

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-4

Study No.: 427

Title: Measurement of sportfishing harvest in lakes Michigan, Huron, Erie, and Superior.

Period Covered: October 1, 2002 to September 30, 2003

**Study Objective:** To obtain random samples of sport-fishing effort, catch, and harvest from ports along the shoreline of the Great Lakes (Superior, Michigan, Huron, and Erie), Lake St. Clair, and rivers that support anadromous fish species. To use these samples to estimate total sport-fishing effort, catch, catch rate, harvest, and harvest rate in Michigan waters of the Great Lakes. To combine these estimates with other States and Canada to obtain lake-wide data.

**Summary:** This report presents results from the 2002 angling season. Similar data are being collected for the 2003 season; these will be summarized in next year's report. During the 2002 angling season, the Michigan Department of Natural Resources (MDNR), Fisheries Division conducted creel surveys at key fishing ports on Lakes Michigan, Huron, Erie, Superior, and St. Clair, including ports where anglers harvest lake trout and whitefish from 1836 Treaty waters. An agreement made between the State of Michigan and Native American tribes over fishing rights in 1836 Treaty waters (2000 Consent Decree) required ports in those waters to be continuously sampled on a rotating schedule. The Great Lakes creel survey is an integral part of that agreement and provides the harvest data needed to monitor catch and determine fishing quotas.

Estimates of sport-fishing effort and harvest showed similar spatial differences as previous years. Total effort and salmonine estimates are highest in Lake Michigan. Percid (walleye and yellow perch) harvest estimates are highest in Lake Erie. In contrast, sport-fishing effort and harvest estimates showed some temporal differences when they were compared to the previous year (2001). Estimates of total fishing effort (of all species combined), and harvest of chinook salmon, appear to be much higher in 2002 relative to 2001. There may be additional differences between years; however, these cannot be determined until statistical analyses that account for the variability around the estimates are performed. We are planning to use more rigorous statistical analyses on future data. To date, spatial and temporal comparisons have been "descriptive".

**Findings:** Jobs 1 through 6 were scheduled for 2002-03, and progress is reported below.

**Job 1. Title: Measure effort using aerial surveys.**—In 2002, we conducted aerial surveys of boat, shore, and pier angling effort on Saginaw Bay and portions of Lake Huron (Tawas to Harbor Beach, and St. Ignace to Drummond Island); and boat angling effort on the Michigan waters of St. Clair River, Lake St. Clair, the Detroit River, and Lake Erie. Aerial surveys of shanty and open ice effort continued throughout the winter on Saginaw Bay, and began on the St. Clair River, Lake St. Clair, and the Detroit River in March. All air flights were conducted using stratified random sampling schedules. At each survey area, flights were attempted on each weekend day and three randomly selected weekdays per week. Random take-off times were used to ensure that fishing pressure counts were made at various times during daylight hours each month.

We used aerial counts in place of ground counts for the above locations because we did not believe ground counts would provide an accurate measure of effort. It is believed that anglers enter the lake/river in these locations from many access sites where they cannot be accounted for by a creel clerk on the ground (e.g. privately-owned property); therefore effort may be underestimated with a ground count. Lockwood and Rakoczy (2003) completed a study this year that compared the estimated effort from aerial and ground boat counts made at the same time in 2000 and 2001 at a site along a central Lake Michigan shoreline. The results of the study showed there were no significant differences in the effort estimates obtained from the two methods, suggesting aerial counts are not necessary at this location, and validating the accuracy of the count method that has been used at this site for many years. These results are useful for validating ground count methods along the Lake Michigan shoreline. They may not be useful for predicting the accuracy of ground counts at other locations in Michigan. There are limited access sites along the rocky shoreline of central Lake Michigan; therefore, it was quite probable that ground counts provide an accurate measure of effort; however, topography, and the number and type of access sites, may be different at other locations. The appropriateness of aerial surveys at these other locations is not yet known, but we hypothesize aerial surveys provide the most accurate estimates.

**Job 2. Title: Monitor Great Lakes and anadromous sport fisheries.**—Creel census clerks followed stratified random work schedules to monitor the sport fisheries in their respective Great Lakes shoreline areas.

Throughout the 2002 season, creel clerks sent completed data forms to the Charlevoix Fisheries Research Station every two weeks for computer entry. Charlevoix staff completed data entry (optical scanning) of 2002 data by February 2003; and estimation of effort, catch, catch rate, harvest, and harvest rate by June, 2003. Data entry for the current year (2003) is ongoing because creel clerks are still collecting data for the season.

*Lake Michigan.*—In 2002, creel clerks collected samples from twenty-three Lake Michigan sites, from New Buffalo to Harbor Springs in the Lower Peninsula, and from Menominee to Big Bay de Noc in the Upper Peninsula. A large portion of these sites were located in 1836 Treaty waters.

