THE EFFECTS OF LOW FLOWS ON THE FLATHEAD CATFISH (*PYLODICTIS OLIVARIS*) IN THE UPPER SUNFLOWER RIVER

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INTRODUCTION

The Sunflower River is a low gradient, warm water river which runs through the Mississippi Delta. It is important to several nearby municipalities as a source for effluent dilution and is utilized for crop irrigation and both recreational and commercial fishing. Base flows in Delta streams are produced from water entering the stream channel from the Mississippi River Alluvial Aquifer. Over the past years, the decline of the Mississippi River Alluvial Aquifer level, due to heavy agricultural use, has been followed by the decline of base flows in the Sunflower River. The multiple uses of this river make the decrease in these flows a significant issue.

The Sunflower River experiences an annual period of low flows beginning in September with the end of the rice flooding season and ending in November with the advent of the cool, rainy season (see Figure 1).

The initiating factor of this project was Yazoo Mississippi Delta Joint Water Management District's (YMD) interest in the impact of declining flows of the Sunflower River on water quality and fish population in the river. The Mississippi Department of Wildlife, Fisheries & Parks (MDWFP) became involved due to their desire and mandate to manage the fisheries of Mississippi's river systems.

In September of 1992, YMD along with the MDWFP conducted a preliminary survey of the fish population in the Sunflower River using rotenone. Two sample sites were selected on the upper Sunflower River that had been sampled by Parker and Robinson in 1972. Comparing the 1972 data with the data collected in 1992 provided an opportunity to see how the fisheries in the river had changed over the twenty year period. The 1992 assessment indicated that the fish population had undergone substantial improvement since 1972.

Sampling of the fish population was continued in 1993 using hoop nets. Two size hoop nets were used, medium (106cm) and small (49cm) diameter. The small nets were used to ensure that, during low flows and associated shallow water conditions, the river could be sampled with hoop nets. Using two size of nets also allowed for a comparison of net size and capture results. Medium hoop nets have been reported by Jackson and Jackson (1989) to be effective in sampling the catfish populations of streams in the Yazoo River Basin, and hoop nets are a principal commercial fishing gear in Mississippi streams. Pugibet and Jackson (1989) indicated that small diameter hoop nets were appropriate for sampling small streams for flathead catfish.

The target species were channel catfish (Ictalurus punctatis) and flathead catfish (Pylodictis Olivaris). Flathead catfish in the Tallahatchie and Big Black Rivers have been shown to have a restricted linear movement (Skains 1992). The captured flathead catfish were tagged to determine if low flows caused the territorial flathead catfish to move to a more suitable environment.

The recapture effort also tested the sampling effectiveness of hoop nets to capture fish under low water volume and velocity conditions.

METHODS

Two sites were selected for rotenone sampling in September 1992 that corresponded to stations that were sampled in July and August 1972 by Parker and Robinson (1972). The Hobson's bridge sample site (just south-east of Clarksdale) was sampled on September 24, 1992, and was the same site as station number 2 of Parker and Robinson. Due to changes in access, the 1972 station number 3 sample site of Parker and Robinson was moved a few kilometers upstream to the Zumbro plantation site (located near Cleveland) and was sampled on September 25, 1992. Standard stream rotenone procedure was followed (Holder and Crochet

1984) using five percent emulsified rotenone which was neutralized with potassium permanganate.

In 1993, river fisheries investigations continued focusing on the Upper Sunflower River. The lower limit of the survey area was the confluence of the Quiver and the Sunflower Rivers and the upper limit was approximately 2.5 kilometers north of Hobson's crossing. The sampling was accomplished using medium (106 cm diameter) and small (49 cm diameter) hoop nets.

The nets were placed in sets of ten (5 small and 5 medium), and individual nets were positioned 100 m apart in sections of the river randomly chosen from reaches of the river with access (see Figure 2). The nets were alternated by size, and were set in the morning hours usually between 9:00 and 11:00 a.m. The nets were checked approximately 48 hours later.

All captured fish were speciated, weighed, and measured for length before being released. The flathead catfish were tagged in the left operculum using floy T-bar anchor tags.

