



Status of the Fisheries in Michigan Waters of Lake Erie and Lake St. Clair, 2020

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Crew members of the Lake St. Clair Fisheries Research Station hold up a nice Lake Sturgeon sampled during Sturgeon Trawls conducted in August 2020 on Lake St. Clair

Lake St. Clair Fisheries Research Station

Website: http://www.michigan.gov/dnr/0,4570,7-350-79136_79236_80537_80704---,00.html

“Highlights” for 2020

Like much of the rest of the world, our work in 2020 was heavily impacted by the effects of the COVID-19 pandemic and the necessary restrictions on work and gatherings that followed. As a result, many of our standard surveys were not completed. Therefore, rather than briefly touch on the few surveys we were able to complete in 2020, we have decided to highlight some of our recent and upcoming work in this edition of our annual station report. Next year, we will hopefully be able to provide a more “normal” report that details many of the long-term monitoring work typically conducted by our station. In the meantime, we hope that you enjoy this summary of some of our staff’s recent publications as well as previews of new and ongoing work occurring at the Lake St. Clair Fisheries Research Station.

New Research Publication: Trends and Effects of a Recreational Lake Sturgeon Fishery in the St. Clair System

Lake Sturgeon population levels are a fraction of their historical levels across their range, but much work is being done to restore them. Restoration plans for Lake Sturgeon often cite a desire to eventually create a recreational fishery for Lake Sturgeon. Given this interest, it is important for managers to know what kind of angler participation to expect, harvest rates, and the effects of catch and release on Lake Sturgeon. However, since there are few places where Lake Sturgeon angling is permitted little work has been done to evaluate these metrics for recreational Lake Sturgeon fisheries.

Since the St. Clair system has had a recreational fishery for Lake Sturgeon since 1950 and has been monitored in some way since 1996, we evaluated the trends and effects of the recreational Lake Sturgeon fishery in the St. Clair system as a case study for those seeking to establish a similar fishery in other bodies of water. In the St. Clair system, Lake Sturgeon fishing is allowed from July 16 to March 15 with harvest of Lake Sturgeon between 42 and 50 inches being allowed from July 16 to September 30 (only catch-and-release permitted after that). Several data sources were used to evaluate the Lake Sturgeon fishery in the St. Clair system, including an angler diary program, Lake Sturgeon harvest database, Michigan DNR “Master Angler” database, Lake Sturgeon recapture database, and Lake Sturgeon tagging database.

Lake Sturgeon anglers in the St. Clair system are mostly male (89%) and most reside in the three counties nearest to the system (72%). However, anglers do come from all over the state of Michigan and several other states and the province of Ontario to participate in the fishery and more anglers seem to be coming from outside the three nearest counties in recent years. Estimates of angler abundance, angler recaptures of tagged Lake Sturgeon, harvested Lake Sturgeon registered, and reported Master Angler Lake Sturgeon all have had an increasing trend in recent years, suggesting that



participation in the fishery has been increasing. Despite this increase, there has not been a detectable population-level effect on the Lake Sturgeon population in the St. Clair system as apparent survival estimates for Lake Sturgeon have been constant. This is largely due to the low harvest rates, most anglers practicing catch and release, and low hooking mortality.

Managers of other systems deciding whether to implement a similar recreational fishery for Lake Sturgeon will need to evaluate their sturgeon population(s) and angler attitudes toward a sturgeon fishery. Although anglers predominantly practice catch and release in the St. Clair system, anglers in other systems may have a greater interest in harvest. We believe that the opportunity to fish for and regularly catch Lake Sturgeon in the St. Clair system has helped foster an engaged, conservation minded angling community.

Publication citation:

Briggs, A. S., J.-M. Hessenauer, M. V. Thomas, B. E. Utrup, and T. C. Wills. 2020. Trends and effects of a recreational Lake Sturgeon fishery in the St. Clair system. *North American Journal of Fisheries Management* 40:752-761.

