



ILLINOIS NATURAL
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A Survey of Sport Fishing in the Illinois Portion of Lake Michigan March through September 2017

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University of Illinois
Prairie Research Institute
Illinois Natural History Survey

Submitted to
Division of Fisheries, Illinois Department of Natural Resources
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Table 1. Common and scientific names of fishes appearing in this report of the survey of sport fishing in the Illinois portion of Lake Michigan. Only common names will be used in the following text.

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
Bluegill	<i>Lepomis macrochirus</i>
Brown trout	<i>Salmo trutta</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Common carp	<i>Cyprinus carpio</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Lake trout	<i>Salvelinus namaycush</i>
Largemouth bass	<i>Micropterus salmoides</i>
Northern pike	<i>Esox lucius</i>
Rainbow smelt	<i>Osmerus mordax</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Rock bass	<i>Ambloplites rupestris</i>
Round goby	<i>Neogobius melanostomus</i>
Sea lamprey	<i>Petromyzon marinus</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Yellow perch	<i>Perca flavescens</i>

EXECUTIVE SUMMARY

The purpose of this study was to estimate sport fishing effort, harvest, and expenditures by anglers fishing the Illinois portion of Lake Michigan (excluding charter fishing). Information provided by this study is important for management of sport fisheries in the Illinois waters of Lake Michigan. Data were collected via a contact creel survey on randomly-selected days over a six month period (4/1 - 9/30), and were summarized and extrapolated over the six month period to obtain estimates for specific locations as well as for the entire Illinois portion of Lake Michigan. Sampling dates were randomly chosen for access sites within two strata: time period (segment = three week blocks) and type of day (weekday vs. weekend/holiday). An additional March survey was conducted at selected sites along the Lake Michigan shoreline. The March survey was stratified by weekend/ weekday, but the entire month of March was treated as one segment. All data have been summarized by month for this report.

Conclusions:

1. Total angler effort in 2017 declined 12.7% from the 2016 survey period. Effort decreased 7.7% for boat anglers and 19.4% for pedestrian anglers.
2. The yellow perch harvest decreased 14.8% from 2016 estimates to 9,568 fish. Mean length increased 9.4% to 25.3 cm (9.9 in), while mean weight increased 69.4% to 275.9 g (0.61 lb.).
3. Coho salmon comprised most of the salmonid harvest (71.5%) and harvest increased 25.8% compared to 2016. The estimated 2017 Coho salmon harvest was 32,080 fish. The mean size of Coho salmon measured by creel clerks in 2017 was 1,349 g (2.97 lb.), and 53.0 cm (20.9 in) long, representing decreases of 14.6% in weight and 3.1% in length from 2016.
4. Chinook salmon harvest was estimated at 3,356 fish, a 45.0% decrease from 2016. The mean size of Chinook in 2017 was 5,341 g (11.8 lb., an increase of 47.8%) and 76.8 cm (30.2 in) long (an increase of 14.7% from 2016).
5. Compared to 2016, rainbow trout harvest decreased 68.3% to 2,248 fish. Mean rainbow trout weight decreased 20.9% to 2162 g (4.77 lb.) and length decreased 9.9% to 59.1 cm (23.3 in).
6. The lake trout harvest decreased to an estimated 2,783 fish, a 62.4% decrease from 2016. The mean length of lake trout harvested increased compared to 2016 by 2.7% to 70.4 cm (27.7 in), and mean weight increased 11.6% to 3,804 g (8.39 lb.).
7. The estimated brown trout harvest increased 35.5% from 2016 to 4,379 fish. Mean length of harvested brown trout decreased by 5.3% to 56.3 cm (22.2 in), and mean weight decreased by 27.9% to 2,282 g (5.03 lb.).

8. Estimates of total expenditures for boats, motors, trailers and fishing gear in 2017 were \$3.79 million, 291.9% higher than in 2016.

9. In March, 2017, angler effort decreased 41.9% compared to 2016 to 8,023 angler hours. Brown trout harvest decreased 78.7% to 125 fish, and Coho salmon decreased 79.8% to 391 fish. Harvest of lake trout was 124 fish, compared to 0 fish in March of 2016, but harvest of rainbow trout was 0 fish (compared to 41 fish in March, 2016). As in March of 2016, no yellow perch or Chinook salmon harvest was documented in March of 2017.

ABSTRACT

A contact creel survey was conducted from April 1 to September 30, 2017, covering all legal sport fishing during that period (both by pedestrians and anglers fishing from boats), excluding fishing from chartered boats and smelt fishing. The intent of the survey was to provide reliable estimates of sport fishing activity, sport fish harvest, expenditures for sport fishing, and the quality and distribution of sport fishing for the Illinois portion of Lake Michigan. Total fishing effort for pedestrians and boaters for the survey period was estimated at 266,563 angler-hours. Total harvest estimates for major species during the survey period include 9,568 yellow perch, 4,379 brown trout, 2,248 rainbow trout, 2,783 lake trout, 32,080 Coho salmon, and 3,356 Chinook salmon. Angler expenditures for boats, motors, trailers and fishing gear were estimated at \$3.79 million. Anglers traveled an estimated 2.22 million miles (round trip). The yield value of fish harvested by sport fishing was approximately \$1.35 million.

An additional early-season survey was conducted during March 1 to March 31 at Waukegan Harbor, Montrose Harbor, and Calumet Park for pedestrian anglers and Waukegan Harbor and Calumet Park for launched-boat anglers. In total, anglers harvested an estimated 125 brown trout, 124 lake trout, and 391 Coho salmon in an estimated total of 8,023 hours of fishing during March. Total expenditures for fishing gear, boats, and motors during March were estimated at \$9,407.

INTRODUCTION

This report summarizes results of a survey of sport fishing in the Illinois portion of Lake Michigan from April 1 to September 30, 2017. All types of legal sport fishing during that period, with the exceptions of charter-boat fishing and smelt fishing, were covered by the survey. One supplemental survey was completed: a survey of the early spring fishery was conducted from March 1 to March 31. The intent of the project was to provide estimates of sport fishing effort, harvest, and quality, as well as estimated fishing-related expenditures for anglers fishing Illinois waters of Lake Michigan. Biological data concerning length, weight, sea lamprey wounding and scarring, and marks (fin clips and external tags) were also collected from angler-harvested fish. Creel surveys for the Illinois portion of Lake Michigan have been conducted annually by the Illinois Natural History Survey since 1985; results from the first thirty years of these surveys have been reported in annual technical reports, most recently for the 2016 survey (Roswell and Czesny 2017). Prior to these annual surveys, the most recent creel survey of this type in Illinois was conducted in 1979 by the Illinois Department of Conservation (Muench 1981).

Geographic setting

This survey occurred at access locations along the 63-mile Illinois shoreline of Lake Michigan (Figure 1), a highly-developed stretch of shoreline. Chicago covers roughly one-third of the Illinois shore, and a series of smaller cities cover most of the remainder. No significant tributary streams enter Lake Michigan in Illinois waters. The slope of the near-shore lake bottom is steeper in the northern part of Illinois waters than near Chicago, which forces boaters

from Chicago to go considerably farther from shore to reach good salmon waters (deep and cold) during the summer than boaters departing from North Point Marina. Another geographic feature is the easy access to other states' waters for boaters (e.g., Wisconsin waters for boaters launching at North Point Marina and Indiana waters for anglers launching at Calumet Park). For this survey, data were assumed to represent anglers fishing in Illinois waters.

Figure 1. The Illinois shoreline of Lake Michigan.



METHODS

Non-charter angling activity was categorized into two groups that were evaluated separately: (1) Pedestrian and launched-boat anglers, for which data were generated via personal interviews and direct head counts, and (2) anglers using moored boats. The moored boat estimates presented here are based on extrapolating estimates for anglers using launched boats using data quantifying the distribution of moored-boat angling relative to launched-boat angling.

Pedestrians and launched-boat anglers

Effort and harvest were estimated for pedestrian and launched-boat anglers using selected primary fishing areas (i.e., selected shore access locations and boat ramps), and those estimates were extrapolated to other areas. For each primary fishing area, a modified stratified random sampling design similar to that suggested by Malvestuto (1996) was used. The primary sampling unit of the survey was the fishing day. Daily estimates (e.g., total harvest by species, expenditures by category, etc.) for each primary site were combined to estimate seasonal totals using the formula for stratified random samples given by Cochran (1977).

Use of primary fishing areas

The primary fishing areas for pedestrian anglers were North Point Marina (Winthrop Harbor), Waukegan Harbor (Waukegan), and four locations in Chicago: Montrose Harbor, Belmont Harbor, Jackson Park, and Calumet Park. The primary fishing areas for launched boats were boat ramps at North Point Marina (Winthrop Harbor), Waukegan Harbor (Waukegan), Diversey Harbor (Chicago), and Calumet Park (Chicago). For each day scheduled to be surveyed, a creel clerk was assigned to visit three areas, two pedestrian areas and one launch area, in a prescribed order. The three areas were always one of three groups: (1) Waukegan Harbor (pedestrians), North Point Marina (pedestrians), North Point Marina (launched boats); (2) Montrose Harbor (pedestrians), Belmont Harbor (pedestrians), Diversey Harbor (launched boats); and (3) Jackson Park (pedestrians), Calumet Park (pedestrians), Calumet Park (launched boats). Additional visits to the launch ramps at Waukegan Harbor were added to the design in 2006 and were surveyed in the same manner as the launch ramp sites in the three groups.

Estimates obtained for the primary fishing areas were extrapolated to all other areas of the Illinois shoreline based on the distribution of pedestrian anglers and boat trailers. Data describing these distributions were obtained via an annual series of aerial counts during helicopter flights (conducted on weekends during the spring and summer during 2005-2013 and 2016; no helicopter flights during 2014, 2015, or 2017). During each flight, pedestrian anglers were counted and recorded on a form divided by site and the type of pedestrian site: structure (piers and breakwalls), shore (shoreline) and harbor (inside enclosed harbors). Pedestrian anglers who were not at a recognized site were counted and listed in the vicinity of the closest recognized site; the sum of these became the total for "other areas" on the form. Boat trailers with a vehicle attached were counted in the parking lots of launch ramps and were listed on the form at the appropriate site. All of the data collected were combined for the period to calculate an average

percentage of total fishing effort occurring at each location (Table 2). Distribution data for the last 10 years with flights were included to increase confidence in extrapolating estimates from primary fishing areas.

Distribution of fishing

Pedestrians and launched boats

The aerial survey documented angler use of 24 fishing areas (in addition to “other” areas; Table 2). During 2005 – 2013 and 2016, these 24 areas accounted for 96.5% of the pedestrian anglers observed in the aerial surveys and 100% of the boat trailers parked near launch areas. Boats launched from the Calumet Yacht Club were not included in this survey (located in Illinois, but boats must leave the marina via Indiana waters). Interviews for the creel survey were conducted at six pedestrian fishing areas that accounted for 78.9% of the pedestrian anglers observed during the helicopter flights and four launch areas that accounted for 80.3% of the boat trailers observed near launch areas.

Table 2. Distribution of pedestrian anglers and boat trailers along the Illinois shoreline of Lake Michigan, determined by helicopter flights during 2005-2013 and 2016.

Area	Pedestrian anglers (%)	Boat trailers (%)
1. IL Beach State Park & North Point Marina	1.2	36.6
2. Waukegan Harbor and breakwalls	7.5	29.4
3. Great Lakes Naval Training Station	0.2	0.3
4. Forest Park	0.0	1.3
5. Central Park	0.1	1.7
6. Winnetka (Lloyd and Tower Parks)	0.3	4.0
7. Wilmette Harbor	1.2	NA
8. Northwestern Univ. and Dawes Park	0.3	5.4
9. Farwell Avenue pier	0.9	NA
10. Hollywood Avenue pier	0.7	NA
11. Foster Avenue pier	0.6	NA
12. Montrose Harbor and breakwalls	58.7	NA
13. Belmont Harbor	5.6	NA
14. Diversey Harbor and breakwalls	1.8	7.1
15. North Avenue pier	0.1	NA
16. Navy Pier	0.4	NA
17. Monroe Street breakwalls	0.7	NA
18. Burnham Harbor and vicinity	8.5	6.1
19. McCormick Place seawall	0.8	NA
20. 31st Street Marina	0.4	0.3
21. 50th Street access area	0.2	NA
22. 59th Street Harbor	0.6	NA
23. Jackson Park Harbor and breakwall	5.0	0.6
24. Calumet Park	0.8	7.2
25. other areas	3.5	0

Moored boats

In the Illinois portion of Lake Michigan, boats are moored at several locations: North Point Marina, Waukegan Harbor, Great Lakes Naval Training Station, Wilmette Harbor, and the Chicago Park District harbors. The number

of power boats kept at moorings was used as an index of fishing activity from moored non-charter power boats (Table 3). Some fishing may occur from sail boats, but we assumed that it was a negligible portion of all fishing. Two private lift services (referred to as I/O service in Table 3) were included in the survey: Larsen Marine at Waukegan Harbor and Skipper Bud's at North Point Marina. Boats kept at moorings or on land (lift service) in the Calumet or Chicago River systems were assumed to represent a negligible portion of fishing activity and were not included.

