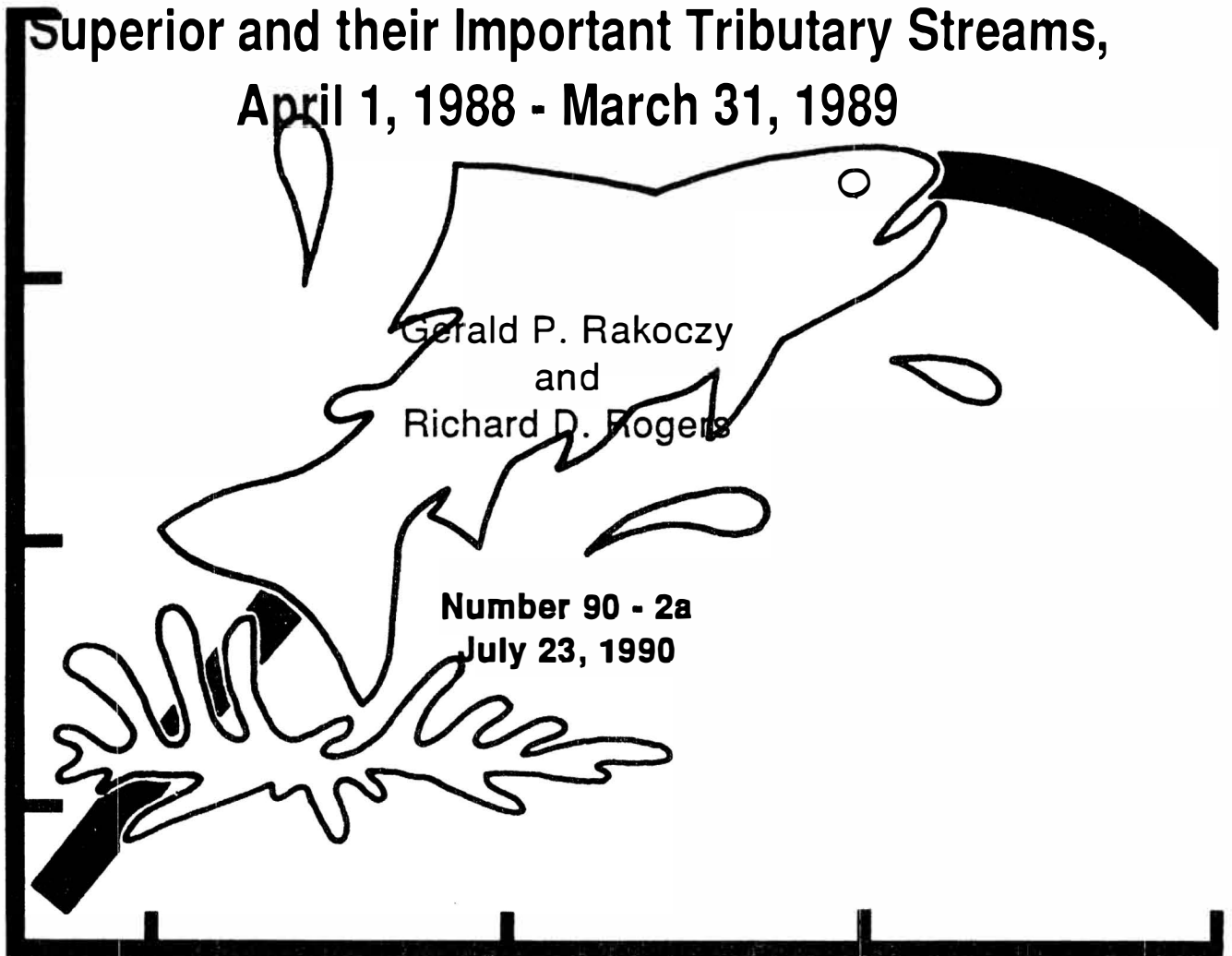


# FISHERIES DIVISION

## TECHNICAL REPORT

Sportfishing Catch and Effort from the Michigan Waters of Lakes Michigan, Huron, Erie, and Superior and their Important Tributary Streams, April 1, 1988 - March 31, 1989



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Richard D. Rogers

Number 90 - 2a  
July 23, 1990



Michigan Department of  
Natural Resources

**MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
FISHERIES DIVISION**

**Fisheries Technical Report No. 90-2a  
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**SPORTFISHING CATCH AND EFFORT FROM THE MICHIGAN WATERS  
OF LAKES MICHIGAN, HURON, ERIE, AND SUPERIOR,  
AND THEIR IMPORTANT TRIBUTARY STREAMS,  
APRIL 1, 1988 - MARCH 31, 1989<sup>1</sup>**

**Gerald P. Rakoczy  
and  
Richard D. Rogers**

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<sup>1</sup>A contribution from Dingell-Johnson Project F-53-R, Michigan

**Sportfishing Catch and Effort from the Michigan Waters  
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**Gerald P. Rakoczy  
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*Abstract.*—Sportfishing catch and effort were sampled on lakes Michigan, Huron, Erie, and Superior, and on several important river systems from April 1, 1988 through March 31, 1989. The objective of the creel census program is to obtain a continuous record of sport catch, catch rates, and catch composition for the Great Lakes and important anadromous river fisheries.

Over 68,000 anglers were interviewed at the end of their fishing trips. Catch and effort estimates were calculated by month for all areas sampled. It was estimated that anglers spent 13,351,244 ( $\pm 811,889$ ) angler hours in all areas of Michigan's waters of the Great Lakes that were censused. Thirty-eight percent of the total angler hours during the open-water season were spent on Lake Michigan while, 34% and 26% were spent on lakes Erie and Huron, respectively.

Total harvest was estimated to be over 9.4 million fish. The yellow perch was the most abundant species in the sport catch in most sample areas, totaling 5,509,399 ( $\pm 656,758$ ) fish. In addition, sport anglers harvested an estimated 2,181,168 ( $\pm 420,148$ ) walleye, 331,924 ( $\pm 35,858$ ) chinook salmon, 237,208 ( $\pm 42,490$ ) lake trout, 91,962 ( $\pm 12,073$ ) rainbow trout, 71,341 ( $\pm 15,375$ ) coho salmon, and 28,030 ( $\pm 5,766$ ) brown trout.

Michigan's Great Lakes sport fishery has been monitored with a state-wide contact creel census program since 1983. The objective of the program is to obtain a continuous record of sport catch, catch rates, and catch composition for the Great Lakes and important anadromous river fisheries.

A fundamental requirement for sound management of the Great Lakes fisheries is knowledge of the response of fish stocks to fishing and the contributions of various fish stocks to the fisheries. The success and future

value of the Great Lakes and anadromous stream fisheries depends on the long-term consequences of current management. It is essential that management decisions be based on a sound empirical knowledge of the history, current status, and dynamics of the fish communities.

Fishing statistics are needed for stock assessment and to facilitate stock identification. Coupled with fish marking studies, these kinds of data can identify Great Lakes and anadromous fish stocks and determine

their spatial distribution, movements, and contribution to various sport fisheries. In future years, data collected from this program could be used to develop, test, and improve decision models which will help to discern management strategies for Great Lakes fish communities and fisheries.

During the 1988 open-water fishing season, angler catch and effort were sampled on lakes Michigan, Huron, Erie, and Superior. In addition, several important fisheries on rivers tributary to lakes Michigan and Huron were sampled. During the winter months of 1989, ice fisheries were sampled at several important locations on lakes Superior, Michigan, and Huron.

Michigan Department of Natural Resources (MDNR) Fisheries Division personnel interviewed over 68,000 anglers at the end of their fishing trips during the 1988 license year, April 1, 1988 through March 31, 1989. Approximately 65,000 of these anglers were contacted during the April through November open-water season. A total of 3,100 anglers were interviewed during the winter ice fishing season, January through March, 1989.

### **Study Area and Methods**

In 1988, creel monitoring operations were conducted at two levels of intensity. In the most intensive creel census, the geographical area sampled per census worker was smaller than in a less intensive census. As a general rule, the most intensive creel census was designed such that the sampling area was no larger than could be covered in one 8-hour workday. The same sample area was then traversed 5 days per week. For the less intensive creel sampling operations, personnel were spread over a much broader area covering several ports or fishing areas per week. As a result, a particular port or fishing area may have been sampled only six or seven times per month. The same sampling designs and data collection methods were used regardless of sampling frequency.

During the 1988 open-water season, an intensive creel census was conducted at all

important ports and sportfishing areas on Lake Huron from Port Huron to St. Ignace and from St. Ignace to Potagannissing Bay (Figure 1). An intensive creel census focused on the boat fishery was also conducted on Lake Erie from Pointe Mouillee to the Michigan-Ohio state line (Figure 2). On Lake Superior, Black River Harbor, Ontonagon, Traverse Bay, Huron Bay, Marquette, and Munising Bay were intensively sampled (Figure 3). Less intensive creel sampling was conducted on important ports and angling areas of Lake Michigan from New Buffalo to Harbor Springs and from Manistique to Menominee (Figure 4). Sampling at some Lake Michigan and Lake Superior ports began as early as March 15, 1988.

The surveys in lakes Huron, Erie, and Superior were terminated at the end of September for most sample areas, 1 month earlier than planned, because of budget constraints in MDNR's Fisheries Division. Only two Lake Huron ports, Oscoda and Harrisville, were sampled in October. All comparisons between years in the analysis are made utilizing April through September data for Lake Huron and May through September statistics for lakes Erie and Superior. Comparisons between years for Lake Michigan utilize April through October data.

The winter fishery was intensively sampled at three sites in Saginaw Bay-Au Gres, Pinconning, and Sebewaing to Sand Point (Lake Huron). Several other Saginaw Bay census sites which were surveyed during the winters of 1987 and 1988 were not sampled due to budget constraints. Winter ice fisheries were also intensively sampled at Big and Little bays de Noc, and Grand Traverse Bay (Lake Michigan), and Keweenaw Bay, and Huron Bay (Lake Superior).

The creel census used in Michigan is based on a stratified design using simple random sampling within strata. Strata included port fished by month by weekday-weekend (holiday) and by mode of fishing. Catch and effort estimates were made for each strata and then combined to give monthly and seasonal figures. Each work schedule was specifically tailored for the area being sampled. Both weekend days and three

randomly selected weekdays were sampled each week. In some cases, four 10-hour days per work week were used when permanent personnel were required to drive long distances to and from the sampling area. In these cases, two randomly selected weekdays and both weekend days were sampled each week. The entire angling day from dawn to 1 hour past dusk was covered. This was accomplished by breaking each day into two 8-hour work shifts, then randomly selecting the actual shift to be worked. In the case where an individual was responsible for sampling more than one area, the port or fishing areas were also randomly selected for each day.

Two types of data were collected for each area sampled: angler party interviews for catch rates and angler (or boat) counts for effort. An angler party was defined as one or more anglers who fished together. Angler parties were interviewed at the end of their fishing trips at various boat launching ramps, marinas, piers, and along the shoreline. Anglers were queried as to their mode of fishing (i.e., boat, shore, pier, open ice, or shanty ice), where they fished, how long they fished, what they fished for, the numbers (by species) of fish they kept, and the number of fishing trips they made or intended to make that day. Additional data were collected on each angler in the party such as age and sex, zip code or county of residence, and the types of angling methods used (casting, still fishing, trolling, etc.). These data were recorded on an angler interview form by census personnel (Figure 5).

Instantaneous and interval counts were used to sample fishing effort. Instantaneous counts were used when all boats or anglers in a sample area could be observed from a given point at one time. Interval counts were used when the sample area was too large to be observed from one point. In this case, the number of boats or anglers passing the observation point during a 45-minute period was used to determine the number of fishermen in the entire sampling area. All counts of boat trailers, pier anglers, shore anglers, open-ice anglers, and ice shanties were instantaneous. However, both instant-

aneous and interval boat counts were made depending on the sampling area. The type and number of boating access points within the sample area determined the type of boat count used. Interval counts were used in cases where boat access to the open lake was limited to harbor areas where all boats exited through defined channels.

Most fishing effort counts were done from the ground by census workers at randomly selected times. Counts made from airplanes (instantaneous) of boats, pier, and shore anglers were used only when ground counts were not feasible, such as areas with many access points or restricted visibility. These areas were: Saginaw Bay, southern Lake Huron from Tawas to Port Huron, northern Lake Huron from St. Ignace to Potagannissing Bay, and western Lake Erie from Pointe Mouillee to the state line. Counts during the winter months at the three sites sampled on Saginaw Bay were made from the ground during 1989. Previous winter fishery effort counts (1987 and 1988) on Saginaw Bay were made via airplane.

Local flight service companies were contracted to make aerial counts. Five flights were made each week at randomly selected starting times—one each weekend day, and one on each of three randomly selected week days. All effort counts, whether accomplished from the ground or air, were recorded on count data forms by census clerks or contract pilots (Figure 6).

Seasonal workers were trained on-site by permanent fisheries technicians at the beginning of the field season. Count and interview data forms, completed by both the seasonal and permanent personnel, were reviewed every 2 weeks by a designated individual at each district or research station office. Throughout the field season, completed data forms were sent to the Charlevoix Great Lakes Research Station for computer entry. Data forms were further scrutinized at Charlevoix prior to data entry. The software used for data entry employed range checks on various data fields for each count or interview record that was keyed. In addition, a module of the creel catch estimate

software performed a final check of the data before the catch estimates were made.

Catch and effort estimates were made for each port or fishing area by month and species. Standard mathematical formulas for creel census (Ryckman 1981; Smith and Ryckman, in preparation) were used to calculate all estimates. Three measures of fishing effort were calculated: angler hours, angler trips, and angler days. An angler trip is one completed fishing excursion. An angler day is composed of one or more fishing excursions during a 24-hour period.

Statistical significance in the analysis comparing lake-wide or port estimates between years is based on two standard error limits. Information from the previous year is contained in Rakoczy and Rogers (1988a,b) and reviewed in Keller et al. (1990).

Scientific and common names of fish species observed during this study are contained in Table 1. Detailed catch estimates by month, species, and sample area are contained in the appendices, Michigan Department of Natural Resources, Fisheries Technical Report 90-2b.

## Results

### *Lake Michigan*

Anglers spent an estimated 4,908,291 ( $\pm 339,323$ ) hours fishing the Michigan waters of Lake Michigan during the March 15 through November 15, 1988 open-water season (Table 2). The number of hours fished converts to an estimated 1,145,853 ( $\pm 82,520$ ) individual angler trips or 1,078,709 ( $\pm 81,414$ ) angler fishing days. Total angling effort by mode of fishing was 87% boat, 11% pier, and 2% shore.

Total angler effort in 1988 at ten major sample areas combined decreased by 24% compared to the same period in 1987 (Table 3). Total angler effort has decreased each year since 1986 at these sites. The greatest percentage (52%) decrease in angler effort in 1988 compared to 1987 occurred at Frankfort. Decreases in angler effort greater than 30% occurred at Grand Haven, Muskegon, and

Ludington. Angler effort increased in 1988 compared to 1987 at New Buffalo and St. Joseph. The port of Manistee had more angler activity than any other port in 1988, with an estimated 435,687 ( $\pm 102,153$ ) angler hours.

The average length of a fishing trip (all modes of fishing) was 4.3 hours. Anglers made approximately 1.1 fishing trips per day. These statistics were virtually unchanged compared to 1987. Boat trips were the longest in duration, averaging 4.8 hours. Pier and shore trips averaged 2.6 and 2.3 hours, respectively.

Fishermen caught an estimated 3,801,444 ( $\pm 565,188$ ) fish comprising 31 species during 1988 (Table 2). The bulk of this catch (90%) came from the boat fishery, while pier and shore anglers harvested 9% and 1% of the total catch, respectively (Tables 4-6).

The yellow perch was the most numerous species in the catch, making up 85% of all the fish harvested. An estimated 3,210,842 ( $\pm 563,326$ ) yellow perch were harvested by all modes of fishing (Table 2). During 1988, 15% of all Lake Michigan anglers interviewed said their target species was yellow perch. Fifty-two percent of the lake-wide yellow perch catch came from three of Lake Michigan's southernmost ports—New Buffalo, St. Joseph, and South Haven. The largest perch catch (618,933  $\pm 260,933$  fish) occurred at South Haven. The bulk of this harvest (97%) came from the boat fishery.

Lake-wide yellow perch catch rates have been increasing since 1985. The total catch rate for several important southern, central, and northern Lake Michigan perch fishing areas has increased over 100% from 0.295 ( $\pm 0.057$ ) fish per hour in 1985 to 0.669 ( $\pm 0.167$ ) in 1988 (Table 7). The greatest catch rate for perch during 1988 was 1.912 ( $\pm 0.959$ ) fish per angler hour at South Haven. Big Bay de Noc, New Buffalo, and St. Joseph anglers had yellow perch catch rates in excess of one fish per hour in 1988. The greatest decrease (91%) in catch rates for yellow perch in 1988 compared to 1987 occurred at West Grand Traverse Bay (Table 7).

Although yellow perch are important to the Lake Michigan sport fishery, most anglers

(66%) seek the various species of salmonids. The Lake Michigan salmonid catch, exclusive of lake whitefish, in the study area was estimated at 473,475 ( $\pm 42,262$ ) fish. The vast majority of the salmonid harvest (95%) came from the boat fishery (Table 4).

