**Lake Michigan Committee**
**2005Annual Meeting**
**Ypsilanti, Michigan**
**March 22-23, 2005**

# Lake Michigan Management Reports

**Lake Michigan Fisheries Team**
**Wisconsin Department of Natural Resources**

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# INTRODUCTION

These reports summarize some of the major studies and stock assessment activities by the Wisconsin Department of Natural Resources on Lake Michigan during 2004. They provide specific information about the major sport and commercial fisheries, and describe trends in some of the major fish populations. The management of Lake Michigan fisheries is conducted in partnership with other state, federal, and tribal agencies, and in consultation with sport and commercial fishers. Major issues of shared concern are resolved through the Lake Michigan Committee, which is made up of representatives of Michigan, Indiana, Illinois, Wisconsin, and the Chippewa Ottawa Resource Authority. These reports are presented to the Lake Michigan Committee as part of Wisconsin's contribution to that shared management effort.

For further information regarding any individual report, contact the author at the address, phone number, or e-mail address shown at the end of the report, or contact the Department's Great Lakes Fisheries Specialist, Bill Horns, at 608-266-87782 or william.horns@dnr.state.wi.us.

## SPORTFISHING EFFORT AND HARVEST

Open-water fishing effort was 2,618,700 hours during 2004, 3.0% below the five-year average of 2,699,189 (Table 1). The ramp, shore and stream fisheries accounted for the majority of the fishing effort decreases estimated in 2004. The charter and moored-boat fishery effort increased slightly in 2003 by 8.5% and 7.8%, respectively.

Wisconsin anglers had an excellent salmonid fishery during 2004. Trout and salmon harvest was 498,592, 19% above the five-year average (Tables 2-4). Chinook salmon harvest showed the largest increase, 67% above the 5-year mean and the highest estimated harvest recorded since 1987. In fact, only 1987 had a higher estimated harvest since the creel survey was instituted in 1969. Coho salmon harvest increased to 76, 944 fish, 12% above the 5-year mean. Because of the extremely successful chinook and coho fishery and low stream water levels in 2004, the harvest of other salmon and trout species declined from the 5-year mean (i.e. –36% to –99%).

The estimated open-water harvest of yellow perch was 108,293 fish, a decrease from the last few years (Table 2). In recent years, the yellow perch harvest has been supported almost entirely by the 1998 year-lass. As the aging 1998s decline in abundance, yellow perch harvest will likely continue to decline in the near future. Walleye harvest was estimated at 8,458, while smallmouth bass and northern pike harvests were 18,849 and 946 respectively. For more detailed summaries, check out of Lake Michigan Website at http://www.dnr.state.wi.us/org/water/fhp/fish/lakemich/.

Table 1. Fishing effort (angler hours) by various angler groups in Wisconsin waters of Lake Michigan and Green Bay during 2004 and percent change from the 5-year average (1999 – 2003).

| YEAR | RAMP | MOORED | CHARTER | PIER | SHORE | STREAM | TOTAL |
|---|---|---|---|---|---|---|---|
| 2004 | 1,255,719 | 382,556 | 256,274 | 191,308 | 211,104 | 321,739 | 2,618,700 |
| % change | -8.4% | + 7.8% | + 8.5% | + 19% | - 6% | - 8% | - 3% |

Table 2. Sport harvest by fishery type and species for Wisconsin waters of Lake Michigan and Green Bay during 2004.

| SPECIES | RAMP | MOORED | CHARTER | PIER | SHORE | STREAM | **TOTAL** |
|---|---|---|---|---|---|---|---|
| Coho salmon | 30,764 | 21,447 | 20,334 | 2,143 | 851 | 1,405 | **76,944** |
| Chinook salmon | 141,859 | 95,830 | 93,468 | 6,446 | 5,886 | 17,502 | **360,991** |
| Rainbow trout | 8,454 | 7,148 | 4,038 | 668 | 715 | 4,506 | **25,529** |
| Brown trout | 9,947 | 1,210 | 1,686 | 2,043 | 3,723 | 2,309 | **20,918** |
| Brook trout | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Lake trout | 4,929 | 4,783 | 4,468 | 29 | 0 | 0 | **14,209** |
| Northern pike | 567 | - | - | 121 | 140 | 118 | **946** |
| Smallmouth bass | 8,399 | 9,087 | - | 383 | 625 | 355 | **18,849** |
| Yellow perch | 83,715 | 5,589 | - | 9,587 | 9,014 | 388 | **108,293** |
| Walleye | 7,416 | 142 | - | 666 | 33 | 201 | **8,458** |
| **TOTAL** | **353,037** | **133,922** | **100,037** | **17,144** | **26,771** | **35,256** | **666,177** |

**Table 3. Trout and salmon harvest by species in Wisconsin waters of Lake Michigan, 1986-2004.**

| Species | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brook Trout | 4,587 | 1,369 | 5,148 | 2,192 | 5,927 | 1,659 | 4,431 | 1,967 | 7,481 | 1,914 | 419 | 299 | 159 | 574 | 199 | 263 | 144 | 126 | 1 | 38,859 |
| Brown Trout | 68,806 | 82,397 | 59,397 | 55,036 | 45,092 | 59,164 | 51,554 | 64,546 | 52,397 | 49,654 | 38,093 | 43,224 | 27,371 | 37,187 | 40,966 | 26,421 | 35,220 | 23,654 | 20,918 | 881,097 |
| Rainbow Trout | 26,483 | 56,055 | 60,860 | 87,987 | 51,711 | 67,877 | 79,525 | 104,769 | 114,776 | 117,508 | 77,099 | 94,470 | 110,888 | 84,248 | 71,829 | 72,854 | 74,031 | 48,548 | 25,529 | 1,427,047 |
| Chinook Salmon | 356,900 | 396,478 | 176,294 | 189,251 | 111,345 | 139,080 | 103,564 | 87,365 | 99,755 | 162,888 | 183,254 | 130,152 | 136,653 | 157,934 | 136,379 | 191,378 | 275,454 | 317,619 | 360,991 | 3,712,734 |
| Coho Salmon | 127,919 | 111,886 | 136,695 | 105,224 | 64,083 | 44,195 | 70,876 | 74,304 | 110,001 | 65,647 | 104,715 | 138,423 | 59,203 | 56,297 | 87,927 | 47,474 | 102,313 | 50,625 | 76,944 | 1,634,751 |
| Lake Trout | 96,858 | 113,930 | 89,227 | 94,614 | 75,177 | 85,841 | 52,853 | 61,123 | 53,989 | 69,332 | 36,849 | 57,954 | 82,247 | 39,819 | 31,151 | 40,408 | 39,865 | 23,881 | 14,209 | 1,159,327 |
| **TOTAL** | **681,553** | **762,115** | **527,621** | **534,304** | **353,335** | **397,816** | **362,803** | **394,074** | **438,399** | **466,943** | **440,429** | **464,522** | **416,521** | **376,059** | **368,451** | **378,798** | **527,027** | **464,453** | **498,592** | **8,853,815** |
| Harvest | | | | | | | | | | | | | | | | | | | | |
| Per Hour | 0.1469 | 0.1593 | 0.1068 | 0.1220 | 0.0979 | 0.1103 | 0.0980 | 0.1213 | 0.1256 | 0.1426 | 0.1481 | 0.1619 | 0.1451 | 0.1331 | 0.1614 | 0.1382 | 0.1789 | 0.1719 | 0.1904 | 0.1373 |

**Table 4. Trout and salmon harvest by angler group in Wisconsin waters of Lake Michigan, 1986-2004.**

| Fisheries Type | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ramp | 255,559 | 266,036 | 222,428 | 173,224 | 118,439 | 150,840 | 111,260 | 145,689 | 167,388 | 193,752 | 176,085 | 190,976 | 155,953 | 141,903 | 170,081 | 156,470 | 236,241 | 196,235 | 195,953 | 3,424,512 |
| Moored | 186,611 | 225,586 | 98,908 | 184,011 | 97,206 | 103,633 | 111,441 | 110,507 | 134,315 | 128,743 | 125,017 | 129,332 | 141,538 | 100,078 | 68,872 | 85,435 | 110,094 | 111,148 | 130,418 | 2,382,893 |
| Charter | 124,282 | 150,249 | 133,861 | 125,969 | 85,773 | 88,490 | 71,113 | 81,490 | 81,909 | 84,898 | 86,346 | 94,556 | 84,867 | 73,622 | 91,665 | 76,868 | 106,631 | 100,037 | 123,995 | 1,866,621 |
| Pier | 47,643 | 44,280 | 26,527 | 7,548 | 6,946 | 8,701 | 10,867 | 9,144 | 15,130 | 14,621 | 6,218 | 5,002 | 4,200 | 4,614 | 4,402 | 7,327 | 10,629 | 8,464 | 11,329 | 253,592 |
| Shore | 27,947 | 30,043 | 22,945 | 13,268 | 14,538 | 16,830 | 16,602 | 13,645 | 16,370 | 17,676 | 19,676 | 16,726 | 8,997 | 12,685 | 13,971 | 18,308 | 20,111 | 14,995 | 11,175 | 326,508 |
| Stream | 39,511 | 45,921 | 22,952 | 30,284 | 30,433 | 29,322 | 41,520 | 33,599 | 23,287 | 27,253 | 27,087 | 27,930 | 20,966 | 43,157 | 19,460 | 34,390 | 43,321 | 33,574 | 25,722 | 599,689 |
| **TOTAL** | **681,553** | **762,115** | **527,621** | **534,304** | **353,335** | **397,816** | **362,803** | **394,074** | **438,399** | **466,943** | **440,429** | **464,522** | **416,521** | **376,059** | **368,451** | **378,798** | **527,027** | **464,453** | **498,592** | **8,853,815** |

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## WISCONSIN'S 2004 WEIR HARVEST

The Wisconsin Department of Natural Resources (WDNR) operates three salmonid egg collection stations on Lake Michigan tributaries. The Strawberry Creek Weir (SCW) which has been in operation since the early 1970's, is located on Strawberry Creek in Door County near Sturgeon Bay and is the primary facility for chinook salmon *Oncorhynchus tshawytscha*. The Buzz Besadny Anadromous Fisheries Facility (BAFF) has been in operation since 1990 and is located on the Kewaunee River in Kewaunee County near Kewaunee. BAFF is a co-primary egg collection station for three strains of steelhead *O. mykiss*, and coho salmon *O. kisutch.* BAFF also serves as a backup for Chinook salmon egg collection. The Root River Steelhead facility (RRSF) has been in operation since 1994 and is located on the Root River in Racine County in Racine. RRSF is a co-primary egg collection station for the three strains of steelhead, and coho and serves as a backup for Chinook salmon egg collection.

Strawberry Creek is a rather small creek with no public land above the SCW. As a result all fish returning to SCW are harvested. Surplus eggs are sold under contract to a bait dealer and salmon carcasses are removed. The Kewaunee River is a rather large tributary to Lake Michigan and there is a considerable amount of public frontage below and above the BAFF. As a result salmonids captured at BAFF but not needed for hatchery egg production are released for the sport stream fishery. A large sport stream fishery has developed on the Root River, and salmonids captured at the RRSF but not needed for hatchery egg production are also released.

Salmonid egg harvest quotas vary from one year to the next based on projections to satisfy WDNR hatchery needs and accommodate egg requests from other agencies. In 2004 the projected salmonid egg quotas were: 3.8 million chinook salmon eggs, 2.0 million coho salmon eggs, 1.5 million steelhead eggs.

Low Stream flow and low Lake Michigan water level was a potential problem for Chinook harvest at SCW again in the fall of 2004. However, the 3,500 foot pipeline and pump capable of pumping approximately 1,500 – 2,000 gallons of water per minute, that was installed in 2000 was utilized again for the fifth consecutive fall during 2004. This pump and pipeline delivered water to Strawberry Creek above the SCW and created an artificial flow sufficient for attracting and harvesting chinook. As a result SCW was able to operate despite the low water conditions and all of the Chinook salmon egg quota was collected at SCW in 2004. Although Chinook gametes could have been collected at BAFF in 2004, the RRSF experienced poor water conditions for the second consecutive and it is doubtful that any meaningful number of chinook eggs could have been harvested there. Coho egg collection was also limited by the low flow and low water conditions. The RRSF managed to collect ~ 0.55 million coho eggs and ~ 1.19 million were harvested at BAFF. Surplus eggs from other state agencies were required to fill coho egg quotas in 2004.

Table 1. Yearly summary of chinook salmon returns and egg collection at Strawberry Creek, 1981 through 2004.

| Harvest Year | Total fish Live and Dead | Adipose clipped fish | Total Weight (pounds) | Hatchery Egg Production[1] | |
|---|---|---|---|---|---|
| | | | | Number | Pounds |
| 1981 | 4,314 | - | 74,209 | 9,786,000 | 9,786 |
| 1982 | 3,963 | - | 60,206 | 7,728,000 | 7,728 |
| 1983 | 3,852 | 48 | 66,091 | 6,954,000 | 6,954 |
| 1984 | 5,208 | 64 | 76,905 | 7,652,000 | 7,652 |
| 1985 | 5,601 | 582 | 90,860 | 7,085,000 | 7,058 |
| 1986 | 4,392 | 322 | 53,700 | 5,052,000 | 5,052 |
| 1987 | 7,624 | 701 | 99,100 | 4,929,000 | 4,929 |
| 1988 | 3,477 | 408 | 43,645 | 3,997,000 | 3,997 |
| 1989 | 1,845 | 301 | 20,849[2] | 1,350,000 | 1,350 |
| 1990 | 3,016 | 501 | 47,091[2] | 2,378,000 | 2,378 |
| 1991 | 3,009 | 377 | 43,630[2] | 1,649,000 | 1,649 |
| 1992 | 4,099 | 382 | 51,878[2] | 1,677,100 | 1,677 |
| 1993 | 4,377 | 582 | 66,094[2] | 2,156,666 | 2,156 |
| 1994 | 4,051 | 733 | 63,195[2] | 3,426,026 | 3,426 |
| 1995 | 2,381 | 408 | 30,001[2] | 2,221,446 | 2,221 |
| 1996 | 6,653 | 1,185 | 97,134[2] | 4,720,000 | 4,720 |
| 1997 | 4,850 | 969 | 78,085[2] | 4,060,944 | 4,606 |
| 1998 | 5,035 | 1,092 | 61,427[2] | 3,489,144 | 3,489 |
| 1999[3] | 1,934 | 535 | 21,081[2] | 633,000 | 633 |
| 2000[4] | 6,649 | 2,201 | 75,400[2] | 3,672,771 | 3,673 |
| 2001[4] | 8,125 | 2,566 | 119,438[2] | 3,775,982 | 3,776 |
| 2002[4] | 11,027 | 3,678 | 160,994[2] | 3,820,396 | 3,820 |
| 2003[4] | 6,086 | 1,614 | 81,551 | 3,421,976 | 3,422 |
| 2004[4] | 10,917 | 1,039 | 145,196 | 3,435,828 | 3,436 |

1 Chinook salmon eggs harvested for hatchery production (does not include eggs sold for bait).
2 Annual average weight per fish used to estimate total weight (2002 average weight was 14.6 pounds).
3 During 1999 extreme low flow conditions persisted throughout the summer and fall in Strawberry Creek, and these conditions are known to have limited the ability of chinook to return to the weir. All values for 1999 were affected by these low flow conditions.
4 From 2000 through 2004 extreme low stream flow and low lake levels persisted. A pipeline was installed which delivered approximately 1,500 – 2,000 gallons of water per minute, and allowed weir operation.

The Chinook salmon capture at BAFF during the fall of 2004 was above the 14 year average (Table 2) despite the intentional passage of Chinook not needed for egg production. The run of Chinook to BAFF was also influenced by lower numbers of chinook imprinted to return to BAFF during the fall of 2004 and low water level and low flow conditions. Because Chinook were bypassed without handling, it is uncertain how large the run would have been if the BAFF had been fully operational.

Table 2. Yearly summary of chinook returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2004.

| Year | Number of fish harvested | Number of fish passed upstream | Dead fish | Hatchery transfer | Total number of fish examined | Adipose clipped | Number of eggs harvested |
|---|---|---|---|---|---|---|---|
| CHINOOK SALMON | | | | | | | |
| 1990 | 1,307 | 1,797 | | | 3,104 | 214 | 1,081,000 |
| 1991 | 2,390 | 966 | | | 3,356 | 21 | 1,880,000 |
| 1992 | 2,254 | 995 | 625 | | 3,874 | 120 | 2,148,000 |
| 1993 | 2,180 | 726 | 354 | | 3,260 | 241 | 880,000 |
| 1994 | 813 | 847 | 62 | | 1,722 | 452 | 471,000 |
| 1995 | 1,182 | 1,362 | 77 | | 2,621 | 737 | 1,360,000 |
| 1996 | 952 | 2,029 | 212 | | 3,193 | 629 | 700,000 |
| 1997 | 144 | 1,139 | 235 | | 1,518 | 148 | 0 |
| 1998 | 695 | 2,858 | 452 | | 4,005 | 72 | 1,155,080 |
| 1999 | 1,803 | 3,189 | 806 | | 5,798 | 496 | 3,291,346 |
| 2000 | 720 | 1,733 | 321 | | 2,774 | 741 | 0 |
| 2001 | 4,322 | 1,066 | 48 | | 5,092 | 2,063 | 0 |
| 2002 | 4,929 | 174 | 1,121 | | 6,224 | 2,713 | 0 |
| 2003 | 1,075 | * | 122 | | 1,197 | 22 | 184,224 |
| 2004 | 2,496 | * | 325 | | 2,821 | 13 | 0 |

*During weir operation in 2003 and 2004,chinook egg harvest at BAFF was not anticipated and bypass gates were intentionally left open at times to allow fish to move upstream without being trapped. It is unknown how many chinook were able to move upstream through the bypass.

The coho salmon return to BAFF in the fall of 2004 was 2,081 (Table 3). This is above the fourteen-year average of 1,646 and the highest harvest since 1998. Approximately 1.187 million coho salmon eggs were collected at BAFF in the fall of 2004. Low flow in the Kewaunee River no doubt affected the coho return over the past five years, but is not likely the only factor responsible for the low returns of coho at BAFF.

Table 3. Yearly summary of coho salmon returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2004.

| Year | Number of fish harvested | Number of fish passed upstream | Dead fish | Hatchery transfer | Total number of fish examined | Adipose clipped | Number of eggs harvested |
|---|---|---|---|---|---|---|---|
| COHO SALMON | | | | | | | |
| 1990 | 1,889 | 1,813 | | 185 | 3,887 | | 1,374,000 |
| 1991 | 780 | 287 | | 73 | 1,140 | | 790,000 |
| 1992 | 307 | 596 | | | 958 | | 163,000 |
| 1993 | 448 | 130 | 326 | 725 | 1,671 | | 529,000 |
| 1994 | 433 | 185 | 97 | | 746 | | 350,000 |
| 1995 | 698 | 2,744 | 325 | | 3,767 | | 535,000 |
| 1996 | 632 | 989 | 248 | | 3,328[1] | 54 | 688,000 |
| 1997 | 773 | 337 | 52 | | 1,162 | 251 | 524,000 |
| 1998 | 847 | 1,518 | 67 | | 2,432 | 299 | 607,898 |
| 1999 | 809 | 536 | 143 | 150 | 1,638 | | 1,445,423 |
| 2000 | 768 | 656 | 205 | | 1,629 | | 1,115,000 |
| 2001 | 124 | 34 | 17 | | 175 | | 109,000 |
| 2002 | 184 | 37 | 20 | | 241 | | 160,000 |
| 2003 | 255 | 11 | | | 266 | | 156,222 |
| 2004 | 1,593 | 335 | 153 | | 2,081 | | 1,187,000 |

[1] Coho salmon total includes 1,459 fish sacrificed for disease control.

