	55.33		14.27	11.18	12.71
	Total	100	--	100	100	100		100	100	100

Table 7. Annual mean age (years) of Lake Erie walleye by gear, management unit, and agency.

	Sport Fishery															Commercial Fishery					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4		
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
75	2.53	2.53	3.26	2.59	1.53	--	1.53	--	--	--	--	--	--	--	2.48	--	--	--	--	--	2.48
76	2.49	2.49	2.35	2.48	2.05	--	2.05	--	--	--	--	--	--	--	2.46	1.51	1.51	--	--	1.51	2.29
77	3.29	3.29	2.64	3.27	2.44	--	2.44	--	--	--	--	--	--	--	3.26	2.74	2.74	--	--	2.74	3.20
78	3.50	3.62	3.07	3.48	3.33	--	3.33	--	--	--	--	--	--	--	3.48	2.69	2.69	--	--	2.69	3.35
79	2.71	2.71	2.67	2.71	2.29	--	2.29	--	--	--	--	--	--	--	2.70	2.83	2.83	--	--	2.83	2.72
80	3.00	3.00	2.84	3.00	2.92	--	2.92	2.65	--	2.65	--	--	--	--	2.99	2.96	2.96	--	--	2.96	2.98
81	3.61	2.97	3.47	3.59	2.62	--	2.62	2.72	--	2.72	--	--	--	--	3.56	3	3.00	2.99	--	3.00	3.41
82	3.25	3.25	2.76	3.24	2.58	--	2.58	2.51	--	2.51	--	--	--	--	3.23	2.81	2.81	2.81	--	2.81	3.12
83	3.03	3.03	3.17	3.03	2.25	--	2.25	2.07	--	2.07	--	--	--	--	2.94	3.47	3.47	3.47	--	3.47	3.15
84	2.64	2.64	2.90	2.64	2.61	--	2.61	2.68	--	2.68	--	--	--	--	2.64	2.89	2.89	2.89	--	2.89	2.72
85	3.36	3.36	3.17	3.36	3.24	--	3.24	3.58	--	3.58	--	--	--	--	3.35	3.04	3.04	3.04	--	3.04	3.24
86	3.73	3.61	3.54	3.71	3.69	--	3.69	4.08	--	4.08	--	--	--	--	3.72	3.61	3.70	4.22	--	3.71	3.72
87	3.83	3.32	3.78	3.73	3.68	--	3.68	4.10	--	4.10	--	--	--	--	3.73	3.71	3.47	3.40	--	3.61	3.69
88	3.97	3.43	4.58	3.78	3.81	--	3.81	5.37	--	5.37	--	--	4.87	4.87	3.93	3.27	3.15	3.89	--	3.32	3.74
89	4.48	3.75	4.29	4.28	4.65	4.29	4.64	5.13	4.29	5.00	--	--	5.59	5.59	4.44	3.49	3.51	4.22	--	3.60	4.16
90	4.44	4.64	5.00	4.52	5.31	5.41	5.31	6.41	5.41	6.36	--	--	5.70	5.70	4.90	3.91	3.90	4.60	--	3.99	4.50
91	4.91	5.29	5.01	4.95	6.22	6.03	6.20	6.70	5.91	6.58	--	--	6.36	6.36	5.41	4.21	4.63	5.14	--	4.41	4.87
92	4.60	3.49	3.45	4.43	4.89	6.72	5.15	5.67	6.42	5.73	--	--	6.35	6.35	4.71	4.03	4.23	5.49	--	4.27	4.49
93	4.60	4.41	4.09	4.57	5.79	6.45	5.83	5.98	6.17	5.99	--	--	6.15	6.15	4.96	3.64	4.38	5.21	--	4.00	4.43
94	4.53	4.19	5.84	4.49	5.38	6.41	5.45	6.22	6.85	6.28	--	--	6.49	6.49	4.93	3.65	4.36	5.60	--	4.03	4.35
95	4.04	3.55	4.74	4.02	6.07	7.29	6.12	6.08	7.17	6.33	--	--	6.80	6.80	4.48	3.38	4.63	5.92	--	3.94	4.10
96	3.98	3.46	4.31	3.93	4.22	7.22	4.26	6.06	7.57	6.22	--	--	6.47	6.47	4.35	3.57	3.36	5.21	--	3.73	3.93
97	4.21	3.99	4.21	4.18	5.30	5.30	5.30	6.27	6.27	6.22	--	--	6.25	6.25	4.67	3.87	3.68	4.83	--	3.96	4.11
98	3.74	3.13	3.15	3.69	4.66	8.09	4.74	4.64	7.81	4.69	9.55	--	10.13	9.92	4.32	3.26	4.00	5.26	7.00	3.72	3.83
99	3.72	3.16	3.43	3.63	5.35	9.17	5.48	5.95	10.00	6.18	8.15	--	10.29	9.32	4.55	3.41	4.29	5.28	6.76	3.81	3.91
00	3.94	3.27	3.43	3.75	4.12	9.17	4.27	6.36	10.00	6.53	8.15	--	9.75	9.11	4.51	3.69	4.67	5.65	6.46	4.11	4.21
01	3.66	3.02	3.43	3.56	4.09	9.17	4.23	6.14	10.00	6.52	8.15	7.70	9.09	8.04	4.02	3.19	3.77	5.52	6.00	3.57	4.72
Mean	3.70	3.43	3.65	3.65	3.89	6.98	3.93	4.88	7.22	4.93	8.50	7.70	7.16	6.96	3.88	3.30	3.53	4.51	6.56	3.45	3.68

