

**THE INTERNATIONAL GREAT LAKES SPORT  
FISHERY OF 1980**

by  
**Daniel R. Talhelm**

**SPECIAL PUBLICATION 88-4**



**Great Lakes Fishery Commission**

1451 Green Road  
Ann Arbor, Michigan 48105

September 1988

The Great Lakes Fishery Commission was established by the Convention on Great Lakes Fisheries between Canada and the United States, which was ratified on October 11, 1955. It was organized in April 1956 and assumed its duties as set forth in the Convention on July 1, 1956. The Commission has two major responsibilities: first, develop coordinated programs of research in the Great Lakes and, on the basis of the findings, recommend measures which will permit the maximum sustained productivity of stocks of fish of common concern; second, formulate and implement a program to eradicate or minimize sea lamprey populations in the Great Lakes.

The Commission is also required to publish or authorize the publication of scientific or other information obtained in the performance of its duties. In fulfillment of this requirement the Commission publishes the Technical Report Series, intended for peer-reviewed scientific literature, and Special Publications, designed primarily for dissemination of reports produced by working committees of the Commission. Technical Reports are most suitable for either interdisciplinary review and synthesis papers of general interest to Great Lakes fisheries researchers, managers, and administrators or more narrowly focused material with special relevance to a single but important aspect of the Commission's program. Special Publications, being working documents, may evolve with the findings of and charges to a particular committee. Sponsorship of Technical Reports or Special Publications does not necessarily imply that the findings or conclusions contained therein are endorsed by the Commission.

#### COMMISSIONERS

Canada	United States
P. Asselin	J. M. Cady
H. A. Regier	S. Recce (acting)
P. H. Sutherland	C. C. Krueger
G. Whitney	J. M. Ridenour

#### SECRETARIAT

C. M. Fetterolf, Jr., Executive Secretary  
A. K. Lamsa, Assistant Executive Secretary  
R. L. Eshenroder, Senior Scientist for Fishery Resources  
M. A. Dochoda, Fishery Biologist  
B. S. Staples, Administrative Officer  
L. D. Clove, Secretary  
P. M. Bronkowski, Word Processing Secretary  
M. E. Brown, Clerk

THE INTERNATIONAL GREAT LAKES SPORT FISHERY OF 1980

by

Daniel R. Talhelm  
Department of Park and Recreation Resources  
Michigan State University  
East Lansing, Michigan 48824

Citation: Talhelm, D. R. 1988. The international Great Lakes sport fishery of 1980. Great Lakes Fishery Commission Special Publication 88-4. 70 p.

SPECIAL PUBLICATION 88-4

GREAT LAKES FISHERY COMMISSION  
1451 Green Road  
Ann Arbor, Michigan 48105

September 1988

## CONTENTS

	Page
Acknowledgements . . . . .	iii
Highlights . . . . .	iv
Introduction . . . . .	1
Statistical Tables and Related Figures . . . . .	5
A. Aggregate Statistics . . . . .	5
1. Expenditures and long term outlays for angling for Great Lakes fish in 1980 . . . . .	6
2. Expenditures and long term outlays for angling for Great lakes fish per angler day in 1980 . . . . .	8
<b>3a. Expenditures by income level for angling in            Canadian waters. . . . .</b>	<b>10</b>
<b>3b. Expenditures by income level for angling in            U.S. waters. . . . .</b>	<b>11</b>
<b>4a. Expenditures per angler day by income level            for angling U.S. waters . . . . .</b>	<b>12</b>
4b. Expenditures per angler day by income level . . . . .	13
for angling in U.S. waters . . . . .	13
5. Number of anglers and angler days by age . . . . .	16
6. Number of anglers days by sex . . . . .	16
7. Number of angler days by by income . . . . .	16
B. Lake Statistics by Jurisdiction Fished . . . . .	19
1. Angler days by lake jurisdiction fished . . . . .	20
2. Number of anglers by lake and jurisdiction fished . . . . .	21
3. Trip expenditures by residents and non-residents . . . . .	22
4. Trip expenditures per angler day by jurisdiction fished . . . . .	33
5. Ownership of boats used for Great Lakes angling . . . . .	35
C. Lake Statistics by Angler Origins and Species Sought . . . . .	39
1. Angler days by origin and destination by lake . . . . .	40
2. Number of anglers by origin and destination by lake . . . . .	45
3. Number of anglers by species sought . . . . .	49
4. Effort by species sought . . . . .	50
Appendices . . . . .	53
A. Definitions and Explanatory Notes . . . . .	55
<b>B. Canadian Survey Methods and Statistical Reliability . . . . .</b>	<b>57</b>
c. U.S. Survey Methods and Statistical Reliability . . . . .	61
D. Possible Survey Biases . . . . .	69

## ACKNOWLEDGEMENTS

The data incorporated in this report were collected by the teams working for the Canadian and U.S. national surveys of angling for the year 1980. In the United States, Dr. John Charbonneau, Division of Program Plans, U.S. Fish and Wildlife Service, Washington, designed the special features of the U.S. questionnaire, analyzed and reported the U.S. Great Lakes results and otherwise supervised the U.S. survey operation. Keith Brickley, Chief, Surveys Group, Economic Policy Branch, Department of Fisheries and Oceans, Ottawa, designed the special features of the Canadian questionnaire and coordinated the survey and analysis. Nilam Bedi, Fisheries Branch, Ontario Ministry of Natural Resources, Toronto, supervised the Ontario portion of the Canadian survey and analysis. The Ontario Great Lakes data were analyzed and reported by Paul Clifford, a consultant from Toronto. Many unnamed persons also deserving of acknowledgement were involved in collecting and processing the data in both countries.

The Great Lakes Fishery Commission recognized that the dual national fishing surveys of 1980 provided a unique opportunity for gathering social and economic data on the combined U.S. and Canadian Great Lakes recreational fishery. The Commission asked the Canadian Department of Fisheries and Oceans and the U.S. Fish and Wildlife Service if they would plan and conduct their surveys in such a manner that Great Lakes data could be broken out. Both agencies generously agreed, and the provincial, interstate, international, interagency, interdisciplinary effort was underway. Carlos M. Fetterolf, Jr., Executive Secretary to the Commission, called together a team with expertise in fishery science, statistics, surveys and economics, to define the results desired and to develop the methods, design, analysis and report format needed to achieve them. In addition to Nilam Bedi, Keith Brickley, John Charbonneau and Carlos Fetterolf, the team members were Gary Eck, Great Lakes Fishery Laboratory, U.S. Fish and Wildlife Service; Randy Eshenroder, Senior Scientist, Great Lakes Fishery Commission Secretariat; and Gale C. Jansen, Fisheries Division, Michigan Department of Natural Resources. Daniel R. Talhelm, Department of Park and Recreation Resources, Michigan State University, under contract to the Great Lakes Fishery Commission, was the project leader. He combined the statistics from the U.S. and Canadian survey teams and wrote this report. Charbonneau, Eck and Jansen were valuable reviewers of the resultant manuscript. Portions of this report are based on the Canadian and U.S. texts by Clifford and Charbonneau. Chris Branson, a consultant from Ann Arbor, refined several graphics and created others. Final copy preparation and printing were done by Pat Bronkowski and Mary Brown, respectively.

A summary of the U.S. Great Lakes data is included in "1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation" by the U.S. Department of the Interior, Fish and Wildlife Service and the U.S. Department of Commerce, Bureau of the Census. The Canadian Great Lakes data are in "1980 Surveys of Ontario's Resident and Non-Resident Sport Fishermen: Selected Results Prepared for the Great Lakes Fishery Commission" by Paul Clifford for Fisheries Economic Development and Marketing, Canadian Department of Fisheries and Oceans.

HIGHLIGHTS

Angling for Great Lakes fish in 1980

---

PARTICIPATION	Total anglers	4,039,000
	Canadian	1,023,000
	U.S.	3,016,000
	Total angler days	54,930,000
	Canadian	14,397,000
	U.S.	40,533,000

---

EXPENDITURES IN 1980	Total trip expenditures	\$766,188,000
	Canadian	\$124,968,000
	U.S.	\$641,220,000
	Total long term outlays	\$997,164,000
	Canadian	\$205,333,000
	U.S.	\$791,831,000
	Total trip + long term	\$1,763,351,000
	Canadian	\$330,300,000
	U.S.	\$1,433,051,000

---

EXPENDITURES PER DAY FISHED	Trip expenditures per angler day	\$14
	Canadian	\$9
	U.S.	\$16
	Long term outlays per angler day	<b>\$18</b>
	Canadian	<b>\$14</b>
	U.S.	\$20
	Trip + long term per angler day	\$32
	Canadian	\$23
	U.S.	\$35

---

ANGLING EFFORT (DAYS FISHED) BY LAKE	Lake Superior	1,761,000
	Lake Huron	11,900,000
	Lake Michigan'	14,380,000
	Lake Erie	19,120,000
	Lake Ontario	9,596,000

---

TRIP EXPENDITURES BY LAKE	Lake Superior	\$35,625,000
	Lake Huron	\$155,447,000
	Lake Michigan	\$233,438,000
	Lake Erie	\$220,692,000
	Lake Ontario	\$107,776,000

---

EFFORT (DAYS FISHED) FOR SELECTED SPECIES	Perch	19,671,000
	Walleye/Sauger	15,166,000
	Bass	12,270,000
	Salmon/Steelhead	10,303,000
	Panfish	8,543,000
	Other Trout	7,368,000
	Lake Trout	7,071,000
	Catfish/Bullhead	7,038,000

## INTRODUCTION

This report presents the results of the first direct estimates of angling effort and expenditures for angling for Great Lakes fish over the entire Great Lakes region. It is based on data collected in the U.S. 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation and the Canadian federal-provincial 1980 Survey of Sport Fishing in Ontario.

The Great Lakes provide an outstanding fishery, Four million anglers spent well over a billion dollars in 1980 for fishing for Great Lakes fish. Thus the fishery is not only an important source of recreation for millions of anglers in the region, but it is also the source of billions of dollars worth of economic activity.

This information about the entire Great Lakes fishery provides a new perspective. We can more easily see the significance of the overall sport fishery, and understand the contributions of the various lakes, management jurisdictions and fish species to the whole. While sport fishing is only one of several important uses of the fishery--commercial and ecological uses are others--these estimates have been awaited by the management agencies and others as an aid in better planning for future use of the resource.

The various jurisdictions have for years surveyed the fishery with their own, differing survey techniques in differing base years. The fact that it was not until 1984 that relatively consistent overall estimates became available points to one of the lesser difficulties in managing a resource that is divided between two countries, eight states, one province and thousands of local governments. The two surveys combined here differ mainly in that the Canadian team surveyed anglers by mail, whereas the U.S. team surveyed anglers by personal interview.

Because this was a first attempt, several difficulties were encountered that may be avoided in the future. Although both the U.S. and Canadian survey teams designed the 1980 surveys so Great Lakes angling could be separated from other kinds of angling, the task proved more difficult than expected. In the U.S. survey, expenditures and effort were sometimes inaccurately divided between lakes, whereas in the Canadian survey, stream angling for migrating Great Lakes fish was difficult to separate from stream angling for resident fish. To the extent possible, only angling for Great Lakes fish was included. In both surveys long term expenditures were overcounted because long term expenditures for Great Lakes angling purposes could not be separated from similar expenditures for other freshwater angling purposes. In addition, both survey teams had to write special computer programs to analyze Great Lakes data and to correct for the difficulties encountered. Overall, several unexpected delays occurred.

### Data Bases

The U.S. study was conducted in two stages: an initial screening of households to identify participants, and a followup personal interview with selected households to collect detailed data about the household's angling and other wildlife-related recreation. In the Great Lakes states, over 24,500 interviews were conducted in the screening phase of the survey, and over 6,000 participants were interviewed in the followup survey. In the latter, 1,454 Great Lakes anglers were interviewed. Non-residents of the U.S. were not

included in this survey. Estimates include data for persons aged 16 and over only. Appendix C contains a more detailed explanation.

In Canada, randomly selected Ontario residents and randomly selected holders of Ontario non-resident fishing licenses were surveyed by mail. They were asked about household angling and expenditures in Ontario. A total of 3,078 Ontario resident and 1,395 Ontario non-resident respondents fished in the Great Lakes. Participation estimates include data for persons aged 17 and over only, whereas expenditure estimates include total household expenditures, Appendix B contains a more detailed explanation.

#### Likely Statistical Biases and Errors

The estimates of angling effort reported here could be higher--up to two to four times higher--than the actual angling effort for Great Lakes fish. Evidence is accumulating that anglers tend to over-report their angling effort and catch in mail and household interview surveys. (Perhaps the common belief about anglers exaggerating is true!) It also appears that the household interview estimates (U.S. survey) are consistently higher than those of some mail surveys.

For instance, estimates of angling in Michigan for Great Lakes fish from the 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (NSFH&WAR) are about 72% higher than corresponding estimates based on the annual mail survey of licensed anglers by the Michigan Department of Natural Resources (MDNR). The NSFH&WAR estimates of numbers of anglers are about 57% higher than those of the MDNR. See Appendix D for details. MDNR estimates, in turn, tend to be 0% to 200% higher than estimates of the same angling effort using "creel census" techniques--field surveys of angling as it occurs. Statisticians are still uncertain whether mail surveys overestimate, creel surveys underestimate, or both. Some evidence supports each of these possibilities. For more details, see Appendix D.

We have no indication yet whether the NSFH&WAR estimates of expenditures and other variables tend to be higher or lower than actual. Interpretation of these results is further complicated by the fact that some of the estimates reported here--estimates for particular locations or for particular segments of the population--are based on relatively small samples, so may be somewhat inaccurate. For example, NSFH&WAR estimates of angling effort for Lake Superior fish in Michigan are lower than MDNR estimates. The amount of Lake Superior angling is relatively small, so few of these anglers appear in the sample of Great Lakes anglers. This low estimate appears attributable to normal statistical error due to a small sample. Other unexpected results that seem attributable to the same source of error are: (1) Illinois angling in Lake Michigan is almost twice that of Wisconsin (Table B1), (2) high angling effort for walleye in Lake Superior (Table C4). and (3) high angling effort for salmon/steelhead and lake trout in Lake Erie (Table C4). Sampling procedures, statistical accuracy and other sources of error are discussed in more detail in Appendices B and C.

#### Organization of this Report

The statistical portion of this report is divided into three sections: (A) aggregate statistics, (B) lake statistics by jurisdiction fished and (C) lake statistics by angler origins and species sought. The aggregate statistics



summarize the entire Great Lakes sport fishery, as well as the breakdown between the U.S. and Canadian portions. Section B presents statistics for each individual lake, subdivided by the contributions of the various jurisdictions on the lake, Section C describes for each lake the origins of anglers and the fish species sought by anglers. Explanatory notes, definitions, statistical procedures and statistical error terms are presented in the Appendix.

STATISTICAL TABLES

A. AGGREGATE STATISTICS

TABLE A1. EXPENDITURES AND LONG TERM OUTLAYS FOR ANGLING FOR GREAT LAKES FISH IN 19801 (000's omitted)

Item	CANADA			u. s.	AGGREGATE
	In Ontario by residents	Non- res.	Canadian Total	In U.S. by residents	
<u>TRIP EXPENSES</u>					
1. Lodging	9,882	7,311	17,193	31,110	48,304
2. Food	20,456	8,260	28,716	171,497	200,213
3. Supplies <sup>2</sup>	13,243	1,522	14,765	168,981	183,746
4. Bait	4,122	1,264	5,384	9,145	14,529
5. Fees <sup>3</sup>	7,194	3,088	10,282	16,800	27,082
6. Boat use <sup>4</sup>	15,721	2,659	18,380	96,074	114,454
7. Transport.	23,029	5,555	28,584	138,779	167,363
8. Other <sup>5</sup>	933	731	1,664	8,833	10,497
Subtotal	94,579	30,389	124,968	641,220	766,188
<u>LONG TERM OUTLAYS</u>					
1. Boat & acc. <sup>6</sup>	99,611	607	100,218	323,890	424,108
2. Vehicles	33,886	0	33,886	401,800	435,686
3. Camping equip.	21,380	580	21,960	31,701	53,661
4. Other	45,766	3,503	49,269	34,440	83,709
Subtotal	200,643	4,690	205,333	791,831	997,164
<b>TOTAL</b>	<b>295,222</b>	<b>35,078</b>	<b>330,300</b>	<b>1,433,051</b>	<b>1,763,351</b>

1 The Canadian survey estimated Great Lakes trip expenditures by pro-rating each household's total trip expenditures: Great Lakes trip expenditures equal total trip expenditures times the ratio of Great Lakes angling days to total provincial angling days. The U.S. survey specifically identified Great Lakes expenditures for travel, lodging, food, and fees. All other Great Lakes expenditures were counted only as part of the individual's freshwater fishing expenditures. Thus, for categories other than travel, lodging, food and fees, all expenditures and long term outlays for freshwater fishing were counted for all anglers who reported at least one occasion of fishing for Great Lakes fish. Canadian long term outlays were treated similarly: all long term outlays in Ontario were counted for households for which one or more anglers fished in the Ontario Great Lakes. Therefore, U.S. and Canadian long term outlays reported here are not solely attributable to Great Lakes angling.

<sup>2</sup>Rods, reels, tackle, clothing, etc., purchased in 1980.

