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-17

PROJECT PERIOD: July 1, 2015 through June 30, 2016

REPORT PERIOD: April 1, 2016 through March 30, 2017

ABSTRACT:

Each spring Paddlefish migrate upstream out of the headwaters of Lake Sakakawea with rising river discharge to reach river spawning grounds. A pulse in Yellowstone River discharge during the week leading up to Paddlefish season that peaked at 22,000 cubic feet per second (CFS) on May 13, 2016 (USGS station #06329500 Sidney, MT) made Paddlefish available at Intake Fishing Access Site (FAS) for the season opener (May 15th). Snagging success at popular downstream locations (e.g. Sidney Bridge, State line) was higher during the first half of the harvest season. Harvest never reached the intense level that has come to be expected during good water years, but was slow and steady with most of harvest occurring before Memorial Day Weekend likely due more to angler effort than Paddlefish density. The harvest season was closed after 15 full harvest days. Catch-and-release fishing for Paddlefish was allowed for 10 additional days at Intake FAS, ending June 20, 2016. Fish, Wildlife & Parks (FWP) staff tagged 504 Paddlefish with jaw tags in 2016 during catch-and-release fishing. The 2016 season was the first year requiring mandatory reporting of harvested Paddlefish which could be done either by phone or physically at Intake FAS. During the month of May, FWP staff surgically implanted 58 adult Paddlefish with radio telemetry transmitters in the 10 mile long reach downstream of Intake FAS as part of a native fish passage study. A subset of radio telemetered female Paddlefish were given an additional small radio transmitter (Lotek Nano tag) that would be expelled with their eggs to assist in documenting the specific time and location of their spawning event.

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 (Purkett 1961, Rehwinkel 1978; Carlson and Bonislawsky 1981). The Yellowstone/Sakakawea stock is sustained primarily through natural recruitment although hatchery stocking has occurred periodically with the specific purpose of introducing known age fish into the stock for validation of aging methods. It has also been observed that some Paddlefish immigrate from the Fort Peck stock that resides in Fort Peck Lake and the Missouri River upstream of Fort Peck Dam. Similarly, it has been observed that Paddlefish emigrate and are permanently lost from the Yellowstone Sakakawea population by passing over Garrison Dam into the Garrison reach of the Missouri River below the Dam (e.g. as observed most recently in 2011 during historic Missouri River flows).

The harvest of Paddlefish at Intake, MT has been documented for over a century and as understanding of the fishery has improved some important management decisions have been made particularly 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). In 1989, the Montana legislature passed a bill that allows regulated production of caviar from the roe of harvested Paddlefish at Intake Fishing Access Site (FAS). Since 1990, 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 under a memorandum of understanding with Fish, Wildlife & Parks (FWP) because of this legislation. Proceeds from the sale of caviar fund community improvement grants, as well as Paddlefish research, monitoring and management (Scarnecchia et al. 2008). This arrangement and regulated 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 1,000-fish harvest 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 an additional 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 and only at Intake FAS) on Sunday, Monday and Thursday. Legal fishing hours are from 6 a.m. to 9 p.m. mountain time.

Objectives for the 2016 season were as follows: 1) keep harvest under the 1,000 fish harvest cap, while spreading harvest over more days to increase angler satisfaction and maintain opportunity, 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, condition of fish, and sex ratio of the population, 4) document movements of radio tagged Paddlefish with emphasis on passage at Intake FAS, and 5) explore use of small transmitters for documenting specific timing and location of spawning for radio telemetered female Paddlefish.

METHODS:

The 2016 Paddlefish season was the first year in which a new regulation was implemented requiring report of harvested Paddlefish by either phone or in person at the Intake cleaning station. In 2016 the MRRE phone hotline used by FWP to report harvest of game animals such as Bighorn Sheep and Mountain Lions was used to collect harvest information for Paddlefish. The data collected by this hotline was used in combination with the Intake cleaning station harvest count to decide when to implement the instantaneous harvest closure. A post season 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 since 2003. The 2016 phone creel included 11 questions about angler harvest, angler effort, use of gaffs, use of Glendive Chamber of Commerce fish cleaning services, and participation in catch-and-release fishing. The phone creel was used to provide the final estimate of harvest.

University of Idaho and FWP staff ran a biological check station to collect data from harvested Paddlefish brought by anglers to Intake FAS to be cleaned by the Glendive Chamber of Commerce Caviar Contractors. Harvested fish were weighed to the nearest pound, measured to the nearest inch (front of eye to fork of the caudal fin), and inspected for tags (jaw, radio, coded wire, ect.). Gender of harvested fish was recorded by FWP staff and confirmed when filleted by caviar staff. A portion of the Paddlefish caught during designated catch-and-release fishing by anglers were measured and tagged by FWP creel clerks. Fish sex was assigned based on length, abdominal shape and presence of tubercles on rostrum and head. Monel metal bands (National Band and Tag Co., Size 16, ½ inch inside diameter) have been used to tag Paddlefish around the dentary bone since 1997. Recent runs of the bands have been corroding badly, so that the numbers are not discernible after just a few years. This lack of longevity for tags being put on a species of fish that could be at large after tagging for half a century poses a problem. In 2016 FWP staff began using an aluminum version of the metal jaw tags. North Dakota Game and Fish Department (NDGF) staff jaw tags roughly 300 Paddlefish annually below the confluence prior to both the North Dakota and Montana Paddlefish seasons. The NDGF tagging effort functions as the mark event and the harvested fish from both states function as the recapture events used to model population (Scarnecchia et al. 2008). Both states collected jaw

sections from harvested Paddlefish to be aged by the University of Idaho. This age data was used to model population (Scarnecchia et al. 2014).

Paddlefish length and weight data were used to determine relative weight (W_r), an index of condition (Murphy and Willis 1996). Length frequency histograms were calculated to describe the length distribution of harvested Paddlefish (Murphy and Willis 1996, Brouder et al. 2009). These indices provide a metric for analysis of the size and condition of the Yellowstone/Sakakawea population relative to other Paddlefish 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 knowledge 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 ensure harvest from this Paddlefish population is sustainable (Scarnecchia et. al 2008).

During the month of August NDGF staff conducted transects in the upper end of Lake Sakakawea counting young-of-the-year Paddlefish with methods as described by Fredericks and Scarnecchia (1997). While conducting these visual transects from a boat it is also common for NDGF staff to observe sub-adult Paddlefish. This effort provides an indication of the relative strength of reproduction from the current year as well as recruitment of the previous few year classes to sub-adulthood.

Additionally during 2015 and 2016 field seasons FWP and the Bureau of Reclamation (BOR) conducted a telemetry study using radio tagged native species (Pallid Sturgeon, Shovelnose Sturgeon, Blue Sucker, Sauger, and Paddlefish) to evaluate passage at Intake Diversion Dam under current conditions. Only a description of the movements of telemetered Paddlefish will be summarized in this report. Paddlefish were surgically equipped with Lotek MCFT2-3L radio transmitters adapting methods described by Ross and Kleiner (1982). Incisions were made on fishes left just offset from the abdominal midline, and closed with wax coated braided silk sutures (Photo 1). Relocations of telemetered fish were made weekly by boat and continuously with a network of ground receivers. In 2016, three gravid female Paddlefish from the study population (already fitted abdominally with Lotek MCFT2-3L) were fitted with Lotek NTQ-2 Nanotags. These 5x3x10mm radios weighed 0.31 grams with an estimated battery life of 52 days (Photo 2). These Nanotags were inserted in the oviduct of gravid female Paddlefish with methods adapted from Pierce et al. then followed daily (except weekends) to document specific spawning locations (2007).

RESULTS / DISCUSSION:

A pulse in Yellowstone River discharge during the week leading up to Paddlefish season that peaked at 22,000 cubic feet per second (CFS) on May 13, 2016 (USGS station #06329500 Sidney, MT) made Paddlefish available at Intake FAS for the season opener (May 15th). The peak discharge during Paddlefish season was 31,400 CFS on June 12, 2016. Early season harvest occurred primarily at the state line (Figure 1). Snagging success at popular downstream locations (e.g. Sidney Bridge, State line) was higher during the first half of the harvest season. Harvest never reached the intense level that has come to be expected during good water years, but was slow and steady with most of the harvest occurring before Memorial Day Weekend more

a result of angler effort than Paddlefish density. The harvest season was closed after 15 full harvest days. Catch-and-release fishing for Paddlefish was allowed for 10 additional days at Intake FAS, ending June 20, 2016. The Yellowstone/Sakakawea telephone creel estimated total harvest at 997 Paddlefish for 2016 (Skaar and Selby 2016, Appendix A).