For a pdf copy of the full article please contact A. Briggs: briggsa4@michigan.gov

Project Update: Evaluation of Northern Madtom in the St. Clair River



The Northern Madtom is a small secretive catfish that is listed as a state endangered species in Michigan (Image #1). There are four other species of madtom catfishes found in the state – Stonecat, Brindled, Tadpole, Margined. They are most common in medium to large rivers and require clean water and healthy aquatic invertebrate populations, and thus are important indicators of habitat and water quality. In Michigan, Northern Madtoms are found only in the St. Clair, Detroit, and Huron Rivers.

Our station has been setting baited minnow traps to monitor the St. Clair River population since 2010. Early efforts only saw an average of 10 madtoms being caught per year. In 2016, we saw an enormous increase in our catch to 299 fish! The catch has trended down since then and has returned to more historic levels (Figure 1). Our catch data suggests a natural population increase and subsequent natural mortality. We tagged 280 fish during 2016 and 2017 and only recovered two marked fish thereafter, indicating a large population and confirming that we were not catching the same individuals repeatedly.

In 2020, we collected a small sample of Northern Madtoms for detailed lab work. Our diet analysis indicated they are primarily feeding on *Hydropsychid* caddis flies and



mayfly larvae during June. We confirmed dorsal spines were acceptable for age estimation by comparing them with otoliths. Madtoms, in general, are not long-lived fish and our findings showed most of our catch was comprised of individuals 3-5 years old. The fecundity (total number of eggs a female produces) counts from the females we evaluated ranged from 125-288, and the average was 177. These counts are much higher than populations outside the St. Clair River, but are consistent with our expectations with the average size of our fish being greater as well.

It appears the St. Clair River is providing a suitable habitat for the madtoms living here. They are growing quickly to large sizes – often greater than published maximum sizes in field guides. Ongoing habitat work such as shoreline restoration and artificial reef installations should continue to improve conditions for madtoms and other fish species.



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Image 1 – A Northern Madtom from the St. Clair River

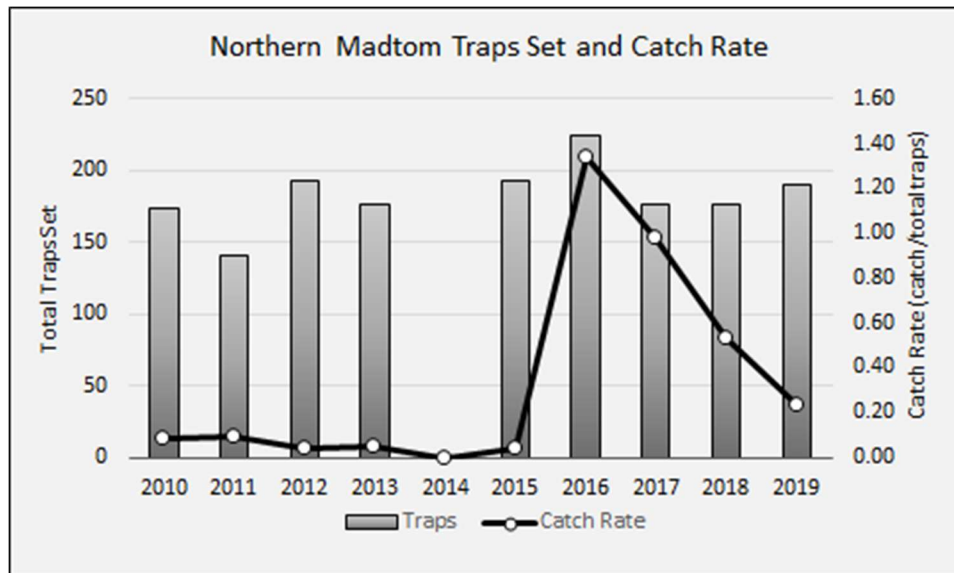


Figure 1 - Trapping effort and catch rates for Northern Madtoms from the North Channel of the St. Clair River

