

# Status of Yellow Perch in Lake Michigan and Yellow Perch Task Group Progress Report



(Indiana DNR employee with 14  $\frac{3}{4}$ " yellow perch captured in sampling near Michigan City, Indiana.)

REPORT TO THE LAKE MICHIGAN COMMITTEE  
Ypsilanti, Michigan  
March 20, 2007

Prepared by:  
Dan Makauskas (ILDNR) and David Clapp (MDNR)

**Table of Contents**

	<u>Page</u>
List of Graphs	3
Contact list	5
Status of Yellow Perch in Lake Michigan	6
Adult Relative Abundance	6
Population Age Structure	10
Recruitment	13
2006 Yellow Perch Harvest Restrictions	17
Yellow Perch Task Group Progress Report	18
Charge #1: Lakewide assessment plan	18
Charge #3: Yellow perch recruitment research	19
Charge #4: Develop and implement perch population models	19
Charge #5: Advise LMC concerning regulation change	19
Task Group Meetings	20
References	21
Appendix	22

## **List of Graphs**

<u>Figure</u>	<u>Page</u>
1. Adult yellow perch gill net CPUE and percent females from Michigan waters of Lake Michigan, 1996 to 2006	7
2. Age 1 and older yellow perch trawl CPUE and percent female from Indiana waters of Lake Michigan, 1975 to 2006	7
3. Adult yellow perch gill net CPUE and percent female from Illinois waters of Lake Michigan, 1976 to 2006	8
4. Adult yellow perch gill net CPUE and percent female from Wisconsin waters of Lake Michigan, 1986 to 2007	8
5. Adult yellow perch gill net CPUE in Little Traverse Bay, 2001 to 2006	9
6. Standard graded mesh (51, 64, 76-mm stretched mesh) gill net CPUE of adult yellow perch from southern basin (Indiana, Illinois, Michigan, and Wisconsin waters) of Lake Michigan, 1984 to 2006	9
7. Yellow perch age structure from gill net assessment in Michigan waters of Lake Michigan, 2006	10
8. Yellow perch age structure from trawl assessment in Indiana waters of Lake Michigan, 2006	11
9. Yellow perch age structure from gill net assessment in Illinois waters of Lake Michigan, 2006	11
10. Yellow perch age structure from fyke net assessment in Illinois waters of Lake Michigan, 2006	12
11. Yellow perch age structure from gill net assessment in Wisconsin waters of Lake Michigan, 2007	12
12. Yellow perch age structure from spring gill net assessment in Little Traverse Bay, Lake Michigan, 2006	13
13. Age-0 yellow perch trawl CPUE from Michigan waters of Lake Michigan, 1996 to 2006	14
14. Age-2 yellow perch trawl CPUE from Indiana waters of Lake Michigan, 1984 to 2006	14

<u>Figure</u>	<u>Page</u>
15. Age-0 yellow perch seine CPUE from Illinois waters of Lake Michigan, 1978 to 2006	15
16. Age-0 yellow perch trawl CPUE from Illinois waters of Lake Michigan, 1987 to 2006	15
17. Age-0 yellow perch seine CPUE from Wisconsin waters of Lake Michigan, 1989 to 2006	16

## Yellow Perch Task Group Contact List: 2006-2007

This report was prepared from information provided by the following Lake Michigan Yellow Perch Task Group members and contributors. Questions regarding data from a specific area of Lake Michigan, or concerning a specific aspect of Lake Michigan yellow perch research, should be directed to the contributor of that information (see Appendix 1 for a map of lake areas).

<u>NAME</u>	<u>AGENCY</u>	<u>E-MAIL</u>	<u>AREA</u>
Jim Bence	Michigan State University	<a href="mailto:bence@msu.edu">bence@msu.edu</a>	Population models
Brian Breidert	Indiana DNR	<a href="mailto:bbreidert@dnr.IN.gov">bbreidert@dnr.IN.gov</a>	Indiana
Wayne Brofka	Illinois Natural History Survey	<a href="mailto:wbrofka@inhs.uiuc.edu">wbrofka@inhs.uiuc.edu</a>	Illinois
Bo Bunnell	USGS-GLSC	<a href="mailto:dbunnell@usgs.gov">dbunnell@usgs.gov</a>	Lakewide
Sergiusz Czesny	Illinois Natural History Survey	<a href="mailto:czesny@inhs.uiuc.edu">czesny@inhs.uiuc.edu</a>	Illinois
Dave Clapp	Michigan DNR	<a href="mailto:clappd@michigan.gov">clappd@michigan.gov</a>	MM-8 to MM-3
John Dettmers	Great Lakes Fishery Commission	<a href="mailto:jdettmers@glfc.org">jdettmers@glfc.org</a>	Lakewide
Jason Doll	Ball State University	<a href="mailto:jcdoll@bsu.edu">jcdoll@bsu.edu</a>	Indiana
Brad Eggold	Wisconsin DNR	<a href="mailto:Bradley.Eggold@wisconsin.gov">Bradley.Eggold@wisconsin.gov</a>	WM-5
Pradeep Hirethota	Wisconsin DNR	<a href="mailto:Pradeep.Hirethota@wisconsin.gov">Pradeep.Hirethota@wisconsin.gov</a>	WM-5
Brian Irwin	Michigan State University	<a href="mailto:irwinb@msu.edu">irwinb@msu.edu</a>	Population models
John Janssen	University of Wisconsin	<a href="mailto:jjanssen@uwm.edu">jjanssen@uwm.edu</a>	Wisconsin/Illinois
Mike Jones	Michigan State University	<a href="mailto:jonesm30@msu.edu">jonesm30@msu.edu</a>	Population models
Dave Jude	CGLAS, Univ. of Mich.	<a href="mailto:djude@umich.edu">djude@umich.edu</a>	MM-8 to MM-7
Steve Lenart	Little Traverse Bay Band	<a href="mailto:SLenart@ltbbodawa-nsn.gov">SLenart@ltbbodawa-nsn.gov</a>	MM-3
Chuck Madenjian	USGS-GLSC	<a href="mailto:chuck_madenjian@usgs.gov">chuck_madenjian@usgs.gov</a>	Lakewide
Dan Makauskas	Illinois DNR	<a href="mailto:dan.makauskas@illinois.gov">dan.makauskas@illinois.gov</a>	Illinois
John Netto	USFWS	<a href="mailto:john_netto@fws.gov">john_netto@fws.gov</a>	WM-1, WM-2
Janel Palla	Indiana DNR	<a href="mailto:jpalla@dnr.IN.gov">jpalla@dnr.IN.gov</a>	Indiana
Steve Pothoven	GLERL/NOAA	<a href="mailto:Steve.Pothoven@noaa.gov">Steve.Pothoven@noaa.gov</a>	MM-7
Rebecca Redman	Illinois Natural History Survey	<a href="mailto:rredman@uiuc.edu">rredman@uiuc.edu</a>	Illinois
Mike Wilberg	University of Maryland	<a href="mailto:wilberg@cbl.umces.edu">wilberg@cbl.umces.edu</a>	Population models
Troy Zorn	Michigan DNR	<a href="mailto:zornt@michigan.gov">zornt@michigan.gov</a>	MM-1

## **Status of Yellow Perch in Lake Michigan**

Yellow perch assessment activity is occurring throughout the lake, with numerous agency and university personnel sampling perch utilizing various gear types in different seasons. Selected parts of this information are presented here, in three sections. The first section covers the relative abundance of adult (age 1 and older) yellow perch. The second section examines the most recent age structure data available for different parts of the lake. The final section consists of estimates (or indices) of juvenile yellow perch recruitment: most of this data comes from collections of age-0 yellow perch. Coordinated regulation of yellow perch harvest has been an important part of perch management in recent years. Current commercial and recreational regulations for all Lake Michigan jurisdictions are included as a final section of this status report.

