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

STATE: Montana PROJECT NO.: F-78-R-1

PROJECT TITLE: Statewide Fisheries Investigations

JOB TITLE: Missouri River Pallid Sturgeon Inventory

Period Covered: July 1, 1994 through June 30, 1995

ABSTRACT

A study to evaluate the status of the pallid sturgeon in the middle Missouri River was continued. A total of five pallid sturgeon were captured, one of which was a sexually mature female. All of these pallids had been captured 1-4 years earlier. One young-of-year shovelnose sturgeon was sampled by trawling and five post-hatch larval sturgeon were captured in larval fish nets.

INTRODUCTION

Pallid sturgeon are found in the Wild and Scenic portions of the Missouri River in Montana. They exist in low numbers throughout their geographic range (Pflieger 1975) as is probably the case in this section of the Missouri River. In 1990 the U.S. Fish and Wildlife Service listed the pallid as "endangered" under the Endangered Species Act 1973. Reasons for listing are habitat modification and apparent lack of reproduction. Reports of pallid sturgeon sightings have also declined dramatically in the last 20 years (U.S. Fish and Wildlife Service, 1989). The pallid sturgeon has been listed as a class A "species of special concern" in Montana since 1973 (Holton, 1980).

The Montana Department of Fish Wildlife and Parks (MTFWP) initiated a fisheries study during 1989 to determine the past and present status of the pallid sturgeon in the 175 mile reach of river between Fort Benton and Fort Peck Reservoir. Results from the study will be used to develop a status report. This report will aid in devising management and recovery plans to maintain and enhance the pallid population in the river.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. **To locate and define pallid sturgeon spawning, juvenile and adult habitat areas in the Missouri River between Great Falls and Fort Peck Reservoir.** Sampling for pallid sturgeon was continued and information on habitat use is presented.

2. **To document population size, seasonal movements and evidence of most recent reproduction.** Drift netting, trawling and larval fish sampling for pallid sturgeon were completed and results are presented.

3. **To identify limiting factors and attempt to improve coldwater fish populations in the Marias River immediately downstream from Tiber Dam.** This work is summarized in the annual Northcentral Montana Coldwater Stream Report, Project number F-78-R-1.

4. **To review projects proposed by state, federal and local agencies and private parties which have potential to affect fisheries resources and aquatic habitats. Provide technical advice or decisions to reduce or mitigate resource damage.** (state funded). Two stream alteration projects were evaluated and recommendations were submitted to the applicants.

PROCEDURES

Setlines and trammel nets were used to capture sturgeon. The setlines were 100 - 200 ft long with 7 - 15 hooks. Circular-type hooks were attached to the one-quarter inch diameter groundline by 16 inch long staging lines. The hooks ranged in size from 11/0 to 14/0. The setline was anchored in position with a 40 lb cement block at each end; a steel stake and block were used as anchors when the lines were set from the river bank. The terminal end was usually marked with a buoy. Setlines were positioned in the river either parallel, perpendicular or angled to the current and left overnight. Catch per unit effort for setline sampling was expressed as number of fish caught for an overnight set. This sampling method has been used with satisfactory results for white sturgeon in the Kootenai River (personal communication, Kim Apperson, Idaho Fish and Game Dept.).

Trammel nets were 150 feet long and 6 feet deep. Two mesh sizes were used: 1 inch inner walls with 10 inch outer walls, and 2 inch inner walls with 10 inch outer walls. Mesh material for both inner and outer walls were light-weight for better fish tangle characteristics and to insure that the net could be retrieved off submerged objects in the event that net material had to be torn

free. The trammel nets were set in snag-free areas of the river and allowed to drift with the current along the bottom. Distances of the drift varied from 50 to 400 yds. Catch per unit effort for drift netting was expressed as number of fish caught per drift.

All sturgeon were measured to the nearest 0.1 inch and weighed to the nearest 0.1 pound. A numbered plastic spaghetti tag was attached to the keel of the dorsal fin for identification purposes. Morphometric measurements recorded from pallid sturgeon were: total, fork and standard lengths, head length, barbel lengths, mouth width, distance between inner barbel and mouth; and distance between outer barbel and snout tip. These measurements were then used for a Character Index, as modified by Carlson and Pflieger (1981), to test for hybridization.

A 6 foot wide, beam "rockhopper" trawl was used for sampling young-of-the-year (YOY) sturgeon. The trawl consisted of a 6 x 1½ foot rectangular metal frame with skids, 18 foot long outer chafing net and a 11 foot long, 1/8 inch mesh inner liner. The trawl was towed downstream off the bow of the boat usually for a distance of 150-200 yards. A 50 foot length of rope was attached to each side of the trawl and at the end the run the trawl was retrieved by hand by a person at the end of each rope. This was a scaled-down version of the trawl used by the white sturgeon researchers in the lower Columbia River (Lance Beckman, USFWS).

