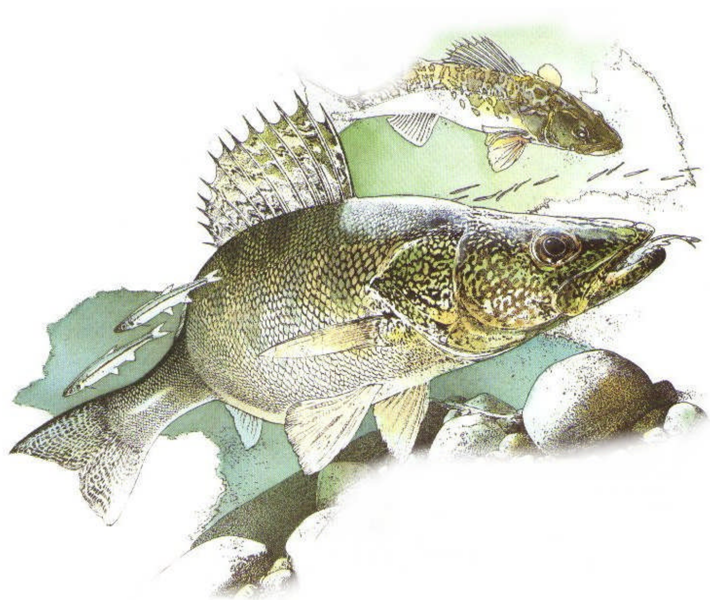
Report for 2005 by the

LAKE ERIE WALLEYE TASK GROUP

March 2006



Prepared by members:

Mike Thomas, *Michigan Department of Natural Resources*
Don Einhouse, *New York Department of Environmental Conservation*
Kevin Kayle, *Ohio Department of Natural Resources*
Mark Turner, *Ohio Department of Natural Resources*
Chris Vandergoot (co-chairman), *Ohio Department of Natural Resources*
Megan Belore, *Ontario Ministry of Natural Resources*
Andy Cook, *Ontario Ministry of Natural Resources*
Tim Johnson, *Ontario Ministry of Natural Resources*
Elizabeth Wright (co-chairman), *Ontario Ministry of Natural Resources*
Roger Kenyon, *Pennsylvania Fish and Boat Commission*

Presented to:
Standing Technical Committee
Lake Erie Committee
Great Lakes Fishery Commission

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

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Charges to the WTG from the STC, 2005-2006

The charges from the Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period from March 2005 to February 2006 were to:

1. Maintain and update centralized time database for population modeling; including tagging, fishing harvest and effort by grid, growth, maturity, and abundance indices. Additionally, note the continuing effort to establish Biological Reference Points by examining walleye SSB, S/R or Spawner –Recruit relationships for use with ADMB.
2. Report recommended allowable harvest (RAH) level for 2006.
3. Continue development of eastern basin catch-at-age analyses for walleye.
4. Review different methods for calculation of lambdas for use in catch-at-age analyses and select one defensible method for weighting data sources used in catch-at-age analyses.

Review of Walleye Fisheries in 2005

Fishery effort and walleye harvest data were combined for all jurisdictions and Management Units (Figure 1) to produce lake-wide estimates. The 2005 total estimated lake-wide harvest of walleye was 3.646 million fish (Tables 1 and 2) with a total of 3.581 million fish were harvested in the TAC area. This harvest represents 61.6% of the 2005 total allowable catch (TAC) of 5.815 million walleye and includes walleye harvested in lake-wide commercial and sport fisheries. An additional 65,080 fish were harvested outside of the TAC area.

Michigan sport anglers harvested only 12% of the TAC allocated to them (Table 1). Similarly, the sport fisheries in Ohio harvested only 20% of the TAC allocated to them (Table 1). One reason for this was because both the Michigan Department of Natural Resources and the Ohio Department of Natural Resources had 15” minimum size limits on sport-caught walleye that reduced the harvest of young walleye in 2005. Throughout much of the fishing season age-2 walleye, although abundant, were not vulnerable to harvest in these jurisdictions. The sport harvest of approximately 0.73 million fish was the lowest since 1977 and was very similar to the harvest of walleye in 1976. (Table 2, Figure 2).

The Ontario harvest in 2005 was approximately 2.9 million fish (Table 2, Figure 2), taken mainly in the commercial fishery, and was 16.5% above the TAC allocation of 2.5 million walleye. This occurred because the Ontario Ministry of Natural Resources converts the TAC in numbers of walleye to an allocation in weight. It is the allocation in weight that is provided to the Ontario commercial fishing industry. If the weight conversion factor is not identical to the average weight of walleye that are harvested, there is either an over-harvest or an under-harvest. In 2005, the average size of walleye was smaller than the conversion factor used to allocate quota to the Ontario commercial fishery. A new method for converting numbers of walleye to weight will be adopted in 2006 by the Ontario Ministry of Natural Resources.

The declining trend in sport effort began in 1988 and was continued in 2005 (Table 3, Figure 3). Sport effort decreased 15% from 2004 for a total of 2.5 million angler hours and it was the lowest amount of lakewide walleye angler effort recorded since 1976. Sport effort declined in 2005 compared to 2004 in Management Unit 1 by 21% and in Management Unit 2 by 25%. In Management Units 3, 4 and 5, angler effort increased in 2005 (Table 3, Figure 3). Lakewide commercial gill net effort increased 40% to 15,933 kilometers of net in 2005 (Table 3, Figure 4).

Sport catch-per-unit-effort (CUE, walleye/ angler hour) decreased in Management Units 1 and 2, and this decrease is directly related to the influence of the 15" minimum size limit in place for walleye sport fisheries in Michigan and Ohio. Sport CUEs increased in Management Units 3, 4 and 5. For the purpose of this report, CUE reflects the number of fish harvested. The lakewide average sport catch rate of 0.28 fish/ hour was below the 1975-2005 mean of 0.42 fish/ hour (Table 4, Figure 5). In Management Units 1 and 2, catch rates were below the long-term mean in those respective management units, whereas in Management Units 3, 4, and 5 the sport catch rates were higher than the 1975-2005 mean values for those areas.

Average commercial gill net CUE (all Management Units combined) increased 25% to 183 walleye/ kilometer of net in 2005. Gill net catch rates were above the 1975-2005 average for all Management Units. This marks the fifth consecutive year of increasing catch rates for the commercial fishery and represents a reversal in the trend of declining CUE's observed since the mid 1980's (Table 4, Figure 5).

The 2003 year-class (i.e., age-2 walleye) comprised 18% of the total sport fishery harvest and 47% of the total harvest taken in the commercial fishery. Despite the abundance of age-2 walleye in the west and central basins, these fish were less than 15" for much of the year and, therefore, were not harvested in Michigan and Ohio until after they had grown beyond the 15" minimum size limit imposed on the sport fisheries.

The 2001 year-class (i.e., age-4 walleye) represented 38% of the total harvest for the sport fishery and 30% of the commercial fishery. Age-6 walleye (i.e., 1999 year-class) contributed 21% to the sport fishery, but only 11% to the commercial fishery (Tables 5, 6). Lakewide the 1999, 2001, and 2003 year-classes contributed 13%, 31% and 42%, respectively, to the total harvest. As observed in previous years, older fish (age-7+) made up a larger proportion of the catch from in eastern Management Units (Units 3, 4 and 5) relative to the western Management Units (Units 1 and 2).

Across all management units, the mean age of walleye in the harvest ranged from 4.2 to 6.7 years old in the sport fishery and from 3.1 to 4.7 years old in the commercial fishery (Table 7, Figure 6). The mean age of fish increased in both the sport and commercial fisheries from 2004 values. The mean age in the sport fishery was 5.2 years, remaining above the long-term mean of 4.0 years (1975-2005). In the commercial fishery, mean age was 3.7 years and was similar to the long-term mean of 3.5 years (1975 to 2005).

Walleye Management Plan

To help ensure that the walleye population would not need such rapid and drastic management action as that taken during the 2001-2003 Coordinated Percid Management Strategy (CPMS; Lake Erie Committee, 2004), the LEC determined that it required a plan that it could implement to manage walleye. The Walleye Management Plan (WMP; Locke et al., 2005) addresses fishery sustainability and establishes quality objectives that the LEC will employ as a basis for walleye management. The plan focuses primarily on the walleye stocks that spawn on shoals and in tributaries of the western basin, and generally inhabit the west and central basins of Lake Erie. This is the primary population of interest to the LEC management exercise as it provides most of the benefits to users throughout Lake Erie. There are additional stocks within the lake, and these are found in Presque Isle Bay and east of Long Point in the eastern basin. Catch-at-age modelling and population estimates for this eastern population are ongoing, but it is clear (Ryan et al. 2003) that the population is small relative to the western population. The eastern Lake Erie walleye population is briefly described in the WMP.

The WMP takes advantage of lessons learned and models developed during the CPMS and will form the basis for future work towards managing walleye stocks in Lake Erie. The WMP is a dynamic tool and will continue to change with advances in assessment technology and fisheries population, modeling, and yield theories.

Central to the WMP are two main components: The first is a set of population objectives that define the biological and fishery quality characteristics that the LEC has determined, in cooperation with stakeholders, for the Lake Erie walleye population. The second is an exploitation policy that has been designed to help meet these objectives and at the same time recognizes the economic importance of the walleye fishery to stakeholders. This exploitation policy does so by joining state of the art population and harvest simulation modelling with lessons learned from other fisheries and the recent history of walleye management on Lake Erie. All of these components are described in the WMP, along with walleye fishery and population objectives, actions and tasks developed in support of the WMP plan implementation, and measures of success/ targets for evaluation.