The 2016 Paddlefish season was the tenth season under regulations designed to keep harvest under 1,000 fish, temporally spread out harvest and increase catch-and-release fishing opportunity. Harvest has been kept under the harvest cap eight of the last ten years. An estimated 2,441 anglers participated in the 2016 Paddlefish season on the Lower Missouri and Yellowstone Rivers, generating 7,478 angler days (Skaar and Selby 2016, Appendix A). Phone creel results indicate that staying under the harvest cap and increasing catch-and-release opportunity has been generally successful but regulations have not increased the average number of harvest days per season (Figure 2). An estimated 79.5% of fish harvested were cleaned by the Glendive Chamber of Commerce (Skaar and Selby 2016, Appendix A). The phone creel results indicate that 60% of harvest anglers use a gaff to assist them in landing their Paddlefish and 59% believe gaff elimination would reduce their harvest ability (Skaar and Selby 2016, Appendix A).

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

Tag sales for the Lower Yellowstone Paddlefish fishery suggest more participation prior to the last bundle of regulation changes in 2007 than from 2007 to 2012 (Figure 3). In 2006 anglers could purchase both a yellow and white tag giving them the opportunity to harvest two fish in Montana. Beginning in 2007, anglers had to choose one area, this eliminated everyone that preferred the Fort Peck fishery but were previously in the habit of buying the yellow tag purely as second opportunity. 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). Catch-and-release fishing appears to be strongly influenced by fish availability at Intake. In good water years (e.g. 2013, 2014, and 2015) phone creel results demonstrate higher participation in catch-and-release than observed in a poor water year (e.g. 2012). An estimated 27.1% of anglers participated in catch-and-release fishing in 2016 and landed a cumulative total of 4,317 Paddlefish at a rate of 2.2 Paddlefish caught per angler and fished a total of 1,955 catch-and-release angler days (Skaar and Selby 2016, Appendix A). The percentage of anglers participating in catch-and-release fishing and total fish landed were both higher than observed in 2015 but fewer Paddlefish were caught per angler and fewer catch-and-release angler days were generated suggesting anglers fished catch-and-release days when fish were available but did not expend effort when fish were not available. Catch-and-release fishing has provided an opportunity for FWP staff to tag angler caught Paddlefish at Intake FAS three

days a week during the harvest season and 10 days immediately after the season closure since 2008. During catch-and-release fishing at Intake FAS in 2016, FWP staff tagged 504 Paddlefish, which is close to the 20-year average number of Paddlefish tagged per year of 583 (Figure 5). Additionally, the average number of tagged Paddlefish has risen from 171±51 (avg±SE) prior to catch-and-release opportunity to 557±111 (avg±SE) post catch-and-release (Figure 6).

The sex ratio of harvested Paddlefish during 2016 was 59 percent female and 41 percent male (Figure 7). As expected when harvest is associated with a spawning run harvested fish are mature and some individuals are of trophy size (Figure 8). The relative weight (Wr) of females was greater than that of males (Figure 9). 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 9). Fish collected at Intake FAS demonstrated condition factor at or just slightly below other populations.

The 1995 year class continued to be the best represented single cohort in the Paddlefish harvest in 2016. Male Paddlefish from the 1995 year-class had skewed the sex ratio of harvested Paddlefish toward male for much of the past decade (Figure 7). These male fish from the 1995 year class began showing up in 2003, at age eight, and were the dominant year class in male harvest by 2005 (Scarnecchia 2016b). The sex ratio began to shift back to one to one in 2013 as the 1995 year class females became sexually mature and represented in spawning runs. However, in recent years the harvest of Paddlefish has been skewed toward females (Figure 7).

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 20 years (Figure 10). These closed population estimates with the mark-recapture data collected on spawning individuals for a given year estimate a subset of the entire population. In any given year there are off-year spawners and sexually immature fish residing within Lake Sakakawea that are not estimated. A strong class of young-of-the-year (YOY) fish were documented during reservoir transects in 2011. Sakakawea transects in 2012 and 2013 suggested that little reproduction occurred in these years but these surveys showed an unprecedented presence of sub-adult fish assumed to be the 2011-year class (Fred Ryckman, personal communication). While the 2011 cohort is the most recent year class that offers some promise of substantial contribution to the population, history has demonstrated that documenting high levels of reproduction for a year class of Paddlefish as young-of-the-year does not guarantee recruitment to adulthood.

During the month of May in 2015, 40 adult Paddlefish were surgically implanted with radio telemetry transmitters in the 10 mile reach downstream of Intake FAS as part of a native fish passage study. The movements of telemetered Paddlefish in 2015 demonstrate passage over or around Intake Diversion Dam (Figure 11). Five Paddlefish migrated upstream of Glendive. Four continued upstream to the Powder River area, with one male Paddlefish migrating as far as Rosebud, MT. During the month of May in 2016, 58 adult Paddlefish were surgically implanted with radio telemetry transmitters in the 10 mile reach downstream of Intake FAS as part of a native fish passage study. In 2016, 0 of 53 Paddlefish that encountered Intake Diversion Dam passed over or around as flows were likely inadequate to make passage available (Figure 12).

Three gravid female Paddlefish (Codes 120, 123, and 184 on frequency 148.480, Lotek MCFT2-3L radio transmitters) were fitted with a spawning tag (Lotek Nanotag NTQ-2) between May 25 and June 3, 2016. Code 120 was recaptured, fitted with a spawning tag, relocated still carrying the spawning tag twice within the next week, and then rapidly emigrated out of the

study area (Figure 13). Ground stations recorded Code 120 passing downstream of the state line the day after (June 9th) its last relocation (June 8th) and then passing downstream of the confluence early morning June 10th. Two of three female Paddlefish were monitored while carrying spawning tags and deposited spawning tags within the study area. Code 184 was fitted with a spawning tag, followed closely, and found to have deposited the spawning tag just downstream of Intake Diversion Dam at river mile 70.8 between June 8th and June 10th (Figure 14). Code 123 was fitted with a spawning tag, followed closely, found to no longer be carrying the spawning tag on June 12th, and two days later the deposited tag was found at river mile 67 (Figure 15). Efforts to recapture Codes 123 and 184, post spawning tag deposition were unsuccessful. Larval sampling below the spawning tag deposition locations for Codes 123 and 184 was conducted from June 16th to June 20th, but only one larva suspected to be of the order Acipenseriformes was collected. In summary, Codes 123 and 184 are suspected to have spawned within the study reach, but not being able to recapture and assess them for presence of eggs, and failure to capture larval Paddlefish precludes definitive determination of spawning time and location. Efforts in 2017 should focus on improving methods for recapture efficiency using three designs of hobbled gill nets. Relocations during weekends and increased efforts larval sampling may also be necessary to document spawning sites. These modifications in methodology may not be feasible because of other sampling commitments and ongoing projects during the Paddlefish spawning window.

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Harvest
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Paddlefish caviar
Phone creel survey
Paddlefish tagging

Photo 1. Example of Paddlefish surgery, abominal insertion on fishes left of Lotek MCFT2-3L radio transmitter on frequency 148.480, closure with silk sutures.

Photo 2. Lotek NanoTag model NTQ-2, 5mm width by 3mm height by 10mm length, 0.31 gram weight, 10 seconds between burst 52 day lifespan. Used as spawning tag during 2016.

