

Lake Michigan Committee
Milwaukee, WI
March 25, 1999
Agenda Item 9.

REPORT OF THE LAKE MICHIGAN TECHNICAL COMMITTEE

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

Status of Yellow Perch in Lake Michigan

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Northern Lake Michigan

Assessment data from this portion of the lake is sparse. Electrofishing was conducted in the fall (September) at night in Epoufette Bay from 1993 through 1998 by COTFMA. The resulting catches of yellow perch were predominantly young-of-the-year (YOY) fish less than 120 mm in total length. Yearly capture rates can be found in Figure 1. A total of 23 perch age 1+ or older were captured in 1998. The assessments were conducted to evaluate the survival and relative abundance of walleye and the associated fish community in the bay.

Central Michigan University conducted larval fish pushes and took zooplankton samples near Onkama, MI and in Crystal Lake MI in May, June, and July. Peak larval collections occurred on June 17 at both locations. YOY trawling and seining were also accomplished in July, August, and October. A few YOY were taken in Lake Michigan. YOY were more abundant in Crystal Lake. MDNR conducted larval tows at Charlevoix between July 1 and July 14. No yellow perch were collected. Peak larval alewife catches occurred between July 7 and 14. A limited number of adult alewife stomachs were collected concurrently with the larval sampling, but no larval fish were found in the stomachs. Zooplankton samples were also taken and have yet to be analyzed.

USGS-BRD did not capture any YOY perch in their bottom trawl tows at Manistique, Frankfort, and Sturgeon Bay in the fall of 1998.

Green Bay

Index station trawling continued in 1998 at the standard sites established in 1978 and the deep sites established in 1988. The deeper sites were developed as a result of a trend of increasing abundance of yellow perch observed at a single deep site (off Marinette) established in 1985. Standard and deep site information has been combined based on the amount of habitat they represent and an adjustment made for standard site information prior to 1988 to account for the increasing area of occupancy, creating a weighted area average value. The number of YOY yellow perch caught per trawl hour in 1998 (849) ranked it 6th in the past 21 years, since index sites were established in 1978. 1998 was above the median of 299 and mean of 843 (Figure 2). Trawl catches of yearling and older perch remained low in 1998 (Figure 3)

In 1998, YOY yellow perch assessment continued at the intensified level begun in 1997 with the participation and funding from Sea Grant. Sampling was conducted at least weekly at Little Tail Point from first hatching on April 29, through September 8th. There was an earlier spring warm up in 1998. Mean water temperatures at the mouth of the Fox River were 51.1 degrees F. in April and 68.3 degrees in May compared to 46.4 and 57.0 respectively in 1997. In 1998 peak spawning occurred on April 18, compared to April 27, in 1997. The first larval perch were captured on April 29 in 1998 and May 13 in 1997. Pelagic YOY perch ranging from 3 to 22 mm. total length were sampled by Light trap, Miller sampler, and Neuston net. Benthic YOY perch ranging from 8 to 120 mm. total length were sampled by survey seine and trawl. Peak larval abundance measured by Miller Sampler was higher and earlier in 1998. On May 14, the peak catch was 500 per ½ mile transect compared to 327 on June 9, in 1997; mean lengths were 9.2 and 8.9 mm respectively. In 1998, YOY abundance in benthic sampling was also higher than 1997. Peak seine abundance was 3,197 per haul compared to 803, while peak trawl abundance was 1,084 per trawl hr. compared to 269.

The Michigan DNR has employed both trawls and gill nets (1 to 4" stretched mesh gill net) to assess perch stocks in Little Bay de Noc (LBDN) and Big Bay de Noc (BBDN). In LBDN trawl catch rates of YOY perch were much higher in 1998(110.5/10 minute trawl) than in 1997(20/10 minute trawl). The 1998 catch rate was well above the mean catch rate for YOY perch from 1988 through 1998 (31.3/haul) (Figure 4). Trawl catch rates in BBDN for YOY perch increased from 20.8/10 minute trawl to 123.5/10 minute trawl. This is well above the 11 year mean of 63/10 minute trawl.

Central Lake Michigan

Assessment data for the central part of the lake is scarce. USGS-BRD did not collect any perch in their bottom trawl tows at Port Washington, WI or Ludington, MI in the fall of 1998.

Southern Lake Michigan

Considerable assessment activity has been conducted annually in the southern portion of the lake for a number of years by Illinois, Indiana, Wisconsin, and Michigan as well as several universities.

Adult Assessment

Catch per effort in the IL DNR spawning assessment (1.0 to 3.0" stretched mesh gill net) decreased slightly to 430 fish per 1000' of net per night (Figure 5). Approximately 63% of the perch captured were age-6 or older with age-10 (1988 yearclass) being the mode (31%). The 1995 year-class (age-3) comprised about 29% of the catch and the majority of the females. Males comprised about 83% of the assessment catch. INHS fyke nets captured over 5700 adult yellow perch in 1998. The 1988 year-class (age-10) made up 30% of the subsampled fish with the 1995 year-class (age-3) contributing 18%.

Michigan DNR gill net assessments (1.0 to 3.5" stretched mesh) at four southern ports (Grand Haven, Saugatuck, South Haven, and St. Joseph) had a combined CPE of 74 fish per 1000' per night in 1998 down

from 94 fish per 1000' per night in 1997 (Figure 6). Trawl catches of adult yellow perch also declined in 1998 (Figure 7). The overall sex ratio remained near 50:50 in 1998.

The Wisconsin DNR graded mesh gill net assessment in 1998 had (Table 1) Age-7 and older perch make up most of the catch. Males comprised 80% of the total catch.

Young -of-the-Year Assessment

Captures of YOY perch in the annual beach seine assessments in Illinois and Wisconsin remained low in 1998 (0.6 and 3.0 perch/seine haul, respectively) (Figures 8 and 9).

Illinois Natural History Survey (INHS) trawling for YOY perch resulted in poor capture rates (0.626 perch/1000m²). Trawling in the Indiana waters of Lake Michigan, Ball State University had much higher catches of YOY perch (629.8 perch/hour). This was the third highest level since 1975 (Figure 10). The Indiana DNR conducted a trawl assessment from late July to late September with a YOY CPE of 148/hour, much higher than 1997 (<2 YOY/hour). The Michigan DNR also conducted trawling in July and August of 1998 near Muskegon, Grand Haven, South Haven, and St. Joseph and had a trawl CPE of 164 YOY yellow perch, much higher than previous years (Figure 11). The University of Michigan, Center for Great Lakes and Aquatic Sciences found YOY perch in trawls off Muskegon and in seines off Muskegon, Port Sheldon, and South Haven.

No YOY Perch were collected in the USGS-BRD bottom trawling in fall of 1998(Figure 12).

Early Life Stages

Egg Mass Sampling: WDNR dive teams surveyed 2 transects near Green Can Reef off Milwaukee from June 3 - 10. No egg masses were found on the transects but egg masses were seen near trap nets set on Green Can Reef. INHS surveyed the abandoned US Steel intake line south of Waukegan, IL between May 14 and June 15. Eggs were only found on June 2, when 15 egg masses were observed. The egg masses were sampled and viability was determined to be 95%. INDNR conducted 4 dive surveys between May 26 and June 10. Seven egg masses were found. MDNR found no egg masses in sampling at Muskegon; poor weather limited sampling to 2 dives.

