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-12

PROJECT PERIOD: July 1, 2011 through June 30, 2012

REPORT PERIOD: April 1, 2011 through March 30, 2012

ABSTRACT:

The Yellowstone River experienced record flow in the spring and early summer of 2011. A regional rain event prior to the opener of paddlefish season provided a 60,000 cubic feet per second (CFS) pulse that brought fish up the Yellowstone River (USGS gauge at Sidney, MT). Flow was 28,100 at the start of the paddlefish season on May 15, 2011 and peaked at 121,000 CFS on May 25, 2011. Paddlefish harvest was allowed on Tuesday, Wednesday, Friday and Saturday during 2011. Catch-and-release fishing only was allowed on Sunday, Monday and Thursday. Paddlefish catches were 50-100 fish/day the first four harvest days with 37% caught at sites downstream of Intake Fishing Access Site (FAS). Intake FAS and catch and release fishing were closed from May 23 to June 2 because elevated flows flooded the site and caused safety concerns. Intake re-opened June 3 and remained open for five additional harvest days before the season was closed at Intake FAS on June 10 after nine harvest days. An estimated 949 paddlefish were harvested from the Yellowstone/Sakakawea population in Montana during 2011. Fish, Wildlife & Parks (FWP) staff tagged 682 paddlefish with jaw tags during catch-and-release fishing. Catch and release fishing ended June 20, 2011.

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). They 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 main stem below the confluence and some continue up the lower Yellowstone River below Intake Diversion dam and the Missouri River below Ft. Peck dam. 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 fish. 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). Since 1995, there have been mandatory catch and release periods for paddlefish at Intake, MT. Catch and release fishing provides additional angling opportunity without increasing harvest and provides FWP personnel opportunity to measure and tag paddlefish for population estimates (Scarnecchia and Stewart 1997).

In Montana, the harvest of paddlefish at Intake FAS is closed instantaneously when FWP staff estimates that harvest is approaching the 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 6 a.m. to 9 p.m.

The 2011 paddlefish season was the fifth season under new regulations aimed at facilitating more efficient season closure and combating the crowding problems caused by meeting the harvest cap in progressively less time. Objectives for the 2011 season were as follows: 1) keep harvest under the 1000 fish 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 infer information about size distribution, condition, sex ratio, and population size. FWP staff also tracked the number of harvested paddlefish caught at Intake FAS and those caught downstream that are brought to be cleaned by the Chamber of Commerce in order to close the harvest season before the cap is exceeded. In previous years, FWP staff did not close harvest until 800 fish were counted at Intake FAS assuming off-site harvest comprised less than 20% of the total. In 2011, because off-site harvest was exceeding the built in buffer and site closures caused staff to lose track of harvest for a period of 11 days, all fish harvested at Intake FAS and voluntarily brought to the cleaning station by anglers, as well as warden checked fish off-site were used in calculating the current number of fish harvested.

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 was conducted in 2011 to obtain harvest numbers for the Yellowstone/Sakakawea paddlefish population. The seven question phone creel included questions about angler harvest, angler effort, participation in catch and release fishing and use of Glendive Chamber of Commerce fish cleaning services. This 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).

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:

Paddlefish harvest opened on the descending limb of a 60,000 CFS pulse in the Yellowstone River caused by a regional rain event (USGS gauge at Sidney, MT). The flow pulse was a spawning cue and as a result paddlefish migrated into the Lower Yellowstone River. Catch rates were 50-100 fish per day during the first four harvest days with 37% caught at sites downstream of Intake FAS (Figure 1). Catch rates increased as the hydrograph began to rise due to another regional rain event. On May 23rd Intake FAS was closed at 104,000 CFS because flooding threatened angler safety. All Yellowstone River FAS's were closed on May 24th due to safety concerns. Flow peaked at 121,000 CFS on May 25, 2011. Most FAS's re-opened fairly quickly but Intake FAS remained closed until June 3rd. Harvest averaged 77 fish per day after Intake FAS re-opened with only 8% coming from downstream sites (Figure 1). A decision was made by FWP staff, the FWP commission, and agreed upon by the Glendive Chamber of Commerce to instantaneously close the harvest season at Intake after 740 paddlefish were known to have been harvested. Closing at 740 known harvested fish, including fish harvested away from Intake FAS, was an adaptive management decision in response to an above average harvest rate at sites downstream of Intake FAS during the first four days of season and an unknown amount of harvest during 6 harvest days when FWP sites were closed to the public. Paddlefish harvest was closed at Intake FAS on the ninth harvest day (June 10). The Yellowstone/Sakakawea telephone creel estimated harvest at 949 paddlefish for 2011 (Skaar 2011, Appendix A). The phone creel result suggests that onsite adaptive management allowed FWP staff to keep harvest under the 1000 fish harvest cap.