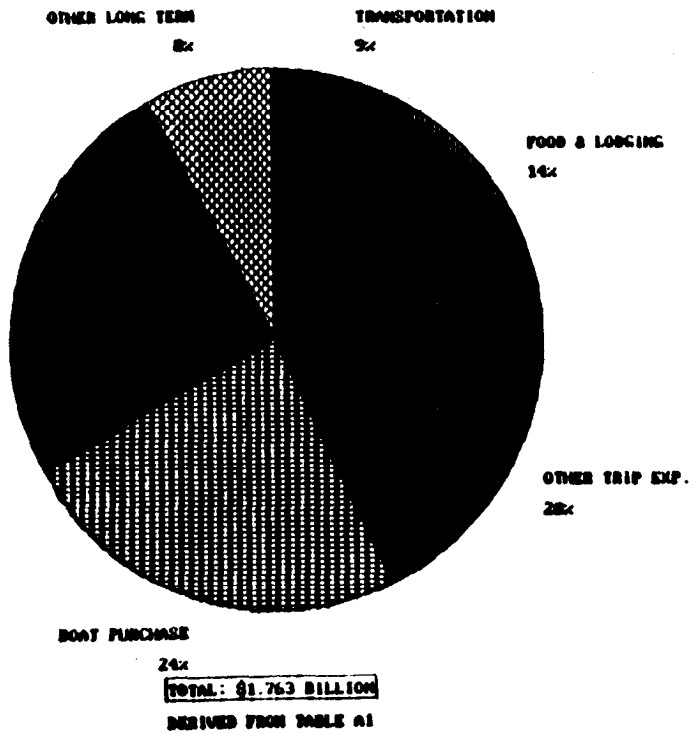
<sup>3</sup>Access fees, permits, guide services, boat rentals, campsite fees, etc.

<sup>4</sup>Gas, repairs, moorage, etc.

<sup>5</sup>Contains expenses not distributable by lake.

<sup>6</sup>Boats and boat accessories.

TRIP EXPENDITURES AND  
LONG TERM OUTLAYS  
FOR GREAT LAKES ANGLING  
IN 1980



TRIP EXPENDITURES  
FOR GREAT LAKES ANGLING

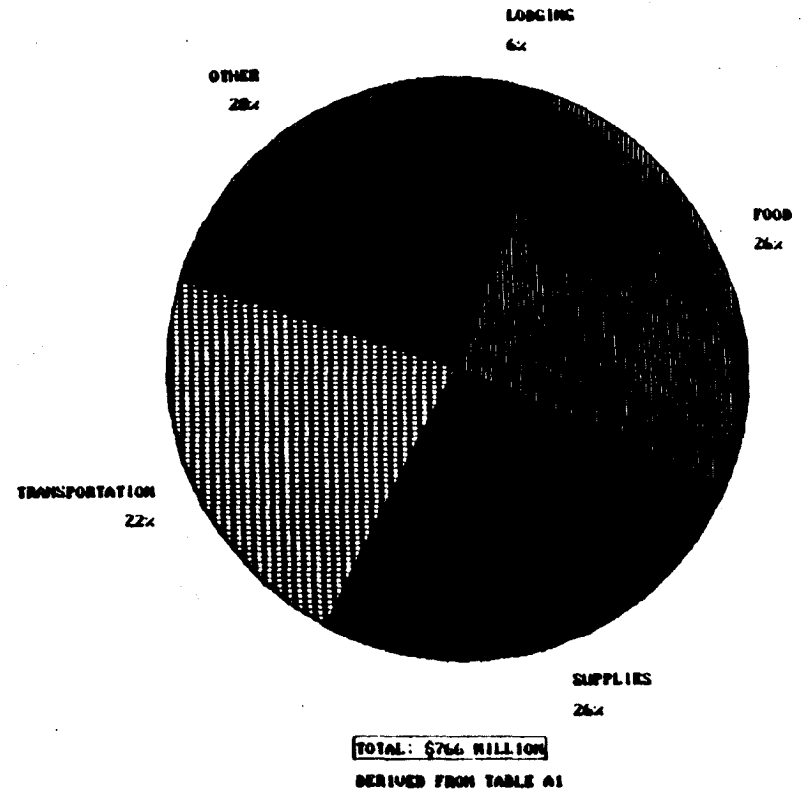
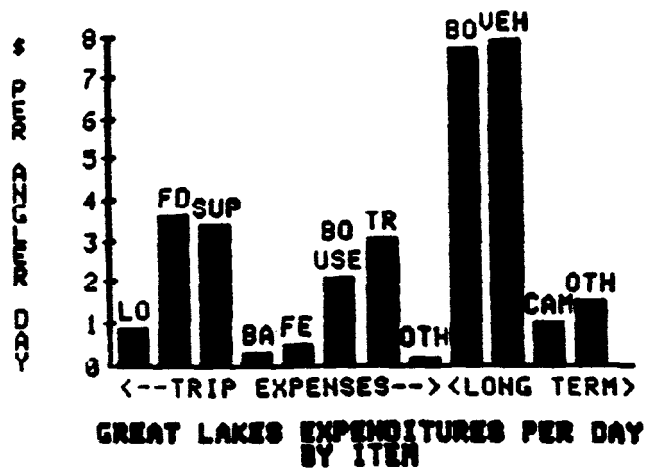


TABLE A2. **EXPENDITURES AND LONG TERM OUTLAYS (DOLLARS) FOR ANGLING FOR GREAT LAKE FISH PER ANGLER DAY IN 1980**<sup>1</sup>

Item	CANADA			U.S.	AGGREGATE
	In Ontario by residents	Non- res.	Canadian Total	In U.S. by residents	
<b>TRIP EXPENSES</b>					
1. Lodging	0.79	3.98	1.19	0.77	0.88
2. Food	1.63	4.44	2.00	4.23	3.63
3. Supplies <sup>2</sup>	1.06	0.82	1.03	4.17	3.33
4. Bait	0.33	0.68	0.37	0.23	0.26
5. Fees <sup>3</sup>	0.57	1.66	0.71	0.41	0.49
6. Boat use <sup>4</sup>	1.25	1.43	1.28	2.37	2.08
7. Transport.	1.84	2.99	2.00	3.47	3.04
8. Other <sup>5</sup>	<u>0.07</u>	<u>0.39</u>	0.12	<u>0.22</u>	<u>0.19</u>
Subtotal	7.54	16.34	8.68	<b>15.82</b>	<b>13.89</b>
<b>LONG TERM OUTLAYS</b>					
1. Boat & ace. <sup>6</sup>	7.95	0.33	6.96	7.99	7.69
2. Vehicles	2.70		2.35	9.91	7.90
3. Camping equip.	1.70	0.31	1.53	0.78	0.97
4. Other	3.65	1.88	3.42	0.85	1.52
Subtotal	16.00	2.52	14.26	19.54	18.15
<b>TOTAL</b>	<b>23.55</b>	<b>18.86</b>	<b>22.94</b>	<b>35.36</b>	<b>32.10</b>

See Table A1 for footnotes.



(Derived from Table A2)

TABLE A3a. EXPENDITURES BY INCOME LEVEL FOR ANGLING IN CANADIAN WATERS<sup>1</sup> (000's omitted)

Item	INCOME CATEGORY				
	Under \$5,000	\$5,000 \$9,999	\$10,000 \$14,999	\$15,000 \$19,999	\$20,000 \$24,999
<u>TRIP EXPENSES</u>					
Lodging	115	430	844	1,679	1,981
Food	325	720	1,572	3,001	3,742
Supplies <sup>2</sup>	184	575	1,140	2,637	2,537
Transport.	246	695	1,668	3,568	3,454
Other <sup>3,4,5</sup>	<u>213</u>	<u>528</u>	<u>1,363</u>	<u>2,954</u>	<u>3,988</u>
Subtotal	1,083	2,949	6,588	13,839	15,702
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	329	1,593	4,239	7,564	16,901
Vehicles	0	264	811	6,276	6,294
Camp equip.	10	1,161	2,186	3,556	1,744
Other	61	<u>180</u>	<u>7,159</u>	<u>1,239</u>	<u>2,398</u>
Subtotal	400	3,198	14,395	18,635	27,337
<b>TOTAL</b>	<b>1,483</b>	<b>6,146</b>	<b>20,983</b>	<b>32,474</b>	<b>43,039</b>

Item	INCOME CATEGORY (continued)				
	\$25,000 \$29,999	\$30,000 \$39,999	\$40,000 \$49,999	Over \$50,000	Not Specified
<u>TRIP EXPENSES</u>					
Lodging	1,897	2,025	1,155	1,136	5,931
Food	3,136	3,456	1,585	1,620	9,560
Supplies <sup>2</sup>	1,873	2,640	1,125	1,087	6,351
Transport.	3,157	3,632	1,591	1,731	8,842
Other <sup>3,4,5</sup>	<u>2,869</u>	<u>4,689</u>	<u>1,691</u>	<u>2,192</u>	<u>9,637</u>
Subtotal	12,932	16,443	7,147	7,965	40,320
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	14,200	13,142	4,759	11,951	24,933
Vehicles	1,476	6,639	2,320	0	9,806
Camp equip.	2,335	1,535	101	3,018	5,733
Other'	<u>1,815</u>	<u>3,653</u>	<u>3,831</u>	<u>20,469</u>	<u>4,962</u>
Subtotal	19,826.	24,969	11,011	35,438	45,434
<b>TOTAL</b>	<b>32,758</b>	<b>41,412</b>	<b>18,158</b>	<b>43,403</b>	<b>85,754</b>

See Table A1 for footnotes.

TABLE A3b. EXPENDITURES BY INCOME LEVEL FOR ANGLING IN UNITED STATES WATERS<sup>1</sup> (000's omitted)

Item	INCOME CATEGORY				
	Under \$5,000	\$5,000 \$9,999	\$10,000 \$14,999	\$15,000 \$19,999	\$20,000 \$24,999
<u>TRIP EXPENSES</u>					
Lodging	727	4,317	1,764	2,868	4,003
Food	9,616	15,688	16,182	21,587	26,298
Supplies <sup>2</sup>	6,094	13,976	18,712	18,698	26,443
Transport.	6,752	14,825	15,035	16,856	17,246
Other <sup>3,4,5</sup>	<u>2,092</u>	<u>5,331</u>	<u>9,663</u>	<u>14,421</u>	<u>21,351</u>
Subtotal	25,281	54,137	61,356	74,700	95,341
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	44	2,045	26,857	27,034	16,028
Vehicles	73	1,706	22,190	32,968	88,640
Camp equip.	302	1,007	6,457	5,696	3,318
Other	66	<u>140</u>	<u>338</u>	<u>3,054</u>	<u>96</u>
Subtotal	485	4,898	55,842	68,752	108,082
TOTAL	25,766	59,035	117,198	143,452	203,423

Item	INCOME CATEGORY (continued)				
	\$25,000 \$29,999	\$30,000 \$39,999	\$40,000 \$49,999	Over \$50,000	Not Specified
<u>TRIP EXPENSES</u>					
Lodging	9,305	3,647	296	1,979	2,204
Food	31,303	20,232	9,110	8,840	12,640
Supplies <sup>2</sup>	24,656	24,297	9,788	11,164	24,028
Transport.	20,572	23,202	5,018	6,858	12,418
Other <sup>3,4,5</sup>	<u>19,521</u>	<u>19,478</u>	<u>5,429</u>	<u>9,268</u>	<u>15,156</u>
Subtotal	105,357	90,856	29,641	38,109	66,446
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	100,986	69,113	13,752	39,883	28,149
Vehicles	67,865	46,628	14,264	13,508	113,958
Camp equip.	5,470	3,402	2,066	1,464	2,518
Other	<u>5,496</u>	<u>225,693</u>	<u>68</u>	<u>30</u>	<u>2,462</u>
Subtotal	179,817	141,836	30,150	54,885	147,087
TOTAL	285,174	232,692	59,791	92,994	213,533

See Table A1 for footnotes.

TABLE A4a. EXPENDITURES PER ANGLER DAY (DOLLARS) BY INCOME LEVEL FOR ANGLING IN CANADIAN WATERS <sup>1</sup>

Item	INCOME CATEGORY				
	Under \$5,000	\$5,000 \$9,999	\$10,000 \$14,999	\$15,000 \$19,999	\$20,000 - 4,999
<b>TRIP EXPENSES</b>					
Lodging	0.76	0.60	0.79	0.79	1.10
Food	2.15	1.00	1.48	1.41	2.07
Supplies <sup>2</sup>	1.22	0.80	1.07	1.24	1.40
Trans.	1.63	0.97	1.57	1.67	1.91
<b>Other<sup>3,4,5</sup></b>	<u>1.41</u>	0.73	1.28	1.38	2.21
Subtotal	7.17	4.10	6.20	6.49	8.68
<b>LONG TERM OUTLAYS</b>					
Boat & acc <sup>6</sup>	2.18	2.22	3.99	3.54	9.35
Vehicles	0.0	0.37	0.76	2.94	3.48
Camp equip.	0.07	1.61	2.06	1.67	0.96
Other	0.40	0.25	<u>6.73</u>	0.58	<u>1.33</u>
Subtotal	2.65	4.45	13.54	8.73	15.12
<b>TOTAL</b>	<u>9.82</u>	<u>8.55</u>	<u>19.74</u>	<u>15.22</u>	<u>23.80</u>

Item	INCOME CATEGORY (continued)				
	\$25,000 \$29,999	\$30,000 \$39,999	\$40,000 \$49,999	Over \$50,000	Not Specified
<b>TRIP EXPENSES</b>					
Lodging	1.48	1.52	2.04	1.73	1.27
Food	2.44	2.59	2.80	2.47	2.04
Supplies <sup>2</sup>	1.46	1.98	1.98	1.66	1.36
Transport.	2.46	2.73	2.81	2.64	1.89
<b>Other<sup>3,4,5</sup></b>	<u>2.24</u>	<u>3.52</u>	<u>2.98</u>	<u>3.35</u>	<u>2.06</u>
Subtotal	10.08	12.34	12.60	12.16	8.60
<b>LONG TERM OUTLAYS</b>					
Boat & acc <sup>6</sup>	11.07	9.87	8.39	18.25	5.32
Vehicles	1.15	4.98	4.09	0.0	2.09
Camp equip.	1.82	1.15	0.18	4.61	1.22
Other	<u>1.41</u>	<u>2.74</u>	<u>6.76</u>	<u>31.25</u>	1.06
Subtotal	15.45	18.75	19.42	54.10	9.69
<b>TOTAL</b>	<u>25.53</u>	<u>31.09</u>	<u>32.02</u>	<u>66.26</u>	<u>18.30</u>

See Table A1 for footnotes.



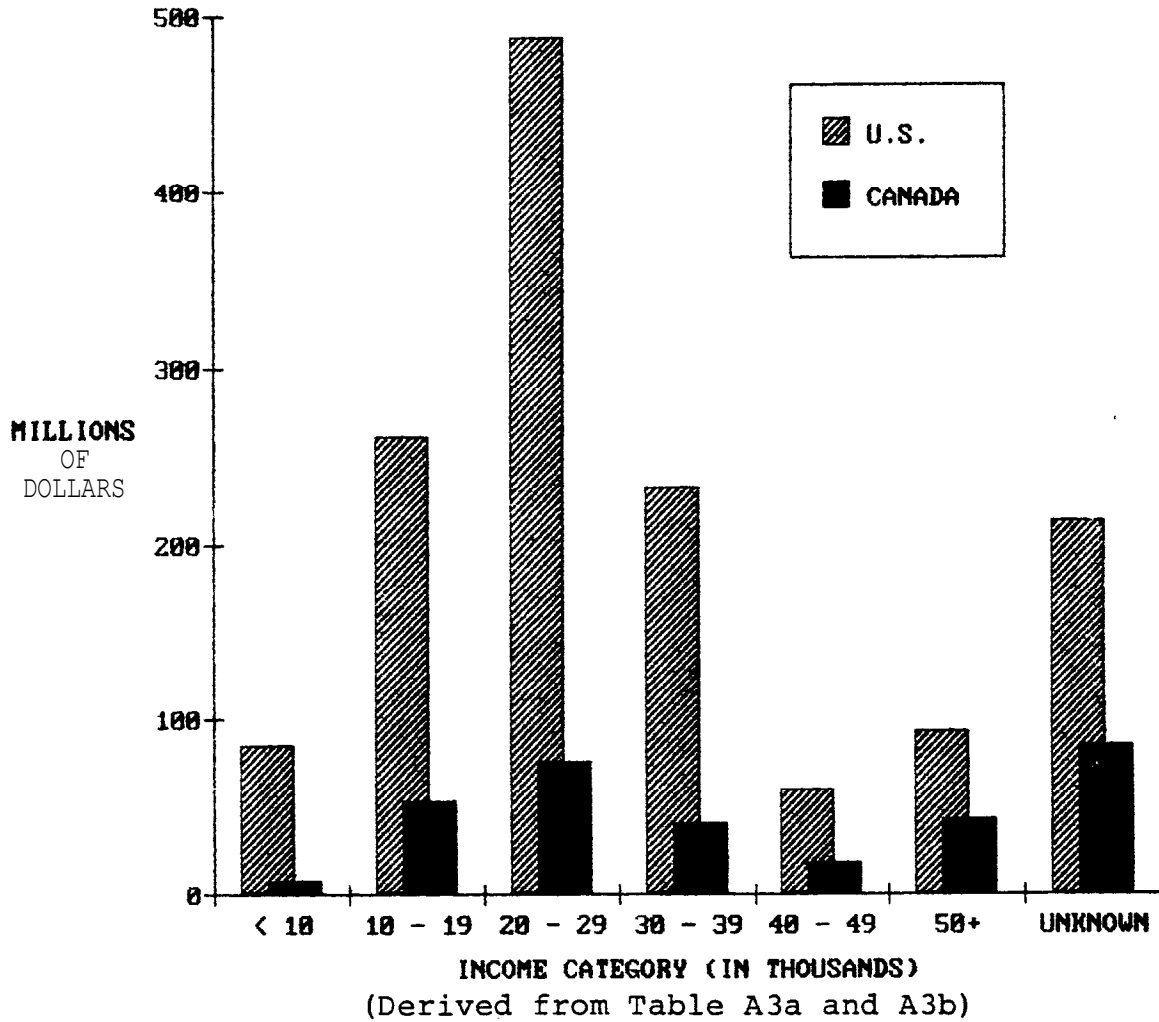
TABLE A4b. EXPENDITURES PER ANGLER DAY (DOLLARS) BY INCOME LEVEL FOR ANGLING IN UNITED STATES WATERS<sup>1</sup>