Larval Collections: INHS conducted neuston net tows for larval yellow perch between June 4 and July 9. A 2 x 1 m neuston net was towed at a speed of approximately 1.5 m•sec⁻¹ both day and night. Larval yellow perch were contained in all samples collected at night between 04 June and 19 June; highest density of yellow perch larvae occurred on 10 June (11 larvae •100 m⁻³). Samples collected at night had greater numbers of yellow perch larvae than samples collected during the day at the same sites. Zooplankton collections were made at the time of larval collections. INDNR conducted push net and neuston net samples from June 4 to July 20. Identification of larval fishes from these collections is not yet complete. Zooplankton collections were also taken. The University of Michigan, Center for Great Lakes and Aquatic Sciences conducted neuston net and push net samples off Port Sheldon, Muskegon, and Grand Haven.

Alewife Predation on Yellow Perch Larvae:

The INHS collected 61 adult alewife concurrent with larval sampling on June 10 and 19. One unidentifiable larval fish was found in one adult alewife. INDNR collected adult alewife on 3 dates between June 8 and June 22. No larval fish were found in stomachs in 1998.

Lakewide Tagging Project

A total of 12,523 adult yellow perch were tagged in Lake Michigan and Green Bay during the 1998 spawning season (Table 2). Tagging occurred at 21 sites: Illinois (6 sites), Indiana (2 sites), southern Green Bay (4 sites), Michigan (6 sites), and Wisconsin (3 sites). Approximately 47,400 yellow perch have been tagged since 1996. To date, 9.4% (1,272) of the yellow perch tagged during 1996 have been recaptured;

6% and 3% for 1997 and 1998, respectively. Commercial catch accounted for 52% of the recaptured yellow perch in Green Bay during 1997 and 1998; 35% of the recaptures were by the Wisconsin DNR and 13% by sport anglers. For Lake Michigan, agency catches accounted for the majority of recaptures (84%), with 16% of the recaptures coming from sport anglers. One yellow perch, tagged in Illinois, was recaptured in Green Bay; no yellow perch that were tagged in Green Bay have been recaptured outside of Green Bay.

1998 Yellow Perch Harvest Restrictions

Following the harvest restrictions imposed by the four Lake Michigan states in 1995, 1996, and 1997, there were no regulation changes in 1998:

Sportfishing regulations:

1. Illinois continued the closed season for perch in June with a 15 perch daily bag limit with an 8 to 10 inch slot limit the rest of the year. Perch less than 8 inches or greater than 10 inches must be released immediately.
2. Indiana continued to have June open for sportfishing with a 15 perch daily bag limit.
3. Michigan continued to have June open and a daily bag of 35 perch.
4. Wisconsin maintained the June closure and daily bag limit of 5 perch.

Commercial regulations:

1. Illinois perch fishery remained closed.
2. Indiana perch fishery remained closed.
3. Michigan does not allow a commercial harvest.
4. Wisconsin perch fishery remained closed.

Yellow Perch Task Group Progress Report

Multi-Agency Research Initiative

Pre-demersal survival and alewife predation on larval perch.

1998 marked the second year of the lakewide research initiative implemented by the Lake Michigan Management Agencies in 1997. Table 3 summarizes research activities conducted in 1998 by agency/institution. Activities planned for 1999 are summarized in Table 8. The majority of activities planned for 1998 were conducted, however, weather and time constraints precluded or reduced some sampling effort. Results from this component of the research initiative are discussed in the status section of this report along with the assessment data.

Reproductive indicators in yellow perch - Candy Schrank of the Wisconsin DNR is analyzing and comparing yellow perch from Lake Michigan and Lake Mendota (near Madison, WI) for a number of parameters including GSI, blood, plasma VTG, gonad histopathology, plasma protein, and liver enzyme

activity. The purpose of this study is to obtain information on the spawning or reproductive status of yellow perch from Lake Michigan as well as information on the health of the fish and their sex organs. Samples of ovaries, testes, blood and liver were taken from perch from Lake Michigan and Lake Mendota during winter 1996, spring 1997, and fall 1997. These samples were then examined to determine the reproductive status and health of the fish. Follow-up sampling of Lake Michigan perch during the spring 1998 spawning season was also conducted to look at variation by year in selected parameters. Statistical analyses are being conducted to look at how the health data varies with sex, age and reproductive status of the fish in addition to differences between sites. Also, abnormalities and differences in micro-structure (appearance of a cross section of tissue under a microscope) were detected and are being tallied. Further detail and final results and differences between the two sites should be completed this year.

Early life history - Fred Binkowski, University of Wisconsin-Milwaukee-Water Institute conducted laboratory trials to compare the performance of early life stages of perch derived from Lake Michigan (Milwaukee), Green Bay, Lake Ontario, and Lake Mendota spawning populations. Preliminary results indicate:

- average egg fertility rate was above 95% for all groups
- estimated hatching success was between 37% - 67%
- observed first-feeding for all groups was between 2-4 days post hatch; the Green Bay group exhibited first-feeding at 2 days (early first food acceptance is a good indicator of healthy fish)
- estimated survival to 42 days post-hatch was between 5%-13% with Green Bay at 13%

Several new research projects funded by the Sea Grant Programs from Michigan, Wisconsin and Illinois-Indiana began in 1998. These projects both complement and expand upon the multi-agency initiative. The Sea Grant Programs are providing a total of \$375,000 to support the following projects and principal investigators:

- RECRUITMENT DECLINE OF YELLOW PERCH IN GREEN BAY, LAKE MICHIGAN: EVALUATION OF ENVIRONMENTAL INFLUENCES AND PREDATION - Fred Binkowski (Univ. of WI-Milwaukee), Clifford Kraft (Univ. of WI-Green Bay), and Brian Belonger (WDNR);
- RECRUITMENT MECHANISMS IN YELLOW PERCH (*Perca flavescens*): INTERACTIONS AMONG GROWTH, CONDITION AND PREDATION - Fred Binkowski (Univ. of WI-Milwaukee), Thomas Miller (Univ. of Maryland-Solomons), James Rice (North Carolina State Univ.-Raleigh), and Larry Crowder (North Carolina State Univ.-Raleigh) (4 year study);
- RECRUITMENT FAILURE OF YELLOW PERCH IN LAKE MICHIGAN: EVALUATION OF THE STARVATION AND PREDATION HYPOTHESES - David Jude (Univ. of MI - Center for Great Lakes and Aquatic Sciences), John Janssen (Loyola Univ.).

Progress reports on each of these studies will be presented at the next Yellow Perch Task Group meeting later this month.

