DEPARTMENT OF NATURAL RESOURCES

Status of the Fisheries in Michigan Waters of Lake Erie and Lake St. Clair, 2019

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Photo collage of Lake St. Clair Muskellunge acoustic tagging efforts, Anchor Bay, May 2019

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Lake St. Clair Fisheries Research Station
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FISHERIES DIVISION

Highlights for 2019

The purpose of this report is to provide an update on the status of the fisheries in the Great Lakes and connecting waters of Southeast Michigan. Sources of information used in compiling this report include creel surveys, charter boat reports, an angler diary program, the Michigan Department of Natural Resources (MDNR) Master Angler program, commercial fishery records, and fisheries survey results. Some of the highlights described in detail include:

- Recreational anglers spent over 583,000-hours fishing the Michigan waters of Lake Erie and Lake St. Clair in 2019, taking 112,000 total trips
- The 2019 Lake Erie Walleye year class as assessed by the August trawl survey was the largest in our survey time series, which started in 2014
- Lake Erie Walleye harvest by non-charter anglers was the second highest on record since 2006, following the 12-year record high in 2018
- The 2019 Yellow Perch fishery in Lake Erie was challenging, with very low harvest rates in both the non-charter recreational boat fishery and the charter fishery
- Nearly 1 in 10 Smallmouth Bass captured on Lake St. Clair during fishery surveys was over 20 inches in total length, while 2/3 of fish were over 17 inches in total length
- A total of 18 Muskellunge were tagged with acoustic tags in Anchor Bay of Lake St. Clair; angler partners assisted in collecting 16 of these fish for tagging
- Station personnel handled 147 Lake Sturgeon from the St. Clair River and Lake St. Clair; these fish averaged nearly 50 inches in total length

About the Lake St. Clair Fisheries Research Station

The Lake St. Clair Fisheries Research Station is a unit of the Research Section of the MDNR Fisheries Division. The station conducts research and stock assessment on fish populations of Lake Erie, the St. Clair-Detroit River System (St. Clair River, Lake St. Clair and the Detroit River), and Saginaw Bay. Results of this work are instrumental in fisheries management decisions affecting these waters. The station works closely with MDNR fisheries managers and routinely collaborates in joint projects with other state and federal partner agencies, local units of government, non-government organizations, academic institutions, and stakeholder groups. Federal Aid in Sport Fish Restoration (SFR) Act dollars provide support for the majority of the station's assessment activities. The SFR Program provides grant funds to restore and better manage America's fishery resources through excise taxes on the purchase of fishing equipment, motorboat and small engine fuels, import duties, and interest. More information on the SFR Program can be found at: http://wsfrprograms.fws.gov/Subpages/GrantPrograms/SFR/SFR.htm.

Methods Summary

The Lake St. Clair Fisheries Research Station collects data on the status of fisheries in Michigan waters of Lake Erie and Lake St. Clair through a variety of methods. Information on angler catch rates, effort, and opinion of Michigan's sport fisheries is collected with angler surveys. An angler survey can be conducted on-site where anglers are interviewed or counted while on the water, or off-site when anglers are interviewed by mail or telephone. On-site methods, also known as creel surveys, have been used extensively by the MDNR on various Michigan waters to estimate angler effort, harvest, and catch. For some types of fish, such as Yellow Perch and Walleye in Lake Erie, angler effort and harvest are recorded separately by species. This is referred to as targeted effort or targeted harvest throughout the report, and it allows Fisheries Division to assess how much effort and harvest is invested by anglers who are specifically seeking these two species. In Southeast Michigan, on-site creel survey data are collected each year from the non-charter recreational fishery of Lake Erie. An on-site creel survey was also conducted on Lake St. Clair during 2019. Charter boat harvest, release, and angling effort are also recorded by Lake Erie and St. Clair-Detroit River System charter operators, who are required to report this information to the MDNR on a monthly basis for their activities in the

American waters of these systems. In 2019 some charter captains began voluntarily reporting their catches in the Canadian waters of the St. Clair-Detroit River system. Reports from Canadian waters represented roughly 15% of the total trips reported from Lake St. Clair and 19% of the total hours fished. Catch rates for key species targeted including Smallmouth Bass and Muskellunge were similar among trips reported in Michigan and Canadian waters. However, in order to retain consistency with past years we only report data submitted from the American waters of the system in this document. Nevertheless, we thank captains providing their catch data regardless of what jurisdiction that they fished, as this provides a much more complete picture of the status of the fishery.

A voluntary Sport Fishery Diary Program is 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 and Forestry (OMNRF) 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 MDNR became involved in the program in 1993. From 1993-2018, the program was a cooperative effort between the OMNRF and MDNR to provide annual estimates of catch rates for the major sport fish species in Lake St. Clair. Starting in 2019 the OMNRF ended their participation, but the MDNR plans to continue the program. The MDNR Master Angler program, established in 1973 to recognize anglers who catch unusually large fish, also provides information on trends in voluntary reports of "trophy" catches throughout the Great Lakes waters of Southeast Michigan.

The MDNR conducts several annual assessments using a variety of gear types to target the diverse fish communities present in Lake Erie and the St. Clair-Detroit River System. Since 1978, the Lake St. Clair Fisheries Research Station has fished variable mesh multi-filament gill nets at two fixed (index) locations in western Lake Erie each fall, as part of the interagency Walleye assessment program. We conduct a bottom trawl survey in Lake Erie each August to measure recruitment of important fish species, and forage abundance. Trap nets have been deployed in Anchor Bay of Lake St. Clair each spring since 2002 to sample adult fish populations, while juvenile and forage fish populations in Lake St. Clair have been assessed with bottom trawls each spring and fall since 1996. In 2016 a nearshore electrofishing survey was added to better characterize fish communities in the nearshore areas of Lake St. Clair where larger vessels cannot operate. A setline survey has been used to monitor the Lake Sturgeon population in the North Channel of the St. Clair River each June since 1997; beginning in 2013 the MDNR modified its bottom trawl to increase its success in capturing Lake Sturgeon in Lake St. Clair.

Lake Erie

Sport Fishery Summary

The annual creel survey conducted by the MDNR during 2019 produced an effort estimate of 334,026 angler hours and a total harvest estimate of 208,164 fish (Table 1) for Michigan's Lake Erie non-charter recreational boat fishery. Angling effort and harvest both decreased (Figure 1) compared to 2018 (2018 effort: 411,581 hours, 2018 total harvest: 490,372 fish). The decrease in both angler effort and total harvest in 2019 was driven by the poor Yellow Perch fishery; targeted Yellow Perch effort (57,929 angler hours) and total harvest (48,595 fish) decreased by 58% and 84% from 2018. Total harvest was mostly comprised of Walleye (74%), followed by Yellow Perch (23%) and White Bass (1%). Channel Catfish, White Perch, Freshwater Drum, Smallmouth Bass, Rock Bass, Rainbow Trout, and Northern Pike accounted for the remaining 2% of total harvest.

In 2019, Michigan charter boat operators reported a total harvest of 21,935 fish of all species from Michigan waters of Lake Erie during 884 excursions, down substantially from 2018 (40,256 fish during 1,117 excursions). The steep decline reflected the challenging fishing conditions for Yellow Perch in Michigan waters of Lake Erie in 2019. Similar to the non-charter recreational boat fishery, Walleye comprised 87% of all fish harvested in the charter fishery.

Yellow Perch

The difficult Yellow Perch fishery in Lake Erie during 2019 is reflected not only in angler effort and total harvest, but also in the harvest rate, which provides a standardized annual measure of fishery performance. The non-charter recreational boat fishery targeted harvest rate for Yellow Perch in 2019 was 0.84 fish per angler hour, a 63% decrease from the 2018 targeted harvest rate of 2.3 fish per angler hour and the 2nd lowest harvest

rate observed in the 1986-2019 creel survey time series (Figure 2). The targeted Yellow Perch charter harvest rate was 1.63 fish per hour, a 60% decrease from 2018 (4.05 fish per hour). Similar results were observed in Ohio waters of Lake Erie's west and central basins, where angler harvest decreased from 41-93% in the west, west central, and east central basins compared to 2018. Changes in Yellow Perch abundance do not explain the poor fishery performance, as the population size of Yellow Perch was projected to decrease in a smaller proportion (1-13%) than the observed change in harvest in the west, west central, and east central basins of Lake Erie from 2018 to 2019. For more information on Yellow Perch fishery performance and abundance across Lake Erie, refer to the annual report of the Lake Erie Yellow Perch Task Group which is available on the Great Lakes Fishery Commission (GLFC) website: http://www.glfc.org/lake-erie-committee.php.

Yellow Perch harvested in the Michigan Lake Erie non-charter recreational boat fishery were primarily age- 2-4 fish from the 2015-2017 year classes, which each contributed between 23-27% of the total harvest by age. Age-5 fish from the 2014 year class accounted for 17% of the Yellow Perch harvest, with smaller contributions from age-1 (2018 year class), age-6 (2013 year class) and age-7 (2012 year class) fish (Figure 3). Average lengths of age- 3-5 Yellow Perch in 2019 were slightly lower than 2018 (Figure 4) but above long-term averages. Yellow Perch reproduction continues to be successful, as evidenced by young-of-year catch rates in the August bottom trawl survey. During 2019 we captured 611 age-0 Yellow Perch per 10-minute tow, the second highest catch rate observed since the survey began in 2014.

Walleye

While the total harvest and harvest rate of Lake Erie Walleye during the 2019 non-charter recreational boat fishery decreased compared to 2018, the fishery remained excellent. A total of 265,330 angler hours were spent harvesting 153,171 Walleye, the second-highest harvest observed since 2006 and only 13% below the 12-year high of 176,089 Walleye harvested in 2018. The targeted harvest rate of 0.58 Walleye per angler hour in 2019 was the fifth highest in the 1975-2019 time series (Figure 2). The harvest rates of the past two years, which include the time series record of 0.67 Walleye per angler hour in 2018, have not been observed since the early 1980s and are well above the long-term average of 0.37 Walleye per angler hour for Michigan waters, and 0.43 Walleye per hour for the western and central basins of Lake Erie. Walleye fishing in the Lake Erie charter fishery was also strong; the 2019 charter targeted harvest rate was 1.23 fish per hour, similar to last year (1.22 fish per hour).