Item	INCOME CATEGORY				
	Under \$5,000	\$5,000 \$9,999	\$10,000 \$14,999	\$15,000 \$19,999	\$20,000 \$24,999
<u>TRIP EXPENSES</u>					
Lodging	0.38	1.14	0.31	0.48	0.93
Food	4.97	2.45	2.82	3.62	6.11
Supplies <sup>2</sup>	3.15	2.14	3.24	3.18	6.15
Transport.	3.49	2.32	3.62	2.82	4.01
Other <sup>3,4,5</sup>	<u>1.08</u>	<u>0.83</u>	<u>1.69</u>	<u>2.42</u>	4.96
Subtotal	13.08	8.46	10.69	12.51	22.17
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	0.02	0.32	4.68	4.53	3.73
Vehicles	0.04	0.27	3.86	5.52	20.61
Camp equip..	0.16	0.16	1.12	0.95	0.77
Other	<u>0.03</u>	<u>0.02</u>	<u>0.06</u>	<u>0.51</u>	<u>0.02</u>
Subtotal	0.25	0.77	9.73	11.52	25.13
<b>TOTAL</b>	<b>13.33</b>	<b>9.23</b>	<b>20.41</b>	<b>24.03</b>	<b>347.30</b>

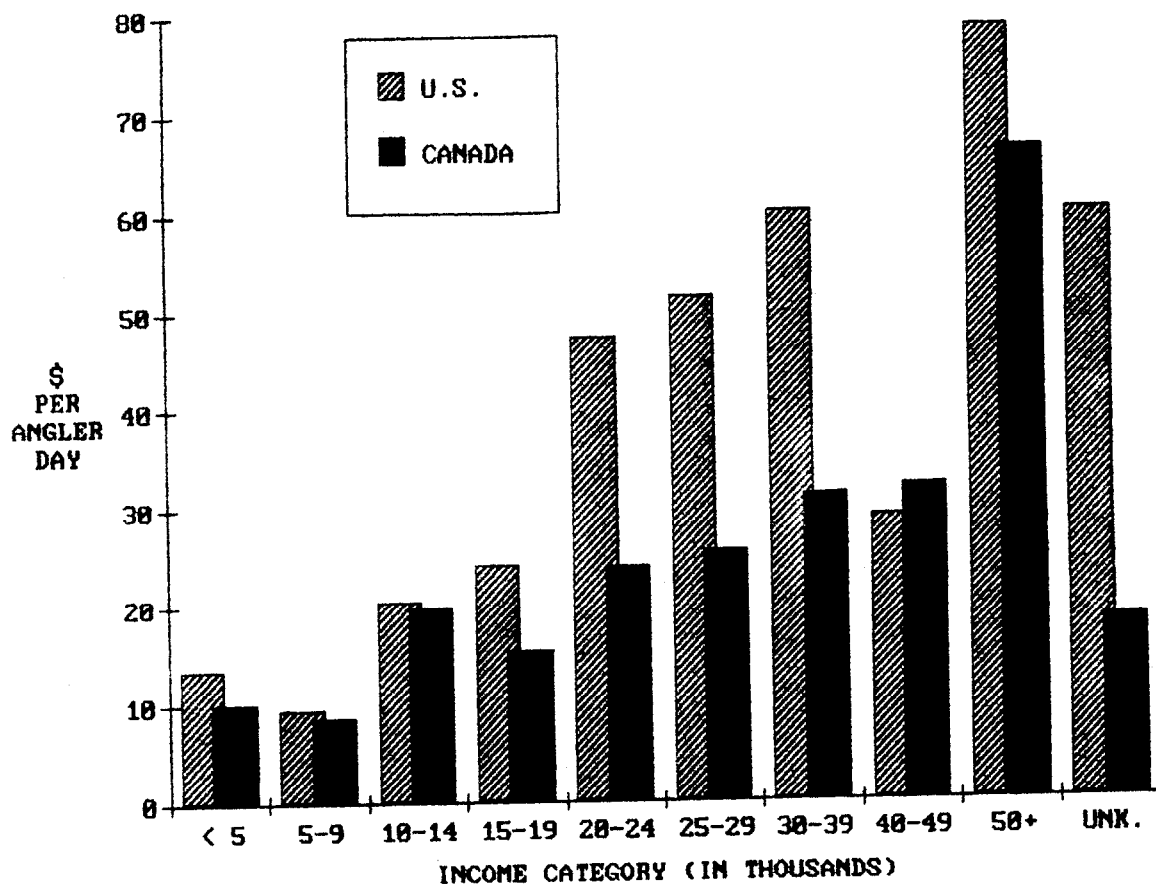
Item	INCOME CATEGORY (continued)				
	\$25,000 \$29,999	\$30,000 \$39,999	\$40,000 \$49,999	Over \$50,000	Not Specified
<u>TRIP EXPENSES</u>					
Lodging	1.68	0.94	0.14	1.67	0.62
Food	5.67	5.24	4.42	7.47	3.55
Supplies <sup>2</sup>	4.47	6.29	4.75	9.43	6.75
Transport.	3.72	6.00	2.44	5.79	3.49
Other <sup>3,4,5</sup>	<u>3.53</u>	<u>6.00</u>	<u>2.44</u>	<u>5.79</u>	<u>3.49</u>
Subtotal	19.07	23.51	14.39	32.19	18.67
<u>LONG TERM OUTLAYS</u>					
Boat & acc <sup>6</sup>	18.28	17.89	6.68	33.68	7.91
Vehicles	12.29	12.07	6.92	11.41	32.02
Camp equip.	0.99	0.88	1.00	1.24	0.71
Other	<u>0.99</u>	<u>5.87</u>	<u>0.03</u>	<u>0.03</u>	<u>0.69</u>
Subtotal	32.55	36.71	14.64	46.36	41.33
<b>TOTAL</b>	<b>51.62</b>	<b>60.22.</b>	<b>29.02</b>	<b>78.54</b>	<b>60.00</b>

See Table A1 for footnotes.

EXPENDITURES (TRIP + LONG TERM)  
 BY INCOME LEVEL  
 FOR U.S. AND CANADIAN ANGLING



**TOTAL EXPENDITURES  
(TRIP AND LONG TERM)  
PER ANGLER DAY  
BY INCOME CATEGORY  
IN THE U.S. AND CANADA**



(Derived from Table A4a and A4b)

TABLE AS. NUMBER OF ANGLERS AND ANGLER DAYS BY AGE  
(000's omitted)

Age	U.S. ANGLERS			ONTARIO ANGLERS			AGGREGATE		
	number	%	days	number	%	days	number	%	days
Unknown	0	0	0	37	4	426	37	1	426
16-24	731	24	8,538	111	11	1,361	842	20	9,899
25-34	905	29	10,514	318	31	3,894	1,223	30	14,408
35-44	499	16	5,510	213	21	3,475	712	17	8,985
45-54	468	15	7,008	161	16	2,582	629	15	9,590
55-64	336	11	4,145	117	11	1,755	453	11	5,900
65+	144	5	4,818	66	6	904	210	5	5,722

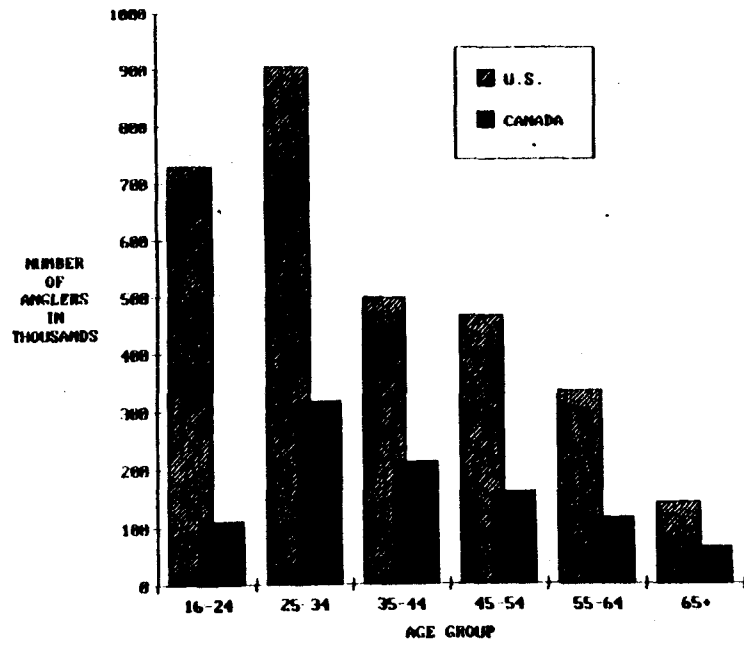
TABLE A6. NUMBER OF ANGLERS AND ANGLER DAYS BY SEX  
(000's omitted)

Sex	U.S. ANGLERS			ONTARIO ANGLERS			AGGREGATE		
	number	%	days	number	%	days	number	%	days
Male	2,394	78	33,124	708	69	10,339	3,102	76	43,463
Female	689	22	7,409	315	31	4,058	1,004	24	11,467

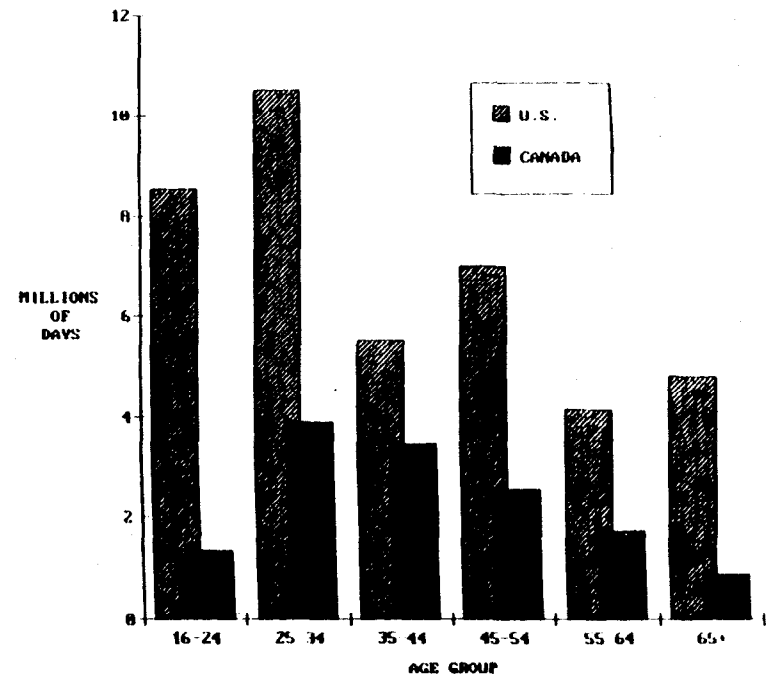
TABLE A7. NUMBER OF ANGLERS AND ANGLER DAYS BY INCOME  
(000's omitted)

Household Income	U.S. ANGLERS			ONTARIO ANGLERS			AGGREGATE		
	number	%	days	number	%	days	number	%	days
under 5,000	115	4	1,933	20	2	151	125	3	2,084
5,000-9,999	269	9	6,397	46	4	719	315	8	7,116
10,000-14,999	314	10	5,742	86	8	1,063	400	10	6,805
15,000-19,999	361	12	5,969	114	11	2,134	475	12	8,103
20,000-24,999	500	16	4,301	128	12	1,808	628	15	6,109
25,000-29,999	468	15	5,524	94	9	1,283	562	14	6,807
30,000-39,999	360	12	3,864	112	11	1,332	472	12	5,196
40,000-49,999	141	5	2,060	49	5	567	190	5	2,627
50,000 or more	133	4	1,184	44	4	655	177	4	1,839
Not Known	421	14	3,559	333	32	4,687	754	18	8,246

NUMBER OF ANGLERS  
BY AGE GROUP  
U.S. AND CANADA



ANGLER DAYS BY AGE GROUP  
U.S. AND CANADA



(Derived from Table A5)

STATISTICAL TABLES

B. LAKE STATISTICS BY JURISDICTION FISHED

TABLE B1. ANGLER DAYS By LAKE AND JURISDICTION FISHED (000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>		Lake Huron		Lake Michigan		Lake Erie <sup>2</sup>		Lake Ontario <sup>3</sup>		TOTAL <sup>5</sup>	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Ontario	850	48	5,050	42	0	0	3,974	21	4,304	45	14,397	26
Minnesota	381	22	0	0	0	0	0	0	0	0	382	1
Wisconsin	183	10	0	0	2,501	17	0	0	0	0	2,715	5
Michigan	347	20	6,850	58	6,828	48	4,114	22	0	0	<b>16,119<sup>6</sup></b>	29
Illinois	0	0	0	0	4,559	32	0	0	0	0	4,589	8
Indiana	0	0	0	0	492	3	0	0	0	0	499	1
Ohio	0	0	0	0	0	0	8,781	46	0	0	8,787	16
Pennsylvania	0	0	0	0	0	0	1,055	5	0	0	1,055	2
New York	0	0	0	0	0	0	1,174	6	5,292	55	6,387	12
Unspecified <sup>4</sup>	0	0	0	0	0	0	22	0	0	0	0	0
<b>TOTAL</b>	<b>1,761</b>	<b>100</b>	<b>11,900</b>	<b>100</b>	<b>14,380</b>	<b>100</b>	<b>19,120</b>	<b>100</b>	<b>9,596</b>	<b>100</b>	<b>54,930</b>	<b>100</b>

1 Lake Superior includes the St. Marys River.

2 Lake Erie includes the Detroit River, Lake St. Clair and the St. Clair River.

<sup>3</sup>Lake Ontario includes the St. Lawrence River and the Niagara River.

<sup>4</sup>State of destination not given.

5 Includes angler days not allocated by lake. Effort in U.S. waters by non-U.S. residents is not included.

6 The total is less than the components because some anglers reported more than one lake fished on the same days.

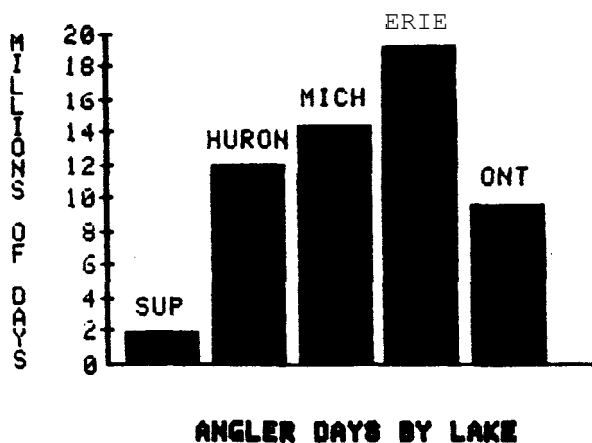


TABLE B2. NUMBER OF ANGLERS BY LAKE AND JURISDICTION FISHED (000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>		Lake Huron		Lake Michigan		Lake Erie <sup>2</sup>		Lake Ontario <sup>3</sup>		TOTAL <sup>5</sup>	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Ontario	99	37	478	51	0	0	288	22	360	50	1,023	25
Minnesota	72	27	0	0	0	0	0	0	0	0	73	2
Wisconsin	29	11	0	0	383	31	0	0	0	0	411	10
Michigan	67	25	454	49	449	36	211	16	0	0	1,071	26
Illinois	0	0	0	0	322	26	0	0	0	0	318	7
Indiana	0	0	0	0	84	7	0	0	0	0	85	2
Ohio	0	0	0	0	0	0	653	49	0	0	656	16
Pennsylvania	0	0	0	0	0	0	105	8	0	0	105	2
New York	0	0	0	0	0	0	72	5	357	50	423	10
Unspecified <sup>4</sup>	0	0	0	0	0	0	7	0	0	0	7	0
<b>TOTAL<sup>5</sup></b>	<b>267</b>	<b>100</b>	<b>932</b>	<b>100</b>	<b>1,238</b>	<b>100</b>	<b>1,336</b>	<b>100</b>	<b>717</b>	<b>100</b>	<b>4,039</b>	<b>100</b>

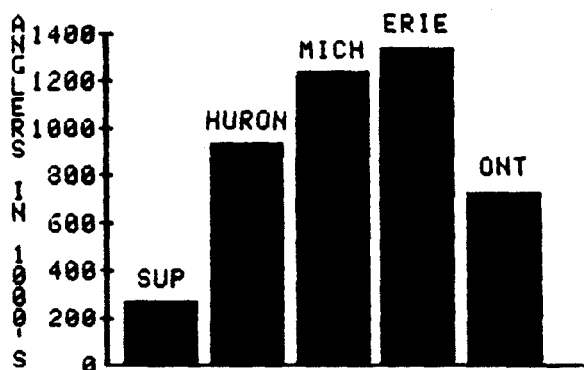
1 Lake Superior includes the St. Marys River.

2 Lake Erie includes the Detroit River, Lake St. Clair and the St. Clair River.

3 Lake Ontario includes the St. Lawrence River and the Niagara River.

<sup>4</sup>State of destination not given.

5 Totals are not additive because each angler is counted in each jurisdiction and lake fished, but only once in the total. Totals include anglers not allocated by lake. Non-U.S. resident anglers fishing in U.S. waters were not included.



