STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-4

Study No.: 460 **Title:** Dynamics of Lake Erie walleye and yellow perch populations and fisheries

Period Covered: October 1, 2002 to September 30, 2003

Study Objective: To work with Ohio, New York, Pennsylvania, and Ontario to develop and verify models for inter-agency harvest quotas of walleye and yellow perch in Lake Erie using population samples taken each spring and fall.

Summary: In 2002 and 2003, walleye and yellow perch samples were collected from a spring trap net survey, a fall gill net survey, and an on-site creel survey. To fulfill inter-agency objectives, Michigan's survey data and data analyses were shared with the other Lake Erie fishery management agencies. The inter-agency task groups combined their walleye tag data, and their walleye and yellow perch survey data, to produce estimates of mortality and exploitation rates. These estimates were used to establish harvest quota recommendations for the lakewide recreational and commercial percid fisheries.

Findings: Jobs 1 through 8 were scheduled for 2002-03, and progress is reported below.

Job 1. Title: Carry out trap-net sampling.–In spring 2002, the Michigan Department of Natural Resources (MDNR) made 81 net lifts at the Monroe site between April 1 and April 29. In spring 2003, electrical repair work on the RV Channel Cat delayed the trap net sampling until mid May. A total of 24 net lifts were made, but data collected should not be considered comparable to the long-term spring time series.

Age and growth data were collected from walleye and yellow perch. Total number and total weight data were collected for all fish species. In 2002, the combined catch-per-net-lift (CPUE) for all species (237.0) was below the long-term mean, but well above the mean for the 1990-99 time period (Table 1). CPUE values for smallmouth bass, channel catfish, redhorse spp., freshwater drum, and quillback carpsucker were all above the 24-year means. The walleye catch rate was lower than in 2000, but remained just slightly lower than the 24-year mean. Smallmouth bass catch rates have been highest since 1994. This is likely an indication of increased abundance since the mid-90s, probably a result of improving habitat conditions for smallmouth bass in Michigan’s waters of Lake Erie. Yellow perch catch per net lift in 2002 was the highest observed since 1991. Lake whitefish have rarely been seen during the 20 year history of this survey. However, during 1997-2002 several lake whitefish have been captured each spring in the index trap nets.

To date, 49,671 walleyes have been tagged at the Monroe tag site, including 2,823 captured in the trap nets in spring 2002.

Job 2. Title: Analyze growth data from trap nets and angler catches.–Age 3 walleye (1999 year class) made up nearly 56% of the 2002 trap net walleye catch (Table 2). The 1998, 1997, and 1996 year classes were also well represented, accounting for a combined 28% of the trap net catch. Growth, as reflected by mean length at age, remained good for both male and female walleye

(Table 3). The age distribution of yellow perch caught in the trap nets in 2002 (Table 4) was dominated by age 6 (42%), age 5 (23%), and age 4 (22%) fish. In fact, the CPUE of 17.13 for Age 6 fish in 2002 (1996 year class) is the highest observed for Age 6 since 1989. It is possible that year class strength and decreased fishing mortality were both factors in the high observed catch rate. No trend in growth was apparent for either sex during recent years (Table 5). Scale samples collected from walleye and yellow perch in 2003 have not yet been processed and interpreted for ages.

Sport-caught walleye and yellow perch from Michigan's Lake Erie waters have been sampled for biological data (length, weight, and age) as part of Michigan's Great Lakes creel survey (Federal Aid Study 427). A total of 666 walleye and 840 yellow perch scale samples collected during the 2002 creel survey were interpreted for ages. Age 3 (63%) walleye accounted for the largest portion of the walleye recreational harvest (Table 6), reflecting the strength of the 1999 year class. No trend in growth was apparent for sport-caught walleye over the past six years.

The strong 1998 year class dominated the yellow perch sport catch in 2002, accounting for 39% of the total catch (Table 7). The 1999 year class (age 3) added an additional 29% to the total. Age 5 and older yellow perch represented another 27% of the total harvest. The strong contribution by older yellow perch resulted in the highest average size (224 mm) harvested by Michigan sport anglers since at least 1996. No obvious trend in growth was apparent for sport-caught yellow perch over the past six years.

Job 3. Title: Collect tag recovery data.–A total of 49,671 walleye have been tagged at the Monroe station since spring 1978. Of those, 4,108 (8.3%) have been reported caught by anglers and commercial fishermen through 2002. A total of 2,823 walleye were tagged in 2002; of which, none were subsequently recovered by fishermen in 2002. There were 204 reported recoveries from all years of tagging, at Monroe, during the 2002 fishing season. The geographical distribution of the 2002 returns (Table 8) is as follows: Lake Huron 1.0%; St. Clair River 6.9%; Lake St. Clair 7.4%; Detroit River 27.5%; Western Basin-Lake Erie 48.5%; Central Basin-Lake Erie 6.7%; and Eastern Basin-Lake Erie 2.0%. Recoveries were reported from all months except January with 90.3% reported during the months of April (11.8%), May (19.1%), June (26.0%), July (22.1%), and August (11.3%).