Table 3. Mooring locations along the Illinois shoreline of Lake Michigan and numbers of non-charter power boats moored at each location, as determined by the marinas and port authorities. Total number of power boats per port in bold.

Mooring area	Number of power boats
North Point Marina	329
Public Moorings	287
Skipper Bud's I/O service	42
Waukegan Harbor	332
Public Moorings	252
Larsen Marine I/O service	80
Great Lakes Naval Training Station	55
Wilmette Harbor	190
Chicago Harbors	2,823
Diversey	660
other harbor moorings	2,163

Early spring survey

Only two groups of sites were surveyed in the month of March. A group in Lake County consisted of Waukegan Harbor (pedestrians) and Waukegan Harbor (launched boats). A Chicago group consisted of Montrose Harbor (pedestrians), Calumet Park (pedestrians), and Calumet Park (launched boats). Virtually all the open boat ramps and the areas of heaviest concentrations of open water pedestrian anglers this early in the season were included in these groups (based on personal observations and previous surveys). Effort, harvest, and expenditures by moored-boat anglers were not estimated in the March survey because very few boats are at moorings at that time.

Selection of dates in a stratified random sample

The creel survey season (1 April through 30 September 2017, representing the major portion of fishing activity) was stratified by segment (three-week time periods) and type of day (weekends and holidays, or weekdays). The following 18 strata were formed:

1. Week days 4/1 - 4/16
2. Weekend days 4/1 - 4/16
3. Week days 4/17 - 5/7
4. Weekend days 4/17 - 5/7
5. Week days 5/8 - 5/28
6. Weekend days 5/8 - 5/28

- | | |
|---------------------------|------------------------------|
| 7. Week days 5/29- 6/18 | 8. Weekend days 5/29- 6/18 |
| 9. Week days 6/19 - 7/9 | 10. Weekend days 6/19 - 7/9 |
| 11. Week days 7/10 – 7/30 | 12. Weekend days 7/10 – 7/30 |
| 13. Week days 7/31 - 8/20 | 14. Weekend days 7/31 - 8/20 |
| 15. Week days 8/21 - 9/10 | 16. Weekend days 8/21 - 9/10 |
| 17. Week days 9/11 - 9/30 | 18. Weekend days 9/11 - 9/30 |

For each of the three groups of sites, four survey dates were selected at random within each stratum, with the restriction that all three groups were sampled at least one week day (Monday through Friday) and one weekend day each week. For strata 1 and 18, which were shorter than the others, fewer than four dates were selected for each group of sites. All three sites in each group were visited on the dates selected for that group. In addition to the surveys conducted at the three groups of sites, the launch ramps at Waukegan Harbor were surveyed three times per stratum, except during strata 1 and 18, when only 2 visits were made per stratum.

The early spring survey was treated in a similar fashion to the core survey except that the segment duration was the entire month of March.

- | | |
|-------------------------|----------------------------|
| 1. Week days 3/1 - 3/31 | 2. Weekend days 3/1 - 3/31 |
|-------------------------|----------------------------|

Data collection

Data were collected via two methods at each site: interviews during a two-hour period, and counts at the beginning and end of the two-hour period. Additionally, at boat launch sites, the arrival times of returning boats were recorded for all boats (whether interviews were conducted or not). Each interview was designed for one angling party i.e., one or more anglers fishing together) to increase the number of angling parties that could be interviewed and to minimize redundant questions within angling parties. At the eight pedestrian sites, the two-hour interview period was either 0600 to 0800 or 0830 to 1030. At the boat launch sites, the two-hour period was always 1100 to 1300. For pedestrian sites, individual anglers were counted at the beginning and end of each two-hour period. For boat launch sites, trailers (with vehicles attached, excluding personal watercraft trailers) were counted.

Creel clerks (who conducted the interviews) gathered information related to effort (number of angler-hours, number of angler-trips), expenditures for the present fishing trip (by category: major = boat, motor, or trailer; minor = fishing gear), zip code (to calculate distance driven to fishing locations, round-trip), harvest (by species), and species sought by angling parties. The species sought by anglers were grouped into four categories: Salmonids (including salmon and trout), yellow perch, other species (any species or group of species – e.g., “bass” – except salmonids and yellow perch), and unspecified (when the angling party was not targeting a specific species or group, i.e., “anything that bites”). Clerks also weighed and measured fish in possession of the anglers, noted whether each fish had sea lamprey wounds and scars, and noted any tags or marks (including clipped fins). The instructions to, and data form used by, creel clerks are in Brofka and Czesny (2008).

Calculation of round trip miles

The distance traveled by automobile was estimated for each angling party using Google Earth (Google Inc., 2015) in August, 2018. The “Get Directions” application was used to estimate distance from each party’s zip code (using the location provided by Google Earth for that zip code) and the main parking area at the location where the angler was surveyed. As many drivers utilize Google for directions, these results likely closely match true distances driven, accounting for decisions to optimize both distance and travel time. The use of Google Earth instead of Google Maps resulted in directions not influenced by traffic; while traffic likely is a factor influencing the route taken by anglers to fishing sites, traffic is always changing, and optimal routes accounting for traffic would likely be different at the time distance was estimated (long after the interview). The distance given by Google Earth was doubled to produce a round trip estimate. When anglers provided other locations instead of zip codes (e.g., city, neighborhood, or intersection), we used the “Get Directions” application in the same way, replacing the zip code with the given location. When anglers in a party traveled from separate zip codes, we used the zip code provided by the party leader (i.e., the angler providing most answers for the survey).

Variables measured for each date

Data collected during interviews were used to estimate the following variables for each date at each site: (1) Harvest per angler-hour, determined for each species by dividing the number of fish harvested by all parties interviewed by the number of hours of fishing by individuals in those parties; (2) Expenditures per angler-trip, categorized into major and minor categories. For all expenditures, total expenditures by all anglers interviewed were divided by the number of anglers interviewed; (3) Distance traveled (by automobile) per angler-trip. As for expenditures, the total, round-trip miles traveled by all anglers interviewed were divided by the number of anglers interviewed; (4) Angler-hours (i.e., total time spent fishing by all anglers; see following paragraph); (5) angler-trips (i.e., total number of anglers who fished; see following paragraph); (6) total harvest was calculated for each species as harvest per angler-hour multiplied by angler-hours; and (7) total expenditures were determined for each category as expenditures per angler-trip multiplied by angler-trips.

Angler-hours and angler-trips were determined differently for pedestrians and boaters. For pedestrians, angler-hours was calculated by multiplying the average number of anglers (from counts at the beginning and end of each two-hour period) by the number of hours in the day (from 0.75 hour before sunrise to 0.75 hour after sunset), and angler-trips was calculated as angler-hours divided by the average duration of a pedestrian fishing trip (mean of 3.91 hours for all pedestrian interviews in 2017). The number of angler-trips for anglers using launched boats was estimated by multiplying the number of anglers returning on boats during the two-hour interview period by the ratio of the number of all boats returning in a day to the number returning between 1100 and 1300. By monitoring all boat traffic at North Point Marina on 13 days during 2014 - 2016, the number of boats returning all day was estimated to be 2.759 times the number returning during 1100 to 1300 interview period. Launched-boat angler-hours were estimated by multiplying the number of angler-trips by the monthly mean trip duration. To smooth unrealistic differences between months, estimates of angler-trips were multiplied by the ratio of the annual mean to monthly mean of estimated anglers per trip. Estimates of angler-hours were multiplied by both this ratio and the ratio of

annual mean to monthly mean of hours per trip. In 2017, the annual mean number of anglers per boat was 2.41, and the annual mean trip duration for boat anglers was 5.64 hours.

Expansion of daily estimates

The formula given by Cochran (1977) for stratified random samples was used to expand daily estimates to seasonal site-specific estimates of effort, harvest, and expenditures. A different set of strata were used for expansion of estimates: we used month-long segments (e.g., April, May, June), each divided into weekend days and week days (instead of the three-week segments described above) and obtained monthly totals for each type of estimate.

Extrapolation to other areas

Extrapolations of seasonal estimates from primary fishing areas to other areas were based on the distributions of pedestrian anglers and boat trailers (assumed to reflect the distribution of launched-boat anglers; Table 2). Harvest, effort, and expenditures at areas not visited were estimated by extension of estimates for the nearest primary fishing areas. Thus, for pedestrian anglers, estimates for Waukegan Harbor were extended to all other areas north of and including Wilmette Harbor (except North Point Marina); estimates for Montrose Harbor were extended to all remaining areas north of Belmont Harbor; estimates for Belmont Harbor were extended to all remaining areas north of the Monroe Street breakwalls; estimates for Jackson Park were extended to all areas south of Monroe Street except for Calumet Park. For launched boats, estimates for Waukegan Harbor were extended to all launch ramps north of Wilmette (including the "other" areas listed in Table 2, but excluding North Point Marina); estimates for Diversey were extended to Dawes Park; and results for Calumet Park were extended to the ramps at Jackson Park, 31st Street Harbor, and Burnham Harbor.

Moored boats

Effort, harvest, and expenditure estimates for anglers using moored boats were extrapolated from calculations for launched boats. First, the ratios of moored fishing boats to launched fishing boats for North Point Marina and Diversey Harbor were estimated: On six dates during the spring and summer of 2017 the numbers of fishing boats returning to moorings were counted while, simultaneously, the numbers of fishing boats returning to the launch ramp were also counted. Charter boats were excluded from these counts. Due to low numbers of returning boats, the ratios of moored to launched boats were estimated using data from 2008-2017. These ratios were 0.794 in North Point Marina and 1.529 in Diversey Harbor.

Using these figures, seasonal estimates of effort, harvest, and expenditures by anglers using launched boats at North Point, Waukegan (ratio assumed to be equal to North Point Marina), and Diversey harbors were extrapolated to moored boats. Thus, for example, the moored boat effort at North Point Marina for a given segment was estimated to be the launched boat effort for that segment multiplied by 0.794. Based on the distribution of moored power boats, estimates for Waukegan Harbor were extrapolated to boats moored in Wilmette Harbor and Great Lakes

Naval Training Station, and the estimates for Diversey Harbor were extrapolated to all other boats moored in Chicago.

Changes in creel survey methods

Creel survey methods have varied during the past thirty-two years of the creel survey, so comparisons should be made with caution. In particular, estimation of round-trip miles differs from years prior to 2015. The influences of changes in methods will continue to be evaluated.

Confidence intervals and bias

Estimates of harvest, effort, and expenditures are presented without confidence intervals, as we have not fully evaluated bias in our estimates. Although we have collected and will continue to collect data with which to partially assess biases, assessing potential impacts on precision of estimates is not possible at this time.

Yield values

The term “yield value” is used in this report to describe the hypothetical market price of fish harvested by anglers (if sold as fillets). To estimate the yield value, the estimated harvest for each species was multiplied by the estimated mean weight of that species to produce an estimated round weight. That round weight was then multiplied by 0.4 (assuming 60% loss in filleting process in keeping with previous years’ estimates; e.g., Roswell and Czesny 2017) to produce the harvested marketable weight for each species. The marketable weight for each species was then multiplied by species-specific prices (approximated using prices observed on the internet in August 2017 by C.R. Roswell) to produce the market value of the 2017 harvest for each species.

Missing data

On some dates creel clerks were unable to complete their assigned interviews due to factors such as illness and vehicle break-downs. In 2017, all or some of the scheduled surveys were incomplete on approximately 9% of all scheduled survey days, mostly due to unexpected staff shortages. While slightly more survey days were missed in 2017 than in other years, schedules were adjusted to maintain an even distribution of sampled dates across sites/strata. When data were missing from some of the assigned dates in a stratum, estimates for the stratum were based only on data from the surveyed dates. Thus, the sample size was smaller in these cases than for strata in which all interview sets were completed, and the resulting estimates were not as precise as estimates derived from full data sets.

Alternate sites/altered sites

Unforeseen circumstances (e.g., construction) have caused one or more primary sites to be closed or less accessible during part or all of many past sampling seasons. In 2017, there were few minor disruptions. The floating dock portion of the fishing pier at North Point Marina was not accessible for much of April. Other access limitations were restricted to scattered single-day disruptions.

