MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

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JOB NO: III-C

PROJECT TITLE: Statewide Fisheries Investigations
STUDY TITLE: Survey and Inventory of Warmwater Streams
JOB TITLE: Yellowstone River Paddlefish Investigations

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REPORT PERIOD April 1, 1991 through March 31, 1992

ABSTRACT

The Intake paddlefish harvest in 1991 was estimated at 4,203 fish, the highest since 1982. Nonresident paddlefish tag sales were the highest percentage of total sales recorded. Female paddlefish made up 57.2% of the harvest, the lowest since 1974. Average size of male paddlefish in the angler harvest is not changing, but average size of females may be slowly increasing. Percentage of small male paddlefish in the angler harvest was even higher than in 1990. Angler exploitation rate of the Garrison Reservoir paddlefish is probably near 10% per year. The commercial caviar operation at Intake collected roe from 1,711 paddlefish and had gross income of $292,563.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. Prevent overharvest of the paddlefish population during the spawning migration; limit harvest to 5,000 or fewer fish most years at Intake. This objective was met. Harvest in 1991 was an estimated 4,203 fish.

2. Determine acceptable angler harvest. Progress was made toward this objective in 1991. Data is presented in Table 6 on angler exploitation rates of paddlefish.

3. Locate and preserve paddlefish spawning habitat. Progress was made toward this objective in 1991 by locating paddlefish upstream of Intake. Data is shown in Table 9.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 1991. As many anglers as possible were interviewed. The interview total in 1991 was 999 which amounted to 30% of the estimated total angler days. The seasons was divided into three

sampling periods and calculations for angler hours, harvest and success rate were made for each period. Anglers were counted each day of the season (May 15 through June 30). Counts were made at 8 randomly chosen times each day between the hours of 6:00 A.M. and 9:00 P.M. A 24 hour fishing day was used in fishing pressure calculations. Analysis of the data was accomplished by adapting formulas 5 through 32 from Spence (1970) to the creel census. Calculations were made by computer.

Angler caught paddlefish were weighed to the nearest pound. Eye to fork length was measured to the nearest millimeter. Sex was determined by internal examination of the gonad.

Paddlefish were located in the Yellowstone River with boat mounted electrofishing gear. Approximately 10 amps were used to bring paddlefish to the surface where they could be observed. Power was turned off briefly when a fish approached close enough to the positive electrode to possibly cause immobilization. Location of paddlefish was noted on maps.

Paddlefish were obtained for jaw tagging by snagging.

RESULTS AND DISCUSSION

General Observations

Well above average late May and June 1991 Yellowstone River flows produced the largest paddlefish harvest at Intake since 1982. The river rose before the May 15 start of the Intake paddlefish season. Fishing was good on May 15 and got even better by the Memorial Day weekend. On that three day weekend approximately 1,000 paddlefish were taken by snaggers at Intake. During the second week of June a significant fishery developed just downstream of a railroad bridge near Glendive. Tag returns and observations suggest that several hundred paddlefish were caught by snaggers at this site. Also during the second week of June the angler success rate for paddlefish decreased at Intake. Presumably this was due to the large river flows that allowed paddlefish to migrate upstream of Intake.

Total paddlefish tag sales were higher than in 1990 (Table 1). Nonresident tag sales were the highest recorded. Nonresidents bought 30% of paddlefish tags, also a record high.

Paddlefish Size and Sex Rates

A total of 2558 paddlefish were weighed, measured and sexed from the 1991 angler catch at Intake (Table 2). This number was 61 percent of the estimated Intake paddlefish harvest. Females made up 57.2 percent of the angler harvest (Table 2). This was the lowest female percentage measured since 1974.

Table 3 shows average length and weight by sex of paddlefish from the Intake angler harvest. Size of males has remained very steady for at least the past ten years. Size of females has shown a small increase in recent years.

Small fish in the angler catch at Intake are of particular interest because their presence indicates a continuing recruitment of young paddlefish. Table 4 shows numbers and percentages of two size classes of small fish for each sex at Intake for the past 11 years. Percentages of fish in each weight category in Table 4 have fluctuated within a rather narrow range, suggesting a continuous recruitment of young paddlefish to the spawning population. Male paddlefish in the 10-15 pound group in 1991 were more abundant than in past years. Female paddlefish weighing 25-30 pounds were less abundant than in previous years.

