



DEPARTMENT OF NATURAL RESOURCES

Status of the Fisheries in Michigan Waters of Lake Erie and Lake St. Clair, 2018

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*2018 Marks the 50th Anniversary of the Stations primary work platform, the R/V Channel Cat
Logo designed by Drew Martin*

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Lake St. Clair Fisheries Research Station
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FISHERIES DIVISION

Highlights for 2018

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 411 thousand hours fishing each Lake St. Clair and Lake Erie in 2018, for a total of 822 thousand hours
- The 2018 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 more than tripled to 176 thousand fish compared to 2017
- More master angler Smallmouth Bass were awarded in Lake St. Clair in 2018 than any previous year
- Smallmouth Bass mortality rates dropped compared to 2017, and have remained steady or declined since 2012, despite changes in Michigan's fishing regulations
- Ten Muskellunge were implanted with acoustic tags in Anchor Bay of Lake St. Clair in 2018, providing a growing dataset of Muskellunge movement
- Strong year classes of Yellow Perch were observed in the Michigan waters of Lake Erie and Lake St. Clair

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, and Saginaw Bay. Results of this work are instrumental in fisheries management decisions affecting these waters. The station works closely with fisheries managers in the MDNR's Lake Erie Management Unit 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 Sport Fish Restoration (SFR) Program 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>.

Reorganization of this Report

To make the information in this report more intuitive and available for interested parties we

have reorganized this report compared to past years. The report is now divided among waterbodies surveyed (St. Clair River – Lake St. Clair and Lake Erie), with emphasis on the fish species and communities rather than the individual surveys. This approach centralizes the results obtained from multiple surveys for an individual species.

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. 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 2018. 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.

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. Since that time, the program has been 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. 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 2018 produced an effort estimate of 411,581 hours of fishing and a total harvest estimate of 490,372 fish (Table 1) for Michigan's Lake Erie non-charter sport fishery. Angling effort increased slightly (Figure 1) compared to 2017 (2017 effort: 405,855 hours), but harvest declined sharply compared to harvest in 2017 (948,062 fish). Harvest was dominated by Yellow Perch and Walleye in 2018 (99% of total harvest).

In 2018, Michigan charter boat operators reported a total harvest of 40,256 fish of all species from Michigan waters of Lake Erie. Walleye and Yellow Perch made up over 99% of all fish harvested. The total number of charter excursions was up 10% from 2017, to 1,117, the highest level observed since 2006.

Yellow Perch

A total of 314,807 Yellow Perch were harvested by non-charter anglers in 2018, a decline of 65% compared to 2017. Total harvest rate declined to 0.76 fish/hr compared to 2.17 fish per hour in 2017 (Figure 2). The targeted Yellow Perch harvest rate (harvest rate of anglers specifically targeting Yellow Perch) was 2.28 fish/angler hour in 2018. A total of 33% of total fishing effort was directed at Yellow Perch.

Yellow Perch harvest was dominated by age 4 fish (2014 year-class), which accounted for 46% of the total harvest (Figure 3). The overall average length of Yellow Perch harvested in the sport fishery in 2018 was 9.2 inches. The mean length-at-age for Yellow Perch taken in the Michigan sport fishery increased for ages 2, 3, and 4 fish in 2018 relative to 2017 (Figure 4), likely reflecting lower densities of fish.

The Yellow Perch charter total harvest rate declined from 2017 to 0.83 fish per hour (2017: 2.002 fish per hour), but still exceeded the long-term mean of 0.70 fish/angler hour for the 9th consecutive year (Figure 5). Targeted Yellow Perch charter catch rate was 4.05 fish per hour almost twice as high as the targeted catch rate for non-charter boat anglers (2.19 fish per hour).



Finally, we captured 678 age-0 Yellow Perch per 10-minute tow during our August trawl survey, the highest observed catch rate since 2014.

Walleye

Non-charter anglers harvested an estimated 176,089 Walleyes in Michigan waters of Lake Erie (Figure 1), a substantial increase from 2017 (56,938 fish). Total Walleye catch rate was 0.43 fish/hr (Figure 2), up from 0.14 fish/hr in 2017, and above the long term mean. Targeted Walleye catch rate (the catch rate of anglers specifically targeting Walleye) was 0.63 fish/hr, with 64% of total angler effort on Lake Erie directed towards Walleye.

Harvest of Walleye during the 2018 on-site creel survey indicated that harvested Walleye were primarily comprised of age 3 and 4 individuals (2014 and 2015 year-classes), collectively representing 85% of the harvest (Figure 3). However, the 2015 year class (age 3) single-handedly made up 65% of the catch. Age 5 and older Walleye accounted for only 15% of the harvest (Figure 3). The average length of Walleye harvested in the sport fishery in 2018 was 17.9 inches, nearly an inch lower than in 2017 and reflecting the high abundance of age 3 walleye from the 2015 year class.

The total harvest rate of Walleye reported by charter operators in 2018 was 0.97 fish per hour, which was above the long-term average of 0.72 fish per hour for the first time since 2007 (Figure 5). The observed total harvest rate was the highest since 1998. Charter targeted harvest rate was 1.22 fish per hour, about twice as high as for non-charter anglers (targeted harvest rate of 0.63 fish per hour).

The average Walleye gillnet catch rate for the two index sites (145 fish/lift) in 2018 was almost double that observed during 2017 (Figure 6), and above the long-term average. Three-year-old fish from the robust 2015 year class accounted for 35% of the total catch, followed by age 1 (2017 year class; 34%) and age 2 (2016 year-class; 22%) Walleye. The average catch rate of yearling Walleye (50 fish/lift) increased 276% from 2017 and was above the average of 37 fish/lift for the 1978-2018 time series (Figure 7), which reflects the relatively higher abundance of the 2017 year class compared to the smaller 2016 year class. The 2015 Walleye year class, which became fully recruited to the fishery in 2018, is expected to be a

strong contributor to the Lake Erie fishery in upcoming years. Additionally, the 2018 year class, sampled by our August trawl survey, was the highest observed (20 fish/10-minute tow) since the survey began in 2014. This indicates that 2018 was an exceptional year for Walleye reproduction. Pending the overwinter survival of these fish, the 2018 year class should be a strong contributor to the fishery in the future.

Forage fish

A total of 33,670 forage fish representing 17 different species were captured during 8 trawl tows for an average catch-per-effort (CPE) of 4,277 fish/10-minute tow. Age-0 White Perch had the highest average CPE (3,240 fish/10-minute tow). Trout Perch (139 fish/10 minute tow), Gizzard Shad (104 fish/10-minute tow), Round Goby (26 fish/10-minute tow), White Bass (21 fish/10-minute tow), Mimic Shiner (18 fish/10-minute tow), and Freshwater Drum (18 fish/10-minute tow) were also substantial contributors to the catch. Emerald Shiner, Spottail Shiner, Silver Chub, age-0 Smallmouth Bass, Logperch, Tubenose Goby, Rock Bass, and Johnny Darter were also captured.

The 2018 forage catch rate was the highest overall forage CPE observed since Michigan's modern-day bottom trawl survey began in 2014. Since this was only the fifth annual trawl survey in recent memory, it is difficult to put the catch rates that we observed into a broader context for the West Basin of Lake Erie. However, Michigan's young-of-year Yellow Perch and Walleye CPE paralleled those of the decades-long Ontario and Ohio bottom trawl survey, which indicated a record Walleye year class, and near record Yellow Perch year class, in 2018.

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 2018, a total of three Michigan commercial fishing licenses were active on Lake Erie. The 2018 commercial harvest included 12 types of fish for a total of 308,517 pounds (Table 2). In combination, Gizzard Shad (38%), Channel Catfish (17%), White Bass (16%) and Common Carp (11%) accounted for 83% of the total harvest by weight. The total value of the 2018 Lake Erie



commercial harvest from Michigan waters was estimated at \$176,782. The 2018 total harvest was the lowest since 2004 with harvest declining for all species besides Gizzard Shad, Sucker species, and Whitefish (Table 2). The harvest of Common Carp was the lowest since 1981.

St. Clair River – Lake St. Clair

Sport Fishery Summary

In 2018 the MDNR conducted a creel survey of the American waters of Lake St. Clair. Non-charter recreational anglers spent 411,416 hours fishing Lake St. Clair (Table 3; down from 540,779 hours in 2017). Anglers seeking Black Bass (Smallmouth Bass and Largemouth Bass) accounted for the majority of fishing effort on Lake St. Clair (Figure 8; 58% of total fishing effort). Non-charter recreational anglers harvested a total of 87,865 fish, down from 137,511 fish in 2017 (Table 2). Walleye made up 52% of the total harvest in 2018.

For the St. Clair-Detroit River System (St. Clair River, Lake St. Clair and Detroit River), charter boat anglers reported a harvest of 29,271 fish of all species. Walleye accounted for (79%) of total charter harvest in 2018.

In 2018, charter boat captains reported a total of 2,198 excursions on the St. Clair-Detroit River System a 9% increased from 2017, continuing a trend of increased charter activity since 2012.

