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-4

PROJECT PERIOD: July 1, 2003 through June 30, 2004

REPORT PERIOD: April 1, 2003 through March 30, 2004

ABSTRACT

The paddlefish harvest cap shared by North Dakota and Montana was set at 2,000 for the 2003 season. Drought conditions continued in Montana in 2003, but mountain snow pack was sufficient for the lower Yellowstone River flows to peak at 48,400 c.f.s., on June 5. Good numbers of paddlefish migrated to the Intake Fishing Access Site and the harvest season was closed on June 7 when Montana's portion of the harvest cap (1,000 paddlefish) was reached. Catch-and-release fishing continued through the remainder of the paddlefish season. Statewide paddlefish tag sales were 25 percent higher in 2003 than in 2002, but nonresident tag sales continue to trend downward. The percentage of female paddlefish harvested in 2003 was up from 2002 but was similar to the four years prior to 2002. The average size of male paddlefish was the smallest ever recorded at Intake and the average size of female paddlefish was the smallest since 1985. Data suggests that young male paddlefish are entering the fishery. Relative exploitation of the paddlefish population was higher from 1995 through 1997 after a decrease in the early 1990's. Exploitation rates have been lower since 1997. Exploitation for the sexes was greater for females in the 1970's and 1980's. Since the early 1990's the exploitation rates have been similar between the sexes.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 2003. As many anglers as possible were questioned concerning amount of time spent fishing and number of fish caught. The interview total for periods requiring retention of fish was 716 or 35.6% of the estimated angler days in 2003. Anglers were counted each day of the season during daylight hours. On days with no catch and release, eight counts were made. On catch and release days, three counts were made on the catch and release portion of the day and eight counts were made on the remaining portion of the day. The paddlefish harvest season closed on June 7, 2003, but the remainder of the season was left open to catch and release fishing. Eight counts per day were made after June 7. A 24 hour fishing day was used in calculations to estimate fishing pressure on days with no catch and release and for catch and release days after June 7. An 18 hour day was used on catch and release days (6 hours per day of catch and release fishing). Analysis of the data was accomplished by adapting formulas 5 through 32 from Spence (1970) to the census.

Catch and release statistics were estimated by counting number of fish caught and by three angler counts made during each 6-hour catch and release day.

Angler caught and kept paddlefish were weighed to the nearest pound. Body length (front of eye to fork of caudal fin) was measured to the nearest millimeter. Sex was determined by examination of the gonads of harvested fish. For fish released, sex was assigned on the basis of length and shape. Angler released fish were not weighed. Most of the released paddlefish were jaw tagged. Monel metal bands (National Band and Tag Co., Size 16, ½ inch inside diameter) were placed around the dentary bone.

RESULTS

General Observations

The Montana-North Dakota Paddlefish Management Plan (Scarnecchia, et al. 1995), establishes the goals and objectives guiding the management of the Yellowstone River/Lake Sakakawea paddlefish population. A 3,000 fish per year harvest cap was established in 1995 to slow the harvest of this late maturing , long lived species. Montana and North Dakota were each allowed to harvest 1,500 paddlefish per year. Beginning in 2003, the harvest cap was reduced to 2,000 paddlefish (1,000 paddlefish per state). This reduction was necessary to bring harvest in line with recruitment and has its basis in the paddlefish stock index developed by Dr. Dennis Scarnecchia as outlined in objectives 1 and 2 of the management plan. Dr. Scarnecchia discusses the method of obtaining the model outputs in a letter attached as Appendix A. In Montana, when the observed harvest approaches the harvest cap, the Fish, Wildlife and Parks Commission can close the paddlefish season early.

Yellowstone River flows in 2003 peaked on June 5 at 48,400 c.f.s. (Figure 1). As flows started to climb in late May, an abundance of paddlefish arrived at the Intake Fishing Access Site. The observed harvest rapidly approached the harvest cap and the harvest season was closed on June 7th. The remainder of the season was left open to catch and release fishing. By way of comparison, the long term, mean daily flow for the Yellowstone River at Sidney is 38,840 c.f.s. for the month of June (USGS, 2002).