Tag Return and Exploitation Rate

Individually numbered plastic poultry bands placed around the dentary bone have been used to study paddlefish movements beginning in 1964. More recently, return of tagged paddlefish has been used to infer angler exploitation rate.

Of the 5,990 paddlefish tagged at Intake and at downstream points since 1964, at least 1,389 (22.5%) have been harvested by anglers (Table 5). Because Department personnel are present at Intake continuously during the paddlefish season, I think most tags on angler caught fish are returned. Probably some tags are not returned for fish caught at other sites.

In 1991, 49 tags were returned from paddlefish tagged in the Yellowstone River. Of these, 14 were from fish tagged in 1984, and 11 were from fish tagged in 1988. One tag was returned from a fish tagged in 1965. Of the 49 tags returned, 40 were caught at Intake, 4 in North Dakota and 5 at the railroad bridge near Glendive. An additional 7 fish were caught at Intake that were tagged in the Missouri River in Montana downstream of Ft. Peck Reservoir.

Exploitation rates are most reliably calculated from fish tagged in recent years because of compounding underestimation from non-angling mortality and angler failure to return tags. Exploitation rates are shown in Table 6 for paddlefish tagged in 1984, 1986, 1988 and 1990. For the four groups calculated average annual exploitation rates range from 3.3 percent to 8.4 percent. These calculated rates are known to be low, but the degree of underestimation is unknown. True exploitation rates could easily be as much as 10 percent. Paddlefish literature (Pasch and Alexander 1986) would suggest that even 10 percent is not

excessive. Whatever the true rate of exploitation, the lack of decrease in average size of both male and female paddlefish suggests that the population is not being overharvested.

With the exception of the year of tagging, recapture of tagged fish is highest three years after tagging (Table 6). This indicates that many individuals of the population tend not to make the migration each year. Probably many paddlefish migrate and spawn only every third year.

CREEL CENSUS

Results from the 1991 creel census at Intake are shown in Table 7. Results from 1991 can be compared with previous years in Table 8.

Overall, fishing at Intake was quite good. The total harvest was the highest since 1982. Fish caught per hour in 1991 was double the 1991 figure. The success rate decreased rapidly after June 1, 1991. By late May Yellowstone River flows were high enough to allow paddlefish to move upstream of Intake, resulting in progressively fewer fish caught and a lower success rate at Intake.

For the first time, a paddlefish fishery developed just downstream of the "Black Bridge" located just upstream of Glendive. Fish concentrated in a large pool immediately downstream of an exceptionally fast and narrow section of river with large standing waves. The five tag returns from the "Black Bridge" suggests that several hundred paddlefish were caught at the site in 1991.

PADDLEFISH MIGRATION

Because of the high river flows during the 1991 paddlefish season considerable effort was made in locating paddlefish upstream of Intake Diversion Dam (Table 9). Paddlefish are able to move upstream of Intake only in years of above average May - June flow. Paddlefish are known to use the high water channel that bypasses Intake Diversion Dam (Table 9). It is uncertain that paddlefish also swim upstream over the diversion dam.

Paddlefish were scattered through the river upstream of Intake, none were observed upstream of the Tongue River mouth (Table 9). Several paddlefish were snagged by anglers near the mouth of the Tongue River in June, 1991, but none were known to be caught farther upstream. The only significant concentration of paddlefish located upstream of Intake was immediately downstream of the "Black Bridge." This did not appear to be a spawning aggregation, but rather a "staging area" immediately downstream of an exceptionally swift river section.

PADDLEFISH CAVIAR

The Glendive Chamber of Commerce and Agriculture continued their collection of paddlefish roe at Intake for a second year in 1991. The weight of roe collected and their gross income were much higher in 1991 than in 1990. Their offer to paddlefish snaggers of free fish cleaning in exchange for roe donation continued. The Chamber cleaned 3,090 fish of which 1,711 were females. From these fish a total of 10,672 pounds of caviar was produced giving the Chamber gross income of $292,563. Almost all anglers took advantage of the free fish cleaning; very few snaggers were interested in keeping the roe from their fish.

LITERATURE CITED

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Paddlefish sex ratio
Paddlefish tagging

Table 1. Number of anglers purchasing paddlefish tags (tags were free in 1981).

Year	Total	Resident	Nonresident	% Nonresident
1991	4216	2863	1353	32
1990	3745	2625	1120	30
1989	4243	3070	1173	28
1988	3374	2471	903	27
1987	2877	2182	695	24
1986	3696	2661	1035	28
1985	3593			
1984	5063			
1983	4636			
1982	4834			
1981	4166			

Table 2. Summary of paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-1991.

