LAKE MICHIGAN

2008 Creel Survey Report

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EXECUTIVE SUMMARY

- A nonuniform probability creel survey was conducted on Lake Michigan from April 1 to October 31, 2008 and three Lake Michigan tributaries from March 1 to March 31, 2008, and July 1 to December 31, 2008. The survey covered sport fishing by shore anglers and boat anglers (including chartered trips) from several Indiana ports (Washington Park and Trail Creek Marina, Michigan City; numerous private ramps and slips on Burns Waterway, Portage; Pastrick Marina, East Chicago; Whihala Beach County Park boat launch, Whiting, and Hammond Marina, Hammond) and stream anglers on three tributaries of Lake Michigan (Trail Creek, LaPorte County; East Branch of the Little Calumet River, Porter County, and Salt Creek, Porter County).

- Due to Indiana's close proximity to neighboring states' borders and the migratory nature of trout and salmon, many boat fishing trips were conducted in other states' waters. The estimates provided represent estimates of fish returned to Indiana ports. Because a subset of all fishing locations was surveyed, the creel survey cannot yield estimates of total harvest and effort for southern Lake Michigan. Rather, the creel data is used to monitor trends in the Lake Michigan fishery.

- During the survey period anglers fished an estimated 314,726 h, which was 6% higher than the estimated number of hours anglers fished in 2007. Seventy-five percent of the fishing hours came from boat anglers.

- Estimated total catch from the combined fisheries was 225,690 fish representing thirty fish species, approximately 8% lower compared to total catch observed during 2007. Yellow perch dominated the 2008 catch, comprising 60% of the total. The boat fishery, including chartered trips, dominated the total catch accounting for 92% of the total.

- Coho salmon and lake trout catch rates (CPUE) increased compared to the prior fishing season; whereas Chinook salmon, steelhead trout, brown trout, yellow perch and bass catch rates declined. Both the coho salmon and lake trout CPUE nearly doubled over what was observed in 2007. For lake trout, the boat CPUE was the highest observed from the prior ten-year time series. Comparing 2008 catch rates with their long-term averages, steelhead trout, coho salmon and yellow perch anglers caught fish at below-average rates. By fishery, boat anglers experienced an above-average season for lake trout, Chinook salmon, and brown trout, an average season for steelhead trout, and below-average for yellow perch and coho salmon. Coho salmon fishing was characterized as below-average since the 2008 boat coho CPUE fell 16% below the 10-year average. Shore and stream anglers experienced a below-average season for Chinook salmon, steelhead trout, brown trout, yellow perch, and bass, but an above-average year for coho salmon.

- Biological data collected from coho salmon, Chinook salmon, and steelhead trout show lower mean lengths and weights compared to 2007. Coho, Chinook and steelhead mean weights ranged between 17% and 23% below their ten-year average.

- Bass continue to play an important role in the Lake Michigan boat and shore fisheries. The 2008 effort was nearly double the observed 2007 bass fishing effort. The majority of fishing occurred from boats, accounting for 90% of the effort and 92% of the catch. Most bass caught were released; less than 5% of the total catch was harvested.

- Anglers from 58 Indiana counties fished Lake Michigan and it's tributaries in 2008. The majority of anglers interviewed were from Lake County, accounting for 26% of all anglers. LaPorte County, Porter County, and out-of-state residents followed, with 22%, 18%, and 18% of the anglers, respectively. Other counties with frequent use included St. Joseph, Elkhart, Allen, Kosciusko, Marshall, and Jasper counties. Angler parties from twenty-one different states were represented in the survey, with the majority of these anglers coming from Illinois (85%); primarily Cook and Will Counties.

- The majority of anglers felt it was very important to important to have salmonine species and yellow perch in Lake Michigan. Most anglers were satisfied with the trout and salmon fishery; greater than 72% of all anglers rated satisfaction between somewhat satisfied to extremely satisfied. However, 30% of boat anglers and 47% of stream anglers were dissatisfied with the brown trout fishery. Thirty percent of the shore anglers and 22% of the boat anglers were less than satisfied with the lake trout fishery. For yellow perch, only 7% of the perch parties gave a low satisfaction rating.

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INTRODUCTION

Since 1969, the Indiana Department of Natural Resources (IDNR) has stocked trout and salmon along the Indiana shoreline of Lake Michigan to utilize the population of non-native alewives and enhance the sport fishery. The area stocked extends from Whiting, Indiana to Michigan City, Indiana, and includes sites along Trail Creek, the East Branch of the Little Calumet River, and the St. Joseph River (Figure 1). Trout and salmon are reared at Mixsawbah State Fish Hatchery in Walkerton, Indiana and Bodine State Fish Hatchery in Mishawaka, Indiana. From 1999 to 2008, the number of trout and salmon stocked in Indiana waters of Lake Michigan by the IDNR has averaged 1.1 million fish per year (Table 1, Figure 2). Lake-wide, an annual average of 12.7 million fingerling and yearling trout and salmon have been stocked into Lake Michigan since 1999 (Table 2).

To effectively manage Lake Michigan, biologists need to annually evaluate what is occurring within the fishery. One evaluation technique is the creel survey, utilized to gauge angler use and harvest on a body of water. These data are collected and used to assess the quality and quantity of a fishery, and provide information to evaluate stocking and fishing regulations. Since 1966, the Indiana Department of Natural Resources Division of Fish and Wildlife (DFW) has collected sport harvest data on Indiana's portion of Lake Michigan (McReynolds, 1966).

The objective of the Indiana Lake Michigan creel survey is to evaluate sport fishing effort, fish catch by species, angler preferences and angler attitudes from southern Lake Michigan and northwest Indiana tributaries as part of the DFW Work Plan 300FW1F10D41504. Due to limitations in site access (e.g. access restrictions to industrial areas based upon the National Threat Advisory level) and budgetary restrictions, however, the creel survey can only provide an index of fishing catch, harvest, and effort along Lake Michigan and its tributaries. These data assist the DFW Lake Michigan fishery management efforts in providing valuable trend information concerning the status of sport fish in Lake Michigan and provides the sport community with catch and effort statistics.

STUDY SITE

Indiana's portion of Lake Michigan is the smallest of the four states bordering the Lake (approximately 1% of the Lake Michigan area), encompassing about 43 miles of shoreline (224 square miles). Most of the area is highly developed and heavily industrialized, with the exception of the Dunes National Lakeshore and the Indiana Dunes State Park.

Several lakefront marinas provide boat and shore access, including: Washington Park and Trail Creek Marina, Michigan City; one municipal ramp and several private ramps along Burns Waterway, Portage; Robert A. Pastrick Marina, East Chicago; Lake County Parks and Recreation Whihala Beach boat launch, Whiting; and Hammond Marina, Hammond. Three coal-fired power plants are also located along the shoreline, including the Northern Indiana Public Service Company (NIPSCO) Michigan City Generating Station, Michigan City; NIPSCO Bailly Generating Station, Burns Harbor; and the Dominion State Line Power Plant, Hammond. The NIPSCO Michigan City station and State Line Power Plant provide fishing opportunities for pedestrian (i.e. shore) anglers. No public entry is allowed at the NIPSCO Bailly Generating Station, although limited access exists just west of the station near Indiana Dunes National Lakeshore boat-in beach. Various industries and private clubs along the shoreline also provide limited access to pedestrian/shore and/or boat anglers [e.g. Mittal Steel (formerly Bethlehem Steel), Burns Harbor; Midwest Steel, Burns Harbor; Amoco Whiting Refinery, Whiting; etc.]. Access, however, is typically limited to employees or members of those businesses or clubs. Access or access restrictions at private industrial properties is directly influenced by the National Threat Advisory issued through the United States Department of Homeland Security. In the past, high national threat levels have resulted in closure to access.

Public access to the tributaries of Lake Michigan is limited to county parks, city parks and state access sites. Main tributaries of the Lake Michigan coastal area include: the Little Calumet River, Grand Calumet River, Turkey Creek, Deep River, Salt Creek, Coffee Creek, Dunes Creek, Trail Creek, Galena River, and several smaller tributaries and man-made ditches.

METHODS

The Lake Michigan creel survey was divided into boat, shore, and stream components. Sport fishing from the boat and shore fisheries was monitored between April 1 and October 31, 2008 at four main ports including: Washington Park and Trail Creek Marina in Michigan City; numerous private ramps and slips on Burns Waterway (Portage Marina, Doyne's Marina, Treasure-Chest Marina) in Portage; Pastrick Marina in East Chicago; the Lake County Parks and Recreation Whihala Beach boat launch in Whiting and Hammond Marina in Hammond (Figure 1). The shore fishery was also monitored at the Michigan City Washington park pier, Port of Indiana Public Access Site (Portage), East Chicago Pastrick Marina pier, and the Hammond Marina pier. The lake survey was conducted using a non-uniform probability access design. Sampling probabilities, proportional to the amount of fishing expected, were assigned to each site (based upon prior angler survey effort data). The sum of the probabilities assigned to the sampling sites equaled one.

Stream sport fishing surveys were conducted at main public access sites (i.e. county parks, state access sites) and popular fishing areas on Trail Creek, the East Branch of the Little Calumet River, and Salt Creek. Each stream was sampled separately, from March 1 through March 31, and from July 1 through December 31, 2008. Trail Creek was sampled from the Trail Creek basin upstream to Johnson Road (Appendix I); the East Branch of the Little Calumet River was sampled from the Ameriplex complex (S.R. 249) upstream to the Indiana National Lakeshore Heron Rookery located on 600 East (Appendix I), and Salt Creek was sampled from the Ameriplex complex upstream to U.S. 30 (Appendix I). The stream survey was conducted using a non-uniform probability roving-access design. Probabilities were assigned to each tributary (based upon prior angler survey effort data) so that the total of the probabilities equaled one.

Sample size determination followed the guidelines recommended by Shipman and Hudson (1980); survey time covered at least 25% of the available fishing hours. The fishing season was stratified by fishery type (lake or stream), site (port or tributary), survey period (i.e. months), and day type (i.e. weekday, weekend). A two-stage sampling design (see Pollock et al., 1994) was used to assign days (primary sampling unit, PSU)

and the site/shift combination (secondary sampling unit, SSU). The creel survey was conducted on most weekend days and on two to three randomly chosen days during the week. Weekends were sampled more heavily due to heavier fishing effort compared to weekday effort. Holidays were classified as weekend days; however, no holidays were sampled due to administrative restrictions.

Fishing day lengths were standardized for the entire creel season to represent daylight hours (sunrise to sunset). The fishing day was described as 14-hours in length (0600 hours to 2000 hours) from April through September, 12-hours in length (0600 hours to 1800 hours) in March and October, and 9-hours in length (0700 hours to 1600 hours) in November and December. The fishing day was divided into two periods, or shifts: AM and PM. Shifts were equal in duration, did not overlap, and were sampled with equal probability. One or two shifts were worked per workday. Although a seasonal night fishery on Lake Michigan and tributaries exists, personnel safety precluded the justification of including an additional shift in the Lake Michigan creel design.

Two intermittent employees (i.e. clerks) performed the lake survey from April through October; one intermittent employee performed the stream survey in March and July through December. The shift included time for travel to the site, and scheduling of two non-overlapping periods ranging from 7-hours April through September (0600 to 1300 hours and 1300 to 2000 hours), 6-hours March and October (0600 to 1200 hours and 1200 to 1800 hours), and 4.5-hours November and December (0700 to 1130 hours and 1130 to 1600 hours). All times were adjusted by 1 hour (moved forward or back) during daylight savings. Dates and SSU's were selected via random selection with replacement. Minor adjustments were made to the schedule in order to comply with the maximum 75-hour bi-weekly state personnel requirements.

Three types of data were collected for each lake site or tributary sampled: angler and/or vehicle counts for effort, angler interviews for harvest rates and total catch, and biological information on harvested fish.

Two types of multiple counts were utilized for the lake creel survey: interval and instantaneous. For the interval count, fishing boats were counted for a twenty-minute period as they returned to the port being surveyed. Three counts were made each day at

the selected port. The count times for the early or late shift were selected at random, without replacement, to insure that counts were made at various hours throughout the day during any given month. Interval boat counts occurred at sample areas where all boats returned to the port through a defined channel. Shore anglers were counted using instantaneous counts, performed immediately following the interval boat counts. Stream effort was measured by utilizing progressive counts. The clerk drove the entire stream section, stopping at predetermined sites to count either angler vehicles or anglers (anglers counted only at the DNR Public Fishing area located in the Trail Creek basin). Two progressive counts were performed per shift. Count times were selected using systematic random sampling as outlined in Pollock et al. (1994).

After the counts were completed, the clerk (s) interviewed anglers to obtain catch and fishing times. Boat angler parties were interviewed at the completion of their fishing trip while shore and stream angler parties were interviewed while they were actively fishing. Both incomplete and completed fishing interviews were obtained from shore and stream anglers. If applicable, incomplete shore and stream fishing trips were updated throughout the shift. Anglers or angler parties were asked what time they started their fishing trip, if they came by car and parked at the vehicle count site (stream anglers only), what they fished for, and the number/type of fish harvested and released. Additional information about angler county-of-residence, species preference, and angler satisfaction was also collected. If a large number of boat, shore or stream anglers were encountered, the clerk (s) sub-sampled anglers for interviewing. Biological information was taken on harvested fish, including species, total length (mm), weight (kg), and presence or absence of fin clip (s). The collection of weight data from harvested fish began in 2000 and 2001. Both length and weight data were converted to inches and pounds for reporting purposes.

Effort and catch calculations followed Lockwood et al. (1999) and Pollock et al. (1994). Catch (fish harvested and released) and effort estimates were generated for each combination of site (lake port or tributary), day type, fishing mode, month and target species (information on target species obtained from the interviews when anglers were asked what species they were fishing for). From the sample of counts and interviews, catch rate (R) and angling effort (E) were calculated; catch (C) was estimated as their product. All calculations were based upon multiple-day estimates. Multiple-day

estimates treat all interviews within a longer period (i.e. month) as though they were random samples from that longer time period. A single catch-rate was calculated for the month, then multiplied by effort for that month to produce estimates of catch. Multiple-day estimates were summed over the creel survey time period and angling mode to provide a total estimate of angling effort (angler hours) and catch. Although the multiple-day estimate ignores day-to-day differences in catch rates, inadequate sample sizes precluded the use of daily estimates (Lockwood et al., 1999). For a detailed description of the effort and catch calculations utilized, see Palla (2007).

With Indiana's close proximity to neighboring states' borders and the migratory nature of fish, many boat trips were actually conducted in other states' waters. The estimates provided in this report represent estimates of fish returned to Indiana ports. Since the Lake Michigan creel sampling design differs among years, direct comparison of catch and effort is problematic. Catch-per-unit-of-effort (CPUE) comparisons, however, produce standardized indices of catch to allow yearly comparisons. CPUE is provided as a measure of fishing quality or fishing success for important Lake Michigan sport fish species. Catch, or the total number of fish caught (whether kept or released), provides a more detailed recreational description; thus CPUE was utilized to standardize each fishing season.

Estimates of catch and effort are presented without confidence intervals.

RESULTS

From March 1 through December 31, 2008, 2,493 interviews (4,960 anglers) were collected from pedestrian (shore and stream) and boat anglers. Fishing effort was estimated at 314,726 h, a 6% increase in effort compared to the 2007 fishing season (Table 3). Boat angler effort dominated all angler hours fished on Lake Michigan, 235,073 h, or 75% of the total (Table 4). Anglers spent the majority of time pursuing trout and salmon species; salmonine effort dominated with 202,862 h, or 64% of the total.

Boat fishing effort was greatest in July (63,048 h) and June (51,548 h, Table 4). Shore angler effort peaked in July at 9,042 h and declined to a low of 1,326 h in October (Table 5). October (15,012 h) and September (9,057 h) accounted for the greatest stream angler effort (Table 6).

Total catch from the combined fisheries was an estimated 225,690 fish representing thirty fish species; an 8% decline in catch compared to the estimated total catch observed during the 2007 creel season (Tables 4-6, Appendix II). Boat anglers accounted for the majority of the catch, 207,714 fish, or 92% of the total.

Yellow perch dominated the catch, comprising 136,346 fish or 60% of the total (Tables 4-6). For trout and salmon species, total catch was dominated by coho salmon comprising 32,715 fish or 50% of the total. Chinook salmon catch was second to coho salmon at 14,175, or 22% of the total. Lake trout catch was 8,279, or 12% of the total, followed by steelhead trout at 7,443 or 11% of the total. Brown trout comprised just 3% of the catch at 1,892, followed by juvenile trout and salmon at 1,497 fish (Table 7). Juvenile salmonines were mainly caught from the stream fishery. These sub-legal catches occurred mostly during March, and October through December, which directly corresponds to state fish hatchery stockings (Table 6).

Trout and salmon (directed effort)

Anglers spent 202,862 h pursuing trout and salmon, catching 65,527 salmonines, all fisheries combined (Table 8). Of the fish caught, 95%, or 62,462, were equal to or greater than the minimum size limit of 14 inches. Catch was greatest during the months of July, April, and June for the boat fishery; April for the shore fishery; and October, November, March, and September for the stream fishery. Both salmonine effort and catch increased compared to the 2007 survey data, 8% and 37%, respectively.

The combined salmonine CPUE was 31.6 fish/100 h[1], a 22% increase over what was observed in 2007 and 7% higher than the ten-year average of 29.5 (Figure 3). Although the CPUE from the boat, shore and stream fisheries all increased relative to 2007, the stream CPUE still remains 4% below its long-term average (11.1 fish/100 h, Figure 4).

By species, CPUE for coho salmon and lake trout increased compared to the prior fishing season; whereas the Chinook salmon, steelhead trout, and brown trout CPUE declined (Figures 5, 7, 9, 11, and 13). Both the coho salmon CPUE and lake trout CPUE

[1] The CPUE excludes juvenile salmonids. Juvenile salmonid catch data estimates are unavailable for 1999-2005.

nearly doubled over what was observed in 2007. For lake trout, the boat CPUE was the highest observed from the prior ten-year time series (Figure 13). With the exception of steelhead trout, boat anglers had the largest overall influence on salmonine catch rates.

For steelhead, the overall CPUE was directly influenced by the shore and stream fisheries (Figure 10). Shore steelhead CPUE declined to 2.6 fish/100 h and stream steelhead CPUE declined to 5.1 fish/100 h; 70% and 20% lower than what was observed in 2007, respectively. The 2008 stream steelhead catch was the lowest observed from the 1999-2008 time series (Table 9).

Comparing 2008 salmonine catch rates with their long-term averages, only steelhead trout and coho salmon anglers caught fish at below-average rates (Figures 5, 7, 9, 11, and 13). By fishery, boat anglers experienced an above-average season for lake trout, Chinook salmon and brown trout. Coho fishing, however, was below-average since the 2008 coho CPUE fell 16% below the 10-year average of 24.9 fish/100 h. Shore and stream anglers experienced a below-average season for Chinook salmon, steelhead trout, and brown trout but an above-average year for coho salmon.

Biological data collected from coho salmon, Chinook salmon, and steelhead trout show lower mean lengths and weights compared to 2007 (Appendix III-VIII). Brown trout and lake trout mean length and weights increased; however, small sample sizes collected for brown trout precluded their inclusion in the analysis.

Biological data collected on angler-caught lake trout during 2008 show an average length of 27.3 (± 3.0) in and average weight of 7.64 (± 2.8) lbs, a slight increase compared to the ten-year length and weight average (Appendix III and Appendix VIII). Coho salmon, Chinook salmon and steelhead trout 2008 mean size, however, were below their long-term averages (Appendix III-VI). Coho salmon had an average length of 19.9 (± 2.1) in and 2.58 (± 1.0) lbs, a decline in length from the ten-year average of 21.0 (± 3.0) in and weight of 3.10 (± 1.6) lbs. Chinook salmon average length was 8% below the ten-year length average and 23% below the ten-year weight average of 29.0 (± 5.1) in and 9.8 (± 4.7) lbs, respectively. Steelhead trout average size of 25.8 (± 4.4) in and 6.13 (± 2.9) lbs was 8% (length) and 18% (weight) below the steelhead ten-year average.

Yellow perch (directed effort)

Anglers fished an estimated 79,177 h, catching 136,032 yellow perch (Table 10). Harvest was 80,528 fish, or 59% of the total catch, the lowest harvest observed from the 1999-2008 time series. Both perch effort and catch declined compared to the 2007 survey data, 9% and 15%, respectively. This is the third consecutive year where effort and catch declined compared to the prior fishing season.

Boat anglers accounted for the majority of the yellow perch catch, 132,903 fish or 98% of the total (Table 4). Yellow perch were mainly caught in June, July and April.