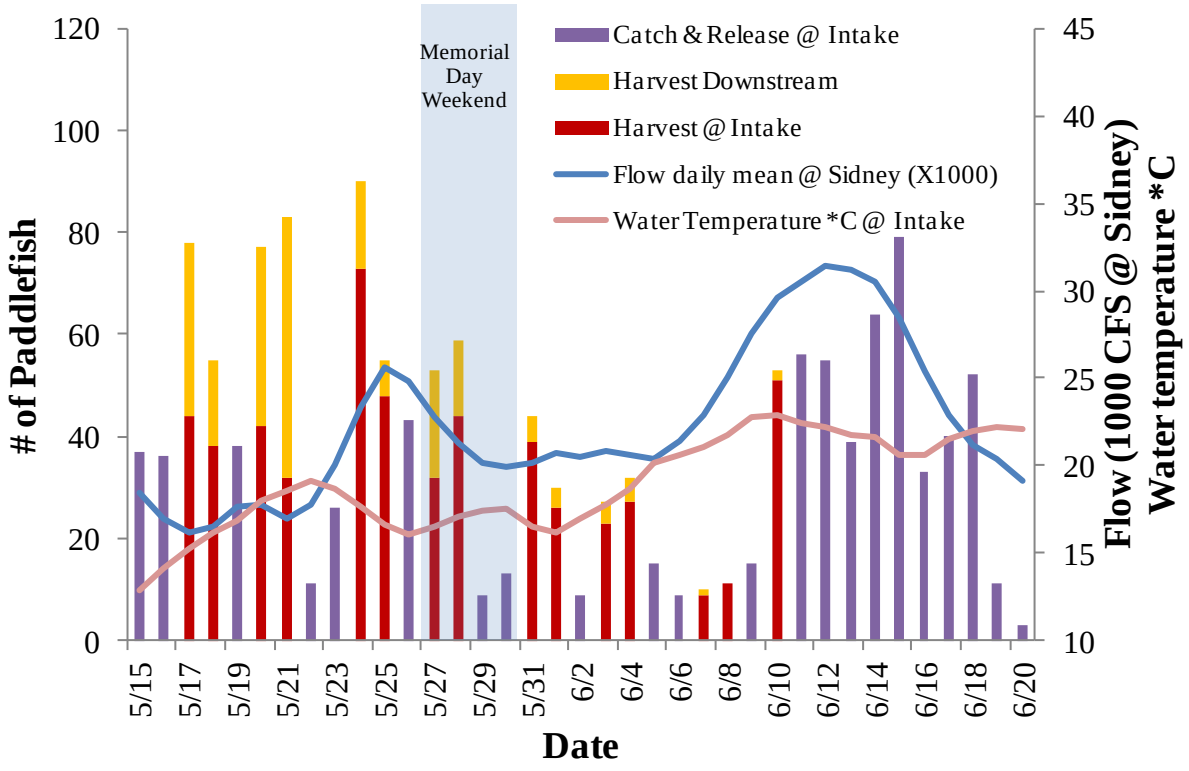

Figure 1. Observed Paddlefish harvest in number of fish and Yellowstone River discharge (flow measured in cubic feet per second) recorded at the USGS gauging station at Sidney, MT by day during the 2016 Paddlefish season

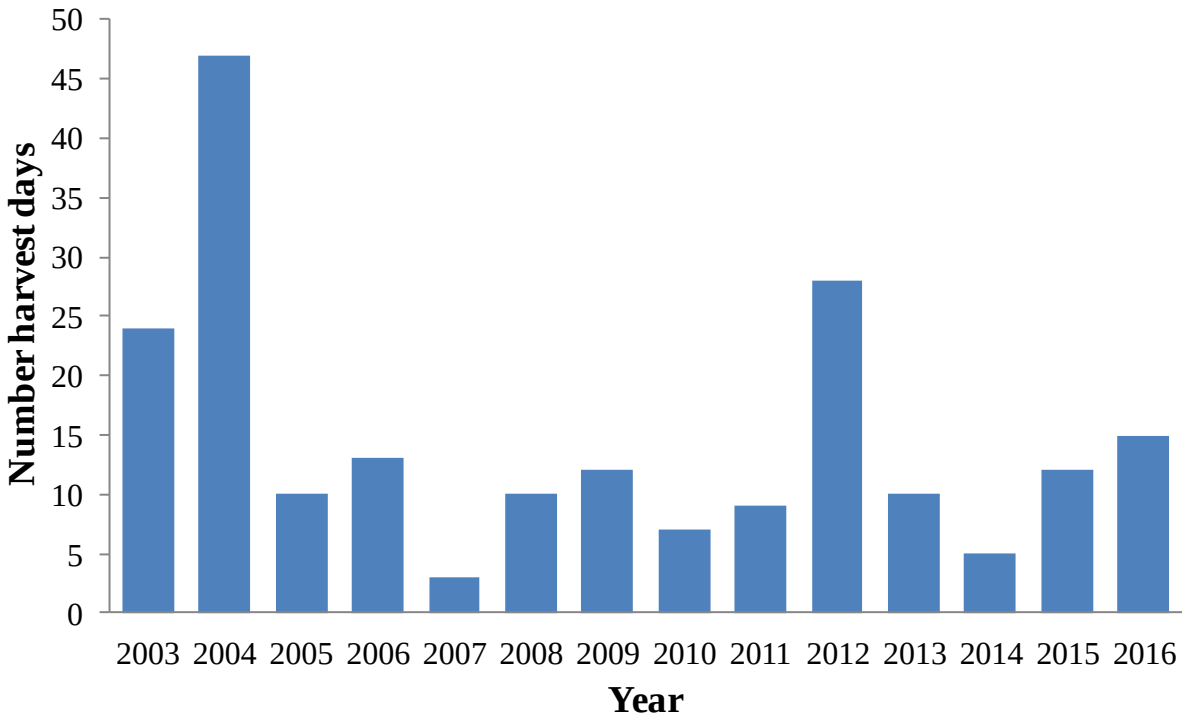

Figure 2. Number of harvest days per season for the Lower Missouri and Yellowstone Rivers.

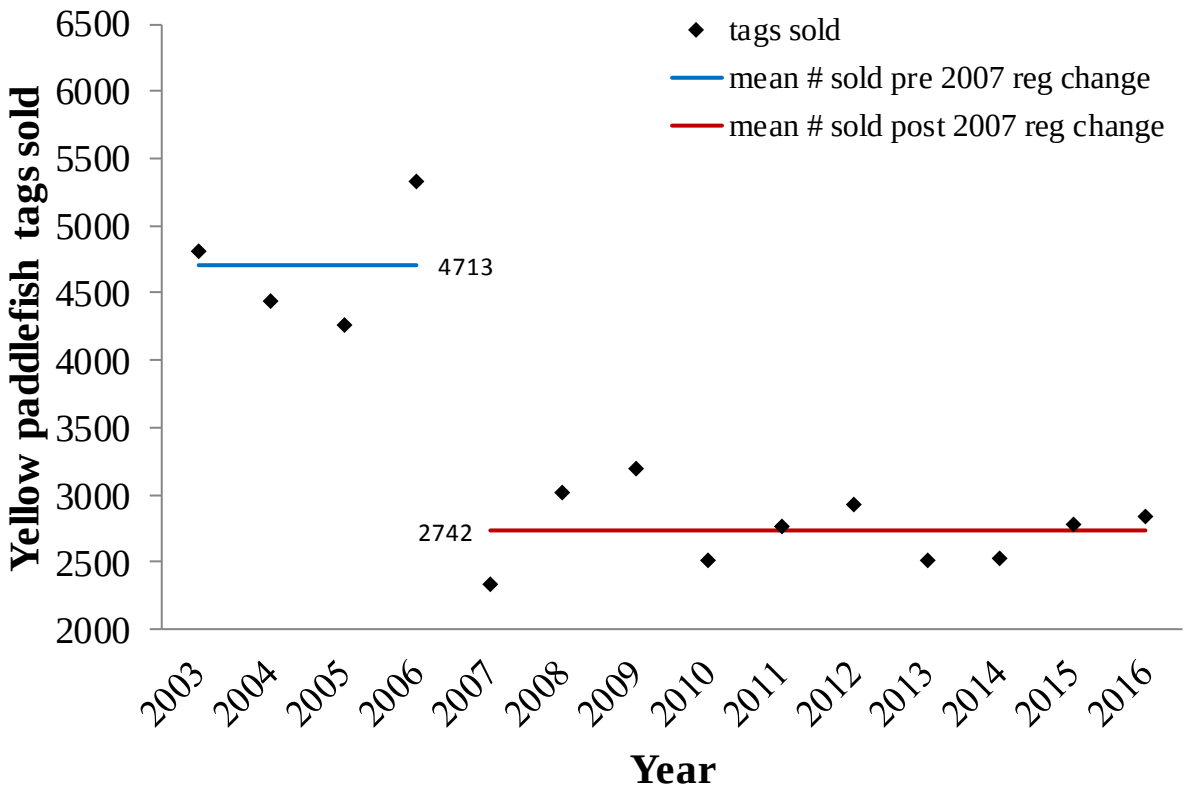

Figure 3. Number of Paddlefish tags sold for the Lower Missouri River and Yellowstone River in Montana by year with mean tag sales from 2003 to 2006 indicated by the blue line and mean tag sales from 2007 to 2016 indicated by the red line.

