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A SURVEY OF SPORT FISHING IN THE
ILLINOIS PORTION OF LAKE MICHIGAN

(F-52-R6)

Final Report
to
IL Department of Conservation

Center for Aquatic Ecology

William H. Horns and Wayne A. Brofka

February 1992

A SURVEY OF SPORT FISHING
IN THE ILLINOIS PORTION OF LAKE MICHIGAN

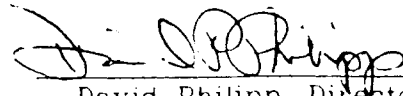
April 1991 through September 1991

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Center for Aquatic Ecology, Illinois Natural History Survey

Submitted to
Division of Fisheries, Illinois Department of Conservation
in fulfillment of the reporting requirements of
Federal Aid Project F-52-R6



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February 1992

This survey was conducted under a memorandum of understanding between the Illinois Department of Conservation and the Board of Trustees of the University of Illinois. The research was performed by the Illinois Natural History Survey, a division of the Illinois Department of Energy and Natural Resources. The project was supported by funds made available through the Federal Aid in Sport Fish Restoration Act and administered by the Illinois Department of Conservation. The form and content of this report and the interpretations of the data are the responsibility of the University of Illinois and the Illinois Natural History Survey and not the Illinois Department of Conservation.

ABSTRACT

A survey of sport fishing in the Illinois portion of Lake Michigan was conducted from April 1 to September 30, 1991. The survey covered all legal sport fishing during that period except fishing from chartered boats and smelt fishing. It included angling by pedestrians and fishing from boats. The intent of the survey was to provide reliable estimates of sport fishing activity, sport fish harvest, expenditures for sport fishing, and quality of sport fishing. Estimated total fishing effort for pedestrians and boaters was 1.22 million angler-hours. The estimated total harvest included 1,317,000 yellow perch, 7,000 brown trout, 2,500 rainbow trout, 6,000 lake trout, 20,000 coho salmon, and 14,000 chinook salmon. Estimated expenditures for boats, motors, trailers, fishing gear, and automobile gas were \$6.08 million. The yield value of the sport fishing harvest was approximately \$2.5 million.

One additional special survey was conducted. From October 1 to November 10, 1991, a survey of snagging was conducted. Snaggers using the four legal snagging areas fished for 18,200 hours, catching 1,500 chinook salmon, 800 coho salmon and insignificant numbers of other species.

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I INTRODUCTION

This report summarizes a survey of sport fishing in the Illinois portion of Lake Michigan from April 1 to September 30, 1991. The survey covered all types of legal sport fishing during that period, with the exceptions of charter-boat fishing and smelt fishing. In addition, a supplemental survey was conducted: A survey of snagging was conducted from October 1 to November 10. That survey is reported in Appendice C. The intent of the project was to provide reliable estimates of sport fishing activity, sport fish harvest, expenditures for sport fishing, and quality of sport fishing. Results from the first six years of this series of annual surveys were reported elsewhere (Horns and Gorden 1986, Horns and Gorden 1988, Horns 1988, Horns 1989, Horns and Brofka 1990, Horns and Brofka 1991). The most recent preceding creel survey of this type in Illinois was conducted in 1979 by Bruce Muench (Muench 1981).

Geographic Setting

The geographic setting of this survey is illustrated in Figure 1. The area under the jurisdiction of Illinois includes 63 miles of Lake Michigan shoreline. This area is highly developed and heavily industrialized. Chicago covers roughly one-third of the shoreline, and a series of smaller cities cover almost all of the remainder. This section of Lake Michigan lacks significant tributary streams. A geographic feature that influences the distribution and success of sport fishing is the slope of the near-shore lake bottom; the slope becomes progressively steeper as one moves from south to north. This progression means, for example, that boaters from Chicago must go considerably farther from shore to reach good salmon waters than boaters departing from Waukegan.

Distribution of Fishing

Pedestrians and launched boats

The survey recognized 27 fishing areas (Table 1). Helicopter flights in 1985-90 were used to determine the distribution of fishing. The 27 areas accounted for 94.4% of the pedestrian anglers observed in the aerial surveys and 100% of the boat trailers parked near launch areas. Boats launched from the Calumet Yacht Club (25 to 50 launches per week in mid summer) were not included in this survey. In this survey interviews were conducted at eight pedestrian fishing areas and four launch areas. The pedestrian areas (Waukegan Power Plant, Waukegan Harbor, Montrose Harbor, Diversey Harbor, Burnham Harbor, McCormick Place, Jackson Park, and Calumet Park) accounted for 68% of the pedestrian anglers observed during the helicopter flights. The four launch areas (North Point Marina, Diversey Harbor, Burnham Harbor east ramp, and Calumet Park) accounted for 59% of the boat trailers observed near launch areas. In 1990 and 1991 launches from North Point Marina accounted for a substantially larger fraction of all launches than in previous years.

Figure 1. The Illinois shoreline of Lake Michigan.

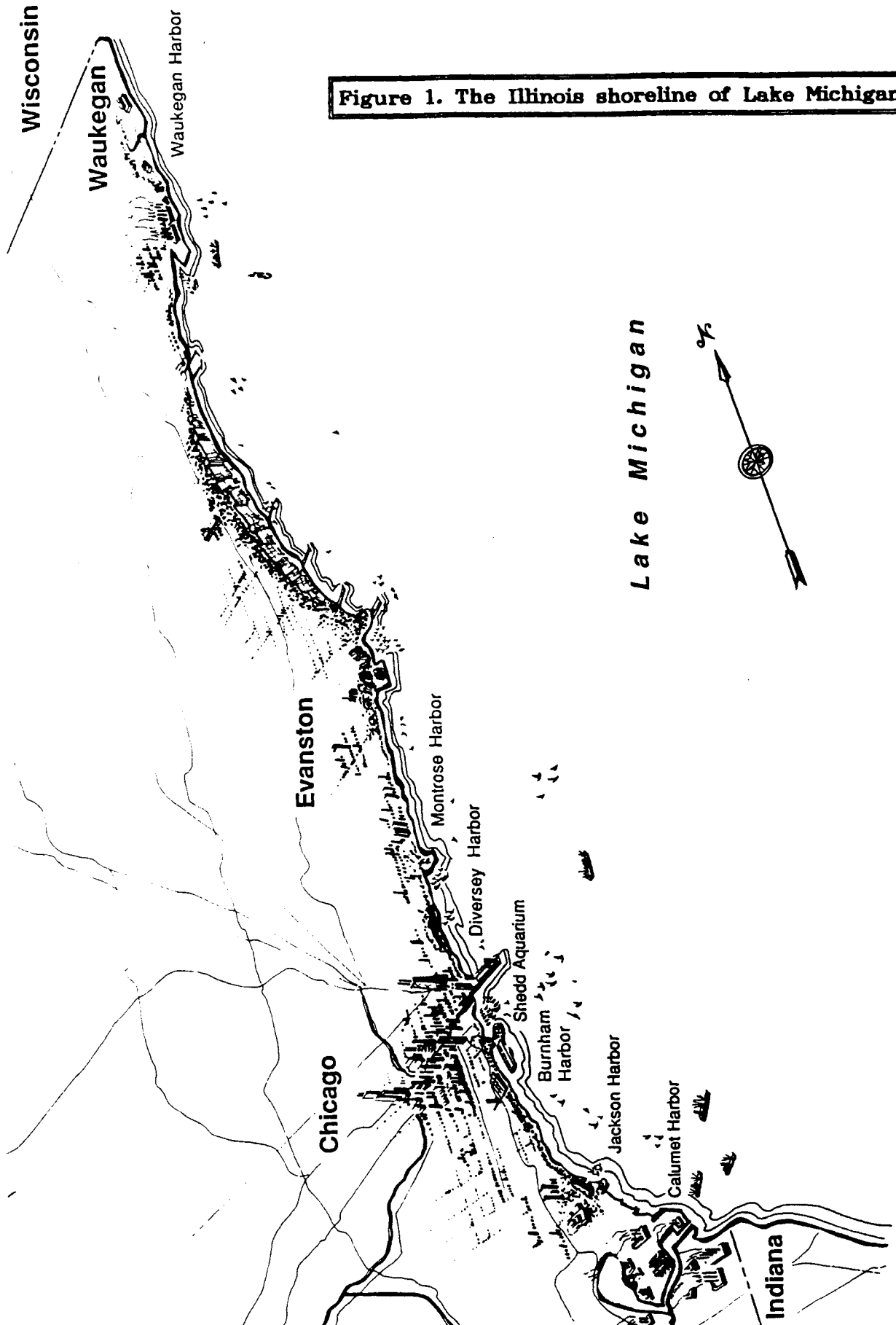


Table 1. Distribution of pedestrian anglers and boat trailers (1990).