Table 8. Estimated abundance at age, mean survival (S) and mean exploitation (u) for Lake Erie walleye, 1978 – 2001 from the 2002 catch-at-age analysis model in ADMB, M=.32. WTG 2002.

Year	2	3	4	5	6	7+	Total	S	U
1978	2873660	10796100	793436	32456	357098	3589	14,856,338	0.538	0.224
1979	19257900	1886230	5643920	406097	16612	184607	27,395,366	0.258	0.568
1980	23300000	9709900	404313	1172370	84355	41798	34,712,736	0.561	0.197
1981	11757800	15514500	5365930	216787	628607	67641	33,551,265	0.296	0.520
1982	18336500	6242000	3985550	1326320	53584	172094	30,116,048	0.458	0.320
1983	9213490	11389900	2738110	1682870	560028	95291	25,679,689	0.314	0.498
1984	51130400	5000140	3214490	724734	445428	173452	60,688,644	0.545	0.215
1985	4534720	33741900	2727620	1661530	374605	319891	43,360,266	0.600	0.150
1986	19576000	3089490	20146200	1581810	963563	402756	45,759,819	0.579	0.175
1987	16992700	13178000	1787480	11178200	877674	758106	44,772,160	0.581	0.172
1988	51380000	11452400	7593410	998584	6244760	913838	78,582,992	0.574	0.181
1989	14488400	34484900	6515820	4180430	549755	3941050	64,160,355	0.540	0.221
1990	10583100	9524220	18272600	3342250	2144320	2303530	46,170,020	0.546	0.215
1991	6552940	6982350	5116310	9485550	1735000	2308930	32,181,080	0.608	0.140
1992	13380700	4486170	4267680	3009220	5579030	2378480	33,101,280	0.577	0.177
1993	21645000	8999110	2597480	2357250	1662140	4395330	41,656,310	0.547	0.213
1994	3934720	14302100	4978460	1343880	1219590	3134000	28,912,750	0.547	0.213
1995	13593800	2599310	7932210	2570820	693964	2248150	29,638,254	0.521	0.244
1996	15456700	8836320	1383960	3857590	1250240	1430810	32,215,620	0.483	0.290
1997	1702610	9784860	4338770	613013	1708690	1187550	19,335,493	0.515	0.251
1998	17393100	1102290	5149000	2079780	293846	1388310	27,406,326	0.497	0.273
1999	9016140	11121500	561122	2358360	952585	770464	24,780,171	0.507	0.261
2000	7409010	5804680	5761400	263597	1107880	809432	21,155,999	0.531	0.232
2001	25987500	4845280	3135810	2866350	131142	953881	37,919,963	0.590	0.161

Table 9. Data used to estimate the abundance of age 2 walleye by simple linear regression where Y=ADMB AGE2 and X=ONT YOY Trawl. Values in bold are regression estimates and used for RAH projections 2002-2003, respectively. Regression statistics are given at the bottom of the page.

Year of Recruitment	Year Class	ONT YOY Trawl	Estimated Age 2s (millions)
1984	1982	115.4182	51.1304
1985	1983	0.5	4.53472
1986	1984	16.75472	19.576
1987	1985	31.62439	16.9927
1988	1986	73.58824	51.38
1989	1987	2.634146	14.4884
1990	1988	19.94595	10.5831
1991	1989	2.133333	6.55294
1992	1990	55.38462	13.3807
1993	1991	75.42857	21.645
1994	1992	0.333333	3.93472
1995	1993	13.33333	13.5938
1996	1994	34.10526	15.4567
1997	1995	1.588235	1.70261
1998	1996	60.9375	17.3931
1999	1997	10.125	9.01614
2000	1998	7.875	7.40901
2001	1999	70.8	**30.23714**[1]
2002	2000	0.5625	**5.486401**[2]
2003	2001	23.66667	**13.62799**[3]

1. This regression estimate was higher but not significantly different than the ADMB estimate of about 26 million age 2 walleye on Table 9.
2. This regression estimate was used for 2002 age 2 projection (see Table 9).
3. This regression estimate was used for 2003 age 2 projection (see Table 9).

Note: The regression equation, with standard errors in parentheses, was,

$$Y=5.288\ (2.608) + 0.352\ (0.058)X,$$

with $n=17$, $F=36.9$, $p<0.0001$ and an $r^2=0.71$. Both parameters were significant at $p<0.07$ and no transformations were used. The y-intercept was, as expected, not significantly different than 0.

