

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-1

Study No.: 488

Title: Status of the Lake St. Clair fish community and sport fishery

Period Covered: October 1, 1999 to September 30, 2000

Study Objective: The objectives of this study are (1) to measure the abundance of yellow perch and other forage species in Lake St. Clair, (2) to monitor yellow perch diet and growth, and compare with yellow perch populations of Saginaw Bay and Lake Erie, (3) to monitor the abundance and distribution of newly-introduced exotic fish species in Lake St. Clair, (4) document the abundance and distribution of species of special concern, and (5) to monitor trends in sport fish catch rates for the Lake St. Clair fishery.

Summary: Fish populations were sampled with 10 m and 4.8 m headrope bottom trawls during 1999 and 2000. Data entry and analysis for all 1999 trawls were completed. Yellow perch, spottail shiner, trout-perch, smallmouth bass, and rock bass dominated the trawl catches. Round goby trawl catch rates have been fairly stable over the past four years, but mean annual catch rates for logperch and johnny darter have declined dramatically. Special-concern species sampled with trawls included eastern sand darter and lake sturgeon. Sport fishing catch and effort information was collected with a voluntary angler diary program. Catch rates for walleye in 1999 remained high, while smallmouth bass and yellow perch catch rates increased by nearly 50% over 1998. Muskellunge catch rates declined in 1999. Processing of yellow perch diet samples collected in 1998 and 1999 continues.

Job 1. Title: Sample yellow perch and forage with index trawls.

Findings: During 1999, fish were collected at the Anchor Bay index site with a 10 m headrope bottom trawl with 6 tows in June and 23 tows in September. In June, yellow perch, trout-perch, and spottail shiner were most abundant. During September, spottail shiner, rock bass, and mimic shiner were most abundant. Comparison of spring and fall densities for Anchor Bay since 1993 revealed some interesting seasonal patterns (Table 1). Rainbow smelt were abundant in June but decreased to low abundance in September, probably a result of the warmer water conditions found in Lake St. Clair during July and August. Similarly, yellow perch density was consistently higher during June than during the fall sampling period. We suspect that yellow perch catch rates were low in September due to yellow perch distribution in macrophyte beds, which were abundant by September. Unfortunately, we were unable to effectively trawl in heavily vegetated areas of the lake. Conversely, mimic shiners were rather rare in the June trawls, but were one of the most abundant species in the fall trawl catch. Similarly, alewife and smallmouth bass abundances were generally higher in the fall sampling. This increase may be related to recruitment of age 0 fish to the trawl gear by September.

While no trends in catch rates across the time period from 1993-99 were evident in 1999, several species experienced the lowest catch rates observed for the period. Alewife, logperch, trout-perch, and rainbow smelt September catch rates were the lowest observed during this study, while September catch rates for mimic shiner and white perch were the second lowest observed. Conversely, rock bass and spottail shiner catch rates in September 1999 were the highest for fall

sampling for this time period. Samples of yellow perch collected in June and September 1999 were frozen for later analysis of age, growth, condition, and diet.

Sampling has continued on schedule in 2000.

Job 2. Title: Sample exotic and other fish species with trawls.

Findings: In addition to trawls included under Job 1, exotic species and special concern species were sampled from June through October 1999 with a total of 194 trawl tows made lakewide. We divided Lake St. Clair into a 5 minute grid system. The 5 minute grids were grouped for the three main areas of the lake: the northwest portion or Anchor Bay, the southwest area, and the southeast area. Trawl locations were randomly selected from shoreline and offshore grids. Shoreline grids were sampled with the 4.8 m headrope trawls pulled by 18 foot work boats. Offshore grids were sampled with 10 m headrope trawls pulled by the RV Channel Cat.

Over 35,000 fish comprising 43 species were collected (Table 2) from a total of 194 trawl tows. Yellow perch (28.2%), spottail shiner (21.6%), trout-perch (14.2%), smallmouth bass (7.8%), and rock bass (6.7%) were the most abundant species combining for over 77% of the total catch. Round gobies were collected from all three areas of the lake, and from both nearshore and offshore grids. A total of 1,579 round gobies were collected lakewide, representing 4.4% of the total catch. In contrast, only 51 tubenose gobies were collected. Special concern species, including eastern sand darter (2), and lake sturgeon (65), were also collected.

