DEPARTMENT OF NATURAL RESOURCES

Status of the Fisheries in Michigan Waters of Lake Erie and Lake St. Clair, 2015

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Age-0 muskellunge caught during electrofishing survey, Lake St. Clair, November 2015

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FISHERIES DIVISION

Highlights for 2015

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 Master Angler program, and commercial fishery records, as well as fisheries survey results. Some of the highlights described in detail include:

- The 2015 non-charter angler harvest rate for Lake Erie yellow perch was well above the long-term average, while the walleye harvest rate was slightly below the long-term average.
- Michigan non-charter anglers on Lake Erie caught 82,816 walleye and harvested 65,740 of those fish. Anglers reported releasing higher numbers of sub-legal size walleye in 2015 compared to 2014.
- 2015 Lake Erie index gill net catch rates of walleye for Michigan waters were 30% lower than 2014, but yearling catch rates were 88% higher than for 2014 and near the long-term average.
- The Michigan commercial fishery on Lake Erie harvested over 1 million pounds of fish in 2015, with carp, white bass, channel catfish, freshwater drum, and buffalo accounting for 76% of the total harvest.
- Long-term tagging studies on Lake Erie walleye stocks clearly illustrate the important contribution of Lake Erie walleye to the Great Lakes sport fishery of Southeast Michigan, from Port Huron to Toledo.
- A binational creel survey of the Detroit River in 2015 estimated boat anglers spent over 623,000 hours fishing and harvested a total of over 446,000 fish. White bass, walleye, and yellow perch accounted for a total of 97% of the harvest.
- Lake St. Clair continues to be the premier Michigan water for trophy muskellunge and smallmouth bass based on the number of entries recorded in the Master Angler program in 2015.
- Rock bass, smallmouth bass, and channel catfish were the dominant species in the Lake St. Clair trap net survey in 2015. Over 23% of the channel catfish exceeded Master Angler minimum length.
- Trawl surveys on Lake St. Clair continue to document high abundance of yellow perch, but average size is small. Spottail shiner abundance has declined greatly.

Fishery Forecast for 2016

Harvestable-size yellow perch abundance in the Michigan waters of Lake Erie is forecasted to increase in 2016, with the strong contributions expected from the 2013 and 2014 year-classes. Anglers can expect to see more small perch in their catch. Abundance of legal-size walleye in Lake Erie is expected to increase in 2016. Michigan anglers will continue to find fewer walleye from the strong 2003 year-class, and the fishery will rely heavily on contributions from the strong 2014 and weaker 2013, 2012, 2011, and 2010 year-classes. This is not surprising, as annual variation in reproductive success of walleye and yellow perch can result in substantial year-to-year changes in their abundance. Muskellunge and smallmouth bass numbers tend to remain more stable from year to year and both species should continue to provide excellent fishing opportunities in 2016, particularly in Lake St. Clair and the Detroit River. Still, since weather conditions can affect sport fishing success as much as fish abundance it is difficult to predict fishing success. Water levels in Lake St. Clair, the connecting rivers, and Lake Erie are forecasted to rise to a point above or near their long-term average in 2016. Thus, anglers may find easier access to some shallow water fishing areas.

About the Lake St. Clair Fisheries Research Station

The Lake St. Clair Fisheries Research Station is a unit of the Research Section of the Michigan Department of Natural Resources (MDNR) Fisheries Division. The station conducts research and stock assessment on fish populations of Lake Erie, the St. Clair-Detroit River System (includes the St. Clair River, Lake St. Clair, and Detroit River), and Saginaw Bay. Results of this work are instrumental in fisheries management decisions affecting these waters. The station 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.

Sport Fishery Summary

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. Creel surveys are less frequent on the St. Clair-Detroit River System due to budgetary constraints. Charter boat harvest, release, and angling effort are recorded annually 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.

Another example of an off-site angler survey is an angler diary program, where anglers keep their own records of angling activity and success. 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 the lake. 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.

Lake Erie non-charter recreational fishery

The annual creel survey conducted by the MDNR during 2015 produced a total harvest estimate of 461,826 fish (Table 1) for Michigan's Lake Erie sport fishery (non-charter), representing a substantial increase when compared to harvest in 2014 (222,835 fish). Walleye and yellow perch accounted for 95% of the total harvest, reflecting their continued importance to the sport fishery. Non-charter anglers harvested an estimated 65,740 walleye in Michigan waters of Lake Erie, up substantially from 2014 (34,326 fish). Harvest of bass by Michigan's Lake Erie anglers remained low with an estimate of less than 200 fish harvested. Angler effort in 2015 increased 28% compared to 2014 (Figure 1). The walleye harvest rate in 2015 (0.20 fish/angler hour) increased 30% from 2014, and is close to the long-term average of 0.22 fish/angler hour (Figure 2). The yellow perch harvest rate (1.12 fish/angler hour) increased 39% in 2015, and remained well above the long-term average of 0.57 fish/angler hour. Trends in angler effort and harvest rates for walleye and yellow perch since the mid-1980's suggest that the level of angler effort on Lake Erie is affected by many factors in addition to harvest rates. Other factors, including weather, prey fish abundance, fishing success on other Great Lakes waters, fuel expenses, and regional economic conditions have likely contributed to the comparatively low level of fishing effort since 1991.

Biological data were collected from walleye and yellow perch during the 2015 on-site creel survey. One quarter of harvested walleye in 2015 were age-4 representing the 2011 year class (Figure 3). The age-3 (2012) and age-5 (2010) year classes also provided strong contributions to the 2015 harvest, each representing nearly 20% of the total harvest. In contrast to last season, age-10 and older walleye (including the 2003 year-class as 12 year-old fish) accounted for only 11% of the harvest. The average length of walleye harvested in the sport fishery in 2015 was 486 mm (19.1 in.).

Yellow perch harvest was primarily comprised of age-2 fish (2013 year-class), which accounted for 65% of the total harvest (Figure 3). The average length of harvested age-2 yellow perch was 208 mm (8.2 in.). The overall average length of yellow perch harvested in the sport fishery in 2015 was 216 mm (8.5 in.). Observed average length-at-age for yellow perch taken in the Michigan sport fishery decreased for age-4 and age-5 fish in 2015, while average length of age-3 fish remained similar to 2014 (Figure 4).

Detroit River non-charter recreational fishery

In 2015 the MDNR conducted a creel survey of the Detroit River in collaboration with the OMNRF and the United States Geological Survey. This survey is the first characterization of recreational fishing on the Detroit River since 2002-2005. Recreational anglers spent 623,792 hours fishing

the Detroit River and harvested a total of 446,593 fish (Table 2). White bass were the most commonly harvest fish (224,865 fish) in the Detroit River, representing 50% of the total harvest. Walleye and yellow perch combined represented 47% of the total harvest. Non-charter anglers harvested a total of 135,319 walleye in 2015, representing a harvest rate of 0.22 fish/angler hour, similar to the harvest rate in Michigan waters of Lake Erie in 2015 (0.20 fish/angler hour). Non-charter recreational anglers harvested an estimated 72,412 yellow perch, a catch rate of 0.12 fish/angler hour. Catch rates of yellow perch were substantially lower in the Detroit River, when compared to the Michigan waters of Lake Erie in 2015 (1.12 fish/angler hour). Nearly 77,000 legal-sized bass (largemouth and smallmouth combined) were captured in the Detroit River, and 96% were released. Additionally in 2015, a total of 2,120 legal-sized Muskellunge were captured and none were recorded in the harvest.

Biological data were collected from walleye and yellow perch during the 2015 Detroit River creel survey. The age composition of harvested walleye was dominated by ages 3 and 4 (2012 and 2011 year-classes), which collectively accounted for 54% of the harvest (Figure 5). Age-10 and older walleye accounted for only 10% of the harvest. The average length of walleye harvested in the Detroit River sport fishery in 2015 was 480 mm (18.9 in.). Three-quarters of yellow perch harvested in the Detroit River were age-2 (2013 year-class) (Figure 5). Average length of yellow perch harvested in the sport fishery in 2015 was 217 mm (8.6 in.).

Charter fishery

In 2015, Michigan charter boat operators reported a harvest of 24,491 fish from Lake Erie (Table 3). In combination, walleye (38%) and yellow perch (59%) accounted for 97% of the total harvest. The walleye harvest rate (0.67 fish/angler hour) in 2015 was nearly unchanged from 2014 and remained slightly below the long-term average harvest rate of 0.72 walleye per hour (Figure 6). Yellow perch harvest rate (1.06 fish/angler hour) increased 22% from 2014, exceeding the long-term average of 0.63 yellow perch per hour for the 6th consecutive year. The charter boat walleye harvest rate was 3.4 times higher than those estimated for non-charter anglers (0.20 fish/angler hour) in 2015, while the yellow perch charter harvest rate was about 7% less than the rate for non-charter boat anglers (1.13 fish/angler hour).

Beginning in 2010, Michigan charter boat operators were also required to report catch-and-release fishing activity as well as harvest. For Lake Erie, charter operators reported releasing 11,257 fish in 2015 (Table 3). About 48% of the released fish were from the “other species” category, which is composed largely of white perch, white bass, freshwater drum, and channel catfish. Lake Erie charter boat operators reported a total catch of 13 muskellunge with 1 fish harvested in 2015.

For the St. Clair-Detroit River System, charter boat anglers reported a harvest of 9,783 fish (Table 4). Walleye (50%), yellow perch (23%), and smallmouth bass (22%), made up the bulk of the harvest. In 2015, charter boat harvest rate for walleye was nearly unchanged from 2014, but remained below the long-term average walleye harvest rate of 0.20 walleye per hour (Figure 7). Yellow perch harvest rate decreased 38% in 2015 and remained well below the long-term yellow perch harvest rate of 0.51 yellow perch per hour.

Charter operators on the St. Clair-Detroit River System reported releasing 21,335 fish (Table 4). Smallmouth bass (76%) and muskellunge (8%) accounted for the majority of the fish caught-and-released. For smallmouth bass, charter operators released 88% of the 18,300 smallmouth bass caught in 2015. Of the 1,747 muskellunge reported caught, 1 fish was harvested, for a release rate of 99.9%.

The number of reported Michigan charter excursions on Lake Erie decreased 9% in 2015, and remained well below the levels reported prior to 2004 (Figure 8). In 2015, charter boat excursions on the St. Clair-Detroit River System increased 27% from 2014. We suspect much of the increase in reported St. Clair System charter excursions since 2010 has been the result of the new reporting requirement for catch-and-release fishing activity. For many years, much of the charter fishing activity on the St. Clair-Detroit River System has been catch-and-release oriented, and was largely unreported.

Sport Fishery Diary and Master Angler programs

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 2015, the catch rate increased more than 50% from the low level recorded in 2014 (Figure 9). This rebound in 2015 continues a pattern of increased variability in catch rates over the past 13 years. We suspect this increased variability may be more reflective of the lower number of muskellunge anglers involved in the diary program, than of actual changes in the muskellunge population. Overall, angler participation in the diary program has waned and efforts to recruit new participants have not been very successful.

For years, the quality of the Lake St. Clair muskellunge fishery was reflected in the MDNR's Master Angler Program. Lake St. Clair continued to dominate the statewide Master Angler entries for muskellunge in 2015, with 26 of the 47 total entries originating from the St. Clair System. However, the number of Lake St. Clair muskellunge Master Angler entries has generally declined since 2000 (Figure 10). We suspect this is largely a reflection of waning interest in submitting Master Angler entries for muskellunge less than 50" in length, which has become a local "trophy" benchmark for muskellunge from the St. Clair-Detroit River System. By all accounts, the muskellunge population continues to provide exceptional fishing opportunities. We expect that the following factors will continue to contribute to a strong muskellunge population and fishery in Lake St. Clair and the connecting waters: 1) a 44" minimum size limit (MSL) for Ontario waters and a 42" MSL with 1 fish per year harvest limit for Michigan waters of the St. Clair System; 2) physical and biological changes in the lake such as clearer water and increased aquatic plant growth resulting in improved habitat for muskellunge; and, 3) extensive voluntary practice of catch-and-release fishing for muskellunge in Lake St. Clair by both charter and non-charter anglers.

Statistics from the Master Angler program indicate that Lake St. Clair is one of the premier waterbodies in the state for trophy smallmouth bass. Lake St. Clair accounted for 20% (17 entries) of all smallmouth bass entries statewide in 2015 (catch/keep and catch/release programs combined). No other single waterbody in the state produced more than 2 smallmouth bass entries in 2015. From the early 1990's through 2011, Master Angler smallmouth bass entries from Lake St. Clair exhibited an increasing trend (Figure 11). Since 2012, entries have declined. Catch/release entries have outnumbered catch/keep entries for the last 15 years. The 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.

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. However, a small-mesh trap net license has been active since 2006 resulting in an increased harvest of open water species such as channel catfish, freshwater drum, white bass, and white perch. In 2015, a total of two Michigan commercial fishing licenses were active on Lake Erie. The 2015 commercial harvest included 13 types of fish for a total of 1,025,959 pounds (Table 5). In combination, common carp (22%), white bass (17%), channel catfish (14%), freshwater drum (13%), and buffalo (10%) accounted for 76% of the total harvest by weight. The major species in the trap net harvest included white bass, freshwater drum, and quillback. The primary species in the seine harvest included common carp, channel catfish and goldfish. The total value of the 2015 Lake Erie commercial harvest from Michigan waters was estimated at $727,928 (Table 5). The 2015 harvest of channel catfish was the highest since 1981 (Table 6). The 2015 harvests of goldfish, white perch, and white bass were the second highest reported since 1981. There is no commercial fishing in Michigan waters of the St. Clair-Detroit River System.