Job 4. Title: Analyze tag recovery data.–Walleye tag data were analyzed to estimate annual rates for tag recovery and survival during the period from 1986 through 2002. The computer program, known as ESTIMATE (Brownie et al. 1985), was used and all parameter estimates were taken from Model 1 under the assumption that survival and reporting rates were year-specific. Model 1 was more compatible with all data sets than three alternative models and probably produced the least biased estimates. Another assumption made was that all tag recoveries attributable to the 2002 fishing year had been received; thus, the recovery rate estimates for 2002 were comparable to those for prior years.

Walleye tag and recovery data from the Ohio, Ontario, and Michigan surveys covered the period from 1986 through 2002 (Table 9). Walleyes were not tagged by Ontario in 1989 and 1996 and Ohio in 1999; and Michigan tagged very few (94) in 2001. Michigan, Ontario, and Ohio used a monel metal tag which was placed in the lower jaw. During some years, Ontario also used a plastic streamer tag which was sewn into the dorsal musculature with monofilament nylon. Based on a literature review of studies comparing different tag types, tag loss was considered to be a potential problem only with the plastic streamer tag.

Analysis of the combined data produced an estimate for mean annual survival of 63.9% and mean recovery rate of 3.1% (Table 10). These values were used to estimate instantaneous natural mortality (M) according to the relationship M = Z - **u**Z/A where (**u**Z/A = F) for type II fisheries; where, Z is instantaneous total mortality, **u** is the exploitation rate, A is the total mortality rate, and F is the instantaneous fishing rate (Ricker 1975). A walleye reward tag study, funded by the Ontario Ministry of Natural Resources, was conducted during 1990 by Ontario, Ohio, and Michigan. This study, based on random application of $100.00 US tags to 10% of the walleyes, produced a reward/non-reward ratio of 2.73 (Thomas and Haas 1999). A value for **u** of 8.5% was generated by expanding mean recovery rate (3.11%) by the non-reporting rate (2.73). The resulting value for M was 0.34. It is important to note that survival rate estimates from program "ESTIMATE" are independent of recovery rates; thus expansion of the tag recovery rate by reward/non-reward ratios will not alter survival rate estimates in any way.

The highest walleye exploitation (**u**), 13.6%, occurred in 1993 and was significantly higher compared to **u** in the remaining 14 years. Exploitation was also high in 1996 (11.1%) and 1992 (10.4%) both of which were consistent with higher sport angler catch/effort values documented by creel surveys.

The reward tag program was replicated in 2000, to provide an updated non-reporting rate. Funding for the $100.00 US tags was provided by the US agencies (NY, PA, OH, and MI). Reward tags were applied to 10% of the tagged walleye population at the Chicken and Hen Island site in Ontario, the Lackawanna and Van Buren Bay sites in New York, the Grand River and Sandusky Bay sites in Ohio, and the Raisin River site in Michigan (Table 11). Anglers reported catching 221 non-reward and 75 reward tags from the 2000 tagged population during the 2000, 2001, and 2002 fishing seasons. The non-reporting ratio for anglers was 3.04 which was very similar to the 2.73 value calculated from the long-term recovery data from the 1990 reward study. However, commercial operators reported 85 reward tags and only 41 non-reward tags resulting in a non-reporting ratio of 18.56. This was much higher than any non-reporting ratios encountered during the 1990-99 period suggesting that the commercial operators, during 2000, 2001, and 2002, dramatically altered how frequently they reported non-reward tags. These data were not used to calculate a new non-reporting ratio because they need to be adjusted for this change in reporting behavior. The reporting pattern for the reward tags may provide a basis for adjusting the non-reward tag numbers.

Job 5. Title: Carry out gill net sampling.–The MDNR has fished experimental gill net at two stations in western Lake Erie since the fall of 1978, as part of the inter-agency assessment program. The 2001 fall gill net survey included two 1300-foot sets of variable-mesh multi-filament gill net at each index station, as well as two sets at two random stations. All nets were suspended from the surface. A total of 712 walleye were captured, and sampled for age and growth information.

Job 6. Title: Analyze growth and abundance data from gill net sampling.–Scale samples taken from walleyes captured in 2002 fall gill-nets have been processed and aged. Mean length (mm) at age is presented in Table 12. No trends in walleye growth were evident over the last five years. Mean length of yearlings collected in 2002 remained well within the range observed since 1978 and very near the long-term mean of 330 mm (Table 13). Total walleye catch-per-effort for the index sites (Table 12) was well below the long-term mean annual cpue (127.1 fish/net-lift). The 2001 cohort cpue (42.8) is about average (45.6), suggesting much better recruitment in 2001 than during the previous year. Age 2 fish, representing the 2000 year class, exhibited the lowest age 2 catch rate since the 1995 and 1992 year classes, suggesting it is probably among the weakest year classes in the last 20 years. The extremely poor recruitment for Lake Erie walleye in 1992 and 1995 is well illustrated in the low catch rates for both these cohorts over the past 8 years. Age 3 fish (1999 year class) accounted for 21% of the catch with a CPUE of 21.5 fish per net lift, comparable with the Age 3 catch rates for the 1996 and 1997 cohorts. This strong year class is expected to contribute heavily to the fishery in 2003.

