STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-5

Study No.: 230488 **Title:** Status of the Lake St. Clair fish community and sport fishery

Period Covered: October 1, 2003 to September 30, 2004

Study Objectives: The objectives of this study are (1) to measure the abundance of yellow perch, juvenile gamefish, and various forage species in Lake St. Clair, (2) to monitor abundance of adult gamefish species, (3) to document the abundance and distribution of aquatic plants in Lake St. Clair with sidescan sonar and hydroacoustic technology, and (4) to monitor trends in sport fish catch rates for the Lake St. Clair fishery.

Summary: Fish populations were sampled with 10 m headrope bottom trawls and trap nets during 2003 and 2004. Data entry and analysis for all 2003 trawls are complete. Yellow perch and spottail shiner dominated the trawl catches. Predator fish populations were surveyed with trap nets in Anchor Bay in 2003 and 2004. In 2004, a total of 55 net lifts captured 71 northern pike, 79 muskellunge, 302 smallmouth bass, and 147 walleye. A total of 147 walleye and 253 smallmouth bass were tagged in 2004. Anglers reported capturing 96 tagged walleye and 27 tagged smallmouth bass through September 2004. Analyses of the walleye tag data indicated that Lake St. Clair walleye have recently been subjected to a much higher annual exploitation rate (35%) compared to either Lake Erie (8.6%) or Saginaw Bay (9.1%) fish. Smallmouth bass tag reporting has been too low to support mortality estimation. On average, walleye tag recoveries were more widely dispersed from the tag site than smallmouth tag recoveries. Sport fishing catch and effort information was collected with a voluntary angler diary program in 2003 and 2004. Data entry and analysis for all 2003 sport diaries are complete. Catch rates for walleye, smallmouth bass, and muskie improved, while yellow perch catch rate declined. Sport diaries were distributed to cooperators in April 2004 for the 2004 fishing season. Yellow perch recruitment in Lake St. Clair is highly variable between years. The 1992, 1999, 2000, and 2002 year classes appeared weak, while the 1993, 1994, and 1998 year classes were comparatively strong. About five weeks of survey time were spent continuing to develop effective and efficient aquatic plant survey techniques. Hydroacoustic techniques were used along with intensive plant sampling at 27 Lake St. Clair stations and Clifford Lake, Montmorency, County. In addition, nine sites within three of the Lake St. Clair one hectare plots were sampled for plant and zebra mussel biomass with scuba and remote hydroacoustic equipment to develop calibration factors for the remote data. These results will provide a basis for descriptions of the Lake St. Clair plant community in 2005 and comparing it to the plant community in 1978 and 2003. Analysis of the data collected will also aid in developing and improving sampling protocols for monitoring the plant communities in other Michigan lakes and rivers.

Findings: Jobs 1, 3, 5, 6, 9, 10, and 11 were scheduled for 2003-04, and progress is reported below.

Job 1. Title: **Sample yellow perch and forage with index trawls.**–During 2003 fish were collected at the Anchor Bay index site with a 10 m headrope bottom trawl with 5 tows in June and 17 tows in September. In June, yellow perch, spottail shiner, rock bass, smelt, and trout-perch were most abundant. During September spottail shiner, mimic shiner, yellow perch, rock bass, and logperch

were most abundant. Comparison of spring and fall densities for Anchor Bay since 1997 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, alewife and smallmouth bass abundances were generally higher in the fall sampling. This increase is likely related to recruitment of age 0 fish to the trawl gear by September.

While few trends in catch rates across the time period 1997-2003 were evident, several species appear to have lower catch rates in recent years. Logperch, trout-perch, and johnny darter have all exhibited lower catch rates since 1998. We believe that the observed declines in these three species is evidence that round gobies are negatively impacting the abundance of native benthic fish species in Lake St. Clair.

Sampling has continued on schedule in 2004.

Job 3. Title: Collect catch and effort data for the sport fishery with angler diaries.–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 2003, the MDNR distributed 68 angler diaries to Michigan resident sport anglers interested in participating in the diary program. A total of 50 diaries were returned by cooperating anglers during 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 2003 estimates (Table 2). The walleye catch rate in 2003 was the second highest recorded since 1996 and the number kept was the highest for this period. Yellow perch catch rate declined and was the lowest since 1998. However, the number of yellow perch kept was second only to 2002. This continues a trend of lower proportion of catch and release for yellow perch since 2001. Presumably this is due to an increase in the average size of yellow perch caught by anglers in the lake during this time period. Muskellunge catch rates in 2003 were at the low end of the range of values observed since 1996. The smallmouth bass catch rate increased for the second consecutive year. Effort, number caught, and number kept for smallmouth bass were well within the range observed in previous years. Fishing effort for muskellunge was the lowest since 1996. Anecdotal reports indicate muskie fishing activity has remained steady or even increased in recent years. This suggests angler diary participation by muskie anglers has declined. Efforts to recruit new muskie anglers to the diary program should be a priority in 2005. Increased angler participation is needed if this program is to continue to provide reasonable estimates of catch rates for sport fish in Lake St. Clair. MDNR creel survey data collected from Lake St. Clair from 2002 to 2004 will be compared with angler diary program results. In particular, comparison of angler diary catch rates with creel survey catch rate estimates will be most interesting.

New angler diaries were distributed in April 2004 and will be recalled in November 2004.