AREA	PEDESTRIAN ANGLERS (%)	BOAT TRAILERS (%)
1. Ill. Beach State Pk & (North Pt. Marina)	0.7	29.9
2. Waukegan Power Plant discharge and pier	3.6	0.0
3. Waukegan Harbor and breakwalls	11.3	15.4
4. Great Lakes Naval Training Station	3.0	2.1
5. Forest Park	0.3	2.8
6. Central Park	0.5	3.0
7. Winnetka (Lloyd and Tower Parks)	1.6	1.1
8. Wilmette Harbor	1.7	0.0
9. Northwestern Univ. and Dawes Park	1.9	5.8
10. Farwell Avenue pier	1.3	0.0
11. Hollywood Avenue pier	1.1	0.0
12. Foster Avenue pier	0.6	0.0
13. Wilson Avenue ramp	0.0	1.3
14. Montrose Harbor and breakwalls	32.3	0.0
15. Belmont Harbor	4.5	0.0
16. Diversey Harbor and breakwalls	4.1	11.6
17. North Avenue pier	1.1	0.0
18. Navy Pier	1.9	0.0
19. Monroe Street breakwalls	2.3	0.0
20. Burnham Harbor and vicinity	7.2	(E) 6.7 (W) 8.4
21. McCormick Place seawall	1.9	0.0
22. 31st Street pier	1.6	0.0
23. 50th Street access area	0.4	0.0
24. 59th Street Harbor	1.2	0.0
25. Jackson Park Harbor and breakwall	4.8	0.7
26. Rainbow Park	0.8	0.5
27. Calumet Park	2.7	10.7
28. other areas	5.6	0.0

Moored boats

The principal boat mooring areas are North Point Marina, Waukegan Harbor, Great Lakes Naval Training Station, Wilmette Harbor, and the Chicago Park District harbors. This survey did not include boats kept at moorings or on land in the Calumet or Chicago river systems. In this survey we used the numbers of power boats kept at moorings as an index of fishing activity from moored non-charter power boats. Table 2 summarizes the distribution of moored power boats. Although some fishing occurs from sail boats, we assumed that it was a negligible portion of all fishing. The only private lift service that we included in the survey was that of Larsen Marine (referred to as I/O service in Table 2), which operates in Waukegan Harbor.

Table 2. Distribution of moored non-charter power boats.	
MOORING AREA	NUMBER OF POWER BOATS
North Point Marina	797
Waukegan Harbor	597
Public Moorings	477
Larsen Marine I/O service	120
Great Lakes Naval Training Station	96
Wilmette Harbor	85
Chicago Park District	1960
Diversey	690
Burnham	502
other harbor moorings	768

II METHODS

The following groups were considered separately: (1) Pedestrian and launched-boat anglers. These anglers could be studied directly through personal interviews and direct head counts conducted between 1 April and 30 September. (2) Anglers using moored boats. The data presented here are based entirely on extrapolations from estimates for anglers using launched boats.

Pedestrians and Launched-boat Anglers

Estimates were made for selected *primary fishing areas*, and those estimates were extrapolated to less heavily fished areas. For each primary fishing area, a stratified random sampling design similar to that suggested by Malvestuto (1983) was used. The fishing day was the primary sampling unit. Daily estimates of variables of interest (total catch by species, expenditures by category, etc.) for each primary site were combined to form seasonal estimates using the formula for stratified random samples given by Cochran (1977).

Use of primary fishing areas

The primary fishing areas for pedestrian anglers were Waukegan Power Plant, Waukegan Harbor, Montrose Harbor, Diversey Harbor, Burnham Harbor, McCormick Place, Jackson Park, and Calumet Park. The primary fishing areas for launched boats were North Point Marina, Diversey Harbor, Burnham Harbor (east ramp), and Calumet Park. For each day of work, a creel clerk was assigned to visit three areas, two pedestrian areas and one launch area, in a prescribed order. The three areas were always one of four groups: (1) Waukegan Harbor (pedestrians), Waukegan Power Plant (pedestrians), North Point Marina (launched boats); (2) Montrose Harbor (pedestrians), Diversey Harbor (pedestrians), Diversey Harbor (launched boats); (3) Burnham Harbor (pedestrians), McCormick Place (pedestrians), Burnham Harbor east ramp (launched boats); and (4) Jackson Park (pedestrians), Calumet Park (pedestrians), Calumet Park (launch ramps). The primary fishing areas accounted for 68% of pedestrian fishing and 59% of fishing from launched boats (Table 1). Estimates obtained for the primary fishing areas were extrapolated to all other areas based on the distributions of pedestrian anglers and boat trailers.

Selection of dates in a stratified random sample

The summer fishing season (1 April through 30 September 1991) was stratified by time period and type of day. Each date fell within one time period and was either a working day or a nonworking day (weekends and holidays). The following 16 strata were formed:

- | | |
|-----------------------------|---------------------------------|
| 1. working days 4/1 - 4/21 | 2. nonworking days 4/1 - 4/21 |
| 3. working days 4/22 - 5/12 | 4. nonworking days 4/22 - 5/12 |
| 5. working days 5/13 - 6/2 | 6. nonworking days 5/13 - 6/2 |
| 7. working days 6/3 - 6/23 | 8. nonworking days 6/3 - 6/23 |
| 9. working days 6/24 - 7/14 | 10. nonworking days 6/24 - 7/14 |
| 11. working days 7/15 - 8/4 | 12. nonworking days 7/15 - 8/4 |

- | | |
|------------------------------|---------------------------------|
| 13. working days 8/5 - 8/25 | 14. nonworking days 8/5 - 8/25 |
| 15. working days 8/26 - 9/15 | 16. nonworking days 8/26 - 9/15 |
| 17. working days 9/16 - 9/30 | 18. nonworking days 9/16 - 9/30 |

Within each stratum dates were selected at random. This sampling process was conducted separately for each of the four groups of three areas. Three dates were selected from each stratum except 17 and 18; in those strata, which were several days shorter than the others, fewer than three dates were selected for each group of areas. All areas in each group were visited on the dates selected for that group.

Data collection

Data collection at pedestrian fishing areas consisted of counting all pedestrian anglers at the start and finish of a two-hour interview period and interviewing a representative sample of anglers during the two hours. For four of the primary pedestrian areas (Waukegan Harbor, Montrose Harbor, Burnham Harbor, and Jackson Park) the interview period was always 6:00 a.m. to 8:00 a.m.; for the other four (Waukegan Power Plant, Diversey Harbor, McCormick Place, and Calumet Park) the interview period was always 8:30 a.m. to 10:30 a.m. Each interview was designed for one angling party (i.e., one or more anglers fishing together) rather than for one individual angler. At launch ramps the number of angling boats returning to the ramp between 11:00 a.m. and 1:00 p.m. were counted and a representative sample of all returning fishing parties were interviewed.

The interviewers (referred to as creel clerks) gathered information related to effort (number of angler-hours, number of angler-trips), expenditures for the present fishing trip (by category: major = boat, motor, or trailer; minor = fishing gear; other = auto gas @ 10 cents per mile), species sought, and catch (by species). In previous years "minor" expenditures by pedestrians averaged \$4.53 per angler-trip and "other" expenditures by pedestrians averaged \$1.67 per angler-trip. For launched-boat anglers the corresponding values were \$10.59 and \$2.12. Those average expenditures were applied to 1991 anglers. Clerks also weighed and measured fish in possession of the anglers and noted clipped fins. The data form and instructions to creel clerks are reproduced in Appendix A.

Variables measured for each date

The data collected in the interviews on one date at one area were reduced to a set of variables describing daily fishing activity: (1) *Catch per angler-hour* was determined for each species and was the number of fish caught by all parties interviewed divided by the number of hours of fishing by individuals in those parties. (2) *Expenditures per angler-trip* was determined in each of three categories (major, minor, and other). For "major" expenditures total expenditures by all anglers interviewed was divided by the number of anglers interviewed. For "minor" and "other" expenditures, average expenditures per angler-trip was derived from past creel survey data. (3) *Angler-hours* (i.e., total time spent fishing by all anglers) and (4) *angler-trips* (i.e., total number of anglers who fished) were determined

differently for pedestrians and boaters. For pedestrians, angler-hours was the average number of anglers (at start and finish of interviews) multiplied by the number of hours in the day (from 0.5 hour before sunrise to 0.5 hour after sunset), and angler-trips was angler-hours divided by the average duration of a pedestrian fishing trip (4.31 hours for all interviews with conventional pedestrian anglers during the 1987 survey). The number of fishing boats launched for the day was estimated by multiplying the number of fishing boats landing during the two-hour interview period by the estimated average ratio of the number of all boats returning in a day to the number returning between 11:00 a.m. and 1:00 p.m. That ratio was estimated to be 3.13 by monitoring all boat traffic at one of three launch ramps on 47 days in 1985, 1986, 1987, and 1988. Angler-trips was then estimated as the total number of boats launched for the day multiplied by the average number of anglers per boat (2.77, based on data from 1987). Angler-hours was taken as angler-trips multiplied by the yearly average number of hours per angling trip by boaters (5.25, based on data from 1987). (5) *Catch* was determined for each species as catch per angler-hour multiplied by angler-hours, and (6) *expenditures* was determined for each category as expenditures per angler-trip multiplied by angler-trips.