Yellow perch year class contributions to the fishery

Anal spines of harvested yellow perch have been collected annually since 2005 to estimate age composition of yellow perch harvest (age is estimated via examination of sectioned spines; see Dub and Czesny 2016 for details). An index of year class contributions to the yellow perch fishery was calculated by multiplying annual harvest per unit effort (shown in Figure 2b) by proportions of harvest comprised of each year class. Only pedestrian data were used, as boat data have been inconsistently collected in recent years. The result is an estimated harvest rate index (harvest per unit effort) for each combination of year class and year of harvest.

RESULTS

Overview

Estimates reported here are rounded; this may result in values for “totals” that differ slightly from the sum of individual values. For simplicity, the words "approximately" or “estimated” are not repeated with each estimated value. Detailed results for 2017 are presented in Tables 4 - 10. Tables 4 and 5 list seasonal harvest and effort (angler hours) estimates for anglers. Tables 6 and 7 present effort and harvest for each segment. Table 8 provides yield values. Table 9 lists fin clip abbreviations; fin clips observed by our creel clerks are listed in Table 10, with the number of occurrences of each clip or clip combination listed by species. Table 10 can assist in determining the contributions of different stockings of fish to the sport fishery in the Illinois portion of Lake Michigan. Tables 11 and 12 report angler trips and expenditures among angler types and among years. Tables 13 and 14 compare angler hours and harvest by fish species between angler types and for each year. Table 15 compares minor fish species harvest for each year.

Total April-September non-charter sport fishing effort in the Illinois portion of Lake Michigan was 266,563 angler-hours. Harvest for major species included 9,568 yellow perch, 32,080 Coho salmon, 3,356 Chinook salmon, 2,248 rainbow trout, 2,783 lake trout and 4,379 brown trout (Table 4). Anglers spent \$3.79 million during the study period for boats, motors, trailers, and fishing gear used on Lake Michigan fishing trips (Table 11). Anglers fishing Lake Michigan drove 2.22 million miles (round trip; Table 11). The Illinois sport fishing harvest was estimated to have a yield value of \$1.35 million (Table 8).

Pedestrian fishing

From April 1 - September 30, 2017, pedestrian anglers spent 105,905 hours fishing in 27,070 trips to Lake Michigan (Table 4, Table 11). Yellow perch comprised the largest portion of the pedestrian harvest (9,516 fish; Table 4). Pedestrian anglers spent \$444,502 (mean = \$16.42 per trip) for fishing gear and drove 794,390 miles (mean = 29.35 miles per round trip – to and from the lake shore; Table 11).

Boater fishing

Anglers using launched or moored boats made 28,445 trips to Lake Michigan (Table 11) and spent 160,658 hours fishing (Table 4). The most abundant components of boater harvest were Coho salmon (30,711) and brown trout (3,348; Table 4). North Point Marina accounted for 40.5% of the salmonines (lake trout, brown trout, rainbow trout, Chinook salmon, and Coho salmon) taken by all anglers who used boats, more than any other port (Table 4). See Appendix A for a comparison of the charter-boat fishery with non-charter boat angling. Yellow perch harvest by boat anglers was estimated at 52 fish (Table 4). Total, fishing-related expenditures by anglers using boats were \$3,341,919 (\$117.49 per trip), with 80.7% of that amount spent on boats, motors, and trailers (Table 11). Boaters drove 1,423,337 round-trip miles (50.0 miles per trip; Table 11).

Yield values

The estimated yield values of the three most valuable (in total yield) sport species were \$646,999 for Coho salmon, \$449,661 for Chinook salmon, and \$79,359 for lake trout (Table 8). Aside from yellow perch harvested from the Wisconsin portion of Green Bay, none of the species listed in Table 8 are currently commercially available from Lake Michigan. Therefore, the values of all species are estimated from the retail prices for fish that are farm-raised or commercially-harvested in other waters. An estimated price for brown trout fillets was not available, so the price for lake trout fillets was used to estimate the yield value of brown trout.

Comparisons with preceding years

The estimated total of 266,563 angler hours represents the lowest total fishing effort recorded in this survey (1986-2017). Compared to 2016, total angler fishing effort decreased by 12.7% (Table 13). Boater effort decreased 7.7%, and pedestrian effort decreased 19.4% (Table 13). Compared to 2016, angler harvest rates for salmonids (number of fish per angler hour) increased (to the second-highest level in the last decade for boat anglers), but decreased for pedestrian anglers (Figure 2a). Pedestrian angler harvest rates for yellow perch increased compared to 2016, while yellow perch harvest rates for boat anglers remained low, similar to 2016 (Figure 2b); yellow perch harvest rates for both boaters and pedestrians remained near record lows (observed in 2015). Total effort directed at salmonids was 202,070 angler-hours, lowest on record; about 69% of salmonid-directed effort occurred from boats, similar to most years in the last decade (Table 4, Figure 3a). Total effort directed at yellow perch was 24,135 angler-hours, lowest on record; boat anglers accounted for approximately 15%. Total perch-directed effort, as well as the proportion of angler-hours comprised by boaters, were much higher during 2008-2010 (Table 4, Figure 3b).

The yellow perch harvest of 9,568 was a decrease of 14.8% from the 2016 harvest (Table 13 and Figure 4). The average weight of yellow perch kept by anglers increased to 275.9 g (0.61 lb.; Table 8), and average length increased 9.4% to 253 mm (Figure 5). Pedestrian harvest of yellow perch peaked in June (56.4% of pedestrian harvest), and most of the pedestrian harvest for the entire period occurred at our Montrose site (84.2% of overall pedestrian harvest; Table 6). In 2017, monthly contributions to total harvest (as a percent of total harvest) were similar to typical monthly patterns observed under the current season structure (2015-present; Figure 6).

The 2017 harvest of Coho salmon increased by 25.8% compared to 2016 (Table 13 and Figure 7). Weight (1,349 g, or 2.97 lb.) of creel Coho salmon decreased 14.6% and length (530 mm) decreased 3.1% compared to 2016 (Table 8 and Figure 8). The majority (63.7%) of the harvest occurred in May and June (Tables 6 and 7).

The Chinook salmon harvest was 3,356 fish for 2017, a decrease of 45.0% from 2016 (Table 13 and Figure 9). Average length was 768 mm, an increase of 14.7 % compared to 2016, and the average weight increased 47.8% compared to 2016, to 5,341 g (11.77 lb.; Table 8 and Figure 10). Chinook salmon harvest peaked in July (25.1% of harvest) and again in September (35.4% of harvest; Tables 6 and 7).

The 2017 harvest of lake trout was 2,783, a 62.4% decrease from harvest in 2016 (Table 13). The average weight increased by 11.6% and average length increased by 2.7% compared to 2016 (Table 8). Lake trout harvest was highest in April (25.4% of total harvest) and July (29.2% of harvest; Tables 6 and 7).

The 2017 brown trout harvest (4,379) increased by 35.5% from 2016 (Table 13). The average length (563 mm) decreased by 5.3% compared to 2016 and the average weight of 2,282 g (5.03 lb.) decreased by 27.9% (Table 8). The majority (90.7%) of the harvest occurred in April (Tables 6 and 7).

The 2017 rainbow trout harvest (2,248) decreased from 2016 by 68.3% (Table 13). The average length of 591 mm was a decrease of 9.9% compared to creel rainbow trout in 2016, and weight (2,162 g, or 4.77 lb.) decreased 20.9% (Table 8). More harvest occurred in July and August than in other months (61.8%; Tables 6 and 7).

Estimated expenditures for boats, motors, and trailers increased by 2,003% compared to 2016 (Table 11). Minor expenditures (i.e., fishing tackle) increased by 30.1% and total mileage decreased by 14.1%.

The 2017 early spring (March) survey saw a decrease of 41.9% in angling effort compared to March of 2016. Overall harvest of salmonines was lower than for March of 2016: lake trout harvest was 124 fish (compared to 0 in March of 2016), but Coho salmon harvest decreased 79.8%, brown trout harvest decreased 78.7%, and rainbow trout harvest declined to 0 fish (compared to 41 in March of 2016). As in March of 2014 -2016, no yellow perch or Chinook salmon were harvested in the month of March in 2017 (Table 14).

Seasonal patterns in salmonid harvest and effort

The majority of salmon and trout were harvested in April, May, and June (68.9%; Figure 11a, b). The majority of brown trout harvest occurred in April (90.7%), while Coho salmon harvest peaked in May and June (63.7%). The summer months (June, July, and August) accounted for most rainbow trout harvest (78.6%), and most lake trout were harvested in April, July, or August (76.3%). Most (60.5%) of Chinook salmon harvest occurred during either July or September. Salmonid-directed effort by pedestrians was high during April and September, and much lower

during May-August. Boater salmonid effort was highest during August and lowest during September, with intermediate levels occurring during April, May, June, and August.

Yellow perch year class contributions to the fishery

Pedestrian harvest for a year class typically peaks at age 3 or 4, followed by declining harvest as the year class ages to 5 years and beyond; an average of 75.3% of the total pedestrian harvest is composed of age-3, 4, and 5 yellow perch (Figure 12a). Figure 12b shows the mean age 3-5 harvest rate in the pedestrian segment of the fishery for each yellow perch year class. Mean age 3-5 harvest rates are only shown for year classes for which harvest rate estimates were available for ages 3, 4, and 5 (year classes 2002 – 2012). Relative to many past year classes, the 2011 and 2012 year classes have contributed little to the yellow perch fishery.

Minor species

In addition to the species for which results are presented in detail in Tables 4 - 14 (commonly-encountered salmonids and yellow perch), creel clerks reported the catch and/ or harvest of several other species by anglers (referred to here as “minor species”; Table 15). For some species, the total number of fish harvested (and total numbers caught) were estimated. For other species, very few fish were observed, so only the actual number observed in anglers’ possession by creel clerks during interviews is reported. Most of these “minor” species were harvested in or near the harbors. Minor species harvested (total caught in parentheses) include: **round goby**, 1,695 (4,274); **freshwater drum**, 534 (726); **smallmouth bass**, 337 (3840); **common carp**, 30 (362); **largemouth bass**, 54 (392); **alewife**, 18 harvested fish observed; **northern pike**, 3 harvested fish observed. Additionally, an estimated 1937 **rock bass** and 44 **bluegill** were released (none harvested).

DISCUSSION

Changes in the fishery and the creel survey in 2017

The primary purpose of this report is to report data summaries and other information from this long-term monitoring project to fisheries scientists and managers. As such, much of the data collection, analyses, and reporting is very similar to previous years. This provides a better comparison with previous years’ data, enabling a more complete understanding of inter-annual trends in the fishery. However, some minor changes have occurred as a result of changing information needs and changes in the fishery (e.g., access and regulation changes).

Unlike years prior to 2012, formal estimates of vehicle fuel costs were not included in this report. Previously, an estimate of \$0.10 per mile for fuel was applied to the total miles driven by anglers to and from creel locations. Due to changes in gas prices, this likely would underestimate the actual amount spent by anglers on vehicle fuel. One approach to estimating fuel costs, used by Melstrom and Lupi (2013) as part of a model estimating the value of Great Lakes recreational fishing, uses rates published annually by AAA (AAA 2017). Average gas cost reported by AAA was \$0.1026 per mile in 2017 (AAA 2017). Melstrom and Lupi (2013) added \$0.05 per mile for vehicles

towing trailers to account for increased fuel consumption; employing this approach produces an estimate of \$0.1526 per mile for vehicles towing trailers in 2017. Applying the average rate for pedestrian and moored boat anglers' round-trip miles, and the vehicle-with-trailer rate for launched boat anglers' miles, produces estimated fuel costs of \$262,616 for all non-charter anglers fishing Illinois waters of Lake Michigan during April – September, 2016. This is slightly more than an estimated total of \$257,646 in fuel costs for 2016 (derived via AAA's 2016 rate; Roswell and Czesny 2016).

Another change related to vehicle fuel costs was the use of zip codes to estimate round-trip miles for angling trips (see Methods).

An important change to the fishery occurred in 2015 (and continued in 2016): the establishment of a closed season for yellow perch fishing from May 1 – June 15. Previously (2001 – 2013), fishing for yellow perch was not permitted during the month of July (except for children under 16, with a reduced bag limit, since 2007), and in 2014 there was no closed season for yellow perch. In 2017, June and July accounted for 36.6% and 49.3%, respectively, of angler hours directed at yellow perch. Some illegal perch-directed angling was observed (e.g., 0.2% of perch angling effort occurred in May). June accounted for 56.1% of yellow perch harvest, and July accounted for 40.0% of harvest in 2017. During 2004-2013 (the last ten years with a July closure), July accounted for 3.7% of yellow perch harvest, on average. Thus, the opening of July to yellow perch angling has allowed increased yellow perch harvest during that month, but low overall angler success rates for perch in 2017 contributed to the second-lowest total April-September yellow perch harvest on record. This is also significant because 2015-2017 have been the three worst years for yellow perch harvest recorded in this survey (since 1986).

