Montana Department of Fish, Wildlife and Parks
Fisheries Division

Job Progress Report

STATE: Montana **PROJECT: Statewide Fisheries Management**

JOB TITLE: Yellowstone River Paddlefish Investigations-3740

FEDERAL GRANT: F-113-R-13

PROJECT PERIOD: July 1, 2012 through June 30, 2013

REPORT PERIOD: April 1, 2012 through March 30, 2013

ABSTRACT:

Yellowstone River flows in the spring and early summer of 2012 were minimal for triggering spawning migrations of paddlefish up the Lower Yellowstone and flows fluctuated up and down throughout the season making availability of paddlefish at Intake Fishing Access Site (FAS) sporadic. Low flow and the resulting lack of paddlefish led to few fish harvested and harvested fish coming from sites near the Missouri River confluence (Sidney Bridge and Richland Park). Few paddlefish were caught until May 26th when a pulse in the hydrograph triggered paddlefish migration up the Yellowstone River. Flow was 12,300 cubic feet per second (CFS) at the start of the paddlefish season on May 15, 2012 and peaked at 39,600 CFS on June 9, 2012. An estimated 599 paddlefish were harvested from the Yellowstone/Sakakawea population in Montana during 2012. Fish, Wildlife & Parks (FWP) staff tagged 103 paddlefish with jaw tags during catch-and-release fishing. The harvest cap was not approached in 2012 and fishing was allowed through the end of the season closing on June 30 after 28 harvest days.

INTRODUCTION:

Paddlefish *Polyodon spathula* are a highly sought after sport-fish in the Yellowstone and Missouri rivers. They also garner commercial interest for their eggs that support the caviar trade (Carlson and Bonislawsky 1981). They are native to Montana and are an integral part of the aquatic community in the lower Yellowstone River (Holton and Johnson 2003). Paddlefish have highly developed gill rakers that facilitate filter feeding of zooplankton in large river systems and reservoirs (Meyer 1960, Rosen and Hales 1981). Paddlefish are sexually dimorphic. Males become sexually mature earlier and at a smaller size than females (Scarnecchia et al 1996; Scarnecchia and Stewart 1997). Paddlefish of the Yellowstone/Sakakawea stock reside in the slow and quiet waters of Lake Sakakawea as juveniles. After the onset of sexual maturity, approximately age 10 for males and age 14 for females, they make spawning runs out of the reservoir up the Missouri River to its confluence with the Yellowstone River. Many paddlefish spend the spawning season in the immediate vicinity of this confluence area while others continue to migrate up the Missouri River below Ft. Peck Dam or up the Yellowstone River. They spawn on the clean gravel bars during the high flow period in May and June (Rehwinkel 1978; Carlson and Bonislawsky 1981). Some fish from this stock function as river residents remaining in the rivers above Lake Sakakawea all year e.g. in the dredge cuts below Ft. Peck reservoir (Frazier 1985).

The harvest of paddlefish at Intake, MT has been documented for over a century and with a better understanding of the fishery some important management decisions have been made in the last two decades (Scarnecchia et al. 2008). The Montana-North Dakota Paddlefish Management Plan (Scarnecchia et al. 2008) establishes the goals and objectives guiding the management of the Yellowstone/Sakakawea paddlefish population. Currently a 2,000 paddlefish harvest cap is shared by North Dakota and Montana (1,000 fish each). Since 1989, the Glendive Chamber of Commerce, a non-profit organization, has been allowed to offer onsite fish cleaning services in exchange for roe from female paddlefish. Proceeds from caviar fund community improvement grants, as well as paddlefish research, monitoring and management (Scarnecchia et al. 2008). This arrangement and tight management of the fishery has prevented over-commercialization and subsequent exploitation that plague fisheries of other roe bearing species worldwide (Speer et al. 2000).

In Montana, the harvest of paddlefish at Intake FAS is closed instantaneously when FWP staff estimates that harvest is approaching the 1000 fish cap. Paddlefish harvest closes elsewhere 24 hours after the closure at Intake (After the instantaneous harvest closure at Intake FAS catch and release fishing is permitted at Intake FAS for 10 consecutive days). Regulation changes in 2007 created the current season structure with harvest (mandatory) on Tuesday, Wednesday, Friday and Saturday and catch-and-release (mandatory) on Sunday, Monday and Thursday. Legal fishing hours are from 6 a.m. to 9 p.m.

Objectives for the 2012 season were as follows: 1) keep harvest under the 1000 fish harvest cap, while spreading harvest over more days to increase angler satisfaction and maintain tag sales 2) provide additional paddlefish angling opportunity with catch and release days, and use this opportunity to increase number of tagged fish in the river, 3) characterize size distribution and condition of fish and sex ratio of the population.

METHODS:

Data from harvested fish and catch and release fish were collected by FWP staff at Intake FAS throughout the paddlefish season. Data from both harvested fish and catch and release fish were used to make inferences about size distribution, condition, sex ratio, and population size. Harvested paddlefish were weighed to the nearest pound and measured to the nearest inch (front of eye to fork of caudal fin). Sex of harvested fish was assigned by FWP staff and confirmed when filleted by caviar staff. Most but not all of the paddlefish caught during designated catch and release fishing days were tagged and measured. Fish sex was assigned based on length, abdominal shape and presence of tubercles on rostrum and head. Catch and release fish were not weighed. Paddlefish were jaw tagged with Monel metal bands (National Band and Tag Co., Size 16, ½ inch inside diameter) that were placed around the dentary bone. Paddlefish tagging data is used to model population estimates and infer exploitation (Scarnecchia et al. 2008).

A statewide paddlefish telephone creel has been conducted since 2003 to obtain harvest estimates for the Yellowstone/Sakakawea paddlefish population. The content of the annual phone creel has varied over the years as regulations and management concerns have changed. Estimation of total harvest is the one component of the phone creel that has remained consistent from 2003 to 2012. The 2012 phone creel included seven questions about angler harvest, angler effort, participation in catch and release fishing and use of Glendive Chamber of Commerce fish cleaning services. The phone creel was used to provide the final estimate of harvest. Onsite creel data from Intake has not been used as a harvest estimate since 2007 because the short and intense harvest seasons make onsite estimates prone to underestimation (Riggs and Bollman 2008).

