ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

PRODUCTION NOTE

University of Illinois at
Urbana-Champaign Library
Large-scale Digitization Project, 2007.

ILLINOIS NATURAL HISTORY SURVEY

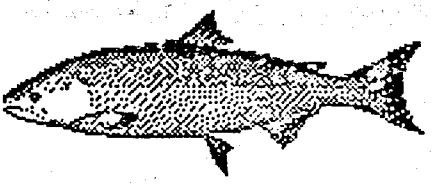
A Survey of Sport Fishing in the Illinois Portion of Lake Michigan

Annual Report, F-52-R4

Center for Aquatic Ecology

William H. Horns

February 1990



Aquatic Ecology Technical Report 90/3

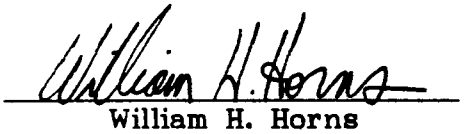
Illinois Natural History Survey
Aquatic Ecology Technical Report 90/3

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

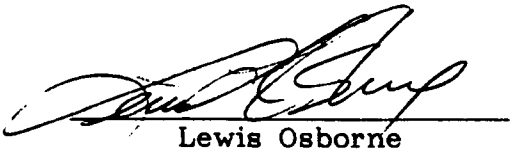
April 1989 through September 1989

William H. Horns and Wayne A. Brofka
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-R4



William H. Horns
Principal Investigator



Lewis Osborne
Head, Center for Aquatic Ecology

February 1990

ABSTRACT AND ACKNOWLEDGMENTS

A survey of sport fishing in the Illinois portion of Lake Michigan was conducted between April 1, 1989, and September 30, 1989. The survey covered all sport fishing, with exceptions of 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 1.13 million angler-hours. The estimated total harvest included 884,000 yellow perch, 7,000 brown trout, 5,000 rainbow trout, 4,000 lake trout, 86,000 coho salmon, and 10,000 chinook salmon. Estimated expenditures for boats, motors, trailers, fishing gear, and automobile gas were $6.5 million. The yield value of the sport fishing harvest was approximately $2.58 million.

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.

Table of Contents

Table of Figures

Table of Tables

I INTRODUCTION

This report summarizes a survey of sport fishing in the Illinois portion of Lake Michigan between 1 April 1989 and 30 September 1989. The survey covered all types of sport fishing, with the exceptions of charter-boat fishing and smelt fishing. It assessed fishing by pedestrians as well as boaters. Winter fishing and snagging which were covered in previous surveys, were outside the scope of the 1989 creel survey. The general 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 four years of this series of annual surveys were reported elsewhere (Horns and Gorden 1986, Horns and Gorden 1988, Horns 1988, Horns 1989). 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 on seven days in 1988 and one flight in 1989 were used to determine the distribution of fishing. The 27 areas accounted for 94% of the pedestrian anglers observed in the aerial surveys and 99% 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 68.4% of the pedestrian anglers observed during the helicopter flights. The four launch areas (Waukegan Harbor, Diversey Harbor, Burnham Harbor east ramp, and Calumet Park) accounted for 49.8% of the boat trailers observed near launch areas. In 1989 launches from Illinois Beach State Park (North Point Marina) accounted for a substantially larger fraction of all launches than in previous years.