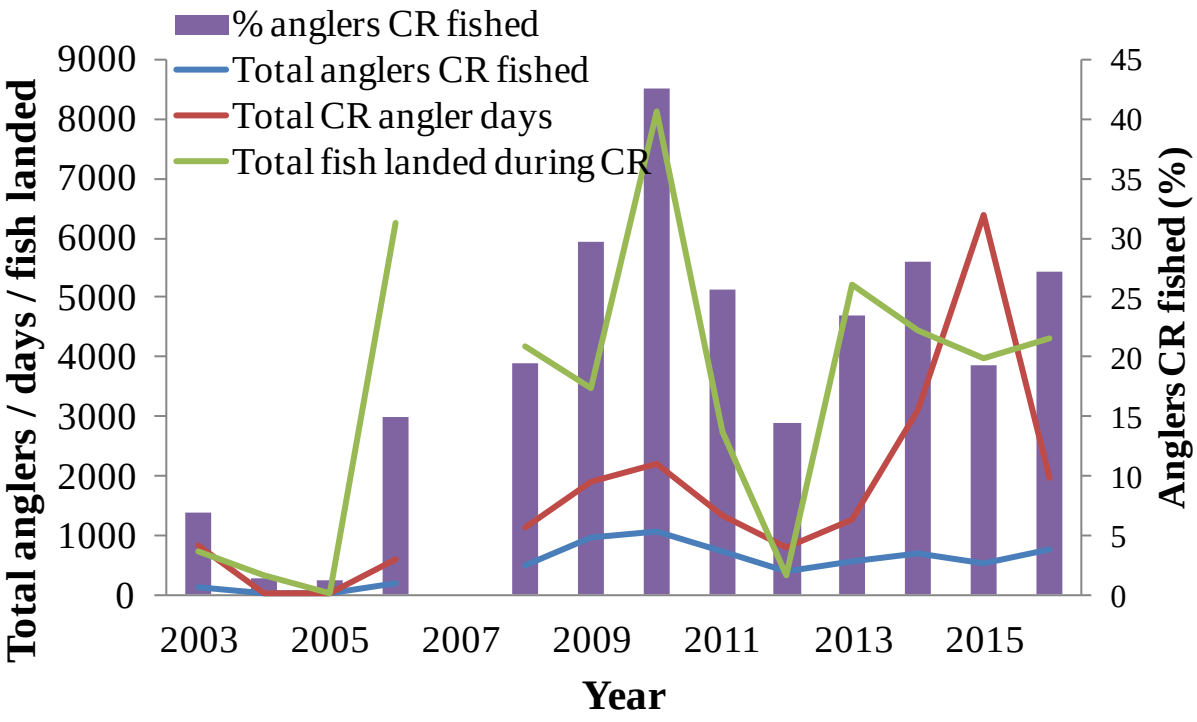

Figure 4. Phone creel catch-and-release (CR) data by year including anglers fished, angler days, total fish landed and percent anglers participating in catch-and-release for Paddlefish of the Lower Missouri River and Yellowstone River in Montana from 2003 to 2016.

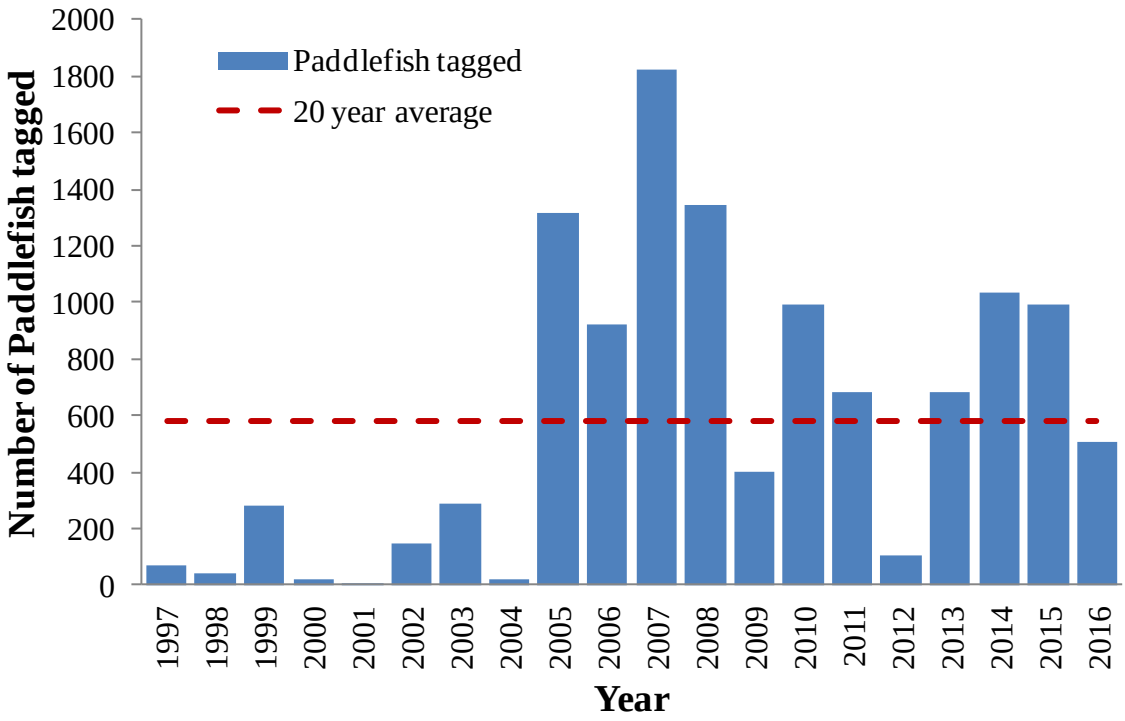

Figure 5. Number of Paddlefish tagged by year from 1997 to 2015, catch-and-release opportunity has been available since 1995, 3 days of catch-and-release only fishing has been available since 2007.

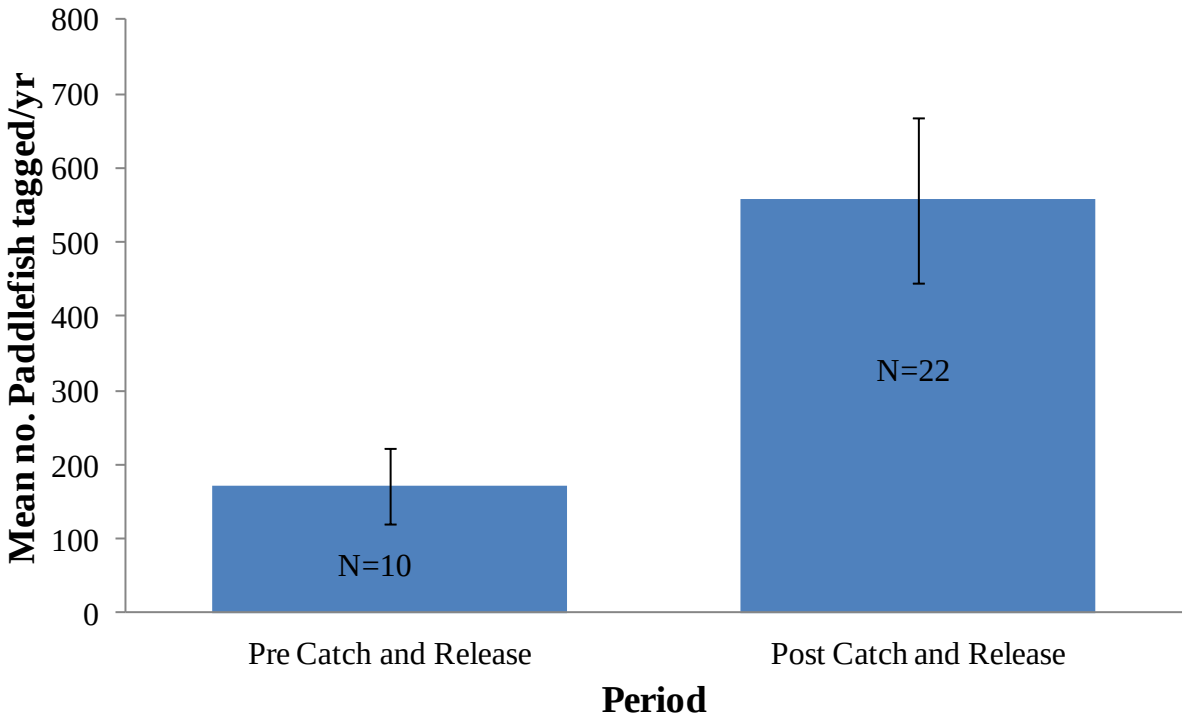

Figure 6. Number of Paddlefish tagged by period pre catch-and-release fishing (1984-1994) and post catch-and-release fishing (1995-2016), catch-and-release opportunity has been available since 1995, 3 days of catch-and-release only fishing has been available since 2007.

