

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-7

Study No.: 230491

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

Period Covered: October 1, 2005 to September 30, 2006

Study Objective: The objectives of this study are (1) to determine spawning period, areal distribution of spawning activity, and 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 rate, age composition, growth rate, age structure, and sex composition of the spawning stock.

Summary: Data entry and analysis for all 2005 field collections has been completed. A research report summarizing the results of this study from 1996 through 2002 was published in 2004. Work continued on Jobs 1, 2, 3, and 4 in 2005 and 2006 under the most recent amendment to the study. Field sampling was conducted on schedule in 2005 and 2006.

Findings: Jobs 1 through 4 were scheduled for 2005-06, and progress is reported below.

Job 1. Title: Collect biological data, and tag juvenile and adult sturgeon.—Four sturgeon were incidentally caught in a survey trap net in Anchor Bay during May 2006. The trap netting is conducted under federal aid project F-81, Study 230488. A total of 141 lake sturgeon were caught with 80 setline lifts in the North Channel of the St. Clair River from May 30 to June 23, 2006. An additional 6 setlines were fished in Lake St. Clair on the shallow, sandy flats near Strawberry Island in an effort to capture juvenile sturgeon in the lake, but only one fish was hooked and it escaped when the setline was lifted. Trawling in Lake St. Clair during June, July, and August 2006 resulted in the capture of 81 lake sturgeon. Data entry and processing for fish caught during 2006 is underway, but incomplete at the time of the preparation of this report.

A summary of the biological statistics for lake sturgeon sampled from the St. Clair River and Lake St. Clair from 1996 to 2005 is presented in Table 1. Age was estimated for a total of 1,491 lake sturgeon based on pectoral fin ray sections (Table 2). A total of 61 year-classes were represented. Strong year-classes since 1990 have included 1993, 1994, and 1990. The weakest year-classes since 1990 include 1995, 1997, and 1998. We suspect the 2001 to 2005 year classes have not been well sampled due to gear selectivity and possible juvenile fish spatial distribution patterns. Data entry for field collections made during 2006 is underway.

Job 2. Title: Characterize adult spawning habitat and juvenile habitat.—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 2005 were younger than age-3 (smaller than about 500 mm total length). Since 1996, a total of 42 fish measuring 640 mm in total length or smaller (approximately age 5 or younger) have been caught with assessment gear, including 11 captured in 2005. Eighteen fish less than 640mm have been caught in the St. Clair River with setlines (mostly on small hooks) or trammel nets. Sampling with small-mesh gill nets, trap nets, and trawls in Lake St. Clair produced a total catch of 23 fish less than 640 mm TL.

During the summer and fall of 2005, we participated in a cooperative mid-summer juvenile lake sturgeon survey in the St. Clair River. This survey effort included personnel from both the Michigan Department of Natural Resources and United States Fish and Wildlife Service. Experimental trammel nets were fished in the North Channel of the St. Clair River in areas frequented by sonic-tagged juvenile lake sturgeon. We found the trammel nets were prone to snagging on debris on the bottom of the river, often restricting the area sampled to practically zero. However, two out of the twelve sets in the river captured sturgeon, including 4 juvenile fish ranging from 462 mm to 729 mm TL caught in a single set. In 2005, we continued cooperative efforts to better document the physical characteristics of locations that consistently produced juvenile lake sturgeon catches with assessment gear or were common locations for sonic-tag-implanted juveniles. Efforts included sidescan sonar mapping and substrate and benthic invertebrate sampling in the North Channel in 2005.

Only 5 fish less than 2 years old have been collected during the study and all five were caught in Lake St. Clair, including 2 age-0 fish caught in a small-mesh gill net set in October 2005 near Strawberry Island. Benson et al. (2005) found that age-0 lake sturgeon remained in their natal rivers through the first summer and then out migrated in the fall and were found inhabiting shallow, sandy areas near Green Bay, Lake Michigan near their natal rivers. It is possible that age-0 lake sturgeon in the St. Clair system inhabit deep channel areas of the St. Clair delta through the first summer of life and then move out into the shallow, sandy areas of the St. Clair delta in the fall. Such a movement pattern would explain the limited success we have had searching for age 0 lake sturgeon over the course of this study. The deep portions of the St. Clair River delta channels are difficult to sample with survey gear other than setlines, and age-0 sturgeon may be almost invulnerable to setline sampling because their mouths are small relative to hook size. We will continue to explore sampling locations and methods that could provide better assessment results for age 0 and age 1 lake sturgeon in the St. Clair River and Lake St. Clair.

No additional progress was made in identifying additional spawning sites in 2005.