In 2002, anglers spent an estimated 2.7 million hours fishing the Michigan waters of Lake Michigan and made an estimated 601,925 fishing trips. Yellow perch were the most abundant species in the catch with an estimated seasonal harvest of 378,227 fish. Seasonal harvest of walleye amounted to 47,251 fish. An estimated 159,116 chinook salmon, 49,941 rainbow trout, 61,257 coho salmon, 20,525 brown trout, and 24,628 lake trout were harvested over the entire season. Monthly estimates are in Table 1. Although some of these harvest estimates differ from previous years, comparisons between years cannot be done without careful consideration of the variance surrounding the estimates. The current biologist will be implementing a procedure to look at temporal and spatial differences in effort, catch, catch rate, harvest, and harvest rate that includes variance.

Creel coverage in 1836 Treaty waters of Lake Michigan (Grand Haven to Little Bay de Noc) was different in 2002, as compared to 2001. The available budget does not make it possible to sample all ports, every year; therefore, ports with less effort are sampled once every 3-5 years, as stipulated in the Consent Decree. In 2002, the ports of Whitehall/Montague and Pentwater were added to the survey as part of this rotation. The harvest at ports that were not sampled in 2002 was estimated with harvest ratios among ports from years when these ports were sampled.

This procedure was used to estimate the total harvest from statistical districts used to manage lake trout in 1836 Treaty waters.

*Lake Huron.*— In 2002, creel clerks collected samples from 19 Lake Huron sites, from Lexington to Roger’s City in the Lower Peninsula and from St. Ignace to Detour in the Upper Peninsula. In 2002, creel clerks only sampled the Munuscong Bay area of the St. Mary’s River. Lake Huron anglers spent an estimated 2.3 million hours fishing on Michigan waters of Lake Huron, and made an estimated 513,364 fishing trips (Table 2). Yellow perch also made up the majority of the harvest in Lake Huron, with an estimated 732,729 fish harvested. Anglers also harvested an estimated 123,170 chinook salmon, 44,610 walleye, 28,244 lake herring, 28,065 lake trout, 9,390 rainbow trout, and 5,890 brown trout. Monthly estimates are in Table 2.

Creel coverage in 1836 Treaty waters (Alpena to Detour) was different in 2002, as compared to 2001. Cheboygan and Hammond Bay ports, which were sampled in 2001, were discontinued in 2002, and will follow the same 3-5 year schedule described above.

*Lake Erie.*— In 2002, creel clerks interviewed anglers, from Point Mouillee to the Michigan-Ohio border, who had fished in 5 grids of Lake Erie that contain water within the Michigan boundary. Lake Erie anglers spent an estimated 820,220 hours fishing these grids and made an estimated 156,394 trips (Table 3). Anglers harvested an estimated 463,226 yellow perch and 166,070 walleye. These two species dominated the catch in Lake Erie, followed by white bass and channel catfish. Relative to water surface area, harvest estimates of yellow perch and walleye in these 5 grids of Lake Erie are at least 10 times higher than those on any other Michigan Great Lake.

*St. Clair and Detroit River System.*— In 2002, the Great Lakes creel survey was expanded in southeastern Michigan to include the St. Clair River, Lake St. Clair, and the Detroit River to its confluence with Lake Erie. A winter creel survey began on the St. Clair River, Lake St. Clair, and the Detroit River in March. This was the first time this entire system was sampled since the early 1980s. Creel clerks interviewed anglers who had fished in 9 grids of Lake St. Clair that contain water within the Michigan boundary. Anglers spent an estimated 1,368,564 hours fishing these grids and made an estimated 260,880 trips (Table 4). Anglers harvested an estimated 455,621 yellow perch and 41,972 walleye. These two species dominate the harvest in Lake St. Clair, followed by smallmouth bass and bluegill. Despite high fishing effort in Lake St. Clair, walleye harvest (41,972) and harvest rate (0.0307) in Lake St. Clair are much lower than walleye harvest (166,070) and harvest rate (0.2019) in Lake Erie, likely due to habitat differences between the two lakes. Analyses of the St. Clair River and Detroit River are currently incomplete.

*Lake Superior.*— In 2002, creel clerks collected samples from 6 sites in western and central Lake Superior. Lake Superior anglers spent an estimated 149,769 angler hours fishing Michigan waters of Lake Superior and made an estimated 42,837 fishing trips (Table 5). Lake trout was the most abundant (24,183) species in the catch. The harvest also included an estimated 10,134 lake whitefish, 6,255 coho salmon, 4,395 siscowet (fat) lake trout, and 805 chinook salmon.

*Anadromous Rivers.*— In 2002, creel clerks sampled portions of the following anadromous river systems: Bear, Cedar, Manistee, Menominee, Muskegon, St. Joseph, and Saginaw/Tittabawassee. Analyses of these data are currently incomplete.

**Job 3. Title: Quality control checks.**—We used a variety of methods to prevent data recording error. MDNR personnel frequently contacted and visited creel clerks on-site, to address clerk

questions and check performance. Charlevoix personnel carefully reviewed all the completed datasheets. If we detected data recording errors, we corrected them and asked creel clerk supervisors to help clerks prevent future errors. After scanning and entering the data into a Microsoft Access database, we used programmed queries to examine various fields within “count” and “interview” tables to identify values in the fields that did not fall within an expected range of values (i.e., potential errors). We checked these values and made corrections where needed.