A special phone creel survey was completed by phone from July 29 through October 2012. Tag holders were randomly selected for the survey, and three attempts were made to reach each individual by phone. Due to time and money constraints, anglers were asked these special survey questions on the first two phone attempts. A total of 285 yellow tag holders were surveyed with these methods.

Paddlefish length and weight data were used to determine relative weight (W_r), an index of condition (Murphy and Willis 1996). Proportional size distribution (PSD) was used to represent the length distribution with a single value (Murphy and Willis 1996, Brouder et al. 2009). These indices provided a comparison of the size and condition of the Yellowstone/Sakakawea population to other paddlefish populations across the species range.

Sex identification of harvested paddlefish was used to infer future trends in sex of paddlefish harvest. Inferences are made using the combination of dominant year classes and differing age at maturity. Consideration of sex ratio, population modeling, and knowledge of strong year classes (as identified by dentary bone aging, Scarnecchia et. al 2006) are used to manage for a sustainable paddlefish population (Scarnecchia et. al 2008).

RESULTS / DISCUSSION:

Discharge measured at the United States Geologic Survey (USGS) gauge station at Sidney, Montana was 12,300 cubic feet per second (CFS) at the start of the paddlefish season on May 15, 2012 and the peak discharge during paddlefish season was 39,600 CFS on June 9, 2012.

Yellowstone River flows in the spring and early summer of 2012 were minimal for triggering spawning migrations of paddlefish up the Lower Yellowstone. Discharge fluctuated up and down throughout the season making availability of paddlefish at Intake Fishing Access Site (FAS) sporadic (Figure 1). Low flow and the resulting lack of paddlefish led to few fish harvested and harvested fish coming from sites near the Missouri River confluence (Sidney Bridge and Richland Park). Few paddlefish were caught until Memorial Day weekend while angler effort was high and a modest pulse in discharge of 24,000 CFS triggered paddlefish migration up the Yellowstone River. Harvest peaked on May 26th with 66 paddlefish harvested on the Friday going into Memorial Day weekend (Figure 1). Discharge fell and remained below 20,000 CFS for six days before building toward the largest peak in the hydrograph occurring during the paddlefish season that reached nearly 40,000 CFS on June 9th (Figure 1). The second and third highest harvest days occurred during this period. The paddlefish season remained open until the end of June. The Yellowstone/Sakakawea telephone creel estimated harvest at 599 paddlefish for 2012 (Skaar 2012, Appendix A).

The 2012 paddlefish season was the sixth season under new regulations designed to keep harvest under 1000 fish, spread out harvest and increase fishing opportunity. These objectives have been met four of the last six years. An estimated 2,261 anglers participated in the 2012 paddlefish season on the Lower Missouri and Yellowstone Rivers, generating 6,070 angler days (Skaar 2012, Appendix A). An estimated 81% of fish harvested were cleaned by the Glendive Chamber of Commerce (Skaar 2012, Appendix A).

A special phone creel survey was completed in 2012 the numerical results as well as angler comments can be found in appendix F. The survey found 89% of current paddlefish anglers surveyed are satisfied with the current season structure. Anglers surveyed would support mandatory reporting of harvest if it provided more efficient population management. Anglers surveyed liked having the option to catch and release but would not be in favor of a lottery style draw for paddlefish tags.

Paddlefish tags were required to fish for paddlefish statewide beginning in 1992. From 1992 to 2002 paddlefish tags were not available through the automated licensing system. In 2003 tags became available through the automated licensing system and record of tag sales for individual tags (yellow tag – Yellowstone and Lower Missouri River, white tag – Upper Missouri River, blue tag – Missouri River Dredge Cuts Archery) became available. Analysis of tag sales for the Lower Missouri and Yellowstone River (yellow tag) demonstrate a declining trend over the period 2003-2012 (Figure 2). Tag sales for the Lower Yellowstone paddlefish fishery were higher in the periods prior to the last bundle of regulation changes in 2007 than from 2007 to 2012 (Figure 3). Mean tag sales were calculated and analyzed by period to determine if regulation changes have contributed to declines in tag sales. From 1981 to 1992 the only tags sold were for the Lower Yellowstone River, and anglers could get two tags per year. During this period fishing on the Missouri required no tags and was only restricted to a bag limit of one fish daily and two in possession. Tags first became required statewide in 1992. In 1996 a harvest cap was placed on the Lower Yellowstone and Lower Missouri fishery and catch and release was allowed on Wednesdays and Sundays from 3pm to 9pm. In the period from 2003 to 2006 tags good for the Lower Yellowstone River were also good on the Lower Missouri, anglers could catch two fish per year, and the harvest cap was reduced to 1000 fish. The last bundle of regulation changes came in 2007 including elimination of night fishing, a split season structure for harvest and catch and release, and a one fish limit. Analysis of variance of tag sales by

period (1981-1992, 2003-2006, and 2007-2012) demonstrates that tag sales are significantly lower for the period 2007-2012 than the previous periods (1981-1992, 2003-2006), (ANOVA: $F = 31.39$, $P < 0.0001$). Monitoring tag sales for this paddlefish population in Montana demonstrates license sales have responded to management of the Intake fishery and reinforces a continued need to strive for ways to increase angler satisfaction while taking biologically necessary measures to maintain a healthy Yellowstone/Sakakawea paddlefish stock.

The change to harvest days and catch and release days in 2007 sought to maintain opportunity without increasing harvest. Phone creel results demonstrate anglers have responded to the increased catch and release fishing opportunity that has been available three days a week since 2007 (Figure 4). The results of the 2012 phone creel demonstrate reduced participation in catch and release fishing for the second year in a row. An estimated 14.4% of anglers participated in catch and release fishing in 2012 and landed 779 paddlefish at a rate of 0.42 paddlefish caught per angler day (Skaar 2012, Appendix A). Catch and release fishing has provided an opportunity for FWP staff to tag angler caught paddlefish at Intake FAS three days a week since 2007. During catch and release fishing at Intake FAS in 2012 FWP staff tagged 103 paddlefish well below the 20 year annual average of 474 tagged paddlefish (Figure 5).

Analysis of harvested paddlefish in 2012 resulted in a PSD value of 100, and high values for PSD-P and PSD-M (Figure 6). These results are not surprising given the selectivity of angling gear for larger fish, and time and location of survey targeting spawning individuals. Data indicate that when compared to a standard length index for paddlefish across their range, Yellowstone/Sakakawea stock are available in good numbers with trophy potential. A regression of relative weight against length gave a similar indication of the size distribution of the Yellowstone/Sakakawea stock compared to other populations across the range (Figure 7). Fish collected at Intake FAS demonstrated condition factor at or just slightly below other populations.

