LAKE MICHIGAN

2009 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, 2009 and three Lake Michigan tributaries from March 1 to March 31, 2009, and July 1 to December 31, 2009. 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 450,335 h, which was 43% higher than the estimated number of hours anglers fished in 2008. Seventy-two percent of the fishing hours came from boat anglers.

- Estimated total catch from the combined fisheries was 534,735 fish representing twenty-four fish species, approximately 2.4 times greater than the 2008 estimated total catch. Yellow perch dominated the 2009 catch, comprising 74% of the total. The boat fishery, including chartered trips, dominated the total catch accounting for 91% of the total.

- The salmonine catch rate (CPUE) was 34.3 fish/100 h, one of the highest rates observed during the 2000 to 2009 data series. Angler success for salmonids increased for both boat and stream anglers but decreased slightly (-3%) for shore anglers compared to 2008. The yellow perch CPUE was 2.69 fish/h, also one of the highest rates observed between 2000 and 2009.

- Yellow perch, coho salmon, and Chinook salmon catch rates (CPUE) increased compared to the prior fishing season; whereas steelhead trout, brown trout, and lake trout CPUE declined. Although the lake trout catch rate fell, this rate was still the second highest reported from the 2000-2009 data series. For steelhead, the overall CPUE fell to one of the lowest from the prior ten-year period; however, the stream steelhead catch rate increased to one of the highest rates observed between 2000 and 2009.

- Comparing 2009 catch rates with their long-term averages, only steelhead trout and brown trout were caught at below-average rates. By fishery, boat anglers experienced an above-average season for yellow perch, coho salmon, Chinook salmon, and lake trout, an average season for black bass (i.e. smallmouth), and a below-average season for steelhead trout and brown trout. Shore anglers had an above-average season for perch and coho, an average season for brown trout, and a below-average season for Chinook, steelhead, and black bass. Stream anglers experienced an above-average season for coho, Chinook, and steelhead, but a below-average year for brown trout.

- Biological data collected from angler-caught coho salmon, Chinook salmon, steelhead trout, and lake trout show higher mean lengths and weights compared to 2008. Average length of yellow perch kept by anglers was similar between 2008 and 2009. Harvested yellow perch ranged in size from 4.6 to 15 in.

- Bass continue to play an important role in the Lake Michigan boat and shore fisheries. The majority of fishing occurred from boats, accounting for 86% of the effort and 92% of the catch. Most bass caught were released; less than 3% of the total catch was harvested.

- Anglers from 58 Indiana counties fished Lake Michigan and it's tributaries in 2009. The majority of anglers interviewed were from Lake County, accounting for 26% of all anglers. Out-of-state residents, LaPorte County, and Porter County residents followed with 21%, 19%, and 19% of the anglers, respectively. Other counties with frequent use included St. Joseph, Elkhart, Allen, Jasper, Kosciusko, Marshall, and Starke counties. Angler parties from fifteen different states were represented in the survey, with the majority of these anglers coming from Illinois (91%); primarily Cook and Will Counties.

- The majority of perch, black bass, and salmonine anglers felt it was very important to have their targeted species in Lake Michigan and its tributaries. Most anglers were satisfied with the trout and salmon fishery; greater than 66% of all anglers rated satisfaction between somewhat satisfied to extremely satisfied. However, 38% of boat anglers, 41% of shore anglers, and 56% of stream anglers were dissatisfied with the brown trout fishery. Fifty-five percent of the shore anglers and 31% of the boat anglers were less than satisfied with the lake trout fishery. For yellow perch, 13% of the perch parties gave a low satisfaction rating. Seven percent of the angler parties targeting bass gave a low satisfaction rating. More shore angler parties were dissatisfied with the perch and bass fisheries than boat angler parties.

TABLE OF CONTENTS

	Page
LIST OF TABLES…….....	iv
LIST OF FIGURES……	vi
LIST OF APPENDICES……	viii
INTRODUCTION……..	1
STUDY SITE…….....	2
METHODS…….	3
RESULTS……...	6
Trout and salmon (directed effort)…….....	7
Yellow Perch (directed effort)……...	9
Black bass species…….	10
Species preference…….	10
Angler residency…….....	11
Importance and satisfaction ratings……...	11
DISCUSSION…….	13
RECOMMENDATIONS……...	20
ACKNOWLEDGMENTS……..	21
LITERATURE CITED……...	21
APPENDICES……	42

LIST OF TABLES

Table		Page
1.	Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 2000 through 2009…….....	24
2.	Millions of trout and salmon, fingerling and yearling stages combined, stocked in Lake Michigan between 2000 and 2009……..	25
3.	Estimated angler hours and catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort..	26
4.	Boat fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort…….....	26
5.	Shore fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort…….....	27
6.	Stream fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort…….....	27
7.	Estimated salmonine catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort……...	28
8.	Estimated salmonine catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……...	28
9.	Estimated salmonine catch and effort from the Indiana Department of Natural Resources Lake Michigan stream creel survey, 2000 through 2009, based on directed effort…….....	29
10.	Estimated yellow perch harvest, catch, and effort from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……..	29

Table		Page
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, 2000 through 2009…….....	30
12.	Preference categories of angler parties fishing Lake Michigan during 2009, by fishery…….....	31

LIST OF FIGURES

Figure		Page
1.	Indiana shoreline of Lake Michigan……..	32
2.	Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 2000 through 2009……...	33
3.	Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort…….....	33
4.	Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)……...	34
5.	Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……..	34
6.	Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)…….	35
7.	Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort…….....	35
8.	Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)……...	36
9.	Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……..	36
10.	Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)…….	37
11.	Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……..	37

Figure		Page
12.	Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)…….	38
13.	Lake trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort……...	38
14.	Yellow perch CPUE and harvest-per-unit-effort (harvest rate) from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort…….	39
15.	Yellow perch CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)…….	39
16.	Black bass CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort)…….....	40
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 2009 (n=3,339)…….	41

LIST OF APPENDICES

Appendix		Page
I (a).	Trail Creek public access map…….	42
I (b).	East Branch of the Little Calumet/Salt Creek public access map…….	43
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 2009……..…….....	44
III.	Average length and weight of salmonine species and yellow perch observed from the Indiana Department of Natural Resources Lake Michigan creel survey during 2000 through 2009. Data from boat, shore, and stream fisheries combined. std. = standard deviation…….	45
IV (a).	Length frequency of coho salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009…….....	47
IV (b).	Average total length of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009….....	47
IV (c).	Average weight of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009…….....	48
V (a).	Length frequency of Chinook salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009…….	48
V (b).	Average total length of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009……..	49
V (c).	Average weight of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.....	49
VI (a).	Length frequency of steelhead observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009…….....	50

Appendix		Page
VI (b).	Average total length of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.....	50
VI (c).	Average weight of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009…...	51
VII (a).	Length frequency of brown trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009……..	51
VII (b).	Average total length of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009…….	52
VII (c).	Average weight of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009…...	52
VIII (a).	Length frequency of lake trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009……...	53
VIII (b).	Average total length of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009……...	53
VIII (c).	Average weight of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.....	54
IX (a).	Length frequency of yellow perch observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009……...	54
IX (b).	Average total length of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009…….	55
IX (c).	Average weight of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 2001 through 2009……...	55

Appendix		Page
X (a).	County of residence of anglers that were surveyed in the Indiana Department of Natural Resources Lake Michigan creel survey fishing from boat from during 2009 (n=1,244)……...	56
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 2009 (n=1,156)…….....	57
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 2009 (n=939)…….....	58
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, 2009…….....	59
XI (b).	Boat angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2009…….	59
XI (c).	Shore angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2009…….	60
XI (d).	Stream angler response to the species importance and species satisfaction questions from the Indiana Department of Natural Resources Lake Michigan creel survey, 2009…….	60

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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 2000 to 2009, 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 12.5 million fingerling and yearling trout and salmon have been stocked into Lake Michigan since 2000 (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 300FW1F10D42504. Due to limitations in site access (e.g. access restrictions to industrial areas based upon the National Threat Advisory level) and budgetary restrictions, 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 other industries and private clubs along the shoreline also provide limited access to pedestrian (shore) and/or boat anglers [e.g. Mittal 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. Implementation of 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 some of these points of access.

Public access to the tributaries of Lake Michigan is limited to county parks, city parks, state access sites or private property with landowner permission. 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, 2009 at 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 historic 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, 2009. 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 historic 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 and staffing concerns 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).

Between counts, 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 seeking). 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).

Targeted (directed) effort and targeted (directed) catch were calculated similar to estimated effort and catch. Targeted effort comes directly from angler interviews where they were asked what target they were fishing for. In some cases we are more interested in effort directed at certain targets. For example, we may want to use catch estimates of yellow perch as an index of that species abundance. Targeted effort rates were calculated using the effort equations by substituting targeted effort for total effort. For a detailed description of the effort, directed effort, catch and directed 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

Total number of interviews collected during the creel survey period from pedestrian (shore and stream) and boat anglers was 3,349, representing 6,752 anglers. Total fishing effort was estimated at 450,335 h, +43% above the 2008 effort (Table 3).

Boat effort increased 38%, shore effort increased 31%, and stream effort increased 75% relative to the prior fishing season. Boat angler effort dominated all angler hours fished on Lake Michigan, 325,783 h, or 72% of the total (Table 4).

Anglers spent the majority of time pursuing trout and salmon species, 272,806 h or 60% of the total. Effort directed at yellow perch followed with 146,567 h or 32% of the total. Boat fishing effort was greatest in May (85,962 h), July (83,984 h), and August (46,921 h, Table 4). Shore angler effort peaked in July at 10,209 h, declining to a low of 1,047 h in October (Table 5). September (22,860 h), October (22,036 h), and July (10,421 h) accounted for the greatest stream angler effort (Table 6).

Total catch from the combined fisheries was 534,735 fish representing twenty-four fish species; 2.4 times the 2008 creel catch of 225,690 fish (Tables 4-6, Appendix II). Boat anglers accounted for the majority of the catch, 487,459 fish, or 91% of the total.

Anglers caught 395,760 yellow perch, 59,313 coho salmon, 19,354 Chinook salmon, 14,024 black bass (mainly smallmouth), 7,830 steelhead trout, 6,378 lake trout, 3,933 smolts (sub-legal juvenile salmonines), and 873 brown trout (Tables 4-7). In addition to the species listed above, several other fish were reported caught in or near the harbors and from area tributaries. These minor species included: catfish, creek chubs, carp, crappie, freshwater drum, northern pike, rock bass, round goby, suckers, sunfish species, walleye, and whitefish (Appendix II).

Yellow perch dominated the overall catch, comprising 74% of the total (Tables 4-6). Coho salmon dominated the salmonine catch, comprising 59,313 fish or 61% of the total (Table 7). Percent of total catch for other trout and salmon species was as follows: Chinook salmon 20%, steelhead trout 8%, lake trout 6%, juvenile trout and salmon 4%, and brown trout 1%. 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 272,806 h pursuing trout and salmon, catching 97,535 salmonines, all fisheries combined (Table 8). Of the fish caught, 95%, or 92,412, were equal to or

greater than the minimum size limit of 14 inches. Catch was greatest during the months of May, April, and September for the boat fishery; April and May for the shore fishery; and September, November, and October for the stream fishery. Salmonine effort and catch both increased compared to 2008, 34% and 49%, respectively. Overall, stream anglers accounted for the largest positive percent change in effort (+76%) and catch (+134%) between 2008 and 2009 (Table 9).

The combined salmonine CPUE was 34.3 fish/100 h[1], an 8% increase over what was observed in 2008 and 16% higher than the ten-year average of 29.6 (Figure 3). The 2009 salmonine catch rate increased to one of the highest rates observed during the 2000-2009 data series. Angler success for salmonids (i.e. CPUE) increased for both boat and stream anglers but decreased slightly (-3%) for shore anglers compared to 2008 (Figure 4). The 2009 boat, shore, and stream catch rates, however, remain 17% to 32% above their long-term averages. The stream CPUE (14.1 fish/100 h) was the highest observed from the prior ten-year period (Figure 4).

By species, CPUE for coho salmon and Chinook salmon increased compared to the prior fishing season; whereas the steelhead trout, brown trout and lake trout CPUE declined (Figures 5, 7, 9, 11, and 13). Steelhead trout catch rates declined to 2.8 fish per 100 h, which is one of the lowest observed during the 2000-2009 data series (Figure 9). Brown trout catch rates declined to 0.31 fish per 100 h, the lowest catch rate observed during the 2000-2009 data series (Figure 11). Although the lake trout catch rate fell compared to 2008, this rate was still the second highest reported from the ten-year data series (Figure 13). Since boat anglers accounted for the majority of the catch and effort, their success throughout the fishing season had the largest overall influence on salmonine catch rates (Figures 4, 6, 8, 10, 12, and 13). For steelhead trout, however, the overall CPUE was directly influenced by the noted success within stream fishery. The stream steelhead catch rate increased to 7.1 fish per 100 hours, the highest rate observed between 2000 and 2009 (Figure 10).

Comparing 2009 salmonine catch rates with their long-term averages, only steelhead trout and brown trout were caught at below-average rates (Figures 9 and 11).

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

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

Biological data collected on angler-caught coho salmon, Chinook salmon, steelhead, and lake trout show their average size increased relative to 2008 (Appendix III-VIII). Small sample sizes collected from brown trout precluded their inclusion in the analysis.

Coho, Chinook, steelhead, and lake trout 2009 mean size was also higher than their long-term average (Appendix III-VIII). Coho salmon had an average length of 21.6 (± 2.6) in and average weight of 3.89 (± 1.8) lb, an increase in length from the ten-year average of 20.4 (± 2.7) in and weight of 3.11 (± 1.6) lb. Chinook salmon average length was slightly above (+2%) the ten-year length average, weight was 6% above the ten-year weight average. Steelhead trout average size of 27.7 (± 3.3) in and 7.73 (± 2.3) lb was also slightly above the ten-year average of 27.4 (± 4.0) in and 7.56 (± 3.0) lb. Lake trout average length and weight were 4% and 18% above the ten-year length and weight averages, respectively.

Yellow perch (directed effort)

Anglers spent 146,567 h pursuing yellow perch, catching 395,015 fish, all fisheries combined (Table 10). Harvest was 214,367 fish, or 54% of the total catch, the highest harvest observed from the 2000-2009 time series. The yellow perch effort of 146,567 h represented a significant increase (+85%) compared to the 2008 effort of 79,177 h. Catch was nearly triple the 2008 estimate.

Boat anglers accounted for the majority of the yellow perch catch, 384,335 fish or 97% of the total (Table 4). Yellow perch were mainly caught in July and August.

Yellow perch ranked first in angler catch, with an overall CPUE of 2.7 fish/h (Table 10, Figure 14). The 2009 yellow perch CPUE increased 56% compared to the 2008 CPUE of 1.7 fish/h, and was 22% above the ten-year mean of 2.2 fish/h. Boat and

shore anglers both experienced an above-average season, 2009 CPUE rose 18% and 6% over the ten-year average of 2.4 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.

The average weight of yellow perch kept by anglers increased to 0.60 lb (Appendix III and IX). Average length of perch kept by anglers was similar between 2008 and 2009. Harvested yellow perch ranged in size from 4.6 to 15.0 in (Appendix IX). Mean total length and mean weight were slightly higher than the 2000-2009 data series mean of 10.1 (± 1.8) in and 0.49 (± 0.3) lb (Appendix IX).

Black bass species

Anglers targeting bass fished 24,408 h and caught 14,024 fish, mainly smallmouth (Tables 4-6). The 2009 effort and catch were slightly lower than the observed 2008 bass fishing effort (Table 11). The majority of fishing occurred from boats, accounting for 86% of the effort and 92% of the catch. The majority of bass were released, only 3% of the total catch was harvested. Within 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 released outnumbered legal-sized bass releases.

Overall, the boat bass fishing season could be categorized as average comparing the 2009 catch rate with the 10-year mean of 0.67 fish/h (Figure 16). The 2009 shore bass fishing season was below-average, catch rates were 43% below the ten-year mean of 0.58 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 3,341 responses were recorded from boat, shore and stream angler-party interviews (Table 12).

Forty-three 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 (42%), followed by Chinook salmon (15%), smallmouth bass (12%), coho salmon (10%), and steelhead trout (8%). 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 five fishing seasons continues to influence overall boat angler preference (Figure 10). Since 2004, the boat steelhead trout catch rate has been nearly equal to or below the 10-year CPUE average of 2.9 fish/100 h (Figure 10). The above-average yellow perch boat catch rate also directly influenced overall angler preference; 42% of the boat anglers rated yellow perch as their favorite species in 2009 compared to 36% in 2008.

Fifty-eight percent of shore anglers also included at least one salmonine species in their response. By species, 28% of shore anglers ranked steelhead trout as their most preferred fish (Table 12). Yellow perch (23%), coho salmon (11%), Chinook salmon (8%), any trout or salmon (8%), smallmouth bass (6%), and catfish (4%) were also among the preferred species.

Stream anglers continue to rank steelhead trout as their most preferred species, accounting for 74% of the responses (Table 12). Chinook salmon (15%), coho salmon 5%), and brown trout (2%) followed.

Angler residency

Local anglers utilize Lake Michigan most often. Of the 3,339 angler parties that responded to the county and state of residence question, 26% were from Lake County, and 19% each were from LaPorte and Porter Counties (Figure 17, Appendix X). Another 8% came from St. Joseph, Elkhart, Allen, Jasper, Kosciusko, Marshall, and Starke counties, which are located in northern section of Indiana. Fifty-eight Indiana counties were represented in the survey (Figure 17). Twenty-one percent, or 692 angler parties, were from out-of-state.

Angler parties from fifteen different states were represented in the survey, with the majority of these anglers coming from Illinois (91%); 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 salmonine, perch, and black bass anglers felt it was very 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 66% of all anglers rated satisfaction between 3 and 5. However, 38% of boat anglers, 41% of shore anglers, and 56% of stream anglers were dissatisfied with the brown trout fishery. Fifty-five percent of the shore anglers and 31% of the boat anglers were less than satisfied with the lake trout fishery. In 2009, the number of displeased boat and shore parties increased for those targeting brown trout, lake trout, and steelhead compared to 2008. The greatest one-year change in angler satisfaction occurred for shore anglers targeting brown trout. In 2008, 10% of shore anglers gave a less than satisfied rating for the brown trout fishery; 41% gave the same rating in 2009 (Palla 2009).

For yellow perch, 13% 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.

Seven percent of the angler parties targeting black bass gave a low satisfaction rating. Again, more shore angler parties were dissatisfied with the bass fishery than boat angler parties.

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

DISCUSSION

During 2009, the best fishing in southern Lake Michigan was for coho salmon, Chinook salmon, lake trout, yellow perch, smallmouth bass, and for stream anglers, steelhead trout. Although differences in catch rates exist between the boat, shore and stream fisheries, in general, catch rates for these species were near-average to above-average from the 2000-2009 data series.