An analysis of the mean annual catch rates during 1996-99 for all species revealed few trends. However, two species have experienced a dramatic decline from 1996 to 1999—johnny darter and logperch (Table 3). Both species have experienced decreased mean catch rates and have reduced spatial distributions in the lake. Researchers have hypothesized that round goby competition could precipitate declines in native benthic fish populations such as darters and sculpins. The declines documented in this study may be a result of such a competitive interaction.

Sampling has continued on schedule in 2000.

Job 3. Title: Collect catch and effort data for the sport fishery with angler diaries.

Findings: A voluntary angler diary program was used to collect catch and effort data for recreational fishing on Lake St. Clair. The program was initiated by the Ontario Ministry of Natural Resources (OMNR) in 1985 to monitor trends in the muskellunge catch rate for Lake St. Clair. Five years later the program was expanded to include other species. The Michigan Department of Natural Resources (MDNR) became involved in the program in 1993. Since that time, the program has been a cooperative effort between the OMNR and MDNR. In 1999, the MDNR distributed 82 angler diaries to Michigan resident sport anglers interested in participating in the diary program. A total of 56 diaries were returned by cooperating anglers during the fall and early winter.

The Lake St. Clair Angler Diary Program provides annual estimates of catch rates for the major sport fish species in the lake. Ontario and Michigan angler diary data were pooled to produce the 1999 estimates (Table 4). The walleye catch rate in 1999 remained essentially unchanged from the previous year, the highest observed since the program expanded in 1992. The catch rates for yellow perch and smallmouth bass increased by almost 50% in 1999. The 1999 muskellunge catch rate for Lake St. Clair declined to the lowest point since 1992. However, effort was also at the lowest point observed for the period. Anecdotal angler reports have not indicated a decline in success for muskellunge fishing. We will closely monitor angler diary muskellunge catch rates for any continued sign of declining catch rates in 2000 and 2001.

New angler diaries were distributed in April 2000 and will be recalled in November 2000.

Job 4. Title: Identify and quantify perch stomach contents.

Findings: Lab processing of 663 yellow perch stomachs collected in June and September of 1997 has been completed. Chironomid pupae and larvae, ephemeroptera, amphipods, and gastropods were all found in high percentages of non-empty June stomach samples (Table 5). While chironomid larvae and ephemeroptera remained common in the September samples; decapods, fish, and zooplankton also became quite common as well. Yellow perch in Lake St. Clair have begun to forage on round gobies - two September 1996, and five September 1997, stomachs were found to contain round gobies.

Lab processing of yellow perch stomachs collected for diet analysis in 1998 and 1999 is underway.

Job 5. Title: Analyze data and estimate growth rates for yellow perch.

Findings: Processing of yellow perch scale samples collected in 1998 and 1999 is underway. Although the data set covers only a five year time span, it appears that growth rates, based on mean length at age, slowed in 1996 and 1997, but showed signs of improvement in 1998 and 1999 (Table 6).

Evaluation of catch rates by age indicated the presence of strong and weak year classes in the population (Table 7). The 1992 and 1995 year classes appeared weak, while the 1991, 1993, and 1994 year classes were comparatively strong. The record high catch rate of yearlings in 1999, suggested that the 1998 year class may have been very strong. Variable recruitment is characteristic of yellow perch populations throughout the Great Lakes. The apparent decline in growth for 1996 and 1997 could be related to higher yellow perch densities due to the strength of the 1993 and 1994 year classes.

Job 6. Title: Prepare annual performance reports.

Findings: In addition to this study performance report, findings of work conducted under this study were summarized in an annual fisheries status report prepared for the Lake Erie Committee of the Great Lakes Fisheries Commission. Results of this study were also included in a case history paper prepared for the Salmonid Communities in Oligotrophic Lakes (SCOL) II workshop, supported by the Great Lakes Fisheries Commission in May 2000.

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Date: September 30, 2000

Table 1.—Mean density (number per hectare) for all fish species caught during spring (June) and fall (September or October) with 10 m headrope index trawls in Anchor Bay, Lake St. Clair 1994-99.