A 50 x 4 foot beach seine with 1/4-inch mesh was used to evaluate use of shallow areas by sturgeon. The seine was dragged in a variety of shoreline habitats for distances of about 30-200 feet in areas with water depths generally less than 2½ feet. All captured fish were counted and identified, and associated habitat type was recorded.

To facilitate interpretation of rearing area and forage fish data, the river channel was categorized into 5 major habitat types that could be effectively seined or trawled. The habitat types were main channel border, main channel pool, main channel run, side channel border and side channel pool. Habitat types were determined based on location, current velocities and water depths. The main channel and side channel border habitat types were defined as the zone adjacent to the channel where average current velocities were greater than 0.5 ft/sec. and depths less than 3 ft. Main channel pools were slow flowing areas with a wide range of depths. Main channel run habitat type was an open water habitat with variable depths and moderate current velocities, usually greater than 1.5 ft/sec. Side channel pools were sections of a side channel with average current velocities less than 0.5 ft/sec and depths less than 3 ft.

Larval fish sampling was used to evaluate pallid sturgeon spawning success and locate spawning sites. Larval samples were obtained using boat-mounted plankton net samplers. Conical, 20-inch diameter, 6 feet long Nitex nets (750 micron mesh) were used in tandem so that duplicate samples could be taken simultaneously.

The nets had a 3-rope harness that were fastened to and suspended off a weighted line attached to each side of the bow of the boat.

Samples were collected near the channel bottom while drifting slightly downstream. This allowed the nets to filter the water without addition of excess weights. Most of the sampling occurred in strong current areas of the river, at a depth range of 4-12 feet, and therefore power was provided by an outboard motor to decrease the downstream drift rate. The nets were positioned and weighted in the river usually for a duration of 6-15 minutes, depending on the amount of debris suspended in the river. The volume of water filtered was determined using General Oceanic flow meters (Model 2030) tied to the front ring of the net and positioned at one-third of the net diameter.

In an effort to improve on the sampling efficiencies a different net configuration was tested and compared to the conical nets. This net consisted of a frame shaped in a "D" configuration, 29.5 inches wide and 21.3 inches high. The net length was 10 feet and consisted of 1/32 inch (800 micron) mesh. The surface area of the D-net opening was 3.67 ft^2 compared to 2.11 ft^2 for the conical net. Only one D-net was sampled at a time off the stern of the boat due to the net length. The net was weighted with a 10 lb. weight at each bottom corner so the frame would rest on the channel bottom.

Larval samples were preserved with formalin in the field and later sorted in the laboratory. Larvae were identified to family using taxonomic keys by Auer (1982) and Wallus (1990). Mr. Darrel Snyder, director of the Colorado State University Larval Fish Laboratory, examined a sample of tentatively identified Polydon and Scaphirhynchus larvae to insure that these two taxonomically similar fish were correctly identified. Further distinguishing of Scaphirhynchus to pallid or shovelnose sturgeon could not be made at the present because the taxonomic differences between these two have not been sufficiently studied.

DESCRIPTION OF STUDY AREA

The pallid sturgeon study area consists of a 175 mile reach of the mainstem middle Missouri River in northcentral Montana between Fort Benton and the headwaters of Fort Peck Reservoir near Lewistown (Fig. 1). There are two major tributaries entering the Missouri in this reach; the Marias River from the north and Judith River from the south. The present flow regimen of the Missouri River in the study area is not entirely natural because of regulation and storage at several upriver dams. The study area was divided into 5 study sections and the boundaries for each are given in Table 1.