The steelhead return to BAFF in 2004 was 775 (Table 4), with most observed during the spring run. The 2004 spring run total was highest total since 1998. However, the 2004 run total was still substantially lower than those observed in 1991 through 1996. The reduction in return number is likely due to the poor return rate for several year classes that were stocked between 1997 and 2000. The summer/fall run began in July and continued through November with 40 steelhead captured of which 32 were Skamania strain. Twenty-four Skamania were sent to Kettle Moraine Springs Hatchery to be spawned as broodstock.

Table 4. Yearly summary of steelhead returns and egg collection at the Besadny Anadromous Fisheries Facility, 1990 through 2004.

| Year | Number of fish harvested | Fish passed upstream | Dead fish | Hatchery transfer | Total fish examined | Adipose clipped | Number of eggs harvested |
|---|---|---|---|---|---|---|---|
| 1992 – Spring | | 2,892 | 446 | | 3,338 | | |
| 1992 – Fall | | 66 | | 408 | 474 | | |
| 1993 – Spring | | 2,096 | 177 | | 2,273 | | |
| 1993 – Fall | | 30 | | 175 | 205 | | |
| 1994 – Spring | | 2,804 | 164 | | 2,968 | | |
| 1994 – Fall | | 321 | | 200 | 521 | | |
| 1995 – Spring | | 1,696 | 151 | | 1,847 | | 756,000 |
| 1995 – Fall | | 457 | 9 | 121 | 587 | | |
| 1996 – Spring | | 1,964 | 180 | | 2,144 | | 454,000 |
| 1996 – Fall | | 24 | 18 | 151 | 193 | | |
| 1997 – Spring | | 1,955 | 136 | | 2,091 | | 780,000 |
| 1997 – Fall | | 85 | 6 | 40 | 131 | | 50,600 |
| 1998 – Spring | | 746 | 130 | | 876 | | 400,000 |
| 1998 – Fall | | 41 | 2 | 7 | 50 | | 15,000 |
| 1999 – Spring | | 608 | 124 | 0 | 732 | | 508,000 |
| 1999 – Fall | | 61 | 7 | 77 | 145 | | 100,000 |
| 2000 – Spring | | 220 | 120 | 0 | 340 | | 259,000 |
| 2000 – Fall | | 2 | 0 | 5 | 7 | | 0 |
| 2001 – Spring | | 324 | 89 | 0 | 413 | | 269,000 |
| 2001 – Fall | | 6 | 0 | 7 | 13 | | Unknown |
| 2002 – Spring | | 307 | 69 | 0 | 376 | | Unknown |
| 2002 – Fall | | 3 | 0 | 0 | 3 | | 0 |
| 2003 – Spring | | 307 | 64 | 0 | 371 | | 80,000 |
| 2003 – Fall | | 0 | 0 | 0 | 0 | | 0 |
| 2004-Spring | | 720 | 15 | 0 | 735 | | Unknown |
| 2004-Fall | | 16 | 0 | 24 | 40 | | Unknown |

For the second consecutive year, extremely dry conditions resulted in a poor return of fish to the RRSF in the fall of 2004. Only 392 chinook salmon and 1,271 coho salmon were captured. (Table 5). No chinook salmon eggs were collected for hatchery production at RRSF in the fall of 2004 as all chinook eggs were collected at SCW. Approximately 550,000 coho eggs were collected.

Table 5. Yearly summary of chinook and coho salmon returns and egg collection at the Root River Steelhead Facility, 1994 through 2004.

| Year | Number of fish harvested | Number of fish passed upstream | Dead fish | Hatchery transfer | Total number of fish | Adipose clipped | Number of eggs harvested |
|---|---|---|---|---|---|---|---|
| CHINOOK SALMON | | | | | | | |
| 1994 | 129 | 1,726 | 3 | | 1,858 | 3 | |
| 1995 | 300 | 2,663 | 16 | | 2,979 | 1 | 1,020,000 |
| 1996 | 62 | 5,440 | 87 | | 5,589 | | 644,000 |
| 1997 | 76 | 3,974 | 52 | | 4,102 | | 0 |
| 1998 | 127 | 3,845 | 5 | | 3,977 | 2 | 93,000 |
| 1999 | 338 | 5,381 | 303 | | 6,022 | | 800,000 |
| 2000 | 267 | 6,972 | 143 | | 7,382 | | No data |
| 2001 | 288 | 9,697 | 229 | | 10,214 | | No data |
| 2002 | 120 | 10,011 | 308 | | 10,439 | | No data |
| 2003 | 0 | 149 | 0 | | 149 | | No data |
| 2004 | 0 | 377 | 15 | | 392 | | No data |
| COHO SALMON | | | | | | | |
| 1994 | 285 | 513 | 15 | | 813 | | |
| 1995 | 199 | 2,115 | 1,040 | | 3,321 | 3 | 330,000 |
| 1996 | 161 | 3,940 | 305 | | 4,406 | | 2,200,000 |
| 1997 | 65 | 6,909 | 16 | 655 | 7,645 | | 1,750,000 |
| 1998 | 90 | 3,336 | 246 | 328 | 4,000 | 1 | 760,000 |
| 1999 | 60 | 978 | 5 | 107 | 1,150 | | 150,000 |
| 2000 | 75 | 2,921 | 181 | 231 | 3,408 | | 1,200,000 |
| 2001 | 71 | 942 | 23 | 291 | 1,327 | | 800,000 |
| 2002 | 217 | 2,076 | 63 | 192 | 2,548 | 140 | 850,000 |
| 2003 | 72 | 126 | 0 | 0 | 198 | 7 | 150,000 |
| 2004 | 111 | 1,148 | 12 | | 1,271 | 60 | 550,000 |

The steelhead return at RRSF in 2004 was 1,426 (Table 6). Most of these steelhead (1,028 or 72 percent) returned in the spring and were likely either Chambers Creek or Ganaraska strain. The steelhead returning in fall (398 or 28 percent) were primarily Skamania strain. Approximately 0.9 million steelhead eggs were collected in spring and 319,000 in fall 2004 at the RRSF.

Table 6. Yearly summary of steelhead returns and egg collection at the Root River Steelhead Facility, 1994 through 2004.

| Year | Number of fish harvested | Number of fish passed upstream | Dead fish | Hatchery transfer | Total fish examined | Adipose clipped | Number of eggs harvested |
|---|---|---|---|---|---|---|---|
| STEELHEAD | | | | | | | |
| 1994 – Fall | | 583 | 47 | 218 | 848 | 2 | 200,000 |
| 1995 – Spring | 120 | 2,582 | 18 | | 2,720 | 2 | 1,008,000 |
| 1995 – Fall | | 208 | | 330 | 538 | 1 | 300,000 |
| 1996 – Spring | 150 | 2,970 | 49 | | 3,169 | | 775,000 |
| 1996 – Fall | | 105 | | 248 | 353 | | 240,000 |
| 1997 – Spring | 2 | 2,918 | 125 | | 3,045 | | 777,000 |
| 1997 – Fall | | 228 | 2 | 408 | 638 | | 500,000 |
| 1998 – Spring | | 382 | | | 382 | | 320,000 |
| 1998 – Fall | | 64 | 1 | 86 | 151 | | 184,000 |
| 1999 – Spring | | 2,131 | | | 2,263 | | |
| 1999 – Fall | | 19 | 1 | 50 | 70 | | |
| 2000 – Spring | 64 | 2,107 | 0 | 0 | 2,171 | | 1,552,476 |
| 2000 – Fall | 0 | 59 | 0 | 160 | 219 | | 145,922 |
| 2001 – Spring | 69 | 790 | | | 859 | | 788,000 |
| 2001 – Fall | | 176 | | 314 | 490 | | No data |
| 2002 – Spring | 123 | 1,180 | | 0 | 1,303 | 2 | 1,425000 |
| 2002 – Fall | | 48 | 3 | 250 | 301 | | No data |
| 2003 – Spring | 83 | 977 | 0 | 0 | 1,060 | | 560,000 |
| 2003 – Fall | 0 | 6 | 0 | 230 | 236 | | No data |
| 2004 – Spring | 62 | 966 | 0 | 0 | 1,028 | | 900,000 |
| 2004 – Fall | 0 | 102 | 0 | 296 | 398 | | 319,000 |

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## STATUS OF THE COMMERCIAL CHUB FISHERY AND CHUB STOCKS

The total chub harvest from commercial gill nets was 1,107,934 pounds for calendar year 2004, a decrease of 5% from 2003 (Tables 1 and 2). Commercial smelt trawlers harvested 45,313 pounds of unmarketable chubs incidental to the targeted smelt harvest which represents a 38% decrease from 2003, when 73,065 pounds of unsorted fish were harvested. In addition to this take in 2004, 2,687 pounds were sorted as marketable catch.

By zone, the harvest in the south was 1,057,905 pounds, which is very similar to the harvest in 2003, while in the north 50,029 pounds were reported caught, a decrease of 51% compared to 2003. This is the second lowest harvest in the north since chub fishing re-opened. Between zones, CPEs were higher in the south. The south showed a 4% increase in CPE from the year before while the north showed a decrease of 16 %. Effort was very similar to the previous year in the south while effort decreased by 42% or 972,100 feet in the north. In the south, 30 of the 43 permit holders reported harvesting chubs while in the north 9 of 21 reported harvesting chubs.

Table 1. Harvest, quota, number of fishers and effort (feet) for the Wisconsin Southern Zone gillnet chub fishery 1979-2004. The actual quota is broken down into three separate periods and runs from July 1 of the previous year to June 30 of the current.

| YEAR | HARVEST | QUOTA | FISHERS | EFFORT (x1,000 FT) | CPE |
|---|---|---|---|---|---|
| 1979 | 992,143 | 900,000 | | 12,677.2 | 78.3 |
| 1980 | 1,014,259 | 900,000 | | 21,811.6 | 46.5 |
| 1981 | 1,268,888 | 1,100,000 | | 18,095.6 | 70.1 |
| 1982 | 1,538,657 | 1,300,000 | | 16,032.6 | 96.0 |
| 1983 | 1,730,281 | 1,850,000 | | 19,490.0 | 88.8 |
| 1984 | 1,697,787 | 2,400,000 | | 30,868.7 | 55.0 |
| 1985 | 1,625,018 | 2,550,000 | | 32,791.1 | 49.6 |
| 1986 | 1,610,834 | 2,700,000 | | 34,606.1 | 46.5 |
| 1987 | 1,411,742 | 3,000,000 | 59 | 32,373.9 | 43.6 |
| 1988 | 1,381,693 | 3,000,000 | 60 | 58,439.0 | 23.6 |
| 1989 | 1,368,945 | 3,000,000 | 64 | 48,218.1 | 27.6 |
| 1990 | 1,709,109 | 3,000,000 | 54 | 41,397.4 | 41.3 |
| 1991 | 1,946,793 | 3,000,000 | 58 | 45,288.3 | 43.0 |
| 1992 | 1,636,113 | 3,000,000 | 53 | 40,483.7 | 40.4 |
| 1993 | 1,520,923 | 3,000,000 | 58 | 42,669.8 | 35.6 |
| 1994 | 1,698,757 | 3,000,000 | 65 | 35,085.5 | 48.4 |
| 1995 | 1,810,953 | 3,000,000 | 59 | 28,844.9 | 62.8 |
| 1996 | 1,642,722 | 3,000,000 | 56 | 27,616.6 | 59.5 |
| 1997 | 2,094,397 | 3,000,000 | 53 | 28,441.8 | 73.6 |
| 1998 | 1,665,286 | 3,000,000 | 49 | 23,921.1 | 69.6 |
| 1999 | 1,192,590 | 3,000,000 | 46 | 25,253.2 | 47.2 |
| 2000 | 878,066 | 3,000,000 | 41 | 22,394.7 | 39.2 |
| 2001 | 1,041,066 | 3,000,000 | 44 | 26,922.8 | 38.7 |
| 2002 | 1,270,456 | 3,000,000 | 47 | 24,940.5 | 50.9 |
| 2003 | 1,069,148 | 3,000,000 | 43 | 22,613.0 | 47.3 |
| 2004 | 1,057,905 | 3,000,000 | 43 | 21,468.9 | 49.3 |

Table 2. Harvest, quota, number of fishers and effort (feet) for the Wisconsin Northern Zone gill net chub fishery 1981-2004.

| YEAR | HARVEST | QUOTA | FISHERS | EFFORT (x1,000 FT) | CPE |
|---|---|---|---|---|---|
| 1981 | 241,277 | 200,000 | | 4,920.4 | 49.0[a] |
| 1982 | 251,832 | 200,000 | | 3,469.8 | 72.5 |
| 1983 | 342,627 | 300,000 | | 6,924.7 | 49.5 |
| 1984 | 192,149 | 350,000 | | 6,148.4 | 31.2 |
| 1985 | 183,587 | 350,000 | | 3,210.0 | 57.2 |
| 1986 | 360,118 | 400,000 | | 7,037.2 | 51.2[b] |
| 1987 | 400,663 | 400,000 | 23 | 6,968.6 | 57.5 |
| 1988 | 412,493 | 400,000 | 23 | 8,382.3 | 49.2 |
| 1989 | 329,058 | 400,000 | 25 | 8,280.8 | 39.7 |
| 1990 | 440,818 | 400,000 | 23 | 8,226.4 | 53.6 |
| 1991 | 526,312 | 400,000 | 22 | 9,453.5 | 55.7 |
| 1992 | 594,544 | 500,000 | 24 | 11,453.1 | 51.9 |
| 1993 | 533,709 | 500,000 | 24 | 15,973.6 | 33.4 |
| 1994 | 342,137 | 500,000 | 24 | 8,176.2 | 41.8 |
| 1995 | 350,435 | 600,000 | 24 | 5,326.4 | 65.8 |
| 1996 | 332,757 | 600,000 | 24 | 4,589.7 | 72.5 |
| 1997 | 315,375 | 600,000 | 23 | 4,365.6 | 72.2 |
| 1998 | 266,119 | 600,000 | 23 | 3,029.0 | 87.9 |
| 1999 | 134,139 | 600,000 | 23 | 1,669.7 | 80.3 |
| 2000 | 77,811 | 600,000 | 21 | 2,199.5 | 35.4 |
| 2001 | 36,637 | 600,000 | 21 | 972.4 | 37.7 |
| 2002 | 63,846 | 600,000 | 21 | 1,098.6 | 58.1 |
| 2003 | 102,692 | 600,000 | 21 | 2,326.5 | 44.1 |
| 2004 | 50,029 | 600,000 | 21 | 1,354.0 | 36.9 |

[a] For the years 81-85, 90 & 91, 98-04 totals were by calendar year.
[b] For the years 86-89 & 92-97 the totals were through Jan. 15 of the following year.

Chub assessment in 2004 marked the third year that otoliths, a small piece of calcified material commonly referred to as ear stones, were extracted and used to age harvested chubs. This replaced the common scale reading method that had been used the past 25 years for aging purposes before 2002. The otolith method has been found to be more accurate, especially when dealing with older populations of fish.

Population assessments with graded-mesh gill nets were conducted in the fall of 2004 off Algoma, Baileys Harbor and Sheboygan with 2 lifts per port. One lift off Baileys Harbor was made in January due to weather constraints in November. Samples of chubs were also collected and aged from standard mesh gear off of Algoma and Sheboygan. The use of otoliths for aging chubs indicates that scale reading may have under-aged fish in the last several years as chub growth slowed.

Chubs over 20 years of age were collected off Baileys Harbor and up to 18 years of age off Algoma and Sheboygan (Figure 1). The two most common ages off Baileys Harbor were age 16 and 17 while ages 13 and 14 were the most common off Algoma and Sheboygan. Although catches from the graded mesh assessments were dominated by older fish, there was a slight

increase of chubs under the age of 10 years old captured at all the ports when compared to last year. Chubs continue to show very little growth as they age (Figure 2). In the standard mesh, ages 12 through 15 were the most common with chubs as old as 19 years of age being captured (Figure 3).