### **Adult Relative Abundance**

The data assembled were collected with either gill nets or bottom trawls (Figures 1 to 6). Generally, this information shows a long-term decline in adult yellow perch abundance. The longer data series show a peak abundance in the mid- 1980s to early 1990s, followed by significant declines through the early 2000s (Figures 2-4). Increases in catch-per-unit-effort resulting from recruitment of the 1998 and 2002 year classes are particularly apparent in some data series (Figures 1, 2, 4, 5), and there is some indication of population recovery in the southern basin (Figure 2) and in northern Lake Michigan (Figure 5). Data from common gear types (graded mesh gill net) fished in all jurisdictions are presented in Figure 6; these index data show that current abundance remains well below the historically observed abundance of the late 1980s and early 1990s.

Since the mid 1990s, there has been a general upward trend in the frequency of females within the adult assessments (Figures 1-4). Percent females in Indiana and Michigan waters of Lake Michigan have fluctuated around 50-60% for the past five years (Figures 1-2). The percentage of females in Illinois and Wisconsin waters has been more variable, ranging from 20-80% (Illinois) and 35-65% (Wisconsin) during the same time period (Figures 3-4).

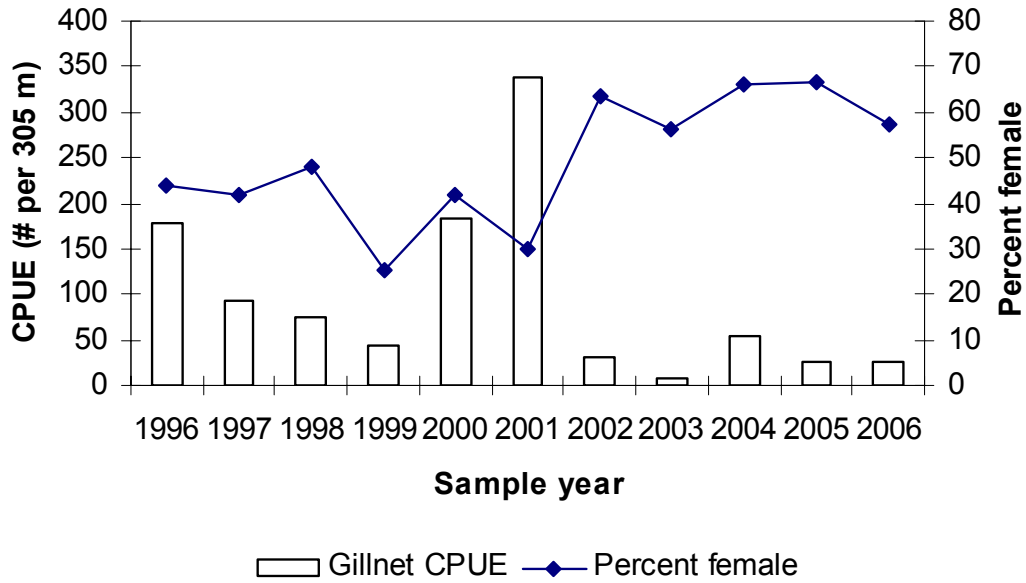


Figure 1. Adult yellow perch gill net catch-per-unit-effort and percent female in the catch at four southern Lake Michigan ports (Grand Haven, Saugatuck, South Haven, and St. Joseph, MI). (MDNR; data from April-June, 1996 – 2006.)

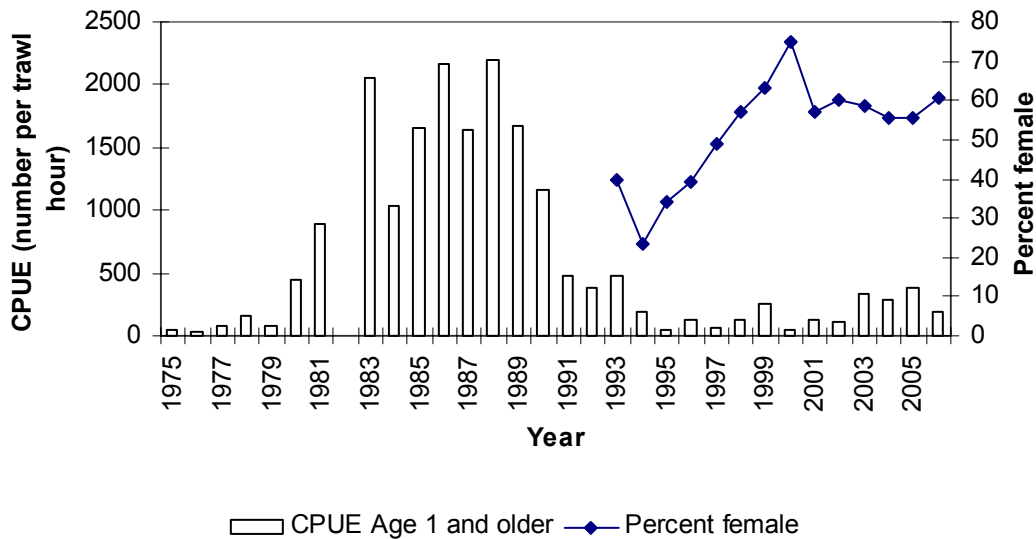


Figure 2. Adult yellow perch trawl CPUE and percent female in Indiana waters of Lake Michigan. (Ball State University; data from summer trawl survey at sites M and K in 1975 – 2006.)

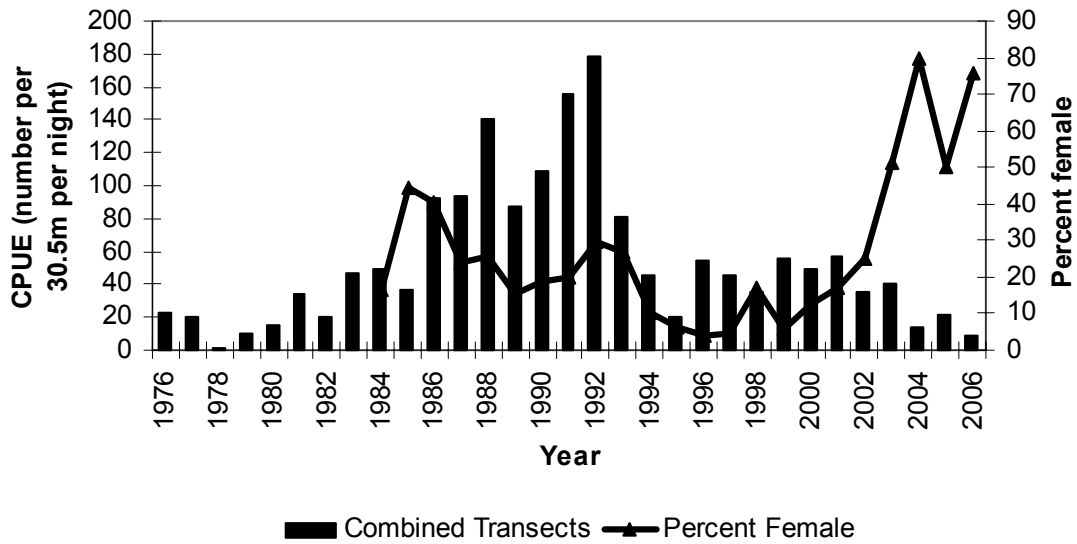


Figure 3. Adult yellow perch relative abundance and percent female in the Illinois waters of Lake Michigan. (ILDNR; data from spring gill net assessment, Chicago and Lake Bluff, IL, 1976 – 2006.)