Relative Abundance and Catch-at-Age Analysis

The walleye catch-at-age model used for the purposes of this report was derived from the model of Deriso et al. (1985). The walleye task group has been using this model for several years and started with the application version called CAGEAN (Deriso et al., 1985). In addition to using fishery derived data, this model includes assessment data from three index gill net surveys from: Michigan (west basin), Ohio (west basin) and Ontario (west and central basins). 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 weightings (or lambdas) of effort data in the model are calculated by the ratio of the 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. lambdas remain constant). While lambdas within similar parameter groups (i.e. effort, catch, survey) are solved and weighted unequally, the groups themselves are given equal weight. The 2005 walleye ADMB model had no functional changes from the 2004 model. The walleye population in the east basin was modeled separately (see section: "*Eastern Basin Catch-At-Age Analysis*").

The 2005 population estimate was 62.9 million age-2+ walleye (Table 8, Figure 7) with approximately 11.1 million age-4+ walleye (Table 8). The increase in the walleye population is the result of the recruitment of a very strong 2003 year-class that was estimated to contribute approximately 51.4 million age-2 fish to the population in 2005 (Table 8). Previous strong year classes of walleye entered the fisheries at age-2 in 1984 and 1988, and they are now estimated to have had a magnitude of 47 million and 44 million age-2 walleye, respectively (Table 8).

Recruitment Estimator for Incoming Age-2 Walleye and 2006 Population Size Projection

A linear regression model was used to estimate age-2 recruitment for 2006 and 2007. This regression utilized estimates of age-2 abundance from catch-at-age analysis and young-of-year trawl data from pooled Ontario and Ohio trawling (Tables 8 and 9, Figure 8). As in the past, the most recent age-2 estimate (2005) from catch-at-age analysis has the widest error bounds, and therefore this value was not used in the linear regression to estimate recruitment. Trawl surveys in 2004 indicated that a low number of young-of-year walleye were produced. The 2004 year-class is expected to be one of the smaller year-classes on record, projected to add 4.6 million age-2 fish to the 2006 population (Table 9, Figure 9). The trawl surveys conducted in 2005 indicated that the 2005 year-class is slightly larger than the estimated 2004 year-class, and is estimated to contribute 5.8 million age-2 walleye to the fishery in 2007 (Table 9, Figure 9).

The stock size estimate for 2006 was projected using catch-at-age analysis estimates of the 2005 population size, estimated survival rates in 2005 and the age-2 recruitment estimate for 2006 (Table 8). The 2006 estimated abundance of age-2+ walleye is approximately 46 million (Table 8, Figure 10). The projected abundance of age-4+ walleye (spawners) in 2006 is approximately 6.7 million walleye (Table 8).

The abundance of age-3 and older walleye in 2007 was estimated to be 25.2 million walleye based on expected survival using the targeted 2006 fishing rate (Table 10).

The estimate of recruitment in 2007 (5.8 million age-2 walleye) was included in the 2007 population estimate of age-2 and older fish (i.e., 31 million walleye).

Harvest Policy and Recommended Allowable Catch for 2006

The harvest management policy adopted by the LEC in the Walleye Management Plan is a feedback, or state-dependent approach, that varies fishing mortality rate with population abundance (Locke et al., 2005). The policy stipulates that when the walleye abundance is 40 million walleye or greater, the fishing mortality rate is F=0.35 (Locke et al., 2005). Based on this harvest policy and the estimated abundance 46.1 million walleye in 2006, the recommended allowable harvest (RAH) for 2006 is 9.886 million walleye (Table 10).

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 spatially explicit version of these data (e.g., catch and effort by statistical grid) is managed by MDNR. Growth, maturity, catch, and effort data are stored in an interagency gill net database that is managed by ODNR-Sandusky. This database is in the process of being reformatted and converted into a relational database. Growth and relative abundance data from the interagency trawl program in the western basin are stored in databases managed jointly by Ohio DNR and Ontario MNR. Use of WTG databases by non-members is only permitted following protocol established in the 1994 WTG Report and reprinted in the 2003 WTG Report (Walleye Task Group, 2003).

Analysis of Walleye Distribution Data and Stock Discrimination

Four recent research projects supported by the Walleye Task Group have now been completed. They included:

1. Spatial analyses of movement, life history and habitat quality of walleye in Lake Erie,
2. Spatial and temporal distribution of Lake Erie walleye,
3. Population dynamics of age-0 walleye in western Lake Erie, and
4. Stock discrimination of Lake Erie walleye: a mixed stock analysis contrasting genetic techniques.

One ongoing research initiative is entitled: *Assessment of PIT tags for estimating exploitation of walleye in Lake Erie and Saginaw Bay, Lake Huron.*

During the spring of 2005 walleyes in Lake Erie and Lake Huron were tagged with PIT (passive integrated transponder) and jaw tags. Approximately 9,500 walleye were tagged, of which 7,400 were double-tagged (i.e., with a PIT and jaw tag). The objectives of the study are to: 1) assess the use of PIT tags as an alternative to jaw tags in estimating walleye exploitation rates in Lake Erie and Saginaw Bay, Lake Huron, in terms of tag retention, cost/benefit analysis, sample size considerations, and precision of exploitation estimates, 2) assess temporal patterns in loss rates of jaw and PIT tags through double-tagging for use in correcting exploitation estimates, 3) determine walleye exploitation rates for different fishery components (i.e., commercial, private, and charter) and determine individual stock contribution to each fishery and 4) obtain additional information regarding walleye movement patterns in each lake through recapture of tagged walleyes by fishers. As of 1 January 2005 we scanned approximately 21,000 harvested walleye from Lake Erie. This project is in the 2nd year of a 2 year study, the results of this study will be used for estimating exploitation, natural mortality and jaw tag loss.

Eastern Basin Catch-At-Age Analysis

The WTG has been pursuing the development of an ADMB catch-at-age model for eastern Lake Erie's walleye resource. This developing stock assessment model incorporates catch-at-age walleye harvest and fishing effort values from Ontario commercial gill nets, New York and Pennsylvania angling fisheries, in addition to survey data from Ontario and New York. A long-term New York walleye tagging study provided the instantaneous natural mortality estimate (M) of 0.16 used for this model.

The current east basin model description for walleye population dynamics is provided in this report for illustrative purposes only. The most apparent shortcoming for the current configuration of this east basin model is that walleye movements into the basin by the much larger western basin spawning stocks are presently not accounted for in the model, which confounds estimates of survival, exploitation, and abundance. These movements must be incorporated in the model for it to be a viable tool for walleye population assessment and therefore at this time, it cannot be used exclusively for stock assessment.

Currently the 2005 estimate of walleye abundance in the eastern basin model is 16.7 million walleye, the highest abundance observed in the time series (Table 11). The east basin model output also describes 96% of the east basin abundance as age-2 (2003) walleye, 31 times larger than the next largest age-2 cohort in this series. During the 1993-2005 time span, the 2003 year class was measured as two times larger than the next largest cohort by the NYSDEC juvenile recruitment index for walleye in eastern Lake Erie. The WTG has not had the opportunity to explore why the modeling results were inconsistent with historic fishery performance and agency surveys, portraying a walleye resource dominated by older cohorts.

Decision Analysis

The development of a Decision Analysis (DA) tool to improve the ability of the LEC to incorporate uncertainty and risk into management decisions was completed in 2005. A yield model was used to simulate the sliding-F harvest strategy which was incorporated into the WMP. A final report, Decision Analysis Application for Lake Erie Walleye Management: Final Report to the Lake Erie Committee (Wright et al., 2005) was completed to document the initiative.

Acknowledgements

The WTG would like to express its appreciation for support during the past year from the Great Lakes Fishery Commission, which continued to handle the financial end of the reward tag study and hosted the summer and fall WTG meetings.

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Table 1. Lake Erie walleye total allowable catch (top) and measured harvest (bottom, bold), in numbers of fish, from 1977 to 2005. New York and Pennsylvania do not have assigned quotas but are included in the annual total harvest.

		TAC Area (MU-1, MU-2, MU-3)				Non TAC Area (MU-4)				All Areas
Year		Michigan	Ohio	Ontario [a]	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	7,700,000
	Har	**252,280**	**932,297**	**2,287,533**	**3,472,110**	**28,599**	**77,512**	**67,000**	**173,111**	**3,645,221**
2001	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**159,186**	**1,157,914**	**1,498,816**	**2,815,916**	**14,669**	**52,796**	**39,498**	**106,963**	**2,922,879**
2002	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**193,515**	**703,000**	**1,436,000**	**2,332,515**	**18,377**	**22,000**	**36,000**	**76,377**	**2,408,892**
2003	TAC	180,200	1,747,600	1,472,200	3,400,000				**0**	**3,400,000**
	Har	**128,852**	**1,014,688**	**1,457,014**	**2,600,554**	**27,480**	**43,581**	**32,692**	**103,753**	**2,704,307**
2004	TAC	127,200	1,233,600	1,039,200	2,400,000				**0**	**2,400,000**
	Har	**114,958**	**859,366**	**1,419,237**	**2,393,561**	**8,400**	**19,969**	**29,864**	**58,233**	**2,451,794**
2005	TAC	308,195	2,988,910	2,517,895	5,815,000				**0**	**5,815,000**
	Har	**37,599**	**610,449**	**2,933,393**	**3,581,441**	**27,370**	**20,316**	**17,394**	**65,080**	**3,646,521**

