STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-1

Study No.: 491 **Title:** Evaluation of lake sturgeon *Acipenser fulvescens* populations in the St. Clair River and Lake St. Clair

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

Study Objective: The objectives of this study are (1) to determine spawning period, to determine areal distribution of spawning activity, and to characterize spawning habitat for lake sturgeon in the St. Clair River, (2) to determine early (juvenile) life history of lake sturgeon in the St. Clair River and Lake St. Clair, and identify habitat requirements of lake sturgeon, (3) to document lake sturgeon population parameters for Lake St. Clair and the St. Clair River; including estimated abundance, exploitation, age composition, growth rate, and age/sex composition of the spawning stock.

Summary: A total of 172 lake sturgeon were collected from the St. Clair River and Lake St. Clair in 1999. Sturgeon were collected with bottom trawls and baited setlines. Pectoral fin ray sections were used to age 168 fish. Ages ranged from 1 to 62 years and included 40 year classes. Mean length at age suggested that these sturgeon grew faster as juveniles than lake sturgeon in Michigan's inland waters. A total of 167 sturgeon were tagged with serial-numbered monel cattle ear tags and released in 1999. An additional 205 sturgeon have been tagged and released through September 1, 2000, bringing the total number of sturgeon tagged and released since 1996 to 885 fish. Tag recoveries have been sparse, comprising eleven recaptures with setlines, two recaptures with trawls, and eleven reported recoveries by sport or commercial fishermen. A spawning site was identified in the St. Clair River in 1997 and documentation of spawning activity and habitat characteristics at the site continued in 2000.

Job 1. Title: Collect biological data, and tag juvenile and adult sturgeon with monel tags in the St. Clair River and Lake St. Clair.

Findings: Sturgeon were collected with two gear types in 1999. A total of 107 sturgeon, including three recaptures, was caught in 64 overnight sets using setlines in the North Channel of the St. Clair River, between May 11 and June 4. Total lengths of sturgeon caught on setlines ranged from 546 mm to 1,816 mm. Ages ranged from 3 to 62 years. All 107 fish were tagged with monel cattle ear tags and released. Additionally, six large sturgeon captured with setlines in the North Channel were implanted with sonic tags as part of a telemetry study in cooperation with the University of Michigan.

A total of 65 lake sturgeon were captured with 10 m headrope bottom trawls from June through October on Lake St. Clair. Total length of sturgeon captured ranged from 351 mm to 1,651 mm. Ages ranged from 1 to 42 years. All 65 fish were tagged with monel cattle ear tags and released. Lower water levels in 1999 may have affected trawl efficiency. An area of the lake that produced high trawl catch rates for sturgeon from 1996-1998 became essentially unfishable with bottom trawls in 1999 due to heavy growth of submerged vegetation (*Chara* spp.). Numerous lake sturgeon

were still present in this area, as evidenced by telemetry, sidescan sonar, and observations of breaching sturgeon.

In 2000, we caught a total of 82 sturgeon, including 4 recaptures, with setlines in 72 overnight sets. An additional 130 sturgeon, including 2 recaptures, were captured with trawls on Lake St. Clair through September 1, 2000. One of the two fish recaptured with trawls in 2000 was a fish previously tagged in the opercle, but the tag had been lost. A scar was clearly evident on the opercle and the left pectoral fin ray had clearly been removed. This is the first documented case of tag loss during this study. Processing of fin rays for age analysis for sturgeon captured in 2000 is underway.

Overall, the age distribution of lake sturgeon captured from 1997 through 1999 appeared well balanced, with a total of 40 year classes represented by the 579 lake sturgeon sampled for age (Table 2). This sample reveals consistently good recruitment from 1973 to 1993. It may not be coincidental that this period of recruitment followed the federal Clean Water Act of 1972. The strongest year-classes were produced in 1993, 1991, 1985, and 1977. The 1995 to 1998 year classes were poorly represented in the sample. This could be due to gear selectivity, juvenile distribution, or poor recruitment in recent years. Since lake sturgeon are known to be capable of exceeding 50 years in age (Scott and Crossman 1973), year-classes prior to 1965 appeared under-represented in the catch. This could be an indication that recruitment prior to 1965 was poor, but has improved dramatically since that time. Alternatively, those year-classes may have experienced high exploitation rates in the past, particularly during the 1970's and early 1980's, prior to the closure of sturgeon season during the spawning period in May and June for these waters in 1983.

