MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT TITLE: Statewide Fisheries Investigations

PROJECT: F-46-R-6 STUDY TITLE: Survey and Inventory of Warmwater Streams

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

PROJECT PERIOD: July 1, 1992 through June 30, 1993

REPORT PERIOD April 1, 1992 through March 30, 1993

ABSTRACT

The Intake paddlefish harvest in 1992 was estimated at 762 fi , the second lowest ever measured. Tag sales were similar to 1991 despite tags being required on the Missouri River for the first time. Average size of female paddlefish caught at Intake has increased in recent years. Angler success rate appears to be lower and exploitation rate higher in recent years. Overall harvest of the Lake Sakakawea paddlefish is higher beginning in about 1980. Paddlefish roe collection at Intake yielded much less than in 1992.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. Prevent over harvest 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 1992 was an estimated 762 fish.

2. Determine acceptable angler harvest. Progress was made toward this objective in 1992. 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 1992 by sampling paddlefish downstream of the Intake area.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 1992. As many anglers as possible were questioned concerning amount of time spent fishing and number of fish caught. The interview total in 1992 was 637 which amounted to 27% 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 each day of the season (May 15 through June 30). Counts were made at eight 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 census. Calculations were made by computer.

Angler caught paddlefish were weighed to the nearest pound. Body length (center of eye to fork of caudal fin) was measured to the nearest millimeter. Sex was determine 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.

Drifted 5 inch bar mesh gill nets 100 to 150 feet long were used to sample paddlefish for examination of gonadal condition and tagging. All paddlefish collected were tagged on the lower jaw with a white individually number plastic band obtained from the National Band and Tag Co.

RESULTS

General Observations

Well below average Yellowstone River flows through most of the paddlefish season resulted in the second lowest harvest recorded at Intake in 19 years of harvest measurement. Mountain snowmelt in the upper Yellowstone River drainage early in May brought paddlefish to Intake well in advance of the May 15 season opening. Paddlefish snagging was poor through much of the season with brief river rises and long periods of falling river stage until the middle of June. Fishing was best in late June after a sustained river rise that began mid June. This river stage increase was caused by sustained heavy rain in the upper Yellowstone drainage. Without the rain paddlefish harvest at Intake would have been a record low.

Total paddlefish tag sales in 1992 were similar to 1991 (Table 1). Tags were required for paddlefish snagging statewide for the first time in 1992. Without this new factor in 1992 tag sales would have been much lower than in 1991. The nonresident fraction of tag sales decreased slightly in 1992 from the previous year.

Paddlefish Size and Sex Ratio

A total of 670 paddlefish were weighed, measured and sexed from the 1992 angler catch at Intake (Table 2). This number was 88% of the estimated Intake paddlefish harvest. Females made up 67.3% of fish weighed and measured. This percentage is near the middle of the range of the years since 1975.

Table 3 shows average length and weight by sex of paddlefish from the Intake harvest. Size of males in 1992 remained consistent with the pattern of virtually unchanged average length and weight over the past 10 years. Average length of females increased 11 mm in 1992 over 1991, but average weight was essentially unchanged. Females show a pattern of slight increase in average length and weight in recent years.

Small fish in the angler catch at Intake are of particular interest because their presence indicates a continuing recruitment of young fish to the migrating segment of the population. Table 4 shows numbers and percentages of two size class of small fish for each sex at Intake over the past 12 years. Percentages of fish in each weight category in Table 4 have fluctuated within a rather narrow range, suggesting a continuous recruitment of young fish to the migrating population. In 1992 small male paddlefish were somewhat less abundant then in 1990 and 1991. Small female paddlefish abundance in 1992 was within the range of recent years.

CREEL CENSUS

Results from the 1992 creel census at Intake are shown in Table 5. Results from 1992 can be compared with previous years in Table 6. In 1992 anglers fished 2396 days, with an average of 3.82 hours per day to catch an estimated 762 paddlefish at a rate of 0.09 fish per hour or 0.34 fish per day. Paddlefish harvest was lower only in 1985 in 19 years of record beginning in 1972. The catch rate of 0.34 fish per day equalled the record low of 1985 (Table 6). The low harvest and success rate in 1992 were consistent with low May-June Yellowstone River flows in 1992.

Despite very low harvests in 1985 and 1992, harvest at Intake has increased in the 1981-1992 period. Harvest ("fish kept" in Table 6) averaged 2023 for the period 1972 through 1979 and 2851 for the period 1981 through 1992, a 40.5% increase.

Harvest of the same population in North Dakota has also increased the total harvest on the population. North Dakota first had a paddlefish season in 1976. Conversation with North Dakota Game and Fish personnel indicated that the harvest was low until the early 1980's, and that recent creel surveys indicate the harvest is presently in the range of 500-1500 paddlefish per year. A more

recent telephone survey for the 1992 season in North Dakota suggests that the harvest was in excess of 1,500 paddlefish (Ryckman 1993), or roughly twice the paddlefish harvest at Intake.

