

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-15

Study No.: 488

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

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

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) to 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 1998 and 1999 (Figure 1). Data entry and analysis for all 1998 trawls are complete. Trout-perch, yellow perch, spottail shiner, mimic shiner, and round goby dominated the trawl catches. Round goby trawl catch rates increased substantially in June but declined in September. Special concern species sampled with trawls included river darter, eastern sand darter, and lake sturgeon. Sport fishing catch and effort information was collected with a voluntary angler diary program. Catch rates for walleye increased; while those for yellow perch, smallmouth bass, and muskellunge decreased in 1997. Yellow perch foraged extensively on invertebrates such as midges (chironomids), mayflies (emphemeroptera), amphipods, caddisflies (tricoptera), and snails (gastropods) during June. Crayfish (decapods), fish, and zooplankton (primarily ostracods) became more common in the yellow perch diet in September. The incidence of round goby in yellow perch stomachs increased in 1997.

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

Findings: During 1998, fish were collected with a 10 m headrope bottom trawl in 18 tows in June and 27 tows in September at the Anchor Bay index site. In June trout-perch, yellow perch, and logperch had the highest densities. During September yellow perch, spottail shiner, trout-perch, and smallmouth bass had the highest densities. 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 their preference for macrophyte beds which were abundant by September. Unfortunately, we were unable to effectively trawl in heavily vegetated areas of the lake. 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 1993-98 were evident, several species experienced their lowest densities in 1998. Alewife, freshwater drum, mimic shiner, and rock bass September densities were the lowest observed during this study, while September densities for bluntnose minnow, logperch, rainbow smelt, and trout-perch were the second lowest observed. Conversely, emerald shiner and smallmouth bass densities in September 1998 were the highest for this time period. Samples of yellow perch collected in June and September 1998 were frozen for later analysis of age, growth, condition, and diet.

Sampling has continued on schedule in 1999.

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, 1998 with a total of 207 trawl tows made lakewide. Lake St. Clair was divided into a 5 minute grid system (Figure 1). 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 grids and offshore grids. Shoreline grids were sampled with the 4.8 m headrope trawls. Offshore grids were sampled with 10 m headrope trawls.

Over 25,000 fish comprising 44 species were collected (Table 2). Trout-perch (28.6%), yellow perch (21.8%), spottail shiner (12.4%), mimic shiner (9.2%), and round goby (5.8%) 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 1,439 round gobies were collected lakewide. In contrast, only 27 of the exotic tubenose goby were collected. Special concern species including river darter (1), and lake sturgeon (153) were also collected.

Sampling has continued on schedule in 1999.

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

Findings: The Ontario Ministry of Natural Resources (OMNR) initiated an angler diary program 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 1997, the MDNR distributed 87 angler diaries to Michigan resident sport anglers interested in participating in the diary program. A total of 53 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 produced the 1998 estimates (Table 3). The walleye catch rate in 1998 was the highest observed since the program was expanded in 1992. Catch rates for yellow perch and smallmouth bass both decreased substantially in 1998. The 1998 muskellunge catch rate for Lake St. Clair was the second highest for the six year period.

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

Findings: Lab processing of 663 yellow perch diet samples 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 the non-empty June stomach samples (Table 4). 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 collected for diet analysis in 1998 is underway.

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

Findings: Processing of yellow perch scale samples collected in 1998 is underway. Although the data set covers only a five year time span, it appears that growth rates slowed in 1996 and 1997 (Table 5).

Evaluation of catch rate by age indicated the presence of strong and weak year classes in the population (Table 6). The 1992 and 1995 year classes appeared weak, while the 1991, 1993, and 1994 year classes were comparatively 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 increased 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, an annual fisheries status report was also prepared.

