

Lake Michigan Committee  
Duluth, MN  
March 20-21, 1996  
Agenda Item 5e.

## 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

This status report was prepared by Rich Hess, IL DNR, from information provided by the following contributors:

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Phil Schneeberger, MDNR - Little and Big Bays de Noc, Central and Southern Lake Michigan  
Brian Belonger, WDNR - Green Bay (WI)  
Mike Toneys, WDNR - Northern Green Bay/Lake Michigan (WI)  
Mike Keniry, WDNR - Wisconsin waters, Southern Lake Michigan  
Dora R. Passino-Reader, NBS - Lakewide and Michigan waters, Southern Lake Michigan  
Steven M. Schroyer and Thomas S. McComish, BALL STATE UNIV. - Indiana waters  
Dan Makauskas, IL DNR - Illinois waters

#### 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 1995 by COTFMA. The resulting catches of yellow perch were predominantly young-of-the-year (YOY) fish less than 120mm in total length. Yearly capture rates were 53, 30, and 38 YOY per hour of electrofishing, respectively. A total of only three perch age 1+ or older were captured during this three year period. The assessments were conducted to evaluate the survival and relative abundance of walleye and the associated fish community in the bay.

The only other assessment information from the northern portion of the lake comes from the National Biological Service (NBS). Among the three forage fish index stations trawled (Manistique, Frankfort and Sturgeon Bay) in the fall (September-October) of 1995 only two YOY perch were captured at Frankfort, MI. However, these perch were collected at the shallowest (18m) depth trawled and any perch in shallower depths would not have been captured at any of the three sites.

#### Green Bay

The Wisconsin DNR has conducted trawl assessments in the bay since 1978 at standard index sites and at deep index sites which were added in 1988. The deeper sites were developed in response to a trend in increasing abundance at a single deep site established in 1985 off Marinette. The standard and deep site assessment data have been combined based upon the quantity of habitat they represent, and a weighted average value is now used which includes an adjustment for standard site data prior to 1988 to account for the increased area occupied by perch. Although 1995 was the third consecutive year of increase in YOY capture rates (249.3 per trawl hour), it was still well below the mean of 926 per trawl hour since 1978

(Figure 1). Four consecutive relatively weak year classes appear to have occurred from 1992-95 in Wisconsin waters of the bay. A declining trend in the relative abundance of yearling and older perch captured in the trawls has also become apparent since 1988, with the exception of 1992 (Figure 2). In 1995 the average number of yearling and older perch caught per trawl hour was higher at the deep index sites (330/hr) than at the standard (shallower) sites (192.3/hr), which was the opposite of what had been observed in the preceding two years.

The Michigan DNR has employed both trawls and gill nets (1, 1.5, 2, 2.5, 3 and 4-inch stretched meshes) to assess perch stocks in Little Bay de Noc (LBDN) and Big Bay de Noc (BBDN). In LBDN trawl catch rates of perch less than 3.5" (90mm) were much higher in 1995 (250%) than in 1994 (Table 1). However, the 1994 catch rate of 9.7/haul was the second lowest observed since 1988, and the 1995 rate of 34.3/haul was the second highest observed during the 1988-95 period. The mean catch rate for perch <3.5" from 1988 through 1995 was 26.1/haul. Although relatively weak year classes appear to have been produced in LBDN in 1992 and 1994, no trend in the relative abundance of YOY perch is apparent (Figure 3). The mean catch rate of 12.7/lift for all perch in the 1995 LBDN gill net assessments (Table 1) was 27% lower than in 1994 (17.5/lift), but only 4% lower than the mean of 13.2/lift for the 1988-95 period. However, no directional trend in relative abundance is apparent and the annual mean catch rates in LBDN have varied by only ~25% from the overall mean catch rate for the entire period (Figure 4).

Trawl catch rates in BBDN for perch less than 3.5" had increased dramatically from 1992-94 (Figure 3), while gill net catches had declined by 57% during the same period (Figure 4). However, the 1995 trawl catch rate of 44.1/haul was 69% lower than the 1994 rate of 141.7/haul and was also 33% lower than the overall mean catch rate of 65.7/haul from 1988 through 1995 (Table 1). The 1995 gill net catch rate of 5.9/lift was the same as in 1994, but was 40% lower than the overall mean rate of 9.9/lift for the 1988-95 period.

Recoveries from the tagging of 19,572 perch (virtually all tagged at the head of LBDN during spawning concentrations) between 1989 and 1993 have continued to indicate there may be little movement from LBDN to BBDN. Although a small percentage of the tagged perch were recovered as far as 14 miles from the tagging site, the vast majority were caught within 4 miles from where they were tagged. Estimates of exploitation (~10% corrected for non-reporting) and survival (41.9%) based on tag returns were the same as in 1994. Survival derived from numbers at age collected in assessment netting was also calculated to be 40% in 1995, lending credence to the estimate derived from tag return data.

On-going tagging studies by the Wisconsin DNR in Green Bay (2284 tagged from 1992-94) and along the Door County shoreline in Lake Michigan (1697 tagged from 1992-94) continued to indicate there may be little movement of perch between the bay and the lake in this area. However, perch tagged on the lake side of Door County at Baileys Harbor (796) and Sturgeon Bay (901) have been recovered as far south as Waukegan, IL and Michigan City, IN (Figures 5a-c). The vast majority of the Baileys Harbor and Sturgeon Bay tagged perch caught in 1995 were taken in the commercial fishery in the Milwaukee area.

### Central Lake Michigan

Assessment data is scant from the central region of the lake. The NBS did not collect any YOY perch at their Port Washington and Ludington trawling index stations. This has essentially been the case for the past 4 years, but it must be remembered they are targeting on forage stocks and their shallowest sampling depth is 18m.

Consumers Power collected scales and provided data for yellow perch caught in nets set near the barrier net for the pump storage facility in 1995. Relative to the last 5 year period, good numbers of perch 5-inches and smaller were caught, but the number of perch larger than 5-inches was down somewhat.

Wisconsin DNR - Green Bay

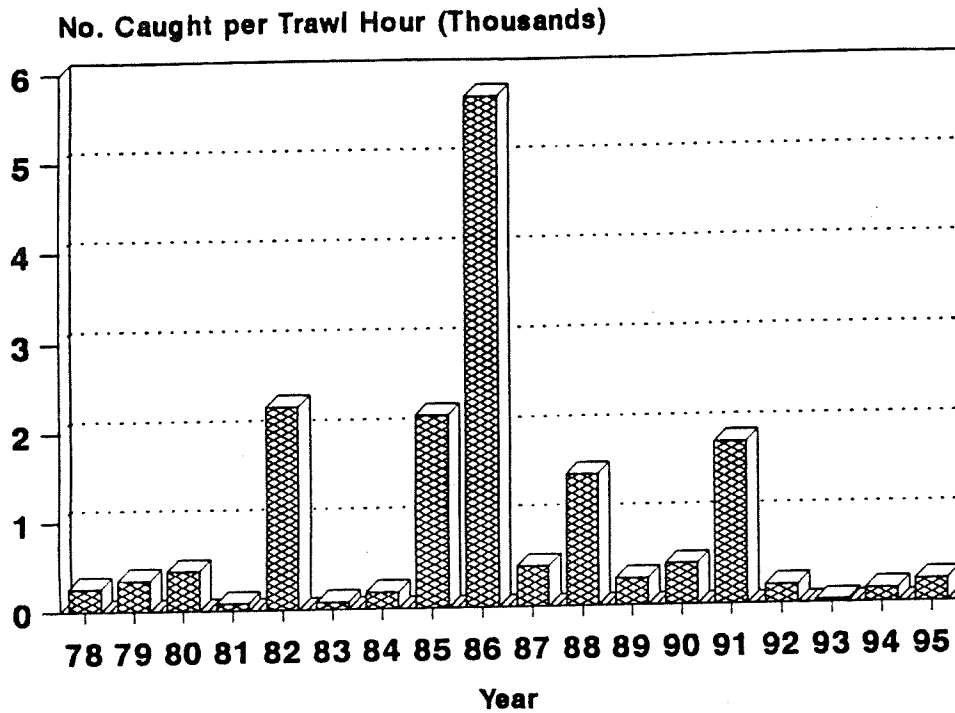


Figure 1. Index Trawl Rel. Abundance  
Yoy Yellow Perch Weighted area Avg.

