

STUDY PERFORMANCE REPORT

State: Michigan
Study No.: 230725
Project No.: F-81-R-7
Title: Fisheries assessments in large, inland lakes of Michigan.
Period Covered: October 1, 2005 to September 30, 2006

Study Objective: To develop and implement a program to assess fisheries in large, inland lakes of Michigan and to develop predictive models to estimate abundance and safe harvest levels in lakes where assessments have not been conducted.

Summary: Year 2006 was the sixth year of this study (formerly Study 230691) involving extensive fish collection and marking in the spring, followed by a year-long creel survey to estimate angler harvest and population size. We surveyed Lake Michigamme (Baraga and Marquette Counties), and Lake Charlevoix (Charlevoix County). Due to budget constraints, we did not survey Lake Margrethe or Platte Lake, lakes previously scheduled for surveys in 2006. We tagged 3,431 walleye, 467 northern pike, and 372 smallmouth bass. All survey data were entered into the Microsoft Access database designed for storing catch and effort data and processing tag returns. Extensive work was done on analyses and report writing for lakes surveyed in 2002 and 2003. Data for 2006 has been entered and error-checked and summaries have been provided to managers. The list of lakes to be surveyed through 2010 has been modified due to budget constraints and because some lake surveys originally scheduled for 2005 and 2006 could not be conducted.

Findings: Jobs 1-8 were scheduled for 2005-06, and progress is reported below.

Job 1. Title: Select lakes and identify target species.-I communicated with basin teams to select lakes to survey in the future. Preliminary lists were developed by each basin team, and final choices were made jointly by the principal investigator and basin team leaders. The final list was then coordinated with Statewide Angler Survey Program personnel and minor changes were made. Only one system will be sampled in 2007 – the Portage/Torch Lake system in Houghton County. Due to the extensive changes made to the list of lakes to be surveyed through 2010, we will now evaluate the list on an annual basis, and plan for the next year only.

Target species for population estimates in coolwater lakes are walleye, northern pike, smallmouth bass, and muskellunge. We continue to have good success collecting enough walleye for reliable population estimates in all cases and for northern pike in some cases. We will continue to tag smallmouth bass at the manager's request in lakes where catch in the spring is high enough to make abundance and exploitation estimates. We have never tagged enough muskellunge for reliable estimates of abundance or exploitation. Hence, in the future we may simply collect biological data on this species.

Job 2. Title: Oversee tagging.-Two lakes were surveyed in 2006: Lake Michigamme and Lake Charlevoix. A summary of the gear effort and number tagged by species is provided in Table 1. All fish were identified, counted, and a sub-sample was measured for length. Total catch is reported in Table 2. All data is housed in an Access database with queries in place to extract data for estimates of exploitation, catch per unit effort, and movement.

Job 3. Title: Manage tag-recovery.-Tag returns are collected from various sources (angler-mailed, internet return, creel clerk, and phone-in) and are entered into the Access database. Queries were developed that validate tag numbers for each return. Additionally, possession of tag is verified before payment vouchers are generated. The database automatically generates payment vouchers and letters to anglers. Responses to anglers are usually sent within 1-2 months after a return is reported to our office. To date, we have approximately 8,300 tag returns in our database from approximately 5.5 years of study.

Job 4. Title: Coordinate with creel survey study.-Ratios of marked-to-unmarked fish observed in the creel have been tallied for lakes surveyed through 2005 (see Study 230646 Progress Report). Creel surveys for lakes surveyed in 2006 are still in progress.

Job 5. Title: Oversee fish aging.-We established a protocol to record digital images of all structures by means of Image-Pro[®] software. All images are archived on both hard disk and compact disk. A final age has been determined (approximately 15 fish per sex per in group) for all samples collected through 2005. Samples collected in 2006 have been sectioned and imaged, and will be aged this winter.

Job 6. Title: Analyze field data.-Significant progress has been made on reports for lakes surveyed in 2002. The report for the Muskegon Lake system has been reviewed and is in press. Reports for Lake Leelanau and the Cisco Chain are completed and awaiting final review by the division editor. Significant progress has also been made on reports for lakes surveyed in 2003. Three separate reports for South, Big, and North Manistique lakes have been finished and are awaiting final review by the editor. The initial draft of the report for Bond Falls Flowage is nearing completion. Raw survey data through 2006 was made available to managers via the statewide database (Fish Collection System) for housing and querying fish survey data.

Significant progress was made to automate spreadsheets that calculate estimates used in analyses. This will make methods more consistent and report writing more efficient. Analyses of 2004 data are almost complete and I expect to complete draft reports this winter. Preliminary abundance estimates from recaptures during netting operations were made for lakes surveyed in 2006, but are not reported here because our policy is to not release 'preliminary' estimates. Final annual exploitation rates have been calculated for lakes surveyed through 2003, and preliminary rates have been calculated for lakes surveyed in 2004 and 2005 (Table 3). Walleye exploitation ranged from 4 - 37%, which is within the range observed for similar lakes.

