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

STATE: Montana **PROJECT TITLE:** Statewide Fisheries Investigations

PROJECT NO.: F-78-R-1 **STUDY TITLE:** Survey and Inventory of Warmwater Streams

STUDY NO.: III **JOB TITLE:** Yellowstone River Paddlefish Spawning Study

JOB NO.: E

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

ABSTRACT

A study to determine the locations of paddlefish spawning sites and evaluate spawning success in the lower Yellowstone and lower Missouri rivers was continued for the fifth year. Larval fish sampling with plankton nets collected a total of 71 paddlefish larvae. The majority (62%) of paddlefish larvae sampled in the Yellowstone were collected at the lower two stations. Seventy-four percent of the paddlefish larvae captured in the Yellowstone River were collected during the June 18 sampling period.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. Locate paddlefish spawning areas. Efforts towards this objective were made and results are reported.

2. Evaluate paddlefish spawning success. Efforts towards this objective were accomplished and results are reported.

3. Determine effect of commercial roe harvest, if any, on the paddlefish population. This is discussed under the heading "Results and Discussion".

4. Report amount of roe harvested commercially. This is reported under the heading "Results and Discussion".

PROCEDURES

Larval fish sampling was used to evaluate paddlefish 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 4-14 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) mounted in the mouth 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. Retained 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.

INTRODUCTION

Every year during the late spring paddlefish from Lake Sakakawea Reservoir migrate up the Yellowstone River to spawn. The Yellowstone contains one of five known natural paddlefish spawning areas within their geographical range (U.S. Fish and Wildlife Service, 1990). Although a few paddlefish larvae have been previously collected in the river (Penkal 1981), exact spawning sites and habitat preferences have not been determined.

In 1989 the Montana Legislature passed House Bill 289 which allows for the commercial sale of paddlefish eggs from paddlefish harvested only in the Yellowstone River at the Intake vicinity. The bill emphasized protection of the paddlefish population from overharvest. One of the methods of protection was to collect more information on spawning success and locate spawning sites so that effects of potential increased harvest of female paddlefish could be better evaluated.

DESCRIPTION OF STUDY AREA

The study area consists of a 185 mile reach of the lower Yellowstone River in southeastern Montana, from Miles City to the confluence with the Missouri River at Fort Buford, ND. Also included is the lower 10-mile portion of the Missouri River. The Yellowstone is one of the few remaining free-flowing rivers. The river is fairly large with a mean annual flow of 12,430 cfs (USGS 1992). The Tongue and Powder Rivers are the only two major tributaries entering the Yellowstone in the reach. The headwaters of Lake Sakakawea Reservoir begin about 35 miles downriver of the confluence. Intake Diversion Dam is the only major diversion in the study area. This diversion is constructed of scattered boulders and spans the width of the river. The drop is approximately 4 feet in 100 feet and is characterized by very turbulent water (Graham and Penkal, 1978). The diversion acts as a partial barrier for upstream travel to most fish species.

The Missouri River is similar in size to the Yellowstone but unlike the Yellowstone, the Missouri's flow is completely regulated by Fort Peck Dam located 183 miles upstream. The mean annual flow is 10,570 cfs (MDNRC 1994). The Milk, Poplar and Redwater rivers are the three major tributaries in this reach.

Sixteen sampling stations were established at 8 sites on the lower Yellowstone in the study area (Figure 1 and Table 1). The distances between successive sampling sites were 5.8, 5.6, 0.8, 1.1, 2.1, 19.4 and 29 miles. Both the right (-R) and left (-L) side of the river channel were sampled at each of the 8 sites to evaluate whether drifting larvae orientated to a particular side.

One site on the lower Missouri River, 6.5 miles upriver from the confluence with the Yellowstone, was also sampled routinely. Sampling stations were established on both right and left sides of the river channel.