The decrease in Walleye catch-per-unit-effort (CPUE) during the 2019 gill net survey (Figure 5) was due to a lower proportion of fish from the large 2015 year class being represented in the catch, an artifact of the gear's size selectivity towards younger, smaller individuals (particularly yearlings). Clearly, the 2015 year class continues to be a strong contributor to the fishery as indicated by fishery-dependent data from the creel survey, which showed that age-4 (2015 year class) Walleye comprised 69% of the total non-charter sport fishery harvest. While slightly lower than 2018, the 2019 gill net catch rate of yearling Walleye remained above average for the second year in a row and is the 4th highest yearling CPUE observed since 2004 (Figure 6), when the very strong 2003 year class was sampled as age-1 fish. Age-0 Walleye catch rates from the 2019 trawl survey (32 fish per 10-minute tow, the highest in the 6-year bottom trawl survey time series), in combination with yearling Walleye catch rates from the gill net survey, show continued strong Walleye reproduction in Lake Erie's western basin during recent years. Pending good overwinter survival, the 2018 and 2019 year classes should be strong contributors to the Lake Erie Walleye fishery in the future. For more information on Walleye fishery performance and abundance across Lake Erie, refer to the annual report of the Lake Erie Walleye Task Group, which is available on the GLFC website: http://www.glfc.org/lake-erie-committee.php.

Forage fish

A total of 7,282 forage fish representing 14 different species were captured during 8 trawl tows for an average CPUE of 931 fish per 10-minute tow. Young-of-year Yellow Perch had the highest average CPE (611 fish per 10-minute tow). Young-of-year White Perch (179 fish per 10-minute tow), Mimic Shiner (64 fish per 10-minute tow), young-of-year Walleye (32 fish per 10-minute tow), and Round Goby (11 fish per 10-minute tow) were also substantial contributors to the catch. Trout-perch, young-of-year White Bass, Emerald Shiner, Spottail Shiner, Freshwater Drum, Silver Chub,

Logperch, Channel Catfish, and Gizzard Shad were also captured.

The 2019 forage catch rate was equal to the median (50th percentile) CPUE observed since Michigan's modern-day bottom trawl survey began in 2014. Since this was only the sixth annual trawl survey in recent years, it is difficult to put these catch rates into a broader context for the West Basin of Lake Erie. However, Michigan's young-of-year Walleye CPE paralleled that of the decades-long Ontario and Ohio bottom trawl survey, which also indicated another large Walleye year class in 2019.

Commercial Fishery Summary

Since 1979 the commercial fishery in Michigan waters of Lake Erie has primarily harvested rough fish species using seines in the shallow embayments along the shoreline, although a small-mesh trap net license has been active since 2006. In 2019, one Michigan commercial fishing operator fished two active licenses on Lake Erie. The 2019 commercial harvest included 14 types of fish for a total of 328,194 pounds (Table 2). In combination, Channel Catfish (31%), Goldfish (13%), White Bass (12%), and Common Carp (12%) accounted for 69% of the total harvest by weight. The 2019 total harvest rebounded slightly from 2018 (307,128 total lbs).

St. Clair River – Lake St. Clair

Sport Fishery Summary

Non-charter recreational anglers spent a total of 249,300 hours fishing the Michigan waters of Lake St. Clair in 2019, down roughly 40% from 2018. A total of 40,423 fish were harvested, down 54% from 2018. Walleye accounted for just under half of all fish harvested in 2019.

For the St. Clair-Detroit River System (St. Clair River, Lake St. Clair and Detroit River), charter boat anglers reported a harvest of 28,260 fish of all species from the American waters of the system. Walleye accounted for (89%) of total charter harvest in 2019.

In 2019, charter boat captains reported a total of 2,524 excursions on the American waters of the St. Clair-Detroit River System, a 13% increase from 2018, which continues a trend of increased charter activity since 2012.

Yellow Perch and Walleye

Non-charter recreational anglers harvested a total of 18,141 Walleye and 9,906 Yellow Perch (Table 3) in 2019 from the Michigan waters of Lake St. Clair. Both values were down substantially from 2018 (Walleye ~60% decline; Yellow Perch ~41% decline) but were roughly congruent with the decline in effort observed.

Charter anglers harvested a total of 25,311 Walleye from the American waters of the St. Clair-Detroit River system, up 9% from 2018 (23,179 fish harvested). Of these, the vast majority (99%) were taken by charters targeting Walleye, and 73% of total harvest occurred in the Detroit River. The targeted charter catch rate of Walleye was 0.84 fish per hour.

There are currently no Walleye-specific survey programs taking place in the St. Clair River and Lake St. Clair. However, Walleye continued to be captured at relatively high rates (2.98 per 24-hour set) in trap nets in Anchor Bay during 2019 (Table 4), down from 2018 and 2017. Nevertheless, this catch rate is slightly above the long-term average from 2002-present (2.31 per 24-hour set). Age-0 Walleye are rarely captured during the fall trawl survey, indicating low levels of reproduction from Lake St. Clair and its tributaries.

Yellow Perch reproductive success as indexed by age-0 catch rate in the fall trawl survey decreased from 2018 and was the lowest observed since 2014 (Figure 7). However, high reproductive success doesn't necessarily lead to increased recruitment to the adult population in Lake St. Clair. For example, the 2017 age-0 Yellow Perch catch rate in the fall trawls was the second highest since 2010; however, this did not translate to higher catch rates of age-1 fish in the spring 2018 trawls (Figure 8).

Growth of Yellow Perch in Lake St. Clair continues to be below the statewide average. Average length-at-age for Yellow Perch is below the statewide average at all consistently observed ages (age-1 to age-5; Figure 9). Additionally, Yellow Perch growth is lower than it has been historically as seen by average length-at-age estimates from pervious time periods (Figure 9).

Black Bass (Smallmouth Bass and Largemouth Bass)

Non-charter recreational anglers reported capturing 108,145 Smallmouth Bass in the Michigan waters of Lake St. Clair in 2019. Of these fish, 71,397 legal-sized fish were released and 1,856 legal-sized fish were harvested. Both Smallmouth Bass release and harvest were down in comparison to 2018, but again declines were of similar magnitude to the decrease in fishing effort. A total of 58,821 Largemouth Bass were captured by anglers in the Michigan waters of Lake St. Clair in 2019. A total of 13,366 legal-sized fish were released, and 176 legal-sized fish were harvested.

Charters targeting Smallmouth Bass in the St. Clair-Detroit River System captured and released 14,539 fish in 2019, virtually unchanged from 2018 (14,600 total). Only 602 fish were harvested, resulting in a total release rate of about 96%. Targeted Smallmouth Bass catch rates were 1.42 fish per hour, down slightly from 2018 (1.46 fish per hour).

Statistics from the Master Angler program indicate that Lake St. Clair is the premier waterbody in the state for trophy Smallmouth Bass. With 20 entries in the Master Angler program in 2019, Lake St Clair represented 36% of the total Smallmouth Bass entries statewide. The next highest waterbody had 4 total entries and that was the adjoining St. Clair River. Master Angler catches of Smallmouth Bass on Lake St. Clair vary over time (Figure 10) due to a combination of biological, weather, and human-related factors. The continued strong representation of Lake St. Clair Smallmouth Bass in the statewide Master Angler program is likely a reflection of an abundance of trophy-size Smallmouth Bass in the lake, a high degree of angler effort targeting the species, and widespread practice of catch-and-release among Smallmouth Bass anglers.

A total of 343 Smallmouth Bass were captured in the spring 2019 Anchor Bay trap net survey for a catch rate of 3.82 fish per 24-hour set, which was up from last year (2.89 fish per 24-hour set), but slightly below the long term average of 4.16 fish per 24-hour set (2002-2019). Of these 343 captures, 306 individuals received jaw tags, with the remainder being too small to tag. Concurrent with our spring trap net survey, we sampled additional Smallmouth Bass by electrofishing near the “Mile Roads” area of Lake St. Clair, east of St. Clair Shores. An additional 59 Smallmouth Bass were sampled, with 58 receiving tags as part of this electrofishing effort. Therefore the total sample size for 2019 was 402 Smallmouth Bass handled, 364 of which were tagged. Valid age estimates were obtained for 389 individuals.

Analysis of age composition and annual mortality includes individuals from both trap netting and electrofishing efforts pooled together. Year-class contribution to Smallmouth Bass catch was relatively uniform; the 2010 year class was most abundant (16% of the catch), but strong contributions by the 2011, 2012, and 2015 year classes were evident as well (range 11-15% of total catch). Smallmouth Bass averaged 17.3 inches in length across the two surveys. We estimated proportional size distributions for Smallmouth Bass, which can be thought of as the percent of the adult population (considered 8 inches in total length or larger for this exercise) that is larger than a given threshold. We calculated these values for fish 14, 17, and 20 inches and greater. In 2019, 88% of adult Smallmouth Bass we caught were 14 inches or larger, 67% were 17 inches or larger, and 9% were 20 inches or larger (Figure 11). Smallmouth Bass sampled in the Anchor Bay trap net surveys had an average weight of 3.4 lbs (weights are not collected electrofishing). The annual mortality rate was estimated using catch curve analysis, which assumes that the abundance of year classes in a given sample is related to the population mortality rate. For 2019 the annual mortality rate was estimated at 39.8%, maintaining an overall flat trend since 2006 (Figure 12). This suggests no change in Smallmouth Bass mortality has occurred across the time series.

Since 2002, a total of 5,648 Smallmouth Bass captured in survey trap nets in Anchor Bay have been tagged and released. Smallmouth Bass movements appear rather localized, with nearly all the Smallmouth Bass tag recoveries reported to date coming from the Michigan waters of Lake St. Clair. The northernmost Smallmouth Bass tag recovery has been from the Port Huron area of the St. Clair River, and the southernmost recovery came from the Oak Harbor area in Ohio waters of Lake Erie. On average, recaptured Smallmouth Bass tagged during 2002-2019 traveled less than 6 mi (9.7 km) from the Anchor Bay tagging site.

In 2019, Michigan tagged a total of 306 Smallmouth Bass with non-reward jaw tags in Anchor Bay of Lake St. Clair. A total of 18 non-reward tags placed on Smallmouth Bass in 2019 were recovered by anglers for a single-season reporting rate of 5.8%.