Historical walleye catch data were used to develop a mean rank for the 1974-2000 year classes, some of which were not yet completely represented throughout their life (Table 15). Total harvest included the sport and commercial catches from Lake Erie. Trap and gill net catch-per-effort data came from Michigan's spring and fall surveys. Year classes were ranked for each capture method and then averaged. There was very good agreement between the three gear types and a nonparametric statistical comparison showed no significant differences. The top five year classes were 1982, 1986, 1985, 1984, and 1981. The worst five year classes were 2000, 1995, 1976, 1992, and 1974. In general, a pattern of inconsistent recruitment is evident throughout the time series.

Job 7. Title: Participate in inter-agency work groups.–Data summaries and analyses for 2002 MDNR surveys were completed and presented (as computer files and hard copies) to the Scientific Technical Committee, the Walleye Task Group (WTG), the Forage Task Group, and the Yellow Perch Task Group. Inter-agency walleye tag data for 2001 and 2002 were compiled and disseminated to each agency. Extensive walleye and yellow perch population modeling was done utilizing the inter-agency tag and fishery data sets. Estimates of walleye size selectivity by the commercial and sport fisheries were determined from tag recovery data and submitted to the WTG to assist with development of a walleye management model. We also served as chairmen of the WTG and the STC during 2002 and 2003.

Job 8. Title: Prepare annual reports.–This progress report was prepared. Additionally, some of the data collected during this study were presented in the annual "Status of the fisheries in Michigan waters of Lake St. Clair and Lake Erie" report prepared each winter by the Lake St. Clair Fisheries Research Station for the Great Lakes Fisheries Commission's, Lake Erie Committee, Annual Meeting.

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Table 1.–Mean catch per trap-net lift for all species taken during spring trap net surveys in Michigan waters of Lake Erie, 1996-2002.

Species	Survey year 1996	1997	1998	1999	2000	2002	78-89 Mean	90-99 Mean	78-02 Mean
Walleye	52.0	30.2	34.8	38.0	41.4	35.7	42.3	43.1	42.6
Smallmouth bass	2.1	1.2	1.9	1.9	2.2	1.2	0.1	1.1	0.6
Yellow perch	36.6	30.7	33.3	61.0	50.1	74.5	254.6	41.5	153.0
Rock bass	1.1	0.9	1.0	2.8	0.7	1.1	1.2	1.4	1.2
White bass	0.6	2.6	1.3	4.6	4.0	3.0	3.9	1.5	2.9
White perch	5.9	10.2	8.7	79.4	54.7	36.3	40.0	29.4	36.0
Pumpkinseed	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Bluegill	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Black crappie	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1
Channel catfish	8.8	4.4	11.4	16.0	5.2	8.0	5.5	7.4	6.4
Brown bullhead	1.1	0.4	0.0	1.0	2.9	0.8	2.7	2.7	2.6
White sucker	14.0	4.7	15.0	6.0	5.8	6.3	10.1	9.4	9.5
Redhorse sp.	5.5	1.9	3.3	2.2	3.8	4.8	1.3	2.3	2.0
Freshwater drum	15.4	6.8	28.3	50.4	11.3	42.7	25.8	18.3	22.8
Common carp	8.2	0.6	3.1	8.0	12.2	1.6	6.7	3.4	5.3
Goldfish	0.5	0.1	0.0	0.1	0.0	0.0	1.0	0.5	0.7
Gizzard shad	0.3	0.0	0.0	0.2	2.4	0.1	9.9	0.6	5.3
Longnose gar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bowfin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quillback	8.9	2.2	7.9	8.5	3.7	20.8	3.7	5.1	5.0
Stonecat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	161.2	96.9	150.0	280.3	200.4	237.0	409.0	167.8	292.6
% yellow perch	22.7	31.7	22.2	21.8	25.0	31.4	55.2	24.8	40.3
% white perch	3.6	10.5	5.8	28.3	27.3	15.3	11.1	15.7	13.9
Net lifts	45	57	44	45	51	81	49	48	50

Table 2.–Age composition (expressed as percentage) of annual walleye catch in survey trap nets for Lake Erie, near Monroe, 1992-2002.

	Survey year										
Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1	–	–	0.08	0.29	0.04	–	–	0.06	0.19	–	–
2	11.00	3.31	0.76	63.60	5.53	0.98	31.50	23.70	9.08	69.8	4.8
3	6.75	32.18	30.86	0.59	25.30	32.30	3.39	49.70	26.70	7.5	55.6
4	11.30	4.61	23.31	13.10	1.54	22.30	23.1	0.93	35.00	3.8	8.9
5	12.20	9.41	4.22	4.81	19.70	1.95	13.7	6.47	1.71	3.8	9.7
6	33.20	11.22	6.45	1.57	15.50	15.10	2.67	5.60	8.51	1.9	9.5
7	10.00	23.49	13.99	4.91	5.36	8.23	10.3	2.33	5.18	4.7	1.9
8	10.20	7.92	11.59	6.58	9.35	5.75	4.37	4.02	4.04	0.9	4.4
9	2.17	4.02	5.27	2.55	8.45	5.23	3.52	1.92	3.80	1.9	1.6
10	2.65	1.69	2.19	1.47	5.83	4.89	4.17	2.45	2.66	0.9	1.8
11	0.14	1.95	0.84	0.10	1.97	2.13	1.24	1.05	1.28	2.8	1.0
12	0.05	0.13	0.38	0.29	0.94	0.52	1.43	1.16	1.23	1.9	0.5
13	–	0.06	0.04	–	0.21	0.29	0.39	0.35	0.24	–	0.2
14	–	–	–	–	0.04	0.06	–	0.06	0.19	–	–
15	–	–	–	–	–	0.06	0.06	0.06	–	–	–
Total aged	2,073	1,542	2,387	1,017	2,330	1,737	1,532	1,714	2,112	106	2,872

Table 3.–Mean length-at-age (mm) and standard error (SE) of walleyes caught in trap nets during spring surveys 1995-2002. Sample size in parentheses.