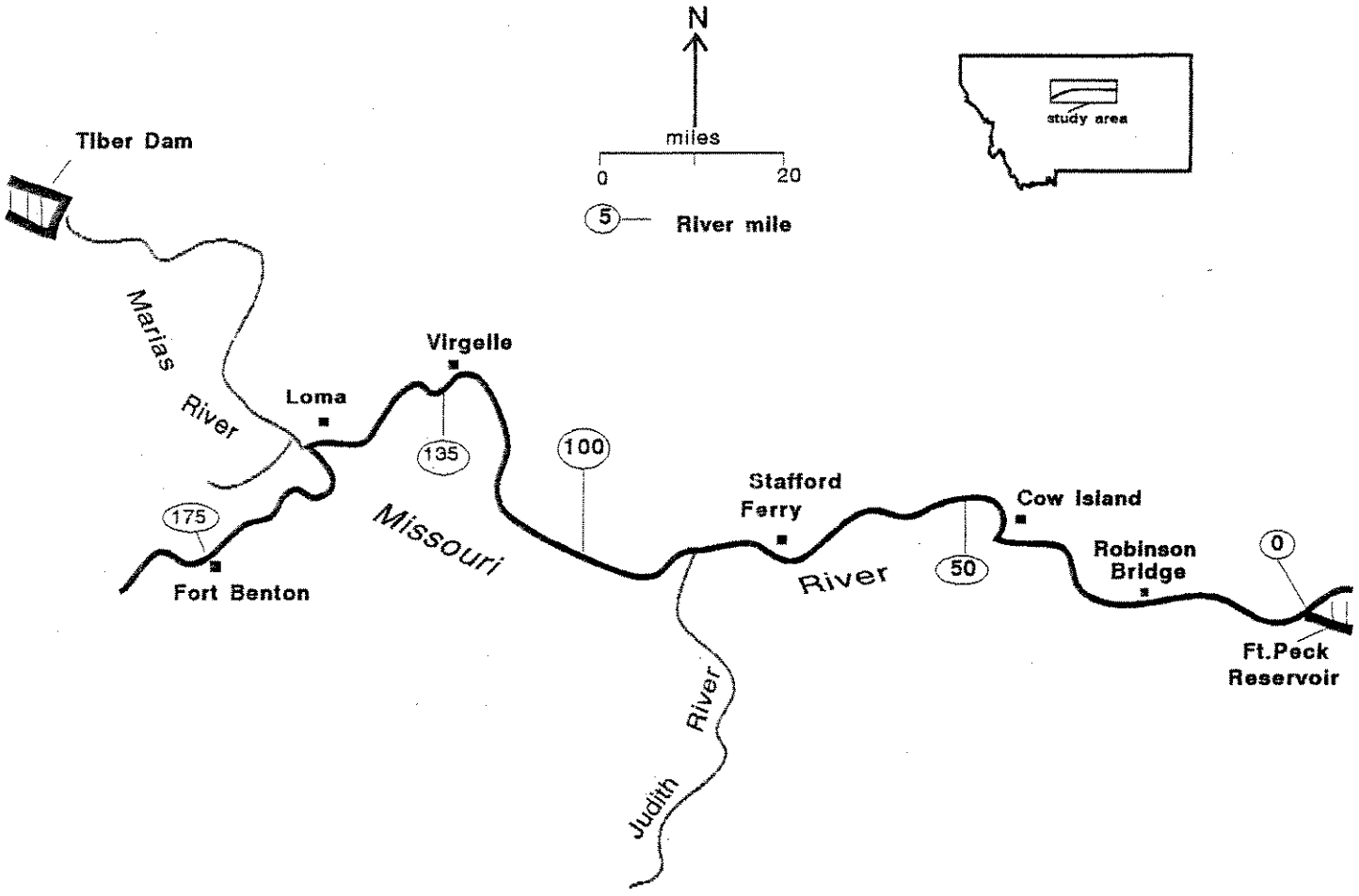

Figure 1. Map of study area.

Table 1. Locations of study sections on the middle Missouri River.

SECTION	RIVER MILE upper	lower	LOCATION
Fort Benton	175	154	T24N R8E Sec26 to T25N R10E Sec18
Loma	154	127	T25N R10E Sec18 to T26N R12E Sec13
White Rocks	127	88	T26N R12E Sec13 to T23N R16E Sec26
Stafford F.	88	50	T23N R16E Sec26 to T23N R22E Sec 6
Robinson Bg.	50	0	T23N R22E Sec6 to T21N R27E Sec10

FINDINGS

The upper Missouri River experienced below-normal flows during 1994. The period when flows were the most abnormal probably occurred during the spring run-off. The average monthly flows at the Robinson Bridge gauge for May, June and July were 82, 39 and 48% of average (USGS 1995). The peak flow of 18,700 cfs occurred on April 27. The Marias River experienced above average spring run-off flows and lower than usual summer flows. The average monthly flows at Tiber Dam for April - August were 118, 237, 292, 76 and 62% of average, respectively (USGS 1995). The reason for the different Marias run-off pattern in 1994 was because the MTFWP requested that water releases from Tiber resemble more natural run-off conditions.

Continuous water temperature recordings were made at the Robinson Bridge and results are shown in Appendix A-1. Water temperatures were also monitored near the confluence of the Marias River because of concerns dealing with coldwater releases from Tiber Dam. Temperatures of the lower Marias River near Loma appear to be similar to the Missouri River at Robinson Bridge (Appendix A-2). This indicates coldwater releases from Tiber Dam were tempered to normal ambient water temperatures by the time water travelled 80 miles downstream from Tiber.

Present Status of the Pallid Sturgeon Population

A total of 5 different pallid sturgeon were captured in the study area during the period April 1 - October 15, 1994. All of these sturgeon had been caught previously (Table 2). One pallid, first captured in 1992, had been recaptured two other times. All pallids were caught in the deeper areas and within 30 miles of the upper end of Fort Peck Reservoir. Table 3 is a summary of pallid catches for 5 years of this study. The lower number of pallids caught in 1994 was the result of expanding the sampling effort to include YOY and juvenile sampling, thereby reducing the sampling effort towards adults.