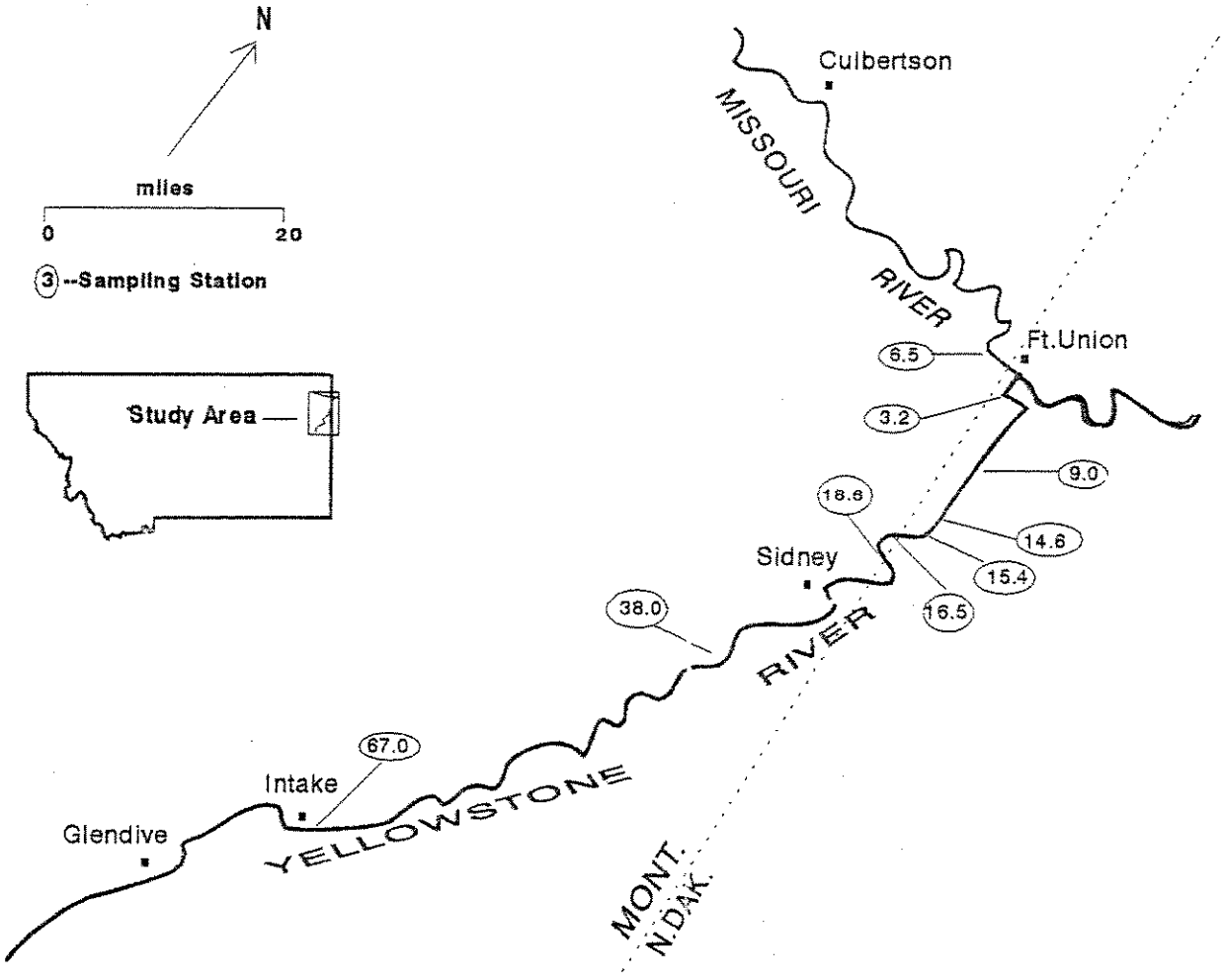


Figure 1. Map of study Area

Table 1. Locations of sampling stations in the Yellowstone and Missouri rivers, 1994.

Station Number	Locality	Legal Description		
RM - 3.2	Confluence (Yel. R)	T152N	R104W	Sec 35
RM - 9.0	Fairview Bdg (Yel. R)	T151N	R104W	Sec 26
RM - 14.6	Lower Jettie (Yel. R)	T150N	R104W	Sec 20
RM - 15.4	Upper Jettie (Yel. R)	T150N	R104W	Sec 17
RM - 16.5	Stateline (Yel. R)	T24N	R60E	Sec 32
RM - 18.6	Ridgelawn (Yel. R)	T23N	R60E	Sec 6
RM - 38.0	7-Sisters (Yel. R)	T21N	R59E	Sec 12
RM - 67.0	Intake (Yel. R)	T18N	R57E	Sec 16
RM - 6.5	Nohly (Missr. R)	T26N	R59E	Sec 16

RESULTS AND DISCUSSION

The Yellowstone River experienced below normal run-off during the 1994 paddlefish spawning season. The average monthly flows for May, June and July, 1994 were 118, 41 and 27% of average (USGS 1995 and Koch et al. 1977). The peak flow of 33,400 cfs occurred on May 17 and was far less than the normal spring peak flow. A second peak of 24,800 cfs occurred on June 5.

River flows in the regulated Missouri River were above normal during the early paddlefish spawning season, however, flows were reduced by late June. The average monthly flows for May, June and July were 147, 126 and 76% of normal and peak flows of approximately 13,500 cfs occurred on May 22 and June 10 (USGS 1995 and MDNRC 1994). These two peak flow periods in the Missouri were largely the result of heavy run-off in the Milk River. The flows in the Milk River during the paddlefish spawning season were above average for May and June and considerably lower than normal during July. The average monthly flows for May, June and July were 106, 247 and 42 % of normal. (USGS 1995 and MDNRC 1994). The peak flow of 2,110 cfs occurred on June 11.

Paddlefish Spawning Success and Spawning Locations

From previous years information it was determined the reach near the Fairview Bridge area had particularly greater densities of paddlefish larvae in the drift samples than other sites. To better determine the location of specific paddlefish sites in this area the sampling effort was changed from the previous year so that there were 5 stations in this 7½ mile reach. Additionally, a D-shaped larval net was used to further test the efficiency at collecting paddlefish larvae.

Larval fish were sampled in the Yellowstone and Missouri rivers from late May through early-August, 1994, to determine timing and location of paddlefish hatching and emergence.

A volume of 846,527 ft^3 of water was filtered for both rivers and net types combined. Physical parameters and sampling effort for each station are presented in Appendix Tables 1-3. A total of 303 larvae were collected in 358 samples representing 7 taxonomic families (Tables 2 and 3). Sucker was the most common larval fish group sampled, comprising 38% of all the larvae collected. Average total larval densities ranged from a low of 0.3 at RM-67.0 to a high of 20.1 larvae/10,000 ft^3 at RM-9.0, both of these extremes were recorded from the D-net samples (Table 3).

Table 2. Numbers of larval fish collected with a conical net in the Yellowstone and Missouri rivers, 1994.

Station[1]	Paddlefish	Sturgeon	Goldeye	Sucker	Minnow	Sticklebk	Sauger/We	Total # Larvae	Avg.[2] Density	Total# Samples
RM-3.2	11	2	5	11	2	0	0	31	6.8	32
RM-9.0	17	4	9	32	6	1	0	68	8.5	48
RM-14.6	8	2	3	10	3	1	0	27	4.5	36
RM-15.4	5	0	1	1	0	0	0	7	3.1	16
RM-16.5	3	1	5	17	3	0	0	29	2.8	44
RM-18.6	4	3	0	6	0	0	0	13	2.8	32
RM-38.0	2	1	4	6	4	0	0	17	1.4	40
RM-67.0	1	5	6	3	7	0	0	22	4.2	27
RM-6.5 (Missr. R)	0	1	1	11	3	1	10	27	3.7	32

[1] Stations are labeled in river miles above the confluence.
[2] Density of larval fish expressed as number per 10,000 ft^3 of water filtered.

Table 3. Numbers of larval fish collected with the D-shape net in the Yellowstone and Missouri rivers, 1994.