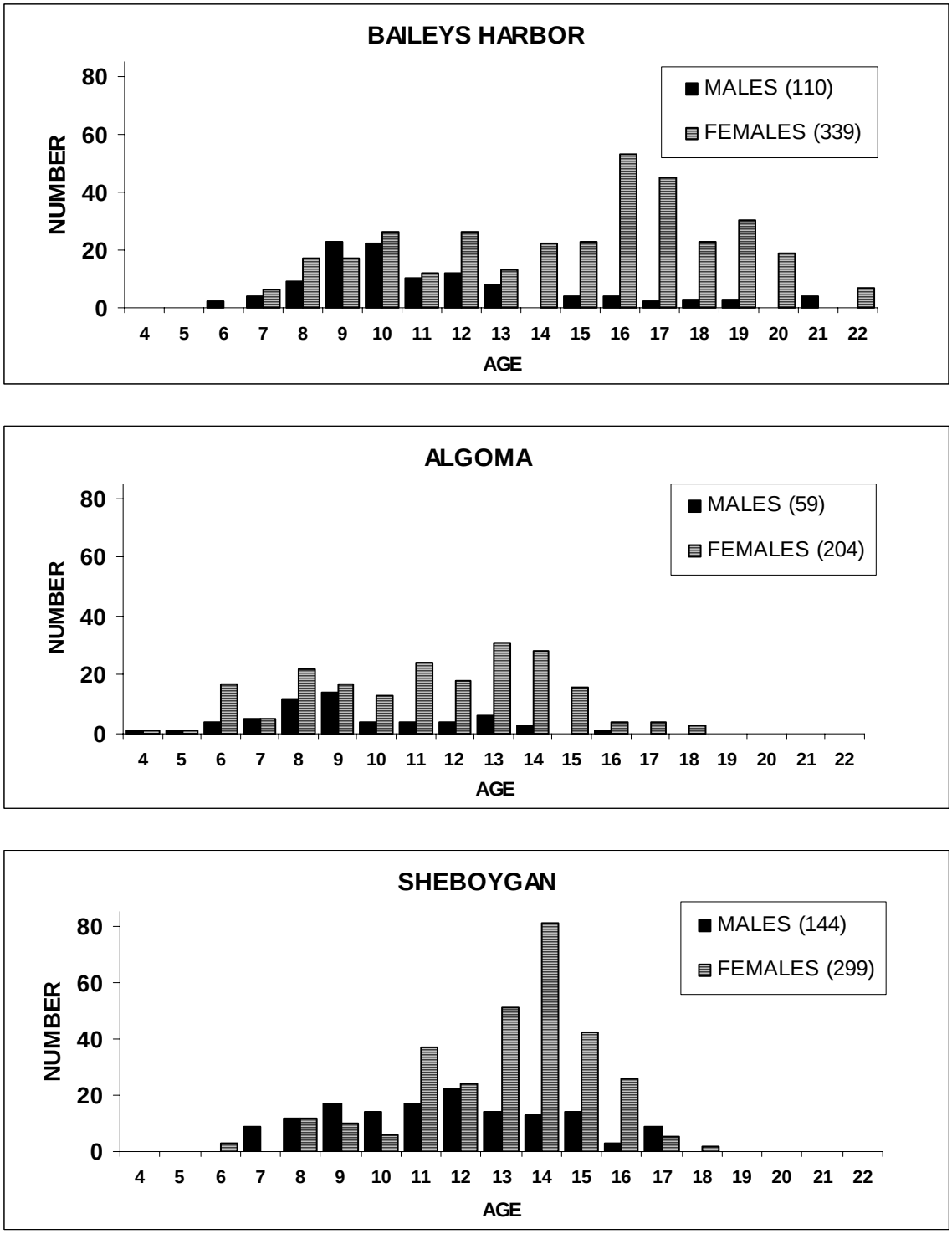
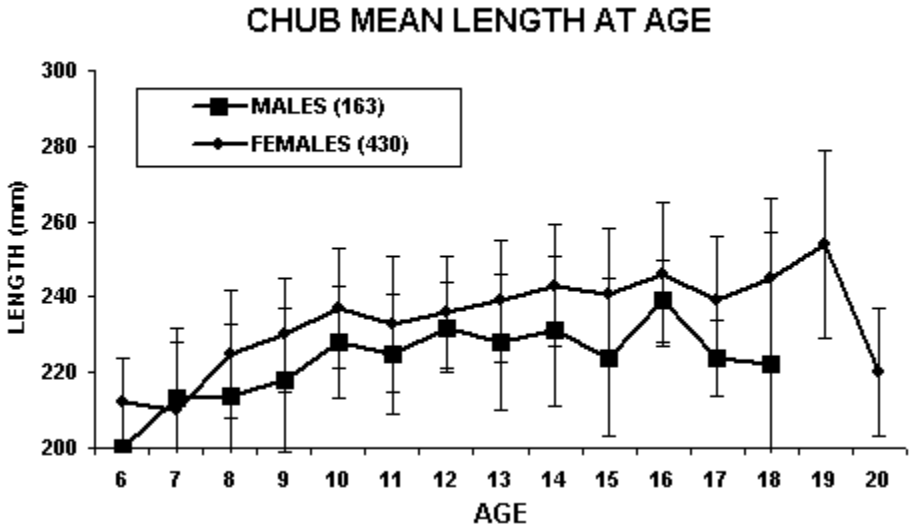
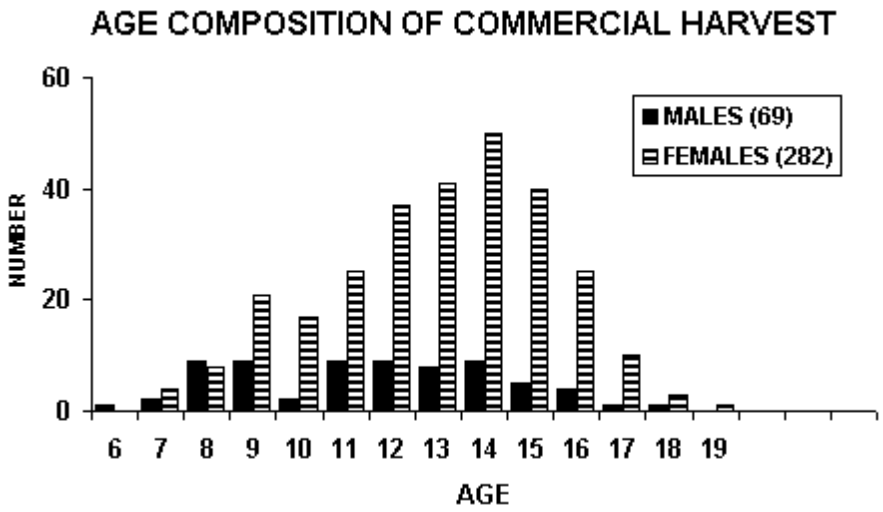



Figure 1. Age composition by number and sex of chubs captured during graded mesh assessments at three locations along the Wisconsin Lake Michigan shoreline, fall 2004.


CHUB MEAN LENGTH AT AGE
MALES (163)
FEMALES (430)
LENGTH (mm)
300
280
260
240
220
200
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
AGE


AGE COMPOSITION OF COMMERCIAL HARVEST
MALES (69)
FEMALES (282)
NUMBER
60
40
20
0
6 7 8 9 10 11 12 13 14 15 16 17 18 19
AGE

Sex ratios of chubs from standard and graded mesh continue to show a predominance of females, however, the gap has continued to decrease over the last couple years with an increase in percent males caught. In the graded mesh, 73% of the catch was female while the previous years catch resulted in an 82% female catch and the year before showed an 87% female catch. Sex ratios in the standard mesh were 80% females compared to a ratio of 91% in 2003 and 94% in 2002. An advantage of the female-dominated population to the commercial fishers is an added profit in the sale of chub roe to the caviar market during the late fall and winter months.

The following people were instrumental in varying aspects of this project: David Schindelholz for assistance with aging otoliths, and Pat McKee and Cheryl Peterson for data collection, entry and summary. Also, commercial fisherman Mark Nelson from Sheboygan and Hickey Bros. Fishery from Baileys Harbor were of great help in completing this assessment.

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## STATUS OF THE LAKE WHITEFISH POPULATION

The reported commercial harvest of lake whitefish *Coregonus clupeaformis* from the Wisconsin waters of Lake Michigan (Figure 1) during quota year 2003-04 dropped to 1,243,611 pounds with 3.4 percent of the total harvest from pound nets, 66.9 percent in trap nets, and 29.7 percent in gill nets. The total annual quota of whitefish for Wisconsin commercial fisherman has been increased four times since it was first established at 1.15 million pounds in quota year 1989-90 and is currently at 2.47 million pounds.

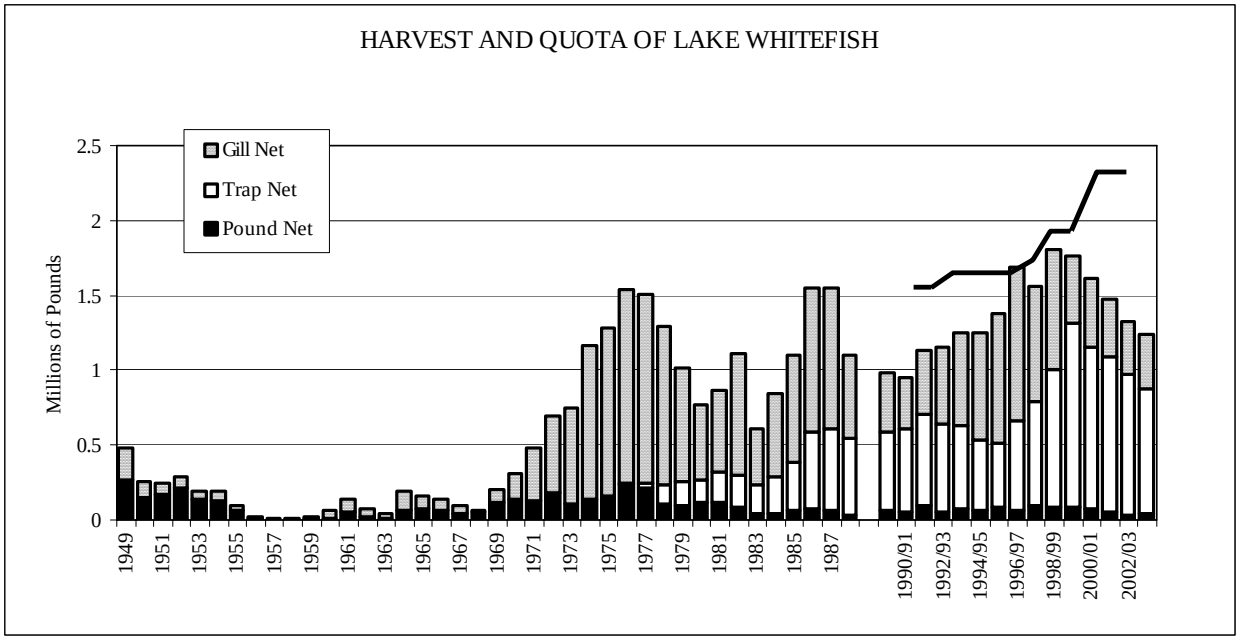


Figure 1.-Lake Whitefish reported commercial harvest by gear in pounds (dressed weight) from Wisconsin waters of Lake Michigan including Green Bay, from 1949 through 2004. (Calendar years 1949 through 1988; quota years 1989-90 through 2003-04).

Wisconsin commercial fishermen have used trap nets as a legal gear to harvest lake whitefish from Lake Michigan since 1976. The use of trap nets has increased steadily and over the last 15 years has accounted for over 50 percent of the whitefish harvest. Over the last three years trap nets have accounted for an average of 70 percent of the lake whitefish harvest which is a direct result of more trap net effort and less gill net effort (Figure 2). Trap net effort is up to over 3,100 pots lifted per year, and gill net effort is down to less than 6 million feet fished per year. Catch per unit of effort (CPE) has shown a general downward trend over the last three to five years in all types of commercial gear (Figure 3), but, changes in seasonal whitefish distribution may have contributed to this decline.

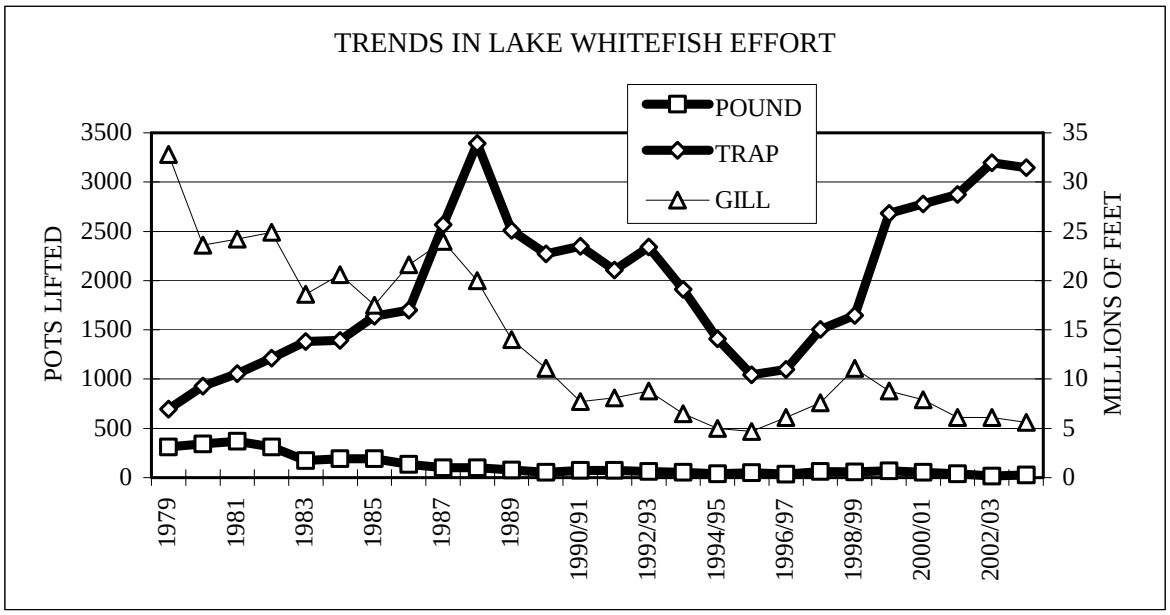


Figure 2.-Trends in gill net, trap net, and pound net effort fished for lake whitefish in Wisconsin waters of Lake Michigan, including Green Bay, 1979 through 2004 (Calendar years 1949 through 1988; quota years 1989-90 through 2003-04). (Gill net effort = millions of feet; trap net and pound net effort = number of pots lifted).

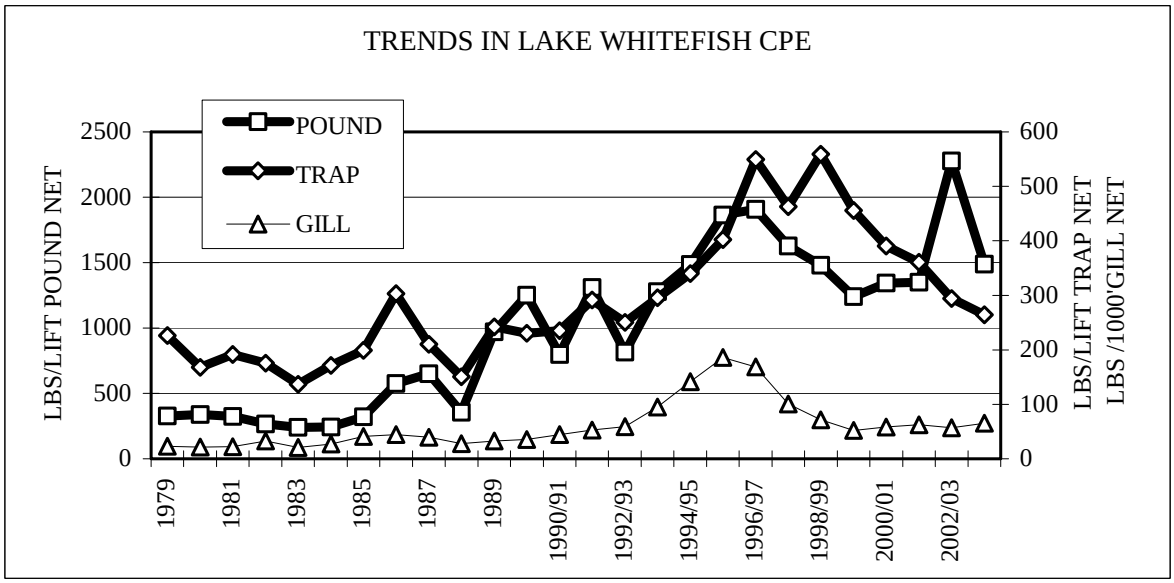


Figure 3.-Trends in gill net, trap net, and pound net lake whitefish commercial catch per unit of effort (CPE) in the Wisconsin waters of Lake Michigan including Green Bay, 1979 through 2004 (Calendar years 1949 through 1988; quota years 1989-90 through 2003-04). (Gill net CPE = pounds of whitefish harvested per 1,000 feet lifted; trap net and pound net CPE = pounds of whitefish harvested per pot lifted).

The mean length and mean weight of lake whitefish in the NMB population has experienced a steady decline. In spring 2003 whitefish mean length and weight at age (ages 2-5) were the lowest values documented since 1985 (Figures 4&5). As a result of the decreased length and weight at age, the age at which whitefish are recruited to the commercial fishery has increased from age four (as recently as the early to mid 1990's) to age six.

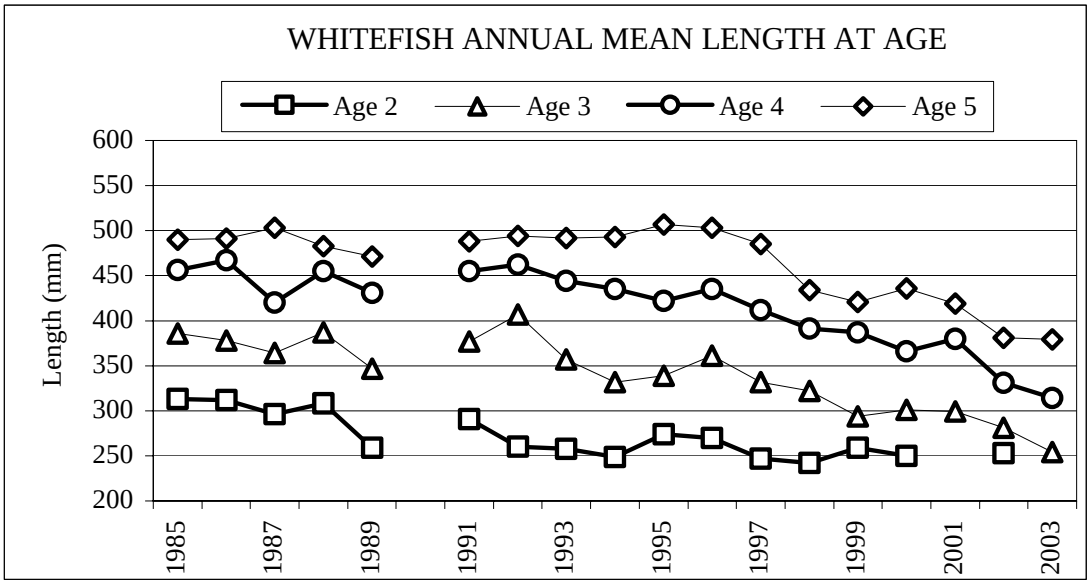


Figure 4.- Mean length of lake whitefish, at age, in spring, from the North/Moonlight Bay population, 1985-2003.

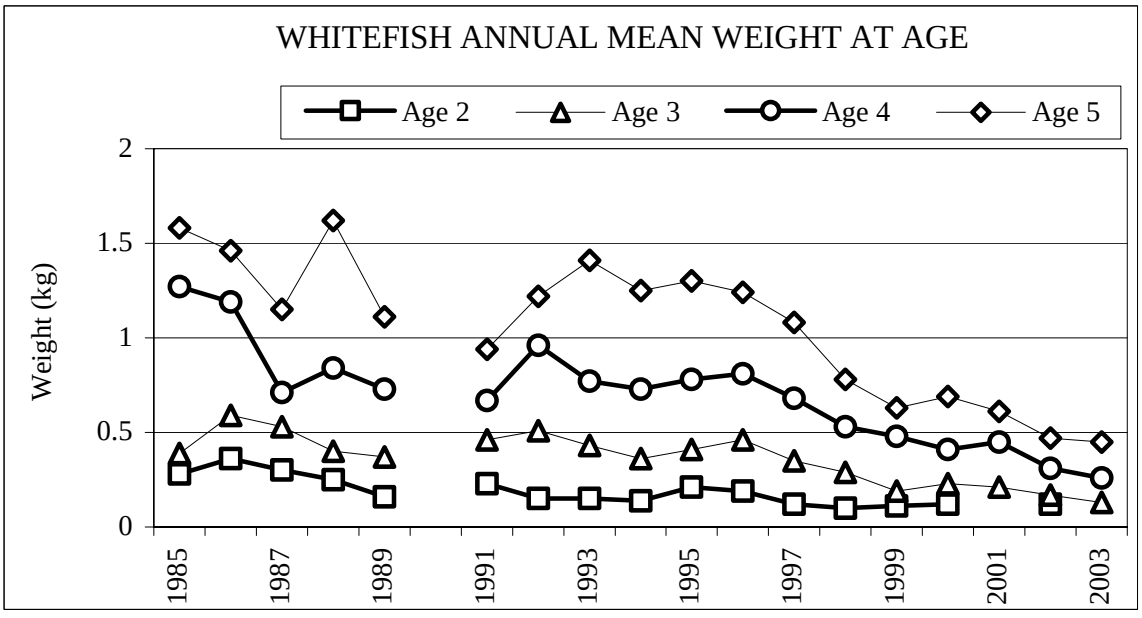


Figure 5.- Mean length and mean weight of lake whitefish, at age, in spring, from the North/Moonlight Bay population, 1985-2003.

