STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-3

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

Period Covered: October 1, 2001 to September 30, 2002

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 2001 and 2002, 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 2001-02, and progress is reported below.

Job 1. Title: Carry out trap-net sampling.–In spring 2001, the Michigan Department of Natural Resources (MDNR) made only 12 trap net lifts at the Monroe site due to vessel maintenance scheduling. Since the 12 lifts occurred in late May, data collected can not be considered comparable to the previous 23 years of the data time series. In spring 2002, a total of 81 net lifts were made in April.

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 23-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, 46,848 walleye 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 2 walleye made up nearly 70% of the 2001 trap net walleye catch, reflecting the lack of older mature spawners due to the later sampling date (Table 2). The age distribution of yellow perch caught in the trap nets in 2001 (Table 3) was dominated by age 3 (30%) and age 5 (39%) fish. The comparatively poor contribution by age 4 fish (13%) indicates that the 1997 year class was quite weak. Scale samples collected from walleye and yellow perch in 2002 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 312 walleye and 240 yellow perch scale samples collected during the 2001 creel survey were interpreted for ages. Age 2 (46%), age 3 (24%), and age 4 (14%) walleye accounted for the largest portion of the walleye recreational harvest (Table 4). 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 2001, accounting for 45% of the total catch (Table 5). The 1999 year class (age 2) added an additional 26% to the total. Age 4 (1997 year class) and age 5 (1996 year class) each accounted for 14% of the total harvest. Contributions from all other year classes were minor. 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 46,848 walleye have been tagged at the Monroe station since spring 1978. Of those, 3,904 (8.3%) have been reported caught by anglers and commercial fishermen through 2001. A total of 94 walleye were tagged in 2001; of which, none were subsequently recovered by fishermen in 2001. There were 44 reported recoveries from all years of tagging, at Monroe, during the 2001 fishing season. The geographical distribution of the 2001 returns (Table 6) is as follows: Lake Huron 0.0%; St. Clair River 0.0%; Lake St. Clair 0.0%; Detroit River 4.3%; Western Basin-Lake Erie 76.6%; Central Basin-Lake Erie 13.8%; and Eastern Basin-Lake Erie 4.3%. Recoveries were reported from all months except February, November, and December with 85% reported during the months of April (10.6%), May (29.8%), June (25.5%), and July (19.1%).

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 2000. 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 2001 fishing year had been received; thus, the recovery rate estimates for 2001 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 2001 (Table 7). Walleye were not tagged by Ontario in 1989 and 1996 nor by Ohio in 1999; 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 62.5% and mean recovery rate of 3.3% (Table 8). These values were used to estimate instantaneous natural mortality (M) according to the relationship $M = Z - \mathbf{u}Z/A$ where ($\mathbf{u}Z/A = F$) 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 walleye, produced a reward/non-reward ratio of 2.73 (Thomas and Haas 1999). A value for **u** of 9.02% was generated by expanding mean recovery rate (3.4%) by the non-reporting rate (2.69). The resulting value for M was 0.36. 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 (10.5%) 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 9). Anglers reported catching 165 non-reward and 56 reward tags from the 2000 tagged population during the 2000 and 2001 fishing seasons. The non-reporting ratio for anglers was 3.12, which was very similar to the 2.72 value calculated from the long-term recovery data from the 1990 reward study. However, commercial operators reported 80 reward tags and only 36 non-reward tags, resulting in a non-reporting ratio of 20.45. This was much higher than any non-reporting ratios encountered during the 1990-99 period suggesting that commercial operators, during 2000 and 2001, 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.

The Lake Erie Committee of the Great Lakes Fishery Commission reported at the annual meeting in March, 2001 that about 2.4 million walleye were harvested by the commercial fishery and only about 1.3 million by anglers. There is an apparent discrepancy because nearly equal numbers of reward tags were reported from the two fisheries. We believe this can be explained by differences in geographical extent of the two fisheries; commercial fisheries operated within Lake Erie only, while angling also occurred throughout Lake St. Clair, the connecting rivers, and southern Lake Huron. The angling fishery was expected to report a higher frequency of reward (and non-reward) tags, relative to the commercial fishery, because significant numbers of the 2000 tagged population would have migrated through Lake St. Clair and into Lake Huron.