Species	Spring						Fall					
	1994	1995	1996	1997	1998	1999	1994	1995	1996	1997	1998	1999
Alewife	3.4	4.3	29.2	10.6	2.5	1.9	24.9	30.8	28.3	30.7	11.5	1.6
Banded killifish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Black crappie	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
Blackchin shiner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blackside darter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Bluegill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.7	0.0	0.0	0.0	7.5
Bluntnose minnow	62.5	18.8	0.7	0.0	0.2	0.0	1276.9	30.1	0.0	33.5	0.2	9.4
Brook silversides	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.1	0.0	0.1	0.0	2.5
Brook stickleback	62.9	2.3	0.0	0.0	0.0	0.0	1.6	0.2	1.1	0.0	0.0	0.0
Brown bullhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Channel darter	1.1	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Common carp	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.2	0.9	0.0	0.1
Common white sucker	1.1	0.0	5.4	3.7	3.6	0.0	1.6	0.2	0.5	2.3	0.0	0.3
Eastern sand darter	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emerald shiner	0.0	0.2	0.7	0.2	0.0	0.0	0.0	4.3	3.8	1.1	7.5	0.0
Freshwater drum	1.6	0.2	6.6	12.5	5.0	2.3	0.9	4.5	1.1	0.6	0.2	1.4
Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.9	0.0
Golden redhorse	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1
Iowa darter	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Johnny darter	61.4	17.9	21.7	2.8	7.0	0.0	0.0	4.3	17.7	4.0	0.0	0.0
Lake sturgeon	0.0	0.0	2.3	0.4	0.0	0.1	0.0	0.0	1.8	0.0	1.4	0.0
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.0	55.0	18.6	0.0	0.0	0.0	3.0
Logperch	9.7	75.6	8.8	75.6	83.3	7.6	14.3	27.8	32.4	40.0	20.6	1.3
Mimic shiner	1.4	1.4	17.2	26.3	1.6	0.0	1711.4	1594.6	267.6	1094.9	0.2	29.8
Muskellunge	0.2	0.0	0.0	0.2	0.0	0.1	3.2	0.7	0.2	0.2	0.0	0.0
Northern pike	0.7	0.0	0.0	0.4	0.2	0.0	0.5	1.4	0.0	0.4	0.0	0.1
North. shorthead redhorse	3.4	0.9	7.7	6.7	0.7	6.9	0.0	1.1	0.2	0.4	0.2	0.4
Pumpkinseed	0.0	0.0	0.0	0.6	0.0	0.0	2.3	77.0	0.2	4.0	0.0	1.6
Quillback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.1	1.1	0.0
Rainbow smelt	1417.5	986.2	593.0	656.1	4.3	4.0	0.2	3.6	0.9	16.5	0.2	0.0
Rock bass	26.5	36.9	43.0	17.5	5.4	1.0	66.6	94.6	18.3	81.5	0.9	89.0
Round goby	0.0	0.2	4.8	14.3	28.1	6.0	0.5	20.2	65.7	9.7	22.2	9.6
Silver lamprey	0.0	0.0	0.0	0.2	0.0	0.9	0.0	0.0	0.5	0.0	0.0	0.2
Silver redhorse	0.0	0.0	0.7	2.3	0.2	0.4	0.0	0.2	4.5	0.9	0.7	0.0
Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Smallmouth bass	0.2	0.2	0.2	3.2	0.5	0.0	3.6	2.9	13.6	10.6	24.5	10.7
Spottail shiner	22.9	24.7	178.2	122.6	8.2	68.9	7.2	72.5	17.0	487.2	45.3	200.0
Threespine stickleback	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trout-perch	11.1	52.1	231.2	345.9	98.5	154.0	19.2	153.1	775.7	92.3	25.8	2.9
Tubenose goby	0.2	0.7	0.2	0.0	0.0	0.0	0.7	1.4	0.0	0.0	0.0	0.0
Unid. redhorse	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Walleye	1.6	1.6	4.5	10.4	0.9	1.7	0.7	4.3	7.2	1.3	2.7	0.9
White bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
White perch	0.0	0.0	1.4	0.7	0.0	0.4	0.0	4.1	16.1	11.7	7.5	0.1
Yellow perch	265.1	785.4	1184.1	560.3	249.7	866.9	38.5	76.5	34.2	26.8	68.8	21.7

Table 2.—Catch summary for 194 trawl tows on Lake St. Clair in 1999.