The tagging summary for surveys conducted in 2006 was sent out to all fisheries managers (Tables 1 and 2), and updates on angler exploitation were sent to managers throughout the year.

Job 7. Title: Develop walleye versus lake size regression.-We fit models of both legal (≥ 15 in) and adult (≥ 15 in, or < 15 in, but of identifiable sex) walleye abundance to lake area for the ten lakes that had final population estimates (Table 4). We used an approach similar to that used by the Wisconsin DNR (Hansen 1989), where lake area is used to predict walleye abundance in lakes with no population estimates. A log-log regression explained 81% of the variation in legal-size walleye abundance ($F = 33.6$; $df = 9$; $P = 0.0004$; Table 4), while the log of lake area explained 55% of the variation in adult walleye abundance ($F = 9.9$; $df = 9$; $P = 0.01$). The intent of this exercise was to examine the model fit; it has little utility thus far as a predictive model. Additional abundance estimates will be added to the model as they become available.

Job 8. Title: Write annual report. -This performance report fulfills obligations for an annual study report. Additionally, results for individual lakes are being incorporated into MDNR Special Reports.

References:

Hansen, M. J. 1989. A walleye population model for setting harvest quotas. Wisconsin Department of Natural Resources, Bureau of Fisheries Management, Fish Management Report 143, Madison.

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Date: September 30, 2006

Table 1.—Summary of effort and number of fish marked in 2006. Numbers of reward (R) and non-reward (NR) tags are in parentheses.

	Lake Charlevoix (17,268 acres)	Lake Michigamme (4,292 acres)
Effort		
Fyke-net lifts	162	222
Trap-net lifts	318	0
Electrofishing runs	2	1
Walleye		
Total tagged (R+NR)	1,940 (1,064 + 876)	1,491 (784 + 707)
Sub-legal-sized clipped	142	436
Northern pike		
Total tagged (R+NR)	311 (142 + 169)	156 (82 + 74)
Sub-legal-sized clipped	283	349
Smallmouth bass		
Total tagged (R+NR)	344 (198 + 146)	28 (17 + 11)
Sub-legal-sized clipped	154	53

Table 2.—Total catch by species from spring 2006 surveys (includes recaptures).

Species	Lake Charlevoix	Lake Michigamme
Black Bullhead	89	7
Black crappie	5	30
Bluegill	14	0
Bowfin	117	0
Brook trout	3	3
Brown bullhead	1,244	0
Brown trout	1	0
Bullhead spp.	1,178	0
Burbot	2	28
Carp	33	0
Channel catfish	3	0
Common shiner	10	0
Drum	5	0
Gizzard shad	3	0
Lake trout	13	0
Lake whitefish	0	10
Largemouth bass	16	3
Longnose gar	2	0
Longnose sucker	1	0
Mudpuppy	17	0
Northern musky	0	2
Northern pike	876	653
Pumpkinseed	5	4
Quillback	23	0
Rainbow trout	72	0
Rock bass	1,586	507
Round goby	17	0
Sculpin spp.	2	0
Sea lamprey	1	0
Silver redhorse	16	0
Smallmouth bass	522	114
Tiger musky	0	1
Walleye	2,703	2,326
White perch	11	0
White sucker	4,906	100
Yellow perch	195	144

Table 3.—Annual exploitation of walleye for lakes surveyed through 2005.

Year sampled	Lake	Annual exploitation rate (% based on reward tags)
2001	Houghton	10.6
	Michigamme	29.3
	Crooked-Pickerel	16.3
	Burt	8.0
2002	Cisco chain	17.3
	Lake Leelanau	16.0
	Muskegon	3.5
2003	North Manistique	7.9
	Big Manistique	9.4
	South Manistique	27.5
	Bond Falls Flowage	36.8
2004	Grand Lake ¹	6.9
	Long Lake ¹	7.6
	Peavy Pond ¹	18.1
2005	Black Lake ¹	10.3
	Lake Gogebic ¹	7.9

¹ Preliminary estimates.

Table 4.—Analysis of modeled legal walleye abundance data. The dependent variable in the model is log (legal walleye abundance) and the independent variable is log [lake area (acres)].

SUMMARY OUTPUT					
<i>Regression Statistics</i>					
Multiple R		0.898607			
R Square		0.807494			
Adjusted R Square		0.783431			
Standard Error		0.468678			
Observations		10			
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	7.371141	7.371141	33.55718	0.000408477
Residual	8	1.757273	0.219659		
Total	9	9.128414			