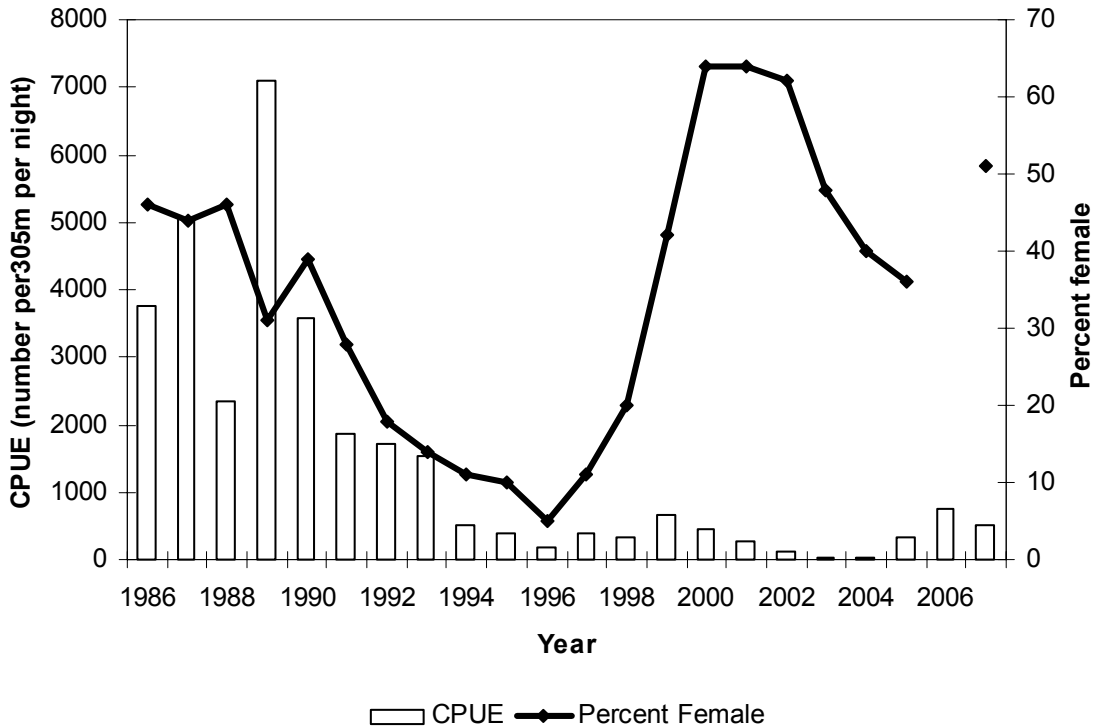


Figure 4. Adult yellow perch relative abundance and percent female in the Wisconsin waters of Lake Michigan. (WDNR; data from winter gill net assessment, Milwaukee, WI, 1986 – 2007. “Percent female” data not available for 2006.)



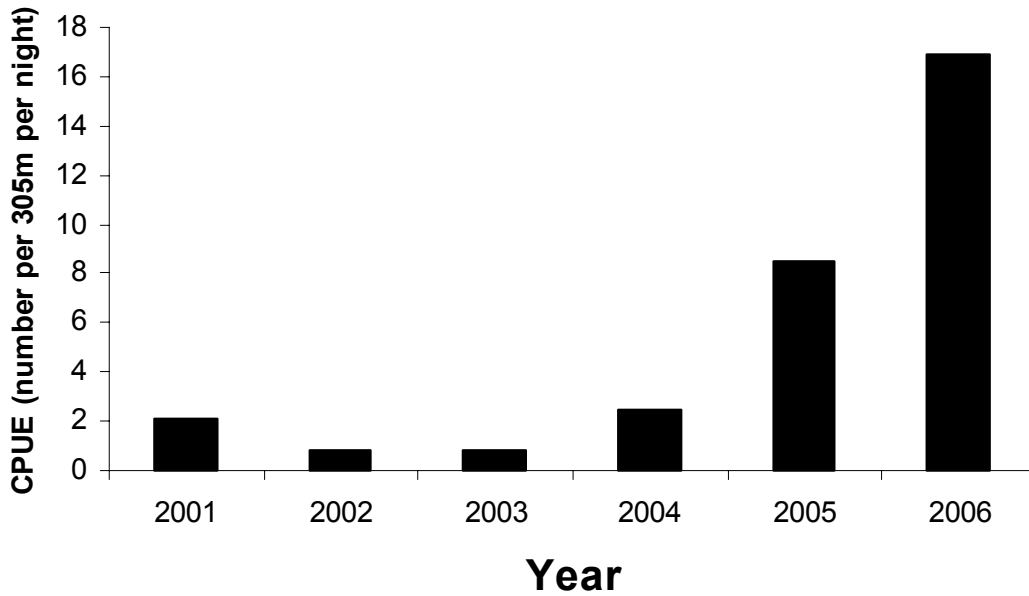


Figure 5. Adult yellow perch gill net catch-per-unit-effort in Little Traverse Bay. (LTBB; data from spring assessment, 2001 – 2006.)