A total of three of the 58 non-reward tags placed on Smallmouth Bass in the Mile Roads area during 2019 were recovered by anglers for a single season reporting rate of 5.1%, nearly identical to the reporting rate in Anchor Bay. Similar reporting rates suggest that, all else being equal, angling pressure for Smallmouth Bass is likely similar in Anchor Bay and along the Mile Roads area of Lake St. Clair. Like tagged Anchor bay fish, recaptured Smallmouth Bass that were jaw-tagged during 2016-2019 did not travel far, ranging an average of 5.0 mi (8.0 km) from the Mile Roads tagging site.

Recruitment of age-0 Smallmouth Bass as indexed by our August Lake St. Clair trawl survey was down slightly to 2.2 age-0 Smallmouth Bass per acre trawled (Figure 13; 2018 value: 2.3 Smallmouth Bass per acre trawled). The average size of age-0 recruits, which is a critical indicator of overwinter survival, was 2.9 inches, slightly below the long-term average (1996-2019 average age-0 Smallmouth Bass length: 3.1 inches). While monitoring of age-0 Smallmouth Bass abundance is a useful indicator of summer conditions and nesting success, strong compensatory effects are known to occur for Smallmouth Bass, such that year class strength is not necessarily correlated with high abundance of adults in the future.

Generally, few Largemouth Bass are captured during spring trap netting in Anchor Bay, and 2019 was no exception with eight individuals sampled. These eight fish ranged from 10.4 to 15.8 inches in total length, with weights ranging from 0.6 to 2.3 lbs.

During the fall nearshore electrofishing survey 254 Largemouth Bass of all sizes were captured (1.6 to 18.1 inches). Total catch rates of Largemouth Bass have varied from 17.4 fish per 10-minutes of shocking in 2016 to a low of 7.7 fish per 10-minutes of shocking in 2017. The average catch rate of Largemouth Bass was 9.8 fish per 10-minutes of shocking in 2019. The size structure of Largemouth Bass indicated many large, catchable-size individuals, and no apparent cropping at the legal harvest size. Moving forward the nearshore survey will provide a strong basis for evaluating change in size structure and recruitment of Largemouth Bass in Lake St. Clair.

Northern Pike and Muskellunge

In 2019 five Muskellunge were reported harvested from Lake St. Clair, with 4 additional fish reported harvested from the Detroit River. 2018 was the first year of mandatory harvest reporting of Muskellunge in the State of Michigan, and five Muskellunge were registered as harvested from Lake St. Clair that year. Anglers are reminded to report harvested Muskellunge within 24 hours by visiting http://www.michigan.gov/registerfish or calling 1-844-345-3474.

A total of 2,163 Muskellunge were captured by non-charter recreational anglers in the Michigan waters of Lake St. Clair in 2019. Of these, 824 legal-sized fish were estimated released. A total of 4,011 Northern Pike were estimated captured in the Michigan waters of Lake St. Clair, of which 3,024 were estimated released and 186 were estimated harvested.

Charter captains reported a total catch of 647 Muskellunge in 2019 throughout the American waters of the St. Clair – Detroit River System, with two fish harvested. Charter targeted catch rates were 0.08 fish per angler hour.

Muskellunge catch rates derived from the Sport Fishery Diary Program on Lake St. Clair improved through the late 1980's and early 1990's, but were more variable in the 2000's. In 2019, the catch rate showed a small decrease from the previous year (Figure 14). The observed Muskellunge catch rates for 2019 continues a pattern of increased variability in catch rates over the past 17 years. Efforts are in place in 2020 to increase the number of Muskie anglers in the Angler Diary program, which we hope will provide more consistency in Muskie catch rate reporting.

Lake St. Clair continued to dominate the statewide Master Angler entries for Muskellunge in 2019 with 19 of the 31 total entries (61%). Another six fish were entered from the adjoining St. Clair and Detroit rivers. This year was the first decline in entries since 2011 (Figure 15), though there has been a general decline in Muskellunge entries since the peak in 2001. We suspect this is largely a reflection of waning interest in submitting Master Angler entries for Muskellunge less than 50 inches in length, which has become a local benchmark for "trophy" status for Muskellunge from the St. Clair-Detroit River System. By all accounts, the Muskellunge population continues to provide excellent fishing opportunities.

Two Muskellunge were captured during our 2019 Anchor Bay trap net survey, continuing a trend of decreased gear effectiveness observed in Anchor Bay since 2010. We believe this decline in catch is correlated with increased water clarity, which makes trap nets easier to see and likely increases the ability of Muskellunge to avoid the gear.

In 2019 we tagged 18 Muskellunge with acoustic telemetry tags. Sixteen of these fish were captured by angler partners before being tagged by MDNR fisheries personnel. Since 2016, 48 Muskellunge have been tagged in the American waters of Lake St. Clair and the Detroit River, with an additional 92 fish tagged by our Canadian counterparts in the Ontario waters of Lake St. Clair. These acoustic telemetry tags have an expected battery life of 7+ years and can be detected by stationary listening stations located throughout the Great Lakes as part of the Great Lakes Acoustic Telemetry Observation System (GLATOS; https://glatos.glos.us/). Since 2016, more than 1.1 million detections of these tagged fish have been logged, revealing substantial movements and use of Lake St. Clair, the Detroit River, and Lake Erie.

A total of two age-0 Muskellunge were captured during our fall nearshore electrofishing survey, for a catch rate of 0.05 fish per 10-minutes of shocking. This value was down from 0.10 fish per 10-minutes of shocking in 2018. Over time this annual Muskellunge recruitment index will provide valuable information about the success of Muskellunge spawning, as well as the spatial distribution of age-0 Muskellunge within Michigan waters of Lake St. Clair.

We captured a total of 101 Northern Pike during our spring trap net survey in Anchor Bay. Valid age estimates were obtained for 98 individuals. The majority of the catch was comprised of the 2015 (37%) and 2014 (32%) year classes. Across all individuals captured the average length was 28.7 inches; total length ranged from 20.5 inches to 33.7 inches.

Lake Sturgeon

A total of 147 Lake Sturgeon were collected during assessment surveys on Lake St. Clair and the St. Clair River in 2019. Captured Lake Sturgeon averaged 49.7 inches in total length, ranging from 23.0 inches to 72.7 inches. A total of 103 Lake Sturgeon were caught in the St. Clair River during the annual setline survey in June, while 44 fish were caught with trawls in Lake St. Clair during August. The length frequency for setline and trawl-captured Lake Sturgeon in 2019 illustrates the higher proportion of large individuals in the trawl catch in the lake (Figure 16). We suspect this reflects a difference in the actual size structure of the Lake Sturgeon population present in the lake during the summer, rather than a product of differences in size bias between the two survey gear types. Survey setlines were modified in 2002 to include small hooks, providing a less biased sample of the Lake Sturgeon population in the St. Clair River. In addition to sampling Lake Sturgeon, each setline is also set with two minnow traps, one attached to each end. These traps target Northern Madtom, a small catfish species that is endangered in the State of Michigan and Province of Ontario. Each trap is baited with earthworms, which experimentation in past years has suggested as being the preferred bait. A total of 44 Northern Madtoms were sampled in 2019. Northern Madtoms have very specific habitat and water quality requirements, making them a sensitive indicator of environmental quality. The high catch rate suggests high quality habitat conditions exist in the St. Clair River at this time.

A total of 3,449 Lake Sturgeon have been tagged and released in the St. Clair River and Lake St. Clair since 1996. To date, 918 tagged Lake Sturgeon have been recaptured with survey gear or reported by fishermen. A total of 551 tagged sturgeon have been recovered with survey setlines. One was recovered in a survey trap net in Anchor Bay, one in a survey gill net, and 16 have been recaptured in assessment trawls on Lake St. Clair. Sport anglers have reported 315 recoveries, most from the North Channel of the St. Clair River. Twenty-six recoveries have been reported from the Ontario commercial trap net fishery in southern Lake Huron, approximately 70 km (43.5 mi) from the tag site. Seven recoveries have been made on Lake Sturgeon that were found dead from boat strikes or unknown causes.

Forage fish community

Recent declines of most shiner species in our spring and fall trawling continued in 2019. However, we captured 86.6 Spottail Shiners per acre trawled in our spring trawls, up from 10.9 fish per acre trawled last year and the highest catch rate observed since 2014 (but well below the long-term average). Along with Spottail Shiner, Johnny Darter (24.2 fish per acre trawled) and Round Goby (4.5 fish per acre trawled) were the most

common forage-sized fish captured during spring trawls. During our fall trawl survey Spottail Shiner (38.9 fish per acre trawled), Round Goby (7.7 fish per acre trawled), and Mimic Shiner (6.9 fish per acre trawled) were the most common forage species captured.

Brook Silversides were again the most frequently captured forage-sized fish species during our fall nearshore electrofishing survey (46.3 fish per 10-minute sample period). This value was up from 2018 (40.5 fish per 10-minute sample period) and the highest observed across the four-year time frame of the survey. Other key forage species captured included Emerald Shiner (29.8 fish per 10-minute sample period), Spottail Shiner (13.1 fish per 10-minute sample period), and Gizzard Shad (14.8 fish per 10-minute sampling period). While still new (2019 was the fourth consecutive year of effort), the nearshore electrofishing survey provides important additional insight into the lake's forage fish community, which can in time be compared to our traditional trawl surveys to provide a more complete picture of the status and trends of Lake St. Clair forage species and their potential availability to sportfish.

Commercial Fishery Summary

No state regulated commercial fishery exists in the Michigan waters of the St. Clair River or Lake St. Clair.