NUMBER OF ANGLERS BY LAKE



TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS  
(000's omitted?)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
------------------------	-------------------------------	---------------	------------------	---------------------------	------------------------------	-------

ONTARIO<sup>4</sup>

All anglers

1. Lodging	1,261	6,842	0	3,619	5,334	17,193
2. Food	2,591	12,135	0	6,172	7,634	28,716
3. Supplies <sup>5</sup>	1,329	7,167	0	5,516	5,725	20,148
4. Transportation	2,428	11,810	0	6,734	7,424	28,584
5. Other <sup>5</sup>	<u>1,469</u>	<u>11,502</u>	0	<u>8,849</u>	<u>8,339</u>	<u>30,326</u>
TOTAL	9,078	49,456	0	308901	34,455	124,968

Residents

1. Lodging	581	4,153	0	2,083	2,984	9,801
2. Food	1,738	9,379	0	3,793	5,466	20,376
3. Supplies <sup>5</sup>	1,116	6,584	0	4,283	5,062	17,009
4. Transportation	1,847	9,935	0	4,809	6,339	22,930
5. Other <sup>5</sup>	<u>1,055</u>	<u>9,500</u>	0	<u>6,960</u>	<u>6,213</u>	<u>23,728</u>
TOTAL	6,337	39,515	0	21,929	26,064	94,579

Non-residents

1. Lodging	680	2,689	0	1,536	2,350	7,255
2. Food	852	2,756	0	2,380	2,168	8,156
3. Supplies <sup>5</sup>	213	619	0	1,233	662	2,727
4. Transportation	581	1,875	0	1,925	1,085	5,466
5. Other <sup>5</sup>	<u>415</u>	<u>2,002</u>	0	<u>1,889</u>	<u>2,126</u>	<u>6,432</u>
TOTAL	2,741	9,941	a	8,962	8,392	30,389

MINNESOTA

All anglers

1. Lodging	1,415	0	0	0	0	1,415
2. Food	2,774	0	0	0	0	2,774
3. Supplies <sup>5</sup>	3,575	0	0	0	0	3,575
4. Transportation	1,903	0	0	0	0	1,903
5. Other <sup>5</sup>	<u>2,326</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2,326</u>
TOTAL	11,993	0	0	0	0	11,993

Residents

1. Lodging	484	0	0	0	0	484
2. Food	1,753	0	0	0	0	1,753
3. Supplies <sup>5</sup>	2,832	0	0	0	0	2,832
4. Transportation	1,278	0	0	0	0	1,278
5. Other <sup>5</sup>	<u>2,213</u>	0	0	0	0	<u>2,213</u>
TOTAL	8,560	a	0	0	0	8,560

TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS (Cont)  
(000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
<u>Non-residents</u>						
1. Lodging	931	0	0	0	0	931
2. Food	1,021	0	0	0	0	1,021
3. Supplies <sup>5</sup>	743	0	0	0	0	743
4. Transportation	625	0	0	0	0	625
5. Other <sup>5</sup>	113	0	0	0	0	113
TOTAL	<u>3,433</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3,433</u>
<u>WISCONSIN</u>						
<u>All anglers</u>						
1. Lodging	42	0	4,381	0	0	4,423
2. Food	1,056	0	12,827	0	0	13,882
3. Supplies <sup>5</sup>	1,031	0	22,748	0	0	23,779
4. Transportation	1,427	0	12,748	0	0	14,076
5. Other <sup>5</sup>	884	0	11,448	0	0	12,332
TOTAL	<u>4,439</u>	<u>0</u>	<u>64,052</u>	<u>0</u>	<u>0</u>	<u>68,491</u>
<u>Residents</u>						
1. Lodging	42	0	399	0	0	441
2. Food	436	0	7,827	0	0	8,262
3. Supplies <sup>5</sup>	465	0	15,520	0	0	15,985
4. Transportation	651	0	6,305	0	0	6,955
5. Other <sup>5</sup>	463	0	7,601	0	0	8,064
TOTAL	<u>2,056</u>	<u>0</u>	<u>37,652</u>	<u>0</u>	<u>0</u>	<u>39,708</u>
<u>Non-residents</u>						
1. Lodging		0	3,982	0	0	3,982
2. Food	620	0	5,000	0	0	5,619
3. Supplies <sup>5</sup>	566	0	7,228	0	0	7,794
4. Transportation	776	0	6,344	0	0	7,120
5. Other <sup>5</sup>	421	0	3,846	0	0	4,267
TOTAL	<u>2,383</u>	<u>0</u>	<u>26,400</u>	<u>0</u>	0	<u>28,783</u>
<u>MICHIGAN</u>						
<u>All anglers</u>						
1. Lodging	703	5,067	5,067	954	0	11,791
2. Food	2,634	32,679	32,679	12,906	0	80,898
3. Supplies <sup>5</sup>	2,829	23,641	23,641	8,725	0	58,835
4. Transportation	2,459	25,286	25,286	10,290	0	63,321
5. Other <sup>5</sup>	1,490	19,318	19,318	10,580	0	50,706
TOTAL	<u>10,114</u>	<u>105,991</u>	<u>105,991</u>	<u>43,455</u>	0	<u>265,552</u>

TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS (Cont)  
(000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
<u>Residents</u>						
1. Lodging	591	3,496	3,496	392	0	7,975
2. Food	1,998	27,252	27,252	10,368	0	66,870
3. Supplies <sup>5</sup>	1,917	18,087	18,087	5,888	0	43,980
4. Transportation	1,486	20,661	20,661	7,770	0	50,578
5. Other <sup>5</sup>	<u>1,069</u>	<u>17,150</u>	<u>17,150</u>	<u>9,662</u>	0	<u>45,031</u>
TOTAL	7,061	86,647	86,647	34,080	0	214,434
<u>Non-residents</u>						
1. Lodging	111	1,571	1,571	562	0	3,816
2. Food	636	5,427	5,427	2,538	0	14,028
3. Supplies <sup>5</sup>	912	5,553	5,553	2,837	0	14,855
4. Transportation	972	4,625	4,625	2,520	0	12,743
5. Other <sup>5</sup>	<u>421</u>	<u>2,168</u>	<u>2,168</u>	<u>918</u>	0	<u>51,117</u>
TOTAL	3,054	19,345	19,345	9,374	0	51,117
<u>ILLINOIS</u>						
<u>All anglers</u>						
1. Lodging	0	0	504	0	0	504
2. Food	0	0	9,291	0	0	3,291
3. Supplies <sup>5</sup>	0	0	23,663	0	0	23,663
4. Transportation	0	0	11,942	0	0	11,942
5. Other <sup>5</sup>	0	0	<u>8,336</u>	<u>0</u>	<u>0</u>	<u>9,336</u>
TOTAL	0	8	53,735	0	0	53,735
<u>Residents</u>						
1. Lodging	0	0	459	0	0	459
2. Food	0	0	7,964	0	0	7,964
3. Supplies <sup>5</sup>	0	0	22,691	0	0	22,691
4. Transportation	0	0	11,286	0	0	11,286
5. Other <sup>5</sup>	0	0	<u>7,640</u>	<u>0</u>	<u>0</u>	<u>7,640</u>
TOTAL	0	0	50,040	0	0	50,040
<u>Non-residents</u>						
1. Lodging	0	0	45	0	0	45
2. Food	0	0	1,327	0	0	1,327
3. Supplies <sup>5</sup>	0	0	972	0	0	972
4. Transportation	0	0	656	0	0	656
5. Other <sup>5</sup>	0	0	<u>696</u>	<u>0</u>	<u>0</u>	<u>696</u>
TOTAL	0	0	3,695	0	6	3,695

TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS (Cont)  
(000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
<u>INDIANA</u>						
<u>All anglers</u>						
1. Lodging	0	0	118	0	0	118
2. Food	0	0	2,824	0	0	2,824
3. Supplies <sup>5</sup>	0	0	4,149	0	0	4,149
4. Transportation	0	0	1,158	0	0	1,158
5. Other <sup>3</sup>	0	0	<u>1,051</u>	0	0	<u>1,051</u>
TOTAL	0	0	9,660	0	0	9,660
<u>Residents</u>						
1. Lodging	0	0	118	0	0	118
2. Food	0	0	2,307	0	0	2,307
3. Supplies <sup>5</sup>	0	0	3,090	0	0	3,090
4. Transportation	0	0	1,268	0	0	1,268
5. Other <sup>3</sup>	0	0	<u>721</u>	<u>0</u>	0	<u>721</u>
TOTAL	0	0	7,504	<u>0</u>	0	7,504
<u>Non-residents</u>						
1. Lodging	0	0	0	0	0	0
2. Food	0	0	517	0	0	517
3. Supplies <sup>5</sup>	0	0	1,059	0	0	1,059
4. Transportation	0	0	250	0	0	250
5. Other <sup>3</sup>	0	0	<u>330</u>	<u>0</u>	0	<u>330</u>
TOTAL	0	0	2,156	<u>0</u>	a	2,156
<u>OHIO</u>						
<u>All anglers</u>						
1. Lodging	0	0	0	5,113	0	5,113
2. Food	0	0	0	31,429	0	31,429
3. Supplies <sup>5</sup>	0	0	0	34,147	0	34,147
4. Transportation	0	0	0	22,774	0	22,774
5. Other <sup>3</sup>	0	0	0	<u>23,733</u>	0	<u>23,733</u>
TOTAL	a	0	0	117,195	0	117,195
<u>Residents</u>						
1. Lodging	0	0	0	4,796	0	4,796
2. Food	0	0	0	29,382	0	29,382
3. Supplies <sup>5</sup>	0	0	0	29,872	0	29,872
4. Transportation	0	0	0	20,599	0	20,599
5. Other <sup>3</sup>	0	0	0	<u>23,057</u>	0	<u>23,057</u>
TOTAL	0	0	0	107,705	0	107,705

TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS (Cont)  
(000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
<u>Non-residents</u>						
1. Lodging	0	0	0	317	0	317
2. Food	0	0	0	2,047	0	2,047
3. Supplies <sup>5</sup>	0	0	0	4,275	0	4,275
4. Transportation	0	0	0	2,175	0	2,175
5. Other <sup>5</sup>	0	0	0	676	0	676
TOTAL	0	0	0	9,490	a	9,490
<u>PENNSYLVANIA</u>						
<u>All anglers</u>						
1. Lodging	0	0	0	355	0	355
2. Food	0	0	0	4,222	0	4,222
3. Supplies <sup>5</sup>	0	0	0	5,770	0	5,770
4. Transportation	0	0	0	4,305	0	4,305
5. Other <sup>5</sup>	0	0	0	2,638	0	2,638
TOTAL	0	0	0	17,290	0	17,290
<u>Residents</u>						
1. Lodging	0	0	0	246	0	246
2. Food	0	0	0	3,989	0	3,989
3. Supplies <sup>5</sup>	0	0	0	5,491	0	5,491
4. Transportation	0	0	0	4,069	0	4,069
5. Other <sup>5</sup>	0	0	0	1,809	0	1,809
TOTAL	0	0	0	15,604	0	15,604
<u>Non-residents</u>						
1. Lodging	0	0	0	109	0	109
2. Food	0	0	0	233	0	233
3. Supplies <sup>5</sup>	0	0	0	280	0	280
4. Transportation	0	0	0	236	0	236
5. Other <sup>5</sup>	0	0	0	829	0	829
TOTAL	a	0	0	1,686	0	1,686
<u>NEW YORK</u>						
<u>All anglers</u>						
1. Lodging	0	0	0	100	7,292	7,393
2. Food	0	0	0	4,008	22,094	26,102
3. Supplies <sup>5</sup>	0	0	0	3,267	18,314	21,581
4. Transportation	0	0	0	2,908	15,996	18,904
5. Other <sup>5</sup>	0	0	0	1,577	9,624	11,201
TOTAL	0	0	0	11,861	73,320	85,191

TABLE B3. TRIP EXPENDITURES BY RESIDENTS AND NON-RESIDENTS (Cont)  
(000's omitted)

Jurisdiction fished	Lake Superior <sup>1</sup>	Lake Huron	Lake Michigan	Lake Erie <sup>2</sup>	Lake Ontario <sup>3</sup>	TOTAL
<u>Residents</u>						
1. Lodging	0	0	0	100	5,808	5,907
2. Food	0	0	0	3,802	18,959	22,761
3. Supplies <sup>5</sup>	0	0	0	2,323	11,462	13,785
4. Transportation	0	0	0	2,728	14,172	16,900
5. Other <sup>5</sup>	<u>0</u>	<u>0</u>	0	<u>1,545</u>	<u>7,269</u>	<u>8,814</u>
TOTAL	<u>0</u>	<u>0</u>	0	10,497	57,670	68,167
<u>Non-residents</u>						
1. Lodging	0	0	0	0	1,485	1,485
2. Food	0	0	0	206	3,134	3,341
3. Supplies <sup>5</sup>	0	0	0	944	6,852	7,796
4. Transportation	0	0	0	180	1,824	2,004
5. Other <sup>5</sup>	<u>0</u>	<u>0</u>	0	32	2,355	<u>2,388</u>
TOTAL	<u>0</u>	0	8	1,363	15,650	17,014
<u>AGGREGATE<sup>6</sup></u>						
<u>All anglers</u>						
1. Lodging	3,421	11,909	10,069	10,141	12,627	48,304
2. Food	9,055	44,814	57,621	58,737	29,728	200,213
3. Supplies <sup>5</sup>	8,764	30,809	74,200	57,425	24,039	198,275
4. Transportation	8,216	37,096	51,395	47,012	23,420	167,363
5. Other <sup>5</sup>	<u>6,169</u>	<u>30,820</u>	<u>40,153</u>	<u>47,377</u>	<u>17,963</u>	<u>152,033</u>
TOTAL	<u>35,625</u>	<u>155,447</u>	<u>233,438</u>	<u>220,692</u>	<u>107,776</u>	<u>766,188</u>
<u>Residents</u>						
1. Lodging	1,698	7,649	4,471	7,617	8,792	30,313
2. Food	5,925	36,631	45,350	51,333	24,425	163,876
3. Supplies <sup>5</sup>	6,329	24,671	59,398	47,857	16,524	157,143
4. Transportation	5,262	30,596	39,520	39,976	20,511	136,048
5. Other <sup>5</sup>	<u>4,800</u>	<u>26,650</u>	<u>33,113</u>	<u>43,032</u>	<u>13,482</u>	<u>129,192</u>
TOTAL	<u>24,014</u>	<u>126,162</u>	<u>181,842</u>	<u>189,816</u>	<u>83,734</u>	<u>616,050</u>
<u>Non-residents</u>						
1. Lodging	1,722	4,260	5,598	2,524	3,835	17,991
2. Food	3,129	8,183	12,271	7,404	5,302	36,336
3. Supplies <sup>5</sup>	2,435	6,172	14,811	9,569	7,514	41,131
4. Transportation	2,954	6,500	11,875	7,036	2,909	31,316
5. Other <sup>5</sup>	<u>1,370</u>	<u>4,170</u>	<u>7,040</u>	<u>4,344</u>	<u>4,481</u>	<u>22,842</u>
TOTAL	<u>11,610</u>	<u>29,286</u>	<u>51,596</u>	<u>30,876</u>	<u>24,042</u>	<u>150,138</u>

TABLE B3. **TRIP EXPENDITURES** BY RESIDENTS AND NON-RESIDENTS (Cont)

Footnotes

1 Lake Superior includes the St. Marys River.

2 Lake Erie includes the Detroit River, Lake St. Clair and St. Clair River.

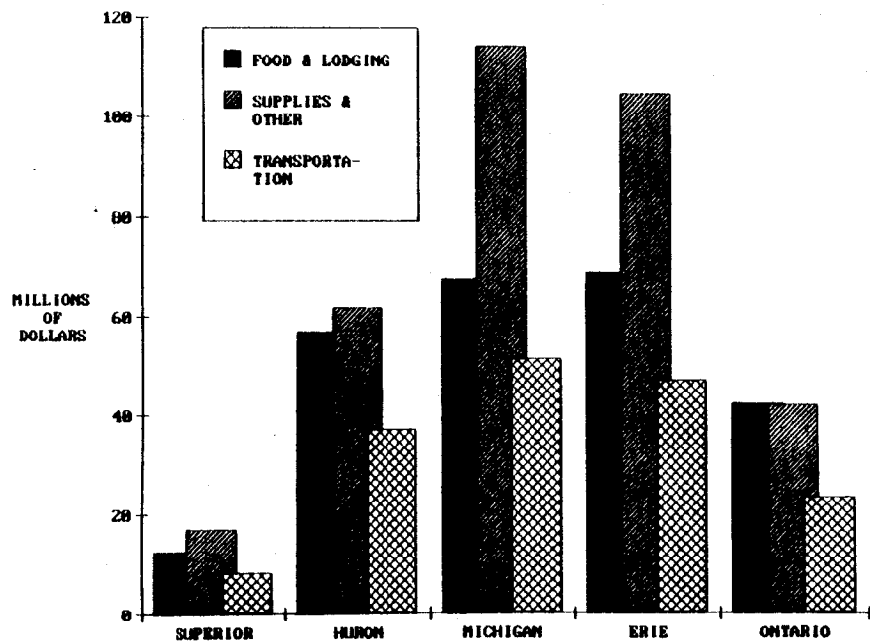
3 Lake Ontario includes the St. Lawrence River and Niagara River,

<sup>4</sup>Total column for Expenditures for Ontario includes \$1,087,500 in expenditures not identified by lake fished.

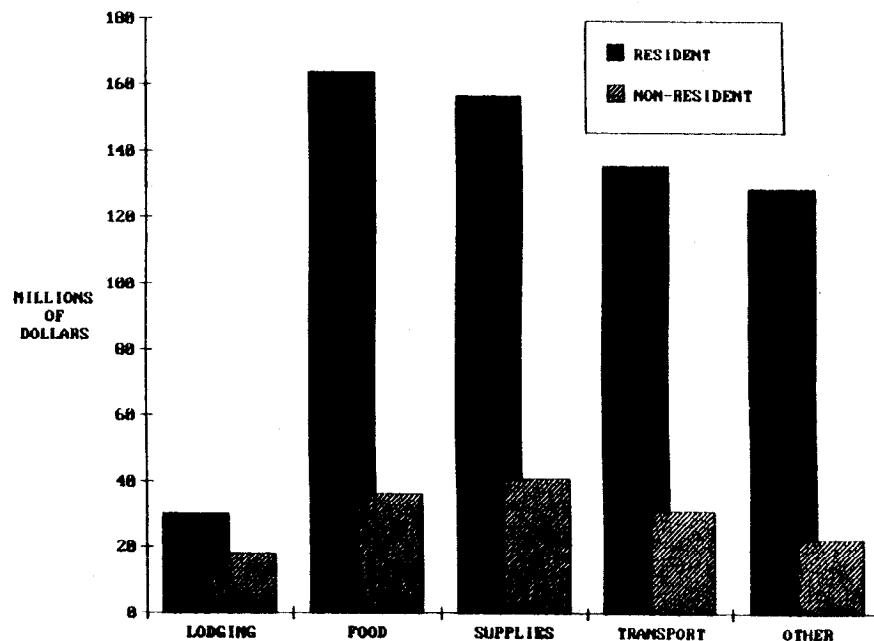
<sup>5</sup>Supplies include bait, rods, reels, tackle, clothing, etc. "Other" includes access fees, permits, guide service, rentals, charters, boat, gas, repairs, moorage, household owned costs, etc.

6 The "Aggregate" total column includes \$12,123,000 in U.S. expenditures that were not included in lake and jurisdiction fished totals because the expenditures could not be assigned to particular locations fished.

