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

STATE: Montana PROJECT TITLE: Statewide Fisheries Investigations

PROJECT NO: F-46-R-1 STUDY TITLE: Survey and Inventory of  
Warmwater Streams

JOB NO: III-c JOB TITLE: Yellowstone River Paddlefish  
Investigations

PROJECT PERIOD: July 1, 1987 through June 30, 1988

REPORT PERIOD: April 1, 1987 Through March 30, 1988

ABSTRACT

Despite very low streamflows anglers enjoyed a reasonably good paddlefish season. Anglers at Intake spent 2,386 days fishing to catch 2,612 paddlefish. Females continued to dominate the catch and average size of both sexes is remaining constant. Paddlefish tagged in 1984 were harvested at an annual rate of 9.5%. Exploitation rates have increased in recent years but are probably still safe. Day and night anglers counts indicate that average number of anglers is similar during both daylight and dark hours. Location of paddlefish over long river reaches indicated few paddlefish were able to move upstream of Intake and that paddlefish distribution downstream of Intake was not highly "clumped."

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To prevent overharvest of the paddlefish population during the spawning migration, limit harvest to 5,000 or fewer fish most years. The objective was met. Harvest in 1987 was approximately 2,600 fish.
2. To determine acceptable angler harvest. Progress was made toward this objective in 1987. The total harvest of approximately 2,600 fish resulted in a 9.5% return of paddlefish tagged in 1984.
3. To locate and preserve paddlefish spawning habitat. Progress was made toward this objective in 1987 by determining distribution of paddlefish in the Yellowstone River.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 1987. As many anglers as possible were interviewed. The interview total in 1987 was 1,184, which amounted to 49% of the total estimated angler days. The season was divided into half month sampling periods and calculations for angler hours, harvest and success rate were made for each period. Anglers were

counted on over 90% of the days of the fishing season with 8 counts, on most days, between the hours of 6:00 A.M. and 9:00 P.M. A 24 hour fishing day was used in fishing pressure calculations. Night angler counts were made on 13 nights to test the assumption that night fishing pressure was equal to daytime fishing pressure and that use of a 24 hour fishing day in pressure and harvest calculations was valid. 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 except for most fish weighing more than 50 pounds. Male paddlefish weighing 50 pounds or more are not observed at Intake.

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

## RESULTS AND DISCUSSION

### General Observations

Paddlefishing at Intake in 1987 was reasonably good despite very low Yellowstone River flows in May and June. The June average streamflow of 14,450 cfs at Sidney (USGS unpublished data) was the lowest in many years. The first fish was caught at Intake on May 17 and fishing was slow until the last few days of May when the numbers of fish caught increased in response to a rising river level. The Yellowstone River flow at Sidney peaked on May 31 and fishing was excellent during the first week of June. Fishing then gradually tapered off as the river level fell through the month of June. By June 25 very few fish being caught few people were fishing. Creel census was ended on June 28, the first day no paddlefish were caught at Intake.

Angler interest in paddlefish, as indicated by tag sales, has waned in recent years. Approximately 2,800 anglers bought paddlefish tags in 1987, with non-residents purchasing approximately 25 % of that total. In 1985 and 1986 approximately 3,700 anglers bought tags, with the corresponding number being approximately 5,000 in 1983 and 1984. Low June flows and resultant angler expectation of poor paddlefishing may be part of the reason for decreased tag sales in recent years.

### Paddlefish Size and Sex Ratio

A total of 1,412 paddlefish were weighed, measured and sexed from the 1987 angler catch at Intake (Table 1). Average length and weight of all fish processed was 1091 mm and 49.7 pounds. The

female percentage in the angler harvest was 77.2%, higher than the 63.3% of 1986, but less than the 82.6% of 1983.

Table 1. Summary of paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-1987.

Year	Number of fish measured	Average		Average weight (pounds)	Percentage of females
		Total Length (inches)	Eye-Fork length (mm)		
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		49.1	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

1 Based on 62 measurements

2 Based on 131 measurements

Table 2 indicates average length and weight by sex of paddlefish from the angler harvest at Intake. In 1987 males averaged 916 mm length and 25.6 pounds. Corresponding figures for females were 1143 mm and 56.8 pounds. Figures for both sexes are similar to recent past years, suggesting a stable paddlefish population.

#### Tag Return and Exploitation Rate

Individually numbered plastic poultry bands placed around the dentary bone have been used to study paddlefish movements since 1964. More recently return of tagged paddlefish has been used to

infer angler exploitation rate of paddlefish. Paddlefish movements are now well determined. All paddlefish in the Yellowstone River are residents of Garrison Reservoir in North Dakota.