Another way to analyze the apparent decrease in mean length and weight at age is to follow individual cohorts as they age. Figure 6&7, illustrates the size at age of six recent cohorts from the NMB stock. When the 1988 year class of whitefish from the NMB stock reached four years of age in the spring of 1992, it had a mean length of 462 mm and a mean weight of 0.96 kg. At this size the 1988 year class was at least partially recruited to the commercial fishery and vulnerable to the gear being used. When the 1998 year class reached age four in the spring of 2002 it averaged 331 mm and 0.31 kg. The minimum legal size for the commercial whitefish fishery is 432 mm. Only the fastest growing individuals from this cohort would have attained the minimum legal size.

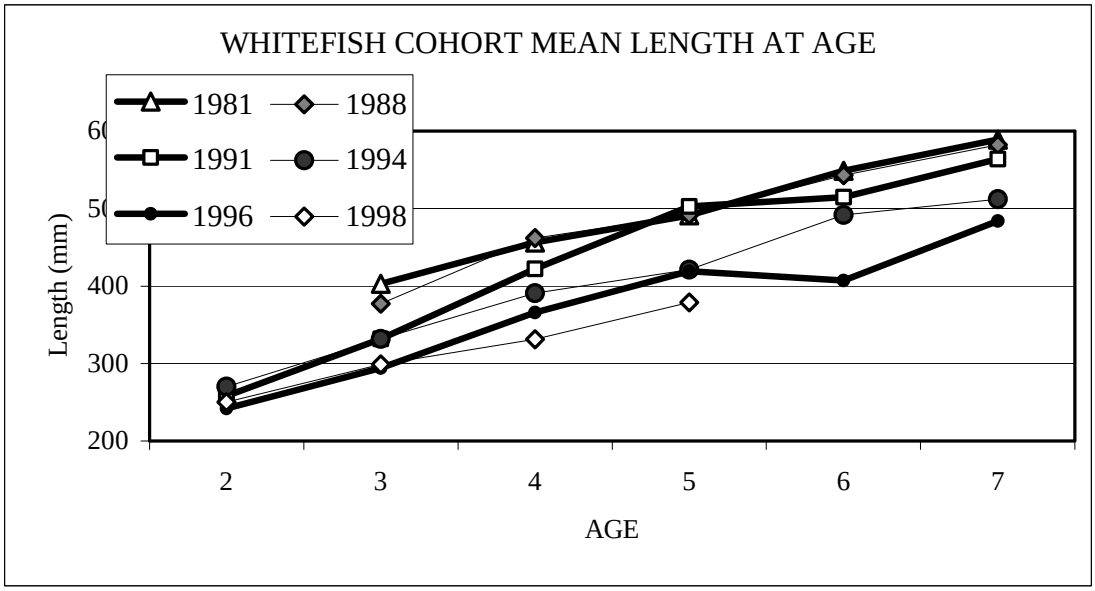


Figure 6.-Comparison of the spring time, mean length at age, of six cohorts from the North/Moonlight Bay stock of lake whitefish, 1981, 1988, 1991, 1994, 1996, and 1998.

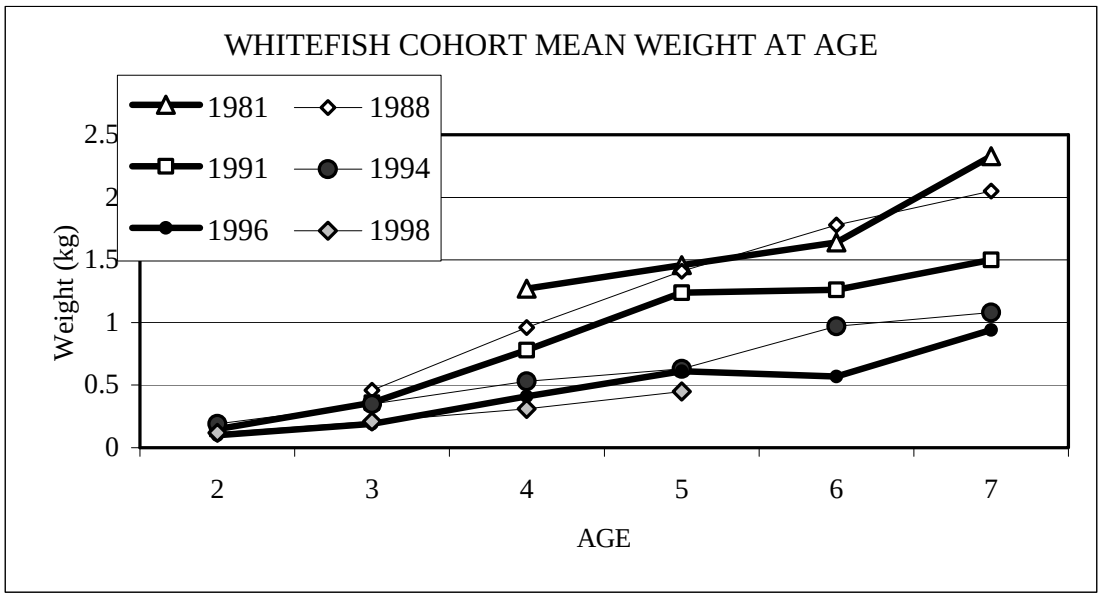


Figure 6.-Comparison of the spring time, mean weight at age, of six cohorts from the North/Moonlight Bay stock of lake whitefish, 1981, 1988, 1991, 1994, 1996, and 1998.

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## SMELT WITHDRAWAL BY THE COMMERCIAL TRAWL FISHERY

Historically, commercial trawling targeted three main species of fish in the Wisconsin waters of Lake Michigan. Much of the harvest was a general forage catch that caught large numbers of fish, chiefly alewife *Alosa pseudoharengus*, rainbow smelt *Osmerus mordax*, and bloater chub *Coregonus hoyi*. The other portion of the trawl fishery was a targeted rainbow smelt harvest. With the adoption of new rules in 1991 the general forage harvest component of the fishery was eliminated. Targeted rainbow smelt trawling rules have been established for the waters of Lake Michigan and Green Bay and the quota was set at 1,000,000 pounds, of which no more than 25,000 pounds can be harvested from Green Bay.

By utilizing the required biweekly catch reporting forms, it can be determined that commercial smelt trawlers reported catching 155,127 pounds of rainbow smelt during calendar year 2004 (Figure 1). This reported harvest was 52.7% greater than the 101, 578 pounds reported in 2003. However, the 2004 harvest was only 72.4% of the average harvest of the previous three years (2001-2003) and 43.5% of the five year average (1999-2003).

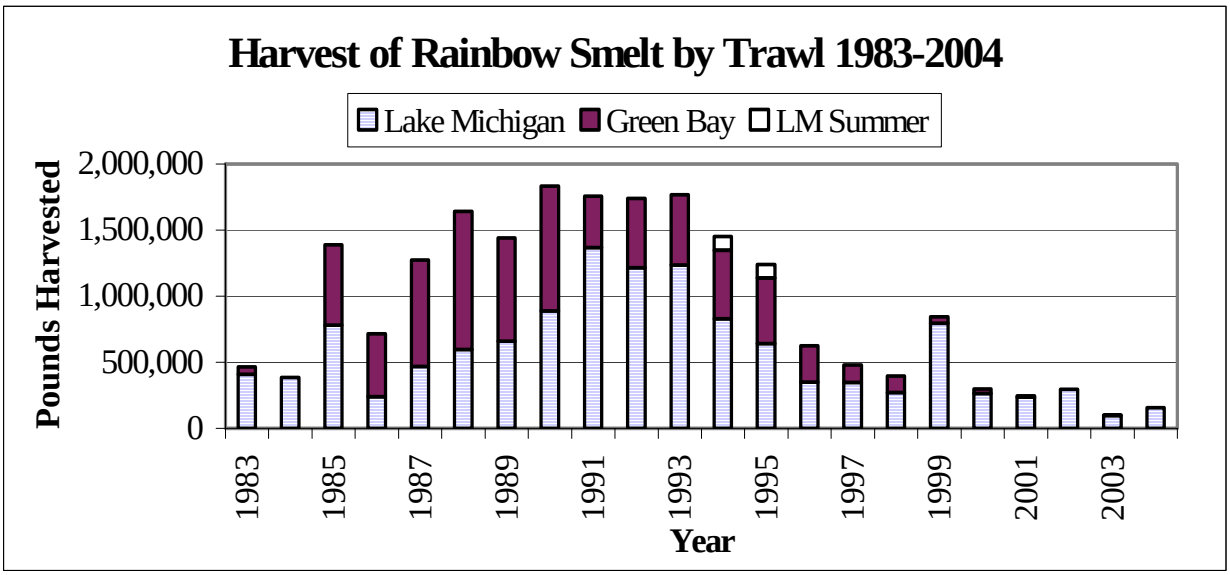


Figure 1. Reported rainbow smelt harvest by trawl from the Wisconsin waters of Lake Michigan for the years 1983 through 2004.

The harvest of rainbow smelt from Lake Michigan was 154,537 pounds (Figure 1), with an average CPE of 143 pounds per hour trawled (Figure 2). The 2004 Lake Michigan rainbow smelt harvest was 59% greater than the 2003 harvest of 97,315 pounds. The calendar year 2004 harvest was just 74% of three year average harvest and 46% of the five year average harvest on Lake Michigan. CPE on Lake Michigan in 2004 substantially increased from the all time low in CPE observed in 2003 of 85 pounds per hour trawled.

Commercial trawlers on Green Bay reported a rainbow smelt catch of 590 pounds (Figure 1), with a CPE of 79 pounds per hour trawled (Figure 3). The 2004 rainbow smelt harvest on Green Bay was

much less than the 2003 harvest of 4,263 pounds and was the second lowest reported harvest on record. The harvest in 2004 represented only 10.9% and 2.9% of the three and five year average harvests respectively. CPE in 2004 declined from the 2003 level (127 pounds per hours) and is the second lowest on record. Total fishing hours were very low in 2004 and is only a fraction of the total yearly effort of the mid-1990's.

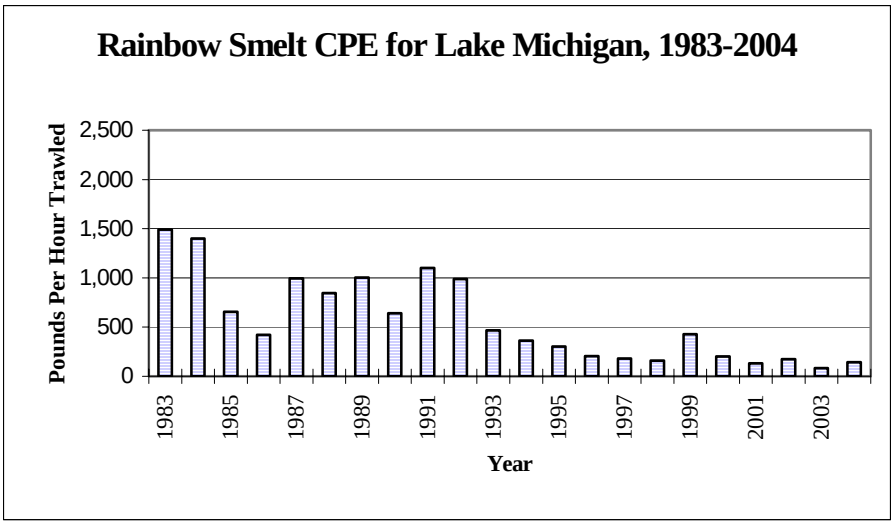


Figure 2. Rainbow smelt CPE in pounds per hour trawled on Lake Michigan during the years 1983 through 2004.

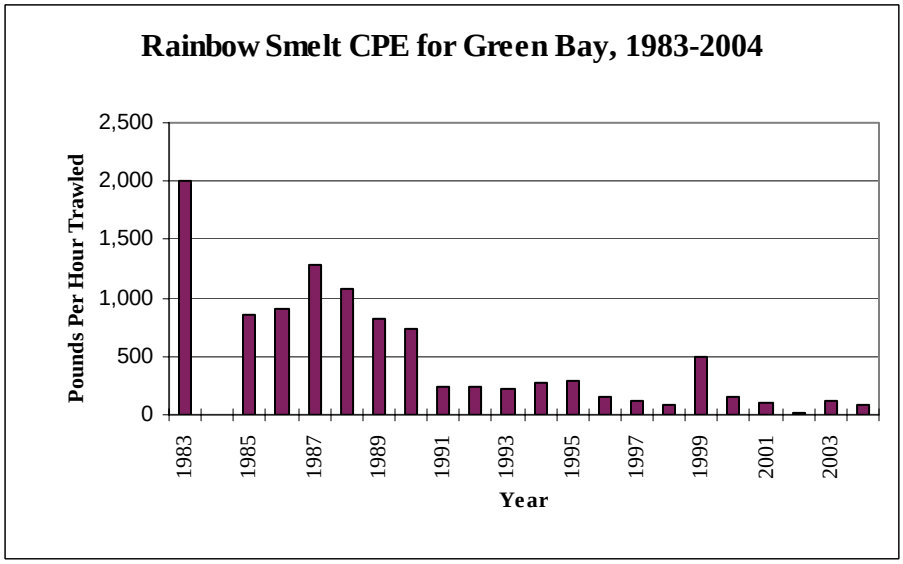


Figure 3. Rainbow smelt CPE in pounds per hour trawled on Green Bay during the years 1983 through 2004.

The commercial rainbow smelt harvest has declined dramatically since peaking in the early 1990's and has reached a substantially lower, but stable level since 2000. Although total harvest and Lake Michigan harvest increased in 2004, the rainbow smelt harvest of 2004 was still less than short-term average harvests and substantially less than longer term averages. Harvest from Green Bay continues to decline. Declines in Lake Michigan and Green Bay smelt harvest by commercial fishers is likely due to the decline in lakewide abundance of rainbow smelt.

Increased harvest by commercial trawlers in 2004 was not predicted by 2003 fall lakewide biomass estimates of the U.S.G.S. This increase in harvest may be the result of favorable fishing conditions in January 2004 when trawlers caught 41% of their yearly total and not due to a change in rainbow smelt abundance. U.S.G.S. biomass estimates have generally predicted the harvest trend for rainbow smelt by commercial trawlers except for 1999, when trawlers reported a sharp increase in rainbow smelt harvest not forecasted by U.S.G.S. numbers. Sharp declines in rainbow smelt harvest and CPE since 2000 by trawlers seem to indicate that 1999 was an unusual harvest year and that lakewide rainbow smelt numbers remain depressed from past levels. Recent U.S.G.S trawl data does not indicate any major change in lakewide rainbow smelt abundance, so it is likely that commercial harvest will not substantially change in the near future.

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## STATUS OF WALLEYE IN LOWER GREEN BAY AND THE LOWER FOX RIVER

### Introduction

Walleye populations in southern Green Bay were decimated during the early to mid 1900s by habitat destruction, pollution, interactions with invasive species, and over-exploitation. At one point, only the Menominee River supported a spawning population (Schneider et al. 1991). The water quality and fish community of southern Green Bay began to improve by the mid 1970s, and rehabilitation of walleye populations by the Wisconsin Department of Natural Resources began during 1973 with the stocking of fry and fingerlings into the Sturgeon Bay area. Stocking began in the lower Fox River (downstream from the DePere Dam) during 1977. Stocking (fingerlings and fry) was so successful in lower Green Bay / lower Fox River that it was discontinued in 1984 to allow for surveys of natural reproduction and recruitment; other areas of southern Green Bay are still stocked with walleye. The results of tagging studies suggest that populations remain in small areas and are quite discrete (Schneider et al. 1991). The walleye population in lower Green Bay and the lower Fox River (generally residing between a line drawn across Green Bay from Longtail Point to Point Sable and the DePere Dam) is likely distinct from other populations in Green Bay. The purpose of this report is to summarize data collected during the 2004 field season on the lower Green Bay / lower Fox River walleye population, and to describe trends in long-term data sets.

### Spawner abundance

The spawning population of adult (>= age-3 and >= 370 mm) walleye in the lower Fox River during the spring of 2004 was estimated at 54,826 (95% CI 40,116-82,992; Figure 1). This estimate was the third highest during our 1987-2004 time series, and much greater than the 2003 estimate of 10,214 and the preceding ten year average of 24,092. The 2004 spawner abundance estimate was substantially greater than estimates for 1999-2003 because the very strong 2001 year class recruited to the 2004 spawning population, while 1999-2003 spawner abundance was composed of the poor 1999 and 2000 and relatively poor 1998 year classes. Furthermore, low water levels on Green Bay and the lower Fox River compromised our ability set nets in appropriate locations during 2003, and may have disrupted normal walleye spawning behavior. Water levels on Green Bay and the lower Fox River were higher during 2004 than 2003, and we were able to set our nets in appropriate locations. Higher water levels in lower Green Bay and strong flows in the Fox River may have contributed to the 2004 spawner abundance estimate being greater than the 2003 estimate. The high 2004 estimate supports our previous claims that angler harvest was not limiting spawner abundance during 2001-2003; the poor 1999 and 2000 and relatively poor 1998 year classes were driving spawner abundance during 2001-2003.

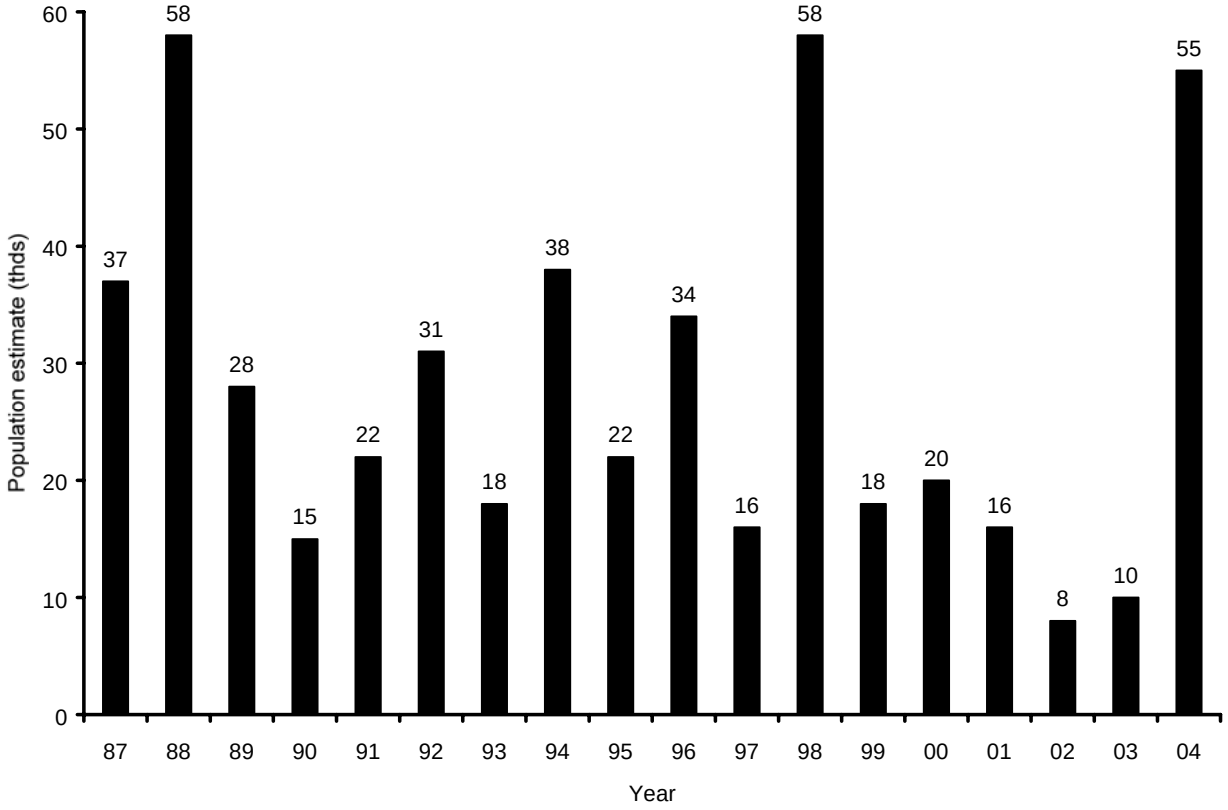



Figure 1. Lower Fox River adult walleye (>= 370 mm in length; age-3 and older) spawning population estimates from fyke net surveys conducted during 1987-2004.