MDNR personnel held an annual creel clerk training session in May, 2002. This training session included a review of sampling methods, optical forms, biological sampling, sampling schedules, safety, commercial and tribal fisheries, and data from previous years. Training did not take place in the Spring of 2003 due to State of Michigan employee travel restrictions.

The current training procedure is now being reviewed by a MDNR Fisheries Division workgroup that was charged to evaluate all aspects of the Great Lakes and Inland Creel Programs, including quality control procedures. This workgroup is currently developing a formal quality assurance procedure that will require comprehensive and continuous training of clerks, documentation that procedures are followed, and a request to the Division for additional creel clerks who will be responsible for these tasks. Furthermore, there has been an on-going effort to reduce sampling error by replacing datasheets with personal data assistants (PDAs) that contain “error-trapping” routines that prevent errors when data is first recorded.

**Job 4. Title: Prepare succeeding years’ sampling schedules.**—At the end of 2002, Charlevoix personnel prepared sampling schedules for the 2003 season to cover the following areas: St. Clair River, Lake St. Clair, Detroit River, Lake Erie, Lake Michigan, Lake Huron including Saginaw Bay, western and central Lake Superior, and the Manistee, Muskegon, St. Joseph, and Saginaw/Tittabawassee river systems. We developed a randomized schedule for each of the 36 creel clerks who covered these areas.

**Job 5. Title: Prepare status report summarizing results.**—We estimated the harvest, catch, and effort for all sites sampled in 2002. Results are posted in a shared folder on the Fisheries Division computer network. In addition, tables of these estimates have been sent to Fisheries Division management and research offices, by request, on a continuous basis since January, 2003. Federal aid reports were completed. Charlevoix staff also made several presentations during the year regarding the status of the sport harvest in 2002 and how this harvest compares to previous seasons. These presentations were made at sportsmen's clubs, charter boat workshops, and MDNR Citizen’s Advisory meetings.

**Job 6. Title: Analyze and evaluate data.**—Creel data are used by many Fisheries Division personnel to help manage Great Lakes fisheries and fish populations. They are used to describe the fisheries, to help determine appropriate fishing regulations and quotas, to assess stocking, and to help understand the population dynamics of fish (e.g., survival, growth, and maturity).

During 2000, the State of Michigan entered into a binding agreement (Consent Decree) with various Native American tribes in the 1836 Treaty waters of lakes Michigan, Huron, and Superior. The Great Lakes creel survey is an integral part of that agreement and provides essential harvest data for the management of fisheries in those shared waters. For example, lake trout harvest statistics for lakes Michigan, Huron, and Superior are provided to task groups working under the Consent Decree so they can calculate and monitor the total allowable catch (TAC) of lake trout in various zones in the 1836 Treaty waters of the Great Lakes. These data

are also provided to the Lake Technical Committees of the Great Lakes Fishery Commission (GLFC).

The Lake Erie sport effort, harvest, and catch estimates, and biological data for walleye and yellow perch are used annually by the Lake Erie Technical Committee of the GLFC to set harvest quota limits for the various state and provincial commercial and sport fisheries. Members of the committee include the Ohio Department of Natural Resources, Pennsylvania Fish Commission, New York Department of Environmental Conservation, OMNR, and MDNR. All agencies contributed their sport and commercial assessment data to this management effort.

**Literature cited:**

Lockwood, R. N., and G. P. Rakoczy. 2003. Comparison of interval and aerial count methods for estimating boating effort in Lake Michigan's MM-6. Michigan Department of Natural Resources, Fisheries Research Report, Ann Arbor.

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Table 1.—Estimated harvest per hour, number harvested, and effort (angler hours, trips, and days) for all survey sites (N = 23) in Lake Michigan, by all modes (non-charter) of sport-fishing, 2002. Two standard errors of the mean in parentheses. In some cases, variance could not be calculated due to small sample size (-).

Species	Harvest per hour	Month												Season			
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov					
Pink salmon	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (15)	0 (0)	0 (0)	14 (15)	
Coho salmon	0.0229 (0.0039)	0 (0)	0 (0)	3,486 (465)	8,137 (2,348)	2,110 (1,216)	4,695 (2,644)	6,259 (2,076)	23,558 (7,544)	12,609 (4,220)	403 (136)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	61,257 (9,657)
Chinook salmon	0.0594 (0.0076)	0 (0)	0 (0)	57 (109)	848 (412)	15,715 (5,451)	24,336 (7,470)	36,006 (7,026)	58,093 (11,773)	22,720 (4,965)	1,341 (312)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	159,116 (17,274)
Rainbow trout	0.0187 (0.0035)	0 (0)	0 (0)	186 (14)	1,700 (596)	876 (516)	10,694 (4,439)	28,494 (7,269)	4,595 (1,482)	1,112 (530)	2,284 (401)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	49,941 (8,707)
Atlantic salmon	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (24)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (24)
Brown trout	0.0077 (0.0014)	0 (0)	0 (0)	186 (78)	10,560 (2,925)	2,455 (880)	1,550 (658)	3,323 (974)	1,856 (721)	449 (209)	146 (131)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20,525 (3,361)
Brook trout	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	30 (60)	5 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	35 (61)
Lake trout	0.0092 (0.0018)	0 (0)	0 (0)	0 (0)	174 (117)	2,530 (1,068)	7,985 (3,093)	8,225 (2,840)	5,340 (1,506)	366 (194)	8 (17)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	24,628 (4,593)
Splake	0.0005 (0.0002)	0 (0)	0 (0)	0 (0)	651 (361)	230 (201)	45 (65)	281 (335)	81 (154)	0 (0)	13 (26)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,301 (558)
Northern pike	0.0005 (0.0007)	851 (1,809)	120 (35)	0 (0)	0 (0)	34 (37)	213 (154)	91 (147)	19 (28)	110 (152)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,438 (1,829)
Muskellunge	0.0005 (0.0007)	0 (0)	0 (0)	0 (0)	0 (0)	1,421 (1,821)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,421 (1,821)
Tiger Musky	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	144 (288)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	144 (288)

