Lake Michigan Management Reports - 2011

Lake Michigan Fisheries Team
Wisconsin Department of Natural Resources
December 7, 2011

RV Coregonus, the DNR's new Lake Michigan research vessel.

CONTENTS

INTRODUCTION

Bill Horns

These reports summarize some of the major studies and stock assessment activities conducted by the Lake Michigan Fisheries Team during 2010. They provide specific information about sport and commercial fisheries, and describe trends in some of the major fish populations. For further information regarding any individual report, contact the author at the address, phone number, or e-mail address shown at the end of this document.

The Lake Michigan Fisheries Team is charged with implementing the Lake Michigan Integrated Fisheries Management Plan[1] and coordinating the Lake Michigan Fisheries Program for the Department of Natural Resources. Our management of Lake Michigan fisheries is conducted in partnership with other state, federal, and tribal agencies, and in consultation with the public, particularly sport and commercial fishers. Major issues of shared inter-jurisdictional concern are resolved by the Lake Michigan Committee[2], which includes representatives of Michigan, Indiana, Illinois, Wisconsin, and the Chippewa Ottawa Resource Authority.

These studies and assessments take place in the context of a continuous ecosystem change, driven by the proliferation of nonnative species. The rapid decline of alewives and the collapse of the chinook salmon fishery in Lake Huron in the past decade have focused our attention on the central issue of what levels of salmon and trout stocking are compatible with sustaining an adequate forage base to support our salmon and trout fisheries. Annual forage surveys conducted by the US Geological Survey along with indices of salmon abundance and size-at-age described in reports here allow us to assess the health of that part of our recreational fishing program. In cooperation with other agencies around the Lake and with the help of interested citizens and the Quantitative Fisheries Center at Michigan State University, we are currently undertaking a thorough analysis of the lakewide salmon and trout stocking program. The Wisconsin contribution to that program is summarized in the following table.

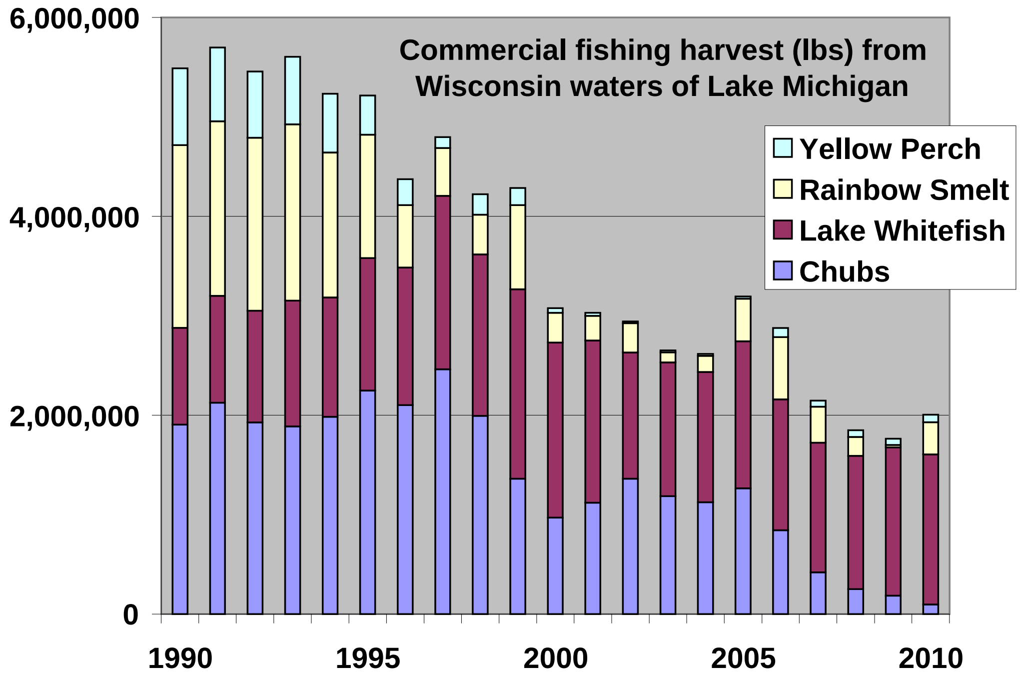
Fish stocked in Wisconsin waters during fall of 2010 and spring of 2011.

species	strain	fall 2010	spring 2011
brown trout	seeforellen (feral)		317,205
	St. Croix (domestic)	42,105	
	Wild Rose (domestic)	134,963	259,801
chinook salmon			1,127,244
coho salmon		11,665	433,196
lake sturgeon		1,209	
rainbow trout	Chambers Creek (steelhead)		152,595
	Ganaraska (steelhead)		144,118
	Arlee (nearshore)		130,980
walleye			75,192

The Wisconsin salmon and trout stocking program costs between \$3.0M and \$3.5M annually, and is sustained by roughly equal contributions from Salmon Stamp revenues and from other license fees[3].

[1] Lake Michigan Fisheries Team. 2004. Lake Michigan Integrated Fisheries Management Plan, 2003-2013. Administrative Report No. 56, Wisconsin Department of Natural Resources.
[2] Inter-jurisdictional fisheries governance on the Great Lakes is guided by *A Joint Strategic Plan for Management of Great Lakes Fisheries*, to which all state, federal, and tribal fisheries agencies on the Great Lakes are signatories. A copy may be obtained through the Great Lakes Fishery Commission at www.glfc.org.
[3] Bureau of Fisheries Management. 2011. Great Lakes Trout and Salmon Stamp Revenue and Expenditures Report, Fiscal Years 2006-2911. Administrative Report No. 66, Wisconsin Department of Natural Resources.

Several of the reports here describe aspects of our commercial fisheries for yellow perch, bloater chub, lake whitefish, and rainbow smelt. The number of active commercial fishing licenses has fallen below 60 and as the following chart illustrates, commercial harvests of all species except lake whitefish have declined over the past 20 years.



Not included in this year's compilation of reports is a summary activities related to fish health. Through our Fish Health Specialist, Sue Marcquenski, the Department maintains a vigilant program of inspections and interventions at hatcheries and spawning weirs. Currently, Sue is working with counterparts in other US and Canadian state, tribal, and federal agencies to revise the Great Lakes Fish Disease Control Policy and Model Program.

For additional information about our program on Lake Michigan, please contact one of the authors (see page 77), or visit http://dnr.wi.gov/org/water/fhp/fish/lakemich/index.htm, the Department's Lake Michigan web page.

SPORTFISHING EFFORT AND HARVEST

Brad Eggold and Jeff Zinuticz

Wisconsin's Lake Michigan open water fishing effort was 2,841,338 hours during 2010, 1.24% above the five-year average of 2,806,468 (Table 1). Effort was above the five-year average for most fishery types except for the charter boat industry, shore, and stream anglers. All of which that were below the five year average by -7.13%.

Wisconsin Lake Michigan trout and salmon anglers had a far better season in 2010 than in 2009. Overall harvest was up, with 437,372 salmonids harvested; and the harvest rate increased to 0.1539, fish per hour (Table 3). Chinook dominated the catch, with a harvest of 315,294 fish which was the sixth highest harvest in the last eight years. Coho salmon harvest continues to stay steady with 42,445 fish taken, a slight decrease from 2009. Cold water near-shore made for good fishing conditions the majority of the season, and both shore and boat anglers took advantage for a good portion of the early season. However, later in the season little, if any, thermocline had set-up in deeper waters, making it more difficult for trollers to target schools of trout and salmon.

The open-water Yellow Perch harvest was 277,260 fish (Table 2), a slight increase from 2009 but still below the five-year average of 428,598. Encouraging news was that the Lake Michigan harvest was about the same as 2009 (50,000 fish) with the majority of the catch comprised of the 2005 year-class, along with 2001 and 2002 year-classes as well.

Walleye harvest was estimated at 66,922, a minor decrease from 2009. The Northern Pike catch was also slightly r less in 2010 with 2,518 fish caught. Smallmouth Bass harvest was 10,721 fish, a nice increase over 2009. .

For more summaries, see http://dnr.wi.gov/fish/lakemich/managementreports.htm

Table 1. Fishing effort (angler hours) by various angler groups in Wisconsin waters of Lake Michigan and Green Bay during 2010 and percent change from the 5-year average (2004-2010).

YEAR	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
2010	1,571,491	418,297	270,274	198,904	149,279	233,093	**2,841,338**
% change	2.81%	6.36%	-7.46%	8.26%	-9.49%	-4.49%	**1.24%**

Table 2. Sport harvest by fishery type and species for Wisconsin waters of Lake Michigan and Green Bay during 2010.

SPECIES	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	**TOTAL**
Coho salmon	15,048	14,699	10,925	748	390	665	**42,445**
Chinook salmon	120,216	92,501	85,552	4,769	2,974	9,282	**315,294**
Rainbow trout	15,673	12,297	13,778	1,504	776	5,093	**49,121**
Brown trout	4,370	2,175	1,650	1,137	2,243	1,454	**13,029**
Brook trout	0	0	0	0	0	0	**0**
Lake trout	6,610	5,174	5,099	45	15	0	**17,483**
Northern pike	2,449	0	0	33	13	23	**2,518**
Smallmouth bass	2,996	6,331	0	180	399	815	**10,721**
Yellow perch	224,671	24,853	0	6,672	9,767	11,297	**277,260**
Walleye	62,141	3,829	0	124	37	791	**66,922**
TOTAL	**454,174**	**161,859**	**117,004**	**15,212**	**16,614**	**29,420**	**794,793**

Table 3. Total number of fish harvested by year by species across all angler groups in Wisconsin waters of Lake Michigan, 1995-2010.																
Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL*
Brook Trout	1,914	419	299	159	574	199	263	144	126	1	18	17	62	13	27	0	38,996
Brown Trout	49,654	38,093	43,224	27,371	37,187	40,966	26,421	35,220	23,654	20,918	27,489	17,769	37,947	23,763	15,792	13,029	1,016,886
Rainbow Trout	117,508	77,099	94,470	110,888	84,248	71,829	72,854	74,031	48,548	25,529	48,490	48,420	62,249	41,552	46,529	49,121	1,723,408
Chinook Salmon	162,888	183,254	130,152	136,653	157,934	136,379	191,378	275,454	317,619	360,991	418,918	398,905	431,143	256,796	214,621	315,294	5,748,411
Coho Salmon	65,647	104,715	138,423	59,203	56,297	87,927	47,474	102,313	50,625	76,944	59,244	56,136	94,677	25,453	42,690	42,445	1,955,396
Lake Trout	69,332	36,849	57,954	82,247	39,819	31,151	40,408	39,865	23,881	14,209	14,139	10,638	19,281	12,763	14,946	17,483	1,248,577
TOTAL	466,943	440,429	464,522	416,521	376,059	368,451	378,798	527,027	464,453	498,592	568,298	531,885	645,359	360,340	334,605	437,372	11,731,674
Harvest per Hour	0.1426	0.1481	0.1619	0.1451	0.1331	0.1614	0.1382	0.1789	0.1719	0.1904	0.2036	0.1916	0.2108	0.1443	0.1171	0.1539	0.1443

Table 4. Total number of salmonids harvested by year by angler group in Wisconsin waters of Lake Michigan, 1995-2010.																
Fisheries Type	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL*
Ramp	193,752	176,085	190,976	155,953	141,903	170,081	156,470	236,241	196,235	195,953	241,535	197,833	254,231	115,698	113,446	161,917	4,509,172
Moored	128,743	125,017	129,332	141,538	100,078	68,872	85,435	110,094	111,148	130,418	149,845	128,666	164,286	92,635	91,986	127,356	3,137,667
Charter	84,898	86,346	94,556	84,867	73,622	91,665	76,868	106,631	100,037	123,995	137,922	152,749	173,250	110,481	91,333	117,004	2,649,360
Pier	14,621	6,218	5,002	4,200	4,614	4,402	7,327	10,629	8,464	11,329	9,284	8,835	15,440	6,487	7,975	8,203	309,816
Shore	17,676	19,676	16,726	8,997	12,685	13,971	18,308	20,111	14,995	11,175	8,557	13,472	16,394	10,191	8,519	6,398	390,039
Stream	27,253	27,087	27,930	20,966	43,157	19,460	34,390	43,321	33,574	25,722	21,155	30,330	21,758	24,848	21,346	16,494	735,620
TOTAL	466,943	440,429	464,522	416,521	376,059	368,451	378,798	527,027	464,453	498,592	568,298	531,885	645,359	360,340	334,605	437,372	11,731,674

* Totals represent total number of salmonids harvested from 1986 - 2010.

WEIR HARVEST

Cheryl Masterson, Steve Hogler, Scott Hansen

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 two 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 two strains of steelhead, and coho, and serves as a backup for Chinook salmon egg collection.

Historically, RRSF and BAFF began operating in late summer when the Skamania strain of steelhead appeared in the rivers. Skamania brood stock were collected at the weirs and overwintered at the Kettle Moraine Springs Hatchery until they were ready to spawn the following January/February. However, since 2007 VHS concerns have prompted the disease protocol which prohibits the transfer of live adult fish from the weir to the hatcheries. Therefore, we no longer collect Skamania at RRSF or BAFF and have consequently discontinued stocking that strain until a viable alternative source arises.

Total numbers of fish returning as reported here cannot necessarily be interpreted strictly as the absolute number of fish returning to Wisconsin weirs. Returns can vary depending upon several variables including the timeframe the weir was operated during a particular season, whether fish were passed upstream, and the number of smolts previously released at these sites. The salmonid egg harvest quota varies from one year to the next for each species or strain based on the projected needs of WDNR hatcheries and egg requests from other agencies. In 2010, all Lake Michigan salmon and trout egg quotas for Wisconsin waters were met. Wisconsin was also able to supply Chinook eggs to Illinois and Indiana for their stocking needs.

Strawberry Creek Weir

Lake Michigan water level conditions were good for the 2010 spawning run at Strawberry Creek although the flows were greatly supplemented by the 3,500 foot pipeline and pump delivering approximately 1,500 – 2,000 gallons of water per minute to the creek. This greatly increases the flow thereby helping attract Chinook salmon to the weir. During the fall 2010 run, 2,014 Chinook salmon were handled at SCW (Table 1). This is a historical low but not entirely unexpected due to lake-wide stocking cuts in 2006 and variable stocking rates by location. The final component of fish returning from the 2006 year class (age-4+) will have made their way to SCW by 2010. As mentioned, the amount of time the weir is operated plays a part in total return counts. However, in 2010 the weir was allowed to run a total of 30 days which was 14 days longer than it was run in 2009. Therefore, total return in 2010 was lower than would have been expected under these circumstances. Despite the reduced number of returning Chinook salmon, Wisconsin's entire Chinook salmon egg quota was once again collected at SCW in 2010. Approximately 2.1 million eggs were harvested for WI stocking in addition to eggs collected here and at the Kewaunee facility for IN and IL.

Chinook average size at age in 2010 approximated the 2009 levels and is still above the record lows set in 2007 (Figures 1 and 2). From 2001 - 2007, mean lengths and weights at age for Chinook salmon returning to Strawberry Creek had generally followed a decreasing trend although the levels rebounded in 2008 and have generally leveled off since albeit at a lower level. For example, since 2001 length and weight at age for age 3+ male Chinooks has on average decreased by 98 mm and 3 kg, respectively.

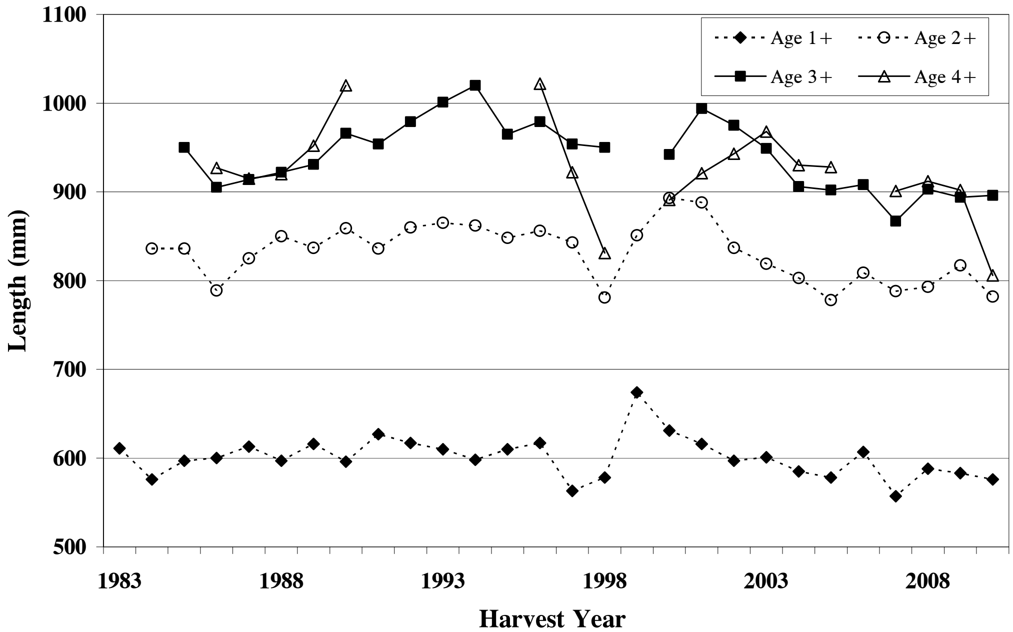


Figure 1. Average length at age of male chinook salmon returning to Strawberry Creek weir between 1983 and 2010.

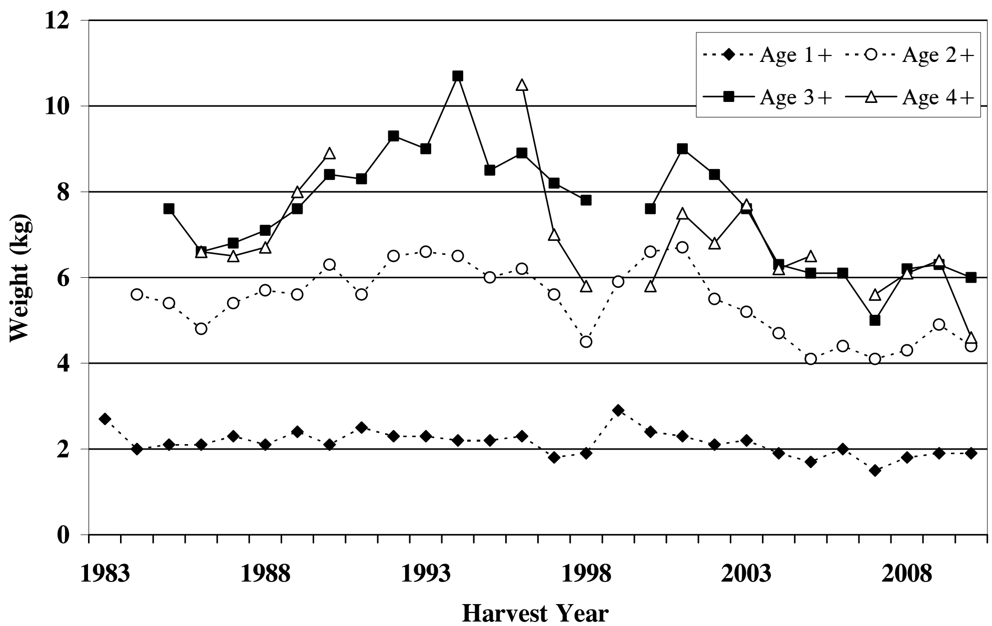


Figure 2. Weight at age of male chinook salmon returning to Strawberry Creek weir between 1983 and 2010.

Besadny Anadromous Fisheries Facility

Spring Operations

Spring operations in 2010 began on March 25 when the ponds were sorted to look for steelhead with Chambers Creek and Ganaraska fin clips and continued through April 14. During this period 699 steelhead were handled at BAFF consisting of 219 Chambers Creek strain steelhead, 150 Ganaraska, 62 Skamania and 268 non-broodstock steelhead (Table 2).

The 2010 spring run total of 699 steelhead was near the five year average of 771 steelhead for BAFF. The 2006 stocking year class was the dominant year class that returned to BAFF in 2010. This stocking year class has been the most common year class of returning steelhead since the spring of 2008. Subsequent stocking year classes have returned in lower number although the 2007 stocking year class has returned in fair numbers.

Gamete collections for the two spring strains of steelhead resulted in approximately 239,000 Chambers Creek strain and 220,000 Ganaraska strain eggs being collected from BAFF in 2010. Combined with RRSF steelhead egg collections, our egg collection quotas for these two strains of steelhead were met and should produce normal numbers for stocking in 2011.

Fall Operations

The fall 2010 trout and salmon run on the Kewaunee River was expected to be good as Kewaunee River water levels and other conditions were very good during the late summer/early fall time period. The high levels of the parasite *Ichthyophthirius Multifiliis* that were noted in 2009 were not present in 2010. This improvement in disease conditions was owed to a mechanical change in water flow throughout the ponds. In 2010 water was drawn from the bottom of the ponds, as opposed to a top draw, thus removing the heavy sediment conditions that allow the parasite to flourish. BAFF ponds were sorted seven times during October and November to process migrating fish.

For the first time since spring of 2007, brown trout and rainbow trout were passed above the weir for 2010 spring and fall operations at BAFF. Fish passage was previously stopped to prevent the spread of VHS. However, the Kewaunee River above the weir has recently been designated VHS positive thus negating the need to stop fish.

Summer/fall steelhead collections began on October 12 when the ponds were sorted. Ponds were sorted twice during October and three times in November to process migrating fish. Twenty-four steelhead were captured at BAFF during the 2010 summer/fall run. This was 80 percent lower than the fall 2009 run when 122 steelhead were captured. Thirty eight percent of the 2010 steelhead had identifiable Skamania clips. The 2005 stocking year class appears to have been successful with measurable returns noted in the summer/fall collection years of 2008 through 2010. Adult Skamania used as brood fish have not been collected since 2008 due to VHS concerns. In future years, the return of Skamania is expected to dwindle because of the cessation of stocking.

The number of Chinook salmon captured at BAFF during the fall operations in 2010 was down by 107 fish from 2009 (Table 1). Return rates have been following a declining trend in recent years although stocking cuts may have played a role in these reduced returns. Approximately 618,000 Chinook eggs were harvested from BAFF for the state of Illinois' stocking needs.

Adult Skamania to be used as brood fish were not collected from either steelhead facility in 2010 due to VHS concerns which will result in no Skamania stocking in 2012 by Wisconsin unless gametes or fingerlings are obtained from another source.

In 2010 the coho run rose considerably from a level in 2009 that ranked among the lowest on record (Table 3). Approximately 530,000 coho salmon eggs were collected at BAFF in the fall of 2010 for Wisconsin stocking and in conjunction with the Root River Steelhead Facility, Wisconsin's egg collection quota for coho was met.

Root River Steelhead Facility

Spring Operations

The Root River Steelhead Facility (RRSF) was in operation for 3 processing dates during the spring 2010 migration. We were able to capture and process 431 steelhead between March 19 and April 14 (Table 2). This was not a strong return to RRSF, but significant numbers of fish were able to bypass the facility during high water events right after ice out and again after considerable rainfall. For the year, 321,000 eggs were collected from the Chambers Creek strain of steelhead and 261,000 eggs were collected from the Ganaraska strain. In conjunction with the Besadny Anadromous Fisheries Facility in Kewaunee, we met our egg collection quotas for Chambers Creek and Ganaraska strains of steelhead.

Due to the constraints placed on the hatchery systems by Viral Hemorrhagic Septicemia (VHS), the Skamania contribution to the Lake Michigan steelhead program has been halted. There has been no stocking of this strain since 2008, but the overall lakewide steelhead quotas were made up of additional Chambers Creek and Ganaraska strains.

Fall Operations

Historically, RRSF began operating in late summer when the Skamania strain of steelhead appeared in the river. However, since we no longer collect Skamania at RRSF due to VHS concerns we only need to run the facility when coho start to show up in significant numbers, usually in October. With a later fall processing season, Chinooks and steelhead are able to migrate upriver past the facility before we start capturing fish, resulting in lower numbers handled at the facility. Furthermore, stream flows were extremely low for most of the operating season, which likely reduced the return of fish to the facility.

The Root River Steelhead Facility (RRSF) was in operation for 8 processing dates during the Fall 2010 fish migration. A total of 1,508 Chinook and 1,682 coho salmon were captured between September 30 and November 16 (Tables 1 and 3). However, our egg-take and biological sampling goals were met. Approximately 890,000 coho eggs were collected at RRSF and in conjunction with the Besadny Fisheries Facility in Kewaunee, we met Wisconsin's egg collection quota for coho.

Table 1. The total number of chinook salmon handled during fall migrations at Strawberry Creek (1982-2010), Besadny (1990-2010) and Root River (1994-2010) weirs.

Harvest Year	SCW	BAFF	RRSF
1982	3,963		
1983	3,852		
1984	5,208		
1985	5,601		
1986	4,392		
1987	7,624		
1988	3,477		
1989	1,845		
1990	3,016	3,104	
1991	3,009	3,356	
1992	4,099	3,874	
1993	4,377	3,260	
1994	4,051	1,722	1,858
1995	2,381	2,621	2,979
1996	6,653	3,193	5,589
1997	4,850	1,518	4,102
1998	5,035	4,005	3,977
1999	1,934	5,798	6,022
2000[1]	6,649	2,774	7,382
2001	8,125	5,092	10,214
2002	11,027	6,224	10,439
2003	6,086	1,197[2]	149
2004	10,917	2,821[2]	392
2005	5,500	3,268[2]	3,623
2006	4,510	4,671[2]	10,318
2007	3,101	3,351	3,547
2008	3,706	2,451	1,504
2009	2,171	1,672	1,716
2010	2,014	1,565	1,508

1 Beginning in 2000 through the present, low stream flow and low lake levels have persisted. A pipeline was installed in 2000 which delivers approximately 1,500 – 2,000 gallons of water per minute, and facilitiates weir operation.
2 All fish were allowed to bypass BAFF until October 1.