**Recruitment of Age-3 Males**

We estimate that 41,495 age-3 male walleye recruited to the spawning population during 2004 (Figure 2). Recruitment of the 2001 year class of male walleye was by far the strongest in our 18 year data set. This was not predictable, however, because while the year class measured as fall young-of-year (YOY) in 2001 was the fifth largest since we began conducting fall index electrofishing surveys in 1987, it was relatively small compared to the 1991, 1993, and 2003 year classes (Figure 3).

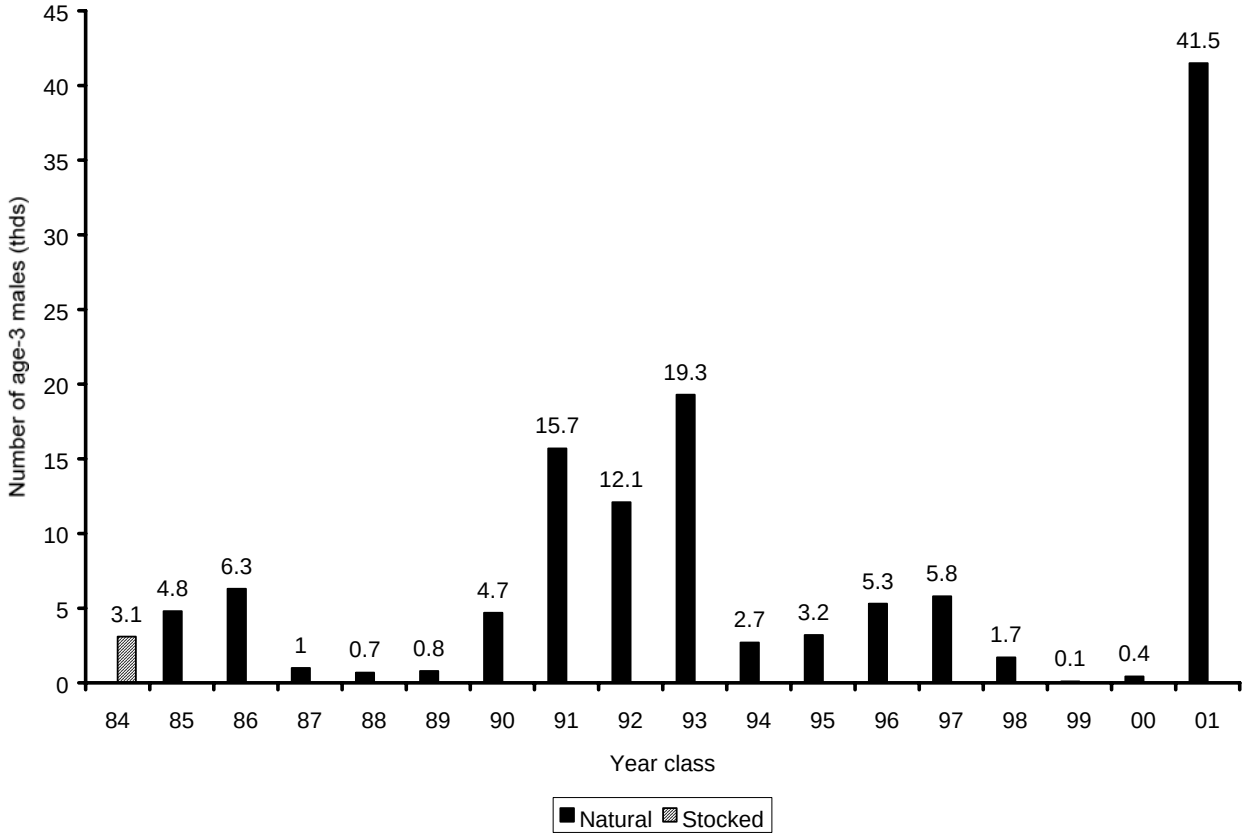



Figure 2. Relative year class strength of lower Fox River walleye measured as the estimated number of age-3 walleye recruited to the adult spawning population. Data was collected from spring spawning surveys during 1987-2003.

**Age Structure**

Age-3 males (2001 year class) were the most abundant male cohort measured during the 2004 spawning assessment, and represented 93.4% of all male walleye captured (Table 1). The abundant YOY walleye captured during 2001 have survived well and males have recruited to the spawning population. This is a good indication for future populations, and females of the same cohort will recruit to the spawning population during 2005-2006. Age-4 males (2000 year class) were the next most abundant cohort captured during the spring survey (3.3% of all male walleye captured). Age-3 walleye had an average length of 398 mm and average weight of 598 g while age-4 males had an average length of 458 mm and average weight of 983 g.

Age-7 female walleye (1997 year class) were the most abundant female cohort captured during the 2004 spawning survey, with similar representations by the age-6, age-8, and age-9 cohorts (Table 2). Age-7 female walleye had an average length of 613 mm and an average weight of 2,703 g. Based on YOY fall index electrofishing surveys, we expected the age-6 (1998 year class) and age-8 (1996 year class) female cohorts to be better represented, but they recruited to the 2004 spawning population at proportions similar to the age-7 (1997 year class) cohort (Table 2, Figure 3).

Table 1. Age distribution (%) of male walleye captured in spawning survey fyke nets in the lower Fox River during 1998-2004.

| | Age | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1998 | 2.0 | 16.8 | 35.5 | 37.2 | 6.2 | 1.6 | 0.4 | - | 0.1 | 0.1 | - | - |
| 1999 | 3.3 | 53.2 | 10.4 | 20.5 | 9.5 | 2.0 | 1.0 | - | - | - | - | - |
| 2000 | 11.5 | 48.7 | 26.3 | 9.7 | 3.1 | 0.5 | 0.2 | - | - | - | - | - |
| 2001 | 0.4 | 20.5 | 41.6 | 20.3 | 12.0 | 3.4 | 0.6 | 0.4 | 0.6 | 0.2 | - | - |
| 2002 | 1.6 | 7.7 | 29.3 | 22.0 | 20.7 | 8.9 | 5.3 | 1.6 | 1.2 | 1.2 | - | 0.0 |
| 2003 | 54.7 | 5.4 | 9.3 | 17.6 | 9.7 | 2.2 | 0.7 | 0.2 | 0.2 | 0.1 | - | - |
| 2004 | 0.7 | 93.4 | 3.3 | 1.3 | 0.6 | 0.3 | 0.4 | 0.1 | - | - | - | - |

Table 2. Age distribution (%) of female walleye captured in spawning survey fyke nets in the lower Fox River during 1998-2004.

| | Age | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1998 | - | 1.0 | 14.1 | 25.3 | 30.6 | 15.3 | 5.2 | 2.6 | 3.4 | 1.0 | 0.5 | 0.9 |
| 1999 | - | - | 4.0 | 32.9 | 22.1 | 19.1 | 8.9 | 4.6 | 2.7 | 3.8 | 1.3 | 0.5 |
| 2000 | - | 1.8 | 26.1 | 27.9 | 27.3 | 10.9 | 2.6 | 0.9 | 1.7 | 0.6 | - | - |
| 2001 | - | 6.0 | 10.8 | 33.6 | 16.3 | 9.8 | 10.0 | 6.0 | 2.7 | 2.7 | 1.6 | 0.5 |
| 2002 | - | 0.2 | 17.7 | 17.3 | 21.0 | 10.0 | 12.3 | 12.5 | 4.4 | 2.7 | 0.6 | 1.2 |
| 2003 | - | 0.5 | 1.0 | 19.7 | 23.2 | 26.9 | 16.9 | 10.7 | 0.5 | 0.1 | 0.4 | |
| 2004 | - | 0.4 | 1.2 | 7.4 | 23.0 | 24.1 | 17.9 | 17.1 | 6.6 | 1.6 | 0.8 | - |

## Recruitment of YOY

Results of 2004 fall index electrofishing surveys show YOY survival to the fall fingerling stage to be the sixth highest we have measured since 1991 for both lower Green Bay and the lower Fox River (Figure 3). The noticeable 2004 year class following a very strong 2003 year class is a unique phenomenon to the 15 year data set. The 2004 year class appears to be in the same range of magnitude as the 2001 year class, but smaller than the 1991, 1993, and 2003 year classes. The 2004 year class and the weak 2002 and strong 2003 year classes should recruit to the spawning population over the next several years.

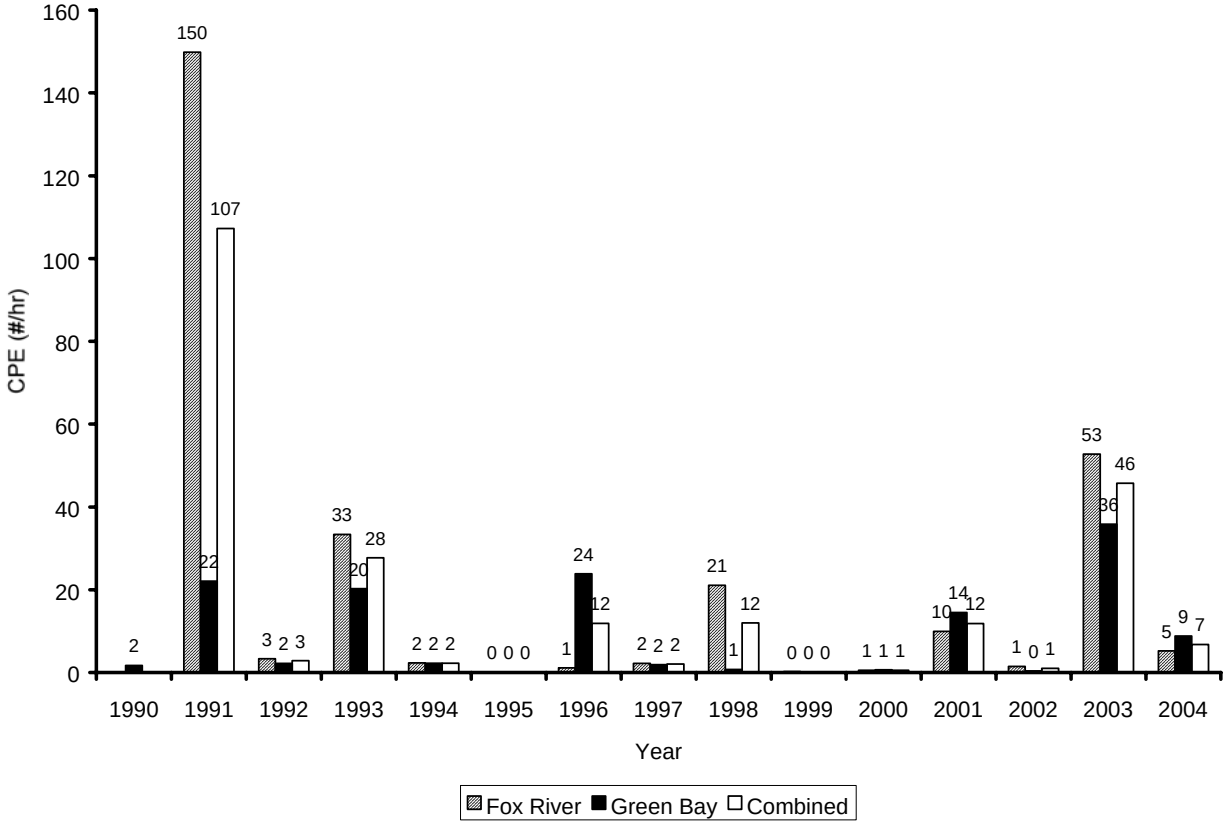
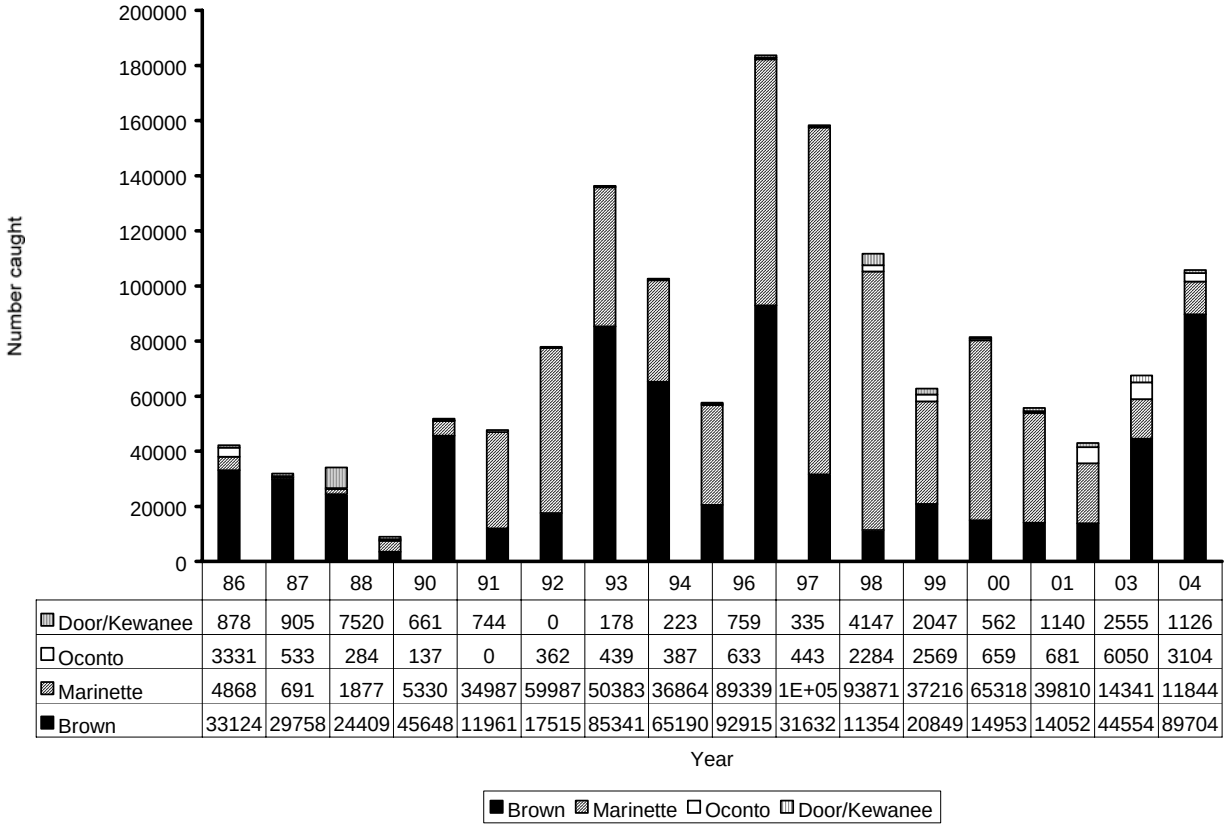



Figure 3. Relative abundance of young-of-year walleye in the lower Fox River (DePere Dam to mouth) and Green Bay (south of a line drawn from Longtail Point to Point Sable) as measured by catch per unit effort (CPE; number per hour) from data collected in fall index electrofishing surveys during 1990-2004.

## Angler Catch and Harvest

Total catch of lower Green Bay / lower Fox River walleye was estimated at 105,778 during the 2004 open water season, a 64% increase from the estimated 67,500 caught during 2003 (Figure 4). This increase in total catch occurred because the very large 2001 year class of Fox River walleye was recruiting to the fishery in Brown County, even though total catch in the four other counties decreased. Total catch of walleye generally declined during 1996-2002, but this trend was

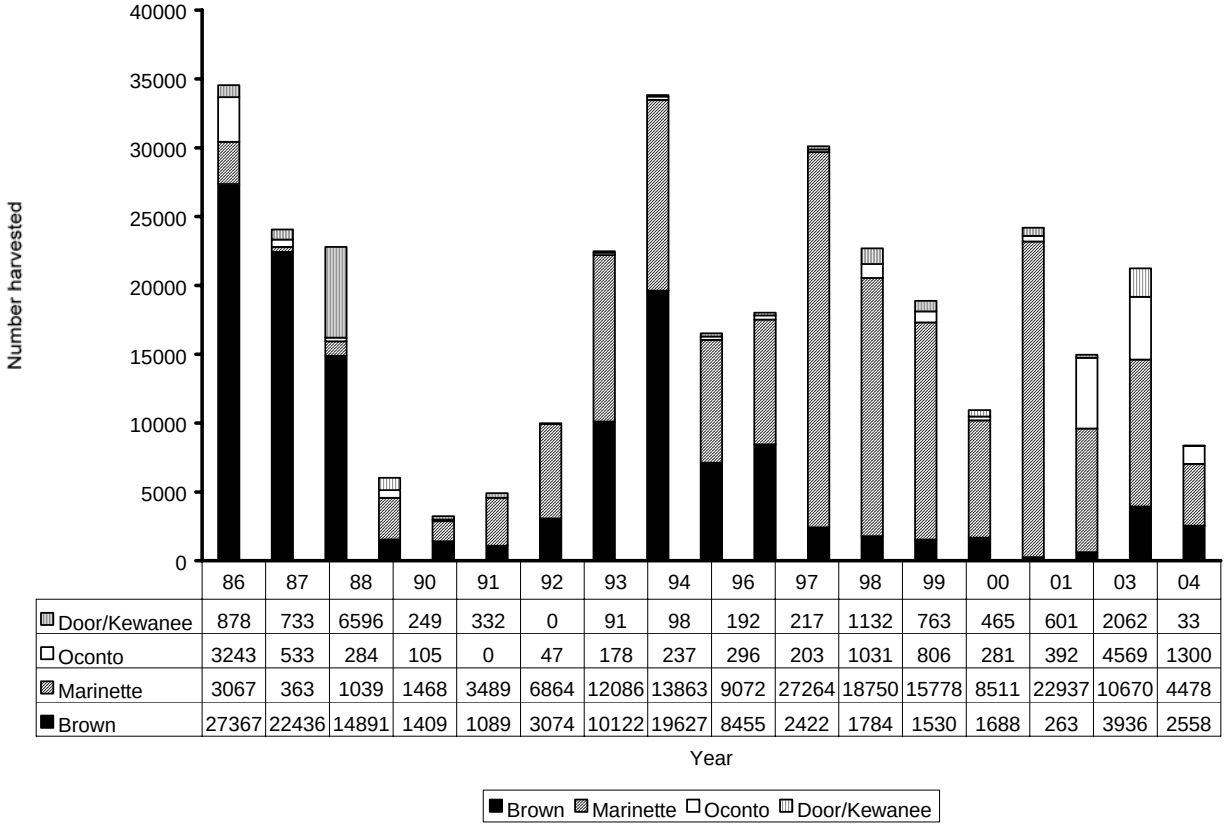
reversed during 2003-2004 because the large 2001 year class of Fox River walleye was recruiting to the fishery (Figures 2-4).




| | 86 | 87 | 88 | 90 | 91 | 92 | 93 | 94 | 96 | 97 | 98 | 99 | 00 | 01 | 03 | 04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Door/Kewanee | 878 | 905 | 7520 | 661 | 744 | 0 | 178 | 223 | 759 | 335 | 4147 | 2047 | 562 | 1140 | 2555 | 1126 |
| Oconto | 3331 | 533 | 284 | 137 | 0 | 362 | 439 | 387 | 633 | 443 | 2284 | 2569 | 659 | 681 | 6050 | 3104 |
| Marinette | 4868 | 691 | 1877 | 5330 | 34987 | 59987 | 50383 | 36864 | 89339 | 1E+05 | 93871 | 37216 | 65318 | 39810 | 14341 | 11844 |
| Brown | 33124 | 29758 | 24409 | 45648 | 11961 | 17515 | 85341 | 65190 | 92915 | 31632 | 11354 | 20849 | 14953 | 14052 | 44554 | 89704 |

Figure 4. Estimated total walleye catch from Wisconsin waters of lower Green Bay and the lower Fox River by county during 1986-2004.