The 1995 year class continues to be the cohort providing the largest percentage of harvested paddlefish in 2012 (aging data, Scarneccia et. al 2006, Scarnecchia 2010 A). Mean length and weight has been steady over the last 10 years while the exceptional 1995 year class males have skewed the sex ratio toward male (Figure 9). These male fish from the 1995 year class began showing up in dominant numbers in 2005, at age ten upon reaching sexual maturity (Rehwinkel 1978; Carlson and Bonislawsky 1981). The sex ratio is shifting back toward a one to one ratio now that the 1995 year class females are becoming sexual mature and represented in spawning runs (Rehwinkel 1978; Carlson and Bonislawsky 1981). Population estimates for the Yellowstone/Sakakawea stock developed by Dr. Dennis Scarnecchia of the University of Idaho using tagging information from Montana and North Dakota have been consistent over the last 10 years with an average population estimate of 34,000 paddlefish (Figure 9). The female component of the 1995 year class will continue to provide more recruitment to the adult population than the current harvest level but once the 1995 year class is fully recruited regulations may need to be changed if another strong year class is not identified. A strong class of young-of-the-year (YOY) fish were documented during reservoir transects in 2011 (Fred Ryckman, personal communication). Numbers were comparable to the mid to late 1990's counts and half as much as observed in 2008 counts. Size and condition of YOY fish was lacking (Fred Ryckman, personal communication). Sakakawea transects in 2012 suggested that little reproduction occurred in 2012 but yearling fish from the 2011 year class were abundant, demonstrating a high level of survival in spite of poor condition going into the winter of 2011/2012. While the 2011 cohort is the most recent year class that offers some promise of

future contribution to the population, history has demonstrated that identification of successful reproduction has not consistently resulted in recruitment of sexually mature fish to the adult population.

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Waters Referred to: Yellowstone River Sec. 1 21-1350-02

Key Words:	Catch and release	Paddlefish caviar
	Harvest	Phone creel survey
	Paddlefish sex ratio	Paddlefish tagging

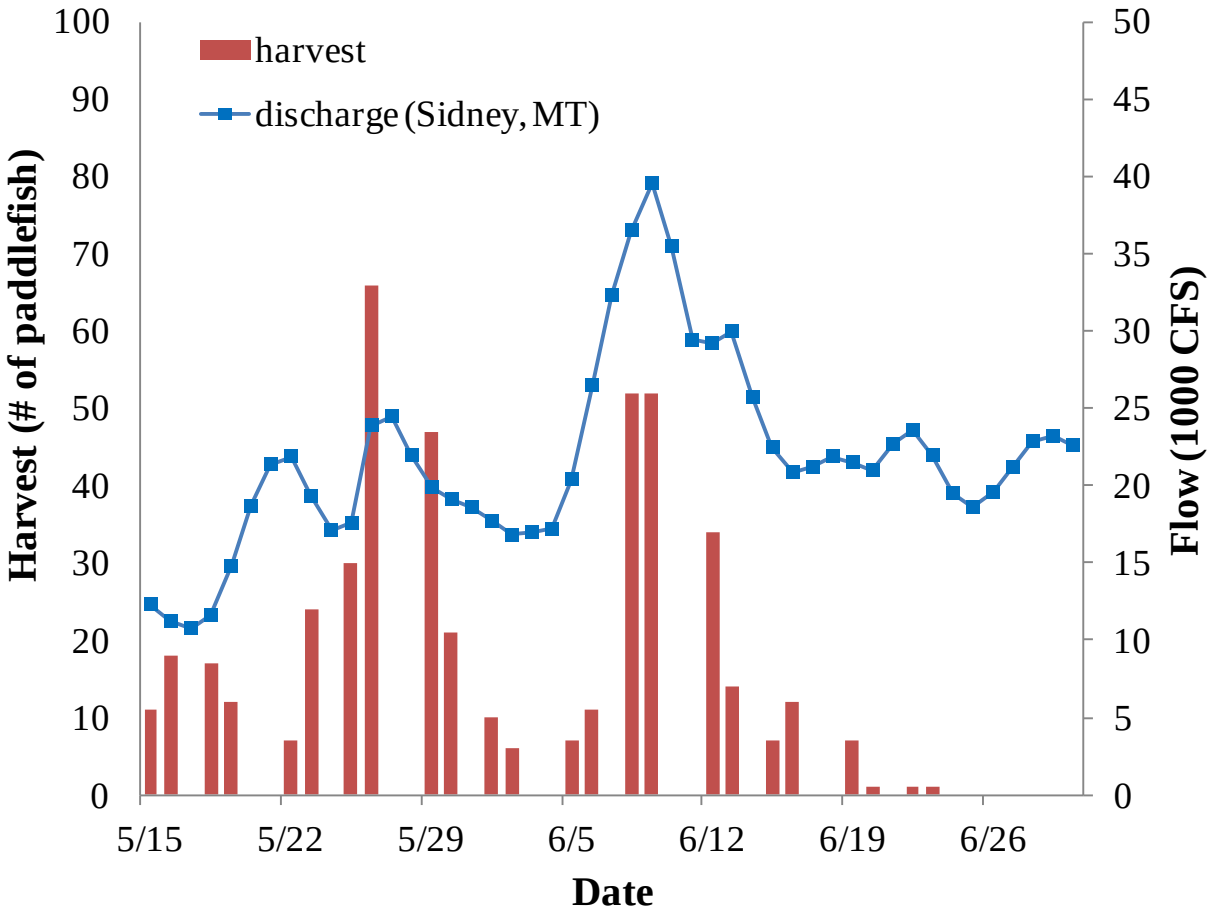

Figure 1. Observed paddlefish harvest in number of fish and Yellowstone River discharge (1000 cfs) recorded at the USGS gauging station at Sidney, MT by day over the 2012 paddlefish season