Paddlefish tag sales were up about 25 percent in 2003 from tag sales in 2002(Table 1). The non-resident portion of tag sales has been trending down in recent years. In 2003, non-residents purchased 14 percent of paddlefish tags sold which is the lowest since resident and non-resident tag sales have been recorded separately.

Catch and release fishing remains popular during those periods when paddlefish are present at Intake.

Paddlefish Size and Sex Ratio

A total of 841 paddlefish (79.3% of the estimated catch) were checked by creel clerks, from the angler catch, at Intake in 2003. Of these, a complete record of length, weight and sex was recorded for 831 (Table 2).

Females made up 52.8% of the total fish weighed and measured for length in 2003 (Table 2). This is an increase from 2002 but similar to the four years prior to 2002 and is short of the heavily dominated female harvests of the 1970s and 80s.

The average size of male paddlefish in 2001 was the smallest ever recorded at Intake (Table 3). The average size of female paddlefish was less than in 2002 and the smallest since the mid-1980's.

Creel Census

Results from the 2003 creel census are shown in Table 4. Results from 2003 can be compared to previous years in Table 5. In 2003 at Intake, anglers fished an estimated 2009 days with an average of 2.26 hours per day to catch an estimated 1060 paddlefish. Effort to catch a paddlefish in 2003 was similar to that required in 2002.

The calculated harvest at Intake in 2003 (1060 paddlefish) was 20.7 percent greater than the observed harvest. In 2003, 841 paddlefish were checked by creel clerks. This number is 79.3 percent of the estimated harvest. This discrepancy is similar to past years and has been attributed to using daytime counts to estimate nighttime fishing pressure when less night fishing actually occurs.

The angler catch rate in 2003 (0.24 fish per hour) was similar to 2002 (Table 5). The lower catch rates in 2000 and 2001 are from low water years when fewer paddlefish migrated to Intake.

Tagging, Tag Return and Exploitation Rate

Return rates of individually numbered plastic and monel metal bands placed around the dentary bone are used to infer exploitation rate. Of 8,087 paddlefish tagged in the Yellowstone River (mostly near Intake) at least 2,097 (25.9%) have been harvested by anglers (Table 6).

In 2003, 47 tags from angler harvested fish were recovered from paddlefish tagged in the Yellowstone River. Of these, 11 were caught in North Dakota, and the remainder from Intake or within a few miles downstream. Also, of the 47 returned tags, 14 were tagged in 2003. An additional 30 tags recovered at Intake were from paddlefish tagged in North Dakota.

Table 7 summarizes tag return rates for multi-year periods. Tag returns through 2003 reinforce the past conclusion of lighter exploitation in the 1960's and 1970's, heavier in the 1980's and lighter in the 1990's.

Tables 6 and 8 indicate lower exploitation for paddlefish tagged from 1998 through 2000. To date the average exploitation rate of fish caught in 1998, 1999 and 2000 are 4.4, 6.1 and 5.0 percent, respectively (Table 8). Exploitation rates for fish tagged in 2001 and 2002 are higher at 15.9 and 8.6 percent, respectively. The 33.3 percent exploitation rate in 2003 of the fish tagged in 2001 is the highest one-year return ever seen. Only seven fish were tagged in 2001.

Table 9 shows angler exploitation of paddlefish for five years after tagging. Exploitation of 1995, 1996 and 1997 tagged paddlefish shows a dramatic increase over what was seen in the early 1990's. In 1995, 1996 and 1997, more male paddlefish were tagged than females (Table10). Since male paddlefish appear to enter the run on a more regular basis than female paddlefish they may be exposed to greater angler exploitation over a short period of time. Average exploitation of paddlefish tagged in 1998 is similar to that seen in the early 1990's.

Table 10 compares tag return rates by sex for fish tagged in the years 1977 through 2003. The heavier harvest rate for females in the earlier years is not apparent from 1992 to the present. Since the early nineties, with the exception of 1994, 2000 and 2001 tag return rates for the sexes have been similar or heavier toward males. The tag return rate by sex in 2000 and 2001 indicates a heavier harvest of female paddlefish, but few fish overall were tagged in 2000 and 2001. In 2003, tag returns for male and female paddlefish were similar.