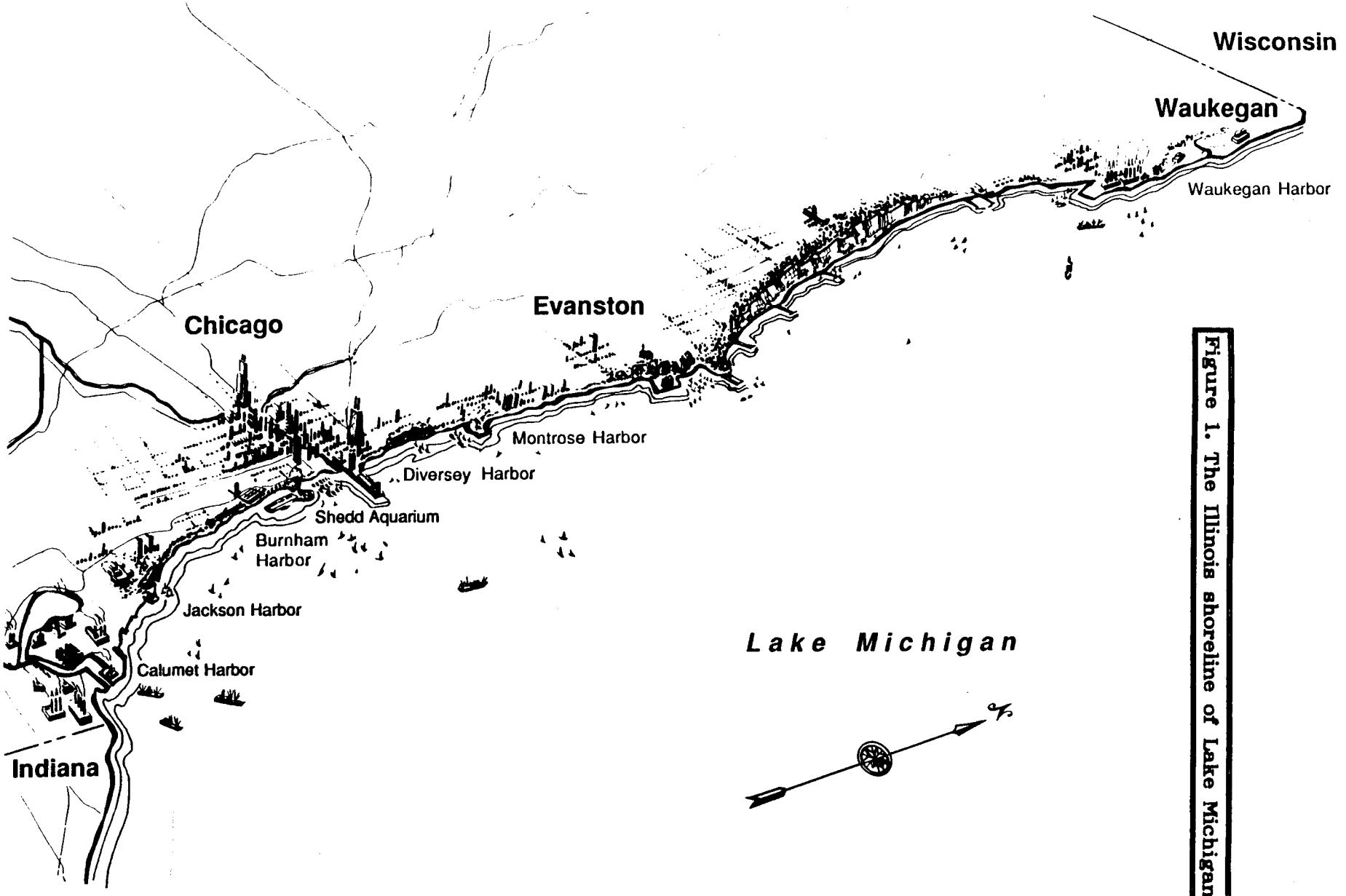


Figure 1. The Illinois shoreline of Lake Michigan.

Table 1. Distribution of pedestrian anglers and boat trailers (1989).

AREA	PEDESTRIAN ANGLERS (%)	BOAT TRAILERS (%)
1. Ill. Beach State Pk (North Pt. Marina)	0.4	24.3
2. Waukegan Power Plant discharge and pier	3.3	0.0
3. Waukegan Harbor and breakwalls	11.0	25.6
4. Great Lakes Naval Training Station	2.8	2.7
5. Forest Park	0.5	2.7
6. Central Park	0.4	2.9
7. Winnetka (Lloyd and Tower Parks)	1.6	0.6
8. Wilmette Harbor	1.7	0.0
9. Northwestern Univ. and Dawes Park	1.4	5.2
10. Farwell Avenue pier	1.1	0.0
11. Hollywood Avenue pier	1.1	0.0
12. Foster Avenue pier	0.3	0.0
13. Wilson Avenue ramp	0.0	0.6
14. Montrose Harbor and breakwalls	33.1	0.0
15. Belmont Harbor	5.1	0.0
16. Diversey Harbor and breakwalls	4.5	9.9
17. North Avenue pier	0.5	0.0
18. Navy Pier	2.0	0.0
19. Monroe Street breakwalls	2.4	0.0
20. Burnham Harbor and vicinity	7.3	(E) 5.9 (W) 9.4
21. McCormick Place seawall	2.0	0.0
22. 31st Street pier	1.8	0.0
23. 50th Street access area	0.5	0.0
24. 59th Street Harbor	1.3	0.0
25. Jackson Park Harbor and breakwall	5.1	0.6
26. Rainbow Park	0.7	0.2
27. Calumet Park	2.1	8.4
28. other areas	6.0	1.1

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	**239**
Waukegan Harbor	**574**
Public Moorings	454
Larsen Marine I/O service	120
Great Lakes Naval Training Station	**119**
Wilmette Harbor	**78**
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 Waukegan Harbor, 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), Waukegan Harbor (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 68.4% of pedestrian fishing and 49.8% 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 1989) 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 1989 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 Waukegan Harbor 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 1.13 million angler-hours, with 64% of that attributable to summer pedestrian anglers. Anglers caught 884,000 yellow perch, 7,000 brown trout, 5,000 rainbow trout, 4,000 lake trout, 86,000 coho salmon, and 10,000 chinook salmon. Expenditures for boats, motors, trailers, fishing gear, and automobile gas used on Lake Michigan fishing trips during the study period were $6.5 million. The yield value of the Illinois sport fishing harvest was $2.58 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 1989, pedestrian anglers made over 167,000 trips to Lake Michigan and spent 722,000 hours fishing. Yellow perch was the predominant species in their catch, with a harvest of 820,000 fish. Montrose Harbor was the most productive area, with 37% 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 was the next most important species for summer pedestrians, with a catch of 13,000. Pedestrian anglers spent $758,000 ($4.53 per trip) for fishing gear and $280,000 ($1.67 per trip) for automobile gas.