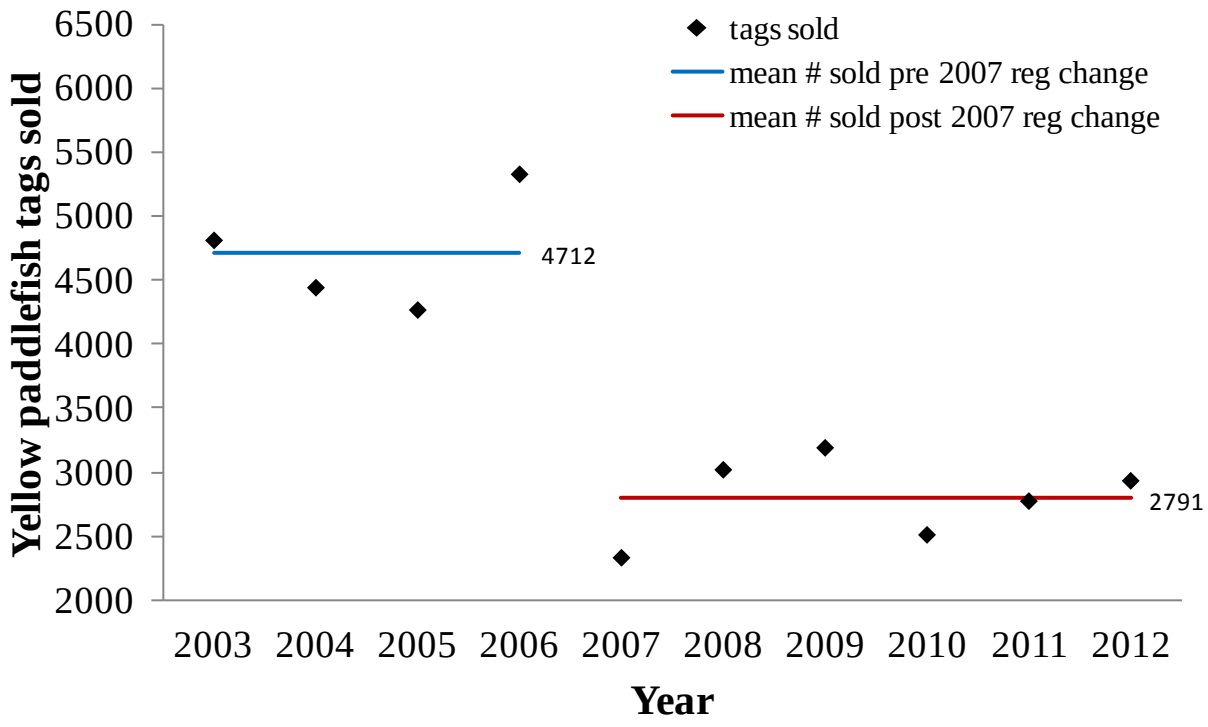

Figure 2. Paddlefish tags sold for the Lower Missouri River and Yellowstone River in Montana by year from 2003 to 2012.

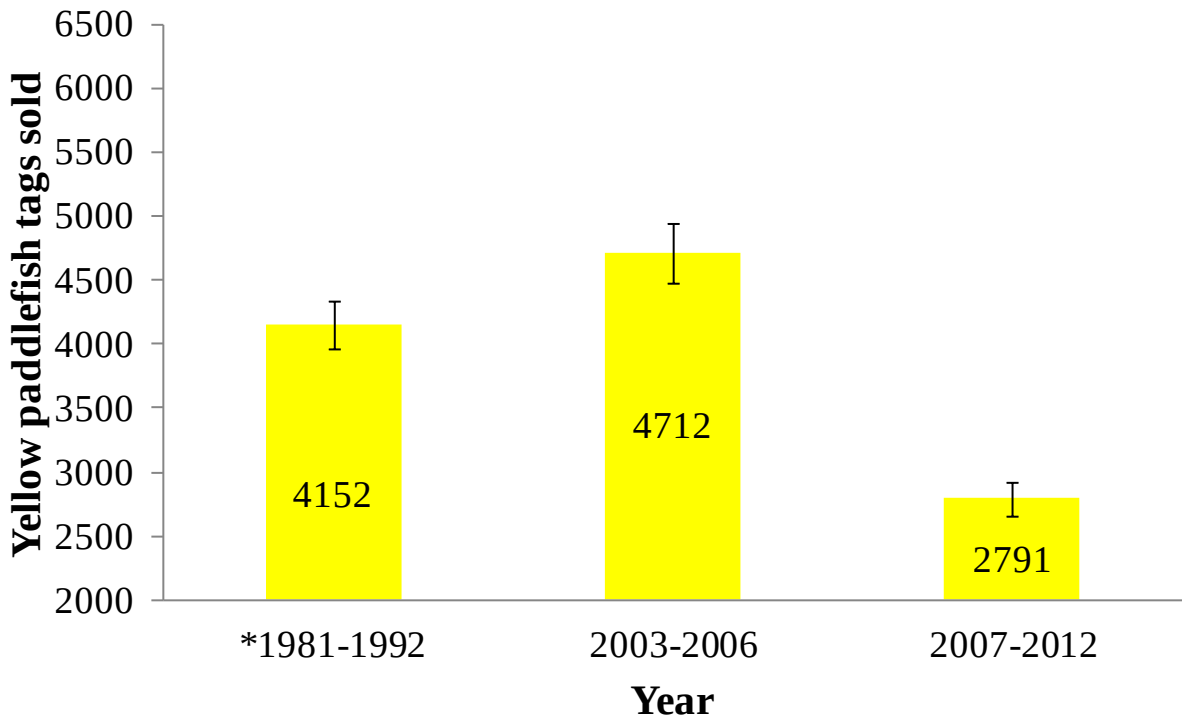

Figure 3. Mean paddlefish tags sold with standard error bars for the Lower Missouri River and Yellowstone River in Montana by period.
*From 1981 to 1992 tags were only required on Lower Yellowstone, and an angler could get two tags per year. The Missouri River allowed 1 daily and two in posession year round.