Station[1]	Paddlefish	Sturgeon	Goldeye	Sucker	Minnow	Sticklebk	Sauger/We	Total # Larvae	*Avg. Density	Total# Samples
RM-3.2	4	1	2	3	2	0	0	12	5.4	6
RM-9.0	14	0	9	2	0	0	0	25	20.1	7
RM-15.4	0	0	0	1	0	0	0	1	1.4	2
RM-16.5	0	0	1	5	0	0	0	6	1.1	9
RM-18.6	0	0	2	0	0	0	0	2	2.0	3
RM-38.0	0	0	2	0	2	0	0	4	1.1	6
RM-67.0	0	1	0	1	0	0	0	2	0.3	8
RM-6.5 (Missr. R)	2	3	3	1	0	1	0	10	3.7	10

[1] Stations are labled in river miles above the confluence.
[2] Density of larval fish expressed as number per 10,000 ft^3 of water filtered.

A total of 71 paddlefish larvae were sampled during 1994 (Tables 2-5). Paddlefish larvae were sampled at all stations and they comprised 24% of the total larvae collected.

From Tables 4 and 5 it is evident that paddlefish larvae were found in the Yellowstone River samples from the first sampling period, May 24, through June 28, however, 74% of the total were sampled during the June 18 sampling period. Peak larval paddlefish catches occurred within 10 days after the Yellowstone reached the end of its second river discharge peak (June 8). The flow in the Yellowstone once again peaked at a discharge of 21,100 cfs on June 18, but larval paddlefish catches did not likewise increase during the following sampling period, June 28, indicating the greater portion of the larval drift had been completed by June 18. Based on these observations and assuming a 7-10 day incubation period (Yeager and Wallus 1982 and Ballard and Needham 1964) it can be concluded that peak paddlefish spawning occurred during the period June 8-11. Figure 2 depicts the 7-10 day lag relationship between the hydrograph maximums and paddlefish densities.

Table [redacted] Average densities (number/10,000 ft^3) [redacted]d total number of paddlefish larvae sa[redacted]ed with conical nets in the Yellowstone and Missouri rivers, 1994.

	Sampling Period									
Station	May 24	Jun 1	Jun 11	Jun 18	Jun 28	Jul 7	Jul 14	Jul 20[1]	Total # Larvae	Number of Samples
RM-3.2(L)	0	5.8	0	2.1	0	0	-	0	3	16
RM-3.2(R)	0	0	5.0	17.4	0	0	-	0	8	16
RM-9.0(L)	1.8	5.8	2.0	13.4	0	0	-	0	11	24
RM-9.0(R)	4.4	0	0	2.9	0	0	-	0	5	24
RM-14.6(L)	-	0	1.6	5.5	0	0	-	-	5	18
RM-14.6(R)	-	0	2.0	4.0	0	0	-	-	3	18
RM-15.4(L)	-	-	6.8	9.0	0	0	-	-	4	8
RM-15.4(R)	-	-	0	4.4	0	0	-	-	1	8
RM-16.5(L)	2.2	0	0	4.8	0	0	-	0	4	22
RM-16.5(R)	0	0	0	0	0	0	-	0	0	22
RM-18.6(L)	-	-	0	15.6	0	0	-	-	4	16
RM-18.6(R)	-	-	0	0	0	0	-	-	0	16
RM-38.0(L)	0	0	0	0	0	0	-	0	0	20
RM-38.0(R)	2.2	0	0	0.8	0	0	-	0	2	20
RM-67.0(L)	0	0	0	5.3	0	0	-	0	1	13
RM-67.0(R)	0	0	0	0	0	0	-	0	0	14
RM-6.5(L)[2]	0	0	0	0	0	0	0	0	0	16
RM-6.5(R) (Missr. R)	0	0	0	0	0	0	0	0	0	16
Total # Larvae	6	3	6	36	0	0	0	0	51	

1 - Denotes this period includes collections from 7/19 - 8/10.
2 - Denotes that 8 of the 16 samples were collected at river-mile 2.0.

Table 5. Average densities (number/10,000 ft^3) and total number of paddlefish larvae sampled with D-nets in the Yellowstone and Missouri rivers, 1994.

Station	Sampling Period								Total # Larvae	Number of Samples
	May 24	Jun 1	Jun 11	Jun 18	Jun 28	Jul 7	Jul 14	Jul 20[1]		
RM-3.2	0	-	4.4	4.0	0	0	-	0	4	6
RM-9.0	0	-	0	94.9	2.1	0	-	0	14	7
RM-15.4	-	0	-	-	-	-	-	-	0	1
RM-16.5	0	-	0	0	0	0	-	0	0	12
RM-18.6	-	0	0	-	-	-	-	-	0	2
RM-38.0	0	-	0	0	0	0	-	0	0	6
RM-67.0	0	0	0	0	0	0	-	0	0	7
RM-6.5[2] (Missr. R)	0	-	0	0	2.4	-	4.6	0	2	9
Total # Larvae	0	0	2	15	2	0	1	0	20	

1 - Denotes this period includes collections from 7/19 - 8/10.
2 - Denotes that 8 of the 16 samples were collected at river-mile 2.0.

Paddlefish larvae were collected farther up the Yellowstone during 1994 than has been the case for previous years (Gardner 1994). Paddlefish larvae were regularly collected at stations RM-3.2, RM-9.0, RM-14.6 and RM-15.4. On one occasion a paddlefish larvae was collected at station RM-67.0, (Intake) 67 miles upriver of the confluence (Table 2). Figure 3 depicts the paddlefish larvae longitudinal distribution in the Yellowstone River based on the conical net calculated densities for the peak larval drift period (6/18). Average paddlefish densities were the greatest at the lower two stations and least at RM-38.0. It is difficult at this time to correlate paddlefish spawning sites with peak larval densities because the sampling effort was limited, but it is interesting to note the densities were not even between stations and there were a few stations with sudden increases in paddlefish densities.