Table 1.-Continued.

Species	Harvest per hour	Month												Season
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov		
White sucker	0.0001 (0.0001)	0 (0)	0 (0)	4 (8)	10 (0)	144 (287)	0 (0)	0 (0)	0 (0)	0 (0)	49 (71)	0 (0)	0 (0)	207 (296)
Channel catfish	0.0003 (0.0001)	0 (0)	0 (0)	0 (0)	21 (31)	58 (81)	234 (194)	163 (104)	203 (148)	28 (35)	16 (32)	0 (0)	0 (0)	723 (284)
White perch	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	146 (250)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	146 (250)
White bass	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	28 (13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	28 (13)
Rock bass	0.0005 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	180 (0)	295 (246)	347 (24)	269 (279)	0 (0)	175 (347)	0 (0)	0 (0)	1,266 (509)
Pumpkinseed	0.0001 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	60 (-)	0 (0)	263 (-)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	323 (-)
Bluegill	0.0002 (0.0002)	0 (0)	0 (0)	0 (0)	0 (0)	381 (483)	0 (0)	121 (-)	124 (226)	0 (0)	0 (0)	0 (0)	0 (0)	626 (534)
Smallmouth bass	0.0022 (0.0007)	0 (0)	0 (0)	0 (0)	0 (0)	106 (-)	1,528 (1,031)	1,588 (1,331)	684 (540)	1,210 (558)	739 (627)	93 (170)	0 (0)	5,948 (1,964)
Black crappie	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	59 (117)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	59 (117)
Yellow perch	0.1413 (0.0271)	29,240 (17,933)	23,594 (4,109)	5,259 (500)	12,819 (15,155)	8,233 (6,900)	90,392 (39,163)	67,677 (29,033)	66,632 (26,601)	57,826 (28,882)	16,555 (7,989)	0 (0)	0 (0)	378,227 (67,811)
Walleye	0.0176 (0.0062)	1,255 (1,496)	832 (115)	0 (0)	697 (581)	16,125 (15,491)	14,425 (3,347)	1,677 (917)	2,732 (1,392)	2,556 (1,509)	3,279 (1,871)	3,673 (1,347)	0 (0)	47,251 (16,252)
Freshwater drum	0.0019 (0.0005)	0 (0)	0 (0)	0 (0)	0 (0)	105 (146)	3,871 (1,101)	732 (523)	249 (130)	106 (92)	0 (0)	0 (0)	0 (0)	5,063 (1,238)
Lake herring	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (43)

Table 1.-Continued.

Species	Harvest per hour	Month												Season
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov		
Lake whitefish	0.0036 (0.0010)	156 (402)	290 (85)	1,109 (354)	4,015 (1,224)	517 (414)	2,547 (2,029)	342 (299)	0 (0)	32 (60)	526 (340)	0 (0)	0 (0)	9,534 (2,507)
Round whitefish	0.0007 (0.0003)	0 (0)	0 (0)	0 (0)	143 (262)	38 (41)	73 (98)	0 (0)	0 (0)	0 (0)	1,633 (750)	0 (0)	0 (0)	1,887 (802)
Other	0.0003 (0.0001)	5 (35)	0 (0)	0 (0)	18 (11)	0 (0)	531 (314)	95 (169)	0 (0)	0 (0)	84 (88)	0 (0)	0 (0)	733 (369)
Angler hours		62,437 (16,624)	65,732 (9,843)	25,726 (3,012)	154,198 (21,446)	219,504 (77,754)	438,019 (73,428)	553,340 (79,977)	693,176 (108,800)	334,997 (51,427)	95,416 (11,870)	34,613 (8,579)	2,677,158 (182,682)	
Angler trips		15,255 (4,417)	16,736 (3,089)	5,979 (706)	40,710 (5,548)	52,352 (19,248)	93,515 (14,560)	120,511 (15,838)	151,709 (21,274)	75,152 (10,916)	23,386 (2,457)	6,620 (1,711)	601,925 (38,397)	
Angler days		13,211 (3,864)	13,764 (2,736)	5,568 (669)	36,764 (5,121)	46,261 (15,105)	86,928 (13,652)	112,884 (14,796)	136,550 (18,799)	69,726 (10,112)	20,644 (2,038)	4,812 (1,286)	547,112 (33,823)	



Table 2.—Estimated harvest per hour, number harvested, and effort (angler hours, trips, and days) for all survey sites (N = 19) in Lake Huron, by all modes (non-charter) of sport-fishing, 2002. Two standard errors of the mean in parentheses.