Summary of Netting Surveys

The MDNR conducts a number of 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. In 2014 and 2015, a bottom trawl survey was conducted in the Michigan waters of Lake Erie to measure recruitment of important fish species. 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 the lake have been assessed with bottom trawls each spring and fall since 1996. A setline survey has been used to monitor the lake sturgeon population in the North Channel of the St. Clair River 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

A bottom trawl fish community survey was completed during 2015, which is the second time since the 1970's that this type of effort has been accomplished by the MDNR in Michigan waters of Lake Erie. Eight sites previously sampled by the United States Geological Survey, including the two index gill net stations, were selected for sampling in 2015. A total of 6,982 fish representing 17 different species were captured during 8 trawl tows for an average catch per effort (CPE) of 1,033 fish/10-minute tow. White perch (43%) dominated the catch of forage-size species, followed by mimic shiner (30%), yellow perch (17%), and round goby (6%). A combination of spottail shiner, trout-perch, logperch, freshwater drum, white bass, walleye, rainbow smelt, gizzard shad, and smallmouth bass comprised the remaining 4% of the forage-size catch. The non-forage size (adult) catch was dominated by yellow perch (37%) followed by freshwater drum (29%), channel catfish (14%), and white perch (13%). The remaining 7% of the non-forage size catch was composed of gizzard shad, walleye, white bass, white sucker, quillback, and shorthead redhorse.

In 2015, a total of 446 fish representing 12 species were captured during four net lifts completed during the annual October gill net survey in Michigan waters of Lake Erie. Walleye (44%) and gizzard shad (36%) comprised over three-quarters of the catch by number, followed by white perch (6%), white bass (5%), channel catfish (4%), and yellow perch (2%). The remaining six species (quillback, freshwater drum, goldfish, black redhorse, golden redhorse, and goldfish X carp hybrid) accounted for less than 3% of the total catch. The average CPE of white perch (7 fish/lift) in 2015 was the lowest average white perch CPE observed since 2003 and is the 4th lowest observation on record since data on species other than walleye were first recorded in 1992.

The average total walleye CPE for the two index sites (50 fish/lift) decreased by 30% from 2014 (Figure 12). The decrease was due to lower catch rates of age-3 and older walleye, which accounted for 15% of the total catch. The average CPE of yearling walleye (36 fish/lift) was 88% higher than the CPE recorded for the 2013 year-class (Figure 13) and is equal to the average CPE of 36 fish/lift for the 1978-2014 time series. The 2014 year-class (age 1) was the most abundant cohort in the survey, accounting for 72% of the catch. Combined, the 2013-2014 year-classes will be the largest component of the Michigan Lake Erie walleye fishery in 2016.

Lake St. Clair and St. Clair River

In 2015, four trap nets were fished from April 27 to May 18 at index net sites in Anchor Bay. The sampling period was characterized by cool and unusually clear water conditions. The trap nets were visible from the surface on nearly every day of the survey. A total of 1,623 fish representing 21 species were captured during the survey. The catch also included a total of 2 mudpuppies. As usual, rock bass were numerically dominant, accounting for 59% of the total catch (Figure 14). Other common species in the nets included smallmouth bass (10%), channel catfish (7%), and northern pike (7%).

Ages were estimated for smallmouth bass (N=162), northern pike (N=105), and walleye (N=72) based on interpretation of dorsal spine or fin ray samples. Smallmouth bass ranged from age-3 to age-15. The 2011 (20%) and 2010 (30%) year-classes accounted for 50% of the total trap net smallmouth bass catch in 2015 (Figure 15). Northern pike ages ranged from 2 to 9 years. The 2012 (27%), 2011 (33%), and 2010 (21%) year classes accounted for 81% of the total northern pike catch. The dominant walleye cohort was the 2012 year-class (age-3), accounting for 33% of the total catch. Walleye ranged from age-2 to age-12. A total of 153 smallmouth bass were tagged and released at the Anchor Bay trap net site in 2015.

The trap net survey documented an abundant population of channel catfish in Anchor Bay including many trophy size individuals. The average weight of channel catfish captured during the 2015 trap net survey was 7.3 pounds. Over 23% of the channel catfish exceeded the minimum size requirement (27 inch total length) for the MDNR Master Angler program. Lake St.

Clair anglers are discouraged from keeping large channel catfish for food due to consumption advisories as a result of PCB contamination. However, catch-and-release trophy channel catfish angling opportunities are clearly available in Anchor Bay during the spring.

Over the 14 years of the trap net survey in Anchor Bay, rock bass have dominated the catch (Table 7). Smallmouth bass CPE has varied considerably, while walleye CPE has been fairly steady. We suspect smallmouth bass catch rates in the trap nets are related to spawning movements during the survey period and are likely affected by annual variations in the warming of the waters of Anchor Bay. Sturgeon catch rates are low, but a few are captured in the trap nets each year.

The forage fish community of Lake St. Clair has been surveyed with bottom trawls each year since 1996 by the MDNR. A total of 9 trawl tows were conducted at the Anchor Bay index trawling site in 2015. The spring samples were dominated by yellow perch (Table 8). The species with highest average densities in the fall samples were yellow perch, round goby, and logperch (Table 9). Spottail shiner densities in both the spring and fall 2015 index trawls were among the lowest seen during the time series. Alewife catches have been low since 2003, likely a result of the alewife population crash in Lake Huron. Trawl catch rates by year-class, when summed across years, indicate highly variable recruitment for yellow perch in Lake St. Clair (Figure 16). Yellow perch recruitment in 1998, 2003, 2007, 2008, 2010, and 2013 was strong, with total June index trawl CPE values for those year-classes all over 1,000 fish. Growth rates for Anchor Bay yellow perch, based on June trawl survey samples, have declined and are now well below the statewide average for age-1 to age-4 fish (Figure 17). During recent years, a high proportion of the age-1 males caught during the June trawl survey have been sexually mature. Factors contributing to early maturation and slow growth for yellow perch in Anchor Bay remain unclear.

September trawling in Anchor Bay provides early indications of spawning success for yellow perch and smallmouth bass. Catch rates for young-of-year yellow perch from September trawls indicate spawning success in 2015 was similar to the strong year-class produced in 2013 (Figure 18). In combination, the strong 2013 and 2015 year-classes will contribute to the Lake St. Clair fishery over the next several years.

Smallmouth bass recruitment patterns are variable based on September trawl catch rates of young-of-year (Figure 19). The 2015 year-class densities were about the same as for 2011 and much less abundant than the record high densities recorded for the 2010 year-class. Population studies have suggested that average length of young-of-year smallmouth bass in the fall can be more important than abundance in determining year-class strength. The average length of young-of-year smallmouth bass caught in 2015 was above the long-term average length recorded since 1996, suggesting the 2015 year-class may be a major contributor to the fishery in the future.

Exploratory work in October and November in nearshore areas of Anchor Bay showed that electrofishing was a reliable method for collecting young-of-year muskellunge. Sampling at 9 locations along the west shore of Anchor Bay resulted in the capture of 30 young-of-year muskellunge in 4.5 hours of shocking, for a catch rate of 6.6 fish/hour. Further work to evaluate this survey as a measure of annual muskellunge spawning success is planned for 2016.

A total of 115 lake sturgeon were collected during assessment surveys on Lake St. Clair and the St. Clair River in 2015. Captured sturgeon averaged 46.2 inches (1,174 mm) in total length, with a range from 21.1 inches (536 mm) to 72.0 inches (1,829 mm). A total of 87 sturgeon were caught in the St. Clair River during the annual setline survey, while 23 fish were caught with trawls in Lake St. Clair during July – September. The length frequency for setline and trawl captured sturgeon in 2015 illustrates the higher proportion of large individuals in the trawl catch in the lake (Figure 20). Smaller (juvenile) fish are proportionately more common in the setline sampling in the St. Clair River. We suspect this reflects a difference in the actual size structure of the 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 2003 to include small hooks, providing a less size-biased sample of the sturgeon population. In 2015, minnow traps were fished on each setline, producing a total catch of 12 northern madtom, a state-listed endangered fish species.

Fish Tagging Studies

The MDNR uses a number of different tagging methods that are dependent upon the type of fish being tagged and the purpose for tagging, which can include estimating fish abundance, growth, mortality, exploitation, and movement. The tags most commonly used by the MDNR in the St. Clair-Detroit River System and Lake Erie are metal tags located on the jaw of walleye and smallmouth bass or on the dorsal fin of lake sturgeon. Angler cooperation is an essential component of fish tagging programs, and all anglers are encouraged to report tagged fish by filling out the on-line form available at: http://www.michigandnr.com/taggedfish/.

Lake Erie

Although Michigan placed walleye tagging in Lake Erie on indefinite hold in 2011, the capture of fish tagged in previous years continues to be reported by anglers. During 2015, two tag returns were reported from fish tagged in the Huron River at Flat Rock. An additional nine tag returns were reported from fish tagged near the Raisin River. The long-term distribution of tag recoveries from walleye tagged in the Huron River at Flat Rock show that these fish tend to be captured along the south and western shores of Lake Erie, in the Detroit and St. Clair rivers, and on Michigan's side of Lake St. Clair (Figure 21). In contrast to the localized movements of smallmouth bass tagged in Lake St. Clair, recoveries of tagged Lake Erie walleye continue to provide evidence of substantial movement from spawning locations in Lake Erie through the connecting waters of the St. Clair-Detroit River System. For example, recoveries of walleye tagged at the Huron River in Flat Rock show they have travelled to the Detroit River, Lake St. Clair, the St. Clair River, and even southern Lake Huron. However, it is obvious from tag recovery patterns that other individuals from the Lake Erie spawning stocks migrate within the lake, travelling as far as the Central and Eastern basins.

Lake St. Clair and St. Clair River

In 2015, Michigan tagged a total of 153 smallmouth bass with non-reward jaw tags in Anchor Bay of Lake St. Clair. A total of 6 non-reward tags placed on smallmouth bass in 2015 were recovered by anglers for a single-season reporting rate of 3.9%. The 2015 reporting rate marked the second decrease in tag reports in five years and was two-thirds the 6.0% reporting rate observed in 2014. The 2015 tag reporting rate is closest to the 3.1% reporting rate observed in 2010. Walleye captured during the spring trap net survey were not tagged, although two walleyes that were tagged in Lake St. Clair during previous surveys were reported by anglers in 2015.

Since 2002, a total of 5,061 smallmouth bass captured in survey trap nets in Anchor Bay have been tagged and released. In contrast to Lake Erie walleye, 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 Bolles Harbor area of Lake Erie (Figure 21).

One smallmouth bass tagged in Anchor Bay was recovered from Whitmore Lake in Washtenaw County in 2011 (Figure 21). As there is no connection between the two water bodies this fish was illegally transported from Lake St. Clair to Whitmore Lake and released, where it was subsequently recaptured and reported. Anglers are reminded that the unauthorized transfer of fish from one water body to another poses significant risks, particularly for introduction of invasive species or diseases such as viral hemorrhagic septicemia (VHS; the illness responsible for large fish die-offs in the Great Lakes region during the early 2000s).

A total of 2,958 lake sturgeon have been tagged and released in the St. Clair River and Lake St. Clair since 1996. To date, 579 tagged lake sturgeon have been recaptured with survey gear or reported by fishermen. A total of 368 tagged sturgeon have been recovered with survey setlines in the North Channel. One was recovered in a survey trap net in Anchor Bay, while 13 have been recaptured in assessment trawls on Lake St. Clair. Sport anglers have reported 161 recoveries, nearly all from the St. Clair River North Channel, except for one reported from Lake Erie, near Huron, Ohio. Twenty-one 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. One recovery came from a commercial trap net near Gravelly Shoal Light, in Lake Huron near Au Gres, Michigan, a distance of approximately 160 miles. All other recaptures have occurred within 10 miles of the tag sites.

Sport Fishing Regulations

Walleye in Lake Erie are managed cooperatively with other jurisdictions under a harvest quota system. Since 2011, the walleye daily bag limit for anglers in Michigan waters of Lake Erie has been directly related to the Total Allowable Catch (TAC) for walleye determined by the Great Lakes Fishery Commission Lake Erie Committee (LEC) in late March. The table below provides the quota thresholds used to determine the daily bag limit under this regulation. The walleye daily bag limit regulation is effective from May 1 through the end of April in the following year. For 2015, the LEC agreed upon a TAC of 4.11 million walleye, with a Michigan quota of 240,000 walleye. This quota set the Michigan walleye daily possession limit at 6 fish from May 1, 2015 to April 30, 2016. The 2016 daily possession limit for walleye fishing in Michigan waters of Lake Erie will be announced in April. The Michigan walleye minimum size limit (15 inches) and season (open all year) for Lake Erie waters remain unchanged for 2016.

MI walleye quota	Daily bag limit
more than 108,364 fish	6
96,958 to 108,364 fish	5
85,551 to 96,957 fish	4
74,144 to 85,550 fish	3
62,737 to 74,143 fish	2
less than 62,737 fish	1

In 2015, Michigan bass fishing seasons were changed to provide year-round bass fishing opportunities. Catch-and-immediate-release bass fishing is now legal all year. The possession season for smallmouth and largemouth bass fishing in the Michigan portion of the St. Clair River, Lake St. Clair, and the Detroit River is the third Saturday in June (June 18, 2016) thru December 31. The black bass possession season for the Michigan waters of Lake Erie opens on the Saturday before Memorial Day (May 28 in 2016).