Table 2. The total number of steelhead examined during spring and fall runs at BAFF and RRSF (1995-2010).

Year	BAFF	RRSF
1995 – Spring	1,696	2,720
1995 – Fall	457	538
1996 – Spring	1,964	3,169
1996 – Fall	24	353
1997 – Spring	1,955	3,045
1997 – Fall	85	638
1998 – Spring	746	382
1998 – Fall	41	151
1999 – Spring	608	2,263
1999 – Fall	145	70
2000 – Spring	220	2,171
2000 – Fall	2	219
2001 – Spring	324	859
2001 – Fall	6	490
2002 – Spring	307	1,303
2002 – Fall	3	301
2003 – Spring	307	1,060
2003 – Fall	0	236
2004 – Spring	720	1,028
2004 – Fall	16	398
2005 – Spring	407	887
2005 – Fall	6	116
2006 – Spring	552	845
2006 – Fall	15	536
2007 – Spring	431	428
2007 – Fall	50	98
2008 – Spring	1,582	241
2008 – Fall	79	10
2009 – Spring	815	1,024
2009 – Fall	107	99
2010 - Spring	699	431
2010 - Fall	24	65

Table 3. The total number of coho salmon examined at BAFF (1990-2010) and the RRSF (1994-2010).

Year	BAFF	RRSF
1990	3,887	
1991	1,140	
1992	958	
1993	1,671	
1994	746	813
1995	3,767	3,321
1996	3,328	4,406
1997	1,162	7,645
1998	2,432	4,000
1999	1,638	1,150
2000	1,629	3,408
2001	175	1,327
2002	241	2,548
2003	266	198
2004	2,081	1,271
2005	937	841
2006	856	1,400
2007	2,482	1,169
2008	3,296	2,581
2009	487	1,338
2010	1,388	1,682

GREEN BAY YELLOW PERCH

Tammie Paoli

This report summarizes assessments and monitoring of the yellow perch population in southern Green Bay completed in 2010 (Figure 1). Yellow perch abundance in Green Bay increased steadily through the 1980's. The estimated total biomass of yearling and older yellow perch rose from under 1 million pounds in 1978 to nearly 9 million pounds in 1987. The population growth was fueled by the production of strong year classes in 1982, 1985, 1986, and 1988. Following the late 1980's, yellow perch abundance began to decline and the biomass estimate dropped to between 500 and 600 thousand pounds by 2002. The decline in the population during the 1990's and early 2000's can be attributed to poor recruitment. From 1988 to 2002, only two reasonably strong year classes (1991 and 1998) appeared during summer trawling surveys (Figure 2). More recent summer trawling surveys, however, show a trend towards improved recruitment. Surveys from 2002 to 2010 indicate reasonably strong year classes (Figure 2).

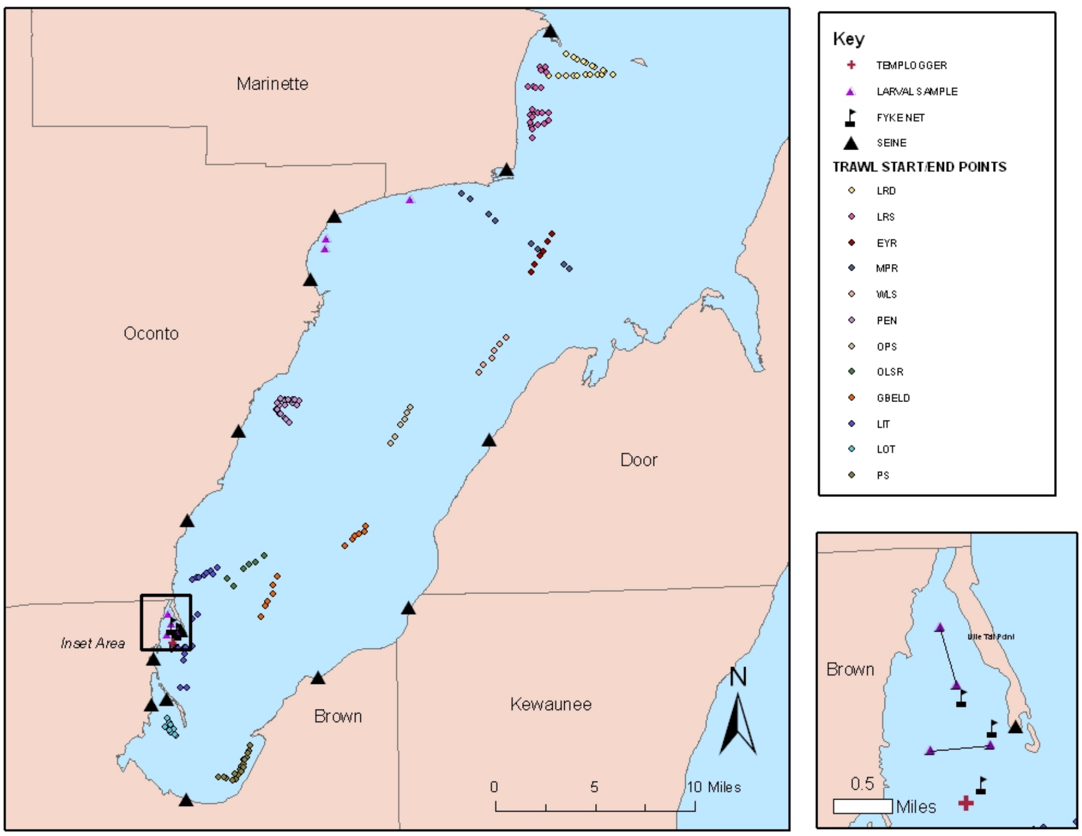


Figure 1. Yellow perch sampling locations in Green Bay, 2010.

Spawning assessment

The spring spawning assessment continued for the 33rd year on Green Bay at Little Tail Point. Double-ended fyke nets were set at three locations at ice-out on April 6, 2010. Water temperature reached 50 F on April 12, roughly two weeks earlier than a typical year. On April 19, 65% of mature females sampled were ripe or spent. Nets were removed on April 20, 2010, for a total effort of 42 net nights. By that date, nets were not fishing efficiently due to abundant cladophora.

Aging structures from immature females, mature females, and males were collected from 20 fish per

10 mm group when possible. All fish species were counted and lengths were taken from 500 yellow perch per sex and maturity category and incorporated into the age expansion. Fish under 100 mm were considered yearlings and were counted (n=10146). Age-2 (2008 year class) males comprised 98% of the total males over 100 mm sampled (n=643) with a mean length of 134 mm, or 5.3 inches. Immature females over 100 mm (n=542) averaged 135 mm, or 5.3 inches. A majority (91%) of the mature females sampled (n=605) were age-2 with a mean length of 164 mm, or 6.5 inches. Younger females (ages 2 and 3), continue to contribute significantly to the spawning population in southern Green Bay. Besides yellow perch, spottail shiners dominated the catch, followed by trout perch, white sucker, black bullhead, and round goby.

Water temperature

A StowAway TidbiT® templogger (Onset Computer Corporation) was deployed on April 6, 2010 near Little Tail Point (Figure 1 inset) to record water temperature every 30 min until August. May 2010 water temperatures averaged 59.4 F. The 8-year May average for this location is 57.2F.

Larval sampling

In 2010, larval sampling continued for the 13th year, with support from University of Wisconsin Sea Grant for equipment. Larval yellow perch were collected using a high-speed Miller sampler at two 0.5 mile transects off of Little Tail Point (Figure 1 inset) every two to seven days from May 12 through June 3, and at three 0.5 mile transects north of Oconto River (Figure 1) on May 19 and June 10. Small numbers of larval yellow perch and abundant daphnia began appearing in samples on May 12, with peak abundance of both noted on May 20. Spiny waterfleas (*Bythotrephes*) were first noted in samples on May 25. Abundant yellow perch mixed with daphnia were noted in samples taken near the Oconto area on May 19. All samples were delivered to University of Wisconsin-Milwaukee's Great Lakes Water Institute for identification and analysis.

Beach seining

Due to budget constraints, index station seining has been reduced since 2009. Fourteen index sites along the west and east shores of Green Bay (Figure 1) were sampled once in late June using a beach seine (25ft x 6ft, ¼-in delta mesh with 6x6x6ft bag). At each site, two 50ft hauls were pulled in perpendicular to shore. The number of YOY retained and escaped from the seine bag when it was placed in a tub was recorded. Catch per effort (CPE) was calculated as the mean number of YOY yellow perch per 100ft seine haul. YOY yellow perch were captured at all fourteen sites and the mean CPE was 117. This is above the 12-year average of 89. The site with the highest abundance in 2010 was Red Arrow Park which had a CPE of 424 and a low escapement rate (3%).

Mean length of YOY during the late June survey period was 41 mm which was 4 mm larger on average than the 2009 samples collected in early July. As expected, escapement rates decreased with larger fish and all YOY ≥ 45 mm were retained in the seine bag. Because many YOY had not yet reached a size where they were effectively captured, our CPE values are probably underestimated. However, a seine with a smaller mesh is difficult to pull in areas with abundant cladophora. In these locations, retention of small YOY increased because algae clogged the mesh. A total of twenty-five fish species were identified during the survey. Yellow perch YOY dominated the catches followed by white perch YOY, common carp YOY, gizzard shad YOY, and spottail shiners.

Trawling survey

Annual late summer trawl surveys continued for the 33rd year to monitor trends in yellow perch abundance. Trawling was conducted at 77 index sites at 12 locations (Figure 1): 45 shallow sites (established in 1978-1980) and at 32 deep water sites (added in 1988) using a 16-ft semi-balloon trawl with 1½-in stretch mesh on the body, 1¼-in stretch mesh on the cod end, and a cod end liner with ½-in stretch mesh. The net was towed for 5 minutes at a speed of 2.8 knots. Hauls were made during daylight hours. At each of the 12 locations, 100 YOY were preserved when possible and later measured. On average, YOY were 6 to 8 mm larger than the previous four years.

The average number of yellow perch collected per trawl hour was adjusted based on the amount of habitat that standard and deep sites represent, creating a weighted area average value. The trawling surveys indicated that 2010 produced a strong year class with the relative abundance of YOY yellow perch (2583/hr) ranking as the 2nd highest since the deep water sites were added in 1988, and the 3rd highest since the surveys began (Figure 2).

While the trawling surveys are designed to assess YOY distribution and abundance, yearling and older yellow perch are also measured, weighed, sexed, and aged. Abundance of age-1 and older fish decreased at index sites from 66/hr in 2009 to 51/hr in 2010. A majority (84%) of the age-1 and older fish captured were yearlings (2009 year class) with males and females represented near equally. Other common species in order of abundance captured at shallow sites were white perch YOY, gizzard shad, trout perch, and spottail shiner. Deep water trawls were dominated by round goby, adult rainbow smelt, adult alewife, and rainbow smelt YOY.

At each of the 12 locations, a temperature and dissolved oxygen profile is taken along with a secchi disk reading. Water clarity was highest at the northernmost locations and decreased at each site farther south.

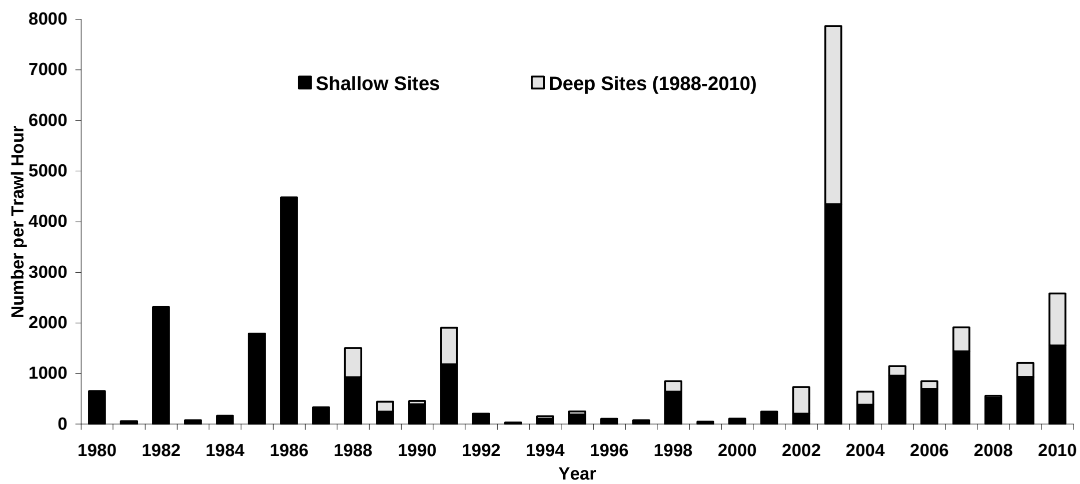


Figure 2. Relative abundance (weighted area average) of young-of-year yellow perch collected during late summer index trawling surveys in Green Bay from 1980 to 2010.

Sport harvest

Sport fishing harvest is estimated from an annual creel survey. Fish obtained through that survey were used to describe the age and size composition of the catch. Open water harvest of yellow perch in 2010 was 225,995 (49,182 lbs), compared to 204,209 fish (52,630 lbs) in 2009 (Figure 3). The harvest rate (0.21/hr) and catch rate (0.41/hr) of yellow perch in 2010 increased from 0.17/hr and 0.25/hr, respectively, in 2009. A majority (70%) of the open water harvest was from the 2008 year class, while the 2007 year class comprised approximately 13%. The mean length of open water harvested yellow perch was 7.8 inches (n = 71; SE = 0.1), compared to 7.9 inches in 2009.

Winter harvest is influenced largely by ice conditions, daily bag limits, angler effort, and abundance of adult perch. Since the creel survey began in 1986, angler harvest of yellow perch during winter months has ranged from 2 million fish in 1990 to 6,930 in 2002 (Figure 3). Winter harvest of yellow perch in 2010 (33,070) fell compared to 2009 (42,782). In addition, 2010 was lower than the previous four years and well below the 13-year harvest average (45,093). Harvest rate for anglers targeting yellow perch remains low at 0.21/hr, but catch rates increased significantly from 0.68/hr in 2009 to 2.0/hr in 2010. The mean length of winter harvest of yellow perch was 7.4 inches (n = 38; SE = 0.2), compared to 8.3 inches in 2009. High catch rates and low harvest rates suggest that anglers sorted through many small fish to find a keeper.

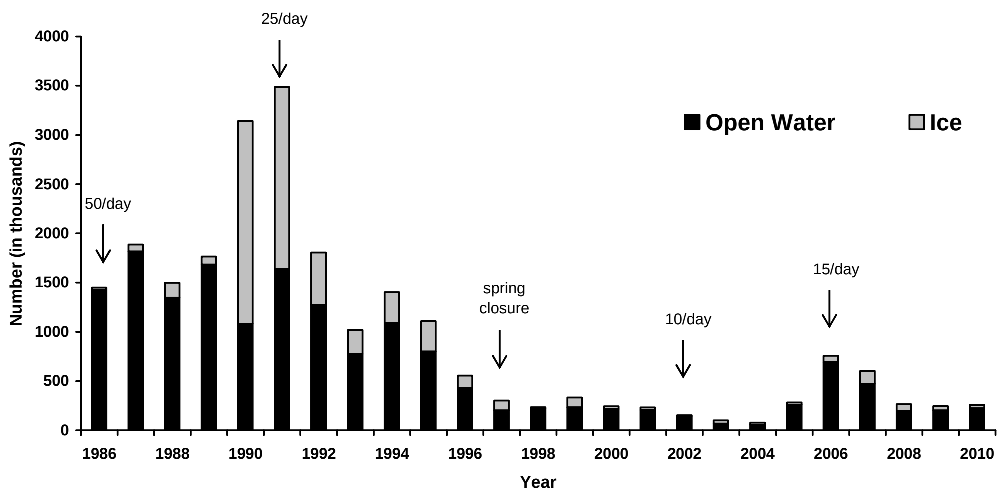


Figure 3. Estimated sport harvest of yellow perch in Green Bay from 1986 to 2010. Regulation changes indicated by arrows.

Commercial harvest

The annual commercial harvest was reported by commercial fishermen who are required to weigh their harvest daily. Fish sampled by WDNR at commercial landings were used to describe the age and size composition of the catch. Since 1983, the yellow perch commercial harvest in Green Bay has been managed under a quota system. The zone 1 (Green Bay) quota has ranged over the past decade from 20,000 pounds to a high of 475,000 pounds.

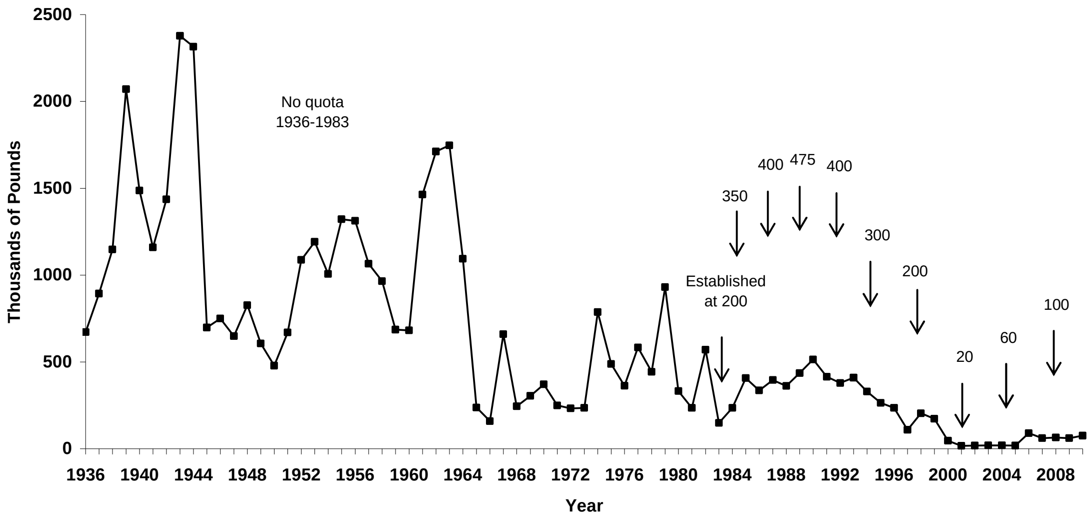


Figure 4. Commercial harvest of yellow perch in Green Bay from 1936 to 2010. Total allowable commercial harvest changes (thousands of pounds) indicated by arrows.

In 2010, commercial fishers harvested a total of 75,641 pounds using gill and drop nets, compared to 61,509 pounds in 2009 (Figure 4). The total allowable commercial harvest has remained at 100,000 pounds since 2008. The harvest rate (CPE) for gill nets has remained stable at around 30 pounds per 1000 ft fished for the last four years, while drop net CPE was at 7.3 pounds per net in 2010 (Figure 5). Age-2 perch (2008 year class) made up 60% of the total commercial harvest in 2010, while age-3 comprised 36%.

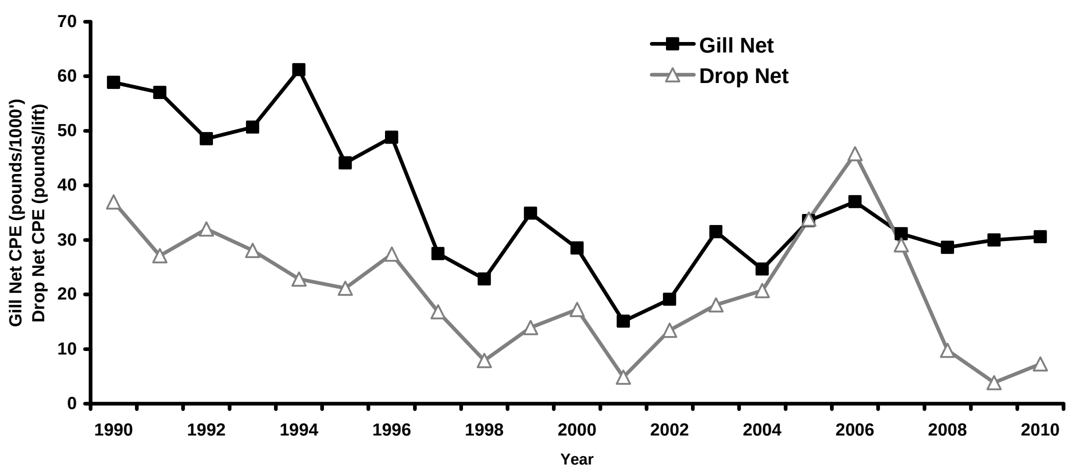


Figure 5. Gill net and drop net catch per unit effort (CPE) of all licensed yellow perch commercial fishers in Green Bay waters, 1990 – 2010. Gill net CPE is in pounds of yellow perch harvested per 1,000 feet lifted. Drop net CPE is in pounds of yellow perch harvested per pot lifted.

Discussion and Management actions

The 2010 year class of yellow perch on Green Bay was the third highest in 30 years. Water temperatures reached 50F two weeks earlier than a typical year and did not drop sharply during egg incubation in April or larval development in May. Size of age-0 yellow perch captured in shoreline seines and bottom trawls were, on average, a half-inch larger than most years. Good growth rates, coupled with ideal environmental conditions in the spring, may have bolstered year class strength and survival.

In summary, yellow perch recruitment has been steady for the last nine years, with peak year classes occurring in 2003, 2005, and 2010. Of concern is the lack of a corresponding increase in the total adult population.

Wisconsin DNR evaluates a statistical catch-at-age (SCAA) model regarding changes to yellow perch commercial and sport regulations. Presently, WDNR has a policy of allocating yellow perch harvest equally between the sport and commercial fishery over the long term (Figure 6) while protecting the resource from overfishing.

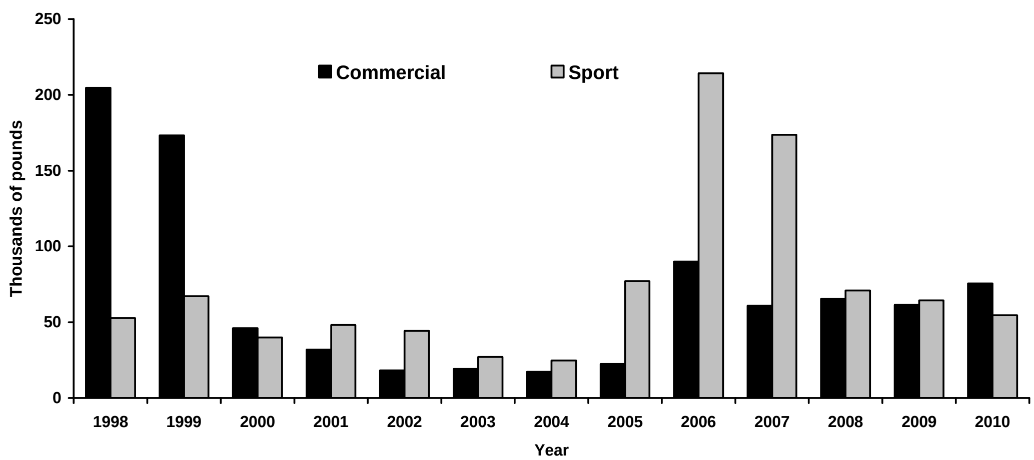


Figure 6. Commercial harvest and estimated sport harvest in Green Bay from 1998 to 2010.

LAKE MICHIGAN YELLOW PERCH

Pradeep Hirethota

This report is a summary of the status of young and adult perch in Lake Michigan assessed through several annual surveys in Wisconsin waters during 2010-11.

Young-of-the-year Assessment

Southern Lake Michigan work unit of WDNR conducted an annual survey of YOY yellow perch along the Lake Michigan shoreline from 8/24/2010 to 9/1/2010. We used a standard 25-foot beach seine which is pulled by two persons in the shallow nearshore waters. In general, each pull consisted of a 100-foot sweep either parallel to the beach or perpendicular to the beach along the pier/jetty depending on the depth and feasibility of seining. At each station, two 100-foot pulls were taken – one a parallel and the other a perpendicular one. Fourteen stations were sampled from Sheboygan to Kenosha. Some stations were infested with cladophora making it difficult to pull the seine by clogging. A total of 24 species of fish were captured. Young-of-the-year and juvenile alewife (72.7mm average length) dominated the catch followed by Spottail shiner and YOY yellow perch.

A total of 3,955 ft of seine hauls were taken in fourteen sites capturing 424 YOY yellow perch yielding a CPE of 11 YOY yellow perch per 100 foot seine haul. In 2009, we captured only seven YOY yellow perch with a CPE of 0.12. The CPE in 2010 is the third highest since 1990 (the other two years being 2005 and 2007) (Figure 1). The average size of the YOY yellow perch in 2010 was 60.56mm which is much greater than previous two years – 37mm in 2009 and 52.7mm in 2008, respectively. The majority of YOY yellow perch in the 2010 survey were within the size range of 53-67 mm (Figure 2). It is possible that the warm spring temperature may have caused some early hatch, which grew at a faster rate feeding on the early plankton bloom. The surface water temperature in 2010 remained relatively warmer throughout the summer ranging in the upper 60s at all stations. Seining conditions were generally good excepting a few stations choked with cladophora.

Two index stations, Shoop Park (Racine Co.) and Doctors Park (Milwaukee Co.), were selected for setting micromesh gill net. This year we chose not to set the net off Wind Point because of unsuitable conditions. Shoop Park is just south of Wind Point and is little more protected. The nets were set in the nearshore water using an inflatable boat on a calm day at depths ranging from 5 to 10 feet and fished overnight. We used a 100-foot long and 5--foot deep monofilament net made of 12mm stretch mesh. Each lift consisted of two gangs of 100 ft of net (200ft total) at each station. Three lifts were conducted at each site. The weather conditions were very good for sampling. A total of eleven species of fish were captured in these nets with rainbow smelt dominating the catch followed by YOY yellow perch.