The salmonid catch was composed of 45% chinook salmon, 27% lake trout, 12% rainbow trout, 11% coho salmon, 5% brown trout, and less than 1% of other salmonids such as pink salmon, Atlantic salmon, brook trout, and splake. The species composition of the salmonid catch shifted in 1988 compared to 1987. Lake trout, rainbow trout, and brown trout increased by 9, 5, and 1 percentage points, respectively. Coho and chinook salmon decreased by 9 and 6 percentage points, respectively. The percent composition of lake trout and rainbow trout in the salmonid catch has increased in each of the past two seasons, while the percent composition of chinook salmon has decreased.

The total 1988 salmonid harvest at nine important Lake Michigan fishing areas combined decreased by 64% and 46% compared to 1986 and 1987, respectively (Table 8). The decrease in the total salmonid catch was caused by both a decrease in total angler effort and lower catch rates for chinook and coho salmon. Angler effort in 1988 for these areas decreased by 1.8 million hours (41%) compared to 1986. Catch rates for all salmonids combined decreased from 0.157 ( $\pm 0.028$ ) fish per hour in 1986 to 0.097 ( $\pm 0.014$ ) in 1988. The greatest decline in catch rates (56%) for any one species of salmonid during this same period occurred for chinook salmon (Table 8).

Chinook salmon is the most important salmonid in the Lake Michigan sport fishery in terms of numbers and weight of fish harvested. An estimated 212,715 ( $\pm 33,156$ ) chinooks were creel by anglers during 1988 (Table 2). Biological data collected from the Lake Michigan sport catch during 1988 indicated that the mean size of a chinook in the catch was 29.31 ( $\pm 0.35$ ) inches or 10.66 ( $\pm 0.32$ ) pounds. Based on these data, fishermen harvested approximately 2.3 million pounds of chinook from the Lake Michigan ports which were sampled during 1988. The harvest of

chinook in 1988 at nine important salmonid ports decreased by 74% and 59% in numbers of fish compared to 1986 and 1987, respectively (Table 8). Catch rates for chinook at these nine areas combined declined from 0.091 ( $\pm 0.023$ ) fish per hour in 1986 to 0.040 ( $\pm 0.009$ ) in 1988. The decline in chinook catch rates over the past 2 years may have precipitated the decline in angler effort at many Lake Michigan ports.

The largest catch of chinook (30,382  $\pm$  14,516 fish) came from the port of Ludington. The 1988 chinook harvest at Ludington decreased by 77% and 63% compared to 1986 and 1987, respectively.

Decreases in catch rates for chinook in 1988 compared to 1987 appeared to be the greatest in the area from Grand Haven to Frankfort (Table 9). Catch rates at New Buffalo, St. Joseph, and West Grand Traverse Bay were similar to 1987.

The decline over the past 2 years of the Lake Michigan chinook fishery has been attributed to one or more of the following: failure of one or more chinook year classes, changes in the forage base, bacterial kidney disease, indiscriminate losses to gill-net fisheries, and entrainment and impingement losses to power plants (Keller et al. 1990).

The lake trout was the second most abundant salmonid in the sport catch. An estimated 125,703 ( $\pm 18,084$ ) were harvested from all the ports sampled in 1988. Data collected from the sport fishery during 1988 indicated that creel lake trout averaged 24.52 ( $\pm 0.22$ ) inches in length and weighed 5.49 ( $\pm 0.15$ ) pounds. Therefore, anglers harvested over 690,000 pounds of lake trout from the ports which were sampled in 1988. Of all the fishing areas sampled, the largest estimated lake trout catch (13,580  $\pm$  8,274 fish) occurred at Saugatuck. The total catch of lake trout at nine important salmonid fishing areas has decreased from 113,802 ( $\pm 44,425$ ) in 1986 to 68,192 ( $\pm 12,594$ ) in 1988 (Table 8). The decline in catch can be attributed to the decline in total angler effort in these areas since 1986. Catch rates have remained stable since 1985, ranging from 0.021 ( $\pm 0.004$ ) to 0.026 ( $\pm 0.005$ ) fish per hour.

The greatest catch rates for lake trout in 1988 were noted in the Charlevoix ( $0.142 \pm 0.052$ ) and West Grand Traverse Bay ( $0.078 \pm 0.019$ ) areas (Table 9). Catch rates alone however, can be a misleading indicator of species abundance. In southern and central Lake Michigan, anglers tend to fish for chinook salmon, usually with downriggers. Lures are fished a substantial distance above the bottom. Because salmon are a mid-water species, while lake trout are usually associated with the bottom, a large percentage of the lake trout catch in these areas is taken incidental to salmon fishing. In Grand Traverse Bay and the Charlevoix area, anglers spend a good portion of the season (May and June) seeking lake trout with lures fished at or very near the bottom because salmon normally do not enter the area in large numbers until July. This is the main reason why catch rates for lake trout are higher in some of the northern ports than in the south and central portion of the lake.

Rainbow trout was the third most numerous salmonid in the sport catch. An estimated 58,355 ( $\pm 11,142$ ) were harvested from all ports sampled during 1988. Sixty-two percent of this harvest was taken during June, July, and August in the offshore boat fishery, compared to 1987 when 68% of the harvest came during September and October from the pier and shore fishery (Keller et al. 1990). Mean size of rainbow in the Lake Michigan sport catch during 1988 was 26.80 ( $\pm 0.28$ ) inches or 7.25 ( $\pm 0.19$ ) pounds. Catch, and catch rates for rainbow have increased slightly since 1986 despite the decline in angler effort at the nine salmonid ports (Table 8). The greatest catch ( $10,155 \pm 4,940$ ) and catch rate ( $0.047 \pm 0.028$ ) for rainbow in 1988 occurred at Manistee and Portage Lake, respectively.

The estimated harvest of coho salmon in 1988 was 52,745 ( $\pm 14,307$ ) fish (Table 2). The average coho harvested was 22.12 ( $\pm 0.45$ ) inches in length and weighed 4.10 ( $\pm 0.24$ ) pounds. The catch of coho at nine ports combined declined significantly in 1988 by 58% compared to 1987 (Table 8). Catch rates at these areas combined were 0.014 ( $\pm 0.005$ ) fish per hour in 1988 compared to 0.025 ( $\pm 0.006$ ) in 1987. The greatest catch (13,990

$\pm 10,825$ ) and catch rate ( $0.052 \pm 0.043$ ) for coho occurred at New Buffalo. Eighty percent of the New Buffalo coho harvest was taken during April.

A total of 22,896 ( $\pm 5,526$ ) brown trout, with an average size of 20.00 ( $\pm 0.39$ ) inches or 5.08 ( $\pm 0.32$ ) pounds, was estimated to have been caught by Lake Michigan anglers in 1988 (Table 2). The brown trout catch or catch rate did not significantly change between 1988 and 1987 (Table 8). The greatest catch ( $8,554 \pm 4,399$  fish) and catch rate ( $0.019 \pm 0.011$ ) for brown trout in 1988 occurred at Manistee. As has been the case in recent years (Rakoczy and Rogers 1988a,b) a large percentage (45%) of the brown trout catch has been taken during April and May at the central Lake Michigan ports of Ludington, Manistee, and Frankfort.

#### *Lake Huron*

The 1988 intensive survey of the Michigan waters of Lake Huron revealed that anglers spent an estimated 3,343,721 ( $\pm 217,398$ ) hours fishing during the open-water season, April through October (Table 10). An estimated 769,405 ( $\pm 48,652$ ) individual angler trips were made during the season or 666,145 ( $\pm 43,942$ ) angler days. Compared to 1987, total angler effort (April through September) decreased 14%.

Angler effort by mode of fishing was 94% boat, 3% shore, and 3% pier. The waters of Saginaw Bay had the greatest concentration of fishing effort (43%) on Lake Huron. Anglers spent an estimated 1,428,189 ( $\pm 155,718$ ) hours, 330,618 ( $\pm 34,876$ ) trips, or 300,543 ( $\pm 32,670$ ) days fishing Saginaw Bay from Port Austin to Tawas (Table 11). Total angler effort on Saginaw Bay in 1988 decreased by 22% compared to 1987 (Table 12). Within Saginaw Bay, the area from Saganing Creek to Au Gres had the greatest amount of fishing effort ( $321,858 \pm 81,675$  angler hours). Areas outside of Saginaw Bay which had significant amounts of angler activity were Eagle Bay to Harbor Beach, Oscoda, and Drummond Island to De Tour (Table 12).



The average length of a Lake Huron fishing trip (all modes of fishing) was 4.3 hours in 1988, as compared to 3.9 hours in 1987. During 1988 anglers made approximately 1.2 fishing trips per day. Boat trips were the longest in duration, averaging 4.5 hours. Pier and shore trips averaged 2.6 hours.

Lake Huron fishermen harvested an estimated 2,154,888 ( $\pm 289,944$ ) fish comprising 33 species during 1988 (Table 10). Ninety-four percent of the catch (2,017,494  $\pm$  285,201 fish) came from the boat fishery (Table 13). Shore and pier anglers combined only accounted for 6% of the total harvest (Tables 14 and 15).

During 1988, 20% of all anglers interviewed responded that their target species was yellow perch, 11% were fishing for walleye, and 48% were seeking various species of salmonids. On Saginaw Bay, 43% of all anglers interviewed responded that they were fishing for yellow perch while 21% were fishing for walleye.

Yellow perch dominated the catch in Lake Huron, making up 70% of all fish harvested. An estimated 1,510,522 ( $\pm 250,316$ ) yellow perch were caught by all modes of fishing (Table 10). The 1988 yellow perch harvest at Saginaw Bay, Drummond Island, and the Les Cheneaux Islands combined decreased 47% compared to 1987 (Table 16). The greatest decline in terms of numbers of fish occurred at Saginaw Bay, where the yellow perch catch decreased 49% compared to 1987. The lower yellow perch harvest in 1988 compared to 1987 was caused by both a decrease (20%) in total angler effort and reduced (33%) catch rates at these areas (Table 16). The mean size of yellow perch in the Lake Huron sport catch was 8.59 ( $\pm 0.06$ ) inches.

The combined catch rate for yellow perch during the 1988 open-water season for these three major Lake Huron perch fishing areas was 0.754 ( $\pm 0.147$ ) fish per hour compared to 1.129 ( $\pm 0.158$ ) in 1987. Although yellow perch catch rates also declined on Saginaw Bay from 1.276 ( $\pm 0.189$ ) to 0.828 ( $\pm 0.191$ ) fish per hour during the same time period, the 1988 rate was virtually unchanged compared to

1986 (Table 16). Saginaw Bay anglers in the Au Gres area had the greatest catch rate for yellow perch (1.940  $\pm$  0.839) of all the Lake Huron sample areas in 1988.

The walleye is becoming an important species to the Lake Huron sport fishery. An estimated 138,030 ( $\pm 26,367$ ) walleye were harvested in 1988 (Table 10). The walleye harvest in 1988 was unchanged compared to 1987. The average size of walleye creel by Lake Huron anglers in 1988 was 18.79 ( $\pm 0.26$ ) inches or 2.44 ( $\pm 0.12$ ) pounds. Most of the walleye catch (73%) came from Saginaw Bay. The Saginaw Bay walleye catch (100,129  $\pm$  25,077) increased by 58% compared to 1987 (Table 11). Saginaw Bay anglers in the area from the mouth of the Saginaw River to Saganing Creek had the largest estimated catch (44,459  $\pm$  11,698 fish) of walleye. Good catches of walleye (greater than 10,000 fish) also occurred in the Au Gres, mouth of the Saginaw River to Essexville, and Sebewaing to Essexville sample areas. In addition to Saginaw Bay, a substantial catch of walleye (26,014  $\pm$  6,719) was estimated for the Port Huron area. The majority of these fish were taken in the upper St. Clair River.

Catch rates for walleye on Lake Huron have been increasing since 1986 when the rate was 0.027 ( $\pm 0.007$ ) fish per hour compared to 0.041 ( $\pm 0.008$ ) during 1988. The walleye catch rate in Saginaw Bay has also been increasing since 1986. The 1988 rate of 0.070 ( $\pm 0.019$ ) fish per hour was two times greater than the rate estimated for 1986 and over 20 times greater than the catch rate for the 1983 season (Ryckman 1986).

Several species of salmonids are an important part of the Lake Huron sport fishery. An estimated 182,070 ( $\pm 38,582$ ) salmonids were caught by anglers during 1988 which was virtually unchanged compared to 1987. The salmonid catch was composed of 58% chinook salmon, 34% lake trout, 4% coho salmon, 2% brown trout, 2% rainbow trout, and less than 1% of other salmonids such as Atlantic salmon, pink salmon, brook trout, and splake. Ninety-six percent of the salmonids harvested came from the boat fishery.

An estimated 105,406 ( $\pm 13,190$ ) chinook salmon were caught by anglers during 1988 (Table 10). This estimated harvest was not significantly different than 1987. Anglers fishing the port of Rogers City had the greatest estimated catch of chinook (15,820  $\pm$  2,969) (Table 17). The mean size of chinook in the 1988 sport catch was 30.41 ( $\pm 0.45$ ) inches or 11.95 ( $\pm 0.44$ ) pounds. Unlike 1987, the 1988 chinook harvest was fairly evenly distributed across Lake Huron with 30%, 21%, and 24% of the catch coming from southern, (Port Austin to Lexington), central (Oscoda and Harrisville) and northern (Rogers City and Rockport) sample areas, respectively (Table 17). During 1987, southern Lake Huron anglers experienced a poor spring fishery which reduced their share of the catch (Rakoczy and Rogers 1988a,b).

The chinook catch rate in 1988 at seven important salmonid ports was 0.053 ( $\pm 0.006$ ) fish per angler hour and was not significantly different than 1987 (Table 17). Anglers in the Rockport and Rogers City areas had the greatest catch rates for chinook, 0.134 ( $\pm 0.025$ ) and 0.103 ( $\pm 0.022$ ) fish per hour, respectively. The Lexington to Port Sanilac area had the greatest increase in catch rates (160%) for chinook compared to 1987. As was mentioned earlier, southern Lake Huron anglers experienced a poor spring fishery in 1987. Chinook catch rates in this area during 1988 returned to levels similar to those estimated for 1986 (Table 17).

Lake trout were the second most abundant salmonid in the 1988 Lake Huron sport catch, with an estimated harvest of 62,401 ( $\pm 35,837$ ) fish (Table 10). The mean size of lake trout harvested by anglers in 1988 was 23.31 ( $\pm 0.46$ ) inches or 5.22 ( $\pm 0.32$ ) pounds. The largest catch of lake trout (32,600  $\pm$  35,343 fish) occurred at Oscoda (Table 18). The catch and catch rate estimates for lake trout at Oscoda in 1988 are thought to be biased upward due to a higher than average ratio of charter boat to launched boat angler party interviews collected during June. When Oscoda data are excluded, the lake trout catch at three other major fishing areas combined indicates that the 1988 harvest declined by 26% (Table 18).

The seasonal (May through August) catch rate for all areas combined was 0.073 ( $\pm 0.152$ ) lake trout per hour in 1988 compared to 0.053 ( $\pm 0.010$ ) in 1987 (Table 18). Anglers in the Oscoda area had the highest Lake Huron catch rate (0.140  $\pm$  0.152 fish per hour) for lake trout.

An estimated 7,158 ( $\pm 5,271$ ) coho salmon with a mean size of 22.60 ( $\pm 0.63$ ) inches or 4.67 ( $\pm 0.41$ ) pounds were harvested by Lake Huron anglers. Although over 500,000 coho are annually stocked in Lake Huron by the MDNR they have never played a major role in the Lake Huron sport fishery.

The total catch of brown and rainbow trout for all areas sampled in 1988 was estimated at 3,499 ( $\pm 1,189$ ) and 2,910 ( $\pm 888$ ) fish, respectively. The harvest of both these species during 1988 declined significantly compared to 1987 by 58% and 54%, respectively. Brown trout averaged 20.10 ( $\pm 0.71$ ) inches or 4.60 ( $\pm 0.55$ ) pounds and rainbow averaged 23.85 ( $\pm 0.98$ ) inches or 5.48 ( $\pm 0.43$ ) pounds.

In addition to perch, walleye, and salmonids, it was estimated that 117,508 ( $\pm 115,049$ ) rock bass, and 49,390 ( $\pm 51,744$ ) channel catfish were harvested by Lake Huron anglers (Table 10). The channel catfish catch probably is underestimated due to the fact that most fishing for this species occurs throughout the night. Data collection was ended for the day about 1 hour after dark.

### *Lake Erie*

Approximately 30 miles of Lake Erie shoreline, from Pointe Mouillee to the Michigan-Ohio state line, were surveyed from April 15 through September, 1988. Anglers spent an estimated 4,362,452 ( $\pm 702,522$ ) hours fishing from boats in the census area (Table 19). A total of 786,560 ( $\pm 128,899$ ) angler trips or 782,962 ( $\pm 128,233$ ) angler days were spent in the area. Total angler effort increased by 84% in 1988 compared to 1987. Angler effort was fairly evenly distributed between the north and south halves of the census area. Forty-eight percent (2,099,161  $\pm$  483,531) of the estimated angler hours

occurred in the north sample area, Pointe Mouillee to the mouth of the Raisin River. The south half, which encompassed the area from the mouth of the Raisin River to the Michigan-Ohio state line, received 52% (2,263,291  $\pm$  509,642) of the angler hours.