Wisconsin DNR - Green Bay

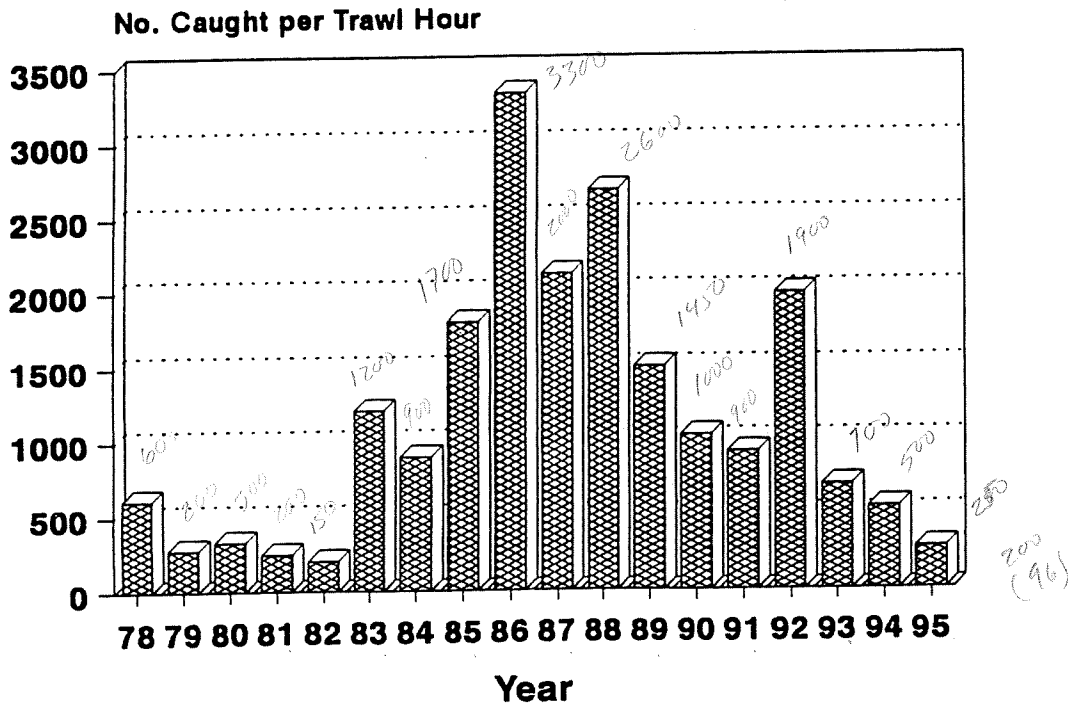


Figure 2. Index Trawl Rel. Abundance  
Ylg. & Older Y. Perch Weighted Area Avg

Table 1.—Catch-per-unit-effort for yellow perch in 10-min trawl hauls and 24-hr, 60-ft experimental gill net sets.

| Bay                  | Year | Number of fish per trawl haul |            |          | Number of fish per gill-net lift |          |          |
|----------------------|------|-------------------------------|------------|----------|----------------------------------|----------|----------|
|                      |      | Fish <3.5"                    | Fish ≥3.5" | All fish | Fish <7"                         | Fish ≥7" | All fish |
| Little Bay<br>de Noc | 1988 | 35.3                          | 43.1       | 71.8     | 15.1                             | 4.8      | 16.8     |
|                      | 1989 | 17.7                          | 10.7       | 21.3     | 11.0                             | 2.7      | 12.5     |
|                      | 1990 | 10.3                          | 18.0       | 24.0     | 9.4                              | 1.8      | 9.8      |
|                      | 1991 | 33.1                          | 11.3       | 36.7     | 6.4                              | 4.3      | 9.6      |
|                      | 1992 | 4.3                           | 11.0       | 13.2     | 12.6                             | 5.9      | 16.1     |
|                      | 1993 | 64.1                          | 17.6       | 67.1     | 9.9                              | 1.8      | 10.5     |
|                      | 1994 | 9.7                           | 3.2        | 12.9     | 14.4                             | 3.2      | 17.5     |
| 1995                 | 34.3 | 3.8                           | 28.6       | 10.8     | 4.0                              | 12.7     |          |
| Big Bay<br>de Noc    | 1988 | 34.7                          | 34.0       | 51.5     | 3.0                              | 3.0      | 5.0      |
|                      | 1989 | 3.5                           | 3.7        | 3.6      | 14.9                             | 7.1      | 20.2     |
|                      | 1990 | 70.3                          | 12.0       | 70.4     | 6.6                              | 4.2      | 9.7      |
|                      | 1991 | 205.0                         | 1.5        | 205.2    | 8.4                              | 3.8      | 9.4      |
|                      | 1992 | 2.9                           | 2.8        | 3.8      | 11.6                             | 3.6      | 13.6     |
|                      | 1993 | 23.4                          | 1.7        | 24.0     | 9.4                              | 2.0      | 9.5      |
|                      | 1994 | 141.7                         | 8.5        | 150.2    | 3.9                              | 1.9      | 5.8      |
| 1995                 | 44.1 | 60.0                          | 52.6       | 5.2      | 1.4                              | 5.9      |          |

Table 2. Catch per effort (fish/1000 feet/night) of age 8 and younger yellow perch, by age, and percent males and females in caught in standardized graded mesh gill net assessments completed in January of each year from 1986 through 1995. Preliminary data for a partially completed assessment in 1996 is included.

| Age      | Year |      |      |      |      |      |      |      |      |      |                   |
|----------|------|------|------|------|------|------|------|------|------|------|-------------------|
|          | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 <sup>2</sup> |
| 1        | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0                 |
| 2        | 343  | 269  | 464  | 626  | 724  | 177  | 48   | 59   | 0    | 0    | 0                 |
| 3        | 2662 | 526  | 453  | 1854 | 1037 | 961  | 276  | 98   | 26   | 0    | 0                 |
| 4        | 368  | 3580 | 386  | 1012 | 938  | 359  | 715  | 559  | 60   | 27   | 0                 |
| 5        | 134  | 541  | 701  | 1563 | 394  | 363  | 281  | 1282 | 219  | 67   | 0                 |
| 6        | 236  | 71   | 324  | 1880 | 381  | 92   | 181  | 299  | 140  | 121  | 17                |
| 7        | 13   | 72   | 12   | 155  | 90   | 92   | 126  | 93   | 48   | 76   | 20                |
| 8        | 1    | 3    | 3    | 1    | 0    | 36   | 88   | 29   | 12   | 65   | 35                |
| % male   | 54   | 56   | 56   | 69   | 61   | 72   | 82   | 86   | 89   | 90   | 89                |
| % female | 46   | 44   | 44   | 31   | 39   | 28   | 18   | 14   | 11   | 10   | 11                |

2. Assessment not yet complete as of this date.

CPE for Yellow Perch <3.5" in 10-minute Trawl Hauls in Little and Big Bay De Noc, MI