Job 3. Title: Collect and analyze tag recovery data.—A total of 105 tag recoveries had been recorded through 2005, representing approximately 6% of 1,620 fish tagged and released over this time period (Table 3). Recapture numbers in 2005 were higher than for any previous year. Setlines have been the single largest source of tag recoveries during this study (Table 4), followed by commercial fishing and sport fishing. Overall, the tag recovery data have documented that St. Clair system lake sturgeon move into Lake Huron and Lake Erie (Table 5). Furthermore, it suggests that sturgeon spawning in the Michigan waters of the St. Clair River experience considerable fishing exploitation in the Ontario waters of southern Lake Huron. These factors should be recognized in future sturgeon management strategies.

Lake sturgeon in the St. Clair system can move back and forth between the Upper Great Lakes and Lake Erie. This potential for free immigration and emigration makes it undesirable to estimate abundance based on closed population mark-recapture techniques. Additionally, other factors such as fishing mortality, tag loss, and individual fish behavior make it challenging to use mark-recapture techniques for estimating abundance and survival rates. In 2005 and 2006, we explored the use of open population estimation techniques. For example, we used a Cormack-Jolly-Seber model based on individual fish capture histories to estimate population abundance and survival for lake sturgeon tagged in the St. Clair system. We will continue to explore the use of the most appropriate mark-recapture programs and models as they become available in the future.

Job 4. Title: Analyze data and prepare annual performance report, final report, and other reports.—A summary of all Lake St. Clair Fisheries Research Station sturgeon assessment activities was prepared for inclusion in the annual Interbasin Sturgeon Working Group Report, compiled by the US Fish and Wildlife Service, Alpena Fisheries Resource Office. Additionally, some of the data collected during this study were presented in the annual status report prepared each winter by the Lake St. Clair Fisheries Research Station for the Great Lakes Fisheries Commission's Lake Erie Committee Annual Meeting (Thomas and Haas, 2006). This report is included as an attachment to the Study Performance Report for F-81-R-7, Study 230460.

References:

- Benson, A. C., T. M. Sutton, R. F. Elloitt, and T. G. Meronek. 2005. Seasonal movement patterns and habitat preferences of Age-0 lake sturgeon in the lower Peshtigo River, Wisconsin. *Transactions of the American Fisheries Society* 1334:1400-1409.
- Thomas, M. V., and R. C. Haas. 2006. Status of the fisheries in Michigan waters of Lake Erie and Lake St. Clair, 2005. Report to the Lake Erie Committee of the Great Lakes Fisheries Commission. Michigan Department of Natural Resources, Mt. Clemens.

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Table 1—Mean length, weight, girth, and age for sturgeon collected from the St. Clair River and Lake St. Clair, from 1996 to 2005.

	St. Clair River (Setline)	Lake St. Clair (Trawl)
Total number caught	822	840
Mean length (mm)	1,188	1,215
Length range (mm)	546–1,887	244–1,849
Mean weight (kg)	13.1	13.5
Weight range (kg)	0.8–53.6	0.2–44.0
Mean age (years)	18.0	19.4
Age range (years)	3–74	1–59

Table 2.—Combined age distribution for 1,320 lake sturgeon sampled for age from the St. Clair River and Lake St. Clair in 1997 to 2004 with four gear types (trap net, setline, trawl, and gill net).

Year class	Sample year									Total catch
	1997	1998	1999	2000	2001	2002	2003	2004	2005	
2005	0	0	0	0	0	0	0	0	2	2
2004	0	0	0	0	0	0	0	0	1	1
2003	0	0	0	0	0	0	0	0	1	1
2002	0	0	0	0	0	1	0	0	2	3
2001	0	0	0	0	0	0	0	2	10	12
2000	0	0	0	1	0	2	0	11	24	37
1999	0	0	0	0	1	0	0	6	15	22
1998	0	0	1	0	0	1	0	8	3	13
1997	0	0	1	0	3	1	0	6	3	14
1996	1	1	2	0	2	8	0	7	12	33
1995	0	1	3	0	0	2	0	2	5	13
1994	2	3	7	3	10	6	2	7	4	44
1993	7	13	13	12	6	7	1	13	15	87
1992	5	3	1	4	2	1	0	6	4	26
1991	11	7	6	9	5	2	1	7	4	50
1990	10	6	4	3	3	3	1	7	3	40
1989	7	12	4	8	7	8	6	5	4	60
1988	10	6	7	7	8	7	1	9	5	60
1987	5	7	1	6	8	1	0	5	4	37
1986	7	4	4	11	6	5	0	8	7	52
1985	12	7	10	7	13	3	0	6	6	64
1984	5	8	5	9	6	2	1	8	9	53
1983	8	3	3	11	8	2	0	7	9	50
1982	3	11	5	13	8	3	1	6	8	58
1981	1	7	3	8	3	2	0	4	6	34
1980	5	10	3	6	5	3	0	5	4	41
1979	6	8	7	13	7	6	5	5	4	60
1978	8	10	7	6	7	5	4	8	2	57
1977	7	14	7	6	9	8	1	5	3	60
1976	5	10	7	10	6	6	0	2	3	49
1975	10	7	7	8	5	4	2	4	0	47
1974	4	12	6	9	5	4	0	0	0	40
1973	6	7	6	9	5	4	1	3	5	46
1972	2	7	5	2	4	2	0	2	2	26

Table 2.—Continued.

