STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-6

Study No.: 230488

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

Period Covered: October 1, 2004 to September 30, 2005

Study Objectives: The objectives of this study are (1) to measure the abundance of yellow perch, juvenile game fish, and various forage species in Lake St. Clair, (2) to monitor abundance of adult game fish species, (3) to document the abundance and distribution of aquatic plants and other fish habitat 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 2004 and 2005. Data entry and analysis for all 2004 trawls and trap nets are completed. Spottail shiner, mimic shiner, and yellow perch dominated the trawl catches. 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, 1998, and 2003 year classes were comparatively strong. Predator fish populations were surveyed with trap nets in Anchor Bay. In 2004, a total of 55 net lifts captured 71 northern pike, 73 muskellunge, 296 smallmouth bass, and 147 walleye. A total of 147 walleye and 253 smallmouth bass were tagged in 2004. Anglers reported capturing 111 tagged walleye and 28 tagged smallmouth bass through September 2005. Smallmouth bass tag reporting has been too low to support mortality estimation. Walleye tag recoveries were more widely dispersed from the tag site (average distance 23.3 km) than smallmouth tag recoveries (8.2 km). Sport fishing catch and effort information was collected with a voluntary angler diary program in 2004 and 2005. Data entry and analysis for all 2004 sport diaries are complete. Catch rates for walleye, yellow perch, and smallmouth bass declined in 2004, while muskellunge catch rates remained about the same. Diary participants reported releasing 99.96% of all muskellunge and 93.6% of all smallmouth bass caught during their fishing activities on Lake St. Clair during 2004. About five weeks of survey time were spent continuing to developing effective and efficient aquatic plant survey techniques. Hydroacoustic techniques were used along with intensive plant sampling at 56 Lake St. Clair square hectare plots in 2005. Plant biomass was estimated for 18 of the hectare plots that had hydroacoustic data collected in 2003, 2004, and 2005. In addition, twelve sites within four of the Lake St. Clair one hectare plots were sampled for plant biomass with both scuba and remote hydroacoustic equipment to develop calibration factors for the remote data. These results will provide a basis for future descriptions of the Lake St. Clair plant community during 2003-2005 and for comparing it to the plant community in 1978 based on hook tosses. Analysis of the data collected will also aid in developing and improving sampling protocols for monitoring the plant community in other Michigan lakes and rivers.

Findings: Jobs 1, 3, 5, 6, 9, 10, and 11 were scheduled for 2004-05, and progress is reported below.

Job 1. Title: <u>Sample yellow perch and forage with index trawls.</u>–During 2004 fish were collected at the Anchor Bay index site with a 10 m headrope bottom trawl with 9 tows in June and 13 tows in September. In June, spottail shiner, yellow perch, mimic shiner, trout-perch, and white sucker were most abundant. During September mimic shiner, spottail shiner, trout-perch, yellow perch, and bluntnose minnow were most abundant. Comparison of spring and fall densities of fish for Anchor Bay index trawls since 1997 revealed some interesting seasonal patterns (Table 1). 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 1998-2004 were evident, several species appear to have lower catch rates in recent years. Alewives were absent from both spring and fall trawls in 2003 and 2004. This coincides with the collapse of the alewife population in Lake Huron, suggesting alewives found in Lake St. Clair likely originate from southern Lake Huron. 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 2005.

Job 3. Title: <u>Collect catch and effort data for the sport fishery with angler diaries.</u>–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 2004, the MDNR distributed 64 angler diaries to Michigan resident sport anglers interested in participating in the diary program. A total of 49 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 2004 estimates (Table 2). The walleye catch rate in 2004 was the lowest recorded since 1996 and the number kept was the lowest for this period. This agreed well with numerous anecdotal reports from long-time Lake St. Clair walleye anglers who reported walleye fishing in 2004 was the worst in many years. Yellow perch catch rate declined and was the lowest since 1998. The number of yellow perch kept declined for the second year in a row, but remained within the range of values recorded since 1996. Muskellunge catch rates in 2004 were within range of values recorded since 1996. Only 1 of the 236 muskellunge caught by angler diary participants was kept. This represents a catch-and-release rate of 99.96%. The smallmouth bass catch rate and number caught declined in 2004. Diary program participants released 93.6% of the smallmouth bass they caught. Fishing effort for muskellunge was the lowest since 1996. Anecdotal reports indicate muskellunge fishing activity has remained steady or even increased in recent years. This suggests angler diary participation by muskellunge anglers has declined. Efforts to recruit new muskellunge anglers to the diary program should be a priority in 2006. 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 interesting.

