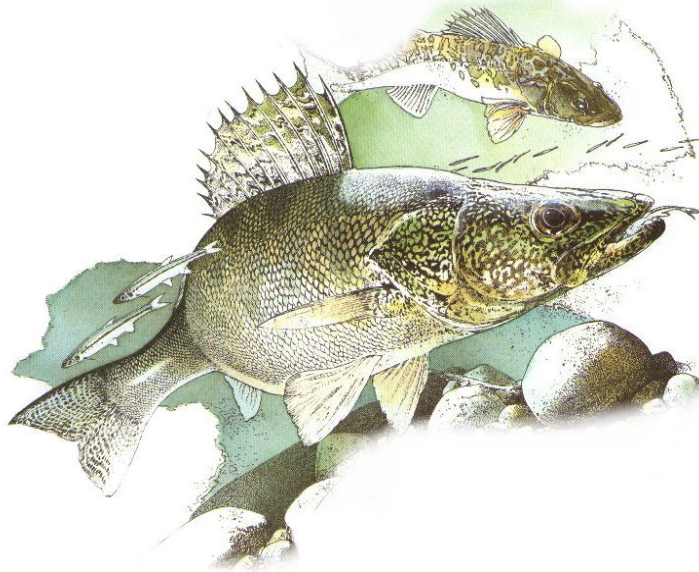


**Report for 2006 by the
LAKE ERIE WALLEYE TASK GROUP**

March 2007



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

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Charges to the WTG from the STC, 2006-2007

The charges from the Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period from March 2006 to February 2007 were to:

1. Maintain and update centralized database for population modeling; including tagging, fishing harvest and effort by grid, growth, maturity, and abundance indices. Continue development of eastern basin catch-at-age analysis for walleye.
2. Report recommended allowable harvest (RAH) level for 2007.
3. Review different methods for calculation of lambdas for use in catch-at-age analyses; implement the most defensible method for weighting data sources used in analysis.

Review of Walleye Fisheries in 2006

Fishery effort and walleye harvest data were combined for all jurisdictions and Management Units (Figure 1) to produce lake-wide estimates. The 2006 total estimated lake-wide harvest of walleye was 5.926 million fish (Tables 1 and 2) with a total of 5.669 million fish harvested in the TAC area. This harvest represents 57% of the 2006 total allowable catch (TAC) of 9.886 million walleye and includes walleye harvested in commercial and sport fisheries in Management Units 1, 2 and 3. An additional 257,549 fish were harvested outside of the TAC area in Management Units 4 and 5. The sport fish harvest of 2.392 million fish is considered average for the time series and represents a significant increase from 2005 harvest levels. This significant increase can be attributed by the dominance of age-3 walleye no longer restricted to the sport fisheries by Michigan Department of Natural Resources (MDNR) and the Ohio Department of Natural Resources (ODNR) 15" minimum size limit (Table 2, Figure 2). The 2006 Ontario harvest was approximately 3.532 million fish (Table 2, Figure 2), taken mainly in the commercial fishery, and was 82% of the Ontario TAC allocation of 4.281 million walleye. The commercial harvest was the highest since the Coordinated Percid Management Strategy (CPMS) implemented during 2001-2003 and was comparable to harvest levels observed in 1999 (LEC 2004, Table 2, Figure 2).

Sport effort increased 57% in 2006 from 2005, to a total 3.9 million angler hours (Table 3, Figure 3). Compared to 2005, Management Unit 1 experienced a 68% increase in effort, while Management Unit 2 effort increased 57%, and Management Units 4 and 5 (combined) saw an increase of 50%. Management Unit 3 was unchanged from 2005 (Table 3, Figure 3). Lakewide commercial gill net effort decreased by 11% to 14,107 kilometers of net in 2006 (Table 3, Figure 4).

In general, harvest-per-unit-effort (HUE, walleye/angler hour) increased across the lake to levels not seen since 1984. Sport HUE were among the highest ever recorded and HUE in all management units increased from a total of 0.28 walleye/angler hour in 2005

to 0.61 walleye/angler hour in 2006. The lakewide average sport catch rate of 0.61 fish/hour is 43% higher than 1975-2006 mean of 0.43 fish/hour (Table 4, Figure 5).

Total commercial gill net CUE was the highest on record (all management units combined) with an increase of 37% to 250 walleye/kilometer of net in 2006. Gill net catch rates were above the 1975-2006 average for all Management Units. This marks the sixth 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).

Fishing success was largely based on the strong 2003 year-class (age-3 walleye) as evidenced by the age composition in the harvest. Age-3 walleye comprised 76% of the total sport fishery harvest and 89% of the total commercial fishery harvest (Tables 5 and 6). Unlike previous years where older fish (age-7+) made up a larger proportion of the harvest in eastern Management Units 3, 4 and 5 relative to western Management Units 1 and 2, the strength of the 2003 (age-3) walleye dominated the harvest across the entire lake.

The 2001 year-class (age-5 walleye) represented 9% of the total harvest for the sport fishery and 5% of the commercial fishery. Age-7+ walleye contributed 10% to the sport fishery but only 3% to the commercial fishery (Tables 5 and 6). Lakewide the 1999, 2001, and 2003 year-classes contributed 6%, 7% and 84%, respectively, to the total harvest.

Across all jurisdictions, the mean age of walleye in the harvest in the sport fishery ranged from 3.24 to 6.38 years old and from 3.19 to 4.82 years old in Ontario's commercial fishery (Table 7, Figure 6). The mean age of fish decreased in both the sport and commercial fisheries from 2005 values. The mean age in the sport fishery was 3.85 years, similar to the long-term mean of 4.00 years (1975-2006). In the commercial fishery, the mean age was 3.26 years which was slightly lower than the long-term (1975 to 2006) mean of 3.46 years.

Walleye Management Plan

The Coordinated Percid Management Strategy (CPMS) was used to manage walleye from 2001-2003 (Lake Erie Committee, 2004). During 2004-2005, the Walleye Management Plan (WMP) was drafted and it includes a strategy to manage walleye from 2005 into the future (Locke et al., 2005). The WMP established quality objectives that the LEC employs as the 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 LEC walleye management 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, the Grand River (Ontario), and New York shoals and tributaries of the eastern basin. Catch-at-age modeling and population

estimates for this eastern population are ongoing, but it is clear that the eastern population is small relative to the western population (Ryan et al. 2003). The eastern Lake Erie walleye population is briefly described in the WMP.

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 recognize the economic and social importance of the walleye fishery to the diverse stakeholders. This exploitation policy does so by joining state of the art population and harvest simulation modeling 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, as are 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

In 2006, the WTG continued to use the Auto Differentiation Model Builder (ADMB) to estimate walleye population abundance (Walleye Task Group, 2001). There were no functional changes in the 2006 run of this model compared to the 2005 model, although updates and refinements will occur throughout 2007. The model includes fishery data from the Ontario commercial fishery (west and central basins) and sport fisheries in Ohio (west and central basins) and Michigan (west basin). In addition to fishery 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, concentrated likelihood objective 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 within a range less than 0.1). While lambdas within similar parameter groups (*i.e.*, effort, catch, and survey) are solved and weighted unequally, the groups themselves are given equal weight. The walleye population in the east basin was modeled separately (see section: “*Eastern Basin Catch-At-Age Analysis*”) but used similar model techniques.

The 2006 population estimate was 39.0 million age-2 and older walleye (Table 8, Figure 7) with approximately 37.3 million age-3+ walleye (Table 8). The very strong 2003 year-class was estimated to contribute approximately 33 million age-3 fish to the population in 2006 (Table 8). Statistical catch at age analysis (SCAA) estimated the abundance of the 2003 year class to be 49.9 million walleye at age 2, which is comparable to the earlier 1982 and 1986 strong year classes (Table 8).

Recruitment Estimator for Incoming Age-2 Walleye and 2007 Population Size Projection

A linear regression model was used to estimate age-2 walleye recruitment for 2007 and 2008. This regression utilized estimates of age-2 walleye abundance from catch-at-age analysis and young-of-year walleye catches from pooled Ontario and Ohio trawling (Tables 8 and 9, Figure 8). As in the past, the most recent (2006) age-2 estimate from catch-at-age analysis has the widest error bounds, and therefore this value was not used in the linear regression to estimate recruitment. Recent cohort strength appears below average based on YOY trawl surveys in 2005 and even more so for 2006. The 2005 year-class is larger than the 2004 year class, but it is expected to contribute only 5.6 million age-2 fish to the 2007 population (Table 9, Figure 9).

The stock size estimate for 2007 was projected using catch-at-age analysis estimates of the 2006 population size, estimated survival rates in 2006, and the age-2 recruitment estimate for 2007 (Table 8). The 2007 estimated abundance of age-2 and older walleye is approximately 29.9 million (Table 8, Figure 10). The 2003 year-class will make up approximately 68% (20 million) of the population in 2007

This 2003 cohort will comprise the majority (88%) of the projected abundance of age-4 and older spawners in 2007; estimated at approximately 23.1 million walleye (Table 8). As a result, walleye spawner abundance will be the highest estimated for the time period (1978-2006). However, the spawner/recruit relationship for Lake Erie walleye is weak. In fact, two of the strongest Lake Erie walleye year-classes (1982 and 2003) were produced during years of lower spawner abundance.