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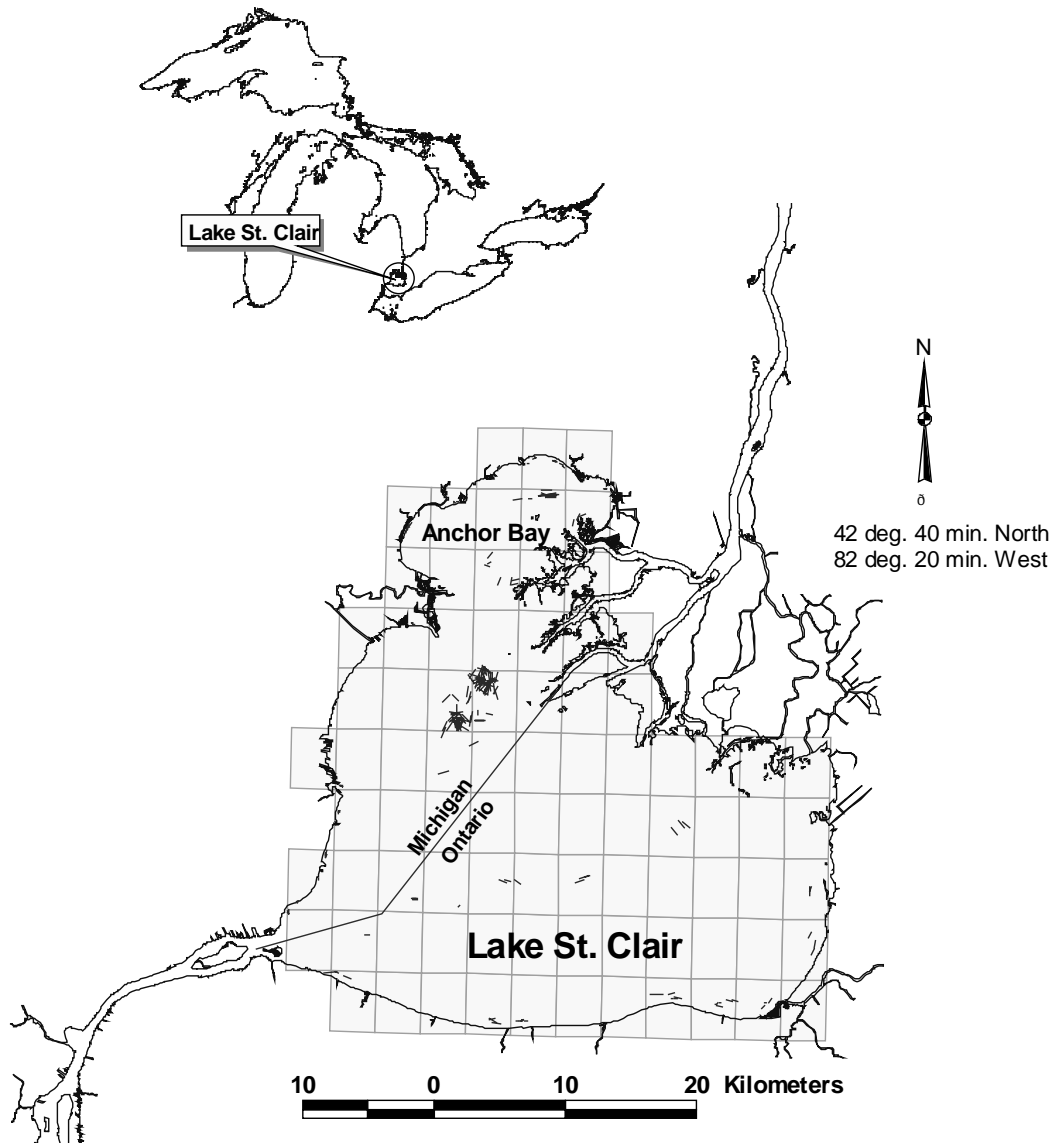


Figure 1.—Map of Lake St. Clair showing trawl transects and the 2.5 minutes of latitude and longitude grid system (shaded) used to randomize trawling locations.

Table 1.—Mean density (number per hectare) for all species caught during spring (June) and fall (September or October) 10 m headrope index trawls during 1993-1998 in Anchor Bay, Lake St. Clair.