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. All nets were suspended from the surface. A total of 486 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 walleye captured in 2001 fall gill-nets have been processed and aged. Mean length (mm) at age is presented in Table 10. No trends in walleye growth were evident over the last five years. Mean length of yearlings collected in 2000 remained well within the range observed since 1978 and very near the long-term mean of 330 mm (Table 11). Total walleye catch-per-effort for the index sites (Table 12) remained slightly below the long-term mean annual cpue of 127.1. Age 1 fish, representing the 2000 year class, exhibited the lowest age 1 catch rate since the 1995 and 1992 year classes, suggesting it was 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 these cohorts over the past 8 years. Age 2 fish (1999 year class) accounted for 60% of the catch with a CPUE of 73.3 fish per net lift, the highest age 2 CPUE for a year class since the

1996 year class. This strong year class is expected to contribute heavily to the fishery in 2002 and 2003.

Historical walleye catch data were used to develop a mean rank for the 1974-99 year classes, some of which were not yet completely represented throughout their life (Table 13). 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 the 1995, 1976, 1974, 1992, and 1975. 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 2001 MDNR surveys were completed and presented (as computer files and hard copies) to the Scientific Technical Committee, the Walleye Task Group, the Forage Task Group, and the Yellow Perch Task Group. Inter-agency walleye tag data for 2000 and 2001 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 Walleye Task Group to assist with development of a walleye management model. We also participated in an external review process of the walleye and yellow perch task group catch at age analyses.

Job 8. Title: Prepare annual reports.–This progress report was prepared. A final report presenting the results of this study for the period from 1994-98 was completed (Thomas and Haas 2000). 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 Mt. Clemens 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, 1996-02.

Species	Survey year 1996	1997	1998	1999	2000	2002	1978-89 Mean	1990-99 Mean	1978-02 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, 1992-01.

Age	Survey year 1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
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
3	6.75	32.18	30.86	0.59	25.30	32.30	3.39	49.70	26.70	7.5
4	11.30	4.61	23.31	13.10	1.54	22.30	23.1	0.93	35.00	3.8
5	12.20	9.41	4.22	4.81	19.70	1.95	13.7	6.47	1.71	3.8
6	33.20	11.22	6.45	1.57	15.50	15.10	2.67	5.60	8.51	1.9
7	10.00	23.49	13.99	4.91	5.36	8.23	10.3	2.33	5.18	4.7
8	10.20	7.92	11.59	6.58	9.35	5.75	4.37	4.02	4.04	0.9
9	2.17	4.02	5.27	2.55	8.45	5.23	3.52	1.92	3.80	1.9
10	2.65	1.69	2.19	1.47	5.83	4.89	4.17	2.45	2.66	0.9
11	0.14	1.95	0.84	0.10	1.97	2.13	1.24	1.05	1.28	2.8
12	0.05	0.13	0.38	0.29	0.94	0.52	1.43	1.16	1.23	1.9
13	–	0.06	0.04	–	0.21	0.29	0.39	0.35	0.24	–
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

Table 3.–Yellow perch catch per unit effort (CPUE) by age for trap net surveys during 1989-01 (expressed as number caught per net per 24 h).

Year	Days	Age 2	3	4	5	6	7	8+	Total 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	21.6	0.00	4.98	2.21	6.48	1.74	0.79	0.24	16.44

[1]Sampling period delayed six weeks.

Table 4.–Mean length-at-age (mm) of walleye sampled from Michigan's Lake Erie sport fishery, 1996-2001. Sample size in parentheses.

Age	Survey year 1996	1997	1998	1999	2000	2001
1	– –	– –	– –	– –	357 (2)	– –
2	348 (132)	339 (5)	341 (196)	357 (105)	363 (152)	356 (142)
3	414 (322)	415 (192)	431 (72)	411 (211)	430 (208)	427 (75)
4	454 (18)	465 (182)	473 (147)	446 (66)	470 (170)	469 (45)
5	489 (83)	518 (21)	513 (25)	496 (21)	500 (28)	500 (27)
6	547 (27)	519 (44)	548 (14)	561 (4)	510 (19)	535 (5)
7	528 (10)	558 (30)	576 (8)	567 (4)	555 (10)	531 (7)
8	566 (14)	565 (16)	583 (8)	569 (3)	561 (6)	603 (4)
9	631 (11)	623 (12)	655 (3)	628 (6)	638 (2)	612 (3)
10	662 (5)	625 (4)	651 (5)	546 (2)	650 (4)	670 (3)
11	671 (4)	680 (3)	– –	– –	742 (2)	742 (1)
12	560 (2)	625 (1)	– –	655 (2)	746 (1)	– –
13	– –	– –	– –	572 (1)	– –	– –
Mean	430 (628)	467 (510)	424 (478)	416 (425)	437 (607)	418 (312)