Table 10. Projection of Lake Erie walleye stock size estimates (M=0.32) to 2003 and estimated total allowable harvest.
Age-2 from Ontario Trawl 1982-2001 (x) and Age-2 from ADMB (y) Regression

	2001 Parameters from ADMB catch-at-age analysis								
	Stock Size (millions)				Mortality Rates				Survival Rate
Age	Mean	SE	Min	Max	(F)	(Z)	(A)	(u)	(S)
2	25.988	9.986	6.016	45.959	0.069	0.389	0.322	0.057	0.678
3	4.845	1.379	2.087	7.604	0.203	0.523	0.407	0.158	0.593
4	3.136	0.802	1.531	4.740	0.246	0.566	0.432	0.188	0.568
5	2.866	0.710	1.445	4.287	0.246	0.566	0.432	0.188	0.568
6	0.131	0.032	0.067	0.195	0.246	0.566	0.432	0.188	0.568
7+	0.954	0.228	0.497	1.411	0.246	0.566	0.432	0.188	0.568
Total	37.920		11.643	64.196	0.210	0.530	0.410	0.161	0.590

	PROJECTED 2002 PARAMETERS											
	Stock Size (millions)				Mortality Rates				Survival Rate	Expected 2002 Harvest		
Age	Mean	SE	Min	Max	(F)	(Z)	(A)	(u)	(S)	E(C)	Hvmin	Hvmax
2	5.486	2.296	0.895	10.078	0.052	0.372	0.311	0.044	0.689	0.239	0.039	0.440
3	17.612	3.465	10.682	24.543	0.154	0.474	0.377	0.122	0.623	2.157	1.308	3.006
4	2.872	0.565	1.742	4.001	0.187	0.507	0.397	0.146	0.603	0.420	0.255	0.586
5	1.780	0.350	1.079	2.480	0.187	0.507	0.397	0.146	0.603	0.261	0.158	0.363
6	1.627	0.320	0.987	2.267	0.187	0.507	0.397	0.146	0.603	0.238	0.144	0.332
7+	0.616	0.121	0.373	0.858	0.187	0.507	0.397	0.146	0.603	0.090	0.055	0.126
Total	29.992		15.758	44.227	0.159	0.479	0.380	0.125	0.620	3.406	1.959	4.852

	PROJECTED 2003 PARAMETERS											
	Stock Size (millions)				Mortality Rates				Survival Rate			
Age	Mean	SE	Min	Max	(F)	(Z)	(A)	(u)	(S)	E(C)	Hvmin	Hvmax
2	13.628	1.931	9.767	17.489	0.055	0.375	0.312	0.046	0.688	0.621	0.445	0.796
3	3.781	0.744	2.293	5.269	0.161	0.481	0.382	0.128	0.618	0.482	0.293	0.672
4	10.966	2.158	6.651	15.281	0.195	0.515	0.402	0.152	0.598	1.671	1.013	2.329
5	1.730	0.340	1.049	2.411	0.195	0.515	0.402	0.152	0.598	0.264	0.160	0.367
6	1.072	0.211	0.650	1.494	0.195	0.515	0.402	0.152	0.598	0.163	0.099	0.228
7+	1.351	0.266	0.820	1.883	0.195	0.515	0.402	0.152	0.598	0.206	0.125	0.287
Total	32.529		21.231	43.828	0.166	0.486	0.384	0.130	0.616	3.407	2.135	4.679

Projection to 2003 aimed at stopping further declines with respect to 2000 and not surpass
the ceiling TAC of 3.4 million walleye at M=0.32

Table 11. Mean Recommended Allowable Harvests (RAHs in millions of fish) for Lake Erie Walleye using 2000 and 2001 data, respectively. The Mean RAH for 2003 using only 2000 data assumed a recruitment of 12 million age-2 walleye whereas the Mean RAH for 2003 using 2001 data uses a regression estimated recruitment of 13.63 million age-2 walleye