Expansion of daily estimates

The formula given by Cochran (1977) for stratified random samples was employed to expand the daily estimates to form seasonal area-specific estimates of effort, catch, and expenditures.

Seasonal averages of catch per angler-hour were obtained for each primary fishing area by taking unweighted averages of daily values. In these calculations, seasonal averages for yellow perch included only data from anglers who were fishing for perch, and seasonal averages for salmonids included only data from anglers who were fishing for salmonids.

Extrapolation to other areas

Extrapolations of seasonal estimates for primary fishing areas to other areas were based on the distributions of pedestrian anglers and boat trailers (Table 1). The distribution of boat trailers was assumed to reflect the distribution of launched-boat anglers. In the extrapolations, catch, effort, and expenditures at areas not visited were estimated by extension of results for the nearest primary fishing areas. Thus, for pedestrian anglers, results for Waukegan Harbor were extended to all other areas (except Waukegan Power Plant) north of and including Wilmette Harbor; results for Montrose Harbor were extended to all remaining areas north of Diversey Harbor; results for Diversey Harbor were extended to all remaining areas north of the Monroe Street breakwalls; results for Burnham Harbor were extended to all remaining areas north of McCormick Place, including the west ramp in Burnham Harbor; results for McCormick Place were extended to all remaining areas north of 31st Street; results from Jackson Park were extended to all remaining areas north of Rainbow Park; and results from Calumet Park were extended to all remaining areas south of (and including) Rainbow Park. For launched boats, results for North Point Marina were extended to all launch ramps north of Wilmette (including the "other" areas listed in Table 1); results for Diversey

were extended to Dawes Park and the Wilson Avenue ramps; results for Burnham Harbor east ramp were extended to Burnham Harbor west ramp; and results for Calumet Park were extended to ramps at 59th Street Harbor, Jackson Park, and Rainbow Park.

Moored Boats

To estimate effort, catch, and expenditures by anglers using moored boats, estimates for launched boats were extrapolated. First, the ratios of moored fishing boats to launched fishing boats for Waukegan Harbor, Diversey Harbor, and Burnham Harbor (east ramp) were estimated. On several dates during the summers of 1987 and 1988 counts were made of the numbers of fishing boats returning to moorings and to Larsen Marine I/O service at Waukegan Harbor while simultaneous counts were made of the number of fishing boats returning to the launch ramp. Charter boats were excluded from the counts. The ratio of moored to launched boats was 0.83 in Waukegan Harbor. In similar series of counts, the ratios were 0.92 in Diversey Harbor and 1.38 in Burnham Harbor (east ramp). Using these figures, seasonal estimates of effort, catch, and expenditures by anglers using launched boats at Waukegan, Diversey, and Burnham harbors were extrapolated to moored boats. Thus, for example, the moored boat catch at Waukegan Harbor for a given time period was estimated to be the launched boat catch for that time period multiplied by 0.83. Values so derived for Waukegan, Diversey, and Burnham harbors were then extrapolated to other moored boats based on the distribution of moored power boats (Table 2). Estimates for Waukegan Harbor were extrapolated to boats moored in North Point Marina, Wilmette Harbor, and Great Lakes Naval Training Station, and the combined estimates for Diversey Harbor and Burnham Harbor were extrapolated to all other boats moored in Chicago.

Yield Values

Here the term *yield value* means the hypothetical market price of the sport fish harvest. For salmonids, approximate market prices of whole fish, headed and gutted were used. For yellow perch market prices of fillets were used. The estimated catch for each species was multiplied by the average individual weight of fish weighed in our survey. That estimated harvested round weight was then multiplied by a factor to estimate the harvested market weight. For salmonids, the factor was 0.75 because approximately 25% of the weight of a salmonid is in the head and viscera. For yellow perch the factor was 0.40 because approximately 60% of the fish is wasted in the filleting process. Total harvested marketable weight was then multiplied by approximate market prices (Table 9).

Missing Data

On some dates creel clerks were unable to complete their assigned interviews. When data were missing from some but not all of the assigned dates in a stratum, estimates for the stratum were based on data from the completed dates. No special formula was used, but the sample size was smaller than for strata where all interviews were completed.

III RESULTS

All estimates derived in this survey are often given here without qualification; for simplicity of expression, the word "approximately" is not repeated with each estimated value. Estimates are rounded in the following paragraphs.

Total fishing effort in the Illinois portion of Lake Michigan during the study period was 1.22 million angler-hours, with 69% of that attributable to summer pedestrian anglers. Anglers caught 1,317,000 yellow perch, 7,000 brown trout, 2,500 rainbow trout, 6,000 lake trout, 20,000 coho salmon, and 14,000 chinook salmon. Expenditures for boats, motors, trailers, fishing gear, and automobile gas used on Lake Michigan fishing trips during the study period were \$6.08 million. The yield value of the Illinois sport fishing harvest was \$2.5 million.

Detailed results are presented in Tables 3 - 11. Tables 3 and 4 summarize all expenditure, catch, and effort estimates. Tables 5a, 5b, and 6 list seasonal catch and effort estimates for pedestrians and anglers using launched boats. Tables 7a, 7b, and 8 present catch rates for pedestrians and launched boaters. Table 9 provides yield values. Table 10 presents average weights of the six most important species, with separate estimates given for the catch of boaters, and pedestrians. Fin clips observed by our creel clerks are listed in Tables 11a and 11b, with the number of occurrences of each clip or clip combination listed by season and angler type.

Pedestrian Fishing

During the summer of 1991, pedestrian anglers made over 196,000 trips to Lake Michigan and spent 845,000 hours fishing. Yellow perch was the predominant species in their catch, with a harvest of 1,072,000 fish. Montrose Harbor was the most productive area, with 32% of the summer harvest of yellow perch by pedestrians, although catch rates by anglers fishing for yellow perch at Waukegan Harbor often exceeded those at Montrose Harbor during the mid-summer period of best fishing for yellow perch. Coho salmon and brown trout were the next most important species for summer pedestrians, with a catch of 4,400 for each species. Pedestrian anglers spent \$889,000 (\$4.53 per trip) for fishing gear and \$328,000 (\$1.67 per trip) for automobile gas.

Fishing by Boaters Using Launched Boats

Anglers who used launched boats made over 38,000 trips to Lake Michigan and spent 196,000 hours fishing. The most abundant species in their catch were coho salmon (8,000), yellow perch (152,000) and chinook salmon (5,000). For Pacific salmon, North Point Marina was the most productive of the four primary launch areas, accounting for 41% of the coho salmon and 53% of the chinook salmon taken by anglers who used launched boats. Expenditures by anglers using launched boats reached over \$2,672,000 (\$71 per trip), with 82% of that amount going for boats, motors, and trailers.

Fishing by Boaters Using Moored Boats

Our estimates for boaters using boats kept at moorings were derived by extrapolation from estimates for boaters using launched boats. This group of anglers caught 8,200 coho salmon, 92,000 yellow perch and 6,300 chinook salmon, and spent nearly \$2,190,000 for boats, motors, trailers, fishing gear, and automobile gas (we do not include mooring costs here).

Yield Values

The estimated yield values of the three most popular sport species were \$1,278,000 (yellow perch), \$304,000 (coho salmon), and \$652,000 (chinook salmon).

Minor Species

In addition to the species for which results are presented in detail in Tables 3-11, creel clerks reported several other species of fish in possession of anglers: **brook trout** (1 from Waukegan Power Plant discharge channel); **Atlantic salmon** (2 from North Point Marina boat ramps); **pink salmon** (1 from Calumet Park boat ramps); **lake whitefish** (1 from Waukegan harbor piers); **white perch** (105 from Calumet Park boat ramps); **white bass** (1 from Jackson Park harbor and 1 from Diversey Harbor); **common carp** (18 from Waukegan Power Plant discharge channel); **freshwater drum** (2 from Jackson Park harbor, 6 from Diversey harbor, 2 from Calumet Park shoreline, 3 from Calumet boat ramps); **white sucker** (3 from Waukegan Power Plant discharge channel); **unspecified catfish** (1 from Waukegan Power Plant pier, 1 from Diversey harbor); **unspecified bullhead catfish** (1 from Jackson Park harbor, 1 from Waukegan piers 1 from Montrose harbor); **rock bass** (12 from Burnham harbor, 47 from Diversey harbor, 3 from Jackson Park harbor, 4 from McCormick Place, 6 from Calumet Park pier, 4 from Montrose harbor, 1 from Waukegan harbor piers); **pumpkinseed sunfish** (1 from Burnham harbor); **bluegill sunfish** (1 from North Point Marina boat ramps, 2 from Waukegan harbor piers, 5 from Diversey harbor, 1 from Burnham harbor, 1 from Calumet Park boat ramps); **black crappie** (1 from Montrose harbor, 1 from Waukegan harbor piers); **unspecified crappie** (1 from Montrose harbor, 1 from Diversey harbor, 1 from Burnham harbor, 1 from McCormick Place); **largemouth bass** (1 from Diversey harbor); and **smallmouth bass** (3 from Jackson Park harbor, 1 from Jackson Park pier, 4 from Diversey harbor piers, 1 from Montrose harbor piers, 1 from Calumet Park shoreline). Anglers also caught **alewives** for use as bait.