The 2011 paddlefish season was the fifth season under regulations designed to keep harvest under 1000 fish, while spreading out harvest in attempt to increase fishing opportunity without increasing harvest. Regulation changes alone have not satisfied all objectives with the harvest cap exceeded in 2008 and 2010. There have been minor gains in dispersing harvest and staying under the harvest cap. Angler use has continued to be strong in spite of the intense nature of the short seasons. An estimated 2,885 anglers participated in the 2011 paddlefish season on the Lower Missouri and Yellowstone Rivers, generating 4,861 angler days (Skaar 2011, Appendix A). An estimated 84.6% of fish harvested were cleaned by the Glendive Chamber of Commerce (Skaar 2011, Appendix A).

Total paddlefish tag sales for the state of Montana have been steadily increasing from 1981-2011 (Appendix B). Long-term data suggests that reduction in the harvest cap and progression towards crowded and intense paddlefish seasons has not curbed angler use and desire to participate and purchase a tag. Analysis of tag sales for the Lower Missouri and Yellowstone River demonstrate a slightly declining trend from 2003-2011 (Figure 2). The upward trend of total paddlefish tag sales in Montana but declining trend in lower Missouri/Yellowstone tag sales supports the need to strive for ways to increase angler satisfaction while preserving this population.

Separating harvest days and catch and release days has been the greatest success of the regulation changes implemented in 2007 and satisfies the objective to increase opportunity without increasing harvest. The results of the 2010 phone creel demonstrate the expanded opportunity created by catch and release fishing days. In the 2011 phone creel catch and release

numbers were down in 2011 but this is more likely a reflection of the loss of 5 catch and release days while Intake FAS was closed than a decline in catch and release interest. An estimated 25.7% of anglers participated in catch and release fishing in 2011 and landed 2,738 paddlefish at a rate of 2.0 paddlefish caught per angler day (Skaar 2011, Appendix A). During catch and release fishing at Intake FAS in 2011 FWP staff tagged 682 paddlefish. Catch and release fishing has allowed more paddlefish to be tagged than was possible through past sampling techniques (Figure 3).

Analysis of harvested paddlefish in 2011 resulted in a PSD value of 99.9, and high values for PSD-P and PSD-M (Figure 4). 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 6). Fish collected at Intake FAS demonstrated condition factor at or just slightly below other populations across the range.

The current strong year class continues to be the 1995 year class, accounting for roughly half of the harvested paddlefish in 2010 (aging data, Scarneccia et. al 2006, Scarnecchia 2010 A). Analysis of sex of harvested paddlefish continues to demonstrate male dominance in the sexually mature paddlefish population (Figure 5, Appendix D). These male fish from the 1995 year class began showing up in dominant numbers in 2005, at the generally accepted age of 10 for maturity in male paddlefish (Rehwinkel 1978; Carlson and Bonislawsky 1981). The sex ratio should be shifting toward female dominance in future years as 1995 year class females recruit to sexual maturity and become better 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 suggests that more fish were recruited to the sexually mature portion of the population than were harvested from it in 2010 (Scarnecchia 2010 B). 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. After a historic water year in the Missouri River system and with a full reservoir North Dakota Game and Fish Department found high numbers of young-of-the-year (YOY) fish during reservoir transects (Fred Ryckman, personal communication). Numbers were comparable to the mid to late 1990's counts and half as much as found in 2008 counts. Size and condition of YOY fish was lacking (Fred Ryckman, personal communication). History has demonstrated that identification of successful reproduction has not consistently resulted in recruitment of sexually mature fish to the 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

