

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-2

Study No.: 484

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

Period Covered: October 1, 2000 to September 30, 2001

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 five eastern Lake Michigan ports (Charlevoix, Arcadia, Grand Haven, Saugatuck, and South Haven) in April, May, and June, 2001. Catch-per-unit-effort at the five Lake Michigan assessment ports ranged from 9 to 559 yellow perch per 1,000 feet of gill net per 24 h, and averaged 187 fish per net night for the five ports, combined. Yellow perch abundance (based on gill net CPE) was highest at South Haven, and was typically higher in deep (60-70 feet) net sets when compared with shallow (30-40 feet) sets at the Lake Michigan ports we sampled.

Trawling was conducted in July and August, 2001 at Charlevoix, Pentwater, Grand Haven, and South Haven, and yellow perch recreational catch information for the period 1985-2000 was collected in coordination with Studies 427 and 462. Analysis of data from 2001 summer trawl assessments and creel surveys is ongoing and will be presented in future reports.

Results of yellow perch research were summarized for this report, as well as for summaries to various MDNR and external committees. Presentations were made at various scientific and public meetings.

Job 1. Title: Review literature and summarize existing data.

Findings: *Literature Review*—A review of yellow perch literature has been conducted, focusing on the following subjects; yellow perch disease, sampling techniques, interactions with alewife, reproduction and early life history, population fluctuations, age and growth, regulations, stock assessment, foraging, and energetics. This review is ongoing and will be used in planning and completing other jobs within this study.

Archived Michigan Department of Natural Resources Assessment Netting Data—Yellow perch were collected in MDNR assessment netting throughout Lake Michigan between 1968-86. From 300-3,000 yellow perch were collected and aged per year. These data are currently being summarized, along with information on alewife abundance in these same assessments. Results of these analyses will be presented in future reports.

Job 2. Title: Conduct standardized assessment sampling.

Findings: *Spring Assessment Netting*—Gill-net assessments were conducted at five eastern Lake Michigan ports (Charlevoix, Arcadia, Grand Haven, Saugatuck, and South Haven) in April, May, and June, 2001. 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. Subsamples 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 five Lake Michigan assessment ports ranged from 9 to 559 yellow perch per 1,000 feet of gill net per 24 h. The average catch rate was 187 fish per net night for the five ports, combined (Table 1). Yellow perch catch rates were highest at South Haven, and were typically higher in deep (60-70 feet) net sets when compared with shallow (30-40 feet) sets at the Lake Michigan ports we sampled.

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, 2001 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 and will be presented in future reports.

Job 4. Title: Collect and analyze biological data from sport-caught yellow perch.

Findings: *Yellow Perch Harvest*—Yellow perch recreational catch information for the period 1985-2000 were summarized in coordination with Studies 427 and 462. Lake Michigan (Michigan waters only) yellow perch harvest declined from 3.2 million fish in 1988 to 0.4 million fish in 1998. In 1999, yellow perch harvest increased to about 0.8 million fish, but declined to approximately 0.4 million fish again in 2000. The recreational harvest of yellow perch shows significant temporal variation across ports. For example, harvest was highest at St. Joseph (greater than 600,000 yellow perch) in 1985 and in Grand Haven (greater than 200,000 fish) in 1987. However, harvest did not peak at South Haven until 1994 (approximately 1.5 million yellow perch; Table 2).

Biological data collection—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.

Average total length of yellow perch in the recreational catch has been approximately 9.5 inches across all years sampled. Analysis of data collected in 2000 and 2001 is 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.

Findings: *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 Onkama (Table 3). In 2001, recaptures of tagged perch were again obtained from southern 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.

Job 6. Title: Develop information and mathematical models related to yellow perch management strategies.

Findings: 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.

Job 7. Title: Evaluate results, write reports, and develop future study plans for Michigan waters of Lake Michigan south of the 45th parallel.

Findings: 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 Benton Harbor and Ludington. A poster describing this project was presented at the MDNR Fisheries Division Inservice Training session. Articles based on work conducted as part of this study were prepared for the GLFC “State of Lake Michigan” report, and published in the Journal of Great Lakes Research (Clapp et al. 2001). A report describing the work of the GLFC Lake Michigan Yellow Perch Task Group (Makauskas and Clapp 2001) was completed for the GLFC annual meeting in Sault Ste. Marie. Poster and oral presentations were made at the International Association of Great Lakes Research meeting in Green Bay, Wisconsin. 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 submitted (with Dr. John Dettmers, Illinois Natural History Survey) to obtain funding for completion of the yellow perch tagging work described in Job 5.