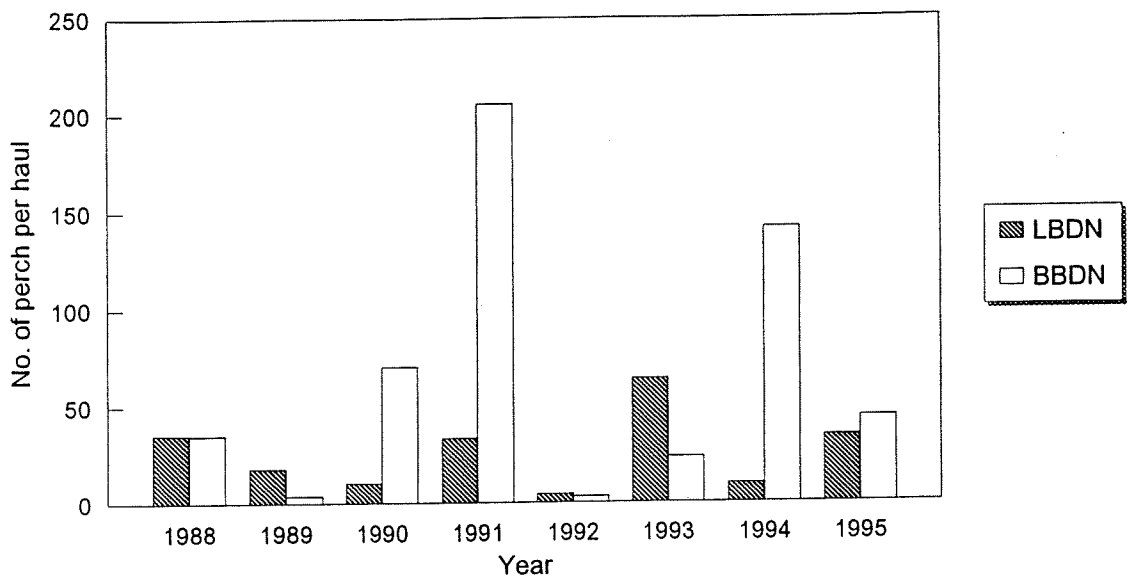


Figure 3

CPE for Yellow Perch in 24-Hour, 60' Gill Nets in Little and Big Bay De Noc, MI

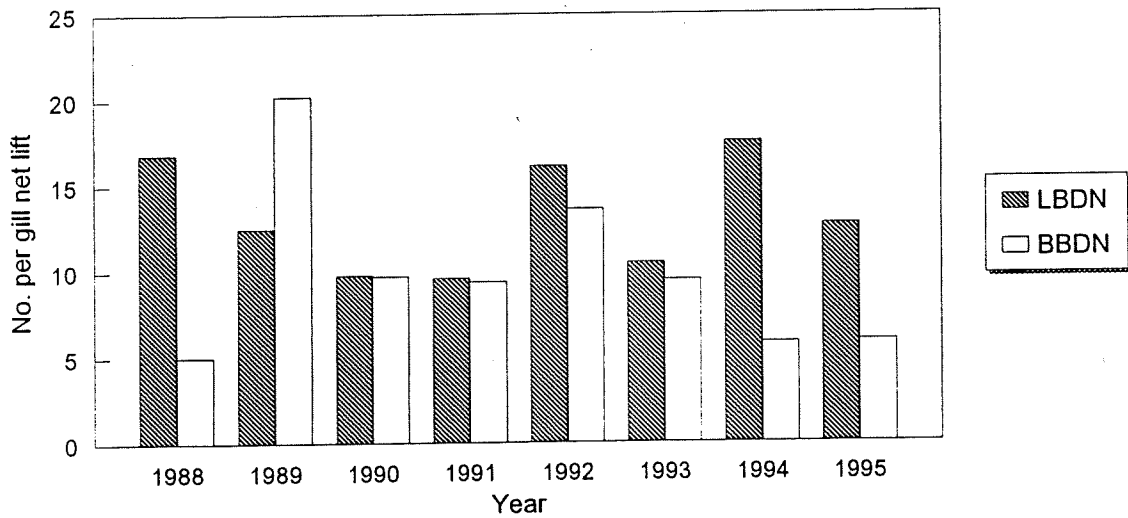


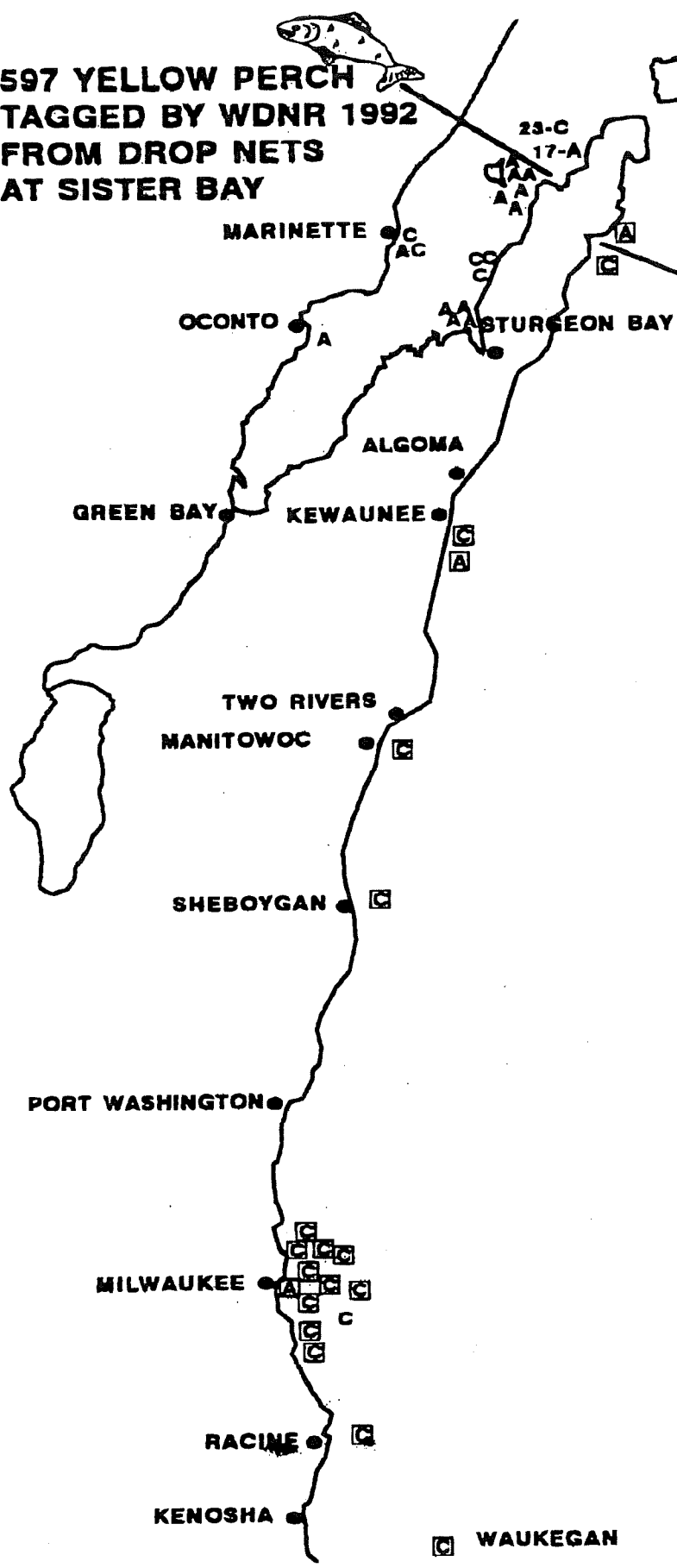
Figure 4

Figure 5a.

A LITTLE BAY DE NOC

597 YELLOW PERCH  
TAGGED BY WDNR 1992  
FROM DROP NETS  
AT SISTER BAY

307 YELLOW PERCH  
TAGGED BY WDNR 1992  
FROM DROP NETS  
AT BAILEYS HARBOR



# YELLOW PERCH RECAPTURES AS OF 2/1/96

## SISTER BAY TAGGED

- A ANGLER CAUGHT
- C COMMERCIAL CAUGHT

## BAILEYS HARBOR TAGGED

- A ANGLER CAUGHT
- C COMMERCIAL CAUGHT

1996  
LAKE MICHIGAN  
WISCONSIN DEPARTMENT  
OF NATURAL RESOURCES

Figure 5b.

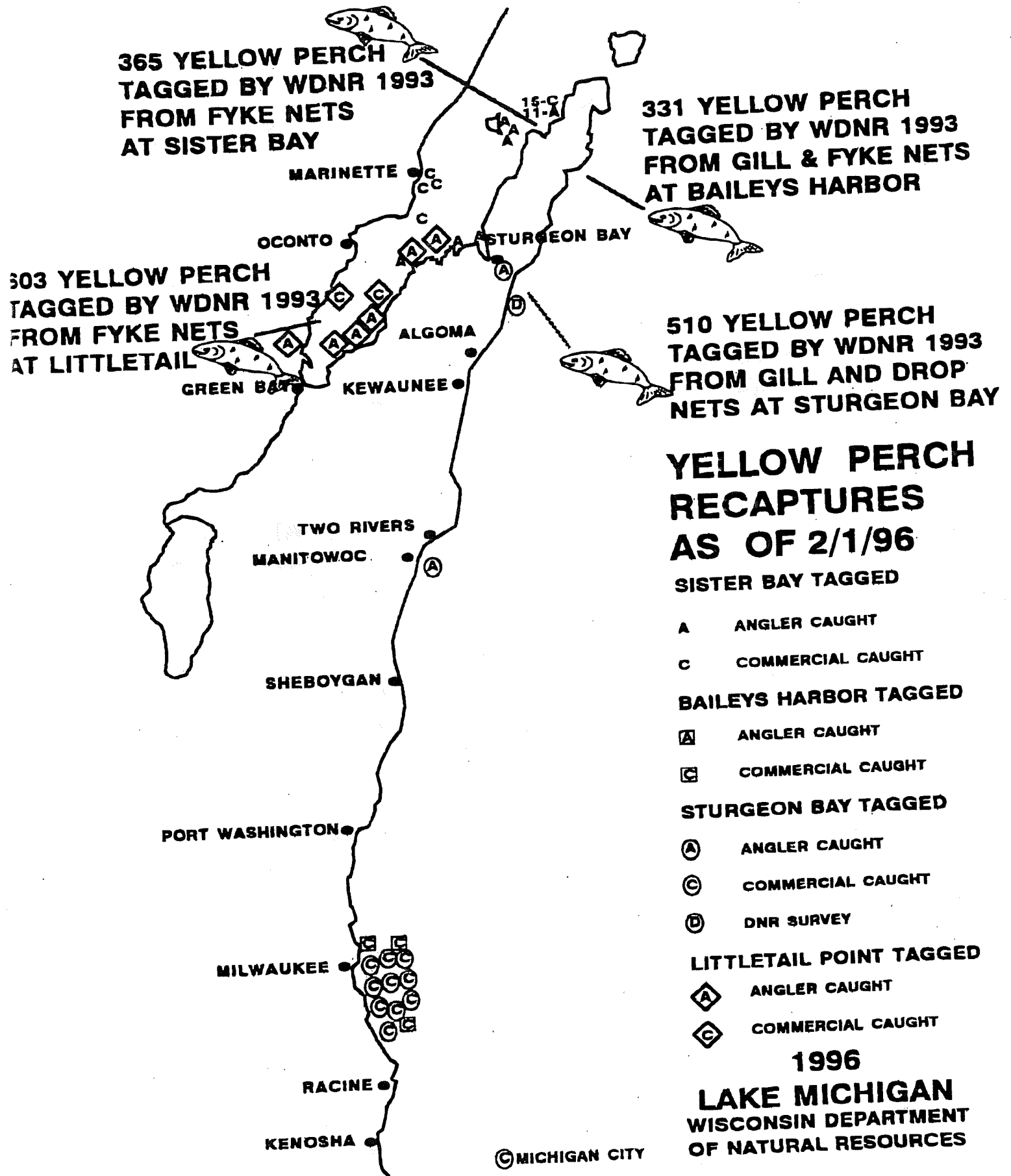
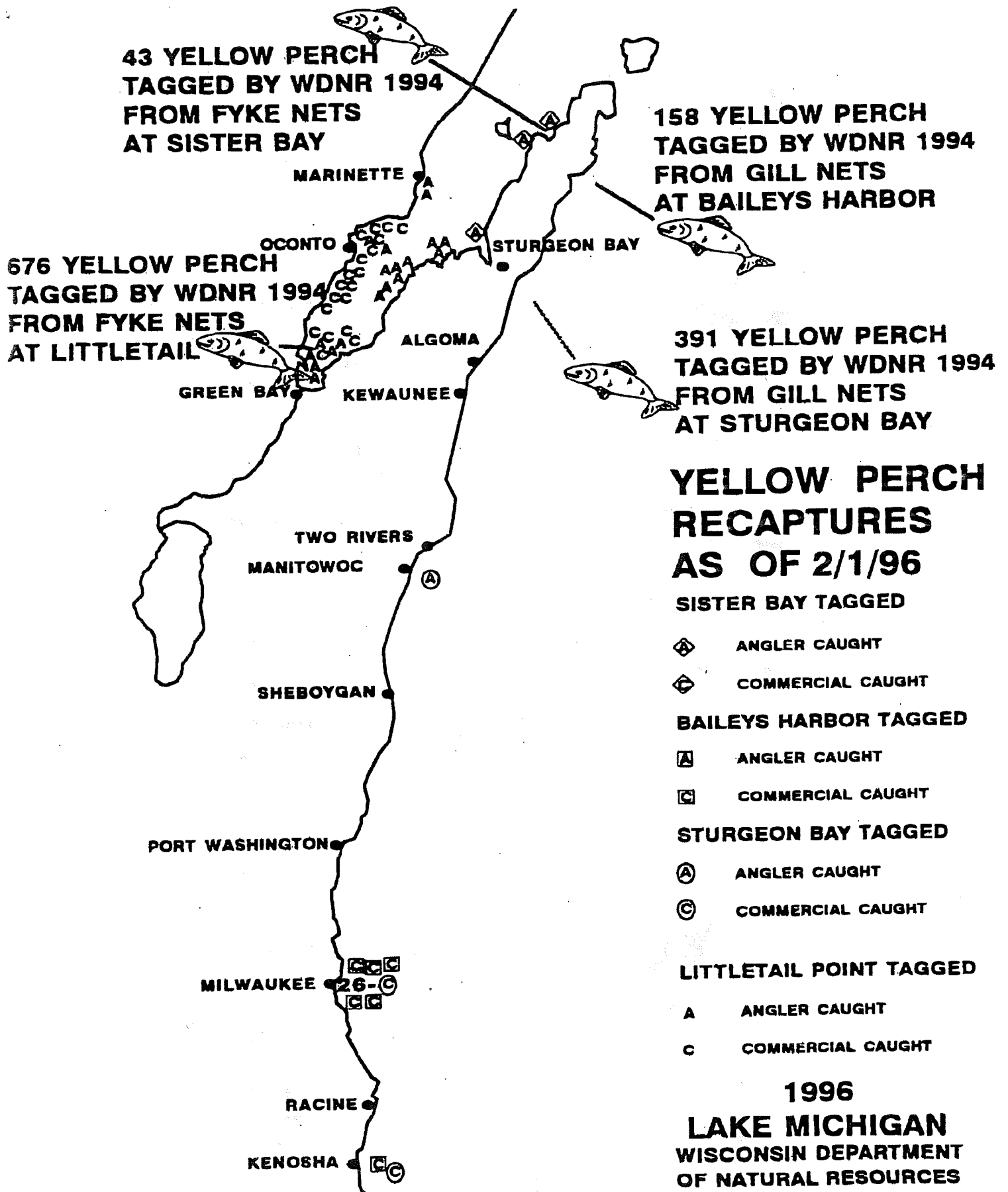