Growth of lake sturgeon in the St. Clair ecosystem was good, with some fish attaining a total length of 1 m as early as age 8. A mean length of 1,270 mm was attained by age 19 (Table 3). In contrast, lake sturgeon in Michigan's inland waters grow slower, particularly from age 1 to age 15, and attain a mean length of 1,270 mm at age 22 (Baker 1980). Based on age and growth data collected during this study, the MDNR has implemented new regulations for sturgeon sport fishing on Lake St. Clair and the St. Clair River. The regulations included a "slot" size limit, with a minimum length limit of 1,067 mm (42 inches) and a maximum length limit of 1,270 mm (50 inches), a season bag limit of 1 fish, an open season from July 16 to September 30, and mandatory registration of harvested sturgeon at designated check stations. This "slot" limit will allow a limited harvest to continue, while protecting sexually mature female fish and potentially allowing older fish to increase in abundance.

Job 2. Title: <u>Characterize adult spawning habitat and juvenile habitat; based on catch distribution and using underwater video, sidescan sonar, doppler flow meter, temperature and oxygen profiles.</u>

Findings: In 1997 we identified a spawning location in the North Channel of the St. Clair River. This site was initially discovered through contacts with local riparians, fishermen, and conservation officers. Sturgeon spawned on the site on June 13 and 14, 1997. The site is characterized by water depths of 9 m to 12 m, flow rates of 1 m/sec, and substrate composed of coal cinders ranging in size from <25 mm to over 200 mm in diameter. Water temperature at the peak of spawning in 1997 was 13.2 ^{o}C. In 1998, water temperatures reached 13 ^{o}C, and sturgeon began spawning on the site, on May 18. In 1999, water temperatures were 12 ^{o}C on May 20, when ripe sturgeon were first captured. The coal cinders are believed to have been deposited at the site during the late 1800s when coal-burning vessels moored and emptied their cinders into the river. The cinder substrate is now encrusted with zebra mussel and the 3-dimensional structure of the cinders (combined with the zebra mussel layer) provides a high level of interstitial space, offering excellent protection for

deposited eggs. The cinder bed measures approximately 25 m by 54 m in size and roughly parallels the shoreline.

Efforts to map the spawning site with sidescan sonar have been largely unsuccessful. While good sidescan images of the site have been obtained from the Seascan system, signal returns from cinder substrate are not obviously different from the surrounding clay and gravel substrates. River currents tend to make the towfish unstable, resulting in distorted images. Also, steep bottom contours typical of the St. Clair River shorelines make it difficult to use the sidescan sonar effectively. Therefore, it is apparently not possible to use the sidescan system to quickly search for other potential spawning locations in the river, as we had originally envisioned. We plan to evaluate the applicability of underwater video equipment in searching for other potential sturgeon spawning locations in 2000 and 2001.

Efforts to identify habitat requirements of juvenile lake sturgeon have been impeded by our inability to consistently collect young lake sturgeon. Less than 1% of the sturgeon captured through 1999 were younger than age 3 (smaller than about 500 mm total length). Efforts to capture Age 0 lake sturgeon in littoral areas with a 4.8m headrope trawl have been unsuccessful. Potentially, Age 0 lake sturgeon in the St. Clair system may inhabit deep channel areas of the St. Clair delta. However, sampling in these areas is extremely difficult. We plan to try searching for YOY or yearlings in some of these deep channel areas with underwater video during fall 2000. Additional catch data from collections over the next few years may also help identify juvenile habitat based on the geographical distribution of juveniles in the catch.

Job 3. Title: <u>Collect and analyze tag recovery data.</u>

Findings: Tag recovery data remain sparse. To date, 24 lake sturgeon tagged and released during this study have been recaptured. Twenty-one were originally caught with setlines, tagged, and released in the North Channel of the St. Clair River. Eleven have been recovered during the setline survey portion of this study in the North Channel. Seven recoveries were reported in 1998 and 1999 by sport anglers in the North Channel. Four recoveries have been reported from the Ontario commercial trap-net fishery in southern Lake Huron, approximately 70 kilometers from the tag site. All other recaptures have occurred within 10 km of the tag sites. Although trawling has accounted for 53% of the sturgeon captured during this study, only two recoveries (8% of the total recoveries) have been from a fish originally caught in a trawl on Lake St. Clair. This could be an indication that fish residing year around in the St. Clair River or in both the St. Clair River and southern Lake Huron, experience a higher level of fishing exploitation. Alternatively, fish captured with trawls in Lake St. Clair may be a sample from a much larger group of fish, perhaps including individuals that are using other spawning areas.