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis

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

	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[a]	Total	OH	ON[a]	Total	OH	ON[a]	Total	ON[a]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1975	77	4	7	88	10	--	10	--	--	--	--	--	--	0	98	--	--	--	--	0
1976	605	30	50	685	35	--	35	--	--	--	--	--	--	0	720	113	44	--	--	157
1977	2,131	107	69	2,307	37	--	37	--	--	--	--	--	--	0	2,344	235	67	--	--	302
1978	1,550	72	112	1,734	37	--	37	--	--	--	--	--	--	0	1,771	274	60	--	--	334
1979	3,254	162	79	3,495	60	--	60	--	--	--	--	--	--	0	3,555	625	30	--	--	655
1980	2,096	183	57	2,336	49	--	49	24	--	24	--	--	--	0	2,409	953	40	--	--	993
1981	2,857	95	70	3,022	38	--	38	48	--	48	--	--	--	0	3,108	1,037	119	3	--	1,159
1982	2,959	194	49	3,202	49	--	49	8	--	8	--	--	--	0	3,259	1,077	134	2	--	1,213
1983	1,626	146	41	1,813	212	--	212	26	--	26	--	--	--	0	2,051	1,129	167	80	--	1,376
1984	3,089	351	39	3,479	787	--	787	179	--	179	--	--	--	0	4,445	1,639	392	108	--	2,139
1985	3,347	461	57	3,865	294	--	294	89	--	89	--	--	--	0	4,248	1,721	432	225	--	2,378
1986	3,743	606	52	4,401	480	--	480	176	--	176	--	--	--	0	5,057	1,651	558	356	--	2,565
1987	3,751	902	51	4,704	550	--	550	132	--	132	--	--	--	0	5,386	1,611	622	405	--	2,638
1988	3,744	1,997	18	5,759	584	--	584	562	--	562	--	--	85	85	6,990	1,866	762	409	--	3,037
1989	2,891	1,092	14	3,997	867	35	902	434	80	514	--	--	129	129	5,542	1,656	621	386	--	2,663
1990	1,467	747	35	2,249	389	14	403	426	23	449	--	--	47	47	3,148	1,615	529	302	--	2,446
1991	1,104	132	39	1,275	216	24	240	258	44	302	--	--	34	34	1,851	1,446	440	274	--	2,160
1992	1,479	250	20	1,749	338	56	394	265	25	290	--	--	14	14	2,447	1,547	534	316	--	2,397
1993	1,846	270	37	2,153	450	26	476	372	12	384	--	--	40	40	3,053	2,488	762	496	--	3,746
1994	992	216	21	1,229	291	20	311	186	21	207	--	--	59	59	1,806	2,307	630	432	--	3,369
1995	1,161	108	32	1,301	159	7	166	115	27	141	--	--	27	27	1,635	2,578	681	489	--	3,748
1996	1,442	175	17	1,634	645	8	653	229	27	256	--	89	39	128	2,671	2,777	1,107	589	--	4,473
1997	929	122	8	1,059	188	2	190	132	5	138	--	89	29	118	1,505	2,585	928	544	--	4,057
1998	1,790	115	34	1,939	215	5	220	299	5	304	19	125	34	178	2,641	2,497	1,166	462	28	4,153
1999	812	140	34	986	139	5	144	83	5	88	19	89	23	131	1,349	2,461	631	317	68	3,477
2000	674	252	34	961	165	5	170	93	5	98	19	78	29	125	1,354	1,603	444	196	48	2,291
2001	941	160	34	1,135	171	5	176	46	5	51	19	53	15	87	1,449	1,004	310	141	20	1,475
2002	516	194	34	744	141	5	146	46	5	51	19	22	18	59	1,000	937	309	146	17	1,409
2003	715	129	34	878	232	5	237	68	5	73	2	44	27	73	1,261	948	283	182	14	1,427
2004	515	115	34	664	272	2	274	72	0	72	2	20	8	30	1,040	866	334	175	11	1,386
2005	374	38	27	438	110	2	112	126	0	126	2	20	27	49	725	1,878	625	401	15	2,920
Mean	1,757	309	40	2,106	265	13	272	173	17	184	13	63	38	46	2,578	1,504	459	297	28	2,147

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are used to determine Ontario's total walleye harvest, but are not used in catch-at-age analysis.

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

	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[c]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1975	486	30	46	562	61	--	61	--	--	--	--	--	--	0	623	--	--	--	--	--
1976	1,356	84	98	1,538	163	--	163	--	--	--	--	--	--	0	1,701	1,796	1,933	--	--	3,729
1977	2,768	171	130	3,069	151	--	151	--	--	--	--	--	--	0	3,220	4,282	1,572	--	--	5,854
1978	2,880	176	148	3,204	154	--	154	--	--	--	--	--	--	0	3,358	5,253	436	--	--	5,689
1979	4,179	257	97	4,533	169	--	169	--	--	--	--	--	--	0	4,702	5,798	1,798	--	--	7,596
1980	3,938	624	92	4,654	237	--	237	187	--	187	--	--	--	0	5,078	6,229	1,565	--	--	7,794
1981	5,766	447	138	6,351	264	--	264	382	--	382	--	--	--	0	6,997	6,881	2,144	622	--	9,647
1982	5,928	449	108	6,484	223	--	223	114	--	114	--	--	--	0	6,821	10,531	2,913	689	--	14,133
1983	4,168	451	118	4,737	568	--	568	128	--	128	--	--	--	0	5,433	11,205	5,352	5,814	--	22,371
1984	4,077	557	82	4,716	1,322	--	1,322	392	--	392	--	--	--	0	6,430	11,550	6,008	2,438	--	19,996
1985	4,606	926	84	5,616	1,078	--	1,078	464	--	464	--	--	--	0	7,158	7,496	2,800	2,983	--	13,279
1986	6,437	1,840	107	8,384	1,086	--	1,086	538	--	538	--	--	--	0	10,008	7,824	5,637	3,804	--	17,265
1987	6,631	2,193	84	8,908	1,431	--	1,431	472	--	472	--	--	--	0	10,811	6,595	4,243	3,045	--	13,883
1988	7,547	4,362	87	11,996	1,677	--	1,677	1,081	--	1,081	--	--	462	462	15,216	7,495	5,794	3,778	--	17,067
1989	5,246	3,794	81	9,121	1,532	77	1,609	883	205	1,088	--	--	556	556	12,374	7,846	5,514	3,473	--	16,833
1990	4,116	1,803	121	6,040	1,675	33	1,708	869	83	952	--	--	432	432	9,132	9,016	5,829	5,544	--	20,389
1991	3,616	440	144	4,200	1,241	79	1,320	724	155	880	--	--	440	440	6,840	10,418	5,055	3,146	--	18,619
1992	3,955	715	105	4,775	1,169	81	1,249	640	145	786	--	--	299	299	7,109	9,486	6,906	6,043	--	22,435
1993	3,943	691	125	4,759	1,349	70	1,418	1,062	125	1,187	--	--	305	305	7,669	16,283	11,656	7,420	--	35,359
1994	2,808	788	125	3,721	1,025	65	1,090	599	130	729	--	--	355	355	5,894	16,698	9,968	6,459	--	33,125
1995	3,188	277	125	3,589	803	65	868	355	130	485	--	--	259	259	5,201	20,521	12,113	7,850	--	40,484
1996	3,060	521	125	3,706	1,132	65	1,197	495	130	625	--	316	256	572	6,101	19,976	15,685	10,990	--	46,651
1997	2,748	374	88	3,210	864	45	909	492	91	583	--	388	273	661	5,363	15,708	11,588	9,094	--	36,390
1998	3,010	374	103	3,487	635	51	686	409	55	464	217	390	280	887	5,524	19,027	19,397	13,253	818	52,495
1999	2,368	411	--	2,779	603	--	603	323	--	323	--	397	171	568	4,699	21,432	10,955	7,630	1,444	41,461
2000	1,975	540	--	2,516	540	--	540	281	--	281	--	244	177	421	3,757	22,238	11,049	7,896	1,781	43,054
2001	1,952	362	--	2,314	697	--	697	261	--	261	--	241	163	404	3,676	9,372	5,746	5,021	639	20,778
2002	1,393	606	--	1,999	444	--	444	246	--	246	--	130	132	262	2,951	4,431	4,212	4,427	445	13,515
2003	1,719	326	--	2,045	675	--	675	236	--	236	30	159	162	351	3,307	4,476	3,946	3,725	365	12,512
2004	1,257	504	--	1,761	736	27	763	178	7	185	--	88	101	189	2,898	3,875	2,977	2,401	240	9,494
2005	1,180	212	40	1,392	573	--	573	261	--	261	--	109	142	251	2,477	7,083	4,174	4,503	174	15,933
Mean	3,494	816	104	4392	783	60	804	464	114	513	123	246	276	248	5888	10,361	6,299	5,282	738	21,261

[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.
[c] Ontario sport fishing effort was estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4.

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[c]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	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	--	.34	.23	--	.23	.26	--	.26	--	.22	.14	.18	.27	114.8	57.6	41.6	47.4	83.9
2000	.34	.47	--	.37	.31	--	.31	.33	--	.33	--	.32	.16	.24	.34	72.1	40.2	24.8	27.1	53.2
2001	.48	.44	--	.48	.25	--	.25	.18	--	.18	--	.22	.09	.16	.38	107.1	54.0	28.1	32.1	71.0
2002	.37	.32	--	.36	.32	--	.32	.19	--	.19	--	.17	.14	.15	.32	211.5	73.4	33.0	37.4	104.3
2003	.42	.40	--	.41	.34	--	.34	.29	--	.29	.07	.28	.17	.22	.37	211.8	71.7	48.9	38.4	114.1
2004	.41	.23	--	.36	.37	.06	.37	.40	--	.40	--	.23	.08	.16	.35	223.5	112.1	73.0	45.4	146.0
2005	.32	.18	.67	.30	.19	--	.19	.48	--	.48	--	.18	.19	.19	.28	265.2	149.8	89.1	86.5	183.2
Mean	.47	.37	.40	.45	.30	.27	.30	.33	.19	.32	.08	.24	.13	.16	.42	153.7	76.6	58.6	43.5	109.3

[a] Sport CPE = Number/angler hour
[b] Commercial CPE = Number/kilometer of gill net
[c] Ontario sport fishing CPE was estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4.