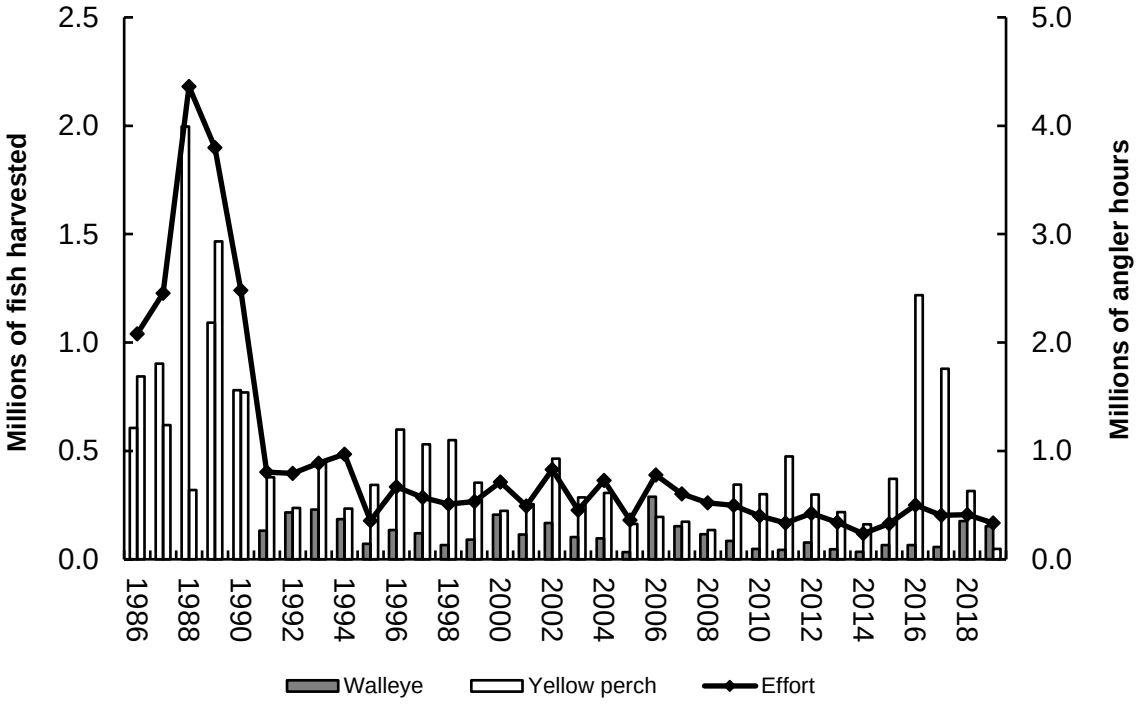

Figure 1. Estimated harvest and effort for Michigan's Lake Erie sport fishery, 1986-2019.

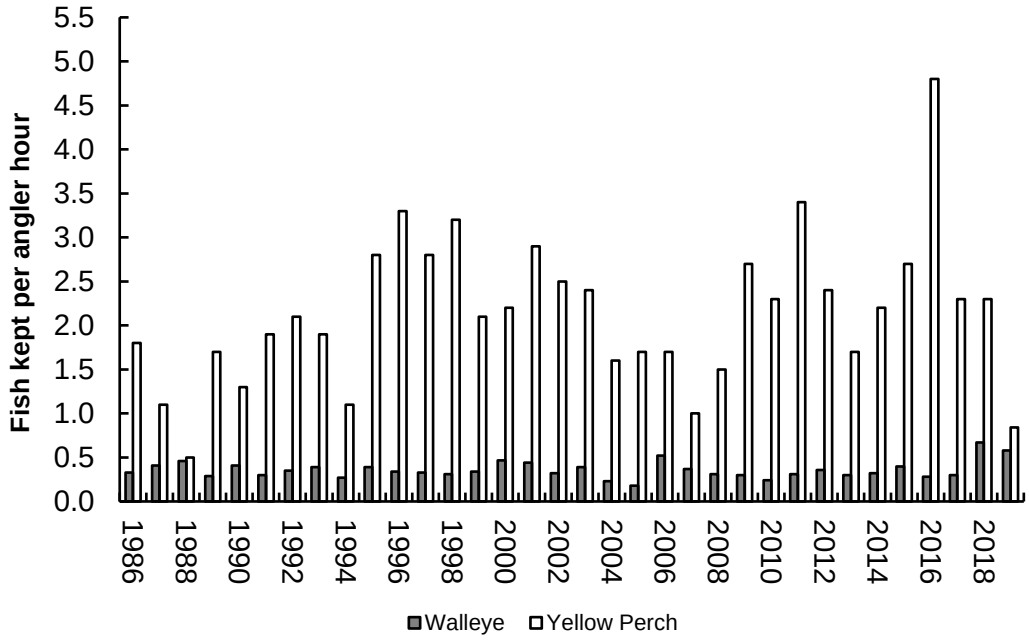

Figure 2. Walleye and Yellow Perch targeted harvest rates (fish per hour) for Michigan's Lake Erie sport fishery, 1986-2019.

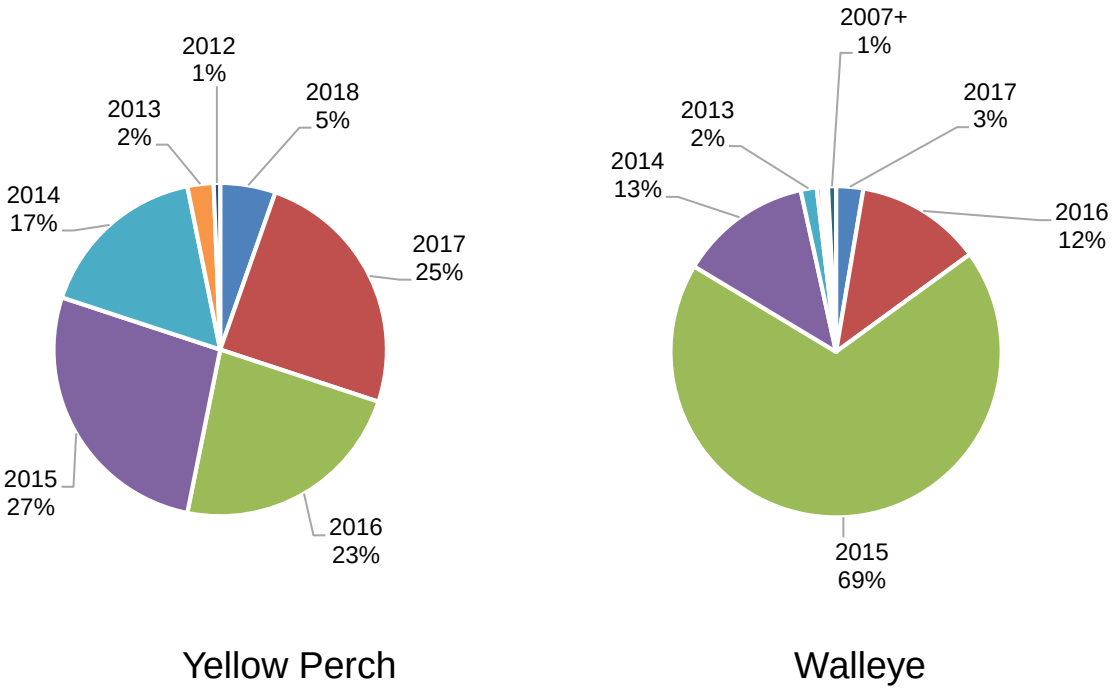

Figure 3. Year-class contribution to Michigan sport harvest for Yellow Perch and Walleye from Lake Erie in 2019.

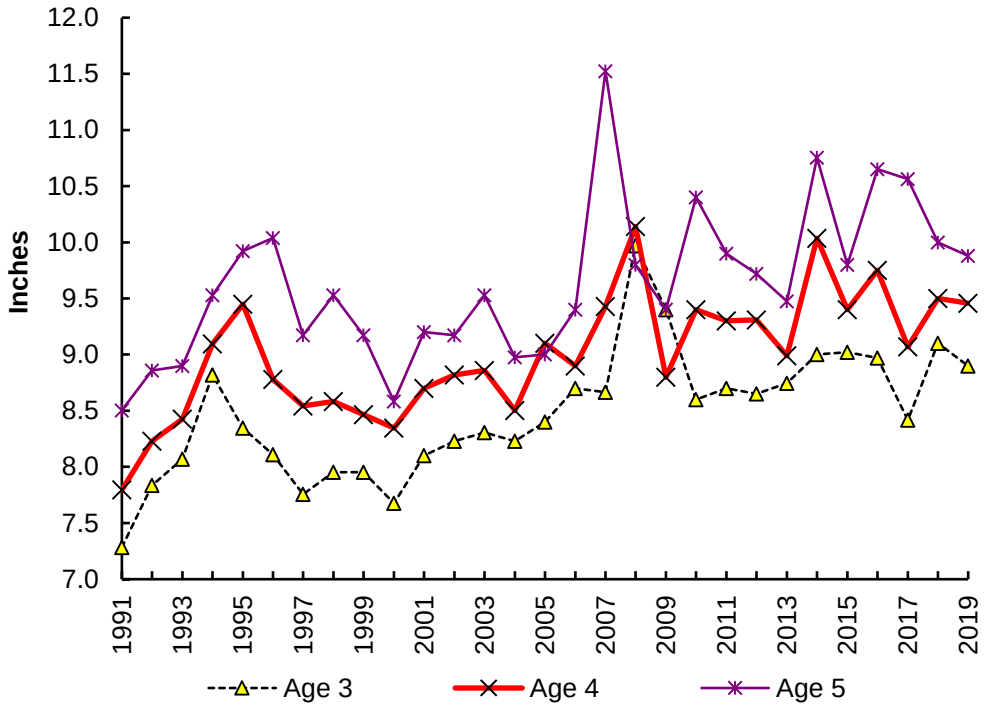

Figure 4. Average length at age for sport-harvested Yellow Perch from Michigan's waters of Lake Erie, 1991-2019.

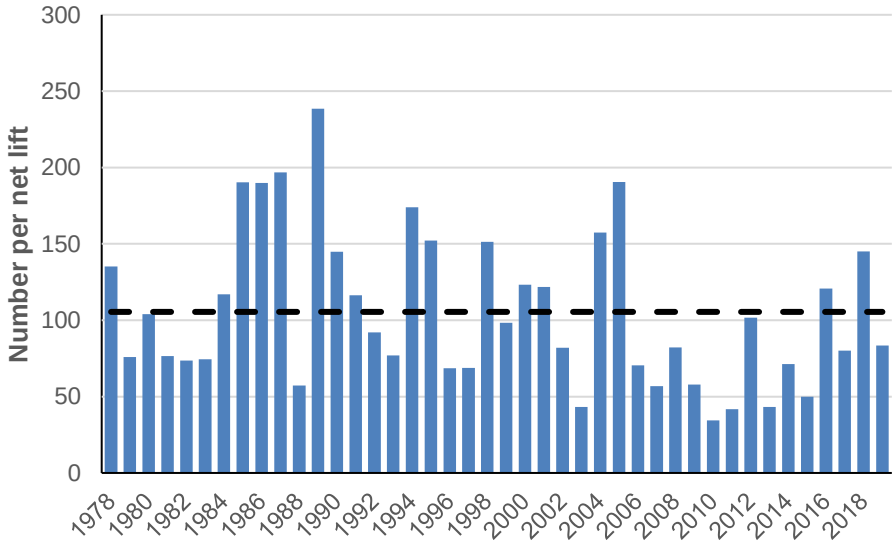

Figure 5. Average total Walleye catch per unit effort, by year for Michigan Lake Erie index gill nets, 1978-2019. The horizontal line represents the average for the time series.