The average length of a boat fishing trip on Lake Erie was 5.5 hours. The average angler made 1.0 trips per day.

Boat fishermen harvested an estimated 2,873,797 ( $\pm$ 481,635) fish comprising 14 species (Table 19). Eighty-seven percent of all Lake Erie anglers interviewed responded that they were fishing for walleye. Walleye made up 69% of the total catch with an estimated harvest of 1,996,824 ( $\pm$ 419,055) fish. The mean size of walleye in the catch was 16.61 ( $\pm$ 0.28) inches or 1.59 ( $\pm$ 0.10) pounds. Sixty-six percent of the catch came from the south half of the census area. The walleye harvest in 1988 increased significantly (121%) compared to 1987. The majority of the 1988 walleye catch (66%) was taken during June and July. The catch rate for walleye in 1988 was 0.458 ( $\pm$ 0.121) fish per hour compared to 0.381 ( $\pm$ 0.077) in 1987. As has been the case in previous years (1986-87), the southern sample area had the greatest walleye catch rate.

Lake Erie anglers harvested an estimated 318,786 ( $\pm$ 205,749) yellow perch during 1988, virtually unchanged compared to the same period in 1987. During 1987 nearly 50% of the total yellow perch harvest (April through October) was taken during October (Rakoczy and Rogers 1988a). Therefore, a large percentage of the 1988 yellow perch harvest was probably missed due to termination of the survey in September.

The seasonal catch rate for yellow perch in 1988 was 0.073 ( $\pm$ 0.049) fish per angler hour compared to 0.131 ( $\pm$ 0.062) in 1987.

In addition to yellow perch and walleye, an estimated 239,244 ( $\pm$ 74,658) white bass and 192,958 ( $\pm$ 82,055) channel catfish were harvested by Lake Erie anglers. The white bass harvest in 1988 was 56% greater than the estimate for 1987. Since 1986, the white bass harvest has increased over 200%, while catch rates have increased by 49%. The channel catfish harvest in 1988 also increased (189%)

compared to the previous year. Catch rates for channel catfish in 1988 were not significantly higher than 1987. As was the case with Lake Huron, the channel catfish catch is probably underestimated due to the fact that most fishing for this species occurs throughout the night.

### *Lake Superior*

Anglers spent an estimated 179,457 ( $\pm$ 8,485) hours fishing the census areas on western and central Lake Superior (Table 20). This translates to 46,113 ( $\pm$ 2,414) individual angler trips, or 43,409 ( $\pm$ 2,308) angler days. Marquette had the greatest amount of angler activity of all the Lake Superior sample areas, accounting for 37% of the total effort. The average length of a fishing trip (all modes of fishing) was 3.9 hours and anglers made 1.1 fishing trips per day.

Lake Superior anglers harvested an estimated 47,705 ( $\pm$ 4,744) fish comprising 18 species (Table 20). Most anglers (59%) interviewed on Lake Superior said they were fishing for the various species of salmonids. Two species of salmonids, lake trout and coho salmon, made up 91% of the catch. The species composition of the salmonid catch (excluding lake whitefish) was 62% lake trout, 29% coho salmon, 3% chinook salmon, 3% rainbow trout, 2% splake, and less than 1% each of brown trout, brook trout, and Atlantic salmon.

The lake trout catch for all sample areas was estimated at 22,461 ( $\pm$ 2,489) fish. Lake trout averaged 21.73 ( $\pm$ 0.22) inches and 3.49 ( $\pm$ 0.18) pounds. The lake trout harvest was fairly evenly distributed across most of the sample areas ranging from 2,569 ( $\pm$ 930) fish at Munising to 5,221 ( $\pm$ 1,041) at Marquette. The lake-wide catch rate for lake trout was 0.125 ( $\pm$ 0.015) fish per angler hour and was not significantly different from the catch rate for 1987. The greatest catch rate (0.264  $\pm$  0.101 fish per hour) for lake trout occurred at the Huron Bay sample area.

Lake Superior anglers also caught an estimated 10,557 ( $\pm$ 1,768) coho salmon and 934 ( $\pm$ 327) chinook salmon. The largest catch

of coho ( $5,584 \pm 1,460$  fish) and chinook ( $431 \pm 258$ ) occurred at Marquette. Lake-wide catch rates for coho and chinook were 0.059 ( $\pm 0.010$ ) and 0.005 ( $\pm 0.002$ ) fish per hour, respectively. In general, catch rates for coho were up at most Lake Superior sample areas during 1988 compared to 1987, while chinook catch rates were down.

### *River Fisheries*

Several Lake Michigan tributary streams were sampled during the spring and fall anadromous fish runs. The St. Joseph River was sampled throughout the entire season (March through December). Anglers spent an estimated 469,608 ( $\pm 17,248$ ) hours fishing the St. Joseph, Kalamazoo, Grand, Muskegon, Betsie, Platte, and Bear rivers (Table 21). The greatest amount of angler activity occurred on the St. Joseph River; where 255,902 ( $\pm 14,070$ ) angler hours were spent from March 15 through December 10, 1988. The average length of a fishing trip on all the Lake Michigan tributaries combined was 4.5 hours. Anglers made an average of 1.1 fishing trips per day. Compared to 1987, angler effort during 1988 decreased significantly at the St. Joseph, Kalamazoo, Grand, and Muskegon rivers. Angler effort did not significantly change at the Betsie or Bear rivers. The Platte River was closed to fishing during the fall of 1988, therefore no comparison can be made with 1987.

A total of 35,458 ( $\pm 4,084$ ) chinook and coho salmon, rainbow and brown trout were harvested on these seven rivers. Rainbow trout were the most abundant salmonid in the catch ( $25,279 \pm 3,203$ ) (Table 21). The total rainbow harvest was virtually unchanged compared to 1987. The largest catch of rainbow ( $13,030 \pm 1,939$  fish) occurred at the St. Joseph River. During 1987, chinook salmon were the most abundant salmonid in the catch (Rakoczy and Rogers 1988a). The 1988 chinook harvest at these seven rivers decreased by 65% compared to 1987. Anglers on the St. Joseph River also had the largest estimated catch of chinook ( $3,393 \pm 939$ ) in 1988.

Coho salmon and brown trout were relatively unimportant in most river fisheries. The total coho catch was estimated at 561 ( $\pm 604$ ) fish while the brown trout harvest was 704 ( $\pm 771$ ).

Three Lake Huron tributary streams, the Au Sable, Saginaw, and Tittabawassee rivers were surveyed during 1988. The Au Sable and Saginaw rivers were surveyed throughout the entire fishing season (April through September) while the Tittabawassee River was censused only during the spring walleye fishery (May and June).

Anglers spent an estimated 109,303 ( $\pm 4,794$ ) hours fishing the Au Sable River from Foote Dam to Oscoda. Angler effort in 1988 decreased significantly (14%) compared to 1987. Channel catfish were the most abundant species in the catch, with an estimated 8,779 ( $\pm 3,356$ ) fish harvested. This figure is probably low since sampling was directed toward the daylight hours. Anglers also caught an estimated 3,403 ( $\pm 2,430$ ) chinook salmon and 2,790 ( $\pm 625$ ) rainbow trout. Compared to 1987, the harvest of chinook salmon was unchanged and rainbow decreased by 28%. However, the 1988 rainbow harvest was over 100% greater than the 1986 figure.

The lower Saginaw River catch was composed of warmwater fish species. Anglers spent an estimated 160,051 ( $\pm 77,768$ ) hours to harvest 9,438 ( $\pm 5,457$ ) fish. Sixty-seven percent of the catch were walleye. The Tittabawassee River, which is a tributary of the Saginaw River, supported an estimated 127,148 ( $\pm 50,138$ ) angler hours during the May-June sampling period. The harvest consisted mainly of walleye ( $31,363 \pm 17,084$ ).

### *Winter Ice Fisheries*

Catch and sportfishing effort were sampled at various areas on lakes Superior, Michigan, and Huron during the winter months of 1989.

Keweenaw Bay and Huron Bay were surveyed on Lake Superior. Keweenaw Bay had the greatest amount of angler activity ( $82,713 \pm 19,380$  angler hours). Lake trout

was the dominate species in the Keweenaw Bay fishery. Angler effort was not significantly different than 1988, but the 1989 harvest of 26,446 ( $\pm 13,705$ ) lake trout was over 200% greater than 1988. The catch rate for lake trout in Keweenaw Bay was 0.320 ( $\pm 0.182$ ) fish per hour compared to 0.114 ( $\pm 0.035$ ) in 1988.

Lake whitefish was the major species (778  $\pm$  490) caught by ice anglers on Huron Bay. The 1989 lake whitefish catch and angler effort on Huron Bay increased compared 1988 due to the poor ice conditions during 1988 which limited access to this fishery.

Areas censused on Lake Michigan included Big Bay de Noc, Little Bay de Noc, and Grand Traverse Bay. Yellow perch were the most abundant species in the catch from Big and Little bays de Noc. Anglers on Little Bay de Noc had both the greatest estimated catch of yellow perch (87,083  $\pm$  25,187 fish) and fishing effort (182,963  $\pm$  21,823 angler hours). Angler effort increased (38%) significantly on Little Bay de Noc in 1989 compared to 1988. The yellow perch harvest did not change significantly. In addition to perch, 6,062 ( $\pm 3,048$ ) walleye were harvested by anglers on Little Bay de Noc. The 1989 walleye harvest was 49% less than the previous year. In 1988, most of the walleye (67%) were caught March 1-15 (Rakoczy and Rogers 1988a,b). During 1989, the walleye season was closed at the end of February in this area in order to protect spawning fish.

Yellow perch catch and effort on Big Bay de Noc were estimated at 11,541 ( $\pm 4,558$ ) fish and 13,357 ( $\pm 2,362$ ) angler hours, respectively. As has been the case in previous years, catch rates for yellow perch (0.864  $\pm$  0.374 fish per hour) were greater on Big Bay de Noc than Little Bay de Noc (0.476  $\pm$  149). The average length of an ice fishing trip on these waters of Lake Michigan was 3.4 hours. Anglers made an average of 1.1 ice fishing trips per day.

Anglers on the East Arm and West Arm of Grand Traverse Bay spent 41,888 ( $\pm 16,050$ ) hours fishing during the month of March. Lake whitefish were the most abundant species with an estimated harvest of 6,071 ( $\pm 3,514$ ) fish. Fifty-nine percent of the lake whitefish were harvested in the East Arm. In

addition to whitefish, 1,503 ( $\pm 3,151$ ) yellow perch were harvested. The yellow perch catch was probably underestimated due to the late start of the survey during the winter of 1989. The yellow perch fishery in the West Arm of Grand Traverse Bay commenced 2 to 3 weeks prior to the start of creel census (Steve Lazar, MDNR, personal communication).

The Saginaw Bay ice fishery is the largest and most important ice fishery, in terms of catch and effort, on Michigan's waters of the Great Lakes (Rakoczy and Rogers 1988a,b). During previous years (1987 and 1988) the entire Saginaw Bay ice fishery from Tawas to Port Austin was surveyed. Due to a shortfall in funding during 1989, only three areas of Saginaw Bay could be surveyed—Sebewaing to Sand Point, Pinconning, and Au Gres. Results from the 1987 and 1988 surveys indicated that these areas accounted for the majority of catch and effort on the Bay.

Anglers at these three areas of Saginaw Bay combined spent an estimated 229,428 ( $\pm 45,112$ ) hours fishing during January through March (Table 22). The harvest included an estimated 356,519 ( $\pm 90,643$ ) yellow perch and 19,024 ( $\pm 11,711$ ) walleye. Total angler effort in 1989 increased by 76% compared to 1988. The yellow perch and walleye harvests also increased compared to 1988 by 28% and 300%, respectively, although these increases were not significant. Most of the yellow perch harvest (42%) came from the Sebewaing to Sand Point area while the vast majority of the walleye catch (90%) was taken at Pinconning. The average length of an ice fishing trip on Saginaw Bay was 3.8 hours and anglers made 1.1 trips per day.

As was mentioned in the methods section, fishing effort counts were conducted from the ground during 1989 as compared to the air surveys used during 1987 and 1988. In 1989, creel census personnel believed that angler effort estimates may be biased (lower) due to the widespread nature of angling effort and their inability to count all open ice fishermen (Raymond Shepherd, MDNR, personal communication). Since the catch estimates are derived from both the count and interview data they may also be biased downward.

Catch rates for yellow perch ( $1.554 \pm 0.500$ ) decreased (28%) while catch rates for walleye ( $0.083 \pm 0.054$ ) increased (132%) in 1989 compared to 1988 at these Saginaw Bay areas combined. However, neither of these changes were statistically significant.

### Summary

During the 1988 license year anglers spent an estimated 13,351,244 ( $\pm 811,889$ ) angler hours in the areas of Michigan's waters of the Great Lakes that were surveyed. This accounted for an estimated 2,912,761 ( $\pm 161,832$ ) individual fishing trips and 2,721,995 ( $\pm 159,297$ ) angler days. Thirty-eight percent of the total angler hours during the open-water season were spent on Lake Michigan while 34% and 26% were spent on lakes Erie and Huron, respectively. Manistee was the busiest port in terms of angler hours on Lake Michigan. The area from the mouth of the Raisin River to the Michigan-Ohio state line was found to be the most heavily fished sample area on Lake Erie, and Saginaw Bay was the most intensely fished area of Lake Huron.

Total catch was estimated to be over 9.4 million fish. Yellow perch were the most abundant species in the sport catch in most sample areas. The yellow perch catch for all areas surveyed was estimated at 5,509,399 ( $\pm 656,758$ ) fish. Fifty-eight percent of the total yellow perch harvest came from Lake Michigan, while 34% came from Saginaw Bay, Lake Huron.

In addition to yellow perch, sport anglers harvested an estimated 2,181,168 ( $\pm 420,148$ ) walleye, 331,924 ( $\pm 35,858$ ) chinook salmon, 237,208 ( $\pm 42,490$ ) lake trout, 91,962 ( $\pm 12,073$ ) rainbow trout, 71,341 ( $\pm 15,375$ ) coho salmon, and 28,030 ( $\pm 5,766$ ) brown trout. Sixty-seven percent of all salmonids harvested by anglers in the areas surveyed came from Lake Michigan. The salmonid catch in Lake Michigan was composed of 45% chinook salmon, 27% lake trout, 12% rainbow trout, 11% coho salmon, and 5% brown trout. The total salmonid catch at nine important Lake Michigan fishing areas combined in 1988 decreased by 46% compared to 1987. The decrease in the total salmonid catch was caused by both a decrease in total angler effort and lower catch rates for chinook and coho salmon.

### Acknowledgments

The authors wish to thank the staffs of the fisheries districts and research stations which participated in the census program. These field units did the day to day work of angler interviews, fishing pressure counts, and supervision of seasonal workers. Paul Wei of the Management Information Division wrote the interview and count data entry programs. Evelyn Davis keyed the data. Special thanks to Kelley Smith, who wrote the computer programs for the calculation of the catch and effort estimates. Charles Pecor edited the manuscript. Figures were prepared by Alan Sutton.



Figure 1.—Lake Huron census area.