Angler effort

Total angler fishing effort (indexed by angler-hours) decreased 7.7% for boats and 19.4% for pedestrians compared to 2016; total effort has declined 51.2% over the last decade (from 546,380 angler hours in 2008). Effort has generally been declining since this survey began in 1986, and total angler effort in 2017 was the lowest on record (1986-2017), and is the fifth straight year of decline, suggesting the trend of decreasing angler effort continues.

Yellow perch

Annual yellow perch harvests by anglers in Illinois have varied substantially over time. Estimated angler harvest was well over one million fish each year from 1986 through 1993 (except 1989). However, harvest fell to fewer than 600,000 in 1994, and by 1997 fell to well under 60,000 (driven in part by regulation changes and reduced effort; Brofka and Dettmers, 1999). Harvest increased somewhat in 2001 (to 169,967) in response to increased effort and new regulation changes (repeal of an unprotected slot limit and moving the month closure from June to July). Yellow perch harvest generally increased from 2002 through 2008 to around 300,000, but then declined, and has been under 100,000 fish for the last seven years (2011-2017). The mean April-September yellow perch harvest during 2008-2017 was 107,020; however, the mean harvest during 2013-2017 was 27,334, less than one-third of the

ten-year mean. Harvest in 2017 decreased 14.3% from 2016 for pedestrian anglers and decreased 57.0% for boat anglers (decrease of 14.8% combined pedestrian and boat harvest). The 2017 harvest of 9,568 yellow perch, though slightly higher than the record low of 8,289 fish in 2015, was far below the pre-2015 low for April-September total yellow perch harvest, which occurred in 1998 (35,936 fish). Overall effort directed at yellow perch decreased 32.7%, and overall HPE (harvest per angler effort expressed in fish-per-angler-hour) was 0.40 yellow perch per angler-hour, 26.5% higher than 2016 HPE and 83.9% higher than 2015 HPE (but sixth-lowest on record for our survey, 1986-2017). Mean weight of angler-harvested yellow perch was 69.4% higher than in 2016, but the distribution of sizes was strongly right-skewed (i.e., the mean weight was driven higher by a small number of large fish). The median weight of harvested yellow perch was 144 g (compared to a 275.9 g mean weight).

Coho salmon

Coho salmon consistently comprise the largest part of both the boat and pedestrian salmonid fishery. Coho salmon typically make up about 64% of the boater salmonid harvest, and in 2016 accounted for 71.5% of salmonids harvested by the overall non-charter angling fishery. The 2017 harvest of 32,080 Coho salmon was 25.8% lower than harvest in 2016. Mean weight of harvested Coho salmon during 2017 was 1,349 g, 9.09% lighter than the thirty-two-year mean.

Other salmonids

While the Coho salmon harvest has traditionally dominated spring and early-summer salmonid harvest, other salmonids (especially Chinook salmon) often make up large portions of the harvest during mid-summer through early fall. Chinook salmon are popular, as they can attain very large sizes and provide anglers with a good fight. The annual Chinook harvest has fluctuated through time. Bacterial kidney disease (BKD) was blamed for die-offs of Chinook salmon beginning in 1988, resulting in reduced angler harvest of Chinook salmon, (as low as 2,900 fish in 1994). Chinook salmon have since been closely monitored in the hatchery and in the wild for BKD (Clark, 1996). Harvest in 2017 decreased by 45.0% (3,356) compared to 2016, and remained below the ten-year mean harvest (2008-2017) of 7,409 fish. Mean weight increased 47.8% from to 2016 to 5,341 g (11.77 lbs.).

Lake trout harvest peaked in 1998 at 12,000, while the lowest harvest occurred in 2006 (653). Lake trout harvests have generally fluctuated in recent years, but remain higher than during a period of relatively low harvest during 2003-2010. The mean lake trout harvest for the past ten years is 2,982 fish; the mean harvest for 2013-2017 is 3,974 fish. In 2017 the harvest was 2,783 fish, slightly below the 1986-2017 mean of 3,542 fish.

Brown trout are an important component of the spring salmonid fishery with a ten-year mean harvest (2008-2017) of 3,110 fish. The 2017 harvest of 4,379 browns was an increase of 35.5% from the 2016 harvest. The mean weight decreased from 2016 to 2,282 g (5.03 lbs.).

Rainbow trout are a component of the fishery during spring and summer. Typically, most rainbow trout harvest occurs in the boat fishery. The average annual harvest for the past ten years has been 3,744. The fishery in 2017 saw a decrease of 68.3% compared to 2016 with a harvest of 2,248 fish. The mean weight decreased to 2,162 g (4.77 lbs.) in 2017, which is 20.9% smaller than the mean weight of rainbow trout harvested in 2016.

Yellow perch year class contributions to the fishery

The mean age 3-5 harvest rate indicates the 2002 and 2003 year classes made large contributions to pedestrian yellow perch harvest rates, while the 2011 and 2012 year classes made below-average contributions (the 2010 year class is the most recent above-average contributor to harvest rates). Thus, the very low yellow perch harvest observed during 2015-2017 is likely largely attributable to consecutive (2011 and 2012) weak year classes.

However, the harvest rate for the 2015 year class (not shown; harvested at age-2 in 2017) has already surpassed the peak harvest rate of several year classes that have previously contributed to harvest. Since harvest tends to peak at age 3 or 4, this may indicate the 2015 year class will be a strong component of harvest in years to come.

Minor species

Some species provide a smaller, yet consistent component of the fishery. The national B.A.S.S. tournament held at Burnham Harbor July 19 - 23, 2000 is evidence that anglers nationwide are aware of opportunities to catch black bass (smallmouth and largemouth bass) in the harbors and shoreline of the Illinois portion of Lake Michigan. Common carp and freshwater drum are targeted both by anglers fishing for food and catch-and-release anglers using European carp tournament fishing techniques. Panfish (other than yellow perch) are targeted or kept incidentally by pedestrian anglers; rock bass harvest has averaged about 1.5% of the annual yellow perch harvest for the last ten years, representing the largest component of the non-perch panfish fishery. Estimated harvests of freshwater drum have often been similar in scale to estimates of harvest for brown, lake, and rainbow trout. Approximately 6.9% of total angling effort was directed at minor species in 2017 (i.e., "other" recorded as the species sought during interviews).

Expenditures

Expenditures increased in 2017, while mileage decreased. Major expenditures (i.e., boat, motor and trailers) increased 2003% and minor expenditures (i.e., tackle, bait, downriggers, etc.) increased 30.1%, against a general declining trend since 2008. Mileage (round-trip, to and from access sites) decreased 14.1%, consistent with a 13.6% decline in angler-trips from 2016. Both angler-trips and total miles estimates have been generally declining over the last decade. Caution should be used when considering differences in mileage due to changes in methods. Collecting zip codes to estimate round trip mileage potentially allows additional future evaluations of angler travel, but may lead to different results for total mileage than using angler-reported mileage (as used in years prior to 2015). Evaluating mean mileage per trip in future years may provide insight into relative biases of the zip code method.

Early spring (March) survey

Fishing effort and success during March is heavily influenced by the weather and the severity of the winter preceding March. For example, March of 2012 was one of the warmest on record for this region, resulting in the highest March angling effort of the last ten years, and above-average harvest of yellow perch, Coho salmon, and brown trout. In contrast, ice limited angling at Waukegan Harbor during 2014 and 2015, resulting in reduced effort, and subsequently low yellow perch and brown trout harvests. Effort in March of 2017, at 8,023 angler hours, was slightly below the mean of the last 10 years, a decrease from March, 2016. Accordingly, March harvest of brown trout and Coho salmon was lower than the ten year mean for those species. As in March, of the previous three years, no perch were harvested in March of 2017; March yellow perch harvest previously ranged between 28 and 19,322 fish during 2008-2013.

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Table 4. Effort (anglers-hours) and harvest (by species) by non-charter anglers in the Illinois portion of Lake Michigan during April-September, 2017. Wau. = Waukegan, Peds = Pedestrian.

Type of angler	Area	Effort		Harvest						
		Total hours	Target perch	Target salmon	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
Peds	North Point	1,478	142	61	324	0	0	0	0	0
	Wau. Harbor	11,960	312	9,358	0	109	30	9	24	150
	Montrose	53,159	15,603	24,890	8,015	656	30	0	980	364
	Belmont	6,307	1,245	4,131	211	58	101	0	31	87
	Jackson	5,226	370	4,102	135	15	0	0	30	135
	Calumet	2,651	229	1,245	0	44	0	0	122	0
	others	25,124	2,502	18,255	831	149	57	4	182	493
	TOTALS	105,905	20,403	62,042	9,516	1,031	218	13	1,369	1,229
Boat	North Point	58,527	0	56,546	0	47	1,589	1,318	14,393	806
	Wau. Harbor	32,569	32	31,912	0	271	301	622	8,438	266
	Diversey	13,463	0	10,314	0	864	0	165	1,068	284
	Calumet	5,185	1,879	1,041	26	35	0	0	233	0
	others	50,914	1,821	40,215	26	2,131	140	665	6,579	771
	TOTALS	160,658	3,732	140,028	52	3,348	2,030	2,770	30,711	2,127
	Combined	TOTALS	266,563	24,135	202,070	9,568	4,379	2,248	2,783	32,080

Table 5. Effort (anglers-hours) and harvest (by species) by non-charter anglers at selected sites along the Illinois portion of Lake Michigan during March, 2017. Wau. = Waukegan, Cal. = Calumet, Peds = Pedestrian.

Location	Effort		Harvest						
	Total hours	Target perch	Target salmon	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
Wau. Harbor	1,099	0	1,028	0	16	0	0	0	0
Wau. Ramp	301	0	301	0	0	0	0	0	0
Montrose	4,989	97	4,497	0	73	0	124	312	0
Cal. Park Peds	1,333	7	1,274	0	36	0	0	59	0
Cal. Park Ramp	301	0	301	0	0	0	0	19	0
Total	8,023	105	7,403	0	125	0	124	391	0

Table 6. Effort and harvest for each month by pedestrian anglers of the Illinois portion of Lake Michigan during April-September, 2017. Wau. = Waukegan.

Time Period	Area	Effort		Harvest						
		Total hours	Target perch	Target salmon	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
April	North Point	0	0	0	0	0	0	0	0	0
	Wau. Harbor	1,682	0	1,327	0	69	0	9	24	0
	Montrose	10,388	187	9,057	0	429	0	0	965	0
	Belmont	1,845	0	1,516	0	41	91	0	31	0
	Jackson	1,228	0	1,175	0	15	0	0	30	0
	Calumet	1,367	72	1,109	0	44	0	0	122	0
	others	5,726	36	5,071	0	117	40	4	181	0
May	North Point	161	0	0	0	0	0	0	0	0
	Wau. Harbor	713	0	422	0	40	0	0	0	0
	Montrose	4,526	57	3,659	0	227	0	0	15	15
	Belmont	990	0	713	0	17	0	0	0	0
	Jackson	104	0	43	0	0	0	0	0	0
	Calumet	103	0	0	0	0	0	0	0	0
	others	1,226	2	798	0	33	0	0	1	1
June	North Point	295	95	53	0	0	0	0	0	0
	Wau. Harbor	1,067	12	408	0	0	20	0	0	0
	Montrose	9,492	5,510	515	4,580	0	0	0	0	0
	Belmont	614	578	0	85	0	0	0	0	0
	Jackson	551	234	0	120	0	0	0	0	0
	Calumet	255	0	0	0	0	0	0	0	0
	others	2,720	1,233	182	580	0	8	0	0	0
July	North Point	227	23	0	0	0	0	0	0	0
	Wau. Harbor	685	252	189	0	0	0	0	0	0
	Montrose	11,319	8,141	44	3,435	0	0	0	0	0
	Belmont	536	493	0	87	0	0	0	0	0
	Jackson	345	136	0	15	0	0	0	0	0
	Calumet	585	157	0	0	0	0	0	0	0
	others	2,128	1,041	110	234	0	0	0	0	0
August	North Point	403	24	9	324	0	0	0	0	0
	Wau. Harbor	1,275	27	1,016	0	0	11	0	0	20
	Montrose	5,706	1,608	1,457	0	0	30	0	0	0
	Belmont	808	174	408	39	0	0	0	0	40
	Jackson	168	0	168	0	0	0	0	0	0
	Calumet	167	0	0	0	0	0	0	0	0
	others	1,613	175	1,037	17	0	5	0	0	25
September	North Point	392	0	0	0	0	0	0	0	0
	Wau. Harbor	6,539	21	5,996	0	0	0	0	0	130
	Montrose	11,728	100	10,158	0	0	0	0	0	349
	Belmont	1,513	0	1,494	0	0	10	0	0	47
	Jackson	2,830	0	2,716	0	0	0	0	0	135
	Calumet	173	0	136	0	0	0	0	0	0
	others	11,710	15	11,057	0	0	4	0	0	467

Table 7. Effort and harvest by anglers using boats of the Illinois portion of Lake Michigan during April-September, 2017. Wau. = Waukegan.