Genetics Study - DNA-BASED MARKERS FOR ASSESSMENT OF GENETIC POPULATION STRUCTURE IN YELLOW PERCH - Anne Kapuscinski and Loren Miller, Univ. of Minnesota

An understanding of the stock structure and movements of perch in the lake will likely dictate what management actions are necessary to maximize recovery of the fishery. However, little is definitively known about the population structure of yellow perch. Prior genetic studies found very little population structure across broad geographic regions (allozyme and mitochondrial DNA).

In 1998 a genetics study was co-funded by the GLFC (Coordination Fund of the CLC) and the USFWS (Great Lakes Fish and Wildlife Restoration Act). The purpose of the study was to assess various

microsatellite DNA markers for their ability to detect population structure among the yellow perch populations in Lake Michigan. Microsatellites are regions of repetitive nuclear DNA (e.g. ACACAC...) subject to high rates of mutation, which often leads to high levels of variability. The researchers have developed a set of 12 microsatellite markers for yellow perch. Nine of the 12 microsatellites were subsequently found to be variable in at least one of the ten populations analyzed (Green Bay, Milwaukee, Zion-IL, Grand Traverse Bay, Baileys Harbor and five other sites outside Lake Michigan). Further analysis indicated that the polymorphic markers had from 2 to 6 or more alleles. This initial screening verified the suitability of these markers for assessing population structure in Lake Michigan yellow perch. The next step is to determine whether or not it exists.

These researchers are currently preparing pre-proposals to conduct the next phase of the study.

New research proposals - Several new research proposals have been developed and submitted for funding by task group members in 1999.

The influence of upwellings and downwellings on the recruitment of Lake Michigan pelagic fishes (Dave Jude, Univ. of MI-CGLAS and John Janssen, Loyola Univ.) includes investigations on the movement of larval perch during these events and subsequent effects on their growth and survival.

Spatial-temporal dynamics of alewife-larval yellow perch interactions in Lake Michigan: implications for yellow perch recruitment (Doran Mason, Purdue Univ. and John Dettmers, INHS) will attempt to quantify the time varying spatial distribution, abundance and overlap of alewife and larval perch from spring to mid-summer relative to environmental factors. Ultimately, they hope to develop a model for alewife-yellow perch interactions for southern Lake Michigan and a statistical model that predicts the timing of alewife inshore migration based on environmental conditions.

Mechanisms affecting recruitment of yellow perch in Lake Michigan (John Dettmers-INHS, Doran Mason-Purdue Univ., Scott McNaught-Central Michigan Univ., Dave Jude-Univ. of MI-CGLAS, and John Janssen-Loyola Univ.) will conduct fieldwork, lab work and experiments to quantify the potential impact of larval perch predators such as alewife, resource limitations (food), and upwelling on recruitment of yellow perch. This information, when compiled with the results of other on-going studies, will lead to the development of regression models that predict yellow perch year class strength.

Task Group meetings

1. The task group met on October 16, 1998 at Des Plaines, IL to report on 1998 fieldwork and discuss the results in comparison to 1997. The meeting was well attended and provided some new insight with regard to sampling techniques and effectiveness. Reports were presented by each task group member with regard to the activities they conducted.
2. The next meeting of the task group is scheduled for March 26-28, 1999 at Muskegon, Michigan in preparation for the upcoming field season. This will be a joint meeting with the Sea Grant funded researchers listed above. Michigan Sea Grant is hosting the meeting and arrangements were made by Dave Jude, Univ. of Michigan-CGLAS.

Table 1. Catch per Effort by age (fish/1000ft/night), and percent of each sex of yellow perch caught in standardized assessment graded mesh gill net sets conducted in January each year, WDNR, Lake Michigan Work Unit.

Age	Year												
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	343	269	464	626	724	159	49	60	0	0	0	3	2
3	2662	526	453	1854	1037	865	276	98	25	0	0	13	6
4	368	3580	386	1012	938	323	715	402	58	28	0	6	29
5	134	541	701	1563	394	327	281	757	218	65	0	14	35
6	236	71	324	1880	381	83	181	165	141	120	19	55	18
7	13	72	12	155	90	82	126	49	48	76	51	194	43
8	1	3	3	1	0	32	73	16	11	65	71	83	110
9	0	0	0	0	0	0	14	0	0	24	31	9	61
10	0	0	0	0	0	0	0	0	0	2	12	0	15
11	0	0	0	0	0	0	0	0	0	0	3	0	4
%Male	54	56	56	69	61	72	82	86	89	90	95.2	89	80
%Female	46	44	44	31	39	28	18	14	11	10	4.8	11	20

Table 2. Number of yellow perch tagged during 1996-1998 in Lake Michigan and Green Bay.

Location	1996	1997	1998
Illinois	13,462	8,482	4,902
Indiana		2,950	620
Grand Traverse Bay		32	
Green Bay		1,844	2,314
Michigan		3,292	3,369
Wisconsin		5,153	1,318
all sites	13,462	21,753	12,523

Table 3. 1998 Multi-agency yellow perch research initiative - activity summary.

	Egg sampling	Larval perch	Post-lar. perch	YOY perch	Hist. data correl.	Alewife monitor./ stomachs	Zooplank sampling	Perch tagging
BALL STATE Indiana				X	X 1 site			
IN DNR Mi. City	X	X	X	X		X	X	X Mi. City Burn Hbr (620)
CGLAS Pt. Shel. S. Haven		X G. Haven Muskegon	X	X				
CMU Fr'fort Onkama		X		X		X	X	
MDNR E. Lake Michigan	X Muskegon	X Charlevoix		X Charlevoix G. Haven S. Haven St. Joe.			X	X St. Joe. Onkama (3,369)
MDNR Bays de noc				X 2 sites trawl				
IL DNR SW Lake Michigan				X 6 sites seine				
INHS Waukegan	X	X	X	X		X	X	X 6 sites (4,902)
Loyola Univ. Chgo.		X	X					
WDNR- G. Bay L. Tail Pt.	X	X	X	X		X	X	X (2,314)
WDNR- L. Mich. Milwau.	X			X 21 sites seine				X (1,318)
UWM- CGL Milw. (Lab)	egg viab. hatch success	X devel. growth survival	devel. growth survival	growth survival sex ratio				
USGS- BRD Lakewide				X 7 trawl sites				

'X' indicates activity was conducted in 1998.

Table 4. 1999 Multi-agency yellow perch initiative - Planned research activities

	Egg sampling	Larval perch	Post-lar. perch	YOY perch	Hist. data correl.	Alewife monitor./ stomachs	Zooplank sampling	Perch tagging
BALL STATE Indiana				X	X 1 site			
IN DNR Mi.City	X	X	X	X	X	X	X	X (3,000)
CGLAS Pt. Shel. S. Haven		X 2 sites	X 2 sites	X 2 sites	X	X 2 sites	X 2 sites	
CMU Fr'fort Onekama		X Pl. Bay Frankf.		X Pl. Bay Onekama		X Pl. Bay	X Pl. Bay	X Onekama (2,000)
MDNR E. Lake Michigan	X 2 ports	X 2 ports	X 2 ports	X 4 ports (trawl)	X	X 2 ports	X 2 ports	X GH-Mus. St. Joe. (5,000)
MDNR Bays de Noc				X 2 sites (trawl)				
IL DNR SW Lake Michigan				X 6 sites (seine)				
LOYOLA UNIV. Chicago		X	X	X		X	X	
INHS Waukegan	X	X	X	X	X	X	X	X 8 sites (9,000)
WDNR- G. Bay L.Tail Pt.	X	X	X	X	X	X	X	X 1site (3,000)
WDNR- L. Mich. Milwau.	X			X 22 sites (seine)		X	X	X 2 sites (5,000)
UWM- GLWI (Lab)	egg viab. hatch success	devel. growth survival	devel. growth survival	growth survival sex ratio			X	
USGS- BRD Lakewide				X 7 sites (trawl)				

'X' indicates activity is planned for 1999.