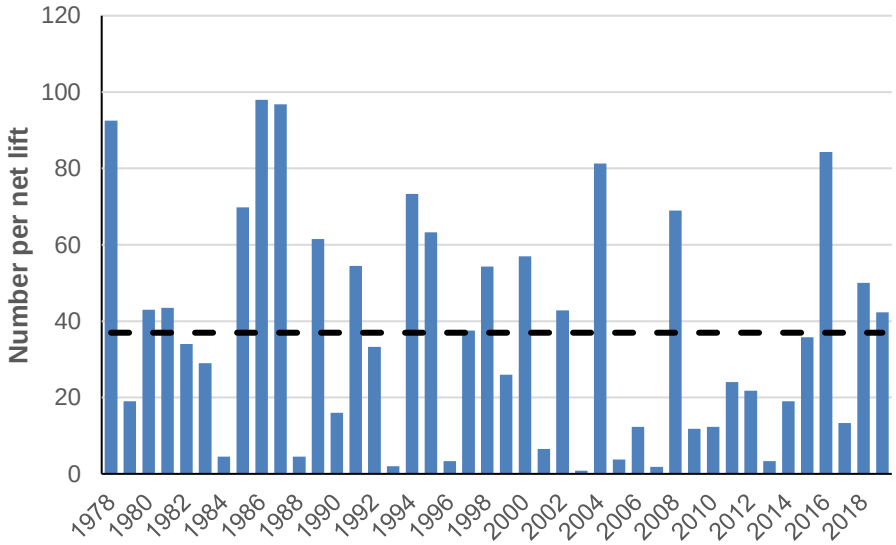

Figure 6. Average yearling Walleye catch per unit effort for Michigan Lake Erie index gill nets, 1978-2019. The horizontal line represents the average of the time series.

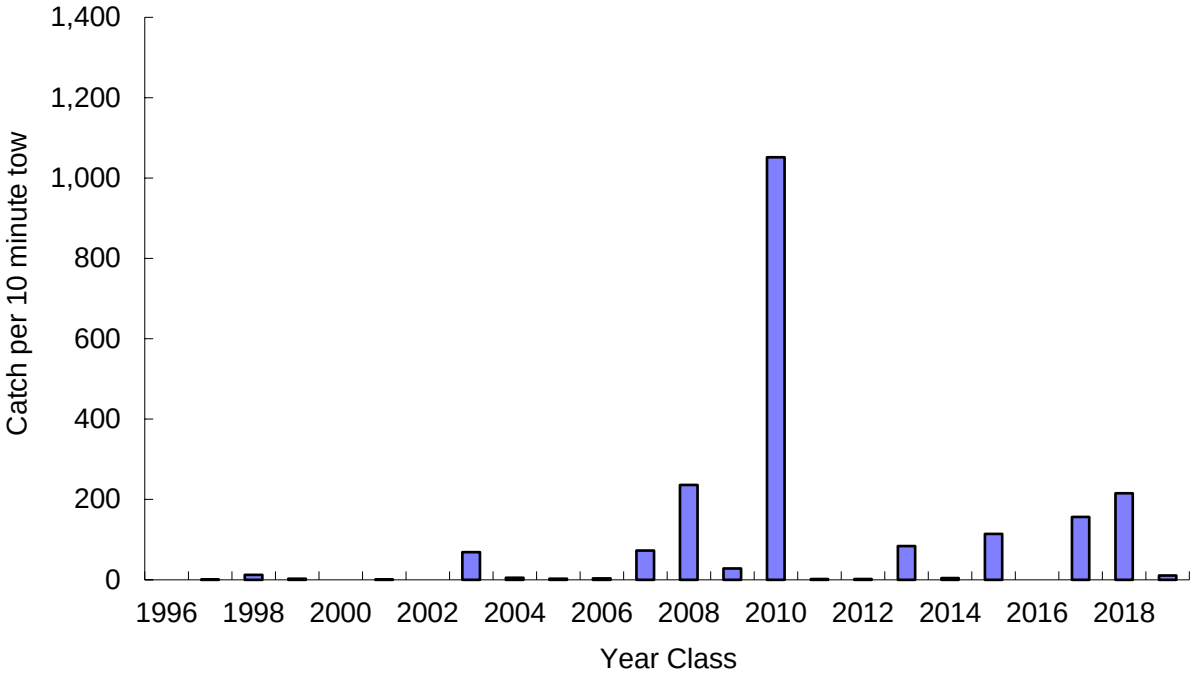

Figure 7. Year-class strength for Yellow Perch in Lake St. Clair as indicated by fall trawl age 0 catch rates, 1996-2019. Note: no trawling occurred in 2016.

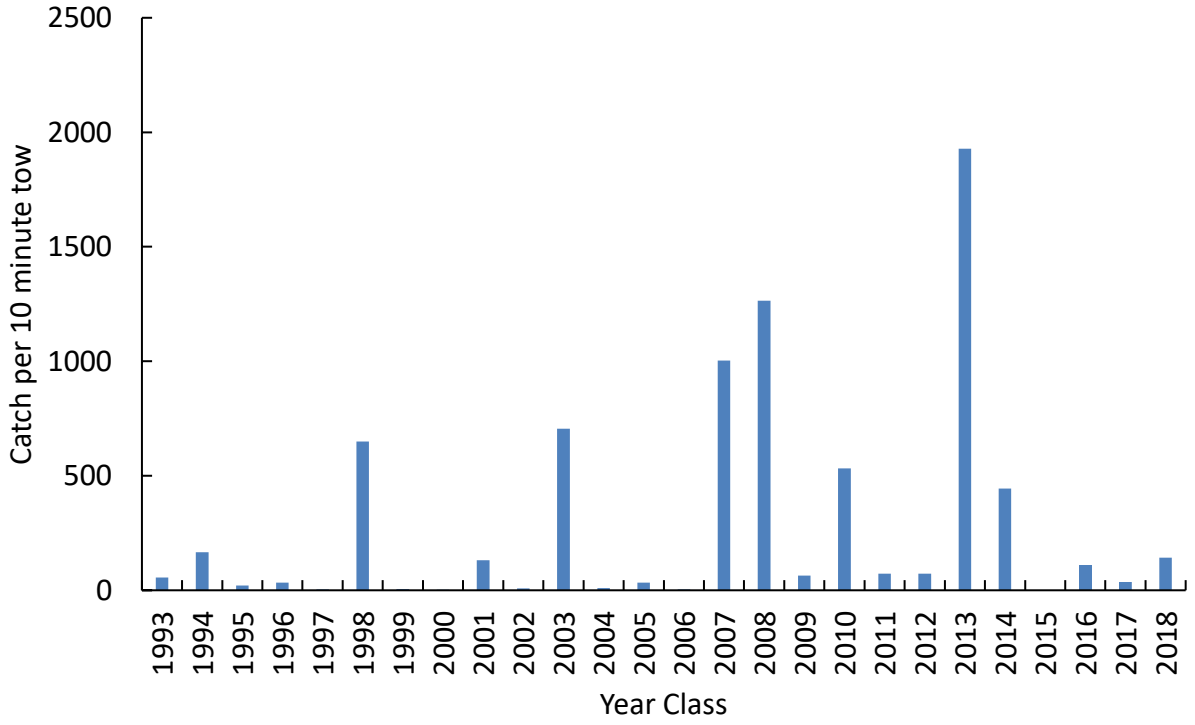

Figure 8. Strength of Yellow Perch year classes in Lake St. Clair as assessed by June trawls. Note: survey year is year class + 1.

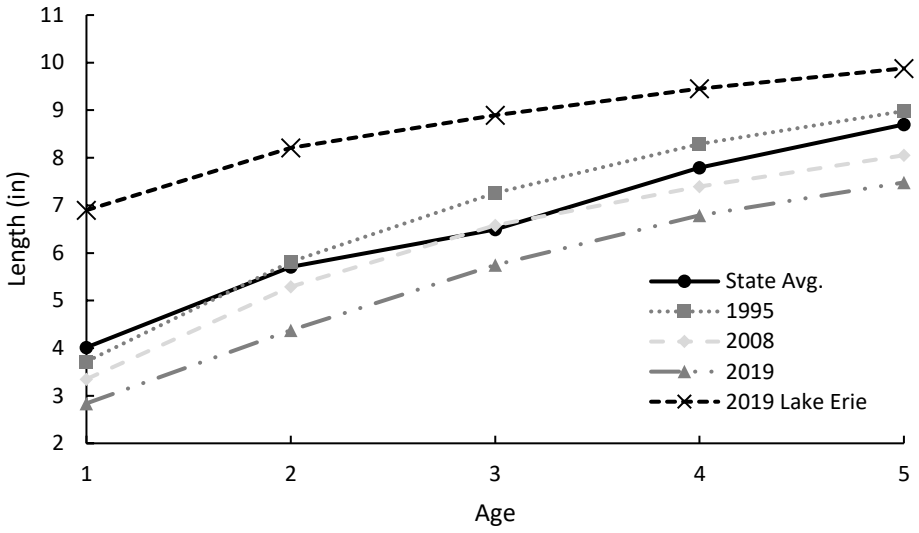

Figure 9. Average length-at-age for Yellow Perch caught in June trawls on Lake St. Clair over three sampling time periods and compared to the state average and sport-caught Yellow Perch from Michigan waters of Lake Erie.