Figure 5c.





## 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 and Wisconsin (Milwaukee), and in 1995 the Michigan DNR reinstated perch assessment activities as well. Unfortunately, the decline in relative abundance of age 3 and older perch continued in 1995 as evidenced by the **gill net** assessment catches in Wisconsin (Table 2), Illinois (Figure 6) and Indiana (Figure 7). In comparison to 1994, catch rates in graded-mesh gill nets declined 30% in Wisconsin and 56% in both Illinois and Indiana waters. Cumulatively, Wisconsin catches have declined by 85% since 1993, Illinois catches have declined by 86% since 1992, and Indiana catches have declined by about 90% since 1991. The most recent relatively strong year class (1988) has predominated in both the Wisconsin and Illinois assessments from 1992 through 1995. The Michigan DNR collected perch from 4 to 11 years of age in gill nets near South Haven in April, 1995.

Shifts in sex ratios towards a lower proportion of females have also been observed during the decline in perch numbers. Females have comprised only 10-28% (mean=15%) of Wisconsin's gill net catches (January) since 1991 compared to 39-46% (mean= 41%) from 1986-90. And, in 1995 in Indiana gill nets, the catch rate of females declined by 69%, although females still comprised 58% of the total catch (June through August). Both of these assessments were conducted outside of the spawning period when segregation by sex is less likely to occur. The decline in females is attributed to their faster growth rate than males, which results in their harvest (sport and commercial) at a younger age. Indiana has observed that the sex ratio is near 1:1 up to the age when females enter the fisheries, and becomes skewed in favor of males at older ages due to selective harvest of females.

Captures of YOY perch in the annual beach **seine** assessments in Wisconsin and Illinois waters remained very low in 1995 (Figures 8 and 9), as did **trawl** catches in Indiana waters (Figure 10b). Figure 10a also provides estimates of perch year class strength in Indiana waters based on trawl catch rates at age 2 and indicates that extremely weak year classes were produced in each year from 1989 through 1993. The Michigan DNR also conducted some small boat trawling (17 tows) in July of 1995 near South Haven and captured a total of only 23 YOY perch.

The NBS conducted a survey on recruitment of juvenile perch in 1995 at South Haven. Sixteen larval perch were captured over rocky areas at 8m depths in June and none were found in July. Adult perch caught in trawls and gill nets ranged from 150-310mm and four to eight years of age. Most perch were four to six years of age and no juvenile perch were taken even though sampling was extensively conducted at depths and in habitat suitable for younger fish. In addition, NBS bottom trawling in September of 1995 at Saugatuck was successful in capturing 115 YOY perch (40-100mm) at depths of 5m (85 YOY), 9m (28 YOY), and 18m (2 YOY). The mean capture rate was 29 per 10-minute trawl (39-foot bottom trawl). A total of 340 adult perch ranging from 200-350mm were also captured and the mean capture rate was 68 per 10-minute trawl.

The NBS also trawled at a depth of 9m off Waukegan, IL in the fall of 1995 in an attempt to capture YOY perch. No perch were collected.

### 1995 Yellow Perch Harvest Restrictions and Their Effects

In response to the decline in yellow perch numbers in the southern portion of the lake, the four states implemented the following harvest restrictions which were intended to extend harvest opportunities and the protection of broodstock over time:

1. The month of June was closed to both sport and commercial fishing;

Illinois Waters

Yellow Perch CPEs for Lake Bluff and Foster Ave transects

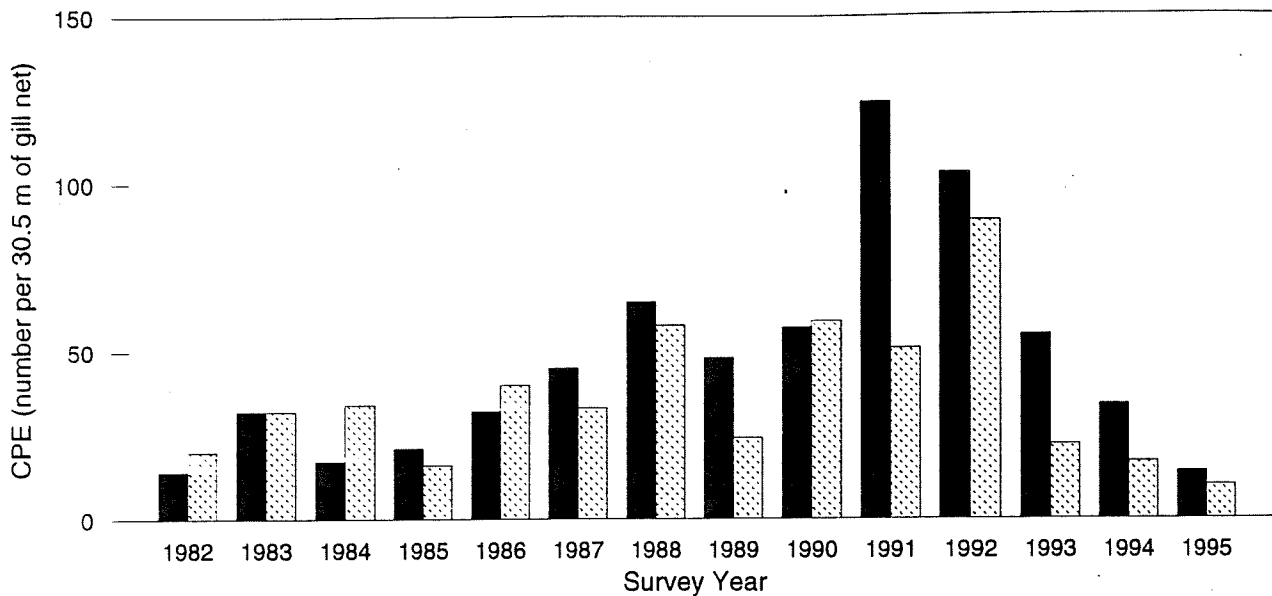


Figure 6.