New angler diaries were distributed in April 2005 and will be recalled in November 2005.

Job 5. Title: **Analyze data and estimate growth rates for yellow perch.**–Processing of yellow perch scale samples collected in 2004 was completed. Although the data set covers a limited time span, it appears that growth rates, based on mean length at age, have declined and are now consistently below state average for all ages (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, and 2003 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 1998 and 2003 year classes.

Processing of scale samples collected in 2005 is underway.

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 Council of Lake Committees.

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 2004, trap nets were fished from May 3 to May 26. The time period, water temperatures, and water clarity were similar to those conditions during the trap net survey in 2002 (Table 5). A total of 55 net lifts captured 71 northern pike, 73 muskellunge, 296 smallmouth bass, and 147 walleye. All of the walleye and 253 of the smallmouth bass were tagged with monel metal jaw tags and released at the site of capture. In 2004, a total of 24 fish species were represented in the trap net catch with rock bass (50%), smallmouth bass (8%), and yellow perch (7%) the most numerically abundant species in the catch (Table 6). The age distribution for the predator species caught in 2004 is shown in Table 7. For smallmouth bass, the age-6 cohort (1998 year class) accounted for 40% of the total captured in the trap nets. Mean age was highest for muskellunge at 7.6 years. The large difference in mean age between muskellunge and northern pike could be a reflection of higher mortality rates for northern pike. Alternatively, it could be a result of differences in the spatial distribution of older fish due to differences in the spawning temperatures for these two species.

The total trap net catch rate for smallmouth bass in 2004 (5.5) was similar to 2002 (Table 8) and well below the long-term mean (19.0). We suspect that the later sampling period with warmer water temperatures was an important factor in the higher catch rate in 2003. The 1998 year class dominated the catch in all three years and is clearly one of the strongest year classes currently in the population. Mean age increased each year, presumably due to the maturation of the dominant 1998 year class. Age 9 and older fish were well represented in the trap net catch again in 2004. 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 2005 occurred from May 11 to May 26. A total of 113 smallmouth bass and 187 walleye were captured in the trap nets. Scale samples collected from predator species will be processed by March 2006.

Job 10. Title: <u>Collect, summarize, and analyze tag recovery data.</u>–A total of 166 walleye and 97 smallmouth bass were tagged with monel metal jaw tags in 2005. Tagging data on individual walleye and smallmouth bass were put into computer and added the MDNR tagging database.

A total of 111 walleye tags and 28 smallmouth bass tags have been recovered through September 2005 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.

There was a large difference in tag reporting rate between walleye (15.3%) and smallmouth bass (1.9%) during all three years (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. Smallmouth bass tag reporting continues to be too low to support mortality estimation. We need to develop a rapport with the bass tournament fishermen so that tagging, and other methodologies, can be effective in estimating mortality parameters for smallmouth bass in Lake St. Clair.

Recaptures of tagged walleye were more dispersed compared to smallmouth bass tag recaptures (Figure 1). The average distance from tag site to recapture site was 23.3 km for walleye and 8.2 km for smallmouth bass. The distribution of walleye tags also shows strong connections with Lake Erie populations compared to local dispersal in northern Lake St. Clair for the smallmouth bass tagged population.

Job 11. Title: <u>Survey aquatic plant community.</u>–We continued to survey submerged aquatic plant growth in Lake St. Clair during 2005 with remote sensing (Biosonics©) split-beam hydroacoustic equipment and plant hook tosses. A total of 56 hectare plots were surveyed compared with 26 plots in 2004 and 68 plots in 2003 (Figure 2). All but two of the 2004 sites were positioned at locations sampled in 2003, while 18 of the 2005 sites were positioned at locations sampled in 2003 and 2004. We analyzed acoustic data for the 18 plots sampled in all three years to look for changes in plant biomass.