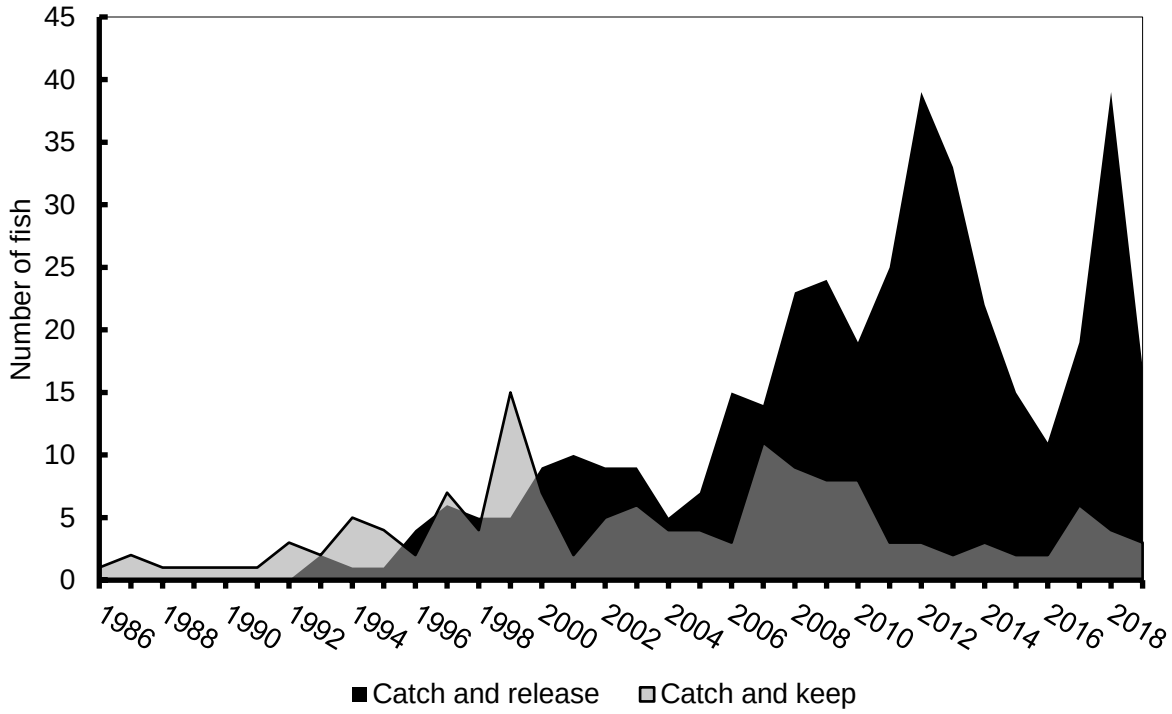

Figure 10. Lake St. Clair Smallmouth Bass entered in the Michigan DNR Master Angler Program, 1986-2019.

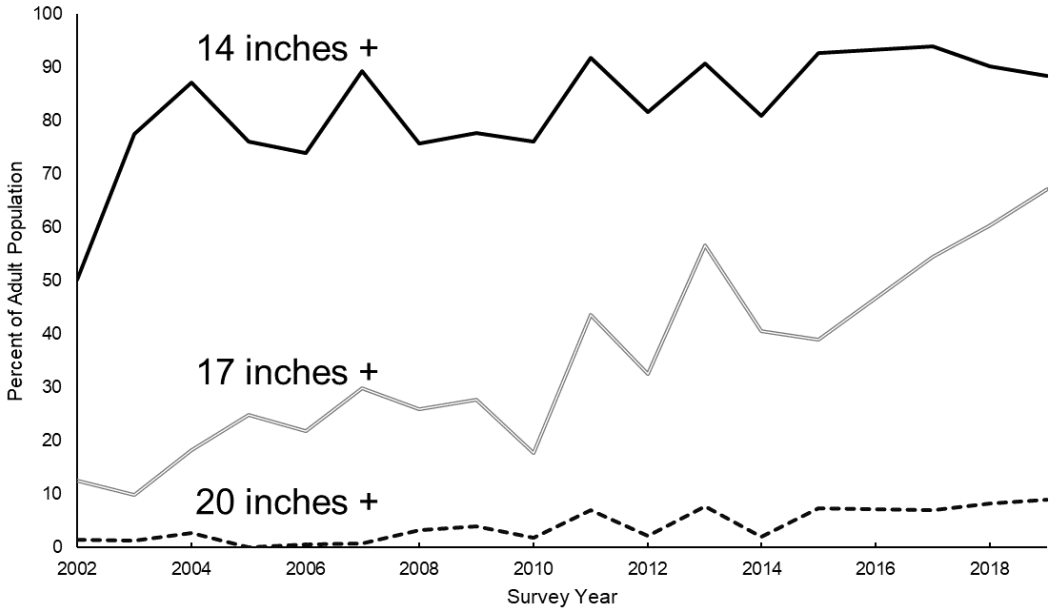

Figure 11. Proportional size distributions of adult Smallmouth Bass for Lake St. Clair, 2002-2019. Lines represent fish 14-inches and larger (solid black line), 17-inches and larger (double grey line), and 20-inches and larger (dashed black line

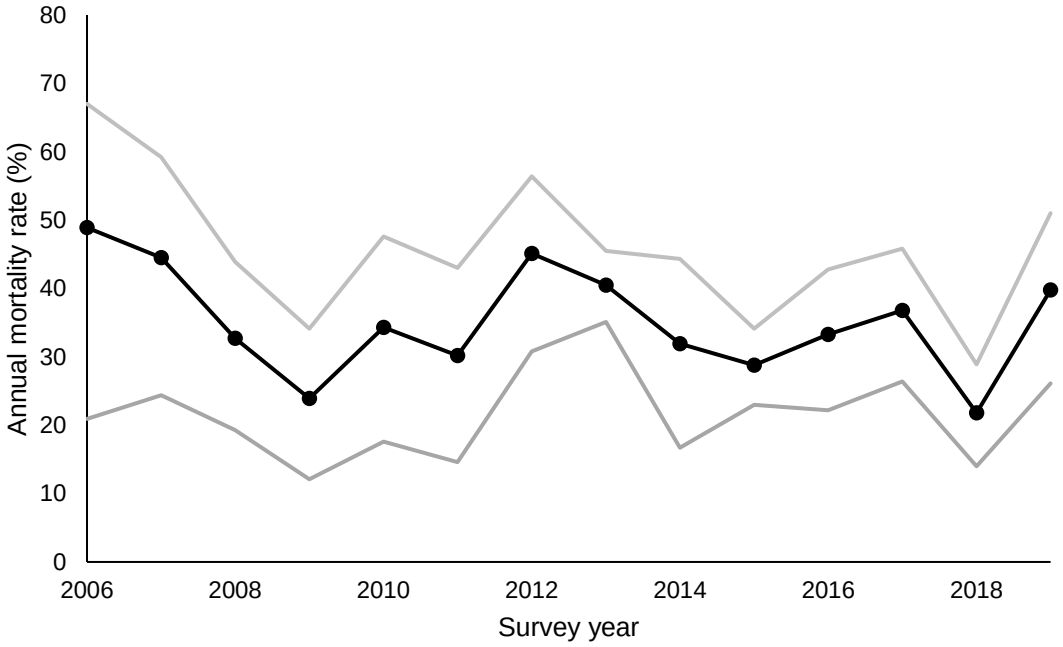

Figure 12. Smallmouth Bass annual mortality rates for Lake St. Clair, 2006-2019, estimated from catch curve regression. Black line and points represent estimates, grey lines represent the upper and lower 95% confidence interval.

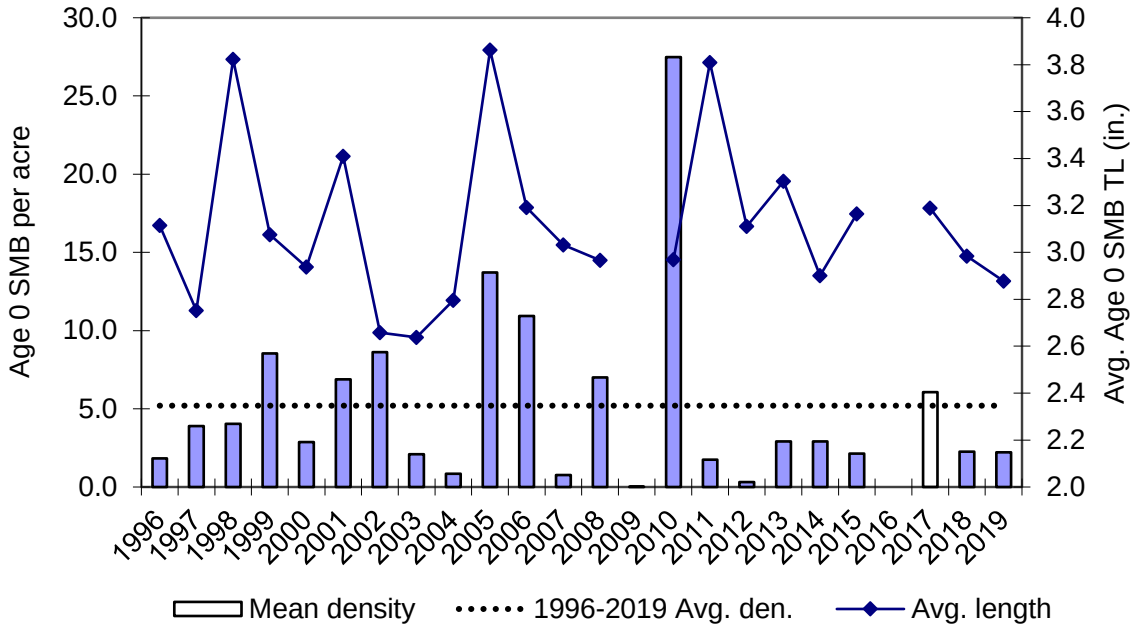

Figure 13. Year-class strength for Lake St. Clair Smallmouth Bass as indicated by fall age-0 catch rates (bars) and average length (solid line), 1996-2019. Average year class strength indicated by the horizontal dashed line.