	1996		1997		1998		1999		2000		2002	
Age	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
						Males						
2	346 (75)	2.5	354 (13)	6.0	337 (301)	0.9	343 (171)	1.8	358 (159)	1.4	358 (122)	1.4
3	410 (500)	1.0	411 (513)	0.9	408 (49)	3.5	407 (711)	0.8	418 (533)	1.0	418 (1410)	0.6
4	459 (26)	5.4	456 (307)	1.4	446 (323)	1.4	466 (11)	7.3	455 (609)	1.0	460 (215)	1.9
5	482 (408)	1.4	491 (30)	5.8	478 (198)	2.1	483 (95)	2.5	486 (28)	3.1	489 (241)	1.8
6	510 (304)	1.6	508 (241)	1.8	512 (37)	5.3	498 (78)	3.1	512 (150)	2.3	511 (217)	2.8
7	534 (113)	3.0	533 (127)	2.6	521 (147)	2.3	508 (33)	5.9	532 (89)	3.0	537 (44)	5.4
8	551 (194)	2.3	558 (94)	3.4	549 (58)	4.3	544 (60)	5.2	556 (77)	3.4	558 (107)	3.1
9	568 (165)	2.8	579 (86)	3.7	575 (46)	5.6	572 (24)	7.3	567 (61)	4.1	588 (40)	5.1
10	577 (107)	3.7	580 (71)	4.8	585 (45)	5.4	594 (33)	5.7	583 (44)	5.8	595 (45)	4.4
11	609 (31)	6.2	581 (29)	7.8	593 (13)	9.0	594 (15)	8.7	596 (18)	7.8	617 (23)	7.6
						Females						
2	–	–	–	–	332 (1)	–	–	–	345 (2)	20.5	–	–
3	453 (5)	17.5	443 (14)	3.7	518 (1)	–	451 (1)	–	431 (1)	–	452 (25)	4.1
4	517 (8)	14.0	497 (41)	3.7	488 (29)	4.8	528 (2)	37.5	505 (78)	3.3	513 (16)	8.6
5	539 (37)	4.6	511 (3)	20.4	532 (7)	12.3	549 (7)	12.1	546 (5)	14.1	538 (24)	6.1
6	572 (55)	4.8	517 (16)	11.0	588 (4)	16.2	579 (5)	4.6	601 (20)	6.9	575 (32)	5.0
7	593 (12)	12.7	586 (13)	11.6	605 (11)	10.1	615 (2)	5.0	616 (14)	6.8	628 (7)	6.2
8	637 (22)	10.4	614 (2)	9.0	636 (9)	11.7	641 (7)	12.0	614 (7)	14.4	638 (12)	11.6
9	652 (29)	9.6	645 (3)	25.9	648 (8)	7.8	634 (3)	10.4	654 (18)	5.0	656 (5)	10.3
10	662 (29)	6.5	667 (12)	16.6	677 (18)	8.2	658 (7)	19.5	693 (11)	9.1	693 (6)	10.7
11	685 (15)	8.3	687 (7)	17.3	688 (6)	17.3	646 (2)	85.0	690 (8)	12.6	697 (6)	14.5
12	720 (9)	15.4	709 (3)	25.9	726 (8)	10.4	722 (3)	14.3	705 (13)	13.1	728 (10)	11.8

Table 4.–Yellow perch catch per unit effort (CPUE) by age for trap net surveys during 1989-2002 (expressed as number caught per net per 24 h).

		Age							Total
Year	Days	2	3	4	5	6	7	Age 8+	CPUE
1989	95.5	0.02	26.64	50.02	39.27	24.63	2.89	1.28	144.83
1990	139.2	0.04	0.35	4.20	8.72	5.82	2.90	1.73	24.58
1991	86.0	0.03	2.74	2.41	9.29	7.99	6.29	1.79	31.91
1992	98.6	0.22	2.31	2.47	1.68	5.04	4.47	2.41	19.50
1993	99.1	0.25	6.28	5.34	2.31	1.58	2.51	0.81	20.24
1994	95.0	0.20	1.70	4.39	2.20	1.29	0.52	0.65	10.95
1995[1]	88.9	0.01	0.09	1.39	1.60	0.84	0.15	0.09	4.16
1996	100.7	0.20	2.42	2.87	4.38	2.82	2.24	0.67	15.60
1997	93.0	0.00	4.87	6.11	2.82	2.67	1.66	0.68	18.82
1998	88.0	0.42	6.30	4.70	2.39	1.68	0.65	0.38	16.51
1999	105.4	0.39	6.57	6.38	10.69	2.42	0.26	0.17	26.88
2000	128.8	0.55	1.24	6.71	6.04	3.66	1.39	0.25	19.84
2001[2]	21.6	0.00	4.98	2.21	6.48	1.74	0.79	0.24	16.44
2002	153	0.10	1.23	8.84	9.41	17.13	2.09	1.39	40.20

[1]Sampling period delayed six weeks.
[2]Sampling period delayed eight weeks.