Job 5. Title: Analyze data and estimate growth rates for yellow perch.–Processing of yellow perch scale samples collected in 2003 was completed. Processing of scale samples collected in 2004 is underway. Although the data set covers only a six year time span, it appears that growth rates,

based on mean length at age, may have declined and are now below state average (Table 3). The causative factor in this decline is not clear.

Evaluation of catch rates by age indicated the presence of strong and weak year classes in the population (Table 4). The 1992, 1999, 2000, and 2002 year classes appeared weak, while the 1993, 1994, and 1998 year classes were comparatively strong. Variable recruitment is characteristic of yellow perch populations throughout the Great Lakes. The apparent decline in growth for recent years could be related to higher yellow perch densities due to the strength of the 1994 and 1998 year classes.

Job 6. Title: Prepare annual performance reports.–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.

Job 9. Title: Sample fish community with trap nets and tag predator species.–Trap nets were fished in Anchor Bay of Lake St. Clair to capture predator fish species and collect biological data on their populations. In 2003, trap nets were fished from May 28 to June 20. This time period was later and was typified by warmer and clearer water conditions than during 2002 (Table 5). A total of 50 net lifts captured 15 northern pike, 28 muskellunge, 962 smallmouth bass, 5 largemouth bass, and 180 walleye. All but 1 of the walleye and 7 of the smallmouth bass were tagged with monel metal jaw tags and released at the site of capture. In 2003, a total of 24 fish species were represented in the trap net catch with rock bass (40%), smallmouth bass (24%), and freshwater drum (14%) the most numerically abundant species in the catch (Table 6). The age distribution for the predator species caught in 2003 are shown in Table 7. For smallmouth bass, the age 5 cohort (1998 year class) accounted for 56% of the total captured in the trap nets.

The total trap net catch rate for smallmouth bass in 2003 (19.2) was 3 times higher than in 2002 (Table 8) and very near the long-term mean (19.0). We suspect that the later sampling period with warmer water temperatures was an important factor in the increased catch rate in 2003. The 1998 year class dominated the catch in both 2002 and 2003 and is clearly one of the strongest year classes currently in the population. Age 9 and older fish were well represented in 2002 and 2003 trap net catches. We believe this is an indication that survival rates are high or that a particularly strong year class is present in that age group. Additional years of survey data will help us discern the current status of the Anchor Bay smallmouth bass population.

Trap net sampling in 2004 occurred from April 30 to May 26. A total of 302 smallmouth bass and 147 walleye were captured in the trap nets. Scale samples collected from predator species will be processed by March 2005.

Job 10. Title: Collect, summarize, and analyze tag recovery data.–A total of 147 walleye and 253 smallmouth bass were tagged with monel metal jaw tags in 2004. Tagging data on individual walleye and smallmouth bass were put into computer files and added to the MDNR tagging database.

A total of 96 walleye tags and 27 smallmouth bass tags have been recovered through September, 2004 by anglers and reported to MDNR. Recovery data were collected from anglers, capture locations were converted to geographic coordinates, and combined with appropriate tagging data. Information letters and shoulder patches were sent to each angler to thank them for their cooperation. All pertinent tag recovery data were placed in the Lake St. Clair tag recovery database.

Similar to our observations in 2003, there was a large difference in tag reporting rate between walleye (10.2%) and smallmouth bass (0.8%) in 2004 (Table 9). We think this is substantial

evidence that angler exploitation was significantly higher on walleye. However, behavioral differences between walleye anglers (primarily catch and harvest) and smallmouth bass anglers (primarily catch and release) may also be involved. Analyses of the walleye tag data indicated that Lake St. Clair walleye have recently been subjected to a much higher annual exploitation rate (35%) compared to either Lake Erie (8.6% from DJ study 460) or Saginaw Bay (9.1% from DJ study 468) fish. Smallmouth bass tag reporting has been too low to support mortality estimation and we do not know what the level of hooking mortality is on smallmouth bass in Lake St. Clair.

Job 11. Title: Survey aquatic plant community.–We continued to develop survey techniques to facilitate sampling of submerged vegetation in Lake St. Clair with remote sensing (Biosonics© hydroacoustic) equipment and computer software. We continued to examine hydroacoustic transect and bathymetry data collected in 2001 and 2002 from several inland lakes with ArcView©, EchoView©, and Surfer© software. Clifford Lake in Montmorency County had been selected in 2001 to be a study lake by the MDNR Lake Conservation Committee to look at the impact of urbanization on submerged macrophyte communities. . We used that study as an opportunity to sample the plant community with our remote sensing hydroacoustic equipment to assist with our development of plant sampling design and protocols for inland lakes, as well as Great Lakes, fisheries habitat assessment. The hydroacoustic equipment was used to sample plant density along numerous identical transects (50m apart) along the lake shore (see Figure 1) on the same calendar days in early August during 2002 and 2004. Clifford Lake had been treated with the herbicide flouridone during 2003 by the Clifford Lake Association to reduce what they considered to be nuisance plants. The echograms shown in Figure 2 clearly show the general, lakewide reduction in plant community observed in 2004 presumably caused by the flouridone treatment. Further analyses of these data will continue in 2004and 2005.