Yellow perch ranked first in angler catch, with an overall CPUE of 1.7 fish/h (Table 10, Figure 14). The 2008 yellow perch CPUE decreased slightly compared to the 2007 CPUE of 1.8 fish/h. The 2008 perch CPUE, however, was 23% below the ten-year mean of 2.2 fish/h. Boat and shore anglers both experienced a below-average season, CPUE fell 24% and 43% compared to the ten-year average of 2.5 fish/h and 0.7 fish/h, respectively (Figure 15). The boat fishery accounted for the majority of the harvest (and catch), influencing the overall success of the yellow perch fishing season.

Harvested yellow perch ranged from 6.7 to 14.7 in (Appendix IX). Mean total length 10.5 (± 1.7) in and mean weight 0.5 (± 0.3) lbs were similar to what was observed in 2007 and from the 1999-2008 time series (Appendix III and IX).

Black bass species

Anglers targeting bass fished 25,779 h and caught 14,755 fish, mainly smallmouth (Tables 4-6). The 2008 effort was nearly double the observed 2007 bass fishing effort (Table 11). The majority of fishing occurred from boats, accounting for 90% of the effort and 92% of the catch. The majority of bass were released; less than 5% of the total catch was harvested. In the boat fishery, the number of legal-sized bass released outnumbered the sub-legal releases (bass less than 14.0 in). In the shore fishery, the number of sub-legal sized bass and legal-sized bass released were similar.

Both the boat and shore CPUE declined compared to the previous fishing season (Figure 16). Overall, the boat bass fishing season could be categorized as average comparing the 2008 catch rate with the 10-year mean of 0.68 fish/h. The 2008 shore bass

fishing season was below-average, catch rates were nearly 65% below the ten-year mean of 0.59 fish/h.

Species preference

To measure species preference, anglers were asked which species of fish they preferred to catch from Lake Michigan and its tributaries. A total of 2,462 responses were recorded from boat, shore and stream angler-party interviews (Table 12).

Forty-seven percent of boat anglers included at least one salmonine species in their response. On a species by species basis, boat anglers ranked yellow perch as their most preferred fish (36%), followed by coho salmon (17%), Chinook salmon (16%), smallmouth bass (15%) and steelhead trout (10%). Typically, steelhead trout preference has ranked third for boat anglers, following yellow perch and coho salmon. The average to below-average catch rates for steelhead trout from the boat fishery the prior four fishing seasons likely influenced overall boat angler preference (Figure 10). Since 1999, the boat steelhead trout catch rate has been nearly equal or below the 10-year CPUE average of 3.3 fish/100 h (Figure 10).

Fifty-eight percent of shore anglers also included at least one salmonine species in their response. By species, 31% of shore anglers ranked steelhead trout as their most preferred fish (Table 12). Yellow perch (25%), coho salmon (14%), Chinook salmon (7%), smallmouth bass (6%), and catfish (4%) were also among the preferred species. Similar to boat anglers, steelhead preference has been directly influenced by steelhead catch rates. Typically, steelhead trout preference has ranked between second or third for shore anglers. The 2007 CPUE of 8.6 fish/100 h, the highest rate recorded from the 1999 to 2008 time series, likely influenced overall shore angler preference during 2008 (Figure 10).

Stream anglers ranked steelhead trout as the most preferred stream species, accounting for 71% of the responses (Table 12). Chinook salmon (12%), coho salmon (10%), and brown trout (2%) followed.

Angler residency

Lake Michigan is popular destination for local anglers. Of the 2,475 angler parties that responded to the county and state of residence question, 26% were from Lake County, 22% were from LaPorte County, and 18% were from Porter County (Appendix X). Another 8% came from St. Joseph, Elkhart, Allen, Kosciusko, Marshall, and Jasper counties, which are located in northern section of Indiana. Fifty-eight Indiana counties were represented in the survey (Figure 17). Eighteen percent, or 437 angler parties, were from out-of-state.

Angler parties from twenty-one different states were represented in the survey, with the majority of these anglers coming from Illinois (85%); primarily Cook and Will Counties.

Importance and satisfaction ratings

During the interview process, each fishing party was asked to rate the importance they placed on having the species they were targeting in Lake Michigan (or tributary) and their overall satisfaction with the quality of that specific fishery within the past 2-year period. If the fishing party was targeting any trout or salmon, all five trout and salmon species were asked to be rated.[2] Parties were instructed to rate the importance and satisfaction questions on a 5-point scale of "Not Important" or "Not Satisfied" (a 1 rating) to "Very Important" or "Very Satisfied" (a 5 rating). If the party was unable to rate these questions because of lack of fishing experience, the rating was recorded as a 6 (don't know).

Overall, the majority of anglers felt it was very important to important to have their targeted species in Lake Michigan and its tributaries (Appendix XI). Less than 2% of anglers responded with a rating of 1 or 2 (i.e. not important/of little importance).

Most anglers were satisfied with the trout and salmon fishery; greater than 72% of all anglers rated satisfaction between 3 and 5. However, 30% of boat anglers and 47% of stream anglers were dissatisfied with the brown trout fishery. Thirty percent of the shore anglers and 22% of the boat anglers were less than satisfied with the lake trout fishery.

[2] Stream anglers were not asked to rate lake trout since lake trout are confined mainly to Lake Michigan proper.

The greatest one-year change in angler satisfaction occurred for stream anglers targeting steelhead and shore anglers targeting Chinook salmon. In 2007, 5% of stream anglers gave a less than satisfied rating for the steelhead fishery; more than 15% gave the same rating in 2008 (Palla 2008). For Chinook salmon, 13% of shore anglers were dissatisfied with the fishery in 2007. In 2008, dissatisfied parties jumped to 30%.

For yellow perch, only 7% of the angler parties targeting perch gave a low satisfaction rating. More shore angler parties were dissatisfied with the yellow perch fishery than boat angler parties.

DISCUSSION

The best fishing in southern Lake Michigan was for lake trout, Chinook salmon, coho salmon and smallmouth bass. Although differences in catch rates exist between the boat, shore and stream fisheries, overall, catch rates for these species were near-average to above-average from the 1999-2008 time series. Particularly for boat anglers, which account for the majority of the fishing effort and catch.

Total fishing pressure increased from 294,987 h to 314,726 h; mainly from additional effort anglers spent pursuing salmonine and black bass species. The total boat fishing pressure for salmonine species in 2008 was 15% higher than 2007, shore salmonine effort was 20% higher. The boat bass effort nearly doubled from 11,889 h to 23,270 h, while the shore bass effort increased 54%. The increase in bass effort is likely the result of an increase in bass fishing tournaments conducted at Pastrick Marina in East Chicago. The increase in salmonine effort is the result of increased fishing pressure during the months of May, June and July. In 2007, trout and salmon anglers fished an estimated 54,594 h from May through July. In 2008, anglers fished an estimated 86,167 h.

Although the total effort was greater, catch declined 8%. The largest decline in catch occurred for yellow perch and round goby. The round goby catch declined 75% compared to 2007. Whether anglers have changed fishing techniques to avoid capturing round gobies or other factors played a role in the reduction is unknown. The U.S. Geological Survey Great Lakes Science Center (GLSC) lake-wide trawl survey of prey fish relative abundance and biomass indicated that round goby increased two orders of

magnitude between 2007 and 2008 (Bunnell et al., 2009). Round gobies represented 18% of the total 2008 prey fish biomass (sum of alewife, bloater, rainbow smelt, deepwater sculpin, slimy sculpin, round goby, and ninespine stickleback).

For yellow perch, the catch, effort and CPUE all declined. The 2008 fishing season was the third consecutive season catch and effort declined compared to the prior fishing season (Table 10). The perch CPUE was also the lowest from the 1999-2008 time series, and 23% below the ten-year mean. The decline in adult relative abundance may explain the lower catch rates observed. Generally, yellow perch assessments throughout the lake show a long-term decline in adult yellow perch abundance, likely due to the loss of the strong 1998 year class (Makauskas and Clapp, 2009). Overall, the 2008 sampling did not provide evidence that the Lake Michigan yellow perch population abundance is changing. The current population is comprised mainly of the 2002, 2003 and 2005 year classes. Yellow perch from the 2005 year class comprised approximately 20-60% of the adult population from surveys within the various state waters (Makauskas and Clapp, 2009). Although the 1998 year class is still present, it is present in low numbers.

Based on the length-frequency of sport harvested yellow perch, the majority of fish harvested averaged 10.5 in. From Ball State University's preliminary 2008 perch assessment, likely a large percentage of those harvested fish were females (Forsythe and Lauer, 2008). Female yellow perch dominated their gill net catch in 2008, 93% of the total, during June through August sampling. Additionally, 2000-2006 sampling indicated female yellow perch generally grew faster than males and were significantly larger for ages-4 to 8 (Lauer and Doll, 2007). The impact of sport harvest on these large females is unknown, however, the reduction in their density may contribute to the already limited recruitment in Southern Lake Michigan. While the larger (and presumably older) female fish produce a greater quantity of larval fish, research by Berkeley et al. (2004) and by Bobko and Berkeley (2004) demonstrated larval quality is also greater for offspring from older fish. The selective harvest of larger, older female black rockfish *Sebastes melanops* from the population led to a reduction in the number of larval fish produced, decreased the length of the reproductive season, decreased the chance larval fish from that population encountering favorable conditions, lowered the average survival of potential larvae produced, and selected for slower growth and reproduction at a smaller size. Older

fish species typically produce larvae that have substantially better survival potential than larvae from younger fishes (Birkeland and Dayton, 2005). Yellow perch collected from Indiana waters of Lake Michigan show a similar relationship of female size to egg size and fecundity (Lauer et al., 2005). Larger females produce smaller larvae with larger yolk sac than smaller female yellow perch that produce larger larvae with smaller yolk sac (Heyer et al., 2001). The larger yolk sac has an immediate advantage as an energy source and may increase larval survival rates. Larger larvae can swim faster, avoid predation more easily (Miller et al., 1988), have higher feeding success (Marteinsdottir and Steinarsson, 1998), and survive periods of low food supply for a longer period (Miller et al., 1988).

Lengths of sport-caught perch show a relatively small percentage of perch under 8.0 in were harvested. However, when comparing the yellow perch sport harvest rate of 1.02 with the sport catch rate (1.72 fish/hr), it is evident that a large number of perch were released. Anglers are likely culling smaller yellow perch in order to keep larger, older fish. Sorting of fish is allowed within the bag limit if fish are in healthy condition at the time of release (i.e. able to swim away normally). Although impacts of sorting on yellow perch have not been quantified, the collection, handling, sorting, and holding of fish species can have significant effects on fish physiology and survival (Portz et al., 2006). Stress-related impacts of short-term holding and tolerance is dependent upon the species, life stage, previous exposure to stress, and the behavior of the held fish. Some negative impacts that may result include suppressed immune systems, decreased growth, impacts to swimming performance, and immediate or delayed post-release mortality (Portz et al., 2006; Hartley and Moring, 1995; Edwards et al., 2004). Stress associated with short-term holding can have negative effects on a fish' overall well-being.

Although yellow perch abundance is still much lower than historical levels, several factors continue to influence yellow perch sport catch rates. To protect the remaining stocks, coordinated yellow perch population regulations will continue via the guidance of the Lake Michigan Committee Yellow Perch Task Group (YPTG). Management actions currently in place include: 1) closure of the Lake Michigan commercial season for yellow perch, with the exception of Green Bay where the quota for 2009 is 100,000 lbs; and 2) daily bag limit of 15 fish in Indiana and Illinois, with a

July closure in Illinois; daily bag limit of 35 fish (south of the 45th parallel) and 50 fish (north of the 45th parallel and Grand Traverse Bays) in Michigan; daily bag limit of 5 fish in Wisconsin waters of Lake Michigan with a May 1 to June 15 closure, and a daily bag of 15 fish in Green Bay with a March 16 to May 19 closure.

For trout and salmon anglers, both effort and catch increased compared to the 2007 survey data, 8% and 37%, respectively. The combined salmonine CPUE rate was 22% higher than in 2007, and 10% higher than the ten-year average. The increase was due to rises in both coho salmon and lake trout catch rates. For lake trout, the boat CPUE was the highest observed from the prior ten-year time series. Although the coho salmon CPUE nearly doubled over what was observed the prior season, overall, catch rates remain 7% below the long-term average.

By fishery, boat anglers experienced an above-average season for lake trout, Chinook salmon and brown trout. Shore and stream anglers experienced a below-average season for Chinook salmon, steelhead trout, and brown trout, but above-average for coho salmon.

Lake-wide, total biomass of salmonines harvested (i.e. total pounds of trout and salmon harvested by sport anglers, including chartered trips, in Illinois, Indiana, Michigan and Wisconsin) fell 35% compared to what was observed the previous fishing season (Breidert et al., 2009). The largest decline occurred for coho salmon; total biomass was 50% lower compared to 2007. Both the Chinook salmon and steelhead sport biomass harvest fell 36%; steelhead harvest was the lowest level observed for the 1985-2008 time series. Declines in salmonine sport biomass could be attributed to a combination of factors, including the smaller size of fish harvested by anglers, stocking reductions, declines in forage, weather patterns, and economic variables.

In 2008, lake-wide trawl surveys of the fish community show forage levels remain at all-time lows. The total lake-wide prey fish biomass estimate by the USGS GLSC fell to 25.62 kilotonnes (kt) (1 kt = 1000 metric tons), the lowest level observed since the survey began in 1973 (Bunnell et al., 2009). Alewife biomass was the smallest biomass estimate in the entire time series and 29% lower than the 2007 estimate. Lake Michigan alewife levels are critical for salmonines as they remain one of the most

important components of the salmonine diet (Jude et al., 1987; Stewart and Ibarra, 1991; Warner et al., 2008).

Lowered prey availability directly impacts salmonine growth, which is evident from the below-average size of Chinook salmon, coho salmon, and steelhead trout harvested within the creel survey. Coho salmon, Chinook salmon and steelhead trout mean weights ranged between 17% and 23% below their ten-year average.

Other tools used to assess growth include evaluation of Chinook salmon weight-at-age 2 and 3 from the Michigan Department of Natural Resources creel survey (both sexes combined), Chinook weight-at-age 3 from Wisconsin's Strawberry Creek weir returns (only females), and Chinook standard weight index (also from Strawberry Creek weir). These weight-at-age indices are used by the Salmonid Working Group (SWG) of the Lake Michigan Technical Committee, a group established to assess overall status of Lake Michigan pelagic salmonines and their prey (Claramunt et al., 2009). Creel survey weight-at-age for age-2 decreased but weight-at-age 3 Chinook salmon increased at the Strawberry Creek weir and from creel samples in 2008. Long-term averages indicated lower weight-at-age 3 for the weir but higher for the creel.

Although alewife biomass from the bottom trawl survey was the lowest value in the 1985-2008 time series, the 2008 USGS acoustic estimate of alewife indicated that the abundance of young alewives (ages 0-2) was very high. The area south of South Haven, Michigan, was especially productive with biomass measuring higher than the lake-wide mean (Warner et al., 2009). Differences exist between the trawl and acoustic surveys since the acoustic survey is more efficient at sampling younger ages of alewife. The trawl survey is more efficient at sampling larger, older alewife; alewives are not fully recruited to the bottom trawl until age-3 (Claramunt et al., 2009; Warner et al., 2009). From the acoustic survey, though, alewife biomass was still 18% lower compared to the long-term average.

Higher abundance of younger alewife, especially within the southern portion of the lake, could benefit salmonine growth and survival as these fish mature. Recent lake-wide stocking reductions may also influence sport catch rates and overall size of harvested salmonines the next several fishing seasons. In 2006, 3.2 million Chinook salmon were stocked by all agencies in Lake Michigan, a 25% reduction compared to the

previous ten-year average of 4.7 million. This reduction was in response to the record low levels of forage fish, particularly alewife. The 2008 sport Chinook salmon catch rate decline can likely be attributed to this lake-wide stocking reduction implemented in 2006.

The 2008 sport steelhead trout catch decline may also be attributed to changes in stocking, particularly by the IDNR. Both the Indiana steelhead sport and charter steelhead catch fell, which was similar to trends observed lake-wide. Indiana charter steelhead harvest fell 20%, with the 2008 harvest being the third lowest in the 1999-2008 time series. Creel harvest fell 13%, with the 2008 harvest marking the third lowest within this time period. The overall steelhead trout CPUE was directly influenced by the shore and stream fishery. Both shore and stream steelhead CPUE declined, 70% and 20% lower than what was observed in 2007 (Figure 10). Boat steelhead CPUE was comparable to what was observed the prior fishing season.

Recent steelhead trout stocking changes in 2006 and 2007 by the IDNR may have contributed to the low 2008 steelhead returns. Due to the shutdown and rehabilitation of Mixsawbah State Fish Hatchery in 2006, the spring release skamania steelhead were stocked in the fall of 2005 and 2006 as fingerlings. The ’05 and ’06 spring release skamania steelhead, typically stocked at a size of 7.5 inches, were approximately 1-inch smaller at the time of release (Bob Bell, personal communication). The smaller size resulted from crowding and lower growth of fish at Bodine State Fish Hatchery. Decreases in the size at stocking may have impacted fish migration. Either fish did not out-migrate until the following year after release, or lower numbers of fish potentially survived at this smaller size. Counts of fall steelhead (skamania) returning to the South Bend Fish Ladder on the St. Joseph River confirm the lower-than-average returns. A total of 1,432 skamania were passed upstream, one of the lowest number of fish passed from the 1998-2008 time period (IDNR, unpublished data).

Whether the poor steelhead catch was a function of decreased fish availability, decreased forage or other environmental variables remains unclear. Weather and stream conditions, however, may also have influenced steelhead catch rates, especially for pedestrian anglers. USGS real-time water data for Trail Creek gauge station 04095300 in Michigan City shows higher monthly average discharges in September 2008 compared to September 2007 (http://waterdata.usgs.gov/in/nwis/rt). The 2007 September monthly

mean discharge was 19.2 cfs; the 2008 September monthly mean discharge was 253.4 cfs. Two weather systems, remnants of Tropical Storm Lowell from the Pacific Ocean and remnants of Hurricane Ike, passed over Northwest Indiana resulting in significant rainfall on the region. Rain totals ranged from 8 in to more than 12 in, resulting in significant flooding, interstate and major road closures, and massive damage to local streams and marinas (http://www.agry.purdue.edu/climate/drought/2008.pdf). Unfavorable fishing conditions (high water flows, high water turbidity, etc.) likely had a negatively impact on the 2008 fall season. Both salmonine catch and effort fell during peak salmonine stream fishing months (i.e. July through October), 36% and 15%, respectively.

Brown trout fishing has improved, with overall catch rates increasing since 2003. This increase is mainly from high boat brown trout CPUE. Brown trout, however, do not significantly contribute to the overall catch. The catch rate increases are likely the result of near shore brown trout stocking in Indiana waters. Since 2002, brown trout have been provided by the Illinois Department of Natural Resources through a cooperative trade agreement with the IDNR.

Most anglers felt it was important to have salmonine species within Lake Michigan and were satisfied with the fishery; however, 30% of the boat anglers and 47% of the stream anglers were dissatisfied with the brown trout fishery and 30% of the shore anglers were less than satisfied with the lake trout fishery. The low satisfaction ratings are likely a reflection of fish availability and the small catch of brown trout and lake trout from the near shore waters and marina piers.

Salmonine species and yellow perch continue to be important components of the Lake Michigan fish community. Trout and salmon, originally planted to utilize an overabundant population of non-native alewives, provide sport fishing opportunities for lake and tributary anglers. Stocking levels have been adjusted in an attempt to minimize the risk of a salmon population crash and its impacts to the fishery. Balanced predator-prey levels remain critical for a stable Lake Michigan salmonine fishery (Claramunt et al. 2009).

Lake-wide stocking levels, forage levels and other environmental variables (i.e. water temperatures) will continue to influence fishing success within southern Lake

Michigan. Indiana waters are unique and diverse, with a shallow basin and the presence of coldwater fish species (i.e. trout and salmon), coolwater fish species (i.e. yellow perch), and warmwater fish species (i.e. smallmouth bass). This diversity within the fish community continues to provide valuable fishing opportunities.

Since boat anglers account for the majority of the catch and fishing effort, the IDNR should investigate the availability of future shore public access sites and/or stocking changes to increase availability of near shore species for pier anglers. This is a timely issue, especially with the need to increase public awareness and appreciation of conserving, protecting, and restoring aquatic resources, and the current economic climate. While boat anglers have the ability to locate and follow fish populations, shore fishing is a more hit or miss opportunity.

Currently, IDNR receives brown trout from the Illinois Department of Natural Resources through a cooperative trade agreement. The number of brown trout stocked, however is relatively small. Brown trout, with a preferred temperature range between 65-75 degrees F, would potentially provide a summer near shore fishery when other trout and salmon species have moved offshore to seek deeper, cooler waters. IDNR should re-assess the Lake Michigan strategic plan, including stocking levels and fishing access, to guide future fishery management strategies for Lake Michigan and its tributaries. The further development of a near shore salmonine fishery would result in increased shore opportunities, especially for individuals or families that are looking for economical ways to experience the Lake Michigan fishery.