The paddlefish spawning run during 1994 was thought to be considerably less than normal years. Stewart (1995) reported the 1994 paddlefish angler success rate at Intake was 27% of normal and the gill net catch rate was correspondingly lower at only 47% that of the 1993 value. Paddlefish spawning migrations are generally influenced by the magnitude of the spring run-off (Russell 1986). During years with low spring run-off conditions fewer spawners will migrate upriver to spawning locations. This was probably the case in the study area for 1994.

The better than normal paddlefish larvae catch rates experienced this year compared to the previous 4 years appear to be contrary to that which was found for the adult spawning run. It is believed that the abnormally lower run-off conditions of 1994 made sampling more effective and, therefore, more paddlefish larvae were collected. Additionally, more samples were taken in the suspected primary paddlefish spawning areas compared to previous years, thereby, improving the odds of catching more paddlefish larvae. However, it is believed that paddlefish larvae distribution and consequently spawning site selection during the low water year of 1994 was typical of normal use and was not greatly altered because of the influence of low flow conditions. Comparing the distribution of paddlefish larvae between 1994 and a high run-off year, 1993, it is apparent that larval concentrations were similarly distributed. Moreover, during the low water year of 1994 successful paddlefish spawning was documented the farthest upriver compared to any other year. Most likely the intensity of spawning was less than normal during 1994 because of fewer number of spawners.

Only three paddlefish larvae were collected in the Missouri River samples (Tables 2-5). These specimens were larger and more developed than the Yellowstone ones and both were collected later than when peak numbers were collected in the Yellowstone. This was consistent with results from previous years (Gardner 1994). Paddlefish larvae have been collected in the Missouri River every year since 1991, the first year this station was sampled.

Figure 2. Relationship between average larval paddlefish densities (no./10,000 ft^3) and Yellowstone River flows and temperatures at station RM-9.0 (Fairview Bdg.), 1994. (A zero indicates samples were taken with no paddlefish present).

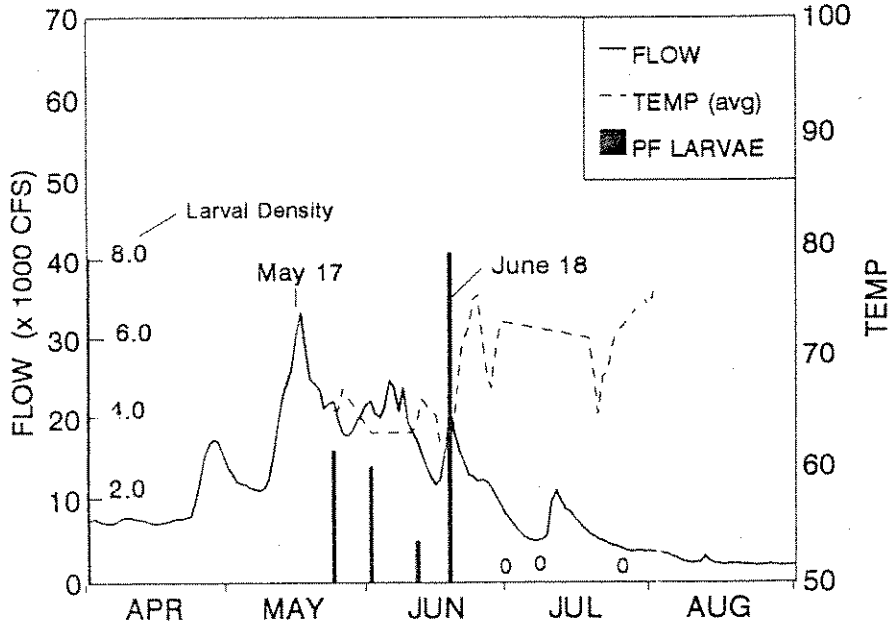
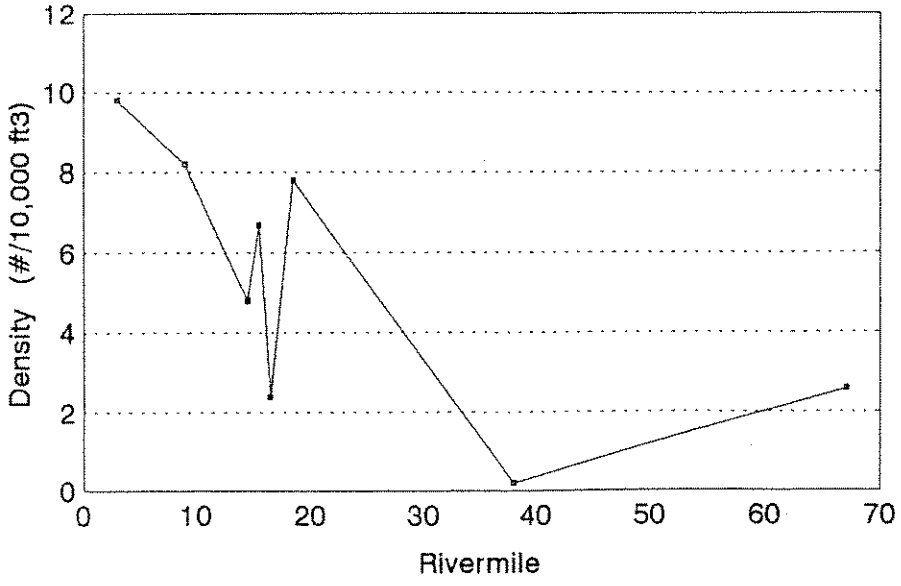


Figure 3. Average larval paddlefish densities for the 8 Yellowstone River stations taken during the peak paddlefish drift period, June 18, 1994. (Only results from the conical nets were used).



