

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-14

Study No.: 470

Title: Great Lakes zooplankton populations near historical and potential walleye spawning rivers

Period Covered: April 1, 1997 to March 31, 1998

Study Objective: To describe Great Lakes macro-zooplankton populations during spring and early summer in the vicinity of major tributaries (i.e., potential walleye spawning grounds). To learn whether food availability during various walleye fry stages is important to survival and recruitment to the adult walleye population.

Summary: Recent walleye catch per effort data were gathered from various sources for Lake Erie, Lake St. Clair, and Saginaw Bay and used to supplement my inventory of walleye year class strengths. Catch data from 1980-97 were used to rank year classes in each body of water. Three sources of Lake Erie catch data were used and there was very good agreement between them. Fall trap net data obtained from the Ontario Ministry of Natural Resources was used to estimate year class strength in Lake St. Clair. Gill net catch rates collected by the Michigan Department of Natural Resources (MDNR) was used to estimate year class strength in Saginaw Bay. There was moderate similarity in year class ranks between Lake Erie and Lake St. Clair but Saginaw Bay was very different.

Job 5. Title: Analyze walleye age/year class data.

Findings: Historical walleye year class strength was estimated from catch data for Lake Erie, Lake St. Clair, and Saginaw Bay. Trawl catches of age-0 and gill net catches of yearling walleye are highly variable and poorly represent the success of some year classes. A comparison of total harvest of 1973-95 year classes with the Ohio Department of Natural Resources trawl catch of young-of-year from these year classes in Western Lake Erie (Figure 1) showed that trawl catches could be substantially lower or higher than expected and therefore were relatively unreliable estimators of eventual harvest. Reliable estimates of year class strength can only be obtained from repeated captures of each cohort throughout the major portion of their life. Spring trap nets fished for a period of 3 weeks or more near Monroe, MI are thought to be one source of reliable walleye catch rates. The mean catch rates of ages 1-11 generated from this operation during the period from 1980-97 are shown in Table 1. Based on these results it is likely that highly reliable estimates can only be produced for a cohort after catch rates for ages 1-5 are available. Walleye are not fully recruited to these nets until age 3 and the majority of their lifetime contribution comes between ages 3 and 5. Therefore, the most reliable estimates for the 1990-95 cohorts will not be available until the 1999 spring trap net data are collected and evaluated. This analysis will be updated annually through 1999 and will provide the basis for testing whether the food base for walleye fry at various spawning tributaries was an important determinant of recruitment success. Walleye populations in Michigan's waters of Lake Erie are being monitored as part of F-53-R, Study 460.

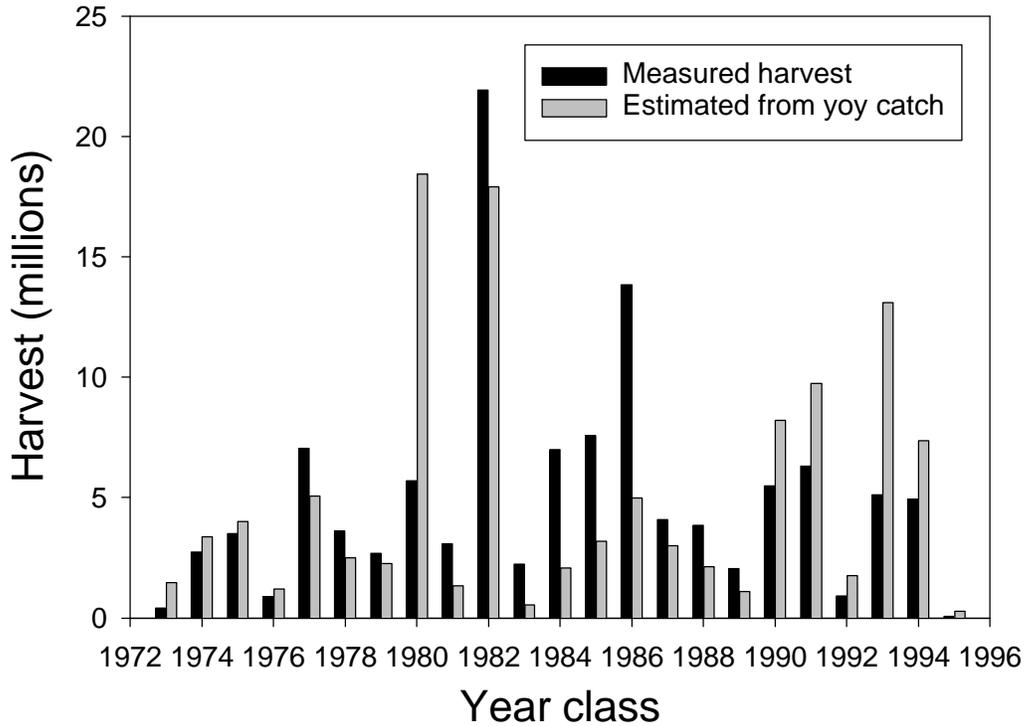


Figure 1.—Harvest by year class for Western Lake Erie walleye from 1973-95. Black bars show measured harvest compiled from Great Lakes Fishery Commission files maintained by the Walleye Task Group. Stippled bars show harvest estimates derived from average bottom trawl catches of young-of-year by the Ohio Department of Natural Resources under Federal Aid in Sport Fish Restoration Project F-69-P.

