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

STATE: Montana PROJECT TITLE: Statewide Fisheries Investigations

PROJECT: F-46-R-3 STUDY TITLE: Survey and Inventory of Warm Water Streams

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

PROJECT PERIOD: July 1, 1989 through June 30, 1990

REPORT PERIOD: April 1, 1989 through March 31, 1990

ABSTRACT

The Intake paddlefish harvest in 1989 was estimated at 2,242 fish. The success rate was about average. Paddlefish tag sales were the highest since 1984. Female paddlefish made up 70% of the harvest. Average length and weight of paddlefish caught at Intake is remaining constant. Angler exploitation rate of the Garrison Reservoir paddlefish population is probably between 5% and 10% annually. Paddlefish spawned in the Intake area in 1989, but very few paddlefish moved upstream of Intake.

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 1989 was approximately 2,200 fish.

2. Determine acceptable angler harvest. Progress was made toward this objective in 1989. Data is presented in Table 5 on angler exploitation rates of paddlefish.

3. Locate and preserve paddlefish spawning habitat. Progress was made toward this objective in 1989 by determining distribution of paddlefish in the Yellowstone River during the spawning period and by noting location of ripe fish.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 1989. As many anglers as possible were interviewed. The interview total in 1989 was 1,292, which amounted to 59% of the estimated total angler days. The season was divided into three sampling periods and calculations for angler hours, harvest and success rate were made for each period. Anglers were

counted from May 15 (opening day of paddlefish season) through June 30, when few paddlefish were present at Intake and paddlefishing had all but ceased. Angler 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 adopting formulas 5 through 32 from Spence (1970) to the creel census. Calculations were may 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 over 50 pounds, which were assumed to be females.

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 electrodes to possibly cause immobilization. Location of paddlefish were noted on maps.

Drifted gill nets were used to sample paddlefish to observe the spawning condition of the fish. These nets were 100 to 150 foot long, 5 or 6 feet deep with 4 or 5 inch square mesh. Spawning condition of angler caught fish was noted at Intake. Fish that ran eggs or milt were considered ripe. Females were considered spent when they would run only a few eggs or when the ovary was noted to be almost empty at the time of cleaning.

RESULTS AND DISCUSSION

General Observations

Paddlefishing at Intake in 1989 was very good during the early season, poor in early June when fishing is often good, and fair in late June. The river rose sharply before the May 15 start of paddlefishing at Intake and peaked at 30,800 cfs (USGS unpublished data, Sidney gage) on May 15. The discharge dropped steadily to 16,500 cfs on June 1, began to rise significantly on June 10, peaked at 31,700 cfs on June 15, dropped slightly, peaked on June 20 at 36,700 cfs and dropped steadily to 15,100 cfs on June 30. Overall May streamflows were above average and June streamflow below average. The last paddlefish of the 1989 season was caught June 30. By that date fishing activity had nearly ceased.

Sales of paddlefish tags increased significantly from 3,374 anglers buying paddlefish tags in 1988 to 4, 243 in 1989 (Table 1). For unknown reasons the increase in tag sales was not reflected by an increase in paddlefish angler days at Intake (Table 7).

Paddlefish Size and Sex Ratio

A total of 1,583 paddlefish were weighed, measured and sexed from the 1989 angler catch at Intake (Table 2). This number was 71% of the estimated Intake paddlefish harvest. Average length and weight of all fish processed was 1084 mm and 47.0 pounds. Females made up 70% of the angler harvest (Table 2). For the past 15 years female percentage of the harvest has been mostly 60% to 80%.

Table 3 indicates average length and weight by sex of paddlefish f rom the Intake angler harvest. In 1989 males averaged 931 mm eye to fork length 24.8 pounds. Corresponding figures for females were 1150 mm and 56.9 pounds. The figures for both sexes have been very consistent for the past nine 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, in general, are now well determined. All paddlefish in the Yellowstone River are residents of Garrison Reservoir in North Dakota.