Yellow Perch and Walleye

A total of 16,670 Yellow Perch were harvested by non-charter recreational anglers in 2018, yielding a total non-targeted harvest rate of 0.04 fish/hr. Both harvest and total catch rate were down compared to 2017 (2017 harvest: 66,946; 2017 total harvest rate: 0.12 fish/hr). However, anglers targeting Yellow Perch accounted for only 5% of total fishing effort, such that targeted catch rate for Yellow Perch was 0.51 fish per hour.

Charter anglers harvested a total of 4,043 Yellow Perch in the American waters the St. Clair-Detroit River System, up slightly from 2017 (3,227 fish). Total charter catch rates of Yellow Perch were also up slightly to 0.09 fish per hour, but still well below the long-term average of 0.45 fish per hour (Figure 9). Targeted charter Yellow Perch harvest rates were 3.01 fish per hour, nearly six times higher than for non-charter anglers.

Walleye were the most commonly harvested species in the American waters of Lake St. Clair by non-charter recreational anglers during 2018, accounting for 51% of the total harvest. A total of 45,351 Walleye were harvested, yielding a total harvest rate of 0.11 fish/hr, both up slightly from 2017. A total of 21% of all fishing effort specifically targeted Walleye, with a targeted catch rate of 0.49 fish per hour.

Charter anglers harvested a total of 23,179 Walleye from the American waters of the St. Clair-Detroit River system, up 46% from 2017 (16,270 fish harvested). Total charter harvest rates were 0.51 fish per hour, above the long-term average of 0.22 fish per hour, and the highest observed in the time series (Figure 9). Targeted charter catch rate of Walleye was 0.92 fish per hour, just under twice the rate of non-charter anglers fishing Lake St. Clair.

Similar to Lake Erie, biological data were collected from Walleye and Yellow Perch during the 2018 on-site Lake St. Clair creel survey. The age composition of harvested Walleye was dominated by age 3 and age 4 (2015 and 2014 year-class), which together accounted for 89% of the harvest (Figure 10). The average length of Walleye harvested in the sport fishery in 2018 was 16.95 inches.

Yellow Perch harvest by recreational anglers was dominated by age 4 and age 5 fish (2014 and 2013 year-classes), which together accounted for 77% of the total harvest (Figure 10). The average length of yellow perch harvested in the sport fishery in 2018 was 8.65 inches.

There are currently no Walleye-specific programs taking place in the St. Clair River and Lake St. Clair. However, Walleye catch rates in the trap net survey were the highest on record in 2017 and second highest in 2018 (Table 4). This is likely a result of the large 2015 Walleye year class from Lake Erie. Age-0 Walleye are rarely captured during the fall trawl survey, indicating low amounts 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 increased from 2017 and was the highest observed since 2010 (Figure 11). However, high reproductive success doesn't necessarily lead to increased recruitment to the adult population. For example,



2017 age-0 Yellow Perch catch rate in the fall trawls is the second highest since 2010; however, this did not translate to higher catch rates of age-1 fish in the spring 2018 trawls (Figure 12).

Growth of Yellow Perch in Lake St. Clair continues to be below the statewide average. Mean-length-at-age for Yellow Perch is below the statewide average at all consistently observed ages (age-1 to age-5; Figure 13). Additionally, Yellow Perch growth is lower than it has been historically as seen by mean-length-at-age estimates from previous time periods (Figure 13).

Black Bass (Smallmouth Bass and Largemouth Bass)

A total of 172,944 legal sized Black Bass (145,491 SMB and 27,453 LMB) were captured and released by non-charter anglers compared with 4,065 Black Bass (3,695 SMB and 370 LMB) harvested on Lake St. Clair in 2018. Total capture rate of legal sized fish was 0.43 fish per hour, and total harvest rate was 0.01 fish per hour. A total of 58% of all fishing effort specifically targeted Black Bass, yielding a targeted total capture rate of legal sized fish of 0.57 fish per hour, and a targeted harvest rate of 0.012 fish per hour.

For charters targeting Smallmouth Bass in the St. Clair-Detroit River System 14,600 fish were captured and released, while 657 fish were harvested resulting in a total release rate of about 96%. Targeted Smallmouth Bass catch rates were 1.46 fish per hour, about 2.5 times higher than non-charter anglers fishing Lake St. Clair.

Statistics from the Master Angler program indicate that Lake St. Clair is one of the premier waterbodies in the state for trophy Smallmouth Bass. With 43 entries in the Master Angler program in 2018, Lake St. Clair represented 31% of the total entries statewide. The next highest waterbody had 8 total entries and that was the adjoining St. Clair River. This represents the highest number of Master Angler Entries ever entered for Lake St. Clair (Figure 14). 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 252 Smallmouth Bass were captured in the spring Anchor Bay trap net survey, for a catch rate of 4.18 fish/lift which equaled the long term average (Trap Net average CPUE 2002-2018: 4.18 fish/lift). Of these 252 captures, 242 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 142 Smallmouth Bass were sampled, and tagged as part of this electrofishing effort, such that the total sample size is 394 Smallmouth Bass handled, 384 of which were tagged, and valid age estimates were obtained for 379 individuals. Analysis of age composition and annual mortality includes individuals from both of these efforts pooled together. Year-class contribution to Smallmouth Bass catch was relatively uniform; the 2015 year class was most abundant (20% of the catch), but strong contributions by the 2014, 2013, 2012, 2011 continued to be evident (range 12-16% of total catch). Smallmouth Bass averaged 16.8 inches in length across the two surveys. Smallmouth Bass sampled in the Anchor Bay trap net surveys had an average weight of 3.23 lbs (weights are not collected electrofishing). Annual mortality rate was estimated using catch curve analysis which assumes that abundance of year classes in a given sample is related to the population mortality rate. For 2018 annual mortality rate was estimated at 21.8% which is the lowest observed since 2012 and represents the continuation of a decreasing trend in Smallmouth Bass annual mortality since 2012 (Figure 15).

Recruitment of age-0 Smallmouth Bass as indexed by our August Lake St. Clair Trawl survey was down 64% from 2017 to 2.3 age-0 Smallmouth Bass per acre (Figure 16; 2017 value: 6.1). However, the average size of age-0 recruits, which is a critical indicator of overwinter survival was 3 inches, only slightly below the long-term average (1996-2018 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 a strong or weak year class is not necessarily correlated with high abundance of adults in the future. For example, the 2012-2015 year classes were similar in strength to the 2018 year class, and comprised a very substantial component of



the current fishery based on spring trap net and electrofishing catches.

Generally, few Largemouth Bass are captured during spring trap netting in Anchor Bay. 2018 was no exception with seven individuals sampled. These seven individuals averaged 14.6 inches in total length, with an average weight of 1.9 lbs. Age ranged from four to ten years old.

During the fall nearshore electrofishing survey 236 Largemouth Bass were captured of all sizes (2.4 to 18 inches). Size structure of Largemouth Bass (Figure 20) indicated many large catchable size individuals, and no apparent cropping at the legal harvest size (14 inches = 36 cm). 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.

Since 2002, a total of 5,342 Smallmouth Bass captured in survey trap nets in Anchor Bay have been tagged and released. Smallmouth Bass movements are 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 2002-2018 traveled less than 6 mi (9.7 km) from the Anchor Bay tagging site.

In 2018, Michigan tagged a total of 233 Smallmouth Bass with non-reward jaw tags in Anchor Bay of Lake St. Clair. A total of 25 non-reward tags placed on Smallmouth Bass in 2018 were recovered by anglers for a single-season reporting rate of 7.7%. This is higher than the 5.9% single-season reporting rate observed during 2017.

A total of seven non-reward tags placed on Smallmouth Bass in the Mile Roads area during 2018 were recovered by anglers for a single-season reporting rate of 5.0%, which is lower than the 7.6% single-season reporting rate observed during 2017 and nearly identical to that observed from Smallmouth Bass tagged in nearby Anchor Bay during 2017. This suggests that, all else being equal, the intensity of the Smallmouth Bass fishery in the Mile Roads area and Anchor Bay is similar. Like tagged Anchor bay fish, recaptured Smallmouth Bass that were jaw-tagged during

2016-2018 did not travel far, ranging an average of 5.0 mi (8.0 km) from the Mile Roads tagging site.

Northern Pike and Muskellunge

Non-charter anglers released 6,131 Northern Pike, and 1,208 legal sized Muskellunge from Michigan waters of Lake St. Clair in 2018 (Table 2). Releases of Northern Pike and Muskellunge were both down slightly from 2017 (Northern Pike 2017: 6,472 fish released; Muskellunge 2017: 1,300 fish released). A total of 347 Northern Pike were reported harvested in 2018, up from 2017 (200 fish reported harvested). No Muskellunge were reported harvested to creel agents. However, 2018 was the first year of mandatory harvest reporting of Muskellunge in the State of Michigan, which resulted in five Muskellunge being registered as harvested from Lake St. Clair in 2018. Anglers are reminded to report harvested Muskellunge within 24 hours by visiting www.michigan.gov/registerfish or calling 1-844-345-3474.

Charter captains reported a total catch of 1,040 Muskellunge in 2018 throughout the St. Clair – Detroit River System, with only one fish harvested. Charter targeted catch rates were 2.69 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 2018, the catch rate again showed a small increase from the previous year (Figure 17). The observed Muskellunge catch rates for 2018 continues a pattern of increased variability in catch rates over the past 17 years. Efforts are in place in 2019 to increase the number of Muskie anglers in the Angler Diary program.

