

PERFORMANCE REPORT

STATE: MONTANA

GRANT TITLE: MONTANA ENDANGERED FISHES PROGRAM
GRANT NUMBER: E-7-6

LOCATION: MISSOURI RIVER, MONTANA

PERIOD COVERED: July 1, 2000 through June 30, 2001

PROJECT PERSONNEL:

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OBJECTIVE:

1. To evaluate pallid sturgeon reintroduction; to determine habitat preference, movements, abundance, feeding and growth of pallid sturgeon in Montana.

COSTS: A total of \$31,111.11 in federal and state funds were expended on this project.

RESULTS:

The study objective was to evaluate the pallid sturgeon reintroduction program in the Recovery Priority Management Area 1 (RPMA-1). A total of 758 hatchery-reared (HRJ) yearling pallids (1997 year class) were released into RPMA-1 during the summer, 1998. The pallid sturgeon augmentation plan called for annual stocking of juvenile pallids for 6 consecutive years, at which time the plan will be evaluated based on its effectiveness. No stocking of juvenile pallid sturgeon occurred in 2000 because of continued concerns about a virus that was detected in the pallid hatchery. Therefore, this report deals with further evaluations of the 1997 year class and a report on propagation efforts during 2000 and 2001.

The study area is a 168-mile reach of the Missouri River immediately upstream of Fort Peck Reservoir (Figure 1). Two methods were used to sample the 1997 year-class release; drift netting and angler reports. Additionally, trawl sampling was conducted in the lower 44 miles of the study area for assessing wild pallid sturgeon reproduction and collection of age-0 shovelnose sturgeon (SNS) for Missouri River Sturgeon Iridovirus (MRSIV) assay work.

Juvenile pallid sturgeon netting survey:

It is important to evaluate the success of the pallid sturgeon augmentation program so that problems can be resolved early on in the program. Stocking densities, age of stocked fish, acclimation and growth of stocked fish, and location of release sites are all important aspects for evaluating survival and ultimately recruitment of the released HRJ pallid sturgeon.

The study area consists of a 168-mile reach of the Missouri River immediately upstream of Fort Peck Reservoir (Figure 1). A total of 758 hatchery-reared yearling (HRJ) pallid sturgeon (1997 year class) were released 2 years ago (1998) at 3 locations of the Upper Missouri River by the USFWS. The average weight of these yearling fish were 0.17 lbs. and all were PIT-tagged. No other pallid releases have subsequently occurred because of the concern about the MRSIV discovered in the pallid sturgeon hatcheries since 1999. Therefore, only this initial pallid sturgeon release has been evaluated over the past 3 years.

Attempts were made to capture the HRJ pallid sturgeon drifting small mesh gill and trammel nets and using a trawl. No pallids were captured using the trawl probably because, at age 3, they were strong enough swimmers to avoid being captured. A total of 4 HRJ pallid sturgeon were captured by netting; all were caught in trammel nets (Table 1). One of the HRJ pallids was captured in the Loma Section (RM 2026.5) and the remaining 3 were captured in the Robinson Bridge Section (RM 1922.7, 1919.9 and 1907.3). Additionally, a total of 2,479 fish, representing 19 species, were sampled while both trammel and gill netting throughout the study area (Table 1). Shovelnose sturgeon, goldeye, longnose sucker and shorthead redhorse dominated the catch comprising 56, 16, 10 and 9 percent of the fish sampled, respectively.

Both trammel nets (TNET) and gill nets (GNET) were used to sample for HRJ pallid sturgeon. The experimental gill nets were used far less than the trammel nets (20 sets vs 147), so comparing the effectiveness between the two may not be entirely valid. Comparison measures of effectiveness between the two are as follows (Tables 1 and 2):

- Total number of fish per net - TNET= 15.7 vs GNET= 8.8
- Total number of species - TNET= 19 vs GNET= 9
- Average SNS CPUE - TNET= 8.1 vs GNET= 6.2

In all measures of sampling effectiveness the trammel nets out-performed gill nets.