Fishing by Boaters Using Launched Boats

Anglers who used launched boats made over 40,000 trips to Lake Michigan and spent 262,000 hours fishing. The most abundant species in their catch were coho salmon (48,000), yellow perch (43,000) and chinook salmon (4,400). For Pacific salmon, Waukegan Harbor was the most productive of the four primary launch areas, accounting for 31% of the coho salmon and 33% of the chinook salmon taken by anglers who used launched boats. Expenditures by anglers using launched boats reached nearly $3,750,000 ($93 per trip), with over 86% 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 25,000 coho salmon and 2,600 chinook salmon, and spent nearly $1,750,000 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 $1,168,000 (coho salmon), $795,000 (yellow perch), and $436,000 (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 pedestrian anglers: **channel catfish** (2 from the Waukegan Power Plant discharge channel; **smallmouth bass** (1 from Waukegan Harbor and 1 from the Waukegan Power Plant discharge channel); **common carp** (9 from the Waukegan Power Plant discharge channel, 1 from Calumet Park boat ramp, and 1 from Waukegan Harbor); **bluegill sunfish** (2 from Diversey Harbor); **rock bass** (1 from Burnham Harbor, 1 from Calumet Park, 3 from Diversey Harbor); unspecified **crappie** (1 from Montrose Harbor); **black crappie** (1 from Waukegan Harbor); **drum** (9 from the Waukegan Power Plant discharge channel, 3 from the Waukegan Power Plant pier, 2 from Calumet Park, 1 from Jackson Park Harbor, 1 from the McCormick Place seawall, 1 from the Waukegan boat ramps); **white sucker** (3 from the Waukegan Power Plant discharge channel); **pink salmon** (2 from Waukegan Power Plant discharge channel); **atlantic salmon** (1 from the Waukegan boat ramps); and **white perch** (1 from Waukegan Power Plant discharge channel). 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	7,526	$0	$34,095	$12,569
	Wau.Harbor	21,484	$0	$97,324	$35,879
	Montrose	54,132	$0	$245,219	$90,401
	Diversey	7,042	$0	$31,899	$11,760
	Burnham	9,904	$0	$44,866	$16,540
	McCormick	2,688	$0	$12,178	$4,490
	Jackson	3,431	$0	$15,545	$5,731
	Calumet	5,832	$0	$26,421	$9,740
	other	55,355	$0	$250,758	$92,443
	TOTALS	**167,396**	**$0**	**$758,306**	**$279,552**
Launched boats	Waukegan	12,830	$472,100	$135,868	$27,199
	Diversey	2,257	$16,242	$23,901	$4,785
	Burnham	2,081	$395,004	$22,035	$4,411
	Calumet	6,774	$1,187,711	$71,732	$14,360
	others	16,319	$1,158,083	$172,822	$34,597
	TOTALS	**40,261**	**$3,229,140**	**$426,358**	**$85,353**
Moored Boats	**TOTALS**	**23,084**	**$1,448,845**	**$244,462**	**$48,939**
SUMMER TOTALS (rounded)		**230,741**	**$4,678,000**	**$1,428,000**	**$414,000**

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.	32,439	9,838	1,369	723	0	159	76
	Wau.Har.	92,597	134,805	240	246	0	3,556	1,105
	Montrose	233,310	300,160	90	148	0	2,905	728
	Diversey	30,349	31,762	124	136	0	358	0
	Burnham	42,687	42,511	39	130	0	329	286
	McCorm.	11,587	23,069	0	24	0	13	11
	Jackson	14,789	12,131	0	0	0	340	45
	Calumet	25,138	3,904	51	0	0	772	0
	other	238,579	261,641	1,685	1,108	0	4,559	1,273
	TOTALS	**721,476**	**819,821**	**3,599**	**2,515**	**0**	**12,991**	**3,550**
Lau'd	Waukeg.	68,802	4,431	801	604	981	15,211	1,474
	Diversey	13,830	4,186	45	36	31	1,044	105
	Burnham	11,864	3,805	13	5	23	537	143
	Calumet	36,457	14,338	259	34	15	7,033	259
	others	131,272	16,372	1,245	916	1,493	24,421	2,473
	TOTALS	**262,223**	**43,132**	**2,363**	**1,595**	**2,544**	**48,246**	**4,454**
Moo'd	**TOTALS**	**148,570**	**21,405**	**1,272**	**950**	**1,537**	**25,098**	**2,643**
SUMMER TOTALS		**1,132,269**	**884,358**	**7,233**	**5,059**	**4,081**	**86,335**	**10,646**