Table 5. Catch at age of walleye harvest by management unit, gear, and agency in Lake Erie during 2005. Units 4 and 5 are combined in Unit 4.

		Commercial	Sport						All Gears	
Unit	Age	OMNR	OMNR[a]	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	526		0	0	--	--	0	526	526
	2	842,227		24,029	8,442	--	--	32,471	842,227	874,698
	3	50,147		13,470	989	--	--	14,459	50,147	64,606
	4	648,244		186,150	17,840	--	--	203,990	648,244	852,234
	5	25,136		6,917	803	--	--	7,720	25,136	32,856
	6	208,548		86,720	7,009	--	--	93,729	208,548	302,277
	7+	103,319		57,062	2,517	--	--	59,579	103,319	162,898
	Total	1,878,147	26,650	374,348	37,599	--	--	438,597	1,904,797	2,316,744
2	1	167		87	--	--	--	87	167	254
	2	397,743		48,243	--	--	--	48,243	397,743	445,986
	3	19,872		4,195	--	--	--	4,195	19,872	24,067
	4	130,385		26,381	--	--	--	26,381	130,385	156,766
	5	6,758		744	--	--	--	744	6,758	7,502
	6	34,198		17,880	--	--	--	17,880	34,198	52,078
	7+	36,274		12,910	--	--	--	12,910	36,274	49,184
	Total	625,397	1,672	110,440	--	--	--	112,112	627,069	737,509
3	1	196		0	--	--	--	0	196	196
	2	131,837		39,259	--	--	--	39,259	131,837	171,096
	3	3,069		1,881	--	--	--	1,881	3,069	4,950
	4	86,039		24,334	--	--	--	24,334	86,039	110,373
	5	35,451		3,679	--	--	--	3,679	35,451	39,130
	6	86,447		24,317	--	--	--	24,317	86,447	110,764
	7+	58,165		32,191	--	--	--	32,191	58,165	90,356
	Total	401,204	322	125,661	--	--	--	125,983	401,526	527,187
4	1	66		--	--	0	0	0	66	66
	2	7,501		--	--	6010	0	6,010	7,501	13,511
	3	0		--	--	0	0	0	0	0
	4	1,354		--	--	6,508	3,386	9,894	1,354	11,248
	5	63		--	--	881	0	881	63	944
	6	2,275		--	--	3,101	5,643	8,744	2,275	11,019
	7+	3,774		--	--	10,870	11,287	22,157	3,774	25,931
	Total	15,033	2,361	--	--	27,370	20,316	50,047	17,394	65,080
All	1	955		87	0	0	0	87	955	1,042
	2	1,379,308		111,531	8,442	6,010	0	125,983	1,379,308	1,505,291
	3	73,088		19,546	989	0	0	20,535	73,088	93,623
	4	866,022		236,865	17,840	6,508	3,386	264,599	866,022	1,130,621
	5	67,408		11,340	803	881	0	13,024	67,408	80,432
	6	331,468		128,917	7,009	3,101	5,643	144,670	331,468	476,138
	7+	201,532		102,163	2,517	10,870	11,287	126,837	201,532	328,369
	Total	2,919,781	31,005	610,449	37,599	27,370	20,316	726,739	2,950,786	3,646,520

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis.

Table 6. Percent age composition of walleye harvested by management unit, gear, and agency in Lake Erie during 2005. Units 4 and 5 are combined in Unit 4.

		Comm'l	Sport						All Gears
Unit	Age	OMNR	OMNR[a]	ODNR	MDNR	NYDEC	PA	Total	Total
1	1	0.0	--	0.0	0.0	--	--	0.0	0.0
	2	44.8	--	6.4	22.5	--	--	7.9	38.2
	3	2.7	--	3.6	2.6	--	--	3.5	2.8
	4	34.5	--	49.7	47.4	--	--	49.5	37.2
	5	1.3	--	1.8	2.1	--	--	1.9	1.4
	6	11.1	--	23.2	18.6	--	--	22.8	13.2
	7+	5.5	--	15.2	6.7	--	--	14.5	7.1
	Total	100	--	100	100	--	--	100	100
2	1	0.0	--	0.1	--	--	--	0.1	0.0
	2	63.6	--	43.7	--	--	--	43.7	60.6
	3	3.2	--	3.8	--	--	--	3.8	3.3
	4	20.8	--	23.9	--	--	--	23.9	21.3
	5	1.1	--	0.7	--	--	--	0.7	1.0
	6	5.5	--	16.2	--	--	--	16.2	7.1
	7+	5.8	--	11.7	--	--	--	11.7	6.7
	Total	100	--	100	--	--	--	100	100
3	1	0.0	--	0.0	--	--	--	0.0	0.0
	2	32.9	--	31.2	--	--	--	31.2	32.5
	3	0.8	--	1.5	--	--	--	1.5	0.9
	4	21.4	--	19.4	--	--	--	19.4	20.9
	5	8.8	--	2.9	--	--	--	2.9	7.4
	6	21.5	--	19.4	--	--	--	19.4	21.0
	7+	14.5	--	25.6	--	--	--	25.6	17.1
	Total	100	--	100	--	--	--	100	100
4	1	0.4	--	--	--	0.0	0.0	0.0	0.1
	2	49.9	--	--	--	22.0	0.0	12.6	21.5
	3	0.0	--	--	--	0.0	0.0	0.0	0.0
	4	9.0	--	--	--	23.8	16.7	20.7	17.9
	5	0.4	--	--	--	3.2	0.0	1.8	1.5
	6	15.1	--	--	--	11.3	27.8	18.3	17.6
	7+	25.1	--	--	--	39.7	55.6	46.5	41.3
	Total	100	--	--	--	100	100	100	100
All	1	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0
	2	47.2	--	18.3	22.5	22.0	0.0	18.1	41.6
	3	2.5	--	3.2	2.6	0.0	0.0	3.0	2.6
	4	29.7	--	38.8	47.4	23.8	16.7	38.0	31.3
	5	2.3	--	1.9	2.1	3.2	0.0	1.9	2.2
	6	11.4	--	21.1	18.6	11.3	27.8	20.8	13.2
	7+	6.9	--	16.7	6.7	39.7	55.6	18.2	9.1
	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
1975	2.53	2.53	3.26	2.59	1.53	--	1.53	--	--	--	--	--	--	--	2.48	--	--	--	--	--
1976	2.49	2.49	2.35	2.48	2.05	--	2.05	--	--	--	--	--	--	--	2.46	1.51	1.51	--	--	1.51
1977	3.29	3.29	2.64	3.27	2.44	--	2.44	--	--	--	--	--	--	--	3.26	2.74	2.74	--	--	2.74
1978	3.50	3.62	3.07	3.48	3.33	--	3.33	--	--	--	--	--	--	--	3.48	2.69	2.69	--	--	2.69
1979	2.71	2.71	2.67	2.71	2.29	--	2.29	--	--	--	--	--	--	--	2.70	2.83	2.83	--	--	2.83
1980	3.00	3.00	2.84	3.00	2.92	--	2.92	2.65	--	2.65	--	--	--	--	2.99	2.96	2.96	--	--	2.96
1981	3.61	2.97	3.47	3.59	2.62	--	2.62	2.72	--	2.72	--	--	--	--	3.56	3.00	3.00	2.99	--	3.00
1982	3.25	3.25	2.76	3.24	2.58	--	2.58	2.51	--	2.51	--	--	--	--	3.23	2.81	2.81	2.81	--	2.81
1983	3.03	3.03	3.17	3.03	2.25	--	2.25	2.07	--	2.07	--	--	--	--	2.94	3.47	3.47	3.47	--	3.47
1984	2.64	2.64	2.90	2.64	2.61	--	2.61	2.68	--	2.68	--	--	--	--	2.64	2.89	2.89	2.89	--	2.89
1985	3.36	3.36	3.17	3.36	3.24	--	3.24	3.58	--	3.58	--	--	--	--	3.35	3.04	3.04	3.04	--	3.04
1986	3.73	3.61	3.54	3.71	3.69	--	3.69	4.08	--	4.08	--	--	--	--	3.72	3.61	3.70	4.22	--	3.71
1987	3.83	3.32	3.78	3.73	3.68	--	3.68	4.10	--	4.10	--	--	--	--	3.73	3.71	3.47	3.40	--	3.61
1988	3.97	3.43	4.58	3.78	3.81	--	3.81	5.37	--	5.37	--	--	4.87	4.87	3.93	3.27	3.15	3.89	--	3.32
1989	4.48	3.75	4.29	4.28	4.65	4.29	4.64	5.13	4.29	5.00	--	--	5.59	5.59	4.44	3.49	3.51	4.22	--	3.60
1990	4.44	4.64	5.00	4.52	5.31	5.41	5.31	6.41	5.41	6.36	--	--	5.70	5.70	4.90	3.91	3.90	4.60	--	3.99
1991	4.91	5.29	5.01	4.95	6.22	6.03	6.20	6.70	5.91	6.58	--	--	6.36	6.36	5.41	4.21	4.63	5.14	--	4.41
1992	4.60	3.49	3.45	4.43	4.89	6.72	5.15	5.67	6.42	5.73	--	--	6.35	6.35	4.71	4.03	4.23	5.49	--	4.27
1993	4.60	4.41	4.09	4.57	5.79	6.45	5.83	5.98	6.17	5.99	--	--	6.15	6.15	4.96	3.64	4.38	5.21	--	4.00
1994	4.53	4.19	5.84	4.49	5.38	6.41	5.45	6.22	6.85	6.28	--	--	6.49	6.49	4.93	3.65	4.36	5.60	--	4.03
1995	4.04	3.55	4.74	4.02	6.07	7.29	6.12	6.08	7.17	6.33	--	--	6.80	6.80	4.48	3.38	4.63	5.92	--	3.94
1996	3.98	3.46	4.31	3.93	4.22	7.22	4.26	6.06	7.57	6.22	--	--	6.47	6.47	4.35	3.57	3.36	5.21	--	3.73
1997	4.21	3.99	4.21	4.18	5.30	5.30	5.30	6.27	6.27	6.22	--	--	6.25	6.25	4.67	3.87	3.68	4.83	--	3.96
1998	3.74	3.13	3.15	3.69	4.66	8.09	4.74	4.64	7.81	4.69	9.55	--	10.13	9.92	4.32	3.26	4.00	5.26	7.00	3.72
1999	3.72	3.16	3.43	3.63	5.35	9.17	5.48	5.95	10.00	6.18	8.15	--	10.29	9.32	4.55	3.41	4.29	5.28	6.76	3.81
2000	3.94	3.27	--	3.76	4.12	--	4.12	6.36	--	6.36	--	--	9.75	9.75	4.55	3.69	4.67	5.65	6.46	4.11
2001	3.66	3.02	--	3.57	4.09	--	4.09	6.14	--	6.14	--	7.70	9.09	8.01	3.99	3.19	3.77	5.52	6.00	3.57
2002	3.80	3.83	--	3.81	4.57	--	4.57	5.46	--	5.46	--	6.59	8.05	7.25	4.21	3.22	3.50	5.37	5.80	3.54
2003	4.67	4.16	--	4.59	4.67	--	4.67	5.87	--	5.87	3.35	7.50	10.01	8.45	4.90	3.68	4.36	5.58	6.59	4.09
2004	4.77	4.41	--	4.70	5.11	6.56	5.11	6.42	--	6.42	--	5.86	11.11	7.41	5.01	2.96	2.59	3.49	6.07	2.96
2005	5.33	4.26	3.35	5.23	4.21	--	4.21	5.53	--	5.53	--	6.61	6.72	6.68	5.22	3.61	3.16	4.64	4.70	3.66
Mean	3.82	3.52	3.66	3.77	3.99	6.58	4.01	5.03	6.72	5.04	7.02	6.85	7.57	7.10	4.00	3.31	3.51	4.55	6.17	3.47

