

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-15

Study No.: 470

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

Period Covered: April 1, 1998 to September 30, 1999

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 1978-1998 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. Angler diary data obtained from the Ontario Ministry of Natural Resources (OMNR) and the Michigan Department of Natural Resources (MDNR) were used to estimate year class strength in Lake St. Clair. Angler harvest data collected by 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 may not accurately represent the success of some year classes. A comparison of total harvest of 1974-1996 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 1980-1998 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. In Lake Erie, 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 1990-1994 cohorts will not be available until the 1999 spring trap net data are evaluated. This analysis will be updated annually through the 1999 survey season which 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-15, Study 460.

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 1974-1996 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, 1984, 1991, and 1993.

Walleye year class strength in Lake St. Clair for the 1982-1996 period was ranked by manipulating angler diary data provided by the interagency diary program that has operated from 1995 to present. A prediction technique, based on the age contributions of Lake Erie walleye to that lake's long-term fishery yield, was used to produce CPE estimates for the 1982-1996 year classes in Lake St. Clair. Total harvest values from these year classes were incomplete because none of the cohorts were represented at all ages in the relatively short time series. Rankings for Lake St. Clair year classes were compared in Table 3 with ranks for 1982-1996 Lake Erie cohorts. 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-15, Study 460) that large numbers of Lake Erie walleye migrate through Lake St. Clair during summer and fall, when they contribute significantly to angler harvest which might bias the year class structure toward that found in Lake Erie.

Walleye year class strength for Saginaw Bay during 1982-1996 was ranked according to harvest data from MDNR annual creel surveys for 1991-1998 (see F-53-R-15, Study 466). The same prediction technique as above, based on the age contributions of Lake Erie walleye to that lake's long-term fishery yield, was used to produce harvest estimates for the 1981-1996 year classes in Saginaw Bay. Total harvest values from these year classes were incomplete because none of the cohorts were represented at all ages in the relatively short time series. Rankings for Saginaw Bay year classes were compared in Table 3 with ranks for 1982-1996 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 angler catches.

Job 6. Title: Prepare performance report.

Findings: This report was prepared on schedule.