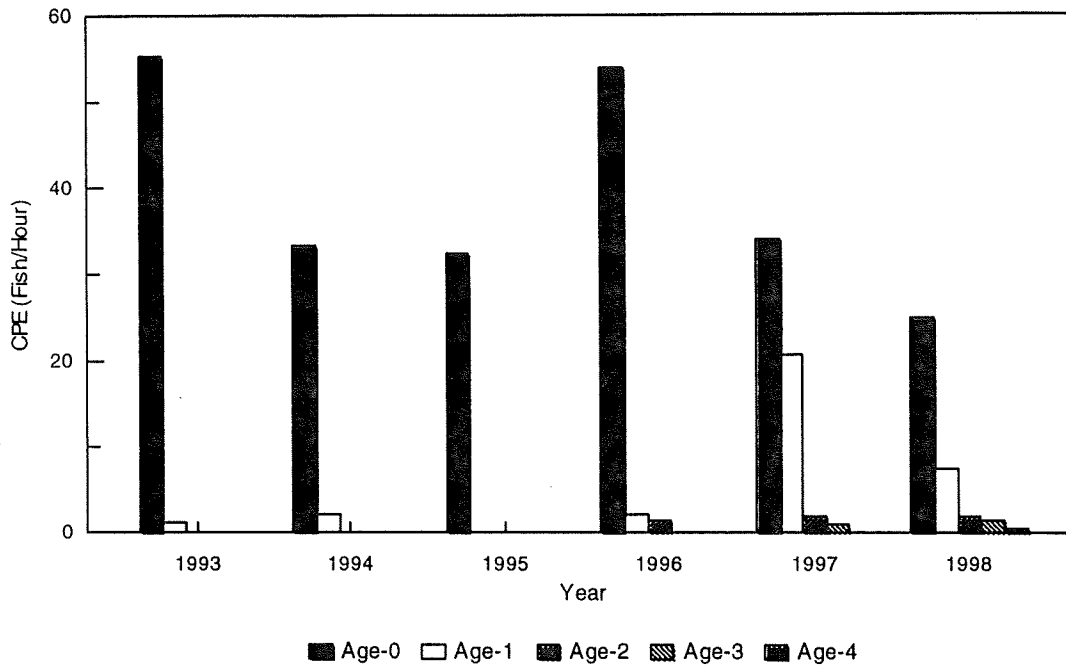


Figure 1. Catch per unit effort (fish/hr) of yellow perch during night-time electrofishing in Epoufette Bay during September 1993 - 1998.

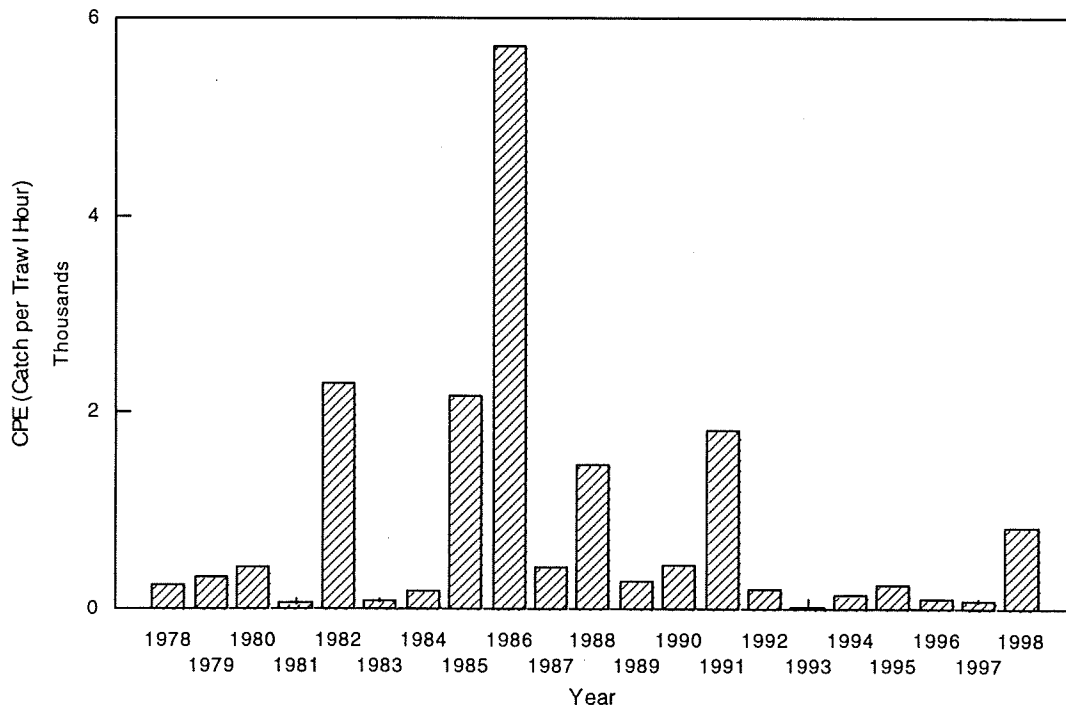


Figure 2. Trawl index of relative abundance (fish/hr) of young-of-the-year yellow perch (weighted area average) from the Wisconsin waters of Green Bay 1978 - 1998.