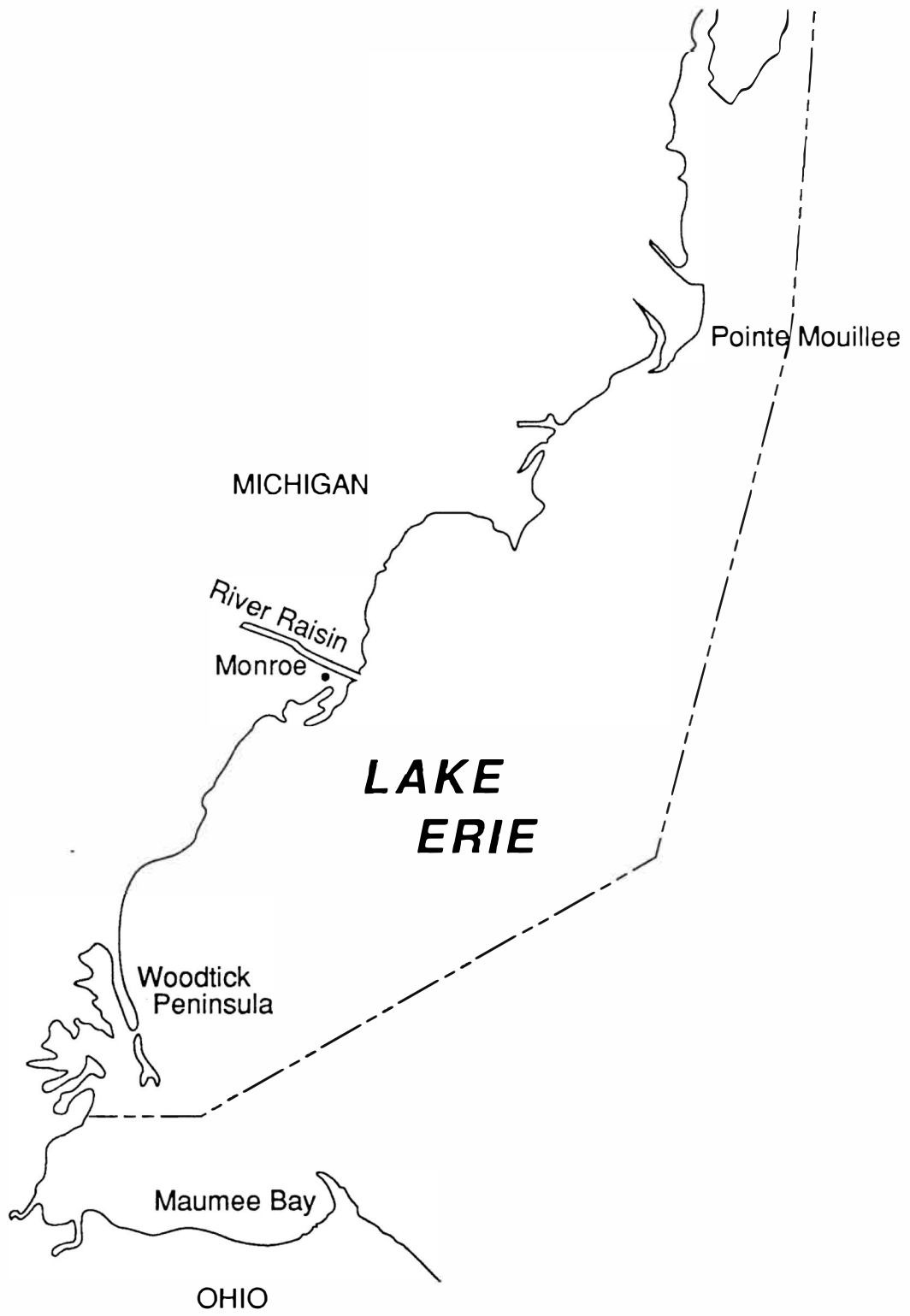


Figure 2.—Lake Erie census area.



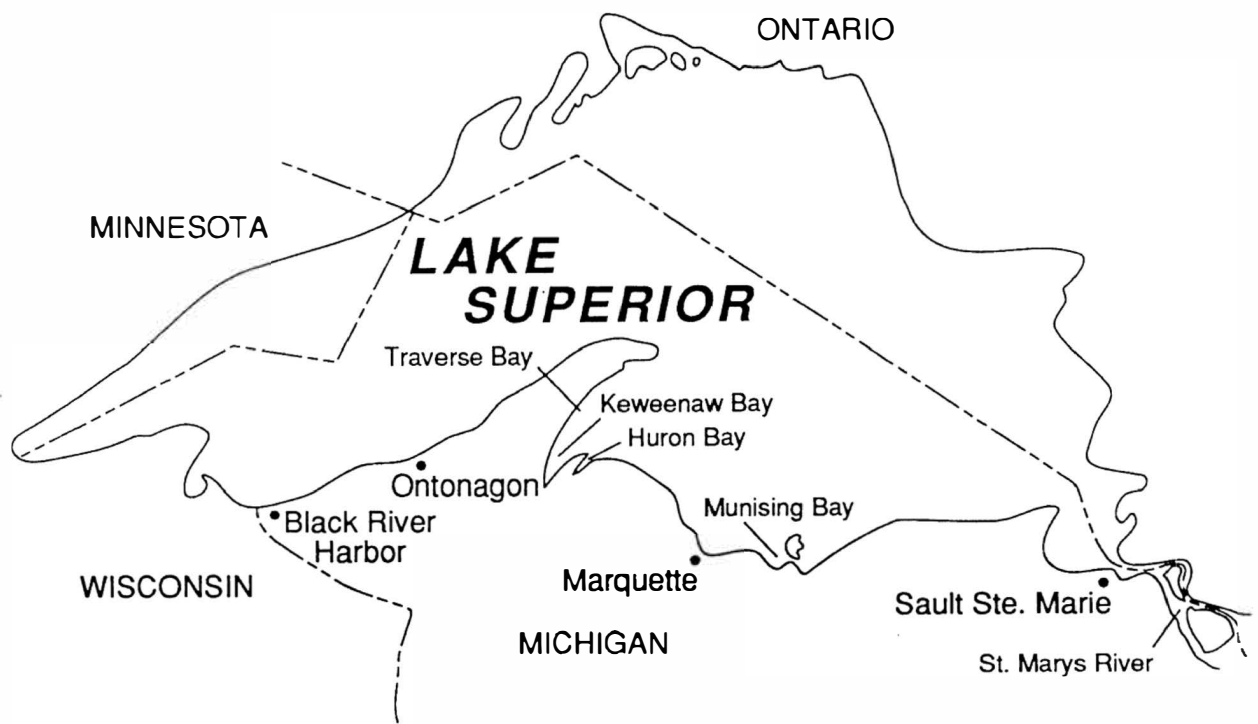


Figure 3.—Lake Superior census area.



Figure 4.—Lake Michigan census area.

# ANGLER PARTY INTERVIEW FORM

**LIBRARY**

Project #: \_\_\_\_\_

Unit: \_\_\_\_\_ Soc. Sec. #: \_\_\_\_\_ Date: \_\_\_\_\_ Seq. #: \_\_\_\_\_

Interview site: \_\_\_\_\_ Site name: \_\_\_\_\_  
Fishing site: \_\_\_\_\_ Site name: \_\_\_\_\_

Fishery type  
 6t Lk    Anad  
 In Lk    In St

Mode of fishing  
 Boat    Shore    Open ice  
 Charter    Non-f. shore    Non-f. open ice  
 Non-f. boat    Pier/dock    Shanty ice  
 Non-f. pier/dock

Start date: \_\_\_\_\_ Day of week: \_\_\_\_\_ End time: \_\_\_\_\_  
1 = Monday   5 = Friday   Start time: \_\_\_\_\_  
2 = Tuesday   6 = Saturday   Hrs fished: \_\_\_\_\_  
3 = Wednesday   7 = Sunday  
4 = Thursday   8 = Holiday   Comp. trip:  Y    N

Military hr: \_\_\_\_\_

Morning AM          Noon          Evening PM

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0  
1 2 3 4 5 6 7 8 9 10 11 12

Ang #	Sex	Age	Zip code	Residence (county/state)	Cnty code	Fishing methods								
						cast	stil	trol	fly	drif	spea	dip	snag	jig
1														
2														
3														
4														
5														
6														
7														
8														

Use this side or use this side, not both!  
Target sp.: \_\_\_\_\_  Anything    Salmon    Trout    Salmon & Trout    Walleye & Perch  
code: \_\_\_\_\_  Bass    Panfish    Bass & Bluegill    Pike & Bass    Pike & Perch

### Catch data

Code	Species	# kept	Code	Species	# kept	Code	Species	# kept
ATL	Atlantic salmon	_____	MUS	Muskellunge	_____	BUF	Buffalo (spp)	_____
BKT	Brook trout	_____	TMU	Tiger musky	_____	LNS	Longnose sucker	_____
BNT	Brown trout	_____	BCR	Black crappie	_____	QIL	Quillback	_____
CHS	Chinook salmon	_____	BLG	Bluegill	_____	RHS	Redhorse (spp)	_____
COH	Coho salmon	_____	GSF	Green sunfish	_____	CWS	White sucker	_____
LHR	Lake herring	_____	LMB	Largemouth bass	_____	BOW	Bowfin	_____
LAT	Lake trout	_____	LSF	Longear sunfish	_____	BUR	Burbot	_____
LWF	Lake whitefish	_____	OSF	Orange sunfish	_____	DRU	Freshwater drum	_____
PKS	Pink salmon	_____	PSF	Pumpkinseed	_____	GAR	Gar (spp)	_____
RBT	Rainbow trout	_____	RSF	Redear sunfish	_____	GZS	Gizzard Shad	_____
RWF	Round whitefish	_____	RKB	Rockbass	_____	MOO	Mooneye	_____
SPL	Splake	_____	SMB	Smallmouth bass	_____	STR	Sturgeon	_____
SMT	Rainbow smelt	_____	WAR	Warmouth	_____	OTH	Other	_____
SAU	Sauger	_____	WCR	White crappie	_____			_____
WAE	Walleye	_____	BLB	Black bullhead	_____			_____
YEP	Yellow perch	_____	BRB	Brown bullhead	_____			_____
WHB	White bass	_____	CCF	Channel catfish	_____			_____
WHP	White perch	_____	YLB	Yellow bullhead	_____			_____
NOP	Northern pike	_____	CAR	Carp	_____			_____

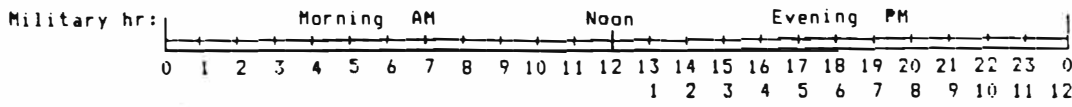
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Figure 5.—Angler party interview data sheet.

### COUNT FORM

Project #:        Unit:    Soc. Sec. #:       -      -       Seq. #:       

Site	Site name	Date	Wk day	Mo de	Durat Hour	Durat (min)	Count	Mo de	Durat Hour	Durat (min)	Count



Mode of fishing: 1 = Boat            6 = Shore            Day of week: 1 = Monday        5 = Friday  
 2 = Charter        8 = Pier/dock        2 = Tuesday        6 = Saturday  
 3 = Car            0 = Open ice        3 = Wednesday     7 = Sunday  
 4 = Trailer        8 = Shanty ice       4 = Thursday       8 = Holiday

Instantaneous count - record zero (0) for duration (Durat).  
 Interval count - record interval used in minutes for duration (Durat).

**Figure 6.—Shore and boat count data sheet.**

Table 1.—List of scientific and common names of fish observed in study.

Common name	Scientific name
Rainbow smelt	<i>Osmerus mordax</i>
Northern pike	<i>Esox lucius</i>
Black bullhead	<i>Ictalurus melas</i>
Yellow bullhead	<i>Ictalurus natalis</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
Channel catfish	<i>Ictalurus punctatus</i>
Burbot	<i>Lota lota</i>
White perch	<i>Morone americana</i>
White bass	<i>Morone chrysops</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Lake whitefish	<i>Coregonus clupeaformis</i>
Round whitefish	<i>Prosopium cylindraceum</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Pink salmon	<i>Oncorhynchus gorbuscha</i>
Rainbow trout	<i>Oncorhynchus mykiss</i> <sup>1</sup>
Atlantic salmon	<i>Salmo salar</i>
Brown trout	<i>Salmo trutta</i>
Brook trout	<i>Salvelinus fontinalis</i>
Lake trout	<i>Salvelinus namaycush</i>
Splake	<i>Salvelinus namaycush</i> x <i>S. fontinalis</i>
White sucker	<i>Catostomus commersoni</i>
Redhorse spp.	<i>Moxostoma</i> spp.
Rock bass	<i>Ambloplites rupestris</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Bluegill	<i>Lepomis macrochirus</i>
Longear sunfish	<i>Lepomis megalotis</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Largemouth bass	<i>Micropterus salmoides</i>
White crappie	<i>Pomoxis annularis</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Yellow perch	<i>Perca flavescens</i>
Walleye	<i>Stizostedion vitreum</i>

<sup>1</sup>Formerly *Salmo gairdneri*.

Table 2.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for Lake Michigan, by all modes of sportfishing, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Pink salmon	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	33 (70)	26 (64)	0 (0)	0 (0)	0 (0)	59 (95)
Coho salmon	0.0107 (0.0030)	727 (893)	17,923 (11,855)	3,897 (1,985)	1,807 (1,607)	4,980 (2,735)	12,032 (5,598)	10,084 (3,972)	1,261 (1,490)	34 (98)	52,745 (14,307)
Chinook salmon	0.0433 (0.0074)	0 (0)	3,071 (2,466)	40,558 (12,457)	20,190 (11,777)	60,009 (19,751)	67,092 (19,022)	20,773 (6,846)	932 (723)	90 (169)	212,715 (33,156)
Rainbow trout	0.0119 (0.0024)	6 (14)	2,309 (1,115)	4,928 (2,114)	6,750 (3,844)	23,329 (7,539)	5,821 (3,952)	7,531 (4,941)	6,548 (2,470)	1,133 (830)	58,355 (11,142)
Atlantic salmon	<0.0001 (<0.0001)	0 (0)	3 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (7)
Brown trout	0.0047 (0.0012)	90 (124)	10,475 (4,372)	3,886 (1,621)	1,942 (1,303)	3,737 (2,129)	1,636 (1,200)	871 (1,031)	259 (217)	0 (0)	22,896 (5,526)
Brook trout	0.0001 (0.0002)	0 (0)	201 (397)	0 (0)	0 (0)	0 (0)	0 (0)	67 (139)	0 (0)	0 (0)	268 (421)
Lake trout	0.0256 (0.0041)	0 (0)	85 (162)	26,672 (7,499)	33,390 (8,414)	46,793 (12,308)	18,737 (6,964)	26 (56)	0 (0)	0 (0)	125,703 (18,084)
Splake	0.0001 (0.0001)	0 (0)	557 (427)	174 (148)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	731 (452)
Rainbow smelt	0.0002 (0.0004)	0 (0)	0 (0)	89 (187)	0 (0)	0 (0)	1,112 (2,343)	0 (0)	0 (0)	0 (0)	1,201 (2,350)
Northern pike	0.0009 (0.0003)	0 (0)	2 (4)	932 (506)	870 (727)	620 (582)	672 (521)	1,075 (810)	44 (69)	0 (0)	4,215 (1,434)
White sucker	0.0001 (0.0001)	0 (0)	168 (274)	170 (358)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	338 (451)
Redhorse spp.	<0.0001 (<0.0001)	0 (0)	0 (0)	71 (143)	133 (308)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	204 (340)
Black bullhead	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	13 (25)	0 (0)	0 (0)	110 (225)	0 (0)	123 (226)
Brown bullhead	0.0001 (0.0001)	0 (0)	38 (75)	283 (270)	0 (0)	0 (0)	162 (245)	0 (0)	0 (0)	0 (0)	483 (372)
Channel catfish	0.0021 (0.0017)	0 (0)	0 (0)	425 (730)	2,731 (3,392)	6,629 (7,264)	299 (268)	48 (105)	65 (77)	0 (0)	10,197 (8,056)
White perch	0.0003 (0.0004)	0 (0)	0 (0)	0 (0)	758 (1,536)	559 (1,204)	0 (0)	173 (264)	0 (0)	0 (0)	1,490 (1,969)
White bass	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	81 (163)	0 (0)	0 (0)	0 (0)	81 (163)

Table 2.—Continued:

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Rock bass	0.0020 (0.0012)	0 (0)	230 (450)	1,234 (1,327)	3,243 (2,694)	836 (200)	3,425 (4,888)	722 (1,055)	0 (0)	0 (0)	9,690 (5,854)
Pumpkinseed	0.0002 (0.0002)	0 (0)	0 (0)	611 (707)	96 (154)	236 (489)	183 (332)	0 (0)	0 (0)	0 (0)	1,126 (934)
Bluegill	0.0004 (0.0005)	0 (0)	0 (0)	42 (66)	208 (468)	711 (1,457)	978 (1,980)	0 (0)	0 (0)	0 (0)	1,939 (2,503)
Smallmouth bass	0.0067 (0.0017)	0 (0)	10 (20)	5,594 (2,361)	7,883 (3,241)	14,031 (5,608)	3,367 (3,171)	1,184 (1,080)	912 (1,441)	0 (0)	32,981 (7,799)
Largemouth bass	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	247 (540)	0 (0)	52 (107)	30 (72)	0 (0)	0 (0)	329 (555)
White crappie	0.0001 (0.0001)	0 (0)	0 (0)	258 (372)	0 (0)	72 (143)	0 (0)	14 (29)	0 (0)	0 (0)	344 (400)
Black crappie	0.0006 (0.0004)	0 (0)	139 (224)	785 (940)	980 (1,234)	473 (965)	439 (661)	0 (0)	0 (0)	0 (0)	2,816 (1,956)
Yellow perch	0.6542 (0.1234)	0 (0)	175,593 (60,017)	199,143 (58,631)	378,482 (119,317)	1,609,878 (440,333)	668,485 (298,617)	91,529 (83,241)	81,590 (77,593)	6,142 (6,667)	3,210,842 (563,326)
Walleye	0.0053 (0.0019)	0 (0)	0 (0)	6,053 (4,613)	2,400 (1,075)	9,257 (6,950)	5,381 (2,726)	1,791 (1,816)	1,330 (1,719)	0 (0)	26,212 (9,188)
Freshwater drum	0.0007 (0.0008)	0 (0)	0 (0)	0 (0)	2,426 (3,891)	1,083 (1,388)	0 (0)	24 (53)	0 (0)	0 (0)	3,533 (4,131)
Lake whitefish	0.0030 (0.0010)	0 (0)	30 (60)	2,048 (2,671)	6,787 (3,489)	2,058 (1,643)	392 (838)	1,933 (1,020)	1,485 (1,196)	0 (0)	14,733 (5,018)
Round whitefish	0.0009 (0.0005)	0 (0)	0 (0)	250 (338)	275 (293)	384 (849)	0 (0)	0 (0)	2,928 (1,793)	355 (717)	4,192 (2,156)
Burbot	<0.0001 (<0.0001)	0 (0)	0 (0)	40 (66)	0 (0)	0 (0)	0 (0)	0 (0)	9 (19)	0 (0)	49 (69)
Other	0.0002 (0.0003)	0 (0)	0 (0)	40 (65)	196 (304)	500 (1,010)	14 (36)	46 (93)	55 (113)	0 (0)	851 (1,067)
<b>Total</b>	<b>0.7745 (0.1270)</b>	<b>823 (902)</b>	<b>210,834 (61,398)</b>	<b>298,183 (60,815)</b>	<b>471,794 (120,532)</b>	<b>1,786,221 (441,189)</b>	<b>790,386 (299,472)</b>	<b>137,921 (83,813)</b>	<b>97,528 (77,713)</b>	<b>7,754 (6,759)</b>	<b>3,801,444 (565,188)</b>
<b>Angler hours</b>		<b>1,908 (1,872)</b>	<b>272,657 (40,657)</b>	<b>662,550 (100,311)</b>	<b>727,177 (103,285)</b>	<b>1,546,448 (201,087)</b>	<b>1,043,193 (205,053)</b>	<b>509,846 (96,263)</b>	<b>136,344 (31,527)</b>	<b>8,168 (3,242)</b>	<b>4,908,291 (339,323)</b>
<b>Angler trips</b>		<b>532 (524)</b>	<b>70,975 (10,199)</b>	<b>139,095 (17,141)</b>	<b>169,423 (20,615)</b>	<b>378,104 (65,712)</b>	<b>223,133 (34,802)</b>	<b>123,730 (20,206)</b>	<b>38,867 (6,954)</b>	<b>1,994 (781)</b>	<b>1,145,853 (82,520)</b>
<b>Angler days</b>		<b>426 (422)</b>	<b>62,199 (9,361)</b>	<b>127,627 (16,393)</b>	<b>161,171 (20,205)</b>	<b>362,855 (65,470)</b>	<b>210,522 (33,649)</b>	<b>117,400 (19,941)</b>	<b>34,515 (6,824)</b>	<b>1,994 (781)</b>	<b>1,078,709 (81,414)</b>

Table 3.—Estimated angler effort (hours) at ten Lake Michigan sample areas, April through October, 1985-88. Two standard errors in parentheses.