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Project Update: Diet Study of Lake St. Clair Yellow Perch

Yellow Perch are an important sportfish in the Great Lakes region and provide substantial economic benefit through sport fishing. Yellow Perch are also an important part of the food web. Yellow Perch feed on zooplankton, benthic invertebrates, and smaller fish. They are also important prey items to larger fish, such as Walleye and Northern Pike. Over the past decade, growth of Yellow Perch in Lake St. Clair has been decreasing, but similar trends have not been observed in Yellow Perch from nearby Great Lakes waters (Lake Erie and Saginaw Bay, Lake Huron) Suggesting that something unique is occurring in Lake St. Clair. A change in diet or food availability may provide one possible explanation for the decline in growth observed in Lake St. Clair.

To explore Yellow Perch diets among Lake St. Clair, Lake Erie, and Saginaw Bay Yellow Perch samples were collected across twelve sampling sites representing all three waterbodies. The samples were collected using bottom trawls, electrofishing, trap nets and gill nets from April 2019 to October 2019. Previous research on Yellow Perch diets in Lake St. Clair from the early 1990's was used for a historical comparison providing insight into how Yellow Perch diet may have changed in Lake St. Clair. Our goal was to characterize how Yellow Perch diets had changed over time within Lake St. Clair and compare differences in Yellow Perch diet in Lake St. Clair with other Great Lakes populations to explore whether diet may explain the changes in growth. In the lab, Yellow Perch were measured and weighed, otoliths were extracted for age



estimation and stomach contents removed for identification. Yellow Perch diets were measured using proportion by number and proportion by total diet weight.

Yellow Perch diets in Lake St. Clair during 2019 were primarily comprised of Mayflies, which was similar to Lake Erie. Yellow Perch collected in Saginaw Bay had primarily Amphipods in their diets, which was like historical diet data from Lake St. Clair. Yellow Perch collected in Lake St. Clair during 2019 had fewer prey items, relative to fish captured in Lake St. Clair during the 1990's and the other Great Lakes populations in 2019. Using models, we compared the actual weights of Yellow Perch caught in 2019 to what we would expect the weights to be if food consumption by Yellow Perch was the same as it was in 1993. We found that the actual weights of Yellow Perch were lower than what was expected, suggesting that current food consumption by Yellow Perch is not supporting the same level of growth that there was in 1993. These findings indicate that a diet shift from Amphipods to Mayflies has occurred in Yellow Perch within Lake St. Clair, and that fish captured in 2019 generally had fewer prey in their stomachs compared with both historic samples within Lake St. Clair and among other Great Lakes Yellow Perch populations. Ongoing work is attempting to explore whether these changes in diet alone are sufficient to explain the changes in growth observed in Lake St. Clair.

Questions: Contact A. Briggs briggsa4@michigan.gov

New Research Publication: Seasonal Movements of Muskellunge in the St. Clair – Detroit River System: Implications for Multi-Jurisdictional Fisheries Management

The St. Clair-Detroit River system contains world-class Muskellunge fisheries, providing an abundance of angling opportunities. Despite this, substantial management uncertainty exists regarding Muskellunge population boundaries, abundance, and behavior because these fish are poorly sampled by existing monitoring programs. Therefore, trends in abundance and population status are difficult to reliably obtain at a system wide scale. Acoustic telemetry provides a new and exciting way to address these problems using state of the art technology. Acoustic telemetry involves surgically implanting tags that emit a unique coded-ping into each fish which can be detected by stationary listening receivers that are distributed throughout the Great Lakes.