Paddlefish angler success rate in terms of fish per angler has been lower in recent years at Intake (Table 7). Success rate for the years 1986-1992 is only about half the value for earlier years. The difference in fish per angler hour for the 1981-85 vs 1986-92 is significantly different ($t=1.927$, $p < 0.05$). The average May-June river flows for the two time periods are very similar. These flows for 1981-85 are 22,452 cfs and 22,158 cfs for 1986-92. Fish per angler day seems to have decreased less (Table 7). Fish per day has been maintained by an increase in the length of the fishing day. The conclusion that success rate has decreased because of a decrease in the number of adult paddlefish may or may not be warranted.

Paddlefish Migration

Very little effort was expended in 1992 looking for paddlefish upstream of Intake because flows were considered too low to allow passage to points upstream of Intake. June flows at the Sidney gage averaged 21,700 cfs and peaked at 39,300 on June 20. The Yellowstone River from 1/4 mile upstream of the "Black Bridge" to Glendive Creek (six river miles) was electrofished on June 25. No paddlefish were observed.

Tag Return and Exploitation Rate

Individually numbered plastic 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 6,211 paddlefish tagged at Intake and at downstream points since 1964, at least 1,438 (23.2%) have been harvested by anglers (Table 8). Because Department personnel are present at Intake continuously during the paddlefish season, I think most tags on angler caught fish at Intake are returned. Probably some tags are not returned for fish caught at other sites, especially the Yellowstone-Missouri confluence area in North Dakota.

In 1992, 49 tags were returned from paddlefish tagged in the Yellowstone River. Of these, tags placed in the years 1984, 1988 and 1992 were most heavily represented in the returns. For the first time, no tags were returned from Yellowstone River tagged fish tagged previous to 1984. Of the 49 tags returned, 45 were returned from Intake and four from North Dakota snaggers. An additional three fish were caught at Intake that were tagged in the Missouri River in Montana downstream of Fort Peck Dam.

Exploitation rates of Lake Sakakawea paddlefish seem to have increased in the 1980's. For 4,932 paddlefish tagged at Intake from 1964 to 1980, a total of 1,078 tags have been returned (21.9%). Very few, if any, additional tags from this period will be returned. For 862 paddlefish tagged from 1984 through 1988, a total of 312 have been returned (36.2%). This percentage will increase significantly in just a few years and will almost certainly exceed 50% before returns cease.

Annual exploitation rates have been calculated for fish tagged from 1984 through 1992 (Table 9). Excluding the year 1992, for which only first year returns are available, calculated average exploitation rates range from 3.5% to 6.9% and average 5.0%. These rates are lower than true rates because of non-return of some tags on angler caught fish and natural mortality of tagged paddlefish.

Annual exploitation rates were calculated in 1983 for fish tagged from 1966 to 1979 (Stewart 1984). Calculated annual exploitation rates averaged 1.1% for fish tagged in the years 1966 through 1974 and 2.5% for the fish tagged in the year 1975 through 1979. Due to longer elapsed time for effects of non-return of tags and natural mortality the 1.1% figure is probably not comparable to the exploitation rates in Table 9. The rate of 2.5 for fish tagged 1975 through 1979 is comparable. The evidence is fairly strong that present exploitation rates are higher than in the 1970's.

DISCUSSION

These are some rather disturbing signs that the Lake Sakakawea adult paddlefish population may be decreasing and that harvest is increasing. Average weight of females in the angler harvest has increased since 1986 (Table 3), suggesting relatively more older and fewer young female paddlefish. The harvest at Intake has increased in the 1980's and at the same time harvest of the same population increased in North Dakota.

Angler success rate for paddlefish has decreased in recent years (Table 7). Almost certainly angler exploitation rate is higher presently than in the 1960's and 1970's (see section on tag return and exploitation rate).

Age structure data by sex is being developed under a contract with Dr. Dennis Scarnecchia, faculty member at the University of Idaho. This information will be useful in evaluating the status of the Lake Sakakawea paddlefish population.

PADDLEFISH CAVIAR

The Glendive Chamber of Commerce and Agriculture continued their collection of paddlefish roe at Intake for a third year in 1992. The small paddlefish harvest in 1992 greatly decreased the weight of roe collected and gross income. The Chamber cleaned 735 fish of

which 529 were females and usable roe was collected from 491 females. From these fish a total of 3,522.8 pounds of roe was produced giving the Chamber a gross income of $63,000. Cooperation by anglers in donating roe was high.

LITERATURE CITED

Ryckman, F. 1993. Paddlefish angler characteristics and phone survey results for the Missouri-Yellowstone River paddlefish snagging season, 1992. North Dakota Game and Fish Dept., Div. Rpt. 6. 9 pp.

Spence, L. 1970. Georgetown Lake Winter Creel Census. Job Prog. Rept., F-12-R-16, Job I-b. Montana Dept. of Fish & Game. 29 pp.

