Characteristics of the Freshwater Drum Fishery below Jordan Dam

John W. Benton,[1] *Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849*

Donald C. Jackson,[2] *Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849*

William D. Davies, *Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849*

Abstract: Freshwater drum (*Aplodinotus grunniens*) are a significant component of the fishery resource in the Jordan Dam tailwater (Coosa River, Ala.). Most of the exploitation of the freshwater drum is centered around a spring influx into the system which appeared to be primarily mature fish moving upstream to spawn. There was little evidence of reproduction by this species within the tailwater. Although condition factors were highly variable across the range of lengths sampled, growth rates for freshwater drum in the Jordan Dam tailwater exceeded those reported elsewhere in the United States. By age six, freshwater drum reached total lengths of approximately 400 mm. From April through July 1983, 28.2% of those anglers interviewed had harvested freshwater drum even though few had specifically targeted it. During this same period, 94.0% of the annual harvest of the freshwater drum was recorded. Mean catch per unit effort for anglers harvesting freshwater drum was 0.27 ± 0.10 kg/hour with most fish harvested being <300 mm total length. Length frequencies of fish in the creel and in electrofishing samples were similar. Freshwater drum in this tailwater fishery may be an important resource for persons using the resource for subsistence purposes.

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Warmwater, multispecies, tailwater fisheries in the southeastern United States can provide productive and diversified angling opportunities (Jackson and Davies 1986). Although traditionally considered as recreational fisheries (Eschmeyer and Miller 1949, Miller and Chance 1954), Hall (1951) found that many tailwater an-

[1]Present address: Florida Game and Freshwater Fish Commission, P.O. Box 1903, Eustis, FL 32727–1903.

[2]Present address: Department of Wildlife and Fisheries, P.O. Drawer LW, Mississippi State, MS 39762.

glers preferred to catch and eat fish considered to be non-game species. In this regard, Jackson and Davies (1986) found freshwater drum to be an important component of the catch from the Jordan Dam tailwater (Coosa River, Ala.).

The freshwater drum has been studied most extensively in the northern portions of its range (Barnikol and Starrett 1951; Daiber 1953; Moen 1955; Priegel 1966, 1967; Fritz and Johnson 1987). Swedberg and Walberg (1970) detailed aspects of development and food habits of juvenile freshwater drum in a northern lake. In warmwater streams, there has been less research into population dynamics and biology of the species and little attention to characteristics of freshwater drum fisheries. Purkett (1958) researched growth rates for freshwater drum in Missouri streams and Knight (1980) studied food habits of freshwater drum in a Mississippi reservoir.

In recognition of the contribution the species makes to the tailwater fishery below Jordan Dam, our objectives were to assess structural composition and basic biological characteristics of freshwater drum stocks in this system. Additionally, we wished to determine patterns of angler exploitation for the species.

Methods

Jordan Dam is located on the Coosa River, Elmore County, Alabama, approximately 30 km upstream from its confluence with the Alabama River. The tailwater extends from Jordan Dam downstream approximately 10 km to the U.S. Highway 14 bridge at Wetumpka. Detailed descriptions of this system and historical perspectives of hydroelectric operations affecting the tailwater are provided by Jackson and Davies (1986).

Fish were collected by electrofishing from a 4.9-m aluminum boat using 1,000-V pulsed DC current produced from a 5,000-W portable generator. The current was converted from AC to pulsed DC current using a Smith-Root Type VI pulsator. An effort was made to maintain a constant current of 6 amps.

One person dipped fish from the bow of the boat. All species were collected and held in a live well until the end of each 30-minute sample period, then measured and released back into the area of capture. General techniques for electrofishing in rivers were followed as outlined by Catchings et al. (1984). All electrofishing was conducted when river stage was at minimum flow (approx. 7 m^3/sec) or, rarely, when 1 turbine was in operation at Jordan Dam (approx. 120 m^3/sec).

The electrofishing schedule included 3 days each month from October 1983 through September 1984, weather and flow conditions permitting. Four sites were electrofished each day.

All fish were weighed (g) and measured (total length, mm) in the field. Scale samples were collected from 60 drum representative of size ranges in the tailwater. Scales were mounted between glass slides and read on a 3M microfiche projector at 24X to assess age structure of the population. Criteria for acceptance of a mark as being a true annulus were taken from Bagenal (1974). All scales were read separately by 2 readers. When discrepancies between the 2 readers were encountered,

the scale was re-read. If there was still disagreement after review of the sample then the scale in question was discarded. Distances were measured from the focus to successive annuli for back-calculation of length at age using the direct proportion formula as outlined in Everhart and Youngs (1981).