Table 2. Measurements and capture information for pallid sturgeon sampled in the upper Missouri River, MT, 1994.

	Pallid Sturgeon				
Tag Number	6640988	4239778	4641585	6642911	7314755
Fork Length	54.3	56.7	52.5	50.3	54.0
Weight	44.5	45.0	37.5	25.8	41.0
Sex	--	Rp ♀	NRp	--	--
Capture Date	Apr 12	May 12	May 20	Oct 13	Oct 13
Rivermile	21.7	24.3	29.7	14.1	14.1
Method	SetL	Net	Net	Net	Net
Depth	7-11	8-12	10	6-10	6-10
Velocity	Moderate	Moderate	Moderate	Moderate	Moderate
Substrate	Sand	Sand	Sand	Sand	Sand
Temperature	51	65	56	52	51
Secchi	1.0	0.8	0.6	2.3	2.3
Recap Record	Tagged 10/3/90 Recap1 11/3/93	Tagged 10/26/93 Recap1 5/21/92 Recap2 5/6/93	Tagged 5/6/92 Recap1 5/20/92	Tagged 8/31/91	Tagged 10/30/92

Table 3. Summary of pallid sturgeon catches for years 1990-94, upper Missouri River. (Suspected hybrid pallids included).

Year	Total Number	Number "New" Fish
1990	5	5
1991	3	2
1992	15	11
1993	9	6
1994	5	0
Total	-	24

Appendix Table B-1 lists all the pallid sturgeon captured since 1990 and a record of the recapture history. Thus far, a total of 24 different pallid sturgeon have been captured since this study commenced in 1989. There was only one confirmed sighting of pallid sturgeon in the study area by anglers. One angler caught and released a pallid while angling for gamefish in the Robinson Bridge section.

Pallid #4239778 was believed to be a sexually mature female. This was determined based on a blood sample analyzed at the US Fish and Wildlife Service Fisheries Tech Center, Bozeman, MT. Mr. Dave Erdahl of the center reported that the blood calcium level was 183 ppm. This level of calcium indicates a female at Stage 8 or 9 of ovarian development (on a scale 1-9), or a female that would likely spawn during 1994.

Four of the pallids caught in 1994 were taken in trammel nets while only one pallid was taken on setlines. The difference in catch between gear types is probably related to the more intensive use of the trammel nets compared to setlines. A total of 179 trammel net drifts were completed during the year compared to 62 setline sets. Setlines could not be used after June because of the large amounts of drifting filamentous algae present in the river after this date. The algae would collect on the lines, covering and burying them, thereby making the setlines ineffective.

Trammel net sampling was especially effective for catching shovelnose sturgeon. Table 4 summarizes the results for the 1994 field season. Fifty-eight percent of the 1,226 fish netted were shovelnose with river carpsuckers the next most abundant species, representing 18% of the sample. The greatest shovelnose catch rate occurred at Loma followed by Stafford Ferry, Robinson Bridge and Marias River. A total of 39 fish were taken on setlines (Table 5). Channel catfish and shovelnose were the most common species captured with setlines, representing 56% and 23% of the sample. Average sizes of shovelnose sturgeon varied according to location with the Marias River and the Loma section exhibiting the largest sizes (Table 6). The only other species measured were pallid sturgeon and blue sucker; blue sucker sizes are shown in Table 7.

An attempt was made to locate sturgeon rearing areas. All the sampling effort was directed to the lower two study sections because these are regarded as the most likely areas to find young sturgeon. The two sections are located between RM-0 and RM-88, encompassing 88 river miles. Seining and trawling methods were used for sampling a variety of habitats in the river. Seining was used for sampling the shallow habitats. A total of 101 completed seine hauls sampled 3,726 fish representing at least 17 species (Tables 8 and 9). By far the most common species was the flathead chub, comprising 67 and 43% of the total catch in the Stafford Ferry and Robinson Bridge reaches, respectively. No sturgeon were captured in the seine hauls.

Table 4. Catch rates (no./drift) and number of fish sampled with trammel nets in the upper Missouri River, MT, 1994.

	Marias River	Loma	Stafford Ferry	Robinson Bridge	Total Number
Bigmouth buffalo	0	0	0	tr.	3
Blue Sucker	0	0.2	0.4	0.1	21
Carp	0.2	0.3	0.4	0.2	49
Channel catfish	0.2	0	0.1	0.1	23
Flathead chub	0.2	0.1	0	tr.	4
Freshwater drum	0	0	0	tr.	3
Goldeye	3.8	0.2	0.1	0.1	51
Longnose sucker	0.2	1.2	0.1	tr.	20
Paddlefish	0	0	0	tr.	4
Pallid sturgeon	0	0	0	tr.	4
Rainbow trout	0	0	0	tr.	4
River carpsucker	0.1	1.5	1.3	1.3	222
Sauger	0.1	0	0.1	0.3	37
Shorthead redhorse	0.4	0.2	0.2	0.3	46
Shovelnose sturgeon	2.6	6.9	5.9	3.3	709
Smallmouth buffalo	0	0	0.1	0.1	14
Stonecat	0	0	0.1	0	1
Walleye	0	0	0	0.1	8
White sucker	0.1	0.2	0	0	3
Total no. fish	65	131	233	793	
No. of sets	8	12	26	133	
Avg drift dist.(yd)	105	223	221	194	
Avg depth (ft)	4	6	8	9	
Avg time/drift (min)	6	5	6	7	

Table 5. Catch rates (no./line) and number of fish sampled with set lines in the upper Missouri River, MT, 1994.