In 2005 we continued to modify our square hectare 10m transect sampling protocol utilizing Biosonics© hydroacoustic equipment in combination with replicated tosses of a plant sampling hook. Four additional plots were added to the three 2004 plots which were selected because of their water clarity and abundant submerged vegetation in Lake St. Clair for sampling plant 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 twelve sites was remotely sampled with our hydroacoustic equipment many times by anchoring over each buoy while collecting continuous data. We also ran hydroacoustic transects with the transducer passing directly over the buoy, as in 2004, while recording acoustic ping numbers to identify the exact location in the hydroacoustic file where scuba samples were to be collected. Volunteer scuba divers from the Macomb County Sheriff's Department Marine Patrol Dive Team collected complete 0.5 m^2 samples of rooted plants at each buoy location later on the same day. These plant samples were washed, weighed, sorted to species, and prepared for wet and dry biomass determination of each vascular plant species. As in 2004, Professor Douglas Hunter and graduate student Sarah Cholder-Blust from Oakland University assisted with our 2005 Lake St. Clair plant study. In 2005, we made preliminary estimates of the overall dry biomass of submerged vegetation from hydroacoustic files using EchoView© software. The recorded acoustic energy was integrated over the hectare transects and converted to wet and dry biomass values according to correction factors developed from the 2004 scuba samples. The dry biomass estimates were averaged over all 18 plots that were sampled each of the three years. These values were 3.4 g/m^2 for 2003 data, 78.4 g/m^2 for 2004 data, and 90.4 g/m^2 for 2005 suggesting that a substantial increase in standing crop of submerged vegetation occurred between 2003 and 2004. Example portions of the hydroacoustic echogram from a typical Anchor Bay hectare plot (station 313) each year showing the increased acoustic energy is presented in Figure 3. At this time we do not have an explanation for this increase, but plan to look for climatological factors that may provide insight. A potential complicating factor is that we upgraded the hydroacoustic surface unit in 2004 which may have altered acoustic receiving sensitivity even though calibrations were performed each year. The dry biomass values for 2004 and 2005 were in the typical range for dense stands of macrophytes in upper Midwest lakes (Lillie 1990).

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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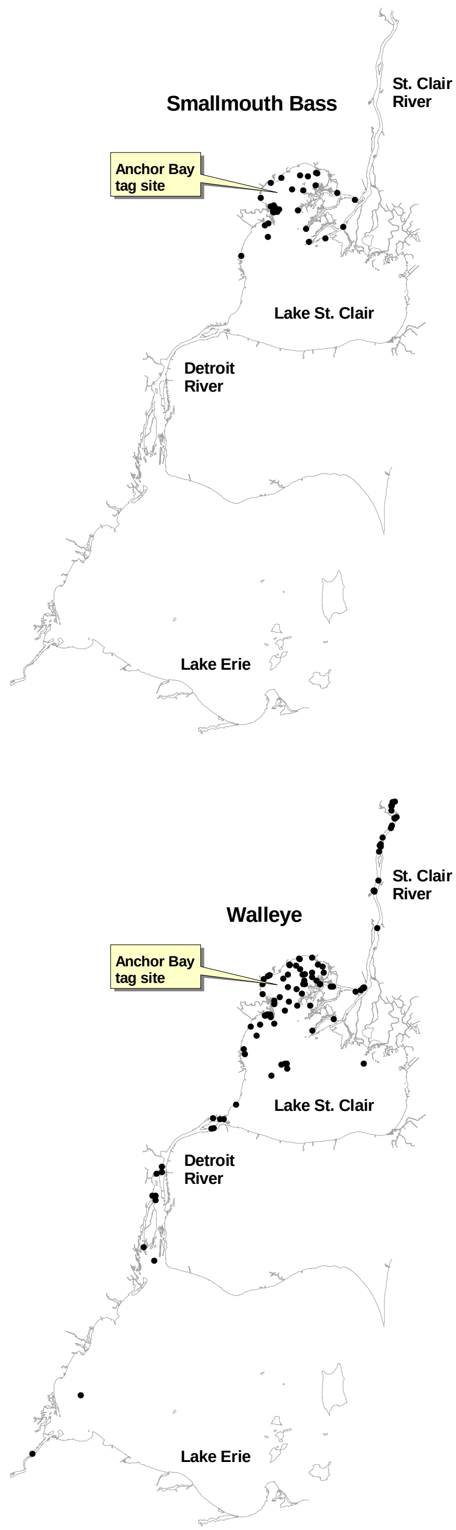

Figure 1.–Maps of 2003-2005 tag recovery locations for smallmouth bass (top, 28 tags) and walleye (bottom, 111 tags). All fish were tagged during spring at the Anchor Bay, Lake St. Clair tag site.

