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ESTABLISHMENT OF AQUATIC BASELINES IN LARGE INLAND IMPOUNDMENTS

Segment 1 Report

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ABSTRACT

Sampling of larval fish in key spawning and nursery areas of the Big Dry Arm of Fort Peck Reservoir was done during May, June and July, 1977. Adult fish were trapped and marked from April through August primarily in areas near the head of the Big Dry Arm and also in mid-areas of this arm. Sampling of Age 0 fish to assess fish production was done by beach seining during late summer in the Big Dry Arm and areas near the dam. Temperatures were continuously recorded from April through September near the head of the Big Dry Arm and in Nelson Creek bay. Benthos samples were collected at the heads of several bays in the Big Dry Arm and also near the head of the arm. Monitoring of goldeye was done at standard sampling sites in lower areas of the reservoir and a commercial goldeye catch was sampled. A film on the commercial fisheries of Fort Peck Reservoir was started with completion expected in 1978.

INTRODUCTION

Major emphasis during this report period included intensive sampling of adult and larval fish in key reproductive and nursery areas of the Big Dry Arm. Adult fish were trapped and tagged while larval fish were captured with the aid of one-half meter nets in paired tows near the head of the Big Dry Arm as well as the heads of all major bays in this arm. Age 0 fish were also sampled by beach seining during the late summer in most of the same areas where larval sampling was done. Other work included collection of benthos samples in the Big Dry and monitoring of water temperatures in Nelson Creek Bay and the head of the Big Dry Arm, both important spawning and nursery areas for a number of fish species. Commercial goldeye catches were sampled and monitoring of the goldeye population at standard sampling sites was done. A film on the commercial fisheries of Fort Peck Reservoir was begun with completion expected to be in 1978. Commercial fishing statistics of the reservoir for 1977 were compiled.

MATERIALS AND METHODS

Larval fish were collected by means of one-half meter (#00 mesh) nets with attached bucket (#00 mesh screen). A digital flow meter (TSK) was installed in the center of the mouth of each half-meter net and a 30-pound torpedo-shaped weight was attached to each net by a short length of chain to provide necessary ballast to keep nets under surface during towing operations. Water temperature, Secchi disk readings, and climatic conditions were recorded prior to each towing operation. Paired tows were made at each sampling site for a period of 10 minutes at constant engine rpm. Nets were dropped and pulled simultaneously and all timing was done with aid of a stopwatch. At the completion of each tow, buckets were removed and all material washed into quart canning jars and preserved in five percent formalin solution containing biological staining dye (Phloxine-B). All tows were made during the day with the exception of six night tows which were made at upper stations only. Samples were later examined in sorting trays and larval fish removed with aid of forceps and stored in 50 dram plastic jars for future identification.

Water temperatures were recorded continuously using Taylor 31-day spring wound thermographs (model 23-3).

Frame traps, 4 feet x 6 feet x 11 feet in length, were used to capture primarily adult fish for tagging purposes. Fifty-foot leads were used on traps and all webbing was of one-inch square nylon. The lead was staked to shore and the trap pulled out perpendicular to shore with aid of a boat. A heavy weight was attached to the bag end and the trap was also staked, usually on each side of the frame to prevent rolling due to wave action. Traps were emptied about every two or three days, depending on fish movement and concentration. Fish were usually removed from traps and placed in tubs for tagging. Samples used for obtaining length and weight information were anesthetized with MS-222

Sampling of Age 0 fish was done by use of a 100- x 10-foot beach seine consisting of 1/4-inch square nylon mesh. This net was set with aid of a boat

and seining deck. Areas seined were usually at heads of bays and along shorelines with gradual bottoms. Upon completion of each haul fish were counted and identified to species.

Benthos sampling was done with a standard Ekman dredge (6 inches x 6 inches x 6 inches) in soft bottom materials near the heads of bays and near the head of the Big Dry Arm. One to five feet square of material was collected at each station. Contents were washed into quart canning jars and preserved in five percent formalin with organisms to be separated and identified at a later time.

Sampling of the goldeye population in lower areas of the reservoir was done at standard sampling sites with two 300- x 8-foot nylon floating gill nets. One net consisted of 1 3/4-inch square mesh only, the other contained three 100-foot panels each of 1 1/4-, 1 1/2-, and 1 3/4-inch square mesh. Nets were set during the afternoon and picked the following morning. All goldeye captured were weighed, measured and sexed. Sampling of a commercial goldeye catch was done at the fish plant site on the day of the catch. Tubs were picked at random and a subsample of goldeye was weighed, measured and sexed.