Year	Number of fish Measured	Average Total Length (inches)	Average Eye-Fork Length (mm)	Average Weight (pounds)	Percentage of Females
1963	46	43.4		29.6	0
1964	920	48.8		21.0	2.8
1965	453	50.6		21.3	2.9
1966	28	49.2		21.2	0
1967	123	50.9		21.8	0
1968	149	52.6		25.0	4.3
1969	499	51.9		23.4	3.7
1970	700	52.0		25.6	11.4
1971	1136	53.1		30.8	45.4
1972	1678	55.5		34.0	48.2
1973	1696	53.9		33.1	44.1
1974	1910	55.1		35.6	51.2
1975	1158	57.3		42.3	67.8
1976	940	57.6		47.4	67.8
1977	1003	58.2		48.2	64.0
1978	809	55.6		43.0	68.0
1979	637	60.1		50.4	67.5
1980	-	58.3 [1]		49.1 [2]	80.2
1981	2528		1086	46.7	75.1
1982	2004		1078	45.1	71.2
1983	1400		1086	50.2	82.6
1984	2691		1080	44.0	69.1
1985	628		1087	47.2	78.7
1986	1462		1064	43.7	63.3
1987	1412		1091	49.7	77.2
1988	1780		1058	43.5	61.0
1989	1583		1084	47.0	70.0
1990	1493		1073	45.6	65.4
1991	2558		1055	45.0	57.2

[1] based on 62 measurements
[2] based on 131 measurements

Table 3. Summary of paddlefish average length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963- 1991.

	Males			Females		
Year	Sample Size	Length (E-F,mm)	Weight (Pounds)	Sample Size	Length (E-F,mm)	Weight (Pounds)
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	954	27.8	1898	1130	53.0
1982	577	937	24.4	1427	1138	53.8
1983	244	932	25.8	1156	1117	55.3
1984	832	954	24.0	1859	1136	52.9
1985	134	914	24.2	494	1134	53.4
1986	537	932	24.7	925	1142	54.7
1987	322	916	25.6	1090	1143	56.8
1988	695	929	25.5	1085	1141	55.0
1989	475	931	24.8	1108	1150	56.9
1990	516	922	23.8	977	1153	57.1
1991	1080	916	24.9	1462	1159	60.3

Table 4. Number (and percentage) of the total number of paddlefish weighed at Intake that are in specific size groups.

	Males		Females		Total	Sum of Four Size
Year	<10 lbs.	10-15 lbs.	<25 lbs.	25-30 lbs.	Weighed	Groups
1991	3(.12)	141(5.5)	8(.31)	3(.12)	2558	155(6.1)
1990	8(.54)	52(3.4)	11(.74)	15(1.0)	1493	86(5.8)
1989	3(.19)	28(1.8)	6(.38)	7(.44)	1583	44(2.8)
1988	3(.16)	40(2.2)	2(.11)	15(.84)	1780	60(3.4)
1987	1(.07)	24(1.7)	1(.07)	14(1.0)	1412	40(2.8)
1986	1(.07)	26(1.8)	5(.34)	10(.68)	1462	42(2.9)
1985	1(.15)	5(.80)	3(.48)	4(.64)	628	13(2.1)
1984	2(.07)	56(2.1)	6(.22)	20(.74)	2691	84(3.1)
1983	1(.06)	29(1.9)	4(.26)	17(1.1)	1554	51(3.3)
1982	2(.10)	34(1.7)	4(.20)	8(.40)	2004	48(2.4)
1981	2(.08)	40(1.6)	6(.24)	23(.91)	2528	71(2.8)

Table 5. Summary of paddlefish tagging at Intake and Tag returns 1964-1991.

Year	Number Tagged	Number Returned In 1991	Total Number Returned	Percentage Returned
1964	958	0	126	13.2
1965	283	1	57	20.1
1966	14	0	4	28.6
1967	60	0	7	11.7
1968	28	0	3	10.7
1969	163	0	28	17.2
1970	197	0	53	26.9
1971	396	0	89	22.5
1972	385	1	77	20.0
1973	455	0	93	20.4
1974	561	0	182	32.4
1975	161	1	36	22.4
1976	194	0	69	35.6
1977	341	1	83	24.3
1978	607	4	140	23.1
1979	129	0	29	22.5
1980	13	0	2	15.4
1984	551	11	214	38.9
1985	2	2	2	100.0
1986	153	7	34	22.2
1988	156	14	47	30.1
1989	10[1]	1	1	10.0
1990	153[1]	4	11	7.2
1991	20	2	2	10.0
Totals	5990	49	1389	23.2

[1] Some of this total tagged between Intake and Crittenden Island.

