

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-15

Study No.: 491

Title: Evaluation of lake sturgeon *Acipenser fulvescens* populations in the St. Clair River and Lake St. Clair

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

Study Objective: The objectives of this study are: (1) to determine spawning period, areal distribution of spawning activity, and characterize spawning habitat 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 244 lake sturgeon were collected from the St. Clair River and Lake St. Clair in 1998. Sturgeon were collected with trap nets, bottom trawls, and baited setlines. Pectoral fin ray sections were used to age 237 fish. Ages ranged from 2 to 43 years and included 39 year classes. Mean length at age suggested that these sturgeon grow faster as juveniles than inland lake sturgeon in Michigan. A total of 242 sturgeon were tagged with serial numbered monel cattle ear tags and released in 1998. An additional 167 sturgeon have been tagged and released through September 1, 1999, bringing the total number of sturgeon tagged and released since 1996 to 677 fish. Tag recoveries have been sparse, with seven recaptures with setlines, 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 1998 and 1999.

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 and tagged with three gear types in 1998. A total of 90 sturgeon were caught in 78 overnight sets using setlines in the North Channel of the St. Clair River between May 7 and May 29. We compared round gobies with other types of bait between May 7 and May 13. During this period, 14 lake sturgeon were caught on a total of 371 hooks baited with round gobies, while a total of 212 hooks baited with other types of bait caught no lake sturgeon. After May 13, all hooks were baited with round gobies. Total length of sturgeon caught on setlines ranged from 589 mm to 1,714 mm. Age ranged from 3 to 43 years. A total of 87 fish were tagged with monel cattle ear tags and released. Additionally, 4 large sturgeon (captured with setlines in the North Channel) were implanted with sonic tags as part of a cooperative telemetry study with the University of Michigan. In early June, 2 sturgeon were incidentally caught in trap nets set in the northern portion of Lake St. Clair, referred to as Anchor Bay. Both fish were tagged with monel cattle ear tags and released.

A total of 209 trawl tows (127 with 10 m headrope trawls and 82 with 4.8 m headrope trawls) from June through October on Lake St. Clair captured 153 lake sturgeon. All sturgeon were collected in the 10m headrope bottom trawls. Total length of sturgeon captured ranged from 427 mm to 1,709 mm. Age ranged from 2 to 38 years. A total of 153 fish were tagged with monel cattle ear tags and released into Lake St. Clair.

A total of 107 lake sturgeon were captured with setlines during May and June 1999, including three recaptures. Six of those fish were implanted with sonic transmitters as part of an ongoing cooperative telemetry study with the University of Michigan. An additional 63 sturgeon were captured with trawls on Lake St. Clair through September 1, 1999. 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 is now essentially unfishable with bottom trawls due to heavy growth of *Chara*. Numerous lake sturgeon are still present in the area, as evidenced by telemetry, sidescan sonar, and observations of breaching sturgeon. Processing of fin rays for age analysis for sturgeon captured in 1999 is underway.

Overall, the age distribution of lake sturgeon caught in 1997 and 1998 appeared well balanced with a total of 40 year-classes represented among the 411 lake sturgeon sampled for age (Table 2). This sample revealed consistently good recruitment to this population from 1973 to 1991. 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 1967, 1991, and 1977. Fish younger than age 4 are poorly represented in the sample. This may 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 appear under-represented in the catch. This could be an indication that recruitment prior to 1965 was poor, and 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 is good, with some fish attaining a total length of 1 m as early as age 8. A mean length of 1,270 mm is attained by age 19. In contrast, inland lake sturgeon in Michigan grow slower, particularly from age 1 to age 15, and attain a mean length of 1270 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 allow older fish to increase in abundance.

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

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 was characterized by water depths of 9 m to 12 m, flow rates of 1 m/s, 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 °C. In 1998, water temperatures reached 13 °C, and sturgeon began spawning on the site

on May 18. An underwater video system was used to capture nearly 80 hours of video of fish activity on the spawning site. Numerous sturgeon spawning events were recorded as well as sturgeon, redhorse spp., and round goby feeding behavior. The coal cinders are believed to have been deposited at the site during the late 1800's when coal burning vessels moored and emptied their cinders into the river. The cinder substrate is now zebra mussel encrusted and the three-dimensional structure of the cinders combined with the zebra mussel layer provide a complex system of interstitial spaces, offering excellent protection for deposited eggs. The cinder bed measures approximately 25 m by 54 m and roughly parallels the shoreline.