Benthic trawling:

The main purpose for trawling was to collect 10-30, age-0 SNS for laboratory testing for the presence of MRSIV. Only 3 SNS were collected, far fewer than the minimum requirement, therefore, the main objective was not met. Even though few SNS were collected, this effort did provide valuable information on SNS recruitment and the distribution and abundance of other species.

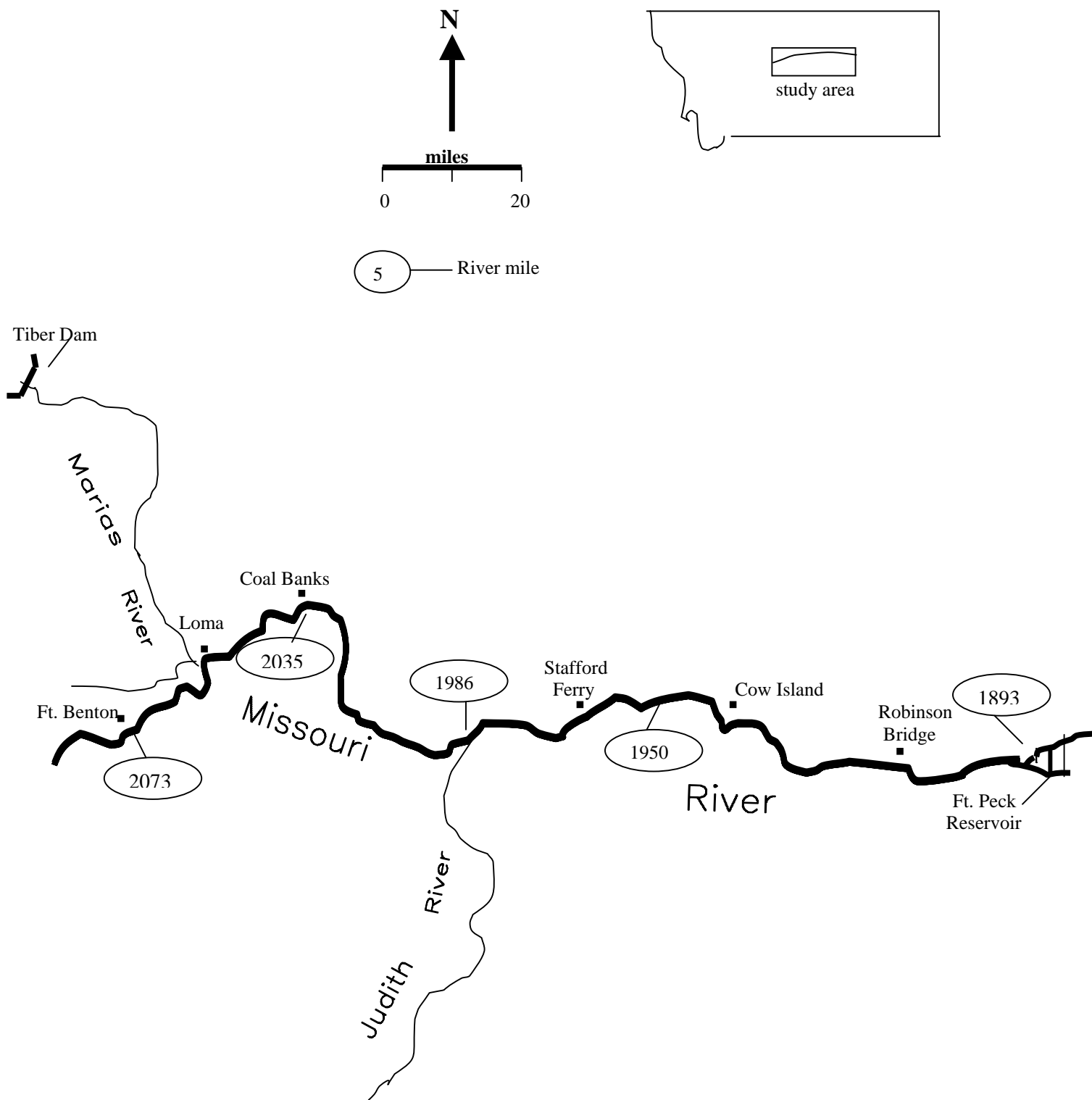


Figure 1. Map of study area.