Table 8. Estimated abundance at age, survival (S) and maximum exploitation (U) for Lake Erie walleye, 1978-2005 from the 2006 catch-at-age analysis model in ADMB, M=0.32. West and central basin population modeled, east basin stock excluded. Projected abundance in 2006 of ages 3 to 7+ is based on survival from 2005. Projected 2006 age-2 abundance is based on regression of pooled trawl YOY data and ADMB age 2 abundance (see Table 9).

	Age								
Year	2	3	4	5	6	7+	Total	S	u
1978	2,264,510	5,911,400	1,221,260	84,015	200,801	24,850	9,706,837	0.556	0.282
1979	17,443,200	1,467,510	3,217,480	567,339	39,030	104,844	22,839,403	0.567	0.372
1980	10,446,700	10,748,700	702,660	1,228,840	216,682	55,040	23,398,622	0.592	0.264
1981	6,772,120	6,829,540	5,960,490	342,083	598,248	132,349	20,634,830	0.481	0.407
1982	11,552,900	4,132,280	3,184,130	2,203,870	126,484	270,279	21,469,943	0.552	0.332
1983	7,432,320	7,293,080	2,097,090	1,351,260	935,266	168,703	19,277,719	0.573	0.268
1984	46,882,000	4,838,720	3,978,280	1,025,490	660,774	540,193	57,925,457	0.615	0.281
1985	6,031,600	30,179,700	2,568,470	1,852,600	477,548	560,260	41,670,178	0.622	0.206
1986	17,908,400	4,115,490	18,628,300	1,485,400	1,071,400	600,900	43,809,890	0.596	0.249
1987	16,430,800	11,965,200	2,401,220	10,027,800	799,603	901,306	42,525,929	0.603	0.211
1988	43,875,500	10,998,200	7,029,380	1,291,830	5,394,810	916,377	69,506,097	0.621	0.228
1989	14,167,800	29,149,100	6,336,600	3,677,980	675,922	3,303,610	57,311,012	0.597	0.209
1990	11,067,800	9,490,010	17,151,200	3,420,750	1,985,520	2,153,220	45,268,500	0.608	0.171
1991	6,154,530	7,526,920	5,800,570	9,841,150	1,962,780	2,378,060	33,664,010	0.623	0.144
1992	12,848,900	4,230,170	4,718,160	3,490,050	5,921,160	2,616,100	33,824,540	0.614	0.180
1993	20,226,700	8,694,620	2,544,310	2,686,800	1,987,440	4,867,210	41,007,080	0.599	0.237
1994	3,482,150	13,340,400	4,874,660	1,334,570	1,409,310	3,609,890	28,050,980	0.562	0.229
1995	12,695,600	2,300,320	7,494,800	2,591,300	709,437	2,680,070	28,471,527	0.577	0.250
1996	14,385,300	8,281,270	1,247,280	3,837,020	1,326,640	1,745,440	30,822,950	0.544	0.330
1997	1,606,730	9,032,680	4,055,700	560,141	1,723,170	1,387,050	18,365,471	0.524	0.277
1998	14,833,000	1,037,150	4,762,100	2,003,810	276,751	1,542,160	24,454,971	0.547	0.342
1999	6,994,440	9,198,160	491,458	2,045,760	860,819	788,026	20,378,663	0.549	0.293
2000	5,564,310	4,468,230	4,711,610	235,134	978,773	792,220	16,750,277	0.534	0.304
2001	16,415,300	3,536,710	2,260,360	2,207,610	110,171	833,076	25,363,227	0.618	0.234
2002	1,993,450	10,841,900	1,993,650	1,184,570	1,156,930	496,543	17,667,043	0.627	0.144
2003	15,554,300	1,370,550	6,803,060	1,199,640	712,794	995,824	26,636,168	0.641	0.167
2004	565,203	10,581,200	835,226	3,959,550	698,221	996,646	17,636,046	0.652	0.103
2005	51,389,900	395,354	6,953,200	533,178	2,527,630	1,083,210	62,882,472		0.171
2006	4,595,855	34,830,540	237,674	4,048,939	310,478	2,105,822	46,129,309		

Table 9. Data used to estimate the abundance of age 2 walleye by simple linear regression where Y=ADMB AGE 2 and X=Pooled ON-OH YOY Trawl. Values in bold are regression estimates and used for RAH projections 2006-2007, respectively. Regression statistics are given at the bottom of the page.

Year Class	Year of Recruitment to Fisheries	Pooled ON and OH YOY Trawl	LN Pooled ON and OH YOY Trawl	ADMB Estimated Age 2 walleye (millions)	LN Estimated Age 2 walleye (millions)
1987	1989	9.22	2.221050	14.168	2.650972
1988	1990	20.70	3.030037	11.068	2.404040
1989	1991	5.60	1.722767	6.155	1.817188
1990	1992	47.03	3.850722	12.849	2.553258
1991	1993	68.02	4.219831	20.227	3.007004
1992	1994	4.64	1.534714	3.482	1.247650
1993	1995	97.78	4.582730	12.696	2.541255
1994	1996	62.15	4.129615	14.385	2.666207
1995	1997	2.67	0.980954	1.607	0.474201
1996	1998	93.13	4.533964	14.833	2.696854
1997	1999	24.75	3.208825	6.994	1.945116
1998	2000	13.67	2.615130	5.564	1.716373
1999	2001	58.14	4.062785	16.415	2.798214
2000	2002	3.19	1.161274	1.993	0.689867
2001	2003	31.16	3.439264	15.554	2.744337
2002	2004	0.17	-1.748700	0.565	-0.570570
2003	2005	204.02	5.318223	51.390	
2004	2006	6.96	1.940453	**4.596** [1]	
2005	2007	10.71	2.371551	**5.846** [2]	

[1]This regression estimate was used for 2006 age 2 projection.
[2]This regression estimate was used for 2007 age 2 projection.

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

$$Y = 0.5583\ (0.0608)\ X + 0.4418\ (0.1931)$$

with n=16, F=84.4, p<0.0001 and an r^2=0.86. Both parameters were transformed by natural logarithm (LN).

Table 10. Estimated harvest of Lake Erie walleye for 2006 and projections for 2007 and 2008. Fishing mortality for the fully-selected age groups is derived from the regression equation described in the Harvest Policy section of this report. Abundance of age 2 and older walleye is from ADMB catch-age results and trawl regressions. Stock size and catch in numbers are in millions of fish.

	2006 Stock Size (millions)		Rate Functions					2006 RAH (millions of fish)	2007 Stock Size (millions)
Age	**Mean**	**F**	**s(age)**	**(F)**	**(Z)**	**(S)**	**(u)**	**Mean**	**Mean**
2	4.596		0.312	0.109	0.429	0.651	0.089	0.408	5.846
3	34.831		0.856	0.300	0.620	0.538	0.223	7.778	2.992
4	0.238		1.000	0.350	0.670	0.512	0.255	0.061	18.744
5	4.049		1.000	0.350	0.670	0.512	0.255	1.033	0.122
6	0.310		1.000	0.350	0.670	0.512	0.255	0.079	2.072
7+	2.106		0.977	0.342	0.662	0.516	0.250	0.527	1.245
Total	46.129	0.350					0.214	9.886	31.022
(3+)	41.533								25.175

	2007 Stock Size (millions)		Rate Functions					Projected 2007 RAH (millions of fish)	Projected 2008 Stock Size (3+ millions)
Age	**Mean**	**F**	**s(age)**	**(F)**	**(Z)**	**(S)**	**(u)**	**Mean**	**Mean**
2	5.846		0.312	0.088	0.408	0.665	0.072	0.424	*
3	2.992		0.856	0.242	0.562	0.570	0.185	0.554	3.887
4	18.744		1.000	0.283	0.603	0.547	0.213	3.984	1.705
5	0.122		1.000	0.283	0.603	0.547	0.213	0.026	10.256
6	2.072		1.000	0.283	0.603	0.547	0.213	0.440	0.067
7+	1.245		0.977	0.276	0.596	0.551	0.208	0.259	1.819
Total	31.022	0.283					0.183	5.687	*
(3+)	25.175								17.734

* No estimate of the 2006 year class recruiting in 2008 is available.