Year	2000 Data	2001 Data
2001	3.40	2.90
2002	3.39	3.40
2003	2.90	3.40

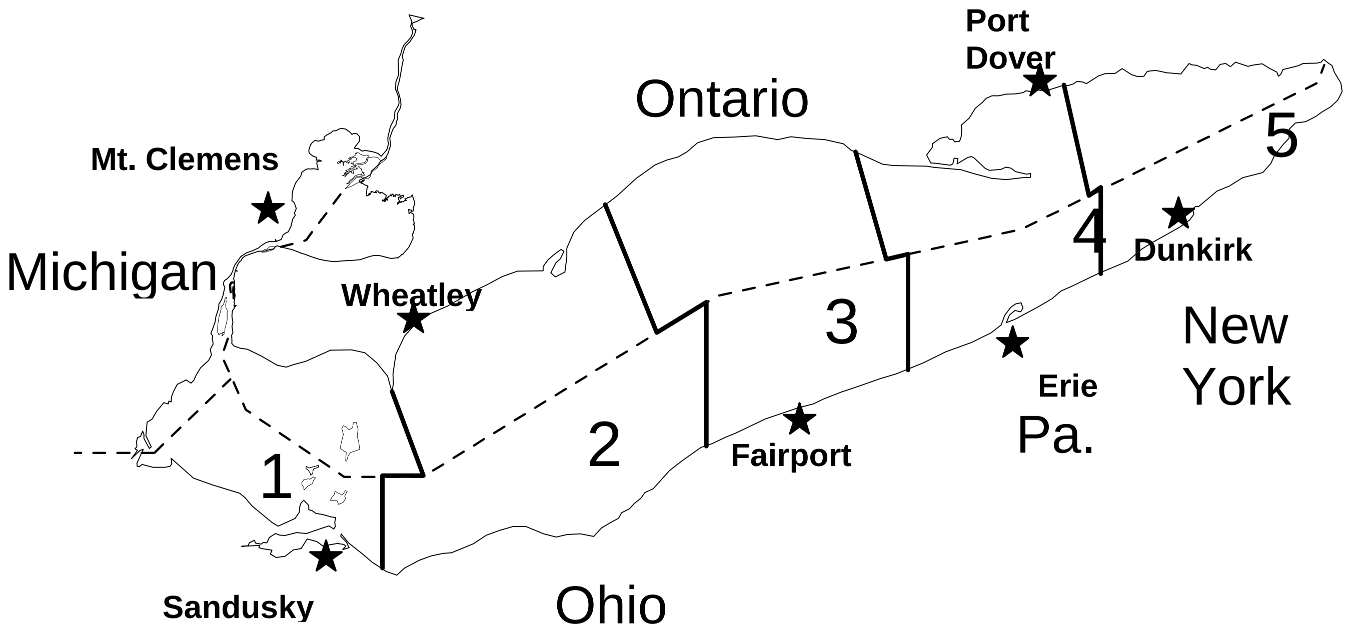

Figure 1. Map of Lake Erie with management units recognized by the Walleye Task Group for interagency management of walleye.

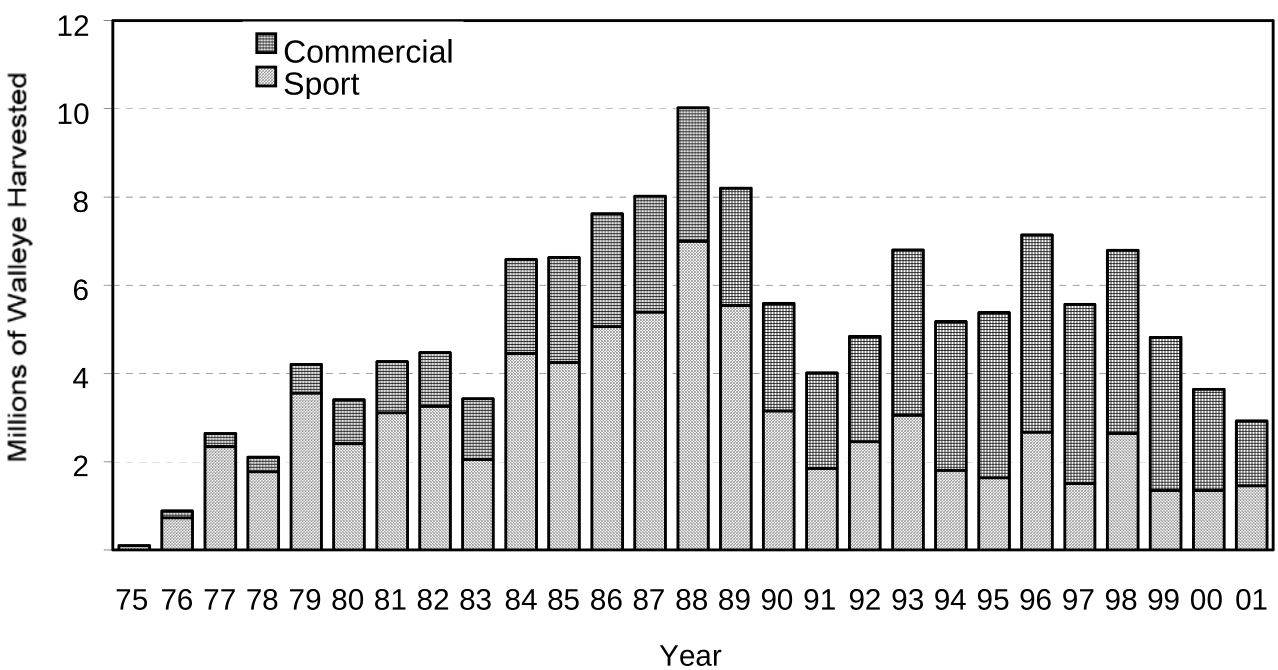

Figure 2. Lakewide harvest of Lake Erie walleye by sport and commercial fisheries, 1975 - 2001.