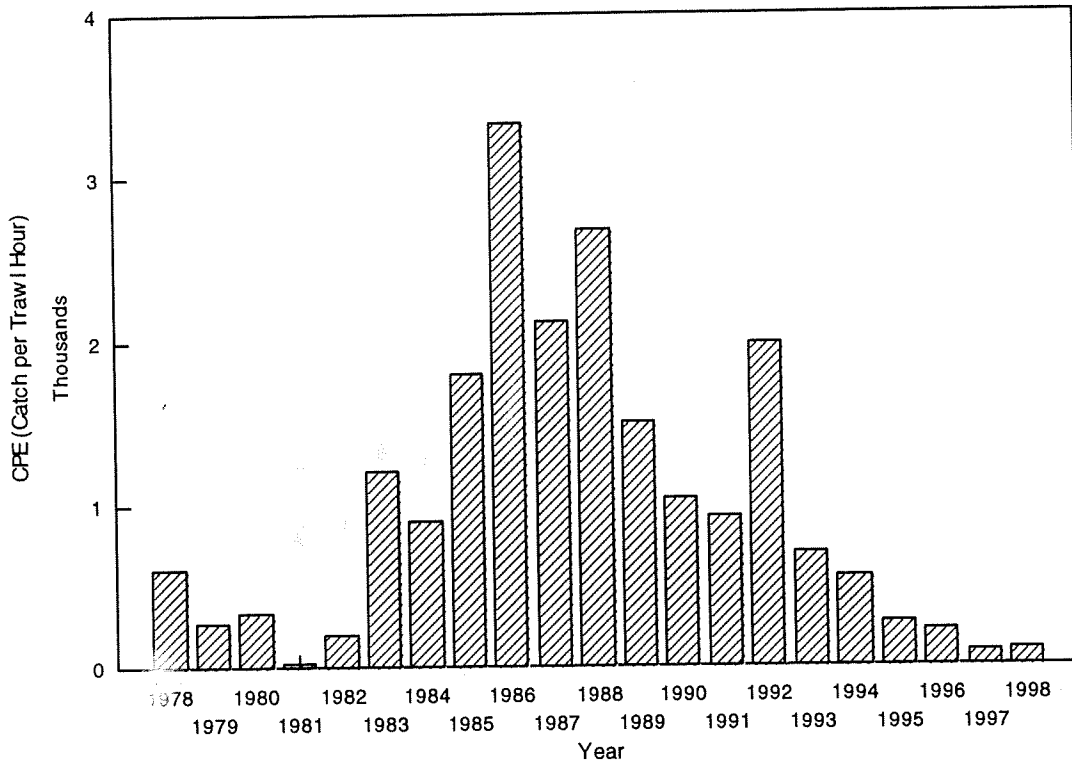


Figure 3. Trawl index of relative abundance (fish/hr) of yearling and older yellow perch (weighted area average) from the Wisconsin waters of Green Bay 1978 - 1998.

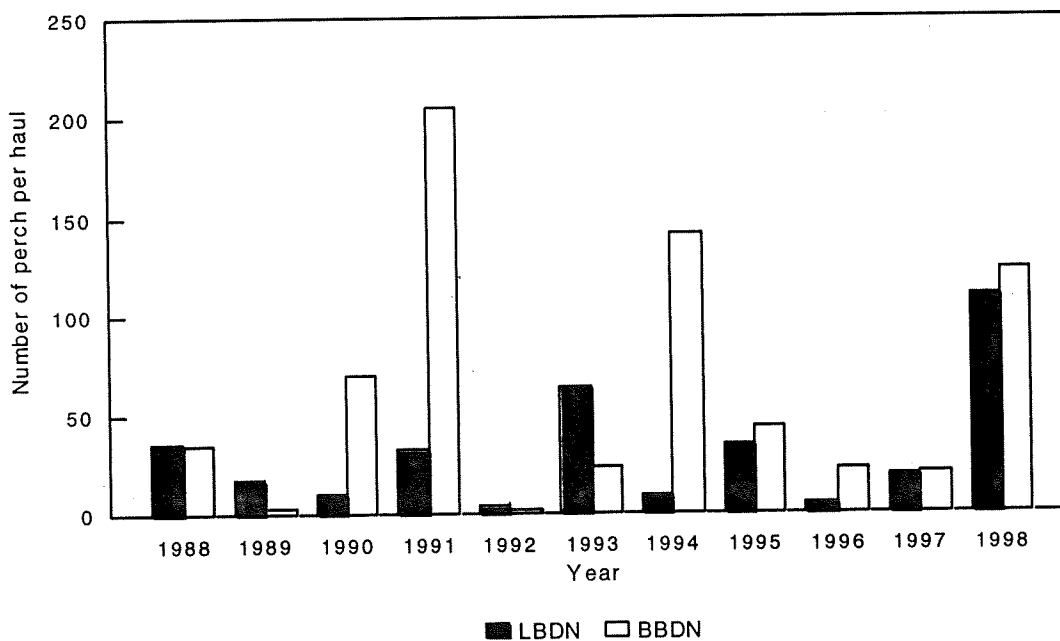


Figure 4. Catch per effort for yellow perch <3.5" in 10-minute trawl hauls in Little Bay De Noc (LBDN) and Big Bay De Noc (BBDN), MI. 1988 -1998.

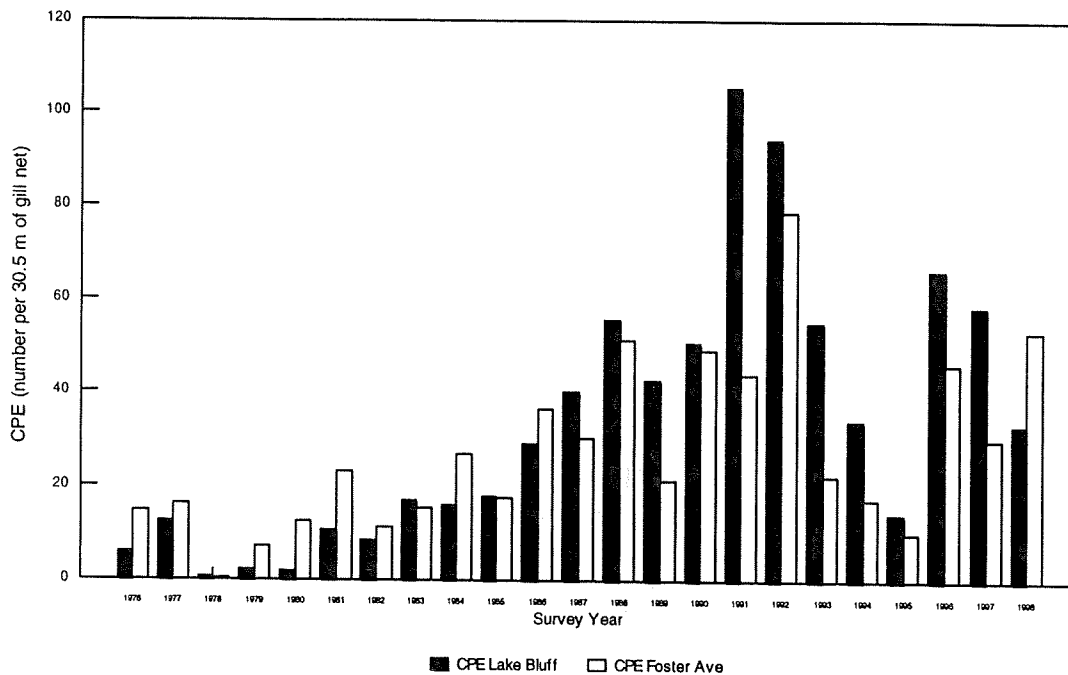


Figure 5. Catch per effort in graded mesh gill nets (1.5" - 3.0") for the Illinois waters of Lake Michigan 1976 - 1998.