	Loma	White Rocks	Stafford Ferry	Robinson Bridge	Total Number
Burbot	0	0	0	tr.	1
Channel catfish	0.2	0.5	0.4	0.3	22
Freshwater drum	0	0	0	tr.	1
Pallid sturgeon	0	0	0	tr.	1
Sauger	0	0	0.1	tr.	3
Shovelnose sturgeon	0.2	0.5	0.1	0.1	9
Walleye	0.2	0	0	tr.	2
Total no. fish	3	2	6	28	
No. of sets	4	2	6	46	
Avg depth (ft)	7	11	8	9	
Avg time/set (hr)	17.6	9.8	14.2	18.2	

Table 6. Average sizes (range in parentheses) of shovelnose sturgeon sampled in the upper Missouri River, MT, 1994.

	Fork length	Weight	No. caught by nets	No. caught by lines
Marias River	30.7 (26.7 - 39.0)	5.1 (3.0 - 10.5)	21	--
Loma	30.5 (22.6 - 40.0)	5.5 (1.6 - 12.0)	83	1
White Rocks	34.0	7.1	--	1
Stafford Ferry	29.6 (17.6 - 37.7)	4.5 (0.7 - 10.4)	164	1
Robinson Bdg.	25.5 (16.0 - 41.3)	2.8 (0.5 - 13.5)	430	6

Table 7. Average sizes (range in parentheses) of blue suckers sampled in the upper Missouri River, MT, 1994.

	Fork length	Weight	No. caught by nets	No. caught by electrofsh
Marias River	28.1 (25.0 - 33.3)	7.8 (5.0 - 13.5)	0	32
Loma	--	--	3	--
Stafford Ferry	29.6 (26.6 - 31.5)	8.1 (5.2 - 12.0)	10	--
Robinson Bdg.	28.1 (19.7 - 33.0)	7.7 (1.9 - 11.5)	13	--

Table 8. Average catch per seine haul (number) for fish sampled in the Stafford Ferry section, 1994.

Channel type	Main channel border	Main channel Pool	Side channel Border	Side channel Pool	Total
# hauls	24	15	4	1	44
Carp - J	<0.1 (1)	0.0 (0)	0.0 (0)	0.0 (0)	<0.1 (1)
Emerald shiner	3.3 (79)	3.9 (58)	0.5 (2)	2.0 (2)	3.2 (141)
Flathead chub J/A*	9.8 (235)	11.5 (173)	12.0 (48)	12.0 (12)	10.6 (468)
Fathead minnow	0.0 (0)	0.1 (1)	0.0 (0)	0.0 (0)	<0.1 (1)
Hybognathus sp.	0.5 (13)	1.4 (21)	0.0 (0)	0.0 (0)	0.8 (34)
Longnose dace J/A	0.5 (12)	0.1 (2)	0.2 (1)	0.0 (0)	0.3 (15)
Longnose sucker J	0.2 (5)	0.0 (0)	3.5 (14)	0.0 (0)	0.4 (19)
Shorthead redhorse - J	0.0 (0)	0.3 (4)	0.0 (0)	0.0 (0)	0.1 (4)
Sturgeon chub J/A	0.0 (0)	0.0 (0)	0.2 (1)	0.0 (0)	<0.1 (1)
Stizostedion sp. - J	0.2 (6)	0.5 (7)	0.8 (3)	0.0 (0)	0.4 (16)
Yellow perch J	0.0 (0)	0.1 (1)	0.0 (0)	0.0 (0)	<0.1 (1)
Total catch	14.6 (351)	17.8 (267)	17.2 (69)	14.0 (14)	15.9 (701)
# species	7	8	6	2	11

* J = Juvenile; A = Adult

Table 9. Average catch per seine haul (number) of fish sampled in the Robinson Bridge section, 1994.