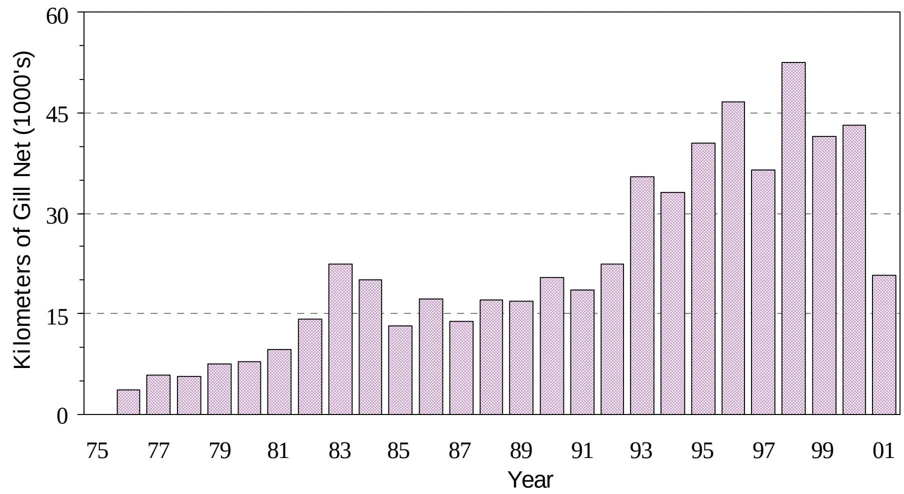

Figure 3. Lakewide total effort (kilometers of gill net) by commercial fisheries on Lake Erie walleye, 1975 – 2001

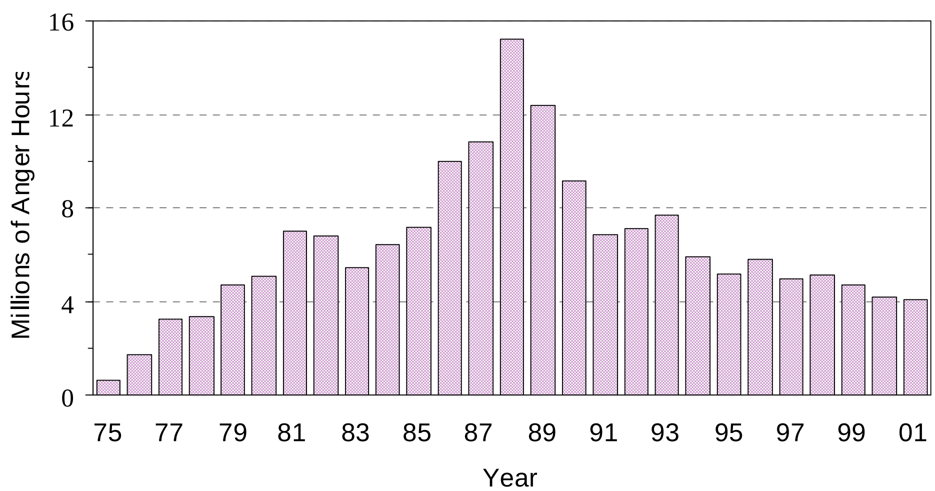

Figure 4. Lakewide total effort (angler hours) by sport fisheries for Lake Erie walleye, 1975 - 2001.