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 targeted fishing mortality rate with population abundance (Figure 11). The policy stipulates that when the walleye abundance is 25-40 million walleye, the targeted fishing mortality rate should be between $F=0.2$ and $F=0.35$ (Locke et al., 2005). Based on this harvest policy and the estimated abundance of 29.9 million walleye in 2007 and $F=0.274$, the recommended allowable harvest (RAH) for 2007 is 5.36 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. Growth and relative abundance data from the interagency trawl program in the western basin are stored in databases managed jointly by ODNR and OMNR. Use of WTG databases by non-members is permitted following protocol established in the 1994 WTG Report and reprinted in the 2003 WTG Report (Walleye Task Group, 2003).

Review of Lambda Weightings

In 2001, the Walleye Task Group (WTG) replaced the use of CAGEAN software with Auto Differentiation Model Builder software (ADMB) as the tool of choice for statistical catch at age estimation. Rationale for adopting ADMB software for estimating walleye abundance included greater flexibility with data and the ability to include auxiliary data series in the model to estimate population size. Inclusion of auxiliary survey gear in the modeling framework has been shown to provide less biased estimates of abundance, as opposed to strictly modeling fishery-dependent data. Most agencies have extensive fishery independent surveys that are administered annually to collect relative catch-at-age information on walleye, as well as for quantification of population parameters (STC, 2007).

When modeling catch-at-age data in ADMB, it is necessary to include a data weighting factor (λ) for each data series included in the model. These weighting factors essentially represent the confidence we have in the datasets relative to the true population trends, and allow for each data series to affect the outcome of the population model based upon this confidence (STC, 2007).

Traditionally, the WTG have calculated catch, effort, and survey catch-per-unit-effort (CPUE) data weighting factors by the variance ratio method as suggested by Deriso et al. 1985. After further review (Wright et al. 2005) and discussion within the task group, external reviewers (Myers and Bence 2001), the LEC and task group recommended that the method used by the WTG to calculate lambda weighting values be re-evaluated (STC, 2007).

In response to this charge, representatives from the WTG, YPTG, and STC arranged for a workshop to be conducted by Michigan State University's Quantitative Fisheries Center (QFC) to explore what we are doing when we weight various data sources and develop the most defensible process for weighting each data sources. At the workshop, it was decided that lambda values for fishery harvest and survey catch rates should be based upon how well harvest, effort and abundance are measured. The data sources would be weighted based on the observed variability in the data sources themselves. As such, all lambda values would be pre-specified prior to population model runs. This process continues to be evaluated by the WTG. A number of additional recommendations emerged from the workshop which may improve the fit of the model;

including the use of variance to derive fishery catch and survey lambdas, as well as alternative model configurations related to selectivity and catchability of fishery and survey data (STC, 2007). While significant progress has been made on this charge, the Walleye Task Group members need more time to pursue issues that were raised at the workshop and improve model fit and performance compared to model inputs. In 2007 the WTG will continue to work with Michigan State University's Quantitative Fisheries Center in order to make improvements to the ADMB walleye catch-at-age model.

Eastern Basin Catch-At-Age Analysis

The WTG has been developing an ADMB catch-at-age model for eastern Lake Erie's walleye resource. This developing stock assessment model incorporates walleye harvest-at-age and fishing effort values from Ontario commercial gill nets, New York and Pennsylvania sport fisheries, and 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 2006 estimate of walleye abundance in the eastern basin model is 9.3 million walleye. The east basin model output also estimates that 93% of the east basin abundance is age-3 (2003 year class) walleye; 24 times larger than the next largest age-3 cohort in this series. This estimate of the 2003 year class is substantially larger than what was measured in the NYSDEC survey index estimate in eastern Lake Erie. This may be a reflection of the fact that the model does not quantify walleye movement into the east basin from west basin stocks. Selectivity of age 3s in the model is also low (~0.1) which can give rise to the wide standard error ($\pm 62\%$) for the estimated abundance of that 2003 cohort. Future model runs should reduce that variation as they gain greater selectivity. The WTG will continue to explore model development for the east basin, but as of yet it is not a functional stock assessment model.

Tagging

One remaining ongoing research initiative is the Assessment of PIT tags for estimating exploitation of walleye in Lake Erie and Saginaw Bay, Lake Huron. During the spring of 2006, walleye in Lake Erie and Lake Huron were tagged with PIT (passive integrated transponder) tags and jaw tags. Approximately 15,478 walleye were tagged, of which

7,285 were tagged with both PIT and jaw tags. 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. Approximately 118,644 walleye harvested from Lake Erie in 2006 were scanned; resulting in 54 PIT tags encountered. PIT tagging is scheduled to continue during the spring of 2007 with scanning to follow throughout the year by all agencies.

Acknowledgements

The WTG would like to express its appreciation for support during the past year from the Great Lakes Fishery Commission which continued to disperse reward tag payments.

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Table 1. Lake Erie walleye total allowable catch (TAC; top) and measured harvest (Har; bottom, bold), in numbers of fish, from 1980 to 2006. New York and Pennsylvania do not have assigned quotas but are included in the annual total harvest.

Year	TAC Area (MU-1, MU-2, MU-3)				Non TAC Area (MU-4)				All Areas Total
	Michigan	Ohio	Ontario ^a	Total	NY	Penn.	Ontario	Total	
1980 TAC	261,700	1,558,600	1,154,100	2,974,400				0	2,974,400
Har	183,140	2,169,800	1,049,269	3,402,209				0	3,402,209
1981 TAC	367,400	2,187,900	1,620,000	4,175,300				0	4,175,300
Har	95,147	2,942,900	1,229,017	4,267,064				0	4,267,064
1982 TAC	504,100	3,001,700	2,222,700	5,728,500				0	5,728,500
Har	194,407	3,015,400	1,260,852	4,470,659				0	4,470,659
1983 TAC	572,000	3,406,000	2,522,000	6,500,000				0	6,500,000
Har	145,847	1,864,200	1,416,101	3,426,148				0	3,426,148
1984 TAC	676,500	4,028,400	2,982,900	7,687,800				0	7,687,800
Har	351,169	4,055,000	2,178,409	6,584,578				0	6,584,578
1985 TAC	430,700	2,564,400	1,898,800	4,893,900				0	4,893,900
Har	460,933	3,730,100	2,435,627	6,626,660				0	6,626,660
1986 TAC	660,000	3,930,000	2,910,000	7,500,000				0	7,500,000
Har	605,600	4,399,400	2,617,507	7,622,507				0	7,622,507
1987 TAC	490,100	2,918,500	2,161,100	5,569,700				0	5,569,700
Har	902,500	4,433,600	2,688,558	8,024,658				0	8,024,658
1988 TAC	397,500	3,855,000	3,247,500	7,500,000				0	7,500,000
Har	1,996,788	4,890,367	3,054,402	9,941,557	85,282			85,282	10,026,839
1989 TAC	383,000	3,710,000	3,125,000	7,218,000				0	7,218,000
Har	1,091,641	4,191,711	2,793,051	8,076,403	129,226			129,226	8,205,629
1990 TAC	616,000	3,475,500	2,908,500	7,000,000				0	7,000,000
Har	747,128	2,282,520	2,517,922	5,547,570	47,443			47,443	5,595,013
1991 TAC	440,000	2,485,000	2,075,000	5,000,000				0	5,000,000
Har	132,118	1,577,813	2,266,380	3,976,311	34,137			34,137	4,010,448
1992 TAC	329,000	3,187,000	2,685,000	6,201,000				0	6,201,000
Har	249,518	2,081,919	2,497,705	4,829,142	14,384			14,384	4,843,526
1993 TAC	556,500	5,397,000	4,546,500	10,500,000				0	10,500,000
Har	270,376	2,668,684	3,821,386	6,760,446	40,032			40,032	6,800,478
1994 TAC	400,000	4,100,000	3,500,000	8,000,000				0	8,000,000
Har	216,038	1,468,739	3,431,119	5,115,896	59,345			59,345	5,175,241
1995 TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
Har	107,909	1,435,188	3,813,527	5,356,624	26,964			26,964	5,383,588
1996 TAC	583,000	5,654,000	4,763,000	11,000,000				0	11,000,000
Har	174,607	2,316,425	4,524,639	7,015,671	38,728	89,087		127,815	7,143,486
1997 TAC	514,000	4,986,000	4,200,000	9,700,000				0	9,700,000
Har	122,400	1,248,846	4,072,779	5,444,025	29,395	88,682		118,077	5,562,102
1998 TAC	546,000	5,294,000	4,460,000	10,300,000				0	10,300,000
Har	114,606	2,303,911	4,173,042	6,591,559	34,090	124,814	47,000	205,904	6,797,463
1999 TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
Har	140,269	1,033,733	3,454,250	4,628,252	23,133	89,038	87,000	199,171	4,827,423
2000 TAC	408,100	3,957,800	3,334,100	7,700,000				0	7,700,000
Har	252,280	932,297	2,287,533	3,472,110	28,599	77,512	67,000	173,111	3,645,221
2001 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	159,186	1,157,914	1,498,816	2,815,916	14,669	52,796	39,498	106,963	2,922,879
2002 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	193,515	703,000	1,436,000	2,332,515	18,377	22,000	36,000	76,377	2,408,892
2003 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	128,852	1,014,688	1,457,014	2,600,554	27,480	43,581	32,692	103,753	2,704,307
2004 TAC	127,200	1,233,600	1,039,200	2,400,000				0	2,400,000
Har	114,958	859,366	1,419,237	2,393,561	8,400	19,969	29,864	58,233	2,451,794
2005 TAC	308,195	2,988,910	2,517,895	5,815,000				0	5,815,000
Har	37,599	610,449	2,933,393	3,581,441	27,370	20,316	17,394	65,080	3,646,521
2006 TAC	523,958	5,081,404	4,280,638	9,886,000				0	9,886,000
Har	305,548	1,868,520	3,494,551	5,668,619	37,161	151,614	68,774	257,549	5,926,168

^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.