Area	Year			
	1985	1986	1987	1988
New Buffalo	270,897 (45,486)	481,717 (151,319)	151,089 (92,752)	268,490 (72,843)
St. Joseph	834,003 (116,076)	607,060 (128,426)	369,500 (93,567)	424,635 (75,266)
Grand Haven	586,641 (66,939)	700,543 (152,499)	759,713 (145,251)	428,996 (121,822)
Muskegon	508,738 (114,646)	319,636 (53,425)	340,095 (73,750)	230,296 (58,704)
Ludington	714,442 (151,419)	833,763 (258,924)	614,485 (169,613)	376,995 (117,169)
Manistee	629,126 (96,422)	681,144 (141,842)	509,415 (125,973)	435,687 (102,153)
Frankfort	322,122 (49,044)	593,406 (192,736)	547,140 (193,979)	262,501 (58,305)
Grand Traverse Bay <sup>1</sup>	466,505 (26,749)	335,002 (24,912)	284,478 (22,721)	262,402 (17,127)
Charlevoix	155,168 (35,350)	100,014 (24,447)	90,043 (12,480)	62,287 <sup>3</sup> (12,761)
Little Bay de Noc <sup>2</sup>	158,157 (21,126)	239,073 (21,787)	154,421 (16,300)	157,723 (19,726)
Total	4,645,799 (264,969)	4,891,358 (437,609)	3,820,379 (356,508)	2,922,773 (240,138)

<sup>1</sup>Includes the East Arm, the West Arm, and the port of Elk Rapids.

<sup>2</sup>Includes the Ford River access site.

<sup>3</sup>May through September.



Table 4.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for Lake Michigan boat fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Pink salmon	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	33 (70)	26 (64)	0 (0)	0 (0)	0 (0)	59 (95)
Coho salmon	0.0111 (0.0034)	0 (0)	16,274 (11,804)	3,792 (1,978)	1,807 (1,607)	4,980 (2,735)	11,932 (5,596)	7,472 (3,681)	1,073 (1,477)	34 (98)	47,364 (14,155)
Chinook salmon	0.0481 (0.0086)	0 (0)	3,007 (2,464)	38,987 (12,391)	19,961 (11,774)	59,919 (19,750)	66,534 (19,015)	16,277 (6,548)	656 (705)	90 (169)	205,431 (33,065)
Rainbow trout	0.0117 (0.0027)	0 (0)	605 (696)	4,225 (2,085)	6,422 (3,823)	22,279 (7,514)	5,675 (3,947)	7,105 (4,926)	3,314 (2,288)	308 (626)	49,933 (11,017)
Brown trout	0.0044 (0.0013)	0 (0)	8,238 (4,103)	3,422 (1,603)	1,246 (1,158)	3,403 (2,088)	1,580 (1,195)	826 (1,027)	92 (121)	0 (0)	18,807 (5,254)
Brook trout	<0.0001 (<0.0001)	0 (0)	12 (17)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (17)
Lake trout	0.0293 (0.0048)	0 (0)	85 (162)	26,535 (7,498)	33,341 (8,414)	46,703 (12,307)	18,706 (6,963)	26 (56)	0 (0)	0 (0)	125,396 (18,083)
Splake	0.0002 (0.0001)	0 (0)	557 (427)	174 (148)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	731 (452)
Rainbow smelt	0.0003 (0.0006)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,112 (2,343)	0 (0)	0 (0)	0 (0)	1,112 (2,343)
Northern pike	0.0009 (0.0003)	0 (0)	2 (4)	932 (506)	740 (675)	543 (558)	653 (520)	907 (753)	31 (64)	0 (0)	3,808 (1,365)
White sucker	<0.0001 (<0.0001)	0 (0)	0 (0)	170 (358)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	170 (358)
Redhorse spp.	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	133 (308)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	133 (308)
Black bullhead	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	110 (225)	0 (0)	110 (225)
Brown bullhead	<0.0001 (<0.0001)	0 (0)	38 (75)	11 (23)	0 (0)	0 (0)	162 (245)	0 (0)	0 (0)	0 (0)	211 (257)
Channel catfish	0.0022 (0.0019)	0 (0)	0 (0)	408 (730)	2,720 (3,392)	6,220 (7,248)	149 (201)	0 (0)	18 (38)	0 (0)	9,515 (8,038)
White perch	0.0003 (0.0004)	0 (0)	0 (0)	0 (0)	758 (1,536)	559 (1,204)	0 (0)	173 (264)	0 (0)	0 (0)	1,490 (1,969)
Rock bass	0.0012 (0.0012)	0 (0)	0 (0)	1,028 (1,287)	881 (839)	0 (0)	3,316 (4,883)	61 (99)	0 (0)	0 (0)	5,286 (5,120)
Pumpkinseed	0.0001 (0.0001)	0 (0)	0 (0)	170 (358)	73 (147)	236 (489)	161 (329)	0 (0)	0 (0)	0 (0)	640 (705)
Bluegill	<0.0001 (<0.0001)	0 (0)	0 (0)	21 (42)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (42)

Table 4.—Continued:

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Smallmouth bass	0.0057 (0.0015)	0 (0)	0 (0)	5,554 (2,360)	7,009 (3,146)	6,638 (3,344)	3,041 (3,140)	1,184 (1,080)	912 (1,441)	0 (0)	24,338 (6,305)
Largemouth bass	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	247 (540)	0 (0)	6 (12)	30 (72)	0 (0)	0 (0)	283 (545)
White crappie	<0.0001 (<0.0001)	0 (0)	0 (0)	149 (301)	0 (0)	0 (0)	0 (0)	14 (29)	0 (0)	0 (0)	163 (302)
Black crappie (1,076)	0.0003 (0.0003)	0 (0)	139 (224)	676 (929)	323 (493)	0 (0)	25 (50)	0 (0)	0 (0)	0 (0)	1,163
Yellow perch	0.6771 (0.1417)	0 (0)	148,577 (56,274)	162,441 (57,192)	302,655 (116,946)	1,457,387 (438,195)	666,330 (298,610)	88,707 (83,190)	67,468 (76,510)	0 (0)	2,893,565 (560,421)
Walleye	0.0061 (0.0022)	0 (0)	0 (0)	5,998 (4,611)	2,247 (1,040)	9,257 (6,950)	5,381 (2,726)	1,690 (1,804)	1,330 (1,719)	0 (0)	25,903 (9,181)
Freshwater drum	0.0006 (0.0009)	0 (0)	0 (0)	0 (0)	2,351 (3,888)	293 (593)	0 (0)	0 (0)	0 (0)	0 (0)	2,644 (3,933)
Lake whitefish	0.0033 (0.0012)	0 (0)	0 (0)	2,044 (2,671)	6,787 (3,489)	2,058 (1,643)	392 (838)	1,933 (1,020)	1,027 (998)	0 (0)	14,241 (4,974)
Round whitefish	0.0005 (0.0004)	0 (0)	0 (0)	234 (337)	275 (293)	384 (849)	0 (0)	0 (0)	1,148 (1,392)	0 (0)	2,041 (1,691)
Burbot	<0.0001 (<0.0001)	0 (0)	0 (0)	40 (66)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (66)
Other	0.0002 (0.0003)	0 (0)	0 (0)	0 (0)	196 (304)	500 (1,010)	14 (36)	0 (0)	55 (113)	0 (0)	765 (1,061)
<b>Total</b>	<b>0.8038 (0.1461)</b>	<b>0 (0)</b>	<b>177,534 (57,704)</b>	<b>257,011 (59,408)</b>	<b>390,172 (118,146)</b>	<b>1,621,392 (439,026)</b>	<b>785,195 (299,456)</b>	<b>126,405 (83,716)</b>	<b>77,234 (76,614)</b>	<b>432 (656)</b>	<b>3,435,375 (562,240)</b>
Angler hours		0 (0)	200,107 (39,021)	584,339 (100,021)	627,200 (102,823)	1,385,206 (200,455)	999,185 (204,970)	399,227 (95,097)	76,995 (31,027)	1,454 (2,268)	4,273,713 (338,091)
Angler trips		0 (0)	46,671 (9,250)	109,717 (16,912)	128,466 (20,150)	304,660 (65,128)	198,442 (34,536)	86,692 (19,452)	18,769 (6,592)	351 (579)	893,768 (81,450)
Angler days		0 (0)	42,452 (8,498)	103,292 (16,206)	124,478 (19,788)	295,984 (64,906)	188,058 (33,405)	83,129 (19,201)	18,233 (6,559)	351 (579)	855,977 (80,418)

Table 5.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Michigan pier fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Coho salmon	0.0084 (0.0038)	727 (893)	1,649 (1,099)	105 (165)	0 (0)	0 (0)	100 (155)	1,707 (1,381)	102 (132)	0 (0)	4,390 (1,995)
Chinook salmon	0.0092 (0.0041)	0 (0)	64 (99)	1,563 (1,273)	229 (289)	90 (121)	430 (456)	2,422 (1,605)	58 (63)	0 (0)	4,856 (2,125)
Rainbow trout	0.0102 (0.0025)	6 (14)	211 (184)	41 (61)	328 (407)	1,050 (617)	115 (184)	118 (123)	2,766 (885)	744 (538)	5,379 (1,306)
Atlantic salmon	<0.0001 (<0.0001)	0 (0)	3 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (7)
Brown trout	0.0075 (0.0033)	90 (124)	2,179 (1,505)	464 (240)	696 (597)	334 (416)	56 (108)	0 (0)	111 (140)	0 (0)	3,930 (1,703)
Brook trout	<0.0001 (<0.0001)	0 (0)	20 (43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20 (43)
Lake trout	0.0006 (0.0004)	0 (0)	0 (0)	137 (128)	49 (71)	90 (136)	31 (40)	0 (0)	0 (0)	0 (0)	307 (204)
Rainbow smelt	0.0002 (0.0004)	0 (0)	0 (0)	89 (187)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	89 (187)
Northern pike	0.0005 (0.0007)	0 (0)	0 (0)	0 (0)	0 (0)	77 (164)	12 (26)	143 (294)	13 (27)	0 (0)	245 (339)
Channel catfish	0.0012 (0.0010)	0 (0)	0 (0)	17 (27)	11 (22)	409 (469)	91 (128)	48 (105)	47 (66)	0 (0)	623 (503)
White bass	0.0002 (0.0004)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	81 (163)	0 (0)	0 (0)	0 (0)	81 (163)
Rock bass	0.0054 (0.0050)	0 (0)	230 (450)	206 (324)	2,247 (2,556)	38 (79)	109 (220)	0 (0)	0 (0)	0 (0)	2,830 (2,626)
Pumpkinseed	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	23 (46)	0 (0)	22 (44)	0 (0)	0 (0)	0 (0)	45 (64)
Bluegill	0.0023 (0.0039)	0 (0)	0 (0)	21 (51)	208 (468)	0 (0)	978 (1,980)	0 (0)	0 (0)	0 (0)	1,207 (2,035)
Smallmouth bass	0.0015 (0.0031)	0 (0)	10 (20)	0 (0)	90 (148)	662 (1,631)	36 (73)	0 (0)	0 (0)	0 (0)	798 (1,639)
Largemouth bass	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	46 (106)	0 (0)	0 (0)	0 (0)	46 (106)
White crappie	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	72 (143)	0 (0)	0 (0)	0 (0)	0 (0)	72 (143)
Black crappie	0.0018 (0.0024)	0 (0)	0 (0)	0 (0)	548 (1,109)	0 (0)	414 (659)	0 (0)	0 (0)	0 (0)	962 (1,290)
Yellow perch	0.5711 (0.1120)	0 (0)	26,971 (20,862)	27,925 (11,697)	73,662 (23,494)	149,859 (43,267)	2,148 (2,148)	155 (315)	13,272 (12,796)	6,142 (6,667)	300,134 (56,648)

Table 5.—Continued:

Species	Total catch per hour	Month									Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Walleye	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	23 (46)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	23 (46)
Freshwater drum	0.0017 (0.0024)	0 (0)	0 (0)	0 (0)	75 (154)	790 (1,254)	0 (0)	24 (53)	0 (0)	0 (0)	889 (1,265)
Lake whitefish	0.0009 (0.0013)	0 (0)	30 (60)	4 (9)	0 (0)	0 (0)	0 (0)	0 (0)	439 (657)	0 (0)	473 (660)
Round whitefish	0.0041 (0.0026)	0 (0)	0 (0)	16 (32)	0 (0)	0 (0)	0 (0)	0 (0)	1,772 (1,130)	355 (717)	2,143 (1,339)
Burbot	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (19)	0 (0)	9 (19)
Other	0.0001 (0.0002)	0 (0)	0 (0)	40 (65)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (65)
Total	0.6272 (0.1134)	823 (902)	31,367 (20,951)	30,628 (11,777)	78,189 (23,677)	153,471 (43,326)	4,669 (3,059)	4,617 (2,167)	18,589 (12,895)	7,241 (6,727)	329,594 (56,937)
Angler hours		1,908 (1,872)	57,859 (11,068)	63,405 (7,512)	88,123 (9,514)	141,977 (15,560)	39,372 (5,707)	79,516 (14,355)	47,612 (5,240)	5,736 (2,278)	525,508 (28,042)
Angler trips		532 (524)	20,222 (4,206)	22,410 (2,686)	35,600 (4,134)	59,236 (7,954)	23,181 (4,272)	26,276 (5,170)	15,883 (1,983)	1,449 (513)	204,789 (12,438)
Angler days		426 (422)	16,919 (3,870)	18,944 (2,348)	32,447 (3,954)	53,961 (7,814)	21,109 (4,012)	24,846 (5,089)	13,418 (1,773)	1,449 (513)	183,519 (11,948)