CPE Lake Bluff  
 CPE Foster Ave  
 5 miles south of Waukegan      Chicago

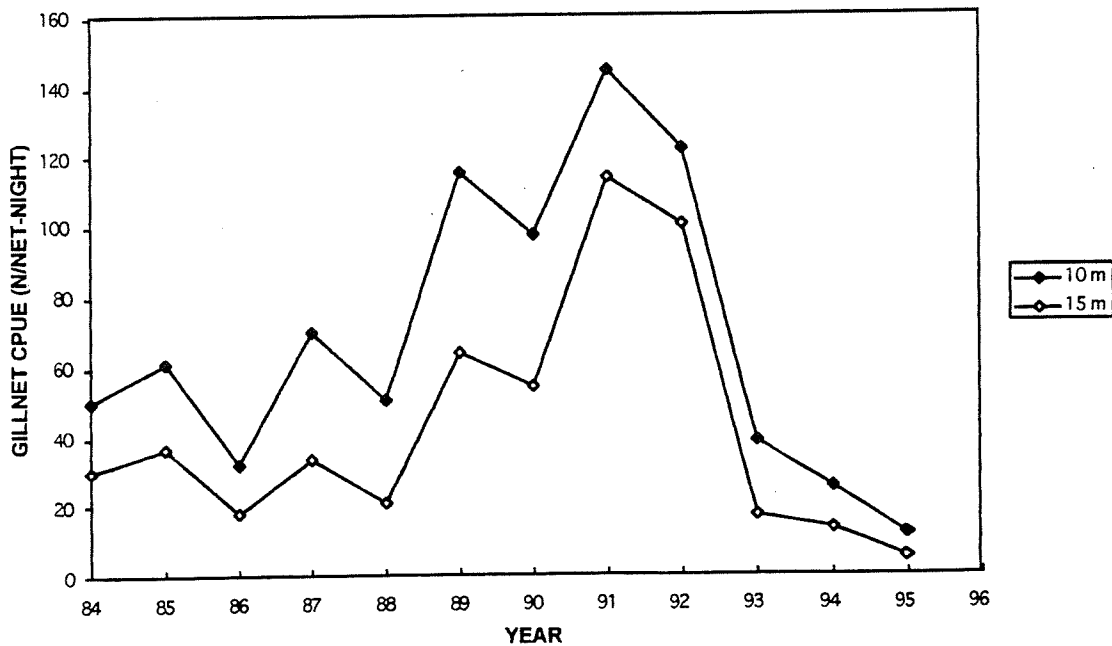
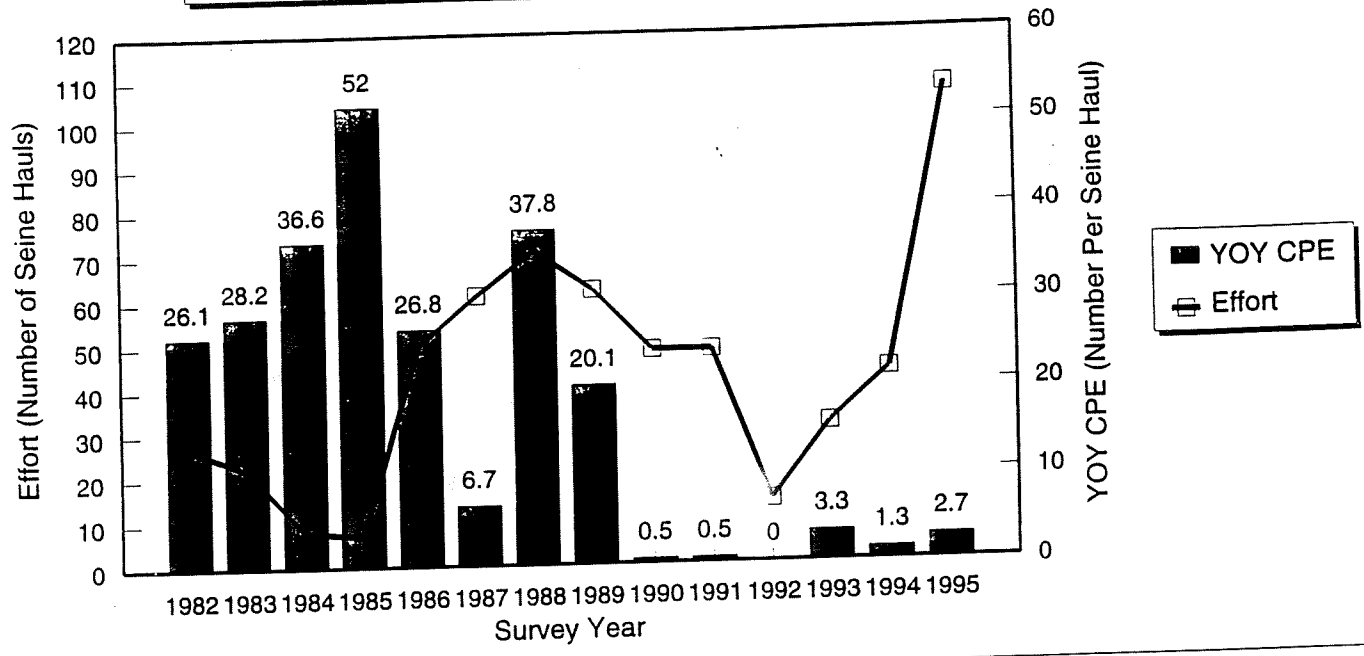


Figure 7 . Gillnet CPUE (n per net-night) of yellow perch at pooled sites M and K in Indiana waters of Lake Michigan at 10 m and 15 m depths.

Figure 8.

**Yellow Perch: Young-of-the-Year**  
Indices of Relative Abundance



**Beach Seining for YOY Yellow Perch**  
Southeast District Waters

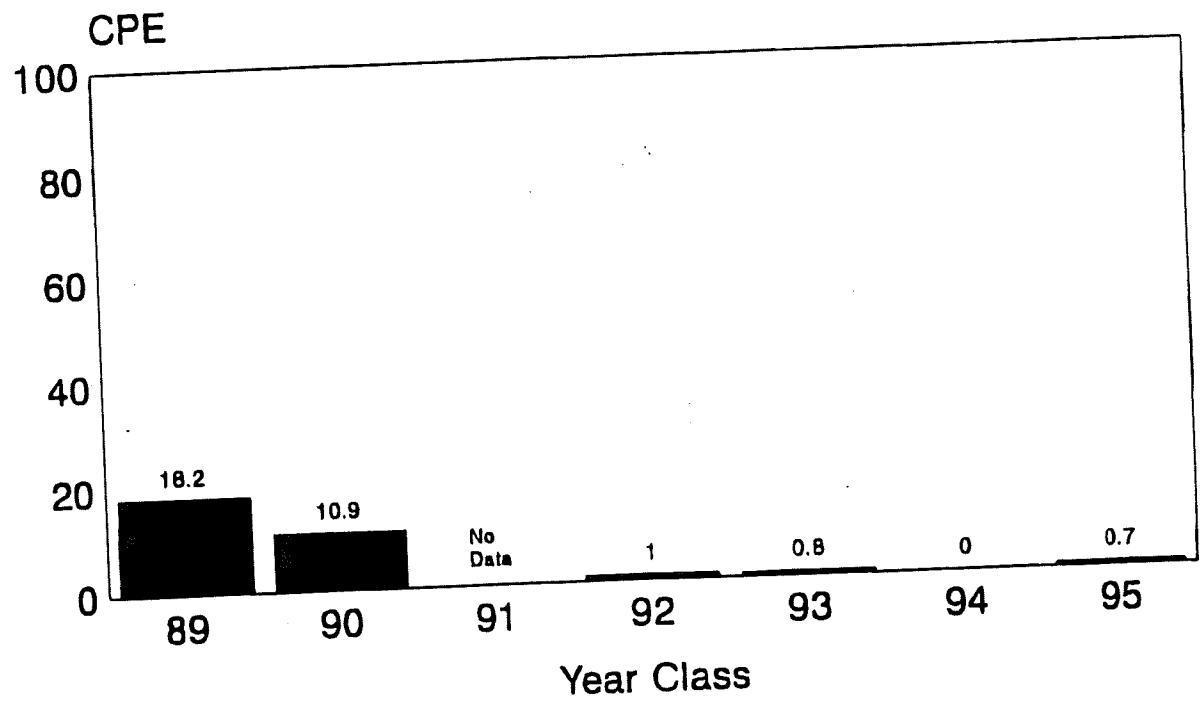


Figure 9. CPE (fish/seine haul) of YOY yellow perch caught in summer beach seining assessment.