Lake sturgeon movements are unrestricted by human or natural barriers in the St. Clair system. The potential for free immigration and emmigration makes it difficult to estimate abundance based on mark-recapture techniques. However, it is possible to produce some estimates of numerical abundance based on the mark-recapture data available from our survey gear. Using the SCHNABEL method (Ricker 1975) we estimated that the abundance of lake sturgeon in the St. Clair system was 37,258 (95% CI=19,760-325,543). Using the CAPTURE method (White et al 1978) we estimated the abundance of lake sturgeon in the St. Clair system was 18,574 (95% CI=1,539-397,720). Despite problems associated with the potential violation of various assumptions regarding these estimation techniques, we believe the magnitude of these estimates suggests sturgeon abundance in the St. Clair system exceeds 10,000 fish.

The adult sturgeon telemetry study (cooperative with the University of Michigan) has provided much more information about sturgeon movement within the St. Clair system. A total of 16 large adults captured near the North Channel spawning site, tagged with sonic tags and released, have been located periodically over the past 3 years. One movement pattern apparent from this study is that many adult sturgeon found in the North Channel during the spawning season moved into Lake St. Clair and spent the summer and fall months in the deeper portions of the U.S. area of the lake. It was also apparent that some adult sturgeon remained in the St. Clair River throughout the year.

A sturgeon telemetry study was initiated in the Detroit River by researchers from the USFWS and Central Michigan University in spring 2000. At least four of the 10 fish implanted in the Detroit River in 2000 were located during the summer in Lake St. Clair. This finding supports that theory that sturgeon from several different spawning areas reside in Lake St. Clair during the summer.

Job 4. Title: Analyze data and prepare annual performance report, final report, and other reports.

Findings: A summary of all Mt. Clemens sturgeon assessment activities was prepared for inclusion in the annual Interbasin Sturgeon Working Group Report, compiled by the Alpena US Fish anwd Wildlife Fisheries Resource Office, and distributed at the Great Lakes Fisheries Commission lake meetings. This annual performance report was also prepared. A paper detailing the setlining method was prepared and published (Thomas and Haas 1999). A poster report was presented at the Great Lakes Fisheries Trust's Sturgeon Workshop in 2000.

Literature Cited:

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White, G.C., K.P. Burnham, D.L. Otis, and D.R. Anderson. 1978. User's manual for program CAPTURE. Utah State University Press, Logan.

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Table 1.–Mean length and weight for lake sturgeon collected from St. Clair River and Lake St. Clair in 1999.

	Set-line	Trawl
Total number caught	107	65
Mean length	1,211 mm	1,170 mm
Length range	546 mm – 1,816 mm	351 mm – 1,651 mm
Mean weight	13.4 kg	12.3 kg
Weight range	0.8 kg – 49.5 kg	0.2 kg – 29.8 kg

Table 2.–Age distribution for all lake sturgeon sampled for age from the St. Clair River and Lake St. Clair in 1997, 1998, and 1999 with three gear types (TN=trap net, SL=setline, TR=trawl).