The latest information on all of Michigan's fishing regulations, including those of the Great Lakes and its connecting waters in Southeast Michigan, can be found on-line at: https://www.michigan.gov/fishingguide.

Station News - 2015

There have been staffing changes at the Lake St. Clair Fisheries Research Station during the past year. Todd Wills was promoted to Area Station Manager in spring 2015. Todd is now responsible for supervising staff and research activities at both the Lake St. Clair Station as well as the Alpena Fisheries Research Station. The biologist position left vacant with Todd's promotion was filled when Dr. Jan-Michael Hessenauer joined the station crew in November 2015. Jan-Michael grew up in Farmington, Michigan. He received a Bachelor of Science degree in Environmental Biology and a Master's Degree in Fisheries and Wildlife from Michigan State University. Jan-Michael earned his Ph.D. with a concentration in Natural Resources from the University of Connecticut. Jan-Michael's research interests include genetics, physiology and the interactions between anglers and fish populations. He has a strong background in population modeling and biological statistics. Jan-Michael is also an avid angler.

Construction of an electrofishing vessel was completed in winter 2015. The *RV Mooneye* has proven to be useful for sampling fish in the shallow, vegetated nearshore areas around Lake St. Clair and the St. Clair River delta. It was used to collect adult walleye in the lower Detroit River in spring 2015 for an ongoing telemetry study. The *Mooneye* also proved effective for sampling age-0 muskellunge along the western shoreline of Lake St. Clair during the fall. Plans are underway for developing a nearshore fish community survey for Lake St. Clair and the *Mooneye* will be a major component of that survey.

The *RV Channel Cat* has been the primary work platform for many of the long-term surveys conducted by the Lake St. Clair station. The vessel was originally purchased and outfitted for survey work in the late 1960's. During winter 2015-16, the *RV Channel Cat* was repowered. The original twin Detroit Diesel 6V53 engines have been replaced by new twin Cummins QSB6.7 engines. Old Borg Warner transmissions were replaced with new Twin Disc transmissions. The original mechanical shifters and gauges have been replaced with electronic systems. The new engines are expected to be 50% quieter, more fuel efficient, and environmentally cleaner. Sea trialing of the new systems will be completed in spring 2016.

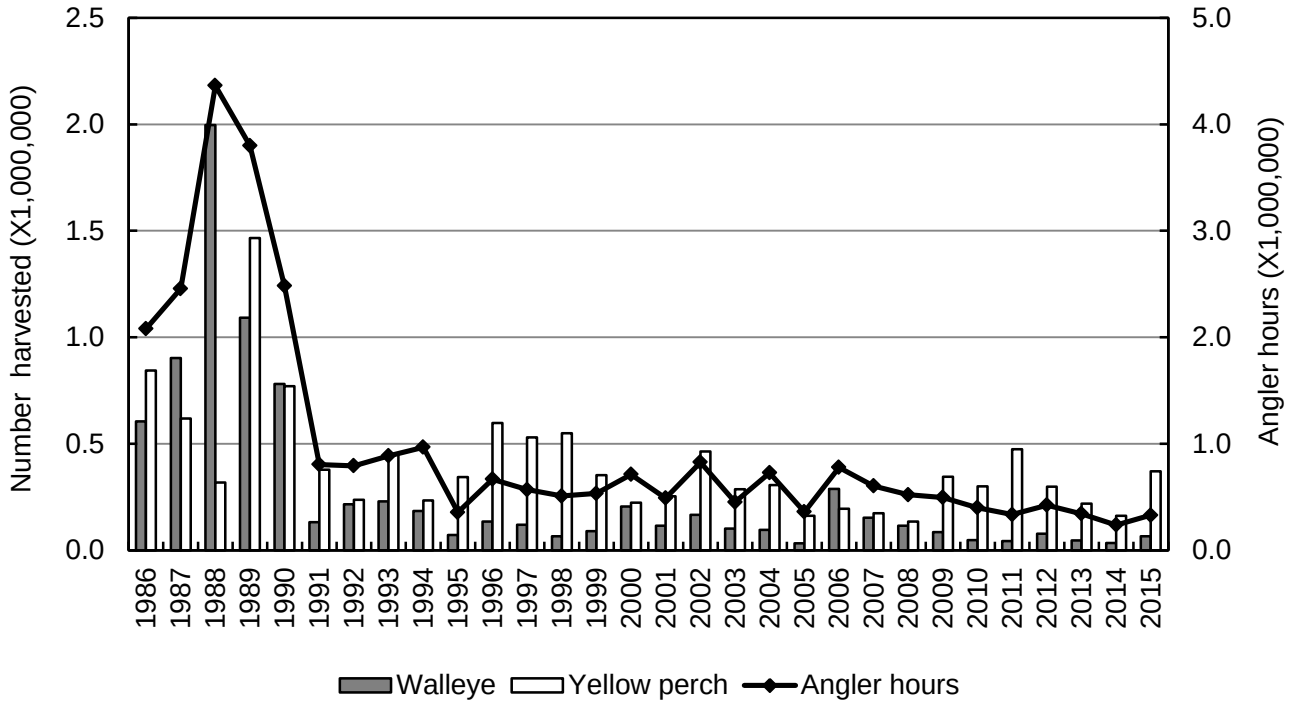

Figure 1.—Estimated harvest and effort for Michigan's Lake Erie sport fishery, 1986-2015.

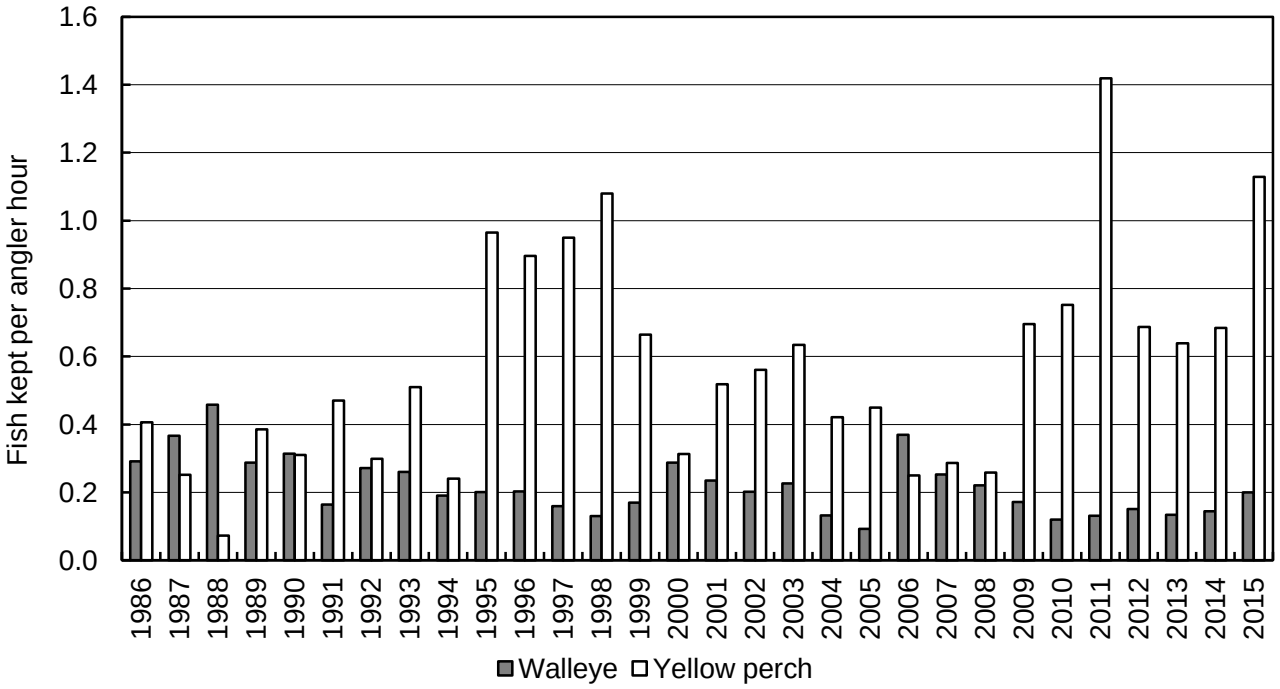

Figure 2.—Walleye and yellow perch harvest rates for Michigan's Lake Erie sport fishery, 1986-2015.

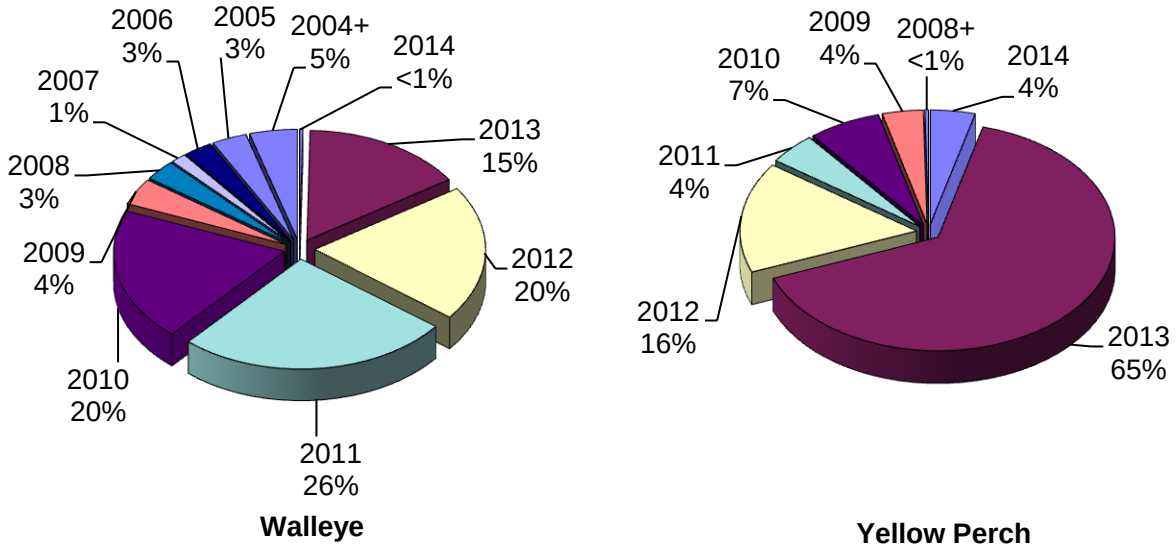

Figure 3.—Year-class contribution to Michigan sport harvest for walleye and yellow perch from Lake Erie in 2015.

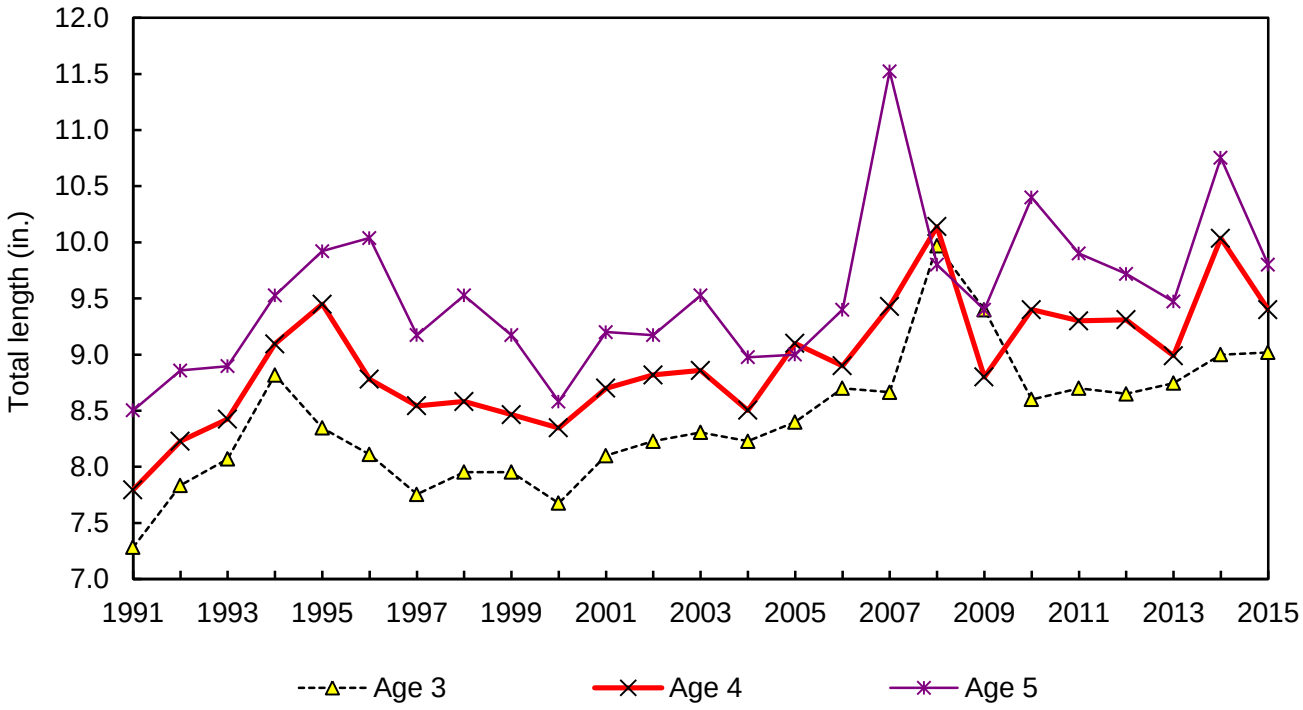

Figure 4.—Average length-at-age for sport-harvested yellow perch from Michigan's waters of Lake Erie, 1991-2015

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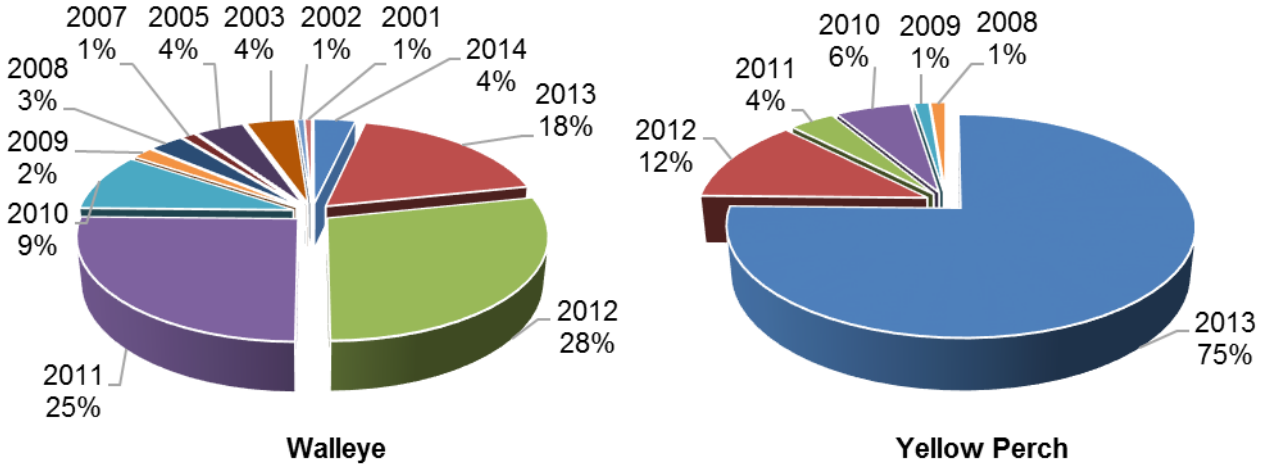

Figure 5.— Year-class contribution to Michigan sport harvest for walleye and yellow perch from the Detroit River in 2015.