Table 5.–Mean length-at-age (mm) and standard error (SE) of yellow perch caught in trap nets during spring surveys 1995-2002. Sample size in parentheses.

	1995		1996		1997		1998		1999		2000		2002	
Age	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Males							
2	187 (1)	–	173 (8)	2.2	–	–	–	–	175 (5)	4.5	183 (6)	4.9	201 (1)	
3	194 (4)	0.7	191 (33)	1.9	191 (30)	1.9	206 (7)	12.6	185 (32)	3.4	207 (7)	8.9	199 (4)	7.0
4	243 (11)	4.6	216 (21)	4.5	212 (25)	3.1	207 (72)	2.3	212 (26)	4.8	213 (35)	3.8	219 (18)	7.5
5	250 (12)	2.4	244 (26)	4.0	231 (16)	5.6	226 (26)	3.9	230 (42)	3.6	238 (37)	3.6	242 (27)	4.4
6	256 (7)	5.0	258 (22)	3.8	257 (17)	4.8	250 (8)	7.8	248 (10)	5.5	251 (15)	3.7	245 (41)	3.9
7	265 (2)	13.5	258 (10)	6.4	255 (18)	1.8	268 (12)	5.0	–	–	252 (4)	12.4	271 (9)	5.5
8	273 (1)	–	277 (4)	12.8	266 (2)	2.0	290 (1)	–	–	–	–	–	295 (2)	31.5
9	286 (2)	7.0	284 (3)	12.4	–	–	–	–	–	–	307 (1)	–	–	–
10	–	–	–	–	–	–	–	–	–	–	–	–	–	–
							Females							
3	251 (1)	–	223 (8)	6.7	215 (14)	3.7	199 (5)	14.4	224 (22)	4.8	220 (9)	7.8	227 (4)	7.2
4	278 (31)	4.2	243 (21)	3.3	238 (48)	3.0	240 (53)	3.8	249 (23)	5.8	249 (36)	4.3	263 (33)	5.1
5	287 (39)	3.0	282 (33)	4.2	261 (23)	5.8	254 (38)	4.9	275 (58)	3.9	264 (19)	5.6	263 (15)	9.4
6	288 (20)	5.6	287 (17)	4.2	295 (27)	3.7	279 (15)	5.6	278 (16)	6.7	286 (23)	4.0	282 (51)	4.6
7	290 (3)	4.2	302 (23)	3.5	305 (10)	6.2	308 (9)	5.8	308 (4)	7.4	289 (10)	6.8	315 (6)	12.4
8	–	–	351 (1)	–	317 (10)	6.3	305 (4)	10.2	327 (4)	7.9	314 (2)	2.0	307 (8)	8.5
9	–	–	316 (2)	30.0	–	–	320 (1)	–	334 (1)	–	324 (2)	16.5	309 (3)	5.6
10	–	–	344 (1)	–	–	–	–	–	–	–	–	–	–	–

Table 6.–Mean length-at-age (mm) of walleyes sampled from Michigan's Lake Erie sport fishery, 1997-2002. Sample size in parentheses.

	Survey year											
Age	1997		1998		1999		2000		2001		2002	
1	–	–	–	–	–	–	357	(2)	–	–	336	(4)
2	339	(5)	341	(196)	357	(105)	363	(152)	356	(142)	371	(22)
3	415	(192)	431	(72)	411	(211)	430	(208)	427	(75)	432	(419)
4	465	(182)	473	(147)	446	(66)	470	(170)	469	(45)	466	(80)
5	518	(21)	513	(25)	496	(21)	500	(28)	500	(27)	499	(52)
6	519	(44)	548	(14)	561	(4)	510	(19)	535	(5)	525	(38)
7	558	(30)	576	(8)	567	(4)	555	(10)	531	(7)	539	(11)
8	565	(16)	583	(8)	569	(3)	561	(6)	603	(4)	580	(17)
9	623	(12)	655	(3)	628	(6)	638	(2)	612	(3)	609	(12)
10	625	(4)	651	(5)	546	(2)	650	(4)	670	(3)	665	(4)
11	680	(3)	–	–	–	–	742	(2)	742	(1)	607	(4)
12	625	(1)	–	–	655	(2)	746	(1)	–	–	705	(3)
13	–	–	–	–	572	(1)	–	–	–	–	–	–
Mean	467	(510)	424	(478)	416	(425)	437	(607)	418	(312)	456	(667)

Table 7.–Mean length-at-age (mm) of yellow perch sampled from Michigan's Lake Erie sport fishery, 1997-2002. Sample size in parentheses.