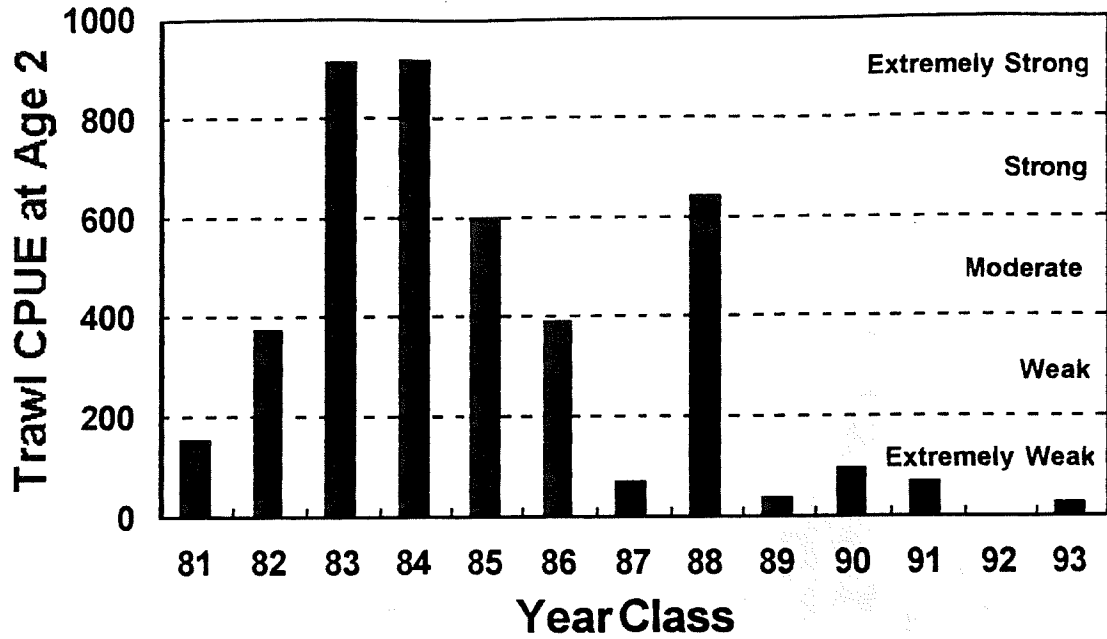


Figure 10a. Relative strengths of the 1981-93 year classes of yellow perch in Indiana waters of Lake Michigan, based on trawl CPUE (N/h) at age 2 at pooled sites M and K.

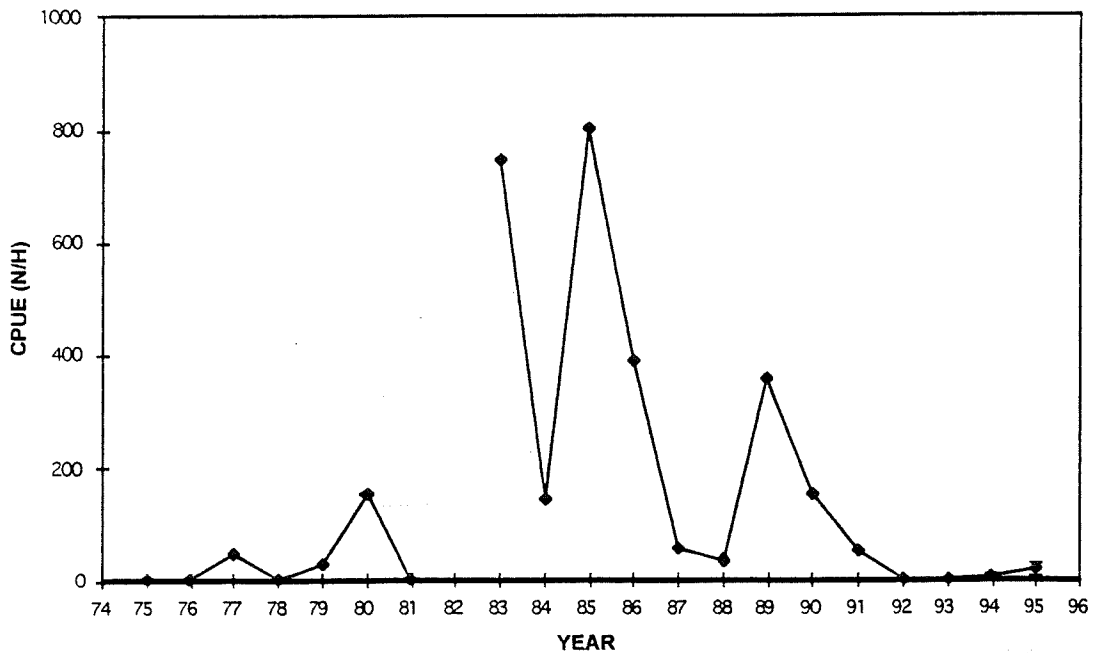


Figure 10b. Trawl CPUE of YOY yellow perch at sites M and K in Indiana waters of Lake Michigan. No trawling was conducted in 1982. Error bars ( $\pm 2SE$ ) are plotted for 1994-95, but are too narrow to be visible for 1994.

2. Sport fishing daily bag limits were set at 50 in Michigan and 25 in Illinois, Wisconsin and Indiana (50 in Michigan as they have no commercial harvest);
3. Commercial catches were reduced by 65% in Illinois (to 120,000 lb.), Indiana (to 360,000 lb.) and Wisconsin (to 112,000 lb.).

The overall result of these joint management actions was a 50% reduction in the number of perch harvested in comparison to 1994. The reduced harvest was primarily fueled by the 65% reduction in commercial perch quotas in Illinois and Wisconsin, a 65% reduction in the Indiana commercial catch, and a 29% reduction in the Michigan sport catch in the southern portion of the lake. Unexpectedly, sport catches increased by 8% in Illinois, 4% in Indiana, and 2% in Wisconsin. The Illinois and Wisconsin catch increases occurred due to extremely favorable environmental conditions during July and August, and the increase in Indiana was due to the concentration of perch near a popular fishing port and a 20% increase in sport fishing effort.

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

The formation of the Yellow Perch Task Group (YPTG) was approved by the LMC in March, 1994 and the YPTG was given three initial charges:

1. Consolidate the available data on yellow perch and assess its compatibility.
2. From the consolidation of the data, evaluate what can be said about the discreteness of stocks in the lake; if there is not a definitive statement about stock discreteness, develop a study plan to address the question.
3. Report progress to the LMTC at the winter meeting in 1995.

The following individuals have participated in the activities of the YPTG since the initial meeting in June of 1994:

|                              |                        |                                  |
|------------------------------|------------------------|----------------------------------|
| Rich Hess, IL DNR (Chairman) | Jim Francis, IN DNR    | Phil Schneeberger, MDNR          |
| Ellen Marsden, INHS          | Cliff Kraft, WI-SG     | Steve Schroyer, Ball State Univ. |
| Tom McComish, Ball State     | Fred Binkowski, U-WI   | Brian Belonger, WDNR             |
| Mike Keniry, WDNR            | Dave Jude, U-MI        | Mark Holey, USFWS                |
| Steve Robillard, INHS        | Wayne Brofka, INHS     | Pradeep Hirethots, WDNR          |
| John Forney, Cornell Univ.   | Robert Herendeen, INHS | Ed Rutherford, MDNR              |

The initial charges given the YPTG have been addressed as follows:

1. A comprehensive listing of past and current assessment and research activities has been compiled for purposes of assessing data compatibility lakewide. The list has been reviewed several times by contributors and has been compiled and included with this report. Data compatibility concerns include the use of different sampling gear, variation in sampling periods for assessment purposes, variability of specific data collected, and use of different methods for age determination. The LMTC is currently in the process of developing a lakewide assessment plan which will include yellow perch. The YPTG recommends that data compatibility issues be addressed during that process.
2. Although the YPTG is not currently able to make a definitive statement about discrete stocks based upon an evaluation of lakewide data, there is at least some evidence from tagging studies in Lake Michigan that separate stocks may exist.

In May of 1950 the USFWS tagged 4,172 yellow perch at six locations in Southern Green Bay (Mraz 1952). Recoveries (108) occurred through the month of September and 72% were recaptured in the tagging area, 19% were recovered within 20 miles of the tagging area, and only 8% were recovered at locations more than 20 miles from the tagging sites. All of the recoveries occurred within the Wisconsin waters of Green Bay.

In 1980 and 1981 the Wisconsin DNR tagged 17,407 yellow perch on the west shore of Green Bay from the southern end to just north of Oconto (approximately 25 miles northeast from the southern end of the bay). The farthest recovery from this study was 35 miles from the location where the perch was tagged and was also within Green Bay (Brian Belonger-Wisconsin DNR, personal communication).

In another yellow perch tagging study conducted primarily off Milwaukee in 1981-85 by the Wisconsin DNR, the majority of the fish (79%) were recaptured within 10 miles of their tagging site (in Marsden et al. 1993).

Recoveries from the tagging of 19,572 yellow perch at the head of Little Bay de Noc by the Michigan DNR between 1989 and 1993 have continued to indicate there may be little movement from Little Bay de Noc to Big Bay de Noc. Although a small percentage of the perch were recovered as far as 14 miles from the tagging site, the vast majority have been caught within 4 miles of where they were tagged (Phil Schneeberger-Michigan DNR, personal communication).