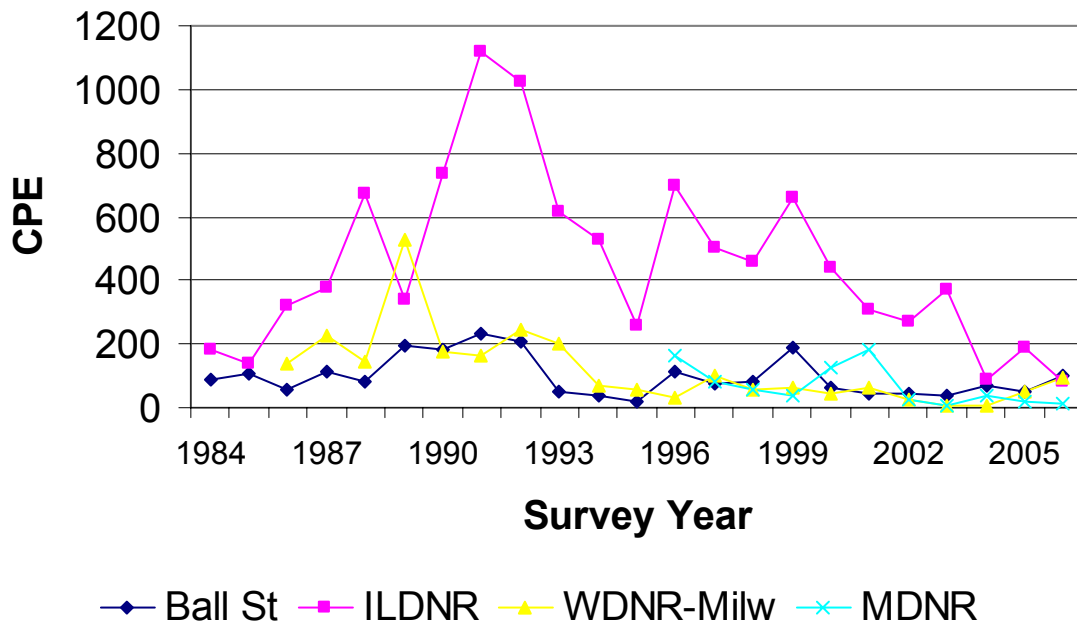


Figure 6. Yellow perch CPE (number of fish per 305 m) in graded mesh gill net consisting of equal length panels of 51mm, 64mm, and 76mm stretched mesh, 1984-2006. (Data from BSU, ILDNR, WDNR, and MDNR; 1997-2000 and 2002-2006 MDNR values calculated from 1996 and 2001 selectivity evaluations.)

## **Population Age Structure**

The yellow perch adult population age structure was determined by evaluating otoliths, opercles, or spines. Although differences in aging techniques and collection methods and times occur between agencies, assessments continued to show increasing recruitment and contribution to the adult population from the 2002-2003 year classes. Successful recruitment of the 2002 year class was apparent in gill net catches from Michigan (Figure 7), Illinois (Figures 9 and 10), and Wisconsin (Figure 11) waters. These data are indicative of successful reproduction by the relatively strong 1998 year class. Strong recruitment and continued survival of the 1998 year class (age 8) is particularly apparent in data collected in Michigan (Figure 7), Indiana (Figure 8), Illinois (Figure 9), and Wisconsin (Figure 11) waters of Lake Michigan.

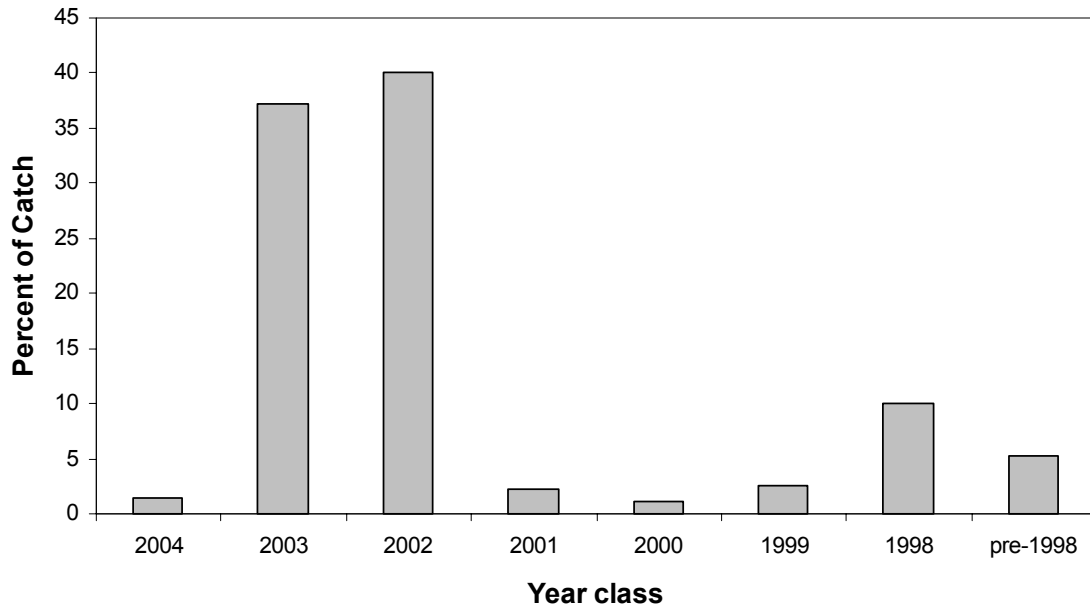


Figure 7. Yellow perch age structure from the Michigan waters of Lake Michigan. (MDNR data from spring gill net assessment, combined four southern Lake Michigan ports – Grand Haven, Saugatuck, South Haven, and St. Joseph, MI – 2006. Age determined using spines.)

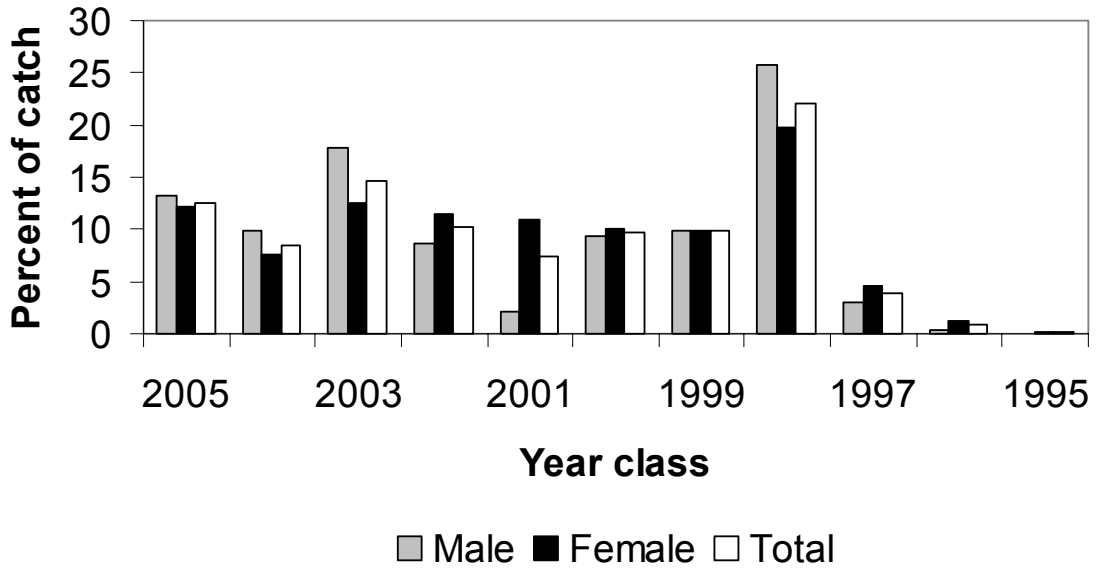


Figure 8. Yellow perch age structure from the Indiana waters of Lake Michigan. (Ball State University; data from summer trawl survey at sites M and K, Indiana, 2006. Ages determined using opercles.)