In 2016 staff from the Lake St. Clair Fisheries Research Station initiated an acoustic telemetry study of Muskellunge throughout the St. Clair – Detroit River System (SCDRS) in collaboration with the Ohio DNR, the Ontario Ministry of Natural Resources and Forestry, and the United States Geological Survey. We analyzed over 1.1 million individual detections from 133 Muskellunge tagged in the Detroit River, near the Thames River, Lake St. Clair, near the Belle River, Lake St. Clair, and in Anchor Bay, Lake St. Clair. Analysis focused on 58 fish representing all tagging locations that were at large for at least 90 days at the time of analysis. The 58 fish extensively tracked averaged daily movement rates of 0.5 miles, with movements highest during the fall, roughly equal



during the spring and summer, and the least movement during the winter. Interestingly, fish frequently returned to their tagging location in subsequent years. While Muskellunge are known to home to spawning areas, even fish tagged in the Fall (primarily from the Belle and Thames Rivers) returned to those areas in subsequent falls. We speculate that behavior is related to remembering forage opportunities that exist near those rivers each year. Another interesting anecdote was that few fish traveled from Lake St. Clair up into the St. Clair River. A handful of fish were detected in the St. Clair River, but the general lack of detections in the St. Clair River indicates that fish in Lake St. Clair and the Detroit River infrequently utilize the St. Clair River. This is particularly, interesting given that a robust Muskellunge population is known to exist in the St. Clair River. Therefore the St. Clair River fish may represent a separate “population” of Muskellunge. Finally, several fish made broadscale movements on a scale that was previously unknown. For example, one fish nicknames “James” because of his tag number #007 moved from his tagging location to the eastern basin of Lake Erie before returning to the Detroit River. This movement was easily, the longest tracked movement of a Muskellunge, and incredibly, was repeated by this fish again in subsequent years. While this fish is somewhat of an outlier, its movement rates were not substantially outside of the range of movements observed in other fish during the study.

This work has several important implications. We found that fish tagged in the SCDRS frequently utilized Lake Erie, but infrequently utilized the St. Clair River. Fish frequently traveled among waterbodies and crossed jurisdictional boundaries often, suggesting that coordination amongst management agencies would be beneficial when considering management regimes. Finally, fish in the system showed considerable repeatability in movements, frequently returning to areas where they were tagged regardless of the season in which they were tagged.

Publication citation:

Hessenauer, J.-M., C. Harris, S. Marklevitz, M.D. Faust, M.W. Thorn, B. Utrup, and D. Hondorp. 2021. Seasonal movements of muskellunge in the St. Clair-Detroit River System: implications for multi-jurisdictional fisheries management. *Journal of Great Lakes Research* 47(2): 475-485.

For a pdf copy of the full article please contact J.-M. Hessenauer

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On the horizon: Expansion of Lake St. Clair Acoustic Receiver Array

Lake St. Clair is a critical movement corridor for numerous migratory fishes including Lake Sturgeon and Walleyes. Additionally, Lake St. Clair has been the site of several other acoustic telemetry studies including the Muskie study detailed above. Now thanks to an equipment loan from the Great Lakes Acoustic Telemetry Observation System (GLATOS, <https://glatos.glos.us/>) the Lake St. Clair acoustic receiver array will be expanded from about 12 total receivers now, to over 40 receivers in 2021-2022. These receivers will



allow researchers to examine fish movements within and through Lake St. Clair in higher resolution than previously available. Likewise, this infrastructure will provide the backbone needed to expand the use of telemetry to other species within Lake St. Clair. For example, staff from the Lake St. Clair Fisheries Research Station will be implanting acoustic tags in about 40 Smallmouth Bass captured in 2021. These fish will provide high resolution movement data to contrast with jaw tagging efforts that have been ongoing since 2002, yielding insight into Smallmouth Bass habitat use and movements within Lake St. Clair. Additionally, the Lake St. Clair Fisheries Research Station staff will be implanting Yellow Perch with acoustic tags in 2022 to monitor movement, mortality, and predation rates within Lake St. Clair. Ultimately the equipment loan provided by GLATOS will increase our knowledge of fish habitat use and movement within Lake St. Clair, benefiting new and existing telemetry projects with the goal of improving the understanding and management of Lake St. Clair's world class fisheries.