Total fishing pressure increased substantially (+43%) over 2008; mainly from the additional effort boat, shore, and stream anglers spent pursuing perch and salmonine species. The total boat fishing pressure for salmonine species in 2009 was 23% higher than 2008, shore salmonine effort was 25% higher, and stream salmonine effort was 76% higher. The boat perch effort nearly doubled from 70,881 h to 133,045 h, while the shore perch effort increased 59%. As with effort, the overall catch also substantially increased; 2.4 times the 2008 creel catch of 225,690 fish. The increased catch was the direct result of higher fishing pressure and significant catch increases observed for yellow perch (+190%), coho salmon (+81%), and Chinook salmon (+36%) compared to the 2008 fishing season. Although the lake trout catch fell, lake trout CPUE was still the second highest reported from the 2000-2009 period. For steelhead trout, both boat and shore catch and CPUE were one of the lowest observed from the prior 10-year time series; however, the stream steelhead catch and CPUE were one of the highest observed.

Fluctuations in total catch from year to year are due to a number of factors, including total angler effort, lake-wide stocking levels, forage levels, fish availability, and other environmental variables (i.e. weather, water temperatures). In 2009, likely a combination of all these variables played a role in the elevated angling pressure and catch.

Due to the slow economy, recreational fishing recently experienced a national resurgence. A recent report by The Outdoor Foundation pointed to an increase of 1.6 percent, or 630,000 additional anglers, participating in angling in 2009 (Zenor 2010). Further, Southwick Associates, on behalf of the Recreational Boating and Fishing Foundation and the American Sportfishing Association, reported substantial increases in fishing license sales, attributing the main cause to the slow economy. The slow economy may allow individuals more time to fish. Fishing can be a lower cost alternative

compared to other recreational activities (Southwick Associates 2010). Within Indiana, IDNR sold more licenses in the first nine months of 2009 than were purchased in the same period of 2008 (Bloom 2009). Increased license sales and the resurgence in recreational fishing likely played a role in the jump in fishing effort. News of the good to excellent salmonine and perch catch may also have played a role in the effort spike. Internet angling websites (i.e. IDNR internet fishing reports and other sites) and cell phones communicate fishing information to large audiences in relatively short periods of time.

The increases in salmonine catch could also be due, in part, to declines in Chinook salmon abundance in Lake Michigan and increases in the total lake-wide prey fish biomass (estimates from acoustic and bottom-trawl surveys). Chinook salmon stocking rates were adjusted in 1999 and 2006 in an effort to better align stocking with prey fish abundance (Claramunt et al. 2010). The reduction in abundance of Chinook salmon, the largest consumers of forage, likely reduced the overall demand on the prey fish population resulting in better survival of older salmonine age classes.

Estimates of lake-wide forage fish biomass from the 2009 cooperative Lake Michigan bottom trawl and acoustic surveys reported mean total prey fish biomass increased between 52% (bottom trawl) to 1.4 times higher (acoustic) compared to 2008 estimates (Madenjian et al. 2010, Warner et al. 2010). For alewife, the lake-wide biomass bottom trawl estimate from the U.S. Geological Survey Great Lakes Science Center (GLSC) was 13.03 kilotonnes (kt) (1 kt = 1000 metric tons), more than double the 2008 estimate (Madenjian et al. 2010). The lake-wide alewife biomass estimate from the GLSC and Michigan Department of Natural Resources and Environment (MDNRE) acoustic survey was 99.2 kilotonnes, 1.7 times the 2008 acoustic estimate (Warner et al. 2010). Although differences exist between the trawl and acoustic surveys (acoustic survey is more efficient at sampling younger ages of alewife; trawl survey is more efficient at sampling larger, older alewife), both surveys document the recent increase in alewife biomass. The increase in biomass suggests that Chinook salmon predation pressure has declined (Warner et al. 2010). One measure that supports the observations of increased alewife biomass is growth of predators including Chinook and coho salmon. Biological data collected on angler-caught salmon show higher mean lengths and weights

compared to the prior fishing season and long-term average. Coho salmon average length was 6% above the ten-year length average; weight was 25% above. Chinook salmon average length was 2% above the ten-year length average; weight was 6% above. Other tools used to assess growth including the evaluation of Chinook salmon weight-at-age 2 from the MDNRE creel survey (both sexes combined), Chinook weight-at-age 3 from Wisconsin's Strawberry Creek weir returns (only females), and Chinook standard weight index from Strawberry Creek weir, also indicate that weight-at-age improved in 2009. These 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. 2010). MDNRE creel survey weight-at-age for age-2 Chinook salmon and Strawberry Creek weir weight of age-3 Chinook both increased from 2008. Long-term averages from Strawberry Creek weir returns, however, show that 2009 weight data were still below the average for their 1985-2009 time series.

Although Lake Michigan prey fish biomass estimates were favorable in 2009, levels remain much lower than levels found in the 1990s (Warner et al. 2010). Additionally, acoustic survey results indicated that the abundance of young alewives (age 0) in 2009 was the lowest of any acoustic survey which may negatively influence future salmonine survival and growth. Warner et al. (2010) predicted relatively poor survival of the 2009 Chinook salmon year class and the potential for continued declines in salmon abundance. Additional stocking reductions of coho salmon by MDNRE in 2007-2009, coho salmon by the Wisconsin Department of Natural Resources (WDNR) in 2008, and Chinook salmon by WDNR in 2009 may also contribute to future declines in salmon abundance.

The below-average boat and shore season for brown trout and steelhead trout may be explained by the availability of other species (i.e. Chinook and coho salmon) rather than fish abundance. The 2009 brown trout and steelhead trout boat CPUE were the lowest observed from the prior ten-year period.

On average, 36,000 brown trout have been stocked annually since 2002. The number of brown trout stocked, however, is relatively small compared to stocking levels

of other salmonine species within Indiana waters. Historically, brown trout have not contributed significantly to the overall trout and salmon catch.

For steelhead, the Indiana recreational sport data continues to show similar trends observed lake-wide. Lake-wide sport harvest of steelhead trout was highest from the 1990s through 2002, dropped substantially through 2008, then increased 42% in 2009 (Brian Breidert, personal communication). The steelhead trout sport harvest has remained below 1 million pounds for the last 6 consecutive seasons, with the 2008 harvest of 420,000 pounds being the lowest level observed in the 1985 to 2009 time period. From the creel survey, both boat and shore steelhead catch declined compared to the 2008 fishing season; however, the stream steelhead catch more than doubled from 2,228 to 5,471 fish. The stream steelhead catch rate (7.1 fish per 100 h) was the highest catch rate observed from the 2000-2009 period. Recent steelhead trout stocking changes in 2006 and 2007 by the IDNR may have contributed to the higher 2009 stream steelhead returns. Stream conditions may also have directly influenced angler success.

Due to the shutdown and rehabilitation of Mixsawbah State Fish Hatchery in 2006, 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 in, were smaller at the time of release (3.8 to 5.4 in). Decreases in the size at stocking may have impacted fish migration as well as overall survival. Due to their small size, fish may not have out-migrated until the following year after release, delaying their return for an additional season.

Within the stream fishery, the largest catch of steelhead occurred in July, September, and October. Based upon time of capture, the majority of fish caught were Skamania strain steelhead. Although fishing effort also climbed during this same period, total catch and total fishing effort increases were not proportional. For example, July angler effort doubled between the 2008 and 2009 fishing season; the catch estimate was 4 times higher in 2009. September angler effort more than doubled between 2008 and 2009; the catch estimate was nearly 7 times higher than in 2008. Overall, the 2009 stream steelhead catch was 2.5 times higher than the 2008 estimate; angler effort was 1.7 times higher.

Usually up to 50,000 fall fingerling Skamania steelhead are stocked within the East Branch of the Little Calumet River and Trail Creek. In 2005, 381,560 fall fingerling Skamania steelhead were stocked. In 2006, 257,206 fall fingerling Skamania steelhead were stocked. Although the boat steelhead catch rate was below-average, above average stream steelhead catch rates suggest a larger number of steelhead returned to northwest Indiana tributaries for the 2009 fishing season. Adult Skamania steelhead return to area tributaries in the fall typically as age 3+ and 4+ fish.

Improved fishing and/or stream conditions also played a role in the successful fishing season. In 2008, unfavorable fishing conditions (i.e. high water flows, high water turbidity, etc.) negatively impacted stream fishing. Both salmonine catch and effort fell during peak salmonine stream fishing months, especially after two large weather systems passed over Northwest Indiana causing significant rainfall, flooding, and massive damage to local streams and marinas (Palla 2009). Provisional data from USGS real-time water data for Trail Creek gauge station 04095300 in Michigan City shows higher monthly mean discharge from September-December 2008 (245.10 cfs) compared to the same period in 2009 (117.26 cfs; http://waterdata.usgs.gov/in/nwis/rt).

Yellow perch fishing was also above average which is reflected in the yellow perch CPUE of 2.7 fish per h, one of the highest rates observed from the 2000-2009 data series. Although yellow perch assessments throughout the lake continue to show sustained low adult yellow perch abundance, recent increases in catch-per-unit-effort during 2009 sampling was evident from all jurisdictions with the exception of Bays de Noc in Michigan and Wisconsin waters of Green Bay (Makauskas and Clapp 2010). The majority of the adult yellow perch population within Illinois, Indiana, and Michigan waters was comprised of the 1998, 2002, 2003, and 2005 year classes. The 2005 year class comprised 25-60% of the adult population from surveys within the various state waters (Makauskas and Clapp 2010). The 1998 year class is still present, albeit in very low numbers from data collected in Illinois (<5% of the adult population) and Wisconsin (<10% of the adult population).

Perch fishing should remain average to above average in the short term as a result of the dramatic surge in perch reproduction in 2005. Lake-wide, however, poor year classes have been produced since 2005 which will directly impact future adult yellow

perch abundance. In 2009, the catch of age-0 perch increased slightly in some areas of southern Lake Michigan; however, recruitment was still relatively low in most areas of the lake in comparison to long-term averages (Makauskas and Clapp 2010). The 2009 GLSC bottom trawl surveys corroborate the increase in catch of age 0-perch in southern Lake Michigan with nearly all of the perch caught from the Saugatuck transect (Madenjian et al. 2010). Weak year classes will keep yellow perch abundance low into the future. Poor yellow perch recruitment in the 1990s and early 2000s can be linked to a combination of factors, including poor weather conditions and low abundance of female spawners (Makauskas and Clapp 2000).

Average size of sport harvested yellow perch was 10.6 in, similar to the mean size harvested in 2008. 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 1.46 with the sport catch rate (2.69 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 overall well-being.

Since the 2009 lake-wide sampling did not provide evidence that the yellow perch population abundance is changing and their abundance is still much lower than historical levels, current management actions will remain in place to protect the remaining stocks. Those management actions include: 1) closure of the Lake Michigan commercial season for yellow perch, with the exception of Green Bay where the quota for 2010 is 100,000 lb; and 2) daily bag limit of 15 fish in Indiana and Illinois, with a July closure in Illinois (exception: under 16 years of age a 10 fish bag limit); 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 sport fishing closure, and a daily bag of 15 fish in Green Bay with a March 16 to May 19 sport fishing closure.

The majority of anglers felt it was very important to have salmonine species, yellow perch, and black bass species (smallmouth) within Lake Michigan and were generally satisfied with those fisheries. However, 38% of the boat anglers, 41% of shore anglers, and 56% of the stream anglers were dissatisfied with the brown trout fishery and 55% of the shore and 31% of the boat anglers were less than satisfied with the lake trout fishery. Thirteen percent of the angler parties targeting perch gave a low satisfaction rating. Seven percent of the angler parties targeting bass gave a low satisfaction rating. More shore angler parties were dissatisfied with the perch and bass fisheries than boat angler parties. The number of displeased boat and shore parties increased for those targeting brown trout, lake trout, steelhead, and yellow perch in 2009. The low satisfaction ratings are likely a reflection of the small catch of brown trout, steelhead, and lake trout from the near shore waters and marina piers. The low perch and bass satisfaction rating from shore anglers is probably related to the lack of yellow perch and smallmouth bass availability at the shore/marina fishing piers.

Salmonine species, yellow perch, and smallmouth bass 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 prey fish and salmon population crash and its overall impact 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 not only provides valuable fishing opportunities but also provides an

economic impact to local communities. Fishing related expenditures such as bait, tackle, food, license fees, lodging, and transportation represent a large monetary value. While our survey does not have an economic component, recent national surveys of hunting and fishing from 2001 to 2006 estimate that nearly five percent of all angling nationwide occurred in Great Lakes waters (U.S. Department of Interior 2006). This represented $1.5 billion dollars in expenditures per year.

Unfortunately, adding a question that asks anglers how much they spent on their fishing trip within the creel survey is not the best approach to gain an understanding of economic impact. Pollock et al. (1994) recommend against taking this casual approach to gather economic data since it will not allow an accurate evaluation and runs the strong risk of asking for the wrong type of data or asking the question (s) in ways that produce bias or inaccurate responses.

One measure that may address the fishery value is looking at yield values (theoretical value) of harvested fish. Based on yield values provided by Illinois Natural History Survey (i.e. market prices of salmonine and perch fillets), we can look at a simplified monetary value. The Illinois Natural History Survey (INHS) added yield values in their Lake Michigan creel report beginning in 1986 to assess the hypothetical price harvested fish represented (Wayne Brofka, personal communication)[3]. Using INHS methodology, the yield value of fish harvested by sport anglers in the IDNR Lake Michigan creel survey was over $3.6 million.

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

[3] For a detailed description of how INHS calculated yield values, see Brofka and Czesny (2010).

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 continue assessments of how to increase fishing opportunities, including but not limited to the addition of public fishing sites, increase fish availability for shore anglers, and emphasize and improve marketing of this extraordinary resource beyond the surrounding Lake Michigan communities.

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Table 1. Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 2000 through 2009.

	LAKE MICHIGAN				ST. JOSEPH RIVER			
	Brown Trout	Chinook Salmon	Coho Salmon	Steelhead	Chinook Salmon	Coho Salmon	Steelhead	Total
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
2009	23,039	206,714	239,846	314,177	0	0	288,268	1,072,044
Avg.	28,750	240,366	204,421	327,704	30,343	0	274,689	1,106,274

[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 2000 and 2009.

	Brook Trout	Brown Trout	Chinook Salmon	Coho Salmon	Lake Trout	Rainbow Trout	Splake	TOTAL
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	3.415	1.761	0.087	11.571
2009	0.000	1.632	3.020	1.746	2.771	2.069	0.000	11.238
Avg.	0.023	1.622	3.778	2.380	2.730	1.841	0.104	12.478

Table 3. Estimated angler hours and catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort.

Fishery	Total Effort	%	Catch	%
Boat	325,783	(72%)	487,459	(91%)
Shore	45,474	(10%)	30,767	(6%)
Stream	79,078	(18%)	16,509	(3%)
TOTAL	450,335	(100%)	534,735	(100%)

Table 4. Boat fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort.

Species	April	May	June	July	Aug.	Sept.	Oct.	Total
Steelhead	115	589	120	499	295	287	0	1,905
Coho	19,232	25,596	4,564	3,001	1,070	754	9	54,226
Chinook	3,077	3,978	596	870	3,433	5,087	18	17,059
Lake trout	410	1,858	1,061	1,111	485	1,408	45	6,378
Brown trout	231	297	0	25	10	28	4	595
TOTAL	23,065	32,318	6,341	5,506	5,293	7,564	76	80,163
Yellow perch	9,297	26,336	37,376	192,902	110,106	6,545	1,773	384,335
Black Bass sp.	1,150	1,173	3,888	1,008	2,864	2,216	481	12,780
Other	0	539	4,195	2,531	1,920	831	165	10,181
Angler hours	34,912	85,962	38,493	83,984	46,921	32,083	3,428	325,783

Table 5. Shore fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort.

Species	April	May	June	July	Aug.	Sept.	Oct.	Total
Steelhead	59	27	172	183	6	7	0	454
Coho	1,181	661	0	0	0	36	0	1,878
Chinook	0	0	0	0	0	144	22	166
Lake trout	0	0	0	0	0	0	0	0
Brown trout	109	28	24	0	0	0	0	161
TOTAL	1,349	716	196	183	6	187	22	2,659
Yellow perch	0	116	2,066	3,083	5,613	261	0	11,139
Black Bass sp.	203	54	147	326	201	201	0	1,132
Other	448	1,931	4,613	3,858	3,108	1,846	33	15,837
Angler hours	9,203	6,051	8,223	10,209	4,978	5,763	1,047	45,474

Table 6. Stream fishery monthly estimated catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort.

Species	March	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Steelhead	351	1,485	398	1,429	605	582	621	5,471
Coho	256	0	33	2,386	516	18	0	3,209
Chinook	0	0	7	1,177	945	0	0	2,129
Brown trout	67	0	0	50	0	0	0	117
smolts*	963	69	49	50	94	2,523	185	3,933
TOTAL	1,637	1,554	487	5,092	2,160	3,123	806	14,859
Yellow perch	0	0	0	286	0	0	0	286
Black Bass spp.	0	0	112	0	0	0	0	112
Other	38	14	569	588	22	21	0	1,252
Angler hours	6,558	10,421	7,012	22,860	22,036	6,723	3,468	79,078

*juvenile salmonids.

Table 7. Estimated salmonine catch from the Indiana Department of Natural Resources Lake Michigan creel survey during 2009, based on total effort.

Coho	59,313	(61%)
Chinook	19,354	(20%)
Steelhead Trout	7,830	(8%)
Lake Trout	6,378	(6%)
Smolts[1]	3,933	(4%)
Brown Trout	873	(1%)
Total Salmonines	*97,681*	

[1]juvenile salmonids

Table 8. Estimated salmonine catch and effort from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

Year	Chinook Salmon	Coho Salmon	Steelhead Trout	Lake Trout	Brown Trout	Smolts[1]	Total	Directed Effort (hrs.)
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
2009	19,353	59,252	7,776	6,380	836	3,938	97,535	272,806

[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 Lake Michigan stream creel survey, 2000 through 2009, based on directed effort.

Year	Chinook	Coho	Steelhead	Brown Trout	Total	Directed Effort (hrs.)
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
2009	2,131	3,209	5,473	117	10,930	77,191

[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, 2000 though 2009, based on directed effort.

Year	Effort (hrs.)	Harvest	Total harvest/hr.	Catch	Total Catch/hr.
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
2009	146,567	214,367	1.46	395,015	2.69

[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, 2000 through 2009.

			Released		Released			
	Harvest		<14	≥14	<14	≥14	Directed Effort	
Year	Boat	Pier	Boat	Boat	Pier	Pier	Boat	Pier
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
2009	376	67	4,262	8,144	636	430	20,977	3,431

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

Table 12. Preference categories of angler parties fishing Lake Michigan during 2009, by fishery.