A total of 453 fish, representing 16 species, were sampled while trawling during August in the lowest section of the study area (Table 3). The average physical conditions measured for the 105 tows were: Tow distance = 196 yards (100-200); Column water velocity = 1.8 fps (1.3-2.8); Depth = 7.7 ft (3-18); Channel location/macro-habitat = 51% channel cross-over area (CHXO), 23% inside bend area (ISB) and 26% outside bend area (OSB); Secchi depth (turbidity) = 0.9 ft; Water temperature = 71.8 F. All of the trawling occurred in the lower 36 miles of the study area between RM-1921 and RM-1885 where it is thought most of the age-0 SNS usually reside. Age-0 channel catfish and sturgeon chub were by far the most abundant species sampled comprising 49% and 32%, respectively. Only 3 age-0 SNS were sampled this year compared to 2 in 1999. The first year of intensive trawling (1995) a total of 28 age-0 SNS were sampled in about 100 tows (Gardner 1996) indicating this method was effective at sampling age-0 SNS when they are more numerous. Based on the low catches of age-0 SNS, it appears there has been poor SNS spawning success during the past 2 years.

Table 1. Average catch rates (no./drift) of fish sampled while drifting trammel nets in the Upper Missouri River, MT, July-November, 2000.

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Table 2. Average catch rates (no./drift) of fish sampled while drifting experimental gill nets in the Upper Missouri River, MT, July- September, 2000.

	Loma	Stafford Fy.	Robinson	Total #
Blue sucker	0.3			2
Channel catfish			0.5	6
Flathead chub		0.3		1
Goldeye	1.7	1.7	0.4	19
Longnose sucker	1.8	0.3		12
Paddlefish			0.1	1
Sauger	0.2		0.3	4
Shorthead redhorse	0.7	1.3	7.6	8
Shovelnose sturgeon	5.5	2.3	7.6	123
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Total # fish	60	18	98	176
Total # drifts	6	3	11	20
Average depth (ft.)	6.0	6.2	5.8	6.0
Avg. col velocity (fps)	1.6	2.3	2.1	2.0
Average distance (yd.)	265	379	293	312
Avg. duration (min.)	5.2	8.7	6.1	6.6
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Location of sets = 50% in CHXO; 30% in ISB; 20% in OSB				

Table 3. Total number caught, catch rates (average number/tow) and composition of fish sampled by trawling in the Robinson Section, Middle Missouri River, MT, 2000.

	Totals	Min. #	Max. #	Average CPUE	Percent Composition	Rank
Channel catfish y	222	0	12	2.1	49	1
Flathead chub	18	0	2	0.2	4	4
Freshwater drum y	11	0	4	0.1	2	
Hybognathus spp	11	0	3	0.1	2	
Longnose dace	1	0	1	T	*	
Sauger y	1	0	1	T	*	
Shorthead redhorse y	1	0	1	T	*	
Shovelnose sturgeon y	3	0	1	T	*	
Sicklefin chub	23	0	2	0.2	5	3
Spottail shiner	1	0	1	T	*	
Stonecat	14	0	3	0.1	3	5
Sturgeon chub	145	0	13	1.4	32	2
River carpsucker y	1	0	1	T	*	
Walleye y	1	0	1	T	*	
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Total # fish	453					
# Taxa	14					
# Hauls	105					

Y = age-0 fish

Fall pallid sturgeon abundance standardized survey:

A total of 435 fish, representing 11 species, were sampled while conducting the fall survey in the 16-mile Robinson Bridge trend area (Table 4). No adult pallid sturgeon were netted, however, 3 HRJ pallid sturgeon were sampled during the survey. Shovelnose sturgeon dominated the catch comprising 90% of the fish sampled. The highest catch rate of 12.1 fish per drift occurred in the channel cross-over (CHXO) macro habitat type.