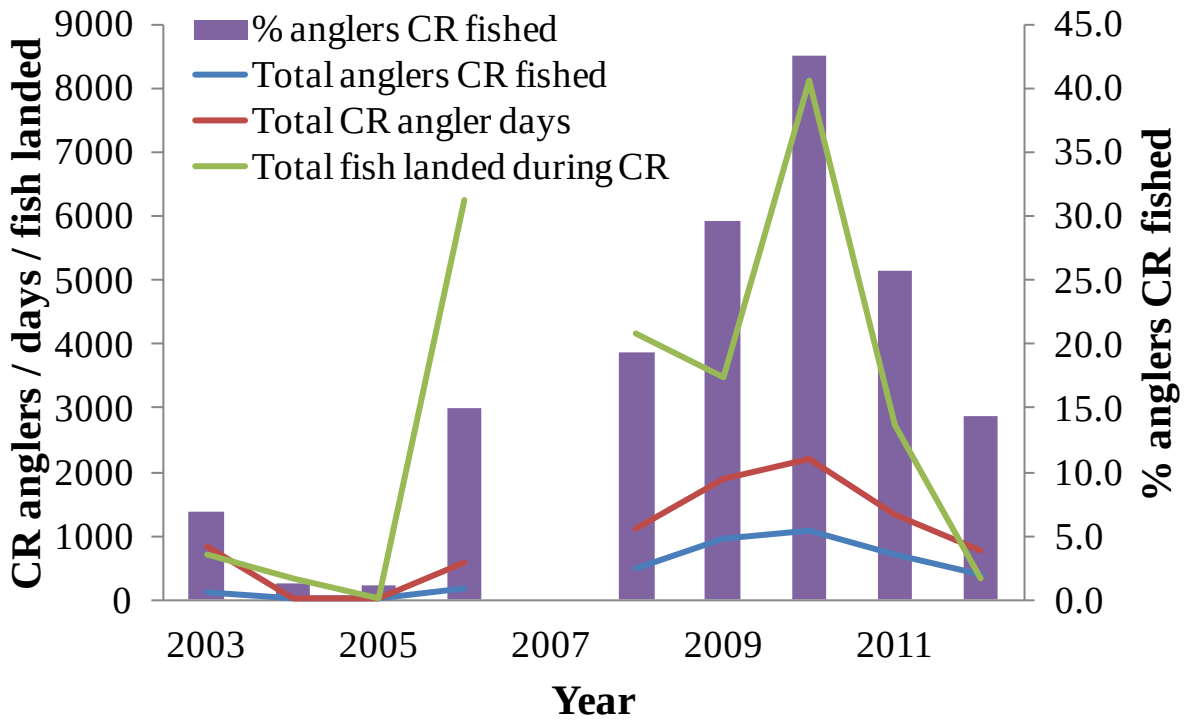

Figure 4. Phone creel catch and release data by year including anglers fished, angler days, total fish landed and percent anglers participating in catch and release for paddlefish of the Lower Missouri River and Yellowstone River in Montana during 2012 season.

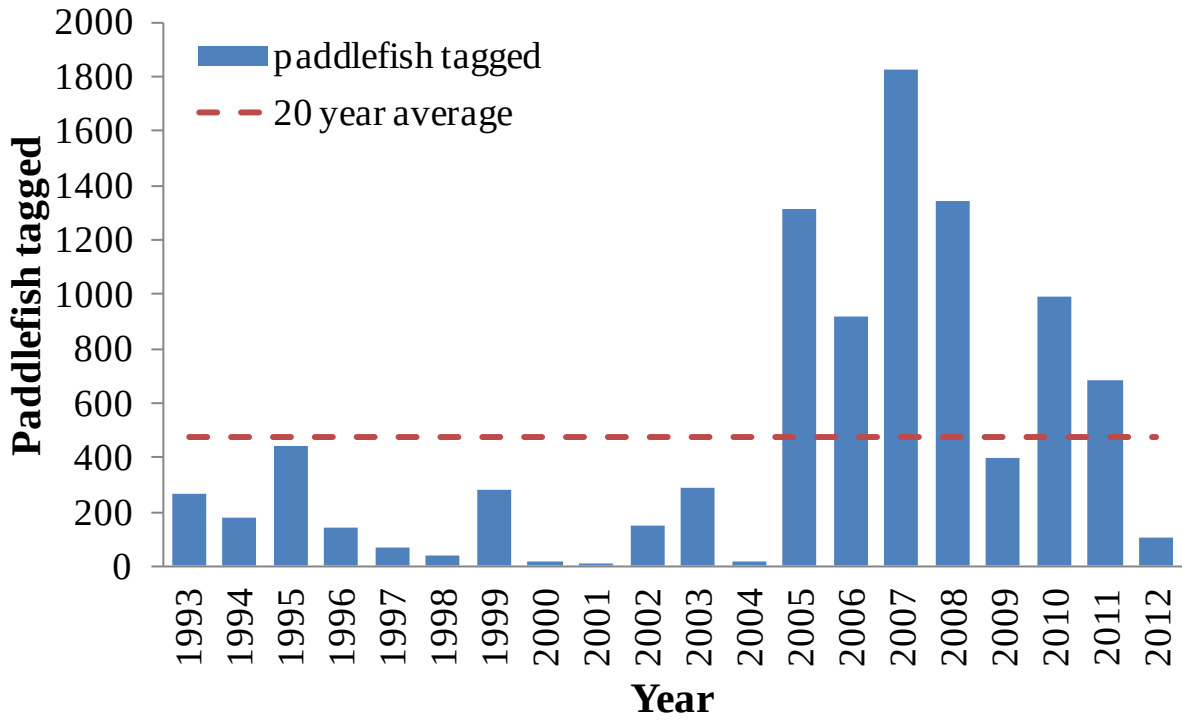

Figure 5. Number of paddlefish tagged by year, catch and release opportunity has been available since 1995, 3 days of catch and release only fishing has been available since 2007.