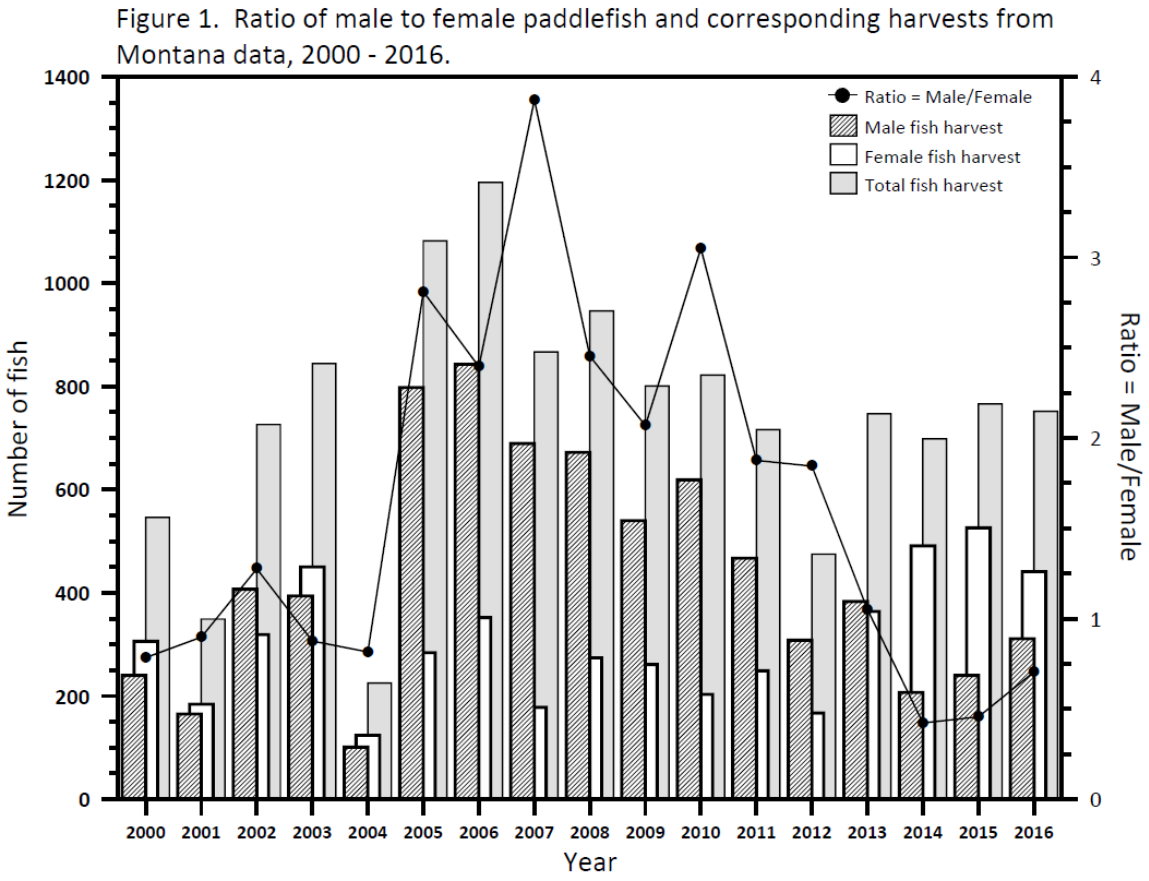

Figure 7. Ratio of male to female Paddlefish and corresponding harvests from Montana data, 2000-2016 (from Scarnecchia 2016b)

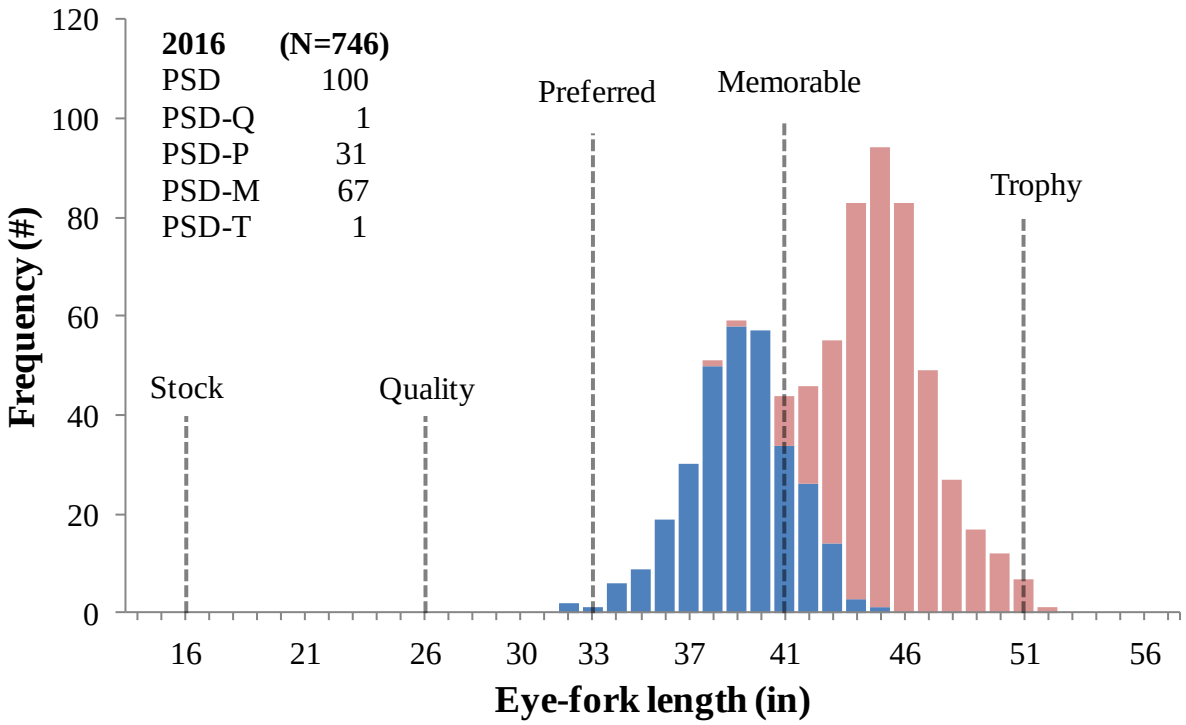

Figure 8. Length frequency histogram with proportion size distribution of Lower Missouri River and Yellowstone River Paddlefish harvested in Montana during 2016, blue bars represent male Paddlefish and pink bars represent female Paddlefish.