The standardized survey has been completed 4 times since 1996. Table 5 summarizes these survey results.

Table 4. Catch rates for fish netted while conducting the fall pallid sturgeon standardized abundance survey, Upper Missouri River, September, 2000.

	----- CHXO	HABITAT ISB	TYPE OSB	----- Not Designated	Average CPUE	Total # fish
Blue sucker			0.2	*	*	2
Carp	0.3			0.1	0.1	5
Freshwater drum	0.2	0.4	0.3	0.3	0.3	16
Goldeye				*	*	1
Pallid sturgeon		0.1		*	0.1	3
Rainbow trout				*	*	1
River carpsucker	0.2			0.1	0.1	5
Sauger				0.1	*	2
Shorthead redhorse				0.1	*	2
Shovelnose sturgeon	11.1	6.6	9.2	6.8	7.8	392
Smallmouth buffalo	0.2			0.1	0.1	6
Total fish	109	57	58	211	--	435
Total drifts	9	8	6	27		
Average depth (ft.)	5.8	6.7	6.0	5.9		
Avg. col velocity (fps)	2.4	2.4	2.3	--		
Average distance (yd.)	216	268	256	203		
Avg. duration (min.)	6.4	6.7	7.4	7.4		

Table 5. Sampling statistics recorded for the pallid sturgeon standardized sampling program in the Upper Missouri River, 1996-99.

	1996	1997	1999	2000
No. pallids sampled	3	1	1	3
Avg. Wt. (lb)	38.0	40.6*	0.33*	0.61
No. pallids/drift	0.06	0.02	0.02	0.06
No. shovelnose sampled	225	131	153	392
Avg Wt. (lb)	3.15	3.17	3.30	3.42
No. shovelnose/drift	4.5	2.6	3.1	7.8
Average drift duration (min)	6.3	6.5	6.7	7.1
Average drift distance (yd)	239	294	239	222
Average depth @ drift site (ft)	7.1	8.3	7.1	6.0

Pallid sturgeon sightings, field season 2000:

Angler reports of pallid sturgeon sightings were recorded by the R-6 seasonal paddlefish creel clerk, FWP game wardens and the pallid sturgeon crew. All sighting reports were scrutinized for identification and accuracy because of the taxonomic similarities between pallid and the commonly caught shovelnose sturgeon. Only pallid sturgeon sightings that included observations of colored elastomere marks on the ventral rostrum, presence of a transmitter, actual measurements of inner and outer barbel lengths ($OBL \geq 2X IBL$), body length measurements ($TL > 48$ inches) or weight (>16 lbs.) were accepted as valid sightings.

Angler reports:

Number caught while snagging for paddlefish = 0
Number caught while bait fishing = 3 (1 adult and 2 jv-radioed; all in Rob Bdg area)

Pallid crew reports:

Number caught in 6x10 gillnets = 11 (adults)
Number caught in trammel nets = 4 (all HRJ pallids)
Number caught by other methods = 1 (HRJ-radio)

Pallid sturgeon spawning:

Preserving a representation of the Upper Missouri River pallid sturgeon gene pool is an important pursuit for recovery. To that end, a pilot effort was initiated in 2000 to test the feasibility of collecting sperm from wild male pallids in this area and ship the fresh milt to Garrison National Fish Hatchery (GNFH) for use in their pallid sturgeon propagation program. River flow conditions during June, 2000 were exceptionally low (6700-7300cfs) and allowed for effective sampling of mature adult pallids. A total of 11 individual adult pallids were netted in 103 drifts using specially designed gill nets. Ten to 50 ml of milt was extracted from all of the pallids classified as males (Table 6). These samples were sent to GNFH, taking two days shipping time from Montana. Four of the 6 sperm samples arrived in good condition and contained viable sperm which was subsequently used in the 2000 propagation program. Additionally, one mature female spawner from the Upper Missouri River was taken to GNFH where her eggs were crossed with sperm from several males. The Upper Missouri River female pallid subsequently died after the spawning process. This effort produced approximately 102,000 eggs, however, all the resulting fingerlings had to be destroyed because of MRSIV concerns.