Of the total 158 YOY yellow perch captured only 7 were caught at Doctors Park although the effort was same at both locations. The water was very clear at Doctors Park compared to Shoop Park which may have had some effect on the catchability. At Shoop Park the water was slightly turbid due to the algae in suspension. The overall catch per effort (CPE) was 13 YOY yellow perch (Figure 3) in 100 feet of gill net effort which is comparable to what we found in 2003 and 2007 assessments. Both 2003 and 2007 year-classes turned out to be reasonable size year-classes in the recent sport harvest. The average size of YOY yellow perch caught was similar to beach seine samples with 62.7 mm at Doctors Park, and 59.32 mm at Shoop Park. Over all, the dominant size range of YOY yellow perch in micromesh gill net sample as well as in beach seine sample remained 58-62 mm. In general, the young perch appeared in good health condition and had attained reasonable growth at this time suggesting a potential strong year-class provided they survive well through their first winter.

Spawning Assessment

This assessment has been conducted since 1990 on the Green Can Reef and in the Milwaukee Harbor (Table 1). The objective is to quantify the relative abundance of mature female perch in previously identified spawning areas. In spring 2010, we took three samples from May 19th to June 2nd each day with an effort of 1000ft (2 boxes) of gillnet. Each box of 500 ft gillnet consisted of 2, 2.5, 2.75, 3.0 and 3.25 inch mesh (100 ft each panel). The nets were set at depths ranging from 30ft to 59ft, and allowed to fish overnight. The bottom water temperature was around 48 ^{0}F. The majority of females caught were still green until May 26th. The final lift on June 2nd had 65% of ripe/spent female indicating peak spawning activity. A total of 616 adult yellow perch – 486 male and 130 female - were caught in three lifts. When compared to the 2008 and 2009 spawning assessment data, the percentage of females was lower (Table 1). A subsample of 69 yellow perch was aged; the ages ranged from 3 to 12 years. 2002 (age 8) males and 2005 (age 5) females comprised the majority of perch.

Yellow perch egg deposition survey was conducted by the WDNR dive team on June 1st, and June 10th. The divers surveyed an area of 45,987 square meters at depth ranging from 25-55ft. They counted 84 egg masses resulting in 1.83 egg mass per 1000 square meters (Figure 4) which is much lower compared to 5.8 egg mass per 1000 square meters found in 2009 survey. The overall number of female spawning perch on the reef has dropped since 2008.

Graded Mesh Gill Net Assessment

The WDNR conducts standardized graded mesh gill net assessments annually in winter months, in grids 1901 and 1902 off Milwaukee. The mesh sizes used in these assessments run from 1 to 3.25 inches stretch on 1/4 inch increments. Four lifts with a total effort of 17,600 ft gillnet (22 boxes of 800 ft each) were taken on12/08/2010, 12/15/2010, 12/16/2010 and 12/17/10 at depths ranging from 65ft to 75ft.

Table 2 shows the relative abundance as catch per effort of perch, by age, for this assessment from 1997 through 2011. The data show variability in catch rates by calendar year. These data show very low CPEs of younger fish and higher CPEs of older fish until 1998 (dominated by 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 1998 year-class perch comprised the major portion of the population for a number of years, and is gradually declining in the catch.

In our 2011 winter graded mesh assessment we documented multiple year classes. The 2005 year-class yellow perch (age 6) emerged as a dominant group (40%) in 2010 continued to dominate the catch in 2011 (44%) (Figure 5) followed by 2003 and 2002 year-classes. In addition to the above three year classes, 2006 and 2007 year-classes also comprised substantially with 10% each. The 1998 year-class comprised a meager 4%, and all of them were females (average size, 342mm). One notable thing was that there were no age 3 perch in the sample. The average sizes of age 4 male and female were 196mm and 233mm, respectively.

Since 2000 the sex ratio of the yellow perch population was shifted toward predominantly female and lasted until 2002. This trend is reversed again since 2003 with greater number of males, except for 2007. But recently the female proportion has increased markedly with 71% in 2010 and 76% in 2011. The data from 2008-2010 spawning assessment also indicated a decreased number male perch in the population. An absence of commercial harvest in Lake Michigan certainly has helped decrease the impact on fast growing larger female perch in the fishery, allowing them to spawn multiple years.

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 five fish per day since September 1996, which is reflected in the total harvest (Table 3). Our creel survey data on the sport caught yellow perch in 2009 indicated that the sport harvest was more than doubled compared to 2008 harvest. The overall harvest in Lake Michigan increased from 20,000 perch in 2008 to 51,000 in 2009. The sport harvest remained the same in 2010 at 51,000 fish. In general, the lakeshore counties – Milwaukee, Racine and Kenosha accounted for 92% of the harvest. The main reason for the dramatic increase is the strong 2005 year-class besides 2006 and 2007 year-classes (Figure 6). The average size of sport caught 4-year-old perch was 250 mm.

The 2005 year-class yellow perch recruited to the fishery as 3-year-old fish continued to dominate the sport catch in 2010 replacing the 1998 year-class. In 2010 sport harvest, the 5-year-old 2005 year-class yellow perch comprised 54% of the catch followed by 2006 (20%) and 2007 (14%) year-classes. Recent data from the winter graded mesh assessment also indicated a strong 2005 year-class in the population which may continue to support a good sport fishery in the years to come. It is interesting that 2002 and 2003 year-classes comprised very little in the sport harvest.

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, in recent years, the 1998 year-class was the strongest year-class supporting the fishery. Recent data indicate that the 2002, 2003 and 2005 year-classes comprise substantial numbers in the population. 2005 year-class has emerged as a dominant year-class in recent years. 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. Effective May 2002, 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, and allowing mature adults to spawn multiple years in their life time. Presence of multiple year-classes in the spawning population as well as in the sport harvest is a positive change. The current regulation will remain in effect until a detailed analysis is complete on the status of yellow perch population. The Yellow Perch Task Group is working with a research team on developing a Statistical Catch at Age model to help guide management actions.

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]
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
2005	1,271	1,207	64	0	5	2,000
2006	1,741	1,580	161	0	9	2,500
2007	2,132	2,076	56	0	3	2,000
2008	326	209	117	0	35.9	4,000
2009	629	465	164	0	26	3,500
2010	616	486	130	0	21	3,000

[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 assessm
mesh gill net sets conducted in January each year, WDNR, Lake Michigan Work Unit.

Age	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	42	323	1	0	2	3	0	3	40	3	2
3	4	2	57	65	243	4	0	1	61	29	24	159	50
4	14	6	215	9	20	118	0	0	12	249	60	7	282
5	11	29	93	27	2	4	33	1	0	37	204	46	6
6	18	35	57	2	2	3	0	27	11	0	31	120	59
7	77	20	45	0	1	1	0	1	226	23	4	16	139
8	251	43	63	8	2	0	0	0	6	417	20	7	18
9	109	110	44	9	1	0	0	0	0	7	113	7	12
10	15	60	33	11	1	0	0	0	0	0	0	69	5
11	0	15	9	1	1	1	0	0	0	0	0	1	78
12	0	4	7	0	0	1	1	1	2	0	0	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0
%M	89	80	58	36	36	38	52	60	64	53	48	51	40
%F	11	20	42	64	64	62	48	40	36	47	52	49	60

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

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)
1995	128	214
1996	15[a]	41[b]
1997	Closed	27[b]
1998	Closed	36[b]
1999	Closed	23[b]
2000	Closed	16[b]
2001	Closed	121[b]
2002	Closed	88[b]
2003	Closed	66[b]
2004	Closed	42[b]
2005	Closed	33[b]
2006	Closed	68[b]
2007	Closed	66[b]
2008	Closed	20[b]
2009	Closed	51[b]
2010	Closed	51[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)

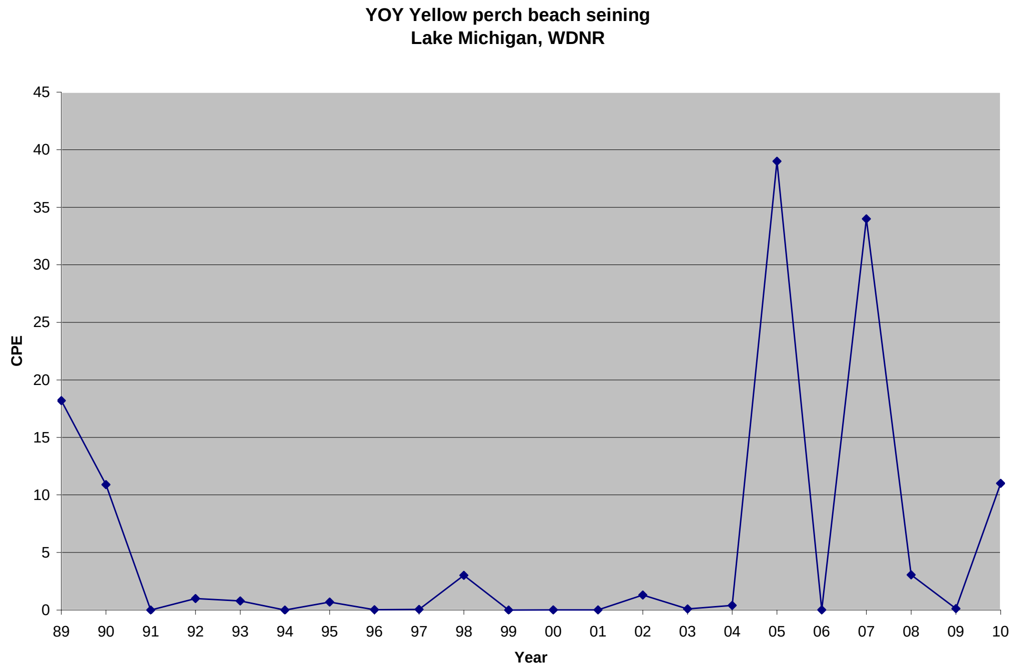


Figure 1. CPE (fish/100') of YOY yellow perch in summer beach seining, WDNR.

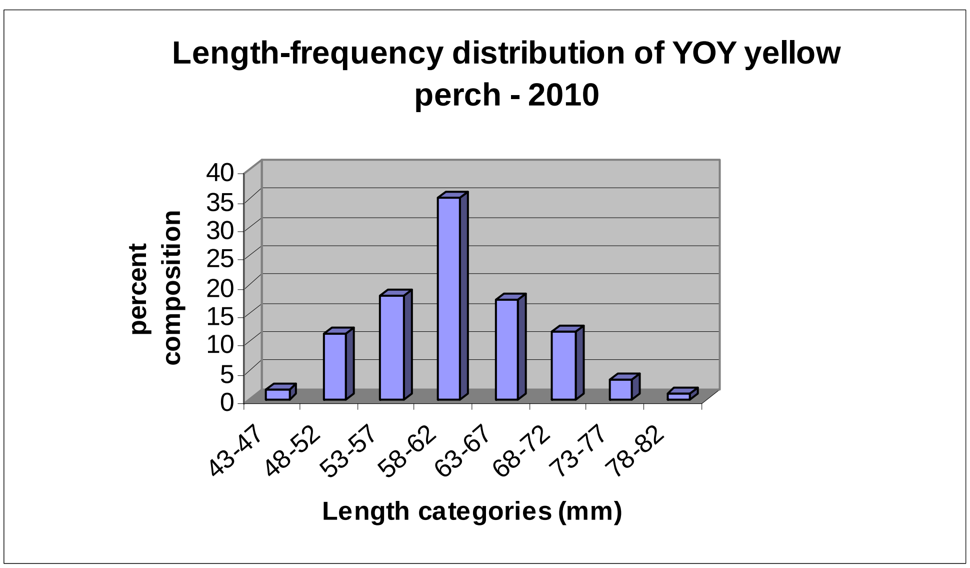


Figure 2. Size structure of young-of-the-year yellow perch captured in the beach seine - WDNR.

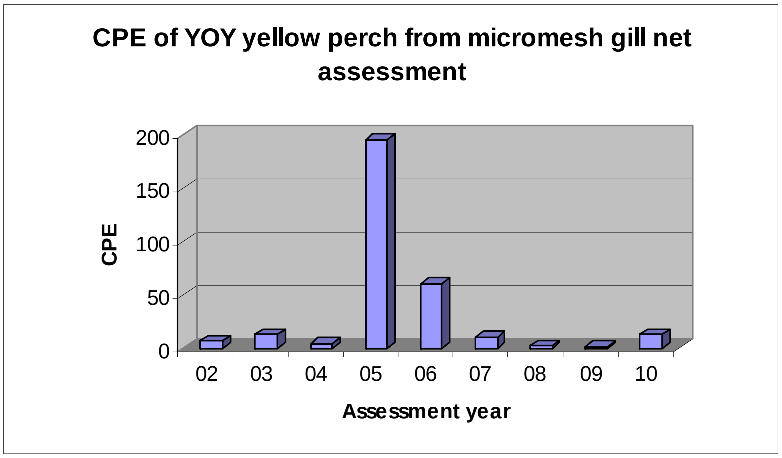


Figure 3. Catch per effort of YOY yellow perch captured in the micromesh gill net, WDNR, 2010.

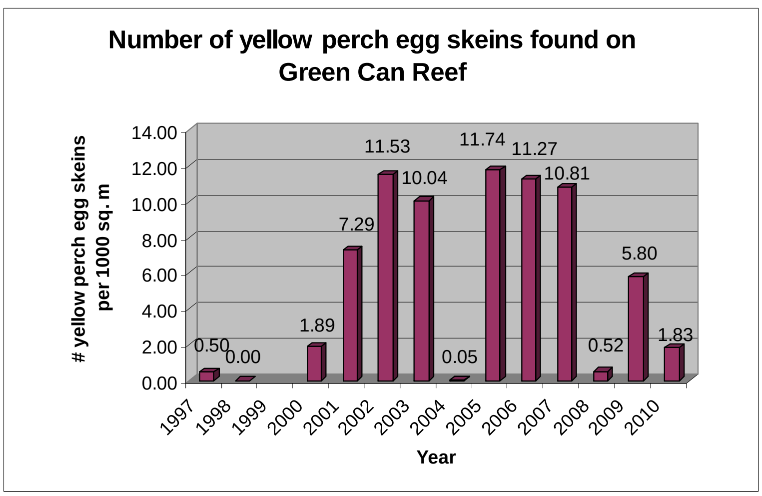


Figure 4. Yellow perch egg deposition survey in Lake Michigan, WDNR.

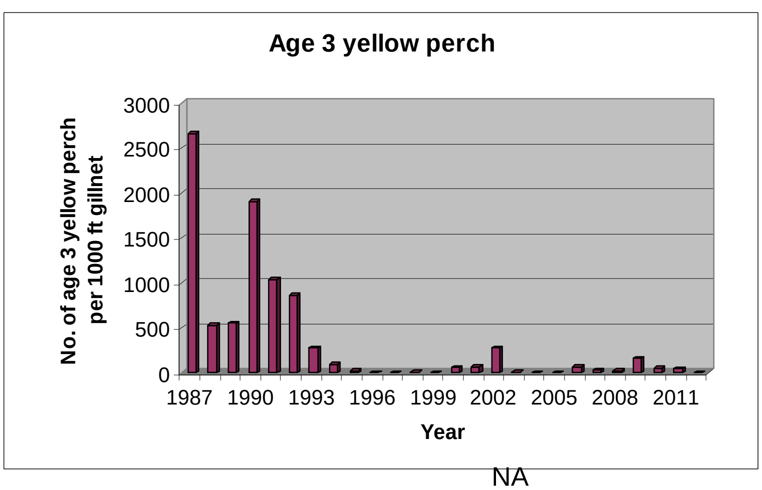


Figure 5. Age 3 yellow perch year-class strength (computed to 1000 ft of gillnet) in the winter graded mesh gillnetting assessment in Lake Michigan.

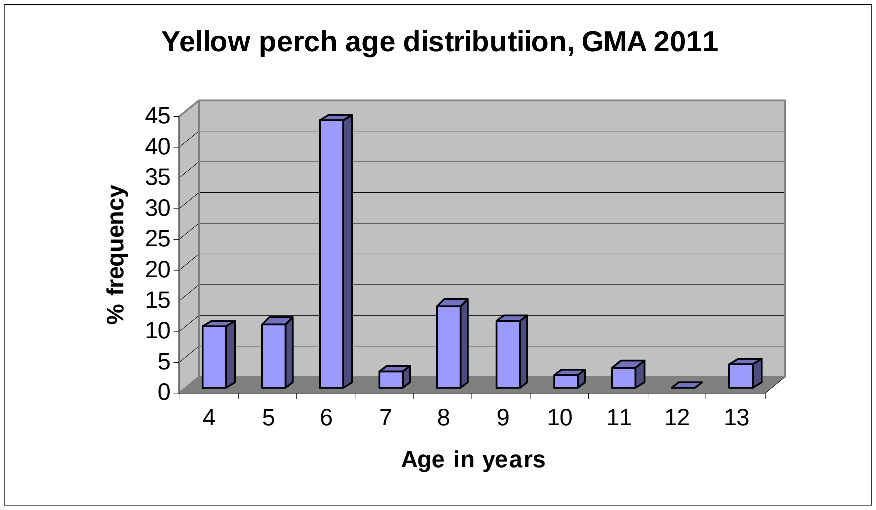


Figure 6. Age distribution of yellow perch in the winter graded mesh gillnetting assessment (GMA) in Lake Michigan, 2011.

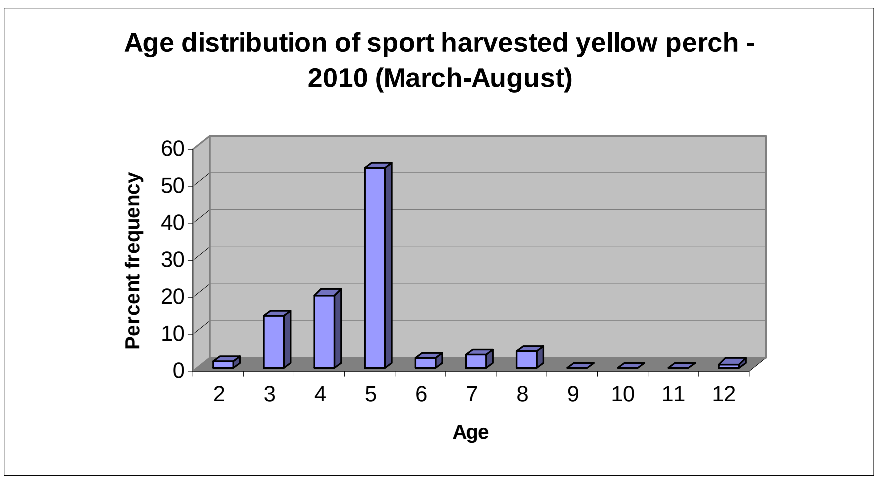


Figure 7. Age distribution of sport harvested yellow perch in Lake Michigan – 2010

WALLEYE IN SOUTHERN GREEN BAY

David Rowe, Steve Hogler, and Rodney Lange

Background

Walleye stocks in southern Green Bay were decimated during the early to mid 1900s by habitat destruction, pollution, interactions with invasive species, and over-exploitation. Water quality and fish community of southern Green Bay began to improve by the mid 1970s after the passage and enforcement of the Clean Water Act in 1972. Rehabilitation of walleye stocks by the Wisconsin Department of Natural Resources began during 1973 with the stocking of fry and fingerlings into the Sturgeon Bay area. Stocking expanded to include the lower Fox River (downstream from the DePere Dam) during 1977. Stocking (fingerlings and fry) was so successful in southern Green Bay and the lower Fox River that it was discontinued in 1984 to allow for surveys of natural reproduction and recruitment.

The results of previous studies suggest that Green Bay walleye stocks are in small areas and are quite discrete (Schneider et al. 1991). The walleye stock in southern Green Bay and the lower Fox River is likely distinct from other stocks in Green Bay, but genetic analysis is needed to verify this assumption. Walleye spawner abundance and YOY production have been variable since monitoring began, but the stock has not been augmented through stocking since 1984 and is considered self-sustaining. The purpose of this report is to summarize data collected during the 2010 field season on the southern Green Bay / lower Fox River walleye stock, and to describe long-term trends in YOY production and angler catch and harvest.

Fall electrofishing index surveys

Recruitment of YOY walleye

Results of our 2010 electrofishing index surveys show that the relative abundance of young of the year (YOY) walleye at the fall fingerling stage was above average for the Fox River (Figure 1) and indicates a strong year class for 2010. The 2010 age 0 catch per unit effort (CPUE) from the Fox River was 22.7 YOY/hour of electrofishing which is well above the 15 year average of 12.3 YOY/hour. The lower Green Bay catch was 0.6 YOY/hour, which is below the 15 year average of 7.7 YOY/hour. The difference between the bay catch rate and the river catch rate may be attributed to warmer temperatures at time of sampling of the bay (16.1º C on the bay and 8.9º C to 12.2º C on the river). The abundant YOY gizzard shad population provided ample forage and likely resulted in better than normal growth for the YOY walleyes with the mean length of captured YOY walleye measured at 240 mm in 2010 as compared to 224 mm in 2009. Stable water temperatures, an extended warming period during spawning and hatching and abundant forage likely produced favorable environmental conditions that resulted in a strong year class in 2010 (Hansen et al. 1998). Year-class failures have not been observed in more than two consecutive years during 2001-2010 (Figure 1).

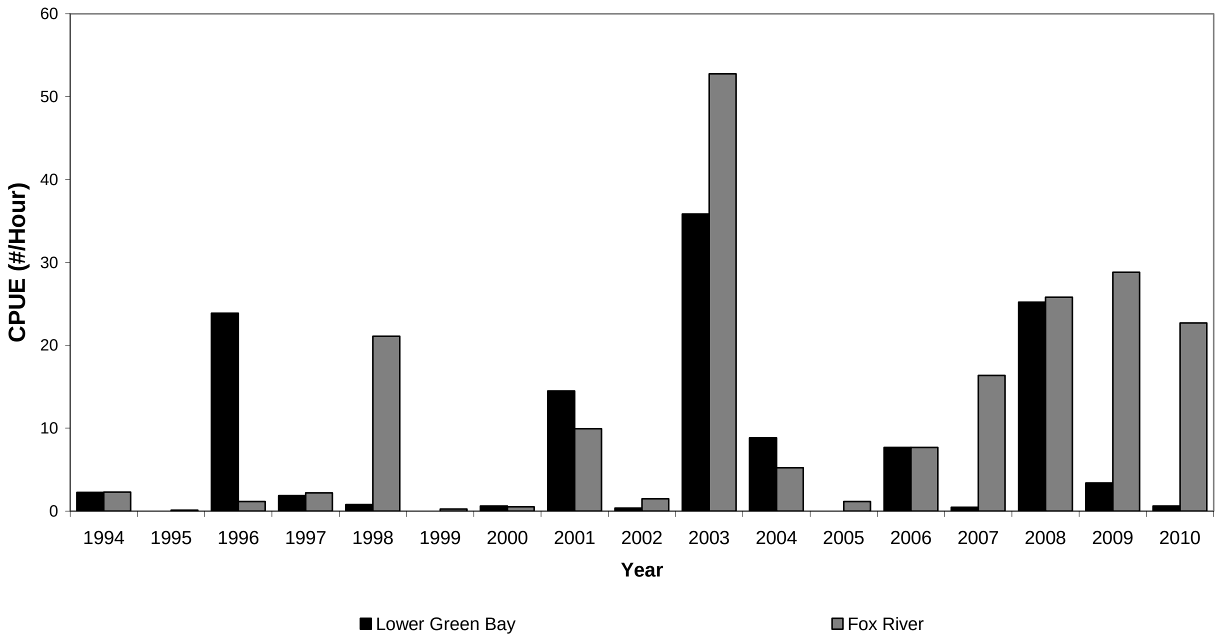


Figure 1. Relative abundance of young-of-year walleye in the lower Fox River (DePere Dam to mouth), lower Green Bay (south of a line drawn from Longtail Point to Point Sable), as measured by catch per unit effort (CPUE; number per hour) from data collected in electrofishing index surveys during 1995-2010.

<u>Walleye stock size and age structure</u>

In 2010, 946 walleye were captured during our electrofishing index surveys on the lower Fox River that averaged 401 mm in total length (range 188-706 mm). The length-frequency distribution of captured walleye indicates that the stock's size structure has not been negatively affected by year-class failures, low recruitment, slow growth, or excessive mortality (Figure 2). Spines were collected from a stratified subsample (n=321) and ages were estimated by cross sectioning and counting annuli. An age-length key was used to assign ages to un-aged individual fish by proportion of known aged fish at length from the sub-sample (Iserman and Knight 2005). Fish from the 2010 year class (YOY) and from the strong year classes of 2009 and 2008 dominated our catch. Few of the walleye that we captured were greater in age than age 7 (Figure 3).

On Green Bay, we captured 132 walleye that averaged 428 mm in length (range 193 mm- 655 mm) during index electroshocking. Few small (YOY) walleye were captured although other sizes were much more abundant (Figure 4).