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	8,751	0	1,060	488	0	23	0
4/21	Wau'Harbor	5,885	0	179	0	0	238	0
	Montrose	16,053	0	90	0	0	2,100	0
	Diversey	1,159	15	8	0	0	327	0
	others	18,373	10	1,216	488	0	1,030	0
4/22-	Wau'Power	4,969	0	152	149	0	0	0
5/12	Wau'Harbor	6,240	102	61	0	0	2,184	0
	Montrose	17,800	10,284	0	0	0	665	130
	Diversey	1,078	31	48	0	0	31	0
	others	15,295	3,107	228	149	0	1,745	38
5/13-	Wau'Power	2,421	0	19	58	0	97	0
6/2	Wau'Harbor	10,056	2,983	0	0	0	669	0
	Montrose	32,405	40,630	0	0	0	0	303
	Diversey	4,205	4,704	0	0	0	0	0
	others	21,853	17,235	19	58	0	566	89
6/3-	Wau'Power	2,598	0	0	0	0	16	16
6/23	Wau'Harbor	10,511	7,762	0	69	0	0	0
	Montrose	20,927	13,239	0	0	0	0	0
	Diversey	4,851	2,062	0	0	0	0	0
	others	19,430	10,733	0	48	0	16	16
6/24-	Wau'Power	3,941	7,033	16	0	0	0	0
7/14	Wau'Harbor	17,866	33,486	0	0	0	0	0
	Montrose	66,615	163,375	0	0	0	0	0
	Diversey	11,614	23,329	69	0	0	0	0
	others	43,970	94,422	64	0	0	0	0
7/15-	Wau'Power	2,056	937	0	0	0	0	0
8/4	Wau'Harbor	11,384	22,162	0	0	0	0	0
	Montrose	36,798	35,619	0	93	0	0	0
	Diversey	2,277	1,194	0	0	0	0	0
	others	22,377	27,711	0	43	0	0	0
8/5-	Wau'Power	1,654	1,841	0	0	0	0	0
8/25	Wau'Harbor	13,019	60,997	0	0	0	0	0
	Montrose	22,873	32,515	0	0	0	0	0
	Diversey	1,013	157	0	0	0	0	0
	others	18,168	54,176	0	0	0	0	0
8/26-	Wau'Power	1,717	28	50	0	0	0	0
9/15	Wau'Harbor	9,885	6,683	0	150	0	0	510
	Montrose	10,565	4,499	0	0	0	73	73
	Diversey	1,670	270	0	0	0	0	0
	others	12,882	6,210	50	105	0	21	378
9/16-	Wau'Power	4,333	0	72	13	0	24	60
9/30	Wau'Harbor	7,752	630	0	27	0	466	595
	Montrose	9,275	0	0	55	0	66	223
	Diversey	2,483	0	0	136	0	0	0
	others	14,187	441	72	141	0	369	542

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	3,452	545	0	64	0	155	0
4/21	McCormick	278	0	0	0	0	0	0
	Jackson	1,195	0	0	0	0	230	0
	Calumet	7,410	0	31	0	0	670	0
	others	5,671	269	10	32	0	562	0
4/22-	Burnham	3,351	0	0	0	0	83	48
5/12	McCormick	324	475	0	0	0	0	0
	Jackson	529	2,737	0	0	0	51	0
	Calumet	1,727	0	20	0	0	102	0
	others	2,992	3,351	7	0	0	132	24
5/13-	Burnham	5,751	5,910	39	0	0	0	0
6/2	McCormick	1,739	2,852	0	0	0	0	0
	Jackson	2,252	4,219	0	0	0	33	0
	Calumet	2,135	557	0	0	0	0	0
	others	6,978	9,324	19	0	0	38	0
6/3-	Burnham	6,513	11,750	0	0	0	0	0
6/23	McCormick	1,909	3,306	0	0	0	0	0
	Jackson	3,062	3,191	0	0	0	0	0
	Calumet	4,324	988	0	0	0	0	0
	others	9,090	11,406	0	0	0	0	0
6/24-	Burnham	10,039	17,555	0	0	0	0	0
7/14	McCormick	2,013	13,334	0	0	0	0	0
	Jackson	3,269	1,846	0	0	0	0	0
	Calumet	3,789	750	0	0	0	0	0
	others	10,938	17,674	0	0	0	0	0
7/15-	Burnham	3,199	2,854	0	46	0	0	0
8/4	McCormick	825	429	0	0	0	0	0
	Jackson	1,221	137	0	0	0	0	0
	Calumet	1,289	94	0	0	0	0	0
	others	3,809	1,810	0	23	0	0	0
8/5-	Burnham	2,973	2,032	0	0	0	0	0
8/25	McCormick	1,662	1,077	0	12	0	0	0
	Jackson	596	0	0	0	0	0	0
	Calumet	1,156	281	0	0	0	0	0
	others	3,360	1,634	0	6	0	0	0
8/26-	Burnham	2,431	1,593	0	19	0	0	157
9/15	McCormick	1,140	1,035	0	12	0	13	26
	Jackson	973	0	0	0	0	0	0
	Calumet	2,200	1,059	0	0	0	0	0
	others	3,609	1,656	0	16	0	6	90
9/16-	Burnham	4,978	272	0	0	0	91	81
9/30	McCormick	1,698	561	0	0	0	0	11
	Jackson	1,691	0	0	0	0	25	45
	Calumet	1,108	175	0	0	0	0	0
	others	5,596	473	0	0	0	74	97