Questions: Contact J.-M. Hessenauer hessenauerj1@michigan.gov

Project Update: Lake St. Clair Angler Diary Program

The Angler Diary Program began as a collaborative project between Michigan and Ontario to monitor catch and effort of muskie on Lake St. Clair with volunteer anglers in the 1990's. Eventually the program grew to encompass all Great Lakes waters of southeast Michigan and all fish species. Participating anglers keep a log of every trip they take in a season. They record the time spent on the water, number of anglers in the boat, general area fished, and all fish caught. At the end of the year the diary is submitted to our station and the data is entered into a database. After analysis, the diary book and a personalized summary is sent back to the anglers.

Angling data from 2020 showed an 18% increase in the number of trips taken and time spent on the water compared to the previous year. Previously to 2020, angler effort by those in the program had been declining (Figure 2). This follows patterns observed statewide in people spending more time recreating outside due to the Covid-19 pandemic.

Muskie catch rates were some of the lowest we have ever recorded in the program. We attribute this to the closure of the Ontario border and angler diary participants being limited to the less productive waters of the lake during the summer season.

We saw a large increase in catch and effort of Yellow Perch on Lake St. Clair. A total of 125 trips totaling 570 hours were spent chasing perch on the lake. Those anglers caught 3,261 fish and harvested 1,174 of them. It was interesting to note that most of these additional trips were taken outside the traditional fall season when anglers target Yellow Perch.



With booming populations of Walleye in the system, anglers took advantage of this fishery in 2020. Catch rates are still showing slight declines each year from the record high in 2017 (Figure 3). Detroit River anglers were affected by the statewide boating ban during the prime time of the spring spawning run. The St. Clair River was less affected as the run peaked later into the season due to the cooler water temperatures.

Questions? Interested in participating? Contact B. Utrup - utrupb@michigan.gov

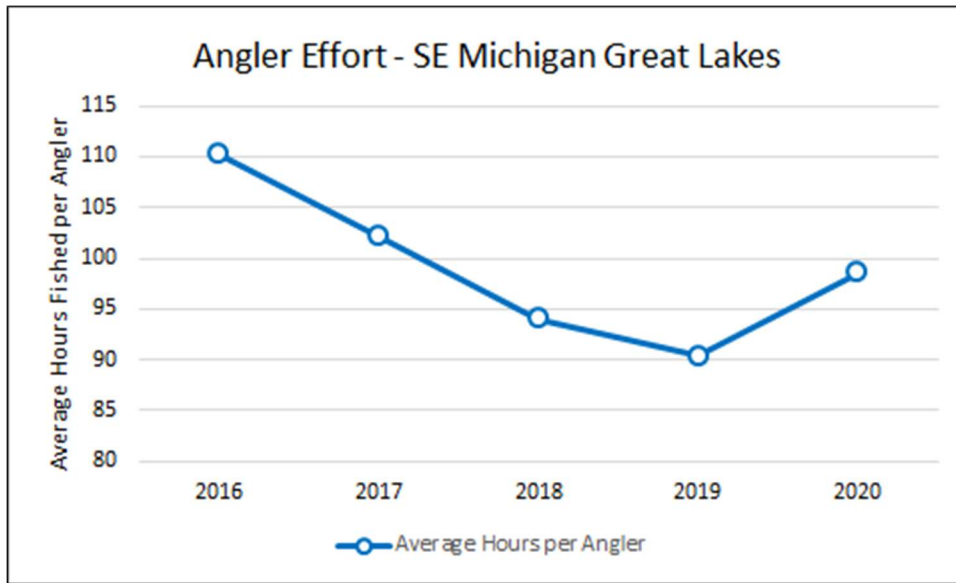


Figure 2 - Angler effort for diary participants for the past five years from the Great Lakes waters of southeast Michigan.