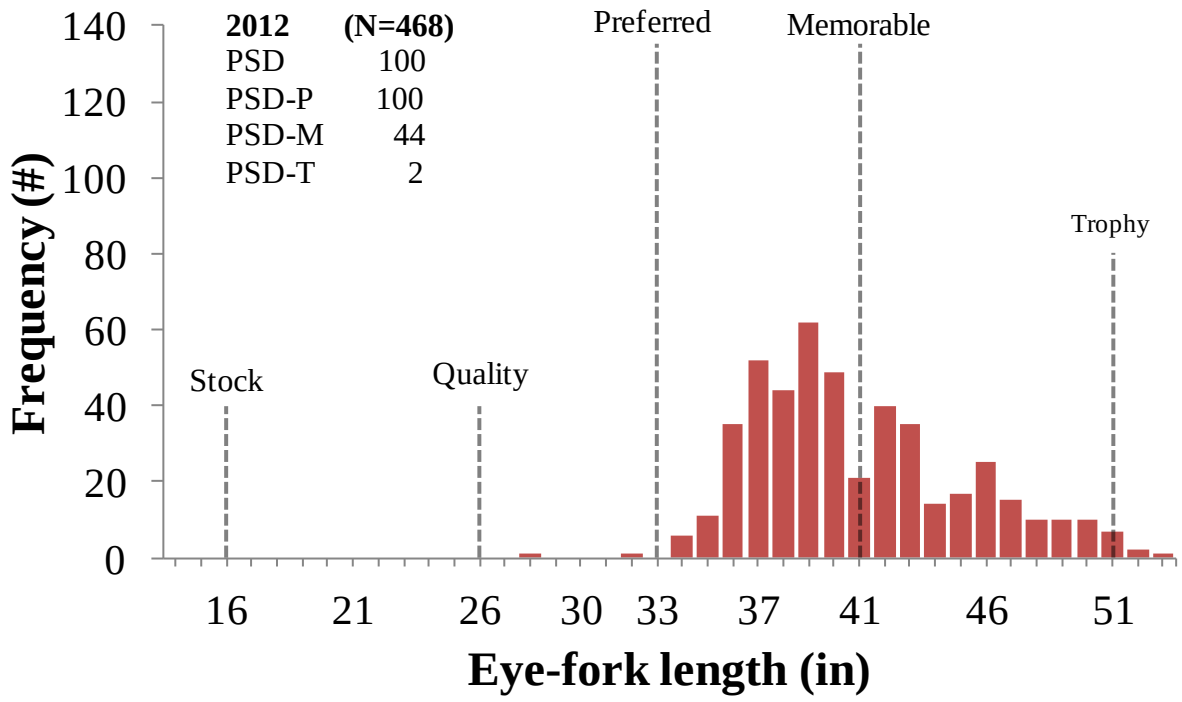

Figure 6. Length frequency histogram of Lower Missouri River and Yellowstone River paddlefish harvested in Montana during 2012 season, including proportional size distribution results

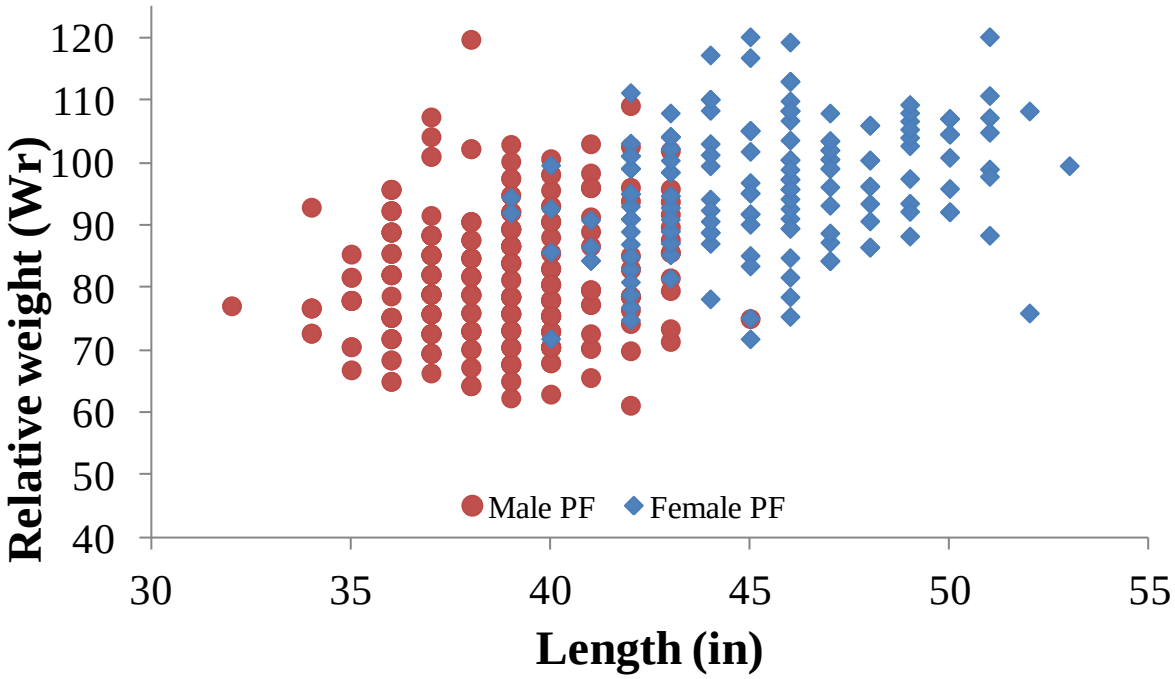

Figure 7. Relative weight by length (in) of Lower Missouri River and Yellowstone River paddlefish harvested in Montana during 2012 season.