A different shaped net was tested for sampling paddlefish larvae. Researchers studying larval white sturgeon have found that a "D" shape net was more efficient at sampling sturgeon larvae than the conventional conical type because the shape of the D-net enables it to rest closer to the bottom where larval white sturgeon are known to occur while drifting to rearing areas (Mr. Lance Beckman, USFWS). During 1992 preliminary testing of the D-nets showed that catch rates of paddlefish larvae were similar to the conical nets but deployment of the D-net was more difficult (Gardner 1993). It was concluded the smaller conical nets were preferred for sampling larval paddlefish for this study.

It was decided to again test the D-net for sampling paddlefish larvae. Instead of deploying the net off the bow of the boat, the D-net was set off the stern. This change was incorporated to prevent the net from collapsing on itself like that experienced periodically when previously used.

Table 6 compares the catch statistics for the two nets. The larger D-net filtered nearly twice as much water per sample effort as the conical nets. This was due to its larger size and greater net velocities. The reason for greater net velocities of the D-nets was related to the procedure of how the net was sampled. While sampling with the D-net enough power was used so that the boat did not drift down river more than 50 yds., whereas, for the conical nets the boat and nets commonly drifted down river over 100 yds. while completing a larval fish sample and, therefore, the net velocities were reduced. Larval catch rates were similar for the two net types. Paddlefish, the target species, were collected in both types of nets. The D-net appeared to have a greater paddlefish catch rate but this was largely the result of one sample that contained 13 paddlefish. This density of paddlefish was unusual for D-net collections where 1-2 larvae in the sample were more common. It appeared that paddlefish were more consistently sampled with conical nets compared to D-nets. Tables 4 and 5 show that paddlefish were collected with the conical nets for all four sampling periods, May 24 - June 18, compared to only three sampling periods (June 1-28) with the D-nets. Sampling with the D-net for paddlefish larvae should continue so that further evaluations can be made.

Paddlefish Caviar

The Glendive Chamber of Commerce and Agriculture continued their collection of paddlefish roe at Intake for the fifth consecutive years in 1994. The very low harvest of paddlefish on the Yellowstone River severely limited their business.

The Chamber cleaned 355 fish of which 233 were females. From these fish a total of 1,166 pounds of caviar was produced. The gross income was $48,137. Sales were made at various prices, but average price was $41.25 per pound.

Table 6. Comparisons of performance parameters between the D-configuration net and the circular larval net, Yellowstone and Missouri river.

Parameter	D-shaped net	Conical net
Net Opening Size	3.67 ft^2	2.11 ft^2
No. of Samples	54	307
Avg. Volume of water filtered (ft^3)	4,172	2,256
Total No. Larvae	64	241
Avg. Larval Density (No./ 10,000 ft^3)	4.4	4.2
Total No. of Paddlefish Larvae	21	51
Avg. Pdlfsh Density (No./10,000 ft^3)	2.3	1.3

RECOMMENDATIONS

1. Larval fish sampling should continue as a means for evaluating paddlefish spawning success and discovering spawning sites.

2. Improvements in sampling methodology for collecting paddlefish larvae are still needed. Efforts at improving sampling efficiencies along with further study of paddlefish larvae drifting behavior should continue to be addressed.

ACKNOWLEDGEMENTS

The author wishes to recognize the assistance that other people provided to this project. Jim Liebelt and crew provided larval fish data for the Missouri River station, June 29 - August 10. Cathy Weigand assisted with the larval sampling and sorted most of the collections.

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Prepared by: William M. Gardner
Date Prepared: August, 1995
Waters Referred to:

Yellowstone River Section 1	21-1350-02
Yellowstone River Section 2	21-1400-02
Missouri River Section 2	16-2420-0

Appendix Table 1. Physical measurements accompanying larval fish samples collected with conical nets in the Yellowstone River, 1994.

Station Number	Number Samples	Avg. Depth at Station (ft.)	Average Net Velocity (ft/s)	Average Net Volume (ft^3)	Average River Flow (cfs)	Avg. Temp. (F)	Avg. Secchi (ft)
RM-3.2 (L)	16	9.3 (7.5 - 12.0)	1.9 (0.6 - 3.7)	1,956 (932 - 3280)	15,845 (5050 - 21900)	67 (64-71)	0.5 (0.1-1.3)
RM-3.2 (R)	16	9.4 (7.5 - 12.0)	1.6 (0.9 - 2.3)	1,705 (773 - 3488)	15,845 (5050 - 21900)	67 (64-71)	0.5 (0.1-1.3)
RM-9.0 (L)	24	7.0 (5.5 - 8.0)	1.5 (0.4 - 2.0)	1,716 (512 - 3273)	31,965 (5060 - 22200)	68 (64-75)	0.6 (0.1-1.6)
RM-9.0 (R)	24	8.7 (6.0 - 12.0)	2.1 (0.7 - 3.5)	2,503 (643 - 4873)	13,965 (5060 - 22200)	68 (64-75)	0.6 (0.1-1.6)
RM-14.6 (L)	18	8.8 (8.0 - 10.0)	1.9 (1.3 - 2.9)	2,288 (1271 - 4488)	13,965 (5060 - 22200)	68 (64-75)	0.7 (0.1-1.6)
RM-14.6 (R)	18	6.9 (6.0 - 7.0)	1.5 (0.4 - 2.3)	1,695 (723 - 3439)	13,965 (5060 - 22200)	68 (64-75)	0.7 (0.1-1.6)
RM-15.4 (L)	8	9.8 (9.0 - 10.0)	1.8 (1.2 - 2.3)	2,140 (1073 - 3944)	12,465 (5060 - 18200)	68 (64-73)	0.7 (0.2-1.4)
RM-15.4 (R)	8	7.5 (6.0 - 9.5)	1.8 (0.7 - 2.7)	2,066 (854 - 4163)	12,465 (5060 - 18200)	68 (64-73)	0.7 (0.2-1.4)
RM-16.5 (L)	22	6.1 (4.0 - 8.0)	2.0 (0.8 - 3.4)	2,299 (975 - 5145)	13,965 (5060 - 22200)	68 (63-74)	0.6 (0.1-1.6)
RM-16.5 (R)	22	7.6 (6.0 - 10.5)	1.9 (0.9 - 2.9)	2,341 (1137 - 4460)	13,965 (5060 - 22200)	68 (63-74)	0.6 (0.1-1.6)
RM-18.6 (L)	16	9.6 (8.5 - 10.5)	1.4 (0.6 - 2.2)	1,617 (523 - 2500)	12,465 (5060 - 18200)	68 (62-74)	0.8 (0.1-1.6)
RM-18.6 (R)	16	8.5 (6.5 - 10.5)	1.7 (1.1 - 2.6)	1,953 (1345 - 3316)	12,465 (5060 - 18200)	68 (62-74)	0.8 (0.1-1.6)
RM-38 (L)	20	6.3 (5.9 - 7.5)	2.5 (1.6 - 3.2)	3,111 (1412 - 4873)	13,376 (5110 - 19700)	70 (65-77)	0.8 (0.2-1.8)
RM-38 (R)	20	7.6 (3.0 - 10.5)	2.3 (1.6 - 3.7)	2,860 (1451 - 5307)	13,376 (5110 - 19700)	70 (65-77)	0.8 (0.2-1.8)
RM-67 (L)	13	8.5 (7.0 - 10.0)	1.9 (1.0 - 3.0)	2,242 (1253 - 3778)	16,089 (5110 - 21800)	69 (64-75)	0.5 (0.2-1.2)
RM-67 (R)	14	8.1 (7.0 - 9.0)	2.1 (0.7 - 4.6)	2,256 (946 - 4107)	16,089 (5110 - 21800)	69 (64-75)	0.5 (0.2-1.2)