Young male paddlefish are recruiting to the population as confirmed by ageing and recruitment studies conducted by Dr. Dennis Scarnecchia (2002) of the University of Idaho. Later maturing young female paddlefish should begin recruiting several years into the future.

Paddlefish Caviar

The Glendive Chamber paddlefish caviar program is summarized in Table 11. On average, 2,912 pounds of caviar are sold for 138,521 dollars each year.

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Key Words:

Angler success rate
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Paddlefish tagging
Paddlefish caviar
Paddlefish exploitation rate
Paddlefish sex ratio

Figure 1. Paddlefish harvested per day at Intake, MT and mean daily flow (1000 cfs) at Sidney, MT in 2003

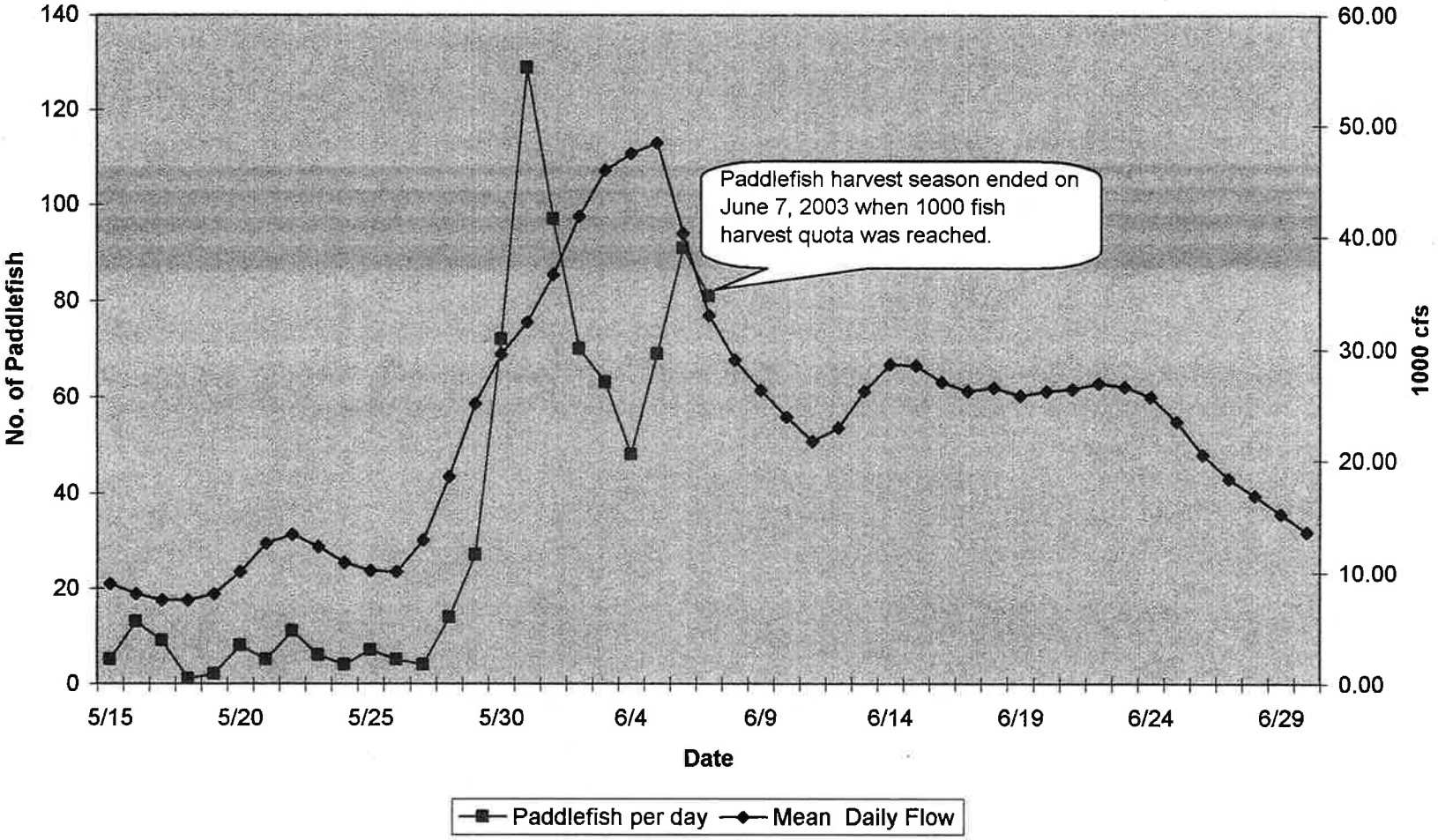

Table 1. Number of anglers purchasing Montana paddlefish tags.

	Total Tag sales				All Area Tag Sale				Upper Missouri River Tag Sales			
Year	Total	Resident	Nonresident	% Nonresident	Total	Resident	Nonresident	% Nonresident	Total	Resident	Nonresident	% Nonresident
2003	7366	6363	1003	14	4812	4020	792	16	2554	2343	211	8
2002	5901	5002	899	15								
2001	4524	3770	754	17								
2000	6056	4859	1197	20								
1999	6785	5522	1263	19								
1998	6051	5004	1047	17								
1997	6169	4930	1239	20								
1996	6787	5495	1292	19								
1995	6544	5495	1049	16								
1994	4065	3237	828	20								
1993	5577	4194	1383	25								
1992	4779	3503	1276	27								
1991	4438	3021	1417	32								
1990	3960	2826	1134	29								
1989	4255	3081	1174	28								
1988	3526	2620	906	26								
1987	2877	2182	695	24								
1986	3696	2661	1035	28								
1985	3593											
1984	5063											
1983	4636											
1982	4834											
1981	4166											

Notes: Tags were free in 1981.
Resident and nonresident tag sales were calculated separately beginning in 1986.
Previous to 1992 tags were required only for the Yellowstone River paddlefish snagging.
Beginning in 1992 tags were required statewide.