Species	Spring						Fall					
	1993	1994	1995	1996	1997	1998	1993	1994	1995	1996	1997	1998
Alewife	53.0	3.4	4.3	29.2	10.6	2.5	70.9	24.9	30.8	28.3	30.7	11.5
Banded killifish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Black crappie	0.2	0.2	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.1	0.0
Blackchin shiner	0.0	0.0	0.0	0.0	0.0	0.0	2.3	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	0.0	0.1	0.0
Bluegill	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	29.7	0.0	0.0	0.0
Bluntnose minnow	12.5	62.5	18.8	0.7	0.0	0.2	82.6	1276.9	30.1	0.0	33.5	0.2
Brook silversides	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.6	1.1	0.0	0.1	0.0
Brook stickleback	11.5	62.9	2.3	0.0	0.0	0.0	0.5	1.6	0.2	1.1	0.0	0.0
Brown bullhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Channel darter	0.0	1.1	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Common carp	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.5	0.2	0.9	0.0
Common white sucker	0.5	1.1	0.0	5.4	3.7	3.6	0.7	1.6	0.2	0.5	2.3	0.0
Eastern sand darter	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0
Emerald shiner	0.5	0.0	0.2	0.7	0.2	0.0	1.6	0.0	4.3	3.8	1.1	7.5
Freshwater drum	0.7	1.6	0.2	6.6	12.5	5.0	4.3	0.9	4.5	1.1	0.6	0.2
Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	11.1	0.0	0.9
Golden redhorse	0.0	0.0	0.0	0.2	0.4	0.0	2.0	0.0	0.0	0.2	0.1	0.0
Iowa darter	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Johnny darter	16.5	61.4	17.9	21.7	2.8	7.0	1.8	0.0	4.3	17.7	4.0	0.0
Lake sturgeon	0.5	0.0	0.0	2.3	0.4	0.0	0.2	0.0	0.0	1.8	0.0	1.4
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.0	0.7	55.0	18.6	0.0	0.0	0.0
Logperch	3.6	9.7	75.6	8.8	75.6	83.3	51.8	14.3	27.8	32.4	40.0	20.6
Mimic shiner	1.4	1.4	1.4	17.2	26.3	1.6	1419.6	1711.4	1594.6	267.6	1094.9	0.2
Muskellunge	0.0	0.2	0.0	0.0	0.2	0.0	0.0	3.2	0.7	0.2	0.2	0.0
Northern pike	0.2	0.7	0.0	0.0	0.4	0.2	0.0	0.5	1.4	0.0	0.4	0.0
North. shorthead redhorse	0.7	3.4	0.9	7.7	6.7	0.7	1.4	0.0	1.1	0.2	0.4	0.2
Pumpkinseed	0.0	0.0	0.0	0.0	0.6	0.0	0.0	2.3	77.0	0.2	4.0	0.0
Quillback	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.9	0.9	0.1	1.1
Rainbow smelt	964.7	1417.5	986.2	593.0	656.1	4.3	0.0	0.2	3.6	0.9	16.5	0.2
Rock bass	6.6	26.5	36.9	43.0	17.5	5.4	81.7	66.6	94.6	18.3	81.5	0.9
Round goby	0.0	0.0	0.2	4.8	14.3	28.1	1.4	0.5	20.2	65.7	9.7	22.2
Silver lamprey	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0
Silver redhorse	0.2	0.0	0.0	0.7	2.3	0.2	0.0	0.0	0.2	4.5	0.9	0.7
Slimy sculpin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Smallmouth bass	0.0	0.2	0.2	0.2	3.2	0.5	15.2	3.6	2.9	13.6	10.6	24.5
Spottail shiner	8.8	22.9	24.7	178.2	122.6	8.2	52.5	7.2	72.5	17.0	487.2	45.3
Threespine stickleback	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trout-perch	49.6	11.1	52.1	231.2	345.9	98.5	61.8	19.2	153.1	775.7	92.3	25.8
Tubenose goby	0.0	0.2	0.7	0.2	0.0	0.0	0.0	0.7	1.4	0.0	0.0	0.0
Unid. redhorse	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
Walleye	1.4	1.6	1.6	4.5	10.4	0.9	0.5	0.7	4.3	7.2	1.3	2.7
White bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0
White perch	0.5	0.0	0.0	1.4	0.7	0.0	1.4	0.0	4.1	16.1	11.7	7.5
Yellow perch	141.3	265.1	785.4	1184.1	560.3	249.7	33.7	38.5	76.5	34.2	26.8	68.8

Table 2.—Catch summary for 207 trawl tows on Lake St. Clair in 1998.