BOAT		SHORE		STREAM	
Species	No. Anglers (%)	Species	No. Anglers (%)	Species	No. Anglers (%)
Yellow Perch	529 (42%)	Steelhead Trout	327 (28%)	Steelhead Trout	696 (74%)
Chinook Salmon	191 (15%)	Yellow Perch	269 (23%)	Chinook Salmon	140 (15%)
Smallmouth Bass	153 (12%)	Coho Salmon	128 (11%)	Coho Salmon	48 (5%)
Coho Salmon	129 (10%)	Chinook Salmon	97 (8%)	Brown Trout	15 (2%)
Steelhead Trout	96 (8%)	Any Trout/Salmon	95 (8%)	Anything	14 (1%)
Any Trout/Salmon	82 (6%)	Smallmouth Bass	74 (6%)	Catfish	9 (<1%)
Walleye	23 (2%)	Catfish	50 (4%)	Yellow Perch	9 (<1%)
Anything	11 (<1%)	Anything	44 (4%)	Largemouth Bass	3 (<1%)
Brown Trout	8 (<1%)	Any Black Bass Species	20 (2%)	Sucker species	2 (<1%)
Any Black Bass Species	7 (<1%)	Brown Trout	20 (2%)	Bluegill	1 (<1%)
Largemouth Bass	5 (<1%)	Walleye	19 (2%)	Carp	1 (<1%)
Lake Trout	5 (<1%)	Largemouth Bass	4 (<1%)	Any Trout/Salmon	1 (<1%)
Carp	2 (<1%)	Rock Bass	3 (<1%)	Any Black Bass Species	1 (<1%)
Bluegill	1 (<1%)	Whitefish	2 (<1%)	Walleye	1 (<1%)
Catfish	1 (<1%)	Crappie	1 (<1%)		
Rainbow Smelt	1 (<1%)	Freshwater Drum	1 (<1%)		
		Lake Trout	1 (<1%)		
		Northern Pike	1 (<1%)		

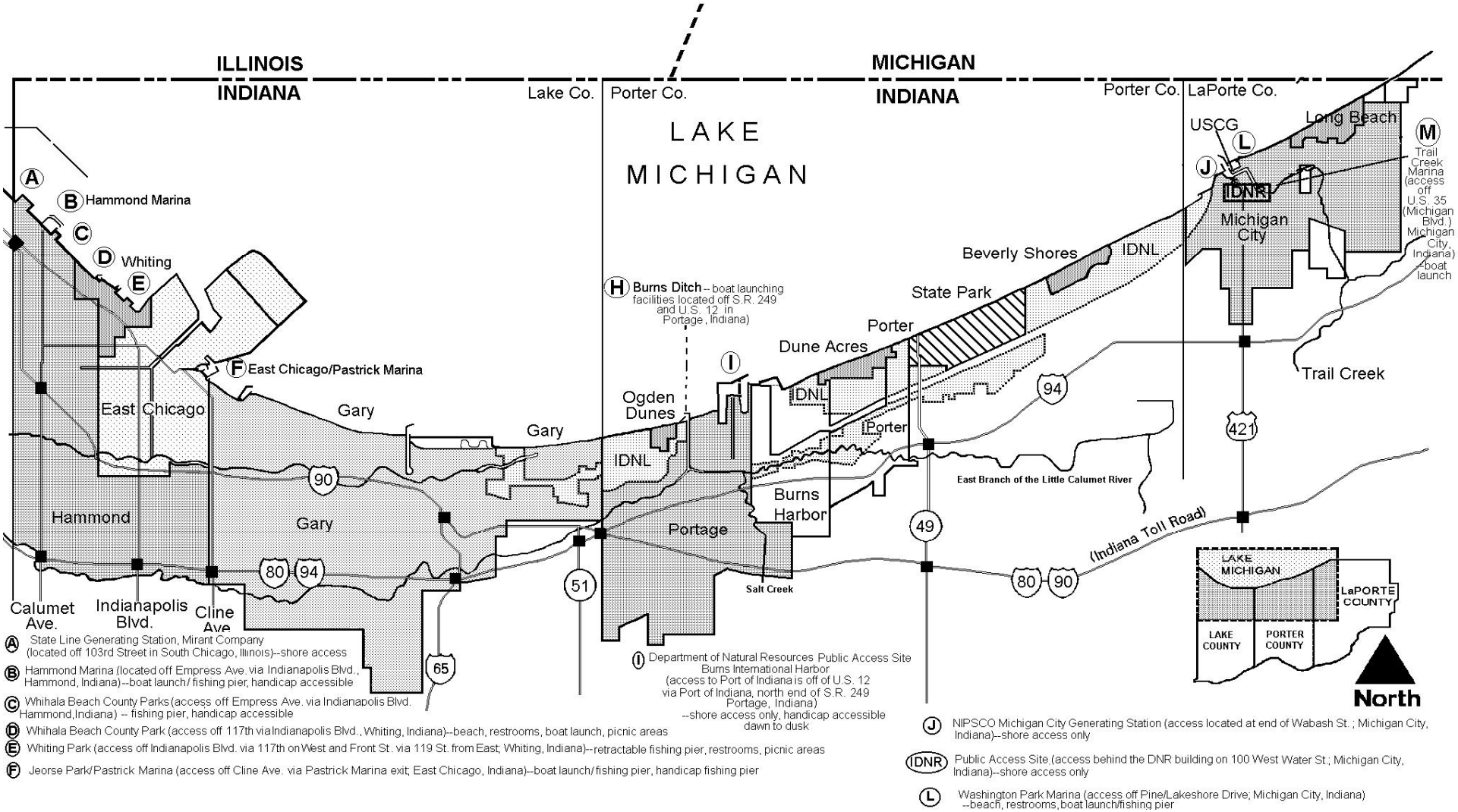


Figure 1. Indiana shoreline of Lake Michigan.

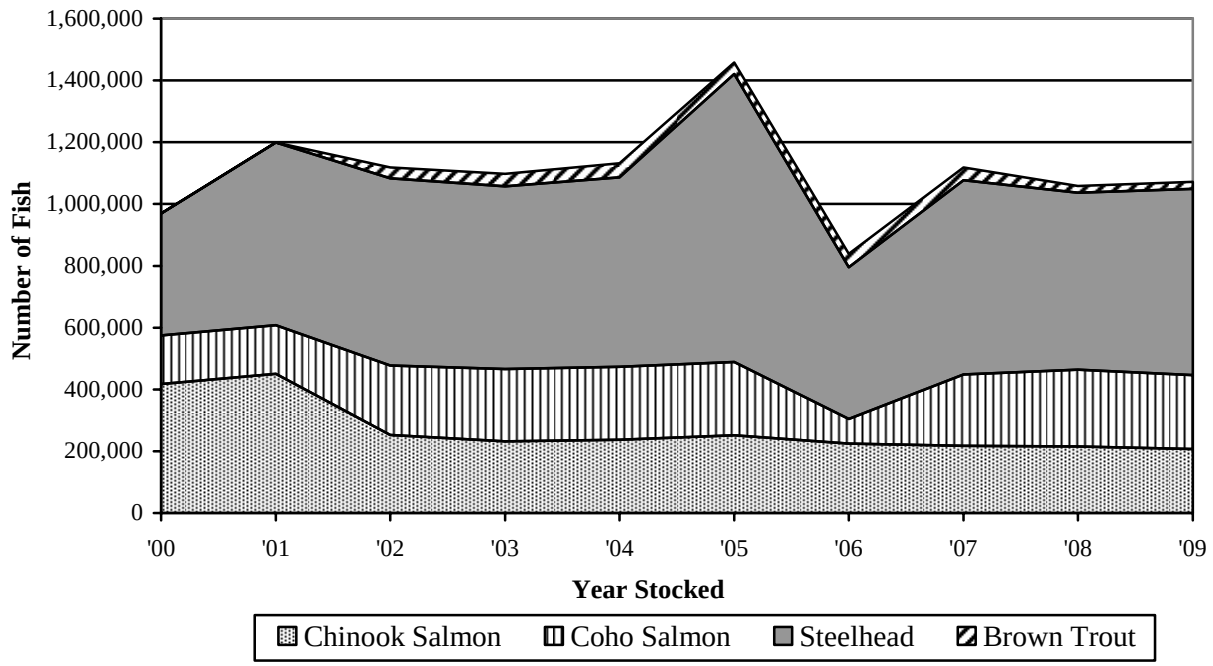


Figure 2. Number of trout and salmon stocked in Lake Michigan by Indiana Department of Natural Resources, 2000 through 2009.