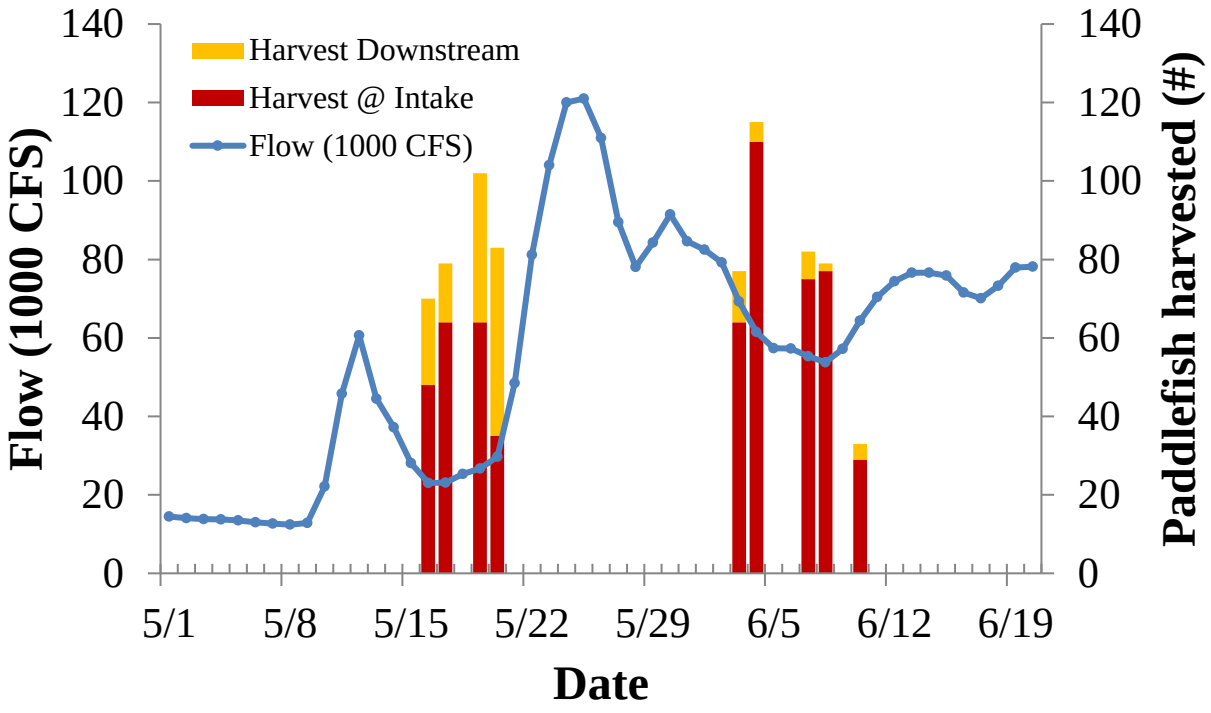

Figure 1. Observed paddlefish harvest in number of fish and Yellowstone River discharge (1000 cfs) recorded at the USGS gauging station at Sidney, MT by day over the 2011 paddlefish season