Year class	Sample year									Total catch
	1997	1998	1999	2000	2001	2002	2003	2004	2005	
1971	3	2	3	1	5	2	0	0	3	18
1970	1	7	10	3	2	2	2	2	1	30
1969	1	10	1	6	1	4	0	0	2	25
1968	5	5	4	4	3	1	2	2	3	29
1967	3	10	1	8	3	0	1	1	2	28
1966	5	3	3	2	2	1	0	1	1	18
1965	2	4	4	2	3	0	0	0	1	16
1964	2	3	1	6	0	1	0	1	1	14
1963	1	5	1	1	2	0	0	0	1	11
1962	0	0	0	0	2	0	0	0	0	1
1961	1	0	2	1	2	1	0	0	1	8
1960	0	1	0	1	1	0	0	0	0	3
1959	0	0	0	2	0	0	0	0	1	3
1958	0	0	0	2	0	0	1	0	0	3
1957	0	1	1	0	0	1	0	0	0	3
1956	0	1	0	0	0	0	0	0	0	1
1955	1	1	0	2	0	0	0	0	0	4
1954	0	1	0	0	0	0	0	0	1	2
1953	0	0	1	0	0	0	0	0	0	1
1952	0	0	0	0	0	0	0	0	1	1
1951	0	0	0	1	0	0	0	0	0	1
1950	0	0	0	0	0	1	0	0	0	1
1946	0	0	0	1	0	0	0	0	0	1
1945	0	1	0	0	0	0	0	0	0	1
1941	0	0	0	1	0	0	0	0	0	1
1937	0	0	1	0	0	0	0	0	0	1
1926	0	0	0	1	0	0	0	0	0	1
Total	171	238	168	223	176	122	32	180	208	1,518

Table 3.—Tag recovery matrix for lake sturgeon tagged with monel tags and released in Lake St. Clair and the St. Clair River. Includes initial capture and recapture by all gear types.

Tag year	Total tagged	Year of tag recovery										Total recoveries	Percent recovered
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005		
1996	81	1	—	—	—	—	—	—	—	—	—	1	1
1997	182	—	3	5	2	—	—	—	—	—	—	10	5
1998	242	—	—	3	5	3	2	1	1	1	—	16	7
1999	169	—	—	—	0	4	5	4	1	3	—	17	10
2000	222	—	—	—	—	3	5	4	—	4	2	18	8
2001	176	—	—	—	—	—	2	4	—	5	2	13	7
2002	124	—	—	—	—	—	—	2	—	5	1	8	6
2003	34	—	—	—	—	—	—	—	2	—	—	2	6
2004	181	—	—	—	—	—	—	—	—	1	13	14	8
2005	209	—	—	—	—	—	—	—	—	—	5	5	2
Total	1,620	1	3	8	7	10	14	15	4	19	23	105	6

Table 4.—Number of lake sturgeon tagged and released by gear type, and mode of recapture for tag recoveries from 1996 to 2005, including seven fish with multiple recoveries.

Tagging gear	Number tagged	Mode of recapture							Total
		Setline	Trap net	Trawl	Gill net	Sport fishing	Commercial fishing	Found dead	
Setline	748	52	0	2	1	17	10	1	83
Trap net	25	0	1	1	0	0	0	0	2
Trawl	826	0	0	4	0	2	10	2	18
Sport fishing	6	0	0	0	0	0	0	1	1
Gill net	10	0	0	1	0	0	0	0	1
Trammel net	5	0	0	0	0	0	0	0	0
Total	1,620	52	1	8	1	19	20	4	105

Table 5.—Number of tagged sturgeon recovered by water body and subsequent recapture locations for tag recovery reports from 1996 to 2005, including seven fish with multiple recoveries, with percentage recovered in parentheses.

Tag location	Number tagged	Number and percent recovered by location									
		Lake Erie		Lake St. Clair		St. Clair River		Lake Huron		All waters	
Lake St. Clair	861	0	(0.0)	7	(0.8)	3	(0.3)	10	(1.2)	20	(2.3)
St. Clair River	759	1	(0.1)	5	(0.7)	69	(9.1)	10	(1.3)	85	(11.2)
Total	1,620	1	(0.1)	12	(0.7)	72	(4.4)	20	(1.2)	105	(6.5)