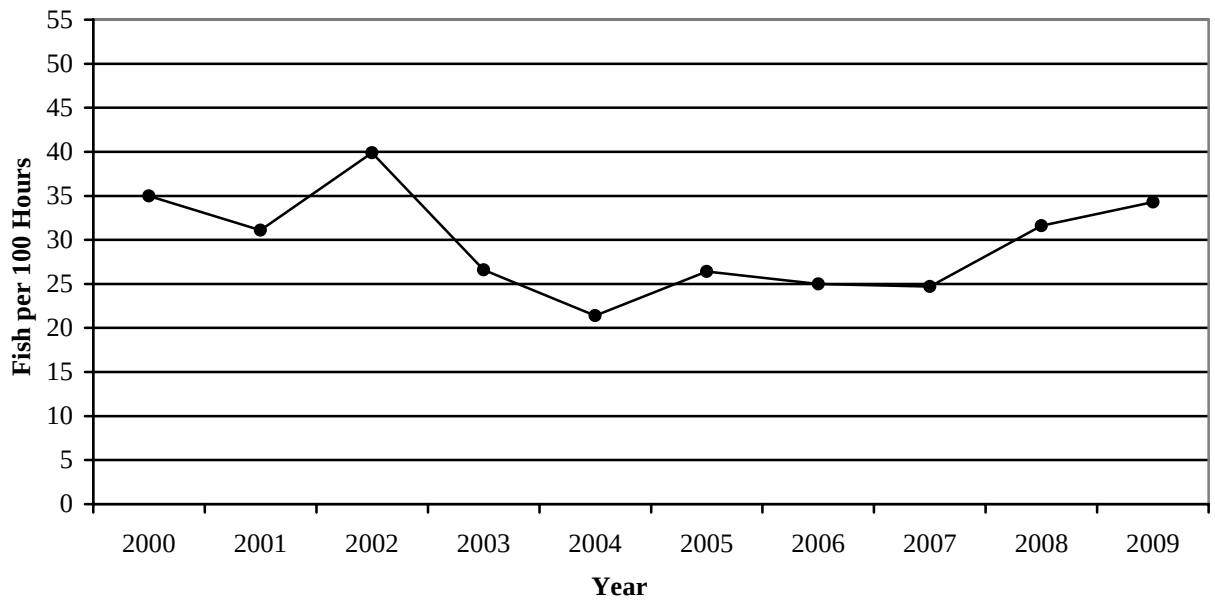


Figure 3. Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

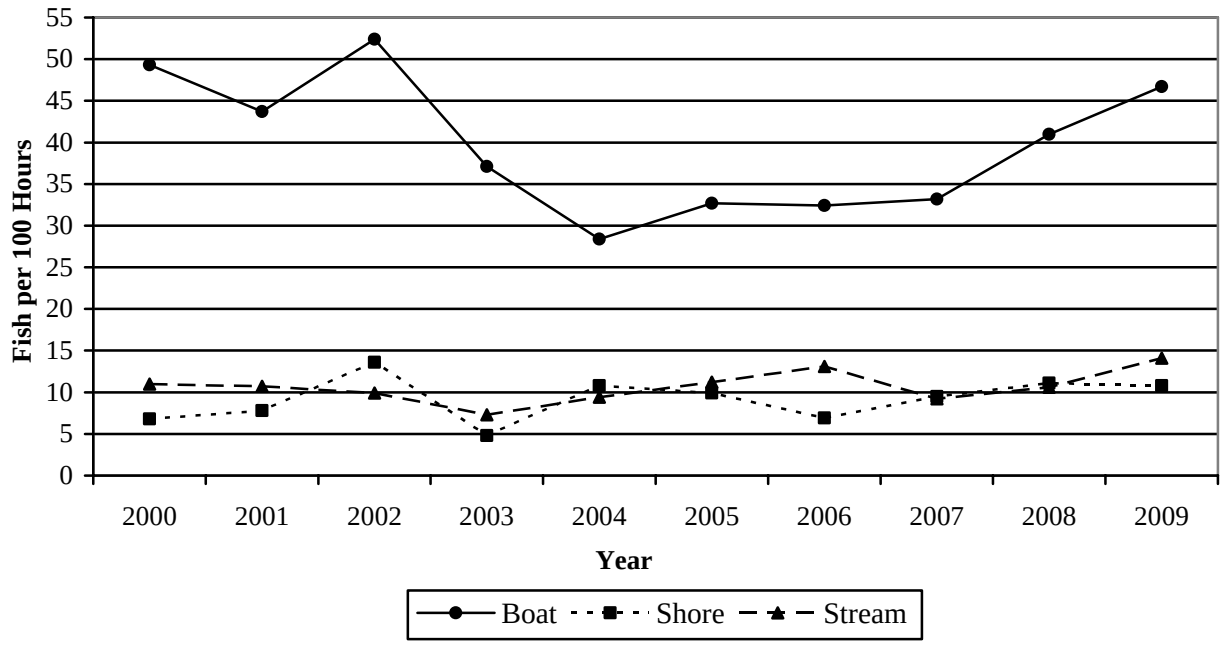


Figure 4. Salmonine CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

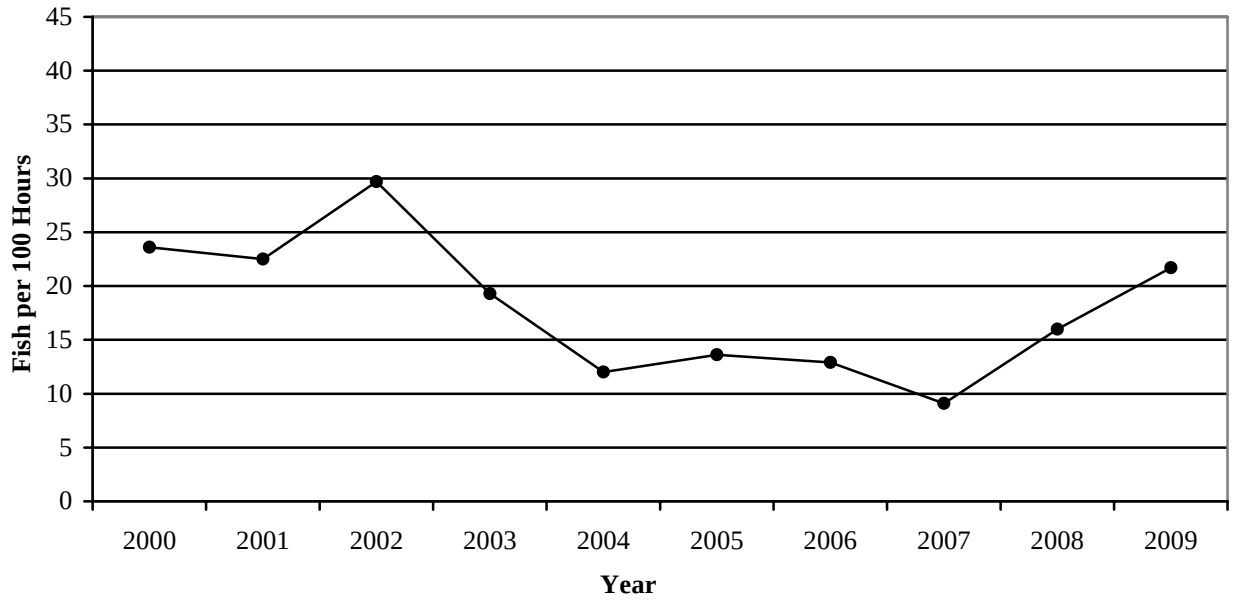


Figure 5. Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

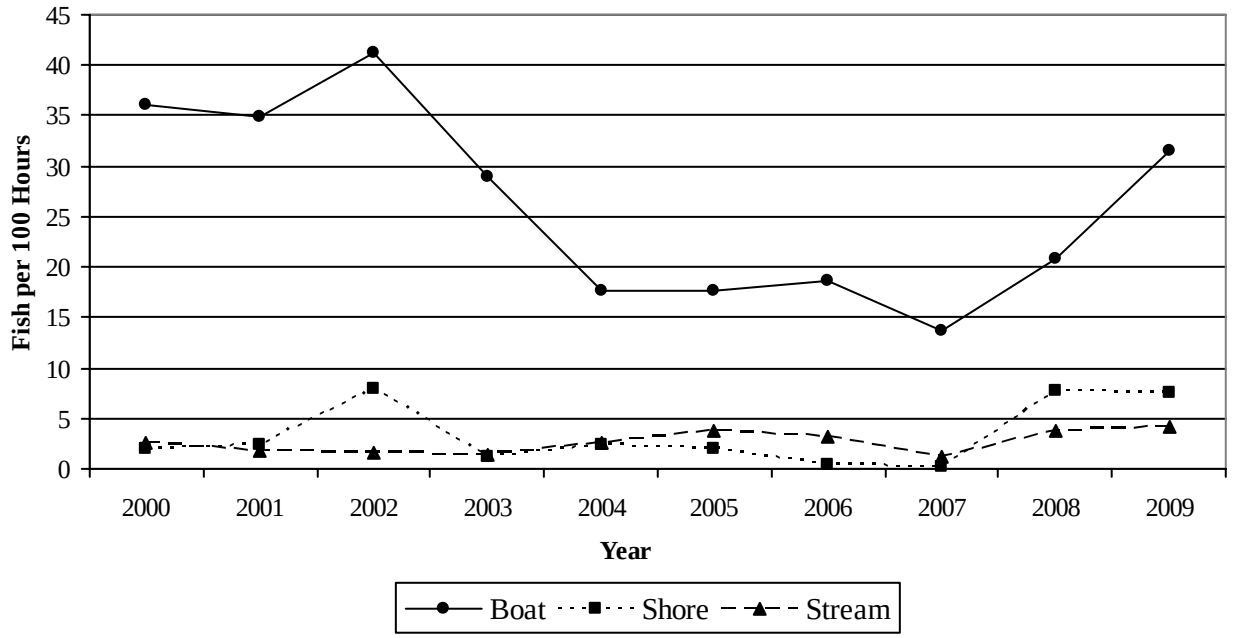


Figure 6. Coho salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

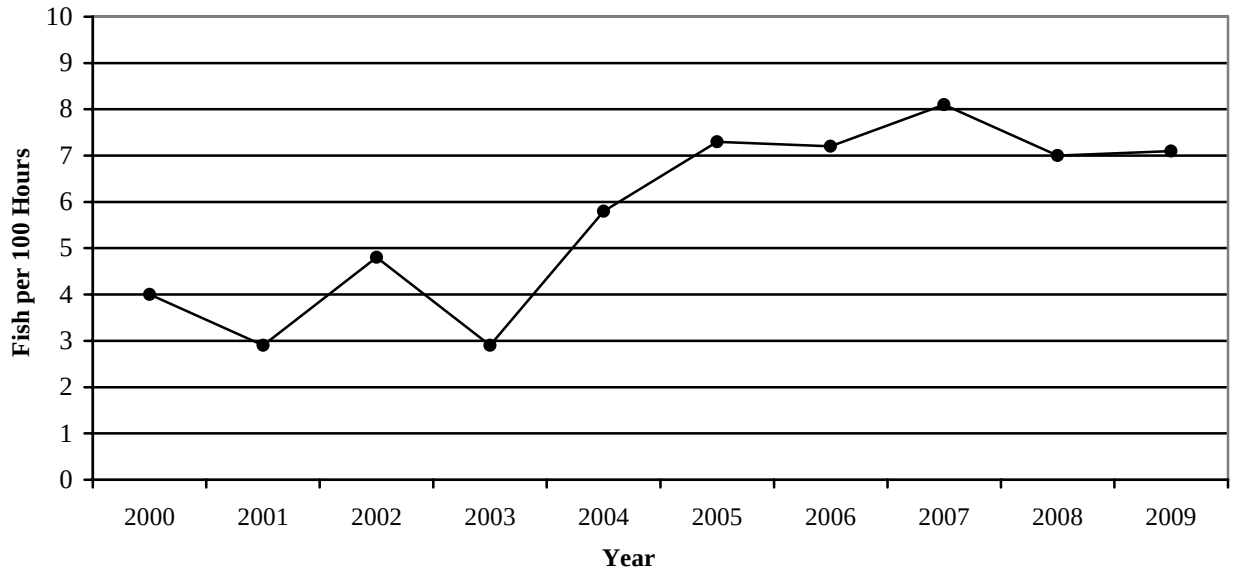


Figure 7. Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

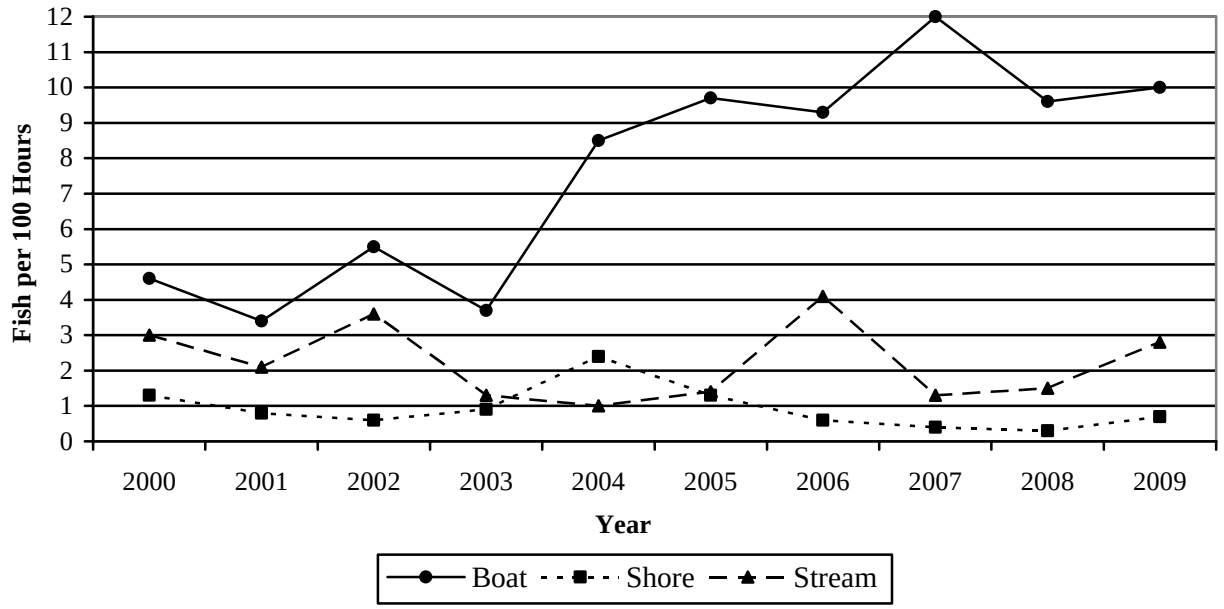


Figure 8. Chinook salmon CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

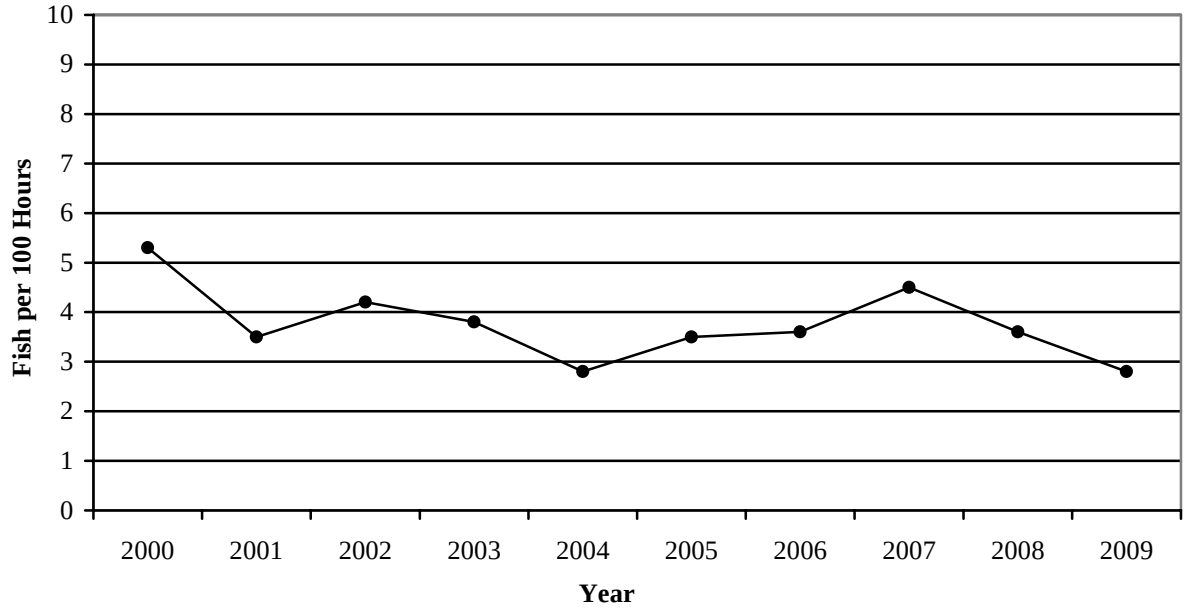


Figure 9. Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

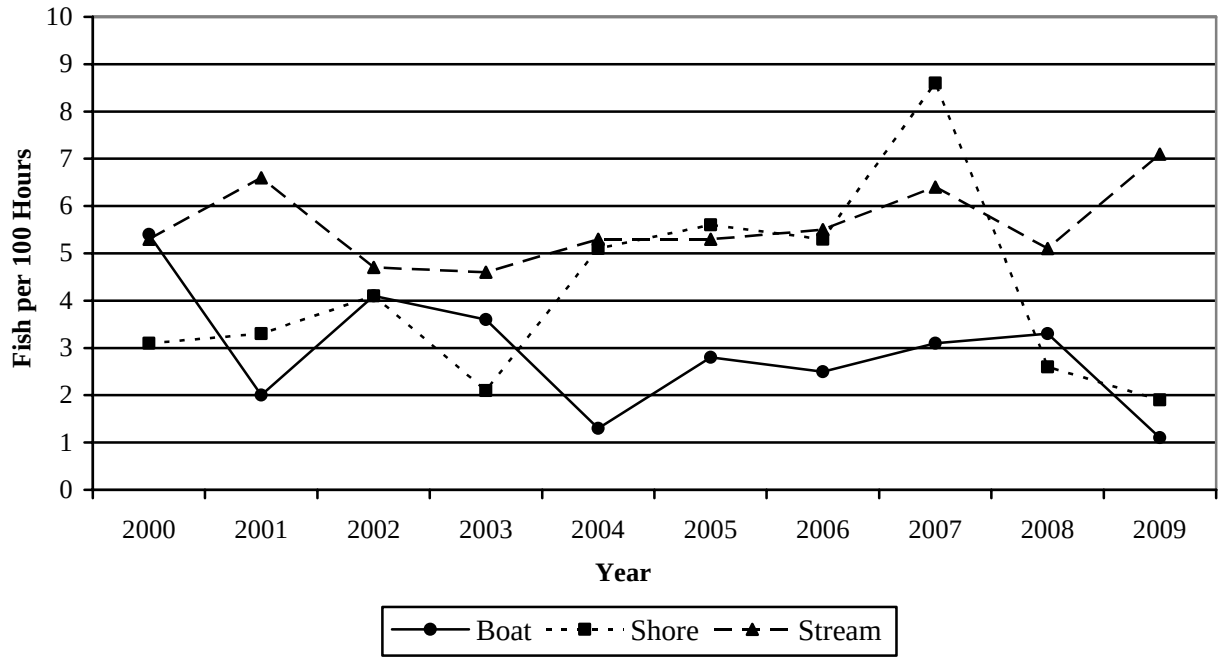


Figure 10. Steelhead trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

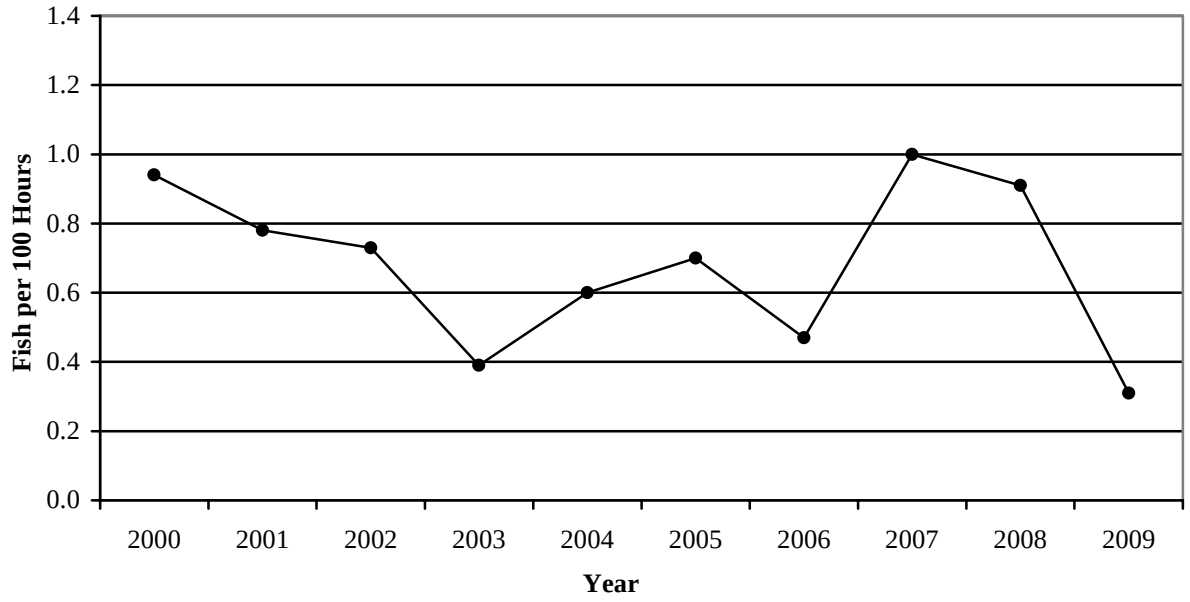


Figure 11. Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

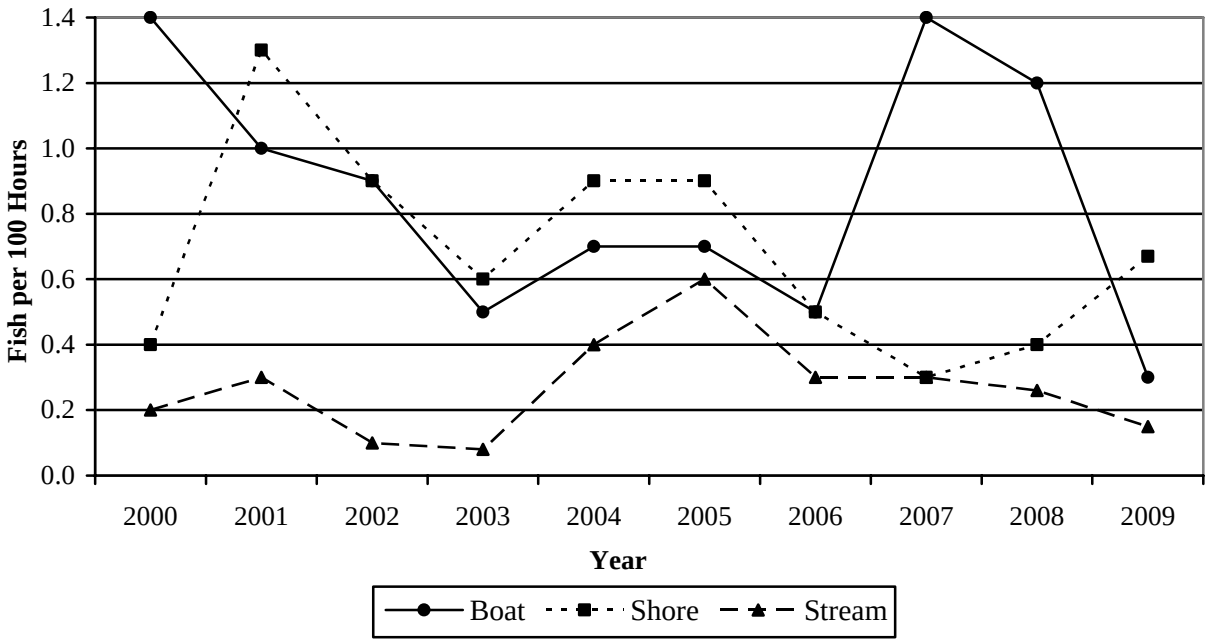


Figure 12. Brown trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

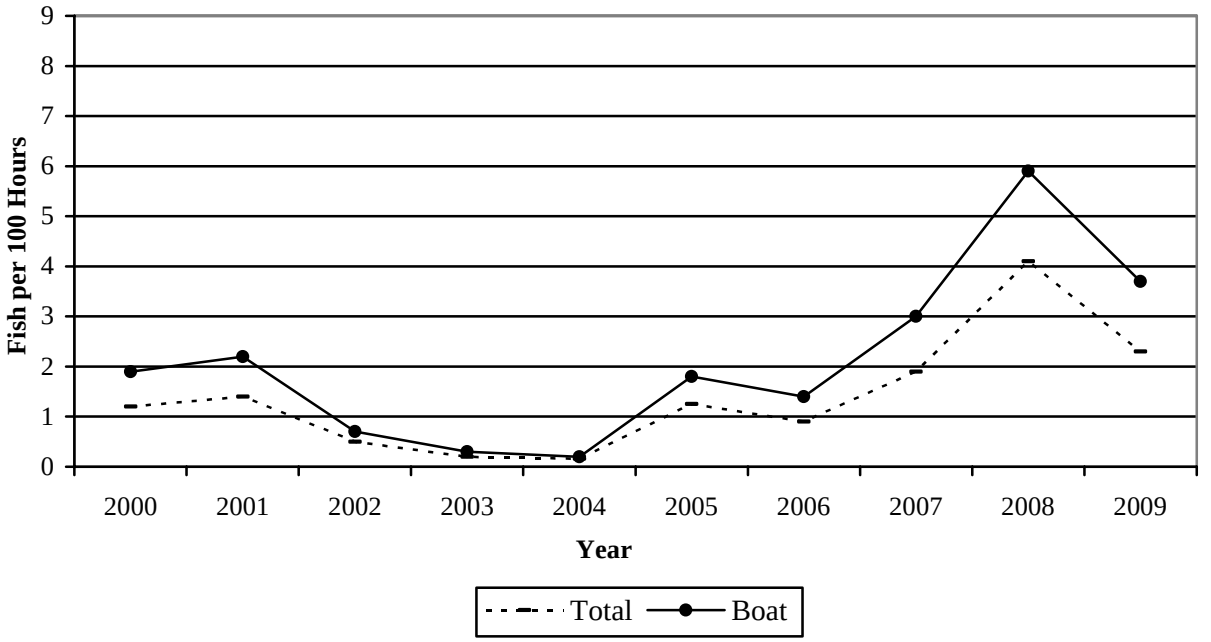


Figure 13. Lake trout CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

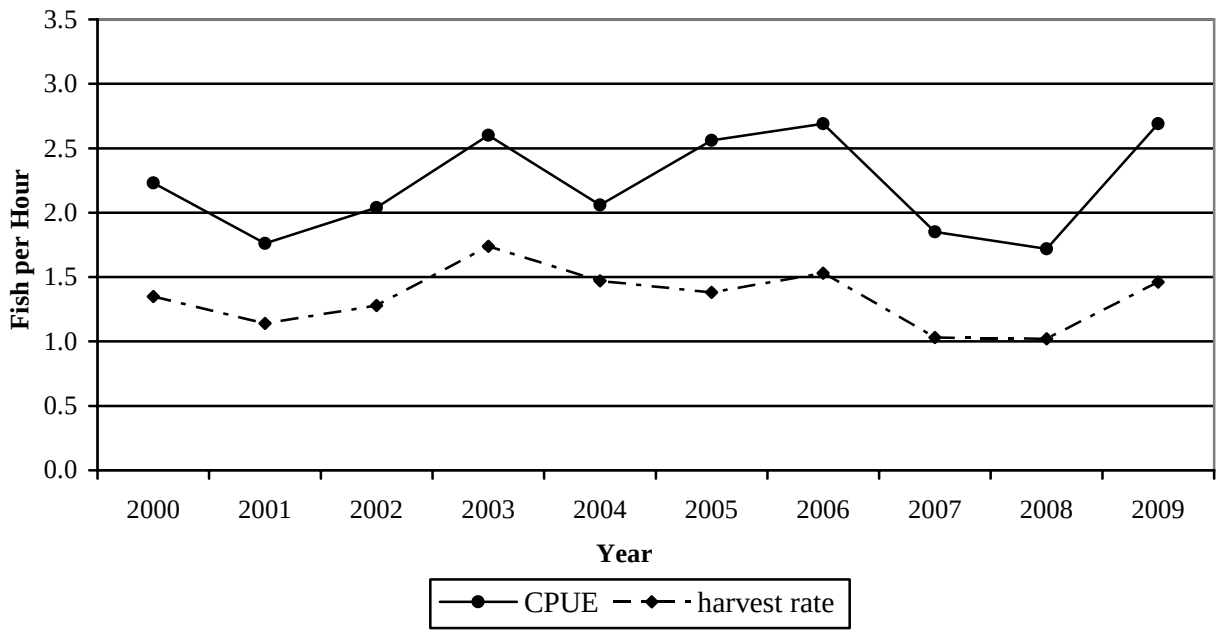


Figure 14. Yellow perch CPUE and harvest-per-unit-effort (harvest rate) from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, based on directed effort.