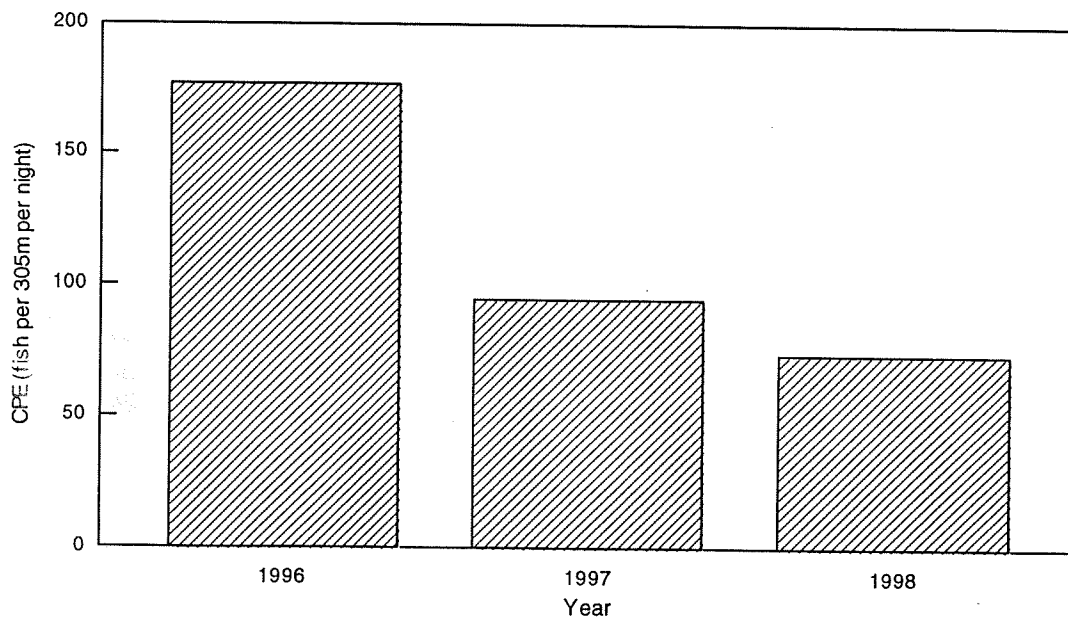


Figure 6. Adult yellow perch gill net catch-per-unit-effort (# per 1,000 of net per night) at four southern Lake Michigan Ports (Grand Haven, Saugatuck, South Haven, and St. Joseph) April 1996 - 1998. Values are for samples from the four ports combined.

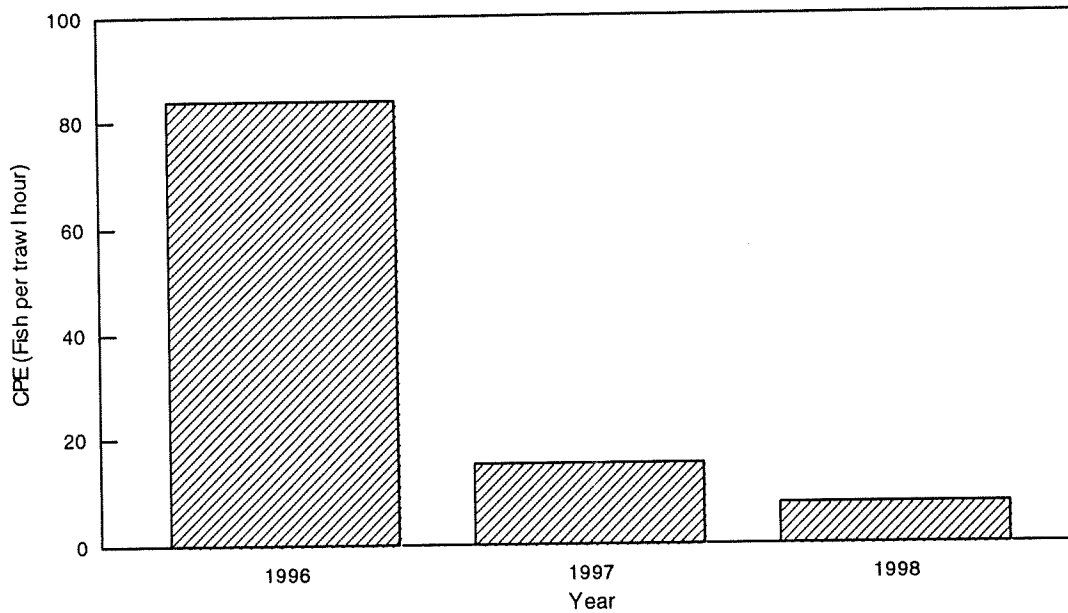


Figure 7. Age 1 and older yellow perch trawl catch-per-unit-effort (# per trawl hour) at three Lake Michigan ports (Grand Haven, South Haven, and St. Joseph); values are for samples from all ports and samples combined. Age class determinations are based on length frequency analysis.

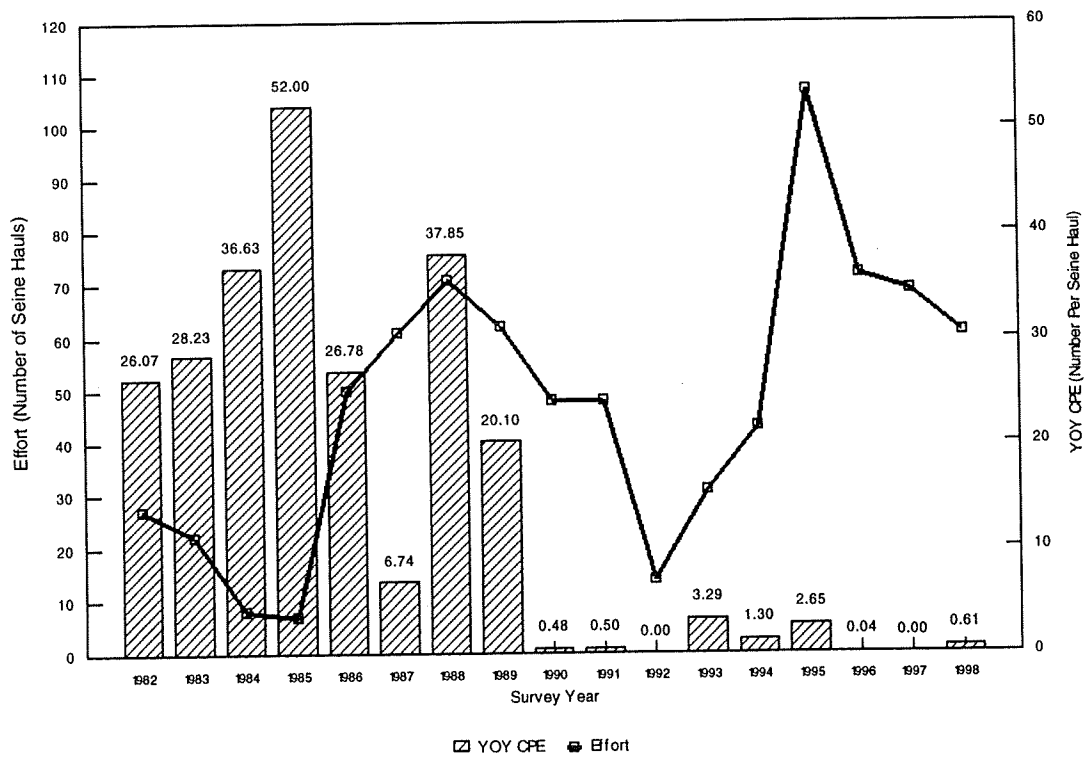


Figure 8. Young-of-the-year (YOY) yellow perch catch per effort and effort for beach seining along the Illinois shoreline of Lake Michigan 1982 - 1998.