Paddlefish tags were added to the automated licensing system in 2003 allowing for all area and upper Missouri tags to be separated.

Table 2. Summary of Paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-2003.

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	0.0
1964	920	48.8		21.0	2.8
1965	453	50.6		21.3	2.9
1966	28	49.2		21.2	0.0
1967	123	50.9		21.8	0.0
1968	149	52.6		25.0	4.3
1969	499	51.9		23.4	3.7
1970	700	52		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
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
1993	1659		1005	36.9	35.1
1994	309		1070	47.4	62.8
1995	1448		1003	39.1	43.6
1996	1120		1002	40.1	42.1
1997	797		1007	38.2	38.7
1998	580		1046	41.0	47.9
1999	1345		1049	43.0	54.0
2000	541		1053	44.4	55.3
2001	344		1064	43.0	52.9
2002	713		1025	38.5	44.6
2003	831	39.1	993	38.1	52.8

* Based on 62 measurements.

** Based On 131 measurements.

Table 3. Summary of paddlefish average length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963-2003.

	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
1993	1076	925	25.2	583	1152	58.6
1994	115	914	25.9	194	1163	60.1
1995	815	889	23.5	631	1151	59.2
1996	649	882	24.0	471	1168	62.3
1997	488	912	24.8	309	1158	59.5
1998	300	933	24.0	278	1173	59.5
1999	619	926	24.9	726	1154	58.5
2000	242	919	25.2	299	1161	60.0
2001	162	960	27.2	182	1156	57.0
2002	395	932	24.2	318	1146	56.4
2003	392	866	20.6	439	1107	53.8

Table 4. Estimate of anglers, hours fished and harvest for the 2003 paddlefish season at Intake.

Time Period	Number of Angler Days	Hours per Angler Day	Angler Hours	Number of Fish Caught	Fish Caught per Angler Hour	Fish Caught per Angler Day
			2003			
			Periods Requiring Angler Retention of Fish			
Wed. & Sun.	379	2.09	792	232	0.29	0.61
Other Days	1630	2.30	3756	828	0.22	0.50
Total or Mean	2009	2.26	4548	1060	0.23	0.52
			Periods Requiring Anglers to Release Fish			
			1365	921	0.67	

Table 5. Comparison of paddlefish fishing pressure, harvest and success rate data at Intake from 1972 to 2003.