Total harvest of lower Green Bay / lower Fox River walleye declined 61% from 21,237 during 2003 to 8,369 during 2004 (Figure 5). Harvest in all counties decreased during 2004 compared to 2003. This decrease in harvest is consistent with the observed decrease in catch from Marinette, Oconto, Door, and Kewanee counties, but contrary to the dramatic increase in catch from Brown County. This suggests that most anglers in Brown County are targeting trophy walleye (not the 2001 year class of walleye recruiting to Brown County's fishery that made up most of the catch), catching most of their walleye during the restricted spring season, exclusively practicing catch and release, or some combination of these three scenarios.




| | 86 | 87 | 88 | 90 | 91 | 92 | 93 | 94 | 96 | 97 | 98 | 99 | 00 | 01 | 03 | 04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Door/Kewanee | 878 | 733 | 6596 | 249 | 332 | 0 | 91 | 98 | 192 | 217 | 1132 | 763 | 465 | 601 | 2062 | 33 |
| Oconto | 3243 | 533 | 284 | 105 | 0 | 47 | 178 | 237 | 296 | 203 | 1031 | 806 | 281 | 392 | 4569 | 1300 |
| Marinette | 3067 | 363 | 1039 | 1468 | 3489 | 6864 | 12086 | 13863 | 9072 | 27264 | 18750 | 15778 | 8511 | 22937 | 10670 | 4478 |
| Brown | 27367 | 22436 | 14891 | 1409 | 1089 | 3074 | 10122 | 19627 | 8455 | 2422 | 1784 | 1530 | 1688 | 263 | 3936 | 2558 |

Figure 5. Estimated total walleye harvest from Wisconsin waters of lower Green Bay and the lower Fox River by county during 1986-2004.

**The Future of the Sport Fishery**

The near future of the lower Green Bay / lower Fox River walleye population and sport fishery appears to be very promising. Surveys during 2004 indicated that recruitment of age-3 males to the spawning population, and therefore the abundance of the spawning population, greatly increased during 2004 compared to 1999-2003. The spawner abundance estimate was the third highest ever recorded and estimated recruitment of age-3 males to the spawning population was the highest ever recorded in our 18 year data set. The increase of walleye to the spawning population and the sport fishery is the result of a strong 2001 year class. Over the next few years, the population should be reinforced by the 2003 and 2004 year classes. The 2003 year class was the second highest measured in our 15 year fall index electrofishing survey data set, and the 2004 year class was above average. If survival from YOY to spawning age of the 2003 and 2004 year classes is similar to that of the 2001 year class, high spawner abundance and an excellent sport fishery should be present over the next several years.

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## STATUS OF YELLOW PERCH – SOUTHERN GREEN BAY

Yellow perch abundance in Green Bay increased steadily through the 1980's and has declined since then. The population growth was fueled by the production of strong year classes in 1982, 1985, 1986, 1988, and 1991 (Figure 1). Since 1991 there had been only one moderately strong year class that appeared in 1998, until 2003 when we observed an extremely strong abundance of young-of-the -year. The estimated total biomass of yearling and older yellow perch rose from under 1,000,000 pounds in 1980 to over 10 million pounds in 1988, and then declined through the 1990's to an estimated biomass in the year 2000 of less than 500,000 pounds.

The decline in the population during the 1990's can be attributed to poor recruitment of young-of-the-year fish, as assessed in the late summer of each year (Figure 1). Following over a decade of good production of young fish, we have seen only one reasonably strong year class (1998) and one extremely large year class (2003) since 1991. The hopeful 1998 year class was abundant as 1 year olds in our trawl survey in 1999 and has been seen as the strongest year class through the commercial and sport harvests since 2001. In 2004 The 1998 year class was still present in the commercial harvest at 8% of their catch with the majority of their catch 68% coming from the 2001 year class.

### Population assessment

Yellow perch spring spawning sampling continued for it's 27$^{th}$ year on Green Bay at Little Tail point. Two double ended fyke nets were set on April 13$^{th}$ one net was fished until April 17$^{th}$ and the second net until April 20$^{th}$. A total of 192 mature females, 40 immature females, 415 mature males, and 4,961 yearlings were sampled. A high percentage of the yearlings that were sampled were mature males.

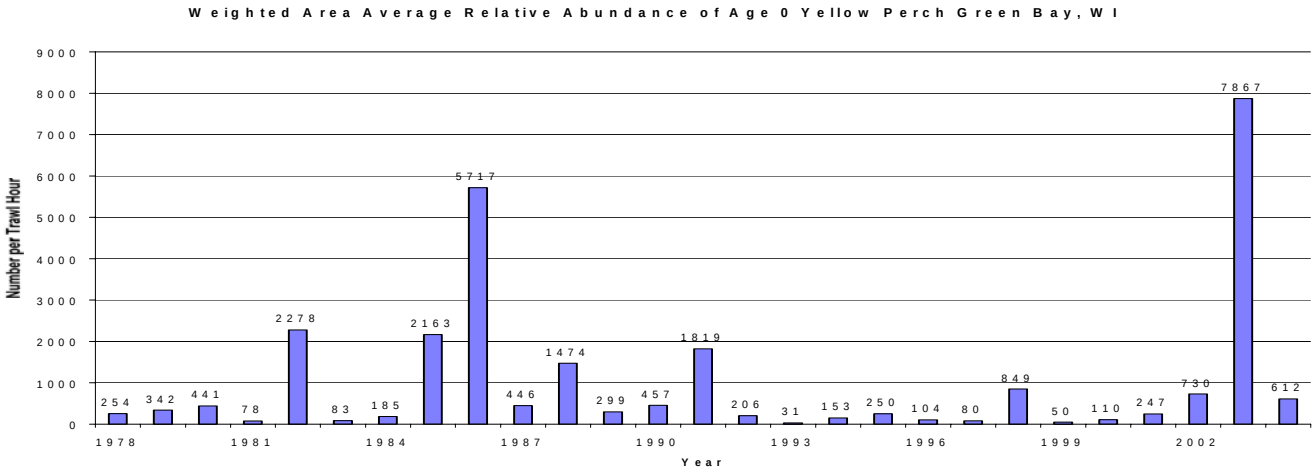
In 2004, larval sampling continued at a lower intensity than in previous years, with support from Sea Grant for equipment and a boat. Larval sampling was conducted using a High Speed Miller Sampler at two locations off of Little Tail Point, every three to four days from May 10$^{th}$ through June 16$^{th}$ and at a site north of Oconto three time between May 20$^{th}$ and June 16$^{th}$. Samples were sent to Sea Grant for analysis. Visual observations showed good numbers of larval yellow perch present in the samples.

Index station seining continued for the 23$^{rd}$ consecutive year at 15 sites spread over 130 miles of Green Bay shoreline. Seining was carried out on the week of June 21-23, July 6-7, and July 12-21. The average number of yoy per site were 136, 34, and 21 respectively and the percent of sites with yoy were 73%, 50% and, 60% respectively.

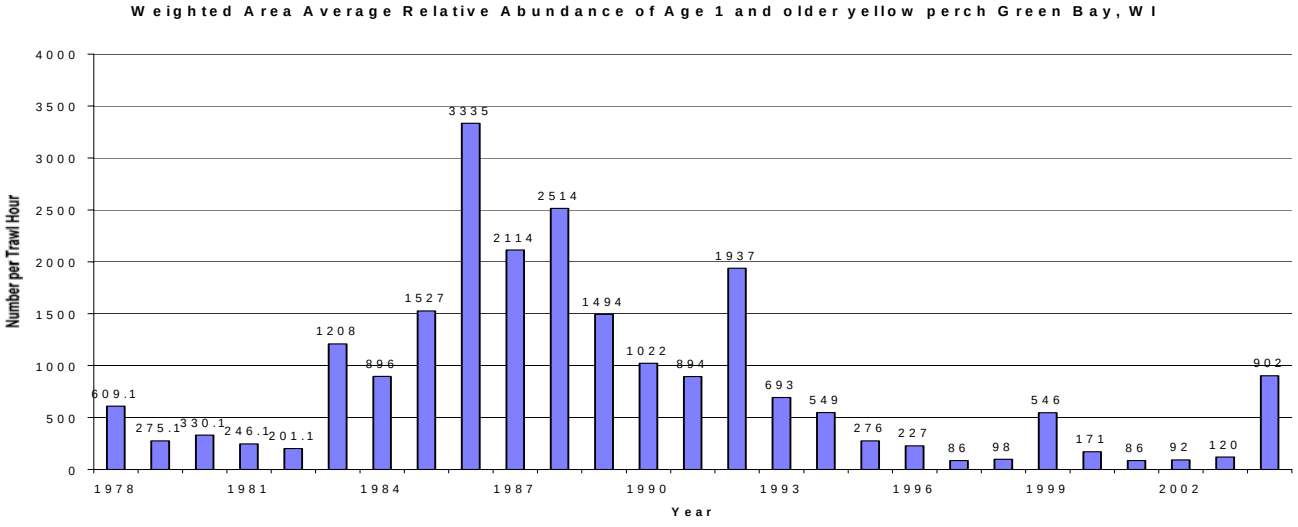
Annual late summer trawl surveys continued for the 27$^{th}$ year. Designated index sampling locations are used to monitor trends in abundance and to estimate mortality rates of individual year classes. In 2004 index trawling continued at the 78 index trawling stations, at the standard sites established in 1978 and at the additional deep-water sites that were added in 1988. The 32 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.

In 2004 the number of yoy yellow perch caught per trawl hour (612) ranked as the 19th highest in the past 26 years since index sites were established in 1978. Figure 1. Shows the catch per trawl hour for yoy from 1978 to 2003.




Yearling and older yellow perch abundance increased at index station sites from 2003 to 2004 (Figure. 2). The weighted area average was 902 age1and older yellow perch per trawl hour in 2004. The catch for 2004 was the 19th highest since 1978 and above the 27year average of 831perch per trawl hour.




## Harvests

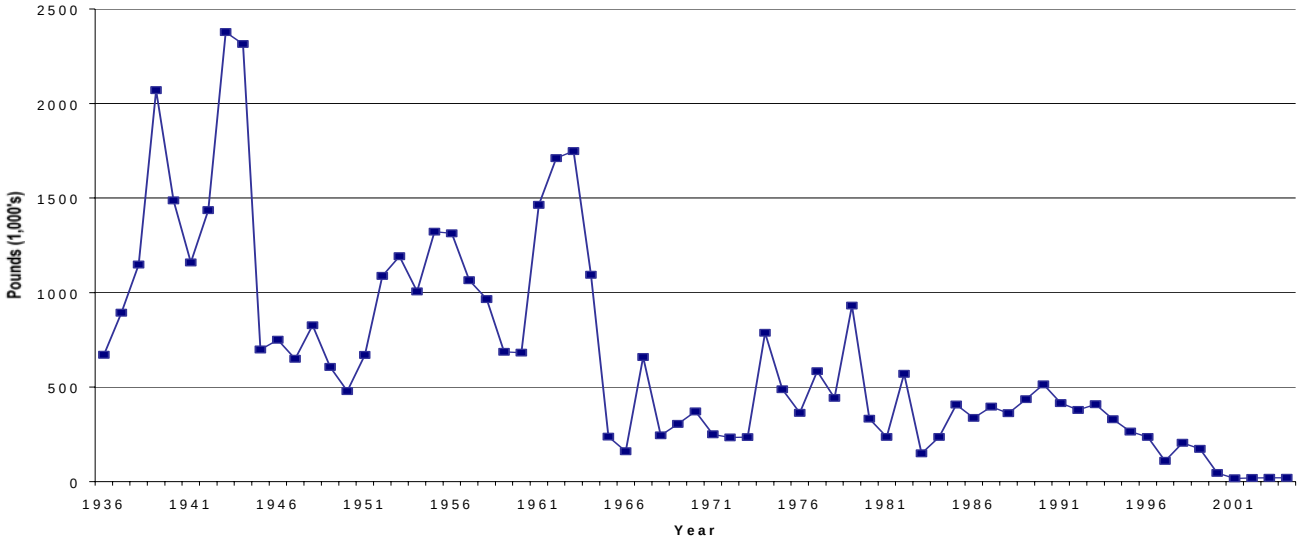
The annual commercial harvest is reported by fishers, and fish sampled at the dock from commercial landings are used to describe the age and size composition of the catch.

The annual sport harvest is estimated using a creel survey, and fish obtained through the survey are used to describe the age and size composition of the catch.

Since the 1983-1984 commercial fishing license year, the yellow perch commercial harvest in Green Bay has been managed under a quota system. Quota shares are allocated to individual licenses based on their harvest for four years prior to the establishment of the quota. The license year quota runs from July 1st to June 30th. The zone 1 (Green Bay) quota has ranged over the past decade from the current low of 20,000 pounds to a high of 475,000 pounds.

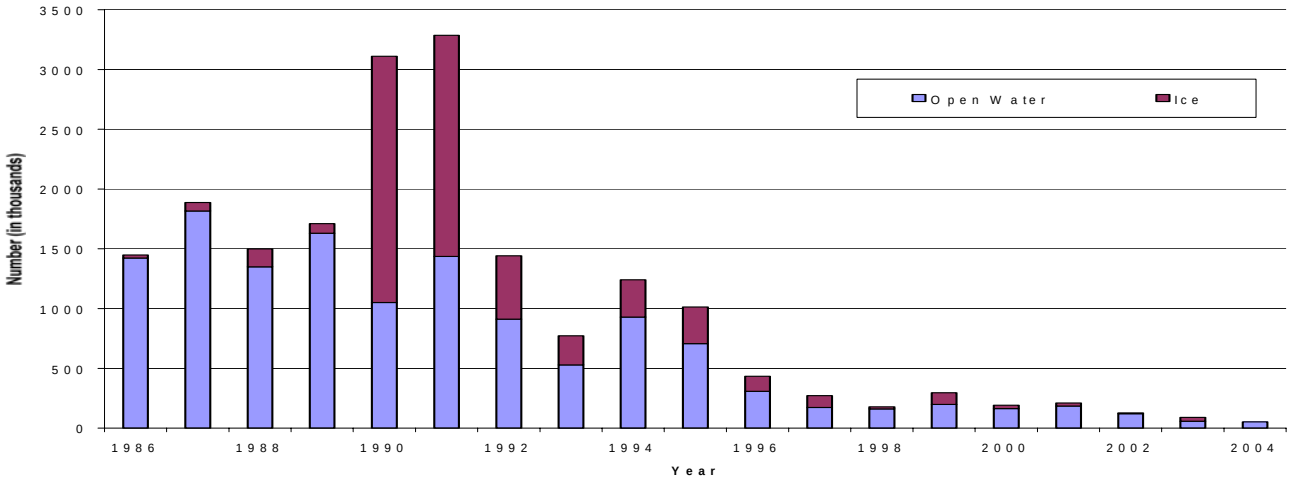
During the commercial fishing year 2003/2004 commercial fishers harvested almost all of their allotted limit of 20,000 pounds they harvested a total of 19,660 pounds (Figure 3). During 2004 both a gill net and a drop net fishery took place, with drop nets only being fished in September and October.

**Figure 3. Green Bay Commercial Yellow Perch Harvest**




Sport fishing harvests have also risen and fallen with changes in yellow perch abundance. Sport harvest peaked at over 3,000,000 fish in 1990 and 1991, when unusual ice conditions and large numbers of fish allowed the estimated harvest of 2,000,000 yellow perch through the ice each year. By the year 2001 the sport harvest had declined to an estimated 210,489 yellow perch in total, with only 24,891 being taken through the ice (Figure 4.). Between 2001 and 2004 catches continued to decline with an open water harvest estimate of only 52,429 yellow perch in 2004 (Figure 4.). The current bag limit on yellow perch is at 10, this is the lowest bag limit during the history of the green bay creel program.

Figure 4. Green Bay Yellow Perch Sport Harvest Estimate




## Management Plans

Although the 2003 year class appears to be the best on record, and have survived in good numbers to age one survival through maturity is unknown. The regulations of a 20,000 pound commercial fishery and a daily bag limit of 10 for sport fishers was granted an extension in 2004 and will remain in effect through June 2006.

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## STATUS OF YELLOW PERCH STOCKS - LAKE MICHIGAN

This report is a summary of the status of young and adult perch in Lake Michigan assessed through several annual assessments in Wisconsin waters during 2004-05. The 1998 year-class yellow perch, which supported the fishery for several years, is declining rapidly in the Wisconsin waters of Lake Michigan.

### Beach seining

In southeastern Wisconsin, beach seining was done to assess young of the year (YOY) yellow perch. In 2004 we sampled at fifteen sites between Kenosha and Sheboygan from August 30, 2004 to September 13, 2004 using a 25' bag seine with ¼" delta mesh. Surface water temperature remained on the cooler side in 60s $^{0}$F. Dense algal growth and strong winds often worked against effective seining. Catch per effort (CPE) is calculated as the mean number of YOY perch per 100ft. seine haul. This number is used as an index of year-class strength. Figure 1 shows the catch per effort of YOY yellow perch for the sites in the Southeast Region (SER) since 1989. No YOY yellow perch were captured in 1994 sampling as well as 1999 sampling. In our 2004 survey, we capture 19 YOY yellow perch with an overall CPE of 0.4, which indicates another year of poor reproductive success. The size range of YOY yellow perch on August 31$^{st}$ sampling ranged from 36mm to 48 mm (9 perch) in Sheboygan, 41 mm to 52 mm (5 perch) in Milwaukee waters. By and large, YOY alewife dominated the catch followed by spottail shiner and longnose dace. Spottail shiners were represented in good numbers through out the area.