RECOMMENDATIONS

- The Lake Michigan Fisheries Research Office should continue to assess sport fish harvest, fishing pressure and angler opinions through the Lake Michigan creel survey. Information on sport fishery harvest and catch per unit effort is essential to make management decisions and develop a better understanding of population dynamics.

- The Lake Michigan Fisheries Research Office should continue to provide creel survey data to the Lake Michigan Technical Committee for use in the recreational database, the lake-wide harvest extraction database, as well as for the SWG in the development of a management strategy for predator/prey communities in the lake, and the YPTG in the development of a management strategy for yellow perch.

- The Lake Michigan Fisheries Research Office should continue to provide an Indiana representative for the Lake Michigan Technical Committee Creel Working Group. A representative will allow additional information/idea exchange with other state and university professionals to further refine and improve Indiana's Lake Michigan creel survey methodology.

- The Lake Michigan Fisheries Research Office should continue to utilize naturalist aides to conduct creel during the summer and fall months. This is a cost-saving measure for the Division and allows the Division to hire quality individuals with a fishery/wildlife background.

- The Lake Michigan Fisheries Research Office should re-assess the 2007 Lake Michigan Strategic Plan. This review will assess goals and objectives and provide future fishery management strategies for the Lake and its tributaries. One component of the assessment should include how to increase fishing opportunities, including but not limited to the addition of public fishing sites, increase fish availability for shore anglers, and marketing of this extraordinary resource beyond the surrounding Lake Michigan communities.

- The Lake Michigan Fisheries Research Office should continue to monitor skamania and winter-run steelhead returns using the creel survey data and South Bend Fish Ladder counts on the St. Joseph River in Mishawaka, Indiana. With the 2008 summer-run skamania passage being one of the lowest number of fish from the 1998-2008 time period, continued monitoring of steelhead populations is essential in understanding their population dynamics. The steelhead assessment should include the cooperation and coordination with other state agencies and universities as the lake-wide steelhead harvest has remained below 1 million pounds for the 6th consecutive year with the 2008 harvest the lowest level for the 24-year time series.

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Table 1. Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 1999 through 2008.

	LAKE MICHIGAN				ST. JOSEPH RIVER			
	Brown Trout	Chinook Salmon	Coho Salmon	Steelhead	Chinook Salmon	Coho Salmon	Steelhead	Total
1999	0	264,608	146,882	319,082	150,811	0	252,491	1,133,874
2000	0	267,865	157,208	174,136	149,911	0	220,439	969,559
2001	0	297,195	157,048	297,971	153,520	0	293,475	1,199,209
2002	35,000	253,000	224,797	298,884	0	0	306,297	1,117,978
2003	40,400	232,395	233,248	309,134	0	0	282,857	1,098,034
2004	46,238	237,052	236,026	334,968	0	0	278,109	1,132,393
2005	36,371	251,281	237,009	645,576	0	0	287,471	1,457,708
2006[1]	42,900	225,000	79,018	257,206	0	0	234,211	838,335
2007[2]	41,110	217,389	231,342	349,497	0	0	279,255	1,118,593
2008	22,446	215,770	248,667	295,489	0	0	276,511	1,058,883
Avg.	26,446	246,155	195,124	328,194	45,424	0	271,112	1,112,457

[1]Due to the shut-down and rehabilitation of Mixsawbah State Fish Hatchery in 2006, the coho salmon plantings were reduced by 60%; the spring release skamania steelhead were stocked in the fall of 2005 as fingerlings; Michigan steelhead (winter-run) were stocked in 2007 as yearlings instead of December 2006 as fingerlings; and the St. Joseph River fall steelhead plantings were reduced by approximately 40,000 fish to offset changes to the Trail Creek and Little Calumet River steelhead stockings

[2]Due to the shut-down and rehabilitation of Mixsawbah State Fish Hatchery in 2006, the spring release skamania steelhead were stocked in the fall of 2006 as fingerlings.

Table 2. Millions of trout and salmon, fingerling and yearling stages combined, stocked in Lake Michigan between 1999 and 2008.

	Brook Trout	Brown Trout	Chinook Salmon	Coho Salmon	Lake Trout	Rainbow Trout	Splake	TOTAL
1999	0.191	1.649	4.324	2.765	2.348	1.680	0.077	13.034
2000	0.045	1.666	4.049	2.499	2.260	1.244	0.079	11.842
2001	0.102	1.749	4.518	2.765	2.382	1.849	0.131	13.496
2002	0.050	1.754	4.015	2.690	2.224	1.861	0.126	12.720
2003	0.024	1.649	4.422	3.124	2.609	2.078	0.104	14.010
2004	0.001	1.601	4.303	1.687	2.354	1.583	0.122	11.651
2005	0.000	1.523	4.306	2.561	2.887	2.170	0.099	13.546
2006	0.001	1.611	3.253	2.430	2.770	1.788	0.166	12.019
2007	0.000	1.487	3.173	2.269	3.624	2.010	0.125	12.688
2008	0.005	1.550	2.724	2.029	3.655	1.761	0.087	11.811
Avg.	0.042	1.624	3.909	2.482	2.711	1.802	0.112	12.682

Table 3. Estimated angler hours and catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008, based on total effort.

Fishery	Total Effort	%	Catch	%
Boat	235,073	(75%)	207,714	(92%)
Shore	34,588	(11%)	10,759	(5%)
Stream	45,065	(14%)	7,217	(3%)
TOTAL	314,726	(100%)	225,690	(100%)

Table 4. Boat fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008, based on total effort.

Species	April	May	June	July	Aug.	Sept.	Oct.	Total
Steelhead	681	1,424	627	1,293	273	400	0	4,698
Coho	8,184	3,334	6,547	10,102	1,117	230	9	29,523
Chinook	321	1,978	2,049	4,886	2,533	1,660	27	13,454
Lake trout	216	2,979	1,314	1,200	1,719	851	0	8,279
Brown trout	1,277	42	0	45	234	70	0	1,668
TOTAL	10,679	9,757	10,537	17,526	5,876	3,211	36	57,622
Yellow perch	18,798	45	57,015	48,814	6,047	1,627	557	132,903
Black Bass sp.	3,744	702	1,961	3,191	3,570	433	598	14,199
Other	214	154	1,756	0	448	381	37	2,990
Angler hours	40,835	30,073	51,548	63,048	25,973	19,357	4,239	235,073

Table 5. Shore fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008, based on total effort.

Species	April	May	June	July	Aug.	Sept.	Oct.	Total
Steelhead	38	0	72	384	0	20	3	517
Coho	1,474	24	0	0	0	17	7	1,522
Chinook	0	0	0	0	0	50	7	57
Lake trout	0	0	0	0	0	0	0	0
Brown trout	68	0	43	0	0	0	0	111
TOTAL	1,580	24	115	384	0	87	17	2,207
Yellow perch	0	0	1,164	1,931	297	0	0	3,392
Black Bass sp.	110	175	127	44	41	32	9	538
Other	79	1,123	1,696	1,003	494	184	43	4,622
Angler hours	6,227	2,832	9,042	7,880	4,507	2,774	1,326	34,588

Table 6. Stream fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008, based on total effort.

Species	March	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Steelhead	292	342	303	209	478	353	251	2,228
Coho	700	0	0	507	422	41	0	1,670
Chinook	6	0	0	310	342	6	0	664
Brown trout	66	0	0	26	0	15	6	113
smolts*	86	14	42	13	245	808	289	1,497
TOTAL	1,150	356	345	1,065	1,487	1,223	546	6,172
Yellow perch	0	32	19	0	0	0	0	51
Black Bass spp.	0	0	18	0	0	0	0	18
Other	0	270	400	116	190	0	0	976
Angler hours	5,847	5,466	4,257	9,057	15,012	3,573	1,853	45,065

*juvenile salmonids.

Table 7. Estimated salmonine and yellow perch catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008, based on total effort.

Coho	32,715	(50%)
Chinook	14,175	(22%)
Lake Trout	8,279	(12%)
Steelhead	7,443	(11%)
Brown Trout	1,892	(3%)
Smolts[1]	1,497	(2%)
Total Salmonines	*66,001*	
Yellow Perch	136,346	

[1]juvenile salmonids

Table 8. Estimated salmonine catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

Year	Chinook Salmon	Coho Salmon	Steelhead Trout	Lake Trout	Brown Trout	Smolts[1]	Total	Directed Effort (hrs.)
1999	13,938	48,740	21,760	3,036	1,049	---	88,523	354,481
2000	14,092	83,505	18,604	4,272	3,319	---	123,792	353,750
2001	9,644	75,207	11,857	4,708	2,602	---	104,018	334,359
2002	17,309	107,432	15,299	1,709	2,654	---	144,403	362,228
2003	8,396	56,144	11,133	624	1,122	---	77,419	290,486
2004	11,407	23,668	5,566	308	1,191	---	42,140	197,291
2005	19,937	37,222	9,748	3,441	1,914	---	72,262	274,161
2006[2]	12,092	21,768	6,044	1,513	787	5,666	47,870	168,650
2007	15,219	17,083	8,452	3,635	1,980	4,384	50,753	187,785
2008	14,166	32,390	7,353	8,279	1,841	1,498	65,527	202,862

[1] Smolt (juvenile salmonid) catch data estimates unavailable for 1997-2005.

[2] Indiana Lake Michigan creel survey re-designed; modifications implemented in 2006.

Table 9. Estimated salmonine catch and effort from the Indiana Department of Natural Resources stream creel survey, 1999 through 2008, based on directed effort.

Year	Chinook	Coho	Steelhead	Brown Trout	Total	Directed Effort (hrs.)
1999	7,820	5,742	9,529	398	23,489	125,441
2000	3,513	2,945	6,205	211	12,874	116,550
2001	2,263	1,840	6,951	302	11,356	105,885
2002	3,308	1,371	4,300	143	9,122	92,106
2003	1,177	1,229	4,080	71	6,557	89,393
2004	629	1,705	3,428	256	6,018	64,099
2005	966	2,567	3,601	381	7,515	67,257
2006[1]	1,963	1,544	2,643	153	6,303	48,002
2007	653	579	3,236	167	4,635	50,481
2008	664	1,669	2,228	113	4,674	43,907

[1] Indiana Lake Michigan creel survey re-designed; modifications implemented in 2006.

Table 10. Estimated yellow perch harvest, catch, and effort from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 though 2008, based on directed effort.

Year	Effort (hrs.)	Harvest	Total harvest/hr.	Catch	Total Catch/hr.
1999	90,622	132,217	1.46	227,304	2.51
2000	96,537	129,988	1.35	215,382	2.23
2001	122,770	140,089	1.14	216,341	1.76
2002	97,161	124,656	1.28	198,275	2.04
2003	119,200	207,401	1.74	309,561	2.60
2004	97,971	144,442	1.47	201,906	2.06
2005	129,630	178,945	1.38	332,320	2.56
2006[1]	99,691	152,202	1.53	267,907	2.69
2007	87,208	89,655	1.03	161,126	1.85
2008	79,177	80,528	1.02	136,032	1.72

[1] Indiana Lake Michigan creel survey re-designed; modifications implemented in 2006.

Table 11. Estimated number of black bass harvested and released by boat and shore anglers from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.

			Released		Released			
	Harvest		<14	≥14	<14	≥14	Directed Effort	
Year	Boat	Pier	Boat	Boat	Pier	Pier	Boat	Pier
1999	300	115	1,836	1,592	983	291	4,884	2,534
2000	230	84	2,086	5,007	1,051	705	11,456	3,212
2001	322	70	1,988	4,447	862	275	10,475	2,208
2002	111	132	9,022	7,606	438	207	18,257	2,101
2003	367	78	1,253	4,220	902	135	13,794	1,850
2004	194	89	1,789	2,081	901	151	6,020	1,247
2005	106	108	3,410	4,288	1,033	254	8,470	2,134
2006[1]	94	80	1,532	4,179	527	377	11,605	917
2007	93	149	1,509	6,989	326	345	11,889	1,628
2008	541	77	4,742	8,916	188	273	23,270	2,509

[1] Indiana Lake Michigan creel survey re-designed; modifications implemented in 2006.

Table 12. Preference categories of angler parties fishing Lake Michigan during 2008, by fishery.

BOAT		SHORE		STREAM	
Species	No. Anglers (%)	Species	No. Anglers (%)	Species	No. Anglers (%)
Yellow Perch	267 (36%)	Steelhead Trout	271 (31%)	Steelhead Trout	602 (71)
Coho Salmon	127 (17%)	Yellow Perch	223 (25%)	Chinook Salmon	98 (12)
Chinook Salmon	122 (16%)	Coho Salmon	123 (14%)	Coho Salmon	84 (10)
Smallmouth Bass	113 (15%)	Chinook Salmon	64 (7%)	Brown Trout	16 (2)
Steelhead Trout	75 (10%)	Smallmouth Bass	53 (6%)	Anything	12 (1)
Walleye	9 (1%)	Catfish	39 (4%)	Yellow Perch	9 (1)
Brown Trout	8 (1%)	Any Black Bass Species	21 (2%)	Catfish	7 (<1)
Largemouth Bass	5 (<1%)	Anything	18 (2%)	Trout/Salmon Species	4 (<1)
Trout/Salmon Species	5 (<1%)	Trout/Salmon Species	16 (2%)	Largemouth Bass	3 (<1)
Any Black Bass Species	5 (<1%)	Brown Trout	12 (1%)	Smallmouth Bass	3 (<1)
Anything	3 (<1%)	Walleye	11 (1%)	Any Black Bass Species	2 (<1)
Lake Trout	3 (<1%)	Bluegill	6 (<1%)	Carp	1 (<1)
Catfish	2 (<1%)	Largemouth Bass	6 (<1%)	Northern Pike	1 (<1)
Bluegill	1 (<1%)	Freshwater Drum	3 (<1%)	Walleye	1 (<1)
Crappie	1 (<1%)	Crappie	2 (<1%)		
		Rainbow Smelt	2 (<1%)		
		Carp	1 (<1%)		
		Lake Trout	1 (<1%)		
		Sunfish Species	1 (<1%)		

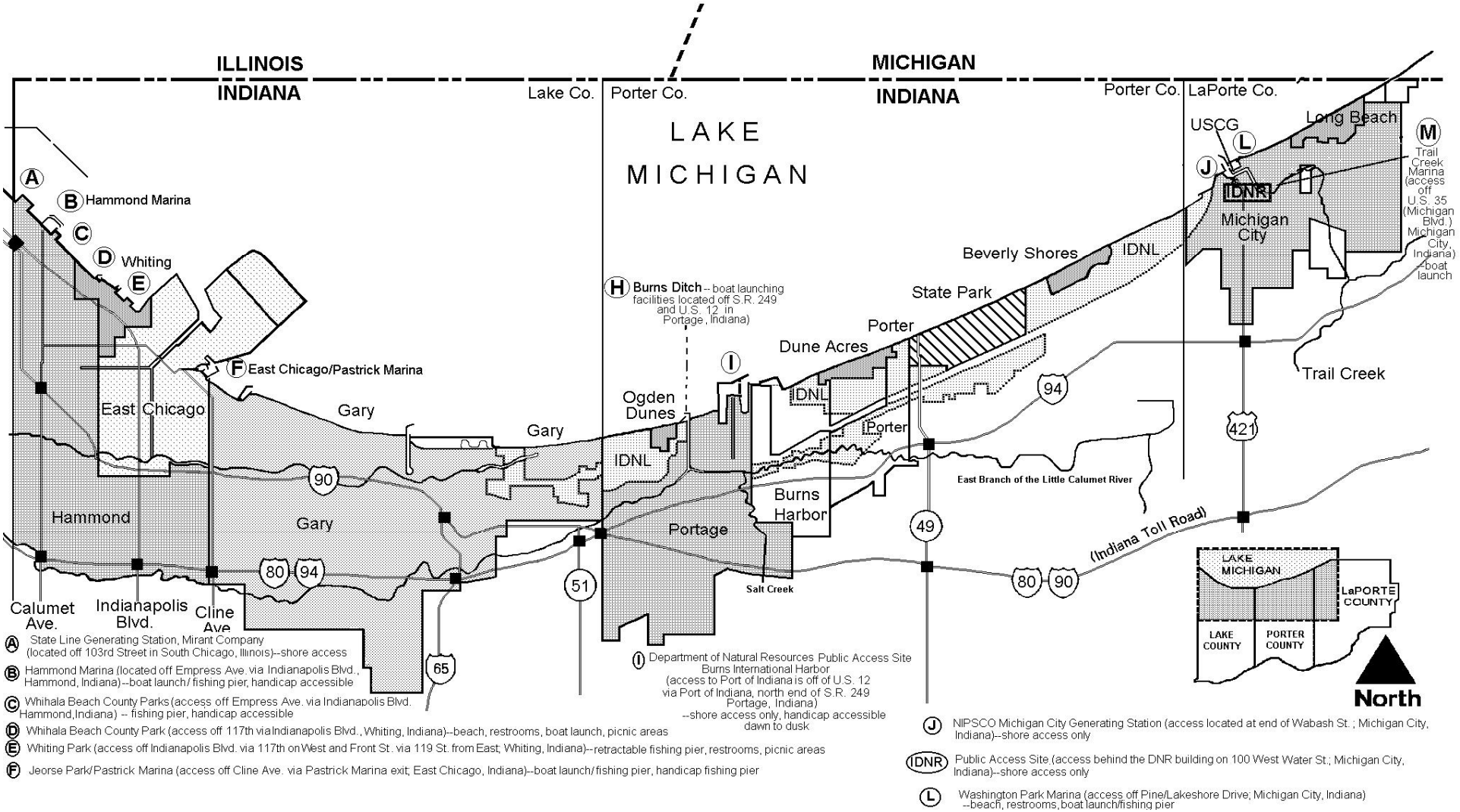


Figure 1. Indiana shoreline of Lake Michigan.

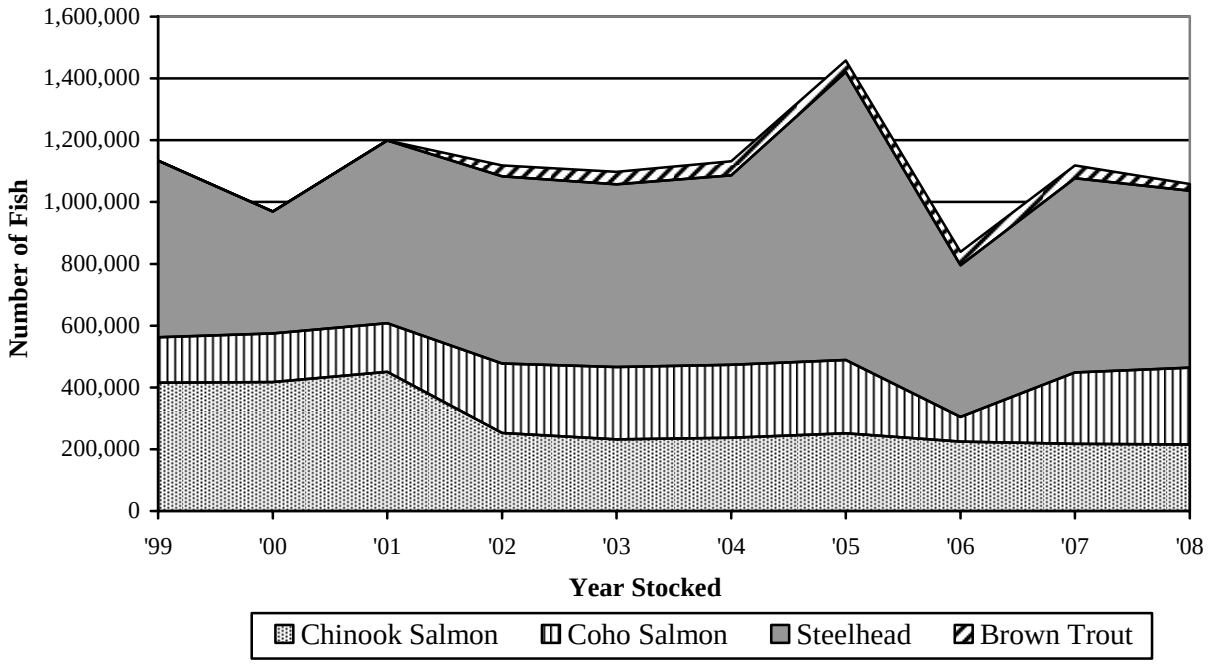


Figure 2. Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 1999 through 2008.