In 2004 we continued with our modified transect sampling protocol utilizing Biosonics© hydroacoustic equipment in combination with replicated tosses of a hook. We sampled at 27 Lake St. Clair stations most of which had also been sampled in 2003. Three hectare plots (247, 247 west, and 246) were selected because of their water clarity and abundant submerged vegetation in Lake St. Clair for sampling plant and zebra mussel biomass with scuba equipment. Three locations within each hectare plot (nine sites total) were marked with a buoy to insure that remote hydroacoustic data and scuba samples would be collected at the same location. Each of these nine sites was remotely sampled with our hydroacoustic equipment at least 5 times by running the transducer directly over the buoy with sonic ping numbers recorded to identify the exact location where scuba samples were to be collected. Volunteer scuba divers from InterSeas Exploration, Ltd., Great Lakes Division., U.S. Naval Sea Cadet Corps collected complete 0.5 m^2 samples of rooted plants and attached invertebrate fauna at each buoy location. These plant samples were washed, weighed, sorted to species, and prepared for biomass determination of all vascular plant species and zebra mussels. Professor Douglas Hunter and graduate student Sarah Cholder-Blust from Oakland University assisted with our plant study and also collaborated on a related zebra mussel study looking at their colonization of Lake St. Clair submerged plants, growth, biomass, and mortality patterns. This collaboration is very important because we will need to eventually subtract biomass measurements of attached zebra mussels which will automatically be included in the remotely collected hydroacoustic information. Some preliminary biomass measurements from actual scuba samples presented as ash-free dry weight (AFDW) are shown in Table 10. The overall average AFDW of plants was 81 g/m2 which is typical biomass for dense stands of macrophytes in upper Midwest lakes (Lillie 1990). High numbers of juvenile zebra mussels (around 100,000/m^2) were attached to many of the plants. Zebra mussels made up about 11% of the total dry biomass. An interesting question being addressed by the Oakland University study is: "What happens to these zebra mussels when the plants senesce during fall?" Hydroacoustic estimates of plant biomass will be generated during winter of 2004-2005 and compared to the scuba measurements. Conversion factors will be calculated and used to properly

scale remote hydroacoustic biomass data and to remove the portion of biomass due to attached zebra mussels.

Literature cited:

Bryant, W.C. and K.D. Smith. 1988. Distribution and population dynamics of smallmouth bass in Anchor Bay, Lake St. Clair. Michigan Department of Natural Resources, Fisheries Research Report #1944, Ann Arbor.

Lillie, R. A. 1990. A quantitative survey of the submersed macrophytes in Devil's Lake, Sauk County, with a historical review of the invasion of Eurasian watermilfoil, Myriophyllum spicatum L. Transactions of the Wisconsin Academy of Sciences, Arts and Letters. Vol. 78. 1-20.

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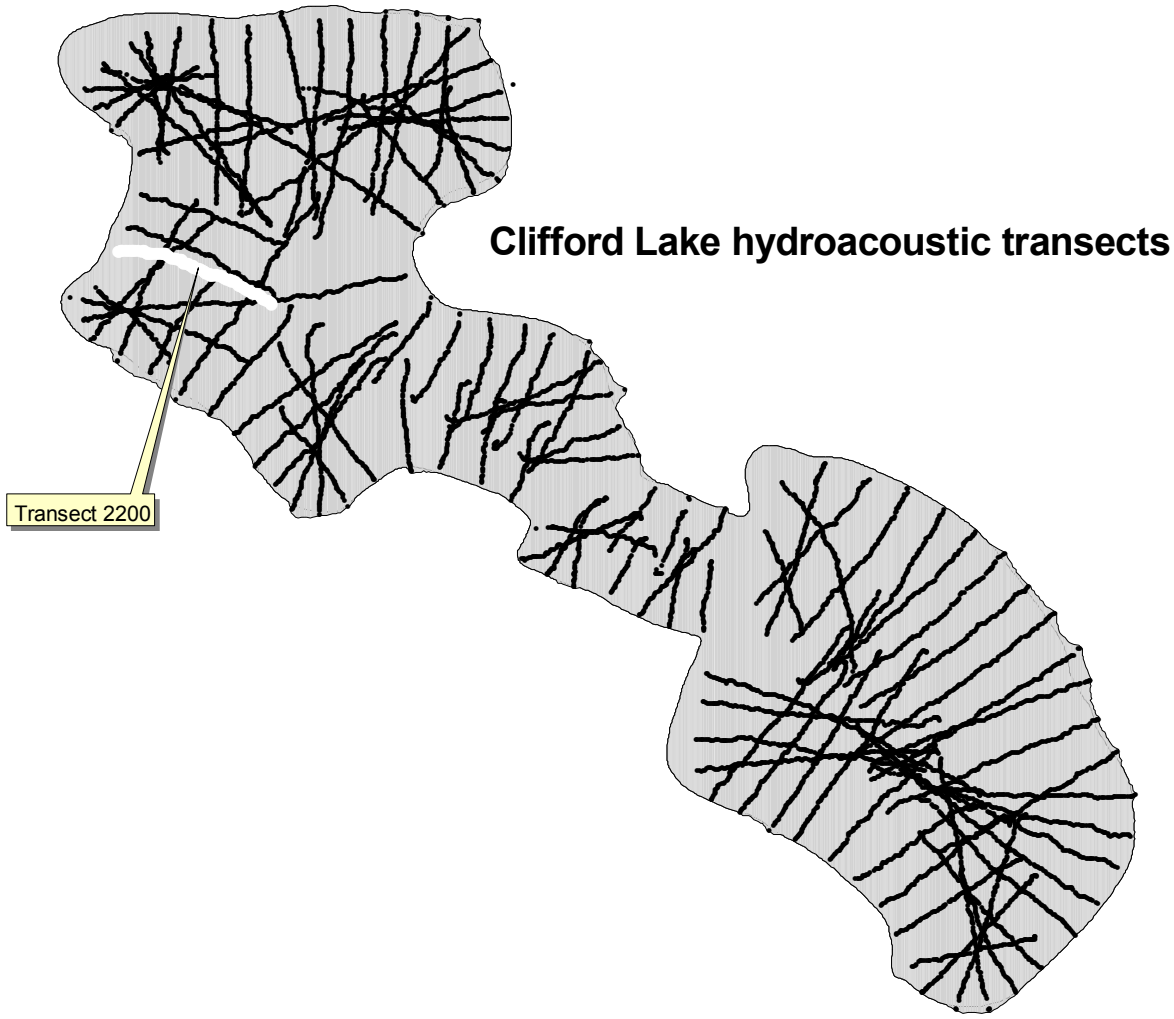