The previous years results were promising, so pallid sturgeon propagation was again attempted in 2001. Missouri River flows were again very low during June, averaging about 4,500 cfs, and this helped to make netting for mature adult pallids much easier than would normally be the case. One female pallid and 5 males were captured and examined for spawning readiness. A list the pallid sturgeon captured and their sizes and tag numbers are presented in Table 7. All were sexually mature and the one female and 3 males were held in a 16 ft diameter tank for staging. Sperm was extracted from the other 2 males prior to release and stored for use in this years propagation effort. Sperm samples from all male pallid sturgeon were cryopreserved to insure preservation of the Upper Missouri River population gene pool. This effort produced approximately 130,000 eggs and resulting fingerlings are presently being reared at the USFWS Bozeman Fish Tech Center and GNFH.

Table 6. A list of pallid sturgeon sampled during June 2000, Upper Missouri River, MT.

PIT #	DATE	FL (in.)	WT (lb.)	Rivermile	Sex	Recap
1F4A415105	June 6	51.5	45.3	1925.7	F	No
1F4A4B5973	June 6	50.8	28.0	1913.2	M *	No
41476A0462	June 8	53.0	35.3	1917.5	M *	Yes
1F4A512325	June 8	52.2	27.9	1915.7	M *	Yes
34354641585	June 12	56.2	31.9	1916.3	M	Yes
411D137942	June 12	57.7	41.0	1913.0	F ?	No
411D150E20	June 13	60.0	52.8	1915.9	F	No
34357316960	June 13	55.9	55.9	1915.9	M	No
411D40360E	June 13	45.5	16.5	1915.7	M *	No
411D0F252E	June 14	55.0	42.0	1918.4	F	No
411D235B0E	June 15	53.5	44.9	1915.7	F *	No

* indicates gametes used in the 2000 pallid spawning program at GNFH

Table 7. A list of pallid sturgeon sampled during June 2001, Upper Missouri River, MT.

PIT #	DATE	FL (in.)	WT (lb.)	Rivermile	Sex	Recap
411D262C1F	June 11	57.0	50	1916.2	F	No
1F4A4B5973	June 5	49.2	26.4	1916.2	M	Yes
17509415139	June 7	56.0	31.2	1916.0	M	No
41476A0462	June 12	53.5	34.0	1916.5	M	Yes
411D0B4E09	June 11	55.0	33.5	1916.5	M	No
411D0E2C5F	June 13	57.5	33.0	1915.8	M	No

Missouri River Sturgeon Irido Virus assistance:

The recently discovered MRSIV could be a serious threat to the wild sturgeon populations in the Missouri River. It is unknown where the virus originated, although most investigators suspect it may exist in the wild. Because of the uncertainty of the virus origin, the viruses virulence and concern for wild sturgeon populations in Montana, the FWP suspended all pallid sturgeon stocking upstream of Fort Peck Dam until more information is available. Therefore, it is important to know if the MRSIV exists in the wild. The USFWS Fish Health Lab, Bozeman, MT, initiated MRSIV evaluations of wild sturgeon in 1999. Tissues (fin and barbel clips) were collected from 29 shovelnose and 1 pallid sturgeon (HRJ) sampled in the Upper Missouri River, MT. Additionally, 5 of the 29 SNS were sacrificed and liver, spleen, kidney, intestine, gill and mouth lining tissues were collected. These samples were fixed in a preservative and sent to the lab for histological study.

I also attempted to participate with the UC-Davis MRSIV studies by collecting age-0 SNS and live-shipping them to Davis, CA for virus testing. However, this effort failed to sample the required 10-30 YOY SNS necessary for the tests. It appeared that because of the abnormally low June flows this year, there was poor SNS spawning success. Only 3 age-0 SNS from 105 trawl tows were sampled this year compared to 1995 (a year with more normal June flows) when 28 age-0 SNS were sampled with a similar trawling effort.