In addition to using a standard bag seine, a 100-foot Swedish monofilament gill net (6.35mm bar length mesh) was used to capture YOY yellow perch in the nearshore waters. The majority of YOY yellow perch were captured in 6.25mm mesh in 2003 assessment. Therefore, we used the net with a uniform 6.35mm bar mesh throughout. The net was set on rocky bottom in approximately 4-6 ft of water, and allowed to fish for one night. Two index sites were sampled – Wind Point, about 17miles south of Milwaukee, and Fox Point, about 9 miles north of Milwaukee. We set net at Wind Point on 9/23/04 and 10/7/04, and on 9/30/04 and 10/7/04 at Fox Point. Catches at the Wind Point comprised of alewife, smelt, yellow perch, longnose dace, spottail shiner and bloater chub. Rainbow smelt dominated the catch followed by alewife. We caught twelve young-of-the-year (YOY) yellow perch ranging from 58mm to 66mm in total length. All of the YOY yellow perch were caught on 10/7/04. At Fox Point, we caught seven YOY yellow perch ranging from 56mm to 65mm in total length. Alewife dominated the catch followed by rainbow smelt. Other species captured included longnose dace, bloater chub, fathead minnow and goby. Catch per 100 ft of gill net effort worked out to be 4.75 YOY yellow perch.

### Spawning Assessment

This assessment has been conducted on the Green Can Reef and in the Milwaukee harbor since 1990 (Table 1). The objective is to quantify the relative abundance of mature female perch in previously identified spawning areas. In 2004, first sampling was done on 5/26/2004 at three different depths ranging from 50-55 ft (Gang 1), 38-47 ft. (Gang 2) and 30-33 ft. (Gang 3), for a total effort of 900 ft net. A total of 725 yellow perch were captured of which 106 were females. Only a limited number of females were ripe at this time. The bottom water temperature was 49 $^{0}$F. The second lift was taken on 6/2/2004 when the water temperature was still 47 $^{0}$F at the bottom. A

total of 399 (31 females) yellow perch were captured in 600 ft of gill net. At this time, 4 females out of the 31 were ripe, and the rest were green. The third lift was taken on 6/9/2004, when the bottom temperature was 48 $^0$F. Seventeen yellow perch captured in 600 ft of gill net set at 35-38 ft of water. By this time the spawning activity had already peaked out. We found 6 of the 7 females captured were spent. In addition, we also collected anal spines from 111 perch for age determination, of which majority of the yellow perch (86%) on the spawning reef belonged to 1998 year-class.

Yellow perch egg deposition survey was conducted by the WDNR dive team. Only one egg skein was recorded during the dive survey. Number of egg skeins per 1000 $m^2$ was 10.04 in 2003 and 11.53 per 1000 $m^2$ in 2002. Where as, the number of egg skein per 1000 $m^2$ in 2004 survey dropped to 0.046.

**Graded Mesh Gill Net Assessment**

The WDNR conducts standardized graded mesh gill net assessments annually in the winter, in grids 1901 and 1902 off Milwaukee. The mesh sizes used in these assessments run from 1 to 3 inches stretch on 1/4 inch increments. Yellow perch begin to recruit to this assessment gear by age 2 and are fully recruited by age 3. A total of five lifts, each with 2800' effort were taken from 1/11/2005 to 2/9/2005 at depth ranges from 38' to 90'.

Table 2 shows the relative abundance as catch per effort of perch, by age, for this assessment from 1989 through 2005. The data show variability in catch rates by calendar year. These data show very low CPEs of older fish and higher CPEs of younger fish until the late 80s. Almost the entire 90s had very low numbers of age 3 and under, while the population was skewed toward older male perch. However, data on age and size distribution of yellow perch from 1999 onward represented smaller and younger perch in significant proportions, essentially from 1998 year-class (Table 2). The proportion of age 8 and older perch has been extremely reduced to almost zero (Fig. 2). The fast growing 1998 year-class seems to have recruited to the fishery at the end of age 2 showing good numbers until recently. However, the 1998 year-class yellow perch appear to be disappearing from the population very fast. The average size of age 7 male was 268 mm (total length) and female was 314 mm (total length). The oldest yellow perch recorded was a 12 year old male (275mm total length).

Since 2000 the sex ratio of the yellow perch population got shifted toward predominantly female and lasted until 2002. This trend is reversed again since 2003 with greater number of males. This pattern is more evident with the 1998 year-class as the larger females get fished out. The overall catch comprised 87% of yellow perch representing the 1998 year-class in 2004 assessment. However, the 2005 data indicated a more encouraging information on 2002 year-class, which contributed 27% of age 3 yellow perch. The average size of 3 year-old male and female perch were 188mm and 215mm, respectively. The 1998 year-class formed 64%, still dominating the overall population. A similar age distribution pattern was observed in the 2004 sport caught yellow perch in the Wisconsin waters on Lake Michigan (Milwaukee, Racine and Kenosha counties in the southeastern Wisconsin).

## Harvest

In September 1996, the commercial yellow perch fishery was closed in the Wisconsin waters of Lake Michigan. Hence, the information on commercial harvest is limited up to 1995 catches. Sport harvest is monitored by a contact creel survey. The sport bag limit has been reduced to 5 fish/day in recent years, which is reflected in the total harvest (Table 3). Our creel survey data on the sport caught yellow perch indicated that the majority of catch consisted of a single year-class. The 1998 year-class dominated the sport harvest in 2001 representing 86.5% of the catch. Similar trend is evident from the 2004 winter graded mesh assessment that the1998 year-class comprised 87% of the catch. Overall sport harvest has decreased significantly in recent years producing 98,000 in 2002 yellow perch compared to 134,000 in 2001; 88,778 yellow perch in 2003 and further decreased to 51,521 in 2004. Because of the decreased density, the perch seem to be growing at a faster rate and attaining larger size at age, and hence the larger individuals in the angler harvest. The 1998 year-class continue to dominate the catch accounting for 67%, while 2001 and 2002 year-classes contributing 13% each. This shows that these two year-classes are growing well and recruiting to the fishery. However, 2001 year-class constituted only 4% of the aged sample (245 perch were aged) in 2005 graded mesh assessment.

## Management Actions

All yellow perch assessments and harvest data from the Wisconsin waters of Lake Michigan show weak year classes beginning with the 1990 year class. However, the 1998 year-class was the strongest yearclass in recent years which is supporting the fishery. Although 2001 and 2002 year-classes starting to appear in the fishery, the 1998 year-class continue to dominate comprising 67% of the sport caught yellow perch, and 86% of the spawning population in 2004. The sport harvest of 1998 year-class in Lake Michigan is gradually decreasing. These observations are consistent with data collected by other agencies throughout the lake. Effective September 1996 commercial fishing was closed in the Wisconsin waters of Lake Michigan and daily sport bag limit was reduced to 5 fish. The sport fishery for Lake Michigan yellow perch is closed from May 1 to June 15. These rule changes are implemented to benefit perch population recovery by reducing impact on spawning stocks. The yellow perch population in the southern Lake Michigan is still dominated by a single year-class of 1998, which grew faster and attained larger size.

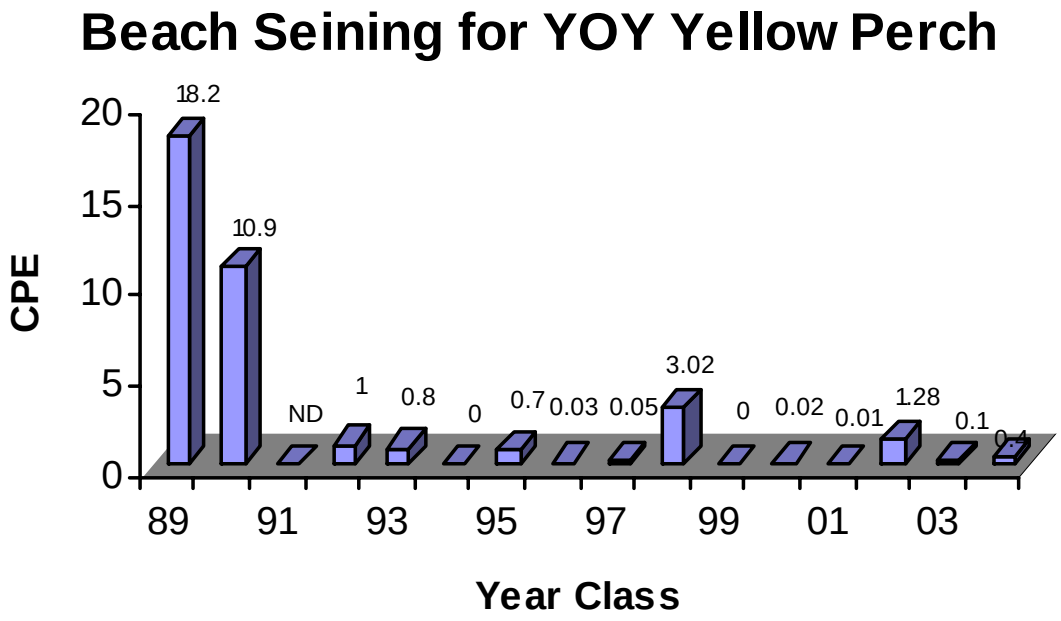


**Figure 1. CPE (fish/100' seine haul) of YOY yellow perch in summer beach seining.**

Table 1. Yellow perch spawning assessment in Milwaukee waters (Green Can Reef) of Lake Michigan.

| Year | Total | Males | Females | Sex-unknown | % Females | Total effort[1] |
|---|---|---|---|---|---|---|
| 1990 | 2,212 | 1,922 | 290 | 1 | 13 | 19,200 |
| 1991 | 3,474 | 2,600 | 874 | 2 | 25 | 14,400 |
| 1992 | 7,798 | 5,242 | 2,556 | 1 | 33 | 14,400 |
| 1993 | 2,085 | 1,188 | 897 | 0 | 43 | 14,400 |
| 1994 | 401 | 330 | 71 | 0 | 18 | 9,600 |
| 1995 | 1,272 | 1,233 | 39 | 0 | 3 | 17,000[2] |
| 1996 | 4,674 | 4,584 | 90 | 0 | 2 | 14,400 |
| 1997 | 14,474 | 14,417 | 46 | 11 | 0.32 | 5,000[3] |
| 1998 | 4,514 | 4,283 | 231 | 0 | 5.1 | 24,600[4] |
| 1999 | 5,867 | 5,635 | 232 | 0 | 4 | 9,200 |
| 2000 | 855 | 722 | 133 | 0 | 15.5 | 3,700 |
| 2001 | 1,431 | 993 | 438 | 0 | 31 | 5,400 |
| 2002 | 1,812 | 1,645 | 167 | 0 | 9.2 | 2,500 |
| 2003 | 1,609 | 1,583 | 26 | 0 | 1.6 | 1,700 |
| 2004 | 1,143 | 997 | 144 | 0 | 12.6 | 2,100 |

[1] effort = length of gill net in feet
[2] includes 7,000 feet of standard 2 1/2 " mesh commercial gill net
[3] in addition to this 5,000' of commercial gill net, double-ended fyke nets were used
[4] in addition, 11 lifts of contracted commercial trap net and 4 lifts of fyke nets were used

Table 2. Catch per Effort (fish/1000ft./night), and the 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 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 626 | 724 | 159 | 49 | 60 | 0 | 0 | 0 | 0 | 0 | 42 | 323 | 1 | 0 | 2 | 3 | 0 |
| 3 | 1854 | 1037 | 865 | 276 | 98 | 25 | 0 | 0 | 4 | 2 | 57 | 65 | 243 | 4 | 0 | 1 | 61 |
| 4 | 1012 | 938 | 323 | 715 | 402 | 58 | 28 | 0 | 14 | 6 | 215 | 9 | 20 | 118 | 0 | 0 | 12 |
| 5 | 1563 | 394 | 327 | 281 | 757 | 218 | 65 | 0 | 11 | 29 | 93 | 27 | 2 | 4 | 33 | 1 | 0 |
| 6 | 1880 | 381 | 83 | 181 | 165 | 141 | 120 | 19 | 18 | 35 | 57 | 2 | 2 | 3 | 0 | 27 | 11 |
| 7 | 155 | 90 | 82 | 126 | 49 | 48 | 76 | 51 | 77 | 20 | 45 | 0 | 1 | 1 | 0 | 1 | 226 |
| 8 | 1 | 0 | 32 | 73 | 16 | 11 | 65 | 71 | 251 | 43 | 63 | 8 | 2 | 0 | 0 | 0 | 6 |
| 9 | 0 | 0 | 0 | 14 | 0 | 0 | 24 | 31 | 109 | 110 | 44 | 9 | 1 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 12 | 15 | 60 | 33 | 11 | 1 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 15 | 9 | 1 | 1 | 1 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 7 | 0 | 0 | 1 | 1 | 1 | 2 |
| %Male | 69 | 61 | 72 | 82 | 86 | 89 | 90 | 95 | 89 | 80 | 58 | 36 | 36 | 38 | 52 | 60 | 64 |
| %Female | 31 | 39 | 28 | 18 | 14 | 11 | 10 | 5 | 11 | 20 | 42 | 64 | 64 | 62 | 48 | 40 | 36 |

Note: Aging of yellow perch changed from scales to spines starting in 2000 to be consistent with Green Bay methodology.

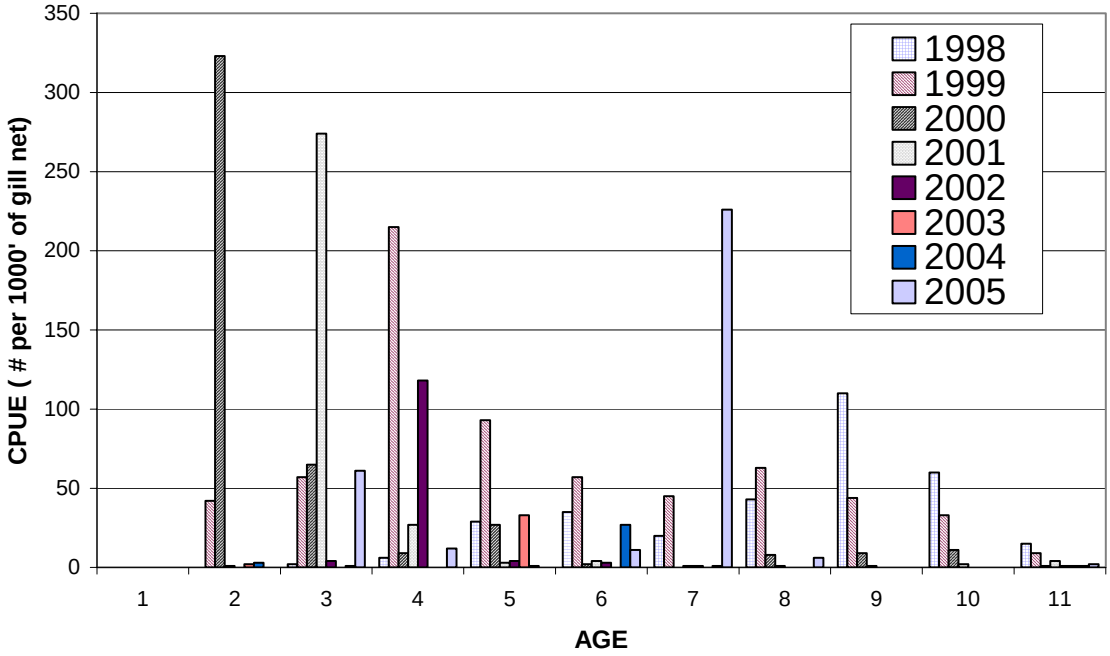


Figure 2. Comparison of Catch at Age for Yellow Perch in Wisconsin Waters of Lake Michigan, 1998-2005.

Table 3. Reported commercial Lake Michigan yellow perch harvest (excluding Green Bay), in thousands of pounds, and sport harvest, estimated in thousands of fish, by calendar year.

| Year | Commercial harvest (lb. x 1000) | Sport harvest (number x 1000) |
|---|---|---|
| 1986 | 373 | 411 |
| 1987 | 550 | 639 |
| 1988 | 431 | 932 |
| 1989 | 267 | 719 |
| 1990 | 256 | 649 |
| 1991 | 326 | 887 |
| 1992 | 282 | 960 |
| 1993 | 267 | 546 |
| 1994 | 254 | 290 |
| 1995 | 128 | 247 |
| 1996 | 15[a] | 95[b] |
| 1997 | Closed | 31[b] |
| 1998 | Closed | 38[b] |
| 1999 | Closed | 34[b] |
| 2000 | Closed | 75[b] |
| 2001 | Closed | 134[b] |
| 2002 | Closed | 98[b] |
| 2003 | Closed | 89[b] |
| 2004 | Closed | 52[b] |

[a] commercial yellow perch fishery was closed effective September 1996
[b] sport bag limit was reduced to 5/day effective September 1996
(Note: Sport harvest data includes Moored boat catch since 1989)

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## NEARSHORE RAINBOW TROUT STOCKING EXPERIMENT

There is a strong public demand for nearshore fishing opportunities on Lake Michigan. Nearshore fishing opportunities for Lake Michigan trout and salmon have declined since the late 1980's due to changes in species or strains stocked, reduction in the Lake Michigan forage base or perhaps from clearer water nearshore making trout and salmon more difficult to catch. With reduced yellow perch abundance and salmon and trout moving farther offshore, anglers have requested the Wisconsin DNR to evaluate the stocking of rainbow trout to increase nearshore fishing opportunities.

The original study outline called for the stocking of six ports with two strains of rainbow to facilitate the evaluation of the effectiveness of rainbow stocking and to identify what strain to stock in the future through direct comparison of the performance of each strain. After taking input from anglers, the Arlee strain of rainbow trout was selected to be stocked. Following the initial stocking of Arlee, a second strain, Kamloops rainbow trout was identified to be part of this study. The ports of Kenosha, Milwaukee, Sheboygan, Manitowoc, Algoma and Sister Bay were the locations selected for the experimental stocking of rainbow trout for this study. The stocking goal was to stock 10,000 rainbow of each strain at each port for three years to aid in the direct comparison of the two strains.

### Stocking History

Arlee Rainbow Trout

The ports of Kenosha, Milwaukee, Sheboygan, Manitowoc, Algoma and Sister Bay each received a stocking of 12,000 Arlee in the spring of 2001. When stocked, the Adipose-Left Pectoral (ALP) clipped fish averaged 174 mm in length and 55.1 g in weight. In 2001, Arlee rainbow were stocked from April 16 through May 1.

In 2002 because of hatchery shortfalls, Manitowoc and Milwaukee each received a stocking of 7,500 Arlee on April 9, while the other four ports were not stocked. The Left Pectoral (LP) clipped fish averaged 170 mm in length and 54.5 g in weight when stocked.

In 2003, each of the six ports received 10,150 Arlee rainbow. The ALP clipped fish averaged 182 mm in length and 74 g in weight at the time of stocking. Stocking of Arlee in 2003 occurred between April 27 and May 9.

Stocking in 2004 was limited to 5,000 Arlee per each of the six ports because of hatchery shortfalls. The LP fish averaged 199 mm in length and 108 g in weight and were stocked between April 12 and April 19.