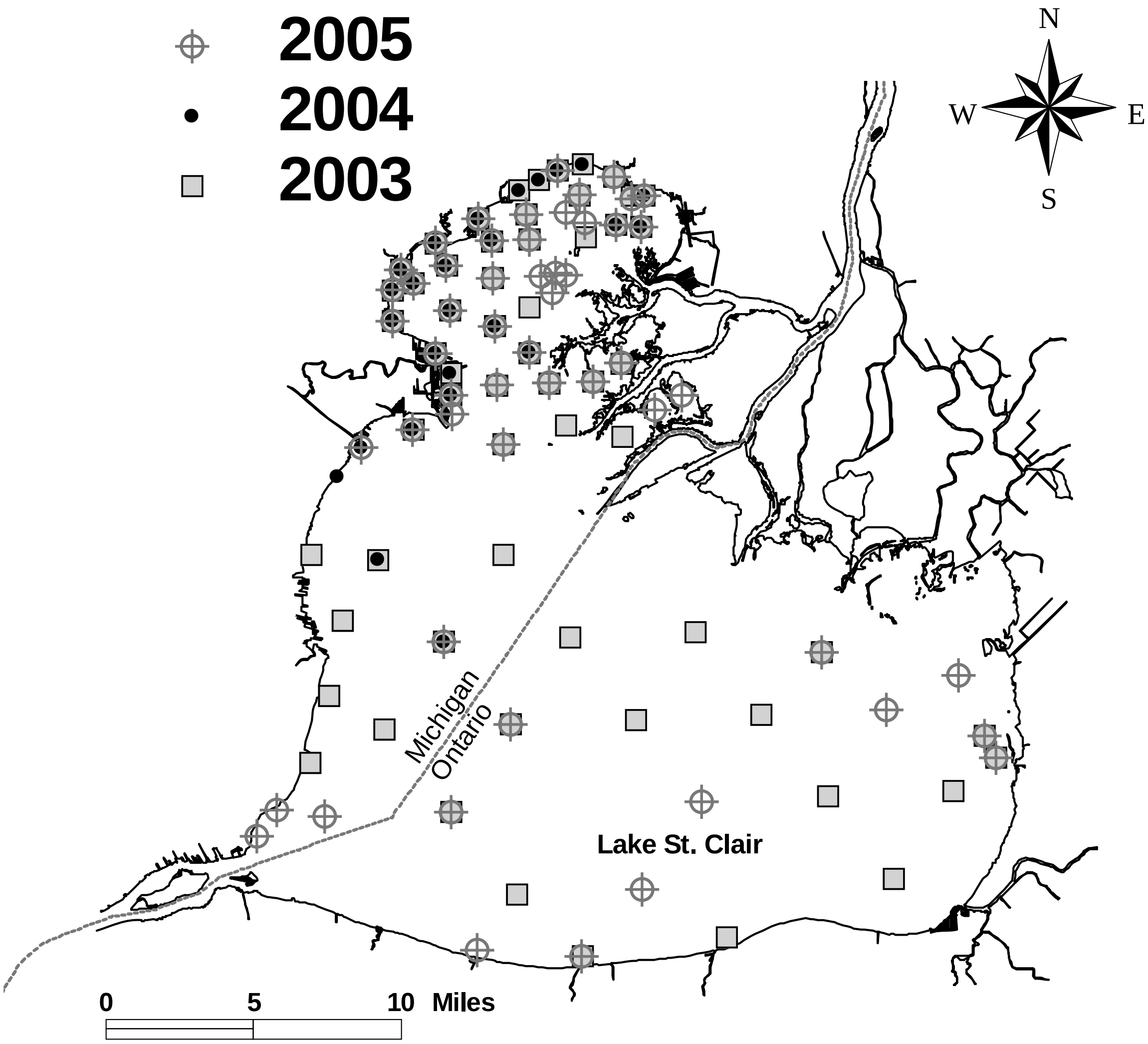

Figure 2.–Map of plant sampling locations in 2003 (gray squares), 2004 (black dots), and 2005 (crosshairs). Each site had square hectare plot sampling with hydroacoustic gear and plant hook tosses during all years. All but two of the 2004 sites were positioned at locations sampled in 2003. Eighteen of the 2005 sites were positioned at locations sampled in 2003 and 2004.