Species	Harvest per hour	Month												Season
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct			
Pink salmon	0.0014 (0.0013)	0 (0)	0 (0)	0 (0)	0 (0)	58 (67)	1,460 (1,618)	1,106 (2,127)	547 (1,018)	117 (409)	0 (0)	0 (0)	3,288 (2,889)	
Coho salmon	0.0050 (0.0030)	0 (0)	0 (0)	0 (0)	270 (274)	1,746 (1,291)	4,623 (4,905)	3,444 (3,971)	1,312 (1,856)	143 (924)	25 (33)	25 (33)	11,563 (6,773)	
Chinook salmon	0.0537 (0.0087)	0 (0)	0 (0)	0 (0)	721 (757)	4,949 (3,590)	11,235 (5,120)	34,857 (9,062)	46,756 (12,634)	19,855 (8,083)	4,797 (5,286)	4,797 (5,286)	123,170 (19,357)	
Rainbow trout	0.0041 (0.0018)	0 (0)	0 (0)	87 (251)	482 (554)	620 (642)	1,850 (2,196)	4,087 (2,974)	1,578 (1,199)	429 (731)	257 (143)	257 (143)	9,390 (4,055)	
Atlantic salmon	0.0003 (0.0006)	0 (0)	0 (0)	0 (0)	0 (0)	42 (169)	268 (1,148)	301 (742)	44 (232)	15 (114)	0 (0)	0 (0)	670 (1,401)	
Brown trout	0.0026 (0.0018)	19 (59)	157 (379)	1,286 (2,485)	1,471 (2,472)	474 (607)	289 (554)	1,193 (1,582)	591 (1,120)	392 (755)	18 (45)	18 (45)	5,890 (4,176)	
Brook trout	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	10 (41)	9 (54)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	19 (68)	
Lake trout	0.0122 (0.0045)	0 (0)	0 (0)	0 (0)	1 (1)	2,846 (2,241)	12,076 (7,773)	7,455 (5,193)	5,311 (3,565)	376 (946)	0 (0)	0 (0)	28,065 (10,297)	
Splake	0.0000 (0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	5 (28)	0 (0)	20 (85)	30 (110)	0 (0)	14 (44)	14 (44)	69 (148)	
Northern pike	0.0007 (0.0005)	540 (693)	266 (278)	150 (347)	20 (105)	222 (291)	172 (488)	130 (427)	25 (288)	98 (446)	13 (17)	13 (17)	1,636 (1,215)	
White sucker	0.0002 (0.0007)	0 (0)	0 (0)	0 (0)	467 (1,468)	0 (0)	3 (24)	0 (0)	0 (0)	0 (0)	20 (273)	20 (273)	490 (1,493)	
Channel catfish	0.0053 (0.0080)	0 (0)	0 (0)	0 (0)	803 (2,115)	623 (2,329)	2,366 (5,200)	5,417 (12,546)	2,070 (11,806)	769 (2,067)	0 (0)	0 (0)	12,048 (18,385)	

Table 2.-Continued.

Species	Harvest per hour	Month												Season
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct			
White perch	0.0001 (0.0005)	0 (0)	0 (0)	17 (98)	0 (0)	0 (0)	1 (6)	34 (181)	0 (0)	119 (1,102)	0 (0)	0 (0)	0 (0)	171 (1,121)
White bass	0.0000 (0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	18 (157)	0 (0)	39 (290)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	57 (330)
Rock bass	0.0002 (0.0003)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	107 (216)	89 (392)	161 (570)	133 (335)	0 (0)	0 (0)	0 (0)	490 (799)
Pumpkinseed	0.0002 (0.0011)	0 (0)	470 (2,563)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	470 (2,563)
Bluegill	0.0009 (0.0047)	418 (1,724)	1,271 (6,934)	0 (0)	9 (43)	6 (24)	266 (8,140)	0 (0)	0 (0)	51 (149)	0 (0)	0 (0)	0 (0)	2,021 (10,833)
Smallmouth bass	0.0008 (0.0010)	26 (114)	0 (0)	0 (0)	0 (0)	764 (1,779)	222 (663)	373 (806)	460 (1,213)	16 (62)	0 (0)	0 (0)	0 (0)	1,861 (2,397)
Largemouth bass	0.0001 (0.0003)	0 (0)	0 (0)	0 (0)	0 (0)	224 (709)	14 (104)	24 (148)	68 (113)	0 (0)	0 (0)	0 (0)	0 (0)	330 (740)
Black crappie	0.0004 (0.0051)	0 (0)	111 (603)	52 (969)	182 (317)	154 (397)	496 (11,586)	0 (0)	28 (199)	0 (0)	0 (0)	0 (0)	0 (0)	1,023 (11,655)
Yellow perch	0.3196 (0.0835)	241,490 (109,839)	74,553 (48,251)	102,600 (63,913)	61,894 (86,182)	3,444 (9,814)	8,700 (20,410)	55,980 (50,044)	88,039 (60,840)	83,115 (46,602)	12,914 (29,826)	0 (0)	0 (0)	732,729 (188,905)
Walleye	0.0195 (0.0094)	154 (305)	326 (433)	824 (1,217)	2,130 (3,396)	1,391 (1,856)	4,104 (5,068)	29,757 (19,200)	4,792 (6,502)	1,013 (2,654)	119 (527)	0 (0)	0 (0)	44,610 (21,463)
Freshwater drum	0.0006 (0.0015)	0 (0)	0 (0)	0 (0)	0 (0)	33 (147)	137 (150)	584 (1,653)	532 (2,950)	160 (489)	0 (0)	0 (0)	0 (0)	1,446 (3,423)
Lake herring	0.0123 (0.0062)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11,149 (7,826)	17,095 (11,786)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	28,244 (14,148)