Appendix Table 2. Physical measurements accompanying larval fish samples collected with conical nets in the Missouri River 1994.

Station Number	Number Samples	Avg.Depth At Station (ft)	Average Net Velocity (ft/s)	Average Net Volume (ft^3)	Average River Flow (cfs)	Avg. Temp. (F)	Avg. Secchi (ft)
RM-6.5 (L)[1]	16	9.7 (8.5-11.0)	1.7 (0.6-2.6)	1,924 (780-2888)	10,528 (8290-15483)	64 (60-69)	0.8 (0.3-1.8)
RM-6.5 (R)[1]	16	8.4 (6.0-10.0)	2.0 (0.7-2.8)	2,292 (568-4361)	10,528 (8290-15483)	64 (60-69)	0.8 (0.3-1.8)

[1] denotes that 8 of the 16 samples were collected at river-mile 2.0.

Appendix Table 3. Physical measurements accompanying larval fish samples collected with D-nets in the Yellowstone and Missouri Rivers, 1994.

Station Number	Number Samples	Avg. Depth At Station (ft)	Average Net Velocity (ft/s)	Average Net Volume (ft^3)	Average River Flow (cfs)	Average Temperature (F)	Average Secchi (ft)
RM-3.2	6	10.1 (8.8-12.0)	2.1 (1.0-3.2)	3,746 (2408-4979)	15,010 (5050-21900)	68 (65-71)	0.6 (0.1-1.3)
RM-9.0	7	7.7 (4.5-11.0)	1.9 (0.9-2.9)	3,605 (1352-4654)	13,863 (5060-22200)	68 (64-73)	0.5 (0.2-1.4)
RM 15.4-18.6	14	6.6 (4.0-10.0)	2.7 (2.1-3.6)	4,502 (3160-5519)	17,131 (5060-22200)	66 (63-73)	0.4 (0.2-1.4)
RM-38.0	6	7.3 (6.0-9.5)	3.1 (2.4-9.5)	5,558 (4332-7507)	12,275 (5270-19700)	69 (65-77)	0.8 (0.2-1.8)
RM-67.0	8	8.9 (7.0-10.0)	2.5 (0.7-4.7)	4,534 (1949-7242)	16,802 (5110-21800)	68 (64-74)	0.5 (0.2-1.2)
RM-6.5[1]	10	9.2 (7.0-14.0)	1.8 (1.0-3.0)	3,086 (1769-4689)	9,863 (8290-12900)	65 (61-69)	0.9 (0.3-1.8)

[1] - denotes that 7 of the 10 samples were collected at river-mile 2.0.

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana **PROJECT:** Statewide Fisheries Investigations

PROJECT NO: F-78-R-1 **STUDY TITLE:** Survey and Inventory of Warmwater Lakes

JOB NO: IV-D **JOB TITLE:** Southeast Montana Warmwater Lakes Investigations

PROJECT PERIOD: July 1, 1993 through June 30, 1994

REPORT PERIOD: April 1, 1993 through March 31, 1994

ABSTRACT

Small fishing reservoirs in 7 counties were sampled to obtain fisheries information in 1993. A total of 27 reservoirs were sampled. Ten of these had never been planted or had not be planted in recent years. They were visited only to determine fisheries potential. Seven of these reservoirs were determined to have sufficient potential that a fish plant was warranted. Of the remaining 17 reservoirs three were found to be devoid of fish, probably from winterkill. Fourteen reservoirs had fishable populations of target fish species.

PROCEDURES

Pond depths were determined by sounding with a calibrated, weighted rope. Fish populations were sampled with 125 feet long sinking experimental gill nets and a 1/4 inch mesh bag seine of 100 feet length.

RESULTS AND DISCUSSION

Survey of New Ponds

Six new ponds were surveyed to determine suitability for producing fish (Table 1). The Burley and Tusler ponds were considered too shallow to dependably winter fish. The Lee Pit #2 was planted with blue gills, the Helm pond was planted with rainbow trout and the Hafla pond was planted with largemouth bass. The Emmons pond was found to have yellow perch, largemouth bass and white crappie and the land owner decided not to participate in the program.

Survey of Previously Planted Reservoirs

Carter County

Sampling at Sidehill Reservoir produced no largemouth bass and but a few fathead minnows (Table 2). This reservoir is marginal in depth and likely winterkilled. It was not replanted. Yellow perch and northern pike were found to be present in Talcott Reservoir.

