AN ASSESSMENT OF BUFFALO FISHERIES RESOURCES IN A MISSISSIPPI STREAM THREE DECADES AFTER CHANNELIZATION

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INTRODUCTION

Fisheries resources associated with the larger floodplain rivers in the Yazoo River Basin of western Mississippi are an integral component of the region's cultural and natural heritage. During winter and spring elevated flow regimes on these systems, artisanal and subsistence fishermen in the region have traditionally directed much of their effort toward buffalos, Ictiobus spp. (Catostomidae). There is considerable evidence suggesting that such seasonal patterns of natural resources exploitation continue to be important components of rural culture even in technologically developed regions of North America.[1]

With few exceptions, streams in the Yazoo River basin of western Mississippi have been channelized.[2] As a result of these federal flood control projects it has been estimated that fewer than 20% of the stream reaches in the basin were capable of supporting a fishery of any kind with even fewer reaches supporting sport fisheries.[3]

Although recovery processes for streams impacted by channelization can be slow,[4 5] this does not preclude the possibility of fisheries resources in such systems recovering to levels capable of providing benefits to society within a reasonable period of time. In this regard we were interested in determining the population structure of buffalo stocks and their status as exploitable resources in the Yalobusha River (Figure 1), one of the principal tributaries of the Yazoo River, three decades after its original channelization. Catch rates of commercial fishes from the Yalobusha River have been reported to be equal to or to exceed those of other major streams in Mississippi and that collectively, buffalo were the most abundant large fishes in the system.[2 6]

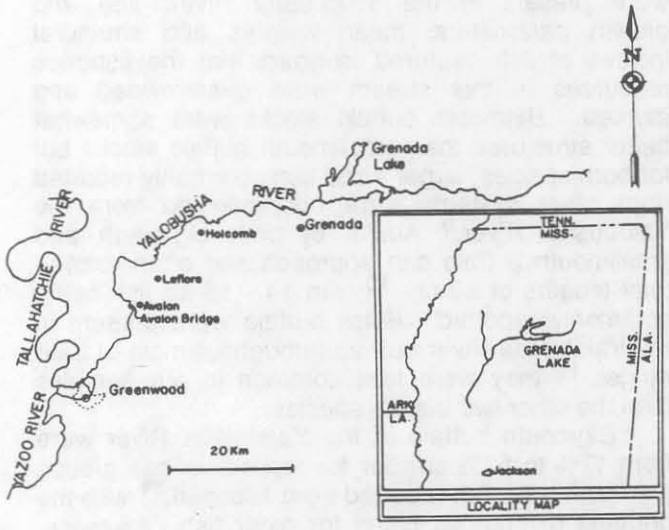

Figure 1. Yalobusha River, Mississippi.

METHODS

Three distinct sampling areas were defined on the Yalobusha River: tailwater - Grenada Dam downstream to the city of Grenada; midreach - from the city of Grenada downstream to the bridge at Avalon; downstream - from the bridge at Avalon downstream to the confluence with the Tallahatchie River. A total sampling effort of 82 net-nights with hoop nets was expended during the period November 1986 - May 1987. Hoop nets are the traditional commercial fishing gear on Mississippi streams. The nets we employed had front hoop diameters of 1.07 m and bar mesh size of 3.81 cm. Collectively, 16 distinct stream reaches were sampled. Nets were set at approximately 100 m intervals within a stream reach and positioned in a manner considered to maximize catch efficiency (i.e. within an interval, locations such as steep banks, eddies, proximity to instream structure were selected). All fish collected were identified to species, measured (total length, mm) and weighed (g) in the field before being returned to the river. Species composition (% biomass) was calculated from pooled data.