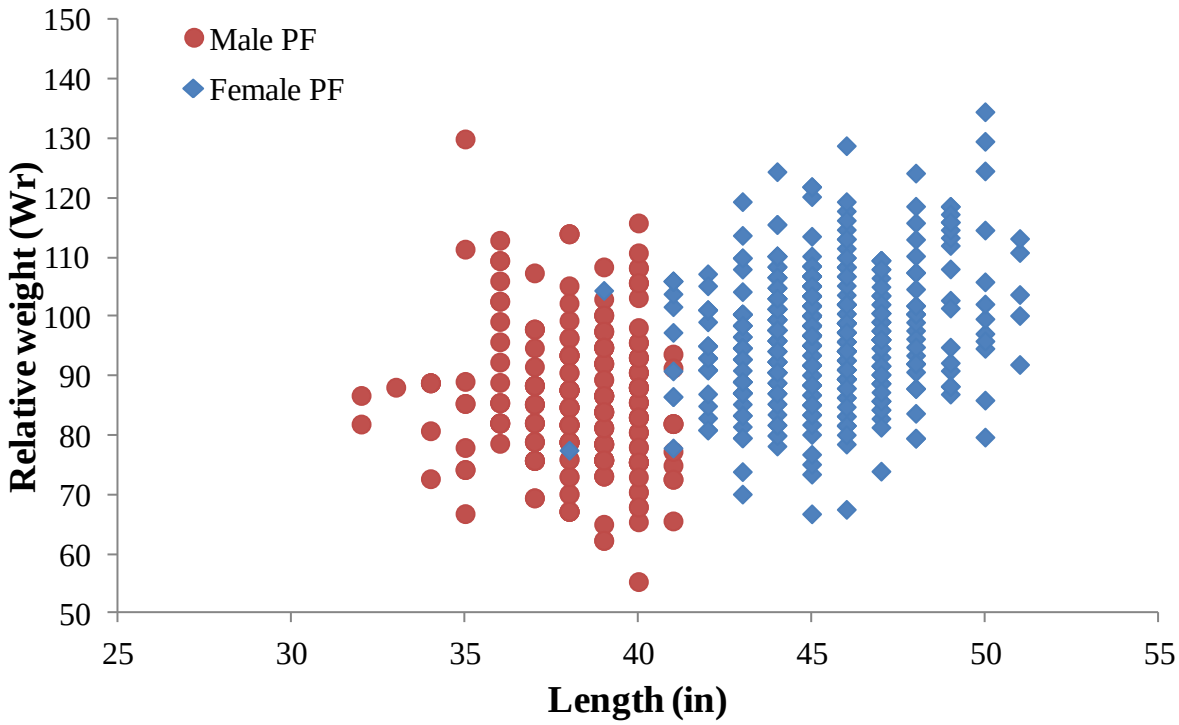

Figure 9. Relative weight by eye-fork-length (in) of Lower Missouri River and Yellowstone River Paddlefish harvested in Montana during 2016 season.

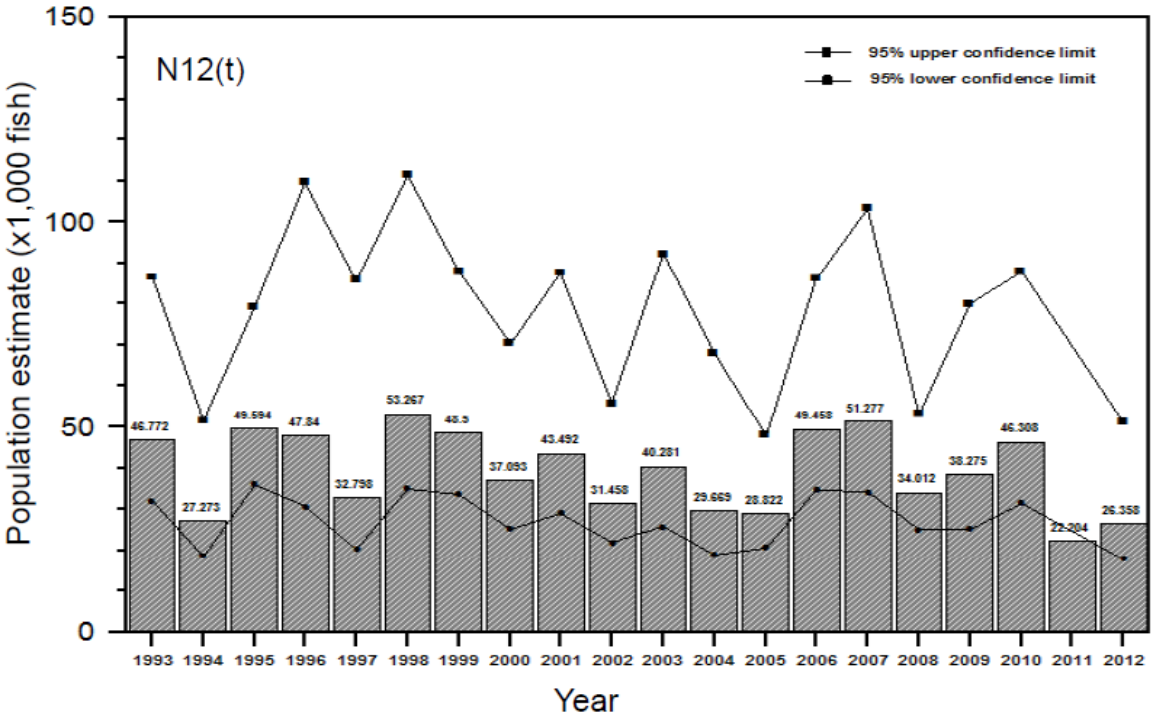

Figure 10. Petersen-Lincoln estimates of paddlefish population size with 95% confidence intervals, using scheme M1(*t*) with R12(*t*) and C12(*t*), where M1(*t*) = Count of: (1) ND-tagged paddlefish in Spring of year *t*, and (2) ND-tagged paddlefish from previous years (*t*-1, *t*-2, …) which were recaptured and released in Spring of year *t*, and the number of ND-tagged fish randomly recaptured from both ND and Montana (MT) water (R12(*t*)), and the number of paddlefish in combined ND and MT harvest in year *t* (i.e., C12(*t*)). (from Scarnecchia 2013)

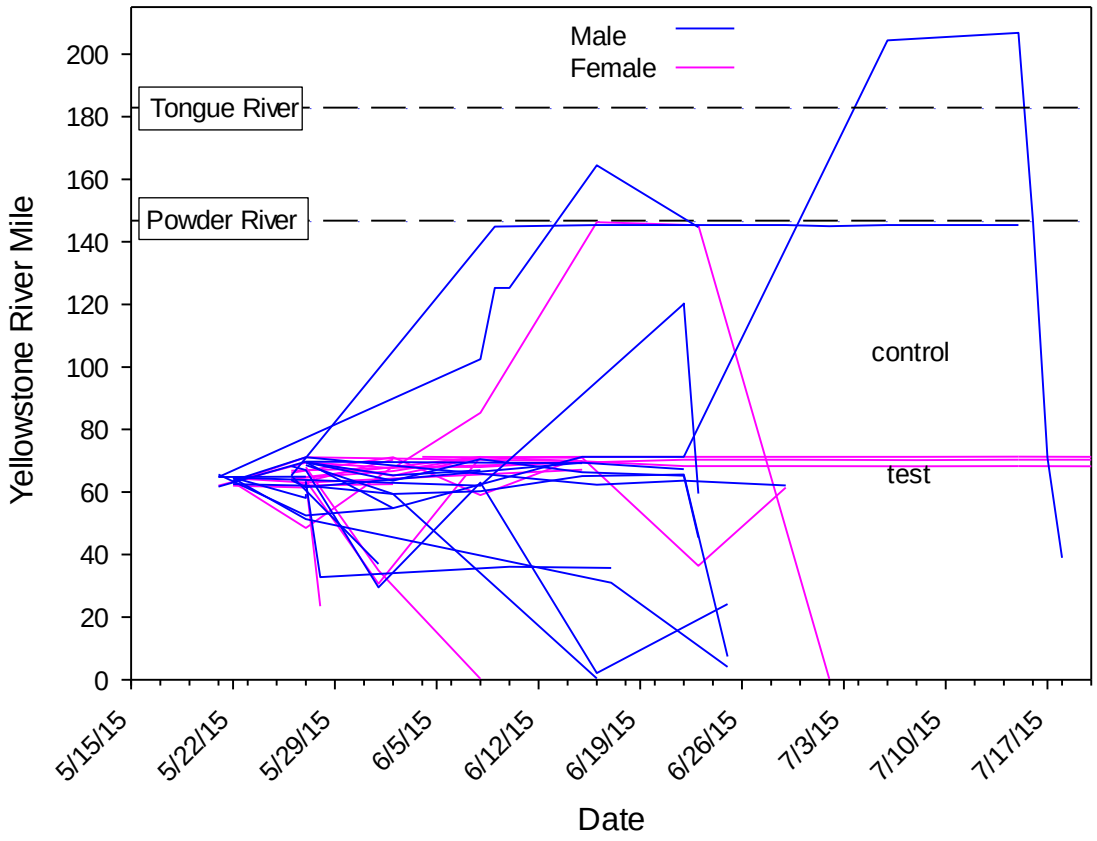

Figure 11. Movements of 40 telemetered Paddlefish in the Yellowstone River by sex during 2015. Yellowstone river mile on the y-axis and date on the x-axis with reference markers for test reach (Intake), control reach (Glendive), Powder River, and Tongue River (by Mat Rugg from Native Species Telemetry presentation to Upper Basin Pallid Sturgeon Workgroup 2015)