Figure 1.–Map of hydroacoustic plant sampling transects in Clifford Lake, Montmorency County during 2002 and 2004. Transect 2200 is highlighted because it was used to examine overall change in plant community over the time period (see next Figure.

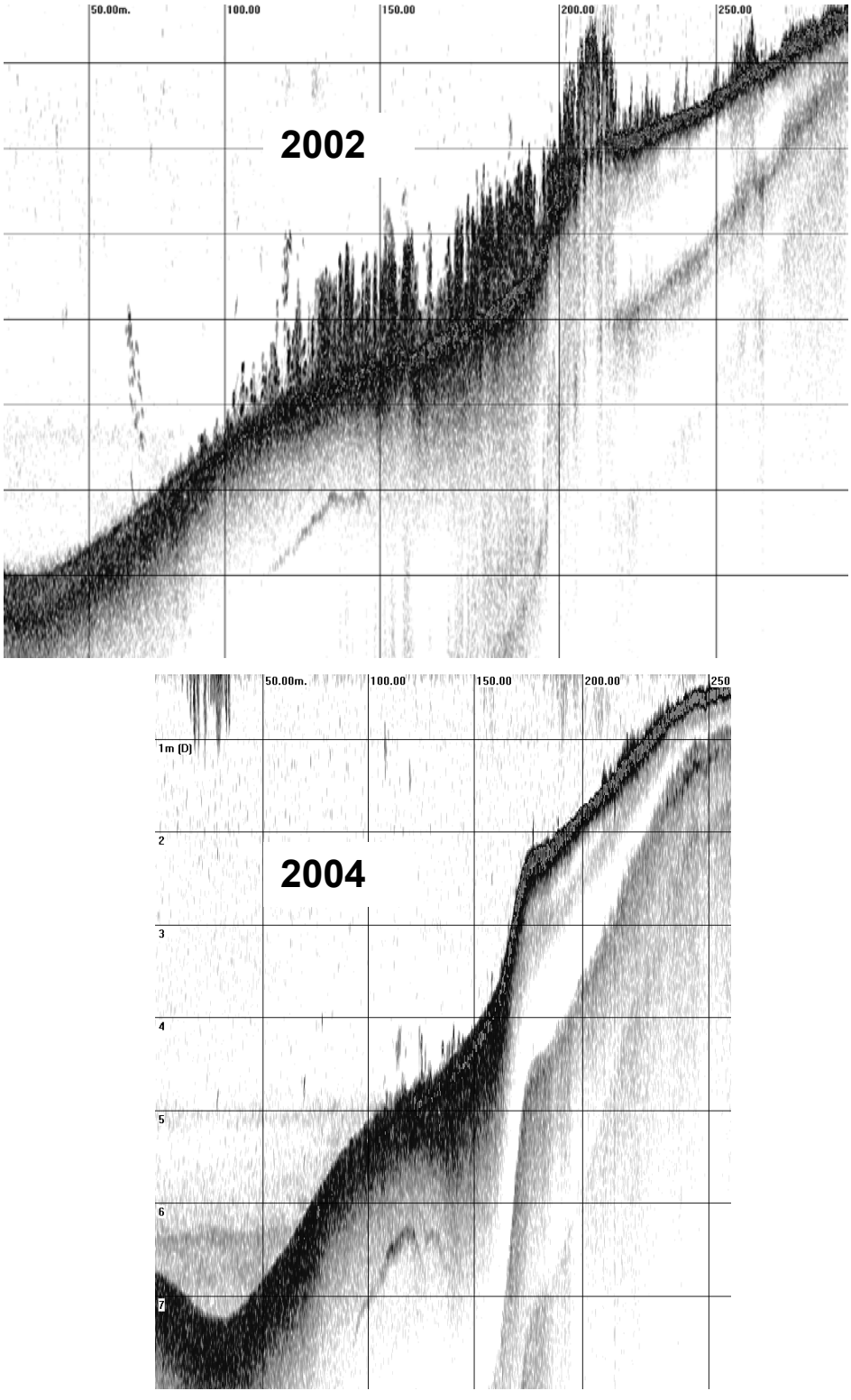

Figure 2.─Example hydroacoustic echograms collected on same calendar day in 2002 and 2004 from the same transect (2200; see previous Figure) in Clifford Lake, Montmorency County showing dramatic decrease in submerged aquatic plants in 2004 attributed to lake treatment with herbicide flouridone in 2003.