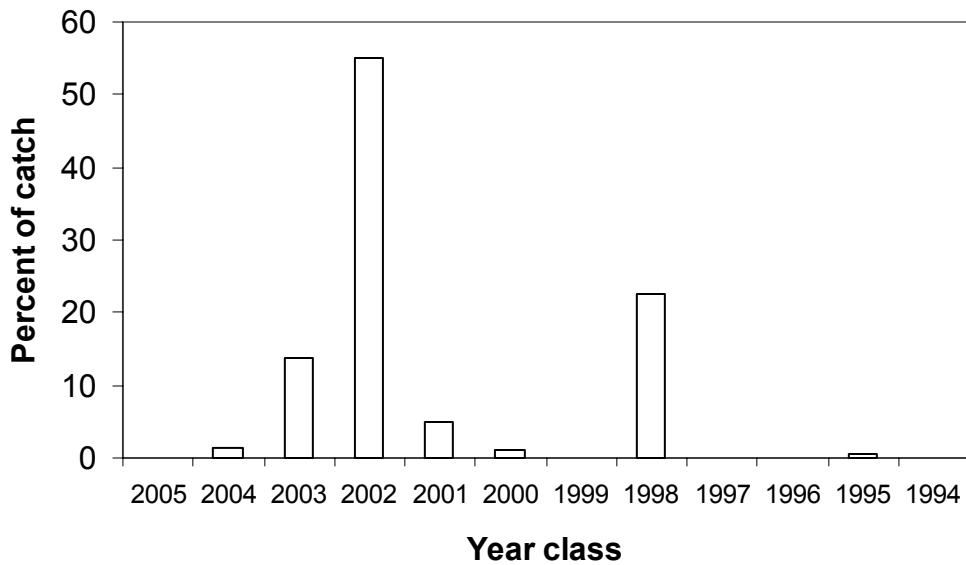


Figure 9. Yellow perch age structure from the Illinois waters of Lake Michigan. (ILDNR; data from spring gill net assessment, Chicago and Lake Bluff, IL, 2006. Ages determined using otoliths.)

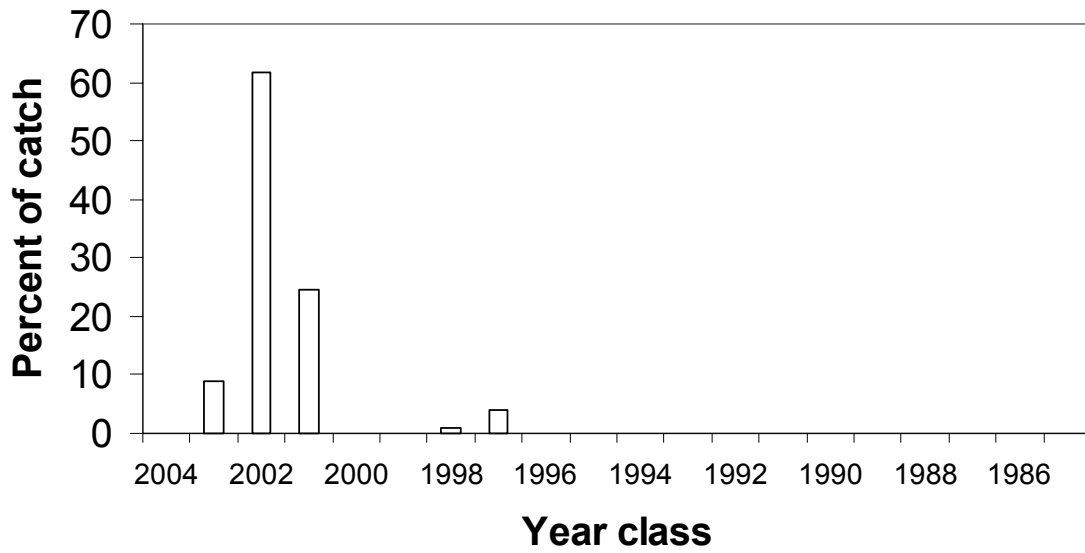


Figure 10. Yellow perch age structure from the Illinois waters of Lake Michigan. (INHS; data from spring fyke net sampling, Waukegan and Lake Bluff, IL, 2006. Ages determined using otoliths.)

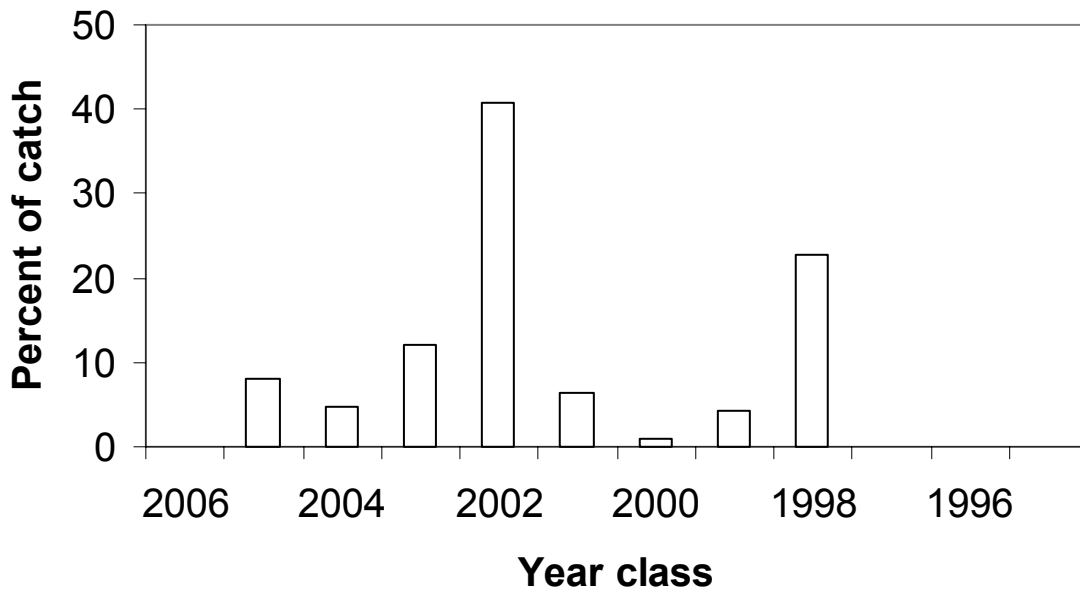


Figure 11. Yellow perch age structure from the Wisconsin waters of Lake Michigan. (WDNR; data from winter gill net assessment, Milwaukee, WI, 2007. Ages determined using spines.)

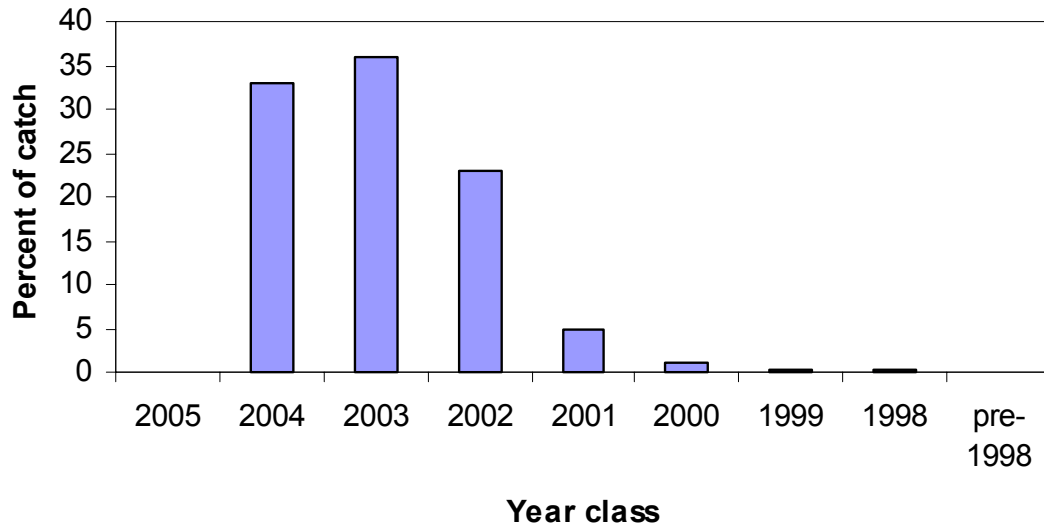


Figure 12. Yellow perch age structure from the Little Traverse Bay region of Lake Michigan. (LTBB; data from spring gill net assessment, 2006. Ages calculated from length frequency.)