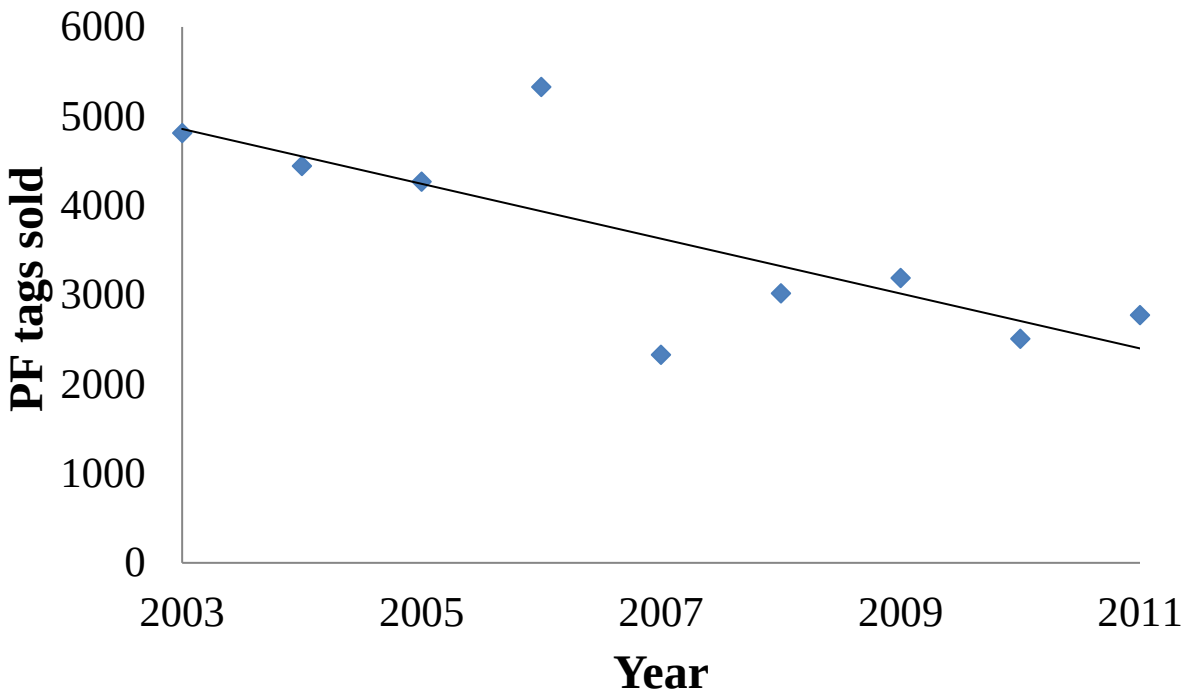

Figure 2. Paddlefish tags sold for the Lower Missouri River and Yellowstone River in Montana by year from 2003 to 2011