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-	Waukegan	8,656	0	604	0	0	5,840	87
4/21	Diversey	1,509	0	12	0	0	165	6
	Burnham	590	0	0	0	0	46	0
	Calumet	10,952	1,250	209	12	0	5,308	12
	others	15,548	119	912	1	0	9,231	131
4/22-	Waukegan	5,924	0	48	46	17	2,945	39
5/12	Diversey	1,818	0	25	16	0	481	40
	Burnham	1,212	0	0	5	0	191	29
	Calumet	5,353	0	0	23	0	914	23
	others	12,185	0	85	86	25	4,988	128
5/13-	Waukegan	16,138	0	49	173	174	4,344	256
6/2	Diversey	2,372	1,887	8	0	0	200	18
	Burnham	2,412	738	13	0	0	97	98
	Calumet	4,723	2,885	50	0	0	711	38
	others	29,324	2,556	102	253	254	6,703	546
6/3-	Waukegan	10,570	109	39	58	56	1,611	105
6/23	Diversey	645	0	0	0	0	70	0
	Burnham	2,028	2,865	0	0	0	181	0
	Calumet	3,483	2,702	0	0	0	19	0
	others	19,425	4,982	58	85	82	2,692	153
6/24-	Waukegan	7,512	1,122	0	30	150	242	17
7/14	Diversey	3,451	2,299	0	0	22	113	0
	Burnham	609	23	0	0	12	22	0
	Calumet	3,553	5,534	0	0	15	31	0
	others	14,335	3,555	0	45	253	458	25
7/15-	Waukegan	4,670	210	6	16	65	79	147
8/4	Diversey	1,438	0	0	0	0	14	7
	Burnham	550	101	0	0	0	0	0
	Calumet	1,757	542	0	0	0	0	0
	others	8,728	521	9	23	96	124	220
8/5-	Waukegan	5,231	2,887	12	65	191	34	224
8/25	Diversey	897	0	0	0	0	0	0
	Burnham	943	78	0	0	11	0	7
	Calumet	1,009	822	0	0	0	0	0
	others	9,787	4,432	18	95	297	49	339
8/26-	Waukegan	8,670	102	43	216	218	117	435
9/15	Diversey	504	0	0	11	0	0	7
	Burnham	403	0	0	0	0	0	0
	Calumet	2,106	603	0	0	0	25	0
	others	13,840	207	63	323	319	174	641
9/16-	Waukegan	1,432	0	0	0	111	0	166
9/30	Diversey	1,194	0	0	9	9	0	26
	Burnham	3,118	0	0	0	0	0	9
	Calumet	3,521	0	0	0	0	26	187
	others	8,099	0	0	5	167	2	290

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	*	0.123	0.060	0.000	0.004	0.000
4/21	Wau' Harbor	*	0.039	0.000	0.000	0.035	0.000
	Montrose	0.000	0.004	0.000	0.000	0.136	0.000
	Diversey	0.000	0.003	0.000	0.000	0.158	0.000
4/22-	Wau' Power	*	0.045	0.032	0.000	0.000	0.000
5/12	Wau' Harbor	2.727	0.012	0.000	0.000	0.422	0.000
	Montrose	0.885	0.000	0.000	0.000	0.159	0.000
	Diversey	0.080	0.072	0.000	0.000	0.055	0.000
5/13-	Wau' Power	0.000	0.006	0.016	0.000	0.072	0.000
6/2	Wau' Harbor	1.366	0.000	0.000	0.000	0.114	0.000
	Montrose	1.170	0.000	0.000	0.000	0.000	0.000
	Diversey	1.107	0.000	0.000	0.000	0.000	0.000
6/3-	Wau' Power	0.000	0.000	0.000	0.000	0.007	0.007
6/23	Wau' Harbor	0.892	0.000	0.000	0.000	0.000	0.000
	Montrose	0.558	*	*	*	*	*
	Diversey	0.447	0.000	0.000	0.000	0.000	0.000
6/24-	Wau' Power	3.024	0.000	0.000	0.000	0.000	0.000
7/14	Wau' Harbor	1.855	0.000	0.000	0.000	0.000	0.000
	Montrose	2.394	0.000	0.000	0.000	0.000	0.000
	Diversey	2.250	*	*	*	*	*
7/15-	Wau' Power	0.322	0.000	0.000	0.000	0.000	0.000
8/4	Wau' Harbor	1.280	*	*	*	*	*
	Montrose	1.047	*	*	*	*	*
	Diversey	0.509	*	*	*	*	*
8/7-	Wau' Power	0.965	0.000	0.000	0.000	0.000	0.000
8/25	Wau' Harbor	3.928	0.000	0.000	0.000	0.000	0.000
	Montrose	1.415	*	*	*	*	*
	Diversey	0.180	*	*	*	*	*
8/26-	Wau' Power	0.113	0.054	0.000	0.000	0.000	0.000
9/15	Wau' Harbor	1.403	0.000	0.020	0.000	0.000	0.047
	Montrose	0.380	0.000	0.000	0.000	0.082	0.082
	Diversey	0.345	0.000	0.000	0.000	0.000	0.000
9/16-	Wau' Power	*	0.026	0.003	0.000	0.005	0.000
9/30	Wau' Harbor	0.396	0.000	0.005	0.000	0.057	0.076
	Montrose	0.000	0.000	0.011	0.000	0.005	0.034
	Diversey	0.000	0.000	0.067	0.000	0.000	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	1.015	0.000	0.015	0.000	0.050	0.000
4/21	McCormick	*	0.000	0.000	0.000	0.000	0.000
	Jackson	*	0.000	0.000	0.000	0.142	0.000
	Calumet	0.000	0.006	0.000	0.000	0.101	0.000
4/22-	Burnham	0.000	0.000	0.000	0.000	0.018	0.008
5/12	McCormick	0.000	0.000	0.000	0.000	0.000	0.000
	Jackson	9.457	0.000	0.000	0.000	0.145	0.000
	Calumet	0.000	0.011	0.000	0.000	0.248	0.000
5/13-	Burnham	1.366	0.000	0.000	0.000	0.000	0.000
6/2	McCormick	2.757	0.000	0.000	0.000	0.000	0.000
	Jackson	1.909	0.000	0.000	0.000	0.000	0.000
	Calumet	0.259	0.000	0.000	0.000	0.000	0.000
6/4-	Burnham	2.285	0.000	0.000	0.000	0.000	0.000
6/23	McCormick	1.466	*	*	*	*	*
	Jackson	0.810	*	*	*	*	*
	Calumet	0.195	*	*	*	*	*
6/24-	Burnham	1.940	0.000	0.000	0.000	0.000	0.000
7/14	McCormick	5.357	*	*	*	*	*
	Jackson	0.306	*	*	*	*	*
	Calumet	0.193	*	*	*	*	*
7/15-	Burnham	1.141	*	*	*	*	*
8/4	McCormick	0.600		*	*	*	*
	Jackson	0.082	*	*	*	*	*
	Calumet	0.076	*	*	*	*	*
8/5-	Burnham	0.693	0.000	0.000	0.000	0.000	0.000
8/25	McCormick	0.397	*	*	*	*	*
	Jackson	0.000	0.000	0.000	0.000	0.000	0.000
	Calumet	0.349	*	*	*	*	*
8/26-	Burnham	5.386	0.000	0.016	0.000	0.000	0.159
9/15	McCormick	1.707	0.006	0.010	0.000	0.013	0.025
	Jackson	0.000	0.000	0.000	0.000	0.000	0.000
	Calumet	1.052	*	*	*	*	*
9/16-	Burnham	0.339	0.000	0.000	0.000	0.009	0.031
9/30	McCormick	0.972	0.000	0.000	0.000	0.000	0.012
	Jackson	0.000	0.000	0.000	0.000	0.011	0.017
	Calumet	0.300	0.000	0.000	0.000	0.000	0.000