Table 3. Effort (angler-trips) and expenditures (major, minor, and other).

TYPE OF ANGLER	AREA	EFFORT (trips)	major (boat etc)	minor (gear)	other (travel)
Pedestrians	Wau.Power	4,724	\$0	\$21,400	\$7,889
	Wau.Harbor	22,703	\$0	\$102,843	\$37,913
	Montrose	65,394	\$0	\$296,270	\$109,221
	Diversey	7,793	\$0	\$35,304	\$13,015
	Burnham	16,420	\$0	\$74,382	\$27,421
	McCormick	3,191	\$0	\$14,457	\$5,330
	Jackson	4,668	\$0	\$21,147	\$7,796
	Calumet	5,915	\$0	\$26,795	\$9,878
	other	65,342	\$0	\$296,009	\$109,125
	TOTALS	196,151	\$0	\$888,606	\$327,588
Launched boats	North Point	12,636	\$0	\$133,816	\$27,673
	Diversey	2,749	\$981,824	\$23,959	\$7,371
	Burnham	1,181	\$136,028	\$12,503	\$2,586
	Calumet	6,857	\$276,964	\$72,617	\$15,017
	others	14,270	\$801,382	\$147,953	\$32,079
	TOTALS	37,693	\$2,196,197	\$390,847	\$84,725
Moored Boats	TOTALS	32,004	\$1,785,799	\$331,154	\$72,120
SUMMER TOTALS (rounded)		268,445	\$3,982,000	\$1,611,000	\$484,000

Table 4. Effort (anglers-hours) and catch (by species).

TYPE OF ANGLER and AREA	EFFORT (hours)	yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'	
Peds	Wau.Pow.	20,360	12,552	1,332	15	0	19	30
	Wau.Har.	97,848	171,042	237	17	17	419	577
	Montrose	281,851	340,554	340	53	0	1,880	561
	Diversey	33,589	24,447	157	12	0	205	0
	Burnham	70,769	86,942	74	54	0	266	391
	McCorm.	13,755	17,867	0	20	0	10	10
	Jackson	20,120	39,096	0	21	0	15	30
	Calumet	25,494	15,038	314	20	0	244	149
	other	281,623	364,236	1,898	116	13	1,343	927
	TOTALS	845,409	1,071,774	4,351	327	29	4,400	2,674
Lau'd	N.Point.	66,332	33,195	517	488	1,229	3,130	2,820
	Diversey	13,074	4,396	26	17	252	573	40
	Burnham	6,197	5,675	7	10	39	191	7
	Calumet	36,000	65,062	85	154	63	591	106
	others	74,074	44,075	458	441	1,219	3,222	2,360
TOTALS	195,676	152,403	1,092	1,111	2,803	7,708	5,333	
Moo'd	TOTALS	179,583	92,457	1,192	1,123	3,172	8,179	6,280
SUMMER TOTALS		1,220,668	1,316,633	6,635	2,561	6,003	20,287	14,287

Table 5a. Effort and catch by pedestrian anglers (northern areas).

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH					
			yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	Wau'Power	6,550	0	722	15	0	0	30
4/21	Wau'Harbor	6,204	0	131	0	0	52	0
	Montrose	19,952	118	270	0	0	1,779	18
	Diversey	1,709	0	128	0	0	192	0
	others	18,977	37	1,020	15	0	768	35
4/22-	Wau'Power	4,449	0	610	0	0	19	0
5/12	Wau'Harbor	5,569	21	106	0	0	21	21
	Montrose	21,931	20,150	0	0	0	100	0
	Diversey	2,574	4,737	29	0	0	0	0
	others	17,792	10,560	715	0	0	66	15
5/13-	Wau'Power	2,232	1,497	0	0	0	0	0
6/2	Wau'Harbor	15,778	38,548	0	0	0	47	0
	Montrose	38,387	75,650	0	0	0	0	0
	Diversey	5,752	6,414	0	0	0	0	0
	others	31,230	59,830	0	0	0	35	0
6/3-	Wau'Power	2,590	3,408	0	0	0	0	0
6/23	Wau'Harbor	14,146	18,469	0	0	0	0	0
	Montrose	58,841	100,846	0	0	0	0	0
	Diversey	8,294	9,787	0	0	0	0	0
	others	39,036	57,572	0	0	0	0	0
6/24-	Wau'Power	3,176	7,562	0	0	0	0	0
7/14	Wau'Harbor	20,150	67,059	0	0	0	0	0
	Montrose	69,296	116,032	0	0	0	0	0
	Diversey	6,339	3,222	0	0	0	0	0
	others	45,646	97,059	0	0	0	0	0
7/15-	Wau'Power	1,364	85	0	0	0	0	0
8/4	Wau'Harbor	16,858	31,735	0	0	0	0	0
	Montrose	34,889	23,738	0	0	0	0	0
	Diversey	2,643	200	0	0	0	0	0
	others	27,294	31,504	0	0	0	0	0
8/5-	Wau'Power	0	0	0	0	0	0	0
8/25	Wau'Harbor	3,767	2,617	0	0	0	0	0
	Montrose	14,183	2,378	0	0	0	0	0
	Diversey	1,848	45	0	0	0	0	0
	others	8,918	2,747	0	0	0	0	0
8/26-	Wau'Power	0	0	0	0	0	0	0
9/15	Wau'Harbor	7,681	12,561	0	0	0	95	47
	Montrose	10,719	116	70	0	0	0	116
	Diversey	2,776	41	0	12	0	0	0
	others	11,603	9,501	22	11	0	71	72
9/16-	Wau'Power	0	0	0	0	0	0	0
9/30	Wau'Harbor	7,696	34	0	17	17	205	509
	Montrose	13,653	1,527	0	53	0	0	427
	Diversey	1,653	0	0	0	0	12	0
	others	11,526	503	0	29	13	165	516

Table 5b. Effort and catch by pedestrian anglers (southern areas).

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH					
			yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	Burnham	3,223	0	0	0	0	139	0
4/21	McCormick	99	0	0	0	0	0	0
	Jackson	204	0	0	0	0	0	0
	Calumet	3,000	0	62	0	0	244	0
	others	2,918	0	20	0	0	153	0
4/22-	Burnham	3,294	1,103	34	0	0	33	0
5/12	McCormick	501	449	0	0	0	0	0
	Jackson	644	1,522	0	0	0	0	0
	Calumet	3,044	1,182	191	0	0	0	0
	others	3,515	2,616	80	0	0	18	0
5/13-	Burnham	7,319	18,793	40	54	0	0	0
6/2	McCormick	2,685	6,719	0	0	0	0	0
	Jackson	4,726	15,423	0	0	0	0	0
	Calumet	5,667	8,712	0	20	0	0	0
	others	11,167	30,037	21	35	0	0	0
6/3-	Burnham	15,249	31,362	0	0	0	0	0
6/23	McCormick	3,010	7,543	0	20	0	0	0
	Jackson	7,500	19,470	0	0	0	0	0
	Calumet	6,040	4,148	61	0	0	0	0
	others	18,372	39,505	20	5	0	0	0
6/24-	Burnham	20,753	29,225	0	0	0	0	0
7/14	McCormick	3,830	2,107	0	0	0	0	0
	Jackson	3,828	2,485	0	21	0	0	0
	Calumet	3,836	268	0	0	0	0	0
	others	17,089	18,636	0	21	0	0	0
7/15-	Burnham	10,671	5,788	0	0	0	0	0
8/4	McCormick	1,898	859	0	0	0	0	0
	Jackson	1,133	197	0	0	0	0	0
	Calumet	1,388	670	0	0	0	0	0
	others	7,737	3,707	0	0	0	0	0
8/5-	Burnham	2,881	132	0	0	0	0	0
8/25	McCormick	470	76	0	0	0	0	0
	Jackson	191	0	0	0	0	0	0
	Calumet	454	29	0	0	0	0	0
	others	1,989	99	0	0	0	0	0
8/26-	Burnham	3,469	540	0	0	0	0	36
9/15	McCormick	329	103	0	0	0	0	10
	Jackson	1,092	0	0	0	0	0	0
	Calumet	837	28	0	0	0	0	0
	others	3,297	322	0	0	0	0	22
9/16-	Burnham	3,910	0	0	0	0	93	354
9/30	McCormick	934	10	0	0	0	10	0
	Jackson	802	0	0	0	0	15	30
	Calumet	1,228	0	0	0	0	0	149
	others	3,519	3	0	0	0	68	267

Table 6. Effort and catch by anglers using launched boats.