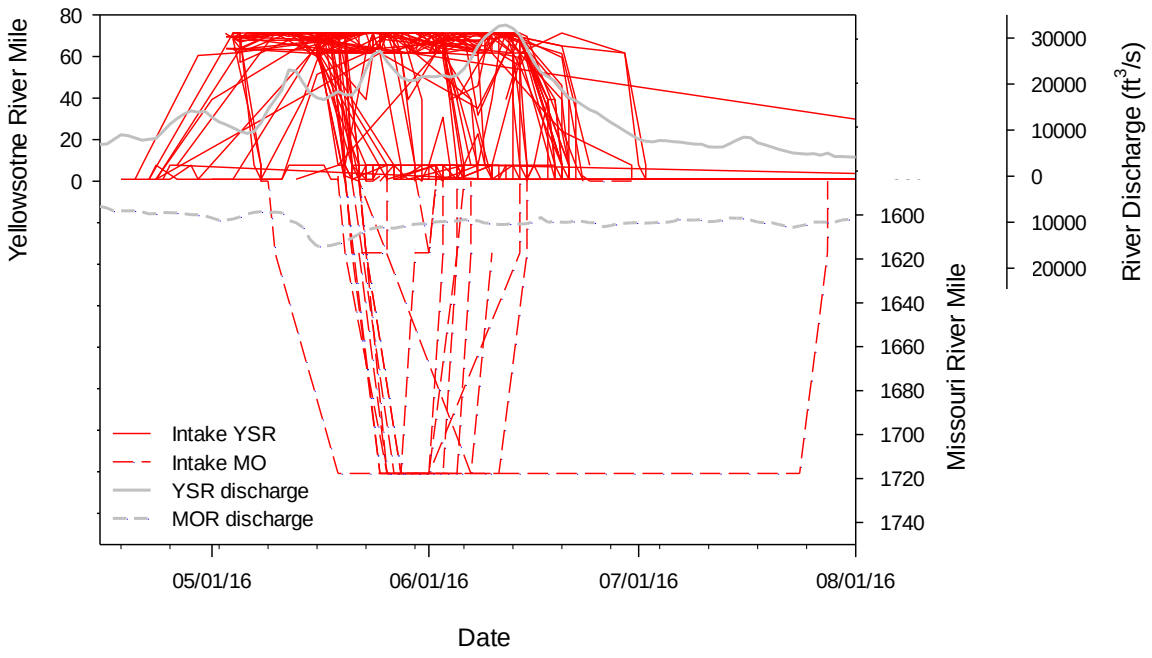

Figure 12. Movements of 58 telemetered Paddlefish in the Yellowstone and Missouri Rivers during 2016. Yellowstone river mile on the primary y-axis, Missouri river mile on the secondary y-axis, river discharge (CFS) on tertiary y-axis, and date on the x-axis with reference marker for test reach (Intake) show in gray (by Mat Rugg from Native Species Telemetry presentation to Upper Basin Pallid Sturgeon Workgroup 2016)

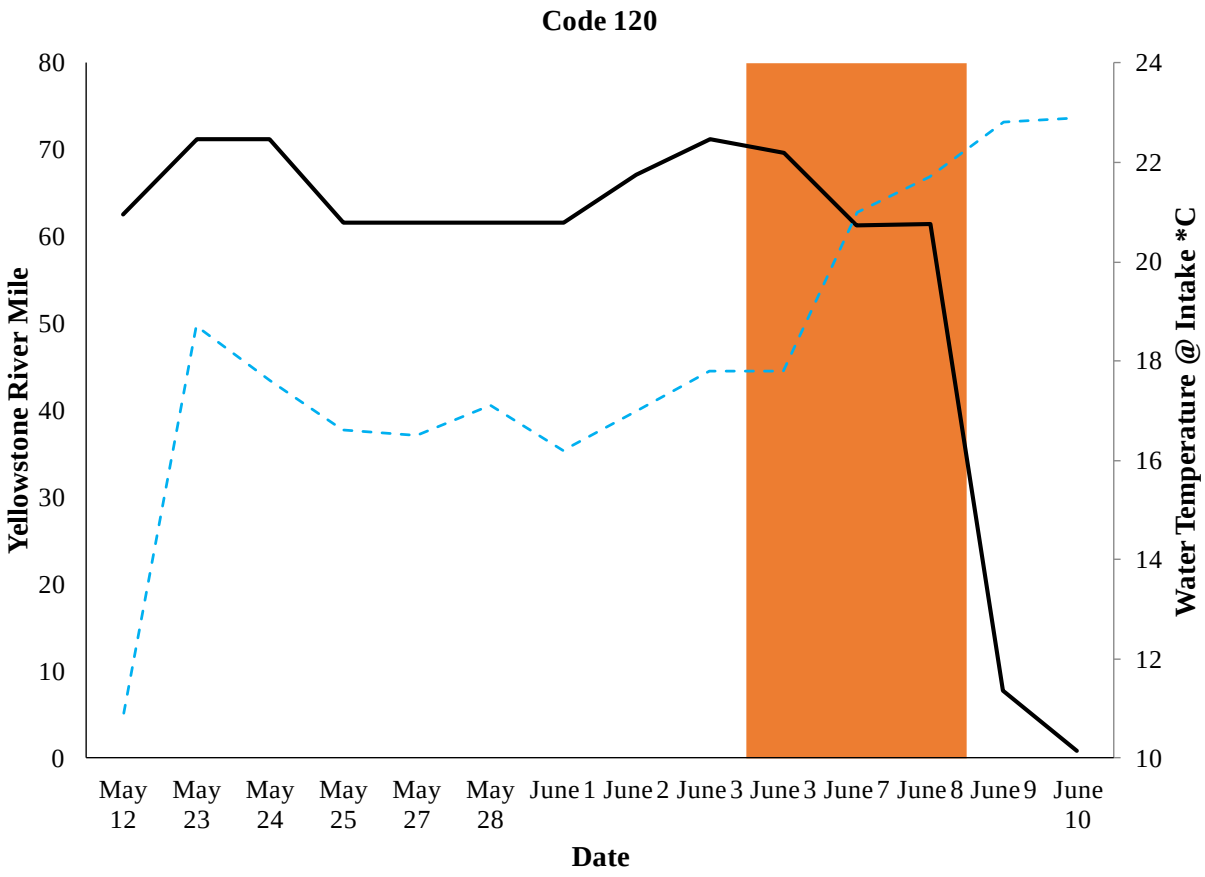

Figure 13. Movements of radio telemetered gravid female Paddlefish Code 120 (Frequency 148.480) with spawning tag Code 185 (Frequency 149.340) represented by solid black line (primary y-axis) by relocation event (x-axis) with water temperature at Intake in °C (secondary y-axis). Orange shading represents time Paddlefish was known to be carrying spawning tag with egg mass.