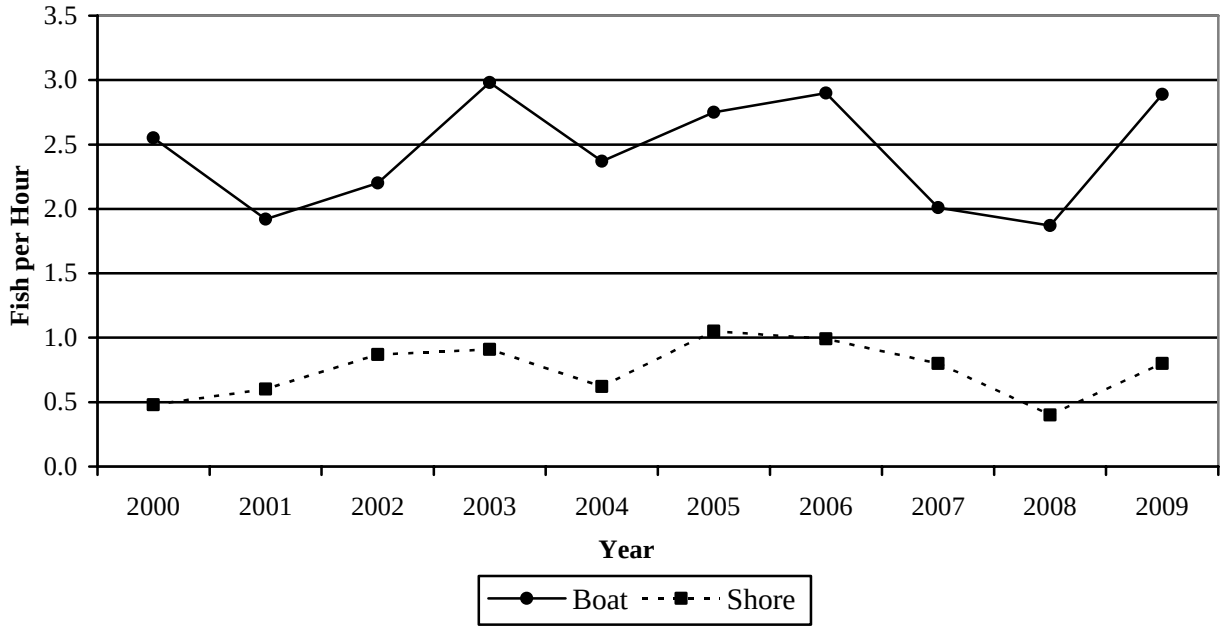


Figure 15. Yellow perch CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

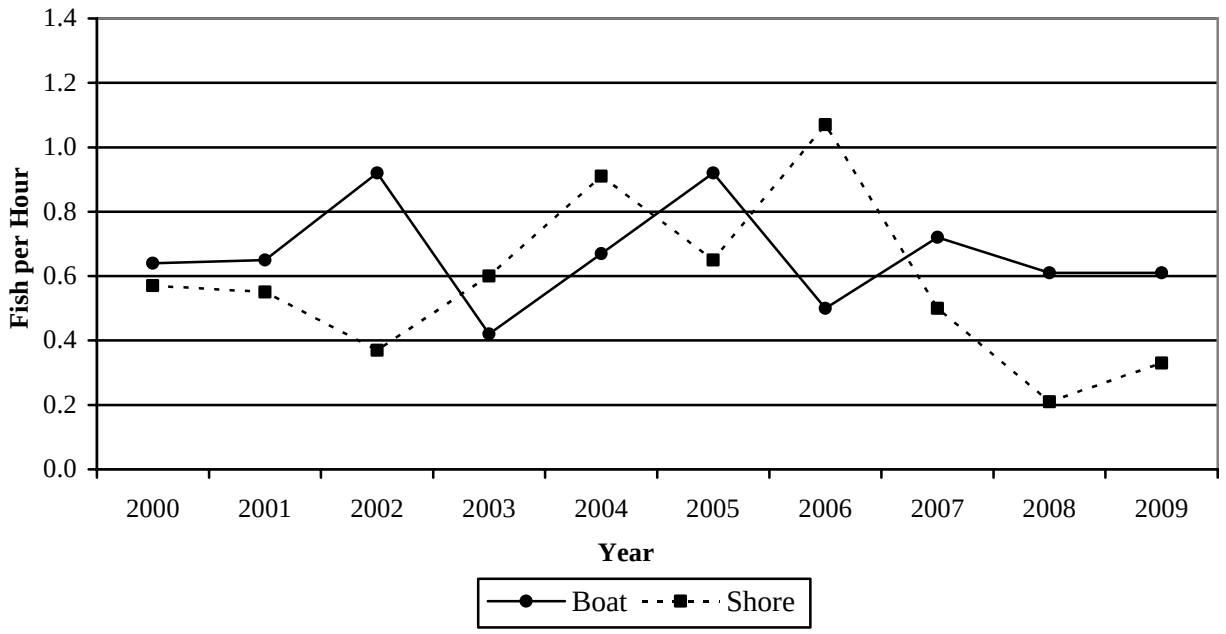
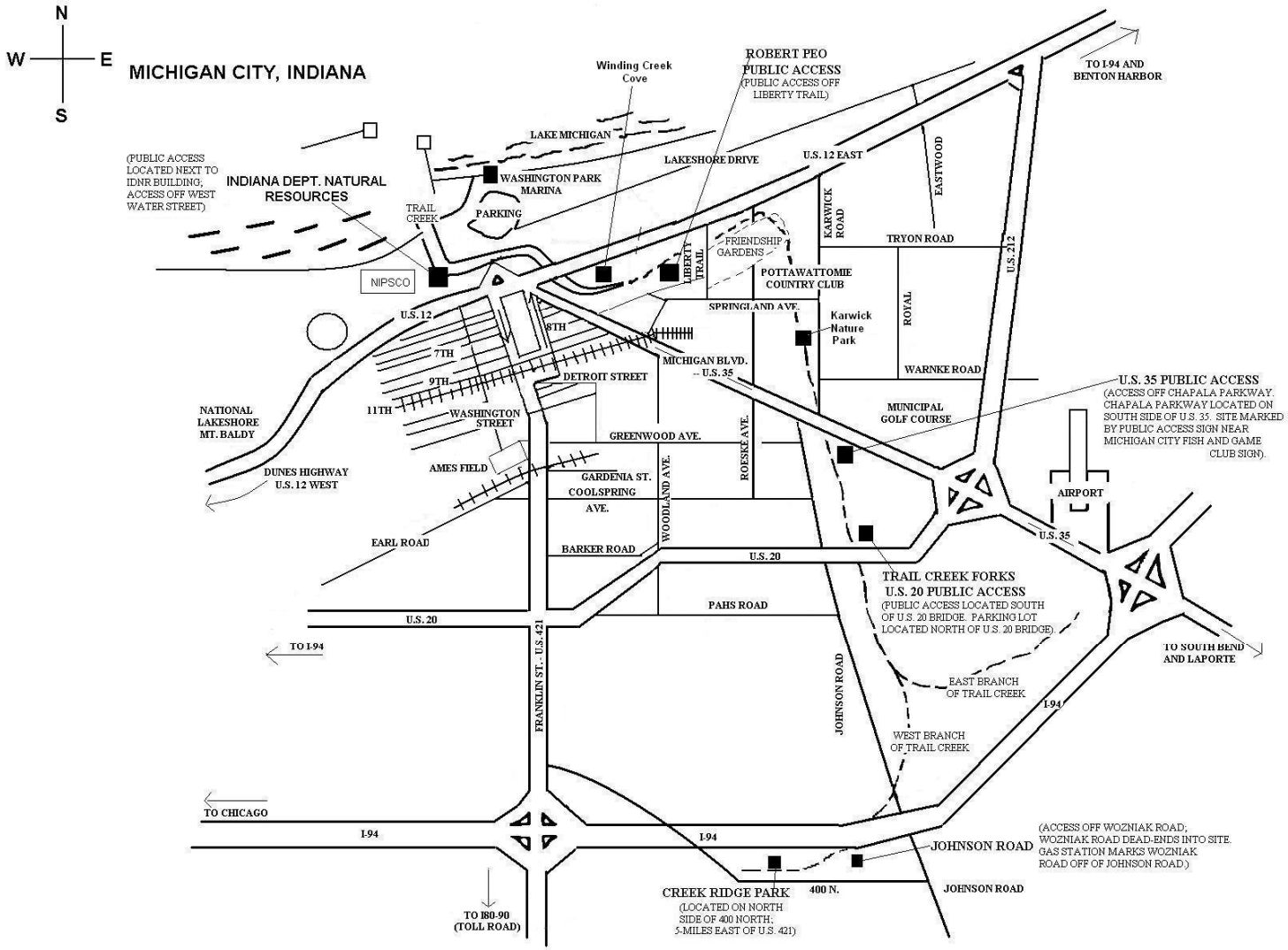
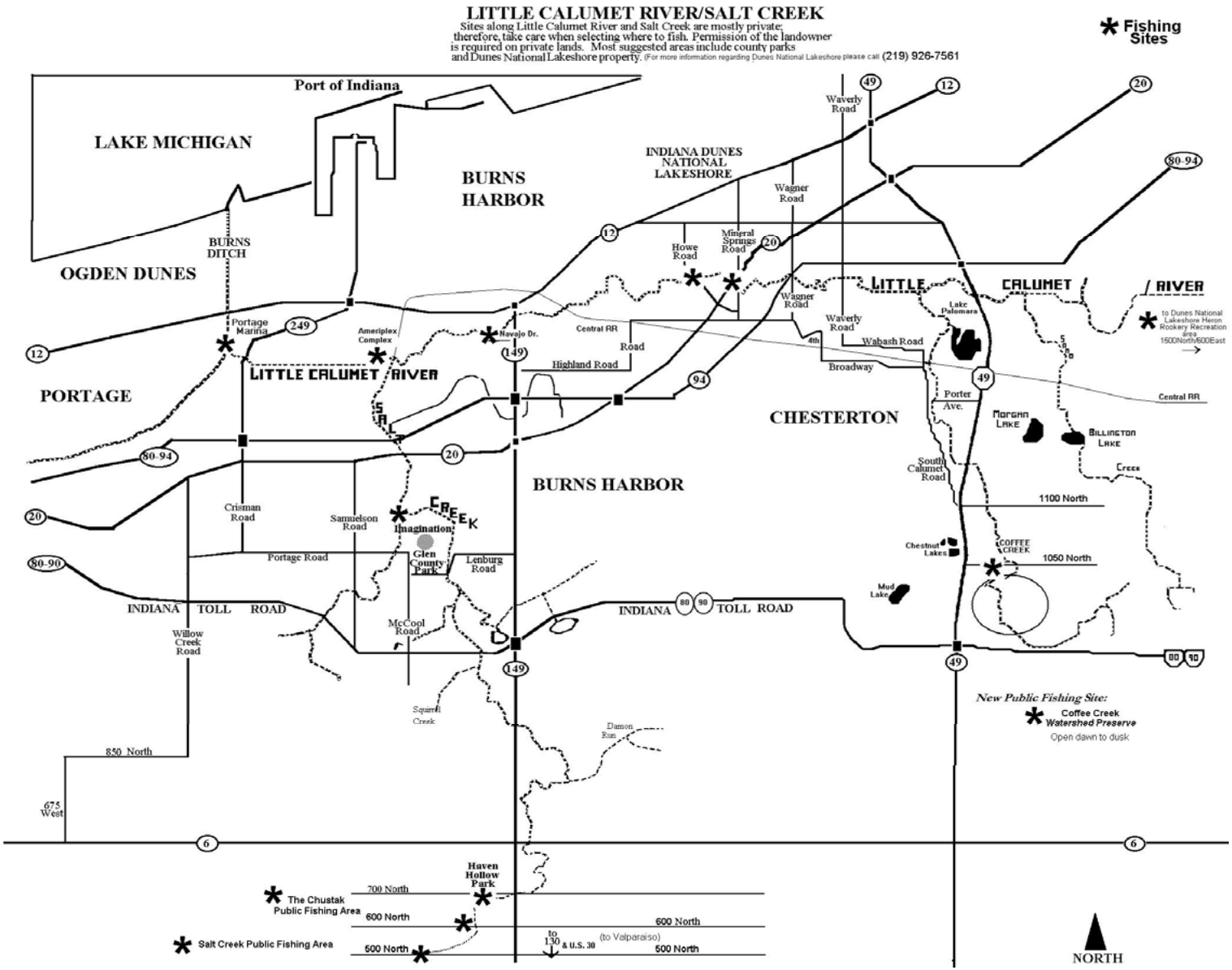


Figure 16. Black bass CPUE from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009, by angler type (directed effort).

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 2009 (n=3,339).



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 2009.

	Catch					
	Boat Fishery		Shore Fishery		Stream Fishery	
	Number Harvested	Total Catch	Number Harvested	Total Catch	Number Harvested	Total Catch
Catfish	278	375	124	297	38	38
Creek Chub	---	---	---	---	0	212
Carp	---	---	0	92	61	61
Crappie	---	---	0	4	---	---
Freshwater Drum	14	395	224	680	---	---
Herring Family (Alewife/Gizzard Shad)	16	16	---	18	---	---
Northern Pike	---	---	---	---	0	22
Rock Bass	0	645	138	1,748	---	---
Round Goby	8,512	8,689	11,995	12,415	734	734
Suckers	---	---	0	24	0	38
Sunfish (Bluegill/Green Sunfish/Redear Sunfish)	0	16	219	449	0	147
Walleye	0	45	100	100	---	---
Whitefish	---	---	10	10	---	---
TOTAL	8,820	10,181	12,811	15,837	833	1,252

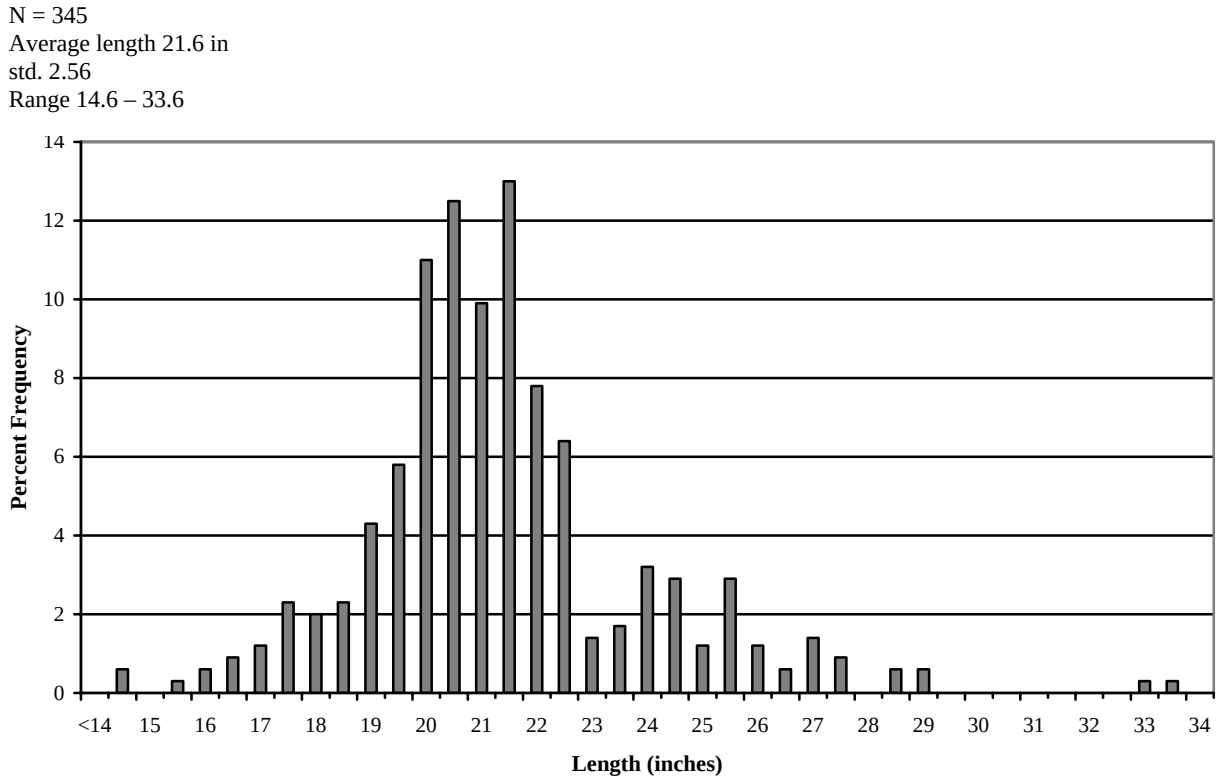
Appendix III. Average length and weight of salmonine species and yellow perch observed from the Indiana Department of Natural Resources Lake Michigan creel survey during 2000 through 2009. Data from boat, shore, and stream fisheries combined. std. = standard deviation.

Year	Average length (in)	std.	Average weight (lb)	std.
Brown Trout				
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
2009	23.6 (n=24)	4.49	6.84 (n=23)	3.50
Coho Salmon				
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
2009	21.6 (n=345)	2.56	3.89 (n=330)	1.84
Chinook Salmon				
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
2009	29.7 (n=502)	3.99	10.5 (n=490)	3.78

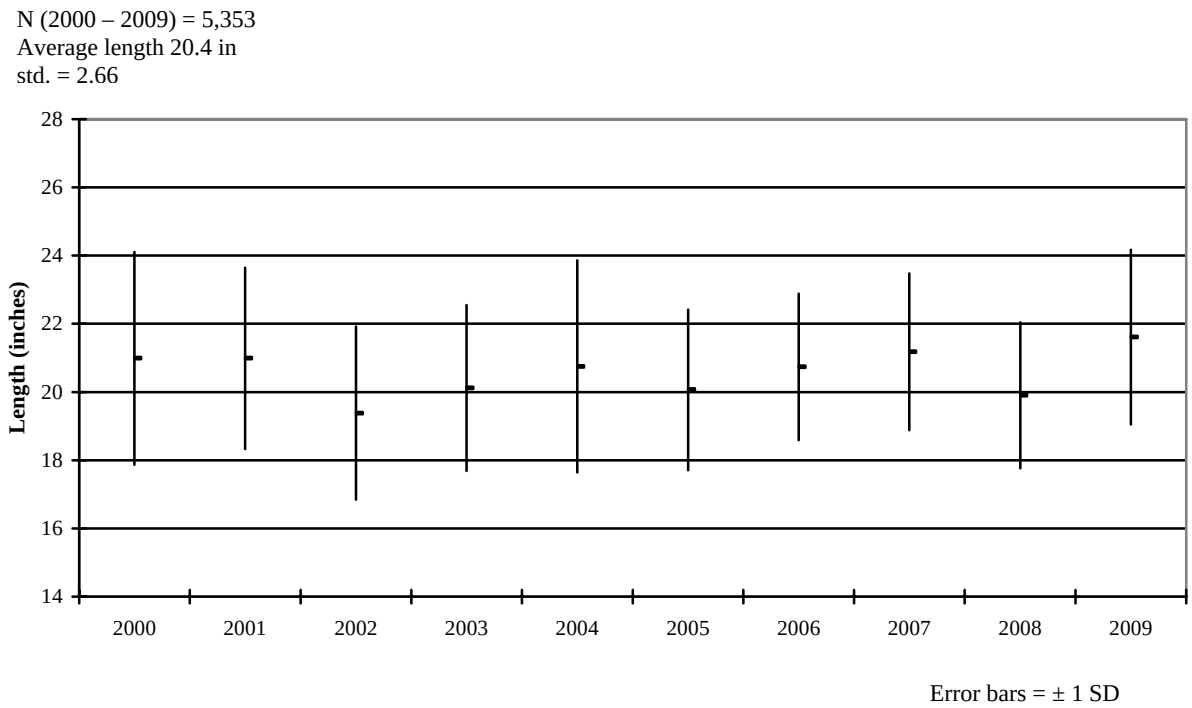
Appendix III *continued*. Average length and weight of salmonine species and yellow perch, observed from the Indiana Department of Natural Resources Lake Michigan creel survey during 2000 through 2009. Data from boat, shore, and stream fisheries combined. std. = standard deviation.