Year	Angler Days	Fish Caught	Fish Kept	Fish per Angler Day	Fish per Angler Hour	Total Weight Harvested (Pounds)
1972	2118	2935	1805	1.39	0.40	61,370
1973	2449	4670	2675	1.91	0.46	88,543
1974	3363	4359	2182	1.30	0.39	70,680
1975	2784	2950	1473	1.06	0.28	77,038
1977	3524	2764	1410	0.78	0.34	67,962
1978	6130	4814	2887	0.78	0.49	124,141
1979	2904	2202	1727	0.76	0.27	87,041
1981	3982	5318	5318	1.34	0.81	248,251
1982	3535	4713	4713	1.33	0.45	212,556
1983	3142	3193	3193	0.92	0.38	160,289
1984	3978	3860	3860	0.98	0.35	169,840
1985	1745	550	550	0.34	0.09	25,960
1986	2521	1791	1791	0.73	0.15	78,267
1987	2386	2612	2612	1.13	0.28	129,816
1988	2320	2923	2923	1.25	0.34	127,151
1989	2208	2242	2242	1.00	0.19	105,374
1990	2877	2046	204	0.65	0.15	93,298
1991	3332	4203	4203	1.19	0.30	189,135
1992	2396	762	762	0.34	0.09	37,109
1993	2818	1635	1635	0.56	0.13	60,331
1994	1037	278	278	0.27	0.08	13,177
1995	2098*	2008	1657*	0.81*	0.39*	64,789*
1996	2062*	1328	1199*	0.58*	0.19*	48,080*
1997	2217*	1149	1075*	0.48*	0.17*	41,065*
1998	1766*	857	717*	0.41*	0.16*	29,397*
1999	2608*	2091	1706*	0.65*	0.28*	73,358*
2000	1599*	692	666*	0.42*	0.15*	29,570*
2001	1005*	410	360*	0.36*	0.15*	15,480*
2002	2419*	1330	1208*	0.50*	0.22*	46,508*
2003	2009*	1981	1060*	0.52*	0.23*	40,386*

* Does not include catch and release periods.

Table 6. Summary of paddlefish tagging and tag returns 1964-2003.

Year	Number Tagged	Number Returned In 2003	Total Number Returned	Percentage Returned
1964-1970	1703	0	279	16.4
1971-1980	3242	1	809	25.0
1984	551	2	249	45.2
1985	2	0	2	100.0
1986	153	0	47	30.7
1988	156	2	67	42.9
1989	10	0	4	40.0
1990	153	0	49	32.0
1991	20	0	8	40.0
1992	221	1	80	36.2
1993	268	4	58	21.6
1994	180	1	57	31.7
1995	442	5	167	37.8
1996	139	1	60	43.2
1997	70	2	29	41.4
1998	42	0	10	23.8
1999	281	12	77	27.4
2000	20	0	4	20.0
2001	7	2	3	42.9
2002	145	5	24	16.6
2003	282	14	14	5.0
Totals	8087	47	2097	25.9

Note: Most fish tagged at Intake or within a few miles downstream of Intake.

Table 7. Tag return rate averages for multi-year periods.

Period Tagged	Number Tagged	Number Returned through 2003	Percentage Returned
1964-1970	1703	279	16.4
1971-1980	3242	809	25.0
1981-1990	1025	418	40.8
1991-1995	1131	359	31.7
1996-2000	552	165	29.9
2001-2003	434	41	09.4

Table 8. Annual angler exploitation rates in percent for Yellowstone - Sakakawea paddlefish as indicated by returns of angler caught fish.