Table 6.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Michigan shore fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month								Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Coho salmon	0.0091 (0.0054)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	905 (571)	86 (149)	0 (0)	991 (590)
Chinook salmon	0.0223 (0.0114)	0 (0)	8 (18)	0 (0)	0 (0)	128 (241)	2,074 (1,195)	218 (148)	0 (0)	2,428 (1,228)
Rainbow trout	0.0279 (0.0097)	1,493 (851)	662 (344)	0 (0)	0 (0)	31 (62)	308 (373)	468 (282)	81 (86)	3,043 (1,036)
Brown trout	0.0015 (0.0018)	58 (119)	0 (0)	0 (0)	0 (0)	0 (0)	45 (91)	56 (113)	0 (0)	159 (188)
Brook trout	0.0022 (0.0039)	169 (394)	0 (0)	0 (0)	0 (0)	0 (0)	67 (139)	0 (0)	0 (0)	236 (418)
Northern pike	0.0015 (0.0026)	0 (0)	0 (0)	130 (271)	0 (0)	7 (15)	25 (51)	0 (0)	0 (0)	162 (276)
White sucker	0.0015 (0.0024)	168 (274)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	168 (274)
Redhorse spp.	0.0007 (0.0014)	0 (0)	71 (143)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	71 (143)
Black bullhead	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	13 (25)	0 (0)	0 (0)	0 (0)	0 (0)	13 (25)
Brown bullhead	0.0025 (0.0025)	0 (0)	272 (269)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	272 (269)
Channel catfish	0.0005 (0.0010)	0 (0)	0 (0)	0 (0)	0 (0)	59 (122)	0 (0)	0 (0)	0 (0)	59 (122)
Rock bass	0.0144 (0.0099)	0 (0)	0 (0)	115 (157)	798 (183)	0 (0)	661 (1,050)	0 (0)	0 (0)	1,574 (1,077)
Pumpkinseed	0.0040 (0.0055)	0 (0)	441 (610)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	441 (610)
Bluegill	0.0065 (0.0133)	0 (0)	0 (0)	0 (0)	711 (1,457)	0 (0)	0 (0)	0 (0)	0 (0)	711 (1,457)
Smallmouth bass	0.0719 (0.0396)	0 (0)	40 (81)	784 (763)	6,731 (4,196)	290 (438)	0 (0)	0 (0)	0 (0)	7,845 (4,288)
White crappie	0.0010 (0.0020)	0 (0)	109 (219)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	109 (219)

Table 6.—Continued:

Species	Total catch per hour	Month								Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Black crappie	0.0063 (0.0091)	0 (0)	109 (140)	109 (221)	473 (965)	0 (0)	0 (0)	0 (0)	0 (0)	691 (1,000)
Yellow perch	0.1572 (0.0692)	45 (91)	8,777 (5,452)	2,165 (2,889)	2,632 (2,459)	7 (15)	2,667 (2,902)	850 (1,772)	0 (0)	17,143 (7,462)
Walleye	0.0026 (0.0033)	0 (0)	55 (117)	130 (271)	0 (0)	0 (0)	101 (208)	0 (0)	0 (0)	286 (361)
Lake whitefish	0.0002 (0.0005)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	19 (44)	0 (0)	19 (44)
Round whitefish	0.0001 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (18)	0 (0)	8 (18)
Other	0.0004 (0.0008)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	46 (93)	0 (0)	0 (0)	46 (93)
Total	0.3344 (0.0859)	1,933 (988)	10,544 (5,513)	3,433 (3,025)	11,358 (5,171)	522 (519)	6,899 (3,391)	1,705 (1,811)	81 (86)	36,475 (9,073)
Angler hours		14,691 (2,805)	14,806 (1,315)	11,854 (2,164)	19,265 (3,399)	4,636 (1,177)	31,103 (4,125)	11,737 (1,961)	978 (419)	109,070 (6,947)
Angler trips		4,082 (869)	6,968 (763)	5,357 (1,364)	14,208 (3,621)	1,510 (463)	10,762 (1,780)	4,215 (984)	194 (103)	47,296 (4,547)
Angler days		2,828 (665)	5,391 (782)	4,246 (1,018)	12,910 (3,549)	1,355 (456)	9,425 (1,752)	2,864 (635)	194 (103)	39,213 (4,287)

Table 7.—Estimated yellow perch catch rate (fish per angler hour), number caught, and angler effort (hours) at selected Lake Michigan ports and fishing areas, April through October 1985-88. Two standard errors in parentheses.

Area	1985		1986		1987		1988	
	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught
St. Joseph	0.797 (0.257)	664,671 (193,119)	0.972 (0.547)	590,044 (307,649)	1.213 (0.864)	448,285 (298,522)	1.356 (0.668)	575,937 (266,099)
Grand Haven	0.187 (0.045)	110,083 (23,606)	0.114 (0.049)	79,972 (29,962)	0.281 (0.115)	213,199 (77,071)	0.365 (0.226)	156,496 (85,951)
Muskegon	0.108 (0.049)	54,923 (21,361)	0.167 (0.162)	53,516 (51,027)	0.904 (0.503)	307,326 (157,717)	0.829 (0.382)	190,964 (73,156)
Ludington	0.170 (0.080)	121,230 (51,031)	0.078 (0.061)	64,712 (46,674)	0.374 (0.182)	229,841 (92,112)	0.473 (0.306)	178,483 (101,864)
Manistee	0.035 (0.030)	22,286 (18,626)	0.332 (0.206)	226,199 (131,847)	0.265 (0.136)	134,736 (60,864)	0.684 (0.502)	298,088 (210,724)
West Grand Traverse Bay	0.207 (0.089)	58,453 (24,657)	0.439 (0.251)	76,971 (43,181)	0.654 (0.338)	102,182 (51,052)	0.061 (0.045)	8,771 (6,431)
Little Bay de Noc	0.483 (0.217)	64,609 (27,230)	0.700 (0.265)	139,828 (50,923)	0.463 (0.141)	57,750 (16,060)	0.384 (0.209)	60,504 (32,156)
Total	0.295 (0.057)	1,096,255 (206,419)	0.346 (0.098)	1,231,242 (349,527)	0.516 (0.127)	1,493,319 (367,400)	0.669 (0.167)	1,469,243 (373,369)
Angler Hours		3,713,865 (253,547)		3,556,617 (361,386)		2,892,057 (288,228)		2,197,822 (220,751)

Table 8.—Estimated catch rate (fish per angler hour), number caught, and angler effort (hours) for various species of salmonids at nine Lake Michigan ports combined (New Buffalo, St. Joseph, Grand Haven, Muskegon, Ludington, Manistee, Frankfort, West Grand Traverse Bay, and Charlevoix), April through October 1985-88. Two standard errors in parentheses.

Species	1985		1986		1987		1988	
	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught
Coho salmon	0.018 (0.003)	75,585 (13,667)	0.024 (0.006)	108,420 (22,786)	0.025 (0.006)	86,876 (19,062)	0.014 (0.005)	36,615 (12,951)
Chinook salmon	0.078 (0.011)	339,513 (41,990)	0.091 (0.023)	407,050 (93,444)	0.073 (0.018)	259,718 (58,950)	0.040 (0.009)	106,287 (21,558)
Rainbow trout	0.007 (0.002)	29,259 (7,866)	0.006 (0.003)	24,583 (12,717)	0.007 (0.002)	26,981 (6,027)	0.011 (0.003)	29,081 (6,999)
Brown trout	0.008 (0.002)	33,456 (6,761)	0.011 (0.003)	50,901 (15,265)	0.005 (0.002)	19,350 (6,197)	0.006 (0.002)	16,336 (5,141)
Lake trout	0.021 (0.004)	88,053 (15,767)	0.025 (0.010)	113,802 (44,425)	0.023 (0.005)	79,929 (18,234)	0.026 (0.005)	68,192 (12,594)
Total	0.132 (0.014)	565,866 (48,022)	0.157 (0.028)	704,756 (107,793)	0.134 (0.023)	472,854 (65,159)	0.097 (0.014)	256,511 (29,436)
Angler Hours		4,303,895 (263,742)		4,492,681 (436,769)		3,537,739 (356,013)		2,646,138 (239,187)



Table 9.—Catch per hour of chinook salmon (April through October) and lake trout (May through August) at nine Lake Michigan ports, 1985-88. Two standard errors in parentheses.

Area	Chinook salmon				Lake trout			
	1985	1986	1987	1988	1985	1986	1987	1988
New Buffalo	0.032 (0.009)	0.023 (0.018)	0.016 (0.017)	0.022 (0.014)	0.008 (0.003)	0.015 (0.013)	0.030 (0.030)	0.025 (0.013)
St. Joseph	0.043 (0.014)	0.049 (0.019)	0.025 (0.015)	0.027 (0.011)	0.025 (0.008)	0.038 (0.025)	0.039 (0.034)	0.021 (0.008)
Grand Haven	0.067 (0.034)	0.098 (0.048)	0.051 (0.024)	0.028 (0.028)	0.020 (0.006)	0.026 (0.015)	0.040 (0.024)	0.031 (0.017)
Muskegon	0.106 (0.051)	0.089 (0.034)	0.082 (0.085)	0.022 (0.014)	0.021 (0.016)	0.033 (0.011)	0.033 (0.022)	0.017 (0.009)
Ludington	0.123 (0.040)	0.155 (0.103)	0.135 (0.068)	0.082 (0.046)	0.024 (0.010)	0.021 (0.014)	0.027 (0.016)	0.029 (0.020)
Manistee	0.108 (0.029)	0.102 (0.039)	0.083 (0.030)	0.048 (0.020)	0.015 (0.004)	0.011 (0.006)	0.021 (0.007)	0.021 (0.009)
Frankfort	0.086 (0.023)	0.109 (0.070)	0.078 (0.059)	0.044 (0.018)	0.033 (0.024)	0.068 (0.085)	0.032 (0.022)	0.058 (0.017)
West Grand Traverse Bay	0.029 (0.012)	0.022 (0.011)	0.028 (0.012)	0.024 (0.011)	0.036 (0.010)	0.073 (0.032)	0.078 (0.028)	0.078 (0.019)
Charlevoix	0.067 (0.029)	0.100 (0.044)	0.103 (0.028)	0.084 <sup>1</sup> (0.064)	0.114 (0.061)	0.081 (0.038)	0.032 (0.014)	0.142 (0.052)

<sup>1</sup>May through September.

Table 10.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for Lake Huron, by all modes of sportfishing, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Pink salmon	0.0002 (0.0002)	44 (68)	58 (96)	32 (51)	77 (78)	446 (576)	0 (0)	0 (0)	657 (595)
Coho salmon	0.0021 (0.0016)	1,430 (842)	375 (288)	1,133 (706)	402 (240)	937 (495)	2,881 (5,118)	0 (0)	7,158 (5,271)
Chinook salmon	0.0315 (0.0044)	13,600 (5,405)	11,738 (3,219)	4,496 (1,771)	15,659 (2,679)	30,020 (5,205)	28,774 (9,826)	1,119 (662)	105,406 (13,190)
Rainbow trout	0.0009 (0.0003)	1,059 (720)	364 (276)	140 (135)	794 (304)	296 (213)	126 (151)	131 (120)	2,910 (888)
Atlantic salmon	<0.0001 (<0.0001)	17 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	17 (27)
Brown trout	0.0010 (0.0003)	905 (445)	305 (227)	37 (51)	1,660 (1,052)	428 (193)	55 (58)	109 (123)	3,499 (1,189)
Brook trout	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (34)	16 (34)
Lake trout	0.0187 (0.0108)	0 (0)	3,587 (1,446)	33,422 (35,302)	22,126 (5,610)	3,266 (2,124)	0 (0)	0 (0)	62,401 (35,837)
Splake	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	6 (13)	0 (0)	0 (0)	6 (13)
Rainbow smelt	0.0079 (0.0145)	26,521 (48,680)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	26,521 (48,680)
Northern pike	0.0068 (0.0021)	29 (51)	2,529 (1,339)	4,223 (2,382)	9,039 (4,496)	5,940 (4,266)	1,028 (999)	0 (0)	22,788 (6,847)
White sucker	0.0006 (0.0006)	1,771 (1,832)	174 (236)	0 (0)	6 (12)	0 (0)	0 (0)	0 (0)	1,951 (1,847)
Redhorse spp.	<0.0001 (<0.0001)	76 (168)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	76 (168)
Black bullhead	0.0008 (0.0012)	82 (141)	1,872 (3,895)	207 (353)	389 (626)	0 (0)	0 (0)	0 (0)	2,550 (3,963)
Yellow bullhead	0.0004 (0.0007)	0 (0)	88 (136)	125 (205)	1,066 (2,157)	0 (0)	0 (0)	0 (0)	1,279 (2,171)

Table 10.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Brown bullhead	0.0016 (0.0009)	8 (15)	2,320 (1,880)	1,812 (1,694)	1,092 (1,434)	227 (450)	0 (0)	0 (0)	5,459 (2,943)
Channel catfish	0.0148 (0.0155)	50 (115)	2,273 (1,701)	15,405 (13,010)	26,481 (49,937)	2,822 (2,181)	2,359 (2,620)	0 (0)	49,390 (51,744)
White perch	0.0004 (0.0005)	24 (37)	0 (0)	396 (514)	68 (109)	778 (1,429)	29 (60)	0 (0)	1,295 (1,524)
White bass	0.0032 (0.0027)	1,976 (2,063)	2,073 (1,865)	202 (224)	590 (496)	3,121 (6,554)	2,816 (5,594)	0 (0)	10,778 (9,071)
Rock bass	0.0351 (0.0344)	3 (7)	866 (1,005)	54,153 (90,795)	19,178 (11,024)	41,076 (69,641)	2,232 (4,485)	0 (0)	117,508 (115,049)
Pumpkinseed	0.0046 (0.0026)	97 (159)	5,415 (5,211)	1,332 (1,284)	5,112 (4,597)	3,321 (5,084)	265 (528)	0 (0)	15,542 (8,723)
Bluegill	0.0009 (0.0008)	26 (54)	1,951 (2,529)	417 (586)	486 (826)	33 (80)	11 (32)	0 (0)	2,924 (2,726)
Longear sunfish	0.0001 (0.0002)	0 (0)	293 (625)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	293 (625)
Smallmouth bass	0.0047 (0.0024)	0 (0)	603 (1,042)	1,261 (745)	7,528 (5,332)	6,331 (5,770)	62 (128)	0 (0)	15,785 (7,961)
Largemouth bass	0.0015 (0.0012)	0 (0)	1,579 (1,169)	1,644 (801)	0 (0)	1,847 (3,778)	0 (0)	0 (0)	5,070 (4,035)
White crappie	0.0005 (0.0006)	46 (59)	1,313 (1,810)	79 (118)	0 (0)	89 (202)	0 (0)	0 (0)	1,527 (1,826)
Black crappie	0.0001 (0.0001)	0 (0)	13 (30)	147 (185)	129 (167)	22 (47)	67 (101)	0 (0)	378 (275)
Yellow perch	0.4517 (0.0804)	85,106 (21,123)	176,292 (51,651)	209,747 (55,661)	428,981 (117,020)	269,744 (98,799)	340,652 (181,635)	0 (0)	1,510,522 (250,316)
Walleye	0.0413 (0.0083)	198 (121)	14,352 (7,771)	11,327 (4,094)	76,097 (22,858)	32,903 (9,588)	3,135 (1,905)	18 (31)	138,030 (26,367)
Freshwater drum	0.0010 (0.0007)	0 (0)	373 (417)	1,328 (2,011)	1,175 (1,045)	482 (491)	97 (137)	0 (0)	3,455 (2,360)

Table 10.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Lake whitefish	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	312 (299)	35 (73)	0 (0)	0 (0)	347 (308)
Round whitefish	0.0005 (0.0003)	3 (5)	34 (74)	0 (0)	1,417 (1,030)	45 (93)	0 (0)	259 (232)	1,758 (1,062)
Burbot	<0.0001 (<0.0001)	25 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	25 (27)
Other	0.0112 (0.0074)	92 (127)	317 (341)	600 (521)	36,558 (24,578)	0 (0)	0 (0)	0 (0)	37,567 (24,586)
Total	0.6445 (0.0963)	133,188 (53,426)	231,157 (52,998)	343,665 (113,112)	656,422 (132,497)	404,215 (121,972)	384,589 (182,146)	1,652 (724)	2,154,888 (289,944)
Angler hours		211,410 (46,516)	432,226 (59,188)	483,144 (100,289)	996,393 (134,649)	676,781 (92,708)	524,860 (69,163)	18,907 (5,321)	3,343,721 (217,398)
Angler trips		60,597 (10,694)	94,614 (11,912)	113,285 (21,326)	222,937 (30,423)	155,910 (20,950)	117,945 (17,036)	4,117 (1,143)	769,405 (48,652)
Angler days		52,664 (9,596)	83,332 (10,975)	95,298 (19,980)	195,558 (27,404)	133,850 (17,661)	102,033 (15,978)	3,410 (978)	666,145 (43,942)

Table 11.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for Saginaw Bay (Port Austin to Tawas), by all modes of sportfishing, 1988. Two standard error in parentheses.