Table 2.-Continued.

Species	Harvest per hour	Month												Season
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct			
Lake whitefish	0.0003 (0.0019)	0 (0)	0 (0)	0 (0)	0 (0)	20 (166)	19 (101)	717 (4,428)	0 (0)	0 (0)	0 (0)	19 (93)	775 (4,434)	
Round whitefish	0.0002 (0.0002)	25 (87)	13 (66)	50 (213)	6 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	356 (444)	450 (505)	
Other	0.0018 (0.0085)	0 (0)	0 (0)	44 (196)	388 (1,584)	0 (0)	2,491 (19,238)	1,090 (2,000)	0 (0)	0 (0)	11 (56)	0 (0)	4,024 (19,408)	
Angler hours		189,519 (31,877)	67,233 (9,897)	72,442 (12,394)	98,027 (18,453)	113,735 (16,647)	314,338 (34,532)	624,558 (52,489)	452,950 (46,718)	295,401 (33,307)	64,682 (7,476)	2,292,885 (95,816)		
Angler trips		51,407 (9,256)	17,265 (2,909)	22,583 (4,883)	28,868 (5,139)	25,157 (3,487)	65,811 (7,209)	123,934 (10,390)	99,270 (10,281)	63,194 (6,999)	15,875 (2,050)	513,364 (21,802)		
Angler days		44,736 (8,473)	15,015 (2,715)	17,769 (3,772)	23,940 (4,469)	22,166 (3,235)	59,504 (6,563)	112,057 (9,646)	88,810 (9,393)	55,766 (6,378)	13,984 (1,848)	453,747 (19,805)		

Table 3.—Estimated harvest per hour, number harvested, and effort (angler hours, trips, and days) by the boat sport fishery in Michigan grids (N = 5) of Lake Erie, 2002. Two standard errors of the mean in parentheses.

Species	Harvest per hour	Month										Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	Season			
Rainbow trout	0.0001 (0.0003)	0 (0)	39 (178)	0 (0)	29 (206)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	68 (272)	
Channel catfish	0.0097 (0.0103)	435 (1,596)	2,066 (3,555)	1,229 (2,988)	1,444 (4,512)	1,388 (4,461)	771 (1,526)	620 (2,016)	7,953 (8,413)			
White perch	0.0024 (0.0054)	0 (0)	556 (2,517)	441 (1,918)	655 (2,916)	165 (843)	96 (294)	59 (170)	1,972 (4,398)			
White bass	0.0146 (0.0147)	128 (861)	5,728 (7,250)	3,895 (8,766)	992 (2,649)	647 (1,683)	470 (1,426)	115 (440)	11,975 (11,926)			
Rock bass	0.0002 (0.0008)	0 (0)	0 (0)	0 (0)	134 (663)	0 (0)	10 (56)	25 (84)	169 (671)			
Bluegill	0.0004 (0.0021)	0 (0)	0 (0)	0 (0)	52 (276)	174 (1,514)	0 (0)	116 (818)	342 (1,743)			
Smallmouth bass	0.0014 (0.0036)	0 (0)	0 (0)	315 (1,818)	554 (2,128)	60 (384)	221 (842)	35 (123)	1,185 (2,951)			
Largemouth bass	0.0004 (0.0018)	0 (0)	0 (0)	0 (0)	330 (1,499)	0 (0)	0 (0)	0 (0)	330 (1,499)			
Black crappie	0.0002 (0.0008)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	147 (615)	147 (615)			
Yellow perch	0.5648 (0.1881)	255 (1,767)	6864 (13,762)	32,101 (57,505)	28,372 (34,671)	126,673 (78,585)	213,094 (89,923)	55,867 (33,293)	463,226 (141,674)			

Table 3.—Continued.