Lake St. Clair continued to dominate the statewide Master Angler entries for Muskellunge in 2018 with 33 of the 58 total entries (57%). The previous four years have shown an increasing trend in the number of Master Angler entries from Lake St. Clair (Figure 18). There has been a general decline in 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



Only one Muskellunge was captured during our 2018 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. The increased water clarity makes trap nets easier to see, and likely increases the ability of Muskellunge to avoid the gear.

In 2018 we tagged 10 Muskellunge with acoustic tags. Nine of these fish were captured by angler partners, before being tagged by DNR fisheries personnel (the 10th fish was caught in the trap net survey). Since 2016, 30 Muskellunge have been tagged in the American waters of Lake St. Clair and the Detroit River, with an additional 59 fish tagged by our Canadian counterparts in the Canadian waters of Lake St. Clair. These acoustic 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 a half 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 four age 0 Muskellunge were captured during our fall nearshore electrofishing survey, for a catch rate of 0.1 fish/10-min shocking. This value was down from 0.31 fish/10-min shocking in 2017, but up from 0.03 fish/10-min shocking in 2016. 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 114 Northern Pike during our spring trap net survey in Anchor Bay. Valid age estimates were obtained for 105 individuals. Similar to last year, the majority of the catch was comprised of the 2014 (36% of total catch) and 2013 (25% of the total catch) year classes (Figure 15). Across all individuals captured the average length was 28.5 inches and average weight was 4.96 lbs.

Lake Sturgeon

A total of 151 Lake Sturgeon were collected during assessment surveys on Lake St. Clair and the St. Clair River in 2018. Captured Lake Sturgeon

averaged 42.1 inches in total length, with a range from 22.0 inches to 71.2 inches. A total of 122 Lake Sturgeon were caught in the St. Clair River during the annual setline survey in June, while 29 fish were caught with trawls in Lake St. Clair during August. The length frequency for setline and trawl-captured Lake Sturgeon in 2018 illustrates the higher proportion of large individuals in the trawl catch in the lake (Figure 19). We suspect this reflects a difference in the actual size structure of the Lake Sturgeon 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 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 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 94 Northern Madtoms were sampled in 2018. 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 3,340 Lake Sturgeon have been tagged and released in the St. Clair River and Lake St. Clair since 1996. To date, 825 tagged Lake Sturgeon have been recaptured with survey gear or reported by fishermen. A total of 514 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, while 15 have been recaptured in assessment trawls on Lake St. Clair. Sport anglers have reported 260 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 shiner species in our spring and fall trawling continued. We captured 27 Spottail Shiners per hectare trawled, down from 55 per hectare last year and well below the long term mean. Johnny Darter (27 per ha trawled) and Rainbow Smelt (106 per ha trawled) were the most



common forage sized fish captured during spring trawls.

During our fall trawl survey Spottail Shiner (79 per hectare trawled) and Trout-Perch (31 per hectare trawled) were the most common forage species captured.

Brook Silversides were the most frequently captured (37.4 per ten-minute sample period) forage sized fish during our fall nearshore electrofishing survey, though this value was down slightly from 2017 (41.7 per ten-minute sample period). Other key forage species captured included Emerald Shiners (5.3 fish per ten-minute sample period), Spottail Shiners (5.8 fish per ten-minute sample period), and Mimic Shiners (8.4 fish per ten-minute sample period). While still a new survey, the nearshore electrofishing survey provides important additional insight into the lakes 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.



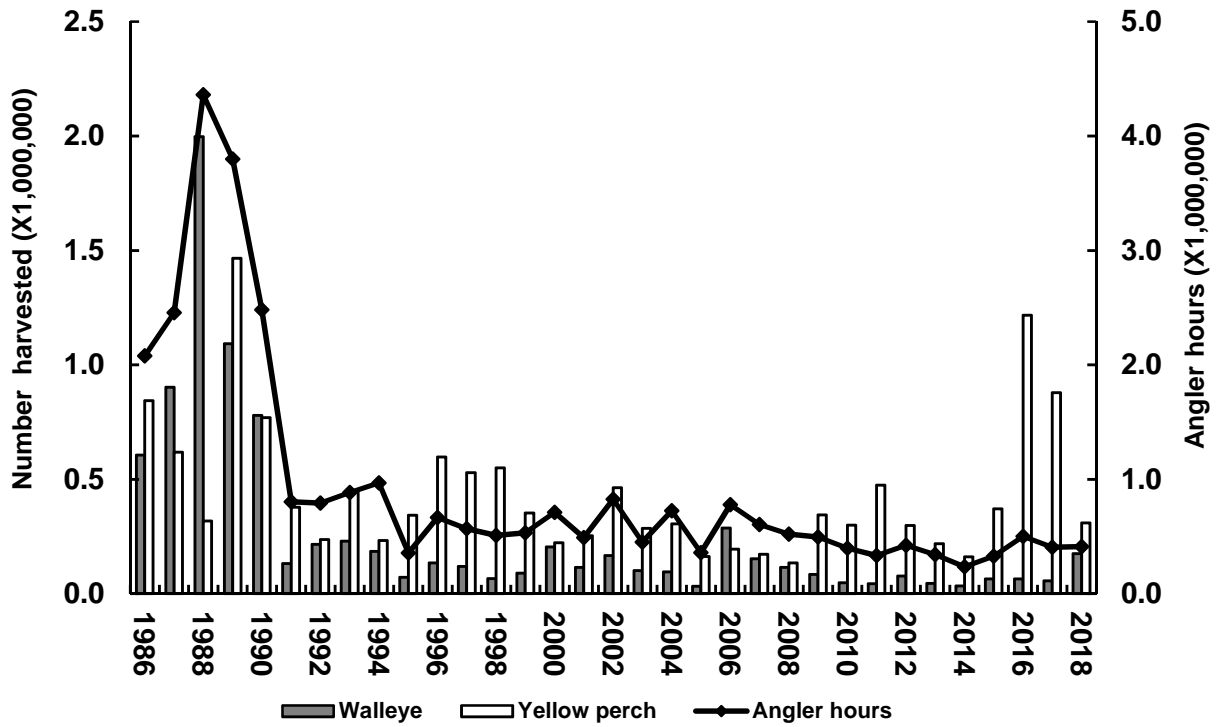


Figure 1. Estimated harvest and effort for Michigan's Lake Erie sport fishery, 1986-2018.

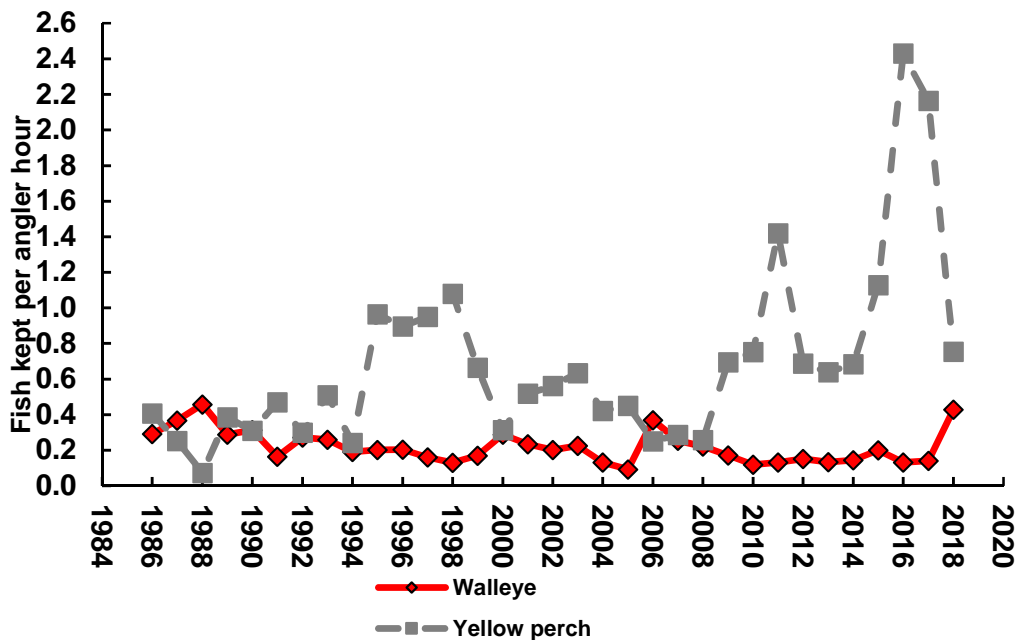


Figure 2. Walleye and Yellow Perch non-targeted harvest rates (fish per hour) for Michigan's Lake Erie sport fishery, 1986-2018.