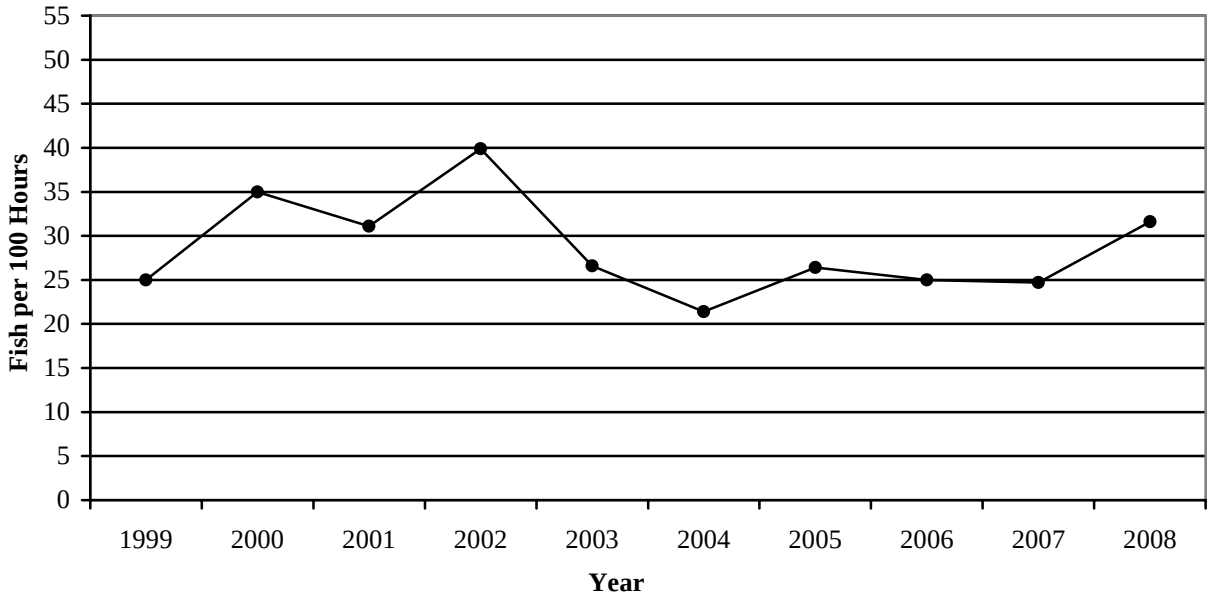


Figure 3. Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

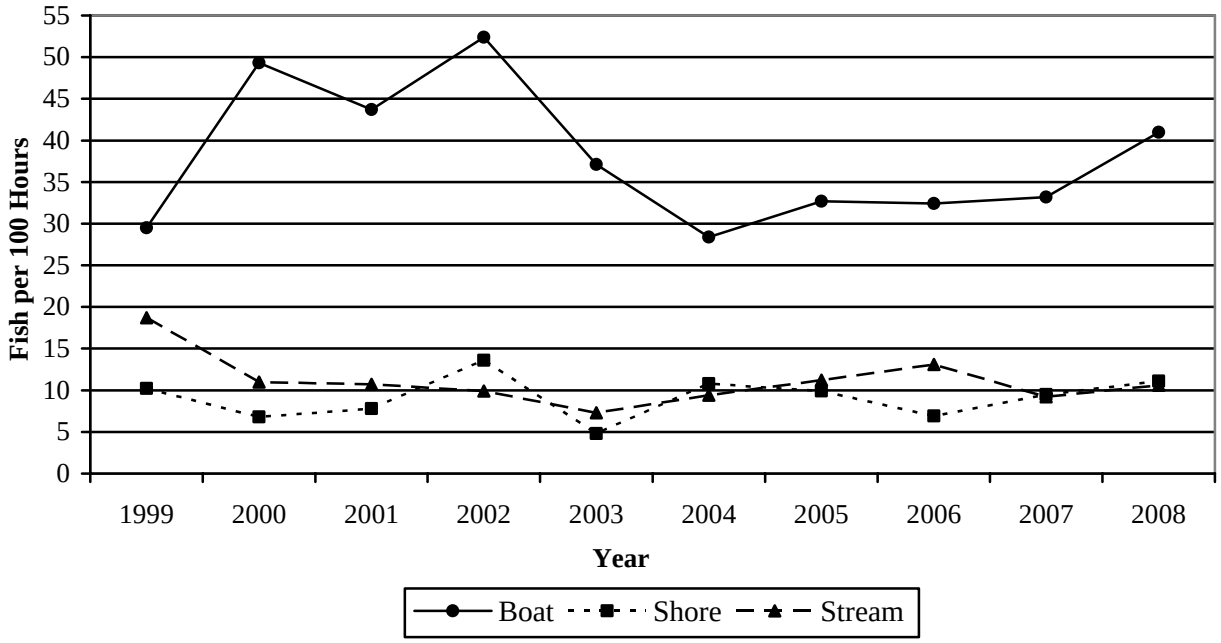


Figure 4. Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

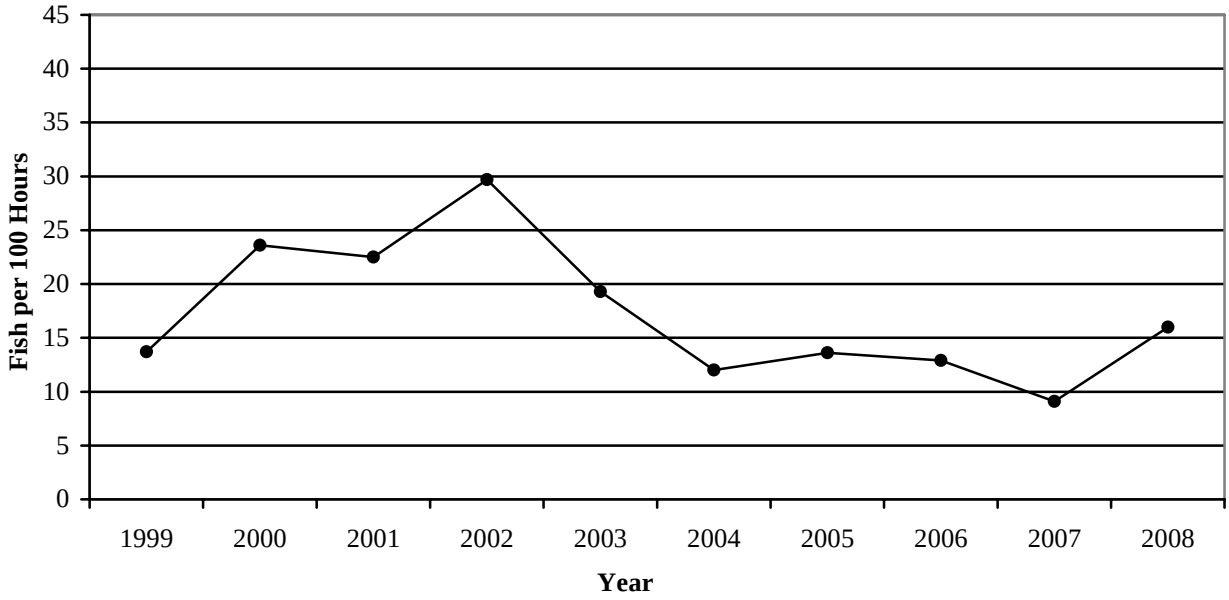


Figure 5. Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

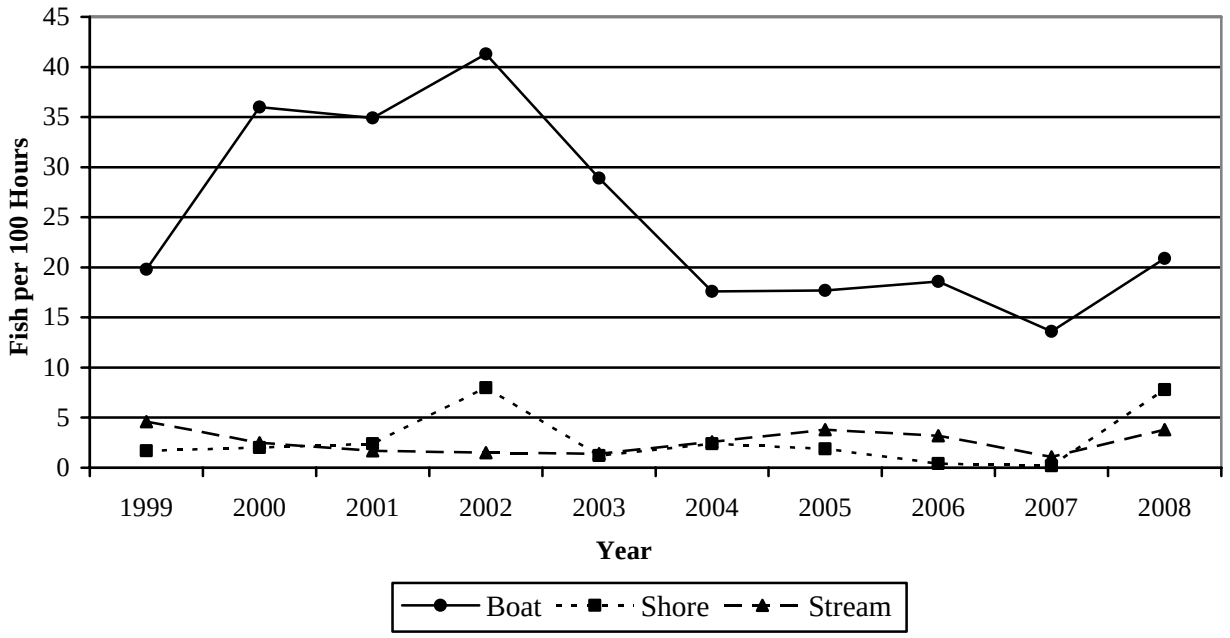


Figure 6. Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

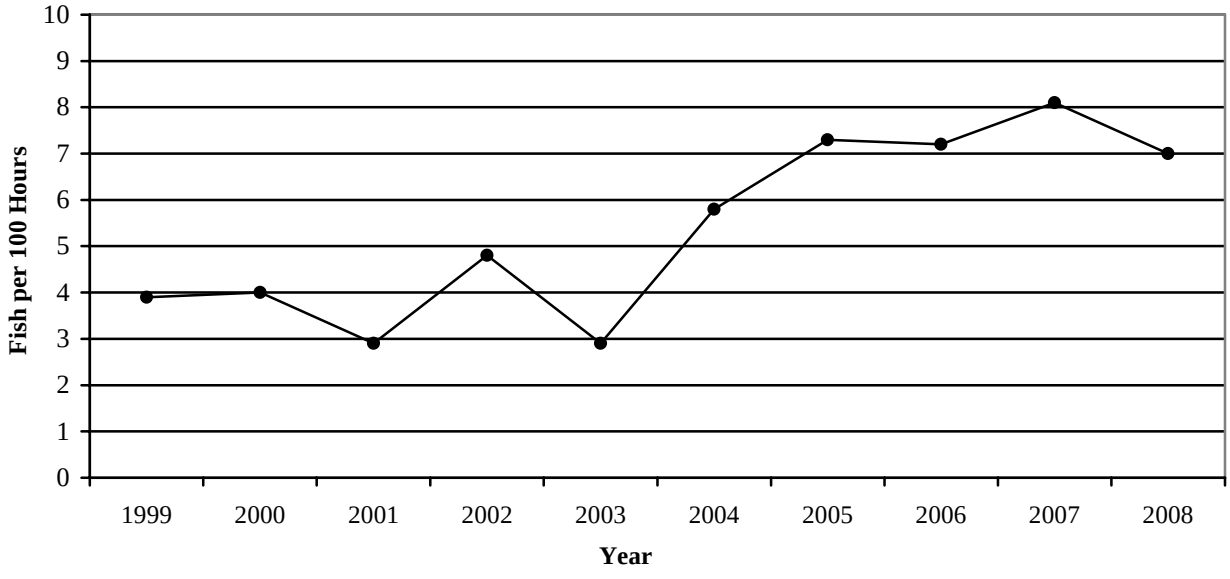


Figure 7. Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

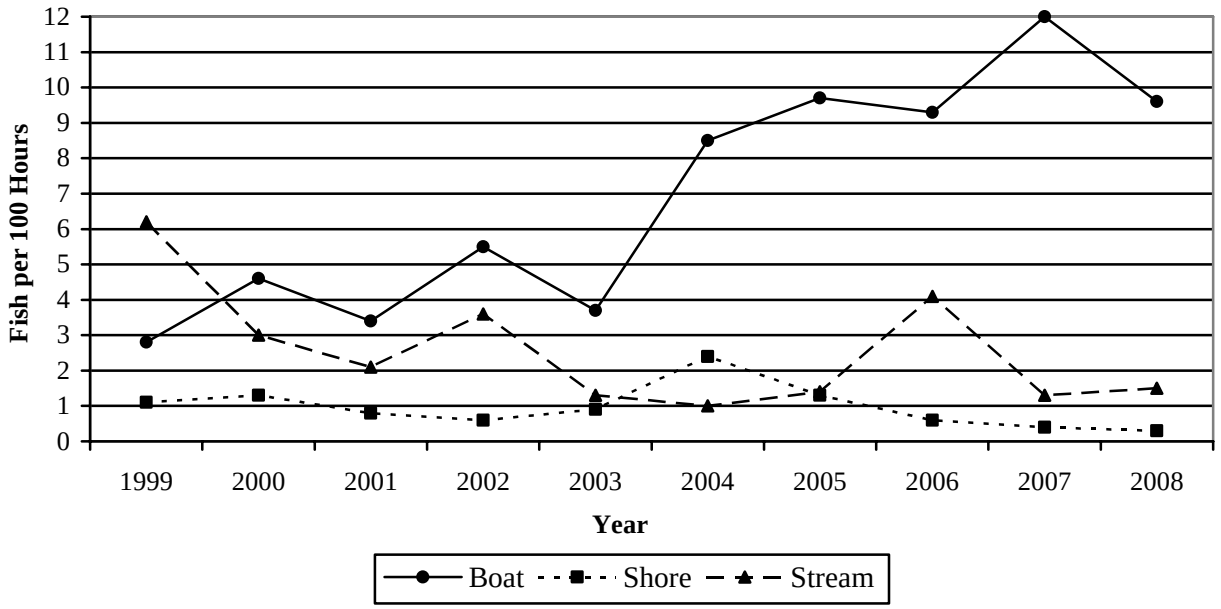


Figure 8. Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

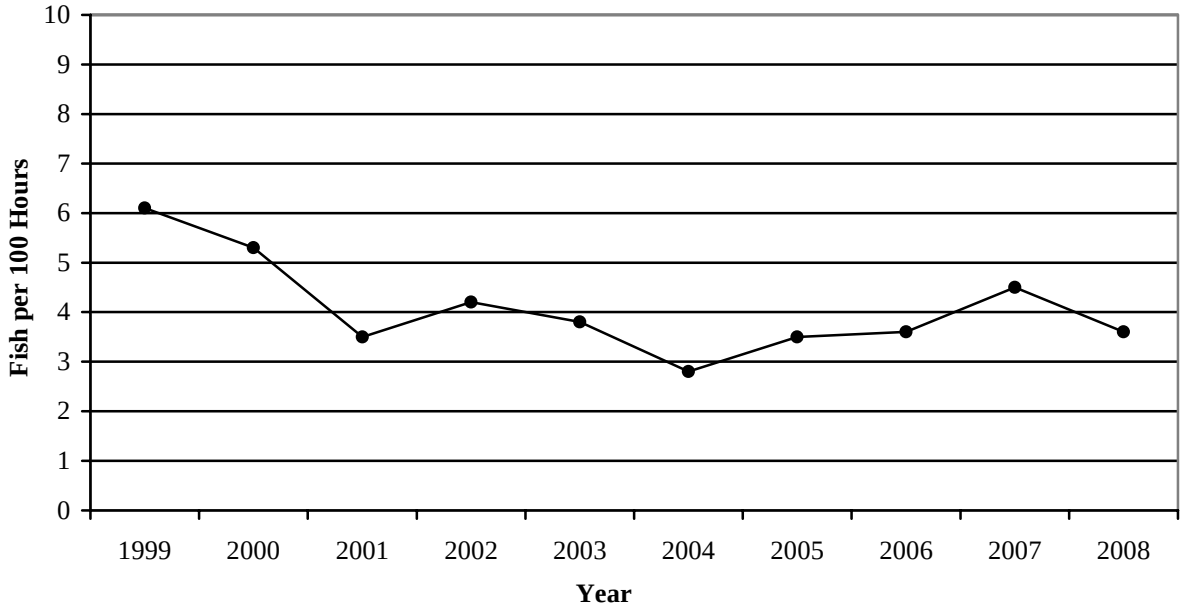


Figure 9. Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

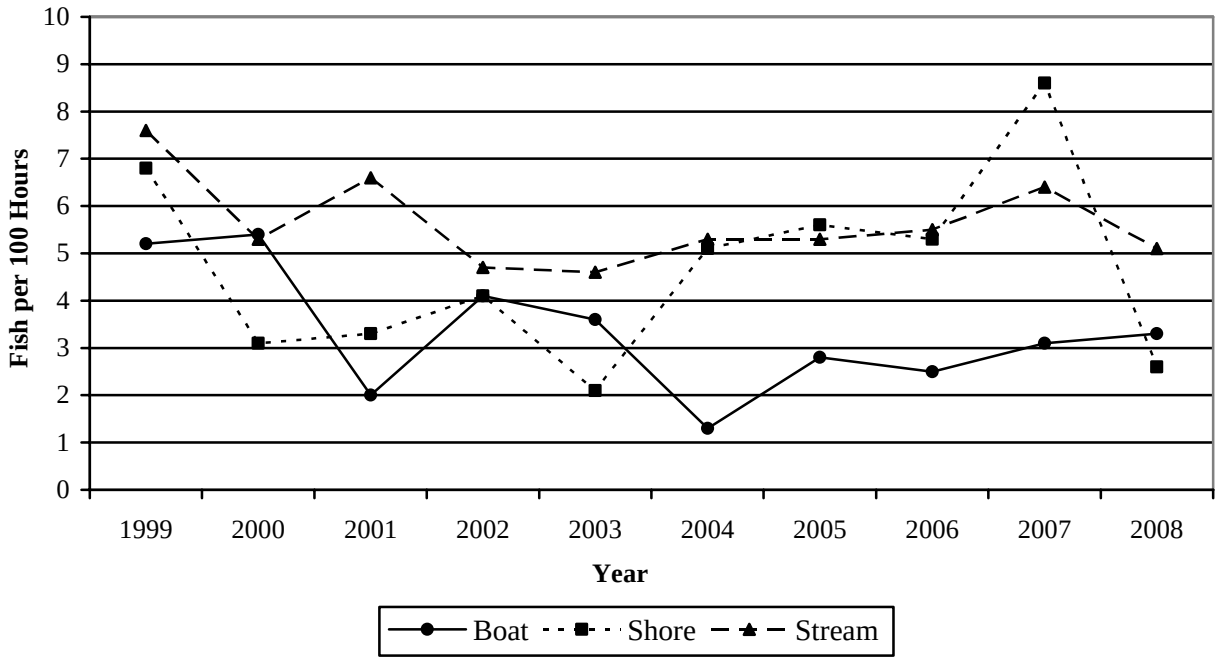


Figure 10. Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

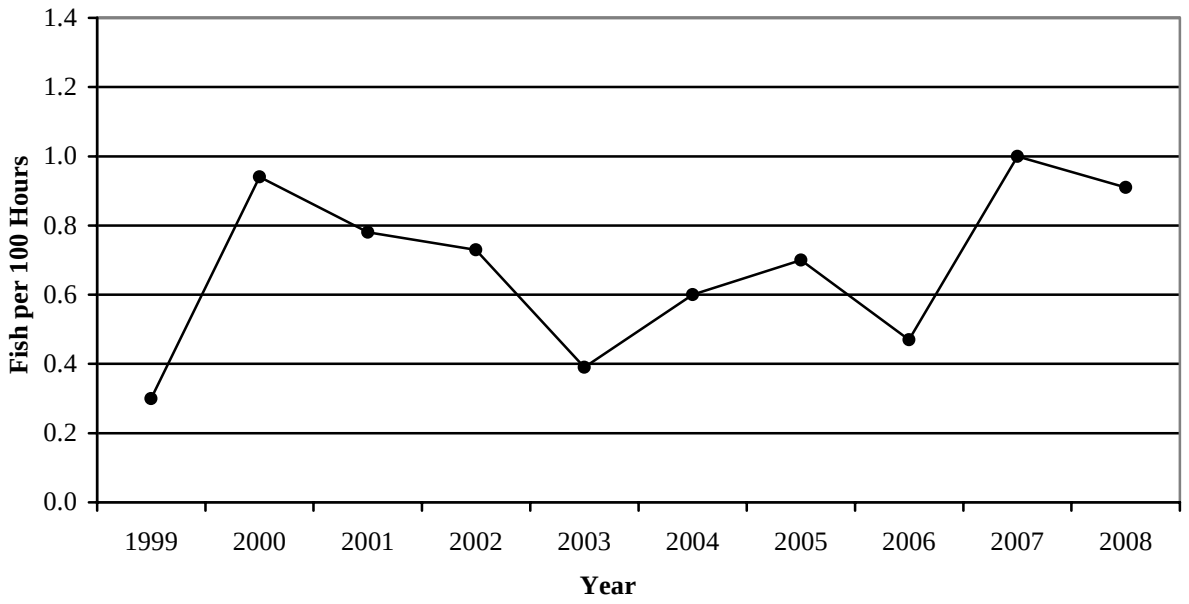


Figure 11. Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

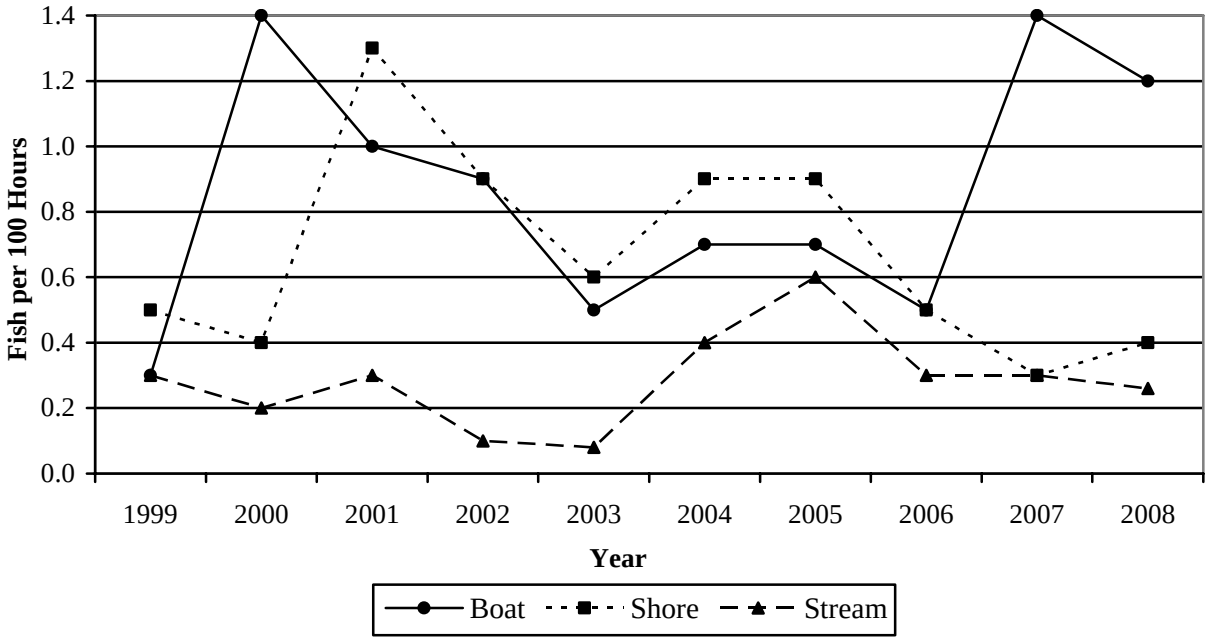


Figure 12. Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