### AGGREGATE TRIP EXPENDITURES BY LAKE

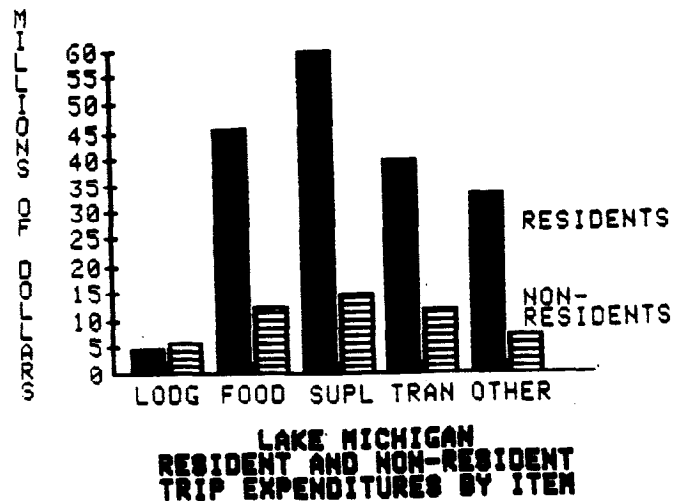
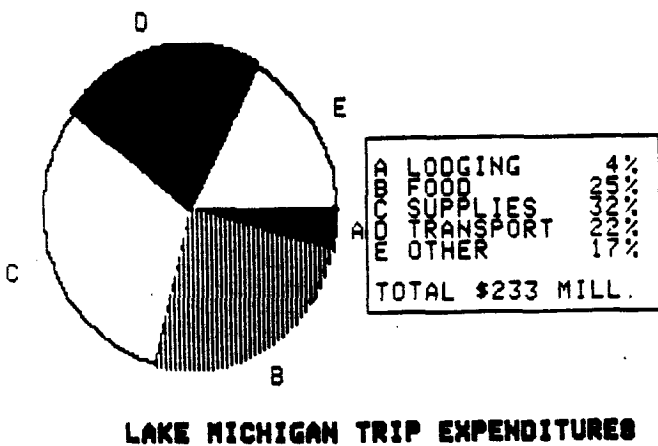
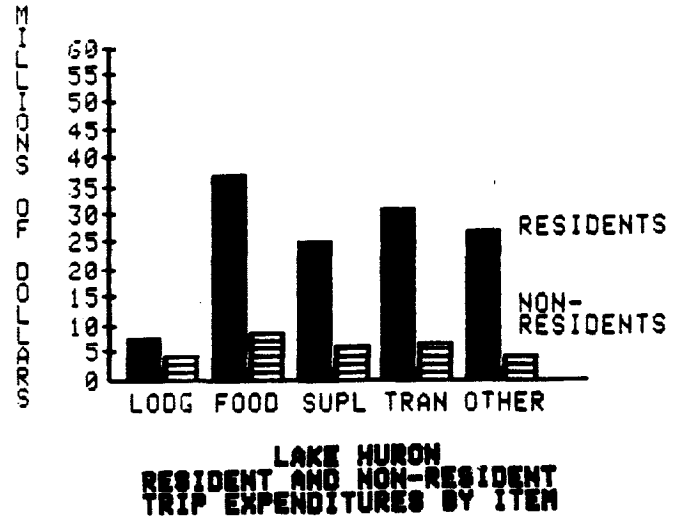
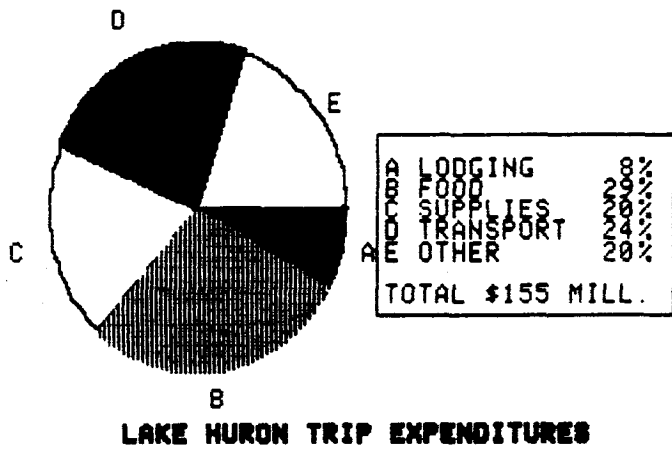
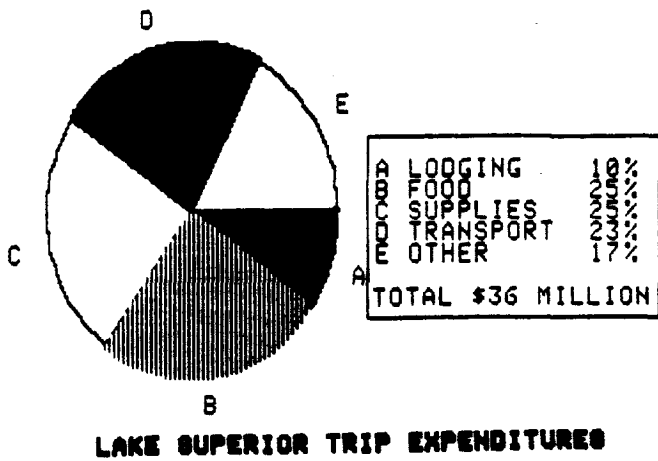


### TOTAL RESIDENT AND NON-RESIDENT TRIP EXPENDITURES BY ITEM

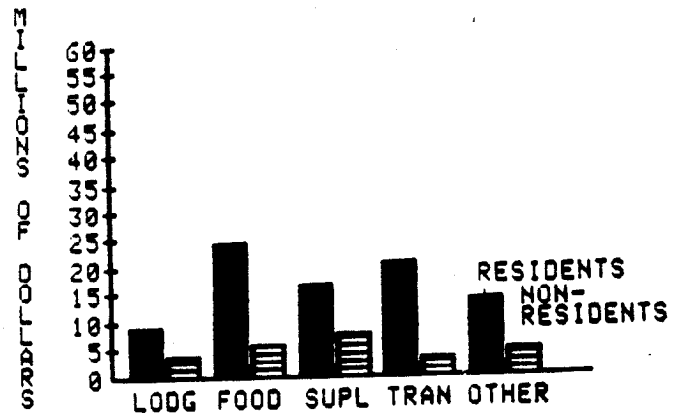
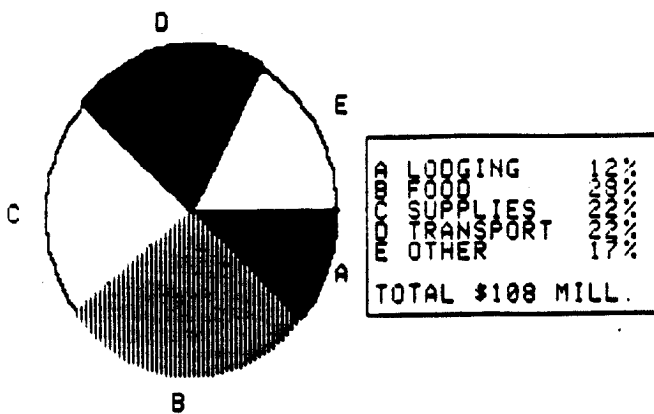
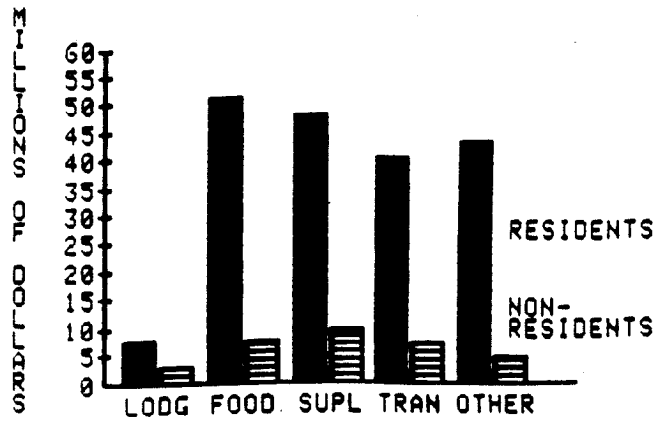
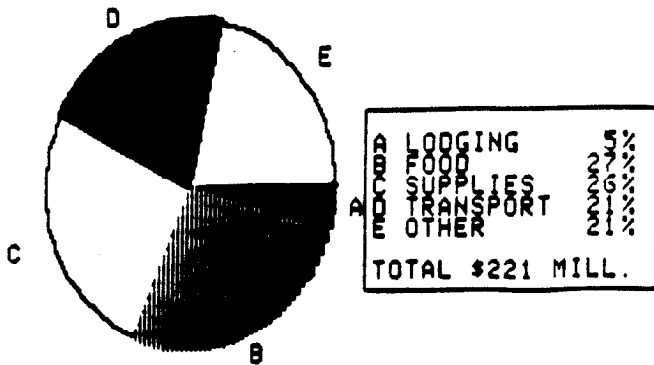


(Derived from Table B3)





(Derived from Table B3)



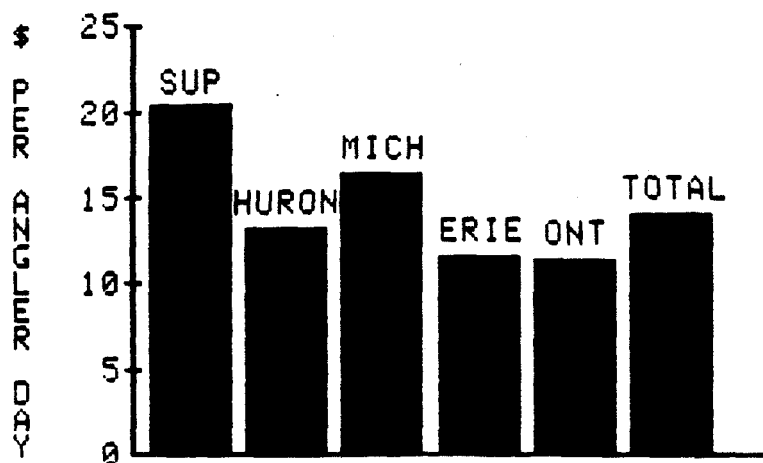
(Derived from Table B3)

TABLE B4. TRIP EXPENDITURES PER ANGLER DAY (DOLLARS) BY JURISDICTION FISHED<sup>1</sup>

Jurisdiction fished	Lake Superior	Lake Huron	Lake Michigan	Lake Erie	Lake Ontario	TOTAL
Ontario	10.68	9.79	0	7.77	8.01	8.68
Minnesota	31.48	0	0	0	0	31.39
Wisconsin	24.21	0	25.61	0	0	25.23
Michigan	29.17	15.47	15.52	10.56	0	16.47
Illinois	0	0	11.79	0	0	11.71
Indiana	0	0	19.65	0	0	19.35
Ohio	0	0	0	13.35	0	13.34
Pennsylvania	0	0	0	16.39	0	16.39
New York	<u>0</u>	<u>0</u>	<u>0</u>	<u>10.10</u>	<u>13.86</u>	<u>13.34</u>
<b>TOTAL</b>	<b>20.23</b>	<b>13.06</b>	<b>16.23</b>	<b>11.54</b>	<b>11.23</b>	<b>13.952</b>

1 Expenditures from Table B3 divided by angler days from Table B1.

2 Grand total include; \$.20 per angler day in U.S. expenditures that were not included in lake and jurisdiction fished totals because the expenditures could not be assigned to particular locations fished.



**TRIP EXPENDITURES PER ANGLER DAY  
BY LAKE**

(Derived from Table B4)

TABLE B5. OWNERSHIP OF BOATS USED FOR GREAT LAKES ANGLING1  
(000's omitted)

Jurisdiction f shed	Lake Superior <sup>2</sup>	Lake Huron	Lake Mich.	Lake Erie <sup>2</sup>	Lake Ontario <sup>2</sup>	TOTAL
<u>ONTARIO</u>	N/A	N/A	N/A	N/A	N/A	N/A
<u>MINNESOTA</u>						
Inbd & I/O <sup>3</sup>	9.9	0	0	0	0	9.9
Outboard	44.1	0	0	0	0	44.1
Other boat	<u>17.5</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>17.5</u>
Total	49.4	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	49.4
Non-Owners	22.6	0	0	0	0	22.6
<u>WISCONSIN</u>						
Inbd & I/O <sup>3</sup>	5.8	0	40.9	0	0	46.7
Outboard	12.0	0	211.5	0	0	220.0
Other boat	<u>5.4</u>	<u>0</u>	<u>76.4</u>	<u>0</u>	<u>0</u>	<u>80.7</u>
Total	16.7	<u>0</u>	258.8	<u>0</u>	<u>0</u>	271.9
Non-Owners	11.3	0	122.4	0	0	136.8
<u>MICHIGAN</u>						
Inbd & I/O <sup>3</sup>	3.1	66.3	66.3	30.6	0	166.2
Outboard	26.8	237.6	237.6	85.5	0	586.5
Other boat	<u>13.8</u>	<u>70.4</u>	<u>70.4</u>	<u>25.2</u>	<u>0</u>	<u>179.9</u>
Total	32.1	301.3	301.3	112.4	<u>0</u>	746.0
Non-Owners	17.7	120.5	120.5	57.4	0	325.0
<u>ILLINOIS</u>						
Inbd & I/O <sup>3</sup>	0	0	35.6	0	0	35.6
Outboard	0	0	104.0	0	0	104.0
Other boat	<u>0</u>	<u>0</u>	<u>38.2</u>	<u>0</u>	<u>0</u>	<u>38.2</u>
Total	<u>0</u>	<u>0</u>	136.3	<u>0</u>	<u>0</u>	136.3
Non-Owners	0	0	174.0	0	0	174.0
<u>INDIANA</u>						
Inbd & I/O <sup>3</sup>	0	0	4.1	0	0	4.1
Outboard	0	0	16.0	0	0	16.0
Other boat	0	<u>0</u>	<u>12.5</u>	<u>0</u>	<u>0</u>	<u>12.5</u>
Total	a	<u>0</u>	21.1	<u>0</u>	<u>0</u>	21.1
Non-Owners	0	0	62.8	0	0	62.8
<u>OHIO</u>						
Inbd & I/O <sup>3</sup>	0	0	0	148.8	0	148.8
Outboard	0	0	0	227.4	0	227.4
Other boat	<u>0</u>	<u>0</u>	<u>0</u>	<u>118.1</u>	<u>0</u>	<u>118.1</u>
Total	<u>0</u>	<u>0</u>	<u>0</u>	388.3	<u>0</u>	388.3
Non-Owners	0	0	0	267.8	0	267.8

TABLE B5. OWNERSHIP OF BOATS USED FOR GREAT LAKES ANGLING<sup>1</sup>  
(Continued)

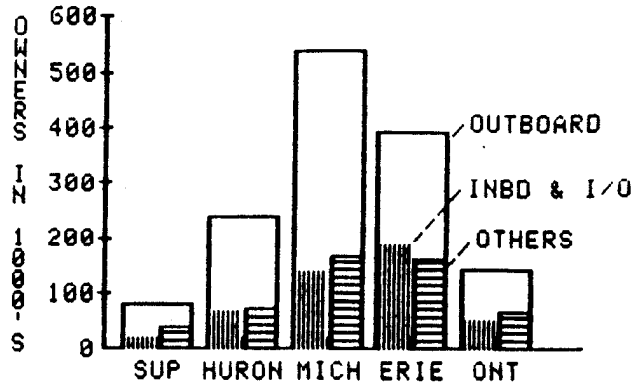
Jurisdiction fished	Lake Superior <sup>2</sup>	Lake Huron	Lake Mich.	Lake Erie <sup>2</sup>	Lake Ontario <sup>2</sup>	TOTAL
<u>PENNSYLVANIA</u>						
Inbd & I/O <sup>3</sup>	0	0	0	8.6	0	8.6
Outboard	0	0	0	55.1	0	55.1
Other boat	<u>0</u>	<u>0</u>	<u>0</u>	<u>20.0</u>	<u>0</u>	<u>20.0</u>
Total	<u>0</u>	<u>0</u>	<u>0</u>	<u>65.2</u>	<u>0</u>	<u>65.2</u>
Non-Owners	0	0	0	40.0	0	40.0
<u>NEW YORK</u>						
Inbd & I/O <sup>3</sup>	0	0	0	6.2	51.0	57.2
Outboard	0	0	0	40.4	142.0	182.4
Other boat	<u>0</u>	<u>0</u>	<u>0</u>	<u>5.0</u>	<u>62.5</u>	<u>67.5</u>
Total	<u>0</u>	<u>0</u>	<u>0</u>	<u>41.6</u>	<u>222.5</u>	<u>264.0</u>
Non-Owners	0	0	0	23.5	132.8	158.5
<u>U.S. TOTAL</u>						
Inbd & I/O <sup>3</sup>	18.5	66.3	138.4	184.6	51.0	455.6
Outboard	76.9	237.6	541.4	392.7	142.0	1,397.1
Other boat	<u>34.1</u>	<u>70.4</u>	<u>167.8</u>	<u>160.0</u>	<u>62.5</u>	<u>501.1</u>
Total	<u>91.9</u>	<u>301.3</u>	<u>668.6</u>	<u>588.7</u>	<u>222.5</u>	<u>1,885.0</u>
Non-Owners	44.7	120.2	464.7	384.1	132.8	1,197.6

N/A: Ontario did not record boat ownership.

<sup>1</sup> Number of Great Lakes anglers (in thousands) reporting boats bought, owned or available in 1980 used "primarily for freshwater fishing." Ownership attributed to each lake fished.

<sup>2</sup> Lake Superior includes the St. Marys River; Lake Erie includes the Detroit River, Lake St. Clair and St. Clair River; and Lake Ontario includes the St. Lawrence River and Niagara River.

<sup>3</sup> Inboard and Inboard/Outboard.