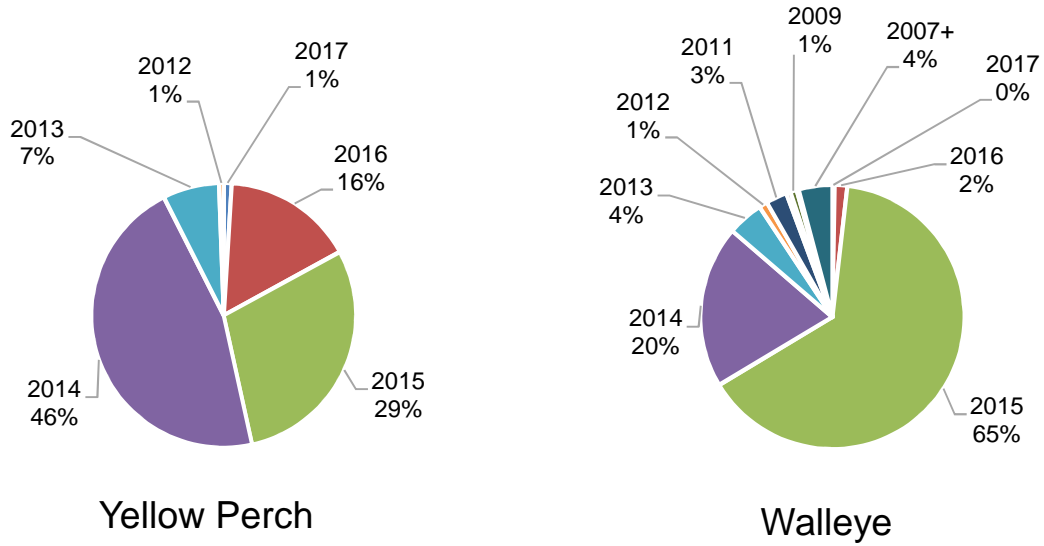


Figure 3. Year-class contribution to Michigan sport harvest for Yellow Perch and Walleye from Lake Erie in 2018.

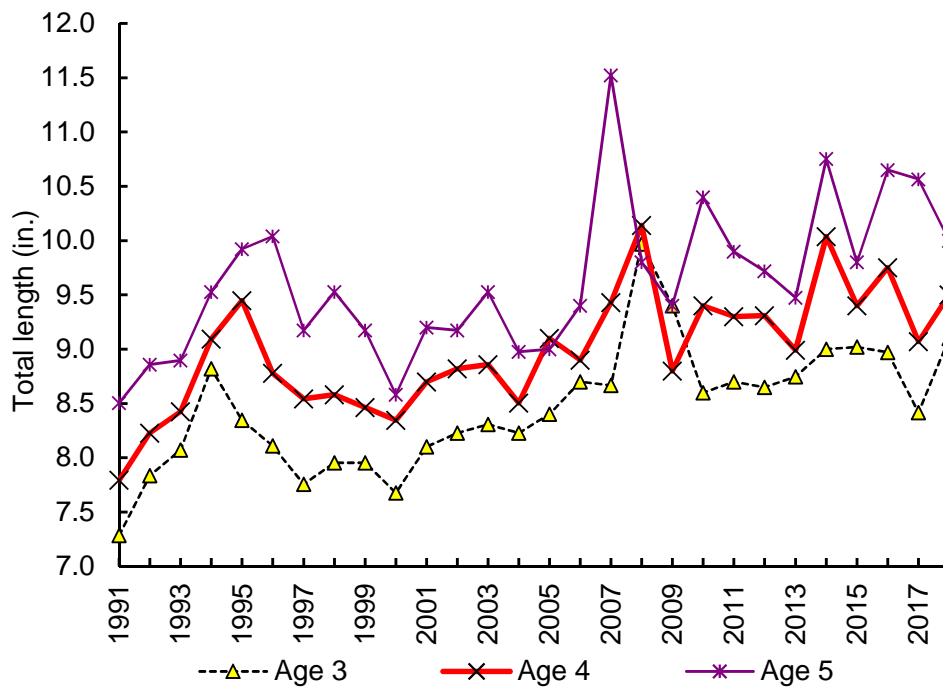


Figure 4. Mean length at age for sport-harvested Yellow Perch from Michigan's waters of Lake Erie, 1991-2018.



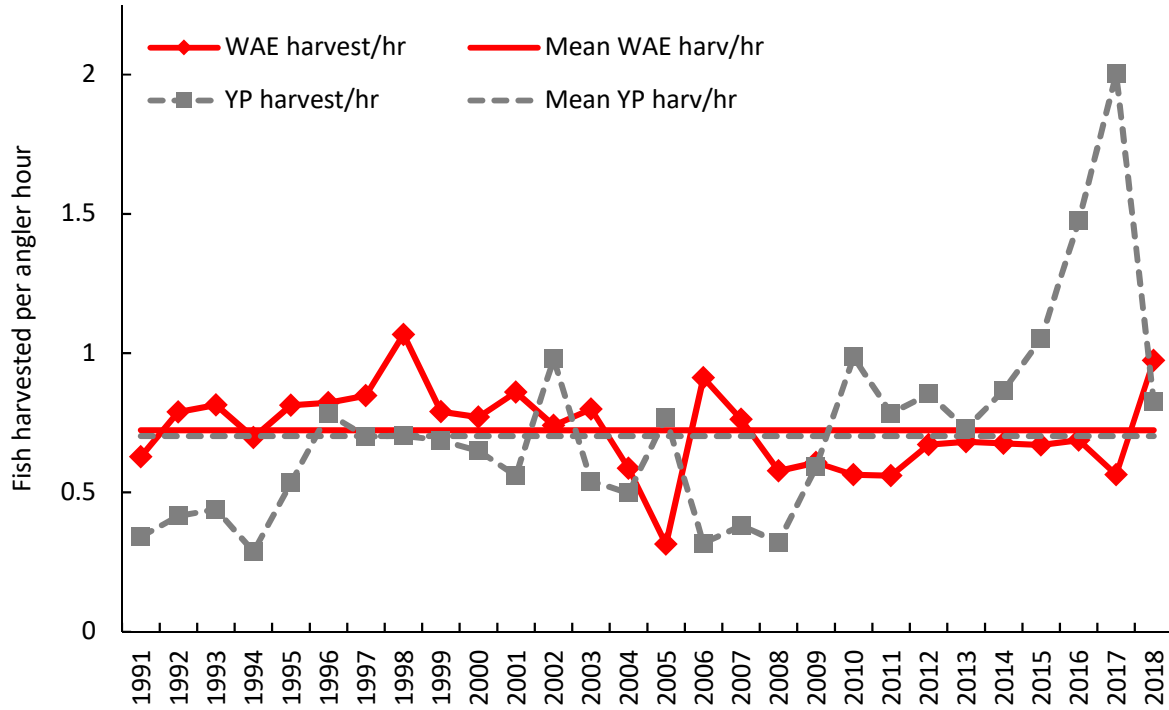


Figure 5. Michigan Lake Erie charter boat non-targeted harvest rates for Walleye and Yellow Perch, 1991-2018.

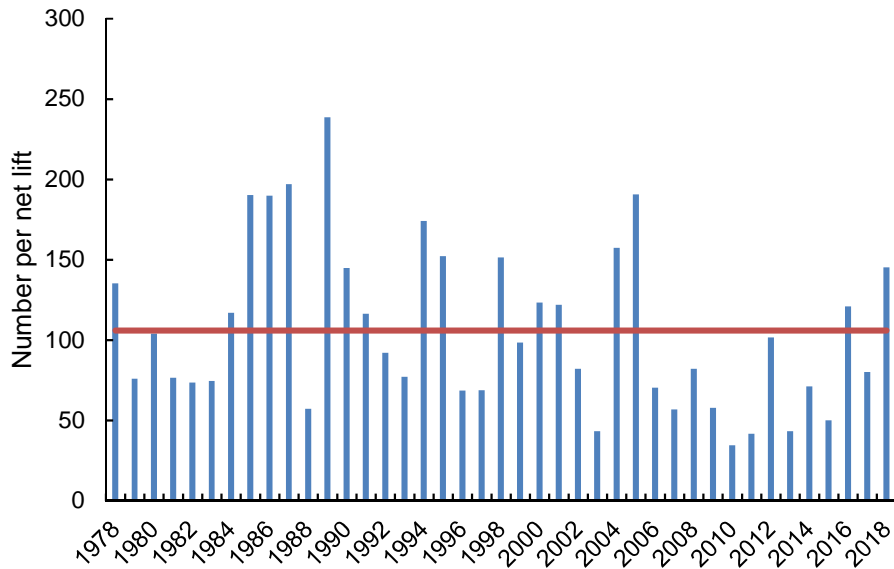


Figure 6. Average total Walleye catch per unit effort, by year for Michigan Lake Erie index gill nets, 1978-2018. The horizontal line represents the average for the time series.