Table 5.–Mean length-at-age (mm) of yellow perch sampled from Michigan's Lake Erie sport fishery, 1995-00. Sample size in parentheses.

Age	Survey year 1996	1997	1998	1999	2000	2001
1	154 (11)	– –	162 (2)	164 (3)	185 (1)	– –
2	190 (355)	182 (101)	182 (224)	179 (26)	185 (100)	188 (63)
3	206 (273)	197 (356)	202 (268)	202 (419)	195 (127)	207 (107)
4	223 (18)	217 (178)	218 (187)	215 (183)	212 (289)	220 (33)
5	255 (8)	233 (24)	242 (45)	233 (86)	218 (140)	234 (33)
6	288 (4)	263 (3)	253 (3)	243 (31)	241 (33)	253 (2)
7	229 (1)	292 (1)	273 (2)	266 (12)	257 (10)	278 (2)
8	– –	– –	– –	263 (5)	315 (1)	– –
9	– –	– –	– –	– –	282 (1)	– –
10	– –	– –	– –	– –	– –	– –
Mean	198 (670)	202 (663)	203 (731)	211 (765)	208 (704)	208 (240)

Table 6.–Geographical distribution of tag recoveries, 1992-01, from walleye tagged at Monroe, Michigan, Lake Erie (expressed as a percentage of the total number recovered each year).

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

[1]Only 94 tags applied in 2001.

Table 7.–Tag recovery data for walleye tagged by Ohio, Ontario, and Michigan at Lake Erie sites, 1986-01.

Year	Number tagged	Year 1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Percent recovered
1986	5,645	158	88	93	51	33	28	10	15	9	3	5	2	3	0	1	1	8.9
1987	4,308	–	163	147	57	28	18	16	10	5	9	0	3	3	0	1	0	10.7
1988	6,871	–	–	234	120	64	35	33	21	15	3	5	12	2	2	0	0	7.9
1989	4,059	–	–	–	134	62	48	34	21	22	10	6	5	2	1	0	0	8.5
1990	4,352	–	–	–	–	152	114	72	58	30	18	14	11	7	2	0	0	11.0
1991	6,568	–	–	–	–	–	242	180	116	52	39	34	17	15	4	1	2	10.7
1992	5,649	–	–	–	–	–	–	237	184	77	36	34	19	11	6	4	1	10.8
1993	5,279	–	–	–	–	–	–	–	306	94	64	52	21	15	8	4	2	10.7
1994	4,545	–	–	–	–	–	–	–	–	152	104	71	36	33	10	7	1	9.1
1995	4,704	–	–	–	–	–	–	–	–	–	157	87	44	22	4	4	3	6.8
1996	5,718	–	–	–	–	–	–	–	–	–	–	253	123	57	31	9	10	8.4
1997	3,460	–	–	–	–	–	–	–	–	–	–	–	132	84	34	14	5	7.8
1998	1,668	–	–	–	–	–	–	–	–	–	–	–	–	28	20	2	0	3.0
1999	1,630	–	–	–	–	–	–	–	–	–	–	–	–	–	36	27	3	4.0
2000	4,469	–	–	–	–	–	–	–	–	–	–	–	–	–	–	112	31	3.2
2001	3,153	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	78	2.5

Table 8.–Annual survival and recovery rate (percent) during 1986-2001 for Lake Erie walleye from Ohio, Ontario, and Michigan nonreward tags produced by program "ESTIMATE" (combined data).