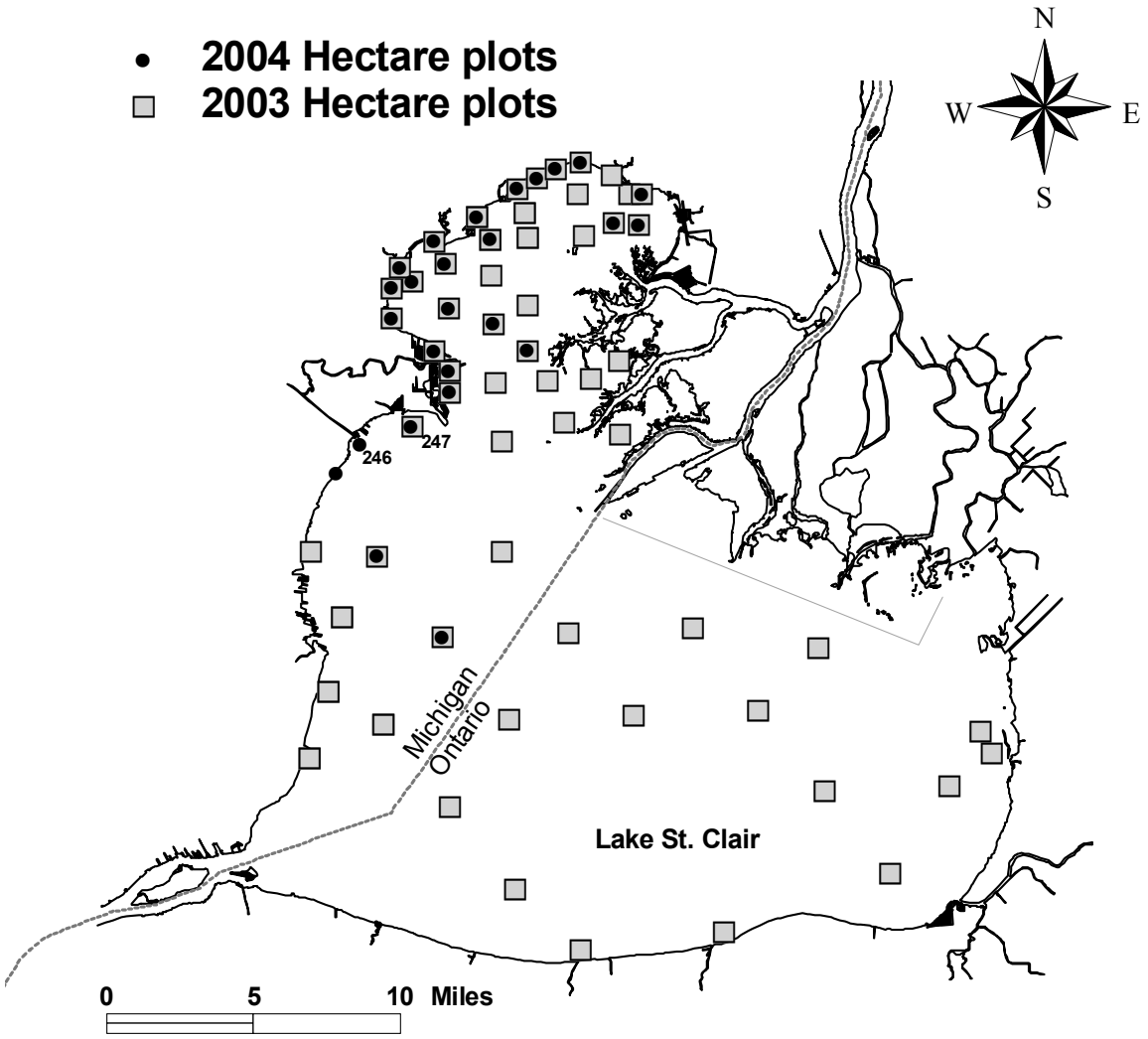

Figure 3.─Map of plant sampling locations in 2003 (gray squares) and 2004 (black dots). Each site had square hectare plot sampling with hydroacoustic gear and plant hook tosses during both years. All but two of the 2004 sites were positioned at locations sampled in 2003. Sites 246 and 247 were selected for plant and zebra mussel biomass sampling with scuba gear to assist with calibration of remote hydroacoustic estimates of plant biomass.

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.