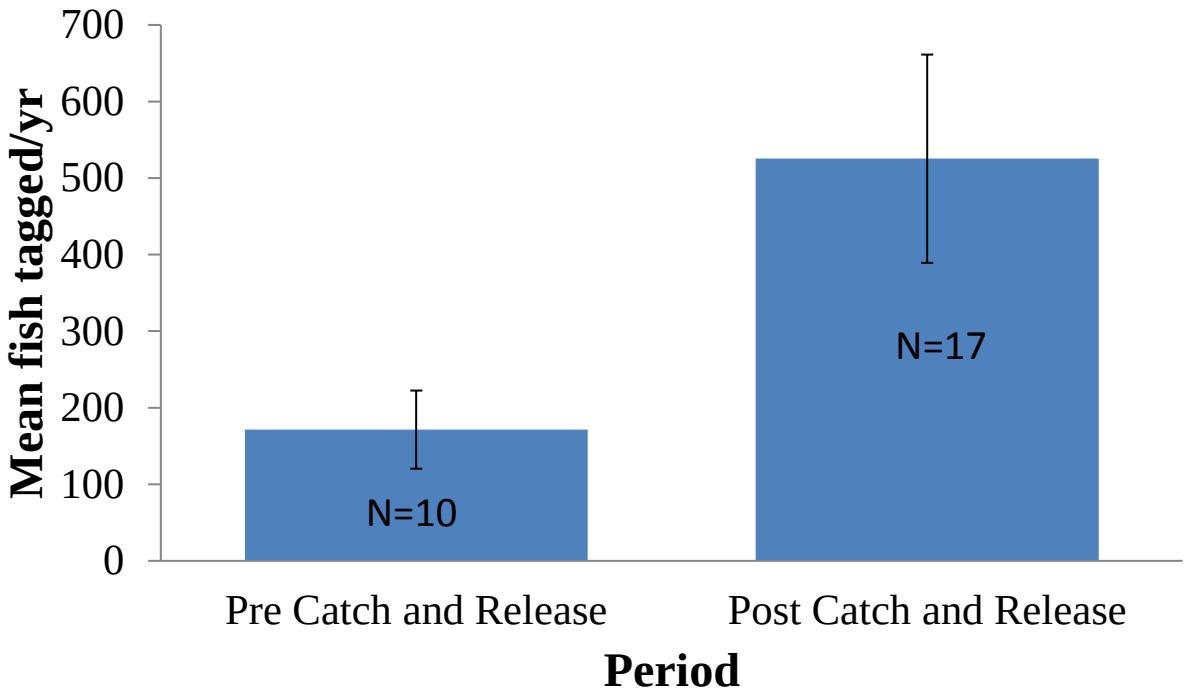

Figure 3. Mean number of paddlefish tagged per year by tagging period, pre-catch and release tagging years date from 1984-1994 and post-catch and release tagging years date from 1995-2011, no fish were tagged in 1987

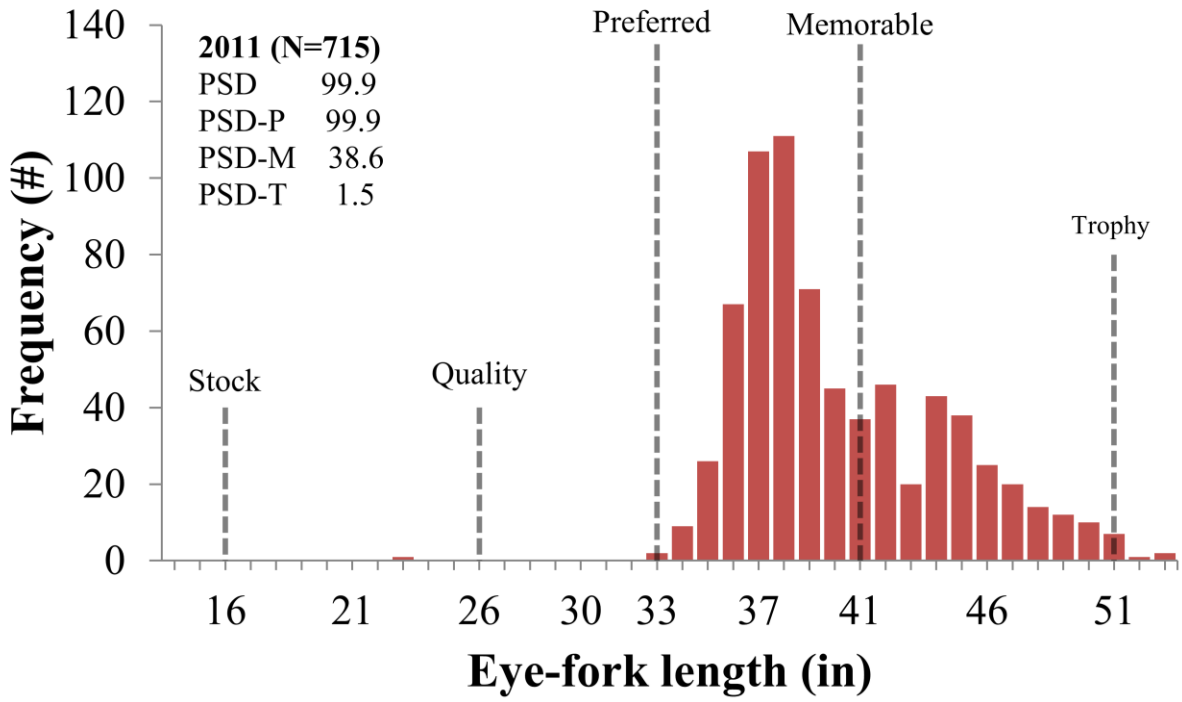

Figure 4. Length frequency histogram of Lower Missouri River and Yellowstone River paddlefish harvested in Montana during 2011 season, including proportional size distribution results