Species	Total catch	Percent of total
Yellow perch	10,096	28.2
Spottail shiner	7,715	21.6
Trout-perch	5,076	14.2
Smallmouth bass	2,802	7.8
Rockbass	2,400	6.7
Mimic shiner	2,060	5.8
Round goby	1,579	4.4
Gizzard shad	928	2.6
Alewife	703	2.0
White perch	410	1.2
Bluntnose minnow	282	0.8
Emerald shiner	242	0.7
Pumpkinseed	183	0.5
Smelt	168	0.5
Freshwater drum	147	0.4
Largemouth bass	141	0.4
Walleye	121	0.3
Logperch	99	0.3
Northern redhorse	75	0.2
Bluegill	75	0.2
Brook silversides	69	0.2
Silver redhorse	66	0.2
Lake sturgeon	65	0.2
Tube-nose goby	51	0.1
Quillback carpsucker	39	0.1
Johnny darter	37	0.1
Silver lamprey	27	0.1
Common carp	24	0.1
White sucker	16	<.1
Longnose gar	15	<.1
White bass	11	<.1
Channel catfish	9	<.1
Northern pike	5	<.1
Banded killifish	5	<.1
Great lakes muskellunge	4	<.1
Brook stickleback	4	<.1
Brindled madtom	3	<.1
Golden redhorse	3	<.1
Eastern sand darter	2	<.1
Brown bullhead	1	<.1
Tadpole madtom	1	<.1
Lake whitefish	1	<.1
Green sunfish	1	<.1

Table 3.—Mean annual catch rates for three species from all Lake St. Clair 10 m headrope trawls, 1996-99 (standard error in parentheses).

Year	Mean annual catch rate					
	Johnny darter		Logperch		Round goby	
1996	3.67	(0.83)	20.21	(6.44)	20.95	(2.54)
1997	2.45	(0.79)	14.04	(1.93)	14.60	(2.97)
1998	0.60	(0.25)	8.42	(2.89)	17.31	(4.99)
1999	0.28	(0.11)	1.58	(0.33)	24.07	(5.37)

Table 4.—Angler effort, catch, and catch rates for the Lake St. Clair sport fishing diary program 1992-99.

Year	Effort (rod-hours)	Number caught	Number kept	Catch per rod-hour
Walleye				
1992	5,558	1,331	1,223	0.24
1993	8,159	2,901	2,616	0.36
1994	7,808	1,983	1,878	0.25
1995	6,296	1,458	1,220	0.23
1996	6,102	1,906	1,685	0.31
1997	4,681	1,479	1,311	0.32
1998	5,599	2,481	1,947	0.44
1999	5,850	2,610	2,239	0.44
Yellow perch				
1992	3,148	6,017	4,297	1.91
1993	5,212	12,076	8,715	2.32
1994	5,548	12,331	8,508	2.22
1995	4,509	10,139	5,969	2.25
1996	3,462	10,654	5,846	3.08
1997	2,701	9,661	5,773	3.58
1998	3,520	7,134	5,048	2.03
1999	2,087	6,142	3,654	2.94
Smallmouth bass				
1992	2,326	1,512	608	0.65
1993	3,284	1,376	584	0.42
1994	2,484	995	352	0.40
1995	2,069	1,008	269	0.49
1996	1,537	545	190	0.35
1997	1,375	687	148	0.50
1998	1,248	495	94	0.40
1999	1,841	1,112	204	0.60
Muskellunge				
1992	9,799	742	16	0.076
1993	13,859	1,096	19	0.080
1994	19,069	1,628	22	0.090
1995	19,587	1,434	13	0.073
1996	15,629	1,458	12	0.093
1997	15,199	1,573	11	0.103
1998	11,336	1,075	8	0.094
1999	9,370	645	5	0.069

Table 5.—Frequency of occurrence of food items (expressed as percent of non-empty stomachs containing each taxa) in yellow perch diets in Lake St. Clair 1996-97.