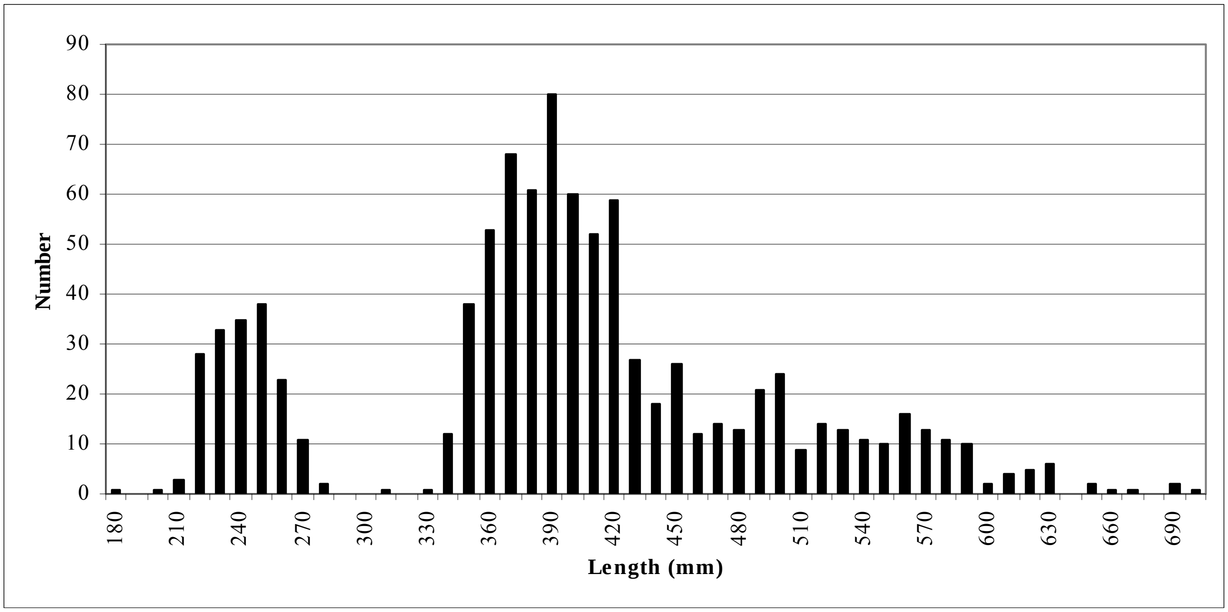


Figure 2. Length-frequency distribution of walleye sampled while electrofishing the lower Fox River during 2010.

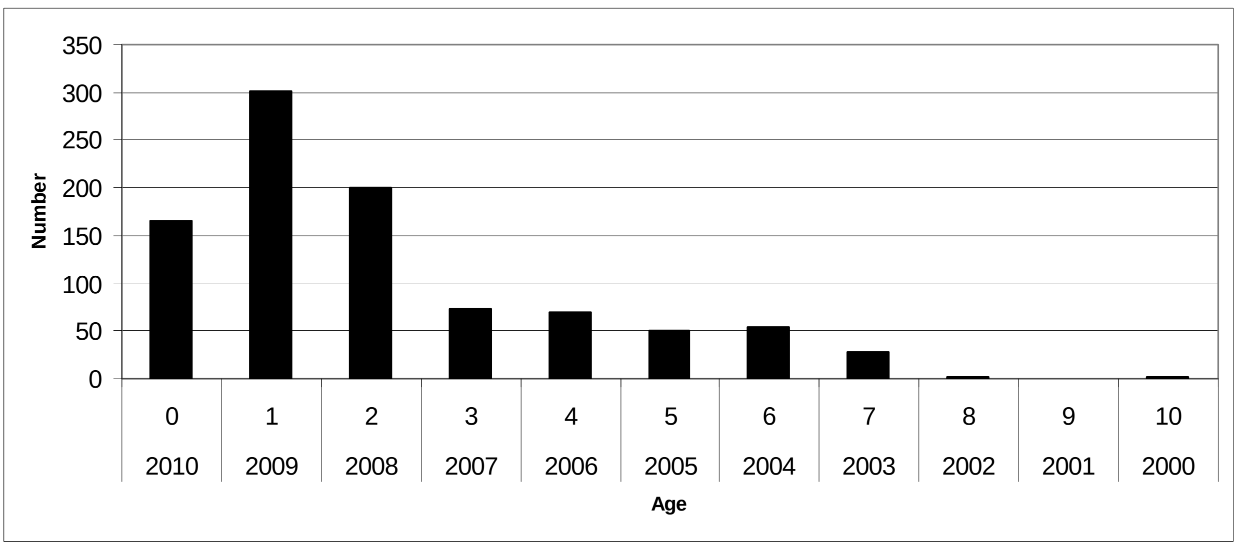


Figure 3. Estimated age-frequency distribution of walleye sampled while electrofishing on the lower Fox River during 2010.

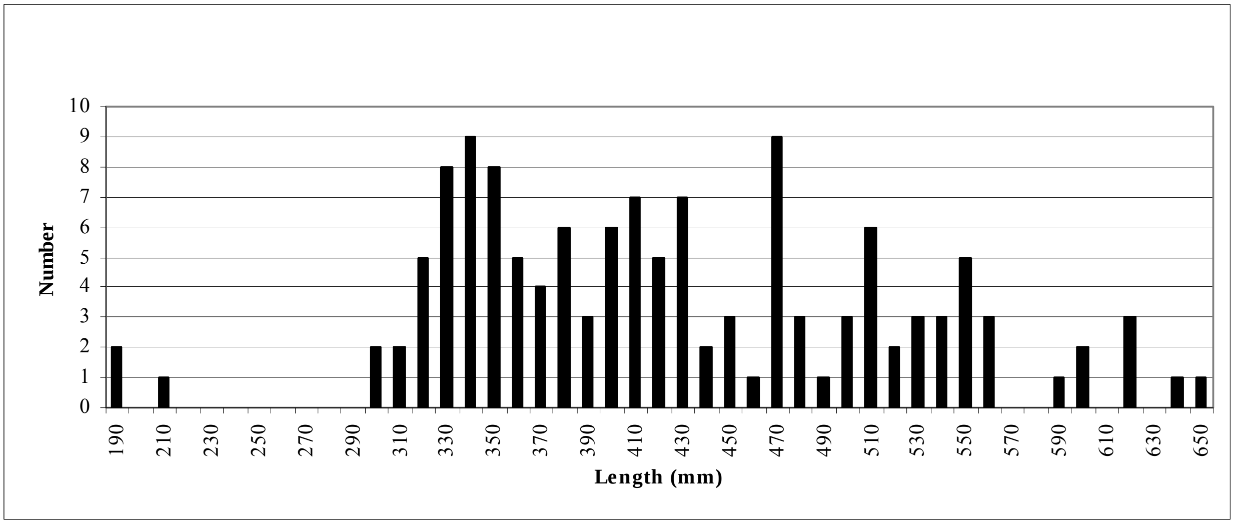


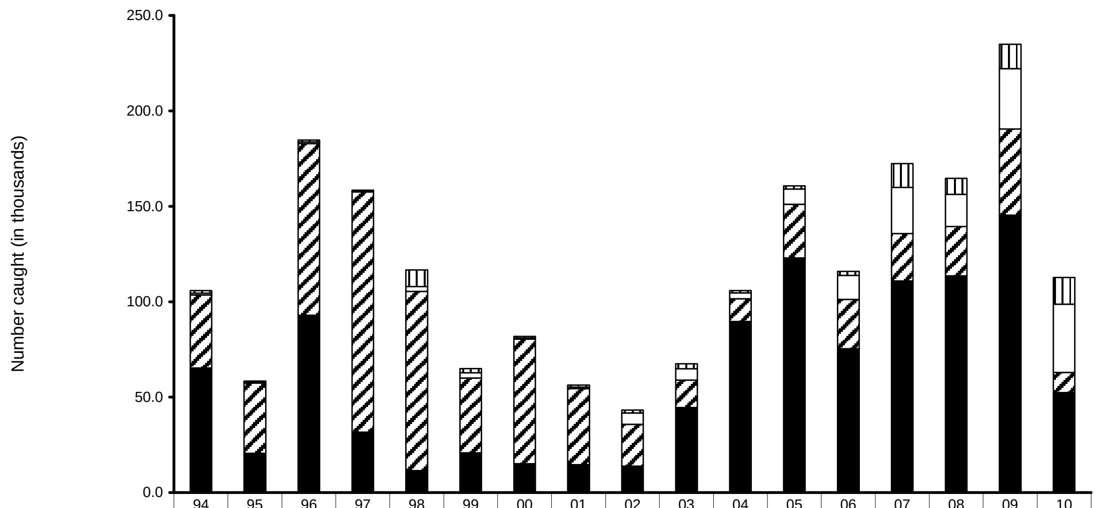
Figure 4. Length-frequency distribution of walleye sampled while electrofishing lower Green Bay during 2010.

Catch and Harvest

Total catch of walleye from Wisconsin waters of Green Bay was estimated at 112,725 during the 2010 open water season (March –October 31). This was a 52% decrease from the estimated 234,872 walleye that were caught during the 2009 open water season (Figure 5). Despite the large decrease in catch, the 2010 estimated catch was still greater than the average walleye catch since 1986 of 96,900. The largest drops in catch were noted in Brown and Marinette Counties, while the other counties, Oconto and Door/Kewaunee showed small increases in catch in 2010.

Total open water season harvest of walleye from Wisconsin waters of Green Bay decreased 25% from 83,425 in 2009 to 62,222 during 2010 (Figure 6). Harvest in 2010, although down from 2009 was still the 2nd highest measured since 1986. Harvest increased in Door/Kewaunee and Oconto Counties during 2010 compared to 2009, while in Brown and Marinette Counties harvest decreased. Most of the overall decline in harvest can be attributed to the large decline noted in Brown County where harvest was down nearly 50% in 2010 compared to what was measured in 2009.

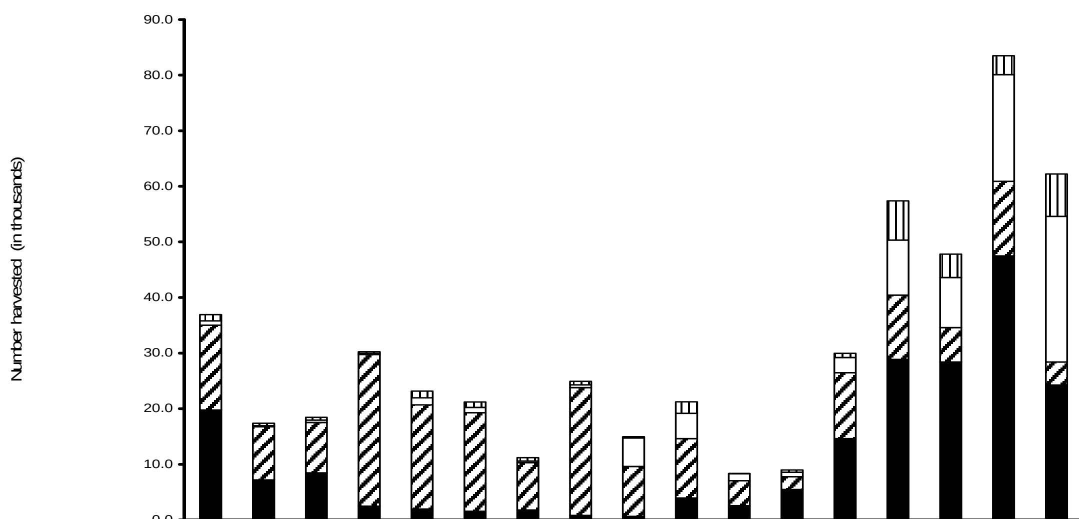
The walleye catch has been relatively high for the last five seasons, with the greatest contribution to the catch from the lower Fox River and Brown County waters of Green Bay. This is likely attributable to the very strong and abundant year class of 2003 (Figures 1 and 3). The decline in harvest in 2010 is likely due to a decline in abundance of the 2003 year class and the lack of fish from much smaller 2004 and 2005 year classes.



	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Door/Kewanee	1.2	0.6	1.0	0.5	8.8	2.2	0.8	1.2	1.5	2.6	1.1	1.7	2.2	12.5	8.3	12.8	14.0
Oconto	0.9	0.4	0.9	0.4	2.5	2.7	0.7	0.8	5.9	6.1	3.1	7.9	12.5	24.1	16.9	31.6	35.8
Marinette	38.3	36.8	89.9	125.9	93.9	39.2	65.3	39.9	21.9	14.3	11.8	28.1	25.8	24.9	25.8	45.1	10.5
Brown	65.3	20.6	92.9	31.7	11.5	20.8	15.1	14.6	13.9	44.6	89.7	122.9	75.4	110.9	113.5	145.4	52.4

Year

Figure 5. Estimated total open water season (March-October) walleye catch from Wisconsin waters of Green Bay and the lower Fox River by county during 1995-2010.



	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Door/Kewanee	1.1	0.4	0.5	0.3	1.2	1.0	0.6	0.6	0.2	2.1	0.0	0.4	0.7	7.1	4.2	3.4	7.6
Oconto	0.8	0.2	0.4	0.2	1.2	0.9	0.3	0.5	5.1	4.6	1.3	0.8	2.7	9.9	9.0	19.2	26.2
Marinette	15.3	9.5	9.1	27.3	18.8	17.8	8.5	23.0	9.0	10.7	4.5	2.3	11.9	11.6	6.2	13.4	4.2
Brown	19.8	7.2	8.5	2.5	2.0	1.5	1.8	0.8	0.6	3.9	2.6	5.5	14.6	28.9	28.4	47.5	24.2

Year

Figure 6. Estimated total open water season (March-October) walleye harvest from Wisconsin waters of Green Bay and the lower Fox River by county during 1995-2010.

The Future of the Sport Fishery

The future of the southern Green Bay/lower Fox River walleye stock and sport fishery appears to be very promising. Substantial walleye year classes have been measured the past three falls during electroshocking. Furthermore, year-class failures have not been observed in more than two consecutive years during 1994-2010. The 2008 and 2009 year classes will recruit to the fishery in the next couple of years and increase the abundance of fish in the fishery. However, there will be a noticeable shift downward in the population size structure as the 2003 year class continues to be reduced in abundance through harvest and as the younger and smaller 2008 and 2009 year classes take their place. Harvest will be continued to be monitored in relation to PCB contamination levels. As contaminant levels continue to decrease, harvest will likely continue to increase.

References

Hansen, M. J., M. A. Bozek, J. R. Newby, S. P. Newman, and M. D. Staggs. 1998. Factors affecting recruitment of walleyes in Escanaba Lake, WI, 1958-1996. North American Journal of Fisheries Management 18:764-774.

Isermann, D. A. and C. T. Knight. 2005. A computer program for age length keys incorporating age assignment to individual fish. North American Journal of Fisheries Management 25:1153-1160.

Kapuscinski, K. L., Zorn, T.G., Schneeberger, P.J., O'Neal, R.P., Eggold, B.T. 2010. The status of Lake Michigan walleye stocks. *In* Status of walleye in the Great Lakes: proceedings of the 2006 Symposium. Great Lakes Fish. Comm. Tech. Rep. 69. pp. 15-69.

Schneider, J. C., and five coauthors. 1991. Walleye rehabilitation in Lake Michigan, 1969-1989, p. 23-61. *In* P.J. Colby, C. A. Lewis, and R. L. Eshenroder [ed.]. Status of walleye in the Great Lakes: case studies prepared for the 1989 workshop. Great Lakes Fisheries Commission Special Publicaiton 91-1.

GREAT LAKES MUSKELLUNGE

David Rowe, Steve Hogler, and Rodney Lange

The Wisconsin Department of Natural Resources (WDNR) in cooperation with several local musky clubs and the Musky Clubs Alliance of Wisconsin initiated a Great Lakes strain muskellunge reintroduction program in 1989 in the Green Bay waters of Lake Michigan. Muskellunge in southern Green Bay were decimated during the early to mid 1900s by habitat destruction, pollution, and over-exploitation (Kapuscinski 2007). The need to re-establish a native inshore predator fish species has been identified in several planning efforts including the Lake Michigan Integrated Fisheries Management Plan and the Lower Green Bay Remedial Action Plan (Lake Michigan Fisheries Team 2004, WDNR 1986). A three-phase plan was drafted by WDNR biologists to re-establish a self-sustaining population of muskellunge in Green Bay: (1) identify an appropriate egg source, obtain eggs, and successfully hatch, rear and stock fish, (2) establish an inland lake broodstock population, and (3) develop a self sustaining population in Green Bay.

Annual Assessments

Nearly annual assessments on the status of the Green Bay muskellunge population have been conducted using fyke nets in spring and electrofishing in fall. Spring netting has been employed annually since 2004. Mean size as measured during the spring sampling period has continued to increase as this re-established population continues to mature (Figure 1). In 2010, the average fish length was 1118 mm (44.0") up from 1105 mm (43.5") in 2009. Male fish appear to recruit to the population sooner, but female fish grow faster and attain larger ultimate size (Figure 2).

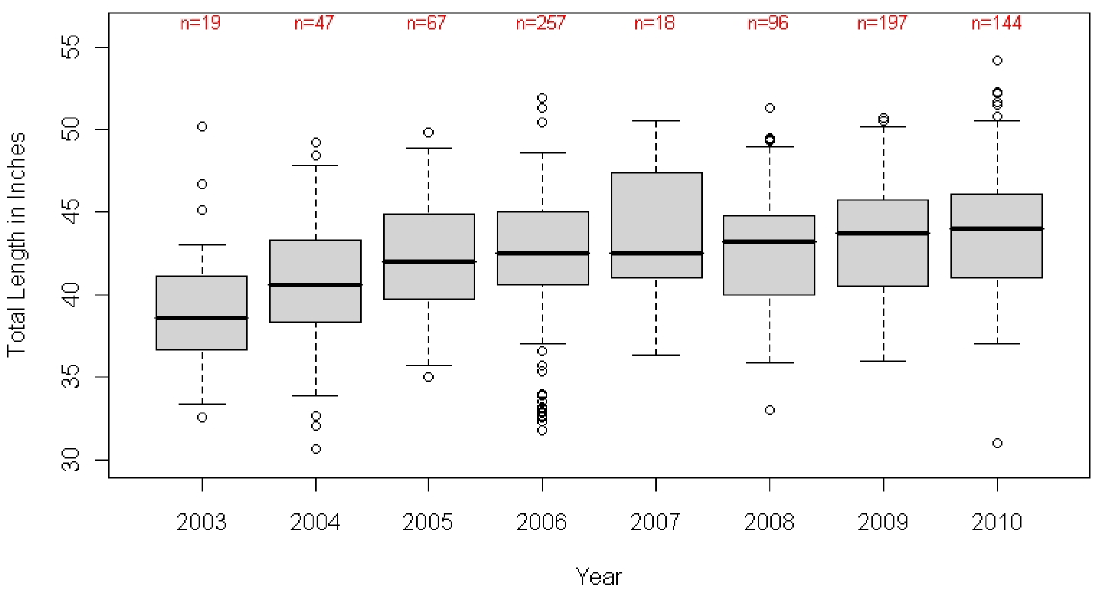


Figure 1. Length distributions of muskellunge captured during spring netting surveys of the lower Fox River and Green Bay from 2003-2010. The shaded box is defined as the upper and lower quartiles with the median described by the solid line in the box and the mean by the dotted line. The whiskers represent the 10th and 90th percentiles of the distribution.

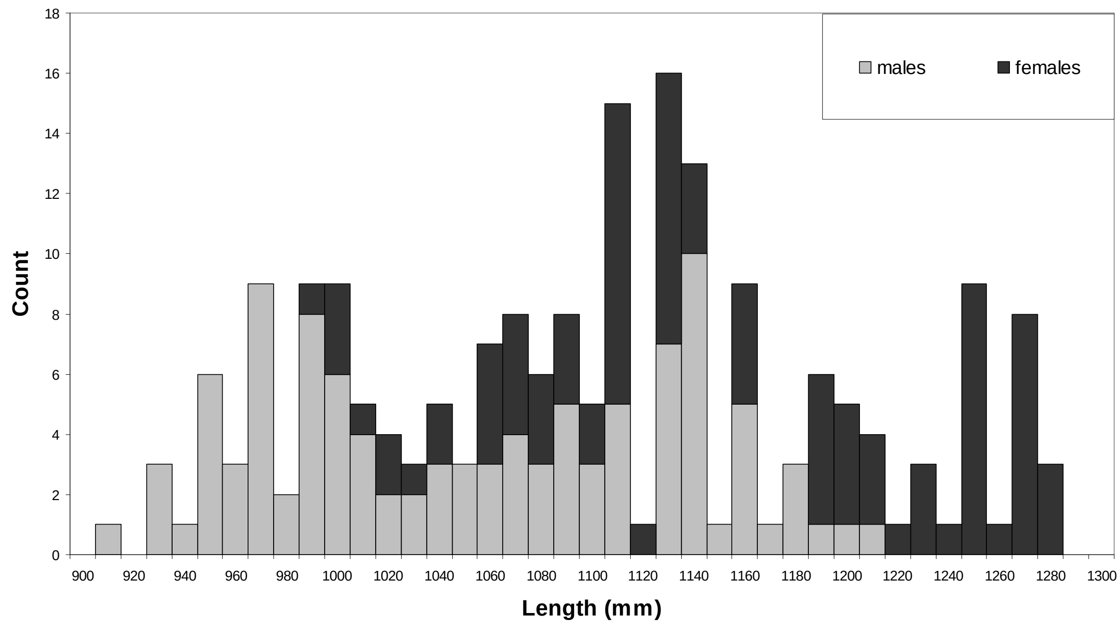


Figure 2. Length frequency distribution of Great Lakes Spotted muskellunge, by sex, from spring 2009 netting of the Lower Fox River and Green Bay.

Nighttime electrofishing surveys have been conducted along the length of the Fox River from the mouth to the DePere dam during the last week of October since 2000 to index muskellunge and walleye populations. In 2010, 33 musky were captured that ranged in size from 899 mm (35.4") to 1209 mm (47.6"), during the 7.5 hours of effort over three evenings. The average length of an adult fish was 1072 mm (42.2"). Adult muskellunge catch per unit of effort (CPUE) was 4.4 fish per hour in 2010 (Figure 3). The CPUE in the fall index sampling has steadily increased over the past eight years, suggesting a growing population, likely as a result of the increases in stocking noted in the early 2000's (Table 1).

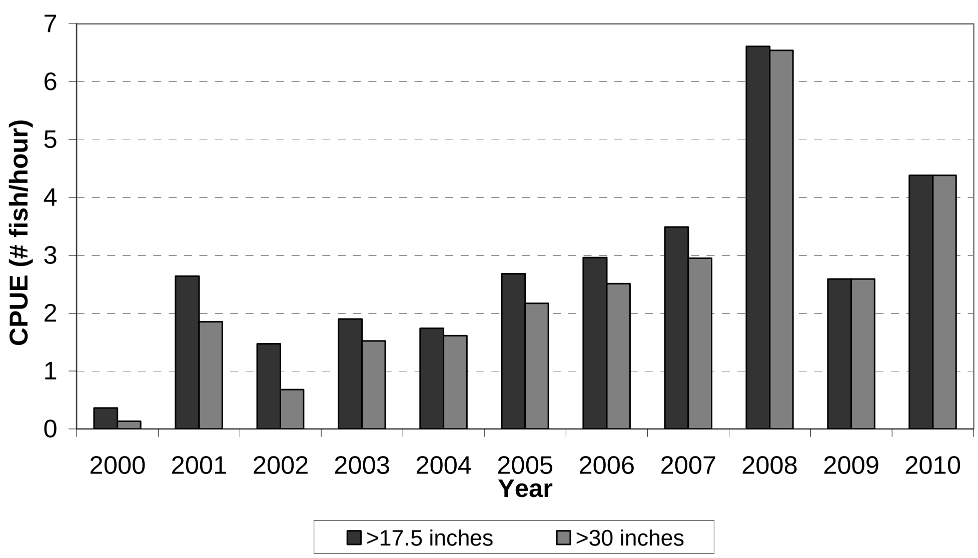


Figure 3. Catch per Unit Effort (CPUE) from night time electrofishing of Lower Fox River for muskellunge greater than 450mm (17.5in) and greater than 762mm (30in) from 2000- 2010.

Propagation and Stocking

During the first six years of the program (1989-94), hatchery production averaged 2,200 fingerling and yearling musky per year. These fish resulted from spawn collected from the Indian Spread Chain in the State of Michigan. From 1995 to 2001, hatchery production averaged 2,875 musky each year and was primarily from spawn collection from Long Lake, with the exception of 1997 when spawn was collected from Lake St. Clair, Michigan. From 2002 to 2006, spawn was collected from the Fox River and Long Lake and the annual hatchery production increased to average 20,324 muskellunge. Stocking has increased as hatchery production increased (Table 1). In 2005, the lower Fox River became the sole location for spawn collection for the reintroduction program. During 2007, Viral Hemorrhagic Septicemia (VHS) virus was discovered in Lake Michigan, DNR policy regarding the collection of spawn from VHS positive waters prevented the collection of eggs from Green Bay and the Fox River in 2008 and 2009. Collection of spawn was again permitted in 2010 and eggs were collected from the Fox River. These eggs and the resulting fish were raised at the Besadny Anadromous Fisheries Facility and stocked into Green Bay at several locations in fall 2010 (Figure 4).

Table 1. Stockings of great lakes strain muskellunge into the waters and tributaries of Green Bay, Lake Michigan from 1989-2010.