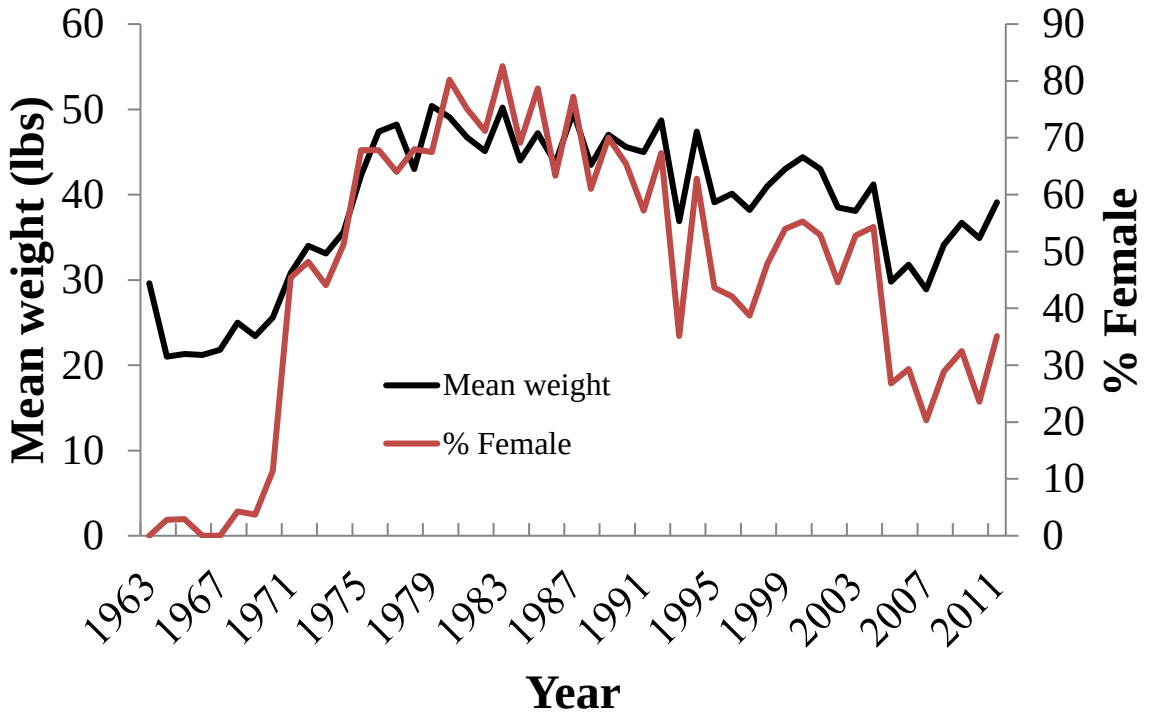

Figure 5. Mean weight (lbs) and % female of paddlefish harvested at Intake, Yellowstone River, MT 1963-2011