Year	Average length (in)	std.	Average weight (lb)	std.
Lake Trout				
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
2009	28.0 (n=96)	3.33	8.81 (n=96)	3.85
Steelhead trout				
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
2009	27.7 (n=205)	3.28	7.73 (n=205)	2.33
Yellow perch				
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
2009	10.6 (n=391)	1.96	0.60 (n=373)	0.35

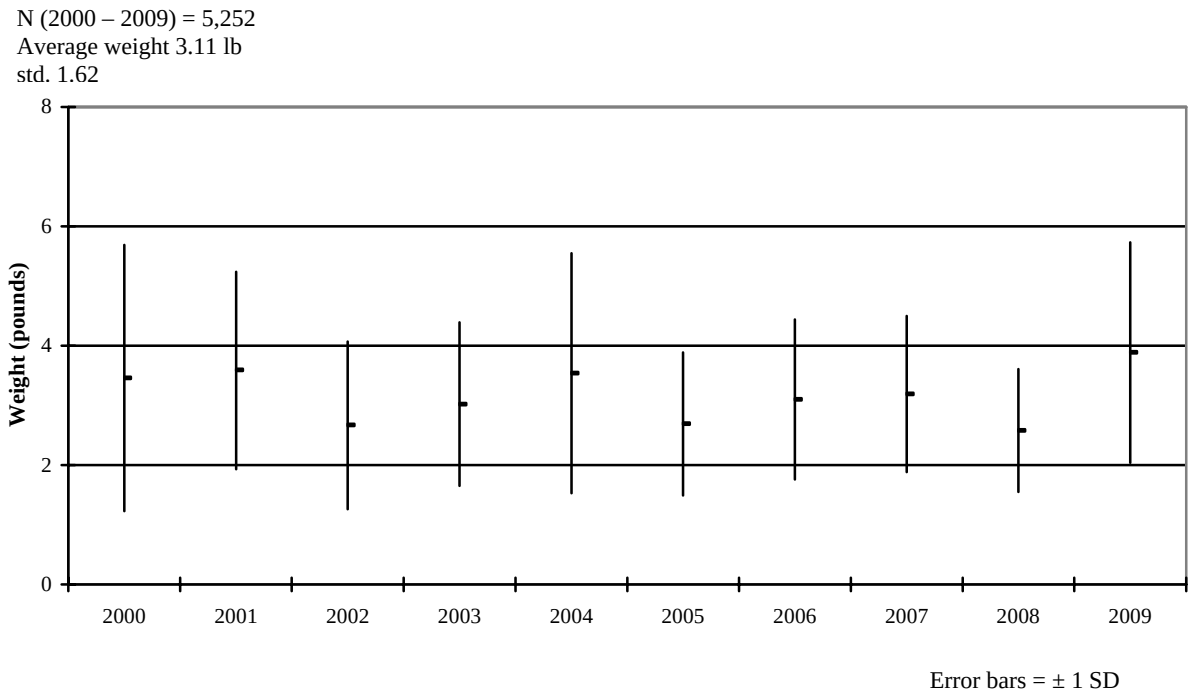
[1] Weight data not available.



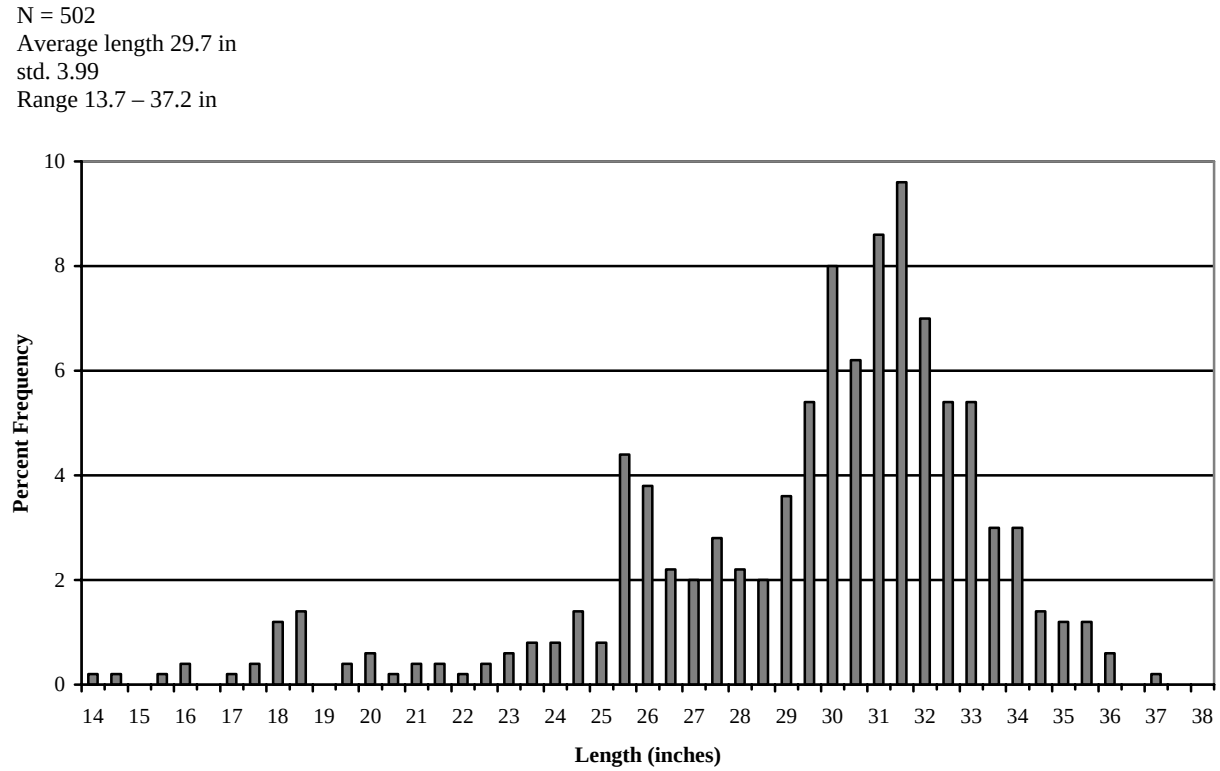
Appendix IV (a). Length frequency of coho salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



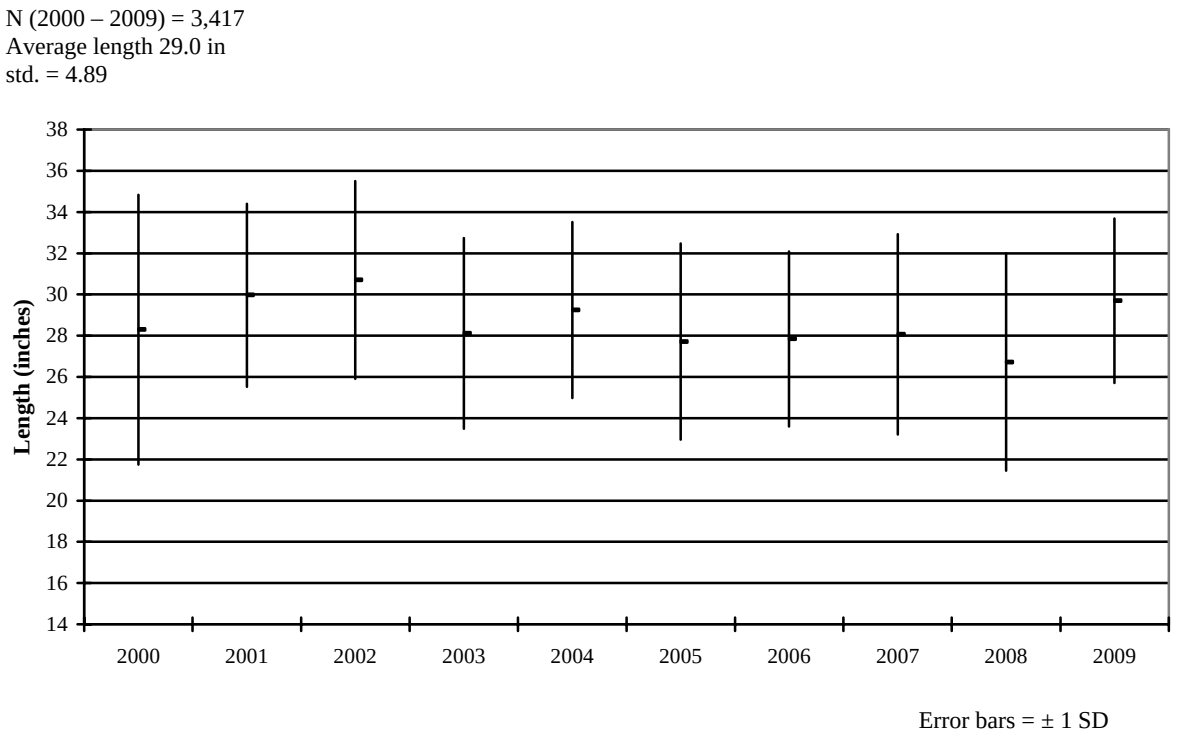
Appendix IV (b). Average total length of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



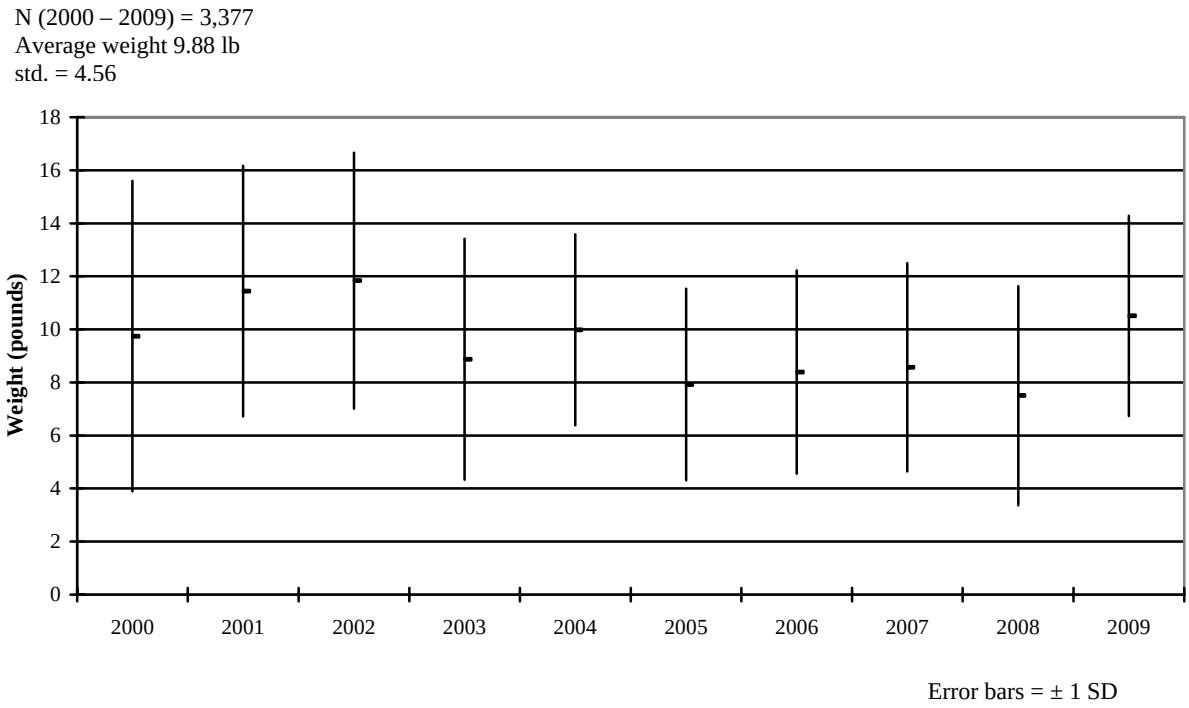
Appendix IV (c). Average weight of creeled coho salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



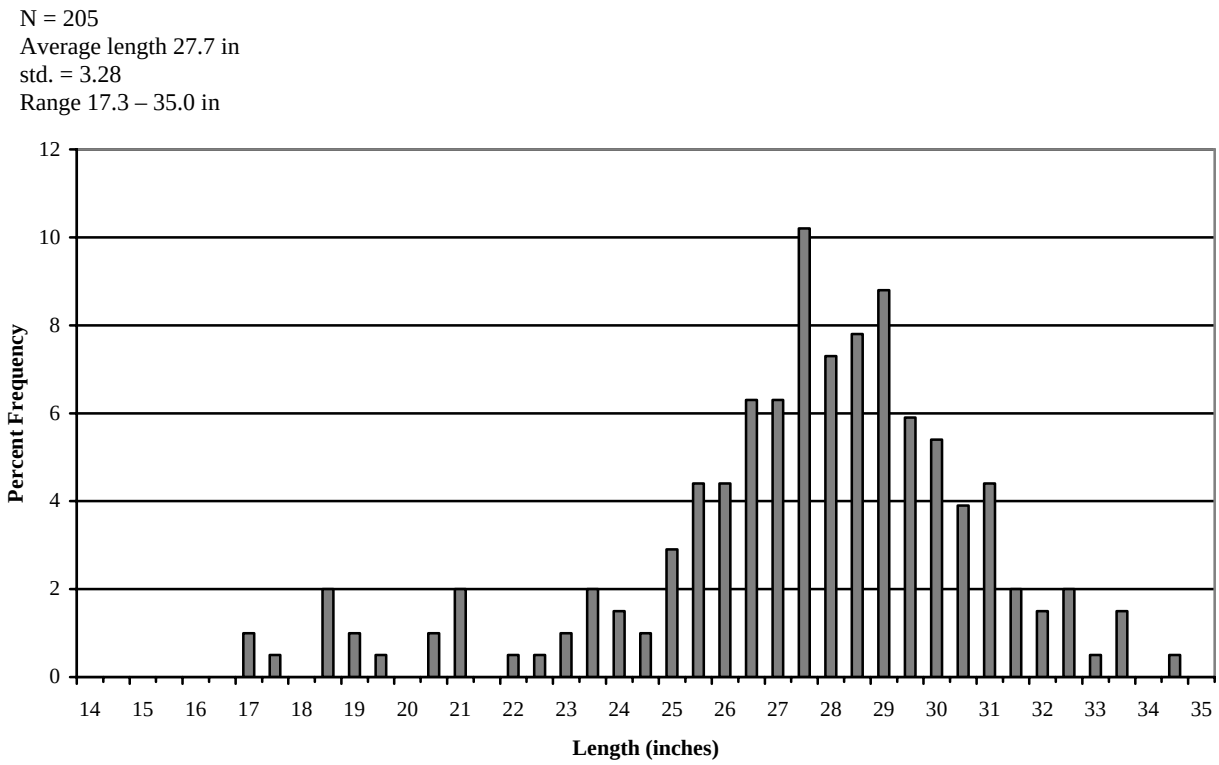
Appendix V (a). Length frequency of Chinook salmon observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



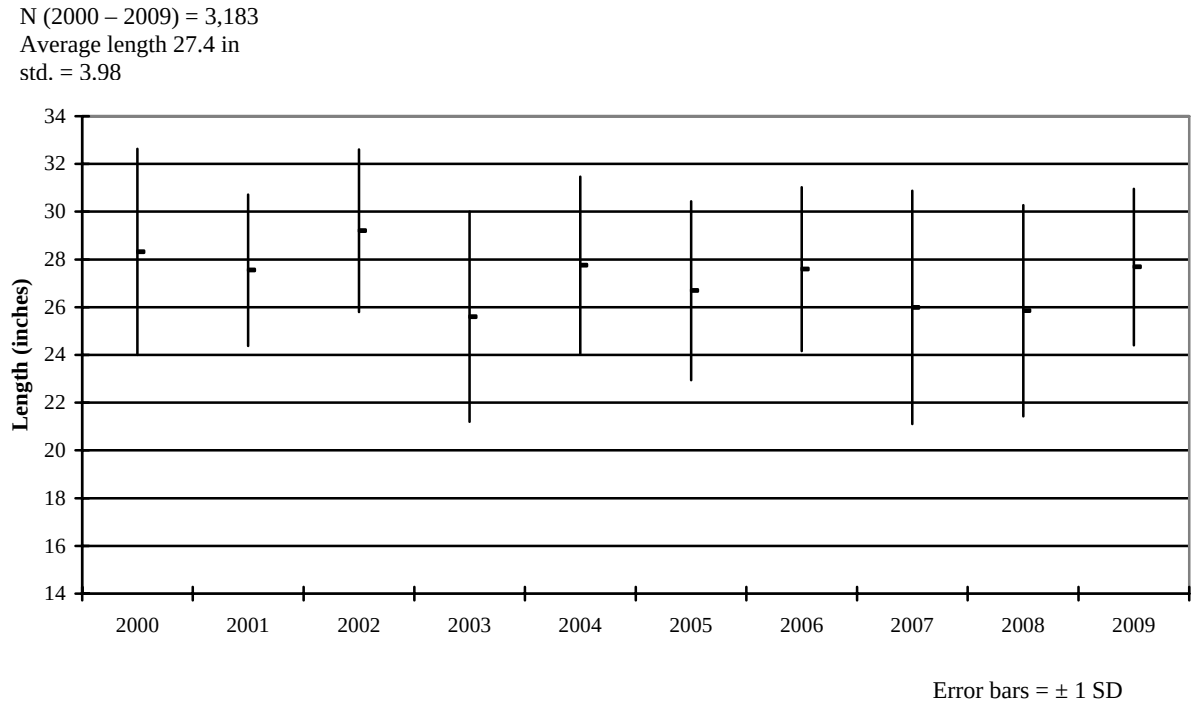
Appendix V (b). Average total length of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