Year	Sport Fishery														Commercial Fishery					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5				Total	Unit 1	Unit 2	Unit 3	Unit 4	Total
OH	MI	ON ^a	Total	OH	ON ^a	Total	OH	ON ^a	Total	ON ^a	PA	NY	Total	ON		ON	ON	ON		
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	6,990	1,866	762	409	--	3,037	
1989	2,891	1,092	14	3,997	867	35	902	434	80	514	--	--	129	5,542	1,656	621	386	--	2,663	
1990	1,467	747	35	2,249	389	14	403	426	23	449	--	--	47	3,148	1,615	529	302	--	2,446	
1991	1,104	132	39	1,275	216	24	240	258	44	302	--	--	34	1,851	1,446	440	274	--	2,160	
1992	1,479	250	20	1,749	338	56	394	265	25	290	--	--	14	2,447	1,547	534	316	--	2,397	
1993	1,846	270	37	2,153	450	26	476	372	12	384	--	--	40	3,053	2,488	762	496	--	3,746	
1994	992	216	21	1,229	291	20	311	186	21	207	--	--	59	1,806	2,307	630	432	--	3,369	
1995	1,161	108	32	1,301	159	7	166	115	27	141	--	--	27	1,635	2,578	681	489	--	3,748	
1996	1,442	175	17	1,634	645	8	653	229	27	256	--	89	39	2,671	2,777	1,107	589	--	4,473	
1997	929	122	8	1,059	188	2	190	132	5	138	--	89	29	1,505	2,585	928	544	--	4,057	
1998	1,790	115	34	1,939	215	5	220	299	5	304	19	125	34	2,641	2,497	1,166	462	28	4,153	
1999	812	140	34	986	139	5	144	83	5	88	19	89	23	1,349	2,461	631	317	68	3,477	
2000	674	252	34	961	165	5	170	93	5	98	19	78	29	1,354	1,603	444	196	48	2,291	
2001	941	160	34	1,135	171	5	176	46	5	51	19	53	15	1,449	1,004	310	141	20	1,475	
2002	516	194	34	744	141	5	146	46	5	51	19	22	18	1,000	937	309	146	17	1,409	
2003	715	129	34	878	232	5	237	68	5	73	2	44	27	1,261	948	283	182	14	1,427	
2004	515	115	34	664	272	2	274	72	0	72	2	20	8	1,040	866	334	175	11	1,386	
2005	374	38	27	438	110	2	112	126	0	126	2	20	27	725	1,878	625	401	15	2,920	
2006	1194	306	27	1,526	503	2	505	170	0	170	2	152	37	2,392	2,137	784	545	66	3,532	
Mean	1,740	308	40	2,088	272	13	279	173	16	184	11	71	38	50	2,572	1,525	469	307	32	2,190

^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.

Year	Sport Fishery ^a														Commercial Fishery ^b					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5				Total	Unit 1	Unit 2	Unit 3	Unit 4	Total
	OH	MI	ON ^c	Total	OH	ON ^c	Total	OH	ON ^c	Total	ON ^c	PA	NY	Total		ON	ON	ON	ON	
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	9,493
2005	1,180	212	40	1,392	573	--	573	261	--	261	--	109	142	251	2,477	7,083	4,174	4,503	174	15,934
2006	1,757	587	--	2,344	899	--	899	260	--	260	--	239	137	376	3,879	5,689	4,008	3,589	822	14,107
Mean	3,439	809	104	4328	787	60	807	457	114	503	124	246	269	252	5825	10,210	6,225	5,217	748	21,030

^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 harvest per unit effort for Lake Erie walleye by gear, management unit, and agency.

Year	Sport Fishery ^a														Commercial Fishery ^b					
	Unit 1				Unit 2			Unit 3			Unit 4 & 5				Total	Unit 1	Unit 2	Unit 3	Unit 4	Total
OH	MI	ON ^c	Total	OH	ON ^c	Total	OH	ON ^c	Total	ON ^c	PA	NY	Total	ON		ON	ON	ON		
1975	0.16	0.13	0.16	0.16	0.17	--	0.17	--	--	--	--	--	--	0.16	--	--	--	--	--	
1976	0.45	0.36	0.50	0.45	0.22	--	0.22	--	--	--	--	--	--	0.42	63.0	22.9	--	--	42.2	
1977	0.77	0.62	0.53	0.75	0.24	--	0.24	--	--	--	--	--	--	0.73	54.9	42.6	--	--	51.6	
1978	0.54	0.41	0.76	0.54	0.24	--	0.24	--	--	--	--	--	--	0.53	52.2	138.2	--	--	58.8	
1979	0.78	0.63	0.81	0.77	0.36	--	0.36	--	--	--	--	--	--	0.76	107.9	16.7	--	--	86.3	
1980	0.53	0.29	0.62	0.50	0.21	--	0.21	0.13	--	0.13	--	--	--	0.47	153.0	25.3	--	--	127.3	
1981	0.50	0.21	0.51	0.48	0.14	--	0.14	0.12	--	0.12	--	--	--	0.44	150.7	55.4	4.9	--	120.1	
1982	0.50	0.43	0.45	0.49	0.22	--	0.22	0.07	--	0.07	--	--	--	0.48	102.2	45.9	2.8	--	85.8	
1983	0.39	0.32	0.34	0.38	0.37	--	0.37	0.20	--	0.20	--	--	--	0.38	100.7	31.2	13.7	--	61.5	
1984	0.76	0.63	0.48	0.74	0.60	--	0.60	0.46	--	0.46	--	--	--	0.69	141.9	65.3	44.4	--	107.0	
1985	0.73	0.50	0.68	0.69	0.27	--	0.27	0.19	--	0.19	--	--	--	0.59	229.6	154.5	75.6	--	179.1	
1986	0.58	0.33	0.49	0.52	0.44	--	0.44	0.33	--	0.33	--	--	--	0.51	211.0	99.0	93.7	--	148.6	
1987	0.57	0.41	0.61	0.53	0.38	--	0.38	0.28	--	0.28	--	--	--	0.50	244.2	146.5	133.1	--	190.0	
1988	0.50	0.46	0.21	0.48	0.35	--	0.35	0.52	--	0.52	--	--	0.18	0.18	0.46	249.0	131.4	108.2	--	177.9
1989	0.55	0.29	0.17	0.44	0.57	0.45	0.56	0.49	0.39	0.47	--	--	0.23	0.23	0.45	211.1	112.7	111.2	--	158.3
1990	0.36	0.41	0.29	0.37	0.23	0.42	0.24	0.49	0.28	0.47	--	--	0.11	0.11	0.34	179.1	90.7	54.5	--	120.0
1991	0.31	0.30	0.27	0.30	0.17	0.30	0.18	0.36	0.28	0.34	--	--	0.08	0.08	0.27	138.8	87.0	87.1	--	116.0
1992	0.37	0.35	0.19	0.37	0.29	0.69	0.32	0.41	0.18	0.37	--	--	0.05	0.05	0.34	163.1	77.3	52.3	--	106.8
1993	0.47	0.39	0.30	0.45	0.33	0.37	0.34	0.35	0.09	0.32	--	--	0.13	0.13	0.40	152.8	65.4	66.8	--	106.0
1994	0.35	0.27	0.17	0.33	0.28	0.31	0.28	0.31	0.16	0.28	--	--	0.17	0.17	0.31	138.2	63.2	66.9	--	101.7
1995	0.36	0.39	0.25	0.36	0.20	0.12	0.19	0.32	0.21	0.29	--	--	0.10	0.10	0.31	125.7	56.2	62.2	--	92.6
1996	0.47	0.34	0.13	0.44	0.57	0.13	0.55	0.46	0.21	0.41	--	0.28	0.15	0.22	0.44	139.0	70.6	53.6	--	95.9
1997	0.34	0.33	0.10	0.33	0.22	0.04	0.21	0.27	0.06	0.24	--	0.23	0.11	0.17	0.28	164.6	80.1	59.8	--	111.5
1998	0.59	0.31	0.33	0.56	0.34	0.10	0.32	0.73	0.08	0.65	0.09	0.32	0.12	0.18	0.48	131.3	60.1	34.8	34.2	79.1
1999	0.34	0.34	--	0.34	0.23	--	0.23	0.26	--	0.26	--	0.22	0.14	0.18	0.27	114.8	57.6	41.6	47.4	83.9
2000	0.34	0.47	--	0.37	0.31	--	0.31	0.33	--	0.33	--	0.32	0.16	0.24	0.34	72.1	40.2	24.8	27.1	53.2
2001	0.48	0.44	--	0.48	0.25	--	0.25	0.18	--	0.18	--	0.22	0.09	0.16	0.38	107.1	54.0	28.1	32.1	71.0
2002	0.37	0.32	--	0.36	0.32	--	0.32	0.19	--	0.19	--	0.17	0.14	0.15	0.32	211.5	73.4	33.0	37.4	104.3
2003	0.42	0.40	--	0.41	0.34	--	0.34	0.29	--	0.29	0.07	0.28	0.17	0.22	0.37	211.8	71.7	48.9	38.4	114.1
2004	0.41	0.23	--	0.36	0.37	0.06	0.37	0.40	--	0.40	--	0.23	0.08	0.16	0.35	223.5	112.2	73.0	45.3	146.0
2005	0.32	0.18	0.67	0.30	0.19	--	0.19	0.48	--	0.48	--	0.18	0.19	0.19	0.28	265.2	149.8	89.1	86.4	183.2
2006	0.68	0.52	--	0.64	0.56	--	0.56	0.65	--	0.65	--	0.63	0.27	0.45	0.61	375.7	195.6	151.9	80.8	250.4
Mean	0.48	0.37	0.40	0.46	0.31	0.27	0.31	0.34	0.19	0.33	0.08	0.28	0.14	0.18	0.43	160.8	80.4	62.1	47.7	113.9

^a Sport HPE = Number harvested/angler hour

^b Commercial HPE = Number/kilometer of gill net

^c Ontario sport fishing HPE 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. Harvest at age of walleye harvest by management unit, gear, and agency in Lake Erie during 2006. Units 4 and 5 are combined in Unit 4.