	Year tagged and (number of fish tagged).											
	1997 (70)		1998 (42)		1999 (281)		2000 (20)		2001 (7)		2002(145)	
	Tag Returns		Tag Returns		Tag Returns		Tag Returns		Tag Returns		Tag Returns	
Year	%*	#	%*	#	%*	#	%*	#	%*	#	%*	#
1997	24.3	17										
1998	0.0	0	2.4	1								
1999	11.3	6	0.0	0	12.5	35						
2000	4.3	2	12.2	5	2.0	5	20	4				
2001	2.2	1	5.6	2	5.4	13	0	0	14.3	1		
2002	2.3	1	5.9	2	4.8	11	0	0	0	0	13.1	19
2003	4.7	2	0	0	5.6	12	0	0	33.3	2	4.0	5
Mean Annual Percentage	7		4.4		6.1		5.0		15.9		8.6	

* Percentage = $\frac{\text{Current Year tag returns x 100}}{\text{\# tagged - \# of previous years tag returns}}$

Table 9. Average annual angler exploitation rates of paddlefish for five years following tagging.

Year tagged	Number fish tagged	Average exploitation rate (%)
1984	551	6.35
1986	153	4.18
1988	156	6.25
1990	153	4.33
1992	221	4.80
1994	180	4.27
1995	442	6.82
1996	139	8.33
1997	70	7.40
1998	42	4.35

Table 10. Comparison of male and female tag return rates.

Year	Number Tagged		Number Returned		Percentage Returned	
Tagged	Female	Male	Female	Male	Female	Male
1977	123	223	44	43	35.8	19.3
1978	158	451	54	76	34.2	16.9
1984	313	238	158	75	50.5	31.5
1986	88	65	29	16	33.0	24.7
1988	98	59	49	18	50.0	30.5
1990	77	77	26	9	33.8	11.7
1992	108	110	38	39	35.2	35.5
1993	63	204	14	42	22.2	20.6
1994	109	74	40	15	36.7	20.3
1995	185	257	72	93	38.9	36.2
1996	47	92	21	38	44.7	41.3
1997	26	44	9	18	34.6	40.9
1998	12	36	1	10	8.3	27.8
1999	127	154	38	39	29.9	25.3
2000	11	9	3	1	27.3	11.1
2001	4	3	2	1	50.0	33.3
2002	66	79	7	16	10.6	20.3
2003	160	119	9	5	5.6	4.2

Table 11. Glendive Chamber of Commerce and Agriculture caviar production and income summary.

Year	Pounds of Caviar	Number of Paddlefish	Income (gross)	Income (net)	Administration Expenses	FWP Share (dollars)	(percent)
1990	4,000	1,600	110,000	68,452	41,548	34,226	50
1991	10,000	3,000	292,000	232,428	59,572	116,214	50
1992	2,200	781	63,000	36,634	26,366	18,317	50
1993	3,592	1,933	68,810	39,667	29,143	19,833	50
1994	1,166	355	48,137	20,114	33,770	15,036*	40
1995	4,162	1,462	240,056	173,701	66,355	69,481	40
1996	3,090	1,145	231,910	177,839	76,381	71,136	40
1997	1,211	797	118,377	58,756	47,009	23,502	40
1998	2,016	553	45,767	13,892	31,875	5,557	40
1999	3,691	1,333	166,831	72,425	94,405	28,970	40
2000	1,587	527	249,328	180,615	77,064	72,246	40
2001	966	335	173,764	126,116	69,623	50,446	40
2002	1,611	688	66,687	15,266	23,951	6,106	40
2003	1,470	824	64,624	15,438	22,615	3,860	25
Totals	**40,762**	**15,333**	**1,939,291**	**1,231,343**	**699,677**	**534,930**	
Averages	**2,912**	**1,095**	**138,521**	**87,953**	**49,977**	**38,209**	

* Includes prior year revenue of $9,290 as a result of underpayment from the program audit of 1994.

Appendix A

December 19, 2003

To: Fred Ryckman
Greg Power
Brad Schmitz
Bill Wiedenheft

From: Dennis Scarnecchia

Subject: Yellowstone-Sakakawea Paddlefish Harvest Model Update prior to 2004 Fishing Season

We have completed the 2003 age assessment of paddlefish from both states, and I have used the results to update our harvest model. Below I have outlined the method of obtaining the model outputs, and I also discuss stock status as well as some issues related to the estimates.