	Survey Year											
Age	1997		1998		1999		2000		2001		2002	
1	–	–	162	(2)	164	(3)	185	(1)	–	–	174	(19)
2	182	(101)	182	(224)	179	(26)	185	(100)	188	(63)	187	(24)
3	197	(356)	202	(268)	202	(419)	195	(127)	207	(107)	209	(242)
4	217	(178)	218	(187)	215	(183)	212	(289)	220	(33)	224	(325)
5	233	(24)	242	(45)	233	(86)	218	(140)	234	(33)	233	(104)
6	263	(3)	253	(3)	243	(31)	241	(33)	253	(2)	248	(92)
7	292	(1)	273	(2)	266	(12)	257	(10)	278	(2)	279	(24)
8	–	–	–	–	263	(5)	315	(1)	–	–	287	(5)
9	–	–	–	–	–	–	282	(1)	–	–	317	(3)
10	–	–	–	–	–	–	–	–	–	–	306	(2)
Mean	202	(663)	203	(731)	211	(765)	208	(704)	208	(240)	224	(843)

Table 8.–Geographical distribution of tag recoveries, 1992-2002, from walleyes tagged at Monroe, Michigan, Lake Erie (expressed as a percentage of the total number recovered each year).

Geographical area	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001[1]	2002
Lake Huron -											
Saginaw Bay	0.5	1.6	2.0	0.8	1.7	0.0	2.4	1.2	0.8	0.0	1.0
St. Clair River	2.7	6.1	6.2	8.3	2.8	4.2	7.9	9.5	4.6	0.0	6.9
Lake St. Clair	4.1	2.6	3.1	2.3	4.5	4.9	7.1	4.8	6.1	0.0	7.4
Detroit River	9.5	8.1	8.8	12.1	11.2	12.2	6.3	8.3	15.3	4.3	27.5
Lake Erie	80.3	79.9	79.8	76.5	79.8	78.8	73.2	75.0	73.2	93.6	57.2
Western Basin	64.5	58.7	54.1	43.9	54.1	57.1	56.7	53.6	65.6	76.6	48.5
Central Basin	13.1	17.7	21.6	28.8	22.9	20.1	16.5	20.2	5.3	13.8	6.7
Eastern Basin	2.7	3.5	4.1	3.8	2.8	1.6	3.1	1.2	2.3	4.3	2.0

[1]Only 94 tags applied in 2001.

Table 9.–Non-reward tag recovery data for walleyes tagged by Ohio, Ontario, and Michigan at Lake Erie sites, 1986-2002.

	Number	Year																	Percent
Year	tagged	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	recovered
1986	5,681	158	93	51	35	36	10	16	10	4	5	2	3	0	2	1	0	0	7.5
1987	4,328	–	163	147	57	28	22	18	11	6	10	0	3	3	0	1	0	0	10.8
1988	6,902	–	–	234	120	69	40	40	22	15	4	5	12	2	2	0	0	0	8.2
1989	4,112	–	–	–	134	64	60	37	23	20	13	6	5	2	1	0	0	1	8.9
1990	6,323	–	–	–	–	225	152	96	83	41	18	20	11	4	2	0	0	3	10.4
1991	8,602	–	–	–	–	–	275	224	160	72	50	43	21	15	4	2	3	0	10.1
1992	7,260	–	–	–	–	–	–	290	228	93	49	35	22	11	6	4	3	3	10.2
1993	7,359	–	–	–	–	–	–	–	402	142	84	70	29	15	9	4	3	4	10.4
1994	5,539	–	–	–	–	–	–	–	–	183	117	80	41	35	11	11	1	6	8.8
1995	5,540	–	–	–	–	–	–	–	–	–	169	92	46	22	4	6	5	5	6.3
1996	5,718	–	–	–	–	–	–	–	–	–	–	254	123	57	31	13	14	12	8.8
1997	6,261	–	–	–	–	–	–	–	–	–	–	–	195	83	35	18	7	16	5.7
1998	1,668	–	–	–	–	–	–	–	–	–	–	–	–	28	20	4	0	6	3.5
1999	1,630	–	–	–	–	–	–	–	–	–	–	–	–	–	36	32	13	11	5.6
2000	4,469	–	–	–	–	–	–	–	–	–	–	–	–	–	–	117	60	33	4.7
2001	2,719	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	79	26	3.9
2002	4,896	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	131	2.7

Table 10.–Annual survival and recovery rate (percent) during 1986-2002 for Lake Erie walleyes from Ohio, Ontario, and Michigan non-reward tags produced by program "ESTIMATE" (combined data).

Fishing year	Tag recovery rate	Standard error	Walleye survival rate	Standard error
1986	2.78	0.22	57.72	3.89
1987	3.30	0.23	91.95	5.86
1988	3.41	0.18	53.56	3.69
1989	3.13	0.20	55.68	3.69
1990	3.29	0.18	69.86	3.67
1991	3.34	0.16	65.95	3.31
1992	3.80	0.17	62.25	3.23
1993	4.95	0.21	61.64	3.66
1994	3.36	0.18	85.47	6.03
1995	2.54	0.16	42.58	3.02
1996	4.23	0.22	80.86	5.83
1997	2.84	0.17	79.58	11.34
1998	1.73	0.24	30.65	5.19
1999	2.42	0.29	68.24	8.84
2000	2.37	0.20	59.72	7.58
2001	2.32	0.25	57.31	8.37
2002	2.68	0.23	–	–
Mean	3.11	0.05	63.94	0.80

Table 11.–Results from the $100 reward tagging effort in Michigan, Ohio, and Ontario waters of Lake Erie through year 2002.