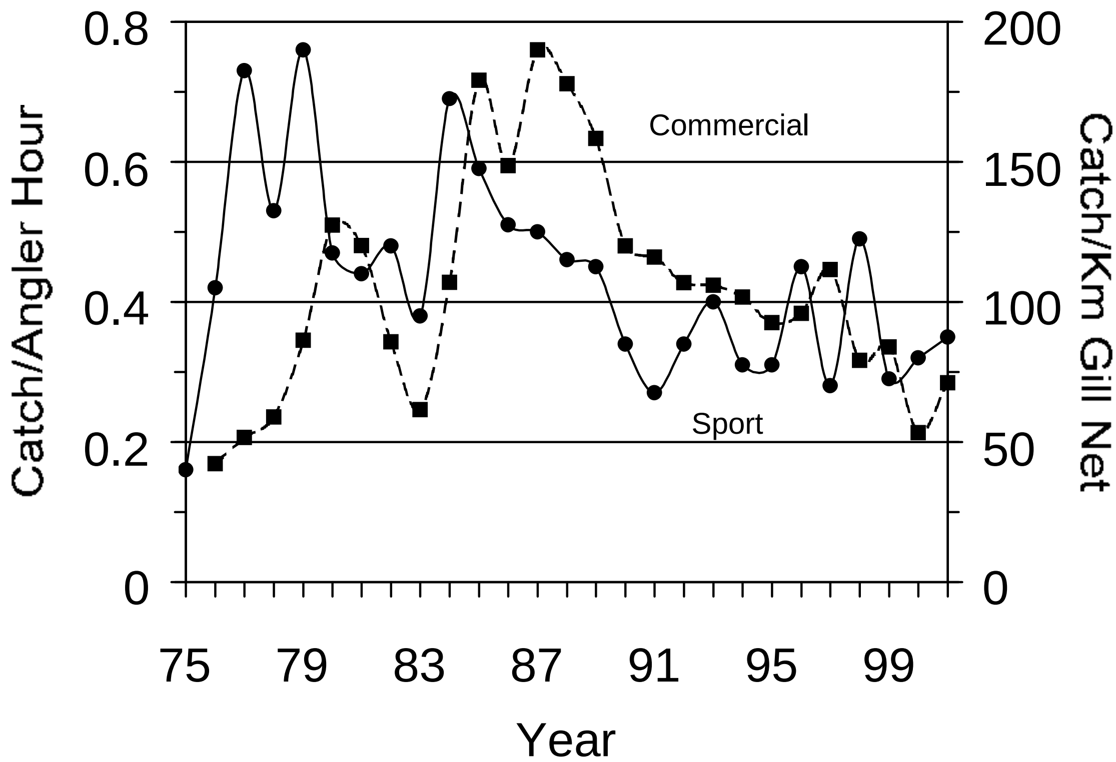

Figure 5. Lakewide CUE for Lake Erie sport and commercial walleye fisheries, 1975 - 2001

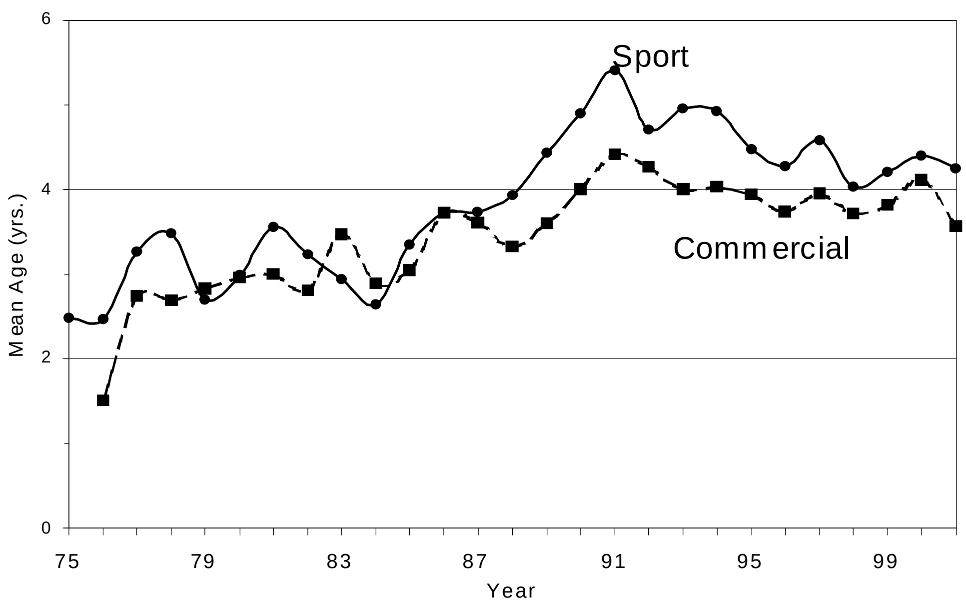

Figure 6. Lakewide mean age of Lake Erie walleye in sport and commercial harvests, 1975 – 2001.