Species	Harvest per hour	Month										Season
		Apr	May	Jun	Jul	Aug	Sep	Oct				
Walleye	0.2025 (0.0657)	1,051 (1,940)	16,835 (11,084)	75,748 (31,293)	66,686 (35,983)	4,531 (4,624)	1,172 (1,643)	47 (123)	166,070 (49,241)			
Freshwater drum	0.0026 (0.0050)	0 (0)	167 (540)	921 (2,953)	697 (2,559)	270 (994)	82 (330)	16 (74)	2,153 (4,082)			
Lake whitefish	0.0001 (0.0005)	0 (0)	55 (359)	22 (163)	0 (0)	0 (0)	0 (0)	0 (0)	77 (394)			
Angler hours		8,437 (3,229)	75,148 (37,147)	281,978 (60,375)	237,240 (74,800)	92,000 (24,735)	99,700 (19,235)	25,717 (8,397)	820,220 (108,087)			
Angler trips		1,887 (752)	13,837 (6,419)	50,600 (10,716)	44,280 (13,861)	19,466 (5,359)	20,652 (4,015)	5,672 (1,896)	156,394 (19,929)			
Angler days		1,722 (704)	13,712 (6,369)	50,600 (10,716)	44,280 (13,861)	19,416 (5,346)	20,652 (4,015)	5,672 (1,896)	156,054 (19,908)			

Table 4.—Estimated harvest per hour, number harvested, and effort (angler hours, trips, and days) by the boat sport fishery in the Michigan grids (N = 9) of Lake St. Clair, 2002. Two standard errors of the mean in parentheses.

Species	Harvest per hour	Month												Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct					
Chinook salmon	0.0000 (0.00003)	0 (0)	0 (0)	31 (363)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	31 (363)
Brown trout	0.0001 (0.00006)	9 (44)	0 (0)	0 (0)	0 (0)	0 (0)	71 (791)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	80 (792)
Brook trout	0.0001 (0.00004)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	80 (505)	80 (505)
Northern pike	0.0011 (0.00045)	0 (0)	9 (55)	89 (432)	395 (1,348)	778 (5,970)	151 (637)	61 (321)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,483 (6,177)
Muskellunge	0.0001 (0.00004)	0 (0)	0 (0)	0 (0)	84 (372)	0 (0)	0 (0)	50 (317)	20 (126)	154 (505)	0 (0)	0 (0)	0 (0)	154 (505)
Tiger Musky	0.0001 (0.00011)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	148 (1,539)	0 (0)	0 (0)	0 (0)	0 (0)	148 (1,539)
White sucker	0.0000 (0.00001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	24 (152)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	24 (152)
Channel catfish	0.0005 (0.00023)	0 (0)	0 (0)	45 (231)	479 (3,047)	42 (202)	67 (367)	71 (259)	9 (50)	713 (3,096)	0 (0)	0 (0)	0 (0)	713 (3,096)
White perch	0.0001 (0.00003)	0 (0)	0 (0)	11 (68)	0 (0)	35 (206)	0 (0)	57 (317)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	103 (383)
White bass	0.0005 (0.00018)	0 (0)	4 (19)	0 (0)	85 (461)	400 (2,171)	135 (900)	40 (294)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	664 (2,413)
Rock bass	0.0062 (0.00080)	0 (0)	123 (341)	292 (1,125)	3,936 (8,915)	1,492 (4,034)	1,526 (4,304)	1,015 (1,725)	123 (828)	8,507 (10,923)	0 (0)	0 (0)	0 (0)	8,507 (10,923)
Pumpkinseed	0.0017 (0.00016)	0 (0)	177 (607)	230 (964)	1,108 (1,546)	375 (722)	332 (676)	130 (482)	31 (185)	2,383 (2,221)	0 (0)	0 (0)	0 (0)	2,383 (2,221)

Table 4.—Continued.

Species	Harvest per hour	Month										Season
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct			
Bluegill	0.0074 (0.0086)	14 (140)	718 (2,053)	1,008 (2,307)	3,096 (6,108)	2,017 (6,566)	1,229 (4,592)	1,297 (3,941)	695 (3,521)	10,074 (11,789)		
Smallmouth bass	0.0088 (0.0128)	0 (0)	0 (0)	0 (0)	1,182 (2,273)	3,279 (14,290)	3,373 (3,775)	4,066 (9,059)	199 (354)	12,099 (17,487)		
Largemouth bass	0.0005 (0.0010)	0 (0)	0 (0)	0 (0)	242 (1,045)	354 (907)	25 (119)	9 (62)	54 (324)	684 (1,428)		
Black crappie	0.0013 (0.0026)	41 (184)	273 (856)	634 (1,902)	306 (1,178)	0 (0)	15 (108)	421 (2,640)	84 (374)	1,774 (3,590)		
Yellow perch	0.3329 (0.1505)	329 (929)	6,388 (7,535)	4,916 (15,675)	76,269 (58,267)	124,760 (88,232)	71,284 (68,836)	135,456 (154,310)	36,219 (28,714)	455,621 (202,133)		
Walleye	0.0307 (0.0173)	110 (255)	314 (1,270)	987 (1,973)	7,716 (7,540)	10,838 (15,657)	15,065 (14,025)	6,216 (6,465)	726 (1,330)	41,972 (23,406)		
Freshwater drum	0.0008 (0.0016)	0 (0)	0 (0)	5 (32)	95 (286)	597 (2,039)	120 (435)	234 (780)	21 (173)	1,072 (2,252)		
Lake herring	0.0000 (0.0000)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (63)	0 (0)	0 (0)	9 (63)		
Other	0.0002 (0.0007)	0 (0)	125 (753)	0 (0)	82 (569)	0 (0)	0 (0)	0 (0)	7 (51)	214 (945)		
Angler hours		2,479 (1,289)	16,221 (3,660)	61,320 (13,262)	368,348 (80,777)	396,657 (64,867)	251,320 (39,762)	219,056 (40,343)	53,163 (11,969)	1,368,564 (119,480)		
Angler trips		850 (438)	3,839 (882)	13,118 (2,839)	70,134 (16,371)	76,294 (13,743)	43,951 (6,830)	41,249 (8,194)	11,445 (2,598)	260,880 (24,217)		
Angler days		824 (426)	3,622 (842)	12,186 (2,645)	67,825 (16,068)	74,662 (13,608)	43,592 (6,816)	40,342 (8,064)	11,222 (2,580)	254,275 (23,862)		