Time period	Area	Effort		Harvest						
		Total hours	Target perch	Target salmon	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
April	North Point	2,478	0	2,064	0	0	0	0	48	0
	Wau. Harbor	5,856	0	5,856	0	241	40	103	836	0
	Diversey	5,080	0	4,470	0	864	0	165	185	153
	Calumet	1,005	352	653	0	35	0	0	220	0
	others	15,290	505	13,450	0	2,117	18	425	1,027	350
May	North Point	13,244	0	13,052	0	0	278	141	6,224	15
	Wau. Harbor	7,027	0	7,027	0	14	0	14	2,723	0
	Diversey	857	0	857	0	0	0	0	102	0
	Calumet	678	0	0	0	0	0	0	0	0
	others	5,882	0	5,491	0	7	0	7	1,495	0
June	North Point	9,454	0	9,454	0	22	133	74	4,150	12
	Wau. Harbor	6,915	0	6,562	0	0	148	289	3,076	108
	Diversey	2,858	0	1,272	0	0	0	0	370	0
	Calumet	1,129	726	217	0	0	0	0	0	0
	others	10,837	439	6,745	0	0	69	134	2,270	50
July	North Point	17,287	0	17,161	0	8	657	605	2,777	269
	Wau. Harbor	7,298	0	7,095	0	15	34	142	1,429	99
	Diversey	2,953	0	2,953	0	0	0	0	411	131
	Calumet	1,996	801	171	26	0	0	0	13	0
	others	12,084	860	10,020	26	7	16	66	1,614	344
August	North Point	12,010	0	11,864	0	0	520	499	1,194	476
	Wau. Harbor	3,446	32	3,414	0	0	79	74	333	40
	Diversey	762	0	762	0	0	0	0	0	0
	Calumet	0	0	0	0	0	0	0	0	0
	others	3,336	17	3,319	0	0	37	34	155	19
September	North Point	4,054	0	2,952	0	17	0	0	0	34
	Wau. Harbor	2,028	0	1,958	0	0	0	0	41	18
	Diversey	953	0	0	0	0	0	0	0	0
	Calumet	377	0	0	0	0	0	0	0	0
	others	3,484	0	1,188	0	0	0	0	19	9

Table 8. Yield values of fish harvested by non-charter sport anglers in the Illinois waters of Lake Michigan during April - September 2017. All fish are assumed to be prepared as fillets with 60% waste. Prices for all except brown trout (used lake trout value) are those current in national markets in August, 2017.

Species	Total harvest	Av. wt. (lbs.)	Round wt. (lbs.)	Market wt. (lbs.)	Price per pound	Yield value
Yellow perch	9,568	0.61	5,820	2,328	\$18.33	\$42,674
Brown trout	4,379	5.03	22,034	8,814	\$8.50	\$74,915
Rainbow trout	2,248	4.77	10,713	4,285	\$13.50	\$57,849
Lake trout	2,783	8.39	23,341	9,336	\$8.50	\$79,359
Coho salmon	32,080	2.97	95,428	38,171	\$16.95	\$646,999
Chinook salmon	3,356	11.77	39,513	15,805	\$28.45	\$449,661

Combined yield value of all species: \$1,351,457

Table 9. Fin clip abbreviations.

Name of fin or bone	Abbreviation
Adipose fin	ad
Dorsal fin	do
Left maxillary bone	lm
Right maxillary bone	rm
Left pectoral fin	lp
Right pectoral fin	rp
Left ventral fin	lv
Right ventral fin	rv

Table 10. Fin clip summary for salmonids harvested by non-charter anglers in the Illinois waters of Lake Michigan during 2017. Typically, only a portion of the salmonids stocked each year are marked. However, all stocked lake trout are clipped. Lake trout examined by clerks which exhibit no fin clips are one of four possibilities: 1. the lake trout is naturally produced (wild), 2. the lake trout failed to receive a fin clip in the hatchery, 3. the lake trout regenerated the missing fin or fins, 4. the clerk did not examine the lake trout thoroughly enough and missed the clip or clips.

Clip	Species				
	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
ad	0	1	11	3	21
ad, lp	1	0	0	0	0
ad, lp, rp	1	0	0	0	0
ad, rp	2	0	0	0	0
lm	0	0	0	1	0
lp	0	0	4	0	0
lp, rv	0	0	1	0	0
rp	0	0	2	0	0
rv	0	0	3	0	0
no clip	41	32	11	325	14

Table 11. Estimated number of angler trips and expenditures by non-charter anglers in the Illinois portion of Lake Michigan, during 2008 - 2017. In previous years, expenditure estimates were rounded to the nearest \$1,000 (or 10,000 miles); 2013 - 2017 estimates were rounded to the nearest whole-dollar amount (or mile). NA = not applicable.

Type of angler	Year	Effort	Expenditures		
		(angler-trips)	Major (boat)	Minor (gear)	Miles (travel)
Pedestrians	2008	83,841	NA	\$1,128,000	1,440,000
	2009	90,555	NA	\$900,000	1,650,000
	2010	61,303	NA	\$502,000	1,040,000
	2011	40,781	NA	\$163,000	730,000
	2012	52,758	NA	\$266,000	910,000
	2013	44,709	NA	\$300,173	891,196
	2014	45,078	NA	\$374,365	888,160
	2015	34,111	NA	\$302,143	1,142,899
	2016	33,755	NA	\$392,304	1,094,062
2017	27,070	NA	\$444,502	794,390	
Boats	2008	47,636	\$2,949,000	\$1,469,000	1,360,000
	2009	41,349	\$7,584,000	\$624,000	1,230,000
	2010	55,701	\$12,171,000	\$895,000	1,760,000
	2011	37,061	\$2,320,000	\$532,000	1,230,000
	2012	44,863	\$1,668,000	\$912,000	1,510,000
	2013	36,575	\$750,284	\$424,726	1,285,864
	2014	32,471	\$6,124,859	\$765,368	1,107,217
	2015	32,484	\$3,377,158	\$576,078	1,303,955
	2016	30,500	\$128,238	\$445,616	1,486,934
2017	28,445	\$2,696,374	\$645,545	1,423,337	
Season Totals	2008	131,477	\$2,949,000	\$2,597,000	2,880,000
	2009	131,904	\$7,584,000	\$1,524,000	2,880,000
	2010	117,004	\$12,171,000	\$1,397,000	2,800,000
	2011	77,842	\$2,320,000	\$695,000	1,960,000
	2012	97,621	\$1,668,000	\$1,178,000	2,420,000
	2013	81,284	\$750,284	\$724,899	2,177,060
	2014	77,549	\$6,124,859	\$1,139,733	1,995,377
	2015	66,595	\$3,377,158	\$878,221	2,446,854
	2016	64,255	\$128,238	\$837,920	2,580,996
2017	55,515	\$2,696,374	\$1,090,047	2,217,727	

Table 12. March fishing effort and expenditures by non-charter anglers at selected sites in the Illinois portion of Lake Michigan, during 2008 – 2017. In previous years, expenditure estimates were rounded to the nearest \$1,000 (or 1,000 miles); 2013 - 2017 estimates were rounded to the nearest whole-dollar amount (or mile). NA = not applicable.

Type of angler	Year	Effort	Expenditures		
		(angler-trips)	Major (boat)	Minor (gear)	Miles (travel)
Pedestrians	2008	1,656	NA	\$33,000	30,000
	2009	1,750	NA	\$42,500	40,000
	2010	2,292	NA	\$51,400	51,000
	2011	1,667	NA	\$5,300	27,000
	2012	4,517	NA	\$47,400	85,000
	2013	611	NA	\$3,846	15,081
	2014	1,309	NA	\$10,469	25,284
	2015	1,517	NA	\$12,197	35,052
	2016	3,313	NA	\$30,779	112,738
	2017	1,897	NA	\$8,607	65,384
Launched Boats	2008	605	\$0	\$37,000	9,000
	2009	1,925	\$514,000	\$61,000	50,000
	2010	2,067	\$993,000	\$83,000	55,000
	2011	215	\$1,599,000	\$400	3,000
	2012	1,417	\$0	\$16,400	31,000
	2013	259	\$0	\$502	2,145
	2014	207	\$276,616	\$13,255	2,063
	2015	300	\$0	\$5,020	6,388
	2016	160	\$280,510	\$19,155	4,474
	2017	107	\$0	\$800	1,261
March Totals	2008	2,261	\$0	\$70,000	37,000
	2009	3,675	\$514,000	\$103,000	90,000
	2010	4,359	\$993,000	\$135,000	106,000
	2011	1,882	\$1,599,000	\$5,700	30,000
	2012	5,934	\$0	\$63,800	116,000
	2013	870	\$0	\$4,348	17,226
	2014	1,516	\$276,616	\$23,724	27,347
	2015	1,817	\$0	\$17,217	41,440
	2016	3,473	\$280,510	\$49,934	117,212
	2017	2,004	\$0	\$9,407	66,645

Table 13. Fishing effort and harvest by non-charter anglers in the Illinois portion of Lake Michigan, in 2008 - 2017. Estimates were rounded to the nearest whole number. Peds = Pedestrian anglers, Boat = Boat anglers.

Angler type	Year	Effort	Harvest					
		(angler-hours)	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
Peds	2008	284,555	144,144	1,854	395	0	2,179	2,313
	2009	325,802	147,941	745	507	0	2,366	2,922
	2010	231,121	93,986	630	384	0	4,712	1,755
	2011	169,723	33,071	664	312	0	4,759	1,155
	2012	207,171	74,406	878	22	12	67	1,464
	2013	172,865	43,314	659	83	0	3,118	1,291
	2014	180,470	51,731	849	555	118	6,017	806
	2015	133,885	8,289	793	303	0	9,663	463
	2016	131,329	11,110	2,018	122	193	3,470	1,011
	2017	105,905	9,516	1,031	218	13	1,369	1,229
Boat	2008	261,825	173,285	2,594	1,895	1,662	13,799	8,637
	2009	217,193	115,601	854	1,206	689	15,361	3,985
	2010	293,884	107,928	1,973	2,591	958	26,143	6,467
	2011	196,848	23,725	434	2,800	3,008	24,859	4,747
	2012	257,762	19,443	317	4,659	3,624	48,777	12,192
	2013	209,530	9,793	4,356	3,071	2,962	33,121	5,132
	2014	182,583	2,744	5,237	6,277	4,175	24,297	4,206
	2015	187,078	0	655	3,039	2,418	25,193	7,093
	2016	174,154	121	1,212	6,972	7,220	22,025	5,095
	2017	160,658	52	3,348	2,030	2,770	30,711	2,127
Season	2008	546,380	317,429	4,447	2,289	1,660	15,979	10,950
	2009	542,995	263,542	1,599	1,713	689	17,727	6,907
	2010	525,005	201,914	2,603	2,975	958	30,855	8,222
	2011	366,571	56,796	1,098	3,112	3,008	29,618	5,902
	2012	464,933	93,849	1,195	4,681	3,636	48,844	13,656
	2013	382,395	53,107	5,015	3,154	2,962	36,239	6,423
	2014	363,053	54,475	6,086	6,832	4,293	30,314	5,012
	2015	320,963	8,289	1,448	3,342	2,418	34,856	7,556
	2016	305,483	11,231	3,230	7,094	7,413	25,495	6,106
	2017	266,563	9,568	4,379	2,248	2,784	32,080	3,356

Table 14. March fishing effort and harvest by non-charter anglers at selected sites in the Illinois portion of Lake Michigan, in 2008 - 2017. Estimates were rounded to the nearest whole number. Peds = Pedestrian, Lau'd = Launched boat anglers.