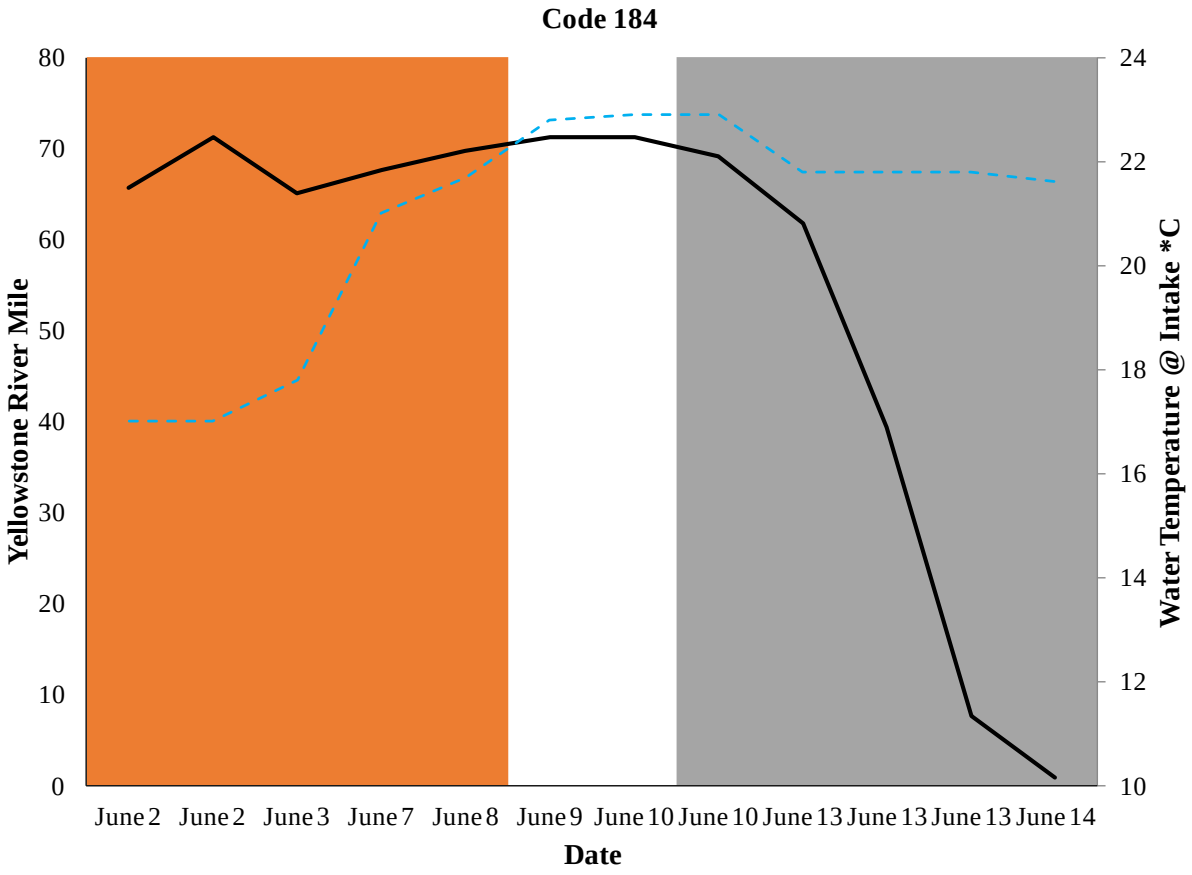

Figure 14. Movements of radio telemetered gravid female Paddlefish Code 184 (Frequency 148.480) with spawning tag Code 184 (Frequency 149.340) represented by solid black line (primary y-axis) by relocation event (x-axis) with water temperature at Intake in °C (secondary y-axis). Orange shading represents time Paddlefish was known to be carrying spawning tag with egg mass; gray shading represents time Paddlefish was known to not be carrying spawning tag.

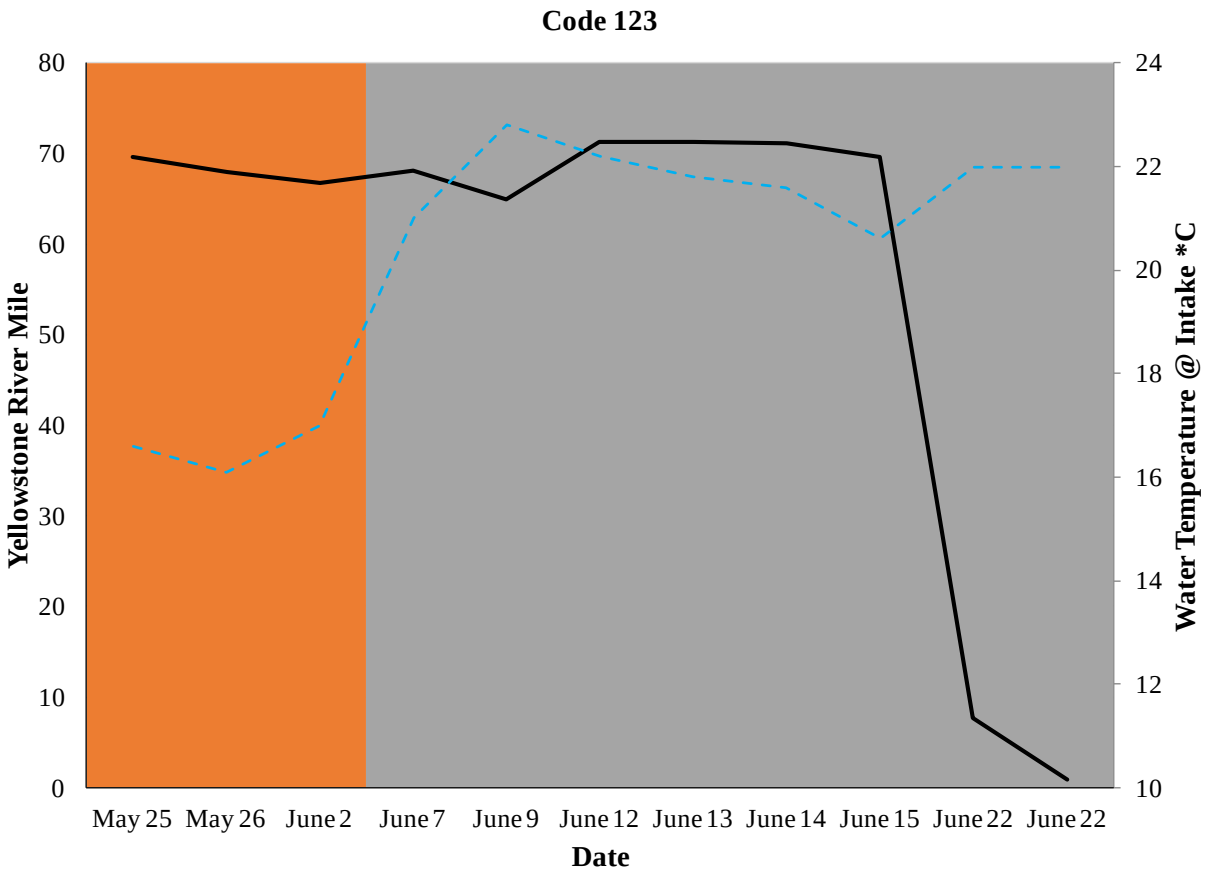

Figure 15. Movements of radio telemetered gravid female Paddlefish Code 123 (Frequency 148.480) with spawning tag Code 183 (Frequency 149.340) represented by solid black line (primary y-axis) by relocation event (x-axis) with water temperature at Intake in °C (secondary y-axis). Orange shading represents time Paddlefish was known to be carrying spawning tag with egg mass; gray shading represents time Paddlefish was known to not be carrying spawning tag.

APPENDIX A

Yellowstone/Missouri River (Yellow Tag) Paddlefish Phone Survey – 2016

Compiled by Don Skaar and Corrine Selby, March 1, 2017

Number of tags sold:	**2,841**
Number tag holders sampled:	**997**
Number respondents:	**448**
Response rate:	448/997 = **44.9%**
Percent respondents fished	385/448 = **85.9%**
Percent fished on Yellowstone	379/384 = **98.7%**
Percent fished on Missouri	4/384 = **1.0%**
Percent fished on both	1/384 = **0.03%**
Total Anglers Fished	(.859)(2,841) = **2,441 anglers**

Harvest Fishing

Fish harvested:	(2,441)(149/385) = **945 paddlefish**
Average days fished to harvest:	369/149 = **2.48 days**
Average days fished to no harvest:	502/256 **= 1.96 days**
Average hrs/day harvest fishing:	
-Yellowstone River	**1.96 hr/day**
-Missouri River	**3.87 hr/day**
Total Angler Days (harvest fishing):	(2.26)(2,441) = **5,523 days**
Catch rate (harvested fish):	149/871 = **0.17 pf/day**
Percent cleaned at chamber:	116/146 = **79.5%**
Percent using a gaff to land fish:	90/150= **60.0%**
Gaff elimination reduces harvest ability:	160/270 = **59.2%**

Catch and Release Fishing

Percent anglers c/r fishing:	103/379 = **27.1%**
Total anglers c/r fishing	(.271)(.984)(2,841) = **760 anglers**
Average days c/r fishing	265/103 = **2.57 days**
Total days c/r fishing	(2.57)(760) = **1,955 days**
Average number of fish landed	585/103 = **5.68 pf/angler**
Total fish landed	(5.68)(760) = **4,317 paddlefish**
Catch rate c/r fishing	4317/1,955 = **2.21 pf/day**
Percent Missouri River anglers purchasing a tribal permit	**100.0%** (n=5)

General Location of Snagging	
Intake FAS	234
Downstream of Intake FAS	103
Intake FAS & downstream of Intake FAS	36
Upstream Intake & Intake FAS	2
Upstream Intake FAS	1
General Location of Harvest	
Intake	84
Sidney Bridge	26
Richland Park	11
State Line	6
5 mi downstream of Intake	5
Savage	3
1-3 miles downstream of Sidney Bridge	3
1/4 mi downstream of Intake	2
1/4 mile upstream of Sidney Bridge	1
between Sidney Bridge and Richland Park	1
by dam in Sidney	1
by Fairview	1
Elk Island	1
on private ranch near Sidney	1
private land by State Line	1
Seven Sisters	1