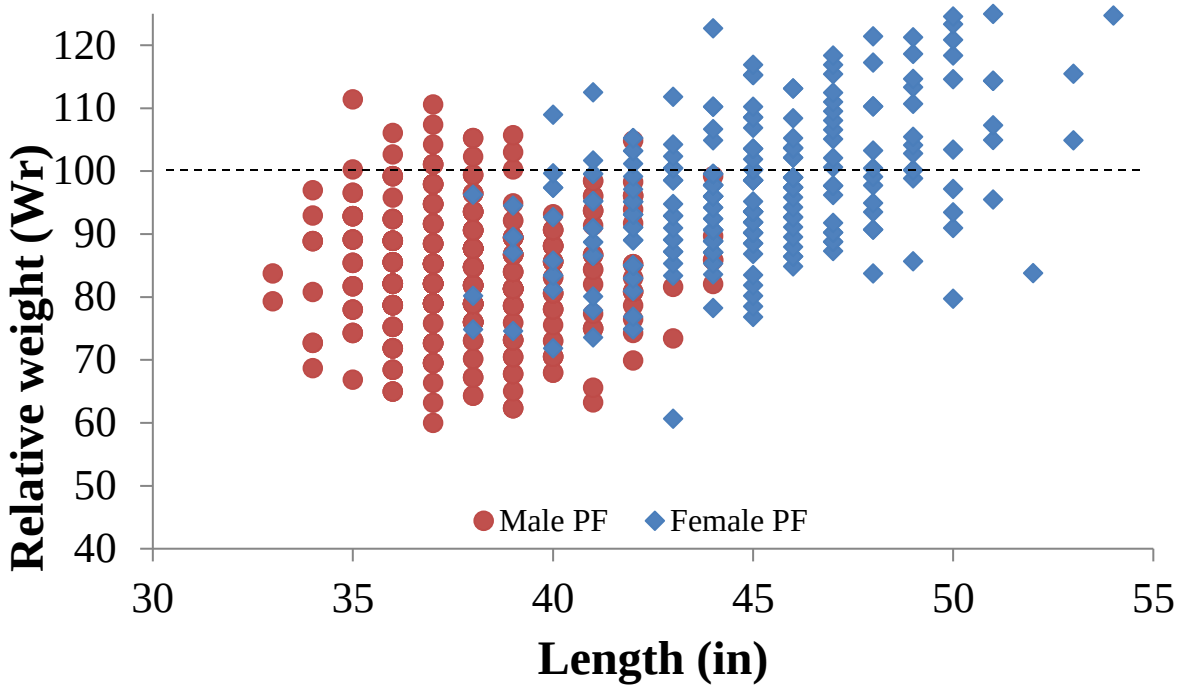

Figure 6. Relative weight by length (in) of Lower Missouri River and Yellowstone River paddlefish harvested in Montana during 2011 season, dashed line indicates the average relative weight for paddlefish throughout their distribution

APPENDIX A

Paddlefish – 2011 – Yellowstone River February 13, 2012 Don Skaar

Number of tags Sold	2,772
Number sampled	971
Number respondents	616
Response rate	616/ 971 = 63.4%
Percent fished	78.4%
Percent fished on Yellowstone	476/486 = 97.9%
Percent fished on Missouri	10/486 = 2.1%
Anglers Fished	(.784)(2,772) = **2,173 anglers**
Fish harvested	(2,173)(.4368) = **949 paddlefish**
Average days fished to harvest	356/211 = 1.687
Average days fished not harvest	430/275 = 1.564
Total Angler Days	(1.627)(2,173) = **3,535 days**
Catch rate (Total days)	949/3,535 = **0.268 pf/day**
Percent cleaned at chamber	**84.6%**

Catch and Release Fishing

Percent anglers c/r fishing	25.7%
Total anglers c/r fishing	(.257)(2,772) = **712 anglers**
Average days c/r fishing	231/124 = 1.86 days
Total days c/r fishing	(1.86)(712) = **1,326 days**
Average number of fish landed	477/124 = 3.846 pf/angler
Total fish landed	(3.846)(712) = **2,738 paddlefish**
Catch rate c/r fishing	2,738 / 1,326 = **2.065 pf/day**
Percent anglers purchasing a tribal permit	20% (n=10)

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
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 1964-2011

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	0	179	40.5
1996	139	0	62	44.6
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	2	58	40.0
2003	282	3	77	27.3
2004	20	0	6	30.0
2005	1321	20	236	17.9
2006	921	19	121	13.1
2007	1825	30	184	10.1
2008	1344	34	139	10.3
2009	398	13	45	11.3
2010	992	3	31	3.1
2011	682	17	17	2.5
Totals	14908	142	2997	19.2

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, 1963-2011

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

APPENDIX E

Summary of Paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1981-2011

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

*based on 62 measurements

**based on 131 measurements

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