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-	Waukegan	*	0.069	0.000	0.000	0.693	0.006
4/21	Diversey	0.000	0.005	0.000	0.000	0.077	0.005
	Burnham	*	0.000	0.000	0.000	0.117	0.000
	Calumet	4.884	0.022	0.001	0.000	0.538	0.001
4/22-	Waukegan	*	0.021	0.005	0.002	0.479	0.006
5/12	Diversey	*	0.013	0.008	0.000	0.260	0.025
	Burnham	*	0.000	0.006	0.000	0.147	0.019
	Calumet	*	0.000	0.002	0.000	0.147	0.012
5/13-	Waukegan	*	0.006	0.018	0.011	0.280	0.024
6/2	Diversey	2.694	0.003	0.000	0.000	0.084	0.011
	Burnham	2.476	0.005	0.000	0.000	0.041	0.058
	Calumet	2.349	0.012	0.000	0.000	0.169	0.008
6/4-	Waukegan	0.371	0.002	0.004	0.004	0.124	0.007
6/23	Diversey	*	0.000	0.000	0.000	0.109	0.000
	Burnham	3.522	0.000	0.000	0.000	0.181	0.000
	Calumet	1.319	0.000	0.000	0.000	0.015	0.000
6/24-	Waukegan	1.969	0.000	0.004	0.015	0.026	0.003
7/14	Diversey	2.079	0.000	0.000	0.008	0.046	0.000
	Burnham	0.210	0.000	0.000	0.030	0.047	0.000
	Calumet	1.416	0.000	0.000	0.013	0.026	0.000
7/15-	Waukegan	0.285	0.003	0.004	0.015	0.017	0.050
8/4	Diversey	0.000	0.000	0.000	0.000	0.028	0.014
	Burnham	0.397	0.000	0.000	0.000	0.000	0.000
	Calumet	0.393	0.000	0.000	0.000	0.000	0.000
8/5-	Waukegan	3.628	0.002	0.015	0.026	0.008	0.030
8/25	Diversey	0.000	0.000	0.000	0.000	0.000	0.000
	Burnham	0.354	0.000	0.000	0.013	0.000	0.015
	Calumet	1.509	0.000	0.000	0.000	0.000	0.000
8/26-	Waukegan	0.830	0.008	0.035	0.026	0.025	0.055
9/15	Diversey	0.000	0.000	0.019	0.000	0.000	0.037
	Burnham	0.000	0.000	0.000	0.000	0.000	0.000
	Calumet	0.472	0.000	0.000	0.000	0.027	0.000
9/16-	Waukegan	*	0.002	0.002	0.026	0.006	0.043
9/30	Diversey	*	0.000	0.006	0.006	0.000	0.017
	Burnham	*	0.000	0.000	0.000	0.000	0.006
	Calumet	0.000	0.000	0.000	0.000	0.020	0.091

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 November 1988.