Of the 5,807 paddlefish tagged at Intake since 1964, at least 1,287 (22.2%) have been harvested by anglers (Table 4). 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 1989, 35 tags were returned from Intake tagged fish (Table 4). About half (19) were returned from fish tagged in 1984, but two were tagged 18 years previous in 1971. In addition eight tags were returned at Intake from fish tagged in the Missouri River, downstream of Ft. Peck Dam. Of the 35 tags returned from Intake tagged fish only three were returned from a location other than Intake. These three fish were caught by anglers at three different locations: Fairview Bridge - Yellowstone River - North Dakota; Missouri - Yellowstone confluence in North Dakota; Missouri River - Montana, near Frazer.

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 5 for paddlefish tagged at Intake in 1984, 1986 and 1988. For these three groups calculated average annual exploitation rates range from 5.3 to 8.2 percent. These calculated rates are known to be low, but the degree of underestimation is unknown. True exploitation rates could easily be 8% to 10%. Paddlefish literature (Pasch and Alexander 1986) would suggest that even 10% is not excessive. Whatever the present true rate of exploitation, the lack of a decrease in size of paddlefish at Intake indicates the rate is not excessive.

Creel Census

Results from the 1989 creel census at Intake are given in Table 6. Results for 1989 are compared to previous years in Table 7. In 1989, 1,292 anglers were interviewed for angling information. This number was 59% of the estimated paddlefish angler days in 1989 at Intake. Creel census results showed that anglers spent 2,208 days or 12,386 hours paddlefishing to catch 2,242 fish. The average angler day was 5.6 hours. Anglers caught, on the average, 0.19 fish per hour or 1.00 fish per day.

Overall, fishing was not as good in 1989 as in 1988. Anglers compensated by fishing more hours in a day (average 3.9 in 1988, 5.6 in 1989). The numbers of fish caught in 1989 was also lower. Compared to past years fishing pressure and fish caught were somewhat below average and success rate was about average.\

Paddlefish Migration, Concentration and Spawning

As beginning toward answering questions about the location of paddlefish spawning in the Yellowstone River, distribution of paddlefish in the Yellowstone River during the spawning period was first determined in 1987. Paddlefish counts made in 1989 are shown in Table 8. These counts are similar to those made in the two previous years. Through the spawning period paddlefish have been distributed throughout much of the Yellowstone River downstream from Intake. The distribution was not highly "clumped." Points of concentration would likely indicate spawning locations. June, 1987, 1988 and 1989 Yellowstone River flows have been well below average and paddlefish distribution during the spawning period should be observed during a June with average or above average flows. The mean June Yellowstone River flow for the years 1972 through 1985 at Sidney was 32,675 cfs. Mean June flows in 1987, 1988 and 1989 were 14,450 cfs, 19,210 cfs and 23,970 cfs.

Significant paddlefish spawning did occur in the area just downstream of Intake in 1989. In the angler catch at Intake 19 ripe males were noted over the period 5-30 to 6-22, 2 ripe females, 6-24 to 6-25, and 10 spent females, 5-25 to 6-26. Ripe and spent female paddlefish were noted in the angler catch in only one previous year, 1985 (Stewart 1986).

Paddlefish were also sampled with drifted gill nets from June 1 through June 20, in the river reach from 1/2 mile downstream of Intake to 2 1/2 miles downstream of Intake. These nets were not highly successful in capturing paddlefish, but a total of 11 paddlefish were sampled. Of these 11, five were males, 5 were females and one could not be sexed. Two of the males were ripe. One of these was sampled on June 1 and one on June 20.

Paddlefish larvae were also collected in the Yellowstone River in 1989. This work will be discussed in a separate report.

Table 9 shows river reaches upstream of Intake electrofished for paddlefish in 1989. Only one paddlefish was observed in 97 river miles electrofished. This fish was noted on 6-26. I concluded that river flows were too low in 1989 to allow significant numbers of paddlefish to move upstream of Intake. Again, a June of average or above streamflow is needed to determine if paddlefish are able to move upstream of Intake and spawn in that area.