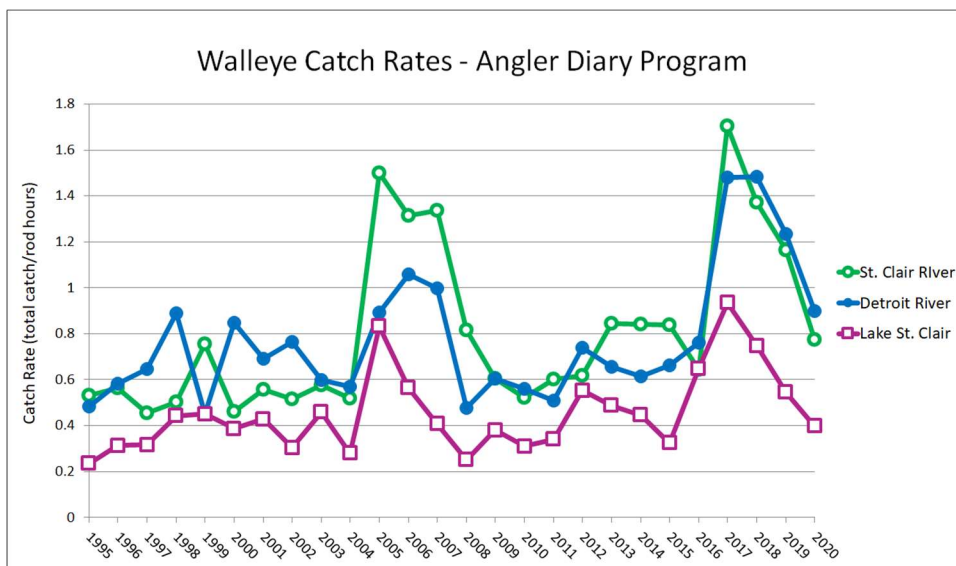


Figure 3 - Catch rates for Walleye from the St. Clair River, Detroit River, and Lake St. Clair from the Angler Diary participants.



Project Update: Monitoring of Lake Sturgeon Fishing Effort

Targeted Lake Sturgeon fishing effort does not typically show up in traditional creel surveys. Therefore, other methods are used to gauge angler effort for Lake Sturgeon. These have included tracking trends in Lake Sturgeon registered as harvested (mandatory harvest reporting has been in place since 1999), recapture rate of tagged Lake Sturgeon by anglers (Lake Sturgeon tagging has taken place since 1996), and reports of Master Angler Lake Sturgeon (minimum length for Master Angler Lake Sturgeon is 50 inches). Additionally, since 2019 we have received data from charter fishing operations that target Lake Sturgeon.

Trends in harvested Lake Sturgeon registered, angler recapture rates of tagged Lake Sturgeon, and reports of Master Angler Lake Sturgeon have all been increasing since monitoring began, particularly in recent years. Harvested Lake Sturgeon increased from nine in 2019 to 11 in 2020 (Figure 4). This is above average since 1999 (average = 6.5) and about average for the last 8 years (average = 11.6). Angler recapture rate (as number of recaptures per 100 externally tagged Lake Sturgeon) in 2020 was 1.5, down slightly from 2019 (1.6). However, 2019 and 2020 represent the two highest recapture rates since tagging began (Figure 5). Master Angler numbers are not yet available for 2020, but 2018 and 2019 had the two highest reports of Master Angler Lake Sturgeon (Figure 6).

Lake Sturgeon charter fishing effort in the St. Clair – Detroit River System was up in 2020 compared to 2019. In 2020 there were 120 charter fishing trips targeting Lake Sturgeon (80 in 2019). A total of 320 anglers were on these trips (194 in 2019) and they fished for 1857 angler hours (1158 in 2019). Although fishing effort was up, Lake Sturgeon catch rate during charter fishing trips was down slightly compared to 2019. In 2020 2.4 Lake Sturgeon were caught per charter fishing trip (2.9 in 2019) with 0.16 Lake Sturgeon caught per angler hour (0.20 in 2019).