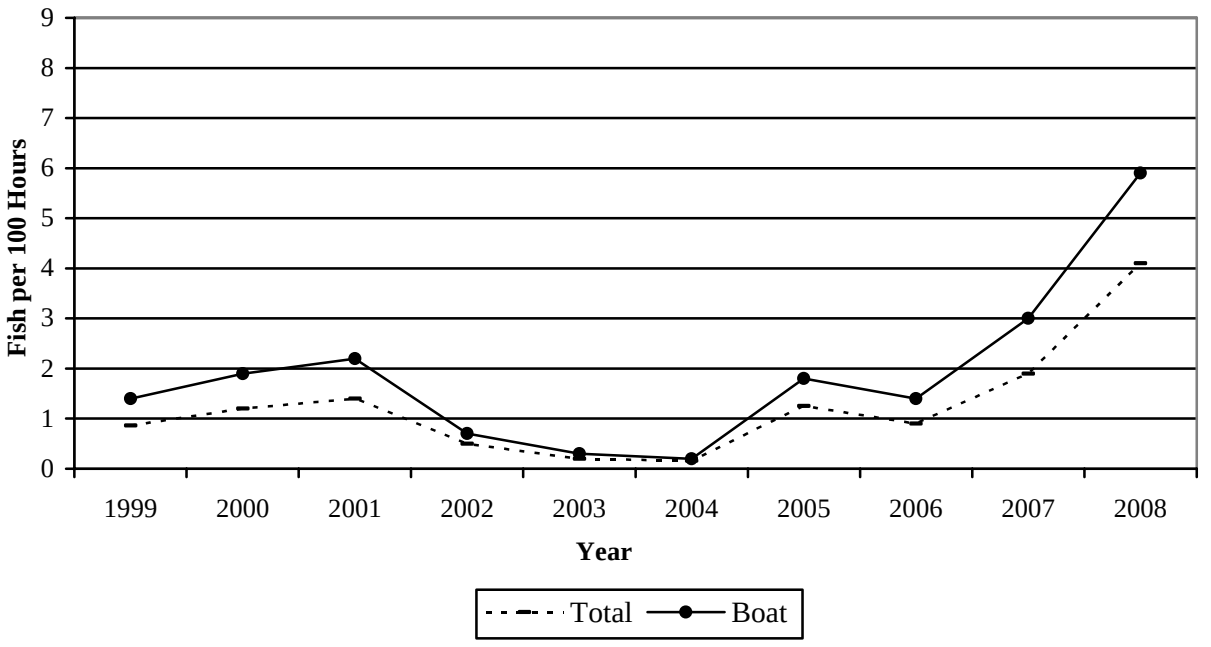


Figure 13. Lake trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

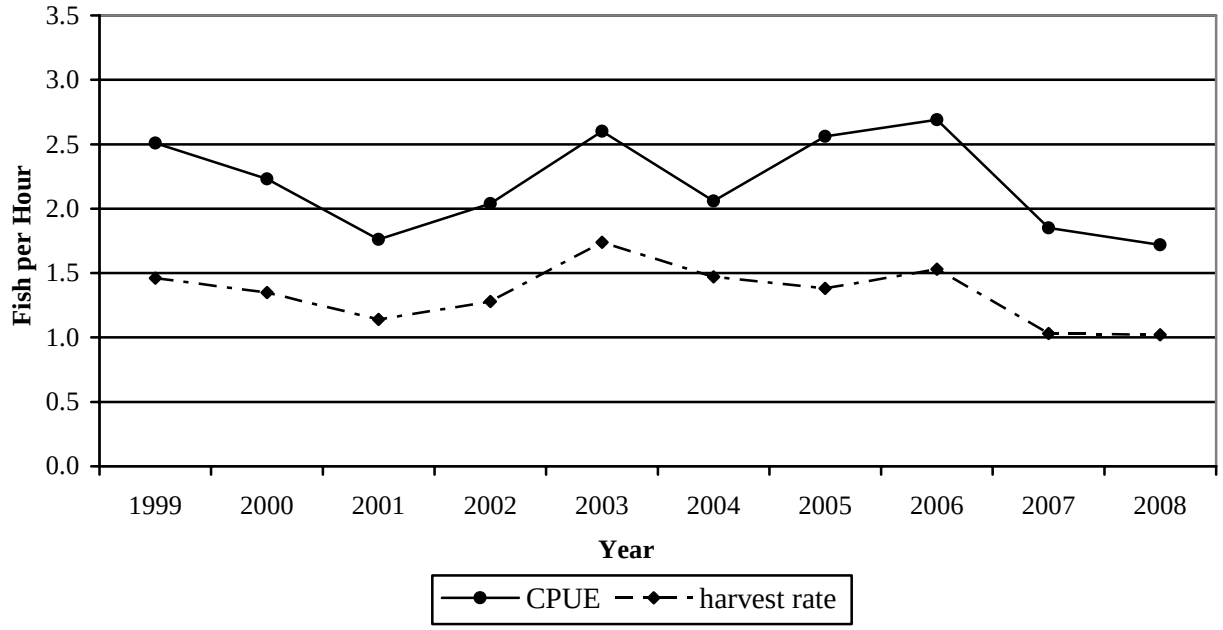


Figure 14. Yellow perch CPUE and harvest-per-unit-effort (harvest rate) from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, based on directed effort.

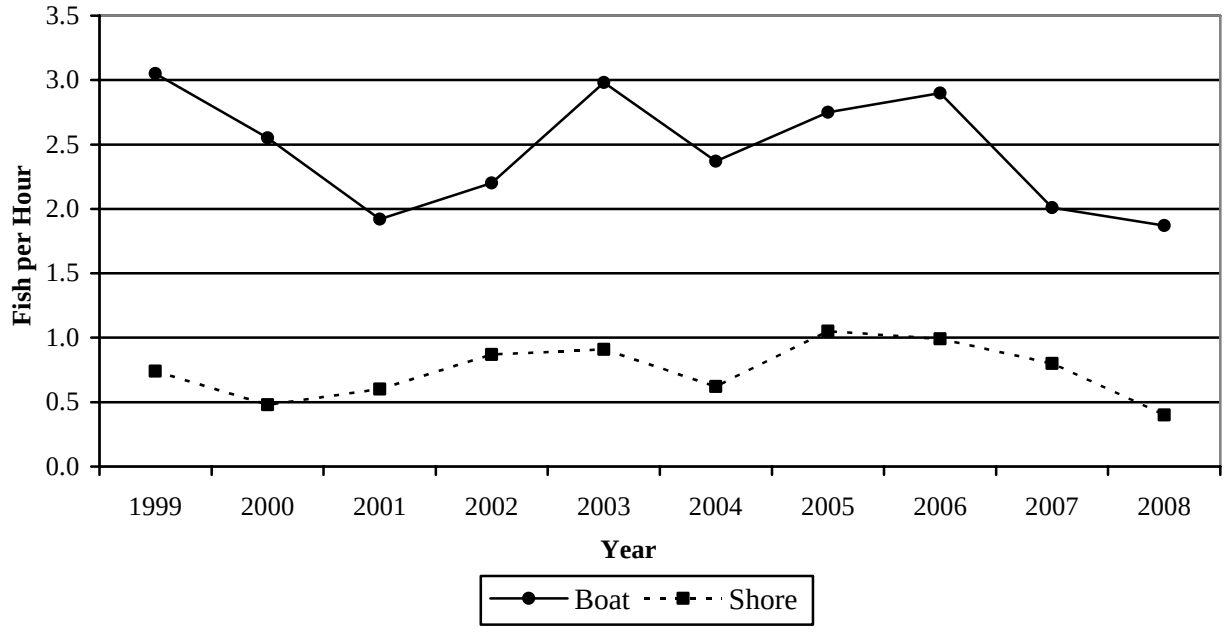


Figure 15. Yellow perch CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

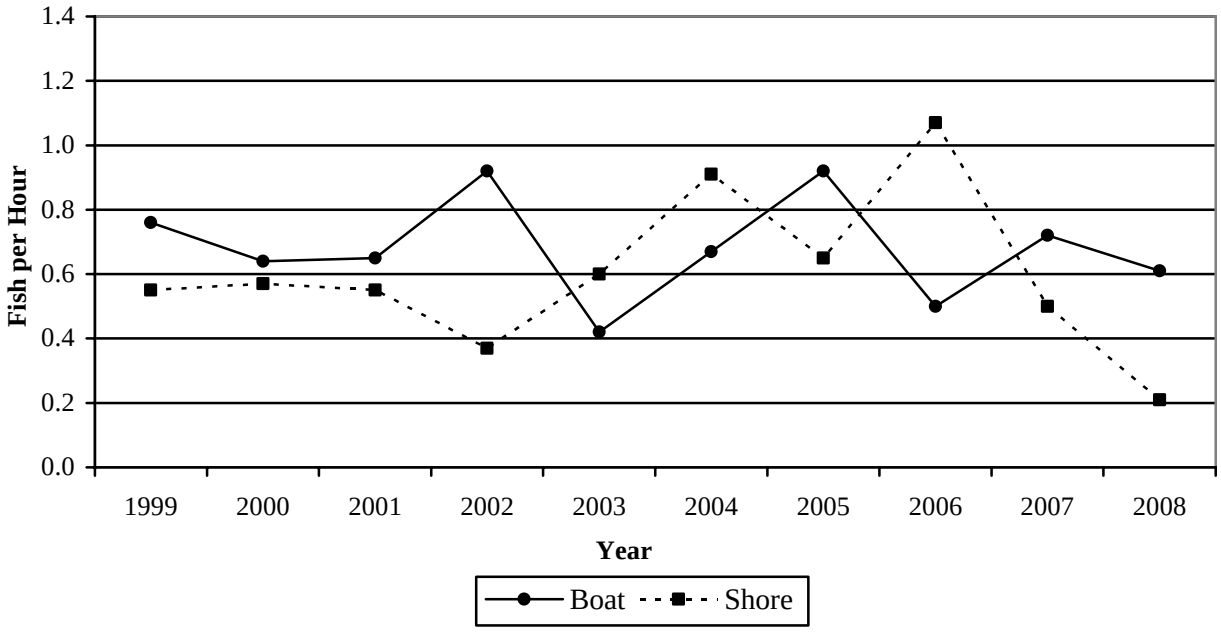
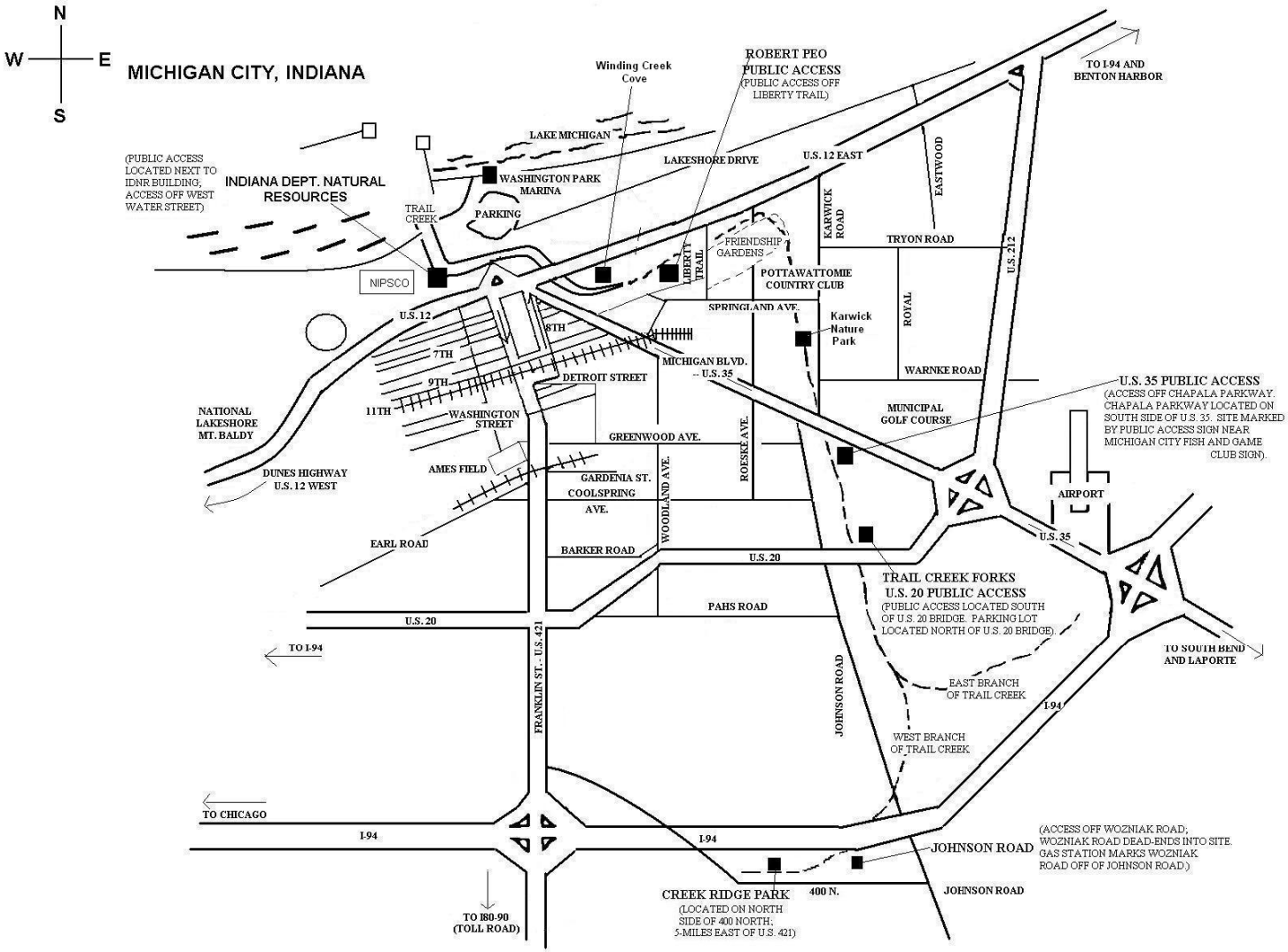
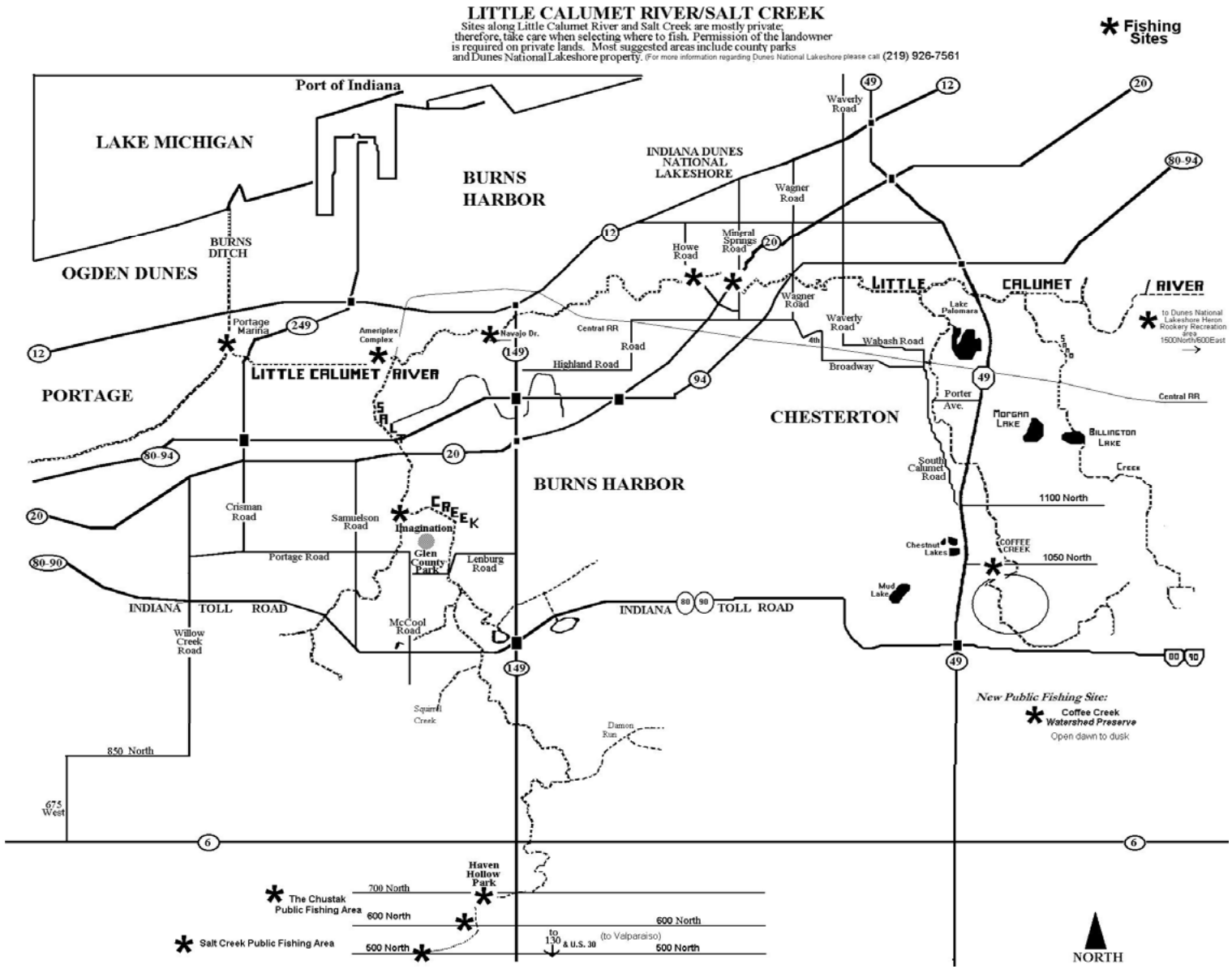


Figure 16. Black bass CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008, by angler type (directed effort).

Figure 17. County of residence of anglers that were surveyed in the Indiana Department of Natural Resources Lake Michigan creel survey fishing from boat, shore and stream during 2008 (n=2,038).



Appendix I (a). Trail Creek public access map.



Appendix I (b). East Branch of the Little Calumet/Salt Creek public access map.