Efforts to map the spawning site with sidescan sonar in 1998 were partially successful. Unfortunately, plans to sidescan the cinder pit during the spawning period in 1999 were not completed due to equipment malfunction. The sidescan unit was repaired and will be used to map the spawning site during the year 2000 spawning period.

Efforts to understand the habitat requirements of juvenile lake sturgeon have been impeded by our inability to consistently collect young lake sturgeon. Only 7% of the sturgeon captured through 1998 were younger than age 6 (smaller than about 760 mm total length). Efforts to capture Age 0 lake sturgeon in littoral areas with a 4.8m headrope trawl have been unsuccessful. Age 0 lake sturgeon in the St. Clair system may inhabit deep channel areas of the St. Clair delta. Additional catch data from collections over the next few years may help identify a juvenile habitat based on the geographical distribution of juveniles in the catch.

Job 3. Title: Collect and analyze tag recovery data.

Findings: Tag recovery data remain sparse. To date, eighteen lake sturgeon tagged and released during this study have been recaptured. Seventeen were originally caught with setlines, tagged, and released in the North Channel of the St. Clair River. Seven more 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 56% of the 680 sturgeon captured during this study, only one recovery (6% of the total recoveries) has been from a fish originally caught in a trawl on Lake St. Clair. This could be an indication that fish that reside year around in the St. Clair River or move north into southern Lake Huron experience a much higher level of fishing exploitation.

The cooperative adult sturgeon telemetry study with the UM has provided much more information about sturgeon movements 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 course of the past 3 years. One movement pattern apparent from this study is that many of the adult sturgeon found in the North Channel during the spawning season move into Lake St. Clair and spend the summer and fall months in the deeper portions of the US area of the lake.

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 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).

Literature Cited:

Baker, J.P. 1980. The distribution, ecology, and management of the lake sturgeon (*Acipenser fulvescens* Rafinesque) in Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1883, Ann Arbor.

Scott, W. B. and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada. Bulletin 184, Ottawa.

Thomas, M.V. and R.C. Haas. 1999. Capture of lake sturgeon with setlines in the St. Clair River, Michigan. *North American Journal of Fisheries Management* 19:610-612.

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Date: September 30, 1999

Table 1.—Mean length and weight for lake sturgeon collected from St. Clair River and Lake St. Clair in 1998.

	Gear type		
	Trap net	Set-line	Trawl
Total number caught	2	88	153
Mean length	588 mm	1,190 mm	1,234 mm
Length range	470 mm – 706 mm	589 mm – 1,714 mm	427 mm – 1,709 mm
Mean weight	1.3 kg	13.3 kg	13.7 kg
Weight range	0.6 kg – 2.1 kg	1.0 kg – 36.0 kg	0.3 kg – 40.9 kg

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

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

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

Age	Mean length (mm)		Michigan Inland ¹
	SCR&LSC	SE	
1	244	—	152
2	427	—	279
3	596	49.1	318
4	659	14.5	409
5	721	17.0	513
6	826	13.0	561
7	843	14.5	627
8	922	16.9	699
9	929	17.0	770
10	968	20.5	810
11	972	19.2	884
12	1036	27.2	940
13	1095	28.7	1008
14	1080	19.7	1054
15	1178	34.7	1133
16	1147	38.0	—
17	1267	24.2	1171
18	1253	18.6	1171
19	1291	17.2	1173
20	1287	28.9	1242
21	1351	17.8	1245
22	1381	19.9	1278
23	1357	28.6	1288
24	1320	36.2	1293
25	1396	23.4	1341
26	1399	24.7	1344
27	1398	60.2	1392
28	1468	32.5	1389
29	1483	20.3	1463
30	1490	38.0	1384
31	1480	22.5	1466
32	1522	46.5	1453
33	1429	151.0	1440
34	1624	87.8	1511
35	1431	4.0	1496
36	1563	47.5	1529
37	—	—	1557
38	1451	21.5	1542
39	1562	—	1638
40	—	—	1651
41	—	—	1590
42	1668	93.5	—
43	1529	—	—

¹ from Baker (1980)