Summary results of the hatchery-reared juvenile pallid sturgeon stocking success:

A total of 3 HRJ pallids were recaptured during the release year (1998), all using the trawl. Table 7 is a summary of the information collected from the HRJ pallids released in 1998. Their average sizes were 11.5 inches (10.4-13.2) and 0.18 lbs. (0.12-0.27). Two of these were recaptured in the nearby site where they were released (Robinson Bdg), while the third pallid (released @ Loma), moved 135 miles downriver. All 3 pallids were captured in the lower reach of the study area.

A total of 3 HRJ pallid sturgeon were recaptured during 1999; all in the lower reach of the study area. One was captured with the trawl and 2 while drifting gill and trammel nets. Their average sizes were 15.3 inches (13.3-17.8) and 0.42 lbs. (0.26-0.68). Only one pallid was recaptured near its release site; the other 2 (released @ Judith Landing), both moved about 65 miles downriver during the 1 year period they were at large.

A total of 5 HRJ pallid sturgeon were recaptured during 2000; three pallids were captured in the lower reach of the study area (Robinson B.), while the remaining 2 were captured in the upper reach of the 168-mile study area (Coal Banks). Four of the 5 pallids were caught in the trammel nets. They have now been at large in the wild for over 2 years. Their average sizes were 18.2 inches (16.3-20.4) and 0.70 lbs. (0.46-1.02). Four of the 5 pallids were checked for tags and only 3 of these pallids had a detectable PIT tag. Of these 3 fish, 2 (both released @ Loma) moved downriver about 140 miles. The third pallid (released @ Judith Landing) moved upriver 41 miles to Coal Banks.

Figure 2 compares the 1997 year-class growth rates between those in the GPNFH (personal com. Herb Bollig, USFWS) with that of the limited number of pallids sampled in the Upper Missouri River. The HRJ pallids have been at large now for 26 months, and since this period the average weight of the hatchery pallids are over twice that of the Upper Missouri River "released" pallids. It appears the released HRJ pallids are growing at far from the maximum (hatchery) rate while in the wild. Anticipated wild sturgeon growth rates that could be used as a comparison for evaluating observed rates are unknown. However, measured shovelnose growth rates over the first 5 years would be a valuable comparison for evaluating the performance of the released HRJ pallids.

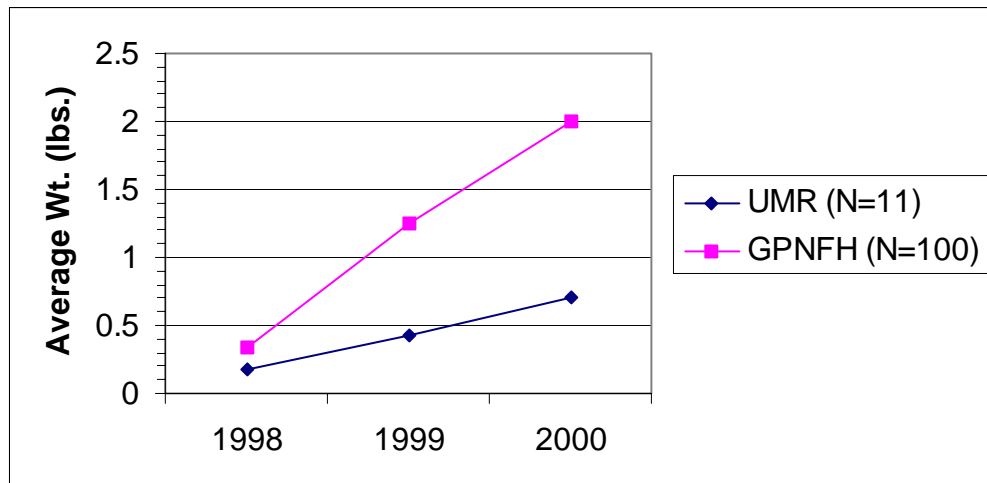
It is still too early to state with any certainty about how successful the pallid release was in the Upper Missouri River. However, there are a few items that are worth noting:

- The pallids released into the wild are growing only at 1/2 of optimal rate after 2 years at large.
- Most of the recaptured fish originated from the upriver release sites (Loma and Judith Landing). Six of the 9 pallids with known release site locations (as determined from detected PIT tag readings) were from the upper and middle release sites. The 3 Robinson Bridge released pallids that have been recaptured were all sampled by trawling and within 9 months after the release date.