	Spring							Fall						
Species	1997	1998	1999	2000	2001	2002	2003	1997	1998	1999	2000	2001	2002	2003
Alewife	10.6	2.5	1.9	3.9	2.9	3.0	0.0	30.7	11.5	1.6	2.8	32.3	0.0	0.0
Bluntnose minnow	0.0	0.2	0.0	11.1	10.0	6.8	0.9	33.5	0.2	9.4	14.8	53.8	32.7	12.5
Common carp	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.9	0.0	0.1	0.0	1.1	2.1	0.0
Emerald shiner	0.2	0.0	0.0	5.1	0.0	10.6	0.0	1.1	7.5	0.0	0.0	0.0	0.6	0.0
Freshwater drum	12.5	5.0	2.3	0.7	4.5	0.8	3.6	0.6	0.2	1.4	1.0	2.3	0.2	0.6
Johnny darter	2.8	7.0	0.0	0.2	0.3	0.0	0.0	4.0	0.0	0.0	0.10	0.0	0.2	7.2
Lake sturgeon	0.4	0.0	0.1	0.2	0.0	0.8	0.5	0.0	1.4	0.0	0.1	0.0	0.0	0.0
Largemouth bass	0.0	0.0	0.0	0.1	0.6	0.0	0.0	0.0	0.0	3.0	1.8	16.4	35.5	13.2
Logperch	75.6	83.3	7.6	0.2	1.6	7.5	0.0	40.0	20.6	1.3	5.2	17.5	5.9	13.6
Mimic shiner	26.3	1.6	0.0	13.5	20.4	362.3	0.0	1094.9	0.2	29.8	14.8	9.6	44.1	507.2
Muskellunge	0.2	0.0	0.1	0.0	0.6	0.8	0.0	0.2	0.0	0.0	0.1	1.1	0.0	0.4
Northern pike	0.4	0.2	0.0	0.1	1.3	0.0	1.4	0.4	0.0	0.1	0.3	0.6	0.6	0.6
Northern shorthead redhorse	6.7	0.7	6.9	2.5	3.6	6.8	4.1	0.4	0.2	0.4	0.7	2.3	0.3	0.0
Pumpkinseed	0.6	0.0	0.0	0.0	1.9	0.0	0.0	4.0	0.0	1.6	0.4	5.1	5.4	3.2
Quillback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.0	0.7	0.0	1.7	0.8
Rainbow smelt	656.1	4.3	4.0	3.8	61.1	0.0	14.0	16.5	0.2	0.0	1.0	0.0	0.0	4.0
Rock bass	17.5	5.4	1.0	12.8	29.8	38.5	18.1	81.5	0.9	89.0	92.8	39.6	40.8	34.9
Round goby	14.3	28.1	6.0	10.8	1.3	30.2	5.9	9.7	22.2	9.6	10.0	10.2	99.3	1.8
Silver lamprey	0.2	0.0	0.9	0.3	0.0	0.0	0.5	0.0	0.0	0.2	0.0	0.3	0.0	0.4
Silver redhorse	2.3	0.2	0.4	0.9	0.0	2.3	4.5	0.9	0.7	0.0	0.4	1.1	5.7	0.0
Smallmouth bass	3.2	0.5	0.0	0.8	2.9	3.8	1.8	10.6	24.5	10.7	6.1	0.0	51.4	6.8
Spottail shiner	122.6	8.2	68.9	935.4	7.4	5729.6	210.6	487.2	45.3	200.0	50.5	878.5	2406.5	1068.0
Trout-perch	345.9	98.5	154.0	34.3	11.0	264.9	13.1	92.3	25.8	2.9	0.2	0.0	9.7	5.7
Walleye	10.4	0.9	1.7	1.2	0.6	0.8	0.9	1.3	2.7	0.9	0.8	0.0	11.3	0.0
White perch	0.7	0.0	0.4	13.3	0.6	0.8	0.5	11.7	7.5	0.1	0.1	0.0	13.2	8.4
White sucker	3.7	3.6	0.0	2.5	1.3	61.1	2.3	2.3	0.0	0.3	1.0	0.6	8.0	0.7
Yellow perch	560.3	249.7	866.9	157.8	1131.7	724.5	306.1	26.8	68.8	21.7	40.9	113.8	73.3	181.2

Table 2.–Angler effort, catch, and catch rates for the Lake St. Clair sport fishing diary program.

Year	Trips seeking	Effort (rod-hours)	Number caught	Number kept	Catch per rod-hour
			Walleye		
1996	484	6,102	1,906	1,685	0.31
1997	408	4,681	1,479	1,311	0.32
1998	510	5,599	2,481	1,947	0.44
1999	625	5,850	2,610	2,239	0.44
2000	444	4,672	1,753	1,646	0.37
2001	342	4,051	1,893	1,681	0.47
2002	425	4,475	1,357	1,298	0.30
2003	543	5,533	2,536	2,280	0.46
			Yellow perch		
1996	265	3,462	10,654	5,846	3.08
1997	252	2,701	9,661	5,773	3.58
1998	305	3,520	7,134	5,048	2.03
1999	226	2,087	6,142	3,654	2.94
2000	235	2,892	10,436	5,660	3.61
2001	164	2,047	5,862	4,350	2.86
2002	412	4,658	12,841	9,091	2.87
2003	335	3,829	9,694	6,149	2.53
			Smallmouth bass		
1996	153	1,537	545	190	0.35
1997	143	1,375	687	148	0.50
1998	127	1,248	495	94	0.40
1999	222	1,841	1,112	204	0.60
2000	190	1,126	1,484	126	1.22
2001	74	512	280	48	0.55
2002	153	1,207	954	110	0.79
2003	179	1,586	1,466	135	0.92
			Muskellunge		
1996	494	15,629	1,458	12	0.093
1997	425	15,199	1,573	11	0.103
1998	383	11,336	1,075	8	0.094
1999	318	9,370	645	5	0.069
2000	269	8,874	749	16	0.084
2001	241	7,248	851	2	0.117
2002	156	3,953	277	4	0.070
2003	141	3,731	341	10	0.091

Table 3.–Mean length at age (mm) for yellow perch from Lake St. Clair trawls in June. Sample size in parentheses. SWAVg is the Michigan statewide average growth value.