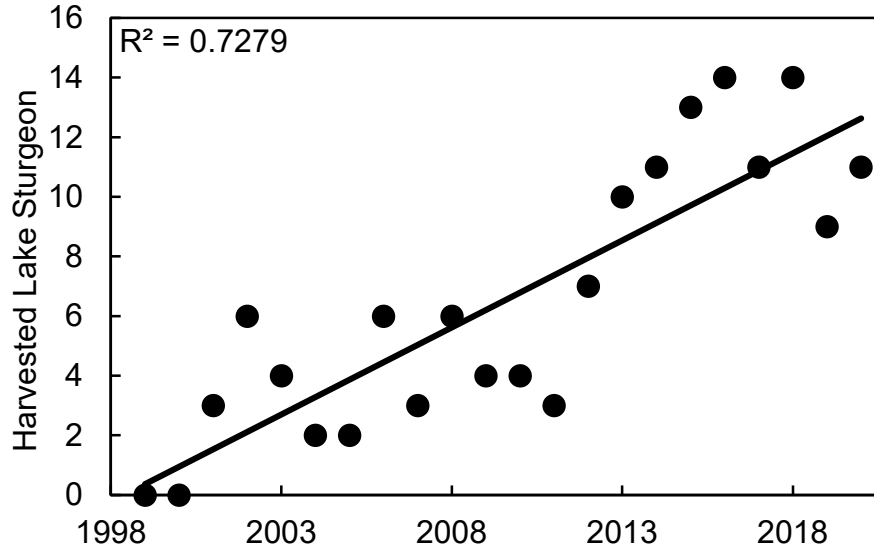


Figure 4 - Number of Lake Sturgeon registered as harvested from the St. Clair system by year. Solid black line indicates a significant trend.

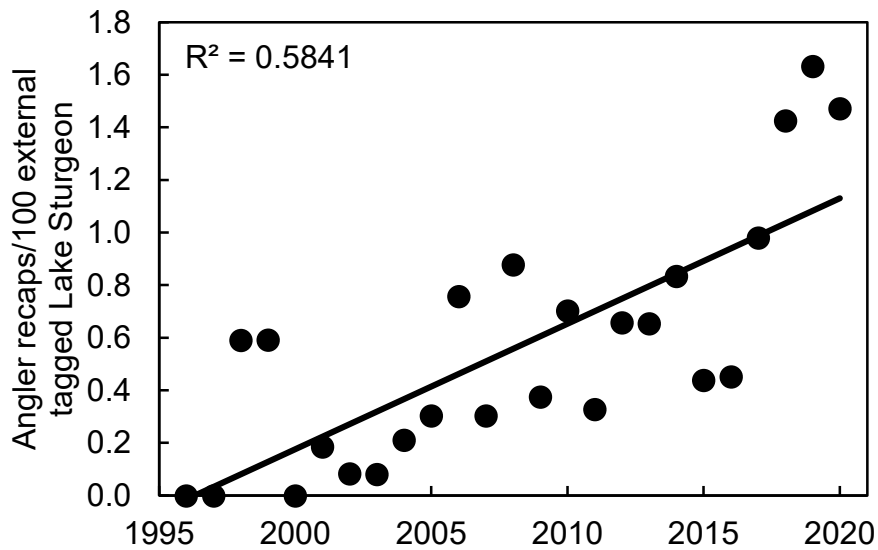


Figure 5 - Reported recaptures of Michigan DNR-tagged Lake Sturgeon in the St. Clair-Detroit River System by year corrected for number of tagged Lake Sturgeon available to catch (number of recaptures per 100 external tagged Lake Sturgeon). Solid black line indicates a significant trend.