Species	Total catch per hour	Month						Season
		Apr	May	Jun	Jul	Aug	Sep	
Pink salmon	<0.0001 (<0.0001)	0 (0)	15 (32)	0 (0)	45 (66)	0 (0)	0 (0)	60 (73)
Coho salmon	0.0003 (0.0002)	0 (0)	55 (66)	64 (61)	119 (159)	162 (159)	25 (37)	425 (245)
Chinook salmon	0.0078 (0.0023)	206 (290)	4,694 (1,890)	820 (566)	2,861 (1,840)	1,296 (679)	1,334 (1,253)	11,211 (3,065)
Rainbow trout	0.0007 (0.0004)	453 (536)	194 (212)	29 (37)	224 (197)	72 (67)	7 (14)	979 (614)
Brown trout	0.0006 (0.0005)	236 (166)	39 (51)	0 (0)	528 (633)	85 (102)	0 (0)	888 (664)
Lake trout	0.0050 (0.0017)	0 (0)	1,556 (855)	2,024 (1,026)	3,415 (1,821)	210 (156)	0 (0)	7,205 (2,264)
Rainbow smelt	0.0186 (0.0342)	26,521 (48,680)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	26,521 (48,680)
Northern pike	0.0002 (0.0003)	29 (51)	28 (37)	34 (65)	3 (6)	257 (437)	0 (0)	351 (446)
White sucker	0.0013 (0.0013)	1,771 (1,832)	135 (210)	0 (0)	0 (0)	0 (0)	0 (0)	1,906 (1,844)
Redhorse spp.	0.0001 (0.0002)	76 (168)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	76 (168)
Black bullhead	0.0001 (0.0002)	82 (141)	0 (0)	7 (17)	4 (10)	0 (0)	0 (0)	93 (142)
Yellow bullhead	0.0001 (0.0001)	0 (0)	88 (136)	125 (205)	0 (0)	0 (0)	0 (0)	213 (246)
Brown bullhead	0.0011 (0.0007)	8 (15)	787 (579)	411 (429)	374 (674)	7 (16)	0 (0)	1,587 (987)
Channel catfish	0.0334 (0.0364)	50 (115)	1,899 (1,512)	15,098 (13,007)	25,661 (49,927)	2,682 (2,176)	2,346 (2,620)	47,736 (51,728)

Table 11.—Continued:

Species	Total catch per hour	Month						Season
		Apr	May	Jun	Jul	Aug	Sep	
White perch	0.0005 (0.0010)	0 (0)	0 (0)	0 (0)	68 (109)	660 (1,413)	0 (0)	728 (1,417)
White bass	0.0073 (0.0064)	1,976 (2,063)	2,063 (1,865)	182 (220)	370 (352)	3,064 (6,553)	2,816 (5,594)	10,471 (9,063)
Rock bass	0.0005 (0.0004)	3 (7)	154 (200)	189 (250)	284 (433)	103 (163)	3 (8)	736 (563)
Pumpkinseed	0.0024 (0.0026)	97 (159)	1,016 (598)	201 (180)	1,988 (3,697)	127 (212)	6 (16)	3,435 (3,759)
Bluegill	0.0020 (0.0019)	26 (54)	1,951 (2,529)	417 (586)	450 (823)	33 (80)	11 (32)	2,888 (2,725)
Longear sunfish	0.0002 (0.0004)	0 (0)	293 (625)	0 (0)	0 (0)	0 (0)	0 (0)	293 (625)
Smallmouth bass	0.0008 (0.0009)	0 (0)	10 (23)	89 (123)	1,097 (1,271)	3 (8)	0 (0)	1,199 (1,277)
Largemouth bass	0.0022 (0.0010)	0 (0)	1,579 (1,169)	1,496 (770)	0 (0)	0 (0)	0 (0)	3,075 (1,400)
White crappie	0.0011 (0.0013)	46 (59)	1,313 (1,810)	79 (118)	0 (0)	89 (202)	0 (0)	1,527 (1,826)
Black crappie	0.0001 (0.0001)	0 (0)	0 (0)	67 (139)	20 (41)	22 (47)	67 (101)	176 (183)
Yellow perch	0.8281 (0.1907)	83,072 (20,885)	74,240 (40,674)	119,261 (34,559)	355,671 (115,051)	228,180 (91,575)	322,201 (180,698)	1,182,625 (239,915)
Walleye	0.0701 (0.0191)	32 (34)	12,306 (7,651)	5,306 (3,311)	60,751 (22,174)	20,155 (8,125)	1,579 (1,276)	100,129 (25,077)
Freshwater drum	0.0020 (0.0016)	0 (0)	271 (354)	1,294 (2,009)	1,009 (1,027)	174 (325)	92 (137)	2,840 (2,311)
Round whitefish	<0.0001 (<0.0001)	3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (5)

Table 11.—Continued:

Species	Total catch per hour	Month						Season
		Apr	May	Jun	Jul	Aug	Sep	
Burbot	<0.0001 (<0.0001)	4 (8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (8)
Other	0.0007 (0.0004)	92 (127)	283 (334)	487 (489)	154 (187)	0 (0)	0 (0)	1,016 (634)
Total	0.9875 (0.2065)	114,783 (53,048)	104,969 (41,659)	147,680 (37,168)	455,096 (127,460)	257,381 (92,210)	330,487 (180,812)	1,410,396 (251,739)
Angler hours		93,685 (17,356)	217,896 (43,330)	206,975 (37,071)	528,580 (123,752)	220,809 (52,414)	160,244 (51,315)	1,428,189 (155,718)
Angler trips		35,865 (6,815)	47,739 (8,678)	45,623 (7,688)	115,051 (27,320)	49,426 (11,868)	36,914 (12,175)	330,618 (34,876)
Angler days		30,180 (5,930)	44,319 (8,333)	40,475 (6,989)	105,903 (25,495)	45,947 (11,434)	33,719 (11,538)	300,543 (32,670)

Table 12.—Estimated angler effort (hours) at eight Lake Huron sample areas, April through September 1986-88. Two standard errors in parentheses.

Area	Year		
	1986	1987	1988
Lexington to Port Sanilac	327,789 (67,473)	301,980 (52,237)	225,893 (49,145)
Eagle Bay to Harbor Beach	397,664 (87,267)	365,230 (55,415)	320,748 (75,974)
Saginaw Bay <sup>1</sup>	1,871,136 (145,335)	1,825,524 (116,250)	1,428,189 (155,718)
Oscoda	216,811 (58,752)	227,095 (51,071)	302,115 (102,967)
Harrisville	126,913 (35,331)	170,062 (39,378)	146,382 (32,082)
Rockport	54,972 (9,035)	48,649 (7,042)	74,237 (7,559)
Rogers City	60,934 (7,156)	80,862 (24,118)	153,954 (14,976)
Drummond Island to De Tour	367,619 (66,753)	353,585 (51,681)	273,189 (44,960)
Total	3,423,838 (206,347)	3,372,915 (163,630)	2,924,707 (215,336)

<sup>1</sup>Port Austin to Tawas.



Table 13.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Huron boat fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Pink salmon	0.0002 (0.0002)	24 (50)	58 (96)	32 (51)	77 (78)	446 (576)	0 (0)	0 (0)	637 (593)
Coho salmon	0.0022 (0.0017)	1,254 (793)	375 (288)	1,133 (706)	402 (240)	937 (495)	2,881 (5,118)	0 (0)	6,982 (5,264)
Chinook salmon	0.0317 (0.0047)	13,581 (5,405)	11,621 (3,216)	4,496 (1,771)	15,659 (2,679)	29,215 (5,077)	24,631 (9,719)	741 (611)	99,944 (13,057)
Rainbow trout	0.0007 (0.0002)	605 (483)	266 (195)	140 (135)	786 (304)	295 (213)	57 (58)	18 (27)	2,167 (657)
Atlantic salmon	<0.0001 (<0.0001)	17 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	17 (27)
Brown trout	0.0011 (0.0004)	821 (429)	305 (227)	37 (51)	1,660 (1,052)	428 (193)	55 (58)	42 (97)	3,348 (1,181)
Brook trout	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (34)	16 (34)
Lake trout	0.0198 (0.0115)	0 (0)	3,587 (1,446)	33,422 (35,302)	22,126 (5,610)	3,266 (2,124)	0 (0)	0 (0)	62,401 (35,837)
Splake	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	6 (13)	0 (0)	0 (0)	6 (13)
Northern pike	0.0072 (0.0022)	0 (0)	2,446 (1,331)	4,219 (2,382)	9,036 (4,496)	5,938 (4,266)	1,028 (999)	0 (0)	22,667 (6,845)
White sucker	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	6 (12)	0 (0)	0 (0)	0 (0)	6 (12)
Black bullhead	0.0008 (0.0013)	0 (0)	1,872 (3,895)	200 (353)	385 (626)	0 (0)	0 (0)	0 (0)	2,457 (3,961)
Yellow bullhead	0.0004 (0.0007)	0 (0)	57 (122)	89 (192)	1,066 (2,157)	0 (0)	0 (0)	0 (0)	1,212 (2,169)
Brown bullhead	0.0014 (0.0009)	0 (0)	1,731 (1,807)	1,572 (1,679)	1,031 (1,430)	220 (450)	0 (0)	0 (0)	4,554 (2,886)
Channel catfish	0.0152 (0.0164)	50 (115)	1,990 (1,672)	14,774 (12,992)	26,098 (49,937)	2,735 (2,175)	2,359 (2,620)	0 (0)	48,006 (51,739)

Table 13.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
White perch	0.0004 (0.0005)	24 (37)	0 (0)	374 (512)	68 (109)	778 (1,429)	29 (60)	0 (0)	1,273 (1,523)
White bass	0.0034 (0.0029)	1,970 (2,063)	1,898 (1,855)	193 (223)	590 (496)	3,121 (6,554)	2,816 (5,594)	0 (0)	10,588 (9,069)
Rock bass	0.0373 (0.0367)	0 (0)	840 (1,004)	54,131 (90,795)	19,050 (11,021)	41,075 (69,641)	2,229 (4,485)	0 (0)	117,325 (115,049)
Pumpkinseed	0.0045 (0.0028)	0 (0)	4,442 (5,179)	1,159 (1,272)	5,101 (4,596)	3,306 (5,084)	259 (528)	0 (0)	14,267 (8,700)
Bluegill	0.0008 (0.0008)	0 (0)	1,901 (2,528)	238 (494)	481 (826)	0 (0)	0 (0)	0 (0)	2,620 (2,705)
Smallmouth bass	0.0050 (0.0026)	0 (0)	593 (1,042)	1,216 (738)	7,528 (5,332)	6,331 (5,770)	62 (128)	0 (0)	15,730 (7,961)
Largemouth bass	0.0016 (0.0013)	0 (0)	1,508 (1,164)	1,639 (801)	0 (0)	1,847 (3,778)	0 (0)	0 (0)	4,994 (4,034)
White crappie	0.0004 (0.0005)	0 (0)	1,269 (1,809)	40 (83)	0 (0)	89 (202)	0 (0)	0 (0)	1,398 (1,822)
Black crappie	0.0001 (0.0001)	0 (0)	13 (30)	147 (185)	129 (167)	22 (47)	67 (101)	0 (0)	378 (275)
Yellow perch	0.4497 (0.0851)	39,008 (17,237)	154,400 (50,697)	192,207 (55,300)	422,314 (116,847)	267,460 (98,696)	340,490 (181,635)	0 (0)	1,415,879 (249,621)
Walleye	0.0433 (0.0089)	198 (121)	13,273 (7,715)	10,877 (4,063)	76,097 (22,858)	32,901 (9,588)	3,121 (1,904)	14 (30)	136,481 (26,346)
Freshwater drum	0.0010 (0.0007)	0 (0)	327 (406)	1,298 (2,010)	1,095 (1,040)	474 (490)	97 (137)	0 (0)	3,291 (2,355)
Lake whitefish	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	312 (299)	35 (73)	0 (0)	0 (0)	347 (308)
Round whitefish	0.0005 (0.0003)	0 (0)	34 (74)	0 (0)	1,417 (1,030)	45 (93)	0 (0)	13 (29)	1,509 (1,037)
Burbot	<0.0001 (<0.0001)	21 (26)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (26)
Other	0.0117 (0.0078)	20 (46)	247 (329)	148 (193)	36,558 (24,578)	0 (0)	0 (0)	0 (0)	36,973 (24,581)

Table 13.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Total	0.6407 (0.1007)	57,593 (18,212)	205,053 (52,048)	323,781 (112,930)	649,072 (132,344)	400,970 (121,883)	380,181 (182,140)	844 (622)	2,017,494 (285,201)
Angler hours		152,134 (44,703)	400,210 (58,899)	459,656 (100,190)	984,236 (134,569)	659,972 (92,628)	481,514 (69,076)	10,933 (5,171)	3,148,655 (216,777)
Angler trips		32,232 (8,859)	82,290 (11,685)	101,780 (21,104)	217,196 (30,359)	149,953 (20,890)	108,521 (16,909)	2,264 (1,081)	694,236 (48,016)
Angler days		28,971 (7,951)	73,059 (10,792)	86,135 (19,817)	190,793 (27,355)	128,920 (17,606)	94,579 (15,877)	1,926 (924)	604,383 (43,400)

Table 14.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Huron shore fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Chinook salmon	0.0452 (0.0157)	19 (38)	78 (127)	0 (0)	0 (0)	0 (0)	4,097 (1,443)	373 (253)	4,567 (1,471)
Rainbow trout	0.0051 (0.0058)	328 (526)	98 (196)	0 (0)	0 (0)	0 (0)	69 (139)	17 (34)	512 (579)
Brown trout	0.0008 (0.0008)	19 (23)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	64 (75)	83 (78)
Rainbow smelt	0.2618 (0.4827)	26,469 (48,680)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	26,469 (48,680)
White sucker	0.0177 (0.0183)	1,653 (1,822)	135 (210)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,788 (1,834)
Black bullhead	0.0009 (0.0014)	82 (141)	0 (0)	7 (17)	4 (10)	0 (0)	0 (0)	0 (0)	93 (142)
Yellow bullhead	0.0007 (0.0010)	0 (0)	31 (60)	36 (71)	0 (0)	0 (0)	0 (0)	0 (0)	67 (93)
Brown bullhead	0.0090 (0.0059)	8 (15)	589 (519)	240 (224)	61 (116)	7 (16)	0 (0)	0 (0)	905 (577)
Channel catfish	0.0051 (0.0038)	0 (0)	238 (296)	222 (219)	60 (116)	0 (0)	0 (0)	0 (0)	520 (386)
White bass	0.0018 (0.0019)	6 (15)	165 (190)	9 (19)	0 (0)	0 (0)	0 (0)	0 (0)	180 (192)
Rock bass	0.0004 (0.0003)	3 (7)	20 (24)	7 (10)	4 (9)	0 (0)	3 (8)	0 (0)	37 (29)
Pumpkinseed	0.0123 (0.0064)	97 (159)	938 (575)	173 (170)	11 (29)	15 (36)	6 (16)	0 (0)	1,240 (622)
Bluegill	0.0030 (0.0034)	26 (54)	50 (77)	179 (315)	5 (12)	33 (80)	11 (32)	0 (0)	304 (340)
Longear sunfish	0.0029 (0.0062)	0 (0)	293 (625)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	293 (625)
Smallmouth bass	0.0005 (0.0009)	0 (0)	10 (23)	45 (100)	0 (0)	0 (0)	0 (0)	0 (0)	55 (103)

Table 14.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Largemouth bass	0.0008 (0.0011)	0 (0)	71 (105)	5 (11)	0 (0)	0 (0)	0 (0)	0 (0)	76 (106)
White crappie	0.0013 (0.0012)	46 (59)	44 (57)	39 (84)	0 (0)	0 (0)	0 (0)	0 (0)	129 (117)
Yellow perch	0.3675 (0.1241)	25,491 (10,126)	4,195 (3,072)	5,942 (4,268)	1,522 (1,908)	6 (16)	0 (0)	0 (0)	37,156 (11,568)
Walleye	0.0133 (0.0101)	0 (0)	1,049 (929)	295 (383)	0 (0)	0 (0)	0 (0)	0 (0)	1,344 (1,005)
Freshwater drum	0.0009 (0.0011)	0 (0)	46 (96)	28 (38)	6 (15)	8 (18)	0 (0)	0 (0)	88 (106)
Other	0.0057 (0.0051)	53 (111)	70 (90)	452 (484)	0 (0)	0 (0)	0 (0)	0 (0)	575 (505)
Total	0.7565 (0.5056)	54,300 (49,759)	8,120 (3,399)	7,679 (4,341)	1,673 (1,915)	69 (92)	4,186 (1,450)	454 (266)	76,481 (50,122)
Angler hours		39,046 (11,713)	15,651 (4,183)	8,403 (2,718)	4,250 (2,497)	1,334 (1,081)	26,843 (2,188)	5,574 (1,027)	101,101 (13,241)
Angler trips		20,606 (5,454)	6,599 (1,802)	4,152 (1,472)	2,081 (1,206)	631 (488)	3,788 (1,091)	974 (238)	38,831 (6,172)
Angler days		17,630 (4,979)	5,434 (1,522)	2,961 (1,033)	1,630 (922)	570 (467)	2,690 (733)	756 (204)	31,671 (5,461)