Appendix II. Estimated total catch for species other than salmonines, yellow perch, or black bass species from the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

	Catch					
	Boat Fishery		Shore Fishery		Stream Fishery	
	Number Harvested	Total Catch	Number Harvested	Total Catch	Number Harvested	Total Catch
Bowfin	---	---	---	---	3	3
Bullhead	---	---	---	---	0	16
Catfish	45	476	86	166	28	47
Carp	0	28	11	110	3	34
Chubs	---	---	---	---	0	167
Crappie	0	82	4	82	8	8
Freshwater Drum	---	---	43	260	69	88
Goldfish	---	---	0	22	---	----
Herring Family (Alewife/Gizzard Shad)	0	57	17	50	---	---
Northern Pike	---	---	---	---	0	38
Lamprey	19	19	---	---	---	---
Rainbow Smelt	---	---	---	---	---	---
Rock Bass	247	378	251	566	0	5
Round Goby	144	1,809	1,465	2,210	313	382
Suckers	0	9	0	16	3	79
Sunfish (Bluegill/Green Sunfish/)	---	---	425	1,097	38	109
Temperate Bass Family (White Bass, White Perch)	---	---	18	18	---	---
Walleye	132	132	0	8	---	---
Whitefish	---	---	0	17	---	---
TOTAL	587	2,990	2,320	4,622	465	976

Appendix III. Average length and weight of salmonine species and yellow perch observed from the Indiana Department of Natural Resources Lake Michigan creel survey during 1999 through 2008. Data from boat, shore, and stream fisheries combined. std. = standard deviation.

Year	Average length (in)	std.	Average weight (lb)	std.
Brown Trout				
1999[1]	20.3 (n=60)	3.72	---	---
2000	21.8 (n=59)	3.90	5.36 (n=58)	3.97
2001	22.3 (n=94)	5.05	5.95 (n=88)	4.10
2002	21.1 (n=102)	4.33	4.83 (n=96)	3.38
2003	20.7 (n=51)	3.78	4.58 (n=51)	3.12
2004	22.9 (n=55)	4.63	6.53 (n=53)	4.07
2005	22.8 (n=68)	4.57	6.05 (n=68)	4.24
2006	23.6 (n=26)	4.65	6.70 (n=26)	4.13
2007	22.0 (n=53)	4.21	5.24 (n=53)	3.30
2008	23.6 (n=24)	4.39	7.47 (n=23)	5.10
Coho Salmon				
1999[1]	23.4 (n=1,434)	2.83	---	---
2000	21.0 (n=598)	3.12	3.46 (n=555)	2.23
2001	21.0 (n=513)	2.66	3.59 (n=509)	1.66
2002	19.4 (n=1,008)	2.54	2.66 (n=978)	1.41
2003	20.1 (n=945)	2.43	3.02 (n=940)	1.37
2004	20.7 (n=378)	3.11	3.54 (n=375)	2.01
2005	20.1 (n=516)	2.35	2.69 (n=516)	1.20
2006	20.7 (n=436)	2.15	3.10 (n=436)	1.34
2007	21.2 (n=365)	2.30	3.19 (n=364)	1.31
2008	19.9 (n=249)	2.14	2.58 (n=249)	1.03
Chinook Salmon				
1999[1]	30.0 (n=281)	5.43	---	---
2000	28.3 (n=288)	6.55	9.74 (n=267)	5.84
2001	30.0 (n=410)	4.45	11.4 (n=405)	4.73
2002	30.7 (n=585)	4.83	11.8 (n=584)	4.82
2003	28.1 (n=218)	4.62	8.87 (n=218)	4.54
2004	29.2 (n=389)	4.27	9.98 (n=389)	3.61
2005	27.7 (n=375)	4.76	7.92 (n=374)	3.61
2006	27.8 (n=285)	4.24	8.39 (n=285)	3.83
2007	28.1 (n=164)	4.86	8.57 (n=164)	3.93
2008	26.7 (n=201)	5.27	7.50 (n=201)	4.13

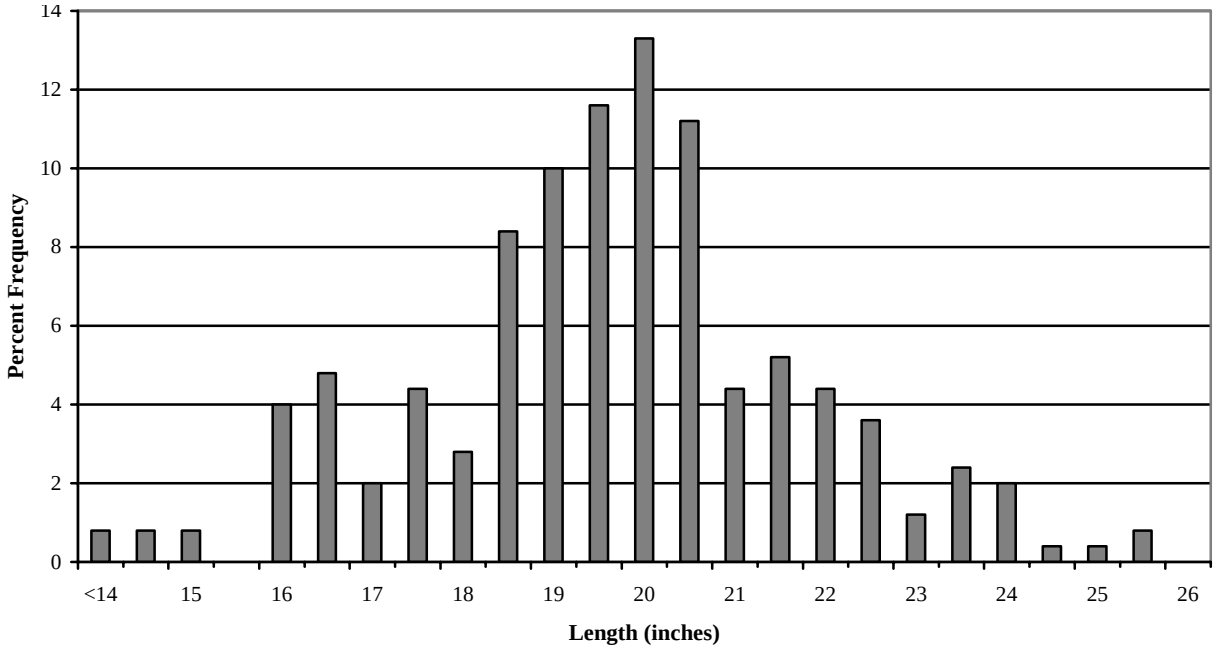
[1] Weight data not available.

Appendix III *continued*. Average length and weight of salmonine species and yellow perch, observed from the Indiana Department of Natural Resources Lake Michigan creel survey during 1999 through 2008. Data from boat, shore, and stream fisheries combined. std. = standard deviation.

Year	Average length (in)	std.	Average weight (lb)	std.
Lake Trout				
1999[1]	26.5 (n=63)	3.42	---	---
2000	27.0 (n=114)	2.84	7.27 (n=114)	2.64
2001	26.3 (n=124)	2.56	7.10 (n=123)	2.35
2002	27.0 (n=65)	3.17	7.57 (n=64)	2.96
2003	26.5 (n=27)	2.14	6.78 (n=27)	1.61
2004	26.8 (n=41)	3.10	7.54 (n=41)	2.92
2005	26.8 (n=79)	3.28	7.75 (n=79)	3.03
2006	25.6 (n=62)	2.43	6.55 (n=62)	2.28
2007	26.9 (n=172)	3.01	7.30 (n=171)	2.54
2008	27.3 (n=187)	2.97	7.64 (n=187)	2.82
Steelhead trout				
1999[1]	29.3 (n=606)	3.34	---	---
2000	28.3 (n=296)	4.31	8.41 (n=287)	3.43
2001	27.6 (n=503)	3.17	7.76 (n=494)	2.61
2002	29.2 (n=481)	3.39	8.67 (n=477)	2.68
2003	25.6 (n=318)	4.38	6.50 (n=318)	3.16
2004	27.7 (n=278)	3.70	8.16 (n=278)	2.80
2005	26.7 (n=325)	3.75	6.74 (n=324)	2.75
2006	27.6 (n=321)	3.43	7.63 (n=321)	2.66
2007	26.0 (n=266)	4.88	6.77 (n=265)	3.30
2008	25.8 (n=190)	4.43	6.13 (n=190)	2.95
Yellow perch				
1999[1]	9.85 (n=2,150)	1.73	---	---
2000[1]	10.4 (n=930)	1.78	---	---
2001	10.4 (n=891)	2.10	0.50 (n=809)	0.34
2002	9.69 (n=904)	1.74	0.46 (n=894)	0.34
2003	10.0 (n=1,489)	1.67	0.50 (n=1,488)	0.29
2004	9.53 (n=901)	1.75	0.45 (n=889)	0.29
2005	10.4 (n=808)	1.79	0.56 (n=803)	0.32
2006	9.51 (n=878)	1.45	0.42 (n=878)	0.22
2007	10.7 (n=265)	1.48	0.55 (n=265)	0.25
2008	10.5 (n=273)	1.72	0.53 (n=273)	0.29

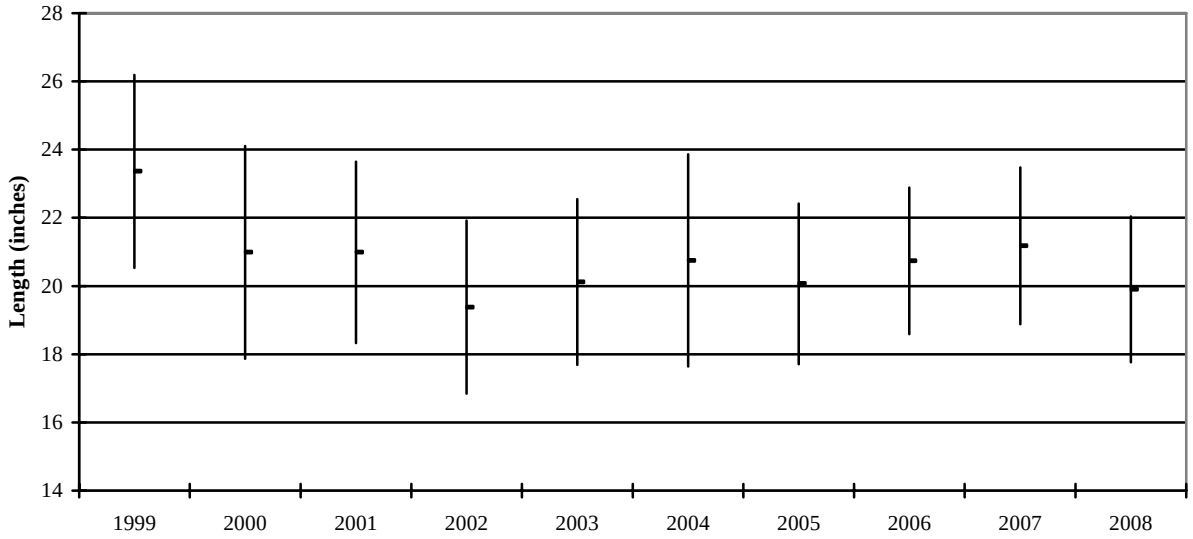
[1] Weight data not available.

N = 249
Average length 19.9 in
std. 2.14
Range 12.3 – 25.9



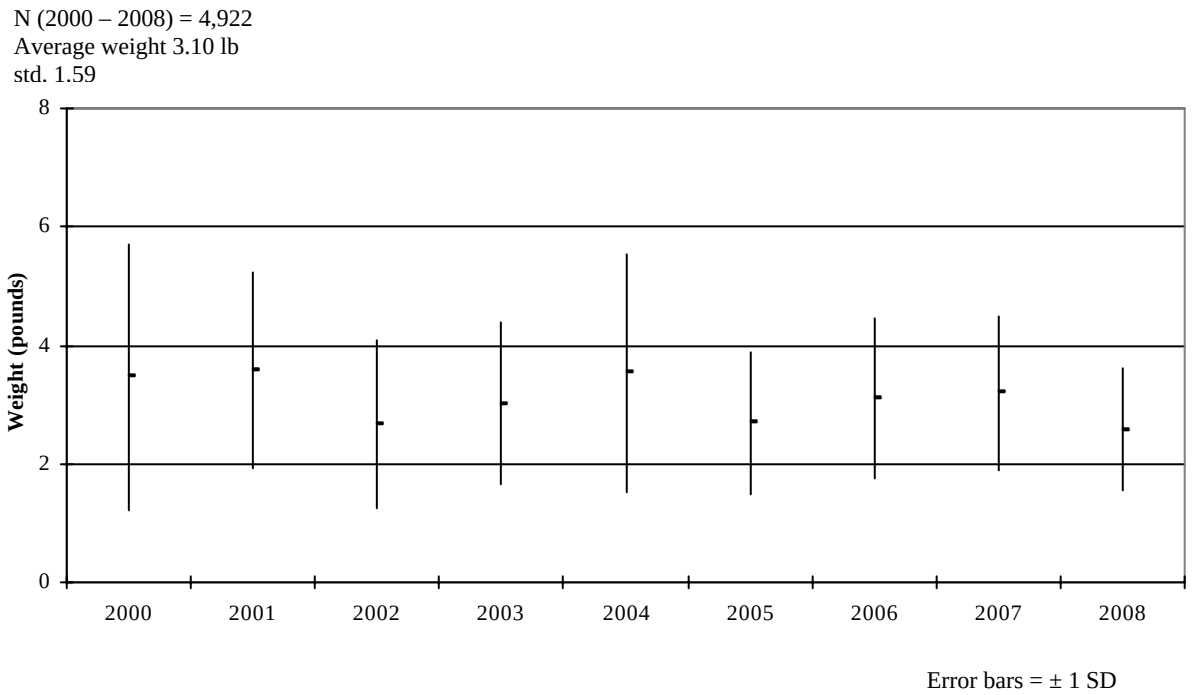
Appendix IV (a). Length frequency of coho salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

N (1999 – 2008) = 6,442
Average length 21.0 in
std. = 2.97

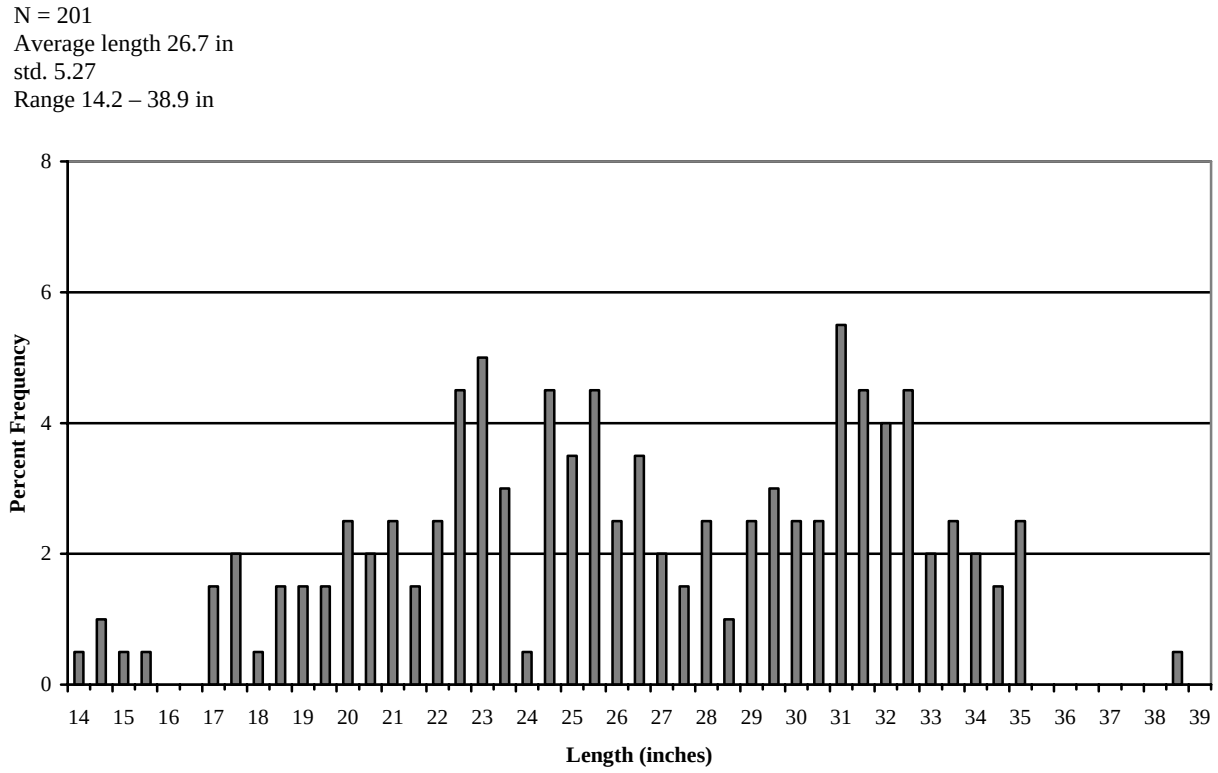


Error bars = ± 1 SD

Appendix IV (b). Average total length of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.

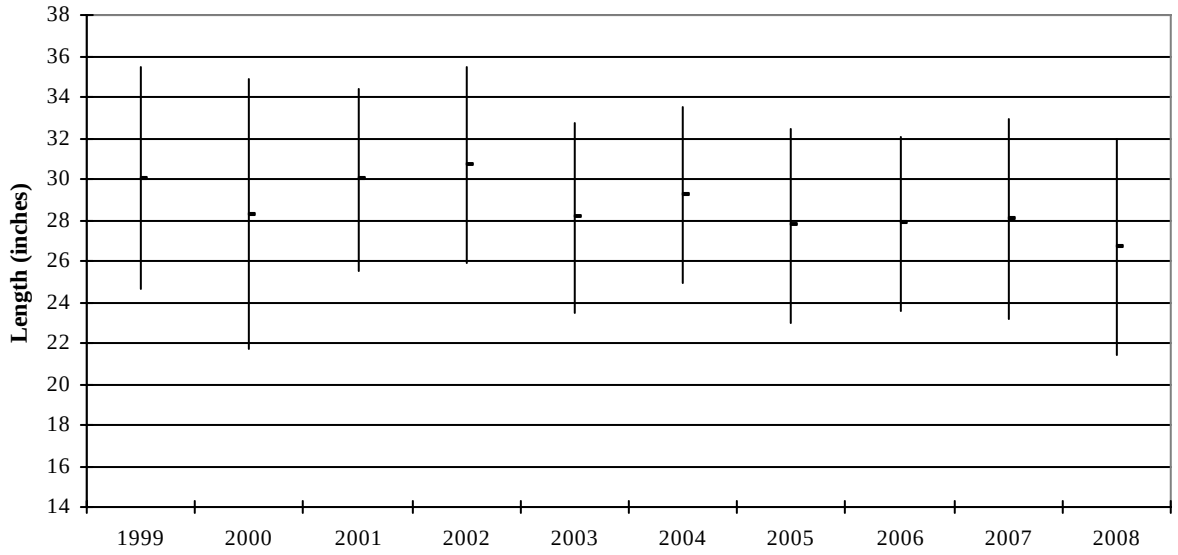


Appendix IV (c). Average weight of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2008.



Appendix V (a). Length frequency of Chinook salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

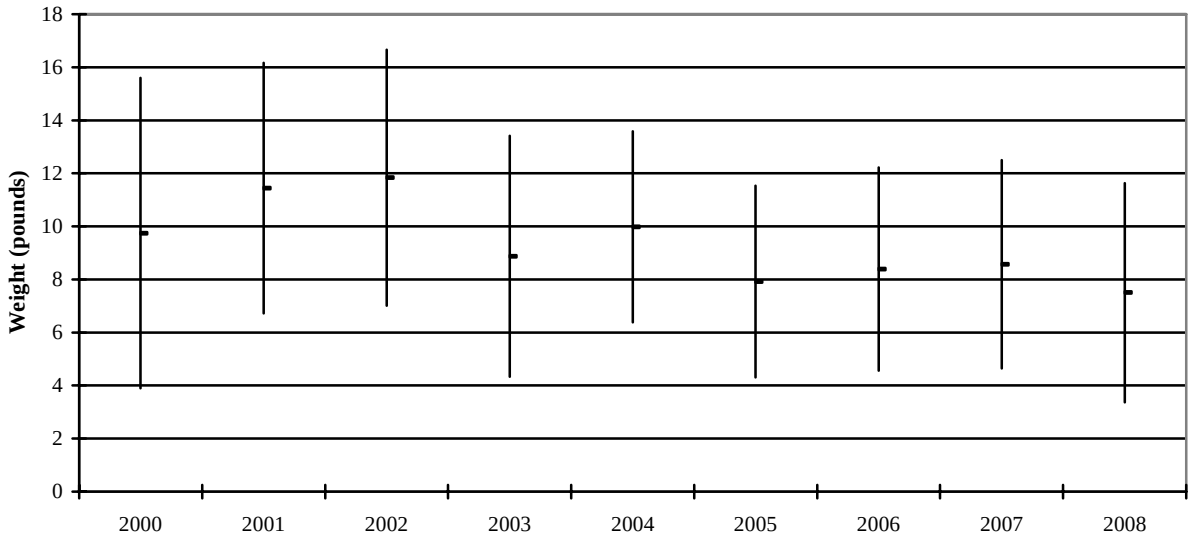
N (1999 – 2008) = 3,196
Average length 29.0 in
std. = 5.07



Error bars = ± 1 SD

Appendix V (b). Average total length of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.