Age	1998	1999	2000	2001	2002	2003	SWAVg
			Males				
1	102 (4)	102 (59)	109 (6)	109 (3)	103 (5)	100 (7)	
2	132 (104)	140 (48)	129 (110)	126 (8)	139 (6)	131 (43)	
3	162 (39)	158 (64)	158 (17)	142 (56)	153 (16)	147 (3)	
4	171 (111)	179 (45)	171 (60)	175 (12)	169 (43)	180 (11)	
5	187 (43)	186 (70)	189 (57)	193 (23)	189 (13)	181 (38)	
6	209 (12)	193 (43)	200 (47)	206 (18)	213 (7)	196 (6)	
7	238 (4)	218 (4)	209 (4)	207 (6)	215 (7)	216 (4)	
			Females				
1	101 (5)	106 (94)	108 (2)	114 (2)	106 (24)	104 (6)	
2	141 (70)	139 (38)	138 (147)	126 (1)	161 (1)	149 (50)	
3	167 (11	170 (43)	171 (18)	160 (59)	168 (4)	155 (1)	
4	186 (54)	181 (29)	194 (35)	181 (25)	198 (34)	203 (4)	
5	196 (47)	209 (42)	206 (46)	230 (25)	189 (42)	208 (39)	
6	226 (17)	223 (45)	229 (24)	241 (15)	219 (11)	208 (24)	
7	253 (2)	247 (4)	234 (14)	263 (12)	227 (2)	232 (5)	
			Sexes combined				
1	102 (9)	103 (163)	109 (8)	111 (5)	105 (29)	102 (13)	102
2	135 (174)	139 (86)	134 (257)	126 (9)	142 (7)	140 (93)	145
3	163 (50)	163 (107)	164 (35)	151 (115)	156 (20)	149 (4)	173
4	176 (165)	180 (74)	180 (95)	179 (37)	182 (77)	186 (15)	198
5	192 (90)	195 (112)	197 (103)	212 (48)	189 (56)	195 (77)	221
6	219 (29)	208 (88)	210 (71)	221 (33)	219 (11)	205 (30)	246
7	243 (6)	233 (8)	228 (18)	245 (18)	227 (10)	225 (9)	267

Table 4.–Catch rate by age for yellow perch in June index trawl tows on Lake St. Clair.

Year class	Total CPUE	Survey year									
		1994[a]	1995[a]	1996	1997	1998	1999	2000	2001	2002	2003
1984	0.5	0.1	0.3	–	–	–	–	–	–	–	
1985	0.2	0.2	0.0	–	–	–	–	–	–	–	
1986	0.3	0.1	0.0	–	–	–	–	–	–	–	
1987	1.0	0.6	0.3	0.1	–	–	–	–	–	–	
1988	4.1	1.6	0.9	0.3	0.3	–	–	–	–	–	
1989	10.2	3.7	2.2	1.2	0.3	–	–	–	–	–	
1990	30.4	4.1	13.4	5.2	1.3	0.3	–	–	–	–	
1991	164.4	47.0	32.1	18.7	12.9	1.8	0.6	–	–	–	
1992	52.1	3.4	5.8	11.5	9.6	10.4	1.1	0.1	0.5	–	0.7
1993	581.2	56.3	125.8	171.4	113.7	43.0	54.3	1.5	3.3	–	1.3
1994	902.2	–	166.2	293.2	348.2	88.1	20.6	8.3	10.6	1.3	0.7
1995	147.4	–	–	21.4	40.7	26.4	32.2	12.3	21.1	10.4	2.7
1996	277.7	–	–	–	33.3	77.1	70.3	11.3	35.3	9.7	9.4
1997	205.5	–	–	–	–	2.7	37.6	5.5	52.8	61.3	44.4
1998	1314.1	–	–	–	–	–	650.2	114.1	347.7	83.7	118.4
1999	73.1	–	–	–	–	–	–	4.8	25.8	17.6	24.9
2000	12.7	–	–	–	–	–	–	–	2.7	4.6	5.4
2001	220.8	–	–	–	–	–	–	–	–	131.3	89.5
2002	8.7										8.7

[a] Data collected during previous studies.

Table 5.–Effort and physical data for trap net surveys in Lake St. Clair at the Anchor Bay index site.

	Survey year	
	2002	2003
Number of net lifts	64	50
Hours fished	2748	2839
Starting date	5/3	5/28
Ending date	5/30	6/20
Starting water temperature (^{0}C)	9	12
Ending water temperature (^{0}C)	15	16
Average secchi depth (m)	1.75	2.17

Table 6.–Catch rate, total catch, and percent of annual catch for all species caught in Lake St. Clair trap nets in 2002 and 2003. Trap nets fished in May and June at Anchor Bay index site.