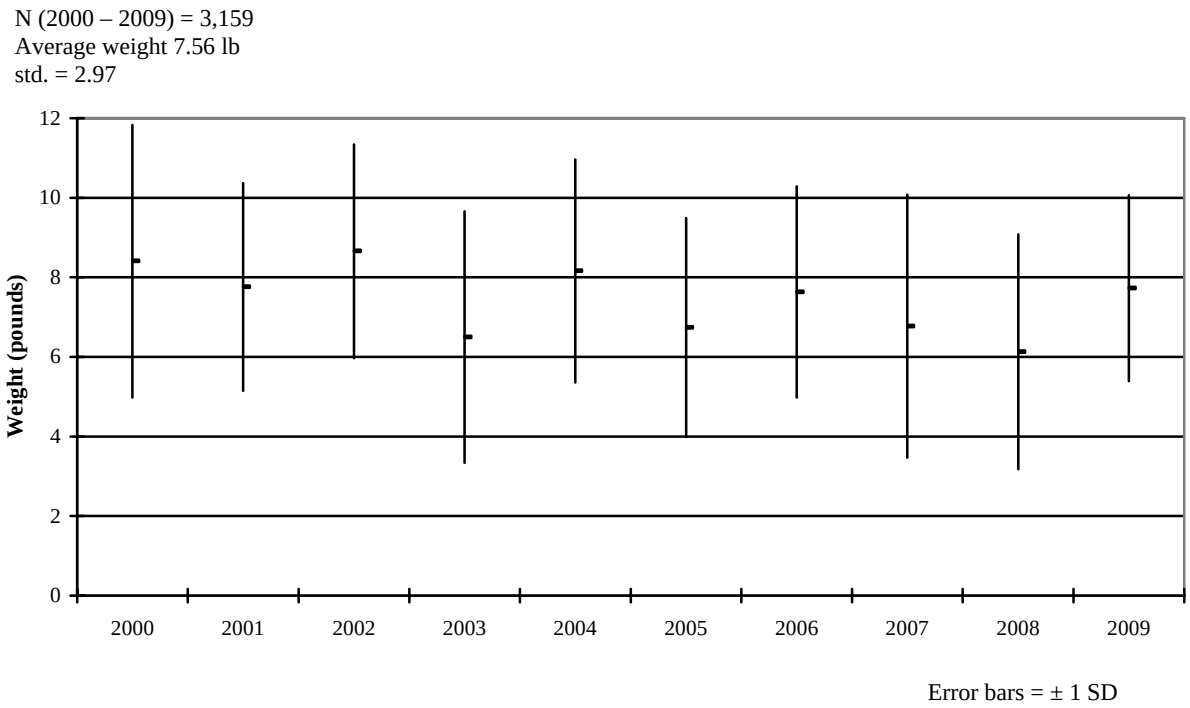
Appendix V (c). Average weight of creeled Chinook salmon from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



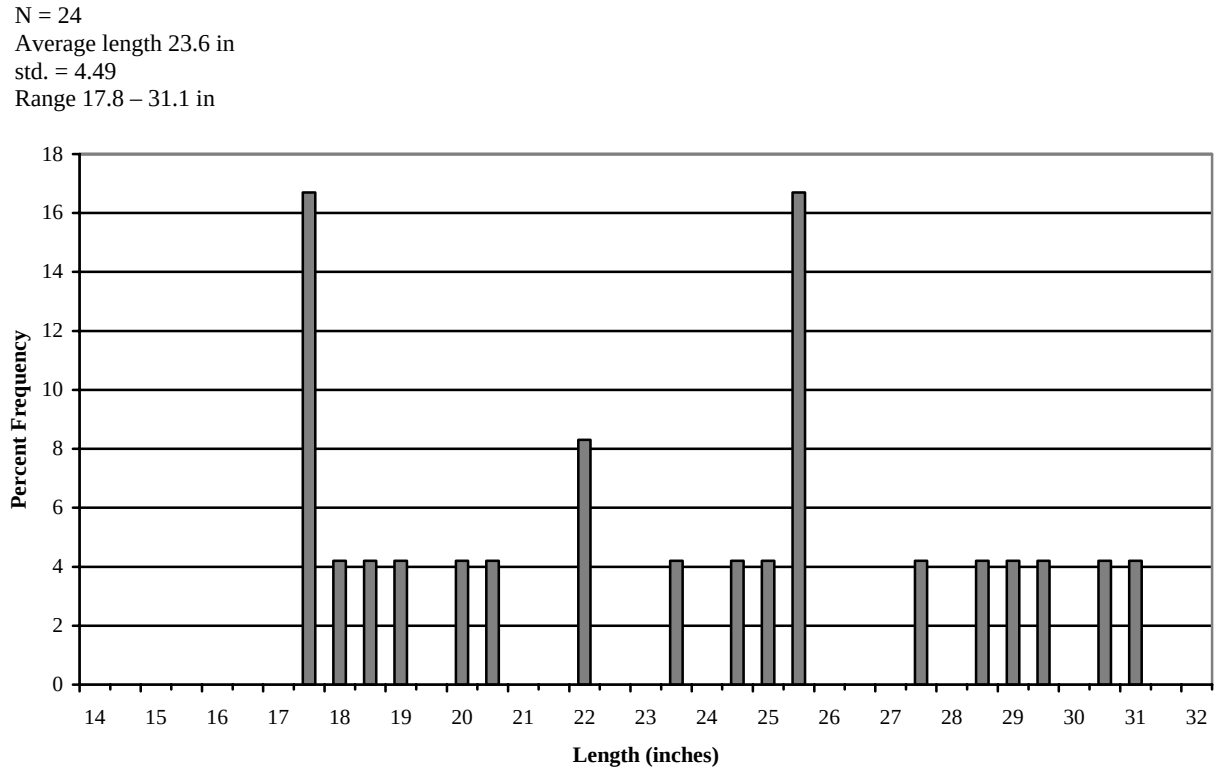
Appendix VI (a). Length frequency of steelhead observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



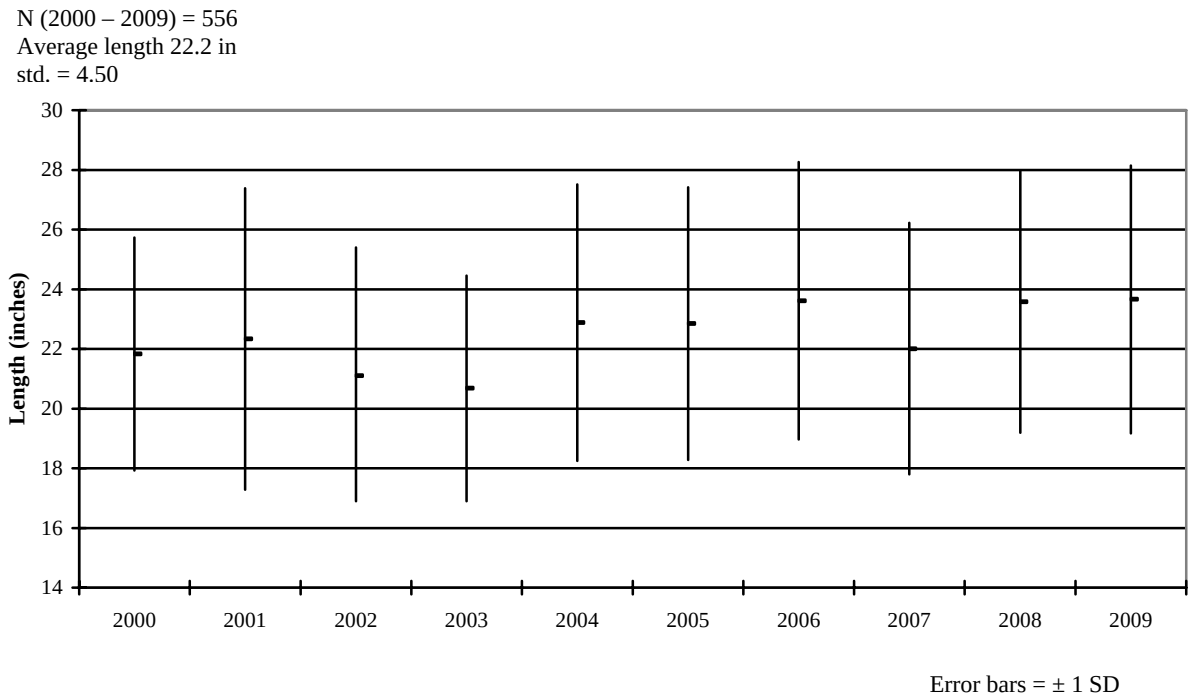
Appendix VI (b). Average total length of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



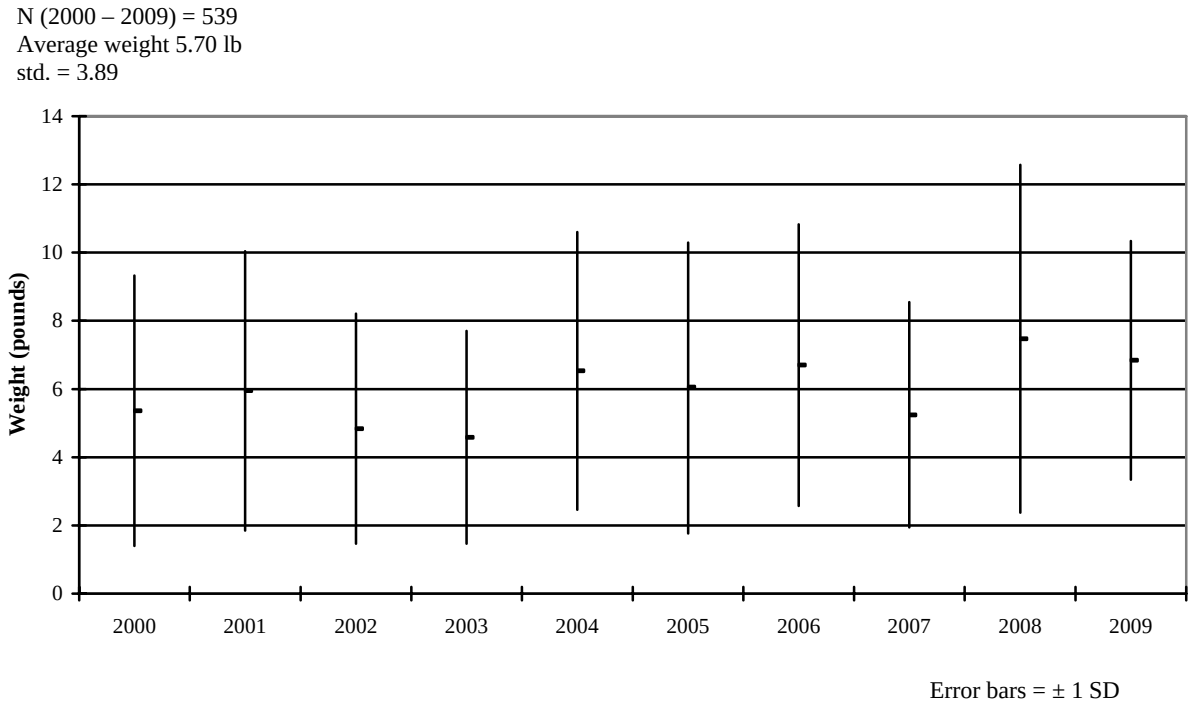
Appendix VI (c). Average weight of creeled steelhead from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



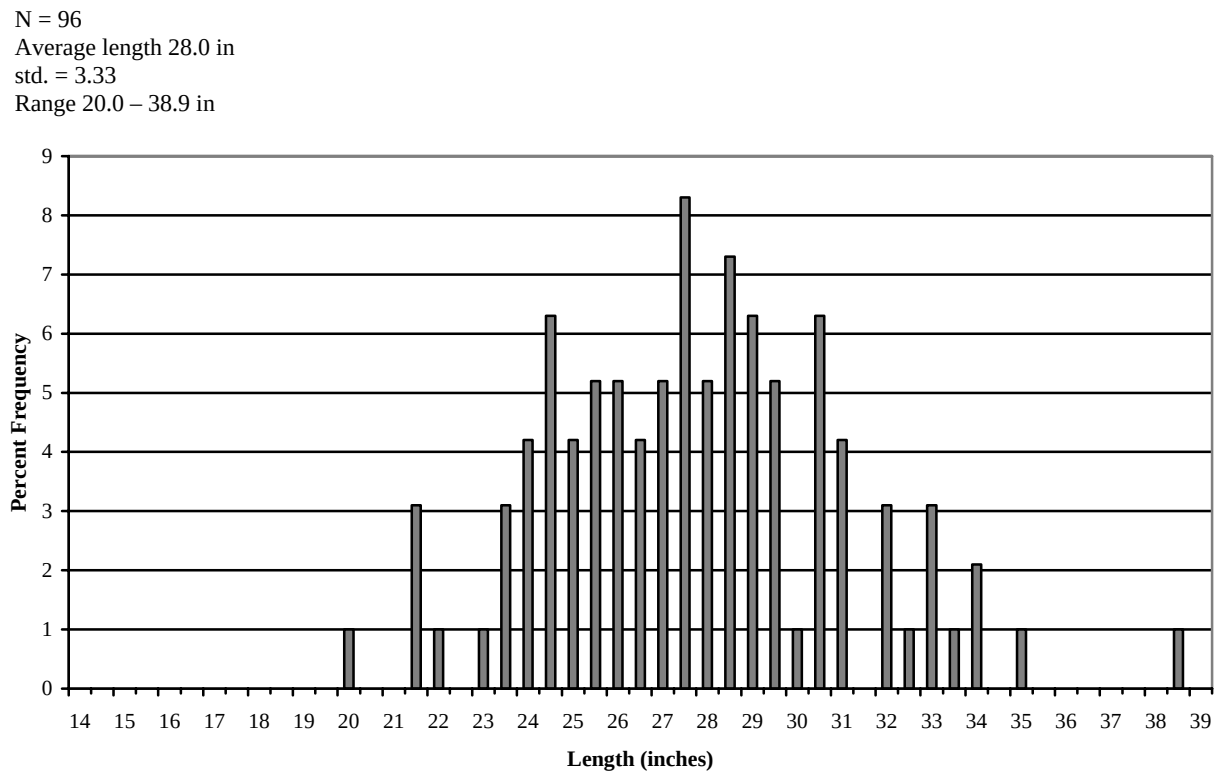
Appendix VII (a). Length frequency of brown trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



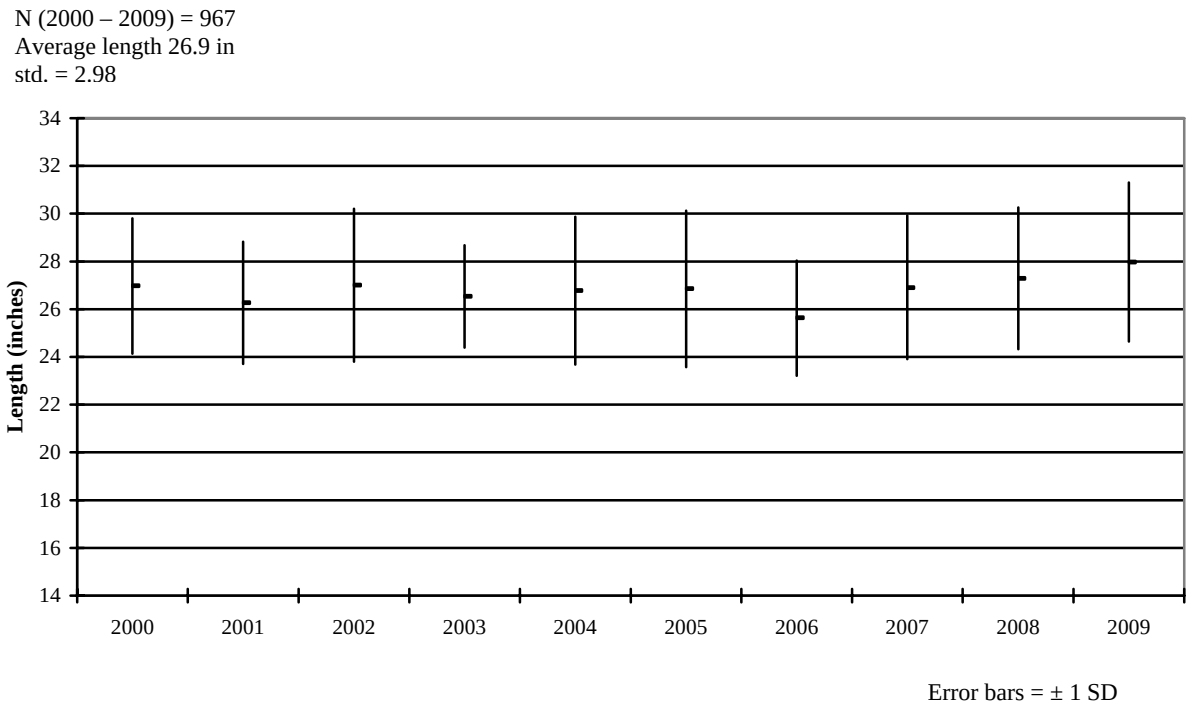
Appendix VII (b). Average total length of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



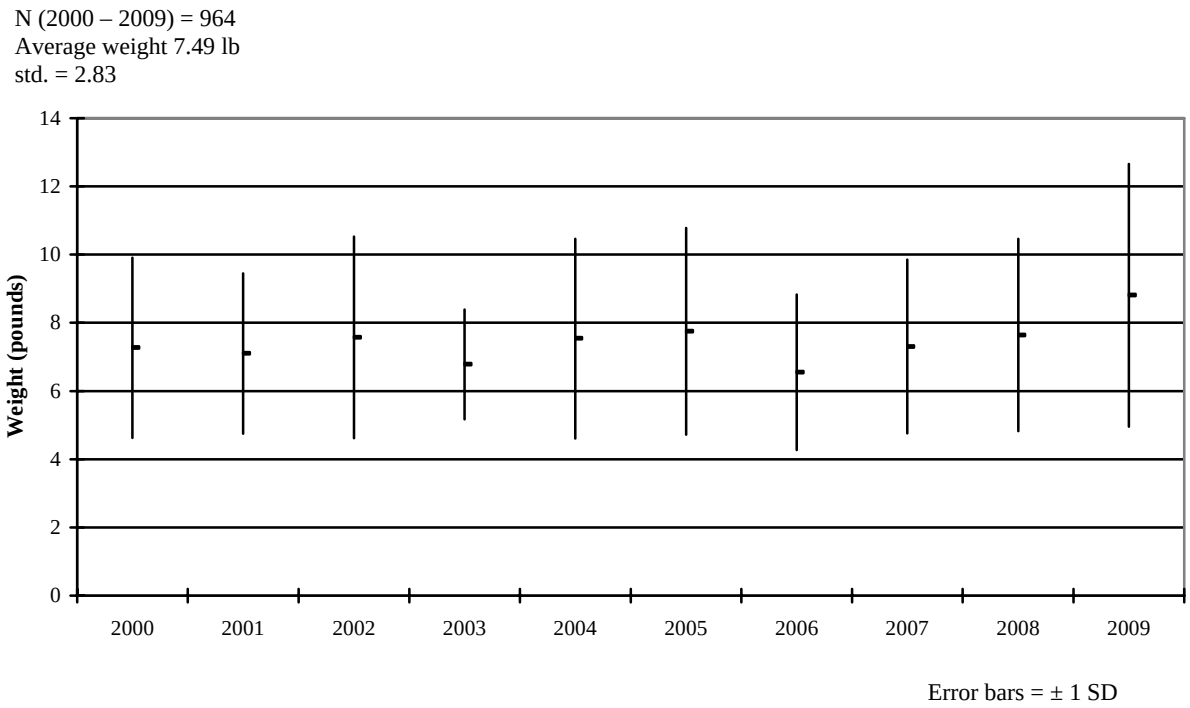
Appendix VII (c). Average weight of creeled brown trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