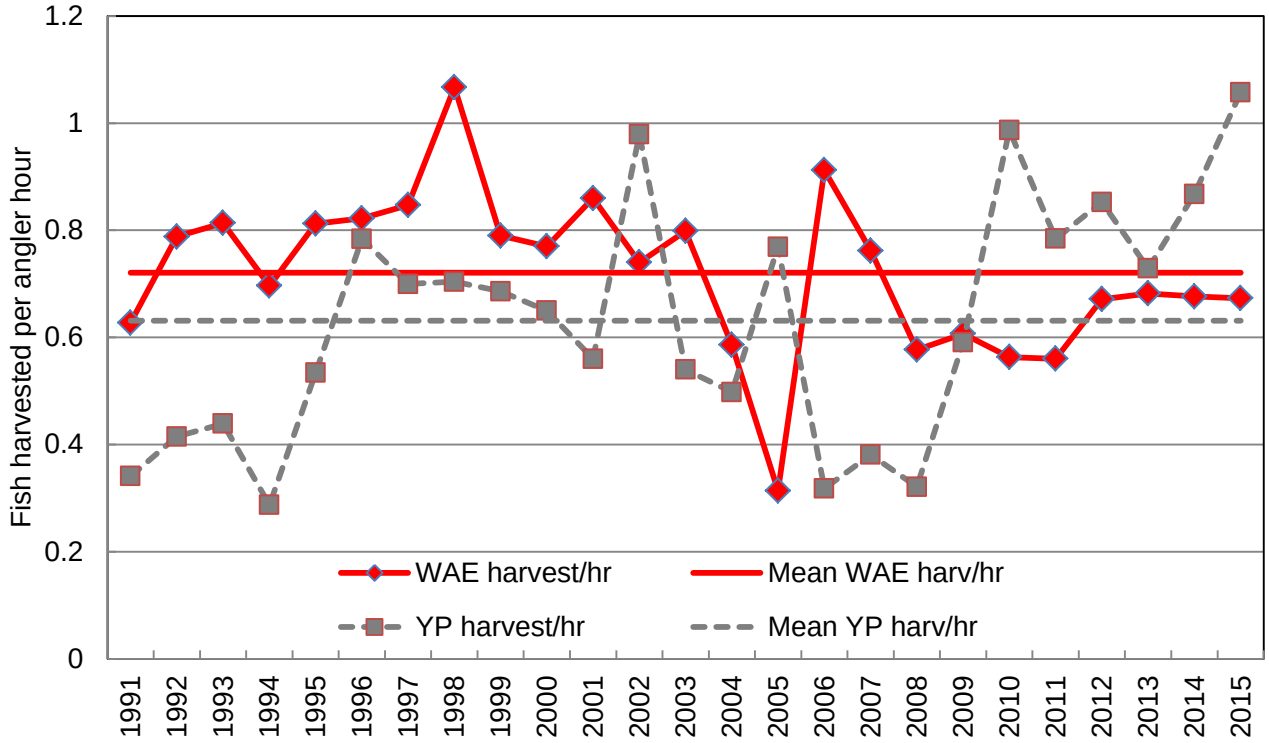

Figure 6.—Michigan Lake Erie charter boat harvest rates for walleye and yellow perch, 1991-2015.

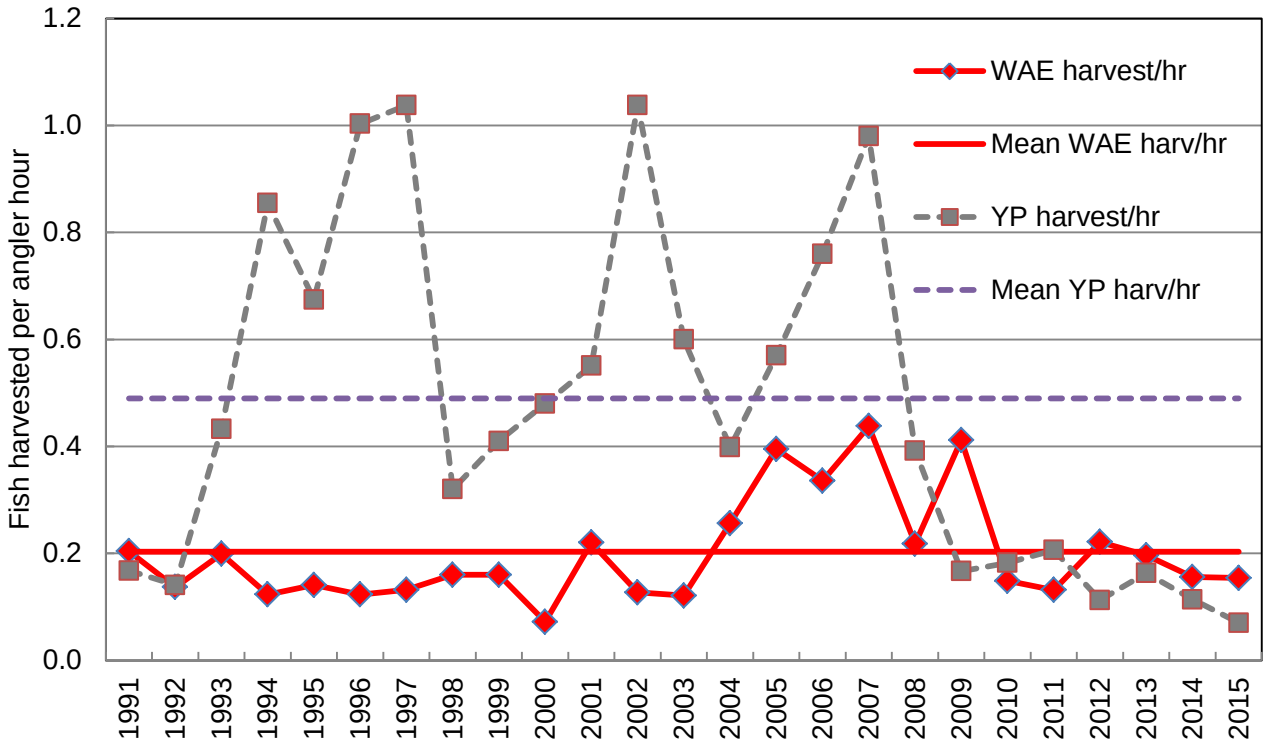

Figure 7.—Michigan St. Clair-Detroit River System charter boat harvest rates walleye and yellow perch, 1991-2015.

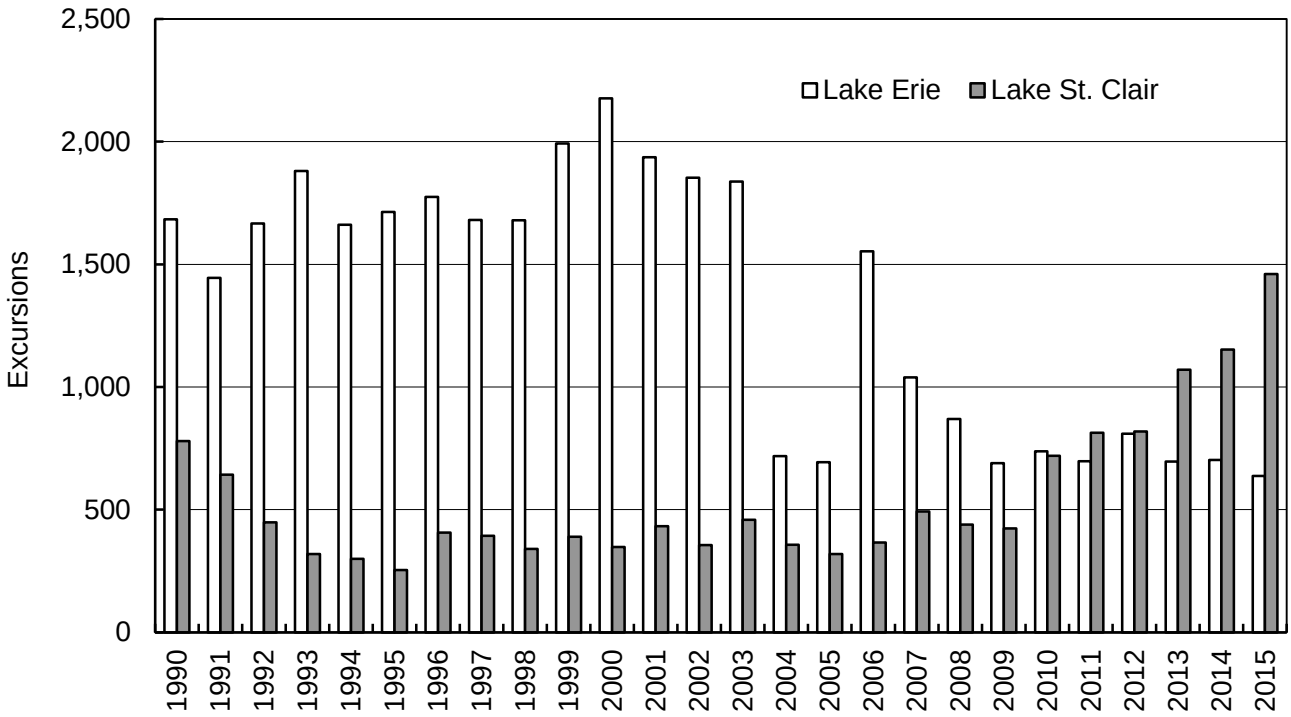

Figure 8.—Reported charter boat excursions on Lake Erie and the St. Clair-Detroit River System, 1990-2015.

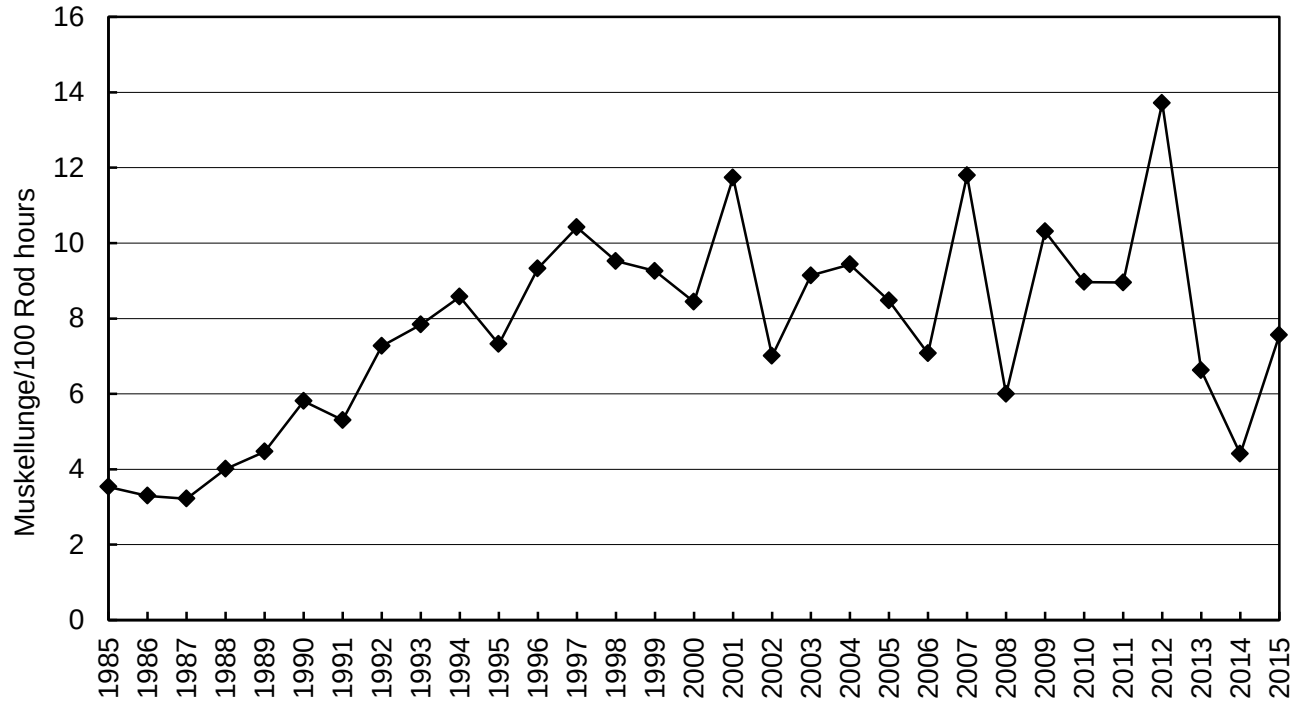

Figure 9.—Lake St. Clair muskellunge catch rate from Angler Diary Program, 1985-2015.