	Tags applied		Tags returned		Rate		Non-reporting
Tag location	non-reward	reward	non-reward	reward	non-reward	reward	ratio
Angler tag returns							
Chicken and Hen Islands (Ontario)	1,091	115	26	5	0.024	0.043	1.824
Lackawanna Shoreline (New York)	239	29	20	4	0.084	0.138	1.648
Raisin River (Michigan)	1,874	208	113	40	0.060	0.192	3.189
Sandusky Bay (Ohio)	1,460	162	24	14	0.016	0.086	5.257
Van Buren Bay (New York)	761	92	38	12	0.050	0.130	2.612
Total angler	5,425	606	221	75	0.041	0.124	3.038
Commercial tag returns							
Chicken and Hen Islands (Ontario)	1,091	115	21	36	0.019	0.313	16.263
Lackawanna Shoreline (New York)	239	29	0	1	0.000	0.034	–
Raisin River (Michigan)	1,874	208	14	38	0.007	0.183	24.455
Sandusky Bay (Ohio)	1,460	162	5	8	0.003	0.049	14.420
Van Buren Bay (New York)	761	92	1	2	0.001	0.022	–
Total commercial	5,425	606	41	85	0.008	0.140	18.559

Table 12.–Mean total length-at-age (mm) for walleyes caught during fall in survey index multi-filament gill nets (sample size in parentheses) in Michigan waters of Lake Erie, 1998-2002.

Age	Survey year 1998		1999		2000		2001		2002	
					Sexes combined					
1	319	(357)	339	(233)	327	(228)	345	(26)	338	(316)
2	404	(593)	416	(301)	410	(118)	418	(293)	420	(51)
3	439	(7)	462	(218)	447	(81)	460	(59)	464	(244)
4	487	(38)	514	(5)	484	(53)	493	(61)	487	(48)
5	514	(20)	515	(16)	513	(3)	521	(39)	502	(33)
6	525	(12)	535	(10)	525	(7)	540	(3)	528	(15)
7	517	(6)	554	(6)	492	(1)	565	(3)		
8	525	(1)	562	(2)	530	(1)	558	(2)	530	(2)
9	525	(1)	569	(1)	–	–			580	(1)
10	586	(1)	648	(2)	–	–				
Mean	382	(1036)	412	(795)	388	(492)	439	(486)	409	(710)
					Males					
1	317	(133)	337	(87)	326	(91)	342	(17)	335	(140)
2	396	(328)	406	(154)	401	(81)	412	(181)	413	(35)
3	428	(3)	444	(133)	441	(63)	443	(40)	451	(170)
4	473	(27)	480	(3)	467	(40)	480	(46)	477	(34)
5	502	(15)	492	(10)	494	(2)	493	(22)	490	(26)
6	525	(12)	511	(7)	498	(5)	540	(3)	501	(11)
7	517	(6)	544	(4)	492	(1)	528	(2)		
8	525	(1)	562	(2)	530	(1)	499	(1)	538	(1)
9	525	(1)	569	(1)	–	–				
10	586	(1)	–	–	–	–				
Mean	388	(527)	411	(402)	398	(492)	430	(312)	415	(417)
					Females					
1	321	(223)	340	(146)	328	(136)	350	(9)	339	(176)
2	413	(265)	426	(147)	428	(37)	429	(112)	435	(16)
3	447	(4)	489	(85)	471	(17)	497	(19)	492	(74)
4	522	(11)	564	(2)	535	(13)	533	(15)	511	(14)
5	550	(5)	553	(6)	550	(1)	556	(17)	546	(7)
6	–	–	592	(3)	594	(2)	638	(1)	604	(4)
7	–	–	572	(2)	–	–	618	(1)		
8	–	–	–	–	–	–			522	(1)
9	–	–	–	–	–	–			580	(1)
Mean	376	(508)	414	(393)	374	(206)	456	(174)	401	(293)

Table 13.–Mean total length (mm) for yearling walleyes caught in Michigan fall gill-net surveys (sample size in parentheses), in Lake Erie, 1978-2002.

Survey year	Year class	Mean length	Standard error
1978	1977	343 (410)	1.0
1979	1978	330 (115)	1.9
1980	1979	344 (222)	1.3
1981	1980	336 (86)	2.0
1982	1981	333 (143)	1.9
1983	1982	308 (116)	1.7
1984	1983	311 (18)	4.7
1985	1984	329 (279)	1.2
1986	1985	339 (392)	1.0
1987	1986	332 (387)	1.1
1988	1987	347 (18)	4.2
1989	1988	336 (246)	1.2
1990	1989	352 (64)	2.4
1991	1990	345 (218)	1.3
1992	1991	309 (252)	1.4
1993	1992	331 (13)	6.5
1994	1993	328 (415)	1.0
1995	1994	318 (444)	1.1
1996	1995	326 (18)	4.0
1997	1996	306 (210)	1.3
1998	1997	319 (357)	1.0
1999	1998	339 (233)	1.1
2000	1999	327 (228)	1.0
2001	2000	345 (26)	2.0
2002	2001	338 (316)	1.0

Table 14.–Walleye CPUE (number per net lift), by cohort, in multi-filament gill nets during fall surveys on Michigan waters of Lake Erie, 1985-02.