Kamloops Rainbow Trout

The first stocking of Kamloops occurred in 2003, when each of the six study ports received 10,300 Kamloops. The Adipose-Right Pectoral (ARP) clipped fish averaged 148 mm in length and 32 g in weight. In 2003, Kamloops rainbow trout were stocked between April 17 and April 19.

In 2004, each of the six study ports received a stocking 10,066 Kamloops rainbow. The Right Ventral (RV) rainbow averaged 147 mm in length and weighed 36 g at the time of stocking. The Kamloops rainbow were stocked between April 20 and April 27.

**Harvest**

2001

In 2001, anglers harvested an estimated 1,324 Arlee (Table 1). Harvested Arlee ranged in length from 229 to 432 mm and averaged 330 mm in length. Anglers fishing from piers or from the shore harvested most of the Arlee that were caught in 2001.

Table 1. The estimated 2001, 2002, 2003 and 2004 sport harvest of Arlee and Kamloops Rainbow Trout from the Wisconsin waters of Lake Michigan by fishery type. Percent harvest () is the percent of a given years harvest by strain and location.

| Strain | Harvest Year | Harvest Location | | | Total Harvest |
|---|---|---|---|---|---|
| | | Boat | Pier and Shore | Stream | |
| Arlee | 2001 | 62 (5%) | 1262 (95%) | 0 | 1324 |
| | 2002 | 1,259 (78%) | 285 (18%) | 61 (4%) | 1605 |
| | 2003 | 46 (5%) | 813 (95%) | | 859 |
| | 2004 | 250 (26%) | 585 (61%) | 118 (12%) | 953 |
| Kamloops | 2003 | 0 | 267 (100%) | 0 | 267 |
| | 2004 | 73 (11%) | 513 (78%) | 73 (11%) | 659 |

2002

In 2002, it was estimated that anglers harvested 1,605 Arlee (Table 1). Most of the harvested fish (1,116 of 1,605) were from the 2002 stocking. These LP clipped fish averaged 566 mm in length and 1.7 kg in weight. The 2001 stocked Arlee were also harvested, but in much lower number. The ALP clipped fish averaged 547 mm in length and weighed 2.3 kg. Unlike 2001, the boat fishery took the majority of the harvested Arlee in 2002. Shore and pier anglers also harvested a substantial number of Arlee in 2002, but harvested fewer than in 2001. However, the harvest estimate and average length and weight must be viewed cautiously because of the small number of fish handled that had the appropriate clips.

2003

It was estimated that anglers in 2003 harvested 1,126 Arlee and Kamloops rainbow trout (Table 1). Of this total, 859 (76%) were Arlee strain rainbow, with the remaining 267 (24%) Kamloops strain rainbow trout.

Anglers caught all three year classes of stocked Arlee during 2003 fishing season. Arlee that were stocked in 2003 represented 58% of the catch, with the remainder of the catch evenly split between

fish stocked in 2001 and 2002. Most (95%) of the Arlee harvest was from anglers fishing from piers or from shore, with only 5% of the harvest by boat anglers (Table 1). By 2003, fish stocked in 2001 had grown to average 658 mm in length and 3.1 kg in weight, with 2002 stocked fish averaging 610 mm in length and 2.4 kg in weight. 2003 stocked Arlee averaged 414 mm in length and 1.1 kg in weight when harvested.

It was estimated that anglers harvested 267 Kamloops rainbow trout during the 2003 fishing season (Table 1). All reported Kamloops harvest was from anglers fishing from piers or from the shore. Harvested Kamloops averaged 358 mm in length and 0.7 kg in weight.

2004

It was estimated that anglers harvested 1,612 Arlee and Kamloops rainbow trout in 2004 (Table 1). It was estimated that of this total, 953 (59%) were Arlee strain rainbow, with the remaining 659 (41%) Kamloops strain rainbow trout.

Anglers caught Arlee from all four years of stocking during the 2004 fishing season. Most of the Arlee harvested in 2004 were stocked in 2001. They represented 46% of the Arlee catch, with 2003 stocked fish accounting for 31%, 2002 stocked fish 15% and 2004 stocked fish 8% of the harvest. Most (61%) of the Arlee harvest was from anglers fishing from piers or from shore, with 26% of the harvest by boat anglers and 12% of the harvest by stream anglers (Table 1). Growth of stocked Arlee appeared to be good. Fish stocked in 2001, averaged 688 mm in length and 4.5 kg in weight in 2004. 2002 stocked fish averaged 655 mm in length and 2.6 kg in weight. Arlee stocked in 2003 averaged 521 mm in length and 1.5 kg in weight. 2004 stocked fish averaged 323 mm in length and 0.5 kg in weight.

It was estimated that anglers harvested 659 Kamloops rainbow trout during the 2004 fishing season (Table 1). Harvest of 2003 stocked Kamloops represented 78% of the catch with the remainder from 2004 stocked Kamloops rainbow. Most of the reported Kamloops harvest (78%) was from anglers fishing from piers or from the shore with the remainder of the harvest evenly divided between boat and stream anglers. Kamloops stocked in 2003 and harvested in 2004 averaged 424 mm in length and was 0.9 kg in weight. Only a single 2004 stocked Kamloops was measured and weighed in 2004 and it was 553 mm in length and 1.5 kg in weight.

**Summary**

The first four years of creel survey data is encouraging and indicates that the Arlee and Kamloops rainbow trout may be benefiting nearshore anglers. Since the inception of this project, 66% of the nearshore rainbow harvested has been by anglers fishing from piers or from the shore.

In years that Arlee and Kamloops rainbows were both stocked, it appears that each strain of rainbow have returned to the creel in similar numbers (Table 2, Table 3). We do not know at this time if Arlee, which are larger in size when stocked or Kamloops, which are longer lived will ultimately provide the greater return to anglers.

Table 2. Return rates (number per thousand stocked) to creel for Arlee Rainbow Trout stocking into Lake Michigan 2001 through 2004.

| | Year Stocked | | | |
|---|---|---|---|---|
| Year Harvested | 2001 | 2002 | 2003 | 2004 |
| 2001 | 18.3 | -- | -- | -- |
| 2002 | 6.8 | 74.4 | -- | -- |
| 2003 | 3.7 | 17.7 | 9.8 | -- |
| 2004 | 6.1 | 9.7 | 4.8 | 2.5 |
| Total | 34.9 | 101.8 | 14.6 | 2.5 |

Table 3. Return rates (number per thousand stocked) to creel for Kamloops Rainbow Trout stocking into Lake Michigan 2003 through 2004.

| | Year Stocked | | | |
|---|---|---|---|---|
| Year Harvested | 2001 | 2002 | 2003 | 2004 |
| 2001 | -- | -- | -- | -- |
| 2002 | -- | -- | -- | -- |
| 2003 | -- | -- | 4.3 | -- |
| 2004 | -- | -- | 8.3 | 2.4 |
| Total | -- | -- | 12.6 | 2.4 |

It also appears that the fish are growing well as anglers have caught fish over 5.5 kg in weight. Based on comparable age at harvest it appears that Arlee strain fish are larger in size than Kamloops strain fish. However, stocking must continue through 2006 before a final evaluation is made on the success of the program and a determination made what strain, if any, is stocked as normal production fish.

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## GREEN BAY FORAGE TRAWLING

Wisconsin has adopted rules that set seasons, locations, depths, and quotas for the commercial harvest of smelt with the use of trawling gear. The regulations established a daylight, deep water (depths greater than 60 feet) Lake Michigan fishery from November 15 to April 20, and a nighttime, deep water (depths greater than 65 feet) Green Bay fishery from June 15 to September 30 (Figure 1).

The lakewide decline in the biomass of smelt has resulted in the reduction of the smelt quota from 2.358 million pounds with no more than 830,000 pounds to be harvested from Green Bay in 1998 to 1 million pounds of which no more than 25,000 pounds can be caught in Green Bay in 2003. The reduction of quota has been controversial especially on Green Bay where limited data exists on smelt population trends other than biweekly catch reports filed by commercial fishers or from onboard monitoring conducted in the late 1980's.

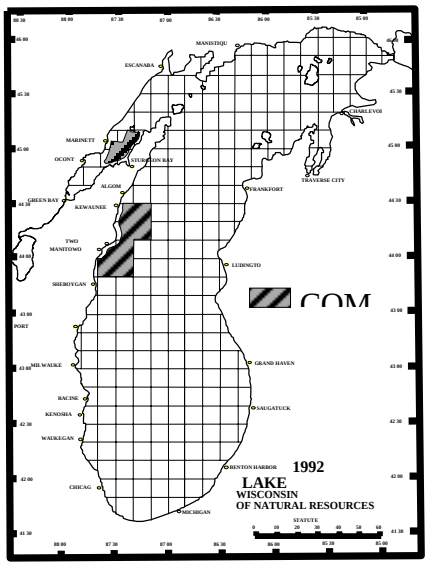


**Figure 1.Permitted commercial trawling grounds in Wisconsin waters of Lake Michigan.**

In 2003, the Wisconsin DNR began a project on Green Bay to assess forage that uses sampling protocols and trawl gear developed by the U.S.G.S. for forage assessment on Lake Michigan. We trawl during daylight hours in September using a 39-foot headrope net. Ten minute trawls at 2 MPH are made at ten foot depth increments following contours beginning at 50 feet along two preset transects that cross the commercial trawling zone (Figure 2).

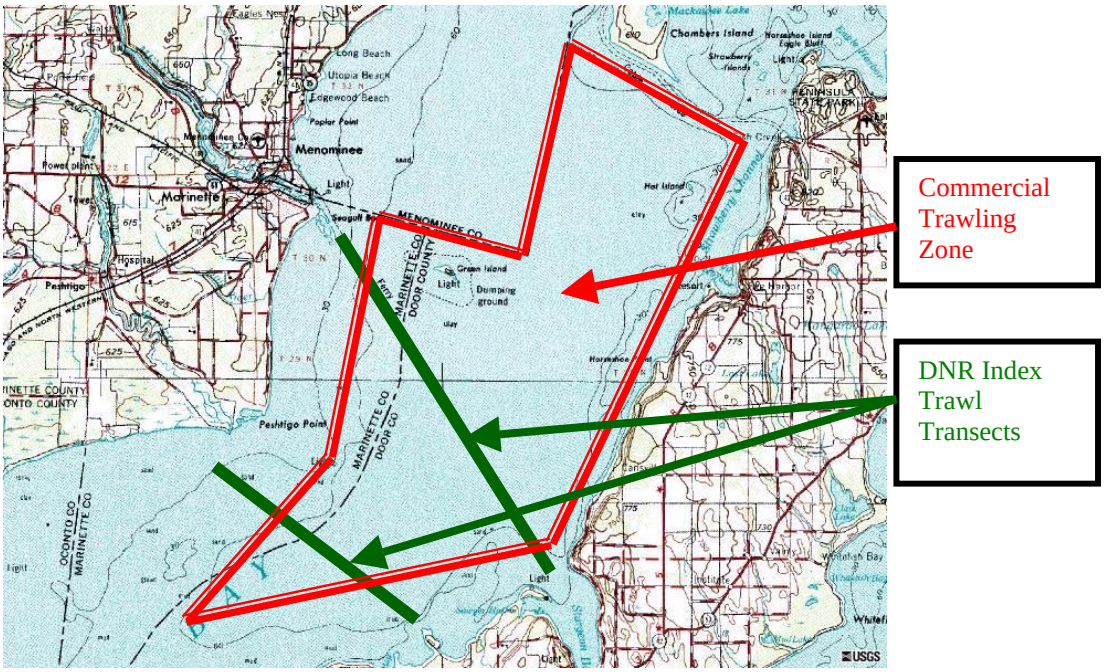


**Figure 2. The location of the index trawling transects in relation to the Green Bay commercial trawling zone.**

## 2003 Results

In 2003 transects were trawled starting at 50 feet in ten foot increments out to the deepest depth along each transect. The northern transect ran from 60 to 104 feet, while the southern transect ran from 50 to 80 feet. Individual fish were sorted by species, measured, and an aggregate species weight taken. Zebra mussels were sorted from the fish catch and had an aggregate weight measured.

When equivalent depth strata were combined, it was apparent that as depth increased, the composition of the catch changed (Figure 3). In shallower depths, 50 and 60 feet, smelt and alewife were major components of catch. Lake whitefish, round goby, burbot, yellow perch and a mixture of forage fish (trout-perch and shiners) were also captured. From 70 feet out to 104 feet lake whitefish dominated the catch. Gamefish captured at 80 and 100 feet included brown trout and smallmouth bass. The whitefish catch at all depths included both young-of-year and adult fish. Zebra mussels were collected at 50 and 60 feet and their biomass equaled or nearly equaled the fish biomass at those depths (Figure 4).

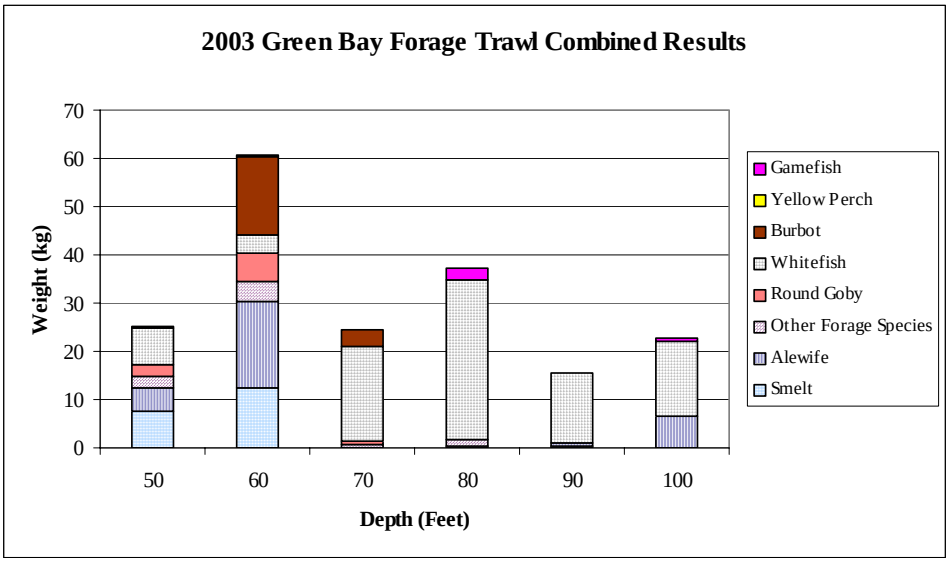


**Figure 3. The weight composition of catch of fish by species and depth strata on Green Bay in 2003.**

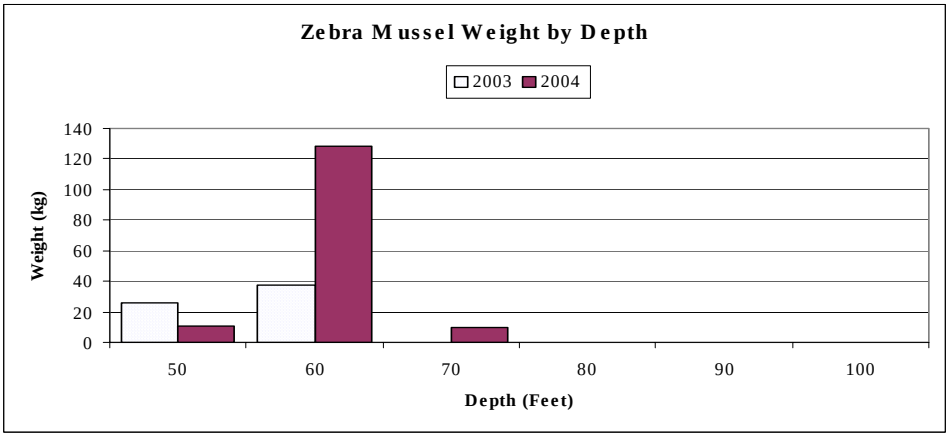


**Figure 4. The weights of the zebra mussel catch by depth during trawl surveys in 2003 and 2004 on Green Bay.**

## 2004 Results

In 2004, there were some changes in protocol to increase sample coverage. Location of the southern was moved approximately 5 miles to the south. Transects were trawled starting and ending at about 50 feet in ten foot increments across the bay. The deepest sampling site on the northern transect was 94 feet and 80 on the southern. Fish and zebra mussels were handled as in 2003.

Depth strata were again combined to determine the catch (biomass) by depth. At 50 feet, native forage fish, round goby, whitefish and yellow perch were the most commonly captured species (Figure 5). Lake whitefish and smelt were also captured but in lower abundance. Alewife, forage species, round goby, whitefish and burbot were commonly captured at 60 feet. From 70 feet out to 90 feet, lake whitefish dominated the catch. At 90 feet burbot were also commonly caught. The whitefish catch at all depths included both young-of-year and adult fish. Zebra mussels were collected at 50, 60 and 70 feet (Figure 4). At 60 feet, the biomass of zebra mussels was nearly three times the biomass of the captured fish.

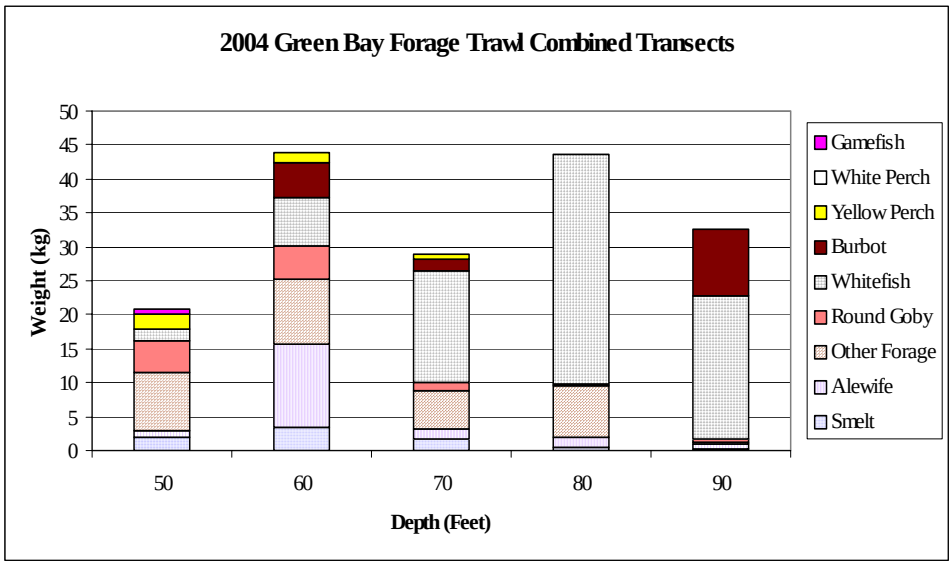


**Figure 5. The weight composition of catch of fish by species and depth strata on Green Bay in 2004.**

Two years of data does not allow for analysis of trends, but does allow for general statements about the results to be made. First, there does appear to be a difference in shallow water (50-60 feet) and deeper water (>69 feet) composition of catch with forage species and diversity greater in shallow samples. Second, zebra mussels appear to be abundant out to depths of 70 feet in Green Bay. Third, round goby appear to be well established in Green Bay as they were captured at each depth sample in 2004. Finally, we were able to capture smelt at all depths in 2004, which will allow us to monitor the smelt population over time in this area of Green Bay.

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