Year		1997				1998				1999		Total
Class	Age	TN	SL	TR	Age	TN	SL	TR	Age	SL	TR	Catch
1998					0	0	0	0	1	0	1	1
1997	0	0	0	0	1	0	0	0	1	0	1	1
1996	1	0	0	1	2	0	0	1	2	2	0	4
1995	2	0	0	0	3	1	2	0	3	0	3	6
1994	3	1	0	1	4	0	5	1	4	6	1	15
1993	4	0	1	5	5	0	3	4	5	8	5	26
1992	5	0	1	1	6	0	3	1	6	1	0	7
1991	6	1	4	8	7	0	4	3	7	4	2	26
1990	7	0	6	4	8	0	3	6	8	2	2	23
1989	8	0	2	7	9	0	4	5	9	0	4	22
1988	9	0	4	5	10	0	4	4	10	3	4	24
1987	10	0	3	2	11	0	0	5	11	0	1	11
1986	11	0	0	10	12	0	1	4	12	2	2	19
1985	12	2	4	5	13	0	3	5	13	7	3	29
1984	13	1	0	4	14	0	2	5	14	4	1	17
1983	14	0	4	1	15	0	3	3	15	1	2	14
1982	15	1	1	3	16	0	0	8	16	2	3	18
1981	16	0	1	0	17	0	3	6	17	2	1	13
1980	17	2	2	1	18	0	1	5	18	2	1	14
1979	18	2	4	3	19	0	4	7	19	3	4	27
1978	19	0	3	3	20	0	3	6	20	6	1	22
1977	20	0	7	1	21	0	7	11	21	3	4	33
1976	21	0	5	4	22	0	4	4	22	3	4	24
1975	22	0	2	4	23	0	1	9	23	6	1	23
1974	23	0	1	1	24	0	4	7	24	5	1	19
1973	24	0	2	2	25	0	5	7	25	4	2	22
1972	25	0	1	1	26	0	2	5	26	4	1	14
1971	26	0	2	1	27	0	1	0	27	2	1	7
1970	27	0	2	2	28	0	1	3	28	6	4	18
1969	28	0	2	2	29	0	2	2	29	1	0	9
1968	29	0	1	2	30	0	2	4	30	2	2	13
1967	30	0	4	0	31	0	4	9	31	1	0	18
1966	31	0	2	3	32	0	0	3	32	3	0	11
1965	32	0	0	1	33	0	1	1	33	4	0	7
1964	33	0	0	0	34	0	1	2	34	1	0	4
1963	34	0	0	0	35	0	0	2	35	1	0	3
1962	35	0	0	0	36	0	0	1	36	0	0	1
1961	36	0	1	1	37	0	0	0	37	1	1	4
1960	37	0	0	0	38	0	1	1	38	0	0	2
1959	38	0	0	0	39	0	1	0	39	0	0	1
1958	39	0	0	0	40	0	0	0	40	0	0	0
1957	40	0	0	0	41	0	0	0	41	0	1	1
1956	41	0	0	0	42	0	1	0	42	0	0	1
1955	42	0	1	0	43	0	1	0	43	0	0	2
1953	44	0	0	0	45	0	0	0	46	1	0	1
1937	60	0	0	0	61	0	0	0	62	1	0	1

Table 3.–Mean length (mm) at age for all lake sturgeon sampled for age from the St. Clair River (SCR) and Lake St. Clair (LSC) in 1997, 1998, and 1999 and standard error (SE), compared to mean length (mm) from Michigan's inland lakes (Baker 1980).

Age	SCR&LSC (SE)		Michigan Inland
1	298	(53.5)	152
2	451	(24.0)	279
3	583	(35.0)	318
4	653	(14.0)	409
5	747	(17.0)	513
6	814	(11.7)	561
7	837	(14.9)	627
8	924	(19.0)	699
9	935	(15.7)	770
10	975	(16.6)	810
11	1009	(19.6)	884
12	1036	(25.6)	940
13	1094	(24.3)	1008
14	1128	(20.6)	1054
15	1177	(31.2)	1133
16	1144	(31.4)	–
17	1269	(19.0)	1171
18	1252	(16.2)	1171
19	1282	(16.7)	1173
20	1297	(21.6)	1242
21	1345	(14.4)	1245
22	1385	(17.6)	1278
23	1357	(22.0)	1288
24	1348	(29.3)	1293
25	1404	(19.4)	1341
26	1402	(21.0)	1344
27	1381	(39.9)	1392
28	1452	(25.6)	1389
29	1471	(20.4)	1463
30	1491	(34.4)	1384
31	1469	(19.8)	1466
32	1502	(41.2)	1453
33	1408	(50.3)	1440
34	1488	(61.8)	1511
35	1484	(53.1)	1496
36	1496	(74.9)	1529
37	–	(–)	1557
38	1486	(33.2)	1542
39	1562	(–)	1638
40	–	(–)	1651
41	–	(–)	1590
42	1637	(62.3)	–
43	1529	(–)	–