The first step was to estimate the total harvest. I have done this for North Dakota based on estimates derived from the phone creel census. All numbers from there are final. For Montana, the estimates are based on calculations by Vic Riggs from 1999-2001. For 2002 and 2003, however, harvest was estimated only approximately because final estimates are not yet available. I believe the 1,000 fish per year is quite close to the actual harvest, however.

Estimated Harvest -- 1999-2003

Year	*ND*	*MT*
1999	*1,309*	*1,706*
2000	*2,205*	*666*
2001	*1,566*	*360*
2002	*1,364*	*1,000**
2003	*1,041*	*1,000**

** estimated*

Total Harvest = 12,217 for 5 years, or 2,443 fish per year

Because some fish harvested are very young recruits from ages not fully recruited to the fishery, they are considered too young to be included in the harvest totals, so I also calculated an adjusted harvest of all fish of only fully recruited ages. I estimated the number of fish to be removed by assuming that the number of recruits of these youngest ages was proportional to their abundance in the actual harvest. The adjusted harvest is obviously somewhat less than the total harvest:

Estimated harvest of fish of ages not fully recruited (<10 for males, <17 for females) = 784

Adjusted Harvest = Harvest of all fish of fully recruited ages (10 and older for males, 17 and older for females) = 12,217 - 784 = 11,433 for 5 years, or 2,286 fish per year.

I next estimated the total recruitment of young, fully-recruited age classes based on the age distribution of fish harvested from the fisheries. With mandatory retention, the age structure of the harvested fish was assumed to accurately reflect the age distribution of the actual mature, harvestable population:

Estimated Recruitment – 1999-2003

Year	*ND*		*MT*	
	M	*F*	*M*	*F*
1999	*78/462*	*60/405*	*272/539*	*255/616*
2000	*84/433*	*68/390*	*78/167*	*96/260*
2001	*85/694*	*94/527*	*37/124*	*75/170*
2002	*95/823*	*93/434*	*119/353*	*150/288*
2003	*54/404*	*100/351*	*102/232*	*319/440*

Total = 2,314/8112 = 0.285, or 28.5% of the aged fish were young recruits (ages 10-14 for males, ages 17-21 for females.

Total population estimates of the mature, recruited portion of the stock were obtained from Jeff Hendrickson. They were based on Schnabel estimates from both netting and tag and creel recovery data for North Dakota:

Population estimates and 95% confidence intervals (J. Hendrickson; updated 10-22-03)

1. ***Spring and fall tagging :*** ***33,270 (30,582, 36,334)***

2. ***Spring tagging only and angler harvest :*** ***29,399 (14,508, 42,290)***

3. ***Previous fall tagging only and angler harvest 22,402 (10,474, 39,307)***

4. ***Prev. fall and spring tagging/ang. harvest 28,778 (17,439, 40,118)***

The percentage of the total catch of fully recruited ages consisting of "young" recruits (28.5%) was then multiplied by the population estimates in order to estimate total 5-year recruitment as well as mean annual recruitment over the period 1999-2003:

Using a population estimate of 30,000 fish, total recruitment was estimated as 30,000 (0.285) = 8,557 young recruits over the period 1999-2003, or 1,711 new recruits per year.

With 33,270 fish, estimated new recruits = 9,481 or 1,896 per year

With 29,399 fish, estimated new recruits = 8,379 or 1,676 per year

With 22,402 fish, estimated new recruits = 6,385 or 1,277 per year

With 28,778 fish, estimated new recruits = 8,210 or 1,640 per year

In summary, total harvest was estimated as 2,443 fish per year, or an adjusted harvest (i.e., fully recruited ages only) of 2,286 fish per year. The corresponding recruitment was estimated to be from 1,277 to 1,896 per year, depending on the population estimate used. If a "median" population estimate of 30,000 fish is used, the total recruitment was 1,711 per year fish versus a harvest of 2,286 fish per year. About 575 more fish were being harvested than were being recruited. This difference does not include additional natural mortality.