LARVAL FISH SAMPLING

Sampling of larval fish was done on a weekly basis beginning May 6 through June 17, 1977. A total of 72 paired tows (66 day - 6 night) were made. An additional two tows were made at the upper two stations near the head of the Big Dry Arm only, July 28, 1977, to check for reproduction of late spring spawning species.

Sampling sites were divided into upper, middle and lower stations in the Big Dry Arm. Upper stations consisted of two sites near the head of the Big Dry Arm and near the head of Nelson Creek bay. Middle stations were near the heads of McGuire and Bug Creek bays on the east side of the Big Dry Arm and Lonetree and Lost Creek bays on the west side. Tows were also made on the main Big Dry Arm on the east side in the proposed water intake area. Lower sampling sites were near the heads of the North Fork of Rock Creek and Sand Arroyo bays on the east side of the Big Dry Arm and Box Creek and Box Elder Creek bays on the west side. Only one scheduled tow (Box Elder Creek bay) was missed due to adverse weather conditions.

Preliminary examination of larval fish samples indicates the largest concentrations of larval fish were present in the upper stations, particularly Nelson Creek bay, and also in McGuire Creek bay at middle sampling sites. The least number of larval fish were found in the lower four stations. Preliminary examination of samples also indicates the greatest majority of larval fish captured from all areas are yellow perch. Final results will be reported in a future report.

TRAPPING

Traps were set in areas near the head of the Big Dry Arm beginning April 12 and run through May 24, 1977, and periodically thereafter in June, July and

August. Traps were also fished in mid-areas of the Big Dry Arm from April 19 through April 25, 1977. Traps were fished a total of 295 trap-days in the upper Big Dry Arm during April and May (Table 1) with a total catch of 4,070 fish or an average of 13.8 fish per trap-day. Walleye averaged 5.8 fish per trap-day and were the most abundant species caught. Northern pike, river carpsucker and black bullhead were the only other species caught which averaged over one fish per trap-day. This area of the Big Dry Arm is relatively shallow with highly turbid water and muddy bottom. Although the area appears unfavorable for purposes of fish reproduction, several species including walleye, river carpsucker, shorthead redhorse sucker, freshwater drum, channel catfish, black bullhead and goldeye congregate near the head of the Big Dry Arm at various periods throughout the spring for reproductive purposes. Smallmouth and bigmouth buffalo also use this area for spawning when rising water levels inundate shoreline vegetation.

Traps were fished a total of 15 trap-days during April in mid-areas of the Big Dry Arm (Table 1). This was done primarily to check for spawning activity of walleye. This area of the Big Dry Arm is characterized by having water of low turbidity with numerous sand-gravel bars and shorelines which would appear to provide excellent spawning substrate, especially for walleye. However, as can be seen from the results, a total of only 28 fish were captured for an average of 1.7 fish per trap-day. Walleye averaged 0.5 fish per trap-day as compared to 5.8 fish per trap-day in the upper area.

Traps were fished periodically in the upper Big Dry Arm only during June, July and August (Table 2) to monitor fish movement in this area. An average of 64.0 fish were captured per trap-day in June as compared to 37.3 during July and 22.8 during August. The majority of fish captured in all three months were river carpsucker with 54.1 fish caught per trap-day in June and 18.9 and 15.0 in July and August, respectively. Most of the river carpsucker captured during June were sexually mature adults while during July and August, juvenile fish were predominant.

Traps were not fished after August in upper areas of the Big Dry Arm due to a relatively rapid decrease of water levels within the reservoir. Trapping sites could not be maintained because of this situation. The low water levels also had a negative influence on fish activity in this area.

WATER TEMPERATURES

Continuous recording thermographs were installed near the head of the Big Dry Arm and in Nelson Creek bay during April and were taken out of service in September. The Nelson Creek bay thermograph was relocated to a different site within the bay when low water conditions made servicing impractical at the original installation site. Temperatures were not recorded for two and six consecutive days in April and July, respectively, in Nelson Creek bay due to machine malfunction. Results are given in Table 3. The minimum and maximum average water temperatures during April were 49°F and 56°F (range 37-70°F) in the upper Big Dry Arm which included the beginning and peak of the walleye spawning period. Sexually mature river carpsucker were especially abundant in this area during June when the average minimum and

Table 1. Species and average number of fish caught per trap day during spring, 1977 from Upper and Middle areas of Big Dry Arm of Fort Peck Reservoir.