Table 5.—Estimated harvest per hour, number harvested, and effort (angler hours, trips, and days) for all survey sites (N = 6) in Lake Superior, by all modes (non-charter) of sport-fishing, 2002. Two standard errors of the mean in parentheses. For some months, a standard error could not be calculated (-).

Species	Harvest per hour	Month												Season
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct				
Pink salmon	0.0004 (0.0004)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	60 (56)	5 (7)	65 (56)		
Coho salmon	0.0418 (0.0057)	96 (-)	2,162 (364)	2,203 (513)	1,064 (387)	175 (107)	132 (121)	86 (50)	215 (96)	122 (65)	6,255 (767)			
Chinook salmon	0.0054 (0.0016)	0 (0)	30 (9)	28 (16)	290 (174)	194 (110)	72 (58)	139 (85)	38 (29)	14 (20)	805 (234)			
Rainbow trout	0.0036 (0.0020)	6 (-)	5 (1)	110 (60)	332 (290)	28 (29)	13 (19)	15 (21)	29 (28)	4 (7)	542 (300)			
Brown trout	0.0010 (0.0005)	0 (0)	3 (7)	39 (27)	32 (12)	36 (54)	6 (10)	0 (0)	0 (0)	0 (0)	152 (78)			
Lake trout	0.1615 (0.0206)	0 (0)	220 (172)	13 (12)	509 (289)	5,730 (1,296)	8,082 (1,646)	6,222 (1,505)	2,902 (880)	505 (217)	24,183 (2,755)			
Splake	0.0043 (0.0014)	176 (-)	166 (169)	127 (80)	54 (37)	17 (28)	0 (0)	0 (0)	24 (24)	80 (65)	644 (205)			
Siscowet	0.0293 (0.0073)	0 (0)	401 (32)	88 (56)	123 (101)	1,078 (559)	880 (453)	962 (481)	863 (603)	0 (0)	4,395 (1,062)			
Northern pike	0.0005 (0.0004)	0 (0)	0 (0)	0 (0)	11 (23)	7 (11)	35 (51)	16 (33)	0 (0)	11 (15)	80 (67)			
White sucker	0.0001 (0.0001)	0 (0)	0 (0)	0 (0)	0 (0)	6 (12)	9 (10)	0 (0)	0 (0)	0 (0)	15 (15)			
White perch	0.0000 (0.0000)	0 (0)	5 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (1)			



Table 5.—Continued.

Species	Harvest per hour	Month												Season
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct				
Rock bass	0.0002 (0.0004)	0 (0)	0 (0)	0 (0)	0 (0)	34 (64)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	34 (64)
Yellow perch	(0.0032) (0.0011)	84 (-)	142 (41)	211 (144)	0 (0)	3 (7)	33 (46)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	473 (157)
Lake herring	0.0193 (0.0031)	21 (-)	1,753 (166)	1,079 (400)	0 (0)	11 (23)	0 (0)	11 (19)	13 (16)	0 (0)	0 (0)	0 (0)	0 (0)	2,888 (435)
Lake whitefish	0.0677 (0.0179)	2,197 (-)	1,892 (815)	309 (377)	1,933 (1,545)	2,669 (1,856)	317 (250)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	817 (421)	10,134 (2,622)
Round whitefish	0.0115 (0.0049)	15 (-)	388 (249)	10 (11)	468 (288)	403 (500)	193 (273)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	242 (252)	1,719 (730)
Other	0.0010 (0.0006)	3 (-)	100 (71)	15 (28)	26 (46)	0 (0)	0 (0)	13 (23)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	157 (92)
Angler hours		1,592 (1,014)	21,299 (1,865)	17,833 (2,742)	14,705 (2,580)	29,443 (4,868)	27,509 (4,058)	21,143 (3,208)	12,425 (2,354)	3,820 (767)	149,769 (8,676)			
Angler trips		387 (227)	6,475 (672)	6,076 (948)	4,314 (832)	7,680 (1,335)	7,342 (1,167)	5,254 (877)	3,875 (775)	1,434 (325)	42,837 (2,591)			
Angler days		320 (224)	6,331 (653)	6,024 (940)	3,877 (742)	7,012 (1,164)	7,194 (1,153)	5,165 (855)	3,808 (765)	1,434 (325)	41,165 (2,453)			