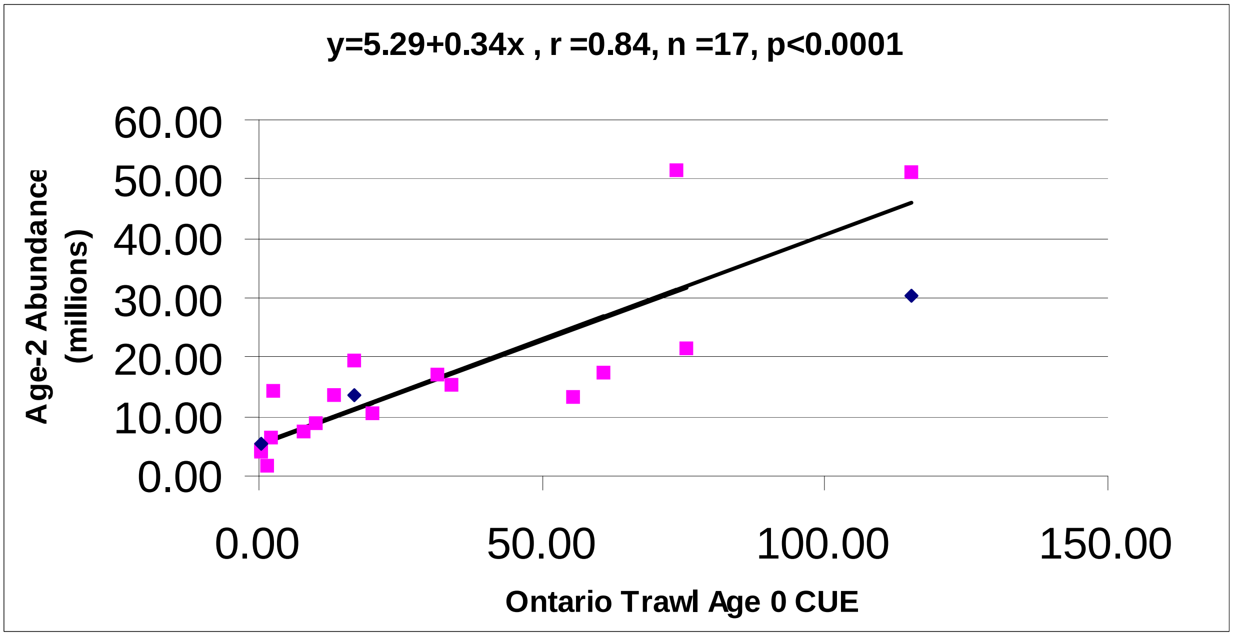

Figure 7. Regression estimates of abundance for age-2 Lake Erie walleye using the ADMB 2002 model catch-at-age estimates (y) and Ontario Young-of-the-year trawl indices. The 2001 catch-at-age estimates were not used in the regression.

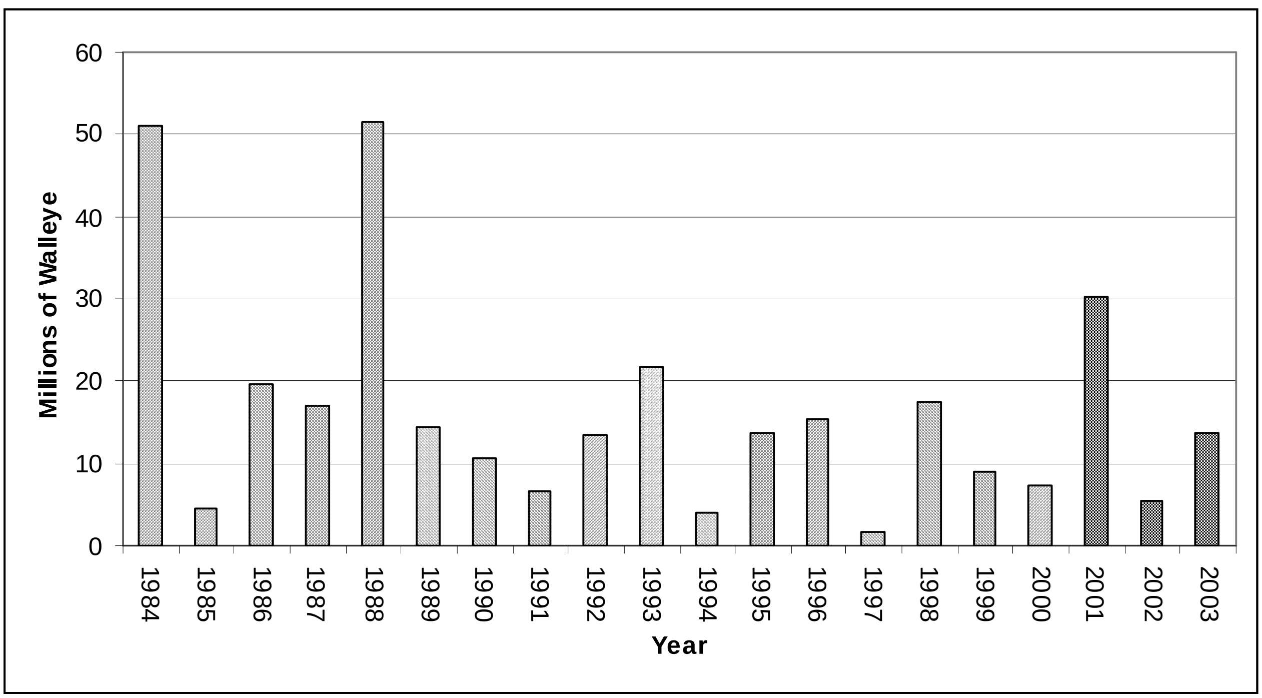

Figure 8. Catch-at-age estimates of age-2 Lake Erie walleye for 1984 to 2000. Estimates for 2001-2003 are from the regression of YOY index and numbers of age-2 from catch-at-age analysis. (see Table 9)