Area	Date	Trap Days	Species[3] WE	SG	YP	NP	RC	SB	WS	SR	C	BB	CC	FD	B	Avg. Per Trap Day[4]	Total Fish[4]
UBDA[1]	4/12-5/24	295	5.8	0.2	0.5	1.4	2.2	0.2	0.5	0.6	0.8	1.3	0.1	0.1	0.2	13.8	4,070
MBDA[2]	4/19-5/25	15	0.5	0.0	0.0	0.4	0.0	0.1	0.3	0.0	0.5	0.0	0.0	0.1	0.1	1.7	28

1. Upper Big Dry Arm.

2. Middle Big Dry Arm.

3. WE-walleye
SG--sauger
YP--yellow perch
NP--northern pike
RC--river carpsucker
SB--smallmouth buffalo
WS--white sucker
SR--shorthead redhorse sucker
C--carp
BB-black bullhead
CC-channel catfish
FD--freshwater drum
B--burbot

4. Includes all species trapped (less than 0.1 fish per day caught in both areas of following species: bigmouth buffalo; goldeye; black crappie; rainbow trout).

Table 2. Species and average number of fish caught per trap day during June, July and August, 1977, from Upper Big Dry Arm of Fort Peck Reservoir.

Area	Month	Trap Days	Species[2.]													Avg. Per Trap Day	Total Fish
			WE	SG	YP	NP	RC	SB	C	BB	CC	GE	FD	BC	WS		
UBDA[1.]	June	11.0	1.1	0.2	0.0	0.4	54.1	2.4	0.6	0.8	0.5	3.2	0.7	0.0	0.0	64.0	704
	July	4.5	4.2	1.8	0.4	1.3	18.9	0.7	1.8	3.6	0.2	3.6	0.0	0.4	0.4	37.3	168
	August	5.0	3.2	0.4	0.4	0.3	15.0	0.8	0.0	0.0	0.0	2.0	0.0	0.0	0.8	22.8	114

1. Upper Big Dry Arm.

2. WE--walleye
SG--sauger
YP--yellow perch
NP--northern pike
RC--river carpsucker
SB--smallmouth buffalo
C--carp
BB--black bullhead
CC--channel catfish
GE--goldeye
FD--freshwater drum
BC--black crappie
WS--white sucker

Table 3. Average minimum and maximum temperatures and temperature range recorded during April through September, 1977, in the Big Dry Arm of Fort Peck Reservoir.

Month	No. of Days	Avg. Min. Temp. (°F)	Avg. Max. Temp. (°F)	Range (°F)
UPPER BIG DRY ARM:				
April	25[1.]	49	56	37-70
May	31	59	65	50-72
June	30	66	73	60-80
July	31	67	74	61-83
August	31	63	70	56-77
September	19[2.]	58	66	47-78
NELSON CREEK BAY:				
April	23[1-3.]	47	59	38-74
May	31	54	63	47-75
June	30	63	73	53-83
July	31	67	72	63-79
August	25[4.]	64	68	59-73
September	19[2.]	60	64	56-71

1. Thermographs installed April 6.
2. Thermographs removed.
3. Temperatures not recorded for 2 days due to machine malfunction.
4. Temperatures not recorded for 6 days due to machine malfunction.

maximum water temperatures were 66°F and 73°F (range 50-80°F). Water temperatures increased through July in both areas with the exception of a one degree drop in the average maximum temperature during July from that recorded in June in Nelson Creek bay. Water temperature dropped after July in both areas with the exception noted above. The greatest range in water temperatures occurred in April in both areas with a 33 degree difference between minimums and maximums in Nelson Creek bay.

REPRODUCTION ASSESSMENT

Sampling of Age 0 and forage minnows was done in key spawning and nursery areas of the Big Dry Arm and also areas near the dam during August and September, 1977. Areas seined where larval fish sampling was done included the upper Big Dry Arm, and near the heads of Nelson Creek, McGuire Creek, Lonetree Creek, Lost Creek, Bug Creek and Rock Creek bays. The results are given in Table 4. Yellow perch and freshwater drum were the most abundant in all areas seined. Yellow perch abundance ranged from 19.2 fish per haul in the upper Big Dry Arm to 249.7 fish per haul in Nelson Creek bay. Freshwater drum abundance ranged from 3.4 fish per haul in Rock Creek bay to 157.5 fish per haul in Lonetree Creek bay. River carpsucker were found only in McGuire Creek bay and averaged 0.2 fish per haul. Forage minnows ranged from 13.9 fish per haul in the upper Big Dry Arm to 270.2 fish per haul in Bug Creek bay. No Age 0 goldeye, buffalo or carp were found in any of the areas seined. The apparent poor reproduction of river carpsucker, buffalo and carp is probably due in large part to the drop in reservoir level during June of 0.7 feet and a further drop of 1.9 feet during July. This prevented any flooding of shoreline vegetation which is necessary to allow for successful reproduction of these species.