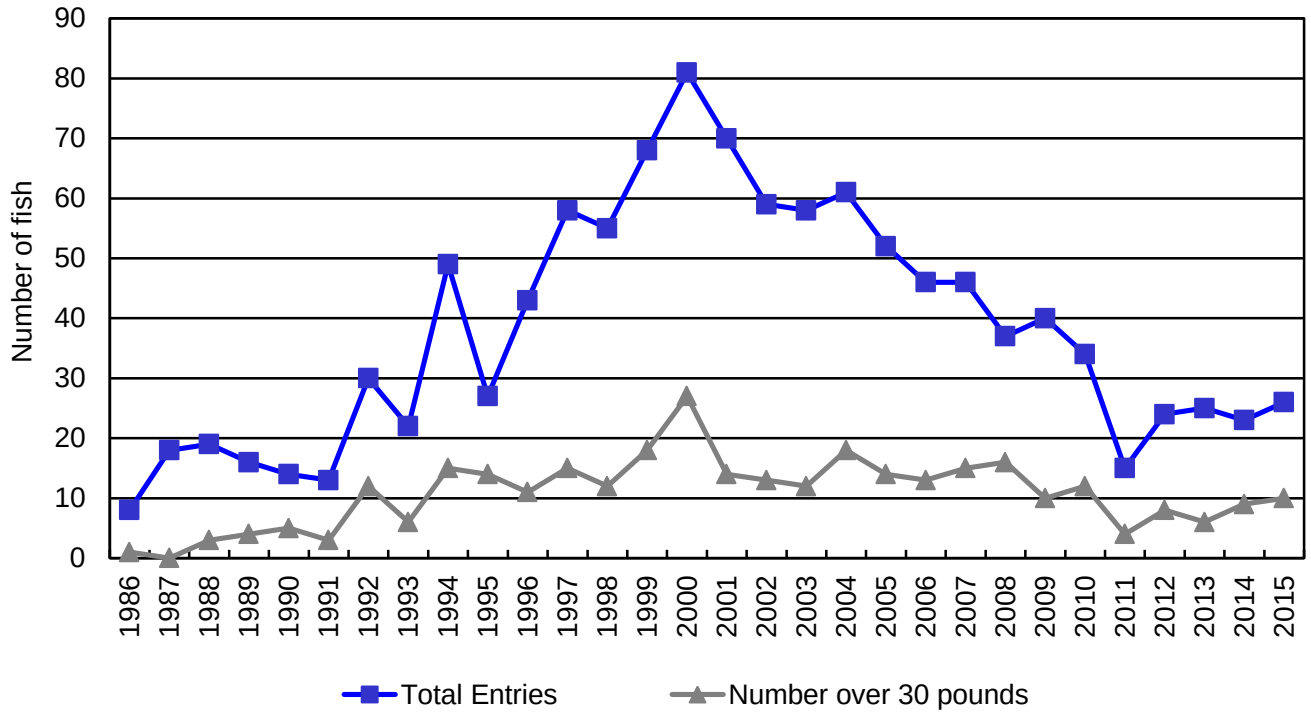

Figure 10.—Lake St. Clair muskellunge entered in the Michigan DNR Master Angler Program, 1986-2015. Values for 1992-2015 represent combined regular and catch-and-release Master Angler categories.

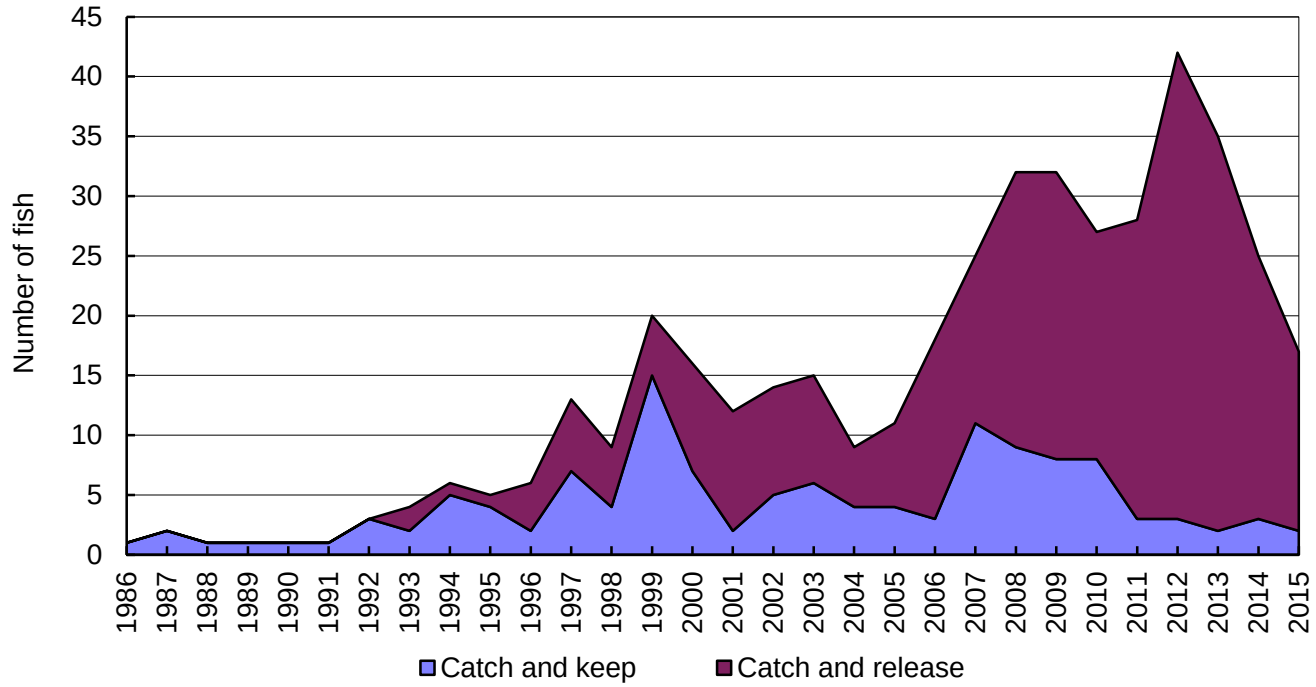

Figure 11.—Lake St. Clair smallmouth bass entered in the Michigan DNR Master Angler Program, 1986-2015.

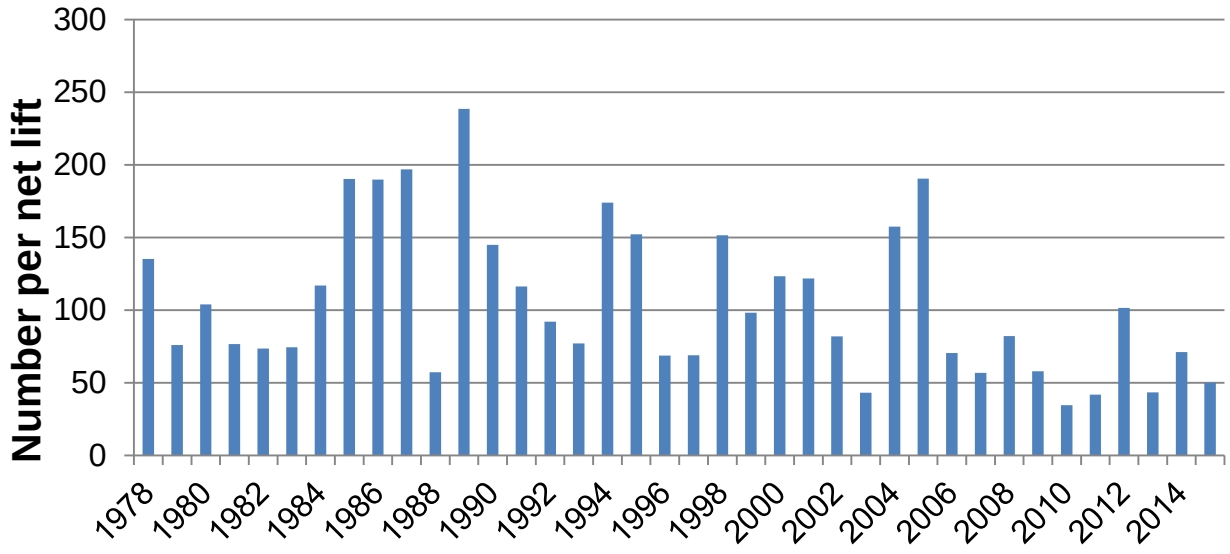

Figure 12.—Average total walleye catch per unit effort, by year, for Michigan Lake Erie index gill nets, 1978-2015.

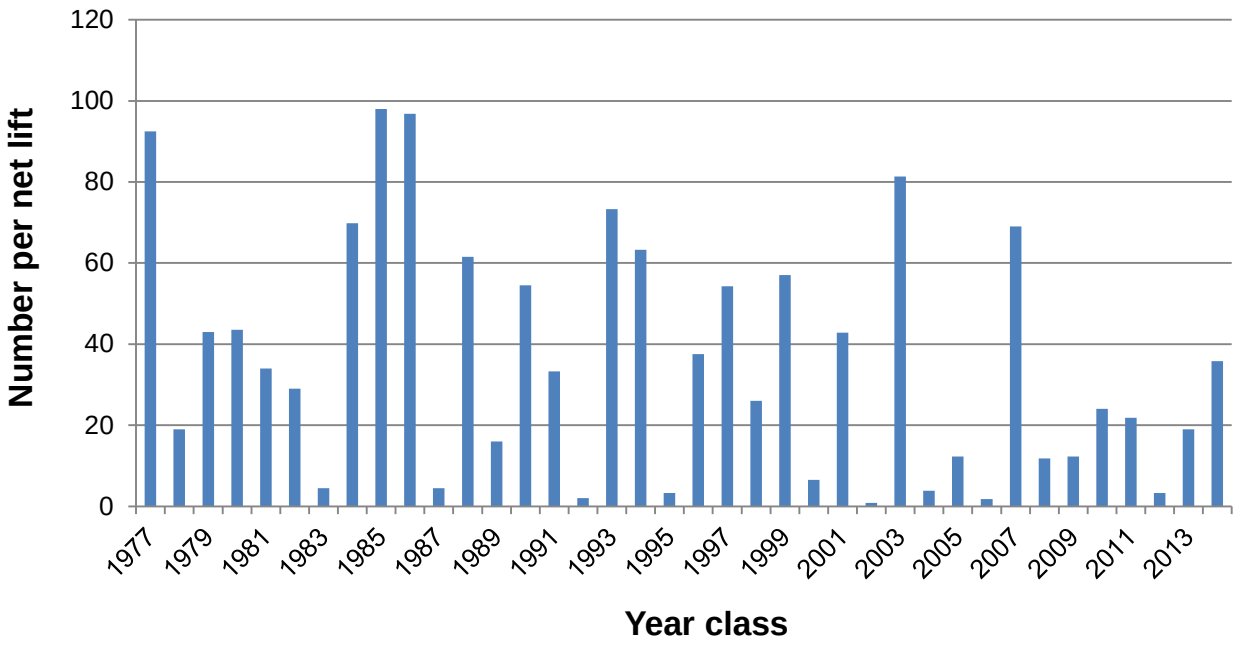

Figure 13.—Average yearling walleye catch per unit effort, by year-class, for Michigan Lake Erie index gill nets.

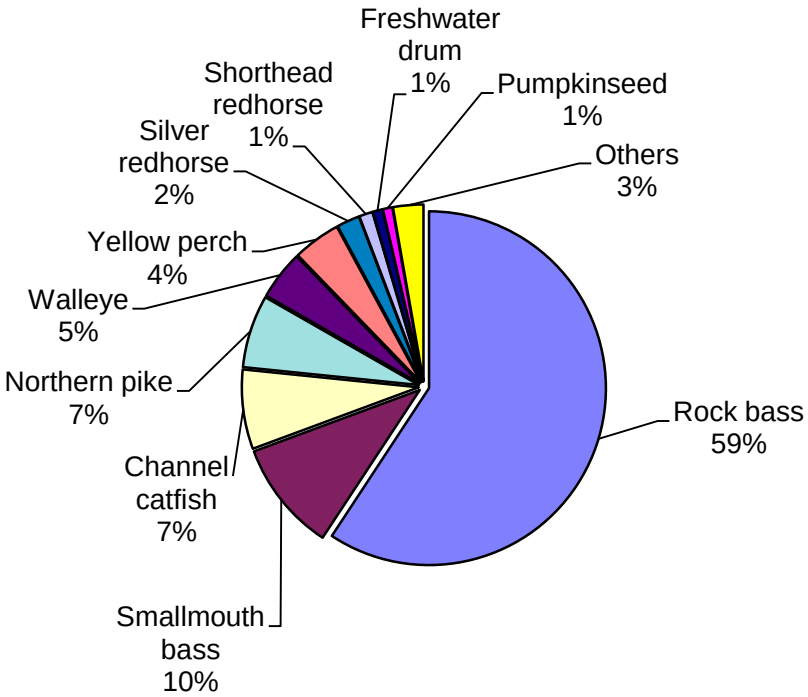

Figure 14.—Catch composition for trap nets fished in Lake St. Clair during April - May 2015.