Prepared by: Robert C. Haas

Date: September 30, 1999

Lake Erie Walleye

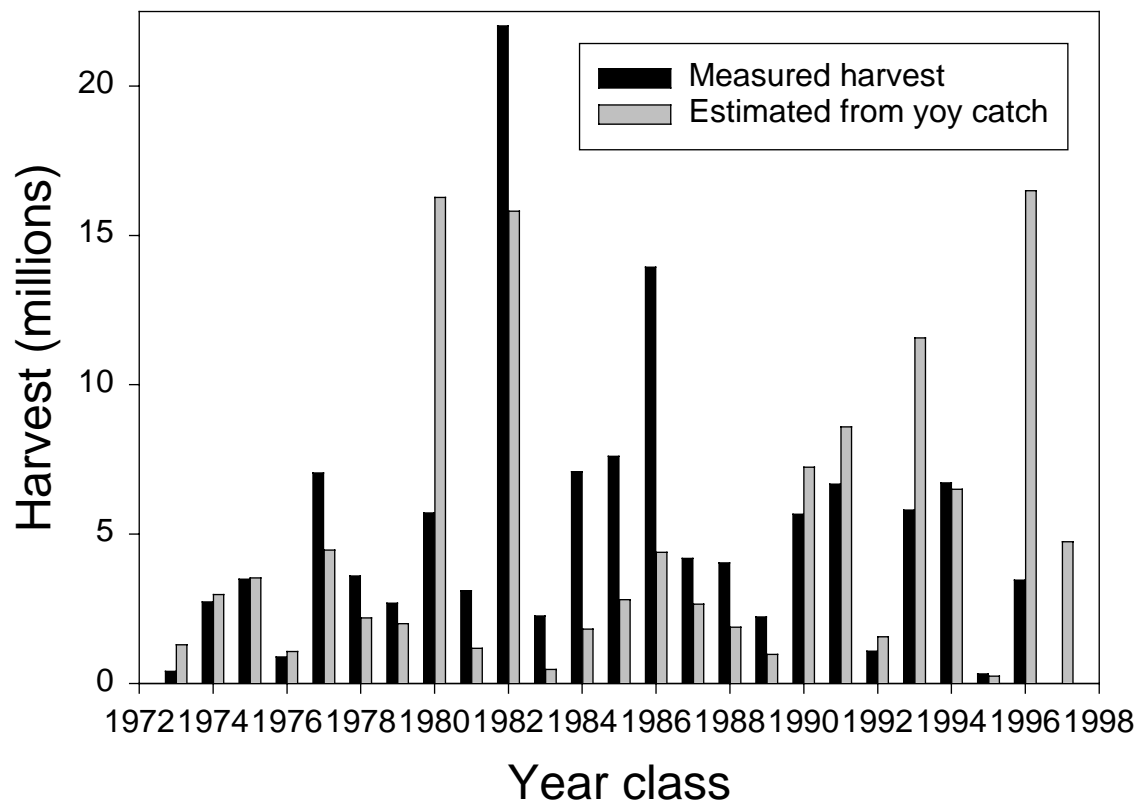


Figure 1.—Harvest by year class for Western Lake Erie walleye from 1973-1997. Black bars show measured harvest compiled from Great Lakes Fishery Commission files maintained by the Walleye Task Group. Stippled bars show harvest estimates derived from average bottom trawl catches of young-of-year by the 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, 1980-1998.

Age	CPE
1	0.767
2	4.818
3	5.845
4	3.823
5	3.226
6	1.502
7	1.286
8	0.851
9	0.444
10	0.281
11	0.286

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	17	0.39	23	13.6	23	21.00
1975	3,487,115	14	1.32	20	42.8	19	17.67
1976	888,028	22	0.81	21	18.4	21	21.33
1977	7,045,673	5	10.23	14	171.0	5	8.00
1978	3,596,299	13	8.91	15	61.6	16	14.67
1979	2,683,484	18	8.65	16	72.4	14	16.00
1980	5,705,365	9	21.54	6	92.7	13	9.33
1981	3,108,403	16	16.93	11	72.3	15	14.00
1982	22,011,721	1	98.64	1	306.2	1	1.00
1983	2,262,177	19	21.43	7	34.6	20	15.33
1984	7,090,702	4	28.10	3	147.7	7	4.67
1985	7,604,884	3	27.02	5	177.2	4	4.00
1986	13,942,269	2	56.57	2	297.5	2	2.00
1987	4,189,711	11	27.29	4	127.5	9	8.00
1988	4,041,153	12	15.54	12	125.0	11	11.67
1989	2,225,224	20	8.26	17	52.3	18	18.33
1990	5,666,003	10	20.14	8	136.1	8	8.67
1991	6,669,951	7	19.65	10	194.0	3	6.67
1992	1,085,236	21	1.41	19	15.4	22	20.67
1993	5,806,348	8	19.79	9	167.4	6	7.67
1994	6,713,725	6	11.37	13	125.1	10	9.67
1995	319,070	23	0.77	22	5.4	24	23.00
1996	3,452,544	15	5.50	18	121.8	12	15.00
1997	13,302	24	0.00	24	54.3	17	21.67
Mean	5,097,354		17.93		109.7		

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

Table 3.—Rank of 1982-1996 walleye year classes from Lake St. Clair, Lake Erie, and Saginaw Bay.

Year class	Lk. St. Clair	Lake Erie	Saginaw Bay
1982	6	1	11
1983	3	13	6
1984	2	8	3
1985	1	5	4
1986	4	2	1
1987	5	10	2
1988	8	11	10
1989	12	12	7
1990	9	9	5
1991	11	7	8
1992	14	14	9
1993	13	6	14
1994	10	4	13
1995	15	15	12
1996	7	3	15