Seining in areas near the dam (Table 5) indicated yellow perch and white sucker were the most abundant Age 0 species captured. Yellow perch averaged 281.7 fish per haul and white sucker averaged 34.0 fish per haul. The presence of Age 0 northern pike, 0.2 fish per haul, is believed to be the result of fingerling plants of this species during the spring in the area and not due to natural reproduction. The presence of Age 0 walleye, 0.8 fish per haul, is also probably a result of plants made during the spring in this area of the reservoir. No plants of walleye or northern pike were made in the Big Dry Arm during 1977. Forage minnows (primarily emerald shiner) averaged 376.2 fish per haul, which was higher than any area seined in the Big Dry Arm.

GOLDEYE MONITORING

Standard goldeye sampling sites were monitored during July, August and September, 1977. These sites are located in the lower areas of the reservoir which is closed to commercial fishing. Monitoring of this species is being continued as part of the overall management program of goldeye in Fort Peck Reservoir. Three hundred by eight foot nylon floating gill nets consisting of three 100-foot panels each of 1 1/4-, 1 1/2-, and 1 3/4-inch bar mesh were set in Area I over shallow water (approximately 10-25 feet)

Table 4. Average number of Age 0 fish (except adult forage minnows) captured by beach seining in Big Dry Arm of Fort Peck Reservoir during August, 1977.

Area	Date	Hauls	Species[2.]							
			YP	WE	FD	CC	BC	WS	RC	FM
HBDA[1.]	8/12 & 8/16	16	19.2	0.1	46.1	0.3	0.0	0.0	0.0	13.9
Nelson Creek Bay	8/12 & 8/16	11	249.7	0.3	55.5	0.1	0.0	0.0	0.0	19.4
McGuire Creek Bay	8/18	6	191.8	0.3	64.8	0.0	0.7	0.3	0.2	65.0
Lonetree Creek Bay	8/18	4	102.5	1.0	157.5	0.0	19.5	0.3	0.0	36.5
Lost Creek Bay	8/24	7	182.7	0.0	6.4	0.0	0.3	0.3	0.0	41.0
Bug Creek Bay	8/24	5	43.2	0.2	28.8	0.0	13.4	0.0	0.0	270.2
Rock Creek Bay	8/25	9	33.7	0.1	3.4	0.0	0.9	0.4	0.0	48.9

1. Head of Big Dry Arm.

2. YP--yellow perch
   WE--walleye
   FD--freshwater drum
   CC--channel catfish
   BC--black crappie
   WS--white sucker
   RC--river carpsucker
   FM--forage minnow species including emerald shiner, lake chub, flathead chub, silvery, plains and fathead minnow.

Table 5. Average number of Age 0 fish (except adult forage minnows) captured by beach seining from areas near the dam in Fort Peck Reservoir during September, 1977.

Date	Hauls	Species[1.]						
		YP	WE	FD	BC	WS	NP	FM
9/6, 9/7 & 9/13	25	281.7	0.8	0.5	18.2	34.0	0.2	376.2

1. YP--yellow perch
   WE--walleye
   FD--freshwater drum
   BC--black crappie
   WS--white sucker
   NP--northern pike
   FM--forage minnows including emerald shiners, lake and flathead chub, silvery, plains and fathead minnow.

perpendicular to the shoreline. Similar nets of only 1 3/4-inch bar mesh were set over deep water (approximately 60-80 feet) in Area II, which is a mid-bay area. The results shown in Table 6 indicate that although males captured in 1 1/4-inch bar mesh are slightly larger than females captured in this mesh size, females in both the remaining two mesh sizes are of a larger average size. The 1 3/4-inch mesh size of both nets clearly show that females attain a greater average size than males and, in fact, selectively fish for females. Goldeye commercial fishermen almost exclusively use this mesh size since the larger goldeye command higher prices in Winnipeg, Manitoba, where these fish are transported and sold.

One commercial goldeye catch from lower areas of the reservoir was sampled during September, 1977 to obtain size and sex ratio data. A total of 198 females averaged 13.57 inches total length and averaged 0.878 pounds; 33 males averaged 13.03 inches total length and averaged 0.774 pounds. Females comprised 86 percent of the total catch.

FISH MARKING

Approximately 4,300 fish of various species were marked during trapping operations during 1977 primarily to obtain information regarding the movement, harvest and population density of these fish. Colored, numbered tags (FD-68B, Floy Tag) were used to mark walleye and northern pike and the remaining species were marked with colored monofilament flag tags (FD-67, Floy Tag) or fin clipped. Species and number of fish were marked as follows: walleye--1,270; northern pike--393; river carpsucker--1,271; black bullhead--336; shorthead redhorse sucker--282; carp--244; white sucker--145; yellow perch--122; smallmouth buffalo--95; goldeye--59; sauger--49; burbot--44; freshwater drum--29; channel catfish--16; bigmouth buffalo--3; rainbow trout--1.