Unit	Age	Commercial	Sport					All Gears		
		OMNR	OMNR ^a	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	33,445		0	0	--	--	0	33,445	33,445
	2	8,997		14,894	5,306	--	--	20,200	8,997	29,197
	3	1,930,366		924,348	272,372	--	--	1,196,720	1,930,366	3,127,086
	4	0		2,618	0	--	--	2,618	0	2,618
	5	108,453		112,075	21,177	--	--	133,252	108,453	241,705
	6	2,792		6,918	951	--	--	7,869	2,792	10,661
	7+	53,002		133,667	5,742	--	--	139,409	53,002	192,411
Total		2,137,055	26,650	1,194,520	305,548	--	--	1,526,718	2,163,705	3,663,773
2	1	2,732		0	--	--	--	0	2,732	2,732
	2	6,438		4,285	--	--	--	4,285	6,438	10,723
	3	731,153		410,997	--	--	--	410,997	731,153	1,142,150
	4	1,610		2,615	--	--	--	2,615	1,610	4,225
	5	16,863		41,593	--	--	--	41,593	16,863	58,456
	6	0		2,565	--	--	--	2,565	0	2,565
	7+	25,086		41,137	--	--	--	41,137	25,086	66,223
Total		783,882	1,672	503,192	--	--	--	504,864	785,554	1,288,746
3	1	746		0	--	--	--	0	746	746
	2	1,734		766	--	--	--	766	1,734	2,500
	3	456,454		100,460	--	--	--	100,460	456,454	556,914
	4	11,066		1,655	--	--	--	1,655	11,066	12,721
	5	43,222		29,979	--	--	--	29,979	43,222	73,201
	6	0		2,814	--	--	--	2,814	0	2,814
	7+	31,747		35,133	--	--	--	35,133	31,747	66,880
Total		544,969	322	170,807	--	--	--	171,129	545,291	716,098
4	1	0		--	--	0	0	0	0	0
	2	39		--	--	0	0	0	39	39
	3	30,639		--	--	14,655	86,212	100,867	30,639	131,506
	4	6,716		--	--	1,862	28,242	30,104	6,716	36,820
	5	9,147		--	--	5,930	11,891	17,821	9,147	26,968
	6	6,544		--	--	409	8,919	9,328	6,544	15,872
	7+	13,328		--	--	14,305	16,350	30,655	13,328	43,983
Total		66,413	2,361	--	--	37,161	151,614	191,136	68,774	257,549
All	1	36,923		0	0	0	0	0	36,923	36,923
	2	17,208		19,945	5,306	0	0	25,251	17,208	42,459
	3	3,148,612		1,435,805	272,372	14,655	86,212	1,809,044	3,148,612	4,957,656
	4	19,392		6,888	0	1,862	28,242	36,992	19,392	56,384
	5	177,685		183,647	21,177	5,930	11,891	222,645	177,685	400,330
	6	9,336		12,297	951	409	8,919	22,576	9,336	31,912
	7+	123,163		209,937	5,742	14,305	16,350	246,334	123,163	369,497
Total		3,532,319	31,005	1,868,519	305,548	37,161	151,614	2,393,847	3,563,324	5,926,166

^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. Age composition (in %) of walleye harvested by management unit, gear, and agency in Lake Erie during 2006. Units 4 and 5 are combined in Unit 4.

Unit	Age	Commercial	Sport					All Gears		
		OMNR	OMNR ^a	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	33,445		0	0	--	--	0	33,445	33,445
	2	8,997		14,894	5,306	--	--	20,200	8,997	29,197
	3	1,930,366		924,348	272,372	--	--	1,196,720	1,930,366	3,127,086
	4	0		2,618	0	--	--	2,618	0	2,618
	5	108,453		112,075	21,177	--	--	133,252	108,453	241,705
	6	2,792		6,918	951	--	--	7,869	2,792	10,661
	7+	53,002		133,667	5,742	--	--	139,409	53,002	192,411
Total		2,137,055	26,650	1,194,520	305,548	--	--	1,526,718	2,163,705	3,663,773
2	1	2,732		0	--	--	--	0	2,732	2,732
	2	6,438		4,285	--	--	--	4,285	6,438	10,723
	3	731,153		410,997	--	--	--	410,997	731,153	1,142,150
	4	1,610		2,615	--	--	--	2,615	1,610	4,225
	5	16,863		41,593	--	--	--	41,593	16,863	58,456
	6	0		2,565	--	--	--	2,565	0	2,565
	7+	25,086		41,137	--	--	--	41,137	25,086	66,223
Total		783,882	1,672	503,192	--	--	--	504,864	785,554	1,288,746
3	1	746		0	--	--	--	0	746	746
	2	1,734		766	--	--	--	766	1,734	2,500
	3	456,454		100,460	--	--	--	100,460	456,454	556,914
	4	11,066		1,655	--	--	--	1,655	11,066	12,721
	5	43,222		29,979	--	--	--	29,979	43,222	73,201
	6	0		2,814	--	--	--	2,814	0	2,814
	7+	31,747		35,133	--	--	--	35,133	31,747	66,880
Total		544,969	322	170,807	--	--	--	171,129	545,291	716,098
4	1	0		--	--	0	0	0	0	0
	2	39		--	--	0	0	0	39	39
	3	30,639		--	--	14,655	86,212	100,867	30,639	131,506
	4	6,716		--	--	1,862	28,242	30,104	6,716	36,820
	5	9,147		--	--	5,930	11,891	17,821	9,147	26,968
	6	6,544		--	--	409	8,919	9,328	6,544	15,872
	7+	13,328		--	--	14,305	16,350	30,655	13,328	43,983
Total		66,413	2,361	--	--	37,161	151,614	191,136	68,774	257,549
All	1	36,923		0	0	0	0	0	36,923	36,923
	2	17,208		19,945	5,306	0	0	25,251	17,208	42,459
	3	3,148,612		1,435,805	272,372	14,655	86,212	1,809,044	3,148,612	4,957,656
	4	19,392		6,888	0	1,862	28,242	36,992	19,392	56,384
	5	177,685		183,647	21,177	5,930	11,891	222,645	177,685	400,330
	6	9,336		12,297	951	409	8,919	22,576	9,336	31,912
	7+	123,163		209,937	5,742	14,305	16,350	246,334	123,163	369,497
Total		3,532,319	31,005	1,868,519	305,548	37,161	151,614	2,393,847	3,563,324	5,926,166

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

Year	Sport Fishery															Commercial Fishery				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5				Total	Unit 1	Unit 2	Unit 3	Unit 4	Total
	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total		ON	ON	ON	ON	
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
2006	3.86	3.24	--	3.73	3.68	--	3.68	4.57	--	4.57	--	4.10	6.38	4.55	3.85	3.19	3.19	3.44	4.82	3.26
Mean	3.82	3.52	3.66	3.77	3.98	6.58	4.00	5.01	6.72	5.03	7.02	6.39	7.50	6.97	4.00	3.31	3.50	4.51	6.02	3.46

Table 8. Estimated abundance at age, survival (S) and maximum exploitation (U) for Lake Erie walleye, 1978-2006 from the 2007 catch-at-age analysis model in ADMB, M=0.32. West and central basin population modeled, east basin stock excluded. Projected abundance for 2007 of ages 3 to 7+ is based on survival from 2006, and projected 2007 age-2 abundance is based on regression of pooled trawl YOY data and ADMB age 2 abundance (see Table 9).