Custer County

Rainbow trout in Rest and Boulware Reservoirs are doing well and are providing anglers with good fishing. Sampling at Dan Haughian Reservoir produced largemouth bass and northern pike. This reservoir continues to provide some of the better bass fishing in the region. Largemouth bass in the Jim Beardsley Reseroir diplayed good growth since being planted in 1993. Yellow bullheads in the Cody Taylor Pond are abundant but small.

Dawson County

Lindsey reservoir overwintered yellow perch and northern pike but winter kill is always a threat here. Sampling at the John Wilgosh Reservoir resulted in largemouth bass averging 256 mm and weighing up to 900 grams.

Fallon County

Fewer and smaller yellow perch were sampled from Baker Lake in 1994 than in previous years. Black bullheads also appeared to be less abundant but were larger in size. Yellow perch are abundant but small in South Sandstone Reservoir (Table 2), but large walleye and northern pike are present. The numbers of largemouth bass, smallmouth bass and crappie remain limited. Crappie, yellow perch

and largemouth bass are present in Maier Reservoir but growth has been poor since the illegal introduction of carp. We plan to rehab this reservoir in 1995. Pinnow and Schweigert Reservoirs appear to have good numbers of rainbow trout but are marginal in depth and suseptible to winterkill.

Garfield County

The turbid water at Smith Cattle #1 (trout) Reservoir causes slow fish growth so rainbow trout are not large (Table 2). Smith Cattle #3 (bass) Reservoir was replanted in 1993 after winterkilling. Largemouth bass sampled in 1994 had not grown as well as might be expected. Kreider bass reservoir was replanted in 1993 after winterkilling. Largemouth bass were abundant in 1994 sampling and displayed good growth. Smallmouth bass were less abundant and did not grow as well. Largemouth bass sampled from Brooks Bass Reservoir grew at about the expected rate. This reservoir was planted for the first time in 1993. No fish were collected at the Jarden Bass Reservoir. This pond apparently winterkilled and will be replanted in 1994.

Powder River County

Rainbow Trout are growing well at Jansen Reservoir after being planted for the first time in 1993 (Table 2). Sampling at Williams #1 and Williams #2 Reservoirs resulted in no largemouth bass being collected. These resservoirs apparently winterkilled and will not be replanted.

Prairie County

Bass populations are doing well at Homestead Reservoir. Largemouth bass sampled at Don Lee #1 Reservoir were abundant and displayed good growwth (Table 2). Some rainbow trout are present but will not be replanted.

Richland County

Yellow perch found in the Wilmer Buxbaum Reservoir in previous years sampling were not seen in 1994. Rainbow trout older than age one were not found. Yellow perch were replanted in the Walter Buxbaum Reservoir in 1993 after winterkill and 1994 sampling found perch young-of-the-year present. Cayko Reservoir has an abundant yellow perch population but largemouth bass planted in 1993 are not yet numerous. Sampling at Gartside Reservoir found seven fish species present (Table 2). Walleye planted in 1993 were not sampled and will be replanted again in 1994.

Rosebud County

Catles Rock Reservoir continues to provide an excellent fishery

with abundant and large blue gill (Table 2). Walleye, northern pike, largemouth bass and smallmouth bass are also doing well in this reservoir. Four other reservoirs were sampled in 1994. Largemouth bass were present in Lee #2, Lee Pit and Boggs #1. The two Boggs reservoirs are very turbid and of minimal potential if the do not clear up.

Treasure County

Sampling at Kicker #1 Reservoir produced no largemouth bass which was surprising as this reservoir had good water. Largemouth bass were present in Kicker #2 reservoir and displayed good growth.

Wibaux County

Ray Banister Reservoir will be replanted in 1994 with largemouth bass after winterkill. No largemouth bass or crappie were sampled in Wibaux pond. Yellow perch overwintered in Witkowski Reservoir after being replanted in 1993 after winterkill. A few northern pike survived the winterkill and are still present.

Prepared by: Phillip A. Stewart

Date: September 1, 1994

Water referred to:

Baker Lake	21-1778
South Sandstone Res.	21-8775
Gartside Reservoir	21-3250

Keywords

small reservoirs	Yellow perch
largemouth bass	crappie
smallmouth bass	northern pike
rainbow trout	

Table 1. Results of new pond surveys in 1994.

Pond Name	County	Location T R S	Max. Depth (Ft.)	Fish Species Present	Management Plan
Helm, Jim	Garfield	16N,43E,05	12	None	Plant RBT
Hafla, Anton	Garfield	16N,42E,03	11	1 CCat	Plant RBT
Burley, Scott	Powder R.	5S,49E,03	11	None	Don't plant
Emmons, Charlie	Powder R.	3S,51E,18	15	YP,LMB, WCR	Don't plant
Tusler, Bill	Prairie	11N,52E,18	10	None	Don't plant
Lee, Al (Pit #2)	Rosebud	7N,40E,14	13	None	Plant BG

Table 2. Results of sampling previously planted reservoirs, 1994.

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
		CARTER COUNTY					
Sidehill	1 seine haul	A few FHM collected					
	2 gill nets	No fish collected					
Talcott	1 seine haul	No fish collected					
	2 gill nets	YP	147	203	118	166-245	60-200
		NP	5	434	504	326-513	200-820
		CUSTER COUNTY					
Rest	1 seine haul	No fish collected					
	1 gill net	RBT	5	265	230	202-293	90-300
Boulware	1 seine haul	RBT	25	223	130	168-265	50-210
	1 gill net	No fish collected					
Dan Haughian	3 seine hauls	LMB	1	290	330	-	-
		LMB(YOY)	1	27	-	-	-
		NP	4	263	133	126-327	10-220
	2 gill nets	LMB	2	247	235	242-251	220-250
		NP	9	401	741	255-850	100-4400
Cody Taylor	1 seine haul	YBH	90	177	63	148-193	40-70
Jim Beardsley	1 seine haul	No fish collected					
	2 gill nets	LMB	28	207	163	190-220	100-210