### **Recruitment**

Having a reliable indicator of future inputs to an adult population is vital to understanding the dynamics of the fish population and helping predict changes in abundance. An early indicator of recruitment is most beneficial to managers. In Lake Michigan, indicators of yellow perch recruitment are collected using bottom trawls or beach seines. Recruitment of young-of-the-year (YOY, age-0) yellow perch in 2006 was significantly less than that observed in 2005; young-of-year production in 2005 was the highest in the time series for Michigan (Figure 13) and Wisconsin (Figure 17) waters of the main basin, and the highest in 16 years for Illinois (Figure 16) waters. Although less than the record levels observed in 2005, 2006 year class recruitment indices in Michigan were the second highest measured since 1998 (Figure 13), and better than (recent) average YOY production was also observed in Illinois waters (Figure 15).

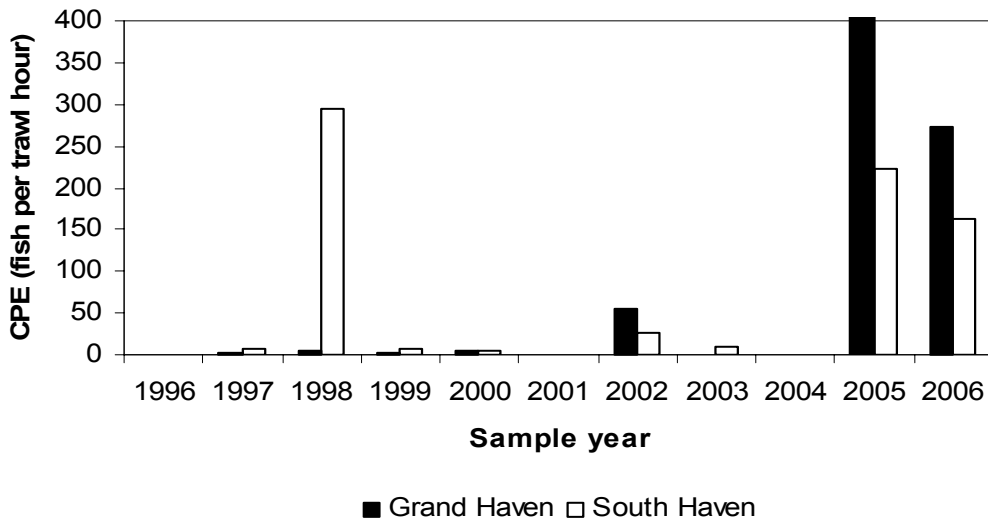


Figure 13. CPUE of age-0 yellow perch in the Michigan waters of Lake Michigan. (MDNR; late summer bottom trawl data from Grand Haven and South Haven, 1996 - 2006. Grand Haven was not sampled in 2003. CPUE at South Haven in 2005 = 2,070 fish per trawl hour.)

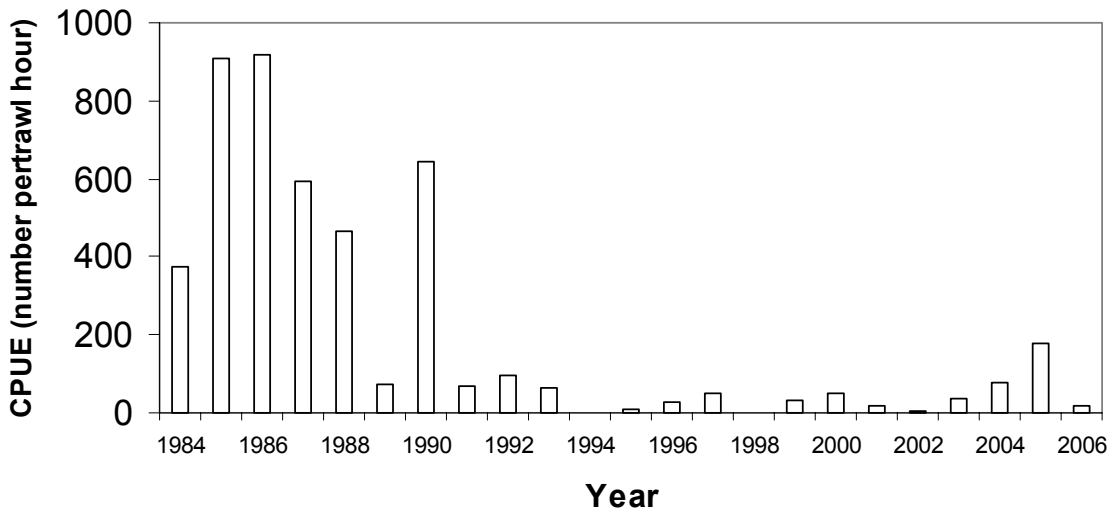


Figure 14. CPUE of age-2 yellow perch from the Indiana waters of Lake Michigan. (Ball State University; data from summer bottom trawl assessments, 1984 – 2006.)

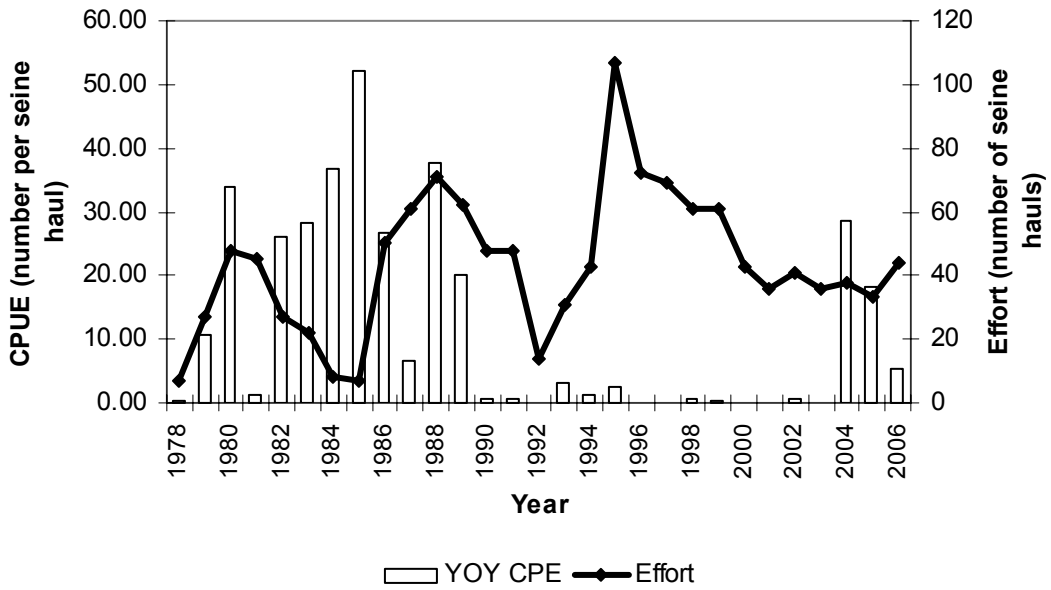


Figure 15. CPUE of YOY yellow perch from the Illinois waters of Lake Michigan. (ILDNR; data from summer beach seining along the Illinois shoreline, 1978 – 2006.)