Angler type	Year	Effort	Harvest					
		(angler-hours)	Yellow perch	Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon
Peds	2008	5,940	261	347	52	0	797	0
	2009	6,296	108	160	85	0	84	0
	2010	8,642	0	549	97	0	65	0
	2011	6,937	28	15	75	0	292	0
	2012	17,941	4,103	915	0	0	1,941	0
	2013	2,363	0	67	0	0	28	0
	2014	5,241	0	0	0	0	988	0
	2015	5,954	0	199	0	0	754	0
	2016	12,891	0	567	41	0	1,921	0
	2017	7,420	0	125	0	124	372	0
Lau'd	2008	3,117	1,024	81	0	0	0	0
	2009	10,109	19,214	10	0	0	37	0
	2010	10,907	16,928	451	0	206	113	0
	2011	1,144	0	72	0	0	909	0
	2012	8,059	4,780	912	41	21	1,283	0
	2013	1,486	1,135	0	0	0	19	0
	2014	1,167	0	73	15	0	381	0
	2015	1,730	0	654	0	0	541	0
	2016	915	0	19	0	0	18	0
	2017	603	0	0	0	0	19	0
March Totals	2008	9,057	1,285	428	52	0	797	0
	2009	16,405	19,322	170	85	0	121	0
	2010	19,549	16,928	1,000	97	206	178	0
	2011	8,081	28	87	75	0	1,201	0
	2012	26,000	8,883	1,827	41	21	3,224	0
	2013	3,849	1,135	67	0	0	47	0
	2014	6,408	0	73	15	0	1,369	0
	2015	7,684	0	853	0	0	1,295	0
	2016	13,806	0	586	41	0	1,939	0
	2017	8,023	0	125	0	124	391	0

Table 15. Minor species harvest by non-charter anglers in the Illinois portion of Lake Michigan, in 2008 - 2017. Estimates were rounded to the nearest whole number.

Year	Smallmouth bass	Largemouth bass	Rock bass	Bluegill sunfish	Pumpkinseed sunfish	Common carp	Freshwater drum	Round goby
2008	80	45	7,561	405	0	43	2,033	-
2009	76	0	3,934	298	0	240	1,482	-
2010	51	0	1,938	402	9	8	1,768	-
2011	0	4	575	309	0	238	2,946	-
2012	38	0	2,001	406	42	216	3,540	-
2013	68	20	804	546	0	208	6,205	-
2014	154	0	274	0	0	104	688	33,484
2015	0	0	284	76	0	121	2,786	18,803
2016	0	27	159	93	0	154	1,223	6,506
2017	337	54	0	0	0	30	534	1,695

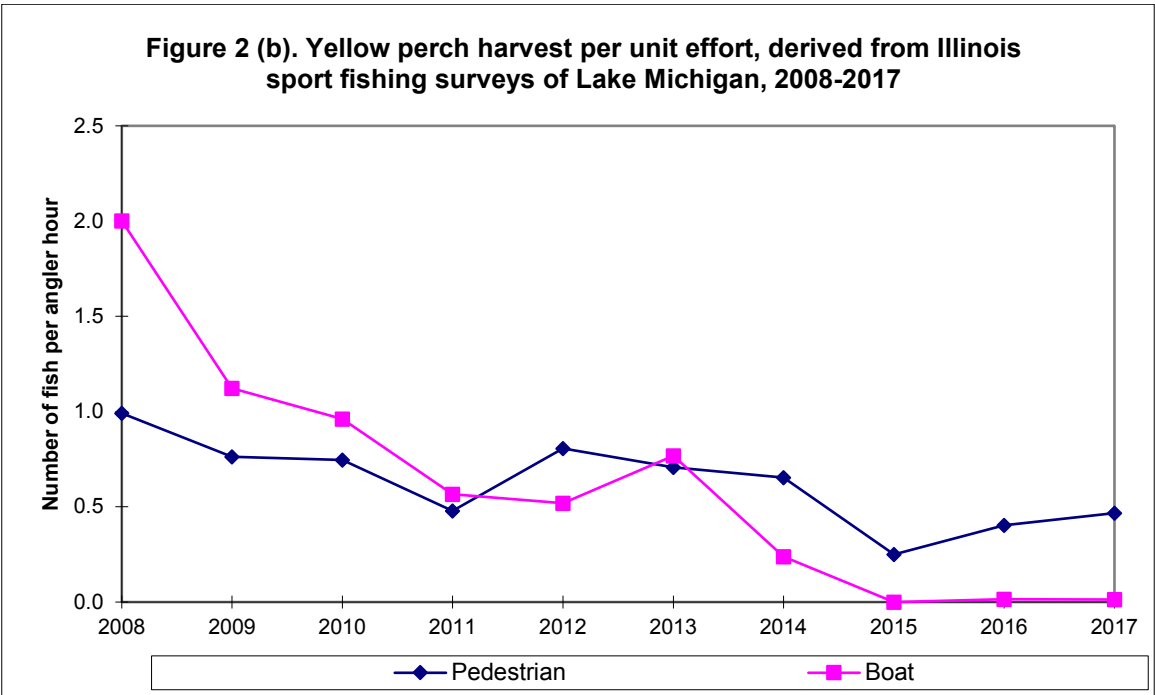
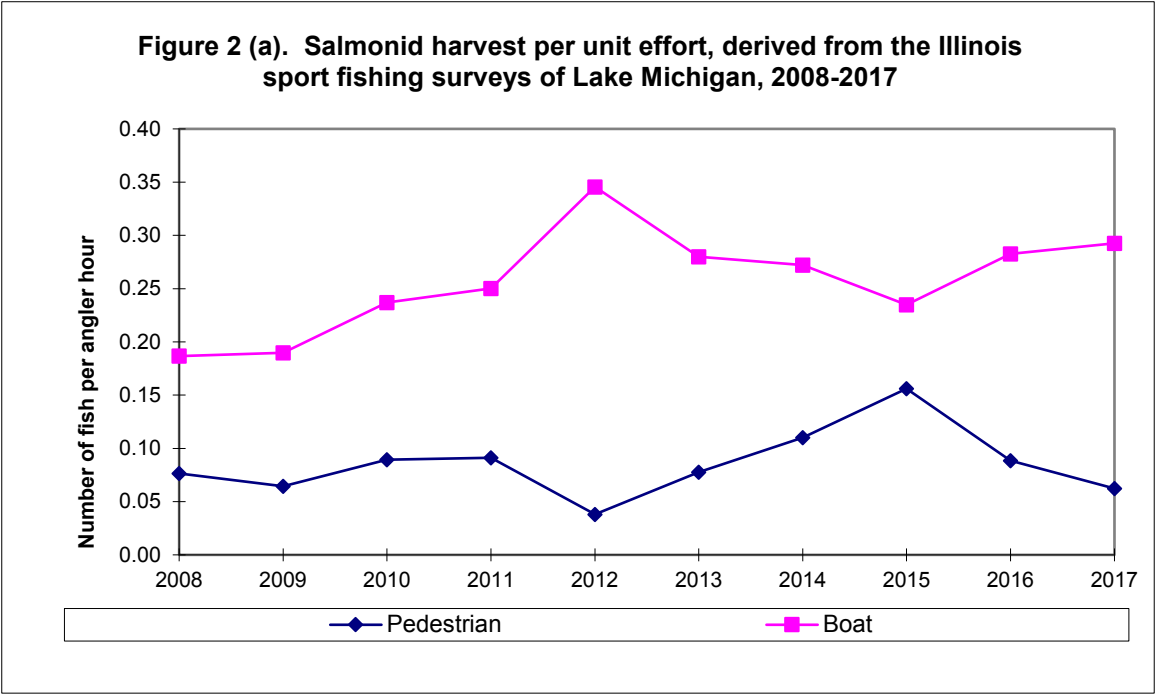


Figure 3 (a). Directed angler effort for salmonids in the Illinois portion of Lake Michigan, 2008-2017

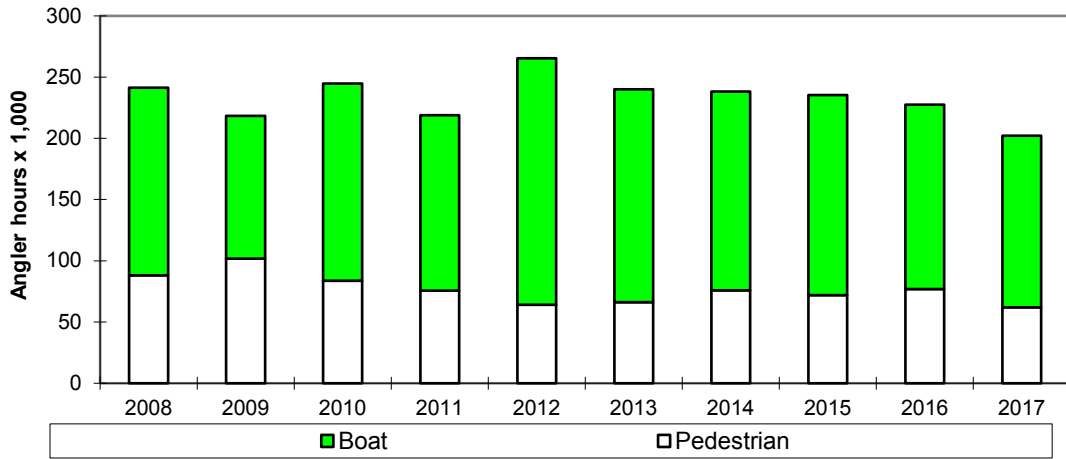


Figure 3 (b). Directed angler effort for yellow perch in the Illinois portion of Lake Michigan, 2008-2017

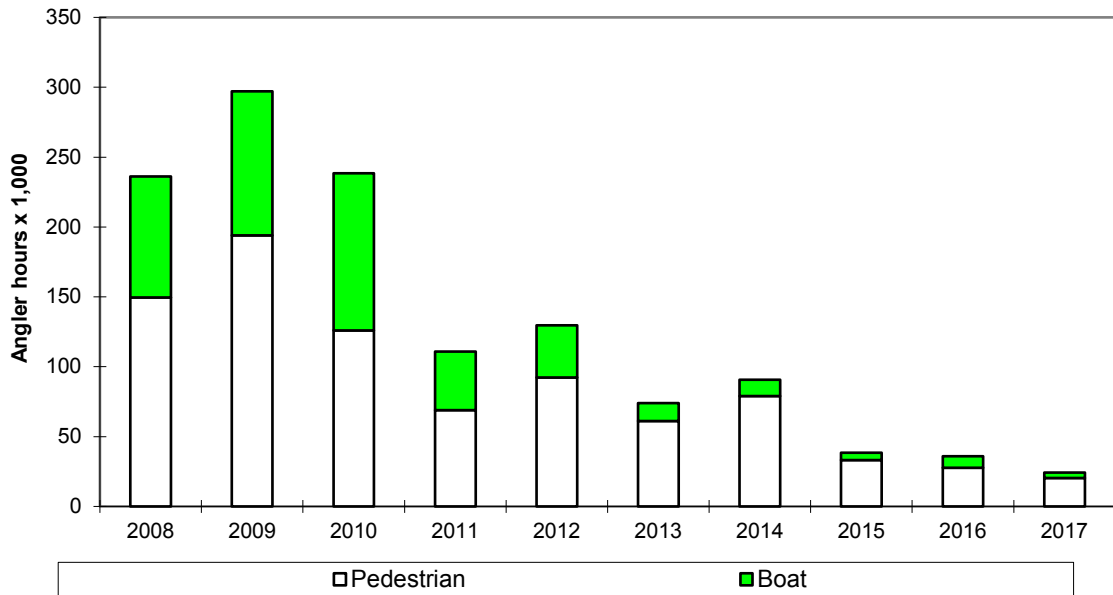


Figure 4. Total yellow perch non-charter sport harvest in the Illinois waters of Lake Michigan, 2008-2017

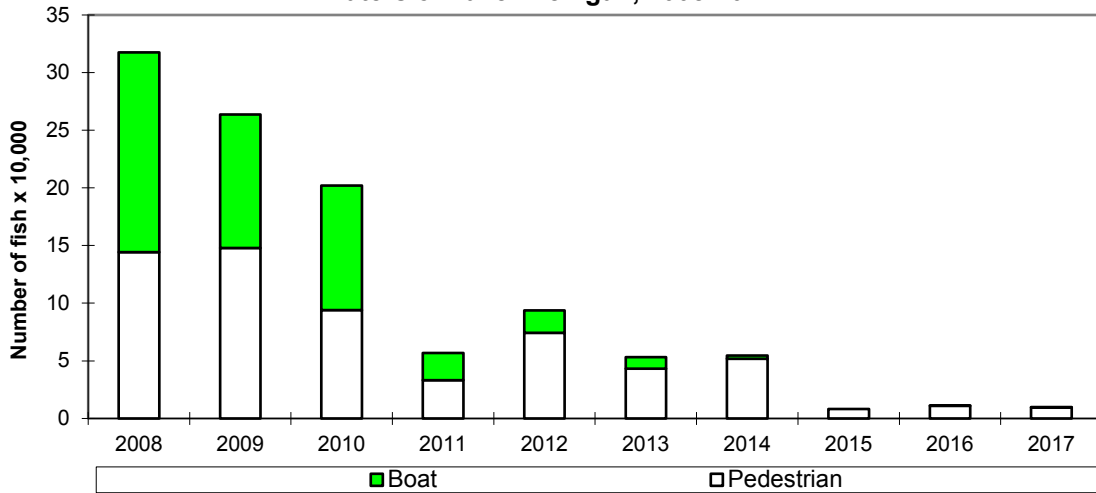


Figure 5. Average lengths of creel yellow perch from the Illinois waters of Lake Michigan, 1986 - 2017