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH					
			yellow perch	brown brown	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	N.Point	3,473	0	93	8	27	424	8
4/21	Diversey	1,821	0	0	0	0	95	0
	Burnham	339	0	7	0	0	49	0
	Calumet	1,863	0	34	0	0	217	43
	others	4,591	0	89	7	22	491	11
4/22-	N.Point	3,845	0	30	0	23	705	0
5/12	Diversey	2,521	564	26	7	14	271	25
	Burnham	342	181	0	0	7	43	0
	Calumet	5,981	17,278	7	37	0	153	28
	others	5,778	2,454	41	8	36	815	19
5/13-	N.Point	8,385	595	54	68	121	1,215	63
6/2	Diversey	1,597	1,097	0	0	0	30	0
	Burnham	499	359	0	5	0	62	0
	Calumet	8,385	19,868	17	0	0	183	0
	others	9,395	3,774	46	62	99	1,113	51
6/3-	N.Point	6,825	1,281	0	58	194	307	214
6/23	Diversey	1,771	1,356	0	0	86	171	10
	Burnham	777	195	0	0	0	15	0
	Calumet	9,071	21,719	12	6	44	19	9
	others	8,642	4,493	1	48	217	377	183
6/24-	N.Point	9,202	7,643	0	50	158	67	180
7/14	Diversey	1,163	637	0	0	34	7	0
	Burnham	1,517	3,818	0	0	0	0	0
	Calumet	5,461	5,426	14	16	14	21	14
	others	10,743	11,992	1	43	152	61	149
7/15-	N.Point	9,089	8,375	69	170	141	187	613
8/4	Diversey	1,365	473	0	10	106	0	5
	Burnham	1,323	972	0	5	32	22	0
	Calumet	1,408	637	0	0	5	0	0
	others	10,092	8,439	57	153	221	181	506
8/5-	N.Point	9,677	3,081	161	103	331	142	767
8/25	Diversey	1,486	0	0	0	13	0	0
	Burnham	422	45	0	0	0	0	0
	Calumet	422	6	0	0	0	0	12
	others	9,423	2,585	132	85	279	116	631
8/26-	N.Point	11,243	12,220	46	16	214	54	911
9/15	Diversey	506	269	0	0	0	0	0
	Burnham	304	0	0	0	0	0	0
	Calumet	1,722	0	0	95	0	0	0
	others	10,103	10,194	38	24	175	44	748
9/16-	N.Point	4,593	0	63	14	21	28	63
9/30	Diversey	843	0	0	0	0	0	0
	Burnham	675	105	0	0	0	0	7
	Calumet	1,687	127	0	0	0	0	0
	others	5,308	144	52	12	17	23	61

Table 7a. Catch rates by pedestrian anglers (northern areas). For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR					
		yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	Wau' Power	*	0.099	0.001	0.000	0.000	0.003
4/21	Wau' Harbor	0.000	0.026	0.000	0.000	0.004	0.000
	Montrose	0.117	0.017	0.000	0.000	0.110	0.002
	Diversey	*	0.087	0.000	0.000	0.121	0.000
4/22-	Wau' Power	*	0.211	0.000	0.000	0.016	0.000
5/12	Wau' Harbor	0.000	0.033	0.000	0.000	0.003	0.003
	Montrose	1.094	0.000	0.000	0.000	0.021	0.000
	Diversey	2.719	0.108	0.000	0.000	0.000	0.000
5/13-	Wau' Power	1.100	0.000	0.000	0.000	0.000	0.000
6/2	Wau' Harbor	2.681	0.000	0.000	0.000	0.037	0.000
	Montrose	1.464	*	*	*	*	*
	Diversey	1.180	*	*	*	*	*
6/3-	Wau' Power	2.912	0.000	0.000	0.000	0.000	0.000
6/23	Wau' Harbor	1.114	0.000	0.000	0.000	0.000	0.000
	Montrose	1.305	*	*	*	*	*
	Diversey	0.979	0.000	0.000	0.000	0.000	0.000
6/24-	Wau' Power	4.247	*	*	*	*	*
7/14	Wau' Harbor	3.033	*	*	*	*	*
	Montrose	1.881	*	*	*	*	*
	Diversey	0.522	*	*	*	*	*
7/15-	Wau' Power	0.241	0.000	0.000	0.000	0.000	0.000
8/4	Wau' Harbor	1.139	*	*	*	*	*
	Montrose	0.523	*	*	*	*	*
	Diversey	0.061	*	*	*	*	*
8/7-	Wau' Power	*	*	*	*	*	*
8/25	Wau' Harbor	0.401	0.000	0.000	0.000	0.000	0.000
	Montrose	0.180	0.000	0.000	0.000	0.000	0.000
	Diversey	0.047	0.000	0.000	0.000	0.000	0.000
8/26-	Wau' Power	*	*	*	*	*	*
9/15	Wau' Harbor	2.470	0.000	0.000	0.000	0.042	0.021
	Montrose	0.121	0.005	0.000	0.000	0.000	0.013
	Diversey	0.047	0.000	0.000	0.000	0.000	0.000
9/16-	Wau' Power	*	*	*	*	*	*
9/30	Wau' Harbor	*	0.000	0.002	0.002	0.019	0.064
	Montrose	0.219	0.000	0.009	0.000	0.000	0.083
	Diversey	0.000	0.000	0.000	0.000	0.006	0.000

Table 7b. Catch rates by pedestrian anglers (southern areas). For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR					
		yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	Burnham	*	0.000	0.000	0.000	0.020	0.000
4/21	McCormick	*	*	*	*	*	*
	Jackson	*	0.000	0.000	0.000	0.000	0.000
	Calumet	*	0.012	0.000	0.000	0.112	0.000
4/22-	Burnham	0.363	0.018	0.000	0.000	0.018	0.000
5/12	McCormick	0.477	*	*	*	*	*
	Jackson	10.296	0.000	0.000	0.000	0.000	0.000
	Calumet	0.236	0.212	0.000	0.000	0.000	0.000
5/13-	Burnham	2.681	*	*	*	*	*
6/2	McCormick	3.141	*	*	*	*	*
	Jackson	2.793	*	*	*	*	*
	Calumet	1.141	*	*	*	*	*
6/4-	Burnham	1.681	*	*	*	*	*
6/23	McCormick	2.631	*	*	*	*	*
	Jackson	2.454	*	*	*	*	*
	Calumet	0.638	*	*	*	*	*
6/24-	Burnham	1.346	*	*	*	*	*
7/14	McCormick	0.885	*	*	*	*	*
	Jackson	0.575	*	*	*	*	*
	Calumet	0.056	*	*	*	*	*
7/15-	Burnham	0.061	*	*	*	*	*
8/4	McCormick	0.656	*	*	*	*	*
	Jackson	0.574	*	*	*	*	*
	Calumet	0.130	*	*	*	*	*
8/5-	Burnham	0.050	0.000	0.000	0.000	0.000	0.000
8/25	McCormick	0.215	*	*	*	*	*
	Jackson	0.000	*	*	*	*	*
	Calumet	0.160	0.000	0.000	0.000	0.000	0.000
8/26-	Burnham	0.179	0.000	0.000	0.000	0.000	0.021
9/15	McCormick	0.480	0.000	0.000	0.000	0.000	0.138
	Jackson	0.000	0.000	0.000	0.000	0.000	0.000
	Calumet	0.023	0.000	0.000	0.000	0.000	0.000
9/16-	Burnham	0.000	0.000	0.000	0.000	0.018	0.081
9/30	McCormick	0.000	0.000	0.000	0.000	0.025	0.000
	Jackson	*	0.000	0.000	0.000	0.015	0.030
	Calumet	0.000	0.000	0.000	0.000	0.000	0.057