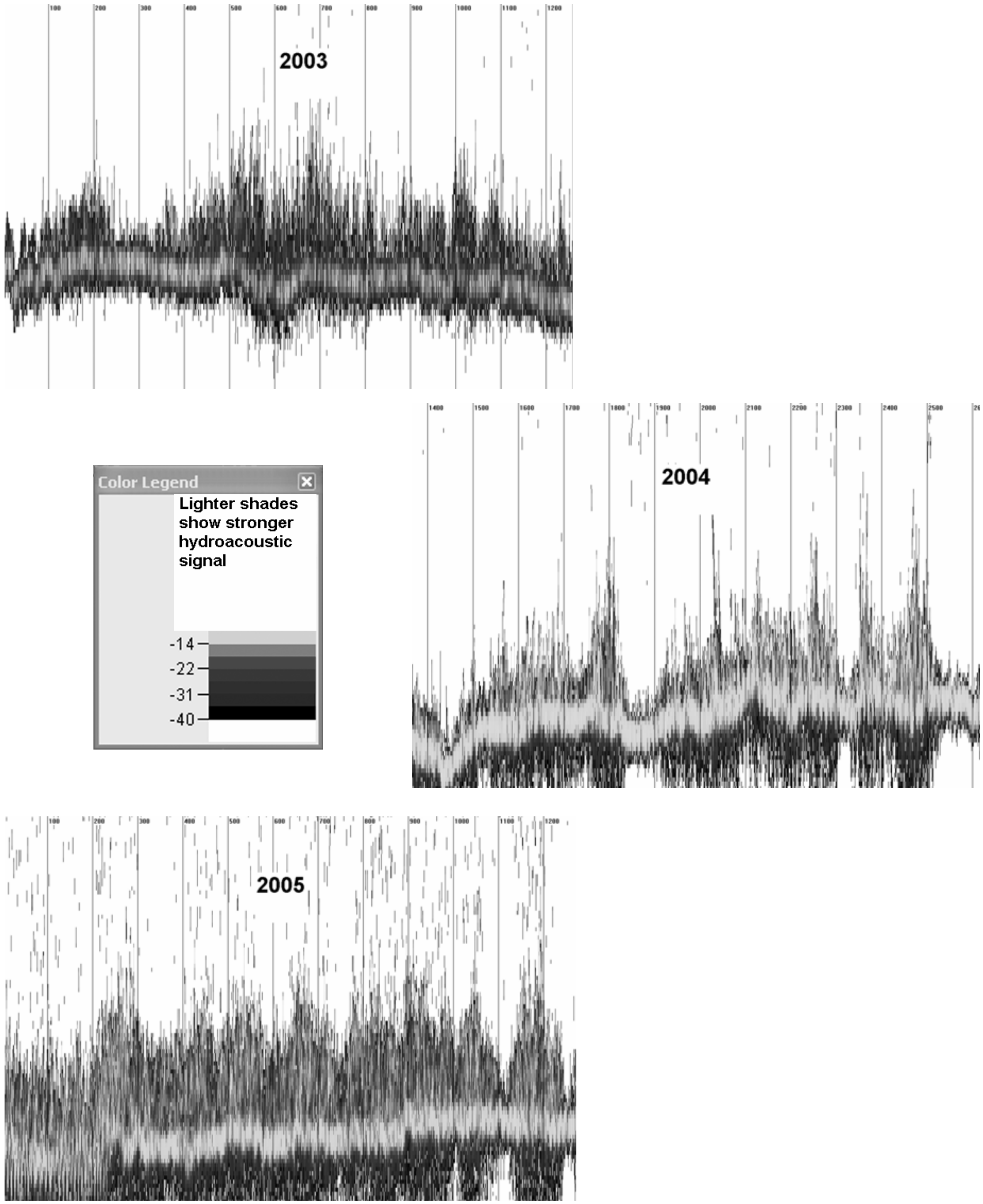

Figure 3.–Example submerged plant hydroacoustic echograms collected at the same location (hectare station 313) in Anchor Bay of Lake St. Clair in 2003, 2004, and 2005. Predominance of lighter shades in 2004 and 2005 show dramatic increase in submerged aquatic plant biomass compared to 2003.