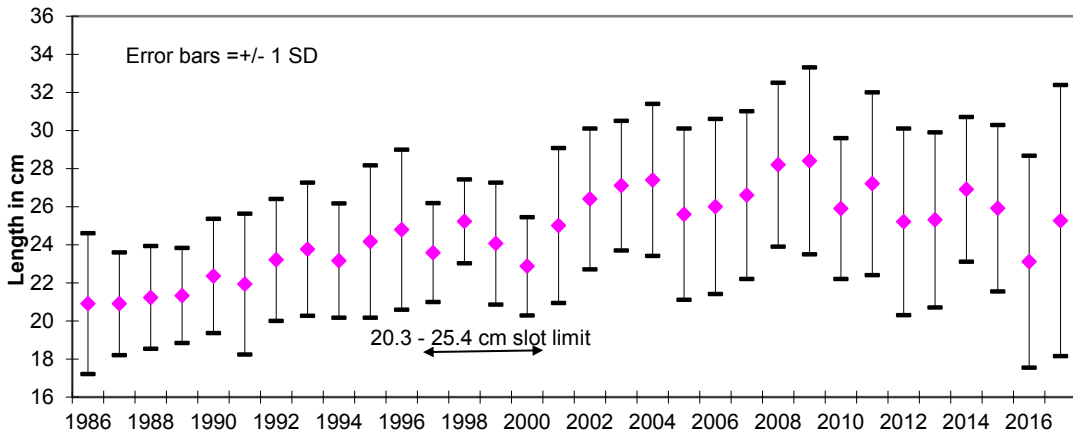


Figure 6. 2017 yellow perch sport harvest from the Illinois waters of Lake Michigan, per month

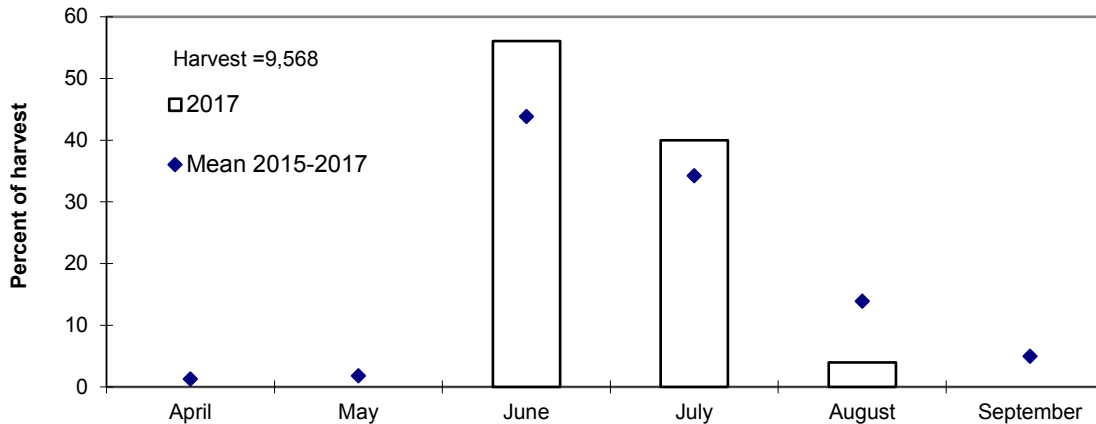


Figure 7. Total non-charter coho salmon sport harvest in the Illinois waters of Lake Michigan, 2008- 2017

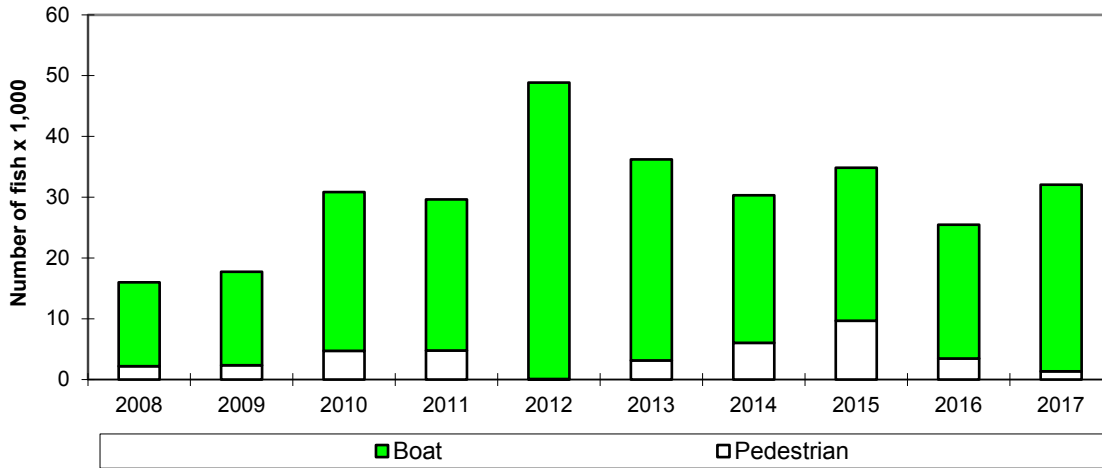


Figure 8. Average lengths of creel coho salmon from the Illinois waters of Lake Michigan, 1986 - 2017

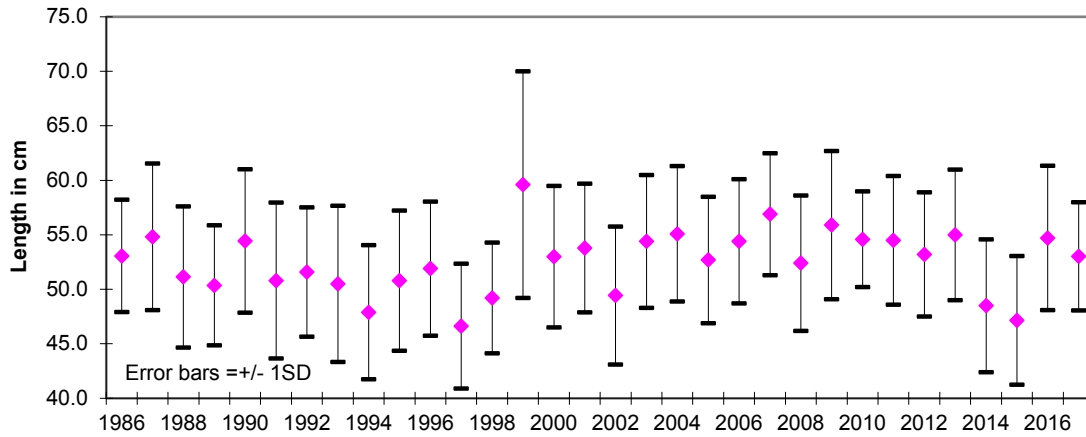


Figure 9. Total non-charter chinook salmon sport harvest in the Illinois waters of Lake Michigan, 2008-2017

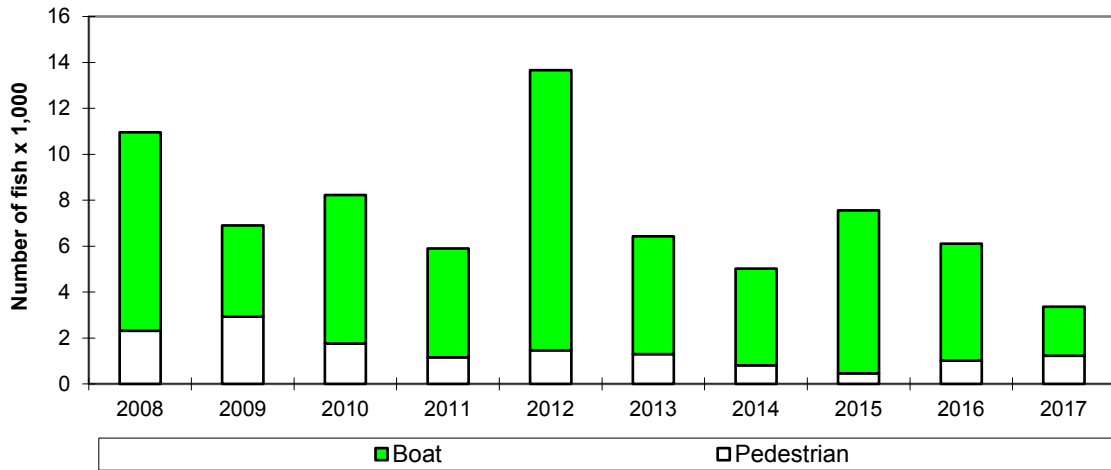


Figure 10. Average lengths of creelred chinook salmon from the Illinois waters of Lake Michigan, 1986 - 2017

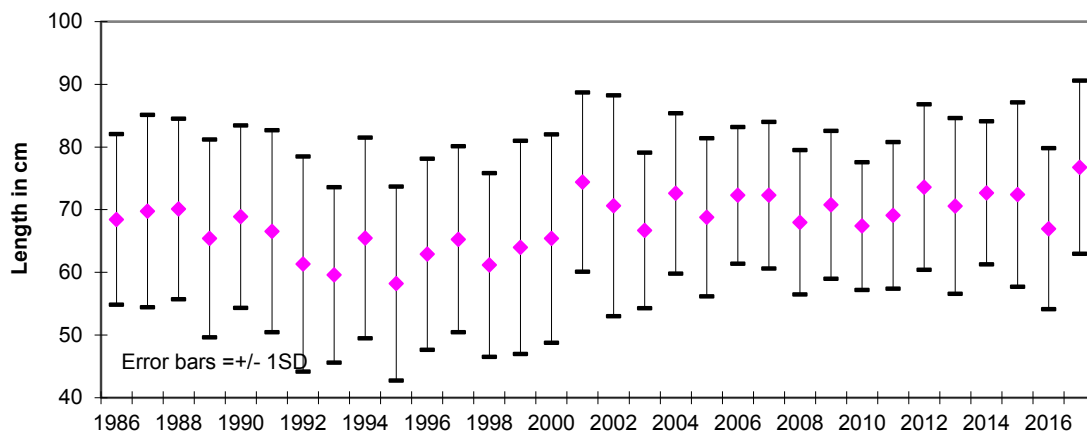


Figure 11 (a). 2017 Salmonid non-charter harvest and effort by pedestrians, per month

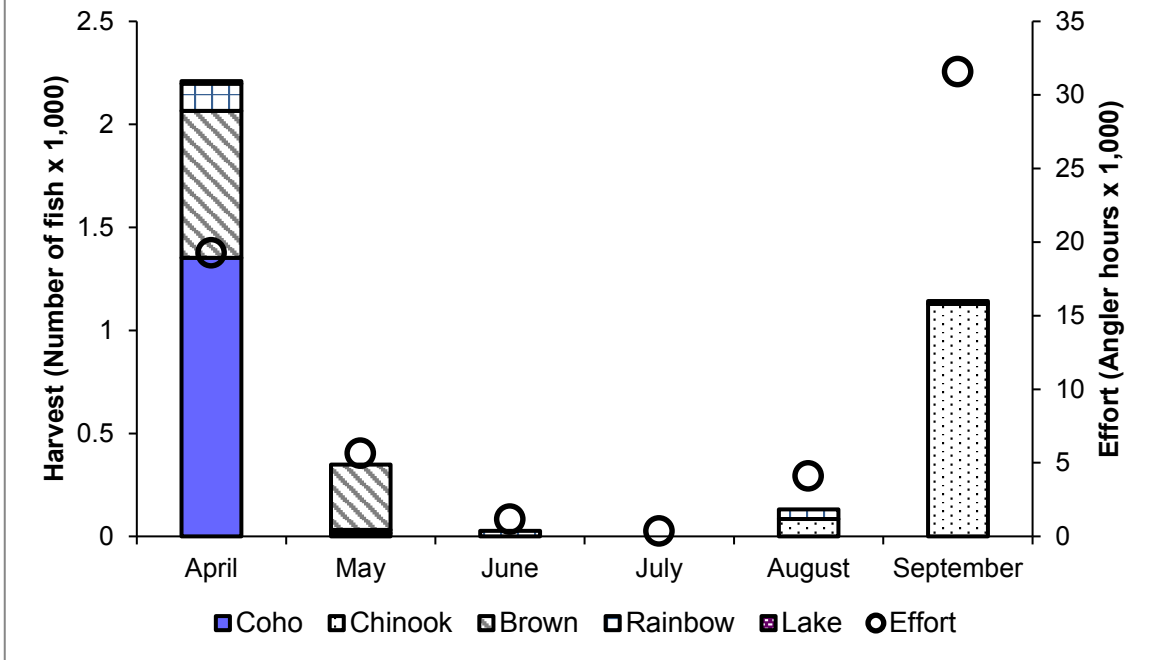


Figure 11 (b). 2017 Salmonid non-charter harvest and effort by boaters, per month