Table 8. Catch rates by anglers using launched boats. For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR					
		yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	N.Point	*	0.015	0.001	0.005	0.068	0.001
4/21	Diversey	*	0.000	0.000	0.000	0.039	0.000
	Burnham	*	0.021	0.000	0.000	0.145	0.000
	Calumet	*	0.029	0.000	0.000	0.124	0.028
	N.Point	*	0.003	0.000	0.002	0.150	0.000
4/22-	Diversey	3.987	0.032	0.001	0.004	0.080	0.013
	Burnham	1.880	0.000	0.000	0.023	0.176	0.000
	Calumet	7.531	0.002	0.022	0.000	0.054	0.016
5/13-	N.Point	0.645	0.007	0.011	0.018	0.170	0.009
	6/2	Diversey	1.238	0.000	0.000	0.000	0.026
6/4-	Burnham	*	0.000	0.013	0.000	0.225	0.000
	Calumet	2.491	0.016	0.000	0.000	0.190	0.000
	N.Point	4.522	0.000	0.007	0.020	0.031	0.102
	6/23	Diversey	2.563	0.000	0.000	0.028	0.162
6/24-	Burnham	0.438	0.000	0.000	0.000	0.057	0.000
	Calumet	2.954	0.034	0.017	0.087	0.051	0.013
	N.Point	2.143	0.000	0.006	0.021	0.009	0.028
	7/14	Diversey	1.201	0.000	0.000	0.049	0.010
7/15-	Burnham	2.883	0.000	0.000	0.000	0.000	0.000
	Calumet	1.198	0.000	0.014	0.000	0.000	0.000
	N.Point	1.179	0.008	0.067	0.049	0.111	0.204
	8/4	Diversey	0.396	0.000	0.020	0.125	0.000
8/5-	Burnham	1.498	0.000	0.005	0.041	0.032	0.000
	Calumet	0.383	0.000	0.000	0.031	0.000	0.000
	N.Point	1.733	0.019	0.007	0.037	0.014	0.080
	8/25	Diversey	0.000	0.000	0.000	0.017	0.000
8/26-	Burnham	0.123	*	*	*	*	*
	Calumet	0.000	0.000	0.000	0.000	0.000	0.068
	N.Point	4.083	0.013	0.002	0.017	0.013	0.074
	9/15	Diversey	1.988	*	*	*	*
9/16-	Burnham	0.000	0.000	0.000	0.000	0.000	0.000
	Calumet	0.000	0.000	0.048	0.000	0.000	0.000
	N.Point	0.000	0.014	0.003	0.005	0.006	0.014
	9/30	Diversey	0.000	0.000	0.000	0.000	0.000
9/30	Burnham	0.190	0.000	0.000	0.000	0.000	0.049
	Calumet	0.149	0.000	0.000	0.000	0.000	0.000

Table 9. Yield values. Yellow perch are assumed to be prepared as fillets with 60% waste and salmonids as whole gutted fish with 25% waste. Prices for all except brown trout are those current in February 1992.

SPECIES	TOTAL CATCH	AVE WT (lbs)	ROUND WT (lbs)	MARKET WT (lbs)	PRICE PER POUND	YIELD VALUE
yellow perch	1,316,633	0.27	355,491	142,196	\$8.99	\$1,278,342
brown trout	6,635	3.36	22,294	16,720	\$3.88	\$64,874
rainbow trout	2,561	5.27	13,496	10,122	\$3.88	\$39,273
lake trout	6,003	7.11	42,681	32,011	\$4.99	\$159,735
coho salmon	20,287	2.86	58,021	43,516	\$6.99	\$304,177
chinook salmon	14,287	8.70	124,297	93,223	\$6.99	\$651,629
COMBINED YIELD VALUE OF ALL SPECIES:						\$2,498,030

Table 10. Average weights (coho salmon, chinook salmon, rainbow trout, lake trout, brown trout, and yellow perch). Weights are in pounds. Sample sizes (n) are shown. Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Asterisks represent situations where no fish were measured.

SPECIES	ANGLER TYPE		SPRING	-----SUMMER-----			FALL
				early	mid	late	
coho salmon	boaters	ave	2.18	3.15	3.71	3.85	1.27
		n	59	69	5	8	2
	pedestrians	ave	1.99	3.48	*	3.57	4.72
		n	53	2	0	1	5
chinook salmon	boaters	ave	11.09	7.29	3.96	5.33	3.85
		n	4	4	17	24	4
	pedestrians	ave	10.04	*	*	11.77	11.48
		n	3	0	0	8	23
rainbow trout	boaters	ave	3.03	5.85	7.68	8.04	6.70
		n	1	8	6	2	1
	pedestrians	ave	1.67	0.52	*	0.50	4.02
		n	1	3	0	1	1
lake trout	boaters	ave	8.70	6.38	7.97	5.86	8.48
		n	2	7	15	11	3
	pedestrians	ave	*	*	*	*	5.69
		n	0	0	0	0	1
brown trout	boaters	ave	3.02	5.10	6.81	3.87	3.18
		n	9	3	2	6	5
	pedestrians	ave	3.09	0.31	*	4.46	*
		n	51	1	0	1	0
yellow perch	boaters	ave	0.37	0.38	0.41	0.45	*
		n	25	168	50	10	0
	pedestrians	ave	0.23	0.25	0.26	0.27	0.24
		n	161	930	396	33	3

Table 11a. Fin clip summary (coho salmon, chinook salmon, and rainbow trout). Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Occurrences of clips are shown separately for two types of anglers: boaters (b), and pedestrians (p).

SPECIES	CLIP	SPRING		-----SUMMER-----						FALL	
				early		mid		late			
		b	p	b	p	b	p	b	p	b	p
coho salmon	ad	1	1	2	0	0	0	0	0	0	0
	ad,lp	6	4	9	0	1	0	0	1	0	0
	do,lp	1	0	0	0	0	0	0	0	0	0
	do,rp	1	0	0	0	0	0	0	0	0	0
	lp	2	1	6	0	2	0	0	0	0	0
	lv	0	0	1	0	0	0	0	0	0	0
	rp	0	0	0	0	1	0	0	0	0	0
	rv	0	0	1	0	0	0	0	0	0	0
no clips	132	52	131	2	13	0	6	1	2	6	
chinook salmon	ad	0	0	1	0	3	0	0	0	0	1
	ad,lp	0	0	1	0	1	0	0	0	0	0
	ad,lv	0	0	0	0	1	0	0	0	0	0
	do	0	0	1	0	0	0	0	0	0	0
	lp	0	0	1	0	1	0	1	0	0	1
	lv,rv	0	0	0	0	1	0	0	0	0	0
	rp	0	0	0	0	2	0	0	0	0	1
	rv	0	0	0	0	2	0	0	0	0	1
no clips	7	4	7	0	27	0	56	9	4	25	
rainbow trout	ad	0	0	1	0	0	0	0	0	0	0
	ad,do,lp	0	0	1	0	0	0	0	0	0	0
	ad,lm	0	0	0	0	1	0	0	0	0	0
	do,rp	0	0	0	1	0	0	0	0	0	0
	lv	0	0	0	0	1	0	0	0	0	0
	rp	0	0	0	0	1	0	0	0	0	0
	no clips	5	1	9	3	5	1	2	1	1	1

Table 11b. Summary of fin clips (lake trout and brown trout). Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Occurrences of clips are shown separately for two types of anglers: boaters (b), and pedestrians (p).

SPECIES	CLIP	SPRING		SUMMER						FALL	
				early		mid		late			
		b	p	b	p	b	p	b	p	b	p
lake trout	ad	3	0	2	0	3	0	4	0	0	0
	ad,lp	4	0	13	0	8	0	4	0	1	0
	ad,lv	0	0	1	0	3	0	1	0	1	1
	ad,lv,rv	0	0	1	0	0	0	0	0	0	0
	ad,rp	0	0	1	0	7	0	2	0	0	0
	ad,rv	0	0	2	0	0	0	1	0	1	0
	do,rp	0	0	1	0	0	0	0	0	0	0
	do,rv	0	0	0	0	0	0	1	0	0	0
	lp	0	0	2	0	2	0	0	0	0	0
	lp,rp,rv	0	0	0	0	0	0	1	0	0	0
	lp,rv	0	0	0	0	0	0	1	0	0	0
	lv	0	0	1	0	0	0	0	0	0	0
	lv,rp	0	0	1	0	0	0	2	0	0	0
	lv,rv	0	0	0	0	0	0	1	0	0	0
	rp	0	0	0	0	1	0	1	0	0	0
	rv	0	0	1	0	0	0	1	0	0	0
no clips	0	0	0	0	0	0	1	0	0	0	
brown trout	do,lp	0	1	0	0	0	0	0	0	0	0
	do,rp	0	1	0	0	0	0	0	0	0	0
	lp	0	1	0	0	0	0	1	0	0	0
	lp,rp	1	2	1	0	0	0	1	0	1	0
	rp	0	1	0	0	0	0	0	0	1	0
	rv	0	0	0	0	0	0	1	0	0	0
	no clips	18	45	7	1	4	0	9	1	3	0

IV DISCUSSION

Comparisons with preceding years

These results can be compared with those from 1986 through 1990 (Tables 12 and 13). Effort continued to increase after bottoming out in 1989. Effort by launched boat anglers declined however, with pedestrian anglers and moored boat anglers being responsible for the increase. In 1991 the yellow perch harvest fell 18.5% from the 1990 level but was still over 1.3 million. The 1991 harvest of coho salmon was only 35% of 1990, the worst catch since this survey began. The harvest of chinook salmon in 1991 was the best since 1987, 33% above the 1990 catch. The harvest of lake trout was the highest since this survey began, 157% above the 1990 catch. Estimated expenditures for boats, motors, and trailers, which had jumped markedly between 1987 and 1988, returned to previous levels in 1989-1991. Tables 12 and 13 summarize these and other results from this series of creel surveys. Creel survey methods were different in the six years, so comparisons should be made with caution, especially where estimates for anglers using moored boats are concerned.