Table 1.—Mean trap net catch per effort (CPE) of walleye age groups per day for Michigan waters of Lake Erie, 1980-97.

Age	CPE
1	0.809
2	4.781
3	6.137
4	3.811
5	3.272
6	1.559
7	1.258
8	0.856
9	0.435
10	0.256
11	0.289

For Lake Erie, the combined lakewide angler and commercial harvest estimates (Great Lakes Fishery Commission, Lake Erie Committee Walleye Task Group, unpublished data) were used. These data were used to develop a mean rank for the 1974-95 year classes, some of which were not yet completely represented throughout their life (Table 2). Total harvest included the sport and commercial catches from the Western and Central basins of Lake Erie. Trap and gill net CPE data came from MDNR 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 six year classes were 1982, 1986, 1985, 1977, 1984, and 1991.

Walleye year class strength in Lake St. Clair for the 1981-94 period was ranked from Ontario Ministry of Natural Resources fall index trap net catches (D. MacLennan, unpublished data). The Ontario trap net program has operated from 1970-96 and produced CPE estimates for the 1969-85 year classes. Trap net CPE values from the 1964-68 and 1986-94 year classes were incomplete as these cohorts were not completely represented in the time series. I did not correct the CPE values for those cohorts since the values for the 1990-94 cohorts will improve as more years of catch data become available. Rankings for Lake St. Clair year classes were compared in Table 3 with ranks for 1981-95 Lake Erie cohorts derived from the data described above. There was a modest amount of similarity between the estimated ranks for the two lakes and it is not known whether year class strength is quite different. There is strong evidence from tagging studies (see F-53-R, Study 460) that large numbers of Lake Erie walleye migrate through Lake St. Clair during summer and fall, when they could be captured in trap nets which might bias the year class structure toward that found in Lake Erie.

Table 2.—Mean rank of Lake Erie walleye year classes based on measured harvest and survey catch per effort.

Year class	Total harvest ¹	Harvest rank	Trap CPUE	Trap rank	Gill CPUE	Gill net rank	Mean rank
1974	2,728,109	16	4.59	19	13.6	21	18.67
1975	3,487,115	14	12.01	13	42.8	17	14.63
1976	888,628	21	1.77	20	18.3	20	20.33
1977	7,045,673	4	36.44	3	170.9	5	4.00
1978	3,596,299	13	8.93	16	61.5	15	14.67
1979	2,683,348	17	8.99	15	72.3	13	15.00
1980	5,704,888	7	21.86	6	92.5	12	8.33
1981	3,091,794	15	17.85	8	72.0	14	12.33
1982	21,925,955	1	112.03	1	306.0	1	1.00
1983	2,234,666	18	9.24	14	34.5	19	17.00
1984	6,987,746	5	34.07	4	147.6	7	5.33
1985	7,559,794	3	31.93	5	177.1	4	4.00
1986	13,852,246	2	55.05	2	297.4	2	2.00
1987	4,098,022	11	17.82	9	127.4	9	9.67
1988	3,844,448	12	14.80	12	124.9	10	11.33
1989	2,055,511	19	7.66	17	52.0	16	17.33
1990	5,475,255	8	19.34	7	136.1	8	7.67
1991	6,314,496	6	17.81	10	192.7	3	6.33
1992	903,329	20	0.94	21	13.1	22	21.00
1993	5,106,511	9	17.40	11	164.1	6	8.67
1994	4,935,441	10	7.33	18	120.3	11	13.00
1995	73,128	23	0.18	22	4.6	23	22.67
1996	566,847	22	0.00	23	37.5	18	21.00
Mean	5,006,924		16.68		116.4		

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

Walleye year class strength for Saginaw Bay during 1981-95 was ranked according to CPE data from MDNR fall gill net surveys for 1992-97 (see F-53-R-12, Study 466). I did not correct the CPE values for any cohorts since the values for the 1990-94 cohorts will improve as more years

of catch data become available. Rankings for Saginaw Bay year classes were compared in Table 3 with ranks for 1981-95 Lake Erie and Lake St. Clair cohorts. There was very little similarity between the estimated ranks between Saginaw Bay and the other two lakes and it is not known whether year class strength in the bay is typically asynchronous. Annual plantings of walleye fingerlings are typically made in Saginaw Bay and are known to be producing substantial recruitment. There is some movement of walleye from the Lake St. Clair and Lake Erie stocks into Saginaw Bay but probably not enough to strongly bias the age distribution in net catches.

Table 3.—Rank of 1981-94 walleye year classes from Lake St. Clair, Lake Erie, and Saginaw Bay. Ranking for Lk. St. Clair walleye was not updated to include 1995 year class because 1997 netting data were not available from the Ontario Ministry of Natural Resources.

Year class	Lk. St. Clair	Lake Erie	Saginaw Bay
1981	5	9	15
1982	1	1	13
1983	6	12	14
1984	2	4	12
1985	4	4	10
1986	3	2	7
1987	7	8	6
1988	9	10	4
1989	12	12	3
1990	8	6	2
1991	10	5	1
1992	14	14	8
1993	11	7	11
1994	13	10	5
1995	—	15	9

Job 6. Title: Prepare performance report.

Findings: This report was prepared on schedule.

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Date: March 31, 1998