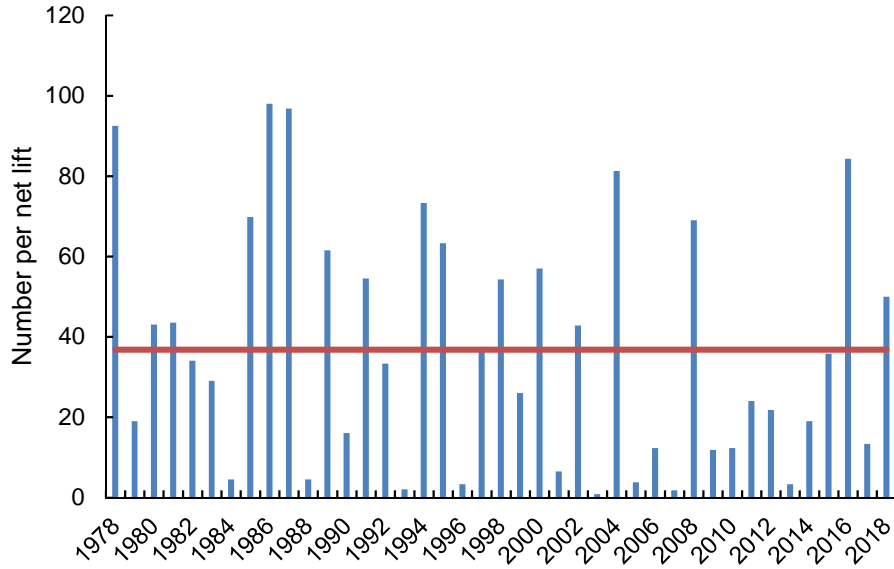


Figure 7. Average yearling Walleye catch per unit effort for Michigan Lake Erie index gill nets, 1978-2018. The horizontal line represents the average of the time series.

Lake St. Clair Non-Charter Targeted Fishing Effort

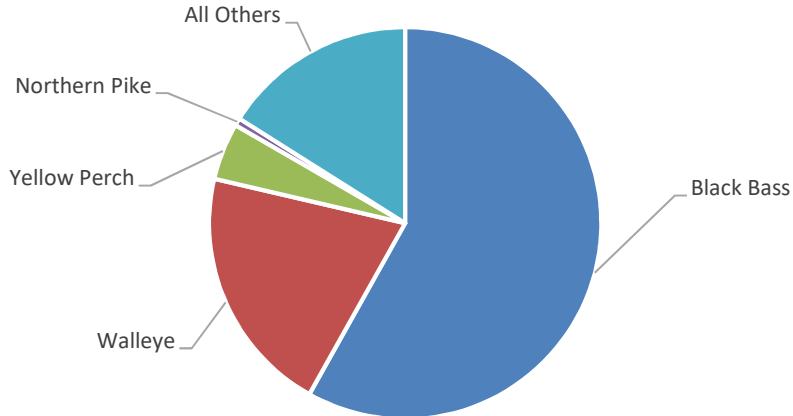


Figure 8. Proportion of recreational angling effort targeting various Lake St. Clair fish species.



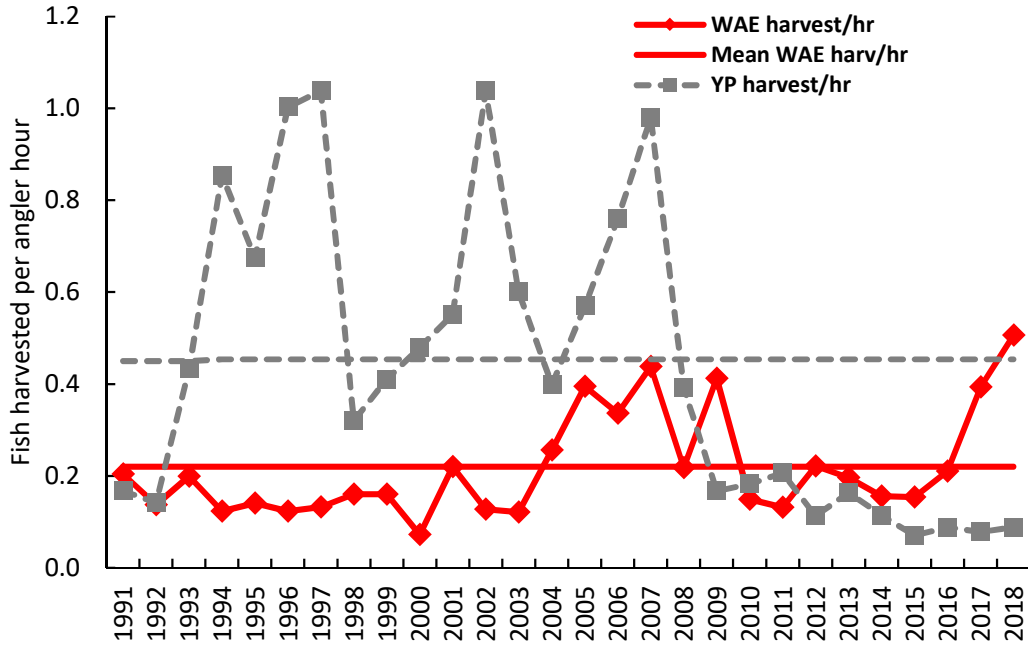


Figure 9. Michigan St. Clair-Detroit River system charter boat harvest rates (total harvest rates) for Walleye and Yellow Perch, 1991-2018.

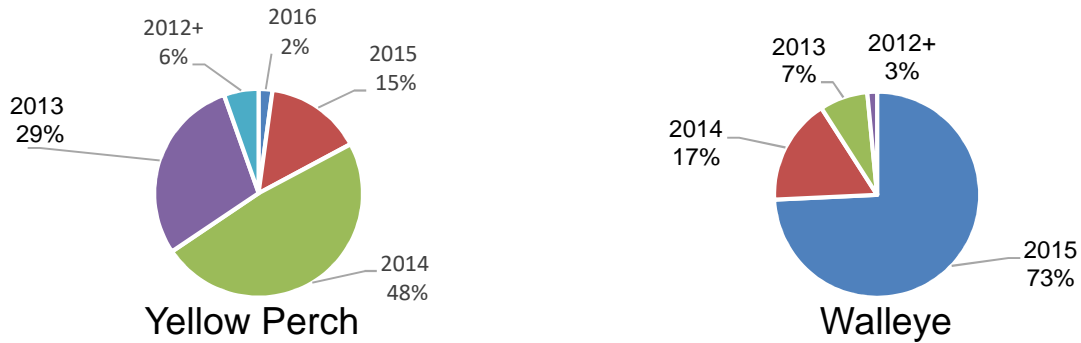


Figure 10. Year-class contribution to Michigan sport harvest for Yellow Perch and Walleye from Lake St. Clair in 2018.



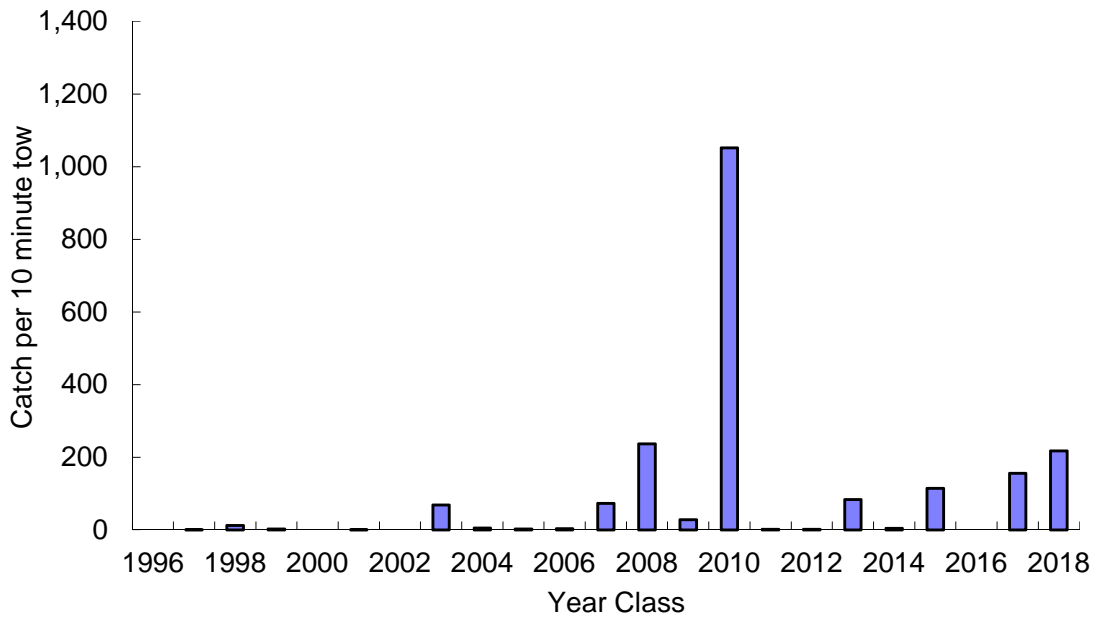


Figure 11. Year-class strength for Yellow Perch in Lake St. Clair as indicated by fall trawl age 0 catch rates, 1996-2018. Note: no trawling occurred in 2016.