Year	Age						Total	S	u
	2	3	4	5	6	7+			
1978	2,356,790	6,288,270	1,087,670	73,037	205,091	19,704	10,030,563	0.515	0.302
1979	18,020,700	1,528,640	2,983,470	514,058	34,519	106,269	23,187,656	0.566	0.403
1980	11,893,500	11,109,700	599,638	1,163,440	200,463	55,075	25,021,816	0.572	0.275
1981	7,208,720	7,793,080	5,530,490	296,693	575,654	126,554	21,531,191	0.450	0.427
1982	11,760,500	4,379,160	2,903,680	2,045,290	109,723	259,938	21,458,291	0.544	0.348
1983	7,627,710	7,448,390	1,918,880	1,262,990	889,623	161,379	19,308,972	0.555	0.283
1984	46,127,700	4,964,580	3,677,500	937,228	616,875	513,937	56,837,820	0.616	0.296
1985	5,778,960	29,862,600	2,395,000	1,756,100	447,549	541,760	40,781,969	0.599	0.171
1986	17,976,000	3,948,580	17,478,200	1,393,780	1,021,970	577,004	42,395,534	0.601	0.212
1987	16,527,300	12,067,100	2,181,350	9,572,350	763,337	877,652	41,989,089	0.596	0.215
1988	44,231,900	11,096,300	6,625,570	1,189,460	5,219,690	897,143	69,260,063	0.617	0.233
1989	13,747,100	29,464,000	5,921,510	3,509,400	630,028	3,242,440	56,514,478	0.578	0.215
1990	10,696,900	9,227,880	16,176,700	3,228,160	1,913,180	2,119,950	43,362,770	0.604	0.176
1991	6,072,410	7,289,200	5,368,500	9,346,500	1,865,150	2,336,210	32,277,970	0.619	0.147
1992	12,770,100	4,178,610	4,420,310	3,230,340	5,623,980	2,535,770	32,759,110	0.613	0.185
1993	19,975,500	8,657,030	2,406,930	2,521,860	1,842,960	4,665,080	40,069,360	0.595	0.240
1994	3,466,350	13,204,900	4,601,040	1,261,110	1,321,330	3,434,610	27,289,340	0.553	0.232
1995	12,758,200	2,296,950	7,122,610	2,443,110	669,639	2,545,650	27,836,159	0.579	0.254
1996	14,257,600	8,360,430	1,199,490	3,650,890	1,252,280	1,665,330	30,386,020	0.536	0.334
1997	1,606,990	8,987,030	3,823,300	535,762	1,630,700	1,315,630	17,899,412	0.510	0.281
1998	14,683,400	1,039,860	4,495,010	1,874,010	262,607	1,453,420	23,808,307	0.556	0.344
1999	6,884,480	9,203,500	467,416	1,971,000	821,728	763,697	20,111,821	0.536	0.300
2000	5,430,230	4,410,830	4,463,800	221,699	934,860	757,723	16,219,142	0.524	0.314
2001	15,478,200	3,457,430	2,089,090	2,067,190	102,669	789,441	23,984,020	0.610	0.249
2002	1,447,690	10,203,000	1,811,790	1,080,110	1,068,790	465,135	16,076,515	0.601	0.162
2003	11,968,300	990,489	6,062,390	1,067,620	636,470	905,493	21,630,762	0.621	0.202
2004	498,282	8,046,670	556,702	3,368,000	593,124	860,784	13,923,562	0.621	0.131
2005	49,942,900	345,191	4,983,890	342,588	2,072,630	897,134	58,584,333	0.637	0.245
2006	1,640,900	32,825,700	183,141	2,592,550	178,210	1,551,370	38,971,871	0.623	0.129
2007	5,580,905	1,138,752	20,366,938	113,051	1,600,393	1,071,127	29,871,166		

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 2007-2008, 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	13.747	2.620828
1988	1990	20.70	3.030037	10.697	2.369954
1989	1991	5.60	1.722767	6.072	1.803756
1990	1992	47.03	3.850722	12.770	2.547107
1991	1993	68.02	4.219831	19.976	2.994507
1992	1994	4.64	1.534714	3.466	1.243102
1993	1995	97.78	4.582730	12.758	2.546174
1994	1996	62.15	4.129615	14.258	2.657290
1995	1997	2.67	0.980954	1.607	0.474363
1996	1998	93.13	4.533964	14.683	2.686718
1997	1999	24.75	3.208825	6.884	1.929270
1998	2000	13.67	2.615130	5.430	1.691981
1999	2001	58.14	4.062785	15.478	2.739433
2000	2002	3.19	1.161274	1.448	0.369969
2001	2003	31.16	3.439264	11.968	2.482261
2002	2004	0.17	-1.748700	0.498	-0.696589
2003	2005	204.02	5.318223	49.943	3.910880
2004	2006	6.96	1.940453	1.641	
2005	2007	10.71	2.371551	5.581	
2006	2008	1.52	0.420280	1.726	

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

²This regression estimate was used for 2008 age 2 projection.

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

$$Y = 0.6014 (0.0586) X + 0.2931 (0.1960)$$

with n=17, F=105, p<0.0001 and an r²=0.88. Both parameters were transformed by natural logarithm (LN).

Table 10. Estimated harvest of Lake Erie walleye for 2007 and projections for 2008 and 2009. Fishing mortality for the fully-selected age groups is derived from the Harvest Policy as shown in Figure 11. 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.

Age	2007 Stock Size (millions of fish)	F	Rate Functions					2007 RAH (millions of fish)	2008 Stock Size (millions)
	Mean		s(age)	(F)	(Z)	(S)	(u)	Mean	Mean
2	5.581		0.279	0.076	0.396	0.673	0.063	0.352	1.726
3	1.139		0.969	0.266	0.586	0.557	0.201	0.229	3.754
4	20.367		1.000	0.274	0.594	0.552	0.207	4.208	0.634
5	0.113		1.000	0.274	0.594	0.552	0.207	0.023	11.245
6	1.600		1.000	0.274	0.594	0.552	0.207	0.331	0.062
7+	1.071		0.978	0.268	0.588	0.555	0.203	0.217	1.479
Total	29.871	0.274					0.179	5.360	18.900
(3+)	24.290								17.174

Age	2008 Stock Size (millions of fish)	F	Rate Functions					Projected 2008 RAH (millions of fish)	Projected 2009 Stock Size (millions)
	Mean		s(age)	(F)	(Z)	(S)	(u)	Mean	Mean
2	1.726		0.279	0.050	0.370	0.691	0.042	0.072	*
3	3.754		0.969	0.172	0.492	0.611	0.136	0.511	1.193
4	0.634		1.000	0.178	0.498	0.608	0.140	0.089	2.294
5	11.245		1.000	0.178	0.498	0.608	0.140	1.577	0.385
6	0.062		1.000	0.178	0.498	0.608	0.140	0.009	6.834
7+	1.479		0.978	0.174	0.494	0.610	0.137	0.203	0.940
Total	18.900	0.178					0.130	2.460	*
(3+)	17.174								11.646

* No estimate of the 2007 year class recruiting in 2009 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)

Number Year	Age										Total
	2	3	4	5	6	7	8	9	10	11+	
1993	233,020	354,044	145,241	252,508	39,254	183,283	97,832	158,689	18,507	63,382	1,545,760
1994	91,319	198,264	295,944	106,409	180,859	28,115	131,276	70,072	113,661	60,115	1,276,033
1995	324,055	77,640	162,727	181,627	64,215	109,143	16,967	79,221	42,286	107,853	1,165,734
1996	579,748	275,507	64,872	123,096	130,470	46,128	78,401	12,188	56,907	108,961	1,476,278
1997	43,432	492,051	224,988	40,791	71,847	76,151	26,923	45,760	7,114	100,377	1,129,433
1998	329,618	36,949	410,402	161,691	28,632	50,431	53,452	18,898	32,120	78,059	1,200,253
1999	86,614	280,365	30,767	291,852	111,862	19,808	34,890	36,980	13,074	78,305	984,517
2000	424,610	73,606	232,451	21,714	195,177	74,808	13,247	23,333	24,730	62,781	1,146,456
2001	291,753	360,682	60,192	142,729	12,748	114,588	43,920	7,777	13,699	54,053	1,102,141
2002	60,724	248,060	298,267	40,247	92,647	8,275	74,381	28,509	5,048	45,887	902,045
2003	483,701	51,665	207,268	217,969	28,725	66,122	5,906	53,085	20,347	37,417	1,172,204
2004	15,524	411,465	42,875	141,047	145,783	19,212	44,224	3,950	35,505	39,980	899,564
2005	10,173,700	13,219	347,268	33,847	110,171	113,871	15,006	34,543	3,085	59,473	10,904,184
2006	18,336	8,665,430	11,194	281,250	27,248	88,692	91,670	12,081	27,809	50,900	9,274,610

(b)

Biomass (kgs) Year	Age										Total
	2	3	4	5	6	7	8	9	10	11+	
1993	133,055	379,535	156,134	371,440	64,533	414,952	232,155	470,830	61,370	220,570	2,504,574
1994	62,645	207,979	367,267	203,455	479,095	64,047	355,758	203,629	342,005	209,198	2,495,078
1995	224,246	82,920	215,613	353,265	114,752	224,615	48,576	242,416	127,239	364,867	1,998,509
1996	370,459	256,222	102,887	222,803	260,026	94,931	202,432	35,418	171,234	379,183	2,095,595
1997	27,753	457,608	356,832	73,831	143,191	156,718	69,516	132,979	21,405	349,314	1,789,147
1998	210,626	34,363	650,898	292,661	57,064	103,787	138,014	54,918	96,650	271,644	1,910,624
1999	74,921	303,075	50,796	572,906	225,403	42,152	92,074	101,879	33,235	256,918	1,753,359
2000	306,569	98,043	362,624	36,696	407,335	172,358	33,515	76,018	70,704	195,248	1,759,109
2001	201,309	409,735	85,833	273,611	20,359	243,500	139,314	23,588	44,835	178,051	1,620,136
2002	34,127	305,858	422,644	71,157	194,002	16,161	185,654	80,623	13,282	150,416	1,473,924
2003	337,623	72,795	318,985	339,160	53,629	165,569	16,583	125,759	49,544	111,055	1,590,703
2004	10,417	480,180	54,408	270,809	308,186	43,188	110,073	9,914	87,377	99,309	1,473,861
2005	5,626,040	13,153	471,590	62,753	230,588	256,095	38,836	91,747	7,593	155,701	6,954,095
2006	24,864	15,658,400	20,754	716,063	61,281	175,964	399,499	42,801	144,910	188,584	17,433,121