Table 8. A list of hatchery-reared pallid sturgeon and recapture information sampled in the Upper Missouri River, MT, 2000.

PIT Number	Color	Recap date	Recap Rivermile	Release Rivermile	Miles moved	Yrs@ large	Recap Meth.	FL (in)	TL (lb)
414D643B15	Blue	9/23/98	1918.0	1921.2	3.2 ↓	0.1	Trawl	10.4	0.12
414D4B6466	Blue	9/23/98	1914.0	1921.2	7.0 ↓	0.1	Trawl	10.8	0.14
4109407023	Yellw	10/30/98	1917.7	2051.2	133.5 ↓	0.2	Trawl	13.2	0.27
414D590E65	Green	4/13/99	1916.0	1921.2	5.2 ↓	0.6	Trawl	13.3	0.26
414D640A4B	Red	8/18/99	1914.5	1984.3	69.8 ↓	1.0	Gillnt	17.8	0.68
41094B2000	Yellw	9/21/99	1923.4	1984.3	60.9 ↓	1.1	Tram	14.7	0.33
414D48054C	Red	7/13/00	2026.5	1984.3	42.2 ↑	1.9	Tram	17.6	0.50
No sensor Telem fsh	Green	9/8/00	2035.5	??	??	2.1	Elec	20.4	1.06
414D3F0975	Red	9/25/00	1922.7	2051.2	128.5 ↓	2.1	Tram	17.5	0.63
(New tag) . 411D132519	Blue	9/26/00	1919.9	??	??	2.1	Tram	19.3	0.75
414D412116	Blue	9/28/00	1907.3	2051.2	143.9 ↓	2.1	Tram	16.3	0.46

Figure 2. Growth rates of the 1997 year-class hatchery-reared pallid sturgeon; Gavins Point National Fish Hatchery lot vs. the lot released into the Upper Missouri River, MT. (Herb Bollig provided the data for the GPNFH lot.)



RECOMMENDATIONS

1. Continue with the intensive drift netting for HRJ pallid sturgeon. The success of the 1998 pallid release remains unknown and recapturing these fish will give better information on acclimation, survival and desirable release locations.
2. The fall pallid sturgeon abundance survey should be continued on an annual basis as funding allows. The HRJ pallid sturgeon should be approaching a size where they are more effectively sampled and this effort will more accurately describe their abundance in the area.
3. The Upper Missouri River pallid sturgeon gene pool has not yet been preserved. Efforts to collect sperm from ripe males should continue as conditions allow. The fresh sperm should be either used during the current propagation year or reserved in cryopreservation.
4. Tissue samples for MRSIV testing should continue to be collected from wild sturgeon in the Upper Missouri River. The attempt to capture age-0 shovelnose sturgeon for bioassay tests relating to MRSIV should continue. The trawling effort directed at this objective have provided a considerable amount of information on shovelnose spawning success and the distribution and abundance of several unique fish species such as the sicklefin chub. A better habitat description

and quantification of the river reach where the age-0 sturgeon are found is needed so that age-0 rearing requirements can be evaluated.

5. A baseline larval sturgeon survey should initiated now so that comparisons can be made in the future regarding pallid sturgeon larval production and changes in environmental conditions.

LITERATURE CITED

Gardner, W.M. 1996. Missouri River pallid sturgeon inventory. Montana Fish Wildlife and Parks. Fed. Aid to Fish and Wildlife Rest. Proj. F-78-R-3. Helena.