Table 11. East basin walleye ADMB catch-age model results in numbers of fish (a), and biomass (b) by age, based on PA, NY and ONT Units 4 and 5 data; M=0.16.

(a)

	Age										
Number	2	3	4	5	6	7	8	9	10	11+	Total
1993	236,589	369,881	153,890	236,034	36,471	178,569	92,925	134,380	20,309	60,390	1,519,437
1994	92,309	201,277	308,656	113,672	168,633	26,056	127,578	66,390	96,007	58,224	1,258,803
1995	308,758	78,452	164,615	190,857	68,555	101,702	15,714	76,942	40,039	94,190	1,139,825
1996	511,546	262,498	65,411	126,273	135,418	48,642	72,160	11,150	54,592	95,640	1,383,330
1997	43,113	434,081	213,389	41,934	72,397	77,641	27,888	41,372	6,393	87,411	1,045,618
1998	262,925	36,670	361,088	153,786	29,174	50,368	54,016	19,403	28,784	66,220	1,062,434
1999	92,833	223,589	30,437	257,072	105,026	19,924	34,398	36,889	13,251	65,635	879,053
2000	378,256	78,879	184,718	21,693	168,830	68,975	13,085	22,591	24,227	52,399	1,013,653
2001	291,565	321,163	64,107	113,193	12,410	96,583	39,458	7,485	12,923	44,774	1,003,661
2002	63,944	247,805	264,252	42,623	71,828	7,875	61,288	25,039	4,750	37,290	826,693
2003	470,503	54,391	206,373	192,693	29,943	50,460	5,532	43,056	17,590	29,910	1,100,450
2004	5,886	400,075	44,917	138,818	126,086	19,593	33,018	3,620	28,173	31,548	831,733
2005	16,047,500	5,011	336,820	35,201	106,841	97,042	15,080	25,412	2,786	46,154	16,717,846

(b)

Biomass	Age										
(kgs)	2	3	4	5	6	7	8	9	10	11+	Total
1993	135,093	396,512	165,432	347,206	59,958	404,281	220,511	398,706	67,344	210,155	2,405,198
1994	63,324	211,140	383,042	217,342	446,709	59,356	345,736	192,928	288,886	202,621	2,411,084
1995	213,660	83,787	218,114	371,218	122,508	209,303	44,990	235,442	120,478	318,645	1,938,145
1996	326,878	244,124	103,742	228,553	269,888	100,105	186,318	32,401	164,267	332,826	1,989,102
1997	27,549	403,695	338,435	75,900	144,288	159,785	72,008	120,228	19,235	304,189	1,665,312
1998	168,009	34,104	572,685	278,353	58,144	103,658	139,470	56,384	86,610	230,445	1,727,861
1999	80,300	241,700	50,251	504,632	211,626	42,398	90,777	101,630	33,683	215,347	1,572,344
2000	273,101	105,067	288,160	36,661	352,349	158,918	33,105	73,601	69,265	162,962	1,553,188
2001	201,180	364,841	91,416	216,991	19,818	205,238	125,162	22,703	42,298	147,486	1,437,134
2002	35,937	305,543	374,446	75,357	150,408	15,380	152,974	70,810	12,497	122,237	1,315,588
2003	328,411	76,637	317,608	299,830	55,903	126,352	15,534	101,998	42,832	88,771	1,453,877
2004	3,950	466,888	56,999	266,531	266,546	44,045	82,182	9,086	69,333	78,366	1,343,925
2005	8,874,260	4,986	457,401	65,263	223,618	218,246	39,026	67,495	6,856	120,831	10,077,981

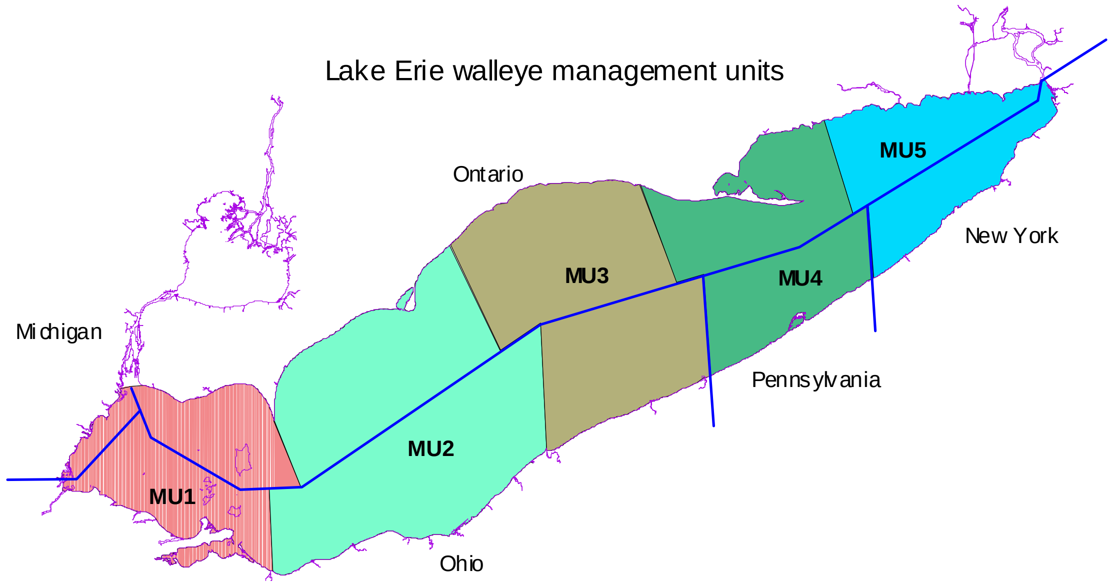

Figure 1. Map of Lake Erie with management units recognized by the Walleye Task Group for interagency management of walleye.

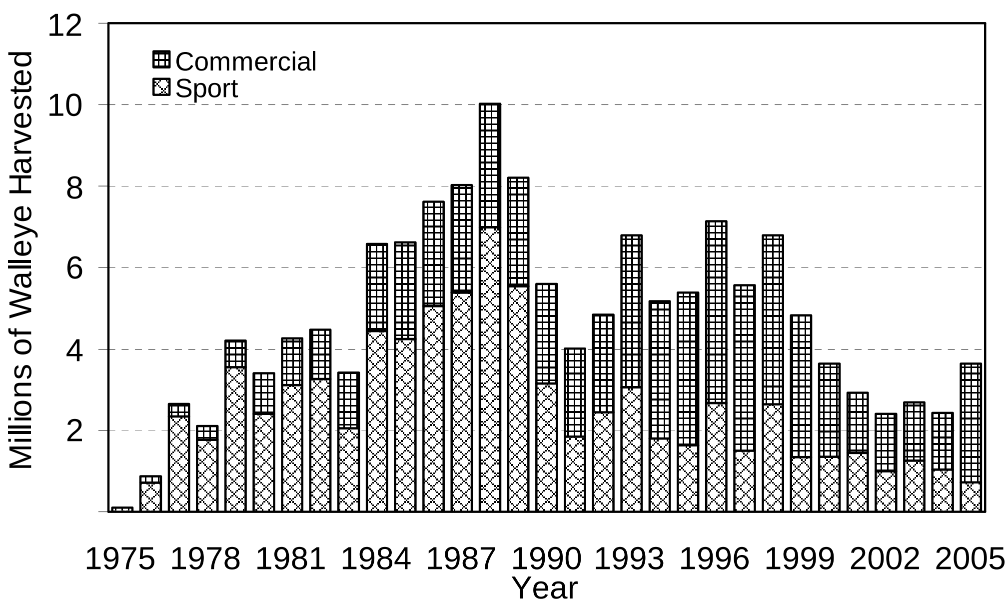

Figure 2. Lakewide harvest of Lake Erie walleye by sport and commercial fisheries, 1975 - 2005.

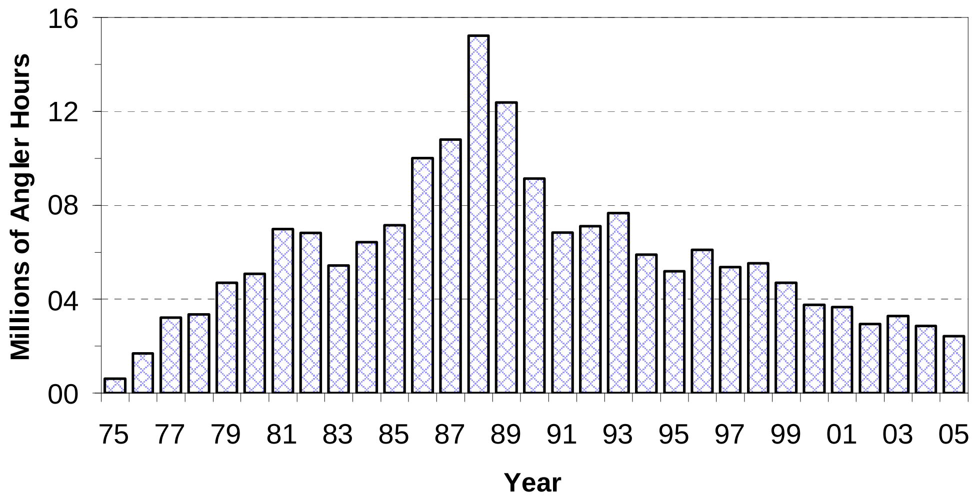

Figure 3. Lakewide total effort (angler hours) by sport fisheries for Lake Erie walleye, 1975 – 2005 (1999-2005 excludes Ontario sport effort).