Channel type	Main channel border	Main channel Pool	Side channel Border	Side channel Pool	Total
# hauls	21	27	3	6	57
Carp - J	3.7	7.4	22.0	7.3	6.8
	(77)	(201)	(66)	(44)	(388)
Emerald shiner	10.0	6.4	10.0	1.3	7.4
	(211)	(173)	(30)	(8)	(422)
Flathead chub J/A*	20.6	11.8	97.7	40.8	22.6
	(433)	(318)	(293)	(245)	(1289)
Fathead minnow	0.0	<0.1	0.0	4.5	0.5
	(0)	(1)	(0)	(27)	(28)
Goldeye - J	0.8	0.4	0.0	0.0	0.5
	(18)	(11)	(0)	(0)	(29)
Hybognathus sp.	6.0	5.7	4.7	56.8	11.2
	(126)	(155)	(14)	(341)	(636)
Longnose dace J/A	0.2	0.1	0.0	0.0	0.1
	(4)	(2)	(0)	(0)	(6)
Longnose sucker - J	0.1	0.1	0.0	4.8	0.6
	(3)	(2)	(0)	(29)	(34)
Northern pike - J	0.0	0.0	0.0	0.2	<0.1
	(0)	(0)	(0)	(1)	(1)
Rivercarpsucker - J	0.6	0.1	0.0	0.2	0.3
	(13)	(2)	(0)	(1)	(16)
Stonecat	0.0	<0.1	0.0	0.0	<0.1
	(0)	(1)	(0)	(0)	(1)
Sicklefin chub J/A	0.0	0.1	0.0	0.0	0.1
	(0)	(4)	(0)	(0)	(4)
Shorthead redhorse - J	1.6	0.3	0.0	0.0	0.7
	(33)	(9)	(0)	(0)	(42)
Sturgeon chub J/A	0.2	<0.1	0.0	0.0	0.1
	(5)	(1)	(0)	(0)	(6)
Spottail shiner	0.0	<0.1	0.0	0.0	<0.1
	(0)	(1)	(0)	(0)	(1)
Sauger/walleye -J	1.2	1.4	8.3	5.0	2.1
	(26)	(39)	(25)	(30)	(120)
Yellow perch - J	0.0	<0.1	0.0	0.2	<0.1
	(0)	(1)	(0)	(1)	(2)
Total catch	45.2	34.1	142.7	121.2	53.1
	(949)	921)	(428)	(727)	(3025)
# species	11	16	5	10	17

* J = Juvenile; A = Adult

Trawling was used for sampling the deep open-water habitats of the main channel. A total of 139 hauls sampled 527 fish, representing at least 12 species (Tables 10 and 11). Longnose dace was the most abundant fish sampled in the Stafford Ferry reach, while sturgeon chub and sicklefin chub dominated the samples in the Robinson Bridge reach. Only one shovelnose sturgeon was sampled by trawling. The 4 inch YOY shovelnose was sampled at RM-12.5; average depth was 8.9 feet and average velocity was 1.5 ft/sec. The substrate type where the sturgeon was sampled was comprised of sand.

Larval fish sampling was used for determining the occurrence and location of sturgeon spawning in the study area. A total of 112 samples contained 309 larvae, representing at least 7 species (Table 12). The sucker group comprised the largest portion of the sample constituting 80% of the total. A total of 8 sturgeon larvae were collected, all of which were found at the lowest station, RM-25 (Robinson Bridge). These larvae were examined by Mr. Darrel Snyder, however, none could be identified below the genus Scaphirhynchus because of the early developmental stage.

An effort was made to evaluate sturgeon use of the Fort Peck Reservoir headwaters area. This area extended from the Musselshell River confluence up-reservoir to Fisher Coulee (RM-0), a distance of 25 miles. A total of 7 trammel net drifts, 7 experimental gill net over-night sets, 3 setline night sets and 8 trawl hauls sampled 232 fish of which 3 were shovelnose sturgeon. No pallid sturgeon were captured in this effort. It appears that sturgeon are only rarely found in the headwaters of Fort Peck Reservoir.

RECOMMENDATIONS

1. Continue with the pallid sturgeon study. Sampling should be continued in the delta area at the head end of Fort Peck Reservoir. The early life stages of pallid sturgeon should be investigated by sampling for larvae and juveniles with a trawl. Continue testing radio telemetry gear so that improvements can be made with the present system.

ACKNOWLEDGEMENTS

Randy Rodencal, Darren Johnson and Grant Grisak assisted with all aspects of the sturgeon sampling and data collection. Their efforts were greatly appreciated. The trawling and seining findings reported here were the results of a joint effort between the MTFWP and the Montana Cooperative Research Unit, Grant Grisak, M.S. graduate student.

Table 10. Average catch per trawl (number) of fish sampled in the Stafford Ferry section, 1994.

Channel type	Main channel Run	Main channel Pool	Total
# hauls	12	5	17
Channel cat	<0.1 (1)	0.0 (0)	<0.1 (1)
Flathead chub	0.3 (3)	1.0 (5)	0.5 (8)
Longnose dace	1.4 (17)	0.0 (0)	1.0 (17)
Stonecat	<0.1 (1)	0.0 (0)	<0.1 (1)
Sturgeon chub	<0.1 (1)	0.7 (7)	0.5 (8)
Shorthead redhorse	<0.1 (1)	0.2 (1)	0.1 (2)
Sauger/walleye	<0.1 (1)	0.0 (0)	<0.1 (1)
Unidentified	0.9 (11)	0.0 (0)	0.6 (11)
Total catch	3.0 (36)	2.6 (13)	2.9 (49)
# species	8	3	8

Table 11. Average catch per trawl (number) for fish sampled in the Robinson Bridge section, 1994.