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	1998	1999	2000	2001	2002	2003	2004	1998	1999	2000	2001	2002	2003	2004
Alewife	2.5	1.9	3.9	2.9	3.0	0.0	0.0	11.5	1.6	2.8	32.3	0.0	0.0	0.0
Bluntnose minnow	0.2	0.0	11.1	10.0	6.8	0.9	6.0	0.2	9.4	14.8	53.8	32.7	12.5	42.6
Common carp	0.0	0.0	0.2	0.0	0.0	0.0	0.5	0.0	0.1	0.0	1.1	2.1	0.0	0.3
Emerald shiner	0.0	0.0	5.1	0.0	10.6	0.0	1.5	7.5	0.0	0.0	0.0	0.6	0.0	41.2
Freshwater drum	5.0	2.3	0.7	4.5	0.8	3.6	3.0	0.2	1.4	1.0	2.3	0.2	0.6	5.1
Johnny darter	7.0	0.0	0.2	0.3	0.0	0.0	2.5	0.0	0.0	0.1	0.0	0.2	7.2	0.4
Lake sturgeon	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	38.0
Largemouth bass	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	12.6
Logperch	83.3	7.6	0.2	1.6	7.5	0.0	42.3	20.6	1.3	5.2	17.5	5.9	13.6	38.0
Mimic shiner	1.6	0.0	13.5	20.4	362.3	0.0	118.2	0.2	29.8	14.8	9.6	44.1	507.2	8,908.9
Muskellunge	0.0	0.1	0.0	0.6	0.8	0.0	0.0	0.0	0.0	0.1	1.1	0.0	0.4	0.0
Northern pike	0.2	0.0	0.1	1.3	0.0	1.4	0.0	0.0	0.1	0.3	0.6	0.6	0.6	0.0
North. shorthead redhorse	0.7	6.9	2.5	3.6	6.8	4.1	2.0	0.2	0.4	0.7	2.3	0.3	0.0	0.2
Pumpkinseed	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	1.6	0.4	5.1	5.4	3.2	0.5
Quillback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.7	0.0	1.7	0.8	1.0
Rainbow smelt	4.3	4.0	3.8	61.1	0.0	14.0	0.0	0.2	0.0	1.0	0.0	0.0	4.0	26.3
Rock bass	5.4	1.0	12.8	29.8	38.5	18.1	5.0	0.9	89.0	92.8	39.6	40.8	34.9	25.4
Round goby	28.1	6.0	10.8	1.3	30.2	5.9	53.3	22.2	9.6	10.0	10.2	99.3	1.8	28.0
Silver lamprey	0.0	0.9	0.3	0.0	0.0	0.5	0.5	0.0	0.2	0.0	0.3	0.0	0.4	0.4
Silver redhorse	0.2	0.4	0.9	0.0	2.3	4.5	2.0	0.7	0.0	0.4	1.1	5.7	0.0	4.1
Smallmouth bass	0.5	0.0	0.8	2.9	3.8	1.8	1.5	24.5	10.7	6.1	0.0	51.4	6.8	3.3
Spottail shiner	8.2	68.9	935.4	7.4	5,729.6	210.6	1,777.1	45.3	200.0	50.5	878.5	2,406.5	1,068.0	544.6
Trout-perch	98.5	154.0	34.3	11.0	264.9	13.1	107.7	25.8	2.9	0.2	0.0	9.7	5.7	58.5
Walleye	0.9	1.7	1.2	0.6	0.8	0.9	0.0	2.7	0.9	0.8	0.0	11.3	0.0	2.2
White perch	0.0	0.4	13.3	0.6	0.8	0.5	2.0	7.5	0.1	0.1	0.0	13.2	8.4	6.2
White sucker	3.6	0.0	2.5	1.3	61.1	2.3	67.9	0.0	0.3	1.0	0.6	8.0	0.7	1.2
Yellow perch	249.7	866.9	157.8	1,131.7	724.5	306.1	887.5	68.8	21.7	40.9	113.8	73.3	181.2	47.8