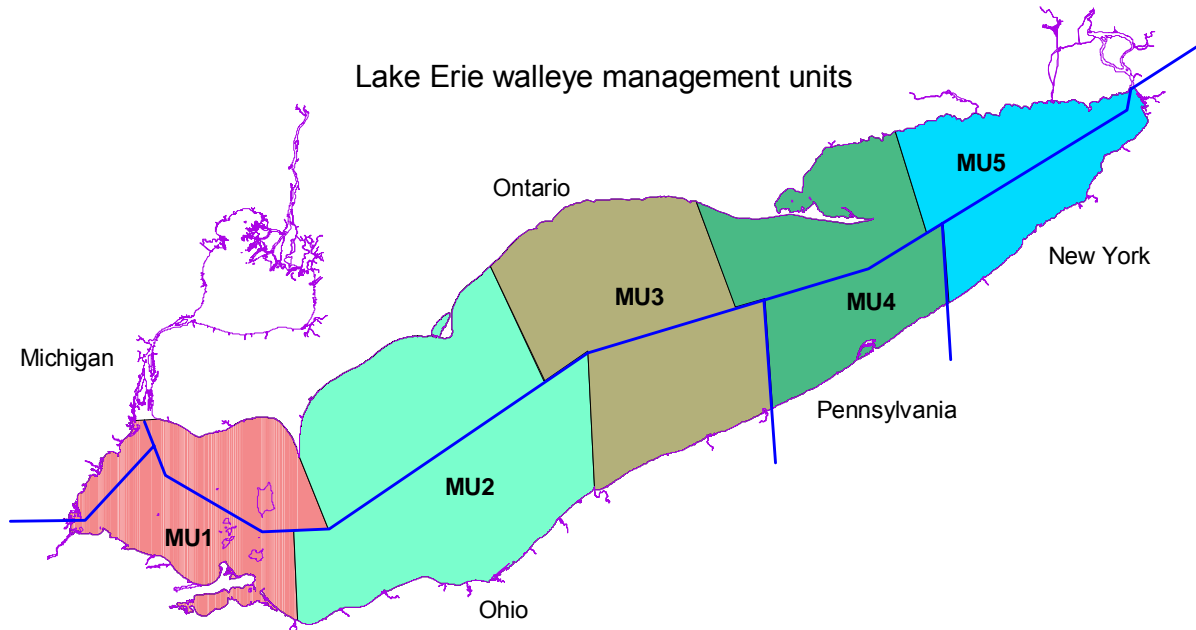


Figure 1. Map of Lake Erie with management units recognized by the Walleye Task Group for interagency management of walleye.

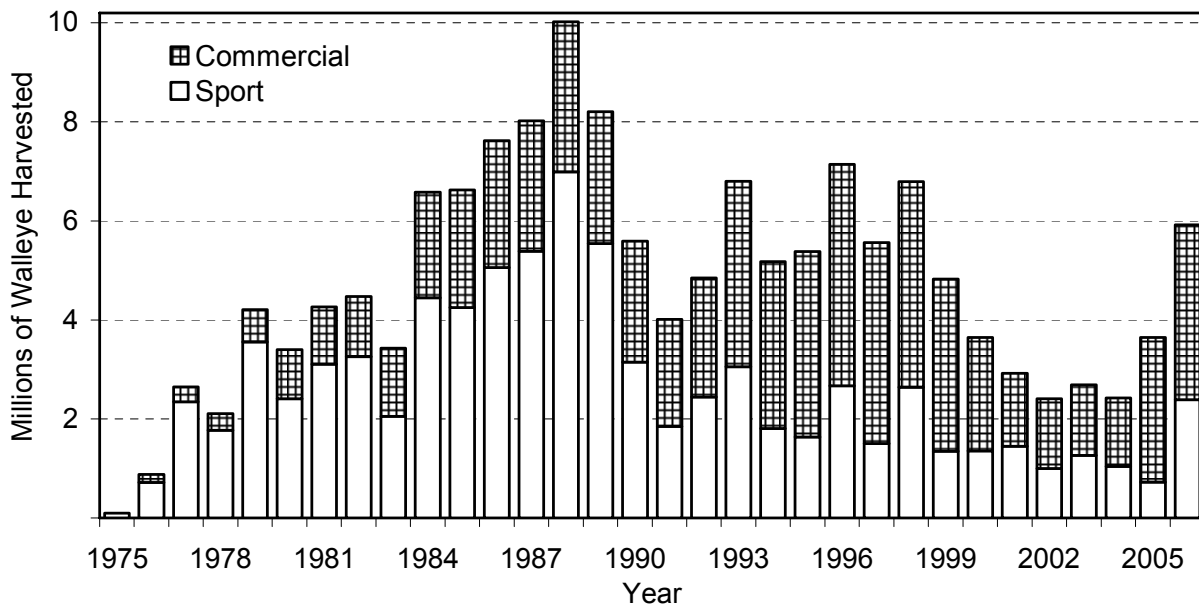


Figure 2. Lakewide harvest of Lake Erie walleye by sport and commercial fisheries, 1975-2006.

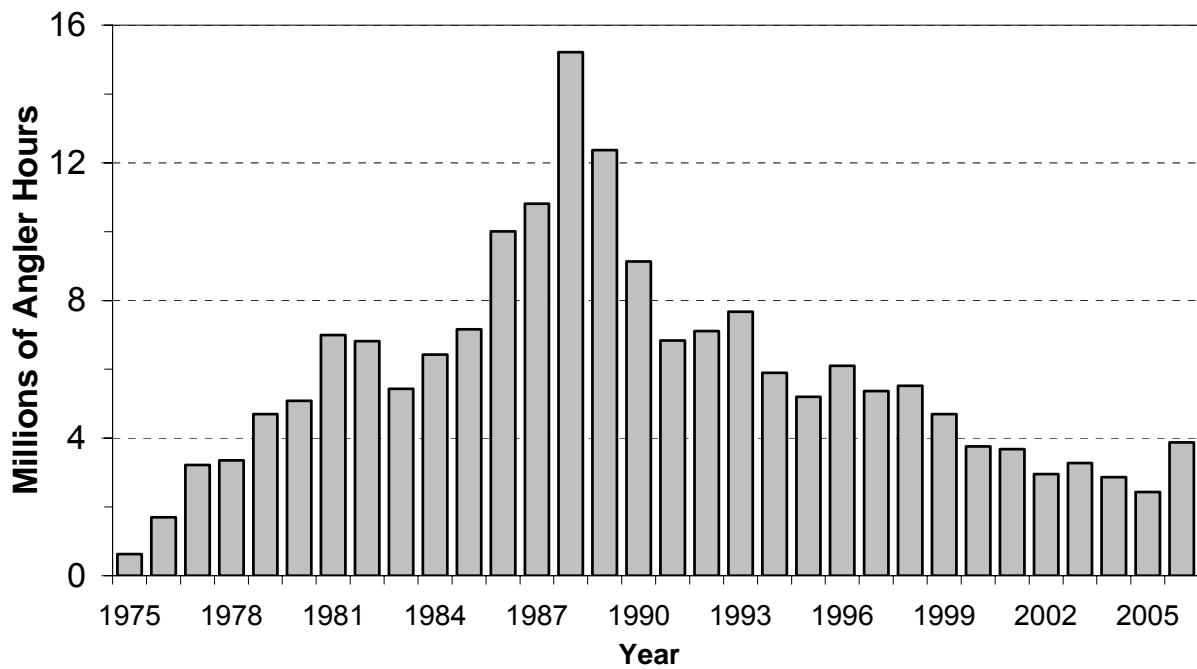


Figure 3. Lakewide total effort (angler hours) by sport fisheries for Lake Erie walleye, 1975-2006 (1999-2006 excludes Ontario sport effort).

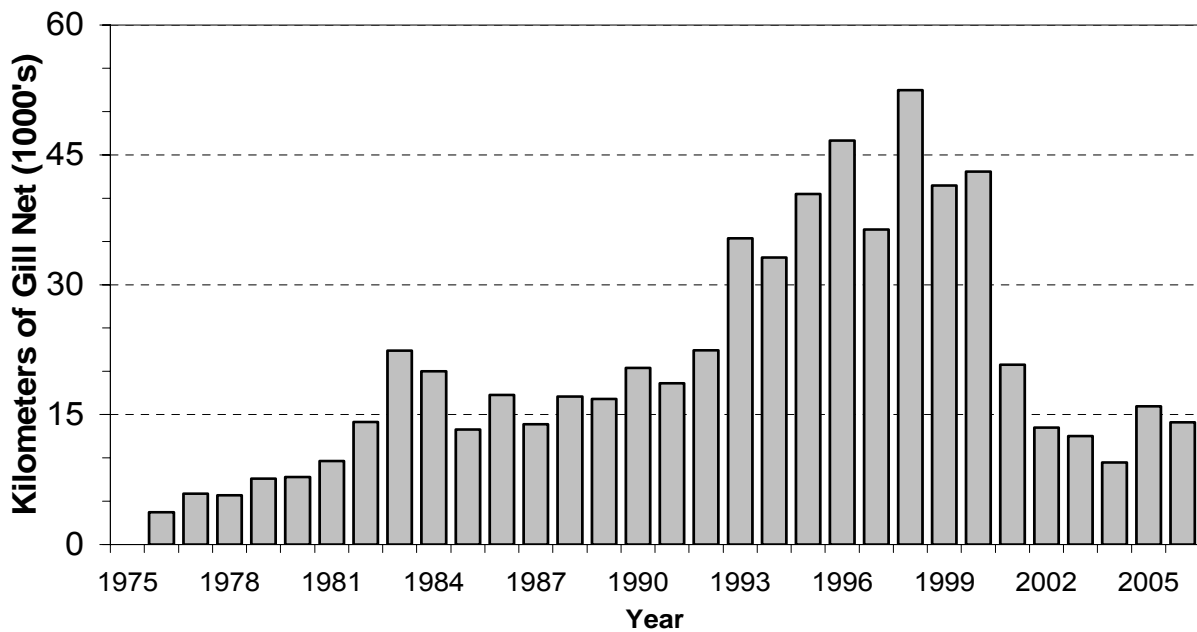


Figure 4. Lakewide total effort (kilometers of gill net) by Ontario commercial fisheries for Lake Erie walleye, 1975-2006.