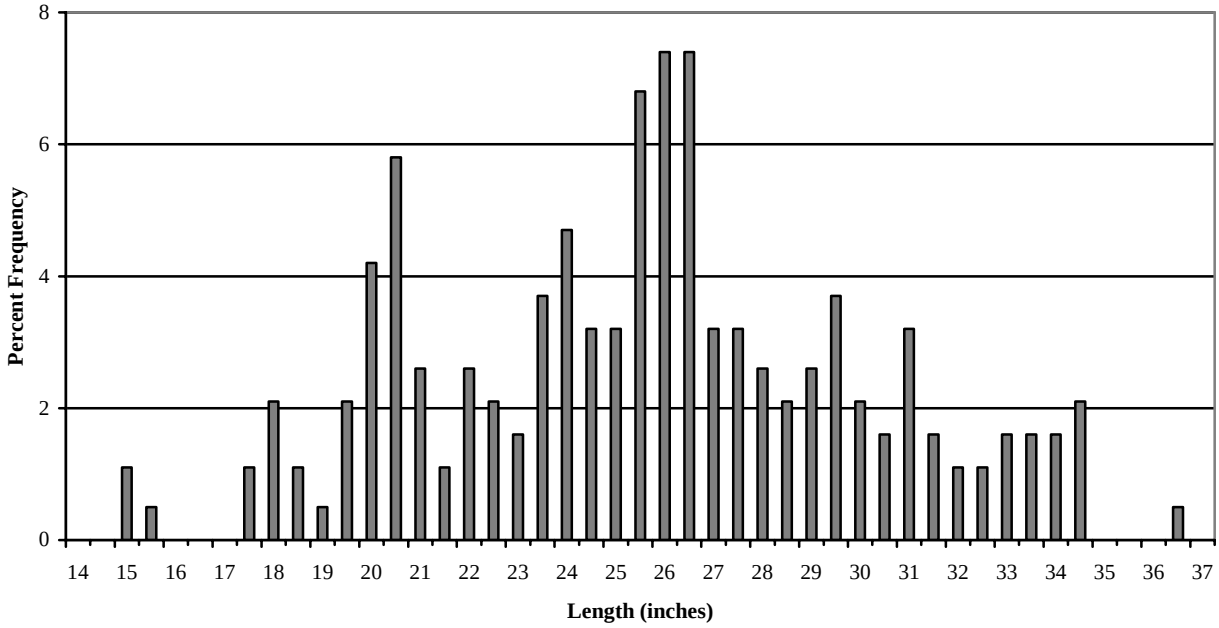
N (2000 – 2008) = 2,887
Average weight 9.80 lb
std. = 4.67



Error bars = ± 1 SD

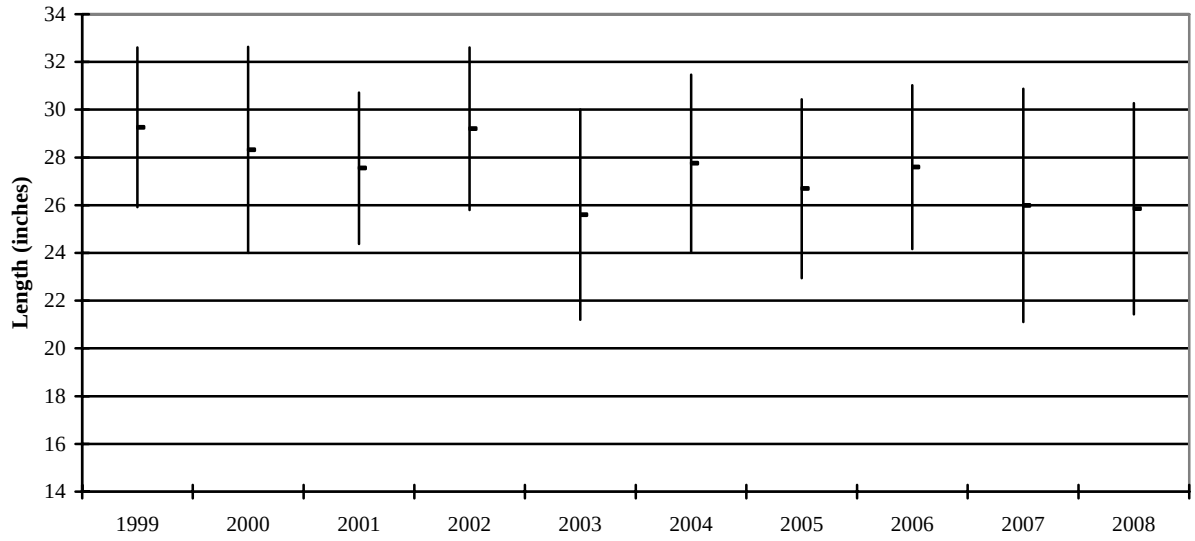
Appendix V (c). Average weight of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2008.

N = 190
Average length 25.8 in
std. = 4.43
Range 15.3 – 36.5 in



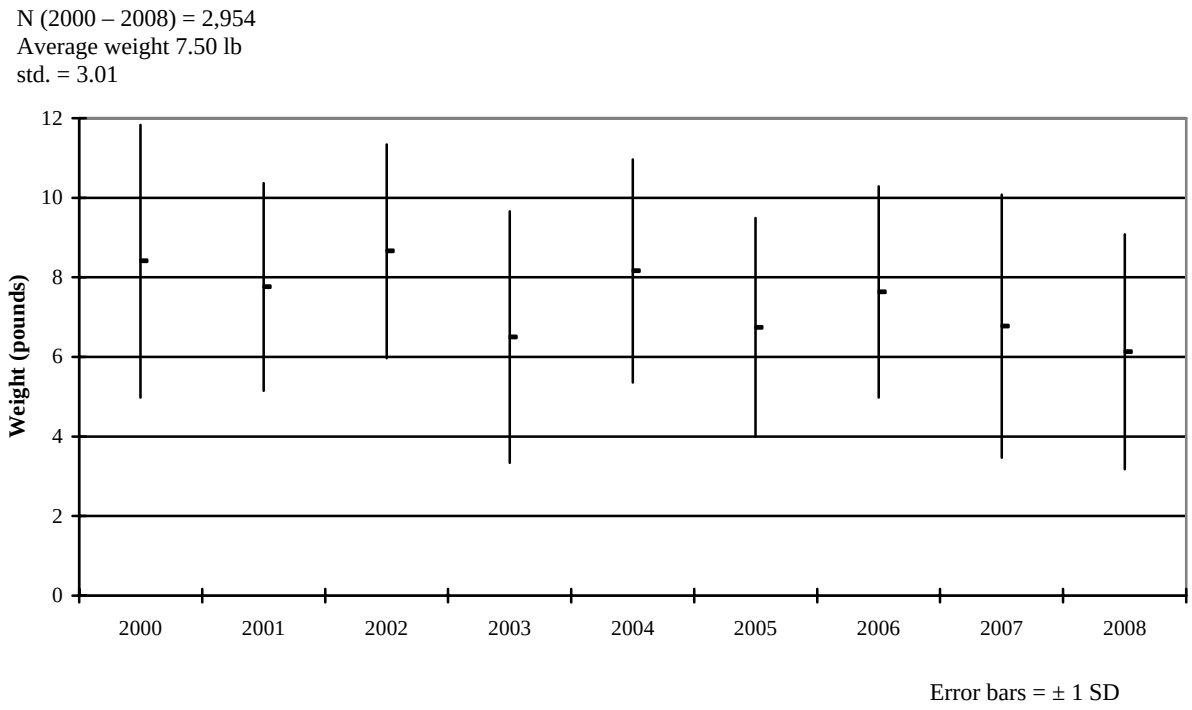
Appendix VI (a). Length frequency of steelhead observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

N (1999 – 2008) = 3,584
Average length 27.7 in
std. = 3.98

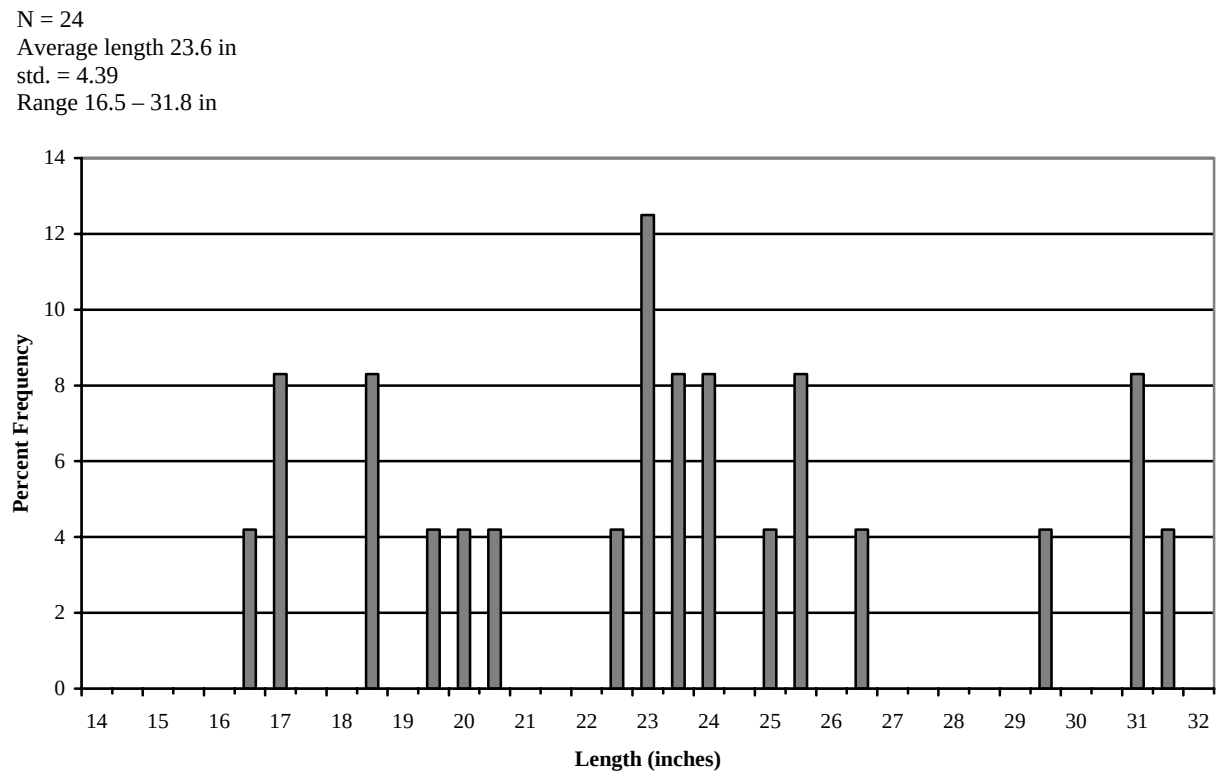


Error bars = ± 1 SD

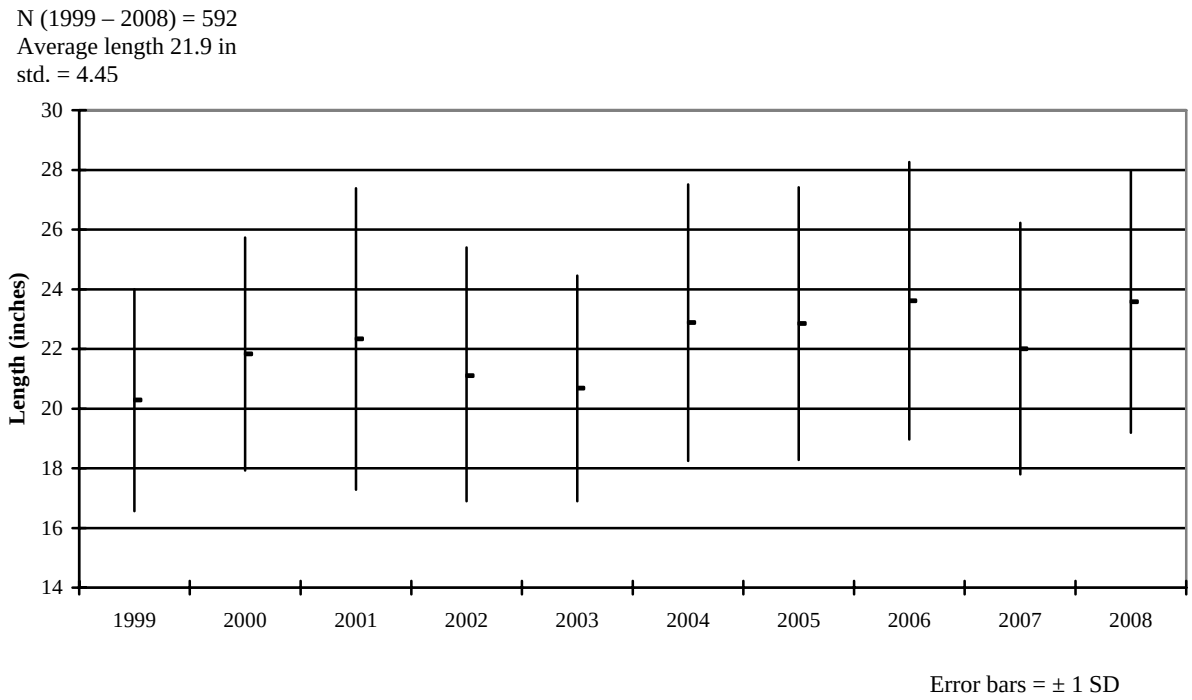
Appendix VI (b). Average total length of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.



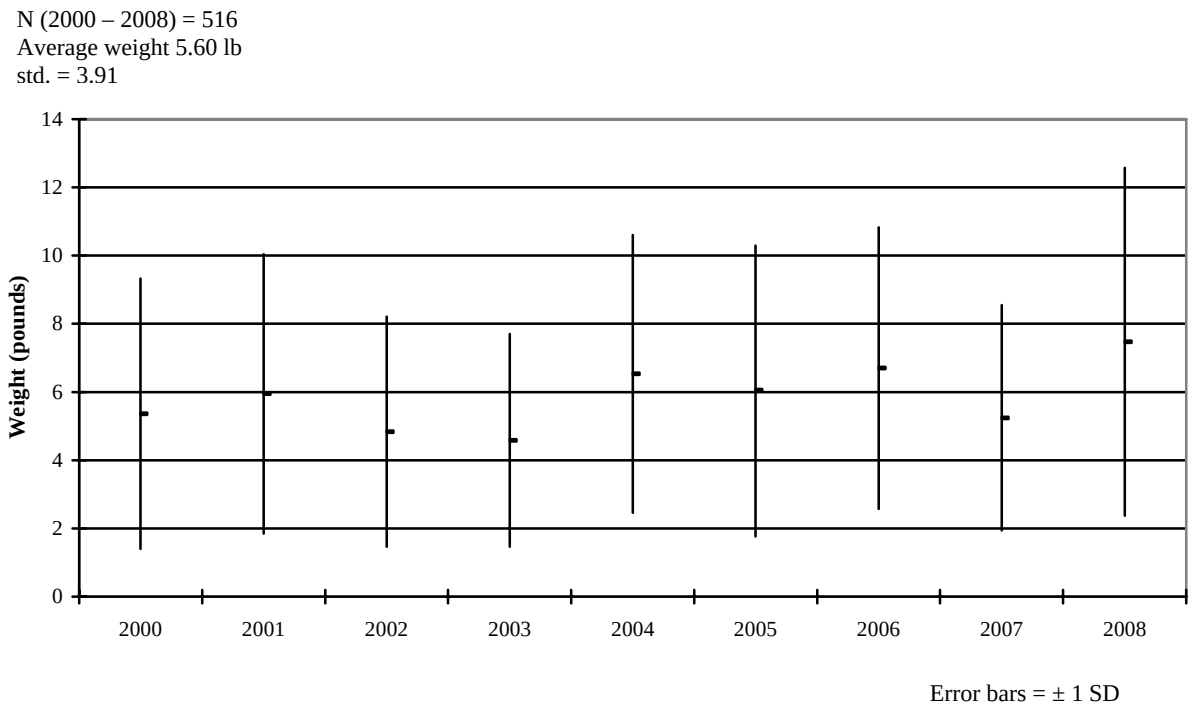
Appendix VI (c). Average weight of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2008.



Appendix VII (a). Length frequency of brown trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

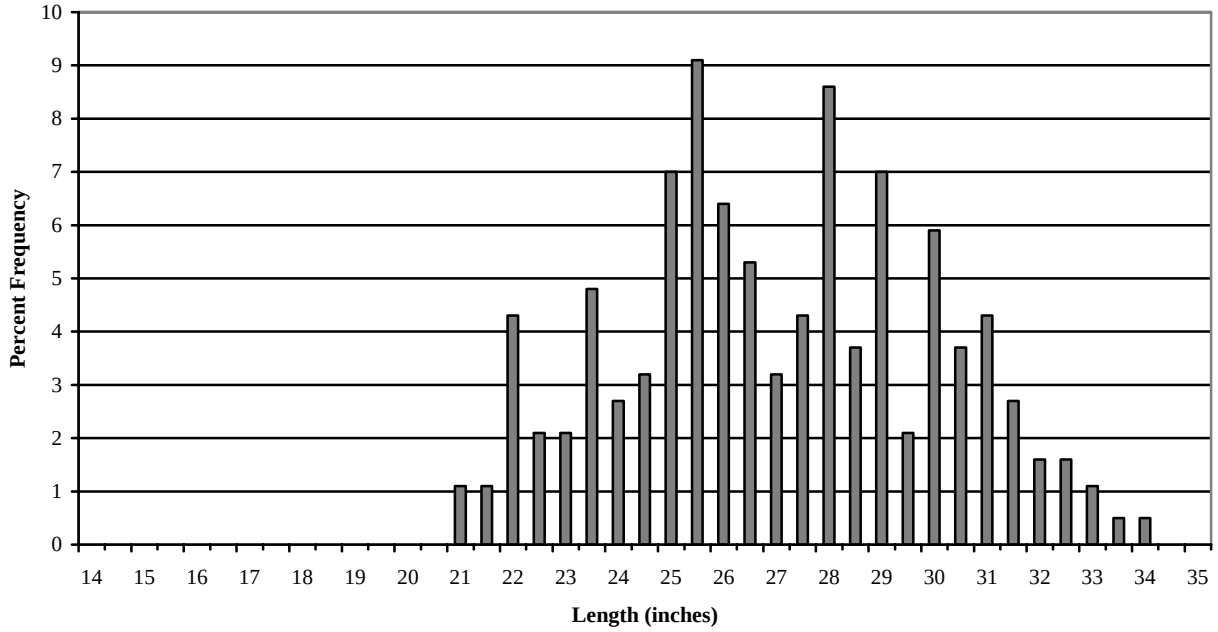


Appendix VII (b). Average total length of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.



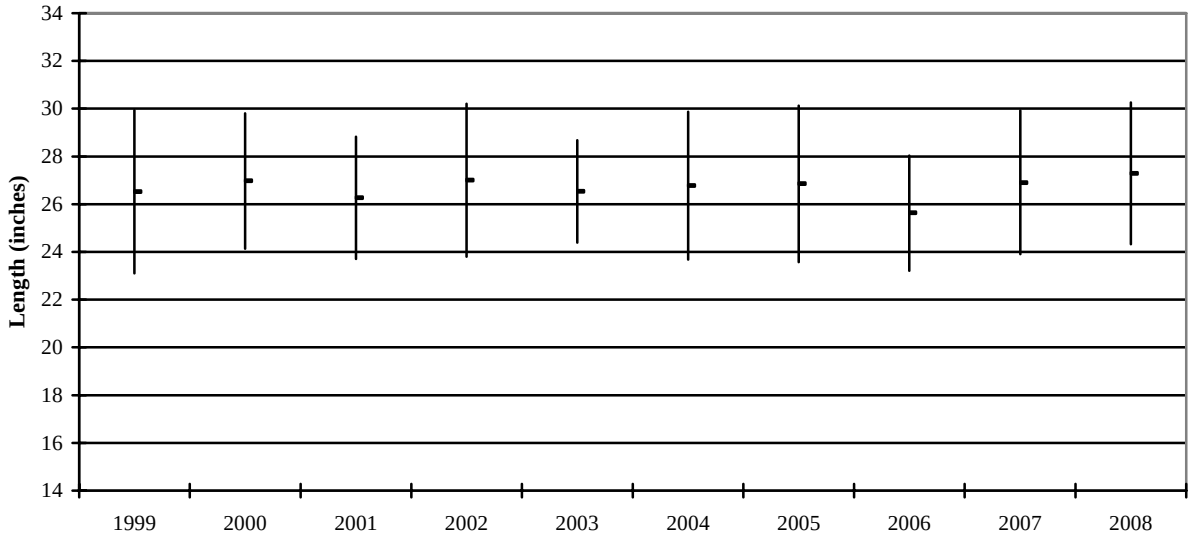
Appendix VII (c). Average weight of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2008.