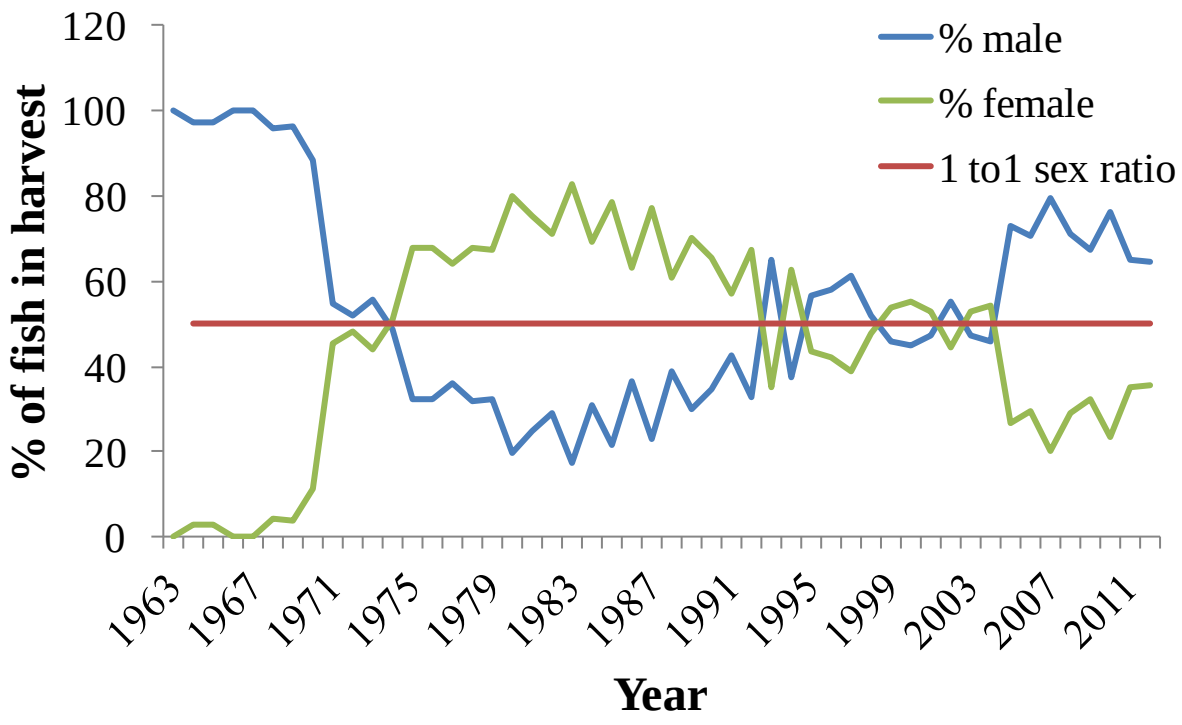

Figure 8. Percent of males and females by year in Lower Missouri River and Yellowstone River paddlefish harvest in Montana during 2012 season.

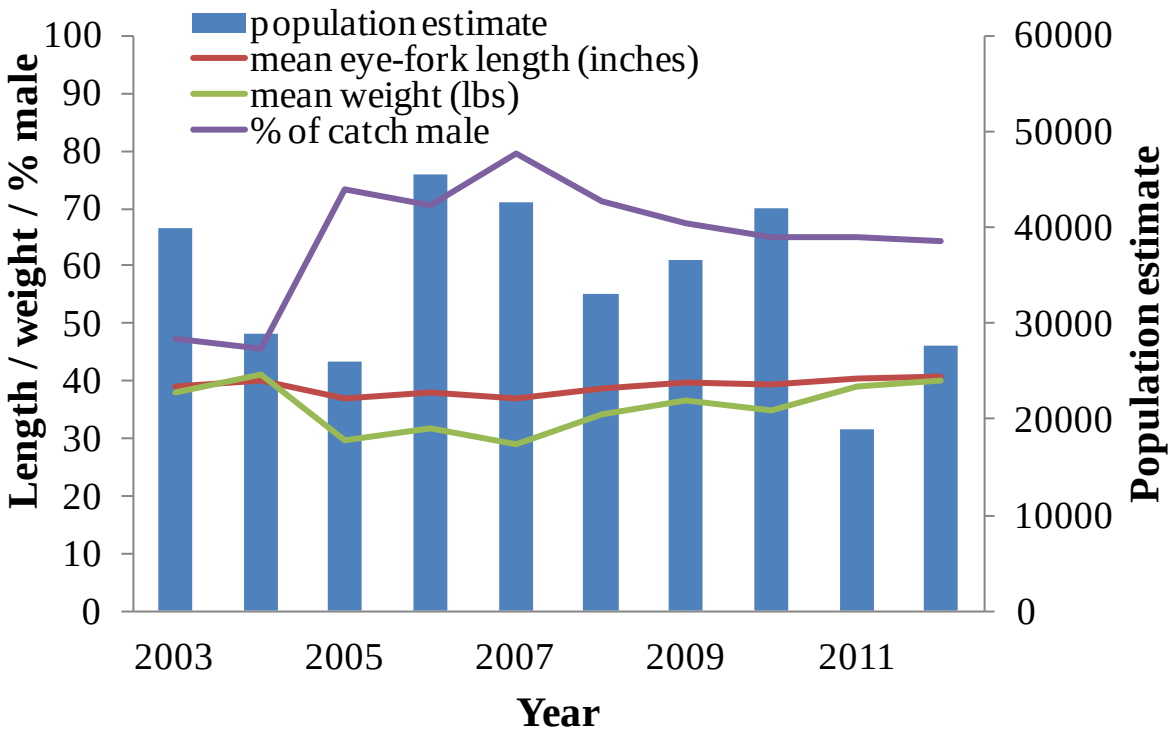

Figure 9. Phone creel catch and release data by year including anglers fished, angler days, total fish landed and percent anglers participating in catch and release for paddlefish of the Lower Missouri River and Yellowstone River in Montana during 2012 season.

APPENDIX A

Paddlefish – 2012 – Yellowstone River

January 29, 2013

Number of tags Sold	2,931
Number sampled	1,026
Number respondents	634
Response rate	634/1,026 = 61.7%
Percent fished	489/634 = 77.1%
Percent fished on Yellowstone	472/489 = 96.5%
Percent fished on Missouri	22/489 = 4.5%
Anglers Fished	(.771)(2,931) = **2,261 anglers**
Fish harvested	(2,261)(.265) = **599 paddlefish**
Average days fished to harvest	338/129 = 2.62
Average days fished not harvest	975/365 = 2.67
Total Angler Days	(2.69)(2,261) = **6,070 days**
Catch rate (harvested fish)	129/1313 = **0.098 pf/day**
Percent cleaned at chamber	98/121 = **81.0%**
Catch and Release Fishing	
Percent anglers c/r fishing	68/472 = **14.4%**
Total anglers c/r fishing	(.965)(.144)(2,931) = **408 anglers**
Average days c/r fishing	130/68 = 1.91 days
Total days c/r fishing	(1.91)(408) = **779 days**
Average number of fish landed	55/68 = 0.81 pf/angler
Total fish landed	(0.81)(408) = **330 paddlefish**
Catch rate c/r fishing	55/130 = **0.42 pf/day**
Percent anglers purchasing a tribal permit	5.9% (n=18)

APPENDIX B

Number of anglers purchasing Montana paddlefish tags

	Total Tag sales				Yellowstone/Lower Missouri River Tag Sales			
Year	Total	Resident	Nonresident	% Nonresident	Total	Resident	Nonresident	% Nonresident
2012					2931			
2011					2772			
2010					2508			
2009	5308	4370	938	18	3189	2430	759	24
2008	5301	4344	957	18	3017	2239	778	26
2007	4810	4061	749	16	2329	1809	520	22
2006	6910	6022	888	13	5329	4496	833	16
2005	6596	5833	763	12	4267	3691	576	13
2004	6920	6032	888	13	4442	3759	683	15
2003	7366	6363	1003	14	4812	4020	792	16
2002	5901	5002	899	15				
2001	4524	3770	754	17				
2000	6056	4859	1197	20				
1999	6785	5522	1263	19				
1998	6051	5004	1047	17				
1997	6169	4930	1239	20				
1996	6787	5495	1292	19				
1995	6544	5495	1049	16				
1994	4065	3237	828	20				
1993	5577	4194	1383	25				
1992	4779	3503	1276	27				
1991	4438	3021	1417	32				
1990	3960	2826	1134	29				
1989	4255	3081	1174	28				
1988	3526	2620	906	26				
1987	2877	2182	695	24				
1986	3696	2661	1035	28				
1985	3593							
1984	5063							
1983	4636							
1982	4834							
1981	4166							

Notes: Tags were free in 1981.