For buffalo species, scales were collected from the left side of each fish, returned to the laboratory and read at 40 X for age and growth determination. Length-weight relationships were compared to length specific weight standards to calculate relative condition factors (K_n).[7] Likewise, proportional stock densities were calculated.[8]

RESULTS

Three species of buffalo were collected from the Yalobusha River during this investigation: bigmouth buffalo (Ictiobus cyprinellus), black buffalo (Ictiobus niger) and smallmouth buffalo (Ictiobus bubalus). The mean catch (all fish species) was 2.79 kg/net-night of which the three buffalo species collectively contributed 45%. Gar (Lepisosteidae) were the only other major component of the catch (24.0%). Catfish (Ictaluridae) contributed more to hoop net catches later in the season,[2] but still made up 8.0% of the catch during the winter and spring

elevated flow regimes addressed by this study. Of the three buffalo species, black buffalo were rare and incidental to the catch (0.7% of the total catch). Bigmouth buffalo contribution to the catches decreased, and smallmouth buffalo catches increased from downstream to upstream (Table 1). Black buffalo were only collected in the downstream area.

Bigmouth buffalo stocks appeared better structured for exploitation purposes than did smallmouth buffalo stocks. Nearly 90% of the bigmouth buffalo captured were of quality size (> 41 cm) while only 30% of the smallmouth buffalo fell within this category (Table 2). Superimposed on this size structure of buffalo stocks, condition factors (K_n) suggest that at larger sizes, bigmouth buffalo had good length-weight relationships while those of smallmouth buffalo were somewhat less than optimal (Figure 2). Back calculated lengths (Table 3) indicate that bigmouth buffalo achieved and maintained a size advantage over smallmouth buffalo throughout the age groups collected during this study (IV - X). Further, relatively few smallmouth buffalo had attained legal harvestable size in this river (41 cm) while bigmouth buffalo did so at approximately age VI.

Table 1. Composition of buffalo catch (% biomass) during winter/spring high flow regimes on the Yalobusha River, Miss. (November 1986-May 1987).

Species	Stream Reach		
	Downstream	Midreach	Tailwater
Bigmouth buffalo	71.76	32.91	8.82
Black buffalo	3.74	0	0
Smallmouth buffalo	24.50	67.09	91.18

Table 2. Proportional stock density (PSD)* and mean weights (kg) of bigmouth buffalo and smallmouth buffalo captured with hoop nets during winter/spring high flow regimes on the Yalobusha River, Mississippi (November 1986 - May 1987).

Species	N	PSD	Mean Weight
Bigmouth buffalo	33	0.87	1.67(+ 0.17)
Smallmouth buffalo	66	0.30	0.80(+ 0.08)

*PSD standards as per Gablehouse (1984).

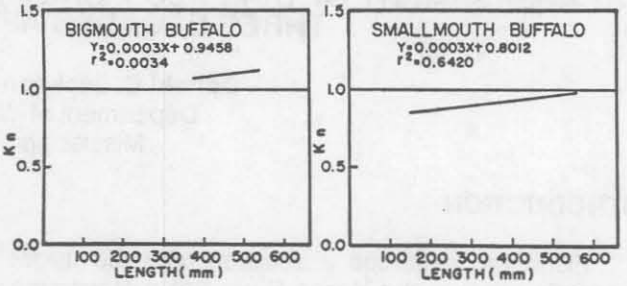

Figure 2. Condition factors (K_n) for bigmouth buffalo and smallmouth buffalo collected during winter/early spring high flow regimes on the Yalobusha River, Mississippi (November 1986 - May 1987).

Table 3. Mean back calculated total lengths (cm) of bigmouth buffalo and smallmouth buffalo collected with hoop nets from the Yalobusha River, Mississippi (November 1986-May 1987).*

Species	Age Group						
	IV	V	VI	VII	VIII	IX	X
Bigmouth buffalo	35.6	39.0	40.6	41.7	42.5	44.3	47.0
Smallmouth buffalo	29.7	32.5	33.5	34.2	35.4	39.4	-

* Fishes in age groups I-III were not collected during this study.

DISCUSSION

Although resources capable of supporting traditional artisanal/subsistence buffalo fisheries were present in the Yalobusha River, age and growth parameters, mean weights and structural indices of fish captured, suggest that the fisheries resources in this stream were overcrowded and stunted. Bigmouth buffalo stocks were somewhat better structured than smallmouth buffalo stocks but for both species, larger sized fish commonly reported from other systems were not collected from the Yalobusha River.[9] Adults of both bigmouth and smallmouth buffalo can approach and often exceed total lengths of 80 cm [10] with 14 - 18 kg fish being commonly reported. Black buffalo were present in the Yalobusha River but, as throughout most of their range, [11] they were less common in our samples than the other two buffalo species.