N =187
Average length 27.3 in
std. = 2.97
Range 21.2 – 34.1 in



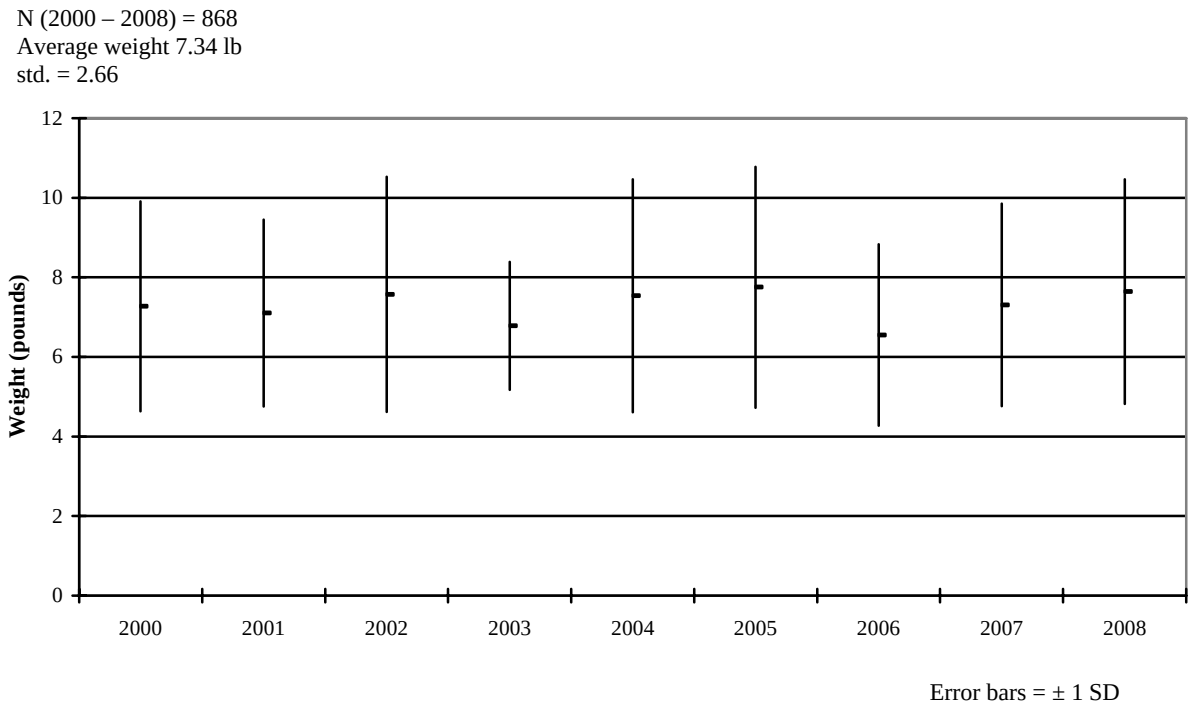
Appendix VIII (a). Length frequency of lake trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.

N (1999 – 2008) = 934
Average length 26.8 in
std. = 2.96

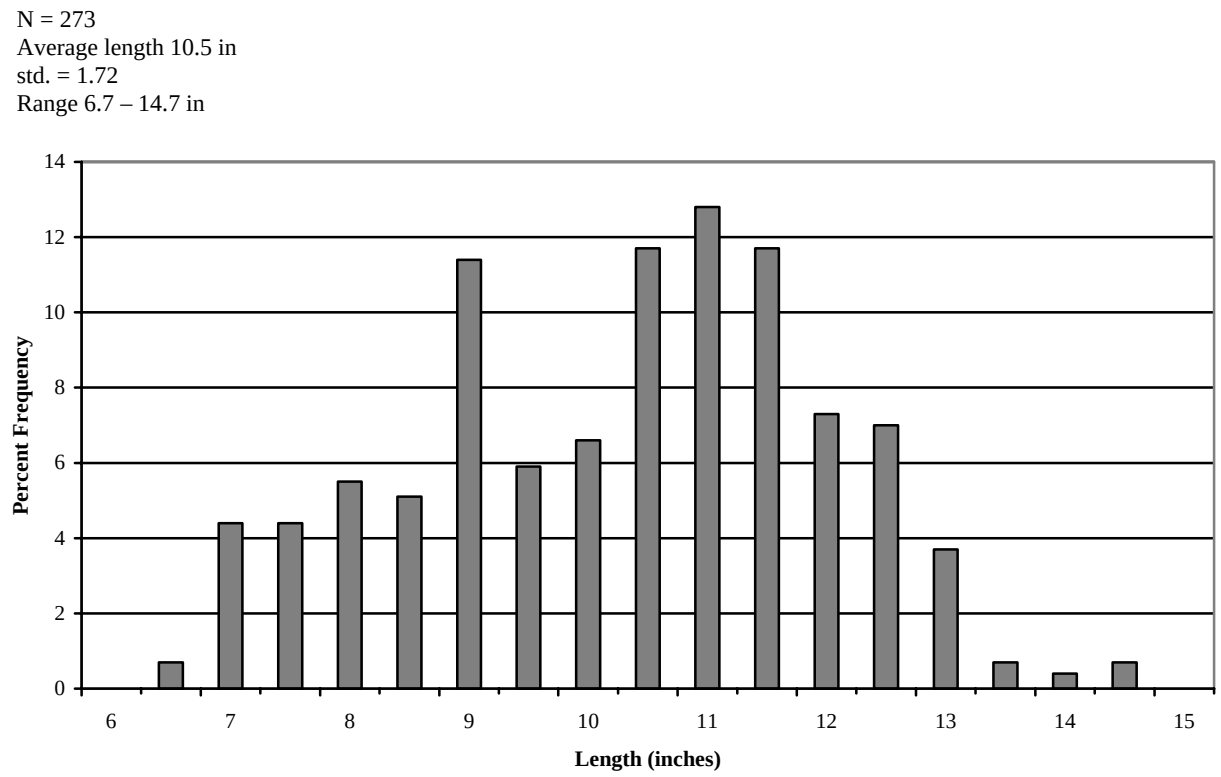


Error bars = ± 1 SD

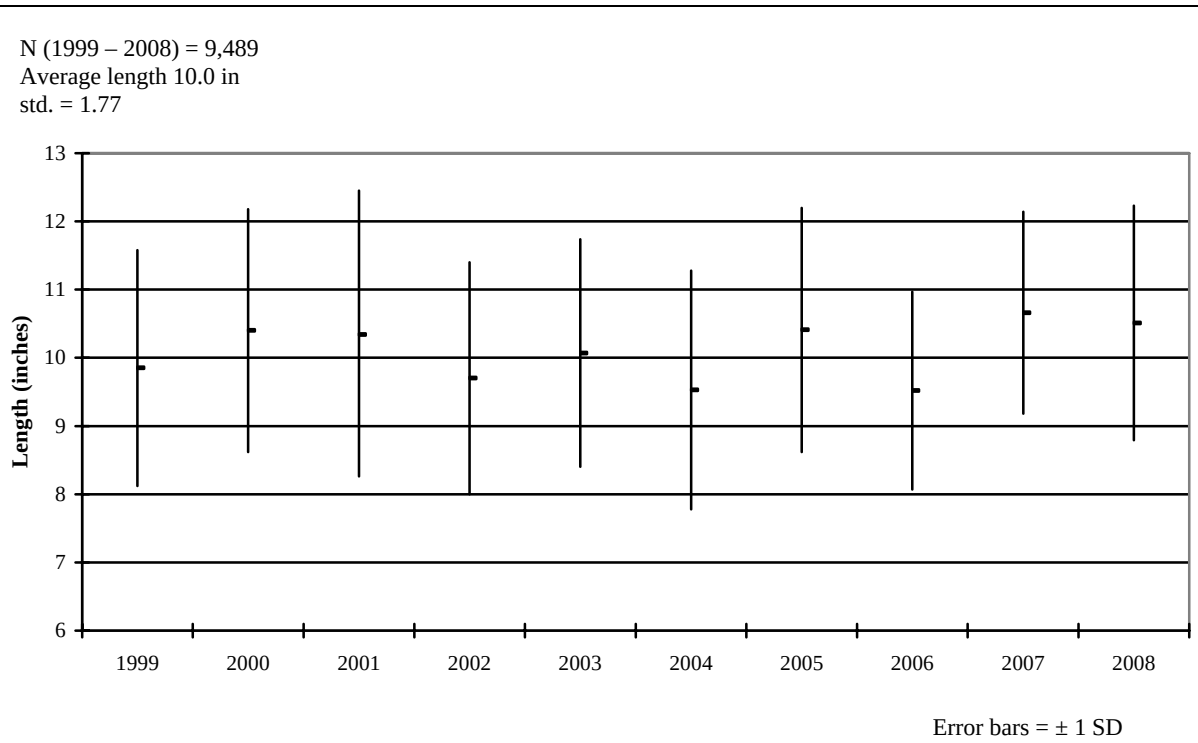
Appendix VIII (b). Average total length of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.



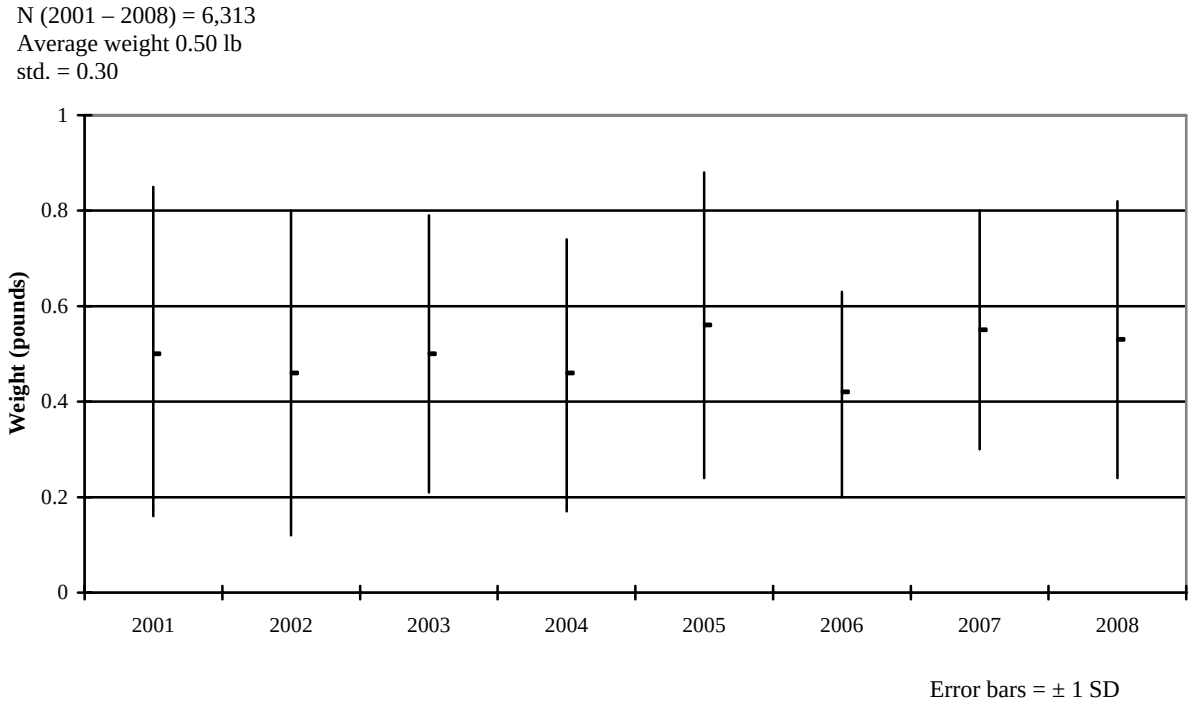
Appendix VIII (c). Average weight of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2008.



Appendix IX (a). Length frequency of yellow perch observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2008.



Appendix IX (b). Average total length of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 1999 through 2008.



Appendix IX (c). Average weight of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 2001 through 2008.

Appendix X (a). County of residence of anglers that were surveyed in the Indiana Department of Natural Resources Lake Michigan creel survey fishing from boat during 2008 (n=743).

County	No. Parties	%	County	No. Parties	%
Lake	288	(38.8)	Starke	1	(0.1)
Out-of-State	174	(23.4)	Vigo	1	(0.1)
Porter	125	(16.8)	White	1	(0.1)
LaPorte	80	(10.8)			
Elkhart	12	(1.6)			
St. Joseph	10	(1.3)			
Jasper	7	(0.9)			
Marion	7	(0.9)			
Tippecanoe	7	(0.9)			
Allen	6	(0.8)			
Wells	3	(0.4)			
Benton	2	(0.3)			
Boone	2	(0.3)			
Cass	2	(0.3)			
Grant	2	(0.3)			
Marshall	2	(0.3)			
Ripley	2	(0.3)			
Wabash	2	(0.3)			
Adams	1	(0.1)			
Franklin	1	(0.1)			
Lawrence	1	(0.1)			
Martin	1	(0.1)			
Noble	1	(0.1)			
Pulaski	1	(0.1)			
Shelby	1	(0.1)			

Appendix X (b). County of residence of anglers that were surveyed in the Indiana Department of Natural Resources Lake Michigan creel survey fishing from shore during 2008 (n=890).

County	No. Parties	%	County	No. Parties	%
Lake	289	(32.5)	Monroe	1	(0.1)
LaPorte	221	(24.8)	Montgomery	1	(0.1)
Porter	196	(22.0)	Newton	1	(0.1)
Out-of-State	83	(9.3)	Starke	1	(0.1)
Elkhart	23	(2.6)	Wabash	1	(0.1)
St. Joseph	11	(1.2)	Wayne	1	(0.1)
Marion	10	(1.1)	Wells	1	(0.1)
Cass	5	(0.6)	White	1	(0.1)
Hendricks	5	(0.6)			
Kosciusko	5	(0.6)			
Miami	5	(0.6)			
Allen	4	(0.4)			
Jasper	4	(0.4)			
Carroll	3	(0.3)			
Clinton	2	(0.2)			
Johnson	2	(0.2)			
Madison	2	(0.2)			
Tipton	2	(0.2)			
Vigo	2	(0.2)			
Blackford	1	(0.1)			
Dekalb	1	(0.1)			
Delaware	1	(0.1)			
Franklin	1	(0.1)			
Grant	1	(0.1)			
Hamilton	1	(0.1)			
Lawrence	1	(0.1)			
Marshall	1	(0.1)			

Appendix X (c). County of residence of anglers that were surveyed in the Indiana Department of Natural Resources Lake Michigan creel survey fishing from stream during 2008 (n=842).

County	No. Parties	%	County	No. Parties	%
LaPorte	239	(28.4)	Fountain	1	(0.1)
Out-of-State	180	(21.4)	Franklin	1	(0.1)
Porter	138	(16.4)	Jackson	1	(0.1)
Lake	73	(8.7)	Lagrange	1	(0.1)
St. Joseph	49	(5.8)	Lawrence	1	(0.1)
Elkhart	26	(3.1)	Madison	1	(0.1)
Marion	13	(1.5)	Newton	1	(0.1)
Marshall	11	(1.3)	Noble	1	(0.1)
Delaware	10	(1.2)	Pulaski	1	(0.1)
Kosciusko	10	(1.2)	Shelby	1	(0.1)
Allen	9	(1.1)	Sullivan	1	(0.1)
Tippecanoe	7	(0.8)	Vigo	1	(0.1)
Grant	6	(0.7)	Washington	1	(0.1)
Hendricks	6	(0.7)	Wayne	1	(0.1)
Huntington	6	(0.7)	White	1	(0.1)
Carroll	5	(0.6)	Whitley	1	(0.1)
Starke	5	(0.6)			
Miami	4	(0.5)			
Wabash	4	(0.5)			
Dekalb	3	(0.3)			
Howard	3	(0.3)			
Jasper	3	(0.3)			
Owen	3	(0.3)			
Vanderburgh	3	(0.3)			
Clinton	2	(0.2)			
Fayette	2	(0.2)			
Fulton	2	(0.2)			
Putnam	2	(0.2)			
Decatur	1	(0.1)			
Dubois	1	(0.1)			

Appendix XI (a). Boat, shore and stream angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2008.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	563(91%)	36(6%)	16(2%)	2(<1%)	3(<1%)	1(<1%)	232(37%)	114(18%)	145(23%)	48(8%)	32(5%)	50(8%)
Chinook	473(90%)	32(6%)	19(3%)	2(<1%)	1(<1%)	1(<1%)	122(23%)	80(15%)	153(29%)	70(13%)	46(9%)	58(11%)
Steelhead	962(94%)	38(3%)	17(2%)	2(<1%)	1(<1%)	2(<1%)	304(30%)	223(22%)	256(25%)	91(9%)	60(6%)	86(8%)
Brown Trout	157(79%)	17(9%)	11(6%)	6(3%)	5(2%)	2(1%)	44(22%)	25(13%)	37(19%)	19(10%)	41(21%)	31(16%)
Lake Trout	81(72%)	10(9%)	12(11%)	4(4%)	5(4%)	0	42(38%)	16(14%)	20(18%)	12(11%)	14(13%)	7(6%)
Yellow Perch	414(96%)	16(4%)	3(<1%)	0	0	0	207(48%)	99(23%)	72(17%)	14(3%)	20(5%)	21(5%)

Appendix XI (b). Boat angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2008.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	231(90%)	13(5%)	9(3%)	1(<1%)	2(<1%)	0	116(45%)	39(15%)	58(23%)	21(8%)	16(6%)	6(2%)
Chinook	194(92%)	12(6%)	4(2%)	1(<1%)	0	0	75(35%)	35(17%)	61(29%)	20(9%)	15(7%)	5(2%)
Steelhead	100(90%)	7(6%)	3(3%)	1(1%)	0	0	45(40%)	19(17%)	21(19%)	14(13%)	9(8%)	3(3%)
Brown Trout	74(79%)	8(8%)	6(6%)	2(2%)	3(3%)	1(1%)	33(35%)	15(16%)	15(16%)	9(10%)	17(18%)	5(5%)
Lake Trout	66(72%)	8(9%)	8(9%)	4(4%)	5(5%)	0	39(43%)	13(14%)	17(19%)	10(11%)	10(11%)	2(2%)
Yellow Perch	237(99%)	3(1%)	0	0	0	0	136(57%)	55(23%)	33(14%)	4(2%)	7(3%)	5(2%)

Appendix XI (c). Shore angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2008.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	172(93%)	8(4%)	3(2%)	0	1(1%)	0	50(27%)	43(23%)	55(30%)	9(5%)	7(4%)	20(11%)
Chinook	128(91%)	8(6%)	4(3%)	0	0	0	13(9%)	15(11%)	51(36%)	26(19%)	16(11%)	20(14%)
Steelhead	255(94%)	12(4%)	4(1%)	0	1(<1%)	0	81(30%)	60(22%)	75(28%)	21(8%)	11(4%)	23(8%)
Brown Trout	33(81%)	7(17%)	1(2%)	0	0	0	9(23%)	6(16%)	11(28%)	2(5%)	2(5%)	9(23%)
Lake Trout	15(71%)	2(10%)	4(19%)	0	0	0	3(15%)	3(15%)	3(15%)	2(10%)	4(20%)	5(25%)
Yellow Perch	176(92%)	13(7%)	3(1%)	0	0	0	71(37%)	43(23%)	39(20%)	10(5%)	13(7%)	16(8%)

Appendix XI (d). Stream angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2008.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	160(89%)	15(8%)	4(2%)	1(<1%)	0	1(<1%)	66(36%)	32(18%)	32(18%)	18(10%)	9(5%)	24(13%)
Chinook	151(86%)	12(7%)	11(6%)	1(<1%)	1(<1%)	1(<1%)	34(19%)	30(17%)	41(23%)	24(14%)	15(8%)	33(19%)
Steelhead	607(95%)	19(3%)	10(1%)	1(<1%)	0	2(<1%)	178(28%)	144(23%)	160(25%)	56(9%)	40(6%)	60(9%)
Brown Trout	50(80%)	2(3%)	4(6%)	4(6%)	2(3%)	1(2%)	2(3%)	4(6%)	11(17%)	8(12%)	22(35%)	17(27%)
Lake Trout	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Perch	1(100%)	0	0	0	0	0	0	1(100%)	0	0	0	0