**TYPES OF BOATS OWNED  
BY U.S. ANGLERS  
BY LAKE**

(Derived from Table B5)



**BOAT OWNERSHIP BY U.S. ANGLERS  
BY LAKE**

(Derived from Table B5)

STATISTICAL TABLES

C. LAKE STATISTICS BY ANGLER ORIGINS AND SPECIES SOUGHT

TABLE C1. S LAKE SUPERIOR ANGLER DAYS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Superior <sup>1</sup> Destination				TOTAL
	Ontario	Michigan	Minnesota	Wisconsin	
Ontario <sup>2</sup>	696	-			696
Other Canadian <sup>2</sup>	0				0
Michigan	62	197	0	0	259
Minnesota	20	1	277	11	309
Wisconsin	22	24	20	141	207
Illinois	0	47	14	8	68
Ind./Ohio	0	44	12	0	56
Other U.S.	<u>50</u>	<u>35</u>	<u>58</u>	<u>24</u>	<u>167</u>
<b>TOTAL</b>	<b>850</b>	<b>347</b>	<b>381</b>	<b>183</b>	<b>1,761</b>

1 Lake Superior includes the St. Marys River.

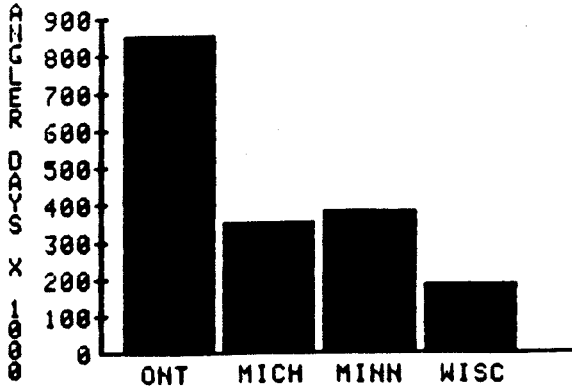
2 Angling in U.S. waters by non-U.S. residents is not included.

TABLE C1.H LAKE HURON ANGLER DAYS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Huron Destination		TOTAL
	Ontario	Michigan	
Ontario <sup>1</sup>	4,549		4,549
Other Canadian <sup>1</sup>	0		0
Michigan	148	5,908	6,056
Ohio	163	215	378
Other U.S.	<u>190</u>	<u>726</u>	<u>916</u>
<b>TOTAL</b>	<b>5,050</b>	<b>6,849</b>	<b>11,899</b>

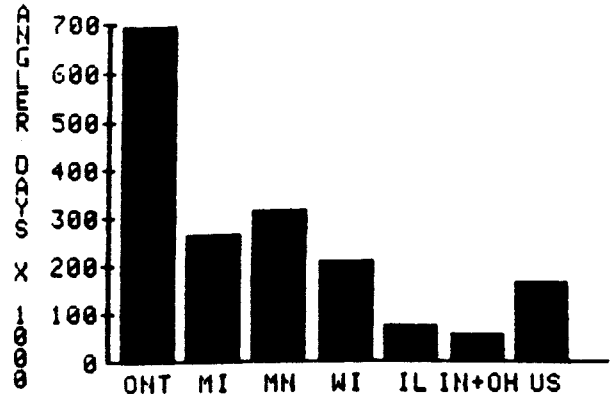
1 Angling in U.S. waters by non-U.S. residents is not included.



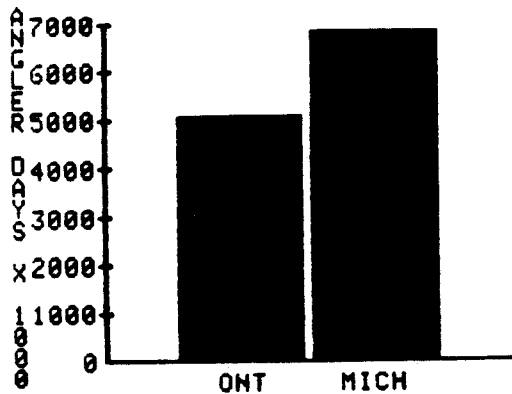


**LOCATION OF LAKE SUPERIOR ANGLING**

(Derived from Table C1.S)

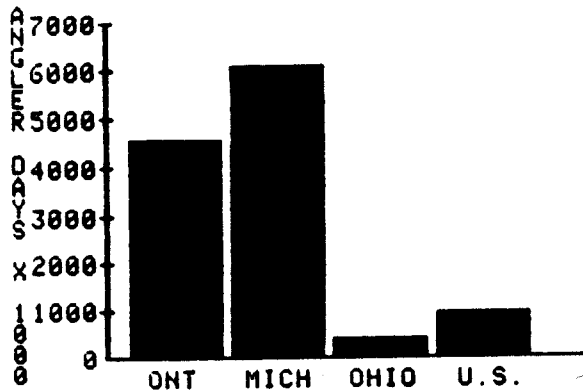


**ORIGINS OF LAKE SUPERIOR ANGLERS**



**LOCATION OF LAKE HURON ANGLING**

(Derived from Table C1.H)



**ORIGINS OF LAKE HURON ANGLERS**

TABLE C1.M LAKE MICHIGAN ANGLER DAYS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Michigan Destination				TOTAL
	Michigan	Wisconsin	Illinois	Indiana	
Michigan	5,908	0	3	0	5,912
Wisconsin	30	2,129	5	0	2,165
Illinois	78	138	4,426	118	4,760
Indiana	180	45	65	374	664
Minnesota	5	49	0	0	54
Ohio	215	0	19	0	234
IA, MO, KY <sup>1</sup>	35	45	0	0	80
Other U.S.	375	95	40	0	511
Canada <sup>2</sup>					
<b>TOTAL</b>	<b>6,828</b>	<b>2.501</b>	<b>4.559</b>	<b>492</b>	<b>14,379</b>

1 Iowa, Missouri, and Kentucky.

<sup>2</sup>Angling in U.S. waters by non-U.S. residents is not included.

TABLE C1.E LAKE ERIE ANGLER DAYS BY ORIGIN AND DESTINATION  
(000's omitted)

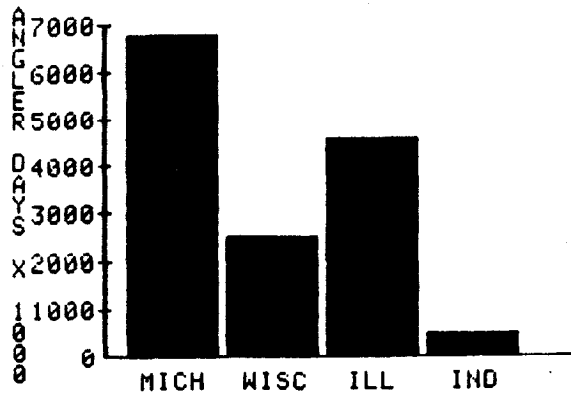
Origin	Lake Erie Destination					TOTAL
	Ontario	Michigan	Ohio	Penn.	New York	
Ontario <sup>2</sup>	3,331		-		-	3,331
Other Can. <sup>2</sup>	0					0
Michigan	461	3,675	0	0	0	4,136
Ohio	63	98	8,522	19	10	8,713
Penn.	0	0	63	1,015	5	1,084
New York	69	0	0	0	1,155	1,224
Indiana	0	68	46	0	0	113
KY & WV <sup>3</sup>	0	1	16	0	0	16
Other U.S.	<u>49</u>	<u>2 7 3</u>	<u>1 3 4</u>	21	3	<u>5 0 2 4</u>
<b>TOTAL</b>	<b>3,974</b>	<b>4,114</b>	<b>8,781</b>	<b>1.055</b>	<b>1,174</b>	<b>19.1204</b>

1 Lake Erie includes the Detroit River, Lake St. Clair and the St. Clair River.

2 Angling in U.S. waters by non-U.S. residents is not included.

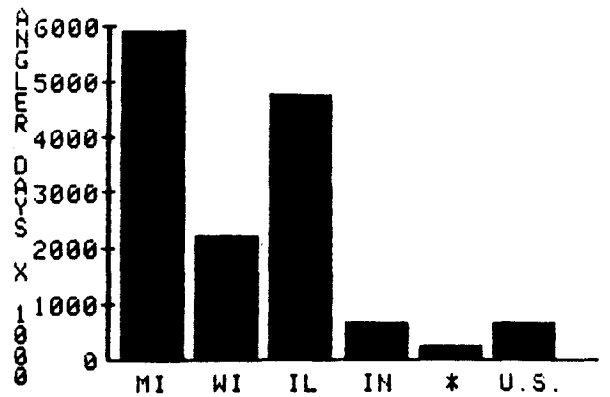
3 Kentucky and West Virginia.

4 Includes 22,000 angler days for which Lake Erie jurisdiction fished was not specified.



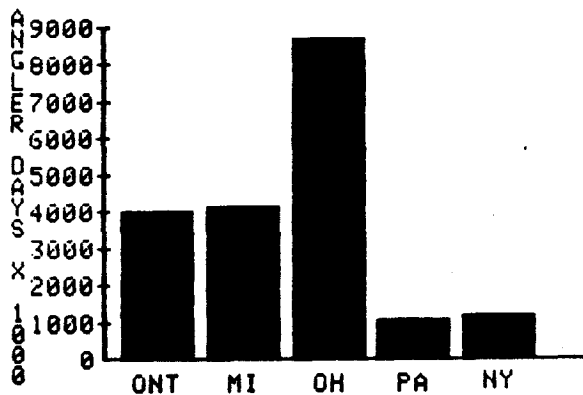
**LOCATION OF LAKE MICHIGAN ANGLING**

(Derived from Table C1.M)



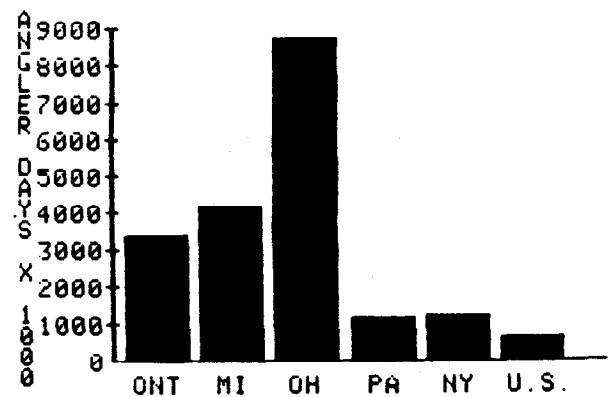
**ORIGINS OF LAKE MICHIGAN ANGLERS**

\* MN, OH, IA, MO, KY



**LOCATION OF LAKE ERIE ANGLING**

(Derived from Table C1.E)



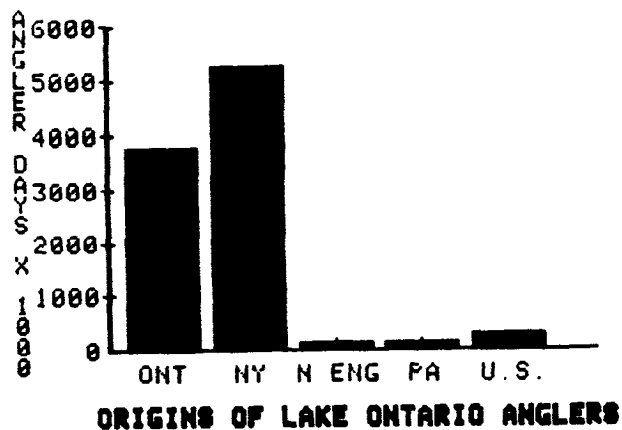
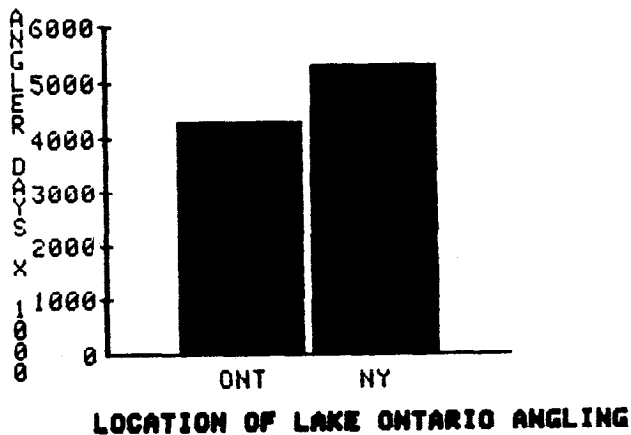
**ORIGINS OF LAKE ERIE ANGLERS**

TABLE C1.0 LAKE ONTARIO ANGLER DAYS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Ontario <sup>1</sup> Destination		TOTAL
	Ontario	New York	
Ontario <sup>2</sup>	3,792		3,792
Other Canadian <sup>2</sup>	0		0
New York	238	5,027	5,265
New England	36	96	132
Pennsylvania	97	46	143
Ohio	29	10	39
Other U.S.	<u>111</u>	<u>111</u>	<u>222</u>
<b>TOTAL</b>	<b>4,304</b>	<b>5,292</b>	<b>9,596</b>

1 Lake Ontario includes the St. Lawrence River and the Niagara River.

2 Angling in U.S. waters by non-U.S. residents is not included.



(Derived from Table C1.0)

TABLE C2.S LAKE SUPERIOR ANGLERS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Superior <sup>1</sup> Destination				TOTAL <sup>3</sup>
	Ontario	Michigan	Minnesota	Wisconsin	
Ontario <sup>2</sup>	75	-	-	-	75
Canadian <sup>2</sup>	0				0
Michigan	7	42	0	0	49
Minnesota	4	0	45	9	58
Wisconsin	4	5	1	9	19
Illinois	0	3	7	8	17
Ind./Ohio	0	11	4	0	15
Other U.S.	-9	-6	15	-4	31
<b>TOTAL</b>	<b>99</b>	<b>67</b>	<b>72</b>	<b>29</b>	<b>264</b>

1 Lake Superior includes the St. Marys River.

2 Angling in U.S. waters by non-U.S. residents is not included.

3 Totals are not additive because each angler is counted in each jurisdiction fished, but only once in the total.

TABLE C2.H LAKE HURON ANGLERS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Huron Destination		TOTAL <sup>2</sup>
	Ontario	Michigan	
Ontario <sup>1</sup>	423		423
Other Canadian <sup>1</sup>	0		0
Michigan	14	342	356
Ohio	16	24	40
Other U.S.	25	<u>9</u>	<u>114</u>
<b>TOTAL</b>	<b>478</b>	<b>454</b>	<b>932</b>

1 Angling in U.S. waters, by non-U.S. residents is not included.

2 Totals are not additive because each angler is counted in each jurisdiction fished, but only once in the total.

TABLE C2.M LAKE MICHIGAN ANGLERS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Michigan Destination				TOTAL <sup>3</sup>
	Michigan	Wisconsin	Illinois	Indiana	
Michigan	342	0	1	0	343
Wisconsin	6	280	0	0	284
Illinois	12	48	296	27	358
Indiana	19	7	14	58	76
Minnesota	3	8	0	0	11
Ohio	24	0	4	0	28
IA, KY, MO <sup>1</sup>	4	10	0	0	14
Other U.S.	39	30	7	0	75
Canada <sup>2</sup>	—	—	—	—	—
<b>TOTAL</b>	<b>449</b>	<b>383</b>	<b>322</b>	<b>84</b>	<b>1,189</b>

1 Iowa, Kentucky, and Missouri.

2 Angling in U.S. waters by non-U.S. residents is not included.

3 Totals are not additive because each angler is counted in each jurisdiction fished, but only once in the total.

TABLE C2.E LAKE ERIE ANGLERS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Erie1 Destination					TOTAL4
	Ontario	Michigan	Ohio	Penn.	New York	
Ontario2	240		-	-	-	240
Other Can.2	0	-				0
Michigan	32	<b>170</b>	0	0	0	202
Ohio	7	<b>7</b>	602	3	5	615
Pennsylvania	0	<b>0</b>	13	90	1	99
New York	4	<b>1</b>	0	0	63	67
Indiana	0	<b>10</b>	14	0	0	21
KY & WV3	0	<b>0</b>	5	0	0	5
Other U.S.	6	<u><b>22</b></u>	19	12	3	<u><b>69</b></u> 5
<b>Total</b>	<b>289</b>	<b>211</b>	<b>653</b>	<b>105</b>	<b>72</b>	<b><u>1,319</u></b> 5

1 Lake Erie includes the Detroit River, Lake St. Clair and the St. Clair River.

2 Angling in U.S. waters by non-U.S. residents is not included.

3 Kentucky and West Virginia.

4 Totals are not additive because each angler is counted in each jurisdiction fished, but only once in the total.

5 Includes 7,302 anglers for which Lake Erie jurisdiction fished was not specified.

TABLE C2.0 LAKE ONTARIO ANGLERS BY ORIGIN AND DESTINATION  
(000's omitted)

Origin	Lake Ontario <sup>1</sup> Destination		TOTAL <sup>3</sup>
	Ontario	New York	
Ontario <sup>2</sup>	306		306
Other Canadian <sup>2</sup>	0		0
New York	21	314	335
New England	4	12	16
Pennsylvania	14	11	25
Ohio	3	5	8
Other U.S.	<u>12</u>	<u>15</u>	<u>27</u>
<b>TOTAL</b>	<b>360</b>	<b>357</b>	<b>717</b>

1 Lake Ontario includes the St. Lawrence River and the Niagara River.

2 Angling in U.S. waters by non-U.S. residents is not included.

3 Totals are not additive because each angler is counted in each jurisdiction fished, but only once in the total.



TABLE C3. NUMBER OF ANGLERS BY SPECIES SOUGHT (000's omitted)

Species	Lake Superior	Lake Huron	Lake Michigan	Lake Erie	Lake Ontario	TOTAL <sup>9</sup>
<b>Slmn/sthd<sup>1</sup></b>	41.9	141.2	546.8	178.6	90.2	982.9
Lake Trout	63.8	121.0	418.0	69.0	87.9	750.2
Other trout <sup>2</sup>	60.4	172.4	268.6	67.4	138.4	651.1
Bass	16.8	176.4	196.3	251.8	261.7	880.0
Wall/Saug <sup>3</sup>	66.7	200.1	119.5	600.0	119.5	1,040.2
Pike	45.6	91.8	105.7	76.3	135.7	450.6
Pikrl/Muskiel	4.7	37.3	31.2	65.4	48.0	189.1
Panfish <sup>5</sup>	11.5	79.7	134.2	182.8	102.0	509.5
Perch	20.0	244.1	402.1	674.3	146.1	1,481.4
Smelt <sup>7</sup>	33.9	49.6	200.9	33.4	19.0	336.9
Catfish/Bulhd <sup>6</sup>	4.0	41.6	104.2	222.6	99.3	471.5
White Bass <sup>7</sup>	3.3	17.5	24.6	142.7	13.5	201.6
Sheepshead <sup>7</sup>	6.0	21.3	24.0	149.4	14.2	214.9
Other/no pref <sup>8</sup>	33.3	152.2	206.6	183.7	159.1	701.3

1 Salmon and steelhead trout.

2 Brown trout, brook trout, rainbow trout, and splake.

<sup>3</sup>Walleye (sauger).