RESULTS

Parker and Robinson (1972) found 20 and 44 kilograms of fish per hectare at stations 2 and 3, respectively, in 1972. Equivalent sites in 1992 had 80 and 291 kilograms of fish per hectare, respectively (see Table 1). Species com-position also changed. Station 2 in 1972, had 4 species, dominated by carp, with yellow bullhead the only catfish sampled. In 1992, that site had 9 species and was dominated, by weight, by channel catfish. Station 3 in 1972 had 11 species and was dominated, by weight, by gizzard shad. In 1992, that site had 20 species and catfish were a substantial component of the population by weight, as were buffalo and freshwater drum.

No flathead catfish were sampled at either site in 1972 or in 1992 at the Hobson's crossing site. The Zumbro site in 1992 produced a small number of flathead catfish which represented 12.3 kg per hectare.

Medium size hoopnets set during July to September 1993 captured an average of 1.99 fish per net night (all species) with an average catch rate by weight of 2.59 kg (see Table 2.). The catch from small hoopnets averaged .94 fish and .78 kg per net night. The catch rate (number per net night) for flathead catfish was similar between medium and small nets at .20 and .29 flatheads per night, respectively. Catch by weight for flathead catfish was .91 and .41 kg per net night for medium size nets and small nets, respectively. The average weight of flathead catfish was .45 kg and .14 kg for medium and small nets, respectively. The average catch rate for channel catfish was higher for medium size nets, .93 fish and .60 kg /net night versus small nets which captured .41 fish and .14kg/net night.

Medium size hoopnet catches were compared to catches in the Yazoo River system (Jackson et al. 1990; Jackson et al. 1991; Jackson et al. 1992; Jackson et al. 1993). The average weight of flathead catfish in the Sunflower River was higher than that encountered in the Yazoo River system (see Figure 3). The average weight of channel catfish in the Sunflower River was less than that of the Yazoo River system. The catch rate for all catfish in small hoop nets in the Sunflower River in 1993 was higher than that for the Noxubee River in 1988.

All of our low flow efforts were conducted as recapture efforts. There were no tagged flathead catfish caught during these efforts.

CONCLUSION

Flow in the Sunflower River was greater during 1972 rotenone study period than in the 1992 study period. The improvement in fish population status is believed to be due to water quality improvements rather than changes in flow. During the 1970's, the fish populations in the Mississippi Delta were adversely affected by high levels of pesticides (principally DDT) (Parker and Robinson 1972). Also, since 1972, substantial progress has been made in the development of facilities to treat municipal waste entering the Sunflower River.

Hoop nets appeared to be effective in catching both species of catfish throughout the summer. The ability of hoop nets to catch flathead catfish appears to be most efficient around 100-150 cfs (Figure 1.). The one year of data collected at recapture is inconclusive as to the effectiveness of hoop nets under low flow conditions. The extreme low flow conditions made accessing the recapture areas, where the nets were set during the moderate flows, very difficult. Flows under 50 cfs (taken at the Sunflower gage) corresponded to extremely difficult boat maneuverability throughout the study area of the river and no capture of flatheads in the nets

FUTURE WORK

Our study indicated two methods that could be effective in future efforts to determine the effects of low flow on the flathead catfish in the upper Sunflower River. First, intensive capture-tagging and recapture efforts could be conclusive if the randomly selected areas were accessible during low flows and a satisfactory sampling method

could be established for low flow conditions. These areas should be land accessible so that a researcher could walk down to the river and set the small hoop nets as done by Pugibet and Jackson (1989).

A second method would include telemetry studies where the flathead catfish captured are equipped with a transmitter and released to study movement as done by Skains (1992). Telemetry studies conducted during the river's low flow period could give definitive results regarding effects of low flow conditions on flathead movement.

Further work should also include a study of other possible limiting factors of the flathead catfish population of the upper Sunflower River. Environmental parameters such as suspended sediment levels and pesticide levels, as well as breeding structures, are possible limiting factors.

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Table 1. Comparison of 1972 and 1992 Rotenone Data on Stations 2 and 3 of the Sunflower River.