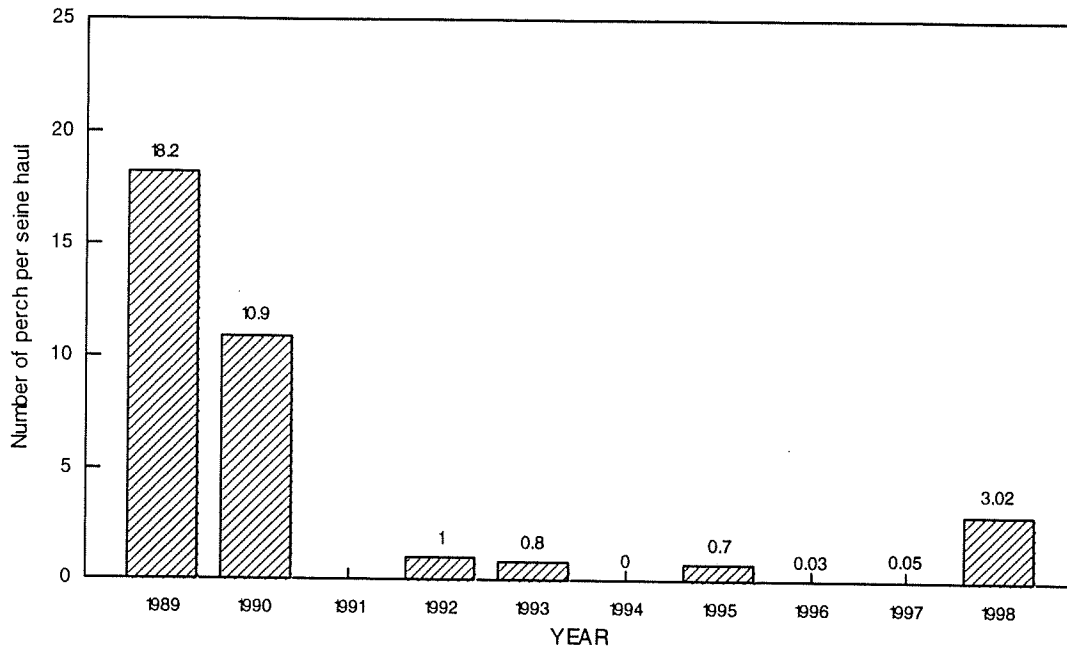


Figure 9. Young-of-the-year yellow perch catch per effort for the Wisconsin waters of southern Lake Michigan 1989 - 1998.

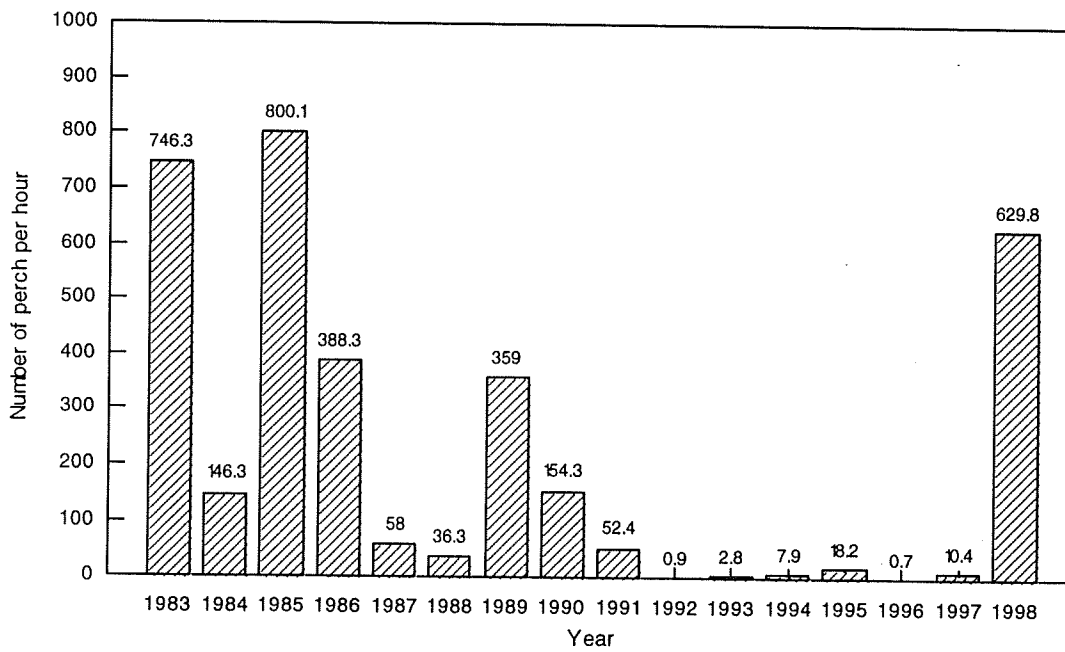


Figure 10. Trawl catch per effort for young-of-the-year yellow perch from the Indiana waters of Lake Michigan 1983 - 1998.

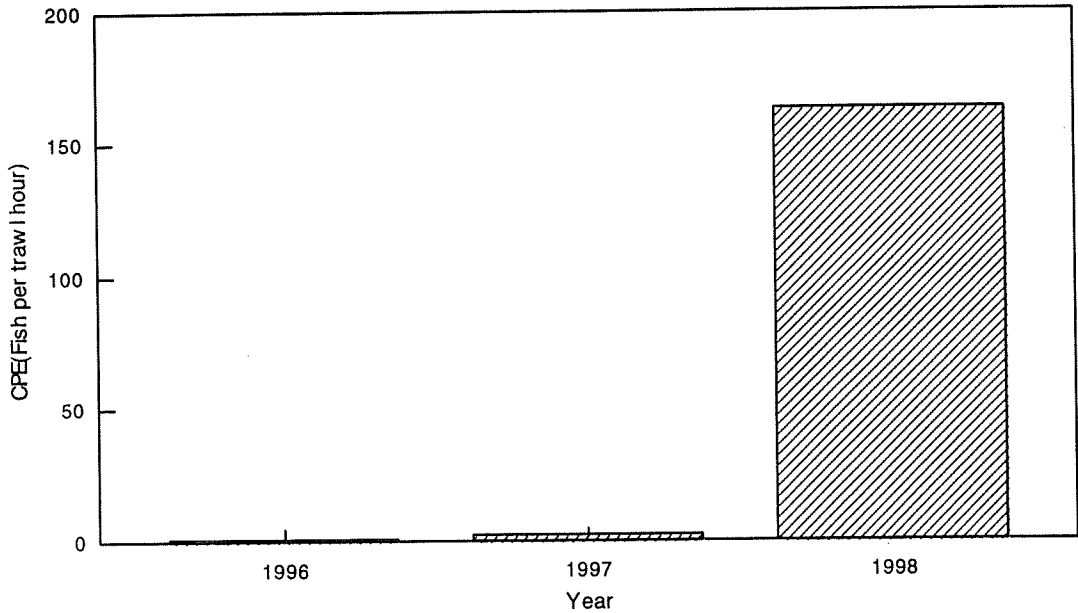


Figure 11. YOY yellow perch trawl catch-per-unit-effort (# per trawl hour) at three Lake Michigan ports (Grand Haven, South Haven, and St. Joseph); values are for samples from all ports and samples combined. Age class determinations are based on length frequency analysis.