Stocking	Fingerlings	Yearlings
1989	5261	0
1990	1274	9
1991	2624	0
1992	2107	152
1993	1394	215
1994	0	237
1995	1803	0
1996	3135	247
1997	1842	130
1998	4311	278
1999	3305	294
2000	2451	295
2001	1854	176
2002	9281	140
2003	33107	103
2004	20772	161
2005	18609	325
2006	18785	421
2007	0	640
2008	0	0
2009	0	0
2010	2791	0

Fishery

The Lake Michigan creel survey estimated a total of 35,342 hours of directed effort for muskellunge on Green Bay and the lower Fox River occurred from March 15th through October 31st, 2010 (Figure 4). Although the 2010 total effort estimate increased over the 2009 total it is likely that this value still underestimates total effort since a substantial amount of angling goes on in November after the creel survey ends. The creel estimated catch rate has decreased since 2006 reaching its lowest level of 0.015 fish/hour in 2010 (Figure 5). For comparison, statewide directed muskellunge catch rates average 0.039 fish/hour (25.6 hours/fish) for naturally reproduced populations, and 0.020 fish/hour (50 hours/fish) for populations maintained by stocking (Simonson 2003). In 2010 the creel survey estimated that anglers caught 541 musky but the harvest was estimated at zero. Figure 4 also shows the catch rates from a Muskies Inc. tournament that has been held annually on the lower part of the Bay and the Fox River since 2006. This tournament is only conducted over 2 days but during the most active period of muskellunge angling. The similarity in values of the tournament census data, and the creel estimates gives good confidence in the creel survey estimates.

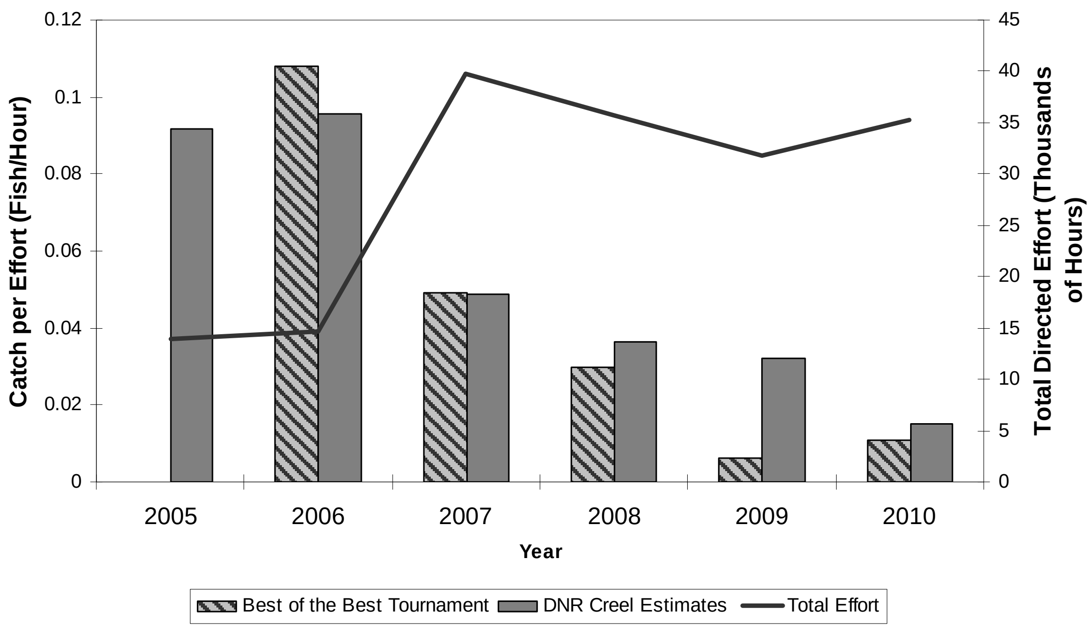


Figure 4. Total directed fishing effort for muskellunge on Green Bay waters of Lake Michigan from 2005-2010 is displayed by the solid black line and on the right axis. The left axis shows catch rate in number of muskellunge caught per hour of directed fishing, the estimated catch rate from creel surveys is displayed in gray, catch rate from the Muskies Inc. “Best of the Best Tournament” is shown with diagonal stripes

Future

The population of adult Great Lakes strain muskellunge in Green Bay waters is increasing as documented by the fall index CPUE steadily increasing since 2000. This is likely in response to the increases in stocking and hatchery production. This population appears to be separate from the populations in the Menominee River and Peshtigo River area, and the Sturgeon Bay area based on recaptures of tagged fish.

Fishing effort has sharply increased since 2005 prompting concern among musky anglers regarding overharvest despite low harvest estimates from the creel survey. This concern has lead to development of a new management plan and a review of the current minimum size limit for Great Lake Muskellunge in the Wisconsin waters of Green Bay.

References

Crossman, E.J. 1990. Reproductive homing in muskellunge, *Esox masquinongy.* Canadian Journal of Fisheries and Aquatic Sciences 47:1803-1812

Kapuscinski, K. L., B.J. Belonger, S. Fajfer, and T.J. Lychwick. 2007. Population Dynamics of muskellunge in Wisconsin waters of Green Bay, Lake Michigan, 1989-2005. Environmental Biology of Fishes 79:27-36.

Lake Michigan Fisheries Team. 2004. Lake Michigan Integrated Fisheries Management Plan 2003 -2013. Wisconsin Department of Natural Resources, Bureau of Fisheries and Habitat Management, Admin. Report No. 56, Madison, WI.

Simonson, T. 2003. Muskellunge Management Update. Publication FH - 508 – 2003 Wisconsin Department of Natural Resources , Bureau of Fisheries Management and Habitat Protection, Madison, WI

Wisconsin Department of Natural Resources. 1986. Lower Green Bay remedial action plan. Wisconsin Department of Natural Resources, Bureau of Fisheries Management and Habitat Protection, Madison, WI

NEARSHORE RAINBOW TROUT

Steve Hogler and Brad Eggold

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 stocking six ports, Kenosha, Milwaukee, Sheboygan, Manitowoc, Algoma and Sister Bay with two strains of rainbow trout to facilitate the evaluation of the effectiveness of rainbow trout stocking. Following the initial stocking of Arlee rainbow trout in 2001, a second rainbow trout strain, Kamloops, was identified to be part of this study in 2003. Both strains were stocked from 2003 through 2007. In 2008 and 2009, only Arlee strain rainbow trout were stocked and in 2010 Erwin strain rainbow from Wisconsin's inland trout program were used because of a disease outbreak at the federal hatchery were Wisconsin obtains Arlee rainbow trout used for this stocking experiment.

2010 Results

In 2010, 88,269 marked and 47,032 unmarked Erwin strain rainbow trout were stocked into Wisconsin waters of Lake Michigan (Table 1). Stocking size and date were related to if the fish were fin clipped. Clipped fish were smaller in size and were stocked at an earlier date then were unclipped fish.

Table 1. Stocking history of nearshore rainbow trout stocked into Wisconsin's waters of Lake Michigan since 2001.

Strain	Year Stocked	Number per Port	Number of Ports	Fin Clip	Average Length	Average Weight	Stocking Dates
Arlee	2001	12,000	6	ALP	174 mm	55 g	April 16 - May 1
	2002	7,500	2	LP	170 mm	55 g	April 9
	2003	10,150	6	ALP	182 mm	74 g	April 27 - May 9
	2004	5,000	6	LP	199 mm	108 g	April 12 - April 19
	2005	10,590	6	ALP	178 mm	72 g	March 30 - April 19
	2006	10,000	6	LP	178 mm	59 g	April 4 - April 20
	2007	10,978	6	ALP	173 mm	55 g	March 26 - April 25
	2008	6,665	9	LP	178 mm	62 g	April 8 - April 15
	2009	13,462	9	--	153 mm	43 g	March 11 - March 17
Kamloops	2003	10,300	6	ARP	148 mm	32 g	April 17 - April 19
	2004	10,066	6	RV	147 mm	36 g	April 20 - April 27
	2005	8,500	6	LV	152 mm	29 g	April 21 - April 27
	2006	9,762	6	RV	145 mm	28 g	March 23 - April 7
	2007	10,161	6	RV	178 mm	55 g	March 26 - April 25
Erwin	2010	29,423	3	LP	159 mm	44 g	March 2 - March 4
	2010	11,758	4	--	191 mm	81 g	April 20 - April 23

It was estimated that anglers harvested 3,262 marked nearshore rainbow trout in 2010 (Table 2). The estimated harvest in 2010 was 35.7 % lower than the 2009 harvest estimate and continued the decline in harvest noted the past several years. Anglers in 2010 harvested the least number of Arlee since the inception of the program in 2001 and the lowest number of Kamloops since 2007. Harvest of Erwin strain rainbow was very low in 2010 with the harvest estimated at 78 fish. In 2010 nearshore rainbow harvest by angler group was 38% from boats, 31% by stream anglers and 31% by pier and shore anglers.

Table 2. Estimated angler harvest of nearshore rainbow trout by strain and fishery type from 2001 through 2010.

Strain	Harvest Year	Harvest Location			Total Harvest
		Boat	Pier and Shore	Stream	
Arlee	2001	62 (5%)	1,262 (95%)	0	1,324
	2002	1,259 (78%)	285 (18%)	61 (4%)	1,605
	2003	46 (5%)	813 (95%)	0	859
	2004	250 (26%)	585 (61%)	118 (12%)	953
	2005	600 (43%)	201 (14%)	600 (43%)	1,401
	2006	426 (20%)	1,193 (52%)	511 (24%)	2,130
	2007	911 (24%)	2,126 (56%)	760 (20%)	3,797
	2008	635 (28%)	1,015 (44%)	635 (28%)	2,285
	2009	465 (26.3%)	1,024 (57.9%)	279 (15.8%)	1,768
	2010	78 (14.3%)	233 (42.9%)	233 (42.9%)	544
Kamloops	2003	0	267 (100%)	0	267
	2004	73 (11%)	513 (78%)	73 (11%)	659
	2005	875 (50%)	525 (30%)	350 (20%)	1,750
	2006	1,111 (43%)	855 (33%)	600 (24%)	2,566
	2007	740 (29%)	1,199 (47%)	613 (24%)	2,552
	2008	1,644 (57%)	1,011(35%)	254 (8%)	2,909
	2009	757 (22.9%)	1,226 (37.1%)	1,321 (40.0%)	3,304
	2010	1087 (41.2%)	776 (29.4%)	776 (29.4%)	2,640
Erwin	2010	78 (100%)	0	0	78

Arlee Rainbow Trout

In 2010 it was estimated that anglers harvested 544 Arlee rainbow trout (Table 2). Non-boat anglers caught most of the Arlee (85.7%) this past year while boat anglers accounted for only 14.3% of the harvest. This was the lowest percentage of Arlee harvested by boat anglers since 2003 when they accounted for only 5% of the Arlee harvest.

Analysis of fin clips noted on harvested Arlee in 2010 indicates that they appear to be growing well in the lake. For example, after two summers in the lake, Arlee rainbow averaged 551 mm in length and 2.0 kg in weight (Table 3). After 5 summers in the lake they averaged 685 mm in length and 3.5 kg in weight. Fin clips can also help to determine how a stocked year class is returning to the creel. In 2010, Arlee stocked in 2004 through 2007 were harvested. Fish stocked in 2004 were the most common followed by the 2006 stocking year class (Table 4). Other stocking year classes retuned at lower rates.

Table 3. The average length and weight of nearshore rainbow trout after 1,2,3,4, 5 or 6 summers in Lake Michigan by strain. Fish that spent 1 summer in the lake were stocked that year in spring. Average lengths are in mm and weights in kg.

	Length						Weight					
Strain	1	2	3	4	5	6	1	2	3	4	5	6
Arlee	371 mm	551 mm	599 mm	640 mm	683 mm	728 mm	0.9 kg	2.0 kg	2.4 kg	3.2 kg	3.5 kg	4.2 kg
Kam-loops	412 mm	550 mm	590 mm	634 mm	686 mm	654 mm	0.8 kg	1.7 kg	2.2 kg	2.9 kg	3.6 kg	3.0 kg
Erwin	300 mm	--	--	--	--	--	1.0 kg	--	--	--	--	--

Kamloops Rainbow Trout

It was estimated that anglers harvested 2,640 Kamloops rainbow trout in 2010 (Table 2). The 2010 harvest of Kamloops rainbow trout declined 20% from the 2009 harvest and was the lowest number of Kamloops harvested since 2007 (Table 2). Most of the harvested Kamloops rainbow were taken by the boat fishery (41.2%) with fewer taken in the other fisheries (Table 2).

Fin clips can help to determine how fish are growing in the lake. Based on fin clips, Kamloops rainbow that have spent two summers in the lake averaged 550 mm in length and 1.7 kg in weight (Table 3). By the time they have spent five summers in the lake, Kamloops trout averaged 686 mm in length and 3.6 kg in weight. Analysis of fin clips can also help in determining the rate return of each stocking cohort. In 2010, harvested Kamloops rainbow harvested came from all the stocking years from 2003 through 2007. Kamloops rainbow stocked in 2005 were the most commonly harvested cohort followed by the 2006 stocking cohort (Table 5).

Erwin Rainbow Trout

The harvest estimate for Erwin strain rainbow trout was 78 in 2010 (Table 2). This estimate was the lowest first stocking year estimate for any of the strains used in the nearshore experiment. Although harvest was down for the other strains of nearshore rainbow in 2010, it was anticipated that the harvest of Erwin rainbow would be equal to other first year harvests of the Arlee and Kamloops strains since the number of marked fish stocked was similar to previous first year stockings. It is not clear why so few Erwin trout were harvested.

The average length and weight of Erwin strain fish was 300 mm and 1.0 kg respectively (Table 3). This was the lowest 1 summer in the lake length noted for this project, although 1 summer in the lake weight was similar to the other strains. The return rate of stocked Erwin strain fish in 2010 was 0.9 fish per thousand stocked which was the lowest first year return for any strain in the experiment (Tables 4 and 5).

Table 4. Return rates (number per thousand stocked) to creel for Arlee Rainbow Trout stocked into Lake Michigan 2001 through 2010.

	Year Stocked								
Year Harvested	2001	2002	2003	2004	2005	2006	2007	2008	2009
2001	18.3	--	--	--	--	--	--		
2002	6.8	74.4	--	--	--	--	--		
2003	3.7	17.7	9.8	--	--	--	--		
2004	6.1	9.7	4.8	2.5	--	--	--		
2005	2.4	23.3	2.9	17.5	2.8	--	--		
2006	0.0	28.4	9.8	11.4	0.0	12.8	--		
2007	0.0	0.0	5.0	45.6	11.9	12.6	9.2		
2008	0.0	0.0	2.1	21.2	6.0	10.6	5.8	2.1	
2009	0.0	0.0	3.1	34.1	1.5	1.6	1.4	3.1	0.0
2010	0.0	0.0	0.0	7.8	1.2	2.6	1.2	0.0	0.0
Total	37.3	153.5	37.5	140.1	23.4	40.2	17.6	5.2	0.0

Table 5. Return rates (number per thousand stocked) to creel for Kamloops Rainbow Trout stocked into Lake Michigan 2003 through 2007.

	Year Stocked						
Year Harvested	2001	2002	2003	2004	2005	2006	2007
2001	--	--	--	--	--	--	--
2002	--	--	--	--	--	--	--
2003	--	--	4.3	--	--	--	--
2004	--	--	8.3	2.4	--	--	--
2005	--	--	19.8	5.6	3.4	--	--
2006	--	--	12.5	20.0	5.0	5.7	--
2007	--	--	4.9	9.9	11.8	15.4	2.5
2008	--	--	4.1	18.8	12.4	10.8	4.1
2009	--	--	4.6	25.0	24.0	3.2	1.6
2010	--	--	2.6	7.7	19.8	9.3	7.6
Total	--	--	61.1	89.4	76.4	44.4	15.8

Summary

The first ten years of creel survey data indicates that stocking Arlee and Kamloops rainbow trout may be benefiting nearshore anglers although the results are not clear cut (Table 1). Since the inception of this project, it is estimated that anglers have harvested 33,391 nearshore rainbow trout. Of that total, 15,109 (45.2%) have been harvested by anglers fishing from piers or from the shore. However, the percent harvested by pier and shore anglers has varied greatly from a high of near 100% in 2003 to a low of 23% in 2005. This may indicate that the rainbow trout stocked as part of this experiment have not consistently improved nearshore fishing.

In the years that Arlee and Kamloops rainbow trout were both stocked, anglers have harvested more Kamloops rainbow than Arlee rainbow in both number and standardized return rate (# per thousand stocked) (Tables 2, 4 and 5). In years in which both strains were stocked, it appears that fish stocked in stocked in 2004 have returned well, while fish stocked in 2007 have returned poorly. The high return rates of Arlee stocked in 2004 and Kamloops stocked in 2005 are puzzling. These were low stocking years for each strain yet the return rates have been very good. It is unclear if the high return was due to large stocking size, late stocking date, lake effect (good conditions and forage) or if the results are skewed by another factor such as misclipping other rainbow trout with a nearshore clip.

It appears that the fish are growing well as anglers have caught fish of each strain over 10.0 kg in weight. Recent size information however indicates that growth of both Arlee and Kamloops strains have slowed. From comparisons of length and weight at age for each strain, it appears that Arlee and Kamloops rainbow trout grow at similar rates in Lake Michigan (Table 3). Since it also appears that Kamloops trout live longer based on the length of time a fin clip is observed in the fishery, it is unknown at this time whether Arlee rainbow or Kamloops rainbow will ultimately provide the greater return to anglers. Since Erwin strain rainbow trout were stocked for a single year, it is too early to assess their impact on nearshore fishing.

BROWN TROUT MANAGEMENT

Tammie Paoli

This report summarizes assessments and management actions for brown trout in Green Bay waters of Lake Michigan completed in 2010.

Background and Sport Harvest

The Wisconsin Department of Natural Resources has stocked various salmonid species into Green Bay over the last forty years. The initial intent of that stocking effort was to control introduced prey species like alewives and rainbow smelt while providing a quality near shore and offshore fishery for Green Bay anglers. Brown trout provided a consistent early season nearshore and summer trolling fishery, along with other stocked salmonines. Creel survey results indicate that harvest and return rates for Green Bay brown trout were exceptional throughout the late 1980's and 1990's. Since 2000, brown trout fishing has experienced a sharp decline. Stocking numbers for Green Bay have varied somewhat over the last 23 years but, in general, remain fairly consistent (Figure 1).

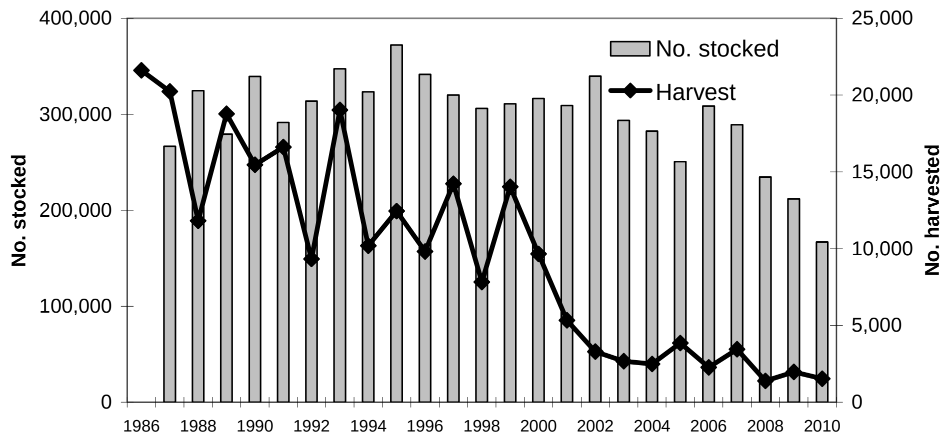


Figure 1. Number of stocked and harvested brown trout in Wisconsin waters of Green Bay by year.

Return to creel of brown trout in Green Bay has fallen from an average of 4% prior to 2000 to less than 1% from 2001 to present. Based on results from the Lake Michigan creel survey, the harvest in 2008 reached an all-time low in Green Bay and was estimated at 1,384 fish with a 0.6% return of stocked fish. Harvest estimates for 2009 and 2010 continued to be low, at 1,968 and 1,532 fish, respectively. Harvest rates based on targeted salmonid fishing effort between 1986 and 1999 averaged 16.4 hours per fish. Since 2000, harvest rates averaged 32.9 hours per fish.

A comprehensive review of brown trout data and related fisheries information was completed in 2009. The problem was discussed at several meetings of the Lake Michigan Fisheries Team throughout 2009 and forwarded to the Fisheries Management Board. In January 2010, the FM Board adopted a plan to offshore stock fish to avoid nearshore predators and to discontinue stocking fall fingerlings into Green Bay. Parts of this plan were implemented in 2010 (Table 1), and full implementation (discontinue fall fingerlings) will begin in 2011. This plan seeks an integrated approach to adjust stocking strategies with the following management objective:

> Two indices measured by creel surveys for Green Bay waters (% return and total harvest of brown trout) will trend towards the targets within five years of implementation of the plan. Results should indicate consistent returns from stocking levels. Fishing pressure will be considered in the analyses

to determine if changes in harvest or return rate are associated with changes in effort. Lastly, catch per unit effort of fall electrofishing surveys in the lower Menominee River will continue to serve as a fishery-independent index of brown trout abundance in Green Bay.

The target indices are:

a) Total harvest greater than or equal to 4% of number stocked BNT. This return rate is comparable to return rates for Green Bay prior to 2000; OR
b) Total harvest of 5,000 or more fish based on 126,000 yearlings stocked annually into Green Bay, AND
c) Brown trout harvest rate less than or equal to 23 hours per fish based on targeted total salmonid fishing effort.

Table 1. Green Bay brown trout stocking information for 2010.

Date	*Location*	*Strain/Size*	*Number*	*Vessel Used*
1-Mar-2010	Under ice Grid 804	Seeforellen yearling	14,732	--
5-Mar-2010	Under ice Grid 804	Seeforellen yearling	8,000	--
20-Mar-2010	Under ice Grid 804	Seeforellen yearling	8,000	--
22-Mar-2010	Under ice Grid 804	Seeforellen yearling	18,255	--
23-Mar-2010	Under ice Grid 804	Seeforellen yearling	17,554	--
4-May-2010	Offshore Grid 804	St. Croix yearling[1]	5,035	WDNR pontoon cage
24-May-2010	Offshore Grid 703	St. Croix yearling[1]	42,454	R/V Spencer Baird
3-Jun-2010	Offshore Grid 804	St. Croix yearling[1]	10,005	WDNR pontoon cage
5-Oct-2010	Offshore Grid 703	Wild Rose fingerling	27,473	WDNR pontoon cage
6-Oct-2010	Offshore Grid 804	Wild Rose fingerling	12,755	WDNR pontoon cage
6-Oct-2010	Grid 606	Wild Rose fingerling	2,799	--
		Total yearlings	**124,035**	
		Total fingerlings	**43,027**	

[1] St. Croix strain were substituted for Wild Rose strain yearlings for this year due to 2010 confirmation of VHSv in Lake Superior and associated risks of stocking St. Croix fish raised in Brule Hatchery into inland waters.

Brown Trout Derby

The Marinette-Menominee Great Lakes Sport Fishermen has sponsored a summer Brown Trout Derby for nearly 30 years. Data sets from this derby indicate that upwards of a thousand brown trout were typically harvested during the 2-day event. Since 2001, the number of brown trout registered in the derby has sharply declined. In 2010, brown trout comprised only 9% of the total derby harvest (Table 2).

Table 2. Number and mean weights of fish harvested during the two-day MMGLSF Brown Trout Derby.

	BROWN TROUT		*CHINOOK*		*RAINBOW TROUT*		*WALLEYE*	
	#	**Avg lb.**	**#**	**Avg lb.**	**#**	**Avg lb.**	**#**	**Avg lb.**
2005	237	4.7	1694	5.8	32	5.7	29	5.2
2006	28	5.4	693	10	10	4.1	44	2.3
2007	143	5.9	969	8.5	54	6	22	2.9
2008	102	8.4	730	8.4	47	5.6	30	3.1
2009	26	7.8	444	8.7	18	6.5	21	3.1
2010	89	8	818	9.6	39	4.9	55	3.8

Fall Surveys

Electroshocking surveys on the lower Menominee River resulted in an all-time low catch of brown trout for 2010. Surveys were completed on October 20 and November 9, with a total CPE of 6 fish/hour. Mean length of fish captured was 25.5 inches (n=12). Electrofishing effort was reduced for 2010 since staff was limited and WDNR did not collect seeforellen broodstock from the Menominee River this year. The Kewaunee and Root Rivers continue to provide broodstock for Wisconsin's seeforellen program.

Floy-tagging and Voluntary Fishing Logs

In June 2009, WDNR and the Marinette-Menominee Great Lakes Sport Fishermen cooperatively floy-tagged 392 yearling brown trout (mean length = 11.1 in.) that were stocked into the Menominee Marina for the club-sponsored Kid's Fishing Day. The goal of this tagging project is to gain information on harvest return and movement of fish. An additional 772 fish (mean length = 8.6 in.) were floy-tagged in June 2010. Excluding the fish that were harvested for the Kid's Fishing Day, the percent return from fish stocked in 2009 is 4.4% at the time of writing. The majority of tag returns came from the Menominee/Marinette area or Stoney Point. However, there were three fish captured near the Peshtigo River mouth, Oconto River mouth, and Egg Harbor/Door County (Figure 2), suggesting that these fish dispersed 8 miles or more from the release location.

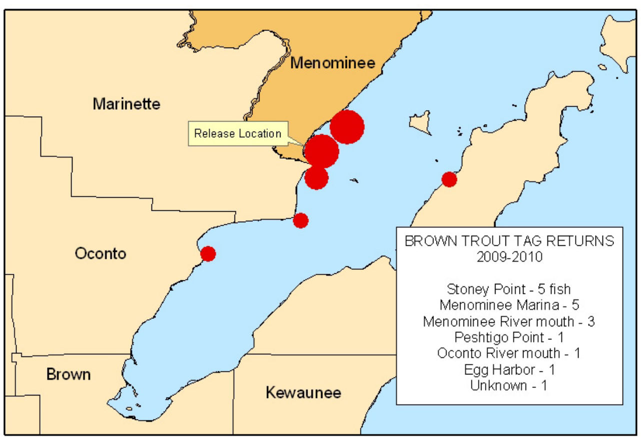


Figure 2. Locations of floy-tagged brown trout caught by sport anglers in 2009 and 2010. Size of circle represents the number of fish at each location.