Resident and nonresident tag sales were calculated separately beginning in 1986.

Previous to 1992 tags were required only for the Yellowstone River paddlefish snagging.

Beginning in 1992 tags were required statewide.

Paddlefish tags were added to the automated licensing system in 2003, allowing sales of Lower Yellowstone River and Lower Missouri River tags to be separated from Upper Missouri River tags

Prior to 2007, the Yellowstone/Lower Missouri River tag could also be used on the Upper Missouri River.

APPENDIX C

Summary of paddlefish tagging and tag returns 1964-2012

Year	Number Tagged	Number Returned In 2011	Total Number Returned	Percentage Returned
1964-1970	1703	0	279	16.4
1971-1980	3242	0	812	25.0
1984	551	0	250	45.4
1985	2	0	2	100.0
1986	153	0	47	30.7
1988	156	0	67	42.9
1989	10	0	4	40.0
1990	153	0	49	32.0
1991	20	0	8	40.0
1992	221	0	82	37.1
1993	268	0	61	22.8
1994	180	0	61	33.9
1995	442	1	180	40.7
1996	139	1	63	45.3
1997	70	0	28	40.0
1998	42	0	12	28.6
1999	281	0	90	32.0
2000	20	0	5	25.0
2001	7	0	2	28.6
2002	145	0	58	40.0
2003	282	2	79	28.0
2004	20	0	6	30.0
2005	1321	6	242	18.3
2006	921	19	140	15.2
2007	1825	17	201	11.0
2008	1344	14	153	11.4
2009	398	3	48	12.1
2010	992	28	59	5.9
2011	682	10	27	4.0
2012	103	7	7	6.8
Totals	15693	108	3122	19.9

Note: Most fish tagged at Intake or within a few miles downstream of Intake.

APPENDIX D

Summary of paddlefish average length and weight, by sex, from angler catch at Intake, Yellowstone River, 1963-2012

Year	Male N	Male Mean EF Length (in)	Male Mean weight (lbs)	Female N	Female Mean EF Length (in)	Female Mean Weight (lbs)
1963	46		29.6			
1964	28		21.2			
1967	123		21.8			
1968				6		42.3
1970	620		26.3			
1971	620		25.7	516		52.6
1972	869		23.5	809		53.4
1974	932		24.4	978		55.4
1976	303		25.9	637		60.2
1978	259		30.0	550		66.0
1979	207		25.0	430		61.6
1981	630	37.6	27.8	1898	44.5	53.0
1982	577	36.9	24.4	1427	44.8	53.8
1983	244	36.7	25.8	1156	44.0	55.3
1984	832	37.6	24.0	1859	44.7	52.9
1985	134	36.0	24.2	494	44.6	53.4
1986	537	36.7	24.7	925	45.0	54.7
1987	322	36.1	25.6	1090	45.0	56.8
1988	695	36.6	25.5	1085	44.9	55.0
1989	475	36.7	24.8	1108	45.3	56.9
1990	516	36.3	23.8	977	45.4	57.1
1991	1080	36.1	24.9	1462	45.6	60.3
1992	214	36.1	24.7	451	46.1	60.2
1993	1076	36.4	25.2	583	45.4	58.6
1994	115	36.0	25.9	194	45.8	60.1
1995	815	35.0	23.5	631	45.3	59.2
1996	649	34.7	24.0	471	46.0	62.3
1997	488	35.9	24.8	309	45.6	59.5
1998	300	36.7	24.0	278	46.2	59.5
1999	619	36.5	24.9	726	45.4	58.5
2000	242	36.2	25.2	299	45.7	60.0
2001	162	37.8	27.2	182	45.5	57.0
2002	395	36.7	24.2	318	45.1	56.4
2003	392	34.1	20.6	439	43.6	53.8
2004	100	34.6	22.0	120	44.6	57.3
2005	768	34.4	21.1	281	44.2	54.1
2006	844	34.7	21.8	350	44.5	56.0
2007	691	35.3	22.3	176	44.4	55.2
2008	672	36.3	24.9	274	44.8	56.7
2009	540	36.7	25.6	260	45.6	59.7
2010	627	37.5	28.1	194	44.8	56.9
2011	463	37.8	28.5	250	44.8	58.7
2012	301	38.5	29.2	166	45.3	60.0

APPENDIX E

Summary of Paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1981-2012

Year	Number of fish measured	Eye-Fork Length (in)	Weight (lbs)
1981	2528	42.8	46.7
1982	2004	42.4	45.1
1983	1400	42.8	50.2
1984	2691	42.5	44
1985	628	42.8	47.2
1986	1462	41.9	43.7
1987	1412	43	49.7
1988	1780	41.7	43.5
1989	1583	42.7	47
1990	1493	42.2	45.6
1991	2558	41.5	45
1992	670	42.8	48.7
1993	1659	39.6	36.9
1994	309	42.1	47.4
1995	1448	39.5	39.1
1996	1120	39.4	40.1
1997	797	39.6	38.2
1998	580	41.2	41
1999	1345	41.3	43
2000	541	41.5	44.4
2001	344	41.9	43
2002	713	40.4	38.5
2003	831	39.1	38.1
2004	221	40	41.2
2005	1051	36.9	29.8
2006	1194	37.6	31.8
2007	867	37.1	28.9
2008	946	38.7	34.1
2009	800	39.6	36.7
2010	821	39.2	34.9
2011	713	40.3	39.1
2012	467	40.9	40.1

*based on 62 measurements

**based on 131 measurements

Note: For measurements from 1964-1980 see progress reports prior to 2009