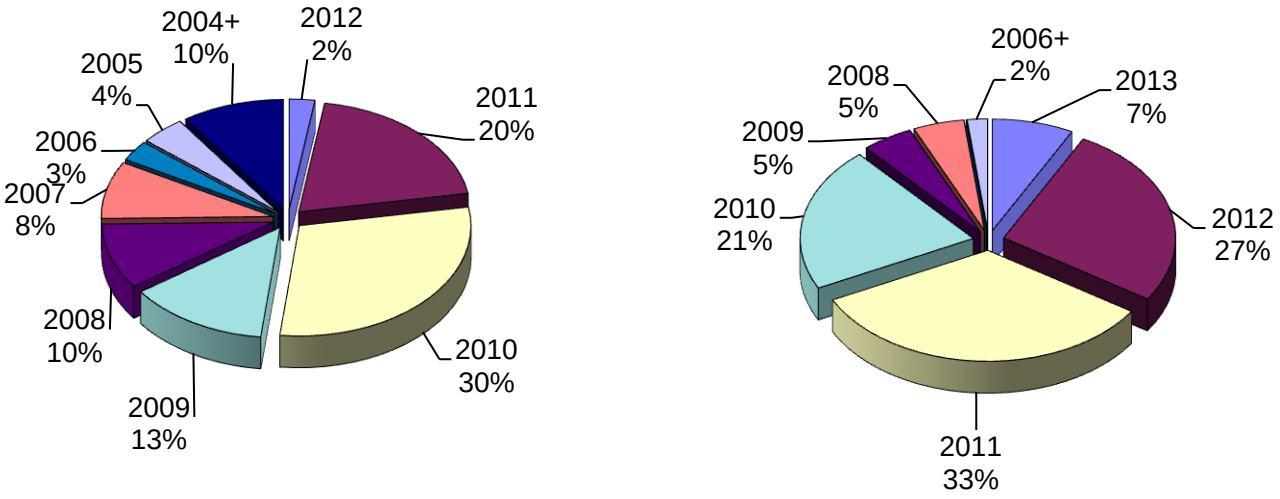

Figure 15.—Contribution by year-class to catch in survey trap nets in Lake St. Clair during April-May 2015.

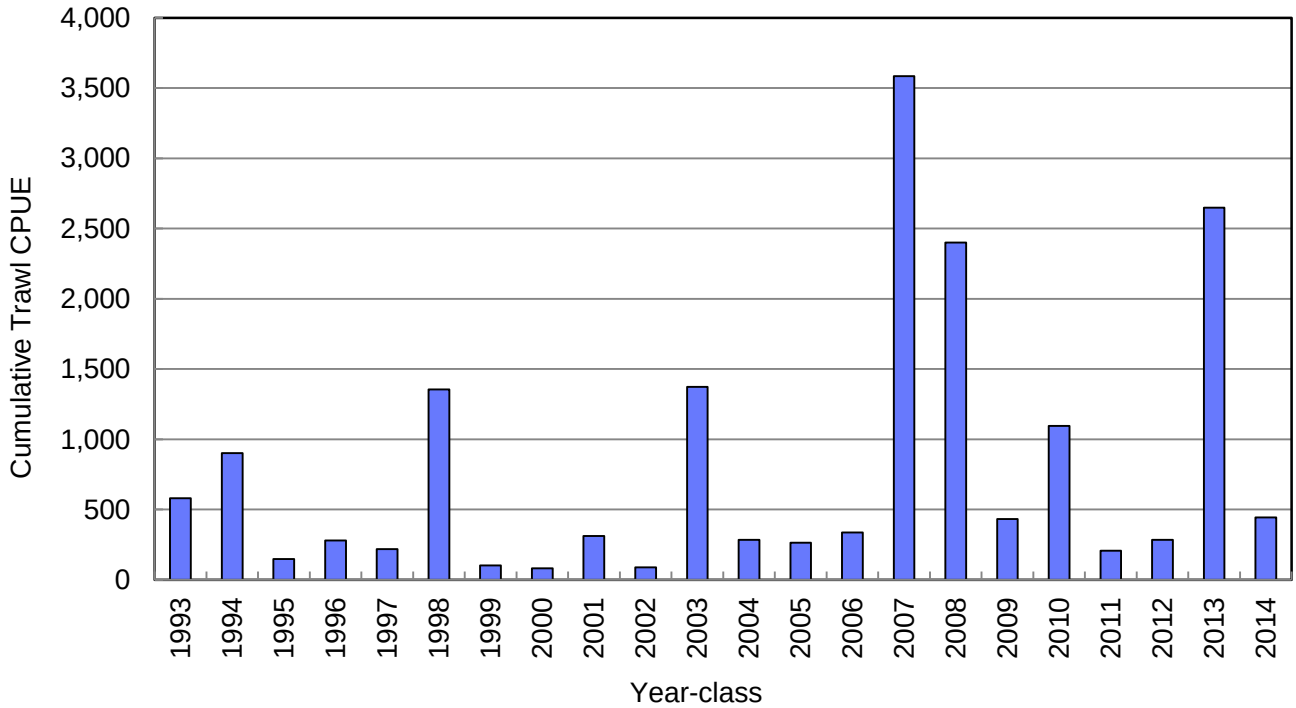

Figure 16.—Year-class strength for yellow perch in Lake St. Clair as indicated by June trawl catch rates summed across years (survey years 1994 to 2015).

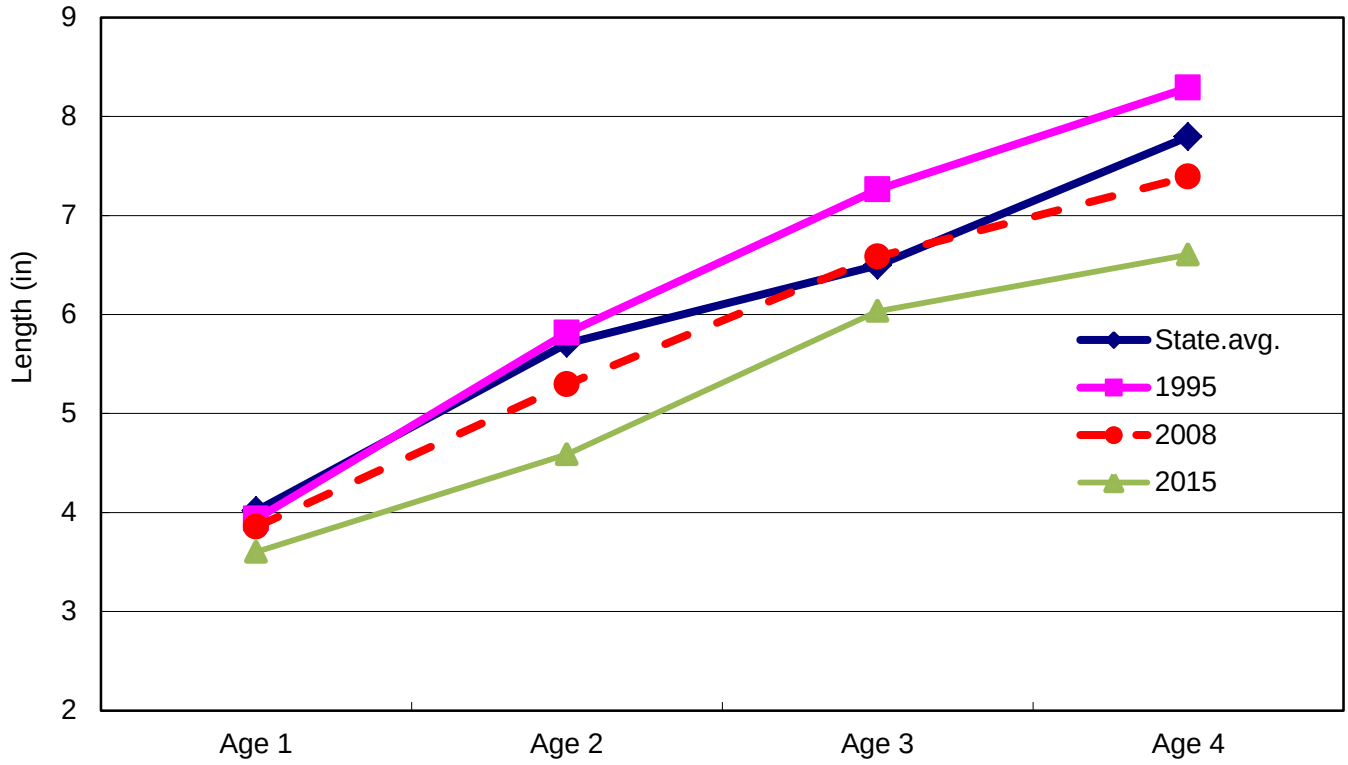

Figure 17.—Average length-at-age for yellow perch caught in June trawls on Lake St. Clair.

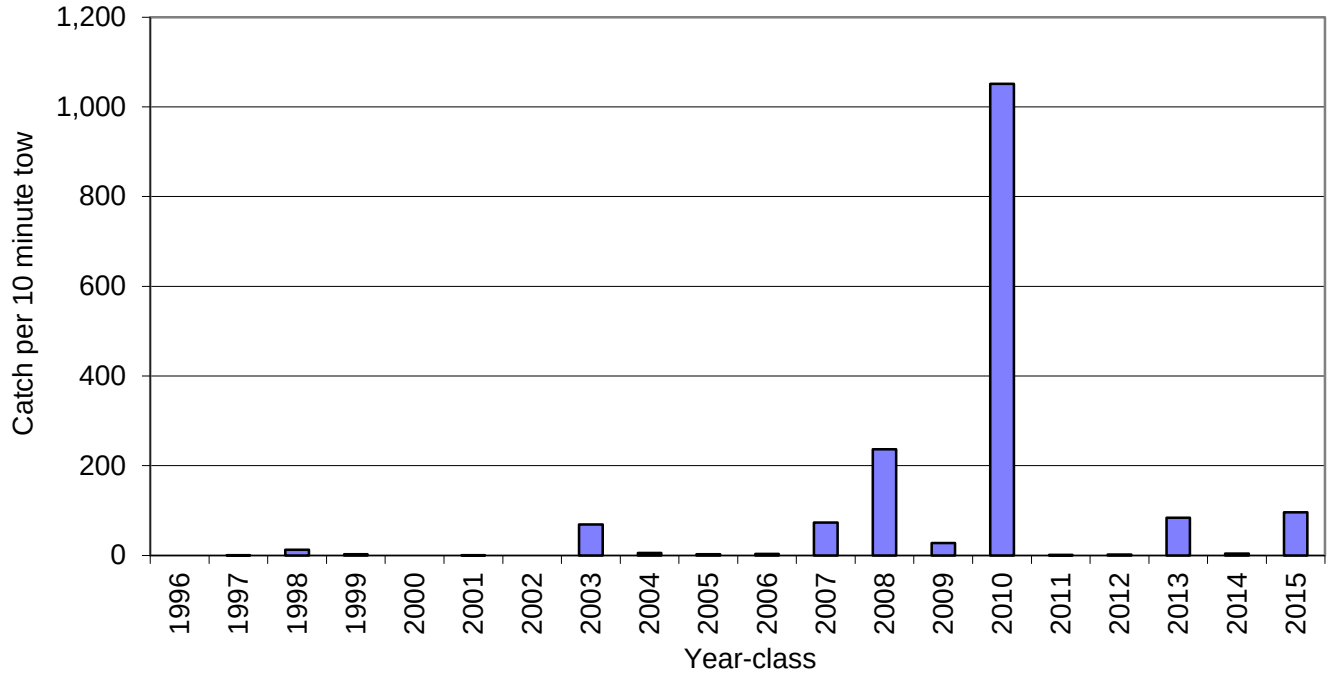

Figure 18.—Year-class strength for yellow perch in Lake St. Clair as indicated by September trawl age-0 catch rates, 1996 to 2015.