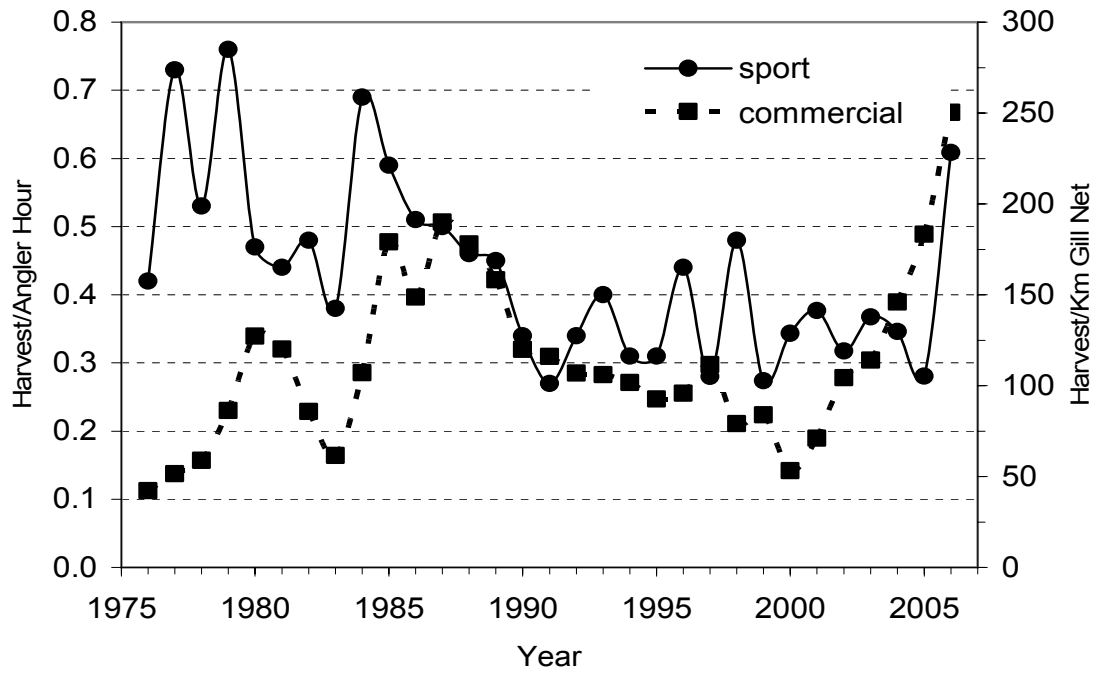


Figure 5. Lakewide harvest per unit effort (HPE) for Lake Erie sport and commercial walleye fisheries, 1975-2006.

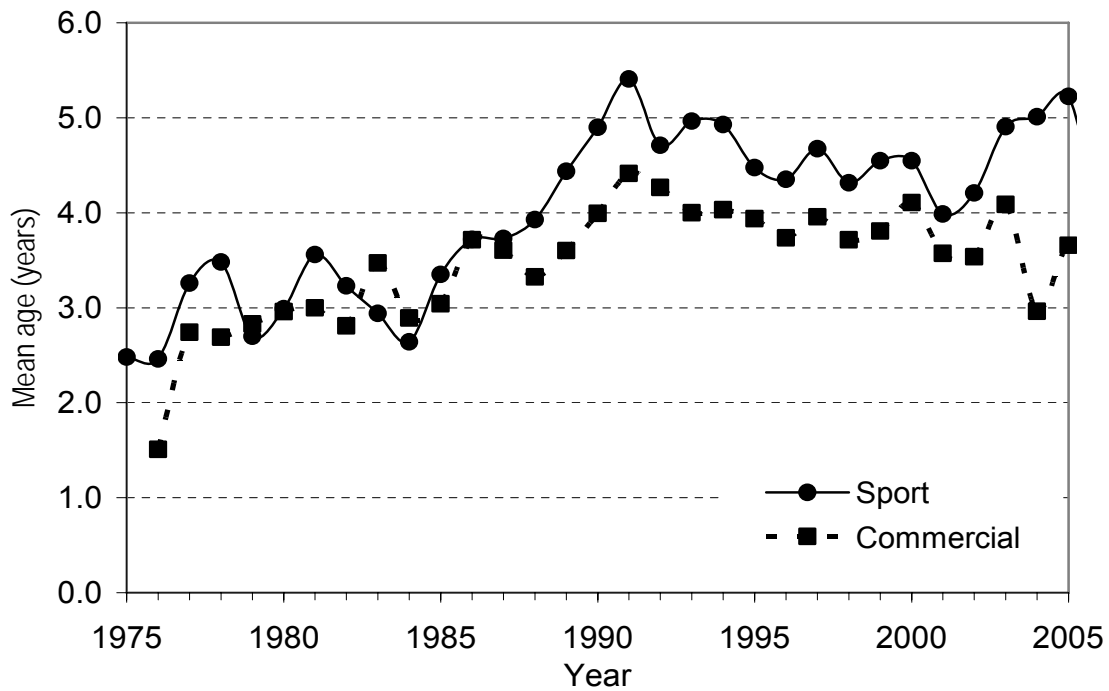


Figure 6. Lakewide mean age of Lake Erie walleye in sport and commercial harvests, 1975-2006.

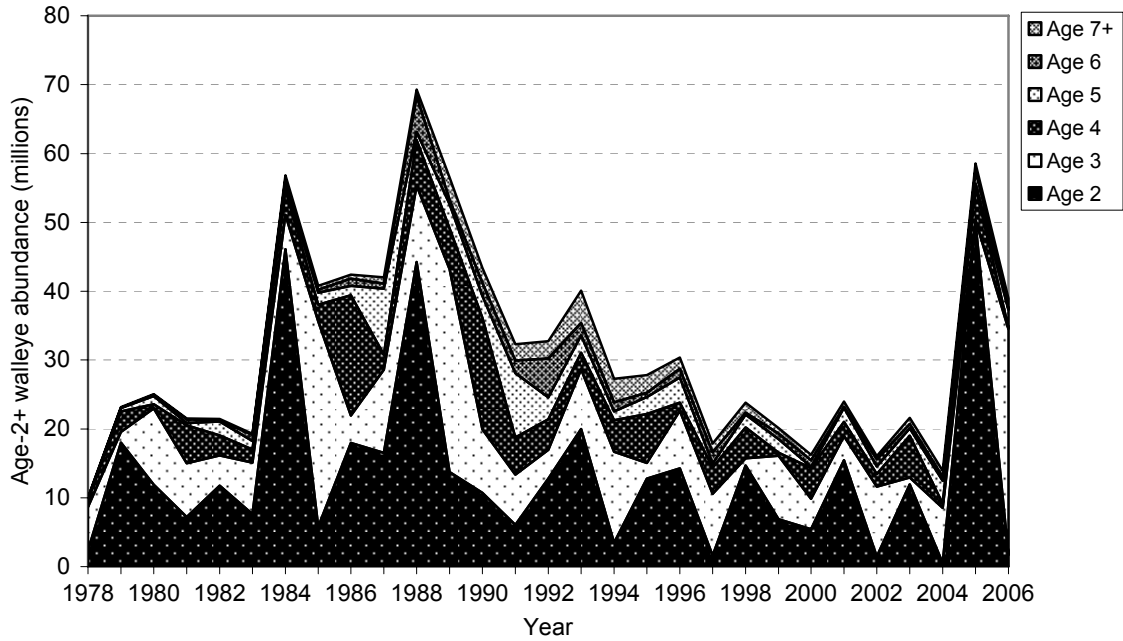


Figure 7. Age class composition of Lake Erie walleye 1978-2006. Data are from Table 8 in this document.