	Station 2 South of Clarksdale		Station 3 Cleveland Area	
	kilograms/hectare			
	1972	1992	1972	1992
Yellow Bullhead	3.04	0.32	0.00	0.00
Blue Catfish	0.00	0.00	0.00	1.83
Channel Catfish	0.00	76.29	7.65	35.02
Flathead Catfish	0.00	0.00	0.00	12.11
Smallmouth Buffalo	0.00	0.00	0.00	2.50
Black Buffalo	0.00	0.00	0.00	19.17
Gizzard Shad	2.81	0.00	27.57	8.96
Common Carp	10.46	0.95	0.00	20.32
Grass Carp	0.00	0.00	0.00	11.88
Drum	0.00	0.00	2.48	171.26
Crapple	0.00	0.00	0.00	0.64
Carpsucker	3.94	0.00	0.00	0.00
Spotted Gar	0.00	0.00	0.00	2.32
Green Sunfish	0.00	0.00	0.00	0.48
Bluegill	0.00	0.00	0.45	0.00
Orange Spotted Sunfish	0.00	0.00	0.79	0.02
Pirate Perch	0.00	0.00	0.01	0.00
Longear Sunfish	0.00	0.00	4.28	0.73
Warmouth	0.00	0.00	0.00	0.05
Mosquito Fish	0.00	0.03	0.00	0.78
Bullhead Minnow	0.00	1.16	0.11	0.00
Blacktail Shiner	0.00	0.81	0.23	0.00
Emerald Shiner	0.00	0.00	0.23	0.00
Golden Shiner	0.00	0.07	0.00	0.00
Notropis sp.	0.00	0.03	0.00	1.47
Tadpole Madtom	0.00	0.15	0.11	0.00
Madtom sp.	0.00	0.15	0.00	2.30
Standing Stock kilograms/hectare	20.25	79.95	43.89	291.84
Number of Species	4	10	11	18

Table 2. A Comparison of Catches from Medium (106 cm) and small (46 cm) Hoop Nets.

	Medium Nets	Small Nets
Total fish catch per night		
Catch per night by number	1.99	0.94
Catch per night by weight	2.59 kg	0.78 kg
Flathead catfish catch per night		
Catch per night by number	0.20 **	0.29
Catch per night by weight	0.91 kg *	0.41 kg
Average weight for flathead catfish	0.45 kg	0.14 kg
Average catch weight for channel catfish		
Catch per night by number	0.93	0.41
Catch per night by weight	0.6 kg	0.14 kg

* Significantly different using the T-Distribution Test at the 95% probability level.