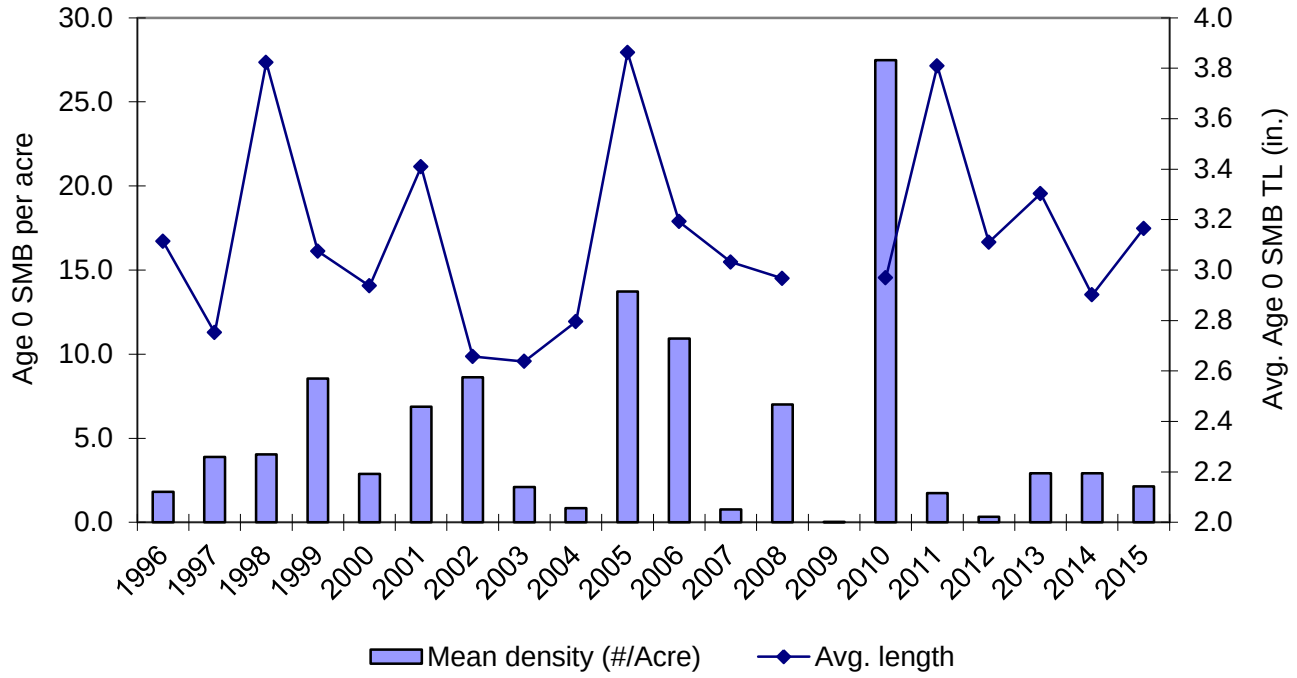

Figure 19.—Year-class strength for Lake St. Clair smallmouth bass as indicated by September trawl age-0 catch rates and average lengths, 1996 to 2015.

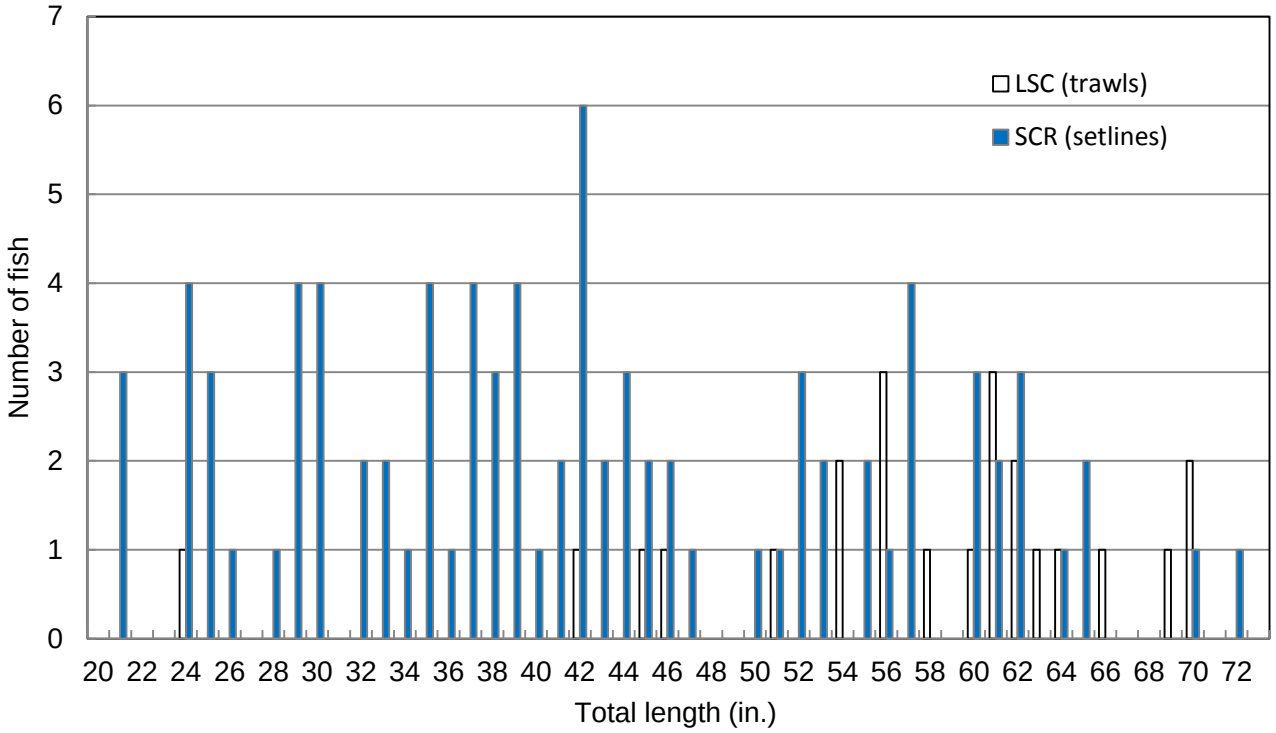

Figure 20.—Length frequency distribution for lake sturgeon caught in 2015 with survey setlines (n=87) in the St. Clair River and bottom trawls (n=23) in Lake St. Clair.

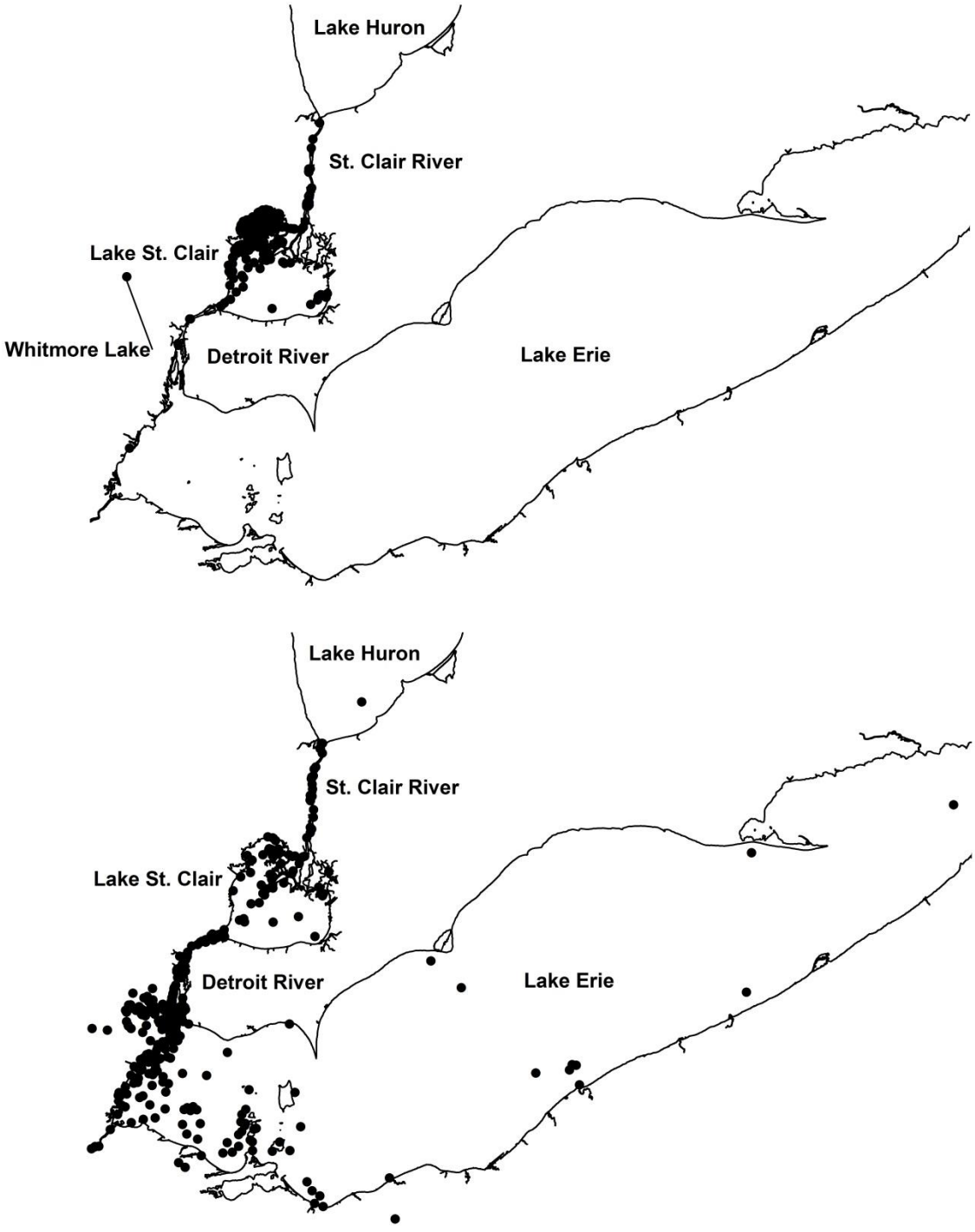

Figure 21.— Geographical distribution of smallmouth bass tag recoveries (n=597) for fish tagged during 2002-2015 at the Anchor Bay site in Lake St. Clair (top map) and for all tag recoveries since 2003 for walleye tagged during 1994-2010 in the Huron River (n=485, bottom map). Black dots represent the recovery location of individual fish.

Table 1.—Estimated harvest, harvest rate, effort, and released catch of legal-sized fish for Michigan's 2015 Lake Erie non-charter boat fishery. Two standard deviations in parentheses.

Species	Harvest Rate (fish/hr)	Month Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow perch	1.1286 (0.5148)	441	278	2,043	57,477	106,555	166,312	37,589	370,695 (74875)
Walleye	0.2001 (0.0938)	11,589	19,513	11,278	21,566	1,712	45	37	65,740 (13647)
Channel catfish	0.0148 (0.0064)	0	2,960	790	802	283	14	0	4,849 (930)
White bass	0.0543 (0.0761)	56	15,497	1,425	707	107	0	35	17,827 (11068)
White perch	0.0049 (0.0078)	0	628	52	169	535	14	216	1,614 (1128)
Freshwater drum	0.0012 (0.0017)	0	116	130	34	85	44	0	409 (247)
Smallmouth bass	0.0006 (0.0011)	0	0	19	78	32	44	14	187 (156)
Other	0.0015 (0.0041)	0	499	0	0	0	0	6	505 (593)
Total Harvest	1.4061 (0.5289)	12,086	39,491	15,737	80,833	109,309	166,473	37,897	461,826 (76,926)
EFFORT									
Angler hours		16,784	54,761	35,643	88,876	62,128	54,621	15,641	328,454 (145,432)
Angler trips		3,484	11,526	6,906	17,008	13,198	10,654	3,372	66,147 (8248)
RELEASED									
Walleye Sub-legal	0.0520 (0.0309)	0	3,010	4,443	6,842	630	1,678	473	17,076 (4489)
Largemouth bass	0.0108 (0.0121)	0	536	299	860	525	47	1,264	3,531 (1758)
Smallmouth bass	0.0133 (0.0045)	0	861	385	1,805	802	360	156	4,369 (651)
Yellow perch	0.8712 (0.4997)	0	279	473	24,724	65,819	169,403	25,445	286,143 (72,676)
White bass	0.3788 (0.2384)	1,632	68,403	12,423	17,268	8,875	15,270	532	124,403 (34,664)

Table 2.—Estimated harvest, harvest rate, effort, and released catch of legal-sized fish for the 2015 Detroit River non-charter boat fishery. Two standard deviations in parentheses.

Species	Harvest rate (fish/hr)	Month Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST										
White bass	0.3605 (0.3535)	0	4,120	167,212	52,468	792	273	0	0	224,865 (38,146)
Walleye	0.2169 (0.2448)	0	63,456	40,890	11,931	5,633	2,092	10,992	325	135,319 (26,416)
Yellow perch	0.1161 (0.5595)	157	12,113	2,777	3,768	920	2,475	47,155	3,047	72,412 (60,379)
Channel catfish	0.0067 (0.0373)	0	0	0	427	90	2,283	1,328	77	4,205 (4,023)
Smallmouth bass	0.0052 (0.0161)	0	0	0	47	423	709	1,956	96	3,231 (1,737)
Northern pike	0.0004 (0.0023)	0	149	62	60	0	0	0	8	279 (253)
White perch	0.0004 (0.0027)	0	0	0	92	156	0	0	0	248 (289)
Largemouth bass	0.0002 (0.0015)	0	0	0	47	0	0	65	0	112 (160)
Muskellunge	0	0	0	0	0	0	0	0	0	0
Other	0.0162 (0.0861)	0	70	1,389	336	1,888	1,816	392	31	5,922 (9,291)
Total Harvest	0.7159	157	79,908	212,330	69,176	9,902	9,648	61,888	3,584	446,593 (76,451)
EFFORT										
Angler hours		377	215,156	127,549	74,638	54,845	51,227	78,638	21,362	623,792 (107,912)
Angler trips		98	42,228	32,798	17,608	15,204	12,226	20,408	4,988	145,558 (24,998)
RELEASED										
White bass	0.4596 (0.8708)	6	4,319	178,839	97,571	4,684	750	475	24	286,668 (93,965)
Smallmouth bass	0.0854 (0.2573)	0	686	8,590	6,365	6,917	8,218	20,543	1,984	53,303 (27,767)
Largemouth bass	0.0326 (0.1236)	0	43	5,412	2,603	2,170	3,009	5,889	995	20,121 (13,336)
Muskellunge	0.0034 (0.0081)	0	213	83	114	862	254	99	495	2,120 (869)
Northern pike	0.0048 (0.0142)	0	605	1,102	600	68	90	413	94	2,972 (1,529)

Table 3.—Total numbers harvested and released, harvest and release per angler hour, harvest per excursion, and fishing effort (angler hours, trips, and charter excursions) reported for charter boats on Lake Erie, 2015.