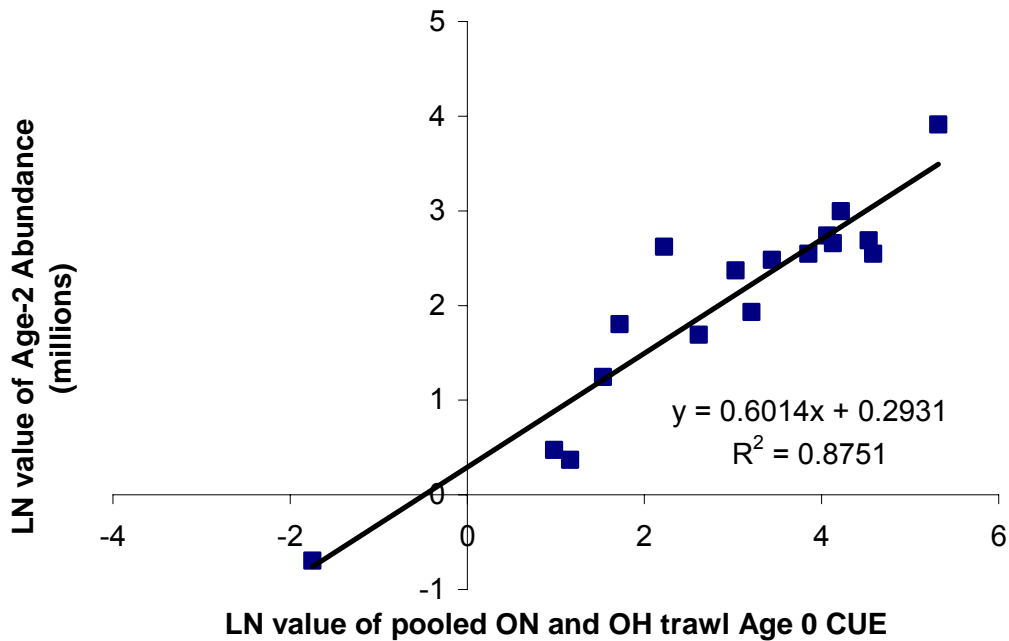


Figure 8. Regression estimates of abundance for age-2 Lake Erie walleye using natural logarithm transformed ADMB 2007 model catch-at-age estimates (y) and pooled Ontario and Ohio young-of-the-year trawl indices (x).

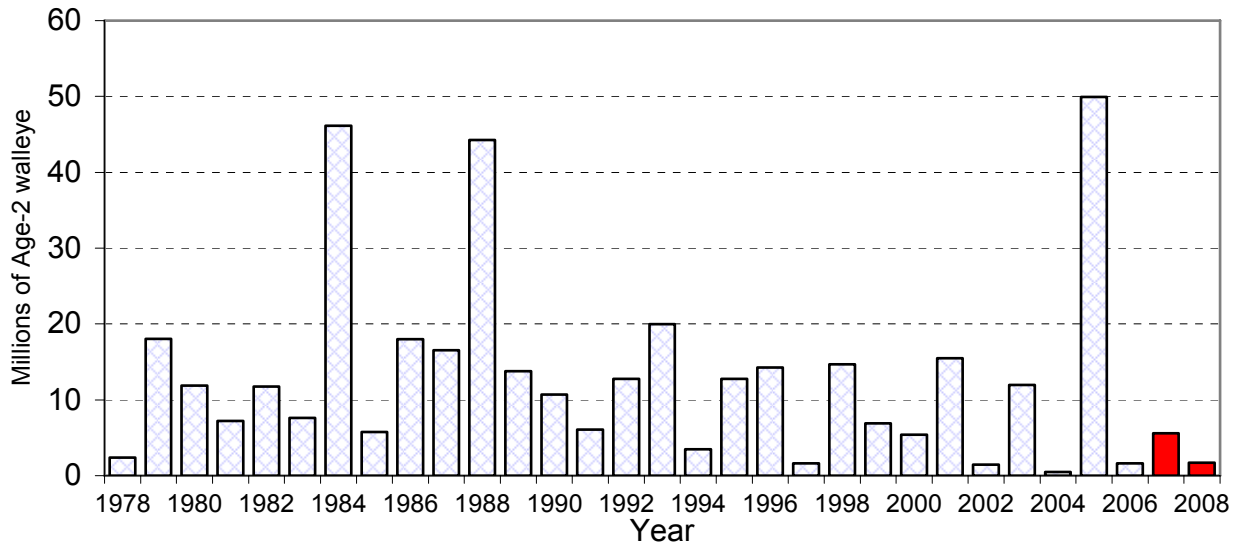


Figure 9. Estimated of age-2 abundance for Lake Erie walleye for 1978 to 2006. Estimates for 2007-2008 are from the regression of YOY index and numbers of age-2 from catch-at-age analysis (see Table 9).

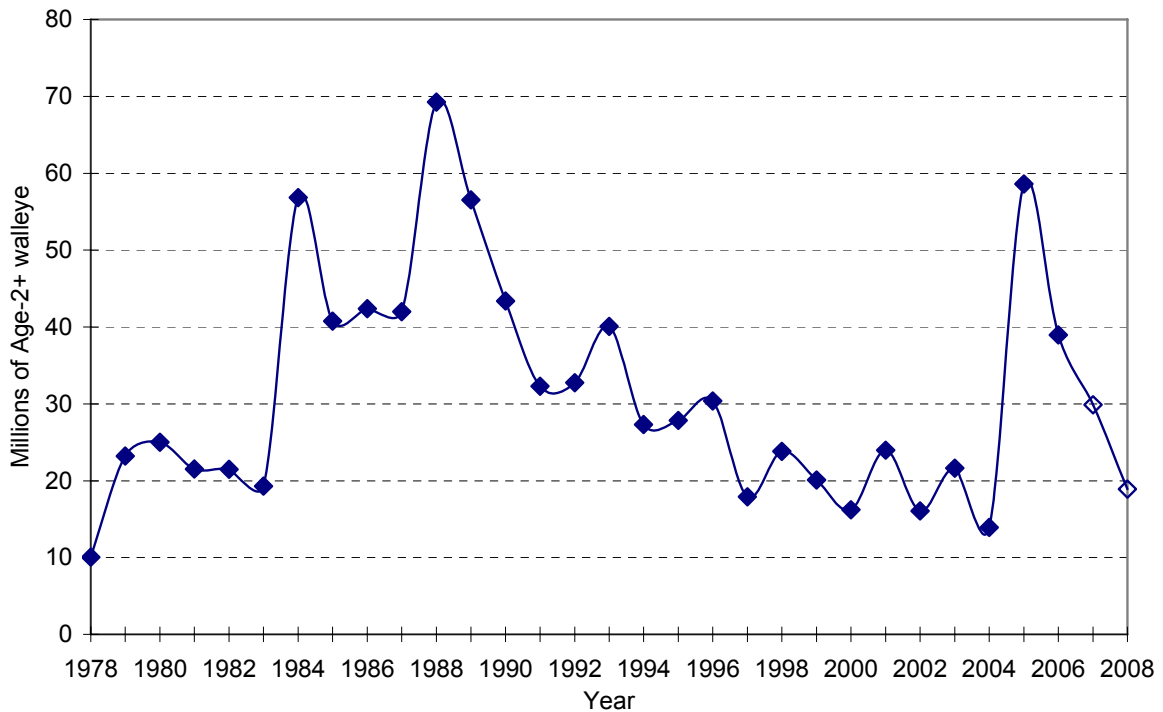


Figure 10. Abundance of Lake Erie walleye from 1978-2006, forecasting two additional years of population abundance.

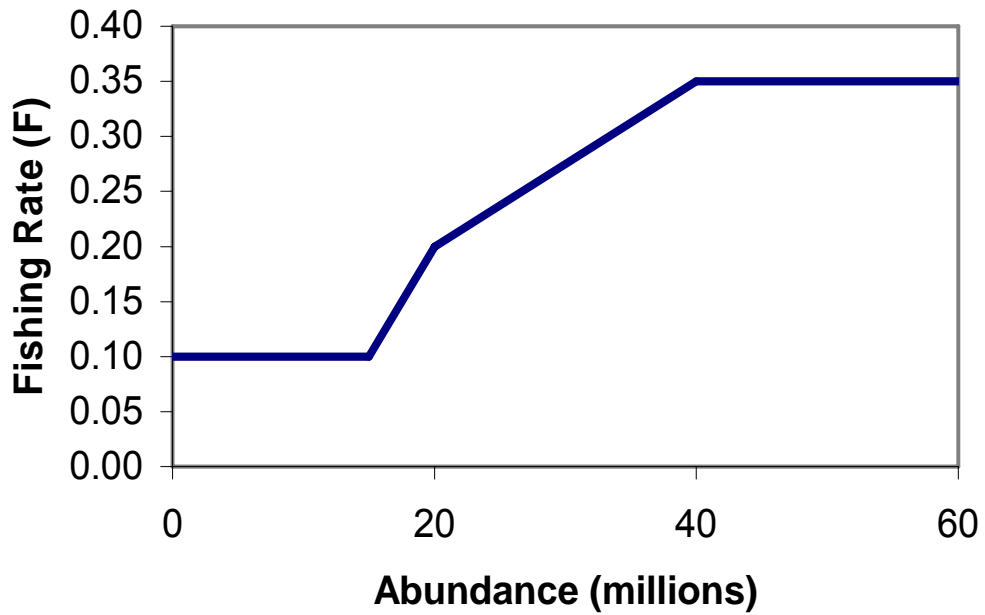


Figure 11. Lake Erie walleye harvest policy for age-2 and older walleye: below 15 million fish, $F=0.1$; between 15 and 20 million fish, $F= 0.02(N)-0.02$ (N is abundance in millions of fish); between 20 and 40 million fish, $F= 0.0075(N)+0.05$; and at 40 million fish and above, $F=0.35$.