Species	Total catch	% of total	Species	Total catch	% of total
Trout-perch	7,158	28.6	Gizzard shad	20	0.1
Yellow perch	5,463	21.8	Northern redhorse	17	0.1
Spottail shiner	3,093	12.4	Lake whitefish	15	0.1
Mimic shiner	2,299	9.2	Silver lamprey	14	0.1
Round goby	1,439	5.8	Pumpkinseed	10	<.1
Emerald shiner	855	3.4	Brook silversides	10	<.1
Rockbass	828	3.3	White bass	9	<.1
Logperch	635	2.5	Black crappie	8	<.1
Smelt	581	2.3	Banded killifish	6	<.1
Alewife	464	1.9	Common carp	6	<.1
Smallmouth bass	418	1.7	Channel catfish	5	<.1
Bluegill	331	1.3	White sucker	4	<.1
Bluntnose minnow	264	1.1	Goldfish	3	<.1
White perch	262	1.1	Eastern sand darter	3	<.1
Largemouth bass	218	0.9	Northern pike	2	<.1
Lake sturgeon	153	0.6	Great lakes muskellunge	2	<.1
Walleye	114	0.5	Mooneye	1	<.1
Johnny darter	101	0.4	Brindled madtom	1	<.1
Freshwater drum	93	0.4	Golden redhorse	1	<.1
Silver redhorse	37	0.2	Iowa darter	1	<.1
Quillback carpsucker	30	0.1	River darter	1	<.1
Tubenose goby	27	0.1	Rainbow darter	1	<.1

Table 3.—Angler effort, catch and catch rates for Lake St. Clair sport fishing diary program.

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
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
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
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

Table 4.—Frequency of occurrence (expressed as percent of non-empty stomachs containing each taxa) for yellow perch diet in Lake St. Clair.

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 5.—Mean length at age (mm) for yellow perch from June Lake St. Clair trawls. Sample size in parentheses.

Age	Year				
	1993	1994	1995	1996	1997
Males					
1	87.3 (6)	100.9 (38)	99.8 (44)	94.4 (33)	86.8 (33)
2	129.8 (124)	138.6 (21)	148.4 (55)	125.7 (106)	125.5 (32)
3	164.0 (22)	163.2 (187)	185.9 (9)	166.1 (122)	146.7 (172)
4	179.0 (35)	190.8 (19)	207.9 (52)	197.8 (9)	180.9 (74)
5	194.5 (13)	202.1 (34)	228.0 (8)	211.5 (56)	206.1 (11)
6	--	216.6 (17)	225.1 (12)	225.8 (15)	213.1 (24)
7	210.3 (3)	227.0 (6)	243.0 (3)	236.8 (5)	224.7 (3)
Females					
1	94.3 (7)	101.8 (10)	100.2 (46)	96.9 (20)	90.2 (23)
2	134.2 (157)	146.5 (12)	146.9 (53)	129.5 (119)	136.3 (20)
3	163.6 (17)	180.4 (155)	180.3 (3)	176.7 (119)	159.8 (136)
4	193.1 (8)	196.3 (23)	220.5 (14)	189.9 (20)	195.4 (56)
5	235.0 (2)	225.9 (10)	228.4 (5)	235.8 (26)	211.1 (8)
6	--	249.8 (4)	--	246.5 (16)	245.5 (4)
7	--	267.0 (2)	281.5 (2)	237.0 (2)	--

Table 6.—Catch rate by age for yellow perch in June index trawl tows on Lake St. Clair.

Year Class	1993	1994	1995	1996	1997
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
1992	1.00	3.39	5.81	11.49	9.56
1993	—	56.28	125.80	171.41	113.67
1994	—	—	166.16	293.17	348.22
1995	—	—	—	21.42	40.66
1996	—	—	—	—	33.26