SPECIES	TOTAL CATCH	AVE WT (lbs)	ROUND WT (lbs)	MARKET WT (lbs)	PRICE PER POUND	YIELD VALUE
yellow perch	884,358	0.25	221,090	88,436	$8.99	$795,040
brown trout	7,233	3.01	21,771	16,328	$2.99	$48,821
rainbow trout	5,059	4.97	25,143	18,857	$3.69	$69,582
lake trout	4,081	6.47	26,404	19,803	$2.99	$59,211
coho salmon	86,335	2.58	222,744	167,058	$6.99	$1,167,735
chinook salmon	10,646	7.81	83,145	62,359	$6.99	$435,889
					COMBINED YIELD VALUE OF ALL SPECIES:	**$2,576,278**

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------ early	mid	late	FALL
coho salmon	boaters	ave	2.16	3.00	5.51	3.54	4.11
		n	249	103	22	9	3
	pedestrians	ave	2.10	3.38	*	4.12	4.93
		n	107	11	0	2	9
chinook salmon	boaters	ave	8.43	6.00	7.76	6.93	8.77
		n	13	22	14	36	14
	pedestrians	ave	4.24	6.50	*	12.35	5.66
		n	1	2	0	16	7
rainbow trout	boaters	ave	3.73	3.86	9.37	7.39	7.25
		n	3	1	2	16	2
	pedestrians	ave	5.77	2.45	.25	2.66	.61
		n	24	3	4	6	6
lake trout	boaters	ave	*	11.53	6.20	6.44	4.91
		n	0	1	11	19	1
	pedestrians	ave	*	*	*	*	*
		n	0	0	0	0	0
brown trout	boaters	ave	2.60	2.47	6.25	6.78	1.65
		n	28	7	1	4	1
	pedestrians	ave	2.94	.51	*	5.65	2.72
		n	47	1	0	3	2
yellow perch	boaters	ave	0.20	0.34	0.28	0.32	*
		n	5	84	32	23	0
	pedestrians	ave	0.23	0.22	0.25	0.25	0.22
		n	60	452	715	368	7

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).

		SPRING		--------SUMMER--------						FALL	
				early		mid		late			
SPECIES	CLIP	b	p	b	p	b	p	b	p	b	p
coho	ad	36	6	23	1	1	0	0	0	0	1
salmon	ad,lp	0	2	0	0	0	0	0	0	0	0
	ad,rp	5	2	3	0	0	0	0	0	0	0
	ad,lv	18	2	5	1	0	0	0	0	1	1
	ad,lv,rv	0	0	1	0	0	0	0	0	0	0
	lp	8	1	7	0	0	0	1	0	1	1
	lp,rp	0	0	1	0	0	0	0	0	0	0
	lv	8	2	1	1	3	0	1	0	0	0
	rp	6	4	1	0	1	0	0	0	0	0
	rv	8	3	3	0	0	0	1	0	0	1
	no clips	560	104	268	8	38	0	13	2	1	5
chinook	ad	1	0	1	0	1	0	1	1	0	1
salmon	lv	0	0	0	0	0	0	1	0	0	0
	rp	0	0	1	0	0	0	0	1	0	0
	no clips	17	1	32	2	16	0	50	14	23	1
rainbow	ad	0	0	0	0	0	0	1	0	0	0
trout	ad,do	0	0	1	0	1	0	0	0	0	0
	ad,lv	0	2	0	0	1	0	0	0	0	0
	ad,do,lv	0	0	0	1	0	0	0	0	0	0
	do	0	0	0	0	1	1	0	0	0	0
	do,lv	0	0	1	0	0	0	0	0	0	0
	fl	0	2	0	0	0	0	0	0	0	0
	fl,lp	0	0	0	0	0	0	0	1	0	0
	lm	0	1	0	0	0	0	0	0	0	0
	lm,lp	0	1	0	0	0	0	0	0	0	0
	lm,lv	0	2	0	0	0	0	0	0	0	0
	lp	1	1	0	0	0	0	1	0	1	0
	lp,rm	0	0	0	0	0	0	1	0	0	0
	lp,rp	0	0	0	0	0	0	0	1	0	0
	lp,rv	1	0	0	0	0	0	0	0	0	0
	lv	0	0	0	0	0	0	1	0	0	0
	lv,rp,rv	0	0	0	0	0	0	1	0	0	0
	lv,rp	1	0	0	0	0	0	0	0	0	0
	lv,rv	0	0	1	0	0	0	0	0	0	0
	rp	1	3	1	0	1	0	2	0	0	0
	no clips	5	11	8	3	2	3	22	4	1	7

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).