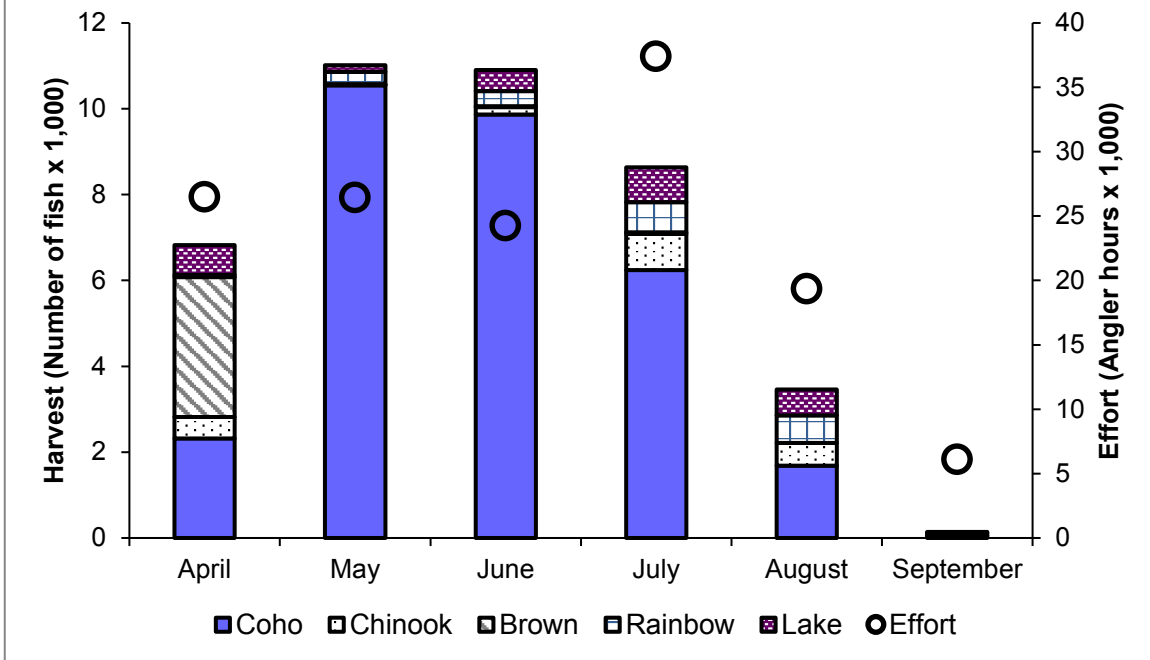


Figure 12 (a). Mean age composition of annual pedestrian yellow perch harvest, 2005-2017

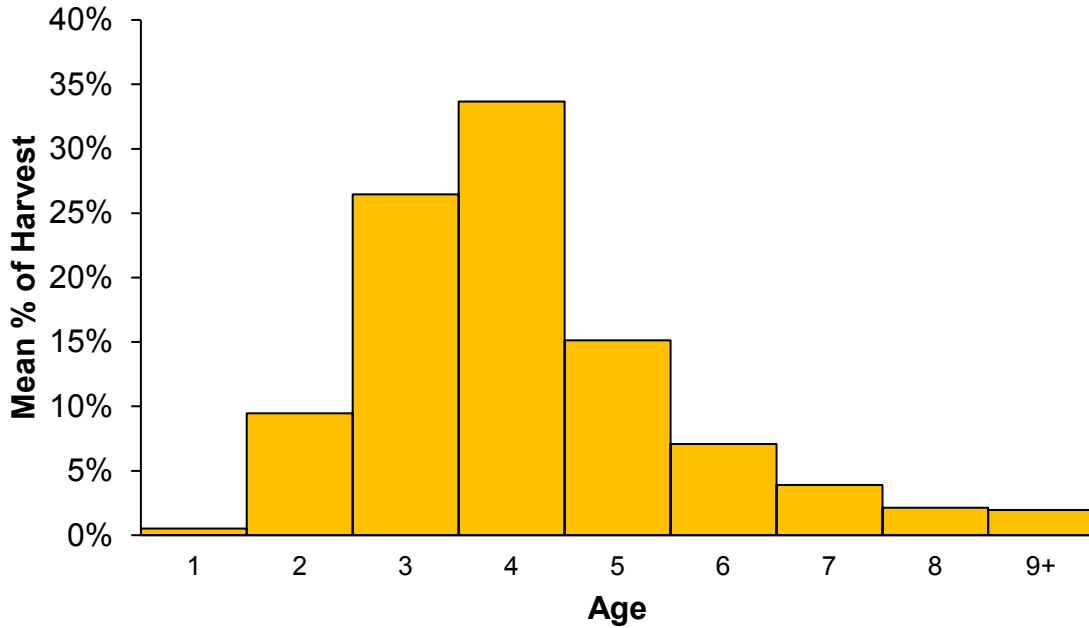
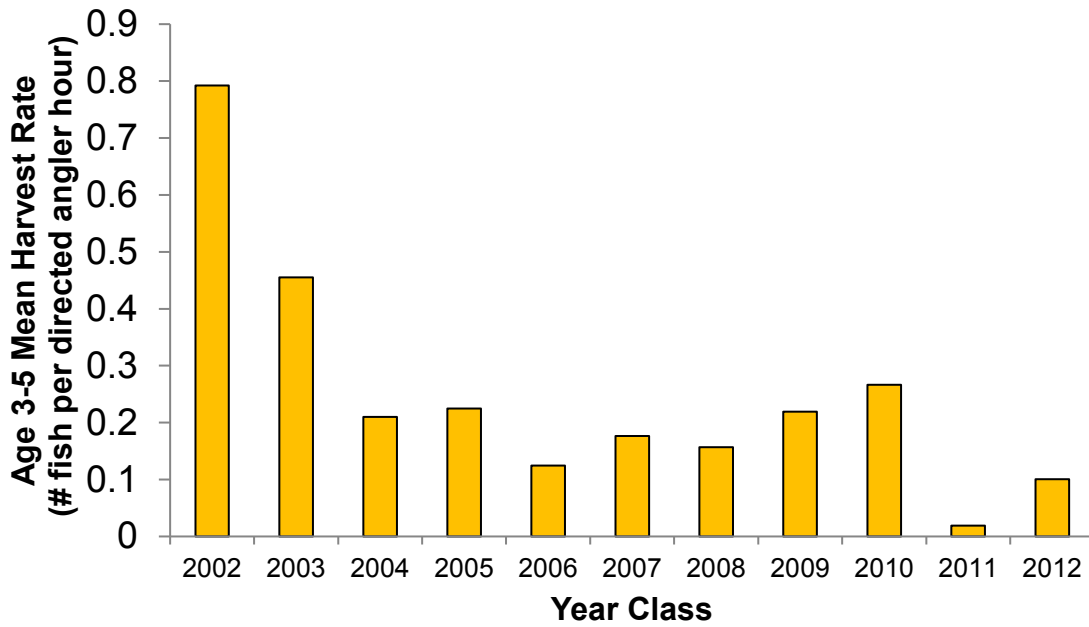


Figure 12 (b). Age 3-5 mean pedestrian harvest rate for each year class



APPENDIX A - COMPARISON OF THE CHARTER AND NON - CHARTER SALMONID BOAT FISHERY

The charter and non - charter boat salmonid fisheries were compared to evaluate whether the two groups target the same salmonid species (Tables A1 and A2). In general, composition of total harvest for both groups has been similar for the last ten years. Harvest-per-unit-effort (HPE) for both groups is presented in Figure A1; the charter fishery has generally exhibited higher success than the non - charter boat fishery (charter HPE approximately double non-charter HPE). The combined harvest of both charter and non - charter anglers (boats and pedestrians) for 2008 - 2017 is presented in Figure A2. These data represent harvest and effort from April-September (early spring surveys are not included).

Table A1. Non-charter boat harvest composition (boats only) April – September 2008 - 2017.

Year	Effort (angler- hours)	Percent of total harvest					
		Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon	Total salmonids
2008	153,169	9.1	6.6	5.8	48.3	30.2	28,587
2009	116,514	3.9	5.5	3.1	69.5	18.0	22,095
2010	160,945	5.2	6.8	2.5	68.6	17.0	38,132
2011	143,331	1.2	7.8	8.4	69.3	13.2	35,848
2012	201,326	0.5	6.7	5.2	70.1	17.5	69,569
2013	173,695	9.0	6.3	6.1	68.1	10.6	48,642
2014	162,453	11.9	14.2	9.4	55.0	9.5	44,192
2015	163,424	1.7	7.9	6.3	65.6	18.5	38,398
2016	174,154	2.9	16.4	17.0	51.8	12.0	42,524
2017	160,658	8.2	5.0	6.8	74.9	5.2	40,986

Table A2. Charter boat harvest composition April – September 2008 - 2017.

Year	Effort (angler- hours)	Percent of total harvest					
		Brown trout	Rainbow trout	Lake trout	Coho salmon	Chinook salmon	Total salmonids
2008	91,756	2.9	5.2	4.6	59.4	28.0	41,499
2009	88,221	2.0	6.7	5.3	59.1	26.9	34,349
2010	94,406	1.1	13.9	6.0	53.1	26.0	43,883
2011	91,235	0.5	8.6	7.0	67.6	16.3	48,585
2012	96,818	1.0	6.0	10.8	58.1	24.2	50,425
2013	95,530	2.2	7.1	12.2	63.8	14.6	42,556
2014	94,976	1.2	10.0	19.2	60.2	9.4	40,902
2015	97,893	1.4	7.9	27.1	58.4	5.2	40,902
2016	89,409	0.9	16.1	25.8	49.5	7.6	38,439
2017	83,960	0.8	3.9	20.7	70.9	3.7	43,157

Figure A1. Comparison of charter and non-charter boat salmonid harvest rates for the Illinois portion of Lake Michigan, 2008-2017

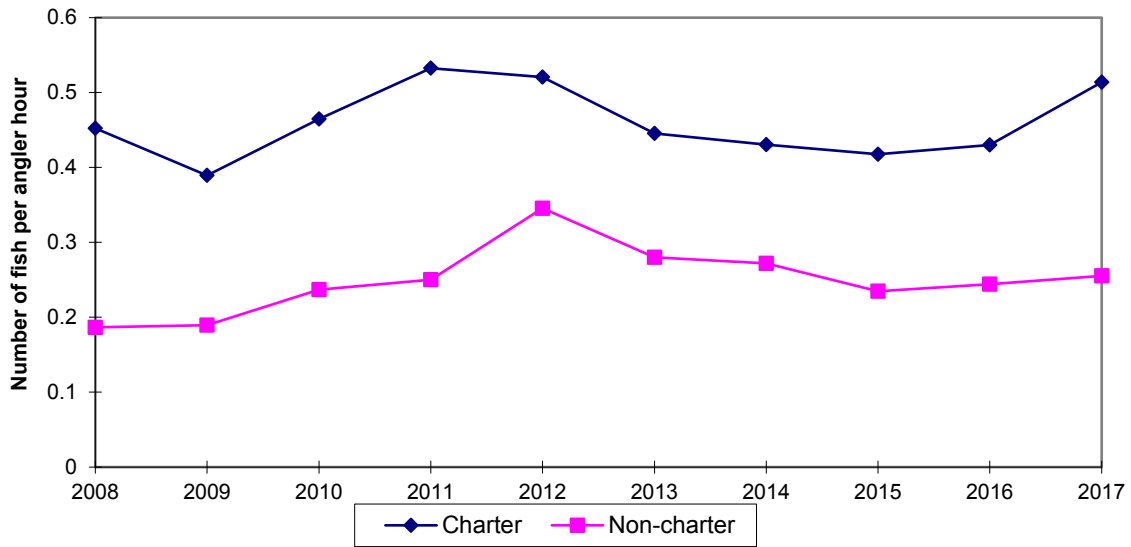


Figure A2. Illinois Lake Michigan sportfishing harvest (charter & regular combined) 2008 - 2017