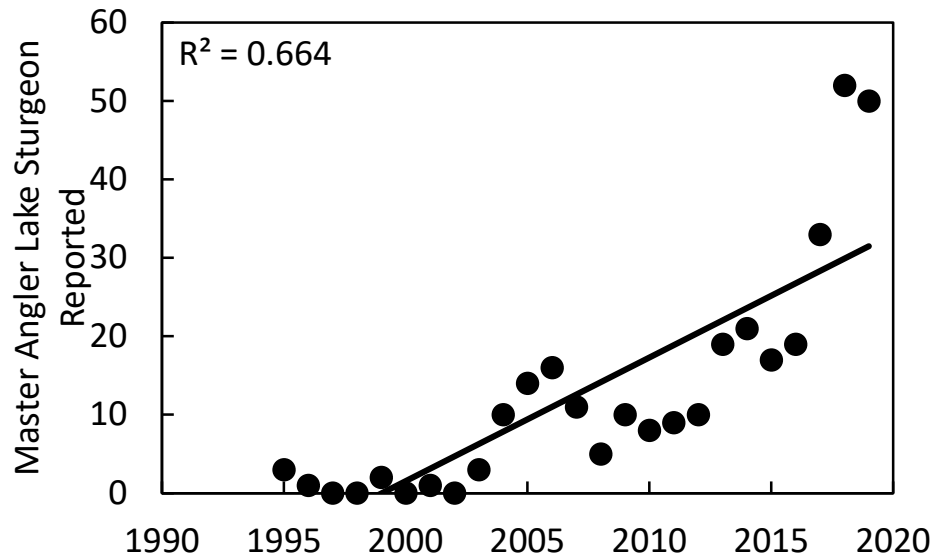


Figure 6. Master angler Lake Sturgeon (minimum entry length is 50 inches) reported by year for the St. Clair-Detroit River System. Solid black line indicates a significant trend.

Questions? Contact A. Briggs briggsa4@michigan.gov

Project update: Reef habitat assessments

The St. Clair and Detroit rivers historically supported a diverse and productive fishery supported by excellent spawning habitat. Species such as Lake Sturgeon, Walleye, and Lake Whitefish took advantage of the fast-flowing currents, natural limestone reefs, and rocky substrates in the rivers for depositing their eggs. However, beginning in the late 1800s much of this habitat was destroyed or modified due to dredging, including the construction of shipping channels, and sedimentation. The effects of this habitat loss are still felt today and have sparked restoration efforts in both rivers to improve habitat and help strengthen native fish communities throughout southeast Michigan's Great Lakes.

A diverse team of partners from state, federal, and provincial governments, private entities, not-for-profit organizations, and academic institutions has been working to improve habitat in the St. Clair and Detroit rivers and collectively evaluate the success of that effort. The construction of limestone cobble reefs in both systems, which began in 2004, has been a major component of habitat restoration efforts in the region. The design and strategic placement of the reefs incorporate adaptive learning and are based on fish biology and population studies, models of river processes and dynamics, and lessons learned from other projects. The St. Clair and Detroit river reef construction projects mimic the spawning habitat that was historically present in the rivers and provide a place for Lake Sturgeon, Walleye, and other native fish to lay their eggs, where they and newly hatched fry will be protected from sediment, strong currents, and predators. Research teams from the project partnership monitor habitat conditions and



fish activity at the reefs to gage their success. To date, construction is complete and assessment ongoing at three reef projects in the St. Clair River and five reef projects in the Detroit River.

While over a dozen native fish species have been documented using the reefs, the focus of the Michigan Department of Natural Resources' assessment efforts has been documentation of reef maturation, or changes in physical habitat conditions at the project sites. This work, which was recently published with co-authors at the University of Toledo and the U.S. Geological Survey, has shown that reefs placed with consideration of river processes including flow patterns and sediment transport have remained functional for a longer time than reefs that did not consider such characteristics. However, sediment accumulation was observed at all reefs, and each reef showed a variable and unique maturation trajectory. While this caused the amount of coarse substrate preferred by spawning fish to decrease with reef age, fish spawning still occurred throughout the project as indicated by continued collection of eggs from the reefs. Data collection is ongoing, and this long-term assessment continues to inform other reef construction projects throughout the Great Lakes.

For additional information on this, and other habitat restoration projects in the St. Clair-Detroit River System, please visit <https://www.michiganseagrant.org/topics/restoration/>.