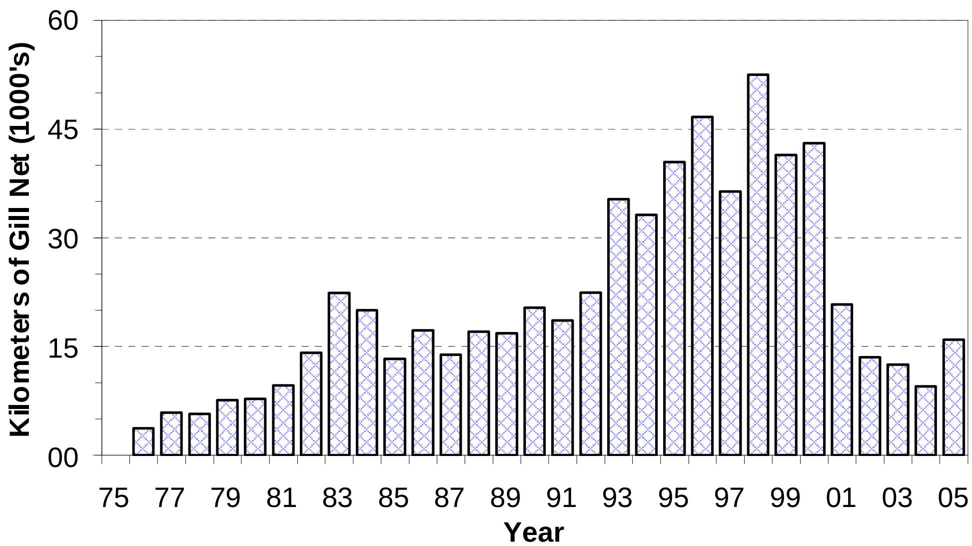

Figure 4. Lakewide total effort (kilometers of gill net) by commercial fisheries for Lake Erie walleye, 1975-2005.

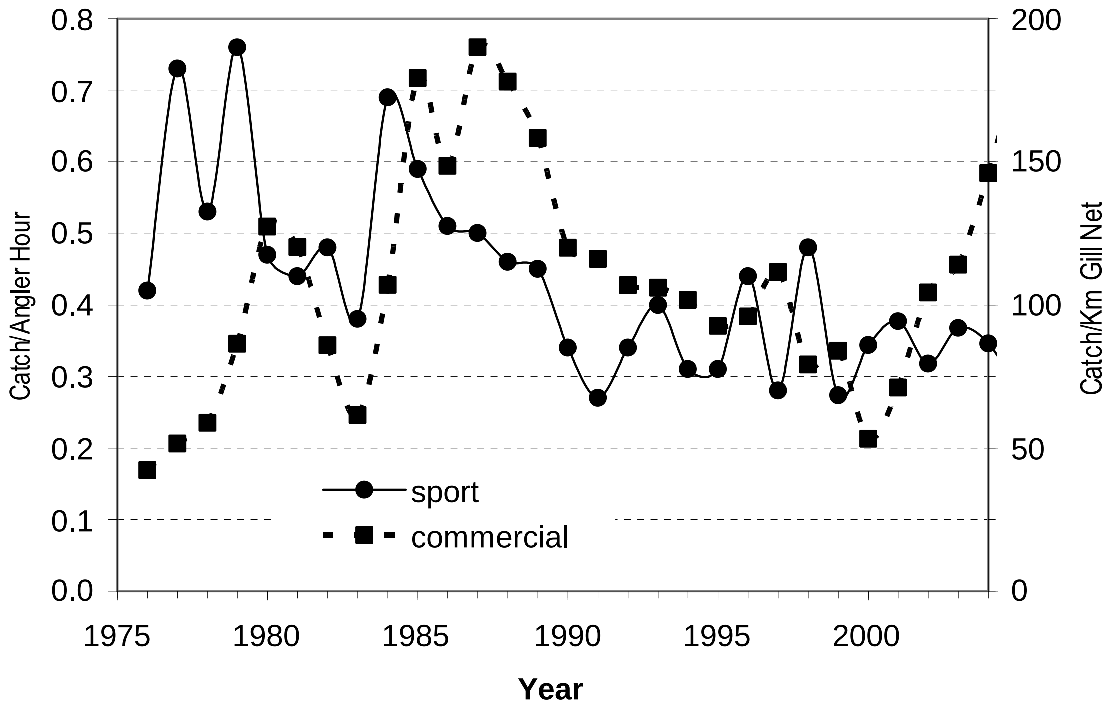

Figure 5. Lakewide CUE for Lake Erie sport and commercial walleye fisheries, 1975-2005.

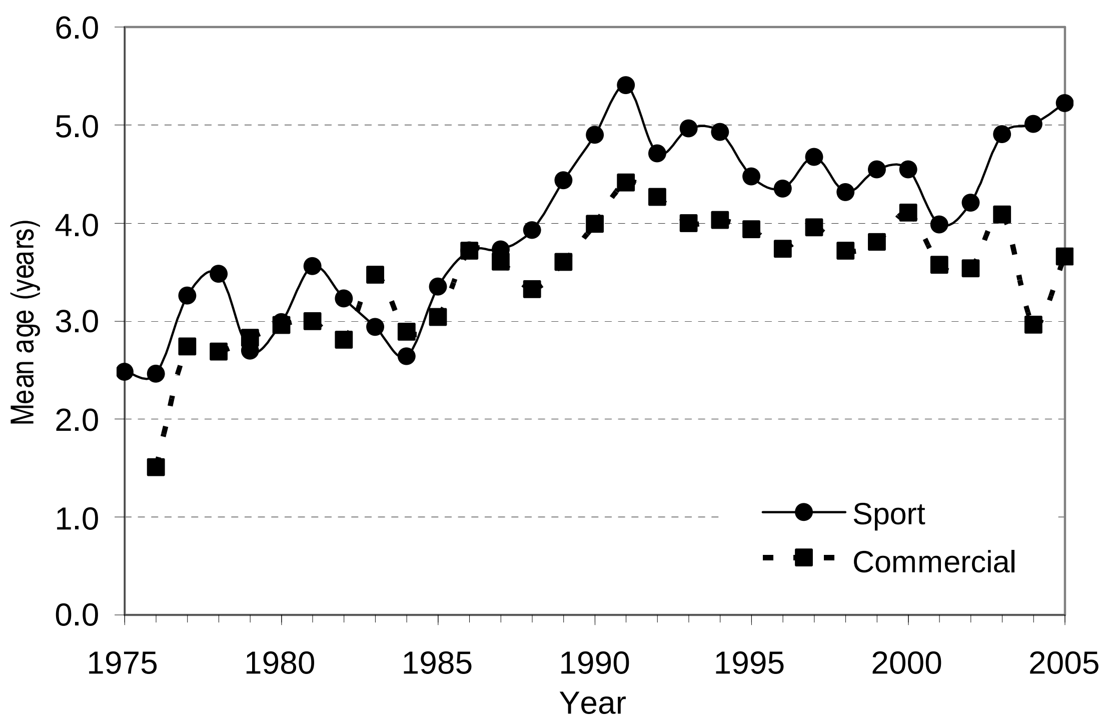

Figure 6. Lakewide mean age of Lake Erie walleye in sport and commercial harvests, 1975-2005.

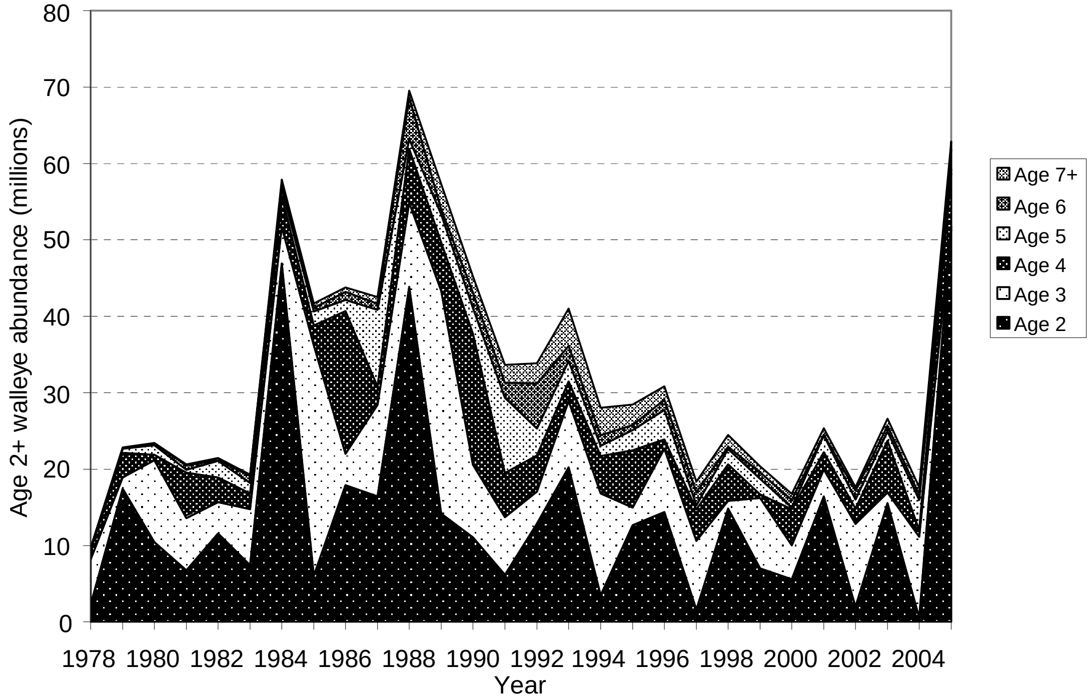

Figure 7. Age class composition of Lake Erie walleye 1978-2005. Data are from Table 8 in this document.