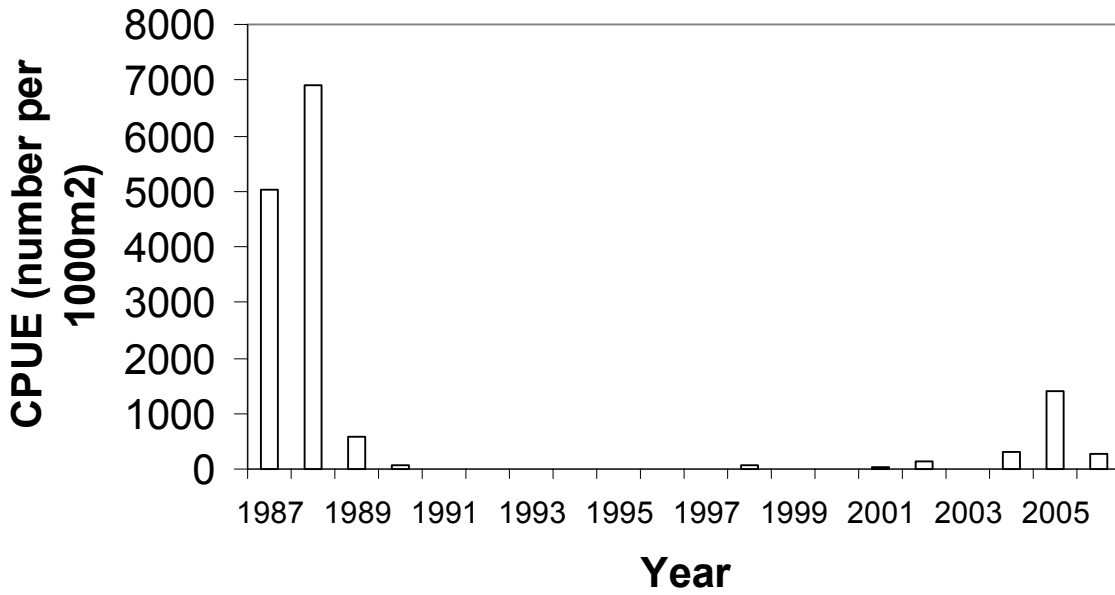


Figure 16. CPUE of age-0 yellow perch in the Illinois waters of Lake Michigan. (INHS; data from summer and fall bottom trawls off Waukegan, IL, 1987 – 2006.)

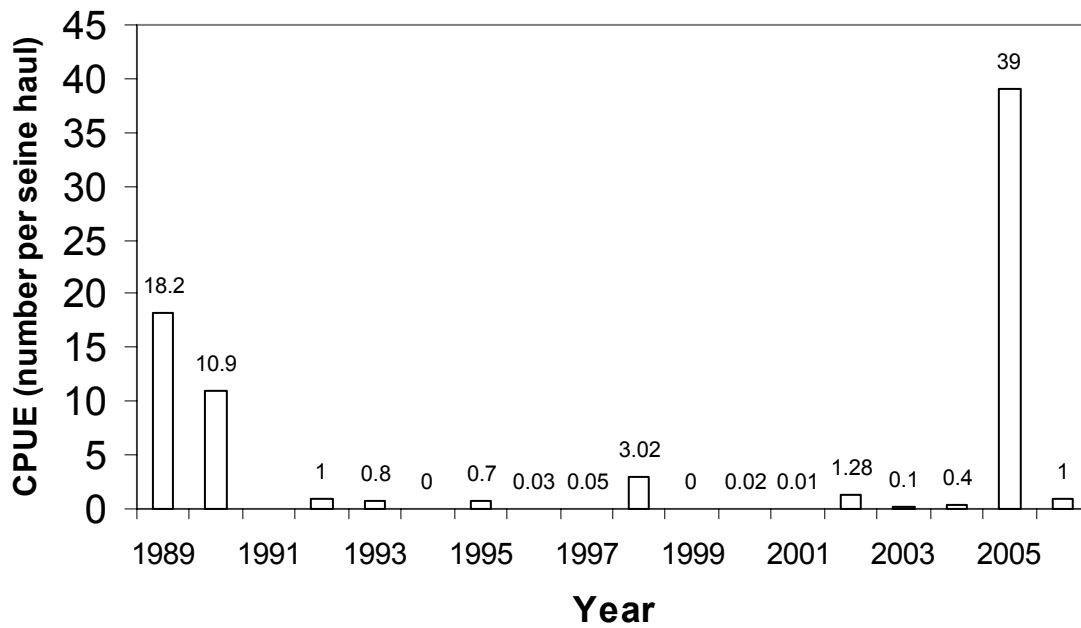


Figure 17. CPUE of age-0 yellow perch from the Wisconsin waters of Lake Michigan. (WDNR; data from summer beach seine assessments along the southern Wisconsin shoreline, 1989 – 2006.)



## **2007 Yellow Perch Harvest Restrictions**

### Sportfishing regulations:

- Illinois
  - July closed to sportfishing for yellow perch (exception: under 16 years of age – 10 fish bag limit)
  - Daily bag limit 15 fish
- Indiana
  - No closed season for yellow perch
  - Daily bag limit 15 fish
- Michigan
  - No closed season for yellow perch
  - Daily bag limit 35 fish (south of the 45<sup>th</sup> parallel)
- Wisconsin (Lake Michigan)
  - May 1 through June 15; closed to sportfishing for yellow perch
  - Daily bag limit 5 fish
- Wisconsin (Green Bay)
  - March 16 through May 19; closed to sportfishing for yellow perch
  - Daily bag limit 15 fish

### Commercial regulations:

- Illinois perch fishery remained closed
- Indiana perch fishery remained closed
- Michigan does not allow a commercial harvest (outside of 1836 Treaty waters)
- Wisconsin perch fishery remained closed (outside of Green Bay, where quota is 60,000 pounds)

## **Yellow Perch Task Group Progress Report**

The Yellow Perch Task Group (YPTG) was formally given four charges by the Lake Michigan Committee in May 2000, and an additional fifth charge in March 2003:

- 1. Develop a Lakewide Assessment Plan for yellow perch and associated fish species by formalizing the procedures utilized to achieve compatibility of information and to standardized sampling methodology for yellow perch;**
- 2. Formally summarize, in a GLFC report, a Fisheries article, or through other means, the work previously conducted by the Yellow Perch Task Group that addressed the original hypothesis set forward for yellow perch recruitment failure;**
- 3. Identify any additional work necessary to address the original hypotheses for yellow perch recruitment failure;**
- 4. Develop and implement a lakewide population model that describes the yellow perch population in Lake Michigan providing estimates of total abundance, age and size structure, and geographical distribution.**
- 5. Complete a review of assessment data collected during 2003, and advise the LMC about potential risks to Lake Michigan yellow perch populations if current harvest regulations are maintained.**

Charge #2 has been completed, as described in the 2006 Yellow Perch Task Group annual report (Makauskas and Clapp 2006). The following section of this report provides a brief summary of the progress made towards the completion of charges 1 and 3-5 during 2006-07.