Fishing year	Tag recovery rate	Standard error	Walleye survival rate	Standard error
1986	2.80	0.22	56.63	3.88
1987	3.34	0.23	91.16	5.97
1988	3.43	0.18	52.95	3.76
1989	3.18	0.21	48.36	3.46
1990	3.44	0.21	70.54	4.21
1991	3.58	0.18	65.82	3.66
1992	3.99	0.20	63.20	3.69
1993	5.04	0.24	62.24	4.10
1994	3.36	0.20	84.07	6.27
1995	2.74	0.18	48.25	3.55
1996	4.14	0.22	55.23	4.34
1997	3.88	0.26	127.51	19.75
1998	1.78	0.26	29.68	5.71
1999	2.46	0.32	49.31	8.14
2000	2.43	0.22	30.76	5.52
2001	2.47	0.28	–	–
Mean	3.31	0.06	62.45	1.18

Table 9.–Preliminary results from the $100 reward tagging effort in Michigan, Ohio, and Ontario through year 2001.

Tag location	Tags applied		Tags returned		Return rate		Non-reporting ratio
	Non-reward	Reward	Non-reward	Reward	Non-reward	Reward	
Angler tag returns							
Chicken and Hen Islands (Ontario)	1,091	115	19	4	0.017	0.035	1.997
Grand River (Ohio)	152	0	10	0	0.066	–	–
Lackawanna Shoreline (New York)	239	29	15	3	0.063	0.103	1.648
Raisin River (Michigan)	1,874	208	67	26	0.036	0.125	3.496
Sandusky Bay (Ohio)	1,460	162	23	14	0.016	0.086	5.486
Van Buren Bay (New York)	761	92	31	9	0.041	0.098	2.401
Total angler	5,577	606	165	56	0.030	0.092	3.123
Commercial tag returns							
Chicken and Hen Islands (Ontario)	1,091	115	17	31	0.016	0.270	17.300
Grand River (Ohio)	152	0	0	0	0.000	–	–
Lackawanna Shoreline (New York)	239	29	0	1	0.000	0.034	–
Raisin River (Michigan)	1,874	208	12	37	0.006	0.178	27.780
Sandusky Bay (Ohio)	1,460	162	6	10	0.004	0.062	15.021
Van Buren Bay (New York)	761	92	1	1	0.001	0.011	–
Total commercial	5,577	606	12	80	0.006	0.132	20.451

Table 10.–Mean total length-at-age (mm) for walleye caught during fall in survey index multi-filament gill nets (sample size in parentheses), 1997-01.

	Survey year									
Age	1997		1998		1999		2000		2001	
Sexes combined										
1	306	(210)	319	(357)	339	(233)	327	(228)	345	(26)
2	380	(7)	404	(593)	416	(301)	410	(118)	418	(293)
3	443	(63)	439	(7)	462	(218)	447	(81)	460	(59)
4	475	(35)	487	(38)	514	(5)	484	(53)	493	(61)
5	523	(7)	514	(20)	515	(16)	513	(3)	521	(39)
6	521	(13)	525	(12)	535	(10)	525	(7)	540	(3)
7	556	(5)	517	(6)	554	(6)	492	(1)	565	(3)
8	572	(3)	525	(1)	562	(2)	530	(1)	558	(2)
9	581	(3	525	(1)	569	(1)	–	–		
10	604	(3)	586	(1)	648	(2)	–	–		
Mean	372	(349)	382	(1036)	412	(795)	388	(492)	439	(486)
Males										
1	302	(94)	317	(133)	337	(87)	326	(91)	342	(17)
2	372	(4)	396	(328)	406	(154)	401	(81)	412	(181)
3	429	(37	428	(3)	444	(133)	441	(63)	443	(40)
4	462	(27)	473	(27)	480	(3)	467	(40)	480	(46)
5	475	(4)	502	(15)	492	(10)	494	(2)	493	(22)
6	499	(9)	525	(12)	511	(7)	498	(5)	540	(3)
7	542	(4)	517	(6)	544	(4)	492	(1)	528	(2)
8	572	(3)	525	(1)	562	(2)	530	(1)	499	(1)
9	537	(2)	525	(1)	569	(1)	–	–		
10	554	(2)	586	(1)	–	–	–	–		
Mean	380	(186)	388	(527)	411	(402)	398	(492)	430	(312)
Females										
1	310	(115)	321	(223)	340	(146)	328	(136)	350	(9)
2	392	(3)	413	(265)	426	(147)	428	(37)	429	(112)
3	463	(25)	447	(4)	489	(85)	471	(17)	497	(19)
4	519	(8)	522	(11)	564	(2)	535	(13)	533	(15)
5	586	(3)	550	(5)	553	(6)	550	(1)	556	(17)
6	571	(4)	–	–	592	(3)	594	(2)	638	(1)
7	612	(1)	–	–	572	(2)	–	–	618	(1)
8	670	(1)	–	–	–	–	–	–		
9	704	(1)	–	–	–	–	–	–		
Mean	364	(161)	376	(508)	414	(393)	374	(206)	456	(174)