On-going studies by the Wisconsin DNR in Green Bay (1608 yellow perch tagged since 1992) and along the Door County shoreline in Lake Michigan (1542 tagged since 1992) have continued to indicate there may be little or no movement of perch between the bay and the lake in this area. However, perch tagged on the lake side at Baileys Harbor and Sturgeon Bay have been recaptured as far south as Waukegan, IL and Michigan City, IN (Mike Toney-Wisconsin DNR, personal communication).

In the Illinois portion of the lake a total of 55,346 yellow perch were tagged by the Illinois Natural History Survey from 1988-92. Recoveries (1548) through 1992 occurred widely during the summer and fall and as far away as Baileys Harbor, WI and Manistee, MI. However, recaptures of perch tagged in the spring during the spawning period indicated that they tended to return to the same site in spring year after year for spawning (Marsden et al. 1993).

Another recent study also provided some interesting insight into the stock discreteness question. Researchers in Canada wanted to test the hypothesis that yellow perch return to their natal location to spawn. During the period 1978 through 1989 egg masses deposited by female perch were counted at a number of sites in Lochaber Lake (Nova Scotia) and from 1984 through 1987 a significant portion of the egg masses deposited at one of the spawning sites were removed (Aalto and Newsome 1990). In subsequent years, when females from the 1984 through 1987 year classes had reached sexual maturity, researchers observed a statistically significant reduction in the proportion of egg masses deposited only at the site from which egg masses were removed. The researchers concluded that the assumption that any perch selects a spawning site independently of its natal site (random spawning site selection) could be rejected, and that the results provide additional support for the hypothesis that yellow perch exhibit demic behavior.

Although the aforementioned tagging studies are suggestive of discrete stocks in terms of limited movements of tagged individuals and apparent spawning site fidelity, they are certainly not conclusive that discrete stocks exist in Lake Michigan. However, attempts to provide genetic evidence for discrete stocks of perch in the lake have not been successful.

Protein electrophoresis (starch gel) was used to assay 19 enzymatic loci in samples of yellow perch collected from Green Bay, Lake Michigan (including Chicago, IL) and Keyes Lake, WI in 1979 and 1980 (Leary and Booke 1982). No evidence of discrete populations was found as all of the loci were effectively monomorphic.

More recently, the Illinois Natural History Survey (INHS) completed protein electrophoresis for 30 individuals from each of three populations, Baileys Harbor (WI), Zion (IL) and Green Bay. Only 2 of the 20 loci examined were found to be polymorphic.

The INHS also conducted analyses of both mitochondrial (RFLP analysis) and nuclear DNA (RAPD analysis) which revealed a small number of markers in yellow perch collected from different geographic areas of Lake Michigan. Unfortunately, no clear answers have emerged from these analyses and genetic evidence for discrete stocks is still lacking.

3. The YPTG chairman has provided progress reports to the LMTC at their winter meetings in both 1995 and 1996, as well as the summer meeting in 1995.

In addition to the above activities related to the charges given to the YPTG, the Lake Michigan Fish Chiefs also requested that the YPTG expand research on perch by developing a multi-agency initiative to identify likely causes for the lack of perch recruitment. This request was made in January of 1995 in response to the interactions between the management agencies, researchers, and constituents at the Lake Michigan Perch Conference held in Kenosha, Wisconsin in December of 1994.

In response to this request, the YPTG met in August of 1995 to discuss research projects and priorities. The YPTG decided to focus research efforts on factors limiting survival in the first year of life. Research needs were identified by generating specific hypotheses with regard to potential factors limiting survival, of which the following received the strongest support from YPTG members:

1. *Alewife predation on larval perch is limiting their survival*
2. *Pre-demersal mortalities are limiting survival*
3. *Weather is limiting pre-demersal survival*

Additional research projects in priority order were:

4. *The development of an individual-based model of YOY yellow perch survival in Lake Michigan*
5. *An investigation of the effects of increased water clarity on sampling efficiency*

These hypotheses (3) and projects (2) have been developed into research proposals by YPTG members and are currently undergoing their second review process. The reviewers have included members of the YPTG, the LMTC, the GLFC, and several invited experts. YPTG members are currently in the process of finalizing each of them under the format of research pre-proposals, and are planning to deliver them to the Fish Chiefs and the LMC by April 1st.

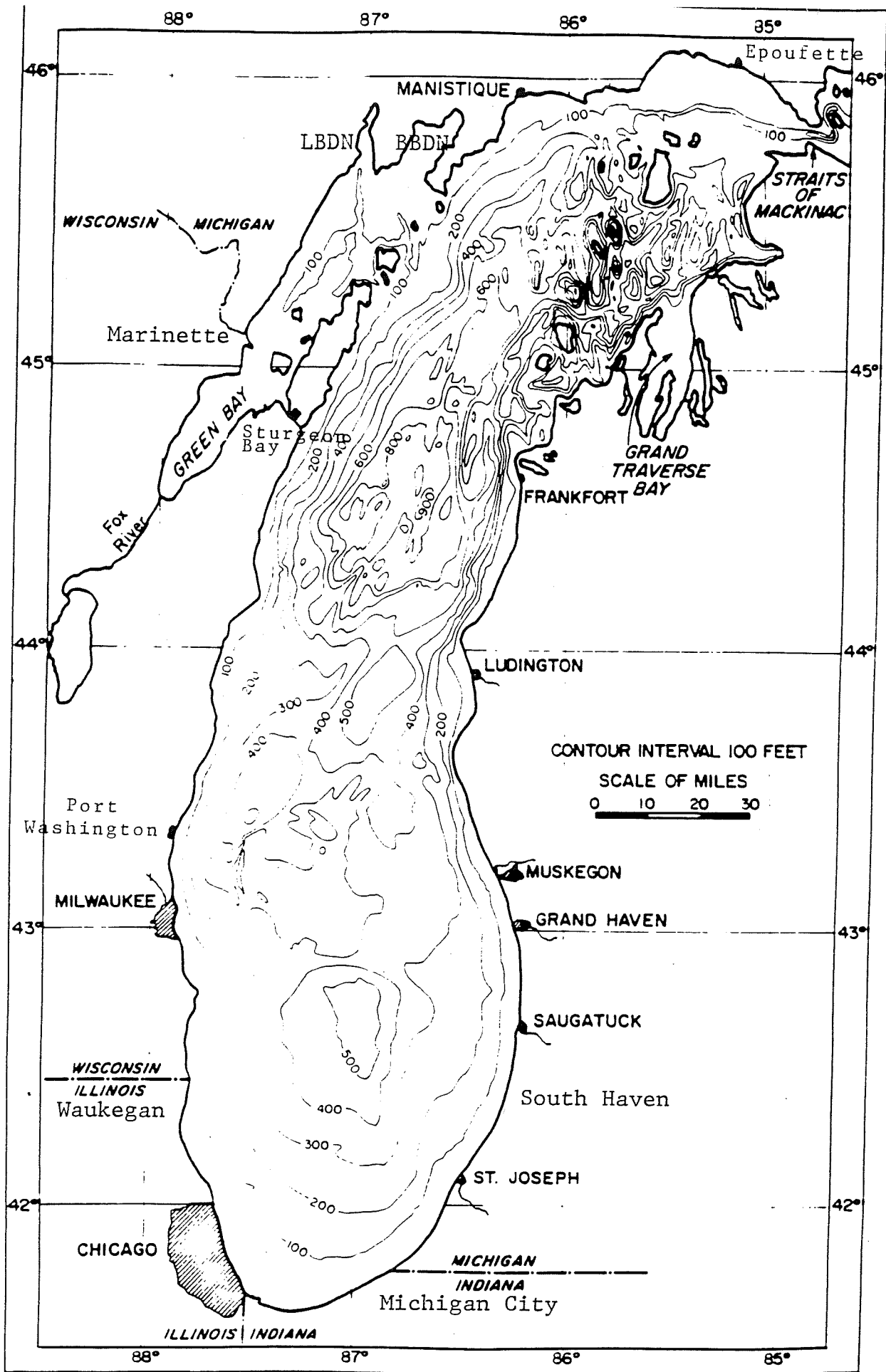
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## LAKE MICHIGAN YELLOW PERCH ASSESSMENT/RESEARCH SUMMARY