	Mean Catch/lift		Total catch		% of catch	
Species	2002	2003	2002	2003	2002	2003
Black crappie	0.0	0.0	0	1	0.0	0.0
Bluegill	0.1	0.0	5	0	0.1	0.0
Bowfin	0.0	0.0	0	2	0.0	0.1
Brown bullhead	0.0	0.0	2	1	0.0	0.0
Channel catfish	3.8	4.1	244	207	4.6	5.2
Common carp	0.5	0.6	33	31	0.6	0.8
Freshwater drum	2.1	10.8	133	543	2.5	13.6
Gizzard shad	0.0	0.1	3	4	0.1	0.1
Golden redhorse	0.0	0.0	1	2	0.0	0.1
Lake sturgeon	0.0	0.1	2	7	0.0	0.2
Largemouth bass	0.4	0.1	23	5	0.4	0.1
Muskie	0.6	0.6	41	28	0.8	0.7
Northern pike	1.9	0.3	120	15	2.3	0.4
Pumpkinseed	5.0	1.5	318	77	6.0	1.9
Quillback carpsucker	0.4	0.3	24	15	0.5	0.4
Rock bass	49.5	32.0	3172	1603	60.3	40.1
Shorthead redhorse	1.8	4.1	118	204	2.2	5.1
Silver redhorse	0.5	0.7	32	33	0.6	0.8
Smallmouth bass	6.2	19.2	399	962	7.6	24.1
Walleye	3.8	3.6	243	180	4.6	4.5
White bass	0.0	0.1	2	5	0.0	0.1
White perch	0.2	0.1	13	5	0.2	0.1
White sucker	0.3	0.2	18	10	0.3	0.3
Yellow perch	4.9	1.1	313	57	6.0	1.4

Table 7.–Age distribution for predator species captured in Anchor Bay assessment trap nets in 2003.

Age	Species			
	Muskellunge	Northern pike	Smallmouth bass	Walleye
1	–	–	–	–
2	–	1	–	29
3	–	5	19	3
4	–	3	225	54
5	1	4	537	9
6	4	1	76	33
7	7	–	31	37
8	7	–	18	7
9	6	–	8	3
10	–	–	8	3
11	2	–	10	1
12	–	–	6	1
13	–	–	1	–

Table 8.–Age-specific catch per net lift for smallmouth bass in Anchor Bay assessment trap net surveys. Total CPUE represents the combined age 2 through age 13 catch per net lift values. Age 9+ is the catch per net lift for age groups 9, 10, 11, 12, and 13. Data from 1974 to 1985 is from Bryant and Smith (1988).

Age	Survey year											
	1974	1975	1977	1978	1979	1980	1981	1983	1984	1985	2002	2003
2	–	0.01	0.07	0.09	0.05	–	0.07	0.04	0.15	0.07	–	–
3	1.62	0.16	0.48	3.09	4.55	20.64	2.87	3.12	8.16	2.93	0.16	0.42
4	3.66	3.21	7.96	7.44	5.89	14.34	24.12	5.19	10.19	16.91	4.42	4.68
5	2.64	2.43	1.31	12.76	2.11	5.20	6.80	2.19	4.35	6.33	0.52	10.89
6	0.81	0.90	1.85	0.94	3.12	1.71	1.53	3.60	2.00	2.21	0.25	1.54
7	0.36	0.42	0.99	0.59	0.49	2.12	0.34	0.68	1.67	0.81	0.16	0.69
8	0.06	0.08	0.19	0.24	0.26	0.97	0.37	0.02	0.19	0.59	0.17	0.33
9	0.02	0.07	0.13	–	0.18	0.11	0.10	0.07	0.11	0.18	0.16	0.13
10	–	0.03	0.03	–	0.02	0.11	–	0.01	0.08	0.11	0.19	0.19
11	–	0.02	–	–	–	–	–	–	0.00	–	0.10	0.21
12	–	–	–	–	–	–	–	–	0.01	–	0.06	0.10
13	–	–	–	–	–	–	–	–	–	–	0.03	0.02
9+	0.02	0.12	0.16	0.00	0.20	0.22	0.10	0.08	0.20	0.29	0.54	0.65
Total CPUE	9.17	7.33	13.01	25.15	16.67	45.20	36.20	14.92	26.91	30.14	6.23	19.20
Mean age	4.44	4.86	4.69	4.56	4.43	4.02	4.27	4.58	4.24	4.47	4.87	5.12

Table 9.–Walleye and smallmouth bass tag recoveries from Lake St. Clair during 2002, 2003, and 2004.

Year	Number tagged	Tags recovered				Percent recovered
		2002	2003	2004	Total	
			Walleye			
2002	241	28	18	6	52	21.6
2003	173		21	8	29	16.8
2004	147			15	15	10.2
Total	561				96	17.1
			Smallmouth bass			
2002	270	11	7	0	18	6.7
2003	831		5	2	7	0.8
2004	267			2	2	0.7
Total	1,368				27	2.0

Table 10.–Biomass of submerged vegetation and attached zebra mussels collected by volunteer scuba divers at three stations on Lake St. Clair during 2004. Biomass was determined as ash free dry weight (AFDW).

Hectare station	Sample site (0.5 m^2)	Total sample wet mass (g)	Zebra mussel density (num./m^2)	Zebra mussel AFDW g/m^2	Number plant species	Submerged plant AFDW g/m^2
247	Site 1-1	1,404	7,759	6.30	5	118.62
	Site 1-2	1,967	20,520	27.60	3	146.85
	Site 1-3	1,281	11,311	4.74	1	91.82
247 west	Site 2-1	485	19,022	2.49	5	37.63
	Site 2-2	1,115	73,717	19.23	7	101.73
	Site 2-3	1,594	75,253	24.89	5	160.86
246	Site 3-1	479	32,997	1.28	4	32.56
	Site 3-2	117	9,056	1.28	4	7.97
	Site 3-3	487	155,477	6.12	1	29.21
Mean				10.44		80.80