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
2004	393	3,740	1,048	862	0.28
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
2004	293	3,917	7,910	5,119	2.02
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
2004	126	999	845	54	0.84
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
2004	114	2,510	236	1	0.094

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	1999		2000		2001		2002		2003		2004		SWAVg
							Males						
1	102	(59)	109	(6)	109	(3)	103	(5)	100	(7)	109	(7)	
2	140	(48)	129	(110)	126	(8)	139	(6)	131	(43)	139	(11)	
3	158	(64)	158	(17)	142	(56)	153	(16)	147	(3)	160	(32)	
4	179	(45)	171	(60)	175	(12)	169	(43)	180	(11)	184	(3)	
5	186	(70)	189	(57)	193	(23)	189	(13)	181	(38)	188	(16)	
6	193	(43)	200	(47)	206	(18)	213	(7)	196	(6)	198	(21)	
7	218	(4)	209	(4)	207	(6)	215	(7)	216	(4)	216	(9)	
							Females						
1	106	(94)	108	(2)	114	(2)	106	(24)	104	(6)	106	(7)	
2	139	(38)	138	(147)	126	(1)	161	(1)	149	(50)	145	(4)	
3	170	(43)	171	(18)	160	(59)	168	(4)	155	(1)	167	(16)	
4	181	(29)	194	(35)	181	(25)	198	(34)	203	(4)	181	(36)	
5	209	(42)	206	(46)	230	(25)	189	(42)	208	(39)	211	(5)	
6	223	(45)	229	(24)	241	(15)	219	(11)	208	(24)	214	(4)	
7	247	(4)	234	(14)	263	(12)	227	(2)	232	(5)	241	(36)	
							Sexes combined						
1	103	(163)	109	(8)	111	(5)	105	(29)	102	(13)	107	(14)	102
2	139	(86)	134	(257)	126	(9)	142	(7)	140	(93)	140	(15)	145
3	163	(107)	164	(35)	151	(115)	156	(20)	149	(4)	162	(48)	173
4	180	(74)	180	(95)	179	(37)	182	(77)	186	(15)	182	(39)	198
5	195	(112)	197	(103)	212	(48)	189	(56)	195	(77)	208	(23)	221
6	208	(88)	210	(71)	221	(33)	219	(11)	205	(30)	201	(25)	246
7	233	(8)	228	(18)	245	(18)	227	(10)	225	(9)	236	(45)	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[1]	1995[1]	1996	1997	1998	1999	2000	2001	2002	2003	2004
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	0.0
1994	937.8	–	166.2	293.2	348.2	88.1	20.6	8.3	10.6	1.3	0.7	0.6
1995	167.8	–	–	21.4	40.7	26.4	32.2	12.3	21.1	10.4	2.7	0.6
1996	250.0	–	–	–	33.3	77.1	70.3	11.3	35.3	9.7	9.4	3.6
1997	231.8	–	–	–	–	2.7	37.6	5.5	52.8	61.3	44.4	27.5
1998	1,336.8	–	–	–	–	–	650.2	114.1	347.7	83.7	118.4	22.7
1999	95.8	–	–	–	–	–	–	4.8	25.8	17.6	24.9	22.7
2000	55.7	–	–	–	–	–	–	–	2.7	4.6	5.4	43.0
2001	271.0	–	–	–	–	–	–	–	–	131.3	89.5	50.2
2002	20.1	–	–	–	–	–	–	–	–	–	8.7	11.4
2003	705.2	–	–	–	–	–	–	–	–	–	–	705.2

[1] Data from 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	2004
Number of net lifts	64	50	55
Hours fished	2,748	2,839	3,080
Starting date	5/3	5/28	5/3
Ending date	5/30	6/20	5/26
Starting water temperature (°C)	9	12	8
Ending water temperature (°C)	15	16	15
Average secchi depth (m)	1.75	2.17	1.23

Table 6.–Catch rate, total catch, and percent of annual catch for all species caught in Lake St. Clair trap nets in 2002, 2003, and 2004. Trap nets fished in May and June at Anchor Bay index site.