| DOC | DATA              | SAMPLING  | DATES      | SITES      | DEPTH (m)          | DAY/NIGHT  | DATA COLLECTED   |
|-----|-------------------|---|------------|------------|--------------------|------------|--|
|     | 1978-PRES         | SPAWNING ASSESSMENT (GMGN 1-3" 1/2inc.)                           | 5/25-6/3   | 2          | 7, 11, 14.5, 18    | 24hr       | L, WT, SEX, AGE(SCALES), DIET, RELATIVE ABUN.                            |
|     | 1984              | SPAWNING ASSESSMENT (GMGN 1-3" 1/2inc.)                           | 5/25-6/3   | 3          | 7, 11, 14.5, 18    | 24hr       | L, WT, SEX, AGE(SCALES), DIET, RELATIVE ABUN.                            |
|     | 1978-PRES         | YOY SEINING   | 7/7-8/31   | 8-10       | SHORE              | DAY        | L, RELATIVE ABUN.  |
|     | 1979-PRES         | COMMERCIAL MONITORING (GILL NET)                                  | 4/1-3/31   | ---        | ---                | ---        | L, CPUE  |
|     | 1978-PRES         | CREEL SURVEY (SPORT ANGLER)                                       | 4/1-9/30   | 4          | SHORE/BOAT         | ---        | L, WT  |
|     | 1978-PRES         | YOY TRAWLING (18" SEMIBALLOON BOTTOM TRAWL)                       | 9-10       | 1          | 4-10               | DAY        | L, WT  |
|     | 1988-PRES         | SPAWNING (TAG) ASSESSMENT (4x8 DE FYKE NETS)                      | 5/10-7/10  | 2          | 5, 10              | 24hr       | L, WT, SEX, AGE (OTOLITH - SCALES COLLECTED)                             |
|     | 1988-1990, 93     | SEINING   | 8          | 2          | SHORE              | DAY/NIGHT  | RELATIVE ABUNDANCE   |
|     | 1987-PRES         | LARVAL SAMPLING   | 5/25-7/14  | 4          | SURFACE            | NIGHT      | RELATIVE ABUNDANCE   |
|     | 1994              | LARVAL SAMPLING - HARBOR, DEPTH STRATA                            | 6/10-7/1   | 2          | 0.2, 4.8, 8        | DAY/NIGHT  | RELATIVE ABUNDANCE   |
|     | 1988-1992         | TAG SURVEY  | 5/10-7/10  | 2          | ---                | ---        | >55,000 TAGGED   |
|     | 1988-PRES         | SPRING ASSESSMENT (GMGN 1-3" 1/4inc.)                             | 1          | 1          | 7-18               | 24hr       | L, WT, SEX, AGE(SCALE), RELATIVE ABUNDANCE                               |
|     | 1984-PRES         | SPAWNING ASSESSMENT (GMGN 2-3" 1/4inc.)                           | 6          | 1          | 7-18               | 24hr       | L, WT, SEX, CPUE   |
|     | 1985-1994         | FALL ASSESSMENT (FYKE 3/4" STRETCH)                               | 7-8        | 1          | HARBOR             | 24hr       | L, WT, SEX, SOME AGE(SCALE), RELATIVE ABUNDANCE                          |
|     | 80, 90, 1992-PRES | YOY SEINING   | 8-9        | X          | SHORE              | DAY        | L, WT, RELATIVE ABUNDANCE  |
|     | 1985-PRES         | COMMERCIAL MONITORING (GILL NET)                                  | 9/15-4/30  | ---        | ---                | ---        | L, WT, SEX, AGE(SCALE), CPUE   |
|     | 1985-PRES         | SPORT CREEL SURVEY  | 4-9        | 5          | ---                | ---        | L (AGE - SCALE - 1994)   |
|     | 1978-PRES         | CREEL SURVEY (SPORT ANGLER)                                       | 4/25-5/1   | 1          | 1.3-4.8            | ---        | L, WT, AGE(SCALE<190, ANAL FIN SPINES>190) COUNT MALES                   |
|     | 1979-PRES         | SPAWNING ASSESSMENT (FYKE NET, 4" FRAMES, 3/4" inc.)              | 6/13-7/9   | 14         | SHORE              | 24-72hr    | FEMALES: L, AGE(SCALE<190, ANAL FIN SPINES>190) COUNT MALES              |
|     | 1979-PRES         | YOY SEINING (50" X 2)   | 8          | 10         | 2-28               | DAY        | L, NUMBER/SITE(RELATIVE ABUNDANCE)                                       |
|     | 1978-PRES         | TRAWLING (25" SEMIBALLOON BOTTOM TRAWL)                           | 5/20-3/15  | 15         | 5-20               | DAY        | L, WT, SEX, AGE(SCALE<190, ANAL SP.>190), NO./TRAWL HR(REL. AB.)         |
|     | 1978-PRES         | COMMERCIAL MONITORING (GILL NET)                                  | 7/1-3/15   | 15         | 5-20               | MULTI-DAY  | 500 FISH SAMP., L, WT, SEX, AGE(SCALES<190, ANAL SP.>190), CPE           |
|     | 1978-PRES         | COMMERCIAL MONITORING (DROP NET)                                  | 9/5-4/30   | 4          | 1.3-7              | MULTI-DAY  | 500 FISH SAMP., L, WT, SEX, AGE(SCALES<190, ANAL SP.>190), CPE           |
|     | 1980-91           | TAG SURVEY  | ---        | 5          | 1.3-4.8            | 24-72hr    | 2,713 TAGGED   |
|     | 1980-91           | TAG SURVEY  | ---        | LAB        | ---                | ---        | 17,407 TAGGED  |
|     | 1985-PRES         | EARLY LIFE HISTORY STUDIES  | ---        | ---        | ---                | ---        | PREDATOR/PREY, FEEDING BEHAVIOR, GROWTH                                  |
|     | 1985-PRES         | MM-1 CREEL SURVEY (SPORT ANGLER)                                  | 4/10-1/3   | 5-10       | ---                | DAY        | L, WT, CPE, SEX, AGE (SCALES)  |
|     | 1988-PRES         | LBDN ASSESSMENT (GMGN 1/2-2", 1/4inc.)                            | 6-9        | 2/BBDN     | 3, 6               | 24hr       | L, WT, SEX, AGE (SCALES), DIET, REL. ABUN.                               |
|     | 1988-PRES         | BBDN ASSESSMENT (GMGN 1/2-2", 1/4inc.)                            | 6-9        | 2/LBDN     | 3, 8               | 24hr       | L, WT, SEX, AGE (SCALES), DIET, REL. ABUN.                               |
|     | 1988-PRES         | L&BBDN ASSESSMENT (TRAWL, 3-M SHRIMP TRY NET)                     | 6-9        | 5          | 3-15               | DAY        | L, WT, SEX, AGE (SCALES), DIET, REL. ABUN.                               |
|     | 1989-93/91-92     | L&BBDN TAG SURVEY   | ---        | 2          | ---                | ---        | 19,572 TAGGED  |
|     | 1973-1994         | TRAWLING (30" SEMI BALLOON BOTTOM TRAWL)                          | 9/15-11/15 | 7          | 9-91               | DAY        | RELATIVE ABUNDANCE   |
|     | 1971-1979         | GILL NETS (GRADED MESH, 3.8-6.0 CM STRETCHED)                     | 7 & 8      | <=0        | 5.5-11             | OVERNIGHT  | L, WT, SEX, AGE (SCALES), DIET, RELATIVE ABUNDANCE                       |
|     | 1973-1982         | ENTRAINMENT, IMPINGEMENT, GILL NETTING, TRAWLING, SEINING, LARVAL | 4/1-11/30  | 3-6 (COOK) | 1, 6, 9            | 24 HR      | L, WT, SEX, SOME DIET, CPUE, LARVAL FISH DENSITIES                       |
|     | 1977-1982         | ENTRAINMENT, IMPINGEMENT, GILL NETTING, TRAWLING, SEINING, LARVAL | 4/1-11/30  | 3-6 PTSHE  | 1, 3, 6, 9, 12, 15 | 24 HR      | L, WT, SEX, CPUE, LARVAL FISH DENSITIES                                  |
|     | 1988-1988         | LARVAL FISH TOWS, SEINING, FALL AND SPRING TRAWLING               | 4/1-7/31   | 3 PTSHEL   | 1.5, 3, 6, 9       | NIGHT ONLY | DENSITIES, L, AGES (OTOLITHS OF YEP LARVAE), INDEX OF YOY YEP & ALE      |
|     | 1989-1993         | LARVAL FISH TOWS, SEINING, FALL AND SPRING TRAWLING, GILL NETTING | 5/1-9/31   | PTSHEL     | 1.5, 3, 6, 9       | NIGHT ONLY | DENSITIES OF LARVAL FISH, INDEX OF YOY YEP & ALE, DIETS OF ADULT YEP.    |
|     | 1975-PRES         | CREEL SURVEY (SPORT ANGLER)                                       | 4/1-10/31  | 4          | SHORE/BOAT         | DAY/8HR    | L  |
|     | 1984-PRES         | COMMERCIAL MONITORING (MANDATORY REPORTING)                       | 1/1-12/31  | ---        | ---                | ---        | CPUE (TOTAL LBS)   |
|     | 1984-PRES         | STOCK ASSESSMENT (18" SEMIBALLOON BOTTOM TRAWL)                   | 6/1-8/31   | 2-3        | 5                  | NIGHT      | L, WT, SEX, AGE(SCALE - OPERC. BACKUP) MATURITY, REL. AB.                |
|     | 1980-83           | TAG SURVEY  | 6/1-8/31   | 2-3        | 10, 15             | OVERNIGHT  | L, WT, SEX, AGE(SCALE - OPERC. BACKUP), MATURITY, REL. AB.               |
|     | 71-72, 84, 92-93  | DIET (TRAWL, SOME GILL NET)                                       | 6/1-8/31   | 4          | 5, 10, 15          | NIGHT      | 13,373 TAGGED; RETURNS YEAR ROUND<br>REL. ABUN. OF PREY IN LAKE AND DIET |



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.