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Waters Referred to:

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Yellowstone River Section 2	21-1400-02

Key Words:

Angler success rate	Paddlefish migration and passage
Fishing pressure	Paddlefish sex ratio
Creel census	Paddlefish spawning
Paddlefish exploitation rate	Paddlefish tagging

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

Year	Total	Resident	Nonresident	% Nonresident
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, 1963-1988.

		Average			
Year	Number of fish measured	Total length (inches)	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

1 based on 62 measurements
2 based on 131 measurements

Table 3. Summary of paddlefish length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963-1988.

	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

Table 4. Summary of paddlefish tagging at Intake and tag returns 1964-1989.

Year	Number Tagged	Number Returned In 1989	Total Number Returned	Percentage Returned
1964	958	0	126	13.2
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	2	89	22.5
1972	385	0	76	19.7
1973	455	1	93	20.4
1974	561	0	180	32.1
1975	161	1	35	21.7
1976	194	0	66	34.0
1977	341	2	81	23.8
1978	607	2	134	22.1
1979	129	0	26	20.2
1980	13	0	2	15.4
1984	551	19	182	33.0
1985	2	0	0	0.0
1986	153	7	23	15.0
1988	156	3	25	16.0
Total	5807	35	1287	22.2

Table 5. Annual angler exploitation rates of Garrison Reservoir paddlefish as indicated by tag returns for fish in 1984, 1986 and 1988.

Year	Number of Fish	Number (%) [1] Returned In 1984	1985	1986	1987	1988	1989	Average Annual
1984	551	73(13.2)	2(0.4)	33(6.9)	42(9.5)	13(3.2)	19(4.9)	6.4
1986	153			9(5.9)	0(0.0)	7(4.9)	7(5.1)	5.3
1988	156					22(14.1)	3(2.2)	8.2

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

Table 6. Estimate of anglers, hours fished and harvest for the 1989 paddlefish season at Intake.

Time Period	No. of Angler Days	Hours/ Angler Day	Angler Hours	No. of Fish Caught	Fish Caught/ Angler Hr	Fish Caught Per Angler Day
5/15- 5/31	1270	4.78	6069	1443	.24	1.14
6/01- 6/15	561	7.11	3987	369	.09	0.66
6/16- 6/30	399	5.84	2330	430	.18	1.08
Total/mean	2208	5.61	12,386	2242	.19	1.00

Table 7. Comparison of paddlefish fishing pressure and harvest data at Intake from 1972 to 1988.

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

Table 8. Number of paddlefish counted during electrofishing by two mile intervals for the Yellowstone River from Intake to the North Dakota Border.

River Miles	5-31	6-7, 8	6-14	6-21
71-70 (Intake)	3		4	2
69-68	15		23	13
67-66	5		16	7
65-64	6		10	4
63-62	3		1	0
61-60	13		20	13
59-58	0		3	3
57-56	2		4	6
55-54	7		4	6
53-52 (Elk Island)	3		3	3
51-50	2		1	2
49-48	2		0	0
47-46		1		
45-44		3		
43-42		2		
41-40 (7 Sisters)		1		
39-38		1		
37-36		1		
35-34		2		
33-32		0		
31-30		2		
29-28 (Sidney)		1		
27-26		3		
25-24		1		
23-22		2		
21-20		4		
19-18		7		
17-16		11		
15- (ND Border)		8		
Total	61	50	89	59

Table 9. Yellowstone River reaches upstream of Intake electrofished for paddlefish in 1989.

Date	River Reach	Number of River Miles
6-2	Glendive to Intake	20
6-12	Miles City vicinity	7
6-16	Powder River Mouth to Fallon	22
6-22	Glendive to Intake	20
6-23	Moon Creek to Tongue River	10
6-26	Calypso Bridge to Fallon	18
	Total	97