Stewart, P.A. 1984. Paddlefish Investigations. Job Prog. Rept. F-30-R-20. Job IIa. Mont. Dept. of Fish, Wildl. & Parks. 11 pp.

Prepared by: Phillip A. Stewart

Date prepared: June 15, 1993

Waters Referred to:

Yellowstone River Sec. 1	21-1350-02

Key Words:

Angler success rate	Paddlefish exploitation rate
Fishing pressure	Paddlefish sex ratio
Creel census	Paddlefish tagging
Paddlefish caviar	

Table 1. Number of anglers purchasing paddlefish tags.

Year	Total	Resident	Nonresident	% Nonresident
1992[3]	4298	3069	1229	29
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[2]	2661	1035	28
1985	3593			
1984	5063			
1983	4636			
1982	4834			
1981[1]	4166			

[1] Tags were free in 1981

[2] Resident and nonresident tag sales were calculated separately beginning in 1986.

[3] Previous to 1992 tags were required only for Yellowstone River paddlefish snagging. Beginning in 1992 tags were required statewide.

Table 2. Summary of paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-1992.

Year	No. 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
1992	670		1087	48.7	67.3

[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, 1963-1992.

	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
1992	214	917	24.7	451	1170	60.2

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

	Males		Females			Sum of
Year	<10 lbs.	10-15 lbs.	<25 lbs.	25-30 lbs	Total Weighed	Four size Groups
1992	0(.00)	14(2.1)	4(.60)	4(.60)	670	22(3.3)
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. Estimate of anglers, hours fished and harvest for the 1992 paddlefish season at Intake.

Time Period	No. of Angler Days	Hours/ Angler Days	Angler Hours	No. of Fish Caught	Fish Caught/ Angler Hr	Fish Caught Per Angler Day
5-15-5-31	1060	4.10	4345	204	0.05	0.19
6-01-6-15	681	3.35	2280	162	0.07	0.24
6-16-6-30	648	3.91	2536	396	0.16	0.61
Total/Mean	2396	3.82	9161	762	0.09	0.34

Table 6. Comparison of paddlefish fishing pressure, harvest and success rate data at Intake from 1972 to 1992.

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	70,680
1975	2784	2950	1473	1.06	77,038
1977	3524	2764	1410	0.78	67,962
1978	6130	4814	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
1992	2396	762	762	0.34	37,109

Table 7. Comparison of mean number of paddlefish per angler hour, mean angler hours per day and mean fish per day at Intake, 1972 to 1992.

Year	Fish Per Hour	Period Mean	Hrs/ Angler Day	Period Mean	Fish Per Day	Period Mean
1992	0.09		3.82		0.34	
1991	0.30		4.07		1.19	
1990	0.15		4.40		0.65	
1989	0.19	0.21	5.61	4.36	1.00	0.92
1988	0.34		3.90		1.25	
1987	0.28		4.00		1.13	
1986	0.15		4.70		0.73	
1985	0.09		3.37		0.34	
1984	0.35		2.87		0.98	
1983	0.38	0.42	2.40	2.63	0.92	1.10
1982	0.45		2.90		1.33	
1981	0.81		1.60		1.34	
1979	0.07		2.87		0.76	
1978	0.49		1.60		0.78	
1977	0.34		2.27		0.78	
1975	0.28	0.38	3.82	3.07	1.06	1.17
1974	0.39		3.32		1.30	
1973	0.46		4.14		1.91	
1972	0.40		3.50		1.39	

Table 8. Summary of paddlefish tagging at Intake and tag returns 1964-1992.

Year	Number Tagged	Number Returned in 1992	Total Number Returned	Percentage Returned
1964	958	0	126	13.2
1965	283	0	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	0	77	20.0
1973	455	0	93	20.4
1974	561	0	182	32.4
1975	161	0	36	22.4
1976	194	0	69	35.6
1977	341	0	83	24.3
1978	607	0	140	23.1
1979	129	0	29	22.5
1980	13	0	2	15.4
1984	551	10	224	40.7
1985	2	0	2	100.0
1986	153	4	38	24.8
1988	156	1	48	30.8
1989	10[1]	1	2	20.0
1990	153[1]	10	21	13.7
1991	20	0	2	10.0
1992	221[1]	23	23	10.4
Totals	6211	49	1438	23.2

[1] Some of this total tagged between Intake and Crittenden Island. Most tagged between Intake and five miles downstream.

Table 9. Annual angler exploitation rates (percent) 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 (581)	1986 (153)	1988 (156)	1990 (153)	1992 (221)
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)	
1992	10 (3.0)	4 (3.4)	1 (0.9)	10 (4.0)	23 (10.4)
Average Annual %	(5.5)	(4.0)	(6.9)	(3.5)	(10.4)

[1] Percentage = $\frac{\text{number caught that year}}{\text{Number tagged - number caught previous years}}$ x100