Table 11.–Mean total length (mm) for yearling walleye caught in Michigan fall gill-net surveys (sample size in parentheses), 1978-01.

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

Table 12.–Walleye CPUE (number per net lift), by cohort, in multi-filament gill nets during fall surveys on Michigan waters of Lake Erie, 1984-01.

Year class	Total CPUE	Survey year 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1973	1.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1974	13.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1975	42.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1976	18.4	0.0	0.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1977	171.0	3.0	0.5	0.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1978	61.6	1.8	0.5	1.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1979	72.4	2.3	2.0	0.5	0.5	0.3	–	–	–	–	–	–	–	–	–	–	–	–	–
1980	92.7	5.0	5.3	2.3	0.5	0.3	0.0	0.3	–	–	–	–	–	–	–	–	–	–	–
1981	72.3	7.8	3.8	2.8	2.3	0.5	0.3	0.0	–	–	–	–	–	–	–	–	–	–	–
1982	306.2	91.8	95.8	44.3	28.5	5.3	7.5	3.5	0.5	–	–	–	–	–	–	–	–	–	–
1983	34.6	4.5	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	8.0	–	–	–	–	–	–	–	–	–	–	–	–	3.3	1.3	0.8	1.0	0.8	0.8
1996	175.4	–	–	–	–	–	–	–	–	–	–	–	–	–	37.5	84.3	30.5	13.3	9.8
1997	124.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	54.3	34.3	20.3	15.3
1998	70.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.0	29.5	14.8
1999	130.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	57.0	73.3
2000	6.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5
	Total	116.2	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
	Net lifts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 13.–Mean rank of Lake Erie walleye year classes based on measured harvest and survey catch per effort, 1974-2000.

Year class	Total harvest[1]	Harvest rank	Trap CPUE	Trap rank	Gill CPUE	Gill-net rank	Mean rank
1974	2,727,989	17	0.4	25	13.6	25	21.3
1975	3,356,110	15	1.3	22	42.8	21	18.3
1976	812,855	25	0.8	24	18.4	23	22.0
1977	6,837,878	6	10.2	15	171.0	6	8.7
1978	3,578,926	14	8.9	17	61.6	18	15.7
1979	2,535,057	20	8.7	18	72.4	16	17.7
1980	5,426,616	11	21.5	7	92.7	15	9.7
1981	3,093,746	16	16.9	12	72.3	17	14.3
1982	21,305,596	1	98.6	1	306.2	1	1.0
1983	2,572,846	19	21.4	8	34.6	22	15.3
1984	6,639,741	7	28.1	3	147.7	8	6.0
1985	7,518,595	4	27.0	5	177.2	4	4.0
1986	13,469,004	2	56.6	2	297.5	2	2.0
1987	4,081,685	12	27.5	4	127.8	12	9.3
1988	3,941,361	13	15.9	13	125.0	13	13.0
1989	2,688,970	18	8.9	16	52.6	19	17.7
1990	6,106,960	10	20.9	9	136.4	9	9.3
1991	7,163,771	5	20.9	10	194.3	3	6.0
1992	1,579,416	22	2.5	20	16.7	24	22.0
1993	6,356,968	9	21.5	6	169.7	7	7.3
1994	7,803,377	3	13.8	14	130.5	10	9.0
1995	670,314	26	1.2	23	8.0	26	25.0
1996	6,516,106	8	19.3	11	175.4	5	8.0
1997	1,998,969	21	8.3	19	124.2	14	18.0
1998	1,412,230	23	1.5	21	44.3	20	21.3
1999	1,191,232	24	0.0	26	130.3	11	20.3
2000	3,573	27			6.5	27	27.0
Mean	4,866,292		17.8		109.2		

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