		SPRING		--------SUMMER--------						FALL	
				early		mid		late			
SPECIES	CLIP	b	p	b	p	b	p	b	p	b	p
lake	ad	0	0	3	0	2	0	3	0	0	0
trout	ad,lp	0	0	1	0	8	0	7	0	0	0
	ad,lv	0	0	2	0	0	0	1	0	1	0
	ad,lv,rp	0	0	0	0	0	0	0	0	1	0
	ad,rp	0	0	1	0	1	0	6	0	1	0
	ad,rv	0	0	1	0	1	0	1	0	0	0
	do	0	0	0	0	1	0	0	0	0	0
	do,lp	0	0	0	0	1	0	0	0	0	0
	do,rp	0	0	1	0	1	0	1	0	0	0
	lm	1	0	0	0	0	0	0	0	0	0
	lp	0	0	0	0	2	0	2	0	0	0
	lp,rv	0	0	0	0	0	0	1	0	0	0
	lv,rp	0	0	0	0	1	0	2	0	1	0
	lv,rv	0	0	0	0	2	0	3	0	0	0
	rp	0	0	0	0	0	0	3	0	0	0
	rv	0	0	0	0	2	0	0	0	0	0
	no clips	0	0	0	0	0	0	1	0	0	0
brown	ad	0	1	0	0	0	0	0	0	0	0
trout	fl	1	0	0	0	0	0	0	0	0	0
	lm	0	1	0	0	0	0	0	0	0	0
	lp	2	1	1	0	0	0	0	0	1	0
	lp,rp	0	2	0	0	0	0	0	0	0	0
	lv	0	0	0	0	0	0	1	0	0	0
	rp	0	1	0	0	0	0	0	0	0	0
	no clips	37	52	11	3	1	2	5	3	0	6

IV DISCUSSION

Comparison with 1986, 1987, and 1988

These results can be compared with those from 1986, 1987, and 1988 (Tables 12 and 13). Yellow perch catch was high in 1986 through 1988, averaging over 1.5 million, but dropped by nearly 50% in 1989. The harvest of coho salmon which had declined markedly in 1987 recovered somewhat in 1988 and continued to improve in 1989. Waukegan Harbor provided by far the best coho fishing. Fishing for chinook salmon was extremely poor in 1988 but improved slightly in 1989. Estimated expenditures for boats, motors, and trailers, which had jumped markedly between 1987 and 1988, returned to previous levels in 1989. Tables 12 and 13 summarize these and other results from this series of creel surveys. Creel survey methods were different in the four 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, 1987, 1988 and 1989.

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
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
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
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

Table 13. Summer effort and catch in 1986, 1987, 1988 and 1989.

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
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
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
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

The most important differences between the methods of collecting and analyzing data used in these four years are these: (1) In 1986 six pedestrian areas and three launch areas were visited for interviews; in 1987, 1988 and 1989 eight pedestrian areas and four launch areas were visited. Thus higher proportions of total catch, effort, and expenditures were estimated directly in 1987 through 1989 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 four 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 four 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 in 1989, but were derived from previous creel surveys.

Table 14. Parameters used in deriving estimates.			
PARAMETER	1986	1987	1988 & 1989
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.		

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

Cochran, W.G. 1977. Sampling techniques, 3rd ed. John Wiley and Sons, New York. 428 pp.

Horns, W.H. 1988. A survey of sportfishing in the Illinois portion of Lake Michigan - April 1987 through March 1988. Aquatic Biology Technical Report 88/7. Illinois Natural History Survey, Champaign, Illinois, 37 pp.

Horns, W.H. 1989. A survey of sportfishing in the Illinois portion of Lake Michigan - April 1988 through March 1989. Aquatic Ecology Technical Report 89/6. Illinois Natural History Survey, Champaign, Illinois, 36 pp.

Horns, W.H., and R.W. Gorden. 1986. A sport fishing creel survey of the Illinois portion of Lake Michigan. Aquatic Biology Technical Report 86/3. Illinois Natural History Survey, Champaign, Illinois, 46 pp.

Horns, W.H., and R.W. Gorden, 1988. A sport fishing creel survey of the Illinois portion of Lake Michigan. Aquatic Biology Technical Report 88/2. Illinois Natural History Survey, Champaign, Illinois, 46 pp.

Malvestuto, S.P. 1983. Sampling the recreational fishery. Pages 397-419 in L.A. Nielsen and D.L. Johnson, eds., Fisheries Techniques. American Fisheries Society. Bethesda, Maryland. 1983.

Muench, B. 1981. 1979. Sport fishing creel survey on the Illinois portion of Lake Michigan. Division of Fisheries, Illinois Department of Conservation (mimeo). 25 p.

VI APPENDIX A - DATA FORM AND INSTRUCTIONS TO CLERKS

We record data on the **Interview Form** and a modified version of the same.

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 impartiallity 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).

angs - 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 - Three specific items are recorded. 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), record the purchase price of any fishing gear

(rods, reels, downriggers, line, hooks, lures, bait, nets, etc.) purchased since the last fishing trip on Lake Michigan. Include only things directly used in the capture of fish. Do not include electronic equipment, food and drink, and items for the boat. 3) In the column headed "other", record the estimated cost of driving to this fishing site. Here we assume a cost of ten cents per mile, so you simply record the round trip mileage divided by ten. This should be the **total** round trip distance for all cars used for this trip by members of the fishing party.

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 examin 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.

PAGE _____ OF _____

REPORTER _____ LOCATION _____

DATE ____ ____ ____
M D Y

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

PARTY RECORD															CATCH RECORD											
ID	ANGLER TYPE (CIRCLE ONE)	# ANGS		# LINES		# NETS			TRIP TIMES			EXPENSES ($)			SOUGHT	NUMBERS IN POSSESSION										
		TOT	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																									

TIME (start time of interview set): _____

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

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

VII APPENDIX B - PROJECT F-52-R4 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.