Taxa	1996		1997	
	June	September	June	September
Amphipod	47.0	5.3	42.7	3.2
Chironomid larvae	84.1	33.6	83.9	7.8
Chironomid pupae	38.5	3.3	8.9	0.9
Dressiena polymorpha	1.9	0.7	1.1	0.0
Decapod	1.9	7.2	0.3	11.0
Ephemeroptera	79.9	49.3	65.9	41.3
Gastropod	6.6	8.6	33.9	21.6
Hydracarina	1.1	0.7	9.7	0.5
Isopod	29.1	2.0	7.8	0.0
Pelecepod	0.3	0.0	0.5	0.5
Tricoptera	13.5	23.0	37.9	16.5
All fish species	0.8	20.4	3.2	17.0
All zooplanton	0.3	19.1	1.3	11.5
Non-empty stomachs	364	152	372	218

Table 6.—Mean length at age (mm) for yellow perch from Lake St. Clair trawls in June 1995-99. Sample size in parentheses.

Age	Year					State Average
	1995	1996	1997	1998	1999	
Males						
1	100 (44)	94 (33)	87 (33)		113 (19)	
2	148 (55)	126 (106)	126 (32)	133 (44)	147 (17)	
3	186 (9)	167 (122)	147 (172)	168 (7)	158 (26)	
4	208 (52)	198 (9)	181 (74)	176 (24)	189 (16)	
5	228 (8)	212 (56)	206 (11)	191 (20)	192 (28)	
6	225 (12)	226 (15)	213 (24)	206 (7)	208 (12)	
7	243 (3)	237 (5)	225 (3)	240 (3)	224 (2)	
Females						
1	100 (46)	97 (20)	90 (23)	101 (5)	117 (27)	
2	147 (53)	130 (119)	136 (20)	144 (43)	135 (24)	
3	180 (3)	177 (119)	160 (136)	172 (2)	173 (31)	
4	220 (14)	190 (20)	195 (56)	188 (22)	187 (15)	
5	228 (5)	236 (26)	211 (8)	199 (26)	216 (19)	
6	--	246 (16)	245 (4)	241 (11)	229 (24)	
7	282 (2)	237 (2)	--	269 (1)	244 (1)	
Sexes combined						
1	100 (90)	94 (62)	88 (61)	101 (5)	115 (53)	102
2	148 (108)	128 (227)	130 (52)	139 (87)	140 (43)	145
3	184 (12)	171 (241)	152 (308)	169 (9)	166 (61)	173
4	211 (66)	192 (29)	187 (130)	182 (46)	188 (32)	198
5	228 (13)	219 (82)	208 (19)	195 (47)	203 (48)	221
6	225 (12)	236 (31)	218 (28)	227 (18)	221 (40)	239
7	258 (5)	239 (7)	229 (4)	247 (4)	231 (3)	267

Table 7.—Catch rate by age for yellow perch in June index trawl tows on Lake St. Clair 1993-99 (1998 and 1999 samples do not include yellow perch frozen for diet samples).

Year Class	1993	1994	1995	1996	1997	1998	1999
1984	0.06	0.08	0.27	—	—	—	—
1985	0.00	0.23	0.00	—	—	—	—
1986	0.18	0.08	0.00	—	—	—	—
1987	0.00	0.62	0.27	0.13	—	—	—
1988	0.90	1.63	0.94	0.27	0.33	—	—
1989	2.80	3.68	2.15	1.24	0.33	—	—
1990	6.12	4.12	13.41	5.18	1.28	—	—
1991	51.30	47.01	32.09	18.69	12.90	5.31	0.59
1992	1.00	3.39	5.81	11.49	9.56	18.41	20.50
1993	—	56.28	125.80	171.41	113.67	53.71	57.05
1994	—	—	166.16	293.17	348.22	53.20	15.42
1995	—	—	—	21.42	40.66	6.72	29.23
1996	—	—	—	—	33.26	108.52	71.44
1997	—	—	—	—	—	3.82	36.47
1998	—	—	—	—	—	—	636.19