Freshwater drum collected during April, May, and June were examined in the laboratory to document spawning in the tailwater. Fish were opened and their sex and stage of maturity were determined (Nikolski 1963). Ovaries of female fish were weighed on a precision balance and the gonosomatic index (GSI) was calculated as the ratio of gonad weight to total weight of the fish.

Condition factors (K_n) were determined using standard weight at length values for Alabama fish (Swingle and Shell 1971). K_n values were computed from mean weights for each cm length group on a seasonal basis.

Characteristics of the freshwater drum fishery were determined in conjunction with a catch assessment survey conducted on the tailwater from January through December 1983 (Jackson and Davies 1986). Sampling effort consisted of 120 days in the field (10 days each month) evenly distributed between weekday and weekend days. Sixty percent of the sampling effort was allocated to shoreline interception of fishermen in the immediate stilling basin area below Jordan Dam. Forty percent of sampling effort was allocated to travel by boat and interception of anglers in the downstream reaches of the tailwater. Sample days and time of day sampled were randomly selected.

During each 4-hour sample period, instantaneous counts were made and as many anglers as possible were interviewed. These were classified as bank or boat anglers, asked to identify their county of residence (or trip origin) and to estimate their out-of-pocket expenses. Catch per unit effort was based on effort expended (hours) and the fish harvested at the time of interview. Anglers were then asked to identify their target species. All fish harvested were identified to species, counted, and measured (total length). Lengths were converted to weights using standards established by Swingle and Shell (1971).

Results

All freshwater drum in the Jordan Dam tailwater appeared to be fully recruited to the fishery. Electrofishing and creel survey length frequencies were very similar in percentages observed and range of lengths found in the tailwater (Fig. 1). However, the creel survey did detect several smaller, and 1 larger size class than was represented in the electrofishing sample. Both electrofishing and angler harvest suggested that the maximum size of freshwater drum in this system was approximately 600 mm.

Analysis of scales showed freshwater drum ages to range from 2 to 9 years. Back-calculated lengths at age are given in Table 1. Condition factors (K_n) tended to improve until fish approached 450 mm and thereafter declined (Fig. 1).

Electrofishing data gave estimates of relative abundance for freshwater drum as 5.8%, 11.7%, and 11.5% of all fish collected during winter, spring, and summer

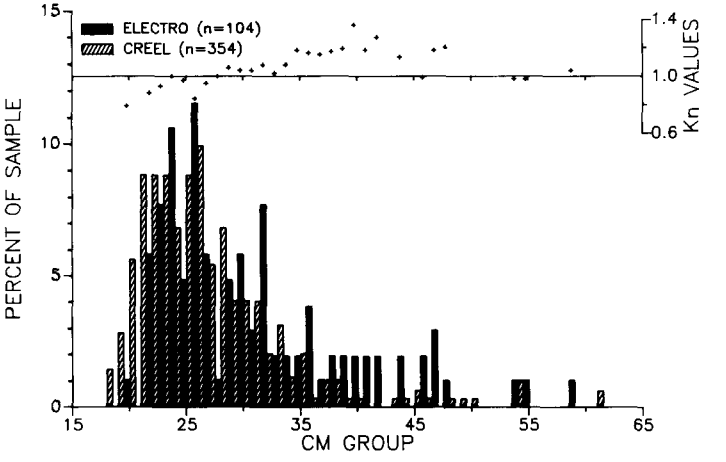

Figure 1. Length frequency percentages for electrofishing and creel surveys with K_n-values for each cm group.

samples, respectively. During the period of greatest stock abundance (April – July) male freshwater drum dominated the population. The first mature female fish appeared in samples during late April when water temperatures exceeded 20° C. Mature females were collected until early June when water temperatures reached 25° C.

Trends in the gonosomatic index (GSI) were apparent when female fish were grouped into 2 length classes: >350 mm and <350 mm total length. Only 2 of the 9 female fish collected <350 mm were mature. Of fish >350 mm, all were judged to be fully mature. The 2 mature and ripe fish in the smaller size group had a mean GSI of 1.23. In the large size range, 6 of the 9 fish were mature and ripe (Stages IV –V). The GSI for this group was 3.6 ± 1.5. Two fish were judged to be post spawn (Stage VI).

The mean monthly percentage of anglers actually targeting freshwater drum was 6.3 ± 4.4%. This was considerably less than those targeting catfishes (46.0 ± 17.4%), but only somewhat less than those targeting white bass (9.0 ± 4.7%).