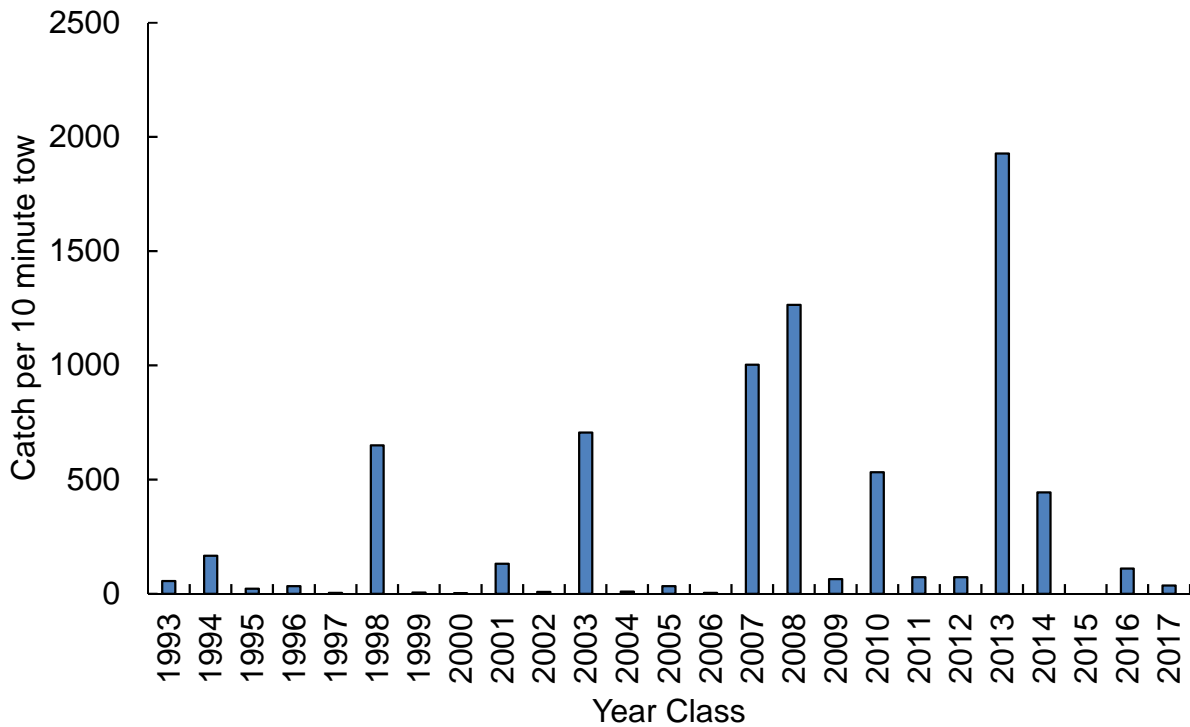


Figure 12. Strength of Yellow Perch year classes as assessed by June trawls. Note: survey year is year class + 1.



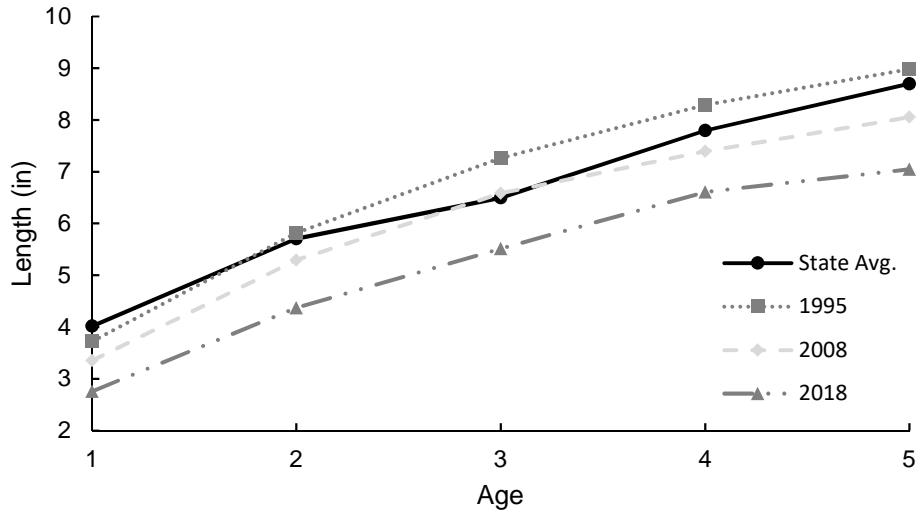


Figure 13. Average length-at-age for Yellow Perch caught in June trawls on Lake St. Clair over three sampling time periods and compared to the state average.

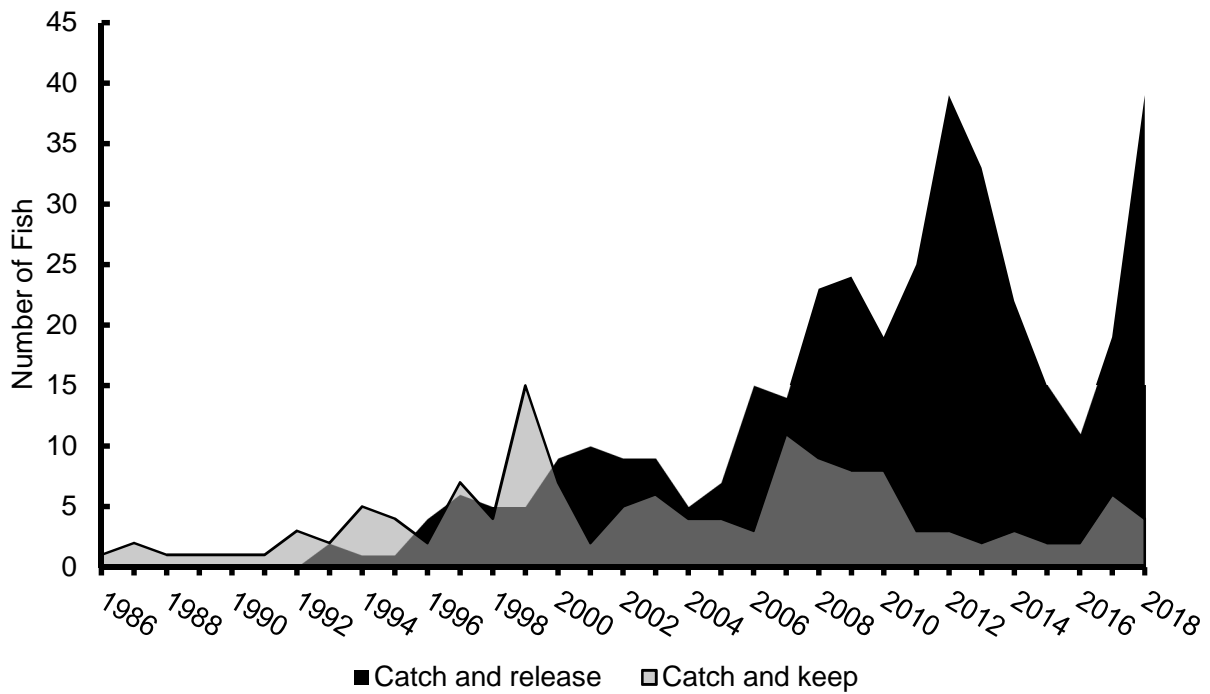


Figure 14. Lake St. Clair Smallmouth Bass entered in the Michigan DNR Master Angler Program, 1986-2018.



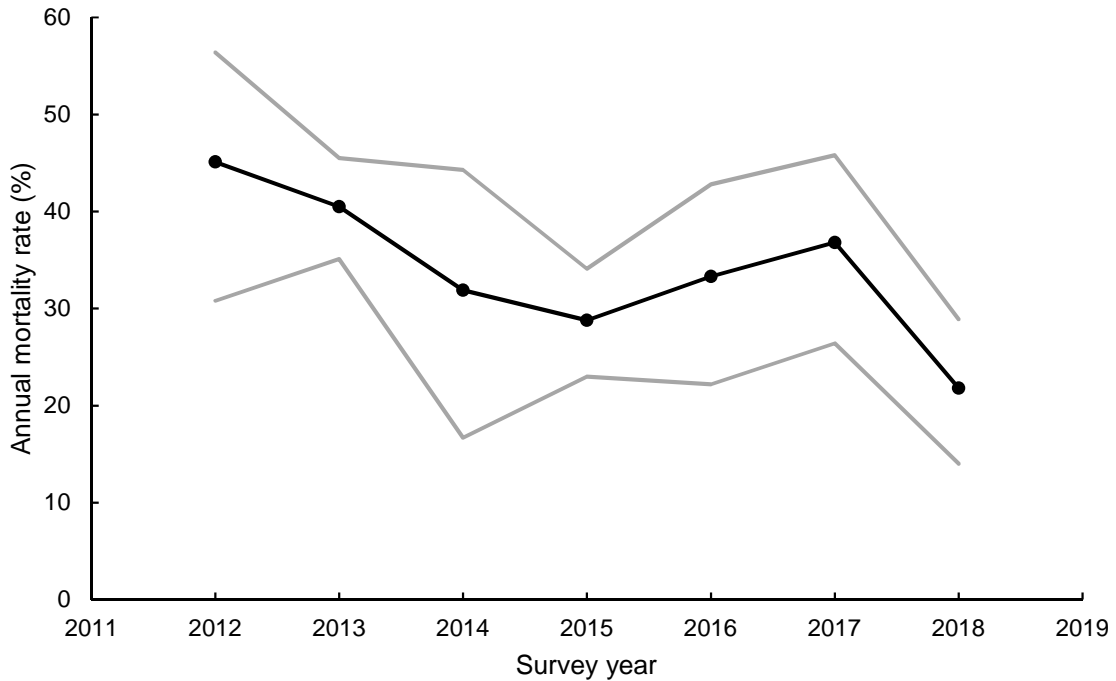


Figure 15. Smallmouth Bass annual mortality rates for Lake St. Clair. Estimated from catch curve regression. Black line and points represent estimates, grey lines represent the upper and lower 95% confidence interval.