Table 2. Continued

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
		DAWSON COUNTY					
Lindsay	2 seine hauls	YP	54	95	-	76-146	-
		YP(YOY)	23	61	-	56-65	-
		NP	1	211	60	-	-
		Carp	5	149	-	141-156	-
John Wielgosh	3 seine hauls	Sticklebacks	300	-	-	-	-
		FHM	50	-	-	-	-
	2 gill nets	LMB	71	256	363	186-370	90-900
		FALLON COUNTY					
Baker Lake	6 seine hauls	NP	2	161	-	156-166	-
	2 gill nets	BBH	190	220	191	172-256	70-280
		YP	3	184	87	180-186	80-90
South Sandstone	4 seine hauls	NP	3	325	277	215-437	70-560
		SMB	1	215	150	-	-
		YP	254	150	61	91-191	20-110
		YP(YOY)	7	52	-	45-56	-
		BBH	3	231	227	220-242	170-280
	3 gill nets	NP	16	471	902	320-896	150-5000
		WE	5	486	1140	465-530	950-1400
		YP	534	162	70	132-289	10-360
		BCR	2	202	160	184-220	120-200
		BBH	113	234	241	136-272	40-420

Table 2. Continued.

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
Maier	1 seine haul	Crappie	90	127	38	34-170	20-90
		YP	5	104	40	80-135	-
		SMB	1	88	-	-	-
		FHM	2	-	-	-	-
	2 gillnets	Crappie	102	143	50	132-155	30-60
		Carp	7	351	546	340-360	450-600
		YP	2	150	35	-	30-40
Pinnow Trout	1 seine haul	No fish collected					
	2 gill nets	RBT	33	286	414	215-461	170-1330
Schweigert Trout		Observed rbt jumping					
		GARFIELD COUNTY					
Smith Cattle Trout	1 seine haul	RBT	8	200	106	142-270	40-200
Smith Cattle Bass	1 seine haul	No fish collected					
	2 gill nets	LMB	8	139	55	131-145	50-60
Kreider Bass	1 seine haul	SMB	1	153	50	-	-
	2 gill nets	LMB	74	209	153	164-236	70-240
		SMB	6	151	53	139-161	30-70
Brooks Bass	1 seine haul	No fish collected					
	2 gill nets	LMB	10	169	108	139-215	60-200
Jarden Bass	2 gill nets	No fish collected					

Table 2. Continued.

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
		POWDER RIVER COUNTY					
Janssen Trout	1 gill net	RBT	61	321	535	188-453	60-1360
Williams #1	1 seine haul	No fish collected					
Williams #2	2 seine hauls	FHM	500	-	-	-	-
		PRAIRIE COUNTY					
Homestead	2 seine hauls	SMB	2	127	30	109-144	20-40
		LMB(YOY)	1	27	-	-	-
		FHM	6	-	-	-	-
	2 gill nets	LMB	21	262	303	133-418	20-1100
		SMB	1	121	30	-	-
Don Lee #1	hook & line	RBT	4	227	130	217-240	120-150
	2 gill nets	RBT	123	225	141	142-273	90-200
		LMB	98	210	138	190-221	100-160
		RICHLAND COUNTY					
Buxbaum, Wilmer	1 seine haul	FHM	100	-	-	-	-
	2 gill nets	RBT	18	209	146	152-279	60-320
Buxbaum, Walter	1 seine haul	YP(YOY)	34	63	-	57-75	-

Table 2. Continued.

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
Cayko	2 seine hauls	YP	7	162	60	132-238	30-130
		YP(YOY)	643	57	-	47-70	-
	2 gill nets	YP	196	189	90	138-250	30-180
		LMB	1	237	210	-	-
Gartside	3 seine hauls	YP	13	186	82	160-233	60-160
		SMB	1	227	150	-	-
		SMB(YOY)	22	69	-	60-97	-
		LMB	1	160	40	-	-
		LMB(YOY)	8	75	-	65-81	-
	3 gill nets	NP	5	460	590	380-517	320-760
		BCR	32	158	60	138-177	30-90
		WCR	5	170	60	-	-
		YP	122	171	68	155-193	50-100
		WSU	15	391	749	348-440	510-970
		ROSEBUD COUNTY					
Castle Rock	4 seine hauls	BG	423	75	78	27-205	15-230
		NP	7	239	96	130-367	50-290
		LMB	9	63	40	50-125	-
		Crappie	46	41	-	40-45	-
		GS	1	60	-	-	-
		SMB	6	-	-	40-50	-
	4 gill nets	WE	31	408	771	298-687	200-3700
		BG	19	176	132	110-227	30-250
		NP	6	466	672	371-668	260-1850
Lee #2	1 seine haul	LMB	1	234	200	-	-

Table 2. Continued.

Pond Name	Type of Sample	Species	No. Caught	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)
Lee Pit	1 seine haul	SMB	2	157	45	148-165	40-50
		LMB	1	176	60	-	-
Boggs #1	1 seine haul	LMB	1	179	70	-	-
Boggs #2	1 seine haul	No fish collected					
		TREASURE COUNTY					
Kicker #1	2 seine hauls	No fish collected					
	2 gill nets	No fish collected					
Kicker #2	2 seine hauls	No fish collected					
	2 gill nets	LMB	39	241	238	213-258	160-300
		WIBAUX					
Banister, Ray	1 seine haul	No fish collected					
	2 gill nets	No fish collected					
Wibaux Pond	1 seine haul	GS	2	57	-	54-60	-
		WSU	3	78	-	77-80	-
		CREEK CHUB	1	70	-	-	-
	2 gill nets	NP	1	406	500	-	-
		WSU	20	267	272	165-418	120-820
		BBH	16	210	159	192-273	110-370
		CREEK CHUB	1	174	60	-	-
Witkowski	2 seine hauls	NP	2	163	20	162-164	-
		YP	8	146	38	134-160	20-60