Table 6. Annual angler exploitation rates of Garrison Reservoir paddlefish as indicated by tag returns of angler caught fish.

Number (%)[1] Returned in	Year tagged and (number of fish tagged) 1984(551)	1986(153)	1988(156)	1990(153)
1984	73(13.2)			
1985	2(0.4)			
1986	33(6.9)	9(5.9)		
1987	42(9.5)	0(0.0)		
1988	13(3.2)	7(4.9)	22(14.1)	
1989	19(4.9)	7(5.1)	3(2.2)	
1990	21(5.7)	4(3.1)	8(6.1)	6(3.9)
1991	11(3.1)	7(5.5)	14(11.4)	4(2.7)
Average Annual %	(5.9)	(4.1)	(8.4)	(3.3)

[1] Percentage = $\frac{\text{number caught that year}}{\text{number tagged - number caught in previous years}}$

Table 7. Estimate of anglers, hours fished and harvest for the 1991 paddlefish season at Intake.

Time Period	No.of Angler Days	Hours/ Anger Days	Angler Hours	No. of Fish Caught	Fish Caught/ Angler Hr.	Fish Caught Per Angler Day
5-15- 5-31	1784	3.62	6464	2755	0.43	1.54
6-01- 6-15	1287	4.30	5586	1283	0.23	0.99
6-16- 6-30	261	4.79	1251	165	0.13	0.63
Total/Mean	3332	4.07	13,301	4203	0.30	1.19

Table 8. Comparison of paddlefish fishing pressure and harvest data at Intake from 1972 to 1990.

Year	Angler Days	Fish Caught	Fish Kept	Fish/ Angler Day	Total Weight Harvested(Pounds)
1972	2118	2935	1805	1.39	61,370
1973	2449	4670	2675	1.91	88,543
1974	3363	4359	2182	1.30	77,680
1975	2784	2950	1473	1.06	77,038
1977	3524	2764	1410	0.78	67,962
1978	6130	4812	2887	0.78	124,141
1979	2904	2202	1727	0.76	87,041
1981	3982	5318	5318	1.34	248,251
1982	3535	4713	4713	1.33	212,556
1983	3142	3193	3193	0.92	160,289
1984	3978	3860	3860	0.98	169,840
1985	1745	550	550	0.34	25,960
1986	2521	1791	1791	0.73	78,267
1987	2386	2612	2612	1.13	129,816
1988	2320	2923	2923	1.25	127,151
1989	2208	2242	2242	1.00	105,374
1990	2877	2046	2046	0.65	93,298
1991	3332	4203	4203	1.19	189,135

Table 9. River reaches electrofished and number of paddlefish observed in 1991.

Date	Reach Description	River Miles	Paddlefish Observed
5-30	Glendive and Downstream	94 - 77	6
5-31	Below Cracker Box Creek	115.4-97	5
6-3	Moon Creek to Pirogue Island	194.6-182	0
6-4	Custer Creek to Terry Bridge	153.2-137.6	7
6-5	Cartersville Diversion to Rosebud Creek	237.4-224.5	0
6-7	Tongue River to Dixon Creek	185 -168.1	0
6-10	Lower 5 miles of Powder River	5.0- 0.0	0
6-10	Powder River to Calypso Brdg.	149.5-145.4	2
6-11	Glendive to Intake	91.6- 73.0	33
6-11	High water channel at Intake	73.0- 69.0	10
6-12	Clear Creek to Glendive	107.6- 91.6	28
6-14	Tongue River -Gaging Station	8.1- 0.0	0
	Mouth		0
6-19	Mack Creek to Gate Coulee	157.7-150.5	2
6-20	Fallon Bridge to Clear Creek	126.9-108	2
6-21	Above Deer Creek	98 - 85.7	6
6-24	Cartersville Diversion to Sand Creek	237.4-218.7	0
6-25	Sand Creek to Lignite Creek	218.7-192.3	0
6-26	Sunday Creek to Custer Creek	175.7-153.2	3
6-27	Lignite Creek to Sunday Creek	192.3-175.7	0
6-28	Black Bridge to I-94 Bridge	98.0- 91.0	2