

## STUDY PERFORMANCE REPORT

**State:** Michigan

**Project No.:** F-81-R-3

**Study No.:** 484

**Title:** Population dynamics of yellow perch stocks in Michigan waters of Lake Michigan.

**Period Covered:** October 1, 2001 to September 30, 2002

**Study Objectives:** (1) To summarize pertinent existing data from state, federal, commercial, sport, university, and private sources; (2) to conduct assessment netting to establish baseline data and determine whether lack of recruitment and declining yellow perch numbers are problems in Michigan waters; (3) to determine whether factors of fish health might be affecting abundance or recruitment of yellow perch; (4) to reestablish a program of biological data collection for sport-caught yellow perch; (5) to investigate discreteness of yellow perch populations in Lake Michigan; and (6) to develop information and mathematical models from these data that will allow managers to predict, with some predetermined level of certainty, the outcome of various yellow perch management strategies.

**Summary:** Gill-net assessments were conducted at seven eastern Lake Michigan ports (Charlevoix, Leland, Arcadia, Grand Haven, Saugatuck, South Haven, and St. Joseph) in April, May, and June, 2002. Catch-per-unit-effort at the seven Lake Michigan assessment ports ranged from 1 to 37 yellow perch per 1,000 feet of gill net per 24 h, and averaged 25 fish per net night for the four southern ports, combined. Yellow perch abundance (based on gill net CPE) was highest at South Haven, and was typically higher in intermediate depth (50-foot contour) net sets, as compared with shallow (30-40 foot) or deep (100-150 foot) sets at the Lake Michigan ports we sampled.

Trawling was conducted in July and August, 2002 at Charlevoix, Pentwater, Grand Haven, and South Haven, and yellow perch recreational catch information was collected in coordination with Studies 427 and 462. Preliminary analysis of data from summer trawl assessments indicated the presence of a relatively strong 2002 year class. Analysis of creel survey data for 2002 is nearing completion.

Results of yellow perch research were summarized for various MDNR and external committee reports. Presentations were also made at various scientific and public meetings. A 5-year report / draft manuscript will be submitted to the Fisheries Division's Editing and Finishing Process for Publication of Research and Technical reports by December 31, 2002. This manuscript will be published as a Fisheries Research Report during 2002-03, and submitted as a final report December 2003.

**Findings:** Jobs 1, 2, 4, 5, 6, and 7 were scheduled, and progress is reported below.

**Job 1. Title:** Review literature and summarize existing data.—A review of yellow perch literature is ongoing and will be used in completing other jobs within this study.

**Job 2. Title: Conduct standardized assessment sampling.**–*Spring Assessment Netting*– Gill-net assessments were conducted at seven eastern Lake Michigan ports (Charlevoix, Leland, Arcadia, Grand Haven, Saugatuck, South Haven, and St. Joseph) in April, May, and June, 2002. Three to six nets (each net 1,000 feet long, 1.5 to 3.5” stretched nylon mesh, 0.5” intervals) were fished overnight at each port. In addition, yellow perch were collected near Ludington, Michigan as part of a study of the barrier net at the Ludington Pumped Storage Hydroelectric Project. Sub-samples of fish from MDNR assessments and from the Ludington study were returned to the Charlevoix Great Lakes Station for analysis of age and growth, fecundity, body composition (percent water, gonadosomatic index), and diet.

Catch-per-unit-effort at the seven Lake Michigan assessment ports ranged from 1 to 37 yellow perch per 1,000 feet of gill net per 24 h, and averaged 25 fish per net night for the four southern Lake Michigan ports, combined (Table 1). Yellow perch catch rates were highest at South Haven, and were higher across all ports at intermediate depths (50-foot contour; 28 fish per net night) as compared to shallow (30-foot; 14 fish per net night) and deep (100-foot and 150-foot; 9 and 0 fish per net night, respectively) contours.

Additional species collected in yellow perch assessment nets include alewife, rainbow smelt, spottail shiner, lake trout, brown trout, chinook salmon, whitefish (lake and round), sucker (white and longnose), and round goby. Analysis of data on alewife and other species collected in spring assessment netting is ongoing.

*Summer Trawl Assessments*–Trawling was conducted in July and August, 2002 at Charlevoix, Pentwater, Grand Haven, and South Haven. Samples consisted of 12, 10-minute trawls at each port during each month. Six trawls were conducted prior to sunset and six were conducted after dark. Analysis of data from summer trawl assessments is ongoing. Catch of age 0 yellow perch at two long-term index ports (Grand Haven and South Haven) indicated that the 2002 year class was second in abundance to only the 1998 year class during the time period sampled (1996-2002; Table 2). Additional data analyses will be presented in future reports.

**Job 4. Title: Collect and analyze biological data from sport-caught yellow perch.**–Yellow perch recreational catch and effort information for the period 1985-2002 are currently being summarized, in coordination with Studies 427 and 462.

Yellow perch length and age data were collected in 1985-92 as part of the Lake Michigan creel survey program (Study 427). Beginning in 1996, data were again collected from the recreational creel at four sites for which fisheries-independent assessment data are available. In 1997, this data collection program was expanded to include all standard creel sites between New Buffalo and Grand Traverse Bay. At a given site, data are collected from up to 100 angler-caught yellow perch per month. Length and sex are recorded for each fish examined. Analyses of biological data collected in 2000-02 are ongoing. Age composition of the recreational catch will be determined in the future, using a length-age key based on otolith-aged yellow perch collected in fishery independent gillnet assessment samples.