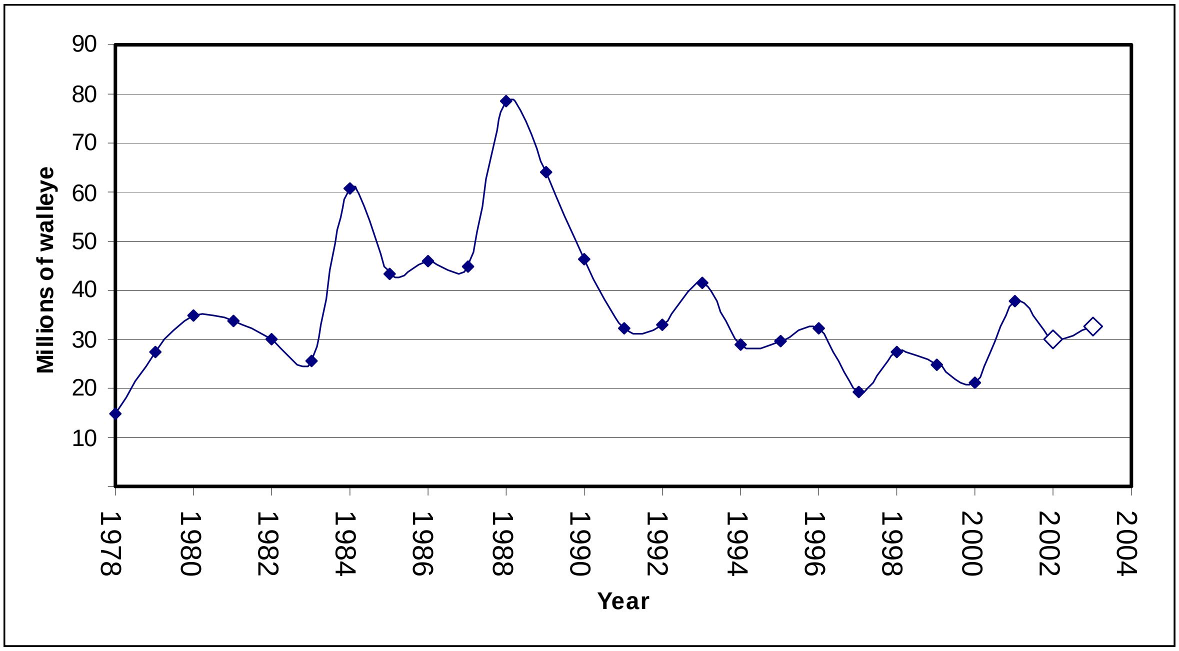

Figure 9. Abundance of Lake Erie walleye from 1978-2001 forecasting two additional years and given a harvest of 3.4 million walleye in each of 2002-2003.

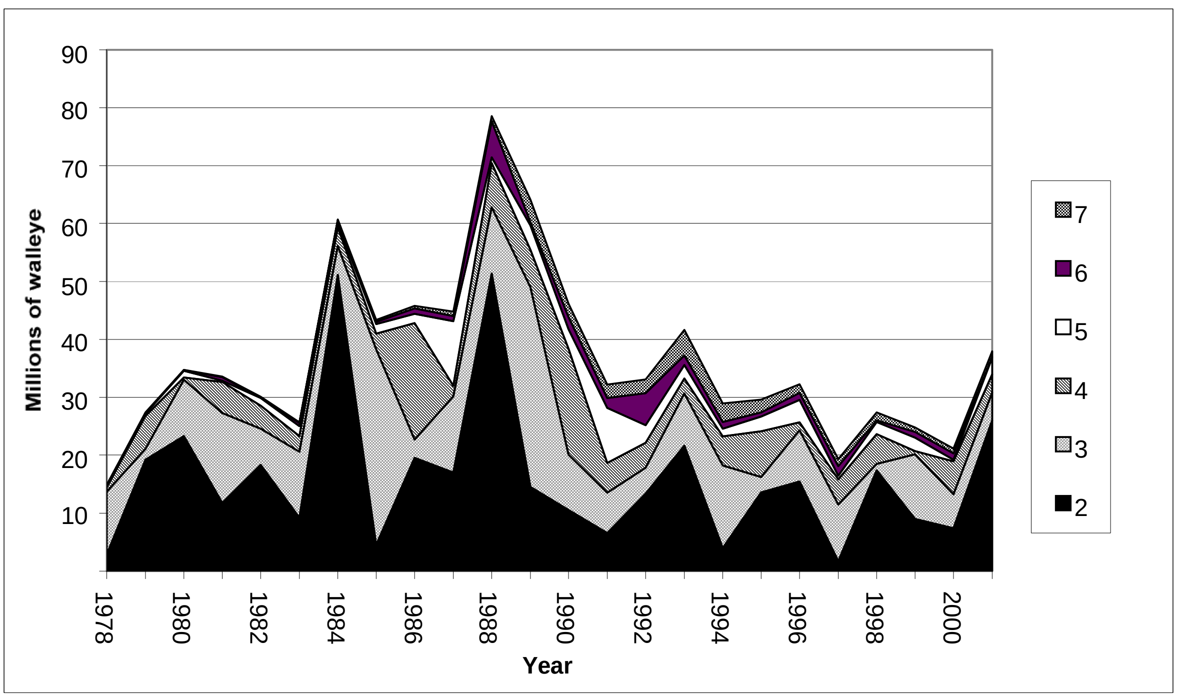

Figure 10. Age class composition of Lake Erie walleye 1978-2001. Data are from Table 8 in this document.