** Not significantly different using the T-Distribution Test at the 95% probability level.

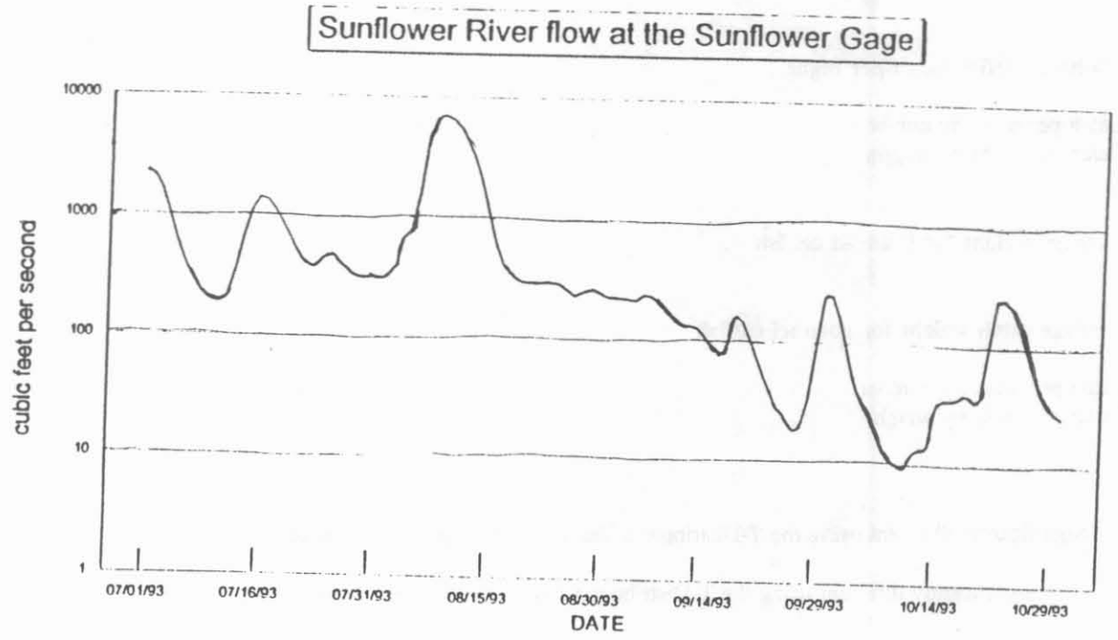

Figure 1. Sunflower River flows taken at the Sunflower Gage from the period beginning July 1 to October 31, 1993.

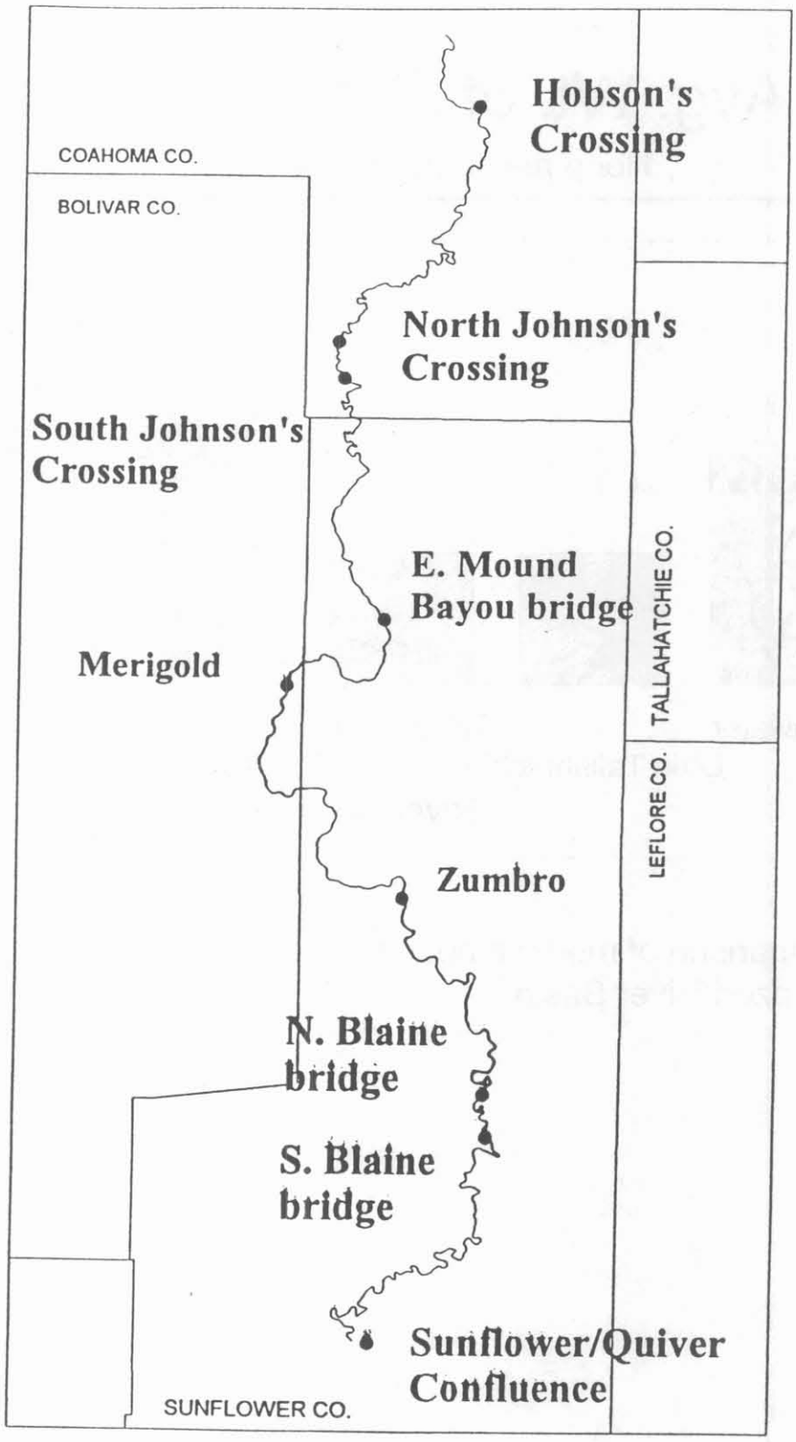

Figure 2. Sample sites along the upper Sunflower River.