Table 12. Summer effort and expenditures in 1986 - 1991.

TYPE OF ANGLER	YEAR	EFFORT (angler- trips)	EXPENDITURES		
			major (boat)	minor (gear)	other (travel)
Pedestrians	1986	299,454	\$0	\$844,000	\$397,000
	1987	289,307	\$0	\$1,674,000	\$475,000
	1988	250,251	\$0	\$1,133,000	\$417,000
	1989	167,396	\$0	\$758,000	\$280,000
	1990	183,446	\$0	\$831,000	\$306,000
	1991	196,151	\$0	\$889,000	\$328,000
Launched Boats	1986	71,009	\$2,079,000	\$1,598,000	\$131,000
	1987	54,043	\$2,427,000	\$618,000	\$119,000
	1988	58,009	\$8,061,000	\$614,000	\$123,000
	1989	40,261	\$3,229,000	\$426,000	\$85,000
	1990	45,394	\$2,115,000	\$481,000	\$99,000
	1991	37,693	\$2,196,000	\$391,000	\$85,000
Moored Boats	1986	74,307	\$2,022,000	\$2,395,000	\$138,000
	1987	28,911	\$996,000	\$363,000	\$60,000
	1988	34,321	\$5,251,000	\$373,000	\$73,000
	1989	23,084	\$1,449,000	\$244,000	\$49,000
	1990	24,752	\$803,000	\$262,000	\$54,000
	1991	32,004	\$1,786,000	\$331,000	\$72,000
SUMMER TOTALS	1986	444,770	\$4,101,000	\$4,837,000	\$666,000
	1987	372,261	\$3,423,000	\$2,655,000	\$654,000
	1988	344,422	\$13,312,000	\$2,120,000	\$613,000
	1989	230,741	\$4,678,000	\$1,428,000	\$414,000
	1990	253,592	\$2,919,000	\$1,574,000	\$460,000
	1991	268,445	\$3,982,000	\$1,611,000	\$484,000

Table 13. Summer effort and catch in 1986 - 1991.

ANGLER TYPE and YEAR		EFFORT (angler- hours)	CATCH					
			yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Peds	1986	1,278,678	1,614,979	5,478	2,914	171	20,415	5,455
	1987	1,252,796	1,715,219	10,982	2,486	55	13,101	9,066
	1988	1,077,816	1,636,985	4,912	2,346	33	17,577	3,815
	1989	721,476	819,821	3,599	2,515	0	12,991	3,550
	1990	790,651	1,393,047	2,570	1,284	0	8,438	4,216
	1991	845,409	1,071,774	4,351	327	29	4,400	2,674
Lau'd	1986	386,287	53,316	2,094	2,849	1,030	43,539	11,856
	1987	285,076	84,172	690	811	2,299	14,861	8,266
	1988	304,547	73,999	836	1,545	2,188	32,016	3,556
	1989	262,223	43,132	2,363	1,595	2,544	48,246	4,454
	1990	238,317	97,771	1,168	1,659	1,483	30,833	4,060
	1991	195,676	152,403	1,092	1,111	2,803	7,708	5,333
Moo'd	1986	404,232	24,973	1,633	3,772	641	52,219	12,482
	1987	151,770	20,964	330	444	1,286	8,855	4,057
	1988	180,186	34,980	485	868	1,446	19,205	2,107
	1989	148,570	21,405	1,272	950	1,537	25,098	2,643
	1990	129,944	40,682	621	1,023	852	18,094	2,468
	1991	179,583	92,457	1,192	1,123	3,172	8,179	6,280
SUMMER	1986	2,069,197	1,693,268	9,205	9,535	1,842	116,173	29,793
TOTALS	1987	1,689,642	1,820,355	12,002	3,751	3,640	36,817	21,389
	1988	1,572,210	1,747,027	6,269	4,813	3,736	70,123	9,607
	1989	1,132,269	884,358	7,233	5,059	4,081	86,335	10,646
	1990	1,158,911	1,531,500	4,359	3,966	2,336	57,365	10,744
	1991	1,220,668	1,316,633	6,635	2,561	6,003	20,287	14,287

The most important differences between the methods of collecting and analyzing data used in these six years are these: (1) In 1986 six pedestrian areas and three launch areas were visited for interviews; in 1987 through 1991 eight pedestrian areas and four launch areas were visited. Thus higher proportions of total catch, effort, and expenditures were estimated directly in 1987 through 1991 than in 1986, and lower proportions were estimated by extrapolation to areas that were not visited. (2) Several parameters used in deriving estimates are themselves estimated, and the estimated values were different in the six years. Table 14 lists the values of these parameters used each year. (3) The formulae for extrapolating catch, effort, and expenditures by anglers using launched boats to estimate those things for anglers using moored boats were quite different in the six years. This occurred because the estimated ratios of moored boat traffic to launched boat traffic for Diversey Harbor and Burnham Harbors changed greatly between 1986 and 1988 (Table 14) as new data became available. (4) Average expenditures per angler-trip for "minor" and "other" expenditures (see Methods) were not

estimated independently from 1989 to 1991, but were derived from previous creel surveys. (5) In 1991 North Point Marina replaced Waukegan Harbor as a primary fishing area for launched boats.

Table 14. Parameters used in deriving estimates.			
PARAMETER	1986	1987	1988 - 1991
Duration of fishing trip (hours)			
summer pedestrians	4.27	4.31	4.31
launched boats	5.44	5.25	5.25
Number of anglers per launched boat	2.91	2.77	2.77
Ratio of number of launched boats returning in a day to the number returning between 11:00 a.m. and 1:00 p.m.	3.125	2.94	3.13
Ratio of number of moored boats used for fishing on any day to number of launched boats used for fishing			
Waukegan Harbor	0.82	0.83	0.83
Diversey Harbor	2.39	1.54	0.92
Burnham Harbor (East)	no est	0.34	1.38
Distributions of pedestrian anglers, launched boats, and moored boats (Tables 1 and 2).	Differences between years were slight, except that North Point Marina has become the major port for launching boats.		

Confidence Intervals and Bias

Estimates of catch, effort, and expenditures are presented above without confidence intervals. Confidence intervals presented without estimates of bias are meaningful only if bias is assumed to be negligible, an assumption that we are not willing to make. Although we have collected and will continue to collect data with which to partially assess biases, we are presently unable to make such assessments. Table 14 lists the parameters used in our estimation procedures. Those parameters, to the extent that they are incorrect, introduce bias into the estimation process. Other sources of bias in this survey include the assumption that fishing effort and catch rates during the times of our interview sets (6:00 a.m. to 8:00 a.m. or 8:30 a.m. to 10:00 a.m. for pedestrians; 11:00 a.m. to 1:00 p.m. for launched boat anglers) are, on average, representative of the entire day.

V REFERENCES

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VI APPENDIX A - DATA FORM AND INSTRUCTIONS TO CLERKS

We record data on the **Interview Form** and a modified version of the same. The modified version is sometimes used by a helper in connection with interviews of boaters (see "Instructions to Clerks -- Work Assignments").

One important general rule applies to both forms: "Fill in all the blanks". If you don't know a particular value, draw a diagonal slash through that space on the form. The **only** exception to this rule is the "numbers in possession" section of the **Interview Form**. In that section, blanks are interpreted as zeros.

Interviews are obtained in sets. For each set, you visit a site and interview a number of angling parties. Each interview involves data for an entire angling party, although you might only speak with one individual angler. The interviews are taken from pedestrian anglers or from boaters returning to a launch ramp.

When pedestrian anglers are being interviewed, interview either all present or all that can be interviewed in the assigned period (usually two hours). Counts of pedestrian anglers are made at the start and finish of the interview set. When all pedestrian fishing parties cannot be interviewed, interview a **representative** sample of the anglers present. Thus, if the site includes harbor, shore, and structure areas (see maps), you interview parties from all three areas in proportion to their numbers. Approach all types of people (men, women, Chinese, hispanic, white, polite, surly, etc.) without special favor for or against any. To assure impartiality skip a fixed number of anglers between interviews, with the number to skip determined so that the entire site is covered during the interview period. If you encounter an angling party that has already been interviewed in our creel survey that day, skip them.

When counting anglers, ignore spectators (casual passers-by) but include members of the angling party who are not fishing at the moment. This can include family members (spouses and children over five years old) who are accompanying the angler.

When boaters are interviewed, stay at the ramp for a predetermined time (usually two hours) and record data for **all** returning boats. Sometimes it is not possible to interview all angling boats. When that happens, you will interview a representative sample of boats containing anglers. When a boat is not interviewed, you record an ID number (see below), the time (under "interview time"), and one of four notes (in the right-hand margin): "ANI" (anglers - no interview), "PNA" (power - no anglers), "SAIL" (sail boat), and "CH" (charter fishing boat). Counts of trailers are made at the start and finish of the interview period. It is important that the counts indicate the number of trailers at the times when you start and finish your interview set. Sail boats, non-angling power boats, and charter boats are never interviewed.