Bigmouth buffalo in the Yalobusha River were from 17% to 57% smaller for respective age groups (IV - VIII) than fish reported from Missouri,[11] with the greatest differences being for older fish. Likewise, smallmouth buffalo in the Yalobusha River were from 32% to 63% smaller for respective age groups

(IV -VII) than fish reported from the Tennessee-Tombigbee Waterway.[12] Again, the greater differences were for older fish. Indications are that the older age components of the Yalobusha River buffalo stocks are at carrying capacity and are probably subject to fairly intense intraspecific competition for available instream resources.

While there was some evidence that hoop net fisheries were operative on the system, exploitation of the resource is apparently insufficient for stimulating buffalo stocks into more dynamic growth and recruitment modes. During our study we used mesh size much smaller than legal size but caught few small and/or younger aged fish (I - III). This suggests that reproduction and subsequent recruitment processes may be limited in this system and is further evidence of an overcrowded fisheries resource.

Suspecting that underexploitation of the resource could be influenced by lack of demand in the market, we conducted a telephone survey of fish vendors in Memphis, Tennessee. The survey indicated that buffalo are selling at retail prices of $3.00 to $3.50 per kg ($1.40 to $1.60 per pound). Most fish sold were said to have come from Mississippi. These prices are approximately twice the retail price of whole chicken, suggesting that buffalo is a relatively valuable natural resource commodity.

Smallmouth buffalo were reported to be the second highest income producing species (after catfish) for commercial fishermen operating in the lower Tombigbee River and the Mobile River Delta (Alabama).[13] However, commercial fishing on these systems resulted in a mean, net annual loss of $120 per fisherman. Of the commercial fishermen interviewed on these two systems, 43% said that they engaged in commercial fishing for enjoyment and not for any real profit motive. Additionally, 32% of the fishermen interviewed did not sell their catch. This last group either gave their fish away or used the catch for their own consumption. This suggests that the majority of the commercial fishermen operating on these two systems would be more appropriately classified under the category of artisanal or subsistence fishermen, for whom fishing is a component of cultural activity patterns rather than an intense economic enterprise.[1]

We assume that historically, the cultural traditions associated with exploitation of stream fisheries in the lower Tombigbee River and the Mobile River Delta are similar to those of the Delta region of western Mississippi. If this is true, then the question arises as to why the fisheries resources of the Yalobusha River are apparently being overlooked by artisanal and subsistence fishermen.

A possible explanation may be that for three decades persons living the vicinity of the Yalobusha River have lived in association with a stream ecosystem severely impacted by channelization. For many, the perceived social value of this system has been that it served solely as a conduit for the transport of flood waters. With the destruction of the river and subsequent loss of its exploitable fisheries resources in the 1950's, skills and traditions associated with artisanal and/or subsistence stream fisheries apparently declined as components of natural resources exploitation patterns in the surrounding area. Persons who once exploited these resources may have died without passing their knowledge on to new generations of fishermen.

Recently enhanced ecological awareness has led to stream ecosystems and the resources they afford being recognized by increasingly greater numbers of persons as important components of Mississippi's heritage. Yet in spite of strong public opposition to renewed channelization of streams in the Upper Yazoo River Basin, the U.S. Army Corps of Engineers proceeded with plans to clear, dredge and snag the lower 18.3 km of the Yalobusha River during the summer of 1988.[2] By the time the Corps of Engineers received an order by Federal Court to halt operations, the clearing was 86% complete and dredging and snagging 32% complete.

In those reaches of the Yalobusha River impacted by these operations, it is unlikely that artisanal and/or subsistence fisheries will become re-established in the foreseeable future. However, upstream from the impacted area the buffalo fisheries resources we were able to document during our study offer excellent opportunities for such fisheries development.

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