WDNR distributed volunteer angler fishing logs to 36 individuals in 2010 and obtained information from 12 of those logs. Anglers reported a total of 32 brown trout harvested, a total fishing effort of 204.7 hours, and a harvest rate of 6.4 hours per fish. This harvest rate is significantly less than brown trout harvest rates obtained from creel surveys on Green Bay in 2010 (42.5 hr/fish). One likely reason for the difference is fishing ability. The creel survey includes anglers of all skill levels, while anglers volunteering to fill out a fishing log tend to be more experienced at successfully targeting brown trout. We will monitor trends obtained from the volunteer fishing logs in 2011.

Summary

WDNR will continue to closely monitor total harvest and harvest rate of brown trout in Green Bay to determine if those indices are responding to the new stocking strategy.

LAKE STURGEON

Michael Donofrio, Brad Eggold, and Michael Baumgartner

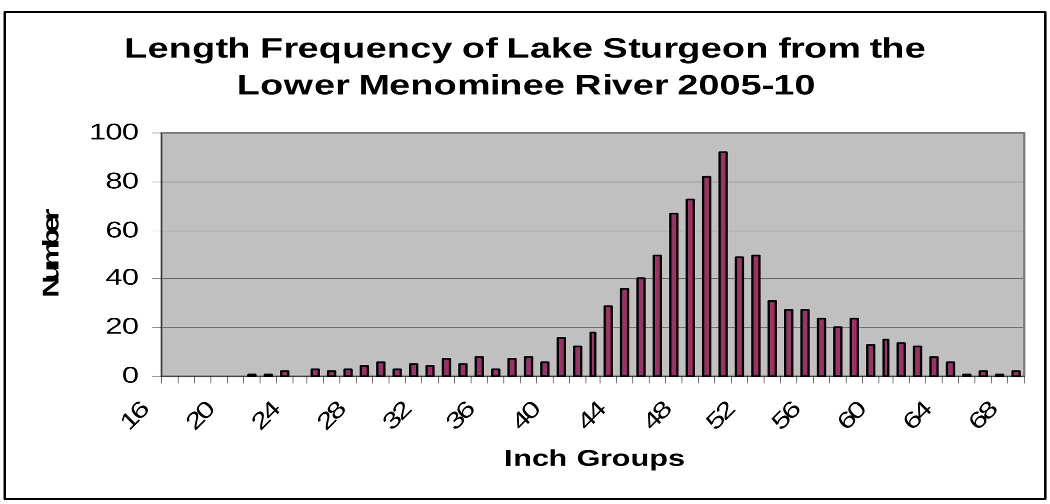
Introduction

Lake sturgeon populations were decimated by the early 1900s through over fishing by commercial fishermen, altered stream flows, interruption of migration routes with dams and water quality degradation in Wisconsin's Lake Michigan's major rivers (Milwaukee, Manitowoc, Kewaunee, Menominee, Peshtigo, Oconto, and Fox). Passage of the Clean Water Act with associated permits for industry and implementation of new Federal Energy Regulatory Commission licenses have improved conditions for fisheries in general. Lake Sturgeon populations have also benefited in the last 15 years and natural reproduction currently occurs on the Menominee, Peshtigo, Oconto, and Fox Rivers. These populations are self sustaining without benefit of stocking. The results of tagging studies and genetic analysis indicate a distinction between the Fox and Oconto River sturgeon and another population on the northern tributaries of Green Bay (Menominee and Peshtigo). The Menominee River contains the largest population in Lake Michigan waters with contributions from stocks of Wisconsin's Peshtigo River and Michigan's Cedar and Whitefish rivers. The Menominee River supports a hook and line fishery from 1946 to the present. The exploitation was highest in 2005 at 172, although recent regulation restrictions reduced the total harvest to 6 from 2006-10 fall seasons. Lake sturgeon stocking is occurring on the Milwaukee and Manitowoc/ Kewaunee rivers and recovering is dependent on those stocking efforts and continued habitat improvements.

Menominee River

Population Assessment

Field sampling, a one day electrofishing surveys with 2 electrofishing boats, in 2010 produced 86 lake sturgeon from the lower Menominee River. Similar efforts produced 142 in 2009, 194 fish in 2008, 132 fish in 2007, 276 lake sturgeon in 2006 and 278 in 2005. From 2005-10, most of the fish (85%) were subjectively labeled as adults (>107 cm in total length), but several sub-adults sturgeon were observed during the surveys. The overall average total length during these sampling events was 122 cm. From 2005-10, the smallest sturgeon recorded was 44 cm and several fish were over 173 cm in length. The population estimate for the 42 inch and larger segment of the population was 2,287 with confidence intervals of 2,060 to 2,554 in 2009.



The agencies continue to participate in genetic analysis research of Lake Michigan's lake sturgeon performed by Michigan State University through Great Lakes Fishery Trust and USFWS grants. That research indicated that Fox and Oconto river populations are closely associated with linkage to the Lake Winnebago population. The Menominee and Peshtigo rivers form one population and ranged north to the Cedar and Whitefish rivers in Michigan's Upper Peninsula. That theory is supported by movement studies from Menominee River recaptured lake sturgeon. Sturgeon recaptured from 2005-09 in the Menominee River originated in the Peshtigo River (10%), Cedar River (5%), Green Bay (2%) and Whitefish River (1%).

We proceeded with our movement study through ultrasonic transmitters implanted in lake sturgeon at the Menominee, Peshtigo and Oconto rivers. We currently have sonic tags in 83 adults (Menominee (43%), Peshtigo (33%), and Oconto (24%)). Their movements are monitored continuously through 2 stationery receivers in each of those 3 rivers. Since we have recaptures from the Cedar and Fox rivers, we installed additional receivers in those rivers. These fish were sexually identified as 1% F1, 13% F2, 4% F3, 27% F4, and 55% M2. The average length of the females was 60.1 inches and males were 54.9 inches. The movements between rivers will be monitored through 2014.

Sport Fishery

The Menominee River is the only river open to sport harvest in Lake Michigan waters. Licensed, modern day harvest of lake sturgeon on the Menominee River has occurred since 1946. A mandatory registration system was enacted in 1983. The harvest in that year was 19 sturgeon and the minimum size limit was 50". The bag limit was reduced from 2 to 1 fish per season in 1992. In 1997, Tom Thuemler of WDNR wrote, "An alternative (regulation approach) would be complete closure of the season every other year. This would halve the exploitation rates and yet still allow some harvest, and might be acceptable if catch and release only season operated in the year when harvest was prohibited".

In 2000, the minimum size limit differed in alternating years with a 70" limit in even years and a 50" limit in odd years. The hook and line harvest of lake sturgeon from the Menominee River increased to the following in selected years: 80 in 1989, 109 in 1998, 167 in 1999, 185 in 2001, and 210 in 2003. The harvest in the three 70" size limit years (2000, 2002, and 2004) averaged at 0 fish. While the alternating year's size limits reduced the overall harvest, the average harvest for the last 6 years (1999- 2004) was 94 fish. Fishing pressure since 1999 has increased by 12%/ harvest year. The harvest in 2005 was recorded as 172 lake sturgeon with 136 stemming from waters below the Menominee Dam.

The Menominee River is jointly managed with the State of Michigan. The agencies decided that current harvest extractions were negatively impacting the recovery of lake sturgeon in the Menominee River and Green Bay. The State of Michigan adopted the following regulation for the 2006 hook and line season: catch and release only below the Menominee Dam, 1 lake sturgeon per angler with a minimum size limit of sixty inches above that dam and open season from first Saturday in September to September 30. Wisconsin Department of Natural Resources adopted the same regulations in 2006. Those regulation changes reduced the harvest to one lake sturgeon in 2006, 0 in 2007, 1 in 2008, and 3 in 2009.

Streamside Rearing Facilities

During the spawning of Lake Sturgeon on the Wolf River in 2010, genetic samples were taken from the adults used to provide eggs for the Milwaukee and Manitowoc SRF. A small section of the caudal fin was clipped and stored in uniquely number vials filled with 96% ETOH. In addition, fin samples from the all stocked lake sturgeon were taken and stored in 96% ETOH. These samples are being saved for genetic analysis and have been transferred to Dr. Brian Sloss.

The Lake Michigan Lake Sturgeon Rehabilitation Plan was used as a guideline during the collection of gametes for the Milwaukee and Kewaunee SRF. We sought to rear lake sturgeon to a size of approximately 6 inches by fall for annual stocking in each river. We collected 6 females and mated them with at least 4 and in most cases 5 males per female. This gave us 24 families of fish. The individual batches from a female were then put into separate hatching jars at the Milwaukee and Kewaunee SRF. Because we had 6 females for each Wisconsin SRF, we decided that each facility would keep eggs from 4 females. The Milwaukee River SRF kept eggs from females 2 – 5, while the Kewaunee facility kept eggs from females 1, 3, 4 and 6. Because of lower densities of larvae in the fry tanks (1,000 per tank) and better feeding protocols we ended up with 1,012 lake sturgeon for stocking in the Milwaukee River. The lake sturgeon in the Milwaukee SRF were stocked out below the Thiensville Dam in the City of Thiensville on October 2, 2010 and the lake sturgeon produced at the Kewaunee SRF were stocked out below the Buzz Besadny Fisheries Facility on October 5, 2010.

At the time of stocking, sturgeon averaged 194 mm (7.6") and 30.0 g (1.1 ounces) at the Milwaukee River SRF and 208.6 (8.2") and 36.4g (1.3 oz) at the Kewaunee River SRF. The lengths and weights for the Milwaukee River SRF fish are considerable higher than past stockings. Two factors contributed to the better condition factor in 2010: 1) densities in all the tanks were much lower overall than in 2009 with a starting number of 1,000 in each tank and 2) efficient feeding at small sizes based on the results from the Kewaunee River in 2009. Plans are underway to continue this improved feeding protocol at small sizes in 2011.

We presented information about the SRF program to other DNR staff, sport clubs, the Milwaukee Journal Sentinel, the Ozaukee News, Fox 6 Wake-up News, Milwaukee Public Radio, Madison Public Radio.

<u>Milwaukee River SRF</u>
The Milwaukee SRF was deployed in 2010 on April 7, 2010 and put into service on April 16, 2010. Wisconsin DNR personnel artificially spawned 6 females from the Wolf River and transferred those fertilized eggs to the trailer on April 16, 2010. Approximately 25,000 eggs from six females were transferred to the trailers. Eggs from each female were placed into a separate hatching jar. After hatch, eggs were selected from 4 females for further development.

During the initial egg incubation, formalin treatments were applied to the eggs on day 3, 4, 5 and 6. These treatments drastically reduced egg mortality and lead to increased number of hatched larval lake sturgeon. By April 25, lake sturgeon larvae began to hatch and could be seen in the incubation jars. Over the course of the next seven days hatching continued until all larvae were in the smaller fry tanks. On May 5th, all sturgeon were transferred from the smaller fry tanks to the larger fingerling tanks to make it easier to feed and clean the raceways. During the month of May and into June, sturgeon were fed brine shrimp followed by grated blood worms and finally whole blood worms.

It was estimated that following hatching, there were approximately 1,500 – 4,000 larvae per fry tank. Numbers of larvae were lowered to 1,000 fish in all four tanks. The number of lake sturgeon in each tank was set based on experiences in 2007 through 2009 that suggested higher levels would result in excessive mortalities.

VHS testing was conducted on May 17th, 2010 which allowed us to stock smaller fingerlings to reduce density in the tanks. On August 24th, 2010, we stocked 180. From September 1 until the fish were stocked on October 2 only a few more fish died. Because of the early success in number of hatched larvae, we were able to stock 1,012 on October 2, 2010. This year represented the second highest number of fish stocked from the facility in the 5 years of operation.

Total length and weight has been measured biweekly for the fish in the Milwaukee River SRF and are summarized below. Lake Sturgeon in the four tanks (A – D) exhibited similar growth patterns for the first 69 days. After that point, lake sturgeon in tanks A and C were longer and heavier than fish in the other two tanks. On days 87 and 116, fish were grouped into similar size fish in order to apply food at a more uniform amount for each size of sturgeon. This had a large effect on the smallest of the sturgeon (Tank B) because they grew at very good growth rates reaching lengths and weights very close to the largest sturgeon stocked from tank by the time they were stocked on October 2, 2010.

<u>Kewaunee River SRF</u>
In 2010 the sturgeon eggs were collected from the Wolf river at Shawano 10 days earlier (April 16th) than in 2009 (April 25th &26th) and eggs were collected from a total of 6 females (4 used in 2009) with each batch of eggs being fertilized by milt from 5 males as advised by genetic protocols. Eggs were incubated in six jars containing between 5,500 and 8,000 eggs each with all eggs subjected to 4 formalin treatments over the course of the 16 day incubation period. Fifteen days after hatching, as they were about to begin feeding, fish from each family were hand counted (1,000 per tank) into the rearing tanks.

Frequent extended periods of very poor water conditions during the early rearing cycle resulted in very high mortalities. By the time the very poor gill quality was diagnosed as the probable cause of the mortalities very few of the fish remained to be subjected to salt treatments on a regular basis to restore the gill tissue. By August 4th only 18 total fish remained from the 4,000 fry that were counted into the rearing tanks. By early August, the poor gill quality, a result of being subjected to the frequent poor water conditions, put the fish behind in average length and weight compared to 2009. However, once the 2010 fish regained their health, they were similar in average length and weight by the time they were stocked compared to the 2009 fish.

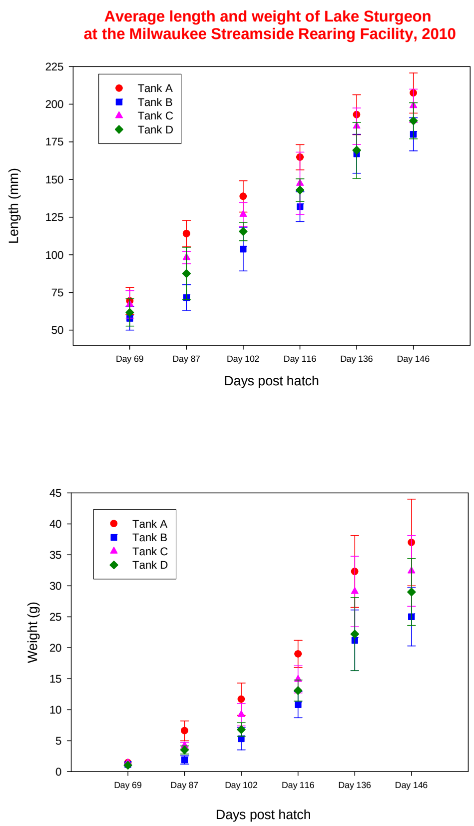
Slight changes that have been made to the way the facility was set up and operated last year are listed below.

- Rearing trailer moved to a more secure and permanent location on the property
- New speed controlled pump installed to replace broken pump
- Only 2 of the 2" head tank outlets are being used to supply water to all four tanks
- Chopped Blood worms fed earlier in rearing cycle than in previous years
- Whole blood worms in addition to krill were fed for a much longer period of time

In 2010, we used the same system to track lake sturgeon after stocking on the Kewaunee River that had been previously done on the Milwaukee River in 2007 and 2008 and the Kewaunee River in 2009. This system, developed by VEMCO Inc., uses surgically implanted sonic tags in the fish and under water hydrophones placed throughout the river to detect fish passage. The sonic tags send a coded ping every 30 to 90 seconds that gets transmitted from the fish into the water and then detected by the hydrophones. The main benefit to this new system is that daily and weekly surveys do not have to be conducted because the detection is conducted by the under water hydrophones. These hydrophones continuously check for the sonic tags and the data can be downloaded once the tags have stopped working.

On September 30, 2010 sonic tags were surgically implanted into the six largest, by weight, along with all of the 17 total fish being PIT tagged. The fish were held and observed until October 5, 2010 when they were released into the Kewaunee River just above the County Highway F bridge (same stocking site as 2009). Hydrophone receivers (4 total) were place into the Kewaunee River on October 1, at the same locations as in 2009 to track the post stocking movements of the fingerling sturgeon. After about 30 days the furthest upstream receiver was retrieved and placed in the Kewaunee harbor at the same location as the 2009 harbor location. The timing and distances of fish movements in 2010 were similar to 2009. All the tagged fish moved downstream quickly. Within less than 24 hours of being stocked 5 of the 6 tagged fish had been detected by the receiver at the County Highway E location, a distance of 4.3 miles from the stocking location. In addition, 2 of the 5 detected at the County Highway E location were detected by the farthest downstream receiver in the same time frame, at a distance of 6.5 miles from the stocking location. By ice up (approx. Dec 4, 2010), when the receivers had to be removed, only one fish had not been detected at the County Highway E location or lower and 4 of the 6 had been detected at the farthest downstream location.

Similar to the 2006 - 2009 movement patterns of stocked lake sturgeon observed in the Milwaukee and Kewaunee River, these fish initially moved quickly downriver and were detected at the County Road F location the night of stocking. All seven fish moved passed this hydrophone between the hours of midnight and 3:00 a.m. the night of the stocking.



Lake Sturgeon were grouped by size on Day 87 and again on Day 116.

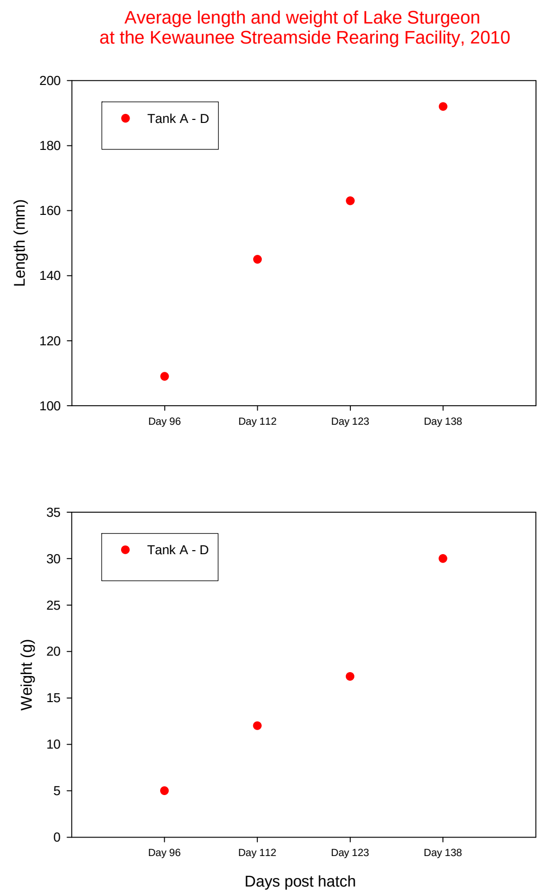


Table 1. Lake sturgeon detections by sonic tag number, date and location of hydrophones.						
October 6	County Road F at 00:39 a.m. Footbridge at 2:46 a.m. County Road E at 8:18 a.m.	County Road F at 01:04 a.m. Footbridge at 2:48 a.m. County Road E at 8:35 a.m.	County Road F at 00:23 a.m. Footbridge at 1:54 a.m. County Road E at 8:56 a.m.	County Road F at 02:04 a.m.	County Road F at 00:50 a.m. Footbridge at 2:36 a.m. County Road E at 7:41 a.m.	County Road F at 00:47 a.m. Footbridge at 2:30 a.m. County Road E at 7:10 a.m.
October 7	County Road E at 12:00 a.m. Railroad at 7:45 a.m.		County Road E at 00:58 a.m.		Railroad at 5:22 a.m.	
October 12				Footbridge at 9:37 a.m.		
October 16				Footbridge at 1:04 a.m.		
October 20				Footbridge at 10:41 a.m.		
October 21				Footbridge at 12:00 a.m.		
October 28		Railroad at 4:00 a.m.				
November 7		Railroad at 9:41 a.m.				
November 8		Railroad at 00:41 a.m.				
November 9		Railroad at 12:00 a.m.				
November 10		Railroad at 00:32 a.m.				
November 11		Railroad at 00:42 a.m.				
November 18						Railroad at 10:08 a.m.
November 19						Railroad at 12:00 a.m.
December 4						Railroad at 6:37 a.m.

COMMERCIAL CHUB FISHERY AND CHUB STOCKS

Timothy Kroeff and David Schindelholz

The total chub harvest from commercial gill nets was 96,430 pounds for calendar year 2010, a decrease of 47% from 2009 (Tables 1 and 2). Commercial smelt trawlers harvested 16,090 pounds of unmarketable chubs incidental to the targeted smelt harvest and no marketable chubs were reported for the year. This compares to 19,370 pounds of unmarketable chubs harvested in 2009 and 15 pounds of marketable chubs. Going back one more year to 2008, 91,965 pounds of unmarketable chubs were harvested and 1,542 pounds of marketable fish were harvested.

Table 1. Harvest, quota, number of fishers and effort (feet) for the
Wisconsin Southern Zone gill net chub fishery 1979-2010. 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
2005	1,213,345	3,000,000	43	24,119.8	50.3
2006	807,031	3,000,000	40	19,110.4	42.2
2007	410,025	3,000,000	43	13,837.4	29.6
2008	227,026	3,000,000	39	9,823.2	23.1
2009	165,158	3,000,000	37	7,960.8	20.7
2010	90,879	3,000,000	38	5,645.6	16.1

Table 2. Harvest, quota, number of fishers and effort (feet) for the
Wisconsin Northern Zone gill net chub fishery 1981-2010.

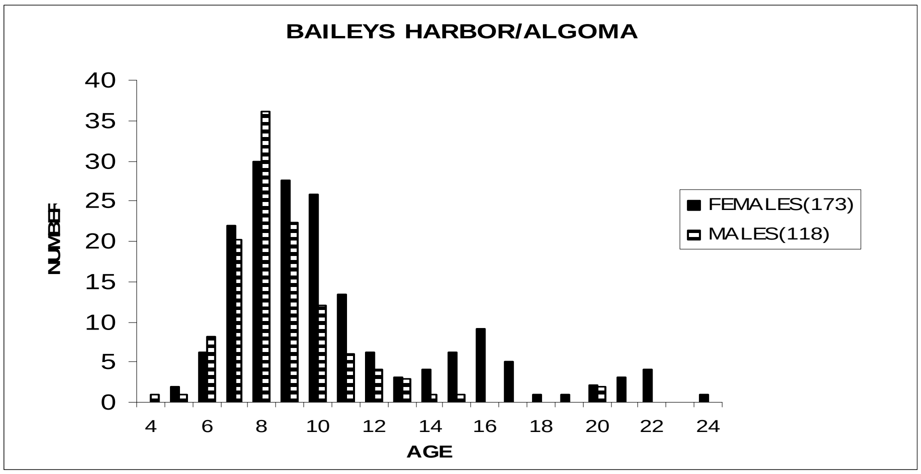
YEAR	HARVEST	QUOTA	FISHERS	EFFORT (x1,000 FT)	CPE
1981	241,277	200,000		4,920.4	49.0[a]
1982	251,832	200,000		3,469.8	72.5
1983	342,627	300,000		6,924.7	49.5
1984	192,149	350,000		6,148.4	31.2
1985	183,587	350,000		3,210.0	57.2
1986	360,118	400,000		7,037.2	51.2[b]
1987	400,663	400,000	23	6,968.6	57.5
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
2005	50,831	600,000	21	1,376.8	36.9
2006	36,285	600,000	19	1,011.1	35.9
2007	6,590	600,000	18	216.0	30.5
2008	23,942	600,000	18	845.0	28.3
2009	17,091	600,000	18	831.4	20.6
2010	5,551	600,000	18	474.2	11.7

[a] For the years 81-85, 90 & 91, 98-10 totals were by calendar year.
[b] For the years 86-89 & 92-97 the totals were through Jan. 15 of the following year.

By zone, the harvest in the south was 90,879 pounds, which was a decrease of 45% from 2009, or 3% of the allowed quota of 3 million pounds. The 2010 chub catch for this zone is easily the lowest on record since chub fishing reopened in 1979. The southern zone is basically waters from Algoma south to Illinois. In the north 5,551 pounds were reported caught, a 68% decrease from 2009. Less than 1% of the total northern quota of 600,000 pounds was caught. This is the lowest yearly catch for this zone since chub fishing reopened in 1981. The northern zone is basically waters from Baileys Harbor north to Michigan. The southern zone showed a 22% decrease in CPE from the previous year while the CPE in the north dropped by 43% from the year before. Both these catch rates were the lowest on record since chub fishing reopened. Gill net effort in the south decreased by 29% or 2,315,200 feet while effort in the north decreased 357,200 feet or 43%. In the south, 11 of the 38 permit holders reported harvesting chubs, while in the north, 4 of 18 permit holders reported harvesting chubs.

Population assessments with graded-mesh gill nets (1,300 ft. per box), were conducted off Algoma and Baileys Harbor in September 2010 and off Sheboygan in December of 2010 and January of 2011 (1 box per lift) set along with standard 2-1/2 or 2-3/8 inch gill nets. Two assessment lifts each were made off Algoma, Baileys Harbor and Sheboygan. Net nights totaled 21 for all sights combined. Samples were collected out of standard mesh gear at all sights and aging results were combined.

Catches from graded-mesh gill nets showed some improvement off Baileys Harbor and Sheboygan, but remain poor off Algoma. Data was pooled off Algoma and Baileys Harbor for reporting. Chubs up to 24 years of age were collected off Baileys Harbor/Algoma and up to16 years of age off Sheboygan (Figure 1). Although female chubs outnumbered male chubs off Baileys Harbor/Algoma as in the past, an interesting change was males well outnumbering female chubs off Sheboygan, especially in younger ages. It is believed that female chubs outlive males.