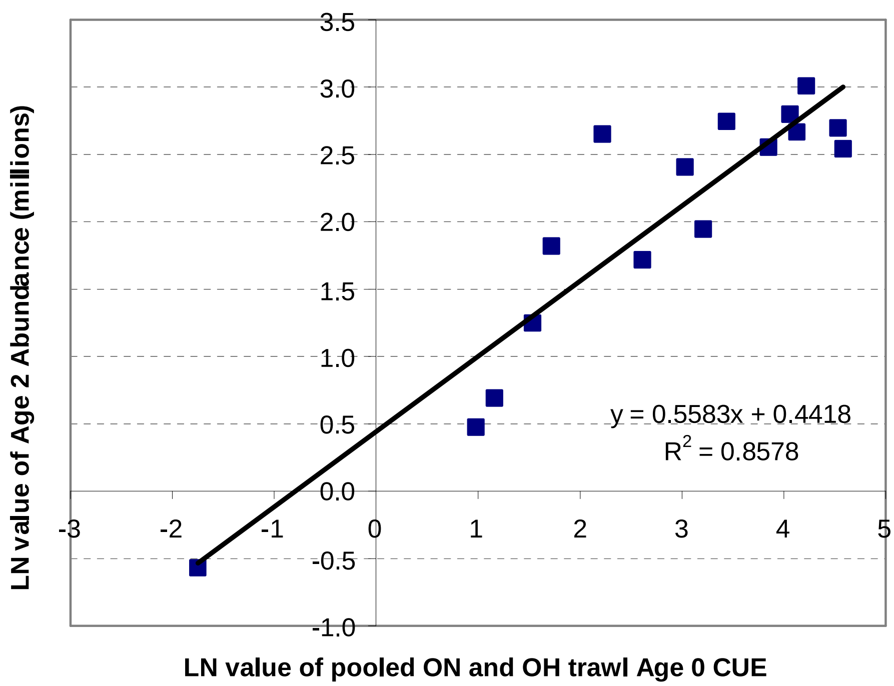

Figure 8. Regression estimates of abundance for age-2 Lake Erie walleye using natural logarithm transformed ADMB 2006 model catch-at-age estimates (y) and pooled Ontario and Ohio young-of-the-year trawl indices (x).

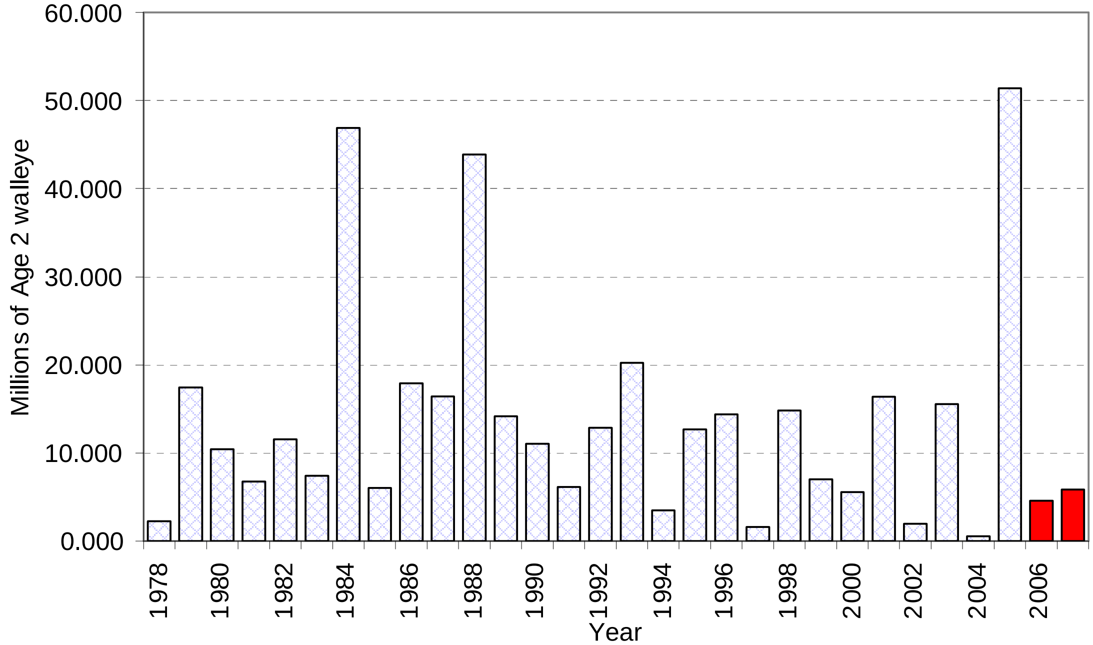

Figure 9. Catch-at-age estimates of age-2 Lake Erie walleye for 1978 to 2005. Estimates for 2006-2007 are from the regression of YOY index and numbers of age-2 from catch-at-age analysis (see Table 9).

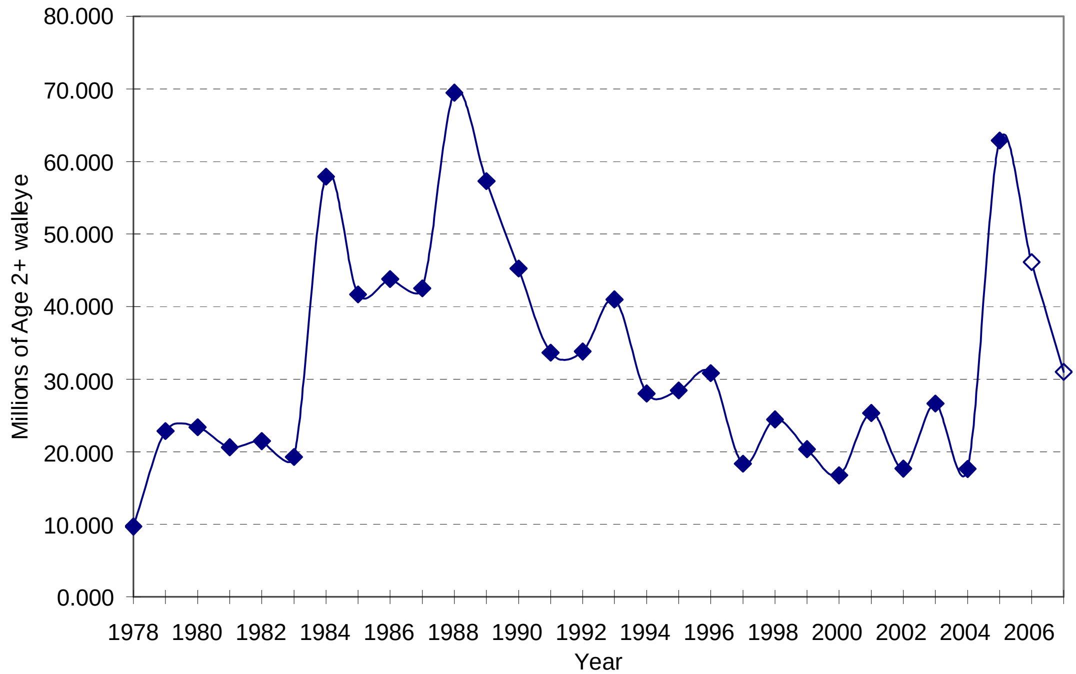

Figure 10. Abundance of Lake Erie walleye from 1978-2005, forecasting two additional years of population abundance.

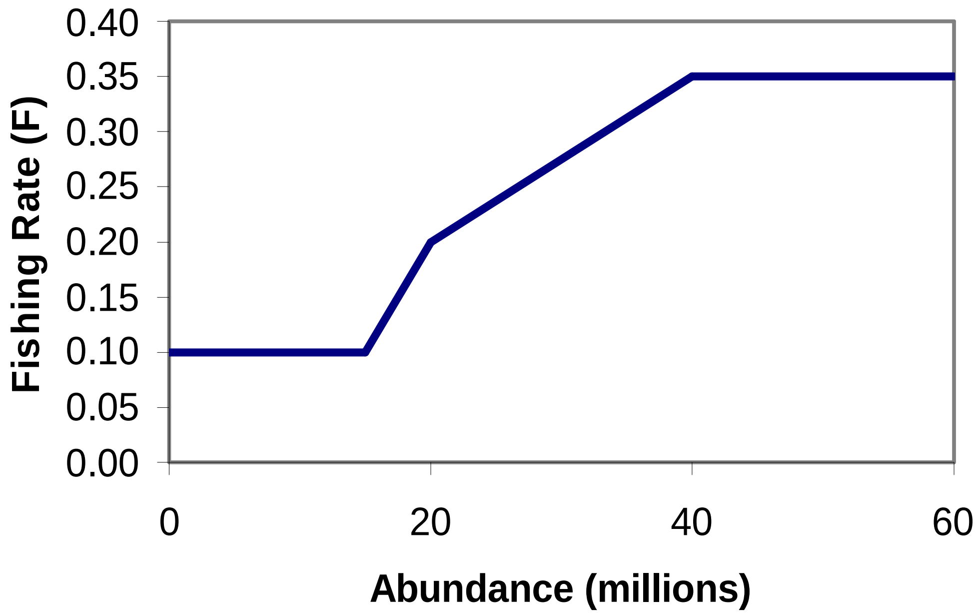

Figure 11. Lake Erie walleye harvest policy for age-2 and older walleye: below 15 million fish, F=0.1; between 15 and 20 million fish, F= 0.02(N)-0.02 (N is abundance in millions of fish); between 20 and 40 million fish, F= 0.0075(N)+0.05; and at 40 million fish and above, F=0.35.