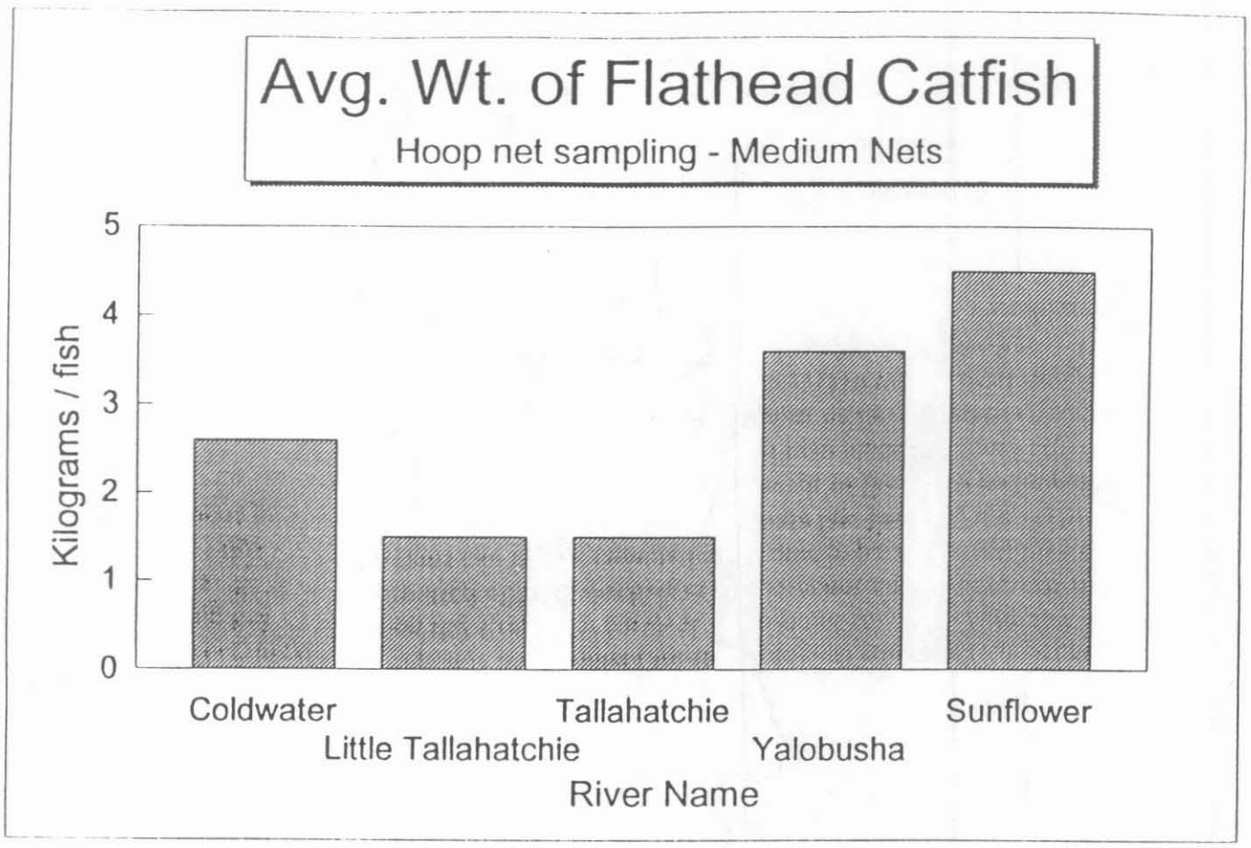

Figure 3. Comparison of medium hoop net samplings of the flathead catfish in the Yazoo River Basin.