**Job 5. Title: Investigate discreteness of yellow perch populations in Lake Michigan.**–*Tagging study*–Tagging of yellow perch was conducted during spring 1997-99, in coordination with other Lake Michigan management agencies through the GLFC Yellow Perch Task Group. Yellow perch tagged by MDNR personnel (approximately 3,000 per year) were released in Michigan waters near Bridgman, St. Joseph, and Onekama. In 2002, recaptures of tagged perch were again obtained from Lake Michigan assessment netting and from voluntary angler

returns. Analysis of tag return data from throughout Lake Michigan is ongoing, and will provide much needed information on yellow perch movements, growth, exploitation rates, and mixing of stocks. Additional funding and graduate student assistance for these efforts began in 2002, in coordination with personnel from the Illinois Natural History Surveys, Lake Michigan Biological Station.

*Genetic study*—Tissue samples from assessment-caught fish were provided to Central Michigan University for a study using microsatellite DNA markers to further address the issue of stock discreteness in Lake Michigan yellow perch populations. These samples came from Lake Michigan as well as connected “drowned river mouth” lakes, and will be used to assess the extent of mixing across these systems.

**Job 6. Title: Develop information and mathematical models related to yellow perch management strategies.**—Successful modeling of Lake Michigan yellow perch populations will require information on length, weight, age, sex, maturity, egg production, diet, movement, harvest rates, and predation. These data are currently being collected in Jobs 1-5 (see above). Modeling efforts are being coordinated through an ongoing project of the GLFC Lake Michigan Yellow Perch Task Group, in cooperation with the Michigan State University, Partnership for Ecosystem Research and Management (PERM) unit.

**Job 7. Title: Evaluate results, write reports, and develop future study plans for Michigan waters of Lake Michigan south of the 45th parallel.**—Results of yellow perch research were summarized for this report, as well as for summaries to various MDNR and external committees. Presentations were given at the Michigan State University Fisheries Extension Workshops in Ludington, Grand Haven, and Benzonia. A report describing the work of the GLFC Lake Michigan Yellow Perch Task Group (Makauskas and Clapp 2002) was completed for the GLFC annual meeting in Duluth, Minnesota, and an article was prepared for Fisheries describing the first five years of the research effort conducted by this Task Group (YPTG 2002). Another article was submitted to the Journal of Great Lakes Research (Fitzgerald et al. in revision), using data from MDNR trawl samples to investigate factors influencing first year survival of yellow perch in Lake Michigan. Work was completed on a Great Lakes Fish and Wildlife Restoration Act-funded yellow perch modeling project (in cooperation with Jim Bence of the Michigan State University unit of the Partnership for Ecosystem Research and Management - PERM), and a proposal was funded (with Dr. John Dettmers, Illinois Natural History Survey) for completion of the yellow perch tagging work described in Job 5.

#### **References:**

Dettmers, J., and D. F. Clapp. 2002. Lake-wide mark and recapture investigation of Lake Michigan yellow perch: evaluation of inter-state movements, spawning site fidelity, spawning population abundance, and sources of mortality. Study funded through GLFC Coordination Activities Program.

Fitzgerald, D.G., D.F. Clapp, and B.J. Belonger. 2003. Characterization of growth and winter survival of age-0 yellow perch in southeastern Lake Michigan. Journal of Great Lakes Research. In revision.

Lake Michigan Yellow Perch Task Group. 2002. Yellow perch research and management in Lake Michigan: evaluating progress in a cooperative effort, 1997-2001. Fisheries (to be submitted, December 2002).

Makauskas, D. and D.F. Clapp. 2002. Status of Yellow Perch in Lake Michigan and Yellow Perch Task Group Progress Report. Great Lakes Fishery Commission, Lake Michigan Committee, Annual Meeting Minutes.

Wilberg, M, J. Bence, and D. F. Clapp. 2002. Development of an age-structured yellow perch population model for Lake Michigan. Annual Progress Report to the Great Lakes Fisheries Commission for a Great Lakes Fish and Wildlife Restoration Act-funded project.

**Prepared by:** David F. Clapp.

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Table 1.—Average assessment gillnet catch (fish / 1,000' of gillnet / 24 hours) of yellow perch at eastern Lake Michigan ports, 1996-2002. Three to six nets were set at each port in each year. Two standard errors are shown in parentheses. Combined estimates are for the ports of Grand Haven, Saugatuck, South Haven, and St. Joseph only.

Sample year	Port						Combined
	Charlevoix	Arcadia	Grand Haven	Saugatuck	South Haven	St. Joseph	
1996	---	---	315 (326)	20 (4)	338 (584)	33 (14)	177 (168)
1997	---	---	155 (104)	59 (62)	153 (200)	25 (10)	94 (61)
1998	---	---	158 (238)	35 (50)	86 (74)	17 (15)	74 (64)
1999	---	---	20 (15)	19 (19)	58 (36)	84 (42)	41 (18)
2000	14 (6)	14 (11)	25 (13)	38 (11)	374 (179)	264 (160)	169 (86)
2001	9 (8)	25 (28)	169 (194)	171 (141)	559 (399)	---	300 (178)
2002	1 (1)	9 (6)	27 (20)	3 (4)	37 (28)	33 (24)	25 (10)

<sup>1</sup> Ports not sampled in years indicated

Table 2.—Age-0 yellow perch catch-per-unit-effort (number per trawl hour) at two Lake Michigan ports (Grand Haven and South Haven), 1996-2002. Two standard errors are shown in parentheses. Age determinations are based on length frequency analysis.

Year	Port	
	Grand Haven	South Haven
1996	1.0 (1.6)	1.2 (1.1)
1997	2.2 (1.9)	5.8 (4.5)
1998	3.9 (2.8)	294.3 (194.9)
1999	3.0 (1.7)	5.7 (3.5)
2000	4.2 (3.9)	4.2 (3.8)
2001	0.3 (0.7)	0.0 (0.0)
2002	53.5 (44.5)	26.7 (30.9)