Channel type	Main channel Run	Main channel Pool	Total
# hauls	114	8	122
Channel cat	0.3 (38)	0.9 (7)	0.4 (45)
Flathead chub	0.3 (36)	0.1 (1)	0.3 (37)
Freshwater drum	<0.1 (1)	0.0 (0)	<0.1 (1)
Longnose dace	0.1 (17)	0.0 (0)	0.1 (17)
Longnose sucker	0.1 (10)	0.0 (0)	0.1 (10)
River carpsucker	0.0 (0)	0.1 (1)	<0.1 (1)
Stonecat	0.2 (23)	0.1 (6)	0.2 (29)
Sturgeon chub	1.3 (146)	1.1 (9)	1.3 (155)
Shorthead redhorse	<0.1 (5)	0.0 (0)	<0.1 (5)
Sickelfin chub	1.0 (116)	0.6 (5)	1.0 (121)
Shovelnose sturgeon	<0.1 (5)	0.0 (0)	<0.1 (5)
Sauger/walleye	0.1 (12)	0.4 (3)	0.1 (15)
Unidentified	0.4 (41)	0.6 (5)	0.4 (46)
Total catch	3.9 (445)	4.6 (37)	4.0 (482)
# species	12	8	13

Table 12. Numbers of larval fish sampled in the Upper Missouri River, 1994.

Station[1]	Goldeye	Minnow	Paddlefish	Sauger[2]	Sculpin	Sturgeon	Sucker	Total # Larvae	Avg.[3] Density	Total# Samples
Conical Net										
RM-135	2	6	0	1	0	0	118	127	15.6	20
RM-88	3	0	0	1	0	0	41	45	7.6	20
RM-39	1	6	0	2	1	0	13	23	5.9	20
RM-25	6	11	1	4	0	4	42	68	10.2	24
D-Net										
RM-135	1	0	0	0	0	0	12	13	3.4	7
RM-88	0	1	0	0	0	0	10	11	2.8	7
RM-39	3	1	0	0	0	1	6	11	3.6	7
RM-25	3	0	0	0	0	4	4	11	2.8	7

1 - RM indicates rivermile; RM-175 location is at Fort Benton.
2 - This group includes both sauger and walleye.
3 - Density of larval fish expressed as number per 10,000 ft^3 of water filtered.

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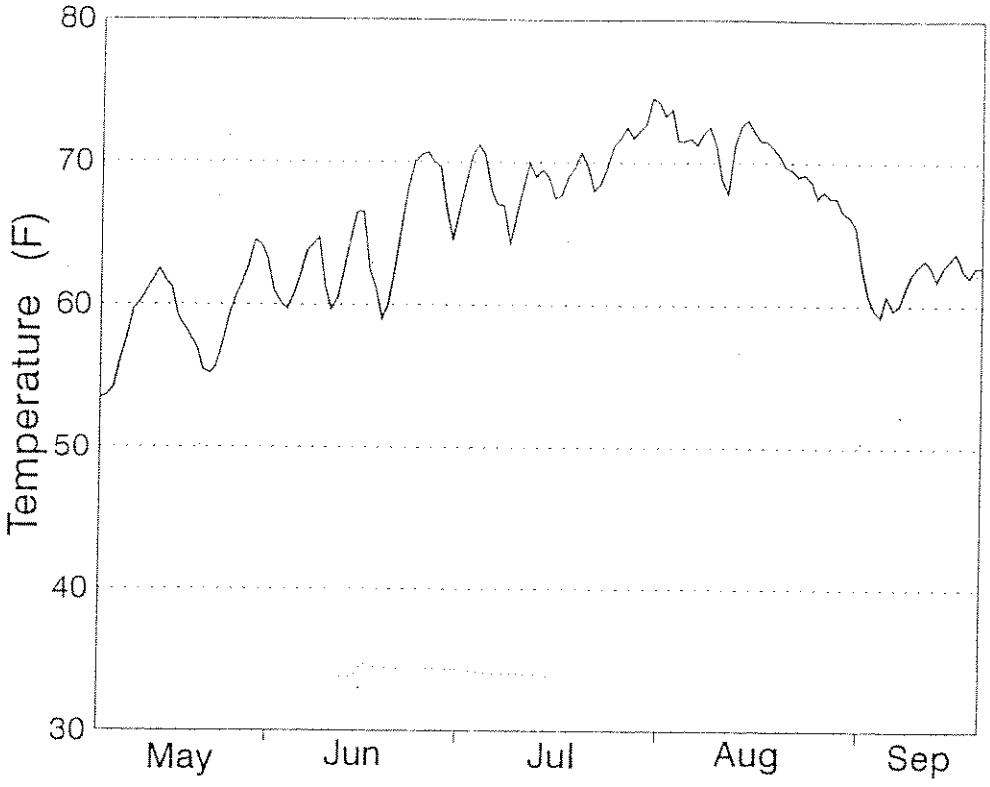
Prepared by: William M. Gardner