<sup>4</sup>Pickrel, muskellunge.

5 Bluegill and other sunfish, crappie, and rock bass.

<sup>6</sup>Catfish, bullhead. Anglers for these species in Canada are tallied under "other."

<sup>7</sup>Anglers for these species in Canada are tallied under "other."

<sup>8</sup>Other species and/or no preferred species indicated.

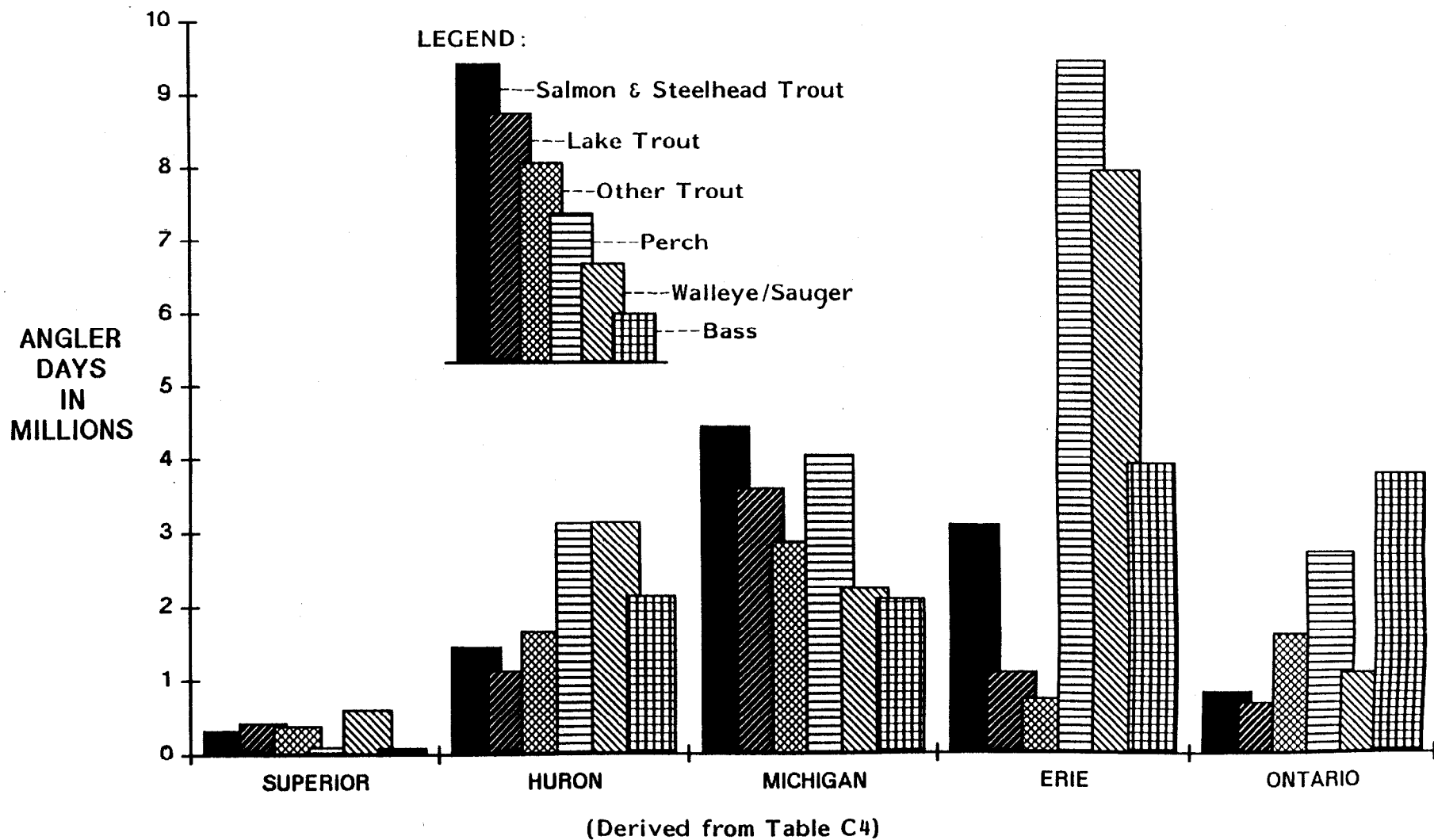
9 Contains anglers not allocated by lake. Totals are not additive because each angler is counted in each lake fished, but only once in the total.

TABLE C4. EFFORT IN ANGLER DAYS BY SPECIES SOUGHT (000's omitted)

Species	Lake Superior	Lake Huron	Lake Michigan	Lake Erie	Lake Ontario	TOTAL <sup>9</sup>
<b>Slmn/Sthd<sup>1</sup></b>	326.1	1,459.2	4,453.1	3,129.7	859.6	10,302.7
Lk.Trout	430.4	1,140.9	3,616.5	1,120.9	707.3	7,071.0
Oth.trout <sup>2</sup>	379.7	X.658.4	2,881.7	739.0	1,655.6	7,368.4
Bass	97.9	2,145.2	2,109.3	3,961.8	3,853.1	12,270.3
Wall/Saug <sup>3</sup>	602.8	3,145.2	2,252.7	7,981.8	1,121.5	15,166.0
Pike	283.8	1,224.7	1,078.4	1,083.7	1,225.0	4,981.0
Pkrl/Musk <sup>4</sup>	20.0	380.6	298.2	888.6	640.2	2,268.6
Panfish <sup>5</sup>	66.4	1,368.0	2,212.6	2,817.7	2,047.0	8,542.7
Perch	112.8	3,132.4	4,069.2	9,476.6	2,770.0	19,671.0
Smelt <sup>7</sup>	68.4	177.4	940.1	542.0	76.2	1,804.1
Cat/Bull <sup>6</sup>	9.8	818.6	1,902.9	3,571.3	735.6	7,038.1
White Bass <sup>7</sup>	7.3	348.0	428.2	2,621.3	468.5	3,873.3
Sheepshead <sup>7</sup>	21.0	531.8	538.7	2,750.0	287.5	4,129.0
Oth/no prf <sup>8</sup>	150.1	1,136.7	1,388.5	2,725.3	2,072.1	7,506.7

See Table C3 for footnotes.

## EFFORT BY SPECIES SOUGHT



## APPENDICES

- A. DEFINITIONS AND EXPLANATORY NOTES
- B. CANADIAN SURVEY METHODS AND STATISTICAL RELIABILITY
- C. U.S. SURVEY METHODS AND STATISTICAL RELIABILITY
- D. POSSIBLE SURVEY BIASES

## APPENDIX A

### DEFINITIONS AND EXPLANATORY NOTES

Great Lakes: Angling for Great Lakes fish includes all angling on the Great Lakes, St. Marys River, St. Clair River, Detroit River, Niagara River and in the U.S. (south of the bridge at Cornwall) and Ontario waters of the St. Lawrence River. Angling for salmon, steelhead and smelt in U.S. waters that run into the Great Lakes is included in U.S. statistics. Angling for any species in Ontario waters for which the nearest town reported by the angler was within a township bordering on the Great Lakes was included in Ontario statistics. These towns were generally within five to fifteen miles of the Great Lakes.

Lake Superior: St. Marys River statistics are included with those of Lake Superior.

Lake Erie: The Detroit River, Lake St. Clair and St. Clair River statistics are included with those of Lake Erie.

Lake Ontario: The St. Lawrence River and Niagara River statistics are included with those of Lake Ontario.

Trip Expenses: Expenditures associated with particular Great Lakes angling trips: primarily expenditures for transportation, lodging, food and fees. Rods, reels; tackle, clothing and other supplies purchased for Great Lakes angling in 1980 were also included. In the Canadian survey, each household's trip expenditures were pro-rated to determine the percentage attributable to Great Lakes angling. The percentage was the ratio of household Great Lakes angling days to household total provincial angling days. In the U.S. survey expenditures for Great Lakes transportation, lodging, food and fees were estimated directly. However, other trip expenditures were lumped under freshwater fishing. Therefore, all expenditures for rods, reels, tackle, clothing and other supplies for U.S. freshwater fishing were included for anglers who reported some Great Lakes angling.

Long Term Outlays: Expenditures in 1980 for boats and boat accessories, vehicles, camping equipment and related items that respondents identified as at least partially attributable to freshwater angling (U.S. survey) or to angling in Ontario (Canadian survey). All of these expenditures were included for all anglers (U.S. survey) or households (Canadian survey) for which some angling for Great Lakes fish was reported. Therefore, long term expenditures reported here are not solely attributable to angling for Great Lakes fish.

Angler: A person aged 16 or above (U.S. survey) or 17 or above (Canadian survey) who attempted to catch Great Lakes fish with hook and line or by archery, spearing, netting or seining for personal consumption, or gigging or shooting for frogs.

Non-resident Angling.: Angling reported in states or Ontario other than the state or province in which the respondent resided at the time he/she answered the questionnaire (the screening questionnaire in the U.S. survey).

Angler Day: Any part of a day spent fishing for Great Lakes fish. For instance, if an angler fished two hours one day and three hours another day,

it would be counted as two angler days. If an angler fished two hours one morning and three hours the evening of the same day, it would be counted as one angler day.

Income: The money income before taxes of all current household members during calendar year 1980.

## APPENDIX B

### CANADIAN SURVEY METHODS AND STATISTICAL RELIABILITY

by  
Paul Clifford  
E6-1475 King Street, W.  
Toronto, Ontario

#### Definition of "Great Lakes Areas"

For each water body fished during 1980, respondents to the federal-provincial survey provided the water body name, the name of the nearest town and an annual summary of effort and catch. To estimate angling for Great Lakes fish in inland waters, "Great Lake Areas" were defined as including angling near towns which appeared repeatedly associated with given Great Lakes. Anglers fishing within these areas contribute to the estimates even if the water body cited was not one of the Great Lakes or connecting rivers. The non-overlapping areas form a continuous border along the system, generally one township (5 to 15 miles) deep. A map showing the sets of towns used to define the Great Lakes areas is included in P. Clifford: "1980 Surveys of Ontario's Resident and Non-Resident Sport Fishermen: Selected Results Prepared for the Great Lakes Fisheries Commission," Economic Policy Branch, Dept. of Fisheries and Oceans, Ottawa, 1983, 33 pp + appendices.

#### Data Processing

Results were obtained using SPSS programs and standard procedures developed for the 1980 Survey of Sport Fishing in Ontario. Programs, printouts and data tapes used in the preparation of this report have been returned to Keith Brickley, Chief-Surveys Group, Economic Policy Branch, Department of Fisheries and Oceans, 8th Floor West, 240 Sparks Street, Ottawa, Ontario, Canada. For a complete description of the survey methodology please refer to: N. Bedi and P. Clifford; "Methodology and Selected Results for the 1980 Surveys of Ontario's Resident and Non-Resident Sport Fishermen," Fisheries Branch, Ontario Ministry of Natural Resources, Toronto, undated, 149 pp + appendices.

**TABLE 1: 1980 SURVEY OF ONTARIO'S RESIDENT SPORT FISHERMEN  
SUMMARY OF PARTICIPATION IN GREAT LAKES AREAS WITH SAMPLING ERRORS**

AREA	# OF ANGLERS (000's)	DAYS OF EFFORT (000's)	%	MEAN	STANDARD DEVIATION (SD)	SAMPLE SIZE	CV (AT 1 SD)
Lake Ontario	233	2821.2	22.5	12.1	18.3	741	5.6
Lake Erie	163	1491.7	11.9	9.1	14.5	517	7.0
Lake St. Clair	51	1349.3	10.8	26.7	37.6	190	10.2
Lake Huron	423	4549.1	36.2	10.8	15.1	1,481	3.6
Lake Superior	65	569.5	4.5	8.8	11.9	452	6.4
St. Lawrence River	50	634.0	5.1	12.6	15.9	138	10.7
Niagara River	23	337.1	2.7	14.5	25.2	73	20.3
Detroit River	17	372.9	3.0	22.4	18.9	53	11.6
St. Clair River	9	117.2	0.9	12.8	15.7	44	18.5
St. Mary River	10	126.3	1.0	12.9	20.7	68	19.5
Other	7	168.3	1.3	25.6	25.9	16	25.3
System <sup>1</sup> total	857	12,536.6	100.0	14.6	21.1	3,078	2.6

<sup>1</sup> Includes effort associated with lake-river combinations and attributable only to the system as a whole.



**TABLE 2: 1980 SURVEY OF ONTARIO'S NON-RESIDENT SPORT FISHERMEN  
SUMMARY OF PARTICIPATION IN GREAT LAKES AREAS WITH SAMPLING ERRORS**

AREA	# OF ANGLERS (000's)	DAYS OF EFFORT (000's)	%	MEAN	STANDARD DEVIATION (SD)	SAMPLE SIZE	CV (AT 1 SD)
Lake Ontario	15	122.5	6.6	8.1	9.9	122	11.1
Lake Erie	21	251.9	13.5	12.1	18.8	195	11.1
Lake St. Clair	18	236.7	12.7	13.1	14.8	181	8.4
Lake Huron	55	501.2	27.0	9.0	12.6	467	6.5
Lake Superior	20	114.5	6.2	5.8	5.0	151	7.0
St. Lawrence River	34	319.2	17.2	9.3	14.5	250	9.9
Niagara River	5	70.0	3.8	12.9	14.8	53	15.8
Detroit River	7	103.1	5.5	14.7	19.7	73	15.7
St. Clair River	3	50.3	2.7	17.1	13.6	29	14.8
St. Mary River	4	39.8	2.1	9.8	7.3	37	12.2
Other	2	50.7	2.7	25.1	18.8	21	16.3
System <sup>1</sup> Total	166	1,859.7	100.0	11.2	15.8	1,395	3.8

<sup>1</sup> Includes effort associated with lake-river combinations and attributable only to the system as a whole.

APPENDIX C

U.S. SURVEY METHODS AND STATISTICAL RELIABILITY

**by**

John Charbonneau  
Division of Program Plans  
U.S. Fish and Wildlife Service  
Washington, D.C.

## 1. Survey Design

The 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) (survey) was designed to provide state-level estimates of hunting and fishing participation rates and regional estimates for other forms of wildlife recreation (e.g., wildlife observation) referred to as nonconsumptive use. The study was conducted in two stages, an initial screening of households to identify participants and a followup enumeration of selected households with participants to collect detailed data about the household's wildlife-related recreation. The 1980 FHWAR sample was selected from expired Current Population Survey (CPS) samples. As such, it is a multistaged stratified sample of the U.S. population.

### FHWAR Screening Sample

The screening sample consisted of roughly 143,000 households identified from expired CPS samples from July 1978 to June 1980. Expired CPS sample households were accumulated until the desired sample size for each state was obtained. The sample in each state was expected to yield a minimum of 1,500 interviewed households. On the average, about 2,800 households per state were contacted. Of these roughly 14.5 percent were found to be vacant or otherwise not to be enumerated. Of the remaining households roughly 5.4 percent could not be enumerated because the occupants were not found at home after repeated calls or were unavailable for some other reason. Overall, 116,000 completed household interviews were obtained for a national response rate of approximately 94.6 percent. About 60 percent of the interviewed households were contacted by telephone and the remaining interviewed households were contacted by personal visit. Interviewing for the screening sample was completed in March 1981. In the Great Lakes states over 24,500 interviews were conducted in the screening phase of the Survey.

### Detailed Samples

Sportsmen. The sportsmen sample was selected in the following manner. Each household was assigned a level of participation dependent upon the highest level of participation according to the screening interview. This procedure grouped households into two levels of participation, substantial households, i.e., at least one household member fished or hunted for 30 days or more or spent more than \$500 for fishing or hunting, and nonsubstantial households. These households were further grouped by hunter and nonhunter classifications. Differential sampling rates were applied to the four strata such that one-third or one-fourth (depending upon the state) of the sportsman households in the nonsubstantial nonhunter stratum were revisited, one-half of the sportsman households in the nonsubstantial hunter stratum were revisited, and all of the sportsman households in the substantial hunter stratum were revisited, and all of the sportsman households in the substantial hunter and nonhunter strata were revisited. Once a sportsman household was selected for detailed interviewing, all participants 16 years old and older, irrespective of their level of participation, were interviewed in detail. The detailed sportsmen sample consisted of roughly 460 households per state selected from households identified from the screening sample as containing a sportsman. On the

average, about 700 sportsmen per state were selected for detailed interviewing. Of these, roughly 10 percent were not at home after repeated calls or were unavailable for some other reason, resulting in a response rate of 90 percent of eligible selected sportsmen. In all, about 30,300 detailed interviews with sportsmen were completed. Preliminary analysis indicated an additional 5 percent of sportsmen may have been incorrectly classified as inactive during the screening phase. Including nonresponse to both the screening phase and the detailed phase as well as misclassification of sportsmen, the overall response rate was roughly 81 percent. Detailed interviewing was completed in June 1981. In the Great Lakes states, over 6,000 interviews with sportsmen were completed. Of these, 1,454 were with Great Lakes fishermen.

## 2. Estimation Procedure

The estimation procedure for the 1980 FHWAR survey involved the inflation of the weighted sample results to independent estimates of the population. A brief description of the major weight components by sample is given below.

### Screening Sample

Base weight. The reciprocal of the probability of selecting a household.

Household noninterview adjustment. A factor to adjust the weight assigned to interviewed households to account for households eligible for interview but for which an interview was not obtained.