Of the 5,651 paddlefish tagged at Intake since 1964 at least 1,192 (21.1) have been harvested by anglers. Because department personnel are present at Intake almost continuously during the paddlefish season, it is thought that most tags on angler caught fish are returned. In 1987, 64 tags were returned from Intake tagged fish (Table 3). Most of these (42) were returned from fish tagged in 1984. In addition 4 metal tags were returned at Intake from fish tagged in the Missouri River. Of the 64 tags returned from Intake tagged fish only one was returned from a location other than Intake. This fish was caught at the Missouri - Yellowstone confluence in North Dakota.

Table 2. Summary of paddlefish length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963-1987.

Year	Males			Females		
	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

Table 3. Summary of paddlefish tagging at Intake and tag returns 1964-1987.

Year	Number Tagged	Number Returned in 1987	Total Number Returned	Percentage Returned
1964	958	0	125	13.0
1965	283	0	56	19.8
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	85	21.5
1972	385	1	75	19.5
1973	455	0	90	19.8
1974	561	1	179	31.9
1975	161	1	33	20.5
1976	194	4	62	32.0
1977	341	3	79	23.2
1978	607	10	128	21.1
1979	129	2	24	18.6
1980	13	0	2	15.4
1984	551	42	150	27.2
1985	2	0	0	0.0
1986	153	0	9	5.9
Total or Mean	5651	64	1192	21.1

Exploitation rates are most reliably calculated from fish tagged in recent years, because of compounding underestimation due to non-angling mortality and angler failure to return tags. Paddlefish tagged in 1984 were harvested at a rate of 9.5% in 1987. The four year average annual angler exploitation rate for 1984 tagged fish is 7.4%. While this rate is higher than those calculated in 1984 for fish tagged in the 1960's and '70's (Stewart 1984), it is probably not excessive.

For the 153 paddlefish tagged in 1986, 9 or 5.9 % were caught by anglers in 1987. Some of these fish should return to Intake in 1988 and again be vulnerable to angler harvest.

#### Creel Census

Results from the 1987 creel census at Intake are given in Table 4. Results for 1987 are compared to previous years in Table 5. In 1987, 1,197 anglers were interviewed for angling information. This was 49% of the estimated paddlefish angler days in 1987 at Intake. Creel census results showed that anglers spent 2,386 days or 9,450 hours paddlefishing to catch 2,612 fish. The

average angler day was 4.0 hours. Anglers caught on the average, 0.28 fish per hour or 1.13 fish per day. Compared to 1986, 1987 had higher harvest and success rate, but fewer angler days and a shorter fishing day.

Table 4. Estimate of anglers, hours fished and harvest for the 1987 paddlefish season at Intake, by half month sampling periods.

Time Period	No. of Angler Days	Hours Per Angler Day	Angler Hours	No. of Fish Caught	Fish Caught Per Angler Hour	Fish Caught/Angler Day
5/15-5/31	1226	3.9	4781	1207	0.25	1.00
6/1- 6/15	903	4.0	3613	1104	0.31	1.22
6/16-6/30	257	4.1	1055	300	0.28	1.15
7/1 -7/10	No creel census - few anglers, few fish caught.					
Total or Mean	2386	4.0	9450	2612	0.28	1.13

Table 5. Comparison of paddlefish of paddlefish fishing pressure and harvest data at Intake from 1972 to 1987.

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

The harvest in 1987 was surprisingly high considering near record low June flows. Flows in 1985 were similar during paddlefish season, but the 1985 harvest was much lower (Table 5). Both pressure and harvest have been relatively low since 1985.

A twenty-four hour fishing day, rather than 16 hours, was used in creel census calculations for both the 1986 and 1987 seasons. In 1985 and previous years it was assumed that fishing pressure was negligible during the hours from 10:00 P.M. to 5:00 A.M. General observations indicate this is no longer true. In 1987 night angler counts were made on 13 nights and compared to counts made on the same day during the daylight. A paired "T" test was used to test the hypotheses that average fishing pressure was equal during the day and night. For the days used the average daytime pressure was 10.8 anglers and the night average was 8.7 anglers. The calculated paired "T" value was 1.918. It was not significant at the 95% level but was significant at the 90% level. Evidence suggests that night fishing pressure may be slightly less on the average.