Literature Cited:

Clapp, D.F., P.J. Schneeberger, D.J. Jude, G. Madison, and C. Pistis. 2001. Monitoring round goby (*Neogobius melanostomus*) population expansion in eastern and northern Lake Michigan. *Journal of Great Lakes Research* 27:335-341.

Makauskas, D. and D.F. Clapp. 2001. Status of Yellow Perch in Lake Michigan and Yellow Perch Task Group Progress Report. Great Lakes Fishery Commission, Lake Michigan Committee, Annual Meeting Minutes.

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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, 1996-2001. Three to six nets were set at each port in each year. Two standard errors are shown in parentheses. Estimates for 2001 are preliminary.

Sample year	Port						Combined
	Charlevoix	Arcadia	Grand Haven	Saugatuck	South Haven	St. Joseph	
1996	-1	-1	315 (326)	20 (4)	338 (584)	33 (14)	177 (168)
1997	-1	-1	155 (104)	59 (62)	153 (200)	25 (10)	94 (61)
1998	-1	-1	158 (238)	35 (50)	86 (74)	17 (15)	74 (64)
1999	-1	-1	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)	-1	187 (138)

1 – Ports not sampled in years indicated

Table 2.—Yellow perch recreational catch at four southern Lake Michigan ports, 1985-2000. Estimates of charter catch were not obtained prior to 1990. Creel estimates were not obtained at Holland and South Haven in 1989-1991.

Sample year	Port													
	Grand Haven		Holland/Saugatuck		South Haven		St. Joseph		Holland/Saugatuck		South Haven		St. Joseph	
	Creel	Charter	Creel	Charter	Creel	Charter	Creel	Charter	Creel	Charter	Creel	Charter	Creel	Charter
1985	110,084	—	105,398	—	292,225	—	664,671	—	—	—	—	—	—	—
1986	79,972	—	27,382	—	307,847	—	590,044	—	—	—	—	—	—	—
1987	213,199	—	126,910	—	313,800	—	448,285	—	—	—	—	—	—	—
1988	156,496	—	119,128	—	618,933	—	575,937	—	—	—	—	—	—	—
1989	121,713	—	—	—	—	—	313,084	—	—	—	—	—	—	—
1990	74,151	1,755	—	74	—	2,107	348,313	16,099	—	—	—	—	—	—
1991	133,783	154	—	2	—	39,870	253,873	6,076	—	—	—	—	—	—
1992	58,126	791	47,610	12	348,138	19,906	430,828	8,293	—	—	—	—	—	—
1993	78,364	1,532	62,585	176	732,128	40,452	384,416	17,822	—	—	—	—	—	—
1994	119,106	1,344	63,588	504	1,414,005	48,756	152,108	11,232	—	—	—	—	—	—
1995	11,490	363	68,882	85	981,999	92,074	74,063	3,528	—	—	—	—	—	—
1996	75,553	608	40,704	0	148,115	35,372	64,113	2,327	—	—	—	—	—	—
1997	84,774	304	16,899	0	209,663	41,771	11,891	800	—	—	—	—	—	—
1998	23,554	79	8,249	39	121,798	25,503	13,369	383	—	—	—	—	—	—
1999	34,562	360	10,495	202	290,001	39,534	70,393	1,492	—	—	—	—	—	—
2000	35,373	6	7,153	6	44,748	23,082	21,255	984	—	—	—	—	—	—

Table 3.—Cumulative number of tagged and recaptured yellow perch, 1996 – 2000 (data from Makauskas and Clapp 2001, and John Dettmers, Illinois Natural History Survey, personal communication).

Location	Tagging year				
	1996	1997	1998	1999	2000
Illinois	13,462	8,482	4,902	6,274	1,855
Indiana	0	2,950	620	3,246	0
Michigan	0	3,292	3,369	2,594	0
Grand Traverse Bay	0	32	0	0	0
Green Bay	0	1,844	2,314	3,026	0
Wisconsin	0	5,153	1,318	3,142	0
Total tagged	13,462	21,753	12,523	18,282	1,855
Total recaptures	1,350	1,596	721	538	14
Recapture %	10.0	7.3	5.8	2.9	0.8