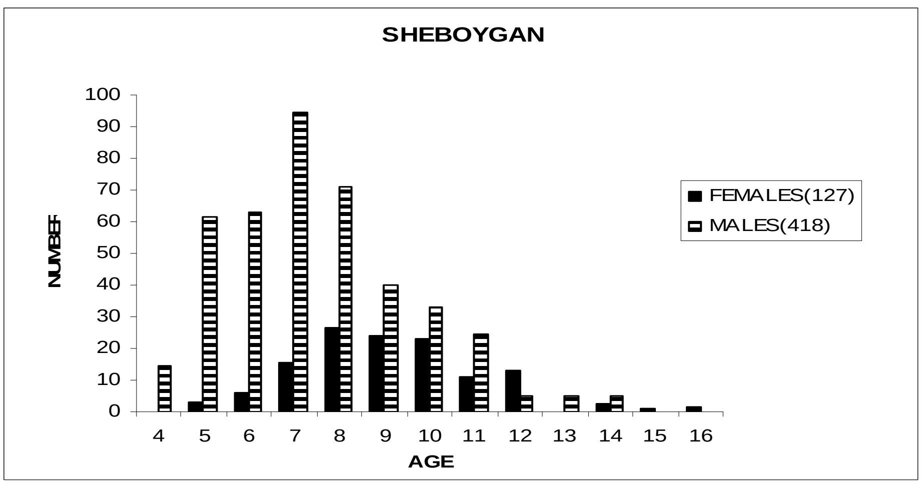


Figure 1.Age composition by number and sex of chubs captured during graded-mesh assessments along the Wisconsin L. Mich. shoreline, 2010.

Catches of chubs in the standard 2-1\2 inch or 2-3\8 inch mesh were poor of Algoma but better off Baileys Harbor in 2010 than 2009. Catches were combined for reporting means off all three sites. Ages from standard mesh ranged from 5 to 22 years of age (Figure 2). Sex ratios in this year's standard mesh have shown a change from recent trends of female dominated catches. Although still favoring females, this year showed a 59% catch of females compared to 80% in 2004, 06, 08 and 09, and 90% in 2005 and 88% in 2007. An advantage of the female dominated population in the commercial fishery is an added profit in the sale of chub roe to the caviar market during the late fall and winter.

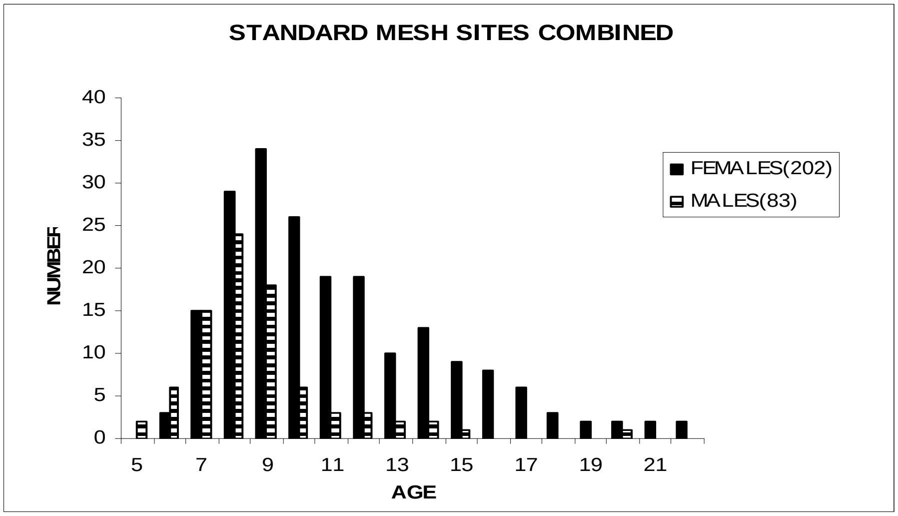


Figure 2.Age composition by numbers and sex caught from standard mesh gill nets off Algoma/Baileys Harbor and Sheboygan combined.

We are grateful to Mark Nelson, a commercial fisherman out of Sheboygan, for the setting and lifting of assessment nets off Sheboygan, essential to the completion of this project.

GREEN BAY FORAGE TRAWLING

Steve Hogler and Steve Surendonk

Since 2003 the Wisconsin DNR has been assessing forage fish in central Green Bay utilizing bottom trawling gear. Two transects, one running between Sturgeon Bay and Marinette (north transect) and the other between Rileys Point and Peshtigo Reef (south transect) were trawled during daylight hours in September using a 39-foot head rope trawl net. Along each transect, trawl drags were made starting at 50 feet and then every 10 feet in depth increment along the depth contour across Green Bay. Each trawl was five minutes in length at 2 MPH. The catch from each drag was individually bagged and returned to shore to be analyzed. For each sample, individual fish were sorted by species and weighed in aggregate. A subsample of fish from each drag was measured to develop length frequencies. Dreissenid mussels were sorted from the fish catch and an aggregate weight measured. Catch from similar depths (east and west) along each transect were combined to determine the catch by depth.

In 2010, both transects were sampled starting at 50 feet and continued across Green Bay in ten foot increments with a total of six- 5 minute drags on each transect sampled. On the north transect the total weight of the catch and CPE (kg/hour trawled) was the highest at 50 feet and 60 feet with much lower numbers at the other depths (Figure 1). Overall, with all drags combined by weight round goby, burbot and dreissenid mussels accounted for 98.1% of the biomass captured along the north transect.

At 50 feet, the catch by weight was dominated by dreissenid mussels, burbot and round goby (Figure 1). Other common species collected at this depth included rainbow smelt, young of year (yoy) whitefish and trout-perch. Dreissenid mussels, round goby and rainbow smelt were the dominant species at 60 feet and 70 feet. Other species including yoy whitefish, nine spine stickleback and trout-perch were captured at substantially lower abundances at these depths. At 80 and 90 feet round goby dominated the catch. Other species commonly caught at these depths included lake whitefish, rainbow smelt and burbot but these were captured in much lower weights.

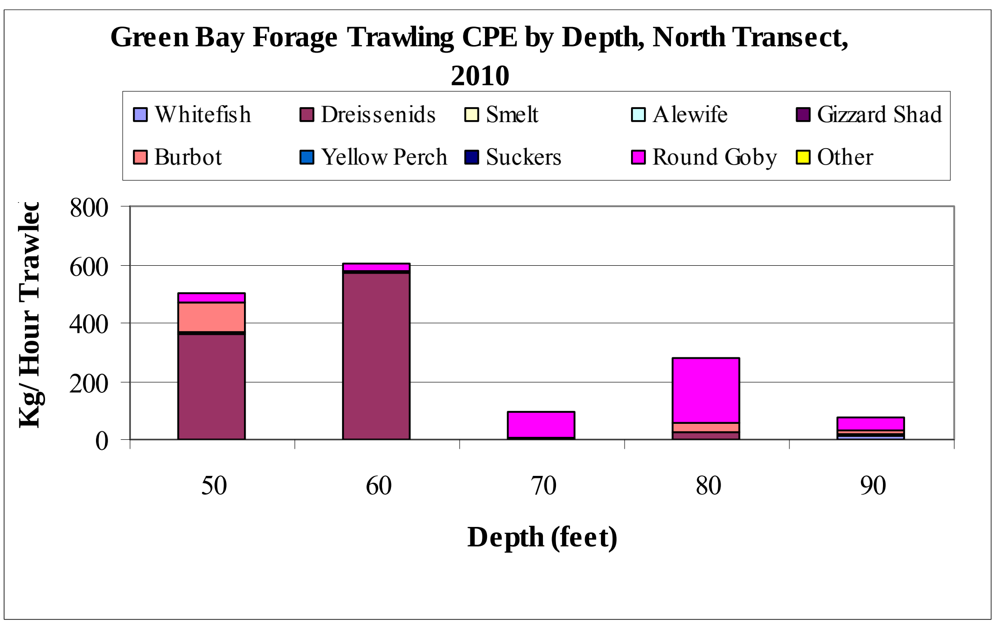


Figure 1. The 2010 CPE (kg/hr) of fish captured by species and depth strata on the north transect on Green Bay.

Unlike the north transect, CPE (kg/ hour trawled) across the south transect was the highest at the shallowest depth (50 feet), and declined sharply at 60 feet and remained very low at 70 feet and 80 feet (Figure 2). Dreissenid mussels, lake whitefish and trout-perch dominated the catch and accounted for 63.9% of the catch by weight along this transect. Suckers, round goby and alewife were also commonly caught. Species richness was much greater on this transect compared to the north transect.

Dreissenid mussels and trout-perch dominated the catch at 50 feet (Figure 2). Other species captured at this depth included suckers, round goby, lake whitefish, rainbow smelt and yellow perch. At 60 feet the catch was dominated by lake whitefish and round goby with rainbow smelt and trout-perch captured in much lower weights. At 70 feet and 80 feet, lake whitefish was the dominant species captured. Alewife, round goby, white sucker and rainbow smelt were also commonly captured at these depths.

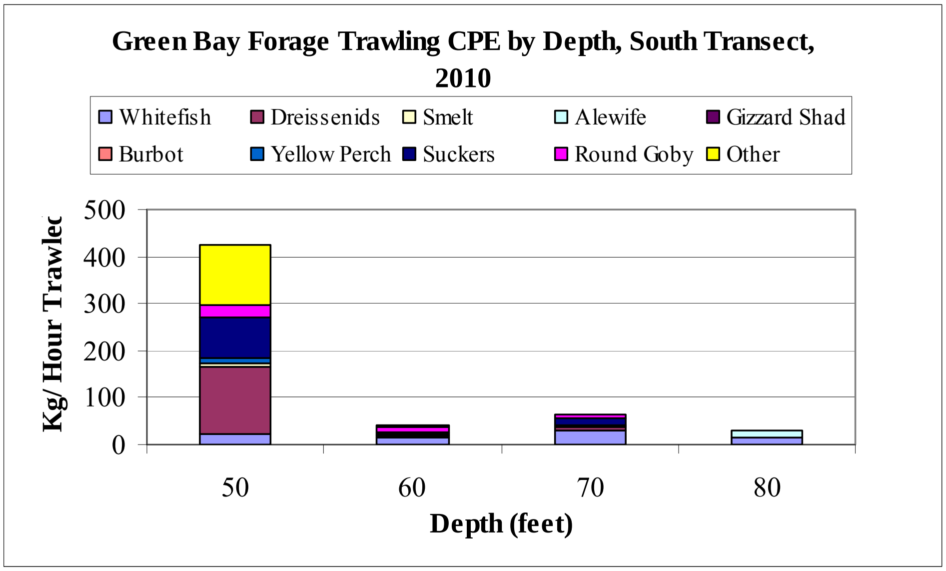


Figure 2. The 2010 CPE (kg/hr) of fish captured by species and depth strata on the south transect on Green Bay.

Eight years of trawling data allows us to make several general statements about the survey results. First, total catch and CPE increased in 2010 after several years of decline (Figures 3 and 4, appendix 1 and 2). The 2010 increase was likely due to an increased catch of dreissenid mussels and round goby on the north transect and one large catch of trout-perch at 50 feet on the southern transect.

Second, there appears to be a difference in the catch between the north and south transects although they are less than 10 km apart (Figures 3 and 4). During the first five years of trawling, the catch along the north transect was consistently more diverse than the catch on the south transect which tended to be dominated by one or two species. It was believed that the diversity of fish species found along the north transect was a reflection of the diversity of habitat that is sampled along that transect. The southern transect is dominated by open water habitats at all depth strata, while the northern transect has a protected bay on the eastern end and a shallow water flat on the western end (Figure 1). However, during the past three years the southern transect has become more diverse while diversity has declined along the northern transect. It is not clear why, although we suspect warmer water temperatures and perhaps low dissolved oxygen levels near the bottom may account for the differences that we noted the past several years.

Third, round goby and dreissenid mussels are well established in Green Bay and generally dominate our catch. In 2009 dreissenid mussel and round goby accounted for 32.8% and 22.3% of our total catch by weight respectively while in 2010 dreissenid mussel accounted for 59.9% and round goby made up 17.9% of our catch. Both are more abundant along the north transect than on the south transect.

Fourth, lake whitefish based on our catch are abundant in Green Bay although our 2010 catch was the lowest on record. The catch trend for adult whitefish has been variable with fewer caught the past several years, however the catch trend for young of year and age 1+ lake whitefish has been increasing throughout this survey.

Finally, on Green Bay, the rainbow smelt population trend remains unclear. Total rainbow smelt CPE and young of year abundance increased in 2010 from 2009 levels, but over the past 3 years the adult biomass remains low (Figures 3 and 4). Although yoy numbers continue to increase, we have not noted a corresponding increase the following fall in adult abundance or biomass.

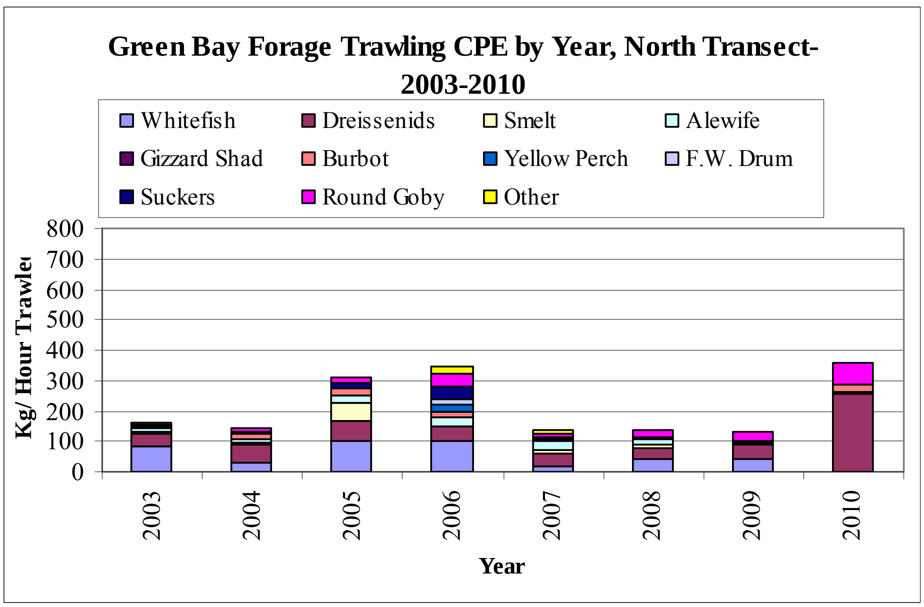


Figure 3. CPE by species for fish and mussels captured during trawling on Green Bay along the north transect, 2003-2010.

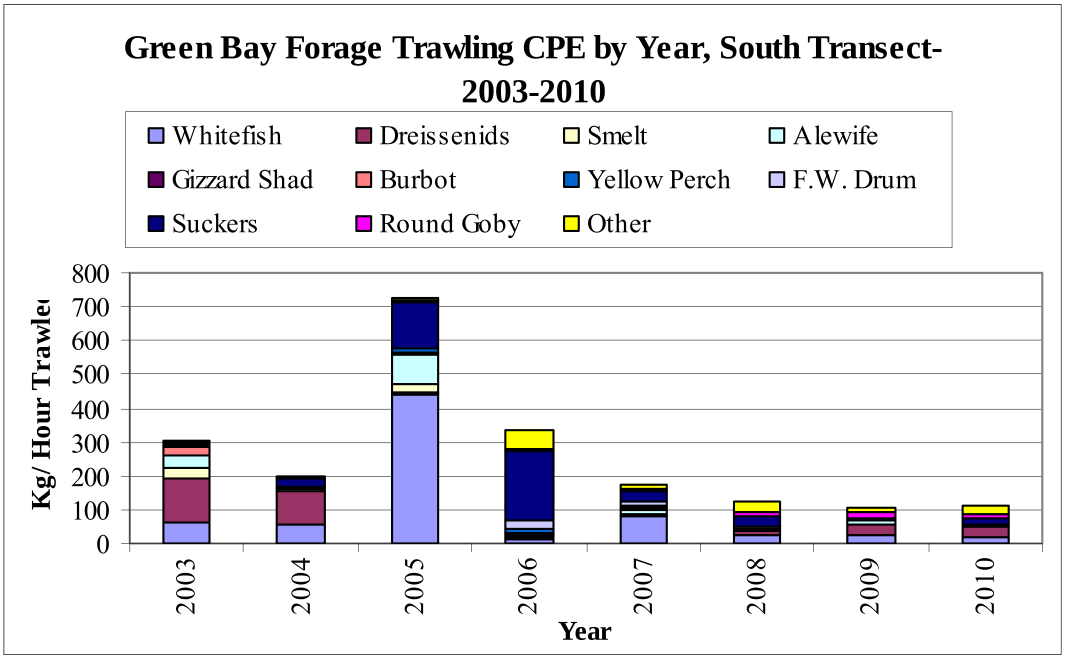


Figure 4. CPE by species for fish and mussels captured during trawling on Green Bay along the south transect, 2003-2009.

Appendix 1. Green Bay forage trawling CPE (kg/hour trawled) by species on the north transect 2003-2009.

North (kg/hr)	2003	2004	2005	2006	2007	2008	2009	2010
Whitefish	80.6	32.7	99.4	102.9	17.3	44.7	39	2.9
Dreissenids	44.1	55.7	65.4	44.5	42.2	33.1	50.7	255.8
Smelt	6.2	4.7	63.7	1.2	14.6	9.3	2.4	3.7
Alewife	11.7	14.1	21.5	28.6	26.8	19.4	0.2	0
Gizzard Shad	0	0	0	3.9	0.8	0	0.4	0
Burbot	8.7	20	21.7	16.8	2.9	1.9	3.6	23.7
Yellow Perch	0.2	2.8	0.8	25.2	7.1	0.2	1.3	0.0
F.W. Drum	0	0	0	17.7	0	0	0	0
Suckers	3.1	2.9	20.7	41.2	1.9	5.8	1.8	0
Round Goby	2.5	7.6	18.2	43.1	13	22.6	33.1	74.1
Other	2.5	0.7	2	19.3	11.5	0.5	1.7	0.2
Total	**159.5**	**141.3**	**313.3**	**344.4**	**138.1**	**137.5**	**134.2**	**360.4**

Appendix 2. Green Bay forage trawling CPE (kg/hour trawled) by species on the north transect 2003-2010.

South (kg/hr)	2003	2004	2005	2006	2007	2008	2009	2010
Whitefish	65	52.9	439.6	9.8	81.4	23.2	25.9	21.5
Dreissenids	129.8	102.5	5.6	0.4	3.6	15.2	27.6	26.3
Smelt	31.4	4.1	24.9	0.2	3.2	5.8	4.1	3.9
Alewife	32.5	4.8	90.4	9.1	12.5	3.3	11.2	3.4
Gizzard Shad	0	0	0.1	6.1	3.8	0	0	0
Burbot	23.5	0	5	3.4	0	0	0	0
Yellow Perch	0.1	2.1	9.7	14.3	5	4.1	1	2.2
F.W. Drum	0	0.6	0.2	26	12.5	0	0	0
Suckers	7.1	25.1	137.5	201.1	34.5	26.5	5.3	19.9
Round Goby	10.5	5	8.5	10.8	3.4	13.5	20	10.3
Other	4.4	2.9	1.5	52.6	12.4	33.1	9.2	23.1
Total	**304.1**	**200.2**	**722.9**	**333.8**	**172.3**	**124.7**	**104.3**	**110.4**

SMELT WITHDRAWAL BY THE COMMERCIAL TRAWL FISHERY

Steve Hogler and Steve Surendonk

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 were 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 could be harvested from Green Bay.

During calendar year 2010, commercial trawlers reported catching 320,503 pounds of rainbow smelt (Figure 1). The 2010 reported harvest was the highest since 2007 and was more than 14 times greater than the 2009 harvest of 22,825 pounds. The 2010 harvest was also above the previous 3 and 5 year average harvest levels.

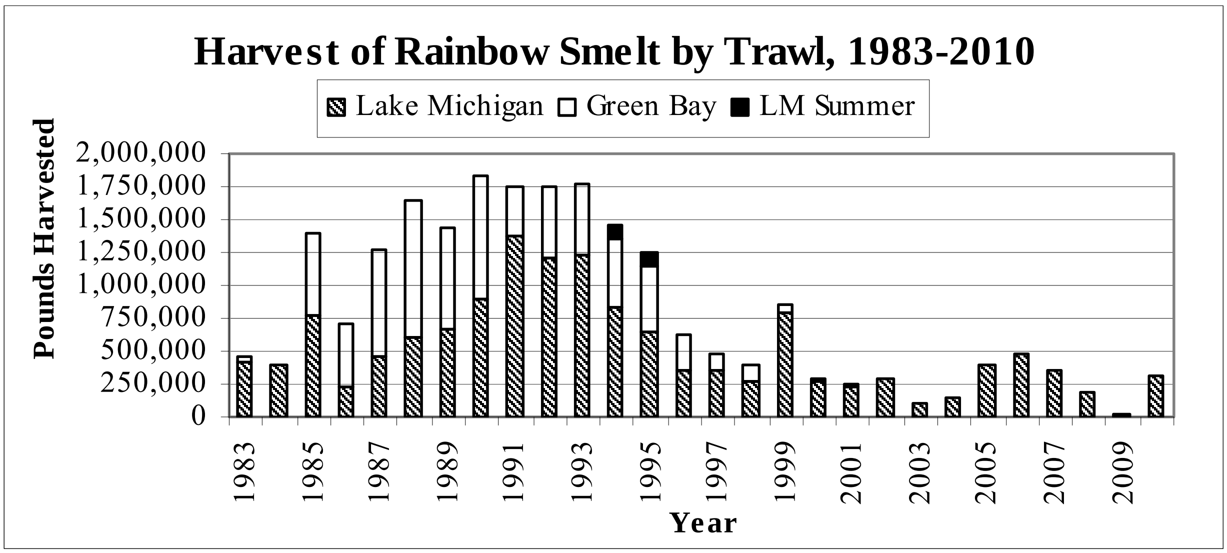


Figure 1. Reported rainbow smelt harvest by trawl from the Wisconsin waters of Lake Michigan for the years 1983 through 2009.

On Lake Michigan in 2010, trawlers harvested 320,503 pounds of rainbow smelt (Figure 1) with a CPE of 323 pounds per hour trawled (Figure 2). The 2010 rainbow smelt harvest on Lake Michigan was the fourth highest on record since 2000 (Figure 1). Similarly, CPE in 2010 sharply increased from previous year and was the second highest on record since 2000 (Figure 2).

Commercial trawlers did not fish on Green Bay in 2010 making it the fourth time in the last six years they did not fish the summer season on Green Bay. The lack of fishing effort on Green Bay in 2010 continued the trend of declining harvest, CPE and effort noted on the Wisconsin waters of Green Bay since 1991.

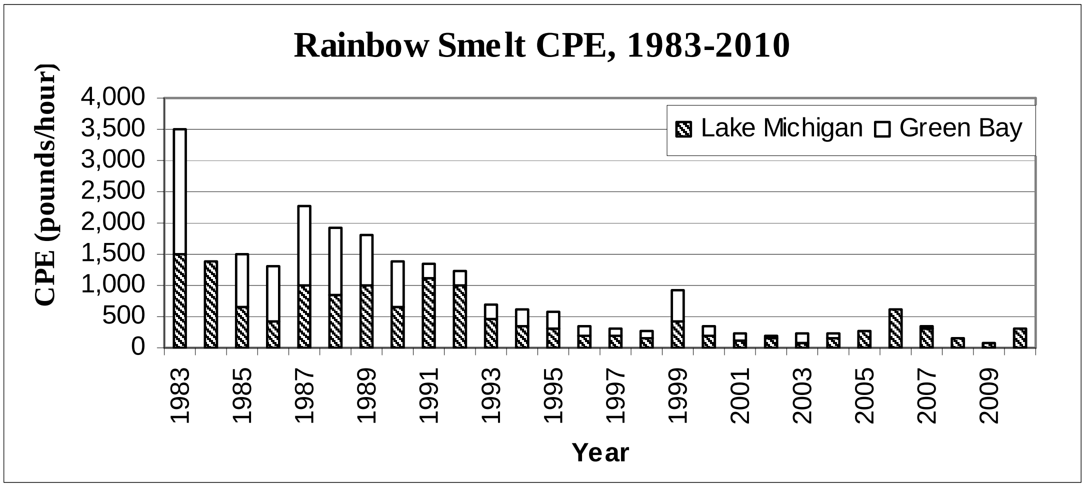


Figure 2. Rainbow smelt CPE in pounds per hour trawled on Lake Michigan and Green Bay during the years 1983 through 2010.

Commercial rainbow smelt trawlers experienced a very good Lake Michigan season in 2010 after a very poor 2009. Although commercial trawlers had a good Lake Michigan season, the lack of effort and harvest of rainbow smelt from Green Bay seems to indicate that in Green Bay the rainbow smelt population is below what is needed to make commercial harvest feasible.

The large increase in rainbow smelt harvest by trawlers in 2010 was somewhat unexpected given the inconsistent biomass estimates from U.S.G.S bottom trawl and acoustic fall surveys in 2009. Historically, increases or decreases in the rainbow smelt harvest by trawlers have been broadly predicted by U.S.G.S. biomass estimates based on fall forage surveys but recently the relationship between survey estimates and commercial harvest has become less clear. In 2009, bottom trawling surveys conducted by the U.S.G.S. indicated that the estimate of rainbow smelt biomass was nearly double their 2008 estimate (Madenjian et al 2010), while the acoustic survey estimated that rainbow smelt biomass declined from the 2008 estimate (Warner et al 2010).