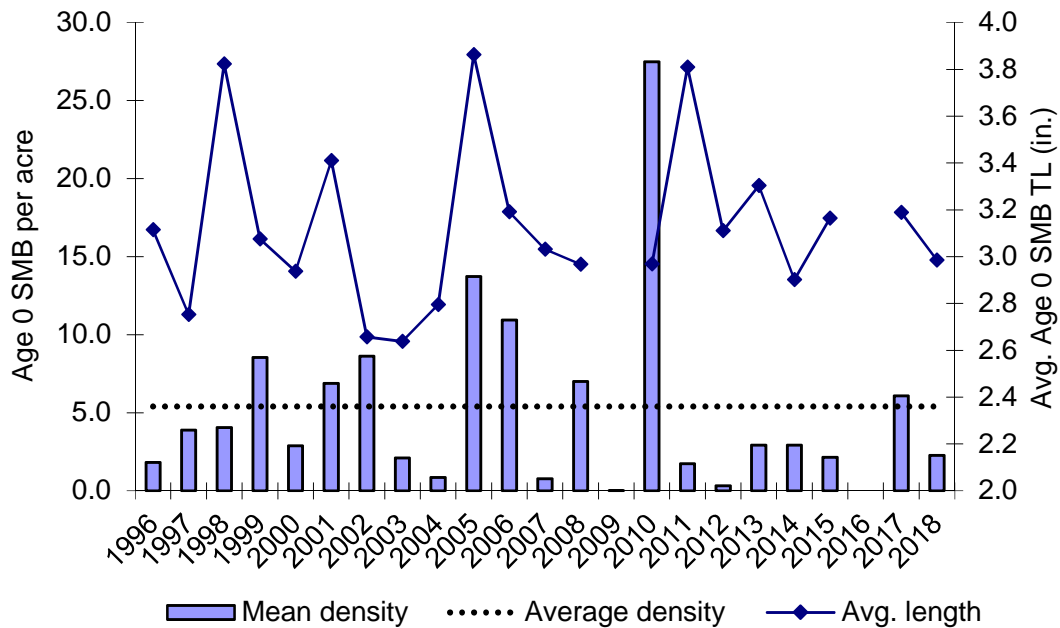


Figure 16. Year-class strength for Lake St. Clair Smallmouth Bass as indicated by fall age-0 catch rates (bars) and average length (solid line), 1996-2018. Average year class strength indicated by the horizontal dashed line.



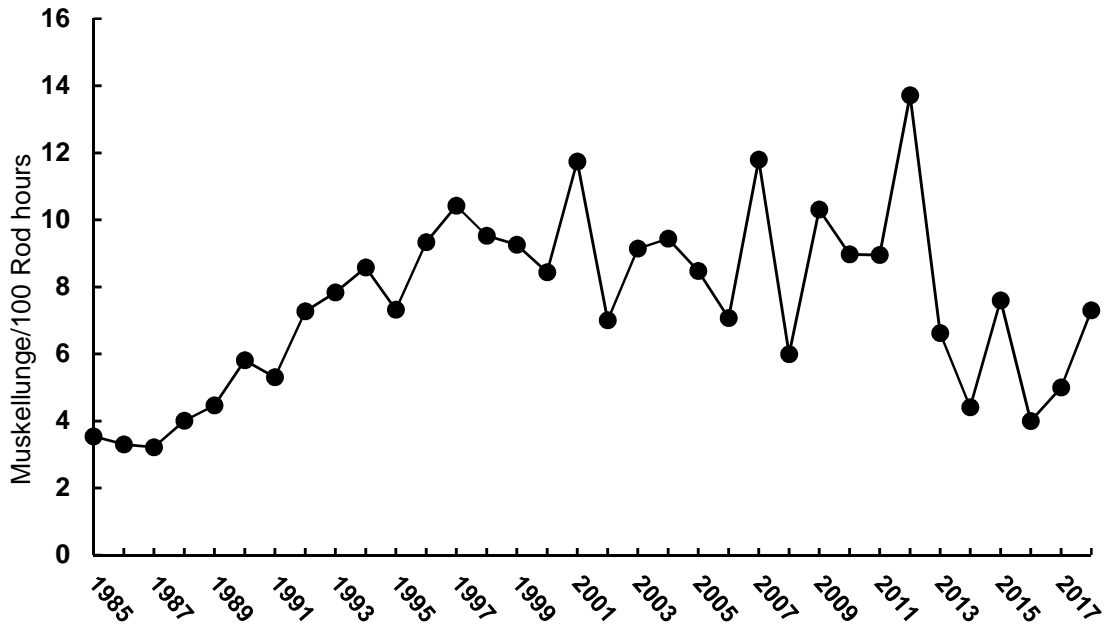


Figure 17. Lake St. Clair Muskellunge catch rate from Angler Diary Program, 1986-2018.

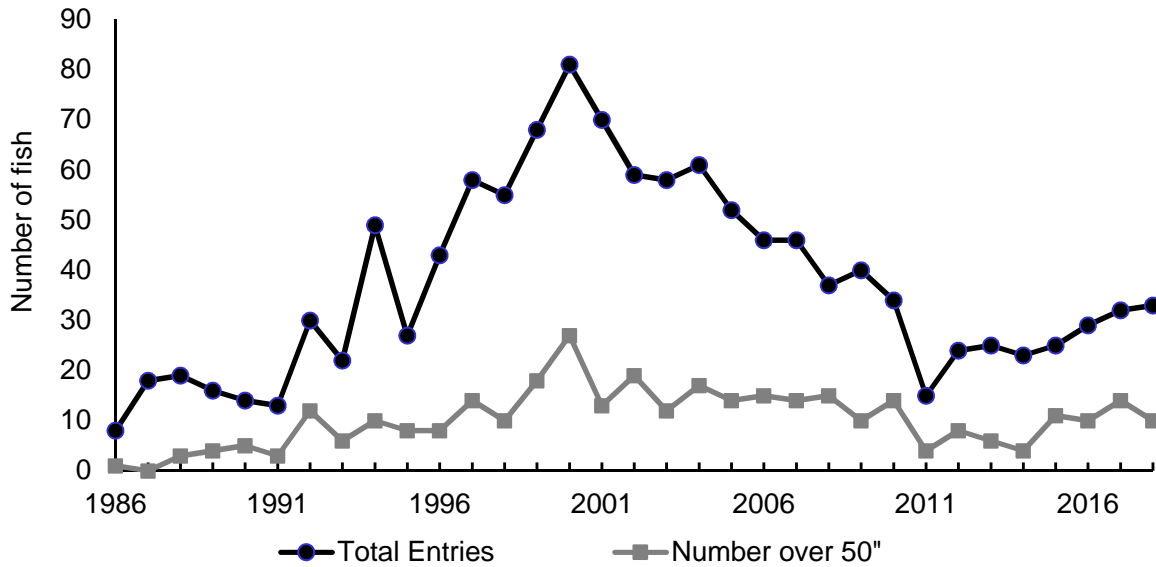


Figure 18. Lake St. Clair Muskellunge entered in the Michigan DNR Master Angler Program, 1986- 2018.



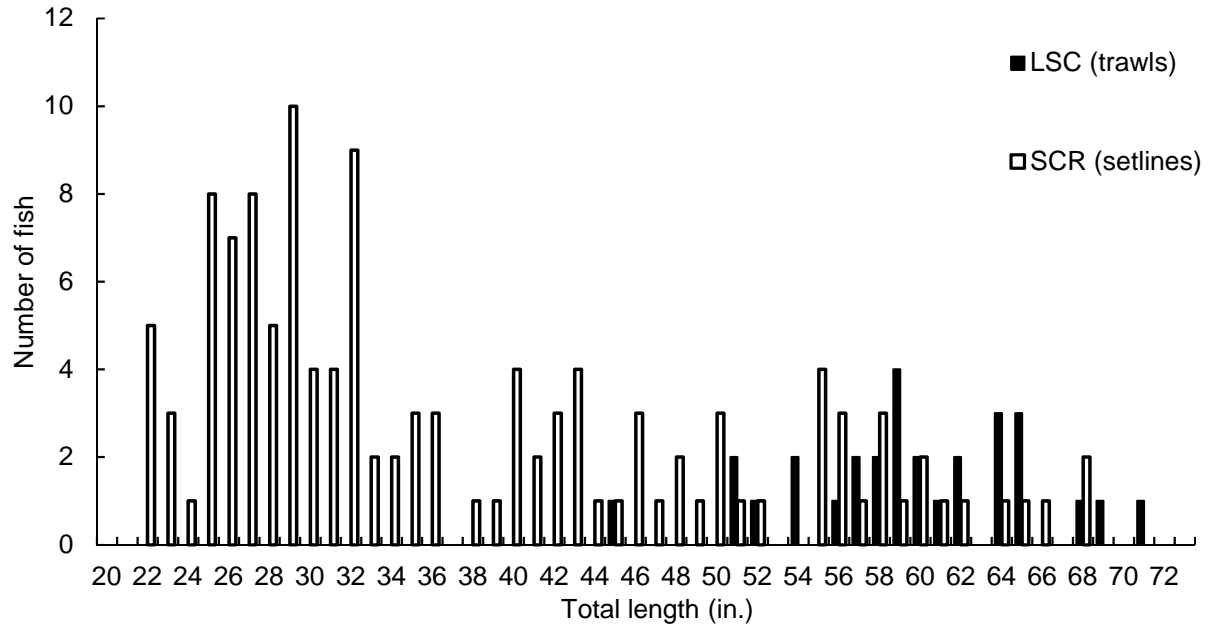


Figure 19. Length frequency distribution for Lake Sturgeon caught in 2018 with survey setlines in the St. Clair River (SCR), and bottom trawls in Lake St. Clair (LSC).