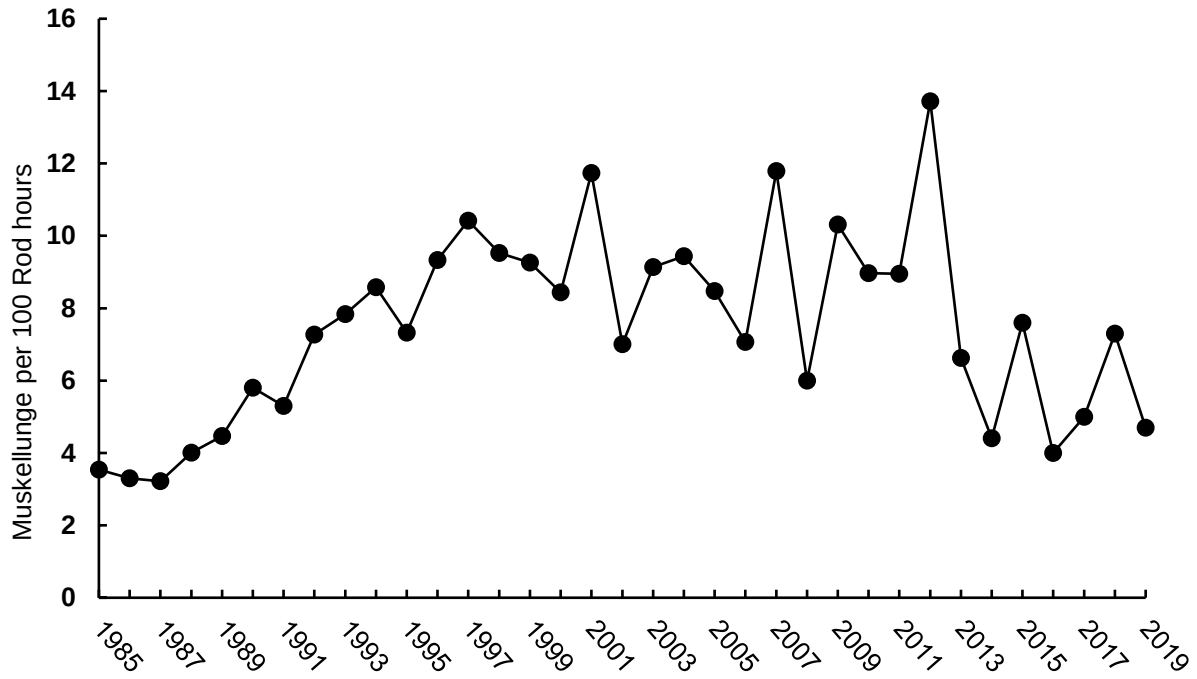

Figure 14. Lake St. Clair Muskellunge catch rate from the Angler Diary Program, 1986-2019.

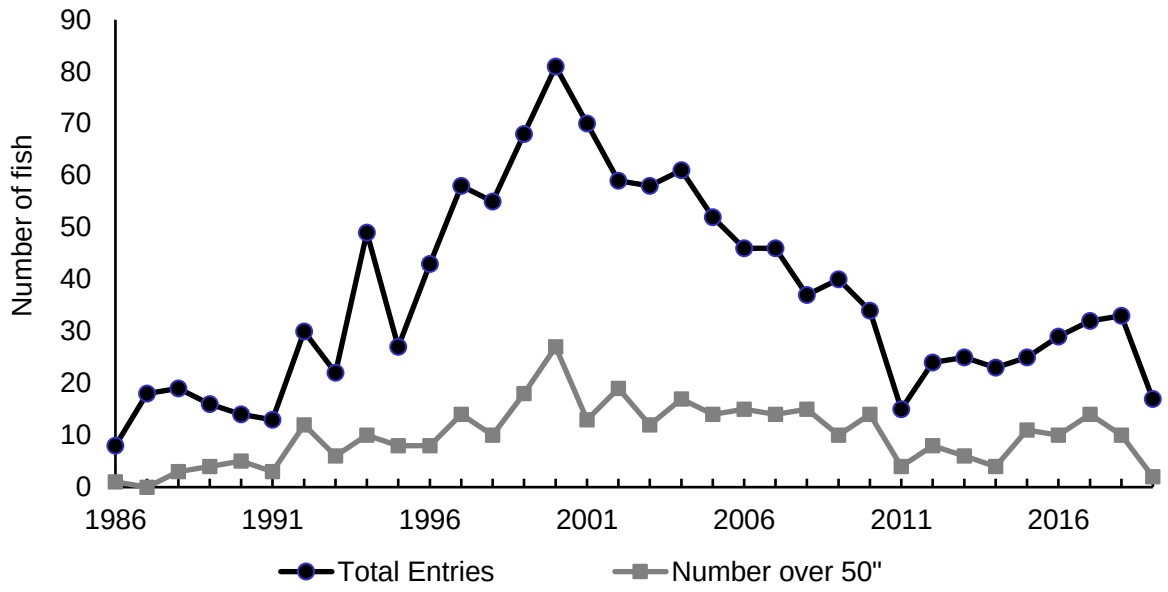

Figure 15. Lake St. Clair Muskellunge entered in the Michigan DNR Master Angler Program, 1986-2019.

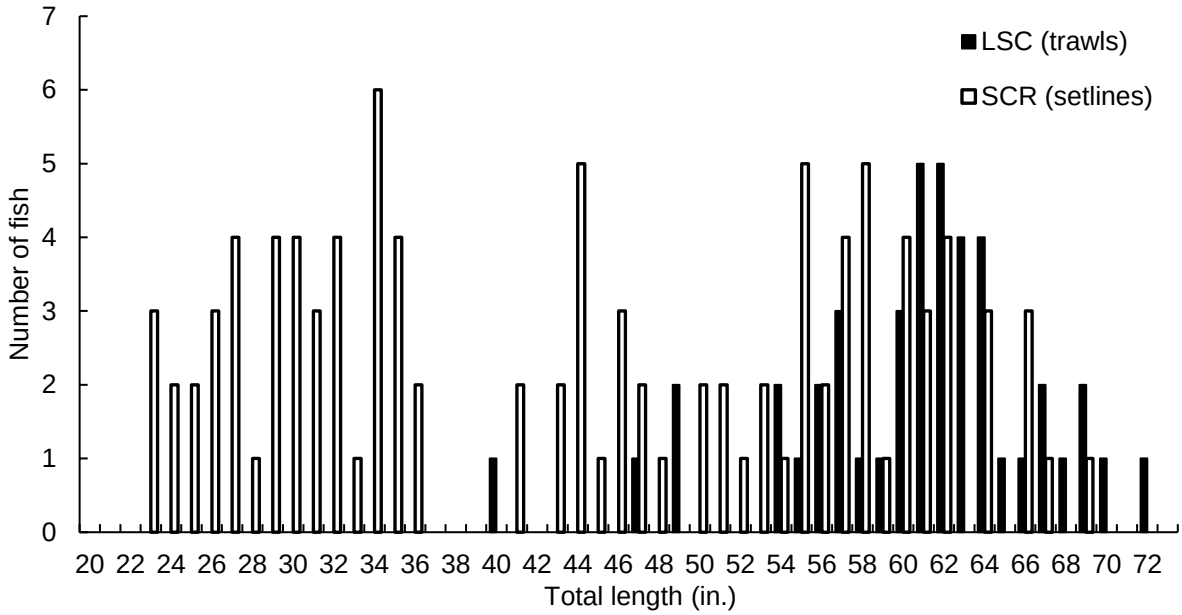

Figure 16. Length frequency distribution for Lake Sturgeon caught in 2019 with survey setlines in the St. Clair River (SCR), and bottom trawls in Lake St. Clair (LSC).

Table 1. Estimated harvest, total harvest rate, effort and released catch for Michigan's 2019 Lake Erie non-charter boat fishery. Released numbers represent legal sized fish where applicable.

	Rate	Month							
Species	(fish/hr)	Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow Perch*	0.84	509	898	3,838	2,232	9,576	14,845	16,697	48,595
Walleye*	0.58	9,623	39,963	50,500	40,751	7,319	980	4,035	153,171
Channel Catfish	<0.01	158	28	307	580	240	347	0	1,660
White Bass	0.01	250	1,556	356	52	71	19	282	2,586
White Perch	<0.01	0	371	416	462	21	78	0	1,348
Freshwater Drum	<0.01	0	0	26	405	25	103	0	559
Smallmouth Bass	<0.01	0	32	0	26	0	4	0	62
Total Harvest	0.62	10,540	42,879	55,508	44,553	17,252	16,376	21,056	208,164
EFFORT									
Angler hours		24,700	56,655	87,072	72,964	36,715	29,084	26,836	334,026
Angler trips		5,367	11,477	16,959	14,969	7,661	6,149	5,418	68,000
RELEASED									
Yellow Perch*	0.47	18	267	1,263	506	4,394	11,740	8,963	27,151
Walleye*	0.03	1,851	3,483	333	1,608	298	161	421	8,155
Largemouth Bass	0.02	0	53	1,480	1,993	638	1,269	1,329	6,762
Smallmouth Bass	0.01	0	155	306	735	1,095	237	440	2,968
White Bass	0.19	2,758	19,319	13,455	9,776	6,149	2,655	9,096	63,208

* Indicates that targeted harvest rate was used instead of total harvest rate.

Table 2. Commercial harvest (pounds caught) of selected species from Michigan waters of Lake Erie, 1982-2019.