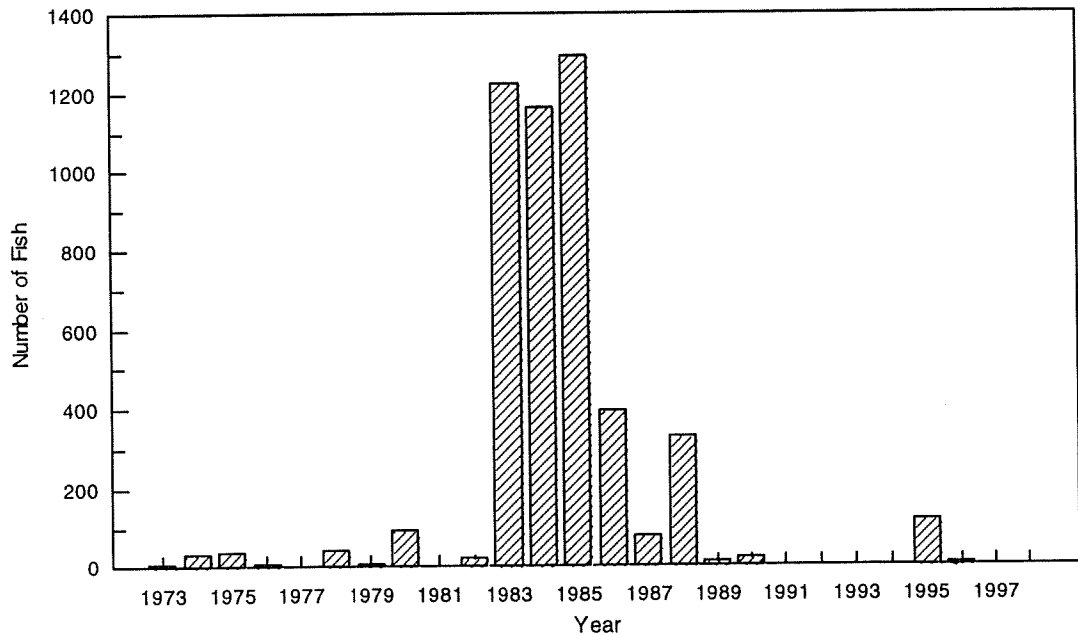
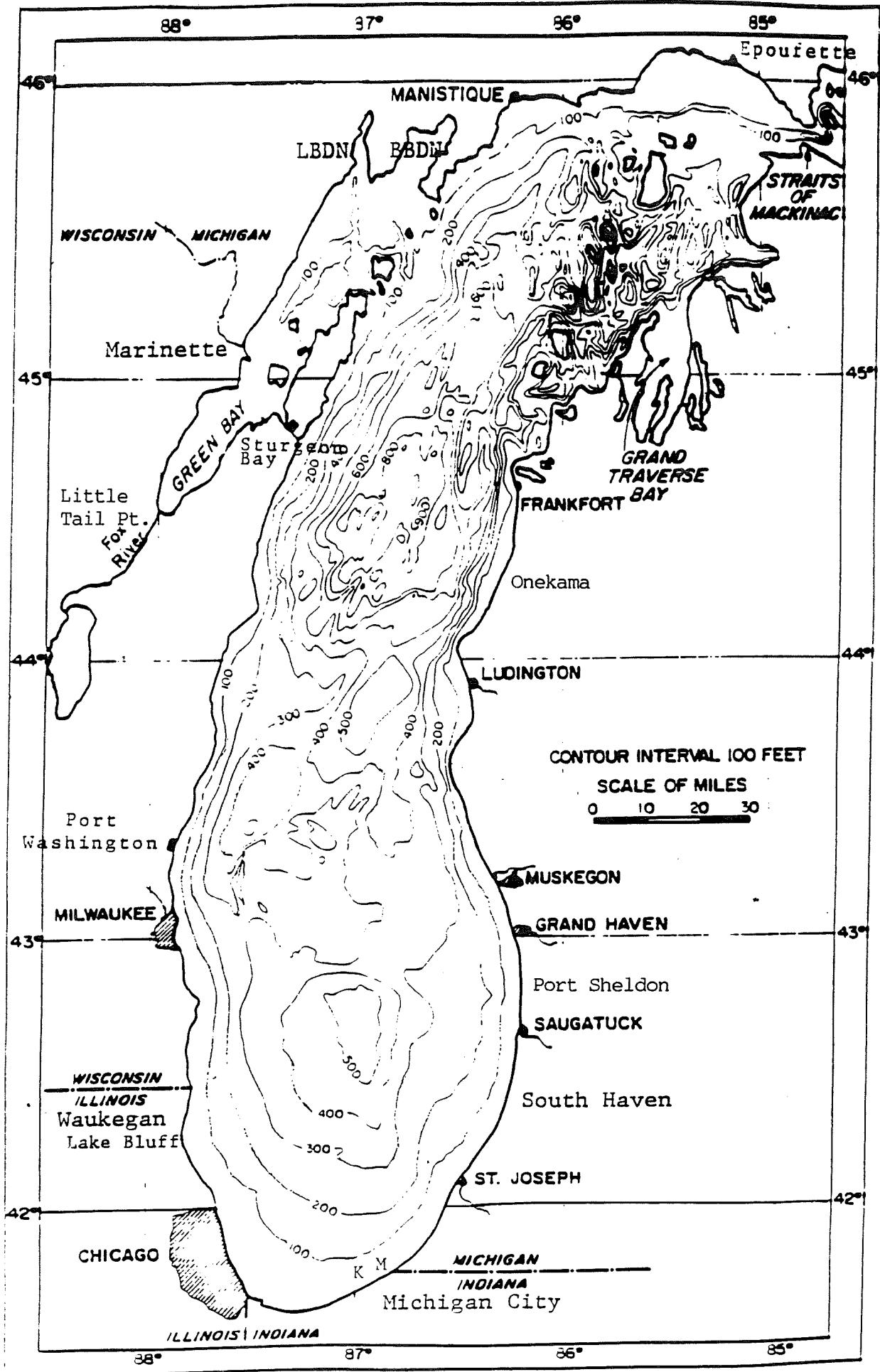


Figure 12. Total catch of age-0 yellow perch taken in USGS-BRD bottom trawls in Lake Michigan, 1973 - 1998.



Lake Michigan (modified from Hough, 1958). Grand Traverse Bay, which is not contoured, has a steeply sloping bottom and a maximum depth of about 600 feet.