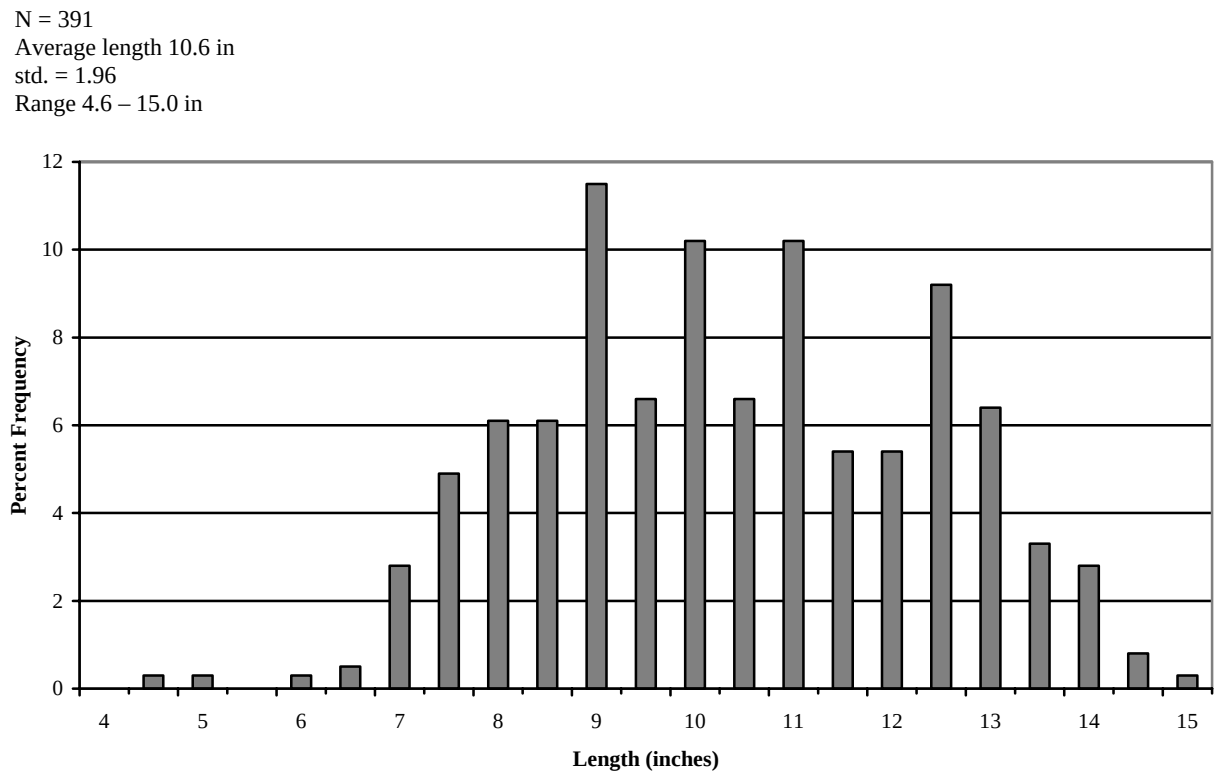
Appendix VIII (a). Length frequency of lake trout observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



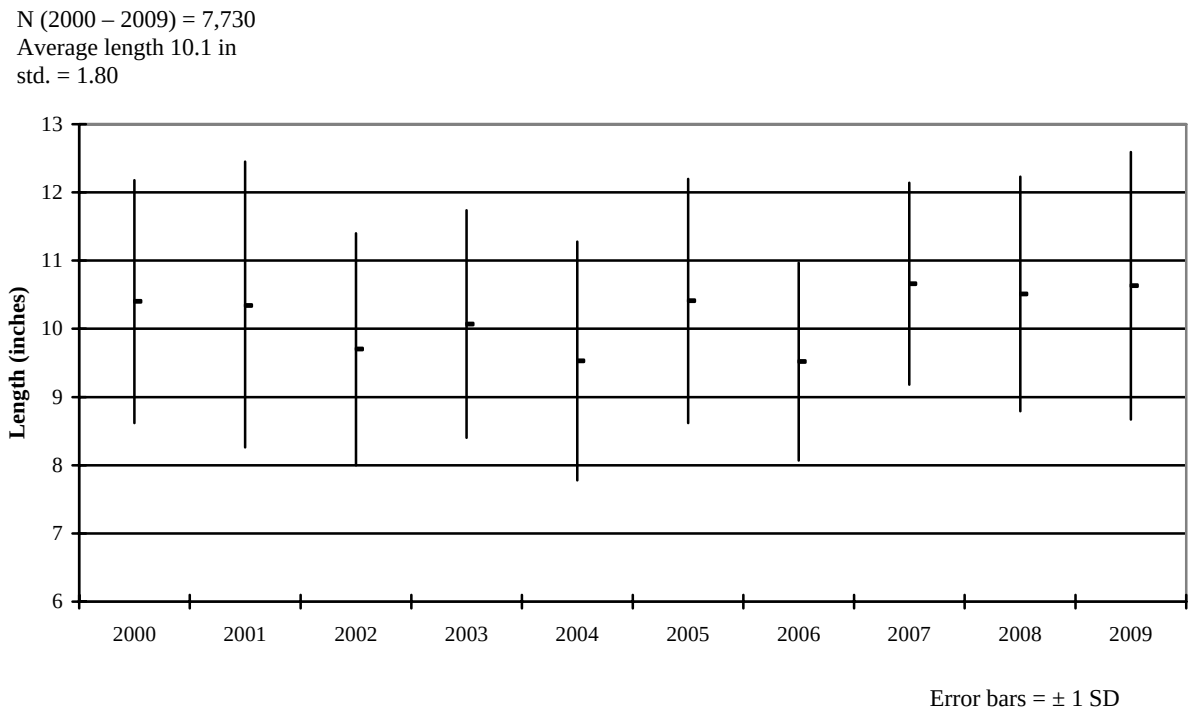
Appendix VIII (b). Average total length of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



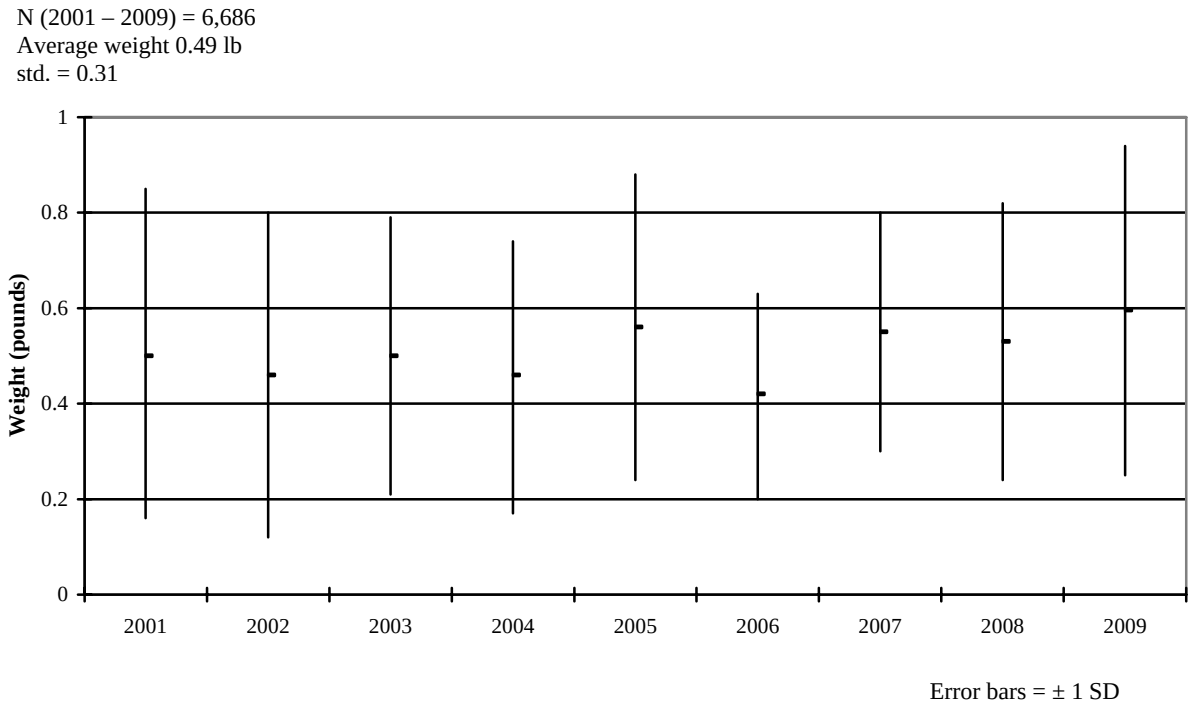
Appendix VIII (c). Average weight of creeled lake trout from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



Appendix IX (a). Length frequency of yellow perch observed in the Indiana Department of Natural Resources Lake Michigan creel survey during 2009.



Appendix IX (b). Average total length of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 2000 through 2009.



Appendix IX (c). Average weight of creeled yellow perch from the Indiana Department of Natural Resources Lake Michigan creel survey, 2001 through 2009.

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 2009 (n=1,244).

County	No. Parties	%	County	No. Parties	%
Lake	421	(33.8)	White	2	(0.1)
Out-of-State	342	(27.5)	Whitley	2	(0.1)
Porter	213	(17.1)	Benton	1	(<0.1)
LaPorte	136	(10.9)	Clinton	1	(<0.1)
Jasper	21	(1.7)	Dearborn	1	(<0.1)
St. Joseph	14	(1.1)	Grant	1	(<0.1)
Elkhart	12	(0.9)	Hancock	1	(<0.1)
Marion	11	(0.9)	Hendricks	1	(<0.1)
Allen	6	(0.5)	Howard	1	(<0.1)
Tippecanoe	6	(0.5)	LaGrange	1	(<0.1)
Dekalb	5	(0.4)	Noble	1	(<0.1)
Boone	4	(0.3)	Owen	1	(<0.1)
Hamilton	4	(0.3)	Parke	1	(<0.1)
Kosciusko	4	(0.3)	Scott	1	(<0.1)
Marshall	3	(0.2)			
Miami	3	(0.2)			
Pulaski	3	(0.2)			
Putnam	3	(0.2)			
Vigo	3	(0.2)			
Wabash	3	(0.2)			
Wells	3	(0.2)			
Adams	2	(0.1)			
Brown	2	(0.1)			
Morgan	2	(0.1)			
Newton	2	(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 2009 (n=1,156).

County	No. Parties	%	County	No. Parties	%
Lake	337	(29.1)	Vigo	2	(0.2)
LaPorte	280	(24.2)	White	2	(0.2)
Porter	249	(21.5)	Boone	1	(<0.1)
Out-of-State	133	(11.5)	Carroll	1	(<0.1)
St. Joseph	39	(3.4)	Franklin	1	(<0.1)
Elkhart	19	(1.6)	Fulton	1	(<0.1)
Allen	13	(1.1)	Hancock	1	(<0.1)
Marion	9	(0.8)	Howard	1	(<0.1)
Jasper	6	(0.5)	Jackson	1	(<0.1)
Kosciusko	6	(0.5)	Jay	1	(<0.1)
Starke	6	(0.5)	Johnson	1	(<0.1)
Marshall	5	(0.4)	Newton	1	(<0.1)
Grant	3	(0.3)	Pulaski	1	(<0.1)
Hamilton	3	(0.3)	Putnam	1	(<0.1)
Hendricks	3	(0.3)			
Madison	3	(0.3)			
Morgan	3	(0.3)			
Tippecanoe	3	(0.3)			
Tipton	3	(0.3)			
Wabash	3	(0.3)			
Blackford	2	(0.2)			
Cass	2	(0.2)			
Clinton	2	(0.2)			
Huntington	2	(0.2)			
LaGrange	2	(0.2)			
Miami	2	(0.2)			
Noble	2	(0.2)			

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 2009 (n=939).

County	No. Parties	%	County	No. Parties	%
LaPorte	224	(24.0)	Benton	1	(0.1)
Out-of-State	217	(23.1)	Boone	1	(0.1)
Porter	176	(18.7)	Dubois	1	(0.1)
Lake	111	(11.8)	Hancock	1	(0.1)
St. Joseph	50	(5.3)	Howard	1	(0.1)
Allen	28	(3.0)	Huntington	1	(0.1)
Elkhart	21	(2.2)	Lawrence	1	(0.1)
Marion	15	(1.6)	Madison	1	(0.1)
Kosciusko	9	(1.0)	Morgan	1	(0.1)
Hendricks	7	(0.7)	Orange	1	(0.1)
Starke	7	(0.7)	Pulaski	1	(0.1)
Grant	6	(0.6)	Vanderberg	1	(0.1)
Marshall	6	(0.6)	Vigo	1	(0.1)
Dekalb	5	(0.5)	Washington	1	(0.1)
Tippecanoe	5	(0.5)	White	1	(0.1)
Adams	3	(0.3)			
Delaware	3	(0.3)			
Hamilton	3	(0.3)			
Jasper	3	(0.3)			
Newton	3	(0.3)			
Noble	3	(0.3)			
Wabash	3	(0.3)			
Wells	3	(0.3)			
Clinton	2	(0.2)			
Dearborn	2	(0.2)			
Johnson	2	(0.2)			
Miami	2	(0.2)			
Scott	2	(0.2)			
Wayne	2	(0.2)			
Bartholomew	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, 2009.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	1,077(90%)	76(6%)	33(3%)	6(<1%)	5(<1%)	3(<1%)	374(31%)	281(23%)	242(20%)	63(5%)	78(7%)	159(13%)
Chinook	740(90%)	46(6%)	19(2%)	5(1%)	4(<1%)	4(<1%)	178(22%)	175(21%)	197(24%)	66(8%)	82(10%)	120(15%)
Steelhead	1,312(93%)	63(4%)	26(2%)	6(<1%)	1(<1%)	7(<1%)	376(27%)	291(21%)	324(23%)	102(7%)	117(8%)	205(14%)
Brown Trout	392(82%)	30(6%)	27(6%)	11(2%)	16(3%)	3(1%)	87(18%)	67(14%)	77(16%)	60(12%)	138(29%)	50(10%)
Lake Trout	298(75%)	34(9%)	29(7%)	11(3%)	22(5%)	3(1%)	80(20%)	66(17%)	55(14%)	25(6%)	133(33%)	38(10%)
Yellow Perch	759(94%)	30(4%)	14(2%)	0	0	2(<1%)	227(28%)	221(27%)	196(24%)	61(8%)	42(5%)	57(7%)
Black Bass	230(92%)	11(4%)	3(1%)	1(<1%)	0	6(2%)	109(43%)	53(21%)	50(20%)	10(4%)	8(3%)	21(8%)

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, 2009.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	483(93%)	19(4%)	13(2%)	1(<1%)	3(<1%)	2(<1%)	219(42%)	135(26%)	86(17%)	18(3%)	16(3%)	45(9%)
Chinook	326(93%)	15(4%)	5(1%)	0	1(<1%)	2(<1%)	112(32%)	86(25%)	81(23%)	24(7%)	24(7%)	21(6%)
Steelhead	235(91%)	13(5%)	4(2%)	2(1%)	1(<1%)	2(1%)	58(23%)	52(20%)	53(21%)	31(12%)	44(17%)	19(7%)
Brown Trout	194(77%)	19(7%)	14(6%)	9(4%)	14(6%)	2(<1%)	60(24%)	34(13%)	42(17%)	35(14%)	61(24%)	20(8%)
Lake Trout	174(69%)	27(11%)	24(9%)	10(4%)	16(6%)	2(<1%)	70(28%)	46(18%)	35(14%)	18(7%)	61(24%)	23(9%)
Yellow Perch	503(96%)	17(3%)	5(1%)	0	0	0	176(34%)	153(29%)	124(24%)	28(5%)	16(3%)	27(5%)
Black Bass	134(96%)	2(1%)	1(<1%)	1(<1%)	0	2(1%)	67(48%)	35(25%)	25(18%)	5(3%)	2(1%)	6(4%)

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, 2009.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	329(90%)	29(8%)	5(1%)	2(<1%)	1(<1%)	1(<1%)	104(28%)	93(25%)	82(22%)	25(7%)	32(9%)	31(8%)
Chinook	163(92%)	10(6%)	2(1%)	0	1(<1%)	2(1%)	19(11%)	48(27%)	47(26%)	20(11%)	27(15%)	17(10%)
Steelhead	378(93%)	20(5%)	4(1%)	1(<1%)	0	3(1%)	96(23%)	115(28%)	100(25%)	27(7%)	40(10%)	28(7%)
Brown Trout	146(86%)	9(5%)	11(6%)	1(1%)	1(1%)	1(1%)	25(15%)	26(15%)	33(19%)	16(9%)	54(32%)	15(9%)
Lake Trout	124(86%)	7(5%)	5(3%)	1(1%)	6(4%)	1(1%)	10(7%)	20(14%)	20(14%)	7(5%)	72(50%)	15(10%)
Yellow Perch	253(92%)	12(4%)	9(3%)	0	0	2(1%)	50(18%)	68(25%)	71(26%)	33(12%)	25(9%)	29(10%)
Black Bass	96(86%)	9(8%)	2(2%)	0	0	4(4%)	42(38%)	18(16%)	25(23%)	5(4%)	6(5%)	15(13%)

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, 2009.

	Importance						Satisfaction					
Species	5	4	3	2	1	n/a	5	4	3	2	1	n/a
Coho	265(85%)	28(9%)	15(5%)	3(1%)	1 (<1%)	0	51(16%)	53(17%)	74(24%)	20(6%)	30(10%)	83(27%)
Chinook	251(86%)	21(7%)	12(4%)	5(2%)	2(<1%)	0	47(16%)	41(14%)	69(24%)	22(7%)	31(11%)	82(28%)
Steelhead	699(93%)	30(4%)	18(2%)	3(<1%)	0	2(<1%)	222(30%)	124(16%)	171(23%)	44(6%)	33(4%)	158(21%)
Brown Trout	52(90%)	2(3%)	2(3%)	1(2%)	1(2%)	0	2(3%)	7(12%)	2(3%)	9(16%)	23(40%)	15(26%)
Lake Trout	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Perch	3(75%)	1(25%)	0	0	0	0	1(25%)	0	1(25%)	0	1(25%)	1(25%)