Table 15.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Huron pier fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Pink salmon	0.0002 (0.0005)	20 (46)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20 (46)
Coho salmon	0.0019 (0.0030)	176 (281)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	176 (281)
Chinook salmon	0.0095 (0.0123)	0 (0)	39 (62)	0 (0)	0 (0)	805 (1,146)	46 (94)	5 (10)	895 (1,152)
Rainbow trout	0.0025 (0.0016)	126 (88)	0 (0)	0 (0)	8 (19)	1 (2)	0 (0)	96 (112)	231 (144)
Brown trout	0.0007 (0.0012)	65 (115)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (6)	68 (115)
Rainbow smelt	0.0006 (0.0012)	52 (104)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	52 (104)
Northern pike	0.0013 (0.0017)	29 (51)	83 (153)	4 (8)	3 (6)	2 (4)	0 (0)	0 (0)	121 (162)
White sucker	0.0017 (0.0025)	118 (199)	39 (108)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	157 (226)
Redhorse spp.	0.0008 (0.0018)	76 (168)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	76 (168)
Channel catfish	0.0092 (0.0075)	0 (0)	45 (100)	409 (640)	323 (212)	87 (159)	0 (0)	0 (0)	864 (700)
White perch	0.0002 (0.0004)	0 (0)	0 (0)	22 (45)	0 (0)	0 (0)	0 (0)	0 (0)	22 (45)
White bass	0.0001 (0.0003)	0 (0)	10 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (27)
Rock bass	0.0016 (0.0032)	0 (0)	6 (13)	15 (24)	124 (288)	1 (3)	0 (0)	0 (0)	146 (289)
Pumpkinseed	0.0004 (0.0009)	0 (0)	35 (76)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	35 (76)
Yellow perch	0.6118 (0.1679)	20,607 (6,820)	17,697 (9,392)	11,598 (4,683)	5,145 (6,074)	2,278 (4,500)	162 (269)	0 (0)	57,487 (14,624)

Table 15.—Continued:

Species	Total catch per hour	Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
Walleye	0.0022 (0.0037)	0 (0)	30 (65)	155 (331)	0 (0)	2 (4)	14 (40)	4 (8)	205 (340)
Freshwater drum	0.0008 (0.0010)	0 (0)	0 (0)	2 (4)	74 (99)	0 (0)	0 (0)	0 (0)	76 (99)
Round whitefish	0.0026 (0.0024)	3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	246 (230)	249 (230)
Burbot	<0.0001 (<0.0001)	4 (8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (8)
Other	0.0002 (0.0004)	19 (42)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	19 (42)
Total	0.6483 (0.1701)	21,295 (6,834)	17,984 (9,395)	12,205 (4,738)	5,677 (6,085)	3,176 (4,646)	222 (288)	354 (256)	60,913 (14,703)
Angler hours		20,230 (5,305)	16,365 (4,083)	15,085 (3,533)	7,907 (3,883)	15,475 (3,692)	16,503 (2,673)	2,400 (719)	93,965 (9,678)
Angler trips		7,759 (2,479)	5,725 (1,455)	7,353 (2,694)	3,660 (1,559)	5,326 (1,504)	5,636 (1,763)	879 (284)	36,338 (4,838)
Angler days		6,063 (2,018)	4,839 (1,294)	6,202 (2,325)	3,135 (1,352)	4,360 (1,311)	4,764 (1,628)	728 (249)	30,091 (4,173)

Table 16.—Estimated yellow perch catch rate (fish per angler hour), number caught, and angler effort (hours) at selected Lake Huron sample areas, April through September 1986-88. Two standard errors in parentheses.

Species	1986		1987		1988	
	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught
Saginaw Bay <sup>1</sup>	0.857 (0.151)	1,603,623 (289,925)	1.276 (0.189)	2,329,021 (327,449)	0.828 (0.191)	1,182,625 (239,915)
Drummond Island	0.403 (0.157)	148,227 (48,721)	0.636 (0.264)	201,968 (84,111)	0.322 (0.127)	79,144 (27,722)
Les Cheneaux Islands	1.206 (0.223)	535,869 (81,978)	0.739 (0.302)	132,280 (45,486)	0.754 (0.270)	152,782 (51,545)
Total	0.853 (0.125)	2,287,719 (305,206)	1.129 (0.158)	2,663,269 (341,125)	0.754 (0.147)	1,414,551 (246,951)
Angler hours		2,683,181 (159,932)		2,358,115 (134,787)		1,876,857 (163,762)

<sup>1</sup>Port Austin to Tawas.



Table 17.—Estimated chinook salmon catch rate (fish per angler hour), number caught, and total angler effort (hours) at selected Lake Huron sample areas, April through September 1986-88. Two standard errors in parentheses.

Species	1986		1987		1988	
	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught
Lexington to Port Sanilac	0.051 (0.018)	16,589 (6,023)	0.022 (0.005)	6,775 (1,611)	0.058 (0.025)	12,990 (4,838)
Eagle Bay to Harbor Beach	0.043 (0.014)	17,077 (5,736)	0.039 (0.010)	14,207 (3,489)	0.040 (0.019)	12,777 (5,370)
Port Austin to Sand Point	0.016 (0.010)	6,700 (4,115)	0.015 (0.005)	5,465 (1,920)	0.023 (0.010)	6,129 (2,435)
Oscoda	0.028 (0.012)	6,077 (2,626)	0.040 (0.018)	9,145 (4,087)	0.034 (0.017)	10,311 (3,904)
Harrisville	0.045 (0.018)	5,706 (2,257)	0.068 (0.019)	11,511 (3,279)	0.077 (0.024)	11,245 (2,793)
Rockport	0.138 (0.047)	7,580 (2,607)	0.157 (0.038)	7,662 (1,866)	0.134 (0.025)	9,923 (1,523)
Rogers City	0.118 (0.024)	7,219 (1,484)	0.144 (0.049)	11,608 (3,923)	0.103 (0.022)	15,820 (2,969)
Total	0.041 (0.006)	66,948 (10,349)	0.043 (0.005)	66,373 (8,049)	0.053 (0.006)	79,195 (9,610)
Angler hours		1,616,455 (157,594)		1,553,575 (115,382)		1,486,969 (148,476)

Table 18.—Estimated lake trout catch rate (fish per angler hour), number caught, and total angler effort (hours) at selected Lake Huron sample areas, May through August 1986-88. Two standard errors in parentheses.

Species	1986		1987		1988	
	Catch per hour	Number caught	Catch per hour	Number caught	Catch per hour	Number caught
Eagle Bay to Harbor Beach	0.046 (0.026)	13,127 (6,829)	0.062 (0.021)	16,613 (5,030)	0.051 (0.017)	13,137 (4,423)
Port Austin to Sand Point	0.041 (0.020)	14,139 (5,946)	0.040 (0.013)	8,968 (2,748)	0.022 (0.009)	4,734 (2,016)
Oscoda	0.053 (0.034)	8,744 (4,837)	0.037 (0.020)	5,834 (2,547)	0.140 (0.152)	32,600 (35,343)
Harrisville	0.126 (0.078)	9,544 (4,740)	0.086 (0.051)	7,291 (3,670)	0.093 (0.046)	6,553 (3,127)
<b>Total</b>	<b>0.052</b> (0.013)	<b>45,599</b> (11,307)	<b>0.053</b> (0.010)	<b>38,706</b> (7,267)	<b>0.073</b> (0.046)	<b>57,024</b> (35,812)
<b>Angler hours</b>		<b>868,630</b> (118,300)		<b>735,914</b> (78,494)		<b>780,043</b> (130,469)

Table 19.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the Lake Erie boat fishery, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month						Season
		Apr	May	Jun	Jul	Aug	Sep	
Rainbow trout	0.0003 (0.0006)	0 (0)	21 (43)	1,495 (3,141)	0 (0)	0 (0)	0 (0)	1,516 (3,141)
Black bullhead	0.0001 (0.0002)	0 (0)	0 (0)	598 (1,256)	0 (0)	0 (0)	0 (0)	598 (1,256)
Yellow bullhead	<0.0001 (<0.0001)	58 (121)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	58 (121)
Channel catfish	0.0442 (0.0201)	1,571 (1,925)	31,619 (21,602)	56,529 (42,465)	34,083 (35,007)	8,178 (9,016)	60,978 (56,148)	192,958 (82,055)
White perch	0.0166 (0.0076)	0 (0)	61 (125)	29,809 (19,465)	37,003 (23,107)	1,461 (2,182)	4,260 (6,355)	72,594 (30,951)
White bass	0.0548 (0.0192)	731 (1,062)	91,784 (51,703)	82,059 (44,861)	40,952 (24,255)	4,802 (4,822)	18,916 (16,597)	239,244 (74,658)
Rock bass	0.0005 (0.0006)	0 (0)	576 (1,181)	1,304 (2,055)	0 (0)	91 (194)	0 (0)	1,971 (2,378)
Bluegill	0.0007 (0.0015)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3,252 (6,821)	3,252 (6,821)
Smallmouth bass	<0.0001 (<0.0001)	0 (0)	0 (0)	160 (338)	0 (0)	0 (0)	0 (0)	160 (338)
White crappie	<0.0001 (<0.0001)	160 (325)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	160 (325)
Black crappie	0.0012 (0.0025)	0 (0)	0 (0)	5,060 (10,630)	0 (0)	0 (0)	0 (0)	5,060 (10,630)
Yellow perch	0.0731 (0.0486)	0 (0)	3,967 (2,352)	10,497 (8,760)	8,958 (9,363)	20,083 (24,847)	275,281 (203,827)	318,786 (205,749)
Walleye	0.4577 (0.1211)	1,294 (1,597)	301,361 (89,594)	1,026,279 (360,282)	634,296 (191,425)	16,181 (13,414)	17,413 (30,830)	1,996,824 (419,055)
Freshwater drum	0.0081 (0.0054)	638 (889)	6,992 (8,653)	13,139 (17,734)	4,998 (6,111)	2,072 (3,050)	7,464 (9,494)	35,303 (22,955)
Other	0.0012 (0.0018)	0 (0)	0 (0)	1,055 (2,098)	3,671 (7,630)	0 (0)	587 (1,204)	5,313 (8,004)

Table 19.—Continued:

Species	Total catch per hour	Month					Season	
		Apr	May	Jun	Jul	Aug		Sep
Total	0.6588 (0.1531)	4,452 (2,880)	436,381 (106,060)	1,227,984 (366,773)	763,961 (197,925)	52,868 (30,265)	388,151 (214,715)	2,873,797 (481,635)
Angler hours		5,952 (2,563)	454,234 (121,327)	1,602,368 (494,997)	1,898,626 (472,192)	217,468 (91,498)	183,804 (49,504)	4,362,452 (702,522)
Angler trips		1,279 (572)	77,536 (20,650)	276,075 (86,657)	347,234 (90,482)	45,983 (19,639)	38,453 (10,298)	786,560 (128,899)
Angler days		1,279 (572)	77,111 (20,561)	274,049 (86,003)	346,087 (90,180)	45,983 (19,639)	38,453 (10,298)	782,962 (128,233)

Table 20.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for all western and central Lake Superior sample areas, by all modes of sportfishing, 1988. Two standard errors in parentheses.

Species	Total catch per hour	Month							Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	
Coho salmon	0.0588 (0.0102)	3,057 (1,029)	2,577 (764)	2,434 (955)	1,212 (426)	181 (106)	127 (93)	969 (607)	10,557 (1,768)
Chinook salmon	0.0052 (0.0018)	0 (0)	72 (82)	363 (150)	36 (35)	32 (33)	135 (122)	296 (246)	934 (327)
Rainbow trout	0.0062 (0.0031)	0 (0)	281 (297)	640 (428)	87 (74)	20 (24)	11 (18)	73 (139)	1,112 (545)
Atlantic salmon	0.0003 (0.0003)	0 (0)	0 (0)	53 (61)	0 (0)	0 (0)	0 (0)	0 (0)	53 (61)
Brown trout	0.0010 (0.0006)	16 (33)	34 (34)	107 (87)	27 (46)	0 (0)	0 (0)	0 (0)	184 (109)
Brook trout	0.0001 (0.0002)	0 (0)	0 (0)	16 (27)	0 (0)	0 (0)	0 (0)	0 (0)	16 (27)
Lake trout	0.1252 (0.0151)	16 (16)	142 (142)	3,259 (724)	6,150 (1,451)	7,348 (1,333)	3,782 (881)	1,764 (996)	22,461 (2,489)
Splake	0.0047 (0.0036)	50 (72)	108 (97)	118 (107)	47 (55)	320 (541)	96 (194)	99 (218)	838 (638)
Rainbow smelt	0.0054 (0.0083)	0 (0)	965 (1,474)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	965 (1,474)
Northern pike	0.0004 (0.0007)	0 (0)	0 (0)	0 (0)	9 (19)	61 (126)	0 (0)	0 (0)	70 (127)
Black bullhead	0.0012 (0.0017)	0 (0)	0 (0)	148 (261)	59 (117)	0 (0)	0 (0)	0 (0)	207 (286)
Bluegill	<0.0001 (<0.0001)	0 (0)	0 (0)	0 (0)	5 (10)	0 (0)	0 (0)	0 (0)	5 (10)
Smallmouth bass	0.0005 (0.0004)	0 (0)	0 (0)	0 (0)	47 (51)	41 (67)	0 (0)	10 (20)	98 (87)
Yellow perch	0.0392 (0.0162)	0 (0)	26 (53)	743 (974)	1,499 (1,042)	4,245 (2,426)	519 (635)	0 (0)	7,032 (2,885)
Walleye	0.0014 (0.0012)	0 (0)	0 (0)	91 (155)	28 (33)	126 (145)	0 (0)	0 (0)	245 (215)

Table 20.—Continued:

Species	Total catch per hour	Month							Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	
Lake whitefish	0.0135 (0.0071)	0 (0)	626 (476)	809 (605)	978 (1,008)	15 (29)	0 (0)	0 (0)	2,428 (1,269)
Round whitefish	0.0026 (0.0018)	0 (0)	170 (140)	167 (240)	42 (78)	88 (125)	0 (0)	0 (0)	467 (314)
Burbot	<0.0001 (<0.0001)	0 (0)	8 (16)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (16)
Other	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	15 (31)	10 (21)	0 (0)	0 (0)	25 (37)
Total	0.2658 (0.0293)	3,139 (1,032)	5,009 (1,770)	8,948 (1,769)	10,241 (2,104)	12,487 (2,833)	4,670 (1,114)	3,211 (1,220)	47,705 (4,744)
Angler hours		6,255 (1,229)	14,631 (1,722)	34,790 (3,177)	38,482 (4,155)	42,280 (3,920)	20,384 (2,380)	22,635 (4,374)	179,457 (8,485)
Angler trips		3,038 (599)	5,250 (655)	10,106 (1,250)	8,738 (925)	8,149 (723)	4,622 (570)	6,210 (1,332)	46,113 (2,414)
Angler days		2,430 (514)	4,473 (584)	9,510 (1,226)	8,506 (907)	8,081 (721)	4,493 (565)	5,916 (1,248)	43,409 (2,308)

Table 21.—Estimated sportfishing catch and effort (angler hours) for salmonids taken from various Lake Michigan tributaries, 1988. Two standard errors in parentheses.

River	Species				Angler hours
	Coho salmon	Chinook salmon	Rainbow trout	Brown trout	
St. Joseph	203 (245)	3,393 (939)	13,030 (1,939)	631 (762)	255,902 (14,070)
Kalamazoo	23 (46)	833 (588)	963 (345)	15 (18)	40,997 (4,050)
Grand	258 (525)	1,455 (1,030)	6,640 (1,890)	58 (117)	59,074 (5,814)
Muskegon	77 (164)	880 (873)	831 (570)	0 (0)	47,448 (5,841)
Betsie	0 (0)	1,267 (1,017)	1,129 (1,119)	0 (0)	41,742 (2,467)
Platte <sup>1</sup>	0 (0)	0 (0)	983 (777)	0 (0)	5,580 (1,182)
Bear	0 (0)	1,086 (1,173)	1,703 (794)	0 (0)	18,865 (2,779)
<b>Total</b>	<b>561 (604)</b>	<b>8,914 (2,337)</b>	<b>25,279 (3,203)</b>	<b>704 (771)</b>	<b>469,608 (17,248)</b>

<sup>1</sup>Closed to fishing during the fall season by court order.

Table 22.—Estimated catch per hour, number caught, and effort (angler hours, trips, and days) for the ice fishery at three areas (Au Gres, Pinconning, and Fish Point) on Saginaw Bay, 1989. Two standard errors in parentheses.

Species	Total catch per hour	Month			Season
		Jan	Feb	Mar	
Rainbow smelt	0.0002 (0.0004)	53 (112)	0 (0)	0 (0)	53 (112)
Northern pike	0.0003 (0.0006)	63 (11)	0 (0)	0 (0)	63 (131)
White perch	0.0099 (0.0099)	2,241 (2,229)	32 (68)	8 (19)	2,281 (2,230)
White bass	0.0002 (0.0004)	53 (109)	0 (0)	0 (0)	53 (109)
Pumpkinseed	0.0011 (0.0016)	246 (346)	0 (0)	0 (0)	246 (346)
Black crappie	<0.0001 (<0.0001)	11 (23)	0 (0)	0 (0)	11 (23)
Yellow perch	1.5539 (0.4994)	218,484 (58,209)	89,025 (35,634)	49,010 (59,650)	356,519 (90,643)
Walleye	0.0829 (0.0536)	0 (0)	11,651 (4,438)	7,373 (10,838)	19,024 (11,711)
Total	1.6487 (0.5137)	221,151 (58,253)	100,708 (35,909)	56,391 (60,627)	378,250 (91,425)
Angler hours		79,541 (15,189)	98,423 (22,468)	51,464 (36,050)	229,428 (45,112)
Angler trips		25,292 (5,494)	22,487 (5,806)	12,183 (8,553)	59,962 (11,707)
Angler days		24,378 (5,365)	19,540 (4,928)	11,252 (8,468)	55,170 (11,170)



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Report approved by W. C. Latta  
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