Table 1. Estimated harvest, total harvest rate, effort and released catch for Michigan's 2018 Lake Erie non-charter boat fishery. Released numbers represent legal sized fish where applicable.

Species	Harvest rate (fish/hr)	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
HARVEST									
Yellow Perch*	2.280	25	2,975	6,084	55,970	148,477	74,501	26,773	314,807
Walleye*	0.626	6,885	56,584	73,658	30,736	8,017	68	114	176,089
Channel Catfish	0.002	0	139	124	305	80	144	0	792
White bass	0.012	15	3,970	672	35	51	68	40	4,851
White Perch	0.011	51	1,534	837	1,964	33	0	0	4,419
Freshwater Drum	0.002	0	94	224	229	118	14	0	679
Smallmouth Bass	<0.001	0	0	0	0	65	0	0	65
Total Harvest	1.191	6,998	59,768	79,902	89,267	157,125	70,384	26,928	490,372
EFFORT									
Angler hours		20,713	67,824	89,316	96,834	90,784	30,479	15,631	411,581
Angler trips		3,870	13,384	19,954	21,439	16,974	6,274	3,484	85,379
RELEASED									
Yellow Perch*	0.439	18	387	1,225	7,185	27,837	21,453	5,342	63,447
Walleye*	0.068	900	4,179	10,521	2,434	23	0	34	18,091
Largemouth Bass	0.023	0	36	750	1,221	321	3,320	3,900	9,548
Smallmouth Bass	0.005	0	193	107	367	626	316	302	1,911
White bass	0.222	1,153	43,958	15,071	20,860	7,209	1,866	1,086	91,203

* 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 – 2018.

Year	Buffalo	Bullhead	Common carp	Channel catfish	Gizzard shad	Goldfish	Quillback	hwater 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
Grand Total	1,974,687	382,218	11,494,241	1,631,400	3,885,943	904,167	1,121,011	1,282,217	102,474	1,331,885	389,777	44,853	24,544,873



Table 3. Estimated harvest, total harvest rate, effort, and released catch for the 2018 Lake St. Clair non-charter boat fishery. Released numbers represent legal sized fish where applicable.

Species	Harvest rate (fish/hr)	Month							
		Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow Perch*	0.506	1,949	229	2,472	2,514	5,817	2,021	1,668	16,670
Walleye*	0.489	47	14,046	16,197	9,855	3,130	1,953	122	45,351
Bluegill	0.029	587	189	3,400	4,579	1,047	538	1,509	11,849
Pumpkinseed	0.007	1,612	43	203	668	70	107	64	2,767
Smallmouth Bass*	0.012	0	350	2315	243	714	72	0	3,695
Rock Bass	0.009	71	1,977	1,107	49	316	0	0	3,520
Total Harvest	0.214	4,599	17,773	26,692	18,541	11,459	5,139	3,662	87,865
EFFORT									
Angler hours		12,074	91,302	106,018	109,991	48,428	31,456	12,147	411,416
Angler trips		2,534	15,399	18,875	19,241	8,633	6,017	2,724	73,423
RELEASED									
Walleye*	0.148	76	10,311	3,612	7,826	628	286	58	22,797
Largemouth Bass	0.007	379	6,923	7,462	9,925	1,441	986	338	27,453
Smallmouth Bass*	0.571	2,487	35,804	41,752	44,604	15,876	3,849	1,119	145,491
Yellow Perch*	3.050	5,823	2,054	5,798	18,303	14,407	8,473	4,040	58,899
Northern Pike*	2.3800	108	2,765	1,479	811	516	394	58	6,131
Muskellunge	0.003	0	93	190	446	336	143	0	1,208

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



Table 4. Mean catch per trap net lift for species during spring trap net surveys in Anchor Bay, Lake St. Clair, 2002-2018.

Species	Survey year																	Mean
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Black bullhead	0.02	0.01	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0.00	0.01	
Black crappie	0	0.01	0.12	0	0	0	0	0.02	0.01	0.06	0.08	0.04	0.01	0	0	0.00	0.02	
Bluegill	0.06	0	0.05	0.01	0.02	0	0.05	0	0.01	0.23	0.03	0.07	0.01	0.04	0.02	0.00	0.04	
Brown bullhead	0.02	0.01	0.02	0	0.01	0.01	0	0.02	0.03	0.02	0	0.08	0.01	0	0.03	0.10	0.02	
Channel catfish	1.88	1.85	1.7	1.21	1.76	2.01	3.14	2.22	2.24	1.22	2.64	2.53	3.94	1.61	2.05	1.01	2.06	
Common carp	0.24	0	0.01	0.01	0.03	0	0	0.43	0.34	0.29	0.08	0.15	0.13	0.12	0.20	0.10	0.13	
Common white sucker	0.14	0.08	0.12	0.1	0.1	0.33	0.15	0.06	0.16	0.22	0.03	0.16	0.31	0.12	0.07	0.16	0.14	
Freshwater drum	1.3	4.01	1.68	0.36	2.27	0.47	0.36	0.59	0.66	0.52	0.35	0.38	0.25	0.21	0.44	0.32	0.89	
Gizzard shad	0.04	0.03	0.01	0.03	0.01	0.01	0	0	0	0.01	0.15	0.1	0.01	0.03	0.32	0.05	0.05	
Goldern redhorse	0.01	0.01	0.02	0.02	0.02	0.01	0	0.05	0	0.01	0	0.05	0.02	0.04	0	0.00	0.02	
Lake sturgeon	0.01	0.06	0.03	0.02	0.05	0	0.1	0.05	0.01	0.09	0.01	0.05	0.02	0.08	0.03	0.03	0.04	
Largemouth bass	0.22	0.04	0.11	0.03	0.03	0.1	0.1	0.11	0.06	0.21	0.03	0.18	0.1	0.1	0.04	0.08	0.10	
Muskellunge	0.56	0.52	0.63	0.71	0.48	0.49	0.13	0.83	0.18	0.12	0	0.13	0.08	0.07	0.03	0.01	0.31	
Northern pike	0.9	0.15	0.58	0.87	0.86	0.66	0.55	0.71	1.02	1.11	0.7	1.54	1.67	1.51	1.30	1.25	0.96	
Pumpkinseed	3.02	0.55	0.5	0.03	0.22	0.46	0.71	0.4	0.74	1.54	0.84	0.77	0.44	0.19	1.57	0.16	0.76	
Quillback carpsucker	0.22	0.13	0.25	0.07	0.28	0.06	0.27	0.34	0.32	0.25	0.06	0.15	0.23	0.02	0.15	0.03	0.18	
Rock bass	30.34	13.95	14.65	6.16	15.44	21.73	22.12	29.09	53.81	43.31	36.35	19.33	8.92	15.49	27.59	14.45	23.30	
Shorthead redhorse	1.14	1.9	0.69	0.77	1.62	0.51	1	0.76	1.16	1.3	0.74	0.52	0.37	0.41	0.59	0.54	0.88	
Silver redhorse	0.25	0.27	0.54	0.59	0.95	0.3	0.95	1.37	1.54	1.29	0.26	0.87	0.64	0.44	1.11	0.45	0.74	
Smallmouth bass	4.32	8.16	2.37	1.73	3.83	5.84	2.74	3.5	8.49	6.92	4.01	3.68	3.47	2.29	2.61	2.89	4.18	
Walleye	2.17	1.55	1.15	2.43	2.4	1.72	1.25	1.98	1.03	2.14	1.02	1.91	1.51	1.32	7.18	5.51	2.27	
White bass	0.03	0.05	0.03	0	0.07	0.05	0.27	0.42	0.15	0.26	1.56	0.37	0.47	0	0.33	0.11	0.26	
White perch	0.11	0.05	0.35	0.05	1.11	0.1	0.96	0.44	0.79	0.83	0.67	0.85	0.12	0.08	0.20	0.44	0.45	
Yellow perch	3.08	0.74	2.04	0.51	0.58	2.22	1.59	0.5	0.39	1.31	1.19	0.96	0.86	1.43	3.20	3.62	1.51	
Total all species	50.08	34.14	27.67	15.72	32.19	37.08	36.48	43.97	73.15	63.4	50.8	34.9	23.59	25.6	49.06	31.297	39.32	
Number of net lifts	64	50	55	34	42	50	35	22	54	54	39	46	40	36	36	36		
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		
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		
Starting water temp. (°C)	9	12	8	9	13	9	13	12	14	9	9	8	8	8	11	7		
Ending water temp. (°C)	15	16	15	13	13	13	11	14	17	13	14	15	13	14	13	12		
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			