First-stage adjustment. The more than 630 areas designated for our samples were selected from roughly 1,900 such areas of the United States. Some of our sample areas represent only themselves and are referred to as self-representing. The remaining areas represent other areas similar in selected characteristics and are thus designated nonself-representing. The first-stage factor reduced the component of variation arising out of sampling the nonself-representing areas.

Second-stage adjustment. This adjustment involved the inflation of the sample results to independently derived postcensal estimates of the civilian noninstitutional and nonbarrack military populations for the states. Overall, the second-stage ratio adjustment was 1.128.

### Sportsman Sample

Base weight. The final person-tabulation weight developed from the weighting of the screening sample.

Stratum adjustment. This factor inflated the weights of the sample households selected from the four level-of-participation categories to account for all households in the category.

Sportsman noninterview. This factor adjusted the weights of the interviewed sportsman intended for interview, but who for some reason were not interviewed.

## 3. Reliability of Sample Estimates

The statistics that this survey produced are estimates derived from a sample and hence are apt to differ somewhat from the actual values being estimated. This occurs because there are two types of errors possible in an estimate based on a sample survey—sampling errors and nonsampling errors.

## Nonsampling Errors

Let us suppose that a comparable complete enumeration was conducted, that is, an interview is attempted for every person 16 years old and older in the United States. Chances are we would still not correctly estimate every parameter under consideration, for example, the proportion of persons who fished. In this instance, the difference is due solely to nonsampling errors. Nonsampling errors occur also in sample surveys and can be attributed to many sources, such as inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, inability or unwillingness on the part of the respondents to provide correct information, inability to recall information, errors made in collection such as in recording or coding the data, and errors made in estimating values for missing data. Explicit measures of these errors are generally not available. It is believed that most of the important operational and out-of-range response errors were detected and corrected in the course of the Census Bureau's review of the data for accuracy and consistency. Unfortunately, some response and operational errors remain.

Another source of error in sample surveys is the failure to represent all units with the sample (undercoverage). There were two particular undercoverage problems in this survey: sample attrition, i.e., loss of the original sample due to nonreturns from the field, processing, etc., and failure to represent new construction in the sampling frame for the period roughly between July 1978 and June 1980. Overall undercoverage as compared to the level of the 1980 decennial census is about 12.8 percent. Generally, undercoverage is larger for males than for females and larger for blacks and other races combined than for whites. Ratio estimation to independent age-sex-race population controls, as described previously, partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that missed persons in missed households or missed persons in interviewed households have different characteristics than interviewed persons in the same age-sex-race group.

A coverage improvement sample was included with the CPS samples beginning in 1978 in order to provide coverage of mobile homes and new construction housing units, which previously had no chance for selection in the CPS sample. The inclusion of this coverage improvement sample in the FHWAR does not have a significant effect on the estimates.

## Sampling Errors

The particular sample used for the 1980 FHWAR survey is one of a large number of all possible probability samples of the same size that could have been selected using the same sample design. Estimates derived from the different samples would differ from each other. The expected deviation of a sample result from the average of all possible samples is called the sampling error. The exact sampling error is unknown; however, guides to the potential size of the sampling error are provided by the standard error of the estimate.

The standard error of a survey estimate attempts to provide a measure of this variation among the estimates from the possible samples and thus is a measure of the precision with which an estimate from a particular sample approximates the

average result of all possible samples. The standard errors that were calculated for this survey also partially measure the effect of variable nonsampling errors, but do not measure any systematic biases in the data.

The estimate and its associated standard error may be used to construct a confidence interval, i.e., an interval having a prescribed probability that it would include the average result of all possible samples. The chances are about 95 out of 100 (95 percent) that the interval from two standard errors below the estimate to two standard errors above the estimate would include the average value of all possible samples.

Of course, any particular 95-percent confidence interval may or may not contain the average value of all possible samples. But for a particular sample, one can say with 95-percent confidence that the average of all possible samples is included in the constructed interval. Also frequently used are 68-percent and 99-percent confidence intervals which are obtained by constructing a one standard error interval (plus or minus) and a 2½ standard error interval (plus or minus), respectively, about the estimate. The chances are about 2 out of 3 that the average result of all possible samples is contained in the 68-percent confidence interval and 99 out of 100 that the average value of all possible samples is included in the 99-percent confidence interval.

#### 4. Standard Error Tables and Their Use

Two or three parameters are used (denoted a, b, and c) to calculate standard errors for each type of characteristic in the generalized standard error tables; they are presented in tables 1 through 3. These parameters are used to calculate the standard errors for numbers of fishermen, and the aggregates, days, and expenditures. Methods for direct computation are given in the following sections.

##### Standard Errors of Estimated Numbers

The approximate standard error  $\sigma_x$  of an estimated number shown in this report can be obtained by use of formulas 1 or 2. Formula 1 is used for standard errors of the number of fishermen.

$$\sigma_x = \sqrt{ax^2 + bx} \quad (1)$$

where x is the size of the estimate and a and b are the parameters in the table associated with the particular characteristic.

$$\sigma_x = \sqrt{ax^2 + bx + \frac{cx^2}{y}} \quad (2)$$

Formula 2 is used for standard errors of the aggregates, days, and expenditures. Here x is again the size of the estimates; y is the base of the estimate; and a, b, and c are the parameters in the tables associated with the particular characteristics.

### Standard Errors of Estimated Averages

Certain mean values for fishermen shown in the report were calculated as the ratio of two numbers. For example, average days per fisherman is calculated as:

$$\frac{\bar{x}}{y} = \frac{\text{total days}}{\text{total fishermen}} \quad (3)$$

Standard errors for these averages may be approximated by the use of formula 4.

$$\sigma_{\frac{\bar{x}}{y}} = \sqrt{\left(\frac{\bar{x}}{y}\right)^2 \left(\frac{\sigma_x^2}{x^2} + \frac{\sigma_y^2}{y^2}\right) - 2\rho \left(\frac{\sigma_x}{x}\right) \left(\frac{\sigma_y}{y}\right)} \quad (4)$$

In formula 4,  $\rho$  represents the correlation coefficient between the numerator and the denominator of the estimate. In the above example and for other ratios of this kind, use 0.7 as an estimate of  $\rho$ .

### 5. Procedures Used to Allocate Participation, Days, and Expenditures by Lake

The 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation gathered basic participation data for a predetermined set of fish and wildlife management regions within each state. The regional boundaries were communicated to those interviewed by the use of a map booklet. In total, there were 23 regions that bordered the Great Lakes. With the exception of the states of Michigan and New York, all regions bordered only one lake. In Michigan and New York there were regions that bordered two or three lakes. In these regions, individual weights were adjusted to reflect possible participation on all lakes bordering the region.

Each individual in the survey was asked for up to five places where they fished in 1980. Therefore, the weights were adjusted so as to avoid double counting the same individual more than once in the same lake in the same state. When an individual fished in two lakes or two states they were counted in each, but only once in the total. This procedure was not used for days of fishing or expenditures since days and expenditures are additive and double counting was not a consideration. The only exception was when a regional designation was given that bordered more than one lake, then the weight was adjusted so as to partition expenditures between lakes.

Table 1. "a" and "b" Parameters and Factors for Calculating Approximate Standard Errors for Fishermen, 16 Years Old and Older

State	Fishermen	
	a	b
UNITED STATES	-.00002727145	4,611
<b>Illinois</b>	-.0011873	10,034
<b>Indiana</b>	-.0014207	5,728
<b>Michigan</b>	-.0009802	6,644
<b>Minnesota</b>	-.0015054	4,567
New York	-.0009056	11,982
Ohio	-.0011205	8,952
Pennsylvania	-.0009306	8,405
Wisconsin	-.0013651	4,778

Table 2. "a", "b", and "c" Parameters for Calculating Approximate Standard Errors for Expenditures

state	Fishermen		
	a	b	C
UNITED STATES	.00003754	160,256	14,497
<b>Illinois</b>	.0016308	347,972	31,499
<b>Indiana</b>	.0019482	198,315	17,960
Michigan	.0013439	229,997	20,830
<b>Minnesota</b>	.0020505	157,062	14,253
New York	.0012447	415,811	37,631
Ohio	.0015396	310,552	28,108
Pennsylvania	.0012787	291,593	26,392
Wisconsin	.0018536	163,814	14,879

Table 3. "a", "b", and "c" parameters for Calculating Approximate Standard Errors for Days

state	Fishermen		
	a	b	C
U N I T E D -	.00002204	95,029	6,871
<b>Illinois</b>	.0009575	206,351	14,951
<b>Indiana</b>	.0011439	117,607	8,524
<b>Michigan</b>	.0007891	136,395	9,887
<b>Minnesota</b>	.0012042	93,155	6,781
New York	.0007308	246,576	17,845
Ohio	.0009040	184,159	13,331
Pennsylvania	.0007508	172,916	12,516
Wisconsin	.0010886	97,166	7,087



## APPENDIX D

### POSSIBLE SURVEY BIASES

As discussed in the Introduction, there is some evidence that estimates based on mail surveys and household surveys of anglers overestimate angling effort, and that the U.S. household survey (NSFH&WAR) does so more than Michigan's mail survey (MDNR). Biases in Canada's mail survey are probably similar to those of the MDNR survey. These techniques may be subject to "upward statistical biases." That terminology refers to consistent overestimation due to "statistical biases:" differences between reality and the assumptions used in the techniques.

Table 1 compares MDNR mail survey results and other figures supplied by Jansen (1985) with corresponding estimates from NSFH&WAR. According to Jansen:

A variety of reasons account for these differences. First, the sampling universe for the surveys is different. Michigan only samples licensed anglers. However, creel censuses conducted on the Great Lakes in 1983 indicate that 86-90% of Great Lakes anglers are licensed. Second, I believe the DNR Great Lakes effort estimates are biased upwards. One bias source, non-response, may generate a positive inflation as high as 20 percent. Memory bias is also believed to exert a positive bias. Preliminary comparisons of fishing effort estimated by the mail survey and aerial counts for southern lake Michigan in 1983 confirms our belief in an upward bias in DNR estimates.

We are strongly convinced DNR estimates are positively biased (several tables are provided comparing the two types of estimates for several locations in Michigan). The National Survey estimates are, in our opinion, unreasonably biased upwards. Many reasons are responsible for this situation. The primary reasons may be a result of a small unrepresentative sample and memory bias.

**TABLE 1. COMPARISON BETWEEN NSFH&WAR AND MDNR ESTIMATES OF ANGLING FOR GREAT LAKES FISH IN 1980. (000's omitted).**

<u>Great Lake</u>	<u>Numbers of Anglers<sup>5</sup></u>		<u>Angler Days</u>	
	<u>NSFH&amp;WAR</u>	<u>MDNR</u>	<u>NSFH&amp;WAR</u>	<u>MDNR</u>
Superior <sup>1</sup>	67	52	347	512
Huron	454	190	6850	1833
Michigan	449	257	6828	2959
Erie <sup>2</sup>	211	223	4114	2864
Smelt <sup>3</sup>	-	na	-	75
Unlicensed <sup>4</sup>	-	82	-	1125
<b>TOTAL</b>	<b>1071</b>	<b>684</b>	<b>16119</b>	<b>9373</b>

<sup>1</sup>Lake Superior includes the St. Marys River.

<sup>2</sup>Lake Erie includes the Detroit River, Lake St. Clair and the St. Clair River.

<sup>3</sup>Stream angling for smelt not included in MDNR lake estimates. The number of anglers in this category is unavailable.

<sup>4</sup>Correction for unlicensed anglers not included in MDNR survey assumed to be 12% of the total.

<sup>5</sup>Totals are not additive because each angler is counted only once in the total. MDNR estimates supplied by Jansen (1985).

The non-response bias Jamsen cites refers to the fact that active anglers are more likely to answer the survey questions than inactive anglers. Inactive anglers are less likely to respond to the questionnaire. Standard statistical procedures assume equal response rates (unless explicit contrary information is available), resulting in estimates that are biased upwards. Non-response bias might be more of a problem in mail surveys such as the MDNR's than in telephone/personal visit surveys such as the NSFH&WARW. However, Charbonneau (Appendix C, above) cites an undercoverage rate in NSFH&WAR of 12.8 percent, which could be a source of the same kind of bias. The memory bias Jamsen cites is the tendency documented by Jamsen and other researchers for anglers to report larger than actual amounts of angling and, particularly, catch, with the difference increasing as recall time increases.

With the information now available, we cannot be sure whether mail and household surveys overestimate, or creel surveys underestimate, or both. MDNR mail survey estimates of Great Lakes angling effort, in about twelve different county-wide comparisons now available, have almost always been two to four times higher than corresponding creel survey estimates. However, exact counts or other controls have never been available for Great Lakes angling for comparison with surveyed populations of anglers. Without independent verification we cannot tell which way the biases lie. Similar comparisons for a few inland lakes and streams show no consistent differences; often the differences are insignificant. In the nearest we have to verification for angling for Great Lakes fish, Jamsen (1985) provided comparisons of mail survey estimates of effort and catch with permit data required of all fall salmon anglers on the Sable River in Ludington (MI) State Park for over twelve years. The averages for the twelve-year period differ by only five percent, but for some reason the mail survey consistently overestimated for the first five years, then underestimated for six of the other seven years. Even this comparison is not perfect, because the mail survey covers a different sampling period than the permit period, and this kind of angling is not similar to most Great Lakes angling. Other evidence, in Rybicki and Keller (1978), showed that MDNR mail survey estimates of lake trout catch in Lake Michigan were about five times the feasible catch based on lake trout population studies (all lake trout in the lake were stocked in known amounts). On the other hand, studies of consumer recall of family expenditure patterns show a tendency for consumers to overreport when asked about short periods, but to report fairly accurately when asked to report a year's purchases, according to studies reviewed by Charbonneau (pers. com., 1985).

#### REFERENCES IN APPENDIX D

- Jamsen, Gale C. 1985. Letter of January 23 to Daniel R. Talhelm. Fisheries Division, Michigan Department of Natural Resources, Lansing. 2pp + 4 tables.
- Rybicki, Ronald W. and Merle Keller. 1978. The lake trout resource in Michigan waters of Lake Michigan, 1970-1976. Michigan Department of Natural Resources Report No. 1863. 71pp.

SPECIAL PUBLICATIONS GREAT LAKES FISHERY COMMISSION

- 79-1 Illustrated field guide for the classification of sea lamprey attack marks on Great Lakes lake trout. 1979. E.L. King and J. A. Edsall. 41 p.
- 82-1 Recommendations for freshwater fisheries research and management from the Stock Concept Symposium (STOCS). 1982. A.H. Berst and G.R. Spangler. 24 p.
- 82-2 A review of the adaptive management workshop addressing salmonid/lamprey management in the Great Lakes. 1982. Edited by J.F. Koonce, L. Greig, B. Henderson, D. Jester, K. Minns, and G. Spangler. 40 p.
- 82-3 Identification of larval fishes of the Great Lakes basin with emphasis on the Lake Michigan drainage. 1982. Edited by N.A. Auer. 744 p.
- 83-1 Quota management of Lake Erie fisheries. 1983. Edited by J.F. Koonce, D. Jester, B. Henderson, R. Hatch, and M. Jones. 39 p.
- 83-2 A guide to integrated fish health management in the Great Lakes basin. 1983. Edited by F.P. Meyer, J.U. Warren, and T.G. Carey. 262 p.
- 84-1 Recommendations for standardizing the reporting of sea lamprey marking data, 1984. R.L. Eshenroder and J.F. Koonce. 21 p.
- 84-2 Working papers developed at the August 1983 conference on lake trout research. 1984. Edited by R.L. Eshenroder, T.P. Poe, and C.H. Olver.
- 84-3 Analysis of the response to the use of "Adaptive Environmental Assessment Methodology" by the Great Lakes Fishery Commission. 1984. C.K. Minns, J.W. Cooley, and J. E. Forney. 21 p.
- 85-1 Lake Erie fish community workshop (report of the April 4-5, 1979 meeting). 1985. Edited by J.R. Paine and R.R. Kenyon. 58 p.
- 85-2 A workshop concerning the application of integrated pest management (IPM) to sea lamprey control in the Great Lakes. 1985. Edited by G.R. Spangler and L.D. Jacobson. 97 p.
- 85-3 Presented papers from the Council of Lake Committees plenary session on Great Lakes predator-prey issues, March 20, 1985. 1985. Edited by R.L. Eshenroder. 134 p.
- 85-4 Great Lakes fish disease control policy and model program. 1985. Edited by J.G. Hnath. 24 p.
- 85-5 Great Lakes Law Enforcement/Fisheries Management Workshop (Report of the 21, 22 September 1983 meeting). 1985. Edited by W.L. Hartman and M.A. Ross. 26 p.
- 85-6 TFM vs. the sea lamprey: a generation later. 1985. 17 p.
- 86-1 The lake trout rehabilitation model: *program* documentation. 1986. C.J. Walters, L.D. Jacobson, and G.R. Spangler. 32 p.
- 87-1 Guidelines for fish habitat management and planning in the Great Lakes (Report of the Habitat Planning and Management Task Force and Habitat Advisory Board of the Great Lakes Fishery Commission). 1987. 15 p.
- 87-2 Workshop to evaluate sea lamprey populations "WESLP" (Background papers and proceedings of the August 1985 workshop). 1987. Edited by B.G.H. Johnson.
- 87-3 Temperature relationships of Great Lakes fishes: A data compilation. 1987. D.A. Wismer and A.E. Christie. 195 p.
- 88-1 Committee of the Whole workshop on implementation of the Joint Strategic Plan for Management of Great Lakes Fisheries (reports and recommendations from the 18-20 February 1986 and 5-6 May 1986 meetings). 1988. Edited by M.R. Dochoda. 170 p.
- 88-2 A proposal for a bioassay procedure to assess impact of habitat conditions on lake trout reproduction in the Great Lakes (Report of the ad hoc Committee to Assess the Feasibility of Conducting Lake Trout Habitat Degradation Research in the Great Lakes). 1988. Edited by R.L. Eshenroder. 11 p.
- 88-3 Age structured stock assessment of Lake Erie walleye (Report of the July 22-24, 1986 Workshop). JULY 1988. Richard S. Deriso, Stephen J. Nepszy, and Michael R. Rawson. 12 p.