Year	Total	Survey year																	
class	CPUE	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1975	42.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1976	18.4	0.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1977	171.0	0.5	0.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1978	61.6	0.5	1.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1979	72.4	2.0	0.5	0.5	0.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1980	92.7	5.3	2.3	0.5	0.3	0.0	0.3	–	–	–	–	–	–	–	–	–	–	–	–
1981	72.3	3.8	2.8	2.3	0.5	0.3	0.0	–	–	–	–	–	–	–	–	–	–	–	–
1982	306.2	95.8	44.3	28.5	5.3	7.5	3.5	0.5	–	–	–	–	–	–	–	–	–	–	–
1983	34.6	12.0	4.0	5.0	3.5	1.8	1.8	2.0	–	–	–	–	–	–	–	–	–	–	–
1984	147.7	69.8	34.3	20.5	3.5	8.0	8.3	2.0	0.5	0.3	0.5	–	–	–	–	–	–	–	–
1985	177.2	–	98.0	42.5	9.3	14.3	8.5	1.5	1.3	0.8	1.0	–	–	–	–	–	–	–	–
1986	297.5	–	–	96.8	30.3	90.3	43.5	19.5	11.0	3.8	2.0	0.3	–	–	–	–	–	–	–
1987	127.8	–	–	–	4.5	53.8	26.8	20.0	13.8	2.5	3.8	1.0	0.5	0.8	–	0.3	–	–	–
1988	125.0	–	–	–	–	61.5	35.8	9.3	7.3	4.5	4.5	0.5	0.8	0.8	–	–	–	–	–
1989	52.6	–	–	–	–	–	16.0	17.0	10.0	2.8	3.3	1.3	0.8	0.8	0.3	0.3	–	–	–
1990	136.4	–	–	–	–	–	–	54.5	48.0	13.0	16.5	1.5	1.3	1.3	0.0	0.3	–	–	–
1991	194.3	–	–	–	–	–	–	–	63.0	47.3	61.5	11.3	6.8	2.8	1.3	0.3	–	–	–
1992	16.7	–	–	–	–	–	–	–	–	2.0	7.3	2.0	0.3	1.5	2.3	1.0	0.3	–	–
1993	169.7	–	–	–	–	–	–	–	–	–	73.3	71.0	11.8	8.08	3.3	1.5	0.3	0.5	–
1994	130.5	–	–	–	–	–	–	–	–	–	–	63.3	43.0	14.0	4.8	2.8	1.8	0.8	–
1995	8.3	–	–	–	–	–	–	–	–	–	–	–	3.3	1.3	0.8	1.0	0.8	0.8	0.3
1996	177.2	–	–	–	–	–	–	–	–	–	–	–	–	37.5	84.3	30.5	13.3	9.8	1.8
1997	127.2	–	–	–	–	–	–	–	–	–	–	–	–	–	54.3	34.3	20.3	15.3	3.0
1998	76.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.0	29.5	14.8	6.3
1999	151.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	57.0	73.3	21.5
2000	12.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5	6.3
2001	42.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	42.8
Total		190.2	187.8	196.6	57.5	237.5	144.5	126.3	154.9	77.0	173.7	152.2	68.6	68.8	151.4	98.3	123.3	121.8	82.0
Net lifts		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 15.–Mean rank of Lake Erie walleye year classes based on measured harvest and survey catch per effort.

Year	Harvest		Trap		Gill-net		Mean
class	total[1]	rank	CPUE	rank	CPUE	rank	rank
1974	2,727,989	17	0.4	26	13.6	26	23
1975	3,356,110	15	1.3	24	42.8	21	20
1976	812,855	26	0.8	25	18.4	24	25
1977	6,837,878	6	10.2	16	171.0	6	9
1978	3,578,926	14	8.9	19	61.6	18	17
1979	2,535,057	21	8.7	20	72.4	16	19
1980	5,426,616	11	21.5	7	92.7	15	11
1981	3,093,746	16	16.9	12	72.3	17	15
1982	21,305,596	1	98.6	1	306.2	1	1
1983	2,572,846	20	21.4	8	34.6	23	17
1984	6,639,741	8	28.1	3	147.7	9	7
1985	7,518,595	4	27.0	5	177.2	5	5
1986	13,469,004	2	56.6	2	297.5	2	2
1987	4,081,685	12	27.5	4	127.8	12	9
1988	3,941,361	13	15.9	13	125.0	14	13
1989	2,688,970	18	8.9	18	52.6	19	18
1990	6,106,960	10	20.9	11	136.4	10	10
1991	7,163,771	5	21.1	9	194.3	3	6
1992	1,579,416	24	2.8	22	16.7	25	24
1993	6,356,968	9	21.8	6	169.7	7	7
1994	7,803,377	3	14.6	14	130.5	11	9
1995	851,533	25	1.5	23	8.0	28	25
1996	6,666,950	7	21.1	10	175.4	4	7
1997	2,119,013	22	10.1	17	124.2	13	17
1998	1,665,243	23	3.2	21	44.3	20	21
1999	2,687,767	19	10.5	15	130.3	8	14
2000	85,447	27	0.1	27	6.5	27	27
2001	62,284	28				21	25
Mean	4,950,867		17.8		110.7		

[1]Total harvest determined by summing each agencies sport and commercial age specific harvest estimates.