Table 1. Back-calculated length (mm) at age (II–IX) for freshwater drum taken from the Jordan Dam tailwater (October 1983–September 1984).

	Annulus								
Age	1	2	3	4	5	6	7	8	9
II	196	244							
III	173	226	292						
IV	158	220	270	298					
V	124	188	244	291	339				
VI	142	213	269	322	362	389			
VII	152	226	293	351	401	443	476		
VIII	122	207	258	303	357	402	436	462	
IX	114	187	256	304	352	388	419	449	479

Annual harvest of freshwater drum was 21.8%, by number, of all species creeled. During the months of April through July, 94.0% of the annual harvest of freshwater drum was recorded (estimated 12,200 freshwater drum, Jackson and Davies 1986). During this period, 305 anglers were interviewed of whom 28.2% had harvested freshwater drum.

More than 77% of the anglers harvesting drum resided in Elmore County (where the tailwater is located) or in nearby metropolitan Montgomery. Most anglers harvesting freshwater drum fished from the bank (93%). Mean out-of-pocket expense per angler trip was \$7.50 ± \$1.20.

Mean expended effort per angler at time of interview was 3.46 ± 0.53 hour. Mean catch per unit effort for anglers harvesting freshwater drum was 0.27 ± 0.10 kg hour (Table 2). Combining these 2 values, the average freshwater drum angler had harvested between 0.60 and 1.48 kg at the time of the interview.

Discussion

Freshwater drum contributed significantly to the tailwater standing stock during all seasons. There was, however, a spring influx into the system which appeared to be primarily mature fish moving upstream to spawn. Harvest was most intense during this period. Most freshwater drum harvested were <300 mm total length and, based on analysis of stock composition, were probably males.

The appearance of post spawn females indicated that some spawning may have occurred in the tailwater, but no juvenile fish were ever observed or collected. Pestrak (1977) collected both eggs and larval freshwater drum from the tailwater but these were suspected to have come from Lake Jordan (upstream) due to their advanced stage of maturity. Rapidly varying, unstable flow regimes originating from

Table 2. Mean recorded catch per unit effort (kg/hour) for successful freshwater drum anglers on the Jordan Dam tailwater (January–December 1983).

Month	*N*	Catch per unit effort	SE
Jan	0		
Feb	1	0.14	
Mar	2	0.13	0.05
Apr	8	0.12	0.06
May	18	0.30	0.09
Jun	11	0.25	0.09
Jul	5	0.40	0.18
Aug	3	0.09	0.04
Sep	1	0.13	
Oct	2	1.05	1.02
Nov	1	0.13	
Dec	1	0.56	

Jordan Dam for hydroelectric generating purposes probably prevent successful reproduction within the tailwater itself.

Growth rates for freshwater drum collected from the Jordan Dam tailwater were superior to those reported for Wisconsin lakes (Priegel 1967) and Missouri streams (Purkett 1958). By age 6, freshwater drum in the Jordan Dam tailwater reached 400 mm. Body condition (K_n) was excellent for intermediate sized drum (320 to 450 mm) which apparently can take advantage of the abundant asiatic clam, *Corbicula sp.*, found in the system (Fig. 1). Forage items appropriate for smaller fish (i.e. insects) and larger fish (i.e. forage fish) may be of limited availability in the tailwater (Jackson 1985, Benton 1987). Only crushed clam shells, no fish or crustaceans, were noted in a cursory examination of stomach contents from freshwater drum in this system. Fish and crustaceans are reported to be a large component of the diet in other locations (Daiber 1953, Moen 1955, Priegel 1967, Knight 1980).

It is apparent that the freshwater drum accounts for a substantial portion of the total annual harvest (21.8%), with the majority being harvested in the spring and early summer. This coincides with an increase in relative abundance found in electrofishing samples. These data suggest an opportunistic pattern of resource use by this angling population.

It is possible that the freshwater drum fishery has a subsistence component to it, in addition to its recreational aspect. During the course of the creel survey anglers remarked on their under- or unemployment, and that retaining any edible fish was an important part of their angling trip. Muth et al. (1987) stressed that rural subpopulations throughout North America, including those associated with technologically developed regions, continue to use fisheries and wildlife resources for subsistence purposes.

From a management perspective, unrestricted harvest of freshwater drum by licensed anglers appears appropriate. Escapement for reproductive purposes is not considered to be crucial to perpetuating this fishery because most freshwater drum in the tailwater are males that apparently originate in reservoirs associated with the system. Current levels of harvest should not affect future productivity and should continue to provide a substantial benefit to anglers.

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