**Charge #1: Lakewide Assessment Plan.** A Lakewide Assessment Plan being developed by the YPTG will formalize the standard procedures utilized to sample yellow perch throughout Lake Michigan. The yellow perch section of the Lakewide Assessment Plan will be appended to the plans previously developed for lake trout, burbot, Chinook salmon, and forage fish by the Lake Michigan Technical Committee. Work to address this charge is ongoing; this report addresses, in part, the charge to “achieve compatibility of information”.

During the winter 2006 YPTG meeting, member agencies agreed to implement standardized spring adult yellow perch assessments, to coincide with other LMTC spring lakewide assessments (for lake trout and burbot). In addition, “micromesh” gill nets will be used lakewide (beginning in summer 2007), to standardize assessment of young-of-year yellow perch production, especially in areas where standard trawl and seine surveys cannot be implemented due to habitat restrictions. Results of these standardized assessments will be presented in subsequent reports.

**Charge #3: Identify any additional work to address yellow perch recruitment failure.** 2006 marked the ninth year of the lakewide research initiative implemented by the Lake Michigan Management Agencies in 1997. The goal of this research effort is to identify likely causes for the lack of perch recruitment observed in Lake Michigan in the early 1990s. The Lake Michigan Yellow Perch Task Group has addressed several hypotheses that may be limiting the survival of yellow perch (see Clapp and Dettmers 2004 for a list of hypotheses and the work conducted to address the hypotheses). Scientific articles resulting from this work are continuing to be published (e.g.; Beletsky et al. 2004, Czesny et al. 2005, Dettmers et al. 2005, Fulford et al. 2006, Graeb et al. 2006, Janssen and Luebke 2004, Lauer et al. 2005, Marsden and Robillard 2004), and additional work to address questions related to recruitment of Great Lakes yellow perch is ongoing.

**Charge #4: Develop and implement a lakewide yellow perch population model.** During 2006-07, population modeling work has continued as part of an effort to develop decision analysis tools, and to apply these tools to evaluate harvest policies for yellow perch in the southern portion of the main basin of Lake Michigan. Statistical catch-at-age models were developed for each region (Wisconsin, Illinois, and Indiana-Michigan) of the Lake Michigan yellow perch fishery (Wilberg et al. 2005). Initially, Indiana and Michigan were combined due to a limited long-term data set from Michigan and insufficient commercial fishery data from Indiana. During 2006-07, Michigan State University researchers were able to incorporate new data and develop separate population models for Michigan and Indiana waters. In addition, USFWS personnel have provide assistance to WDNR biologists in continued development and refinement of a yellow perch population model for Green Bay waters (J. Netto, USFWS, personnel communication). A third decision analysis workshop was held in conjunction with the winter 2007 LMTC meeting in Des Plaines, Illinois (see “Task Group Meetings”, below).

**Charge #5: Complete a review of assessment data collected during 2003 and advise the LMC about potential risks to Lake Michigan yellow perch populations if current harvest regulations are maintained.** Work to address Charge #5 was described in the 2004 report of the Yellow Perch Task Group to the Lake Michigan Committee (Makauskas and Allen 2004). At that time, the Yellow Perch Task Group recommended retaining the current harvest regulations, pending additional analyses of available and subsequently-collected data. Agency members were in agreement to continue to have two YPTG meetings each year, focusing jointly on recruitment questions and implementation of a lake-wide management strategy for the Lake Michigan yellow perch fishery, utilizing annual assessments and modeling efforts. Recently-developed decision analysis tools will help to establish key reference points that signal needed changes in harvest regulation and will aid in providing a much-needed protocol for management decisions regarding the Lake Michigan yellow perch fishery. Semi-annual YPTG

meetings will result in regular status reports to LMC members, as well as management recommendations, as appropriate.

### **Task Group Meetings**

The spring 2006 meeting of the YPTG was held on March 28-29, 2006, at the Indiana DNR office in Michigan City. This meeting included the second decision analysis workshop led by researchers from Michigan State University (Bence, Jones, and Wilberg).

The winter 2006 meeting of the YPTG was held on December 5, 2006, also at the Indiana DNR office in Michigan City. Agenda items at this meeting included regulation criteria, standard assessment protocols, preparation of the annual report, and preparation for the January 2007 decision analysis workshop.

The third decision analysis workshop was held in conjunction with the winter 2007 LMTC meeting in Des Plaines, Illinois. A follow-up (technology transfer) meeting has been tentatively scheduled for October, 2007. A final presentation to the LMC will likely take place in conjunction with the summer 2007 LMTC meeting.

## References

- Beletsky, D., and six co-authors. 2004. Modeling the transport of larval yellow perch in Lake Michigan. Estuarine and Coastal Modeling, the 8th International Conference, November 3-5, 2003, Monterey, CA, p.439-454.
- Clapp, D.F., and J.M. Dettmers. 2004. Yellow perch research and management in Lake Michigan: evaluating progress in a cooperative effort, 1997-2001. Fisheries 29(11):11-19.
- Czesny, S.J., B.D.S. Graeb, and J.M. Dettmers. 2005. Ecological consequences of swim bladder noninflation for larval yellow perch. Transactions of the American Fisheries Society 134:1011-1020.
- Dettmers J. M., J. Janssen, B. Pientka, R.S. Fulford, and D.J. Jude. 2005. Evidence across multiple scales for offshore transport of yellow perch (*Perca flavescens*) larvae in Lake Michigan. Canadian Journal of Fisheries and Aquatic Sciences 62: 2683-2693.
- Fulford, R.S., J.A. Rice, T.J. Miller, F.P. Binkowski, J.M. Dettmers and B. Belonger. 2006. Foraging selectivity by larval yellow perch (*Perca flavescens*): implications for understanding recruitment in small and large lakes. Canadian Journal of Fisheries and Aquatic Sciences 63:28-42.
- Graeb, B.D.S., M.T. Mangan, J.C. Jolley, D.H. Wahl, and J.M. Dettmers. 2006. Ontogenetic changes in prey preferences and foraging ability of yellow perch: insights based on relative energetic return of prey. Transactions of the American Fisheries Society 135:1493-1498.
- Janssen, J., and M. Luebke. 2004. Preference for rocky habitat by young-of-the-year yellow perch and alewives. Journal of Great Lakes Research 30:93-99.
- Lauer, T.E., S.M. Shroyer, J.M. Kilpatrick, T.S. McComish, and P.J. Allen. 2005. Yellow perch length-fecundity and length-egg size relationships in Indiana waters of Lake Michigan. North American Journal of Fisheries Management 25:791-796.
- Makauskas, D., and D.Clapp. 2006. Status of Yellow Perch in Lake Michigan, and Yellow Perch Task Group Progress Report. Minutes of the Lake Michigan Committee.
- Marsden, J.E., and S.R. Robillard. 2004. Decline of yellow perch in southwestern Lake Michigan, 1987-1997. North American Journal of Fisheries Management 24:952-966.
- Wilberg, M.J., J.R. Bence, B.T. Eggold, D. Makauskas, and D. F. Clapp. 2005. Yellow perch dynamics in southwestern Lake Michigan during 1986-2002. North American Journal of Fisheries Management 25:1130-1152.

Appendix 1. Lake Michigan statistical districts.