	Mean Catch/lift			Total catch			% of catch		
Species	2002	2003	2004	2002	2003	2004	2002	2003	2004
Black crappie	0.0	0.0	0.3	0	1	19	0.0	0.0	0.5
Bluegill	0.1	0.0	0.1	5	0	6	0.1	0.0	0.2
Bowfin	0.0	0.0	0.1	0	2	3	0.0	0.1	0.1
Brown bullhead	0.0	0.0	0.0	2	1	2	0.0	0.0	0.1
Channel catfish	3.8	4.1	3.9	244	207	216	4.6	5.2	5.8
Common carp	0.5	0.6	1.3	33	31	72	0.6	0.8	1.9
Freshwater drum	2.1	10.8	3.6	133	543	201	2.5	13.6	5.4
Gizzard shad	0.0	0.1	0.0	3	4	1	0.1	0.1	0.0
Golden redhorse	0.0	0.0	0.0	1	2	2	0.0	0.1	0.1
Lake sturgeon	0.0	0.1	0.1	2	7	4	0.0	0.2	0.1
Largemouth bass	0.4	0.1	0.2	23	5	14	0.4	0.1	0.4
Muskellunge	0.6	0.6	1.4	41	28	78	0.8	0.7	2.1
Northern pike	1.9	0.3	1.3	120	15	72	2.3	0.4	1.9
Pumpkinseed	5.0	1.5	1.1	318	77	62	6.0	1.9	1.7
Quillback carpsucker	0.4	0.3	0.6	24	15	33	0.5	0.4	0.9
Rock bass	49.5	32.0	33.8	3,172	1,603	1,861	60.3	40.1	49.9
Shorthead redhorse	1.8	4.1	1.5	118	204	84	2.2	5.1	2.3
Silver redhorse	0.5	0.7	1.3	32	33	71	0.6	0.8	1.9
Smallmouth bass	6.2	19.2	5.5	399	962	302	7.6	24.1	8.1
Walleye	3.8	3.6	2.7	243	180	147	4.6	4.5	3.9
White bass	0.0	0.1	0.1	2	5	4	0.0	0.1	0.1
White perch	0.2	0.1	0.8	13	5	44	0.2	0.1	1.2
White sucker	0.3	0.2	0.3	18	10	15	0.3	0.3	0.4
Yellow perch	4.9	1.1	5.0	313	57	276	6.0	1.4	7.4

Table 7.–Age distribution (percentage) and mean age (years) for predator species captured in Anchor Bay assessment trap nets in 2004.

	Species			
Age	Muskellunge N=73	Northern pike N=71	Smallmouth bass N=296	Walleye N=147
1	0	0	0	0
2	0	16	0	34
3	0	21	5	5
4	1	25	4	16
5	11	25	27	5
6	16	7	40	14
7	22	3	8	10
8	18	1	6	7
9	18	0	2	5
10	8	1	1	4
11	4	0	3	0
12	1	0	1	1
13	0	0	1	0
Mean age	7.6	4.1	6.1	5.7

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	2004
2	–	0.01	0.07	0.09	0.05	–	0.07	0.04	0.15	0.07	–	–	0.02
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	0.26
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	0.24
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	1.47
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	2.23
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	0.46
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	0.35
9	0.02	0.07	0.13	–	0.18	0.11	0.10	0.07	0.11	0.18	0.16	0.13	0.13
10	–	0.03	0.03	–	0.02	0.11	–	0.01	0.08	0.11	0.19	0.19	0.08
11	–	0.02	–	–	–	–	–	–	0.00	–	0.10	0.21	0.17
12	–	–	–	–	–	–	–	–	0.01	–	0.06	0.10	0.04
13	–	–	–	–	–	–	–	–	–	–	0.03	0.02	0.04
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	0.46
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	5.50
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	6.09

Table 9.–Walleye and smallmouth bass tag recoveries from Lake St. Clair during 2002, 2003, 2004, and 2005.

Year	Number tagged	Tags recovered					Percent recovered
		2002	2003	2004	2005	Total	
Walleye							
2002	241	30	15	8	2	55	22.8
2003	173		25	6		31	18.1
2004	147			18	2	20	13.6
2005	166				5	5	3.1
Total	727	30	40	32	9	111	15.3
Smallmouth bass							
2002	270	11	7			18	6.7
2003	831		5	2		7	0.8
2004	267			2		2	0.7
2005	97				1	1	1.0
Total	1,465	11	12	4	1	28	1.9