Species	Per angler hour	Per excursion	Month							Season
			Apr[1]	May	Jun	Jul	Aug	Sep	Oct[1]	
Harvested										
Rainbow trout	0.0001	0.0	0	0	0	1	0	0	0	1
Yellow perch	1.0575	22.6	0	48	22	440	4,576	5,701	3,660	14,447
Walleye	0.6732	14.4	383	2,125	2,210	3,918	487	56	18	9,197
Small. bass	0.0010	0.0	0	4	6	4	0	0	0	14
Muskellunge	0.0001	0.0	0	1	0	0	0	0	0	1
Other	0.0608	1.3	0	394	322	25	76	4	10	831
Released										
Yellow perch	0.3236	6.9	1	7	38	109	1,339	2,200	727	4,421
Walleye	0.0984	2.1	5	251	522	515	41	1	9	1,344
Small. bass	0.0075	0.2	9	36	18	4	10	25	0	102
Muskellunge	0.0009	0.0	5	2	4	1	0	0	0	12
Other	0.3937	8.4	26	3,298	645	464	667	186	92	5,378
Angler hours			759	2,766	2,738	3,966	1,699	1,199	534	13,661
Angler trips			134	523	532	785	327	219	103	2,623
Charter excursions			40	135	127	186	73	50	27	638

[1]March and April values combined; October, November, and December values combined.

Table 4.—Total numbers harvested and released, harvest and release per hour, harvest per excursion, and fishing effort (angler hours, trips, and charter excursions) reported for charter boats on the Detroit River, Lake St. Clair, and the St. Clair River, 2015.

Species	Per angler hour	Per excursion	Month							Season
			Apr[1]	May	Jun	Jul	Aug	Sep	Oct[1]	
Harvested										
Yellow perch	0.0702	1.5	0	92	331	226	159	1,022	411	2,241
Walleye	0.1539	3.4	2,590	1,725	328	97	91	65	16	4,912
Small. bass	0.0675	1.5	0	0	127	873	828	295	31	2,154
Muskellunge	0.0000	0.0	0	0	0	0	1	0	0	1
Other	0.0149	0.3	1	383	42	25	22	2	0	475
Released										
Yellow perch	0.0368	0.8	0	0	5	0	246	543	380	1,174
Walleye	0.0155	0.3	385	84	11	2	7	0	5	494
Small. bass	0.5058	11.1	454	4,918	4,000	2,653	2,182	1,144	795	16,146
Muskellunge	0.0547	1.2	15	14	221	391	481	267	357	1,746
Other	0.0556	1.2	37	976	466	63	96	82	55	1,775
Angler hours			5,181	5,279	4,616	5,050	5,039	3,596	3,162	31,923
Angler trips			911	891	705	772	769	558	446	5,052
Charter excursions			231	248	222	219	225	164	151	1,460

[1]March and April values combined; October, November, and December values combined.

Table 5.—Commercial harvest (pounds sold) from Michigan waters of Lake Erie in 2015.

Species	Harvest (lbs.)	% of total harvest	Reported market value
Carp	227,946	22%	$84,340
White bass	179,246	17%	$295,756
Channel catfish	144,500	14%	$75,140
Freshwater drum	128,510	13%	$38,553
Buffalo	100,135	10%	$80,108
Goldfish	88,791	9%	$71,033
Quillback carpsucker	76,203	7%	$41,912
White perch	53,245	5%	$24,493
Bullhead	26,396	3%	$15,838
Bowfin	338	0%	$135
Sucker	332	0%	$50
Whitefish	267	0%	$566
Gizzard shad	50	0%	$5
Grand Total	1,025,959	100%	$727,928

Table 6.—Commercial harvest (pounds caught) of selected species from Michigan waters of Lake Erie, 1984 to 2015.

Year	Buffalo	Bullhead	Common carp	Channel catfish	Gizzard shad	Goldfish	Quillback	Freshwater drum	Sucker	White bass	White perch	White-fish	Grand Total
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
Grand Total	1,838,528	330,205	9,925,475	1,293,274	2,986,743	777,839	1,012,242	1,246,446	101,137	1,037,774	334,650	40,753	20,925,066

Table 7.—Average catch per trap net (24 hour lift) for species commonly taken during spring trap net surveys in Lake St. Clair.

	Survey year													
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Black bullhead	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.01
Black crappie	0.01	0.12	0.00	0.00	0.00	0.00	0.02	0.01	0.06	0.08	0.04	0.01	0.00	0.03
Bluegill	0.00	0.05	0.01	0.02	0.00	0.05	0.00	0.01	0.23	0.03	0.07	0.01	0.04	0.04
Brown bullhead	0.01	0.02	0.00	0.01	0.01	0.00	0.02	0.03	0.02	0.00	0.08	0.01	0.00	0.02
Channel catfish	1.85	1.70	1.21	1.76	2.01	3.14	2.22	2.24	1.22	2.64	2.53	3.94	1.61	2.14
Common carp	0.00	0.01	0.01	0.03	0.00	0.00	0.43	0.34	0.29	0.08	0.15	0.13	0.12	0.13
Common white sucker	0.08	0.12	0.10	0.10	0.33	0.15	0.06	0.16	0.22	0.03	0.16	0.31	0.12	0.15
Freshwater drum	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	0.96
Gizzard shad	0.03	0.01	0.03	0.01	0.01	0.00	0.00	0.00	0.01	0.15	0.10	0.01	0.03	0.03
Goldern redhorse	0.01	0.02	0.02	0.02	0.01	0.00	0.05	0.00	0.01	0.00	0.05	0.02	0.04	0.02
Lake sturgeon	0.06	0.03	0.02	0.05	0.00	0.10	0.05	0.01	0.09	0.01	0.05	0.02	0.08	0.04
Largemouth bass	0.04	0.11	0.03	0.03	0.10	0.10	0.11	0.06	0.21	0.03	0.18	0.10	0.10	0.10
Muskellunge	0.52	0.63	0.71	0.48	0.49	0.13	0.83	0.18	0.12	0.00	0.13	0.08	0.07	0.35
Northern pike	0.15	0.58	0.87	0.86	0.66	0.55	0.71	1.02	1.11	0.70	1.54	1.67	1.51	0.92
Pumpkinseed	0.55	0.50	0.03	0.22	0.46	0.71	0.40	0.74	1.54	0.84	0.77	0.44	0.19	0.74
Quillback carpsucker	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	0.19
Rock bass	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	23.62
Shorthead redhorse	1.90	0.69	0.77	1.62	0.51	1.00	0.76	1.16	1.30	0.74	0.52	0.37	0.41	0.92
Silver redhorse	0.27	0.54	0.59	0.95	0.30	0.95	1.37	1.54	1.29	0.26	0.87	0.64	0.44	0.73
Smallmouth bass	8.16	2.37	1.73	3.83	5.84	2.74	3.50	8.49	6.92	4.01	3.68	3.47	2.29	4.38
Walleye	1.55	1.15	2.43	2.40	1.72	1.25	1.98	1.03	2.14	1.02	1.91	1.51	1.32	1.68
White bass	0.05	0.03	0.00	0.07	0.05	0.27	0.42	0.15	0.26	1.56	0.37	0.47	0.00	0.27
White perch	0.05	0.35	0.05	1.11	0.10	0.96	0.44	0.79	0.83	0.67	0.85	0.12	0.08	0.47
Yellow perch	0.74	2.04	0.51	0.58	2.22	1.59	0.50	0.39	1.31	1.19	0.96	0.86	1.43	1.24
Total all species	34.14	27.67	15.72	32.19	37.08	36.48	43.97	73.15	63.40	50.80	34.90	23.59	25.60	40.24
Number of net lifts	50	55	34	42	50	35	22	54	54	39	46	40	36	
Starting date	5/28	5/3	5/11	5/5	5/3	5/6	5/8	5/3	4/25	4/25	4/22	4/24	4/27	
Ending date	6/20	5/26	5/25	5/24	5/22	5/20	5/20	5/24	5/25	5/14	5/20	5/19	5/18	
Starting water temp. (^{0}C)	12	8	9	13	9	13	12	14	9	9	8	8	8	
Ending water temp. (^{0}C)	16	15	13	13	13	11	14	17	13	14	15	13	14	
Avg. secchi depth (m)	2.2	1.2	2.2	1.7	2.6	2.1	1.5	1.7	1.3	1.9	1.93	2.1	3.0	

Table 8.—Average density (number of fish caught per hectare trawled) for all fish species caught during spring (June) with 10 m headrope index trawls in Anchor Bay, Lake St. Clair.

	Year														
Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Alewife	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Bluntnose minnow	7	1	6	118	1	13	0	3	2	4	3	1	4	0	10
Common carp	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Emerald shiner	11	0	2	0	0	0	32	39	4	18	26	17	14	24	9
Freshwater drum	1	4	3	6	4	3	0	0	0	2	0	0	0	1	3
Johnny darter	0	0	3	2	0	7	2	17	3	4	17	61	105	18	13
Lake sturgeon	1	1	0	0	2	1	0	0	0	0	1	0	2	0	0
Largemouth bass	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0
Logperch	8	0	42	6	0	1	3	29	13	107	10	10	133	3	28
Muskellunge	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0
Northern pike	0	1	0	1	1	0	0	0	0	1	2	0	0	0	0
Shorthead redhorse	7	4	2	6	9	1	0	0	4	1	0	0	0	0	3
Pumpkinseed	0	0	0	0	1	1	0	0	0	0	6	0	0	0	1
Quillback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rainbow smelt	0	14	53	11	6	1	68	110	122	18	284	56	148	37	116
Rock bass	39	18	5	10	33	73	4	2	21	4	5	2	1	0	17
Round goby	30	6	53	10	0	30	1	14	33	24	1	2	16	17	15
Sand shiner	362	0	118	45	2	640	4	15	0	20	36	55	8	2	73
Silver lamprey	0	1	1	0	5	2	0	0	1	0	0	0	0	0	1
Silver redhorse	2	5	2	1	1	2	0	0	1	4	1	0	1	0	1
Smallmouth bass	4	2	2	10	4	13	0	0	2	2	1	0	1	0	3
Spottail shiner	5,730	211	1,777	524	769	53	90	2,705	495	5,093	1,988	109	226	22	1,110
Trout-perch	265	13	108	65	248	7	2	3	23	13	42	41	84	27	94
Walleye	1	1	0	2	12	2	0	1	0	0	2	0	0	0	2
White perch	1	1	2	1	2	0	1	1	0	1	1	0	0	0	1
White sucker	61	2	68	22	5	1	20	16	95	9	39	6	57	1	22
Yellow perch	725	306	888	1,107	869	303	3,137	7,144	3,120	3,101	1,865	758	4,723	2,875	1,754

Table 9.—Average density (number of fish caught per hectare trawled) for all fish species caught during fall (September or October) with 10 m headrope index trawls in Anchor Bay, Lake St. Clair.

	Year														
Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Alewife	0	0	0	1	1	0	0	5	0	0	0	0	0	0	6
Bluntnose minnow	33	13	43	238	61	36	65	198	821	189	7	4	1	0	96
Common carp	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Emerald shiner	1	0	41	36	608	0	1	8	2	5	0	4	0	0	38
Freshwater drum	0	1	5	2	3	2	0	2	2	0	1	0	1	1	1
Johnny darter	0	7	0	0	0	1	1	0	0	1	12	0	1	1	2
Lake sturgeon	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0
Largemouth bass	36	13	13	29	22	58	50	45	23	9	1	29	14	3	19
Logperch	6	14	38	113	34	9	175	288	120	31	35	48	33	53	56
Muskellunge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern pike	1	1	0	0	0	0	0	0	0	1	0	0	1	0	0
Shorthead redhorse	0	0	0	1	2	1	0	0	0	1	0	0	0	0	0
Pumpkinseed	5	3	1	0	5	8	24	0	0	5	0	1	0	0	3
Quillback	2	1	1	0	0	0	5	0	0	0	0	0	1	1	1
Rainbow smelt	0	4	26	0	1	0	1	139	0	1	2	0	0	0	10
Rock bass	41	35	25	77	67	71	211	21	104	80	5	29	4	3	58
Round goby	99	2	28	14	10	4	7	11	15	0	8	9	39	54	20
Sand shiner	44	507	8,909	3,072	109	29	408	0	0	383	2,516	2	893	1	963
Silver lamprey	0	0	0	0	1	1	1	0	0	1	3	0	1	0	0
Silver redhorse	6	0	4	5	4	1	1	2	1	1	0	0	0	1	2
Smallmouth bass	51	7	3	41	32	3	22	2	69	13	8	13	8	5	18
Spottail shiner	2,407	1,068	545	2,410	2,668	983	2,191	981	2,492	1,867	28	168	0	0	1,026
Trout-perch	10	6	59	3	79	1	0	3	105	7	14	12	96	25	68
Walleye	11	0	2	9	3	1	0	2	0	2	0	0	0	1	2
White perch	13	8	6	146	12	31	398	9	9	1	0	1	0	0	35
White sucker	8	1	1	4	6	5	7	6	10	1	0	0	0	0	3
Yellow perch	73	181	48	52	34	220	625	1,100	2,601	36	24	246	11	218	289