Although the status of the rainbow smelt population in Lake Michigan and Green Bay remains uncertain, it is clear that rainbow smelt biomass and commercial harvest have declined sharply from their peak levels in the late 1980's and early 1990's. More recently, despite steady to slightly increasing rainbow smelt bottom trawling biomass estimates for Lake Michigan since 2002, commercial harvest has been much more variable with several poor catch years followed by one or two good catch years. The decline of the trawl fishery on Green Bay has been even more dramatic with only token effort and very low harvest the past five years. The continued low biomass of rainbow smelt in Lake Michigan and Green Bay makes the continuing viability of the commercial smelt fishery unknown.

References:

Madenjian, C.P, Bunnell, D.B, J.D. Holuszko, T.J. Desorcie and J.V. Adams. 2010. Status and Trends of Prey Fish Populations in Lake Michigan, 2009. A report to the Great Lakes Fishery Commission, Lake Michigan Committee, Windsor, ON. March 23, 2010.

Warner, D.M., R.M. Claramunt, and J.D. Holuszko. 2010. Status of Pelagic Prey Fishes and Pelagic Macroinvertebrates in Lake Michigan, 2009. A report to the Great Lakes Fishery Commission, Lake Michigan Committee, Windsor, ON. March 23, 2010.

LAKE WHITEFISH

Scott Hansen

Commercial Harvest

Lake whitefish *Coregonus clupeaformis* harvest in Wisconsin's waters of Lake Michigan continued at high levels for the 2010 calendar year with 1,509,090 dressed weight pounds of fish harvested (Figure 1). The 2010 harvest increased slightly, approximately 20,000 pounds, from 2009 and exceeds the 20 year average of approximately 1.42 million pounds.

Commercial whitefish harvest in Wisconsin is regulated by quota year beginning in July through June of the following year with a closed period during spawning. The initial quota established in 1989-90 was 1.15 million pounds. It increased to 2.47 million pounds during the 1998-99 quota year. A recent increase during the 2009-10 quota year resulted in the current quota of 2.88 million pounds. The 2009–10 commercial harvest was 1,525,739 pounds. The Wisconsin quota is allocated to three zones at roughly 9% of the quota for zones 1 and 3, and 82% for zone 2. However, the recent 2009-2010 quota increase of approximately 410,000 pounds was treated as a "Special Increase" and split equally among the zones (Table 1).

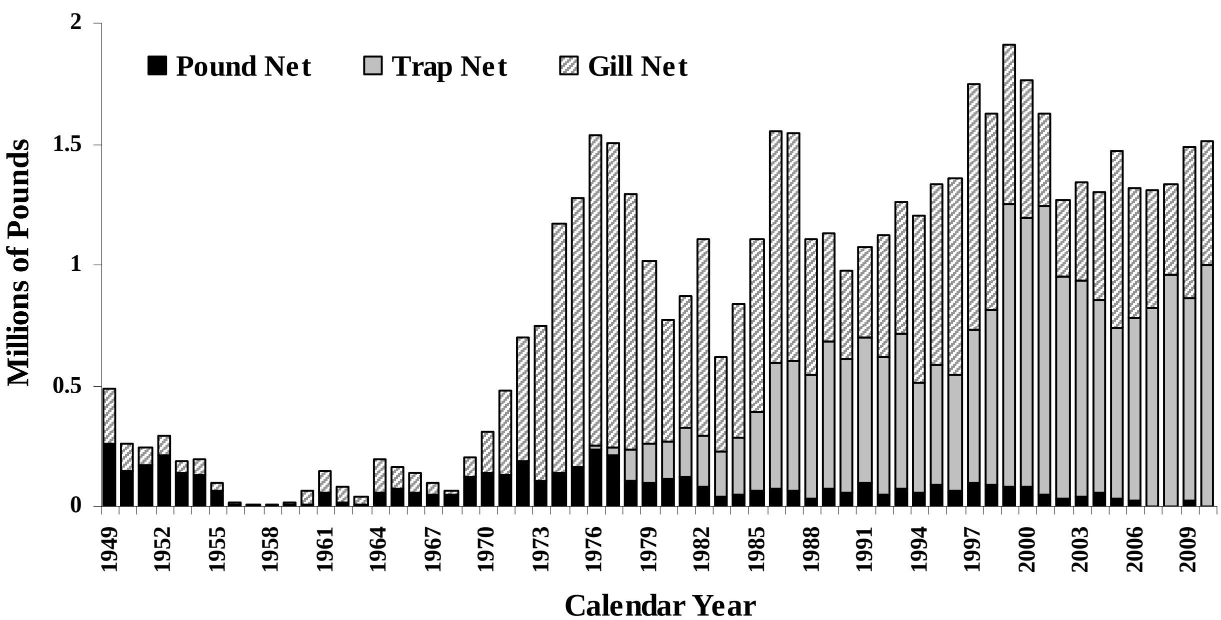


Figure 1. Lake whitefish calendar year commercial harvest reported by gear type in pounds (dressed weight) from Wisconsin waters of Lake Michigan including Green Bay from 1949 through 2010.

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 since 1990 and on average has annually accounted for over 50 percent of the whitefish harvest. For the calendar year, the total proportion of whitefish harvested by trap nets increased from 56.2% in 2009 to 66.6% in 2010 while the proportion of whitefish harvested by gillnets decreased from 42% in 2009 to 33.4% in 2010 (Figure 1). Pound nets were not fished in 2010.

Table 1. Lake whitefish harvest in dressed weight in Wisconsin by quota year broken down by zone through the 2009-2010 quota year.

Quota Year [a,b]	Zone 1 Harvest	Zone 2 Harvest	Zone 3 Harvest	Total Harvest
1998-99	143,225	1,474,605	182,486	1,800,316
1999-00	57,659	1,516,187	193,592	1,767,438
2000-01	72,496	1,330,107	210,604	1,613,207
2001-02	39,333	1,301,209	129,084	1,469,626
2002-03	107,827	1,085,599	131,344	1,324,770
2003-04	81,525	1,050,697	111,389	1,243,611
2004-05	129,081	1,248,689	166,319	1,544,089
2005-06	173,563	1,104,843	118,823	1,397,229
2006-07	181,289	901,935	214,909	1,298,133
2007-08	180,835	938,005	215,228	1,334,068
2008-09	182,614	944,580	211,614	1,338,808
2009-10	317,140	922,533	286,066	1,525,739

[a] Through quota year 2008-2009 the quota was 2.47 million pounds and quotas for zones 1 thru 3 were 225,518, 2,029,662, and 214,820, respectively

[b] Beginning April, 2010 the WI quota was increased to 2.88 million pounds and quotas for zones 1 thru 3 were changed to 362,185, 2,166,629, and 351,487 pounds respectively.

While trap net gear continues to be the primary gear type for whitefish harvest, the overall effort has generally declined since 2003 (Figure 2). However, over the last two years effort has increased and for the 2010 season trap net effort increased substantially from 2009 by about 800 pots lifted. Meanwhile, after a spike in 2005 and subsequent decline over the following two years, the general gillnet effort has increased moderately. However, the effort declined by 370,000 feet between 2009 and 2010. Trap net catch per unit of effort (CPE) has declined over the last two years dropping in 2010 by another 37 pounds per lift (Figure 3). Gillnet CPE also decreased in 2010 by 11.6 pounds per 1000 ft fished.

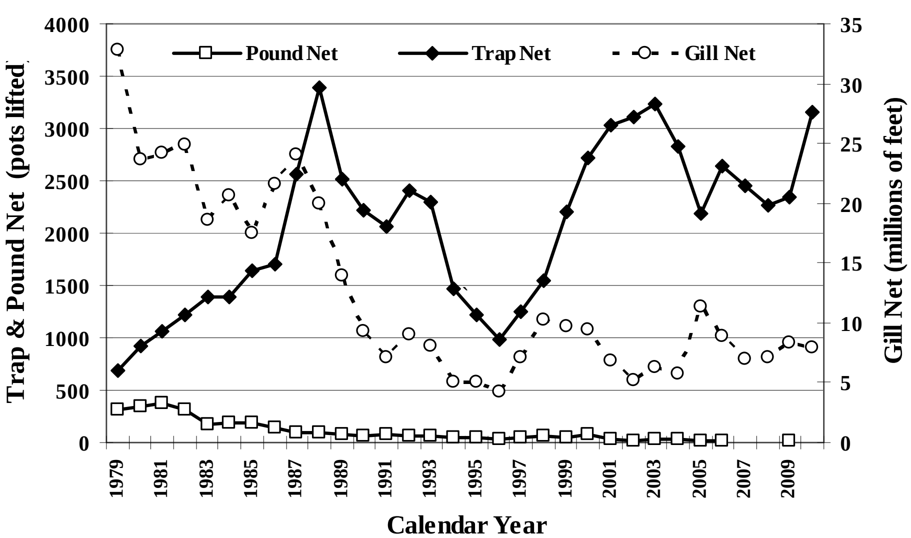


Figure 2. Trends in gill net, trap net, and pound net effort fished for lake whitefish in Wisconsin waters of Lake Michigan including Green Bay, 1979 – 2010. Gill net effort is in millions of feet; trap and pound net effort is number of pots lifted.

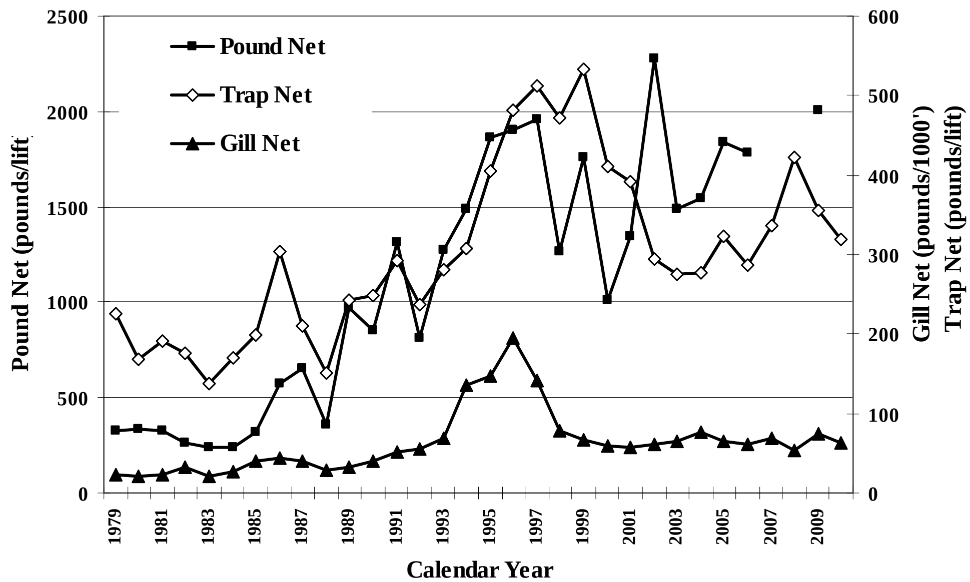


Figure 3. Trends in gill net, trap net, and pound net catch per unit of effort (CPE) in the Wisconsin waters of Lake Michigan including Green Bay, 1979 – 2010. Gill net CPE is pounds of whitefish harvested per 1,000 feet lifted; trap and pound net CPE is pounds of whitefish harvested per pot lifted.

Growth

Mean length and weight-at-age of lake whitefish measured during the spring in Wisconsin waters have demonstrated a general decline since around 1995 (Figures 4 and 5). Although these levels demonstrated some improvement in 2008 and 2009, there again was a considerable decline measured in 2010. After dipping to a historic low in 2007, the average fish length-at-age in 2008 and 2009 rebounded and whitefish first recruited to the commercial fishery (432 mm) at age 7 on average. However, the average size of a 7-year old fish has again fallen below the commercial limit in 2010. Within the past 5 -10 years, obtaining a viable sample size of younger whitefish age classes near the North/Moonlight Bay (NMB) spawning grounds has become difficult. In the spring of 2007 we began sampling for juveniles in Green Bay with some success. Spring sampling efforts in Green Bay have continued to increase and now constitute all of the spring 2010 assessment data. However, a certain level of stock mixing is suspected to occur in Green Bay depending on the time of year. Therefore, the consistency in measuring growth of NMB fish over time may now be affected by fish from other stocks as a result of the respective differences in stock specific growth rates.

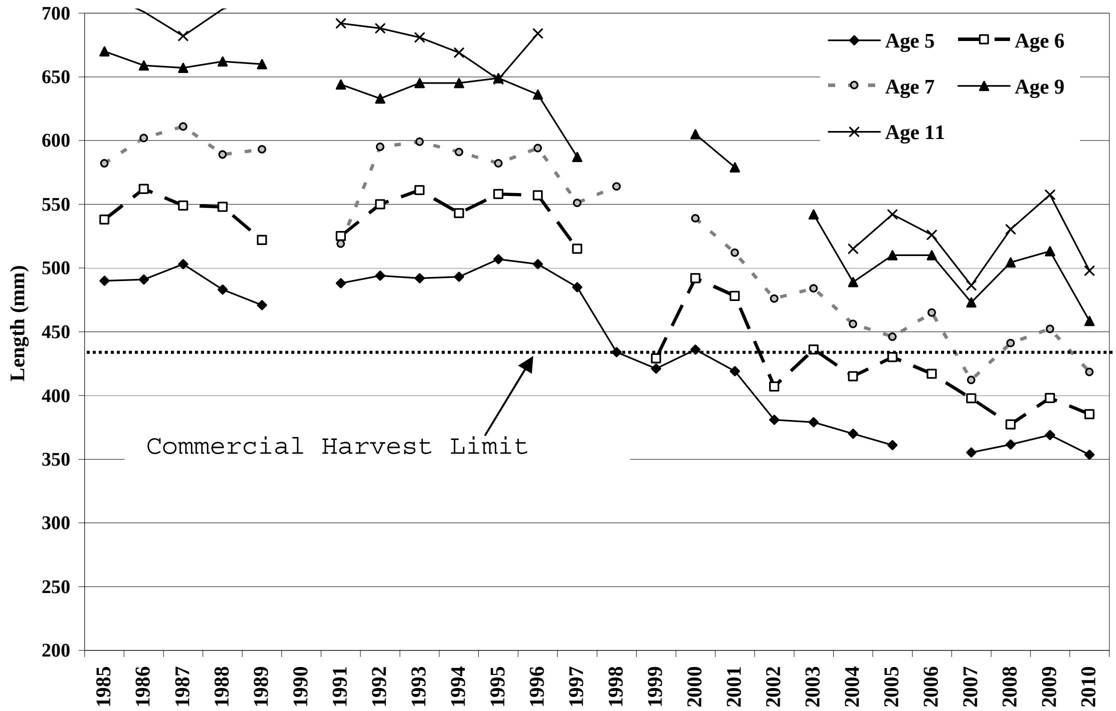


Figure 4. Mean length at age of spring sampled lake whitefish from 1985 thru 2010.

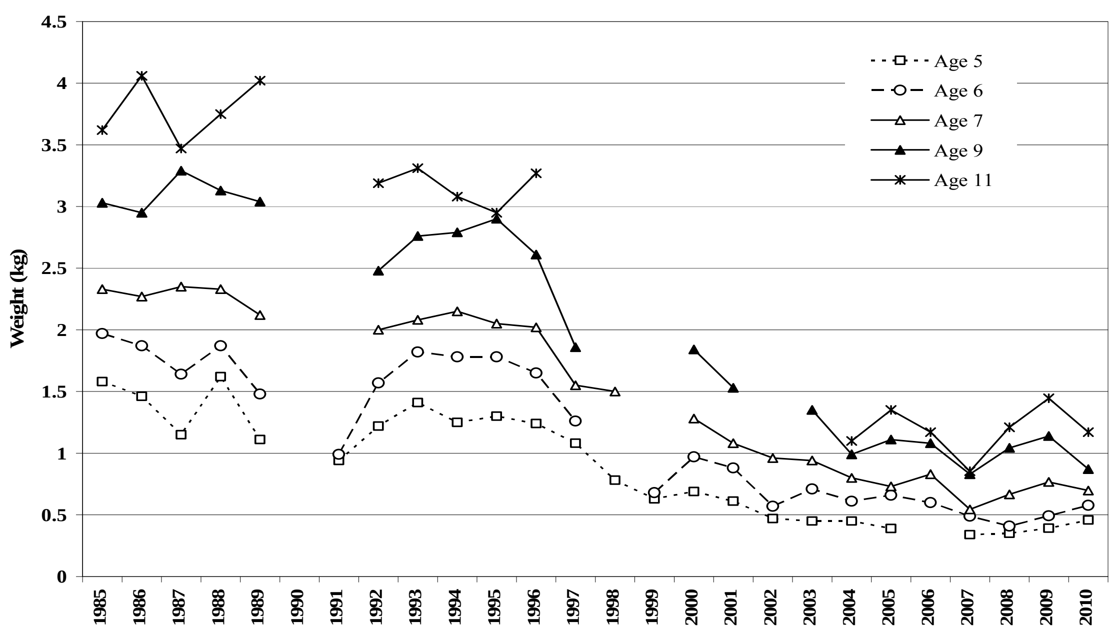


Figure 5. Mean weight at age of spring sampled lake whitefish from 1985 thru 2010.

Sport Angler Harvest

Beginning in the winter of 2006-2007, a sport fishery for lake whitefish developed on the bay of Green Bay at levels unprecedented in recent history. The winter creel season of 2007 recorded the first significant lake whitefish harvest of an estimated 1,559 fish.

Winter creel surveys for Green Bay are conducted during the months of January, February, and March. For the winter of 2010, estimated whitefish harvest was 78,464 fish, an increase of nearly 24,000 fish from the 2009 harvest (Figure 6). Angler effort directed toward whitefish increased considerably as well from 89,641 hours in 2009 to 120,551 hours in 2010, an increase of over 25%. Harvest rates specific to whitefish in 2010 were 0.310, 0.375, and 0.514 whitefish harvested per hour of fishing for January, February, and March, respectively. For the winter of 2010 the overall average whitefish specific harvest rate was 0.397 fish per hour of fishing, up from 0.371 in 2009 (Figure 6). So while the total hours fished for whitefish increased by 25% from 2009 to 2010, the harvest rate only increased by around 7%.

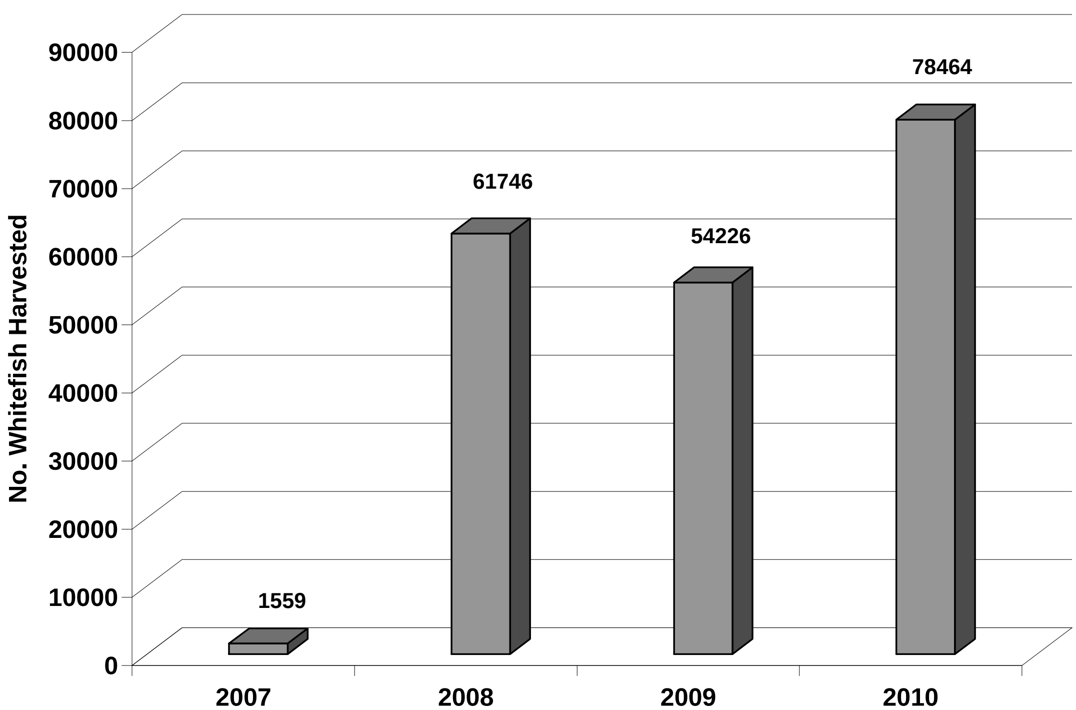


Figure 6. Estimated number of lake whitefish harvested in Wisconsin waters of Green Bay during the winter creel season (January- March) for 2007-2010.

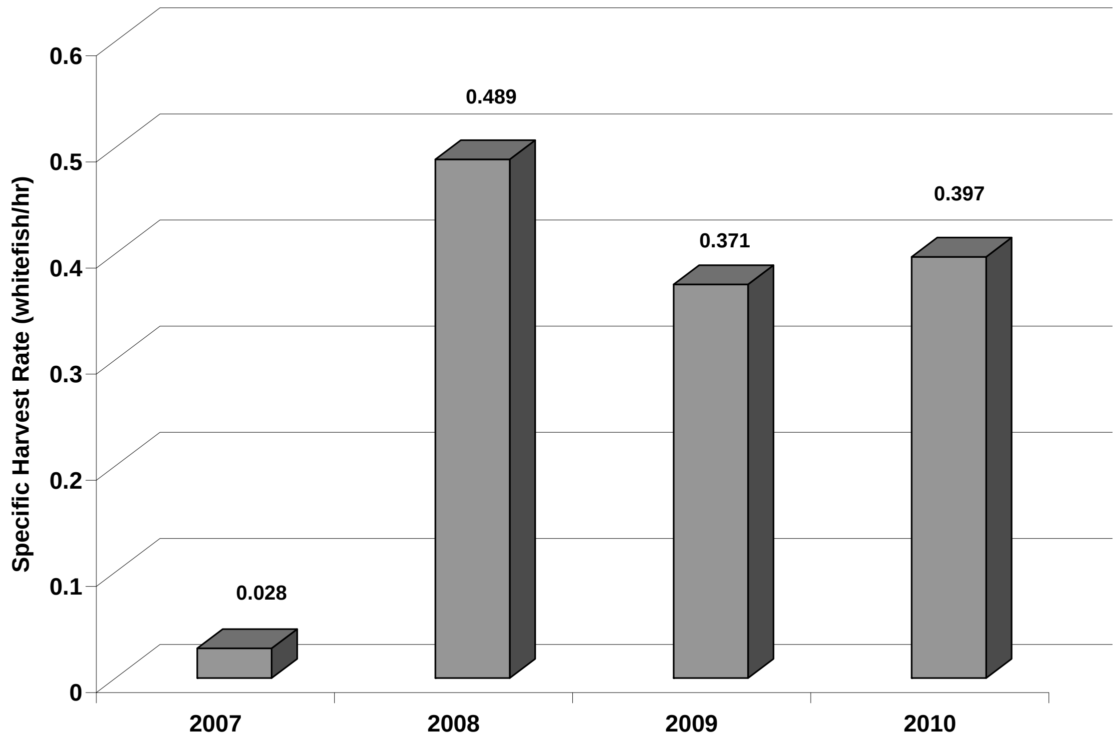


Figure 7. Harvest rate in number of whitefish per hour of fishing specifically for whitefish.

AUTHOR CONTACT INFORMATION

Brad Eggold -- 600 E. Greenfield Ave.; Milwaukee, WI 53204. 414-382-7921.
bradley.eggold@wisconsin.gov

Jeff Zinuticz -- 600 E. Greenfield Ave.; Milwaukee, WI 53204. 414-382-7921.
jeffrey.zinuticz@wisconsin.gov

Steve Hogler -- 2220 East CTH V; Mishicot, WI 54228. 920-755-4982.
steven.hogler@wisconsin.gov

Scott Hansen -- 110 South Neenah Ave.; Sturgeon Bay, WI 54234. 920-746-2864.
scott.hansen@wisconsin.gov

Tammie Paoli -- 101 N. Ogden Rd.; Peshtigo, WI 54157. 715-582-5052.
tammie.paoli@wisconsin.gov

Pradeep S. Hirethota -- 600 E. Greenfield Ave.; Milwaukee, WI 53204. 414-382-7928.
pradeep.hirethota@wisconsin.gov

Timothy Kroeff -- 110 South Neenah Ave.; Sturgeon Bay, WI 54234. 920-746-2869.
timothy.kroeff@wisconsin.gov

Michael Donofrio -- 101 N. Ogden Rd.; Peshtigo, WI 54157. 715-582-5050.
michael.donofrio@wisconsin.gov

David C. Rowe -- 2984 Shawano Ave.; Green Bay, WI 54307. 920-662-5480.
david.rowe@wisconsin.gov

Rodney M. Lange -- 2984 Shawano Ave.; Green Bay, WI 54307. 920-662-5457.
rodney.lange@wisconsin.gov

Steve Surendonk -- 2220 East CTH V; Mishicot, WI 54228. 920-755-4982.
stephen.surendonk@wisconsin.gov

Patrick McKee -- 110 S. Neenah Ave.; Sturgeon Bay, WI 54235. 920-746-2869.
patrick.mckee@wisconsin.gov

Cheryl Masterson -- 600 E. Greenfield Ave.; Milwaukee, WI 53204. 414-382-7923.
cheryl.masterson@wisconsin.gov

Dave Schindelholz 600 E. Greenfield Ave.; Milwaukee, WI 53204. 414-382-7925.
david.schindelholz@wisconsin.gov

Bill Horns -- 101 S. Webster St.; Madison, WI 53707, 608-266-8782.
william.horns@wisconsin.gov