Record the total number of trailers of **all** types, but only count empty trailers (those without boats on them) with cars attached. Only count trailers at the east ramp area when covering Burnham Harbor.

The interview form has four areas for recording data: 1) Site Data, 2) Party Record, 3) Catch Record, and 4) Fish Record.

1) **Site Data.** This area is a condensed version of the **Instantaneous Counts Form**. Counts are recorded at the start and finish of each interview set. Remember the rule: "Fill in all the blanks". When conducting boat interviews, record slashes in the pedestrian spaces. When conducting pedestrian interviews of any kind, enter a slash in the trailers space. When conducting pedestrian interviews with "regular peds", always enter slashes for all three types of "special peds", and vice-versa.

2) **Party Record** and 3) **Catch Record.** These areas are filled-in during the interviews. Column headings are explained here:

ID - Interviews (and non-interviewed boats) are sequentially numbered. For pedestrians, assign a number to each pedestrian party interviewed. For boaters, assign a number to each boat that returns to the ramp, including those that are not interviewed. Each clerk assigns one series of numbers each day, with no repeats. Thus, for example, when you conduct more than one interview set in a day, **do not** begin the second set with number 1; continue numbering where you left off in numbering the previous set. **Also**, for interview sessions at boat ramps, record the registration number of each boat.

angler type - One of eight mutually exclusive possibilities is circled: har (harbor), sho (shore), str (structure), lau (launched), sna (snagger), smt (smelter), ice (ice-angler), and moo (moored).

ang - For each party record the total number of anglers (tot) and the number who are Illinois residents (res). Remember, as in the **Instantaneous Counts Form**, include members of the angling party who are not fishing at the moment.

lines - For each party record the number of fishing rods (rod) and the number of power lines (pwr) in use by that party. Trolley lines are counted as power lines here.

nets - (ignore)

trip times - Record three times: the time the fishing trip started, the time of the interview, and the time the trip ended (or is expected to end). **Always record times in 24-hour time** (e.g., two o'clock p.m. is 1400). When the fishing trip has started the previous day, still record the time of day that fishing started. Fishing trips by pedestrians are considered to start when the angling party arrives at the shoreline. Fishing trips using boats are considered to start when the boat leaves the ramp and to end when the boat arrives back at the ramp.

expenses - Data are only recorded for boaters, not pedestrian anglers. Remember, the data you record applies to the entire party being interviewed. You record only costs of items acquired since the last fishing trip on Lake Michigan. If this is the first trip that an angler has **ever** made to Lake Michigan, include the total purchase price of all items in each category, regardless of when purchased. Notice that we are not concerned with when the item was paid for, only with when it was acquired and what it cost. 1) For major expenses (maj), record the purchase price of boat, motor, and/or

trailer, **if acquired since the last fishing trip on Lake Michigan.** Include newly purchased used equipment. 2) For minor expenses (min) and other expenses (other) record no data.

sought - Record species sought as p (perch), s (salmonid), ps ("whatever bites"), or o (other specific target species).

numbers in possession - Record only the numbers of fish in possession of the angling party. Fish names are abbreviated as follows: BK - brook trout, BN - brown trout, RB - rainbow trout, LT - lake trout, CO - coho salmon, CH - chinook salmon, YP - yellow perch, SM - smallmouth bass, NP - northern pike. **Accurate identification is extremely important; don't hesitate to use your key if you have any doubt about the identification of any fish.** If the fish in possession of an angling party include some caught at any other site, exclude those from the numbers recorded here.

(no heading) - Ask the angler how many floy tags he/she has seen on perch presently in possession. Record that number here.

4) **Fish Record.** Here you record physical measurements made in connection with the interviews. Above this section you record the time your interview set was scheduled to start (usually 0600, 0830, or 1100). You should be able to weigh, measure, and examine for clips (for purposes of this form, we count floy tags under the heading "clips"), scars, and wounds on **all** salmonids that you encounter in possession of anglers. When an angler has more than 5 yellow perch, select five fish **at random** from the catch to weigh, measure, and examine for floy tags (you don't need to look for clipped fins or lamprey marks on yellow perch). In addition to the five randomly selected perch, record data for any other yellow perch on which the angler has found a floy tag. On some occasions anglers will have removed floy tags from fish before you arrive. If it is not possible to know which specific fish the tag came from, record all information printed on the tag in the margin of the form and **keep the tag.** Column headings are explained here:

ID - Record the same number recorded in "Party Record" for the angling party that caught this fish.

species - Record the two-letter abbreviation of the species name. The abbreviations are those that appear as headings in the "Catch Record" section.

weight - Record the weight of the fish **in grams.** Do not record weights of gutted or beheaded fish. Be sure to "zero" the scale and to use the appropriate scale for the size of the fish being weighed.

length - Record total length (distance from tip of snout to tip of tail) **in centimeters.**

clipped fins - As outlined above you will examine **all** salmonids for clipped fins and floy tags, and you will examine **some** yellow perch for floy tags only. You record abbreviations for what you find (for purposes of data recording, assume that perch never have clipped fins or lamprey scars or wounds). The permitted entries are do (dorsal), ad (adipose), lp (left pectoral), rp (right pectoral), lv (left ventral), rv (right ventral), an (anal), fl (floy tag), lm (left maxillary), rm (right maxillary) and none. **Also,** when you encounter a floy

tag, record all the information printed on the tag. **Remember**, leave no blank spaces on the form; if you are unable to examine the fish, draw diagonal slashes through the spaces.

scars and # wounds - This refers to marks left by sea lampreys; we are not interested in scars and wounds from other causes. The distinction is that wounds are still all or partly red, while scars are not. Since yellow perch are not examined for scars and wounds, always draw slashes through these boxes for perch.

SITE DATA		TIME		REGULAR PEDS		SPECIAL PEDS		TRAILERS	
START	FINISH	HAR	SHO	STR	SNA	SMT	ICE		

REPORTER _____ LOCATION _____

DATE _____ M _____ D _____ Y

PARTY RECORD							CATCH RECORD																				
ID	ANGLER TYPE (CIRCLE ONE)	# ANG	# LINES			# NETS	TRIP TIMES		EXPENSES (\$)			SOUGHT	NUMBERS IN POSSESSION														
			RES	ROD	PWR		GILL	DIP	SEINE	BEGIN	INTER-VIEW		END	MAJ	MIN	OTHER	BK	BN	RB	LT	CO	CH	YP	SM	NP	OTHER	
	HAR SHO STR LAU SNA SMT ICE MOO																										
	HAR SHO STR LAU SNA SMT ICE MOO																										
	STR LAU MOO																										

Figure 2. Interview form. The Site Data, Party Record, and Catch Record sections of the form are shown to the left. The Fish Record (back side of the form) is shown below.

TIME (start time of interview set): _____

FISH RECORD						
ID	SPECIES	WEIGHT (g)	LENGTH (cm)	CLIPPED FINS	# SCARS	# WOUNDS

VII APPENDIX B - PROJECT F-52-R6 PERFORMANCE REPORT

The foregoing report does not directly discuss progress toward each of the specific objectives listed in the AFA for this project. The purpose of this appendix is to list the jobs defined in that AFA and to comment on progress toward the objectives of those jobs.

Job 1. Interviews

Objective: To gather the necessary information from pedestrian anglers and boaters.

Progress: Completed.

Job 2. Data entry

Objective: To enter data into computer files.

Progress: Completed.

Job 3. Analysis and reporting

Objective: To produce and summarize the desired estimates of fishing effort and harvest.

Progress: Completed.

VIII APPENDIX C - SNAGGING SURVEY

A survey of snagging was conducted from October 1 through November 10, 1991. During that period a creel clerk visited each of the four legal snagging areas (Waukegan Harbor, Winnetka Power Plant discharge area, Diversey Harbor, and Jackson Park) on 4 days (four weekend days). Up to 10 snaggers were interviewed on each occasion using methods described above. The only difference in methods between this survey and the main summer survey of pedestrian anglers was that the time of day of the interviews was not specified in advance. Instead the creel clerk simply visited all sites on the randomly selected days, with the time of arrival at each location left to his/her discretion. Results of the survey of snagging are summarized in Tables 17 and 18.

LOCATION	EFFORT (angler-trips)	EXPENDITURES		
		major (boat)	minor (gear)	other (travel)
Waukegan	636	\$0	\$4,331	\$1,844
Winnetka	0	\$0	\$0	\$0
Diversey	1,884	\$0	\$12,830	\$5,463
Jackson	1,696	\$0	\$11,550	\$4,918

LOCATION	EFFORT (angler-hours)	CATCH					
		yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Waukegan	2,741	0	15	0	0	254	70
Winnetka	0	0	0	0	0	0	0
Diversey	8,120	0	0	0	0	403	781
Jackson	7,310	0	72	0	0	165	638