Ideally angler counts would be made throughout the 24 hour day, but because of manpower considerations counts are being limited to daylight hours. Available evidence indicates the use of a 24 hour is much more accurate than use of a 16 hour fishing day in creel census calculations.

#### Paddlefish Migration and Concentration

Major gaps still exist in the body of information required for protection of Yellowstone River paddlefish spawning habitat. What particular areas of the river are utilized by paddlefish for spawning? What river flows are required to bring paddlefish upstream of Intake, giving them access to 166 miles of river between Intake and the Cartersville diversion at Forsyth. Only very partial answers are available to either question. Penkal (1981) collected a few paddlefish eggs and larvae in the first 5 miles downstream from the Intake diversion dam, but no search has been made for eggs and larvae at other Yellowstone River sites. Peterman (1979) determined that a flow of 45,000 cfs was sufficient to allow paddlefish passage through the side channel around Intake, but it is not known if somewhat lower flows might allow passage.

As a beginning toward answering the important questions concerning paddlefish spawning, in 1987 paddlefish distribution was determined in the Yellowstone River during the spawning period. Concentrations of paddlefish indicate locations where spawning is likely. Results are shown in Table 6.

The first run for paddlefish counts from Intake to North Dakota was made May 12 through 14, 1987. This run was probably made before any actual spawning. Few fish had traveled upstream to Intake and most fish were still located downstream of Sidney (Table 6).

The late May and mid-June counts are probably the most indicative of likely paddlefish spawning areas. By those dates water temperatures were suitable for spawning and fish had had ample time to reach preferred locations. On both the late May and mid-June runs paddlefish distribution was not sharply clumped. At

least a few fish were present in each two mile interval. Highest counts on both runs were found at two locations - one approximately two miles upstream from Sidney and the other just downstream from Sidney (Table 6).

The last count, made the last two days of June and the first day of July, indicated that paddlefish had virtually left the river. Only three paddlefish were observed in the 53 river miles between Intake and North Dakota.

Only four days were spent making paddlefish counts on the Yellowstone River upstream of Intake diversion dam because it was felt that May-June streamflows in 1987 were too low to allow significant numbers of paddlefish to move upstream of Intake.

Table 6. Number of paddlefish counted by two river mile intervals for the for the Yellowstone River from Intake to the North Dakota border, May and June 1987.

River Mile	5-12,13,14,	5-26,27,28	6-15,16,17,	6-29,30,7-1
71-70 (Intake)	2	36	30	1
69-68	2	11	10	0
67-66	0	1	1	0
65-64	1	10	6	0
63-62	3	11	5	0
61-60 (Burns Cr.)	0	5	13	0
59-58	0	11	4	0
57-56	5	6	4	0
55-54	0	6	11	0
53-52 (Elk Island)	0	12	5	0
51-50	0	7	0	0
49-48	0	5	10	0
47-46	1	7	1	0
45-44	3	7	1	2
43-42	0	7	8	0
41-40 (7 Sisters)	1	3	6	0
39-38	0	5	11	0
37-36	1	4	7	0
35-34	0	9	14	0
33-32	0	8	6	0
31-30	1	13	22	0
29-28 (Sidney)	6	5	6	0
27-26	10	20	18	0
25-24	21	6	6	0
23-22	5	8	2	0
21-20	17	9	3	0
19-18	12	9	4	0
17-16	16	8	2	0
15- (ND Border)	2	1	0	0
Total	109	250	216	3



This proved to be the case. Only three paddlefish were observed in 81 river miles electrofished upstream of Intake. On June 4 and 5, 1987 35 river miles from Cedar Creek to Intake were electrofished; no paddlefish were observed. On June 18, 1987, 23 river miles from Cedar Creek to Three Mile Creek were electrofished; no paddlefish were observed. On June 19, 1987, 23 river miles from the Powder River to the Fallon Interstate bridge were electrofished. Only three paddlefish were observed - one a mile downstream of the Powder River and two near the Milwaukee Railroad bridge near Calypso.

Yellowstone River streamflows in May and especially June 1987, were unusually low. at the Sidney USGS gage the June mean daily discharge is 39,800 cfs (Penkal 1981). The comparable figure for June 1987 is 14,450 cfs. The latter figure is the lowest June mean for many years. It is obviously insufficient to give paddlefish access to spawning areas upstream of Intake and it may also make many spawning areas downstream of Intake unusable for paddlefish. As a result the paddlefish location data from Intake to North Dakota may give little information concerning spawning locations. The same work needs to be done during a May-June period with more typical streamflows.

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