Walleye tag returns amounted to 6.7 percent and northern pike returns amounted to 13.7 percent at time of writing. Over 90 percent of both species were caught within the Big Dry Arm by sport fishermen, which indicated fish tagged during the spring near the head of the Big Dry Arm tended to remain in this arm of the reservoir.

No commercial species (goldeye, river carpsucker, buffalo, freshwater drum) tagged during 1977 in the Big Dry Arm were reported caught by commercial fishermen. Two yellow perch and one black bullhead were reported caught in the Big Dry Arm by sport fishermen.

COMMERCIAL FISHING

Three commercial fishing licenses were issued in 1977 to fish Fort Peck Reservoir, two to residents and one to a non-resident fisherman. One resident fisherman fished exclusively for goldeye from April 1 through October. The other resident licensee, a family company, fished primarily for buffalo but also harvested some river carpsucker and goldeye throughout the season. The non-resident fisherman fished primarily for buffalo only a few days each on two occasions.

Table 6. Results of 300- x 8-foot floating nylon gill nets consisting of three 100-foot panels each of 1 1/4-inch, 1 1/2-inch and 1 3/4-inch bar mesh, and one of 1 3/4-inch bar mesh only for capturing goldeye at standard sampling sites in Fort Peck Reservoir during July, August and September, 1977.

		1 1/4-inch Bar Mesh				1 1/2-inch Bar Mesh				1 3/4-inch Bar Mesh			
Area	Date	Sex	No.	Avg. T.L.	Avg. Wt.	Sex	No.	Avg. T.L.	Avg. Wt.	Sex	No.	Avg. T.L.	Avg. Wt.
I	6/29	M	12	12.16	0.602	M	29	12.56	0.649	M	0	-----	-----
		F	10	11.74	0.559	F	12	12.87	0.748	F	3	14.10	0.940
	8/9	M	14	11.83	0.566	M	28	12.58	0.652	M	5	12.84	0.754
		F	6	11.47	0.488	F	23	13.12	0.789	F	21	13.56	0.901
	9/29	M	11	11.99	0.584	M	11	12.35	0.631	M	1	13.20	0.800
		F	10	12.22	0.594	F	12	12.98	0.749	F	11	13.75	0.972
	Total	M	37	11.98	0.583	M	68	12.54	0.641	M	6	12.90	0.762
		F	26	11.86	0.556	F	47	13.02	0.769	F	35	13.67	0.927
II	6/29									M	3	12.93	0.787
										F	23	13.58	0.884
	8/9									M	3	13.30	0.787
										F	29	13.60	0.879
	9/29									M	1	13.00	0.810
										F	20	13.43	0.868
	Total									M	7	13.10	0.790
										F	72	13.54	0.878

The entire reservoir is open to commercial fishing with the exception of the Big Dry Arm and three relatively small areas adjacent to cabin developments in order to reduce conflicts between commercial and sport fishermen.

The following are estimated total landings (round weight) for 1977 from Fort Peck Reservoir since final catch reports are not yet in from commercial fishermen at this time: goldeye--115,000 pounds; bigmouth and smallmouth buffalo--400,000 pounds; river carpsucker--5,000 pounds.

DISCUSSION

It is apparent from work accomplished during the first segment of this project that the Big Dry Arm, particularly near the head, attracts a wide variety of fish species including walleye, yellow perch, freshwater drum and river carpsucker for reproductive purposes. This was evident from the numbers of sexually mature fish captured during trapping operations as well as from larval fish sampling and beach seining efforts. Also, the heads of various bays sampled for larval and older Age 0 fish indicates at least some are important nursery and perhaps spawning areas for several species, notably yellow perch and freshwater drum. These areas should perhaps be more intensively sampled by trapping during spawning periods in order to better understand their importance as reproductive sites.

The overall low spring reservoir level coupled with a significant drop of 2.6 feet during June and July created an adverse impact on reproduction of several species requiring flooded shoreline vegetation and/or rising water levels for successful spawning. These included smallmouth and bigmouth buffalo, carp and northern pike as evidenced by the complete absence of reproduction of these species. Very poor reproduction was indicated for river carpsucker. However, the low reservoir levels and continued decrease in reservoir elevation throughout the summer did allow for substantial revegetation to occur along some shorelines and around embayments. This situation should benefit fish reproduction in the future when favorable water levels again occur.