Based on these results, our recruitment has fallen since the model run of 1996-2000 on which the 2,000 maximum harvest was established. We of course expected it to drop as the observed strong 1995 and 1996 recruitment left the model. At this time, our reduction of the harvest cap from 3,000 fish to 2,000 fish (1,000 per state) seems wise, but may not be quite restrictive enough at the mean 1999-2003 level of recruitment.

Before any reduction in the harvest cap is needed, however, some better recruitment on the way may make it unnecessary. We have expected some strong recruitment of young paddlefish resulting from the high river and reservoir levels of the mid-1990s. Age-0 paddlefish were abundant in 1995 transects and tagging efforts, and yearling paddlefish were also commonly counted in the years when the reservoir had re-filled. It appears that a secondary trophic upsurge occurred with the re-filling. Over the past 5 years, we have seen sporadic small (immature) male paddlefish in the fisheries at the Confluence and Intake, and we expected to see some strong recruitment from the 1995 year class in 2003 through 2005. Evidence from 2003 indicates that we are getting that recruitment. Of 387 male fish aged from the 2003 Intake harvest, 121 were aged as age-8 fish (i.e. 1995 brood year). This age (8) was by far the most abundant in the male harvest at Intake. Because I do not believe that age-8 fish are fully recruited, I am expecting even larger numbers of young male recruits to contribute to the fisheries this year, mainly at Intake (assuming they can get out of the reservoir). I also expect to see recruits from brood years 1996 and 1997 trailing behind them. Large numbers of these fish would not only portend good recruitment for some years to come, but their mandatory harvest would reduce the actual maximum harvest of fully recruited age classes to under 1,000 fish per state. The best thing that could happen is for us to be swamped with young male recruits for a few years. Their actual abundance will have a strong influence on our recommended course of action.

On balance, for now, I think we are in fairly good shape. In my opinion, no major changes in the harvest cap are called for at this time, as long as each state promptly closes if and when their total harvest approaches 1,000 fish. Our estimated recruitment is pretty much in line with our maximum allowable harvest, and, just as importantly, we are still seeing a wide range of older -aged spawners in the harvest (and thus in the stock). If we do not get the anticipated recruitment surge over the next 3 years, however, it will become necessary to lower the cap below 1,000 fish per state to sustain the mature population.

There are several important items that we should investigate more closely, and I am listing a few of them for us to think about before our next meeting.

1. Non-harvest mortality from boat propellers. I am somewhat concerned that this may be higher than we think, especially in ND and in these years of low river and reservoir levels. It is not only during the season, but in the river during walleye fishing in early spring and fall, as well as in the reservoir itself in summer.

2. Possible stranding and other mortality in the upper end on Lake Sakakawea. Access to the river from the reservoir may be greatly hindered by the low water levels in the reservoir. It is a problem if the fish cannot ascend to spawn (and thus delay spawning to future years), but it is a much worse problem if fish become stranded in the mud and die, or if they winterkill below the ice. I agree with Fred and Greg that we should check this out after ice-out and also during the spawning migration.

3. Population estimates. The reliability of our population estimates is critical to our stock assessment model. I think we should take a good look at these during our meeting this year, and make sure we can live with the unavoidably violated assumptions. It might be good if we could get Jeff to summarize exactly how the estimates are obtained at the meeting and we can run a brief sensitivity analysis to see what effect violated assumptions might have on our estimates.

4. Estimates of off-site harvest. I think we need to take a hard look at our off-site harvest because we cannot afford to be harvesting more unaccounted-for fish than we think we are. We also need to estimate this harvest to accurately effect a closure. This is a special problem in Montana because of the length of river, but the uniform season opening of May 15 this year should help. Also, what is happening on the reservation, and elsewhere up the Missouri, if flow releases pull fish up the Missouri rather than the Yellowstone? Some of these questions can be addressed in the phone creel, but things are always changing out there and offsite harvest in a high flow year may of course differ from that in a low-flow year.

I plan to be working on the updated management plan draft to send out prior to this year's meeting, as well as some jointly-authored manuscripts emanating from the data set.

I will be sending the data summaries for the age determination via regular mail, along with a copy of this letter.

Have a Merry Christmas!