Date: September, 1995

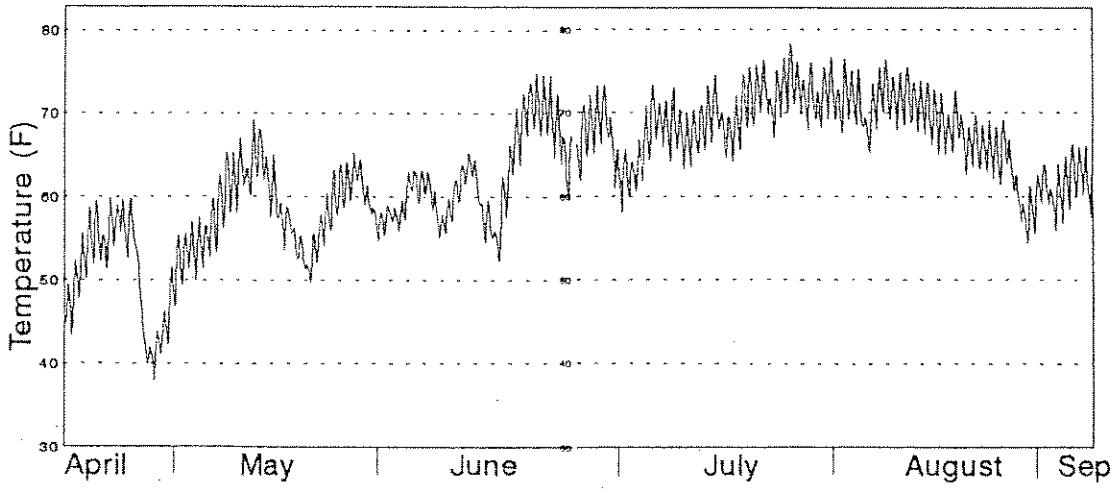
Code numbers of waters referred to in this report are:

16-2520	Missouri River	Section 06
16-2522	Missouri River	Section 06B
17-4864	Missouri River	Section 07
14-3240	Marias River	Section 01

Appendix A-1. Thermograph (average daily temperatures) of the Missouri River at the Robinson Bridge, May 14 - Sept 18, 1995.



Appendix A-2. Thermograph (4-hr. average temperatures) of the Marias River near Loma, MT, April 15 - September 9, 1994.



Appendix B-1. Size data (in. and lbs.) and capture information for pallid sturgeon sampled in the middle Missouri River, MT, 1990-94.

Tag number	FL	WT	Capture date	River mile	Recapture record
S-07479	50.0	30.0	5/16/90	14.3	RM-22 5/12/93;
S-07398	52.0	30.0	6/15/90	34.8	
6640988	54.0	37.0	10/3/90	46.8	RM-17 11/3/93; RM-22 4/11/94
6643419	60.0	50.0	11/1/90	14.3	RM-17 11/10/92;
S-00162	53.8	37.0	11/1/90	14.3	
G-01352	55.0	38.0	7/10/91	41.8	
6642911	50.3	28.5	8/13/91	75.5	RM-17 5/20/92; RM-14.1 10/13/94
4641585	55.5	37.5	5/6/92	23.0	RM-27 5/21/92; RM-22 5/6/93; RM-29.7 5/20/94
6645642	50.5	28.5	5/12/92	23.0	
4134091	51.3	29.5	5/13/92	25.2	
4400923	52.0	29.5	5/28/92	22.8	
6641735	42.7	17.5	6/23/92	42.0	
4689429	54.9	40.0	7/22/92	72.2	
4239794	54.3	32.0	10/1/92	20.2	
4595877	51.3	31.5	10/2/92	18.3	
4625237	56.5	40.0	10/13/92	16.5	
4025646	56.3	37.0	10/28/92	16.3	RM-22 4/26/93;
7314755	54.0	41.0	10/30/92	13.0	RM-14.1 10/13/94
6642865	43.0	13.2	4/21/93	25.2	
7316960	56.0	41.0	4/27/93	26.5	
4616385	43.0	19.5	5/19/93	41.2	
4185048	44.7	22.0	6/17/93	33.6	
6643283	60.0	47.0	9/22/93	25.2	
4239778	59.5	45.0	10/26/93	25.2	RM-24 5/12/94

Reviewed
Mike Aderhold
R4 Supervisor
Sept 19 1995