Year	Buffalo	Bullhead	Common carp	Channel catfish	Gizzard shad	Goldfish	Quillback	Freshwater drum	Sucker	White bass	White perch	Whitefish	Grand Total
1982	22,474	58	676,896	20,354	76,000	0	1,430	608	178	1,742	0	0	799,740
1983	7,837	997	622,604	28,990	665,000	0	1,510	3,555	185	12,042	0	0	1,342,720
1984	789	152	422,571	9,208	1,265,200	0	56,061	116	44	2,041	0	0	1,756,182
1985	7,885	7,340	738,857	9,253	878,000	0	80,018	905	1,378	4,764	0	0	1,728,400
1986	14,732	7,687	367,310	11,183	0	0	2,217	2,032	123	1,397	0	0	406,681
1987	17,814	4,462	685,395	39,603	0	551	1,062	1,825	88	4,142	0	0	754,942
1988	9,471	5,421	417,365	15,208	0	188	1,380	1,180	0	1,049	0	0	451,262
1989	19,549	3,572	194,320	11,481	0	2,951	568	0	0	991	0	0	233,432
1990	40,064	488	158,151	2,025	0	877	0	0	0	0	0	0	201,605
1991	0	704	206,244	1,941	0	466	6,894	0	0	19	8	0	216,276
1992	0	444	251,365	2,929	2,845	1,025	30,204	290	0	357	10	0	289,469
1993	0	844	238,805	9,152	395	501	28,175	4,206	0	1,180	0	0	283,258
1994	0	659	94,662	5,760	2,103	111	8,930	111	0	1,819	0	0	114,155
1995	0	827	329,262	16,168	23	517	66,013	39,673	436	1,850	64	0	454,833
1996	104	828	387,671	24,969	36,996	7,138	73,662	48,218	4,286	2,923	45	0	586,840
1997	91,877	744	325,433	17,936	24,494	10,497	33,937	8,823	72	7,306	4	0	521,123
1998	15,721	2,139	620,015	16,573	4,988	6,862	22,990	24,507	6,180	1,326	0	0	721,301
1999	25,894	7,050	211,055	7,561	6,200	0	0	265	1,945	23	0	0	259,993
2000	27,843	1,742	313,200	14,400	4,595	3,025	0	0	0	1,776	0	0	366,581
2001	24,393	1,197	185,495	16,328	55	8,281	310	2,935	0	492	0	0	239,486
2002	45,367	6,500	336,820	39,778	6,655	4,660	1,300	4,035	0	3,810	0	0	448,925
2003	9,350	900	65,020	7,890	0	0	2,150	0	0	0	0	0	85,310
2004	18,883	1,650	97,380	23,600	5,120	0	3,400	0	550	1,973	0	0	152,556
2005	96,621	5,495	319,700	15,657	14,910	78,333	1,600	331	2,390	1,338	0	0	536,375
2006	85,269	7,277	378,123	42,931	52,382	67,171	5,030	7,876	1,410	5,237	796	10,693	664,195
2007	215,282	12,536	241,356	98,979	242,695	39,140	9,900	67,072	9,712	77,249	35,946	8,800	1,058,667
2008	142,726	31,969	204,881	71,385	134,008	84,361	2,257	137,304	11,244	98,041	56,867	0	975,043
2009	130,295	45,294	196,888	63,725	122,379	90,771	3,900	116,312	11,339	96,456	34,522	9,439	921,320
2010	68,511	47,612	191,321	64,913	0	77,550	107,037	130,533	7,919	37,021	19,524	963	752,904
2011	107,610	57,670	401,034	138,540	0	84,857	84,727	227,873	17,435	47,058	31,949	4,155	1,202,908
2012	221,255	24,450	507,305	129,666	110,800	57,015	93,296	136,679	12,520	96,916	26,070	6,436	1,422,408
2013	164,345	8,600	256,546	102,197	40,050	28,146	138,841	73,101	10,234	187,848	32,954	0	1,042,862
2014	136,743	7,556	353,979	117,835	31,800	34,054	70,180	81,734	1,500	172,126	42,646	0	1,050,153
2015	100,135	26,396	227,946	144,500	50	88,791	76,203	128,510	332	179,246	53,245	267	1,025,621
2016	73,119	29,493	187,838	155,315	0	86,818	69,213	17,282	705	166,613	35,708	0	822,104
2017	21,547	16,820	46,707	81,639	40,200	28,082	25,281	9,777	120	63,270	14,672	0	348,115
2018	11,182	4,645	34,721	51,828	118,000	11,428	11,335	4,549	149	50,444	4,747	4,100	307,128
2019	24,787	14,713	37,876	102,491	6,427	44,273	13,288	13,909	1,990	40,393	26,064	1,683	32,8194*
Grand Total	1,999,474	396,931	11,532,117	1,733,891	3,892,370	948,440	1,134,299	1,296,126	104,464	1,372,278	415,841	46,536	24,544,873

*2019 Grand total includes 300 lbs of Bowfin

Table 3. Estimated harvest, total harvest rate, effort, and released catch for the 2019 Lake St. Clair non-charter boat fishery. Released numbers represent legal sized fish where applicable. Note: in contrast to the Lake Erie creel table (Table 1) all rates represent non-targeted effort.

	Rate	Month							
Species	(fish/hr)	Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow Perch	0.040	553	515	364	1,640	2,112	2,350	2,372	9,906
Walleye	0.073	1,448	6,095	4,981	2,365	3,130	122	-	18,141
Bluegill	0.025	1,505	611	118	-	560	517	3,043	6,354
Pumpkinseed	0.001	-	-	322	-	57	-	-	379
Smallmouth Bass	0.007	-	-	420	313	788	55	280	1,856
Total Harvest	0.162	5,436	8,216	6,828	4,521	6,647	3,061	5,714	40,423
EFFORT									
Angler hours		23,017	68,392	47,192	28,394	51,219	17,489	13,596	249,300
Angler trips		4,625	11,565	8,192	4,780	9,370	3,327	2,185	44,044
RELEASED									
Walleye	0.027	31	2,482	2,418	909	548	144	97	6,629
Largemouth Bass	0.054	770	4,719	3,977	1,241	1,728	782	149	13,366
Smallmouth Bass	0.286	17,688	14,391	13,389	8,583	13,268	2,807	1,271	71,397
Yellow Perch	0.097	222	820	1,221	3,736	10,285	5,280	2,529	24,093
Northern Pike	0.012	142	1,158	740	294	170	293	227	3,024
Muskellunge	0.003	99	295	141	141	38	72	37	823

Table 4. Average catch per 24-hour soak time for species during spring trap net surveys in Anchor Bay, Lake St. Clair, 2002-2019.

	Survey year																		
Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean
BLACK CRAPPIE	0	0.007	0.115	0	0	0	0	0.015	0.009	0.055	0.075	0.041	0.008	0		0	0	0.012	0.02
BLUEGILL	0.057	0	0.053	0.01	0.024	0	0.053	0	0.009	0.229	0.031	0.066	0.008	0.037		0.024	0	0	0.04
BROWN BULLHEAD	0.024	0.01	0.015	0	0.008	0.01	0	0.023	0.026	0.016	0	0.075	0.008	0		0.027	0.096	0.024	0.02
CHANNEL CATFISH	1.88	1.848	1.704	1.205	1.759	2.011	3.143	2.224	2.244	1.22	2.635	2.532	3.916	1.611		2.052	1.014	5.077	2.24
COMMON CARP	0	0	0.009	0.01	0.032	0	0	0.431	0.317	0.046	0.083	0.145	0.147	0.121		0.203	0.097	0.156	0.11
WHITE SUCKER	0.135	0.081	0.12	0.101	0.103	0.331	0.146	0.062	0.161	0.218	0.025	0.158	0.314	0.123		0.072	0.162	0.102	0.14
FRESHWATER DRUM	1.301	4.013	1.683	0.361	2.265	0.474	0.356	0.593	0.655	0.516	0.349	0.38	0.249	0.21		0.443	0.321	0.264	0.85
GIZZARD SHAD	0.04	0.034	0.006	0.03	0.012	0.007	0	0	0	0.006	0.152	0.099	0.012	0.028		0.32	0.051	0.012	0.05
GOLDEN REDHORSE	0.005	0.013	0.019	0.021	0.024	0.01	0	0.054	0	0.009	0	0.049	0.015	0.042		0	0	0	0.02
LAKE STURGEON	0.011	0.055	0.034	0.015	0.05	0	0.098	0.046	0.013	0.089	0.013	0.046	0.017	0.078		0.033	0.028	0	0.04
LARGEMOUTH BASS	0.224	0.037	0.111	0.025	0.033	0.099	0.101	0.108	0.057	0.212	0.03	0.18	0.1	0.104		0.043	0.077	0.096	0.10
MUSKELLUNGE	0.281	0.262	0.626	0.707	0.478	0.492	0.129	0.825	0.18	0.098	0	0.116	0.075	0.066		0.026	0.006	0.024	0.26
NORTHERN PIKE	0.895	0.146	0.575	0.87	0.864	0.655	0.547	0.705	1.023	1.106	0.697	1.544	1.673	1.512		1.3	1.252	1.152	0.97
PUMPKINSEED	3.024	0.546	0.495	0.025	0.224	0.455	0.708	0.399	0.736	1.543	0.838	0.767	0.458	0.193		1.573	0.156	0.138	0.72
QUILLBACK	0.221	0.132	0.262	0.07	0.277	0.063	0.268	0.34	0.323	0.248	0.056	0.152	0.233	0.023		0.149	0.026	0.093	0.17
ROCK BASS	30.343	13.952	14.647	6.163	15.441	21.732	22.117	29.086	53.814	23.253	36.346	19.326	8.97	15.494		27.587	14.452	4.475	21.01
SHORTHEAD REDHORSE	1.137	1.898	0.69	0.773	1.622	0.514	0.997	0.76	1.155	1.295	0.735	0.519	0.367	0.408		0.586	0.539	0.305	0.84
SILVER REDHORSE	0.254	0.266	0.54	0.591	0.95	0.302	0.952	1.365	1.542	1.288	0.264	0.87	0.656	0.443		1.112	0.448	0.423	0.72
SMALLMOUTH BASS	4.32	8.162	2.373	1.732	3.834	5.842	2.743	3.499	8.487	6.921	4.005	3.683	3.471	2.289		2.605	2.89	3.823	4.16
TIGER MUSKIE	0	0	0	0	0	0	0	0	0	0.025	0	0.011	0.006	0		0.024	0.031	0.006	0.01
WALLEYE	2.166	1.552	1.148	2.428	2.403	1.72	1.254	1.978	1.029	2.135	1.017	1.908	1.514	1.315		7.18	5.513	2.978	2.31
WHITE BASS	0.031	0.052	0.031	0	0.071	0.047	0.271	0.423	0.154	0.261	1.56	0.374	0.474	0		0.333	0.112	0.024	0.25
WHITE PERCH	0.112	0.045	0.352	0.049	1.112	0.102	0.956	0.444	0.785	0.826	0.668	0.845	0.122	0.075		0.197	0.438	0.502	0.45
YELLOW PERCH	3.128	0.739	2.148	0.505	0.582	2.218	2.498	0.498	0.393	1.31	1.19	0.963	0.856	1.432		3.202	3.619	0.878	1.54
Number of net lifts	64	50	55	34	42	50	35	22	54	54	39	46	40	36		36	36	28	
Starting date	03-May	28-May	03-May	11-May	05-May	03-May	06-May	08-May	03-May	25-Apr	25-Apr	22-Apr	24-Apr	27-Apr		24-Apr	23-Apr	22-Apr	
Ending date	30-May	20-Jun	26-May	25-May	24-May	22-May	20-May	20-May	24-May	25-May	14-May	20-May	19-May	18-May		18-May	14-May	15-May	
Starting water temp. (^{0}C)	9	12	8	9	13	9	13	12	14	9	9	8	8	8		11	7	6.9	
Ending water temp. (^{0}C)	15	16	15	13	13	13	11	14	17	13	14	15	13	14		13	12	9.4	
Average secchi depth (m)	1.8	2.2	1.2	2.2	1.7	2.6	2.1	1.5	1.7	1.3	1.9	1.93	2.1	3		1.86	2.37	2.2*	

*In 2019 we converted to estimating secchi depth through its relationship with water turbidity measurements.

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